



# PAU Cam instructions

Release

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## Document History

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12/12/19	0.9	Add details for the de-installation of the camera	CP
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Name	Title	Approval Date	Issue Date	Version

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## 1 PURPOSE

These instructions are the reference for the operations team to prepare, install and remove the PAUCam instrument.

## 2 REFERENCES

Reference documents:

Document Identifier	Link	Issue (See latest issue on BSCW)
PAUCamManual_v0.1	<a href="https://bscw.ing.iac.es/bscw/bscw.cgi/d858292/">https://bscw.ing.iac.es/bscw/bscw.cgi/d858292/</a> PAUCamManual_v0.1.pdf	
CRYOTIGER Field Service Manual	<a href="https://bscw.ing.iac.es/bscw/bscw.cgi/d806242/">https://bscw.ing.iac.es/bscw/bscw.cgi/d806242/</a> CRYOTIGER_Systems_Field%20Service%20Manual.pdf	
Varian SH-110 High Performance Dry Scroll Pump	<a href="https://bscw.ing.iac.es/bscw/bscw.cgi/d858297/">https://bscw.ing.iac.es/bscw/bscw.cgi/d858297/</a> SH-110 Brochure.pdf	
Agilent IDP-15 Dry Scroll Vacuum Pump	<a href="https://bscw.ing.iac.es/bscw/bscw.cgi/d858303/">https://bscw.ing.iac.es/bscw/bscw.cgi/d858303/</a> IDP-15 Data Sheet Aug'13.pdf	

## 3 SAFETY

### 3.1 Cryotiger

See '2 SAFETY INFORMATION AND WARNINGS' of the **CRYOTIGER Field Service Manual**.

The gas used by the Cryotigers is highly inflammable. No gas must be released especially to confined spaces. For the refilling a vacuum pump will be used and the exhaust of the pump must be fed to the outside.

The process of refilling is described in '5 REFRIGERANT ADDITION PROCEDURE' of the **CRYOTIGER Field Service Manual**.

### 3.2 Camera shutter

Do not open the camera shutter while the CCD electronics are powered on and while there is light in the dome.

## 4 TEST IN THE ALUMINIZATION ROOM

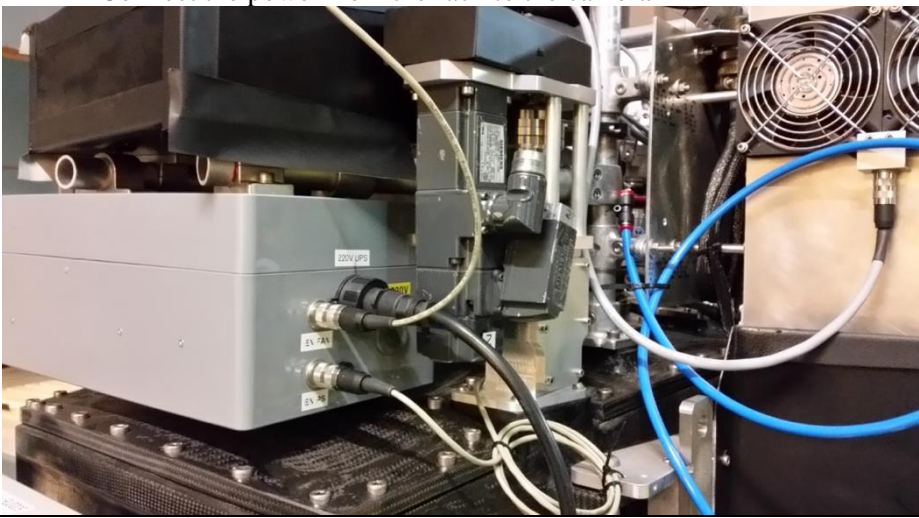
### 4.1 Install the Swan neck into the transport cart

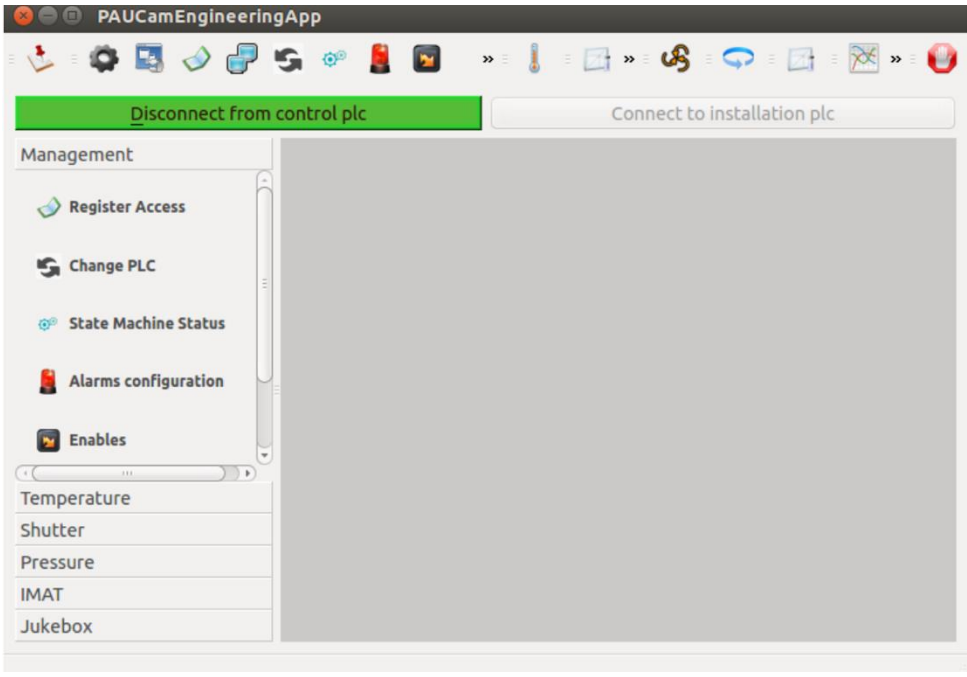
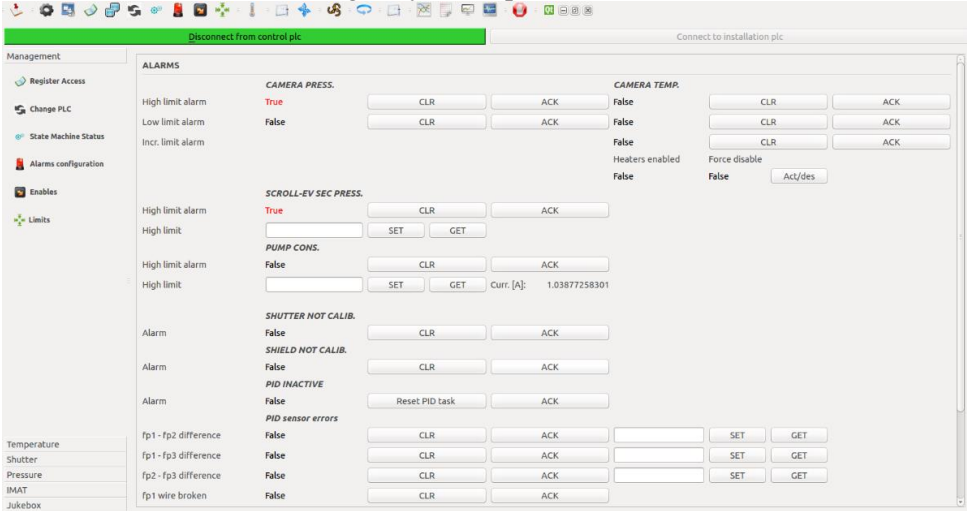
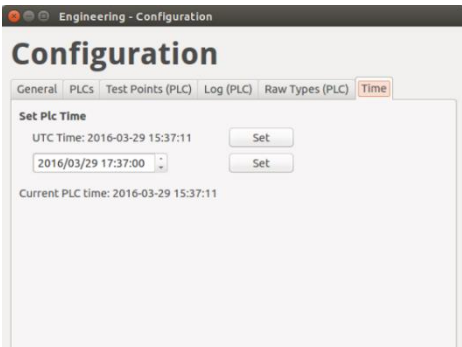
Item	Action/Description	Check
1.	The swan neck is hold vertically in the crane. The cables going outside to the camera side are secured and hold. The ones going inside the swan neck (coming from the spider) are in a bundle	
2.	Bring all cables in the middle of the transport cart. Pay special attention to the vacuum pipe	
3.	Bring down the swan neck to the transport cart at the same time the cables are guided. If the camera is installed, pay also attention to the cables going in the camera side	
4.	Position the swan neck on top of its support	
5.	Screw it to the transport cart (total of 6 screws)	

