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Smithsonian Institution &
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Single Actuator Teststand Installation Instructions

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Single Actuator Teststand Installation Instructions

The teststand has two configurations that allow both the single and the dual actuators to be tested accurately. To prepare the stand for calibration of the single actuators, the teststand will need to be set up as follows:

Figure 1

Figure 1 shows the set of tools that will be necessary for installation and removal of the single actuator adapter.

- Crescent wrench to adjust/remove pressure relief valves
- 3/16" Hex head nut driver to remove/adjust connector jack screws
- 3/16" Allen driver/T driver to remove/adjust transducer bracket to cylinder
- 5/16" Allen wrench to install actuator bolts to teststand
- 7/16" open end wrenches to adjust/remove air hoses
- Small flat head screwdriver to remove/install connectors
- 1" open end wrench to install/remove Trantorque nut
- 1" open end short wrench to hold locking nut on load cell

Figure 2

Figure 2 shows the test stand without either (single/dual) adapter attached. The Trantorque fitting plate must be bolted on for testing the single actuators. On this plate, there is a setting pin and two bolts to tighten. The center cavity is where the actuator shaft and Trantorque nut will be inserted and tightened. Once this plate is attached, the single actuator adapter can be attached.

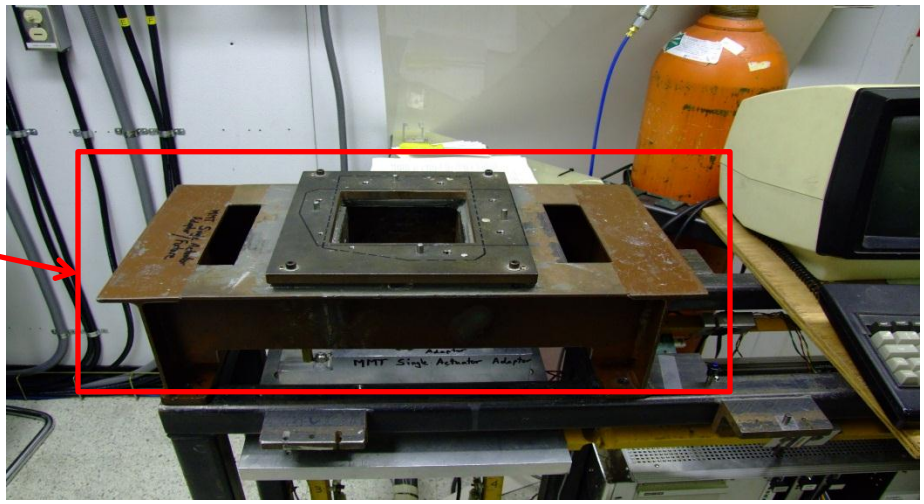

Figure 3

Figure 3 shows the single actuator assembly. This part is one solid piece that attaches to the teststand frame via 4 bolts. It is clearly marked on the surface which direction the adapter faces and where it should lay on the frame. Once this piece is attached, single actuators may be affixed for testing and calibration.

There are differences among some of the single actuators. One of these differences is the direction the actuator is to be seated on the teststand. As you can see in Figure 4, there are two black outlines traced in magic marker that define the different positions for the different actuator bases.

