

NOTICE: This document contains references to Varian. Please note that Varian, Inc. is now part of Agilent Technologies. For more information, go to **[www.agilent.com/chem](http://www.agilent.com/chem)**.



**Agilent Technologies**

# ***Varian Leak Test Data Wizard Software***

*OPERATION MANUAL*

Manual No. 699910003  
Revision A  
November 2006

# **Varian Leak Test Data Wizard Software**

## **Warranty**

Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

Reasonable care must be used to avoid hazards. Seller expressly disclaims responsibility for loss or damage caused by use of its Products other than in accordance with proper operating procedures.

Except as stated herein, Seller makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated herein, Seller shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise. Statements made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Seller unless reduced to writing and approved by an officer of Seller.

## **Warranty Replacement and Adjustment**

All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto, and must be received within the applicable warranty period by Seller or its authorized representative. Such claims should include the Product serial number, the date of shipment, and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from Seller or its authorized representative for the return and instructions as to how and where these Products should be returned must be obtained. Any Product returned to Seller for examination shall be prepaid via the means of transportation indicated as acceptable by Seller. Seller reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been returned by non-acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason, Customer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or non-conformity in the Product. In all cases, Seller has the sole responsibility for determining the cause and nature of failure, and Seller's determination with regard thereto shall be final.

If it is found that Seller's Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at Customer's expense; in addition, a charge for testing and examination may be made on Products so returned.

## **Items Not Covered by the Warranty**

Examples of items not normally covered under warranty include ion sources, thermocouple gauges, O-rings, spectrometer cleaning and overhaul, mechanical pump oils, vacuum system overhauls, and obvious abuse or customer error. These items are considered normal maintenance for this type of equipment.

*This page intentionally left blank.*

# Table of Contents

|   |      |
|---|------|
| Preface .....   | xi   |
| Documentation Standards .....   | xi   |
| Text .....  | xi   |
| Varian Services .....   | xi   |
| Contacting Varian .....   | xii  |
| Section 1. Leak Test Data Wizard Software Introduction and Installation ..... | 1-1  |
| 1.1 The Varian Leak Test Data Wizard Software Introduction .....              | 1-1  |
| 1.1.1 General Software Operations.....  | 1-1  |
| 1.2 Installation.....   | 1-4  |
| 1.2.1 Software Installation.....  | 1-5  |
| 1.2.2 Physical Installation.....  | 1-7  |
| Section 2. Operations .....   | 2-1  |
| 2.1 Serial Setup .....  | 2-2  |
| 2.2 Data Recorder.....  | 2-3  |
| 2.2.1 Operations Screen .....   | 2-6  |
| 2.3 Multi Part Tester.....  | 2-11 |
| 2.3.1 New Part (Evacuated Part Setup Option) .....                            | 2-11 |
| 2.3.2 Existing Part.....  | 2-17 |
| 2.3.3 Pressurized Part - Programmable Test Sequence.....                      | 2-23 |
| 2.3.4 Pressurized Part - Location/Accumulation Test Sequence .....            | 2-28 |
| Appendix A. Introduction to Leak Detection .....                              | 3-1  |
| A.1 Leak Testing—Why is it Needed? .....                                      | 3-1  |
| A.2 Varian's Helium Leak Detection Technologies .....                         | 3-1  |
| A.3 Methods of Leak Testing .....   | 3-3  |
| A.3.1 Vacuum Testing Method (Outside-in) .....                                | 3-4  |
| A.3.2 Pressure Testing Method (Inside-out) .....                              | 3-5  |
| A.3.3 System Leak Test Methods .....  | 3-6  |
| A.4 Typical Leak Detection Applications.....                                  | 3-8  |
| A.4.1 Quality Control of Production Parts and Assemblies .....                | 3-8  |
| A.4.2 Maintenance of Systems .....  | 3-8  |
| A.4.3 System Integrated Leak Detection .....                                  | 3-9  |
| A.4.4 Mass Produced Parts .....   | 3-9  |
| Appendix B. Reports .....   | B-1  |
| B.1 Data Recorder Reports.....  | B-1  |
| B.2 Parts Test Reports.....   | B-3  |

*This page intentionally left blank.*

# List of Figures

| Figure | Title                                | Page |
|--------|--------------------------------------|------|
| 1-1    | Home Screen .....                    | 1-2  |
| 1-2    | Screen Flow .....                    | 1-3  |
| 1-3    | Leak Test Data Wizard Folder .....   | 1-5  |
| 1-4    | Installer Folder .....               | 1-5  |
| 1-5    | Installation Wizard.....             | 1-6  |
| 1-6    | Leak Test Data Wizard Icon.....      | 1-6  |
| 1-7    | Control Panel .....                  | 1-7  |
| 1-8    | System Properties.....               | 1-7  |
| 1-9    | Device Manager.....                  | 1-8  |
| 1-10   | Device Manager - Ports List.....     | 1-8  |
| 1-11   | Port Settings Tab .....              | 1-9  |
| 2-1    | Serial Setup .....                   | 2-2  |
| 2-2    | Home Screen .....                    | 2-2  |
| 2-3    | Data Recorder Setup .....            | 2-3  |
| 2-4    | Operations Screen - Chart Tab.....   | 2-6  |
| 2-5    | Operations Screen - Operate Tab..... | 2-7  |
| 2-6    | Chart Tab - Indicators .....         | 2-9  |
| 2-7    | Scaling .....                        | 2-10 |
| 2-8    | Layout Popup.....                    | 2-10 |
| 2-9    | Test Setup.....                      | 2-11 |
| 2-10   | Part Setup.....                      | 2-12 |
| 2-11   | Setpoints and Units.....             | 2-12 |
| 2-12   | Pressure Setup .....                 | 2-13 |
| 2-13   | Background Setup .....               | 2-14 |
| 2-14   | Save Test Setup .....                | 2-15 |
| 2-15   | Save Dialog Box .....                | 2-15 |
| 2-16   | Final Information .....              | 2-16 |
| 2-17   | Test Setup.....                      | 2-17 |
| 2-18   | Load Test Setup.....                 | 2-17 |
| 2-19   | Save Dialog Box .....                | 2-18 |
| 2-20   | Part Setup.....                      | 2-18 |
| 2-21   | Setpoints and Units.....             | 2-19 |
| 2-22   | Pressure Setup .....                 | 2-20 |
| 2-23   | Background Setup .....               | 2-20 |
| 2-24   | Save Test Setup .....                | 2-21 |
| 2-25   | Final Information .....              | 2-22 |
| 2-26   | Create Data File.....                | 2-22 |
| 2-27   | Test Setup.....                      | 2-23 |
| 2-28   | Load Test Setup.....                 | 2-23 |
| 2-29   | Save Dialog Box .....                | 2-24 |
| 2-30   | Part Setup.....                      | 2-24 |

## Varian Leak Test Data Wizard Software

---

|      |   |      |
|------|---|------|
| 2-31 | Sequencer Setup .....                             | 2-25 |
| 2-32 | Setpoints and Units.....                          | 2-25 |
| 2-33 | Save Test Setup .....                             | 2-26 |
| 2-34 | Save Dialog Box .....                             | 2-27 |
| 2-35 | Final Information .....                           | 2-27 |
| 2-36 | Create Data File.....                             | 2-28 |
| 2-37 | Test Setup .....                                  | 2-28 |
| 2-38 | Load Test Setup .....                             | 2-29 |
| 2-39 | Save Dialog Box .....                             | 2-29 |
| 2-40 | Part Setup.....                                   | 2-30 |
| 2-41 | Setpoints and Units.....                          | 2-30 |
| 2-42 | Pressure Setup .....                              | 2-31 |
| 2-43 | Test Time .....                                   | 2-32 |
| 2-44 | Final Information .....                           | 2-32 |
| 2-45 | Create Data File.....                             | 2-33 |
| 2-46 | Example Part Leak Rates Screen.....               | 2-34 |
| 2-47 | Location Accumulation Sniffing Test.....          | 2-37 |
| 2-48 | Part Failure Message.....                         | 2-38 |
| 2-49 | Control Panel .....                               | 2-38 |
| A-1  | Magnetic Separation Principle .....               | 3-2  |
| A-2  | Selective Ion Pump Detector .....                 | 3-3  |
| A-3  | Locating Leaks: Outside In .....                  | 3-4  |
| A-4  | Measuring Leaks: Outside In .....                 | 3-4  |
| A-5  | Measuring Leaks: Inside Out .....                 | 3-5  |
| A-6  | Locating Leaks: Inside Out .....                  | 3-5  |
| A-7  | Accumulation: Inside Out.....                     | 3-6  |
| A-8  | Vacuum System.....                                | 3-7  |
| B-1  | Data Recorder - Operations Screen Printout.....   | B-1  |
| B-2  | Data Recorder - Data Printout .....               | B-2  |
| B-3  | Parts Leak Rates- Bar Chart Report Printout ..... | B-3  |
| B-4  | Parts Leak Rates- Data Printout .....             | B-4  |



# List of Tables

| Table | Title                                      | Page |
|-------|--|------|
| 1-1   | Installation Requirements .....            | 1-4  |
| 2-1   | Operations Screen Buttons and Fields ..... | 2-7  |
| 2-2   | Chart Tab Color Indicators .....           | 2-9  |
| 2-3   | Part Leak Rates Screen Components .....    | 2-35 |
| 2-4   | Part Leak Rates Message Dialogs.....       | 2-37 |
| 2-5   | Control Panel Screen Components .....      | 2-38 |

*This page intentionally left blank.*

# Preface

## Documentation Standards

This manual uses the following documentation standards:



*Notes contain important information.*



*Cautions appear before instructions, which if not followed, could cause damage to the equipment or data loss.*



*Warnings appear for a particular procedure or practice which, if not followed correctly, could lead to serious injury or death.*

### Text

Hard buttons are depicted in text in **bold** text.

Soft key screen buttons are depicted in **bold** text when part of an action.

*Italics* is used for emphasis or to indicate screen text.

## Varian Services

Varian offers:

- ☐ Rebuilt spectrometers on an exchange basis.
- ☐ NIST-traceable calibrated leak testing and verification services.
- ☐ Preventive maintenance services.
- ☐ Overhaul services.
- ☐ System recertification.
- ☐ Support agreements.
- ☐ On-site support.

Please see our catalog or contact us to learn about available services.

## **Contacting Varian**

See the back cover of this manual for a listing of our sales and service offices.

Internet users:

- ☐ Send email to Customer Service and Technical Support at [vtl.customer.service@varianinc.com](mailto:vtl.customer.service@varianinc.com)
- ☐ Visit our web site at [www.varianinc.com/vacuum](http://www.varianinc.com/vacuum)
- ☐ Order on line at [www.evarian.com](http://www.evarian.com)

*This page intentionally left blank.*



# Section 1. Leak Test Data Wizard Software Introduction and Installation

## 1.1 The Varian Leak Test Data Wizard Software Introduction

The Varian Leak Test Data Wizard software operates the VS Series leak detectors remotely from a PC/Laptop via an easily configured serial port connection. The software is a comprehensive data management package, which can be described as follows:

- ❑ Data recording and plotting mode: Displays and stores *Leak Rate vs. Time* and *Test Port Pressure vs. Time* data.
- ❑ Multiple Parts Testing mode: Custom automation of basic leak test processes. Leak rate test results are graphically displayed and statistically stored and tracked.
- ❑ Basic Control Panel functions: Remotely operate the leak detector from a PC.

### 1.1.1 General Software Operations

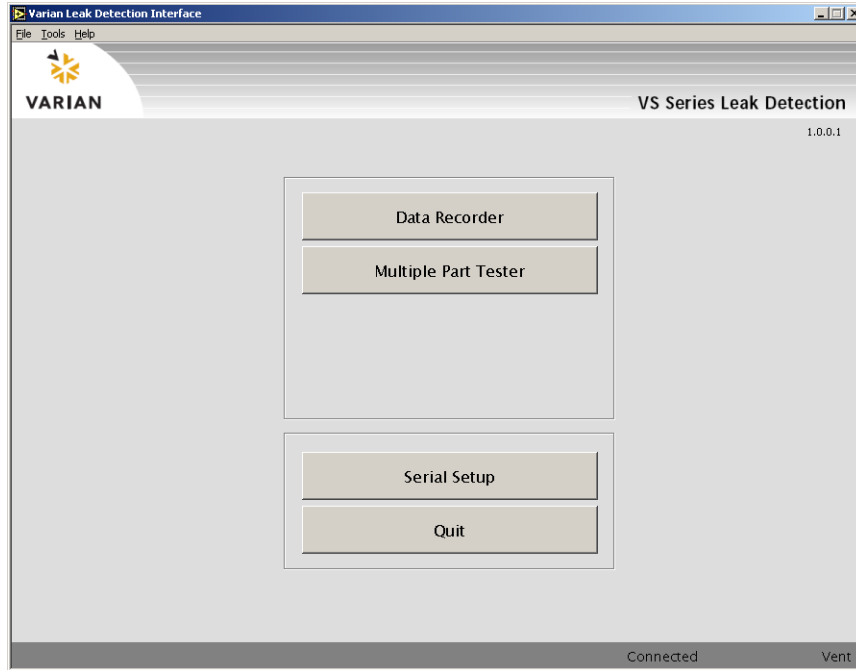
The *Home* screen (Figure 1-1) consists of four *soft* buttons:

- ❑ *Data Recorder* - Opens the *Data Recorder Setup* dialog to configure recording parameters and leads to the *Operations* screen (*Operate* and *Chart* tabs), where monitoring and recording of the leak rate and the test port pressure occurs.
- ❑ *Multiple Part Tester* - Open operations related to the various isolation leak rate tests the software supports. Section A “Introduction to Leak Detection” gives a general discussion of the types of tests available.
- ❑ *Serial Setup* - Opens a dialog to choose the COM port for use.
- ❑ *Quit* - Exits the program.

All operator control and monitoring of results are achieved via the resident software from the Home screen. Operational discussions are in Section 2 “Operations”.

# Varian Leak Test Data Wizard Software

---



**Figure 1-1 Home Screen**



## Varian Leak Test Data Wizard Software

The leak detector operator interface functions through a series of screens, which are navigated as in Figure 1-2.

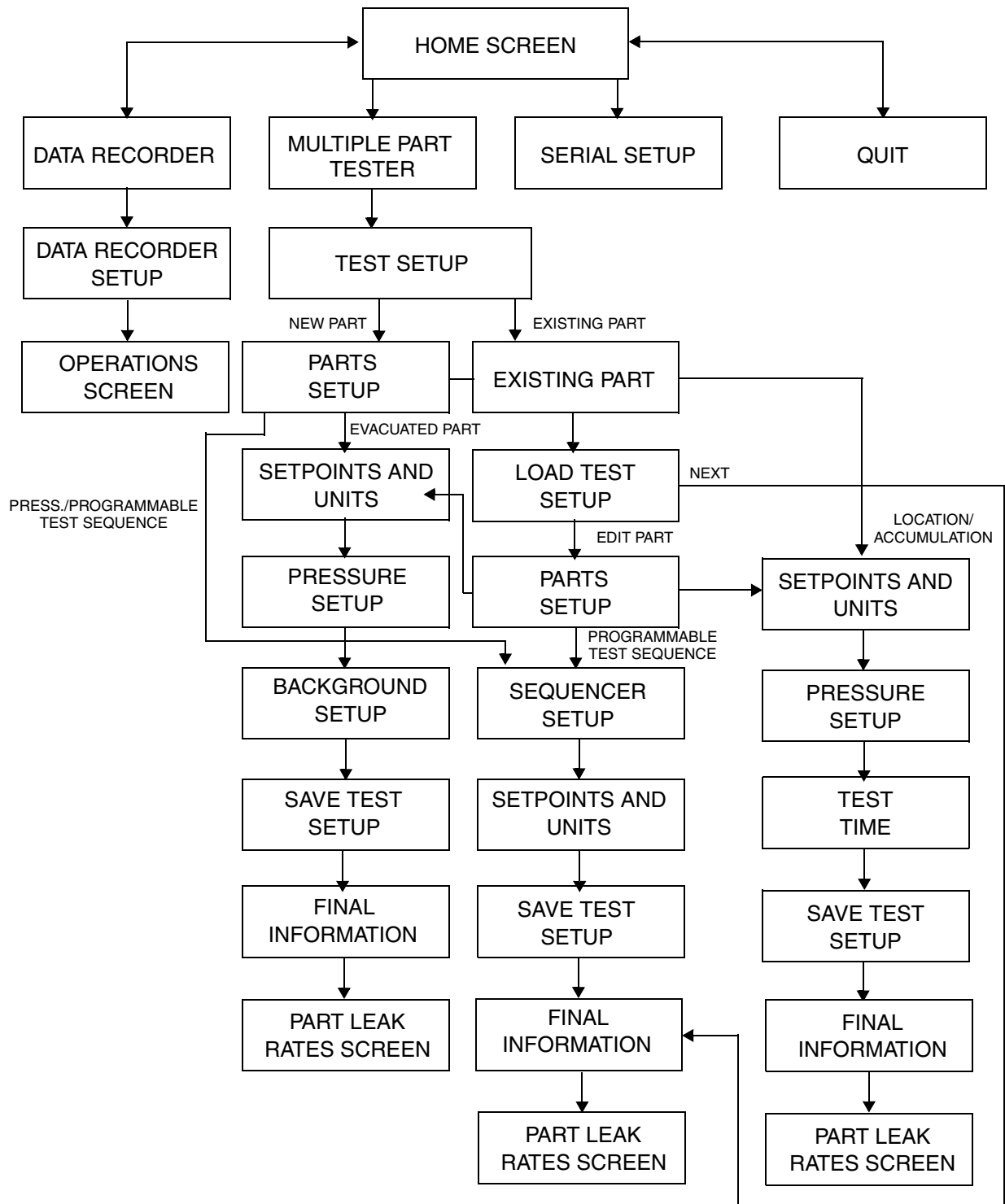


Figure 1-2 Screen Flow

## 1.2 Installation

This section explains the physical and software installations.

