# TRACERMATE II

# User Manual

providing world-class leak test and assembly verification solutions

## IMPORTANT INFORMATION

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CAUTION **–** When you see this warning symbol on the product, refer to the instruction manual for information before proceeding.

CAUTION **–** To avoid personal injury due to electric shock, disconnect all power services before servicing.

If this instrument is not used according to the instructions of this manual, the protection provided by this equipment design may be compromised.

# Table of Contents

# Chapter 1 – Introduction

*In this chapter you will be introduced to the basic pneumatic, electrical connections, and the simple menu structure and navigation of the instrument.*

Thank you for purchasing the TracerMate II™ charge system instrument. The TracerMate II is capable of testing using a variety of pre-packaged test algorithms designed to get you testing as quickly and easily as possible. Let's get started!

## Unpacking

Carefully remove the instrument from the shipping carton. Locate the Colder™ quick connect test port with Self-Test cap, and power cord supplied with the instrument. If this is not a standard instrument you may install any suitable plug fitting into the manifold test port. See the print series shipped with your instrument for the proper thread specifications.

## Instrument Attachment & Clearance

There are four (4) rear mounting holes for ¼ inch (6 mm) socket head cap screws, 3½ inches (90 mm) long (for a ¼ inch ***minimum*** mounting plate thickness). The instrument is supplied with four (4) ¼ inch – 28 x 3½ inch socket head cap screws for convenience.

Please allow 4 inches (100 mm) clearance under the instrument for installation of test line and for hand clearance.

## Installation

The leak test instrument is a modular, flexible instrument designed to operate in a manufacturing, clean room, or lab environment. To operate trouble-free, it requires:

- Clean, dry instrument air for test and pilot air (recommend 0.3 and 5.0-micron coalescing filter). ISO 8573-1, Class 2 filters are recommended, with class 3 being acceptable.
- Vacuum for vacuum test applications (unless the venturi option is configured)
- Supply power: 88-264 VAC 50/60 Hz auto sensing/switching electrical +/- 10% of nominal.
- I/O: Switch to select internal or external 24 VDC electrical power for the inputs and outputs

Because this is a precision instrument, it is preferable to locate this instrument at least 15 feet away from high electromagnetic energy devices (induction heat treat equipment and welders) whenever possible. In addition, plants having poor quality electrical power or ground systems should consider using isolation transformers on the power drops.

**Note: When supplying power, always be certain that there is nearly zero voltage (< 1 V) difference between the neutral and earth ground wires connected to the instrument.**

## User Interface Navigation

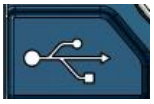
There are multiple monitoring screens available for the instrument. Selecting the Monitor Icon will give you access to all these screens. This menu is also where the user selects to view the graphs available with the unit.

The instrument is designed with a simple graphical icon-based interface. The main menu is activated by pressing the Main Menu button.


The Arrow/Enter Selection buttons are used to navigate through the icons on the screen and select the appropriate menus. The center Enter arrow is also used to select parameters for editing and saving the edits once they are complete.

The Cancel/Back button is used go back to the previous menu. Multiple presses will eventually exit you out of the menu structure entirely and place you on the Monitor Screen. This button is also used to cancel out of any edits before saving.

The Information button is used to get a help screen that is associated the parameter corresponding to where the cursor is located.



The USB button allows a shortcut directly to the USB menu. The menu is located under the Main Menu -> Global Config -> USB menu.

***Note: With a USB memory stick located in the USB connection, holding this button down until it beeps will take a screen shot of the screen and save it to the USB memory stick. Do not remove the USB memory stick until the instrument tells you it is finished writing the image.***

The instrument can store up to 99 different programs. Switching between these programs is done with the Program Select Buttons on the front of the instrument. The current program is shown in the lower right-hand corner of the screen designated by "P" and then a two-digit number corresponding to the current program number.

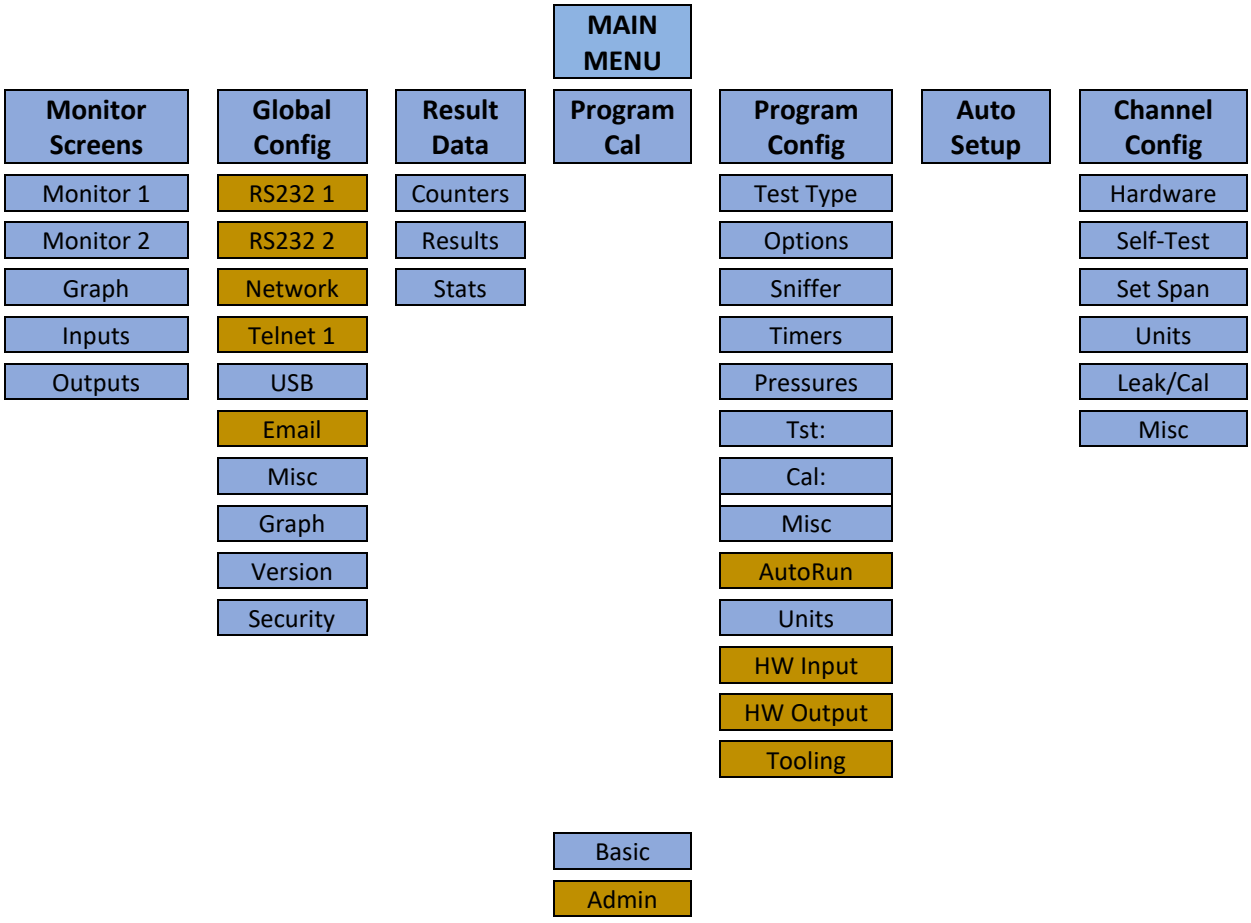
***Hint: Holding down the "+" button for 2 seconds will prompt a screen to appear in which the value of the program may be entered using the arrow buttons. The up and down arrows will increment and decrement the ones digit. The right and left arrows will increment and decrement the tens digit.***


***Note: The Program may also be changed via Digital I/O (See Chapter 19), RS232 or TCP/IP Communication (See Chapter 20).***

## Menu Structure

Below is an overview of the menu structure for the TracerMate II instrument.

*Note: Not all menus are available for all configurations and Test Types.*




*NOTE: Viewing menus with Security enabled in the Misc menu above.*

# Chapter 2 – Instrument Setup

In this chapter, questions will be asked on how you intend for the instrument to function to conduct the test or sequence of tests for the application.

Setting up the instrument to meet specific application requirements is most effectively accomplished by answering these questions. They will guide you through the initial stages of the setup and point you to the appropriate chapters that detail specific instructions based on the answers.

It is highly recommended that each type of part being tested, whether they differ in volume or construction, have their own set of parameters defined in the instrument via individual Programs. Pressure decay leak testing is a volume dependent function. Flow testing can be setup to be volume independent; however, to optimize the testing, it is recommended that each type of part have its own set of parameters. In certain cases, it is possible to group "like parts" together to use the same parameters. In this case we recommend you talk to a CTS applications specialist to assure proper functionality.

## Program Linking & Sequencing

The instrument can support multiple tests on one part. The instrument is also able to conduct these tests on a part with multiple chambers by multiplexing through multiple test ports (if configured).

### *Question:*

***Are you planning to conduct multiple tests on one part as described in either of the two examples in the paragraph above?***

**Yes: It is important that you understand the concepts of Parent Program Linking. This test type is defined on the first page of Chapter 17. See Chapter 17 and then come back and continue the setup.**

**No: Proceed**

The instrument can conduct tests on multiple operations in a set sequence. The **Sequential Linking** test type may be used to test multiple unique parts, or tests may be run on the same chamber, or on different chambers in the part. The way that test results are reported and how tooling is controlled are not the same as the **Parent Program Linking** method.

## *Question:*

***Are you planning to conduct tests on multiple unique parts as described above?***

**Yes: It is important that you understand the concepts of Sequential Linking. This test type is defined on the last page of Chapter 17. See Chapter 17 and then come back and continue the setup.**

**No: Proceed**

## Selecting Test Types

The first step in setting up the instrument is to select the type of test you would like to conduct via the pre-packaged test sequences. Once you set up one type of test repeating this step under a different program will enable you to configure up to 99 different test configurations. The table on the following page includes the different test types available in the instrument, a brief description, and the associated chapter that details the pre-packaged test program. The availability of these test types is based on the configuration of the instrument.

Once you determine which test type is appropriate for your application go to Program 1 (press the + or – buttons until you see a P01 in the lower right-hand corner of the screen.

Press the Main Menu button to view the icons in the Main Menu screen.

Select Program Config icon using the Arrow/Enter Selection buttons.

Select the Test type icon using the Arrow/Enter Selection buttons.

Select the appropriate test type using the Enter button to enable editing and then the up and down arrows to view the options. When you see the desired selection press the Enter button to select.

To simplify the instructions in this manual, the steps above are reduced to the following: The **Test Type** menu is located in **Main Menu > Program Config > Tst type** icon.

## Test Type Table

| TEST TYPE | DESCRIPTION |
|---|---|
| Sniffer<br>Chapter 3 | Measures tracer gas concentration leaking from an external part (not in a chamber) at atmospheric pressure conditions, using a Sniffer Leak Test device, connected to the TracerMate II's RS232 port. The test may be performed in a manual, semi-auto, or automatic mode. |
| Accumulation<br>Chapter 4 | Measures tracer gas concentration leaking from a part at atmospheric pressure conditions, in an enclosed hood or chamber using a Sniffer Leak Test device, connected to the TracerMate II's RS232 port. |
| Basic Hard Vac<br>Chapter 5 | Measures the tracer gas leak concentration using Hard Vacuum chamber and a Tracer Gas Leak Test device. Chamber valve control is provided externally and coordinated through the leak detector interface to the TracerMate II. Parts are evacuated and filled by the TracerMate II. |
| Basic HV (Precharged)<br>Chapter 6 | Measures the helium leak concentration using Hard Vacuum chamber and a Tracer Gas Leak Test device. Chamber valve control is provided externally and coordinated through the leak detector interface to the TracerMate II. Parts are not evacuated, just tested, because they are already PRECHARGED with tracer gas. |
| Advanced Hard Vac<br>Chapter 7 | Measures the helium leak concentration using Hard Vacuum chamber and a Tracer Gas Leak Test device. Chamber valve control is provided by the TracerMate II. Parts are evacuated and filled by the TracerMate II. |
| Adv Hard Vac (Precharged)<br>Chapter 8 | Measures the helium leak concentration using Hard Vacuum chamber and a Tracer Gas Leak Test device. Chamber valves control is provided by the TracerMate II. Parts are not evacuated, just tested, because they are already PRECHARGED with tracer gas |
| Clean Part<br>Chapter 9 | Cleans Part by first evacuating, then simultaneously opening fill and exhaust valves flowing air or nitrogen through the part to purge tracer gas from the part. |
| Evac & Fill<br>Chapter 10 | Provides a method for evacuating and back filling an external part (not in a chamber) with a tracer gas for testing later. Also serves as Nitrogen backfill prior to shipping. |
| Step Proof | Measures and monitors the Peak Pressure over a fixed time. |

| TEST TYPE | DESCRIPTION |
|---|---|
| Chapter 11 | Determined from the maximum pressure during test pressure steps and duration of the test timers. The result is presented in units of pressure. |
| Refrigerant Fill<br>Chapter 12 | Provides a method for evacuating external part (not in a chamber) and backfilling with refrigerant to a specified weight, measured on a scale that is connected to the TracerMate II's RS232 port. |
| Pressure Decay-ΔP<br>(Gross Decay-ΔP)<br>Chapter 13 | Measures the pressure loss (ΔP) over time, determined from the pressure loss over the duration of the Test timer. The result is presented in units of delta pressure. |
| Pressure Decay-Leak Std<br>(Gross Decay-Leak Std)<br>Chapter 14 | Calculates the Leak Rate, based on the pressure loss over the duration of the Test timer. The result is presented in units of flow. |
| Occlusion<br>Chapter 15 | Measures the Back Pressure (part blockage), determined from the pressure at the end of the test timer. The result is presented in units of pressure. |
| Pressure Verify<br>Chapter 16 | Measures the Pressure at the isolated test port (no fill). Determined from the pressure at the end of the Test segment timer. The result is presented in units of pressure. |
| Parent Program Linking<br>Chapter 17 | Facilitates linking individual programs into a single test sequence for conducting multiple tests on one part or one part with multiple chambers. Contains tooling control parameters and link definitions. Each link defines the target program to execute and evaluation conditions for additional program execution. |
| Sequential Linking<br>Chapter 17 | Facilitates linking individual programs into a single test sequence to test multiple parts sequentially. Each link defines the target program and the next program to execute and evaluation conditions for additional program execution. Tooling control parameters are defined in the linked programs. |

Before we begin setting the parameters of the program, we need to determine some of the capabilities and features that are required for the leak test application.

## Tooling Control

The instrument is capable of controlling tooling to potentially eliminate the need for a PLC or other computer that would control cylinders and sealing.

### *Question:*

***Are you planning to use the TracerMate II to control any sealing operations?***

**Yes: It is important that you understand the concepts and safety requirements of Tooling Control. See Chapter 18 then come back and continue the setup.**

**No: Proceed**

## Programming the Inputs and Outputs

The instrument comes with 12 inputs and 12 outputs (24VDC) that are user configurable for each program.

### *Question:*

***Are you planning to use the TracerMate II to control any ancillary devices or communicate with a PLC using discrete I/O?***

**Yes: See Chapter 19 and then come back and**

**continue the setup.**

**No: Proceed**

# Channel Configuration

## Setting the Units of Measure

The instrument has the capability to utilize different units of measure for each configured program. In order to keep things simple and user friendly if you always use the same unit of measure, you can set the units in one place and have them apply instrument wide. This is done in the Channel Configuration menu.

### *Question:*

***Are you planning to use the same units of measure for every program?***

**Yes: Press the Main Menu button. Select the Channel Config Icon. From the Channel Config menu select the Units Icon. Change the Unit/Prec Define parameter to "Channel". Set the desired units on that same screen. These units will apply to every program.**

**No: Press the Main Menu button. Select the Channel Config Icon. From the Channel Config menu select the Units Icon. Change the Unit/Prec Define parameter to "Program". The Unit Icon will now appear under the Program Config menu. When a program is created, the units for the program will use the units under the Channel Config menu as the default settings but can now be changed per program.**

***Note: The units set on the Channel Config screen are also the units used for Self-Test and Set/Span Routines.***

***Note: The precision displayed for each unit may also be set on this screen.***

## Setting the Leak Standard Values

The instrument has the capability to utilize different leak standards for each configured program that uses a leak standard. In order to keep things simple and user friendly if you always use the same leak standard, you can set the leak standard value and pressure in one place and have it applied instrument wide to any program that uses a leak standard. This is done in the Channel Configuration menu.

### *Question:*

***Are you planning to use the same leak standard for every program that requires a leak standard?***

**Yes: Press the Main Menu button. Select the Channel Config Icon. From the Channel Config menu select the Leak/Cal Icon. Change the Leak Std/Cal Define parameter to "Channel". Set the leak standard value and the pressure at which it was calibrated on that same screen. This leak standard value will apply to every program that utilizes a leak standard for calibration.**

**No: Press the Main Menu button. Select the Channel Config Icon. From the Channel Config menu select the Leak/Cal Icon. Change the Leak Std/Cal Define parameter to "Program". The leak standard parameters will now appear on the TST:*** screen under the Program Config menu. When a program is created, the units for the program will use the leak standard value under the Channel Config menu as the default settings but now can be changed per program.**

***Note: Every time the leak standard value changes due to a calibration or when a new leak standard is used this value needs to be modified to reflect the new value.***

***Note: The parameter that determines whether the physical leak standard is located either inside the instrument or connected to a port on the outside is also located in the Leak/Cal Menu or the TST menu. However, to view this parameter you must be in the "Advanced" or "Admin" Display User Level. To change the Display User Level, see Chapter 22 "Features".***

***Remember: Press the information button with the cursor on a parameter if you need help or a description of the available options.***

## Program Configuration

Now that you have created a program, configured the tooling and associated I/O, and set the channel level parameters, it is time to set the regulators to the correct test pressure.

### Pressure Select

To select the proper source for the test, we need to inform the instrument which regulator to use for the current program. For the Pressure Decay test types, this setting is in the **Program Config > Misc** menu. The parameter called Pressure Source will need to be set to match the proper regulator. For the Sniffer test types, the Pressure/Vacuum source options are found in the **Program Config > Options** menu. Find the regulator with the proper range. Locate the label that has the Source Number on it and select that source for the Pressure Source parameter.

### Selecting the Test Port

Next, select the proper test port (if required).

*Question:*

***Does your instrument have multiple test ports (optional configuration)?***

**Yes: from the same Program Config - Misc menu select the Test Port Number you would like to conduct the test on. The port numbers will count upwards from left to right.**

**No: Proceed**

### Setting the Pneumatic Regulator

*Question:*

***Does the pressure source you are using for this program have an electronic regulator?***

**Yes: The electronic regulator has been setup and calibrated at the factory and will be ready to use. For calibrating the electronic regulator see Chapter 23.**

**No: Setting the regulator is done via the Channel Config screen under the Set/Span menu. In order to set the regulator, the test port will need to be blocked which will allow the instrument to hold pressure. Standard instruments are supplied with a quick connect Colder™ fitting with an attached "Self-Test cap" for ease at startup. If this instrument is not a standard setup this may be done with a plug inserted into the test port. For proper plug thread specifications, consult the print set shipped with your instrument.**

## Setting the Test Parameters

It is time to set the test parameters to fit your application. Refer to the chapter associated with the test type chosen from TABLE 1 – TEST TYPES, on pages 10-11.

## Verifying Setup

Once you have everything programmed, run a repeatability study based on your company's quality standards to assure you are getting the results you desire.

## Security

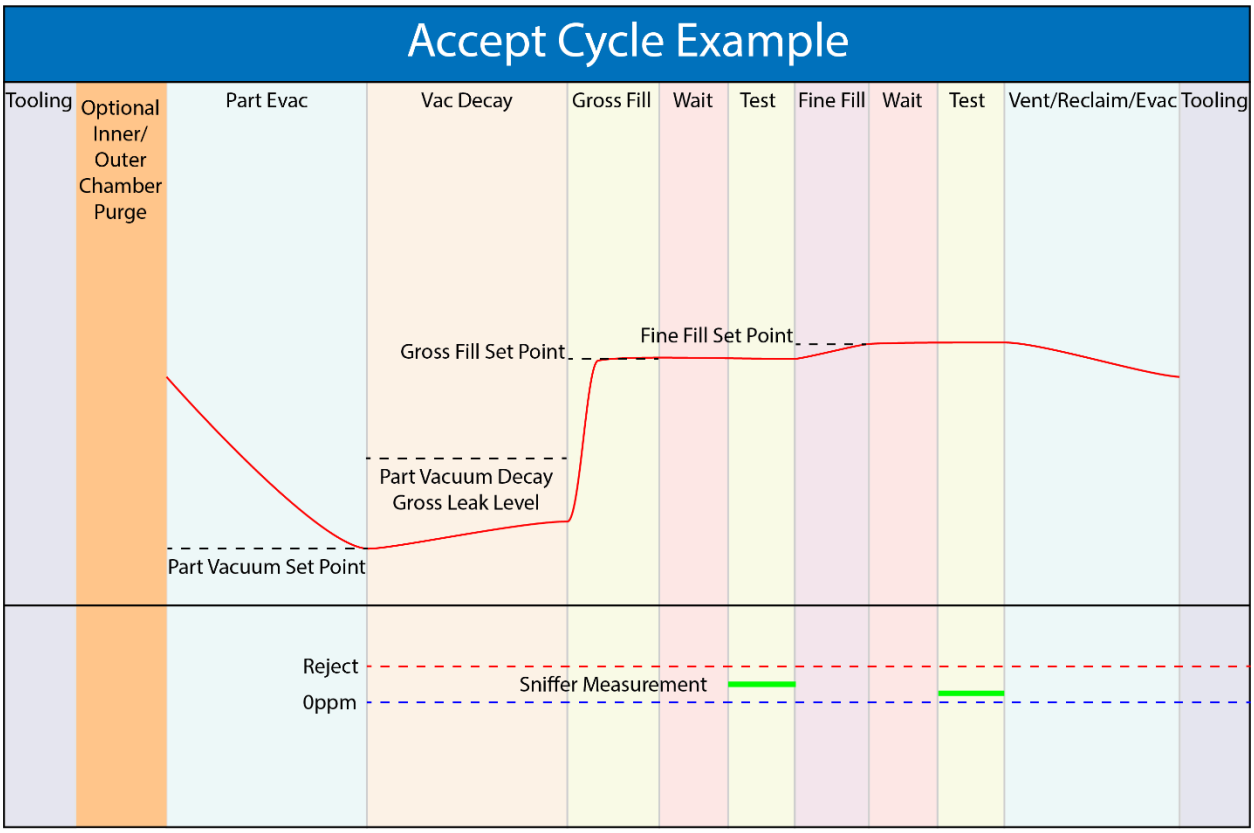
Now that the instrument is setup the way you want, make sure to lock down the parameters that you don't want changed until a key or password is used. See Security parameters in Chapter 21.

## Backup the Instrument Settings

The setup of the instrument for one program is completed. You may now go back and setup multiple programs. Once you have completed setting up programs, it is highly recommended that you create a backup of the instrument. This can be done with a USB memory stick. See Instrument Backup and Restore in Chapter 20.

# Chapter 3 – Sniffer Test

*This chapter explains the theory and parameters for conducting a sniffer test. The TracerMate II controls evacuation and tracer gas fill of the part and communicates with a variety of external sniffer devices. The result of this test can include test results for:Vacuum Decay tests, Gross T-Gas Leak and Fine T-Gas Leak pressure decay tests, Sniffer Test tracer gas leak rate values for individual test points, and cumulative tracer gas Leak values measured with the Sniffer during the Gross T-Gas Leak test and Fine T-Gas Leak test segments (if those test were run).*



## Test Sequence Overview

The following is a brief overview of the test sequence using a helium sniffer.

- **Tooling** – Optional tool motion before start of test.
- **Vacuum and Vacuum Decay** – Evacuate and test the part using a vacuum source and test for gross leaks, as well as prepare the part for charging with helium. The vacuum decay test can also be useful to avoid contamination of the test environment with excessive helium if the test part has a gross leak.
- **Charge with Helium** – Pressurize the part with Helium. If both Air and Helium sources are available, a configurable percentage mix of He/Air can also be used for testing.
- **Sniffer Leak Test** – The operator will be prompted to begin testing the part with the RS232 sniffer probe, while also continuing to monitor for unexpected pressure loss. The operator manually signals the completion of the test, or the test ends with an alarm/alert after a configurable timeout period.
- **Evacuate Helium** – Remove helium from part. If a recovery system is available, internal or external valves can be manipulated to route the helium to the recovery system.
- **Tooling** – Optional tool motion at completion of test.
- **Report** – The Test Result is recorded with an overall ACCEPT/REJECT evaluation and includes multiple Pass/Fail/Skipped results depending on the test option settings. The Vacuum Decay, Gross T-Gas Decay and Fine T-Gas Decay tests all report Pass/Fail/Skipped with measured part pressure and tracer gas pressure loss values. The Sniffer Test reports Test Point Number and Measured T-Gas Leak Rate for each test point as well as cumulative Sniffer leak rates measured during the Gross T-Gas Leak test and Fine T-Gas Leak test segments (if they were run).

Using the configuration options, tests can be created to provide:

- Basic evacuate & fill testing (without communication with the external Sniffer device)
- Advanced testing (with external Sniffer communication)
- Gross T-Gas Decay testing, Fine T-Gas Decay testing
- Clamshell testing

## Options Menu

The options for the program may be viewed by going to the Program Config menu and selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| External Sniffer | Enable/disable communication with external Sniffer Leak Test Device on RS232 port. | Advanced, Admin |
| Clamshell | Enable/disable Clamshell outputs during Sniffer Test. | Advanced, Admin |
| Test Mode | Defines the Sniffer Test mode. Auto, Semi-Auto, Inficon Normal, Inficon I-Guide, Manual. | Basic<br>Advanced, Admin |
| Sample Points | Number of test points measured during the test. This parameter is hidden in some test modes. | Basic<br>Advanced, Admin |
| Part Evacuation | Enable/disable evacuation of the part before filling with T-Gas. Options are: Disabled, Enabled, or Evac to Press. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Evacuation Xdcr | Transducer that will be used to measure evacuation pressure. | Advanced, Admin |
| Vacuum Decay | Enables vacuum decay test prior to tracer fill. | Advanced, Admin |
| Re-Evac After Test | Allows re-evacuation of part after Sniffer Test completion. If enabled, Exhaust/Re-Evac timer is available before the Exhaust timer. | Advanced, Admin |
| Close Inner Purge | Allows the Inner Purge Ring to be closed before the start of the Tracer Gas Fill segment. This option is available in Clamshell mode. | Advanced, Admin |
| T-Gas Source | Specifies the manifold pressure source to utilize for the Sniff Test Tracer pressure. The T-Gas Source must be specified even if the T-Gas Fill option is Disabled. | Advanced, Admin |
| Gross T-Gas Fill | Fill method for the Gross T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Gross Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Gross T-Gas Decay | Enables Gross Leak Decay Test during sniffer test. | Advanced, Admin |

| Option | Description | User Display Mode |
|---|---|---|
| Fine T-Gas Fill | Fill method for the Fine T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Fine Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). Continuous Fill (t-gas fill valve remains open through end of test segment) | Advanced, Admin |
| Fine T-Gas Decay | Enables Fine Leak Decay Test during sniffer test. | Advanced, Admin |
| T-Gas Recovery | Specify method used to remove tracer gas from the part after a test. Options are: Fixed Timer or Exh to Press. | Advanced, Admin |

## Sniffer Menu:

The Sniffer specific options for the program may be viewed by going to the Program Config menu and selecting the Sniffer Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Sniffer Type | Sniffer Type used by this part program. | Viewable in Basic & Advanced Editable in Admin |
| Sniffer Init | Defines when sniffer initialization is performed. Options are before or after part evacuation and fill. | Advanced, Admin |
| T-Gas Sampling | Specifies result reporting method for measured leak rate. Average reports the average leak rate measurement during the sample period. Peak reports the highest leak rate measurement during sample period. | Advanced, Admin |
| Sample Gas Number | Sample Gas ID number to be used by the sniffer device. This parameter is hidden if not available on the active leak detector. | Advanced, Admin |
| Device Zero | If enabled, forces the leak detector to set its Zero level at the end of the Cleanup segment. This parameter is available for use with the Inficon P3000 leak detector. | Advanced, Admin |
| Autozero Enable | Internal Autozero function. The T-Gas leak rate measurement at the end of the Autozero Delay timer will be applied as a zero offset to reported leak rate measurements during the testing cycle. This option is available in Clamshell mode. | Advanced, Admin |
| Min T-Gas Mode | Mode for checking Minimum T-Gas leak rate. Continuous: Leak rate must achieve and maintain setpoint. One-Time: Leak rate must achieve but need not maintain setpoint. Disabled: No minimum setpoint. | Advanced, Admin |

| Option | Description | User Display Mode |
|---|---|---|
| LD Min T-Gas Setpt | Minimum Tracer Gas leak rate that must be measured for a valid test. If the measured sniffer leak rate is below this value, a Tracer Min Fault is generated. | Advanced, Admin |
| LD Background Limit | Maximum Tracer Gas background level allowed prior to starting a Test. If the sniffer reports a tracer level exceeding this value, a Tracer Background Fault is generated. | Advanced, Admin |
| Cleanup Setpoint | Leak rate setpoint for the Chamber Cleanup Fault. Part will not be charged with tracer gas if exceeds this limit. | Advanced, Admin |
| Device Mode | Sniffer Device testing mode option. Some leak detectors operate in multiple modes (i.e. Sniff Mode, Accumulation mode, HardVac Mode). This parameter specifies which mode should be used. Hidden for single mode leak detectors. | Advanced, Admin |

## Timers Menu:

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Sniff Init | Maximum time allowed for establishing communication with the leak detector and completing the device's initialization. When the device indicates it is ready for testing, any remaining time is aborted, and the test sequence continues. If this timer expires before the device has reached a ready state, a Sniffer Not Ready fault is generated. | Advanced, Admin |
| Evacuate | Time allocated to evacuating the part. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Basic<br>Advanced, Admin |
| Continue to Evac | Available if Part Evac is set to Evac to Press.<br>Time to continue to fill after target vacuum is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Time to stabilize part pressure while isolated from the pressure source. | Basic<br>Advanced, Admin |
| Evac Decay 1 | Timer for the Evacuation decay test. | Basic<br>Advanced, Admin |
| Purge Off | Delay time from the end of the evacuation sequence before closing the Inner Purge valve or output. This parameter is hidden if the Clamshell option is Disabled or if the Close Inner Purge option is No. | Advanced, Admin |
| Cleanup | Maximum time allowed for the measured leak rate from the sniffer to fall below the Chamber Clean Setpoint. Remaining time is aborted once the setpoint is reached. | Basic<br>Advanced, Admin |
| Auto-Zero Delay | Delay time for taking the T-Gas leak rate measurement to be used for Auto-Zero from the leak detector. Delay begins when the Chamber Cleanup Setpoint is achieved. | Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| Dev Zero Delay | Delay time before sending the Device ZERO command to leak detector. Available on Inficon P3000. | Advanced, Admin |
| Gross Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic Advanced, Admin |
| Gross Fill | Time allocated to reach the specified Gross T-Gas Target Pressure. The source valve is pulsed open once per second for the time specified by the Gross Fill Pulse parameter. | Basic Advanced, Admin |
| Gross Fill Pulse | Length of time per second to open the T-Gas pressure source valve while adding pressure during Gross T-Gas Fill. | Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic Advanced, Admin |
| Stabilize | Amount of time allocated to the Stabilize segment for execution before continuing. | Basic Advanced, Admin |
| Gross Wait # | Delay timer before beginning the sampling period at a leak rate measurement point. | Basic Advanced, Admin |
| Gross Sample # | Length of the sampling period at a leak rate measurement point. | Basic Advanced, Admin |
| Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic Advanced, Admin |
| Fill | Time allocated to reach the specified Fine T-Gas Target Pressure. | Basic Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic Advanced, Admin |
| Stabilize | Amount of time allocated to the Stabilize segment for execution before continuing. | Basic Advanced, Admin |
| Fine Wait # | Delay timer before beginning the sampling period at a leak rate measurement point. | Basic Advanced, Admin |
| Fine T-Gas Sample # | Length of the sampling period at a leak rate measurement point. | Basic Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| T-Gas Exh | Time allocated to recovering Tracer Gas from the part after a test. During this time the Reclaim valve is opened. This timer is only present if the Reclaim Valve is defined and the T-Gas Recovery option is set to reclaim. | Basic<br>Advanced, Admin |
| Continue T-Gas Exh | Available if Recovery is set to Exh to Press. The testing cycle jumps to this timer when part pressure falls below T-Gas Exh Press setpoint. | Basic<br>Advanced, Admin |
| Exh/Re-Evac | Time allocated to exhaust and re-evacuate the part after a test. This timer is present if the Re-Evacuate After Test option is Yes. The part is first exhausted, and Re-Evacuation will not begin until the part reached a safe pressure. Timer must be long enough to accommodate both. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation Setpoint pressure that is to be achieved. Setpoint for Evacuation. | Basic<br>Advanced, Admin |
| Allow Evac Limit | Maximum pressure allowed during evacuation. If the starting pressure is above this value, no evacuation will be performed. | Advanced, Admin |
| Gross T-Gas Min | Minimum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Gross T-Gas Target | Target pressure for Tracer Gas Gross T-Gas Fill and Test. | Basic<br>Advanced, Admin |
| Gross T-Gas Max | Maximum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Fine T-Gas Min | Minimum test pressure allowed during the Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Fine T-Gas Target | Tracer Gas target pressure that is to be achieved. Setpoint for Sniff Test Tracer Fill. | Basic<br>Advanced, Admin |
| Fine T-Gas Max | Maximum test pressure allowed during the Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| T-Gas Exh Press | Available if Recovery is set to Exh to Press. As this setpoint is crossed, the testing cycle jumps to the Continue T-Gas Exh timer. | Basic<br>Advanced, Admin |

## Test Parameters – Evacuation Decay

The Test parameters for the Evacuation Decay test program may be viewed and modified by going to the Program Config menu and selecting the TST:SVD1 Icon. This icon and test menu will be hidden if the Evacuation Decay test is disabled.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Gross T-Gas Decay & Tracer Leak Rate

The Test Parameters for the Gross T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNG2 Icon. This icon and test menu will be hidden if the Gross T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1-20 | High limit T-Gas Leak Rate for the sniffer test for each of 1-20 individual test points. | Basic<br>Advanced, Admin |
| Reject Rate Total | High limit T-Gas Leak Cumulative Rate. This value is the limit for total measured leak rate across all configured test points. | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Fine T-Gas Decay & Tracer Leak Rate

The Test Parameters for the Fine T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNF2 Icon. This icon and test menu will be hidden if the Fine T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1-20 | High limit T-Gas Leak Rate for the sniffer test for each of 1-20 individual test points. | Basic<br>Advanced, Admin |
| Reject Rate Total | High limit T-Gas Leak Cumulative Rate. This value is the limit for total measured leak rate across all configured test points. | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Inputs

| Input | Description | Functional Group |
|---|---|---|
| Sniffer Ready | The Sniffer Ready input is used to coordinate sharing of a single leak detector between two TracerMate instruments. If the input is defined for a test, the program will wait during the sniffer initialization segment for the input to go high before attempting to communicate with the leak detector. Once active, the input must remain high until the end of the initialization segment or a Sniffer Ready Input fault will be generated. | Sniffer Control Group |
| Sniffer Present | When the Sniffer Present input is defined, a fault will be generated if the input is not active at any time during the test cycle where tracer gas measurements are expected. | Sniffer Control Group |
| Ext Press Sw 1-2 | External Pressure Switch inputs for the Evac(1) and Tracer(2) sources. If defined, this input must go high before the end of the Fill segment or an ERR EXT SW fault will be generated. | Test Control Group |
| Clamshell Flow 1-5 | The Clamshell Flow inputs are used to verify purge flow during a clamshell test. The flow input numbers correspond to the test point numbers during the test. If the input is no active during the test point measurement cycle a fault is generated. | Test Control Group |

## Outputs

| Output | Description | Functional Group |
|---|---|---|
| Ready To Sniff | The Ready To Sniff output goes high after the part has been charged with tracer gas and is ready for testing with the leak detector. | Sniffer Control Group |
| In Sample 1-5 | The In Sample output goes high at the beginning of each sample period returns low at the end of each sample period. | Sniffer Result Group |
| Sample Accept | The Sample Accept output goes high at the end of each sample period if the evaluated value for measured leak rate is less than the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will | Sniffer Result Group |

| Output | Description | Functional Group |
|---|---|---|
| | remain active until the start of a new test. | |
| Sample Reject | The Sample Reject output goes high at the end of each sample period if the evaluated value for measured leak rate exceeds the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sniffer Busy | The Sniffer Busy output is used to coordinate sharing of a single leak detector between two TracerMate instruments. It goes high at the start of the initialization segment and remains high until communication with the sniffer is completed at the end of the test sequence. This output can be used to control an external interface to provide switching of the RS232 link between the TracerMate and leak detector. The Sniffer Ready input is used as feedback to the TracerMate instruments to indicate which has connection to the leak detector. | Sniffer Control Group |
| T-Gas Leak Std | The T-Gas Calibration output is turned on to control an external calibrated leak for use in leak detector calibration. It goes high during the Sniffer tests when the Run Leak Calibrate option is Enabled. | Chamber Control Group |
| Inner Purge Ring | The Inner Purge Ring output is used during the Sniffer Test Type when the Clamshell option is Enabled. It goes high at the start of a sequence. If Close Inner Purge option is Yes, it goes low at the start of the Cleanup segment. If Close Inner Purge option is No, it remains high until the end of the test sequence. | Chamber Control Group |
| Outer Purge Ring | The Outer Purge Ring output is used during the Sniffer Test Type when the Clamshell option is Enabled. It goes high at the start of a sequence and remains high until the end of the test sequence. | Chamber Control Group |
| In Recover | The In Recover output is high during the Tracer Gas Recovery segment. | Test Cycle Group |
| In Re-evac | The In Re-Evac output is high during the Tracer Gas Re-Evacuation segment. | Test Cycle Group |

| Output | Description | Functional Group |
|---|---|---|
| Sample Fault | This output is active during a sniffer test manual cycle whenever the light ring is flashing red to indicate a leak rate reading above the Reject Setpoint. | Sniffer Control Group |

### Valve Outputs

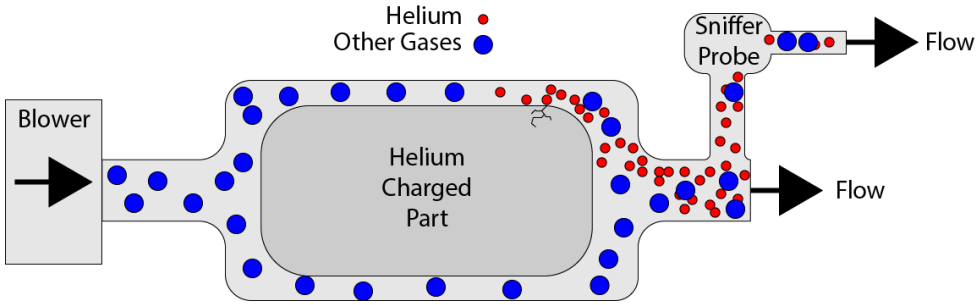
The following optional valves are supported by this test:

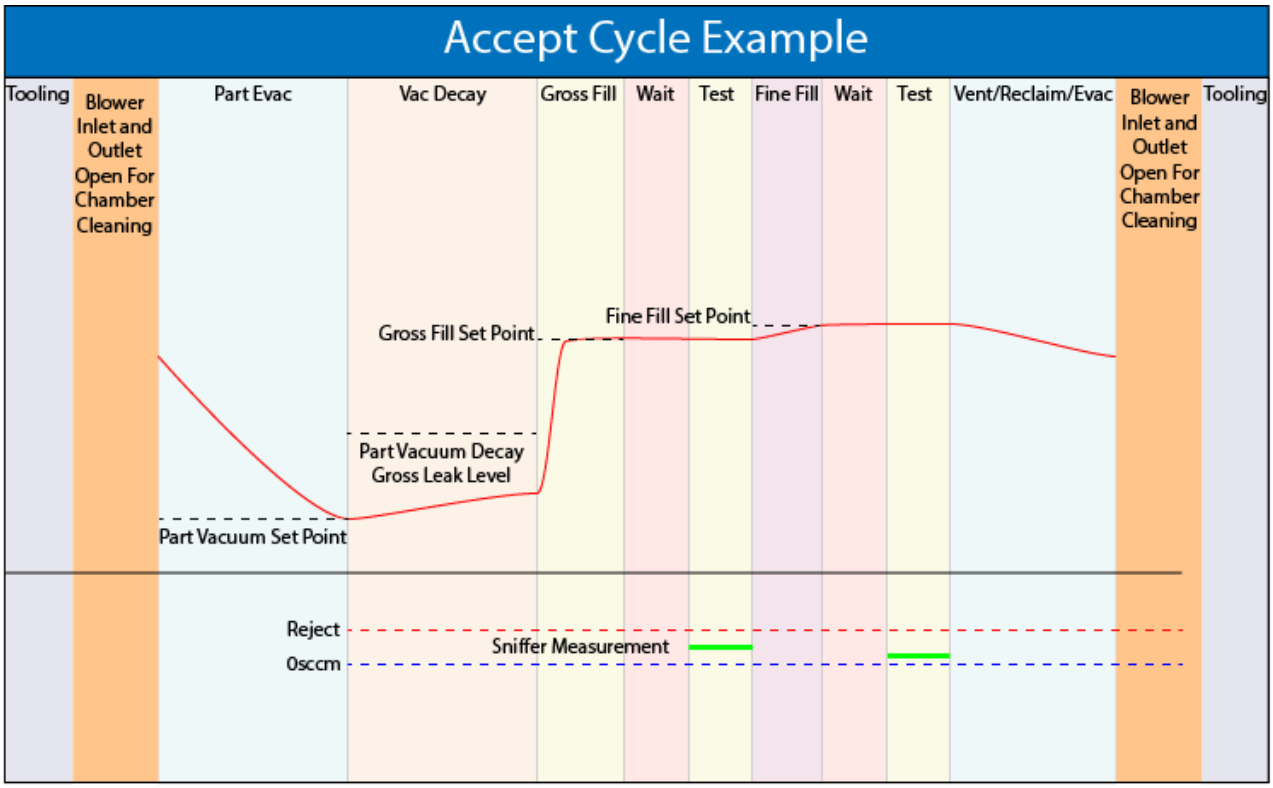
- Reclaim Valve
- T-Gas Calibration
- Inner Purge Ring
- Outer Purge Ring

# Chapter 4 – Accumulation Test

*While similar to the Sniffer Test Type it also provides additional outputs to control an accumulation chamber. Outputs configured as either digital outputs or valve outputs are provided for an Inlet Blower, Outlet Blower, and a Circulation Fan. Variables on the Timer Menu control output on/off times and delays.*

*The Test Result is recorded with an overall ACCEPT/REJECT evaluation and includes multiple Pass/Fail/Skipped results depending on the test option settings. Evacuation, Gross and Fine Decay tests report Pass/Fail/Skipped with Measured Pressure and Pressure Loss. Sniffer Tests report Measured T-Gas Leak Rate.*



