

# **MSA Air Mask Testing and Troubleshooting**

**USING THE POSICHEK<sup>3</sup> SCBA PERFORMANCE TESTER**

For More Information, call 1-800-MSA-2222 or Visit Our Website at [www.MSA.net.com](http://www.MSA.net.com)



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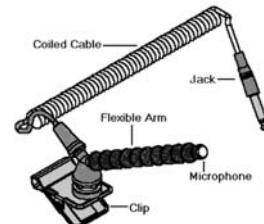
# TROUBLESHOOTING GUIDE

**Important:** The following air mask testing instructions are based on using the PosiChek<sup>3</sup> Tester in combination with the MSA Procheck III 32-bit Software Program, Version 3.20P or higher. When using an earlier version of the MSA ProCheck III 32-bit software or the MSA ProCheck I or II 16-bit software these instructions will be different from what is seen on the computer monitor.

## Equipment and Reference Information required to perform the “Complete SCBA Test” using the PosiChek<sup>3</sup> Tester

The following manuals and equipment are required to perform a complete SCBA test on an MSA air mask. Review the appendices at the end of this guide for more details;

- **PosiChek<sup>3</sup> SCBA Computerized Dynamic Performance Tester:** Low and High Pressure (2216 & 4500 psig) with Middle Stage Transducer including Enhanced Precision (EP) Transducer, Biosystems part number 54-20-1117-32 or 54-20-2117-32 (includes Sound Detection System which is required to use the PosiChek<sup>3</sup> to test the Audi-Larm™ Audible Alarm).
- **MSA Procheck III Software Program:** 32-bit Version 3.20P (or higher) this is a registered software program compatible for use with Windows Operating Systems 98, ME, 2000, NT, XP or Vista and available from MSA (P/N 10042565).
- **PC or Laptop** with Windows 98, ME, NT (Version 4.0 SP5 or higher), 2000, XP or Vista Operating System loaded with the MSA Procheck III Software program version 3.20P (or higher). MSA Software Upgrade Patches are available at the Biosystems download web page <http://www.posichek.com/> or <http://www.biodownloads.com/>. The upgrade patch can only be used if a registered version of the MSA Procheck III software that is version 3.07P or higher was previously installed. Contact an MSA Customer Service representative at 1-877-672-3473 to order a fully licensed registered version of this software.
- **PosiChek<sup>3</sup> Tester Reference Instruction Manual:** Version 2.0 P/N 13-227. This manual is available in PDF format for viewing or downloading at the Biosystems web site at <http://www.posichek.com/> A PDF copy of the PosiChek<sup>3</sup> Tester Manual is installed with the software. MSA recommends periodically checking the Biosystems web site for manual updates.
- **MSA C.A.R.E. Certified Maintenance Binder**
- **Low Pressure Manifold Assembly:** required for testing 2216 psig air masks. This is supplied with the tester (Biosystems P/N 54-21-A03).
- **High Pressure Manifold Assembly:** required for testing 4500 psig air masks. This is supplied with the tester (Biosystems P/N 54-21-A02).
- **Intermediate Pressure Adapter Hose Assembly:** supplied with the tester (Biosystems P/N 35-751).
- **PR14™ First Stage Regulator Adaptors:** required, in conjunction with the tester intermediate pressure hose, to connect the air mask the first stage pressure to the PosiChek<sup>3</sup> Tester when testing Firehawk Air Masks with the PR14 First Stage Regulator and are available from MSA.
- **Low Pressure First Stage Adapter:** used to supply the first stage pressure to the PosiChek<sup>3</sup> Tester when testing 2216/3000/4500 psig air masks with the prior design first stage regulator and is available from MSA (P/N 10006007).
- **Airline and Dual Purpose Adapter:** for testing MSA air masks equipped with the dual-purpose feature and/or MSA supplied airline respirators (P/N 496568).
- **PosiChek<sup>3</sup> Tester** equipped with the Biosystems Sound Detection System is required.



## Loading the MSA Procheck III Software Program & Setting-Up the PosiChek<sup>3</sup> Tester.

Refer to the Biosystems PosiChek<sup>3</sup> Tester Reference Instruction Manual (Version 2.0 P/N 13-227) for instructions to load the MSA Procheck III Version 3.22 (or later), 32-bit software onto a PC or laptop and to initialize the Biosystems PosiChek<sup>3</sup> Tester.

**Note:** Visit [www.biodownloads.com](http://www.biodownloads.com) to upgrade to the latest version.

**Setting-Up the Sound Detection System:** If the sound detection system is installed on the PosiChek<sup>3</sup> Tester, the microphone must be plugged into the PosiChek<sup>3</sup> prior to system pressurization.

Prior to Testing

- Adjust the microphone carrier arm so the microphone is located within 1inch (2cm) from the Audi-Larm. While in use, the software may state to move the microphone closer to or further away from the alarm as needed to properly set the alarm levels.

**Note:** Do not move the microphone during the test sequence unless instructed to by the software. The software “listens” for Audi-Larm activation while the system is being pressurized and it recognizes the sound emitted by the Audi-Larm.

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- During the Alarm Accuracy Test, the raw counts of sound being measured will be displayed while the software is waiting for the alarm to activate. The threshold limit the software is using to determine when activation occurs will also be displayed. The microphone is positioned very close to the Audi-Larm so that the ambient noise in the room does not affect the measurement. When the software detects alarm activation, it will automatically determine whether the test passed. If the test passed, the software will automatically proceed to the next test.
- If the ringdown test is being performed, the microphone will also detect when the alarm stops ringing.

**Note:** It is recommended that ambient background noise be kept to a minimum during testing. Fans, ringing telephones, and other high noise devices may cause the sound detection system to activate prematurely. Keep PASS/Redundant Alarm/ICM devices as far away from the microphone as possible.

### Prior to Testing - Cleaning and Checking the MSA Air Mask Components

MSA recommends thoroughly cleaning and sanitizing the facepiece. After drying, carefully inspect the facepiece, the inhalation check valve, and exhalation valve to ensure they are not "sticking". If the facepiece was disassembled for servicing, perform a careful check to ensure it was reassembled correctly.

Carefully check the first and second stage regulators and Audi-Larm for any obvious signs of damage caused by mechanical impact, high heat stress, and cracking or missing parts before these components are pressurized. Carefully inspect all pressure hoses for cuts, abrasions, and loose connections before subjecting them to high pressure.

All damaged or non-serviceable parts must be replaced and any missing parts must be installed.

Conduct a leak test.

### Testing MSA Facepieces Only

The Procheck software contains a procedure for performing this function test only. Click on "Tests" and from the drop-down menu click "Facepiece Test". Follow the on-screen instructions.

The facepiece test includes visual inspection of the facepiece, facepiece leak test, pressure demand exhalation valve opening pressure test, and a breathing test. An air mask that passed the 'Complete SCBA Test' must be connected to the facepiece in order to perform the facepiece test.

