

8.8 Detector Removal and Installation

Introduction

This section discusses detector removal and installation. The procedures involved are for the science detector; for the OIWFS detector, see the OIWFS documentation.

Both detectors are nearly irreplaceable components, which are sensitive to electrostatic discharge and to contamination. For this reason, it is important to understand when detectors should be removed and when they should be left alone.

Science Detector. The InSb detector can be contaminated by oxygen and water vapor, and should not be exposed to ambient air for prolonged periods. It should be stored in a dry nitrogen atmosphere or under vacuum (preferably the latter). If shorting plugs are applied to the pre-amp, and the dewar is under vacuum, the detector is probably as safe as it can be – if you can store it in this configuration, this is better than removing it and storing it elsewhere, particularly since reinstallation is both time-consuming and potentially hazardous.

Because of the hazards, installation in particular must be done with extreme care, and it is recommended that it be performed by two people, as described in the section below (8.8.1). Essentially, the first person performs the tasks and the second person keeps the checklists and deals with distractions (phone calls, dropped tools, etc.).

8.8.1 Detector Assembly & Detector Focus Assembly

1. Description

This section describes the removal and installation of the GNIRS science detector mount (access to the OIWFS detector is covered in Section 8.8.2). Removal of the detector mount is required if the instrument bench is removed from the bulkhead, but it is also recommended if the instrument will be opened to the air for an extended period of time for other maintenance, particularly in a humid environment. Relatively brief maintenance, such as changing a filter or refurbishing the molecular sieve, can be carried out with the detector in the instrument.

NOTE: The InSb detector should be exposed to the air or a humid environment for only a limited time. The detector in its mount should be stored in an evacuated container until it is to be reinstalled in the instrument.

WARNING: The InSb detector is extremely susceptible to damage from electrical discharge or physical contamination. This procedure should be carried out only by an experienced person with full ESD protection and wearing clean gloves.

2. Nomenclature

| | |
|-------------------|-------------------------|
| 89-NOAO-4200-0037 | Detector Focus Assembly |
| 89-NOAO-4200-0131 | Detector Assembly |
| 89-NOAO-4202-1111 | Detector Port Cover |
| | Detector Pre-Amp Box |

3. Safety Precautions

Electrostatic sensitive device: Follow proper grounding procedures prior to handling components.

4. Special Tools/Fixtures

| | |
|-------------------|--|
| 89-NOAO-4202-1111 | Detector Port Cover |
| 89-NOAO-4202-0049 | Detector Preamp Grounding Cable Assembly |

5. Personnel Recommended/Required to Complete Task

The required number of personnel needed to complete this task is 2.

6. Procedures

Detector Removal

- A. WARNING: Ensure instrument is properly grounded as described in Section 8.3.1 A thru E.
- B. Ensure Instrument has been warmed and purged as described in Section 8.2.
- C. Perform Steps A thru F in Section 8.4.1.
- D. Perform Steps 1 thru 20 in the GNIRS Detector Array Removal Checklist.

Detector Installation

- E. WARNING: Ensure instrument is properly grounded as described in Section 8.3.1 A thru E.
- F. Ensure instrument has been warmed and purged as described in Section 8.2.
- G. Perform Steps A thru F in Section 8.4.1.
- H. Perform Steps 1 thru 26 in the GNIRS Detector Array Installation Checklist.

7. Summary

This section outlined the procedures to remove and install the detector into the optical bench. For removal, the instrument is first prepared for clean room by removing dust, debris, and oily residues by washing with soap and water. Next the instrument is moved to a Class 10,000 clean room. If the internal optical bench structure has not yet been warmed to ambient temperature and purged with dry Nitrogen to ambient

pressure, these procedures are followed as described in Sections 4.2.5, and 4.2.6. The detector port cover and active shield is removed as described in section 8.4.1 exposing the detector mount.

GNIRS DETECTOR REMOVAL CHECK LIST

DATE: _____ TIME: _____
NAME: _____ SECOND: _____

- 1) _____ Install electronics shorting plugs, and ground wire.
- 2) _____ Second person verifies grounding.
- 3) _____ Wearing a wrist strap remove the 2 M6 screws retaining the cooling strap.
- 4) _____ Remove the 2 M4 cooling strap clamp screws, remove the cooling strap clamp.
- 5) _____ Remove 8 M3 screws from detector mount.
- 6) _____ Guide detector mount assembly away from Focus mechanism and install it face up into 89-NOAO-4202-0032 Detector Mount Removal Fixture.
- 7) _____ Place safety shield on front cover.
- 8) _____ Remove 2 4-40 screws from front cover (90deg. From safety shield).
- 9) _____ Rotate safety shield 90 deg.
- 10) _____ Install 2 4-40 screws into safety shield to retain it in place.
- 11) _____ Remove 8 4-40 screws from front cover loosening them in a cross torque pattern.
- 12) _____ Remove 2 4-40 screws and remove safety shield from front cover.
- 13) _____ Remove front cover.
- 14) _____ Remove fiberglass retainer.
- 15) _____ Remove glove.
- 16) _____ Remove array S/N _____, and place into appropriate factory storage carrier and store under vacuum.
- 17) _____ Put glove back on.
- 18) _____ Install fiberglass retainer and front cover and torque 10 4-40 screws in a cross torque pattern to 5 in lbs.
- 19) _____ Move mount assembly into dewar and position it to the bench.
- 20) _____ Guide detector assembly into dowel pin holes, torque 8 M3 screws to 7 in lbs.

