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| Traveler Title | C50R Helium Vessel Assembly Traveler |
| Traveler Abstract | This traveler outlines the necessary steps and checkpoints to install and assemble the cavity pair into the helium vessel assembly. Work within this Traveler is to be performed by trained and authorized Assembly Technicians ONLY. All Cryomodule materials shall be kept inside the established RADCON barrier until they have been surveyed and released. **\*\* Radiation surveys shall be performed and information recorded at traveler hold points.\*\******\*\* Radiological controls are a critical component of the cryomodule rework disassembly and assembly process. Dose rate, as well as contamination surveys (where indium gaskets or seals are present) shall be performed and analyzed, with information communicated to all involved personnel. Results will be recorded at traveler hold points. RW-II training will be required where contamination is identified\*\**** |
| Traveler ID | ER5C-CMACU-HELV-ASSY-C50R |
| Traveler Revision  | R2 |
| Traveler Author | John Fischer |
| Traveler Date | 05-Jun-24 |
| NCR Informative Emails | areilly |
| NCR Dispositioners | areilly,fischer,weaksmc |
| D3 Emails | areilly,fischer |
| Approval Names | John Fischer | Jeff Campbell | John Fischer | Tony Reilly |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author | Reviewer | CMA Group Lead | Project Representative |

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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.**All materials linked below and throughout this traveler are for reference only and should be verified for latest version at time of use.** |
| [Helium Vessel Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71970/CU-HVESSEL.pdf) | [Tuner Assy Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71972/CU-TUNER%20ASSY.pdf) | [Small Leak Check Procedure 11141S0029](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-73238/11141S0029REV_A-SMALL%20LEAK%20CHECK.pdf) | [Large Leak Check Procedure 11141S0033](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-73239/11141S0033%20REV%20A%20%28%20LARGE%20LEAK%20CHECK%29.docx) | [C50R Tuner in HV dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-73237/HV%20w%20Cavity%20dwg.pdf) |
| [HV SMA dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-73236/hv%20instrumentation%20SMA%20dwg.pdf) | [C50R HV Instrumentation dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-73235/hv%20instrumentation%20dwg.pdf) |  |  |  |

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| Revision Note |  |
| R1 | Initial release of this Traveler. |
| R2 | Modified Approvers, 8 pin feedthru step 16, and abstract. |

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| Step No. | Instructions | Data Input |
| 1 | Record the Cryounit serial number which is being built.\*\*\***Follow the Magnetic Hygiene protocols when performing the steps in this traveler. Record the date, starting and finishing time of the major assembly steps identified in the spreadsheet "C75-01 assembly activities logbook" while going through the helium vessel assembly steps. Enter the data to the worksheet corresponding to the cryounit being worked on. This sheet will be uploaded at the end of this Traveler.**[C75-01 Assembly Activities Logbook \*\*\*](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212174/C75-01%20Magnetic%20Hygiene%20Record%20Spreadsheet.xlsx) | [[CUSN]] <<CUSN>>[[CUCMATech]] <<SRFCMP>>[[CUDate]] <<TIMESTAMP>>[[CUComment]] <<COMMENT>> |
| 2 | Verify the Tuner assembly traveler is complete and signed off. | [[VerTunerAssyCMATech]] <<SRF>>[[VerTunerAssyDate]] <<TIMESTAMP>>[[VerTunerAssyComment]] <<COMMENT>>  |
| 3 | Prepare the helium vessel for use. * Clean the Helium Vessel and Heads
* Measure the cavity end dish to cavity end dish OAL to verify whether or not backing rings need to be added to the helium vessel heads.
* Install the HV rounding fixtures, then test fit and match mark the HV heads into the HV. (It may be necessary to bend the HV ends to achieve a good fit and minimize the amount of weld required.)
* Inspect the mini conflats in the HV instrumentation plate. Repair and note any defects in the comment section.
* Weld in the wire retaining clips
* Add the liquid level wire washers as shown in pic below
* Weld in the reworked rotary feed thrus, making sure they are perpendicular to the HV instrumentation plate. [HV Rotary Feedthru Dwg](file:///%5C%5CJlabsgrp%5Csgroup%5Casd%5Casddata%5CCryomoduleAssembly%5CC75%5CTravelers%5CC20%20Cryomodule%20Disassembly%20Traveler.docx)

