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| Traveler Title | SNSPPU Cryomodule Final Assembly Traveler | | | |
| Traveler Abstract | This traveler specifies the assembly steps for the SNS cryomodule after the space frame-thermal shield assembly traveler has been completed. These assembly steps include the vacuum vessel, space frame-thermal shield assembly, thermal and mag shield end extensions, end cans, warm-to-cold beampipes and all final leak checks. | | | |
| Traveler ID | SNSPPU-CMA-CM-ASSY | | | |
| Traveler Revision | R3 | | | |
| Traveler Author | J. Martin | | | |
| Traveler Date | 27-Feb-23 | | | |
| NCR Informative Emails | Jharris,areilly | | | |
| NCR Dispositioners | fischer,marchlik,cheng,jared,edaly | | | |
| D3 Emails | fischer,cheng,marchlik,edaly,areilly | | | |
| Approval Names | J. Martin | J. Fischer | M. Marchilik | N. Huque |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author | CMA Group Lead | Engineering TR | CA Manager |

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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. | | | |
| [104210200-M8U-8200-A001\_-\_SNS PPU CM Top Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246843/104210200-M8U-8200-A001_-_SNS%20PPU%20CRYOMODULE%20ASSY.pdf) | [104210200-M8U-8200-A002\_A\_SPACEFRAME-THERMAL SHIELD Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246844/104210200-M8U-8200-A002_A_SPACEFRAME%20S%20THERMAL%20SHIIELD%20ASSY.pdf) | [104210700-M8U-8200-A001- RETURN END CAN Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246850/104210700-M8U-8200-A001%20TOP%20LEVEL%20ASSEMBLY(1).pdf) | [104210600-M8U-8200-A001-SUPPLY END CAN Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246859/haysg_104210600-M8U-8200-A001-SUPPLY%20END%20CAN%20ASSY.pdf) | [104210200-M8U-8200-A011- SUPPLY END PIPING Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246846/104210200-M8U-8200-A011---dwg1.pdf) |
| [104210200-M8U-8200-A012- RETURN END PIPING Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246847/104210200-M8U-8200-A012---dwg1.pdf) | [104210300-M8U-8200-A200\_-\_RETURN WARM BEAM TUBE Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249686/104210300-M8U-8200-A200_A_RETURN%20WARM%20-%20COLD%20BEAMPIPE%20ASSY.pdf) | [104210300-M8U-8200-A001\_-\_SUPPLY WARM BEAM TUBE Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246848/104210300-M8U-8200-A001_-_SUPPLY%20WARM%20BEAMTUBE%20ASSY.pdf) | [104211100-M8U-8200-A014\_A\_RETURN END THERMAL SHIELD Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246853/104211100-M8U-8200-A014_A_RETURN%20END%20THERMAL%20SHIELD%20ASSY.pdf) | [104211100-M8U-8200-A025\_A\_SUPPLY END THERMAL SHIELD Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246854/104211100-M8U-8200-A025_A_SUPPLY%20END%20THERMAL%20SHIELD%20ASSY.pdf) |
| [104210800-M8U-8200-A001\_A\_VACUUM VESSEL Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246851/104210800-M8U-8200-A001_A_VACUUM%20VESSEL%20ASSY.pdf) | [104210200-M8U-8200-A010-D- COUPLER RETURN PIPING Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249685/104210200-M8U-8200-A010%20-D-%20COUPLER%20RETURN%20PIPING.pdf) | [104211000-M8U-8200-A013- SUPPLY OUTER MAG SHIELD Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246860/haysg_104211000-M8U-8200-A013-OUTER%20MAG%20SHIELD%20EXTENSION%20SUPPLY%20ASSY.pdf) | [104211000-M8U-8200-A022-RETURN OUTER MAG SHIELD Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246861/haysg_104211000-M8U-8200-A022-OUTER%20MAG%20SHIELD%20EXTENSION%20RETURN%20ASSY.pdf) | [104211300-M8U-8200-A002- MLI Dwgs](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246855/104211300-M8U-8200-A002---dwg1.pdf) |
