

Brookhaven National Laboratory/ LIGHT SOURCES DIRECTORATE			
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*Approval signatures on file with master copy.

The following procedures must be followed when bleeding up different beam line sections and when returning these sections to operation (refer to U7A Beam Line Layout Drawing SLS-96.47-001-5):

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 1A AND VALVE 2A, Entrance Slit Section

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 1A and Front End Valve.
3. Coordinator places yellow tag on Valve 1A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N₂ 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 1A 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 tag from Valve 1A.
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 2A AND VALVE 3A, Grating Chamber

A. Bleed-Up

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

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5. Slowly bleed-up with boil-off N₂ while Coordinator monitors pressure in Entrance Slit section.

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 2A into Entrance Slit section provided pressure $< 2 \times 10^{-9}$ Torr downstream of valve.
5. Open Valve 1A 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 2A and Valve 1A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

C. Oxygen-cleaning mode of operation of grating chamber

The grating chamber may be bled up to 1×10^{-6} Torr of oxygen at any time for the purpose of carbon-removal cleaning of the grating (using the synchrotron beam), provided the following interlocks are in place and operating: (a) valve 1A must be interlocked to the pressure reading of the gauge just downstream of valve 1A (which is just upstream of the upstream differential ion pump), such that valve 1A will close if this pressure rises above 2×10^{-8} Torr, and (b) the gate valve between the grating chamber and the leak valve which admits the oxygen must be interlocked to the discharge gauge reading in the grating chamber, such that this valve will close if this pressure reading rises above 1×10^{-5} Torr. N.B.: the grating chamber ion pump must be off when oxygen is admitted. The differential ion pumps upstream and downstream of the grating chamber are able to maintain the pressure upstream and downstream of these pumps, respectively, below 2×10^{-9} Torr for oxygen partial pressures less than or equal to 1×10^{-6} Torr in the grating chamber.

IV SECTION BETWEEN VALVE 3A AND VALVE 4A, Exit Slit Section

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 3A and Valve 2A.
3. Coordinator places yellow tags on Valve 3A and Valve 2A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N₂ while Coordinator monitors pressure in Grating Chamber.

B. Return to Operation

1. Bake and pump to $< 2 \times 10^{-8}$ Torr.
2. Notify the Coordinator (Beeper 5824).

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3. Prepare for RGA scan.*
4. Open Valve 3A into Grating Chamber provided pressure $< 2 \times 10^{-8}$ Torr downstream of valve.
5. Open Valve 2A into Entrance Slit section 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 3A and Valve 2A.
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 4A AND VALVE 5A, I0 Chamber

A. Bleed-Up

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

B1. Return to Operation if I0 Chamber is Ultra High Vacuum (UHV) type:

1. Bake and pump to 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve 4A into Exit Slit section provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
5. Open Valve 3A into Grating Chamber 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 4A and Valve 3A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

B2. Return to Operation if I0 Chamber is non-UHV type:

1. Pressure interlock to valve Valve 5A and Valve 4A must be in place and operating at a trip point 2×10^{-5} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Temporarily open Valve 4A into Exit Slit section. Valve 4A can remain open **ONLY** if pressure in Exit Slit section is $< 1 \times 10^{-7}$ Torr.
5. Open Valve 3A into Grating Chamber provided pressure $< 1 \times 10^{-7}$ Torr downstream of valve. Pressure in Grating Chamber must be $< 1 \times 10^{-8}$ Torr, pressure in Entrance Slit section must be $< 2 \times 10^{-9}$ Torr, and pressure in Front End must be $< 2 \times 10^{-9}$ Torr.

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6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve 4A and Valve 3A.
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 5A and VALVE 6A, Imaging NEXAFS endstation

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 5A and Valve 4A.
3. Coordinator places yellow tags on Valve 5A and Valve 4A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N₂ while Coordinator monitors pressure in I0 Chamber.