### Calibrating & Setting-Up the MSA Air Mask prior to conducting a 'Complete SCBA Test'.

If overhaul or service work was just completed on the facepiece, first and/or second stage regulator, and Audi-Larm then check, set-up, and/or calibrate the air mask prior to performing the "Complete SCBA Test" procedure.

With the air mask properly connected to the tester, and upon successful completion of the software initialization process, click on "Tests". Click "Apparatus Adjustment" from the drop down menu. A pop-up window shows the static operating pressures for the facepiece, first stage, and primary air source. Pressurize the air mask and perform the calibration/set-up procedures for the facepiece static pressure and the first stage pressure detailed in the C.A.R.E Maintenance Manual. Once the calibration is complete click on the "BreathE" button to perform a brief breathing cycle to check the stability and conformity of the pressure readings.

Upon completion of the "Apparatus Adjustment" procedures, and prior to performing a "Complete SCBA Test" perform a "Quick SCBA Test" to determine if any further fine tuning of the calibration/set-up adjustments are required.

### Connecting the Air Mask to the PosiChek<sup>3</sup> Tester

Refer to the Appendices B & C in this manual to connect the air mask to the PosiChek<sup>3</sup> Tester.

### Testing the Air Mask with a Dual Purpose System

Refer to Appendix D in this manual to connect and test the Dual Purpose Air Mask.

### Complete the SCBA Test Procedure

Refer to Appendix E in this manual for test sequence details.

# TROUBLESHOOTING GUIDE

Upon successful initialization:

1. Click the “Tests” menu on the top left side of the screen and select “Complete SCBA Test” from the drop-down menu.
2. On the “Select Apparatus for Testing” screen select the MSA air mask by clicking on the name. Then click “OK”.

**Note:** If the air mask does not show up on the list then an updated version of the MSA ProCheck III software may be required. Check with Biosystems or call MSA Customer Service.

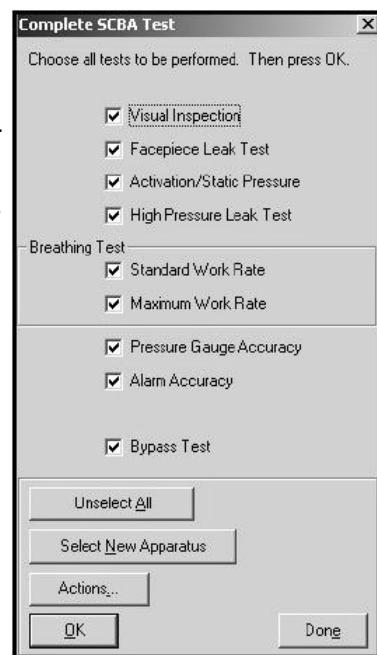
**Important:** Selecting the correct model of air mask is critical to ensure the software selects the appropriate tests to be performed.

3. The air mask “Apparatus Serial Numbers” screen will appear. If the air mask serial number was set up in the database then select the apparatus to be tested by clicking on the serial number and then click “OK”. If the serial number was not set up in the database then follow the instructions for “Adding a New Apparatus” instructions from the PosiChek<sup>3</sup> Tester Instruction Manual.
4. The Complete SCBA Test screen will appear. Select the tests to perform on the air mask.

**Important:** All tests that were selected automatically by the software, (when the model of MSA air mask to be tested was selected) must be performed in order for the test due date to be automatically updated. NFPA requires that NFPA-compliant air masks must successfully pass every test listed in the Complete SCBA Test. In some cases, it is appropriate to leave out a test in the Complete SCBA Test sequence. It is possible to change the list of required tests by clicking the “Actions” button on the “Complete SCBA Test” screen, and selecting “Set List of Required Tests”. Uncheck the tests you do not wish to perform on this screen and then click OK.

The situations where this would be appropriate are as follows:

- a. You are not performing NFPA-Compliant testing. The “Maximum Work Rate” test is for Fire Service NFPA-compliant air masks. The “Standard Work Rate” is considered a sufficient test for industrial (or non NFPA-compliant) air masks such as the MSA WorkMask®, WorkMask II, and AirHawk®.
- b. You are testing facepieces only because users were issued individual facepieces. In this case, test the facepieces using the “Facepiece Test” sequence (click on “Tests” at the top of the main menu screen, a drop down menu appears, then click on “Facepiece Test” and follow instructions), and leave the “Facepiece Leak Test” out of the “Complete SCBA Test”.



**Important:** The “Activation/Static Pressure” test for the air mask should still be performed in the “Complete SCBA Test”. This tests the functionality of the facepiece working in conjunction with the first and second stage regulators.

5. The “Enter Customer Data” screen will appear. Customer data may be added at the discretion of the operator and is not mandatory for proper testing. However, this information will assist the operator to locate specific data in the future through the “View Test Results” option. The Customer Data display can be suppressed by clicking on “Setup – Options – General” screen. Click OK to proceed.
6. The “Visual Inspection” screen will appear. If all of the components pass the visual inspection, enter “Pass” in the pull-down box for each component under Test Results. Components that fail any of the visual inspection must be repaired or replaced prior to resuming the test. The list tree in the Visual Inspection screen can be expanded as a reminder of the items to visually inspect. Comments can be automatically generated by dragging and dropping notes from the tree into the comments box. Click the “Done” button once the visual inspection is complete.
7. A window will appear with instructions to connect the air mask to the PosiChek<sup>3</sup> Tester, if it was not previously connected. To connect the air mask to the tester refer to the Appendices B and C (for Firehawk Air Masks) and D (for Dual Purpose Air Masks) in this manual or click on the “Help” button. Once the air mask is correctly connected to the tester click “OK”.

## HELP TIPS

### Placing the Facepiece on the Test Head

Correctly position the facepiece squarely on the test head and tighten the straps evenly by starting with the bottom set of straps. Ensure the facepiece inner sealing surface is flat, sealed to the test head, and that nothing is breaking the seal. Ensure the nose cup is positioned over and across the test head nose.

## TROUBLESHOOTING GUIDE

**Important:** As the rubber on the nose cup ages it becomes soft and pliable. During flow testing ensure the nose cup does not collapse into the test head mouth port and block or restrict flow. If this occurs either remove or replace the nose cup. Do NOT connect the regulator to the facepiece until instructed. The facepiece must be vented and open to ambient air pressure when the facepiece leak test is started.

### Breaking the Facepiece Seal

Before performing the facepiece leak test, the PosiChek<sup>3</sup> must position the bellows in order to test the exhalation valve opening pressure.

While the PosiChek<sup>3</sup> bellows is being moved, the facepiece must remain vented in order to avoid collapsing the bellows. To do this, remove the second stage regulator from the facepiece.

Do not place fingers or objects in between the facepiece sealing surface and the test head. This can compromise the integral seal achieved after fitting the facepiece to the test head.

### Resealing the Facepiece to the Test Head

Ensure the facepiece is on the test head (see section Placing the Facepiece on the Test Head in this manual).

Attach the regulator assembly for the second stage regulator for the air mask to the facepiece.

When preparing to perform the Facepiece Leak Test, do not pressurize the system. The software will indicate when to pressurize the air mask when pressure is needed.

