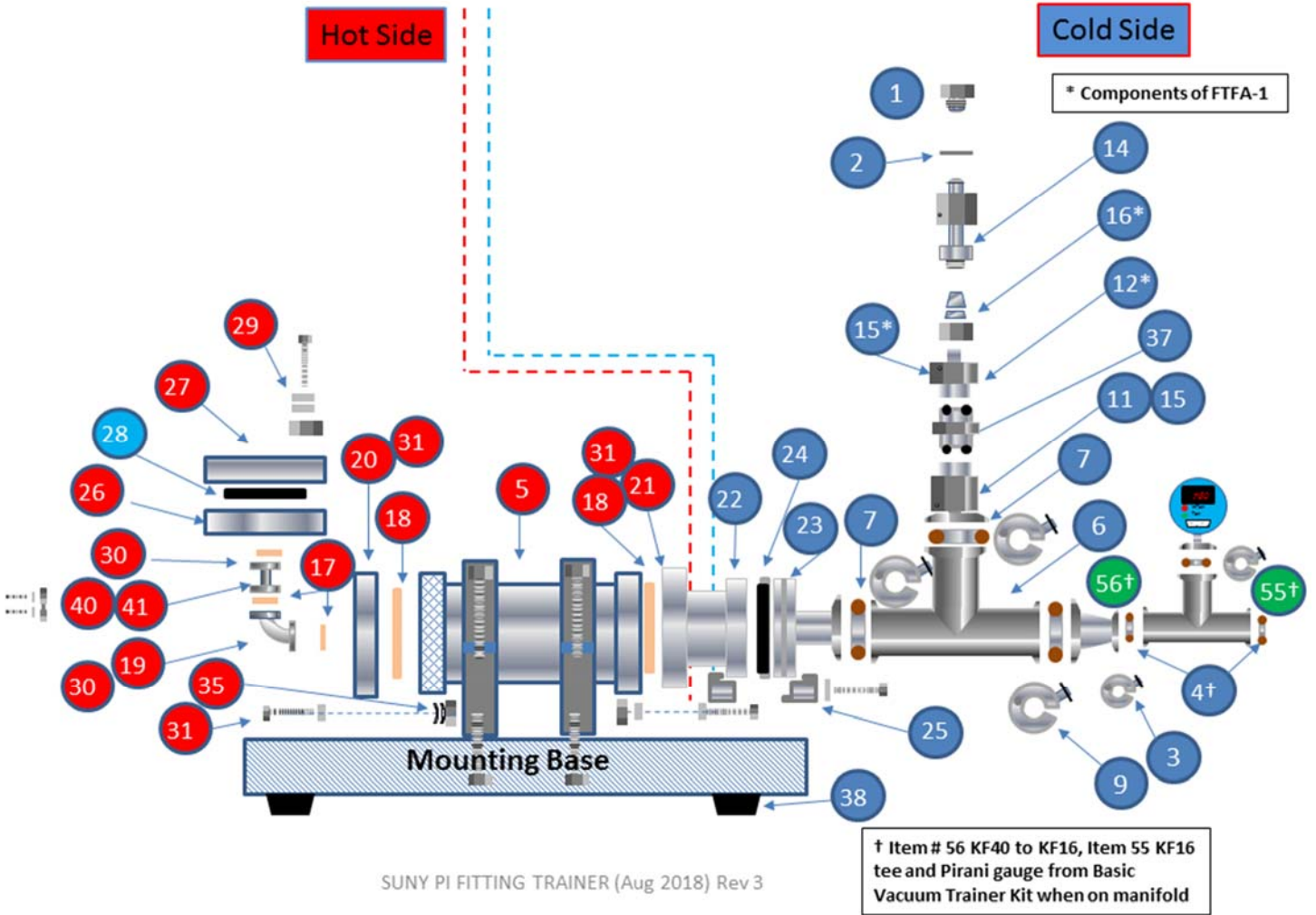


Exercise #3 – System Modification

Preparation: Identify system parts and equipment to complete Exercise #3. Graphic 6, shows the Fitting Trainer's exploded assembly with individual components labeled and numbered.

Graphic 6 – Fitting Trainer nomenclature



Assembly Procedure to replace 4.5-inch CF to KF40 with 4.5-inch CF to Multi-Flange Adapter:

Task 1: Assemble new components to basic chamber: The following tasks simulate a tool upgrade or modification.

Task 1.1: Gather components in quantities listed below to begin chamber assembly modification from components shown in Graphics 1, 2, and 3 and 6.

