

Installation and Operation of TIRCAM2 at DOT

TIRCAM2_Manual_01 is an introductory document for TIRCAM2 mounting and operations at DOT.

Introduction :

TIFR near infrared imaging camera (TIRCAM2) is sensitive up to 3.8 microns and contain selectable standard near IR filters J, H, KCont, K, BrG, polycyclic aromatic hydrocarbon (PAH) and nbL filters for imaging. TIRCAM2 uses a 512x512 InSb based Aladdin III focal plane array (FPA). FPA and optics are cooled by closed cycle Helium cryo-cooler.

TIRCAM2 at DOT :

TIRCAM2 has been used at DOT in June 2016 and January 2017. Fig 1 and 2 shows TIRCAM2 mounted on DOT.

TIRCAM2 brief specifications:

Detector: InSb, 512 Rows x 512 column
Detector Operating temperature : 35 K
Filters : J, H, KCont, K, BrG, polycyclic aromatic hydrocarbon (PAH) and nbL

DOT telescope specific (main port):

Pixel scale :

~ 0.169 arcsec/pixel ,

Field of view :

86.5 " x 86.5 " square arcsec.

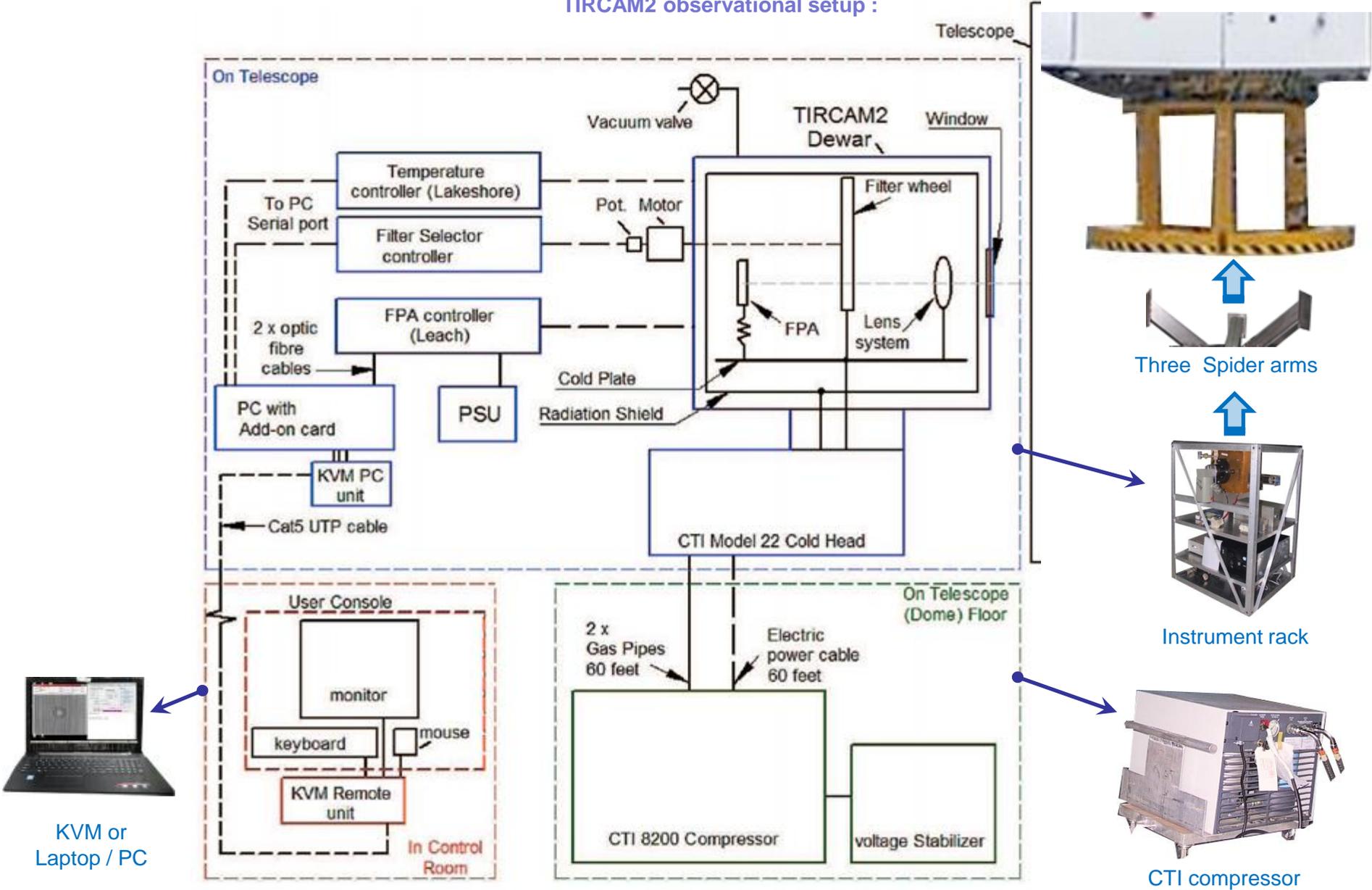


Fig. 1



Fig. 2

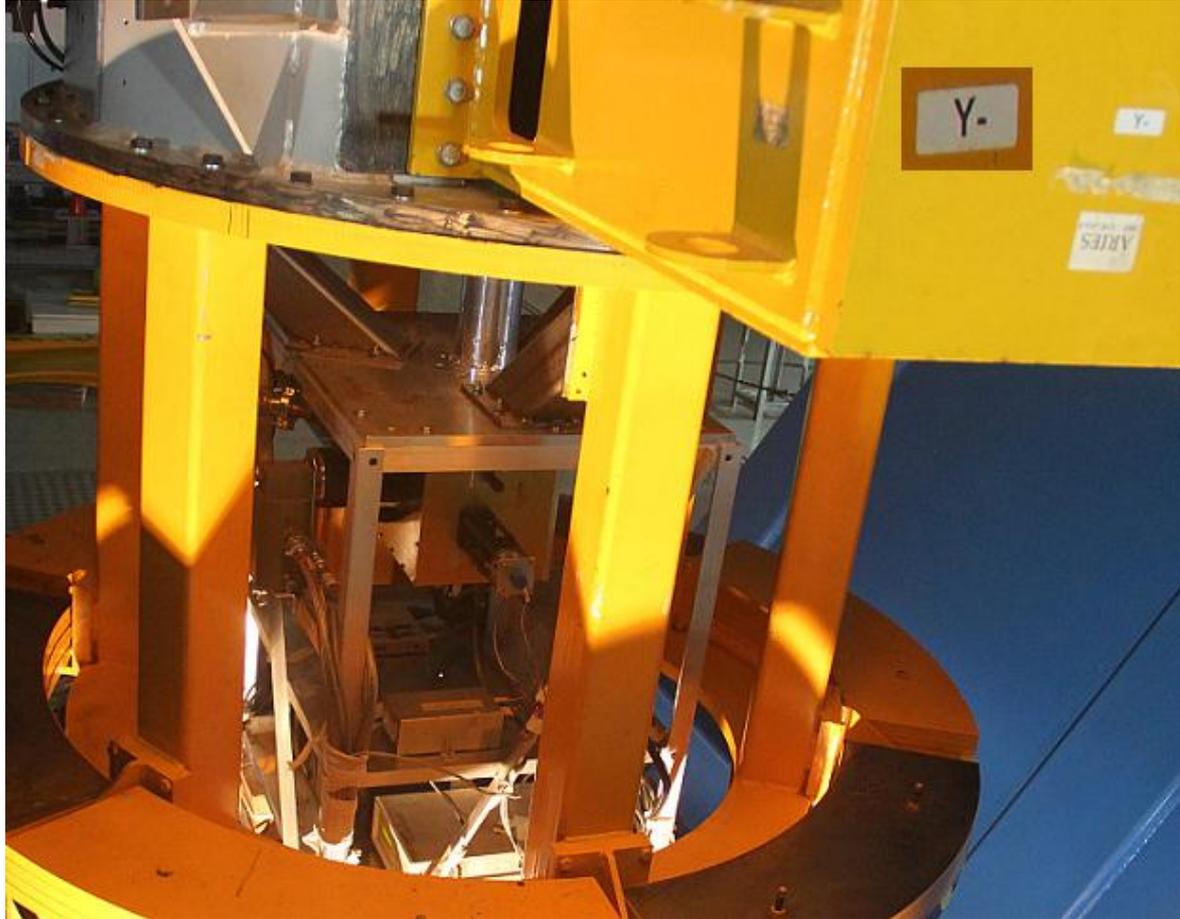
TIRCAM2 observational setup :



Note: Mains power 230V, 5A for instrument rack and 230V, 15A for compressor and CAT5 cable are supplied from telescope pier through anti-twister.

TIRCAM2 mounting orientation with telescope reference:

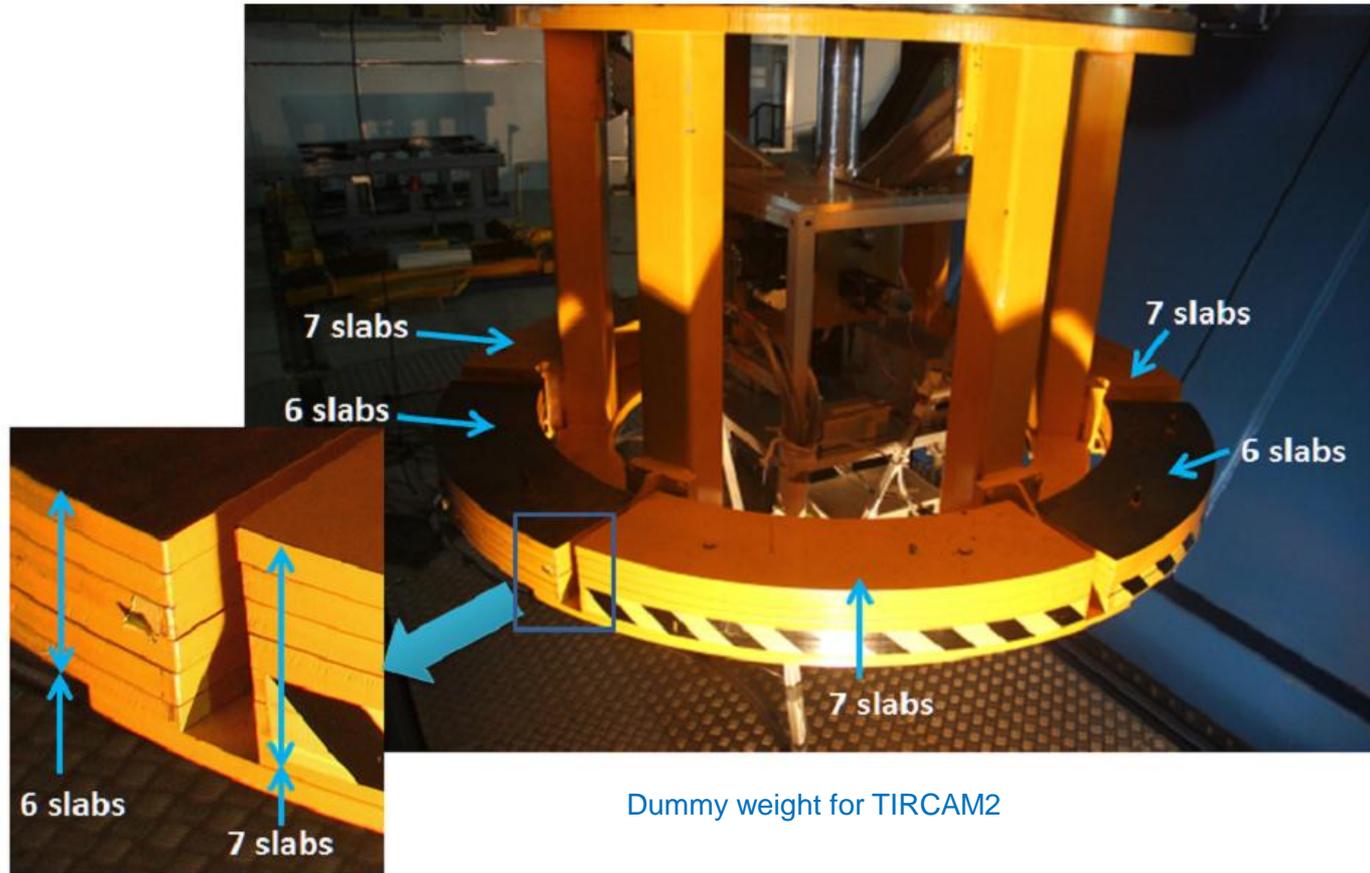
Fig. TIRCAM2 mounting orientation shows TIRCAM2 mounting done for DOT in June 2016/Jan2017. RA and Dec was found aligned with Row and Column axis of the FPA. Align Y- port of telescope and one of the spider arm of TIRCAM2 mount as shown in figure.



