Subject	How to perform calibration	Written by
Model	3Di-xx2, 3Si-xx2	K.Yanazume 2018/05/04

Contents

■Objective

This calibration document is for setting the machine in the customer site.
Calibration items in the customer site is different from the factory.

NOTE Side camera manual refer to [TSM16003-01].

■Tool

Prepare the following parts before the calibration.

・Glass board
510×460mm (P/N [SJJG0A003-01])

・Height calibration jig (P/N [SJJG1P000])

■Outline

1. Calibration menu

NOTE Coaxis shading is used only AOI.

	Calibration item	Tool	Single	Dual(A Lane)	Dual(B Lane)
1	Rail width offset	Vernier	-	-	-
2	Illumination balance for adjustment	Gray chart	○	○	-
3	Focus	Glass board	○	○	Only check
4	Square Reference	Glass board	○	○	-
5	Camera rotation	Glass board	○	○	-
6	Illumination balance	Gray chart	-	-	-
7	Projector angle	Glass board	○	○	-
8	Lens	Glass board	○	○	-
9	Stage position	Glass board	○	○	○
10	Coaxis shading	Gray chart cover	○	○	-
11	Height	Height Jig	○	○	Only check
12	Anchor position	Sample PCB	○	○	○

Table: Calibration list

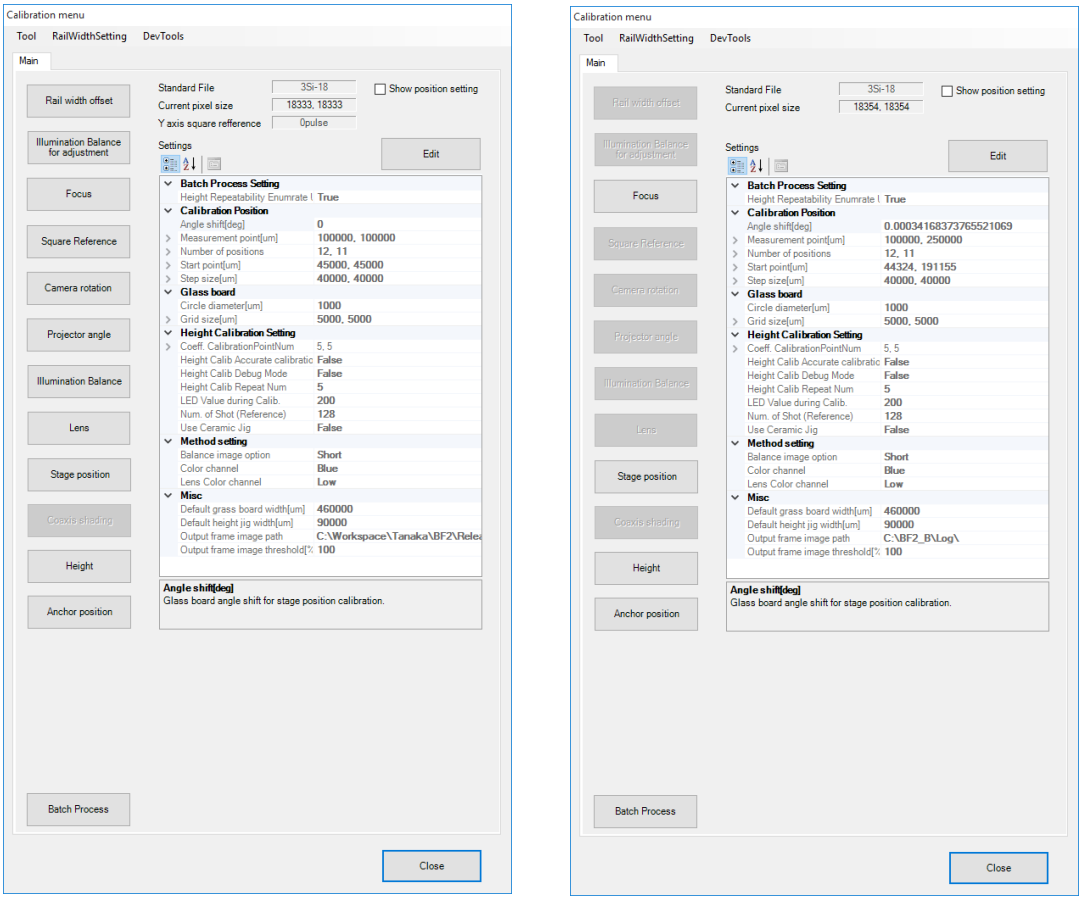


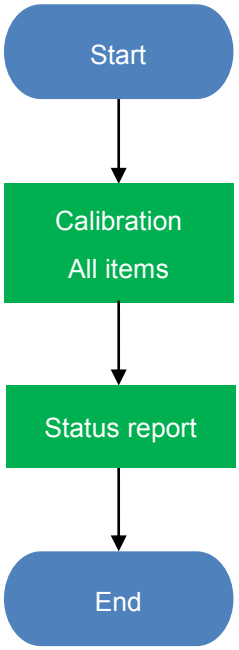
Figure: Calibration Menu (Left : A lane, Right : B lane)

2. Flow chart

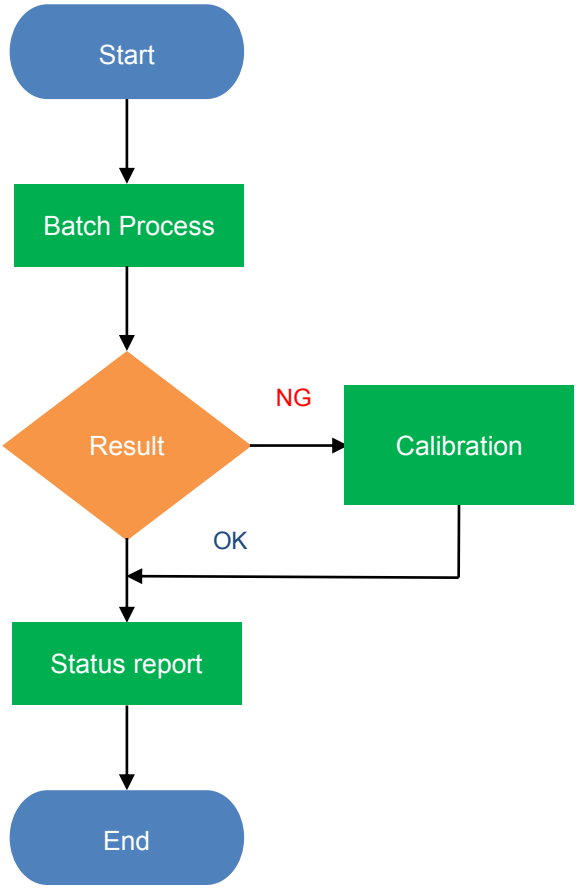
Proceed according to the flow chart (a) when installing the machine in the factory.
Need to calibrate all items from calibration list of Section1.

Proceed according to the flow chart (b) when maintenance is done.
Check the machine condition by **Batch Process** at first and calibrate NG items.

