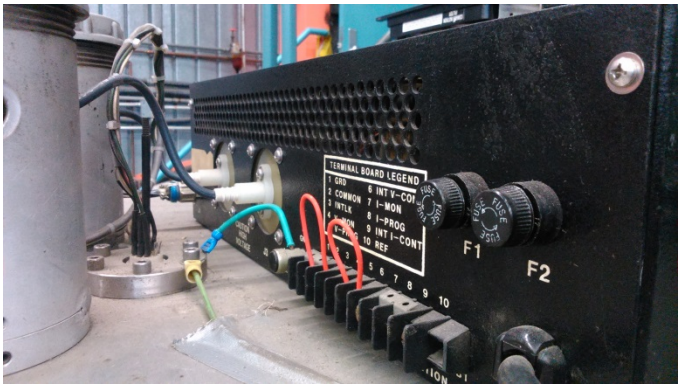
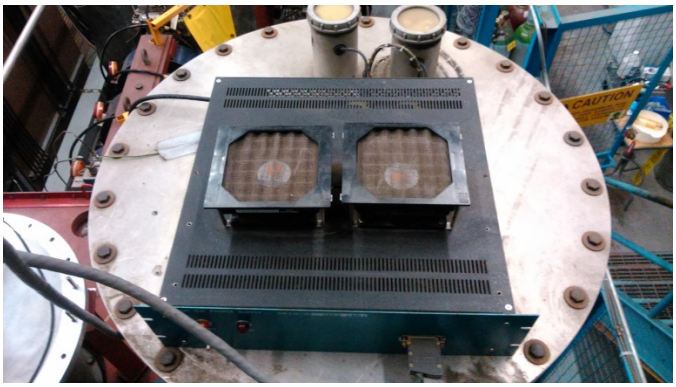
M15 Stack and Feed Through Removal and Replacement

(SEPARATOR 1 Negative was used for the procedure)

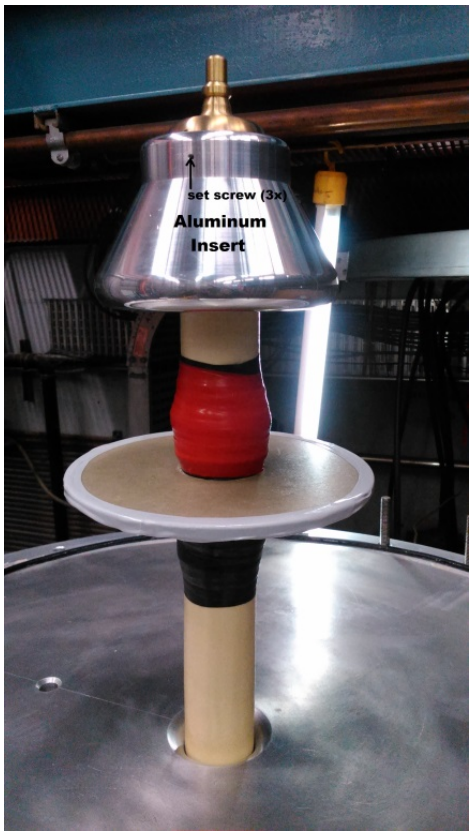




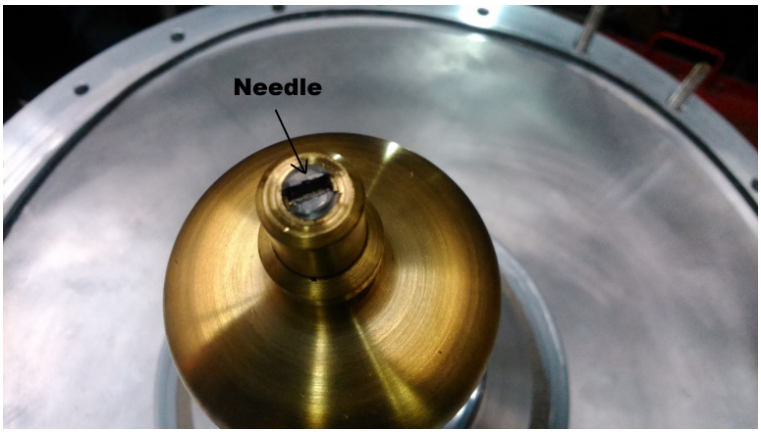
1. Unplug connection from power supply and remove power supply. Label ground wire position. Check psi in the stack (normal is 15psi). Recover SF6 gas using the Dilo Cart or vent to 2-1psi.

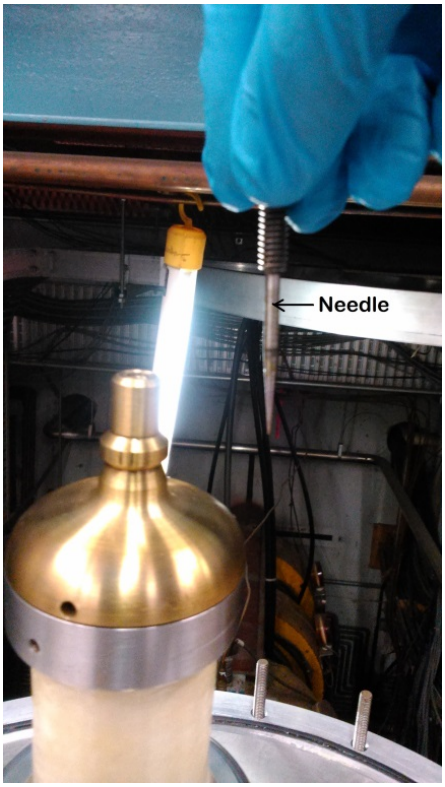
2. Remove oil reservoir and drain.

3. Remove fasteners holding stack to base plate. Using the crane, lift stack and place on plastic wrapped dunnage.



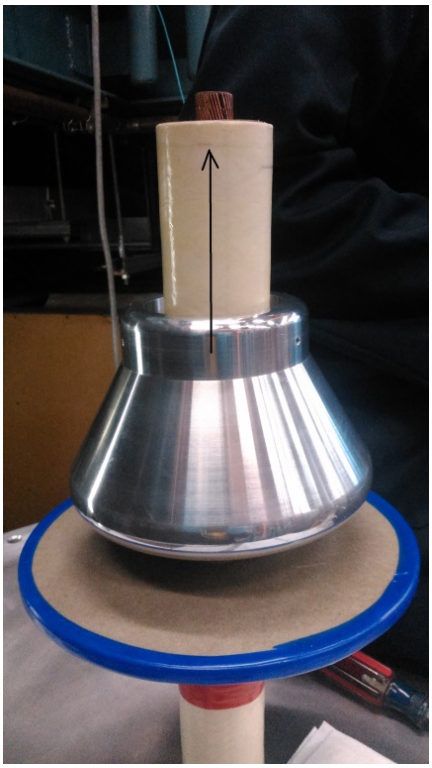
4. Loosen set screws on aluminum insert with 1/16 Allen key and lower aluminum insert on the feed through carefully.



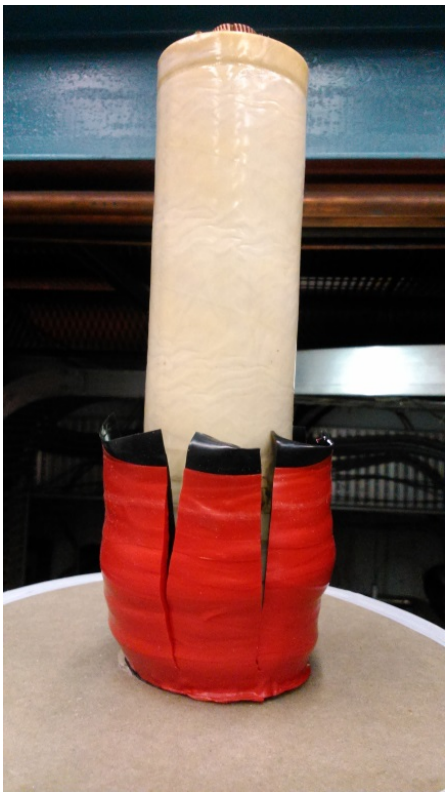


5. Unscrew and remove needle with flat head screw driver.

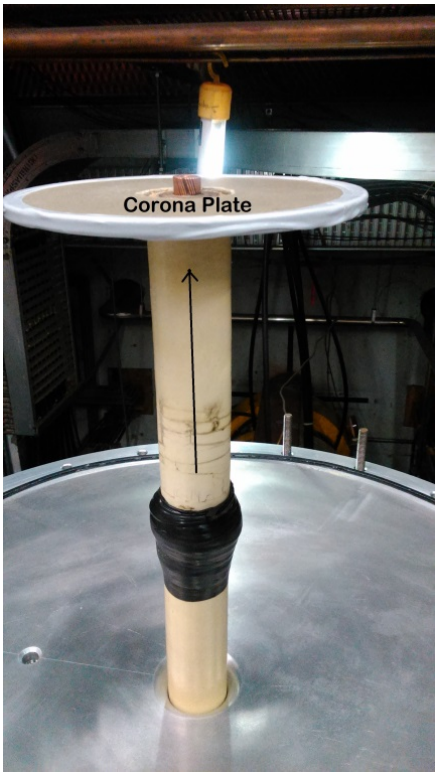
6. Remove 2 piece (brass and aluminum) upper needle housing with job specific spanners.