TIRCAM2 mounting orientation

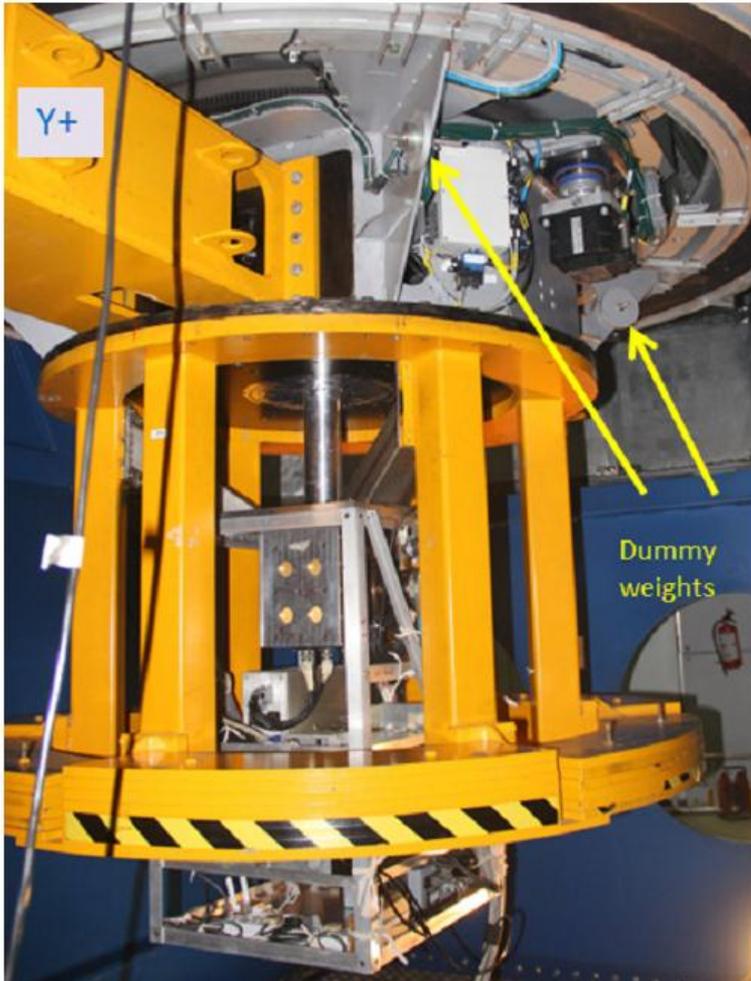
Dummy weight for TIRCAM2 :

TIRCAM2 is mounted with the yellow structure as shown in fig [Dummy weight for TIRCAM2](#). Dummy weight of alternate 6 and 7 slabs were used as shown in figure.



Dummy weight for TIRCAM2 on triangular plates:

Dummy weights were also put on triangular plates as shown in following figures. Dummy weight for triangular plates A,B,C,D and left/right slider weights for January 2017 observations are shown in following figures.



