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| Traveler Title | Downstream Gate Valve / BPM Sub-Assembly Traveler |
| Traveler Abstract | This traveler is for capturing data for the LCLS-II HE downstream sub-assembly (GV2SA), including the downstream bellows, BPM, magnet beam-line, VAT valve, and NEG pump assembly. The downstream sub-assembly will be assembled on the lollipop tooling and leak tested in preparation for further assembly onto the cavity string. |
| Traveler ID | L2HE-CLNRM-BPM-ASSY |
| Traveler Revision  | R1 |
| Traveler Author | Danny Forehand |
| Traveler Date | 8-Dec-21 |
| NCR Informative Emails | hogan,areilly,ganey |
| NCR Dispositioners | forehand,dreyfuss,kdavis |
| D3 Emails | hogan,areilly,forehand,dreyfuss,kdavis,ganey |
| Approval Names | D. Forehand | C. Dreyfuss | K. Davis | J. Hogan |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author | SME | Production Lead | 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. |
| [BPM Lollipop Tooling Image](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-105300/JL0025258.jpg%20BPM%20Assy%20on%20Lollipop.jpg) | [Ionized Nitrogen Cleaning Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-250935/SRF-MSPR-CLNRM-CST-ION-R1.pdf) | [Leak Testing with an RGA Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-250698/SRF-MSPR-CLNRM-LEAK-R1.pdf) | Cleanroom Production Pump System Operation Procedure |  |
| [F10023160-rev-C](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-153539/F10023160_C_DWG1.pdf)[BPM Housing Dwg](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-153539/F10023160_C_DWG1.pdf) | Downstream Gate Valve / BPM Sub-Assembly and Installation Procedure |  |  |  |

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

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| Step No. | Instructions | Data Input |
| 1 | Select the serial number of the cavity string that the BPM sub-assembly is to be assembled for.**Preparation:**Assumptions:1. The rail and the BPM sub-assembly lollipop have been cleaned and staged in the clean room ready for use.
2. The BPM sub-assembly vacuum components are properly cleaned and staged in the clean room ready for assembly. Such components include: BPM housing, 4 BPM feedthrus, magnet beam-line, 4" VAT valve, downstream bellows, Zero length reducer, blank cover flange, NEG pump assembly components, and all required gaskets and required bolt hardware.
3. If assumptions have been verified complete and ready for the BPM sub- assembly, then check "Ready" box.
 | [[CMSN]] <<CMSN>>[[BPMPrepTech]] <<SRFCVP>>[[BPMPrepDate]] <<TIMESTAMP>>[[BPMPrepReady]] <<CHECKBOX>>[[BPMPrepComment]] <<COMMENT>> |
| 2 | Prepare the magnet beam-tube for assembly IAW L2HE-PR-CLNRM-GV2SA-ASSY. Prepare all other components for BPM sub-assembly IAW with the same procedure.Assemble four feed-throughs and the beam-line blank to the BPM housingRecord all serial numbers in appropriate boxesRecord four distances (a,b,c,d) in thousandths of an inch **before** torqueing feed-through fastenersAfter BPM housing is attached to magnet tube, torque fasteners Record four distances (a,b,c,d) in thousandths of an inch **after** torqueing feed-through fasteners  | [[BPMSN]] <<BPMSN>> [[BPMFTSN1]] <<BPMFTSN>>[[BPMFTSN2]] <<BPMFTSN>>[[BPMFTSN3]] <<BPMFTSN>>[[BPMFTSN4]] <<BPMFTSN>> |