| [104211300-M8U-8200-A003- MLI Dwgs 1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246856/104211300-M8U-8200-A003---dwg1.pdf) | [104211300-M8U-8200-A006- MLI Dwgs 2](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246857/104211300-M8U-8200-A006---dwg1.pdf) | [104211300-M8U-8200-A011- MLI Dwgs 3](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246858/104211300-M8U-8200-A011---dwg1.pdf) | [SNS Cryomodule Assembly/Alignment](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249837/SNSPPU-PR-CM-ALIGN-R1.pdf) | [SNS Final Assy Alignment Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249643/SNS%20ALIGNMENT%20PROCEDURE-SH.docx) |
| [11141S0029 Rev B High Sensitivity Vacuum Leak Check](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212814/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf) | [CP-CM-INST-MLI Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212972/CP-C75-CM-INST-MLI-R1.pdf) |  |  |  |

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| Revision Note |  |
| R1 | Initial release of this Traveler. |
| R2 | Modified Step 3 added hold point, re-numbered steps 48-52, added new OSP for Pressure Testing Step 48 |
| R3 | Steps 16, 26, 30, 41 and 45 specify use of a helium standard leak rate.  Steps 47 & 48 require the use of Critical MTE and recording of unique identifier and cal due date. |

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| Step No. | Instructions | Data Input |
| 1 | Record the Vacuum Vessel and Crymoodule serial number. | [[RecDate]] <<TIMESTAMP>>  [[RecTech]] <<SRFCMP>>  [[CMSN]] <<CMSN>>  [[VVSN]] <<VVSN>>  [[RecComment]] <<COMMENT>> |
| 2 | Thermal shield/spaceframe assembly traveler signed off, assembly is ready for installation. | [[SODate]] <<TIMESTAMP>>  [[SOName]] <<SRFCMP>>  [[SOComment]] <<COMMENT>>  [[SFRSN]] <<SFRSN>> |
| 3 | Install the vacuum vessel onto the transfer bench into the carriages, set roll and elevation, lockdown, stage next to spaceframe.  Adjust the carriages to align the VV guide rail to the SF grooved wheel.  Install the VV tooling, will temporarily replace the missing section of the guide rail.  **Remove the coupler blanks from the couplers to provide extra clearance during SF/TS installation into VV.**  **Conduct a toolbox meeting prior to the Cold Mass installation into the VV.**  **Supervisor to review and verify all required steps are completed prior to clearing the hold point and installing the Cold Mass into the Vacuum Vessel.** | [[InstDate]] <<TIMESTAMP>>  [[InstName]] <<SRFCMP>>  [[InstComment]] <<COMMENT>>  [[VerifyHPoint]] {{fischer,jared,jjcamp,marchlik }} <<HOLDPOINT>> |

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| Step No. | Instructions | Data Input |
