WORKING COPY

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System Checkout Procedure

Model: 4906AB **Dial: none**

Revision 2

Revised by:	**Kimberly Gray**	**Date:** 12-20-12
Approved by:	**Tim Monday**	**Date:** 12/20/2012
Q/A Approval:	**Larry Hillis**	**Date:** 20 Dec 12

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1. Prerequisites

a. Assembly

i. The procedure presented here is for the checkout of a fully assembled Model 4906AB Hand and Foot Monitor. Before performing this procedure, ensure the unit is fully assembled.

b. Power Supply

i. Verify that the Model 4906AB unit is connected to the required power supply. Reference the Model 4906 Operator's Manual for power specifications.

c. Gas Supply

i. Verify the Model 4906AB unit is connected to the required detection gas supply. Reference the Model 4906 Operator's Manual for gas type and flow specifications.

d. Firmware

i. Ensure all programmable circuit boards have been loaded with the latest revision of the appropriate firmware. All circuit boards are programmed at the factory and do not require new programming unless installing an update and instructed to do so by LMI personnel. Circuit boards that require a firmware download are listed below.

- *Host Board - Main and peripheral microcontrollers*
- *Hand and Foot Detector Boards – Main microcontroller*
- *Frisker Detector Boards – Main and peripheral microcontrollers*
- *Gas Control Board – Main microcontroller*

e. Detector Board Voltage Calibration

i. All detector boards being checked out must have successfully completed a detector board voltage calibration before completing this procedure. This calibration is performed at the factory and does not need to be repeated unless detector board malfunction is suspected or detector board voltage calibration data is cleared.

f. SBC Software

i. The SBC (Single Board Computer) that is the primary controller for the Model 4906AB must have all required software and drivers installed prior to completion of this procedure. Required software is listed below.

- *SBC operating system*
- *USB-to-serial cable drivers*
- *Monitor drivers (applicability based on monitor type)*

2. Needed Equipment

a. Keyboard

i. To perform the Model 4906AB Hand and Foot Monitor system checkout procedure, a USB keyboard is recommended for software interface and data entry.

3. Visual Inspection

a. Physical Damage

i. Perform a thorough visual inspection for physical unit damage. Take particular note of displays, covers, wires, indicator lights, and sensors. Superficial damage should be corrected as needed. Damage that may cause functional problems must be corrected before proceeding.

b. Serial Numbers

i. Verify each detector (Left Hand Back – LHB, Left Hand Palm – LHP, Right Hand Back – RHB, Right Hand Palm – RHP, Left Foot – LF, and Right Foot - RF) is clearly marked with a serial number. This requires the opening of detector covers. The hand detector covers allow access to all hand detectors (one cover for both left and right sides), the foot cover allows access to both left and right foot detectors, and frisker serial numbers can be viewed on the mounted frisker probe. Opening the hand cover requires a flathead screwdriver. Serial numbers should be expected in a form similar to PRXXXXXX (example PR207281) for all detectors.


LUDLUM Measurements, Inc.
501 Oak Street / PO Box 810
Sweetwater, Texas 79556 U.S.A.
1-800-622-0828 www.ludlums.com
Model: 43-145
Serial #: PR317081


Ludlum Measurements, Inc.
MODEL 43-40-12
S/N: PR317834

ii. Verify the Model 4906AB Unit is marked with a unit serial number. This number is stamped into the Power IO Panel located on the lower side portion of the column. The number is in the format XXXXXX (example 344628).

4. Power ON/OFF Test

a. The following power on/off tests are used to verify the Model 4906AB power cycle functions are working correctly.
b. Power ON with Power Button

   i. Power on the unit by pressing and releasing the POWER/RESET button located on the power IO panel.
   ii. Verify the following sequence occurs.

      - *The frisker clicking noise may be heard if a frisker is equipped.*
      - *The yellow light stack light illuminates.*
      - *The unit display screen turns on to display the SBC boot sequence, followed by the operating system startup, and finally the Model 4906AB Supervisor Operate (Main) screen.*

a. Power OFF with Power Button

   i. Power off the unit by pressing and releasing the POWER/RESET button.
   ii. Verify the following sequence occurs.

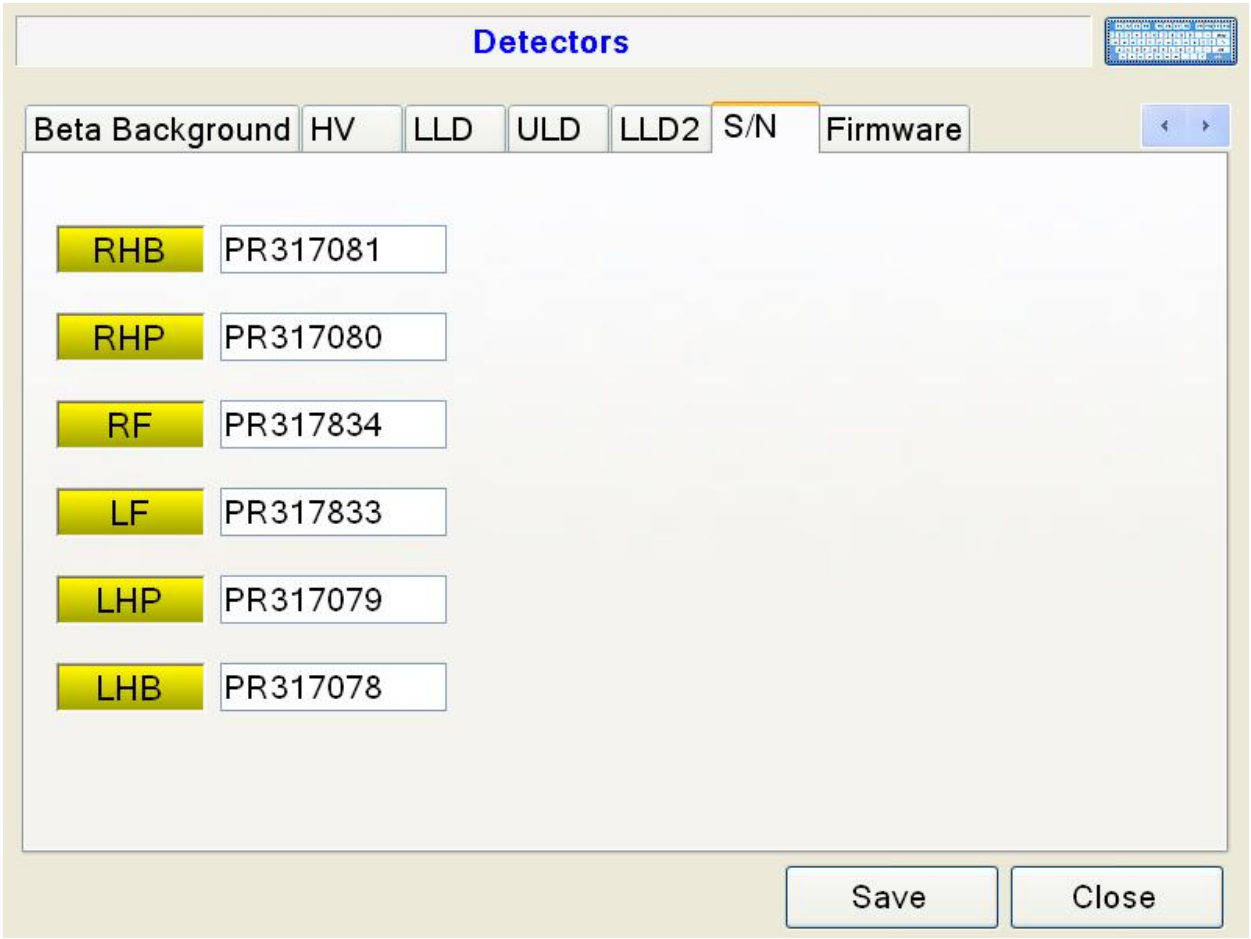
      - *The Model 4906AB Supervisor software closes.*
      - *The operating system shuts down.*
      - *All light stack lights extinguish.*