Dummy weight on triangular plates

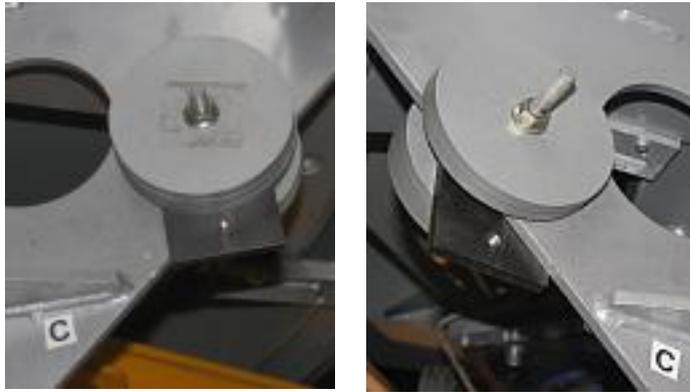


Dummy weight on triangular plate A



Dummy weight on triangular plate B

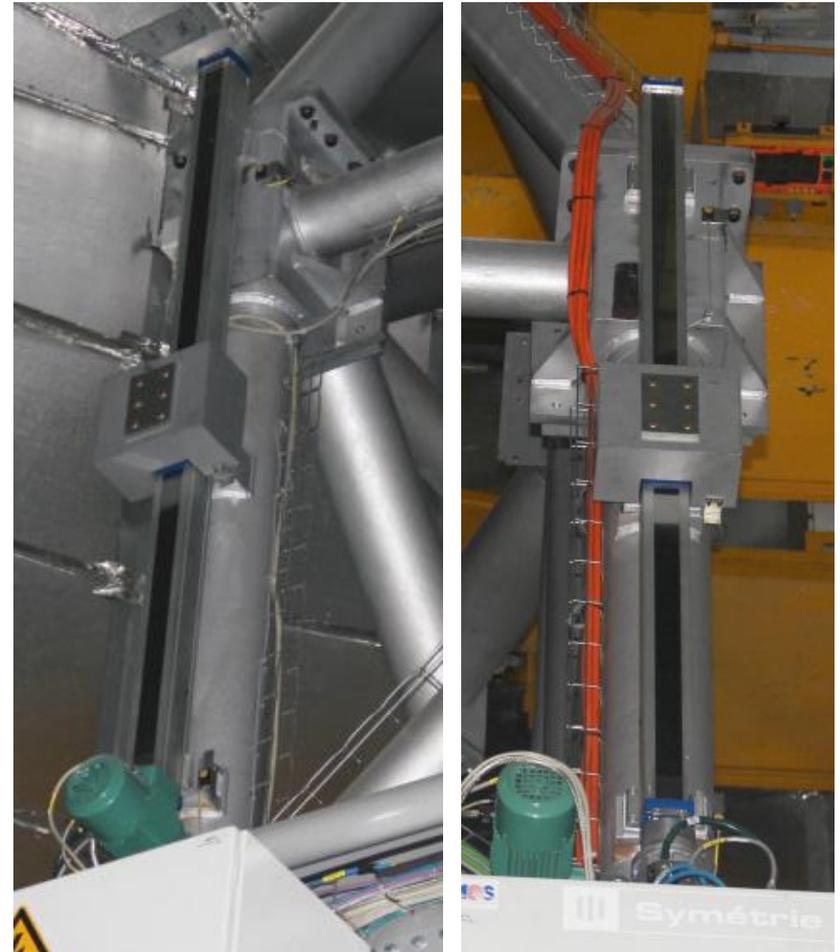
Dummy weight for TIRCAM2 on triangular plates and Slider weight positions:



Dummy weight on triangular plate C



Dummy weight on triangular plate D



Left and right slider weight positions



TIRCAM2 contains static sensitive device. Care must be taken while making electrical connection to the camera to avoid damage from static electricity.

TIRCAM2 Dewar should be handled with care.

Never leave TIRCAM2 Dewar connectors open. Connect shorting cable to protect detector. After cool down Leach controller cable can be connected to TIRCAM2.

TIRCAM2 should not be powered on if the detector temperature is above 50 Kelvin.

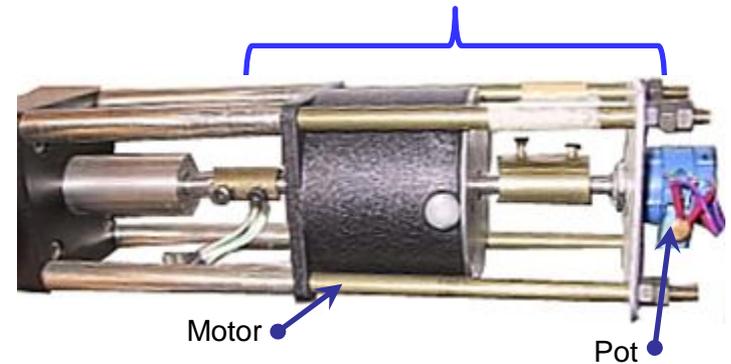
TIRCAM2 detector temperature should never change at rate more than +/- 1 degree Kelvin / Minute.

TIRCAM2 filter wheel motor assembly :

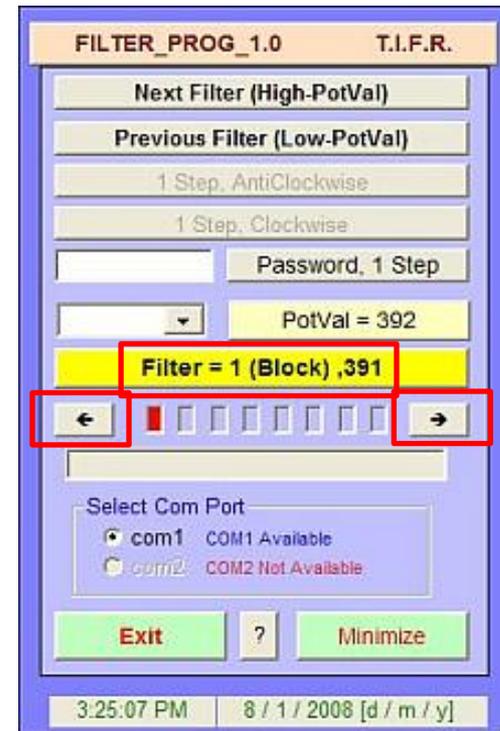
TIRCAM2 filter wheel is driven by stepper motor and position feedback is taken from pot. Motor and pot is connected to Filter controller by two cables. Assemble motor and pot as shown in [Filter wheel motor assembly](#) figure marked by curly bracket.

Filter controller is powered from external +5V power supply. A serial cable is connected to PC.

Figure [Filter wheel controller software](#) can be started by icon provided on desktop. It has two arrow buttons to select next / previous filter. Filter name appears on the screen as well as on taskbar. Filter wheel pot values may need to be re-entered in the look-up text file if the calibration is off after assembly using filter switch (inside Dewar) position . Screen shot of software is shown in fig. When TIRCAM2 is not observing, Block filter should be positioned at detector.



