













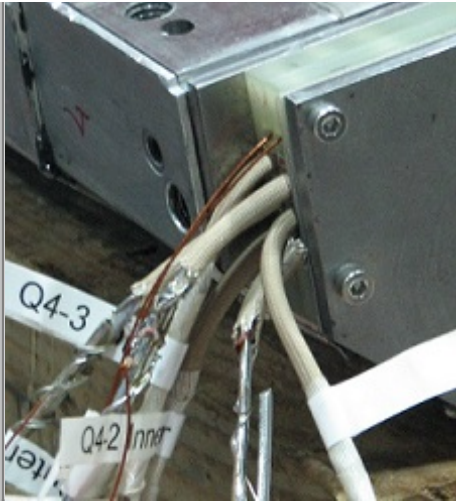


Traveler Title	LCLS2 Prototype Cryomodule Assembly Traveler Cold Mass Phase 1			
Traveler Abstract	This traveler details the assembly and in-process quality control inspections of the LCLS2 Cold Mass Phase 1. All work will be completed in the Cryomodule Assembly areas. The scope of work begins with a completed, delivered Cavity String and ends with an assembly ready to move under the 4 poster for Phase 2 work.			
Traveler ID	L2PRO-CM-ASSY-FRST			
Traveler Revision	R2			
Traveler Author	John Fischer			
Traveler Date	6-July-2016			
NCR Emails	reilly,edaly,fischer,rlegg			
Approval Names	John Fischer	Tony Reilly	Ed Daly	Bob Legg
Approval Signatures				
Approval Dates				
Approval Title	Author	Project Manager	Project Engineer	Reviewer
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.			
PQR026-WPS026 Orbital Welding	PQR027-WPS027 Orbital Welding	F10009887 Rev D. Cavity String Dwg	Magnet Kit List	P&ID for pCM
				pCM Instrumentation List
Revision Note				
R1	Initial release of this Traveler.			
R2	Changed order of steps, also added and deleted			

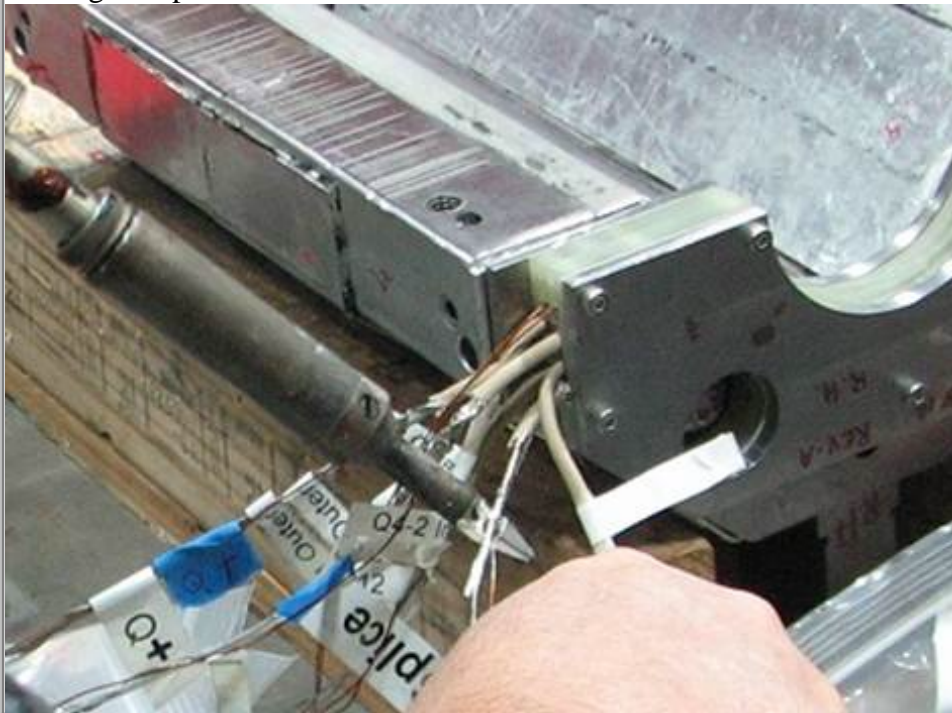
Step No.	Instructions	Data Input
1	Record the Cavity String S/N and vacuum level	CMSN <input type="text" value="-0-"/>  VacuumLevel1 <input type="text"/> SRF1 <input type="text" value="-0-"/>  Date1 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30)
2	Transfer the Cavity String from the clean room to the Cryomodule Assembly rails. Use procedure CP-L2PRO-CST-TSER-CS Transfer Procedure	SRF2 <input type="text" value="-0-"/>  Date2 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment2 <input type="text"/>
3	Record the Cavity and BPM S/Ns. Cavity position 1 is South.	SRF3 <input type="text" value="-0-"/>  Date3 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) CAVSN1 <input type="text" value="-0-"/>  CAVSN2 <input type="text" value="-0-"/>  CAVSN3 <input type="text" value="-0-"/>  CAVSN4 <input type="text" value="-0-"/>  CAVSN5 <input type="text" value="-0-"/>  CAVSN6 <input type="text" value="-0-"/>  CAVSN7 <input type="text" value="-0-"/>  CAVSN8 <input type="text" value="-0-"/>  BPMSN <input type="text" value="-0-"/>  Comment3 <input type="text"/>

