

Instruction Manual Addendum

Second Stage Regulator Water Leak Analyzer

Introduction

This manual provides installation and operation information on the Style D version of the A.I.R. Flow Test Stand. The Style D version provides an added feature that test the water- tight integrity of the second stage regulator housing. This version also provides display enhancements and allows operation under the WINDOWS 7® Platform. The operation of this version remains the same as previous versions with respect to the A.I.R. Flow Test features; therefore, the scope of this manual is focused on the setup and operation of the Leak Analyzer.

Description

The Leak Analyzer is designed to measure very small leaks in the second stage regulator housing that may allow water to enter during the breathing cycle from holes with equivalent diameter sizes of .002 inch to .020 inch. The method of analyzing the magnitude of the leak is based on measuring the differential pressure across a calibrated orifice. In this configuration, one side of the orifice is connected to a measured reference vacuum source and the other side is connected to the measured vacuum on the second stage regulator housing under test. If there is a leak in the housing, a differential negative pressure (the difference between the two vacuum measurements) will exist; the larger the leak, the greater the difference in measurements. This difference in measurement is used to predict the size of the leak. The information used in evaluating a leak is displayed graphically on two scales on the Leak Analyzer Window dashboard of the PC interface. One scale represents the reference vacuum source and the other is the leak magnitude.

The Leak Analyzer utilizes internal components of the test stand to generate the reference vacuum and vacuum measurements. The vacuum venture pump that is used for the A.I.R. Flow Test Stand function supplies the vacuum for the leak test feature. The flow meter differential pressure sensor is utilized for the reference vacuum measurement with the aid of a balancing orifice and the sensor used for measuring cracking vacuum is utilized for the leak measurement. These components in addition to a few external accessory components as described further complete the leak analyzer function.

Accessory Components

The Leak Analyzer is an integral part of the test stand and in addition to the software uses hardware to configure the leak test feature as described here on. The photo below shows the accessory components hardware used in the Leak Analyzer and the following descriptions.

1. Interface Adapter: Allows direct connection to the second stage breathing port and test stand components.

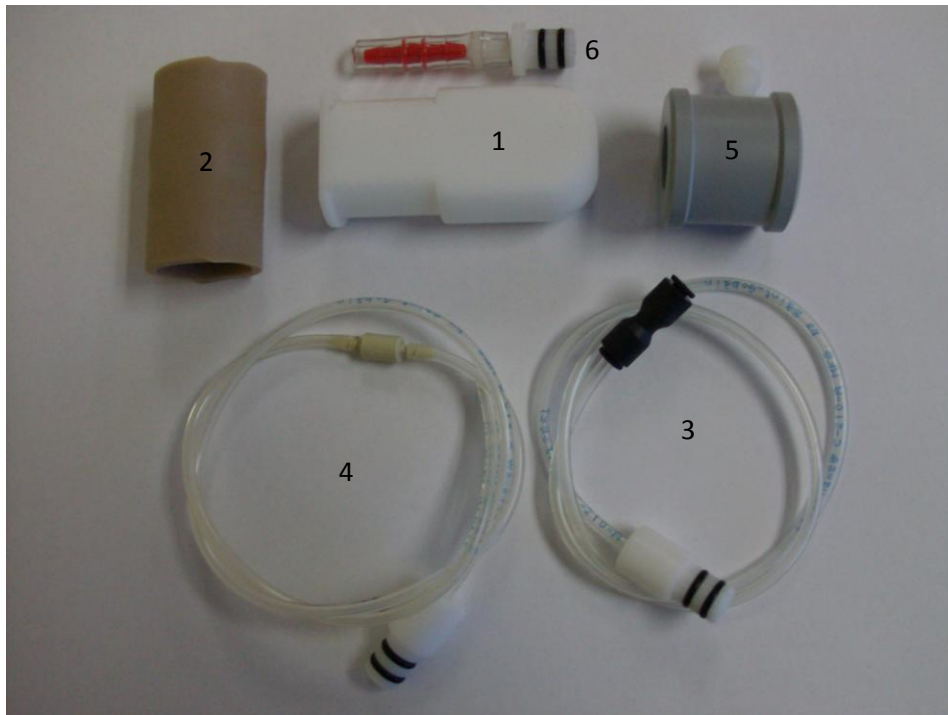
2. Band Seal: Provides the connection from the interface adapter to the second stage.

3. Vacuum Measurement Hose Assembly: Provides the connection from the Interface Adapter to the Test Stand Vacuum Measurement Hose.

4. Orifice Hose Assembly: Provides the connection from the Interface Adapter to the Test Stand Lower Flow Tube Inlet through a calibrated orifice.

