

8.2 Preparation for Disassembly

8.2.1 Introduction to Disassembly Procedures

Section 8 describes the procedures to disassemble the GNIRS instrument from a fully assembled state down to the individual mechanism level. The procedures are structured based on the assumption that the instrument is fully assembled but not mounted onto the telescope. If the instrument is mounted onto the telescope it is first necessary to follow the instrument removal procedures outlined in Section 4.3 prior to continuing with this section. The Disassembly procedures are structured in a step-by-step, logical manner until each mechanism is accessible.

To reassemble the instrument, in general the disassembly procedures outlined in sections 8.3 through 8.5 should be followed in reverse order. However, it will be necessary to torque fasteners to specific torque values depending on fastener size during the reassembly process. Fastener Installation Specification (89-NOAO-4205-0009) defines the appropriate torque value for each fastener size and is shown below for quick reference.

TORQUE VALUES FOR 18-8 STAINLESS FASTENERS INTO 6061 ALUMINUM

FASTENER SIZE	TORQUE (In-Lb)
M1.6x0.35	0.9
M2x0.4	1.8
M2.5x0.45	3.8
4-40	5
M3x0.5	7
6-32	9
M4x0.7	16
8-32	18
10-32	29
M5x0.8	35
M6x1	60
1/4-20	67
1/4-28	75
M8x1.25	139
5/16-24	150
3/8-24	240
M10x1.5	250
M12x1.75	408

It may be necessary to replace fasteners during the reassembly process for various reasons including broken or lost fasteners. If this is necessary, the replacement fastener must be made of stainless steel, cleaned for vacuum use, and dry lubricated with Dow Corning 321 Moly/Graphite dry lubricant. Refer to the NOAO specification: Fastener Installation Specification (89-NOAO-4205-0009) for further details.

If it is necessary to disassemble a mechanism or assembly that is not covered in the procedures outlined in section 8, further detailed information can be found in the 2D fabrication drawing package accompanying this manual.

The estimated time required to complete all tasks outlined in Section 8 for 2 technicians working in parallel is approximately 100 hours. This number can vary due to several factors including the technical personnel's familiarity with the instrument. Prior to engaging in disassembling the instrument, it is important to consider schedule constraints to ensure enough time has been allocated to complete the task. Additionally, the number of technical personnel required to complete a task can vary from 1 to 3 or more depending on the task. Each section will give approximate disassembly times and the number of personnel that are required/recommended to complete the task.

Below is a list of items that are covered in Section 8 Instrument Disassembly Procedures.

Section 8.1 discusses safety issues associated with instrument disassembly and precautions that should be followed.

Section 8.2 discusses handling the instrument and preparing it for disassembly. In this section the following topics are addressed:

- Definition of the cardinal directions that establish up, down, forward, aft, port, and starboard of the instrument for handling purposes.
- Lifting and handling. Proper lift points are identified and discussed so that safe instrument handling is assured.
- Instrument warm up. The internal structure of the instrument must be warmed to ambient temperature prior to disassembly of internal structure.
- Instrument Pressurization to Atmospheric Pressure. The dewar must be purged with dry Nitrogen prior to disassembly of internal structure.

Section 8.3 addresses the removal of external structure on the GNIRS dewar and is the first of 3 sections that cover instrument disassembly. All the procedures in this section are to be conducted in a relatively clean lab environment but clean room handling procedures are not required. Starting with a fully assembled instrument, the following procedures will have been completed in Section 8.3:

- Grounding Instrument
- Removal of Electronics cabling
- Removal of Helium Lines
- Removal of LN₂ pre-cool Lines
- Removal of Glycol coolant lines
- Thermal Enclosure Truss Removal
- Thermal Enclosure Removal
- Forward and Aft Truss Removal

Section 8.4 is the 2nd of 3 sections that cover instrument disassembly. Section 8.4 addresses the removal of internal structure in the GNIRS dewar with the exception of individual mechanisms and optics. From section 8.4 on, all disassembly tasks are to be conducted in a Class 10,000 Clean Room due to risk of contamination of sensitive optical components and cleanliness requirements associated with maintaining high vacuum inside the dewar. It is important to note that the steps outlined in 8.2

and 8.3 *must* be completed prior to advancing to Section 8.4. Disassembly and removal of the following components are outlined in Section 8.4:

- Detector removal.
- Forward and Aft Dewar Shell removal.
- Aft Bulkhead removal.
- Pre-slit bench removal.
- Main bench removal.
- Active shield removal.

