Part 1. Instrument Assembly Instructions

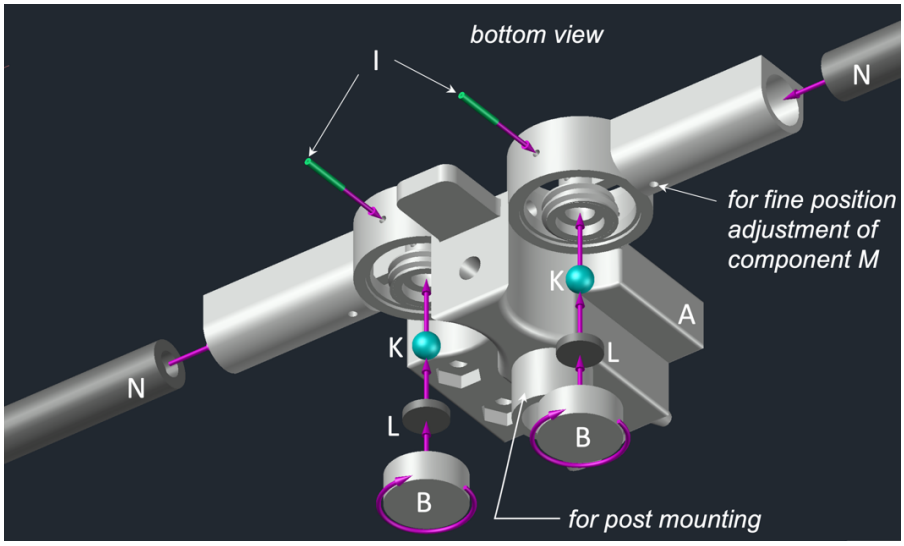
1.1 Parts List

Listed below are all components required to assemble the 3D printed CE-TDA Instrument. Assembly instruction figures that follow label components by their "ID" label given in the following table:

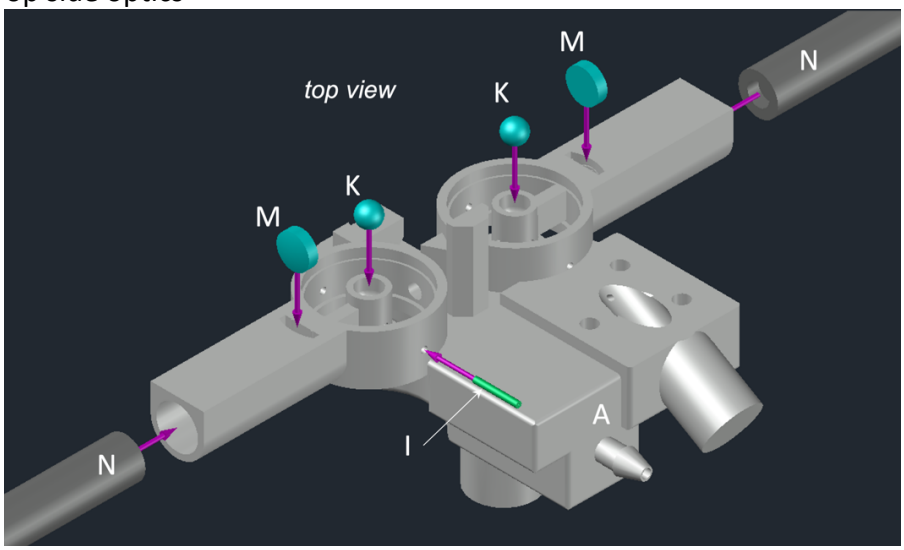
ID	Description	Vendor/Source	P/N	QTY	Notes
3D Printed Components					
A	Instrument Body	https://3d.nih.gov/	3DPX-021372	1	
B	Reflector Cap			2	
C	Periscope			1	
D	Capillary Cartridge			1	
E	Cartridge Key			1	
F	Outlet Lid			1	
$G_{1,2}$	Cooling Assembly			2	
User-fabricated Materials					
H	Silicone/Rubber Gaskets	https://3d.nih.gov/	3DPX-021372	2	See notes in section 1.5
I	Tubing Sleeve Segments*	IDEX	F-262	1	*User cuts one tubing sleeve into three equal segments
J	½" wide Rubber Bands (e.g. sizes 85, 86, or 87)	generic		3	User cuts one rubber band to open into a strip, and the other two are each cut into two equal length strips
Optical Components					
K	N-BK7 Ball Lens, 6 mm dia.	Edmund Optics	32-746	4	
L	Mirror, 10 mm dia.		32-941	2	
M	PCX Lens, 9 mm dia, 20 mm FL	Thorlabs	LA1472	2	
N	Laser Diode Module		CPS532	2	This work utilized the listed 532 nm laser, alternative wavelengths may be desirable for other use cases
O	Right-Angle Prism, L = 10 mm		PS910	2	
Hardware and Additional Components					
P	#8-32 machine screws, 1-1/2"	Everbilt	557720	11	
Q	#8-32 nuts		427258	11	
R	Pt Wire Electrodes, 2"	generic		2	For sample injection and CE at inlet/outlet of the capillary
S	500 uL microcentrifuge tubes			2+	
T	Vinyl tubing, ¼" or 5/16" i.d., 14 cm length			3	
U	Capillary tubing for CE, 50 cm, 360 µm O.D.	Polymicro Technologies		1	Capillary I.D. depends on use case