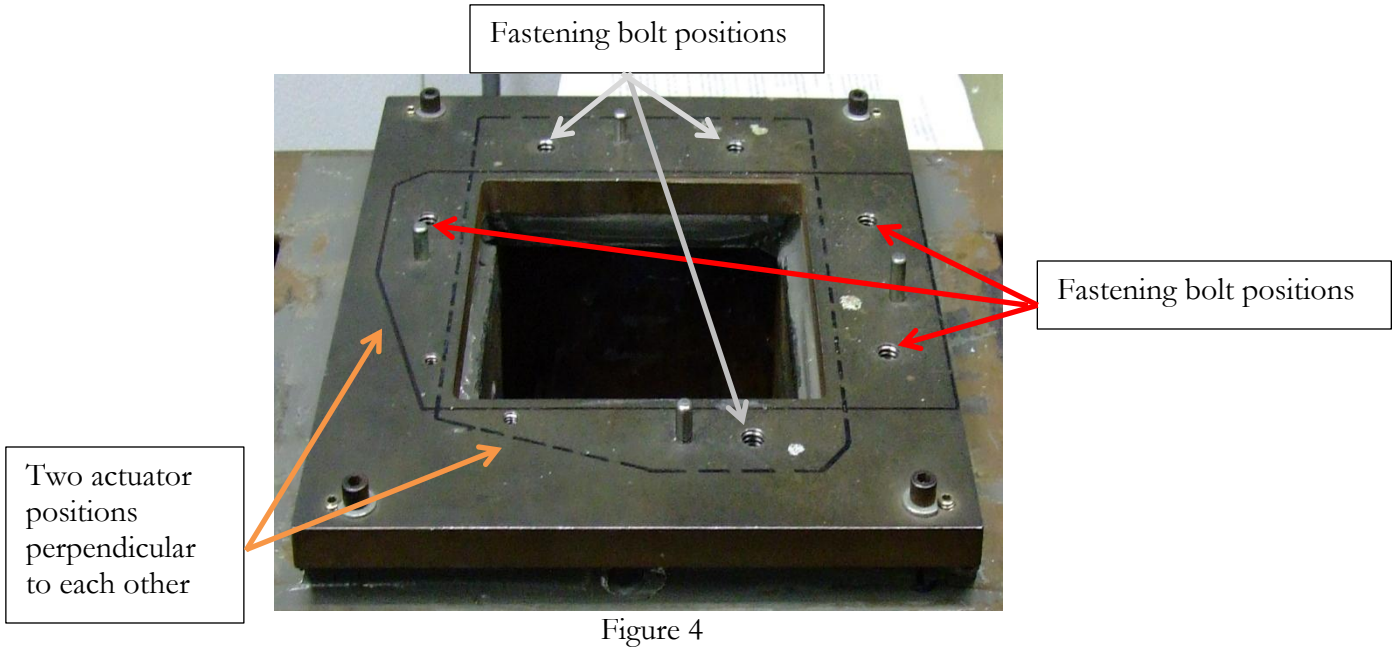

Figure 4

Also shown in Figure 4 are the guiding pins and the fastening bolt positions for each actuator base.

-Install a single actuator on the teststand.

-Align the actuator with the guide pins so it seats in position.

-Fasten the three bolts with the short bolt always fastened in the single spot on the top.

-The two bolt locations that are side by side are always for the longer bolts. Make sure they are hand tight.

-The actuator shaft should have a Trantorque nut that slides onto the shaft, nut side up. Tighten the nut.

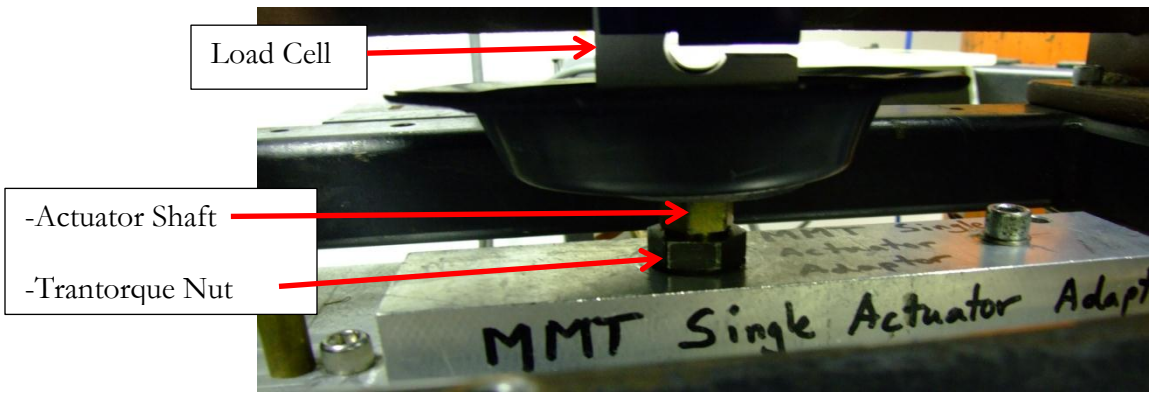

Figure 5

Figure 5 points out the load cell, the shaft and the Trantorque nut which slides onto the shaft of the actuator. Once the nut is in place as shown in Figure 5, the nut can be tightened to a very snug hand tight. If the nut is not tightened enough, the shaft may have more pressure (pulling up) and become loose from the nut (a very loud bang indicates that the shaft has indeed come out of the torque nut).

