

7.1.67 RHIC Ring Nitrogen Purge Procedure

1. Purpose

This procedure describes the preferred method of establishing a nitrogen purge in the RHIC ring for the purpose of preventing air and moisture from entering the magnet line during maintenance.

2. Responsibilities

- 2.1 A Shift Supervisor, or an Operator designated by the Shift Supervisor, is responsible for conducting the procedure and providing documentation in the Cryogenic Control Room Log and in the Cryogenic Valve Log.
- 2.2 Should a problem arise during the completion of this procedure, the Shift Supervisor shall contact the Technical Supervisor for instructions before continuing.

3. Prerequisites

- 3.1 Refrigerator and compressors shut down
- 3.2 Ring warmed to ambient temperature
- 3.3 M-line and all RUSH lines depressurized throughout ring.
- 3.4 Cryogenic system general shutdown LOTO should be in place.

4. Precautions

- 4.1 Excessive nitrogen flow into tunnel with inadequate ventilation can create an oxygen deficient environment. Therefore, whenever a nitrogen purge is established, POM's are required when working in areas near open magnets in the tunnel.

5. Procedure

Overview: Nitrogen is supplied to the ring from the 6:00 nitrogen dewar. Nitrogen flows through a heater and pressure regulator and into the blue and yellow 6:00 valve box vacuum manifolds. Blue and yellow vacuum manifolds are made common to each other and to the m-lines at each valve box service building around the ring. From the 6:00 vacuum manifolds, nitrogen flows through manual ball valves and into both blue and yellow m-lines. Nitrogen flows away from 6:00 in both directions. At 12:00, nitrogen enters the valve box vacuum manifolds from both directions and is vented to atmosphere outside of the service building. Normally, all automatic valves at each valve box are closed during the nitrogen purge. Flow is controlled by the pressure regulator at 6:00 and by adjusting the manual ball valves at the valve box vacuum manifolds. This setup

ensures the m-line is common with the low pressure relief valves in the vacuum manifolds at each valve box service building.

5.1 From a CRISP system monitor, close all automatic valves at each valve box:

- 12:00 Blue automatic valves closed _____
- 12:00 Yellow automatic valves closed _____
- 2:00 Blue automatic valves closed _____
- 2:00 Yellow automatic valves closed _____
- 4:00 Blue automatic valves closed _____
- 4:00 Yellow automatic valves closed _____
- 6:00 Blue automatic valves closed _____
- 6:00 Yellow automatic valves closed _____
- 8:00 Blue automatic valves closed _____
- 8:00 Yellow automatic valves closed _____
- 10:00 Yellow automatic valves closed _____

Check ring system overview page 177 to ensure that all valves are closed. _____

5.2 Install jumper hose around the 12:00 vacuum pump to connect the vacuum manifold directly to the vacuum pump pvc discharge line to atmosphere. _____

5.3 At 6:00, perform the following:

5.3.1 Open the following vacuum manifold valves:

- H4656M - blue vacuum manifold isolation (crescent wrench req'd) _____
- H4651M - blue m-line to vacuum ball valve (north) _____
- H4646M - blue m-line to vacuum ball valve (south) _____
- H6785M – yellow vacuum manifold isolation (crescent wrench req'd) _____
- H6780M – yellow m-line to vacuum ball valve (north) _____
- H6709M – yellow m-line to vacuum ball valve (south) _____

5.3.2 Open vacuum pump inlet valve V5203M (crescent wrench req'd) to make 3 psig relief common with nitrogen. _____

5.3.3 Verify that all other vacuum manifold ball valves and vacuum slide valves are closed. _____

5.4 At 8:00, perform the following:

5.4.1 Open the following vacuum manifold valves:

- H4877M – vacuum pump inlet isolation – blue _____
- H4872M - blue m-line to vacuum ball valve (S. east) _____
- H4867M - blue m-line to vacuum ball valve (N. west) _____
- H6882M - vacuum pump inlet isolation – yellow _____

H6877M – yellow m-line to vacuum ball valve (S. east) _____
H6872M – yellow m-line to vacuum ball valve (N. west) _____

5.4.2 Verify that all other vacuum manifold ball valves and vacuum slide valves are closed. _____

5.5 At 10:00, perform the following:

5.5.1 Open the following vacuum manifold valves:

H5124M - vacuum pump inlet isolation – blue _____
H5159M - blue m-line to vacuum ball valve (S. west) _____
H4867M - blue m-line to vacuum ball valve (N. east) _____
H7086M - vacuum pump inlet isolation – yellow _____
H7081M - yellow m-line to vacuum ball valve (S. west) _____
H7076M - yellow m-line to vacuum ball valve (N. east) _____