| 4 | Slowly roll the spaceframe assembly into the vacuum vessel   * Remove the spaceframe supports as the wheels engage the vacuum vessel. * Verify nothing is exceeding the O.D. of the outer magnetic shielding that may interfere during insertion. Coupler cooling exhaust lines will need to be inside the shield. * **\*\*Tie the Cold Mass and VV together to prevent disengagement of wheels as you install the assembly.\*\*** * Install the Outer Mu shielding patches over the lollipop and SF tooling holes as installation allows. * Roughly align the tophats and spaceframe lockdown points. * Remove the previously installed guide rail replacement tooling * Pull the 1/4" coupler exhaust lines through the VV weldments (x4) * Re install the coupler aluminum covers. * Install the lockdowns to secure the assembly prior to moving. | [[RollDate]] <<TIMESTAMP>>  [[RollTech]] <<SRFCMP>>  [[RollComment]] <<COMMENT>> |
| 5 | Verify the assembly is ready to be moved to the final work station | [[VerifyLead]] <<SRFCMP>>  [[VerifyDate]] <<TIMESTAMP>>  [[VerifyComment]] <<COMMENT>>  [[Ready2Move]] {{fischer,jared,jjcamp }} <<HOLDPOINT>> |

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| Step No. | Instructions | Data Input |
| 6 | Move the assembly to the final work station, align the VV Assembly and reference to the building control system.  **\*\*CGV will need to be closed and ionpump powered down for the move, then re-established once move is complete. Record pre and post move vacuum recordings\*\***  Upload findings. | [[AlignTech]] <<SRFCMP>>  [[ATDate]] <<TIMESTAMP>>  [[ATComment]] <<COMMENT>>  [[MoveBLPreVac]] <<SCINOT>>  [[MoveBLPostVac]] <<SCINOT>> |
| 7 | Align the Cold Mass inside the VV to within +/- 1mm X, Y, and Z using the OHC, lockdowns, and lockdown centering tooling. The JLAB Alignment crew will assist in this operation. Upload findings. | [[Locktech]] <<SRFCMP>>  [[LockDate]] <<TIMESTAMP>>  [[LockComment]] <<COMMENT>>  [[LockData]] <<FILEUPLOAD>> |
| 8 | Tack, then weld the lockdowns. Skip weld to minimize string movement. Use [SNSPPU Lockdown Welding Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249926/SNSPPU-PR-CMA-LKDWN-WELD-R1.pdf) | [[LDWelder]] <<SRFCMP>>  [[LDWDate]] <<TIMESTAMP>>  [[LDWComment]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 9 | Install both Supply and Return end cans into the VV ports, leaving the interface flanges loose.  Record the End Can serial numbers   * Test fit/add the G-10 thermal shield supports into the end can bridge tubes | [[ECTech]] <<SRFCMP>>  [[ECDate]] <<TIMESTAMP>>  [[ECComment]] <<COMMENT>>  [[SECSN]] <<SECSN>>  [[RECSN]] <<RECSN>> |
| 10 | Align the bayonets of both end cans to the VV as referenced in dwgs [104210200-M8U-8200-A001\_-\_SNS PPU CM Top Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246843/104210200-M8U-8200-A001_-_SNS%20PPU%20CRYOMODULE%20ASSY.pdf), [104210700-M8U-8200-A001- RETURN END CAN Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246850/104210700-M8U-8200-A001%20TOP%20LEVEL%20ASSEMBLY(1).pdf), [104210600-M8U-8200-A001-SUPPLY END CAN Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246859/haysg_104210600-M8U-8200-A001-SUPPLY%20END%20CAN%20ASSY.pdf). | [[BayTech]] <<SRFCMP>>  [[BayDate]] <<TIMESTAMP>>  [[BayComment]] <<COMMENT>>  [[BayData]] <<FILEUPLOAD>> |
| 11 | Verify the OAL of the CM is less than or equal to 309.8" Record findings. | [[OALTech]] <<SRFCMP>>  [[OALDate]] <<TIMESTAMP>>  [[OALComment]] <<COMMENT>>  [[OAL]] <<TEXT>> |
