Keck Adaptive Optics Note XXX

**Near-Infrared Tip-Tilt Sensor System**

**Remove/Install Cryo-Cooler Review Report**

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**Document Revision History**

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| --- | --- | --- | --- |
| Revision Number | Revision Date | Summary of Changes | Author |
| 0.1 | 08/07/2016 | first draft | H. Rodriguez |

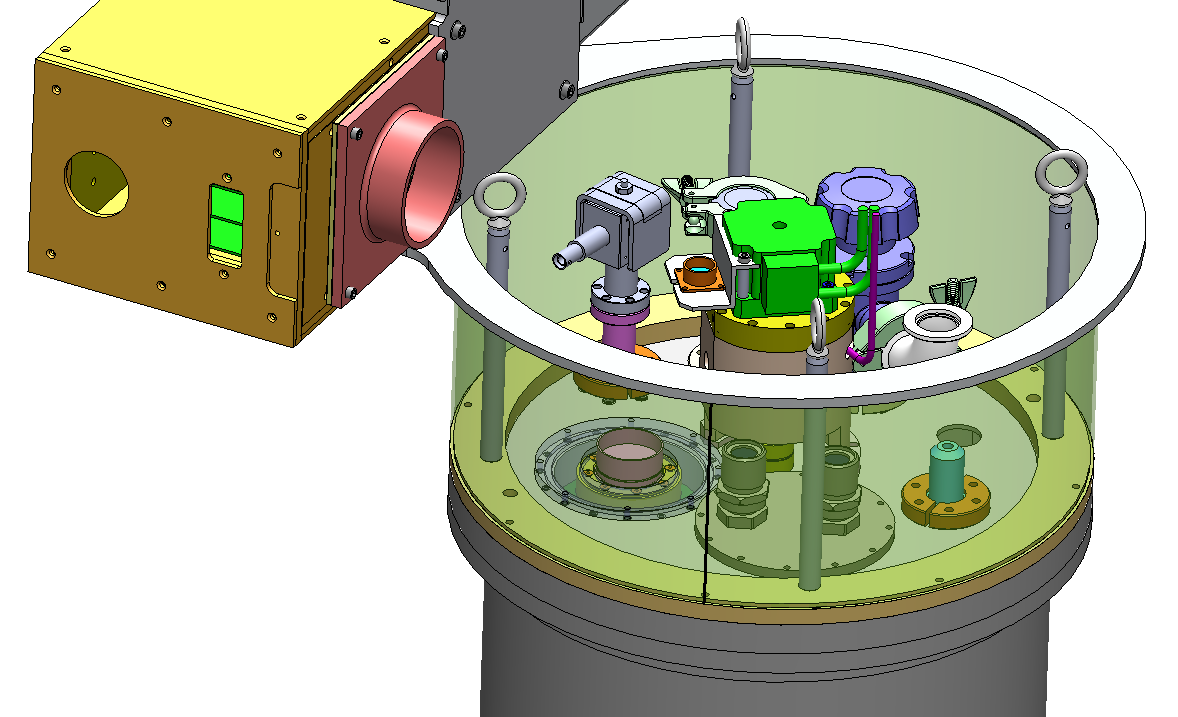
# Overview

The purpose of this procedure is to describe in detail the steps required to safely remove and install the cold head assembly from the Near-Infrared Tip-Tilt Sensor System (NIRTTS).

# Overall Components

Ion Pump

Indexing Pin Access Port



Filter Wheel Motor Assembly

Extension Tube (Shroud)

Cold Head Assembly

Pressure Relief Valve

Cryo-Cooler Assembly Access Port

ARC Electronics

Figure 1: Components that will be affected in this procedure.

**Pre-requisite:**

* Dewar must be at ambient pressure.
* Replacing or maintenance of any components inside the dewar are required to be done inside a clean room environment and follow clean room protocol.

**Tools Required:**

* 5/32” Extra-long T-handle hex key (23”) index pin
* 9/64” Extra-long T-handle Hex Key (18”) cold head
* 3mm Extra-long T-handle hex key (12”) coupler #3
* 3/32” Extra-long T-handle hex key (18”) filter wheel pedestal
* 3/32” allen wrench
* 5/32” allen wrench
* CCR open end wrenches (1”, 1-1/8”, 1-3/16”)
* Grounding strap

# Procedures:

**Remove Cryo-Cooler Assembly**

1. Send filter wheel to the home position.
2. Disconnect cables.

* Disconnect the detector cable and install shorting plug.
  + Use a grounding strap during the removal of the detector cable.
* Disconnect the filter wheel motor cable.
  + Power off the filter wheel controller before disconnecting the cable.
* Disconnect the thermal control cable.

1. Remove electronics.

* The ARC detector controller is installed onto the shroud using (4) 10-32 socket head captive screws. Remove electronics from shroud.