1.2 Subassembly: Instrument Body

Step 1.2.1 – Back side reflector

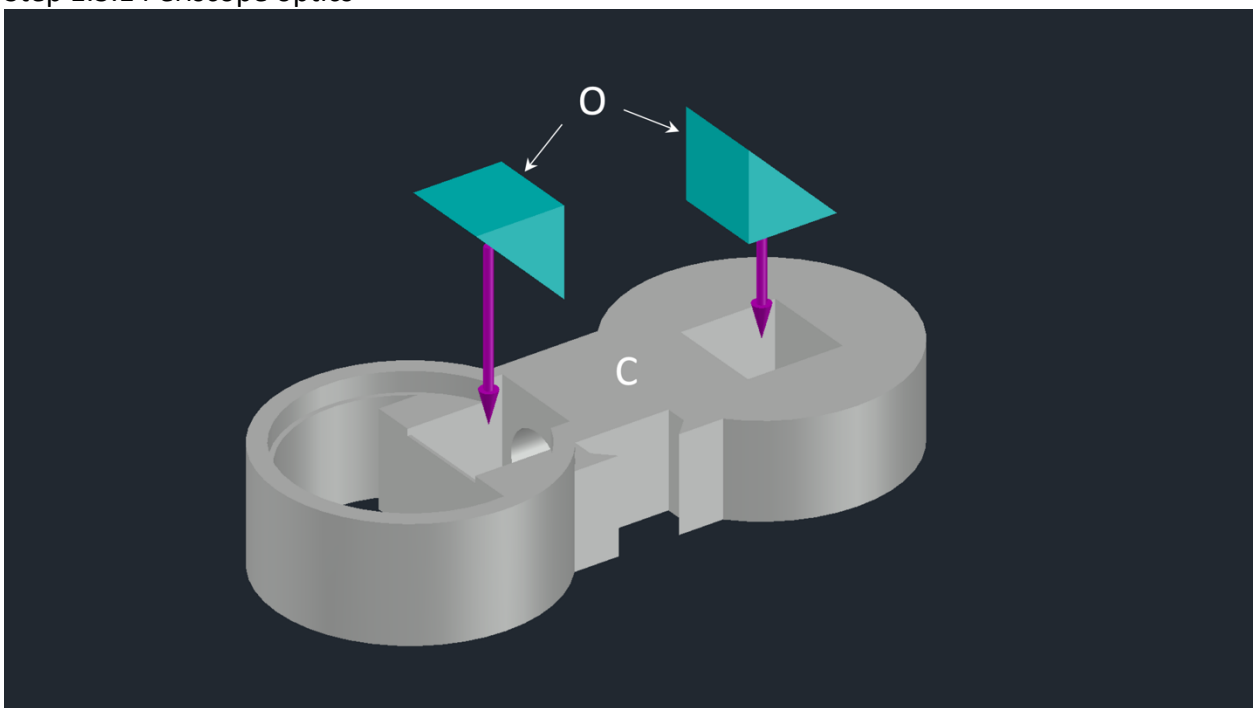


Step 1.2.2 Top side optics



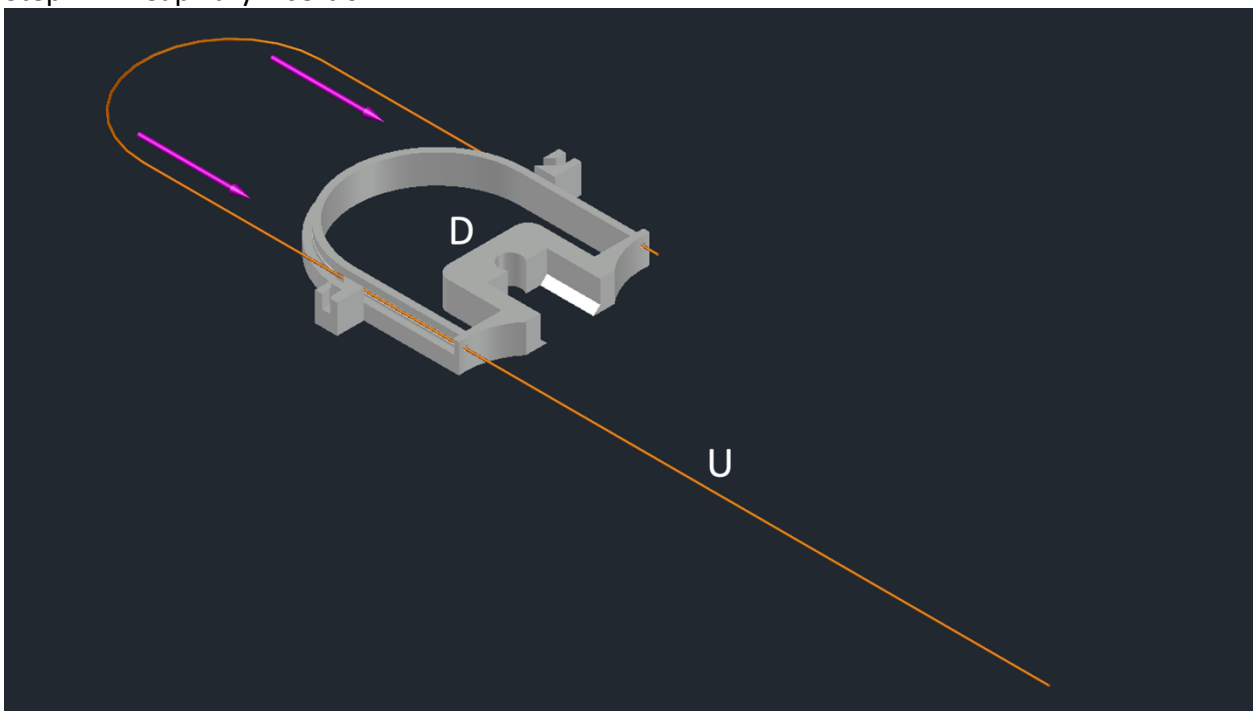
1.3 Subassembly: Periscope

Step 1.3.1 Periscope optics

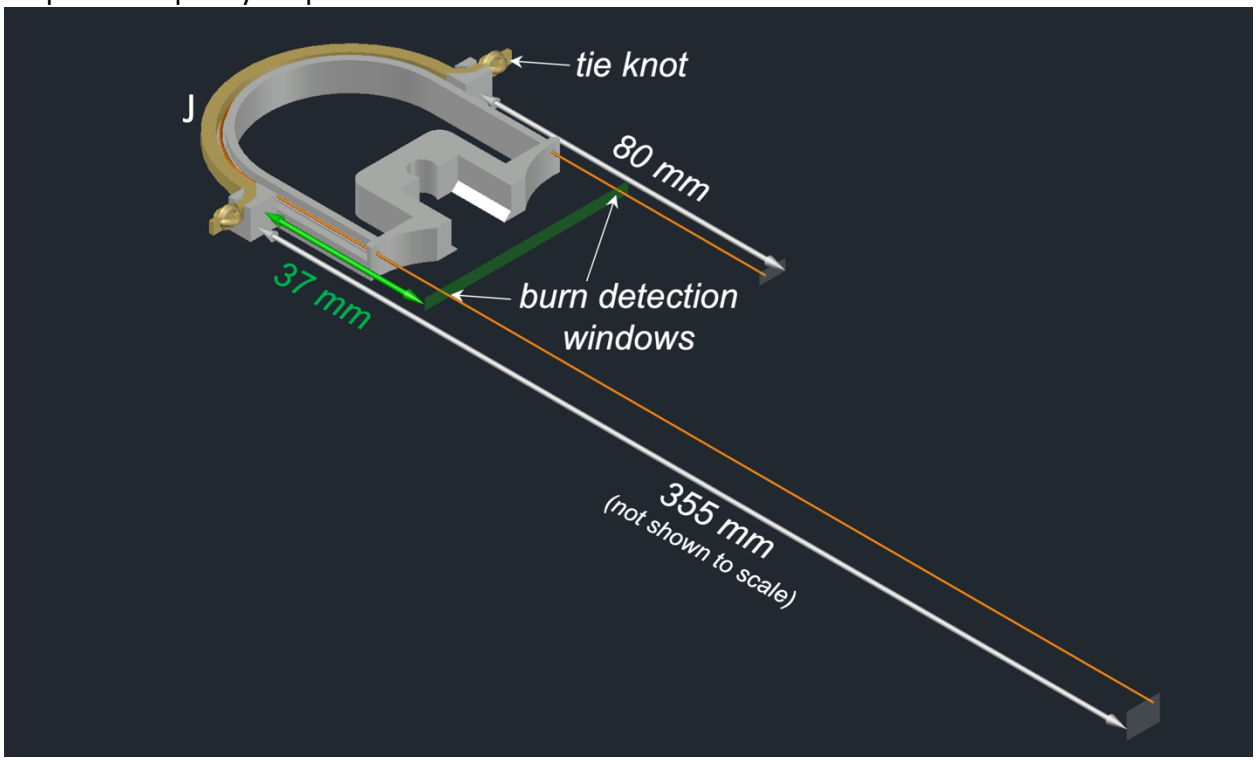


1.4 Subassembly: Capillary Cartridge

Step 1.4.1 Capillary Insertion

