Packaging Technologies and Inspection, LLC

VeriPac 325 Leak Inspection System
Instruction Manual and
Standard Operating Procedures

Instruction Manual Version: VeriPac 325
Version 325 08NOV2011

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Packaging Technologies & Inspection (PTI) is a leading manufacturer of non-destructive inspection technologies for the pharmaceutical, medical device, food and container industries. Recognized as a thought leader in new delivery systems for seal, package and container integrity testing, PTI has set the standard for inspection systems that provide repeatable, reliable results. Having a PTI inspection solution in place for QA/QC process control guarantees that your package is "fit for purpose" from manufacturing through distribution. The entire PTI staff is committed to provide the engineering support and service you need.

The VeriPac inspection system evaluates and analyzes blister package integrity with precision and repeatability. The core technology of the VeriPac is based on an ASTM approved vacuum decay leak test method that was developed using VeriPac instruments.

The VeriPac package integrity test system provides non-destructive, non-invasive package inspection designed for fast and simple test results, while reducing waste associated with package testing and scraping product.

PTI is your source for:

- **Precision Leak Detection Systems**
- **Package/Container Inspection Systems**
- **Package Integrity Testing (ASTM Test Method F2338-09)**
- **Seal Integrity Testing (Seal-Scan™ Technology)**
- **Custom Engineered Solutions**
- **Validation Services**
- **Service & Parts**

Tony Stauffer
President

Heinz Wolf
General Manager

TECHNICAL SUPPORT

Should you have any questions regarding the use of this inspection system, should any problems arise, or to obtain information about other products PTI offers, contact PTI at:

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145 Main Street
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Phone: (914) 337-2005 (Business Hours – 8:00am – 5:00pm (EST)
(800) 532-1501
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VALIDATION SERVICES

A comprehensive Validation Package is available for the PTI Inspection System, VeriPac test system. The Validation Package covers the Qualification Plan and Procedures required to perform a successful validation. For further information, contact a PTI Sales or Service Engineer at 914-337-2005 or 800-532-1501.

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Introduction

The **VeriPac 325** is a bench top Micro Leak Tester designed to inspect a variety of packages and filled & sealed packages for micro leaks. The modular, portable design is suitable for a wide range of testing applications.

This manual will cover the following important information. Please read each section carefully to fully understand the functionality of this system.

- **Section 1: Technical Specifications** – Includes feature description.
- **Section 2: System Components –** Identifies and briefly describes the main components of the system.
- **Section 3: Initial Setup – Air, Electrical and Test Line Connections –** Covers basic compressed air and electrical hookup as well as test line connection to test chamber.
- **Section 4: Touch Screen Operator Display/Setting Date and Time –**General overview of the touch screen display and four menu selections. Also covers setting date and time.
- **Section 5: Run/Hold Mode -** Explains use of the "Hold Vacuum" feature.
- **Section 6: Principles of Operation and Test Method Setup –** Provides an informative overview on the principles of leak tester's operation. Covers setting test parameters and general product testing and test results.
- **Section 7: Sensitivity Adjustment –** Explains how increasing/decreasing sensitivity, which adjusts test reference points.
- **Section 8: VeriPac 325 Data Collection Software** - Explains use of 325 Excel file for electronic data collection.
- **Section 9: Basic and Advanced Troubleshooting** - Provides a basic troubleshooting chart as well as more advanced troubleshooting information.
- **Section 10: Safety and Maintenance –** General guidelines and recommendations.
- **Section 11: Spare Parts –** Reference list of spare part descriptions and part numbers.

Section 1: Technical Specifications

Tester Type:	**Package Integrity Leak Tester**
Test Vacuum Range:	**250 – 750 Mbar Vacuum Range**
Technology:	**High-Resolution Vacuum Transducers**
Test Method:	**Vacuum decay leak testing**
Controls:	**PLC Model Direct Logic 205**
Primary Air:	**50-100 PSI**
Primary Power:	**110-240 VAC, 50-60 Hz., Single Phase**
Tester Frame:	**Compact stainless steel-framed test station houses PLC controller, vacuum generator, operator touch screen display and pneumatic controls**
Operator Interface:	**Touch Screen Color Display**
Dimensions:	**12" W – 18.5" D – 10" H**
Weight:	**28 lbs.**
Certification:	CE

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Declaration of Conformity

We PTI (Packaging, Technologies & Inspection), 145 Main Street, Tuckahoe, NY, declare under our sole responsibility that the product, Model VeriPac 325 Leak Tester to which this declaration relates is in conformity with the following standards or other normative documents.

EMC Emissions:

- EN 55022:1994/A1:1995/A2:1997 Class A ITE emissions requirements (EU)
- FCC 47 CFR Part 15 Class A emissions requirements (USA)
- EN61000-3-2:1995/A14:2000 Limits for harmonic current emissions (equipment input current up to and including 16A per phase)
- EN61000-3-3:1995 Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16A

EMC Emissions and Immunity:

- EN 61326:1997 Electrical equipment for measurement, control and laboratory use – EMC requirements

Low Voltage Directive:

- EN 61010-1
- **Safety Approval**: CE

PTI Authorized Signature:
Print Name:
Title:
Date:

FEATURE DESCRIPTION:

- High-resolution pressure transducers are used to perform vacuum decay leak testing technique used to detect very low flow of any gas..

- Internal vacuum generator

- Inspects a large variety of packages and containers for leaks, including:

  - vials and ampoules
  - filled and sealed bottles
  - blisters
  - cups with heat sealed lids
  - pouches and brick packs
  - cans and can ends

- Test sensitivity adjustment to increase or decrease as needed

- Hold Vacuum Feature to periodically clean test line/test chamber of built-up humidity and moisture – insures optimum test results. ????

- Each product tested can be assigned up to 30 different product numbers for easy product identification, tracking and record keeping. Test parameter settings/reject criteria are also stored with each product number.

- Tester counter up to a maximum of 9999; tester memory retains the last 300 tests within the Data screen.

- External test chamber configuration dependent on specific product to be tested.

- Modular, portable design – easily moved to different locations.

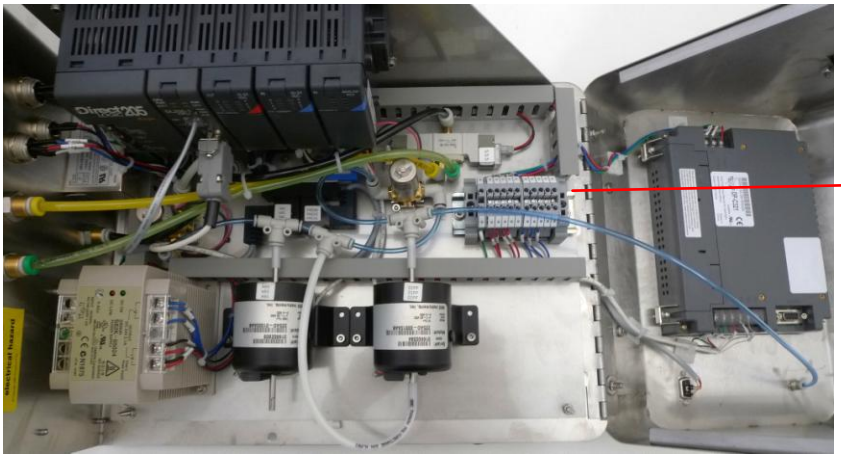
- RS-232 serial interface for PC connection; customized Excel spreadsheet with customized software for automatic data collection included with system.

- Validation Package Available – including complete qualification plan and protocol to validate VeriPac 325.

Section 2: System Components

This section will allow you to become familiar with the main components of this system. The photos that follow include a brief description of each component or section of the tester. Each area will be covered in more detail throughout this manual.

VeriPac 325 Main Unit



Inside of Main Unit – houses all main connections and CPU.

On the CPU, there is a toggle switch which must be in the "Term" mode for machine to operate (will be preset at PTI before shipping.)

Vacuum Test line for connection to the external testing chamber. (This line is also used to connect an optional Microcalibrator Flowmeter.)

RS-232 Serial interface for PC connection.

These are optional pneumatic lines for pneumatic test bridge that closes automatically. Whether or not they are required depends on the specific type of container being tested and use of a test bridge.

Green = down
Yellow = up

Touch Screen Display – The easy to use operator interface touch-screen display is described in more detail in Section 4, beginning on page 15.

4 Menu Selections:

To activate, simply touch the screen for the desired menu.

Section 3: Initial Setup – Electric, Main Air, Test Line And PC Connections

To insure proper functioning of this tester, it must be set up on a **flat, level** surface – preferably a table, counter or bench – where the following conditions are constant:

Power Supply: **110-240 VAC, 50-60 Cycles, Single Phase**

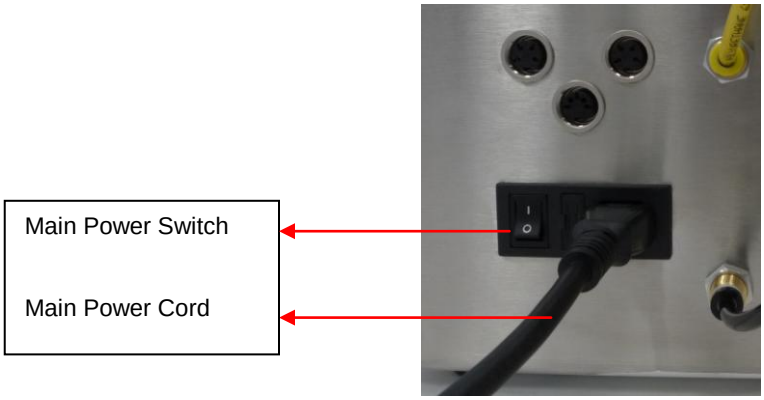
Power Consumption: **2.1 Amp**

Compressed Air Supply: **50-100 PSI**

! IMPORTANT ! – Use dry and non-lubricated compressed air only!

Electric, Compressed Air and Test Line Connections

Step 1 – Connect the tester to the electrical outlet. The power cord and power switch are located on the back of the tester. Turn on the main power switch.



Step 2 – Make sure the top two finger and the bottom mechanical switch outlets are plugged properly. See different configurations (Figure 1, Figure 2, Figure 3).

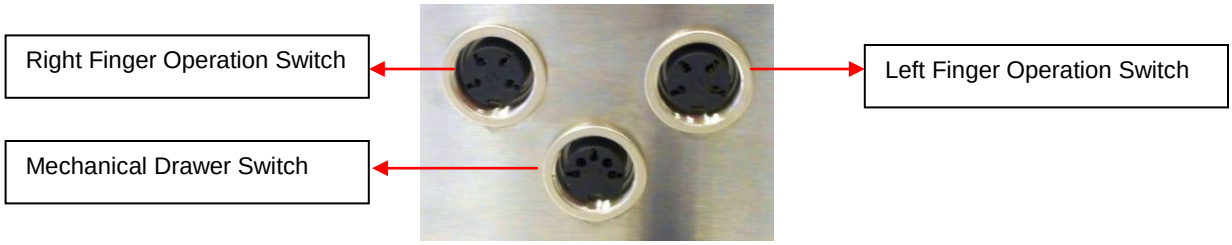


Figure 1 – Configuration for Test Bridge System.
(Mechanical switch not in use so will require a plug)

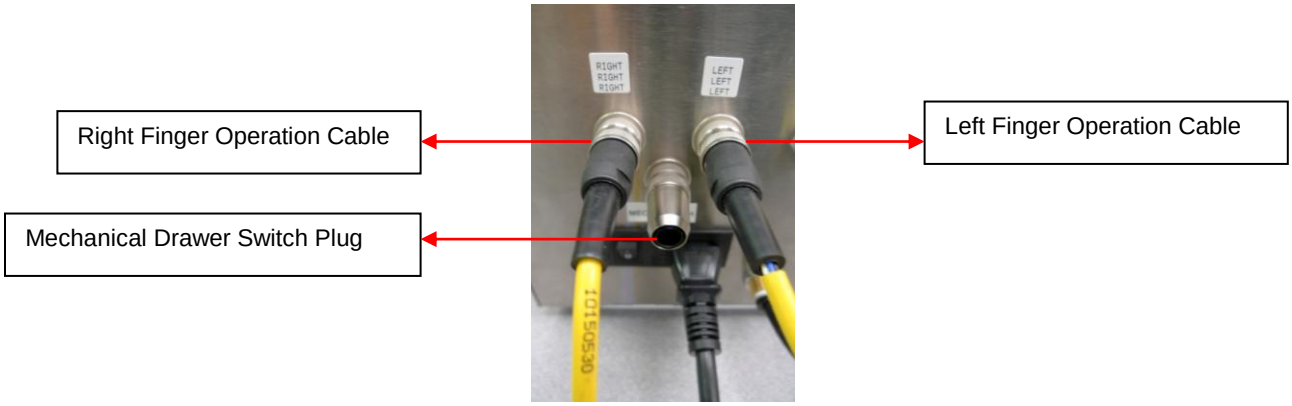


Figure 2 – Configuration for Test Drawer System.
(Finger Operation Test Bridge not in use so will require plugs)

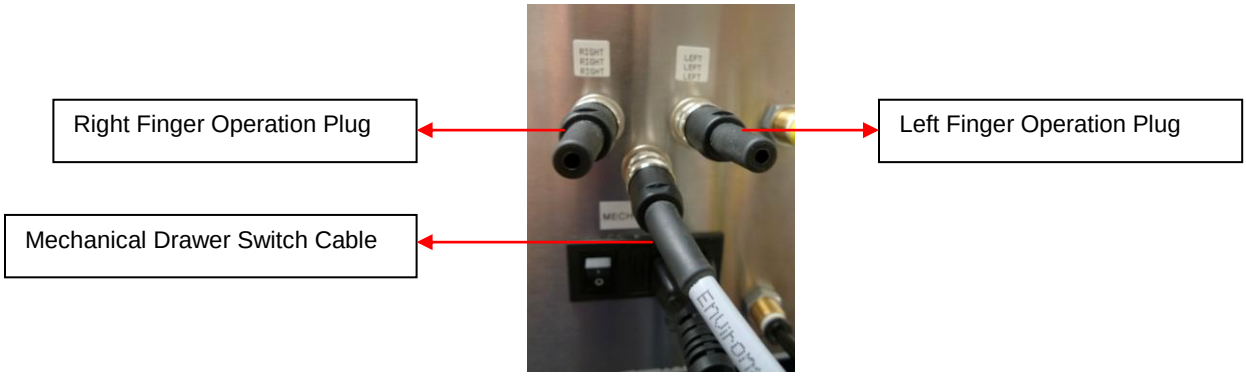
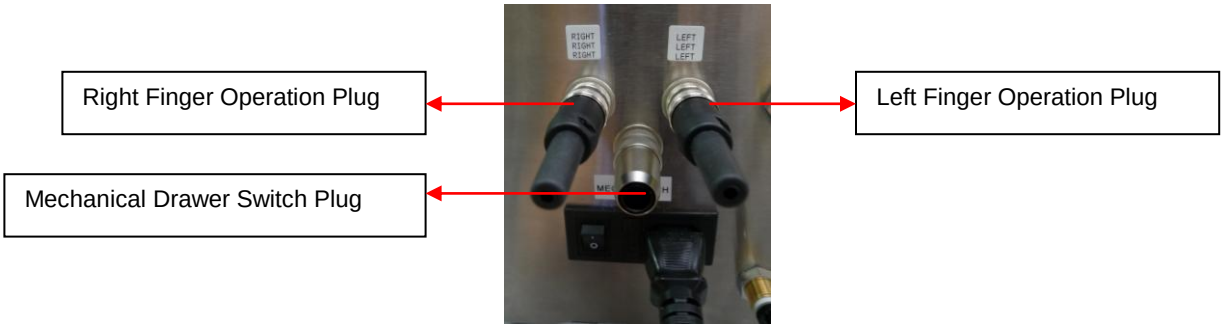
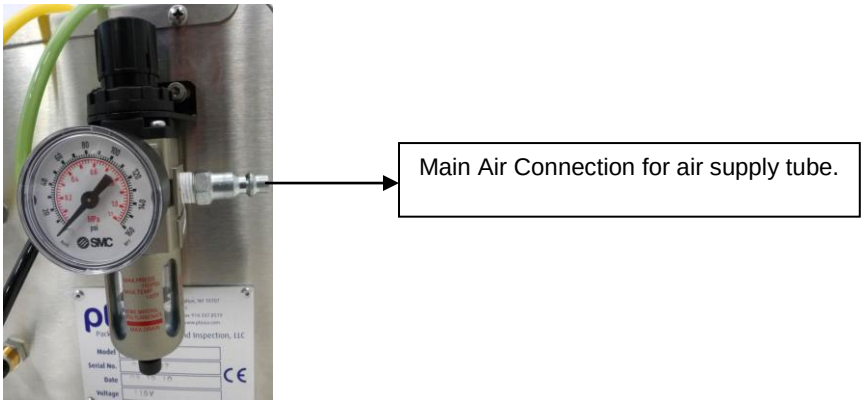


Figure 3 – Configuration for a Hand Tooling.
(Neither the Test Drawer System or the Test Bridge System are in use so will require plugs for all three outlets)

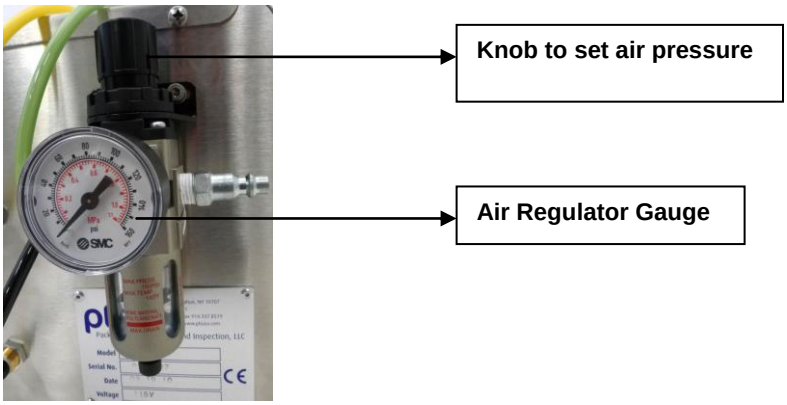


Step 3 - Check the compressed air supply and connect the air supply tube to the main air connection. See photo below.



