

	<b>SERVICE REFERENCE DOCUMENT</b>		Nbr: <b>131030RK</b>
	Product(s):	Discovery Mass Spectrometer	Prepared By: <b>R. Klein</b>
	Subject:	<b><i>How to replace the filaments</i></b>	

## Purpose / Introduction

This document describes how to replace the filaments. Filaments generally have 2000 working hours but can decrease depending on application, cleanliness of ion source, and pressure. When a filament has opened, toggling its button in Process Eye will fail to turn green, turning yellow briefly and back to red. When contaminated, you will see a reduced signal. Toggling between filament 1 and filament 2 (given adequate time for each filament to heat) will show a large discrepancy in signal strength.

## Search phrases

Discovery Mass spec; DMS; filament; burnt out; opened; contamination; poor signal

## Related Documents

If filament 1 and 2 both show poor signal/no signal, or bypass pressure has lowered below normal (25 torr), or the air peaks seem high when running in an inert gas, consider changing the capillary and orifice first as these all suggest a blockage/partial blockage.

[SRD121231DH - How to Replace the Orifice on the Discovery Mass Spectrometer](#)

[SRD121226DH - How to Install the Capillary on the Discovery Mass Spectrometer](#)

## Tools Needed

- Disposable Gloves
- Cleaned needle nose pliers
- Cleaned tweezers
- Cleaned small flathead screwdriver
- #2 Philips head screwdriver
- 10mm nut driver or socket wrench
- Digital voltmeter
- 5/32-inch Allen key



## Safety recommendations

N/A


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## Spare parts needed/recommended

- (2) 202575.001 FILAMENT ASSEMBLY
- (1) 202571.001 GASKET-CU 37X48 FOR 70 O/D FL

## Procedure

1. In Process Eye, shut down the system by toggling the backing pump OFF (red) and waiting 15 minutes for the internal turbo pump to degas. Wait until the bypass pressure is close to atmospheric (760 torr). Remove power.

 Do not move the DMS until the system is fully shutdown. The turbo pump is moving at 90,000rpm and can “crash” if the DMS is jarred.

2. Remove the top cover by loosening the rear fastening screw in Fig 1 enough to slide the cover back and lift straight up. Remove the front cover by removing the fastening screws in Fig 2, and unplugging the TA logo LED cable. Remove the right-side panel by the three fastening screws in Fig 3 and lifting upwards and away.