**CAUTION**

*Read the Preface for all operational warnings and cautions.*



Installation requirements are described in Table 1-1.

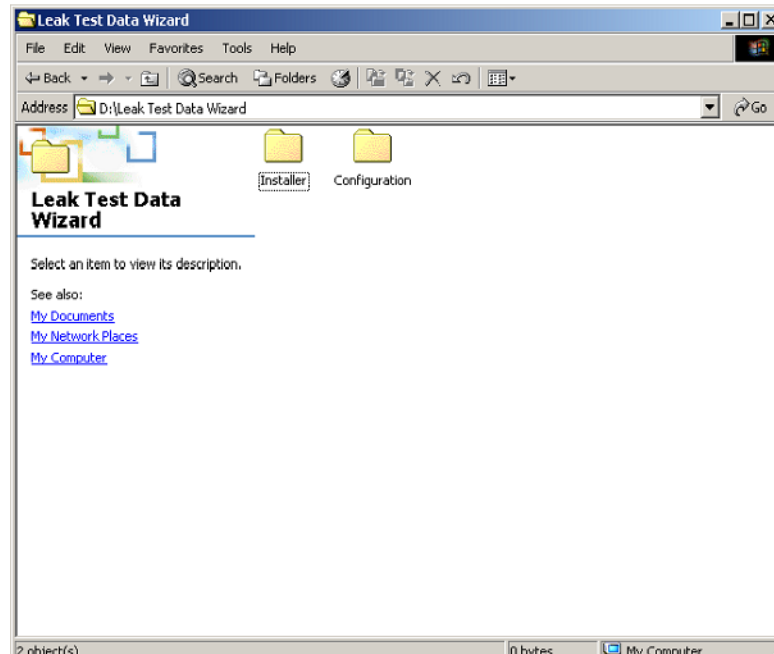
**Table 1-1 Installation Requirements**

| Item             | Requirement  |
|------------------|--|
| Operating System | <input type="checkbox"/> Windows 98, 2000 or XP  |
| Computer         | <input type="checkbox"/> Processor: 266 MB or higher<br><input type="checkbox"/> CD drive for installation<br><input type="checkbox"/> 30 MB of available hard disk space for installation<br><input type="checkbox"/> Minimum of 384 MB total RAM |
| Other Hardware   | <input type="checkbox"/> 9-pin serial (RS-232) null modem cable  |

### 1.2.1 Software Installation

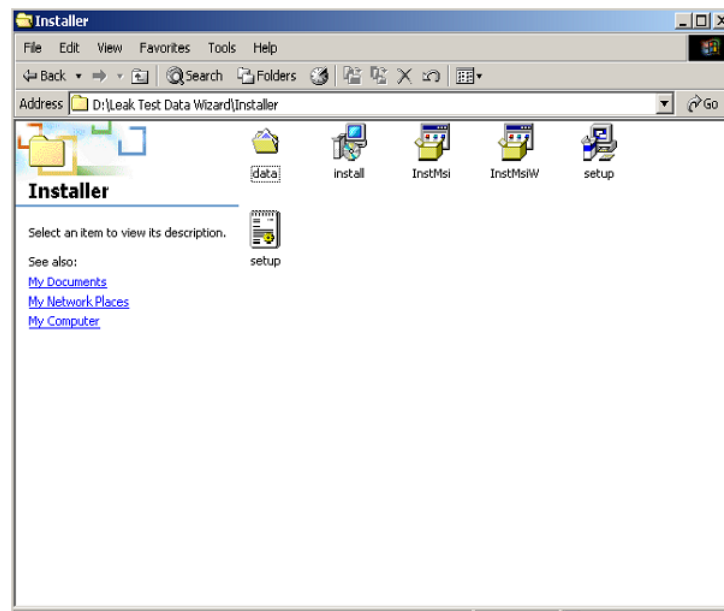
To install the software:

1. Insert the CD.
2. Open *Leak Test Data Wizard* folder (Figure 1-3).



**Figure 1-3 Leak Test Data Wizard Folder**

3. Open *Installer* folder and select *Setup* (Figure 1-4).



**Figure 1-4 Installer Folder**

## Varian Leak Test Data Wizard Software

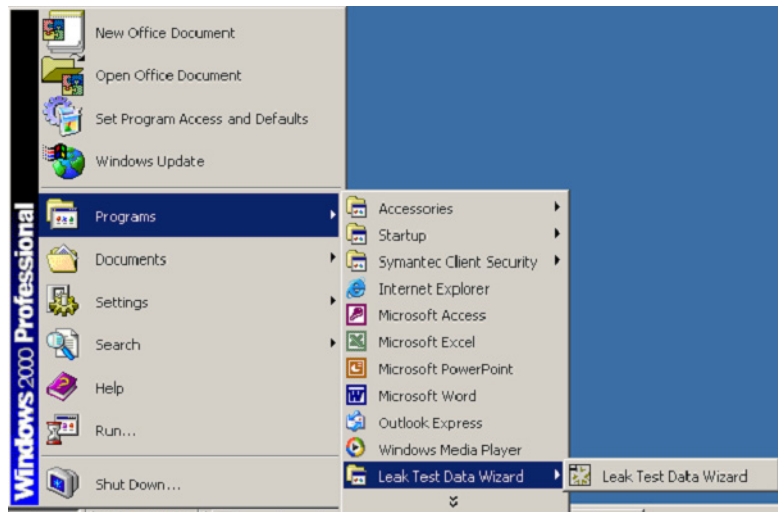
4. Follow the *Leak Test Data Wizard Installation Wizard* prompts (Figure 1-5).



**Figure 1-5 Installation Wizard**

The *Programs* folder is the default directory, this can be changed during the installation procedure.

5. Open the program by clicking on the *Leak Test Data Wizard* icon (Figure 1-6).

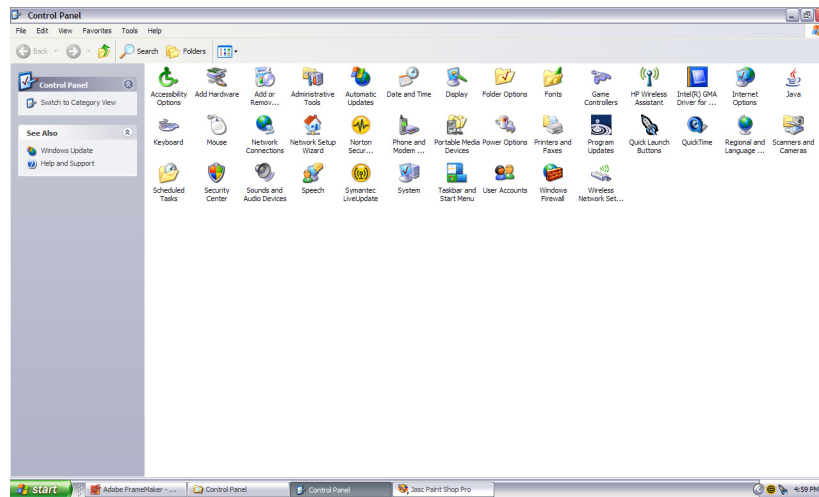


**Figure 1-6 Leak Test Data Wizard Icon**

## 1.2.2 Physical Installation

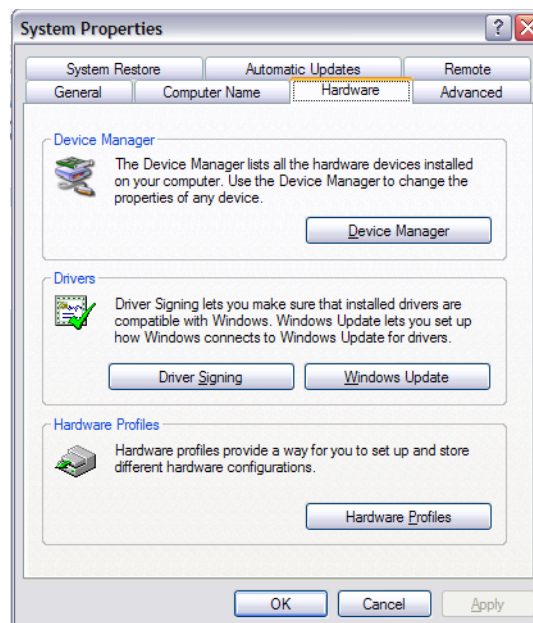
The physical installation requires two steps:

1. Install a null RS-232 cable from the laptop/computer to the 9-pin RS232 connection of the VS Series leak detector. The serial port is selected using the interface software. To do this:
2. Select *Start > Settings > Control Panel* and the *Control Panel* appears (Figure 1-7).



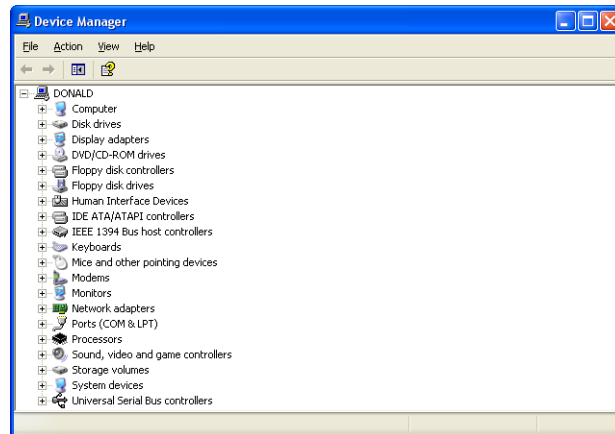
**Figure 1-7 Control Panel**

3. Click the *System* icon and the *System Properties* dialog appears (Figure 1-8).



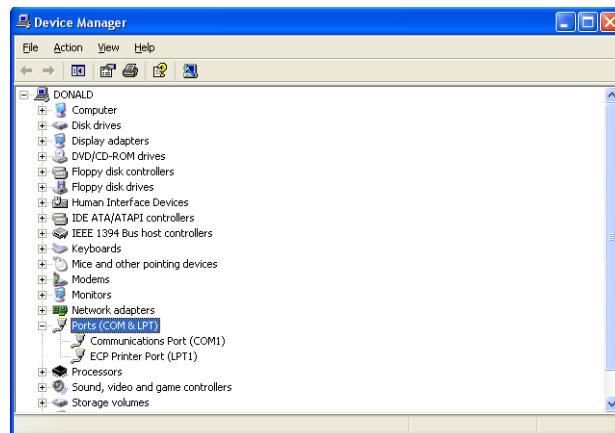
**Figure 1-8 System Properties**

4. Click **Hardware** and then **Device Manager** and the *Device Manager* appears (Figure 1-9).



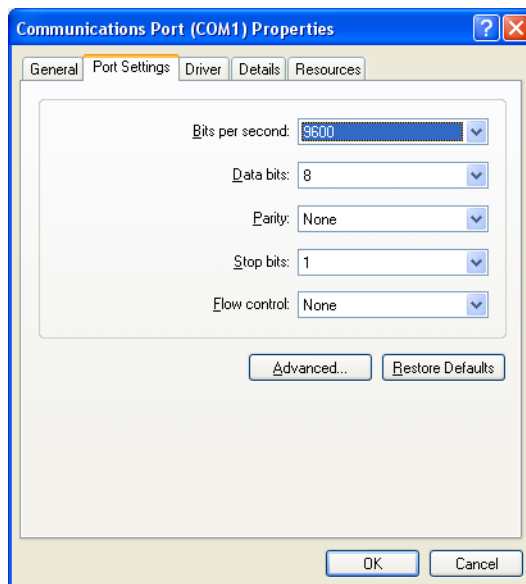
**Figure 1-9 Device Manager**

5. Double-click on **Ports (COM & LPT)** and the list of ports appears below (Figure 1-10).



**Figure 1-10 Device Manager - Ports List**

- Double-click on the required port and the *Communications Port Properties* dialog appears. Click the **Port Settings** tab and it appears (Figure 1-10).



**Figure 1-11 Port Settings Tab**

- Configure the COM port to the following specifications:
  - ☐ Baud rate - 9600
  - ☐ Bit - 8 bit
  - ☐ Stop - 1
  - ☐ Parity - None
- Configure the COM port for the software using the procedure given in Section 2.1 "Serial Setup" on page 2-2.

**NOTE**



*PDA devices (palm pilots), if active, usually default to comm port 1. To activate the comm port for communication with the leak detector:*

- Open Windows Task Manager.*
- Click the **Processes** tab, and disable the PDA device.*

*This page intentionally left blank.*



## Section 2. Operations

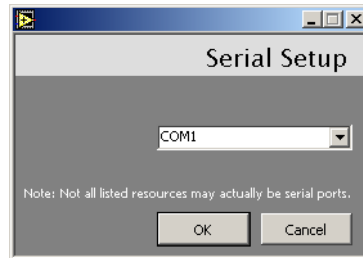
This chapter explains the software operations, including:

- ❑ Section 2.1 “Serial Setup”
- ❑ Section 2.2 “Data Recorder” on page 2-3
  - ❑ Section 2.2.1 “Operations Screen” on page 2-6
- ❑ Section 2.3 “Multi Part Tester” on page 2-11
  - ❑ Section 2.3.1 “New Part (Evacuated Part Setup Option)” on page 2-11
  - ❑ Section 2.3.2 “Existing Part” on page 2-17
  - ❑ Section 2.3.3 “Pressurized Part - Programmable Test Sequence” on page 2-23
  - ❑ Section 2.3.4 “Pressurized Part - Location/Accumulation Test Sequence” on page 2-28
    - ❑ Section 2.3.4.1 “Part Leak Rates” on page 2-34
    - ❑ Section 2.3.4.2 “Control Panel” on page 2-38

### 2.1 Serial Setup

The software arrives from the factory set to COM port 1 and always defaults to COM1. If COM1 is not available, you must manually select another comm port.

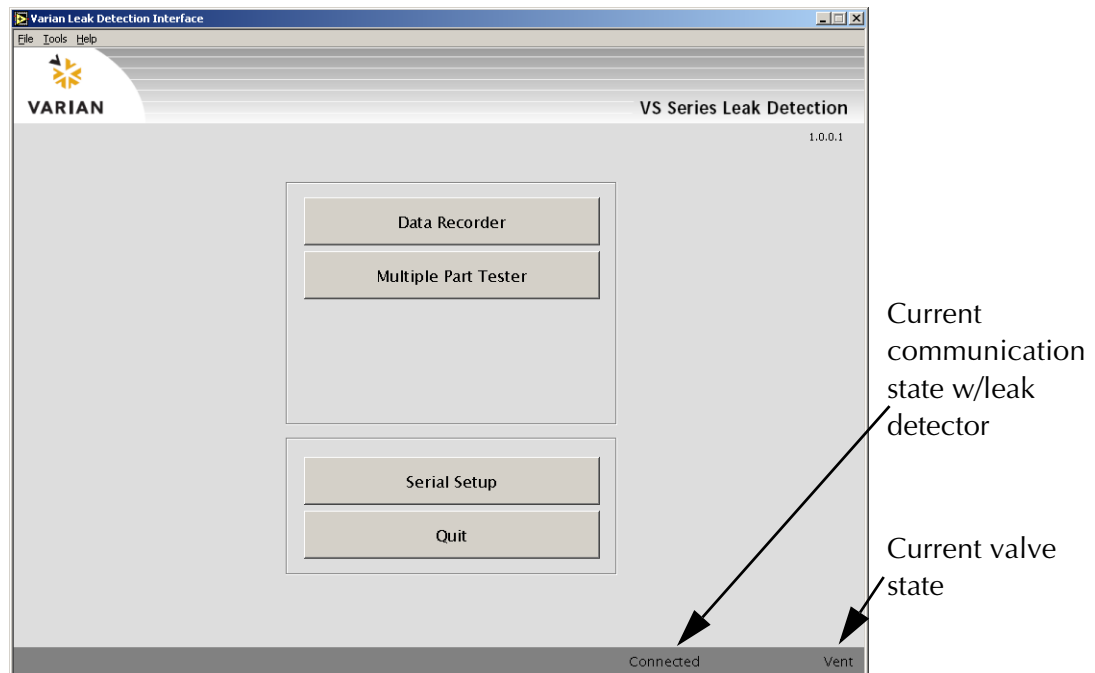
Use Figure 2-1 for the serial set up.