## Options Menu

The Options for the program may be viewed by going to the Program Config menu and selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Evacuation | Enable/disable evacuation of the part before filling with T-Gas. Options are: Disabled, Enabled, or Evac to Press. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Evacuation Xdcr | Transducer that will be used to measure evacuation pressure. | Advanced, Admin |
| Vacuum Decay | Enables vacuum decay test prior to tracer fill. | Advanced, Admin |
| Re-Evac After Test | Allows re-evacuation of part after Sniffer Test completion. If enabled, Exhaust/Re-Evac timer is available before the Exhaust timer. | Advanced, Admin |
| T-Gas Source | Specifies the manifold pressure source to utilize for the Sniff Test Tracer pressure. The T-Gas Source must be specified even if the T-Gas Fill option is Disabled. | Advanced, Admin |
| Gross T-Gas Fill | Fill method for the Gross T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Gross Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Gross T-Gas Decay | Enables Gross Leak Decay Test during sniffer test. | Advanced, Admin |
| Fine T-Gas Fill | Fill method for the Fine T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Fine Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Fine T-Gas Decay | Enables Fine Leak Decay Test during sniffer test. | Advanced, Admin |
| T-Gas Recovery | Specify method used to remove tracer gas from the part after a test. Options are: Fixed Timer or Exh to Press. | Advanced, Admin |

## Sniffer Menu:

The Sniffer specific options for the program may be viewed by going to the Program Config menu and selecting the Sniffer Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Sniffer Type | Sniffer Type used by this part program. | Viewable in Basic & Advanced Editable in Admin |
| Sniffer Init | Defines when sniffer initialization is performed. Options are before or after part evacuation and fill. | Advanced, Admin |
| T-Gas Sampling | Specifies result reporting method for measured leak rate. Average reports the average leak rate measurement during the sample period. Peak reports the highest leak rate measurement during sample period. | Advanced, Admin |
| Sample Gas Number | Sample Gas ID number to be used by the sniffer device. This parameter is hidden if not available on the active leak detector. | Advanced, Admin |
| Device Zero | If enabled, forces the leak detector to set its Zero level at the end of the Cleanup segment. This parameter is available for use with the Inficon P3000 leak detector. | Advanced, Admin |
| Autozero Enable | Internal Autozero function. The T-Gas leak rate measurement at the end of the Autozero Delay timer will be applied as a zero offset to reported leak rate measurements during the testing cycle. This option is available in Clamshell mode. | Advanced, Admin |
| Min T-Gas Mode | Mode for checking Minimum T-Gas leak rate.<br>Continuous: Leak rate must achieve and maintain setpoint.<br>One-Time: Leak rate must achieve but need not maintain setpoint.<br>Disabled: No minimum setpoint. | Advanced, Admin |
| LD Min T-Gas Setpt | Minimum Tracer Gas leak rate that must be measured for a valid test. If the measured sniffer leak rate is below this value, a Tracer Min Fault is generated. | Advanced, Admin |

| Option | Description | User Display Mode |
|---|---|---|
| LD Background Limit | Maximum Tracer Gas background level allowed prior to starting a Test. If the sniffer reports a tracer level exceeding this value, a Tracer Background Fault is generated. | Advanced, Admin |
| Cleanup Setpoint | Leak rate setpoint for the Chamber Cleanup Fault. Part will not be charged with tracer gas if exceeds this limit. | Advanced, Admin |
| Device Mode | Sniffer Device testing mode option. Some leak detectors operate in multiple modes (i.e. Sniff Mode, Accumulation mode, HardVac Mode). This parameter specifies which mode should be used. Hidden for single mode leak detectors. | Advanced, Admin |

## Timers Menu:

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Sniff Init | Maximum time allowed for establishing communication with the leak detector and completing the device's initialization. When the device indicates it is ready for testing, any remaining time is aborted, and the test sequence continues. If this timer expires before the device has reached a ready state, a Sniffer Not Ready fault is generated. | Advanced, Admin |
| Inlet On 1 | Time delay after turning on the accumulation chamber Inlet output. | Advanced, Admin |
| Outlet On 1 | Time delay after turning on the accumulation chamber Outlet output. | Advanced, Admin |
| Evacuate | Time allocated to evacuating the part. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Basic<br>Advanced, Admin |
| Continue to Evac | Available if Part Evac is set to Evac to Press.<br>Time to continue to fill after target vacuum is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Time to stabilize part pressure while isolated from the pressure source. | Basic<br>Advanced, Admin |
| Evac Decay 1 | Timer for the Evacuation decay test. | Basic<br>Advanced, Admin |
| Inlet Off | Time delay after turning off the accumulation chamber Inlet output. | Advanced, Admin |
| Outlet Off | Time delay after turning off the accumulation chamber Outlet output. | Advanced, Admin |
| Cleanup | Maximum time allowed for the measured leak rate from the sniffer to fall below the Chamber Clean Setpoint. Remaining time is aborted once the setpoint is reached. | Basic<br>Advanced, Admin |
| Dev Zero Delay | Delay time before sending the Device ZERO command to leak detector. Available on Inficon P3000. | Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| Gross Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Gross Fill | Time allocated to reach the specified Gross T-Gas Target Pressure. The source valve is pulsed open once per second for the time specified by the Gross Fill Pulse parameter. | Basic<br>Advanced, Admin |
| Gross Fill Pulse | Length of time per second to open the T-Gas pressure source valve while adding pressure during Gross T-Gas Fill. | Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Amount of time allocated to each segment for execution before continuing. | Basic<br>Advanced, Admin |
| Gross Wait | Delay timer before beginning the gross leak rate measurement sample. | Basic<br>Advanced, Admin |
| Gross Sample | Length of the gross leak rate measurement period. | Basic<br>Advanced, Admin |
| Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Fill | Time allocated to reach the specified Fine T-Gas Target Pressure. | Basic<br>Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Amount of time allocated to each segment for execution before continuing. | Basic<br>Advanced, Admin |
| Fine Wait | Delay timer before beginning the fine leak rate measurement sample. | Basic<br>Advanced, Admin |
| Fine T-Gas Sample | Length of the fine leak rate measurement period. | Basic<br>Advanced, Admin |
| T-Gas Exh | Time allocated to recovering Tracer Gas from the part after a test. During this time the Reclaim valve is opened. This timer is only present if the Reclaim Valve is defined and the T-Gas Recovery option is set to Reclaim. | Basic<br>Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| Continue T-Gas Exh | Available if Recovery is set to Exh to Press. The testing cycle jumps to this timer when part pressure falls below T-Gas Exh Press setpoint. | Basic<br>Advanced, Admin |
| Inlet On 2 | Time delay after turning on the accumulation chamber Inlet output. | Advanced, Admin |
| Outlet On 2 | Time delay after turning on the accumulation chamber Outlet output. | Advanced, Admin |
| Exhaust/Re-Evac | Time allocated to exhaust and re-evacuate the part after a test. This timer is present if the Re-Evacuate After Test option is Yes. The part is first exhausted, and Re-Evacuation will not begin until the part reached a safe pressure. Timer must be long enough to accommodate both. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation Setpoint pressure that is to be achieved. Setpoint for Evacuation. | Basic<br>Advanced, Admin |
| Allow Evac Limit | Maximum pressure allowed during evacuation. If the starting pressure is above this value, no evacuation will be performed. | Advanced, Admin |
| Gross T-Gas Min | Minimum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Gross T-Gas Target | Target pressure for Tracer Gas Gross T-Gas Fill and Test. | Basic<br>Advanced, Admin |
| Gross T-Gas Max | Maximum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Fine T-Gas Min | Minimum test pressure allowed during the Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Fine T-Gas Target | Tracer Gas target pressure that is to be achieved. Setpoint for Sniff Test Tracer Fill. | Basic<br>Advanced, Admin |
| Fine T-Gas Max | Maximum test pressure allowed during the Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| T-Gas Exh Press | Available if Recovery is set to Exh to Press. As this setpoint is crossed, the testing cycle jumps to the Continue T-Gas Exh timer. | Basic<br>Advanced, Admin |

## Test Parameters – Evacuation Decay

The Test parameters for the Evacuation Decay test program may be viewed and modified by going to the Program Config menu and selecting the TST:SVD1 Icon. This icon and test menu will be hidden if the Evacuation Decay test is disabled.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Gross Leak Decay & Tracer Leak Rate

The Test Parameters for the Gross T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNG2 Icon. This icon and test menu will be hidden if the Gross T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status.. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1-20 | High limit T-Gas Leak Rate for the sniffer test for each of 1-20 individual test points. | Basic<br>Advanced, Admin |
| Reject Rate Total | High limit T-Gas Leak Cumulative Rate. This value is the limit for total measured leak rate across all configured test points. | Basic<br>Advanced, Admin |
| Reject on Slope | Enables monitoring of the tracer leak rate slope during the sample timer. | Basic<br>Advanced, Admin |
| Slope Window | Time period at the end of the sample timer where the slope of tracer leak rate is calculated. | Basic<br>Advanced, Admin |
| Slope Change/Sec | Reject if the change per second in tracer leak rate exceeds this value. | Basic<br>Advanced, Admin |
| Permit Early Reject | If enabled, the test monitors the leak rate slope throughout the sample timer and rejects early leak rate of change exceeds the configured value. | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |

| | |
|---|---|
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Fine Leak Decay & Tracer Leak Rate

The Test Parameters for the Fine T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNF2 Icon. This icon and test menu will be hidden if the Fine T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1-20 | High limit T-Gas Leak Rate for the sniffer test for each of 1-20 individual test points. | Basic<br>Advanced, Admin |
| Reject Rate Total | High limit T-Gas Leak Cumulative Rate. This value is the limit for total measured leak rate across all configured test points. | Basic<br>Advanced, Admin |
| Reject on Slope | Enables monitoring of the tracer leak rate slope during the sample timer. | Basic<br>Advanced, Admin |
| Slope Window | Time period at the end of the sample timer where the slope of tracer leak rate is calculated. | Basic<br>Advanced, Admin |
| Slope Change/Sec | Reject if the change per second in tracer leak rate exceeds this value. | Basic<br>Advanced, Admin |
| Permit Early Reject | If enabled, the test monitors the leak rate slope throughout the sample timer and rejects early leak rate of change exceeds the configured value. | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Inputs

| Input | Description | Functional Group |
|---|---|---|
| Sniffer Ready | The Sniffer Ready input is used to coordinate sharing of a single leak detector between two TracerMate instruments. If the input is defined for a test, the program will wait during the sniffer initialization segment for the input to go high before attempting to communicate with the leak detector. Once active, the input must remain high until the end of the initialization segment or a Sniffer Ready Input fault will be generated. | Sniffer Control Group |
| Sniffer Present | When the Sniffer Present input is defined, a fault will be generated if the input is not active at any time during the test cycle where tracer gas measurements are expected. | Sniffer Control Group |
| Ext Press Sw 1-2 | External Pressure Switch inputs for the Evac(1) and Tracer(2) sources. If defined, this input must go high before the end of the Fill segment or an ERR EXT SW fault will be generated. | Test Control Group |

## Outputs

| Output | Description | Functional Group |
|---|---|---|
| Ready To Sniff | The Ready To Sniff output goes high after the part has been charged with tracer gas and is ready for testing with the leak detector. | Sniffer Control Group |
| In Sample | The In Sample output goes high at the beginning of each sample period returns low at the end of each sample period. | Sniffer Result Group |
| Sample Accept | The Sample Accept output goes high at the end of each sample period if the evaluated value for measured leak rate is less than the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sample Reject | The Sample Reject output goes high at the end of each sample period if the evaluated value for measured leak rate exceeds the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sniffer Busy | The Sniffer Busy output is used to coordinate sharing of a single leak detector between two TracerMate instruments. It goes high at the start of the initialization segment and remains high until communication with the sniffer is completed at the end of the test sequence. This output can be used to control an external interface to provide switching of the RS232 link between the TracerMate and leak detector. The Sniffer Ready input is used as feedback to the TracerMate instruments to indicate which has connection to the leak detector. | Sniffer Control Group |
| T-Gas Calibration | The T-Gas Calibration output is turned on to control an external calibrated leak for use in leak detector calibration. It goes high during the Sniffer tests when the Run Leak Calibrate option is Enabled. | Chamber Control Group |
| In Recover | The In Recover output is high during the Tracer Gas Recovery segment. | Test Cycle Group |
| In Re-evac | The In Re-Evac output is high during the Tracer Gas Re-Evacuation segment. | Test Cycle Group |
| Inlet Blower | Blower output for purge air source | Chamber Control Group |

| Output | Description | Functional Group |
|---|---|---|
| Outlet Blower | Blower output for purge air exhaust | Chamber Control Group |
| Circulation Fan | Circulates the air in the accumulation chamber to achieve a homogenous trace gas sample. | Chamber Control Group |

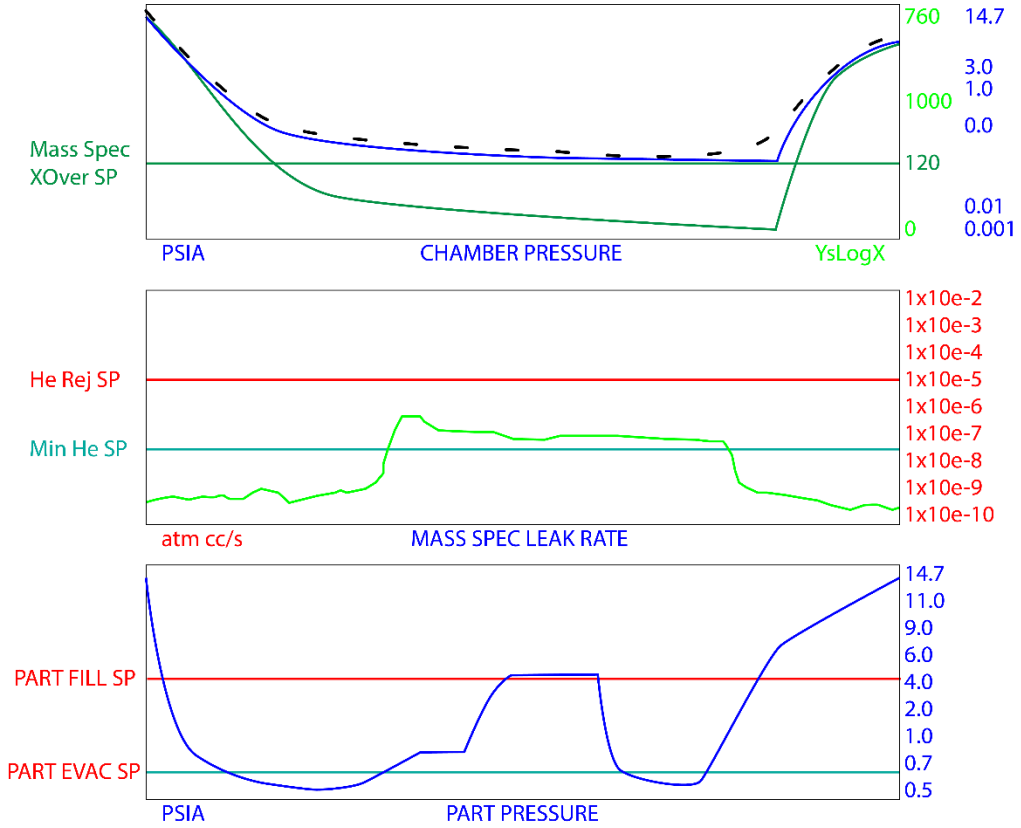
### Optional Valves supported by this test:

- Reclaim Valve
- T-Gas Calibration
- Inlet Blower
- Outlet Blower
- Circulation Fan

# Chapter 5 – Basic Hard Vacuum Test

*This test performs tracer gas testing of a part in a Hard Vacuum chamber. The instrument provides part evacuation and tracer gas fill of the part and communication with the external leak detector. Hard Vac Chamber valve control is performed by the external leak detector.*

*Test Result is recorded with an overall ACCEPT/REJECT evaluation and includes multiple Pass/Fail/Skipped results depending on the test option settings. Evacuation, Gross and Fine Decay tests report Pass/Fail/Skipped with Measured Pressure and Pressure Loss. Gross and Fine Leak Rate tests report Measured T-Gas Leak Rate Pass/Fail/Skipped. Auto-Zero offset value used is included in results.*



## Options Menu

The Options for the program may be viewed by going to the Program Config menu and selecting the Options icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Evacuation | Enable/disable evacuation of the part before filling with T-Gas. Options are: Disabled, Enabled, or Evac to Press. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Vacuum Decay | Enables vacuum decay test prior to tracer fill. | Advanced, Admin |
| Re-Evac After Test | Allows re-evacuation of part after Sniffer Test completion. If enabled, Exhaust/Re-Evac timer is available before the Exhaust timer. | Advanced, Admin |
| T-Gas Source | Specifies the manifold pressure source to utilize for the Sniff Test Tracer pressure. The T-Gas Source must be specified even if the T-Gas Fill option is Disabled. | Advanced, Admin |
| Gross T-Gas Fill | Fill method for the Gross T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Gross Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Gross T-Gas Decay | Enables Gross Leak Decay Test during sniffer test. | Advanced, Admin |
| Fine T-Gas Fill | Fill method for the Fine T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Fine Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Fine T-Gas Decay | Enables Fine Leak Decay Test during sniffer test. | Advanced, Admin |
| T-Gas Recovery | Specify method used to remove tracer gas from the part after a test. Options are: Fixed Timer or Exh to Press. | Advanced, Admin |

## Sniffer Menu:

The Sniffer specific options for the program may be viewed by going to the Program Config menu and selecting the Sniffer Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Sniffer Type | Sniffer Type used by this part program. | Viewable in Basic & Advanced Editable in Admin |
| T-Gas Sampling | Specifies result reporting method for measured leak rate. Average reports the average leak rate measurement during the sample period. Peak reports the highest leak rate measurement during sample period. | Advanced, Admin |
| Sample Gas Number | Sample Gas ID number to be used by the sniffer device. This parameter is hidden if not available on the active leak detector. | Advanced, Admin |
| Device Zero | If enabled, forces the leak detector to set its Zero level at the end of the Cleanup segment. This parameter is available for use with the Inficon P3000 leak detector. | Advanced, Admin |
| Autozero Enable | Internal Autozero function. The T-Gas leak rate measurement at the end of the Autozero Delay timer will be applied as a zero offset to reported leak rate measurements during the testing cycle. This option is available in Clamshell mode. | Advanced, Admin |
| Min T-Gas Mode | Mode for checking Minimum T-Gas leak rate. Continuous: Leak rate must achieve and maintain setpoint. One-Time: Leak rate must achieve but need not maintain setpoint. Disabled: No minimum setpoint. | Advanced, Admin |
| LD Min T-Gas Setpt | Minimum Tracer Gas leak rate that must be measured for a valid test. If the measured sniffer leak rate is below this value, a Tracer Min Fault is generated. | Advanced, Admin |
| LD Background Limit | Maximum Tracer Gas background level allowed prior to starting a Test. If the sniffer reports a tracer level exceeding this value, a Tracer Background Fault is generated. | Advanced, Admin |
| Cleanup Setpoint | Leak rate setpoint for the Chamber Cleanup Fault. Part will not be charged with tracer gas if exceeds this limit. | Advanced, Admin |

| Option | Description | User Display Mode |
|---|---|---|
| Device Mode | Sniffer Device testing mode option. Some leak detectors operate in multiple modes (i.e. Sniff Mode, Accumulation mode, HardVac Mode). This parameter specifies which mode should be used. Hidden for single mode leak detectors. | Advanced, Admin |

## Timers Menu:

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Sniff Init | Maximum time allowed for establishing communication with the leak detector and completing the device's initialization. When the device indicates it is ready for testing, any remaining time is aborted and the test sequence continues. If this timer expires before the device has reached a ready state, a Sniffer Not Ready fault is generated. | Advanced, Admin |
| Evacuate | Time allocated to evacuating the part. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Basic<br>Advanced, Admin |
| Stabilize | Time to stabilize part pressure while isolated from the pressure source. | Basic<br>Advanced, Admin |
| Evac Decay 1 | Timer for the Evacuation decay test. | Basic<br>Advanced, Admin |
| Cleanup | Maximum time allowed for the measured leak rate from the sniffer to fall below the Chamber Clean Setpoint. Remaining time is aborted once the setpoint is reached. | Basic<br>Advanced, Admin |
| Cleanup Delay | Time delay after opening MS Isolation valve before checking for cleanup setpoints. | Basic<br>Advanced, Admin |
| Auto-Zero Delay | Delay time for taking the T-Gas leak rate measurement to be used for Auto-Zero from the leak detector. Delay begins when the Chamber Cleanup Setpoint is achieved. | Advanced, Admin |
| Dev Zero Delay | Delay time before sending the Device ZERO command to leak detector. Available on Inficon P3000. | Advanced, Admin |
| Gross Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Gross Fill | Time allocated to reach the specified Gross T-Gas Target Pressure. The source valve is pulsed open once per second for the time specified by the Gross Fill Pulse parameter. | Basic<br>Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| Gross Fill Pulse | Length of time per second to open the T-Gas pressure source valve while adding pressure during Gross T-Gas Fill. | Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Amount of time allocated to each segment for execution before continuing. | Basic<br>Advanced, Admin |
| Gross Wait | Delay timer before beginning the gross leak rate measurement sample. | Basic<br>Advanced, Admin |
| Gross Sample | Length of the gross leak rate measurement period. | Basic<br>Advanced, Admin |
| Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Fill | Time allocated to reach the specified Fine T-Gas Target Pressure. | Basic<br>Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Amount of time allocated to each segment for execution before continuing. | Basic<br>Advanced, Admin |
| Fine Wait | Delay timer before beginning the fine leak rate measurement sample. | Basic<br>Advanced, Admin |
| Fine T-Gas Sample | Length of the fine leak rate measurement period. | Basic<br>Advanced, Admin |
| T-Gas Exh | Time allocated to recovering Tracer Gas from the part after a test. During this time the Reclaim valve is opened. This timer is only present if the Reclaim Valve is defined and the T-Gas Recovery option is set to Reclaim. | Basic<br>Advanced, Admin |
| Continue T-Gas Exh | Available if Recovery is set to Exh to Press. The testing cycle jumps to this timer when part pressure falls below T-Gas Exh Press setpoint. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation Setpoint pressure that is to be achieved. Setpoint for Evacuation. | Basic<br>Advanced, Admin |
| Allow Evac Limit | Maximum pressure allowed during evacuation. If the starting pressure is above this value, no evacuation will be performed. | Advanced, Admin |
| Gross T-Gas Min | Minimum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Gross T-Gas Target | Target pressure for Tracer Gas Gross T-Gas Fill and Test. | Basic<br>Advanced, Admin |
| Gross T-Gas Max | Maximum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Fine T-Gas Min | Minimum test pressure allowed during the Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| Fine T-Gas Target | Tracer Gas target pressure that is to be achieved. Setpoint for Sniff Test Tracer Fill. | Basic<br>Advanced, Admin |
| Fine T-Gas Max | Maximum test pressure allowed during the Fill and Stabilization timers. | Basic<br>Advanced, Admin |
| T-Gas Exh Press | Available if Recovery is set to Exh to Press. As this setpoint is crossed, the testing cycle jumps to the Continue T-Gas Exh timer. | Basic<br>Advanced, Admin |

## Test Parameters – Evacuation Decay

The Test parameters for the Evacuation Decay test program may be viewed and modified by going to the Program Config menu and selecting the TST:SVD1 Icon. This icon and test menu will be hidden if the Evacuation Decay test is disabled.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Gross T-Gas Decay & Tracer Leak Rate

The Test Parameters for the Gross T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNG2 Icon. This icon and test menu will be hidden if the Gross T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1 | High limit T-Gas Leak Rate | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Fine T-Gas Decay & Tracer Leak Rate

The Test Parameters for the Fine T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNF2 Icon. This icon and test menu will be hidden if the Fine T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1 | High limit T-Gas Leak Rate | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Inputs

| Input | Description | Functional Group |
|---|---|---|
| Sniffer Ready | The Sniffer Ready input is used to coordinate sharing of a single leak detector between two TracerMate instruments. If the input is defined for a test, the program will wait during the sniffer initialization segment for the input to go high before attempting to communicate with the leak detector. Once active, the input must remain high until the end of the initialization segment or a Sniffer Ready Input fault will be generated. | Sniffer Control Group |
| Sniffer Present | When the Sniffer Present input is defined, a fault will be generated if the input is not active at any time during the test cycle where tracer gas measurements are expected. | Sniffer Control Group |
| Ext Press Sw 1-2 | External Pressure Switch inputs for the Evac(1) and Tracer(2) sources. If defined, this input must go high before the end of the Fill segment or an ERR EXT SW fault will be generated. | Test Control Group |

## Outputs

| Output | Description | Functional Group |
|---|---|---|
| Ready To Sniff | The Ready To Sniff output goes high after the part has been charged with tracer gas and is ready for testing with the leak detector. | Sniffer Control Group |
| In Sample | The In Sample output goes high at the beginning of each sample period returns low at the end of each sample period. | Sniffer Result Group |
| Sample Accept | The Sample Accept output goes high at the end of each sample period if the evaluated value for measured leak rate is less than the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sample Reject | The Sample Reject output goes high at the end of each sample period if the evaluated value for measured leak rate exceeds the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sniffer Busy | The Sniffer Busy output is used to coordinate sharing of a single leak detector between two TracerMate instruments. It goes high at the start of the initialization segment and remains high until communication with the sniffer is completed at the end of the test sequence. This output can be used to control an external interface to provide switching of the RS232 link between the TracerMate and leak detector. The Sniffer Ready input is used as feedback to the TracerMate instruments to indicate which has connection to the leak detector. | Sniffer Control Group |
| T-Gas Calibration | The T-Gas Calibration output is turned on to control an external calibrated leak for use in leak detector calibration. | Chamber Control Group |
| In Recover | The In-Recover output is high during T-Gas Recovery. | Test Cycle Group |
| In Re-evac | The In-Re-Evac output is high during T-Gas Re-Evacuation. | Test Cycle Group |

### Optional Valves supported by this test

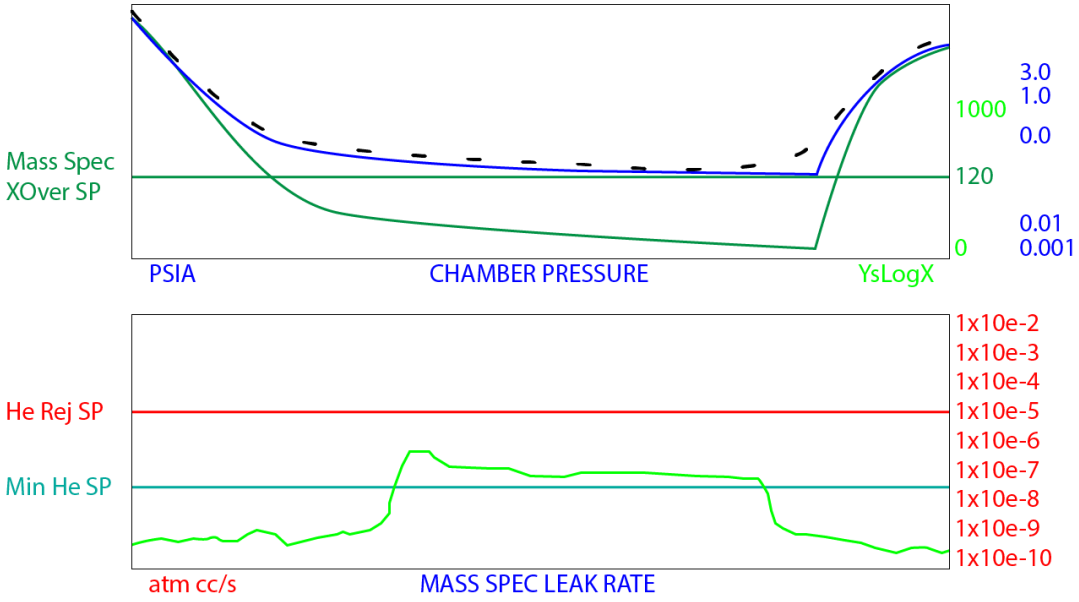
- Reclaim Valve
- T-Gas Calibration

# Chapter 6 – Basic HV (Pre-charged) Test

*This test performs tracer gas testing of a part in a Hard-Vacuum chamber. The instrument provides part evacuation and tracer gas fill of the part and communication with the external leak detector. Hard Vac Chamber valve control is performed by the external leak detector.*

*Test Result is recorded with an overall ACCEPT/REJECT evaluation and includes multiple Pass/Fail/Skipped results depending on the test option settings. Evacuation, Gross and Fine Decay tests report Pass/Fail/Skipped with Measured Pressure and Pressure Loss. Gross and Fine Leak Rate tests report Measured T-Gas Leak Rate Pass/Fail/Skipped. Auto-Zero offset value used is included in results.*

The Basic Hard Vac (Pre-Charged) test type is used for parts that are already charged with tracer gas before being tested. The test is the same as the regular Basic Hard Vac test except that the normal restrictions on the settings for Cleanup Setpoint (e.g. Cleanup Setpoint < Reject Setpoint) are not enforced. This allows additional flexibility in how parts are tested.



# Chapter 7 – Advanced Hard Vac Test

*This test performs tracer gas testing on a part in a Hard Vacuum chamber. The instrument provides part evacuation and tracer gas fill for the part, communication with the external leak detector, and provides valve control for the hard vacuum chamber.*

*Test Result is recorded with an overall ACCEPT/REJECT evaluation, and includes multiple Pass/Fail/Skipped results depending on the test option settings. Evacuation, Gross and Fine Decay tests report Pass/Fail/Skipped with Measured Pressure and Pressure Loss. Gross and Fine Leak Rate tests report Measured T-Gas Leak Rate Pass/Fail/Skipped. Auto-Zero offset value used is included in results.*

## Test Description

Advanced Hard Vacuum Mode Options:

1. Chamber Control for Calibrated Leak, Mass Spec Iso., Vent, Evacuation, and Chamber Vacuum Level
2. Part Evacuation /with or without Vacuum Decay
3. Gross T-Gas Fill / with or without Pressure Decay
4. Fine T-Gas Fill / with or without Pressure Decay
5. Test Point with Automatic Acc or Rej with collected test data
6. Optional Reclaim or Vent
7. Post Evacuation

Sensitivity

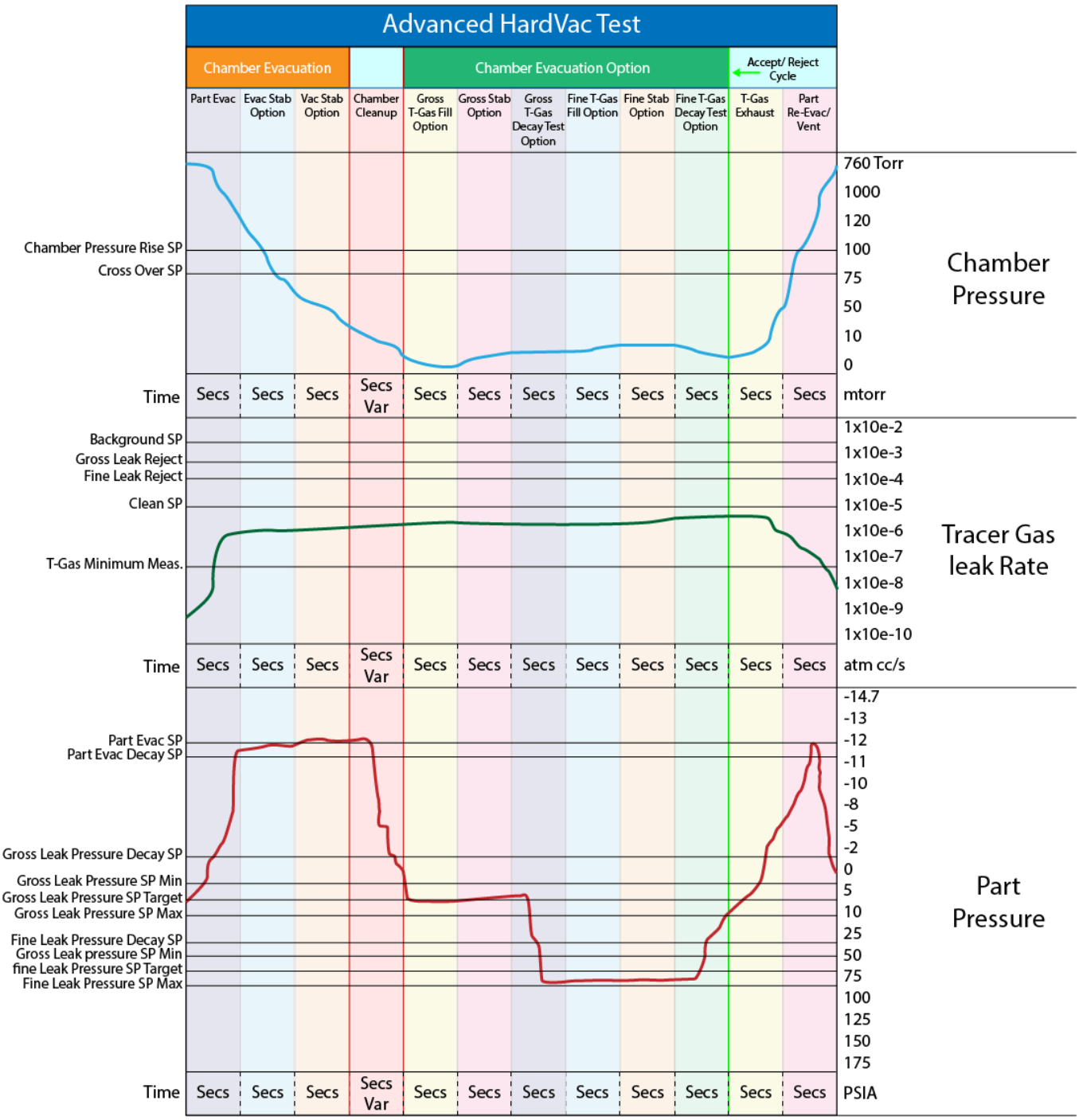
- Ideal sensitivity 10-11 scc/sec
- Practical production sensitivity is 10-10 scc/sec or less
- Used for reject rates from 10-8 to 1 scc/sec

Advantages

- Excellent sensitivity for all leak rates less than 10-2 scc/sec
- Sensitivity and repeatability not affected by part or ambient temperature changes
- Not affected by part elasticity or pressure changes
- Good for leak location or leak rate depending on configuration of system for sniffer or vacuum operation

- Adaptable to high production

**Advanced Hard Vacuum Test**




## Options Menu

The Options for the program may be viewed by going to the Program Config menu and

selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Evacuation | Enable/disable evacuation of the part before filling with T-Gas. Options are: Disabled, Enabled, or Evac to Press. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Vacuum Decay | Enables vacuum decay test prior to tracer fill. | Advanced, Admin |
| Re-Evac After Test | Allows re-evacuation of part after Sniffer Test completion. If enabled, Exhaust/Re-Evac timer is available before the Exhaust timer. | Advanced, Admin |
| Chmbr Evac Close | When to close Chamber Evac valve. After Crossover: Close after chamber crossover is achieved. Before Fill: Close immediately before tracer fill. Always Open: Valve remains open throughout cycle. | Advanced, Admin |
| T-Gas Source | Specifies the manifold pressure source to utilize for the Sniff Test Tracer pressure. The T-Gas Source must be specified even if the T-Gas Fill option is Disabled. | Advanced, Admin |
| Gross T-Gas Fill | Fill method for the Gross T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Gross Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Gross T-Gas Decay | Enables Gross Leak Decay Test during sniffer test. | Advanced, Admin |
| Fine T-Gas Fill | Fill method for the Fine T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Fine Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| Fine T-Gas Decay | Enables Fine Leak Decay Test during sniffer test. | Advanced, Admin |
| T-Gas Recovery | Specify method used to remove tracer gas from the part after a test. Options are: Fixed Timer or Exh to Press. | Advanced, Admin |

| Option | Description | User Display Mode |
|---|---|---|
| Chmbr Post-Purge | Specifies whether a chamber purge will be performed flowing test. No: Never purge. Reject: Only purge on part reject. Any: Always purge. | Advanced, Admin |

## Sniffer Menu:

The Sniffer specific options for the program may be viewed by going to the Program Config menu and selecting the Sniffer Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Sniffer Type | Sniffer Type used by this part program. | Viewable in Basic & Advanced Editable in Admin |
| T-Gas Sampling | Specifies result reporting method for measured leak rate. Average reports the average leak rate measurement during the sample period. Peak reports the highest leak rate measurement during sample period. | Advanced, Admin |
| Sample Gas Number | Sample Gas ID number to be used by the sniffer device. This parameter is hidden if not available on the active leak detector. | Advanced, Admin |
| Device Zero | If enabled, forces the leak detector to set its Zero level at the end of the Cleanup segment. This parameter is available for use with the Inficon P3000 leak detector. | Advanced, Admin |
| Autozero Enable | Internal Autozero function. The T-Gas leak rate measurement at the end of the Autozero Delay timer will be applied as a zero offset to reported leak rate measurements during the testing cycle. This option is available in Clamshell mode. | Advanced, Admin |
| Min T-Gas Mode | Mode for checking Minimum T-Gas leak rate. Continuous: Leak rate must achieve and maintain setpoint. One-Time: Leak rate must achieve but need not maintain setpoint. Disabled: No minimum setpoint. | Advanced, Admin |
| LD Min T-Gas Setpt | Minimum Tracer Gas leak rate that must be measured for a valid test. If the measured sniffer leak rate is below this value, a Tracer Min Fault is generated. | Advanced, Admin |

| Option | Description | User Display Mode |
|---|---|---|
| LD Background Limit | Maximum Tracer Gas background level allowed prior to starting a Test. If the sniffer reports a tracer level exceeding this value, a Tracer Background Fault is generated. | Advanced, Admin |
| Cleanup Setpoint | Leak rate setpoint for the Chamber Cleanup Fault. Part will not be charged with tracer gas if exceeds this limit. | Advanced, Admin |
| Device Mode | Sniffer Device testing mode option. Some leak detectors operate in multiple modes (i.e. Sniff Mode, Accumulation mode, HardVac Mode). This parameter specifies which mode should be used. Hidden for single mode leak detectors. | Advanced, Admin |

## Timers Menu:

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Sniff Init | Maximum time allowed for establishing communication with the leak detector and completing the device's initialization. When the device indicates it is ready for testing, any remaining time is aborted and the test sequence continues. If this timer expires before the device has reached a ready state, a Sniffer Not Ready fault is generated. | Advanced, Admin |
| Chmbr Pre-Purge | Time the Chamber Clean output remains on during the evacuation segment. | Advanced, Admin |
| Part Evac Limit | Maximum time allowed for reaching part evacuation setpoint. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Advanced, Admin |
| Chamber Evac Limit | Timeout for achieving Chamber Evacuation setpoint pressure. Measured from the opening of the chamber evacuation valve. | Advanced, Admin |
| Ch Evac Valve Delay | Delay time after closing the chamber evacuation valve. | Advanced, Admin |
| MS Iso Open Delay | Delay after opening the mass spec isolation valve. | Basic<br>Advanced, Admin |
| Stabilize | Time to stabilize part pressure while isolated from the pressure source. | Basic<br>Advanced, Admin |
| Evac Decay 1 | Timer for the Evacuation decay test. | Basic<br>Advanced, Admin |
| Cleanup | Maximum time allowed for the measured leak rate from the sniffer to fall below the Chamber Clean Setpoint. Remaining time is aborted once the setpoint is reached. | Basic<br>Advanced, Admin |
| Auto-Zero Delay | Delay time for taking the T-Gas leak rate measurement to be used for Auto-Zero from the leak detector. Delay begins when Chamber Cleanup Setpoint is achieved. | Advanced, Admin |
| Dev Zero Delay | Delay time before sending the Device ZERO command to leak detector. Available on Inficon P3000. | Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| Gross Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Gross Fill | Time allocated to reach the specified Gross T-Gas Target Pressure. The source valve is pulsed open once per second for the time specified by the Gross Fill Pulse parameter. | Basic<br>Advanced, Admin |
| Gross Fill Pulse | Length of time per second to open the T-Gas pressure source valve while adding pressure during Gross T-Gas Fill. | Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Amount of time allocated to each segment for execution before continuing. | Basic<br>Advanced, Admin |
| Gross Wait 1 | Delay timer before beginning the sampling period at a leak rate measurement point. | Basic<br>Advanced, Admin |
| Gross Sample 1 | Length of the sampling period at a leak rate measurement point. | Basic<br>Advanced, Admin |
| Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Fill | Time allocated to reach the specified Fine T-Gas Target Pressure. | Basic<br>Advanced, Admin |
| Continue to Fill | Time to continue to fill after target pressure is achieved. | Basic<br>Advanced, Admin |
| Stabilize | Amount of time allocated to each segment for execution before continuing. | Basic<br>Advanced, Admin |
| Fine Wait 1 | Delay timer before beginning the sampling period at a leak rate measurement point. | Basic<br>Advanced, Admin |
| Fine T-Gas Sample 1 | Length of the sampling period at a leak rate measurement point. | Basic<br>Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| T-Gas Exh | Time allocated to recovering Tracer Gas from the part after a test. During this time the Reclaim valve is opened. This timer is only present if the Reclaim Valve is defined and the T-Gas Recovery option is set to Reclaim. | Basic<br>Advanced, Admin |
| Continue T-Gas Exh | Available if Recovery is set to Exh to Press. The testing cycle jumps to this timer when part pressure falls below T-Gas Exh Press setpoint. | Basic<br>Advanced, Admin |
| Exhaust/Re-Evac | Time allocated to exhaust and re-evacuate the part after a test. This timer is present if the Re-Evacuate After Test option is Yes. The part is first exhausted, and Re-Evacuation will not begin until the part reached a safe pressure. Timer must be long enough to accommodate both. | Basic<br>Advanced, Admin |
| Mass Spec Purge | Amount of time at the end of the Chamber Purge timer that the mass spec will be open. If 0, the mass spec is not opened during chamber purge. | Advanced, Admin |
| Chamber Purge | Duration of Chamber Purge at end of testing cycle. This timer begins at first Exhaust segment and runs concurrently with part exhaust. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation Setpoint pressure that is to be achieved. Setpoint for Evacuation. | Basic Advanced, Admin |
| Allow Evac Limit | Maximum pressure allowed during evacuation. If the starting pressure is above this value, no evacuation will be performed. | Basic Advanced, Admin |
| Chmbr Pre-Purge | Defines the pressure at which the Chamber Clean output is turned on during the evacuation segment. | Basic Advanced, Admin |
| Chamber Crossover | Minimum pressure that must be achieved during chamber evacuation. Failure to achieve this setpoint generates a Chamber Evacuation Fault. | Basic Advanced, Admin |
| Gross T-Gas Min | Minimum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic Advanced, Admin |
| Gross T-Gas Target | Target pressure for Tracer Gas Gross T-Gas Fill and Test. | Basic Advanced, Admin |
| Gross T-Gas Max | Maximum test pressure allowed during the Gross T-Gas Fill and Stabilization timers. | Basic Advanced, Admin |
| Fine T-Gas Min | Minimum test pressure allowed during the Fill and Stabilization timers. | Basic Advanced, Admin |
| Fine T-Gas Target | Tracer Gas target pressure that is to be achieved. Setpoint for Sniff Test Tracer Fill. | Basic Advanced, Admin |
| Fine T-Gas Max | Maximum test pressure allowed during the Fill and Stabilization timers. | Basic Advanced, Admin |
| T-Gas Exh Press | Available if Recovery is set to Exh to Press. As this setpoint is crossed, the testing cycle jumps to the Continue T-Gas Exh timer. | Basic Advanced, Admin |

## Test Parameters – Evacuation Decay

The Test parameters for the Evacuation Decay test program may be viewed and modified by going to the Program Config menu and selecting the TST:SVD1 Icon. This icon and test menu will be hidden if the Evacuation Decay test is disabled.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Gross Leak Decay & Tracer Leak Rate

The Test Parameters for the Gross T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNG2 Icon. This icon and test menu will be hidden if the Gross T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1 | High limit T-Gas Leak Rate | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Test Parameters – Fine Leak Decay & Tracer Leak Rate