### Pressurizing the Air Mask

Ensure the facepiece is on the test head (see section Placing the Facepiece on the Test Head in this manual).

Ensure all test adapters, hose fittings, and manifolds are tight and secure.

Ensure the regulator is attached to the facepiece. Slowly open the supply valve to pressurize the system. The software will indicate the minimum pressure needed for the test being performed and will wait until it measures the supply pressure between the minimum required pressure and the maximum service pressure of the breathing apparatus.

The software will also wait for the pressure to stabilize after the supply valve is closed. If the supply pressure is close to the service pressure for the breathing apparatus, it is common for the system to slightly over pressurize when the supply valve is opened. If the pressure does not go below the upper limit after a few seconds, reduce the supply pressure.

Most tests require that the supply valve be closed.

If the supply pressure is too high, close the supply valve and bleed the system pressure as needed by slowly and carefully opening the air mask emergency bypass valve. When the air mask is pressurized between the limits and the pressure has stabilized, the software will continue with the test being performed.

### TEST PROCEDURES CONTINUED

8. The "Exhalation Valve Opening Pressure" screen will appear with instructions to break the facepiece seal. Break the facepiece seal by removing the second stage regulator from the facepiece.
9. The bellows will move inside the tester. A window will appear instructing the facepiece be resealed. Connect the regulator to the facepiece, push the shut-off button in, and then click "OK". The tester will then proceed through the "Exhalation Valve Opening Pressure" test and the "Facepiece Leak Test".

### FACEPIECE TROUBLESHOOTING GUIDE

If the facepiece fails either the Exhalation Valve Opening Pressure or the Facepiece Leak Test, a window will state the reason for failure. Use the following trouble shooting steps for possible causes and corrective action. Implement the corrective action and then click the "retry" (retest) option.

**UNABLE TO PASS THE FACEPIECE LEAK TEST:** Failure to pass the Facepiece Leak Test can be caused by either a leak in the system (either MSA air mask and/or PosiChek<sup>3</sup> Tester) or a loss of communication between the PC and the PosiChek<sup>3</sup>.

**Leaks in the System:** A leak in the system may be located in the air mask, in the interface between the air mask and the PosiChek<sup>3</sup>, or in the PosiChek<sup>3</sup> itself. If a the Facepiece Leak Test was not passed since the last time the PosiChek<sup>3</sup> was assembled, ensure the tester "head" is installed correctly on the PosiChek<sup>3</sup>. The gasket must be in place and the thumb nuts firmly tightened.

## TROUBLESHOOTING GUIDE

- Begin by ruling out air mask components. The most common reason a facepiece fails the facepiece test is due to the facepiece not correctly sealing to the test head. The facepiece may be either too loose or too tight. Even a small leak in the facepiece seal can cause failure of the facepiece leak test. Reseal the facepiece by checking position and tightness of the head straps and retest.
- Verify the bypass is fully closed.
- Verify the cylinder valve is fully closed.
- Verify all hand-tightened fittings and all other fittings on the air mask, including the connections between the air mask and the PosiChek<sup>3</sup>, are tight and sealed.
- Remove the regulator and seal off the facepiece inhalation opening and retest. If this corrects the leakage then the leak is inside the regulator. Check the condition of the regulator diaphragm (no cuts or holes) and the diaphragm seal to the regulator housing. Correct any problems and retest.
- If the facepiece still fails the test after the potential leaks described above are ruled out then it is time to consider that the facepiece itself may be defective. If possible, install a new facepiece and retest.

**Computer lost communication with the PosiChek<sup>3</sup>:** The facepiece pressure remains at a constant value of approximately – 6.9 inches H2O. Re-initialize the tester by using the Setup – Initialize PosiChek<sup>3</sup> menu item.

**Unable to pass the Exhalation Valve Opening Pressure Test:** Failure to pass the exhalation valve opening pressure test can be caused by a leaking or sticking exhalation valve or the spring may need replaced.

- Remove the facepiece and visually inspect the exhalation valve to ensure components are in good clean condition and installed correctly.
- Clean, if necessary, and manually open the valve by gently pressing on the exposed part of the exhalation valve stem. Refer to the C.A.R.E. Certified Maintenance Binder “Facepiece” section for details on cleaning, maintaining, and servicing the pressure demand exhalation valve.
- If failure continues, replace the exhalation valve assembly. Refer to the C.A.R.E. Maintenance Binder “Facepiece” section for details on replacing the pressure demand exhalation valve.

### TEST PROCEDURES CONTINUED

**Note:** If the test fails because the opening pressure is below 1.5 inches H2O, then replace the spring.

10. Upon successful completion of the facepiece leak test and exhalation valve opening pressure test, the “Test Passed” window appears.
11. Click on “Continue to Next Test” and pressurize the system (air mask) by slowly opening the air mask cylinder valve or the air supply source valve.

**Note:** When testing a 2216psig air mask the tester will require at least 1600psig (1830psig for the PR14 First Stage Regulator or the HUD test) to continue testing. When testing a 3000psig air mask the tester will require at least 1600psig (2475psig for the HUD test) to continue testing. When testing a 4500psig air mask the tester will require at least 3200psig (3712psig for the PR14 First Stage Regulator or the HUD test) to continue the testing.

12. When testing the FireHawk Air Mask a window will appear. “Push in shutoff button” on the second stage regulator and then click “OK”. The PosiChek<sup>3</sup> Tester automatically determines the appropriate tests based on the air mask model selection entered by the operator.
13. The PosiChek<sup>3</sup> Tester will generate negative pressure inside the facepiece to release the shut-off button and then perform a “Static Facepiece Pressure” test (This test measures the amount of positive pressure inside the facepiece at no-flow conditions), “Static Medium Pressure” test, and “First Stage Pressure Change” test. A window will appear indicating whether the air mask passed or failed the test. If the test failed, a “Retest” option will be given. Correct the fail condition before proceeding to next test.

### HELP TIP

The “Apparatus Adjustment” choice in the “Action” button allows you to view the static and dynamic pressures in the facepiece and first stage regulator. The “Breathe” button on the ‘Apparatus Adjustment’ screen allows you to switch between static and dynamic readings. You can choose between three breathing rates. The static or dynamic tolerances are shown so you can make adjustments to bring the readings within the specified limits.

### FACEPIECE AND SECOND STAGE REGULATOR TROUBLESHOOTING GUIDE

**FireHawk Air Mask:** If the first breath activation pressure test fails on the air mask then the lever arm on the second stage regulator is sticking or damaged. Disassemble the second stage regulator by following the instructions in the C.A.R.E. Maintenance Binder. Inspect the condition of the lever arm and its operation. If the lever appears to be damaged or defective replace the second stage valve assembly and reassemble.

## TROUBLESHOOTING GUIDE

**Facepiece Static Pressure Failure:** Go to the “Apparatus Adjustment” choice in the “Actions” button to view the static pressure setting in the facepiece and the static facepiece tolerances to confirm failure status.

