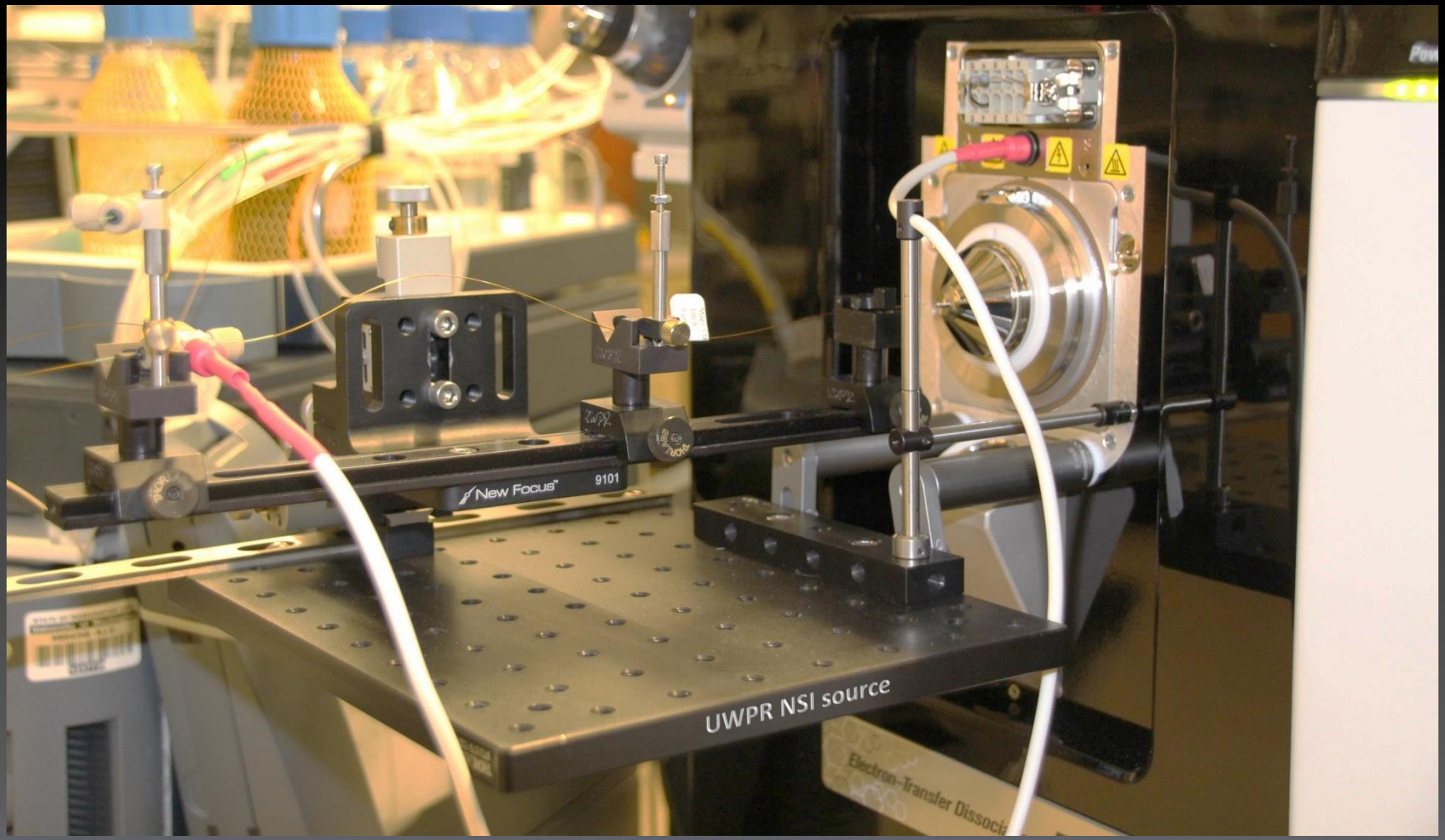
Nano-Spray-Ionization Source



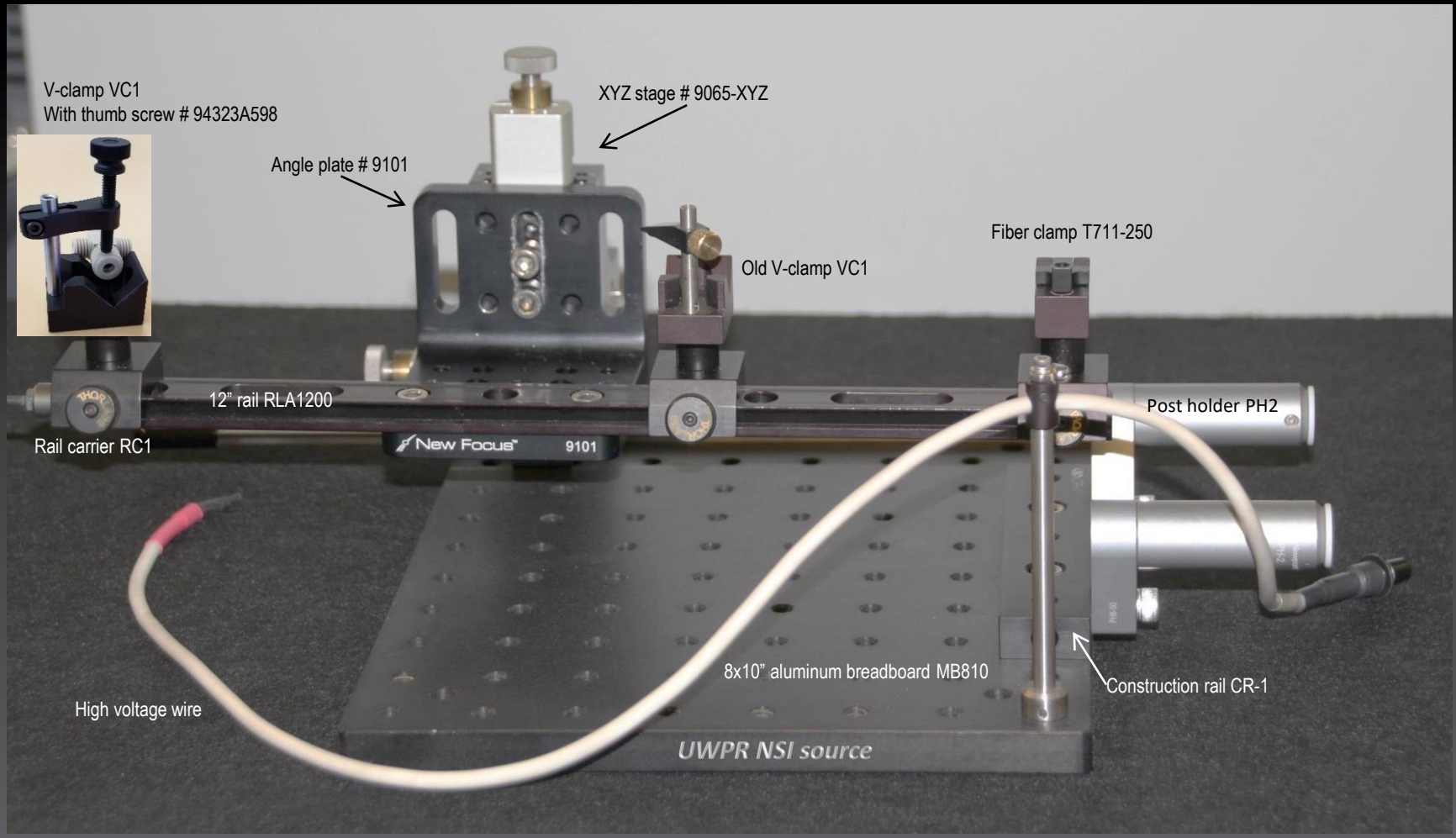
UWPR NSI Source

- The NSI source can be adjusted to fit all Thermo instruments (LTQ, Orbitrap, TSQ, Fusion)
- It offers all the benefits and features of commercial NSI sources:
  - Lower flow rates: no drying gas or thermal heating is required and increased sensitivity compared to higher flow ESI
  - Higher tolerance to a wide variety of liquid compositions than conventional ESI
- Additionally this NSI source offers significant improvements over most commercial NSI sources:
  - Great flexibility: it will not only accommodate in house packed columns of all length but also commercial columns, as well as configurations with traps, spray tips etc.
  - The source can be customized to your specific needs: e.g. mounting of cameras, LED lights or anything else you can think of……