**Figure 2-1 Serial Setup**

To set up the serial connection:

1. Click **Serial Setup** on the *Home* screen and Figure 2-1 appears.
2. Use the pulldown to select the serial port:
  - ☐ COM1
  - ☐ COM2
  - ☐ COM10
3. Click **OK** to save the set up and the *Home* screen reappears (Figure 2-2).



**Figure 2-2 Home Screen**

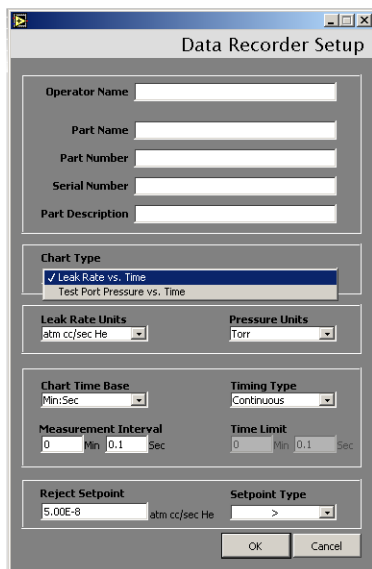


*If a No Connection message appears when using a comm port other than 1:*

1. Open Data Recorder.
2. Open the the Operations screen.
3. Click the Test and Vent buttons.
4. Verify if the leak detector responds.
5. Verify that Connected appears in the bottom right corner of the Data Recorder screen, along with the current mode of operation.

## 2.2 Data Recorder

Use Figure 2-3 to set up the data recorder.



**Figure 2-3 Data Recorder Setup**

To set up the data recorder:

1. Click **Data Recorder** on the *Home* screen and Figure 2-3 appears.
2. Enter the *Operator Name*.
3. Enter the *Part Name*.
4. Enter the *Part Number*.
5. Enter the *Serial Number*.
6. Enter the *Part Description*.

7. Use the pulldown to select the *Chart Type*:
  - ☐ *Leak Rate vs. Time* - Useful for:
    - ☐ Characterizing a system pumpdown for background considerations.
    - ☐ General leak checking practices.
  - ☐ *Test Port Pressure vs. Time* - Useful as a tool for a rate-of-use test. In this case, you pump down to a predetermined vacuum level and place the leak detector into Hold and monitor the rate and rise in pressure over time (if any). This is useful in determining gross leaks prior to Helium leak checking.
8. Use the pulldown to select the *Leak Rate Units*:
  - ☐ *atm cc/sec He*
  - ☐ *mbar l/s*
  - ☐ *Torr l/s*
  - ☐ *Pa m<sup>3</sup>/sec*
  - ☐ *Cubic ft/year*
9. Use the pulldown to select the *Pressure Units*:
  - ☐ *Torr*
  - ☐ *mbar*
  - ☐ *Pa*
10. Use the pulldown to select the *Chart Time Base*:
  - ☐ *Hour:Min:Sec*
  - ☐ *Min:Sec*
  - ☐ *Sec*
11. Use the pulldown to select the *Timing Type*:
  - ☐ *Continuous Recording*
  - ☐ *Time Limit* - activates the *Time Limit* field.
12. Enter the *Measurement Interval*:
  - ☐ *Min* - default is 0
  - ☐ *Sec* - default is .1 secs (100 msec).

### CAUTION



*If you are monitoring a Leak Rate vs. Time or a Test Port Pressure vs. Time for a period of time > 4 to 8 hours, change the Measurement Interval to a more conservative time, such as 1 - 10 seconds or one minute (slow trends). Ensure that the program that opens the chart file has sufficient physical memory available to Windows. Notepad is the suggested program for large files.*

13. Enter the *Time Limit*.
14. Enter a *Reject Setpoint* value. Appears on the chart as a white line.
15. Use the pulldown to select the *Setpoint Type*:
  - ☐ *Off*
  - ☐ *<*
  - ☐ *>*
16. Click **OK** to save the set up and the *Operations* screen appears.

### 2.2.1 Operations Screen

Figure 2-4 and Figure 2-5 show the *Chart* and *Operate* tabs of the *Operations* screen. This screen comprises two tabs:

- ☐ *Chart* - Use this to:
  - ☐ Perform simple chart control functions.
  - ☐ Customize the XY axis for finer resolution.
  - ☐ Create and load data files.
  - ☐ Display and print data (charts).
- ☐ *Operate* - Use this to perform the following leak detector functions:
  - ☐ Perform a Test or Vent sequence
  - ☐ Zero the leak detector
  - ☐ Calibrate the leak detector
  - ☐ Engage/disengage the standard leak mode

Not available for *Test Port Pressure vs. Time*

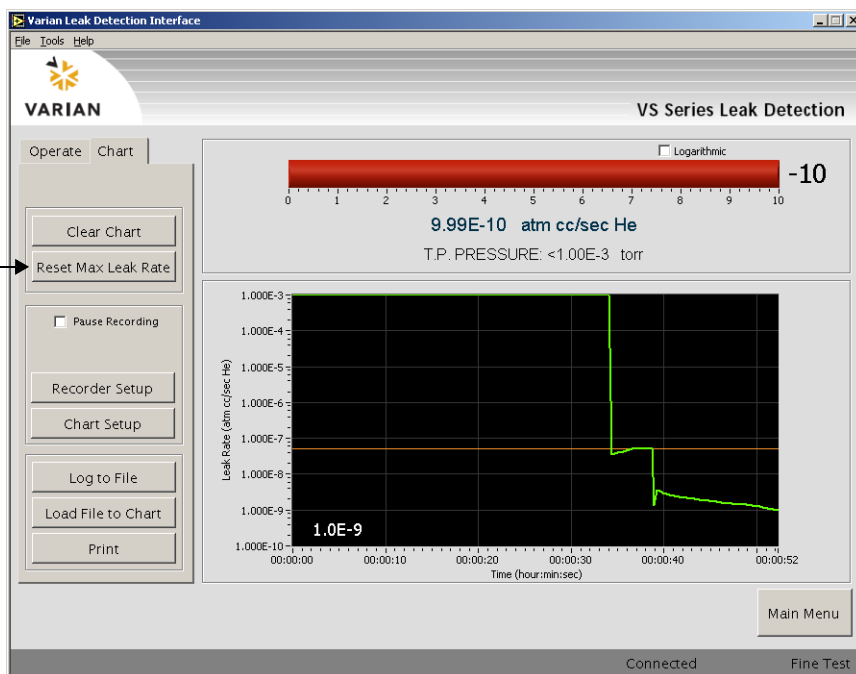
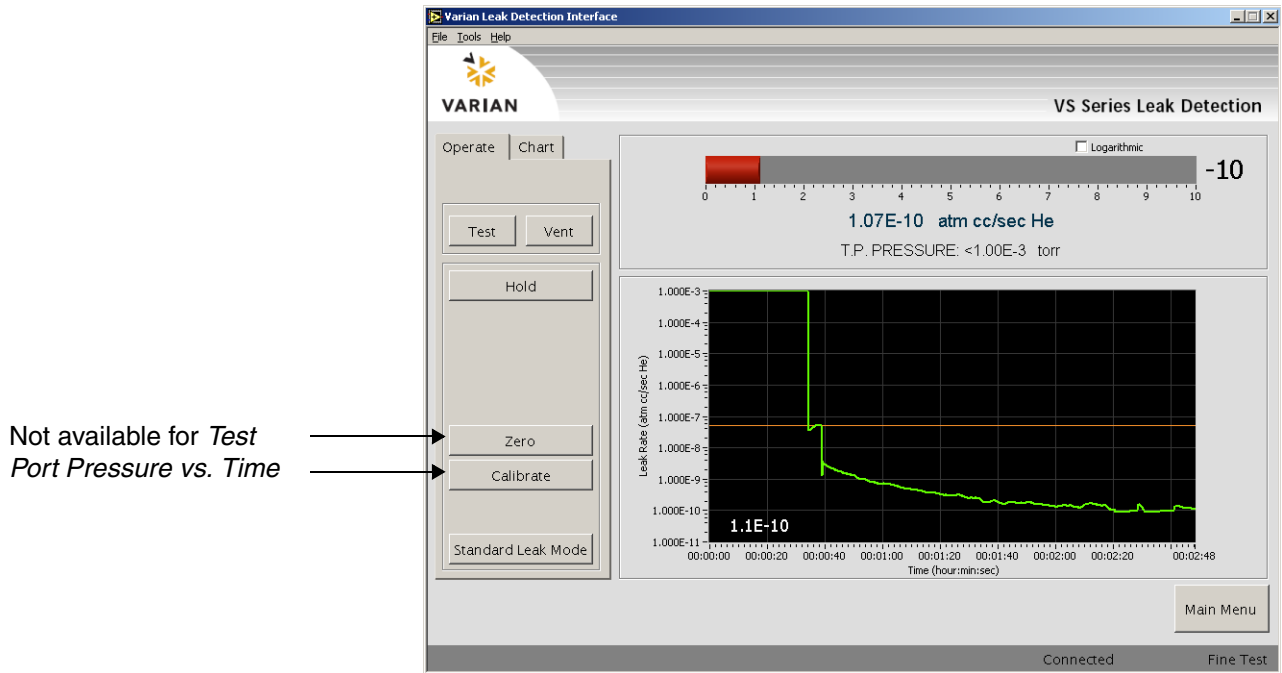


Figure 2-4 Operations Screen - Chart Tab



**Figure 2-5 Operations Screen - Operate Tab**

Table 2-1 explains the functions of the screen buttons and fields.

**Table 2-1 Operations Screen Buttons and Fields**

| Item                       | Function   |
|----------------------------|--|
| <b>Chart</b>               |  |
| <i>Clear Chart</i>         | Clears the display area, empties the data in the buffer  |
| <i>Reset Max Leak Rate</i> | Resets the maximum leak rate, as set on the TBD.   |
| <i>Pause Recording</i>     | Pauses the recording until unchecked. This is useful when it is required to get a clear starting data point for a test.    |
| <i>Recorder Setup</i>      | Opens the <i>Data Recorder Setup</i> dialog (see Section 2.2 "Data Recorder" on page 2-3).                                 |
| <i>Chart Setup</i>         | Opens the Scaling dialog to configure chart presentation characteristics (see Section 2.2.1.2 "Chart Setup" on page 2-10). |
| <i>Log to File</i>         | Opens a <i>Save As</i> dialog to save the chart recorder file (.rec).  |
| <i>Load File to Chart</i>  | Opens a <i>Open</i> dialog to open an existing chart recorder file (.rec) for use in the present session.                  |
| <i>Print</i>               | Opens a standard print dialog to print the chart to a printer.   |

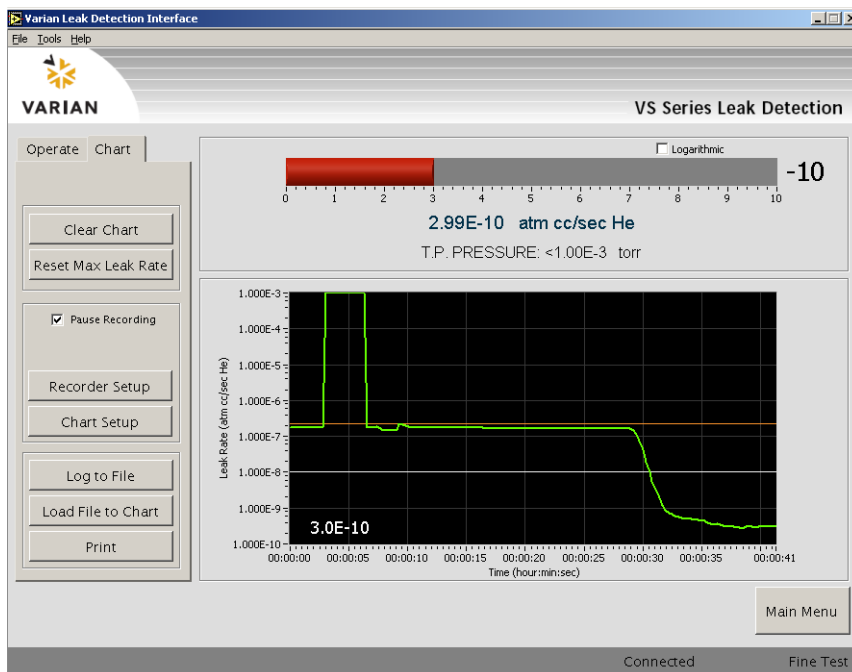
**Table 2-1 Operations Screen Buttons and Fields (Continued)**

| Item                      | Function  |
|---------------------------|---|
| <i>Logarithmic</i>        | Click to change the bar chart to a log form.  |
| <i>Main Menu</i>          | Click to return to the <i>Home</i> screen. If the system is in test, the <i>Exit to Main Menu?</i> dialog appears. Click:<br><input type="checkbox"/> <b>Yes</b> to exit testing; all unsaved data is lost.<br><input type="checkbox"/> <b>No</b> to cancel and continue testing. |
| <b>Operate</b>            |   |
| <i>Test</i>               | Engages the test mode until another button is clicked.  |
| <i>Vent</i>               | Engages the vent mode until another button is clicked.  |
| <i>Hold</i>               | Engages the hold mode until the Test button is clicked.   |
| <i>Zero</i>               | Zeroes the leak detector.   |
| <i>Calibrate</i>          | Calibrates the leak detector.   |
| <i>Standard Leak Mode</i> | Engages the standard leak mode until another button is clicked.   |
| <i>Logarithmic</i>        | Changes the bar chart to a log form.  |
| <i>Main Menu</i>          | Returns you to the <i>Home</i> screen. If the system is in test, the <i>Exit to Main Menu?</i> dialog appears. Click:<br><input type="checkbox"/> <b>Yes</b> to exit testing; all unsaved data is lost.<br><input type="checkbox"/> <b>No</b> to cancel and continue testing..    |



## 2.2.1.1 Chart Indicators

This section discusses the indicators that appear on the chart. Figure 2-6 shows a sample *Chart* tab and Table 2-2 explains the color usage.



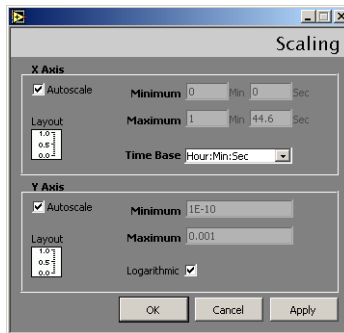
**Figure 2-6 Chart Tab - Indicators**

**Table 2-2 Chart Tab Color Indicators**

| Color            | Meaning                      |
|------------------|------------------------------|
| Orange line      | Maximum leak rate            |
| White line       | Reject setpoint limit        |
| Green line trace | Reject setpoint within limit |
| Red line trace   | Reject setpoint beyond limit |

## 2.2.1.2 Chart Setup

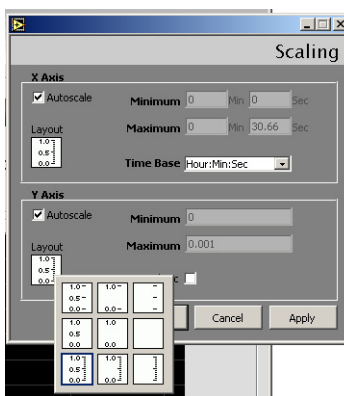
Use Figure 2-7 to set up the chart preferences.



**Figure 2-7 Scaling**

To set up the chart:

1. Click **Chart Setup** on the *Chart* tab of the Operations screen and Figure 2-7 appears.
2. Click the **Autoscale** check box for the X-axis and the program defaults are used for the *Minimum* and *Maximum* fields.
3. Enter the *Minimum* time for display. This becomes the origin point of the chart, if required.
4. Enter the *Maximum* time for display on the axis. This becomes the origin point of the chart, if required.
5. Use the pulldown to select the *Time Base*:
  - ☐ *Hour:Min:Sec*
  - ☐ *Min:Sec*
  - ☐ *Sec*
6. Click the **Layout** box and a popup appears to select the desired scale layout for the axis (Figure 2-8).



**Figure 2-8 Layout Popup**

7. Repeat steps 2 through 6 for the Y-axis.
8. Click the **Logarithmic** check box to set logarithmic as the display default. This can be temporarily overridden using the *Logarithmic* check box on the *Operations* screen.
9. Click **Apply** to save the changes and click **OK** to exit the dialog box and the *Operations* screen reappears.