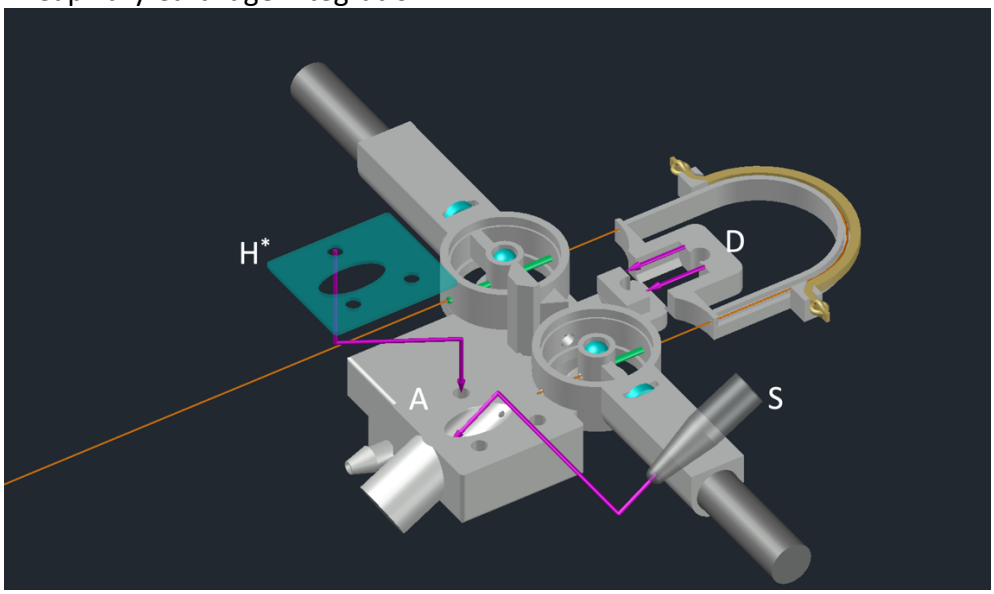


Step 1.4.2 Capillary Preparation



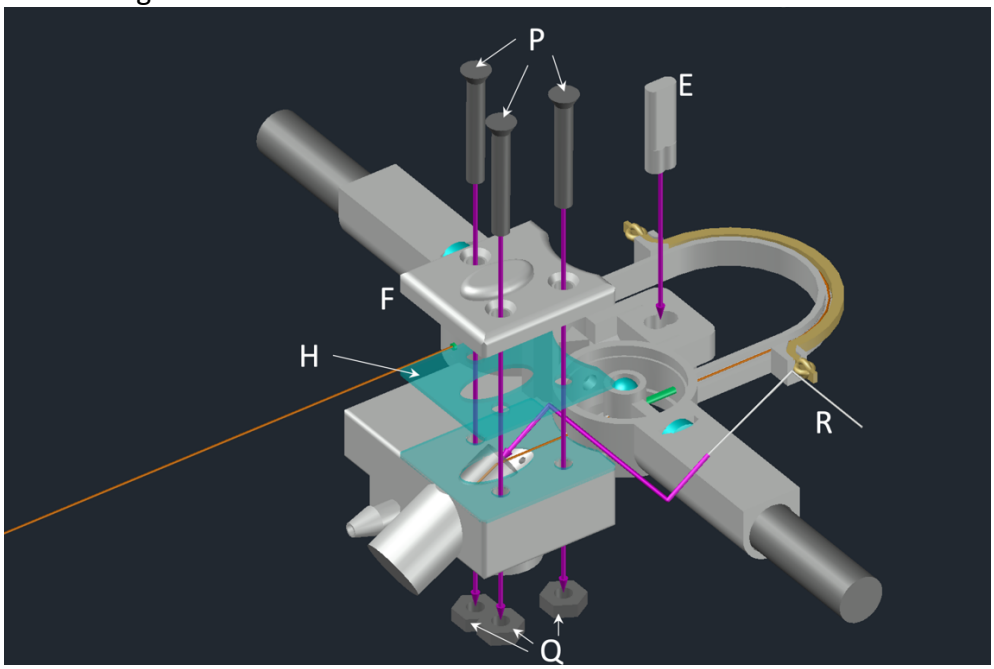
1.5 Superassembly

Step 1.5.1 Capillary Cartridge Integration

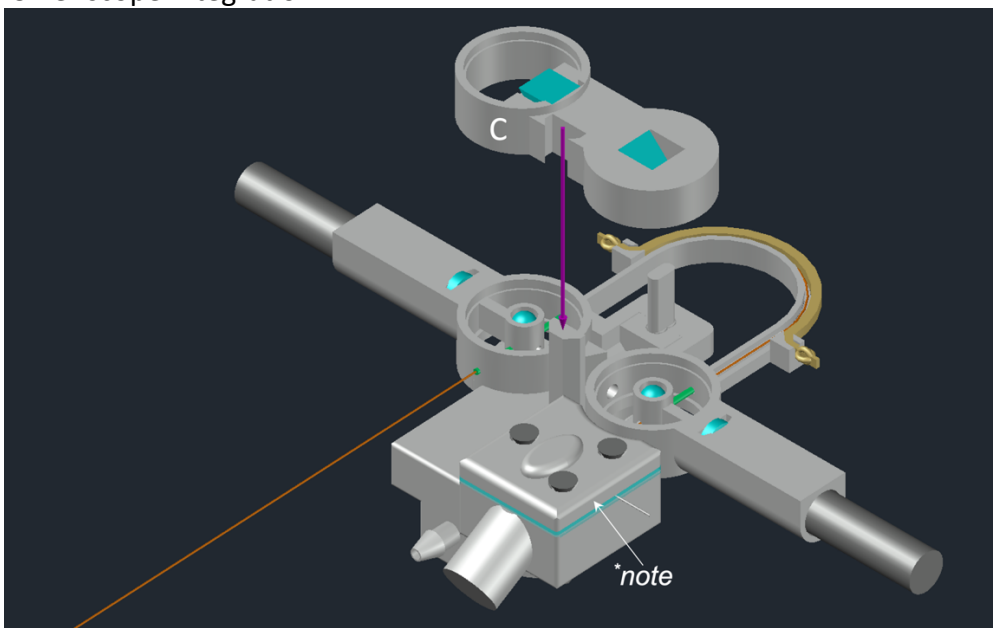


note : This manuscript used laser cut PDMS gaskets for component H. The NIH 3D entry for this instrument includes an STL model for the gasket for those who may wish to attempt printing this gasket in flexible materials. Die cutting (such as with a cricut or similar), liquid cast-in-place gaskets, or manual fabrication (such as using a hold punch) are all possible alternative routes to producing this gasket if laser cutting is not available. So far, we have only tested the laser cut PDMS gaskets.

