Operators Manual for Purge Type Gas Systems

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1.0 The HTCC CO_2 Purge Gas Supply

1.1 Purpose

The purpose of this set of procedures is to allow for the startup and shutdown of the CO_2 gas flow to the HTCC.

1.2 Overview

The HTCC gas supply is shared with the DC Gas System. Gas is supplied from a 160-liter liquid CO_2 dewars. CO_2 gas is supplied at reduced pressure, 15 psi to the Hall supply line. A mass flow controller, MFC, meters the gas flow to the HTCC detector volume.

1.3 System Startup

1. Check that liquid CO2 dewars are in place and online.
2. Slowly open the HTCC gas supply valve in the 96B Gas Shed and monitor the pressure indicated on the pressure regulator output gauge.
3. Adjust the HTCC gas supply pressure regulator to 15 psi.
4. Using the HTCC gas controls GUI, adjust the gas flow setpoint to the desired flow.

1.4 System shut down

CAUTION - Do not secure CO_2 flow without the Hall B Engineers instructions.

1. Close the HTCC gas supply valve in the Gas Shed.

2.0 The RICH N_2 and Air Cooling Purge

2.1 Purpose

The purpose of this set of procedures is to allow for the startup and shutdown of the N_2 gas purge flow and air cooling flow to the RICH. The N_2 purge should not be shut down without permission from the Hall B engineer.

2.2 Overview

The N_2 aerogel purge supply is connected to the N_2 supply line originating from the Gas Shed. Supply line pressure is reduced to 15 psi by a pressure regulator. The gas flows through a charcoal 0.01-micron filter. The purge supply is then split into two circuits, RICH1 and RICH2. Flow rotometers control the flow rate and flow transducers transmit the flowrate to EPICS.

The air cooling flow is supplied from a pair of specialty Class 0 air compressors. The compressors maintain pressure in the 240-gallon receiver at 100 psi. After the receiver, flow is split into two circuits for RICH1 and RICH2. Pressure is reduced by pressure regulators and flow is controlled by flow rotometers. Flow transducers transmit flow rates to the interlock system and EPICS. Pressure in the receiver is monitored by a transducer, which transmits this information to the interlock system and EPICS. The compressors, 240-gallon air receiver, and valve panels are located on the top level of the forward carriage.

Access to this level is by vertical ladder only.

2.3 Procedures

2.3.1 The N_2 Aerogel Purge

2.3.1.1 N_2 Purge Startup

1. Slowly open the N_2 purge supply valve, N2-Supply, and monitor the pressure indicated on the pressure regulator output gauge, N2-PRESS.
2. Adjust the N_2 gas supply pressure regulator to 15 psi.
3. Slowly open the N_2 supply valve N2-RICH1 for RICH1, N2-RICH2 for RICH2, or both valves if both RICH sectors are installed.
4. Adjust the flow rotometers to the desired flow rate, N2-FLOW1 for RICH1 and N2-FLOW2 for RICH2.
5. Verify that the local flow displays on the flow transducers, N2-MFM1 and N2-MFM2 match the rotometers, N2-FLOW1 and N2-FLOW2.

2.3.1.2 N_2 Purge shutdown

CAUTION - Do not secure N_2 flow without the Hall B Engineers instructions.

1. Close the N_2 supply valve N2-RICH1 for RICH1, N2-RICH2 for RICH2, or both valves if both RICH sectors are to be removed.

2.3.2 The Air Cooling System Operation

The RICH air cooling supply cools the internal electronics package of the detector.

2.3.2.1 Normal Air Cooling System Valve Lineup for System Startup

1. Open or check open the air compressor outlet valve on each compressor, AC1 and AC2.
2. Open or check open both air receiver supply valves, COMP1 and COMP2, on the valve panel.
3. Close or check closed both RICH1 and RICH2 air cooling supply outlet valves, AC-OUT1 and AC-OUT2, on the valve panel.

2.3.2.2 Normal System Startup

1. Start up the air compressors using the system control GUI.
2. When the receiver pressure has reached 80 psi, slowly open the air supply valves, AC-OUT1 for RICH1, AC-OUT2 for RICH2, or both.
3. Verify proper air cooling supply pressure on both pressure regulator gauges, AC-PRESS1 and AC-PRESS2.
4. Verify that flows AC-RICH1, AC-RICH2, AC-MFM1, and AC-MFM2 are correct.

2.3.2.3 System Shutdown

1. Shut down the air compressors using the GUI.
2. Close the air supply valves for AC-OUT1 for RICH1, AC-OUT2 for RICH2, or both.

2.4 Cooling Circuit Power Supply Interlocks

2.4.1 Purpose

The RICH detector electronics are sealed inside the detector. This package uses HV and LV power, creating a heat load. This heat must be removed to prevent damage to the electronics package and the adjacent TOF panels. Air cooling was determined to be the only viable method.

2.4.2 The Cooling Circuit

High capacity air compressors supply clean, dry air at room temperature to cool the electronics package inside the detector. The plan is to have two compressors in parallel, charging a 1000-liter capacity air tank. Air pressure is reduced to supply manual valve flow meters, one per detector. In the case of a power outage, the air tank should contain sufficient air to remove the latent heat of the electronics package.

2.4.3 Cooling Circuit Power Supply Interlocks

Powering the electronics package inside the RICH without cooling may result in severe damage or fire. Interlocking RICH HV and LV power supply operation to proper cooling circuit operation eliminates this hazard.

The interlocks perform two functions in the case of a cooling system fault.

- Turns off power to the electronics package.
- Prevents energizing the electronics package.

There are three cooling circuit interlocks.

- Air Compressor Operation – Minimum one compressor operating (and/or).
- Minimum Air Pressure in Tank – Pressure in air tank must be > TBD psi.
- Minimum Cooling Air Flow – Flow to RICH must be >TBD slm.

All three interlocks must be true for the electronics package to have power.

3.0 The FT N_2 Purge

The FT N_2 purge prevents ice from forming due to humid air contacting the low temperature calorimeter surfaces.

3.1 N_2 Purge Startup

1. Open the N_2 supply valve.
2. Adjust the pressure regulator to 15 psi.
3. Adjust the flow rotometer to the correct value.
4. Verify correct N_2 purge flow on the GUI MFM flow read back.

3.2 N_2 Purge Shutdown

1. Close the N_2 supply valve.

4.0 The SVT N_2 Purge

The SVT N_2 purge reduces the humidity in the air volume surrounding the SVT to minimize HV currents.

4.1 N_2 Purge Startup

1. Open the N_2 supply valve.
2. Adjust the pressure regulator to 15 psi.
3. Set the correct purge flow on the MFC using the GUI.

4.2 N_2 Purge shutdown

1. Close the N_2 supply valve.