| **Flange 1** |
| [[Flange1aPreTorque]] <<FLOAT>> in[[Flange1bPreTorque]] <<FLOAT>> in[[Flange1cPreTorque]] <<FLOAT>> in[[Flange1dPreTorque]] <<FLOAT>> in |
| **Flange 2** |
| [[Flange2aPreTorque]] <<FLOAT>> in[[Flange2bPreTorque]] <<FLOAT>> in[[Flange2cPreTorque]] <<FLOAT>> in[[Flange2dPreTorque]] <<FLOAT>> in |
| **Flange 3** |
| [[Flange3aPreTorque]] <<FLOAT>> in[[Flange3bPreTorque]] <<FLOAT>> in[[Flange3cPreTorque]] <<FLOAT>> in[[Flange3dPreTorque]] <<FLOAT>> in |
| **Flange 4** |
| [[Flange4aPreTorque]] <<FLOAT>> in[[Flange4bPreTorque]] <<FLOAT>> in[[Flange4cPreTorque]] <<FLOAT>> in[[Flange4dPreTorque]] <<FLOAT>> in |
| [[BLXDSN]] <<BLXDSN>>[[BTubetoBPMTorquedTo]] <<FLOAT>>f t/lbs[[BPMAssemblyTech1]] <<SRFCVP>>[[BPMAssemblyTech2]] <<SRFCVP>>[[BPMAssemblyDate]] <<TIMESTAMP>>[[BPMAssemblyComment]] <<COMMENT>> |

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| **Flange 4** |
| Please start with "Torque to 106in/lbs" column |
| Torque to 106 in/lb | Torque to 110 in/lb | Torque to 114 in/lb | Torque to 118 in/lb | Torque 5 to 122 in/lb |
| [[Flange4aPostTorque1]] <<FLOAT>>[[Flange4bPostTorque1]] <<FLOAT>>[[Flange4cPostTorque1]] <<FLOAT>>[[Flange4dPostTorque1]] <<FLOAT>> | [[Flange4aPostTorque2]] <<FLOAT>>[[Flange4bPostTorque2]] <<FLOAT>>[[Flange4cPostTorque2]] <<FLOAT>>[[Flange4dPostTorque2]] <<FLOAT>> | [[Flange4aPostTorque3]] <<FLOAT>>[[Flange4bPostTorque3]] <<FLOAT>>[[Flange4cPostTorque3]] <<FLOAT>>[[Flange4dPostTorque3]] <<FLOAT>> | [[Flange4aPostTorque4]] <<FLOAT>>[[Flange4bPostTorque4]] <<FLOAT>>[[Flange4cPostTorque4]] <<FLOAT>>[[Flange4dPostTorque4]] <<FLOAT>> | [[Flange4aPostTorque5]] <<FLOAT>>[[Flange4bPostTorque5]] <<FLOAT>>[[Flange4cPostTorque5]] <<FLOAT>>[[Flange4dPostTorque5]] <<FLOAT>> |
| [[difference of aPre and aPost (x4). SealCrush = average of four differences]] <<NOTE>> | [[difference of aPre and aPost (x4). SealCrush = average of four differences]] <<NOTE>> | [[difference of aPre and aPost (x4). SealCrush = average of four differences]] <<NOTE>> | [[difference of aPre and aPost (x4). SealCrush = average of four differences]] <<NOTE>> | [[difference of aPre and aPost (x4). SealCrush = average of four differences]] <<NOTE>> |
| [[Flange4difference1\_a]] <<FLOAT>>in[[Flange4difference1\_b]] <<FLOAT>>in[[Flange4difference1\_c]] <<FLOAT>>in[[Flange4difference1\_d]] <<FLOAT>>in | [[Flange4difference2\_a]] <<FLOAT>>in[[Flange4difference2\_b]] <<FLOAT>>in[[Flange4difference2\_c]] <<FLOAT>>in[[Flange4difference2\_d]] <<FLOAT>>in | [[Flange4difference3\_a]] <<FLOAT>>in[[Flange4difference3\_b]] <<FLOAT>>in[[Flange4difference3\_c]] <<FLOAT>>in[[Flange4difference3\_d]] <<FLOAT>>in | [[Flange4difference4\_a]] <<FLOAT>>in[[Flange4difference4\_b]] <<FLOAT>>in[[Flange4difference4\_c]] <<FLOAT>>in[[Flange4difference4\_d]] <<FLOAT>>in | [[Flange4difference5\_a]] <<FLOAT>>in[[Flange4difference5\_b]] <<FLOAT>>in[[Flange4difference5\_c]] <<FLOAT>>in[[Flange4difference5\_d]] <<FLOAT>>in |
| [[Flange4SealCrush1]] <<FLOAT>>in[[Flange4ConvertSealCrush1]] <<FLOAT>>mm | [[Flange4SealCrush2]] <<FLOAT>>in[[Flange4ConvertSealCrush2]] <<FLOAT>>mm | [[Flange4SealCrush3]] <<FLOAT>>in[[Flange4ConvertSealCrush3]] <<FLOAT>>mm | [[Flange4SealCrush4]] <<FLOAT>>in[[Flange4ConvertSealCrush4]] <<FLOAT>>mm | [[Flange4SealCrush5]] <<FLOAT>>in[[Flange4ConvertSealCrush5]] <<FLOAT>>mm |