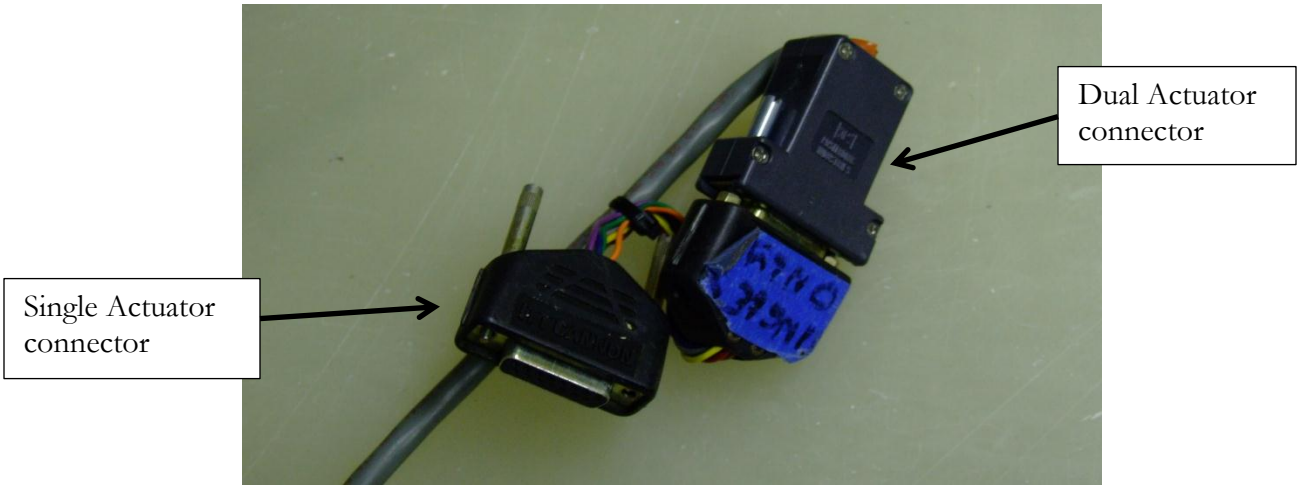

Figure 6

Figure 6 shows the connector which must be attached to the actuator in order to talk to the computer. The connector has two sections: one for testing and calibration of the single actuators and the other for testing and calibration of the dual actuators. There is a jumper assembly attached to the dual connector which is necessary for communication with the single actuators. This is because the single actuator has half the circuit of a dual actuator.

-Keep the jumper attached to the dual connector and fasten the single connector to the circuit card on the actuator.

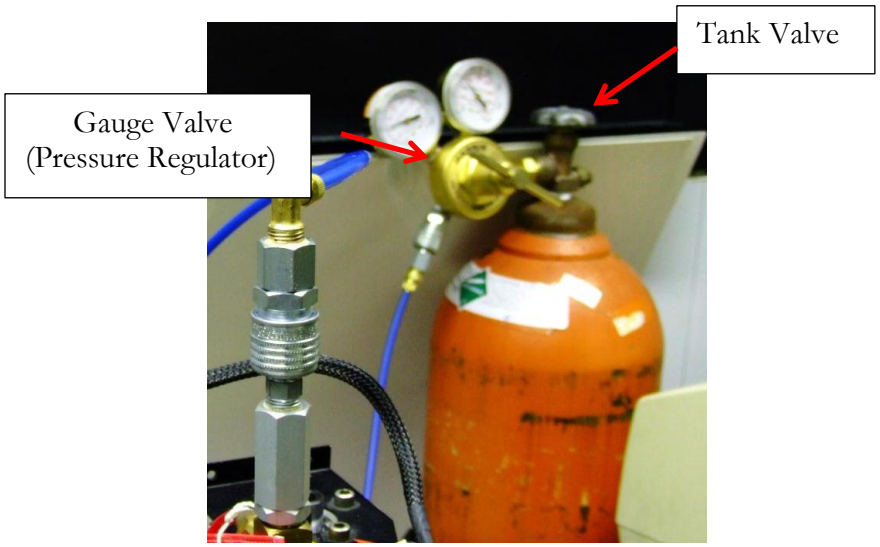

Figure 7

The last step to set up the single actuator on the teststand before powering it up is preparing the necessary air. The nitrogen tank should have a precise, calibrated pressure regulator attached to it (see Figure 7). The pressure valve of the tank should be closed tight and the gauge valve of the pressure regulator should be opened or loose.