! IMPORTANT ! – Use dry and non-lubricated compressed air only!

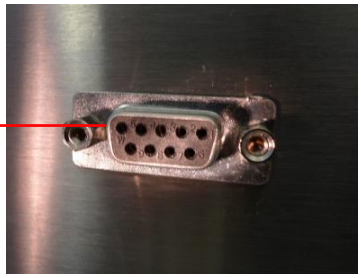
Step 4 - Once air supply tube is connected, use the knob on top of the air regulator gauge to set the air pressure to 50-100 psi or as specified by PTI.



Step 5 – Once power is connected and system turned on, the main power up screen will be shown as follows. This screen appears each time the power is turned on.

Step 6 – If connecting to PC, connect the PC cable into the RS-232 serial interface plug of the tester shown here.

Connect to PC with a Serial cable into the outlet shown.



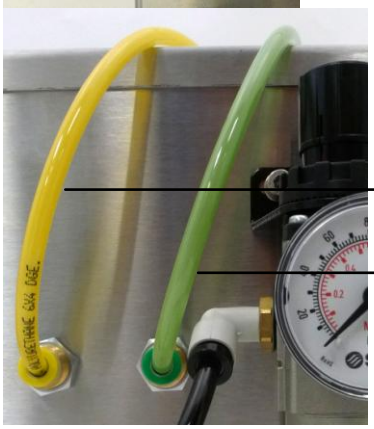
Step 7 – Connect Test Line to Test Chamber

Connect Blue Test Line from the tester to the External Test Chamber and make sure it is securely attached to the fittings.

If External Chamber requires the yellow/orange pneumatic up/down lines, make sure these lines are connected securely both to the tester and to the pneumatic cylinder. If using a manually closed chamber, these lines do not need to be connected and can be plugged closed.

Vacuum Test Line – Insert blue line into plastic cap as shown.

To release line, press in on plastic ring and pull line out.



Pneumatic Up/Down Lines for Test Chamber – if using an automatic chamber, be sure these lines are connected, otherwise if not in use, they can be plug closed.

Section 4: The Test Bridge, Test Drawer, and Hand Tooling Systems

This section will allow you to become familiar with the assembly systems. The PTI VeriPac tester is capable of three fundamental assembly systems: The Test Bridge, Test Drawer, and Hand Tooling Systems.

! IMPORTANT ! – All three assembly systems require unique configurations for the three outlets in the back of the unit. See pages 12-13 for proper configurations.

The Test Bridge System – This system requires a custom made hand tooling to be integrated with the Test Bridge. Once the operator places his left and right fingers in both sensors the Test Bridge will be able to perform the test (See Figure 1).

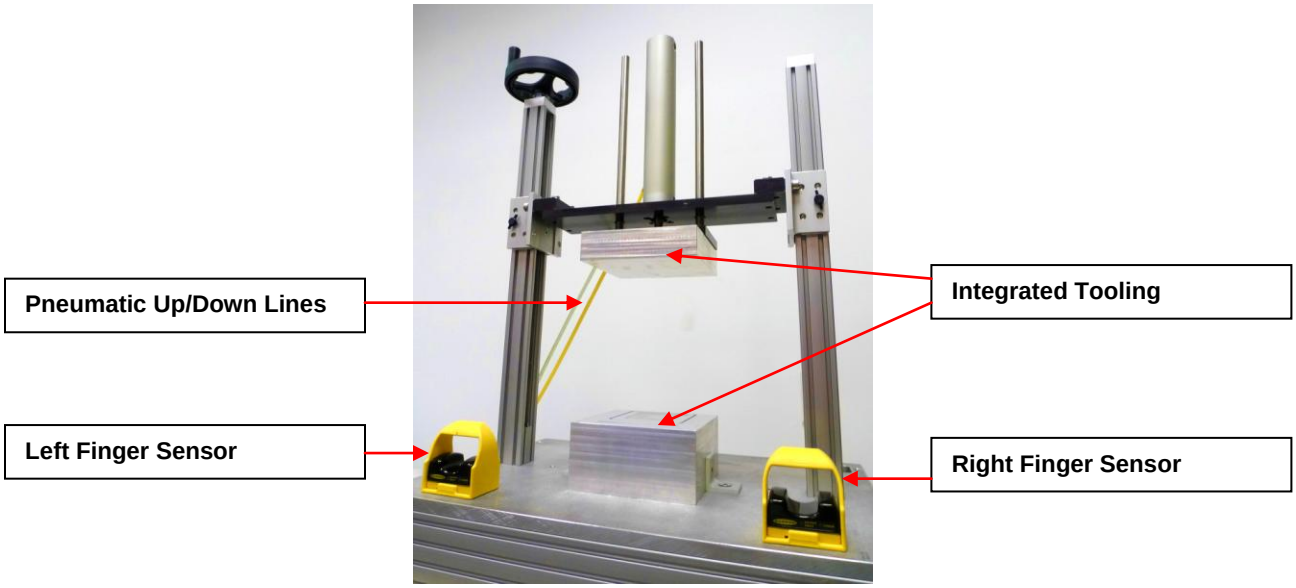
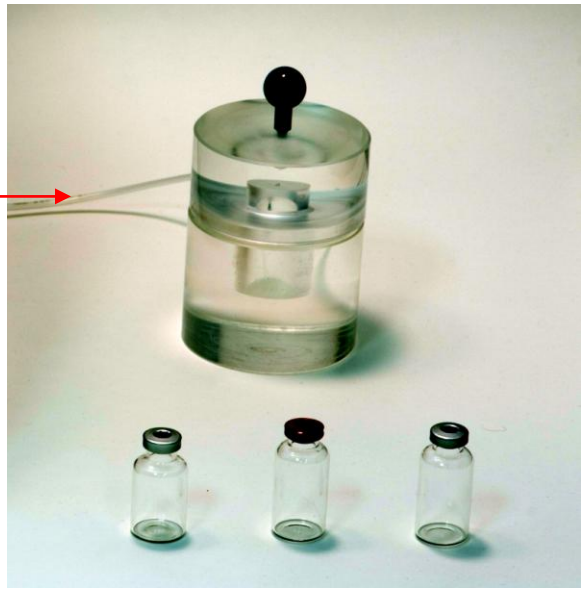


Figure 1 – To operate the test bridge, ensure test chamber is safe to close and all extremities clear of the test chamber. Once the test bridge is confirmed safe to operate, place both fingers into the finger-operating switches simultaneously to initiate the test bridge. Fingers must remain within the finger-operating switches for the test to initiate. Removing fingers will cause test chamber to return to the UP position.

The Test Drawer System – This system utilizes a drawer unit that has an integrated flexible membrane that is ideal for certain types of test chambers and flexible packaging. The operator is required to open the drawer to first insert the product and then fully close the drawer to be able to perform the test. The test cannot engage when drawer is open, and drawer is locked closed when test is being performed. Available in a larger format as well.

***See Flexible Membrane Fault Tree for troubleshooting guide (pg. 55)**

Hand Tooling Operation – This system simply connects the VeriPac's vacuum test line straight to the custom made hand tooling. The operator will be required to manually open and close the tooling.



Section 5: Touch Screen Operator Display Setting Date and Time

This section is a general overview of the color touch screen display and the four menu selections. Also covered is the procedure to set or change date and time.

The touch screen display is the operator interface to all tester settings and machine operations. Test data and test statistics can be easily viewed right on this color screen. Use of the touch screen is as simple as "touching" or pressing the area of the screen you wish to access or change.

4 Menu Selections:

To activate, simply press the screen for the desired menu.

SETTING DATE AND TIME

To activate the Main screen, press **Main** on the touch screen. The date and time are shown in the box in the lower right area of the Main display. The date and time will be set at the PTI factory prior to shipment, however if needed it can be reset at any time.

Date and Time shown here in Main screen. Time is shown in military time (24 - hour clock).

Press the red dot to save any changes made to date and time settings – pressing red dot also resets seconds to zero.

Step 1 – To change date and/or time, the screen must first be “unlocked”. Press **Set** on the touch screen display.

Press **Set** on the touch screen display.

Step 2 - The **Set** menu screen will appear as shown below.

Step 3 – Press **Lock** (in the lower right area of screen) to “unlock” the screen.

LOCKED

UNLOCKED

Once screen is unlocked, display will change as shown above.

Step 4 – Return to the Main menu by pressing **Main** on the touch screen. Now touch the area of the date or time you wish to change. The area selected will blink.

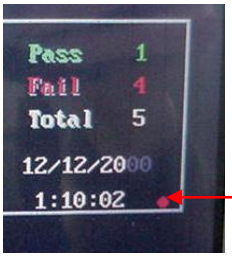
To change the date, simply press the area of the date you need to change on the touch screen. For example, press "01" if you wish to change the month.

To change the time, simply press the hours or minutes on the touch screen. For example, press 0 if you wish to change the hour.

Next, this keypad will appear. Use the arrow keys to increase or decrease the number as needed and press the = sign to confirm the value and change the setting. (Hint – holding down the left or right arrow keys will increase or decrease the value more rapidly)

Simply repeat this procedure to change additional time/date settings as needed.

Step 5 – To save changes, press the red dot next to the time. This also resets the seconds to zero. Changes are <u>not</u> set in the system until this red dot is pressed.



To save the changes made to the date and time settings, you must press the red dot shown here. This will also reset the seconds to zero automatically.

Note: Resetting the seconds can be done at any time by simply pressing the red dot.

Step 6 – Once the settings are complete, if you wish to Lock the screen settings again, press **Set** to access the Set screen and press **Lock** to protect the settings.

DESCRIPTION OF 4 SCREEN SELECTIONS

MAIN SCREEN

Shows current product number selected. Product number range from 1-32 (maximum). Shown on all 4 menu screens.

Run/Hold mode indicator

Timer indicates amount of time (hour/minutes/ seconds) between tests. This timer appears in all 4 menu screens.

Press Test to activate test sequence. Test appears on all 4 menu screens and can be activated from any screen.

Main Screen

Test Statistics – totals number of units that passed, failed and total units tested.

Gauge shows **vacuum result in Mbar (blue)** and **Differential vacuum in Pascale per second (yellow)** for each test sequence.

Date and Time (24-hr. clock – military time).

Main Screen also provides specific reason for **FAIL** tests. For more descriptions on test results and test messages, see Section 6, Pages 39-41.

CHRT SCREEN

The CHRT screen is an easy to read graph that displays two test result curves in the form of colored lines for comparison purposes. A specific test result can be "saved" on the graph for comparison to another test result. For example, save a good test result (pass) and compare the readings to new tests.

Test result of last test sequence shown here (Pass in Green or Fail in Red)

Touch "**Save**" for any test curve you wish to save and compare to another test curve.

Yellow Line – represents differential vacuum on last test.
Pink Line – represents differential vacuum on saved reference test.

Light blue line – represents vacuum on last test.
Dark blue line – represents vacuum on saved reference curve.

DATA SCREEN

This screen shows the specific test results for each test.

V,mb in blue – represents the vacuum level achieved.
dP,Pa/s in yellow – represents the differential vacuum measured in Pascale per second.
Time in green – the time stamp of the test sequence. Time in 24-hour military format.
F indicates a failed test sequence.
P indicates a pass test sequence.

 # Column: Displays test results which are consecutively numbered on the Data screen. Screen shows 10 tests at one time.

Maximum counter is 9999; leak tester memory retains the last 300 tests. Screen scroll options explained to the right.

Note: If expected to do more than 300 tests for a specific product, it is recommended to collect data from tester using the Excel file.

Scroll Functions: The Data screen displays 10 test results – the maximum is 300. These keys are used to scroll forward or backward to review these test results.

Home – moves to top of list

PgUp – moves up by screen (10 lines)

Up - moves up one line

Down – moves down one line

PgDn – moves down by screen (10 lines)

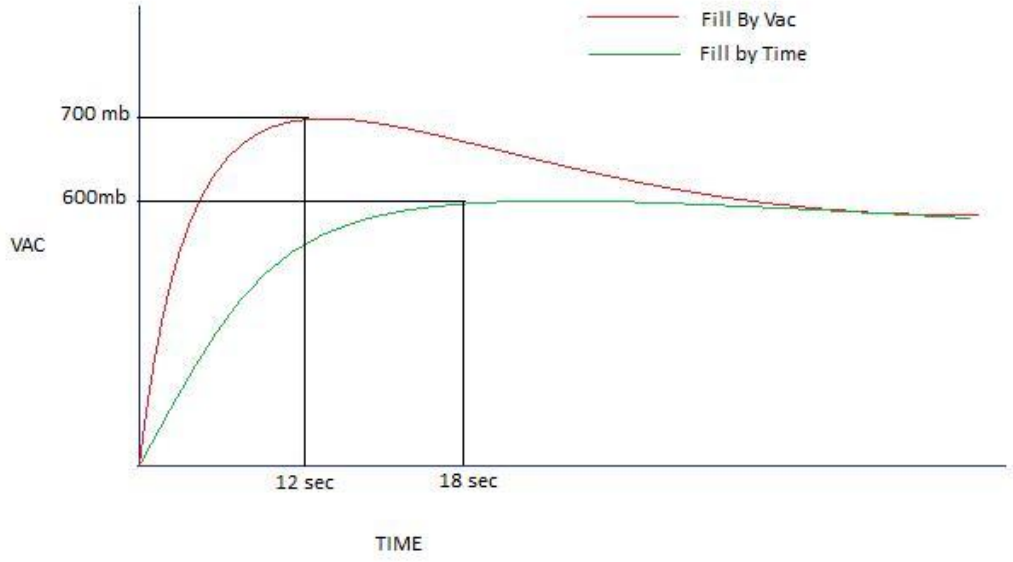
SET SCREEN

The Set screen contains the system settings for vacuum, differential vacuum and test time, plus enables these system settings to be changed. This screen also shows the reference points and statistical averages.

Fill By Options

Fill By Vacuum: The system will pull vacuum until it reaches the specified vacuum level and will stop pulling vacuum at that time. Note that the Reserve Vacuum Level should be no more than 5% above the Fill by Vac Level for rigid test chambers, and 5mb to 20mb above the Fill by Vac Level for PTI FLEX Test Chambers.

Fill By Time: The system will pull vacuum until it reaches the specified point in time and then it will stop. The reserve vacuum needs to be set close to the desired testing vacuum level, and the fill time should exceed the average time to reach the vacuum level by 3 to 5 seconds.

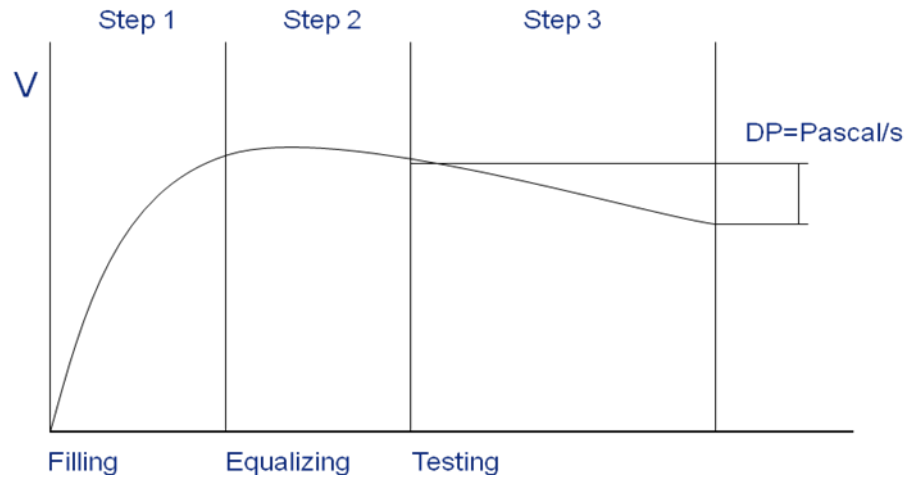


**Instructions on how to change from "Fill by Vac." to "Fill by Time" can be found in Setting Test Parameters section (Pg. 37)*

Time Settings (in Seconds)

TStroke = Stroke Time is the time required to close test chamber.
TEqual = Equalizing Time is the time it takes for the air to settle in the test chamber.
TTest = Test Time is the time that the vacuum level is observed for any changes, indicating whether or not the package is leaking into the test chamber.

