
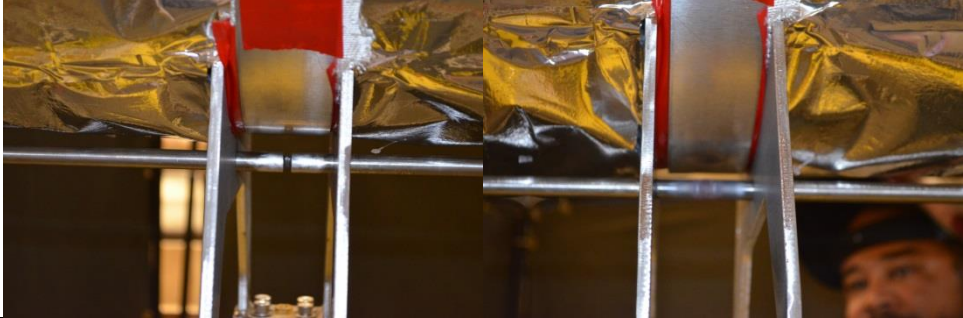



Traveler Title	LCLS2 Prototype Cryomodule Assembly Traveler Cold Mass Phase 2			
Traveler Abstract	This traveler details the assembly and in-process quality control inspections of the LCLS2 Cold Mass Phase 2. All work will be completed in the Cryomodule Assembly areas. The scope of work begins with a completed Cold Mass Phase 1 under the 4 poster and ends with an assembly ready to move onto the Vacuum Vessel Insertion work center.			
Traveler ID	L2PRO-CM-ASSY-SCND			
Traveler Revision	R1			
Traveler Author	John Fischer			
Traveler Date	06-Sept-2016			
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Approval Signatures				
Approval Dates				
Approval Title	Author	Project Manager	Project Engineer	CM Group Lead

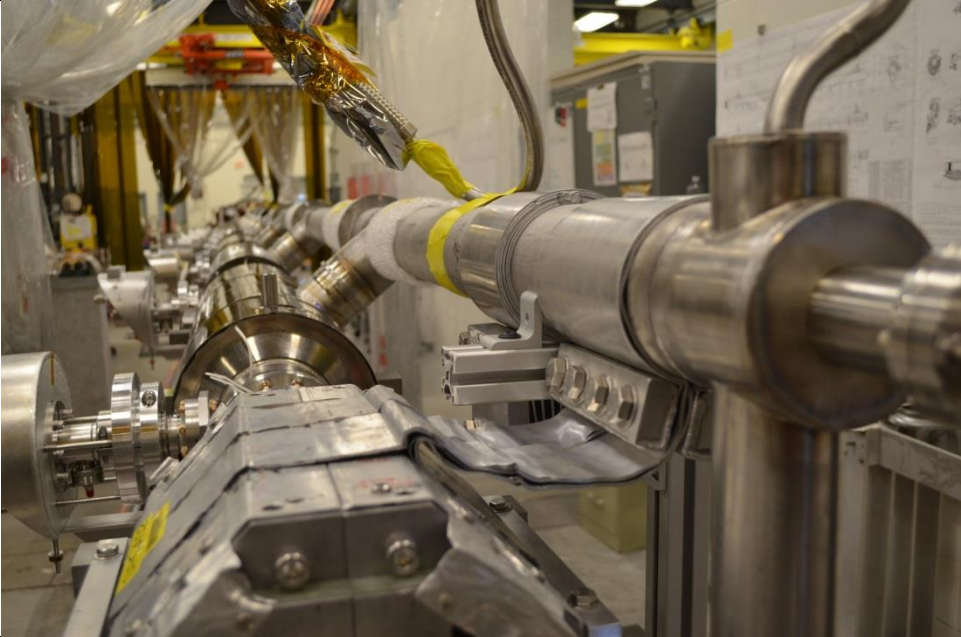
References	List and Hyperlink all documents related to this traveler. This includes, but is not limited to: safety (THAs, SOPs, etc), drawings, procedures, and facility related documents.			
<a href="#">F10009887-D Cavity String</a>	<a href="#">F10009950-Cold Mass Assy</a>	<a href="#">F10009954-F-Upper Cold Mass</a>	<a href="#">F10009945-Cryomodule Top Assy</a>	<a href="#">F10041120-Production Cold Mass</a>
<a href="#">Magnetic Shield Installation Procedure-Rev 8</a>	<a href="#">Fastener Installation and Torque Chart</a>	<a href="#">JLAB Tuner Installation Procedure</a>	<a href="#">Cryomodule Group Alignment Procedure</a>	<a href="#">2 Phase Weld Map</a>
<a href="#">MLI Installation Procedure</a>	<a href="#">11141S0029-Rev A Small Leak Check Procedure</a>	<a href="#">11141S0033-Rev A- Large Leak Check Procedure</a>	<a href="#">F10009375-Rev J- Magnet Package</a>	

Revision Note	
R1	Initial release of this Traveler.