 | [[HELVPrepCMATech]] <<SRF>>[[HELVPrepDate]] <<TIMESTAMP>>[[HELVCleaned]] <<YESNO>>[[HELVBackRing]] <<YESNO>>[[HELVTestFit]] <<YESNO>>[[HELVSealSurfaces]] <<YESNO>>[[HELVWireClipsIn]] <<YESNO>>[[HELVWashers]] <<YESNO>>[[HELVRotaryFeedThrus]] <<YESNO>>[[HELVComment]] <<COMMENT>> |
| 4 | Verify the flatness of the helium vessel feedthru plate. Inspect the indium sealing surfaces for defects. Polish if necessary. Record findings | [[Technician4]] <<SRF>>[[Date4]] <<TIMESTAMP>>[[Comment4]] <<COMMENT>>[[Right]] <<FLOAT>>[[Left]] <<FLOAT>> |

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| Step | Instructions | Data Input |
| 5 | Attach the .06" d. indium seals to the helium vessel feedthru plate using the indium former and associated clamping hardware. Donning gloves, the indium and sealing surface shall be wiped with a lint free cloth soaked with Acetone, then Isopropyl Alcohol to clean. | [[Technician5]] <<SRF>>[[Date5]] <<TIMESTAMP>>[[Comment5]] <<COMMENT>> |
| 6 | Secure the helium vessel shell into the shell holding fixture. Be sure feedthrough flange is level and facing up. Lock the rotation with a twist clamp. See below pic. | [[Technician6]] <<SRF>>[[Date6]] <<TIMESTAMP>>[[Comment6]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 7 | Install the Thompson block insertion fixtures on both ends ofscissor table, then insert the Thompson rail extension bars intothe pillow blocks and level the assembly. | [[Technician7]] <<SRF>>[[Date7]] <<TIMESTAMP>>[[Comment7]] <<COMMENT>> |
| 8 | Engage the 4' Thompson rail extension shafts into the bottom rail of the Cavity Assembly tooling. Slowly transfer the cavity pair into the helium vessel.**\*\*CAUTION\*\***Do Not Force. Find the Obstruction and Move It! | [[Technician8]] <<SRF>>[[Date8]] <<TIMESTAMP>>[[Comment8]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 9 | Once in position, insert the locator pins through the corner holes in the helium vessel feedthrough flange, then thread into the cavity pair FPC flange holes. | [[Technician9]] <<SRF>>[[Date9]] <<TIMESTAMP>>[[Comment9]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 10 | Raise the cavity to the feedthru flange, install the hardware.**Procedure:**Starting with an 1/8" shim, slowly raise the cavity pair, checkthe gap (between the HV feedthrough plate and Dogleg face)frequently. Repaeat the process with a .06" shim, all 8 cornersshould be equal. Mount dial indicators on both ends of thefixture, zero out. Slowly raise the cavity pair the last .055"evenly. The indium seal with be about.005" thick once fully torqued. | [[Technician10]] <<SRF>>[[Date10]] <<TIMESTAMP>>[[Comment10]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 11 | Torque the bolts in the shown sequence to 40,60,and finally, 70 in/lbs. (+/- 5 in/lbs)**REPEAT THIS PROCESS A MINIMUM OF 3 TIMES!!!!** | [[Technician11]] <<SRF>>[[Date11]] <<TIMESTAMP>>[[Comment11]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 12 | Leak check the FPC to HV flange indium seals. Record Findings.[11141S0029 Leak Check Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212194/11141S0029%20Rev%20B%202e-10%20Leak%20Check%20Final.pdf) | [[Technician12]] <<SRF>>[[Date12]] <<TIMESTAMP>>[[Comment12]] <<COMMENT>>[[HVFlangeLeakCheck12]] <<FILEUPLOAD>> |
| 13 | Install the 4 Ti cavity supports, shim if necessary. Drill two 1/8" holes and install roll pins to secure. Torque 1/4"-20 SHCS to 90 in/lbs. | [[Technician13]] <<SRF>>[[Date13]] <<TIMESTAMP>>[[Comment13]] <<COMMENT>> |
| 14 | Remove the cavity pair installation fixture. Be careful not to disturb the cavity pair alignment.**Procedure**:All Cavity hangers are installed and pinned.Remove caps from all three cavity supports.Lower the cavity assembly fixture evenly.Remove all the thumb screws, aluminum cavity support uprights, and rail end plate.Slide the cavity fixture out of the helium vessel, reassemble. | [[Technician14]] <<SRF>>[[Date14]] <<TIMESTAMP>>[[Comment14]] <<COMMENT>> |
| 15 | Rotate the helium vessel to 90˚, plumb and lock down. | [[Technician15]] <<SRF>>[[Date15]] <<TIMESTAMP>> |