**More information can be found in the Setting Test Parameters section (Pg. 38)*



Reference Points

V,mb in blue = Vacuum Level (in Mbar) inside test chamber at the end of the test cycle. If the vacuum level drops below the reference value at any time during the T-Equal or T-Test, the test will abort and the package fails the test.

dP,Pa/s = Differential vacuum achieved during test time is the rate at which the vacuum level is changing during the test. For the PTI-225 this is calculated by subtracting the vacuum level at P2 (shown above) from P1 and dividing this over the TTest. The PTI-325 uses a specific differential vacuum transducer (10 Torr sensitivity) that accurately measures the change in vacuum during the TTest period.

TFill = Time allowed for the tester to achieve the V,mb (Vacuum Level). If the time it takes to pull to the required Vacuum level exceeds the TFill limit, then the package is considered a large leak. A large leak bleeds out air fast enough as to prevent the vacuum from being reached.

Reference Points: The settings in this box are the current vacuum/pressure/fill time settings that determine the testing/reject criteria.

Rst – is the Reset function, which resets the statistical values and test totals on the Data screen to zero.

Lock - Protects access to the Setup box and the Reference points setting, preventing the operator from accidentally making changes during the testing.

The Lock function also protect Date and Time Settings

To unlock the screen, simply press the word "Lock" on the touch screen.

Statistical Min./Avg./Max Counters - These values are the statistical averages that are calculated live as tests occur and **are based on GOOD/PASS tests only.** These values can be reset to zero at any time or will automatically reset to zero once 300 test sequences are completed.

Section 6: RUN/HOLD VACUUM MODE

The VeriPac 325 is equipped with a **"Hold Vacuum"** feature which cleans the test line and test chamber, removing any moisture or humidity that may build up and affect test results. It is recommended to periodically perform the Hold Vacuum procedure to insure optimum test results; and it can be performed as often as needed. A supervisor should designate a schedule or specific recommendation for this procedure. The frequency depends entirely on the testing environment, the operator schedule, time of day, amount of breaks, type of product, etc.

The timer shown below appears in all screens and counts the time lapse between tests. Each time a test is completed, the timer resets to zero automatically.

This timer appears on every screen and indicates the amount of time that has passed since the last test.

In this example, 1 minute and 3 seconds has passed since the last test was completed.

How Often Is It Necessary to Complete the Hold Vacuum Procedure and for How Long?

In most test environments, there will be a certain amount of time that normally passes between tests – some tests will be conducted every minute or every 30 seconds for example, whereas others may have longer breaks between tests.

As a general rule of thumb, the factory recommends that if the amount of time exceeds the regular breaks between tests, the Hold Vacuum procedure should be used before performing the next test. It is recommended to activate the Hold Vacuum for at least 1 – 2 minutes to adequately clean the test line and remove any humidity or moisture that may have built up on the surface of the test chamber and the test line.

Hold Vacuum Procedure **! IMPORTANT ! The test chamber should be closed and empty - without product - when performing this procedure.**

This procedure can be done in any screen.

Press **RUN** on the Touch Screen to change to Hold Vacuum mode.

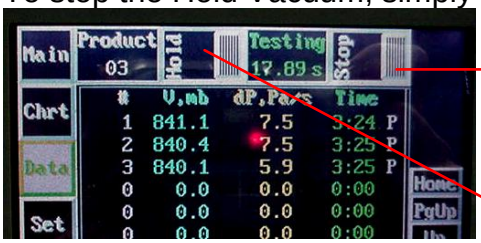
Then, press **TEST** to activate the Hold Vacuum procedure.

Will now show “Hold” indicating tester is now in Hold Vacuum mode.

During the Hold Vacuum, the display will show “Testing” indicating the test line is active and the timer will show the amount of time.

The Hold Vacuum procedure does not count as a regular test, nor is it counted in the test statistics or in the Data screen.

To stop the Hold Vacuum, simply press **Stop** to return to normal “Run” mode.



Press **Stop** to stop the Hold Vacuum and return to standard Run mode.

NOTE: While in the Hold Vacuum mode, DO NOT press Hold to return to Run mode. This will activate a “normal” test sequence and record the test result in the test data. Only stop Hold Vacuum by pressing Stop.

Section 7: Principles of Operation and Test Method Setup

This section begins with an overview and principles of operation followed by descriptions of test limits and the stages of each test cycle. It is recommended to review this section to become familiar with the test parameters as well as what occurs during each phase of a test cycle.

This section also covers selecting product number, and setting the actual test parameters (vacuum, test time, equalizing time and stroke time). Please note PTI may preset the test parameters at the factory for a specific product(s) prior to shipping tester.

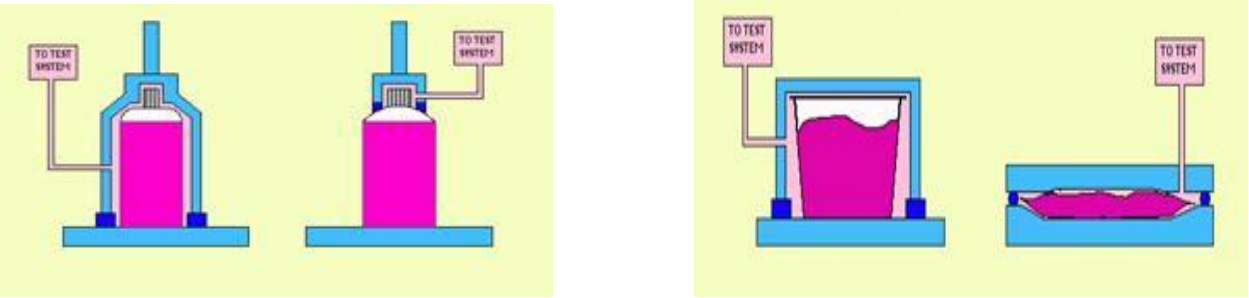
! IMPORTANT ! Appendix II of this manual entitled "Optimizing Test Parameters" provides more details and factory recommendations on setting test parameters. Supervisors and Management personnel are encouraged to review Appendix II as needed when setting test parameters.

The test parameters and reference points are stored with each product number for convenient recall. If test parameters have already been set and stored with the product number, you need to only select the product number and perform the basic steps for product testing also covered in this section.

OVERVIEW AND PRINCIPLES OF OPERATION

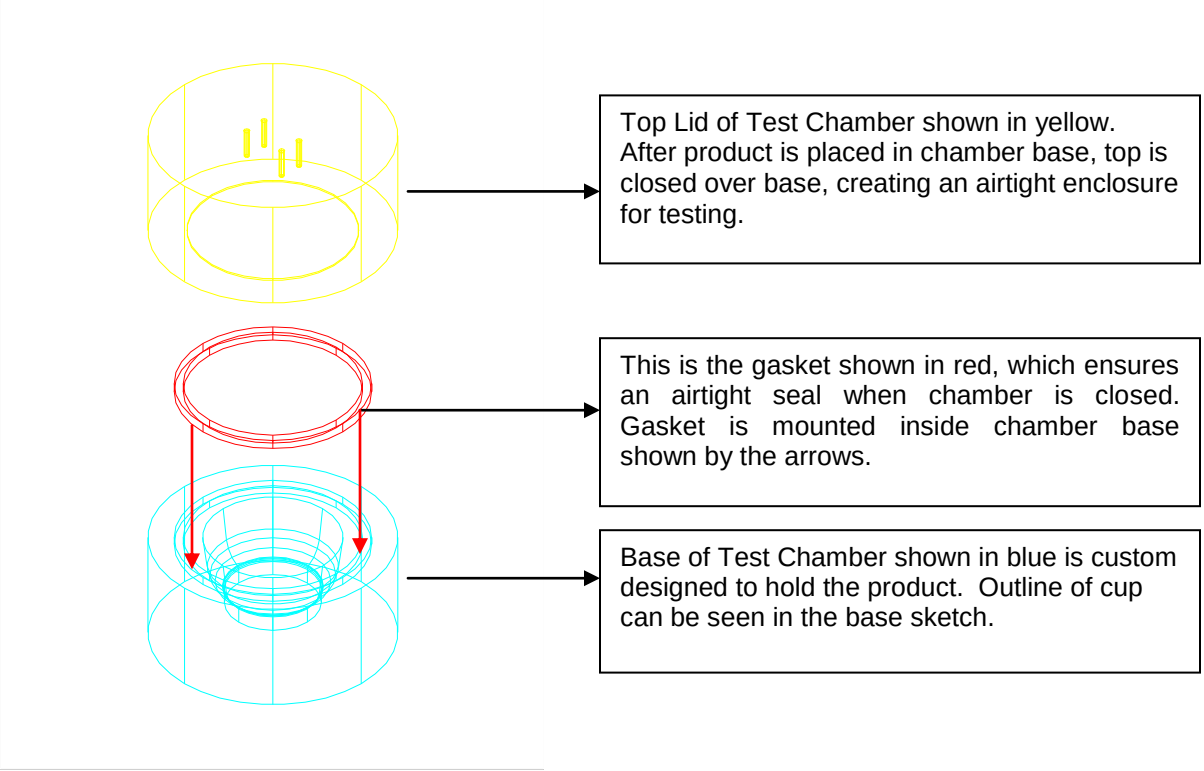
Leak Testing of Filled Packages

Entire Bottle **Bottle Seal & Closure** **Cups & Trays** **Pouches & Blisters**



The instrument is designed to pull a vacuum on a test chamber that is specifically designed to contain the package to be tested. Multiple chambers can be used with one leak tester. Test chamber is connected to the leak tester using a vacuum test line. Once a defined vacuum is pulled inside the chamber, the vacuum and the change in vacuum are monitored and measured. The changes in vacuum level correlate to the presence and size of leaks in the package.

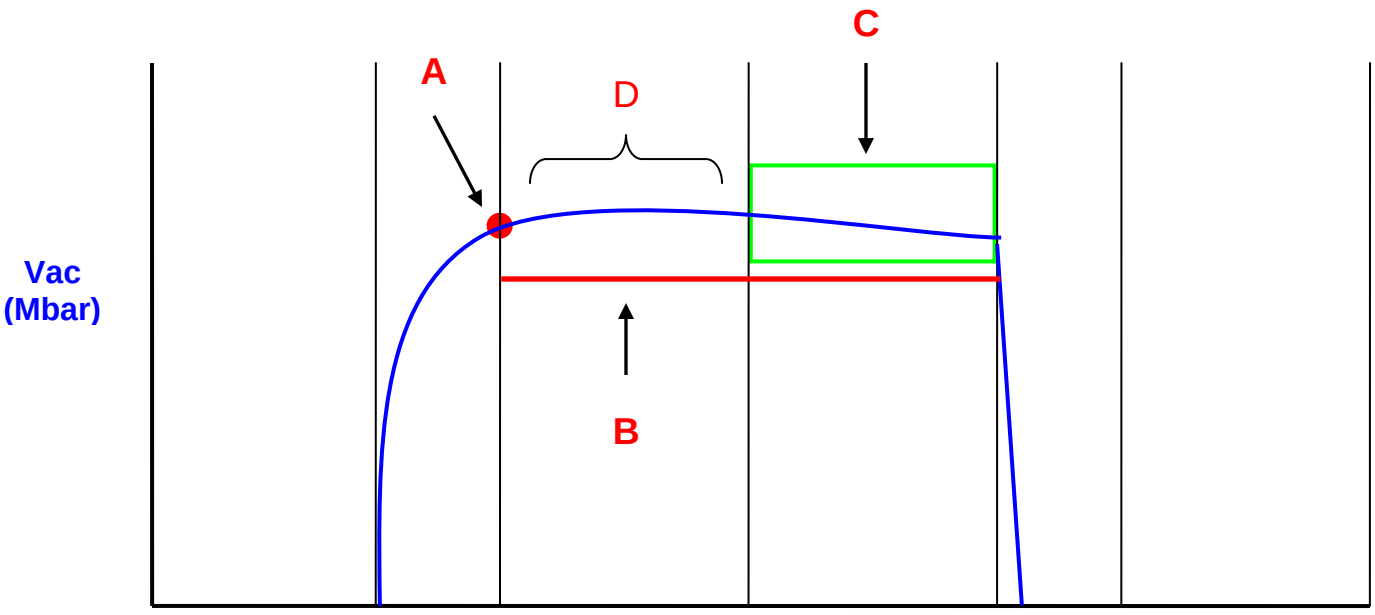
Example Test Chamber Design: This color outline shows the three components of a test chamber – top lid, base and sealing gasket. This particular chamber is designed for a heat sealed cup filled with a food product.



Operation of Tester: The product to be tested is placed in the test chamber. Depending upon the configuration, the chamber can be designed to close manually – requiring the operator to replace the top lid before testing; or it can close automatically using pneumatic lines connected to the leak tester.

DESCRIPTION OF TEST LIMITS AND TEST CYCLE

There are only three limits associated with the VeriPac 325 Leak Detector Test Cycle. The limits are located on the "Set" screen of the Tester and can be input manually. The first limit violated during the test will cause an immediate failure and the tester will immediately jump to the "Venting" portion of the cycle.



Limits are located here on the Set Screen.

"A"- This point on the graph represents the first limit that is encountered during the test cycle, "TFill" Ref. This limit is used to detect any large leak that may exist in the sample being tested (provided that there is sufficient head space in the sample, approximately a 15% increase in the chamber volume). The system must reach the specified vacuum level within the allotted time or the sample is considered a failure.

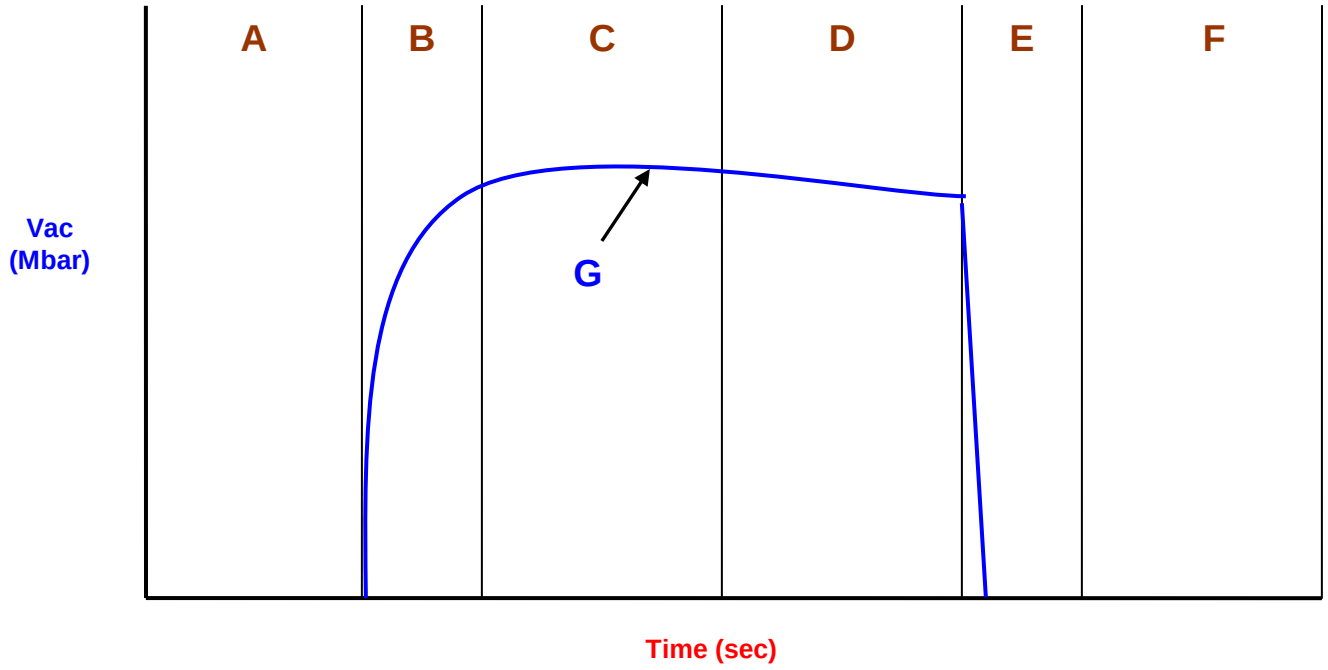
"B"- This line represents the second limit that is encountered during the test cycle, "V,mb" Ref. This limit is used to detect any moderate to large leaks that may exist. Once reaching the specified vacuum level, vacuum must remain above this level until the end

of the test. If vacuum decays to less than this value at any time during equalizing or testing, the sample is considered a failure.