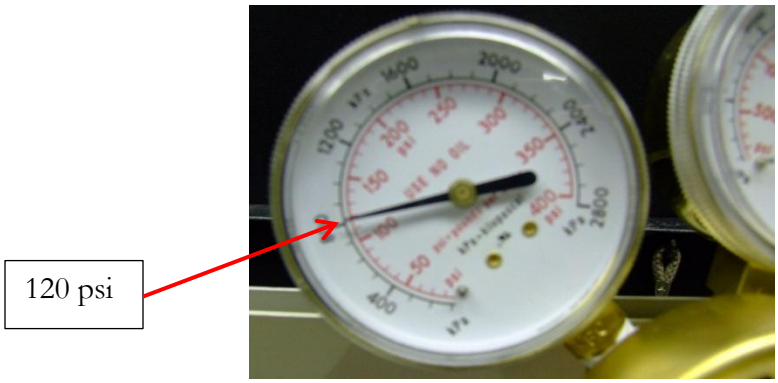

Figure 8

When you are ready to open the air valves and turn the air on, the first step is:

- Make sure the 'gauge valve' is opened

- Turn the valve of the tank on by one full turn (make sure your face is NOT directly in front of the valve as a precaution)

- Open the valve at the gauge by turning in a clockwise direction until the gauge reads 120 psi (the red-numbered section, see Figure 8)

The last step to testing and calibrating the actuator is to turn on the computer and run the vxworks program.

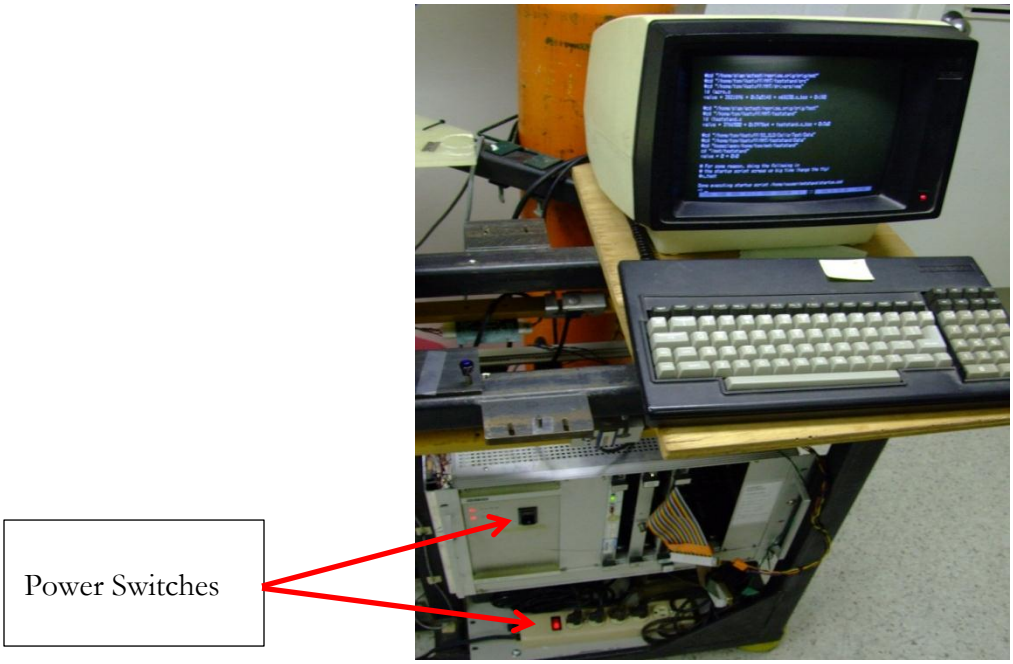

Figure 9

First Set of Tests to be Conducted

-Turn the power on to the power strip and the computer.

-When the program finishes the loading process, type "v_test" and press RETURN.

-The screen will change to the actuator test program. Type "as" and press RETURN. Typing "as" will let the program know it is the single actuator that is to be calibrated.

-"Single Actuator" will now appear on screen. Type "z" and press RETURN. This will zero out any previous readings

-To begin calibrating the actuator, type "c" and press RETURN.

-The program will now require some information about the actuator that is to be calibrated.

Example:

File Name: The filename should look like this: mmddyy-act# (example: 072512-101)

Actuator #: 101

Electronic Card #: 101

Main Cylinder #: 106A

Main Push #: 101c2 (Bottom actuator)

Main Pull #: 101c1 (Top Actuator)

Aux Cylinder #: Information required for Dual Actuators only
Aux Push #: Information required for Dual Actuators only
Aux Pull #: Information required for Dual Actuators only

Press RETURN

Serial #: The serial number should be a starting number or number which will be easy to record.