**Firehawk Air Masks:** If the static facepiece pressure test fails on the Firehawk Air Mask, use the following trouble shooting steps for possible causes and corrective action;

- Remove the adapter from the inhalation component housing and carefully inspect the inlet disc and valve spider assembly to ensure they are clean and not sticking.
- Remove the cover from the second stage regulator and carefully inspect the diaphragm to check for cuts and tears and that it is sealing correctly to the regulator body. Check the pressure demand spring for any signs of damage or elongation.
- Check the valve assembly for leakage by removing the cover with the pressure demand spring attached and the diaphragm, then pressurizing and listening for leaks. Refer to the C.A.R.E. Maintenance Binder for procedures to inspect and set the valve fork height on the valve assembly using the lever height gauge.
- Inspect the pressure demand exhalation valve assembly to ensure components are in clean condition, installed correctly, and not sticking. Clean if necessary and manually open the valve by gently pressing on the exposed part of the exhalation valve stem. Refer to the C.A.R.E. Maintenance Binder “Facepiece” manual for details on cleaning, maintaining, and replacing the pressure demand exhalation valve. If failure continues, replace the pressure demand exhalation valve assembly.

**Static Medium (First Stage) Pressure Failure:** If the “First Stage Static Medium Pressure” test fails on an air mask then the first stage pressure setting is either too low or too high. Use the following suggested trouble shooting steps for possible causes and corrective action.

**FireHawk Air Masks with PR14 First Stage Regulator:** Follow the procedure in the PR14 First Stage Regulator section of the C.A.R.E. Maintenance Binder for “Calibrating or Setting the First Stage Pressure”. If the first stage pressure will not set up correctly, perform an overhaul on the first stage regulator assembly following the procedures in the C.A.R.E. Maintenance Binder.

**FireHawk Air Masks with prior design First Stage Regulator:** Follow the procedure in the First Stage Regulator section of the C.A.R.E. Maintenance Binder for “Calibrating or Setting the First Stage Pressure”. If the first stage pressure will not set up correctly then perform an overhaul on the first stage regulator assembly following the procedures in the C.A.R.E. Maintenance Binder.

**Medium (First Stage) Pressure Change Failure:** If the first stage medium pressure change test fails then the first stage pressure differential (the pressure change between no-flow and full-flow condition) is too high. Follow the same corrective action procedures detailed under “Static Medium (First Stage) Pressure Failure” above.

### TEST PROCEDURES CONTINUED

14. When the test passes, click “Continue to Next Test”. The “High Pressure Leak Test” window appears. When testing the FireHawk Air Mask the window will instruct you to “Push in Shut off button” on the second stage regulator; then click “OK”.
15. A window appears instructing you to “Shut off pressure source”. Close the cylinder valve or the system air supply pressure valve; then click “OK”. The PosiChek<sup>3</sup> Tester will perform a high pressure leak test by checking pressure decay over time. If the test passes click “Continue to Next Test”.

### LEAK TEST TROUBLESHOOTING GUIDE

**High Pressure Leak Test Failure:** If the test fails, correct the condition before proceeding to the next test. Refer to the “Leak Testing” section in the C.A.R.E. Maintenance Binder and follow these procedures to find and correct the leaking condition.

### TEST PROCEDURES CONTINUED

16. A window appears, “Breathing Resistance – Standard Work Rate”, instructing you to “Shut off pressure source, then click Start”. The PosiChek<sup>3</sup> Tester will “breathe” on the air mask at the standard work rate and indicate on a series of two graphs, first stage pressure and facepiece pressure, as the tester breathes the air from full cylinder pressure to almost empty. A window will appear “Breathing Complete” then click “OK”. A window will appear showing the quantitative test results. If tests fail refer to First Stage/Facepiece Troubleshooting Guide for possible corrective action. If tests passed go to step 17.

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## FIRST STAGE REGULATOR TROUBLESHOOTING GUIDE

If the results indicate a pass, continue to the next test. If the results indicate a failure on either test, review the following possible corrective action procedures. Always follow the procedures in the C.A.R.E. Maintenance Binder when performing corrective action.

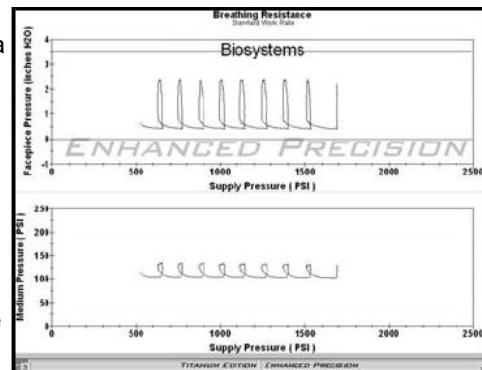
**First Stage Pressure Test Failure during flow test:** If the first stage pressure test fails during the PosiChek<sup>3</sup> Tester flow performance test, use the following suggested trouble shooting steps for possible causes and corrective action.

**FireHawk Air Mask with PR14 First Stage Regulator:** Refer to the procedures in the C.A.R.E. Maintenance Binder, "PR14 First Stage Regulator" section for first stage adjustment.

- Ensure there are no restrictions to air flow in the system. Ensure valves are fully open and pressure lines and filters are not blocked.
- Ensure the inlet filter is not contaminated or blocked.
- If the first stage pressure still does not set up in accordance with the requirements then perform an overhaul on the PR14 First Stage Regulator following the procedures outlined in the C.A.R.E. Maintenance Binder.

**FireHawk Air Mask with Prior Design First Stage Regulator:** Refer to the procedures in the C.A.R.E. Maintenance Binder, "First Stage Regulator" section for first stage adjustment.

- Ensure there are no restrictions to air flow in the system. Ensure valves are fully open and pressure lines and filters are not blocked.
- Ensure the inlet filter is not contaminated or blocked.
- If the first stage pressure still does not set up in accordance with the requirements then perform an overhaul on the first stage regulator following the procedures outlined in the C.A.R.E. Maintenance Binder.



## FACEPIECE PRESSURE TROUBLESHOOTING GUIDE

**Facepiece Pressure Test Failure during flow test:** Before implementing the following checks and corrective action ensure the first stage pressure set-up procedure has been accomplished successfully. Refer to the instructions in the C.A.R.E. Maintenance Binder for "Calibrating and Setting-up the First Stage Pressure".

**FireHawk Air Mask:** Refer to the procedures in the C.A.R.E. Maintenance Binder for the disassembly of the second stage regulator.

- Remove and carefully inspect the diaphragm assembly or CBRN diaphragm assembly and the pressure demand spring. Look for tears or cuts in the diaphragm and distortion and/or elongation of the spring. Replace any part that appears worn or damaged.
- Follow the procedures for inspecting and setting up the valve fork height using the lever height gauge on the main valve assembly, reassemble, and retest.