(a) Machine Install



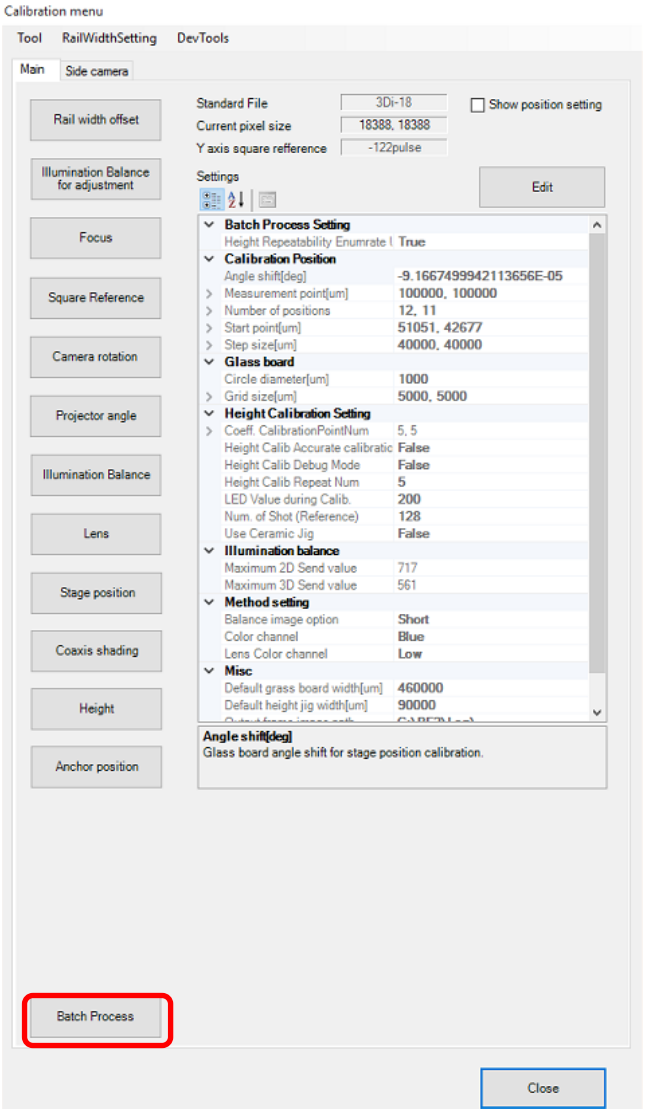
(b) Maintenance



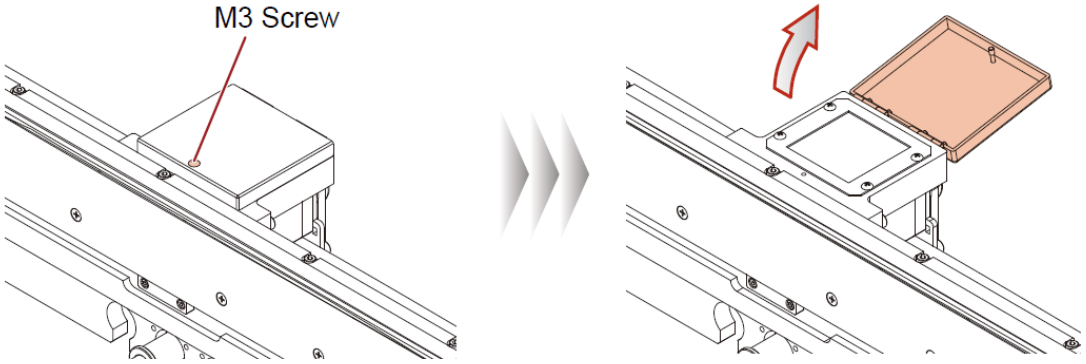
3. Batch Process

[Purpose]
To collectively perform only inspections of each calibration item. The inspections are divided into the following two types: one using the glass board and the other using the height calibration jig.

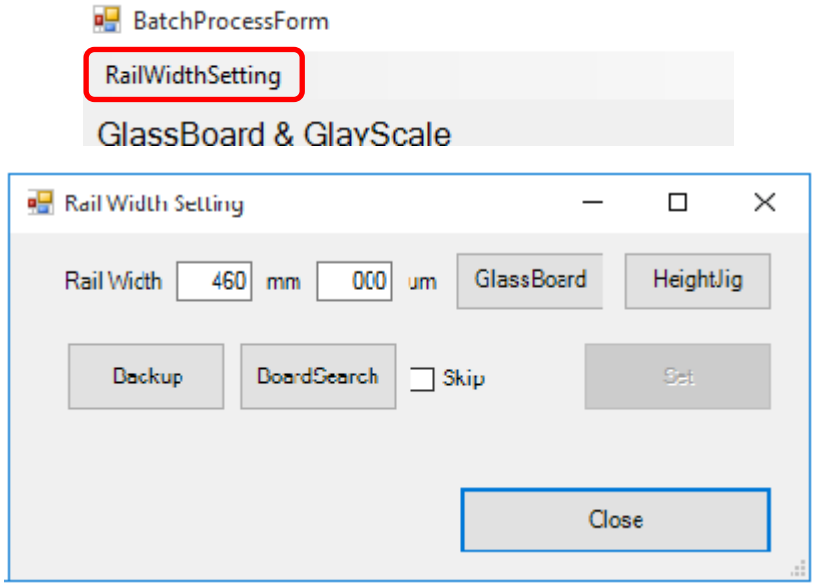
Step1 Click Batch Process from the calibration menu.



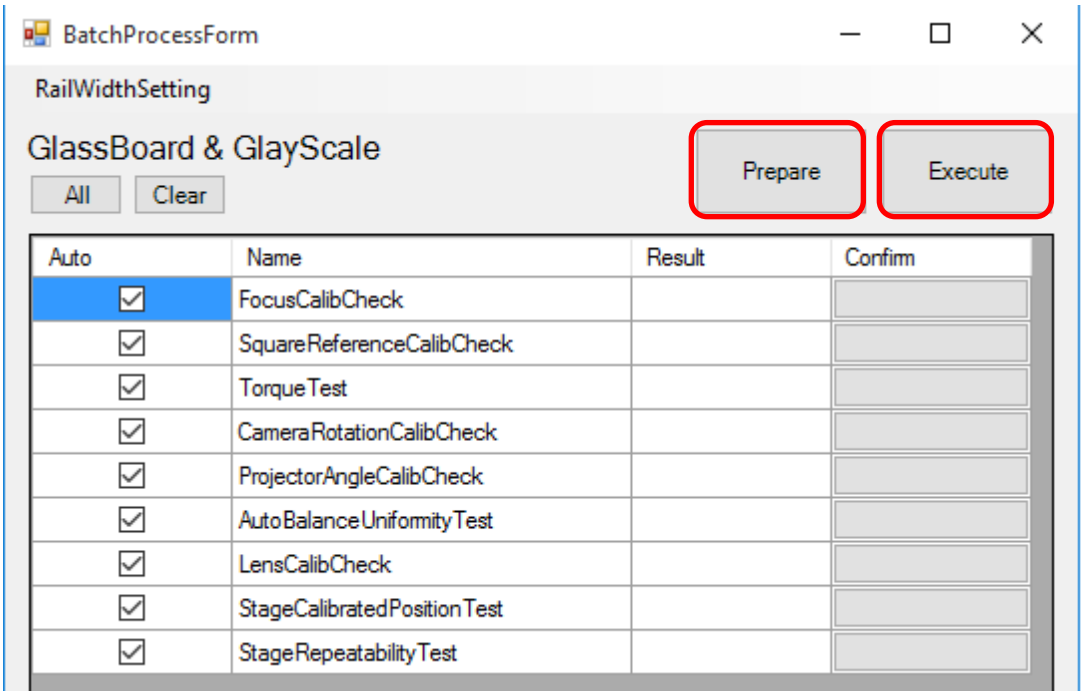
Step2 Open the calibration unit cover on the conveyor.