Max Press: There are two types of single actuators. One requires a maximum force of 600 lbf and the other a maximum force of 200 lbf. The majority of single actuators require a maximum value of 600 to be calibrated appropriately, but there are 13 'special' actuators (12 in the cell and one spare) that have a special air nozzle and require a maximum force of 200 lbf for accurate calibration. These actuators are also marked with a red dot on the electronics card and there is a note specifying that resistor R8 has been changed to a value of 75kΩ.

The difference in the maximum force used is due to the location of the actuators. These actuators lift the cell edges and therefore require a much lower maximum force to avoid any damage.

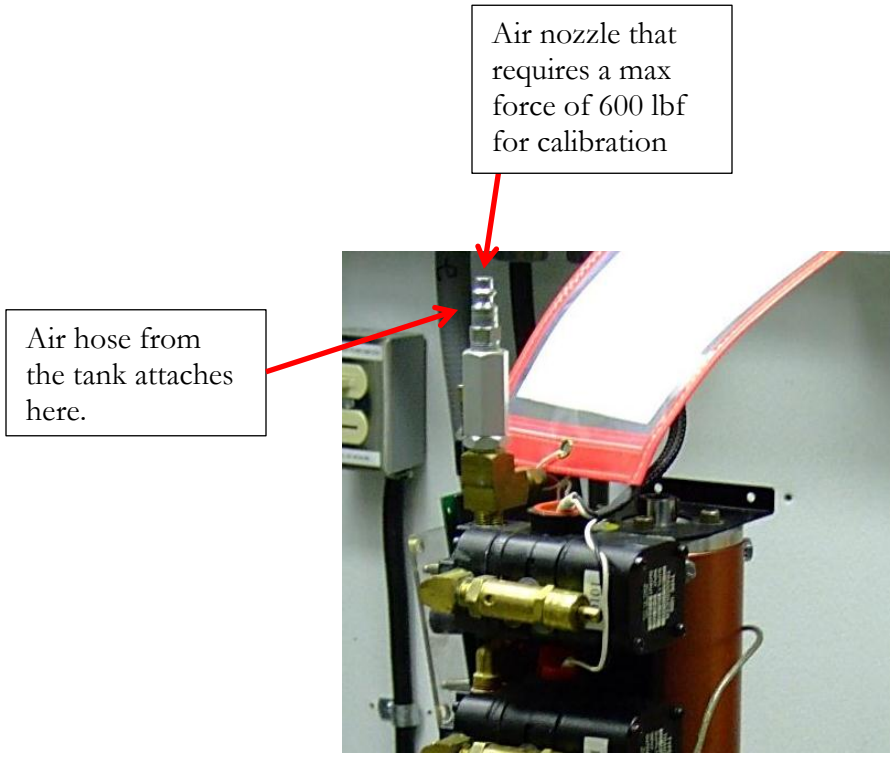

Figure 10

-When directed, apply the air hose to the actuator.

-Once the air hose is attached, gently turn the tank valve on and then set the pressure to 120 psi on the gauge valve.

-Press RETURN on the computer when the air set-up is on and complete.

-The calibration process will now begin.

- Upon completion of the test, remove air pressure, close the air valve, and turn off the power strip.

NOTE:
If any problems occur during the single actuator calibration process, just turn the power off to the computer to stop the process.

Second set of tests (Optional)

- Turn on the power to the power strip and the computer.
- Apply the air hose to the actuator.
- Once the air hose is attached, gently turn the tank valve on and then set the pressure to 120 psi on the gauge valve.
- When the program finishes the loading process, type "v_test" and press RETURN.
- The screen will change to the actuator test program. Type "as" and press RETURN. Typing "as" will let the program know it is the single actuator that is to be calibrated.
- "Single Actuator" will now appear on screen. Type "z" and press RETURN. This will zero out any readings that were previously recorded.
- Check teststand forces. Mx, My and Mz must be less than 100 in-lbs. Fx and Fy must be less than 5lbs and Fz must be -100 to +100 lbs. Record the data.
- Type "J" to enable the integrator (close the force loop). Check the forces; they should be close to zero.
- Perform a bump test in both directions by typing "s1 (and then desired force)". For example, to check +300 and -300, type "s1 300" and record Fz. To check -300, type "s1 -300" and check Fz. Fz should always match the forces induced.
- Check Forces at 0, 200, 300, 400, 500, 600, 400, 200, 0, -200, -300, -400, -500, -600, -400, -200, 0.
- When Force induced is 0, Fz = -5 to 5. When Force induced is 400, Fz = 395 to 405. When Force induced is -400, Fz = -405 to -395. If the forces do not match the numbers induced, the teststand may be out of calibration or the load cell may be out of calibration.
- Type "w" to perform a wave test (z direction)
- When prompted for wave test direction, enter "Z".
- Name your file and type "t" to perform the transient test.
- When prompted for direction, enter "Z".
- Enter a testing time of 4.
- Enter 20 for starting force and -20 for ending force.
- Set the OTHER axis forces to 0.
- Enter filename. Test complete.