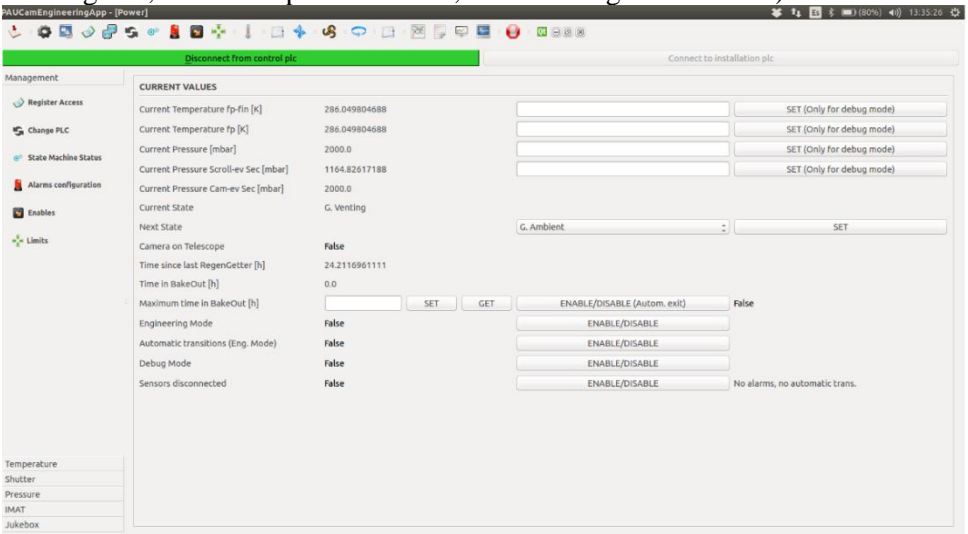


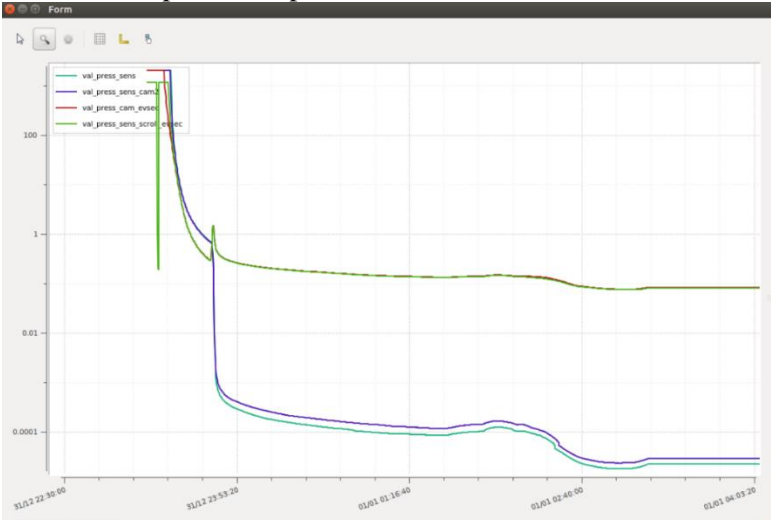
## 5 INSTALLATION

In order to install the camera, the following steps must be done in order to remove the instrument from the preparation area and installation on the WHT.


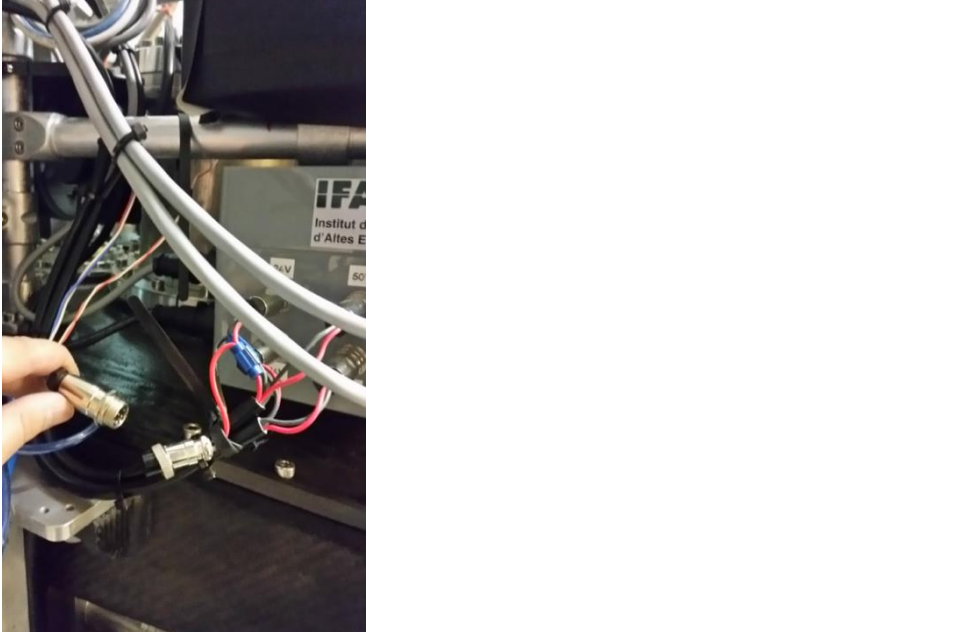
### 5.1 Regenerate the Getter Pump


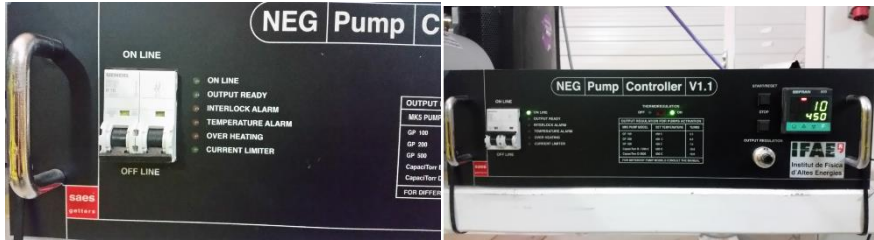
Item	Action/Description	Check
6.	<p>First we need to connect the camera to the PLC rack and to the power.</p> <ul style="list-style-type: none"> <li>• Connect UPS to the PLC rack</li> <li>• Connect the Ethernet cable to the PLC rack</li> <li>• Connect the Profibus cable from the rack to the camera</li> <li>• Connect the power from the rack to the camera</li> </ul> 	
7.	Install the vacuum pipe and connect it to the Scroll Pump	
8.	Enable 230 Volts on the PLC rack. The rack should boot	
9.	Power up the Scroll pump	
10.	Connect the PC with pau software to the PAU Subnet and launch scEngineering	

<p>11.</p>	<p><b>Connect to the PLC</b></p> 	
<p>12.</p>	<p><b>Go to Alarms and acknowledge any alarm present</b></p> 	
<p>13.</p>	<p><b>Check that the PLC has the correct time by going to configuration and setting the time</b></p> 	