Filter wheel motor assembly



Filter wheel controller software

TIRCAM2 Mounting / Dismounting

(Ensure vacuum < 8E-6 mBar is achieved.)

(Ensure all parts are clean)

Ensure TIRCAM2 window is closed with protective cover. Refer Fig. [Mounting three AL. plates](#), place the TIRCAM2 on stand taking care of cold head, lifting with two side handles. Remove both handles. Mount three Al. plates on TIRCAM2 using allen csk screws. Mount DOT telescope plate to circular Al. plate with allen csk screws. Note the spider arm orientation at filter motor. Remove one cross Al. angle from shorter side of instrument rack. Lift whole TIRCAM2 assembly, place on the instrument rack as shown in fig. [Mounting Dot telescope plate and instruments](#). Use nut bolts to fix Dot telescope plate to instrument rack.

Mount PC, Lakeshore, Leach controller, Leach power, Filter controller, Filter power, power strip on the rack with clamps or plates provided.

Mount three spider arms on the telescope yellow dummy weight.

Place TIRCAM2+Instrument rack on hydraulic trolley with alignment for spider arms (filter motor towards Y- port). One special bolt need to be put first (refer plate mark) as it can not be placed later. Carry trolley under yellow dummy weight. Lift trolley to match Dot telescope plate with spider arms. (Further lifting may be needed by placing wood logs under rack.). Lock the trolley downward movement with wooden logs as precautionary measure. Nut bolt spider arms with Dot telescope plate.

Take off window cover, ensure window is clear. Use air bulb pump to blow any dust particles. Place baffle tube and disk and place screws on Dot telescope flange. Seal the disk with tape.

To dismount do the reverse operation. **Ensure to put back window cover.**



[Mounting three AL. plates](#)



[Three spider arms](#)



[Mounting Dot telescope plate and instruments](#)

CTI Compressor connections :

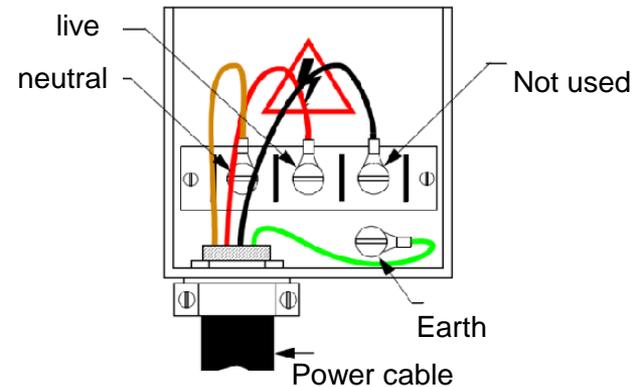
Compressor and cold head (on Dewar) are connected with gas pipes and cold head power cable, after mounting TIRCAM2 on the telescope. Refer [CTI Compressor & connections](#) fig. Gas pipes and connectors are marked with supply and return labels. Connectors are self-sealing type. Use special spanners provided for connections. While connecting avoid gas leak. Refer CTI manual if required. Refer figures [CTI Compressor & connections](#) and [TIRCAM2 Dewar to compressor connection](#) for connections.

Gas pipe connection sequence :

- [1] compressor return
- [2] Cold head return
- [3] Compressor supply
- [4] cold head supply

Gas pipe dis-connection sequence :

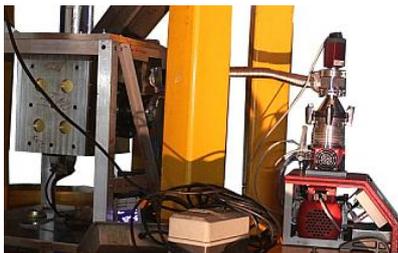
- [1] cold head supply
- [2] Compressor supply
- [3] Cold head return
- [4] compressor return



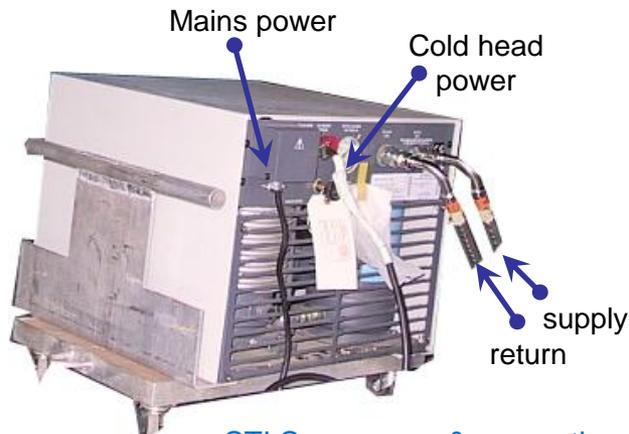
CTI Compressor mains power connections

Connect power as shown in [CTI Compressor mains power connections](#) fig. from 230 volt , 15Amp UPS provided from Pier. Recheck all connections. Mount turbo pump on yellow dummy weight slabs. Confirm vacuum is better than $8E-6$ mBar and still being pumped. Start Lakeshore (refer Lakeshore Temperature controller operations) and Lakeshore temperature logging software. Set parameters for lakeshore : Heater = High, Ramp rate off. Test heater operation by setting set-point about 0.5 deg. K. above current ambient temperature. After heater test, set set-point to 70 deg. K. Turn on CTI compressor. Monitor cooling. When temperature reaches 200 deg. K, (after about 8 hours) **close Dewar valve. Turn off isolation valve.** Put off turbo. After turbo pump rotations are stopped, remove turbo pump. **Place blank flange at isolation valve.** TIRCAM2 will cool and in about 24 hours reach 70K. Tie up all wiring and gas pipes. After reaching 70K, detector is cooled with 1k/Minute rate. Ensure the heater power is more than 13% value. Set Ramp Rate to on at Lakeshore and set to 1K/Min. Set set-point to 69.7, to test ramping is correct . If lakeshore correctly ramps, change set-point to 65 K. After reaching 65K, monitoring heater power is more that 13%, change set-point to 60, 55, 50 ... 35K.