Step No.	Instructions	Data Input
1	Record the Cavity String and UCM SN's	[[FIELDNAME_SRF]] <<SRF>> [[FieldName]] <<TIMESTAMP>> [[CSTSN]] <<CSTSN>> [[GHRPSN]] <<GHRPSN>>
2	Is the Cold Mass Phase 1 Traveler Complete?	[[FIELDNAME_SRF2]] <<SRF>> [[Date2]] <<TIMESTAMP>> [[FieldName2]] <<YESNO>> [[Comment2]] <<COMMENT>>
3	Install the completed UCM Assembly onto the 4 poster fixture. Align the transfer carts and UCM to prepare for string transfer. 	[[FIELDNAME_SRF3]] <<SRF>> [[Date3]] <<TIMESTAMP>> [[Comment3]] <<COMMENT>>
4	Perform the required QC of the UCM Assembly	[[FIELDNAME_SRF4]] <<SRF>> [[Date4]] <<TIMESTAMP>> [[Comment4]] <<COMMENT>>

5	<p>Prepare and install the cavity locking Invar rod.          Weld the rods together          Grind weld smooth so it fits thru GHRP hanger brackets          Demagnetize if required          Slide into ghrp brackets</p> 	<p>[[UCMQCResults]] &lt;&lt;FILEUPLOAD&gt;&gt;          [[FIELDNAME_SRF5]] &lt;&lt;SRF&gt;&gt;          [[Date5]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment5]] &lt;&lt;COMMENT&gt;&gt;</p>
6	<p>Verify the UCM assembly meets the magnetic hygiene requirements</p>	<p>[[FIELDNAME_SRF6]] &lt;&lt;SRF&gt;&gt;          [[Date6]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment6]] &lt;&lt;COMMENT&gt;&gt;          [[MagHygieneResults6]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>
7	<p>Complete the cooldown heater assy and any UCM instrumentation</p>	<p>[[FIELDNAME_SRF7]] &lt;&lt;SRF&gt;&gt;          [[Date7]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment7]] &lt;&lt;COMMENT&gt;&gt;          [[HeaterAssy]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>