5. Reference Vacuum Balancing Orifice: Connects to the Lower Orifice Inlet through a band seal to allow balancing the reference vacuum source.

6. Calibration Reference Assembly: Orifice used to check the accuracy of the Leak Analyzer.



Leak Analyzer Set-up

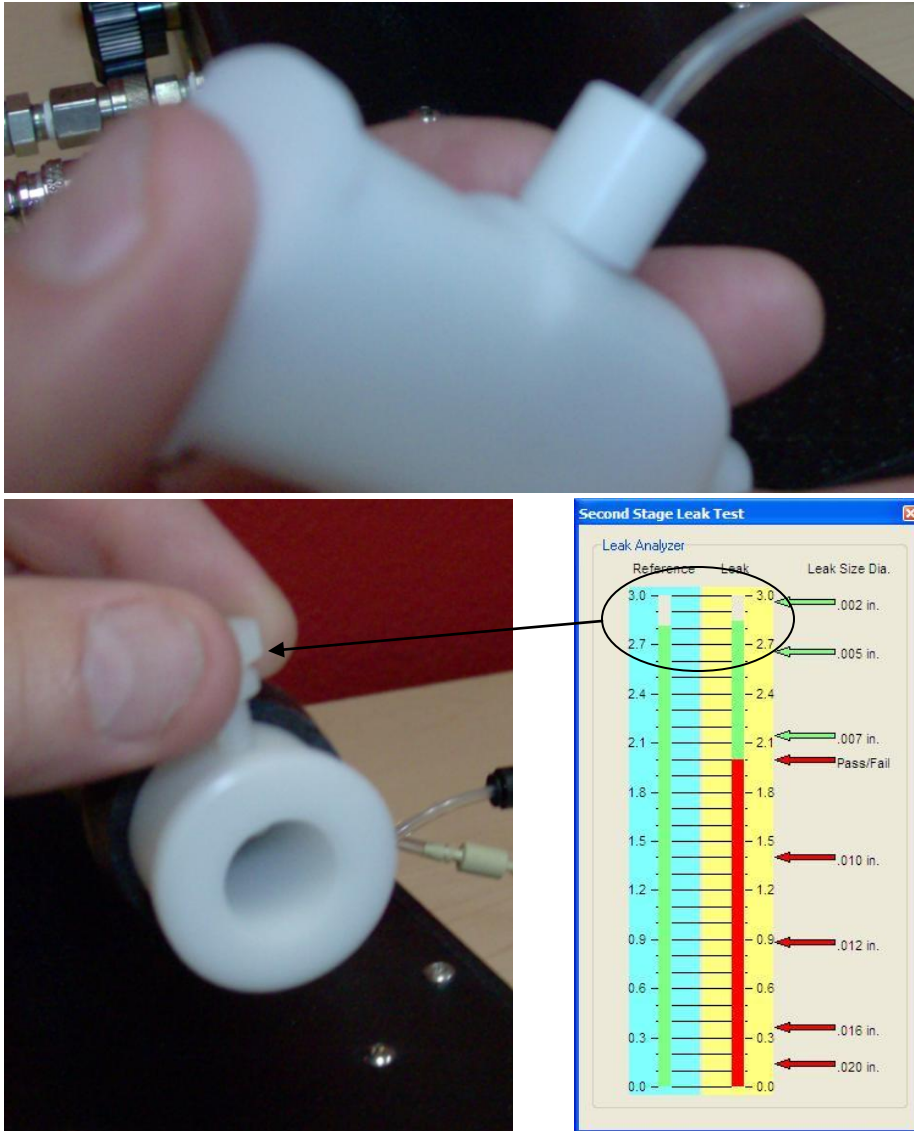
Before attaching the hardware for the Leak Analyzer, ensure that the software has been properly installed and is working in accordance to the installation instruction addendum for the Style D configuration. After the software installation, proceed with the following set-up.

1. Attach the **Reference Vacuum Balancing Orifice (5)** to the Lower Flow Tube Inlet on the test stand through the band seal as shown below.
2. Disconnect the Test Stand Vacuum Measurement Hose from the Lower Flow Tube Inlet. *Push the outside rim of the push-to-connect fitting to release the hose.*
3. Attach the **Vacuum Measurement Hose Assembly (3)** to the Test Stand Vacuum Measurement Hose through the push-to-connect connector. The other end attaches to the **Interface Adapter (1)** as shown.
4. Attach the **Orifice Hose Assembly (4)** to the push-to-connect fitting on the Test Stand Lower Flow Tube Inlet as shown. The other end attaches to the **Interface Adapter (1)**.