4	Record the Cavity String vacuum level after moving is completed.	SRF4 <input type="text" value="- 0 -"/>  Date4 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment4 <input type="text"/> VacuumLevel2 <input type="text"/>
---	--	--

5	Install the bellows protectors on all the exposed bellows.	SRF5 <input type="text" value="-0-"/> <input type="button" value="v"/> Date5 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment5 <input type="text"/>
6	Install the anti roll brackets (F10020678) on each cavity. Secure and lock down.	SRF6 <input type="text" value="-0-"/> <input type="button" value="v"/> Date6 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment6 <input type="text"/>
7	Visually inspect the Cavity String Assembly, use F10009887 Rev D as the reference. Note any anomalies and notify lead personel.	SRF7 <input type="text" value="-0-"/> <input type="button" value="v"/> Date7 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment7 <input type="text"/>
8	There are 12 magnet power leads total (six to each split magnet). All magnet power leads come soldered to a super conducting wire F10050597 and voltage tap wire (F10050947) and are bundled and wrapped by expandable sleeving (FC0053553). The process for soldering all 12 leads will be identical except that any lead tagged with a + or will be soldered to the long (Approximately 66") Tin Plated wire (FC0053566) and all leads tagged with Splice should be soldered with short (Approximately 28") Tin Plated wire (FC0053566). Ensure leads are pre-tinned, if required, tin them.	SRF8 <input type="text" value="-0-"/> <input type="button" value="v"/> Date8 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment8 <input type="text"/>



9 Beginning with any lead, cut the Expandable Sleeving ([FC0053553](#)) as needed to fully expose the Voltage Tap wire ([F10050947](#)). Using a soldering iron, heat the power lead so the solder melts and frees the Voltage Tap wire.



SRF9 ▼

Date9

(ex format 18-Jun-2005 16:30)

Comment9

10 Strip the insulation on the Voltage Tap wire as needed to allow for enough stripped wire to wrap around 1.5" of overlap between the magnet power leads and the Tin Plated wire [FC0053566](#)



11 If soldering a magnet power lead tagged with "Splice" place a short (Approximately 28") Tin Plated wire ([FC0053566](#)) so as to overlap the magnet power lead by 1.5". Wrap the stripped part of the Voltage Tap wire around the magnet power lead, the super conducting wire [F10050597](#) (which should still be soldered to the magnet power lead), and the short Tin Plated wire. Clamp together with a scissors clamp. (If soldering a magnet power lead tagged with + or - follow same process only with long (Approximately 66") Tin Plated wire).

SRF10

Date10

NOW

(ex format 18-Jun-2005 16:30)

Comment10

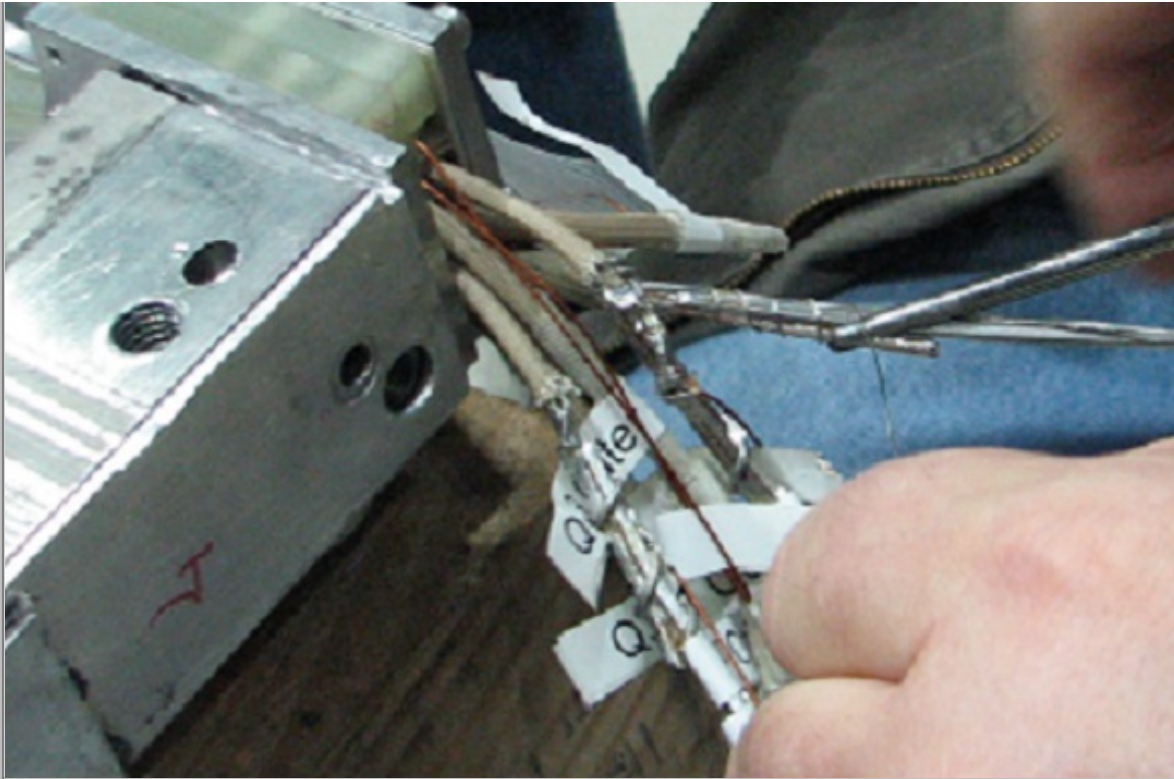
SRF11

Date11

NOW

(ex format 18-Jun-2005 16:30)

Comment11



12 Solder all the wires together on the 1.5" overlap area.



SRF12

Date12

(ex format 18-Jun-2005 16:30)

Comment12

13 After soldering the overlap area leave the insulated portion of the Voltage Tap wire hang free. Continue wrapping and soldering the super conducting wire to the Tin Plated wire until approximately 18-20" to the end of the Tin Plated wire.



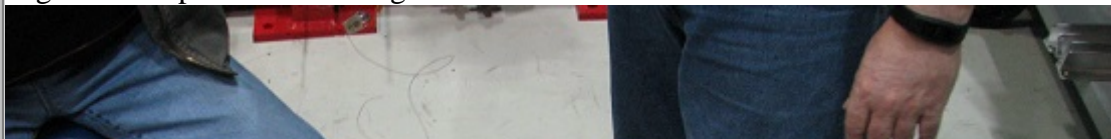
SRF13

Date13

(ex format 18-Jun-2005 16:30)

Comment13

14 Tape the length of the free Voltage Tap wire to the freshly soldered together super conducting wire and Tin Plated wire.

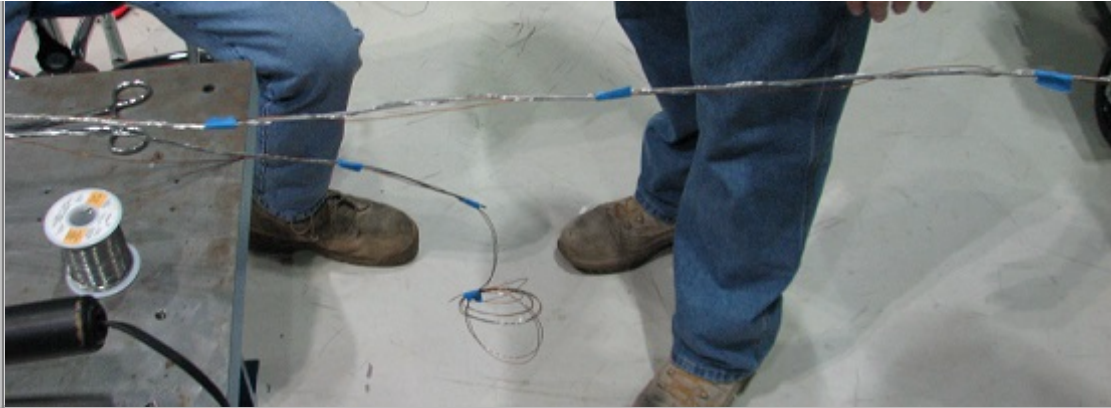


SRF14

Date14

(ex format 18-Jun-2005 16:30)

