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| Traveler Title | LCLS HE Production Cryomodule Assembly Traveler Cold Mass Phase 2 (WS3) | | | |
| Traveler Abstract | This traveler details the assembly and in-process quality control inspections of the LCLS HE Cold Mass Phase 2. All work will be completed in the Cryomodule Assembly areas and performed by authorized and trained personnel. 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 WS4. | | | |
| Traveler ID | L2HE-CMA-CM-ASSY2 | | | |
| Traveler Revision | R1 | | | |
| Traveler Author | John Fischer | | | |
| Traveler Date | 14-Jul-22 | | | |
| NCR Informative Emails | areilly,fischer,hogan,cheng,jjcamp | | | |
| NCR Dispositioners | fischer,jjcamp | | | |
| D3 Emails | areilly,fischer,hogan,jjcamp,cheng | | | |
| Approval Names | John Fischer | Gary Cheng | Tony Reilly | John Hogan |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author/Group Lead | Project Engineer | SRF Dept Head | Project Lead |

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| 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. | | | |
| [F10127865\_D\_Cavity String](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-254210/F10127865_D_DWG1-%20Cavity%20String-Cold%20Mass1.pdf) | [F10009375-U-Magnet Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-254204/F10009375-U-DWG1-Magnet.pdf) | [F10048652-G-Magnetic Shielding Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-254206/F10048652-G-DWG1-%20HV%20Magnetic%20Shielding.pdf) | [F10127864\_A\_Cold Mass Assy 4 Poster](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-254209/F10127864_A_DWG1-%20Cold%20Mass%20Assy%204%20poster.pdf) | [F10151272-A-Magnetic Shielding Cav 1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-254207/F10151272-A-DWG1-%20HV%20Magnetic%20Shielding%20Cav%201.pdf) |
| [F10151275-A-Magnetic Shielding Cav 6](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-254208/F10151275-A-DWG1-%20HV%20Magnetic%20Shielding%20Cav%206.pdf) | [11141S0029-2e-10 Leak Check Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257482/11141S0029%202e-10%20Leak%20Check%20Final.pdf) | [11141S0033-1e9 Leak Check Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257481/11141S0033%201e9%20Leak%20Check%20Final.pdf) | [Cavity Alignment Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257483/Cavity%20alignment%20procedure.docx) | [F10009954\_U\_Upper Cold Mass Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257465/F10009954_U_DWG1-UCM.pdf) |
| [F10017613\_E\_50K Shields Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257466/F10017613_E_DWG1-50K%20SHIELDS.pdf) | [F10040841\_G\_2K Clamp Magnet](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257467/F10040841_G_DWG1-2K%20CLAMP%20MAG.pdf) | [F10045236\_H\_5K Clamp Magnet](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257468/F10045236_H_DWG1-5K%20CLAMP%20MAG.pdf) | [F10046443\_F\_50K Clamp Magnet](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257469/F10046443_F_DWG1-50K%20CLAMP%20MAG.pdf) | [F10127864\_A\_UCM with Cavity String](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257473/F10127864_A_DWG1-UCM-CAV.pdf) |
| [F10127855\_A\_L2HE CM Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257472/F10127855_A_DWG1-HE%20ASSY%20CM.pdf) | [L2HE-CMA-UCM-DMAG-R1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257479/L2HE-CMA-UCM-DMAG-R1.docx) | [L2HE-CMA-UCM-INSP-R1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257480/L2HE-CMA-UCM-INSP-R1.docx) | [JLab Tuner Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125846/JLab%20Tuner%20Installation%20Procedure%20082916.docx) | [LCLSHE Limit Setting Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257488/LCLS%20II%20HE%20LS%20setting%20procedure_V1.pdf) |