  - Additionally this NSI source can be used in conjunction with the Thermo NSI probes (static , dynamic and packed tip probe)
  - The open design allows for leaks to be detected immediately
  - Significantly lower cost
  - The NSI platform can also be used with the adaptor ring of the Thermo NSI source, eliminating the need to machine the adaptor bracket
  - All the parts are commercially available , except for the adaptor system, which is custom machined, e.g. by emachineshop.com
- The UWPR is currently using the NSI source on our Thermo instruments
- The plans for this NSI source are available for free, use at your own risk…. ☺

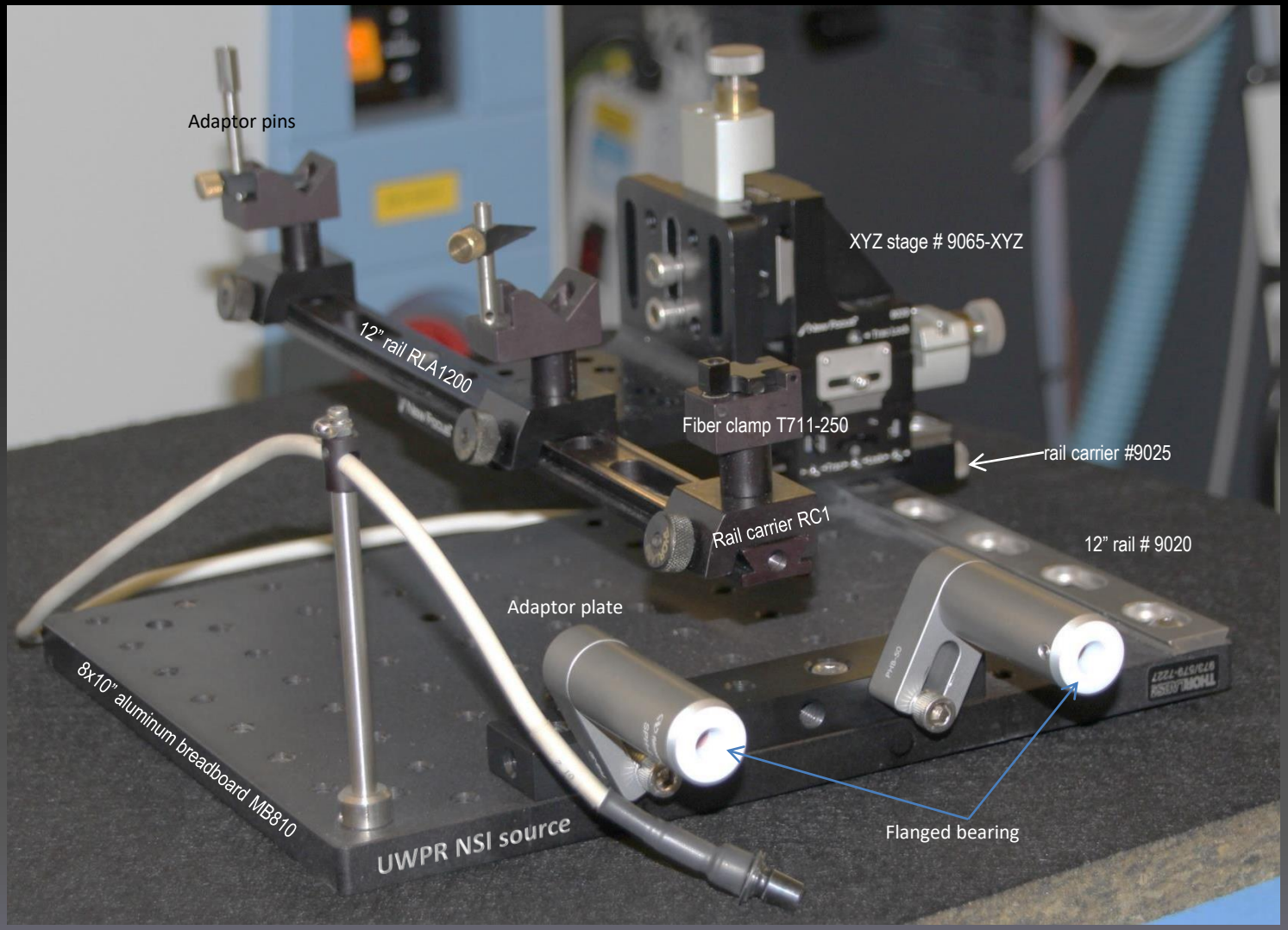
- This document and the xls file with all the part numbers should help you build your own source
- Note this is just a basic version, you can modify this source to fit your needs