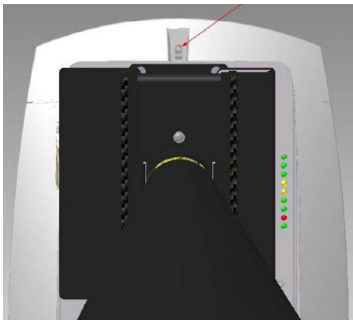


Fig 1

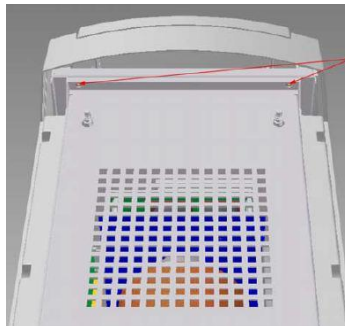


Fig 2

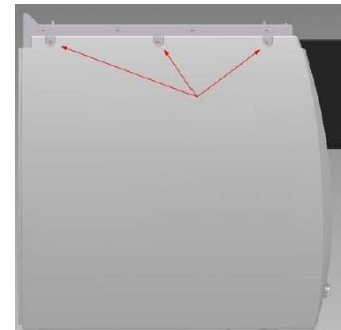


Fig 3



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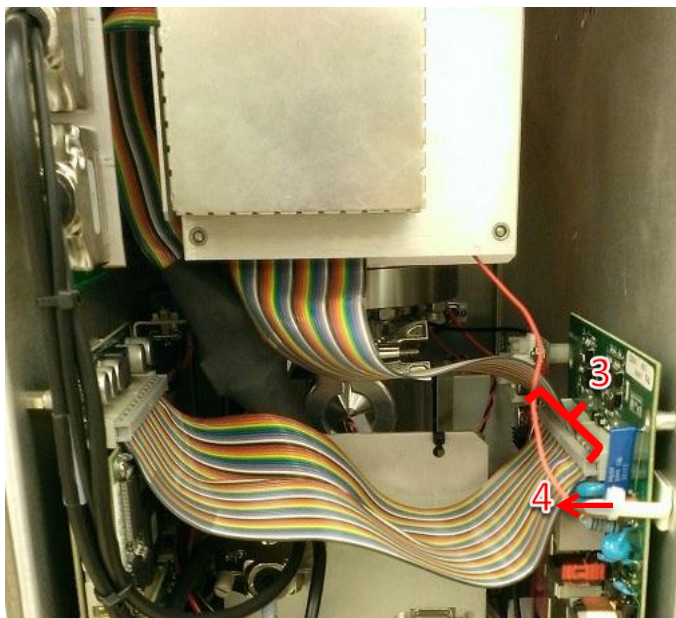


Fig 4

3. Unplug the ribbon cable from the MV2 Power Supplies PCB mounted on the right side.
4. Unplug the red cable from the ball socket connector.

5. Looking through the top grate, locate the Allen bolt accessible by the port located on the right side of the case. Using the 5/32-inch Allen key, loosen this bolt until the clamp ring can slide freely.

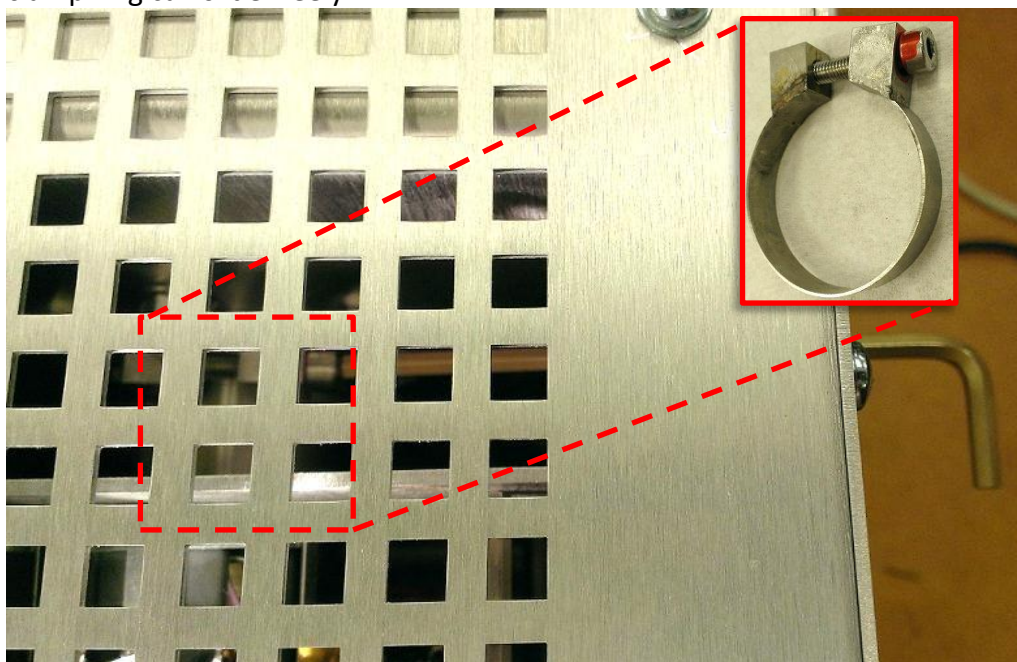


Fig 5



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Fig 6

- Slide the electronics box straight towards you. With the ribbon cable unplugged, you should have enough cable to comfortably set the electronics box on the bench.