Problems that may arise:

All single actuators have two pressure relief valves attached to both the pull and push transducers. These valves are very important to avoid serious problems while the actuators are doing their job of raising the mirror in the cell. For this reason, if problems arise with these valves it should be noted what could happen and what to do next.

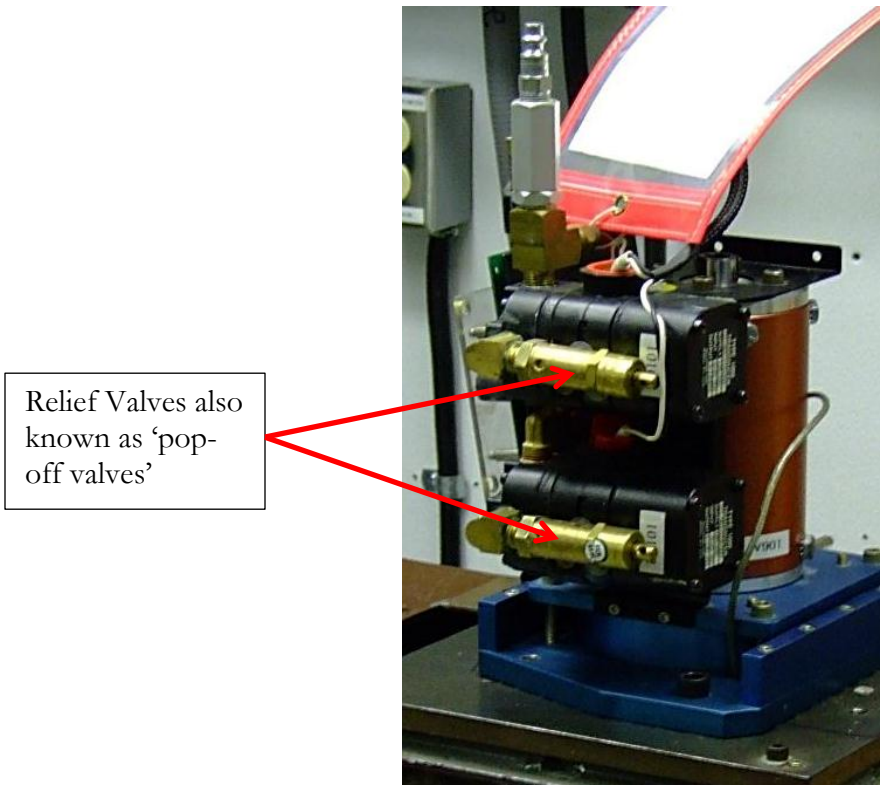

Figure 11

The pressure relief valves are rated to 60 psi. If the transducers see a greater pressure, the valves will open and begin to release air. If this occurs while calibrating a single actuator, the sound will be very loud and will 'pop' on and off very fast, creating a 'machine gun' sound.

If either of the valves 'pop':

-Unplug the air nozzle from the actuator

-Take note of which valve it is (in the pull direction or the push direction)

-Since the primary reason for a valve releasing pressure is that the valve is 'bad', remove the valve in question and replace it with a new one.

-Re-run the calibration.

-Watch the calibration take place and take note of the forces changing. If the valve continues to 'pop', record again which valve it is and at which pressure and set the actuator aside for further troubleshooting.

Other problems that may arise:

-When attaching the air (once the program prompts the user to do so), IF pressure relief valves begin to 'pop' or release air as soon as air is attached, there is a problem with the electronics card. The actuator must be removed, set aside, and the card must be replaced (if necessary, see 'Actuator Troubleshooting' document).