UWPR NSI Source

This is what we are going to build:



UWPR NSI Source



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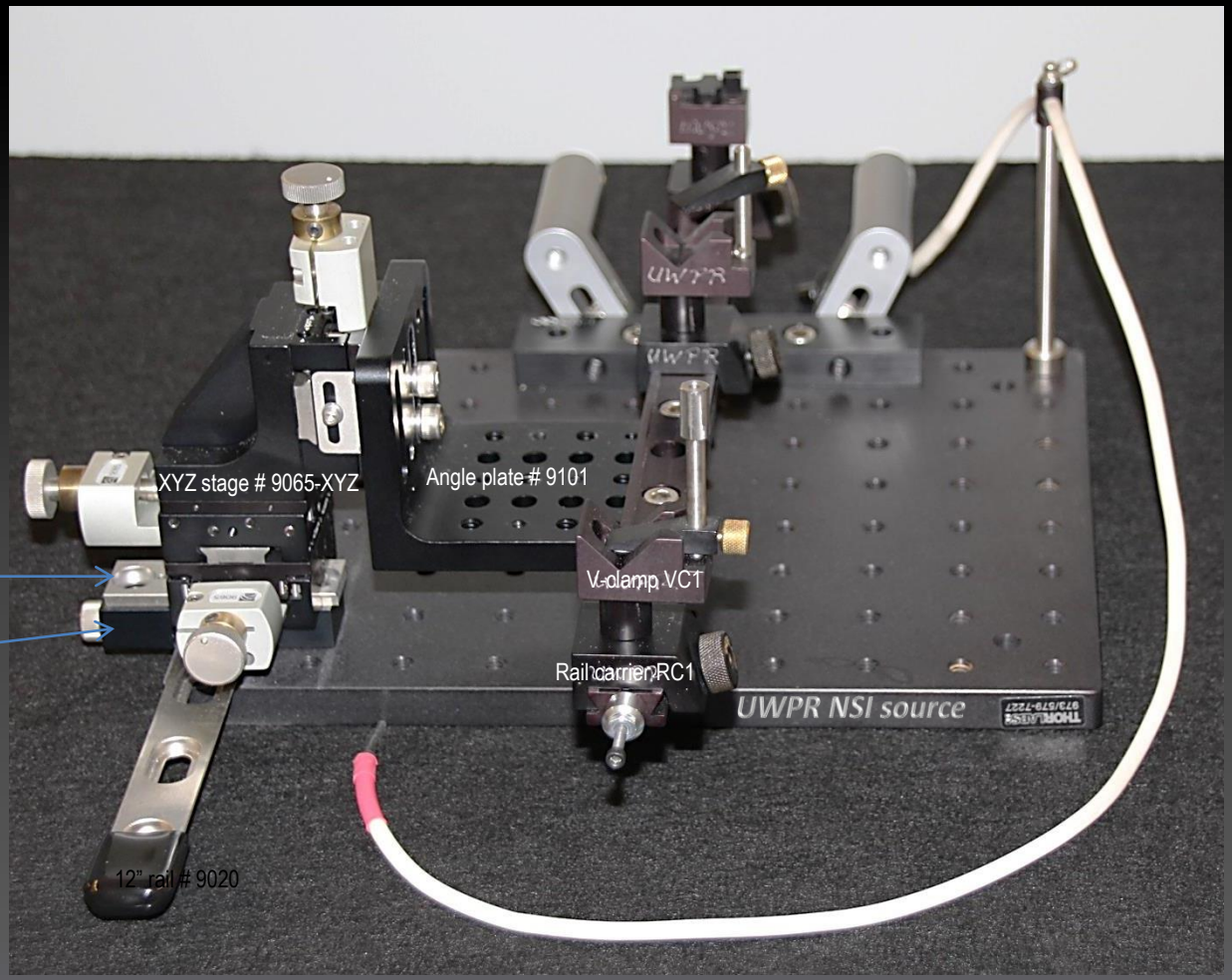
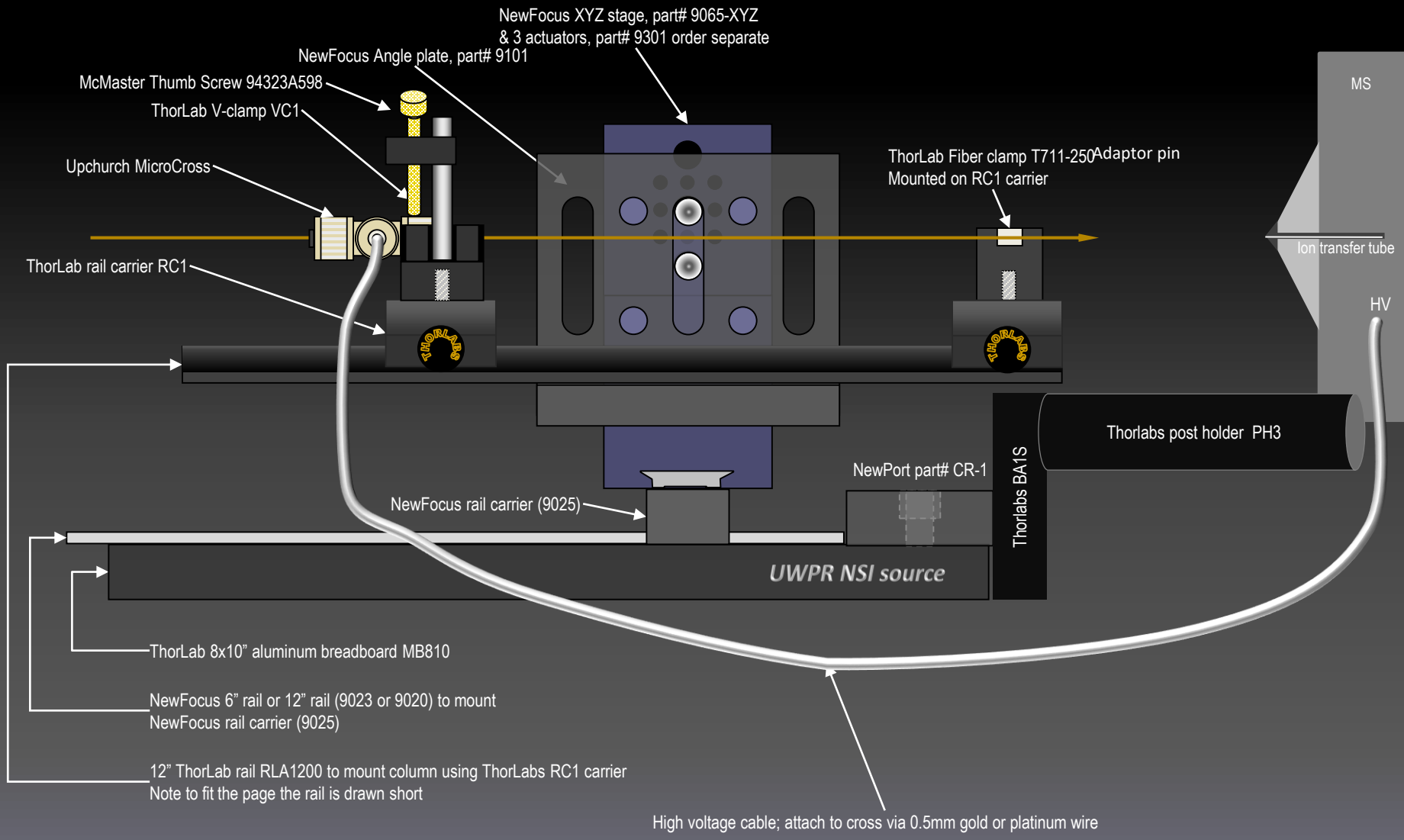