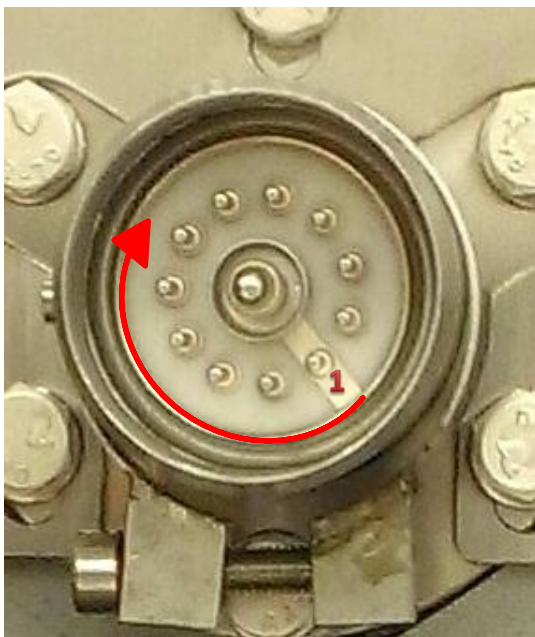


Fig 7

- To confirm a filament has opened, use your voltmeter. Pins 4 to 8, 8 to 10 and 4 to 10 should be short, Pin 8 is the filament common.

Pin#	
1	Ground
2	Source plate
3	Electron Multiplier
4	Filament 1
5	Extraction plate
6	Suppressor plate
7	RF 1
8	Repeller plate / filament common
9	No connection
10	Filament 2
11	RF 2
12	Collector



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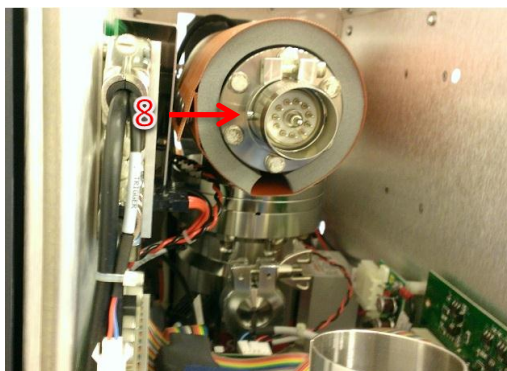


Fig 8

8. Note the position of the guide pin for the electronics box.
9. Remove the 6 silver-plated bolts.

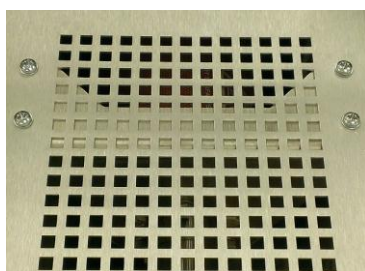


Fig 9 & Fig 10: Not applicable to all systems



Some systems have a top mounted support bracket for the vacuum chamber. Remove by the 4 fastening screws on the top of the case.



Put gloves on before proceeding. Oils from your skin, an unclean work surface or tools can contaminate the system.

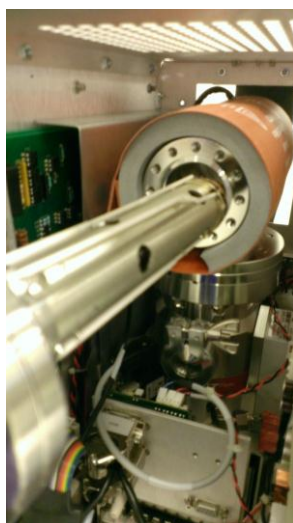


Fig 11

10. Pull the analyzer straight out.



Ceramic insulators run the length of the analyzer. Be careful not to let them hit, touch, or drag as you pull the analyzer outwards.



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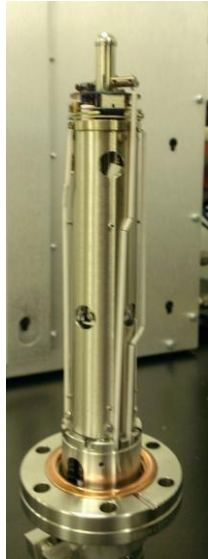


Fig 12

11. Stand the analyzer upright on a clean surface.



Leave the used copper gasket in place to protect the knife edge sealing surface.



Fig 13



Fig 14

12. Use the needle nose pliers or tweezers to hold a barrel connector.

13. Using the small flathead screwdriver, loosen the two side screws until the barrel connector is free to slide up off the filament leads with your pliers/tweezers.