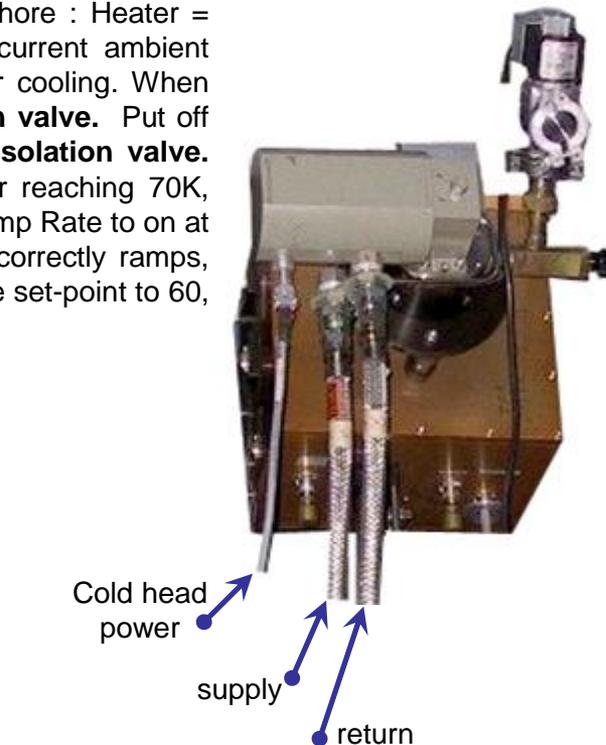
To warm-up TIRCAM2, put off compressor.



TIRCAM2 evacuation on the telescope



CTI Compressor & connections



TIRCAM2 Dewar to compressor connection

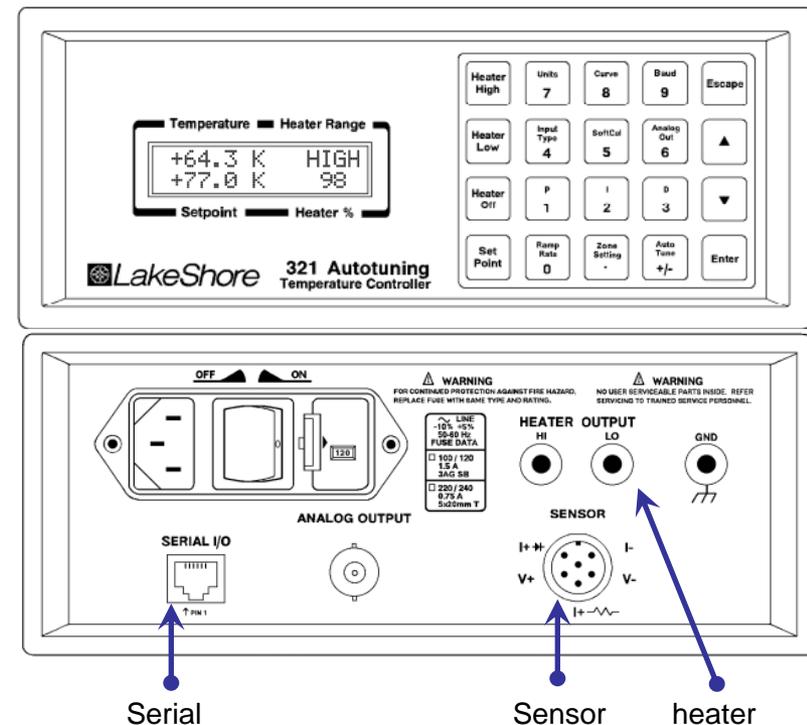
Lakeshore temperature controller operations :

TIRCAM2 detector temperature is indicated and controlled by Lakeshore. Dewar and Lakeshore is connected by cable between round connector at Dewar and Sensor connector, heater connector at Lakeshore.

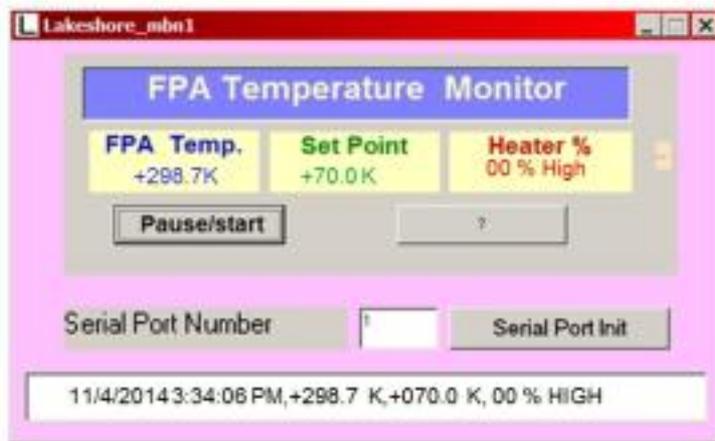
Lakeshore is connected to pc through usb to serial connector cable. Lakeshore front and back panels, Dewar connector and Software screen are as shown in figure [Lakeshore front and back panels](#), [TIRCAM2 Dewar connectors](#) and [Lakeshore software](#).

After connections start lakeshore. Lakeshore will show sensor temperature, set-point, heater % and heater high/low/off. To set set-point press Set point button. Press e.g. 70. Press Enter. To set heater to high press Heater High button. To set ramp on, press Ramp Rate, use arrow key to set ramp on. Set ramp rate to e.g. 1 K/Min. Press enter. After setting Ramp rate set Set-Point again.

