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| Traveler Title | C20 Cryounit Disassembly | | | |
| Traveler Abstract | This Traveler outlines the steps necessary to disassemble a C20 Cryounit, including removing the helium vessel, and extracting the Cavity Pair. 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 | C20-CU-DISA | | | |
| Traveler Revision | R1 | | | |
| Traveler Author | John Fischer | | | |
| Traveler Date | 11-Dec-2020 | | | |
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| Approval Dates |  |  |  |  |
| Approval Title | Author | Reviewer | Project Manager | RADCON Rep. |

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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. | | | |
| [Cryounit Helium Vessel dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71970/CU-HVESSEL.pdf) | [Cryounit HV MLI dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71969/CU-HV%20MLI.pdf) | [Cryounit Nitronis Rod Seat MLI dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71971/CU-ROD%20SEAT%20MLI.pdf) | [Cryounit Tuner Assy dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71972/CU-TUNER%20ASSY.pdf) | [Cryounit VV End View dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71973/CU-VV%20END%20VIEW.pdf) |
| [Cryounit Waveguide Front View dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71974/CU-WG%20FRONT-SIDE.pdf) | [Cryounit Waveguide Top View dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-71975/CU-WG%20TOP%20VIEW.pdf) | [Radcon RAM Control Doc2019](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-205753/C2050_Radcon%20RAM%20Control%20Doc2019.docx) | [WACH's Noise Survey](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-205782/Noise%20Survey%20%e2%80%93%20Cryomodule%20Assembly%20High%20Bay%2c%20Test%20Lab%20Bldg%2058-Sept%2025%2c%202014%20End%20Can%20Cutting%20Cone%20Placement%20Hearing%20Protection%20Required%202-1.doc) | [C20-C50 rework brief slides](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-204610/C2050_reworkbrief.pptx) |
| [C20-C50 Indium Joint Locations](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-205790/C20-C50%20Indium%20Joint%20Locations.pptx) |  |  |  |  |

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

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| Step No. | Instructions | Data Input |
| 1 | Disassemble C20 style cryounits.  Relocate the Cryounit to the disassembly area, record comments. | [[CUSN]] <<CUSN>>  [[Technician1]] <<SRFCMP>>  [[Date1]] <<TIMESTAMP>>  [[Comment1]] <<COMMENT>> |
| 2 | |  |  |  | | --- | --- | --- | | **Component Serial Numbers** | Left | Right | | Tophat | [[THTSSN]] <<SN>> |  | | Manifold Assembly | [[MANFSN]] <<SN>> |  | | Feed Thru Plate | [[INFFSN]] <<SN>> |  | | Warm Window Assy | [[LeftWINSN]] <<SN>> | [[RightWINSN]] <<SN>> | | Waveguide Extension | [[LeftWGDXSN]] <<SN>> | [[RightWGDXSN]] <<SN>> | | Warm Window | [[LeftWINWSN]] <<SN>> | [[RightWINWSN]] <<SN>> | | Vacuum Vessel | [[VVSN]] <<SN>> |  | | Helium Vessel | [[HELVSN]] <<SN>> |  | | Tuner | [[LeftTUNCSN]] <<SN>> | [[RightTUNCSN]] <<SN>> | | Cavity | [[LeftCAVSN]] <<CAVSN>> | [[RightCAVSN]] <<CAVSN>> | | Liquid Level Probe | [[LiquidLevelProbe]] <<YESNO>> |  | | |
| 3 | Verify the Cryomodule Disassembly Traveler is complete.  \*\* **LABEL ALL PARTS, AND RECORD SERIAL NUMBERS AS THEY ARE REMOVED.\*\*** | [[Date3]] <<TIMESTAMP>>  [[Technician3]] <<SRF>>  [[CM\_DISA\_TravelerID]] <<SN>> |