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| Revision Note |  |
| R1 | Initial release of this Traveler. |

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| Step No. | Instructions | Data Input |
| 1 | Record the Cavity String and UCM SN's  **Note: The LCLS Cryomodule assembly has many vulnerable components. Bellows in every vacuum circuit and process piping, feedthrus for the HOM's and Field Probe, and multiple interference points. The attached Risk Matrix identifies these in more detail and must be understood prior to performing any work.** | [[Record\_SRF]] <<SRF>>  [[RecordTime]] <<TIMESTAMP>>  [[GHRPSN]] <<GHRPSN>>  [[CMSN]] <<CMSN>> |
| 2 | Is the Cold Mass Phase 1 Traveler Complete? | [[TravComp\_SRF]] <<SRF>>  [[TravCompDate]] <<TIMESTAMP>>  [[TravCompYesNo]] <<YESNO>>  [[TravCompComment]] <<COMMENT>> |
| 3 | Use the WS3 Fastener Spreadsheet and sign off to complete the steps in the traveler.  [Check list for WS3 fasteners](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-155014/Workstation%203%20sign%20off-1.pdf), [Torque and Loctite Spreadsheet for WS3 fasteners](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-155013/Copy%20of%20Station%203%20Torque%20spreadsheet-1.pdf) | [[WS3SRF]] <<SRFCMP>>  [[WS3Date]] <<TIMESTAMP>>  [[WS3Comm]] <<COMMENT>> |
| 4 | Install the completed UCM Assembly onto the 4 poster fixture. Use [8K Lift Plan](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-136441/8%2c000lb%20spreader%20bar%20lift%20plan.pdf) to complete this lift.  **\*\*\* Note - This crane lift can be done by Authorized Technicians only. \*\*\*** | [[UCMAssyTech]] <<SRF>>  [[UCMAssyDate]] <<TIMESTAMP>>  [[UCMAssyComm]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 5 | Perform the required QC and Demagnetization of the UCM Assembly and parts. This includes the bearing block assemblies,gate valve bracket, split rings, and invar rods. The attached Travelers are for reference.  [L2HE-CMA-UCM-INSP](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257480/L2HE-CMA-UCM-INSP-R1.docx)  [L2HE-CMA-UCM-DMAG-R1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257479/L2HE-CMA-UCM-DMAG-R1.docx) | [[QC\_SRF]] <<SRF>>  [[QCDate]] <<TIMESTAMP>>  [[QCComm]] <<COMMENT>>  [[UCMQCResults]] <<FILEUPLOAD>> |
| 6 | Complete the warm up cooldown heater assy. Use the Fastener Spread Sheet as a guide when reassembling.  **\*\*\*Note- Only trained Electrical Technicians are to perform this step.\*\*\*** | [[ElecTech]] <<SRF>>  [[ElecDate]] <<TIMESTAMP>>  [[ElecComm]] <<COMMENT>> |
| 7 | Raise the UCM to provide proper clearance, slowly move the Cavity string under the 4 poster watching for interferences.  **New to L2HE is the neg pump assembly on the magnet end, shown in the below view. Exercise caution around this manifold.**  Verify the "Z" locations of the Cavities, Magnet, and Gate Valves. Fine tune as needed prior to lowering the UCM.  **\*\*\*Note- Only trained Technicians can lead the transfer of the Cavity string under the UCM. A minimum of 6 people needed during this move.\*\*\*** | [[UCMRaiseTech]] <<SRF>>  [[UCMRaiseDate]] <<TIMESTAMP>>  [[UCMRaiseComm]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 8 | 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 that there are no interferences. GHRP Hanger Pads should be in the proper relationship to the helium vessel lugs.    Spacer Block  **\*\*\*Note- Only trained Technicians can lead the lowering of the UCM to the Cavity String. A minimum of 6 people needed during this move.\*\*\*** | [[GHRP\_SRF]] <<SRF>>  [[GHRPDate]] <<TIMESTAMP>>  [[GHRPComm]] <<COMMENT>> |
| 9 | 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.  **\*\*\*Note- Only trained Technicians will perform this step due to the need to use proper alignment techniques. \*\*\*** | [[Distance\_SRF]] <<SRF>>  [[DistanceDate]] <<TIMESTAMP>>  [[DistanceComm]] <<COMMENT>> |