5. Software Serial Number Verification

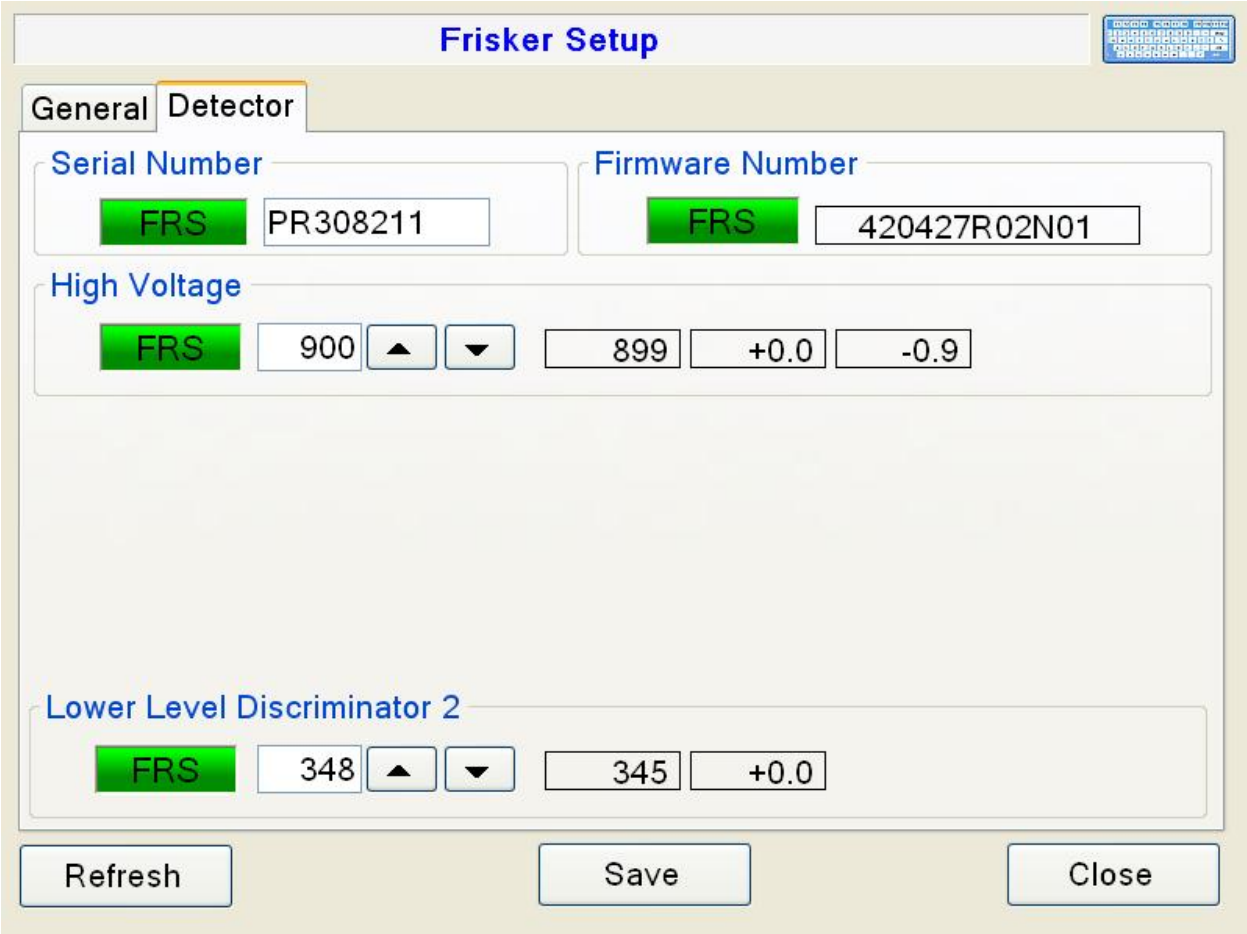
a. To ensure reported accuracy and detector traceability, the serial number on each detector must be verified to match the serial number entered into the Model 4906AB Supervisor software for the appropriate position. If the detector serial numbers have not yet been entered in the software, enter the serial numbers at this time.

b. Navigate to the Setup menu by selecting the Setup button on the Operate (Main) screen. Enter the high-level password (default = 2222) and select the Enter button.

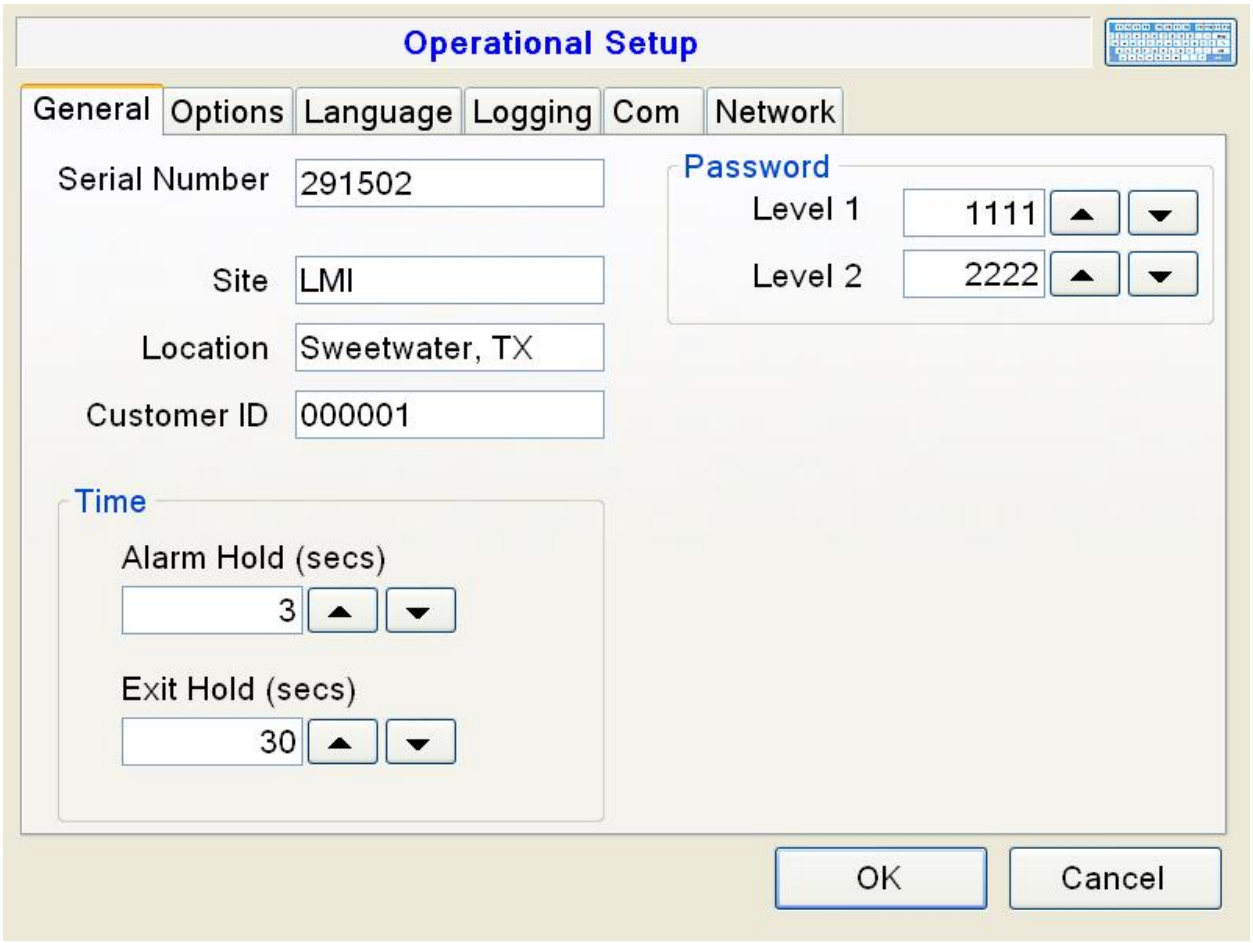
c. Next, select the Detectors button to open the Detectors screen and navigate to the General tab. Verify/enter the detector serial numbers and click the Save button.