Reference Vacuum Balancing

After all components and hose connections have been installed and the Test Stand program has been started, Click the **“Start/Stop Free Run Measurement”** Button on the main dashboard display. Plug the inlet of the Interface Adapter with the Thumb and adjust the venturi vacuum pump adjustment knob for a reading of approximately 2.7 – 3.0 inches H₂O on the Reference Scale of the Leak Analyzer display. While maintaining this reading, adjust the Vacuum Balancing Orifice adjustment knob for the same reading (2.7-3.0 inches H₂O) on the Leak Scale as shown below.

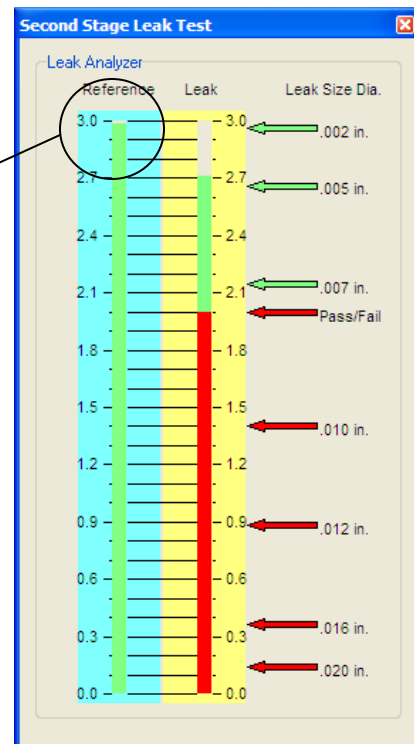
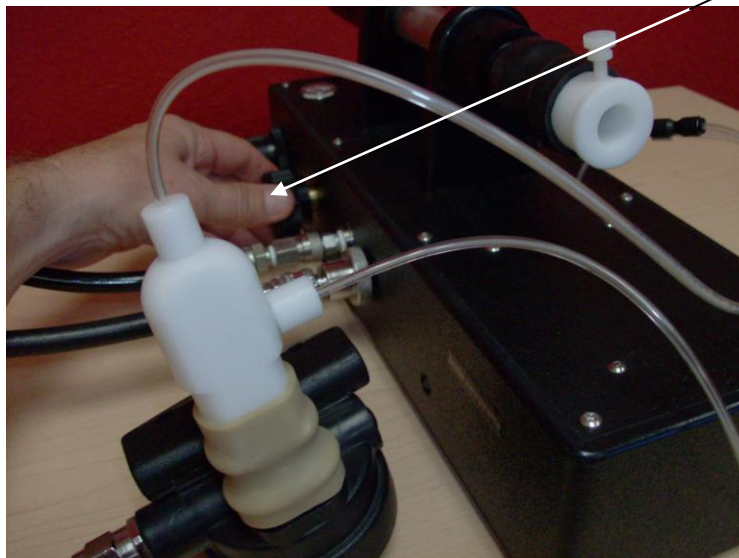


Once this adjustment is made, no further adjustments will be required on the Balancing Orifice as this establishes equilibrium between the two scales under a zero leak condition. However this adjustment can be checked from time to time to ensure balance between the two scales.

Leak Analyzer Operation

The Leak Analyzer test is performed with the regulator disconnected from the supply tank or shut off from the supply with no interstage pressure. There is no need to disconnect the second stage from the first stage of the regulator.

1. Connect the Interface Adapter to the second stage through the band seal as shown below.
2. Ensure the “**Start/Stop Free Run Measurement**” is activated.
3. Increase the venture vacuum pump adjustment knob for a reading of 3.0 inches H₂O on the Reference Scale of the Leak Analyzer display.
4. If there is a leak in the second stage housing, the magnitude of the leak can be read on the Leak scale. *The magnitude values are valid only if the Reference Scale is reading 3.0 inches H₂O.*



If the magnitude of the leak falls below the **Pass/Fail** line, the housing should be inspected for defects or sources for leaks.

Note:

1. Since the Flow sensor and Vacuum sensor is utilized for the Leak Analyzer, the indicators will show values for flow rate and vacuum on the A.I.R. Flow Test Panel during the leak testing procedure and should be disregarded.
2. The Leak Analyzer share common hardware with the A.I.R. Flow Test function and requires a set-up. It is recommended to perform leak tests on groups of regulators at a time to minimize the frequency of set-ups.
3. The accuracy of the Leak Analyzer may be checked with the calibrated orifice plug supplied. The calibration orifice plug simulates a .007 inch diameter leak and can be inserted into the Interface Adapter.