

SAAO Instrumentation Standard Operating Procedure

Title:	Removal and re-installation of SpUpNIC lower-box covers
Document Number:	
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VERSION HISTORY

Document Number	Author	Version	Date	Change History
	Egan	1	17/11/2015	Original
	Lisa	2	22/08/2016	Updated to reflect the current status of the instrument
	Lisa	3	10/02/2017	Further updates following changes to the grating mechanism

ACRONYMS AND ABBREVIATIONS

NRF	National Research Foundation
SAAO	South African Astronomical Observatory
SOP	Standard Operating Procedure
SpUpNIC	Spectrograph Upgrade: Newly Improved Cassegrain

DEFINITIONS

South Cover	Cover section on south side of instrument when telescope is parked at the zenith
North Cover	Cover section on north side of instrument when telescope is parked at the zenith

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1. Purpose

The purpose of this document is to explain the procedure required for the removal and re-installation of the spectrograph's protective covers.

2. Constraints and Warnings

This is at least a two-person task, having a third pair of hands available to help wherever necessary is highly recommended.

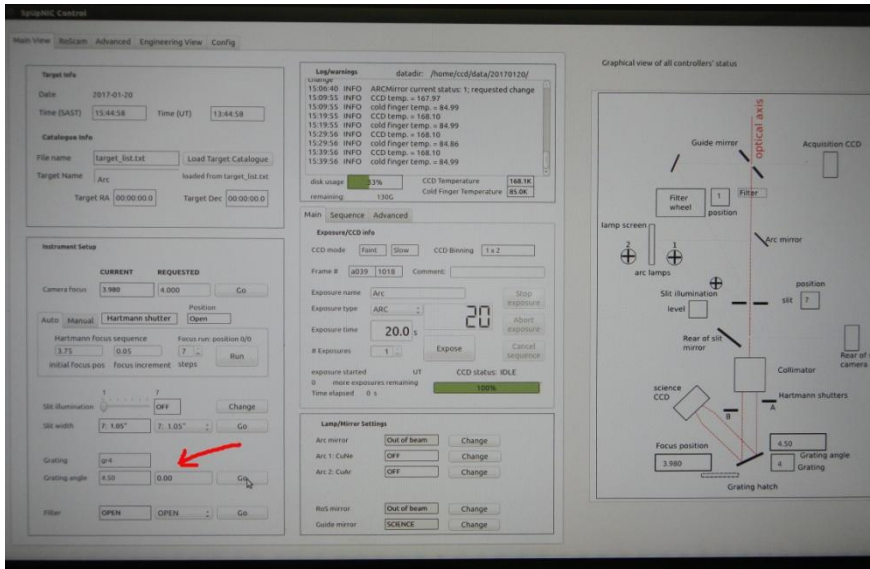
Warning: The covers are vulnerable to rough handling (bumping, scratching, dropping etc) so please treat them with care to prevent them being damaged.

Warning: When removing the plates that make up the vacuum valve port, be extremely careful to avoid dropping either of the inner plates as they could fall and damage the camera optics.

3. Main Description of Cover Removal Procedure

Step 1: Set the grating angle to zero

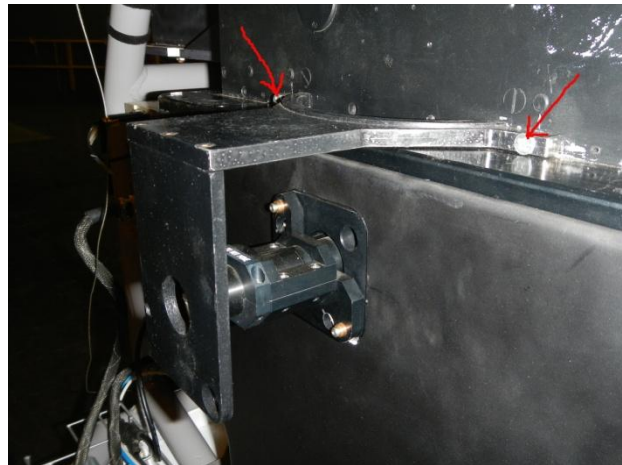
Before attempting the cover removal procedure, make sure to set the grating angle to zero degrees (and click the Go button) on the SpUpNIC Control GUI.



Setting the grating angle to zero on the SpUpNIC control GUI.