Comments: _____

GNIRS DETECTOR INSTALLATION CHECK LIST

DATE: _____ TIME: _____
NAME: _____ SECOND: _____

- 1) ___ Wearing a wrist strap connect ribbon cables to detector mount.
- 2) ___ Electrically ring-out the detector socket.
- 3) ___ Install electronics shorting plugs, and ground wire.
- 4) ___ Second person verifies grounding.
- 5) ___ Remove glove.
- 6) ___ Install array S/N _____, pin one to pin one on the socket.
- 7) ___ Second person verifies pin one to pin one.
- 8) ___ Put glove back on.
- 9) ___ Install fiberglass retainer, front cover, and safety shield, tighten 8 4-40 screws in cross torque pattern to 5 in lbs.
- 10) ___ Second person verifies front cover is down flush and tight.
- 11) ___ Verify lead seal on detector ring mounting surface.
- 12) ___ Remove safety shield from front cover, rotate it 90, reinstall 2 4-40 screws and torque to 5 in lbs.
- 13) ___ Install focus shim.
- 14) ___ Remove safety shield from front cover.
- 15) ___ Move mount assembly into dewar and position it to the bench.
- 16) ___ Guide detector assembly into dowel pinholes, torque 8 M3 screws to 7 in lbs.
- 17) ___ Install cooling strap, torque 2 M6 screws to 60 in lbs.
- 18) ___ Install cooling strap clamp, torque 2 M4 screws to 16 in lbs.
- 19) ___ Remove electronics shorting plugs and all preamp box to controller cables.
- 20) ___ Check cooling strap to detector mount copper ring, "OPEN".
- 21) ___ Reinstall electronics shorting plugs.
- 22) ___ Second person inspect interior of dewar, i.e. shorts, wire lay, etc.
- 23) ___ Install shield cover plate.
- 24) ___ Check port cover o-ring and groove, clean.
- 25) ___ Install port cover, torque M6 screws to 60 in lbs in a cross torque pattern.
- 26) ___ Remove ground wire and wrist strap.

Comments: _____

8.8.2 To Remove the OIWFS Detector Assembly from the Focus Drive

Prior to this procedure, the OIWFS Detector Focus Assembly must be removed from the OIWFS bench as described in Section 8.6.3.

Place the focus assembly on a bench with the Shack-Hartmann tube extending off the end of the bench to access the appropriate screws.

Remove the two M3 screws holding the cold finger plate to the focus drive housing

Remove the remaining ten M3 screws holding the detector assembly to the focus drive. Support the detector assembly when removing the last screw. Place the detector assembly on a clean place, preferably an ESD mat.

To remove the Detector Mount

This procedure should be carried out on an ESD mat with appropriate grounding precautions. A facemask should be worn once the detector surface is exposed. Anti-static gloves should be worn.