7. Remove polished aluminum insert. Be careful not to scratch it.



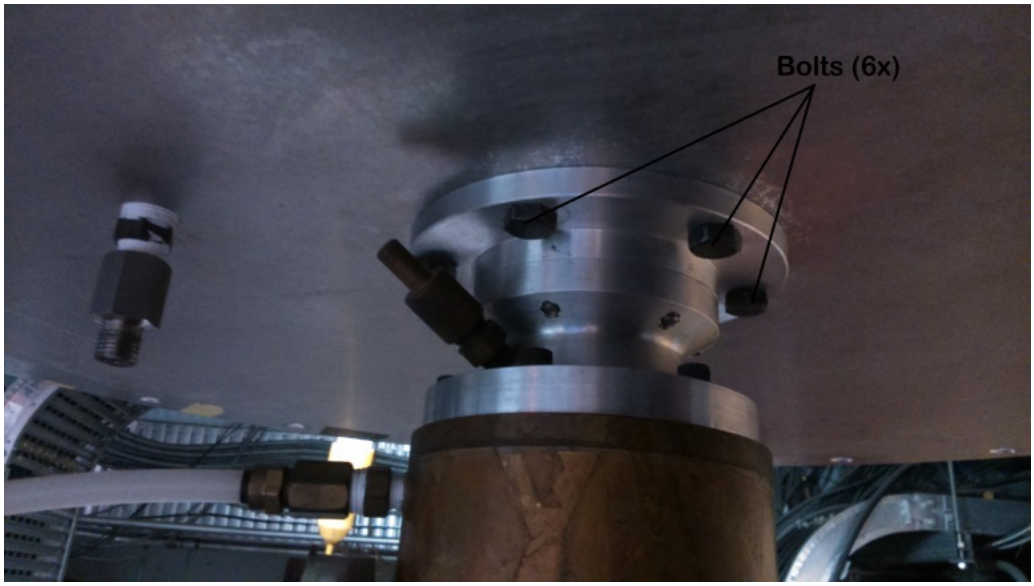
8. Cut, remove and discard self-fusing tape above corona plate.



9. Remove corona plate. Remove and discard self-fusing tape on corona plate.

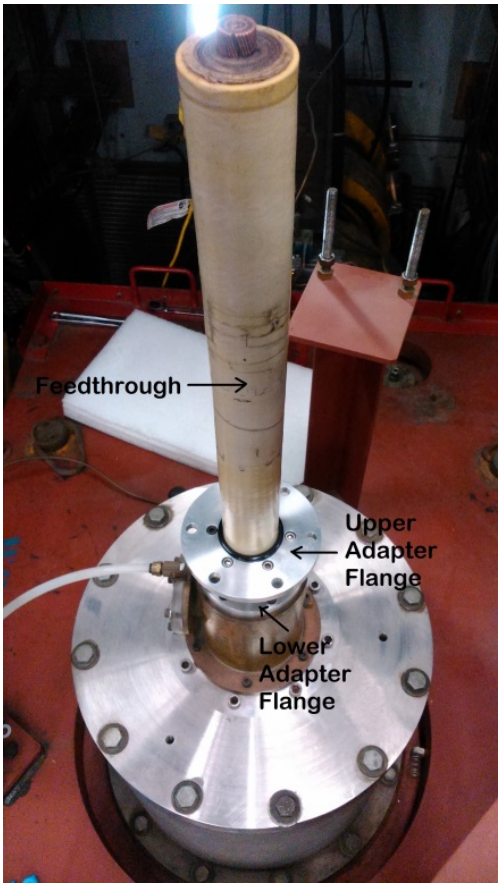
10. Cut, remove and discard remaining self-fusing tape.

- ***Note: Place all above parts to be reused in their own container and clean thoroughly with ethanol***.



11. Remove fasteners from underneath the base plate with 9/16 combo wrench.

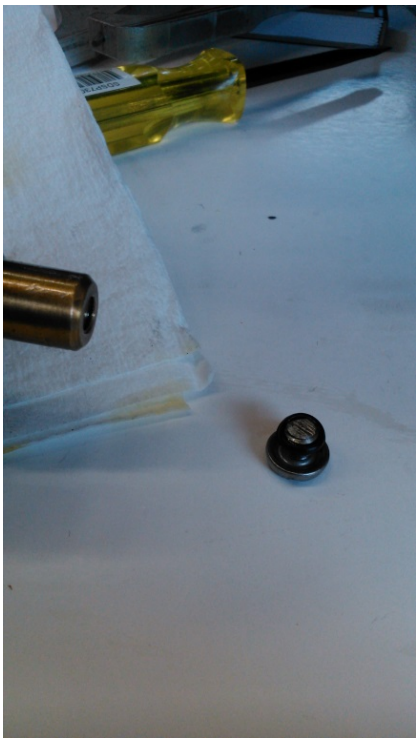
12. Using 3 I bolts, lift and remove base plate while holding feed through. Place base plate on dunnage.



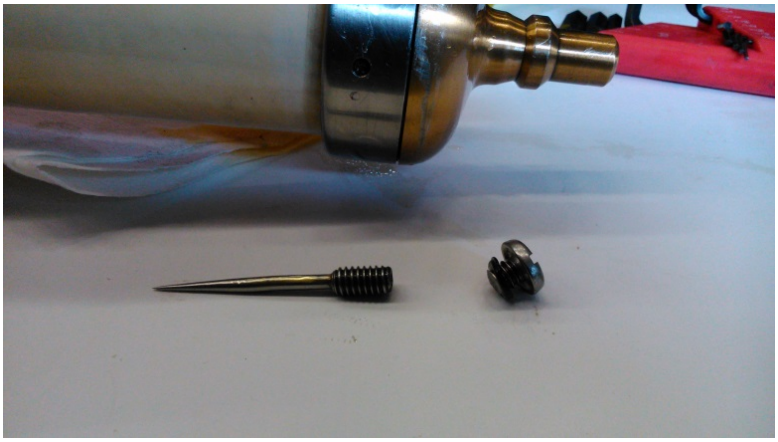
13.Remove fasteners only on upper adapter flange with 3/16 Allen key.

14.Remove fasteners from lower adapter flange with 3/16 Allen key.

15. Pull out feed through with upper and lower adapter flange.



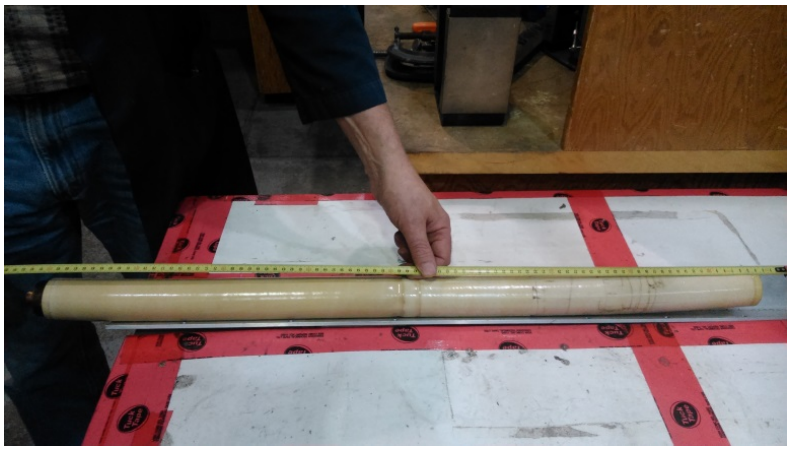
16. Unscrew and remove needle cap from lower needle housing with flat head screwdriver.



17.Remove lower needle from housing with 1/8 Allen key.

18.Remove 2 piece (brass and aluminum) lower needle housing with job specific spanners.

- ***Note: Place all above parts to be reused in their own container and clean thoroughly with ethanol.***



19.Keep and use old feed through as a template.

20.Retrieve new feed through from storage. Cut to 1 meter. ***WEAR GLOVES***

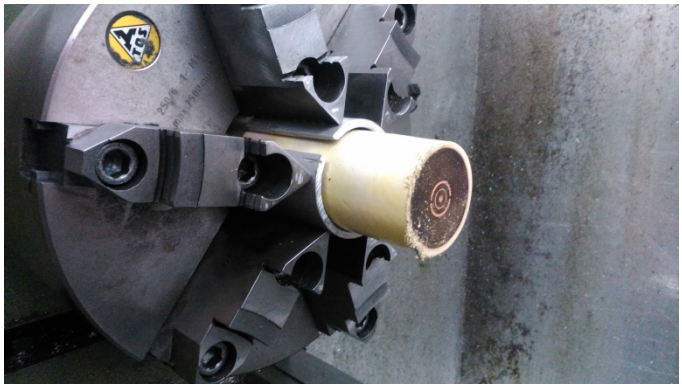
21.With a knife, cut and carefully remove black protective casing from new feed through.

WEAR GLOVES

22.Remove all other protective casings and discard.

23. Take new and old feed through to the lathe in machine shop. Prepare a clean work surface.

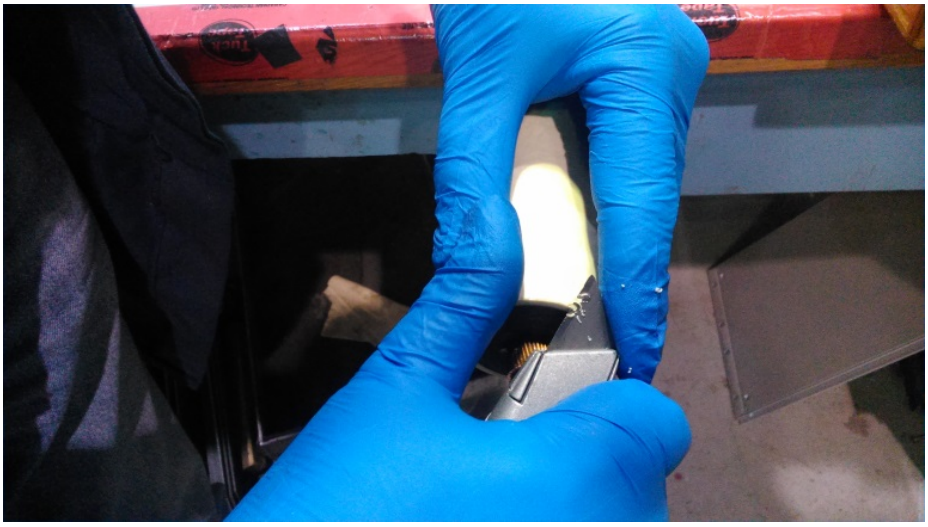
24. Clean lathe opening of any FOD with a piece of pipe with paper towel and scotch brite pad attached to one end.
25. On a band saw with a sharp blade, cut one end of the new feed through square. ***MUST BE*** as square as possible.
26. Mark length of old feed through onto new feed through and cut the other end square on band saw. Discard old feed through.



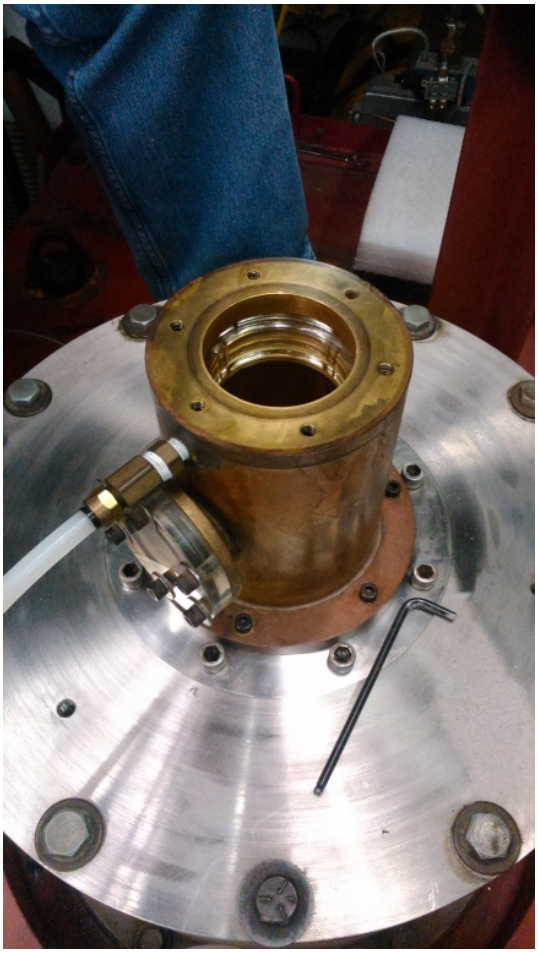
27. Using aluminum feed through sleeve, insert new feed through into lathe and secure. Do not over tighten.

28. Mark 1cm to be cut in from the end of the feed through.
29. Turn on lathe and set to 44 rpm (slowest speed), using a marker, mark a line around entire feed through.

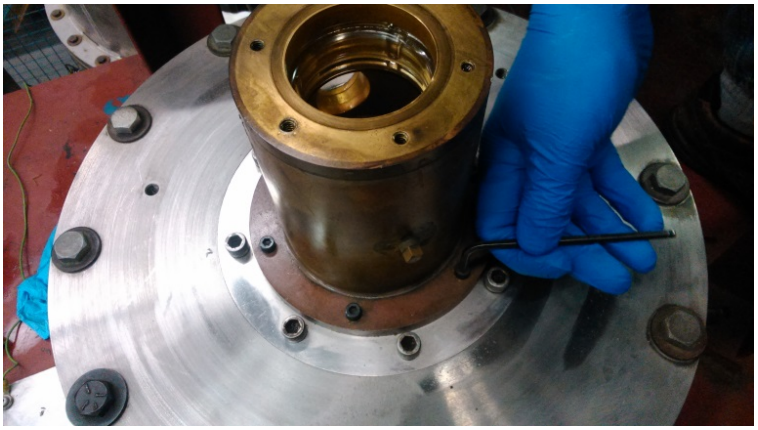
30. Using a knife, cut on the line marked on the feed through. Be careful and cut layer by layer till you reach copper center. Be careful not to score or cut through the copper.
31. Remove feed through and repeat on the opposite end.



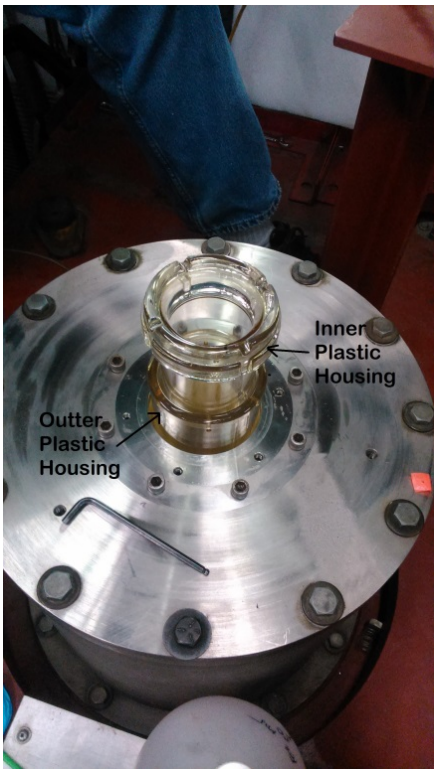
32. Carefully clean up edge of feed through with a knife, and with a file, carefully clean the edge of copper in the spiral direction of the copper. Wipe down feed through with ethanol.



33. Using a syringe and tube (contact Steve Chan), empty the oil from the brass oil canister into a proper container.



34. Remove brass oil canister with 3/16 Allen key. Set aside and clean canister with ethanol.

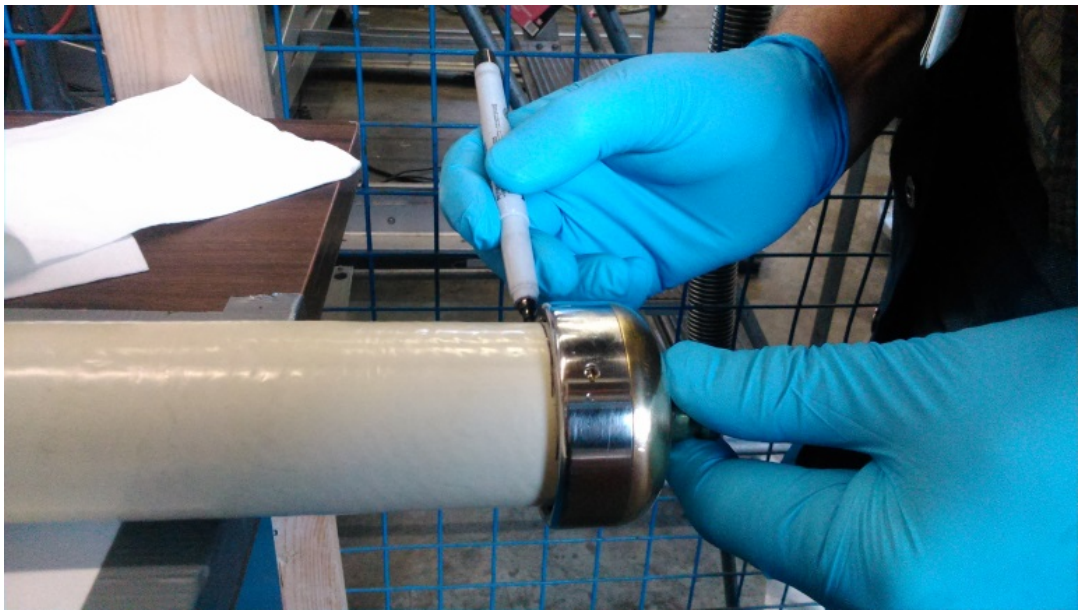


35. Remove the inner plastic housing tube. Be careful not to adjust the springs on the bottom of the tube. Wipe the outside of the tube with a paper towel and set aside.
36. Remove the outer plastic housing tube and wipe inside and outside with a paper towel and set aside.
37. Remove any excess oil from canister with syringe and paper towel and wipe down.
38. Reinstall outer plastic housing tube, and carefully reinstall inner plastic housing tube.

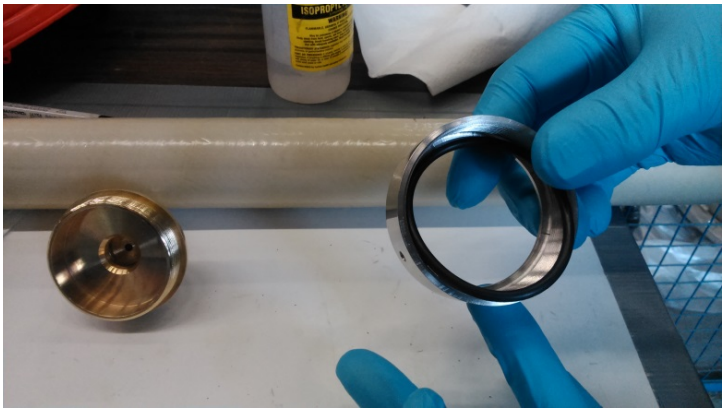
39. Order new ***O*** rings from stores;

Qty.	***Catalogue #/Description***	
• 1	1-1/02008	O-RING, ID 0.176 (+-) .005 x 0.070 W (+-) .003
• 2	1-1/02226	O-RING, ID 1.984 (+-) .010 x 0.139 W (+-) .004
• 2	1-1/02329	O-RING, ID 1.975 (+-) .010 x 0.210 W (+-) .005
• 1	1-1/02334	O-RING, ID 2.600 (+-) .010 x 0.210 W (+-) .005
• 1	1-1/02348	O-RING, ID 4.350 (+-) .015 x 0.210 W (+-) .005

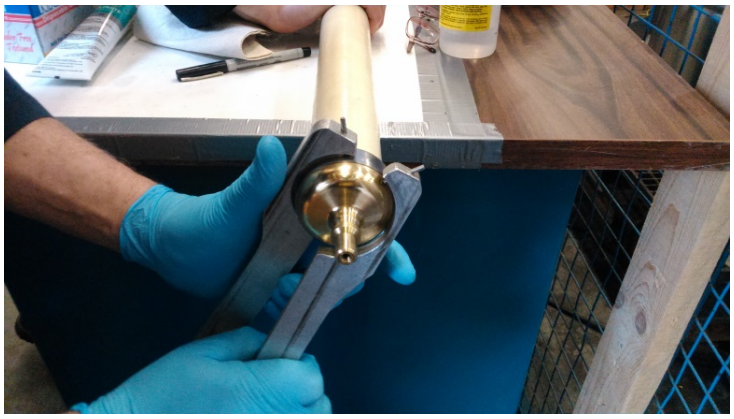
Reassembly Stage



40. Connect the 2 parts of the lower needle housing together ***WITHOUT*** the ***O*** ring and test fit onto the bottom of the feed through. Once satisfied with the position, mark a line around base of needle housing

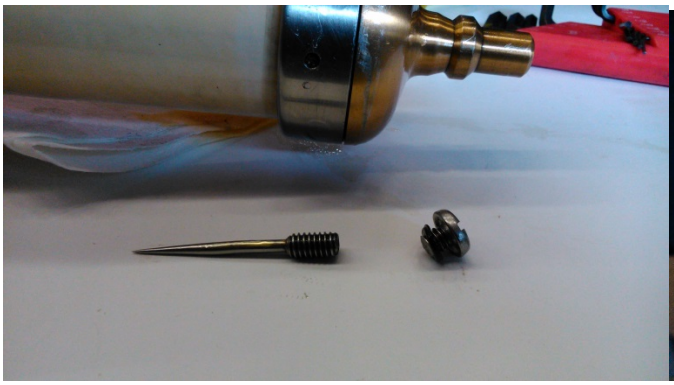


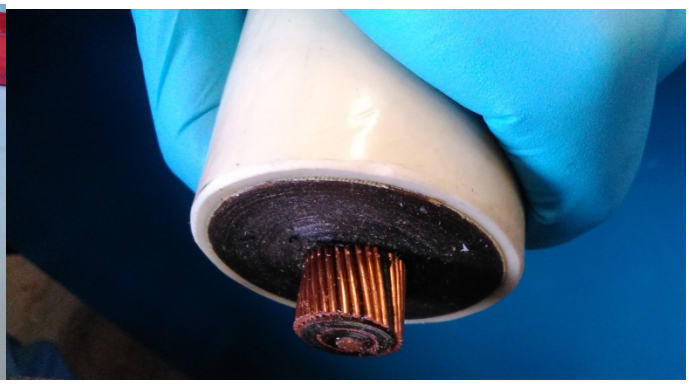
41. Separate the 2 parts of the lower needle housing. With vacuum grease, lightly grease a ***1.984 x 0.139 O*** ring and wipe off with paper towel. Install ***O*** ring into the bottom half of the needle housing.



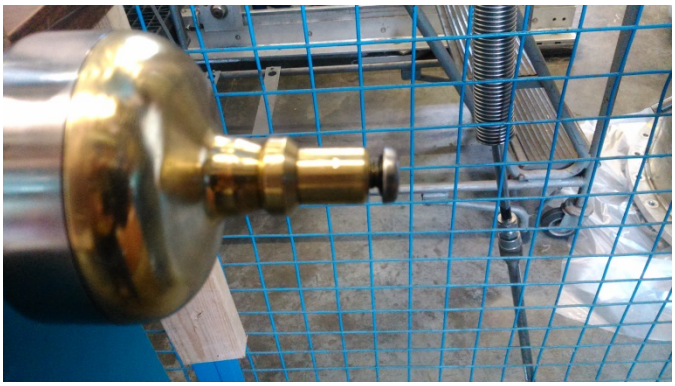
42. Install needle housing onto the feed through, and tighten with spanners. Give the new ***O*** ring a couple seconds to adjust, and retighten needle housing.

43. With vacuum grease, lightly grease a ***0.176 x 0.070 O*** ring and wipe off with paper towel. Install ***O*** ring onto needle cap.