Step 2: Remove the bracket that protects the rear-of-slit camera

Unplug the USB cable from the rear-of-slit camera and then undo the two screws that hold the protective bracket in position. Set the bracket and screws aside.



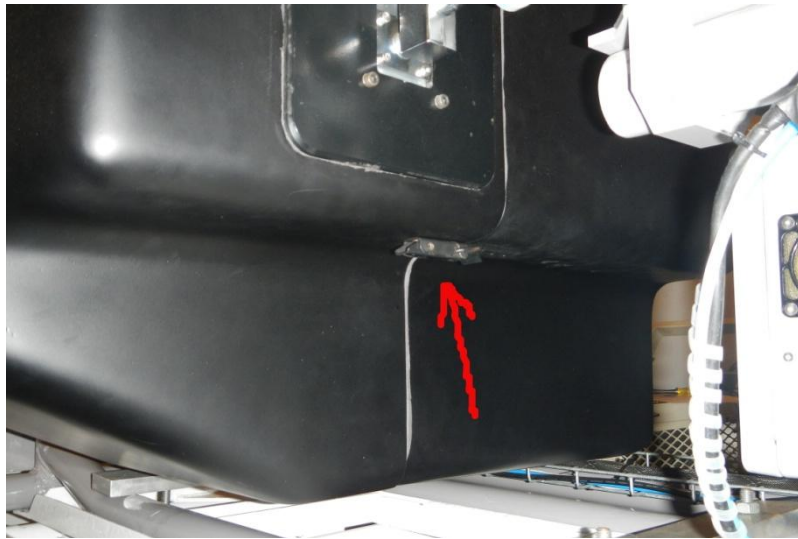
Hole in bracket where USB cable connects (left) and the two screws that attach the protective bracket (right).

Step 3: Unscrew the top plate fixture screws for the south cover (the side with the rear-of-slit camera protruding, i.e. the south side when the instrument is on the telescope)

Only four of the holes contain screws, so note where they go before removing them. Unscrew the four M6 cap screws holding the south cover in place. These screws are located on the top plate. Safely set the screws aside.

Step 4: Undo the toggle clamps

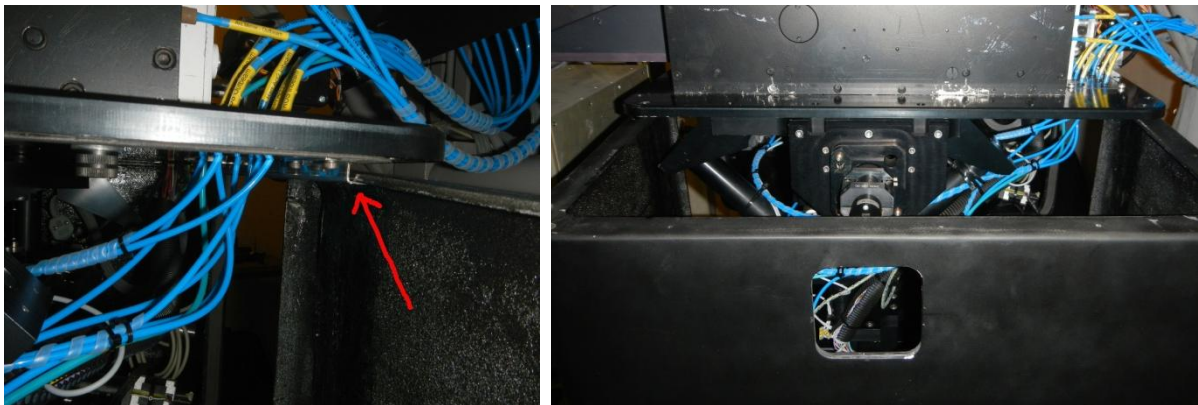
Undo the two toggle clamps on the underside of the covers.



One of the two toggle clamps that hold the two covers together.

Step 5: Remove the south cover (from which the rear-of-slit camera protrudes)

Stand behind the instrument, facing the rear-of-slit camera, and carefully slide the cover out towards you. The cover slides along on a set of z-profiles attached to either side of the top plate. Be careful not to disrupt the rear-of-slit camera as you retract the cover over it.



The z-profiles that support the covers (left) and the south cover being retracted (right).