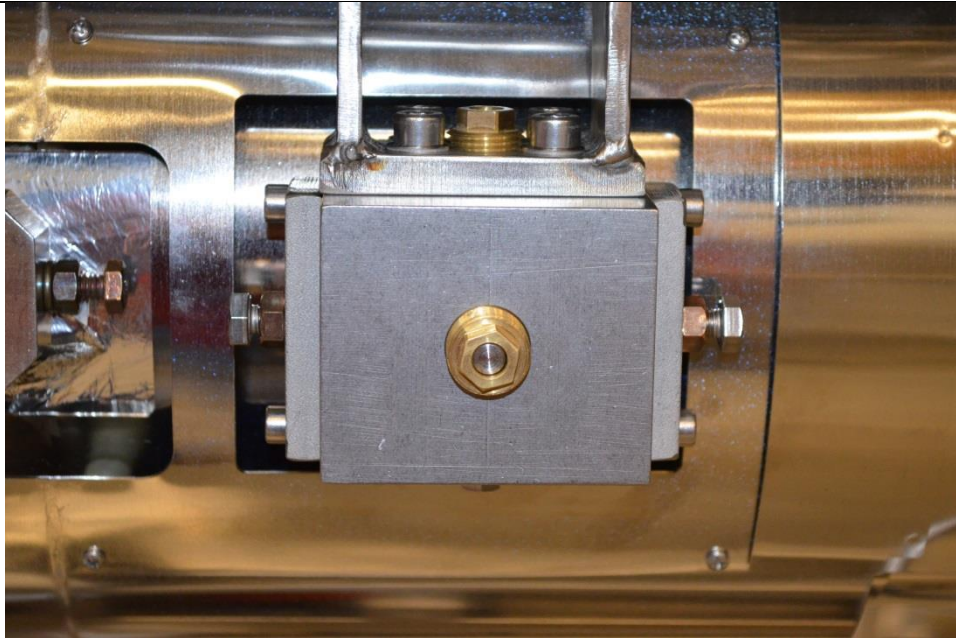
		
8	Measure string Fluxgates. Record values.	[[FIELDNAME_SRF8]] <<SRF>> [[Date8]] <<TIMESTAMP>> [[Comment8]] <<COMMENT>> [[FluxgateValues8]] <<FILEUPLOAD>>
9	Assemble the Magnet Package heat stationing foils into the 2 phase pipe clamp. Leave loose, will be torqued later. <a href="#">F10009375-Rev J- Magnet Package</a> , <a href="#">F10042265-Rev A- Split Quad Clamp</a>	[[FIELDNAME_SRF9]] <<SRF>> [[Date9]] <<TIMESTAMP>> [[Comment9]] <<COMMENT>>

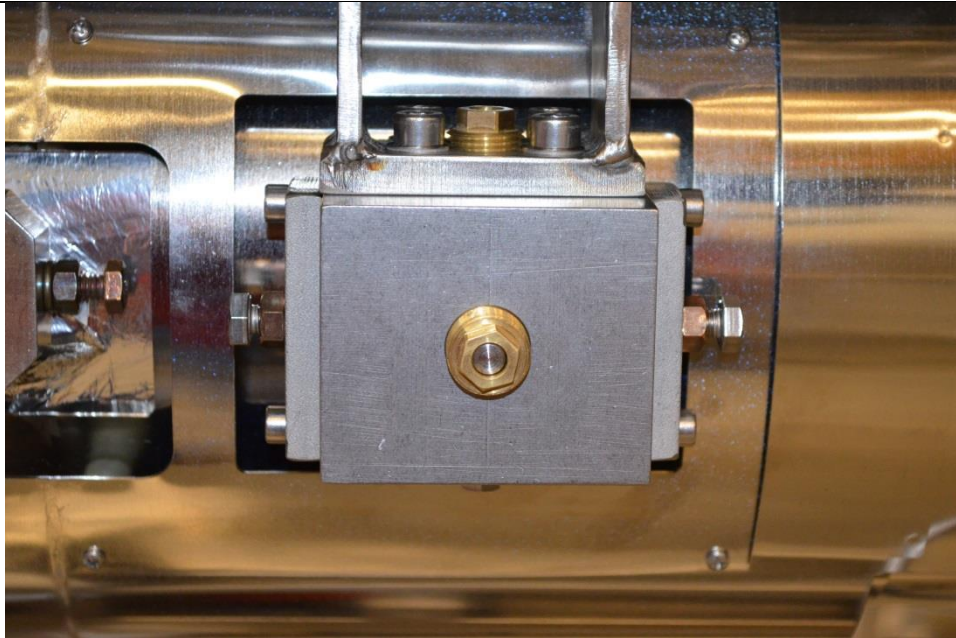
		
10	Move the Cavity string under the 4 poster and verify the articles are aligned. Fine tune as needed.	[[FIELDNAME_SRF10]] <<SRF>> [[Date10]] <<TIMESTAMP>> [[Comment10]] <<COMMENT>>





<p>11</p>	<p>Install the plastic spacer blocks on top of the HV and Magnet support lugs. Slowly lower the GHRP until you have contacted any one spacer. Monitor the move, making sure no weight is not put onto the cavity string and verify there are no interferences. Needle bearings and housings should be in the proper relationship to the helium vessel lugs.</p>	<p>[[FIELDNAME_SRF11]] &lt;&lt;SRF&gt;&gt;          [[Date11]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment11]] &lt;&lt;COMMENT&gt;&gt;</p>
<p>12</p>	<p>Fine tune the HV/Magnet lug to hanger dimension as required to accommodate the bearing block installation. This is achieved by carefully adjusting the lollipop tooling. Measure and record the distance between the features.</p>	<p>[[FIELDNAME_SRF12]] &lt;&lt;SRF&gt;&gt;          [[Date12]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment12]] &lt;&lt;COMMENT&gt;&gt;          [[Distance12]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>
<p>13</p>	<p>Install the needle bearing supports on the HV lugs, snug all hardware.</p>	<p>[[FIELDNAME_SRF13]] &lt;&lt;SRF&gt;&gt;          [[Date13]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment13]] &lt;&lt;COMMENT&gt;&gt;</p>