B. Return to Operation (Imaging NEXAFS endstation is non-UHV type)

1. Pressure interlock to valve Valve 5A and Valve 4A must be in place and operating at a trip point $\leq 1 \times 10^{-6}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Temporarily open Valve 5A into I0 Chamber. Valve 5A can remain open **ONLY** if pressure in I0 Chamber is $< 1 \times 10^{-6}$ Torr.
5. Open Valve 4A into Exit Slit section. Valve 4A can remain open **ONLY** if pressure in Exit Slit section is $< 2 \times 10^{-8}$ Torr.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve 5A and Valve 4A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

C. Bleed-Up of Sample Preparation Section Only

Sections **A** and **B** above apply†, as if the entire Imaging NEXAFS endstation were being Bled-Up and Returned to Operation, with the following exception: valve 5A and valve 4A may be opened to allow beam to pass through to experimental stations downstream provided pressure in the Sample Preparation Section is $< 1 \times 10^{-6}$ Torr. In this case, pressure interlock to valve Valve 5A must be in place and operating at a trip point $\leq 1 \times 10^{-6}$ Torr, and the valve between the Sample Preparation Section and the main section of the Imaging NEXAFS endstation must be yellow tagged†. This yellow tag may be removed when the conditions in section B above are met when this valve is opened.

†N.B.: for the Sample Preparation Section only, Coordinator notification and yellow tagging are **NOT** required for the following U7A PRT members listed on Document LS-OPS-0068 supplementing this document.

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VII. SECTION BETWEEN VALVE 6A and VALVE 7A, Refocusing Mirror Chamber #1

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 6A and Valve 5A.
3. Coordinator places yellow tags on Valve 6A and Valve 5A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N₂ while Coordinator monitors pressure in section upstream of Valve 6A.

B. Return to Operation

1. Bake and pump to 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve 6A into Beam Transport section provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
5. Open Valve 5A into I0 chamber provided pressure $< 1 \times 10^{-6}$ 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 6A and Valve 5A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

VIII. SECTION BETWEEN VALVE 7A and VALVE 8A, Experiment #1 I0 Chamber

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 7A and Valve 6A.
3. Coordinator places yellow tags on Valve 7A and Valve 6A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N₂ while Coordinator monitors pressure in Refocusing Mirror Chamber #1.

Bl. Return to Operation if Experiment #1 I0 Chamber is Ultra High Vacuum (UHV) type:

1. Bake and pump to 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve 7A into Refocusing Mirror Chamber #1 provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
5. Open Valve 6A into Beam Transport section provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
6. Perform RGA scan.*

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7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve 7A and Valve 6A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

B2. Return to Operation if Experiment #1 I0 Chamber is non-UHV type:

1. Pressure interlock to valve Valve 7A and Valve 6A must be in place and operating at a trip point $\leq 2 \times 10^{-5}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Temporarily open Valve 7A into Refocusing Mirror Chamber #1. Valve 7A can remain open **ONLY** if pressure in Refocusing Mirror Chamber #1 is $< 1 \times 10^{-6}$ Torr.
5. Open Valve 6A into Beam Transport section. Valve 6A can remain open **ONLY** if pressure in Beam Transport section is $< 1 \times 10^{-6}$ Torr.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve 7A and Valve 6A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

IX. SECTION BETWEEN VALVE 8A and VALVE 9A, Experimental Chamber #1

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 8A and Valve 7A.
3. Coordinator places yellow tags on Valve 8A and Valve 7A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in Experiment #1 I0 Chamber.

B1. Return to Operation if Experimental Chamber #1 is Ultra High Vacuum (UHV) type:

1. Bake and pump to 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve 8A into Experiment #1 I0 Chamber provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
5. Open Valve 7A into Refocusing Mirror Chamber #1 provided pressure $< 1 \times 10^{-6}$ 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 8A and Valve 7A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

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B2. Return to Operation if Experimental Chamber #1 is non-UHV type:

1. Pressure interlock to valve Valve 8A and Valve 7A must be in place and operating at a trip point $\leq 2 \times 10^{-5}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Temporarily open Valve 8A into Experiment #1 I0 Chamber. Valve 8A can remain open **ONLY** if pressure in Experiment #1 I0 Chamber is $< 1 \times 10^{-6}$ Torr.
5. Open Valve 7A into Refocusing Mirror #1 Chamber. Valve 7A can remain open **ONLY** if pressure in Refocusing Mirror #1 Chamber is $< 1 \times 10^{-6}$ Torr.
6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve 8A and Valve 7A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