“C”- This box represents the final limit, “dP, Pa/s” Ref. This limit is used to detect micro to moderate sized leaks. It is during the test time that a differential pressure is observed and measured between the chamber and a reference volume inside the tester. This differential is continuously monitored and a rate of change is calculated during the “TTest” time. If at any time the limit is exceeded, the sample is considered a failure.

“D”- During the equalizing time the rate at which vacuum moves from the tester across the sample line into the chamber is monitored. The rate is calculated internally and is not displayed. The limit is also calculated and not displayed. If the limit is exceeded it indicates that a large leak exists.

VeriPac Test Cycle



The Test Sequence:
The same series of events occurs every time the "Test" button is touched on the touch screen. In the above drawing the letters represent all the stages that will occur during a test cycle. Their size is dependent upon the following:

"A"- Represents the "TStroke" as set by the operator on the "Set" screen. This value is a time delay before the tester begins pulling a vacuum. Used most often with a pneumatic cylinder and tooling. This time allows the chamber to close and seal.

"B"- Represents the "TFill". If "Fill by Time" is chosen, then this value is set by the operator on the "Set" screen. Most frequently the tester is configured to "Fill by Vacuum". When "Fill by Vacuum" is chosen, this value is a measured value. The magnitude of this number is then dependent upon the level of vacuum and the volume of the test chamber. As the vacuum level and/or the chamber volume increase so does the "TFill". The system begins measuring this time once the vacuum in the system reaches ~50 Mbar.

"C"- Represents the "TEqual" as set by the operator on the "Set" screen. This time is used to allow vacuum level in the chamber to equalize across the poly line and for the container to settle slightly. Smaller, rigid containers typically require less equalizing time while larger more flexible containers may require more. The best method to determine

the correct equalizing time is through experimentation with different time settings. Begin at a reasonable time (3 seconds) and conduct a series of tests to find the optimum time for the specific product and test chamber.

“D”- Represents the “TTest” as set by the operator on the “Set” screen. This is the amount of time during the test cycle where the machine is monitoring the differential pressure. Typically, the longer the test time the more sensitive the system will be. To determine the amount of time, some experimentation will be required. Begin at a reasonable time (3 seconds) and conduct a series of tests to find the optimum time for your product and your test chamber.

“E”- Represents the “Vent Time”. This amount of time can be only as great as the “TFill”. When the test is done, the machine will blow air from its supply line back into the chamber and will continue to do so until it reaches the time it took to fill the chamber with vacuum or until the system measures a pressure in the chamber. Whichever occurs first will terminate this stage.

“F”- Represents the “TStroke” as set by the operator on the “Set” screen. This value was first used in the beginning of the test cycle (Test Sequence “A”) and is again used at this step. “TStroke” at this step of the test sequence allows for a pneumatically controlled chamber to reopen.

“G”- Representation of vacuum inside the chamber during a test. This can be viewed on the touch screen by touching the “Chart” button.

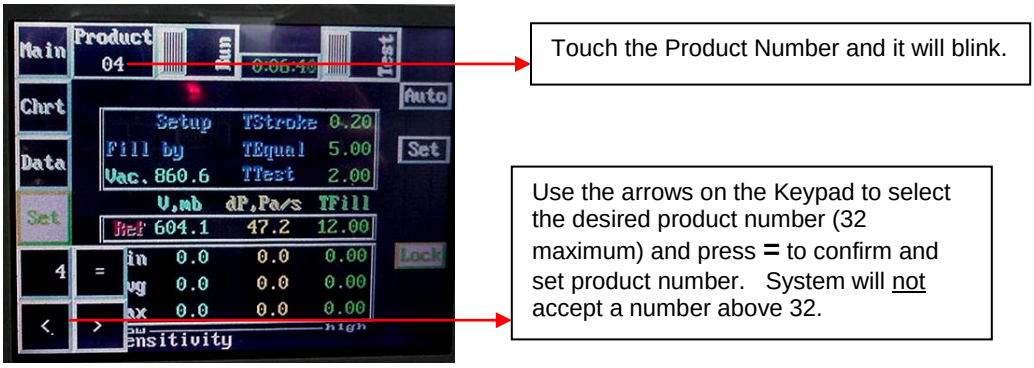
SELECT PRODUCT NUMBER

Step 1 – Access the **Set** screen and touch **Lock** to unlock the screen settings. Screen must be unlocked to access system settings.

Step 2 – Select Product Number Product number can be selected from any of the four menu screens using the procedure shown in the following example.

! IMPORTANT ! Please note that System Settings and reference points are stored with the product number, however test data is NOT stored with the product number. !WARNING! Whenever product number is changed, test data will automatically reset to zero.

Touch the **Product Number** and select the desired number you wish to assign to this particular product. **IMPORTANT NOTE: To protect against losing test data, if you change product numbers without first resetting test data, the system will prompt OK or Cancel**.

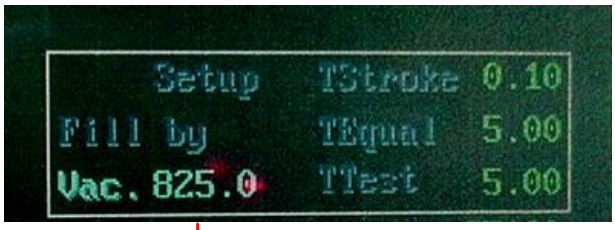


SETTING TEST PARAMETERS

! WARNING !

PTI does not recommend any modifications of testing parameters without the consultation of a PTI engineer.

TEST PARAMETERS SETUP – to set or change any of these parameters, using the touch screen, touch the setting to be changed, and use the keypad that appears in the lower left corner of screen.

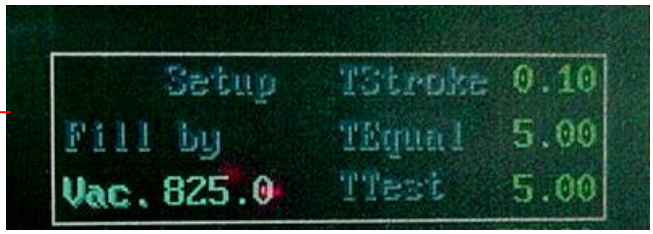


Touch the setting you wish to change and the value will blink.

Once you've selected the setting, use the arrows to increase or decrease the value to the desired setting and press **=** to confirm.

! IMPORTANT !

When setting or changing the vacuum level, the system will prompt you to confirm (OK) or cancel (Cncl) to protect against losing any test data. If there is test data on the Data screen, confirming OK will automatically reset data to zero.



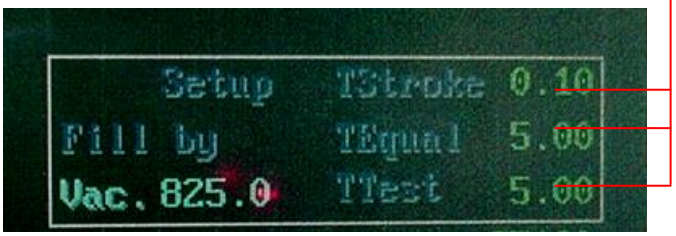
Fill by Vacuum Level* The Fill by Vacuum determines how much vacuum goes into the test chamber. The vacuum level is set in Milibar (Mbar). **If you are unsure as to the vacuum level needed for a particular product, refer to Appendix II, Optimizing Test Parameters, for further details and recommendations.**

Changing the Fill Cycle From Fill by Vac. to Fill by Time

1) Go to the SET screen on the tester.
2) Press on Vac (underneath "Fill by") to switch it from "Fill by Vacuum" Mode to "Fill by Time".
3) Go to the MAIN screen, and select the RUN button to put it into HOLD mode. Select TEST.
   Adjust the Air Regulator in the back of the machine to bring the vacuum level on the front of the tester to your desired vacuum level for the test cycle, then stop the HOLD cycle.
4) Take good packages and place them in the test chamber to test.
5) When you run the test observe the vacuum level, and when it reaches your desired test vacuum level not the value on the timer at the top of the test screen.
6) Fill time is dictated by TFill. Go to the SET screen and select TFill and adjust TFill to the time recorded in Step 5 plus 3 to 6 seconds. Example: Time recorded in Step 5 is 14 Seconds; The TFill can be anywhere from 17 to 20 Seconds.

If you are unsure as to the correct setting for the product you are testing, it is recommended that you consult a PTI Engineer to determine which option is most suitable for your product. Contact PTI @ 914-337-2005 or 1-800-532-1501.

Stroke Time, Equalizing Time and Test Time Settings



T Stroke - This is the **Stroke Time (set in seconds)** that is determined by the amount of time needed to close the test chamber. Normally this value is required if the product being tested will be placed inside a chamber that opens and closes automatically using pneumatic pressure. If a chamber is being used that is closed manually, set the stroke time to .10.

T Equal - Equalizing Time (set in seconds) – Time for system equilibration - the time needed to equalize or settle the vacuum inside the test chamber. The average recommended setting is 5.00 seconds.

T Test - Test Time (set in seconds) – Represents total test time - the length of time required to measure/monitor the differential pressure inside the test chamber. The average recommended setting is 2.00 seconds.

PRODUCT TESTING

Once the product number is selected, test parameters set, you are ready to test product. **! IMPORTANT ! – Do not attempt to do product testing for a new product without setting test parameters.**

Product tests can be activated from any screen mode. Follow these simple steps:

Step 1 – If using Excel software file on PC for data collection, connect PC serial cable to VeriPac 325 tester and prepare to collect data.

Step 2 - Select the product number with the preset test parameters and reference values. Reset counters if needed.

Step 3 - Make sure test chamber test line is connected to tester.

Step 4 - Perform the Hold/Vacuum procedure for at least one minute to clean test line and test chamber.

Step 5 - Place product in test chamber and close chamber. Press **Test** to activate the test sequence.

Press Test to activate test sequence.

NOTE: To STOP or Abort a Test - If after pressing the Test button, you wish to not complete this test and abort it, simply press STOP on the touch screen. The test sequence will stop and not be recorded in the system on the Data screen.

Touch **Stop** to immediately stop or abort a test sequence.

Step 6 – Test results can be viewed on any of the four screens – Green Pass or Red Fail. Examples shown on the following page.

TEST RESULTS – TEST MESSAGES

Main Product Screen – Displays Green/Pass or Red/Fail for test results.

Main Screen also provides explanation of Failed test. Examples of screen messages are described on the following page.

Data Screen shows up to 10 test results at one time and stores the last 300 tests per product. (Maximum counter – 9999)

Use the scroll functions to move forward or backward as needed within the Data screen.

Note: Regarding Data Collection, it is important to remember the tester retains the last 300 tests in memory on the Data screen (maximum counter is 9999). If planning to perform more than 300 tests for a specific product, it is recommended to use the Excel file for electronic data collection or to record data manually.

VeriPac 325 Main Screen Messages Explained

When this message is displayed it indicates a **Large Leak**. The system was unable to reach the test vacuum level in the normal amount of time.

When this message is displayed it indicates a **Moderate to Large Leak**. While equalizing the vacuum level in the test chamber decayed to less than the "V,mb" Ref. This message can also appear in the "TTest" portion of the cycle. In that scenario the word equalizing will be replaced with testing.

When this message is displayed it indicates a **Micro Leak**. The "dP, Pa/s" Ref has been exceeded during the "TTest" portion of the cycle.

When this message is displayed it indicates a **Large Leak**. The rate at which the vacuum migrated from the tester, across the sample line to the chamber exceeded the internally calculated rate.

Section 8: Operator Parameter Auto-Adjustments

The Operator is capable of allowing the unit to make auto-adjustments by three features of the VeriPac tester: Activating the Auto-Learn function, activating the Set function, or by adjusting the Sensitivity Gauge.

! WARNING !

PTI does not recommend the use of the AUTO or SENSITIVITY adjustment functionalities. If used, the testing parameters that were established with the assistance of a PTI Engineer will be changed, and correct values will need to be obtained from validation records and reentered into the system.

The Sensitivity Adjustment changes the reference point settings. As a rule of thumb, **increase the sensitivity** if the tester is not detecting products with a known "unacceptable" leak. **Decrease the sensitivity** if the tester is rejecting products that are known good "acceptable" containers.

The Sensitivity Gauge automatically adjusts the reference points as follows:

Increasing Sensitivity:
Increases Vacuum (V,mb)
Decreases Differential Pressure (dP,Pa/s)
Decreases Fill Time (TFill)

Decreasing Sensitivity:
Decreases Vacuum (V,mb)
Increases Differential Pressure (dP,Pa/s)
Increases Fill Time (TFill)

The Sensitivity Gauge can be accessed only when the Set screen is unlocked, in order to protect the reference point settings.

Step 1 – Access the "**Set**" screen and press **Lock** to unlock the Sensitivity Gauge as shown below.

Touch **Lock** to unlock the Sensitivity Gauge.

Sensitivity Gauge

Step 2 – Press and hold the block on the sensitivity gauge and move it up or down as needed to reach the desired settings.

Press and hold the center of the gauge and move up or down as needed.

Step 3 – It is recommended to re-lock the Set screen to protect settings when the correct sensitivity has been achieved.

Touch Lock to re-lock the Set Screen Settings.

Section 9: VeriPac 325 Data Collection Software

This section covers the PTI customized 325 Excel template worksheet that provides an easy, convenient method of electronically collecting test data.

Requirements: MS Excel must be installed on the computer that will be used for data collection.

Serial Cable required to connect leak tester to computer – cable is obtained directly from PTI.

Software Install Disk available from PTI.

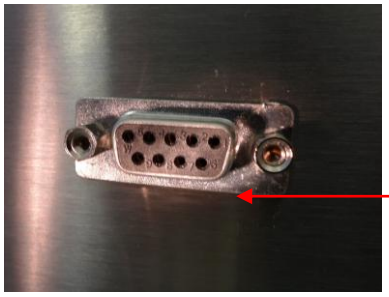
There are two elements of the software that are needed for the data collection program for the VeriPac 325:

- **Automation Direct DDE Server (DSDDE Ver. 1.6)**
- **VeriPac 325 template file for MS Excel**

If you need to obtain this data collection software, contact PTI at 914-337-2005 or 1-800-532-1501. Please note that the Direct DDE Server as well as the PTI VeriPac 325 template files are available for free download at www.ptiusa.com\secure for evaluation purposes only.

Installation: The installation disk contains a "Read Me" file, which contains step-by-step instructions to install software. The install procedure will automatically install the VeriPac 325 Excel template file and the Direct Server software on your computer system. Follow system prompts to install files. System will prompt to assign files to a default directory (C:\Dirctsft) – **DO NOT CHANGE THIS DEFAULT DIRECTORY.**

Connect Tester to PC: Connect the PC serial communication port to the VeriPac 325 serial port with serial extension cable.