d. If equipped with a frisker, the frisker serial number must be verified to match the serial number entered in the Supervisor software, or it must be entered if this has not yet been done.
e. From the Setup menu, select the Frisker button to bring up the Frisker screen. Select the Detector tab and verify/enter the frisker serial number and click the Save button.

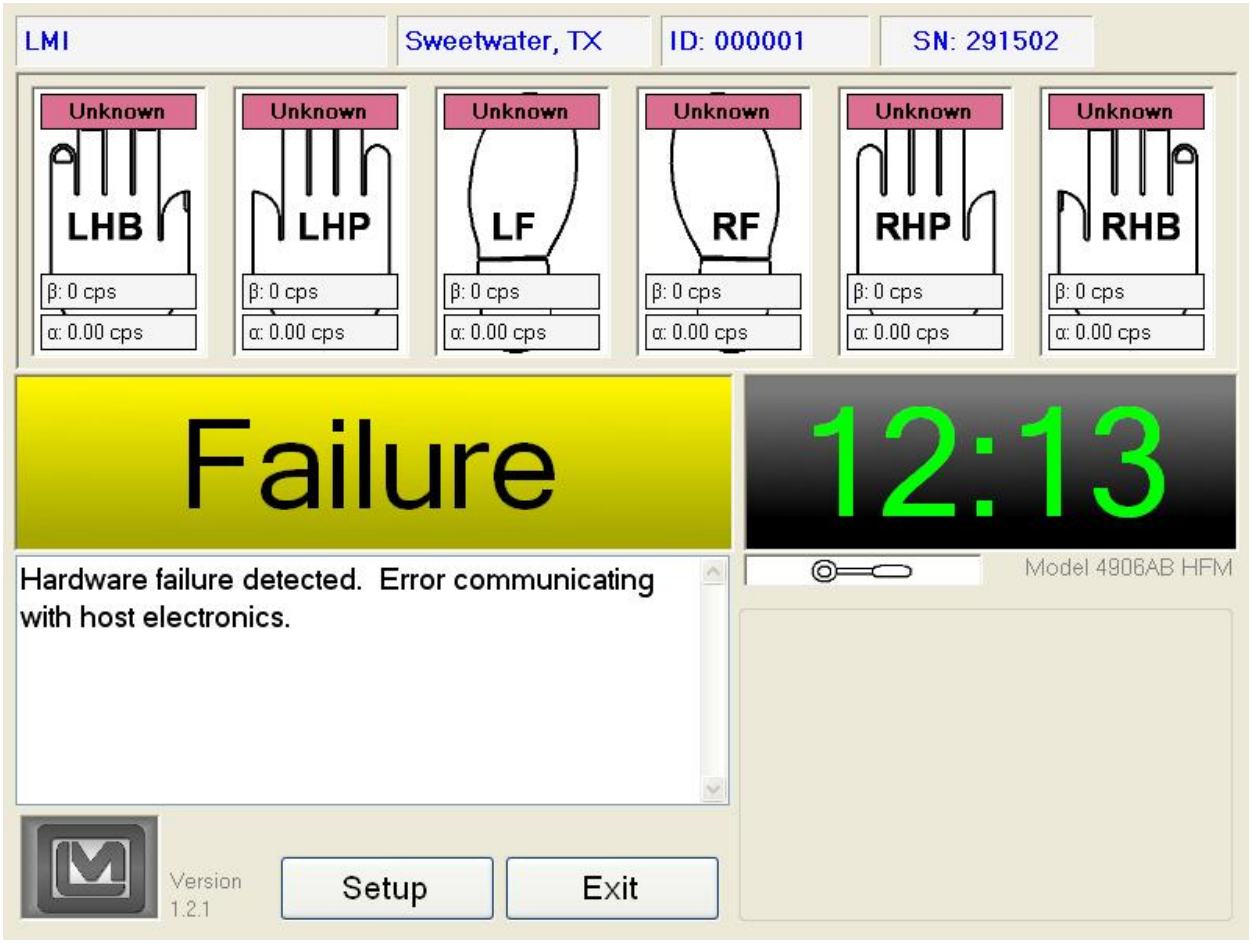


f. In addition to detector serial number entry, the whole unit serial number must be verified to match the serial number entered in the Supervisor software, or entered if this has not yet been done.
g. From the Setup menu, select the Operational button to bring up the Operational Setting screen. Select the General tab and verify/enter the Model 4906AB unit serial number and click the Apply button.