## 2.3 Multi Part Tester

The Multi Part Tester function consists of several different paths (See Figure 1-2 on page 1-3):

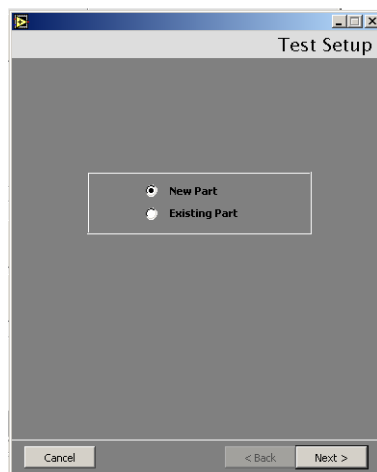
- ❑ Section 2.3.1 “New Part (Evacuated Part Setup Option)”
- ❑ Section 2.3.2 “Existing Part” on page 2-17
- ❑ Section 2.3.3 “Pressurized Part - Programmable Test Sequence” on page 2-23
- ❑ Section 2.3.4 “Pressurized Part - Location/Accumulation Test Sequence” on page 2-28

### 2.3.1 New Part (Evacuated Part Setup Option)

This test is an outside-in test type. For more information on this refer to Section A.3.1 “Vacuum Testing Method (Outside-in)” on page A-4.

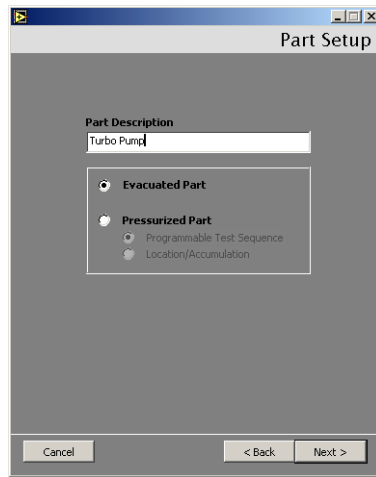
To configure a new part for test:

1. Click **Multi Part Tester** on the *Home* screen and Figure 2-9 appears.



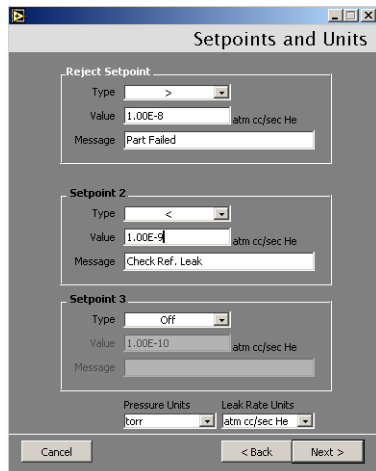
**Figure 2-9 Test Setup**

2. Click **New Part** and click **Next** and Figure 2-10 appears.



**Figure 2-10 Part Setup**

3. Enter a *Part Description*, click **Evacuated Part** and then click **Next** and Figure 2-11 appears.

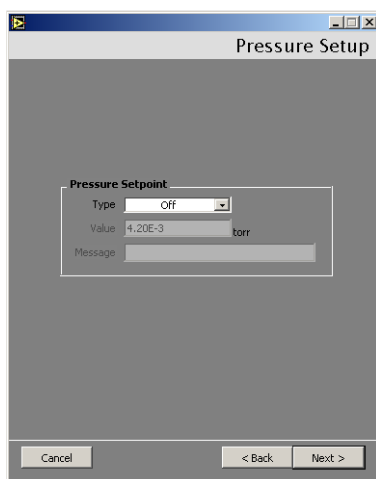


**Figure 2-11 Setpoints and Units**

4. Configure the *Reject Setpoint* by:
  - ☐ Using the pulldown to select the *Type*:
    - ☐ *Off*
    - ☐ *<*
    - ☐ *>*
  - ☐ Entering the reject setpoint *Value*. The label to the right is configured via the *Leak Rate Units* pulldown.
  - ☐ Entering the *Message* that appears on the *Part Leak Rates* screen when the value is activated.

5. Repeat step 4 for *Setpoint 2* and *Setpoint 3*. These two setpoints are used for non-reject setpoints. They are statistically tracked, but not against the reject level. Some uses include reference leaks and test fixturing applications.
6. Use the pulldown to select the *Pressure Units* that appear on the *Part Leak Rates* screen.
7. Use the pulldown to select the *Leak Rate Units* that appear on the *Part Leak Rates* screen.
8. Click **Next** and Figure 2-12 appears.

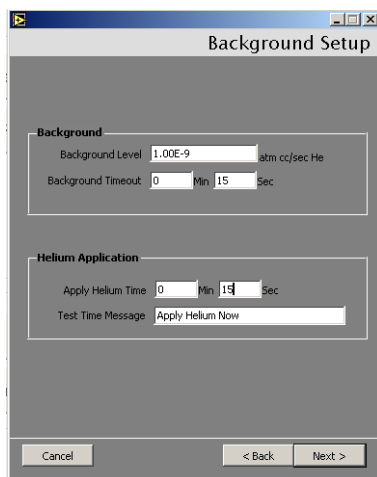
This setup is useful for monitoring elevated test port pressures, for example, nitrogen purge pressure.



**Figure 2-12 Pressure Setup**

9. Configure the *Pressure Setpoint* by:
  - ☐ Using the pulldown to select the *Type*:
    - ☐ *Off*
    - ☐ *<*
    - ☐ *>*
  - ☐ Enter a pressure setpoint *Value* for either a *<* or *>* condition.
  - ☐ Enter a *Message* that appears on the *Part Leak Rates* screen when the pressure setpoint value is activated.

10. Click **Next** and Figure 2-13 appears.



**Figure 2-13 Background Setup**

11. Configure the *Background* by:

- ☐ Entering a *Background Level* value. The label to the right is configured via the *Leak Rate Units* pulldown on the *Setpoints and Units* dialog box.

**CAUTION**



*Go one decade below the reject setpoint to avoid triggering false rejects. For example, if the reject setpoint is 1E-8, set this field to 1E-9.*

- ☐ Entering the *Background Timeout* value. Prior to actual testing, characterize the unit or fixture under test to obtain this time out limit.

**NOTE**



*Actual testing starts (tracking reject and non-reject setpoints) once the background level has been achieved within the programmed timeout limit.*

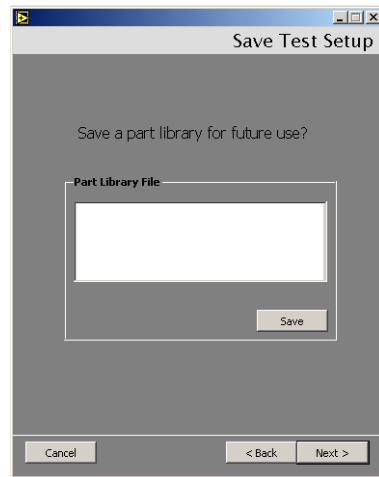
12. Configure the *Helium Application* by:

- ☐ Entering the *Apply Helium Time* value.

Example: Set this field for a bag test (dwell time in He rich environment) or an automated test (see Figure A-4 on page A-4). This is set to zero for a manual test.

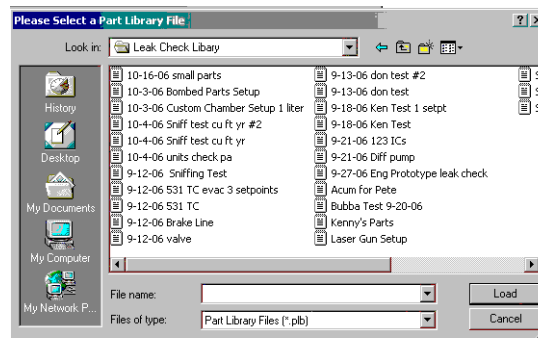
- ☐ Entering the *Test Time Message*. This message appears on the *Part Leak Rates* screen when the helium is required. The *Apply Helium Now* message appears during operation as a prompt.

13. Click **Next** and Figure 2-14 appears.



**Figure 2-14 Save Test Setup**

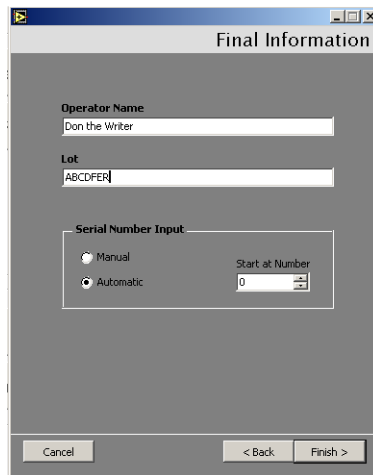
14. Click **Save** and Figure 2-15 appears.



**Figure 2-15 Save Dialog Box**

15. Navigate to the required directory and enter a *File Name* and click **Save**. Figure 2-14 reappears with the file name and path populated into the *Part Library File* field.

16. Click **Next** and Figure 2-16 appears.



**Figure 2-16 Final Information**

17. Enter the *Operator Name*.

18. Enter the *Lot*.

19. Configure the *Serial Number Input* by either:

- ☐ Clicking **Manual**, which allows you to manually input the serial or port number after each test cycle.

or

- ☐ Clicking **Automatic**, which increments each test by one starting with the programmed value stored in the *Start at Number* pull down selection.

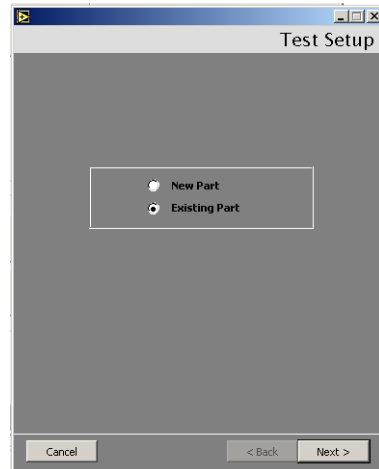
20. Click **Next** and the *Part Leak Rates* screen appears.



### 2.3.2 Existing Part

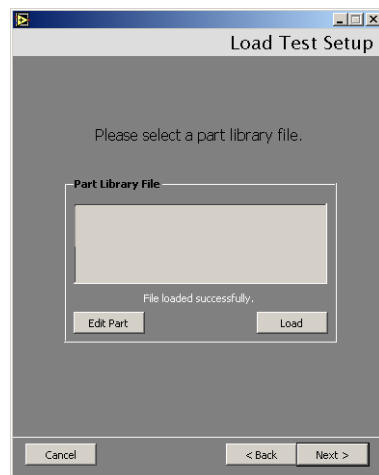
To configure an existing part for test:

1. Click **Multi Part Tester** on the *Home* screen and Figure 2-17 appears.



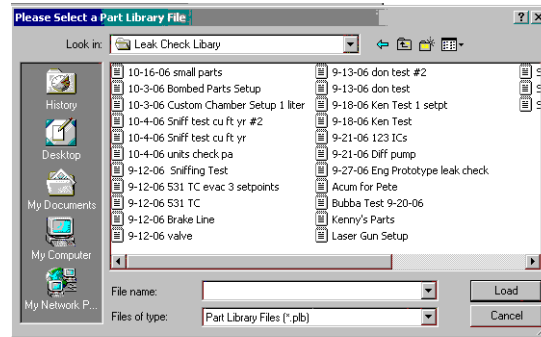
**Figure 2-17 Test Setup**

2. Click **Existing Part** and click **Load** and Figure 2-18 appears.



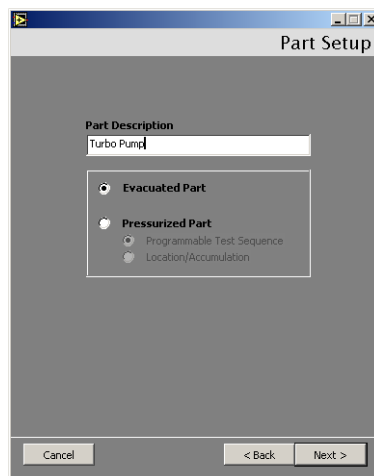
**Figure 2-18 Load Test Setup**

3. Click **Load** and Figure 2-19 appears.



**Figure 2-19 Save Dialog Box**

4. Navigate to the required directory and select a file and click **Load**. Figure 2-18 reappears with the file name and path populated into the *Part Library File* field.
5. Click either:
  - ☐ **Edit Part** and Figure 2-20 appears from which you can change the configuration of the existing part. Proceed to step 6.



**Figure 2-20 Part Setup**

or

- ☐ **Next** and the *Final Info* screen appears from which you can run the test as already configured. Proceed to step 17.

6. Enter a *Part Description*, click **Evacuated Part** and click **Next** and Figure 2-21 appears.

The screenshot shows a window titled "Setpoints and Units". It contains three configuration sections:

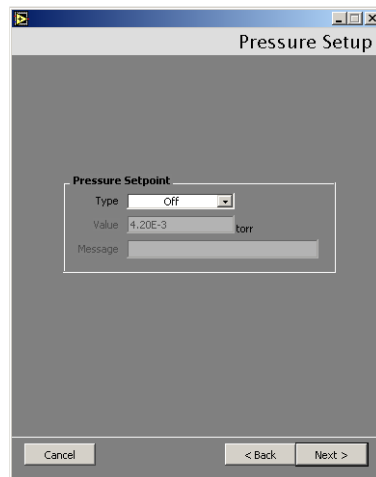
- Reject Setpoint:** Type is ">", Value is "1.00E-8", and Message is "Part Failed".
- Setpoint 2:** Type is "<", Value is "1.00E-9", and Message is "Check Ref. Leak".
- Setpoint 3:** Type is "Off", Value is "1.00E-10", and Message is empty.

At the bottom, there are two dropdown menus: "Pressure Units" (set to "Torr") and "Leak Rate Units" (set to "atm cc/sec He"). Below these are three buttons: "Cancel", "< Back", and "Next >".

**Figure 2-21 Setpoints and Units**

7. Configure the *Reject Setpoint* by:
- ☐ Using the pulldown to select the *Type*:
    - ☐ *Off*
    - ☐ *<*
    - ☐ *>*
  - ☐ Entering the reject setpoint *Value*. The label to the right is configured via the *Leak Rate Units* pulldown.
  - ☐ Entering the *Message* that appears on the *Part Leak Rates* screen when the value is activated.
8. Repeat step 4 for *Setpoint 2* and *Setpoint 3*. These fields are not usually configured for this test type.
9. Use the pulldown to select the *Pressure Units* that appear on the *Part Leak Rates* screen.
10. Use the pulldown to select the *Leak Rate Units* that appear on the *Part Leak Rates* screen.

11. Click **Next** and Figure 2-22 appears.

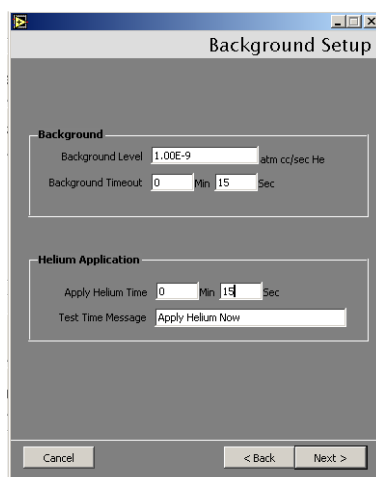


**Figure 2-22 Pressure Setup**

12. Configure the *Pressure Setpoint* by:

- ☐ Using the pulldown to select the *Type*:
  - ☐ *Off*
  - ☐ *<*
  - ☐ *>*
- ☐ Enter a pressure setpoint *Value* for either a *<* or *>* condition.
- ☐ Enter a *Message* that appears on the *Part Leak Rates* screen when the pressure setpoint value is activated.

13. Click **Next** and Figure 2-23 appears.



**Figure 2-23 Background Setup**

14. Configure the *Background* by:

- ☐ Entering a *Background Level* value. The label to the right is configured via the *Leak Rate Units* pulldown on the *Setpoints and Units* dialog box.

**CAUTION**



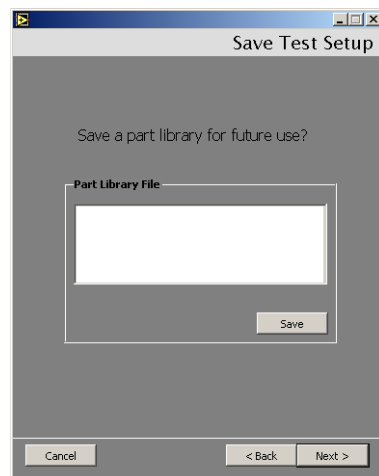
*Go one decade below the reject setpoint to avoid triggering false rejects. For example, if the reject setpoint is 1E-8, set this field to 1E-9.*

- ☐ Entering the *Background Timeout* value. Prior to actual testing, characterize the unit or fixture under test to obtain this time out limit.

15. Configure the *Helium Application* by:

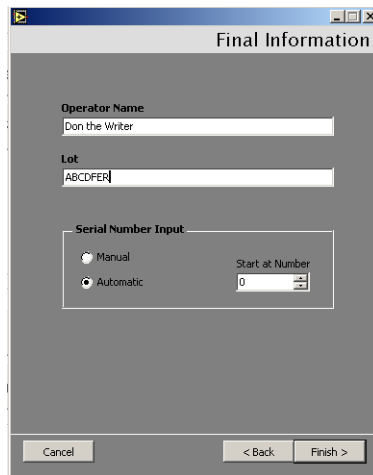
- ☐ Entering the *Apply Helium Time* value. Set this field for a bag test (dwell time in He rich environment) or an automated test (see Figure A-4 on page A-4). This is set to zero for a manual test.
- ☐ Entering the *Test Time Message*. This message appears on the *Part Leak Rates* screen when the helium is required.