UWPR NSI Source



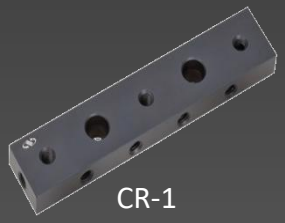
NSI Source: step 1

Note: you need two sets per instrument (one for each pin)

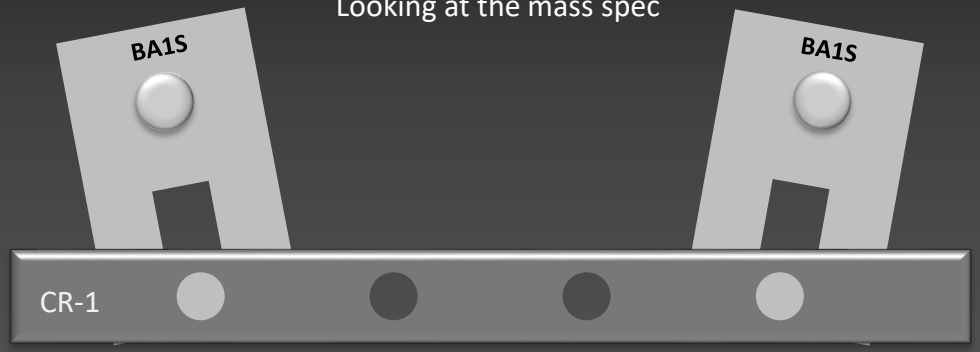
1. Attach base to post holder using a ¼-20 screw
2. Slide the bushings into the post holder in the order shown above
3. Replace the thumb screw with a ¼-20 set screw (optional)
4. Lightly tighten the set screw (or thumb screw) to hold flanged bushing
5. Slide the assembled post holders over the pins on the instrument