| 12 | While monitoring the bayonet positions, tack, then weld, both interface blocks between the EC’s and VV. Record the final bayonet positions. The JLAB Alignment crew will perform this work.  Final bayonet positions shall be recorded with the tooling carts loosened and not influencing measurements. | [[POSTech]] <<SRFCMP>>  [[POSDate]] <<TIMESTAMP>>  [[POSComment]] <<COMMENT>>  [[POSData]] <<FILEUPLOAD>> |
| 13 | Verify the EC installations are complete, then remove the installation tooling carts | [[ECCompTech]] <<SRFCMP>>  [[ECCompDate]] <<TIMESTAMP>>  [[ECCompComment]] <<COMMENT>>  [[ECCompHPoint]] {{fischer,jared,jjcamp }} <<HOLDPOINT>> |

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| Step No. | Instructions | Data Input |
| 14 | Complete the bridge tube bellows flange installation to the VV at both interface regions. Verify minimal thermal shorts if possible. Record any findings. | [[BTTech]] <<SRFCMP>>  [[BTDate]] <<TIMESTAMP>>  [[BTComment]] <<COMMENT>> |
| 15 | Install the process piping in the Supply end of the assembly. This will include 2k, 50k, beamline cooling ring, JT’s, and surge tank tap. Add the G-10 pipe supports as required to separate pipes and reduce thermal shorts.  Use [104210200-M8U-8200-A011- SUPPLY END PIPING Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246846/104210200-M8U-8200-A011---dwg1.pdf)  Upload welding documents as required. | [[SECPPTech]] <<SRFCMP>>  [[SECPPWelder]] <<SRFCMP>>  [[SECPPDate]] <<TIMESTAMP>>  [[SECPPComment]] <<COMMENT>>  [[SECPPWeldDocs]] <<FILEUPLOAD>>  [[VerifyPiping]] {{fischer,jared,jjcamp }} <<HOLDPOINT>> |

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| Step No. | Instructions | Data Input |
| 16 | Leak check all added lines to [11141S0029 Rev B High Sensitivity Vacuum Leak Check](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212814/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf) . Record findings.  Use Helium Standard Leak Rate. | [[SECPPLCTech]] <<SRFCMP>>  [[SECPPLCDate]] <<TIMESTAMP>>  [[SECPPLCComment]] <<COMMENT>> |
| 17 | Install MLI onto all required surfaces, using [CP-CM-INST-MLI Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212972/CP-C75-CM-INST-MLI-R1.pdf) | [[SECMLITech]] <<SRFCMP>>  [[SECMLIDATE]] <<TIMESTAMP>>  [[SECMLIComment]] <<COMMENT>> |
| 18 | Install SEC 50k shield panels and heat stationing straps. Apply indium to interface regions of strapping and follow [Indium Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257359/SRF-MSPR-CMA-THERM-IND-R1.pdf). | [[SEC50KTech]] <<SRFCMP>>  [[SEC50KDate]] <<TIMESTAMP>>  [[SEC50KComment]] <<COMMENT>> |
| 19 | Add the SEC 50k MLI using [CP-CM-INST-MLI Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212972/CP-C75-CM-INST-MLI-R1.pdf), [104211300-M8U-8200-A002- MLI Dwgs](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246855/104211300-M8U-8200-A002---dwg1.pdf), [104211300-M8U-8200-A003- MLI Dwgs 1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246856/104211300-M8U-8200-A003---dwg1.pdf), [104211300-M8U-8200-A006- MLI Dwgs 2](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246857/104211300-M8U-8200-A006---dwg1.pdf) | [[SEC50KMLITech]] <<SRFCMP>>  [[SEC50KMLIDate]] <<TIMESTAMP>>  [[SEC50KMLIComment]] <<COMMENT>> |
| 20 | Install the SEC outer magnetic shielding cap. Handle the material properly, do not compromise the shielding quality. | [[SECOMTech]] <<SRFCMP>>  [[SECOMDate]] <<TIMESTAMP>>  [[SECOMComment]] <<COMMENT>>  [[OMAGSN]] <<OMAGSN>> |