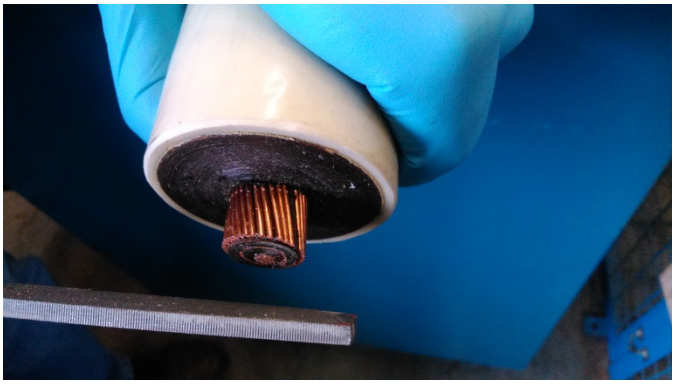




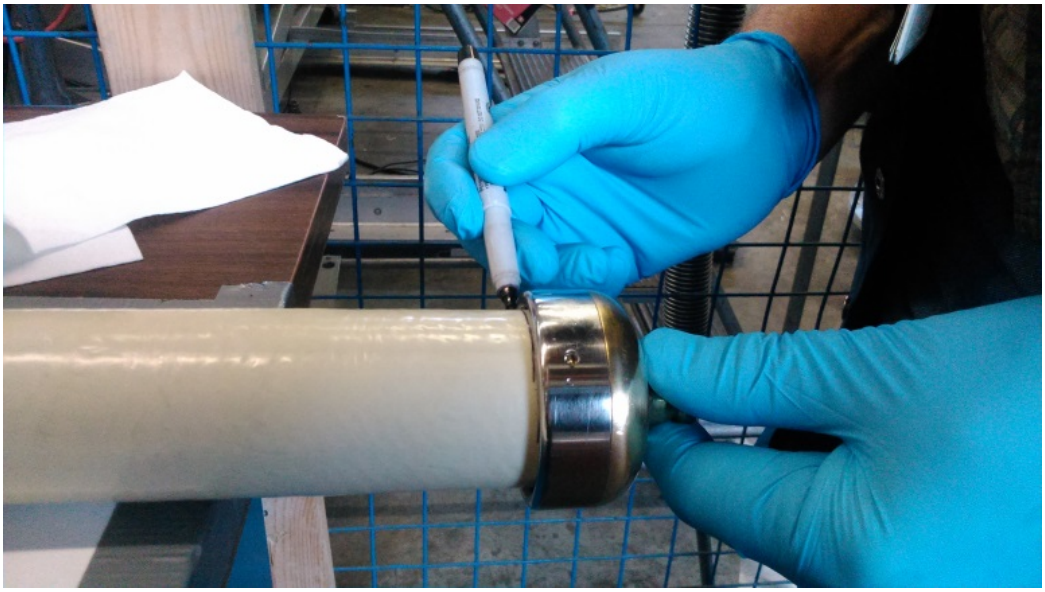
44. Slowly install the needle into the lower needle housing with a 1/8 Allen key. Watch the opposite end of the feed through to make sure the center of the copper cable ***DOES NOT*** push out to far. (1-2 mm acceptable)
45. Also, watch for the lower needle housing pushing away from the marked line. If there is more than 1/8 separation from the line, push needle housing back in with your hand. (1/8 gap is acceptable)



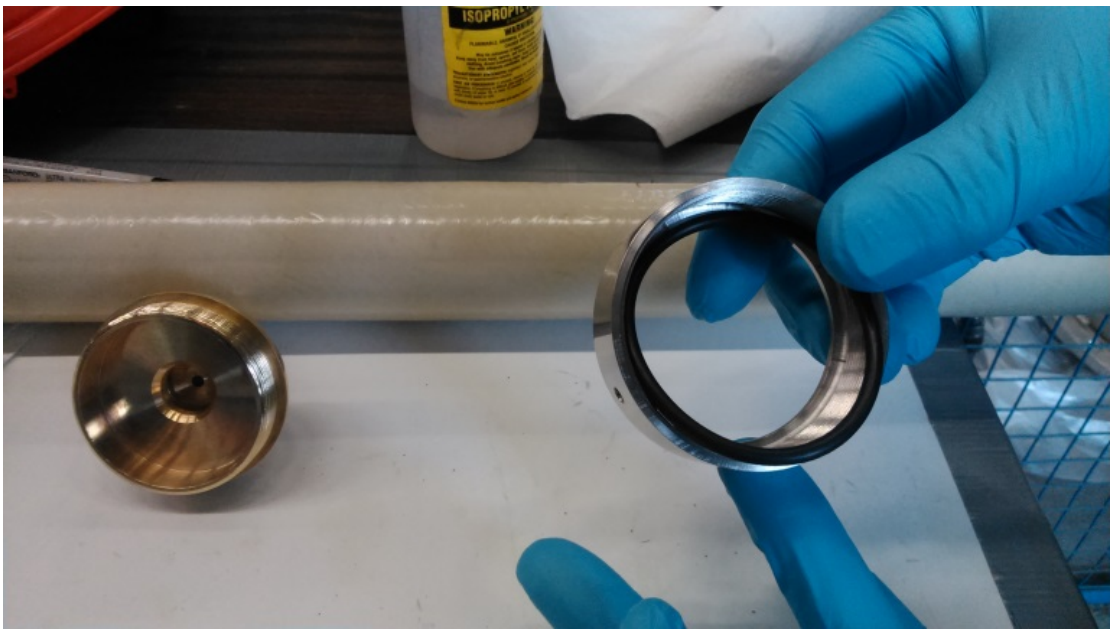
46. Install needle cap with flat head screw driver.



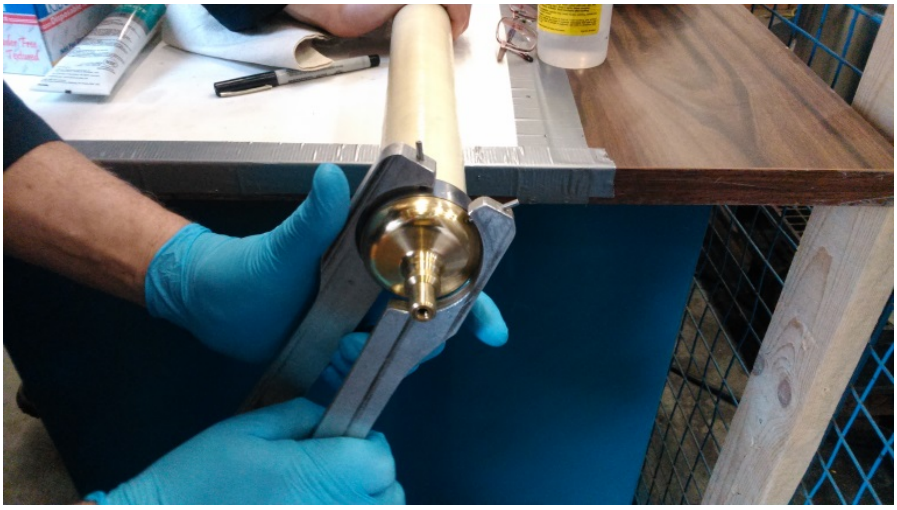
47. File off any excess copper on the opposite end.



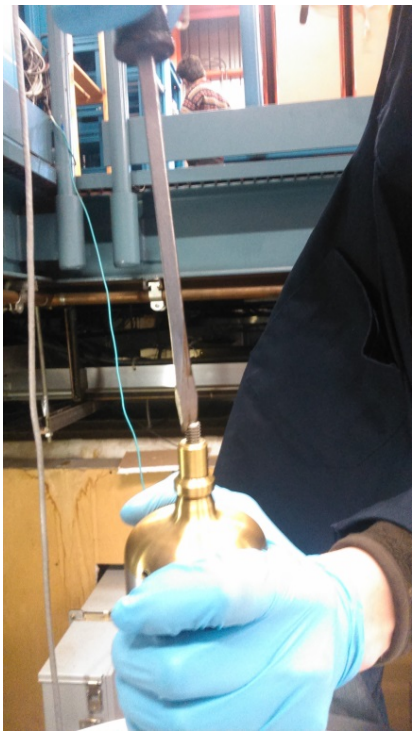
48. Connect the 2 parts of the upper needle housing together ***WITHOUT O*** ring and test fit onto the top of the feed through. Once satisfied with the position, mark a line around base of needle housing.



49. Separate the 2 parts of the upper needle housing. With vacuum grease, lightly grease a ***1.984 x 0.139 O*** ring and wipe off with paper towel. Install ***O*** ring into the bottom half of the needle housing.

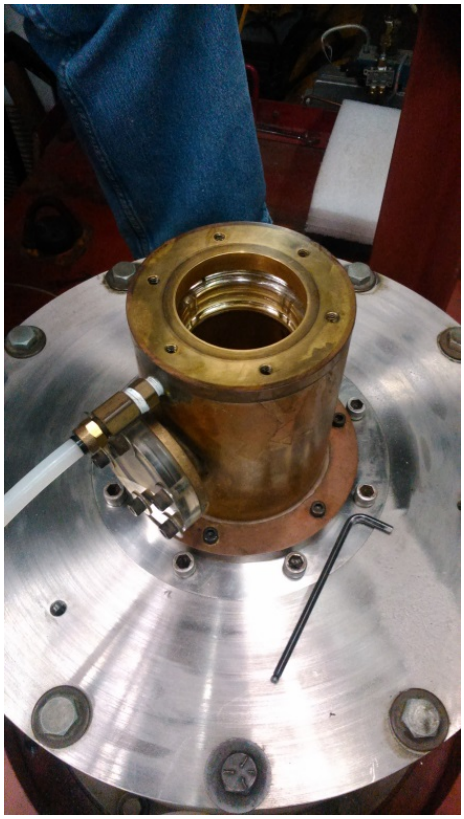


50. Install needle housing onto the feed through, and tighten with spanners. Give the new ***O*** ring a couple seconds to adjust, and retighten needle housing.