| [[Flange4Result1]] <<TEXT>>[[convert SealCrush to mm. if answer is <.15mm redo or > .35mm flag as Do Not Continue(big red letters)]] <<NOTE>> | [[Flange4Result2]] <<TEXT>>[[convert SealCrush to mm. if answer is <.15mm redo or > .35mm flag as Do Not Continue(big red letters)]] <<NOTE>> | [[Flange4Result3]] <<TEXT>>[[convert SealCrush to mm. if answer is <.15mm redo or > .35mm flag as Do Not Continue(big red letters)]] <<NOTE>> | [[Flange4Result4]] <<TEXT>>[[convert SealCrush to mm. if answer is <.15mm redo or > .35mm flag as Do Not Continue(big red letters)]] <<NOTE>> | [[Flange4Result5]] <<TEXT>>[[convert SealCrush to mm. if answer is <.15mm redo or > .35mm flag as Do Not Continue(big red letters)]] <<NOTE>> |

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| Step No. | Instructions | Data Input |
| 3 | **Assemble the downstream gate valve sub-assembly (GV2SA):*** Assemble the downstream bellows, BPM, and Beamtube IAW L2HE-PR-CLNRM-GV2SA-ASSY
* Record the bellows serial number.
* Record the final torque value.
* Prepare the VAT 4" valve IAW L2HE-PR-CLNRM-GV2SA-ASSY.
* Record the serial number of VAT valve in this traveler.
* Assemble the Beamtube to the Gate Valve and record the final torque value.
* Prepare the NEG Pump Assembly IAW L2HE-PR-CLRNRM-GV2SA-ASSY and record the NEG pump serial number.
* Assemble the NEG Pump Assembly to the Gate Valve and record the final torque value.
* Verify the NEG pump assembly support is installed IAW L2HE-PR-CLNRM-GV2SA-ASSY.
* GV2SA is now ready to move to leak check station.
 | [[BellowsSN]] <<BLBSSN>>[[BellowsToBtTorque]] <<FLOAT>> ft/lbs[[AMGVSN]] <<AMGVSN>>[[AMGVTorque]] <<FLOAT>> ft/lbs[[NEGPumpAssyTorque]] <<FLOAT>> ft/lbs[[NEGSupportInstalled]] <<CHECKBOX>>[[GV2SAAssyTech1]] <<SRFCVP>>[[GV2SAAssyTech2]] <<SRFCVP>>[[GV2SAAssyDate]] <<TIMESTAMP>>[[GV2SAAssyComment]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 4 | **Pump and Leak test:*** Install the turbo pump vacuum line to the pump valve. Close the 2 3/4" valve on the NEG pump assembly. Verify the 4" VAT valve is open. Ensure the nitrogen purge line is closed at the turbo.
* Perform an automated slow-pumpdown of the sub-assembly
* Start the RGA and leak test the string as per Leak testing with an RGA procedure
* If any leaks are found report to your supervisor for plan of action.
* Close the NEG Pump Assembly right angle valve. Leave the sub-assembly under vacuum. Slow bleed up of the sub-assembly will occur as part of the cavity string assembly procedure.
 | [[SubAssyLeakTech]] <<SRFCVP>> [[SubAssyLeakDate]] <<TIMESTAMP>>[[SubAssyLeakComment]] <<COMMENT>>[[SubAssyLeakTight]] <<CHECKBOX>>[[SubAssyLeakTestData1]] <<FILEUPLOAD>>[[SubAssyLeakTestData2]] <<FILEUPLOAD>>[[NEGValveClosed]] <<CHECKBOX>> |
| 5 | **Remove turbo pump:*** Bleed-up the turbo pump and disconnect the vacuum hose from the turbo pump.
* Clean the pump. Place a clean blank conflat flange onto the pump port of the sub-assembly and secure with a clean gasket and hardware.
 | [[RemoveHose]] <<COMMENT>>[[ReadyforStringTech]] <<SRFCVP>> |
| 6 | **Holdpoints** | [[Holdpoint]] {{forehand,dreyfuss,kdavis}} <<HOLDPOINT>> |