1. Insert index pin through access port.

* Remove the ion pump by releasing the KF16 bulkhead clamp kit. Use 5/32” allen wrench. Ion pump is susceptible to contaminates when exposed to the environment. Place ion pump in an evacuated chamber after removing from the dewar.

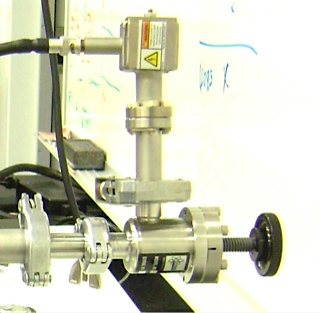


Figure 2: Ion pump connected to a KF16 valve and vacuum pump.

* Use index pin hex key to engage the index pin to the filter wheel.
  + The index pin is spring loaded, and will require a 90° turn to engage.

1. Remove the shroud to get access to coupler #3.

* Remove (8) 8-32 socket head cap screws that fastens the shroud to the rear dewar cover. Remove shroud to get access to coupler #3.
* Unclamp the bottom socket head cap screw from coupler #3 using the 3mm hex key.

1. Loosen the pedestal from the rear dewar cover.

* Loosen (6) 4-40 x ½” socket head cap screws that secures the pedestal to the rear dewar cover.

1. Remove filter wheel motor assembly.
2. Rotate ferrofluidic feed through nut.



Figure 3: Position of nut before removing or installing cold head.

1. Remove the pressure relief valve.

* Remove the KF16 bulkhead clamp kit for the pressure relief valve to get access to the cold head clamp fastener.

1. Unclamp cold head from cryo cooler interface.

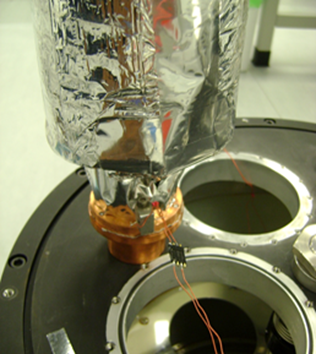
* Loosen the 8-32 x 1 ¼” socket head cap screw on the clamping linkage 4 ½ turns. Use a 9/64” T-handle hex key wrench.

1. Remove cold head assembly.

* Remove (12) 6-32 x ½” socket head cap screws on the cold head flange, and carefully pull up the cold head assembly.

1. Disconnect K14 sensor connector.

* Disconnect the K14 temperature sensor that is mounted to the cold head tip at the quick disconnect connector.



Quick disconnect connector

Carbon Getter

K14 Temperature Sensor

Figure 4: K14 temperature sensor quick disconnect. Constantan wire connections are very fragile, and can easily break.

1. Remove carbon getter and indium seal.

* Replace indium seal if the carbon getter is removed or if the seal is damaged.

1. Cover the cold head port.

* Use 6-32 x ½” socket head cap screws to cover the hole with the cold head blank plate.

1. Cold head removal complete.

**Install Cryo-Cooler Assembly**

1. Install carbon getter to cold head if applicable.

* Cut out indium seal to fit between the carbon getter and cold head tip.
* Fasten (5) 4-40 x ½” socket head cap screws to mount the carbon getter to the cold head tip.

1. Connect K14 temp sensor connector

* Fasten the K14 temperature sensor to the cold head tip with a 4-40 x ¾” socket head cap screw and disc belleville washer.
* Connect the sensor quick disconnect connector.