Section 8.5 is the 3rd of 3 sections that cover instrument disassembly. Section 8.5 addresses mechanism removal from the optical benches. The following mechanisms are addressed in this section:

- Filter Wheel removal.
- Slit/Decker Assembly removal.
- IFU module removal.
- Prism turret removal.
- Grating turret removal.
- Camera turret removal.
- Acquisition mirror removal.
- OIWFS removal.
- Entrance window removal.

Section 8.6 addresses Optics removal from the above mechanisms.

8.2.2 Definition of Instrument Orientations

When referring to the instrument, it is necessary to know which way is up, down, left, right, etc. to communicate the location of a component on the instrument, or how the instrument is oriented. For these reasons, the directions of the instrument have been defined using nautical nomenclature. The six primary directions are defined as **Forward**, **Aft**, **Port**, **Starboard**, **Top**, and **Bottom**. Figures 8.2.2.1 and 8.2.2.2 define Forward, Aft, Port, and Starboard as viewed from the bottom and top respectively. Note that the entrance window is located on the Forward side.

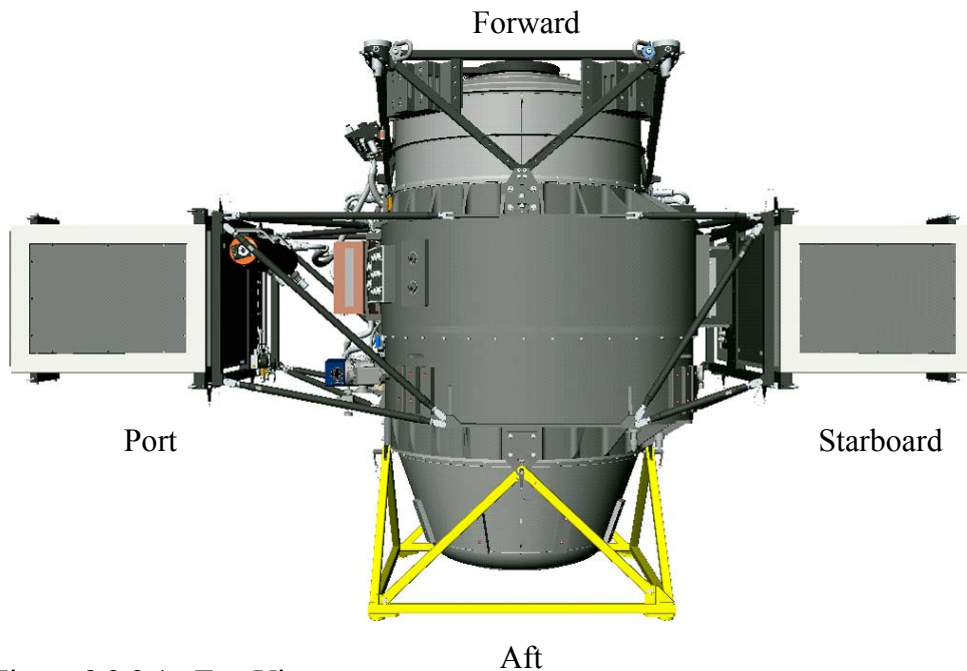


Figure 8.2.2.1. Top View.