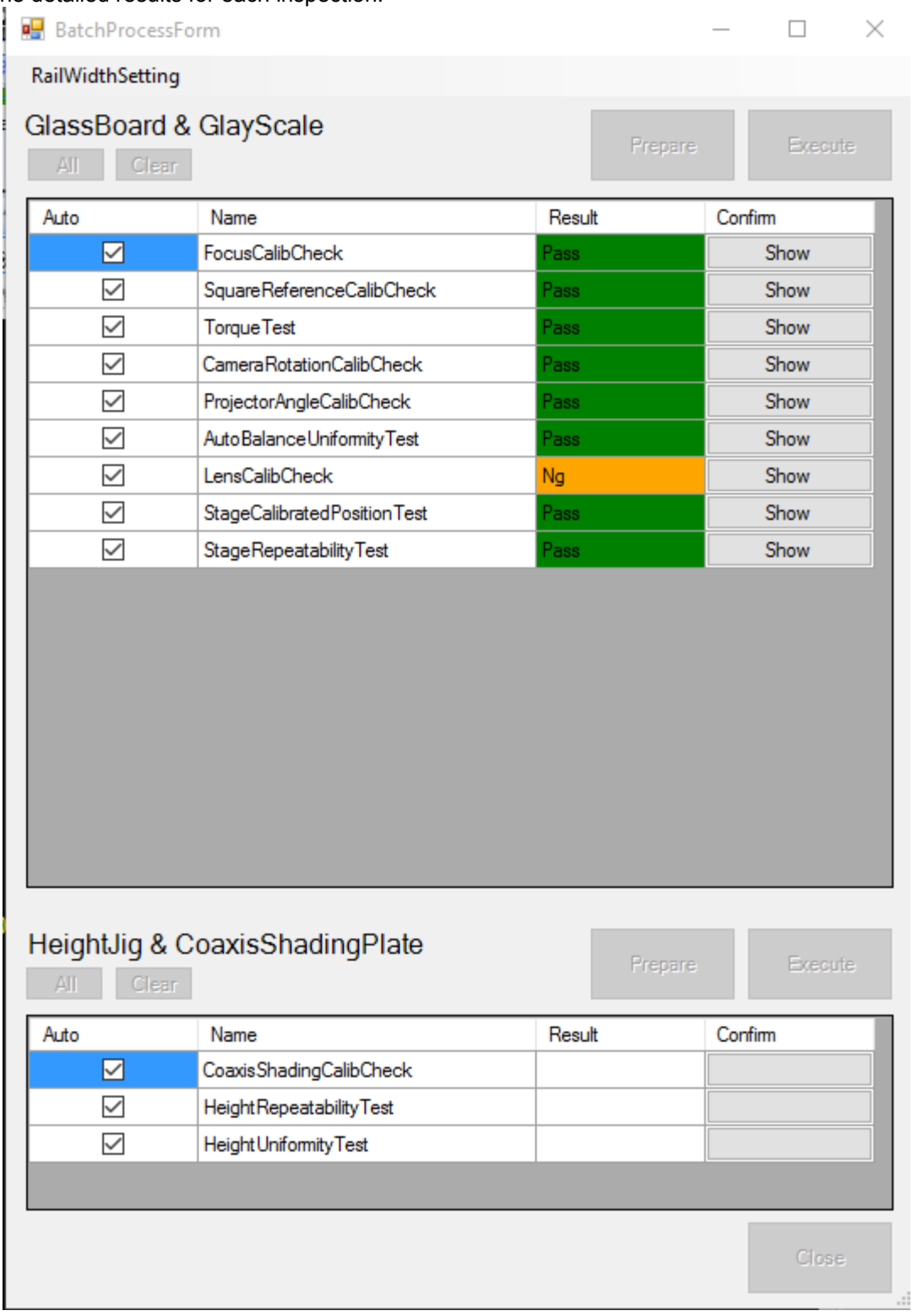
Step3 Start with the inspections using the glass board. Access RailWidthSetting from BatchProcessForm. Adjust the rail width there, and set the glass board.



Step4 Confirm that the calibration unit cover is opened and the glass board is set, and click the Prepare button for GlassBoard & GrayScale. This makes the Execute button available. Click Execute to start the inspections.