## TEST PROCEDURES CONTINUED

17. If the "Test Passed" window appears click "Continue to Next Test". A window will appear "Breathing Resistance – Maximum Work Rate" instructing you to "shut off pressure source, then click start".
18. The PosiChek<sup>3</sup> Tester will then "breathe" on the air mask at the maximum work rate (102 Liters Minute Volume) and indicate on a series of two graphs the first stage pressure and the facepiece pressure as the tester breathes the air from full cylinder pressure to almost empty. A window appears showing the quantitative results of the test. A window appears "Breathing Complete". Click "OK".

## TROUBLESHOOTING GUIDE

If the results indicate a pass then continue to the next test. If the results indicate a failure on either test then review the above possible causes and corrective steps under "first stage pressure test failure during flow test" and "facepiece pressure test failure during flow test", and retest. Always follow the procedures in the C.A.R.E. Maintenance Binder.

## TEST PROCEDURES CONTINUED

19. If the "Test Passed" window appears click "Continue to Next Test".
20. The PosiChek<sup>3</sup> Tester will proceed to the "Alarm and Pressure Gauge" tests.
21. The next screen shows the options available for testing the various alarms and gauges. Select the appropriate tests for the air mask and click OK.
22. If a HUD test was selected, refer to the "HUD Set-Up Instructions" in the Biosystems PosiChek3 Tester Reference Instruction Manual P/N 13-227.
23. If performing the standard gauge-type testing, pressurize the system.
24. Once the PosiChek3 recognizes and indicates sufficient pressure, shut off the pressure source.

## TROUBLESHOOTING GUIDE

25. Click OK to continue. The tester manifold will slowly empty. Press the “enter” (or click OK) at specific pressure reading intervals.
26. The HUD tests are done first if selected. The first HUD test is a pressure gauge accuracy test. The second test (if required) ensures the  $\frac{1}{4}$  test point passes the tolerance for the alarm test, which is tighter than the tolerance for the pressure gauge test.

**HUD Test:** The receiver and transmitter must be no more than 12 to 15 inches apart from each other for the receiver LED lights to work correctly. The wording used by the software assumes that the HUD lights are set to display in continuous mode. Therefore, the receiver must be set to continuous mode before performing the HUD test. It is not recommended to test the HUD on the PosiChek<sup>3</sup> Tester when it is not in continuous mode.

- a. When the HUD reads “full” between 76 to 100% of full cylinder pressure the receiver, four (4) green LED lights are continuously on.
  - b. Press “enter” when the “full” mode turns OFF – one (1) green LED light will turn off.
  - c. When the HUD reads between 51 to 75% of full cylinder pressure the receiver; three (3) green LED lights are continuously on.
  - d. Press “enter” when the 75% mode light turns OFF.
  - e. When the HUD reads between 26 to 50% of full cylinder pressure the receiver; two (2) flashing amber LED lights.
  - f. When the HUD reads between 0 to 25% of full cylinder pressure the receiver; one (1) flashing red LED light.
  - g. Press “enter” when the two (2) flashing amber LED lights turn OFF and the one flashing red LED light turns ON. This occurs “almost” simultaneously. (A flashing red LED light on the outside surface of the HUD receiver also comes on simultaneously).
27. Once the test is completed a screen will appear displaying the pressure gauge accuracy and instructing you to “Shut off pressure source”. Click OK.
  28. The tester manifold will be slowly emptied. You will then be instructed to press the enter key (or click OK button) at specific pressure intervals as read on the pressure gauge.
  29. If the pressure gauge is within the allowable accuracy tolerances click OK to continue. If the pressure gauge is outside the allowable accuracy tolerances then retest. If the pressure gauge fails replace the gauge and retest.
  30. If the sound detection system is installed on the PosiChek<sup>3</sup> Tester, the microphone must be positioned so that it is within one (1) inch or 2 cm of the Audi-Larm during the entire complete SCBA test sequence. The microphone must be initialized by exposing it to the sound of the alarm before the alarm test is performed.
  31. Pressurize the system. Once sufficient pressure is recognized, you will be instructed to shut off the pressure source.
  32. Shut off the pressure and click OK. The PosiChek<sup>3</sup> will then proceed with the Audi-Larm accuracy test. If you have the sound detection system installed on the PosiChek<sup>3</sup> Tester then it will automatically detect the start ringing pressure and the stop ringing pressure (see note below). If test failed refer to Audi-Larm Troubleshooting Guide for possible corrective action or go to step 33 if the test passed.

**Note:** The Audi-Larm test may end before the alarm stops ringing: The purpose of the ringdown test is to verify that the alarm keeps ringing until a certain pressure is reached. Once this pressure is reached, there is no need to continue testing and the test is halted at this time.

### AUDI-LARM AUDIBLE ALARM TROUBLESHOOTING GUIDE

MSA recommends using the microphone.

#### **⚠ WARNING**

**If the sound detection system upgrade was not performed on the Biosystems PosiChek<sup>3</sup> Test Bench, MSA requires C.A.R.E. facilities to use the Audi-Larm Tester (P/N 10045522) to check the accuracy of the Audi-Larm Audible Alarm during each flow test of the SCBA. Failure to follow this warning can cause Audi-Larm malfunction, resulting in serious personal injury or death.**

If using a PosiChek<sup>3</sup> Tester with a sound detection system installed and the Audi-Larm fails the test then MSA Procheck III software will indicate the numeric value of the tolerance that failed.

**Audi-Larm Fails to ring at the correct start pressure:** Refer to the procedures in the C.A.R.E. Maintenance Binder, “Audi-Larm” manual for adjusting the Audi-Larm to the correct start ringing pressure – “Setting the Alarm Point”. If the Audi-Larm cannot be adjusted to the correct start ringing pressure then perform an overhaul on the Audi-Larm following the procedures detailed in the C.A.R.E. Maintenance Binder retest.

## TROUBLESHOOTING GUIDE

**Audi-Larm Fails to ring continuously down to at least 175 psig:** This condition is generally indicative of leaking o-rings and/or a leak between the striker valve pellet and the sealing edge on the piston assembly. Perform an overhaul. Carefully check the valve pellet to ensure it is clean of any debris or residue. If the valve pellet is torn or lost its elastomer properties then replace the striker/pellet assembly and retest. Refer to the disassembly and reassembly procedures in the C.A.R.E. Maintenance Binder, "Audi-Larm" manual for replacing the o-rings and striker/pellet assembly. Check the condition of the Audi-Larm springs and the sealing surface on the open end of the piston assembly.

**Important:** Handle the piston assembly carefully so as not to damage the sealing edge surface.

### TEST PROCEDURES CONTINUED

33. If the Audi-Larm passes the accuracy test a window appears confirming "Test Passed" then click "Continue to Next Test" to continue to the bypass test.
34. "Push in the Shut off Button" then "Shut off pressure source".
35. Shut off the pressure source valve and click OK to continue. Fully open the regulator bypass valve.
36. The PosiChek<sup>3</sup> Tester breathes while the bypass valve is open and verifies that the pressure in the facepiece remains positive.
37. Once the manifold is empty "Close the Bypass" Valve and click OK.
38. A window appears confirming Test Passed and then click "Continue to Next Test". If test failed then refer to Bypass Troubleshooting Guide for corrective action. If test passed go to step 39.