Step 1.5.2 Sealing the Outlet

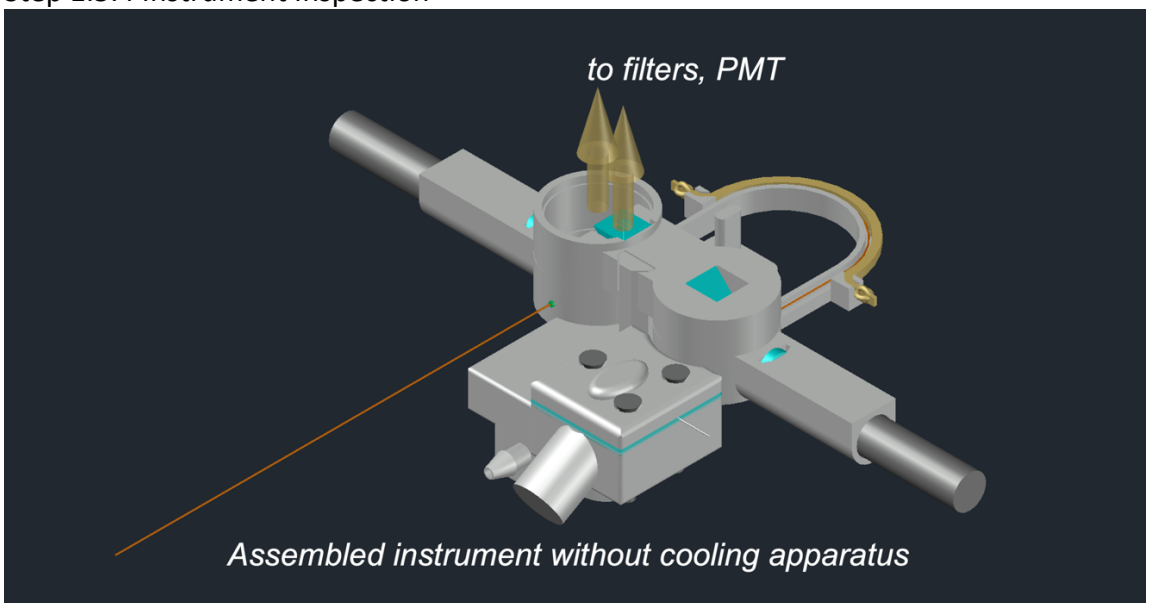


Step 1.5.3 Periscope Integration



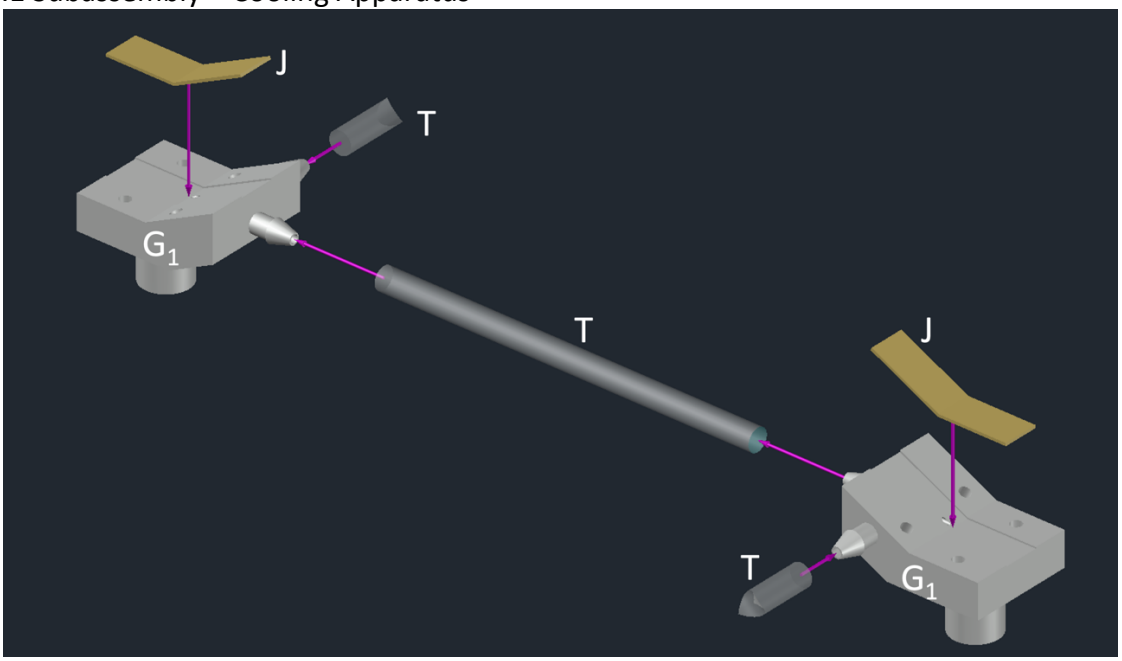
note : The capillary outlet and Pt electrode are sandwiched between two identical gaskets and compressed sufficiently to form a pressure seal around the outlet. This allows the integrated eductor to drive flow via vacuum applied at the capillary outlet. If it is challenging to achieve a pressure seal, consider using thicker and/or softer gasket materials, and/or smaller gauge Pt wire.