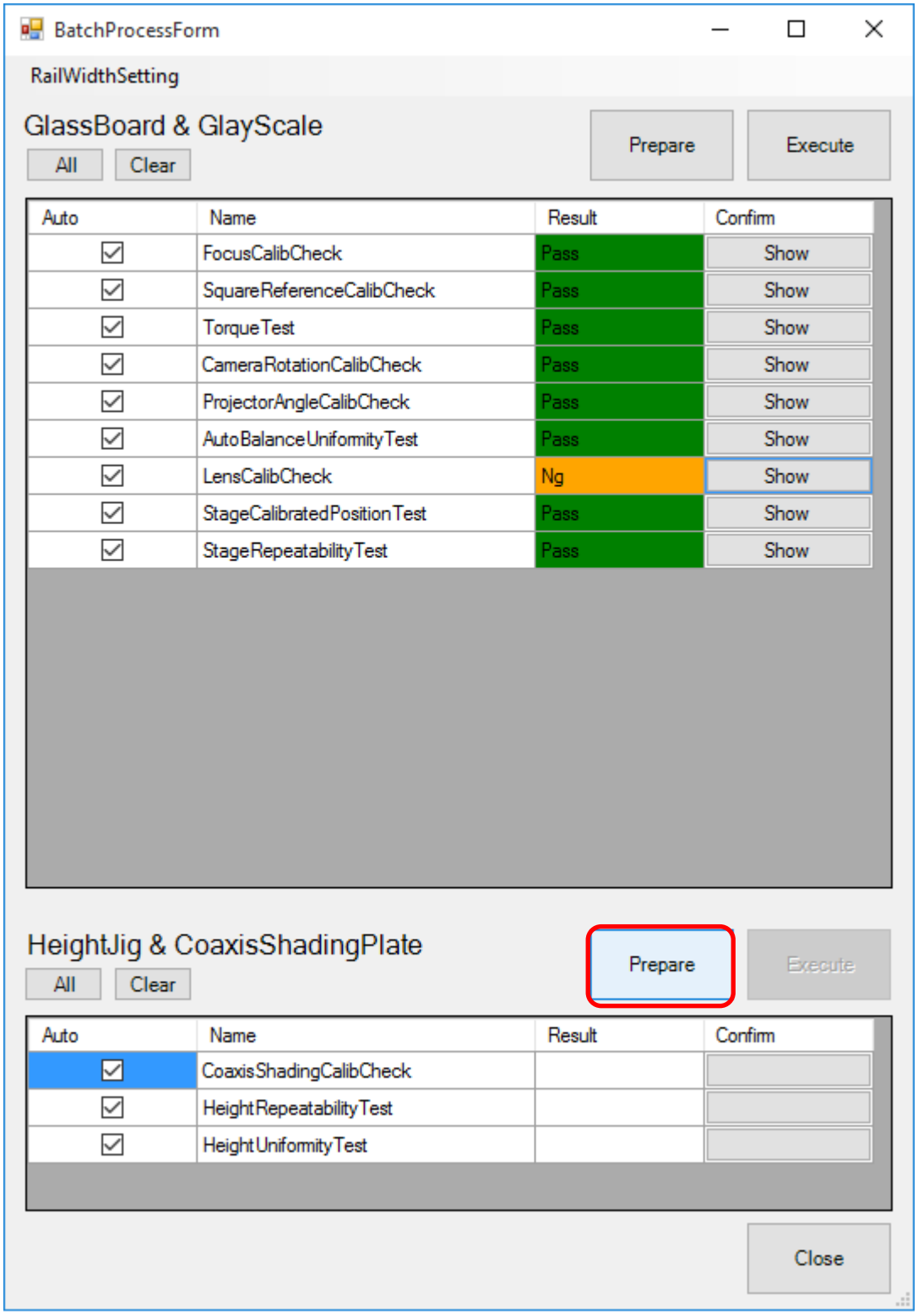


Step5 After all the inspections are completed, each result is shown as "Pass" or "Ng". However, "Error" is shown for inspections that were interrupted and produced no results. Click the Show button to check the detailed results for each inspection.

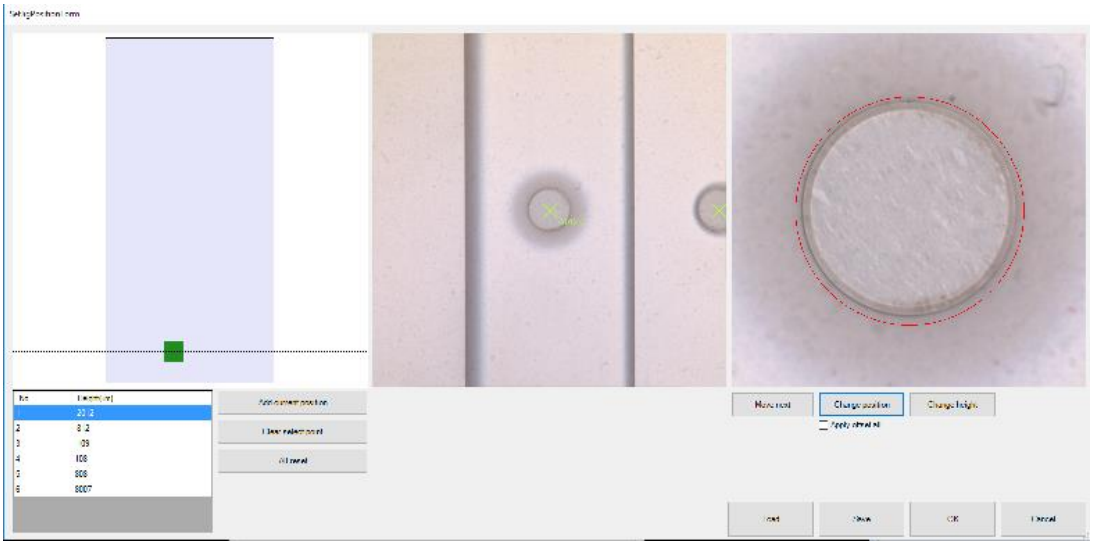


Step6 Take out the glass board. Adjust the width from RailWidthSetting and set the height calibration jig.

Step7 Click the Prepare button for Heightjig & CoaxisShadingPlate.
This starts the position adjustment of the height calibration jig.

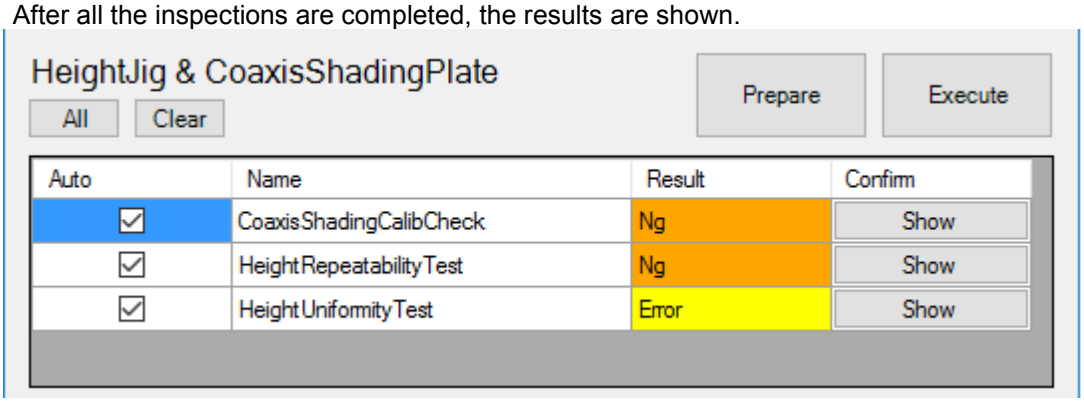


Step8 Adjust the position of the height calibration jig.
(For more details of the position adjustment, refer to the "Height Calibration" section.)



Step9 After adjusting the position of the height calibration jig, click Execute to start the inspections.

Step10 After all the inspections are completed, the results are shown.



Step11 For the inspections with "Ng" in Batch Process, go back to the calibration menu, and perform the calibration.
The calibration items are shown on the calibration menu in order of execution from the top. If "Ng" occurs on and recalibration is required for a calibration item, perform the calibration and all the items shown under that calibration.
The correction values of an upper calibration item affect those of the lower items.

*Close the calibration unit cover after completing the procedure.

4. Calibration

4.1 Rail width for calibration

[Purpose]
This machine requires two types of tools: calibration glass board (L size) and height calibration jig.
Set the rail widths as below depending on the tools.
With the other settings, calibration and Check cannot be performed in some cases.

【Use glass board (L size)】
Single lane type & A lane of Dual lane type
A lane width 460mm

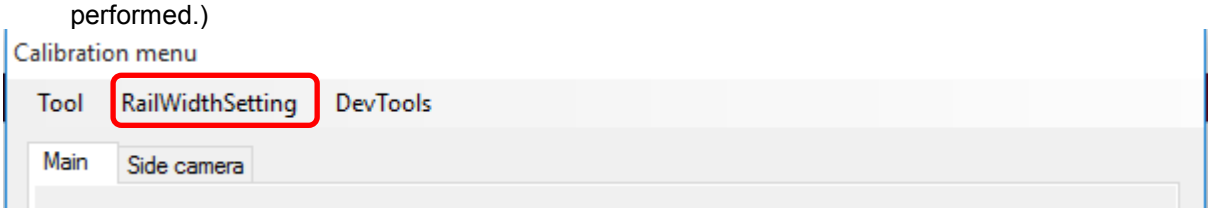
・B lane of Dual lane type
A lane width 50mm
GAP width 100mm
B lane width 460mm

【Use height calibration jig】
Single lane type & A lane of Dual lane type
A lane width 90mm

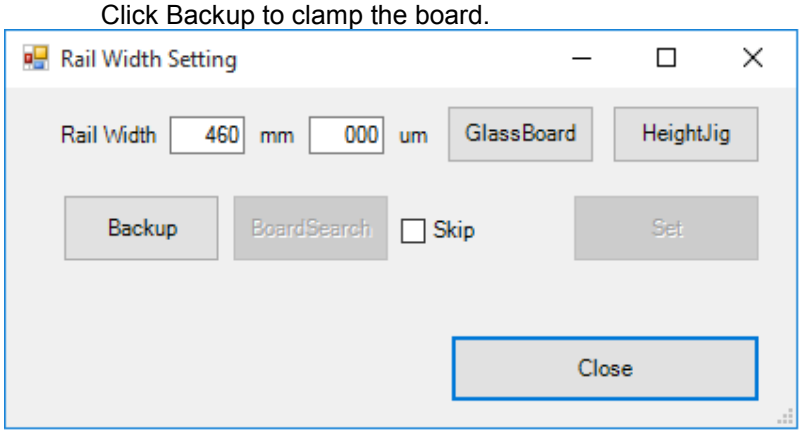
B lane of Dual lane type
A lane width 50mm
GAP width 100mm
B lane width 90mm

Using the following function can automatically configure the above setting.

