

WATERS MANUFACTURING ASSEMBLY PROCEDURE

PAGE 1 OF 26
279002655 REV J
DATE
4-May-12

ITEM NUMBER
279002655

DESCRIPTION
ASSY PROCESS, OPTICS BENCH, 2998

WRITTEN BY
S. Casey

REVISION RECORD

<u>REV</u>	<u>AUTHORITY</u>	<u>NOTES</u>
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C	C.HUDSON	ECR 9174053
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G	M.K.HAN	ECR 9196475
H	DESMOND ANN	ECR 9215018
J	M. FRANKLIN	ECO 9219909

OPER **OPERATION DESCRIPTION**

TOOL NUMBER/DESCRIPTION

NOTE: THIS ASSEMBLY TO BE BUILT IN CLEAN ROOM ENVIRONMENT EXCEPT WHERE NOTED

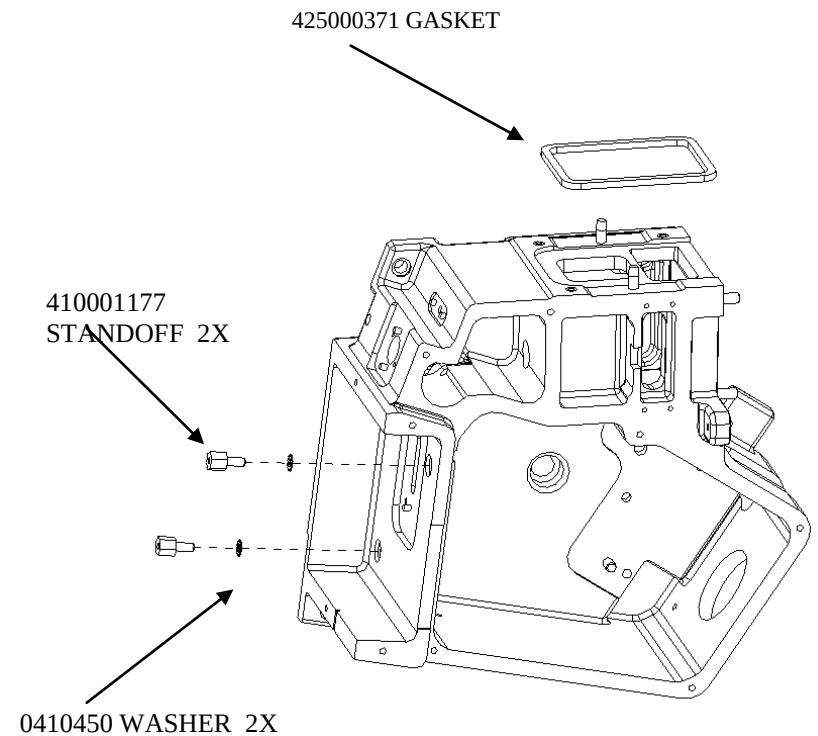
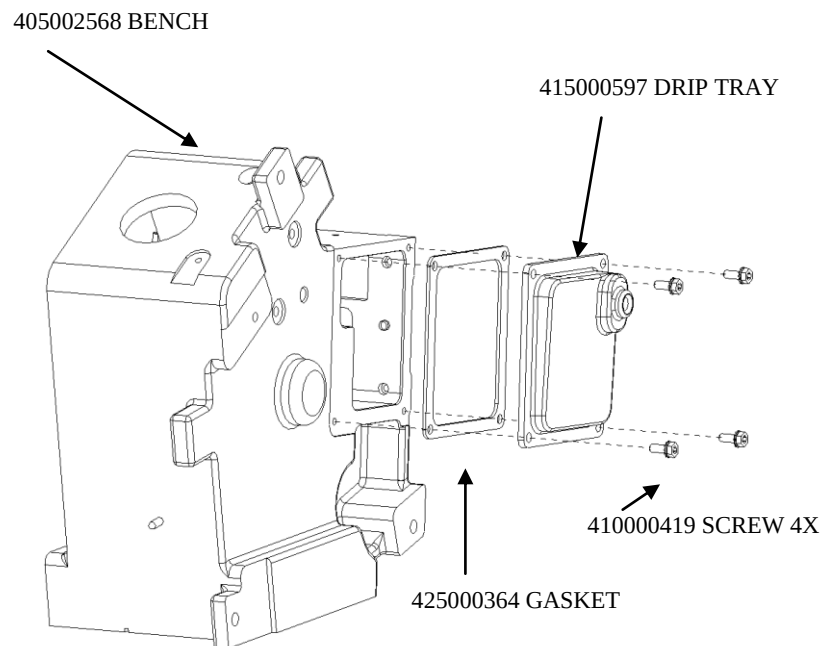
1.0 Adhere Gasket to Bench, then assemble Drip Tray to Bench with hardware.

T20 Torx Driver

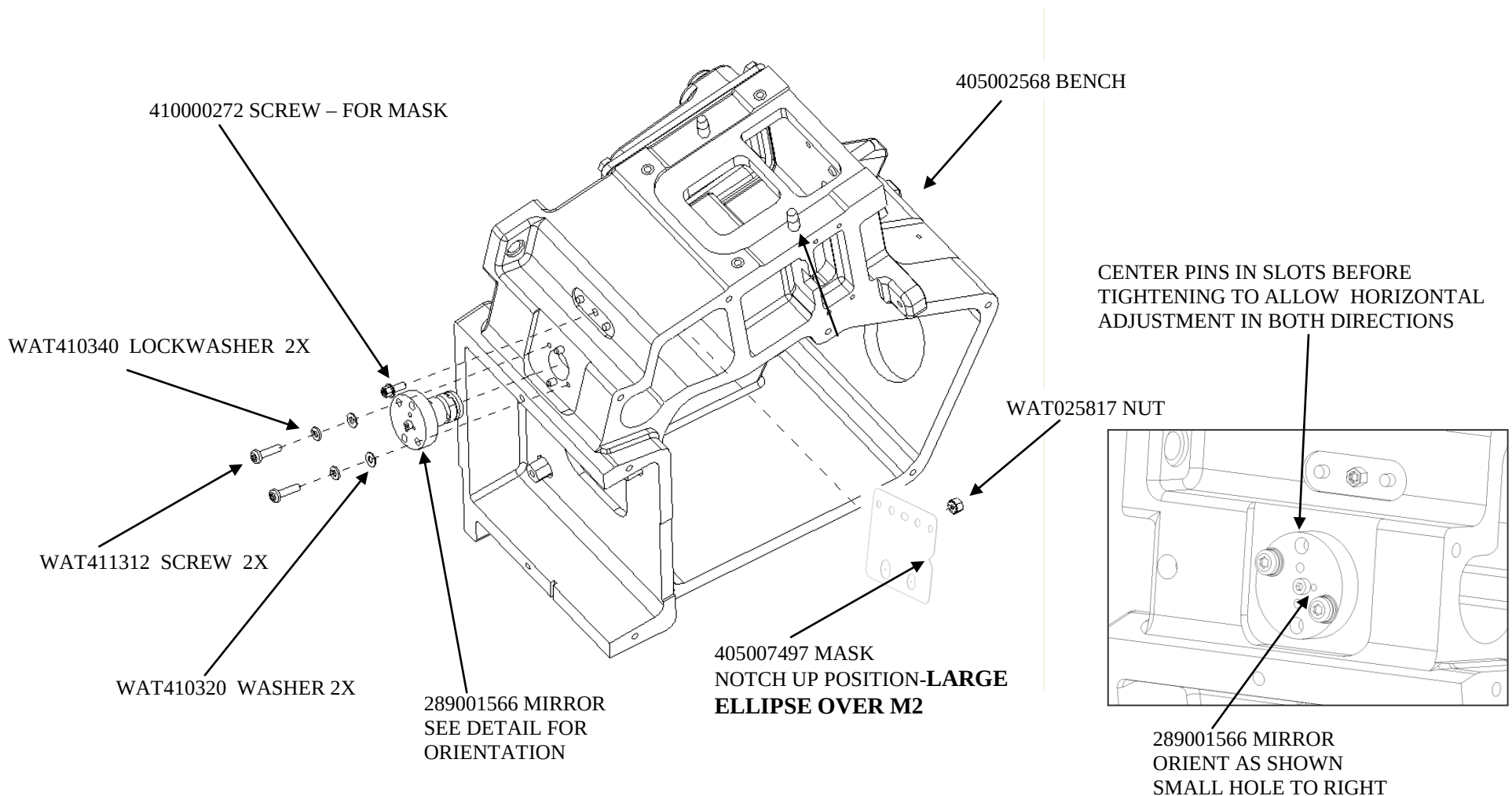
1.1 Adhere Gasket to Flowcell Area.