### BYPASS TROUBLESHOOTING GUIDE

**Failure of the Bypass Test:** Check for sufficient pressure in the manifold and no restrictions to air flow in the system. Ensure valves are fully open and pressure lines and filters are not blocked. Verify the inlet filter is not contaminated or blocked. Carefully inspect the regulator housing for damage or distortion; replace if damaged and retest. Carefully inspect the bypass air flow paths for debris or blockage.

### TEST PROCEDURES CONTINUED

39. Close the bypass valve and click OK

### Preparing the Air Mask to be put back in Service.

1. Shut off the main air supply source.
2. Remove the facepiece from the PosiChek<sup>3</sup> headform.
3. Release all the air pressure from the air mask by slowly opening the bypass.
4. Remove the PosiChek<sup>3</sup> intermediate pressure hose and test adapter.
5. Disconnect the air mask from the PosiChek<sup>3</sup> manifold.
6. Make sure the air cylinder is full and reconnect to the air mask.



**Note:** Prior to use, don the apparatus and perform a functional check. Refer to the operation and instruction manual.

## APPENDIX A - POSICHEK TESTER ACCESSORIES



Low Pressure Manifold,  
2216 psig  
Biosystems (P/N 54-21-A03)



High Pressure Manifold,  
2216 psi  
Biosystems (P/N 54-21-A03)



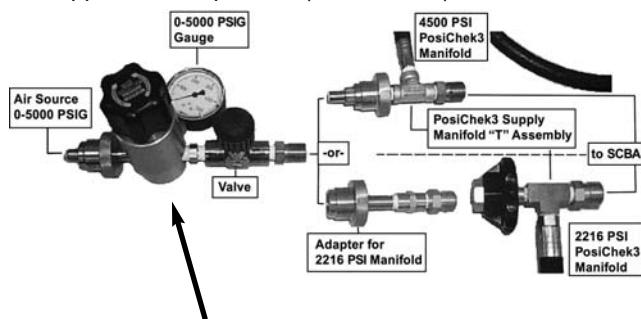
1



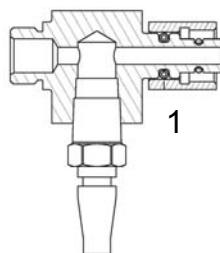
2

### MSA First Stage Adapters (available from MSA under kit P/N 10042824)

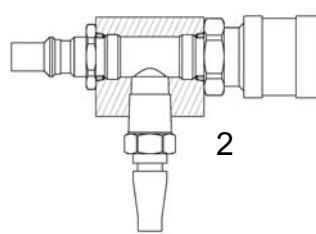
1. Low pressure first stage test adapter for testing 2216/300/4500 psig air masks, (P/N 10006007).
2. Airline and dual purpose test adapter for testing MSA air masks with dual-purpose feature and/or MSA supplied air respirators (P/N 496568).



Self-Venting High-Pressure (0 to 5000 psig) Regulator and Shut-Off Valve  
Assembly Biosystems (P/N 35-0470)



1



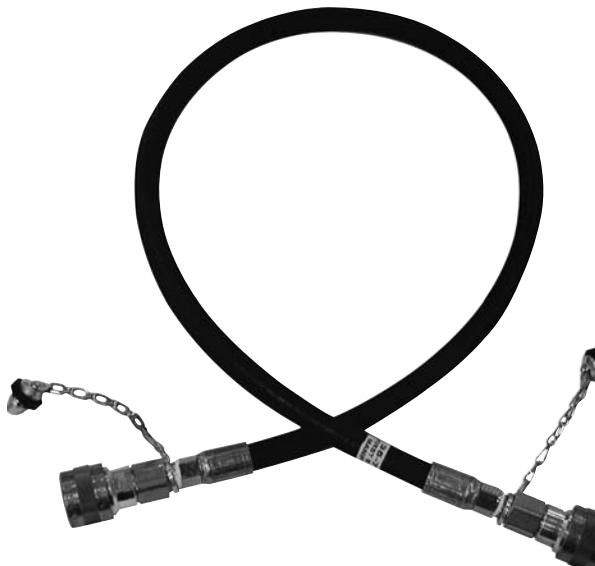
2

### 1. PR14 Threaded First Stage Adapter (P/N 10064117)

For connecting between the first stage hose coming from the PR14 regulator and the second stage hose going to the second stage regulator on the facepiece. Facilitates connection of the PosiChek<sup>3</sup> Tester intermediate hose assembly.

### 2. PR14 Quick-Connect First Stage Adapter (P/N 10064120)

For connecting between the first stage hose coming from the PR14 First Stage Regulator that has a quick-connect/Extend-Aire connection and the second stage hose going to the second stage regulator on the facepiece. Facilitates connection of the PosiChek Tester intermediate hose assembly.

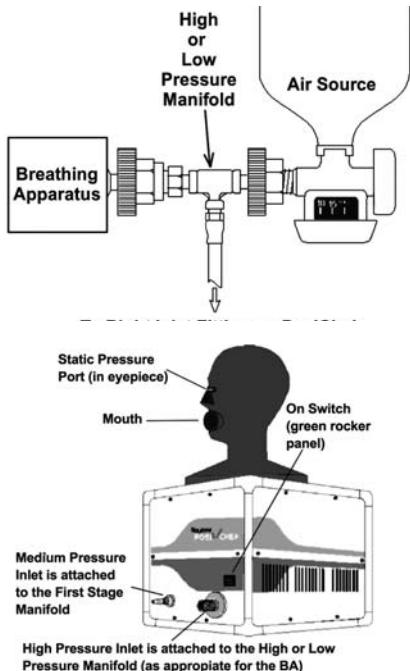


PosiChek Intermediate Pressure Adapter Hose Assembly  
Biosystems (P/N 35-751)

## APPENDIX B - CONNECTING TO THE POSICHEK TESTER

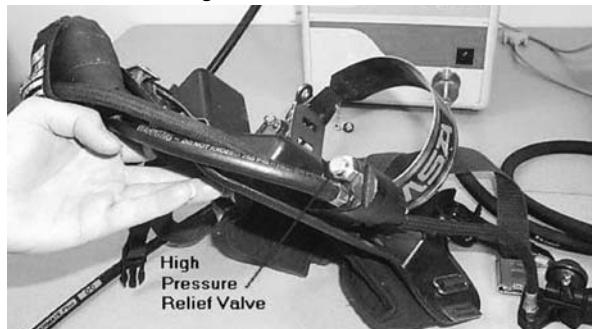
### Connecting the FireHawk Air Mask to the Posi-Chek<sup>3</sup> Tester

1. Attaching the high (4500psig) or low (2216psig) pressure manifold assembly:
  - Insert the T-side of the high or low pressure manifold between the air cylinder male threaded connection and the Audi-Larm coupling nut.
  - Thread the pressure manifold female coupling nut onto the air cylinder (or air source) male thread and ensure a leak tight connection.
  - Turn the Audi-Larm female coupling nut on to the male thread of the pressure manifold assembly and ensure a leak tight connection.