<p>14.</p>	<p>At State Machine status check at which state the camera is and set it to Ambient. (Note: If it was at warm state and we ask to go to Ambient, the PLC sets it first to Venting and, after a couple of minutes, allows it to go to Ambient)</p>  <p>The screenshot shows the PAUCamEngineeringApp interface. On the left, there is a 'Management' sidebar with options like 'Register Access', 'Change PLC', 'State Machine Status', 'Alarms configuration', 'Enables', and 'Limits'. The main area displays 'CURRENT VALUES' for various parameters such as 'Current Temperature fp-fin [K]', 'Current Pressure [mbar]', and 'Current State'. The 'Current State' is currently 'G. Venting'. Below this, there are controls for 'Next State', which is set to 'G. Ambient'. Other parameters include 'Camera on Telescope' (False), 'Time since last RegenGetter [h]', 'Time in BakeOut [h]', 'Maximum time in BakeOut [h]', 'Engineering Mode' (False), 'Automatic transitions (Eng. Mode)' (False), 'Debug Mode' (False), and 'Sensors disconnected' (False). There are also buttons for 'SET', 'GET', and 'ENABLE/DISABLE' for several parameters.</p>	
<p>15.</p>	<p>Open the Monitoring (   ) and make a graph with the two pressure sensors of the camera and the “Cam_evsec” and “Cam_sens_Scroll_evsec” (look below for an example).</p>	
<p>16.</p>	<p>Set the state to “Vacuum” When PLC enters vacuum state it opens the electro valve so the scroll can take out all nitrogen from inside the camera. After some time pressure will start to decrease. As the camera is a big vessel, it takes some time to remove enough air to be seen on the sensors. Sensors on the pipes (evsec - camera and scroll - evsec) are the first to see this change. Later on the sensors on the camera start to show some changes on the pressure. When camera pressure is low enough, PLC will start the turbo pump. When the camera is at low pressure, it automatically changes its state to “warm” The status of the pumps can be checked in the “Pressure” Menu on the left menu of the Engineering application.</p> <p>The standard profile for pressures is as follows:</p>  <p>The graph shows pressure (y-axis, logarithmic scale from 0.0001 to 100) versus time (x-axis, from 31/12 22:38:00 to 01/01 04:03:28). Five data series are plotted: 'val_press_sens' (blue), 'val_press_sens_cam' (purple), 'val_press_sens_evsec' (red), 'val_press_cam_evsec' (green), and 'val_press_sens_scroll_evsec' (yellow). All series show a sharp initial drop in pressure, followed by a gradual decrease and then a stabilization at a low pressure level. The 'val_press_sens_scroll_evsec' series shows the highest pressure, while the other four series are clustered at lower pressure levels.</p>	



17.	Wait until the pressure inside the camera is below $10^{-5}$ mbar	
18.	Place the Getter Controller near the camera	
	 <p>The image shows a black rectangular device labeled 'NEG Pump Controller V1.1'. It features a digital display on the right side showing '0.00' and '0.00'. To the left of the display are several indicator lights and labels: 'ON LINE', 'OUTPUT READY', 'INTERLOCK ALARM', 'TEMPERATURE ALARM', 'OVER HEATING', and 'CURRENT LIMITER'. A small table on the front panel provides 'OUTPUT REGULATIONS FOR PUMPS ACTIVATION' with columns for 'PUMP', 'SET TEMPERATURE', and 'MODE'. The device is placed on a wooden table with various lab supplies in the background.</p>	
19.	Connect the getter fan	
	 <p>The image shows a close-up of a person's hand connecting a cable to a component inside a camera or pump assembly. The component is labeled 'IFA Institut de Física d'Altes Energies'. The hand is holding a cable with a connector, and the assembly is surrounded by various wires and components.</p>	
20.	Connect the control cable to the getter in the camera and to the controller. Be careful not to bend the pins when connecting the cable to the Getter.	
21.	Connect the power cable to the controller.	
22.	Attached to the controller, there must be an interlock. Install it. This interlock is a short circuit.	

23.	<p>Set the knob of the controller to 0.0</p> 	
24.	<p>Switch on the controller</p> 	
25.	<p>Push the start button (ready led must switch on)</p>	
26.	<p>The temperature of the getter and the pressure of the camera also. Wait until the temperature is stable and the pressure in the camera is below <math>10^{-4}</math> mbar</p>	
27.	<p>Keep increasing the knob value in steps with the same method waiting for the pressure to go down in each step. This procedure can last 2-3 hours</p>	
28.	<p>Once 450°C has been reached, wait and leave the getter at this temperature for one hour</p>	
29.	<p>Then, press the stop on the getter controller and set the knob to 0.0</p>	
30.	<p>Once the getter is cold enough, disconnect the getter fan</p>	
31.	<p>Disconnect the controller and remove its interlock</p>	
32.	<p>Keep the camera in vacuum state (with pumps working) until the installation day</p>	

### 5.2 Move racks to GRACE

33.	Power down PAUCam	
34.	Follow inverse of “Connect cables to the Power Supply rack”	
35.	Follow inverse of “Connect cables to the Slow Control rack”	
36.	Move the Racks to GRACE	



**Figure 1**

**Left: Power Supply rack  
Right: Slow Control Rack**




**Figure 2**

**Front: GRACE bench  
Left: Slow Control Rack  
Right: Power Supply rack**

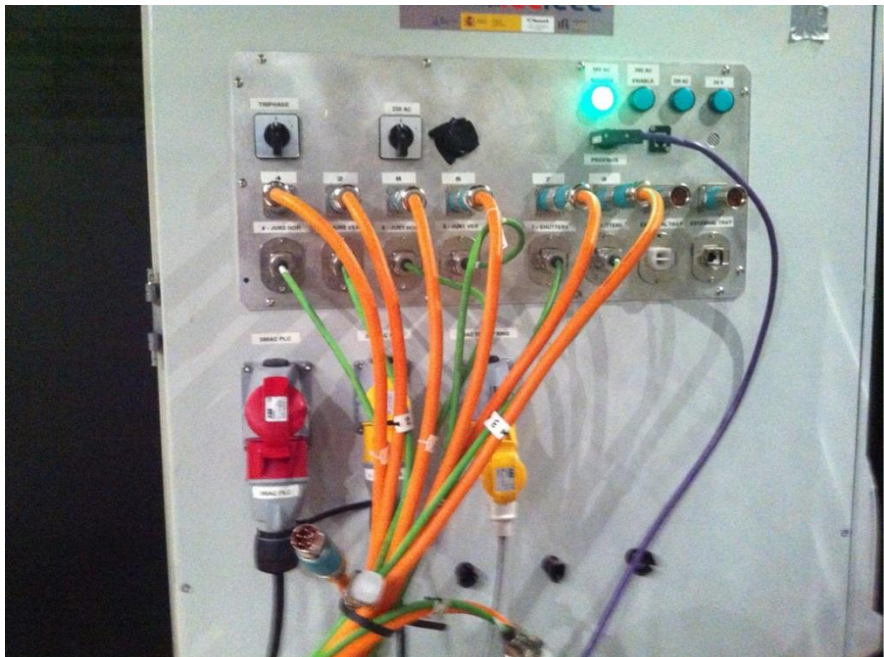
### 5.3 Connect cables to the Power supply rack

Item	Action/Description	Check
37.	<p>Connect the 6 labeled Power Supply cables</p>	



38.	Connect the Ethernet cable	
39.	Screw the earth cables	
		
40.	Connect the mains UPS cable	
41.	Connect the cooling (not needed). Open the racks doors	

**5.4 Connect cables to the Slow Control rack**

Item	Action/Description	Check
42.	<p>Connect the 6 pairs (orange and green) of motor cables. They are labeled as:</p> <ul style="list-style-type: none"> <li>• 4 - Jukebox 0 Hor</li> <li>• 2 - Jukebox 0 Ver</li> <li>• 8 - Jukebox 1 Hor</li> <li>• 5 - Jukebox 1 Ver</li> <li>• 7 - Shutter1</li> <li>• 3 - Shutter0</li> </ul> 	

43.	Connect the slow control profibus (violet) cable	
44.	Connect the Ethernet cable	
45.	Connect the three mains cables <ul style="list-style-type: none"> <li>• Thiphasic</li> <li>• UPS to the top ring</li> <li>• Mains to UPS</li> </ul>	
46.	Connect the four Cryotiger pipes to the compressors using two keys	

### 5.5 Connect cables to the Power Panel

Item	Action/Description	Check
47.	230 Volts (blue) to the Power Supply crate	
48.	230 Volts (blue) to the Slow Control Crate	
49.	Three-phase cable (red) to the Slow Control Crate	
50.	UPS cable (yellow) to the Slow Control Crate	
51.	UPS cable (yellow) to the cables going out to the Ring	

### 5.6 Disconnect swan neck

Item	Action/Description	Check
52.	Follow Inverse of “Connect from the swan neck to the camera” (if applicable)	

### 5.7 Remove the swan neck from the transport cart

Item	Action/Description	Check
53.	Make sure all the cables and pipes are disconnected from the camera and from the racks	
54.	Hold the cables going out of the swan neck and make two bundles	
55.	Attach the crane to the swan neck	
56.	Unscrew from the transport cart	
57.	Take it out paying attention that the cables are guided correctly	
58.	Lower the swan neck onto the swan neck trolley and secure the cables for lifting.	