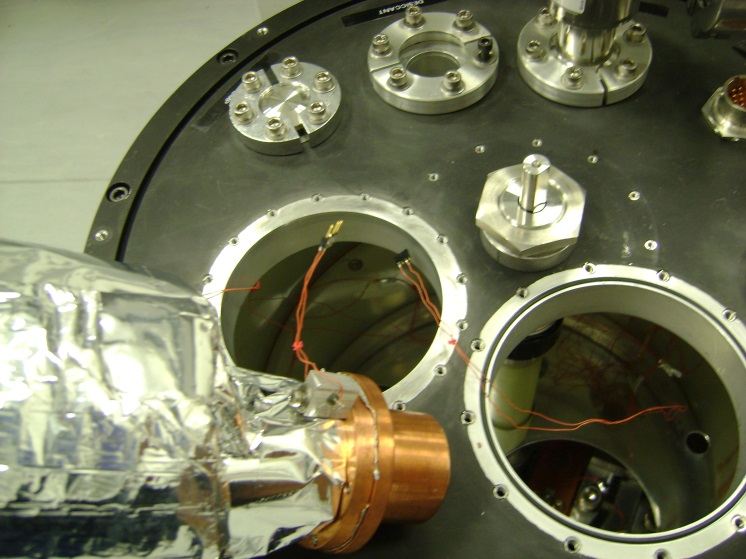
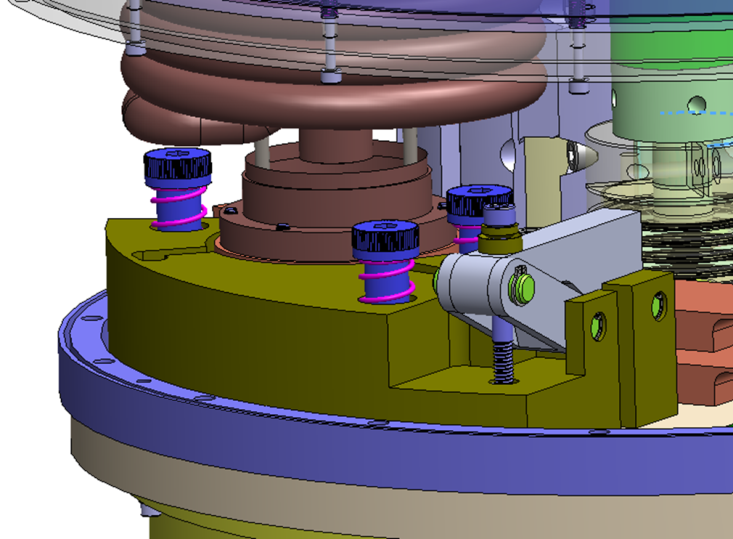


Figure 5: K14 temperature sensor mounted on cold head tip.

1. Lower cold head assembly into the cryo-cooler interface assembly.



Cold Head Tip/Carbon Getter

8-32 x 1 ¼ shcs

Clamping Linkage

Figure 6: Cryo-Cooler Interface Assembly

* Fasten the (12) 6-32 x ½” socket head cap screws on the cold head to the rear dewar cover.

1. Clamp the cold head to the cryo cooler interface.

* After inserting the carbon getter into the cryo-cooler interface, access the cryo-cooler clamp assembly through the pressure relief valve port.
* Clamp the 8-32 x 1 ¼” socket head cap screw. Using the 9/64” T-handle hex key turn the screw 4 ½ complete turns.

1. Install pressure relief valve

* Use the KF16 bulkhead clamp kit to fasten the pressure relief valve to the rear dewar cover. Fasten the #10 socket head cap screws with a 5/32” allen wrench.

1. Use the 1” open end ccr wrench to tighten the ferrofluidic feed through nut.
2. Install filter wheel motor assembly.

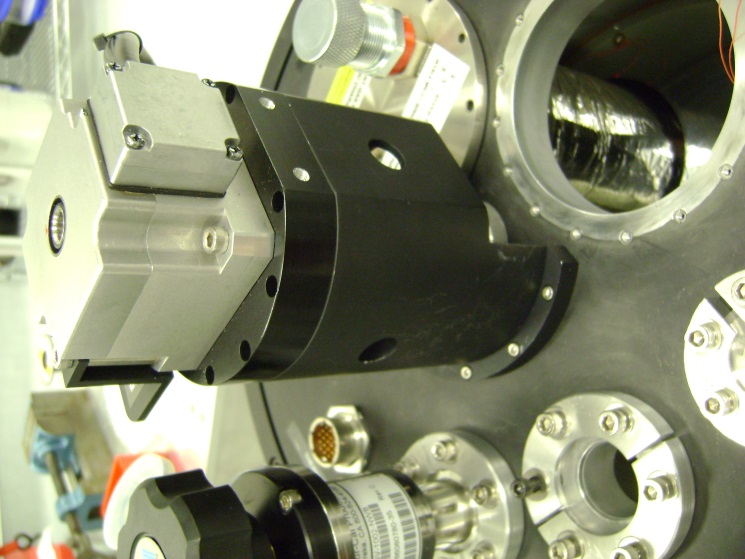


Figure 7: Filter Wheel Motor Assembly

* Lower coupler #3 mounted on the filter wheel motor assy. onto the ferrofluidic shaft.

1. Home filter wheel motor encoder.
2. Clamp coupler #3.

* Use the 3mm T-handle hex key to clamp coupler #3 to the ferrofluidic feed through shaft.

1. Release index pin.

* Access the filter wheel index pin through the ion pump port. See Figure 1.
* Use a 5/32” T-handle hex key to release the pin from the filter wheel.

1. Test filter wheel for rotation.
2. Install ion pump.

* The ion pump is susceptible to contaminants. If the pump is in an evacuated environment, use nitrogen gas to pressurize pump.
* Fasten the ion pump to the rear dewar cover.
* Use KF16 bulkhead clamp kit to secure the pump to the rear dewar cover.
* Fasten the 10-32 screws with a 5/32 allen wrench.

1. Installation of the cold head is complete.