The Test Parameters for the Fine T-Gas Decay test may be viewed and modified by going to the Program Config menu and selecting the TST:SNF2 Icon. This icon and test menu will be hidden if the Fine T-Gas Fill option is disabled. However, the Leak Rate parameters will be displayed.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes. | Advanced, Admin |
| T-Gas Evaluation | Determines evaluation criteria for tracer leak rates. Pass/Fail means Pass when leak rate is below setpoint, fail when leak rate is above setpoint. | Basic<br>Advanced, Admin |
| Reject Rate 1 | High limit T-Gas Leak Rate | Basic<br>Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| Above Hi Limit > Between Limits > Below Lo Limit | Three zones of evaluation for Pass and Fail |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

## Inputs

| Input | Description | Functional Group |
|---|---|---|
| Sniffer Ready | The Sniffer Ready input is used to coordinate sharing of a single leak detector between two TracerMate instruments. If the input is defined for a test, the program will wait during the sniffer initialization segment for the input to go high before attempting to communicate with the leak detector. Once active, the input must remain high until the end of the initialization segment or a Sniffer Ready Input fault will be generated. | Sniffer Control Group |
| Sniffer Present | When the Sniffer Present input is defined, a fault will be generated if the input is not active at any time during the test cycle where tracer gas measurements are expected. | Sniffer Control Group |
| Chamber Crossover Fault | The Chamber Crossover input indicates that the vacuum chamber pressure is above the crossover threshold. It goes and stays low while crossover pressure is achieved. If the Chamber crossover does not go low during Evacuation segment, a Chamber Evacuation Fault is generated. | Chamber Control Group |
| Chamber Rise Fault | The Chamber Rise input goes high is chamber pressure is above the chamber rise threshold. If this occurs after crossover has been achieved and a test is in progress, a Chamber Rise fault is generated. | Chamber Control Group |
| Ext Press Sw 1-2 | External Pressure Switch inputs for the Evac(1) and Tracer(2) sources. If defined, this input must go high before the end of the Fill segment or an ERR EXT SW fault will be generated. | Test Control Group |

## Outputs

| Output | Description | Functional Group |
|---|---|---|
| Ready To Sniff | The Ready To Sniff output goes high after the part has been charged with tracer gas and is ready for testing with the leak detector. | Sniffer Control Group |
| In Sample | The In Sample output goes high at the beginning of each sample period returns low at the end of each sample period. | Sniffer Result Group |
| Sample Accept | The Sample Accept output goes high at the end of each sample period if the evaluated value for measured leak rate is less than the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sample Reject | The Sample Reject output goes high at the end of each sample period if the evaluated value for measured leak rate exceeds the Reject Rate for the sample point. It will remain active until the start of the sample period for the next sample point. After the last sample point in a test, it will remain active until the start of a new test. | Sniffer Result Group |
| Sniffer Busy | The Sniffer Busy output is used to coordinate sharing of a single leak detector between two TracerMate instruments. It goes high at the start of the initialization segment and remains high until communication with the sniffer is completed at the end of the test sequence. This output can be used to control an external interface to provide switching of the RS232 link between the TracerMate and leak detector. The Sniffer Ready input is used as feedback to the TracerMate instruments to indicate which has connection to the leak detector. | Sniffer Control Group |
| T-Gas Calibration | The T-Gas Calibration output is turned on to control an external calibrated leak for use in leak detector calibration. It goes high during the Sniffer tests when the Run Leak Calibrate option is Enabled. | Chamber Control Group |
| Chamber Vent Close | The Chamber Vent Close output goes high at the start of a test, immediately before part evacuation begins. It remains high until the end of the test, during the Chamber Purge segment. | Chamber Control Group |

| Output | Description | Functional Group |
|---|---|---|
| Chamber Evac Open | The Chamber Evac Open output goes high when the Chamber Evac Delay timer expires during the evacuation sequence. It goes low at the time specified by the Chamber Evac Close parameter. It will be re-opened during the Chamber Purge segment if Chamber Purge is enabled and the Chamber Purge Method is set to Evac. | Chamber Control Group |
| Mass Spec Isolation Open | The Mass Spec Isolation Open output goes high when the Mass Spec Open timer expires. It remains open through end of the last leak rate sample period. If Chamber Purge is enabled and the Chamber Purge Method is set to Evac, the Mass Spec Isolation Open output will again go high during the last part of the Chamber Purge timer as specified by the Mass Spec Purge timer. | Chamber Control Group |
| Chamber Clean Open | The Chamber Clean Open output goes high during for the duration of the chamber Purge segment if Chamber Purge is enabled. | Chamber Control Group |
| Chamber Ready | The Chamber Ready output goes high when the chamber crossover is achieved and remains high until the end of the testing cycle. | Chamber Control Group |
| In Recover | The In Recover output is high during the Tracer Gas Recovery segment. | Test Cycle Group |
| In Re-evac | The In Re-Evac output is high during the part re-Evacuation segment. | Test Cycle Group |
| In Purge | The In Purge output is high during the Chamber Purge segment | Test Cycle Group |

## Optional Valves supported by this test:

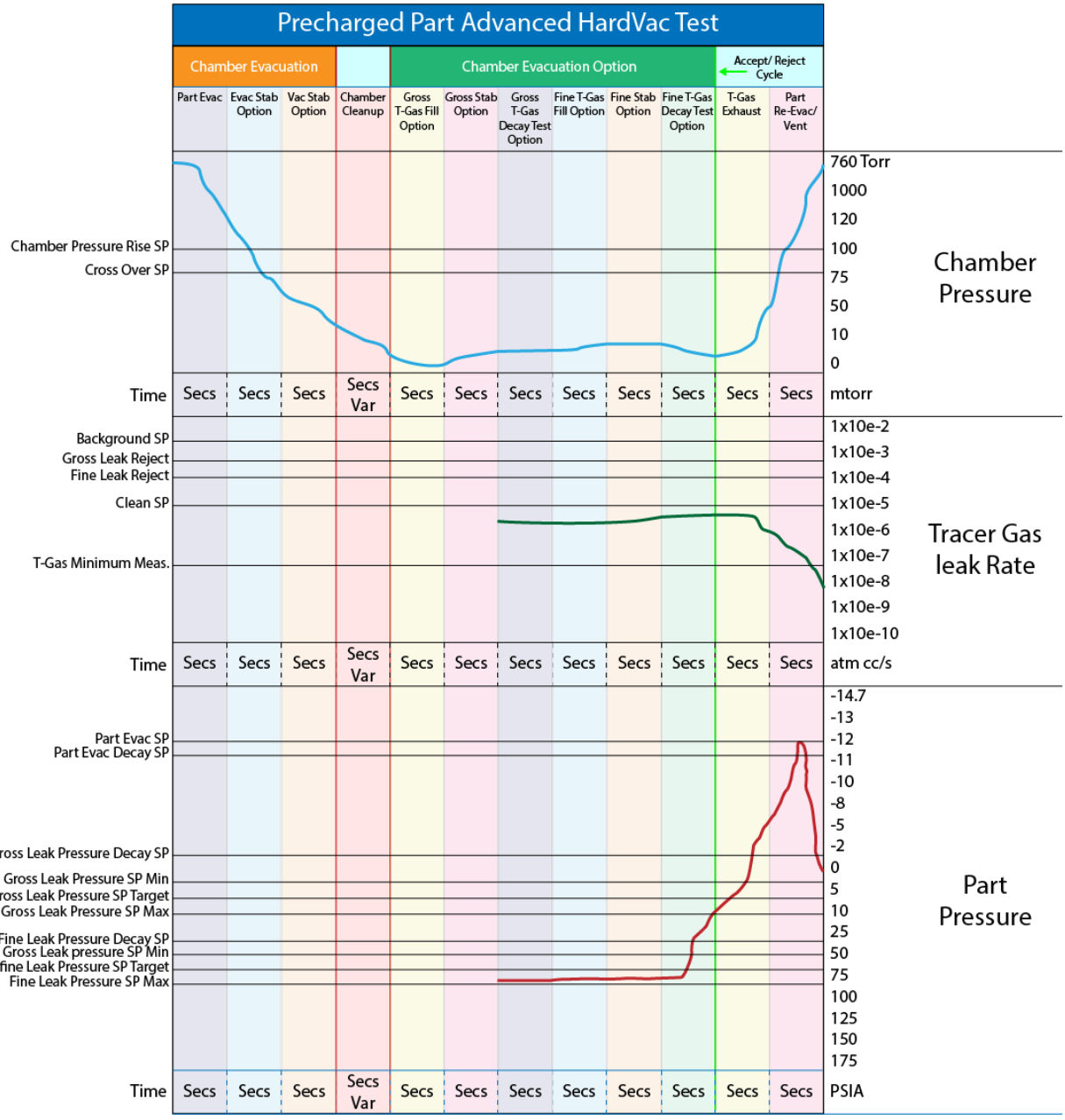
- Reclaim Valve
- T-Gas Calibration
- Chamber Vent
- Chamber Evac
- Mass Spec Isolation
- Chamber Clean

## Optional Analog Inputs used in this test:

- Chamber Pressure Transducer

# Chapter 8 – Adv Hard Vac (Pre-charged)

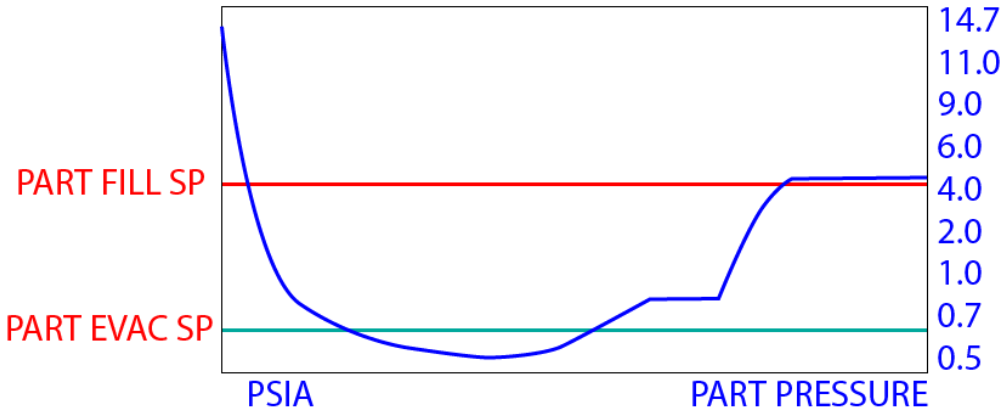
*The Advanced Hard Vac (Pre-Charged) test type is used for parts that are already charged with tracer gas before being tested. The test is the same as the regular Advanced Hard Vac test except that the normal restrictions on the settings for Cleanup Setpoint (e.g. Cleanup Setpoint < Reject Setpoint) are not enforced. This allows additional flexibility in how parts are tested.*



# Chapter 9 – Clean Part (Evac/Purge)

*This test type provides evacuation fill with vent of the part. It is intended for flowing air through the part to remove any residual tracer gas following a sniffer test.*

*This test has no test menu, the test reports SEQ COMP and the final pressure reading measured at end of the Clean Fill segment.*



## Options Menu

The Options for the program may be viewed by going to the Program Config menu and selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Evacuation | Enable/disable evacuation of the part before fill. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Clean Part Source | Specifies the manifold pressure source to utilize for the Clean fill pressure. | Advanced, Admin |
| Vent During Fill | Specifies whether the exhaust valve remains open during the clean fill. | Advanced, Admin |

## Timers Menu

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Evacuate | Time allocated to evacuating the part. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Basic<br>Advanced, Admin |
| Clean | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation Setpoint pressure that is to be achieved. Setpoint for Evacuation. | Basic<br>Advanced, Admin |
| Allow Evac Limit | Maximum pressure allowed during evacuation. If the starting pressure is above this value, no evacuation will be performed. | Advanced, Admin |
| Target Pressure | Desired part Target pressure for Clean fill. | Basic<br>Advanced, Admin |
| Maximum Pressure | Maximum fill pressure. | Basic<br>Advanced, Admin |

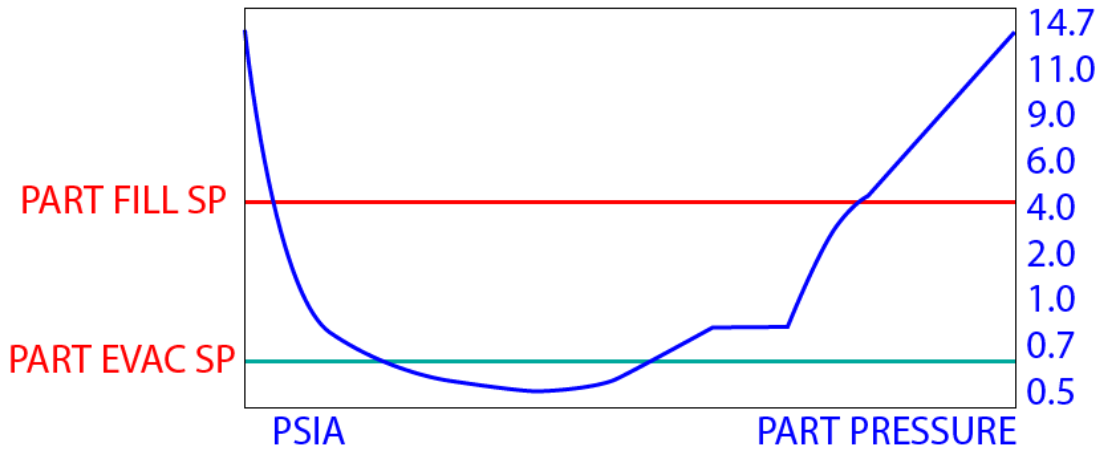
# Chapter 10 – Evac & Fill

*This test type provides evacuation and tracer gas fill of the part. It can provide a method for evacuating and backfilling an external part (not in a chamber) with a tracer gas for testing later. It can also serve as Nitrogen backfill prior to shipping.*

This test type has no test menu. Faults are reported for high or low pressure during the part Evac & Fill segments.

When complete, the instrument reports SEQ COMP (Sequence Complete) and it reports the final pressure reading measured at end of the Fill segment.

## Typical Graph Set for the Evac & Fill Test:



## Options Menu

The Options for the program may be viewed by going to the Program Config menu and selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Evacuation | Enable/disable evacuation of the part before filling with T-Gas. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Evacuation Xdcr | Selects the transducer that will be used to measure vacuum during the test. | Advanced, Admin |
| Re-Evac After Test | Allows re-evacuation of part after Sniffer Test completion. | Advanced, Admin |
| T-Gas Source | Specifies the manifold pressure source to utilize for the Sniff Test Tracer pressure. The T-Gas Source must be specified even if the T-Gas Fill option is Disabled. | Advanced, Admin |
| Fine T-Gas Fill | Fill method for the Fine T-Gas Decay test. Options are: Disabled (no fill, no test), No Fill (no fill, leak rate test only), Timer Fill (fill for duration of Fine Fill timer), Manual Fill (fill until operator presses the Start button), Fill to Press (fill until part pressure meets Target Pressure). | Advanced, Admin |
| T-Gas Recovery | Specify method used to remove tracer gas from the part after a test. Options are: Fixed Timer or Exh to Press. | Advanced, Admin |

## Timers Menu

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Evacuate | Time allocated to evacuating the part. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Basic<br>Advanced, Admin |
| Prefill | Percentage of the fill timer where minimum pressure limit is not monitored. Allows time within fill for the instrument to achieve the minimum test pressure. | Basic<br>Advanced, Admin |
| Fill | Time allocated to reach the specified Fine T-Gas Target Pressure. | Basic<br>Advanced, Admin |
| T-Gas Exhaust | Time to exhaust/recover tracer after the test. | Basic<br>Advanced, Admin |
| Exhaust/Re-Evac | Time allocated to exhaust and re-evacuate the part after a test. This timer is present if the Re-Evacuate After Test option is Yes. The part is first exhausted, and Re-Evacuation will not begin until the part reached a safe pressure. Timer must be long enough to accommodate both. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

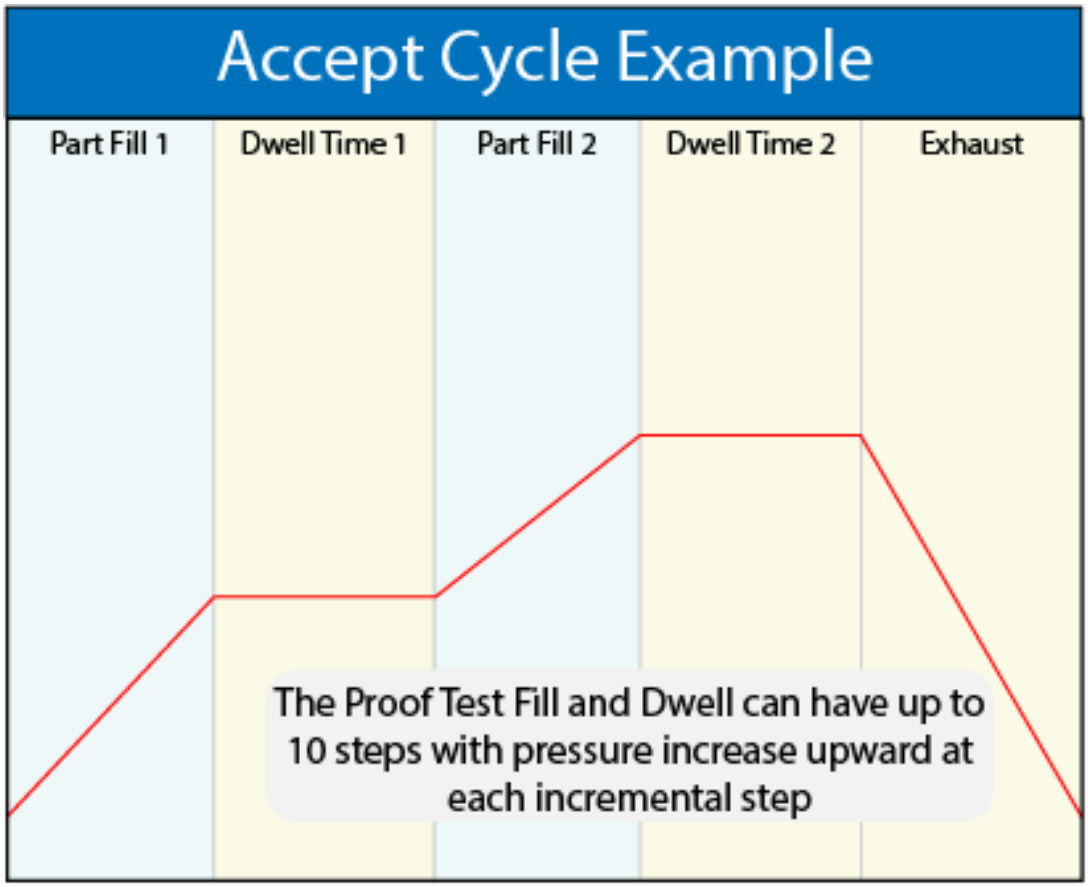
| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation Setpoint pressure that is to be achieved. Setpoint for Evacuation. | Basic<br>Advanced, Admin |
| Allow Evac Limit | Maximum pressure allowed during evacuation. If the starting pressure is above this value, no evacuation will be performed. | Advanced, Admin |
| Fine T-Gas Min | Minimum fill pressure. | Basic<br>Advanced, Admin |
| Fine T-Gas Target | Target pressure that is to be achieved. | Basic<br>Advanced, Admin |
| Fine T-Gas Max | Maximum fill pressure. | Basic<br>Advanced, Admin |

# Chapter 11 – Step to Proof Test

*Measures and monitors the Peak Pressure achieved during up to 10 pressure steps, each with independently defined Fill and Dwell timers.*

*This test has no Test menu. Part evaluation is ACCEPT if the Target Pressure Window at the end of the Fill Timer and maintains it within the window for the Dwell Timer, at each pressure step. Otherwise reports ABOVE_PRESS or BELOW_PRESS fault.*

*Peak part pressure and last completed step number achieved during test.*



## Options Menu

The Options for the program may be viewed by going to the Program Config menu and selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Number of Steps | The number of pressure to be performed during the Step to Proof test. | Basic<br>Advanced, Admin |

## Timers Menu:

The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Fill 1-10 | Time allocated to reach the specified fill pressure for this step. | Basic<br>Advanced, Admin |
| Dwell 1-10 | Time allocated monitoring the fill pressure for this step. Pressure must remain within the Target Window or a fault will be generated. | Basic<br>Advanced, Admin |
| Exhaust | Time to exhaust part pressure after test. | Basic<br>Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Target Press Window | Acceptable Target Pressure window during each pressure step. | Basic<br>Advanced, Admin |
| Target Press 1-10 | Target Pressure for each step during the test. | Basic<br>Advanced, Admin |
| Maximum Pressure | Maximum pressure allowed during the test. | Basic<br>Advanced, Admin |
| Ramp Method | Defines the physical hardware and method utilized to generate the target pressures. | Basic<br>Advanced, Admin |

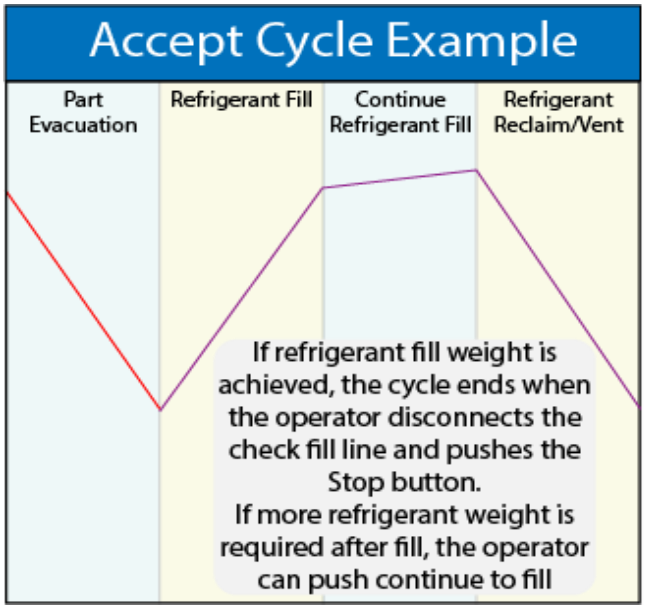
# Chapter 12 – Refrigerant Fill Test

*This test type provides evacuation and refrigerant fill of the part after leak testing of the part has been completed. This test may be linked, following a normal sniffer test with an Accept result.*

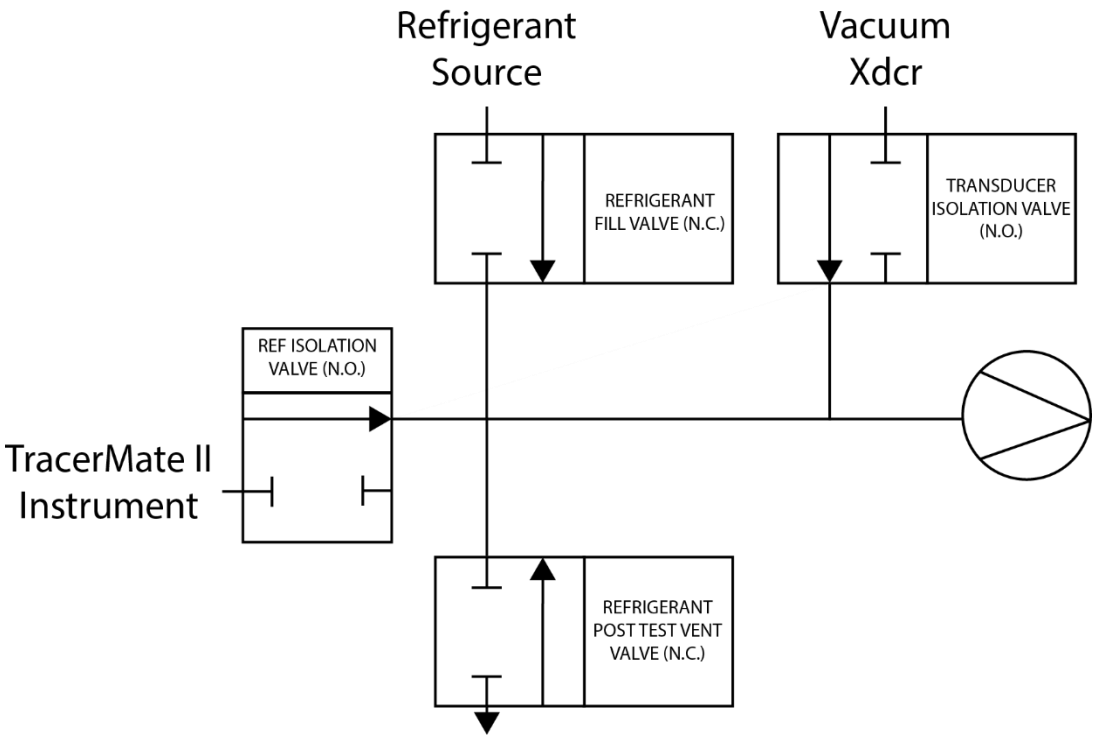
The part is first evacuated to a specified vacuum setpoint using the TracerMate manifold pneumatics. Part pressure is monitored during evacuation using an external high-vacuum transducer connected to the 2nd analog port. The transducer is mounted on the refrigerant fill pneumatics. Both the TracerMate instrument manifold and the vacuum gauge are then isolated from the part and the refrigerant fill pneumatics. The part is filled with refrigerant to a specified weight as measured using a weigh scale connected to RS232_1 serial port. An optional step allows the part weight to be manually increased by the operator using a digital input.

The Test Segment determines part Accept or Reject based on the final measured minimum and maximum weights.

## Refrigerant Evacuation and Fill



## External Pneumatics:



Each external valve is controlled by a TracerMate digital output.

The REF ISOLATION valve isolates the TracerMate instrument from both the part and the External Refrigerant Fill pneumatics. This valve is open during pressure testing, sniffer testing, and the evacuation performed at the beginning of the Refrigerant Fill Test Type. It is closed before refrigerant fill begins. When the test is complete and the part is disconnected from the Check Quick Connect Fitting, the operator presses the TEST COMPLETE digital input. The REFRIGERANT POST-TEST VENT VALVE is opened to remove refrigerant remaining in the refrigerant fill pneumatic assembly, then the REF ISOLATION VALVE is re- opened.

A normally closed valve may be included between the TracerMate instrument and the REF ISOLATION VALVE that will automatically close in the event of a power failure during a test.

## Measured Weight Value:

The refrigerant source bottle is placed on the scale before the test begins. The scale is measuring not the weight of refrigerant added to the part, but the weight removed from the source.

Early fault determination during a Prefill segment (similar to the severe leak fault during a pressure decay test) is not possible.

The value of the Measured Weight for the part is calculated from the change in source weight minus the weight of refrigerant that remains in the fill pneumatic assembly. The "Fill Assy Ref Wgt" parameter on the Weight Menu specifies this value.

## Scale interface:

The TracerMate does not perform weigh scale calibration or zero. This should be done using the scale's user interface before loading the refrigerant fill bottle on the scale.

For the Ohaus 3000 scale interface, all user configuration parameters are forced to their factory default values during scale initialization. The TracerMate accepts weight readings from the scale in KG. This value will be converted to the units selected in the TracerMate, which are KG, G, LB or OZ. This means the weight displayed by the scale may be in different units than on the TracerMate.

## Manual Fill:

When the "Manual Fill" option is enabled, the operator is permitted to manually add refrigerant after the automatic refrigerant fill operation has been completed.

After the normal refrigerant fill operation is completed, the TracerMate display will indicate that it has entered the "Manual Fill" segment and continue to measure and display the measured weight that has been added to the part. In this segment, the instrument will display "Press Start to continue" at the bottom of the display.

An external digital input indicates a Manual Fill request from the operator. If the Manual Fill Digital Input is high on entering this segment a popup is generated and nothing happens until the input goes low. Once this condition is met, the input controls the opening and closing of the refrigerant fill valve. When the input is high, the fill valve is opened. When it is low, the fill valve is closed. The Target Weight Max Limit is still enforced during the manual fill operation. Weight that was added manually is included as a separate value in the part result data.

The Start button/input will indicate normal completion of the manual fill operation and cause the instrument to end the refrigerant fill test sequence.

If the Manual Fill segment timer is set to 0.0 there is no time limit imposed on the duration of the manual Fill segment. Otherwise, if the timer expires the segment will be ended automatically as if the operator had pressed the Start button.

The Manual Fill operation will be ended automatically if the "Max Fill Weight" limit is exceeded.

## Test results:

- Total weight of refrigerant that was added to the part
- Weight of refrigerant that was added during Manual operation
- Part evacuation pressure before fill
- Starting refrigerant Source weight
- Ending refrigerant Source weight

## Hold button operation:

The Hold function does not function during Refrigerant Fill segments.

## Options Menu

The Options for the program may be viewed by going to the Program Config menu and selecting the Options Icon.

| Option | Description | User Display Mode |
|---|---|---|
| Part Evacuation | Enable/disable evacuation of the part before filling with Refrigerant. | Advanced, Admin |
| Evacuation Source | Specifies the manifold pressure source to utilize for part evacuation. The Evacuation Source must be specified even if the Part Evacuation option is Disabled. | Advanced, Admin |
| Manual Fill | Yes/No – this option controls whether a manual Fill segment is added between the normal refrigerant Fill segment and the Test segment. | Advanced, Admin |
| Refrigerant Exhaust | Yes/No – this option controls whether an optional refrigerant exhaust valve is opened after the part is filled and isolated from the external pneumatics. If this option is No, the refrigerant must be removed manually before pressing the Part Removed button. | Advanced, Admin |

## Weight Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Weight | Description | User Display Mode |
|---|---|---|
| Scale Type | Ohaus 3000, … | Basic<br>Advanced, Admin |
| Min Tare Weight | Used during initialization – fill source must exceed this weight for test to begin. | Basic<br>Advanced, Admin |
| Max Tare Weight | Used during initialization – fill source must not exceed this weight for test to begin. | Basic<br>Advanced, Admin |
| Fill Assy Ref Wgt | Specifies the refrigerant weight that will be contained in the fill pneumatics assembly during the refrigerant fill sequence. | Advanced, Admin |
| Min Fill Weight | Minimum weight of refrigerant transferred into the part during Fill segment | Basic<br>Advanced, Admin |
| Target Fill Weight | Target weight of refrigerant transferred into the part during Fill segment | Basic<br>Advanced, Admin |
| Max Fill Weight | Maximum weight of refrigerant transferred into the part during Fill segment | Basic<br>Advanced, Admin |

## Timers Menu

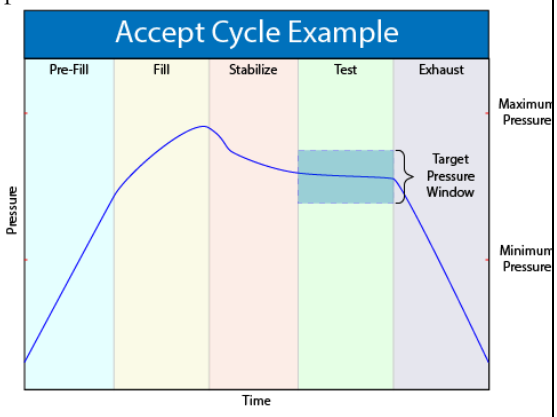
The Timers for the program may be viewed by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Scale Init | Maximum time limit for initializing communication with the scale. | Advanced, Admin |
| Pre-Evac Exhaust | Time allowed for part exhaust before starting test cycle. | Advanced, Admin |
| Evacuate | Time allocated to evacuating the part. If the part has not reached the Evacuation Setpoint pressure by the end of the timer an Evacuation Fault is generated. | Basic<br>Advanced, Admin |
| REF Iso Delay | Delay timer waiting for refrigerant isolation valve to close. | Advanced, Admin |
| XDCR Iso Delay | Delay timer waiting for Vacuum Xdcr Isolation valve to close. | Advanced, Admin |
| Fill | Time allocated to reach the specified Target Weight. | Basic<br>Advanced, Admin |
| Fill Close Delay | This is a delay to allow time for the refrigerant fill valve to physically move from open to closed position. (This timer value is also used after closing the valve in Manual Fill mode) | Advanced, Admin |
| Manual Fill | This timer is the maximum duration of the manual Fill segment. If 0, no time limit is imposed. | Advanced, Admin |
| Stabilize | This timer is used to be sure a stable weight has been achieved and maintained before beginning the Test segment. Segment ends once stability is achieved. | Basic<br>Advanced, Admin |
| Refrigerant Vent | This segment allows time for refrigerant to be vented or removed from the external fill pneumatics before re-opening the REF ISOLATION and TRANSDUCER ISOLATION valves. | Basic<br>Advanced, Admin |
| Refrgnt Vent Close | Delay before allowing isolation valve to reopen after test is complete. | Basic<br>Advanced, Admin |

| Timer | Description | User Display Mode |
|---|---|---|
| Ref Rest | Delay timer for resting manifold. | Advanced, Admin |

## Pressure Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Evacuation Setpoint | Evacuation pressure setpoint that must be achieved and maintained during part evacuation.   | Basic<br>Advanced, Admin |
| Allow Evac Limit | Maximum part pressure at which evacuation will be allowed. If the starting part pressure is higher than this value a fault is generated and no evacuation will be performed. | Advanced, Admin |

## Test Menu

The Pressures for the program may be viewed by going to the Program Config menu and selecting the Pressures Icon.

| Weight | Description | User Display Mode |
|---|---|---|
| Low Limit Weight | Low Limit for measured refrigerant weight | Basic<br>Advanced, Admin |
| High Limit Weight | High Limit for measured refrigerant weight | Basic<br>Advanced, Admin |
| Test Evaluation | F/P/F, etc. | Basic<br>Advanced, Admin |

## Digital Outputs

| Output | Description | Functional Group |
|---|---|---|
| REF Isolation Valve | This output goes high to CLOSE the REF Isolation valve. (Controls a normally open valve type) | Refrigerant Control Group |
| Transducer Isolation Valve | This output goes high to OPEN the Transducer Isolation valve. (Controls a normally closed valve type) | Refrigerant Control Group |
| Refrigerant Fill Valve | This output goes high to OPEN the Refrigerant Fill valve. (Controls a normally closed valve type) | Refrigerant Control Group |
| Refrigerant Exhaust Valve | This output goes high to OPEN the Refrigerant Exhaust valve. (Controls a normally closed valve type) | Refrigerant Control Group |

## Digital Inputs

| Input | Description | Functional Group |
|---|---|---|
| Manual Fill | This input represents a Manual Refrigerant Fill from the operator. High indicates add refrigerant. | Refrigerant Status Group |
| Part Removed | This input indicates when the part has been removed, and that it is safe to re-open refrigerant and transducer isolation valves | Refrigerant Status Group |

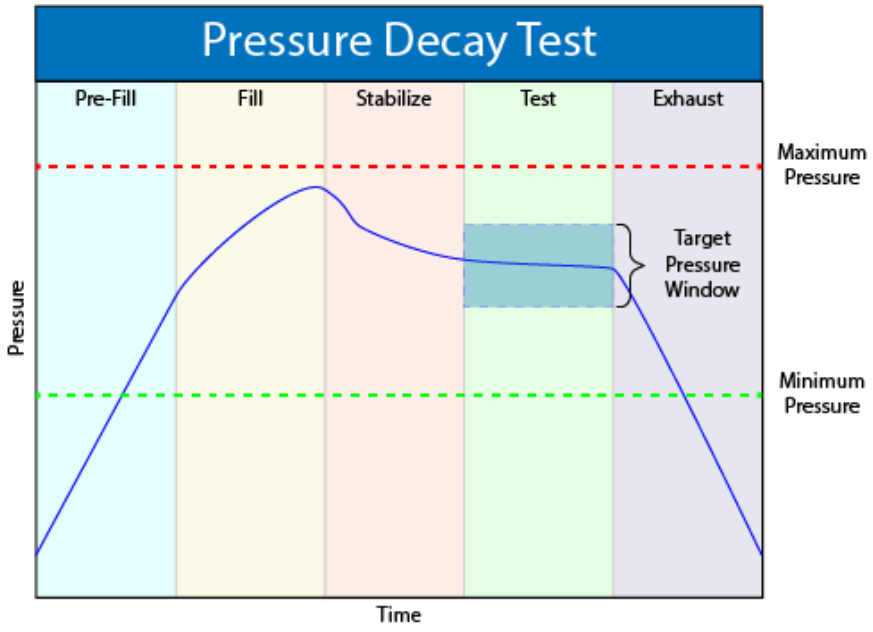
# Chapter 13 – Pressure Decay-ΔP Test

*This chapter explains the theory and parameters for conducting a gross leak test using pressure decay test measuring a pressure loss over time. The result of this test is the pressure loss (or vacuum loss for a vacuum test) measured over a fixed period of time. This test type is typically performed with compressed air or nitrogen and should not be confused with the Gross T-Gas Decay tests described in other chapters.*

The basic principle of operation of a pressure decay leak test instrument is to fill the test part to a specified target test pressure, isolate the test part from the source air and allow the pressure to stabilize, and then measure the pressure loss due to a leak over a defined time.

The Charts below give an overview of the parameters used to setup a Pressure Decay ΔP Test. The Tables that follow give detailed descriptions of each parameter and also document the Display User Level associated with each parameter.

*Note: To change the Display User Level, see* Chapter 22.



## Timer Parameters

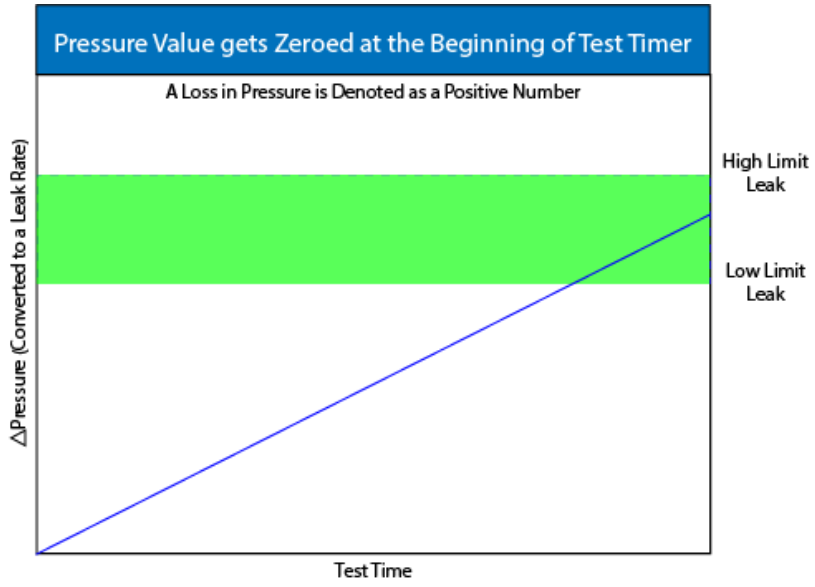
The Timers for the program may be viewed and modified by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Tooling Extend | When tooling control is specified, there can be up to five extend timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |
| Prefill | Checks for excessively leaking parts or lack of pressure. May be set as a % of fill time (Default), for fixed fill time tests, or a not to exceed timer. See the Chapter on Features to change the functionality of this value. Maximum time to reach the minimum pressure. If the variable is set to a not to exceed timer, this segment will exit to the next once the Minimum Pressure value is reached. | Advanced, Admin |
| Fill | Time to enable part to reach the Target Pressure. It may also be used as time to stabilize part pressure with additional air. | Basic<br>Advanced, Admin |
| Stabilize | Time to stabilize part pressure while isolated from the pressure regulator. This time directly affects the repeatability of the test. | Basic<br>Advanced, Admin |
| Test | The precise time over which to measure pressure drop or decay or the precise end time to measure pressure rise. | Basic<br>Advanced, Admin |
| Exhaust | Time to relieve or vent part pressure before signaling the end of test. Need time to prevent blowing out debris or fixture seals. | Basic<br>Advanced, Admin |
| Tooling Retract | When tooling control is specified, there can be up to five retract timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |
| Part Mark | This is used as the duration for an external part (not in a chamber) marking device and is a not to exceed timer when feedback is being utilized. | Advanced, Admin |

## Pressure Parameters

The Pressure menu is located in the **Main Menu > Program Config > Pressure** icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Minimum Pressure | The value that must be reached before the Prefill setpoint is reached and must be maintained through Fill and Stabilization segments or the testing cycle will end as a Severe Leak. | Basic<br>Advanced, Admin |
| Target Pressure | The specified test pressure for the part. For vacuum test pressures enter as positive values if psiv was selected as the pressure unit. Enter as a negative if psig was selected as the pressure unit. (i.e. A test pressure 9.7 psia would be entered as 5 psiv or -5 psig.) Pressure loss may be corrected to the Target Pressure. | Basic<br>Advanced, Admin |
| Maximum Pressure | The value that must not be exceeded at any time to complete a successful test. If the pressure goes above the Maximum Test Pressure, the testing cycle will end as an Over Pressure Malfunction. | Basic<br>Advanced, Admin |
| Target Pressure Window | The is a window (default - +/-50%) set about the Target Pressure that must be maintained during the Test segment of the testing cycle. It generates a Target Pressure Low or High Malfunction if the actual pressure falls outside this window during test. | Advanced, Admin |



## Test Parameters

The Test parameters for the program may be viewed and modified by going to the Program Config menu and selecting the TST:PLO Icon.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Loss | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Upper setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes | Advanced, Admin |
| EDC Enable | Activates Environmental Drift Correction. See Appendix B | Advanced, Admin |
| EDC Percentage | See Appendix B | Advanced, Admin |
| EDC Quantity | See Appendix B | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| **Above Hi Limit>Between Limits> Below Lo Limit** | **Three zones of evaluation for Pass and Fail** |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (Default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

# Chapter 14 – Pressure Decay-Leak Std Test

This chapter explains the theory and parameters for conducting a gross leak test using a pressure decay test with a leak standard. The result of this test is presented in units of flow calculated from the measured pressure loss over the duration of the Test segment timer.

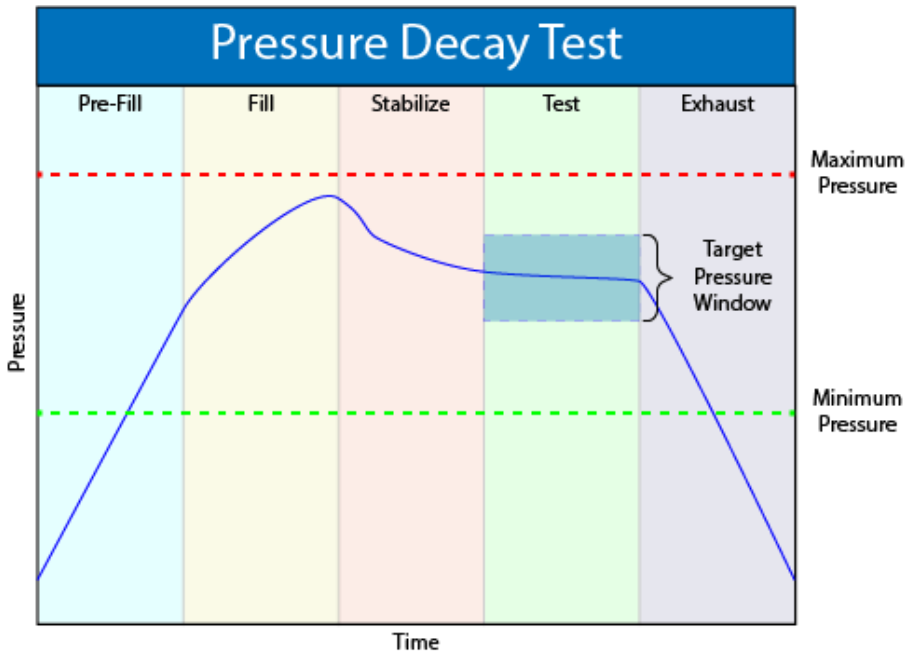
This test type is used for leak applications with a leak rate specified in flow units. This test type is typically performed with compressed air or nitrogen and should not be confused with the Gross T-Gas Decay tests described in other chapters.