### 5.8 Remove the camera from the transport cart holding it vertically

Item	Action/Description	Check
59.	Make sure there are no cables or pipes connected to the camera	
60.	Attach the crane bridge to the "South" part of the camera	
61.	Unlock the pins of the transport cart close	
62.	Lift up the camera until is vertical <b>HAZARD/PELIGRO:</b> The CoG of the camera passes zenith before the bridge is vertical. It is important that two experienced members of staff support the camera and control the movement of the camera.	
63.	Lift up the camera until is vertical	
64.	Remove the pins from the cart	
65.	Take the camera out	
66.	Remove the white frame	



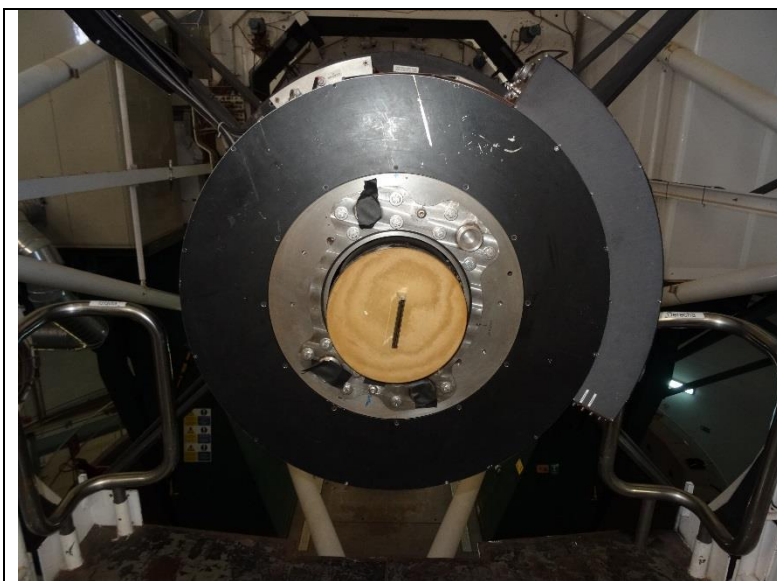
**Figure 3 Lifting of camera off chart**



**Figure 4 Positioning before mounting on PF rotator**

### 5.9 Attach the camera to prime focus

Item	Action/Description	Check
67.	First screw the interface plate to prime focus (16 screws)	
68.	Bring the camera close to the prime focus	
69.	Screw the kinematic mounts	
70.	Make sure the camera is secured	
71.	Remove the camera crane bridge from the aluminum frame	



**Figure 5 Interface plate**

### 5.10 Attach the swan neck to prime focus

Item	Action/Description	Check
72.	Lift the swan neck from its trolley to prime focus	
73.	Bring it close to its mounting position	
74.	Remove the cables from the cable support frame and lay them out on the dome floor	
75.	Mount the swan neck on prime focus	

### 5.11 Mount the cable channel on the top, left vane

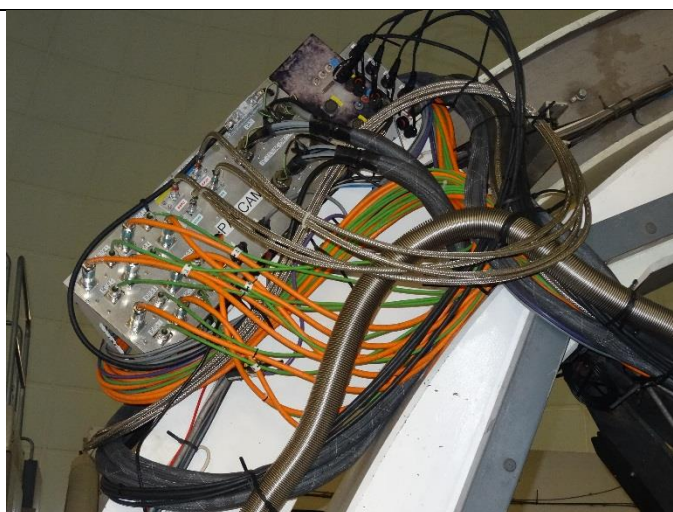
Item	Action/Description	Check
76.	Mount the cable channel on the top, left vane	
77.	Bring all cables and pipe through the guides in the spider	
78.	Close the cable channel cover	

**5.12 Connect cables in the ring (swan neck to GRACE cables)**

<b>Item</b>	<b>Action/Description</b>	<b>Check</b>
79.	Connect the 6 pairs (orange and green) of motor cables. They are labeled	
80.	Connect the slow control (violet) cable	
81.	Connect the UPS cable	
82.	Connect the Power Supply cables	
83.	Connect the four Cryotiger pipes using three keys	
84.	Connect the power cable to the scroll pump	
85.	Connect the computing fibers	
86.	Connect the vacuum pipe to the scroll	



**Figure 6** Cable channel on upper left vane

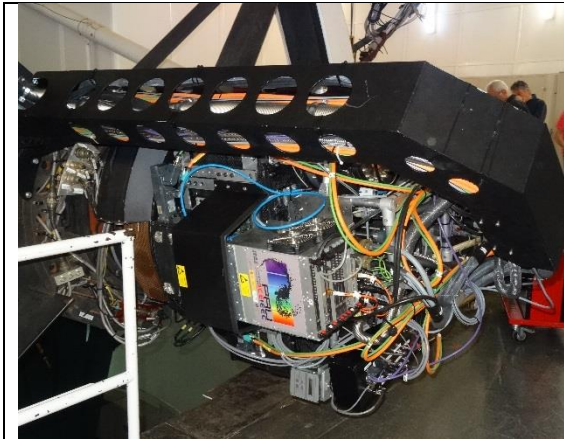


**Figure 7** Patch panel

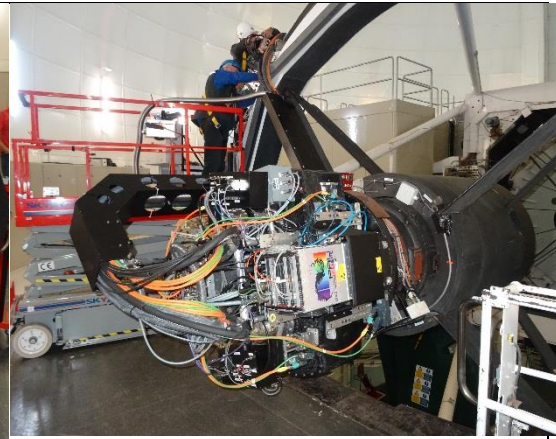


### 5.13 Connect from the swan neck to the camera

Item	Action/Description	Check
87.	First position the guiding bridges into the camera. There are two labelled and they have a unique installed position. Once all four pins are inserted, use cable ties to hold them in place to the camera aluminium frame	
88.	Connect the slow control (violet) cable to the two black boxes. There is a small Velcro tie in the aluminium frame to help guiding the cable between the two slow control boxes	
89.	Connect the UPS cable to the grey box in the camera	
90.	Connect the pairs of motor cables (6). They have labels and they are installed such that they arrive to the correct place	
91.	Connect the Power supply cables to the crates (3 per crate)	
92.	Connect the total 4 black fiber cables (2 per crate)	
93.	Connect the 4 Cryotiger pipes	
94.	Connect the vacuum pipe to the turbo molecular pump	
95.	Connect dry air supply	