5.5.2 Verify that all other vacuum manifold ball valves and vacuum slide valves are closed. _____

5.6 At 12:00, perform the following:

5.6.1 Open the following vacuum manifold valves:

H4027M - vacuum pump inlet isolation – blue _____
H4085M - blue m-line to vacuum ball valve (west) _____
H4080M - blue m-line to vacuum ball valve (east) _____
H6088M - vacuum pump inlet isolation – yellow _____
H6083M - yellow m-line to vacuum ball valve (west) _____
H6078M - yellow m-line to vacuum ball valve (east) _____

5.6.2 Verify that all other vacuum manifold ball valves and vacuum slide valves are closed. _____

5.7 At 2:00, perform the following:

5.7.1 Open the following vacuum manifold valves:

H4219M - vacuum pump inlet isolation – blue _____
H4272M - blue m-line to vacuum ball valve (N. west) _____
H4267M - blue m-line to vacuum ball valve (S. east) _____
H6276M - vacuum pump inlet isolation – yellow _____
H6271M - yellow m-line to vacuum ball valve (N. west) _____
H6266M - yellow m-line to vacuum ball valve (S. east) _____

5.7.2 Verify that all other vacuum manifold ball valves and vacuum slide valves are closed. _____

5.8 At 4:00, perform the following:

5.8.1 Open the following vacuum manifold valves:

H4433M - vacuum pump inlet isolation – blue	_____
H4475M - blue m-line to vacuum ball valve (N. east)	_____
H4470M - blue m-line to vacuum ball valve (S. west)	_____
H6485M - vacuum pump inlet isolation – yellow	_____
H6480M - yellow m-line to vacuum ball valve (N. east)	_____
H6475M - yellow m-line to vacuum ball valve (S. west)	_____

5.8.2 Verify that all other vacuum manifold ball valves and vacuum slide valves are closed. _____

5.9 Open the following Nitrogen dewar valves:

N5023A	_____
N5050M	_____
N5051M	_____

5.10 Turn on heater (breaker ST6BHTR on 6:00 service bldg north wall). Set temperature to 100 degrees F. _____

5.11 Ensure nitrogen heater outlet pressure regulator is backed off. _____

5.12 Slowly open valve N5016M heater outlet valve. _____

5.13 Adjust regulator to between 0 to 3 psig depending on the number of open magnet lines in the ring. Check flow FE5001N from CRISP screen for LSA area. Adjust regulator to maintain approximately 10scfm per open m-line (excluding openings that have temporary jumper hoses installed) _____

5.14 Ceck each service building vacuum manifold to ensure that no relief valves are lifting. (Verify adequate nitrogen pressure at each service building by temporarily opening the vacuum bellows valve at the inlet to each vacuum pump). _____

5.15 Check connections for any temporary jumper hoses to ensure that there is no excessive nitrogen leakage. _____

5.16 Verify that there is adequate, but not excessive nitrogen flow out of all open m-line locations in the tunnel. If flow needs to be balanced, or if nitrogen flow needs to be cut back while work is being performed in the immediate area of an open m-line, throttle flow according to the following table:

Open M-line location

Throttle valves

sector 12/1 blue
sector 12/1 yellow

H4080M at 12blue vlv bx and H4272M at 2blue vlv bx
H6078M at 12yllw vlv bx and H6271M at 2yllw vlv bx

sector 2/3 blue
sector 2/3 yellow

H4267M at 2blue vlv bx and H4475M at 4blue vlv bx
H6266M at 2yllw vlv bx and H6480M at 4yllw vlv bx

sector 4/5 blue
sector 4/5 yellow

H4470M at 4blue vlv bx and H4651M at 6blue vlv bx
H6475M at 4yllw vlv bx and H6780M at 6yllw vlv bx

sector 6/7 blue
sector 6/7 yellow

H4646M at 6blue vlv bx and H4872M at 8blue vlv bx
H6709M at 6yllw vlv bx and H6877M at 8yllw vlv bx

sector 8/9 blue
sector 8/9 yellow

H4867M at 8blue vlv bx and H5159M at 10blue vlv bx
H6872M at 8yllw vlv bx and H7081M at 10yllw vlv bx

sector 10/11 blue
sector 10/11 yellow

H5154M at 10blue vlv bx and H4085M at 12blue vlv bx
H7076M at 10yllw vlv bx and H6083M at 12yllw vlv bx

5.17 If there are several locations where the m-line is open, it may be necessary to shut the vent path to atmosphere at 12:00 (H4027M and H6088M).

6. Documentation

6.1 The check-off lines are for place-keeping only. The procedure is not to be initialed or signed, it is not a record.

6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

7. References

None

8. Attachments

None