The basic principle of operation of a pressure decay leak test instrument is to fill the test part to a specified target test pressure, isolate the test part from the source air and allow the pressure to stabilize, and then measure the pressure loss due to a leak over a defined time. The measured pressure loss is used to calculate a flow rate. The correlated flow rate is based on the two pressure loss values previously measured and stored in memory from calibrations cycles performed on a non-leaking master part.

*This test type utilizes a two point calibration sequence with a non-leaking master part to set the zero flow value and the flow value at the leak standard value.*

The Chart below gives an overview of the parameters used to setup a Gross Decay-Leak Std Test. The Tables that follow give detailed descriptions of each parameter and also document the Display User Level associated with each parameter.

*Note: To change the Display User Level, see* Chapter 22.


Pressure Decay Test
Pre-Fill
Fill
Stabilize
Test
Exhaust
Maximum Pressure
Target Pressure Window
Minimum Pressure
Pressure
Time

## Timer Parameters

The Timers for the program may be viewed and modified by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Tooling Extend | When tooling control is specified, there can be up to five extend timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |
| Relax | Amount of time allocated before continuing to run another test on the same part. This timer is used to allow a calibration master part to return to its original temperature and size if the same master part is used for two calibration cycles. | Advanced, Admin |
| Prefill | Checks for excessively leaking parts or lack of pressure. May be set as a % of fill time (Default), for fixed fill time tests, or a not to exceed timer. See the Chapter on Features to change the functionality of this value. Maximum time to reach the minimum pressure. If the variable is set to a not to exceed timer, this segment will exit to the next once the Minimum Pressure value is reached. | Advanced, Admin |
| Fill | Time to enable part to reach the Target Pressure. It may also be used as time to stabilize part pressure with additional air. | Basic<br>Advanced, Admin |
| Stabilize | Time to stabilize part pressure while isolated from the pressure regulator. This time directly affects the repeatability of the test. | Basic<br>Advanced, Admin |
| Test | The precise time over which to measure pressure drop or decay or the precise end time to measure pressure rise. | Basic<br>Advanced, Admin |
| Exhaust | Time to relieve or vent part pressure before signaling the end of test. Need time to prevent blowing out debris or fixture seals. | Basic<br>Advanced, Admin |
| Tooling Retract | When tooling control is specified, there can be up to five retract timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |

## Pressure Parameters

The Pressures for the program may be viewed and modified by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Minimum Pressure | The value that must be reached before the Prefill setpoint is reached and must be maintained through fill and stabilization segments or the testing cycle will end as a Severe Leak. | Basic Advanced, Admin |
| Target Pressure | The specified test pressure for the part. For vacuum test pressures enter as positive values if psiv was selected as the pressure unit. Enter as a negative if psig was selected as the pressure unit. (i.e. A test pressure 9.7 psia would entered as 5 psiv or -5 psig.) Pressure loss may be corrected to the Target Pressure. | Basic Advanced, Admin |
| Maximum Pressure | The value that must not be exceeded at any time to complete a successful test. If the pressure goes above the Maximum Test Pressure, the testing cycle will end as an Over Pressure Malfunction. | Basic Advanced, Admin |
| Target Press Window | The is a window (default - +/-50%) set about the Target Pressure that must be maintained during the Test segment of the testing cycle. It generates a Target Pressure Low or High Malfunction if the actual pressure falls outside this window during test. | Advanced, Admin |

## Test Parameters

The Test parameters for the program may be viewed and modified by going to the Program Config menu and selecting the TST:PLR Icon.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Leak | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Leak | Upper setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes | Advanced, Admin |
| Max Master+Leak Loss | The maximum value allowed for the second test during the Program Calibration sequence when the leak standard is in the test circuit. | Basic<br>Advanced, Admin |
| Min Master Loss | The minimum pressure loss value allowed for the first test during the Program Calibration sequence. | Basic<br>Advanced, Admin |
| Min Perform Factor | Minimum acceptable value for the Performance Factor compared after the calibration cycle to prevent improper calibrations. | Advanced, Admin |
| Quik Test Enable | Activates Quik Test. See Appendix A | Advanced, Admin |
| Quik Test Timer | See Appendix A | Advanced, Admin |
| Quik Test LL Band | See Appendix A | Advanced, Admin |
| Quik Test HL Band | See Appendix A | Advanced, Admin |
| EDC Enable | Activates Environmental Drift Correction. See Appendix B | Advanced, Admin |
| EDC Percentage | See Appendix B | Advanced, Admin |
| EDC Quantity | See Appendix B | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| **Above Hi Limit>Between Limits> Below Lo Limit** | **Three zones of evaluation for Pass and Fail** |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (Default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

*Note: If the instrument is configured multiple internal leak standards the user must select which leak standard is to be used in the Program. See Selecting the Proper Internal Leak Standard in Chapter 22.*

## Program Calibration

In order to scale the flow transducer to the "zero flow" reading measured by testing a non-leaking part and the "reject" reading measured by testing the non-leaking part with a leak standard incorporated in the circuit, the instrument needs to run the "Program Cal" procedure. This procedure requires at least one known non-leaking part referred to as a "master part." This procedure tests a non-leaking master part in the seal fixture using the timers and pressures established for the program. The procedure automatically tests the non-leaking master part twice with the Relax timer delay between tests. Within each program that uses a leak standard, Program Cal can be configured to use one of four methods. See **Setting the Cal Method and Leak Standard Location** in Chapter 22.

*Remember: The Leak/Cal menu has a parameter called Leak Std/Cal Define that can be configured for the leak standard information to be used Globally, in which case it would be located under the Channel Config menu, or per Program in which case it would be located under the Program menu. Make sure you check which method you have set your instrument. It is critical to make sure the leak standard values are correct for proper use. In order to view the Cal Method parameter you must be in the "Advanced" or "Admin" Display User Level. To change the Display User Level, see Chapter 22.*

### Initiating the Program Cal Sequence

To initiate a Program Cal sequence, go to Main Menu and select the Program Cal Icon. The Program Cal wizard will tell you to connect a non-leaking master part. Connect the non-leaking master part to the instrument. Push the Start button to initiate the Program Cal sequence. The system will conduct an initial test of the non-leaking master part to measure the flow associated with a non-leaking part. This represents the typical offset associated with testing parts within the environment of the test system. The flow value is saved as the Master Part Flow. The system will conduct a second test on a non-leaking master part with a known calibrated leak standard included in the test. The flow value result for this test is saved as the Master+Leak Flow.

*Note: The instrument will require a Program Cal Sequence if any parameters are modified that effects the calibration.*

Several conditions must be met during the Program Calibration procedure for the instrument to accept and store the calibration results. If the procedure does not meet these conditions, any messages & error codes are displayed at the completion of testing cycle.

If the Program Cal routine is successfully completed, "Program-Cal Passed" will be displayed. If there are any problems during the Program Cal sequence an error will be displayed.

See **Appendix A Messages & Error Codes**.

## Calibration Parameters

Calibration parameters are values that are measured or calculated as a result of the Program Cal routine for a Gross Decay-Leak Std test. The table below describes the parameters.

| Parameter | Description | User Display Mode |
|---|---|---|
| Performance Factor | Calculated value representing the performance of the leak test, calculated after the calibration cycles are completed. | Basic<br>Advanced, Admin |
| Master Part Press | Measured pressure at the midpoint of the Test segment for the Master Part during the Auto Calibration process (the first test of the Program Cal process). | Basic<br>Advanced, Admin |
| Master+Leak Press | Measured pressure at the midpoint of the Test Segment for the Master Part with the Leak Standard introduced to the pneumatic test circuit during the Auto Calibration process (the second test of the Program Cal process). | Basic<br>Advanced, Admin |
| Master Part Loss | Test segment pressure loss during the calibration cycle of the non-leaking Master Part (the first test of the Program Cal process). This value is stored to represent normal loss at the specified Target Pressure. | Viewable in Basic & Advanced<br>**Editable in Admin** |
| Master+Leak Loss | Test segment pressure loss during the calibration cycle of the non-leaking Master Part with the Leak Standard introduced to the pneumatic test circuit (the second test of the Program Cal process). This value is stored to represent normal loss + leak standard loss at the specified Target Pressure. | Viewable in Basic & Advanced<br>**Editable in Admin** |
| Corr. Leak Std Flow | The calculated leak standard flow rate based on the Program Target Pressure, the leak standard calibrated pressure, and the leak standard calibrated flow rate. | Basic<br>Advanced, Admin |

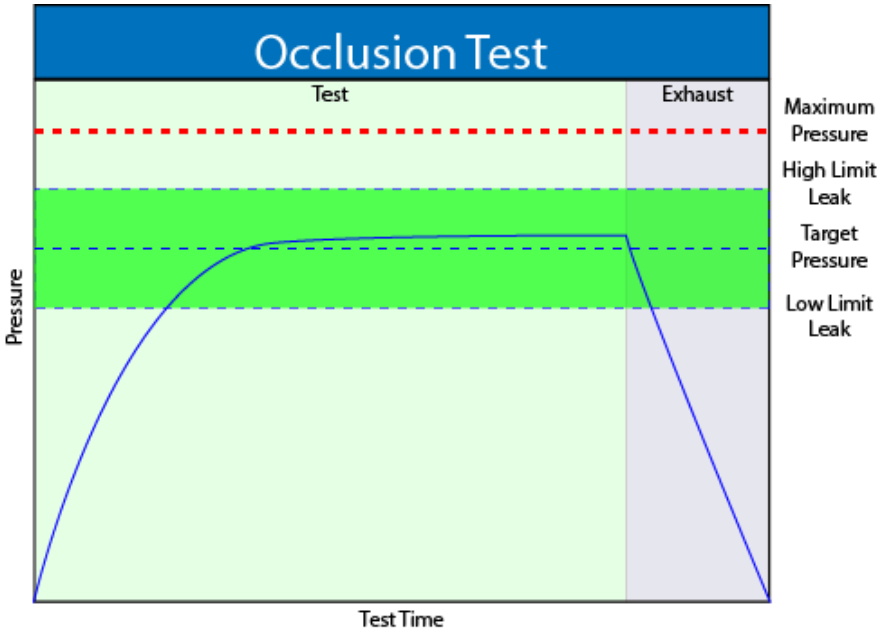
# Chapter 15 – Occlusion Test

*This chapter explains the theory and parameters for conducting an Occlusion Test. The result of this test is the measured back pressure at the expiration of the Test segment.*

The Occlusion Test is a back-pressure test. The part is pressurized throughout the test from a fixed pressure regulator setting. At the end of the Test timer the actual test pressure is compared to the Low Limit Pressure and High Limit Pressure settings. Low Limit Pressure indicates high flow or minimum blockage or low back pressure. High Limit Pressure indicates low flow or maximum blockage or high back pressure.

The Chart below give an overview of the parameters used to setup an Occlusion Test. The Tables that follow give detailed descriptions of each parameter and document the Display User Level associated with each parameter.

*Note: To change the Display User Level, see* Chapter 22.



## Timer Parameters

The Timers for the program may be viewed and modified by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Tooling Extend | When tooling control is specified, there can be up to five extend timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |
| Test | At the end of this timer, the instrument will read the pressure on the pressure transducer. This pressure is due to the backpressure created in the pneumatic circuit and part. | Basic<br>Advanced, Admin |
| Exhaust | Time to relieve or vent part pressure before signaling the end of test. Need time to prevent blowing out debris or fixture seals. | Basic<br>Advanced, Admin |
| Tooling Retract | When tooling control is specified, there can be up to five retract timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |

## Pressure Parameters

The Pressures for the program may be viewed and modified by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Target Pressure | Target Pressure is the desired test pressure to run all tests. | Basic<br>Advanced, Admin |
| Maximum Pressure | The value that must not be exceeded at any time to complete a successful test. If the pressure goes above the Maximum Test Pressure, the testing cycle will end as an Over Pressure Malfunction. | Basic<br>Advanced, Admin |

## Test Parameters

The Test parameters for the program may be viewed and modified by going to the Program Config menu and selecting the TST:OCC Icon.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Pressure | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Pressure | Upper setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| **Above Hi Limit>Between Limits> Below Lo Limit** | **Three zones of evaluation for Pass and Fail** |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (Default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

# Chapter 16 – Pressure Verify Test

*This chapter explains the theory and parameters for conducting a Pressure Verify test.*

The Pressure Verify test is intended to test parts that generate vacuum or pressure, or to verify that the part was pre-charged to the correct pressure, or to verify that the part was evacuated or filled by an external source.

The principle of operation is to close the isolation valve on the TracerMate II internal manifold to isolate the part. The pressure transducer then reads the vacuum or pressure generated by the part or that is already in the part. At the end of the test timer, the test pressure is compared to the low limit pressure and high limit pressure settings. The Test Result is recorded with an overall ACCEPT/REJECT

If the Pressure Verify test was performed with the Self-Test cap on the test port, the only pressure measured will be the small pressure that is trapped by the isolation valve as it actuates to close.

The Tables that follow give detailed descriptions of each parameter and document the Display User Level associated with each parameter.

Note: To change the Display User Level, see Chapter 22.

## Options Menu

There is no Options menu.

## Timer Parameters

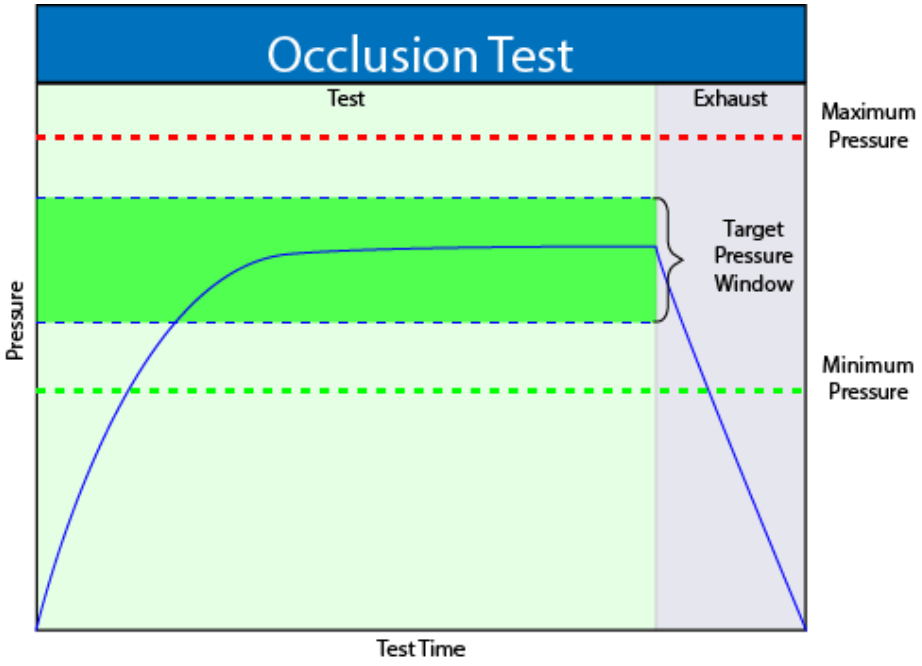
The Timers for the program may be viewed and modified by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Test | Amount of time allocated to each segment for execution before continuing. The pressure measurement is made at the end of the Test segment. | Basic<br>Advanced, Admin |
| Exhaust | Time to relieve or vent part pressure before signaling the end of test. Need time to prevent blowing out debris or fixture seals. | Basic<br>Advanced, Admin |

## Pressure Parameters

The Pressures for the program may be viewed and modified by going to the Program Config menu and selecting the Pressures Icon.

| Pressure | Description | User Display Mode |
|---|---|---|
| Maximum Pressure | The value that must not be exceeded at any time to complete a successful test. If the pressure goes above the Maximum Test Pressure, the testing cycle will end as an Over Pressure Malfunction. | Basic<br>Advanced, Admin |



## Test Parameters

The Test parameters for the program may be viewed and modified by going to the Program Config menu and selecting the TST:PVT Icon.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| Low Limit Pressure | Lower setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| High Limit Loss | Upper setpoint value used to evaluate test results. | Basic<br>Advanced, Admin |
| Test Evaluation | Test results are compared to two setpoints for pass or fail status. There are three areas for evaluation of results: Above high limit, Between limits, and Below low limit. See Table below for codes | Advanced, Admin |

| Test Evaluation Code | Description |
|---|---|
| **Above Hi Limit>Between Limits> Below Lo Limit** | **Three zones of evaluation for Pass and Fail** |
| P P F | Pass if above low limit |
| P F F | Pass if above high limit |
| F P F* (Default) | Pass if between high and low limits |
| F P P | Pass if below high limit |
| F F P | Pass if below low limit |
| P F P | Pass if above the high limit or below the low limit |

# Chapter 17 – Program Linking

*This chapter explains the theory and parameters for conducting multiple tests by linking programs together.*

The applications for program linking fall into three basic categories: Conducting multiple tests on one part, one part with multiple chambers, or Multiple unique parts.

## Parent Program Linking

The Parent Program Linking test type is designed to group test results together for a single part. In certain applications it is desirable to conduct multiple tests on one part. These tests may either be run on the same chamber in the part or on different chambers. In any case, it is desirable to group the test results together and produce a global or "Parent" result.

This test type facilitates the linking of individual programs into a testing sequence. The parent program provides the overall control of the start and stop inputs, tooling inputs and outputs, and program result outputs for all of the test sequences. The following functions within each individual test program are ignored and controlled by the Parent Program.

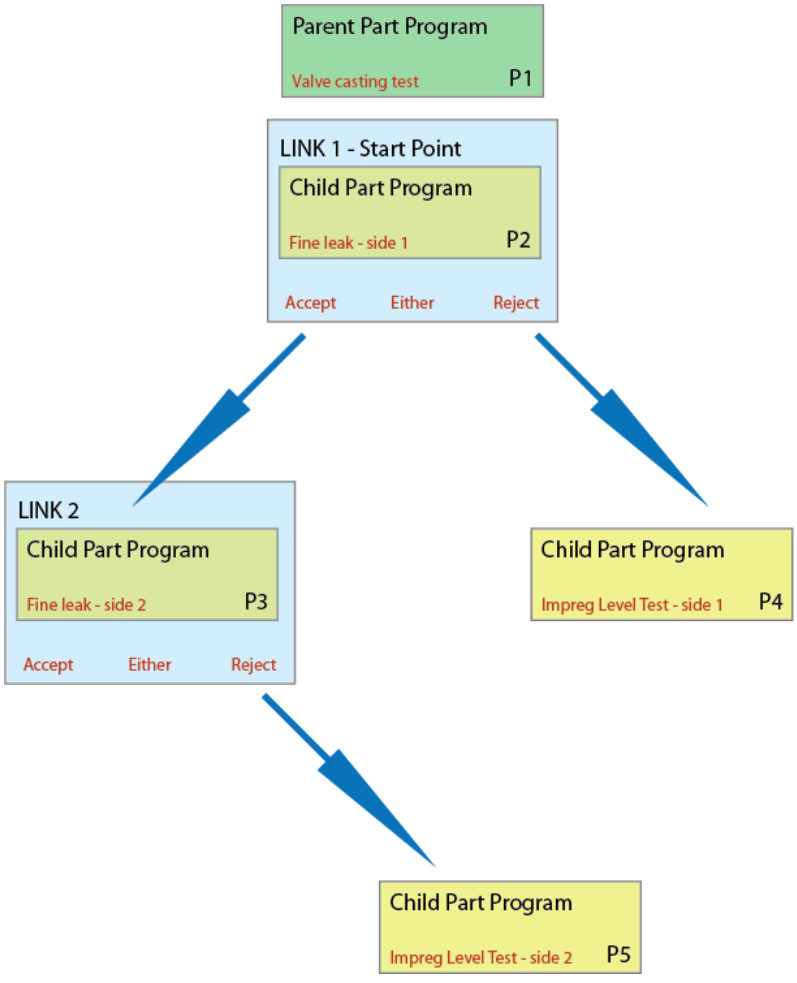
| Functions Overridden and Controlled by the Parent Program Test Type |
|---|
| Tooling options<br>(See Advanced Tooling Control Functionality in Chapter 20) |
| Calibration functions |
| Autorun Methods |
| Barcode storage |
| Relax timer. |

## Rules for Parent Program Linking

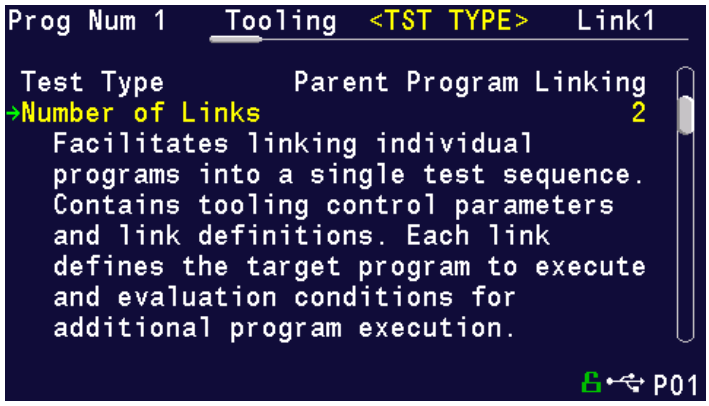
1. Child Programs may contain tooling logic, but only the tooling logic contained in the Parent Program will be executed. This is covered under Advance Tooling Control in Chapter 8.
2. A 'Malfunction' at any time or place in the test logic will result in a Vent/Halt.
3. If any of the Child Programs are Reject, the Parent result will be Reject. (Child result evaluations will be AND'd.)
4. If the user starts a Parent Program, the Monitor screen will indicate that the Parent Program is running. The Stop/Reset event during any Child Programs will not navigate the system away from the Parent Program.

## Parent Program Linking Example

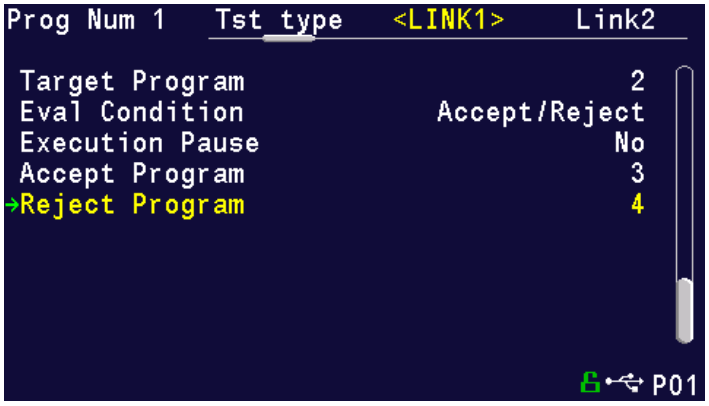
In the example sequence below the user is testing a valve. There are two sides of the valve that must pass a fine leak test. If either side fails the fine leak test, another leak test is run on the failed side to determine if it is possible to repair the leaking part.



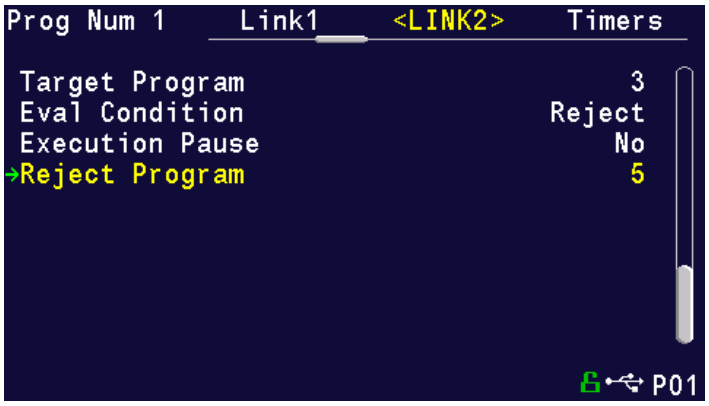
To program this test sequence, the user goes to Program Config and defines the test type for the Program 1 to be "Parent Program Linking" The test sequence example above requires two links.




The first link screen identifies the program where the testing in the Parent Program will begin and how additional tests are initiated or linked to the first program based on the first test result. The link defines the programs that will be run next via the Evaluation Condition.




The second link required by the example above targets Program 3. If Part 3 is Reject then Program 5 will be run. If Program 3 is Accepted, the test sequence stops with a Program Accept light and a Program Accept.



| Evaluation Condition | Description |
|---|---|
| Accept | Directs only the accept parts for further testing using the program defined by "Accept Program". For rejects, severe leaks, and malfunctions the test sequence stops. |
| Reject | Directs only reject and severe leak parts for further testing using the program defined by "Reject Program". For accepts and malfunctions the test sequence stops. |
| Accept/Reject | Directs accept, reject and severe leak parts for further testing using the programs defined by "Accept Program" if the test passes or "Reject Program" if the test fails or a severe leak occurs. For malfunctions, the test sequence stops. |
| Any | Directs accept, reject and severe leak parts for further testing by one additional test program using the program defined by "Next Program" for accept, reject, or severe leak tests. For malfunctions, the test sequence stops. |

## Link Execution Pause

There are applications where it is desirable for the instrument to pause or delay execution between the target program and the next program when utilizing the Parent Program Linking or Sequential Linking test types. An example would be allowing the operator to manipulate a part between programs, such as opening a valve, inserting a component or any action that requires an external event to take place before testing can continue. This feature is defined within each link; thus it is possible to pause during one link and not another.

| Parameter | Description | User Display Mode |
|---|---|---|
| Execution Pause | This parameter will have three options: No, Continue on Start, and Continue after Delay. The feature is disabled when set to No, Continue on Start forces the instrument to pause and wait for a start indication to continue, and Continue after Delay forces the instrument to delay until the timer expires then continue execution. | Basic<br>Advanced, Admin |

| Parameter | Description | User Display Mode |
|---|---|---|
| Delay | This parameter indicates the amount of time to delay after the target program, before execution can continue with the next program. The Delay timer is visible when the Execution Pause option is set to Continue after<br>Delay, otherwise the parameter has no affect. | Basic<br>Advanced, Admin |

***Note: If you are using Parent Program Linking because you have part with multiple chambers and the instrument is configured with multiple test ports, remember to select the appropriate test port. This is described in Chapter 2 under the heading "Selecting the Test Port".***

## Timer Parameters

The Timers for the program may be viewed and modified by going to the Program Config menu and selecting the Timers Icon.

| Timer | Description | User Display Mode |
|---|---|---|
| Tooling Extend | When tooling control is specified, there can be up to five Extend timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |
| Exhaust | Time to relieve or vent part pressure before signaling the end of test. Need time to prevent blowing out debris or fixture seals. | Basic<br>Advanced, Admin |
| Relax | Timer used during Program Cal sequence as a delay between Child Program Links to allow the part to recover to repeatable virgin state. Usually short relax times result in decreasing pressure losses or flows in successive tests. | Basic<br>Advanced, Admin |
| Tooling Retract | When tooling control is specified, there can be up to five Retract timers for up to five tooling motions. This is a not to exceed timer when feedback is being utilized. | Advanced, Admin |

## Sequential Linking

The **Sequential Linking** test type may be used to test multiple unique parts, or tests may be run on the same chamber in the part, or on different chambers. The test results will be reported individually for each program. The functionality and setup of this test type is similar to the **Parent Program Linking** test type. The differences are as follows:

a) Each of the linked program results is stored individually.

b) Each result has no bearing on the accept/reject criteria of past or future linked programs unless they are conditionally linked.

c) The cycle counters increment with each linked program completed.

d) The tooling control uses the defined motions in each of the linked programs (there is no "Parental tooling control").

# Chapter 18 – Tooling Control

*In this chapter the tooling control capability of the instrument is described. Tooling control is a powerful feature of the instrument that has the ability control cylinders and seal actuations.*

> ***Note: The instrument must be in Advanced or Admin mode in order to view and modify the tooling functionality. To change the Display User Level, see Chapter 22.***

The instrument includes user selectable digital inputs and outputs to increase the functionality and simplify the application to various test requirements. The tooling functions are defined within each program. This allows the flexibility to use different tooling functions; permitting the ability to seal unique ports for each program. The tooling functions may be viewed and edited by going to the Program Config menu and selecting the Tooling Icon.

It is important that all precautions be taken when using the tooling control functionality of the instrument. If motions are being controlled, it is important to follow best engineering practices while designing the circuitry. This may include using safety modules in the circuit.

In order to implement the tooling functions, they must be interfaced with the inputs and outputs. See **Chapter 19** for the input and output instructions.

| Parameter | Description | User Display Mode |
|---|---|---|
| Tooling Option | The options for this parameter are On, Off, and Disabled. On causes the tooling motion timers to appear on the Timers menu. When On, the instrument will perform these timers in the order they are listed. It will also allow the associated tooling outputs appear in the selectable list in the Outputs menu. When Disabled, the tooling motion timers still appear but are ignored. It will also allow the associated tooling outputs appear in the selectable list; however, the outputs will not be active in this mode. When Off, the timers will not appear or be active. | Advanced, Admin |

| Parameter | Description | User Display Mode |
|---|---|---|
| Number of Motions | This parameter defines the number of motions intended to be used. You can have up to 5 motions. | Advanced, Admin |
| Two Inputs to Start | For safety purposes, it may be desired to have 2 independent inputs to activate a testing cycle. The 2 inputs are Start and Cycle. | Advanced, Admin |
| Anti-Tie-Down | For safety purposes, it may be desired to use anti-tie- down inputs to activate a testing cycle. The anti-tie-down inputs (Start & Common) require that the inputs go high within 50 to 500 ms of each other. | Advanced, Admin |
| Part Present Check | This parameter is not editable. It determines that the part present input is checked when the start input is received. This parameter is active only when one of the Inputs is set to Part Present. | Advanced, Admin |
| Retract on Reject | This parameter determines whether or not the tooling will retract automatically after a reject. If it is set to No, the instrument will wait until a Stop/Reset input is received or the Stop button is pressed on the keypad before conducting any tooling retract timers or outputs. | Advanced, Admin |
| Part Mark | The options for this parameter are None, Both, Reject, and Accept. Upon completion of a test an output is available to mark Accept, Reject, or Both for all programs. | Advanced, Admin |
| Tooling Feedback 1–5 | Sometimes it is desirable to use proximity sensors or pressure switches on cylinders or seals to determine if and when they reach their intended location. The instrument has the ability to monitor these actions using this parameter. This parameter may be set to Extend, Retract, or Both to determine which locations are to be monitored. | Advanced, Admin |
| Part Mark Feedback | The options for this parameter are Yes and No. This is if you want confirmation that a program marking device has completed its response then the test sequence continues on. | Advanced, Admin |

## Advanced Tooling Control

*Advanced Tooling Control is used to control motions or sealing between linked programs; therefore, it is only applicable if Parent Program Linking is being used.*

There are applications where it may be required that one or more ports on the test part are blocked or opened between tests to appropriately evaluate multiple chambers of the part. To accomplish this additional part manipulation, tooling motions are required between program executions. Thus far we have covered tooling motions pre-test (Tooling Extend) and post-test (Tooling Retract), this feature adds a method for the instrument to preempt the pre/post-test tooling motions. Again, this feature is only for the Parent Program Linking test type.

On the Program Config menu select the Link icon. The Link Motion parameter defines the Tooling Motion to execute between the Target Program and the next appropriate program number. The options available for this parameter are based on the tooling Number of Motions parameter defined on the Tooling menu under the Part Config menu.

The instrument will automatically manage the pre-test and post-test tooling extend and tooling retract motions. The user only needs to determine:

a) The total number of motions needed (with the Number of Motions parameter on the Tooling menu within the Part Config menu).
b) How many motions may change between each linked Child program (with the Link Motion Preempt parameter on the same Tooling menu).
c) Which motions are to occur between linked Child programs (with the numbered Link Motion parameters on the Link menu under the Program Config menu).

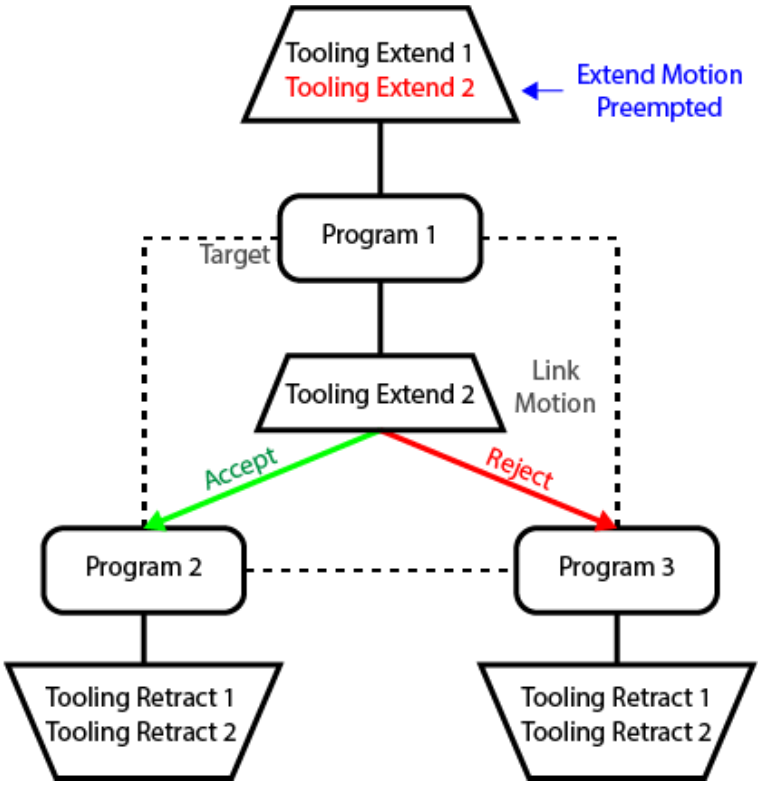
The following rules define this operation:

1. The instrument will place Tooling Extend motions pre-test and Tooling Retract motions post-test up to the number of defined tooling motions.
2. If any path in the decision tree contains a Link Motion configured with a Tooling Extend, with no prior Link Motion configured as a Tooling Retract of the same motion number, the pre-test Tooling Extend motion will not execute.
3. Only those Tooling Extend motions that have been executed either pre-test or using a Link Motion, will have an associated Tooling Retract motion executed post-test.

## Advanced Tooling Motion Example 1

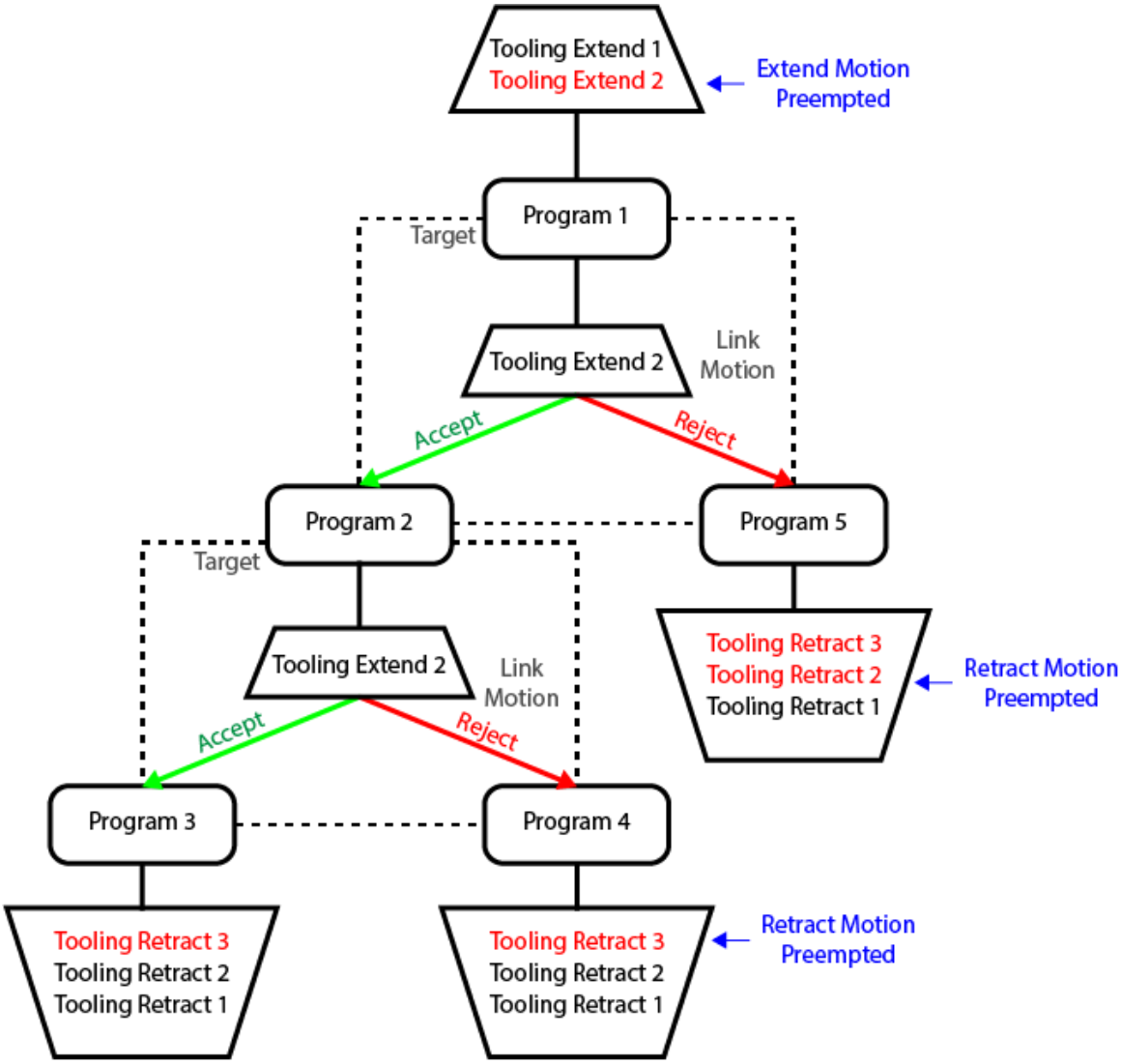
The instrument will attempt to extend all of the tooling motions at the beginning of the test unless there is a matching Link Motion number configured as Extend (obviously there is no reason to extend the same thing twice), thus the pre-test extend is preempted–in defining the link tooling the operator is dictating to the instrument the appropriate tooling sequence. If there is a Link Motion number configured as Retract, then later a Link Motion number configured as Extend of the same motion number, then it appears the operator intended the tooling to be extended at test start (as an operator, if you defined a retract, it is assumed you wanted the tooling to be extended beforehand). At the completion of the test, the instrument is aware of what tooling motions are currently extended, thus only the appropriate retracts will be executed.

The following example of **Parent Program Linking** has two tooling motions, with one link. The instrument automatically places appropriate Tooling Extend motions pre-test and Tooling Retract motions post-test. However, the operator configured a Link Motion as Tooling Extend 2, thus the instrument will not execute the pre-test Tooling Extend 2.



## Advanced Tooling Motion Example 2

Another example of a **Parent Program Linking** scenario (shown below) has three tooling motions, with two links. The instrument automatically places appropriate Tooling Extend motions pre-test and Tooling Retract motions post-test. Since the operator configured within Link 2 a Link Motion as Tooling Extend 2, the instrument will not execute the pre-test Tooling Extend 2. The operator configured within Link 1 a Link Motion as Tooling Retract 3, so the instrument will not execute the post-test Tooling Retract 3. Also, following Program 5 the instrument will not execute the post-test Tooling Retract 2, since the Tooling Extend 2 was never executed; however, after Program 3 and Program 4, the Tooling Retract 2 and Tooling Retract 1 will both be executed.




It is helpful when designing a **Parent Program Linking** test to diagram the desired part operation to appropriately define all the link parameters correctly to achieve the correct test sequence.

# Chapter 19 – Inputs and Outputs

*In this chapter the input and output (I/O) capability of the instrument is described. The I/O is defined by going to the Program Config menu and selecting the Input and Output Icons*

> ***Note: The instrument must be in Advanced or Admin mode in order to view and modify the Input and Output functionality. To change the Display User Level, see*** **Chapter 22**.

The instrument includes user selectable digital inputs and outputs to increase the functionality and simplify the application to various test requirements. The inputs and outputs are divided into two groups – Universal and Program Specific. When a Universal input or output is assigned in a program, it is automatically assigned and available within all programs. When a Program Specific input or output is assigned in a program, that particular input or output will be constrained to use only the inputs or outputs within the same Functional Group. When the input or output is set to "Constrained" in a program it will not function within that program.

In order to remove the selection of an input or an output, change the parameter to either Unassign or Unassign for all. Selecting "Unassign for all" will remove the selection of the input or output for all of the programs. Selecting "Unassign" will only remove the selection from the current program. "Unassign" is not available for Universal inputs or outputs.

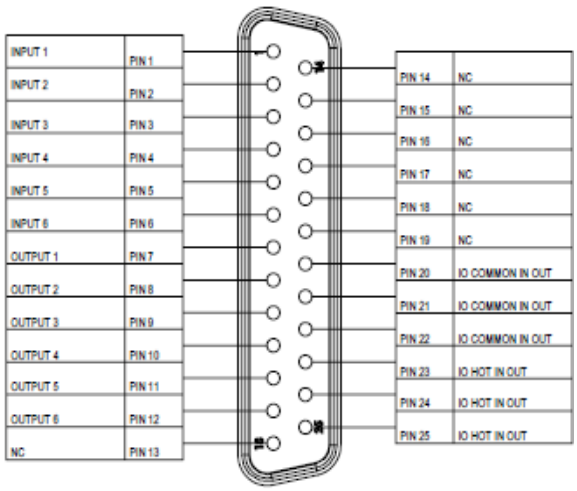
## Input and Output Connector Pinout

The instrument comes equipped with 12 programmable sinking inputs and 12 programmable sourcing outputs. Both inputs and outputs are 24VDC. See Detail "A".

Detail A

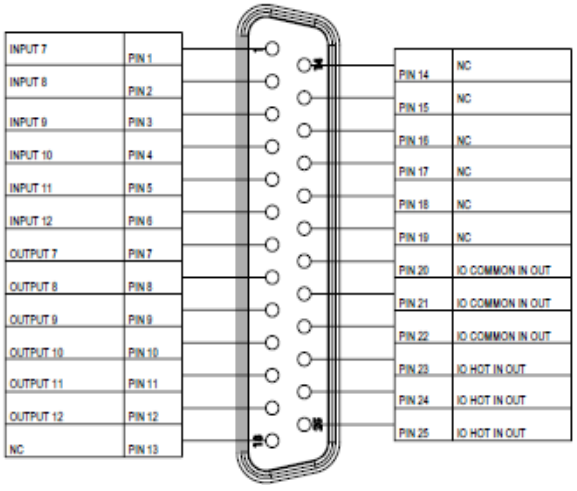
DIGITAL INPUT/OUTPUT

1-6 (24VDC NOMINAL)




DIGITAL INPUT/OUTPUT

7-12 (24VDC NOMINAL)




Detail B

**JUMPER FACTORY POSITION FOR EXTERNAL POWER**


**SWITCH JUMPER POSITION FOR INTERNAL I/O POWER**

The instrument is supplied with the option to elect to use the internal power for the I/O supply or an external supply. If an external supply is used, the I/O Factory Jumper is already set to "External I/O Power". See I/O Jumper in "Detail B" above.

## Input Pinout and Wiring Table

| Input | Function | Wire Color | Connector Location | Instrument Connector | Cable Connector Pin | Wire Color |
|---|---|---|---|---|---|---|
| 1 | User Selectable | Black | Top (I/O A) | 1 | 1 | Black |
| 2 | User Selectable | Brown | Top (I/O A) | 2 | 2 | Brown |
| 3 | User Selectable | Red | Top (I/O A) | 3 | 3 | Red |
| 4 | User Selectable | Orange | Top (I/O A) | 4 | 4 | Orange |
| 5 | User Selectable | Yellow | Top (I/O A) | 5 | 5 | Yellow |
| 6 | User Selectable | Green | Top (I/O A) | 6 | 6 | Green |
| 7 | User Selectable | Black | Bottom (I/O B) | 1 | 1 | Black |
| 8 | User Selectable | Brown | Bottom (I/O B) | 2 | 2 | Brown |
| 9 | User Selectable | Red | Bottom (I/O B) | 3 | 3 | Red |
| 10 | User Selectable | Orange | Bottom (I/O B) | 4 | 4 | Orange |
| 11 | User Selectable | Yellow | Bottom (I/O B) | 5 | 5 | Yellow |
| 12 | User Selectable | Green | Bottom (I/O B) | 6 | 6 | Green |

User selectable or programmable inputs are listed in a table on the next page.