**Figure 8 Swan neck above camera**




**Figure 9 Camera on PF rotator**

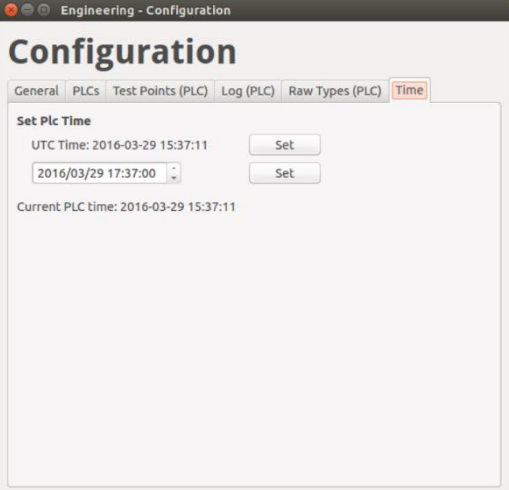
**5.14 Power up PAUCam**

Item	Action/Description	Check
96.	Make sure PAUCam is cabled up to the racks	
97.	<p>Power up the Power Supply rack: Once the main supply is connected, the MAIN AC led must be on. Put the interlock key in the vertical position (IF IT IS IN INTERLOCK POSITION, CONTACT TO THE RESPONSIBLE PERSON) and switch on the MAIN SWITCH to the ON position. The ON/OFF led must be switched on.</p> 	
98.	<p>Once the rack is switched on, the RITTAL CMC III controller (CURRENTLY NOT USED) will start a temperature alarm condition (audible alarm). To acknowledge it just press the “C” key in the CMC front panel.</p>  <p>PRESS</p>	



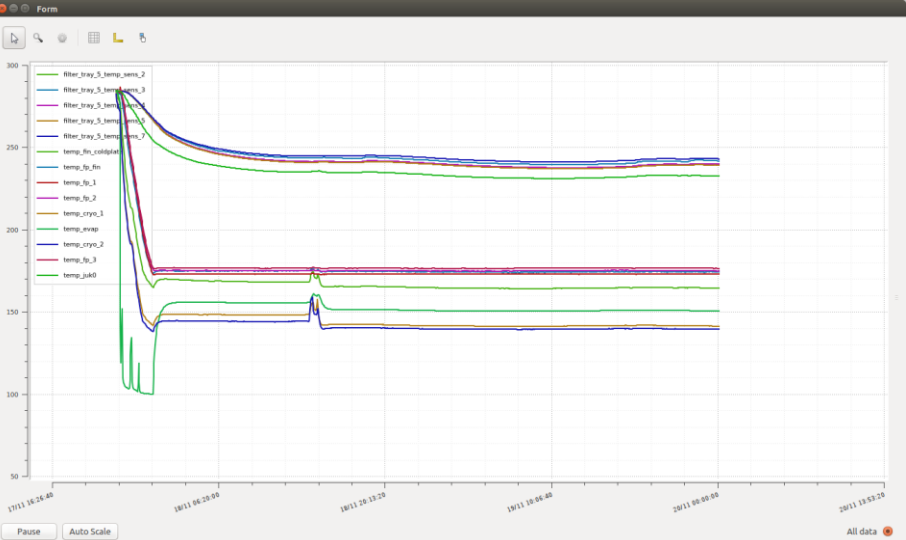
99.	<p>Power up the Slow Control rack. Switch both (230 V and thiphase) on. The fans in the camera will start and the slow control rack will boot. Wait until PLC has boot (~2 minutes). Leds on PLC front should be like:</p>  <p>Leds dp1, dp2 and run should be green</p>	
100.	Power up the scroll pump	

### 5.15 Start Slow control application

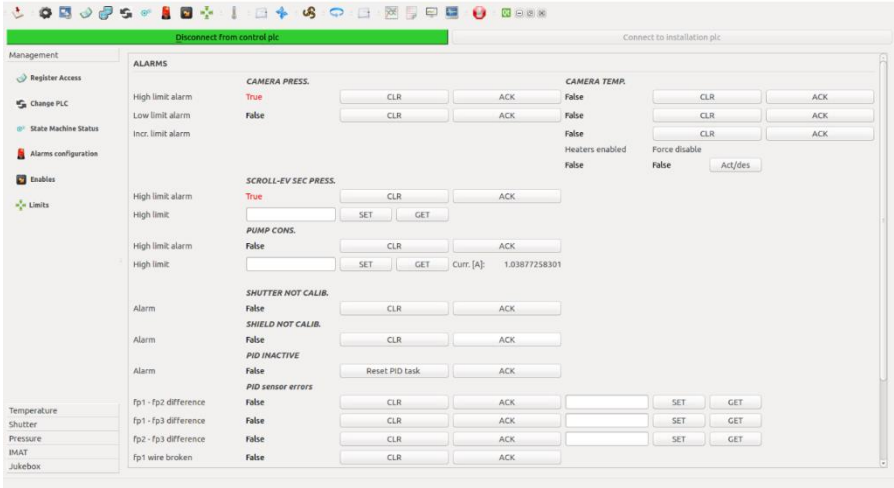
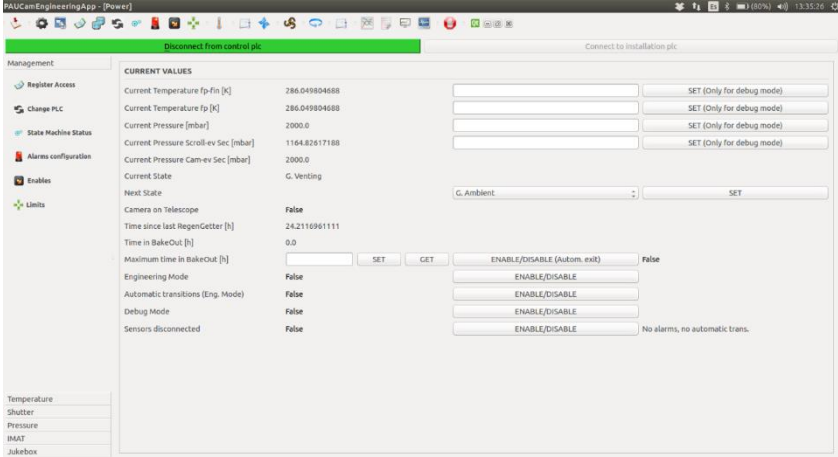
Item	Action/Description	Check
101.	Go to the main PAUCam console and click the PAUCam Icon 	
102.	The PAUCam Master Pannel Should appear	
103.	Click on the “Launch Slow Control Engineering” In the popup window select New Session (there should be none) and press Ok button	

104.	In PAUCam Engineering panel Press <b>Connect to control plc</b> red button. It will turn to green.	
105.	<p>Click the gear icon on the top menu and check the time is correctly set</p> 	

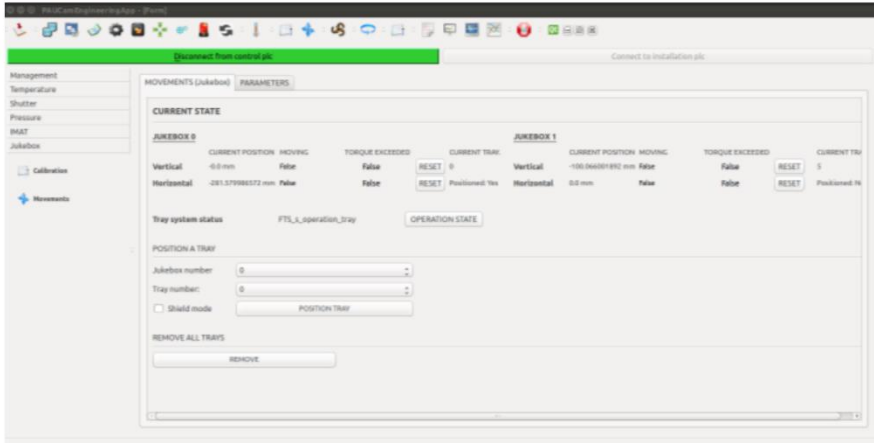
**5.16 Start Monitoring graphs**

Item	Action/Description	Check
106.	<p>In the top menu of the Engineering application to the right, we can see the two icons corresponding to a value display or a time chart display  </p>	
107.	<p>Click on any of them and select either the number you want to see (Typically pressure inside the camera and focal plane temperature or construct a monitoring graph to see the pressure history or the temperature. Typical graph used during cool down is as follows</p>  <p>Where it can be seen the temperature of the Cryotigers, the one of the focal plane and the evaporator temperature, which is at around 100 K during the nitrogen cooldown</p>	