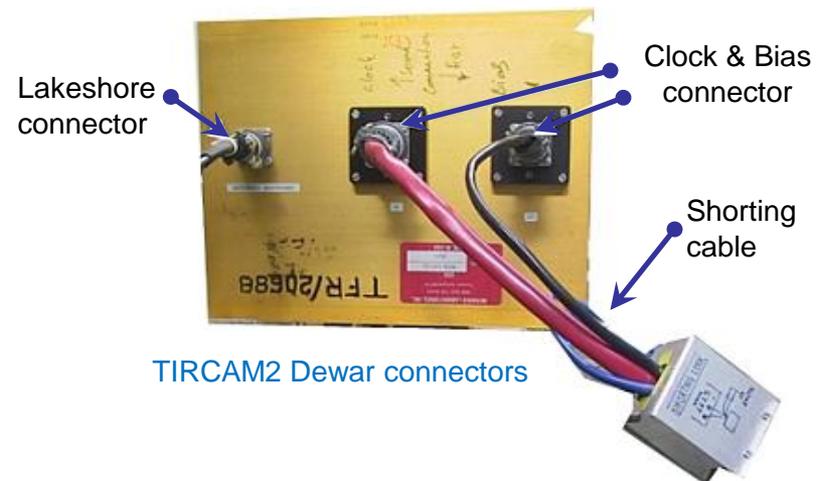
Start lakeshore software by clicking its icon on desktop. From PC properties – Device setting find com port assigned to usb to serial connector. Enter the com port number in Serial port Number box. Click Serial Port Init. Temperature, heater status similar to screen shown will appear.



Lakeshore front and back panels



Lakeshore software



TIRCAM2 Dewar connectors

Camera functional test :

Ensure TIRCAM2 temperature is 35K. Connect Leach controller and its power supply. Refer captioned figure provided. Connect optic fiber to PC and Leach controller. Ensure Leach controller is off. Connect two D connectors of Dewar-Leach cable at Leach controller. Disconnect shorting cable bias connector and connect bias connector of Leach controller cable. Disconnect shorting cable clock connector and connect clock connector of Leach controller cable. Ensure connections. Turn on Leach controller, filter controller at telescope and Laptop at control room. Connect Ethernet cable to PC and Laptop. Remote desktop to PC from Laptop. Start filter controller software and select Block filter. Start camera software (voodoo) by clicking voodoo icon.



Voodoo icon



Optic fiber connectors

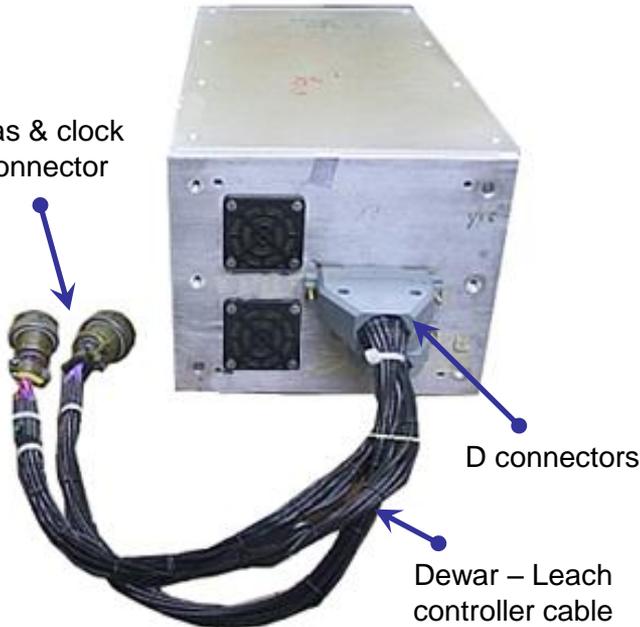


Leach PCI card



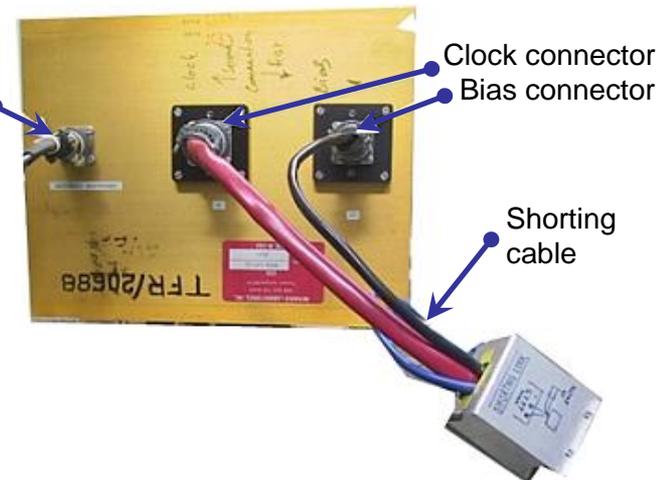
Leach controller Power cable and optic fiber

Bias & clock connector



Leach controller with Dewar cables

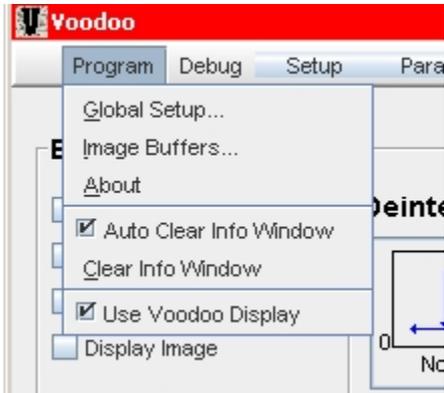
Lakeshore connector



TIRCAM2 Dewar connector details

Camera functional test (cont.):

Refer fig. [Program Menu](#), click **Program** at menu in Voodoo window and check checkbox **Use Voodoo display**.