Step 1.5.4 Instrument Inspection

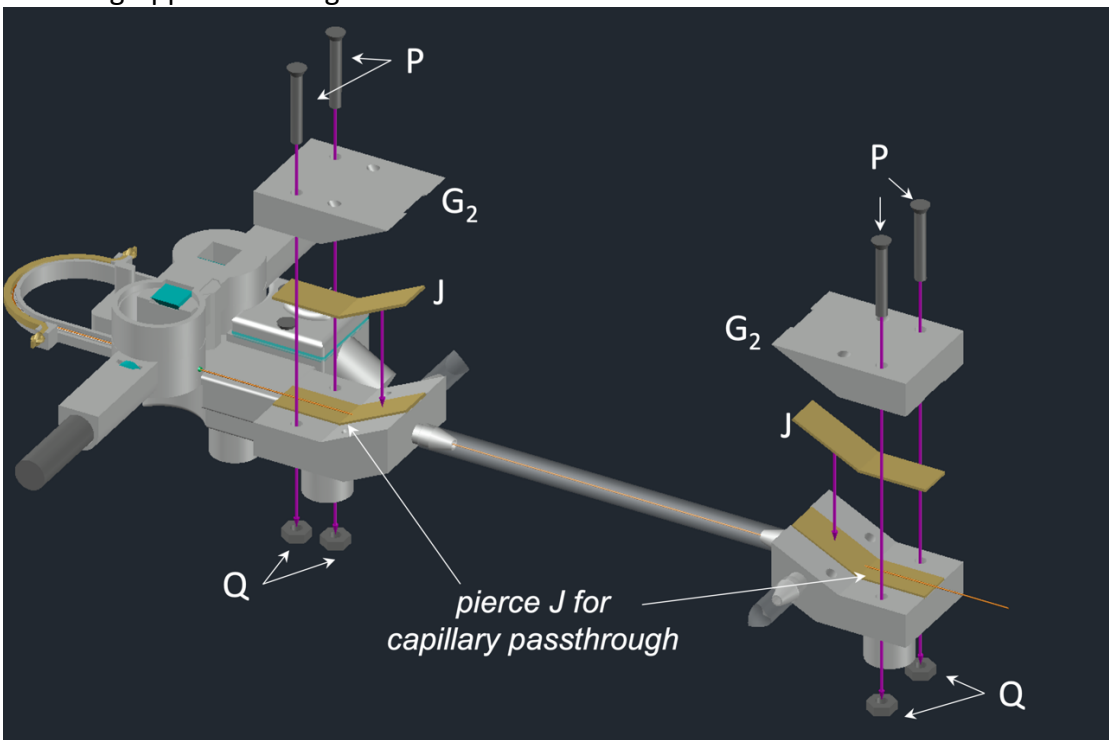


1.6 Cooling Apparatus Assembly]

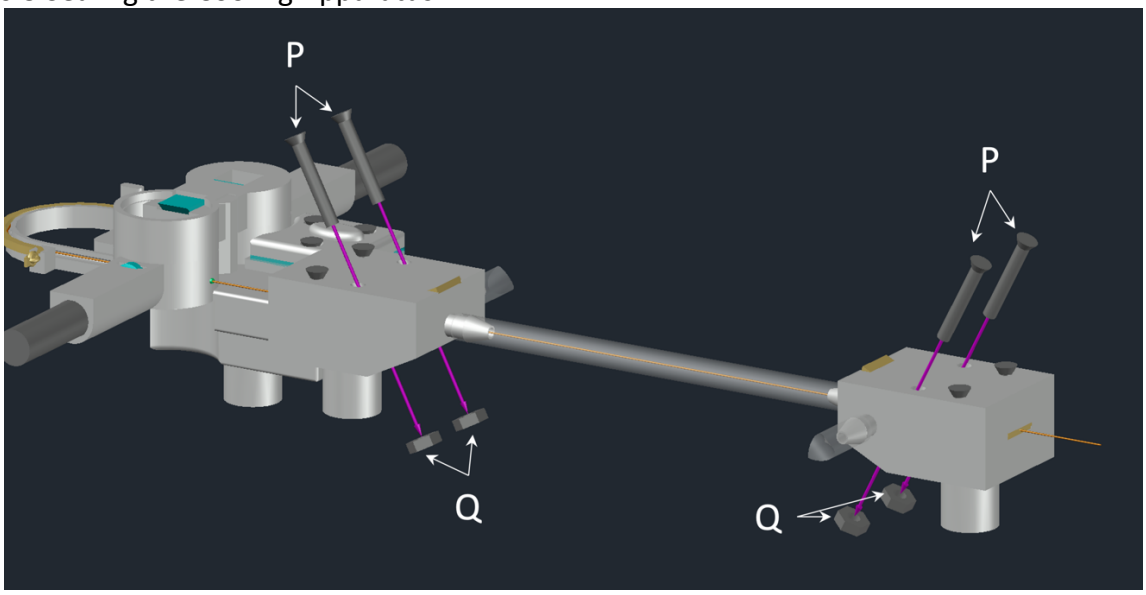
1.6.1 Subassembly – Cooling Apparatus



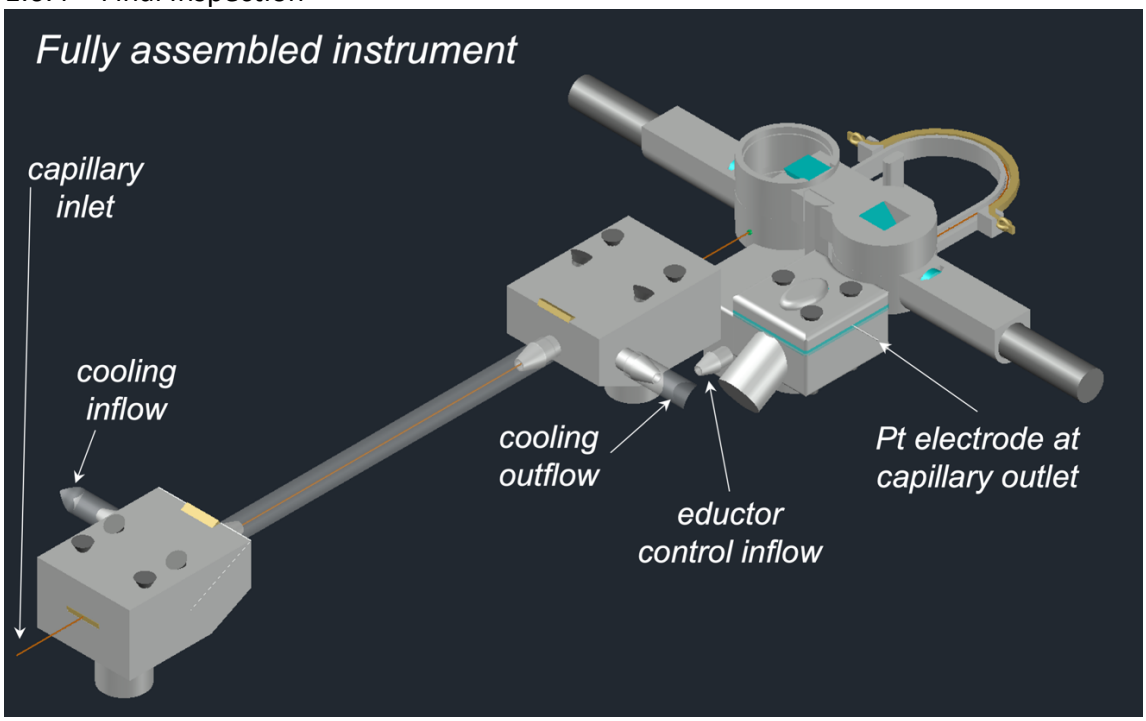