| 10 | Install the previously demagnetized needle bearing support assemblies onto the HV lugs, snug all adjustment hardware to 20 in/lbs. Verify the installation, being sure the ladder bearings are properly positioned, then add the Stop Plates to each bearing assy.    **Stop Plate Bearing Block Assembly Ladder Bearing** | [[Needle\_SRF]] <<SRF>>  [[NeedleDate]] <<TIMESTAMP>>  [[NeedleComm]] <<COMMENT>>  [[SmallPartDemagComplete]] <<YESNO>> |
| 11 | Prepare the magnet assembly by verifying the leveling feet are supporting the magnet weight, then remove the lug clamps and fixture sidewalls. Install the needle bearing supports onto the magnet lugs. Snug all adjustment hardware to 20 in/lbs.  **\*\*\*Note- Only trained Technicians will perform this step due to the need to maintain proper alignment and bellows positioning. \*\*\***    Lug Clamp Fixture Side Walls | [[MagAssy\_SRF]] <<SRF>>  [[MagAssyDate]] <<TIMESTAMP>>  [[MagAssyComm]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 12 | Install the Cavity 1 Extended Tuner using the attached Procedure and Fastener Spread sheet. This assembly is to be demagnetized before installation. [Upstream Gate Valve support procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-159389/Upstream%20Gate%20Valve%20support%20procedure.docx)  **\*\*\*Note- Only trained Technicians will perform this step due to the need to maintain proper alignment and bellows positioning. \*\*\***    Extended Tuner Gate Valve Support Bracket | [[ExtTuneTech]] <<SRF>>  [[ExtTuneDate]] <<TIMESTAMP>>  [[ExtTuneComm]] <<COMMENT>> |
| 13 | Loosely install the 8 HV post and 2 center invar clamps. Cavity 1 thru 8 clamps are 22mm wide and the Magnet clamp is 20mm wide. Install in the correct position. Center clamps will lock the position of the invar rod, be sure to install it tight to the center GHRP support structure prior to tightening.    **Cavities 2-8 invar clamps Cavity 1 and Magnet** | [[HVPost\_SRF]] <<SRF>>  [[HVPostDate]]  <<TIMESTAMP>>  [[HVPostComm]] <<COMMENT>> |
| 14 | Install the gate valve bracket on the Down Stream end. Follow the Fastener Spread Sheet to complete this work.    Gate Valve Support Bracket | [[ValveBrack\_SRF]] <<SRF>>  [[ValveBrackDate]] <<TIMESTAMP>>  [[ValveBrackComm]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 15 | Remove the magnet tooling in preparation of the Magnet Lead soldering.    **Tooling to be removed including lollipops** | [[MagToolRmvSRF]] <<SRF>>  [[MagToolRmvDate]] <<TIMESTAMP>>  [[MagToolRmvComm]] <<COMMENT>> |
| 16 | Lower the cavity tooling lollipops and return to cleanroom  Care should be taken when lowering the tooling that cavity is not caught.  **\*\*\*Note- Only trained Technicians are to perform this step due to the need to maintain proper alignment and bellows positioning. \*\*\***    **Before After** | [[Tooling\_SRF]] <<SRF>>  [[ToolingDate]] <<TIMESTAMP>>  [[ToolingComm]] <<COMMENT>> |
| 17 | Weld the process piping and support discs. Complete the In-Process weld examinations. Upload results. For reference; [2 Phase Weld Map](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-165519/2%20Phase%20Weld%20Map-8-18.docx), [2 Phase Cover Map](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-165520/New%202%20phase%20cover%20map%20final%20final%20update.jpg)  \*\*1/4" fill line uses couplings\*\*    **Fill Line Joints Invar Support Rings** | [[WelderSRF]] <<SRF>>  [[WelderDate]] <<TIMESTAMP>>  [[WelderComm]] <<COMMENT>>  [[WelderDocumentation]] <<FILEUPLOAD>> |