16. Click **Next** and Figure 2-24 appears.



**Figure 2-24 Save Test Setup**

17. Click **Next** and Figure 2-25 appears.



**Figure 2-25 Final Information**

18. Enter the *Operator Name*.

19. Enter for the *Lot*.

20. Configure the *Serial Number Input* by either:

- ☐ Clicking **Manual**, which allows you to manually input the serial or part number after each test cycle.



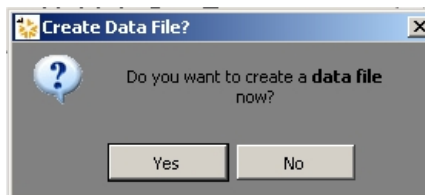
**NOTE**

*A bar code reader can be used to import the part/serial number.*

or

- ☐ Clicking **Automatic**, which increments each test by one starting with the programmed value stored in the *Start at Number* pull down selection.

21. Click **Finish** and the *Create Data File* dialog appears (Figure 2-26).



**Figure 2-26 Create Data File**

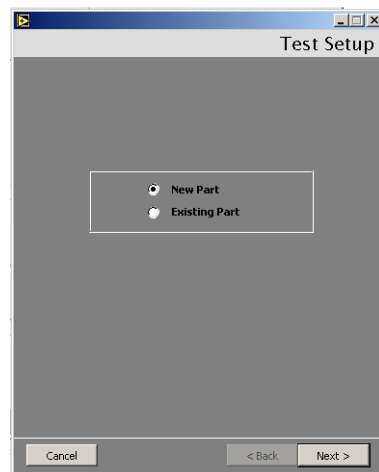
22. Click **Yes** and the *Part Leak Rates* screen appears.

### 2.3.3 Pressurized Part - Programmable Test Sequence

This test is an inside-out test type. For more information on this refer to Section A.3.2 “Pressure Testing Method (Inside-out)” on page A-5. This test is also useful as an evacuated test part method.

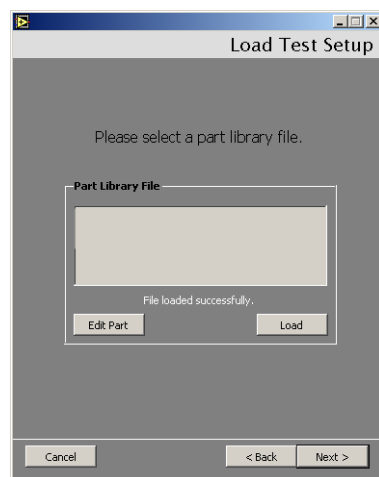
To configure a pressurized part for a programmable test sequence test:

1. Click **Multi Part Tester** on the *Home* screen and Figure 2-27 appears.



**Figure 2-27 Test Setup**

2. Click either:
  - ❑ **Existing Part** and click **Next** and Figure 2-28 appears.

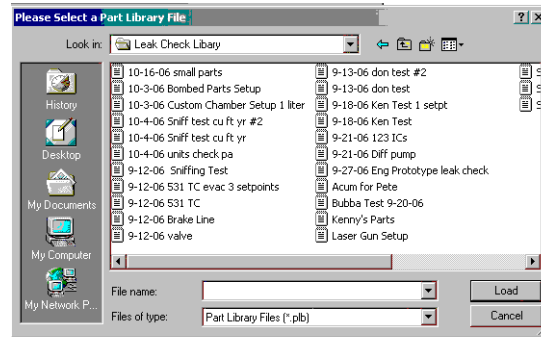


**Figure 2-28 Load Test Setup**

or

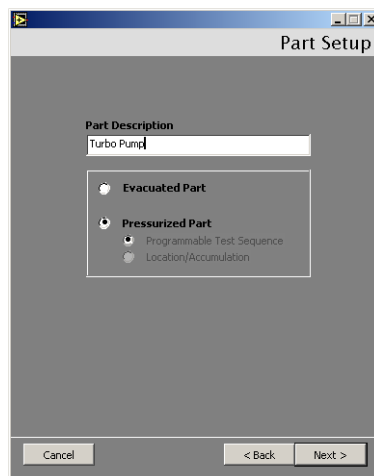
- ❑ **New Part** and proceed to step 5.

3. Click **Load** and Figure 2-29 appears.



**Figure 2-29 Save Dialog Box**

4. Navigate to the required directory and select a file and click **Load**. Figure 2-28 reappears with the file name and path populated into the *Part Library File* field.
5. Click either:
  - ☐ **Edit Part** and Figure 2-30 appears from which you can change the configuration of the existing part. Proceed to step 6.



**Figure 2-30 Part Setup**

or

- ☐ **Next** and the *Final Info* screen appears from which you can run the test as already configured. Proceed to step 16.



6. Enter a *Part Description*, click **Pressurized Part**, which activates the radio buttons below, click **Programmable Test Sequence** and click **Next** and Figure 2-31 appears.

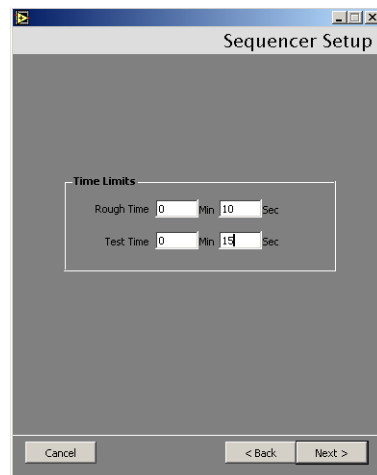


Figure 2-31 Sequencer Setup



**NOTE**

*The sequencer test does not fail a part until the end of the test. All other test fail a part immediately.*

7. Configure the *Time Limits* by entering the *Rough Time* and *Test Time*.



**NOTE**

*Prior to the test, characterize the unit under test to get the rough and test times.*

8. Click **Next** and Figure 2-32 appears.

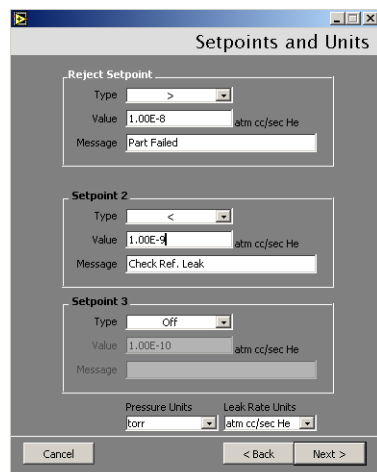
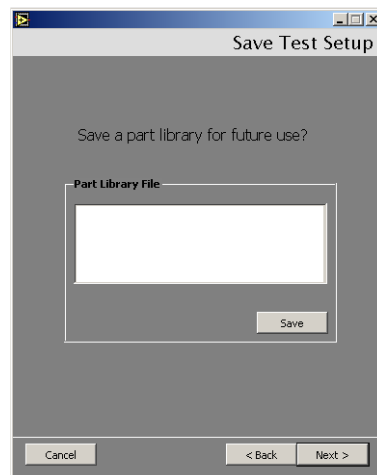


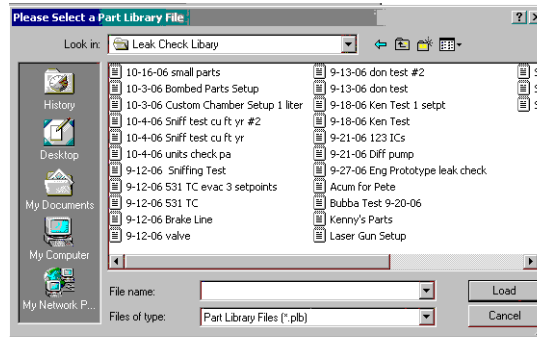
Figure 2-32 Setpoints and Units

9. Configure the *Reject Setpoint* by:
  - ☐ Using the pulldown to select the *Type*:
    - ☐ *Off*
    - ☐ *<*
    - ☐ *>*
  - ☐ Entering the reject setpoint *Value*. The label to the right is configured via the *Leak Rate Units* pulldown.
  - ☐ Entering the *Message* that appears on the *Part Leak Rates* screen when the value is passed.
10. Repeat step 8 for *Setpoint 2* and *Setpoint 3*. These are not often used in this test type.
11. Use the pulldown to select the *Pressure Units* that appear on the *Part Leak Rates* screen.
12. Use the pulldown to select the *Leak Rate Units* that appear on the *Part Leak Rates* screen.
13. Click **Next** and Figure 2-33 appears.



**Figure 2-33 Save Test Setup**

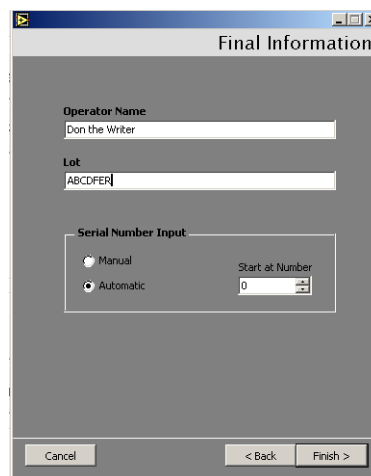
14. Click **Save** and Figure 2-34 appears.



**Figure 2-34 Save Dialog Box**

15. Navigate to the required directory and select a file and click **Save**. Figure 2-33 reappears with the file name and path populated into the *Part Library File* field.

16. Click **Next** and Figure 2-35 appears.



**Figure 2-35 Final Information**

17. Enter the *Operator Name*.

18. Enter the *Lot*.

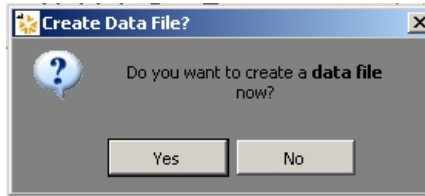
19. Configure the *Serial Number Input* by either:

- ☐ Clicking **Manual**, which allows you to manually input the serial or part number after each test cycle.

or

- ☐ Clicking **Automatic**, which increments each test by one starting with the programmed value stored in the *Start at Number* pull down selection.

20. Click **Finish** and the *Create Data File* dialog appears (Figure 2-36).



**Figure 2-36 Create Data File**

21. Click **Yes** and the *Part Leak Rates* screen appears.

### 2.3.4 Pressurized Part - Location/Accumulation Test Sequence

This is a high pressure/sniffer application test type.

This test uses the power probe and requires that the leak detector auto sequencer be off.

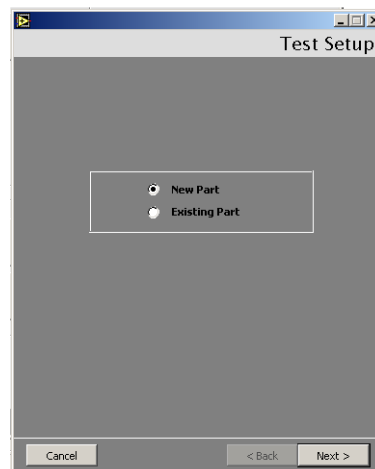
To configure a pressurized part for a location/accumulation test sequence test:



**NOTE**

*Varian recommends that the leak detector be locked into High Pressure Test for this application (Located under Menus - Leak Rate Ranging - High Pressure Test on/off).*

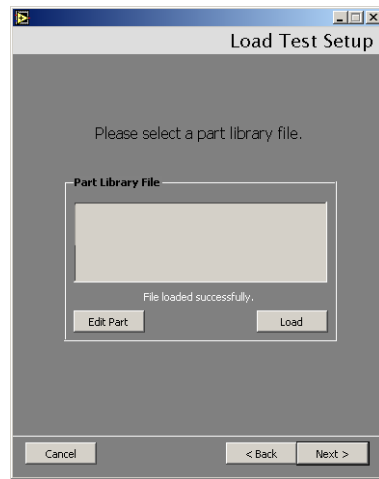
1. Click **Multi Part Tester** on the *Home* screen and Figure 2-37 appears.



**Figure 2-37 Test Setup**

2. Click either:

- ☐ **Existing Part** and click **Next** and Figure 2-38 appears.

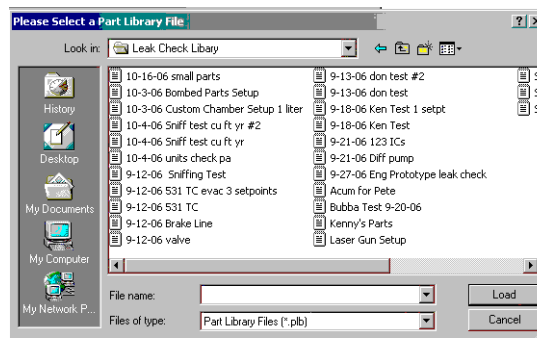


**Figure 2-38 Load Test Setup**

or

- ☐ **New Part** and proceed to step 5.

3. Click **Load** and Figure 2-39 appears.

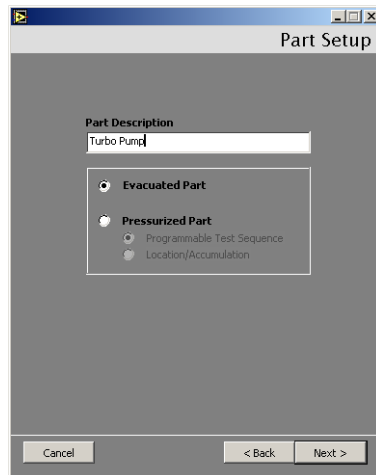


**Figure 2-39 Save Dialog Box**

4. Navigate to the required directory and select a file and click **Load**. Figure 2-38 reappears with the file name and path populated into the *Part Library File* field.

5. Click either:

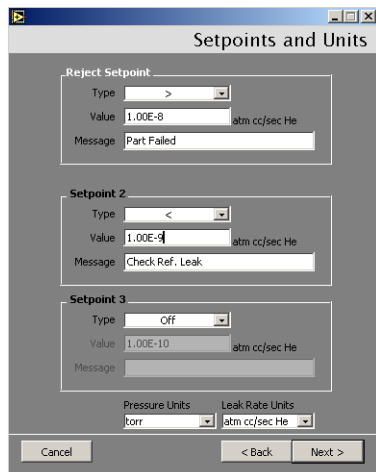
- ☐ **Edit Part** and Figure 2-40 appears from which you can change the configuration of the existing part. Proceed to step 6.



**Figure 2-40 Part Setup**

or

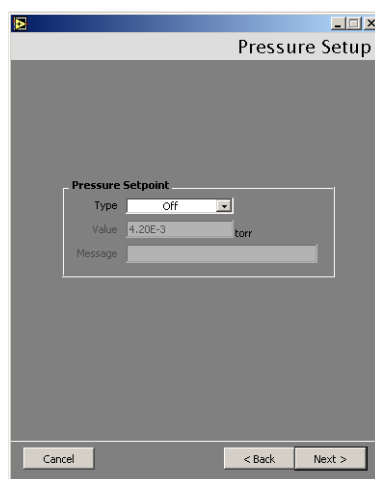
- ☐ **Next** and the *Final Info* screen appears from which you can run the test as already configured. Proceed to step 16.
- 6. Enter a *Part Description*, click **Pressurized Part**, which activates the radio buttons below, click **Location/Accumulation** and click **Next** and Figure 2-41 appears.



**Figure 2-41 Setpoints and Units**

- 7. Configure the *Reject Setpoint* by:
  - ☐ Using the pulldown to select the *Type*:
    - ☐ *Off*
    - ☐ <
    - ☐ >

- ☐ Entering the reject setpoint *Value*. The label to the right is configured via the *Leak Rate Units* pulldown.
  - ☐ Entering the *Message* that appears on the *Part Leak Rates* screen when the value is passed.
8. Repeat step 7 for *Setpoint 2* and *Setpoint 3*. These fields are rarely used for this test type.
  9. Use the pulldown to select the *Pressure Units* that appear on the *Part Leak Rates* screen.
  10. Use the pulldown to select the *Leak Rate Units* that appear on the *Part Leak Rates* screen.
  11. Click **Next** and Figure 2-42 appears.

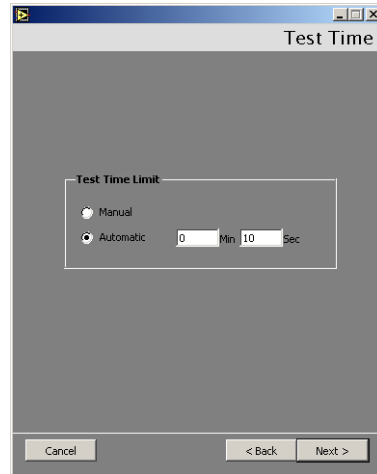


**Figure 2-42 Pressure Setup**

The *Pressure Setup* is useful to track for clogged probes or for a problem the sniffing line in a power probe.