| 21 | Install the SEC VV end plate.  Clean and install the o-rings in both flanges  Wipe down mating surfaces  Align and install the fasteners, leaving the fasteners to the beam pipe hand tight for now.  Record the end plate s/n, it must match the VV for pressure system compliance | [[SECVVEPTech]] <<SRFCMP>>  [[SECVVEPDate]] <<TIMESTAMP>>  [[SECVVEPComment]] <<COMMENT>>  [[SECEPSN]] <<SN>> |
| 22 | Remove the bellows protectors  **Reaching through the VV access ports, carefully remove the fasteners releasing the bellows protectors. This needs to be done carefully and by knowledgeable trained technicians only.**  **Record the beam line vacuum level prior to and after the work is completed.** | [[SECBPLeadTech]] <<SRFCMP>>  [[SECBPSuper]] <<SRFCMP>>  [[SECBPDate]] <<TIMESTAMP>>  [[SECBPComment]] <<COMMENT>>  [[SECBPReviewprior]] {{fischer,jared,jjcamp }} <<HOLDPOINT>>  [[BLVacPrior]] <<SCINOT>>  [[BLVacPost]] <<SCINOT>> |

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| Step No. | Instructions | Data Input |
| 23 | Verify all protection pieces have been removed, then tighten the beam line fasteners on the SEC VV end plate. | [[SECFastTech]] <<SRFCMP>>  [[SECFastDate]] <<TIMESTAMP>>  [[SECFastComment]] <<COMMENT>> |
| 24 | Install bellows protection, apply indium to the clamp i.d.,then install the 50k clamp and torque. Use [Indium Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257359/SRF-MSPR-CMA-THERM-IND-R1.pdf). Record the beam line vac before and after installation. | [[SECCLPTech]] <<SRFCMP>>  [[SECCLPDate]] <<TIMESTAMP>>  [[SECCLPComment]] <<COMMENT>>  [[BLCLPPrior]] <<SCINOT>>  [[BLCLPPost]] <<SCINOT>> |
| 25 | Cleanly install the pump drop assembly and soft shut valve. Use [SNSPPU SEC Pump Drop Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249758/SNSPPU-PR-CMA-SUBP-ASSY-R1.pdf)  Record the SEC Pump drop and valve s/n | [[SECCLNTech]] <<SRFCMP>>  [[SECCLNDate]] <<TIMESTAMP>>  [[SECCLNComment]] <<COMMENT>>  [[SSVSN\_SEC]] <<SSVSN>> |
| 26 | Leak check the added beam line components from the above step. [11141S0029 Rev B High Sensitivity Vacuum Leak Check](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212814/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf) Record findings.  Use Helium Standard Leak Rate. | [[SECPDLCTech]] <<SRFCMP>>  [[SECPDLCDate]] <<TIMESTAMP>>  [[SECPDLCComment]] <<COMMENT>>  [[SECPDLC]] <<FILEUPLOAD>> |
| 27 | Turn on the ion pump while pumping on the Pump Drop assy, establish vacuum. Isolate the turbo. When within 1 decade of string beam line pressure, slowly open the SEC cold GV making vacuum regions common. Record vacuum when stable. | [[PDTech]] <<SRFCMP>>  [[PDDate]] <<TIMESTAMP>>  [[PDComment]] <<COMMENT>>  [[PDVac]] <<SCINOT>> |

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| Step No. | Instructions | Data Input |
| 28 | Once vacuum is stable and recovered, close the REC CGV isolating it from the cavity string. Record vacuum. | [[RECVacTech]] <<SRFCMP>>  [[RECVacDate]] <<TIMESTAMP>>  [[RECVacComment]] <<COMMENT>> |
| 29 | Install the process piping in the Return end of the assembly. This will include 2k, 50k, beamline cooling ring, and surge tank lines. Add the end can G-10 pipe supports as required to minimize thermal shorts.  Use [104210200-M8U-8200-A012- RETURN END PIPING Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246847/104210200-M8U-8200-A012---dwg1.pdf)  Upload welding documentation as required | [[RECPPTech]] <<SRFCMP>>  [[RECPPWelder]] <<SRFCMP>>  [[RECPPDate]] <<TIMESTAMP>>  [[RECPPComment]] <<COMMENT>>  [[RECPPWeldDocs]] <<FILEUPLOAD>> |