### 5.17 Vacuum into the camera

Item	Action/Description	Check
108.	<p>In the left menu, go to “Management” and then “Alarm Configuration panel”</p>  <p>Acknowledge any alarm present</p>	
109.	Make sure the scroll pump is running	
110.	The camera should be in “Install warm” state, since it should already been in vacuum and warm from the day before	
111.	<p>Click into “Management” “State Machine Status”</p> 	
112.	Wait until pressures in evsec-scroll is below 1 mbar	
113.	Set the Status to “Vacuum”	
114.	<p>When the slow control enters the “vacuum” state it starts the turbo. PLC follows a sequence to power up the turbo pump:</p> <ul style="list-style-type: none"> <li>• Start up turbo</li> <li>• When turbo pump frequency is &gt; 95% and evsec-scroll pressure is below a value (usually 0.9mbars), it opens the electro valve</li> </ul>	
115.	Missing details on trouble shooting and procedures when camera is not “Install Warm”	
116.	Notice that once vacuum is starting, the telescope balancing can be done while the vacuum in the camera is being established	

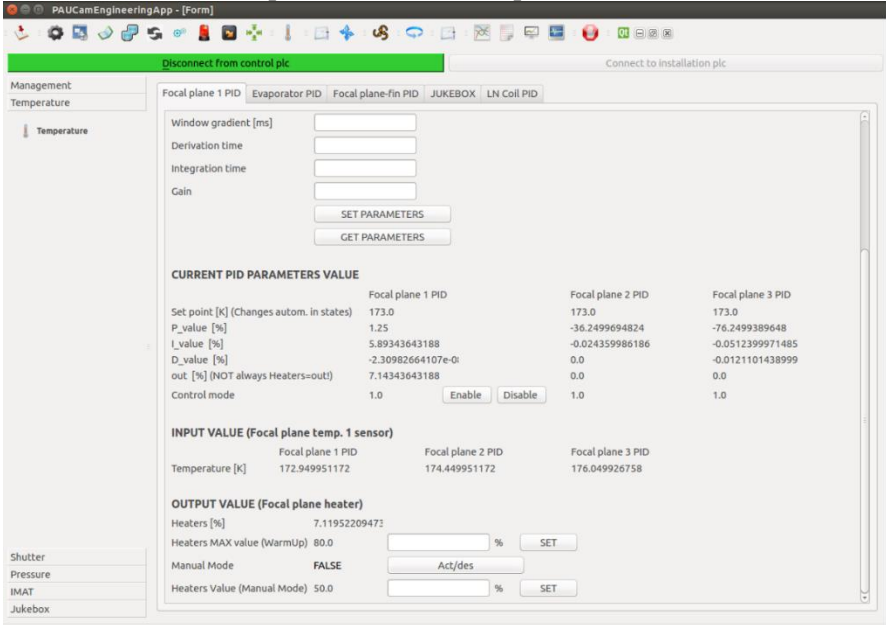
### 5.18 Check motors are connected and trays and shutter move

Item	Action/Description	Check
117.	Go to the Engineering panel. In the left menu, select “Management” and “Enables” Subsection	
118.	The first row is “POWER”. Switch it ON to activate the 380 Volts that power the motors	
119.	Go to the left menu and select “Jukebox”, then “Movements” and press the “Movements (Jukebox)” tab. The panel should look like follows: 	
120.	There are two Jukeboxes. Try to insert a tray in every one to check all motors tray motors are working: <ol style="list-style-type: none"> <li>In “Tray System Status” click the “OPERATION STATE”</li> <li>In “Jukebox Numer” Select 0</li> <li>In “Trray Number” Select 1</li> <li>Click “Position Tray”</li> <li>The first table should show the motors moving</li> <li>In “Tray Number” Select 2 and click “Position tray”</li> <li>Repeat the same sequence inserting trays 1 and 3 for the Jukebox 1</li> </ol> The above sequence will surely move the 4 motors and ha verified that the motors are working	
121.	Now go to the “Shutter”, “Movements” and tab “Movements (Shutter)”	
122.	Move the shutter (TO BE CONFIRMED)	

### 5.19 Start camera Cool-Down


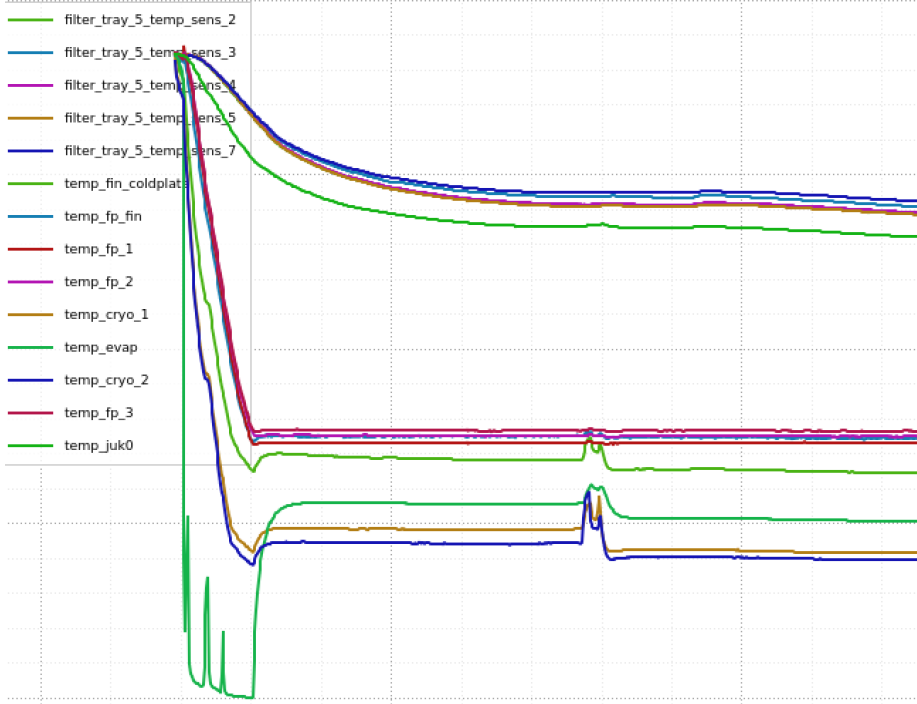
Item	Action/Description	Check
123.	Check the scroll and turbo Pump are working	
124.	Check pressure values inside the camera and at evsec-scroll and camera ev-sec are correct <ul style="list-style-type: none"> <li>Camera &lt; 1E-5mbars</li> <li>Evsec-scroll &lt; 1mbar</li> <li>Camera-evsec &lt; 1mbar</li> </ul>	
125.	Connect the valve control cable to the slow control box in the camera	
126.	Check the Turbo-pump is rotating at least at 95% (Click Pressure → Pressure in the left menu)	



127.	<p>Check the heaters work:</p> <ol style="list-style-type: none"> <li>1. Go to the “Temperature” Menu and to the “Focal Plane 1PID” tab</li> <li>2. At the end of the page, go to “Heaters Value (Manual Mode)” and set the value to 50%</li> <li>3. Check the temperature of the focal plane rises</li> </ol> 	
128.	Go now again to to “Management” “State Machine Status”	
129.	Check the camera is in “Warm” State	
130.	Set the state to “cooldown” state	
131.	When the PLC enters cooldown it switches on the Cryotigers. Check the temperature on Cryotigers goes down. If it is not decreasing, go to GRACE and check the Cryotigers are working	
132.	The camera can be cooled down with the Cryotigers alone but it will take 12-14 hours to reach the nominal focal plane temperature of 173 K	