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| Step No | Instructions | Data Input |
| 4 | **Radcon survey of cryounit prior to start of work. This step is to identify RAM that is being uncovered as the disassembly progresses. Items are to be tagged by Radcon as required. Add notes in comment box provided describing RAM.** | [[Date4]] <<TIMESTAMP>>  [[Technician4]] <<SRF>>  [[Comment4]] <<COMMENT>> |
| 5 | **Waveguide Disassembly:** |  |
| 1. **Leak-check** waveguide manifold assembly & record data. | [[Technician5]] <<SRF>>  [[Date5]] <<TIMESTAMP>>  [[ManifoldLeakCheck]] <<FILEUPLOAD>> |
| 1. Remove the manifold assembly. \***Protect the burst disc**\* | [[RemoveManifold]] <<CHECKBOX>> |
| 1. Remove the tophat, Mu metal, MLI, and G-10 spacers. | [[RemoveTophat]] <<CHECKBOX>> |
| 1. Carefully un-insulate the waveguide assembly, preserving the MLI for re-use. | [[RemoveMLI]] <<CHECKBOX>> |
| 1. Remove the wiring harness, feedthrus, and diodes pertaining to the waveguide only. | [[RemoveInstrumentation]] <<CHECKBOX>> |
| 1. Support the waveguide, protecting the bellows. | [[SupprtWaveguide]] <<CHECKBOX>> |
| 1. Disconnect the G-10 drive assemblies using the spring pin extraction tool. (x2) | [[FreeDriveAssy]] <<CHECKBOX>> |
| 1. Carefully remove the coaxial cables.\*DO NOT BEND\* | [[RemoveCoaxials]] <<CHECKBOX>> |
| 1. Remove the shield to waveguide extension intercept straps. | [[Remove50kIntercepts]] <<CHECKBOX>> |
| 1. **Leak-check** the waveguide & record data. | [[Technician5A]] <<SRF>>  [[Date5A]] <<TIMESTAMP>>  [[WaveguideLeakCheck]] <<FILEUPLOAD>> |
| 1. Remove the waveguide assembly and place in the stand. This step will involve breaking the indium seal and must be witnessed and sampled by RADCON personnel.   ***\*\* 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\*\**** | [[RemoveWaveguide]] <<CHECKBOX>>  [[Technician5b]] <<SRFCMP>>  [[RAD\_USR5b]] <<RAD>>  [[Date5b]] <<TIMESTAMP>>  [[Comment5b]] <<COMMENT>> |
| 1. Record all necessary component serial numbers. | [[RecordSNs]] <<CHECKBOX>> |
| NOTES:\*\*Cover all openings with foil \*\*Store all components in a safe place\*\* | [[CoverOpenings]] <<CHECKBOX>> |
| Note summary of findings. | [[Technician5c]] <<SRF>>  [[RAD\_USR5c]] <<RAD>>  [[Comment5c]] <<COMMENT>> |