14. Repeat steps 12 & 13 if replacing both filaments (recommended).



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Fig 15

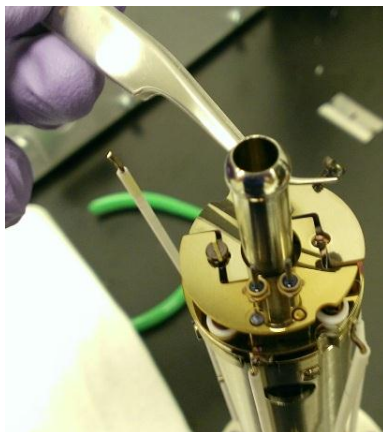


Fig 16

15. Using the small flathead screwdriver, loosen the four slotted screws in Fig 15 until tweezers fit underneath the screw head.

16. Finish unscrewing and lift away with tweezers. Repeat for each screw.

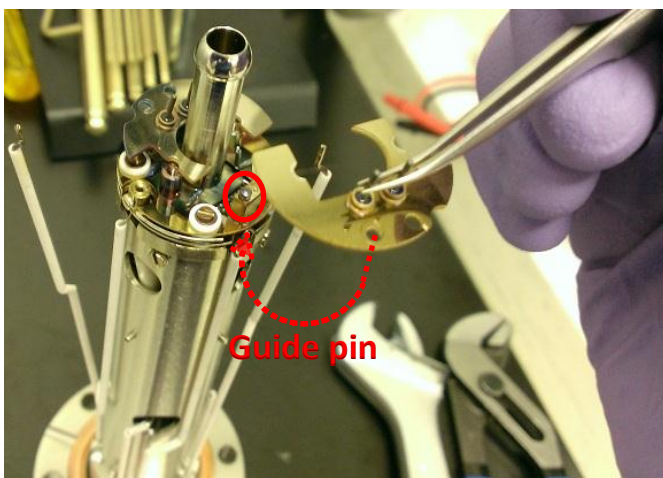


Fig 17

17. Grasp the filament plate posts with tweezers and lift up and away from the analyzer.

18. Using tweezers, place the new filament. The filament will only fit in the correct orientation, as the filaments are keyed and there is a guide pin on the repeller block (Fig 17).

19. Repeat steps 17 & 18 if replacing both filaments (recommended).

20. Replace the four slotted flathead screws.



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Fig 18

21. Note the position of the barrel connectors in Fig 18. Replace the barrel connectors ensuring that they are tightly secured to the filament leads, but do NOT push the barrel connectors into contact with the filament plate.



In Process Eye, “barrel emission trip error” is caused by the barrel connector shorting on the filament plate.

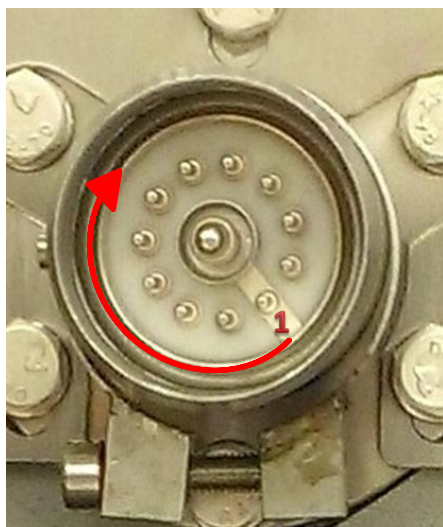


Fig 19

22. Using your voltmeter, make sure the filaments are not shorted to any other part of the system.

Pin#	
1	Ground
4	Filament 1
8	Repeller plate / filament common
10	Filament 2





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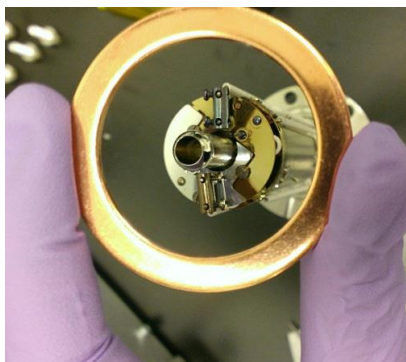