Open P325 Template File: Open MS Excel. Open file entitled "p325.xlt template. The format of the worksheet closely resembles the tester Set

screen, so it is easy to identify information. Each area of the worksheet is described below:

Figure 1

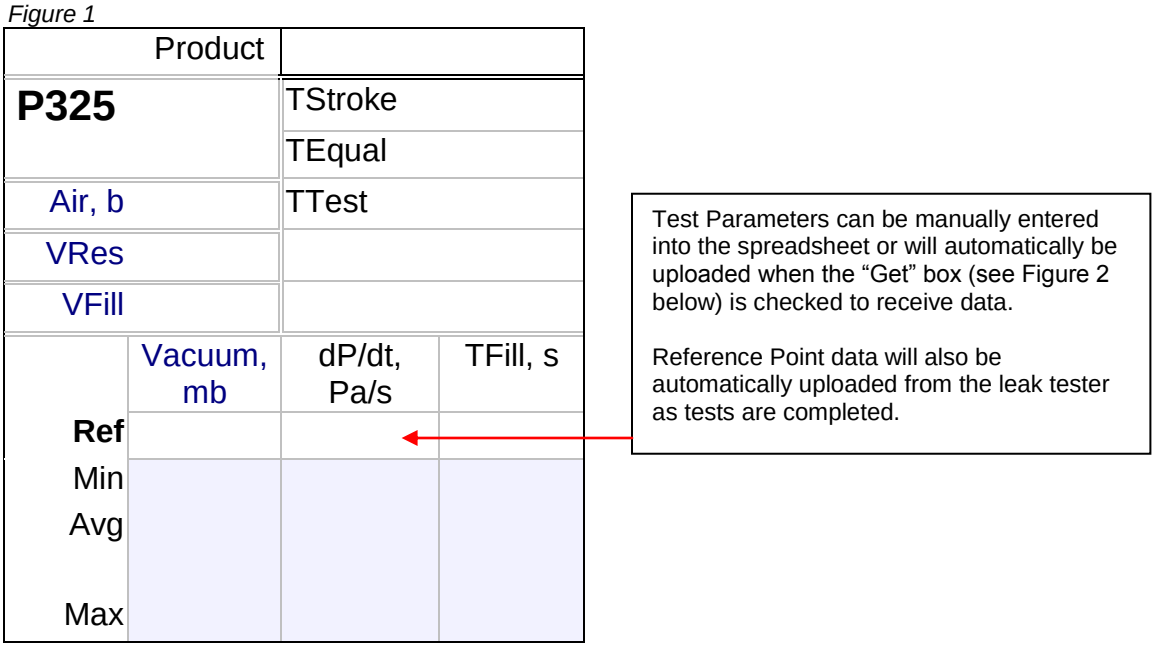


Figure 2

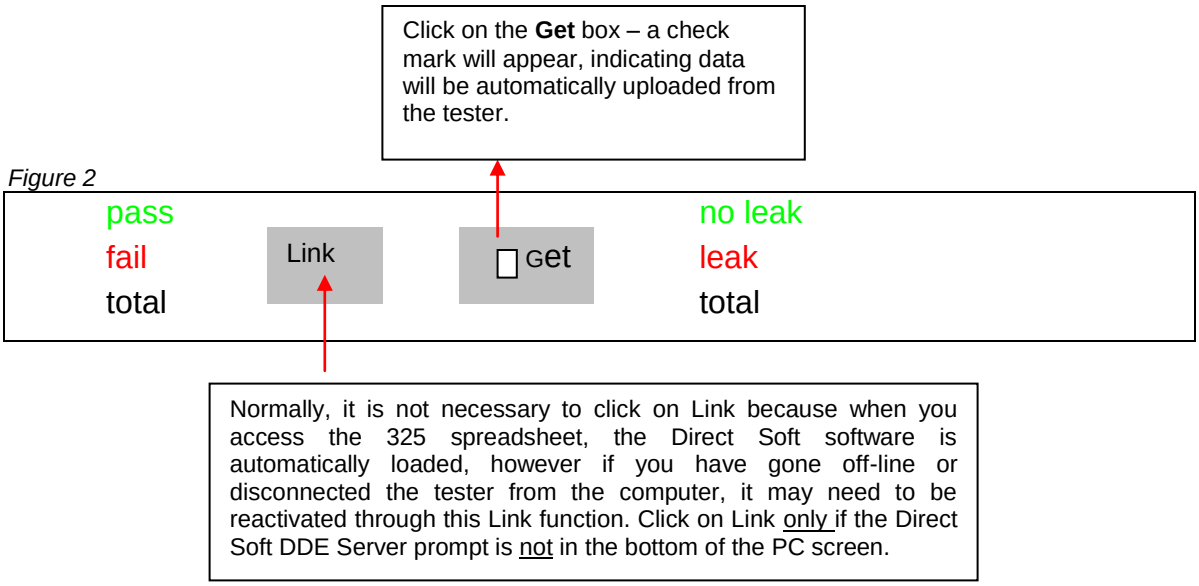


Figure 3

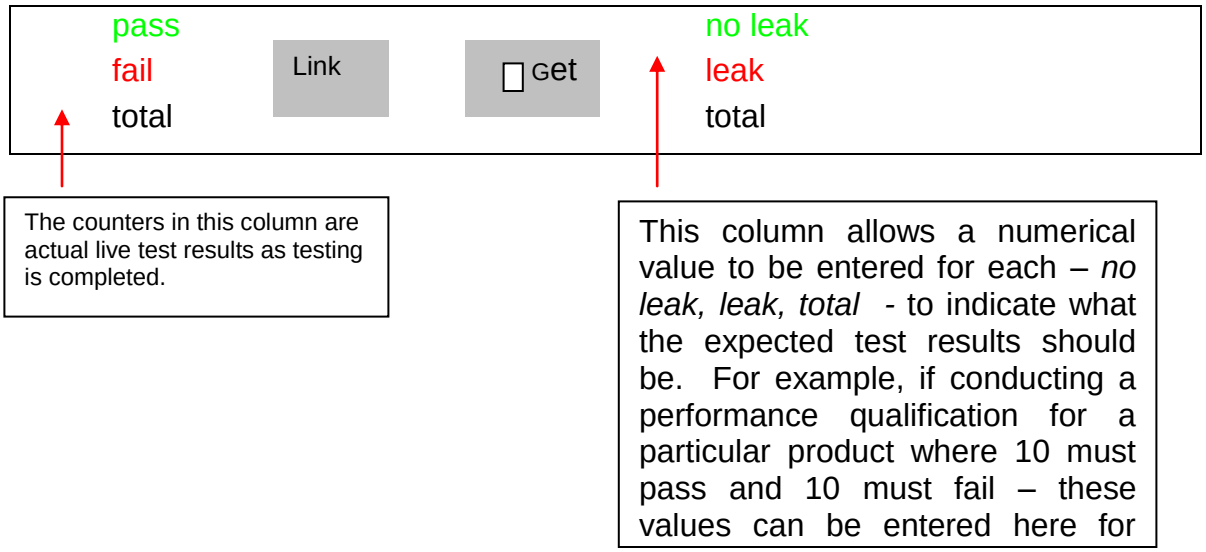


Figure 4

Test #	Vacuum, mb	dP/dt, Pa/s	Time	Pass/Fail	V.Ref, mb	dP/dt Ref, Pa/s	TFill Ref, s

The section of the worksheet in Figure 4 is mainly test # (sequential as on tester), time stamp, pass/fail results and reference points for information only.

Figure 5

Product Code	
Product ID/Name	
Product Description	
Tester S/N	
Firmware Release	
Chamber S/N	
Validation Stage	
Operator	
Test Location	
Test conditions	
Cleaning Interval	
Main Air supply, b	
Vacuum supply, mb	
Microcalibrator S/N	
Target Leak , ccm	

Leak, ccm	*Sample ID*	*Comments*

This section located to the right area of the worksheet is optional information that can be filled out by the operator, pertaining to specific product information, product ID, testing conditions, tester settings, operator information, etc.

This section can also be filled in with details pertaining to specific tests, leak size detected, sample ID, etc.

To Collect Data From Leak Tester:

1. After opening Excel 325 template file, click on the “Get” box to go on-line with the tester. When “Get” box is checked, all data will be automatically uploaded into the Excel spreadsheet.

2. Perform tests and collect data. As necessary, manually input information related to product identification and tests into the appropriate spreadsheet locations.

3. Use the “Save as” function to assign a new file name and save collected data to this file. Print worksheets for record keeping as needed.

3. To stop collecting data, click on the “Get” box again to remove the check mark. This will disconnect the Direct Soft software link from the tester to the computer.

! IMPORTANT ! - INFORMATION REGARDING DATA COLLECTION SOFTWARE

1. **Please note that whenever clicking on the "Get" box, if there is any data collected and displayed on the 325 Excel Worksheet, this data will be automatically cleared and reset. Therefore, be sure to check and save collected data using the "Save as" function whenever going on or off-line with the tester.**

2. **The internal memory of the leak tester holds data for the last 300 tests. The counter maximum is 9999; therefore, if planning to perform more than 300 tests and you need to record this test data, be sure to either electronically collect data using the 325 Excel file or manually record as necessary.**

3. **The 325 Excel template with Direct Soft DDE Server is not intended for use on the computer alone without connection to the leak tester.**

4. **When the Direct Soft DDE Server is loaded and active on your computer, the prompt "DDE Server" will appear on the bottom of the computer screen. Click on "Link box" if necessary to activate.**

5. **If the 325 Excel worksheet template is opened without linking the tester and computer (Link box), the following prompt may appear.**

   Remote data not accessible. Start application 'DSDDE.EXE'? YES/NO

   Click Yes to load or No if you do not wish to load the Direct Soft program.

Section 10: Troubleshooting

There are three sections of Troubleshooting:

- Basic Troubleshooting covers the more basic conditions that may occur and possible solutions.
- Advanced Troubleshooting provides more in-depth explanations and guidelines.
- Flexible Membrane Fault Tree

It is important to remember that for many of the conditions, there are several possible causes that require investigation. **In the majority of situations, if the tester worked fine and now suddenly is not working properly, SOMETHING CHANGED! The quickest way to solve the problem is to determine what changed… is it the product, the settings on the tester? This is the best way to troubleshoot.**

If you require more information or further assistance, please call the PTI Service Department, Monday through Friday 8am – 5pm (EST) at (914) 337-2005 or 800-532-1501 or E-mail: pti@ptiusa.com.

BASIC TROUBLESHOOTING

Condition	Procedure
For questions concerning Test Parameter Settings and Vacuum Level Setting	*Refer to Appendix II, Optimizing Test Parameters, which provides factory recommendations and guidelines regarding these important tester settings.*
Tester is on, but nothing is happening with test chamber when pressing TEST.	*1. Is the test chamber connected to the VeriPac 325?* *2. If using multiple test chambers for different products, is the correct chamber connected for the product you are testing?* *3. If using an external chamber that automatically closes, check orange/yellow pneumatic lines and make sure they are securely connected.*
Product with known leak is not detected.	*1. Increase sensitivity.* *2. Increase Fill Vacuum level and/or Equalizing Time/Test Time.* *4. Did product change in any way? Determine what settings changed.*
Good Product is testing as fail/bad.	*1. Test known bad product to make sure tester rejects. If it is not rejected, decrease sensitivity and test again. Bad product should be rejected. Re-test good product to check that it tests as Pass/good.* *2. Did product change in any way? Determine what settings changed.* *3. Check if there is any leak in the system causing the failed test results. Check vacuum test line and chamber.*
Cannot change Date/Time settings	*Screen is locked. Go to Set screen and unlock. Return to Main screen for date and time change.*
Cannot change test parameters in Set Screen	*Screen is locked. Unlock and proceed with changes.*
Tester does not function at all.	*Lift off top cover of tester and check CPU for correct position of toggle switch. Must be in "Term" mode.*
325 Excel worksheet does not upload data.	*Be sure tester and computer are connected with serial cable. In 325 Excel Template File, click on Link and Get box to upload data. See Section 8, pages 47-48 for more information regarding data collection software.*

VeriPac 325 ADVANCED TROUBLESHOOTING

The following is a summary of common problems and their corrective actions associated with the operation of the VeriPac 325.

Symptom: The repeated appearance of this message while testing good product (no large leak).

Actions: Check gasket on chamber and the chamber seal. Check and verify sample line connections are tight. If using external flow meter, verify its valve is closed. Check external regulator pressure located on the back of the tester and adjust as needed to correct this situation. If you believe this error to be the result of the regulator, make an adjustment to the pressure, then run a test and observe the “TFill” on the “Set” Screen. Repeat this step until the “TFill” has returned to the normal operating range.

Explanation: The tester detects a large leak. If it is not the sample, you must find its source before continuing any testing. The tester is dependent upon a stable source of air in order to achieve a stable and repeatable vacuum level. If the tester is “sharing” its air supply with other equipment, the available airflow will vary and so will the vacuum level and “TFill”. In order to operate at the highest level of sensitivity or detection, the operator will need to observe “TFill” times and ensure that good product remains in a stable operating window. Periodic adjustments to the regulator may be required depending upon the machines air supply. These adjustments are normal and recommended to ensure the highest level of sensitivity.

Symptom: The repeated appearance of this message while testing good product (no large leak).

Action: Check gasket on chamber and the chamber seal. Check and verify sample line connections are tight. If using external flow meter, verify its valve is closed. Verify that tester is not over shooting the desired vacuum level by greater than 10%. If the reason is determined to be the over shoot, perform the vacuum hold procedure in accordance with the tester's manual (Section 5, Page 23-24) and make the appropriate adjustment.

Explanation: The tester detects a moderate to large leak. Correct its source. Vacuum level over shoot will cause this because there is some distance between the test chamber and the vacuum source/sensing element. If the approach to the desired vacuum level is too rapid or the overshoot too great, the tester may stop generating a vacuum before the vacuum actually reaches the test chamber. When the tester enters the equalizing stage, the vacuum is rapidly moving across the sample line. The tester will detect this, abort the test and report a failure because it believes this movement is due to the loss of vacuum through a large leak.

Symptom: The repeated appearance of this message while testing good product (micro leak).

Action: Check gasket on chamber and the chamber seal. Check and verify that sample line connections are tight. If using external flow meter, verify its valve is closed. Investigate any possible production process changes. Retest the suspect samples at a later time. Perform Vacuum Hold procedure in accordance with the manual (Section 5, Pages 23-24) if this symptom is occurring following a large leak.

Explanation: The tester is detecting a micro leak. Correct the source. Possible sources include leaking lines, damaged gaskets or a contaminated test chamber. If a large leak recently occurred, particularly with a liquid containing sample, the residual liquid will falsely elevate the readings of subsequent tests. Perform the Vacuum Hold procedure in accordance with the manual (Section 5, Pages 23-24) until the readings return to normal on a good product.

Symptom: Inconsistent or unstable readings.

Action: Evaluate the tester's overall integrity. Has any physical damage occurred or component gone out of calibration? Inspect and evaluate the stability of the air supply by observing the range of the "TFill" times. Correct any anomaly that is discovered. Refer to Appendix II, "Optimizing Test Parameters", Page 73 of this manual and/or consult with a PTI technician.

Explanation: The VeriPac 325 is a piece of electrical hardware in which analog to digital conversions occur. These conversions along with the operating accuracy of internal components over a range of temperatures contribute to a normal variation of up to **2%** for all numbers displayed. All vacuum levels are measured to atmosphere as the reference. Variations in the weather as well as the altitude above sea level will impact vacuum levels. The tester was designed with all these factors in mind. It was designed such that it would test your product at 5000 feet above sea level on a rainy day with the same sensitivity as a test at sea level on a sunny day. It was designed to test using the same atmosphere as your product was packaged in.

PTI-325/D Tester Checklist and Basic Preventative Maintenance

Tester Checklist

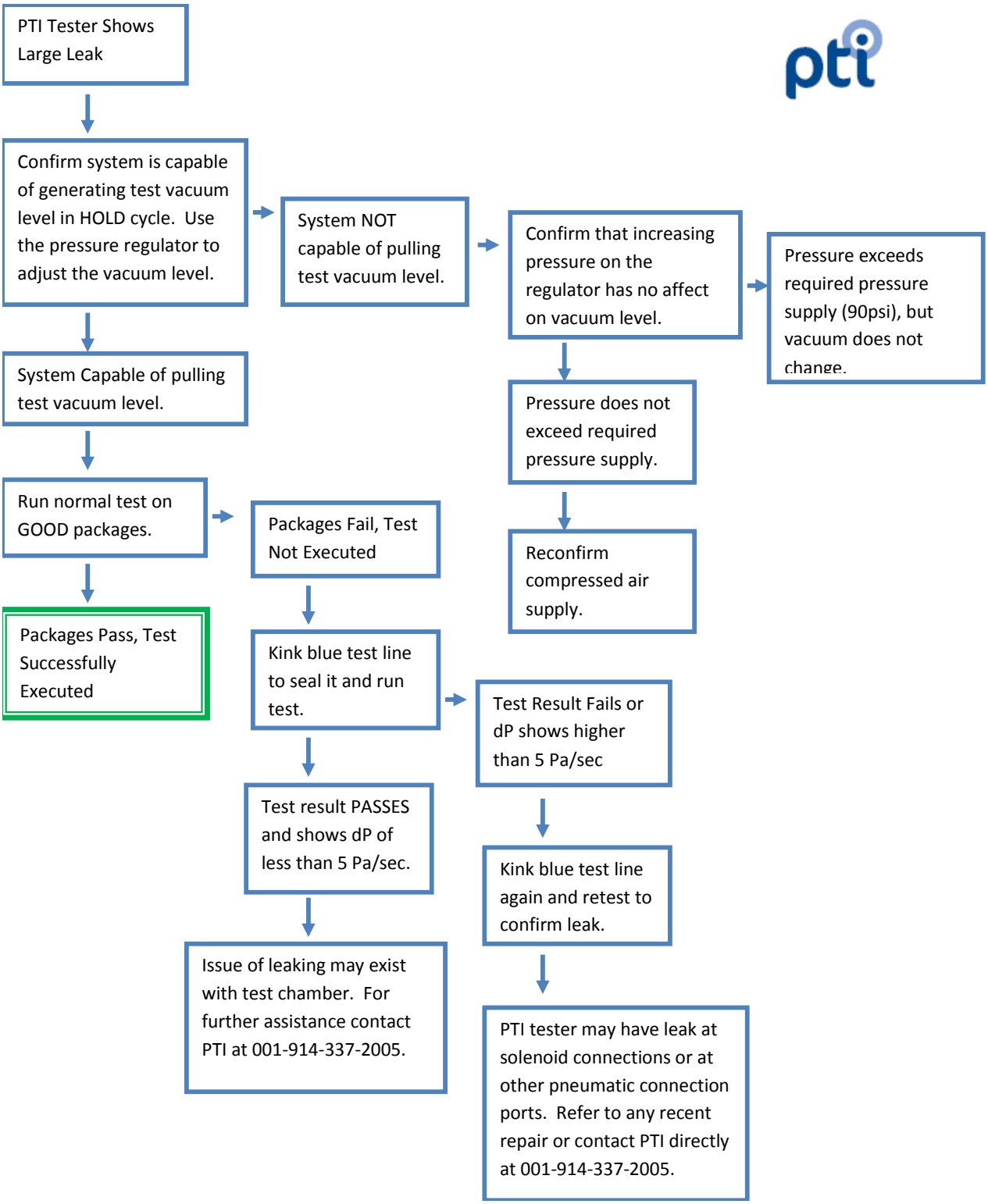
1. Push the RUN button on the screen to go into HOLD mode.
2. Push the TEST button to test vacuum level.
3. Vacuum Level should be between 5 and 20 mb above the target Vac parameter.
    a. Smaller packages may require vacuum levels closer to 5 mb above target.
    b. Larger packages may require vacuum levels closer to 20 mb above target.
    c. If vacuum level is not within required range, adjust input pressure into test system in the back of tester while system is on HOLD. Push stop when vacuum level is set.
4. Push STOP when vacuum level is confirmed.
5. Make sure gasket and upper sealing surface is clean.
6. Confirm Leak tester Settings and Reference Values

TESTER SETTINGS	
Vac.	
T-Stroke	
T-Equal	
T-Test	
TESTER REFERENCE VALUES	
V, mb	
dP, Pa/s	
TFill	

Preventative Maintenance

- Keep flexible membrane surface clean.
- Clean gasket and upper sealing surface when dirty.
- Clean surrounding area inside test cabinet.
- Exchange barb air filter every 6 months or when dirty.

VeriPac 325 Fexible Membrane Fault Tree



VeriPac Troubleshooting Information Guide

Before contacting PTI with issues related to the VeriPac test system, preparing the following information will greatly expedite the process.

1) What is the Serial Number of the tester? S/N_____

2) What is the input pressure in the back of the tester? _____psi

3) What are your Vacuum Test settings?
   a. Go to SET screen on Tester.
   b. Copy the values into the below table.

		TStroke	
		TEqual	
Vac.		**TTest**	
V Ref		**dP/dt Ref**	**TFill Ref**

4) Check the testers vacuum HOLD level.
   a. Bend the test line over.

b. Select the RUN button on the MAIN screen to put it into HOLD mode. Run a hold cycle to confirm tester's vacuum capability

c. If the vacuum HOLD value is approximately 10mb above the vacuum level noted in Step 2, then your vacuum level is set correctly.

d. If the vacuum level is not approximately 10mb above your vacuum level then adjust the pressure gauge in the back to change the vacuum HOLD level accordingly. Also change your value recorded in Step 1.

e. What is the HOLD vacuum's approximate final value? _____mb

5) Confirm tester is operating properly.

a. Run a test cycle with the test line bent over to confirm normal operation of the PTI test module. Repeat this test 5 times.

b. What are the test results received?

Test	V, mb	dP, Pa/sec
1		
2		
3		
4		
5		

6) Test entire leak tester.

a. Take known good samples.
b. Run 10 tests with the samples recorded every piece of information from each test. If the test fails, it is important to note the test stage during which it failed and how far into that specific test stage the failure occurred.

Test	V, mb	dP, Pa/sec	Pass/Fail	Stage of Failure if Applicable	Time at Which Failure Occurred During Test
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Section 11: Safety and Maintenance

The responsibility of a safe working environment must be carried out by the employer and, in addition, by the appointed personnel who operate, maintain, repair or perform any duties on or around this machine. The employer is responsible to understand the functionality and safety features of this inspection system, which ensure optimal performance.

- The VeriPac 325 tester and the external test chamber are specifically designed to ensure safety of personnel, as well as the prevention of damage to the machine.
- Take special care when operating the external test chamber. The chamber should be opened ONLY when a test sequence is completed.
- Periodically perform the Hold Vacuum procedure to clean the test line and test chamber of humidity and moisture.
- Do not attempt any mechanical adjustments of the tester components using tools of any kind or hands while tester is operating.
- When making any mechanical adjustments, take special care to insure bolts and screws are securely tightened so that all components are securely in place.
- Periodically check vacuum test line and pneumatic lines for external chamber to insure connections are secure and leak free.

IF REPAIR OR MAINTENANCE IS REQUIRED:

- **Power must be turned off prior to doing any repair or maintenance on tester. To insure there is no power to the electrical parts, use a faultless voltmeter.**
- **Air Supply must be disconnected prior to doing repair or maintenance.**
- **While working on the tester for repair, maintenance or other reasons, a warning sign should be put up alerting employees.**
- **Repair work must be performed only by trained and qualified personnel and should be supervised by one responsible person.**
- **Prior to any new start of the tester after any repair or maintenance work has been finished, the supervisor should verify that:**

- **All work has been satisfactorily completed**
- **The machine is in a reliable and safe condition**
- **All mechanical components are secure and safe for operation**
- **No loose parts (rags, tools, etc.) are anywhere inside the tester area or around the test chamber.**
- **All connections – power, air, pneumatic line and test line connections have been properly restored.**

- **PTI will discontinue any guarantee or warranty for the safety of the machine if these regulations are not properly followed.**

GENERAL SAFETY REGULATIONS:

- ***Persons under the influence of alcohol, drugs medicine or similar should not be allowed to operate, maintain or repair the machine.***

- ***The operator must inform the supervisor and/or responsible personnel of all defects or problems – especially those concerning safety.***

- ***Technical modifications, which could influence the functionality and/or the safety of the machine, can only be performed by PTI technicians or with special written authorization from PTI. Any failure on the customer's part of observing this point would cause PTI to discontinue any guarantee or warranty of the machine both for the performed modifications and for any damage caused thereby in the future.***

Glossary

Accuracy: Referred to as combined error of non-linearity, hysteresis, thermal error and non-repeatability.

Burst Pressure*:* The maximum pressure that may be applied without physically damaging the pressure transducer.

Calibrated leak: A precision orifice calibrated to a defined leak rate.

Differential pressure: The difference between two pressure points, also the difference measured across physical resistor.

Stabilizing: The time between the filling and testing cycle – usually required to stabilize a test conditions in the container and eliminate turbulences.

Filling: The cycle referred to for applying pressure or vacuum to the container for testing purposes.

Gage pressure (psig): Measured relative to ambient atmospheric pressure. Used for pressure leak testing.

Hysteresis: The difference in output when the same value is approached by increasing and decreasing pressure.

Laminar flow: Is a steady non-turbulent flow of a medium (air, gas, liquid), inside a tube, fitting, nozzle, hole or any solid boundary.

Leak rate: Referred to as an air mass flow rate in sccm (standard cubic centimeters per minute, at standard pressure and temperature condition).

Leak size: Referred to as a diameter of the round hole in the container wall.

Linearity error: The deviation of an output voltage at the specified straight line that represents calibrated pressure to voltage response.

Pressure switch: Provides a discrete voltage output when pressure approaches the preset level.

Pressure transducer: Measure the pressure difference across a device, and provides a linear dc voltage output proportional to that pressure.

Repeatability: The ability to reproduce test results when the tests are repeated.

Response time: The time interval required for the output to change state as a result of the step change in pressure.

Thermal error: Output change due to air temperature change. It does not include effect of changing container flexibility that depends on container material.

Turbulent flow: An airflow in which the velocity at a given point varies erratically in magnitude and direction. The turbulent flow could introduce a significant error in the pressure reading.

Unit Conversion Table

Pressure unit conversion

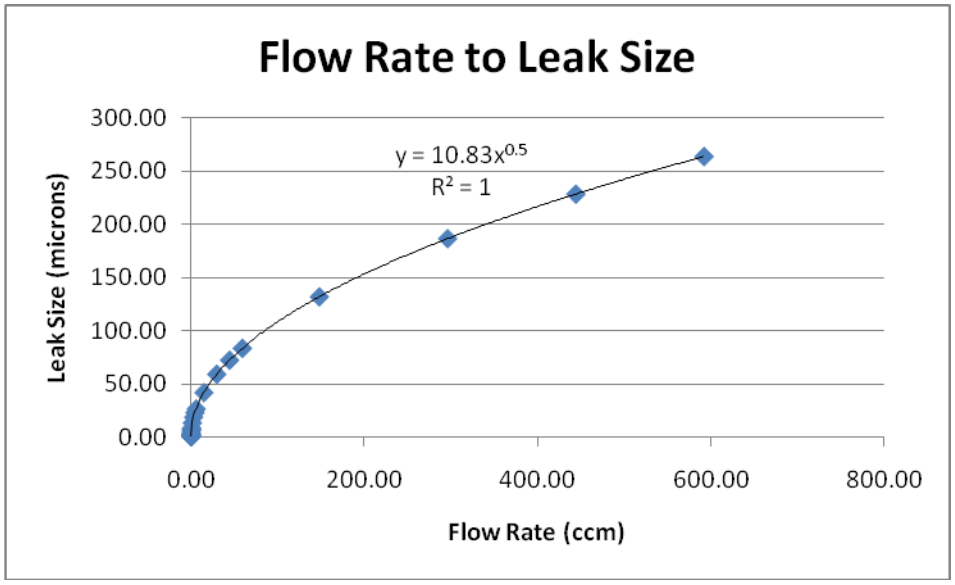
From 1 To	Psi	*bar*	*in.Hg*	*in.H_2O*	*mm Hg (Torr)*	*mm H_2O*	*Pascal*	*atm*
psi	1	14.504	.49116	3.6127 $*10^{-2}$	1.93368* 10^{-2}	1.4223 $*10^{-3}$	1.4504 $*10^{-4}$	14.696
Bar	6.8947 $*10^{-2}$	1	3.3865 $*10^{-2}$	2.4908 $*10^{-3}$	1.3332 $*10^{-3}$	9.8068 $*10^{-5}$	$1*10^{-5}$	1.0132
in.Hg	2.0360	29.529	1	7.3552 $*10^{-2}$	3.9368 $*10^{-2}$	2.8959 $*10^{-3}$	2.9529 $*10^{-4}$	29.920
in.H_2O	27.680	401.47	13.596	1	.53525	3.9372 $*10^{-2}$	4.0147 $*10^{-3}$	406.78
mm Hg (Torr)	51.715	750.06	25.401	1.8683	1	7.3558 $*10^{-2}$	7.5006 $*10^{-3}$	760.00
mm H_2O	703.08	10.197 $*10^{3}$	345.32	25.399	13.595	1	1019.7	10.332 $*10^{3}$
Pascal	6894.8	$1*10^{5}$	3386.5	249.08	133.32	9.8068	1	1.0332 $*10^{5}$
Atm	6.8046 $*10^{-2}$	.98692	3.3422 $*10^{-2}$	2.4583 $*10^{-3}$	1.3158 $*10^{-3}$	9.6788 $*10^{-5}$	9.8692 $*10^{-6}$	1

Volume unit conversion

From 1 To	*ounce*	*gill*	*pint*	*quart*	*gallon*	*$inch^3$*	*liter*	*cm^3*
Ounce	1	4	16	32	128	0.55411	33.812	3.3812 $*10^{-2}$
Gill	0.25	1	4	8	64	0.13853	8.4531	8.4531 $*10^{-3}$
pint	6.25 $*10^{-2}$	0.25	1	2	8	3.4632 $*10^{-2}$	2.1133	2.1133 $*10^{-3}$
quart	3.125 $*10^{-2}$	0.125	0.5	1	4	1.7316 $*10^{-2}$	1.0566	1.0566 $*10^{-3}$
gallon	7.8125 $*10^{-3}$	3.125 $*10^{-2}$	6.25 $*10^{-2}$	0.25	1	4.329 $*10^{-3}$	0.26417	2.64173*10^{-4}
$inch^3$	1.8048	7.219	28.875	57.75	231	1	61.0239	6.1024 $*10^{-2}$
liter	2.9575*10^{-2}	0.1183	0.4732	0.9464	3.7854	1.6387 $*10^{-2}$	1	10^{-3}
cm^3	29.575	118.3	473.2	946.4	3785.4	16.387	1000	1

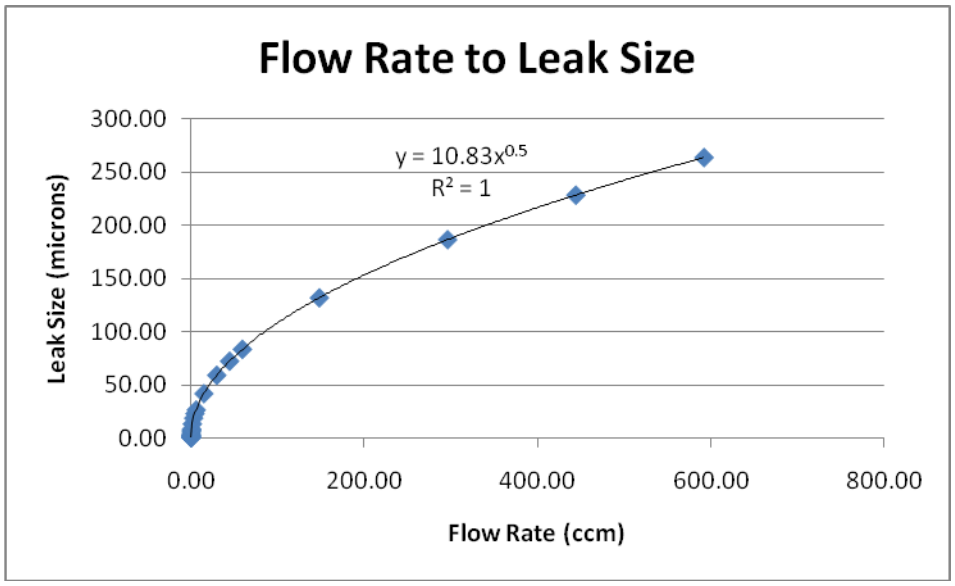
Flow Rate Chart @ 500mBar

Hole Size (microns)	Flow Rate (cc/min)
1	0.009
5	0.213
10	0.853
15	2.543
25	5.329
30	7.673
40	13.642
50	21.315



Flow Rate Chart @ 750mBar

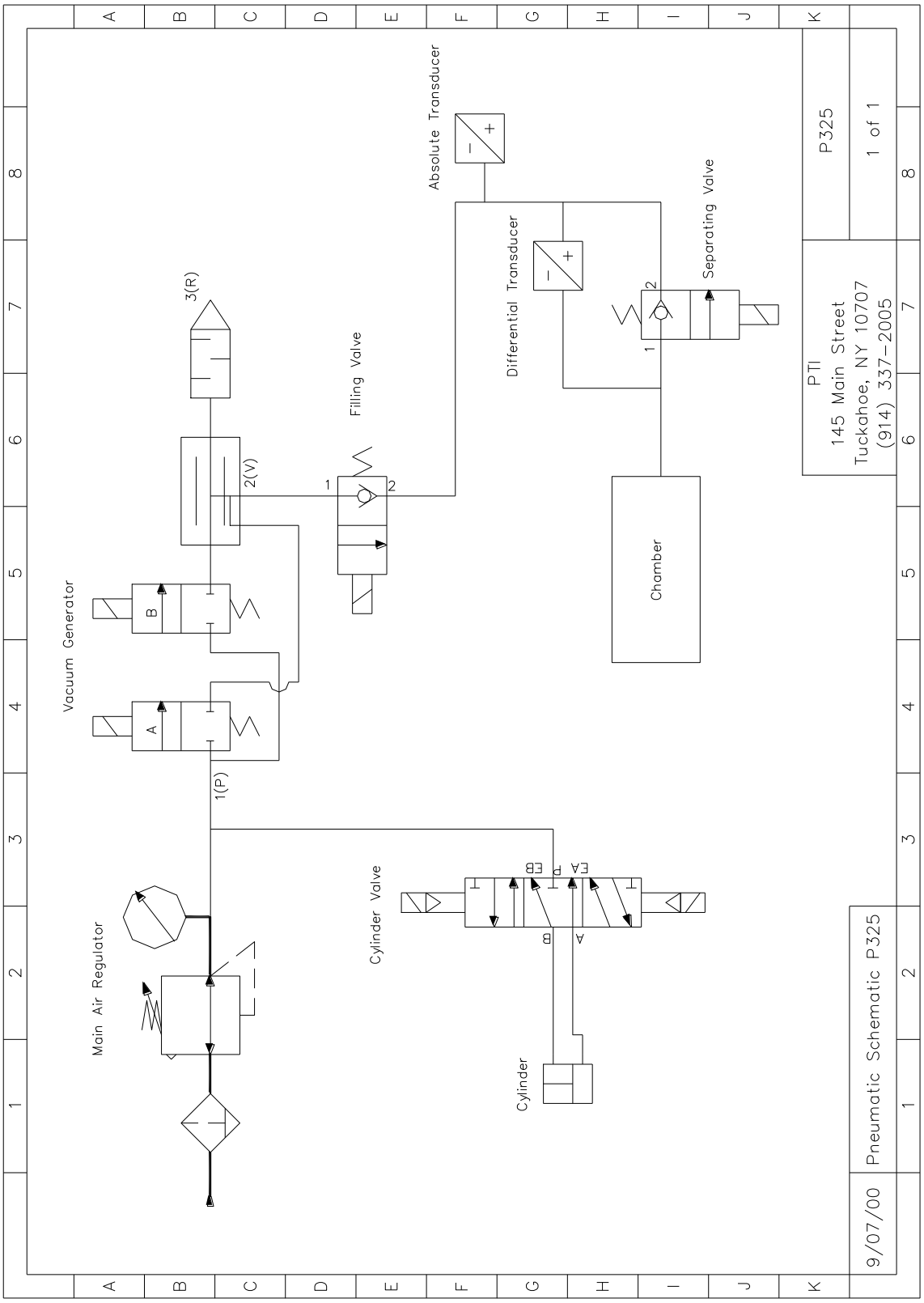
Hole Size (microns)	Flow Rate (cc/min)
1	
5	0.009
10	0.853
15	1.918
25	5.329
30	7.673
40	13.642
50	21.315



Notes

Appendix I – Electrical Diagrams/Schematics

The following pages contain the electrical diagrams and schematics for the VeriPac 325 Leak Test System. For questions or to obtain further information regarding this information, please contact a PTI service engineer @ 1-800-532-1501 or 914-337-2005.