C. Bleed-Up of Sample Preparation Section Only

Sections A, B1 and B2 above apply††, as if the entire Experimental Chamber #1 were being Bled-Up and Returned to Operation, with the following exception: valve 8A and valve 7A may be opened to allow beam to pass through to experimental stations downstream provided pressure in the Sample Preparation Section is $< 1 \times 10^{-6}$ Torr. In this case, pressure interlock to valve Valve 8A must be in place and operating at a trip point $\leq 2 \times 10^{-5}$ Torr, and the valve between the Sample Preparation Section and the main section of Experimental Chamber #1 must be yellow tagged†. This yellow tag may be removed when the conditions in either section B1 or section B2 above are met when this valve is opened.

††N.B.: for the Sample Preparation Section only, Coordinator notification and yellow tagging are **NOT** required for the following U7A PRT members listed on Document LS-OPS-0068 supplementing this document.

X. SECTION BETWEEN VALVE 9A and VALVE 10A, Refocusing Mirror Chamber #2

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 9A and Valve 8A.
3. Coordinator places yellow tags on Valve 9A and Valve 8A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in Experimental Chamber #1.

B. Return to Operation

1. Bake and pump to 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).

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3. Prepare for RGA scan.*
4. Open Valve 9A into Experimental Chamber #1 provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
5. Open Valve 8A into Experiment #1 I0 Chamber provided pressure $< 1 \times 10^{-6}$ 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 9A and Valve 8A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

XI. SECTION DOWNSTREAM OF VALVE 10A, Experimental Chamber #2

A. Bleed-Up

1. Notify the Coordinator (Beeper 5824).
2. Close and seal Valve 10A and Valve 9A.
3. Coordinator places yellow tags on Valve 10A and Valve 9A.
4. Hook up turbo pump to this section.
5. Slowly bleed-up with boil-off N_2 while Coordinator monitors pressure in Refocusing Mirror #2 Chamber.

B1. Return to Operation if Experimental Chamber #2 is Ultra High Vacuum (UHV) type:

1. Bake and pump to 1×10^{-6} Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Open Valve 10A into Refocusing Mirror #2 Chamber provided pressure $< 1 \times 10^{-6}$ Torr downstream of valve.
5. Open Valve 9A into Experimental Chamber #1 provided pressure $< 1 \times 10^{-6}$ 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 10A and Valve 9A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

B2. Return to Operation if Experimental Chamber #2 is non-UHV type:

1. Pressure interlock to valve Valve 10A and Valve 9A must be in place and operating at a trip point $\leq 2 \times 10^{-5}$ Torr.
2. Notify the Coordinator (Beeper 5824).
3. Prepare for RGA scan.*
4. Temporarily open Valve 10A into Refocusing Mirror #2 Chamber. Valve 10A can remain open **ONLY** if pressure in Refocusing Mirror #2 Chamber is $< 1 \times 10^{-6}$ Torr.
5. Open Valve 9A into Experimental Chamber #2. Valve 9A can remain open **ONLY** if pressure in Experimental Chamber #2 is $< 1 \times 10^{-6}$ Torr.

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6. Perform RGA scan.*
7. If RGA scan or pressure reading (if no RGA scan required) is satisfactory, Coordinator removes yellow tags from Valve 10A and Valve 9A.
8. Remove any unprotected turbo pump from this section or valve off the turbo pump and place a yellow tag on the valve.**

*** 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.**

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3 Years

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LIGHT SOURCES DIRECTORATE REVISION LOG		
Document Number:	LS-OPS-0031	
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Rev	Description	Date
B	Initial release in to the Controlled Document System.	February 2001
C	Change to Sect. IX C. Removal of names permitted to vent Sect. IX C without OpCo presence. Document LS-OPS-0068 supplements this procedure with a list of approved personnel.	01/28/04
D	Entire Sect. VI re-written to reflect the addition of the Imaging NEXAFS End Station. Replaced C. Forester with E. Hu as Approver.	04/15/2010