Fig 20

23. Replace the used copper gasket with a new copper gasket.

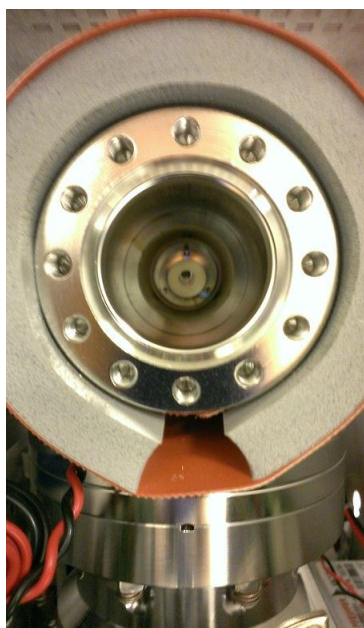


Fig 21

24. Look into the vacuum chamber and note the position of the ceramic inlet assembly, seen in Fig 21. The ceramic inlet assembly is suspended by 3 springs, shown in Fig 22, which allow it to fall from center.

25. Put the analyzer back into the vacuum chamber, allowing the analyzer inlet coupler to slide into the ceramic inlet assy.



Fig 22



If the analyzer inlet coupler and ceramic inlet assembly are properly aligned, the analyzer will slide in easily. If there is resistance, back the analyzer out and check to see if the ceramic inlet assy has moved so as not to damage the ceramic.



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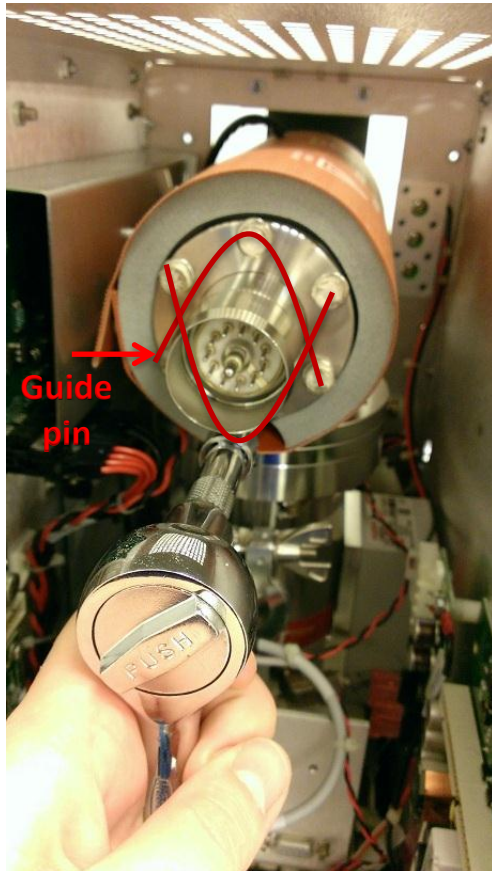


Fig 23

26. Position the analyzer so that the electronics guide pin is back in its original position.



If the system has support bracket for the vacuum chamber, replace it at this time.

27. Gradually tighten the 6 silver-plated bolts in a star or alternating fashion.



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28. Place the clamp ring back over the end of the analyzer so that the Allen bolt head will face the right hand side when situated on top. Leave the ring loose enough to slide the electronics box back on.