NSI Source: step 2

Side view



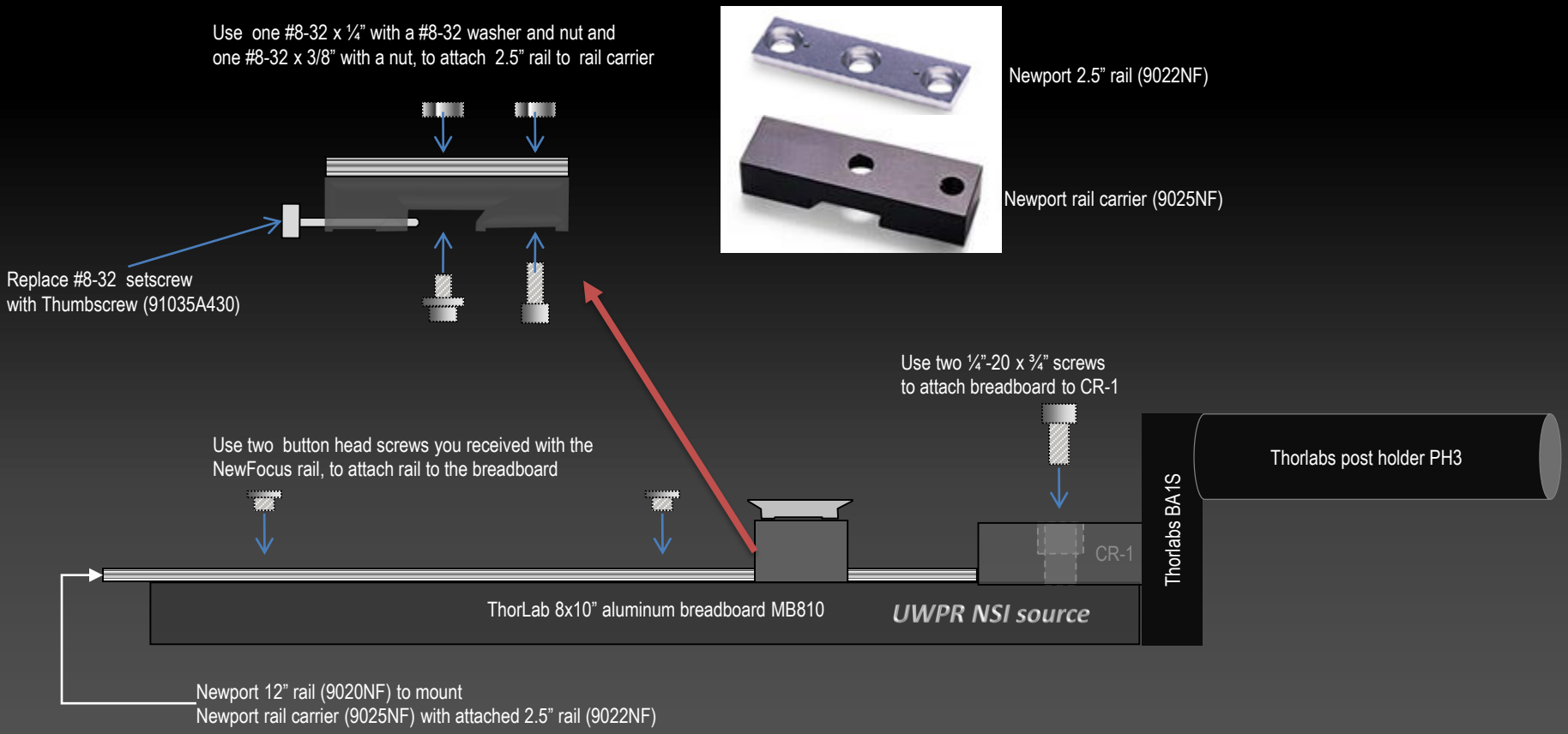
Front View
Looking at the mass spec



5. Slide the two post holders over the two pins on the mass spectrometer
6. While attached to the mass spec use two ¼-20 screws to attach the construction rail to the two bases
   Make sure the construction rail is level and tighten the screws

CR-1 Construction Rail, 1 x 5 in. (Newport)

NSI Source: step 3



9022NF	e·z·Trac™ Rail, 2.5 in. Length	(Newport)
9025NF	e·z·Trac™ Post Carrier, 0.75 in. Width	(Newport)
91035A430	18-8 Stainless Steel Knurled Head Captive Panel Screw	(McMasterCarr)
9020NF	e·z·Trac™ Rail, 12.0 in. Length	(Newport)
MB810	Aluminum Breadboard, 8" x 10" x 1/2", ¼-20 Threaded	(Thorlabs)