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| Step | Instructions | Data Input |
| 16 | Install wiring and instrumentation in accordance with drawings 11126D0015 and 11126D0018, then test wiring and instrumentation circuits.Record the manufacturer and S/N for the new qualified 8 pin cryogenicfeedthrus.[HV Wiring Diagram Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212195/helium%20vessel%20wiring%20diagram.pdf), [Feedthru Plate Instrumentation Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212197/hv%20plate%20instrumentation.pdf) | [[ElectricalTechnician16]] <<SRF>>[[Date16]] <<TIMESTAMP>>[[Comment16]] <<COMMENT>>[[ElectricalData16]] <<FILEUPLOAD>>[[FTManufacturer]] <<FILEUPLOAD>>[[FT08PSN]] <<FT08PSN>>[[FT08PSN]] <<FT08PSN>>[[FT08PSN]] <<FT08PSN>>[[FT08PSN]] <<FT08PSN>> |
| 17 | Install co-axial cables and supports. Perform a TDR check on all connections. Record findings. | [[Technician17]] <<SRF>>[[Date17]] <<TIMESTAMP>>[[Comment17]] <<COMMENT>>[[Left17]] <<FILEUPLOAD>>[[Right17]] <<FILEUPLOAD>> |
| 18 | Assemble tuner drive shaft components (from drawing 11161E0001) (two assemblies, if required): | [[Technician18]] <<SRF>>[[Date18]] <<TIMESTAMP>>[[Comment18]] <<COMMENT>> |
| 19 | Install the Heater on 2 studs located at bottom of He vessel using (4) 1/4-28 nuts, one ontop and one on bottom of the heater card on each stud. | [[Technician19]] <<SRF>>[[Date19]] <<TIMESTAMP>>[[Comment19]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 20 | At this time, if helium vessel gets liquid level probe, install it on right end and run wires to left end. Brackets should be facing inboard and probe should be centered vertically in vessel. | [[Technician20]] <<SRF>>[[Date20]] <<TIMESTAMP>>[[Comment20]] <<COMMENT>> |
| 21 | Tighten the instrumentation feed thru's on the HV saddle to 30 in/lb. | [[Technician21]] <<SRF>>[[Date21]] <<TIMESTAMP>>[[Comment21]] <<COMMENT>> |
| 22 | Hold-point for supervisor's inspection, before the helium vessel is closed up. | [[Technician22]] <<SRF>>[[Date22]] <<TIMESTAMP>>[[Comment22]] <<COMMENT>> |

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| Step | Instructions | Data Input |
| 23 | Position the Helium vessel heads on shell as shown on assembly Drawing 11126E0001.Make sure that the 4 inch diameter inlet/outlet is oriented at the top of the helium vessel using the head orientation fixture. Weld heads to shell (2 places). [Helium Vessel Assembly Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-212191/HV%20Assy.pdf)**\*\*CAUTION\*\***Minimize heat transfer to bellows during welding; finish welding dish to head. | [[Welder23]] <<SRF>>[[Technician23]] <<SRF>>[[Date23]] <<TIMESTAMP>>[[Comment23]] <<COMMENT>> |
| 24 | Leak check the helium vessel in accordance with Specification 11141S0033. Bag both heads, both dishes, both bellows, saddle, and all 4 helium ports. | [[Technician24]] <<SRF>>[[Date24]] <<TIMESTAMP>>[[Comment24]] <<COMMENT>>[[UploadFile24]] <<FILEUPLOAD>> |
| 25 | Hold-point for supervisor's inspection. | [[Technician25]] <<SRF>>[[Date25]] <<TIMESTAMP>>[[Comment25]] <<COMMENT>> |