## Output Pinout and Wiring Table

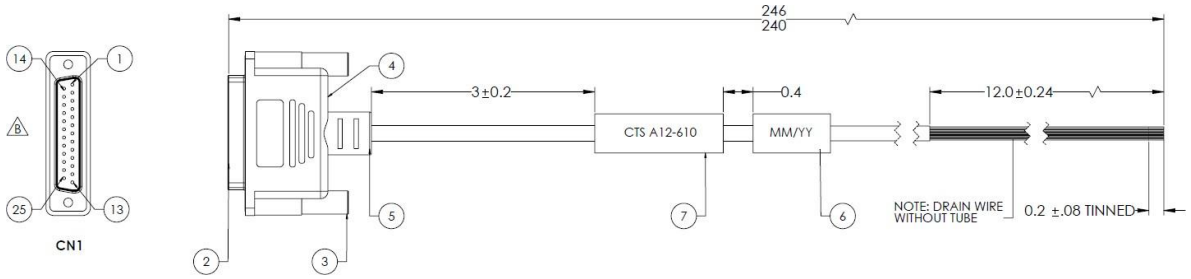
| Output | Function | Wire Color | Connector Location | Instrument Connector | Cable Connector Pin | Wire Color |
|---|---|---|---|---|---|---|
| 1 | User Selectable | Blue | Top (I/O A) | 7 | 7 | Blue |
| 2 | User Selectable | Violet | Top (I/O A) | 8 | 8 | Violet |
| 3 | User Selectable | Gray | Top (I/O A) | 9 | 9 | Gray |
| 4 | User Selectable | White | Top (I/O A) | 10 | 10 | White |
| 5 | User Selectable | Pink | Top (I/O A) | 11 | 11 | Pink |
| 6 | User Selectable | Light Green | Top (I/O A) | 12 | 12 | Light Green |
| 7 | User Selectable | Blue | Bottom (I/O B) | 7 | 7 | Blue |
| 8 | User Selectable | Violet | Bottom (I/O B) | 8 | 8 | Violet |
| 9 | User Selectable | Gray | Bottom (I/O B) | 9 | 9 | Gray |
| 10 | User Selectable | White | Bottom (I/O B) | 10 | 10 | White |
| 11 | User Selectable | Pink | Bottom (I/O B) | 11 | 11 | Pink |
| 12 | User Selectable | Light Green | Bottom (I/O B) | 12 | 12 | Light Green |

User selectable or programmable outputs are listed in a table on **page 89**.

## I/O Power Pinout and Wiring Table

| Function | Wire Color | Connector Location | Instrument Connector | Cable Connector Pin | Wire Color |
|---|---|---|---|---|---|
| IO Common | Red/Black | Top (I/O A) | 20 | 20 | Red/Black |
| IO Common | Orange/Black | Top (I/O A) | 21 | 21 | Orange/Black |
| IO Common | Yellow/Black | Top (I/O A) | 22 | 22 | Yellow/Black |
| IO Hot | Green/Black | Top (I/O A) | 23 | 23 | Green/Black |
| IO Hot | Gray/Black | Top (I/O A) | 24 | 24 | Gray/Black |
| IO Hot | Pink/Black | Top (I/O A) | 25 | 25 | Pink/Black |
| IO Common | Red/Black | Bottom (I/O B) | 20 | 20 | Red/Black |
| IO Common | Orange/Black | Bottom (I/O B) | 21 | 21 | Orange/Black |
| IO Common | Yellow/Black | Bottom (I/O B) | 22 | 22 | Yellow/Black |
| IO Hot | Green/Black | Bottom (I/O B) | 23 | 23 | Green/Black |
| IO Hot | Gray/Black | Bottom (I/O B) | 24 | 24 | Gray/Black |
| IO Hot | Pink/Black | Bottom (I/O B) | 25 | 25 | Pink/Black |

## 25 Pin Digital IO Cable Diagram and Pinout Table




CTS Part Number: **KIT,CTS,A12-770** (includes 2 cables with hardware)

| PIN ID | COLOR | FUNCTION | PIN ID | COLOR | FUNCTION |
|---|---|---|---|---|---|
| 1 | BLACK | | 14 | BROWN/WHITE | |
| 2 | BROWN | | 15 | RED/WHITE | |
| 3 | RED | | 16 | ORANGE/WHITE | |
| 4 | ORANGE | | 17 | GREEN/WHITE | |
| 5 | YELLOW | | 18 | BLUE/WHITE | |
| 6 | GREEN | | 19 | VIOLET/WHITE | |

| | | | | | |
|---|---|---|---|---|---|
| 7 | BLUE | | 20 | RED/BLACK | |
| 8 | VIOLET | | 21 | ORANGE/BLACK | |
| 9 | GRAY | | 22 | YELLOW/BACK | |
| 10 | WHITE | | 23 | GREEN/BLACK | |
| 11 | PINK | | 24 | GRAY/BLACK | |
| 12 | LIGHT GREEN | | 25 | PINK/BLACK | |
| 13 | BLACK/WHITE | | SHELL | DRAIN | |

## Programmable Inputs and Outputs Menus

| Input Options |
|---|
| Start Channel |
| Start Program |
| Stop/Reset |
| Hold |
| Vent/Halt |
| Program Cal |
| Open Leak Std |
| Part Present |
| SPC Test Part |
| Instrument Enable |
| Program Select B1 |
| Program Select B2 |
| Program Select B3 |
| Program Select B4 |
| Program Select B5 |
| Program Select B6 |
| Program Select B7 |
| Common |
| Tool Ext Fdbk 1 |
| Tool Ext Fdbk 2 |
| Tool Ext Fdbk 3 |
| Tool Ext Fdbk 4 |
| Tool Ext Fdbk 5 |
| Ext Press Sw |
| Event Trigger |
| Tool Ret Fdbk 5 |
| Tool Ret Fdbk 4 |
| Tool Ret Fdbk 3 |
| Tool Ret Fdbk 2 |

| Output Options |
|---|
| Malfunction |
| Tool Extend 1 |
| Tool Extend 2 |
| Tool Extend 3 |
| Tool Extend 4 |
| Tool Extend 5 |
| In Relax |
| Program Cal Mode |
| Program Cal Master |
| Program Cal Leak Std |
| Press Select |
| Prefill |
| In Fill |
| Fill Valve |
| In Stabilize |
| Isolation Valve |
| In Test |
| Test Passed |
| Test Failed |
| Bellow LL |
| Between Lim |
| Above HL |
| In Exhaust |
| Program Accept |
| Program Reject |
| Severe Leak |
| Part Acc Mark |
| Part Rej Mark |
| Tool Retract 5 |

| |
|---|
| Tool Ret Fdbk 1 |
| Unassign |

| |
|---|
| Tool Retract 4 |
| Tool Retract 3 |
| Tool Retract 2 |
| Tool Retract 1 |
| Unassign |
| |

The Inputs and Outputs above are listed in their menu selection order. All the options may not be available, depending on the test type and the tooling control setting (On or Off and Number of Motions). Descriptions of these menu options are on the following pages are in related groups.

## Inputs for Program Control

| Input | Description |
|---|---|
| Start Channel | Starts the active Program |
| Common | The Start Channel and Common inputs are universal inputs, where each part program can be set individually to use "Two Inputs to Start" or "Anti-Tie-Down" logic. |
| Vent/Halt | The Vent/Halt input safely ceases the operation of any tooling motion, removes all energy from the part by advancing through the exhaust segment and stops operation. Any programmed tooling motion required to return to the fully retracted positions must be initiated by the Stop/Reset input. While the Vent/Halt input is high, no additional test activity or tooling resets can occur. See description below. |
| Start Program | Changes the Current Program to the one assigned to this input and Starts the Program. |
| Stop/Reset | The Stop/Reset input is available to stop tests and retract tooling. When a stop/reset input is received the test cycle goes immediately through a Vent/Halt routine and then advances to retract the tooling. The Malfunction output (if programmed) will go high at the end of the last tooling motion for errors defined as malfunctions. See description below. |
| Hold | The Hold input halts or suspends the testing sequence as long as this input is high. This can be used to stop the testing while awaiting some other action to occur. |
| Part Present | Enabled by selecting Part Present as one of the inputs, the Part Present input must be high before a start test input is received. It also must go low between tests (after any tooling motion and before the start of the tooling motion for the next test). If more than one input is set to "Part Present", test will execute only if all inputs are made high. |
| Ex Press Sw | Enabled by selecting Ext Press Sw as one of the inputs, the External Pressure Switch input must go high before the end of the fill segment. This input is generally used to validate that the test part is properly charged by detecting pressure downstream of a potential blockage point. For Occlusion test type where fill segment is not present, Ext Press Sw input must go high before the end of the test segment. If Ext Press Sw input is not made high during test execution then a malfunction occurs. For more than one input of Ext Press Sw, test will execute only if all inputs are made high before test segment of Occlusion test and fill segment for other test types. |

| | |
|---|---|
| Instrument Enable | Enabled by selecting Instrument Enable as one of the inputs, the Instrument Enable input must be high before a start test input is received. If the input doesn't go high before executing any test, it shows the malfunction message. If the input goes low in between test execution then test aborts and shows malfunction message. For more than one input of Instrument Enable, test will execute only if all inputs are made high and test aborts with malfunction message if any one input is low or made low in between test execution. |

### *Vent/Halt Request*

The design of a Vent/Halt request (including initial phase of the Stop/Reset request) is to cease operation of tooling motions, safely remove all energy from the part, and stop operation.

A Vent/Halt request operation has multiple operations depending on the state of the instrument while testing. For better understanding, the test sequence can be broken into three basic groups: Tooling Extend, Part Testing, and Tooling Retract. The Program Evaluation (Accept Program/Reject Program/Malfunction/Severe Leak) is always after the Tooling Retract.

Other than a user generated Vent/Halt input, several test errors will generate a Vent/Halt request. Possible scenarios include:

#### *Vent/Halt – Instrument Idle*

While the instrument is idle, a high Vent/Halt input will prevent the instrument from performing any test activity or tooling reset. Any type of Start or Stop request will be ignored until the Vent/Halt input is low.

#### *Vent/Halt – Instrument execution during Tooling Extend Group*

A Vent/Halt request will cause the output related to an executing Tooling Extend to be turned off. If the extend output is completed, it will remain in its current state. Since the part has not been charged no exhaust is necessary and execution will cease. A Tooling Reset is required.

#### *Vent/Halt – Instrument execution during Part Testing Group*

A Vent/Halt request will cause the instrument to exhaust any pressure within the part (if pressure was achieved) and execution will cease. Any output relating to Tooling Extend will remain in its current state. A Tooling Reset is required.

#### *Vent/Halt – Instrument execution during Tooling Retract Group*

A Vent/Halt request will cause the output relating to the current executing Tooling Retract to be turned off. Since the part has already been exhausted, execution will cease. A Tooling Reset is required.

### *Stop/Reset Request*

The design of a Stop request is to safely remove all energy from the part, place the tooling into a fully retracted state, and stop operation. Depending on whether the instrument is actively testing or idle, the stop request has two modes of operations.

Stop – Instrument Testing

- If actively testing, a Stop request will cause the instrument to exhaust any pressure within the part (if pressure was achieved), and then execute a tooling reset sequence (only if tooling is enabled). The retract motion will be executed into a known retracted state for the next test.

Stop – Instrument Idle

- If the instrument is idle or in a safe state with the part pressure exhausted, a Stop request will cause the instrument to execute a tooling reset sequence (only if tooling is enabled). The retract motion will be executed into a known retracted state for the next test.

Besides a user generated Stop, several test errors will generate a Stop/Reset request that causes a Vent/Halt routine and continues with the tooling reset. The possible scenarios include: Transducer Malfunction (zero or over-range), External Switch Fault (not low or high at appropriate time), Severe Leak, Pressure Low/High, Calculation Faults, Calibration Errors, and General Program Fault (setup errors)

In addition, Stop/Reset input is required:

- After any tooling motion or test malfunction where the instrument completed Vent/Halt to safe state and stopped.
- Tooling must be reset to fully retracted position to start next test.

## Inputs for Program Selection

<table>
<tr><th>Input</th><th colspan="2">Description</th></tr>
<tr><td rowspan="9">Binary Program Selection</td><td colspan="2">Programs can be remotely selected using the Binary Program Selection inputs or using one of the communication methods: RS232 or TCP/IP. The number of required inputs for Binary Program Selection depends on the highest program number of the program to which access is required.</td></tr>
<tr><td>Program Numbers</td><td>Binary Program Inputs</td></tr>
<tr><td>1</td><td>B1</td></tr>
<tr><td>2 – 3</td><td>B1 and B2</td></tr>
<tr><td>4 – 7</td><td>B1, B2, and B3</td></tr>
<tr><td>8 – 15</td><td>B1, B2, B3, and B4</td></tr>
<tr><td>16 – 31</td><td>B1, B2, B3, B4 and B5</td></tr>
<tr><td>32 – 63</td><td>B1, B2, B3, B4, B5, and B6</td></tr>
<tr><td>64 – 99</td><td>B1, B2, B3, B4, B5, B6, and B7</td></tr>
</table>

***Note: Programs can also be remotely selected using one of the communication methods: RS232 or TCP/IP, see*** Chapter 23 - *Communication.*

## Inputs for Program Calibration

| Input | Description |
|---|---|
| Program Cal | The Program Cal input prepares the instrument to perform a Program Cal sequence. A Start input initiates the tooling motion and Program Cal sequence. |
| Open Leak Std | The Open Leak Standard input will open the Leak Standard Calibration valve (if equipped) during the Fill, Stabilization, Test, and Exhaust segments. The valve will only open during the testing cycle when the input is high. If the input goes low during the testing cycle, the Leak Std Calibration valve will close. This input is generally used to automatically verify the calibration of a system by indexing or placing a good part in the test fixture and adding the internal leak standard to measure a part with the leak rate equal to the internal leak standard. |

| | |
|---|---|
| SPC Test Part | The SPC Test Part input identifies the next part to test as an SPC Part (often used when performing a test calibration verification test with a leak standard). This input must be high when receiving the Start input. This will mark the test results in the program result with an "*". Also, the test result output using the communication port will include the "*" to identify these parts for separate analysis. |

## Inputs for Tooling Motion

| Input | Description |
|---|---|
| Part Marking Feedback | This input must go high as a response to the Part Mark (Accept, Reject, or Both) output within the Part Mark timer that starts at the end of the exhaust timer when the Part Mark output is initiated. The Part Mark Feedback input must be requested.<br>• Part Config/TOOLING – "Part Mark" must be set for "Accept", "Reject", or "Both".<br>• Part Config/TOOLING – "Part Mark Feedback" set to "Yes".<br>• Part Config/INPUT – Part Mark Feedback assigned to a terminal.<br>• Part Config/OUTPUT – "Part Acc Mark" and/or "Part Rej Mark" assigned to terminal(s)<br>• Part Config/TIMER – Part Mark Timer set to a time.<br>Failure to receive this input before the end of the Part Mark Fdbk timer will cause a Malfunction result and an "ERROR: PART MARK FAULT" display. |
| Tool Ext Fdbk 1 – 5 | If enabled by selecting Tool Ext Fdbk #x as one of the inputs, it is required that the Tool Extend Feedback input go high before the associated Tool Ext Timer expires. If the timer expires before the input goes high the instrument will issue a malfunction. A Stop/Reset will need to be initiated to reset the tooling. |
| Tool Ret Fdbk 1 – 5 | If enabled by selecting Tool Ret Fdbk #x as one of the inputs, it is required that the Tool Retract Feedback input go high before the associated Tool Ret Timer expires. If the timer expires before the input goes high the instrument will issue a malfunction. A Stop/Reset will need to be initiated to reset the tooling. |

## Outputs for Test Cycles

| Output | Description |
|---|---|
| Press Select | Pressure Select goes high during the entire test sequence from start of Prefill or Fill segment to the end of Exhaust segment. ***This output can be used as a Test Active output.*** |
| Prefill | The Prefill output goes high during the Prefill portion of the Fill segment. This output is frequently used to control an external fast-fill valve when testing large volume parts. The external fast-fill valve opens until the instrument reaches the Minimum Pressure. |
| In Fill | The Fill segment output goes high during the Fill segment. |
| Fill Valve | This output mimics the Fill Valve functionality in the instrument. It goes high during the Prefill and Fill segments. |
| In Stabilize | The Stabilization segment output goes high during the Stabilization segment. |
| Isolation Valve | This output mimics the Isolation Valve functionality in the instrument. It goes high just prior to the fill valve closing and stays energized until the end of the Test segment. |
| In Test | The Test segment output goes high during the Test segment. |
| In Exhaust | The Exhaust segment output goes high during the Exhaust segment. This output is frequently used to open an external exhaust valve that vents the test air from the part through a larger valve for fast exhaust or to bypass the instrument and avoid polluting the instrument pneumatics with dirty part air. |
| In Relax | The relax timer output goes high during the Relax segment between the two tests of the Program Cal sequence. It would go high at the end of the first test Exhaust segment until the start of the second test Prefill or Fill segment. The Relax segment is also functional between tests in the Auto Setup routine. |

## Outputs for Program Calibration

| Output | Description |
|---|---|
| Program Cal Mode | The Program Cal Mode output goes high whenever the instrument is performing a Program Cal cycle. It goes high at the beginning of the Prefill or Fill timer for the first test of the Program Cal process. It stays high until the end of the Exhaust segment for the second test of the Program Cal Process. |

| | |
|---|---|
| Prog Cal Master | The Program Calibration Master output goes high during the first complete test of the Program Cal process starting at the beginning of the Prefill or Fill segment to the end of the Exhaust segment. This output is used to alert an external process that the instrument is in the first test of calibration. |
| Prog Cal LS | The Program Calibration Leak Standard output goes high during the second complete test cycle of the Program Cal process when the Leak Standard is added beginning with the Prefill or Fill segment to the end of the Exhaust segment. This output is used to alert an external process that the instrument is in the second test of calibration. |

## Outputs for Program Results and Test Results

| Output | Description |
|---|---|
| Program Accept | The Program Accept output goes high at the completion of the tooling motion (if tooling is turned on) or at the completion of the Exhaust segment if the test passes. |
| Program Reject | The Program Reject output goes high at the completion of the tooling motion (if tooling is turned on) if the test fails. Program Rejects also include Severe Leaks when Minimum Pressure is not reached before reaching the Prefill setpoint or maintained during the Fill or Stabilization segments. |
| Malfunction | If a test has an error or disruption to the normal process and faults out of cycle before the normal completion, a malfunction will occur. With tooling control if the error or disruption occurs during initial tooling action, the tooling will retract. If the error or disruption occurs during the testing cycle, the test will advance immediately to exhaust and the tooling will retract automatically. The Malfunction output goes high at the end of the completion of the last tooling motion. |
| Severe Leak | If a test fails to reach Minimum Pressure before reaching the Prefill setpoint or fails to maintain at least the Minimum Pressure during the Fill and Stabilization segments, the instrument will exhaust the pressure in the part and output Severe Leak high. |
| Part Acc Mark | Part Acc Mark output stamps or marks a part as Accept based on the Part Result. This output goes high during the Park Mark Timer immediately at the end of the Exhaust timer. |
| Part Rej Mark | Part Rej Mark output stamps or marks a part as Reject based on the Part Result. This output goes high during the Park Mark Timer immediately at the end of the Exhaust timer. |
| Test Passed | Signals the completion of a test that passed at the start of the Exhaust segment. This output stays on until the start of a new test. |
| Test Failed | Signals the completion of a failed test at the start of the Exhaust segment. This output stays on until the start of a new test. |
| Below LL | Below Low Limit goes high at the start of Exhaust segment when test results are below the Low Limit setpoint and stays high until the start of the next test. |
| Between Lim | Between Limits goes high at the start of Exhaust segment when test results are between the Low Limit and High Limit setpoints and stays high until the start |

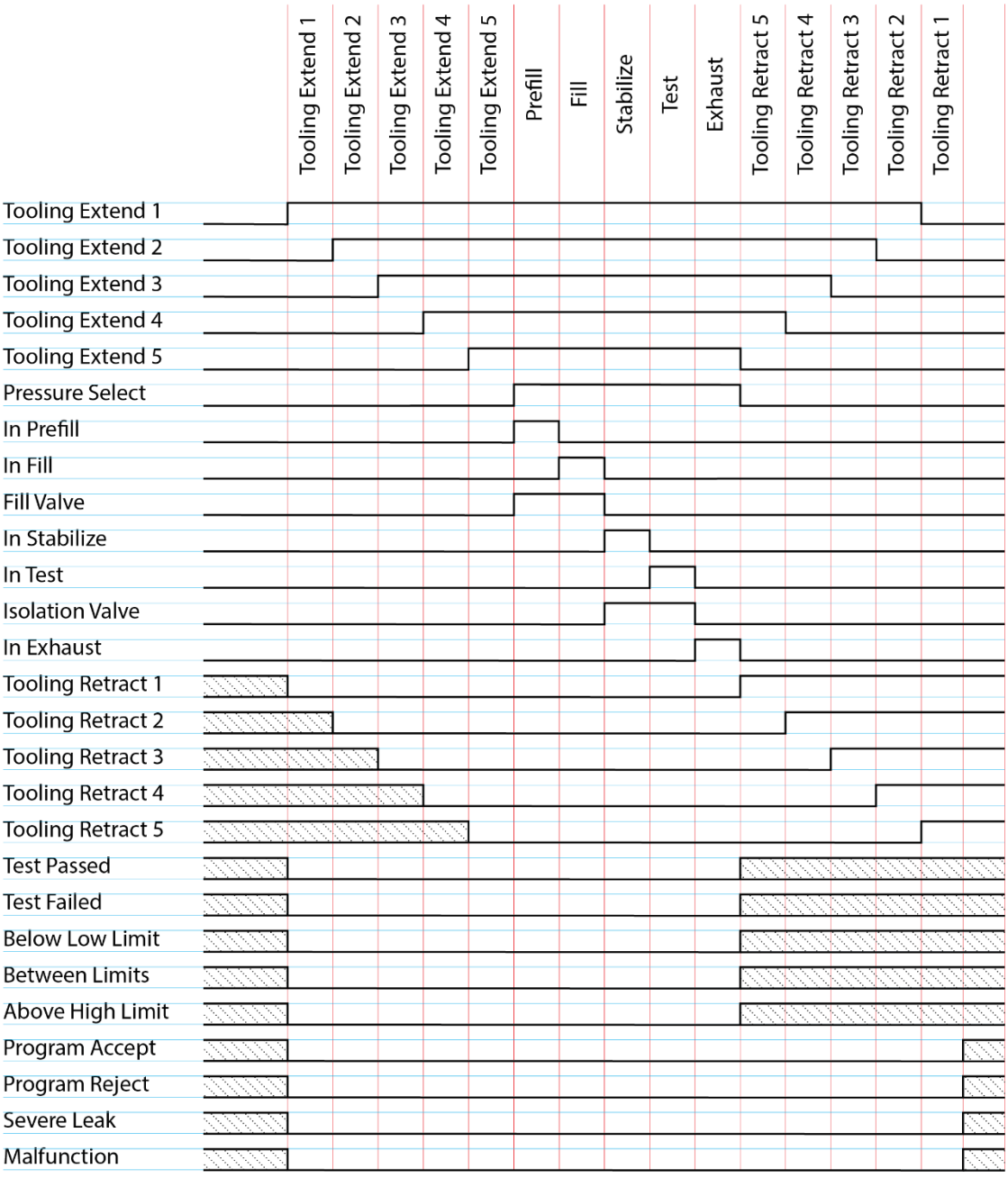
| | |
|---|---|
| | of the next test. |
| Above HL | Above High Limit goes high at the start of Exhaust segment when test results are above the High Limit setpoint and stays high until the start of the next test. |

## Outputs for Tooling Motion

| Output | Description |
|---|---|
| Tooling Extend 1 | This output goes high during the Tooling Extend 1 segment. This option is only available if Tooling is set to "On" or "Disabled". |
| Tooling Extend 2 | This output goes high during the Tooling Extend 2 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 2 or more. |
| Tooling Extend 3 | This output goes high during the Tooling Extend 3 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 3 or more. |
| Tooling Extend 4 | This output goes high during the Tooling Extend 4 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 4 or more. |
| Tooling Extend 5 | This output goes high during the Tooling Extend 5 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 5 or more. |

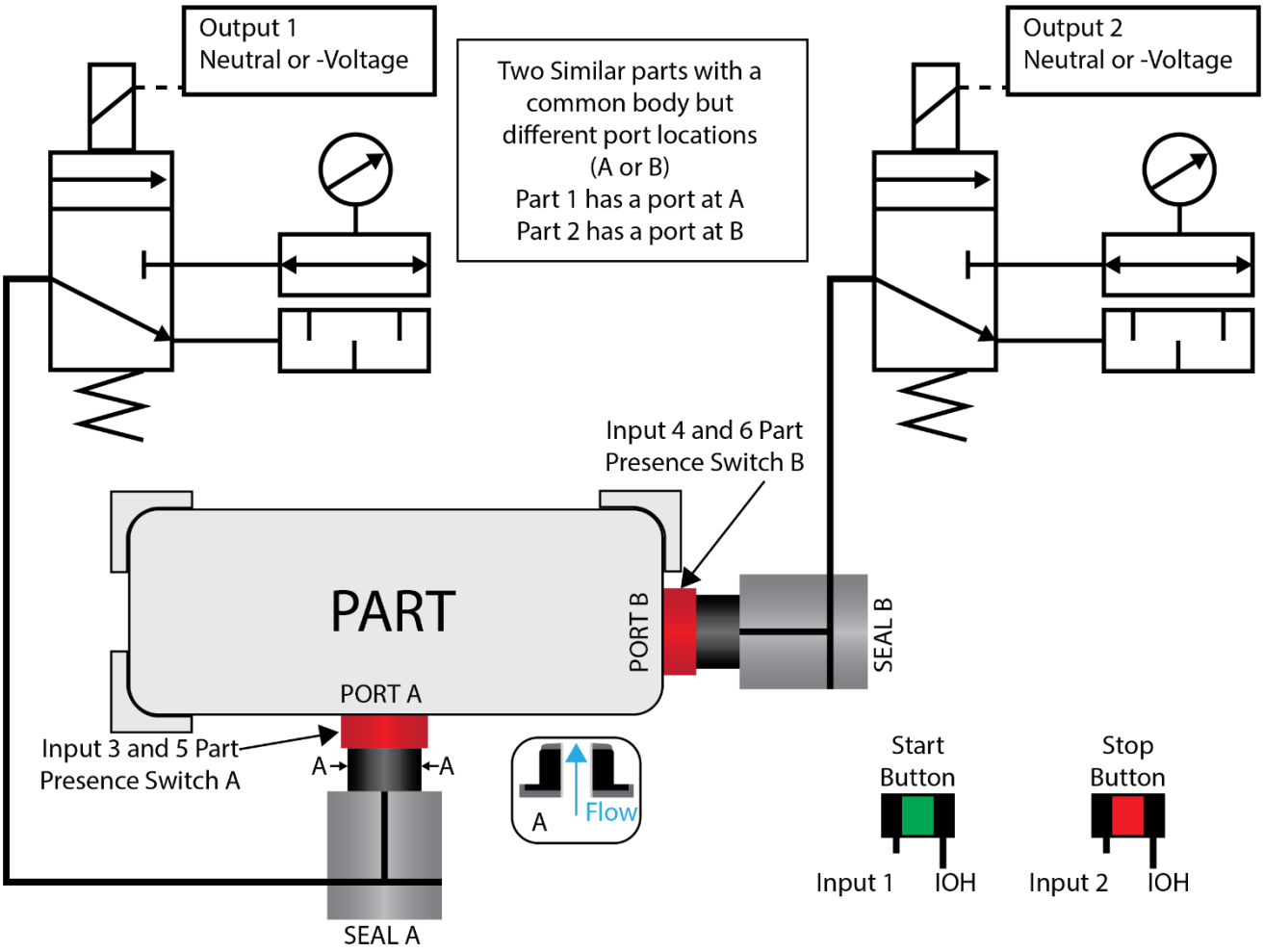
| Output | Description |
|---|---|
| Tooling Retract 5 | This output goes high during the Tooling Retract 5 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 5 or more. |
| Tooling Retract 4 | This output goes high during the Tooling Retract 4 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 4 or more. |
| Tooling Retract 3 | This output goes high during the Tooling Retract 3 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 3 or more. |
| Tooling Retract 2 | This output goes high during the Tooling Retract 2 segment. This option is only available if Tooling is set to "On" or "Disabled" and the Number of Motions is equal to 2 or more. |
| Tooling Retract 1 | This output goes high during the Tooling Retract 1 segment. This option is only available if Tooling is set to "On" or "Disabled". |

# Output Timing Diagram



## Tooling Example

The example below shows the power and flexibility of the Input and Output functionality. In this example the inputs and outputs are being used to seal two different types of parts. The two different parts have sealing ports in different locations. The part presence sensors select the program in the instrument that controls the proper hardware based on the current part in the sealing nest.



| Parameters | Program #1 | Program #2 |
|---|---|---|
| Tooling Motion | On | On |
| Number of Motions | 1 | 1 |
| Part Present Check | On Start | On Start |
| Retract on Reject | No | No |

| Input | Hardware | Program #1 | Program #2 |
|---|---|---|---|
| Input 1 | Start Button | Start Channel | Start Channel |
| Input 2 | Stop Button | Stop/Reset | Stop/Reset |
| Input 3 | Part Select Switch | Program Select B1 | Program Select B1 |
| Input 4 | Part Select Switch | Program Select B2 | Program Select B2 |
| Input 5 | Part Presence Sensor A | Part Presence | Constrained |
| Input 6 | Part Presence Sensor B | Constrained | Part Presence |

| Output | Hardware | Program #1 | Program #2 |
|---|---|---|---|
| Output 1 | Seal A Extend | Tool Extend 1 | Constrained |
| Output 2 | Seal B Extend | Constrained | Tool Extend 1 |

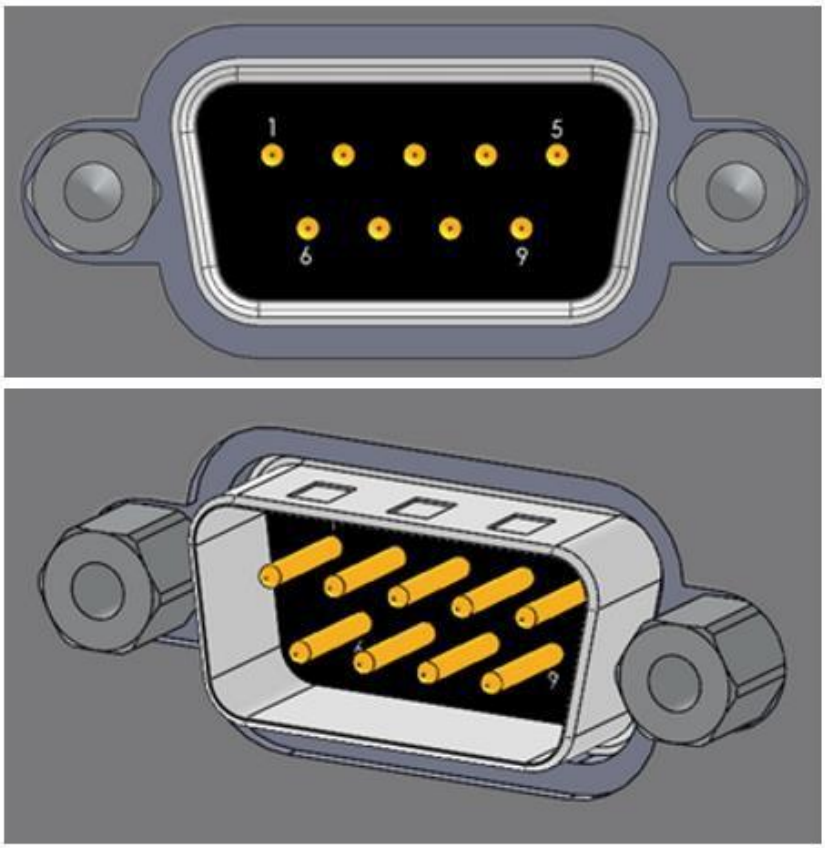
# Chapter 20 – Communication

*In this chapter the communication capability is described. The instrument has the capability to communicate over RS232 and/or Ethernet via TELNET*

The communication parameters are set by going to the main menu and selecting the Global Config icon.

## RS232 Connector Pinout

The pinout for the RS232 connector, located on the side of the I28, is denoted in the diagram below. Pins 1, 4, and 6 are internally connected, but are unused by the instrument.




| | |
|---|---|
| 1 | DCD |
| 2 | RX |
| 3 | TX |
| 4 | DTR |
| 5 | Ground |
| 6 | DSR |
| 7 | RTS |
| 8 | CTS |
| 9 | Not Connected |

## Establishing RS232 Communication

In order to set the RS232 parameters, select the RS232 1 or RS232 2 icon on the Global Config screen. The first step in establishing RS232 communication with the instrument is

to set the RS232 1 or RS232 2 Interface parameter to "2- way" communication. Next, select the baud rate that matches the baud rate of the device that will be communicating with the instrument. This is done via the RS232 1 or RS232 2 Baud parameter. The options are: 115200, 57600, 38400, 19200, or 9600 bits per second.

***Note: The instrument always uses 8 data bits. The Parity is set to "None". The instrument uses 1 stop bit. The flow control is always set to "None".***

Once you have established communication with the desired device you may select whether you would like the instrument to "echo" back each character it receives on the RS232 communication port. If the parameter RS232 1 or RS232 2 Echo is set to "On" the instrument will output an echo for each character, it receives. If this parameter is set to "Off" the instrument will not echo anything.

## Establishing Ethernet (TCP/IP) Communication via TELNET

It is highly recommended that you consult with your company's IT department regarding the configuration of placing the instrument on any network.

In order to set the TCP/IP parameters select the TCP/IP icon on the Global Config screen. The first step in establishing Ethernet communication with the instrument is to determine whether the instrument should be setup using DHCP or a static IP Address. This is done via the Obtain Network Settings parameter. If you set this parameter to "Manual" then you will need to set the Instrument IP Address manually. If you chose DHCP the Instrument IP Address parameter will become a read-only parameter.

The Mail Server IP Address parameter should be set to the address of the SMTP mail server. You should get this information from your company's IT department.

The Subnet Mask parameter will need to be configured next. The most common configuration for this parameter is "255.255.255.0 unless there is more than one subnet in which case a common configuration is "255.255.0.0."

The Gateway IP Address is the default gateway of the network domain. You should get this information from your company's IT department.

The MAC Address is the hardware address of the instrument. This number should not be changed.

Once you have established communication with the desired device you may select whether you would like the instrument to "echo" back each character it receives on the TCP/IP 1 communication port. If the parameter TCP/IP 1 Echo is set to "On" the instrument will output an echo for each character it receives. If this parameter is set to "Off" the instrument will not echo anything.

## Understanding the Header Information

All of the information that the instrument sends over the communication ports is preempted by header information. This data is sent to help parse specific information. This header information is in the format XXYYZZZ H. The header is followed by a Tab as shown in the table below:

| Header | Description |
|---|---|
| XX | 8-Bit CRC in HEX. Used for error checking. |
| YY | Sequence Code in HEX. The value increments from 01 to FF. This value can be used as a verification that all data has been received and nothing was missed by the receiving device. |
| ZZZ | Data length in HEX. |
| | Tab |
| H | Data Type Code. See Data Type Code Table |
| | Tab |

| Data Type Code | Description |
|---|---|
| V | Variable |
| L | List |
| M | Message |
| Q | Result List |
| T | Streaming Started |
| S | Streaming Value |
| X | Streaming Stopped |
| R | Result |

***Note: For the most up to date data type codes type "TABLE HEADER" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

## Test Results via RS232 or Ethernet (TCP/IP) Communication

In order to command the instrument to send the test result data automatically once the test is complete the parameter RS232 1 OR RS232 2 Results or TCP/IP 1 Results (depending on which type of communication is being used) is set to "On." Once this parameter is turned on, the Result Field data parameters show on the screen. Each parameter may be

turned on or off depending on the information that is required for to accompany each result. The Test Field parameter may be set to "All Result Information" or "First 2 Test Results." The "First 2 Test Results" will send the two primary results. The table below shows the format of the Test Result Data.

| Parameter | Number of Characters | Format | Example Text | Description of Example |
|---|---|---|---|---|
| Channel # | 4 | C## | C01 | Channel 1 |
| Port # | 3 | N# | N1 | Port 1 |
| Program # | 4 | P## | P01 | Program 1 |
| Link Information | 4 | | R-- | No Link |
| Time | 13 | HH:MM:SS.XXX | 16:15:14.123 | 16 hours, 15 minutes, 14.123 seconds |
| Date | 9 | MM/DD/YY | 40179 | January 01,2010 |
| Unique Id | 11 | ########## | 0000098353 | Unique test number |
| Program Evaluation | 3 | # | A | Accept |
| SPC Flag | 2 | # | * | SPC Test Data Result |
| Barcode | 41 | 1…40 | 12345 | Barcode Data |

| **Test Field** | **First 2 Test Results** | | | |
|---|---|---|---|---|
| Test Type | 8 | ### | PLR | Pressure Decay Leak Std |
| Test Evaluation | 2 | # | P | Pass |
| Test Data 1 | 22 | TDI Data Unit | LR 0.123456 sccm | Test Data Identifier - Value - Unit |
| Test Data 2 | 22 | TDI Data Unit | LR 0.123456 sccm | Test Data Identifier - Value - Unit |
| TAB | | | | Tab |
| TAB | | | | Tab |
| CR | | | | Carriage Return |
| LF | | | | Line Feed |
| **Test Field** | **All Result Information** | | | |

| | | | | |
|---|---|---|---|---|
| Test Type | 8 | ### | PLR | Pressure Decay Leak Std |
| Test Evaluation | 2 | # | P | Pass |
| Test Data 1 | 22 | TDI Value Unit | LR 0.123456 sccm | Test Data Identifier - Value - Unit |
| Test Data 2 | 22 | TDI Value Unit | LR 0.123456 sccm | Test Data Identifier - Value - Unit |
| \| | \| | \| | \| | \| |
| Test Data X | 22 | TDI Value Unit | LR 0.123456 sccm | Test Data Identifier - Value - Unit |
| TAB | | | | Tab |
| TAB | | | | Tab |
| CR | | | | Carriage Return |
| LF | | | | Line Feed |

***Note: For the most up to date Test Data Identifier codes type "TABLE VARIABLE" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

***Note: For the most up to date Test Evaluation codes type "TABLE EVALUATION" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

***Note: For the most up to date Program Evaluation codes type "TABLE RESULT" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

## Streaming Measured Data

The instrument has the ability to stream measured data via either the RS232 or TCP/IP communication port (one or the other, not both simultaneously) in real time while the test is being conducted. This data may be collected and used for analysis. The data is comma delimited. The table below shows the format of the streaming data.

| Parameter | | Format | Example Text | Description of Example |
|---|---|---|---|---|
| Channel # | Comma Delimited | C## | C01 | Channel 1 |
| Program # | Comma Delimited | P## | P01 | Program 1 |
| Segment | Comma Delimited | XXX | PRF | Prefill Segment |
| Test Data | Comma Delimited | TDI Value Unit | LR 0.123456 sccm | Test Data Identifier - Value - Unit |
| TAB | | | | Tab |
| TAB | | | | Tab |
| CR | | | | Carriage Return |
| LF | | | | Line Feed |

***Note: For the most up to date segment codes type "TABLE SEGMENT" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

***Note: For the most up to date Test Data Identifier codes type "TABLE VARIABLE" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

## Parsing Data Packets

For users who are trying to parse data packets from the instrument, any line beginning with an asterisk "*" should be parsed to be ignored, as these lines will not have header information to be parsed. An example of these types of lines would be the Root Menu displayed at instrument boot.

## Reports

The instrument is capable of generating a variety of reports through RS232, Ethernet, Email, or USB memory port located on the front of the unit. The reports available are in the table below.

| Report | Description |
|---|---|
| Cur Program Res | Reports all of the test results for the current active program. The current program can be seen in the bottom right hand corner of the display. |
| All Results | Reports all of the test results in the instrument memory. |
| Chan Last 1000 | Reports the last 1000 test results. |
| Chan Last 100 | Reports the last 100 test results. |
| Chan Last 20 | Reports the last 20 test results. |
| Chan Last Res | Reports the last test result. |
| Global Config | Reports all of the parameters and their settings within the Global Config menu. |
| Channel Config | Reports all of the parameters and their settings within the Channel Config menu. |
| Cur Program Config | Reports all of the parameters and their settings within the current active program. The current program can be seen in the bottom right hand corner of the display. |
| Program Config | Reports all of the parameters and their settings within the Program Config menu. |
| Regulator Cal | Reports the Electronic Regulator Calibration data if the instrument is configured with an electronic regulator. |
| Transducer Ver | Reports the Transducer Verification data of the last Transducer Verification conducted on the instrument. |
| Transducer Cal | Reports the Transducer Calibration data of the last Transducer Calibration conducted on the instrument. |
| Channel Cntrs | Reports all of the counters in the instrument |

# Chapter 21 – Security

*In this chapter the security parameters are described. The Security menu may be accessed on the Global Config Screen and selecting the Security Icon*

***Note: The Security Icon can be hidden. To view the Security Icon, go to the Global Config menu and select the Misc Icon. Go to the parameter Edit/View Security and turn it On.***

The default security mode of the instrument is set to use a key to unlock security. In the case where a password is desired to unlock security the default password is "5555." It is important that this be changed upon configuring the password. Remember to write down the new password. If the new password is forgotten, Cincinnati Test Systems can provide a back-door password that changes every hour.

The table below describes the all of the levels of security available.

| Parameter | Description | User Display Mode |
|---|---|---|
| Change Password | Edit allows the entry of a new password after entering old password | Basic<br>Advanced, Admin |
| Secure Calibration | Applies security to performing a program calibration. | Basic<br>Advanced, Admin |
| Secure Select Program | Applies security to changing test programs by pressing Change Program buttons. | Basic<br>Advanced, Admin |
| Secure Program Config | Applies security to changing test part parameters. | Basic<br>Advanced, Admin |
| Secure Global/Chan Config | Applies security to changing instrument configuration parameters. | Basic<br>Advanced, Admin |
| Secure Clear Data | Applies security to clearing test result data from instrument. | Basic<br>Advanced, Admin |
| Secure Reset Cntrs | Applies security to clearing the counter registers from instrument. | Basic<br>Advanced, Admin |
| Secure Hold Function | Applies security to hold function. | Basic<br>Advanced, Admin |
| Secure Reject Release | Applies security to protect releasing the part on a reject. This security option only works if retract on reject is set | Basic<br>Advanced, Admin |

| Parameter | Description | User Display Mode |
|---|---|---|
| | to Off in the program's Tooling menu. | |
| Secure Monitor Screen | Applies security to the monitor screen If set to Yes the user will not be able to view any other screens other than the last monitor screen viewed before being secured | Basic<br>Advanced, Admin |
| Backup/Restore | Allows the user to backup and/or restore various instrument settings.<br>***Note: You must have the same manifold code to restore Channel Configuration.*** | Basic<br>Advanced, Admin |

# Chapter 22 – Features

*In this chapter the features of the instrument are described.*

## Selecting the Display User Level

There are three user levels in the instrument. This is done to minimize the number of items shown on the screen for basic users. More advanced users requiring more features may view these by changing this parameter to the appropriate setting. Throughout the manual the parameter tables have denoted the display user level required for viewing and editing access. In order to change the viewing level, go to the Global Config menu and select the Misc menu. From the Misc menu change the parameter to the appropriate level. The three levels available are Basic, Advanced, and Admin.