| 30 | Leak check all added lines to [11141S0029 Rev B High Sensitivity Vacuum Leak Check](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212814/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf) . Record findings.  Use Helium Standard Leak Rate. | [[RECPPLCTech]] <<SRFCMP>>  [[RECPPLCDate]] <<TIMESTAMP>>  [[RECPPLCComment]] <<COMMENT>> |
| 31 | Install MLI onto all required surfaces, using [CP-CM-INST-MLI Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212972/CP-C75-CM-INST-MLI-R1.pdf) | [[RECMLITech]] <<SRFCMP>>  [[RECMLIDATE]] <<TIMESTAMP>>  [[RECMLIComment]] <<COMMENT>> |
| 32 | Install REC 50k shield panels and heat stationing straps. Apply indium to interface regions of strapping and follow [Indium Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257359/SRF-MSPR-CMA-THERM-IND-R1.pdf). | [[REC50KTech]] <<SRFCMP>>  [[REC50KDate]] <<TIMESTAMP>>  [[REC50KComment]] <<COMMENT>> |
| 33 | Add the REC 50k MLI using [CP-CM-INST-MLI Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212972/CP-C75-CM-INST-MLI-R1.pdf), [104211300-M8U-8200-A002- MLI Dwgs](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246855/104211300-M8U-8200-A002---dwg1.pdf), [104211300-M8U-8200-A003- MLI Dwgs 1](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246856/104211300-M8U-8200-A003---dwg1.pdf), [104211300-M8U-8200-A006- MLI Dwgs 2](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246857/104211300-M8U-8200-A006---dwg1.pdf) | [[REC50KMLITech]] <<SRFCMP>>  [[REC50KMLIDate]] <<TIMESTAMP>>  [[REC50KMLIComment]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 34 | Install the REC outer magnetic shielding cap. Handle the material properly, do not compromise the shielding quality. | [[RECOMTech]] <<SRFCMP>>  [[RECOMDate]] <<TIMESTAMP>>  [[RECOMComment]] <<COMMENT>> |
| 35 | While monitoring the beamline pressure (to verify the REC CGV is closed) bleed up the vacuum spool and cleanly remove the 15 L/S ion pump, then blank off the beam pipe end. Record the beam line vacuum. | [[RECBLVacTech]] <<SRFCMP>>  [[RECBLVacDate]] <<TIMESTAMP>>  [[RECBLVacComment]] <<COMMENT>>  [[RECBLVac]] <<SCINOT>> |
| 36 | Install the REC VV end plate.  Clean and install the o-rings in both flanges  Wipe down mating surfaces  Align and install the fasteners, leaving the fasteners to the beam pipe hand tight for now.  Record the end plate s/n, it must match the VV for pressure system compliance | [[RECVVEPTech]] <<SRFCMP>>  [[RECVVEPDate]] <<TIMESTAMP>>  [[RECVVEPComment]] <<COMMENT>>  [[RECEPSN]] <<SN>> |
| 37 | Remove the bellows protectors  **Reaching through the VV access ports, carefully remove the fasteners releasing the bellows protectors. This needs to be done carefully and by knowledgeable trained technicians only.**  **Record the beam line vacuum level prior to and after the work is completed.** | [[RECBPLeadTech]] <<SRFCMP>>  [[RECBPSuper]] <<SRFCMP>>  [[RECBPDate]] <<TIMESTAMP>>  [[RECBPComment]] <<COMMENT>>  [[RECBPReviewprior]] {{fischer,jared,jjcamp }} <<HOLDPOINT>>  [[RECBLVacPrior]] <<SCINOT>>  [[RECBLVacPost]] <<SCINOT>> |