		
14	Prepare the magnet assembly by verifying the leveling feet are supporting the magnet, then remove the lug clamps and fixture sidewalls. Install the needle bearing supports on the magnet lugs. Snug all hardware.	[[FIELDNAME_SRF14]] <<SRF>> [[Date14]] <<TIMESTAMP>> [[Comment14]] <<COMMENT>>
15	Loosely install the HV post to invar clamps and stop plates. Position the clamps to negate the vacuum load, torque hardware to 70in/lbs.	[[FIELDNAME_SRF15]] <<SRF>> [[Date15]] <<TIMESTAMP>> [[Comment15]] <<COMMENT>>
16	Remove the magnet tooling in preparation of the Magnet Lead soldering.	[[FIELDNAME_SRF16]] <<SRF>> [[Date16]] <<TIMESTAMP>> [[Comment16]] <<COMMENT>>
17	Install the gate valve brackets on both ends.	[[FIELDNAME_SRF17]] <<SRF>> [[Date17]] <<TIMESTAMP>> [[Comment17]] <<COMMENT>>



18	Measure string Fluxgates. Record values.	[[FIELDNAME_SRF18]] <<SRF>> [[Date18]] <<TIMESTAMP>> [[Comment18]] <<COMMENT>> [[FluxgateValues18]] <<FILEUPLOAD>>
19	Weld the process piping and support discs. Complete the weld map. Upload results. <a href="#">2 Phase Weld Map</a> **1/4" fill line uses couplings**	[[FIELDNAME_SRF19]] <<SRF>> [[Date19]] <<TIMESTAMP>> [[Comment19]] <<COMMENT>> [[WeldMap19]] <<FILEUPLOAD>>
20	Install the 2 phase invar rods and GHRP to 2 phase clamps (3 x's)	[[FIELDNAME_SRF20]] <<SRF>> [[Date20]] <<TIMESTAMP>> [[Comment20]] <<COMMENT>>
21	Install the GHRP testing caps. GHRP pipe ends may be out of round	[[FIELDNAME_SRF21]] <<SRF>> [[Date21]] <<TIMESTAMP>> [[Comment21]] <<COMMENT>>

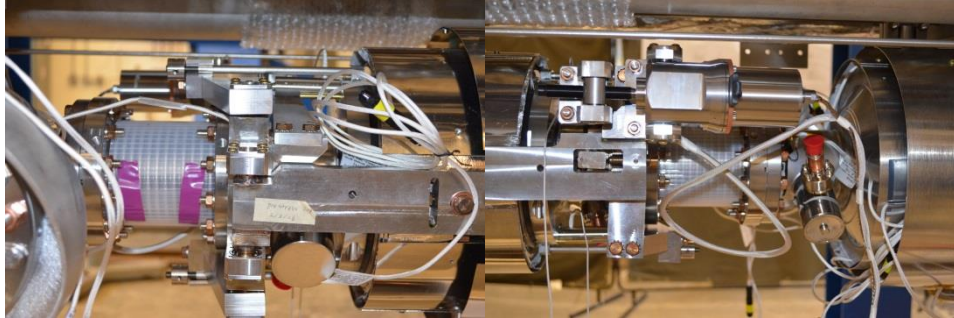


22	Leak check the 2 phase circuit. Upload findings. <a href="#">11141S0033-Rev A- Large Leak Check Procedure</a>	[[FIELDNAME_SRF22]] <<SRF>> [[Date22]] <<TIMESTAMP>> [[Comment22]] <<COMMENT>> [[leakcheck]] <<FILEUPLOAD>>
23	Solder the magnet current leads and install into thermal clamps. Torque clamp hardware to 50 ft/lbs. <a href="#">F10040841-Rev C-2K Clamp Assy</a> , <a href="#">F10045236-Rev C- 5K Clamp Assy</a> , <a href="#">F10046443-Rev A- 50K Clamp Assy</a> . Hi-pot once work is completed. Record results. 	[[FIELDNAME_SRF23]] <<SRF>> [[Date23]] <<TIMESTAMP>> [[Comment23]] <<COMMENT>> [[HipotResults23]] <<FILEUPLOAD>>
24	Finish the 2 <sup>nd</sup> layer magnetic shields. Will add the center section, <a href="#">Magnetic Shield Installation Procedure-Rev 8</a>	[[FIELDNAME_SRF24]] <<SRF>> [[Date24]] <<TIMESTAMP>> [[Comment24]] <<COMMENT>>
25	Measure string Fluxgates. Record values.	[[FIELDNAME_SRF25]] <<SRF>> [[Date25]] <<TIMESTAMP>> [[Comment25]] <<COMMENT>> [[FluxgateValues25]] <<FILEUPLOAD>>