***Suggestion: Set the Display User Level to the most basic level for your requirements. Parameters may be locked from editing. See Security parameters in*** Chapter 21.

## Setting the Date & Time

The date and time will be set at the factory. However, if you are located in a different time zone, it may be desirable to change the date and time on the instrument. This is done via the Global Config menu and selecting the Misc Icon. The Date and Time parameters may be modified. The date format is selectable via the Date Format parameter on the same menu. The time format is 24:00:00.

## Changing the Instrument Language

The instrument is a multi-language instrument. The language may be changed via the Global Config menu and selecting the Misc Icon. The Language may be modified.

***Note: The instrument must be in Advanced or Admin mode in order to view and modify the Instrument Language. To change the Display User Level, see*** Chapter 22.

## Copy & Paste Programs

In order to simplify the setup, the instrument comes with the ability to copy all of the parameters of a program to another program. This is easily done via the Program Config menu of the program you would like to copy. Select the Misc Icon and change the Copy to Target Prog parameter to the program number to "paste" the program. Then, change the Copy Program parameter to "Yes".

***Note: This functionality will overwrite the parameters in the "paste" program location. Make sure you want to overwrite this program before executing. If the "paste" program exists, the instrument will prompt you to make sure you want to continue.***

## Instrument Backup & Restore

The Backup and Restore function of the instrument is a feature that allows you to backup all of your parameters onto a USB memory stick. The instrument will create a backup file on the USB memory stick. This can be used to restore the instrument back to its current state. There is no limit to the number of backup files you can have for an instrument. The files will be named using the following format: YYMMDD_I-28_SERIALNUMBER_*NUMBER*. This will be stored in a folder called Backup-Restore.

***Note: NUMBER will increment for each backup done on the instrument on the same day.***

To execute this function go to the Global Config menu and select the USB Icon. Or you may use the USB quick button on the user interface of the instrument. Move the cursor down to the "Backup/Restore" parameter. Make sure a USB memory stick is placed in the USB port on the front of the instrument. Press the Enter button to activate the edit function and select "Backup Instrument." When it is complete a pop-up window will inform you it was successful.

## Instrument Cloning

This function should only be executed under the advice of CTS personnel. This feature is used for service and support of our products. It enables a technician to replicate the exact instrument within our facility to help with any questions or concerns. To execute this function, go to the Global Config menu and select the USB Icon. Or you may use the USB quick button on the user interface of the instrument. Move the cursor down to the "Backup/Restore" parameter. Make sure a USB memory stick is placed in the USB port on the front of the instrument. Press the Enter button to activate the edit function and select "Instr Clone." When it is complete a pop-up window will inform you it was successful.

## Adjusting the Light Bar Control

The lighting on the front of the instrument can be set to remain on indefinitely after a test, only remain on for 3 seconds (either all lights or only Accept/Reject), or it can be turned off completely. This parameter is set by going to the Global Config menu and selecting the Misc Icon. The Lighting Control parameter can be modified to one of these settings.

The brightness on the lighting may also be adjusted. This is done by changing the Lighting Brightness parameter on the same menu.

## Open Internal Leak Standard

If the instrument is configured with one or more internal leak standards these may be manually forced open during a test to simulate a leak in the test circuit. This may be done via the Open Leak Std parameter. This parameter may be modified by going to the Channel Config menu and selecting the Leak/Cal icon.

> ***Note: If the instrument is configured with an internal leak standard(s), the instrument automatically introduces the leak standard during the appropriate segments of a Program Cal routine.***

## Selecting the Proper Internal Leak Standard

If the instrument is configured multiple internal leak standards the user must select which leak standard is to be used in the Program. This parameter is set by going to the Program Config menu and selecting the Misc icon. The Leak Std Select parameter will define which leak standard is used. This must be set for each program utilized.

## Self-Test

The Self-Test diagnostic provides a way to check the integrity of the instrument's pneumatic circuit. This is a great way to quickly isolate a potential leak by allowing the user to verify the instrument is working correctly. By isolating the instrument from the test part and the external tooling and plumbing, this special test will verify that the instrument is performing properly and leak free.

To run a Self-Test diagnostic, go to the Channel Config menu and select the Self-Test Icon.

| Parameter | Description | User Display Mode |
|---|---|---|
| Self-Test Pressure | Enter the pressure setting of the pressure source chosen to use for the Self-Test diagnostic routine. | Basic<br>Advanced, Admin |
| Self-Test Source | Specifies the pressure source to utilize for the Self-Test diagnostic routine. | Basic<br>Advanced, Admin |
| Self-Test Level | The instrument performs two levels of Self-Test. Level 1 is a general integrity test of the pneumatic circuit. Level 2 is more stringent and should be used when testing for low leak or flow rates. | Basic<br>Advanced, Admin |
| Start Self-Test | Starts the diagnostic routine. | Basic<br>Advanced, Admin |

***Note: It is important that all test ports are plugged during a Self-Test. The instrument will multiplex through the test ports to verify all circuits are operating leak free.***

## Update Firmware

The instrument can update the firmware via the USB port on the front of the instrument. Upon a proper Service request, the file can be sent by an authorized CTS person via email for transfer to a USB memory stick. The file sent via email (for transfer to a USB memory stick), will be in a zip file formatted to create the proper folder structure on a USB memory stick. Once the file is on a USB memory stick, insert the stick into the front of the instrument. Press the USB button on the user interface for quick access to the USB menu. Change the parameter "Update Firmware" to "Yes" in order to start the update process. The instrument will list all of the firmware version files on the screen. Select which file you would like to use. This will start the update process.

***Note: If the firmware version is a minor revision all the parameter settings will be kept the same. However, if the firmware version is a major revision all the settings will be cleared. See the firmware documentation to determine if the firmware version you are upgrading from will cause the settings to be cleared.***

## Saving a Barcode with Results

***Note: The instrument must be in Advanced or Admin mode in order to view and modify the communication port functionality. To change the Display User Level, see*** Chapter 22.

The instrument has the capability to store barcode data with each test result. The instrument will work with any RS232 barcode scanner that can supply a barcode via an ASCII string (no longer than 40 characters) followed by a carriage return. The barcode information will need to be received before a Start command is received by the instrument. There is an option to make this data necessary for the Start command to be acknowledged.

In order to setup the barcode functionality go to the Global Config screen and select the RS232 1 Icon. Change the RS232 1 OR RS232 2 Interface parameter to "Barcode". Then change the RS232 1 OR RS232 2 Baud parameter to set the baud rate of the barcode scanner communication.

***Note: The data bits are always configured to 8. The parity is always set to None. The number of stop bits is always set to 1. The flow control is always set to None.***

If a barcode is required before a start signal is acknowledged by the instrument, go to the Program Config menu and select the Misc Icon. Cursor down to the Barcode Required parameter and change it to "Yes".

## Holding Pressure in the Part after Test (No Exhaust)

In some applications it is desirable to keep the pressure in the part once the test sequence is complete. It is easy to accomplish this by setting the Retain Part Press parameter to "Yes" in the instrument. This parameter is edited by going to the Program Config menu and selecting the Misc Icon. The instrument will retain the pressure until either the part is removed from the sealing fixture or a Stop signal is initiated.

*Note: The instrument must be in Advanced or Admin mode in order to view and modify this functionality. To change the Display User Level, see* Chapter 22.

## Changing the Functionality of the Prefill Timer

When the Prefill Timer is set to a Percent of the Fill Timer, which is the default value, the Minimum Pressure must be met before the value in the Prefill is exhausted. For example, if the Fill Timer is set to 10 seconds and the Prefill Timer is set to 80% then the part must reach Minimum Pressure within 8 seconds. This allows for fixed fill times to be utilized.

When the Prefill Timer is set to a Not to Exceed Timer, the instrument will begin the cycle in the Prefill segment. Once the pressure reaches the Minimum Pressure, the instrument will exit the Prefill segment, regardless of any time remaining, and enter the Fill segment.

To change the function of the Prefill timer go to the Program Config menu and select the Misc Icon. The parameter called Prefill Method changes the Prefill functionality.

## Turning On/Off Pressure Correction

In several test types the instrument uses pressure correction to enhance the performance of the instrument. There are times where pressure correction may not be desirable. For these cases, the instrument has the ability to select whether pressure correction is used. To do this, select the Misc Icon on the Program Config menu. Change the Pressure Correction parameter to the desired setting.

## Setting the Cal Method and Leak Standard Location

This parameter, Cal Method, is located under the Leak/Cal screen under the Channel Config menu when the Leak Standard is set to "Channel". It is located on the Misc screen under the Program Config menu when the Leak Standard is set to "Program".

| Select Parameter | Description | Explanation |
|---|---|---|
| **One Part – Int. LS** | Automatic test cycling using Leak Standard located inside the instrument | Automatically tests same non-leaking master part twice; the second time using a calibrated leak standard mounted on the internal pneumatic block. |
| **One Part - Ext LS** | Manual testing of same part using Leak Standard provided outside the instrument | Tests same non-leaking master part twice; the second time using calibrated leak standard provided externally from the instrument. The instrument will prompt the operator to attach the leak standard when it is time. |

| Select Parameter | Description | Explanation |
|---|---|---|
| **Multi-Part – Int. LS** | Manual testing of two parts using a Leak Standard located inside the instrument | Tests two different non-leaking master parts using the calibrated leak standard mounted on the internal pneumatic block. Any tooling must retract between tests to change parts. A Start signal is required either via the user interface or remotely using programmed start test logic to initiate the second test after changing non-leaking master parts. |
| **Multi-Part – Ext LS** | Manual testing of two parts using Leak Standard provided outside instrument | Tests two different non-leaking master parts using the calibrated leak standard provided externally from the instrument. Any tooling must retract between tests to change parts. A Start signal is required either via the user interface or remotely using programmed start test logic to initiate the second test after changing non-leaking master part with leak standard. |

## Auto Run

Sometimes it is desired to have the instrument cycle automatically without any need for a person pressing the Start button or a start signal being received via the inputs. AutoRun is designed to accomplish this. This is done via the Program Config menu and selecting the Autorun Icon

| Parameter | Description | User Display Mode |
|---|---|---|
| Autorun Relax | The amount of time the instrument pauses in between cycles. | Advanced, Admin |
| Autorun Method | There are two options for this parameter. "Standard" which runs a normal leak test every cycle or "LS on 3rd" which opens the internal leak standard (if supplied) every 3rd cycle. | Advanced, Admin |
| Autorun Cycle Count | The number of cycles left in the Autorun sequence. This parameter is used to determine how many cycles are conducted in an Autorun | Advanced, Admin |
| Autorun Enable | When this parameter is set to "Yes" a start command will initiate the Autorun sequence | Advanced, Admin |

# Chapter 23 – Instrument Calibration

*In this chapter the set/span parameters are described. The Set/Span menu may be accessed on the Channel Configuration Screen and selecting the Set/Span Icon.*

***Note: Calibrations are always done using Test Port #1 (the test port on the left-hand side when facing the instrument)***

## Calibrating a Transducer

The transducers have been calibrated at the factory. A calibration of the transducer should be done periodically according to the quality standards at your facility. The instrument is capable of doing a multiple point calibration. The number of points is determined by the user. You may select up to 32 points for calibration. You will need a calibrated master pressure gauge in order to calibrate the transducer on the instrument. On the Set/Span menu select which transducer you would like to calibrate. Press Enter to enable the edit function. Change the value to "Yes." The following menu will appear on the screen.

### Transducer Cal 1 (Pressure)

| Parameter | Description | User Display Mode |
|---|---|---|
| Number of Points | The number of setpoints to be used for the transducer calibration procedure. Value must be 2 to 32. | Basic<br>Advanced, Admin |
| Setpoints 2–32 | The user can define the setpoints at which the calibration occurs. The number of setpoints shown is based on the number of points selected in the parameter above | Basic<br>Advanced, Admin |
| Linearity Limit | The maximum allowed linearity variance for a successful calibration | Basic<br>Advanced, Admin |
| Start Calibration | Commences the calibration procedure. A wizard will walk you through the calibration process. | Basic<br>Advanced, Admin |

***Note: A Transducer Calibration Report may be downloaded from the instrument if desired. See Chapter 20 Reports.***

### Transducer Cal 3 (Hard Vacuum)

| Parameter | Description | User Display Mode |
|---|---|---|
| Number of Points | The number of setpoints to be used for the transducer calibration procedure. Value must be 2 to 32. | Basic<br>Advanced, Admin |
| Pressure Mode | Determines whether one pressure value is utilized for all setpoints or if individual pressure values are used for each setpoint when calibrating or verifying the transducer. | Basic<br>Advanced, Admin |
| Setpoints<br>2–32 | This parameter is visible if Pressure Mode is set to "Multi Pressure." The user is able to define the setpoints at which the calibration occurs. The number of setpoints shown is based on the number of points selected in the parameter above | Basic<br>Advanced, Admin |
| Cal Pressure | This parameter is visible if Pressure Mode is set to "Single Pressure." It is the desired pressure for all setpoints when calibrating or verifying the transducer. | Basic<br>Advanced, Admin |
| Pressure Correction | Allows the instrument to perform measurement corrections when calibrating or verifying the transducer based upon the relationship between the setpoint pressure and the actual measured pressure. | Basic<br>Advanced, Admin |
| Linearity Limit | The maximum allowed linearity variance for a successful calibration | Basic<br>Advanced, Admin |
| Start Calibration | Commences the calibration procedure. A wizard will walk you through the calibration process. | Basic<br>Advanced, Admin |

***Note: A Transducer Calibration Report may be downloaded from the instrument ifdesired. See Chapter 20 Reports.***

## Verifying a Transducer

The transducer verification process is very similar to the calibration process. You must enter the external master gauge value at each point to step through the sequence. You will be prompted to input values so the ***Transducer Verification Report*** has this data for later review. This feature does not affect the calibration of the instrument.

*Note: A Transducer Verification Report may be downloaded from the instrument if desired. See* Chapter 20 *Reports.*

## Calibrating an Electronic Regulator

The electronic regulator has been calibrated at the factory. The instrument can do a multiple point calibration. The number of points is determined by the user. You may select up to 20 points for calibration. You will need a calibrated master pressure gauge in order to calibrate the electronic regulator on the instrument. On the Set/Span menu select which electronic regulator you would like to calibrate. Press Enter to enable the edit function. Change the value to "Yes." The following menu will appear on the screen.

| Parameter | Description | User Display Mode |
|---|---|---|
| Number of Points | The number of setpoints to be used for the transducer calibration procedure. Value must be 2 to 20. | Basic<br>Advanced, Admin |
| Low Limit Voltage | The user is able to define the low voltage for the calibration process | Admin |
| High Limit Voltage | The user is able to define the high voltage for the calibration process | Admin |
| Start Calibration | Commences the calibration procedure. A wizard will walk you through the calibration process. | Basic<br>Advanced, Admin |

***Note: The Low Limit Voltage and High Limit Voltage values are disregarded if both are set to zero° (default state). You should only change these values if the instrument is not able to automatically analyze the electronic regulator range and perform a proper calibration.***

***Note: The electronic regulator can remain active in between instrument testing cycles or it can be set to be idle. This parameter is edited by going to Channel Config and selecting the Hardware Icon. The parameter is called "E-Regulator Rest"***

***Note: An Electronic Regulator Calibration Report may be downloaded from the instrument if desired. See Chapter 20 Reports.***

# Chapter 24– Webserver

*The instrument provides a rich web server to control and configure the instrument. The Web Server can be used to display and update configuration, backup/restore instrument configurations, upgrade instrument firmware, and navigate remotely.*

## System Requirements

To use the Web Server, you must have the following:

- a TCP/IP-based network
- a web browser installed on your computer, preferably either Google Chrome 60.0X or Microsoft Internet Explorer 11.0X and above

*Note: The web server can be accessed from any operating system that supports the TCP/IP protocol and a web browser. You cannot view the embedded web server pages from outside a firewall.*

## Viewing the Web Server

Launch your web browser. In the Address or Go to field, type the IP address assigned to the instrument (for example: http://192.168.1.1). For more details on setting up the IP address on the instrument, refer to Chapter 20 - Communication.

## Home Page

The top section will always display the Identity information (Instrument name, Firmware Version, Serial number, and MAC address) of the instrument. The Home page is shown in Figure 1.

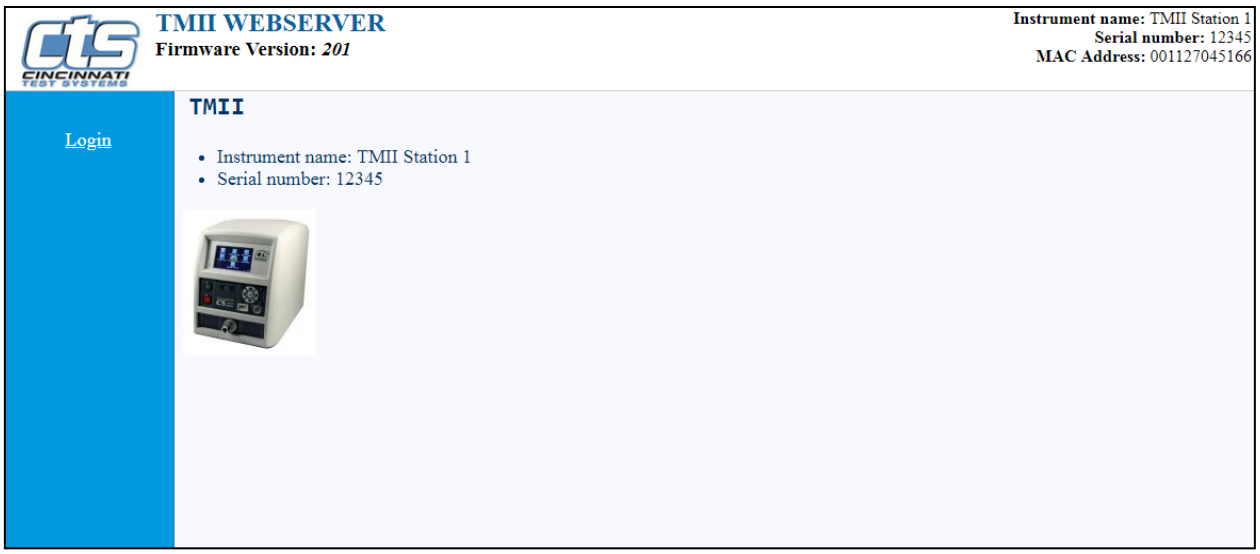



Figure 1 Web page - Login Page

## Web Server Login

Once you click **Login**, the web server will prompt you for a User Name and Password. You must login with the appropriate username and password to access the webserver features. For more details on security, please refer to Chapter 22 - Security.

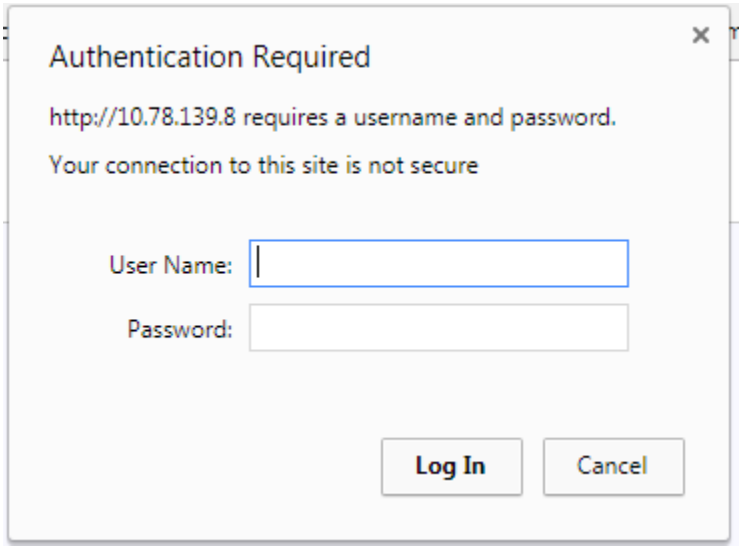



Figure 2 Security login

## Navigation - Web Server

The left section lists all available menus. Clicking a menu in the left section will update the right section with content for the selected menu.

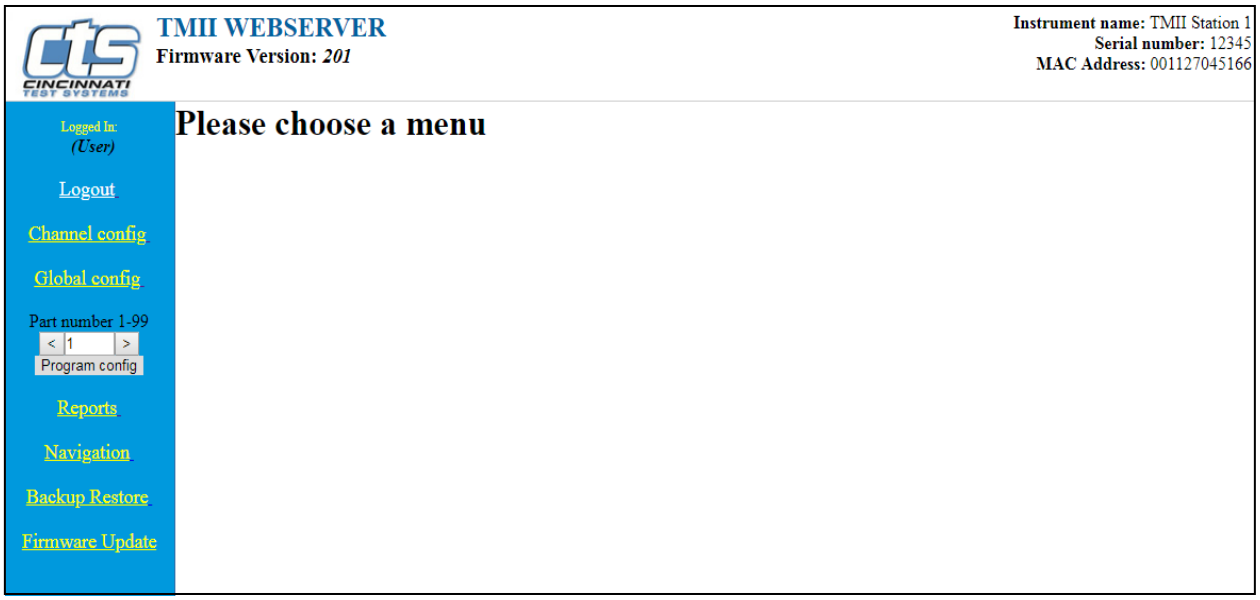



Figure 3 Web Page - Main Page

The **Channel config** page allows you to configure Channel Config parameters for the instrument.

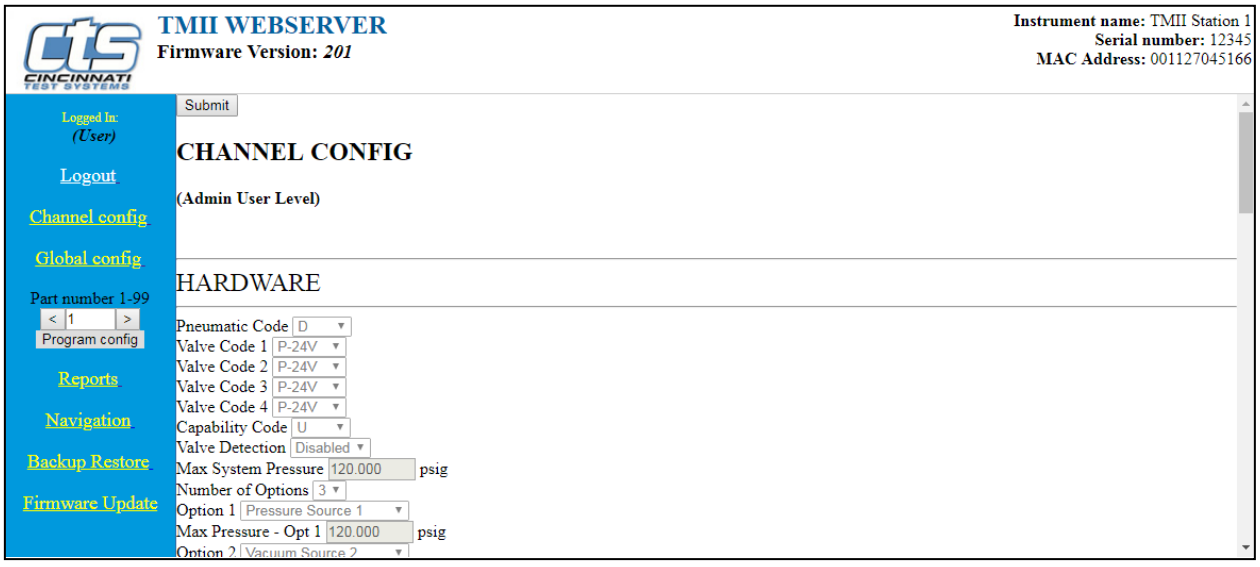



Figure 4 Web Page - Channel Config

The **Global config** page allows you to configure Global Config parameters for the instrument.

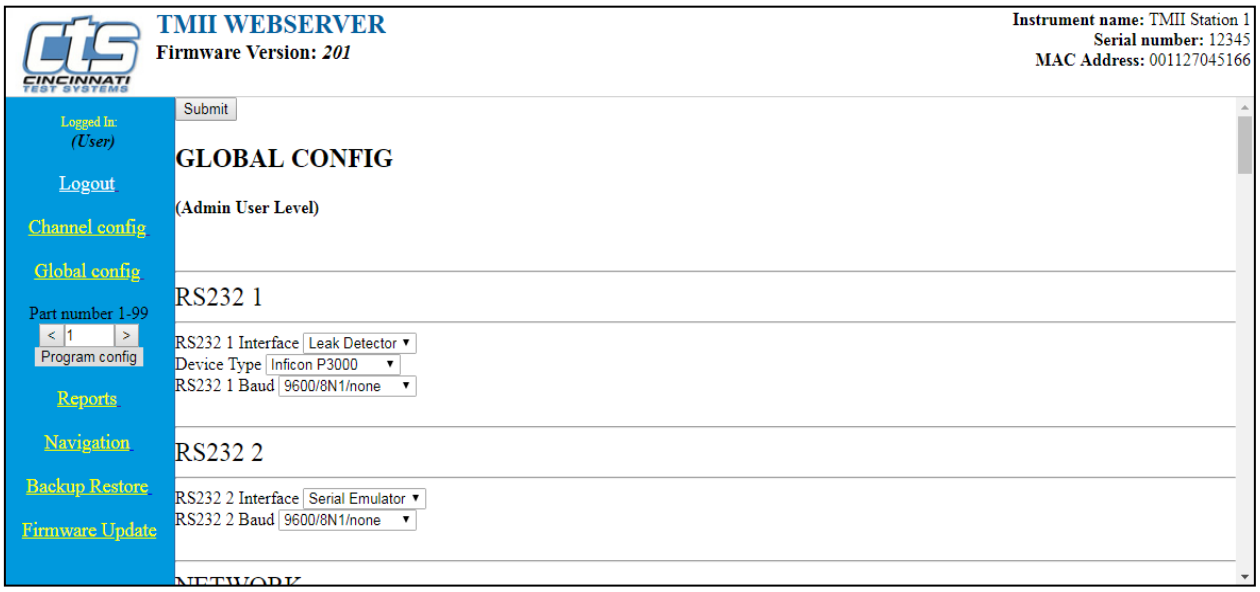



Figure 5 Web Page - Global Config

The **Program config** page allows you to configure Program Config parameters for the selected program. Use the arrow keys to select the desired program number.

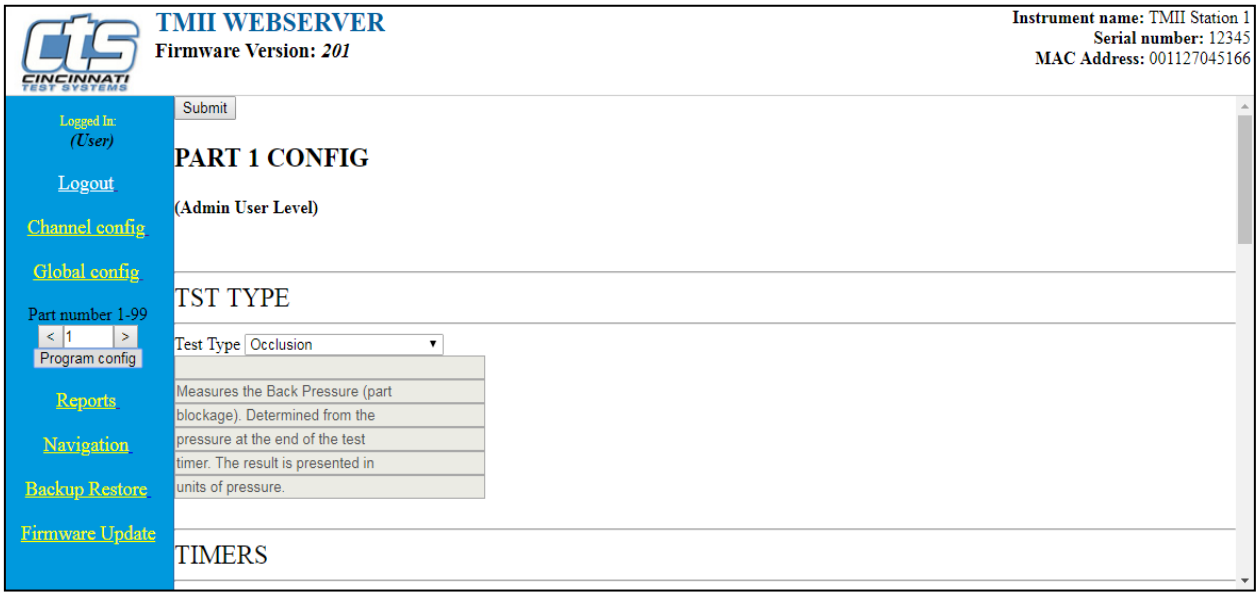



Figure 6 Web Page - Program Config

The **Reports** page allows you to generate a variety of Reports for the instrument.

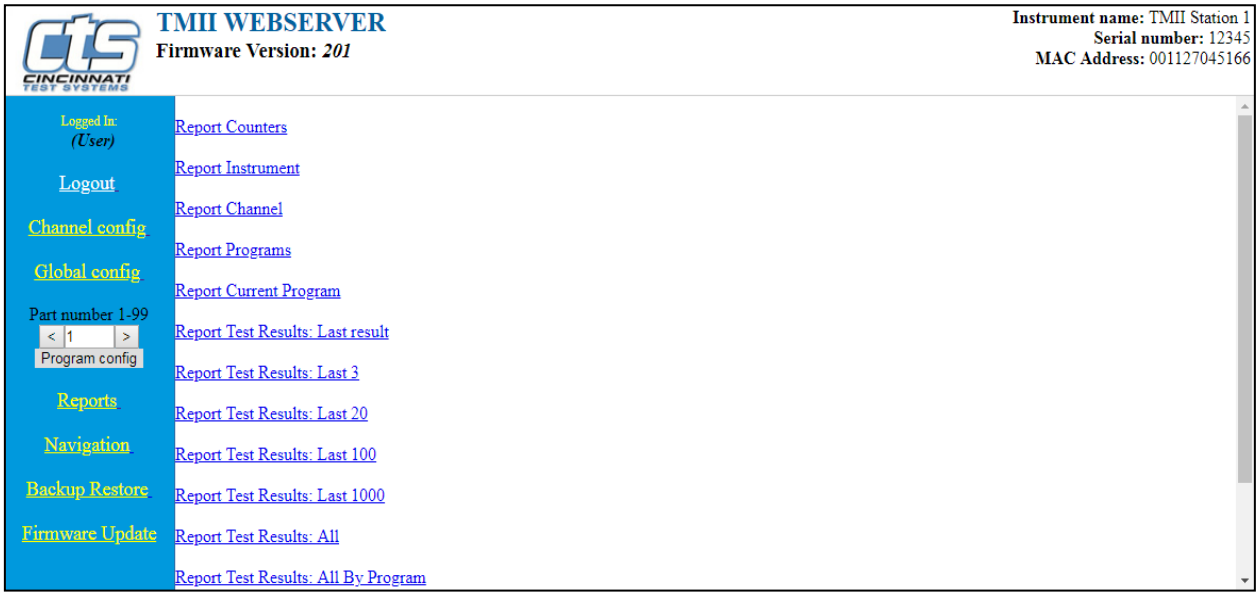



Figure 7 Web Page - Reports

The **Navigation** page gives you a similar user interface to the one available on the front display of the instrument.

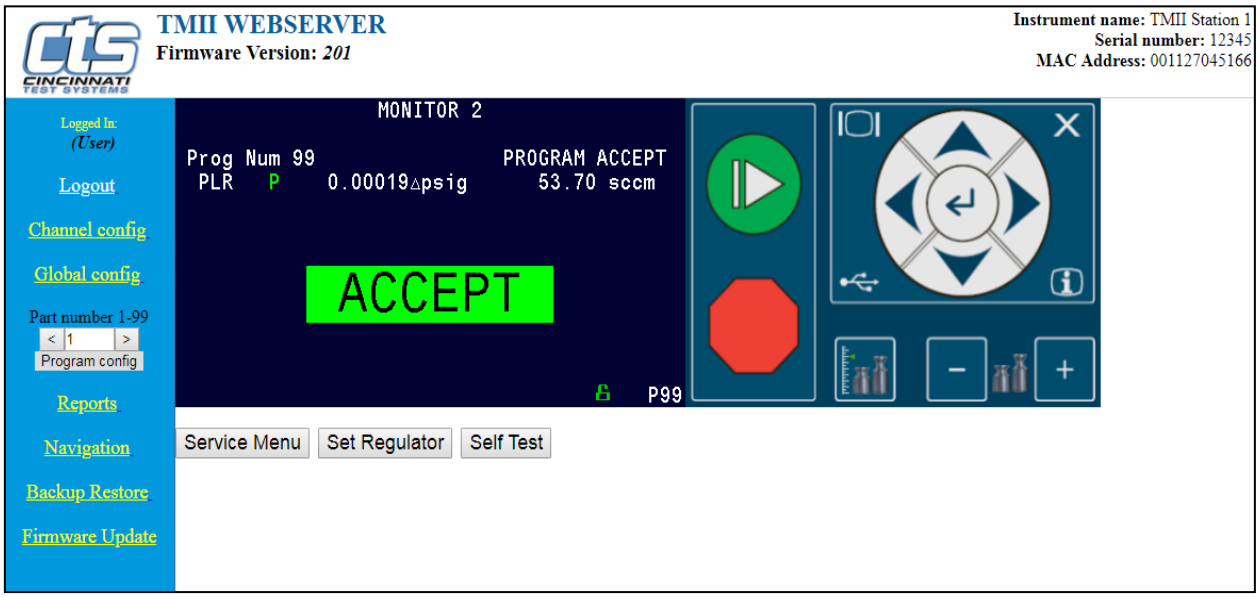



Figure 8 Web Page - Navigation

The **Backup Restore** page allows you to generate a backup of the instrument, generate a backup of all programs, restore a backup, or restore all programs.

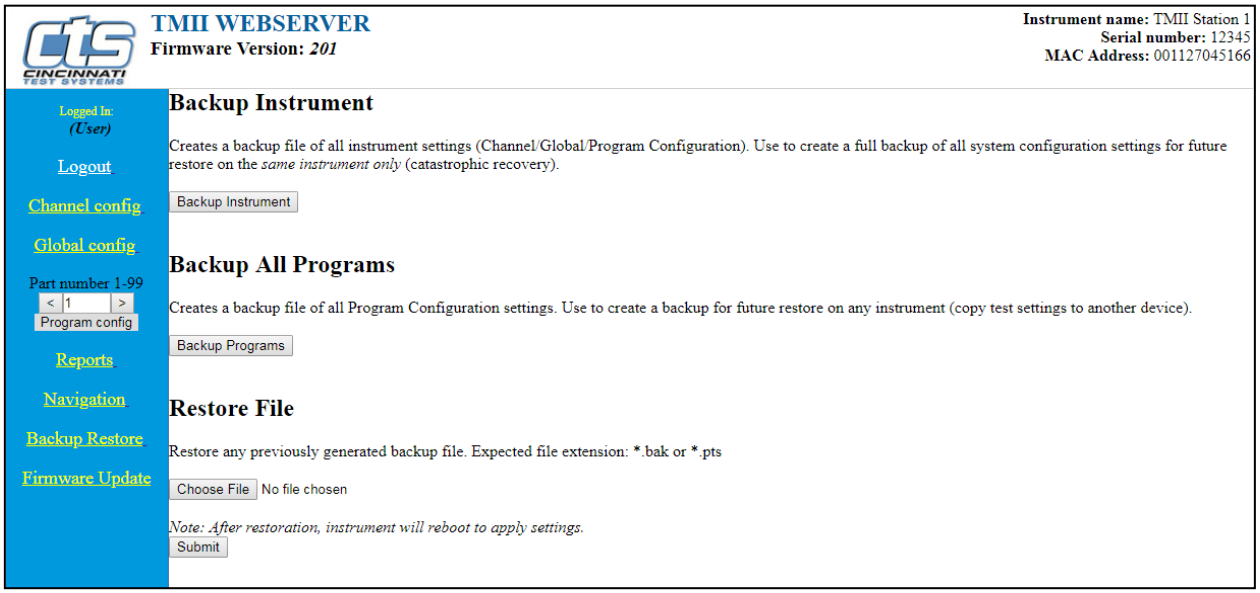



Figure 9 Web Page - Backup/Restore

The **Firmware Update** page allows you to update the instrument's main controller firmware.

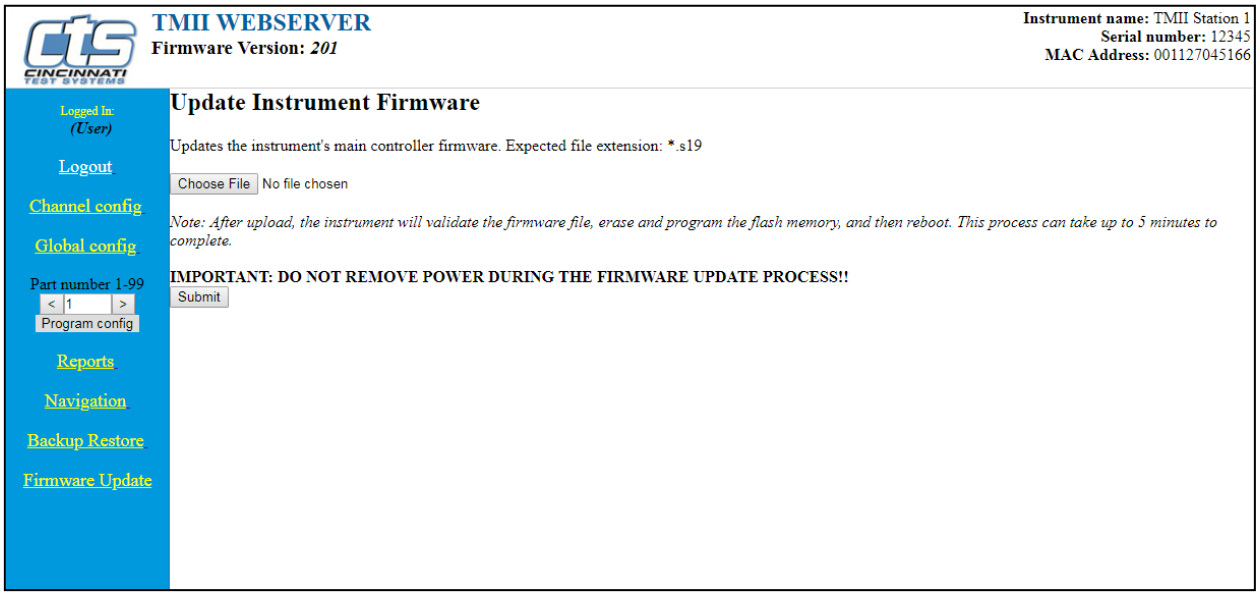



Figure 10 Web Page - Firmware Update

## Parameter Configuration via Web Server

You can edit parameters listed on the right section of webpage. Editable parameters, once changed, are highlighted in yellow. After editing any parameter, you will need to click the "Submit" button at the top of the page to make the change on the instrument.

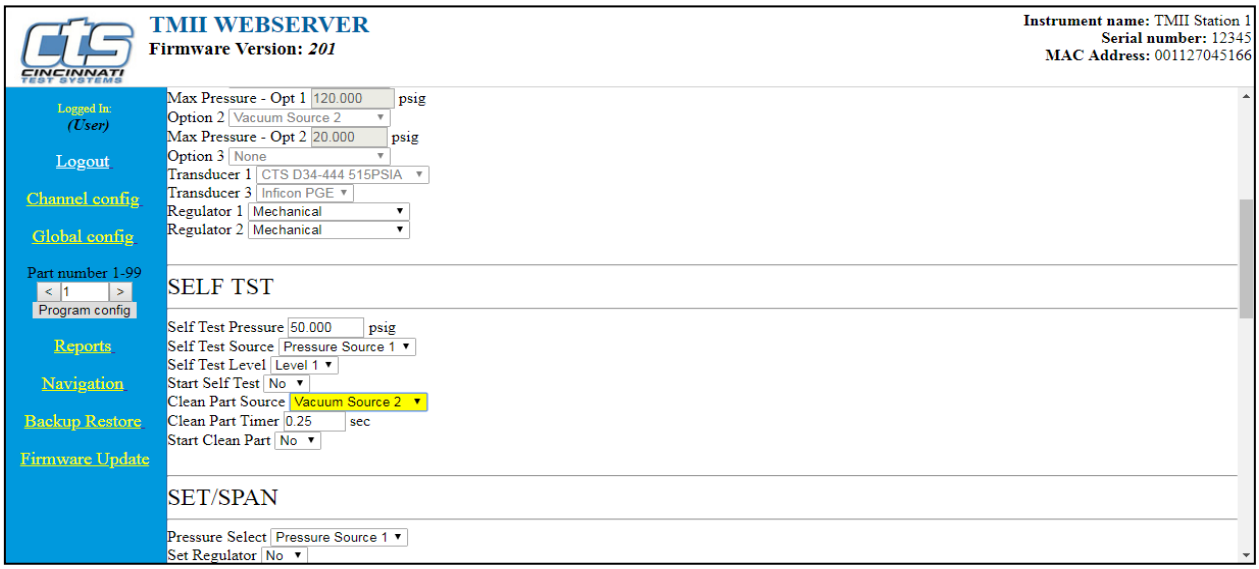



Figure 11 Web page - Editing parameters

# Chapter 25– Monitor Screen Examples

*This chapter is a quick reference for the screens that display at power on and when running the various tests established for your requirements.*

## Monitor Screen Examples

These screens are available by using the right arrow on the Arrow/Enter Navigation buttons. 