51. Slowly install the needle into the upper needle housing with a flat head screw driver. Watch the opposite end of the feed through for lower needle housing movement.
52. If movement or separation is noticed, stop and push both needle housings onto feed through before continuing to screw in the top needle. (1/8 gap is acceptable)
53. Once satisfied with the positions of the upper and lower needle housing, using a flat head screw driver remove the top needle and using spanners separate and remove the top needle housing from the feed through and set aside.


54. With vacuum grease, lightly grease a ***1.975 x 0.210 O*** ring and install onto the ***TOP*** of the lower adapter flange. Also lightly grease a ***2.60 x 0.210 O*** ring and install onto the ***BOTTOM*** of the lower adapter flange.
55. Slide the lower adapter flange onto the feed through. Then slide the upper adapter flange onto the feed through, and set feed through aside. ***DO NOT*** connect upper and lower adapter flange.



56. Retrieve brass oil canister and install ***4.350 x 0.210 O*** ring using vacuum grease onto the bottom of the canister. Install canister by gradually tightening down. Once tightened, let ***O*** ring settle for a couple seconds and then do a final tighten.

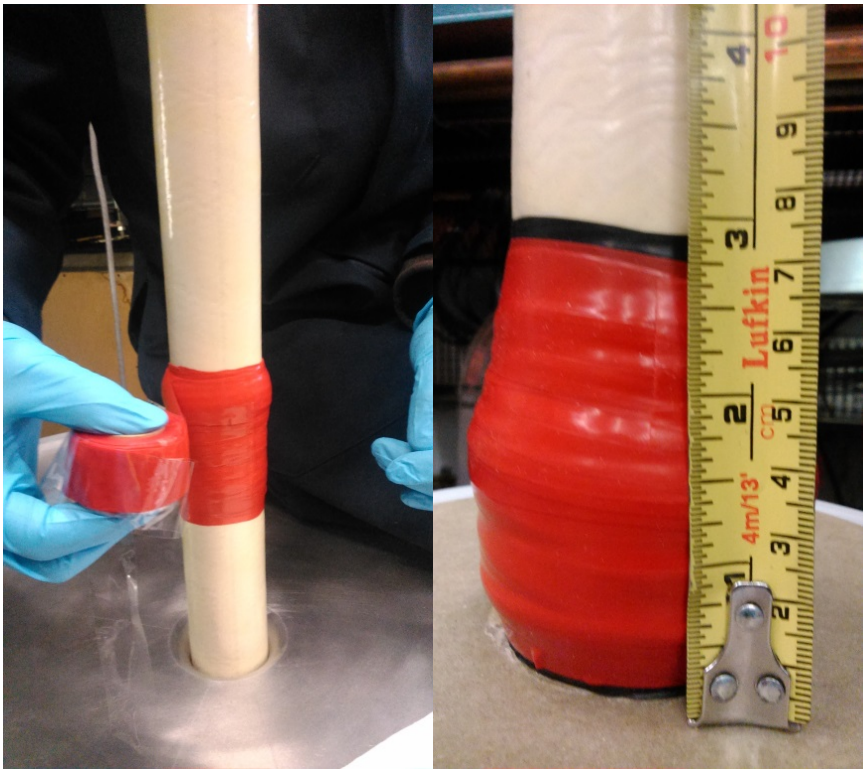
57. Carefully lower the feed through into place and install lower adapter flange to the brass oil canister.

58. Install upper adapter flange to the lower adapter flange.

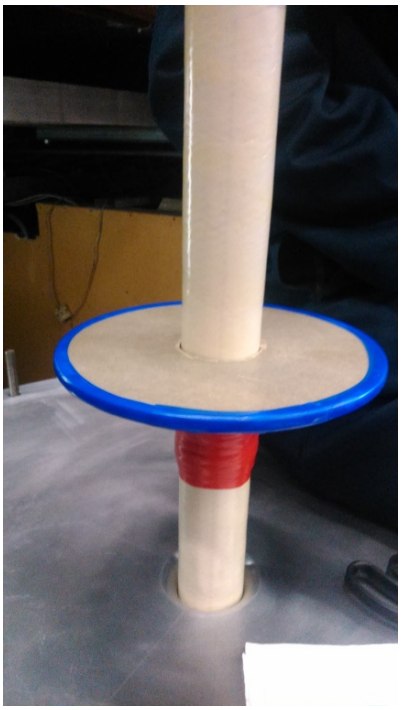
59. Retrieve base plate for stack and thoroughly clean with methanol.

60. Install ***1.975 x 0.210 O*** ring with vacuum grease onto the bottom of the base plate.

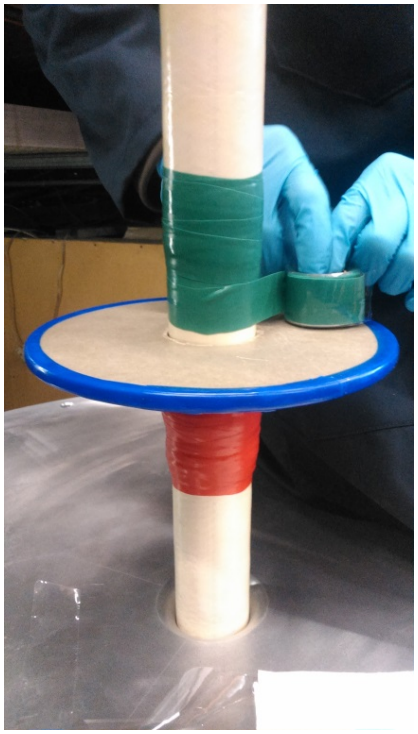
61. With the use of the overhead crane and straps slowly lower the base plate onto the feed through and into position, watching that the ***O*** ring does not fall out. Install base plate to upper adapter flange with a 9/16 combo wrench for the provided fasteners.



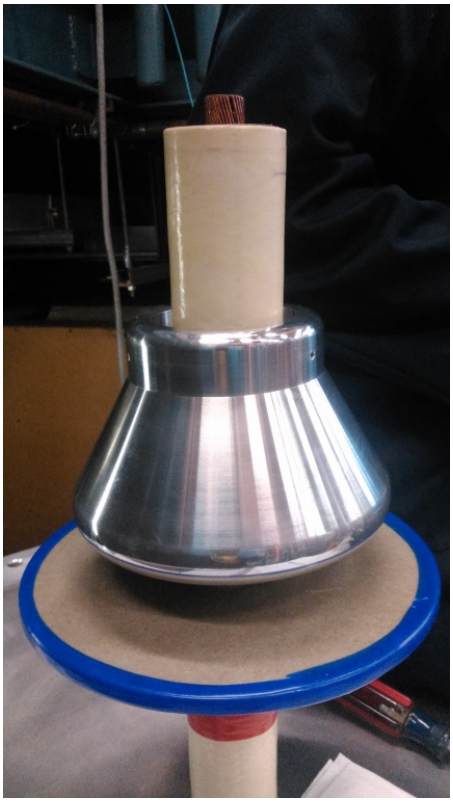
62. Measure 8 inches down from the top of the feed through. Using 2 rolls of self-fusing tape, wrap the tape around the feed through from the 8” mark, down 3 inches.