Step1 Click RailWidthSetting from the calibration menu.
(For the dual machine, perform the operation on the dialogue for the lane where calibration is performed.)



Step2 Select a jig to use on the screen below to automatically enter a rail width value.
Click Set to automatically adjust the width. After the adjustment, set the jig.
Click Backup to clamp the board.



GlassBoard button
Automatically enters 460 mm for the L-size glass board.

Heightjig button
Automatically enters 90 mm for the height calibration jig.

Step3 Click Close to exit the RailWidthSetting screen. Rail width Offset

4.2 Illumination balance for adjustment

[Purpose]
This section describes how to adjust the brightness of the LED lighting units and stripe pattern projection units.

NOTE Before calibration, adjust conveyor width according to Section 4.1

Step1. Open the calibration unit cover.
Before adjusting luminance value, make sure that any board is not set on the conveyor.
Loosen a M3 truss screw (anti-drop type) and open the cover to rear.

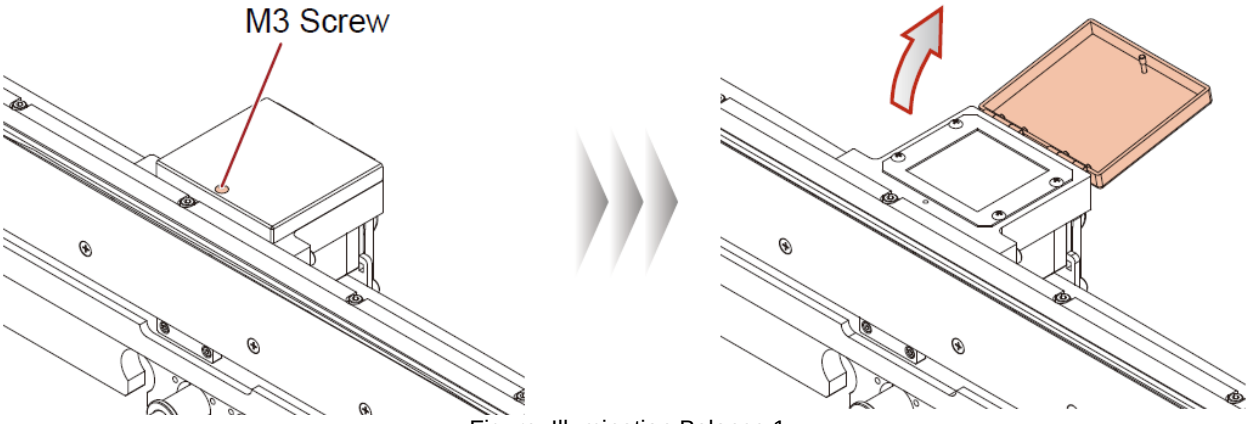


Figure: Illumination Balance 1

Step2. Click **Illumination Balance for adjustment / Illumination Balance**.

NOTE

In the factory, illumination balance is 2 steps.
But in the customer site, you adjust illumination balance only 1 time.
Choice **Illumination Balance for adjustment** or **Illumination Balance**.

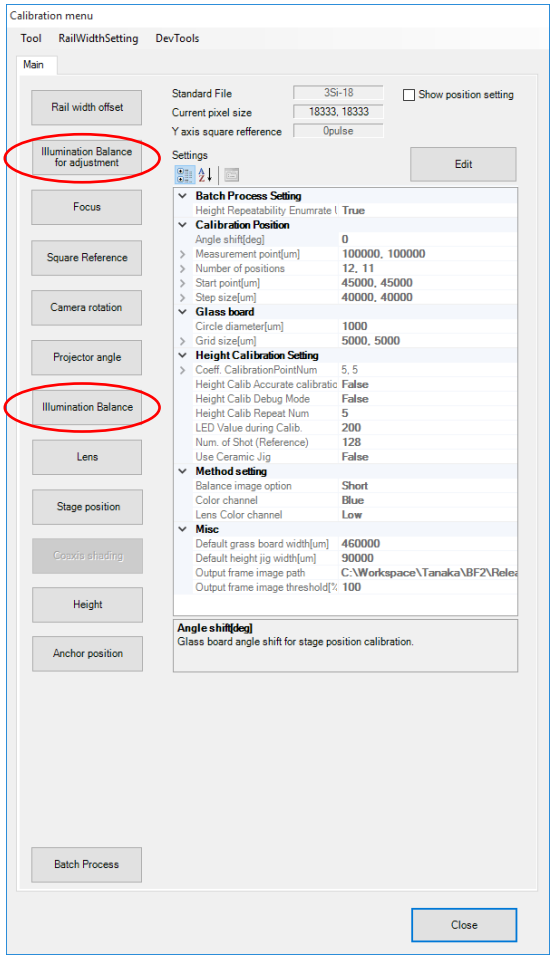


Figure: Illumination Balance 2

Step3. The dialog shown below appears.
If you have already opened the calibration unit cover, click **OK**.
If you have not already done, open it by reference to Step1.

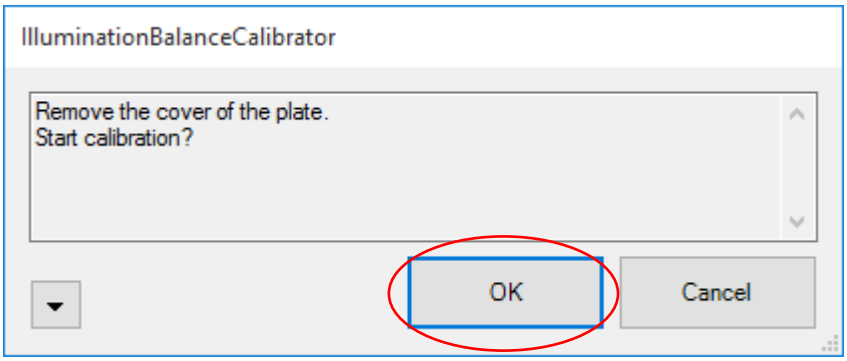


Figure: Illumination Balance 3

Step4. The dialog shown below appears. Click **OK**.