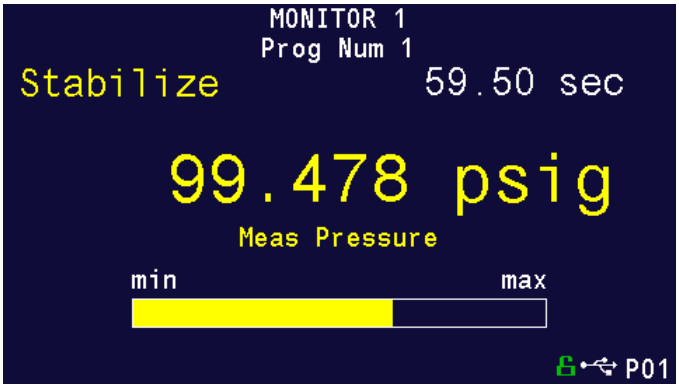



*Figure 1: Monitor 1 highlights the numerical pressure reading:*

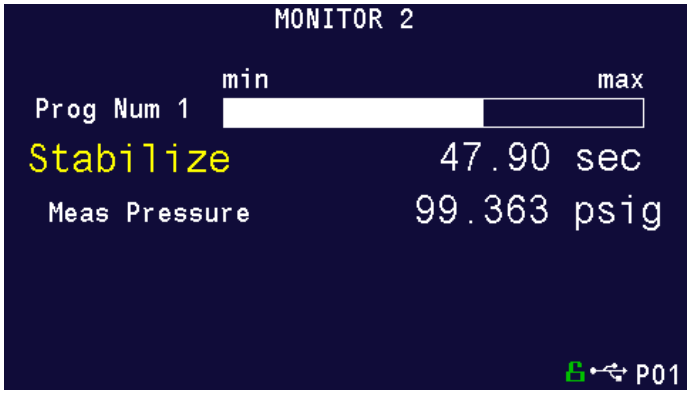



*Figure 2 - Monitor 2 highlights the location of the reading from the Min to the Max allowable pressure*

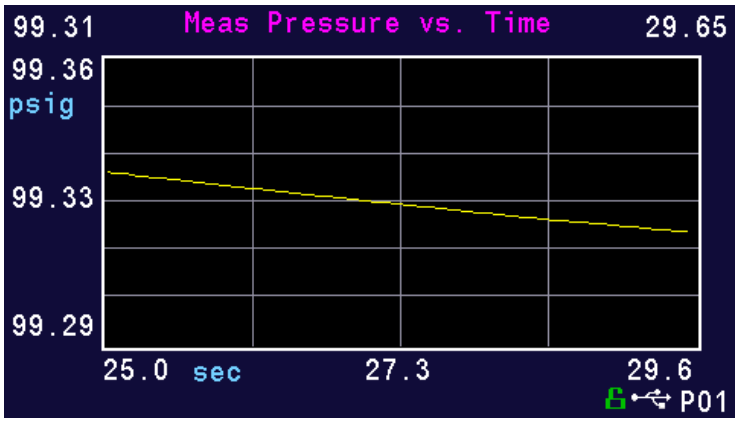



*Figure 3- Graph highlights the pressure as it relates to time*

***Note: You can zoom/adjust the graph by pressing the Enter button. A menu will display on the right side of the screen. Additional graph screen parameters are located in Main Menu > Global Config > Graph icon.***

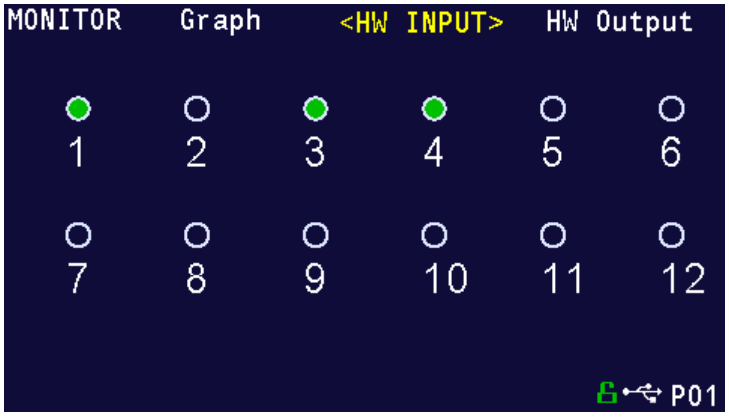



*Figure 4 - Hardware Input highlights which of the possible 12 inputs are engaged*

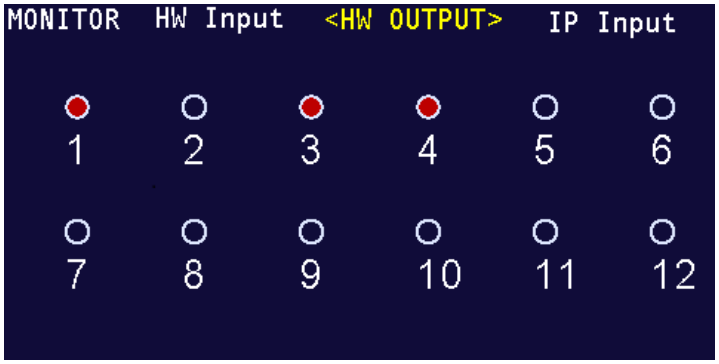


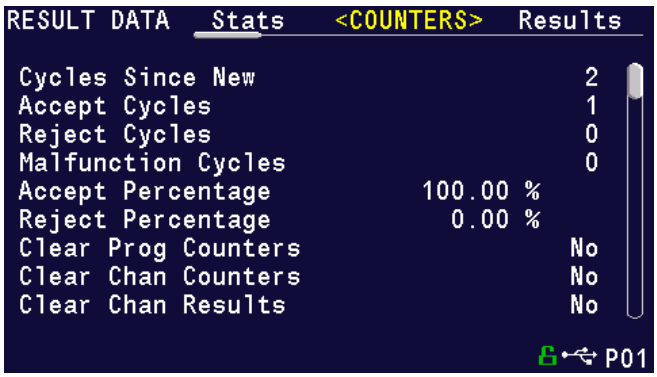

*Figure 5 - Hardware Output highlights which of the possible 12 outputs are engaged*

# Chapter 26– Results Screen Examples

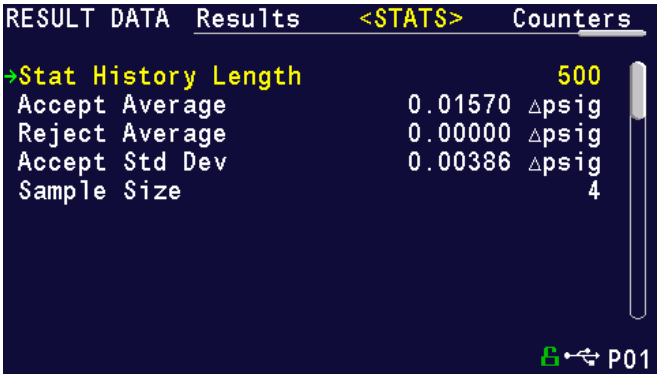
*This chapter is a quick reference for the screens that display when running the various tests established for your requirements. These are examples; your screens will display similar but different data.*

## Result Data Screens

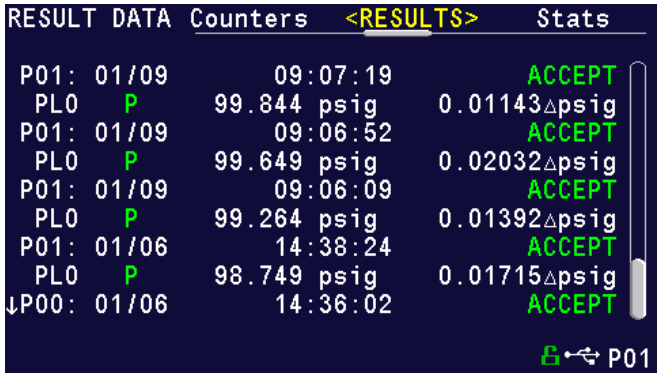
*Counters Screen*




*Results screen*



*Stats Screen*



# Appendix A – Messages & Error Codes

*This chapter is a quick general reference for the test messages & error codes that appear on the screen and through the communication ports.*

***Note: For the most up to date test Messages & Error Codes list, type "TABLE EVALUATION" into the instrument via the communication port. The instrument will return a list of Data Type Codes and Descriptions.***

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| Program Accept | A | Program evaluation was successful, for multiple tests – all tests passed. | |
| Auto Setup Seq Complete | AC | The Auto Setup Sequence is complete | |
| Program Calibration Failed | AF | The test type is one that is capable of conducting a program calibration and this sequence was not successful. | |
| Master Part Complete | AM | The test type is one that is capable of conducting a program calibration. The first phase of the sequence is complete. | |
| Program Calibration Passed | AP | The test type is one that is capable of conducting a program calibration and this sequence was successful. | |
| Error: Anti-tie Down | AT | The two inputs (Start and Common) are not held high during all of the "extend" tooling motions. There is no resultant output. | The two inputs must go high within 0.05 seconds and be held high until the end of all extend tooling motions. |
| Error: Barcode Req to Start | BR | The instrument was expecting a barcode value to be received over the RS232 port. The | Check barcode reader wiring and functionality. |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| | | configuration was set to require this action before a start command is enabled. | Make sure the Baud Rates are set properly within the instrument. |
| Master+Leak Loss<Master Loss | C1 | During the Program Cal routine, the instrument measured a greater pressure loss for the master part by itself than for the master part with the leak in the second test. This results in a Malfunction. | Increase the stabilization and possibly test time.<br>Verify the leak standard. |
| Master Part Loss> Max Mstr+Leak Loss | C2 | The pressure loss during the first test of Program Cal on the master part exceeded the Max Mstr+Leak Loss setpoint. This results in a Malfunction. | Check the seals and master part for leaks or extend stabilization timer. Check that Max Mstr+Leak Loss was correctly set. |
| Master +Leak Loss > Max Mstr+Leak Loss | C3 | The pressure loss during the second test of Program Cal on the master part exceeded the Max Mstr+Leak Loss setpoint. This results in a Malfunction, | Check the seals and master part for leaks or extend stabilization timer. Check to leaks about leak standard.<br>Check that Max Mstr+Leak Loss was<br>correctly set. |
| Master Flow>Max M+L Flow | C4 | The flow value during the first sequence of Program Cal on the master part exceeded the Max Mstr+Leak Flow setpoint. This results in a Malfunction. | Check the seals and master part for leaks, or extend fill or test timers. Check that Max Mstr+Leak Flow was correctly set. |
| Master Flow<Min Master Flow | C5 | The master flow value was less than the Min Master Flow setpoint | Check that the Min Master Flow setpoint was set correctly. Verify the test line is connected to the test port and not the Self-Test cap. |
| Master+Leak Flow>Max M+L Flow | C6 | The flow value during the second sequence of Program Cal on the master part exceeded the | Check seals and master part for leaks or extend fill or test timers. Check |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| | | Max Mstr+Leak Flow setpoint. This results in a Malfunction. | the leak standard. Check that Max Mstr+Leak Flow was correctly set. |
| Master Flow>Max Master Flow | C7 | The flow value during the first sequence of Program Cal on the master part exceeded the Max Master Flow setpoint. This results in a Malfunction. | Check the seals and master part for leaks or extend fill or test timers. Check that Max Master Flow was correctly set. |
| Master+Leak Flow<Master Flow | C8 | The flow value during the second sequence of Program Cal on the master part was less than the Max Master Flow setpoint. This results in a Malfunction. | Check the seals and master part for leaks or extend fill or test timers. Check the leak standard. Check that Max Master Flow was correctly set. |
| Master Loss<Min Master Loss | C9 | The pressure loss reading during the first test of Program Cal cycle for a pressure decay test was less than the Min Master Loss setpoint. This results in a Malfunction. | Check for blockage in the test line of part. |
| Cal Program Accept | CA | The Program Calibration was successful | |
| Calculation Error | CE | This result occurs from illegal program configurations, calculation errors when trying to convert vacuum pressures to positive pressure readings, and other occurrences. | |
| Cal Required - Limit Exceeded | CF | Not Used | |
| Charge Pressure High | CH | Charge Pressure High | |
| Charge Pressure Low | CL | Charge Pressure Low | |
| Min Perf Factor Error | CM | The Performance Factor calculated at the end of Program Cal exceeds the Minimum Performance Factor set in the Test Factors | Check that the Minimum Performance Factor was correctly set. Increase stabilize and |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| | | | test timers |
| Chamber transducer Over-Range | CO | Chamber transducer Over-Range | |
| Calibration Required-Parameters Changed | CP | The stabilization or test timers, target pressure, Leak Std Flow, or Leak Std Pressure have been changed since the last calibration and therefore the part needs to be recalibrated. There is no output resultant. | Recalibrate the instrument for this program. |
| Cal Program Reject | CR | The Program Calibration was not successful. | |
| Chamber Evacuation Fault | CX | Measured Hard Vacuum pressure did not reached the specified level.. | |
| DP Transducer Fault | DF | Not Used | |
| DP Transducer Over Range | DO | Not Used | |
| DP Transducer Zero Bad | DZ | Not Used | |
| Elec Regulator Cal Complete | EC | The Electronic Regulator Calibration was successful. | |
| Elec Regulator Cal Error | EE | The Electronic Regulator Calibration was not successful. | Check the wiring of the electronic regulator.<br>Check that the entry of each pressure calibration point was correct. |
| Part Evac Fault | EF | Part failed to reach evacuation setpoint. | |
| Instrument not enabled | EI | Instrument not enabled | |
| Prog Error | EP | There was an error with the program.<br>Contact Cincinnati Test Systems Service Dept. | |
| System Error - Service Req | ER | There was an error with the instrument<br>Contact Cincinnati Test Systems Service Dept. | |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| Chamber Pressure High | FC | Chamber Pressure High | |
| Flow Transducer Over Range | FO | The flow sensor measured a value out of its range. The instrument stopped the test sequence to prevent damage to the sensor. | |
| Error: Excessive Flow | FX | The flow sensor measured a value out of its range. The instrument stopped the test sequence to prevent damage to the sensor. | |
| Flow Transducer Zero Bad | FZ | The flow transducer was not sending the proper voltage. The instrument checks to make sure that the flow transducer is within range before the test sequence begins. | Check the flow sensor wiring. If this happens multiple times, replace the flow sensor. |
| Helium Background Fault | HF | Not Used | |
| Invalid Input configuration | IC | Invalid Input configuration | |
| Invalid Calibration Data | ID | The calibration data has been corrupted or not properly entered. Calibrate the unit again. | |
| Input initial state error | IE | Input initial state error | |
| I/O Fault | IF | I/O Fault | |
| Invalid I/O Configuration | IO | Invalid I/O Configuration | |
| Invalid Program Selected | IP | The program selected does not exist or has not been configured. | Check BCD Input programming |
| Chamber Rise Input Fault | IR | Chamber Rise Input Fault | |
| Isolation Failure | IS | Isolation Failure | |
| Chamber Crossover Input Fault | IX | Chamber Crossover Input Fault | |
| Error: Duplicate Target Link | LD | The same child program cannot be in the same link structure. If it is desired to conduct the | |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| | | same test twice you will need to copy the program. | |
| Leak Std Select Config Error | LE | Configuration Error. The instrument was not configured properly. | |
| Error: Link Execution Loop | LL | There was an error in the Linking Execution | Check programming of the Parent/Child Structures |
| Error: No Links Defined | LN | The instrument was expecting a link that did not exist | |
| Error: Dissimilar Link Order | LO | When the instrument conducts a Program Calibration sequence on linked programs, the links must execute in the same order for both the first and second sequences for Program Calibration. | |
| Error: Link Program is Parent | LP | A Parent Program may not be a link target. | |
| Error: Link Prog Undefined | LU | The linked program is undefined. | |
| Mass Spec Contamination | MC | Mass Spec Contamination | |
| Error: Part Mark Fault | MF | The part mark feedback input did not receive the input in time. | Check operation of the part marker. Check wiring of the feedback input. Check wiring of the valve to fire the part marker. |
| Man Fill Switch | MS | Man Fill Switch | |
| No Event Occurred | NE | In a test that is looking for an event, this is the result when one does not occur. | |
| Atmospheric Pressure Complete | OC | Atmospheric Pressure Complete | |
| Atmospheric Pressure Error | OE | Atmospheric Pressure Error | |
| Above Target | PA | The instrument will stop conducting a test if the | Check pressure regulator |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| Pressure | | pressure rises above the target pressure window setting. | setting, cut seals, bad parts, or tooling control pressure by testing with master part |
| Below Target Pressure | PB | The instrument will stop conducting a test if the pressure drops below the target pressure window setting. | Check pressure regulator setting, cut seals, bad parts, or tooling control pressure by testing with master part |
| Part Not Changed | PC | The present input signal did not go low between tests to indicate that the part was removed from the fixture after the last test. This results in a Malfunction. | Remove the part after each test. |
| Part Configuration Error | PE | Required digital inputs and outputs to support the test type are not defined. | Define each of the required outputs. |
| Part Not Full | PF | This is an error in the Auto Setup Sequence that can occur if the instrument fails to fill the part to the desired pressure. | |
| Test Pressure Low | PL | Test pressure was below Minimum Pressure during fill cycle. This results in a severe leak. | |
| Test Pressure High | PH | Test pressure was above the Maximum Pressure during fill or stabilization cycles resulting in a Malfunction | Check pressure regulator setting and tooling control pressures |
| Error: Part Not Present | PP | The part present input is set for the active program and the input was not received. | Check the part presence sensor and input wiring |
| Power Reset | PR | Power Reset | |
| Part Not Stabilized | PS | This is an error in the Auto Setup Sequence that can occur if the instrument fails to stabilize the part. | |
| Process Fault | PV | Process Fault | |
| Part Not Exhausted | PX | This is an error in the Auto Setup Sequence that can occur if the instrument fails to exhaust the part. | |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| Sequence Complete | QC | Sequence Complete | |
| Program Reject | R | Program evaluation was not successful, for multiple tests – if any test fails, the part is rejected | |
| Part Reject - Level 1 | R1 | Not Used | |
| Part Reject - Level 2 | R2 | Not Used | |
| Part Reject - Level 3 | R3 | Not Used | |
| Chamber Rise Fault | RF | Measured Hard Vacuum Chamber pressure has risen above the Chamber Rise Fault pressure during test. | |
| Pre-Pressure High | RH | Pre-Pressure High | |
| Pre-Pressure Low | RL | Pre-Pressure Low | |
| Source Pressure Exceeded | RX | The source pressure set by the factory on the hardware configuration menu was exceeded. | |
| Stop Button Pressed | SB | The stop button or input was received | |
| Start Common Input Low | SC | Not Used | |
| Pressure Select Config Error | SE | Configuration Error. The instrument was not configured properly. | Check configuration of each pressure source. |
| Self-Test Failed | SF | The Self-Test failed | Make sure the test line was removed and the test port plugged before the test was conducted. One of the internal valves may be leaking. |
| Error: Stop Input High | SH | The instrument cannot start a test if the Stop input is high. | |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| Stop Input Received | SI | Stop Input Received. | |
| Severe Leak | SL | Severe Leak indicates the test process did not achieve Minimum Pressure before reaching the Prefill setpoint or failed to maintain Minimum Pressure during fill or Stabilization timers. This results in a Program Reject. | Check pressure regulator setting, cut seals, bad parts, or tooling control pressure by testing with master part |
| Sniffer Mode Mismatch | SM | The Sniffer Mode does not match the TracerMate instrument configuration. | Check that mode configuration settings on both the TracerMate and the leak detector are compatible. |
| Sniffer Not Ready | SN | Sniffer Not Ready | Check the RS232 cable. Check Sniffer Type configuration. Check baud rate and port configuration. |
| Self-Test Passed | SP | Self-Test process indicates no internal leak | |
| Sniffer Not Ready Input Fault | SR | Sniffer Not Ready Input Fault | |
| Sniffer Type Mismatch | ST | The Test Part is configured for a different Sniffer Type than expected. | Confirm Sniffer Type configured in Global Config / RS232 1 / Sniffer Type and in Sniffer / Part Sniffer Type. |
| Sniffer Units Mismatch | SU | The Leak Detector configuration for Unit type does not match the TracerMate instrument configuration. | Check that tracer leak rate unit configurations match on TracerMate and leak detector. |
| System Pressure Exceeded | SX | The system pressure of the unit was exceeded. | Confirm the pressure sources are configured correctly, and that previously run tests have not left the manifold in a |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| | | | pressurized state |
| T-Gas Background Fault | TB | The measured leak rate from the leak detector is above the maximum allowed tracer gas background level. | Take steps to reduce background tracer gas level. Adjust the Background limit to a higher value. |
| T-Gas Chamber Cleanup Fault | TC | The measured leak rate from the leak detector is above the maximum allowed during the Chamber Cleanup segment. | Remove tracer gas contamination from chamber. Adjust setpoint to higher value. |
| Tooling Not Reset | TE | If a tooling error occurs involving any motions, there will be a tooling error. Before the start of the next test, the tooling needs to be reset by the Stop/Reset input. This results in a Malfunction. | Push the Stop/Reset Input and possibly Common to return the tooling to the Start position. |
| T-Gas Part Fill Fault | TF | T-Gas Part Fill Fault | |
| Error: Two-Input Req to Start | TI | Both Start Test and Common must go high to start a test. | |
| T-Gas Leak Std Fault | TL | T-Gas Leak Std Fault | |
| T-Gas Min Leak Rate Fault | TM | The measured leak rate from the leak detector is below the minimum allowed for the test to continue. | Confirm the leak rate reported by the leak detector is accurate. See the Min T-Gas Mode description for other adjustment options. |
| Test Port Select Config Error | TP | The instrument configuration is not correct. | |
| Error: Tooling not Retracted | TR | The instrument may not start a sequence if all of the tooling is not retracted. | |
| Tooling Reset | TS | Most tooling errors or some test errors may require a tooling reset with the Stop/Reset input. After completion of the reset, this | |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| | | message appears. | |
| Error: Tooling not Extended | TX | If the instrument is configured for tooling feedback this error will occur if the tooling feedback input is not received within the time allocated. | Check feedback sensor and input wiring. Make sure the tooling motion feedback timer is set properly. |
| Valve Load Fault | VF | Valve Load Fault | |
| Weight Above Max | WA | Part Weight during part evaluation is above maximum. | Part Weight during part evaluation is above maximum. |
| Weight Below Min | WB | Part Weight in part evaluation is below minimum. | Part Weight in part evaluation is below minimum. |
| Scale Config Error | WC | The Test Part is configured for a different Scale Type than expected. | Confirm Scale Type configured in Global Config / RS232 1 / Scale Type and in Weight / Scale Type. |
| Scale Weight High | WH | The refrigerant source weight is above the minimum required starting weight. | Check refrigerant source container. |
| Scale Weight Low | WL | The refrigerant source weight is below the minimum required starting weight. | Check refrigerant source container. |
| Scale Not Ready | WR | The external Weigh Scale is not responding to communication requests from the TracerMate Instrument. | Check the RS232 cable. Check Scale Type configuration. Check baud rate and port configuration. |
| Scale Not Stable | WS | Scale weight not stable. | Check scale. |
| Vent Part Reset Tooling | VR | Message sent when retain part pressure and tooling are both configured to be used. This message is sent upon a reset. | |
| Transducer Cal Complete | XC | The transducer calibration is complete and was successful. | |
| Transducer Cal Error | XE | There was an error when trying to calibrate the transducer | Check transducer wiring |

| Message | Code | Description | Corrective Actions |
|---|---|---|---|
| Pressure Transducer Fault | XF | Not used | |
| External Switch did not go high | XH | The External Pressure Switch input did not go high before the end of the fill timer. This results in a Malfunction. | Check the pressure switch. Make sure that the path to the pressure switch is not blocked. |
| External Switch did not go low | XL | The External Pressure Switch input did not go low between tests. This results in a Malfunction. | Check pressure switch to make sure it is functioning. |
| Transducer Over Range | XO | During the testing process the pressure exceeded the range of the transducer. This results in a Malfunction. | Check the pressure regulator setting |
| Transducer Verify Complete | XV | The transducer verification sequence is complete. | |
| Transducer Zero Bad | XZ | The pressure transducer's atmospheric pressure reading at the beginning of the testing cycle is outside of tolerance. This results in a Malfunction. | Perform transducer calibration routine in Self-Test |

# Appendix B - Environmental Drift Correction

*In this appendix you will understand the theory and parameters for implementing the Environmental Drift Correction feature.*

## How it works

***The environmental drift correction routine helps to maintain the calibration of the system by continuously monitoring and calculating a correction factor for changes in the test conditions. This routine dynamically compensates for slow changes in the test environment like room temperature changes, part temperature changes, test air temperature changes, part elasticity changes, part absorption characteristics, etc. These factors influence the dynamics of how the test part reacts to the testing process and the determination of the leak rate. " Environmental Drift Correction" defines how wide of a band around the Master Part Loss or Master Part Flow value will be considered as normal variations in flow rate for a non-leaking part. The " Environmental Drift Correction (+EDC %) is based on High Limit. The instrument continuously calculates a running average of test results that fall within the band (EDC %) about the original non-leaking master part curve. It corrects each future result by the calculated drift determined from previous test results. The drift value is calculated as shown.***

$$Environmental\ Drift\ Correction\ = \frac{\Sigma n\ Flow}{n} - \text{“}Master\ Part\ Flow\text{”}$$

Typical settings for "Environmental Drift Correction" are 10, 25, 50, and 90%. The sample size is set as EDC quantity (3 or greater). Flexible parts require a greater "Environmental drift correction" than rigid parts.

The "Environmental Drift Correction" effectively defines how much shift can occur. This limits the routine from continuing to compensate for possible growing leaks in the seal or test pneumatics.

| TST Parameter | Description | User Display Mode |
|---|---|---|
| EDC Enable | Enables Environmental Drift Compensation | Advanced, Admin |
| EDC Percentage | Defines the band about the master part curve where test values are saved to calculate EDC drift. Set as a percentage of the High Limit parameter. | Advanced, Admin |
| EDC Quantity | Defines the number of test results within the EDC band used to calculate drift. | Advanced, Admin |

# Appendix C – Leak Detector Support

| LEAK DETECTOR | TracerMate II Device Type | Initial Version | Reference Page |
|---|---|---|---|
| **Inficon P3000** | LD-1001 | (CS) 101 | *218* |
| **Pfeiffer ASM142** | LD-1003 | (CS) 101 | *220* |
| **Inficon ISH2000**<br>**Adixen ASH2000**<br>**Sensistor H2000**<br>**Sentrac** | LD-1002 | (CS) 101 | *222* |
| **Agilent VS-MR15** (Varian) | LD-1011 | (CS) 101 | *224* |
| **Inficon LDS2010** | LD-1009 | (CS) 107 | *225* |
| **Pfeiffer ASI20** | LD-1006 | (CS) 103 | *227* |
| **Agilent PHD4** | LD-1005 | (CS) 107 | *230* |
| **Pfeiffer ASI30** | LD-1007 | (CS) 106 | *229* |
| **Agilent VS-C15** (Varian) | LD-1014 | (CS) 104 | *232* |
| **Inficon HLD5000** | LD-1013 | (CS) 103 | *233* |
| **Licor LI-7000** | LD-1015 | (CS) 108 | *235* |
| **Inficon LDS3000** | LD-1009 | (CS) 108 | *237* |
| **Pfeiffer 182T** | LD-1003 | (CS) 108 | *220* |
| **Oerlikon Leybold PhoeniXL300** | LD-1016 | (CS) 114 | *239* |
| **Pfeiffer ASM340** | LD-1003 | (CS) 119 | *220* |
| **VIC MD-490S** | LD-1017 | (CS) 123 | *241* |
| **Inficon E3000** | LD-1010 | (CS) 128 | *242* |
| **Ulvac Heliot900** | LD-1018 | (TM II) 206 | *244* |
| **Pfeiffer ASM306S** | LD-1003 | (TM II) 206 | *220* |

| WEIGHT SCALE | TracerMate II Device Type | Initial Version | Reference Page |
|---|---|---|---|
| **Ohaus 3000** | WS-1001 | (CS)106 | ***Error! Bookmark not defined.*** |

# Inficon P3000

## Serial Interface Cable

The cable used for the P3000 is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | | P3000 |
|---|---|---|---|
| DB9-Female pins | | DB9-Male pins | |
| RX | 2----------2 | TX | |
| TX | 3----------3 | RX | |
| GND | 5----------5 | GND | |

Neither the TracerMate instrument nor leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | Inficon P3000 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Inficon P3000 |
| Sample Gas Number | 1-4 to set the P3000 gas selection (default=1) |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for P3000 display and communication. |

## Leak Detector Configuration

INTERFACES menu:

| | |
|---|---|
| Control location: | Local and RS232 |

RS232 Protocol: ASCII
Baud Rate & End Sign: 9600 baud, CR+LF

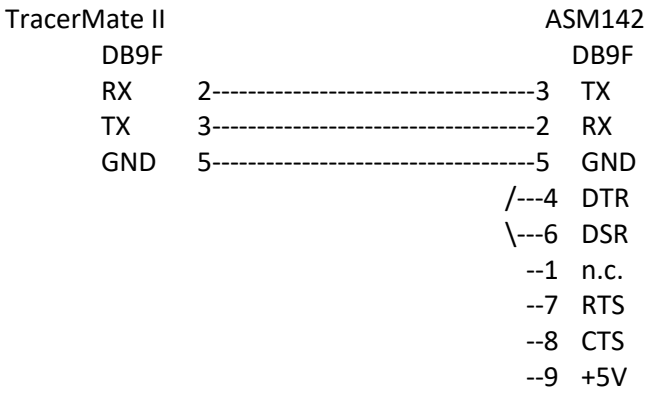
## Operational Notes

1. If the P3000 is in Standby Mode at start of test the TracerMate II sends a wakeup command to the sniffer. The sniffer takes a few seconds to wake up before becoming ready for test. The length of the Sniff Init timer must be long enough to accommodate this wakeup time. The default TracerMate II setting is 5.5 and is usually sufficient.
2. The TracerMate II controls the P3000 settings for Gas Number and Leak Rate Units during test. On the TracerMate II, use the Sample Gas Number and Leak Det Units to control the settings on the sniffer that will be used. The sniffer's built-in display will change to show the selected gas number and units.
3. The P3000 automatically zeroes its internally leak rate measurement at unpredictable intervals. To prevent this from occurring during a sample time while testing, the TracerMate II sends a Zero command to the P3000 during the Cleanup segment. After the measured leak rate from the P3000 is below the TracerMate II Background Limit, the TracerMate II waits expiration of the Dev Zero Delay timer and then sends a *ZERO command to the P3000. This feature is enabled by default but may be disabled using the Device Zero parameter in the Sniffer Menu.

# Adixen ASM 142 / Adixen ASM 182T

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines. This drawing shows the minimum requirements for a hand-built cable:




The ASM142 expects DTR and DSR to be connected on its end of the cable. A standard null-modem cable normally does this. ASM142 supports both software and hardware handshaking. The TracerMate II does not use handshaking signals, so whether the connections are present in the cable does not matter.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 Interface | Leak Detector |
| Device Type | Adixen ASM142 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Adixen ASM142 |
| Device Mode | HardVac Mode or Sniffer Mode to match sniffer configuration |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit/Precision | desired display leak rate units – unit used for TracerMate II display/streaming |
| Leak Det Unit/Precision | desired leak detector unit – same units as configured on the LD |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Must be set to RS232-Advanced Mode.
2. Set the leak detector's Handshaking options to NONE.
3. Set leak rate units as desired – must match the TracerMate II "Leak Det Unit".

The Sniffer's serial interface is fixed at 9600/8/n/1.

# Inficon ISH2000 / Adixen ASH2000 / Sensistor H2000 / Sensistor Sentrac

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines.

| TracerMate II DB9-Female pins | | ASH2000 DB9-Female pins |
|---|---|---|
| RX | 2----------3 | TX |
| TX | 3----------2 | RX |
| GND | 5----------5 | GND |

Neither device uses the RS232 hardware handshaking control signals. If these connections are present in the cable they are ignored.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | Adixen ASH2000 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Adixen ASH2000 |
| Min T-Gas Mode | Disabled (the LD always reports 0.0 until a minimum threshold is exceeded) |

CHANNEL CONFIG – UNITS menu:

(if Channel Config "Unit/Prec Define" is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set units value to match the Leak Detector units (and see note below). |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. General Settings / Printer Port = Analysis Data Output. Using the other modes will cause the leak detector to generate unwanted messages.
2. Test Port = Analysis Mode.

3. Leak Rate Units – The Leak Rate Unit displayed on the ASH2000 Leak Detector is simply a text string. It is not involved in any calculations and is not communicated to the TracerMate II. The relationship between the numeric value displayed on the LD and the actual leak concentration is determined by the "Calibration Coefficient" obtained during the ASH2000 calibration procedure. Set the Leak Rate Units on the ASH2000 and TracerMate II "Leak Det Unit" to the same units as the calibration reference.
4. The LD's serial output is fixed at 9600/8/n/1.

## Operational Notes

1. The Leak Detector does not report its Leak Rate Units setting over the serial interface. Only the numeric value of the leak is reported to the TracerMate II. If the units on TracerMate II and ASH2000 do not match no fault is generated.
2. The Leak Detector's accuracy is heavily influenced by its setting for "Leak Alarm Level". The LD's internal calculations are based on this value and affect both accuracy of the measurement and recovery time between measurements. Refer to the leak detector user manual's Description of Parameters for the recommended settings of this and other LD variables.
3. The Adixen ASH 2000 has been tested only with the default probe that is supplied with the unit. Additional optional probes are available that allow probe specific programming of the Adixen unit for additional functionality. Use of these probes might result in changes affecting the communication protocol, and would need additional testing and possibly require TracerMate II firmware changes.

# Agilent VS-MR15

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines. This drawing shows the minimum requirements for a hand-built cable:

| TracerMate II | | VS-MR15 |
|---|---|---|
| DB9F | | DB9F |
| RX | 2----------3 | TX |
| TX | 3----------2 | RX |
| GND | 5----------5 | GND |

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 Interface | Leak Detector |
| Device Type | Agilent VS-MR15 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Agilent VS-MR15 |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit/Precision | desired display leak rate units – unit used for TracerMate II display/streaming |
| Leak Det Unit/Precision | desired leak detector unit – same units as configured on the LD |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Set Leak Rate Units – must match the TracerMate II “Leak Det Unit”.

# Inficon LDS2010

## Serial Interface Cable

The cable used for the LDS2010 is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | LDS2010 |
|---|---|---|
| DB9-Female pins | | DB9-Male pins |
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | Inficon LDS2010 |
| RS232 2 Baud | 19200/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Inficon LDS2010 |
| Device Mode | Sniffer Mode/HardVac Mode (*see below) |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for LDS2010 communication. |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Set Control Location for RS232.
2. Set for ASCII protocol.
3. Set leak rate units to match the TracerMate II Leak Det Unit parameter.

## Operational Notes

1. The TracerMate II Device Mode parameter controls whether or not the TracerMate II sends *START and *STOP commands to the LDS3000 during test. If set to Sniffer Mode the commands are not sent. In HardVac Mode the *START command is sent during the Sniff Init segment, and the *STOP command is sent at the end of the test cycle.

# Adixen ASI20

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines. This drawing shows the minimum requirements for a hand-built cable:

| TracerMate II | | ASI20 |
|---|---|---|
| DB9F | | DB9F |
| RX | 2----------3 | TX |
| TX | 3----------2 | RX |
| GND | 5----------5 | GND |

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 Interface | Leak Detector |
| Device Type | Adixen ASI20 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Adixen ASI20 |
| Device Mode | HardVac Mode or Sniffer Mode to match sniffer configuration |

CHANNEL CONFIG – UNITS menu:

(if Channel Config "Unit/Prec Define" is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit/Precision | desired display leak rate units – unit used for TracerMate II display/streaming |
| Leak Det Unit/Precision | desired leak detector unit – same units as configured on the LD |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Set Advanced -> Input/Output -> Serial Link #1 -> RS232
2. Set COM Serial Port Mode: ADVANCED
3. Set COM Serial Port handshake: NONE

4. Leak Rate Units – must match the TracerMate II “Leak Det Unit”.

# Adixen ASI30

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines. This drawing shows the minimum requirements for a hand-built cable:

| TracerMate II | | ASI30 |
|---|---|---|
| DB9F | | DB9F |
| RX | 2----------3 | TX |
| TX | 3----------2 | RX |
| GND | 5----------5 | GND |

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 Interface | Leak Detector |
| Device Type | Adixen ASI30 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Adixen ASI30 |
| Device Mode | HardVac Mode or Sniffer Mode to match sniffer configuration |

CHANNEL CONFIG – UNITS menu:

(if Channel Config "Unit/Prec Define" is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit/Precision | desired display leak rate units – unit used for TracerMate II display/streaming |
| Leak Det Unit/Precision | desired leak detector unit – same units as configured on the LD |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Set Advanced -> Input/Output -> Serial Link #1 -> RS232
2. Set COM Serial Port Mode: ADVANCED
3. Set COM Serial Port handshake: NONE
4. Leak Rate Units – must match the TracerMate II "Leak Det Unit".

# Agilent PHD-4

## Serial Interface Cable

The cable used for the Agilent PHD-4000 is a custom cable. The DB15 connector on the PHD-4 contains several signals unrelated to the serial port, so it is important that only the 3 pins used by the RS232 interface be connected on the DB15:

| TracerMate II - DB9F | PHD-4 - DB15M(VGA) |
|---|---|
| RX – 2 – BLK | TX – 2 – GRN |
| TX – 3 – RED | RX – 3 – BLU |
| GND – 5 – BRN | GND – 5 – BLK |

For reference, pinout of the DB15 on the PHD4:

| | |
|---|---|
| 1 | Analog out (+) |
| 2 | RS232 TX |
| 3 | RS232 RX |
| 4 | Remote IN |
| 5 | RS232 GND |
| 6 | Analog out (-) |
| 11 | Relay 1 N.O. |
| 12 | Relay 2 N.O. |
| 13 | Relay 3 N.O. |
| 14 | Relay 4 N.O. |
| 15 | Relay common |

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:
Display User Level Admin

GLOBAL CONFIG – RS232_2 menu:
RS232 2 Interface Leak Detector
Device Type Agilent PHD4
RS232 2 Baud 9600/8N1/none

PROGRAM CONFIG – TEST TYPE menu
Test Type: Sniffer

PROGRAM CONFIG – SNIFFER menu:
Part Config Type Agilent PHD4

CHANNEL CONFIG – UNITS menu:
(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)
Leak Rate Unit Set desired leak rate units for TracerMate II display/streaming data.

| | |
|---|---|
| Leak Det Unit | Must be set to PPM. (*see note 3 below) |

## Leak Detector Configuration

1. Set Communications -> Remote Control -> RS232 Control
2. Set Communications -> Baud Rate -> 9600
3. Set Option -> Unit Measurement -> to match TracerMate II Leak Rate Units (TracerMate II display units). To avoid confusion the TracerMate II display and the sniffer display should be set to the same units. However, the PHD4 uses PPM for its communication interface regardless of the display setting - so the TracerMate II Leak Rate Unit must be PPM.
4. Setup -> Pump On checkbox must be turned on.

# Agilent VS-C15

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines. This drawing shows the minimum requirements for a hand-built cable:

| TracerMate II | | VS-C15 |
|---|---|---|
| DB9F | | DB9F |
| RX | 2----------3 | TX |
| TX | 3----------2 | RX |
| GND | 5----------5 | GND |

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 Interface | Leak Detector |
| Device Type | Agilent VS-C15 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Part Config Type | Agilent VS-C15 |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Inficon P3000 |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit/Precision | desired display leak rate units – unit used for TracerMate II display/streaming |
| Leak Det Unit/Precision | desired leak detector unit – same units as configured on the LD |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Set Leak Rate Units – must match the TracerMate II “Leak Det Unit”.

# Inficon HLD5000

## Serial Interface Cable

The cable used for the HLD5000is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | HLD5000 |
|---|---|---|
| DB9-Female pins | | DB9-Male pins |
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | Inficon HLD5000 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Inficon HLD5000 |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | desired leak detector unit – same units as configured on the LD. |

## Leak Detector Configuration

Set up the HLD5000 configuration parameters using its menu interface:

1. Set Options -> RS232 -> Protocol to Normal.
2. Set Options -> RS232 -> Baud Rate to 9600.
3. Set Leak Units to match the TracerMate II Leak Det Units parameter.

## Operational Notes

1. User must wake the device from standby mode manually by moving the probe. The wakeup command may be enabled in a later TracerMate II version.

# Licor LI-7000

## Serial Interface Cable

The cable used for the LI-7000 is a standard Null-Modem cable with female DB9 connector at both ends. This cable swaps the Rx and Tx lines.

| TracerMate II | | | LI-7000 |
|---|---|---|---|
| DB9-Female pins | | | DB9-Female pins |
| RX | 2----------3 | | TX |
| TX | 3----------2 | | RX |
| GND | 5----------5 | | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | Licor LI7000 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Licor LI7000 |
| Sample Gas Number | 1=CO2A, 2=CO2B, 3=CO2D (differential) (*see notes below) |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for P3000 display and communication. |

## Leak Detector Configuration

Baud Rate is fixed at 9600 baud.

## Operational Notes

1. The Licor LI-7000 documentation refers to Cell A as the Reference Cell and Cell B as the Sample Cell. This is important if measuring in differential mode since the LD will calculate the differential measurement as LeakDiff = (CellB – CellA). If using differential mode measurements, always connect Cell A as the reference gas and Cell B as the sample gas.

# Inficon LDS3000

## Serial Interface Cable

The cable used for the LDS3000 is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | LDS3000 |
|---|---|---|
| DB9-Female pins | | DB9-Male pins |
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | LDS2010/3000 |
| RS232 2 Baud | 19200/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | LDS2010/3000 |
| Device Mode | Sniffer Mode/HardVac Mode (*see below) |
| Sample Gas Number | 2 = Hydrogen, 4 = Helium |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for LDS3000 communication. |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Set for LDS2010 compatibility Mode.
2. Set for ASCII protocol.

3. Set leak rate units to match the TracerMate II Leak Det Unit parameter.
4. (Some menu/configuration changes on the LD may require a reboot of the device to take effect)

## Operational Notes

1. The TracerMate II Device Mode parameter controls whether or not the TracerMate II sends *START and *STOP commands to the LDS3000 during test. If set to Sniffer Mode, the commands are not sent. In HardVac Mode the *START command is sent during the Sniff Init segment, and the *STOP command is sent at the end of the test cycle.
2. A firmware upgrade will change existing tests using LDS2010/3000 to Gas Number = 1 and Device Zero = Disabled. The Gas Number will need to be changed according to the tracer gas in use for the particular leak detector (4 for Helium, 2 for Hydrogen).

# Oerlikon Leybold PhoeniXL300

## Serial Interface Cable

The cable used for the PhoeniXL300is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | XL300 |
|---|---|---|
| DB9-Female pins | | DB9-Male pins |
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | PhoeniXL300 |
| RS232 2 Baud | 19200/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Advanced Hard Vacuum / Basic Hard Vacuum / Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | PhoeniXL300 |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for PhoeniXL300communication. |

## Leak Detector Configuration

Set up the sniffer configuration parameters using its menu interface:

1. Menu -> Settings -> Interface Menu -> Control Location = either “Local and RS232” or “RS232”.
2. Menu -> Settings -> Interface Menu -> RS232 -> Baud & End Sign = 19200, CR+LF
3. Menu -> Settings -> Interface Menu -> RS232 -> RS232 Protocol = ASCII
4. Menu -> Settings -> Interface Menu -> RS232 -> Data Parity Stop = 8 N 1

5. Menu -> Settings -> Interface Menu -> RS232 -> Remote 1 / 2 Protocol = Automatic
6. Menu -> Trigger & Alarms -> Units -> Leak Rate = set to match units selected on TracerMate II
7. Menu -> Mode = Vacuum or Sniff

## Operational Notes

1.