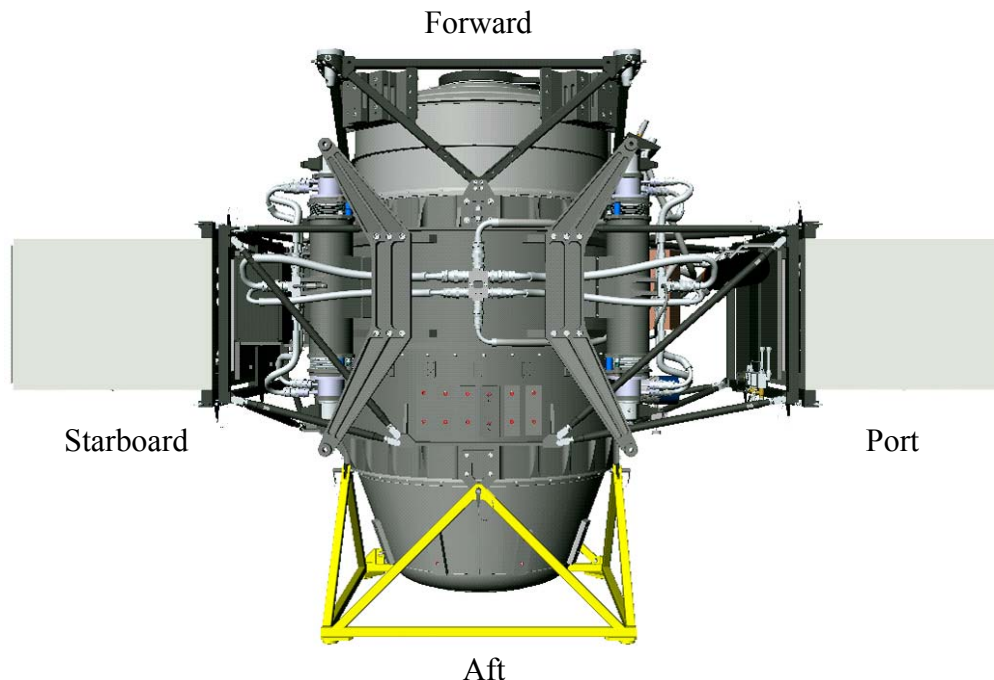


Figure 8.2.2.2. Bottom View.

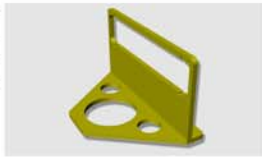
8.2.3 Handling Fixtures

During the disassembly process, many handling fixtures are needed. Handling fixtures facilitate lifting heavy components, aid in aligning critical components, protect optical surfaces, or serve as special tools. These fixtures are painted yellow or have a yellow tag attached to identify the fixture. Each disassembly procedure specifies which fixture is needed for that procedure. Figures 8.2.3.1 and 8.2.3.2 list all of the handling fixtures with an associated illustration of the fixtures.

89-NOAO-4202-0003
Instrument Handling
Cart



89-NOAO-4202-0005
Filter Wheel
Fixture Assembly



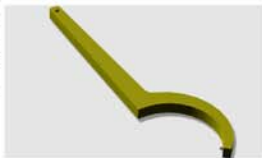
89-NOAO-4202-0006
Optical Bench
Handling Cart



89-NOAO-4202-0010
Vertical Installation
Frame Assembly



89-NOAO-4202-0013
Cryo Cooler
Spanner Wrench



89-NOAO-4202-0015
Cryo Cooler Assembly
Handling Fixture



89-NOAO-4202-0016
Optical Bench
Vertical Installation
Fixture



89-NOAO-4202-0017
Cryo Cooler
Lift Fixture



89-NOAO-4202-0019
Vertical Handling
Stand



89-NOAO-4202-0021
Pre-Slit Optical
Bench Lift Fixture



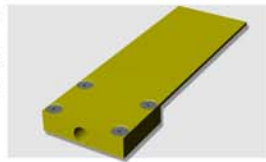
89-NOAO-4202-0032
Detector Mount
Removal Fixture



89-NOAO-4202-0033
Preamp Connector
Access Fixture
Assembly



89-NOAO-4202-0048
Grating Turret
Installation Fixture



89-NOAO-4202-0049
Detector Preamp
Grounding Cable Assembly



89-NOAO-4202-0051
Detector Feedthru
Grounding Cable Assembly



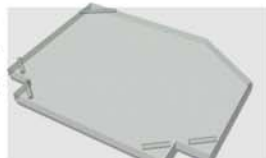
89-NOAO-4202-0052
OIWFS Detector Bulkhead
Feedthru Grounding
Cable Assembly



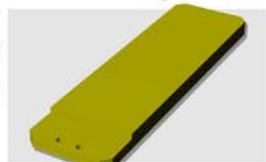
89-NOAO-4202-0053
OIWFS Detector
Bench Connector
Grounding Assembly



89-NOAO-4202-0054
Acquisition Mirror
Protective Cover



89-NOAO-4202-1035
Bulkhead Standoff
Block



89-NOAO-4202-1111
Detector Port
Cover

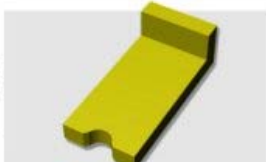


Figure 8.2.3.2. Handling Fixtures, continued

89-NOAO-4202-1113
OIWFS Field
Lens Cover



89-NOAO-4202-1123
Grating Turret
Drive Shaft
Setup Tool



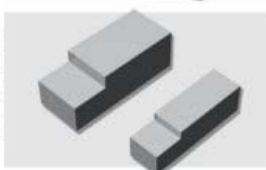
89-NOAO-4202-1128
LN₂ Pre-Cool Fitting
Go/No-Go Gauge



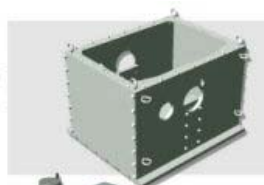
89-NOAO-4203-0070
Cryo Cooler Assy
Leak Fixture