Program Menu

Click checkbox **Display Image** and **Multiple Exp** with value **10** as shown in fig [Image capturing](#). Click **Expose**. 10 Exposure/fames will be read and recent image will be shown in [image window](#) . Progress of capture is shown in main screen as seen in [Image capturing](#) fig. Lines and spot in images are cosmetics of detector. To Save files, refer [saving options](#) fig. Check checkbox **Save To Disk**. Enter folder path and filename similar to format shown. 000 is a counter and will auto-increment if **Auto Incr** checkbox is checked. **Note: Files of same name will be overwritten without any warning if already existed in folder path.**

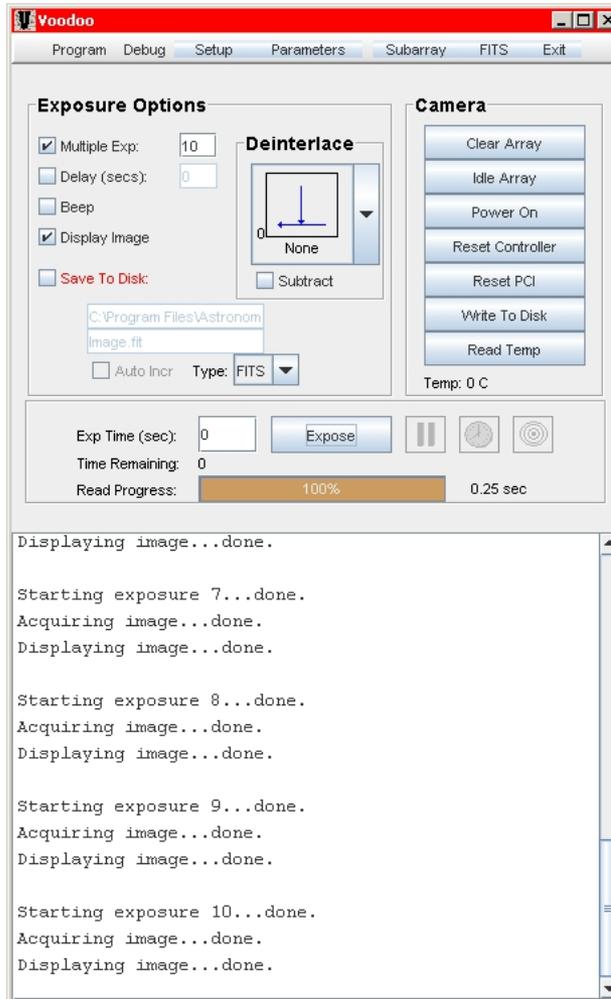
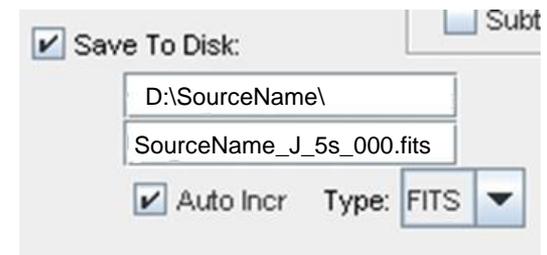


Image capturing



Image Window



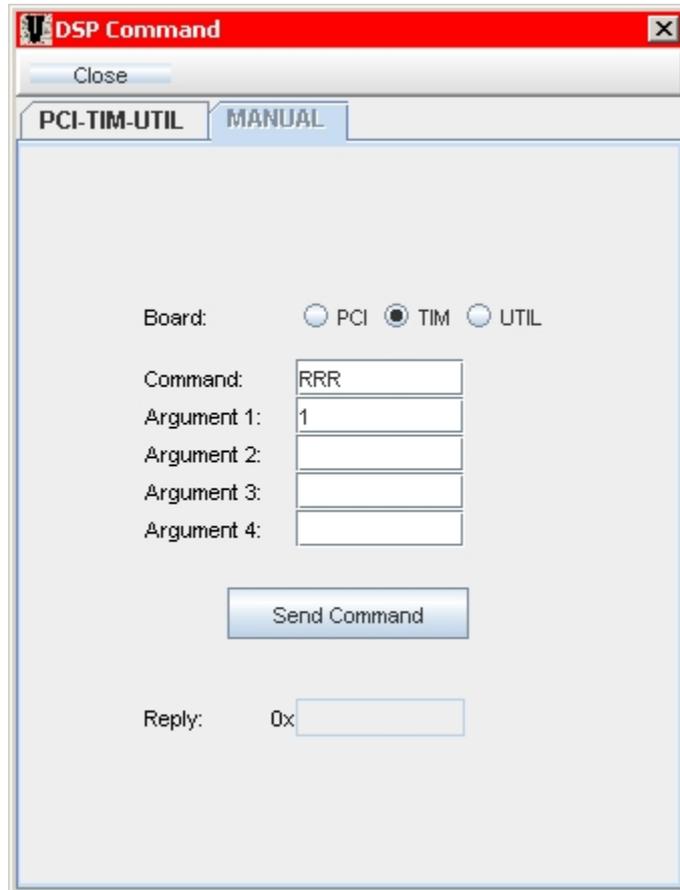
Saving options

Camera functional test (cont.):

For row reset mode select folder named D:\14FEB2011_IGO\RowReset and select RowReset_IGO_Run.setup. Click **Apply**. Click **Debug** at menu as shown in fig [Debug menu](#) and click **DSP commands**. In [DSP command window](#), in **Manual** tab, click **TIM** radio button and enter **command** as **RRR** and **Argument 1** as **1** as shown in fig. Now onward TIRCAM2 will operate in Row reset mode. To switch to global reset mode, re-apply global reset setup.



Debug menu



DSP command window

Blocked filter data (dark current , read noise etc.) is compared with lab values.