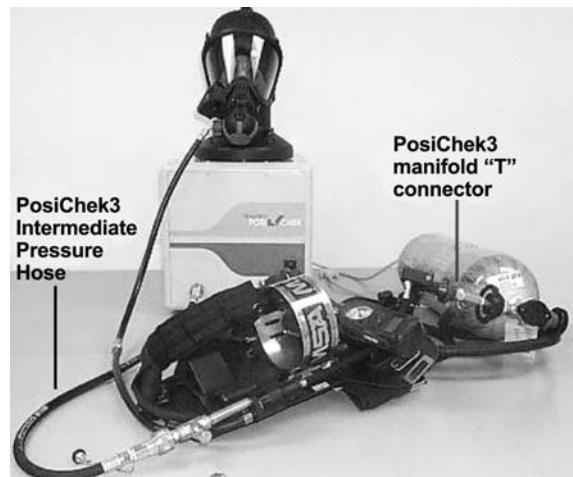


- Connect the remaining female coupling nut on the pressure manifold assembly to the high pressure inlet male thread on the PosiChek<sup>3</sup> Tester and ensure a leak tight connection.
2. Attaching the First Stage Intermediate Pressure Hose Assembly:
  - The first stage adapter is required to connect the intermediate pressure hose assembly to the first stage regulator.
  - The first stage adapter (10006007) can be used with either the 2216psig or the 4500psig FireHawk Air Mask first stage regulators and is available from MSA.
  - Remove the first stage regulator's safety relief valve.
  - Ensure the safety valve o-ring is replaced and retained with the safety relief valve.
  - Ensure an o-ring is attached to first stage adapter and the adapter is threaded in to the safety relief valve threaded port to ensure a leak tight connection.

- Connect the female quick-connect fitting on the intermediate pressure hose assembly into the male quick-connect fitting on the first stage adapter.
- Connect the female quick-connect fitting on the other end of the intermediate pressure hose assembly to the medium pressure male inlet quick-connect fitting on the PosiChek<sup>3</sup> Tester.



Locate and remove the first stage regulator safety relief valve.



Connect the facepiece to the tester headform.

### Connecting the FireHawk Air Mask with PR14 First Stage Regulator

#### Connecting the First Stage Test Manifold Assembly and Threaded Firehawk Hose

1. Verify all pressure is bled from the apparatus.
2. Use a wrench to disconnect the first stage intermediate pressure hose from FireHawk hose.
3. Thread the test manifold assembly (P/N 10064117) onto the first stage intermediate pressure hose. Tighten with a wrench.
4. Thread the FireHawk hose onto the test manifold assembly. Tighten with a wrench.
5. Connect the test manifold assembly to the PosiChek<sup>3</sup> intermediate pressure hose.



## APPENDIX B - CONNECTING TO THE POSICHEK TESTER

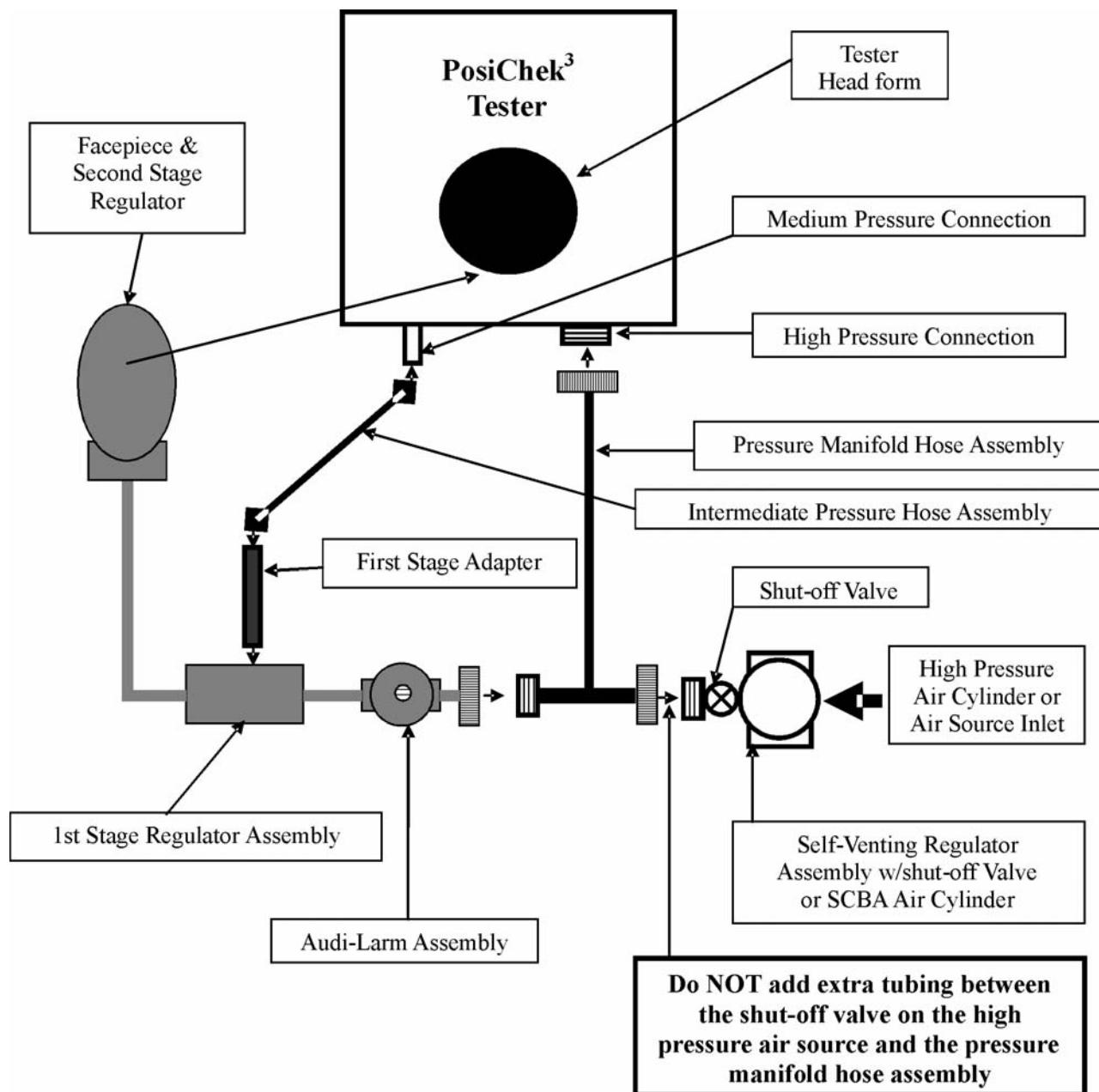
### Connecting the First Stage Test Manifold Assembly and Quick-Connect and Extend-Aire FireHawk Hoses

1. Verify all pressure is bled from the apparatus.
2. Disconnect the Firehawk hose from the first stage intermediate pressure hose.
3. Connect the test manifold assembly (P/N 10064120) to the first stage intermediate pressure hose.
4. Connect the FireHawk second stage hose to test manifold assembly.
5. Connect the PosiChek<sup>3</sup> intermediate pressure hose to the test manifold assembly.
6. Connect the other end of the PosiChek<sup>3</sup> intermediate pressure hose to the connection on the tester.