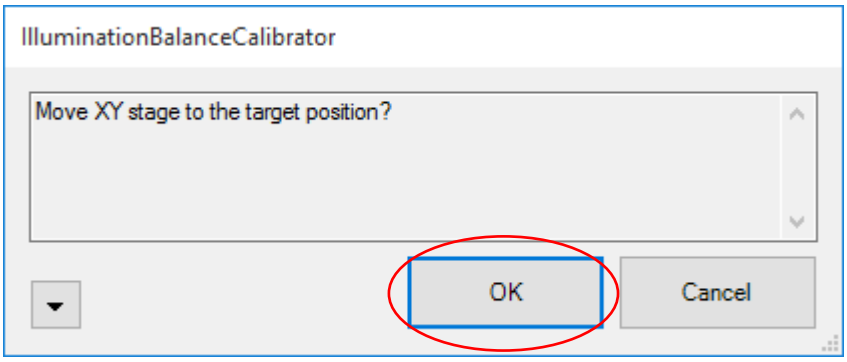


Figure: Illumination Balance 4

Step5. If you have not already moved the conveyor width, the dialog shown below appears.
Enter the conveyor rail width 460000 and click **OK**.
The camera head moves to the gray chart position.

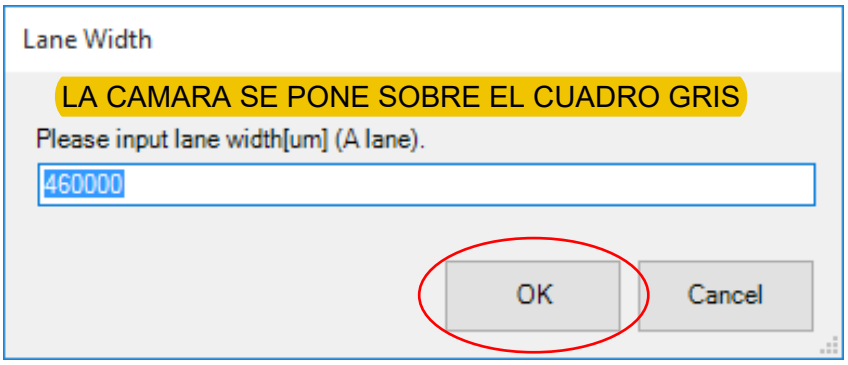


Figure: Illumination Balance 5

Step6. The dialog shown below appears. Click **Calibrate**.

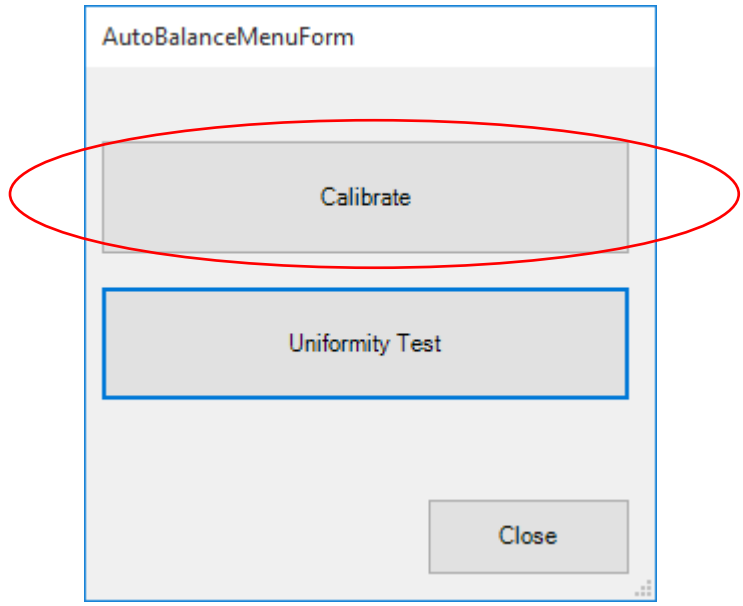
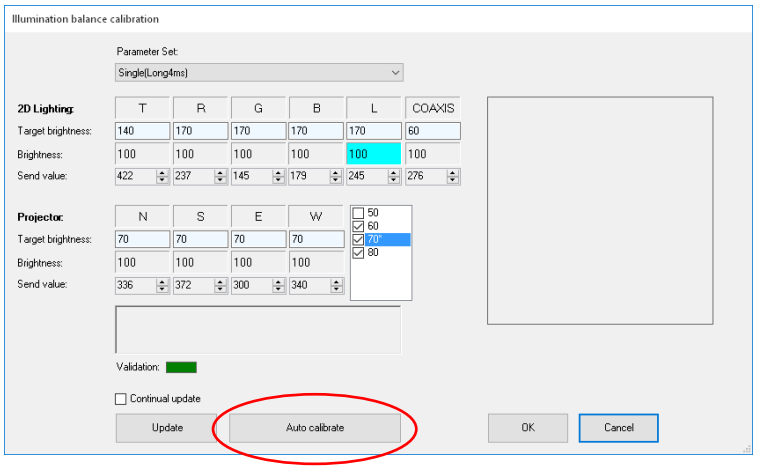


Figure: Illumination Balance 6

Step7. The dialog shown below appears. (Upper side is AOI, and lower side is SPI.)
Click **Auto calibrate** to start calibration. After finishing auto brightness adjustments, click **OK**.



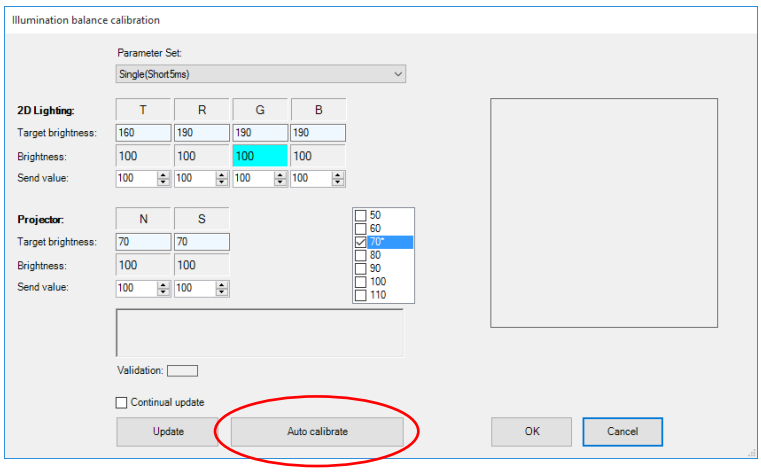


Figure: Illumination Balance 7

Step8. The target value list is below.

Item		Target Value(3Di)	Target Value(3Si)
T	TOP LED Lighting	140	160
R	SIDE LED Red Lighting	170	190
G	SIDE LED Green Lighting		
B	SIDE LED Blue Lighting		
L	LOW LED Lighting		
COAXIS	COAXIAL TOP LED Lighting	60	
N	North Side Stripe Pattern Projector	70 or 10 (in case of Double (Short 1ms))	70
S	South Side Stripe Pattern Projector		
E	East Side Stripe Pattern Projector		
W	West Side Stripe Pattern Projector		

Table: Standard Brightness Value of the LED Lightings and Stripe Pattern Projection Units

The target of N, S, E, and W are 70 as default but you can restore several brightness values.
Select the check boxes that you need.

If the tolerance is not achieved, click **Auto calibrate**.
Each value will be adjusted automatically.

4.3 Focus

[Purpose]
This section describes how to check the camera unit is in focus or not and adjust camera focus.

Step1. Set **number of position**.
3Di-MS2/MD2, 3Si-MS2/MD2 : (X, Y) = (8, 11)
3Di-LS2/ZS2/LD2, 3Si-LS2/ZS2/LD2 : (X, Y) = (12, 11)

Adjust conveyor width according to Section 4.1.
Set a glass board on the machine conveyor. Click **Focus**.