- 1 – 4.5-inch CF to Large Flange (LF) (NW63) (Multi-flange end)
- 1 – NW63 multi-flange to NW40 adaptor
- 1 – NW63 SS Centering ring w/O-ring - Fluorocarbon (black)
- 4 – Double claw clamp (M8X45 thread)
- 1 – 4.5-inch CF copper gasket
- 2 – mini-CF copper gasket
- 2 – mini CF Full Nipple
- 6 – #8-32 socket head screw SS (1/2 inch)
- 1 – ASA4-133 Hybrid adapter (American Standards Association)
- 1 – ASA-4 blank
- 1 – ASA-4 O-ring Viton (black)
- 1 – Hex key set
- 1 – 9/64 inch shortened hex key
- 1 – Combination wrench 1/2 inch
- 1 – Combination wrench (9/16-3/4) inch
- 1 – Combination wrench 5/8 inch
- 1 – Combination wrench 3/4 inch
- 1 – Blunt-Point All-Metal Scissors
- 1 – KJLC 275i Pirani gage from the Basic Vacuum trainer

Task 1.2: Reconfiguration fixed flange components:

- Vent system as necessary.
- Unclamp KF40 tee from the fixed flange KF40. The components attached to the tee may remain intact.
- Unbolt the 4.5-inch CF to KF40 adapter Item # 21 and install protective caps.
- Discard the copper gasket.

Task 1.2.a: Assembly new fixed flange components:

- Install Item # 22 (4.5-inch CF to Large Flange (LF) (NW63) (Multi-flange end)) as follows: - Assemble eight Item # 31 hex head bolts and washers. Use Item # 53 to cut open a Conflat gasket package (if necessary) and center one new 4.5-inch CF gasket Item # 18 between Item # 5 fixed flange and Item # 22 Insert the bolts in the through holes. Re-insert the bolts in the through holes. Install flat washers and capture with the nuts and snug hand tight. Using one wrench hold Item # 31 5/16-24 nuts in place and with the second wrench torque Item # 31 bolts to Item #5. Ensure the copper gasket remains centered.
- Install Item # 23 (NW63 multi-flange to NW40) to Item # 22 by placing Item # 24 (NW63 SS Centering ring w/O-ring - Fluorocarbon (black) between the mating flanges. Install four Item # 25 (Double claw clamp (M8X45 thread)) equally spaced. Snug then torque.

- Inspect the Item # 8 KF40 SS Centering ring w/O-ring - Silicone (**red**) and replace as necessary then re-install the KF40 tee and clamp.

- Inspect the Item # 55 KF16 tee and install to item # 56 (KF40 to KF16 reducer with Item # 4 KF 16 SS Centering ring w/O-ring (**brown**) and Item # 3 KF16 clamp, all items drawn from the Basic Vacuum Kit.

Task 1.3: Reconfiguration rotating flange components:

- Vent system as necessary.

- Remove the Pirani gage clamp, Pirani gage and Item # 3 KF16 SS Centering ring and Item #13 KF16 O-ring - Silicone (**red**).

- Unbolt six Item # 41 (mini CF plate nut set (#8-32 socket head screws 9/16 inch)) and Item # 39 (KF40 to mini-CF adaptor) from Item # 19 (mini-CF elbow). Install protective caps.

- Discard the CF gasket

Task 1.3.a: Assembly new rotating flange components:

- Install Item # 40 (mini CF Full Nipple) to the mini CF elbow by reinstalling the six socket head screws and plate nuts. Use Item # 53 to cut open a Conflat gasket package (if necessary) and center and a new mini CF copper gasket Item # 17.

- Using six Item # 30 (#8-32 socket head screw SS (1/2 inch)) and one mini CF copper gasket install the mini CF full nipple to Item # 26 (ASA4-133 Hybrid adapter (American Standards Association)). Snug then torque.

- Install one Item # 28 (ASA-4 O-ring Viton (black)), one Item # 27 (ASA-4 blank) and four Item # 29 (ASA-4 Bolt (1/2 - 13, 1.75 inch length), two washers, nut set). Ensure the O-ring is in the groove in Item # 26 then torque and turn.

- Install the Pirani to the KF 16 tee using Item # 4 KF 16 SS Centering ring w/O-ring (**brown**) and Item # 3 KF16 clamp. Connect power supply and LabQuest2

- Notify your instructor the system is ready for pumpdown.

Exercise #4 – System Integrity Check

Task 1: Base pressure and helium leak check

- Install the vacuum pump or helium leak detector using the arrangement in Graphic 5.
- Using the table below to record your data, prepare as a team to record the readings from the KJLC 275i vacuum gauge at 30 second intervals upon opening the ball valve (**do not open yet**) to pump down the complete vacuum system.
- Close the vent valve.
- Inform your instructor your team is ready for pumpdown.
- The instructor will inform all groups to open their ball valves to begin pumping down the system.
- After opening the ball valve, record the pressure readings from the pressure gauge at 30-second intervals for 10 minutes. Record the readings from the KJLC 275i vacuum gauge at 30-second intervals and record in the table below until the pressure drops to less than 100 mTorr using the table below to record your readings.
- If your system has reached 100mTorr after 10 minutes, continue the pumpdown until the pressure does not drop lower. This may take 20 minutes or more.
- This final pressure value establishes the **Base or Ultimate pressure** of the system. Note the value in the data table below and then close the ball valve and vent the system. The pumpdown curve developed for this system indicates a system correctly assembled and tested.

Time (Seconds)	Pressure (Torr)
0	
30	
60	
90	
120	
150	
180	
210	
240	
270	
300	
330	
360	
390	
420	
450	
480	
510	
540	
570	
600	