12. Configure the *Pressure Setpoint* by:
  - ☐ Using the pulldown to select the *Type*:
    - ☐ *Off*
    - ☐ *<*
    - ☐ *>*
  - ☐ Enter a pressure setpoint *Value* for either a *<* or *>* condition.
13. Enter a *Message* that appears on the *Part Leak Rates* screen when the pressure setpoint value is activated. For example, *Clogged Probe ... Check*.

14. Click **Next** and Figure 2-43 appears.



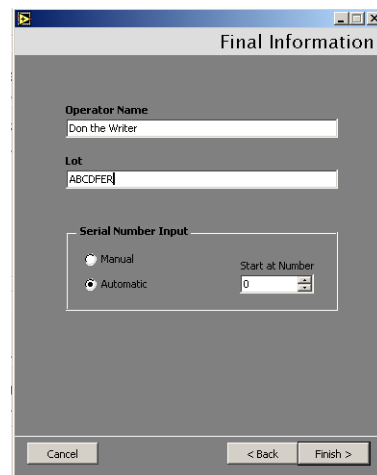
**Figure 2-43 Test Time**

15. Configure the *Test Time Limit* by clicking either:

- ☐ **Manual**, which allows you to control the test from the *Part Leak Rates* screen buttons: *Start* or *Stop*.

or

- ☐ Clicking **Automatic**, which activates the *time* fields to the right. Enter a time and click **Next** and Figure 2-44 appears.



**Figure 2-44 Final Information**

16. Enter the *Operator Name*.

17. Enter the *Lot*.



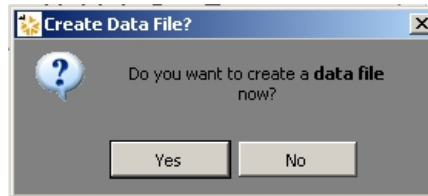
18. Configure the *Serial Number Input* by either:

- ☐ Clicking **Manual**, which allows you to manually input the serial or part number after each test cycle.

or

- ☐ Clicking **Automatic**, which increments each test by one starting with the programmed value stored in the *Start at Number* pull down selection.

19. Click **Finish** and the *Create Data File* dialog appears (Figure 2-45).

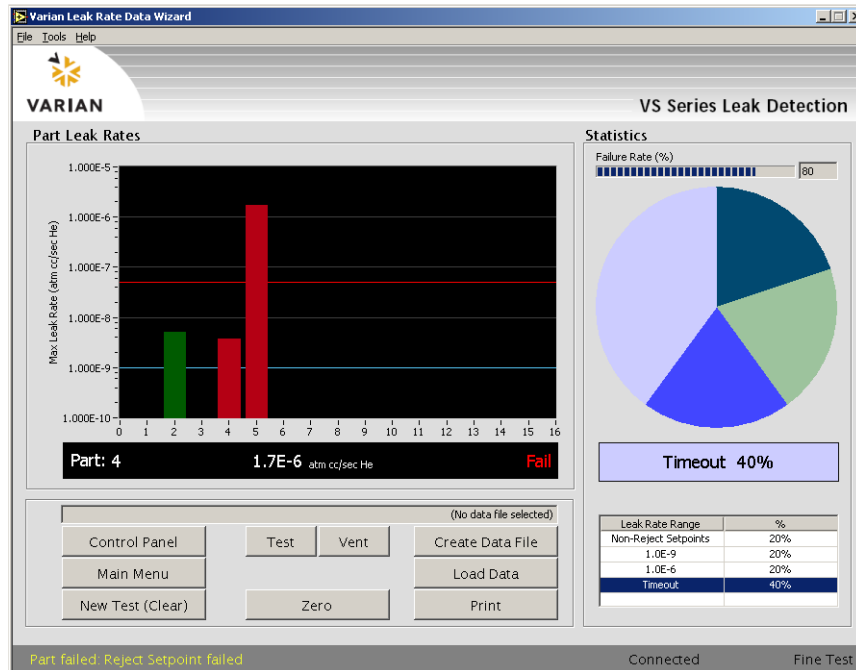


**Figure 2-45 Create Data File**

20. Click **Yes** and the *Part Leak Rates* screen appears.

## 2.3.4.1 Part Leak Rates

Figure 2-46 shows an example *Part Leak Rates* screen. Table 2-3 discusses the screen components and their use. Table 2-4 list the popup dialogs that appear during operation.




Displays status messages as test progresses.

Displays connection status to leak detector.

Displays test mode.

**Figure 2-46 Example Part Leak Rates Screen**

**Table 2-3 Part Leak Rates Screen Components**

| Item                              | Description   |
|-----------------------------------|---|
| <i>Graphs</i>                     |   |
| <i>Bar Graph</i> body             | Shows the test results in log form.   |
| <i>Graph</i> text                 | Lists the <i>Part</i> under test, the He pressure level and gives a <i>Pass/Fail</i> indication.  |
| <i>Failure Rate (%)</i>           | Overall failure rate for the test run. Lumps all failure types together. The number to the right represent the total failure rate.  |
| <i>Pie Chart</i>                  | Results of each test appear as a percentage of decades of leak rate range.  |
| <i>Leak Rate Range</i> and % list | Lists each decade of leak rate range. Click an item to activate it in the graph.  |
| <i>Buttons</i>                    |   |
| <i>Control Panel</i>              | Opens the <i>Control Panel</i> (see Section 2.3.4.2 “Control Panel” on page 2-38).  |
| <i>Main Menu</i>                  | Returns you to the <i>Home</i> screen. If the system is in test, the <i>Exit to Main Menu?</i> dialog appears. Click:<br><input type="checkbox"/> <b>Yes</b> to exit testing; all unsaved data is lost.<br><input type="checkbox"/> <b>No</b> to cancel and continue testing.       |
| <i>New Test</i>                   | Returns you to the <i>Test Setup</i> screen. If the system is in test, the <i>Quit Current Test?</i> dialog appears. Click:<br><input type="checkbox"/> <b>Yes</b> to exit testing; all unsaved data is lost.<br><input type="checkbox"/> <b>No</b> to cancel and continue testing. |
| <i>Test</i>                       | Engages the test mode until another button is clicked.  |
| <i>Vent</i>                       | Engages the vent mode until another button is clicked.  |
| <i>Zero</i>                       | Zeroes the leak detector.   |
| <i>Create Data File</i>           | Opens a <i>Save As</i> dialog to save the data file (.ptest).<br> <i>Do this immediately after the Part Leak Rates screen appears so as to not lose data</i>                                     |

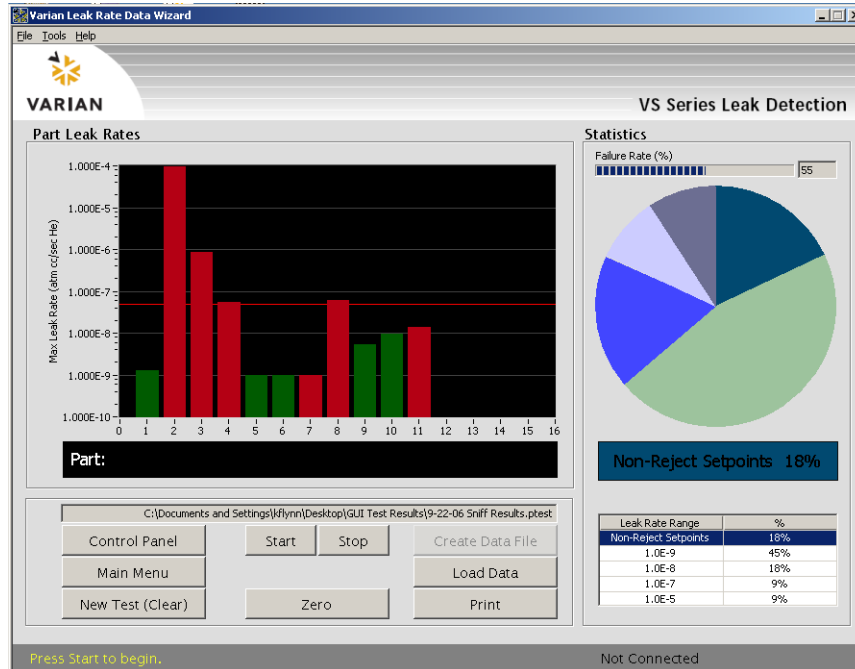
**Table 2-3 Part Leak Rates Screen Components (Continued)**

| Item                        | Description  |
|-----------------------------|--|
| <i>Load Data</i>            | Opens the <i>Select a Data File</i> dialog to open an existing chart recorder file (.plb) for use in the present session. If there is a file open the View Part Test File dialog appears. Click:<br><input type="checkbox"/> <b>Yes</b> to exit testing; all unsaved data is lost.<br><input type="checkbox"/> <b>No</b> to cancel and continue testing. |
| <i>Print</i>                | Opens a standard print dialog to print the chart or results to a printer.  |
| <i>Statistics</i>           |  |
| <i>Failure Rate</i>         | Broken into two parts:<br><input type="checkbox"/> Power bar - displays the present failure rate as it develops (%). The text filed to the right lists the failure percentage rate numerically.<br><input type="checkbox"/> Pie chart - displays the leak rate range as it develops (%).   |
| <i>Leak Rate Range</i> text | Displays the current leak rate range. This turns red on failure.   |
| <i>Leak Rate Range</i>      | List the results of the recent tests. Click a <i>Leak Rate Range</i> item to display it in the graph.  |

**NOTE**

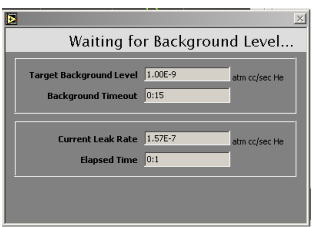
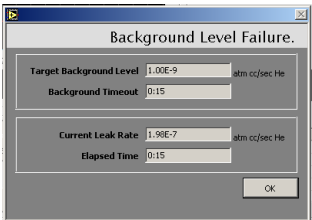


*During a sniffing Location Accumulation test the leak detector is always in Test mode (Figure 2-47). Click:  
Press start for leak locating/sniffing. This starts the test cycle.  
Stop to use manual mode to stop the test. This stops the test at the value programmed in the Test Time Setup screen.*



**Figure 2-47 Location Accumulation Sniffing Test**

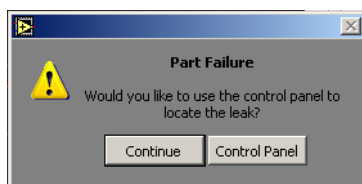
**Table 2-4 Part Leak Rates Message Dialogs**

| Item   | Description  |
|--|--|
|  <p>The dialog box is titled 'Waiting for Background Level...'. It contains two sections. The first section has 'Target Background Level' set to 1.00E-9 atm cc/sec He and 'Background Timeout' set to 0:15. The second section has 'Current Leak Rate' set to 1.57E-7 atm cc/sec He and 'Elapsed Time' set to 0:1.</p>   | Indicates that the part under test has not reached the desired Helium background level, within the specified time limit. Appears for the Evacuated Part Tester only.   |
|  <p>The dialog box is titled 'Background Level Failure.'. It contains two sections. The first section has 'Target Background Level' set to 1.00E-9 atm cc/sec He and 'Background Timeout' set to 0:15. The second section has 'Current Leak Rate' set to 1.90E-7 atm cc/sec He and 'Elapsed Time' set to 0:15. There is an 'OK' button at the bottom right.</p> | Indicates that the background He level is still not sufficient to begin testing. Venting before this disappears or before any <i>Apply Helium</i> message disappears causes a reject setpoint error. Click <b>OK</b> , resolve problem and retest. Appears for the Evacuated Part Tester only. |

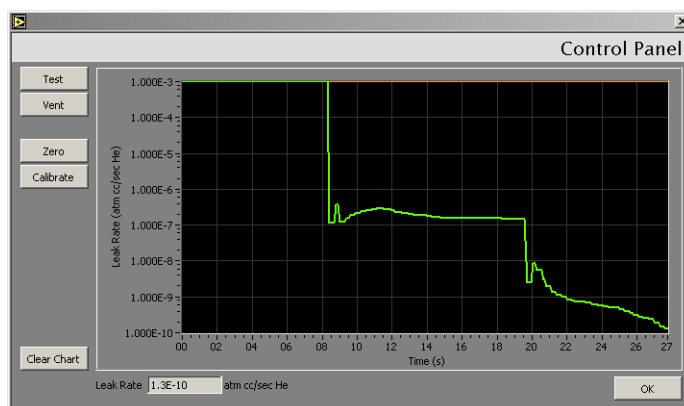
## 2.3.4.2 Control Panel

Figure 2-49 shows the *Control Panel* screen, which is used to operate the leak detector separate from the *Part Leak Rates* screen configuration. When an error appears during *Part Leak Rates* operations Figure 2-48 appears, click **Control Panel** to and Figure 2-49 appears.

This is an offline troubleshooting tool that operates independently from the parts tester.



**Figure 2-48 Part Failure Message**



**Figure 2-49 Control Panel**



### NOTE

*Not recommended for use in Programmable Test sequence mode.*

Table 2-5 discusses the *Control Panel* screen components and their use.

**Table 2-5 Control Panel Screen Components**

| Item           | Description  |
|----------------|--|
| <i>Buttons</i> |  |
| <i>Test</i>    | Engages the test mode until another button is clicked. |
| <i>Vent</i>    | Engages the vent mode until another button is clicked. |
| <i>Zero</i>    | Zeroes the leak detector.                              |

**Table 2-5 Control Panel Screen Components (Continued)**

| Item                  | Description  |
|-----------------------|--|
| <i>Calibrate</i>      | Calibrates the leak detector external leak. A <i>Confirm Calibration</i> dialog appears. Click:<br><input type="checkbox"/> <b>Yes</b> to proceed.<br><input type="checkbox"/> <b>No</b> to cancel and continue testing. |
| <i>Clear Chart</i>    | Clears the display area, empties the data in the buffer  |
| <i>OK</i>             | Closes the <i>Control Panel</i> and reopens the <i>Part Leak Rates</i> screen.   |
| <i>Graph</i>          |  |
| <i>Graph body</i>     | Shows the test results in real time in either log or linear form, as dictated.   |
| <i>Graph text</i>     | Lists the part under test, indicates the leak or pressure level and gives a Pass/Fail indication.  |
| <i>Leak Rate text</i> | Displays the current leak rate range. This turns red on failure.   |

*This page intentionally left blank.*



## Appendix A. Introduction to Leak Detection

### A.1 Leak Testing—Why is it Needed?

Helium is a superior choice of tracer gas used to find leaks for a multitude of reasons. Helium is:

- ☐ Non-toxic
- ☐ Inert and non-condensable
- ☐ Normally not present in the atmosphere at more than trace amounts
- ☐ Relatively inexpensive
- ☐ Readily passes through leaks due to its small atomic size
- ☐ Non-flammable
- ☐ Available in various size cylinders
- ☐ Available in purities appropriate for medical usage

The only molecule smaller than Helium (mass 4) is Hydrogen (mass 2), which is not inert. Helium is much lighter than the next heavier inert molecule, Neon (mass 20) which is much more expensive. Helium is present at a concentration of only 5 ppm in normal atmospheric conditions.

### A.2 Varian's Helium Leak Detection Technologies

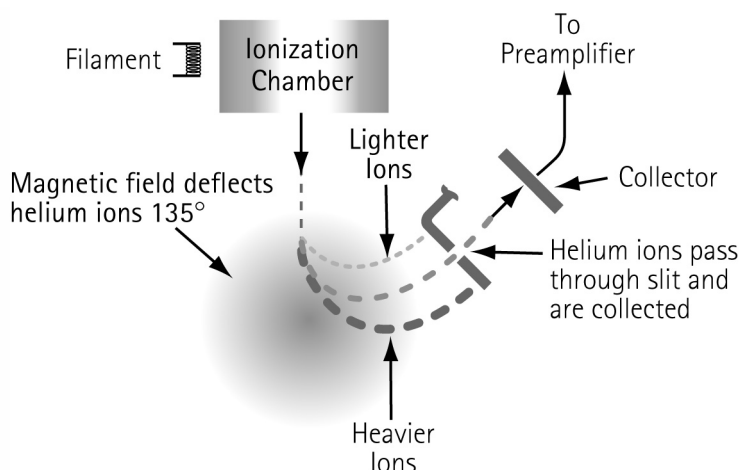
A Mass Spectrometer Leak Detector (*MSLD*) is a complete system for locating and/or measuring the size of leaks into or out of a device or a container. This method of leak detection is initiated when a tracer gas, helium, is introduced to a test part that is connected to the MSLD system. The helium leaking from the test part diffuses through the system, its partial pressure is measured, and results are displayed on a meter.

The MSLD operating principle consists of ionization of the gases in a vacuum and their acceleration across a voltage drop and a magnetic field (Figure A-1). The helium ions are separated and collected, and the resulting ion current is amplified and indicated on the meter or display.