26	Lower the cavity tooling lollipops and return to cleanroom Care should be taken when lowering the tooling that cavity is not caught	[[FIELDNAME_SRF26]] <<SRF>> [[Date26]] <<TIMESTAMP>> [[Comment26]] <<COMMENT>>
27	Align the cavity string, record findings. <a href="#">Cryomodule Group Alignment Procedure</a> Bearing block stop plates should be removed once HV invar clamps are tightened and alignment is completed. Cavity 5 is fixed with a variation of stop plate.	[[FIELDNAME_SRF27]] <<SRF>> [[Date27]] <<TIMESTAMP>> [[Comment27]] <<COMMENT>> [[AlignmentData27]] <<FILEUPLOAD>>
28	Measure string Fluxgates. Record values.	[[FIELDNAME_SRF28]] <<SRF>> [[Date28]] <<TIMESTAMP>> [[Comment28]] <<COMMENT>> [[FluxgateValues28]] <<FILEUPLOAD>>
29	Measure cavity passbands and HOM tuning. Upload results.	[[FIELDNAME_SRF29]] <<SRF>> [[Date29]] <<TIMESTAMP>> [[Comment29]] <<COMMENT>> [[RFData29]] <<FILEUPLOAD>>
30	Install the remaining instrumentation on the cavity string. This will include cold coupler, beamline, HOM's, and magnetic shielding. Record sensor values after installation.	[[FIELDNAME_SRF30]] <<SRF>> [[Date30]] <<TIMESTAMP>> [[Comment30]] <<COMMENT>> [[SensorValues30]] <<FILEUPLOAD>>

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Install the tuners, stepper motors, and piezos. Apply preload. Record setup information. [JLAB Tuner Installation Procedure](#)  
 Perform tuner and piezo functionality tests





**\*\*Note-Cavity 1 Magnetic Shield end cap to be installed loosely while tuner is being installed\*\***

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[[FIELDNAME_SRF31]] <<SRF>>
[[Date31]] <<TIMESTAMP>>
[[Comment31]] <<COMMENT>>
[[TunerData31]] <<FILEUPLOAD>>
[[Cav1StepperSN]] <<SN>>
[[Cav2StepperSN]] <<SN>>
[[Cav3StepperSN]] <<SN>>
[[Cav4StepperSN]] <<SN>>
[[Cav5StepperSN]] <<SN>>
[[Cav6StepperSN]] <<SN>>
[[Cav7StepperSN]] <<SN>>
[[Cav8StepperSN]] <<SN>>
[[Cav1UpperPiezoSN]] <<SN>>
[[Cav1LowerPiezoSN]] <<SN>>
[[Cav2UpperPiezoSN]] <<SN>>
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[[Cav3TunerSN]] <<SN>>
[[Cav4TunerSN]] <<SN>>
[[Cav5TunerSN]] <<SN>>
[[Cav6TunerSN]] <<SN>>
  
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		<p>[[Cav7TunerSN]] &lt;&lt;SN&gt;&gt;          [[Cav8TunerSN]] &lt;&lt;SN&gt;&gt;</p>
32	Measure string Fluxgates. Record values.	<p>[[FIELDNAME_SRF32]] &lt;&lt;SRF&gt;&gt;          [[Date32]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment32]] &lt;&lt;COMMENT&gt;&gt;          [[FluxgateValues32]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>
33	Install remaining interconnect magnetic shielding, HV end caps, and HOM covers. Be sure to keep serial numbers aligned. <a href="#">Magnetic Shield Installation Procedure-Rev 8</a>	<p>[[FIELDNAME_SRF33]] &lt;&lt;SRF&gt;&gt;          [[Date33]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment33]] &lt;&lt;COMMENT&gt;&gt;</p>