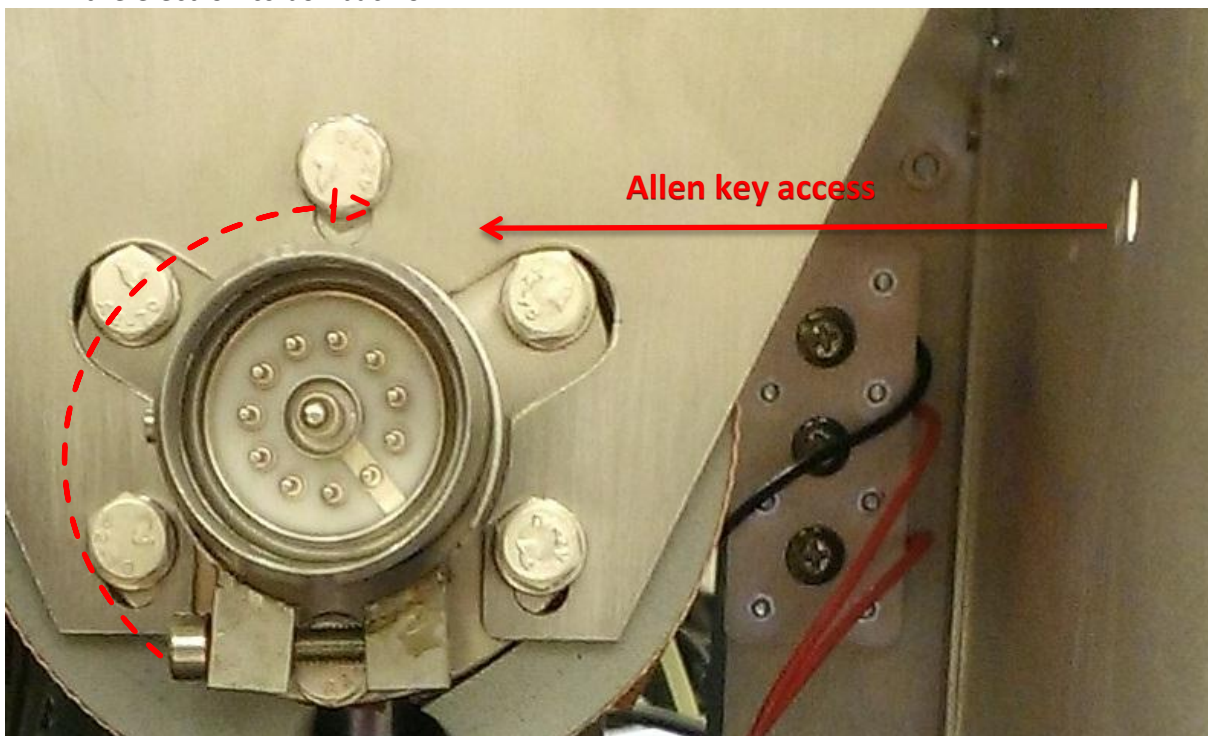


Fig 24

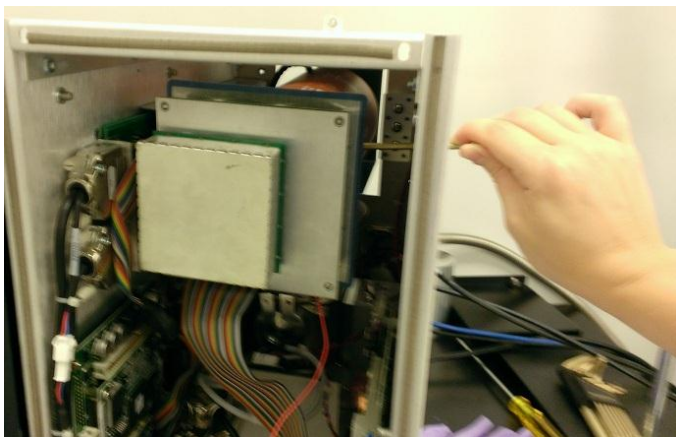


Fig 25

29. Slide the electronics box on to the end of the analyzer and under the clamp ring until it is fully inserted.



If you receive errors in Process Eye the first time running, the electronics box may not have been pushed in completely.

30. Using the 5/32-inch Allen wrench, tighten the clamp ring through the right side access port.



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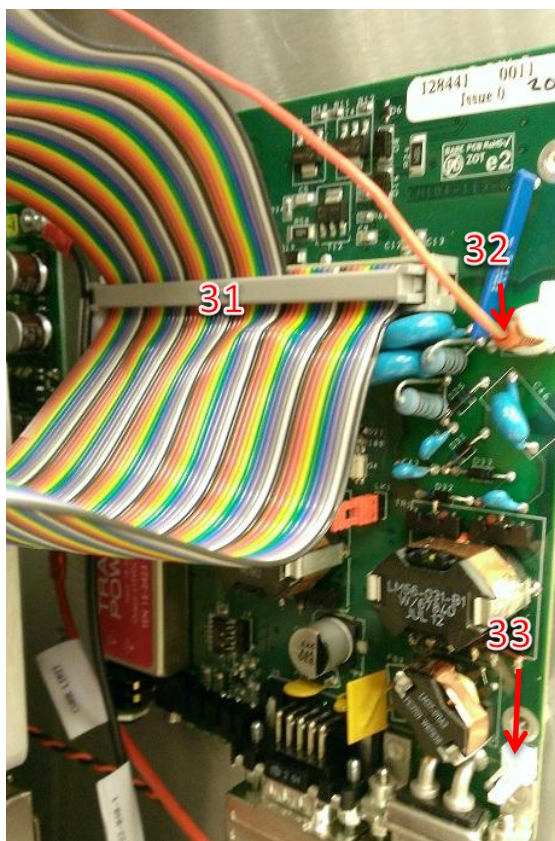