Comment14



15 Tape the length of the free Voltage Tap wire to the freshly soldered together super conducting wire and Tin Plated wire.

SRF15 ▼

Date15

(ex format 18-Jun-2005 16:30)

Comment15

16 Repeat the entire process until all 12 magnet power leads are soldered.

SRF16 ▼

Date16

(ex format 18-Jun-2005 16:30)

Comment16

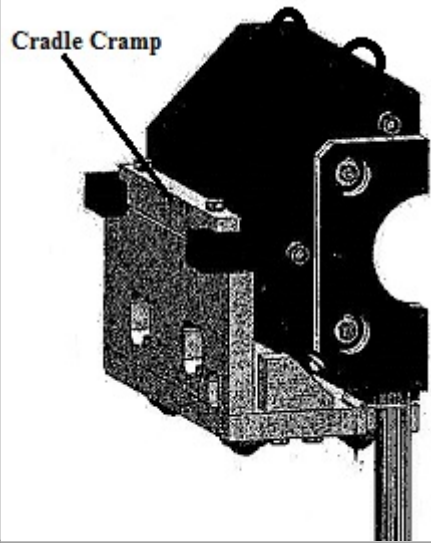
17 Install and align the magnet tooling base to the cavity carriage tooling. The two halves of the split magnet will be installed individually around the spool tube. To begin attach two hooks from the overhead crane to the two lifting lugs on the side of one of the split magnets and carefully lift the magnet. It is important to handle the leads carefully as they are fragile. Gently lower the split magnet on to the Transportation Cradle which should already be split into two halves (each half for one split magnet). Secure the split magnet by attaching the Cradle Cramp.

SRF17 ▼

Date17

(ex format 18-Jun-2005 16:30)

Coment17



18 With the overhead crane gently lift the magnet half (now attached to the transportation Cradle) towards the spool tube. Ensure that the side the magnet with the leads is facing away from the string assembly and flange. Lay gently on the fixture in the grooves. Move the magnet half close to tube and lock in position with the locking screw. Remove the hooks and repeat process with second half of the split magnet. Adjust the magnet height as needed using 4 adjusting screws to avoid any load transferred to the tube.

SRF18

Date18

(ex format 18-Jun-2005 16:30)

Comment18



Magnet position locking screw

Magnet height adjusting screws (4 pcs)

19 Fit the two split magnets halves together and securing two C-Clamps positioned at the lugs as shown below. Make sure the two split magnets are aligned properly and the cradles are in the grooves. Secure together with 4 bolts ([FC0006126](#)) two on each side per drawing [F10009375 Rev F](#). Torque to 20 FT/LBS.



SRF19 ▼

Date19

(ex format 18-Jun-2005 16:30)

Comment19



20 Attach the magnet to the BPM flange and ensure that the sliding tooling is locked.
It may be necessary to shim the magnet face to achieve string alignment.

SRF20

Date20

(ex format 18-Jun-2005 16:30)

Comment20

21 Verify the alignment of the Beamline and Couplers using LCLS2 Prototype Cryomodule Alignment Procedure [LCLS2 Alignment Worksheet](#)

SRF21

Date21

(ex format 18-Jun-2005 16:30)

Comment21

Must submit traveler before attaching files.

