Brookhaven National Laboratory **National Synchrotron Light Source**	**Number:** LS-OPS-0061	**Revision: B**
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Subject:	**VACUUM PROCEDURES FOR BEAMLINE U13UB**		

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*Document must contain approved signatures for validity.

The following procedures must be followed when bleeding up different beam line sections and when returning these sections to operation .

I.   FRONT-END (PROCEDURE TO BE PERFORMED BY NSLS VACUUM GROUP ONLY)

A.   Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Refer to Front-End Vacuum Procedures (SLS-07.19-13-1).

B. Return to Operation
1. Notify the Coordinator (Beeper 5824).
2. Refer to Front-End Vacuum Procedures (SLS-07.19-13-1).

II.   SECTION BETWEEN VALVE V1A/B AND VALVE V2B (M0A and M1A Mirror Boxes)

A.   Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V1A/B and Front End Valve.
3. Hook up turbo pump to this section.
4. Coordinator places yellow tags on Valve V1A/B and Front End Valve.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors Front End pressure.

B.   Return to Operation
1. Bake and pump to $< 2 \times 10^{-9}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V1A/B into Front End provided pressure $< 2 \times 10^{-9}$ Torr downstream of valve.
5. Perform RGA scan.*
6. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve V1A/B and Front End Valve.
7. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

III.   SECTION BETWEEN VALVE V2B AND VALVE V3B (M0B and M0C Mirrors Section)

A.   Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V2B and Valve V1A/B.
3. Hook up turbo pump to this section.
4. Coordinator places yellow tags on Valve V2B and Valve V1A/B.

5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in M0A and M1A Mirror Boxes.

B. Return to Operation

1. Bake and pump to $< 5 \times 10^{-9}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V2B into M0A and M1A Mirror Boxes provided pressure $< 5 \times 10^{-9}$ Torr downstream of valve.
5. Open Valve V1A/B into Front End provided pressure $< 2 \times 10^{-9}$ Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve V2B and Valve V1A/B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

IV. SECTION BETWEEN VALVE V3B AND VALVE V4B (M1B Mirror section)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V3B and V2B.
3. Hook up turbo pump to this section.
4. Coordinator places yellow tags on Valve V3B and Valve V2B.
5. Slowly bleed up with boil-off N_2 while Coordinator monitors pressure in M0B and M0C Mirrors section.

B. Return to Operation

1. Bake and pump to $< 1 \times 10^{-8}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V3B into M0B and M0C Mirrors section provided pressure $< 1 \times 10^{-8}$ Torr downstream of valve.
5. Open Valve V2B into M0A and M1A Mirrors Boxes provided pressure $< 5 \times 10^{-9}$ Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve V3B and Valve V2B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

V. SECTION BETWEEN VALVE V4B AND VALVE V5B (Monochromator section)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V4B and V3B.
3. Hook up turbo pump to this section.
4. Coordinator places yellow tags on Valve V4B and Valve V3B.
5. Slowly bleed up with boil-off N_2 while Coordinator monitors pressure in M1B Mirror section.

B. Return to Operation

1. Bake and pump to $< 5 \times 10^{-8}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V4B into M1 Mirror section provided pressure $< 5 \times 10^{-8}$ Torr downstream of valve.
5. Open Valve V3B into M0B and M0C Mirrors section provided pressure $< 1 \times 10^{-8}$ Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve V4B and Valve V3B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

VI. SECTION BETWEEN VALVE V5B AND VALVE V6B (M2 Refocusing Mirror section)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V5B and V4B.
3. Hook up turbo pump to this section.
4. Coordinator places yellow tags on Valve V5B and Valve V4B.
5. Slowly bleed up with boil-off N_2 while Coordinator monitors pressure in Monochromator section.

B. Return to Operation

1. Bake and pump to $< 1 \times 10^{-7}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V5B into Monochromator section provided pressure $< 1 \times 10^{-7}$ Torr downstream of valve.
5. Open Valve V4B into M1B Mirror section provided pressure $< 5 \times 10^{-8}$ Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve V5B and Valve V4B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

VII. SECTION DOWNSTREAM OF VALVE V6B (Experimental Chamber)

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve V6B and V5B.
3. Hook up turbo pump to this section.
4. Coordinator places yellow tags on Valve V6B and Valve V5B.

5. Slowly bleed up with boil-off N$_2$ while Coordinator monitors pressure in M2 Refocusing Mirror section.

B. **Return to** *Windowless Operation (i.e. glass window valve V6B open when beam is on)*

1. Bake and pump to $< 1 \times 10^{-7}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve V6B into M2 Refocusing Mirror section provided pressure $< 1 \times 10^{-7}$ Torr downstream of valve.
5. Open Valve V5B into Monochromator section provided pressure $< 1 \times 10^{-7}$ Torr downstream of valve.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve V6B and Valve V5B.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

C. **Return to** *Windowed Operation (i.e. glass window valve V6B closed with beam on)******

1. Leave yellow tag on Valve V6B, which remains closed.
2. Notify the Coordinator (Beeper 5824).
3. Open Valve V5B into Monochromator section provided pressure $< 1 \times 10^{-7}$ Torr downstream of valve.
4. If pressure readings are satisfactory, Coordinator removes yellow tag from Valve V5B.

* NSLS POLICY FOR RGA SCANS (24 HOUR NOTICE REQUIRED)

An RGA scan is required before returning to operation if there is a major change of hardware in the vacuum system, i.e. changing of samples, mirrors, windows, monochromator crystals or gratings, manipulators, detectors, etc., **with the following two exceptions:**

1.   After UHV sample chambers have been bled up for replacing components, an RGA scan will not be required if the chamber pressure is returned to $< 2 \times 10^{-9}$ Torr and the Front End pressure remains $< 2 \times 10^{-9}$ Torr when vacuum sections upstream of the chamber are opened into the Front End.

2.   If any vacuum section upstream of the bled-up section remains at a pressure of $< 9 \times 10^{-10}$ Torr as read using a hot-filament ion gauge, when the entire beamline is opened into the Front End, and the Front End pressure does not increase, no RGA is required.

** NSLS TURBO PUMP POLICY

An unprotected turbo pump is one not separated from the Front End by a beamline valve which automatically closes in the event of a power loss or a pressure increase at the turbo pump. **No unprotected turbo pump can share a contiguous vacuum with the Front End.**

*** POWER LOAD ISSUES ON GLASS WINDOW VALVE V6B

Power load calculations (performed by SLH, June 2003) show the absorbed power density on the glass window in Valve V6B is less than 10 microWatts/mm^2 even for the highest possible power from the U13 insertion device

(K=6.7 when fully closed, gap = 33.5mm). The beamline parameters used for this calculation are: VUV ring current = 1000 mA, entrance and exit slits wide open, and grating at zero order. The NSLS administrative limit is an absorbed power density of 10 mW/mm^2. Therefore, this window may be used for any settings of the monochromator, the entire range of U13 insertion device gap values, and up to 1000 mA ring current. N.B. The total incident power density on the window (absorbed plus transmitted) is ~5 times larger than the absorbed value given above, i.e. the incident power density is ~50 micro Watts/mm^2. This is still 200 times lower than the administrative limit.

NSLS REVISION/REVIEW LOG		
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> See NSLS Quality Control Coordinator for review signatures <

REVISION TABLE		
Rev	**Description**	**Date**
B	Section VIIB retitled from Return to Operation to "Return to Operation in Windowless Operation", addition of Section VIIC "Return to Operation in Windowed Operation". Initial release into Controlled Document System.	07/11/03