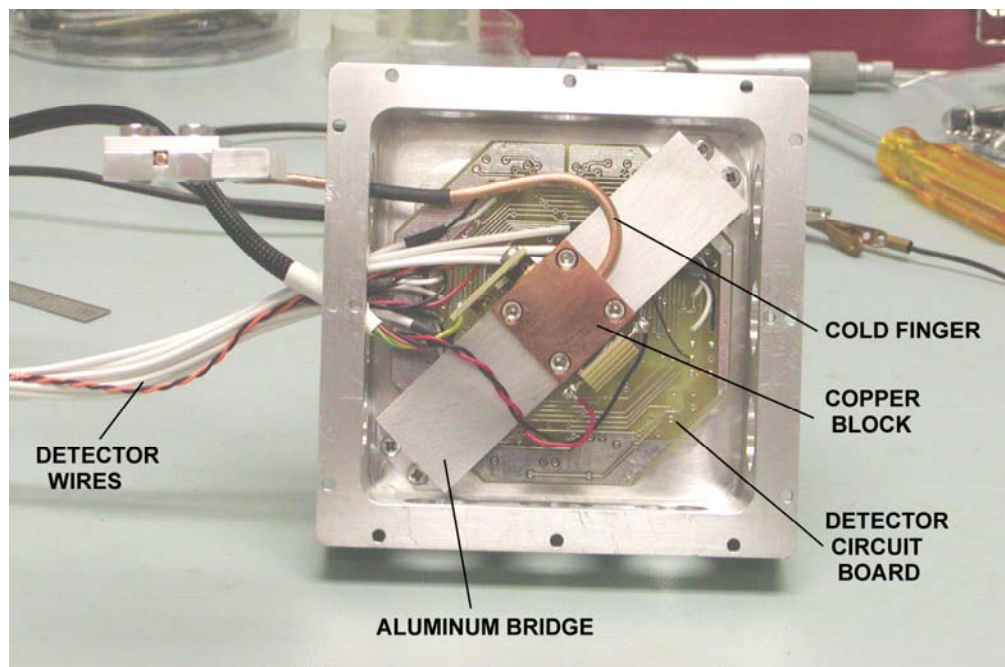


Fig. 8.8.2 Rear view of the detector assembly housing.

Place the detector assembly with the Shack-Hartmann tube down on an ESD mat. A small vise can be used to stabilize it, although it will balance on its own.

Remove the four M3 screws in the copper clamp holding the cold finger wire. Gently work the cold finger loose from the groove in the copper clamp and extract it from the detector mount housing and set aside. Gently reattach the copper clamp to the aluminum bridge.

Remove the four Phillips screws holding the bridge to the detector mount housing and lift the bridge off and to the side, allowing the temp control cables to slide through the housing. Lay the bridge on the bench and carefully work the connector through the hole in the housing.

Remove the two shim plates for the bridge from the inside of the mount housing. Put the shims, screws, and bridge aside.

Turn the assembly over and loosen the three M4 screws holding the detector mount to the mount housing. Holding the assembly in one hand with a finger firmly holding the detector mount in place, remove the three M4 screws and set aside. Carefully turn the assembly over, maintaining pressure on the detector mount. Lift the detector mount by the circuit board straight up until it is clear and then off to the side, feeding the cables through the cutout in the mount housing. Carefully lay the detector mount on the bench.

To work the connector through the mount housing, the grounding strap must be momentarily removed. **Ensure that you and the mount are grounded.** Work the connector through the housing and reconnect the ground strap. Clip the strap to a ground plane on the circuit board.

Cover the detector with the chip clamp alignment block and place the detector mount in a safe place, preferably in an ESD bag.

Remove the wavy washer and spacer from the back end of the Shack-Hartmann lens stack and store in a safe place.

Further work on the detector mount, such as removal or realignment of the detector itself, is beyond the scope of this manual. Refer to the OIWFS service manual.

Installation of the Detector Mount

This procedure should be carried out on an ESD mat with appropriate grounding precautions. A facemask should be worn once the detector surface is exposed. Anti-static gloves should be worn.

Place the Shack-Hartmann lens assembly front end down on the bench. Insert the spacer and the wavy washer into the cavity behind the last lens. Attach a grounding clip to the frame.

Remove the detector from the storage bag, ensuring that the connector is connected to the grounding plug, which is clipped to a ground plane on the detector circuit board. If the

detector chip clamp alignment block is installed, remove the three screws holding it to the chip clamp and remove the block.

Carefully remove the grounding plug from the connector and thread the connector through the wide hole in the Shack-Hartmann frame. It will be necessary to fold the wires to do this, so ensure that no wires are stressed or broken after this is done. Once the connector is through, reconnect the grounding plug. Holding the detector circuit board in one hand, continue to thread the wires through the frame until the detector is face down over the end of the lens cell. Lower the detector board onto the lens cell. Make sure that the wavy washer fits into the bore in the detector chip clamp.

Hold the detector circuit board against the lens tube and insert the three M4 screws through the front of the frame and into the chip clamp until finger tight. Turn the assembly over and lay on the bench. Rotate the detector board until the three screws are centered in the axial slots and tighten the screws evenly.

Place the lens assembly front end down on the bench and lay the two shims for the aluminum bridge over the mounting holes. Thread the connector on the detector temperature control through the same wide hole in the frame used for the detector wires and install the aluminum bridge with the four Phillips head screws. Loosen the four screws holding the copper block on the aluminum bridge and thread the copper cold finger through the hole in the frame adjacent to that used for the wires (Fig. 8.8.2) and into the groove in the copper block so the end of the wire is even with the edge of the copper block. Carefully screw the copper block onto the aluminum bridge, taking up the screws evenly. The cold finger wire should be parallel to the frame (Fig. 8.8.2).

Installing the Detector Assembly onto the Focus Frame

Place the focus frame on the bench with the mounting plate even with the edge of the bench. Install the detector assembly onto the two pins and secure with a M3X10 screw in the top center hole. Check that the two holes in the cold finger clamp line up with those on the detector focus frame and secure the clamp with two M3X12 screws.

Install the remaining M3 screws to secure the detector assembly to the focus frame, excepting the two remaining positions on the top of the frame, which will be used for clamping the cables. NOTE: It is necessary to use M3X8 screws for the two holes on the middle of the sides of the frame.