Fig 26

31. Plug ribbon cable back into the MV2 power supplies PCB on the right side.

32. Plug the red cable back into the ball socket on the same PCB.

33. Plug the TA logo LED cable on the front panel back into the same PCB and secure the front cover back in place.

34. Replace the right side and top covers.

35. Plug the power cable back into the DMS and flip the power switch ON at the rear of the instrument.

36. Launch Process Eye from the computer and toggle the backing pump ON (green).

37. Once the bypass pressure is under 30 torr, verify that both filaments are working by toggling the filament 1 button ON and confirm it turns green. Then repeat for filament 2.

38. With both filaments OFF (red), turn System Bake ON (green). Allow the system to bake for the full 8 hours before automatically turning off. The DMS must be connected to the TGA with gas flowing during the system bake.

39. In Process Eye, turn on a filament and the capillary heater. Wait 15 minutes for the filament to heat.

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40. Select “Start Detector Calibration” on the TA control panel. Calibrate the system with the appropriate gas and atmospheric pressure selected.



In air, the Multiplier 3 Gain will flood the detector causing the calibration to “fail”. To pass calibration, manually change the Gain from 1000 to a lower value, or change the Mass to 30, a rarer isotope of Nitrogen.

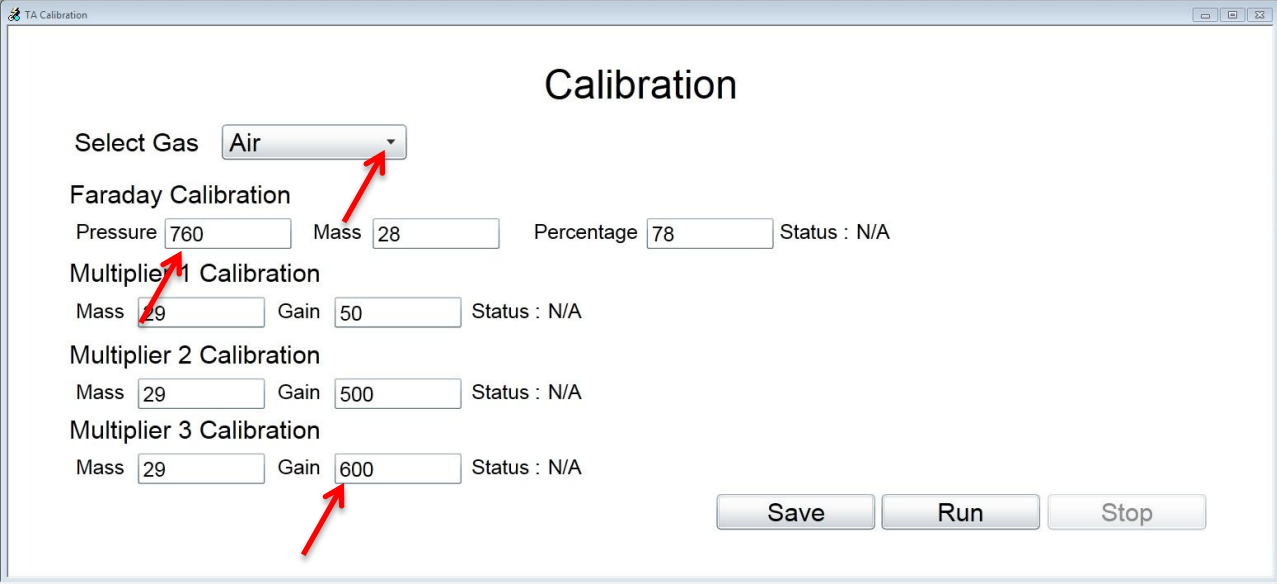


Fig 27