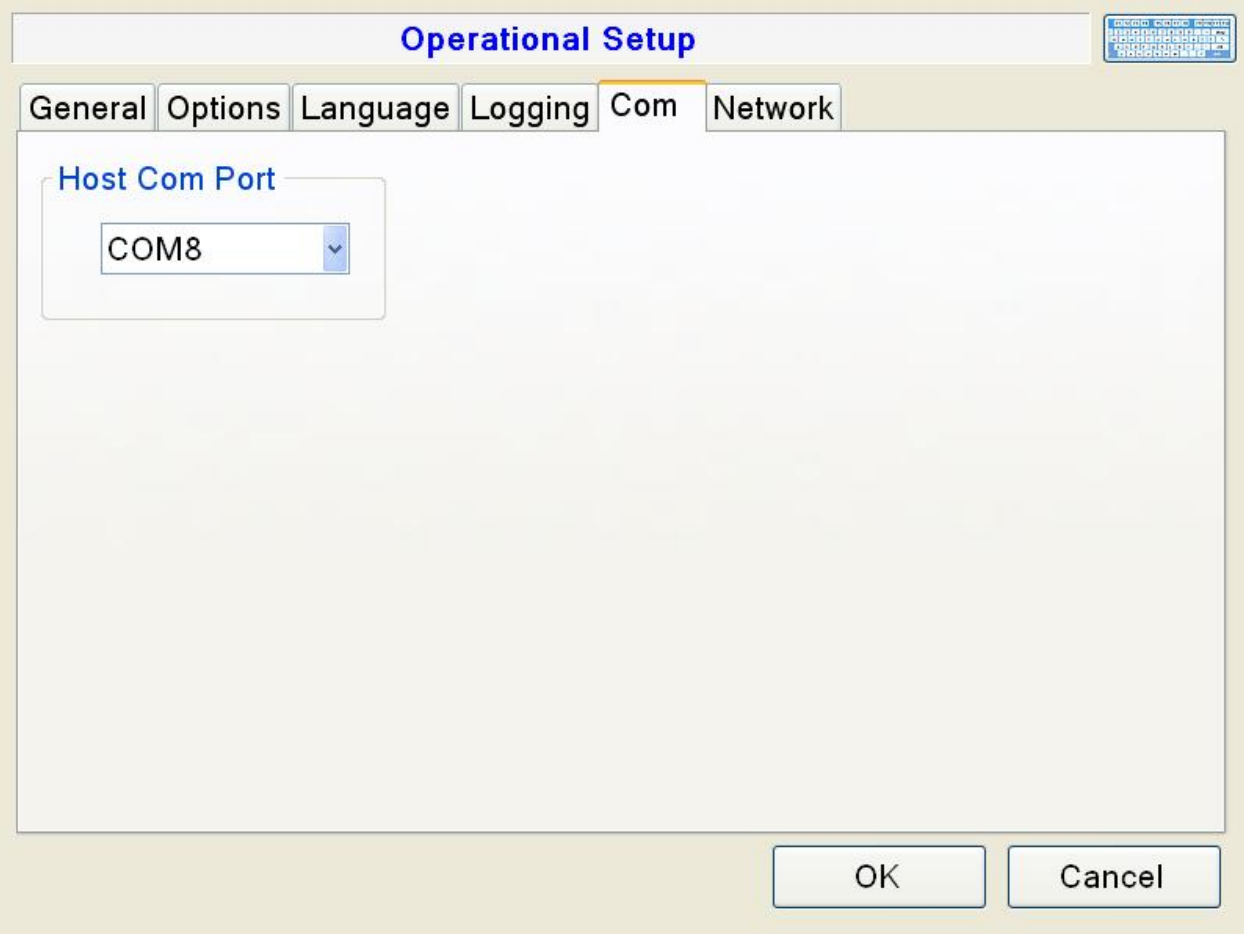

Operational Setup
General
Options
Language
Logging
Com
Network
Serial Number
291502
Site
LMI
Location
Sweetwater, TX
Customer ID
000001
Password
Level 1
1111
Level 2
2222
Time
Alarm Hold (secs)
3
Exit Hold (secs)
30
OK
Cancel

6. SBC to Host Communication

a. To ensure proper Model 4906AB operation, the SBC must communicate to the Host board via a special USB-to-serial data cable, verifying Host-to-SBC communication is done by noting the absence of a hardware communication system failure.
b. The Operate screen displays a System Failure message, indicating that a hardware communication failure has taken place when communication between the SBC and Host is lost or cannot be established.



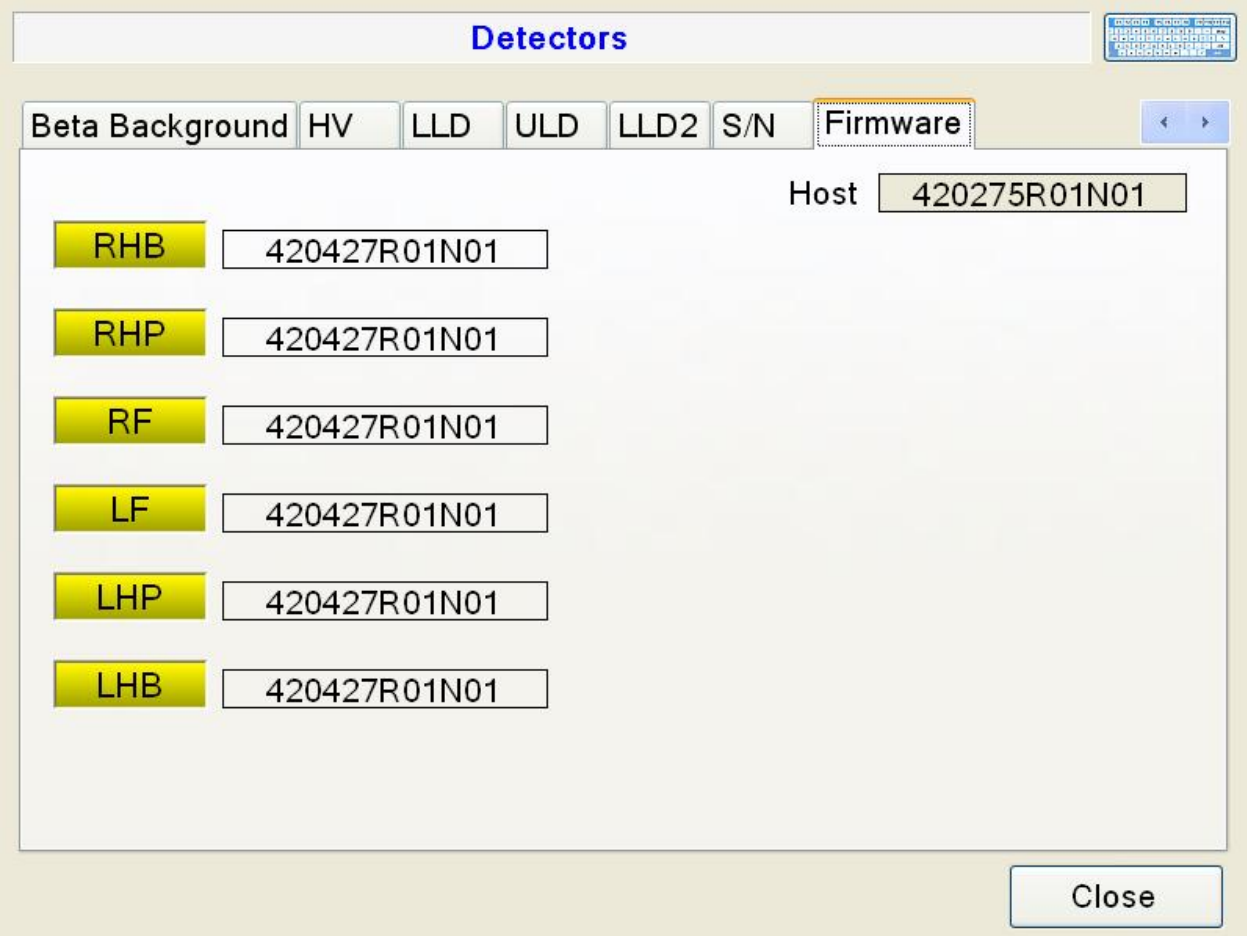
c. If a hardware communication error state does exist, the Supervisor COM port setting must be verified. This can be done by navigating to the Setup menu (click Setup then enter the high-level password).
d. Next, select the Operational button to view the Operational Settings screen. Select the COM tab.
e. Verify the selected COM port is not COM1 or COM2. The selected COM port should be the only COM port in the list that is neither COM1 nor COM2. Select the correct COM port. It should be labeled COM3 or COM4. Once the correct port has been selected, click the OK button.



f. Exit out of the Operational Settings back to the Setup menu using the OK button, and clear the previous failure in the Scaler screen if not already clear.
g. Verify the hardware communication system failure has been eliminated.

7. Firmware Number Verification

a. To verify that communication between the host board, SBC, and detector boards, firmware numbers displayed by the Model 4906AB Supervisor software must be verified to be valid.
b. Start with the host board firmware number. Navigate to the Setup menu by selecting the Setup button on the Operate (Main) Screen. Enter the high-level password (default = 2222) and click the Enter button.
c. Next, select the Detectors button to open the Detectors screen and select the Firmware tab. The host firmware number is located in the upper, right corner.