A mass spectrometer leak detector consists of the following components:

- ☐ A spectrometer tuned to detect the mass of helium
- ☐ A vacuum system to maintain adequately low pressure in the spectrometer
- ☐ A mechanical pump(s) to evacuate the part to be tested

- ❑ Valves that enable the various stages of the leak detection cycle, from evacuation, to test, to venting
- ❑ Amplifier and readout instrumentation that monitors spectrometer output signal
- ❑ Electrical power supplies and controls that sequence valve's, protective circuits, etc.
- ❑ Fixturing that attaches the part to be leak-tested to the leak testing equipment

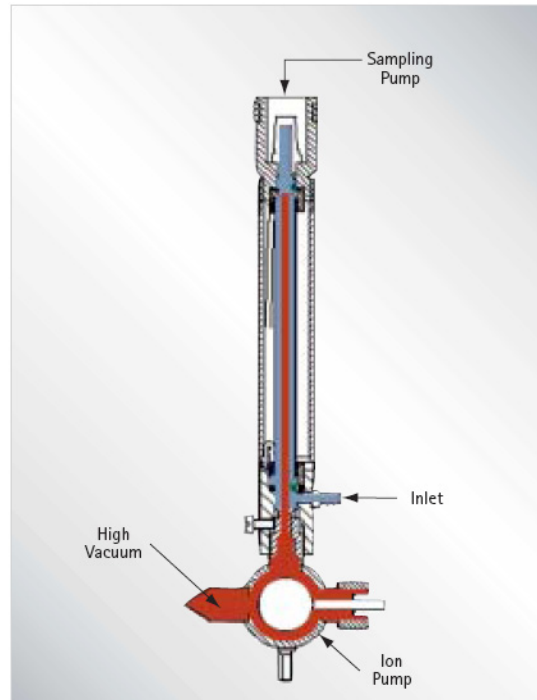


**Figure A-1 Magnetic Separation Principle**

Our *SIPD* family of products is also sensitive to helium and is based on a patented technology called Selective Ion Pump Detection (Figure A-2). The sensor technology incorporates an ion pump connected to a quartz capillary tube and maintained under high vacuum. This membrane is heated with a coiled platinum filament. Once heated, the membrane becomes permeable to helium. As the partial pressure of helium in the ion pump increases, so does the current draw of the ion pump. This current is proportional to the pressure and is therefore representative of the helium at the test probe of the instrument.

A selective ion pump detector consists of the following:

- ❑ An ion pump and controller
- ❑ A permeable quartz capillary
- ❑ A heater coil that surrounds the quartz capillary
- ❑ Electronics to process the signal
- ❑ Display for access to leak rate and other unit functions



**Figure A-2 Selective Ion Pump Detector**

## **A.3 Methods of Leak Testing**

There are many different ways to leak test parts using helium as a tracer gas. In general, the leak detection method is selected based on the actual working conditions of the part being tested. It is recommended that during leak testing, the same pressure differential be maintained and in the same *direction* as exists during the actual use of the part. For example, a vacuum system is tested with a vacuum inside the chamber, while a compressed air cylinder should be tested with a high pressure inside the cylinder.

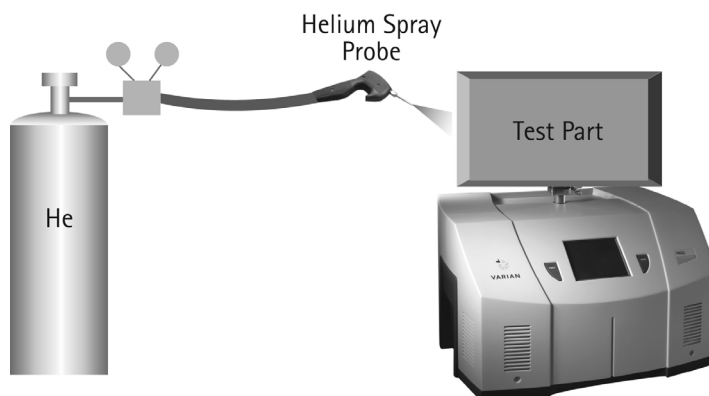
There are two general concerns when leak testing. One is the location of leaks and the other is the measurement of the total leakage rate of the part, as some leakage may be acceptable. In many cases, parts may be first tested to determine if they pass an acceptable level, and if not, the part may be taken off line and subjected to a second test with the intent of locating the leak. Additionally, many parts may be tested in batches. If a batch fails, the individual parts in that batch may then be tested separately to identify the leaking part(s).

### A.3.1 Vacuum Testing Method (Outside-in)

The part to be tested is evacuated with a separate pumping system for large volumes, or with just the leak detector itself. When the appropriate cross over pressure has been reached, the leak detector is valved-in or transfers into test and the part is tested using one of the following methods:

#### A.3.1.1 Locating Leaks

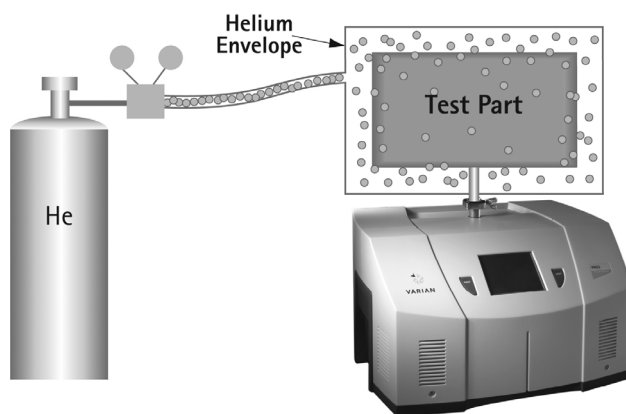
To pinpoint the location of the leak(s) (but not measure the total leakage rate), helium is administered to the suspected leak sites of the part using a spray probe with an adjustable flow (Figure A-3).



**Figure A-3 Locating Leaks: Outside In**

#### A.3.1.2 Measuring Leaks

To determine the total quantity of leakage (but not the number or location of leaks), the part is connected to the leak detector and shrouded by a helium environment. This helium environment can be contained in many methods ranging from a simple plastic bag to more complex bell jar arrangements (Figure A-4).



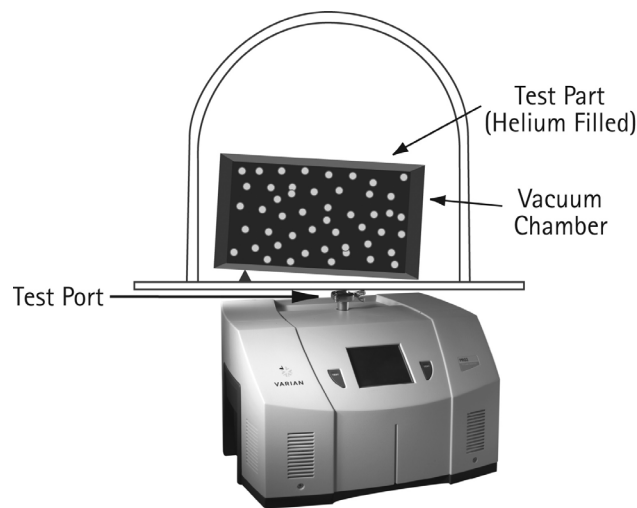
**Figure A-4 Measuring Leaks: Outside In**

### A.3.2 Pressure Testing Method (Inside-out)

In this technique, the part is pressurized with helium or a mixture of helium and air, and tested by one of the following methods.

#### A.3.2.1 Measuring Leaks

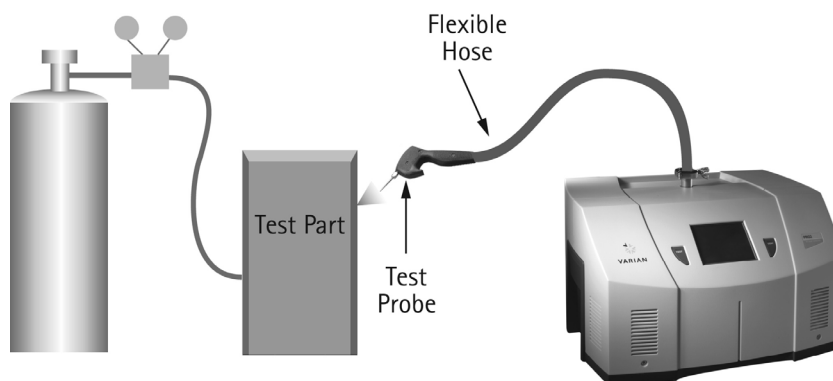
To determine the total quantity of leakage (but not the number or location of leaks), the part is pressurized with helium (or a mixture of helium and air or nitrogen). This can be done by bombing or backfilling small hermetically sealed parts. Larger parts can be actively pressurized using a hose or tubing to deliver the helium. The part is placed in a volume that is then evacuated by the leak detector. All the helium escaping from the part is captured and quantified (Figure A-5).



**Figure A-5 Measuring Leaks: Inside Out**

#### A.3.2.2 Locating Leaks

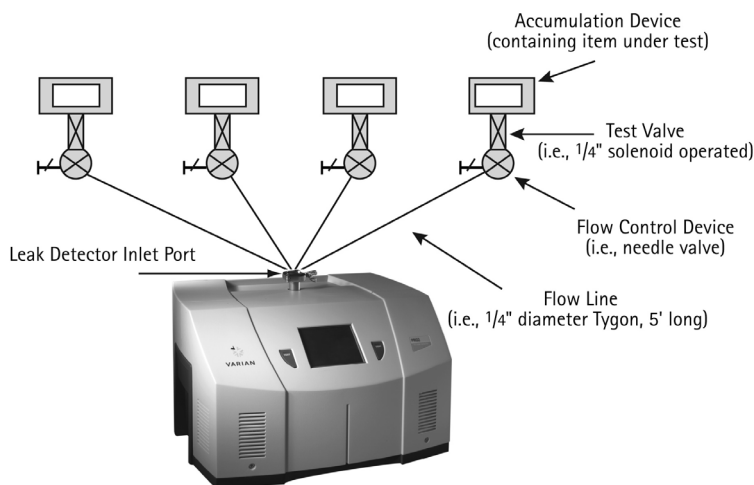
To pinpoint the location of the leak(s) (but not measure the total leakage), the likely potential leak sites of the part are scanned using a Sniffer Probe connected to the inlet of the leak detector (Figure A-6).



**Figure A-6 Locating Leaks: Inside Out**

### A.3.2.2.1 Accumulation Testing Method

This method can both locate and quantify leaks. Some type of shroud or hood is placed in such a manner as to envelop a potential leak site. A certain amount of time is given to allow leaking helium to accumulate in the shrouded area, increasing the helium concentration. The leak detector is then valved-in to the shrouded volume. If many potential leak sites exist in a manifold or if many parts are to be tested at the same time, they can be sequentially valved-in to determine which site is leaking (Figure A-7).



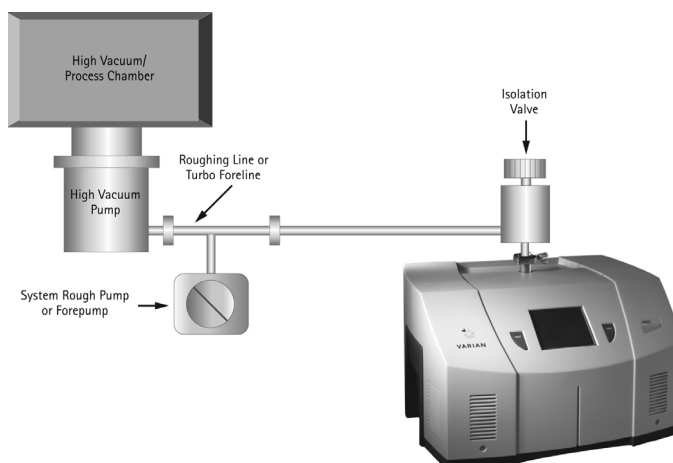
**Figure A-7 Accumulation: Inside Out**

### A.3.3 System Leak Test Methods

Systems, like individual parts, should be tested with the same pressure differential and in the same direction as in actual use. Therefore, systems that are under vacuum while in operation should be leak tested under vacuum, while pressurized systems should be charged with helium to a pressure similar to operational conditions when possible.

#### A.3.3.1 Vacuum Systems

In general, vacuum systems are tested with a portable leak detector. Typically the leak detector is connected by means of a *tee* connected in between the foreline of the high vacuum pump and the inlet of its backing pump. A system should be capable of maintaining a foreline pressure low enough to operate the leak detector at this location. Helium is supplied to potential leak site using a spray probe or *bagging* suspected areas. If a leak exists, helium enters the system and rapidly diffuses through it. The leak detector should respond within several seconds or less. Leak detector sensitivity is diminished in systems with large backing pumps. If a system is using a cryopump as a high vacuum pump, it must be valved off before helium is introduced as cryopumps have limited helium pumping capacity (Figure A-8).



**Figure A-8 Vacuum System**

### A.3.3.2 Pressurized Systems

Many different types of pressurized systems also need to be leak-free. These systems can be charged with helium or some mixture of helium and another gas such as nitrogen. If a diluted helium mixture is used, the helium signal is diminished proportionally. For example, if a mixture of 10% helium and 90% nitrogen is used, the signal reads 10% of the actual value of the leak, or a decade lower. This may be acceptable in many cases as system leak checking is usually to locate rather than quantify leaks. Once the system has been charged with an appropriate amount of helium, leak checking can be performed by means of a sniffer probe, or by *bagging* suspected leak sites so that leaking helium accumulates to a detectable level.

## A.4 Typical Leak Detection Applications

### A.4.1 Quality Control of Production Parts and Assemblies

The detection and location of leaks is critical in the production of many products from individual components, to subassemblies, to completed systems. In many of these cases, it is as important to know the size or rate of the leak, as it is the location. Whether quantitative or qualitative testing is required, our leak detectors help assure the leak integrity of your parts or assemblies. Some examples include:

#### *Evacuated parts and assemblies*

- ☐ Hermetically sealed electronic packages
- ☐ Valves and manifolding
- ☐ Feedthroughs/glass-to-metal seals
- ☐ Vacuum vessels and systems

#### *Pressurized parts and assemblies*

- ☐ Air conditioning and refrigeration assemblies
- ☐ Radiators, heat exchangers, and condensers
- ☐ Brake, fuel, and hydraulic lines
- ☐ Gas tanks
- ☐ Food storage tanks and packaging
- ☐ Body implantable medical devices
- ☐ High purity piping

### A.4.2 Maintenance of Systems

Many vacuum process tools in fabs of all types require occasional leak checking. This may be part of a preventative maintenance schedule or in the event of an unexpected failure. Downtime in either case must be minimized. A rugged, dependable, fast starting leak detector is essential to maximize up time of production tools. Varian VS Series portable leak detectors keep industry moving. Examples of some of these applications are:

#### *Vacuum process equipment or tools*

- ☐ Vacuum furnaces
- ☐ Vacuum coaters
- ☐ Beam lines
- ☐ Electron beam and ion beam process equipment
- ☐ Analytical Instruments



- ☐ Semiconductor process tools
- ☐ Laser process equipment

### *Pressurized systems*

- ☐ Power Plants
- ☐ Underground tanks, cables, and pipes
- ☐ High purity gas handling systems
- ☐ Bioreactors and fermenters
- ☐ Liquid gas manufacturing facilities
- ☐ Fuel tanks and bladders

### **A.4.3 System Integrated Leak Detection**

Manufacturers of large, complex systems may choose to integrate into those systems a component leak detector that can facilitate the on-going maintenance of leak-free integrity, thereby providing additional value to their customers. The Varian 990CLD and 990dCLDII provide the necessary elements for flexible integration of leak detection capability into a large system. Examples of these systems are:

- ☐ Semiconductor process equipment
- ☐ PVD/CVD equipment
- ☐ E-beam and ion beam processing equipment

### **A.4.4 Mass Produced Parts**

Some manufacturing processes require the integration of a leak-checking device into a multi-step process, usually with very high production rates. Component leak detectors are designed specifically for these applications in which a vacuum system and the control electronics may be mounted separately. The Varian 990CLD and 990dCLDII offer the ultimate flexibility in a helium mass spectrometer leak detection system. The flexibility, ruggedness and rapid response time of these units allows for accurate, repeatable, high volume leak testing in demanding production environments. Some examples include:

### *High Volume Manufactured Parts*

- ☐ Automotive fuel systems
- ☐ Automotive brake components
- ☐ Cooling and refrigeration system components
- ☐ Medical devices
- ☐ Automotive airbag components
- ☐ Tire and wheel assemblies

### *Portable Sniffing Applications*

Some applications require operators or technicians to look for leaks from a ladder, outdoors, above or below ground, or in a densely constructed industrial facility or power plant. In these cases, a mobile cart-mounted MSLD may not be practical. A truly portable unit such as the PHD-4 is required. Some examples of such applications are:

- ☐ Aircraft manufacturing and maintenance
- ☐ Power generating plants
- ☐ Pressurized pipelines
- ☐ Bioreactors and fermenters
- ☐ Petrochemical plants and refineries
- ☐ Underground tanks
- ☐ Large condensers or heat exchangers

## Appendix B. Reports

### B.1 Data Recorder Reports

Figure B-1 and Figure B-2 are the printed reports for the *Data Recorder* operations. Figure B-1 shows the trace produced during the test on the *Operations* screen.