### 5.20 Cool down with Nitrogen

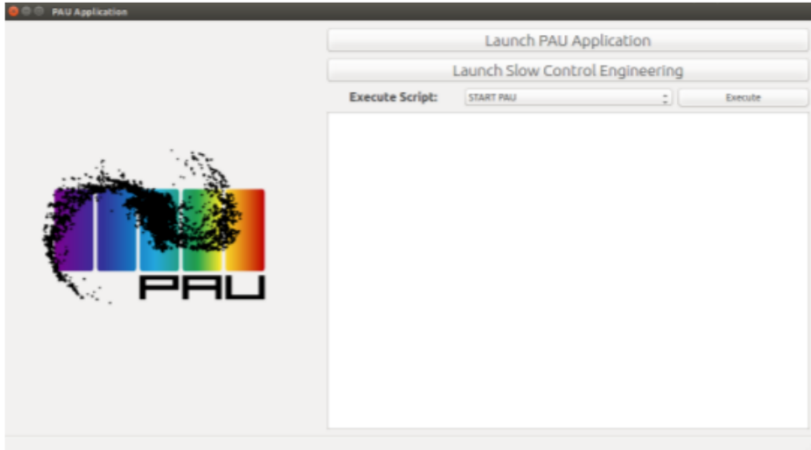


Item	Action/Description	Check
133.	Make sure the Camera is power up, the slow control running and the vacuum is below $10^{-5}$ mbars. Also, we assume here that the Cryotigers are already one and the camera is in cooldown state	
134.	<p>Connect the vacuum pipes to the camera:</p> <ol style="list-style-type: none"> <li>1. Remove the two plastic grey tabs in the nitrogen input</li> <li>2. Connect the long pipe (the one with a triangular adaptor) to the IN nitrogen input (do not forget the O-ring). This is done by hand</li> <li>3. Then, using an Allen key, Tight the triangle screws</li> <li>4. Insert the shorter pipe to the OUT nitrogen of the camera (again use the O-ring)</li> <li>5. Connect the long pipe to the Nitrogen tank</li> <li>6. Place the extreme of the other pipe somewhere where the nitrogen can be wasted</li> </ol>	

		
135.	<p>Now open the Nitrogen. The FP temperature in the camera should start to go down and, eventually reach 100 K</p>	
136.	<p>Once liquid nitrogen has arrived to the end of the output Nitrogen pipe, regulate the nitrogen flow such that there is no liquid but the temperature of the evaporator stays at 100 K. It might require various adjustments to reach and equilibrium and some extra tuning during the process          Typical cooldown graph is as follows, where one can see the evaporator temperature fluctuation (when adjusting the nitrogen flow) and the equilibrium state when the nitrogen is removed</p> 	
137.	<p>All temperatures should start going down. Keep nitrogen flowing until the focal plane temperature reaches 173 K. The procedure should take 3-4 hours</p>	
138.	<p>Disconnect the Nitrogen from the camera:</p>	



	<ol style="list-style-type: none"> <li>1. Close the Nitrogen from the tank</li> <li>2. Use a heat dryer to remove the ice in the input and output pipes in the camera. Use also some paper to avoid the electronics gets wet</li> <li>3. Un-tight the screws of the triangle</li> <li>4. Remove the two pipes</li> <li>5. Insert back the two grey caps</li> <li>6. Insert and secure the insulator in the camera entry pipes</li> </ol>	
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### 5.21 Take a bias image to check all the readout works

Item	Action/Description	Check
139.	This operation can be made when the Focal plane of the camera is below zero °C. It will take a bias image and check the noise	
140.	<p>Go to the PAUCam Master Panel and select “START_PAU” and click execute</p>  <p>This operation starts all the Observation Control system (OCS) and powers all the electronics and CCDs</p>	
141.	Once Finished, click on “Launch PAU Application” to start the control panel	
142.	Press the “configuration” (Gear) Icon.	
143.	Go to /Desktop/yami_conf directory and select he FullSystem_guider.yami	
144.	Press send and wait until the Connection light on the right down corner of the panel goes green	
145.	Press the PAUCam Monitor Icon  to start the main monitoring panel	
146.	<p>Press the New Observation Set icon  on top of the Panel</p> <p>Set the Observer name (PAU) ,select project (PAU) and Set Camera Status to MOUNTED.</p> <p>Pres “New observation Set”</p> <p>Close Window</p>	
147.	Go to the MACRO tab → Click on DAQi subtab → and click on “model18CCDs”. Click Execute	
148.	<p>Go to the MACRO tab → “OB” -&gt; Biass</p> <p>Press Execute and wait for the green tick confirmation</p>	
149.	Go to the “DRACO Section” on the left, and press the window icon to the left. This will open the display with the results of the online post-processing monitoring	

150.	Once the image has been taken, the image number will appear in the DRACO display.	
151.	For bias, it will show the error in the overscan for every amplifier in the system and the average of all of them. The value should be around 9 electrons	
152.	Now, go to the Observation set icon and select "Close observation set" and "Close window"	

## 6 CONFIGURATION

### 6.1 Setting up the TCS

- USER> STATION PRIME
- USER> INSTRUMENT PAUCAM
- USER> AGSELECT PAUCAM

AG selector switch position: 9

### 6.2 Configuring the observing system in DEWARS

- There is a specific "PAUCAM" instrument option.
- This must be selected together with "NOT\_TRIGGER\_ALARM".
- Select detector "EXT\_DETECTOR".
- A DAS machine have to be selected. Any will do, specify one that isn't in use.
- Other detectors may be selected as "KEEPCOLD"

Note that the PAUCAM line on DEWARS will always be in yellow as is no connection to an ING DAS.

### 6.3 Starting the observing system on taurus

- obssys
- startobssys

This will start the PFIP software in ADC\_ONLY mode.

## 6.4 Observing System Checks

To check drama connection to TCS

- tcs page

To check CORBA connection to TCS look at contents of parameter noticeboard

- ParameterNoticeboardViewer &

Expand TCS and look for parameter last (local apparent sidereal time) which should be updating.

Check that the ADC angle changes with telescope initially at zenith, set it tracking and check that the ADC angle changes.

## 7 REMOVAL

In order to remove the camera, the following steps must be done.