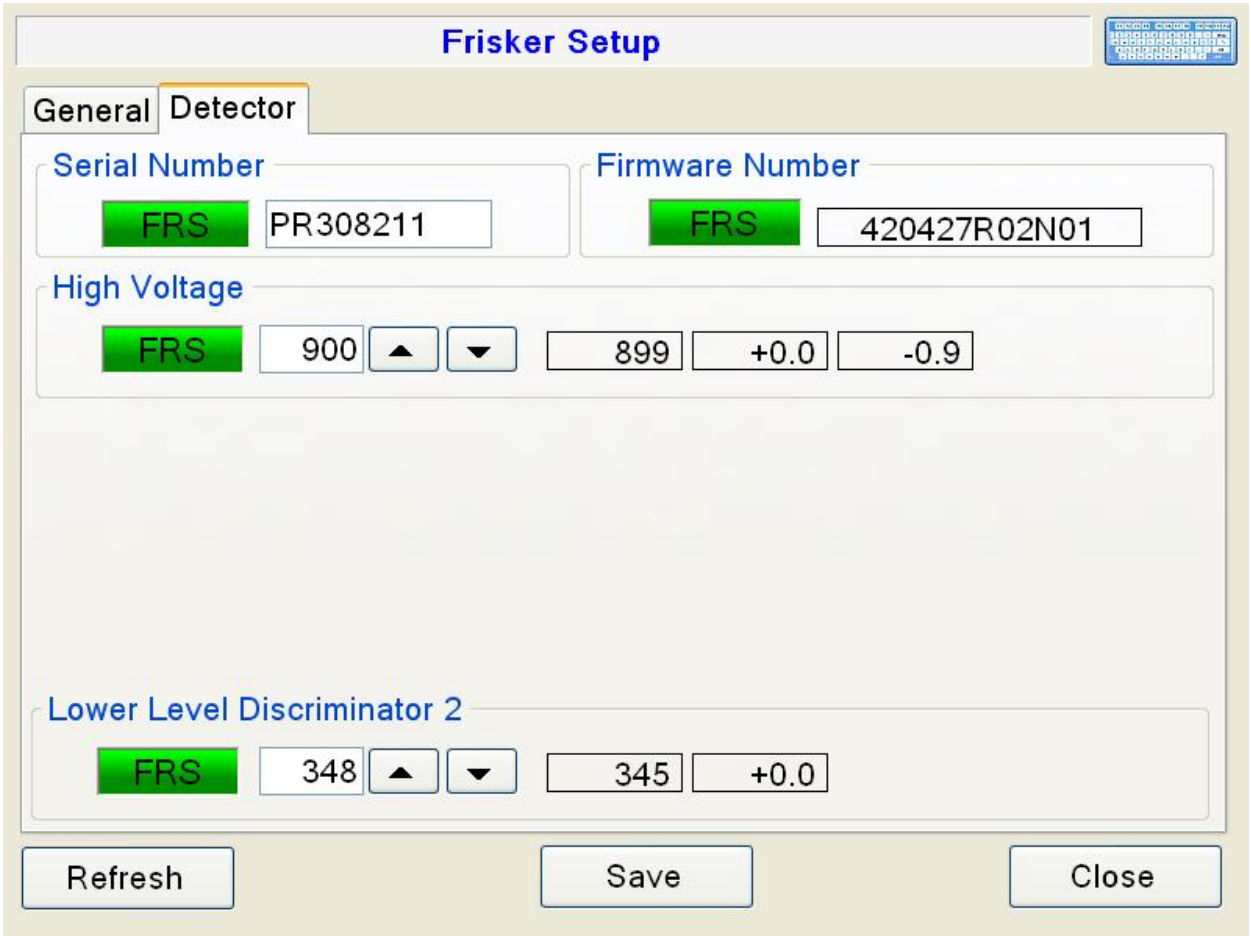


d. Verify the host firmware number is a valid host firmware number. A valid firmware number for the host looks similar to "420275R01N01." The "01" following the "R" and "N" must both be valid numbers greater than zero, not "??" or "00."

e. Now move to verification of the hand and foot detector board firmware numbers. Remain on the Firmware tab of the Detectors screen to verify these numbers.

f. Verify that each detector firmware number is a valid hand and foot detector firmware number. A valid hand and foot detector firmware number looks similar to "420474R01N01." The "01" following the "R" and "N" must both be valid numbers greater than zero, not "??" or "00."

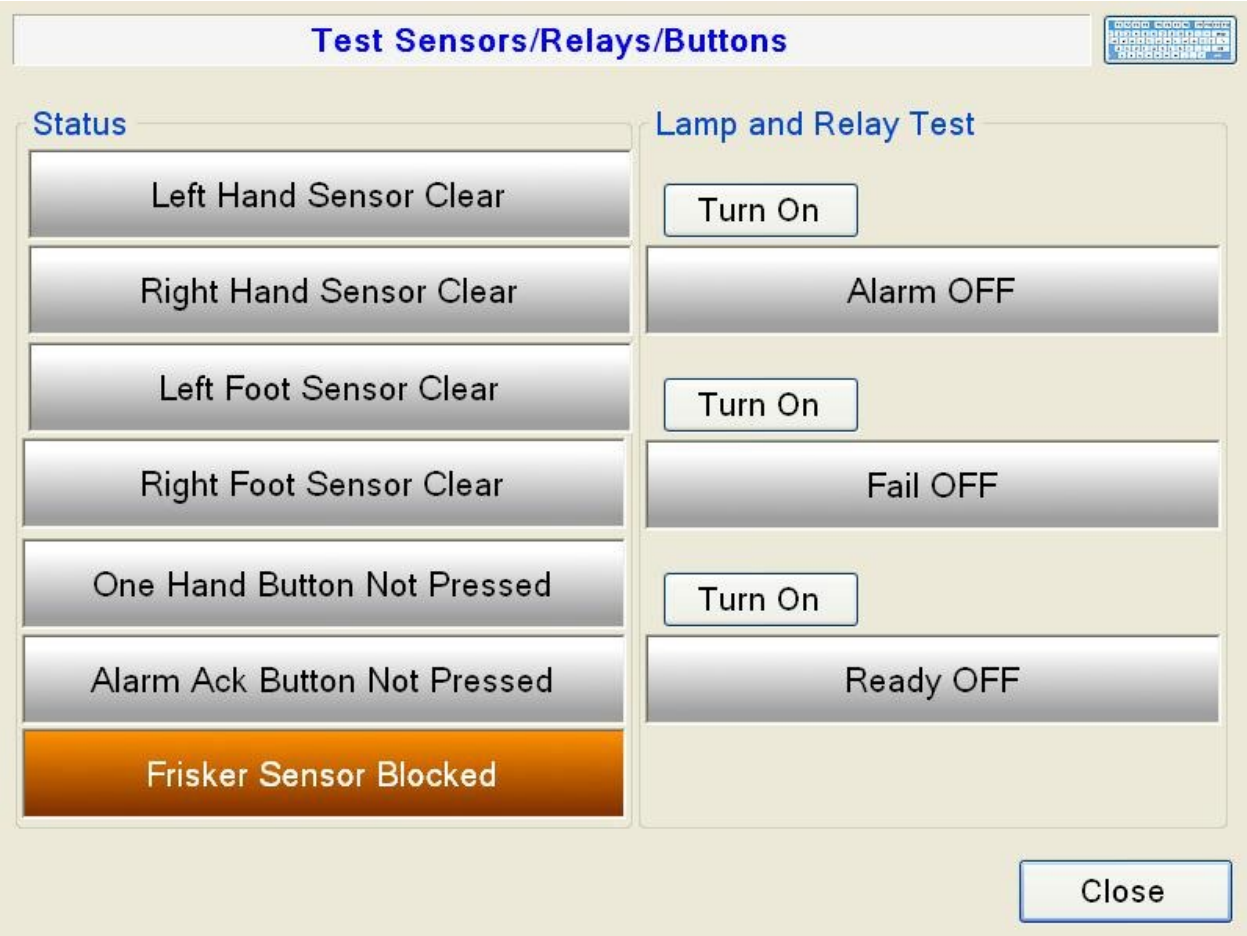
g. Finally, the frisker detector board firmware numbers must be verified. Navigate to the Setup menu and select the Frisker button. Once the Frisker screen is open, select the Detector tab. The frisker firmware number is located in the upper, right corner.



h. Verify the frisker firmware number is a valid frisker detector board firmware number. A valid frisker detector board firmware number looks similar to "420427R01N01." The "01" following the "R" and "N" must both be valid numbers greater than zero, not "??" or "00."