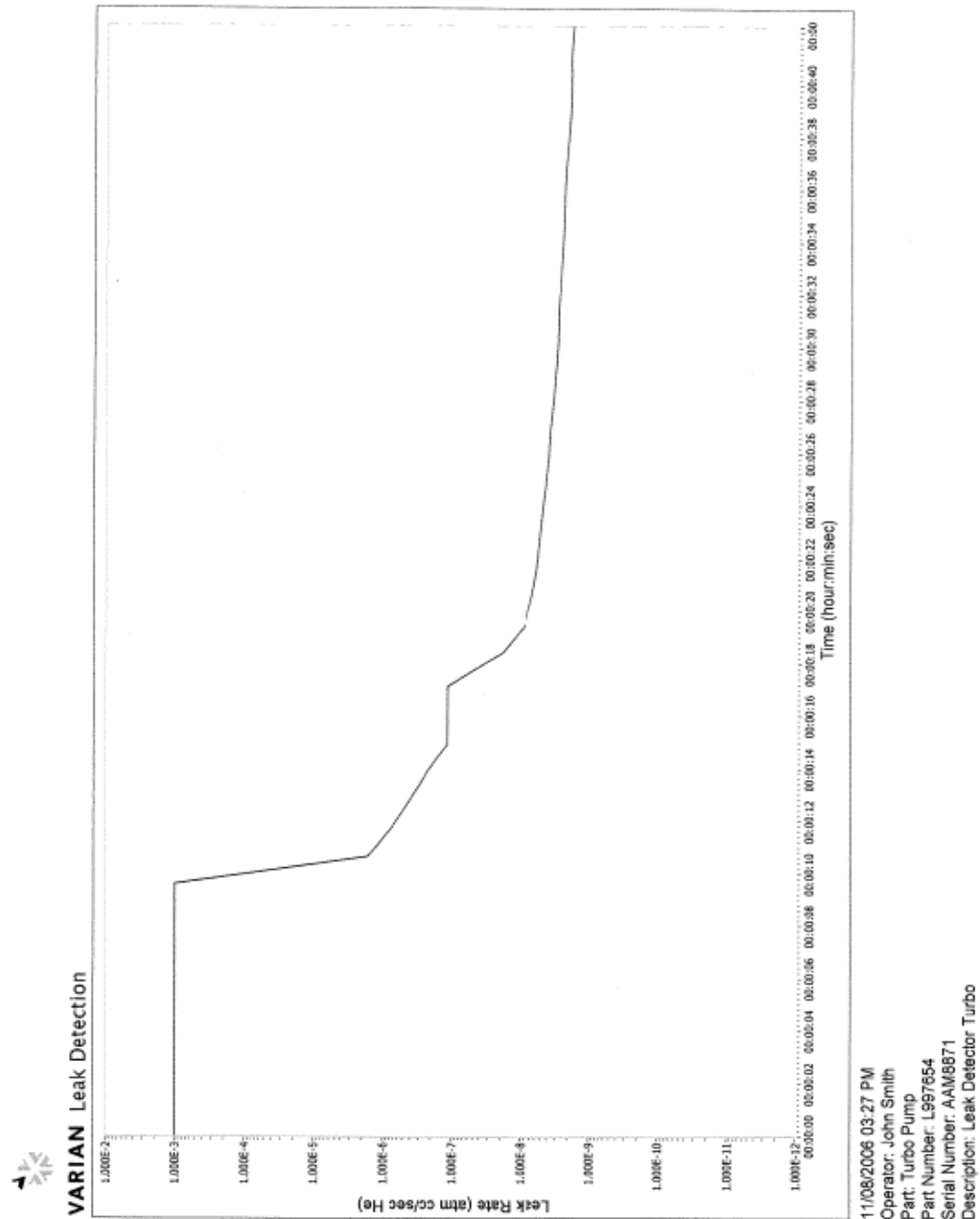


Figure B-1 Data Recorder - Operations Screen Printout

## Varian Leak Test Data Wizard Software

Figure B-2 shows the data produced during the test on the *Operations* screen.

```
11-01-06 chart check.rec
Varian Leak Detector Report
November 01, 2006 16:31
Operator:      John Smith
Part Name:     V70 Turbo
Part Number:   6789000
Serial Number  ABCDEFG
Part Description: Leak Detector Turbo
Reject Setpoint: >1.000000E-8

Time (HH:MM:SS) Leak Rate (atm cc/sec He)
0:0:0.00        1.000000E-3
0:0:1.08        1.000000E-3
0:0:2.14        1.000000E-3
0:0:3.24        1.000000E-3
0:0:4.36        1.000000E-3
0:0:5.40        1.000000E-3
0:0:6.45        1.000000E-3
0:0:7.48        1.000000E-3
0:0:8.51        1.000000E-3
0:0:9.58        1.000000E-3
0:0:10.62       1.620000E-6
0:0:11.74       7.290000E-7
0:0:12.79       3.980000E-7
0:0:13.89       2.180000E-7
0:0:14.90       1.160000E-7
0:0:16.02       1.160000E-7
0:0:17.10       1.160000E-7
0:0:18.38       1.810000E-8
0:0:19.42       8.730000E-9
0:0:20.46       6.830000E-9
0:0:21.48       5.730000E-9
0:0:22.54       5.210000E-9
0:0:23.65       4.720000E-9
0:0:24.71       4.230000E-9
0:0:25.83       3.850000E-9
0:0:26.89       3.660000E-9
0:0:28.02       3.280000E-9
0:0:29.14       3.040000E-9
0:0:30.19       2.850000E-9
0:0:31.34       2.800000E-9
0:0:32.39       2.630000E-9
0:0:33.48       2.470000E-9
0:0:34.60       2.330000E-9
0:0:35.70       2.290000E-9
0:0:36.80       2.190000E-9
0:0:37.86       2.040000E-9
0:0:38.98       1.900000E-9
0:0:40.09       1.870000E-9
0:0:41.11       1.880000E-9
0:0:42.22       1.750000E-9

Max Leak Rate: 1.000000E-3

Chart Formatting Info (For Plot Only):
XScale.Style:      6
XScale.Minimum:    0.000000E+0
XScale.Maximum:    4.222000E+1
XScale.FormatString: "%<%H:%M:%S>t"
XScale.NameLbl.Text: "Time (hour:min:sec)"
XScale.ScaleFit:    2
YScale.Minimum:    1.000000E-12
YScale.Maximum:    1.000000E-2
```

Page 1

**Figure B-2 Data Recorder - Data Printout**

## B.2 Parts Test Reports

Figure B-3 and Figure B-4 are the printed reports for the *Parts Leak Rates* operations. Figure B-3 shows the bar graph produced during the test on the *Part Leak Rates* screen.

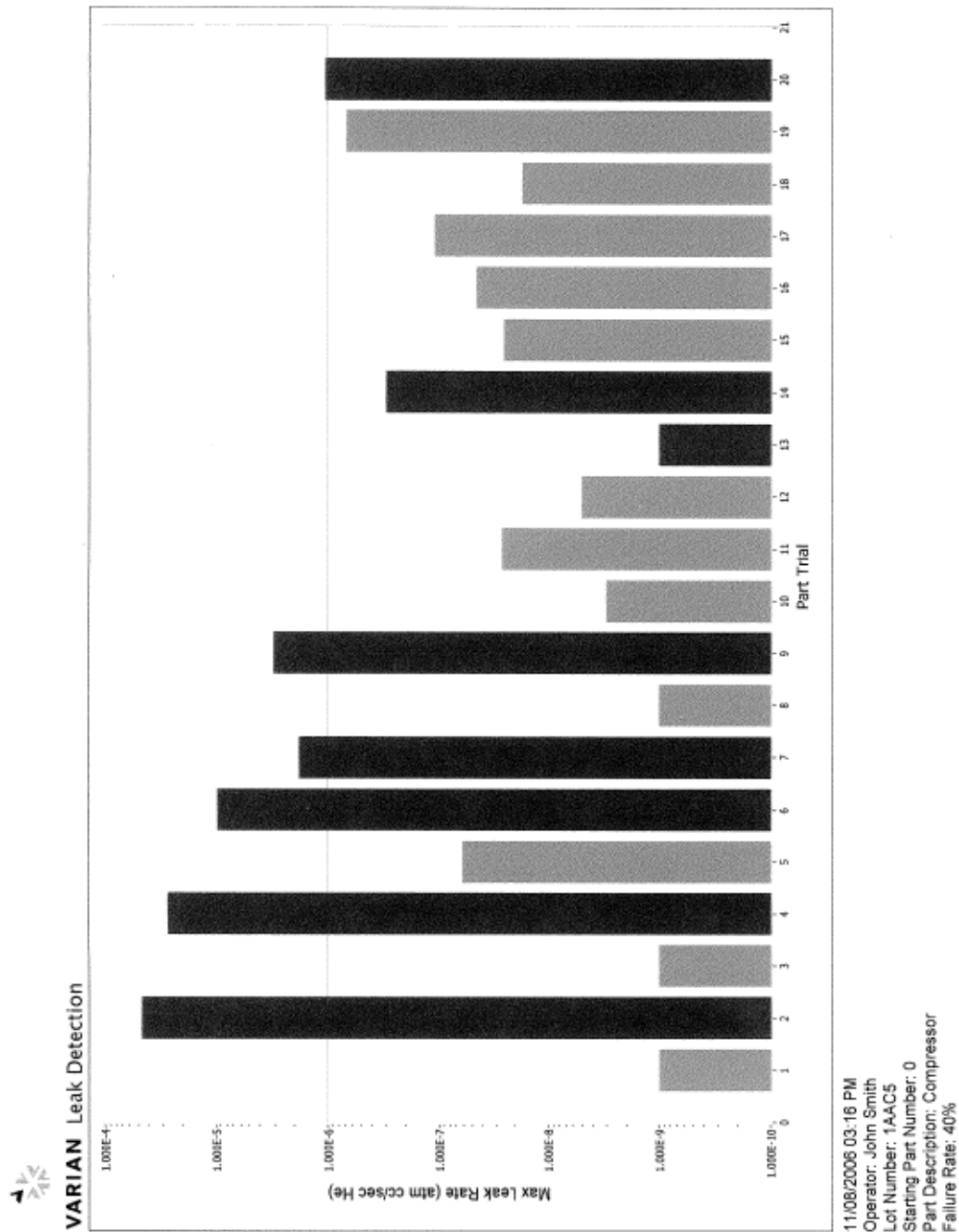


Figure B-3 Parts Leak Rates- Bar Chart Report Printout

## Varian Leak Test Data Wizard Software

---

Figure B-4 shows the data produced during the test on the *Part Leak Rates* screen.

Varian Leak Detector Report

11/2/2006 14:21

|                    |                             |
|--------------------|-----------------------------|
| Operator:          | John Smith                  |
| Part Description:  | Compressor                  |
| Lot:               | 1AAC5                       |
| Starting Part No.: | 0                           |
| Test Type:         | Pressurized                 |
| Test Time:         | 0:05                        |
| Reject Setpoint:   | > 1.000000E-6 atm cc/sec He |
| Setpoint 2:        | Off                         |
| Setpoint 3:        | Off                         |
| Pressure Setpoint: | < 2.000000E-1 Torr          |
| Leak Rate Unit:    | atm cc/sec He               |
| Pressure Unit:     | Torr                        |

Test Data:

| Test Number | Part Number | Max Leak Rate (atm cc/sec He) | Pass/Fail | Setpoints |
|-------------|-------------|-------------------------------|-----------|-----------|
| 1           | 0           | 1.00E-09                      | Pass      |           |
| 2           | 1           | 4.65E-05                      | FAIL      | 1         |
| 3           | 2           | 1.00E-09                      | Pass      |           |
| 4           | 3           | 2.70E-05                      | FAIL      | 1         |
| 5           | 4           | 6.10E-08                      | Pass      |           |
| 6           | 5           | 9.65E-06                      | FAIL      | 1         |
| 7           | 6           | 1.79E-06                      | FAIL      | 1         |
| 8           | 7           | 1.00E-09                      | Pass      |           |
| 9           | 8           | 3.04E-06                      | FAIL      | 1         |
| 10          | 9           | 3.00E-09                      | Pass      |           |
| 11          | 10          | 2.70E-08                      | Pass      |           |
| 12          | 11          | 5.00E-09                      | Pass      |           |
| 13          | 12          | 1.00E-09                      | FAIL      | 4         |
| 14          | 13          | 2.95E-07                      | FAIL      | 4         |
| 15          | 14          | 2.60E-08                      | Pass      |           |
| 16          | 15          | 4.60E-08                      | Pass      |           |
| 17          | 16          | 1.09E-07                      | Pass      |           |
| 18          | 17          | 1.70E-08                      | Pass      |           |
| 19          | 18          | 6.82E-07                      | Pass      |           |
| 20          | 19          | 1.05E-06                      | FAIL      | 1         |

**Figure B-4 Parts Leak Rates- Data Printout**



## Sales and Service Offices

### Canada

#### Central coordination through:

Varian, Inc.  
121 Hartwell Avenue  
Lexington, MA 02421  
USA  
Tel: (781) 861 7200  
Fax: (781) 860 5437  
Toll Free: (800) 882 7426

### China

#### Varian Technologies - Beijing

Room 1201, Jinyu Mansion  
No. 129A, Xuanwumen Xidajie  
Xicheng District  
Beijing 1000031  
P.R. China  
Tel: (86) 10 6608 1031  
Fax: (86) 10 6608 1541

### France and Benelux

#### Varian s.a.

7 avenue des Tropiques  
Z.A. de Courtaboeuf – B.P. 12  
Les Ulis cedex (Orsay) 91941  
France  
Tel: (33) 1 69 86 38 13  
Fax: (33) 1 69 28 23 08

### Germany and Austria

#### Varian Deutschland GmbH

Alsfelder Strasse 6  
Postfach 11 14 35  
64289 Darmstadt  
Germany  
Tel: (49) 6151 703 353  
Fax: (49) 6151 703 302

### India

#### Varian India PVT LTD

101-108, 1st Floor  
1010 Competent House  
7, Nangal Raya Business Centre  
New Delhi 110 046  
India  
Tel: (91) 11 5548444  
Fax: (91) 11 5548445

### Italy

#### Varian, Inc.

Via F.lli Varian, 54  
10040 Leini, (Torino)  
Italy  
Tel (39) 011 997 9 111  
Fax (39) 011 997 9 350

### Japan

#### Varian, Inc.

Sumitomo Shibaura Building, 8th Floor  
4-16-36 Shibaura  
Minato-ku, Tokyo 108  
Japan  
Tel: (81) 3 5232 1253  
Fax: (81) 3 5232 1263

### Korea

#### Varian Technologies Korea, Ltd.

Shinsa 2nd Building 2F  
966-5 Daechi-dong  
Kangnam-gu, Seoul  
Korea 135-280  
Tel: (82) 2 3452 2452  
Fax: (82) 2 3452 2451

### Mexico

#### Varian S.A.

Concepcion Beistegui No 109  
Col Del Valle  
C.P. 03100  
Mexico, D.F.  
Tel: (52) 5 523 9465  
Fax: (52) 5 523 9472

### Russia

#### Central coordination through:

Varian, Inc.  
via F.lli Varian 54  
10040 Leini, (Torino)  
Italy  
Tel: (39) 011 997 9 252  
Fax: (39) 011 997 9 316

### Taiwan

#### Varian Technologies Asia Ltd.

18F-13 No.79, Hsin Tai Wu Road  
Sec. 1, Hsi Chih, Taipei Hsien  
Taiwan, R.O.C.  
Tel: (886) 2 2698 9555  
Fax: (886) 2 2698 9678

### UK and Ireland

#### Varian Ltd.

28 Manor Road  
Walton-On-Thames  
Surrey KT 12 2QF  
England  
Tel: (44) 1932 89 8000  
Fax: (44) 1932 22 8769

### United States

#### Varian, Inc.

121 Hartwell Avenue  
Lexington, MA 02421  
USA  
Tel: (781) 861 7200  
Fax: (781) 860 5437

### Other Countries

#### Varian, Inc.

Via F.lli Varian 54  
10040 Leini, (Torino)  
Italy  
Tel: (39) 011 997 9 111  
Fax: (39) 011 997 9 350

### Customer Support and Service:

#### North America

Tel: 1 (800) 882-7426 (toll-free)  
vtl.technical.support@varianinc.com

#### Europe

Tel: 00 (800) 234 234 00 (toll-free)  
vtl.technical.support@varianinc.com

#### Japan

Tel: (81) 3 5232 1253 (dedicated line)  
vtj.technical.support@varianinc.com

#### Korea

Tel (82) 2 3452 2452 (dedicated line)  
vtk.technical.support@varianinc.com

#### Taiwan

Tel: 0 (800) 051 342 (toll-free)  
vtw.technical.support@varianinc.com

### Worldwide Web Site, Catalog and On-line Orders:

www.varianinc.com

Representatives in most countries



**VARIAN**