89-NOAO-4203-1191,
89-NOAO-4203-1198
OIWFS Shim Blocks
No. 1 & No. 2



89-NOAO-4203-0048
Camera Turret
Test Fixture Assembly



89-NOAO-4203-0054
Grating Turret
Test Fixture Assembly



89-NOAO-4203-0055
Prism Turret
Test Fixture Assembly



89-NOAO-4203-0060
Acquisition Mirror
Test Fixture Assembly



8.2.4 Lifting and Handling Instrument

There are eight lifting points on the instrument designed to support the weight of the fully assembled instrument. See Figure 8.2.4.1. These lift points are identified on the instrument with labels in English and Spanish: “LIFT HERE/LEVANTE AQUÍ”. The lift points are located at the four quadrants of the forward-looking truss and the four quadrants of the aft looking truss. Each lifting point location has a threaded hole that receives a Swiveling Hoist Ring (CLM-2500-SHR-1). The instrument is equipped with 4 swivel hoist rings that can be located at any of the eight lift point locations during lifting and handling operations.

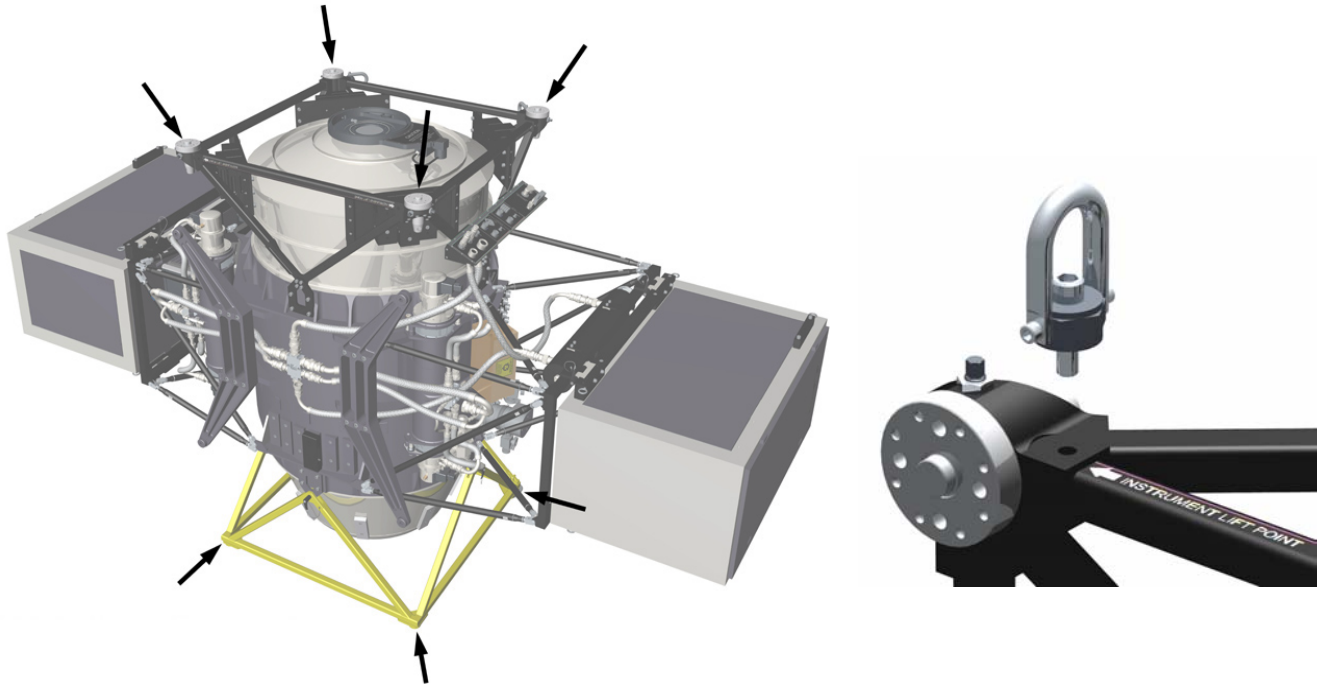


Figure 8.2.4.1. Eight Instrument lift point locations (*left*). Caution: Lift the *fully assembled* instrument at these locations only. Damage will occur if instrument is lifted at locations other than these. (*Right*) Four Swiveling Hoist Rings thread into lift point locations.

When manipulating the fully assembled instrument it is imperative to lift it only at the appropriate lift points. Lifting the instrument at locations other than the appropriate lifting points can cause damage to the instrument or bodily injury to personnel.