## APPENDIX C - AIR MASK CONNECTION TO THE POSICHEK TESTER

### MSA Air Mask Connection to the Posichek<sup>3</sup> Tester Schematic



## APPENDIX D

### Installation and Use of 0 to 5000 psig Self-Venting Pressure Regulator and Shut-Off Valve Assembly

#### Overview

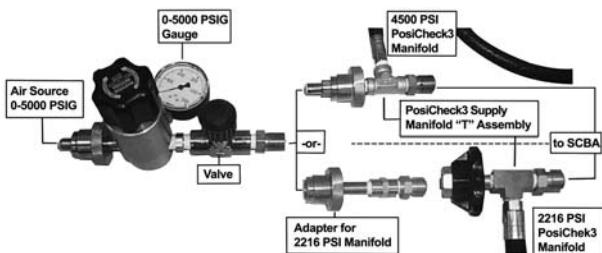
- Biosystems offers a 5000 psig self-venting pressure regulator assembly that allows the pressure in the PosiChek<sup>3</sup> Test Pressure Manifold Assembly to be easily and accurately adjusted during testing.
- This appendix covers the assembly, installation and operation of the 5000 psig regulator between the air source and the PosiChek<sup>3</sup> Tester pressure manifold. This appendix is intended for use by MSA Certified Repair Technicians who are familiar with the operation and use of the PosiChek<sup>3</sup> Tester and the air masks equipped with a redundant alarm or integrated control module.

**Note:** When testing a 2216 psig air mask the tester will require at least 1600 psig (1830 psig for the PR14 First Stage Regulator or the HUD test). When testing a 3000 psig air mask the test will require at least 1800 psig (2475 psig for the HUD test) to continue testing. When testing a 4500 psig air mask the tester will require at least 3200 psig (3712 psig for PR14 First Stage Regulator or the HUD test) to continue the testing.

- Using the pressure regulator and shut-off valve assembly increases the number of tests that can be performed using one cylinder of air.

#### Installation

The 5000 psig regulator must be connected to the primary high pressure air source. If any additional piping is required to complete the connection, it should be located between the air source and the inlet to the 5000 psig regulator and the air mask. The regulator must be installed with the appropriate CGA 346/347 fittings. The CGA 347 inlet can mate either to a low pressure or a high pressure cylinder. The valve is positioned on the outlet side of the regulator. The assembly comes with a CGA 347 outlet. If testing the MSA low pressure (2216/3000 psig) air mask, then purchase a 35-0475 low pressure adapter. Attach the appropriate PosiChek<sup>3</sup> Tester supply manifold "T" assembly handwheel onto the CGA outlet from the regulator. The air mask being tested is attached to the "T" assembly outlet. The handwheel at the long end of the manifold is attached to the front of the PosiChek<sup>3</sup>.



### How to connect and test an MSA Dual-Purpose Air Mask

Adapter (P/N 496568) is required to perform the *Airline Apparatus Test* on the Dual-Purpose System of the MSA air mask.

#### Installation of the Dual-Purpose Air Mask Test Adapter

The adapter is used to verify that air pressure to the air mask dual-purpose connection meets the requirements of the air mask under test.

- Attach the adapter female quick-connect (port A) to the male inlet quick-connect fitting on the dual-purpose system of the air mask.
- Connect the female quick-connect fitting on the tester intermediate pressure hose assembly to the male quick-connect fitting (port B) on the adapter.
- The female quick-connect on the other end of the intermediate pressure hose is connected to the medium pressure male inlet fitting on the PosiChek<sup>3</sup> Tester.

**Note:** Ensure the PosiChek<sup>3</sup> Tester is switched "on" and the software initialized as described in the installation section before attaching the medium pressure hose assembly to the tester.

- Connect a low pressure air supply (85 to 90 psig), using an MSA airline hose assembly with a female Schrader quick-connect fitting to the male quick-connect fitting (port C) on the adapter assembly.

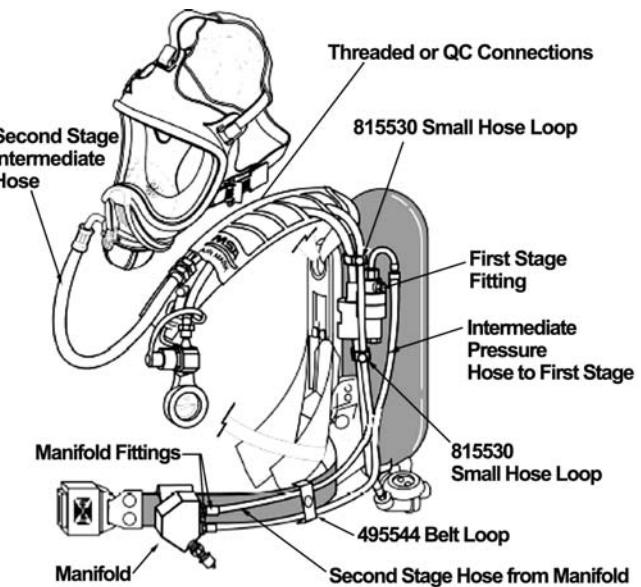
**Note:** This will require locating the PosiChek<sup>3</sup> Tester close enough to the air supply so that the medium pressure hose assembly can reach the medium pressure male connection on the PosiChek<sup>3</sup> Tester.

#### PosiChek<sup>3</sup> Flow Testing Procedures for the MSA Air Mask Dual-Purpose System

- Connect the air mask with the dual-purpose system to the PosiChek<sup>3</sup> Tester in the same manner as a standard MSA air mask.
- From the menu, click on "Test" and then click on "Complete SCBA Test."
- "Select Apparatus for Testing" menu will appear. Scroll down the menu to locate the model of MSA Dual-Purpose Air Mask being tested. Click on the selection and click "OK".
- Follow the instructions in this guide for performing the "Complete SCBA Test".
- When the "Complete SCBA Test" is performed successfully, click "Done".
- Release all air pressure from the air mask, remove the tester intermediate pressure hose from the first stage pressure relief outlet, remove tester adapter from pressure relief outlet and reinstall relief valve.
- Connect the adapter (P/N 496568) to the inlet connection of the dual-purpose system on the air mask in accordance with the installation instructions above.
- Set the inlet low pressure air supply pressure to 85 psig +/- psig.

## APPENDIX D

9. From the menu click on "Test" and then click on "Airline Apparatus Test."
10. "Airline Apparatus Test" menu will appear, click "Unselect All" and then click in the box marked "Standard Work Rate" and click "Done."
11. Follow the tester instructions.



## APPENDIX E: COMPLETE SCBA TEST SEQUENCE

### Complete SCBA Test Sequence