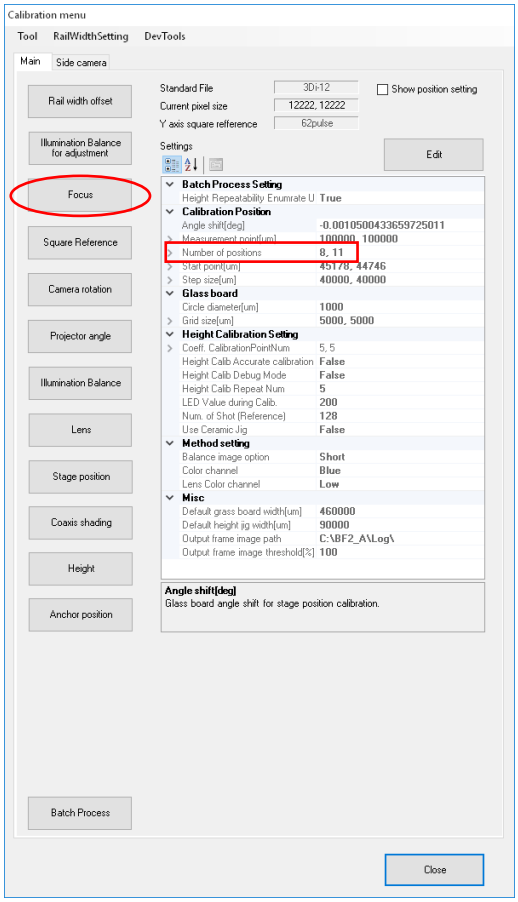


Figure: Adjust Focus 1

Step2. The dialog shown below appears. Click **YES**.

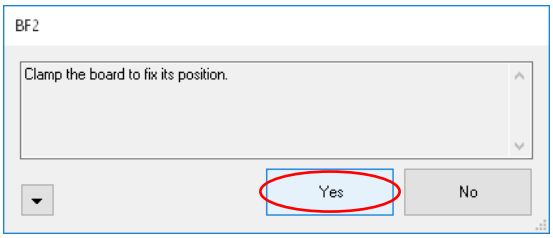


Figure: Adjust Focus 2

Step3. The dialog shown below appears. Click **Front Center**.
Click **Auto** and check if all sample values are within tolerance and Validation is **GREEN.**
Click **OK**. If not, adjust the camera focus mechanically.

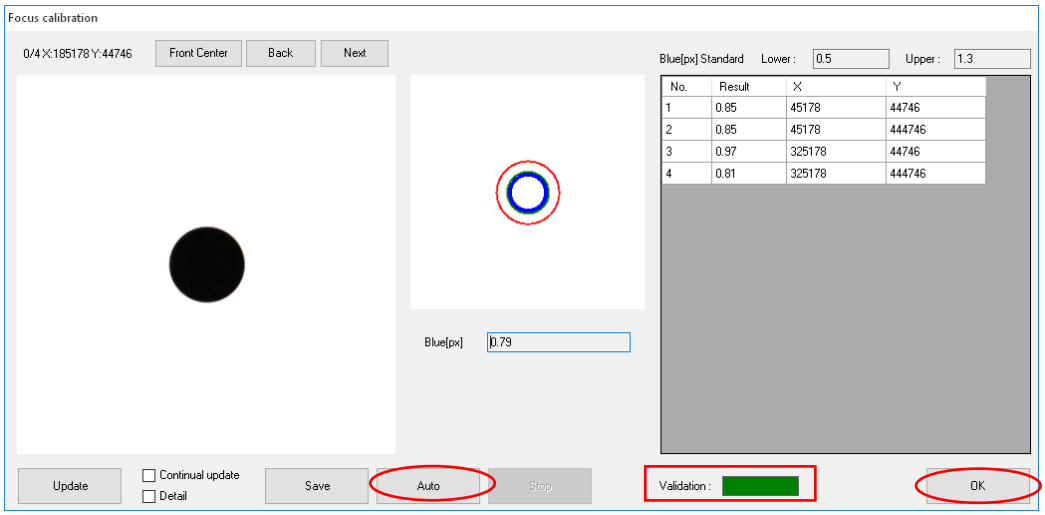


Figure: Adjust Focus 3

Step4. Open the upper front door. Loosen the eight M4 truss screws (four on each side) and remove the optical unit cover shown below.

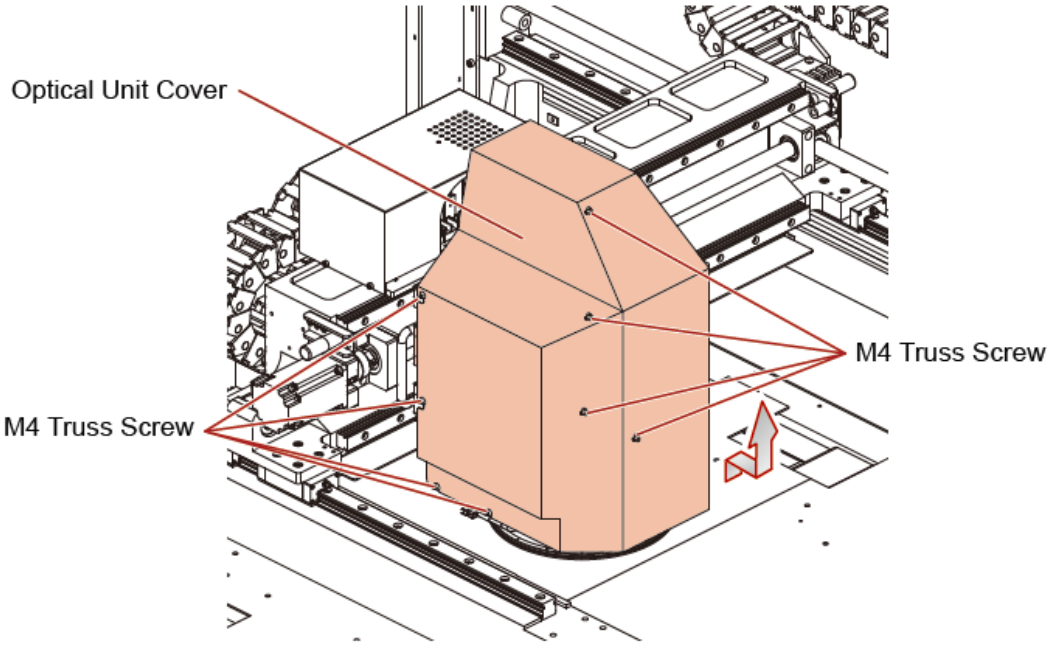


Figure. How to Remove or Open External Covers

Step5. Click **Front Center**.

After click, optical head will move to front center position. Be careful about safety.