Absolute Transducer
Differential Transducer
Separating Valve
Filling Valve
3(R)
2(V)
Vacuum Generator
Chamber
1(P)
Main Air Regulator
Cylinder Valve
Cylinder
P325
1 of 1
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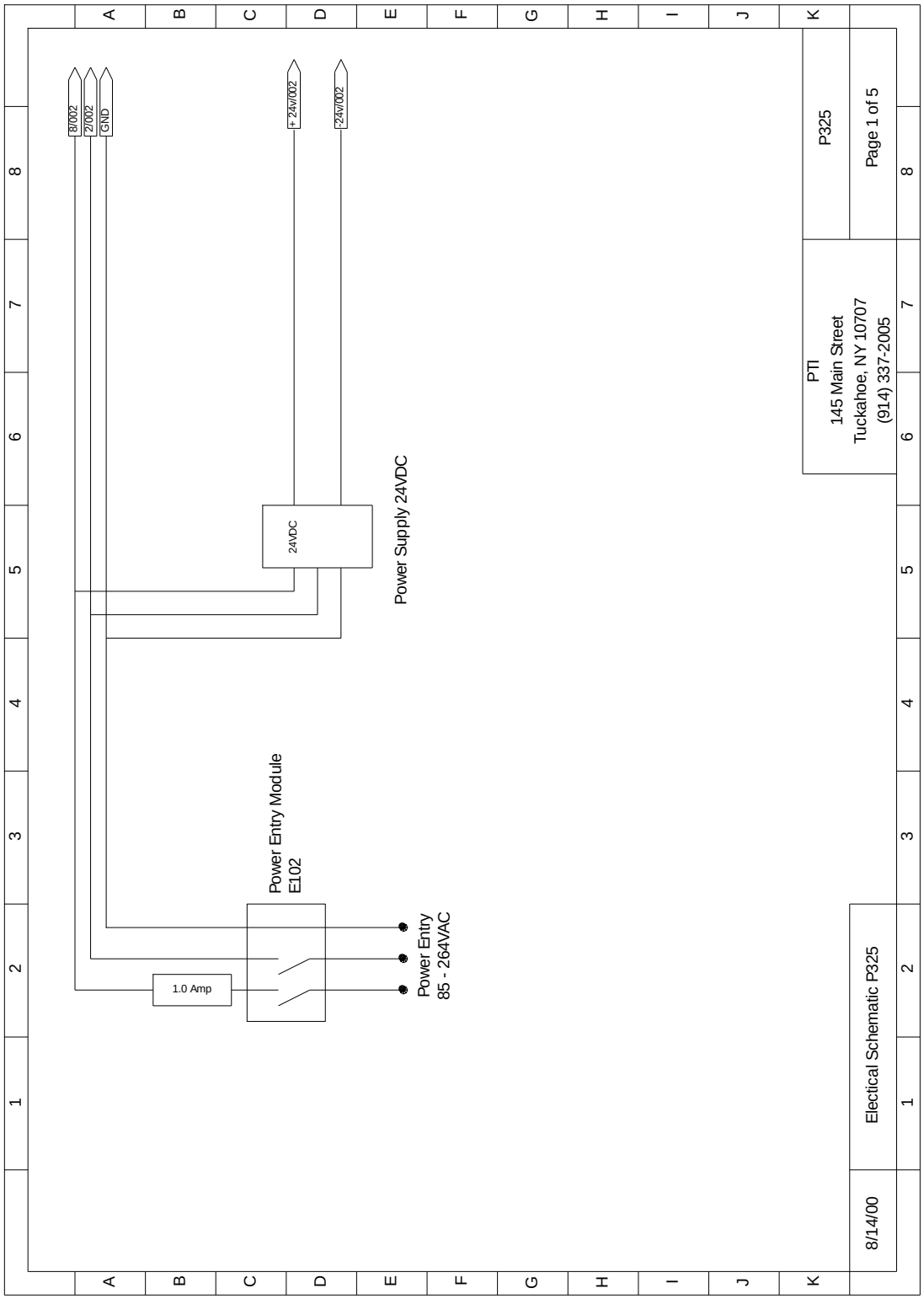
Pneumatic Schematic P325
9/07/00


A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
8/002
2/002
GND
+ 24v/002
-24v/002
24VDC
Power Supply 24VDC
Power Entry Module
E102
1.0 Amp
Power Entry
85 - 264VAC
PTI
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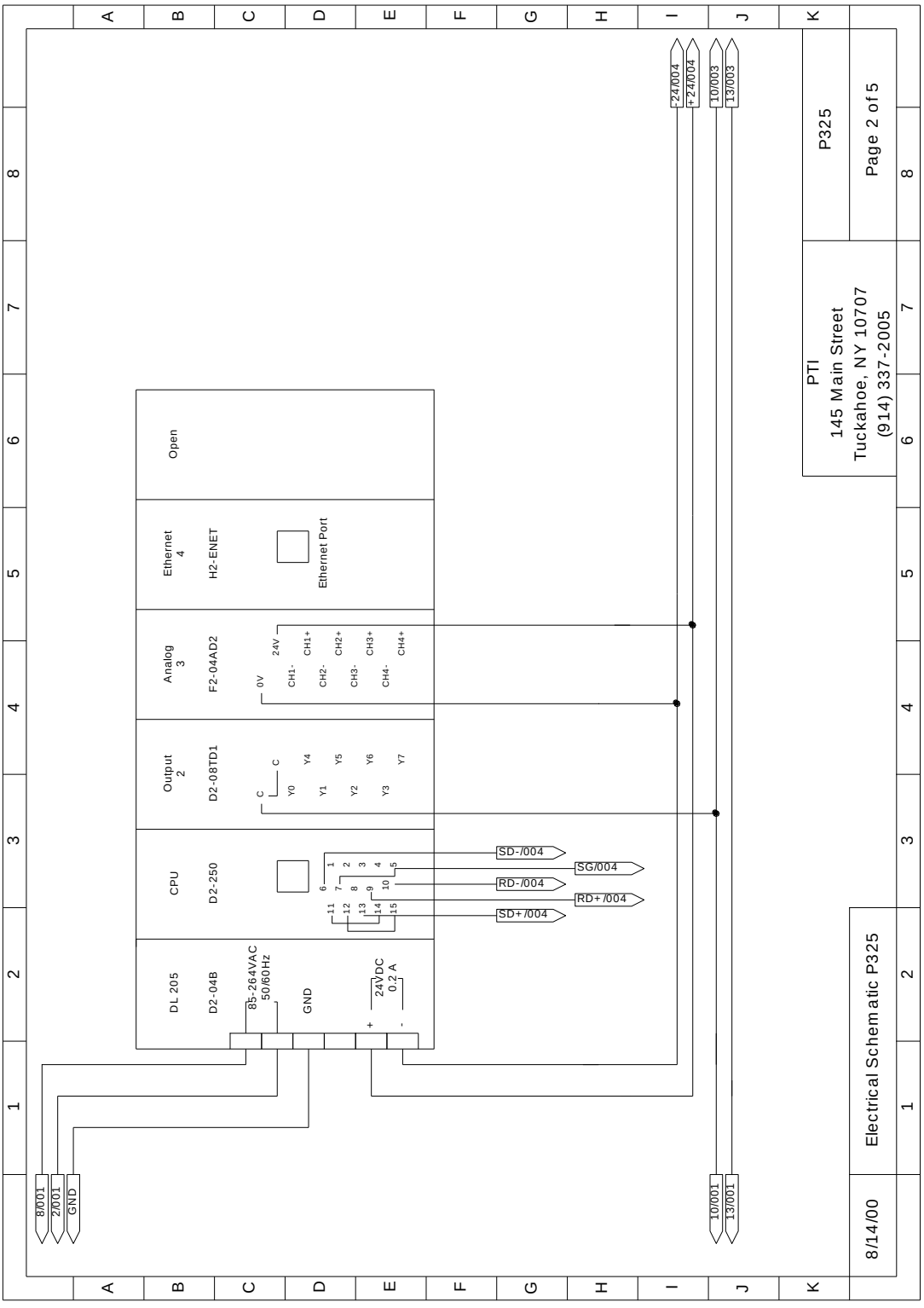
P325
Page 1 of 5
Electical Schematic P325
8/14/00


Open
Ethernet 4
H2-ENET
Ethernet Port
Analog 3
F2-04AD2
24V
0V
CH1-
CH1+
CH2-
CH2+
CH3-
CH3+
CH4-
CH4+
Output 2
D2-08TD1
C
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
CPU
D2-250
SD-/004
SG/004
RD-/004
RD+/004
SD+/004
DL 205
D2-04B
85-264VAC 50/60Hz
GND
24VDC 0.2 A
+
-
-24/004
+24/004
10/003
13/003
8/001
2/001
GND
10/001
13/001
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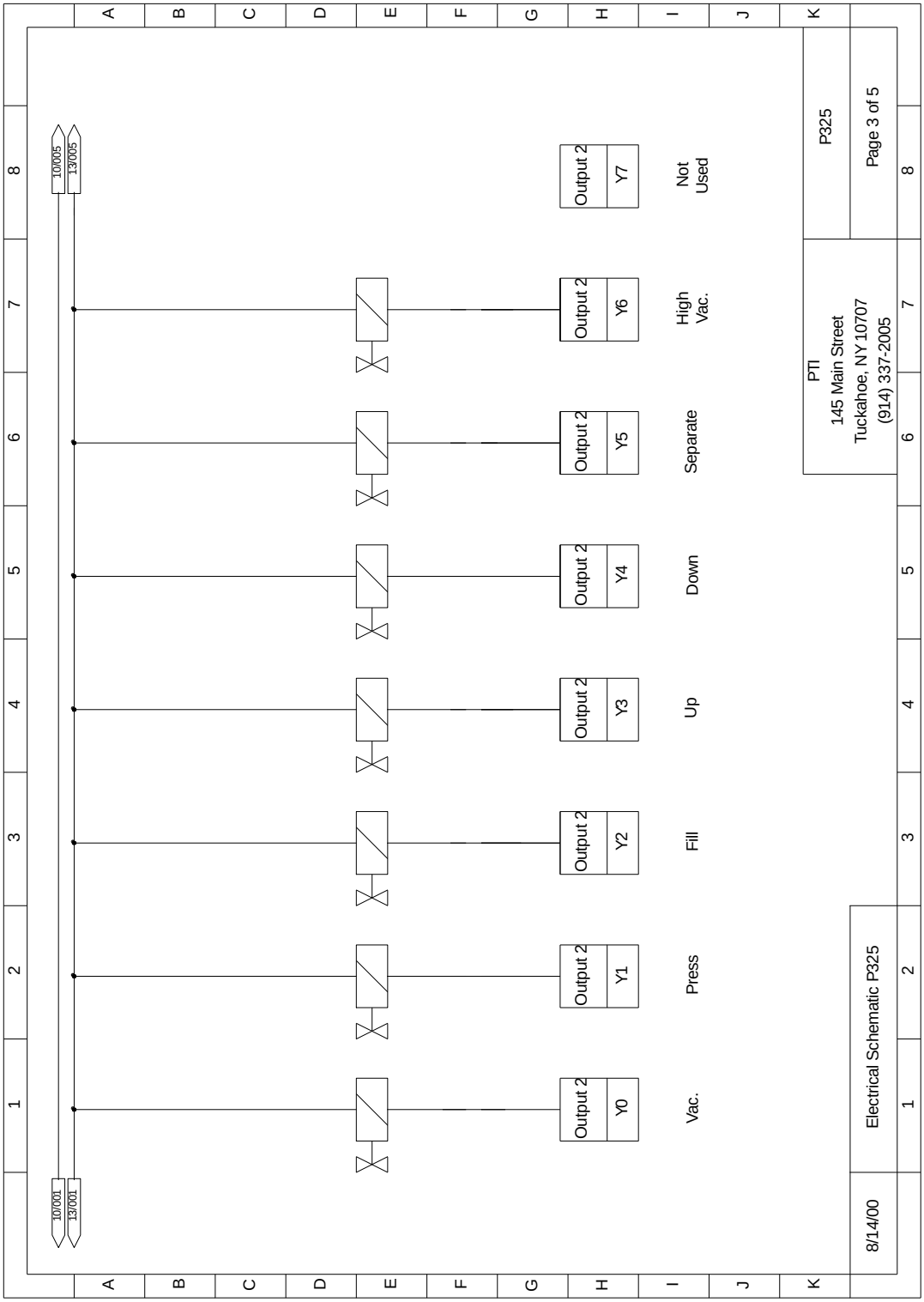
Electrical Schematic P325


A B C D E F G H I J K
1 2 3 4 5 6 7 8
10/005
13/005
10/001
13/001
Output 2 Y0
Output 2 Y1
Output 2 Y2
Output 2 Y3
Output 2 Y4
Output 2 Y5
Output 2 Y6
Output 2 Y7
Vac.
Press
Fill
Up
Down
Separate
High Vac.
Not Used
PTI
145 Main Street
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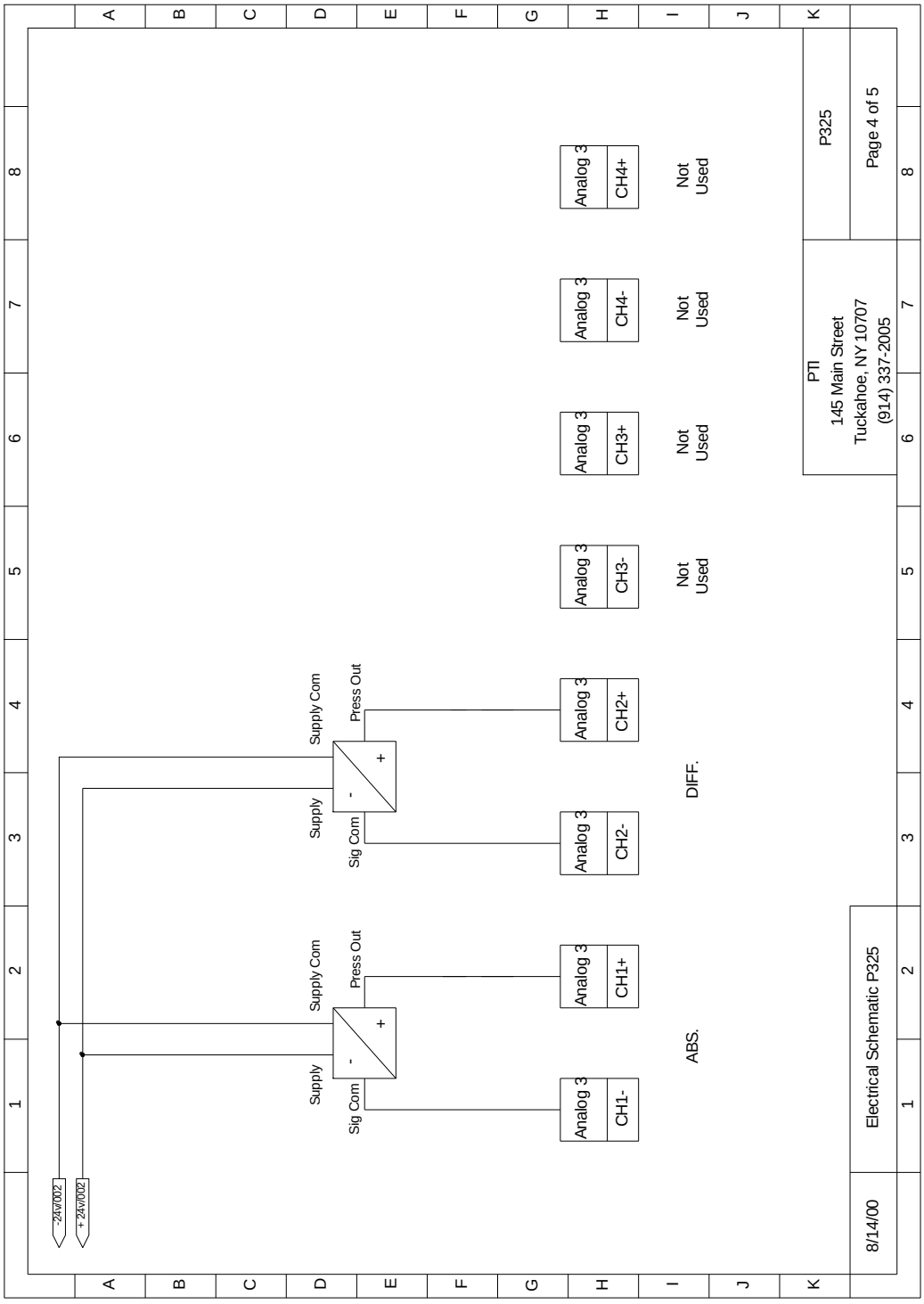
P325
Page 3 of 5
Electrical Schematic P325
8/14/00