1.6.2 Cooling Apparatus Integration



1.6.3 Sealing the Cooling Apparatus



1.6.4 Final Inspection



Part 2. Supplemental Data

Figure S-2.1

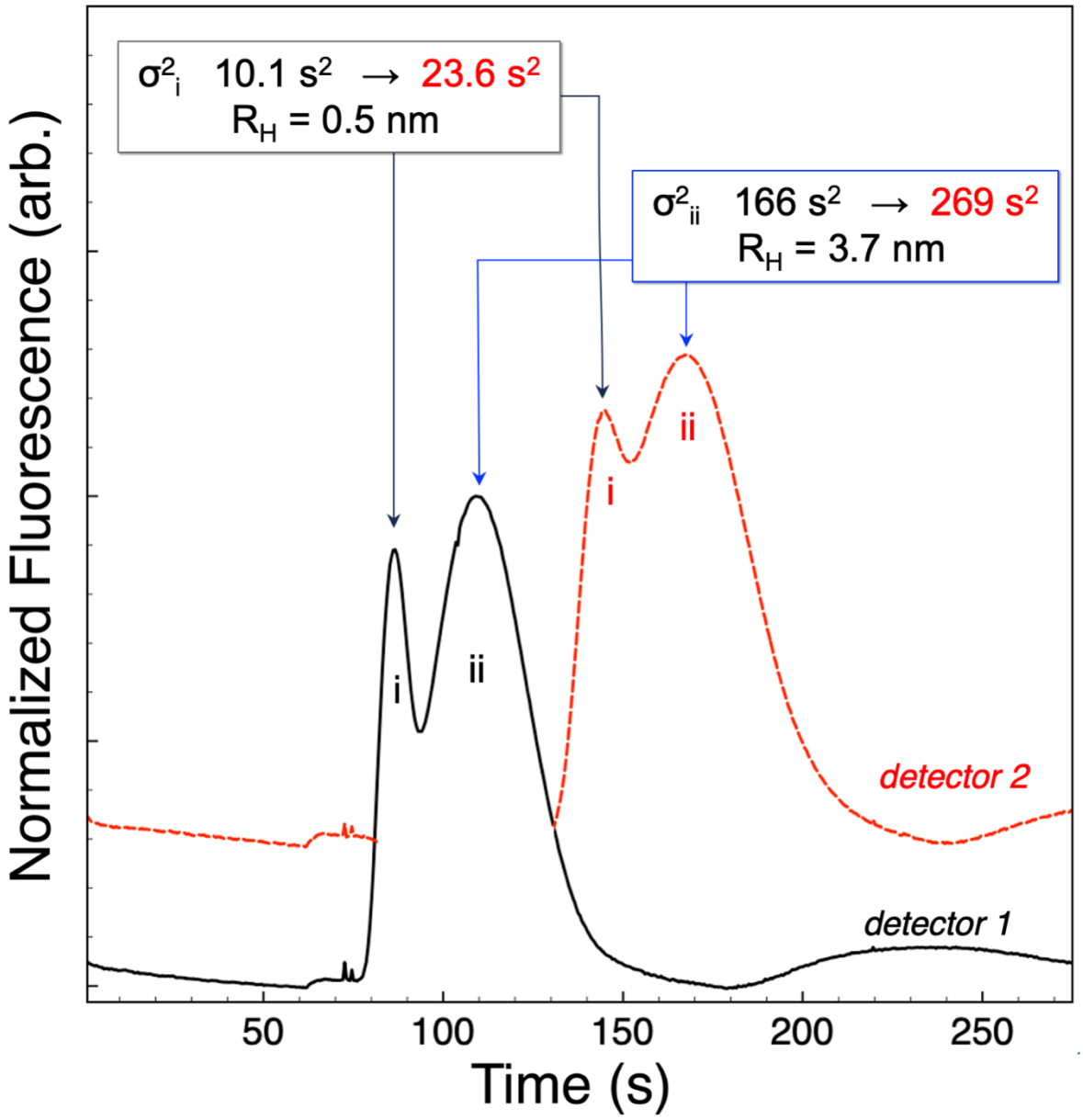


Figure S-2.1 TDA-based peak assignments. CE-TDA results are shown for the CE separation of BSA-TRITC labeling reaction mixture. On the basis of hydrodynamic radius, peak i is assigned as free FITC and peak ii is assigned as FITC-BSA.