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| Step No. | Instructions | Data Input |
| 38 | Verify all protection pieces have been removed, then tighten the beam line fasteners on the REC VV end plate. | [[RECFastTech]] <<SRFCMP>>  [[RECFastDate]] <<TIMESTAMP>>  [[RECFastComment]] <<COMMENT>> |
| 39 | Install bellows protection, apply indium to the clamp i.d.,then install the 50k clamp and torque. Use [Indium Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257359/SRF-MSPR-CMA-THERM-IND-R1.pdf). Record the beam line vac before and after installation. | [[RECCLPTech]] <<SRFCMP>>  [[RECCLPDate]] <<TIMESTAMP>>  [[RECCLPComment]] <<COMMENT>>  [[RECBLCLPPrior]] <<SCINOT>>  [[RECBLCLPPost]] <<SCINOT>> |
| 40 | Cleanly install the beam line spool and soft shut valve. Use [SNSPPU REC Beam Pipe Installation Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249762/SNSPPU-PR-CMA-RTBP-ASSY-R1.pdf)  Record the REC spool and valve s/n | [[RECCLNTech]] <<SRFCMP>>  [[RECCLNDate]] <<TIMESTAMP>>  [[RECCLNComment]] <<COMMENT>>  [[RTBPSN]] <<RTBPSN>>  [[SSVSN\_REC]] <<SSVSN>> |
| 41 | Leak check the added beam line components from the above step. [11141S0029 Rev B High Sensitivity Vacuum Leak Check](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212814/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf) Record findings.  Use Helium Standard Leak Rate. | [[RECPDLCTech]] <<SRFCMP>>  [[RECPDLCDate]] <<TIMESTAMP>>  [[RECPDLCComment]] <<COMMENT>>  [[RECPDLC]] <<FILEUPLOAD>> |
| 42 | Establish similar vacuum as the cavity string, then open the REC CGV making the entire beam line common. Record vacuum. | [[SimVacTech]] <<SRFCMP>>  [[SimVacDate]] <<TIMESTAMP>>  [[SimVacComment]] <<COMMENT>>  [[SimVac]] <<SCINOT>> |
| 43 | Install the VV peripherals, see [104210200-M8U-8200-A001\_-\_SNS PPU CM Top Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246843/104210200-M8U-8200-A001_-_SNS%20PPU%20CRYOMODULE%20ASSY.pdf), with the relative part numbers   * Instrumentation flanges- Items 1,7,11,36,39 * JT actuators- may be added in the CMTF- Item 37 * Coupler tophats- Items * Ins Vac gauge and manifold- Item 21 * Instrumentation bulkhead plates- Item 32 * Coupler exhaust manifold- Item 17 * Ins vac burst disc- Item 28 * Ins vac gate valve- Item 4 | [[VVPerTech]] <<SRFCMP>>  [[VVPerDate]] <<TIMESTAMP>>  [[VVPerComment]] <<COMMENT>>  [[AllInsted]] <<YESNO>> |

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| Step No. | Instructions | Data Input |
| 44 | Weld the coupler exhaust manifold in place. Upload the supporting welding documentation  [104210200-M8U-8200-A010-C- COUPLER RETURN PIPING Assy](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-246845/104210200-M8U-8200-A010%20-C-%20COUPLER%20RETURN%20PIPING.pdf) | [[CplManWelder]] <<SRFCMP>>  [[CplManDate]] <<TIMESTAMP>>  [[CplManComment]] <<COMMENT>>  [[CplManWeldDocs]] <<FILEUPLOAD>> |
| 45 | Leak check the coupler exhaust manifold. Use, [11141S0029 Rev B High Sensitivity Vacuum Leak Check](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212814/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf)  Use Helium Standard Leak Rate.  Record findings | [[CplManLC]] <<SRFCMP>>  [[CplManLCDate]] <<TIMESTAMP>>  [[CplManLCComment]] <<COMMENT>>  [[CplManLCData]] <<FILEUPLOAD>> |