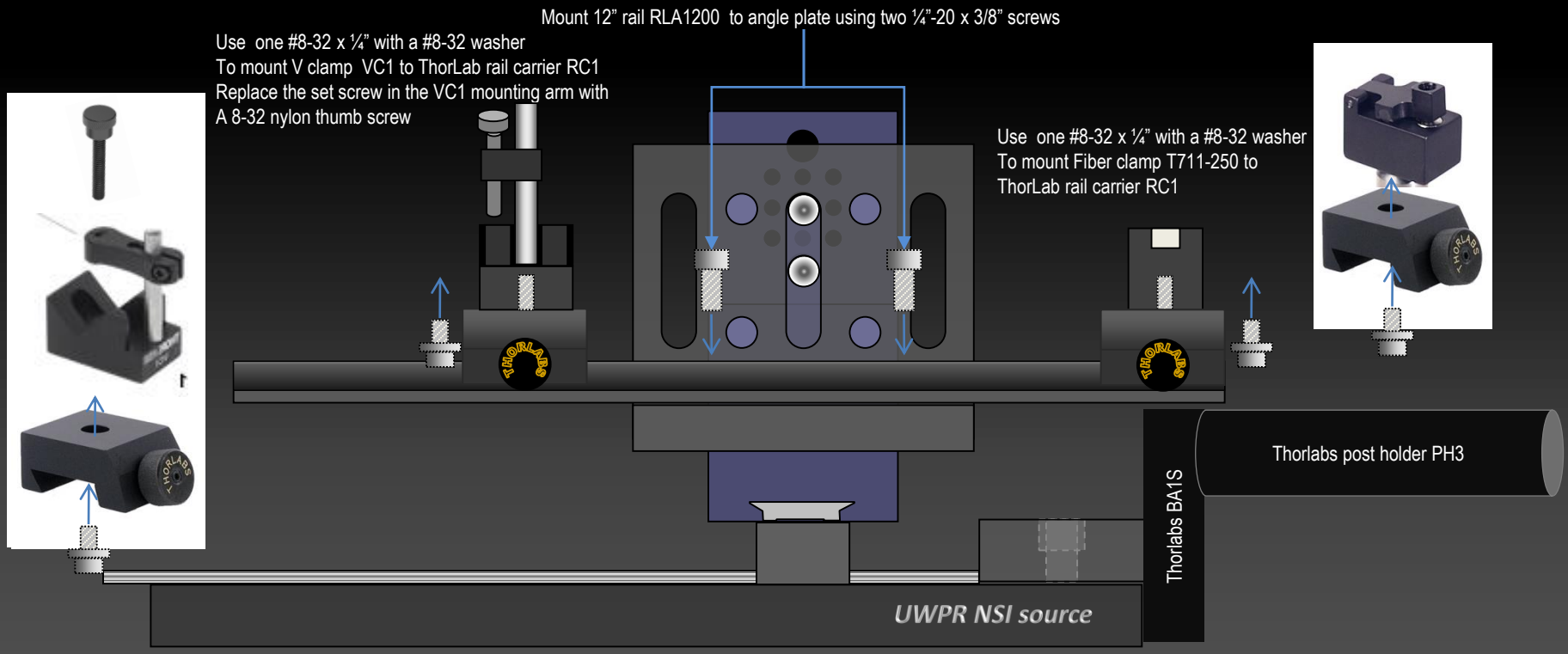
NSI Source: step 4

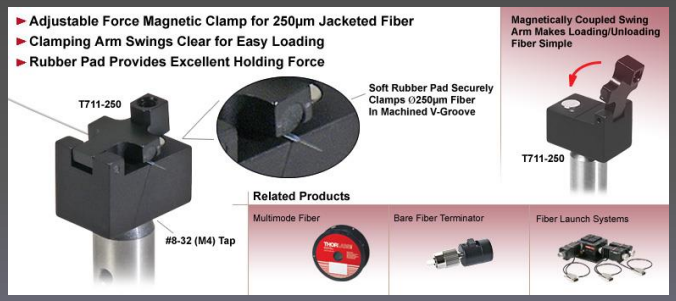
Mount Newport XYZ stage, part# 9065-XYZ
To 2.5" rail using set screws provided with stage

Attach angle plate, part# 9101 to XYZ stage using two ¼"-20 x 3/8" screws

9065-XYZ	Pint-Sized XYZ-Translation Stage	(Newport)
AJS100-0.5K-NL	High Precision Large Knob Adjustment Screw, 12.7 mm Travel, 100 TPI, No Lock	(Newport)
9101NF	Angle Plate, 1/4-20 Thru Slots, 8-32 and 1/4-20 Threads	(Newport)

NSI Source: step 5





RLA1200	Imperial Dovetail Optical Rail, 12"	(Thorlabs)
RC1	Rail Carrier, Counterbored Hole 1"x 1"	(Thorlabs)
VC1	Small V-Clamp with PM3 Clamping Arm	(Thorlabs)
T711-250	Post Mountable Fiber Clamp, 250mm	(Thorlabs)
94323A598	Nylon Raised-Head Thumb Screws 8-32 Thread Size, 1" Long	(McMasterCarr)

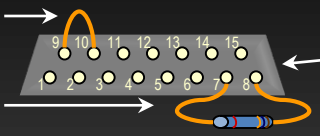
NSI Source: step 6a

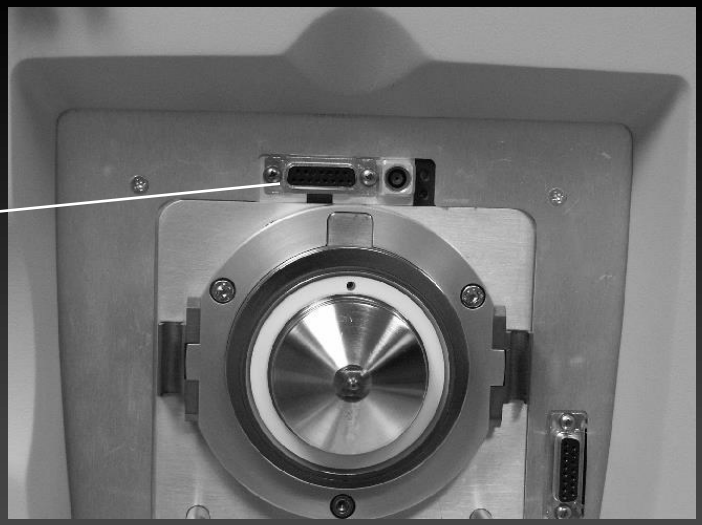
To bypass interlock on ThermoElectron LTQ, TSQ, QE when using alternate nanospray source (NSI)

Note: Jumper and resistor can either be attached directly to the connector on the front of the LTQ or via a DB15 male connector (easier to change between different sources).

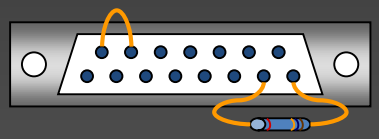
Jumper to bypass interlock between socket 9 and 10

10 K ohm resistor (2% var.) for NSI source recognition between socket 7 and 8





OR use DB15 male connector:
solder the jumper and resistor to the corresponding pins