1.2 Screw Standoffs into Bench with Washers

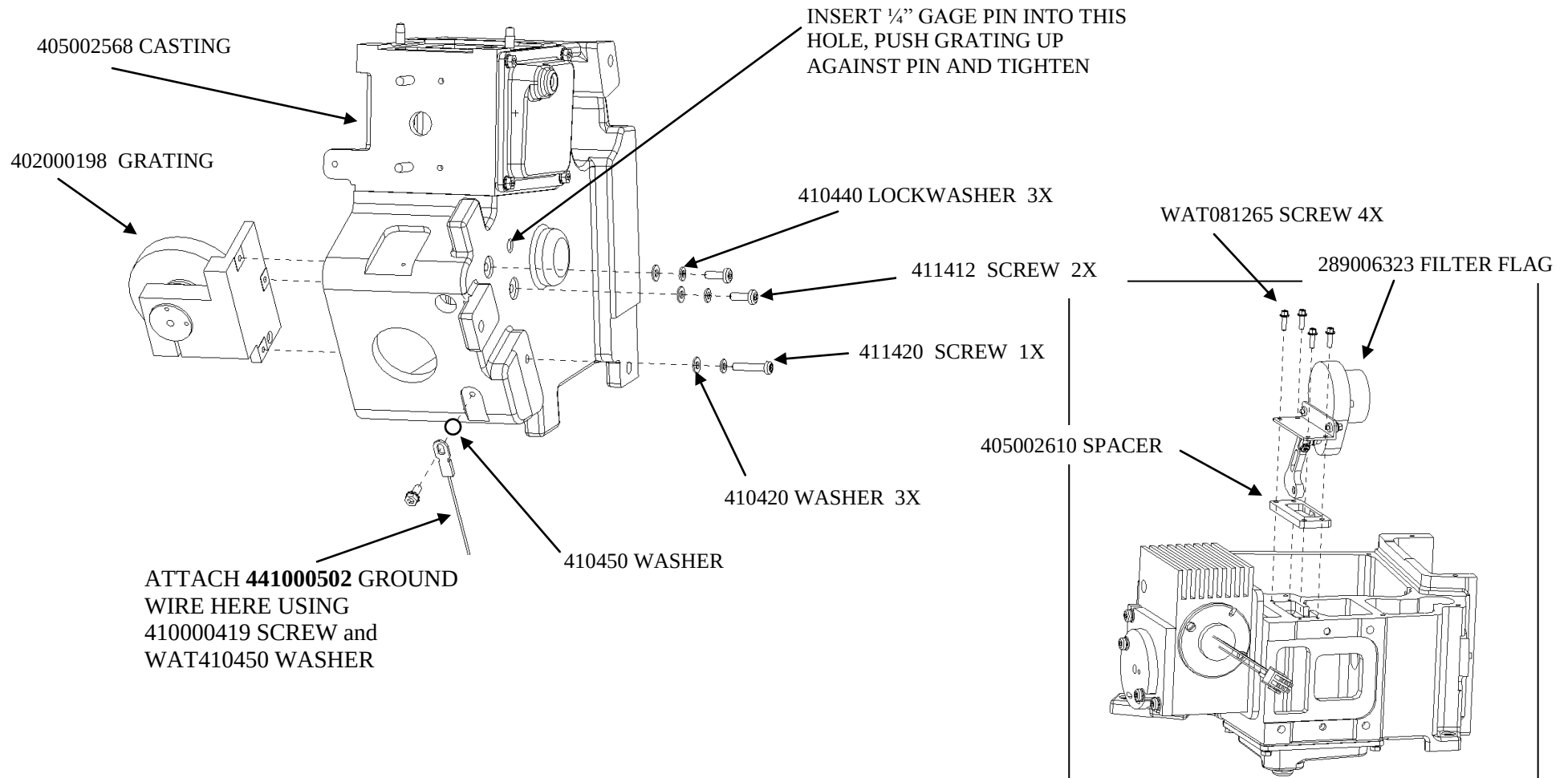
5/16 Nut Driver



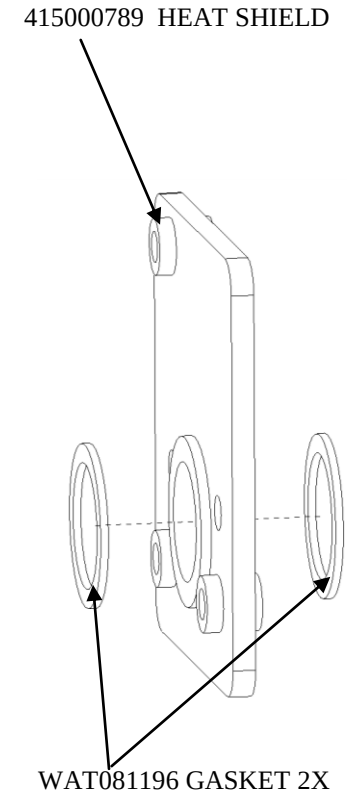
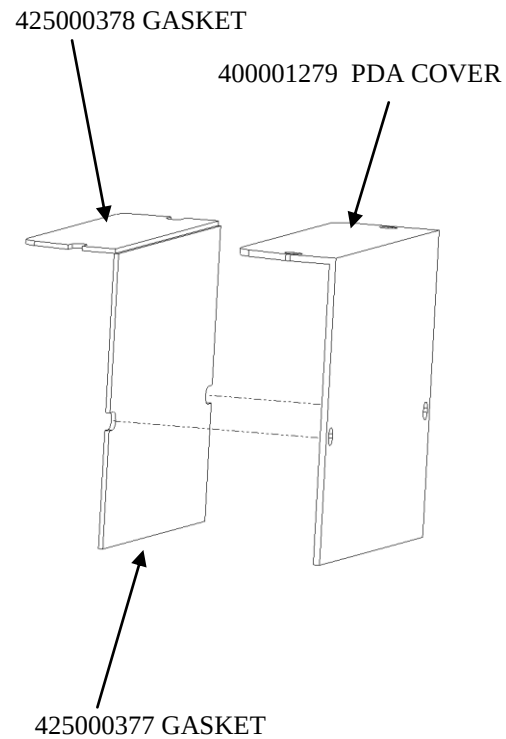
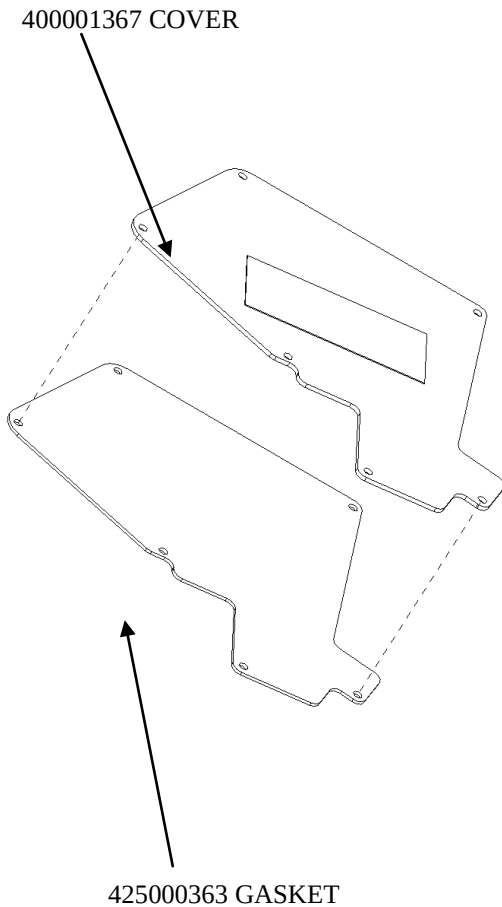
<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
2.0	Place Mask onto Pins inside Bench and secure with Screw and Nut. Notch side up – (larger ellipse over M2 Mirror)	T10 Driver, Tweezer
2.1	Place Mirror Assembly into casting align with pins, orient as shown and secure with hardware.	



<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
3.0	Record Grating Serial # and secure Grating in Bench with hardware, use ¼" (.250" dia.) Gage Pin thru bottom of casting for alignment.	0.250" Gage Pin
3.1	Attach Ground Wire where shown to bench with hardware.	T20 Driver
3.2	Assemble Filter Flag to Bench with hardware.	



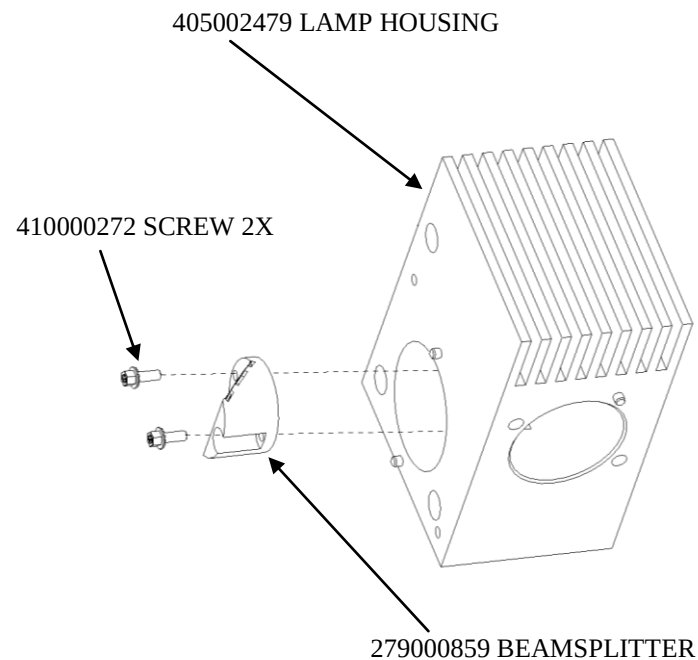
<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
4.0	Adhere Gasket to top Cover using Gasket Fixture.	TOP COVER GASKET FIXTURE 999028958
4.1	Adhere Gaskets to PDA Cover.	
4.2	Adhere Gaskets to Heat Shield	



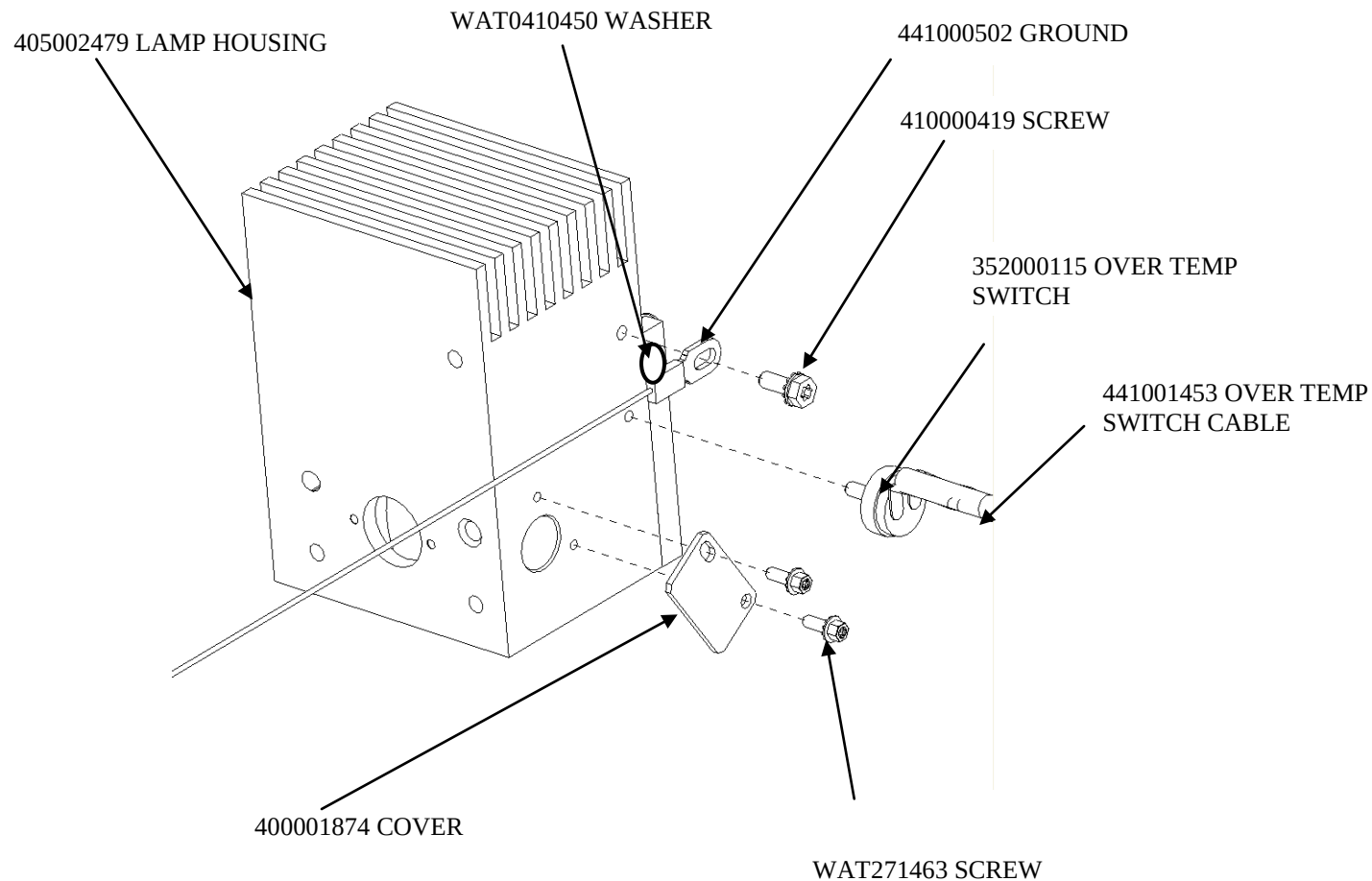
<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
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5.0	ASSEMBLE LAMP HOUSING	
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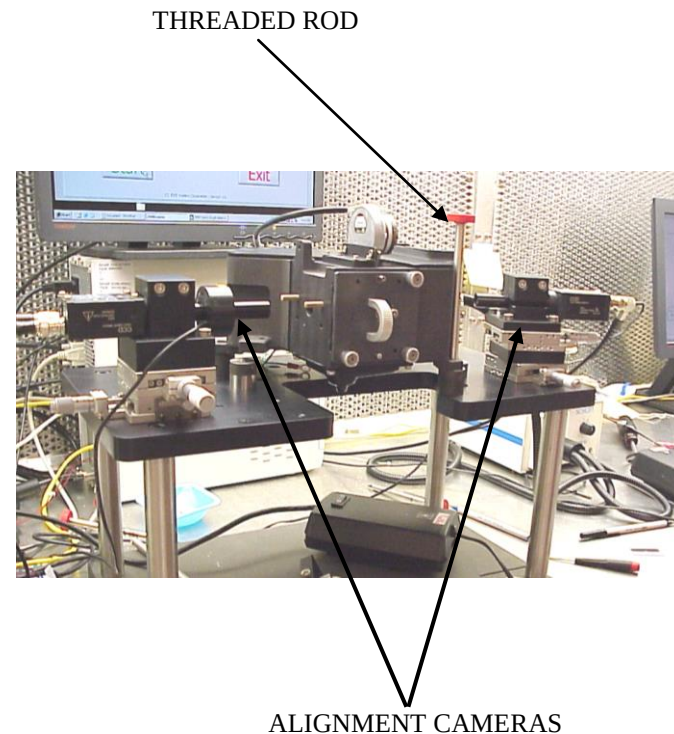
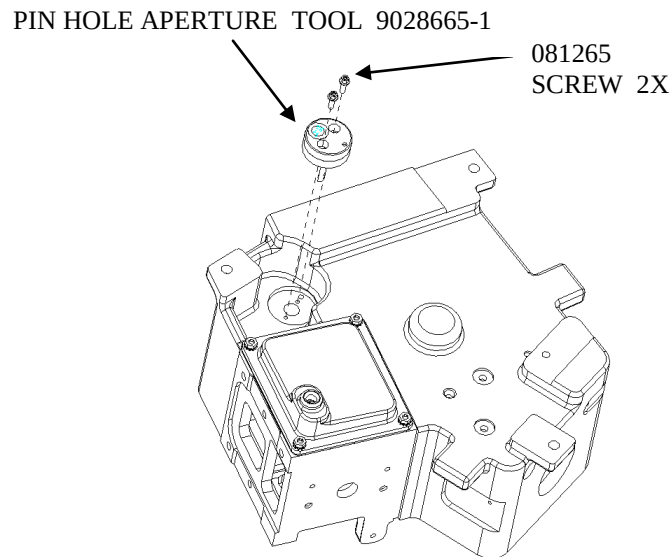
5.1	Insert Beamsplitter into Lamp Housing and secure with Screws. NOTE: Orientation of Beamsplitter	T10 Driver
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<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
5.2	Attach Ground Wire and Cover to Lamp Housing with hardware.	T20 Driver
5.3	Thread Thermal Switch 352000115 into Lamp Housing, and then attach O/T switch cable 441001453 to it. Ensure that terminals are pushed all the way in until you hear a snap.	
5.4	Assemble Cover to Housing with hardware.	



<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
6.0	M2 MIRROR ALIGNMENT. Note: For M2 Spares, install M2 into Bench per OPER. 2.0 – 2.1 Note: If using the universal alignment setup, use the following positions for the Bench Holders and Cameras, where A, B and F are Camera mount locations and C, D and E are bench mounting pole locations: - 2998: A1, B1, C1, D1, E1, F1	T10 Driver 999028665-1 PIN HOLE APERTURE 999029313-1 ROUGH ALIGN FIXTURE TE83096 UNIVERSAL ALIGN FIXTURE
6.1	Assemble Pin Hole Aperture Tool to Bench with hardware and secure Optics Bench to Rough Alignment Fixture 9029313-1 with Threaded Rod as shown. Note: Be careful not to bump cameras when placing Bench on Fixture.	



OPER **OPERATION DESCRIPTION**

TOOL NUMBER/DESCRIPTION

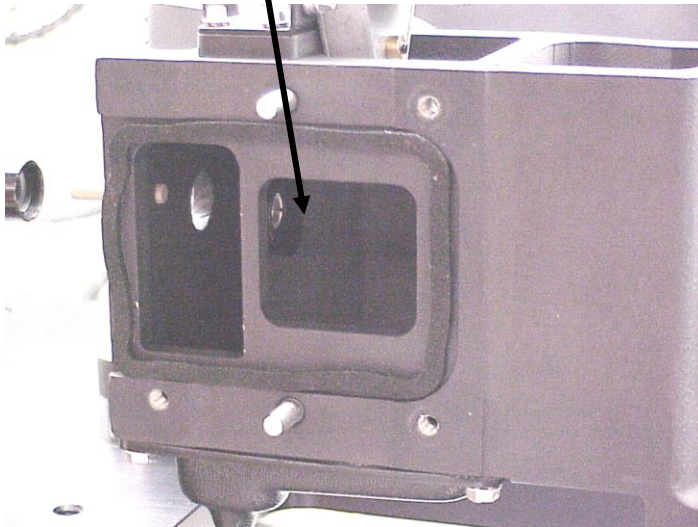
6.2 Pull Filter Flag forward, out of light path.

6.3 Install Target Reticle into Bench.

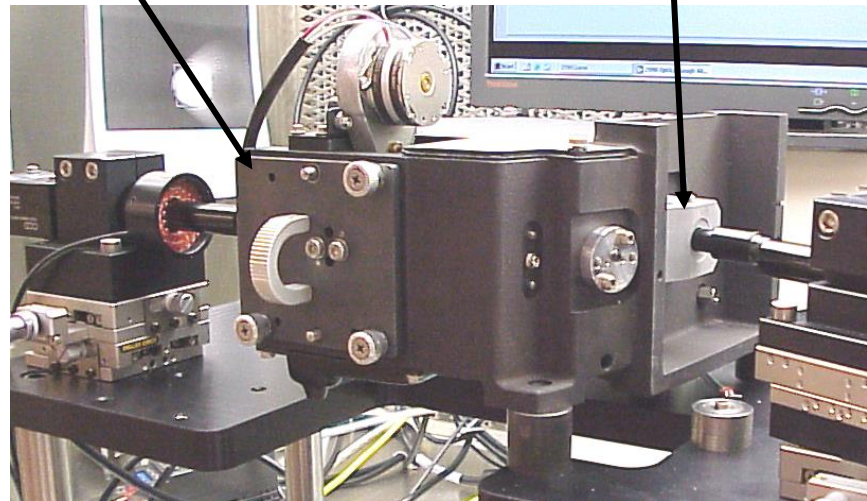
6.4 Attach Light Source to PDA Mount.

999029313-5	TARGET RETICLE
999028612/ 999029313-4	LIGHT SOURCE

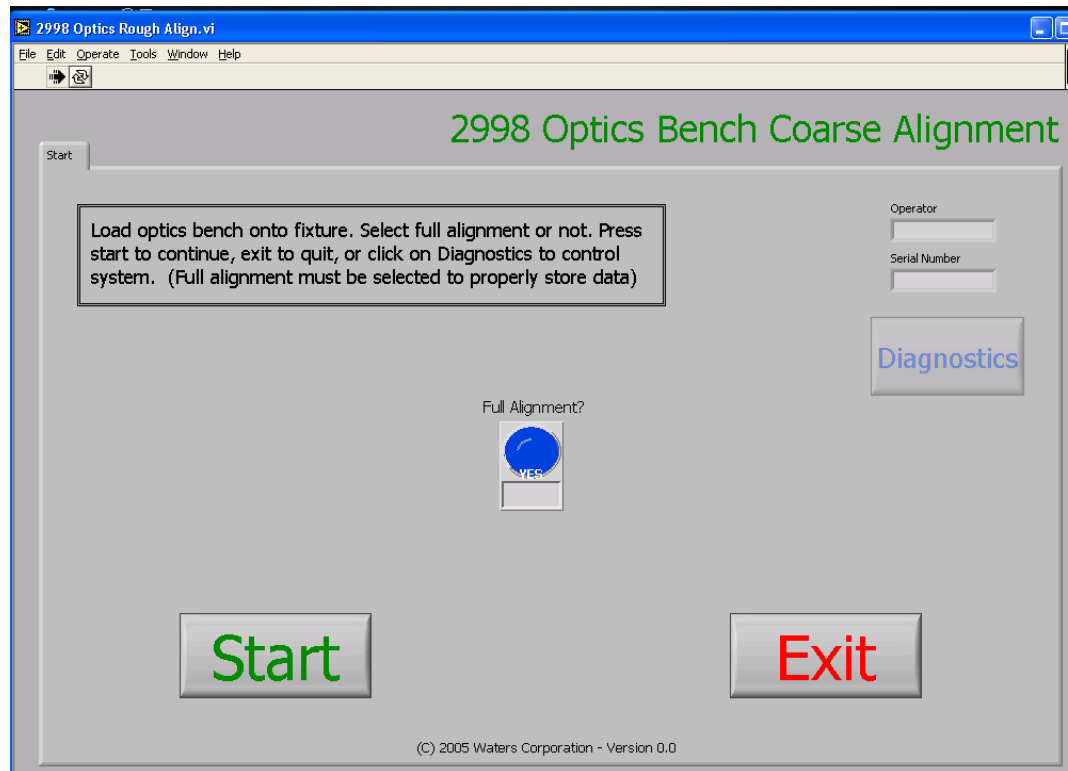
PULL FILTER FLAG FORWARD WITH FINGER



TARGET RETICLE 9029313-5

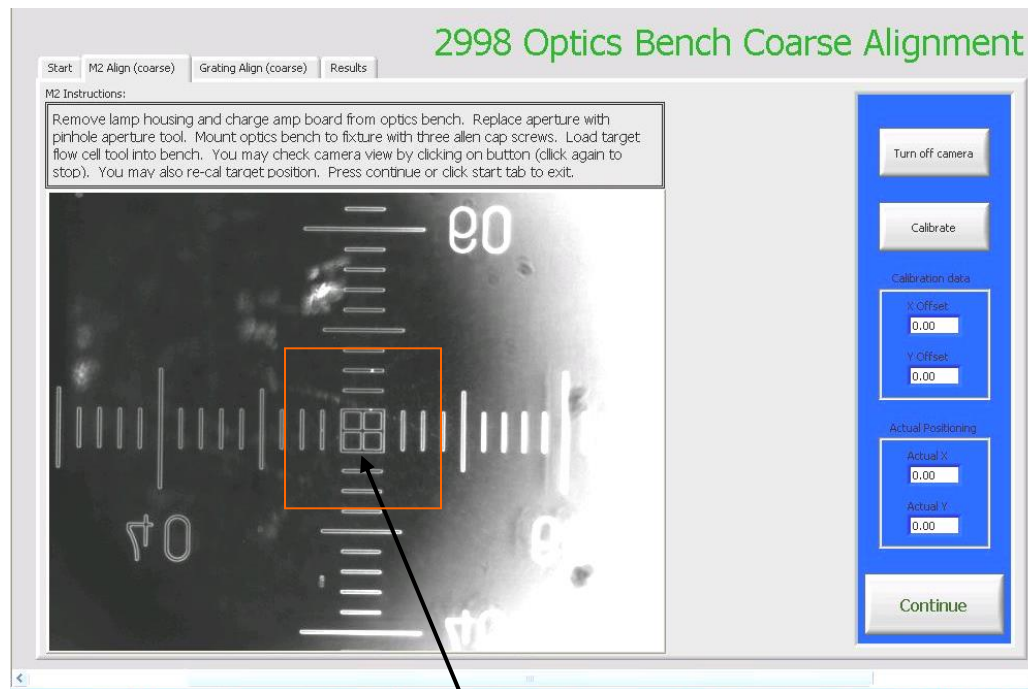


<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
6.4	Start 2998coarse.exe program on Computer, if program is already running hit "Start" button on top.	N/A
6.5	Verify program is set to FULL Alignment, if not click on Full Alignment, click Diagnostics LED Power on, click start	
6.6	Input Operator Name and click enter, input Bench Number and click "Enter" then follow on screen and hit "Continue".	



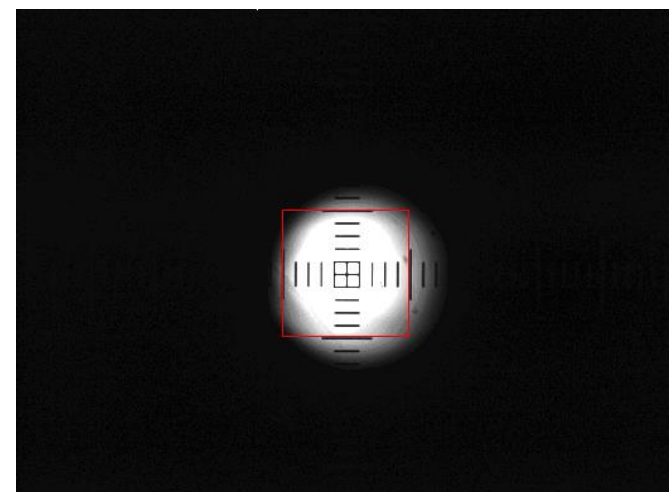
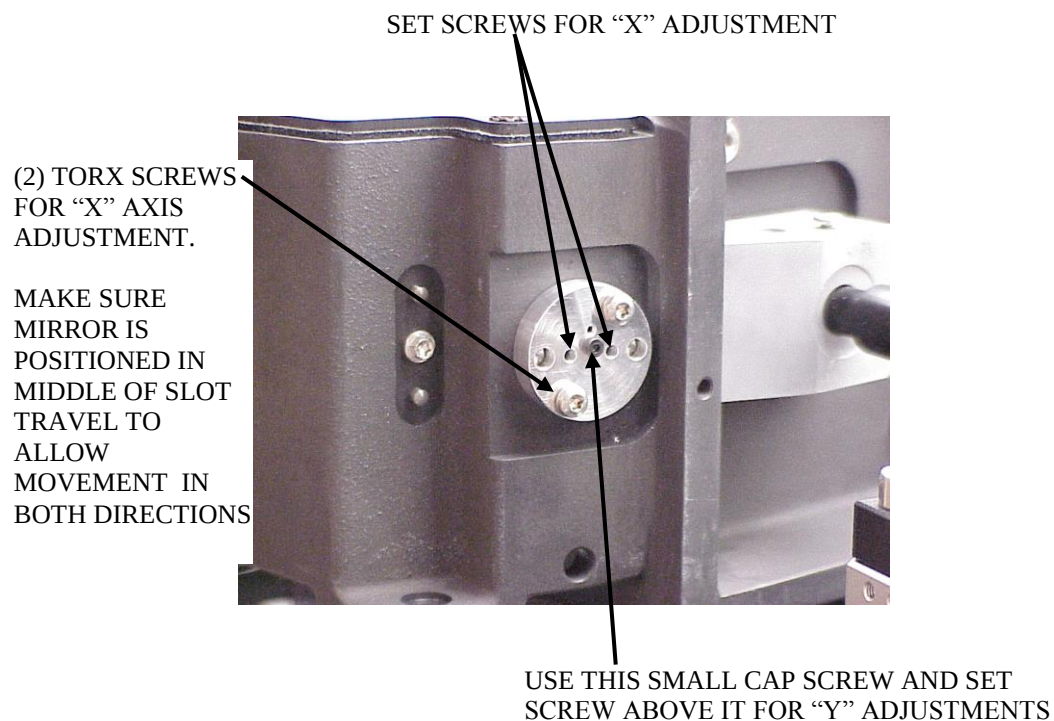
<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
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6.7	Program will take picture of Reticle and a Red Box will appear on screen. If the red box is not close to the center of the screen go back to the Diagnostics button and turn lamp on to center Reticle as shown.	N/A
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IF RED BOX DOES NOT APPEAR NEAR CENTER OF SCREEN,
PRESS DIAGNOSTICS BUTTON TO TURN ON LAMP
MANUALLY AND ROUGHLY CENTER BOX IN MIDDLE OF
SCREEN BY MOVING CAMERA

<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
6.8	Turn on Light Source	
6.9	Adjust M2 Mirror to place white image into Red Box using the (2) Torx screws for the "X" adjustment, (2) set screws for the "X" adjustment and small cap screw along with (1) set screw for the "Y" adjustment. Make sure image is roughly in the center of the "X" axis slot travel by moving mirror back and forth in "X" direction. Make sure set screws are snug and tighten Torx screws when dot is centered. Click "Pinhole Centered"	1.5mm allen driver 0.035" allen driver
6.10	Turn off Light Source and remove from Optics Bench. Remove Flow Cell Target and Pin Hole Aperture.	



WHITE DOT CENTERED

OPER **OPERATION DESCRIPTION**

TOOL NUMBER/DESCRIPTION

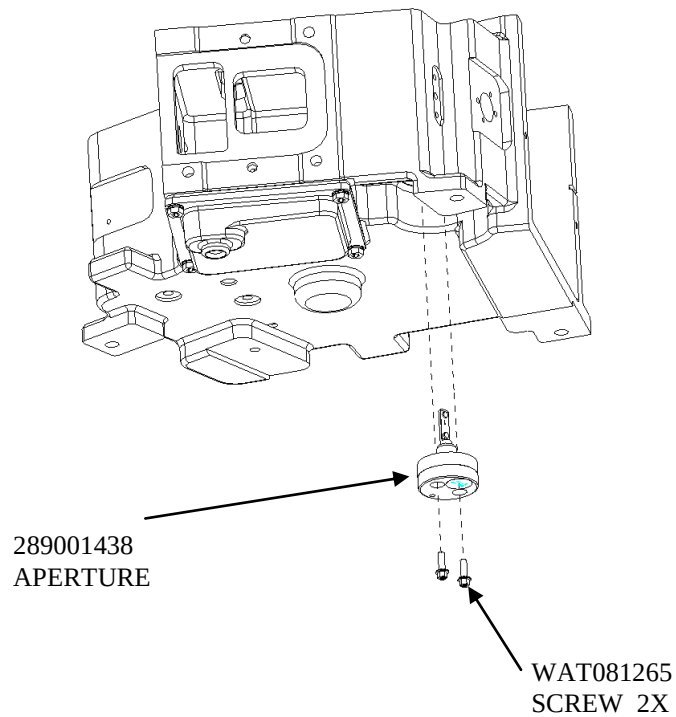
ROUGH ALIGNMENT – GRATING

7.0 Install Slit Aperture into Optics Bench and secure with hardware.

T10 driver

7.1 Mount Alignment Tool onto pins at PDA location.

999029313-2 ALIGNMENT TOOL



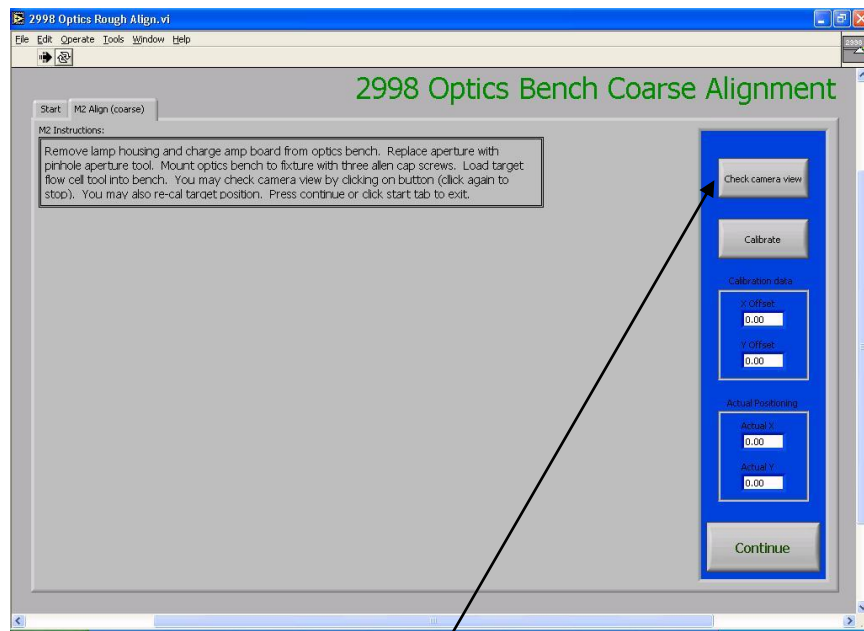
OPER **OPERATION DESCRIPTION**

TOOL NUMBER/DESCRIPTION

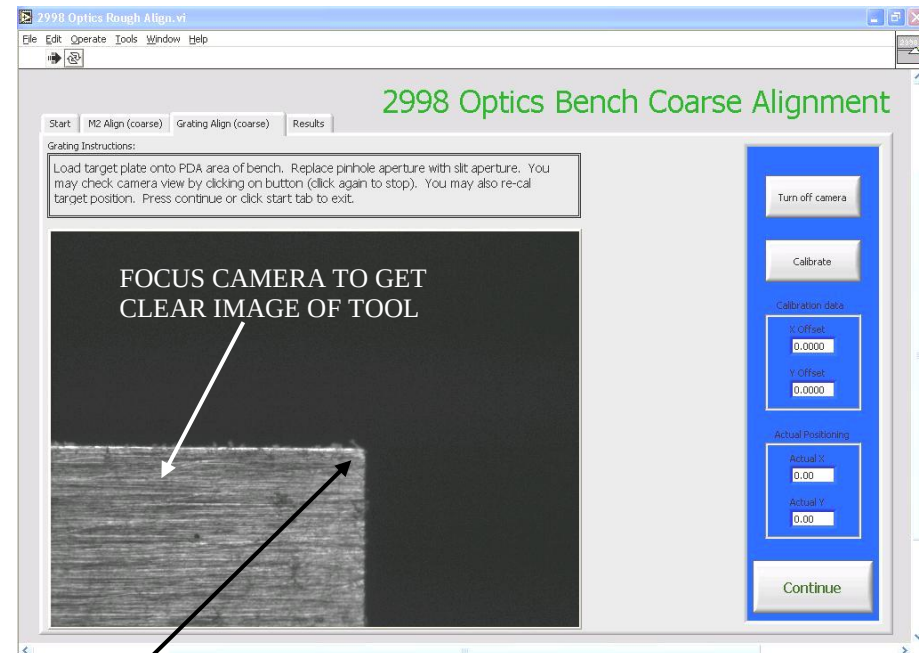
ROUGH ALIGNMENT – GRATING

N/A

- 7.2 Click on “Check Camera View”
- 7.3 Turn on light source. Verify Alignment Tool edge is roughly in center of screen, move camera if required. Focus camera as needed to get clear image of Tool. Click “Continue”.



CLICK ON “CHECK CAMERA VIEW”



ROUGHLY CENTER THIS EDGE
IN SCREEN BY MOVING
CAMERA IF REQUIRED

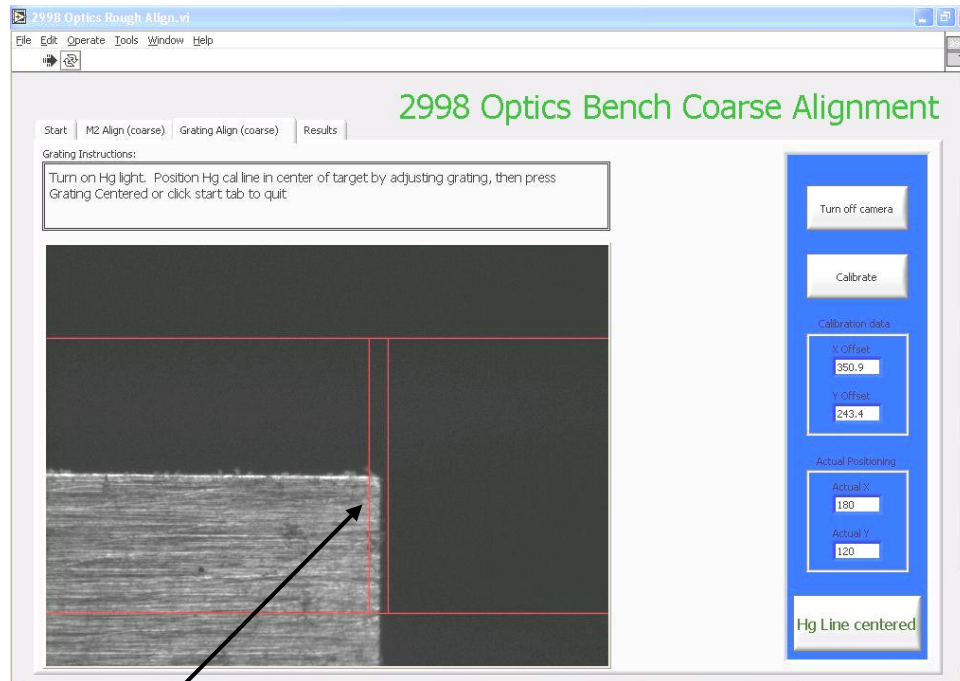
OPER OPERATION DESCRIPTION

TOOL NUMBER/DESCRIPTION

ROUGH ALIGNMENT - GRATING

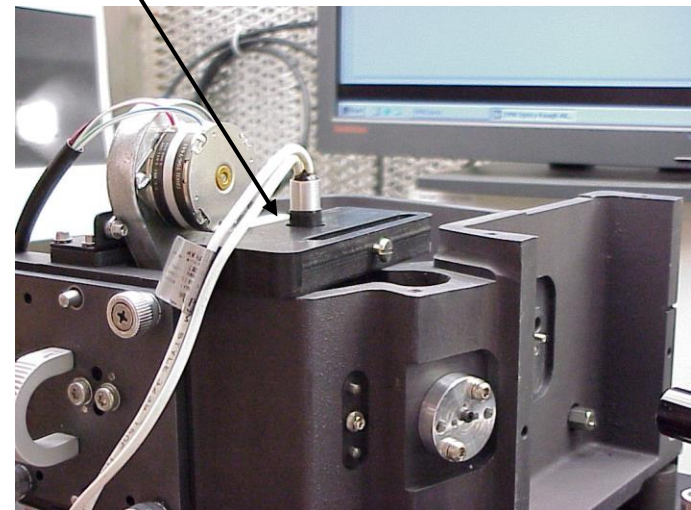
- 7.4 Verify that the red target box is superimposed on the screen in the proper location.
- 7.5 Turn off the light source. Remove the Alignment Tool
- 7.6 Position Mercury Lamp as shown and turn on.
NOTE: DO NOT TURN ON MERCURY LAMP BEFORE PLACING IT IN POSITION

999029313-3 MERCURY LAMP



RED TARGET BOX IN
PROPER LOCATION

MERCURY LAMP 9029313-3



OPER **OPERATION DESCRIPTION**

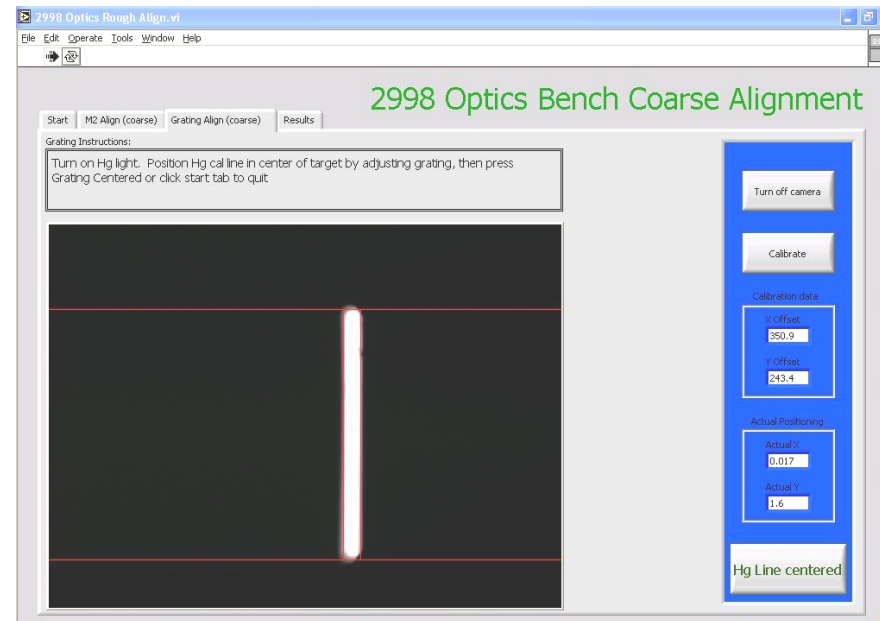
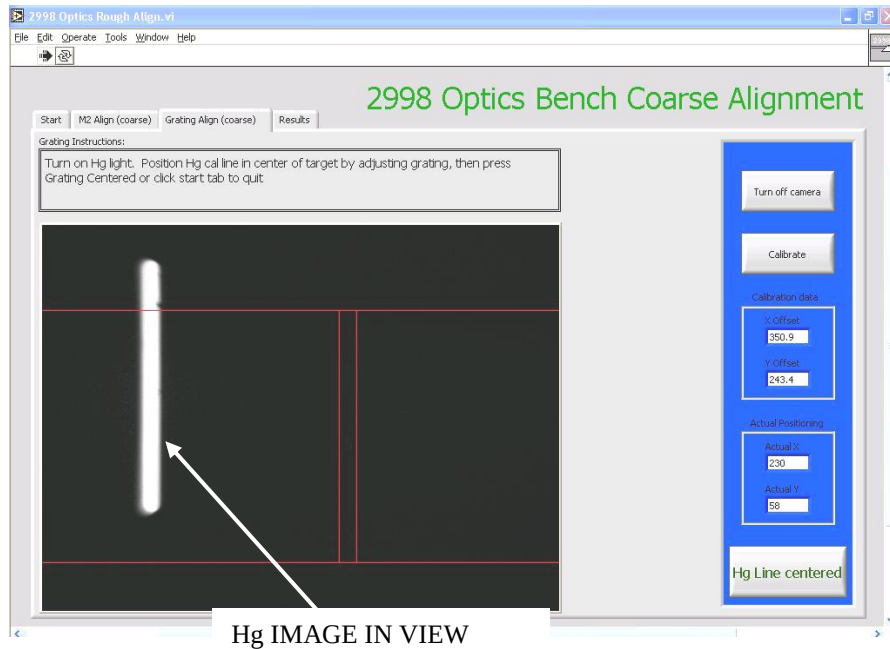
TOOL NUMBER/DESCRIPTION

ROUGH ALIGNMENT - GRATING

- 7.7 Once the Hg Image appears on the screen adjust the Grating using 1.5mm allen driver
the set screws to get the image inside the Target Box.
Click "Hg Line Centered" when complete. Remove bench from station.

NOTE: MAKE SURE GRATING IS TIGHTENED AFTER ADJUSTMENT
REMOVE BENCH FROM ROUGH ALIGNMENT STATION

HIT "START" BUTTON TO ROUGH ALIGN ANOTHER BENCH.



Hg IMAGE IN VIEW POSITIONED
IN TARGET BOX AND FOCUSED

OPER OPERATION DESCRIPTION

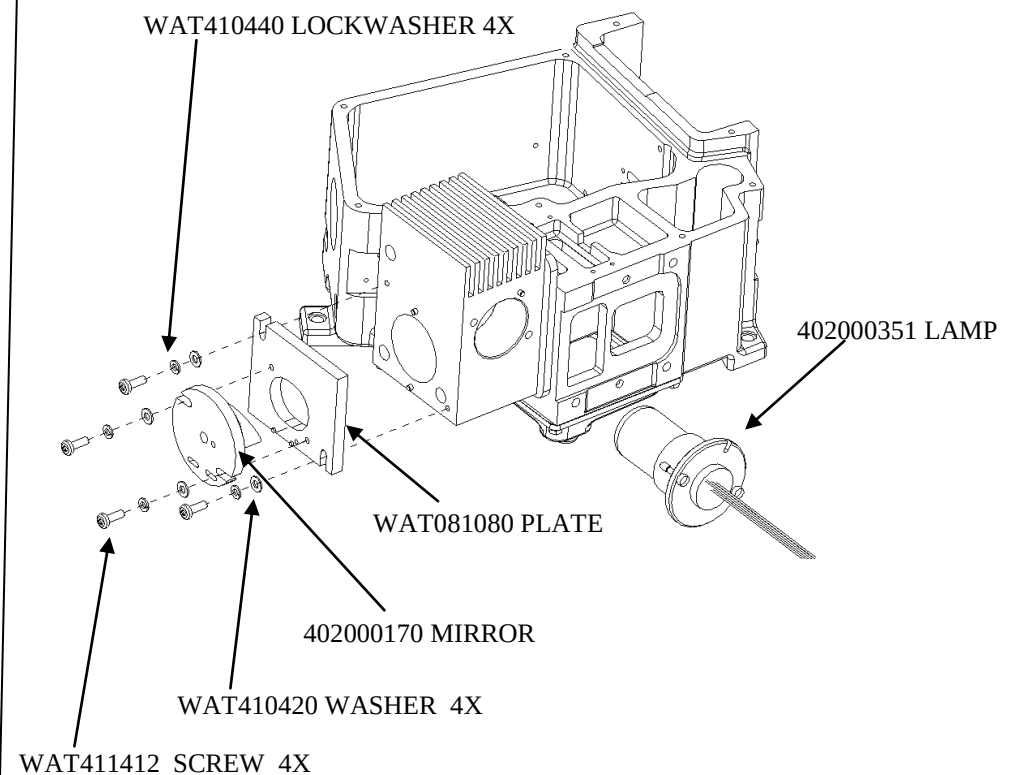
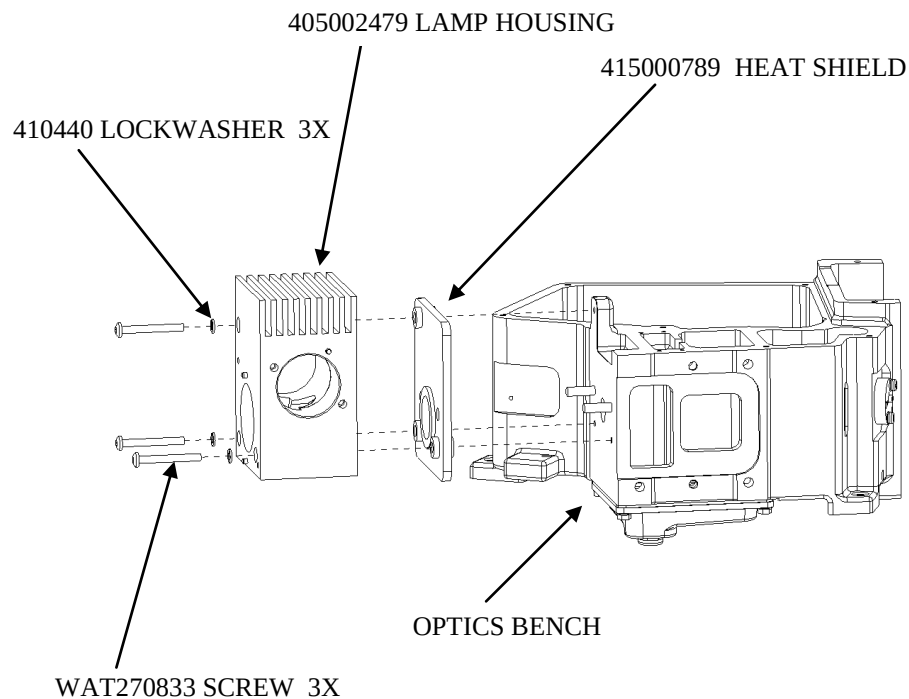
TOOL NUMBER/DESCRIPTION

FINISH ALIGNMENT

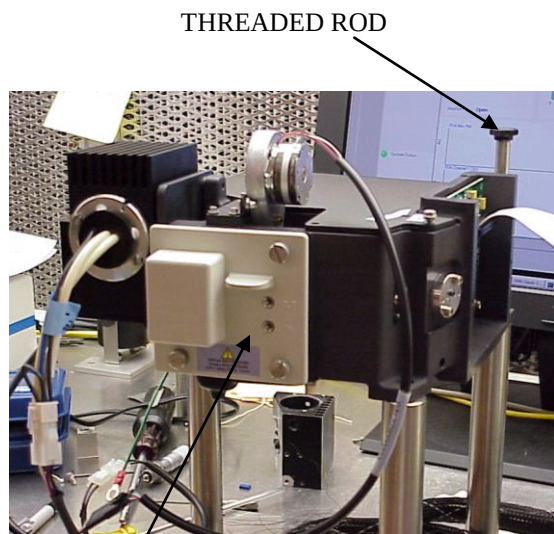
8.0 Assemble Lamp Housing with Heat Shield to Bench with hardware. T20 driver

8.1 Assemble M1 Mirror to Plate then assemble Plate to Lamp Housing,
Center Mirror on Pins in both "X" and "Y" directions, do not tighten.

8.2 Install Lamp into Lamp Housing. Slotted screwdriver



<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
8.3	Mount Bench onto Fine Alignment Station 999029981 and secure with Threaded Rod. Install Flow Cell and tighten with screw driver.	999029981 FINE ALIGNMENT STATION Slotted screwdriver T20 driver
8.4	Attach PDA assembly to Charge Amp Board. Note Pin #1	
8.5	Attach PDA/PCB assembly to Bench with hardware. Attach Ribbon Cable from Test Chassis	
8.6	Connect Lamp Cable, Filter Motor Cable, Temperature Limit Cable and Ground Cable to Bench Unit and turn on power.	



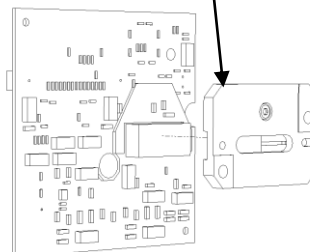
THREADED ROD

FLOW CELL 289007906

999029981 FINE ALIGNMENT

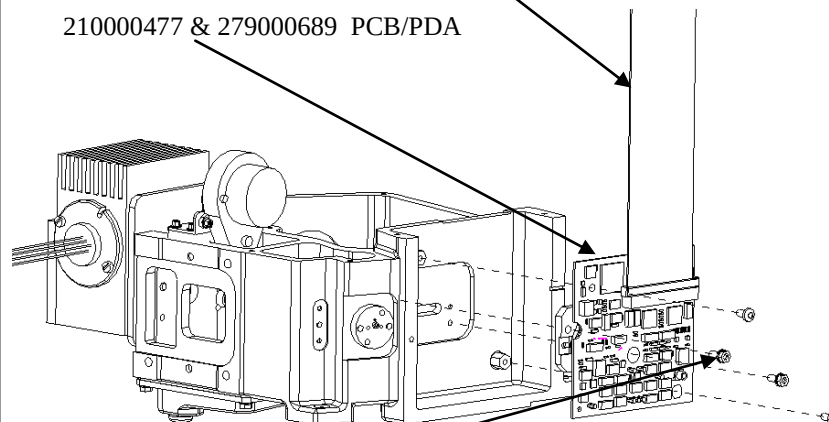
210000477 PCB, CHARGE AMP

279000689 PDA



RIBBON CABLE (FROM TEST STATION)

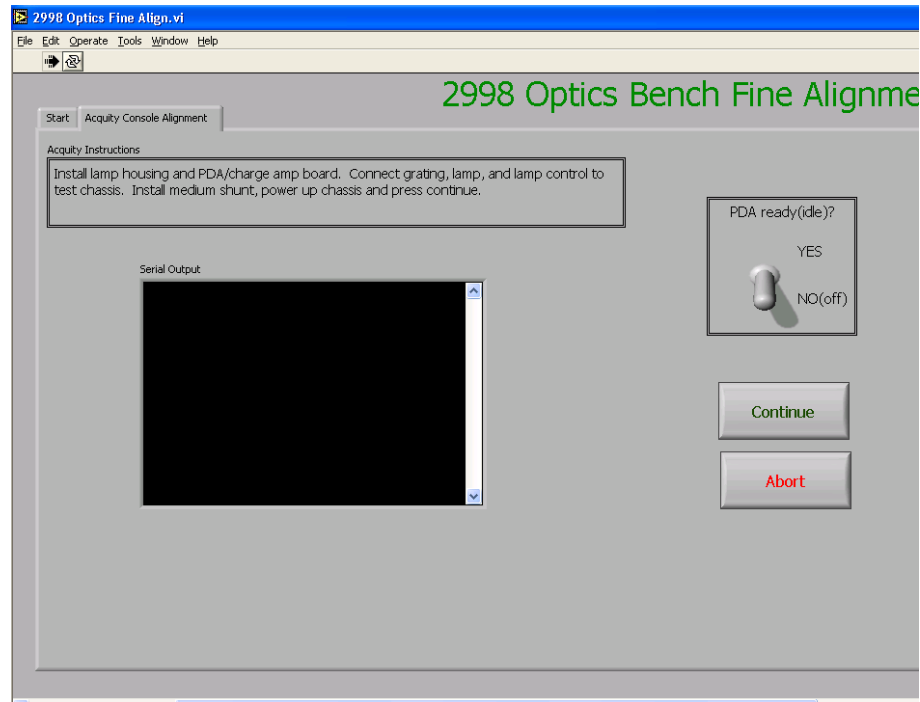
210000477 & 279000689 PCB/PDA



410000419 SCREWS FOR PDA 2X

WAT034347 SCREWS FOR PCB 2X

<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
8.7	Start up 2998fine Program, if program is already running just Click “Start” button and input Operator name and Bench number.	N/A
8.8	When Detector is ready (both lights green) move PDA Ready switch on screen to “Yes” and click “Continue”. If Detector is not ready select “No” and click “Continue”.	

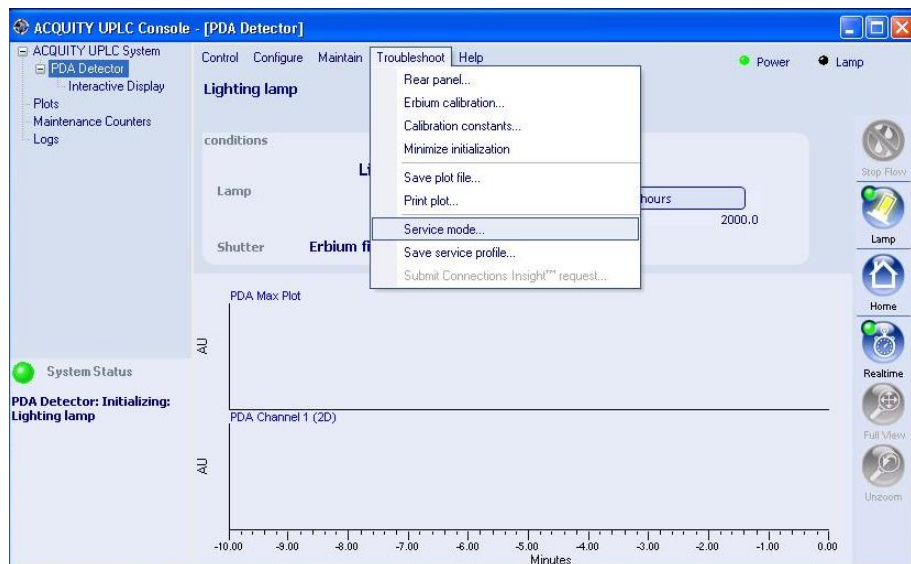


OPER OPERATION DESCRIPTIONTOOL NUMBER/DESCRIPTION**FINISH ALIGNMENT**

N/A

- 8.9 After Console program is loaded, from top menu click Troubleshoot – Service Mode – and enter Password---1147
NOTE: If system status indicates communications failure(red in color) then click control and reset PDA to make it green.
NOTE: If system status indicates wavelength verification failure (status led blinking red), do the following:
- 1) Click on **Troubleshoot | Erbium calibration**
 - 2) Click on the **Optimize Exposures** button
 - 3) Click **Start**
 - 4) When the wavelength appears, click **Stop**
 - 5) In the Wavelength Calibration box, click **Save...**
 - 6) In the Apply Wavelength Calibration dialog box, Click **OK**
 - 7) In the next Applying calibration dialog box, click **OK**
 - 8) Click **Close**
 - 9) Click **Control | Reset PDA**
- 8.10 Click on picture of the PDA Detector.

CLICK ON PDA HERE



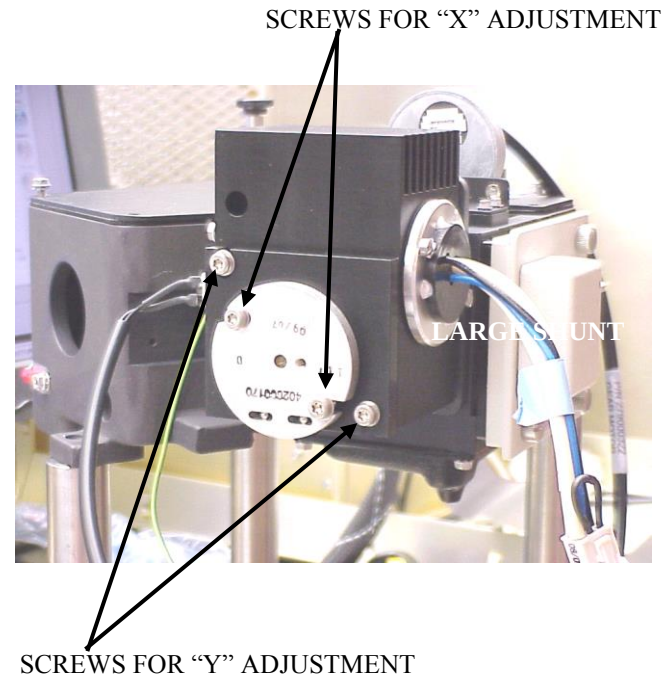
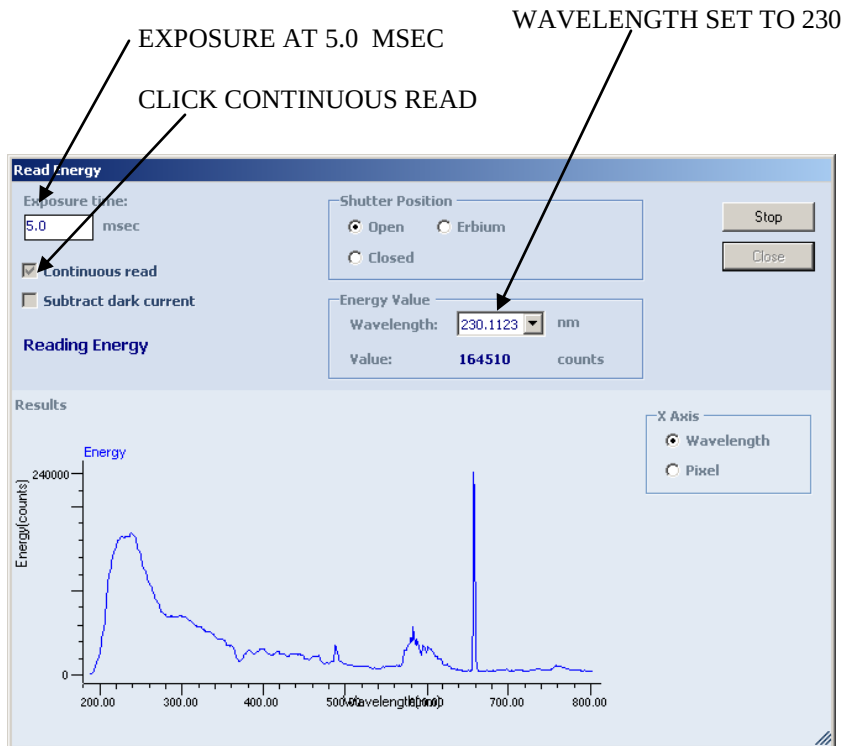
OPER OPERATION DESCRIPTION

TOOL NUMBER/DESCRIPTION

FINISH ALIGNMENT

N/A

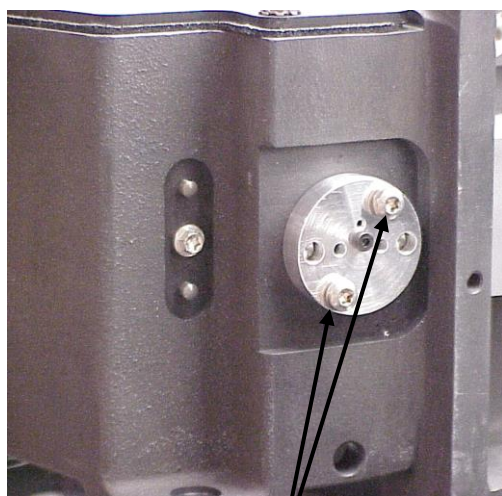
- 8.11 Click Maintain and go to the Read Energy Screen, Exposure time should be 5.0 msec, Check box for Continuous read, set Wavelength to 230 and Click Read.
- 8.12 Maximize energy by adjusting M1 Mirror in “Y” direction first, then “X” direction then “Y” direction again. Once Maximum energy is achieved by adjusting M1, tighten screws. Minimum acceptable energy at 230 is 90,000, if maximum energy exceeds 264,000 at 230nm, set exposure to 4.2 msec, if energy still saturates (over 264,000) contact engineer.



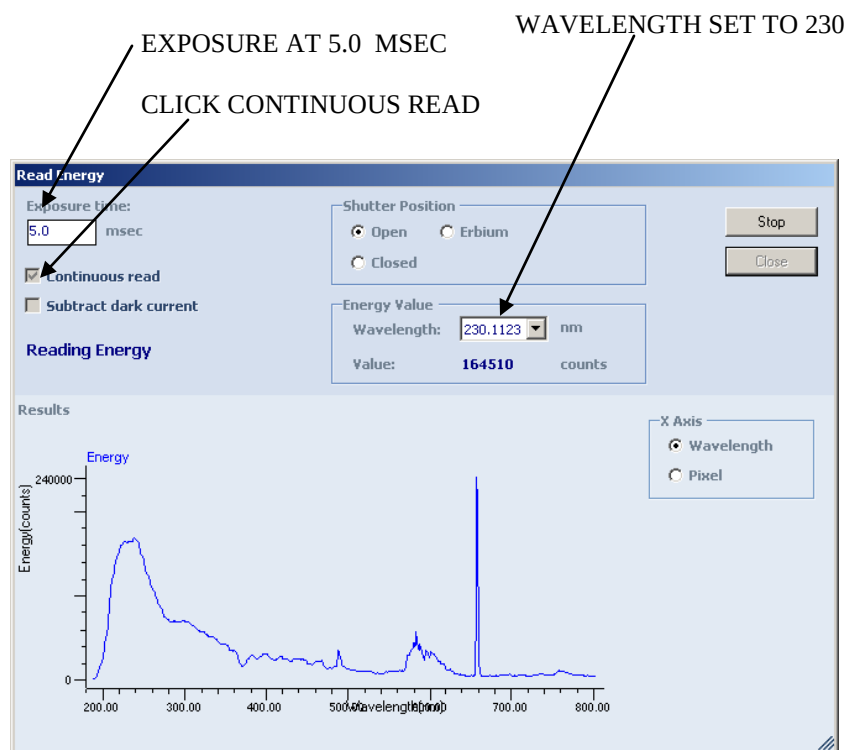
<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
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8.13	Loosen torx screws on M2 and maximize energy by adjusting M2 Mirror in "X" direction only, tighten screws when Maximum energy is achieved. Click "Stop" to stop reading energy.	T10 Driver
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**NOTE: IF MAXIMUM ENERGY EXCEEDS 264,000 CTS (230 nm) AT 5.0 MSEC, SET EXPOSURE TO 4.2 MSEC
IF ENERGY STILL SATURATES (ABOVE 264,000) AT 4.2 MSEC CONTACT ENGINEER**



SCREWS FOR "X" ADJUSTMENT



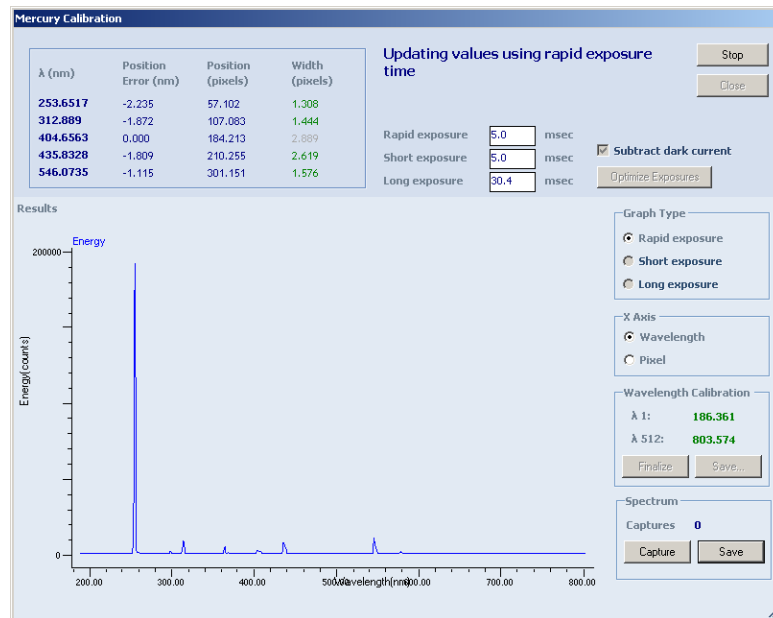
OPER OPERATION DESCRIPTION

TOOL NUMBER/DESCRIPTION

FINISH ALIGNMENT

- 8.14 Click on the Lamp Button on the right side of the screen, click yes to turn off Lamp.
- 8.15 Remove the D2 Lamp and replace with the Mercury Lamp 999029221-2 and switch on.
- 8.16 Click Troubleshoot on the top menu, select Mercury Calibration. Click the Optimize Exposure Button, once exposure times appear, click Start.
- 8.17 If all values, including the Lambda values in the lower right are not green, adjust the Grating in the “X” direction only, using the flecture set screw. DO NOT adjust bottom set screw (“Y” axis) If adjusting the flecture will not bring all values into spec. The Micrometer adjusting tool 9029313-6 must be used to sweep the Grating. Make sure Grating screws are loose underneath. Move Grating back with 9029396 Cam Tool and bring forward by adjusting Micrometer in clockwise direction. Bring all values into spec. (Green) by making sweep and flecture adjustments. Once all values are in spec. tighten Grating from bottom and remove Micrometer, make sure all values stay green..

999029396 CAM TOOL
999029313-6 MICROMETER WITH CLIP
999029221-2 MERCURY LAMP
Slotted Screwdriver



MERCURY CALIBRATION SCREEN

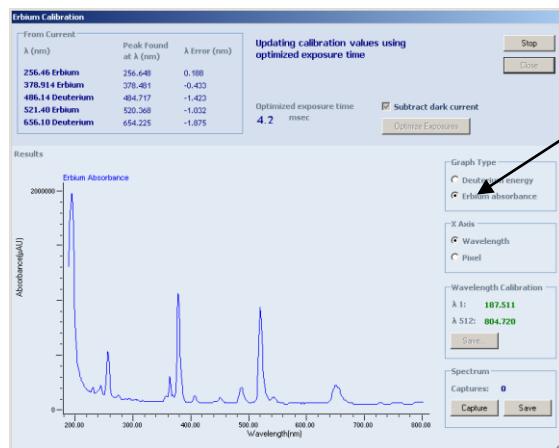
OPER OPERATION DESCRIPTION

TOOL NUMBER/DESCRIPTION

FINISH ALIGNMENT

T20 Driver
T10 Driver

- 8.18 Once all values are green click “Stop” then click “Capture” then “Save” save as serial # Hg.txt. When finished close the Mercury Calibration Window.
- 8.19 Turn off the Mercury Lamp and install the D2 Lamp. Turn on D2 Lamp.
- 8.20 Click on “Maintain” from upper menu, click “Read Energy”. set wavelength to 230nm, exposure to 5.0 msec. and click “Continuous Read” then “Read”
Wait 5 to 10 minutes to warm up D2 Lamp
Maximize energy by adjusting M1 Mirror in “Y” direction first, then “X” direction then “Y” direction again.
Once Maximum energy is achieved by adjusting M1, tighten screws.
Loosen torx screws on M2 and maximize energy by adjusting M2 Mirror in “X” direction only, tighten screws when Maximum energy is achieved. If energy value at 230nm (5.0 msec) is above 264,000 cts, set exposure to 4.2 msec, if energy still exceeds 264,000 cts put bench aside and notify engineer
After a few seconds click “Stop” then “Capture” then “Save”. Save as serial # d2.txt.
Click “Close” to close energy screen.
- 8.21 Click “Troubleshoot “, “Erbium Calibration”, then “Optimize exposure” and “Start” and wait for energy wave to appear, Lambda values should be green, if values are not green the finish alignment will have to be repeated. If values are green click “Stop” then “Capture” and “Save” as # erb.txt. Click Erbium Absorbance and check Erbium peaks
- 8.22 Close all Console windows, wait for software to record data. After data is recorded, turn power off on Bench and remove from Fixture. Bench is now complete. Click on Start button to start new Bench



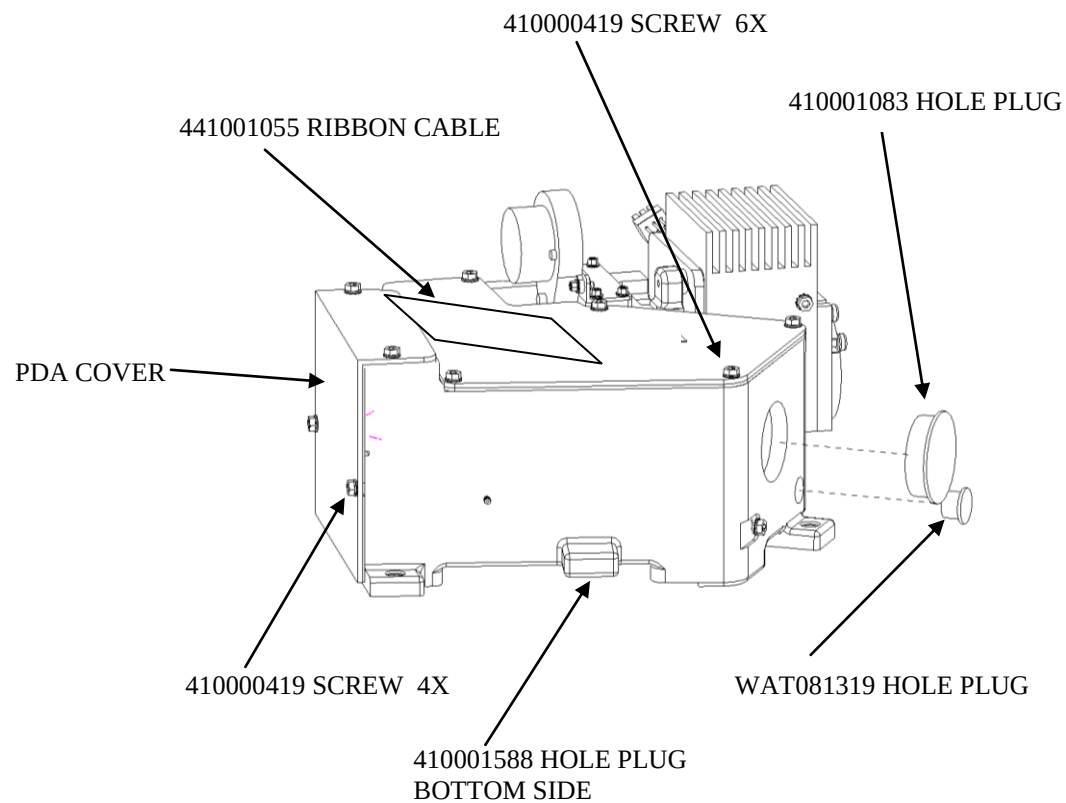
CLICK ERBIUM
ABSORBANCE
NOTE PEEKS

CLICK ON START TO
BEGIN NEW BENCH



RECORDED DATA

<u>OPER</u>	<u>OPERATION DESCRIPTION</u>	<u>TOOL NUMBER/DESCRIPTION</u>
9.0	Attach Ribbon Cable to Charge Amp, fold over Ribbon Cable and secure PDA Cover with screws.	T20 Driver
9.1	Secure top Cover.	
9.2	Insert Plugs into Bench as shown.	



OPER **OPERATION DESCRIPTION**

TOOL NUMBER/DESCRIPTION

- 9.3 Attach Insulation to Bench as shown. (Note: Insulation may optionally be installed outside the clean room after bench assembly and alignment are complete)