| 18 | Solder the magnet current leads and install into thermal clamps. Torque clamp hardware to 50 ft/lbs, use [F10040841\_Rev-G 2k Magnet Lead Clamp](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257467/F10040841_G_DWG1-2K%20CLAMP%20MAG.pdf), [F10045236\_Rev-H 5K Magnet Lead Clamp](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257468/F10045236_H_DWG1-5K%20CLAMP%20MAG.pdf), [F10046443 Rev-F 50K Magnet Lead Clamp](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257469/F10046443_F_DWG1-50K%20CLAMP%20MAG.pdf). Hi-pot once work is completed. Record results.  **\*\*\*Note- Only trained Electrical Technicians are to perform this step.\*\*\*** | [[MagSolderTech]] <<SRF>>  [[MagSolderDate]] <<TIMESTAMP>>  [[MagSolderComm]] <<COMMENT>>  [[HipotResults]] <<FILEUPLOAD>> |

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| Step No. | Instructions | Data Input |
| 19 | Install the 2 phase invar rods and GHRP 2 phase clamps (3 x's)    **2 Phase Invar Rods (2 qnty) GHRP 2 Phase Clamps (3 qnty)** | [[InvarRodInstSRF]] <<SRF>>  [[InvarRodInstDate]] <<TIMESTAMP>>  [[InvarRodInstComm]] <<COMMENT>> |
| 20 | Install the aluminum GHRP testing caps. **Use the installation cart to protect the beamline during the operation.**  GHRP pipe ends may be out of round  **\*\*\*Note- Only trained Technicians are to perform this step. \*\*\***    **Leak Testing Cap** | [[GHRPTestCapSRF]] <<SRF>>  [[GHRPTestCapDate]] <<TIMESTAMP>>  [[GHRPTestCapComm]] <<COMMENT>> |
| 21 | Leak check the 2 phase circuit. **Out board bellows restraints must be in place prior to process piping evacuation.** Upload findings.  [11141S0033-Large Leak Check Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257481/11141S0033%201e9%20Leak%20Check%20Final.pdf)  **\*\*\*Note- Only Leak Detection trained Technicians are to perform this step. \*\*\*** | [[LkChck2PSRF]] <<SRF>>  [[LkChck2PDate]] <<TIMESTAMP>>  [[LkChck2PComm]] <<COMMENT>>  [[LkChk2PFile]] <<FILEUPLOAD>> |
| 22 | Align the cavity string, record findings. [Cryomodule Group Alignment Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125869/LCLS%20ll%20Alignment%20Procedure.docx), [JLAB Align Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257483/Cavity%20alignment%20procedure.docx)  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.  Add Loctite 290 to screws on HV invar clamps after alignment is complete.  **\*\*\*Note- Only trained Technicians are to perform this step. \*\*\*** | [[AlignmentSRF]] <<SRF>>  [[AlignmentDate]] <<TIMESTAMP>>  [[AlignmentComm]] <<COMMENT>>  [[AlignmentData]] <<FILEUPLOAD>> |

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| Step No. | Instructions | Data Input |
| 23 | Continue installation of the 2nd layer magnetic shields.  This will add the center section and beam pipe halves prior to tuners, [Magnetic Shield Installation Procedure-Rev 8](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125847/464267%20Magnetic%20Shielding_V8.pdf)    **Beam Pipe Halves Helium Vessel Center Section** | [[MagShldSRF]] <<SRF>>  [[MagShldDate]] <<TIMESTAMP>>  [[MagShldComm]] <<COMMENT>> |
| 24 | Install the remaining instrumentation onto the Cold Mass Assembly. This will include process piping and shield thermal sensors, and magnet voltage taps.  **\*\*\*Note- Only trained Electrical Technicians are to perform this step.\*\*\*** | [[CMAInstSRF]] <<SRF>>  [[CMAInstDate]] <<TIMESTAMP>>  [[CMAInstComm]] <<COMMENT>> |