Analog 3
CH4+
Not Used
Analog 3
CH4-
Not Used
Analog 3
CH3+
Not Used
Analog 3
CH3-
Not Used
Analog 3
CH2+
Analog 3
CH2-
DIFF.
Supply Com
Press Out
Supply
Sig Com
Analog 3
CH1+
Analog 3
CH1-
ABS.
Supply Com
Press Out
Supply
Sig Com
- 24v/002
+ 24v/002
P325
Page 4 of 5
PTI
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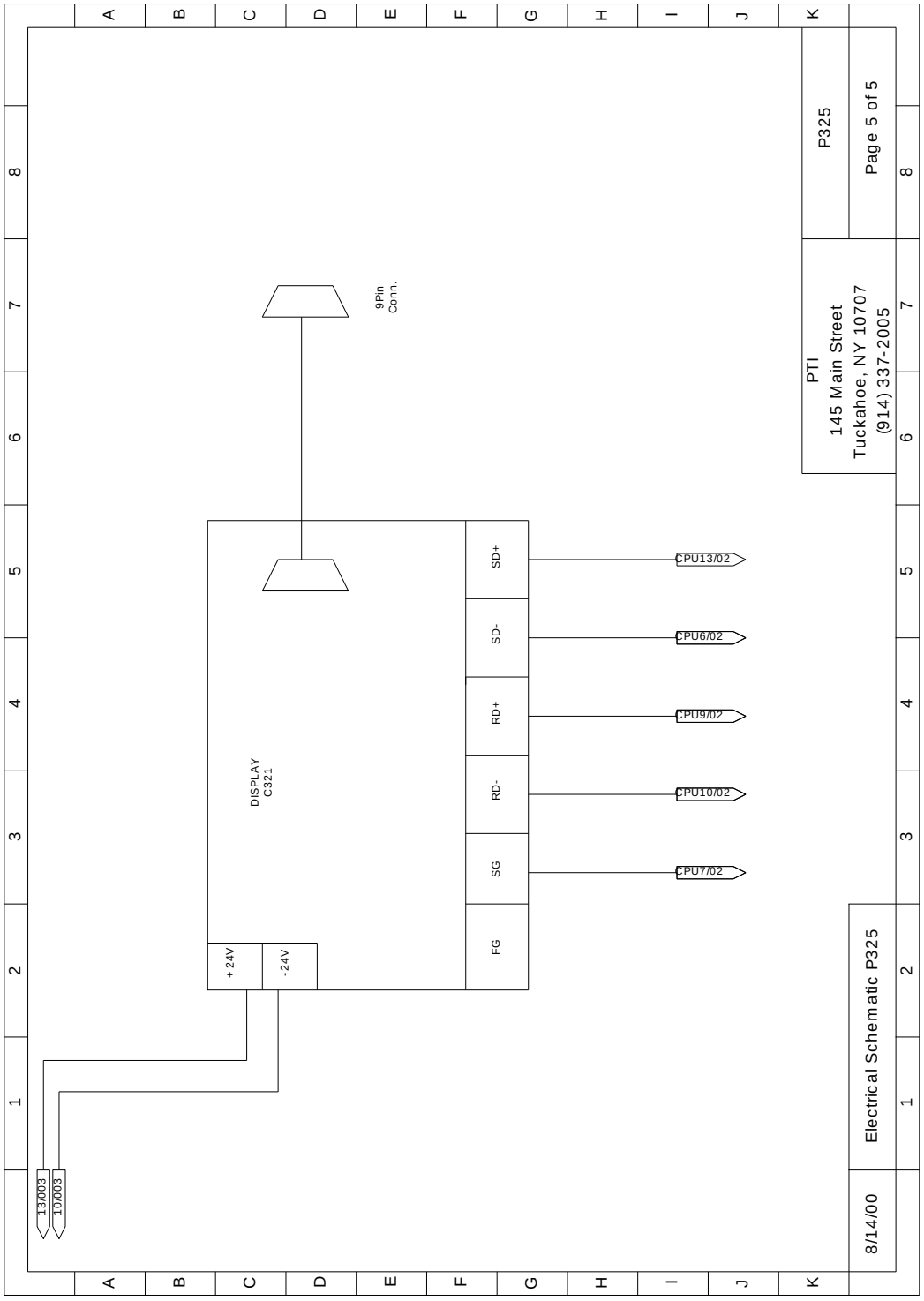
Electrical Schematic P325


A B C D E F G H I J K
8 7 6 5 4 3 2 1
P325
Page 5 of 5
PTI
145 Main Street
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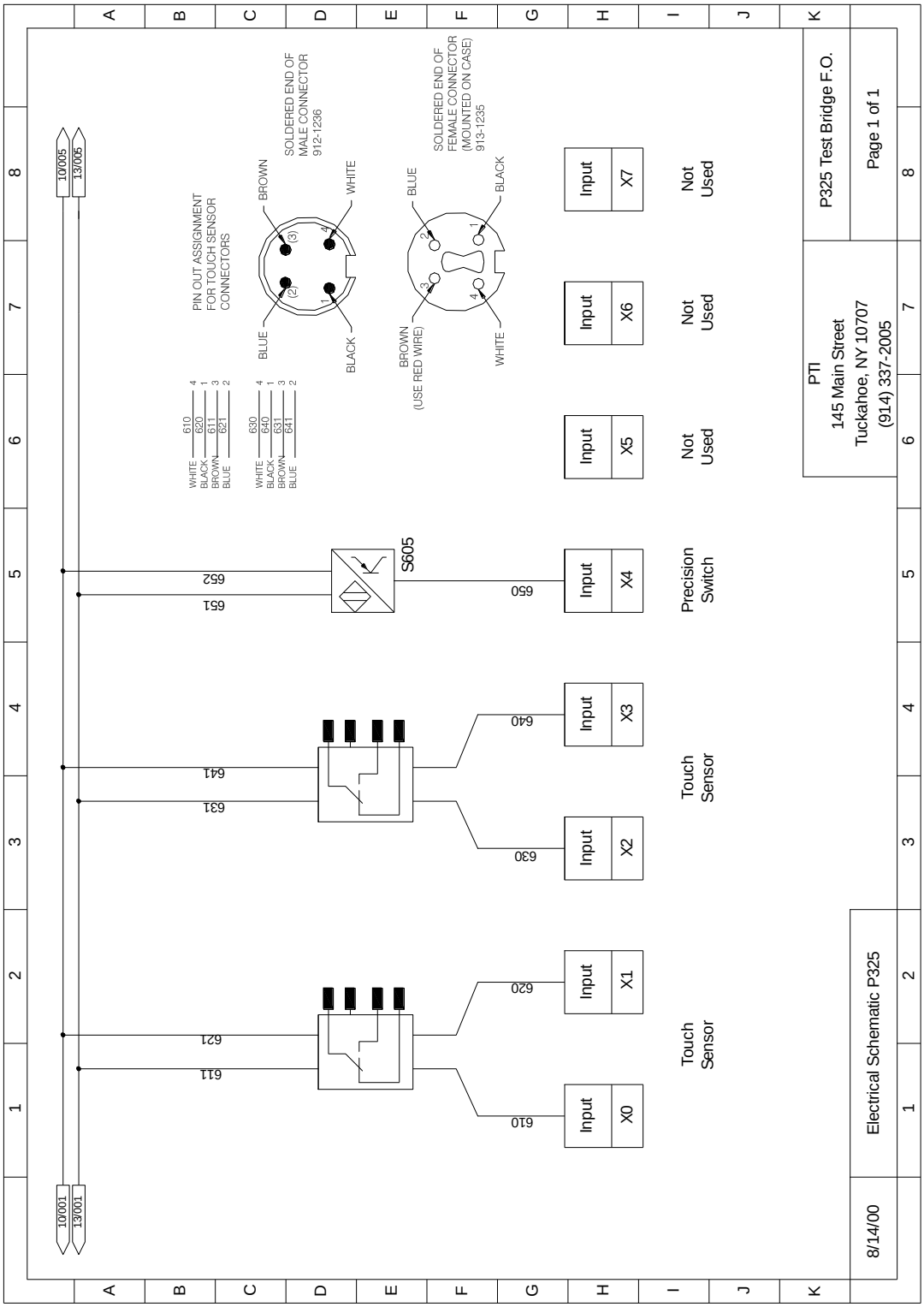
9Pin
Conn.
DISPLAY
C321
SD+
SD-
RD+
RD-
SG
FG
+24V
-24V
CPU13/02
CPU6/02
CPU9/02
CPU10/02
CPU7/02
13/003
10/003
Electrical Schematic P325
8/14/00


PTI
145 Main Street
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P325 Test Bridge F.O.
Page 1 of 1
Electrical Schematic P325
8/14/00
PIN OUT ASSIGNMENT
FOR TOUCH SENSOR
CONNECTORS
SOLDERED END OF
MALE CONNECTOR
912-1236
SOLDERED END OF
FEMALE CONNECTOR
(MOUNTED ON CASE)
913-1235
BROWN
WHITE
BLUE
BLACK
(USE RED WIRE)
WHITE
BLACK
BROWN
BLUE
610
620
611
621
630
640
631
641
10/005
13/005
10/001
13/001
S605
650
652
651
640
641
631
630
620
621
611
610
Input
X0
X1
X2
X3
X4
X5
X6
X7
Touch
Sensor
Touch
Sensor
Precision
Switch
Not
Used
Not
Used
Not
Used

Appendix II – Optimizing Test Parameters

This addendum to the main VeriPac 325 instruction manual provides more detailed information as well as factory recommendations and guidelines regarding the Test Parameter Settings. When developing test parameters and the test method for a particular product, setting the reserve vacuum level is a critical first step. Several initial steps should be followed and conditions carefully observed in order to achieve the best vacuum range. Taking time during this initial setup stage will insure the most efficient, accurate and reliable test results.

Vacuum Supply – Tester Configurations

There are three possible VeriPac 325 configurations for the vacuum supply:

- Internal Motorized Vacuum Pump – for portable units only
- Ejector Design – Vacuum Level reached by internal Ventury Pump

Internal Motorized Vacuum Pump (portable units) – The maximum vacuum level that can be reached is approximately 500-600 Mbar. To achieve the correct vacuum level, it is recommended to put the tester on Hold with empty test chamber and observe vacuum level on main screen. Choose the vacuum fill level at least 10% less than the vacuum level reached during the Hold procedure.

Ejector Design – Vacuum Level reached by internal Ventury Pump – The vacuum level reached by Ventury pump is adjustable within a wide range and proportional to air pressure supply. It is recommended to adjust main air pressure to a level 10% higher than the desired vacuum level (testing level). This level depends on the design of the ejector/Ventury pump as well as the quality and stability of air pressure.

It is recommended to experimentally check what maximum vacuum level can be achieved with the most stability – typically 850 Mbar, with 6 bar air pressure supply, depending on the quality of air and model of ejector.

! Important Note ! - There is a certain range of ejector settings that could be unstable, – typically 790-825 Mbar, indicated by excessive noise. Try to avoid settings in this range. See attached graph examples indicating noise level range as a function of operating pressure. Please note these are examples only - actual noise level range may vary, depending on the model of ejector and quality of air.

Consult PTI for further information regarding Ejector settings @ 1-800-532-1501 or 914-337-2005.

Vacuum Level – Generally, the higher the vacuum level setting, the easier it is to detect a leak. The leak flow through the hole of a certain size is proportional to the difference of the square of the pressure inside the package (typically atmospheric pressure) and the square of the pressure (vacuum level) inside the test chamber.

However, when setting the vacuum level, there are obvious limitations, depending upon the package design and test chamber design. The type of package and how it is supported in the chamber must be considered. Choose a vacuum level that will not destroy the package. With a package or pouch that is heat-sealed for example, it is critical not to apply excessive force that would weaken the heat seal.

General Recommendations:
If the package is supported well inside the test chamber, it is safe to apply full vacuum. Start first with higher vacuum level and observe the behavior of the package. If the package is suspected of being destroyed, lower the vacuum level.

For flexible packages and pouches, aside from damage to the package itself, applying too much pressure could also result in movement of the package inside the test chamber and cause uncertain test results. Use a lower vacuum level to stabilize movement in the chamber faster and save the time required for equalizing.

If it takes too long to reach a certain vacuum level, and if cycle time is restricted, it might be beneficial to lower the vacuum level to save time on filling and focus on actual equalizing and testing time. This mostly applies to larger packages and chambers.

If the vacuum supply is not stable it might be beneficial to use Fill by Time settings and determine the exact filling time rather than fill vacuum level.

Equalizing Time (measured in seconds) - Time for system equilibration - the time needed to equalize or settle the vacuum inside the test chamber. This setting is designed to compensate for any variations that may occur during the filling process and give sufficient time for the product and air movement to stabilize. The Equalizing Time is an important and often critical setting and should be a “reasonable” amount of time, with the average of approximately 5.00 seconds, for most optimal results.

When should Equalizing Time be increased?

An indication to increase Equalizing Time is if there is a large variation of dP/dt,Pa/s reading (Differential vacuum during test time) among good samples, indicating unsettled movement in the chamber of good samples. It is recommended to do several tests and compare good test results, adjusting ET setting if necessary.

Test Time (measured in seconds) - the length of time required to measure/monitor the differential pressure inside the test chamber, typically 1.00-3.00 seconds.

Appendix III – Calibration Curve for Test Chamber & Determination Procedure

VeriPac 325 Tester and Chamber Calibration Procedure

Warning: The following procedure is to be conducted in accordance with the VeriPac 325 Operations Manual and the Micro Flow Meter Operations Manual. Failure to observe these manuals may result in damage to the VeriPac 325 Tester .and/or the Micro Flow Meter.

Required equipment:

- **Micro Flow Meter (0 to 20 or 200 cc/min range)**
- **4mm "Y" connector**
- **Calculator**
- **Flow Rate vs. Hole Size Chart or graph**
- **Dummy Standard (Rigid zero-leak dummy of your product)**

Initial Conditions:

a) **The VeriPac 325 Tester is powered up with the normal testing product selected.**
b) **The machine testing parameters are verified to be the same as the normal testing parameters.**
c) **Clean dry air is connected to the VeriPac 325 Tester.**

Procedure:

a) **Using the "Y" connector, connect the Micro Flow Meter in parallel with the sample line.**

Note: Use the shortest piece of tubing that is reasonably long enough.

b) **Place dummy standard in test chamber and perform Vacuum Hold Procedure for 30 seconds. (If needed, refer to Section 5, Page 24 of this manual. Observe and record vacuum level as displayed on the Main screen of the VeriPac 325 Tester.**
c) **Check Micro Flow Meter Valve closed.**
d) **Enter Auto-Learn Procedure.**
e) **Run 10 (ten) tests on the Dummy Standard.**
f) **Press done.**
g) **Record calculated limits.**

h) **Manually set the "V, mb" ref to 20% of its current value, set "dP Pa/s" ref to the maximum allowed, set "TFill" ref to 10 times its value.**
i) **Use the following equation to determine the target flow rate of the Micro Flow Meter:**

$$X = \frac{\text{Flow Rate from Chart} * \text{Observed Vacuum Level (step b)}}{\text{Test Vacuum Level ("Set" Screen parameter)}}$$

Where:

X = Flow Rate to be set on Micro Flow Meter

j) **Beginning at 1(one) micron calculate the flow rate. (If unable to start at 1(one) micron begin at 5(five) micron (20cc/min meter only displays to the hundredth place))**
k) **Perform Vacuum Hold Procedure and adjust the needle valve on the Micro Flow Meter to achieve the calculated flow rate.**
l) **Press stop.**
m) **Perform normal test.**
n) **Record data ("dP Pa/s") if necessary. (i.e. manual data collection)**
o) **Repeat Steps "g" through "l" at 5, 10, 15, 25, 30, 40 micron hole size.**
p) **Plot data and determine correct "dP Pa/S" ref for your desired level of detection.**
q) **Restore limits recorded in step "g" along with new "dP Pa/S" ref.**
r) **Remove Micro Flow Meter from system and restore system to normal operation.**

Theory:
In the performance of this procedure, the operator is creating a chart or graph that can be used to correlate Pass/Fail criteria to a specific hole size. Specific details are available from PTI upon request.

Additional Information:
This procedure can be adapted for use in a Periodic Review Procedure. Once limits are set, the Micro Flow Meter can be used to periodically check that the limits are correct.