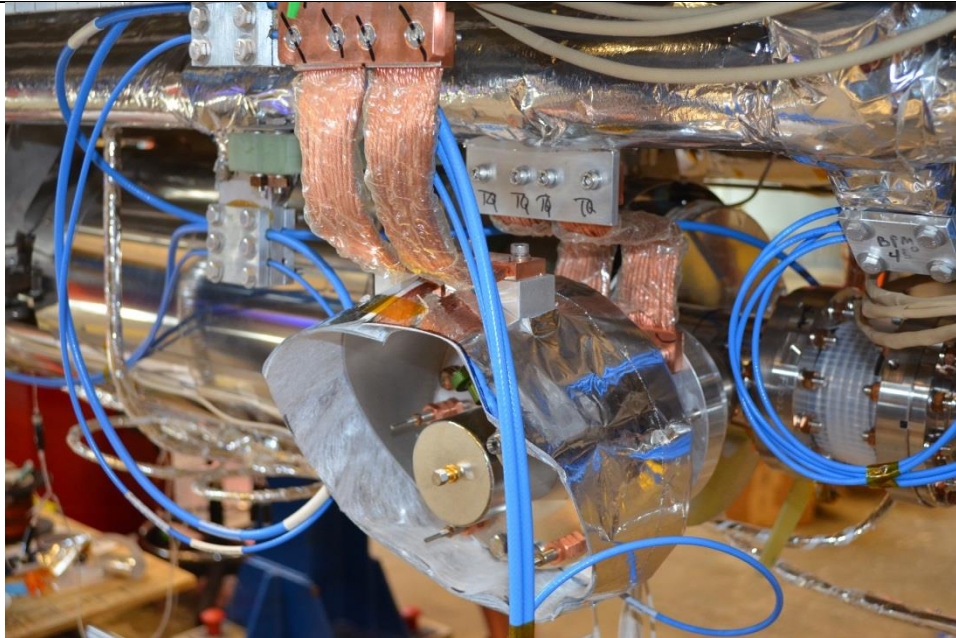


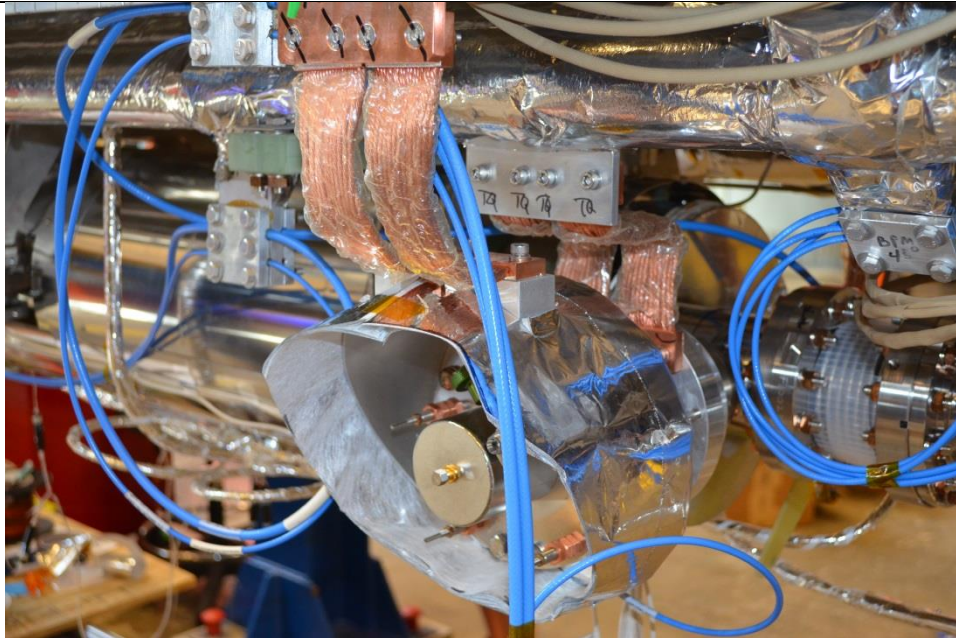
		
<p>34</p>	<p>Install the magnet end ¼” line support assy.  <a href="#">F10057648-Angle Support Bracket</a>  <a href="#">F10057651- G-10 Support</a></p>	<p>[[FIELDNAME_SRF34]] &lt;&lt;SRF&gt;&gt;                  [[Date34]] &lt;&lt;TIMESTAMP&gt;&gt;                  [[Comment34]] &lt;&lt;COMMENT&gt;&gt;</p>
<p>35</p>	<p>Measure string Fluxgates. Record values.</p>	<p>[[FIELDNAME_SRF35]] &lt;&lt;SRF&gt;&gt;                  [[Date35]] &lt;&lt;TIMESTAMP&gt;&gt;                  [[Comment35]] &lt;&lt;COMMENT&gt;&gt;                  [[FluxgateValues35]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>
<p>36</p>	<p>Install the thermal strapping to include stepper motors, HOM’s, and cold coupler 5k and 50 k intercepts. Multi strand Cu straps should have shrink Mylar in place prior. Indium foil, bellevilles, or lock-tite shall be included as defined in- <a href="#">Fastener Installation and Torque Chart</a></p> 	<p>[[FIELDNAME_SRF36]] &lt;&lt;SRF&gt;&gt;                  [[Date36]] &lt;&lt;TIMESTAMP&gt;&gt;                  [[Comment36]] &lt;&lt;COMMENT&gt;&gt;</p>

			
<p>37</p>	<p>Install the RF cables and intercepts. Test cables and record findings. Apply L type apiezon grease as a thermal compound. See <a href="#">Fastener Installation and Torque Chart</a></p> 	<p>[[FIELDNAME_SRF37]] &lt;&lt;SRF&gt;&gt;        [[Date37]] &lt;&lt;TIMESTAMP&gt;&gt;        [[Comment37]] &lt;&lt;COMMENT&gt;&gt;        [[RFCableMap37]] &lt;&lt;FILEUPLOAD&gt;&gt;        [[RFCableTests37]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>	
<p>38</p>	<p>Remove the bellows protectors on the beamline and 2 phase bellows.</p>	<p>[[FIELDNAME_SRF38]] &lt;&lt;SRF&gt;&gt;        [[Date38]] &lt;&lt;TIMESTAMP&gt;&gt;        [[Comment38]] &lt;&lt;COMMENT&gt;&gt;</p>	