Warning: Be careful not to scratch or bump the covers while removing them! Gently set the cover down and ensure that it will not fall over or get scratched.

Step 6: Unscrew the top plate fixture screws for the north cover

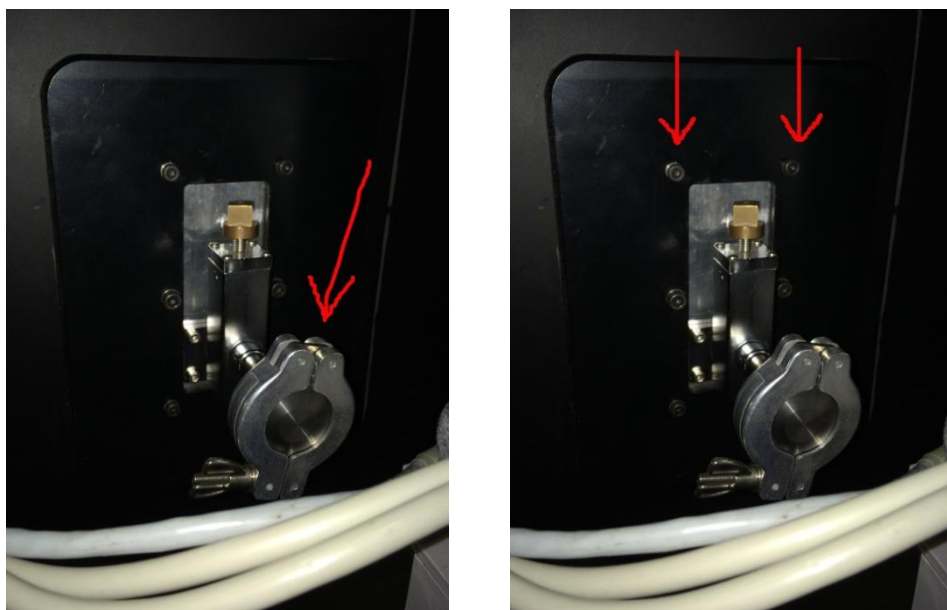
Take note of which holes contain screws (they approximately alternate, but not quite!) before you remove the M6 cap screws from the top plate for the LN tank side cover (i.e. the north cover when the instrument is on the telescope).

Step 7: Undo the vacuum valve port

Warning: The two inner plates behind the valve will be free once the screws are undone. Precautions must be taken to avoid having these plates fall and potentially damage other parts of the instrument. Thus this step is to be carried out by no less than two people.

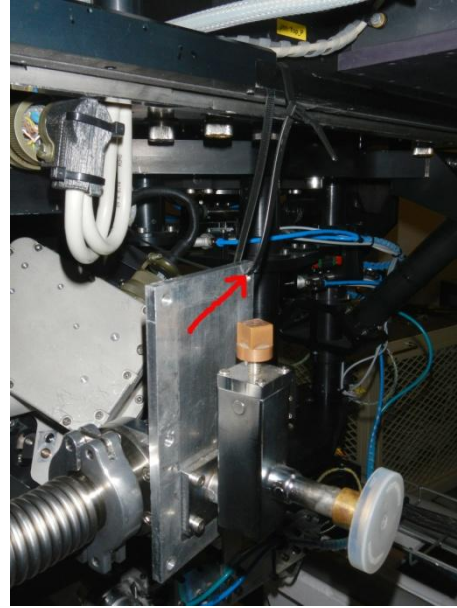
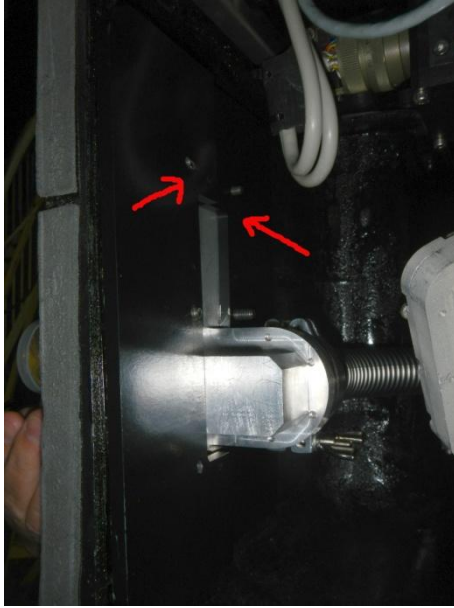
Warning: The cryostat and the pipe to the cryostat valve are under vacuum! Handling the valve and/or the vacuum pipe too roughly could result in a leak and subsequent loss of vacuum, which could severely damage the instrument!