| 46 | Perform final measurements on all instrumentation. Record findings  [104211500-M8U-8200-A002\_A\_COLD MASS ASSY](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249679/104211500-M8U-8200-A002_A_COLD%20MASS%20ASSY.pdf)  [CRYOMODULE WIRING DIAGRAM](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249681/CRYOMODULE%20WIRING%20DIAGRAM-A-dwg1.pdf)  [END CAN WIRING DIAGRAM](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249680/END%20CAN%20DIODE%20WIRING%20DIAGRAM-A-dwg1.pdf) | [[FnlElecTech]] <<SRFCMP>>  [[FnlElecDate]] <<TIMESTAMP>>  [[FnlElecComment]] <<COMMENT>>  [[FnlElecUpload]] <<FILEUPLOAD>> |
| 47 | Leak check the insulating vacuum. Use [11141S0033 LARGE ITEM LEAK CHECK 1E-9](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249682/11141S0033%201e9%20Leak%20Check%20Final.pdf)  .  THIS IS A CRITICAL MEASUREMENT. Use of CRITICAL MTE is required.  Record F-tag (or serial No.) and Cal DUE date for:   1. Critical MTE Helium Standard Leak Rate   Record findings. | [[IVLCTech]] <<SRFCMP>>  [[IVLCDate]] <<TIMESTAMP>>  [[IVLCComment]] [[IVCritHSLRSN]] <<SN>>  [[IVCritHSLRDueDate]] <<TIMESTAMP>>  <<COMMENT>>  [[IVLCData]] <<FILEUPLOAD>>  [[IVLCLDSN]] <<SN>>  [[IVLCLDCal]] <<TEXT>> |
| 48 | Pressure test the Cryomodule internal cryogenic circuits using [CMTF P&ID Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249257/CMTF%20SNS%20P&ID.pdf), [SOP-SNSCMPressureTestingRevD](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-257224/SNS%20CM%20Pressure%20Test%20OSP%20Rev%20D.docx)  THIS IS A CRITICAL MEASUREMENT. Use of CRITICAL MTE is required.  Record F-tag (or serial No.) and Cal DUE date for:   1. Critical MTE Pressure Gauge 2. Critical MTE Helium Standard Leak Rate | [[PTTech]] <<SRFCMP>>  [[PTDate]] <<TIMESTAMP>>  [[PTCritPressSN]] <<SN>>  [[PTCritPressDueDate]] <<TIMESTAMP>>  [[PTCritHSLRSN]] <<SN>>  [[PTCritHSLRDueDate]] <<TIMESTAMP>>  [[PTComment]] <<COMMENT>>  [[PTUpload]] <<FILEUPLOAD>> |
| 49 | Perform final alignment, record findings | [[FnlAlignTech]] <<SRFCMP>>  [[FnlAlignDate]] <<TIMESTAMP>>  [[FnlAlignComment]] <<COMMENT>>  [[FAUpload]] <<FILEUPLOAD>> |
| 50 | Add the soft shut valve supports prior to shipping the CM, [104210200-M8U-8200-A063\_-\_SUPPLY GV Bracket](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249265/104210200-M8U-8200-A063_-_SUPPLY%20WARM%20GATE%20VALVE%20BRACKET.pdf), [104210200-M8U-8200-A065\_-\_RETURN GV Bracket](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-249268/104210200-M8U-8200-A065_-_RETURN%20WARM%20GATE%20VALVE%20%20BRACKET%20ASSY.pdf) | [[SSTech]] <<SRFCMP>>  [[SSDate]] <<TIMESTAMP>>  [[SSComment]] <<COMMENT>> |
| 51 | Verify the final assembly is complete.  Conduct the Technical Review and PS6 form, upload comments. | [[FnlAssyTech]] <<SRFCMP>>  [[FnlAssyLead]] <<SRF>>  [[FnlAssyDate]] <<TIMESTAMP>>  [[FnlAssyComment]] <<COMMENT>>  [[FnlAssyUpload]] <<FILEUPLOAD>>  [[FnlAssyPS6]] <<FILEUPLOAD>>  [[FnlAssyLeadHldPt]] {{fischer,jared,jjcamp}} <<HOLDPOINT>> |

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| Step No. | Instructions | Data Input |
| 52 | Install the Cryomodule into the Test cave for the verification testing.   * Move the CM from the final workstation onto the transport tooling * Slowly roll into the CMTF * Set to dimensions shown on the below views. | [[MoveCMTFTech]] <<SRFCMP>>  [[MoveCMTFDate]] <<TIMESTAMP>>  [[MoveCMTFComment]] <<COMMENT>> |