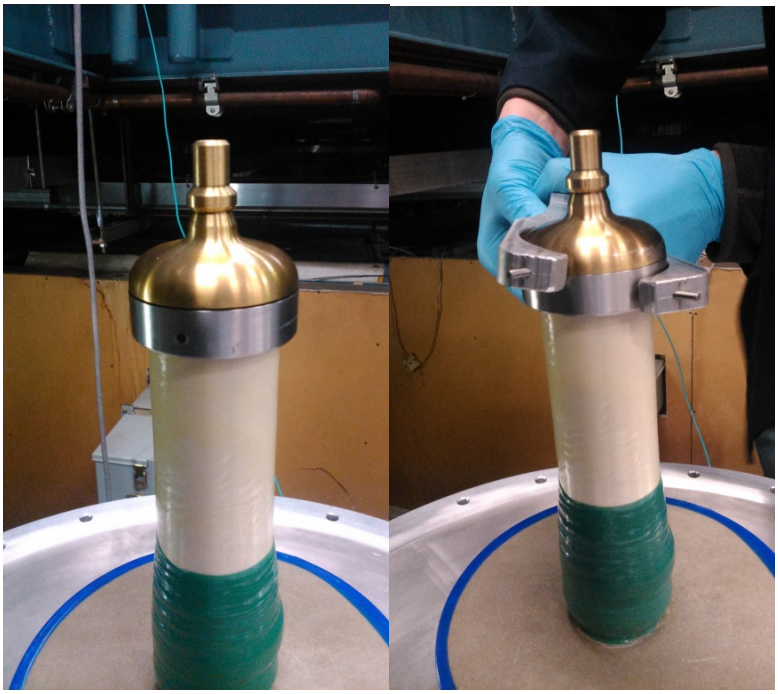
63. Lower the corona plate onto the feed through. The corona plate should sit on top of the self-fusing tape. Using self-fusing tape, wrap the tape around the outside of the corona plate. Wrap 3 layers of tape around the corona plate.



64. Secure the corona plate by wrapping 2 rolls of self-fusing tape above the corona plate 3 inches high on the feed through.



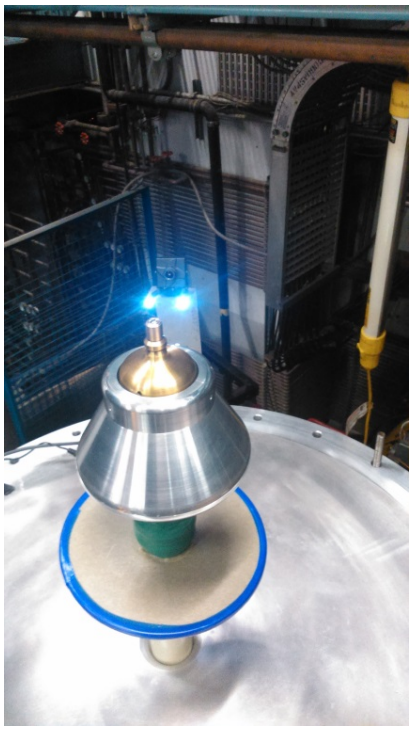
65. Retrieve aluminum insert and lower it onto the feed through and leave it till the next step if finished.



66. Install the 2 piece upper needle housing onto the top of the feed through using spanners and tighten.

67. Install the needle into the needle housing with a flat head screw driver. Watch for the needle housing movement. Stop and correct if you notice the needle housing lifting.

68. Lift the aluminum insert into place and tighten the set screws with a 1/16 Allen key. Tighten set screws equally to make sure the aluminum insert sits in the center of the feed through.



69. Before continuing any further retrieve 2 cameras and monitors from remote handling and set up on the base plate so that the cameras can view proper mating connection of the stack onto the needle housing.

70. Replace ***O*** ring for stack if needed before moving forward. Use the old ***O*** ring as a template for the new ***O*** ring.

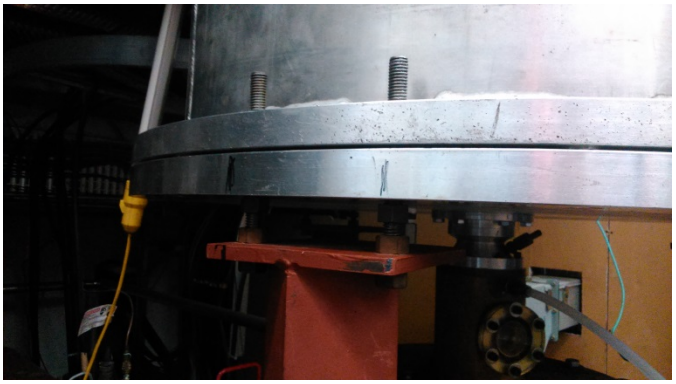
71. Before installing the stack ***O*** ring, suspend the stack with the crane and slings and add dollops of vacuum grease around the ***O*** ring recess. This will help with the ***O*** ring stay put during movement of the stack.

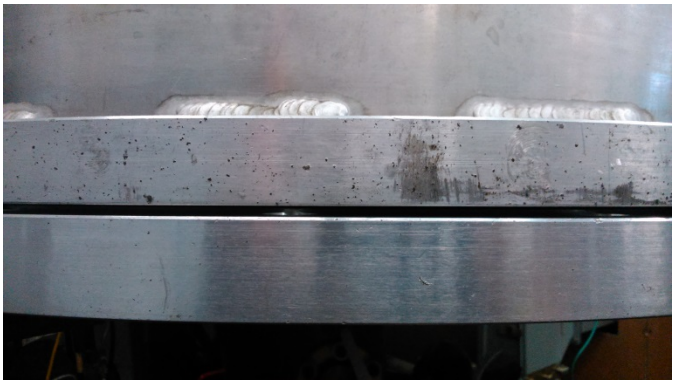
72. Using vacuum grease, grease the stack ***O*** ring and with help if needed, install the ***O*** ring.


73. Raise and move the stack into the proper position corresponding to the base plate. At this point, help will be need to lower stack into place.



74. Slowly and carefully lower the stack into place, watching the 2 monitors for the feed through engagement. ***TAKE YOUR TIME***.
75. Once the feed through has engaged, remove the 2 cameras before lowering the stack onto the base plate. Make sure there is a sufficient gap to remove the cameras and take care not to scratch the stack ***O*** ring.





76. Once cameras are removed, lower stack into place making sure the stack markings line up with the markings on the base plate. There should be a uniform gap between the stack and base plate.
77. Using the provided hardware and a 3/4” combo wrench, gradually tighten the stack to the base plate.

78. Reconnect the copper pipe to the port on the bottom of the base plate.

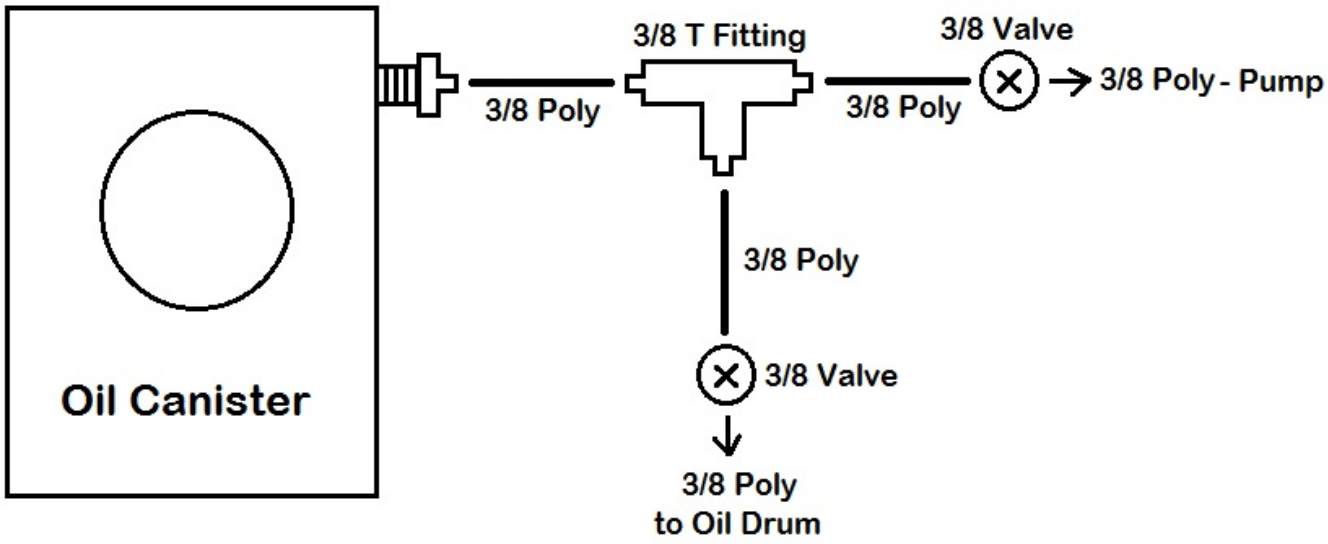
79. Wheel over the nitrogen doer and attach a 3/8 poly flow fitting to the correct connectors. Lines are labeled with corresponding ***SEPERATOR*** name.
80. Keep the pressure gauge valve to the stack closed. When properly connected, open all necessary valves and then open the nitrogen.

81. Now fully open the pressure gauge valve to the stack. You will notice a drop in pressure. Open and close the pressure gauge valve till it reads 6psi.

82. Paste a piece of masking tape onto the pressure gauge valve and label it with the current date, time and the position of the needle. Monitor the gauge for the next couple of days for any pressure drop.