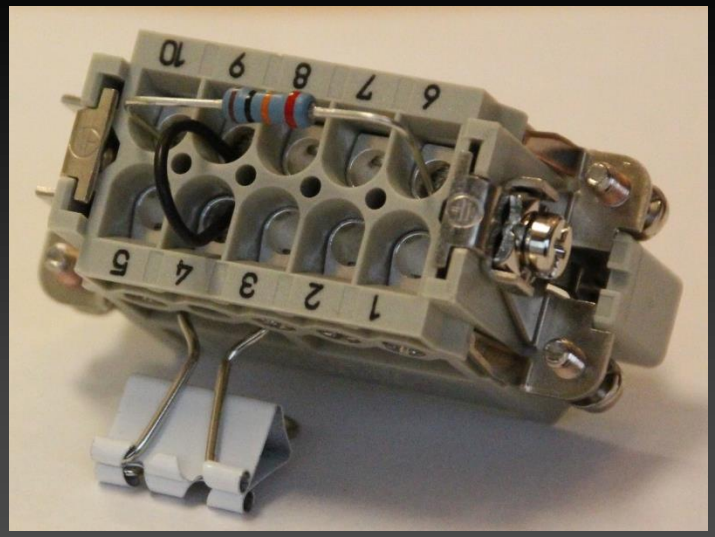
DB15 male connector backside view

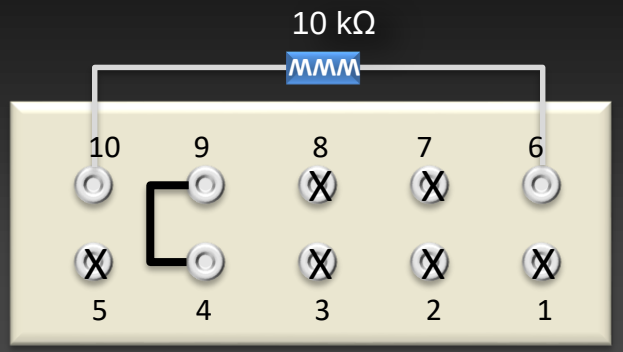
Solder Cup D-Sub Connector, DB15 Male

510-2002	Emerson Network Power, D-Sub Plug; Thermoplastic; Plug; Copper Alloy; Solder Termination	(Allied Electronics)
510-2445	Emerson Network Power, Hood; D-Sub; Chrome; Metalized Plastic; Steel; UL 94 VO; RoHS Compliant	(Allied Electronics)
70201054	Resistor; Metal Film; Res 10 Kilohms; Pwr-Rtg 0.25 W; Tol 2%; Axial; Epoxy	(Allied Electronics)

NSI Source: step 6b

To bypass interlock on ThermoElectron Fusion or Quantiva when using alternate nanospray source (NSI)



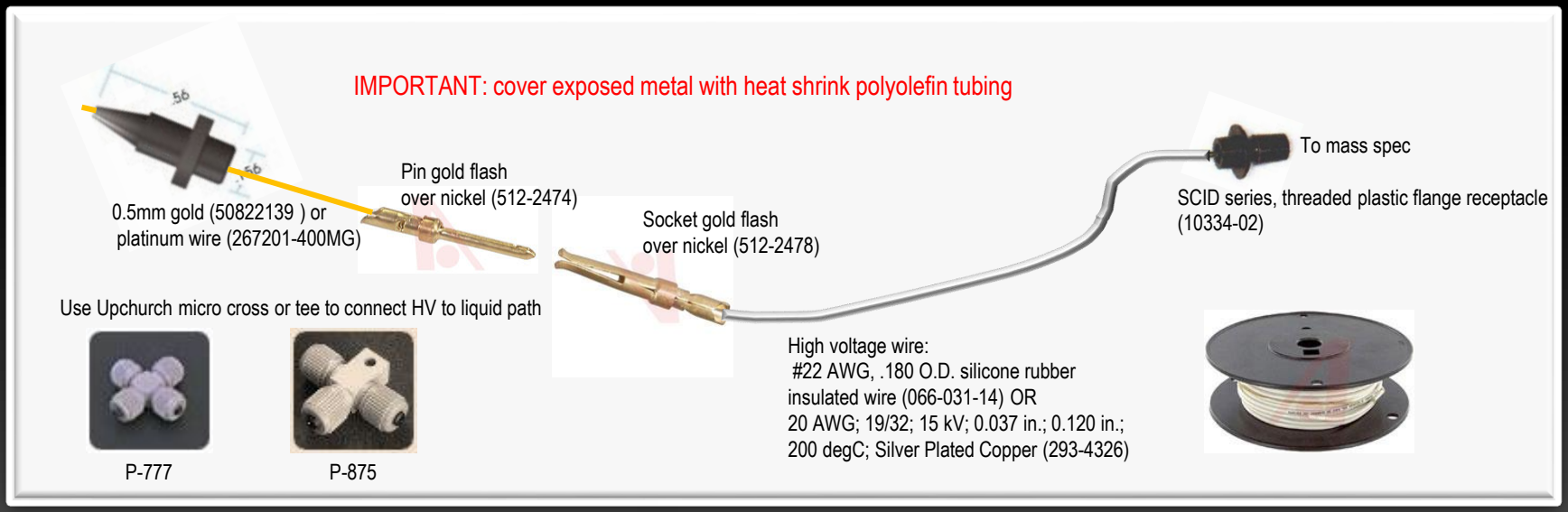


Male Plug HARTING 09200102612: Connect 10 kΩ resistor between pin 6 and 10 and jumper wire between pin 4 and 9
Optionally a ground wire can be attached to pin 7

In case you wonder why I show it upside down… that's because looking at the instrument from the front, that is how it will plug into the instrument

70104585	Insert; 250 V; 16 A; Male; 10; RoHS Compliant; Han A Series; 10 A Product Size Mfr. Part#: 09200102612	(Allied Electronics)
70201054	Resistor; Metal Film; Res 10 Kilohms; Pwr-Rtg 0.25 W; Tol 2%; Axial; Epoxy	(Allied Electronics)

