PROCEDURE FOR BACKFILL/PUMPDOWN DEMONSTRATION AND LN2 CONSUMPTION TEST

LIGO VACUUM EQUIPMENT

Hanford, Washington and Livingston, Louisiana

JOB NO. V59049

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1.0 PURPOSE

The purpose of this specification is to define the procedure for performing the 24 hour air purge and subsequent 100 hour pumpdown of an isolatable section. The baseline RGA data obtained after the pumpdown will provide useful information to LIGO for future reference. Also included in this specification is the 240 hour LN2 consumption test procedure.

2.0 GENERAL

It is intended that the backfill/pumpdown demonstration be performed in the isolatable section after the bakeout acceptance test is complete. The baseline data obtained from the backfill/pumpdown demonstration will thus represent a "best case" condition for each isolatable section when compared to future backfill/pumpdowns performed as part of normal operations.
The 240 hour LN2 consumption test will be performed in parallel with the backfill/pumpdown demonstration. This test will verify that cryopump LN2 consumption and LN2 storage tank boiloff meet acceptance criteria.

3.0 REFERENCE DOCUMENTS

PSI specification V049-2-207, Procedure for Operation of the Back to Air Cart
PSI specification V049-2-186, Procedure for RGA Field Calibration for an Isolatable Section
PSI specification V049-2-113, Systems Acceptance Test Procedure, Corner Station
PSI specification V049-2-114, Systems Acceptance Test Procedure, Mid Station
PSI specification V049-2-115, Systems Acceptance Test Procedure, End Station
PSI specification V049-2-143, Operating Procedure 80K Pump

4.0 RESPONSIBILITY

The backfill/pumpdown demonstration and LN2 consumption test will be performed by PSI personnel in conjunction with cognizant LIGO personnel.

5.0 PREREQUISITES

5.1 The isolatable section has been baked and is under vacuum.

5.2 The cryopump(s) is isolated from the main volume and operating with a normal LN2 level between 85-95%.

5.3 The Main Ion Pump(s) is operating and isolated from the main volume.

5.4 The annulus ion pumps are operating.

5.5 The Main Roughing Pumps (corner station) are ready for operation.

5.6 The The Main Turbo Pump is ready for operation.

5.7 The Clean Air System is ready for backfill and purging the isolatable section. Ref. spec.V049-2- 207.

5.8 Pressure , level, and ion pump data should be recorded manually twice per shift and automatically by the LIGO CDS system as appropriate. Data must also be taken at all Start and Stop points during the pumpdown demonstration (see par 6.10)

5.9 RGA is installed and ready for operation. Ref. Spec. V049-2-186.

6.0 PROCEDURE

6.1 The 240 hour LN2 consumption test clock starts when the cryopump LN2 level is normal and the cryopump has reached a steady state operating condition.A warm cryopump will require several days of "soak time" to achieve this condition.

6.2 Backfill the main volume per spec. V049-2-207 sect. 5.0.

6.3 Purge the main volume per spec. V049-2-207 sect. 6.0. The clean air purge duration is 24 hours.

6.4 After completion of the 24 hour clean air purge, isolate the main volume and initiate rough pumping using the Main Roughing Pump (corner station) or QDP80 Turbo backing pump (mid and end stations). The 100 hour pumpdown clock starts (t= 0 hours) when rough pumping begins. Rough pumping is complete when a pressure of 0.1 torr is achieved at t = 4 hours or less.

6.5 After completion of the 4 hour rough pumping phase, isolate the main volume and initiate turbo pumping using the Main Turbo pump.Turbo pumping is complete when a pressure of 5.0×10^{-6} torr or lower is reached at t = 24 hours or less.

6.6 When turbo pumping is complete, isolate the turbo from the main volume and initiate cryopumping by opening the gate valve isolating the cryopump from the main volume. After cryopumping for 6 hours, start ion pumping the main volume by opening the gate valve isolating the Main Ion pump (t = 30 hours). At t = 100 hours the isolatable section pumpdown is complete .

6.7 Record final RGA baseline and calibration scans of the isolatable section per specification V049-2-186.

6.8 The cryopump and the Main Ion pump will stay on line for the duration of LN2 consumption test. Continue recording pressure , level, and ion pump data twice per shift for the duration of the 240 hour LN2 consumption test.

6.9 At the completion of the LN2 consumption test (t = 240 hours), the average LN2 consumption will be calculated based on storage tank level and pressure readings.

6.10 In addition to normal twice per shift data acquisition, data should be taken at each Start and Stop point shown in the following table :

ACTION	START	STOP
Main Volume Backfill and Purge	After Bakeout	24 hour duration
LN2 Consumption Test	T = 0 hours	
Main Volume Rough Pumping	T = 0	T = 4 hours
Main Volume Turbo Pumping	T = 4	T = 24
Main Volume Cryopumping	T = 24	
Main Volume Ion Pumping	T = 30	
100 Hour Pumpdown Completed		T = 100
RGA Baseline, Cal. Scans	T = 100	
LN2 Consumption Test		T = 240
Main Volume Cryopumping		T = 240
Main Volume Ion Pumping		T = 240

DATA SHEET

STATION		ISO. SECT					
OPER.							
DATE							
TIME							
LN2							
PI							
PI							
LI							
LI							
PT							
PT							
LIC							
LIC							
LCV OP							
LCV OP							
LCV CL							
LCV CL							
MAIN V.							
PI							
PI							
PI							
PI							
GH1							
GH2							
GH3							
ION P.							
EI							
EI							
II							
II							

NOTES: