newview 9000

Service Manual

6311-0100-X1

NOTICE
Users are responsible for ensuring that they have the current revision of this document.
The current revision may be obtained from Doc. Control or online using Dashboard.

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CONTENTS

1. PURPOSE

This procedure describes how to maintain and repair the NEWVIEW 9000 OPTICAL PROFILING SYSTEM (6311-0100-X1).

2. EQUIPMENT REQUIRED

0.5X Zoom

10X Mirau Objective

5.5X Infinite Conjugate Michelson Objective

Silicon Carbide (SiC) Flat

1.8 µm Step Height Standard

6300-0521-01	Alignment Pupil Relay Lens (**PRL**)
6300-0533-01	NV Pupil Crosshair Target Assy (**PCT**)
6300-2198-01	Lateral Calibration Standard
6306-4036-01	200 lpmm Focus Grating (if available, if not use a standard 200 lpmm focus grating)
0220-0699-01	Parcentric Calibration Tool
0220-0719-01	NV8k Calibration Filter Tool

Metric hex wrench set

ContraPro USB Flash Drive, CD-ROM, or the service utilities folder located at C:\ProgramData\Zygo\Utilities.

Unzip Service Utilities. Navigate to C:\ProgramData\Zygo\Utilities, right click on **Service Utilities.zip** and select **Extract All…** then click **Extract**. Enter **Star2017** for the password.
Note: This password is confidential and for ZYGO personnel only. The service utilities folder contains Profiler Utilities, (ContraPro, MicroATP) PI-Test, and Bridge Configurator.

NOTE: When finished servicing the system, use file explorer to delete the folder C:\ProgramData\Zygo\Service\Service Utilities from the local computer.
The folder C:\ProgramData\Zygo\Service\Service Utilities.zip should remain in place.

3. RELATED DOCUMENTS

OMS-6311-XX	NEWVIEW 9000 ASSEMBLY PROCEDURE
ATP-0578	NEWVIEW 9000 TEST PROCEDURE
6311-0100-X1	NEWVIEW 9000 OPTICAL PROFILER

4. SKILLS REQUIRED

Windows 7/10, Mx, ContraPro, and NewView 9000 training

NewView 9000 Service training

Optical handling and cleaning training

ESD awareness

5. Bridge Board Replacement

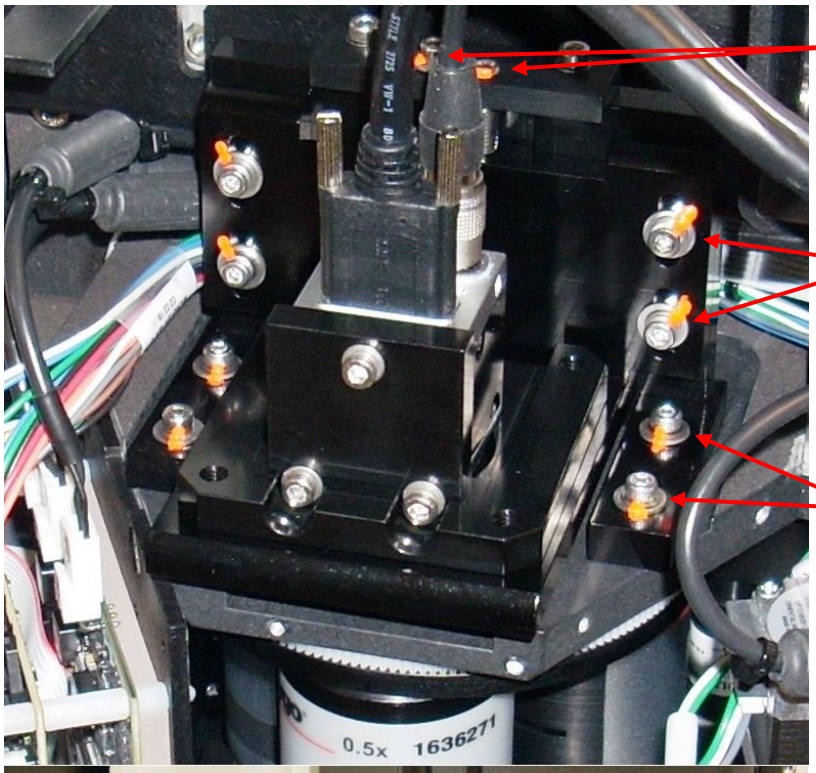
1. Close **Mx**.
2. Switch off power to the electronics enclosure.
3. Make note of the new serial number and MAC address specified on the bottom side of the 6450-8101-01 Ethernet to CAN Bridge assembly.
4. Remove Bridge board from the electronics enclosure.
5. Replace the Bridge board with the new one.
6. Edit the **InstrumentHardware.xml** file located in the **C:\ProgramData\Zygo\Mx\Cfg** directory in accordance with the new MAC address as shown in the example below.

```
- <Section Name="ZygoCanBridge">
    <add Value="00-03-F4-06-CF-FF" Key="Mac"/>
    <add Value="5000" Key="Timeout"/>
    <add Value="1000" Key="BaudRate"/>
```

7. Edit the label on the electronics enclosure to specify the new MAC address.
8. Power on the system and log onto the PC as **administrator**.
9. Open **Bridgetest** by selecting **Start/All Programs/Zygo Corporation/Utilities/ BridgeTest.**
10. In the **BridgeTest** window click "**Scan Bridges**", scroll to and select the MAC address for your system and press" **Connect**".
11. Select "**Tools"** and "**Bridge Configuration**".
12. Set the IP address to **169.1.1.2** and press the "**SET"** button; exit the bridge configuration window.
13. Click "**Scan Bridges**", scroll to and select the MAC address for your system; click the "**Connect**" button.
14. Click the "**Configure**" button; from within this window click the "**Select Directory**" button.
15. The DCF files are located in the "**C:\ProgramData\Zygo\Mx\Cfg\DCFs**" directory
16. Select the appropriate DCF file for the board and click "**Configure**"
17. When finished configuring, click the "**Main**" button to return to the main screen.
18. To the right of the "NMT" button click the down arrow and select "**Reset**" from the pull down menu.
19. Check the "**All Nodes**" box and click the "**NMT**" button
20. Close BridgeTest

Warning! DO NOT TRY TO SET THE BAUD RATE ON THE BRIDGE BOARD! THIS WILL DISABLE THE BRIDGE PERMANANTLY!

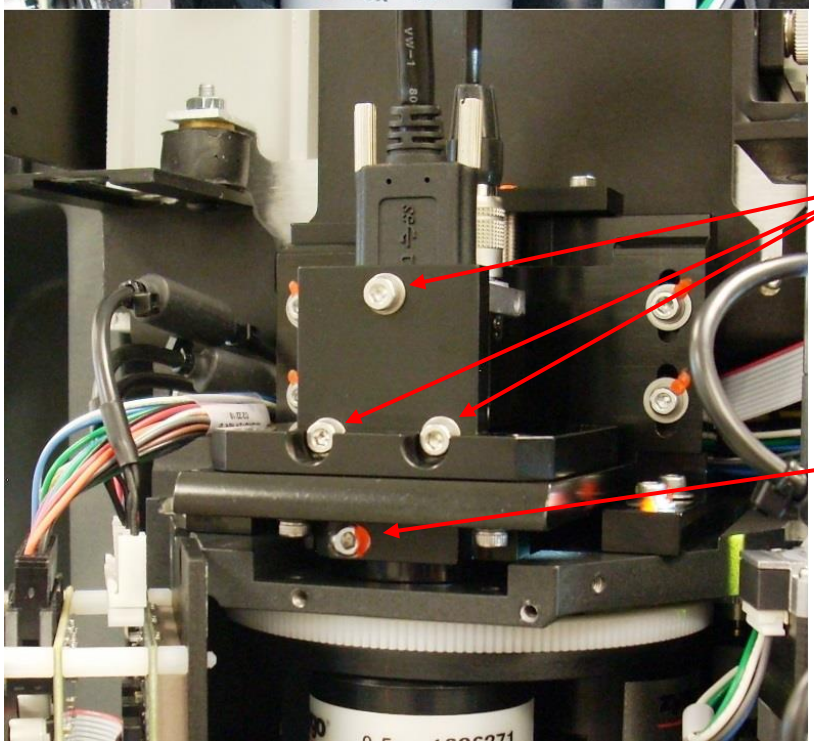
6. Camera Replacement



Camera Z height/focus adjustment

These screws must be loose to adjust camera focus. (two more on opposite side)

Loosen these screws to adjust camera laterally. (two more on opposite side)



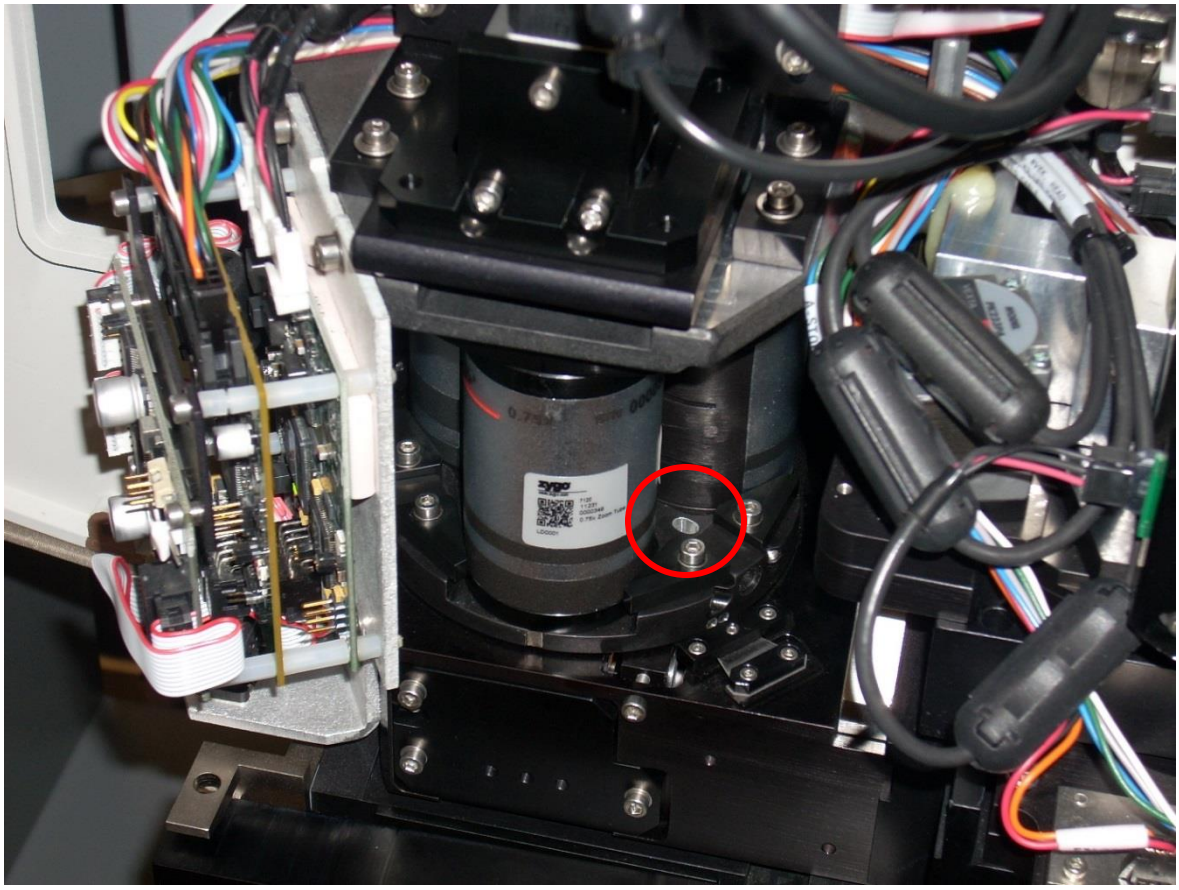
Once camera is removed from head by loosening the clamp screw shown below, these three screws must be removed to uninstall the camera from the aluminum bracket

Loosen this screw for camera rotation and/or to remove the camera.

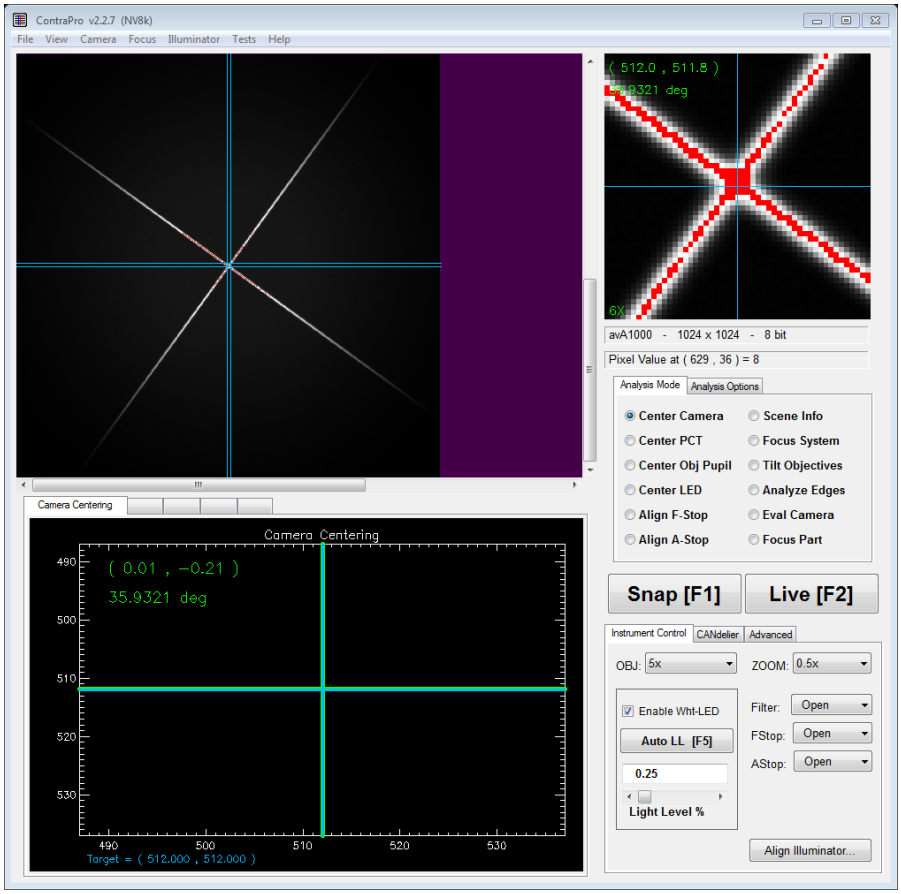
Using the images above as a guideline, remove the defective camera and replace with the new one.
The new camera kit will have the camera tube already installed**. Included in the camera kit is a new heat sink interface pad; be sure to use the new pad when replacing the camera as the camera is heat sensitive.**

The 6311-0900-01 camera kit is a USB3 camera and is a plug & play device; it is up to Windows to re-associate the driver to the new camera. This is mostly done seamlessly but sometimes it doesn't go as planned. Either a reboot or forcing an update is necessary in this case.
What you will have is a camera with a yellow exclamation point in the device manager and you need to go through the normal Windows process of updating the driver.

1. Launch **ContraPro** and select the reference (0.5X) zoom tube, install the PRL in place of the zoom tube and the **PCT** in place of an objective. **NOTE: the reference zoom tube is the one to the left of the DZT alignment hole, (as shown below) this is where the PRL must be installed.**



2. Select the camera mode **"1000 x 1000 @ 195Hz"**
3. Select the **"Center Camera"** analysis mode radio button in ContraPro, then click **"Live [F12]".**
4. Make sure the face of the camera mount is flush with the camera bracket, then adjust the camera z-position to **visually focus the crossline image.** Set the light level and verify that ContraPro is correctly locking onto the crossline image, as shown in the below image.



5. Loosen the M3 screws holding the camera bracket to the head and move the camera laterally until the **crossline image is centered to ± 0.5 pixels**; re-tighten the screws and verify the alignment.

Check for Artifacts

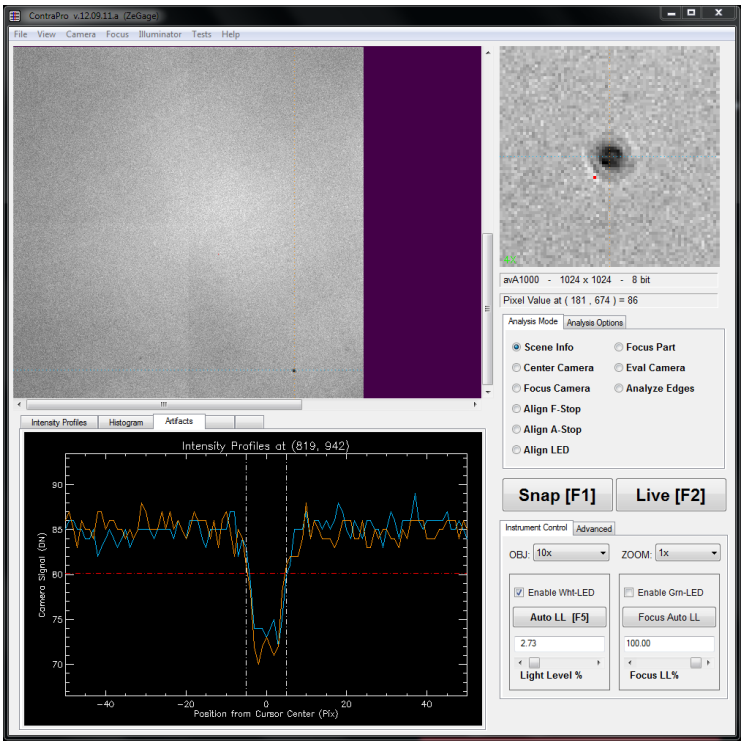
1. In **ContraPro**, select the **2X** zoom position.
2. Install a 10X Mirau objective onto the tool; in the ContraPro Instrument tab, select **OBJ→DEFINE…**, then specify the 10X objective in the active position.
3. Choose the **"Scene Info"** analysis mode in ContraPro, click **"Auto LL [F9]"**, then click **"Live [F12]"**
4. Select the camera mode **"1600 x 1200 @ 150Hz"**
5. Verify that the filter is in place, the F-stop is open, and the A-stop is open.
6. Select the **"Artifacts"** plot tab, and then inspect the image for artifacts by clicking on each questionable artifact in the image window.

a) An artifact is unacceptable if it is wider than 10 pixels, as indicated by the vertical white dashed lines in the plot window; the artifact in the image below fails this spec

b) An artifact is unacceptable if its contrast drops more than 10%, as indicated by a dip below the horizontal dashed line in the plot window; the line will turn red if the artifact under inspection fails this spec, as shown below, otherwise it will be green

c) Single-pixel artifacts ("dead" or "stuck" pixels) are not considered unacceptable

7. Clean the camera to remove any unacceptable artifacts.



Camera Rotation and focus

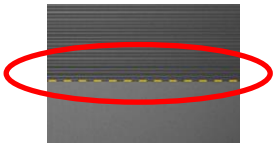
1. Make sure the filter is in the **"Open"** position and the 0.5X zoom is selected with the 10x objective.

2. Select the camera mode **"1000 x 1000 @195Hz"**

3. Select the **"Focus System"** analysis mode radio button in ContraPro, then click **"Live [F12]"**

4. Using a carpenter square or straight edge, place the focus grating on the stage. Orient the focus grating target with the mirrored edge nominally positioned in the field-of-view at the same level as the horizontal yellow line in the main plot window, as seen in Image below.

5. Move the stage in the x axis and check to see if the image moves in the Y axis at the same time.



6. Adjust the rotation of the grating until it runs parallel with the x axis and there is no movement in the Y axis. NOTE: The image does not need to be squared on the screen or the yellow line since the camera has not been optimized.

7. Adjust the PR stage tilt to provide vertical fringes contained within the vertical yellow box on the main plot window, as shown in image below; click **"Auto LL [F9]"** if necessary.

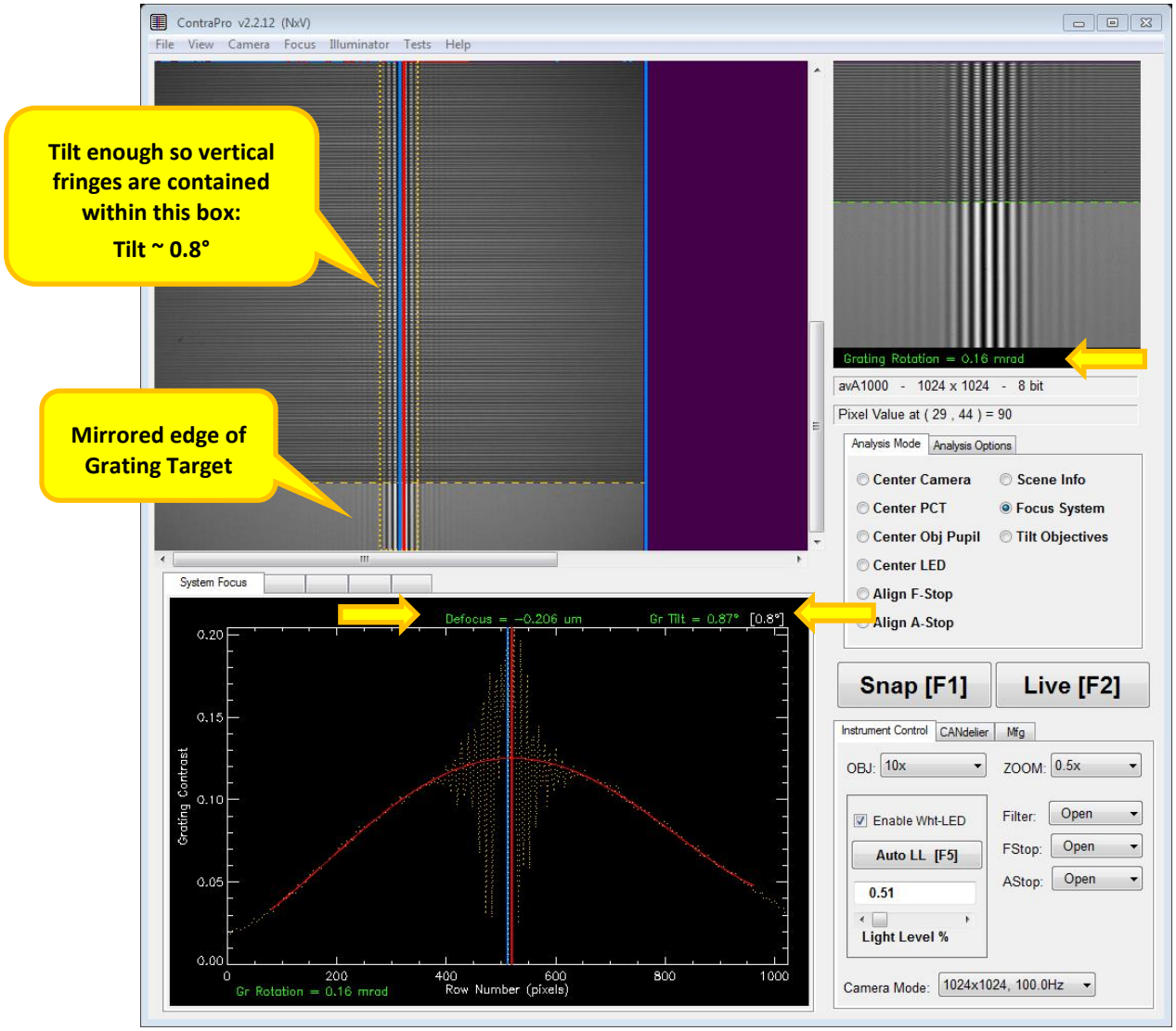
8. The tilt value reported in the bottom plot will turn green when the correct tilt is achieved (~0.82°). Only tilt the grating enough to keep the result consistently green.

9. Orient the focus grating target with the mirrored edge nominally positioned in the field-of-view at the same level as the horizontal yellow line in the main plot window, as seen in image below.

10. Loosen the M3 screw on the camera clamp that holds the camera in the bracket; Rotate the camera such that the **|Grating Rotation| < 0.5 mrad**

11. Loosen the M3 screws on the vertical interface of the camera bracket and use the set screws on top of the camera bracket to adjust the axial position of the camera; Focus the camera to overlap the grating contrast curve (red line) and coherence envelope (blue line) such that the **|Defocus| < 0.32 µm**

12. Tighten all screws on the camera clamp and bracket and verify that the camera alignment is maintained

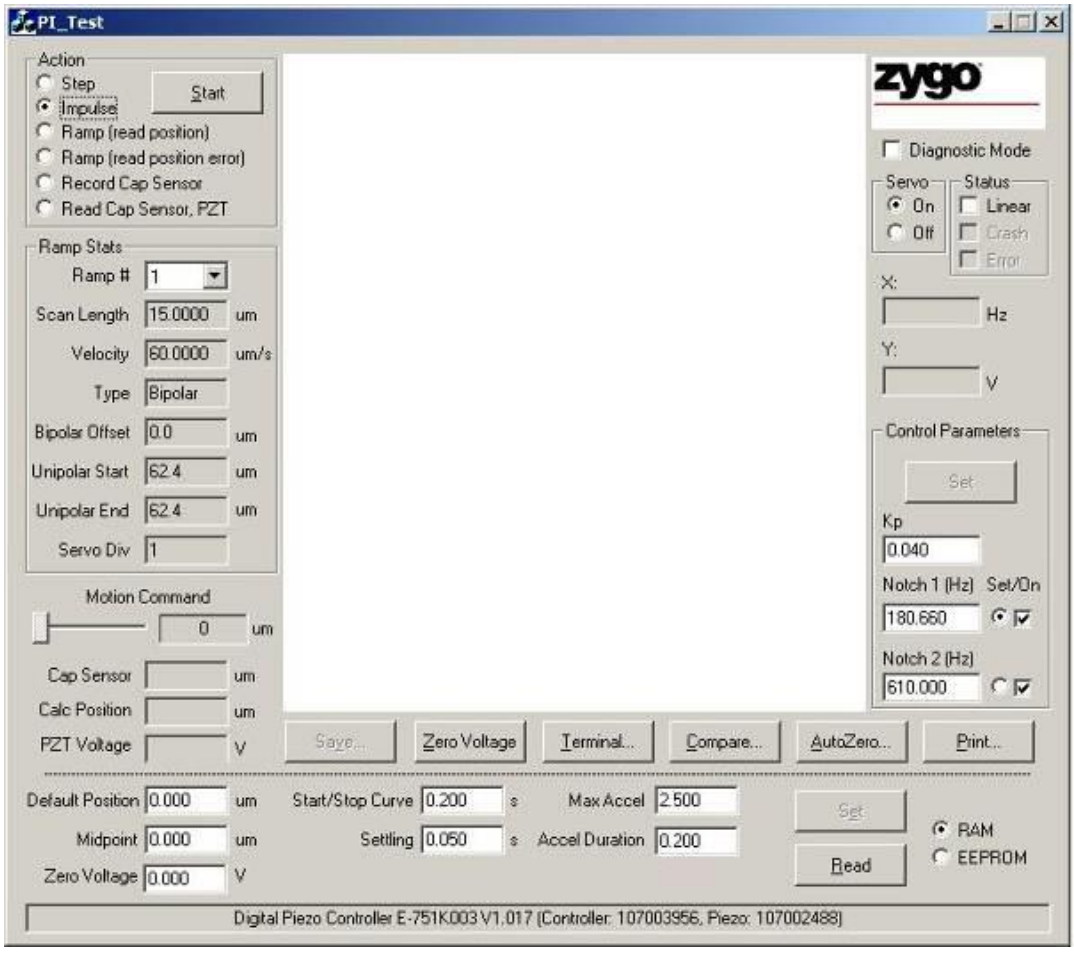

Tilt enough so vertical fringes are contained within this box:
Tilt ~ 0.8°
Mirrored edge of Grating Target
ContraPro v2.2.12 (NxV)
File View Camera Focus Illuminator Tests Help
Grating Rotation = 0.16 mrad
avA1000 - 1024 x 1024 - 8 bit
Pixel Value at (29 , 44) = 90
Analysis Mode
Analysis Options
Center Camera
Scene Info
Center PCT
Focus System
Center Obj Pupil
Tilt Objectives
Center LED
Align F-Stop
Align A-Stop
System Focus
Defocus = −0.206 um
Gr Tilt = 0.87° [0.8°]
Grating Contrast
Gr Rotation = 0.16 mrad
Row Number (pixels)
Snap [F1]
Live [F2]
Instrument Control
CANdelier
Mfg
OBJ: 10x
ZOOM: 0.5x
Enable Wht-LED
Auto LL [F5]
0.51
Light Level %
Filter: Open
FStop: Open
AStop: Open
Camera Mode: 1024x1024, 100.0Hz

7. Scanner Test with PI Test Utility

PI test is a utility that is designed to debug digital scanners; the purpose of using this utility here is to help determine if the scanner has been damaged due to a crash. No special cables are required to run this utility, it can be placed in any directory, and can be used with Mx running.

Service engineers should not: use Step/Impulse Actions, change Control Parameters.

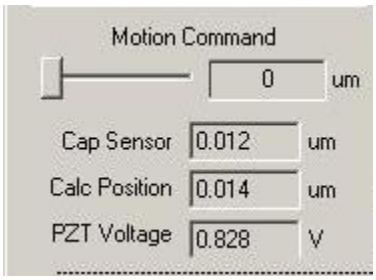
Figure 8 is a screen capture of the PI_Test window when first opened.



Actions:

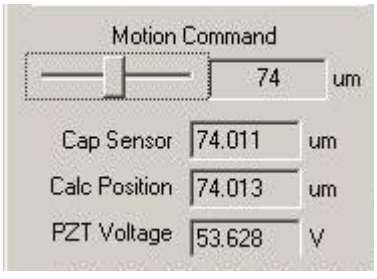
- Ramp (read position). Play the currently selected ramp and read the position.
- Ramp (read position error). Play the currently selected ramp and read the error from the ideal.
- Record cap sensor. Record a time history of position at a 2kHz sample rate
(e.g. Do Environ, except using the cap sensor)
- Read Cap Sensor, PZT. Send motion commands, read the cap sensor, the calculated position and PZT voltage.

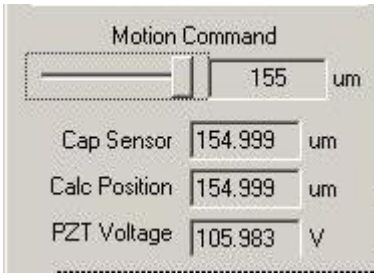
1. Make sure that the scanner has full range of travel, use action: “Read Cap Sensor, PZT”and click Start. The positions should update in the window (see figure 9 below)



   a. The Motion Command should be approximately the same as the cap sensor and calculated position.
   b. If not, make sure that the servo is “On”.
   c. Use the Motion Command slider to move from 0um to the full travel range. The PZT voltage should be approximately -15 to +10 at 0um commanded position. This will vary from system to system.
   d. If the voltage is quite high (10’s of volts), it indicates that there is significant force required and is generally indicative that a crash has occurred and the flexure has been damaged.
   e. Check that the maximum travel position should also be achievable.
      - The PZT voltage range is capable of approximately -30V to about 120V. The maximum travel position should occur at a PZT voltage of around 105 to 115V, if it cannot achieve the command there has been damage. See figure 10 below for an example of a working scanner.

2. When done with this action, click stop.





All the ramps stored in the scanner can be played by selecting the “ramp” actions. The only difference is the output (position, position error). “Ramp (read position)” will allow a ramp to be viewed by clicking Start. While the ramp is “linear”, the Linear checkbox will be set. The Crash indication is not supported for E-751 scanners and was not implemented for the E-753 scanner in the NewView 7000; it has been implemented for the NexView, NV8000, NexView2, and NV9000 microscopes.

3. Upon exiting PI_Test, a dialog will be displayed to store the zero voltage position. Select “Yes” to exit without logging zero offset.

8. Scanner Replacement

1. If open, close Mx and turn off power to the electronics enclosure

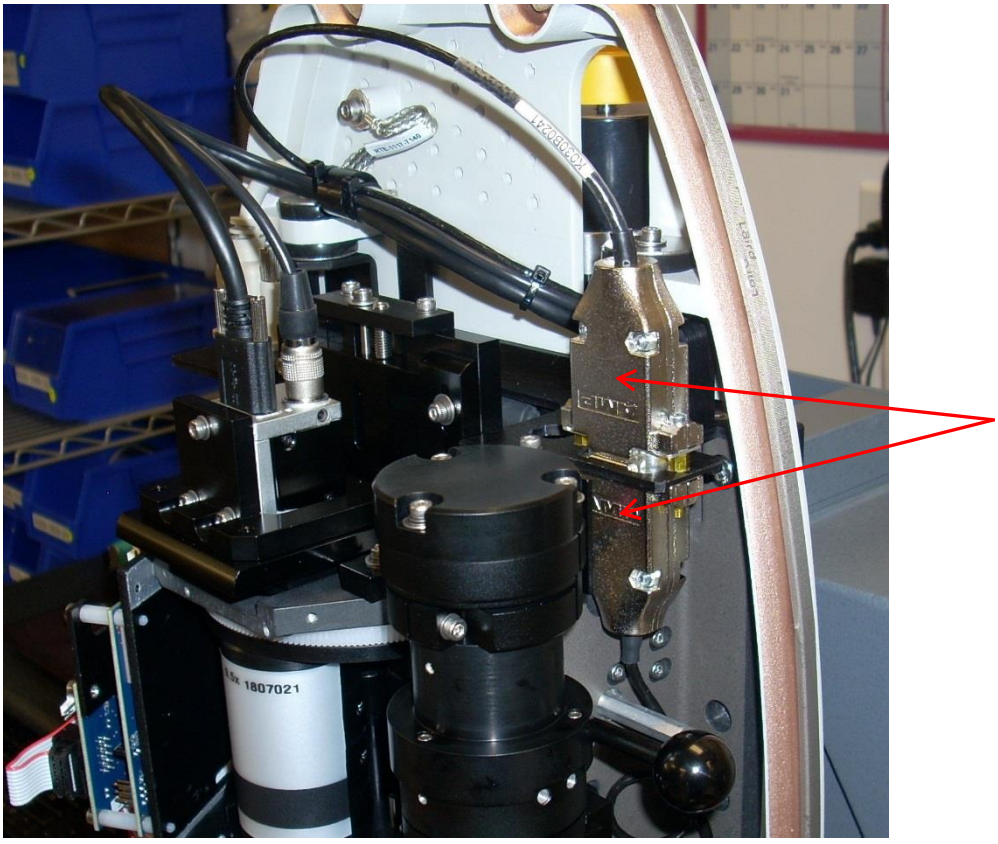
   Always use appropriate ESD precautions when working on electronics.

2. The replacement scanner will be specified as part number **6311-0800-01** and will consist of the scanner and matched digital control board.

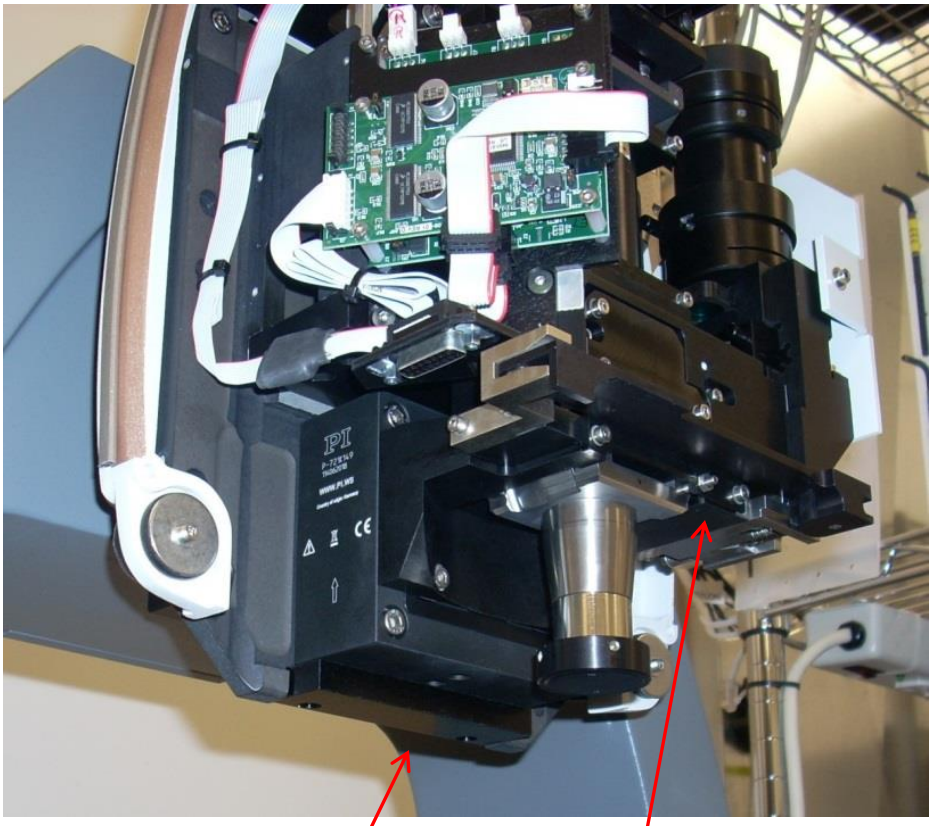
   NOTE: The NewView 9000 system controller uses Mx software to control the instrument. For Mx we do not note the scanner serial number in the control file so we do not need to edit any files when changing the scanner.

3. Remove the digital scanner board from the electronics enclosure and replace it with the new board. It is not necessary to replace the scanner extension cable.

   Remove the NewView 9000 cover and set aside. Disconnect the scanner extension cable at the connector plate on the top right of the microscope head. Remove the scanner bulkhead connector by using a 3/16" nut driver to remove the jack screws. See figure below.



4. The scanner rests on an aluminum bracket (Figure below, Scanner bracket) that may need to be removed in order to remove the scanner from the head. The bracket is held in with two screws that are accessed from the bottom of the bracket. Once the bracket is removed the three M5 screws that hold the scanner can be loosened to remove the scanner. Use caution not to lose the fiber washers behind the three screws.



(Scanner bracket) (M3 set screw)

5. Remove the objective dovetail mount from the old scanner and install it on the new scanner being sure the left side of the mount is flush with the side of the scanner with the serial number information. The assembly can be placed on a flat surface when tightening the screws to ensure the mount is flush with the scanner.

   Install the new scanner leaving the three screws slightly loose; be sure the fiber washers are behind the three screws. Re-install the scanner bracket so the scanner rests on it. Install the scanner bulkhead cable using the jackscrews removed earlier and connect the scanner extension cable being sure the connectors are fully seated and screwed down.

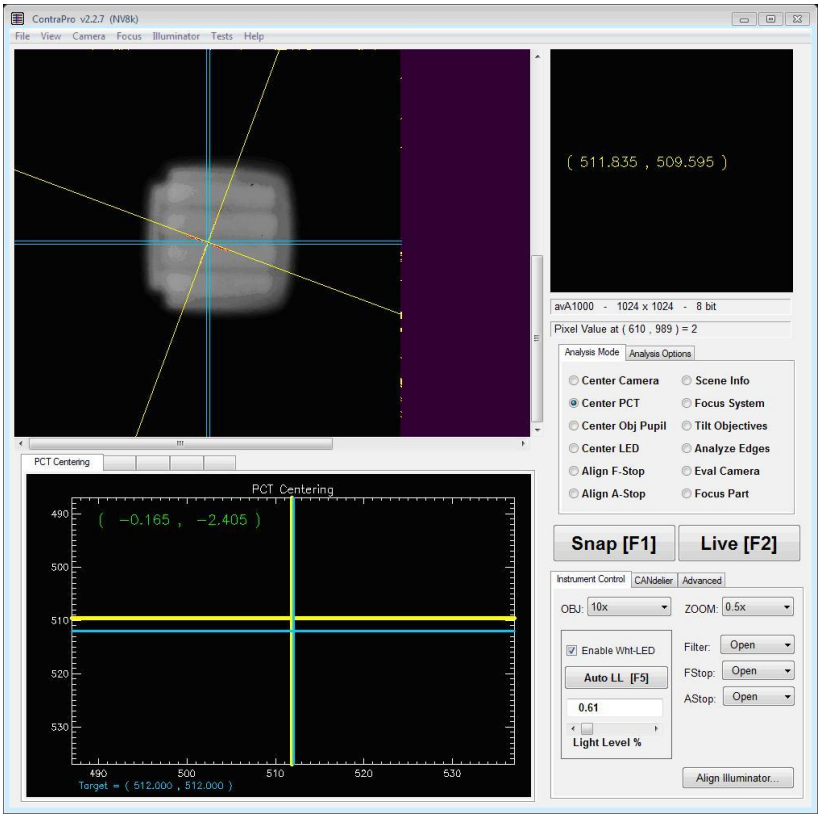
6. Turn on the power to the electronics and launch Contrapro. Remove customer zoom tube and install the **PRL** with lens facing upward. The pupil relay lens must be installed in the reference (0.5x) zoom tube position which is to the left of the alignment pin hole. This ensures the tool is aligned the same way as at the factory.

7. Set the camera mode to **1000 x 1000 @ 195Hz**

8. Select "**Center PCT**" analysis mode button and click "**Live**". Adjust the focus of the PRL to visually focus the PCT crosshair image if necessary.

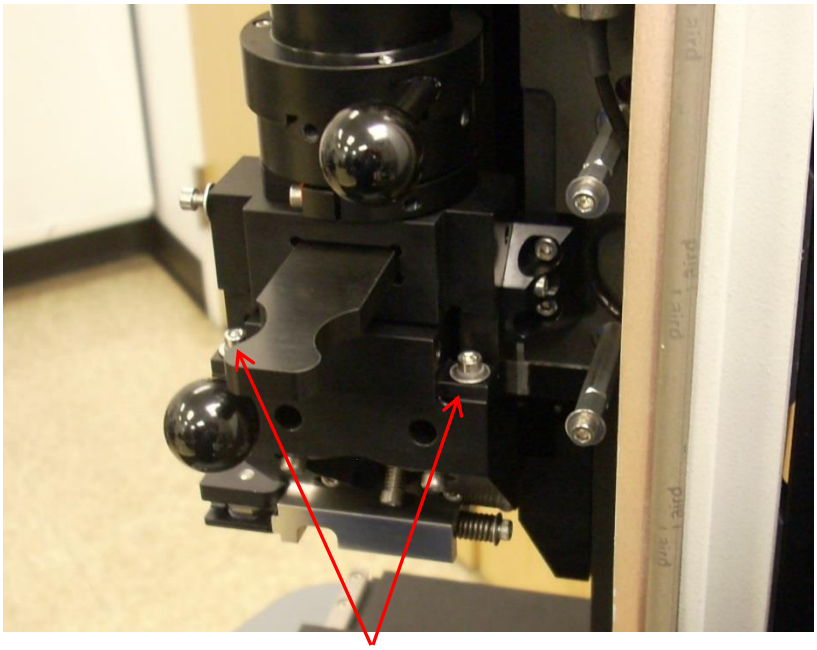
9. Loosen the M3 set screw (figure above) that limits the y-position of the objective dovetail mount. Adjust the scanner x-position and the objective dovetail mount y-position until the **PCT crossline image is centered to ± 1.0 pixel.** See figure below (The version of Contrapro you use may vary from what is shown)

   NOTE: The software will automatically detect the PCT crossline when it's near the target crosshairs; there should be some saturation in the PCT crossline image for the automatic detection to work.



10. Re-tighten the scanner screws and lock the objective dovetail set screw with an M3 nut, verify that the PCT crossline alignment is maintained.

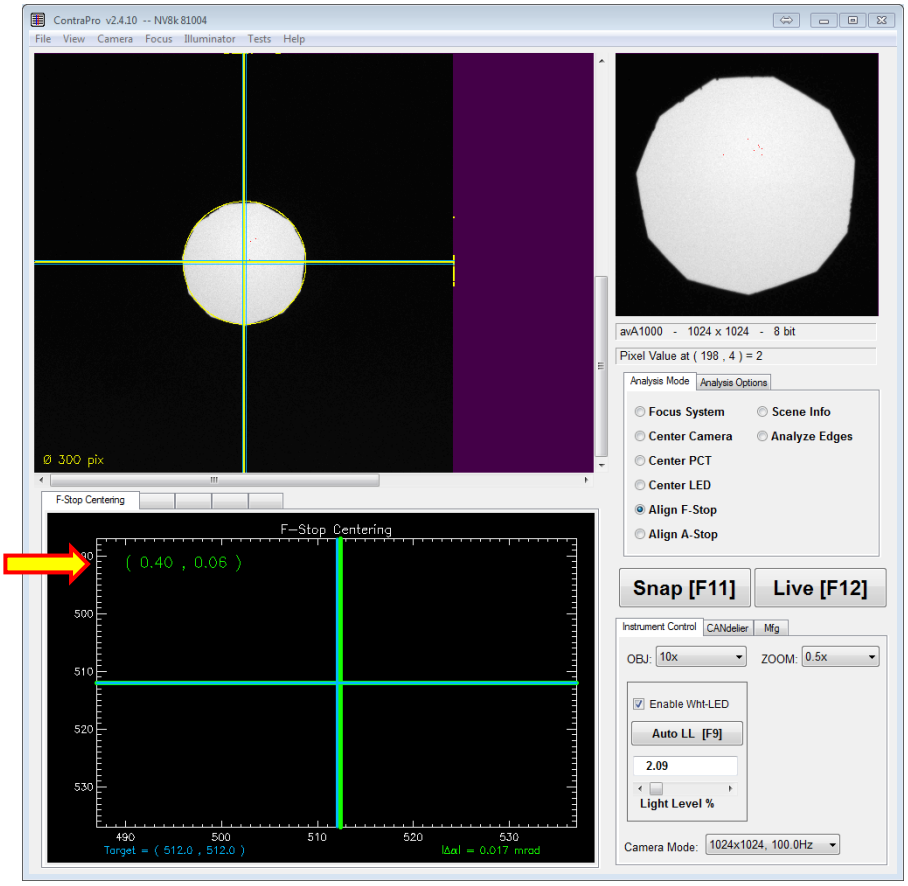
    Check the scanner functionality by taking several measurements is all scan lengths and camera modes. Check the scanner repeatability by running the Step Height Repeatability test in the STP. (ZSP-0069, section 7.8)



(screws for adjusting F-stop, Step 9.5 on next page)

9. Field Stop Alignment

1. A 10X Mirau objective and 0.5X zoom should be used for this step.
2. Pull the F-stop knob on the instrument out to close down the F-stop.
3. Select the "**Align F-stop**" analysis mode radio button in ContraPro, then click "**Live [F12]**"
4. Click "**Auto LL [F9]**" and then adjust the condenser lens in the midplate to visually focus the F-stop using the magnified image in the upper right ContraPro display.
5. Loosen the two M3 screws holding the F-stop assembly in the head; (figure above, previous page) move the entire F-stop assembly until the F-stop image is centered to +/- 1.0 pixel; re-tighten the screws and verify the alignment. See figure below.
6. Push the F-stop knob on the instrument in to open the F-stop; make sure the corners of the image are not clipped by the F-stop.



10. Aperture Stop Alignment

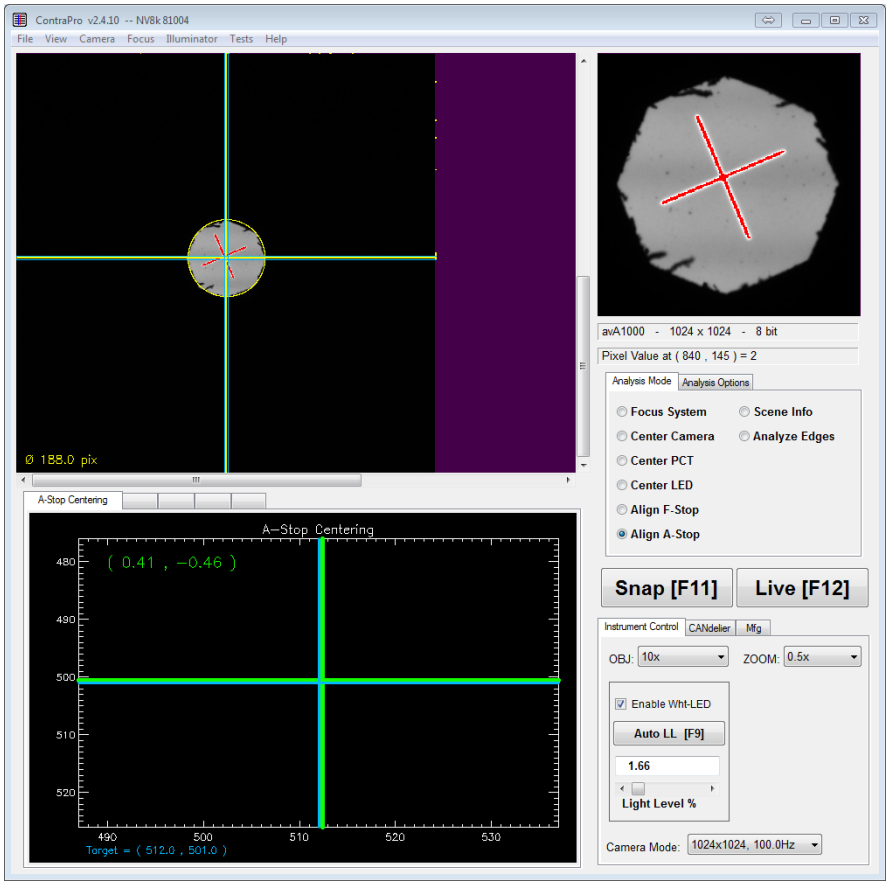
1. Install the PCT and PRL in the tool, select the "**Align A-stop**" analysis mode radio button in ContraPro; if the PCT crossline is not automatically detected, click on the crossline to set the blue target crosshairs.

NOTE: Be sure the F-stop is aligned before adjusting the A-stop.

2. Pull the A-stop knob on the instrument out to close down the A-stop, then click "**Live [F12]**"

3. Loosen the M3 screw holding the enhanced illuminator clamp; move the entire enhanced illuminator assembly up/down to visually focus the A-stop using the magnified image in the upper right ContraPro display; re-tighten the clamp screw and verify alignment.

4. Adjust the set screws just below the A-stop adjustment knob on the front and inside of the enhanced illuminator until the A-stop image is centered to +/- 1.0 pixels.



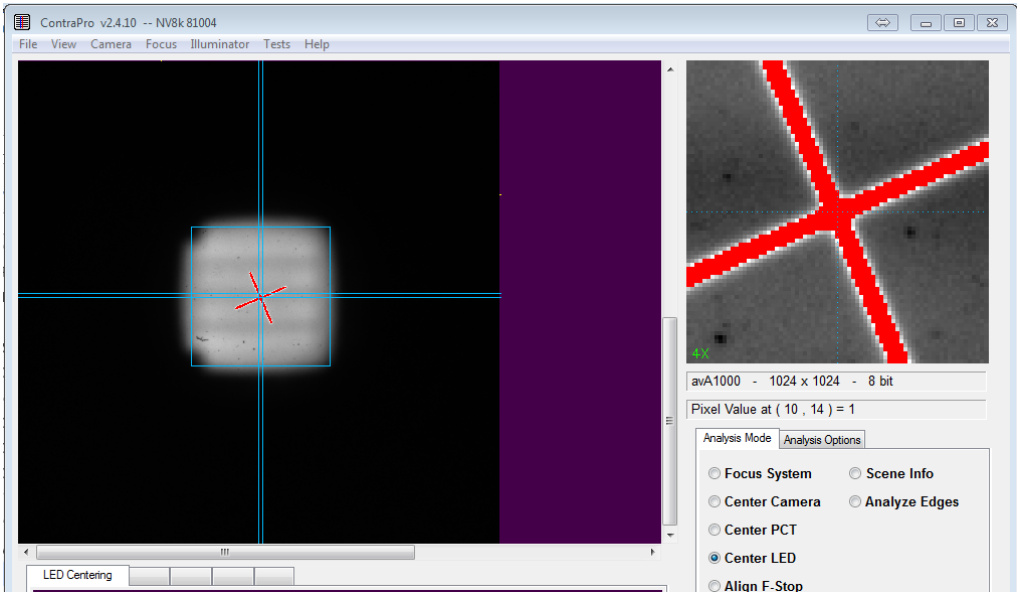
11. LED Alignment

1. Install the **PCT** and **PRL** in the tool, open the A-Stop, then select the **"Center LED"** analysis mode in ContraPro; if the PCT crossline is not automatically detected, click on the center of the crossline to set the blue target crosshairs; click **"Live [F12]".** Be sure camera mode is set to **1000 x 1000 @ 195 Hz**

2. Loosen the M3 screw holding the LED heatsink clamp; move the LED heatsink assembly up/down to visually focus the LED image onto the PCT as shown in the image below.

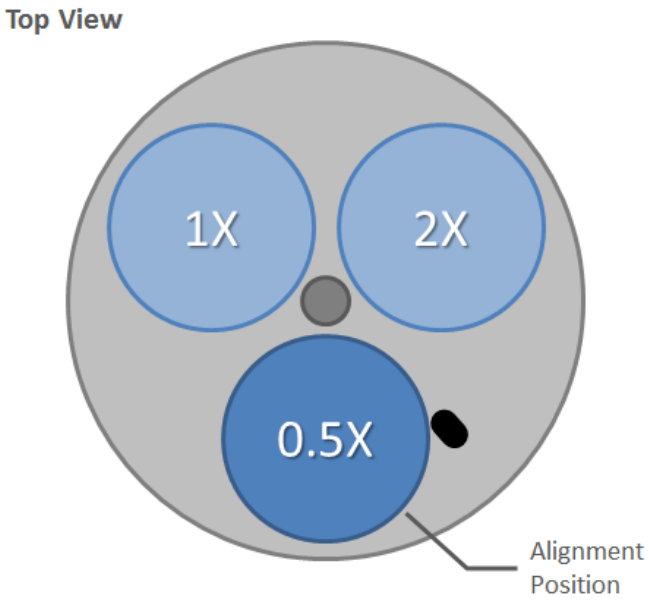
   Note: The LED will not come into sharp focus due to the diffusor above the A-stop, but its size should approximately match the blue fiducial box when correctly focused as shown below.

3. Adjust the lateral position of the LED heatsink to visually center the LED image about the fiducial shown in Contrapro and tighten the screws.



12. Zoom Tube Installation and focus check

1. For NV9300 systems, be sure the zoom tubes that came with the system are in the following DZT positions.



2. Install the 10X objective and check for image artifacts at each zoom magnification as described in section 6; clean the exterior optical surfaces of the zoom(s), if necessary.

3. Install the focus grating tool and setup the grating focus test as described in the camera replacement procedure.
   i. Nominal grating tilt for 0.5X is 0.8°
   ii. Nominal grating tilt for 1X is 1.7°
   iii. Nominal grating tilt for 2X is 3.3°

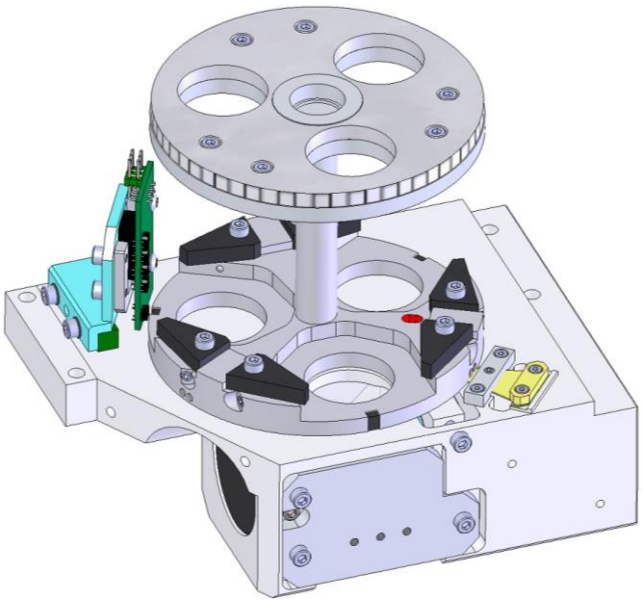
4. Make sure the measure filter is installed.

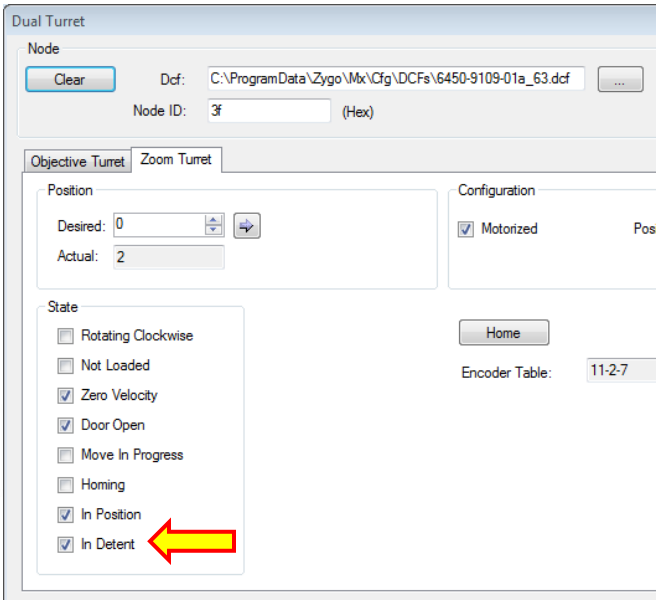
5. Check the focus of each zoom tube and adjust if necessary so that **|Defocus| < 0.32 µm**

6. Install and secure shipping locks on all zoom tubes.

13. DZT Detent Detector Alignment

1. Open **BridgeTest**, connect to the instrument, and select **Objective/Zoom Turret** from the Nodes menu; create the node using the settings shown in the image below:





2. Manually move the zoom out of the detent to either side, noting the positions where the **In Detent** flag in the Objective/Zoom Turret node goes off; these positions should be symmetric about the center of the detent

3. If necessary, adjust the lateral position of the detent board mounting bracket (cyan assy in image above) to make the behavior of the In Detent flag symmetric when the DZT is moved out of detent to either side

4. In ContraPro, select the "**Focus**" F-Stop and **0.5X zoom**, then select "**Measure DZT Repeatability…**" from the **Tests** menu; run the test with the default settings

5. Verify that the **bi-directional repeatability < 1.6 um** in both directions

   a. If the bi-directional repeatability meets the spec above, choose "**Yes**" when prompted to export the repeatability results

   b. If the bi-directional repeatability does not meet the spec above, choose "**No**", then adjust the detent board mounting bracket (cyan assy in image above) as described in 13.3 and repeat the test

14. Lateral Calibration

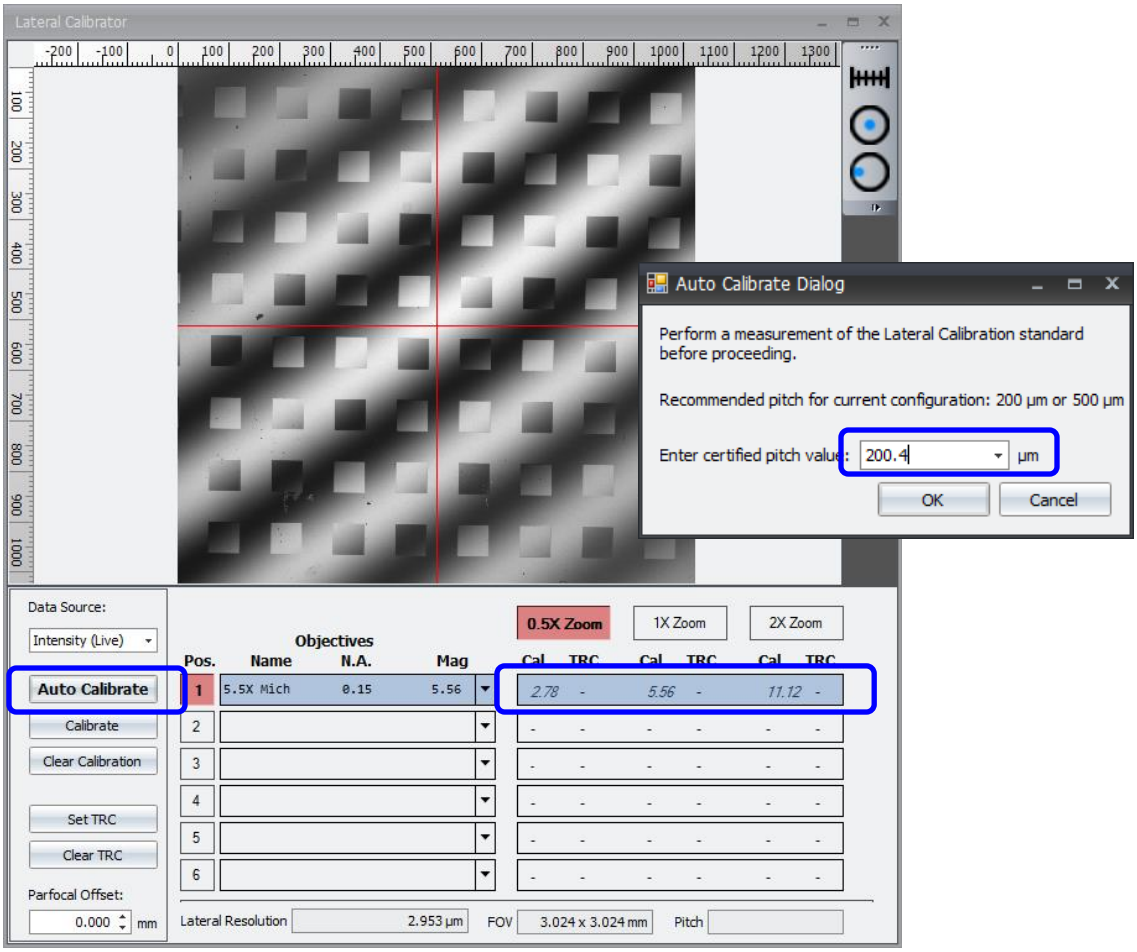
1 Click the "**Load Settings**" toolbar button, and select the **NV9k_StageCal.setx** file. Verify the following:

Objective / Zoom:	**5.5x / 0.5z**
Measurement Type / Mode / Resolution:	**Surface / CSI / High**
Scan Length:	**10 µm**
Camera Mode:	**1000 x 1000 @ 195 Hz**

2 Install the standard **Measure (F1)** filter and **open the A-Stop** (push knob in)

3 For each of the zoom tubes installed in the system, perform the following steps.

4 Install the **Lateral Calibration Standard** under the objective. Setup a cavity with <4 fringes over the **200µm pitch** pattern (or the **100um pitch** pattern for the 2x zoom). Make sure the pattern is squared to the camera grid and fills the FOV, as shown.



5 Set the light level using F9, and then click "**Measure**" [F12] to measure a height map

6 Open the **Lateral Calibrator** [F7],click "**Auto Calibrate",** enter the actual pitch (in um, e.g., 200.4), and then click "**OK**".

7 Verify that the calibrated magnification is within 5% of the nominal magnification (limits shown below), record the calibrated magnification in the checklist, and then close the Lateral Calibrator.

Zoom Tube	Lower limit	Nominal value	Upper limit
0.5x	2.64	2.78	2.92
1.0x	5.28	5.56	5.84
2.0x	10.56	11.12	11.68
0.37x	1.95	2.06	2.16
0.75x	3.96	4.17	4.38
1.5x	7.92	8.34	8.76

15. Stage Calibration [for systems with 5 axis motorized motion]

1 Select the **0.5z zoom**

2 Select the **CALIBRATE** tab and open the **System Status** screen from the Navigator

3 On the Motion Utilities control, select the "**Goto System Load After Homing**" checkbox and then home the stages by clicking the "**Home All Axes**" button. When homing completes, the Mx stage positions should read **X: 0.000 mm, Y: 0.000 mm, Z: 100 mm, P: 0.000°, R: 0.000°** (Z may not be exactly 100.0)

4 From the menu bar select "**File**" and select "**Switch User Level**". From the dialog box change the user level to "**AppsEngineer**" and click "**OK**".

5 Remove the Calibration Fixture from the X-Y stage. Install the **Parcentric Calibration Sphere Tool** under the objective and position it by hand so that the peak of the sphere is in the center of the stage, approximately centered in the camera field of view.

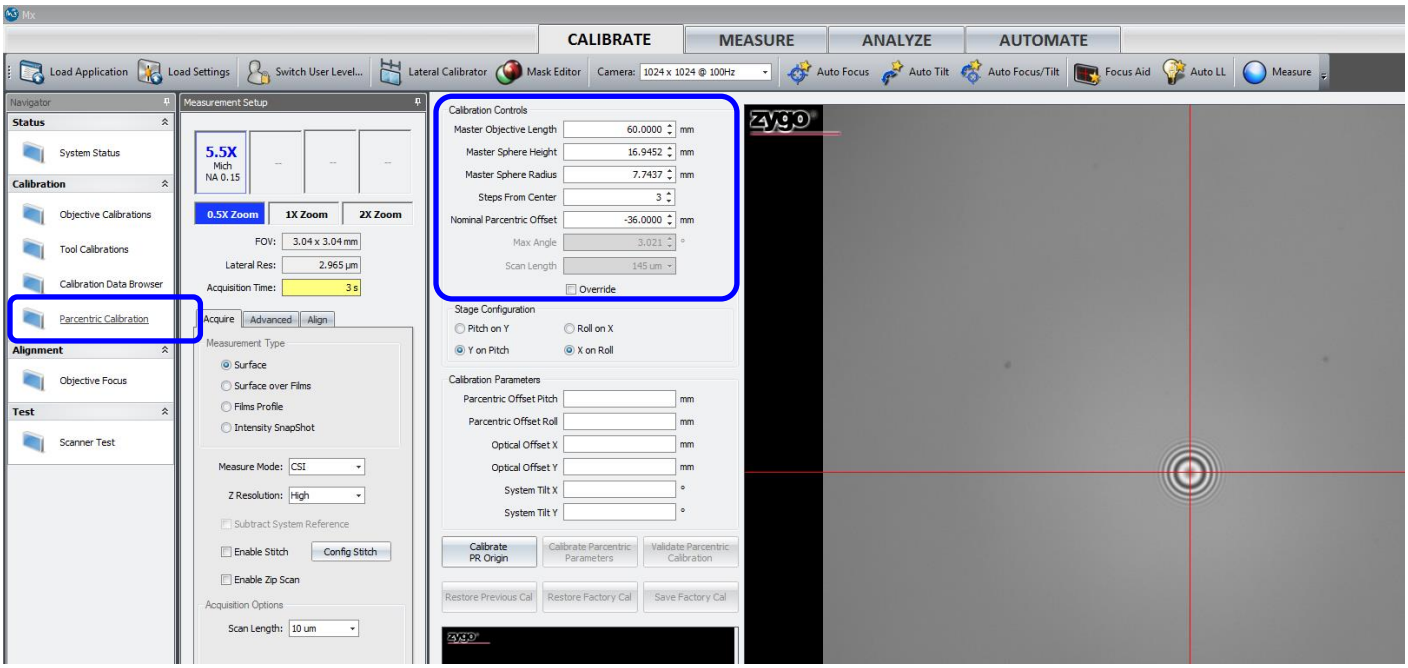
6 Move the XY stage to find fringes on a **flat area** of the tool near the sphere and then set the light level using F9. **DO NOT ADJUST PITCH/ROLL FROM P: 0.000°, R: 0.000°**

7 Open the **Parcentric Calibration** screen from the Navigator, as shown below

8 Enter the following values for the **Calibration Controls**:

Master Objective Length:	**60.00 mm**
Master Sphere Height:	**Enter value from Tool case**, e.g., 17.4428 mm
Master Sphere Radius:	**Enter value from Tool case**, e.g., 7.7428 mm
Nominal Parcentric Offset:	**-36 mm**
Steps from Center:	**3**
Stage Configuration:	**Y on Pitch, X on Roll**
Override:	**Unchecked**

NOTE: If the system has a riser kit then the thickness of any spacer on the X-Y stage must be added to the "Master Sphere Height" listed above. (e.g. for a two inch riser you would add 50.8 mm to the 17.4428 mm shown above)