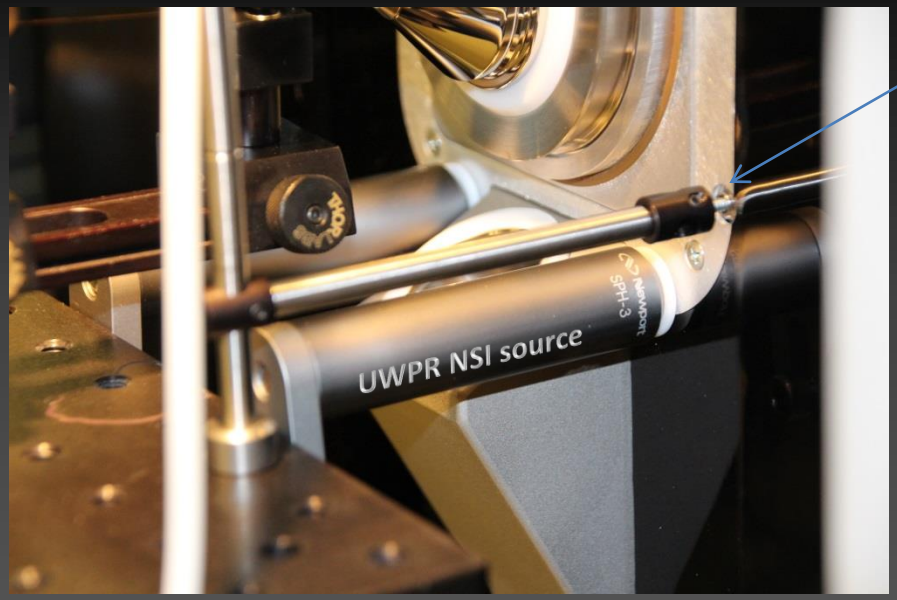
NSI Source: step 7



10334-02	SCID series, threaded plastic flange receptacle assembly	(Connectronics Corp)
Or		
00004-95039	Connector, Feed thru, 15KVdc, 7.5A, Connectronics	(Unity Lab Services)
066-031-14	High voltage wire, #22 AWG, .180 O.D. silicone /rubber insul.	(Connectronics Corp)
512-2474	20DF PIN CONT. LP	(Allied Electronics)
512-2478	20DF SOCKET CONT. L.P.	(Allied Electronics)
AA43288BU	Platinum wire; 99.95% ; Alfa Aesar; 0.5mm dia; 25cm; 4.21g/m	(Fisher)
P-777	Microcross, .025" OD tubing sleeves, .006" THRU HOLE, PEEK	(Upchurch)
P-875	Microtee , w/ mount. whole, for .025" OD tubing sleeves, PEEK™	(Upchurch)
F-172x	Ferrule, for .025" sleeves/P-416 NUT, PEEK™, BLACK (10 PK)	(Upchurch)
F-185x	Tubing sleeve, 395µm (.015") ID x .025", PEEK™, GREEN (10 PK)	(Upchurch)
P-116	Plug, for micro fittings, PEEK™, BLACK	(Upchurch)

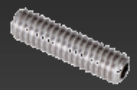
NSI Source: step 8

Note on the Fusion and Quantiva there is a inter-lock that needs to be pushed in
I used the miniature posts and a 0.5” 4-40 set screw



Adjust set screw to make sure the interlock is pressed in

MS3R



Set screw 4-40 0.5”

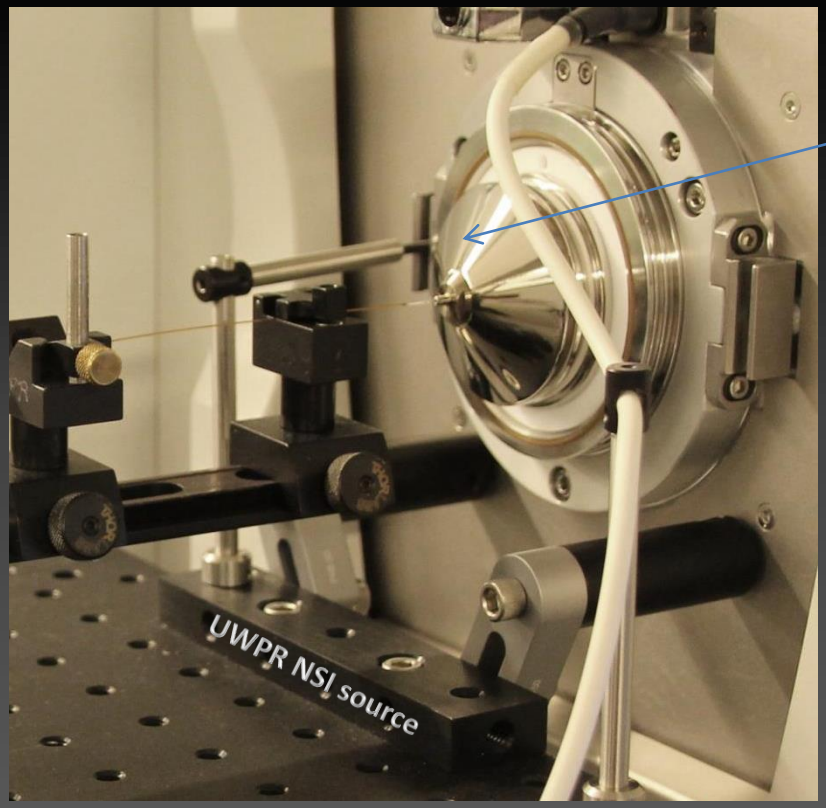
MSA25

ER90B

MS3R	Mini Series Mounting Posts, 6mm Diameter, 3" Long	(Thorlabs)
MSA25	Thread Adapter, 1/4"-20 to #4-40	(Thorlabs)
ER90B	Mini-Post Right Angle Adapter	(Thorlabs)
Set screw 4-40 0.5”		

NSI Source: step 9

Note on the QE there is a inter-lock that needs to be pushed in
I used the miniature posts and a 1” 4-40 set screw



Adjust set screw to make sure the interlock is pressed in

MS3R MS2R

Screw 4-40 1”

MSA25

ER90B

MS3R	Mini Series Mounting Posts, 6mm Diameter, 3" Long	(Thorlabs)
MS2R	Mini Series Mounting Posts, 6mm Diameter, 2" Long	(Thorlabs
MSA25	Thread Adapter, 1/4"-20 to #4-40	(Thorlabs)
ER90B	Mini-Post Right Angle Adapter	(Thorlabs)
4-40 screw 1in long		