| 25 | Install the tuners,stepper motors, and piezos. **Note-The Bellows Braces and Split rings must be removed with care. Use the following documents to execute the work.** [JLAB Tuner Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125846/JLab%20Tuner%20Installation%20Procedure%20082916.docx), [Limit Switch Setting Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257488/LCLS%20II%20HE%20LS%20setting%20procedure_V1.pdf), [914269-Bellows Brace Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-165777/914269-Bellow%20Brace%20Procedure.docx)  Perform tuner and piezo functionality tests  Apply preload. Record setup information  **\*\*\*Note- Only qualified Technicians are to perform this step. Work is in very close proximetry to the Helium Vessel and Beam Pipe Bellows.\*\*\***    **TUNMT – Stepper Motors**  **TUNMC –Tuners**  **TUNPZ - Piezos** | [[TuneStepPiezosInstSRF]] <<SRF>>  [[TuneStepPiezosInstDate]] <<TIMESTAMP>>  [[TuneStepPiezosInstComm]] <<COMMENT>>  [[TunerDataUpload]] <<FILEUPLOAD>>  [[TUNMTSNCav1]] <<TUNMTSN>>  [[TUNMTSNCav2]] <<TUNMTSN>>  [[TUNMTSNCav3]] <<TUNMTSN>>  [[TUNMTSNCav4]] <<TUNMTSN>>  [[TUNMTSNCav5]] <<TUNMTSN>>  [[TUNMTSNCav6]] <<TUNMTSN>>  [[TUNMTSNCav7]] <<TUNMTSN>>  [[TUNMTSNCav8]] <<TUNMTSN>>  [[TUNPZUpperCav1]] <<TUNPZSN>>  [[TUNPZLowerCav1]] <<TUNPZSN>>  [[TUNPZUpperCav2]] <<TUNPZSN>>  [[TUNPZLowerCav2]] <<TUNPZSN>>  [[TUNPZUpperCav3]] <<TUNPZSN>>  [[TUNPZLowerCav3]] <<TUNPZSN>>  [[TUNPZUpperCav4]] <<TUNPZSN>>  [[TUNPZLowerCav4]] <<TUNPZSN>>  [[TUNPZUpperCav5]] <<TUNPZSN>>  [[TUNPZLowerCav5]] <<TUNPZSN>>  [[TUNPZUpperCav6]] <<TUNPZSN>>  [[TUNPZLowerCav6]] <<TUNPZSN>>  [[TUNPZUpperCav7]] <<TUNPZSN>>  [[TUNPZLowerCav7]] <<TUNPZSN>>  [[TUNPZUpperCav8]] <<TUNPZSN>>  [[TUNPZLowerCav8]] <<TUNPZSN>>  [[TUNMCSNCav1]] <<TUNMCSN>>  [[TUNMCSNCav2]] <<TUNMCSN>>  [[TUNMCSNCav3]] <<TUNMCSN>>  [[TUNMCSNCav4]] <<TUNMCSN>>  [[TUNMCSNCav5]] <<TUNMCSN>>  [[TUNMCSNCav6]] <<TUNMCSN>>  [[TUNMCSNCav7]] <<TUNMCSN>>  [[TUNMCSNCav8]] <<TUNMCSN>> |

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| Step No. | Instructions | Data Input |
| 26 | Install the remaining interconnect magnetic shielding and HV end caps.. Be sure to keep serial numbers aligned. [Magnetic Shield Installation Procedure-Rev 8](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125847/464267%20Magnetic%20Shielding_V8.pdf)  **\*\*\*Note- Only qualified Technicians are to perform this step. Work is in very close proximetry to the Helium Vessel and Beam Pipe Bellows.\*\*\***    **Magnetic Shield Cap Magnetic Shield Cap Tuner Side** | [[RemMagShldInstSRF]] <<SRF>>  [[RemMagShldInstDate]] <<TIMESTAMP>>  [[RemMagShldInstComm]] <<COMMENT>> |
| 27 | Install the both ends, the 1/4" line support assy.  [F10057651- G-10 Support](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257471/F10057651___DWG1-%20G-10%20SUPPORT.pdf), [F10057648 Rev-B Angle Support Bracket](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257470/F10057648_B_DWG1-%20ALUM%20ANGLE.pdf) | [[SuppAssyInstSRF]] <<SRF>>  [[SuppAssyInstDate]] <<TIMESTAMP>>  [[SuppAssyInstComm]] <<COMMENT>> |
| 28 | 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- [Fastener Installation and Torque Chart](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125853/Copy%20of%20Fastener%20Summary-1%203CM_20160621.xlsx)    **50K Coupler Heat Station 5K Coupler Station HOM Station Stepper Motor Strap**  **Upstream Thermal Configuration** | [[ThermInstSRF]] <<SRF>>  [[ThermInstDate]] <<TIMESTAMP>>  [[ThermInstComm]] <<COMMENT>>  [[Complete50K]] <<CHECKBOX>>  [[Complete5K]] <<CHECKBOX>>  [[HOMComplete]] <<CHECKBOX>>  [[StepperMotorComplete]] <<CHECKBOX>> |
| 29 | Install the RF cables and intercepts. Test cables and record findings. Apply L type apiezon grease as a thermal compound. See [Fastener Installation and Torque Chart](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-125853/Copy%20of%20Fastener%20Summary-1%203CM_20160621.xlsx)  **\*\*\*Note- Only qualified Technicians are to perform this step. RF Cables are delicate and can be damaged easily.\*\*\***    **BPM Routing 5K Intercept 50K Intercept**    **BPM 5K Intercept BPM 50K Intercept** | [[RFCableInstSRF]] <<SRF>>  [[RFCableInstDate]] <<TIMESTAMP>>  [[RFCableInstComm]] <<COMMENT>>  [[RFCableMapUpload]] <<FILEUPLOAD>>  [[RFCableTestsUpload]] <<FILEUPLOAD>> |