8. Button/Relay Test

a. The button/relay test is intended to verify function of the buttons, relays, and sensors that act as input and output devices to allow user interaction. Navigate to the Buttons/Relays screen by opening the Setup menu and selecting the Buttons/Relays button.



b. Test the following user input/output devices as described.

i. Alarm Light

- *Click the Turn On button in the Outputs group directly above the Alarm Off indicator bar*
- *Verify the button text changes to Turn Off*
- *Verify the indicator bar turns red and text indicates Alarm On*
- *Verify the red Alarm light on all installed light stacks illuminates*
- *Verify the audible alarm sounds (Fast Beep)*
- *Click the Turn Off button in the Outputs group directly above the Alarm On indicator bar*
- *Verify the button text changes to Turn On*
- *Verify the red Alarm light on all installed light stacks extinguishes*
- *Verify the audible alarm silences*
- *Verify the indicator bar turns gray and text indicates Alarm Off*

ii. Fail Light

- *Click the Turn On button in the Outputs group directly above the Fail Off indicator bar*
- *Verify the button text changes to Turn Off*
- *Verify the indicator bar turns yellow and text indicates Fail On*
- *Verify the yellow Fail light on all installed light stacks illuminates*
- *Verify an audible alarm sounds (Slow Beep)*
- *Click the Turn Off button in the Outputs group directly above the Fail On indicator bar*
- *Verify the button text changes to Turn On*
- *Verify the yellow Fail light on all installed light stacks extinguishes*
- *Verify the indicator bar turns gray and text indicates Fail Off*

iii. Ready Light

- *Click the Turn On button in the Outputs group directly above the Ready Off indicator bar*
- *Verify the button text changes to Turn Off*
- *Verify the indicator bar turns green and text indicates Ready On*
- *Verify the green Ready light on all installed light stacks illuminates*
- *Click the Turn Off button in the Outputs group directly above the Ready On indicator bar*
- *Verify the button text changes to Turn On*
- *Verify the green Ready light on all installed light stacks extinguishes*
- *Verify the indicator bar turns gray and text indicates Ready Off*

iv. Left Hand Sensor

- *Place your left hand (or some other object) inside the left hand detector box*
- *Verify the Left Hand Sensor Clear indicator bar changes from gray to orange, and the text changes from Left Hand Sensor Clear to Left Hand Sensor Blocked*
- *Verify that the bar returns to gray with the Left Hand Sensor Clear message once the left hand detector box sensor area is cleared*

v. Right Hand Sensor

- *Place your right hand (or some other object) inside the right hand detector box*
- *Verify the Right Hand Sensor Clear indicator bar changes from gray to orange, and the text changes from Right Hand Sensor Clear to Right Hand Sensor Blocked*
- *Verify that the bar returns to gray with the Right Hand Sensor Clear message once the right hand detector box sensor area is cleared*

vi. Left Foot Sensor

- *Place your left foot (or some other object) all the way forward in the left foot position on the unit base*
- *Verify the Left Foot Sensor Clear indicator bar changes from gray to orange, and the text changes from Left Foot Sensor Clear to Left Foot Sensor Blocked*
- *Verify that the bar returns to gray with the Left Foot Sensor Clear message once the left foot area is cleared*

vii. Right Foot Sensor

- *Place your right foot (or some other object) all the way forward in the right foot position on the unit base*
- *Verify the Right Foot Sensor Clear indicator bar changes from gray to orange, and the text changes from Right Foot Sensor Clear to Right Foot Sensor Blocked*
- *Verify that the bar returns to gray with the Right Foot Sensor Clear message once the right foot area is cleared*

viii. One Hand Button

- *Press and release the One Hand button on the Model 4906AB main cabinet*
- *Verify the One Hand Button Not Pressed indicator bar changes from gray to blue, and the text changes to One Hand Button Pressed*
- *Verify the Once Hand button indicator ring lights up blue*
- *After a short delay (less than 2-3 seconds), verify the One Hand Button Pressed indicator bar changes from blue to gray, and the test changes to One Hand Button Not Pressed*