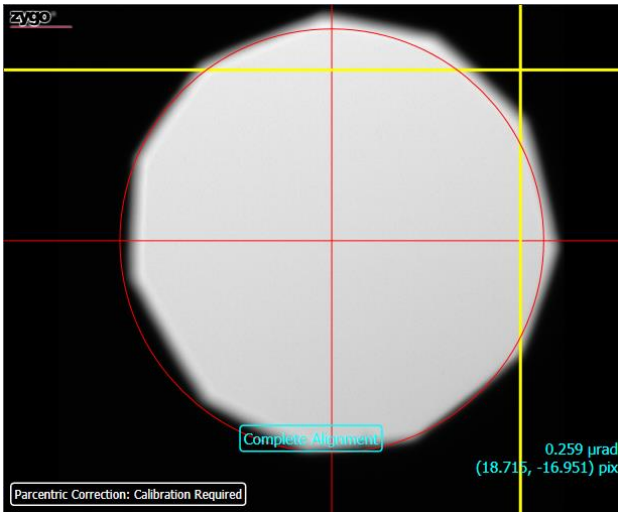
9 Click the "**Calibrate PR Origin**" button, and then follow the instructions in the wizard:

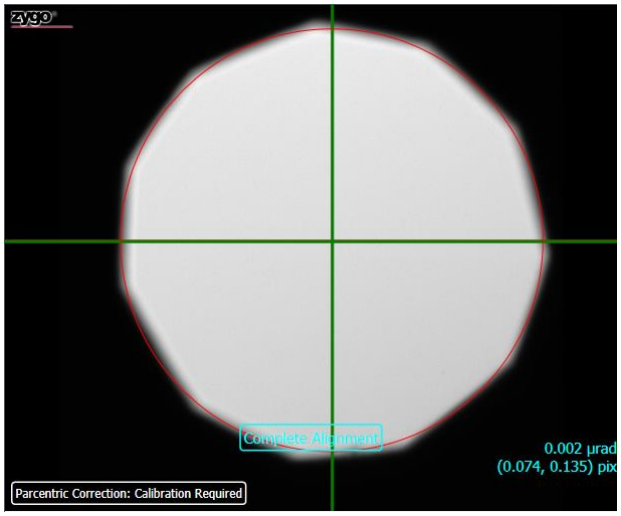
a) Without moving the Parcentric Calibration Sphere Tool, remove the 5.5X objective from the dovetail and hold a flat mirror against the bottom shoulder of the dovetail mount (or install the Objective Shoulder Reference Tool); click "**Next**"

b) Remove the mirror or Objective Shoulder Reference Tool and adjust PR to align the f-stop image reflected from the flat region of the Parcentric Calibration Sphere Tool within the circle fiducial; when both crosshairs are green, click "**Next**" to set the PR Stage Origin (see figures below)

c) Press the "**X-Y**" button on the Pendant to prevent further pitch/roll adjustments

d) Without moving the Parcentric Calibration Sphere Tool, open the F stop (push knob in), reinstall the 5.5X objective and adjust Z to center the fringes if necessary; click "**Next**" to measure the reference tilt of the objective





10 Move the XY and Z stages to find fringes on the top of the calibration sphere and center the sphere in the FOV, as shown in the screenshot on the previous page.

11 Set light level using "F9", and then click the "**Calibrate Parcentric Parameters**" button. The calibration will take approximately 8 minutes to complete

12 When the calibration is complete, verify that the Parcentric Offset is –36.0 ± 2 mm and the Optical Axis Offsets are < 1.5 mm and then click the "**Save Factory Cal**" button

NOTE: If the system has a gantry riser kit then these numbers may be off up to 3mm.

13 Click the "**Override**" checkbox and modify the **Calibration Controls** as follows:

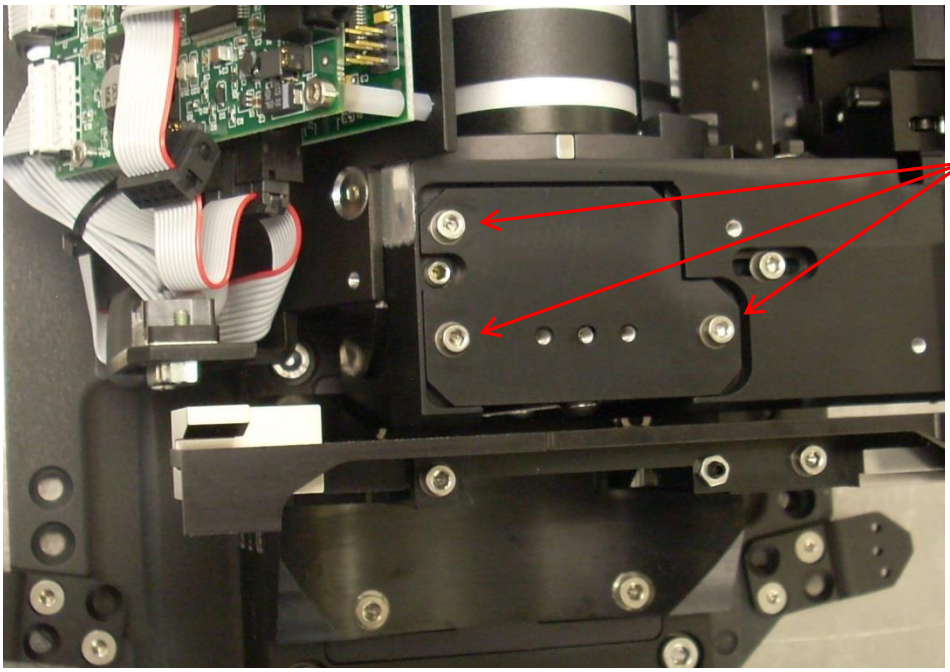
Max Angle:	**3.00°**
Scan Length:	**65 µm**

14 Click the "**Validate Parcentric Calibration**" button. The validation will take approximately 5 minutes. Remove the **Parcentric Calibration Sphere Tool** when complete.

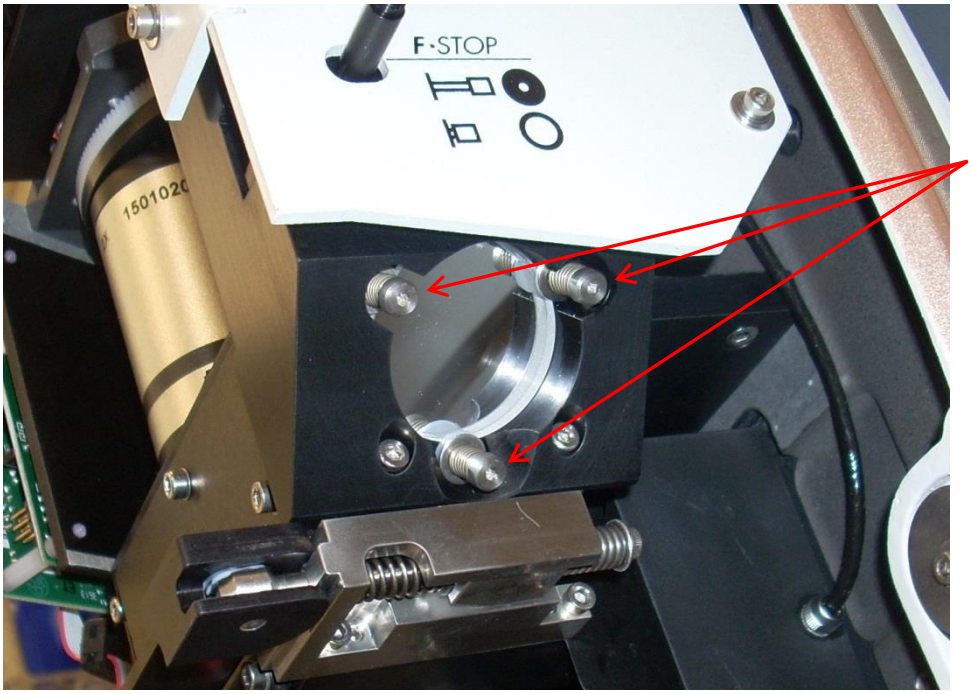
16. Cleaning the cube, quarter wave plate, and fold mirror

The cube/quarter wave plate assembly and the fold mirror are designed so that they can be removed to be cleaned and re-installed without affecting the alignment of the system. Dust and debris may accumulate on these items and may need to be cleaned. See figures below for reference.

It is suggested to use clean filtered air or nitrogen to gently blow loose particles from these optics.



Remove these three screws to remove the cube/quarter wave plate assembly



Remove these three shoulder screws with washers and springs to remove fold mirror

17. Spare Parts

HEAD & ELECTRONICS	
Part #	**Desc.**
6311-0900-01	NewView9k/Nx2 Service Camera Kit
6308-0179-01	LED Heatsink Assembly
6311-0800-01	Scanner Kit – NewView9k/Nx2
6450-8109-01	Motor Driver Board
6450-0120-01	Discreet Zoom Turret Encoder Board
6450-8185-01	CANdelier Color Illum Board
6450-8101-01	Bridge Board Assembly
6450-8504-04	COMotion Pendant
6450-0151-01	Dual Stepnet Interface Board
1195-500-027	Controller Motor Step CANopen (R-P-X-Y-Z-T)
6450-0501-02	Power Supply Module
1186-304-110	CSC Network Card (for bridge communication)
1186-304-118	2 Port USB3 to PCIex1 Board
1115-800-488	USB3 Straight to Type A 4.5m
ARCH & STAGING	
1520-500-158	Motorized X-Y Stage
6500-0352-02	Motorized Actuator (for R-P stage)
1520-500-155	Z Stage
1520-500-190	Encoded X-Y Stage
1520-500-160	Encoded Z Stage
1520-100-058	Pneumatic Isolator (for master and slave)
6300-1420-01	Spherical Bearing (for R-P stage)