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| Step No. | Instructions | Data Input |
| 30 | 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.    **Magnet Lead Thermal Clamp Kapton Magnet MLI** | [[MLICompSRF]] <<SRF>>  [[MLICompDate]] <<TIMESTAMP>>  [[MLICompComm]] <<COMMENT>> |
| 31 | Arrange and harness the cables to the appropriate ports. Perform wire a check to verify. Completed wiring should be inside shield package in preparation of the 50K lower shield installation.  **\*\*\*Note- Only trained Electrical Technicians are to perform this step.\*\*\*** | [[CablePortSRF]] <<SRF>>  [[CablePortDate]] <<TIMESTAMP>>  [[CablePortComm]] <<COMMENT>>  [[WireChkValues]] <<FILEUPLOAD>> |
| 32 | Carefully remove all of the bellows protectors from the Cold Mass assembly.  **\*\*\*Note- Only qualified Technicians are to perform this step. Work is in very close proximetry to the Helium Vessel, Beam Pipe and 2 Phase Bellows.\*\*\***  **Inspect the visual areas of the bellows during the Protector removal** | [[RmvProtectSRF]] <<SRF>>  [[RmvProtectDate]] <<TIMESTAMP>>  [[RmvProtectComm]] <<COMMENT>>  [[QCBellowsHoldPoint]] {{fischer,rlegg,worland}} <<HOLDPOINT>> |
| 33 | Leak check the 2 phase circuit. **Out board bellows restraints must be in place prior to process piping evacuation.** Upload findings.  [11141S0033- Large Leak Check Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257481/11141S0033%201e9%20Leak%20Check%20Final.pdf)  **\*\*\*Note- Only Leak Detection trained Technicians are to perform this step. \*\*\*** | [[SRF33]] <<SRF>>  [[Date33]] <<TIMESTAMP>>  [[Comment33]] <<COMMENT>>  [[LkChk2PFile33]] <<FILEUPLOAD>> |
| 34 | Verify the RF cable routing looking for tight spots that may be affected during cooldown..  Tune and record the HOM notch frequencies. This should be the last step in the assembly process.  **\*\*\*Note- Only qualified Technicians are to perform this step. Work is in very close proximetry to the Helium Vessel and Beam Pipe Bellows.\*\*\*** | [[RFRouteSRF]] <<SRF>>  [[RFRouteDate]] <<TIMESTAMP>>  [[RFRouteComm]] <<COMMENT>>  [[HOMData]] <<FILEUPLOAD>> |
| 35 | Carefully install the HOM magnetic shield cans. Use the correct length hardware and do not force.  **\*\*\*Note- Only qualified Technicians are to perform this step. HOM's have been tuned and need to not be disturbed.\*\*\*** | [[HOMInstSRF]] <<SRF>>  [[HOMInstDate]] <<TIMESTAMP>>  [[HOMInstComm]] <<COMMENT>> |
| 36 | Review the cold mass assembly for completeness before preceeding  Final verification of RF checks, wire values, and thermal strapping.  Upload the Checklist. | [[VerificationSRF]] <<SRF>>  [[VerificationDate]] <<TIMESTAMP>>  [[VerificationComm]] <<COMMENT>>  [[VerificationChecklist]] <<FILEUPLOAD>> |
| 37 | Upload the completed [Check list for WS3 fasteners](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-155014/Workstation%203%20sign%20off-1.pdf). Note any deviations. | [[ChecklistUploadSRF]] <<SRFCMP>>  [[ChecklistUploadDate]] <<TIMESTAMP>>  [[ChecklistUploadComm]] <<COMMENT>>  [[FastenerSheet]] <<FILEUPLOAD>> |
| 38 | **It is acceptable to add the lower 50k shield at either WS3 or 4. So it is in both Traveler sets.** Install the lower 50k shielding. Stich weld as required.  **\*\*Keep welding ground close to area being welded to reduce length of current path\*\***  [**F10017613-Rev E-Lower Shield Assy**](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257466/F10017613_E_DWG1-50K%20SHIELDS.pdf) | [[LowerShldInstSRF]] <<SRF>>  [[LowerShldInstDate]] <<TIMESTAMP>>  [[LowerShldInstComm]] <<COMMENT>> |
| 39 | Cold Mass Phase 2 assembly is complete, ready for Vacuum Vessel. | [[TravCompSRF]] <<SRF>>  [[TravCompDate]] <<TIMESTAMP>>  [[TravCompComm]] <<COMMENT>>  [[TravelerComplete]] {{fischer,rlegg ,worland }} <<HOLDPOINT>> |