22 Verify the coupler to coupler distances. Adjust as required and lock in place. Upload results.


SRF22

Date22

(ex format 18-Jun-2005 16:30)

Comment22

Must submit traveler before attaching

<p>2 3 Perform RF checks; measure the Cavity passbands and HOM notch frequencies. Tune the HOMs as required. RF Technician to upload results. The Cavity String is evacuated.</p>	<p>files. SRF23 <input type="text" value="- 0 -"/> <input type="button" value="▼"/> Date23 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment23 <input type="text"/> Must submit traveler before attaching files.</p>
<p>2 4 Extend all internal HV instrumentation to accommodate the 2 phase pipe installation.</p>	<p>SRF24 <input type="text" value="- 0 -"/> <input type="button" value="▼"/> Date24 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment24 <input type="text"/></p>
<p>2 5 Install the 2 phase piping, will be necessary to trim to fit. Welding to be done to LCLS2 Welding Procedures. Record the 2 phase bellows SNs and locations. Upload file. Sub-assys should be bench welded prior using the orbital welder. **If machining is required on the cavity string piping, be sure to support the helium vessel from roll prior.**</p> 	<p>SRF25 <input type="text" value="- 0 -"/> <input type="button" value="▼"/> Date25 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment25 <input type="text"/> Must submit traveler before attaching files.</p>
<p>2 6 Visually inspect all welds and complete the Weld Map. Upload worksheets. Use ASME 31.3 for code compliance. 2 Phase Piping Weld Map, Weld Map Worksheet</p>	<p>SRF26 <input type="text" value="- 0 -"/> <input type="button" value="▼"/> Date26 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment26</p>

		<input type="text"/> Must submit traveler before attaching files.
27	Leak check the He circuit. *** Be sure all restraints are in place prior to evacuation *** Upload the results. Will consist of 2 leak checks. Cavities 1-4, and 5-8. Backfill 2 phase pipe with filtered N2. Cap ends. JLAB Leak Check Spec, Large Item , JLAB Leak Check Spec, Small Item	SRF27 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date27 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment27 <input type="text"/> Must submit traveler before attaching files.
28	Install the helium vessel temperature sensors and heaters. HV Strip Heater Installation Procedure , HV Bottom RTD Installation Procedure , HV Top RTD Installation Procedure	SRF28 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date28 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment28 <input type="text"/>

29	Install the HOM body temperature sensors, and the Cu L cavity beampipe brackets. HOM RTD Installation Procedure , Copper L Bracket Installation Procedure	SRF29 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date29 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment29 <input type="text"/>
30	Install the cold coupler temperature sensors, 2 per coupler Platinum RTD Installation Procedure	SRF30 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date30 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment30 <input type="text"/>
31	Perform an electrical test on all instrumentation. Record findings.	SRF31 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date31 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment31 <input type="text"/> Must submit traveler before attaching files.
32	Wrap the helium vessels with 10 layers of MLI.(Thermolan) JLAB MLI Installation Procedure	SRF32 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date32 <input type="text"/> <input type="button" value="NOW"/> (ex format 18-Jun-2005 16:30) Comment32 <input type="text"/>
33	Install heat stationiong clamps for the HOM feedthrus. Install with Indium. Torque to 10in/lbs. ***Feedthrus are fragile exercise caution***	SRF33 <input type="text" value="-0-"/> <input type="button" value="▼"/> Date33 <input type="text"/> <input type="button" value="NOW"/>

		<p>(ex format 18-Jun-2005 16:30) Comment33</p> <input data-bbox="1306 175 1986 235" type="text"/>
34	<p>Install the Cavity Magnetic shields. Refer to LCLS2 Magnetic Shield Installation Record the SN and vendor for each cavity. Magnetometers are added between 1st and 2nd layers at specific locations. Electrical staff to provide. Note: Middle section of second layer and endcaps are not installed at this step. Magnetic Shield Installation Procedure</p>	<p>SRF34 <input data-bbox="1423 240 1627 289" type="text" value="- 0 -"/> <input data-bbox="1575 243 1627 289" type="button" value="▼"/></p> <p>Date34 <input data-bbox="1444 292 1890 324" type="text"/></p> <input data-bbox="1306 332 1449 381" type="button" value="NOW"/> <p>(ex format 18-Jun-2005 16:30) Comment34</p> <input data-bbox="1306 462 1986 527" type="text"/> <p>Must submit traveler before attaching files.</p>
35	<p>Cold Mass Phase 1 assembly is complete, ready for Phase 2</p>	<p>SRF35 <input data-bbox="1423 613 1627 662" type="text" value="- 0 -"/> <input data-bbox="1575 617 1627 662" type="button" value="▼"/></p> <p>Date35 <input data-bbox="1444 698 1890 730" type="text"/></p> <input data-bbox="1306 738 1449 787" type="button" value="NOW"/> <p>(ex format 18-Jun-2005 16:30) Comment35</p> <input data-bbox="1306 868 1986 933" type="text"/>