There is a blanking cap attached to the vacuum valve and the associated fitting is too big to fit through the hole in the cover, so the cap needs to be removed before trying to manipulate the valve through the hole. Undo the screw that holds the clamp closed, but be careful not to drop the o-ring and the cap that may spring loose once the clamp is undone. Place one of the plastic caps over the valve once the metal blanking cap has been removed.



Vacuum valve with blanking cap attached (left) and the two rows of three screws that secure the outer and two inner plates that make up the vacuum valve port (right).

On the plate supporting the valve, undo all the screws by one revolution so as to loosen them, but NOT REMOVE them entirely. Facing the valve port, the three screws on the left are responsible for holding the left-hand inner plate in place. Similarly, the three screws on the right are to hold the right-hand inner plate in place. The worker must pay special attention to the sequence of removal and how these parts interlock.



The two inner plates that make up the vacuum valve port (left) and using a cable tie to support the vacuum valve after the port has been removed (right). Note the plastic cap that replaces the metal blanking cap (right).

While one person keeps the left-hand inner plate securely in position from the south side, another worker must undo the screws holding the left plate in position. Remove the screws on the left entirely. The other worker must carefully retract the left inner plate.

Follow the above description to remove the right-hand inner plate. Once the left and right plates are removed, the front plate will also be free and can be removed. Note that it may stick to the outer surface of the cover due to the screws having compressed the neoprene layer, so gently prise the front plate free if necessary.

Step 8: Remove the north cover

The vacuum valve and pipe must now be manipulated by bending the pipe slightly while trying to slide the north cover off. This is where it really helps to have a third person to support and retract the cover, while the other two deal with the vacuum valve from the inside and outside respectively. Be cautious not to damage or over handle the valve and pipe! The covers should be able to slide off without too much difficulty, so find the best space to manipulate the valve and pipe into while the cover is retracted. After fully removing the cover, carefully set it down without bumping or scratching it.

Once the north (LN tank side) cover is removed, tie the vacuum valve and pipe in a safe position using wire, a rope or a cable tie as shown above.

Once Steps 1 – 8 have been carried out, the removal is complete. The process needs to be reversed for the re-installation of the covers.

4. Additional Steps for Re-installation

When repeating Step 7 for re-installation, this sequence for inserting the screws and plates below will be helpful.

- Note that the left and right inner plates have slightly different shapes and their orientations matter. The left-hand plate has an indentation on one section. This must be at the bottom of the "C" and face the instrument (not the cover). The right-hand plate does not have an indentation, but its orientation must allow it to line up exactly with the left-hand plate.
- Turn the centre screws in through the front plate and into the valve plate just enough to have the front plate hang roughly in position. Make sure that the left-hand screw does not protrude through the back of the valve plate. Turn the right-hand screw all the way in so that it protrudes through the back of the valve plate.
- Use the protruding right-hand centre screw as a "locating hook" for the right inner plate. Hang the right inner plate on this screw and rotate it to align the right-hand holes. Once the holes are aligned, insert the other screws and bolt them securely in place.
- Slide the left inner plate in and use the edge of the right inner plate to locate against. This should align the holes on the left inner plate to the front plate. Tighten all three screws to secure the plate in place.

Appendix A. Checklist

Here is a checklist for the procedure, containing a concise description of each step. This list should be easy to follow for someone that is familiar with the procedure. The checklist is to be used each time the procedure is carried out. It should be kept on a separate page to ensure formatting is easy to print or view electronically.

Checklist for standard operating procedure

	Item completed <i>(to be ticked when carried out)</i>
1. Set the grating angle to zero	
2. Remove the bracket shielding the rear-of-slit camera	
3. Unscrew the top plate fixture screws for the south cover	
4. Undo the toggle clamps	
5. Remove the back (south) half of the cover	
6. Unscrew the top plate fixture screws for the north cover	
7. Undo the vacuum valve port	
8. Retract the north cover	
<i>Signature of person who completed the procedure:</i>	
<i>Date:</i>	