<p>39</p>	<p>Complete the 2k MLI package.          Includes all 2k piping, magnet package and intercept clamps.          Magnet thermal clamps should have Kapton sheet installed as an isolater prior to MLI.</p> 	<p>[[FIELDNAME_SRF39]] &lt;&lt;SRF&gt;&gt;          [[Date39]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment39]] &lt;&lt;COMMENT&gt;&gt;</p>
<p>40</p>	<p>Install 15 layer Metglas caps over the Bearing Block assemblies.</p>	<p>[[FIELDNAME_SRF40]] &lt;&lt;SRF&gt;&gt;          [[Date40]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment40]] &lt;&lt;COMMENT&gt;&gt;</p>
<p>41</p>	<p>Arrange and harness the cables to appropriate ports. Perform wire check to verify. Completed wiring should be inside shield package.</p>	<p>[[FIELDNAME_SRF41]] &lt;&lt;SRF&gt;&gt;          [[Date41]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment41]] &lt;&lt;COMMENT&gt;&gt;          [[WireValues41]] &lt;&lt;FILEUPLOAD&gt;&gt;</p>
<p>42</p>	<p>Install MLI to the coupler 50k shields</p>	<p>[[FIELDNAME_SRF42]] &lt;&lt;SRF&gt;&gt;          [[Date42]] &lt;&lt;TIMESTAMP&gt;&gt;          [[Comment42]] &lt;&lt;COMMENT&gt;&gt;</p>





		
43	Measure string Fluxgates. Record values.	[[FIELDNAME_SRF43]] <<SRF>> [[Date43]] <<TIMESTAMP>> [[Comment43]] <<COMMENT>> [[FluxgateValues43]] <<FILEUPLOAD>>
44	Review the cold mass assembly for completeness before preceeding Final verification of RF checks, wire values, and thermal strapping.	[[FIELDNAME_SRF44]] <<SRF>> [[Date44]] <<TIMESTAMP>> [[Comment44]] <<COMMENT>>
45	Install the lower 50k shielding. Stich weld as required. <b>**Keep welding ground close to area being welded to reduce length of current path**</b> <a href="#">F10017613-Rev B-Lower Shield Assy</a>	[[FIELDNAME_SRF45]] <<SRF>> [[Date45]] <<TIMESTAMP>> [[Comment45]] <<COMMENT>>