# VIC MD-490S

## Serial Interface Cable

The serial cable is a standard NULL-MODEM cable with a female DB9 connector at each end. This cable swaps the Rx and Tx lines.

| TracerMate II | | ASH2000 |
|---|---|---|
| DB9-Female pins | | DB9-Female pins |
| RX | 2----------3 | TX |
| TX | 3----------2 | RX |
| GND | 5----------5 | GND |

Neither device uses the RS232 hardware handshaking control signals. If these connections are present in the cable they are ignored.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | VIC MD-490S |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | VIC MD-490S |

CHANNEL CONFIG – UNITS menu:

(if Channel Config “Unit/Prec Define” is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set units value to match the Leak Detector units. |

# Inficon E3000

## Serial Interface Cable

The cable used for the E3000 is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | E3000 |
|---|---|---|
| DB9-Female pins | | DB9-Male pins |
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | Inficon E3000 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | Inficon E3000 |
| Sample Gas Number | 1-4 to set the E3000 gas selection (default=1) |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for E3000 display and communication. |

## Leak Detector Configuration

INTERFACES menu:

| | |
|---|---|
| Control location: | Local and RS232 |
| RS232 Protocol: | ASCII |
| Baud Rate & End Sign: | 9600 baud, CR+LF |

## Operational Notes

1. The TracerMate II controls the E3000 settings for Gas Number and Leak Rate Units during test. On the Tracermate II, use the Sample Gas Number and Leak Det Units to control the settings on the sniffer that will be used. The sniffer's built-in display will change to show the selected gas number and units.

# ULVAC Heliot900

## Serial Interface Cable

The required RS232 cable for the ULVAC Heliot900 is straight through with female DB9s on both ends. This cable does not swap the Rx and Tx lines. (Note this is NOT a standard F-F Null-Modem cable, which swaps Rx and Tx lines).

| TracerMate II DB9-Female pins | | Heliot900 DB9-Female pins |
|---|---|---|
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the leak detector uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either of the serial ports on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Leak Detector |
| Device Type | ULVAC Heliot900 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Sniffer |

PROGRAM CONFIG – SNIFFER menu:

| | |
|---|---|
| Part Config Type | ULVAC Heliot900 |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Leak Rate Unit | Set desired leak rate units for TracerMate II display/streaming data. |
| Leak Det Unit | Set desired leak detector unit for E3000 display and communication. |

## Leak Detector Configuration

SERIAL COMM./EXT I/O:

| | |
|---|---|
| CONTROL: | SERIAL COMM. |
| COMPATIBILTY: | NONE |
| SERIAL COMM.: | RS232C |
| PRINTER: | OFF |

RS232C BAUD RATE: 9600

# Ohaus 3000

## Serial Interface Cable

The cable used for the Ohaus 3000 scale interface is a standard straight-through Modem cable with a male DB9 connector at one end and female DB9 at the other. This cable does not swap the Rx and Tx lines. (Note this is not a Null-Modem cable, which swaps Rx and Tx lines and has female connectors on both ends).

| TracerMate II | | Ohaus 3000 |
|---|---|---|
| DB9-Female pins | | DB9-Male pins |
| RX | 2----------2 | TX |
| TX | 3----------3 | RX |
| GND | 5----------5 | GND |

Neither the TracerMate II nor the scale uses the hardware handshake lines so these are not required. If these connections are present in the cable, they are unused.

## TracerMate II Configuration

Either serial port on the TracerMate II can be used but TracerMate II Global Config must be configured to use the correct port. If the RS232_1 is configured for the leak detector the vertical serial connector is used. If the RS232_2 is configured use the horizontal connector.

GLOBAL CONFIG – MISC menu:

| | |
|---|---|
| Display User Level | Admin |

GLOBAL CONFIG – RS232_2 menu:

| | |
|---|---|
| RS232 2 Interface | Weigh Scale |
| Device Type | Ohaus 3000 |
| RS232 2 Baud | 9600/8N1/none |

PROGRAM CONFIG – TEST TYPE menu

| | |
|---|---|
| Test Type: | Refrigerant Fill |

PROGRAM CONFIG – WEIGHT menu:

| | |
|---|---|
| Part Config Type | Ohaus 3000 |

CHANNEL CONFIG – UNITS menu:

(if Chan Config Unit/Prec Define is set to Program, use the PROGRAM CONFIG – UNITS menu instead)

| | |
|---|---|
| Weight Unit | Set desired weight units for TracerMate II display and communication. |

## Leak Detector Configuration

1. Use Factory default settings.

# Appendix E - Communication Code Tables

Each table can be generated within the communications interface by providing the associated command denoted.

## Data Type or Header Codes

Type "TABLE HEADER"

| | Data Type Code | Description |
|---|---|---|
| 1 | V | Variable Edit |
| 2 | L | List |
| 3 | M | Message |
| 4 | Q | Result List |
| 5 | T | Streaming Started |
| 6 | S | Streaming Value |
| 7 | X | Streaming Stopped |
| 8 | R | Result Value |

## Program Evaluation Codes

Type "TABLE RESULT"

| | Program Evaluation Code | Description |
|---|---|---|
| 1 | P | TEST PASSED |
| 2 | F | TEST FAILED |
| 3 | E | TEST ERROR |
| 4 | S | TEST SKIPPED |
| 5 | X | TEST FAILED - LEVEL 1 |
| 6 | Y | TEST FAILED - LEVEL 2 |
| 7 | Z | TEST FAILED - LEVEL 3 |
| 8 | M | AUTO-CAL MASTER PART |
| 9 | L | AUTO-CAL LEAK STANDARD PART |
| 10 | N | TEST FAILED - NO EVENT |
| 11 | C | TEST COMPLETE |

## Test Evaluation Codes

type "TABLE EVALUATION"

| Test Eval Code | Description |
|---|---|
| A | PROGRAM ACCEPT |
| AC | AUTOSETUP SEQ COMPLETE |
| AF | PROGRAM CALIBRATION FAILED |
| AL | MASTER+LEAK PART COMPLETE |
| AM | MASTER PART COMPLETE |
| AP | PROGRAM CALIBRATION PASSED |
| AT | ERROR: ANTI-TIE DOWN |
| BR | ERROR: BARCODE REQ TO START |
| C1 | MASTER+LEAK LOSS<MASTER LOSS |
| C2 | MASTER LOSS>MAX M+L LOSS |
| C3 | MASTER+LEAK LOSS>MAX M+L LOSS |
| C4 | MASTER FLOW>MAX M+L FLOW |
| C5 | MASTER FLOW<MIN MASTER FLOW |
| C6 | MASTER+LEAK FLOW>MAX M+L FLOW |
| C7 | MASTER FLOW>MAX MASTER FLOW |
| C8 | MASTER+LEAK FLOW<MASTER FLOW |
| C9 | MASTER LOSS<MIN MASTER LOSS |
| CA | CAL PROGRAM ACCEPT |
| CE | CALCULATION ERROR |
| CF | CAL REQUIRED - LIMIT EXCEEDED |
| CH | CHARGE PRESSURE HIGH |
| CL | CHARGE PRESSURE LOW |
| CM | MIN PERF FACTOR ERROR |
| CO | CHAMBER XDCR OVER-RANGE |
| CP | CAL REQUIRED - PARAM CHANGED |
| CR | CAL PROGRAM REJECT |
| CX | CHAMBER EVACUATION FAULT |
| DF | DP TRANSDUCER FAULT |
| DO | DP TRANSDUCER OVER-RANGE |
| DZ | DP TRANSDUCER ZERO BAD |
| EC | ELEC REGULATOR CAL COMPLETE |
| EE | ELEC REGULATOR CAL ERROR |
| EF | PART EVAC FAULT |
| EI | ERROR: INSTRUMENT NOT ENABLED |
| EP | PROG ERROR |
| ER | SYSTEM ERROR - SERVICE REQ |
| F1 | CLAM FLOW FAULT 1 |
| F2 | CLAM FLOW FAULT 2 |

| Test Eval Code | Description |
|---|---|
| F3 | CLAM FLOW FAULT 3 |
| F4 | CLAM FLOW FAULT 4 |
| F5 | CLAM FLOW FAULT 5 |
| FC | CHAMBER PRESSURE HIGH |
| FO | FLOW TRANSDUCER OVER-RANGE |
| FX | ERROR: EXCESSIVE FLOW |
| FZ | FLOW TRANSDUCER ZERO BAD |
| HF | HELIUM BACKGROUND FAULT |
| IC | INVALID INPUT CONFIGURATION |
| ID | INVALID CALIBRATION DATA |
| IE | INPUT INITIAL STATE ERROR |
| IF | I/O FAULT |
| IO | INVALID I/O CONFIGURATION |
| IP | INVALID PROGRAM SELECTED |
| IR | CHAMBER RISE INPUT FAULT |
| IS | ISOLATION FAILURE |
| IX | CHAMBER CROSSOVER INPUT FAULT |
| L0 | MASTER LOSS>MAX MASTER LOSS |
| L1 | MASTER+LEAK LOSS<MIN M+L LOSS |
| L2 | LEAK LOSS<MIN LEAK LOSS |
| L3 | LEAK LOSS>MAX LEAK LOSS |
| L4 | MASTER+LEAK FLOW<MIN M+L FLOW |
| L5 | LEAK FLOW<MIN LEAK FLOW |
| L6 | LEAK FLOW > MAX LEAK FLOW |
| LD | ERROR: DUPLICATE TARGET LINK |
| LE | LEAK STD SELECT CONFIG ERROR |
| LL | ERROR: LINK EXECUTION LOOP |
| LN | ERROR: NO LINKS DEFINED |
| LO | ERROR: DISSIMILAR LINK ORDER |
| LP | ERROR: LINK PROG IS PARENT |
| LU | ERROR: LINK PROG UNDEFINED |
| MC | MASS SPEC CONTAMINATION |
| MF | ERROR: PART MARK FAULT |
| MS | MAN FILL SWITCH |
| NE | NO EVENT OCCURRED |
| OC | ATMOSPHERIC PRESSURE COMPLETE |
| OE | ATMOSPHERIC PRESSURE ERROR |
| PA | ABOVE TARGET PRESSURE |
| PB | BELOW TARGET PRESSURE |
| PC | ERROR: PART NOT CHANGED |
| PE | PROGRAM CONFIGURATION ERROR |

| Test Eval Code | Description |
|---|---|
| PF | PART NOT FULL |
| PH | TEST PRESSURE HIGH |
| PI | SNIFFER PRESENT INPUT FAULT |
| PL | TEST PRESSURE LOW |
| PP | ERROR: PART NOT PRESENT |
| PR | POWER RESET |
| PS | PART NOT STABILIZED |
| PV | PROCESS FAULT |
| PX | PART NOT EXHAUSTED |
| QC | SEQUENCE COMPLETE |
| R | PROGRAM REJECT |
| R1 | PART REJECT - LEVEL 1 |
| R2 | PART REJECT - LEVEL 2 |
| R3 | PART REJECT - LEVEL 3 |
| RF | CHAMBER RISE FAULT |
| RH | PRE-PRESSURE HIGH |
| RL | PRE-PRESSURE LOW |
| RX | SOURCE PRESSURE EXCEEDED |
| S1 | LD ZERO < MIN |
| S2 | LD ZERO > MAX |
| S3 | LD LEAK < MIN |
| S4 | LD LEAK > MAX |
| SB | STOP BUTTON PRESSED |
| SC | START COMMON INPUT LOW |
| SE | PRESSURE SELECT CONFIG ERROR |
| SF | SELF-TEST FAILED |
| SH | ERROR: STOP INPUT HIGH |
| SI | STOP INPUT RECEIVED |
| SL | SEVERE LEAK |
| SM | SNIFFER MODE MISMATCH |
| SN | ERROR: SNIFFER NOT READY |
| SP | SELF-TEST PASSED |
| SR | SNIFFER READY INPUT FAULT |
| ST | SNIFFER TYPE MISMATCH |
| SU | SNIFFER UNITS MISMATCH |
| SX | SYSTEM PRESSURE EXCEEDED |
| TB | T-GAS BACKGROUND FAULT |
| TC | T-GAS CHAMBER CLEANUP FAULT |
| TE | ERROR: TOOLING NOT RESET |
| TF | T-GAS PART FILL FAULT |
| TI | ERROR: TWO-INPUT REQ TO START |

| Test Eval Code | Description |
|---|---|
| TL | T-GAS LEAK STD FAULT |
| TM | T-GAS MIN LEAK RATE FAULT |
| TP | TEST PORT SELECT CONFIG ERROR |
| TR | ERROR: TOOLING NOT RETRACTED |
| TS | TOOLING RESET |
| TX | ERROR: TOOLING NOT EXTENDED |
| VF | VALVE LOAD FAULT |
| VR | VENT PART RESET TOOLING |
| WA | WEIGHT ABOVE MAX |
| WB | WEIGHT BELOW MIN |
| WC | SCALE CONFIG ERROR |
| WH | SCALE WEIGHT HIGH |
| WL | SCALE WEIGHT LOW |
| WR | SCALE NOT READY |
| WS | SCALE NOT STABLE |
| XC | TRANSDUCER CAL COMPLETE |
| XE | TRANSDUCER CAL ERROR |
| XF | PRESSURE TRANSDUCER FAULT |
| XH | EXT SWITCH DID NOT GO HIGH |
| XL | EXT SWITCH DID NOT GO LOW |
| XO | TRANSDUCER OVER-RANGE |
| XP | EXTERNAL XDCR PRESS |
| XV | TRANSDUCER VERIFY COMPLETE |
| XZ | TRANSDUCER ZERO BAD |

## Segment Codes

type "TABLE SEGMENT"

| | Segment Code | Description |
|---|---|---|
| 1 | %VR | Percent of Reference Volume Test |
| 2 | APC | Setup - Atmospheric Pressure Check |
| 3 | AR | Autorun Relax |
| 4 | BAL | Stabilize DP Xdcr Balance |
| 5 | CBC | Chamber - blower control |
| 6 | CC0 | Chamber - circulation off |
| 7 | CC1 | Chamber - circulation on |
| 8 | CCX | Chamber - accumulation rest |
| 9 | CE0 | Chamber - evacuate off |
| 10 | CE1 | Chamber - evacuate on |
| 11 | CHA | Exhaust - Chamber Output Rest |
| 12 | CIF | Chamber - inlet blower off |
| 13 | CIO | Chamber - inlet blower on |
| 14 | CLN | Stabilize Chamber Cleanup |
| 15 | CO0 | Chamber - outlet blower off |
| 16 | CO1 | Chamber - outlet blower on |
| 17 | CP0 | Chamber - pre-purge |
| 18 | CPC | Chamber - clamshell purge rings control |
| 19 | CPG | Chamber - Exh/Purge |
| 20 | CPO | Chamber - clamshell purge rings option |
| 21 | CPR | Chamber - clamshell purge rings rest |
| 22 | CST | Fill Clean |
| 23 | CV0 | Chamber - vent off |
| 24 | DDL | Differential Pressure Decay - Leak Rate (volume calculated) |
| 25 | DDR | Differential Pressure Decay - Rate of Pressure Loss Test (no abs pressure) |
| 26 | DLY | Delay |
| 27 | DPD | Differential Pressure Decay Test |
| 28 | DPD | Differential Pressure Decay Test (no abs pressure) |
| 29 | DPL | Differential Pressure Decay - Leak Standard Test |
| 30 | DPL | Differential Pressure Decay - Leak Standard Test (no abs pressure) |
| 31 | DPS | Setup - DP Transducer Setpoint |
| 32 | DPT | Rate of Pressure Loss Test |
| 33 | DTV | Setup - DP Transducer Verification |
| 34 | DTZ | Setup - DP Transducer Zero |
| 35 | ERA | Setup - Electronic Regulator Analyze |
| 36 | ERS | Setup - Electronic Regulator Setpoint |
| 37 | ERZ | Setup - Electronic Regulator Zero |

| | Segment Code | Description |
|---|---|---|
| 38 | ESI | Internal - Empty-Seq |
| 39 | EST | Fill Evac |
| 40 | EXE | Exhaust until Empty |
| 41 | EXH | Exhaust |
| 42 | EXP | Exhaust until Pressure |
| 43 | EXT | Tooling Motion Extend |
| 44 | FFL | Fill until Full |
| 45 | FGN | General Fill |
| 46 | FLC | Mass Flow - Leak Rate Test |
| 47 | FLL | Fill (without pressure monitoring) |
| 48 | FLR | Precice Mass Flow Test (Differential Flow) |
| 49 | FLW | Mass Flow Test |
| 50 | FRF | Fill Reference |
| 51 | FRP | Fill Ramp |
| 52 | FST | Fill Tracer |
| 53 | FTS | Setup - Flow Transducer Setpoint |
| 54 | FTV | Setup - Flow Transducer Verification |
| 55 | FTZ | Setup - Flow Transducer Zero |
| 56 | HVC | Chamber - hardvac control |
| 57 | LKC | Link Control |
| 58 | LNK | Link Decision |
| 59 | MVX | Setup - Mix Verification |
| 60 | OCC | Occlustion Test (Backpressure) |
| 61 | PLO | Pressure Loss Test |
| 62 | PLR | Pressure Decay - Leak Standard Test |
| 63 | PMK | Tooling Part Mark |
| 64 | PRC | Prefill - Charge Volume |
| 65 | PRF | Prefill/Fill |
| 66 | PRF | Prefill until Pressure |
| 67 | PRF | Proof Test |
| 68 | PRI | Internal - Pre-Seq |
| 69 | PRI | Internal - Evaluate Part Result |
| 70 | PRP | Prefill Pre-Pressure |
| 71 | PRS | Step Proof |
| 72 | PSI | Internal - Post-Seq |
| 73 | PTS | Setup - Pressure Transducer Setpoint |
| 74 | PTV | Setup - Pressure Transducer Verification |
| 75 | PTZ | Setup - Pressure Transducer Zero |
| 76 | PVF | Pressure Verify |
| 77 | RCF | Refrigerant Iso Off |
| 78 | RCX | Refrigerant REF Isolation |

| | Segment Code | Description |
|---|---|---|
| 79 | REC | Exhaust - T-Gas |
| 80 | REF | Refrigerant Fill |
| 81 | RET | Tooling Motion Retract |
| 82 | REV | Exhaust - Re-Evacuate |
| 83 | RFE | Refrigerant Evac |
| 84 | RFM | Refrigerant Manual Fill |
| 85 | RFS | Stabilize Scale |
| 86 | RFT | Refrigerant Fill |
| 87 | RFX | Refrigerant Stabilize |
| 88 | RL | Calibration Relax |
| 89 | RPS | Refrigerant Part Switch |
| 90 | RTE | Ramp to Pressure Event Test |
| 91 | RTF | Ramp to Flow Event Test |
| 92 | RTI | Ramp to Digital Input Event Test |
| 93 | RVN | Refrigerant Vent |
| 94 | SCI | Setup - Scale Init |
| 95 | SD1 | Setup - Sniffer idle |
| 96 | SDP | Stabilize Balance DP |
| 97 | SDP | Stabilize for DP |
| 98 | SFS | Stabilize Tracer |
| 99 | SGL | Fill Tracer Gross |
| 100 | SGS | Stabilize Tracer Gross |
| 101 | SI1 | Setup - Sniffer Init |
| 102 | SI2 | Setup - Sniffer Init 2 |
| 103 | SLE | Tooling Seal Extend |
| 104 | SLR | Tooling Seal Retract |
| 105 | SME | Setup - Manifold Exhaust |
| 106 | SMF | Setup - Manifold Fill |
| 107 | SMI | Setup - Manifold Isolate |
| 108 | SNF | Sniffer Test |
| 109 | SNG | Sniffer Gross Test |
| 110 | SNW | Stabilize Tracer Wait |
| 111 | SPF | Fill Step |
| 112 | SPL | Setup - Pressure Select |
| 113 | SPR | Setup - Pre-Seq |
| 114 | SPS | Setup - Post-Seq |
| 115 | SSD | Stabilize Step Dwell |
| 116 | SSR | Setup - Set Regulator |
| 117 | STE | Stabilize Evac |
| 118 | STF | Stabilize for Flow |
| 119 | STG | General Stabilize |

| | Segment Code | Description |
|---|---|---|
| 120 | STR | Stabilize Reference Volume |
| 121 | STR | Setup - Transducer Residual |
| 122 | STS | Stabilize until Slope |
| 123 | SVD | Evac Test |
| 124 | SXT | Stabilize for Xdcr Test |
| 125 | TMC | Tooling Motion Control |
| 126 | XDR | Transducer Test |

## Variable Codes

type "TABLE VARIABLE"

| Variable Code | Description |
|---|---|
| %P | Percent Precision |
| 2in | Two Inputs to Start |
| AAA | Accum Autozero |
| AAV | Accept Average |
| ACT | Auto-Cycle Tst Mode |
| AD | Analog A/D |
| AER | Permit Early Reject |
| ALR | Alt Leak Rate |
| APC | Accept Percentage |
| APC | Atm Pressure Check |
| APP | Accept Program |
| AQ | Average Quantity |
| ARC | Autorun Cycle Count |
| ARE | Autorun Enable |
| ARM | Autorun Method |
| ARR | Autorun Relax |
| ASA | Short Autozero |
| ASD | Accept Std Dev |
| ASM | AutoSetup Method |
| ASP | Accept SPC Std Dev |
| ATD | Anti-Tie-Down |
| AZD | Autozero Delay |
| AZE | Autozero Enable |
| Ain | Analog Input |
| Aot | Analog Output |
| BC | Batch Calibration |
| BCM | Barcode Method |
| BL | Batch Layout |
| BQ | Batch Quantity |
| BR | Barcode Required |
| CA | Accept Cycles |
| CAP | Calibrate Percent |
| CC | Configuration Code |
| CC | Capability Code |
| CCD | Ch Evac Valve Dly |
| CCP | Clear Prog Counters |
| CCR | Clear Chan Results |
| CCS | Clear Chan Counters |

| Variable Code | Description |
|---|---|
| CEF | Chmbr Evac Limit |
| CEV | Chmbr Evac Close |
| CFS | Cleanup Setpoint |
| CGP | Chmbr Pre-Purge |
| CGT | Chmbr Pre-Purge |
| CHM | Post-Purge Method |
| CHO | Chmbr Post-Purge |
| CHP | Chamber Pressure |
| CHV | Chamber Volume |
| CID | REF Iso Delay |
| CLF | Corr. Leak Std Flow |
| CLM | Clamshell |
| CLP | Check Limit Percent |
| CLR | Cumulative Leak |
| CLR | Cal Required |
| CM | ΔP Cal Method |
| CM | Malfunction Cycles |
| CMN | Clean Min Pressure |
| CMP | Charge Min Press |
| CMX | Maximum Pressure |
| COF | Continue on Fail |
| COL | Cutoff Limit |
| CP | Current Precision |
| CPP | Copy Program |
| CPR | Charge Pressure |
| CPS | TLR Change/Sec |
| CPT | Consecutive Points |
| CPT | Consecutive Points |
| CR | Reject Cycles |
| CRA | Clean Part Source |
| CRF | Pre-Purge |
| CRS | Chmbr Crossover |
| CSC | Cycles Since Cal |
| CSN | Clear Since New Ctr |
| CSN | Cycles Since New |
| CST | Custom Self Test |
| CT | Total Cycles |
| CTE | Continue to Evac |
| CTF | Continue to Fill |
| CTG | Target Pressure |
| CTP | Copy to Target Prog |

| Variable Code | Description |
|---|---|
| CTP | Charge Target Press |
| CTR | Clean Part Timer |
| CTX | Continue T-Gas Exh |
| CXP | Charge Max Press |
| DA | Analog D/A |
| DD | Decay Direction |
| DFL | Direct Flow |
| DHP | Δ Hard Vac Precision |
| DHU | Δ Hard Vac Unit |
| DKL | DP Leak Loss |
| DL | Diff Press Loss |
| DLL | DP Master+Leak Loss |
| DLR | Diff Press Loss Rd |
| DLT | Delay Timer |
| DML | DP Master Part Loss |
| DMR | DP Mstr Part Lss Rd |
| DP | Diff Pressure |
| DPI | DP iso Percent |
| DPP | Δ Press Precision |
| DVF | Vent During Fill |
| DVM | Test Mode |
| DVO | Device Mode |
| Dt | Date |
| ECL | ERC Crossover Limit |
| EDC | EDC Offset |
| EDE | EDC Enabled |
| EDP | Event ΔP |
| EDP | EDC Percentage |
| EDQ | EDC Quantity |
| EDT | Event ΔT |
| EIL | ERC Increment Limit |
| EM | Exhaust Method |
| EMP | Ext Xdcr Pressure |
| ENB | E-NOB |
| ENC | Enable Calibration |
| ENT | Enable Tooling I/O |
| EOL | ERC Offset Limit |
| EPP | Pressure Precision |
| EPR | Pressure Reference |
| EPV | Estimated Part Size |
| ERA | Atm Pressure |

| Variable Code | Description |
|---|---|
| ERC | ERC Method |
| ERE | ERC Enabled |
| ERP | ERC Rate/Period |
| ERQ | ERC Quantity |
| ERR | E-Regulator Rest |
| ERV | Re-Evac After Test |
| ESC | Ext Switch Low Chk |
| ESN | External Sniffer |
| ESP | Exhaust Setpoint |
| ET | Elapsed Time |
| ETP | Evacuation Setpoint |
| ETP | Fine T-Gas Target |
| ETW | ERC Target Window |
| ETW | ERC Target Window |
| ETY | Edge Type |
| EUP | Pressure Unit |
| EVA | Evacuation Source |
| EVC | Eval Condition |
| EVD | Vacuum Decay |
| EVL | Test Evaluation |
| EVM | Allow Evac Limit |
| EVP | Event Pressure |
| EVT | Event Type |
| EXD | Evacuation Xdcr |
| EXP | Execution Pause |
| FCC | Force Cal Cycles |
| FCD | FCal Date Limit |
| FCL | FCal Cyc Limit |
| FCM | Force Cal Mode |
| FCT | FCal Time Limit |
| FCT | Force Cal Time |
| FDC | T-Gas Fill Option |
| FEL | Flow Event Limit |
| FL | Flow |
| FLD | Fine T-Gas Decay |
| FLF | Fine T-Gas Fill |
| FMV | Finish Mix Verify |
| FNB | FF-NOB |
| FP | Flow Precision |
| FPR | Fill Pressure |
| FPS | Fine Sample |

| Variable Code | Description |
|---|---|
| FSW | Final Src Weight |
| FTA | Dwell |
| FTA | Fill |
| FTX | Test Failed Text |
| Fdb | Tooling Feedback |
| GLD | Gross T-Gas Decay |
| GLF | Gross T-Gas Fill |
| GLN | Gross T-Gas Min |
| GLT | Gross T-Gas Target |
| GLX | Gross T-Gas Max |
| GPS | Gross Sample |
| GPT | Gross Fill Pulse |
| HLE | High Limit Event |
| HLF | High Limit Flow |
| HLL | High Limit Loss |
| HLP | High Limit Pressure |
| HLQ | High Limit Leak |
| HLR | High Limit Rate |
| HLV | High Limit %Vref |
| HVP | Hard Vac Precision |
| HVU | Hard Vac Unit |
| I/O | I/O ID |
| IET | Event Type |
| IF | Instrument Flow |
| IIS | Input Initial State |
| ILS | Level State |
| ILT | Level Time |
| IPR | Close Inner Purge |
| IS | Input State |
| ISO | Isolation |
| LAV | Leak Alarm Volume |
| LCD | ΔP Leak Std/Cal Define |
| LCD | ΔP Leak Std Cal Date |
| LCF | Correction Factor |
| LDP | Leak Det Precision |
| LDT | Dev Zero Delay |
| LDU | Leak Det Unit |
| LDZ | Device Zero |
| LF | Master+Leak Flow |
| LFC | ΔP Leak Std Cal Flow |
| LFR | Master+Leak Flow Rd |

| Variable Code | Description |
|---|---|
| LIN | Linearity |
| LKF | Leak Flow |
| LKL | Leak Loss |
| LKM | Link Motion |
| LL | Master+Leak Loss |
| LLE | Low Limit Event |
| LLF | Low Limit Flow |
| LLL | Low Limit Loss |
| LLP | Low Limit Pressure |
| LLQ | Low Limit Leak |
| LLR | Master+Leak Loss Rd |
| LLR | Low Limit Rate |
| LLV | Low Limit %Vref |
| LMP | Link Motion Preempt |
| LNL | Linearity Limit |
| LOF | Loss Offset |
| LQ | Master+Leak QL |
| LQD | DP Mstr+Lk QL Rd |
| LQD | DP Master+Leak QL |
| LQF | Master+Leak QF Rd |
| LQF | Master+Leak QF |
| LQR | Master+Leak QL Rd |
| LR | Leak Rate |
| LRC | ΔP Leak Std Recert |
| LRO | Leak Rate Offset |
| LRO | Leak Rate Offset |
| LSC | ΔP Leak Std Chk |
| LSP | ΔP Leak Std Pressure |
| LSS | ΔP Leak Std Select |
| LSV | ΔP Leak Std Value |
| LV | Launch Validation |
| ME | Malfunction Eval |
| MF | Master Part Flow |
| MFO | Manual Fill |
| MFR | Master Part Flow Rd |
| MFT | Manual Fill |
| ML | Master Part Loss |
| MLF | Min Mstr+Leak Flow |
| MLF | Min Leak Flow |
| MLL | Min Leak Loss |
| MLR | Master Part Loss Rd |

| Variable Code | Description |
|---|---|
| MMF | Min Master Flow |
| MMF | Min Master Flow |
| MML | Max Master Loss |
| MML | Min Mstr+Leak Loss |
| MML | Min Master Loss |
| MNT | Min Tare Weight |
| MO | Master Flow Offset |
| MOR | Master Flow Offset |
| MPC | Malfunction Percent |
| MPF | Min Perform Factor |
| MPP | Max System Pressure |
| MQ | Master Part QL |
| MQD | DP Mstr Part QL Rd |
| MQD | DP Master Part QL |
| MQF | Master Part QF Rd |
| MQF | Master Part QF |
| MQR | Master Part QL Rd |
| MSL | Reject Rate |
| MSO | MS Iso Open Delay |
| MSP | Max Pressure - Opt |
| MSR | Mark Severe Lk Rej |
| MST | Mass Spec Purge |
| MTM | Min T-Gas Mode |
| MTS | T-Gas Source |
| MV | T-Gas Mix Verify |
| MVF | T-Gas Tgt Press |
| MVH | Leakrate High Limit |
| MVL | Leakrate Low Limit |
| MVM | T-Gas Leak Rate |
| MVS | Start Mix Verify |
| MVT | T-Gas Fill Timer |
| MXT | Max Tare Weight |
| Mot | Motion Number |
| Mot | Number of Motions |
| NAM | Program Name |
| NBC | Number of Barcodes |
| NLK | Number of Links |
| NOP | Number of Options |
| NPP | Next Program |
| NPS | Number of Steps |
| NTP | Sample Points |

| Variable Code | Description |
|---|---|
| NUM | Number of Programs |
| OLS | Open ΔP Leak Std |
| OPT | Option |
| OTL | Open T-Gas Leak Std |
| P | Master Gauge Press |
| P | Instrument Pressure |
| P | Meas Pressure |
| P%V | Part %Vref |
| PC | Pneumatic Code |
| PCL | ΔP Leak Std Cal Press |
| PCR | Pressure Correction |
| PCT | Chmbr Post-Purge |
| PDL | Press Delta Limit |
| PET | Part Evac Limit |
| PEV | Part Evacuation |
| PEX | Partial Exhaust |
| PF | Performance Factor |
| PFL | Part Flow |
| PFM | Prefill Method |
| PG | Target Pressure |
| PKP | Peak Pressure |
| PL | Pressure Loss |
| PLP | Predicted Loss |
| PLQ | Master+Leak Q-Press |
| PLR | Pressure Loss Rd |
| PLR | DP Mstr+Lk Loss Rd |
| PM | Part Mark |
| PM | Master Part Press |
| PMF | Part Mark Feedback |
| PML | Master+Leak Press |
| PMN | Minimum Pressure |
| PMQ | Master Part Q-Press |
| PMX | Maximum Pressure |
| PNM | Sniffer Test Point |
| PP | Proof Pressure |
| PP | Pressure Precision |
| PPC | Part Present Check |
| PPC | Prefill Press Check |
| PPE | Pre-Press Enable |
| PPR | Pre-Pressure |
| PPS | Pre-Press Select |

| Variable Code | Description |
|---|---|
| PPW | Pre-Pressure Window |
| PQ | Predicted Leak |
| PRF | Prefill |
| PRI | Programmable Input |
| PRO | Programmable Output |
| PRR | Pressure Restrict |
| PSL | Pressure Select |
| PSL | Pressure Select |
| PSL | Pressure Select |
| PSP | Setpoint Pressure |
| PST | Self Test Pressure |
| PSV | Part Sniffer Type |
| PT | Target Pressure |
| PTF | Prefill |
| PTG | Gross Prefill |
| PTP | ΔP/ΔT Precision |
| PTS | Part Seal |
| PTS | Port Select |
| PTU | ΔP/ΔT Unit |
| PTX | Test Passed Text |
| PW | Weight Precision |
| Pp | Part Pressure |
| Pr | Ref Pressure |
| Ps | Standard Pressure |
| Pt | Target Pressure |
| Pt | Apply to Program # |
| Pt | Program Number |
| Pt | Test Pressure |
| QF | Quik Flow |
| QHL | Quik Test HL Band |
| QL | Quik Loss |
| QLL | Quik Test LL Band |
| QP | Quik Test Pressure |
| QPT | Quantity Points |
| QTE | Quik Test Enable |
| RAN | Number of Points |
| RAP | Analysis Pressure |
| RAS | Analysis Voltage |
| RAT | Analysis Percent |
| RAV | Reject Average |
| RC | Elec Regulator Cal |

| Variable Code | Description |
|---|---|
| RC1 | EReg Zero DA Cal |
| RC2 | EReg Span DA Cal |
| RC3 | EReg Zero Base Cal |
| RC4 | EReg Span Base Cal |
| RCA | Analog Value |
| RCD | Last Cal Date |
| RCI | Instrument Pressure |
| RCP | Retention Cutoff |
| RCS | Setpoint Voltage |
| RCT | Last Cal Time |
| RCV | Master Value |
| RDI | Restore Default I/O |
| RDT | Reg Dwell Timer |
| RED | Refrgnt Vent Close |
| REG | Regulator |
| REO | Refrigerant Vent |
| REX | Refrigerant Vent |
| RFC | Fill Close Delay |
| RFL | Reference Loss |
| RL | Loss Rate |
| RLC | Run Leak Calibrate |
| RLR | Loss Rate Rd |
| RLV | T-Gas LeakStd Value |
| RMX | EReg Span DA Cal |
| RNP | Number of Points |
| ROS | Reject on Slope |
| RPC | Reject Percentage |
| RPM | Ramp Method |
| RPP | Reject Program |
| RPP | Retain Part Press |
| RR | Retract on Reject |
| RR | Ramp Rate |
| RRT | Reject Rate Total |
| RSI | Result Information |
| RSP | Slope Window |
| RSR | Slope Change/Sec |
| RST | Stabilize |
| RVH | High Limit Voltage |
| RVH | High Limit Voltage |
| RVL | Low Limit Voltage |
| RVL | Low Limit Voltage |

| Variable Code | Description |
|---|---|
| RVP | Retain Volume Press |
| RXM | Pre-Evac Exhaust |
| SAM | Sample Size |
| SAS | Start AutoSetup |
| SCF | Cal Coefficient |
| SCL | T-Gas LeakStd Value |
| SCO | Cal Offset |
| SCP | Start Clean Part |
| SCR | Reject Rate Percent |
| SCT | Scale Type |
| SDH | ST DP High Limit |
| SDL | ST DP Low Limit |
| SEV | Leak Rate Window |
| SF | Standard Flow |
| SGN | Sample Gas Number |
| SIO | Sniffer Init |
| SMP | Sample Time |
| SN | Step Number |
| SNR | SNR |
| SOD | Shut Off Delay |
| SP | Starting Pressure |
| SP | Standard Pressure |
| SPM | Fine Wait |
| SPT | Gross Wait |
| SR | Set Regulator |
| SRC | Start Calibration |
| SRH | LD Leak Val Max |
| SRH | ST RPL High Limit |
| SRL | LD Leak Val Min |
| SRL | ST RPL Low Limit |
| SSW | Starting Src Weight |
| STH | ST TPL High Limit |
| STL | Self Test Level |
| STL | ST TPL Low Limit |
| STM | Self Test Method |
| STN | Self Test Program |
| STP | Target Press |
| STS | Self Test Source |
| STS | Start Self Test |
| STT | Self Test Limit |
| STV | Step Target Press |

| Variable Code | Description |
|---|---|
| STW | Target Window |
| SXC | Start Calibration |
| SXT | Start Xdcr Test |
| SXV | Start Verification |
| SZH | LD Zero Val Max |
| SZL | LD Zero Val Min |
| Ser | Serial Number |
| Stn | Channel Number |
| T | Timer |
| T | Timer |
| TBF | LD Background Limit |
| TEP | T-Gas Exh Press |
| TGE | T-Gas Evaluation |
| TI | Iso Delay Timer |
| TL | Tooling Option |
| TLK | Test Leak Rate |
| TLP | Leak Rate Precision |
| TLR | T-Gas Leak Rate |
| TLU | Leak Rate Unit |
| TML | LD Min T-Gas Setpt |
| TMN | Fine T-Gas Min |
| TMP | Temp Precision |
| TMX | Fine T-Gas Max |
| TP | Time Precision |
| TPP | Target Program |
| TPW | Target Press Window |
| TQ | Quik Test Timer |
| TR1 | Cleanup Delay |
| TRA | T-Gas Source |
| TRM | T-Gas Recovery |
| TSM | T-Gas Sampling |
| TT | Test Sel Timer |
| TT | Test Execution Time |
| TTF | TracerMate Flags |
| TTY | Test Type |
| TTY | Test Type |
| TV | Valve Delay Timer |
| TW | Target Weight |
| TWN | Min Fill Weight |
| TWX | Max Fill Weight |
| Tcy | Desired Cycle Time |

| Variable Code | Description |
|---|---|
| Tm | Time |
| Tm | Timer Mode |
| UC | Current Unit |
| UDP | Δ Pressure Unit |
| UF | Flow Unit |
| UP | Pressure Unit |
| UP | Percent Unit |
| UPD | Unit/Prec Define |
| UT | Time Unit |
| UTM | Temperature Unit |
| UV | Voltage Unit |
| UV | Volume Unit |
| UW | Weight Unit |
| V | V |
| VAN | Valve A Num - Opt |
| VAP | Valve A PWM - Opt |
| VAT | Valve A Type - Opt |
| VBN | Valve B Num - Opt |
| VBP | Valve B PWM - Opt |
| VBT | Valve B Type - Opt |
| VC | Valve Code |
| VCN | Valve C Num - Opt |
| VCP | Valve C PWM - Opt |
| VCT | Valve C Type - Opt |
| VDN | Valve D Num - Opt |
| VDP | Valve D PWM - Opt |
| VDT | Valve D Type - Opt |
| VFL | Virtual Flow |
| VHT | Vent/Halt Tooling |
| VLD | Valve Detection |
| VLP | Volume Precision |
| VLV | Valve Number |
| VNP | Number of Points |
| VP | Voltage Precision |
| VPS | Setpoint Pressure |
| VPW | Valve PWM |
| VSP | Setpoint Voltage |
| VTP | Hard Vac Setpoint |
| VWO | Residual Offset |
| Vi | Instrument Volume |
| Vp | Part Volume |

| Variable Code | Description |
|---|---|
| WGT | Refrigerant Weight |
| WHL | High Limit |
| WIN | Stat History Length |
| WLL | Low Limit |
| XAN | Xdcr Zero LL |
| XAX | Xdcr Base Max |
| XBH | Xdcr Zero Hwin |
| XBL | Xdcr Zero Lwin |
| XC | Transducer Cal |
| XC1 | Xdcr Zero AD Cal |
| XC2 | Xdcr Span AD Cal |
| XC3 | Xdcr Zero Base Cal |
| XC4 | Xdcr Span Base Cal |
| XCA | Analog Value |
| XCB | Atm Pressure |
| XCD | Last Cal Date |
| XCF | Instrument Flow |
| XCI | Instrument Pressure |
| XCL | Xdcr Curr Limit |
| XCM | Master Reading |
| XCP | Cal Pressure |
| XCS | Setpoint Pressure |
| XCT | Last Cal Time |
| XCV | Master Value |
| XCX | Xdcr Cal X Array |
| XCY | Xdcr Cal Y Array |
| XFC | Xdcr Filter Code |
| XFP | Flow Precision |
| XID | Xdcr Iso Delay |
| XIS | Xdcr Span Inter Cal |
| XIZ | Xdcr Zero Inter Cal |
| XLF | Max Leak Flow |
| XLF | Max Mstr+Leak Flow |
| XLL | Max Leak Loss |
| XMF | Max Master Flow |
| XML | Max Mstr+Leak Loss |
| XMN | Xdcr Base Min |
| XMX | Xdcr Base Max |
| XNP | Number of Points |
| XOP | Crossover Pressure |
| XPC | Pressure Correction |

| Variable Code | Description |
|---|---|
| XPM | Pressure Mode |
| XPP | Pressure Precision |
| XPR | Pressure Reference |
| XRL | Xdcr Risidual Limit |
| XRW | Xdcr Risidual Warn |
| XSP | Setpoint Pressure |
| XT | Transducer |
| XT | Xdcr Tare |
| XTG | Xdcr Tare Range |
| XTR | Xdcr Typ Residual |
| XUF | Flow Unit |
| XUP | Pressure Unit |
| XV | Transducer Verify |
| XVD | Verify Date |
| XVF | Instrument Flow |
| XVI | Instrument Pressure |
| XVM | Master Reading |
| XVS | Setpoint Pressure |
| XVT | Verify Time |
| XVV | Master Value |
| XZC | Xdcr Zero Check |
| XZH | Xdcr Zero HL |
| XZL | Xdcr Zero LL |
| XZW | Xdcr Zero Window |
| t | Test Time |

# Technical Specifications

**Outside Physical Dimensions**

Wall mount model (W x H x D): 16 x 16 x 8 (inches) 406 x 406 x 204 (mm)

**Electrical Specifications**

Supply power: 100-240 VAC 50-60 Hz auto sensing/switching Input
power fuse: 3 Amp 250VAC, slow, 5X20MM, glass

I/O driver fuse: 1 Amp 250VAC, fast, 5X20MM, glass

Board fuse: 3.125 Amp 250VAC, fast, radial leads, plastic can, vertical plug in fuse Output
current limit for each output: 0.5-amp max

Output current limit for all outputs combined: 1-amp max
Instrument may operate at ± 10% of nominal voltage

**Environmental Factors**

Operating temperature Range: 5°C to 40° C (41°F to 104°F)
Maximum humidity 90% relative humidity, non-condensing
Maximum operating altitude 2,500 meters (8,200 feet) Indoor use
only, IP20

| Inlet Ports & Connection Type | Connection Type & Max Pressure Rating |
|---|---|
| P1 1/4-18 FNPT or 1/4-19 BSPT fitting | Vacuum to 200 psi (1380 kPa) * P2 |
| 1/4-18 FNPT or 1/4-19 BSPT fitting | Vacuum to 200 psi (1380 kPa) * Pilot |
| 1/8 FNPT or 1/8 BSPT fitting | 65 to 105 psi (540 kPa to 725 kPa) Hi |
| Press 1/4-18 FNPT or 1/4-19 BSPT fitting | 0 to 500 psi (3450 kPa) |

* See label on instrument enclosure to determine whether port is for pressure or vacuum

**Air Cleanliness Specifications**

Max Particulate Size: 0.3-micron
Max Dew Point: -30°C

Max Oil: 0.1mg/m3

**Recommended Filter Sets (available separately)**

Small filter (includes 5.0-micron and 0.3-micron filters) for parts less than 300 ml

Medium filter (includes 5.0-micron and 0.3-micron filters) for parts from 300 ml to 13,000 ml Large filter (includes 5.0-micron and 0.3-micron filters) for parts larger than 13,000 ml

Contact Cincinnati Test Systems Service Department

By phone 513-202-5108 or by email service@cincinnati-test.com 8am-5pm eastern US

For after-hours, 24/7 emergency phone support, call 513-202-5174