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| Step No | Instructions | Data Input |
| 6 | **Radcon survey of cryounit prior to next phase of work. This step is to identify RAM that is being uncovered as the disassembly progresses. Items are to be tagged by Radcon as required. Add notes in comment box provided describing RAM.** | [[Date6]] <<TIMESTAMP>>  [[Technician6]] <<SRF>>  [[Comment6]] <<COMMENT>> |
| 7 | **Remove the Helium Vessel:** |  |
| Un-insulate the nitronic rod seats. | [[RemoveMLI2]] <<CHECKBOX>> |
| Remove the nitronic rod thermal stationing clamps and G-10 sleeves.  (Do not bend strapping excessively) | [[Remove50kStraps]] <<CHECKBOX>> |
| Remove the axial restraint rods | [[RemoveAxialRods]] <<CHECKBOX>> |
| Remove the lower nitronic rods on both ends.(The weight of the helium vessel is now supported on the top nitronic rods only.) | [[RemoveLowerRods]] <<CHECKBOX>> |
| Install the helium vessel support tooling and secure. Install rail locks. | [[InstallTooling]] <<CHECKBOX>> |
| Remove the remaining nitronic rods (upper) and monitor the load transfer to ensure gradual solid contact with the support tooling. | [[RemoveUpperRods]] <<CHECKBOX>> |
| Roll the vacuum vessel back, separating it from the helium vessel. | [[RemoveVV]] <<CHECKBOX>> |
| Remove the helium vessel MLI and Mu metal. | [[RemoveMLIandMu]] <<CHECKBOX>> |
| Remove the MLI on the helium vessel ends. | [[RemoveHVMLI]] <<CHECKBOX>> |
| Transfer the helium vessel load to the scissors table. | [[TransferHV]] <<CHECKBOX>> |
| Remove vacuum vessel & tooling. | [[RemoveTooling]] <<CHECKBOX>> |
| **Leak-check** the helium vessel assembly. | [[Date7]] <<TIMESTAMP>>  [[Technician7]] <<SRF>>  [[LeakCheckPressureTestData]] <<FILEUPLOAD>> |
| Pressurize the cavity pair to 15 psi, effectively leak checking the cavity pair. |  |
| Record all data. | [[RecordData]] <<CHECKBOX>>  [[Technician7]] <<SRFCMP>>  [[RAD\_USR7]] <<RAD>> |
| Note summary of findings. | [[Comment7]] <<COMMENT>> |
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| Step No | Instructions | Data Input |
| 8 | **Remove the Cavity Pair:** | [[Date8]] <<TIMESTAMP>>  [[Technician8]] <<SRF>> |
| Remove beam line valves.  The cavities may have particulate sampling done, if this is the case valves must remain closed and in place. Note in the comment area. | [[RemoveColdValves]] <<CHECKBOX>> [[Technician8a]] <<SRFCMP>>  [[Date8a]] <<TIMESTAMP>>  [[Comment8a]] <<COMMENT>> |
| Setup helium vessel into the cutting fixture. | [[HVinCuttingFixture]] <<CHECKBOX>> |
| Cut and grind the end dish and helium vessel head welds, remove heads.  **\*\*Grinding media and chips from cutting operations should be controlled and disposed of in approved RADCON containers. Coordinate these operations with RADCON prior to starting\*\*** | [[GrindEndDishes]] <<CHECKBOX>>  [[Technician8b]] <<SRFCMP>>  [[RAD\_USR8b]] <<RAD>>  [[Date8b]] <<TIMESTAMP>>  [[Comment8b]] <<COMMENT>> |
| \*\***NOTE**: Beware of sharp edges and liquid level probes.\*\* |  |
| Tape or deburr all sharp edges. | [[DeburrEdges]] <<CHECKBOX>> |
| Transfer the helium vessel to the scissors table. | [[HVtoScissorsTable]] <<CHECKBOX>> |
| Disconnect the drive assemblies, helium vessel feedthrus, and instrumentation. | [[RemoveInstrumentation2]] <<CHECKBOX>> |
| Remove the coaxial cables, \*Do not bend\* | [[RemoveCoaxialCables]] <<CHECKBOX>> |
| Install the cavity pair assembly fixture and transfer rails into the helium vessel, Ensure proper orientation of all pillow blocks. | [[InstallCavityFixture]] <<CHECKBOX>> |
| Raise the assembly fixture, tighten the thumb screws, grabbing the cavity. | [[RaiseFixture]] <<CHECKBOX>> |
| Remove the four cavity hangers and hardware from the helium vessel feedthru plate.\*\*May be necessary to use the jacking screws to break the indium seal at the fpc to helium vessel joint. This work must be witnessed and sampled by RADCON personnel\*\*  ***\*\* 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\*\**** | [[RemoveTiHangers]] <<CHECKBOX>>  [[Technician8c]] <<SRFCMP>>  [[RAD\_USR8c]] <<RAD>>  [[Date8c]] <<TIMESTAMP>>  [[Comment8c]] <<COMMENT>> |
| Slowly lower the cavity pair assembly fixture, watch for interferences. | [[LowerCavity]] <<CHECKBOX>> |
| Transfer the cavity out of the helium vessel once sufficient clearance is obtained at the fpc flange. | [[PullCavity]] <<CHECKBOX>> |
| Remove all tuners and instrumentation. | [[RemoveTuners]] <<CHECKBOX>> |
| Record serial numbers and note any discrepancies. | [[RecordSNs2]] <<CHECKBOX>> |
| Store components in respective areas. | [[StoreComponents]] <<CHECKBOX>> |
| Turn the cavity pair over to the cavity group for further disassembly. | [[TurnOverCavityPair]] <<CHECKBOX>> |
| Note summary of findings. | [[Comment8d]] <<COMMENT>> |
| 9 | **Radcon survey of cavity assembly prior to turnover. This step is to identify RAM that is being uncovered as the disassembly progresses. Items are to be tagged by Radcon as required. Add notes in comment box provided describing RAM.** | [[Date9]] <<TIMESTAMP>>  [[Technician9]] <<SRF>>  [[Comment9]] <<COMMENT>> |