There are only two orientations that the instrument is designed to be in when not installed on the telescope: **Vertical** and **Horizontal**. Figure 8.2.4.2 illustrates these orientations. The Vertical orientation corresponds to mounting the instrument to the bottom looking port when the telescope is pointing to zenith, and the Horizontal orientation corresponds to mounting it to a side looking port when the telescope is pointing to zenith.

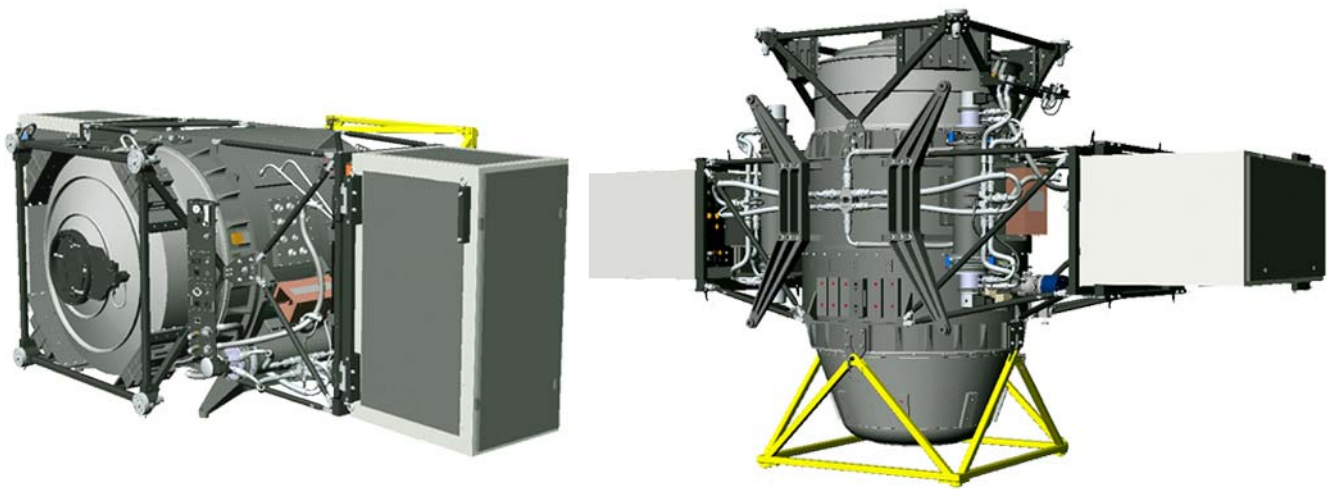


Figure 8.2.4.2. Instrument oriented horizontally (left) and vertically (right).

8.2.5 Orienting Instrument Horizontally

Prior to disassembly of the instrument, it is first necessary to have it in a state that will enable it to be safely disassembled. There are three conditions that must exist before opening the instrument. They are as follows:

- 1) The instrument must be oriented horizontally. (This Section)
- 2) The internal structure (optical bench) must be “warm”. (Section 8.2.6)
- 3) The dewar must be purged with dry Nitrogen. (Section 8.2.7)

To prepare the instrument for disassembly, it is first necessary to position the instrument in the horizontal orientation. If the instrument is in the vertical orientation, attach lifting straps to the upper two (2) lift points on the forward looking truss and lift instrument until it can pivot about the aft mounting truss (yellow) and lower the instrument to the horizontal position. See figure 8.2.5.1. Once the instrument is in the horizontal orientation, it can be lifted onto the Instrument Handling Cart (Figure 8.2.3.2).



Figure 8.2.5.1. Rotating instrument from vertical to horizontal position.



Figure 8.2.5.2. Lifting instrument onto handling cart.

8.2.6 Instrument Warm Up

To warm up instrument in preparation for disassembly, follow procedures outlined in Section 4.2.5 GNIRS Warm Up Procedure.

8.2.7 Instrument Pressurization to Atmospheric Pressure

To pressurize dewar to atmospheric pressure in preparation for disassembly, follow procedures outlined in Section 4.2.6.

Summary

This section addressed preparing the fully assembled GNIRS instrument for disassembly. Starting with the instrument in a state that it would typically be in for scientific use, the instrument gets positioned to the horizontal orientation using a crane rated for 3 tons or greater, placed on the handling cart, warmed to ambient temperature, and purged with dry Nitrogen to ambient pressure. After completion of these steps, the instrument is ready for disassembly.

Proceed to Section 8.3 to begin disassembly procedures.