

# IRIS Ion Chamber Gas System Procedures

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## 1 Preparations

At least one day prior to the start of the experiment, contact Philip Lu (philiplu@triumf.ca, phone 6575) and Rick Maharaj (rickster@triumf.ca, phone 7499) to set up the isobutane supply system, leak check and purge gas supply lines, etc.

## 2 Pump down from Atmosphere (IC and Diagnostic Box)

1. Open **GS2:VB4** manual valve.
2. Select Pump/Vent mode for **SEBT2:MDGS2**.
3. Open **GS2:VA2**.
4. Open **SEBT2:RV3A**, and pump down to **SEBT2:CG3** < 180 Torr → **RV3A** closes automatically.
5. Open **SEBT2:RV3**, pump down to **CG3** < 100 mTorr → **RV3** closes automatically.
6. Open **SEBT2:BV3**, then turn on **SEBT2:TP3**. **GS2:VA2** closes automatically.

## 3 Start Gas Flow to IC

Assumes the IC diagnostic box have been pumped down to vacuum and **SEBT2:TP3** is running.

1. Ensure manual valves **GS2:VB1** and **GS2:VB6** on the IRIS panel on the beam line are open.
2. Close manual valve **GS2:VB4**.
3. Select Normal mode for **SEBT2:MDGS2**.
4. Ensure scroll pump **GS2:SP1** is turned on.
5. Open **GS2:VA3**.
6. Set the PID controller for the desired operating pressure. Increase the setpoint of the controller in steps until you are at the operating pressure.
7. Once **SEBT2:TP3** is at full speed, turn on **SEBT2:PNG3**.
8. Open **GS2:VA1**, adjust the manual needle valve **GS2:VN2** such that the **GS2:FC1** flow is  $\approx 90$  cc/min as the pressure on **GS2:PA1** approaches the PID setpoint.
9. Monitor **SEBT2:PNG3** for any signs of gas leaking from the IC to the diagnostic box.
10. Once the pressure and flow have stabilized at the desired values, turn on the IC HV on Bertram HV module and adjust to operating voltage (600 V at 19.5 Torr).
11. Latch current trip on Bertram HV unit (trip/hold switch on "hold").

## 4 Remove Isobutane from IC

1. Flip trip/hold switch on Bertram HV to "reset". Turn off IC HV.
2. Close **GS2:VA1** (auto HV inhibit).
3. Allow **GS2:PA1** to fall below 5 Torr. You can slowly open (**GS2:VN2** to speed up the process. The **GS2:SP1** pressure will trip off **GS2:VA3** if a high flow at the inlet to pump **GS2:SP1** causes too much pressure. **GS2:PA1** decreasing at  $\approx 1$  Torr/sec is a safe (non-tripping) rate. If **GS2:VA3** trips off, close **GS2:VN2** a bit, reset and open **GS2:VA3**.
4. Once **GS2:PA1**  $< 5$  Torr, open manual valve **GS2:VB4** and pump down to **GS2:PA1**  $< 0.2$  Torr.

## 5 Vent to Atmosphere

Assumes the isobutane has been pumped out of the IC with scroll pump **GS2:SP1** to **GS2:PA1**  $< 0.2$  Torr.

1. Select Pump/Vent mode for **SEBT2:MDGS2**. **GS2:VA1** and **GS2:VA3** close automatically.
2. Turn off turbo pump **SEBT2:TP3**.
3. Open **GS2:VA2**.
4. Open vent valve **SEBT2:VV3**.

## 6 End of Run

Contact Philip Lu (philiplu@triumf.ca, phone 6575) and Rick Maharaj (rickster@triumf.ca, phone 7499) to shut down the gas system, purge the gas supply lines, shut off gas supplies at the gas shack, etc.

## 7 Leak Checking

If any of the gas or IC plumbing has been disturbed, e.g. the IC removed from the diagnostic box, or if the system hasn't been used for a long period, leak checking of the IC and diagnostic Box should be performed.

To test for leaks, increase the IC pressure to  $\approx 20$  Torr, then close **GS2:VA3** (**GS2:VA1** turns off automatically) and turn off **SEBT2:TP3**. Monitor **GS2:PA1** and **SEBT2:CG3** for any changes indicating leaks. Leaks could be from atmosphere to IC (**PA1** increases, **CG3** steady), IC to diagnostic box (**PA1** decreases, **CG3** increases), or from atmosphere to diagnostic box (**PA1** steady, **CG3** increases). Once a leak free system is verified, return to normal operation: Open **SEBT2:BV3**, turn on **SEBT2:TP3**, open **GS2:VA3**, set desired PID pressure setpoint, turn on **SEBT2:PNG3**, open **GS2:VA1**, and adjust flow with **GS2:VN2**

### Note

If **GS2:VN2** is fully open:

- max. available flow of 240 cc/min  $\rightarrow$  **GS2:PA1** pressure  $\approx 5.8$  Torr
- recommended max. flow of 130 cc/min  $\rightarrow$  **GS2:PA1** pressure  $\approx 3.5$  Torr
- recommended typical flow of 90 cc/min  $\rightarrow$  **GS2:PA1** pressure  $\approx 2.65$  Torr
- recommended min. flow of 50 cc/min  $\rightarrow$  **GS2:PA1** pressure  $\approx 1.7$  Torr