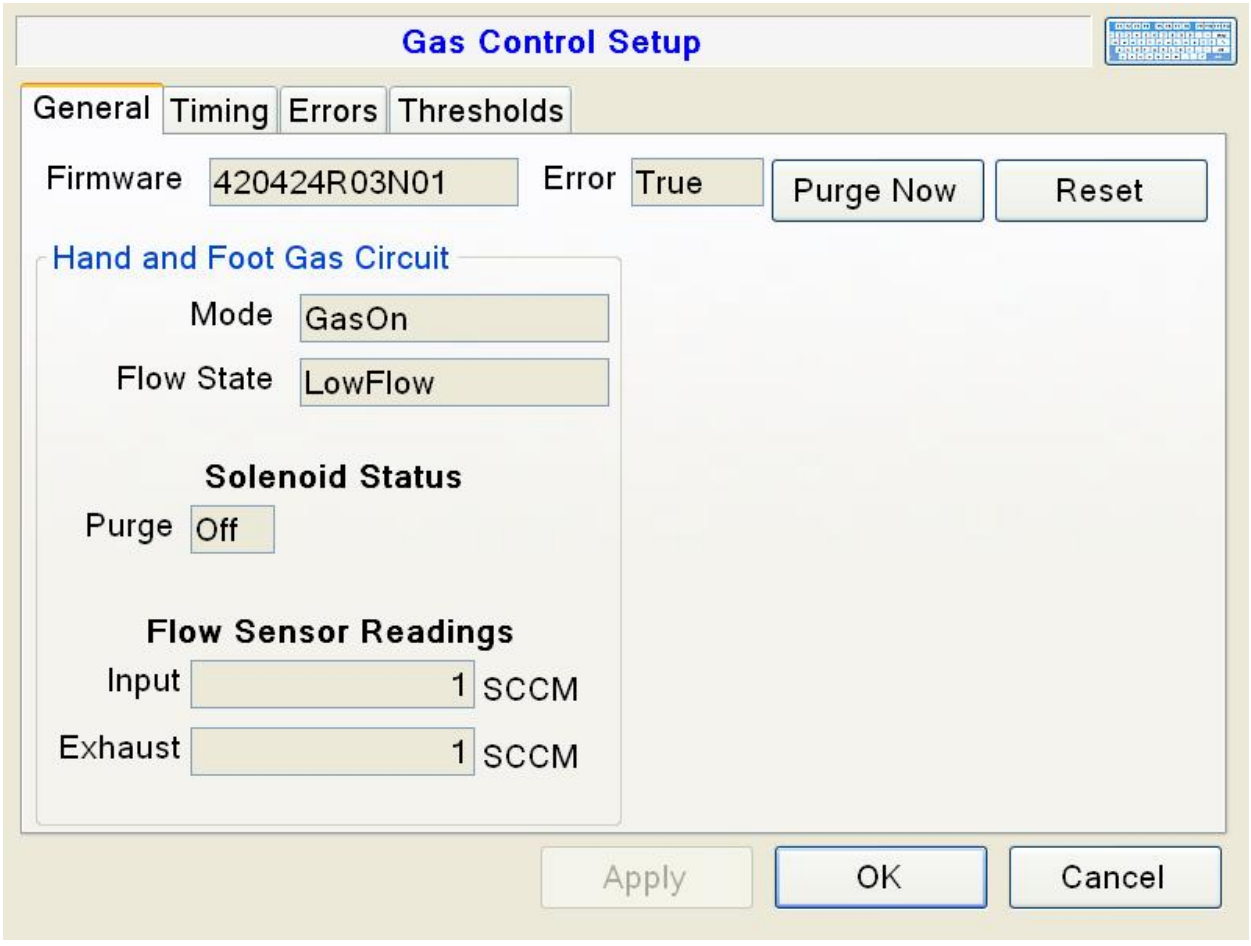
ix. Alarm Acknowledge Button

- *Press and release the Alarm Ack (Acknowledge) button on the Model 4906AB main cabinet*
- *Verify the Alarm Ack Button Not Pressed indicator bar changes from gray to red, and the text changes to Alarm Ack Button Pressed*
- *Verify the Alarm Ack button indicator ring lights up red*
- *After a short delay (less than 2-3 seconds), verify the Alarm Ack Button Pressed indicator bar changes from red to gray, and the text changes to Alarm Ack Button Not Pressed*

9. Gas Flow Test

a. Communication Test

i. To determine if the Model 4906 host board is properly communicating with the Gas Control board, verify the Gas Control board firmware number is valid.
ii. Navigate to the Gas Control Setup screen. Start by clicking the Setup button from the Main (Operate) screen and entering the high-level password (default = 2222) to view the Setup menu.
iii. Next, click the Gas Control button in the Setup menu. If no such button exists, verify the Gas Control Enabled option under the Options tab of the Operational Setup screen is set to Yes.
iv. Once in the Gas Control Setup screen, ensure the General tab is selected. The Gas Control board firmware number can be viewed in the top, left corner of the screen.
v. Verify the firmware number is a valid gas control board firmware number. A valid firmware number for the gas control board looks similar to "420424R01N01." The "01" following the "R" and "N" must both be valid numbers greater than zero, not "??" or "00."



b. Setup Test Values

i. The Gas Control Setup screen has three tabs for setting up the gas control values. These tabs are Timing, Thresholds, and Errors.
ii. Set the values for testing gas flow on each tab as listed below
iii. Timing

- *Purge Time = 2 min*
- *Sensor Read Interval = 1 second*
- *Flow Error Delay = 40 seconds*

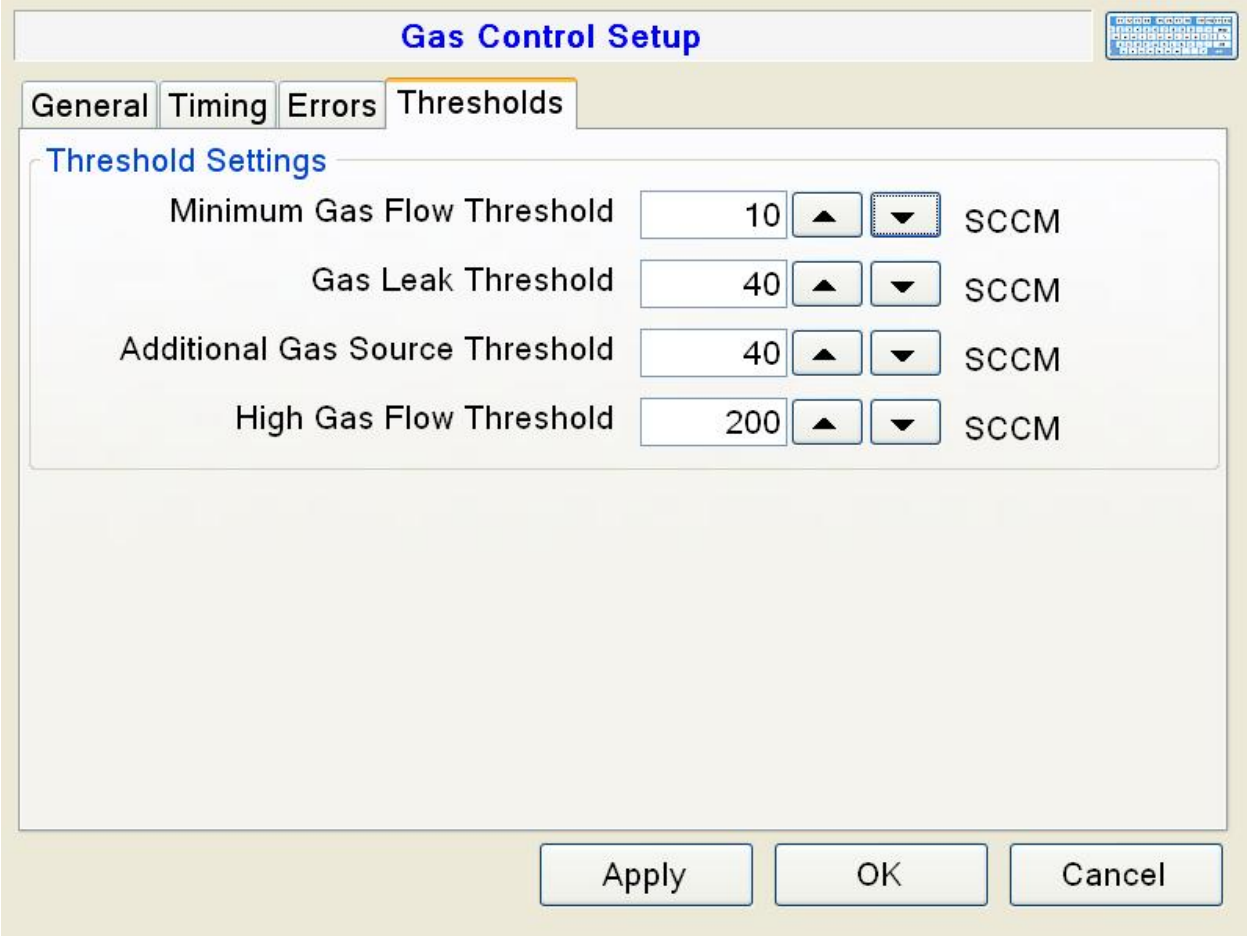
iv. Errors

- *Additional Gas Source Error = 20*
- *Gas Leak Error = 30*
- *High Gas Flow Error = 30*
- *Low Gas Flow Error = 30*

v. Thresholds

- *Minimum Gas Flow Threshold = 10 SCCM*
- *Gas Leak Threshold = 25 SCCM*
- *Additional Gas Source Threshold = 25 SCCM*
- *High Gas Flow Threshold = 200 SCCM*

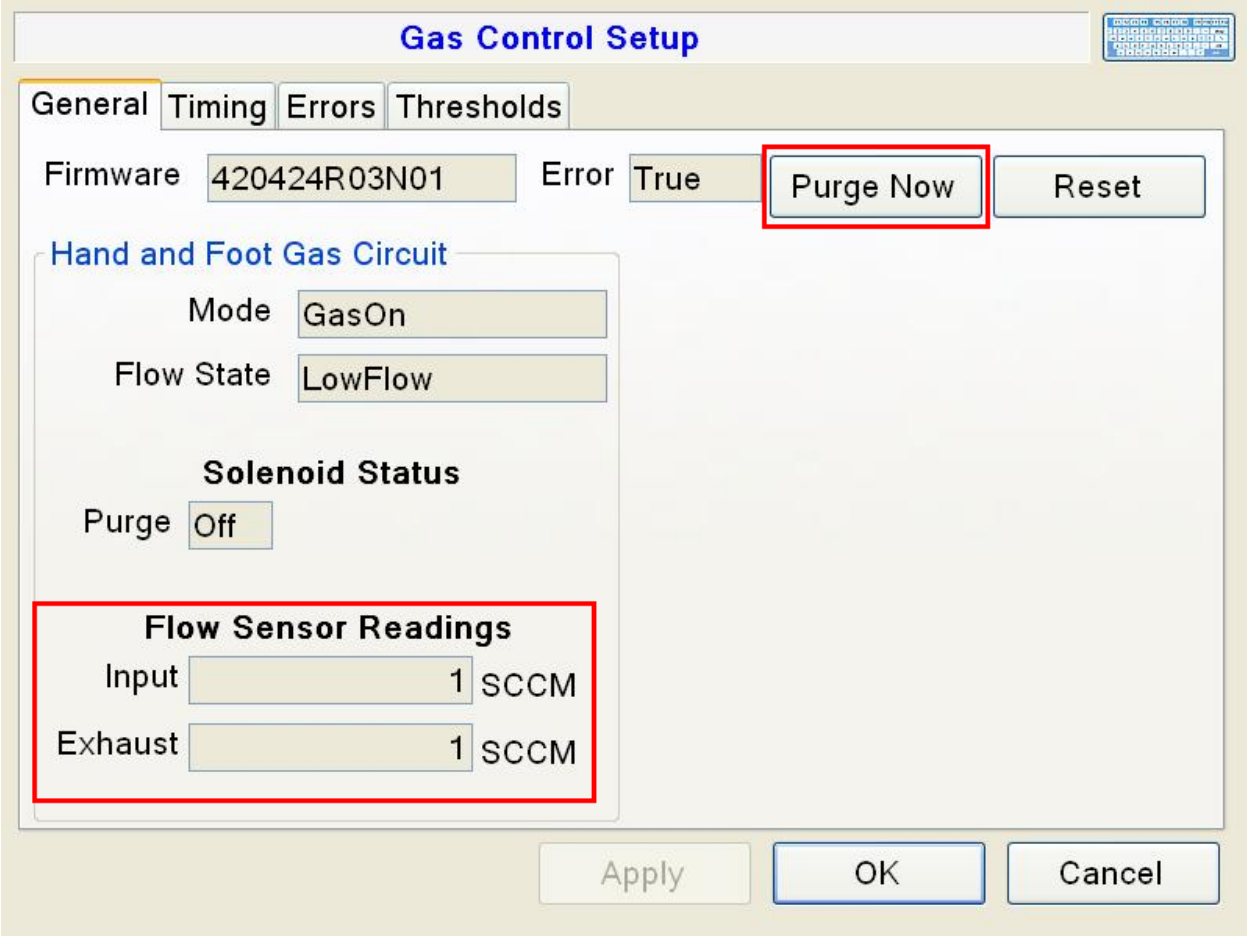
vi. Click the Apply button to save these settings.



c. Function Test

i. This test verifies that the gas purge solenoids are functioning properly.
ii. First verify the unit is in the GasOn mode by checking the General tab on the Gas Control Setup screen.
iii. Then use the Hand/Feet and Frisker gas flow throttle valves located on the Power IO panel (see photo on following page) towards the bottom of the support column to adjust the Hand and Foot flow to approximately 100 SCCM and the Frisker flow (if a gas frisker is mounted) to approximately 30 SCCM.
iv. The flow in each circuit can be viewed from the General tab on the Gas Control Setup screen. Tilt the Model 4906AB monitor down for easier viewing of flow value while adjusting the valves. Flow rates on the screen update once every 2 seconds, and the system takes a few seconds to equalize from changes, so slow incremental adjustments are the best.

v. Next, click the Purge Now button to initiate a gas purge.



vi. Verify the Mode changes from GasOn to GasPurge.
vii. Verify the Input and Output flow readings for each circuit increase drastically (generally to 250 or very close).
viii. Wait two minutes for the purge to end and verify the mode changes from GasPurge back to GasOn and that the flow levels return to their previous settings after a few minutes of settling time.
ix. Verify that all sensors responded to flow changes during the entire procedure, both during valve adjustments and the purge sequence.
x. Remove or shut off the gas supply from the unit and verify all sensors read 0 or very close to 0 (5 or less is best).

d. Setup Default Values
   i. Set the default gas flow values on each tab as listed below
   ii. Timing

- *Purge Time = 2 min*
- *Sensor Read Interval = 1 second*
- *Flow Error Delay = 40 seconds*

iii. Errors

- *Additional Gas Source Error = 20*
- *Gas Leak Error = 30*
- *High Gas Flow Error = 30*
- *Low Gas Flow Error = 30*

iv. Thresholds

- *Minimum Gas Flow Threshold = 10 SCCM*
- *Gas Leak Threshold = 25 SCCM*
- *Additional Gas Source Threshold = 25 SCCM*
- *High Gas Flow Threshold = 200 SCCM*

v. Click the Apply button to save these settings.

10. Calibration and Detector Testing

a. Factory Calibration and Checkout

i. Once the above system checkout procedures are complete, the Model 4906 Calibration procedure must be completed, and collected data stored electronically and printed for shipment with the unit.
ii. Refer to the Model 4906 Factory Documentation List for information about what documents must be stored and printed, as well as where and how to ensure they are properly stored before unit shipment.

b. Field Calibration and Checkout

i. If using the above procedure to perform a field checkout of a Model 4906 unit, performance of the calibration procedure is optional.

11. SBC Software Restoration Point

a. Create a Windows Restore Point via Script

i. As of 4906 Supervisor Software Release Version 1.2.6, a shortcut to a script is now placed on the computer desktop the first time the Supervisor is run. This script can be used to quickly and easily create a Windows restore Point using the following procedure.
ii. First ensure that Version 1.2.6 or later of the Model 4906 Supervisor Software is installed on the unit in question and that this program has been run at least one time.
iii. Next locate the "Create Restore Point" shortcut located on the desktop.
iv. Double-click this shortcut, and a window will appear requesting a description of the restore point. Enter a meaningful description, click OK, and the restore point is now created.
v. NOTE: Settings for how much space is allowed for system restore points will affect if a restore point is created properly and how long it is stored. Ensure system settings are such that a restore point can be stored and maintained. Restore points only apply to drivers and programs. They DO NOT provide any type of file backup.

b. Create a Windows Restore Point

i. Creating a Windows restore point is required when performing a factory calibration and checkout. Creating a restore point is also recommended any time a software or driver update is performed.
ii. This procedure is for creating a restore point using Windows 7. Windows 7 is the installed operating system for all new Model 4906 units at the time of this writing.
iii. Click the Start button.
iv. Right-click Computer and then click Properties in the pop-up menu.
v. In the left pane, click System Protection. If prompted for an administrator password or confirmation, type the password or provide confirmation.
vi. Click the System Protection tab, and then click Create.
vii. In the System Protection dialog box, type a description, and then click Create.
viii. For factory calibrations, the description should be named in a manner that makes it clear that this is the factory restore point. A name such as "Model 4906 Factory Restore Point" is appropriate.