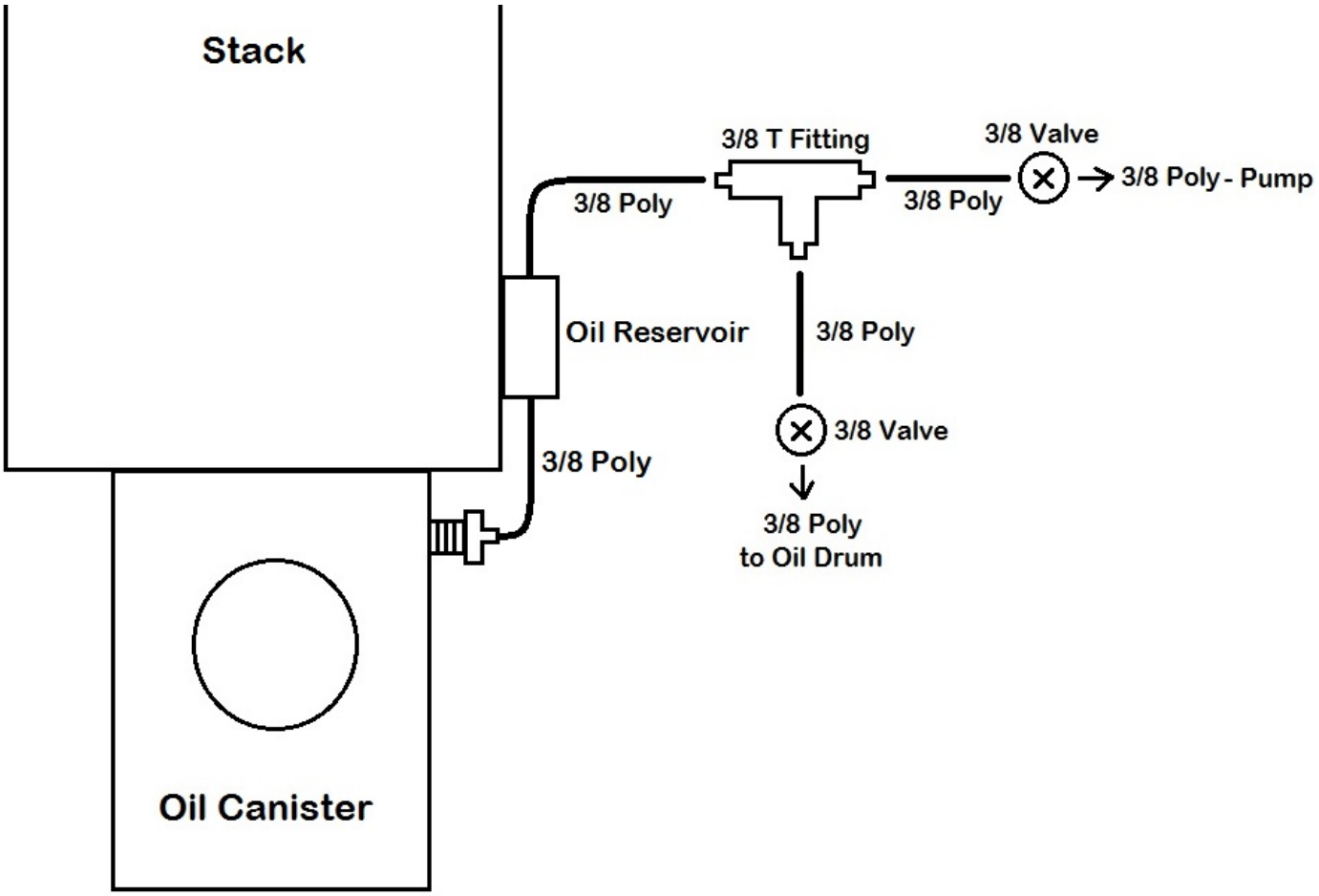
Filling The Oil Canister and Reservoir

83. Retrieve all parts and tools needed to fill the oil canister and reservoir. Attach the oil reservoir to the stack.
84. Prepare the Oil Canister for filling using the provided diagram below.

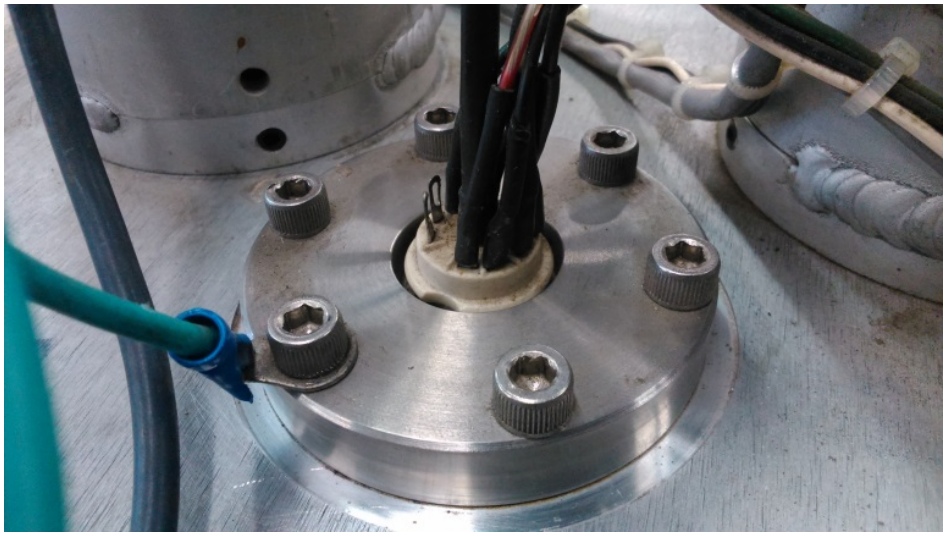


- Close the valve to the oil drum.
- Open the valve to the pump.
- Turn on the pump to create a vacuum in the oil canister.
- Close the valve to the pump once sufficient vacuum is reached. Turn the pump off.
- Open the valve to the oil drum. The oil canister will pull the oil in.
- Once the vacuum is gone, remove the poly attached to the T fitting from the oil canister and secure it to the bottom of the oil reservoir.

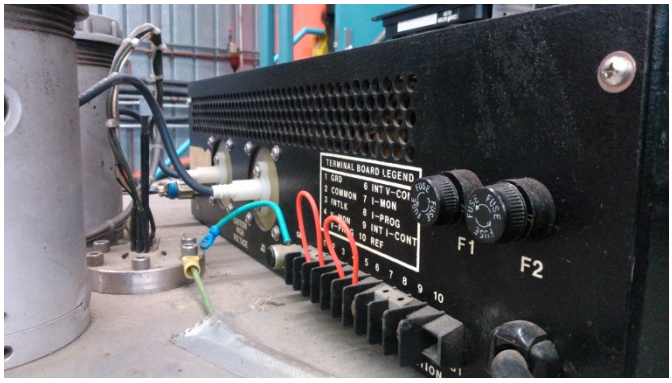
85.Prepare the Oil Reservoir for filling using the provided diagram below.



- Cut a new length of Poly and attach to from the top of the oil reservoir to the T fitting. Make sure the valve to the oil drum is closed.
- Turn on the pump. Once sufficient vacuum is reached, close the pump valve and open the oil drum valve and backfill oil into the reservoir until it is half full. Turn the pump off.



86. After a couple of days, check the pressure level in the stack. If the pressure has maintained its original level, unbolt the feed through connector on the top of the stack. ***DO NOT*** remove the connector. Instead, lift it up until there is just enough space to slide the Allen key use to unbolt it into the gap.
87. Open appropriate valves and pump SF6 gas into the stack for 10 minutes to remove the nitrogen gas in the stack. Replace the feed through connector on top of the stack once the 10 minute pumping is complete.



88. Reattach the power supply onto the top of the stack and plug in all the connectors and wires.

89. Plug the power supply into its appropriate connection box.
90. Pump SF6 gas at 30psi into the stack. Open and close the pressure gauge valve till 6psi is reached.
91. Once 6psi is reached, close the pressure gauge valve and mark the time and psi on the gauge. Close the SF6 tank. Monitor the pressure in the stack for a few hours.
92. If the pressure in the stack has maintained its level, open the SF6 gas tank and fill the stack to 15psi.
93. Once the stack has reached 15psi close the pressure gauge valve and close the SF6 tank.
94. To relieve the pressure in the line, open the pressure gauge valve for a few seconds and then close. Back off the pressure gauge valve on the SF6 tank.
95. Start the Separator vacuum procedure. (See provided procedure book.)

M15

STACK & FEED THROUGH REMOVAL & REPLACEMENT