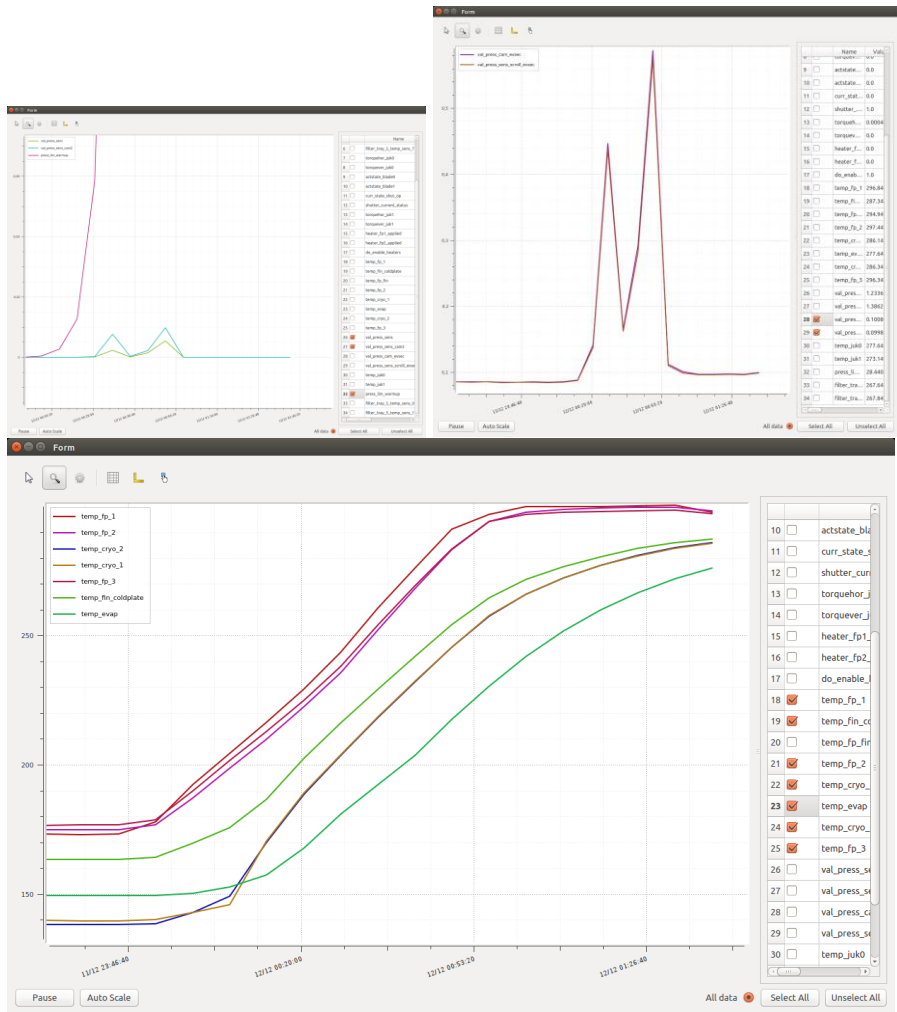
### 7.1 Warm-up PAUCam

Item	Action/Description	Check
153.	Make sure the Camera is power up and the slow control running (PAU instrument control)	
154.	Switch off the Low Voltage Power Supplies. Use the Main PAU Control Panel to select 'Stop "Fuentes de poder" from PANs'	
155.	Move trays to Jukebox 0, tray 6 then to Jukebox 1, tray 6 and the push remove all trays	
156.	Disable the power in the engineering application (in Management → Enables)	
157.	Go to the Temperature icon menu and check that none of the heaters is in manual mode	
158.	Open chart on pressure: <ul style="list-style-type: none"> <li>• Camera Pressure</li> <li>• Limit pressure (press_lim_warmup)</li> <li>• Ev_sec scroll</li> <li>• Cam_Evsec</li> </ul>	
159.	Open chart on temperature: <ul style="list-style-type: none"> <li>• Focal Plane</li> <li>• Cryotigers</li> <li>• ....</li> </ul>	
160.	Open Heaters Chart <ul style="list-style-type: none"> <li>• Applied heaters value</li> </ul>	
161.	Go to Management → State machine State and set the state to "Warmup state"	
162.	Limit pressure is the water saturation pressure for the focal plane temperature. If camera pressure is above this line, it means that water can be saturated in front of CCDs. When camera starts to heat, this pressure raises. Several situations can happen here:	

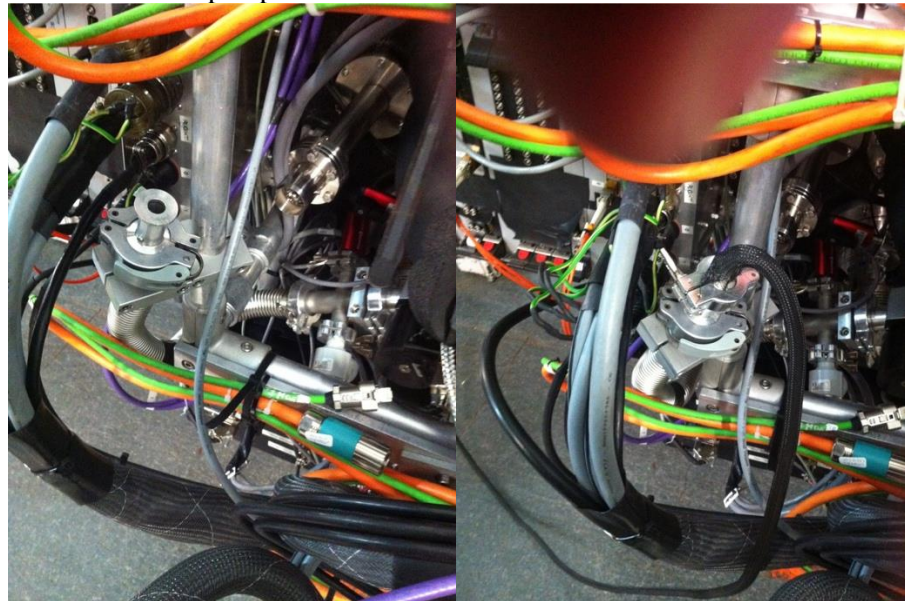
- Pressure is rising too fast:
  - Best way to control it is to set heaters in manual mode and limit its value. Check what was the value applied to heaters and set a lower value. Usually, when pressure is too high, just decrease rising speed of temperature or maintain it until pressure returns to normal values.
- Pressure has passed threshold value of warm state (you can check this limit in Management → Limits) and state machine has passed to “warmup\_vacuum\_alarm”
  - Acknowledge alarm to stop buzzer
  - Once pressure returns to normal values, change state to warm up again

163. During the whole process, the heater of the focal plane can reach 100%. It will start decreasing when the focal plane temperature sensor arrives to 300 K. Once all sensors (Focal plane, Cryotigers and evaporators) are at ~270K state machine should change its state to warm and the heater will be switched off.

The following figures show the pressure in the camera together with the Safe value, which was always way below the limit safe limit (although they triggered twice the Warm-up-Alarm), the pressures in the scroll (that raised twice during the process) and the temperature graphs.





## 7.2 Vent the Camera

Item	Action/Description	Check
164.	Change state machine to venting. The camera will close all valves and switch off all the pumps	
165.	Connect a nitrogen bottle with a small silicone tube to the input of the turbomolecular pump 	
166.	Go to pressure → pressure Set the system to Manual Mode (top button) Open the Ev-sec valve	
167.	Monitor the pressure of the camera and open carefully the nitrogen flow	
168.	Once the pressure is slightly above atmospheric pressure (use the manometer in the bottle to control this), close the ev-sect valve again	
169.	Finally, set back the system to Automatic mode and go to the state machine and set the state to Ambient.	

## 7.3 Power down PAUCam

Item	Action/Description	Check
170.	Power down the Power Supply rack (main switch) 	

171.	Power down the Slow control rack (main switch and Triphase)		
172.	Power down all electricity from the mains panel		
173.	Shutdown the paucontrol PC (sudo shutdown -hP now)		

#### 7.4 Uncabbling

174.	Remove the cover of the cable channel across the top, left vane	
175.	Follow inverse of “Connect cables to the Power Supply rack” (GHRIL)	
176.	Follow inverse of “Connect cables to the Slow Control rack” (GHRIL)	
177.	Follow Inverse of “Connect cables in the ring (swan neck to GHRIL cables)”	
178.	Follow Inverse of “Connect from the swan neck to the camera”	

#### 7.5 Remove swan neck from prime focus

Item	Action/Description	Check
179.	Check all cables are detached	
180.	Attach the cable support frame to the swan neck	
181.	Store and secure the cables to the cable support frame	
182.	Hold the swan neck by supporting its weight with the crane	
183.	Detach the swan neck from prime focus	
184.	Lift the swan neck to the ground floor and store it on its trolley	

**7.6 Remove the camera from prime focus**

<b>Item</b>	<b>Action/Description</b>	<b>Check</b>
185.	Move the derotator such that “North” of the camera is pointing down (Getter pump on top)	
186.	Attach the crane bridge to the aluminum frame	
187.	Support the camera weight with the crane	
188.	Unscrew the kinematic mounts (4-3-2-1) in approx. three iterations while checking the crane supporting the camera	
189.	Once free carefully separate the camera from the interface plate	
190.	Attach the transport chart interface frame to the camera	
191.	Lift the camera to the ground floor and fit the frame in the transport chart	
192.	Rotate the camera into the cart until is in horizontal position <b>Attention: This needs currently three people to push the camera in the required direction while lowering the crane!</b> <b>The center of gravity tends to force the camera in the opposite direction!</b>	
193.	Secure the frame to the transport cart	
194.	Remove the crane interface bridge from the camera	
195.	Secure the kinematic mounts threads 2, 3 and 4 with tape (inserts could be lost)	
196.	Remove the camera interface plate from prime focus	