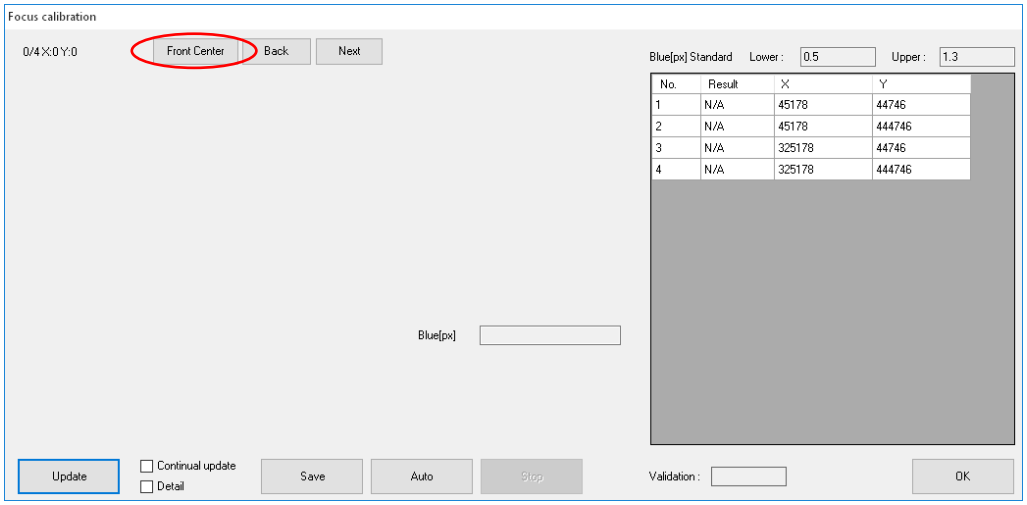


Figure: Adjust Focus 4

Step6. Check **Continual Update**.

Loosen the six M5 cap screws(three on each side).

Rotate the adjust screw and minimize focus value.

Tolerance for this value is written at the upper right corner of the dialog.

After adjustment, stop to rotate the adjust screw and fix the M5 screw.

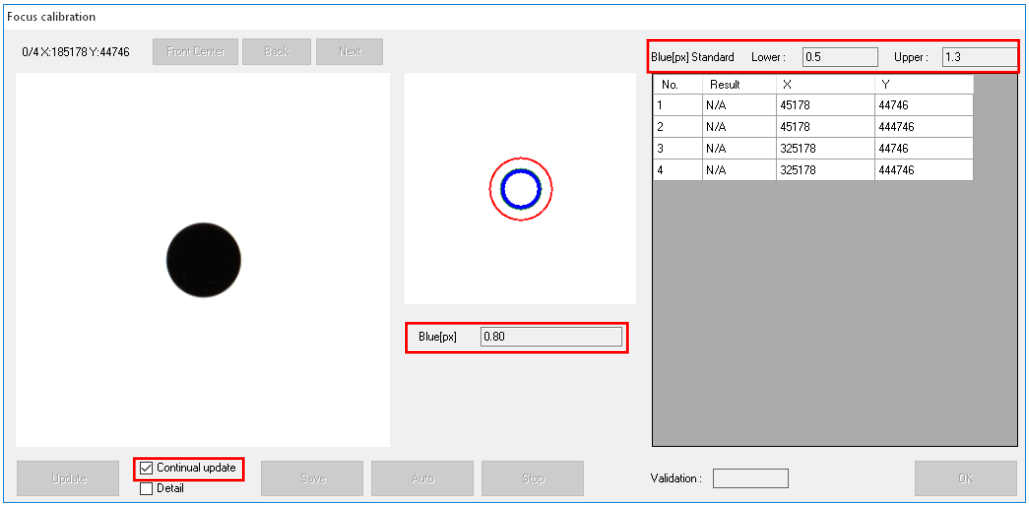


Figure: Adjust Focus 5

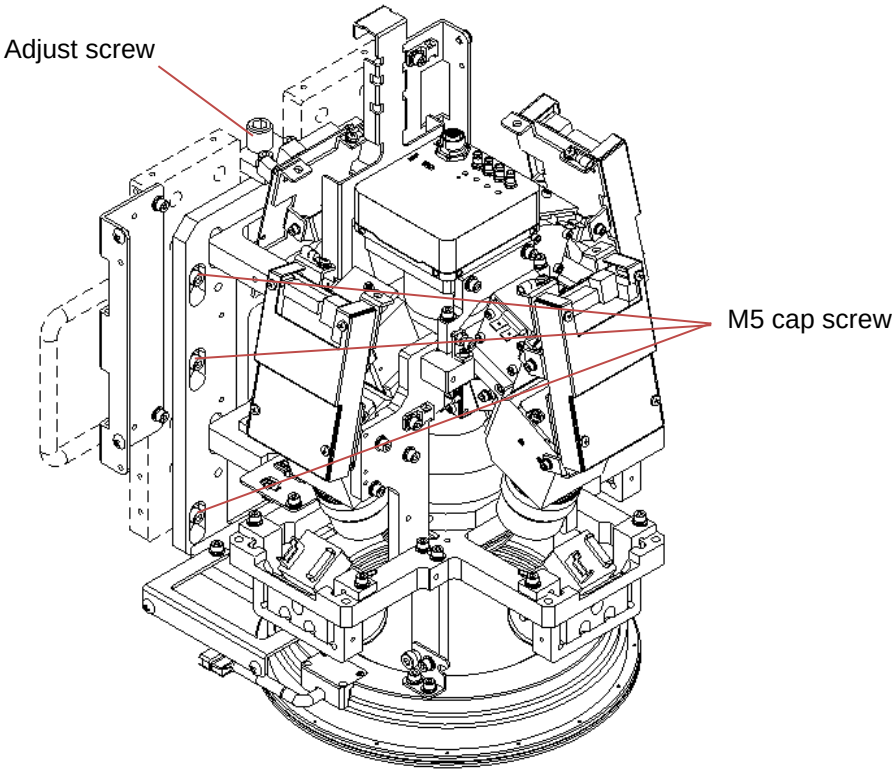


Figure: Adjust Focus 6

Step7. Click **Auto** and check if all sample values are within tolerance and Validation is **GREEN.**
Click **OK**.

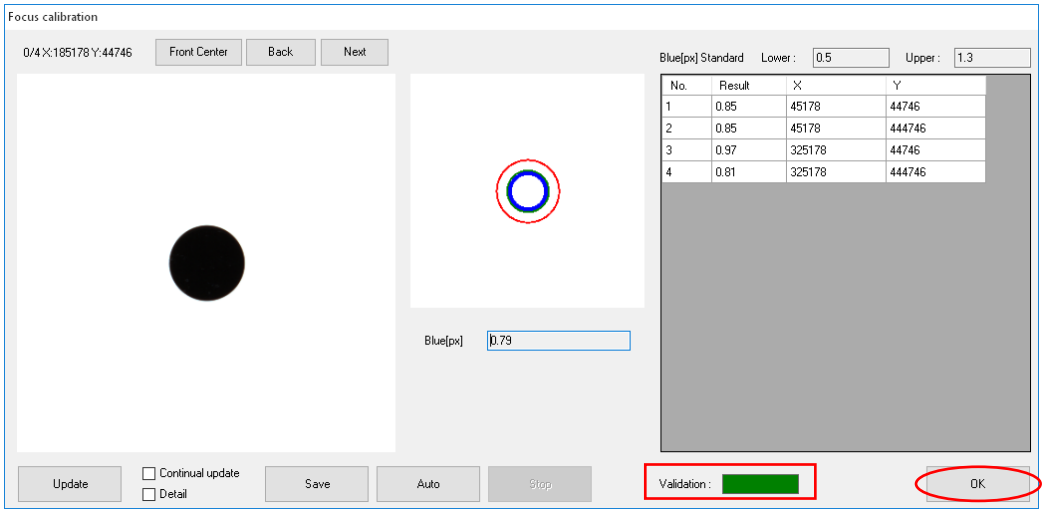


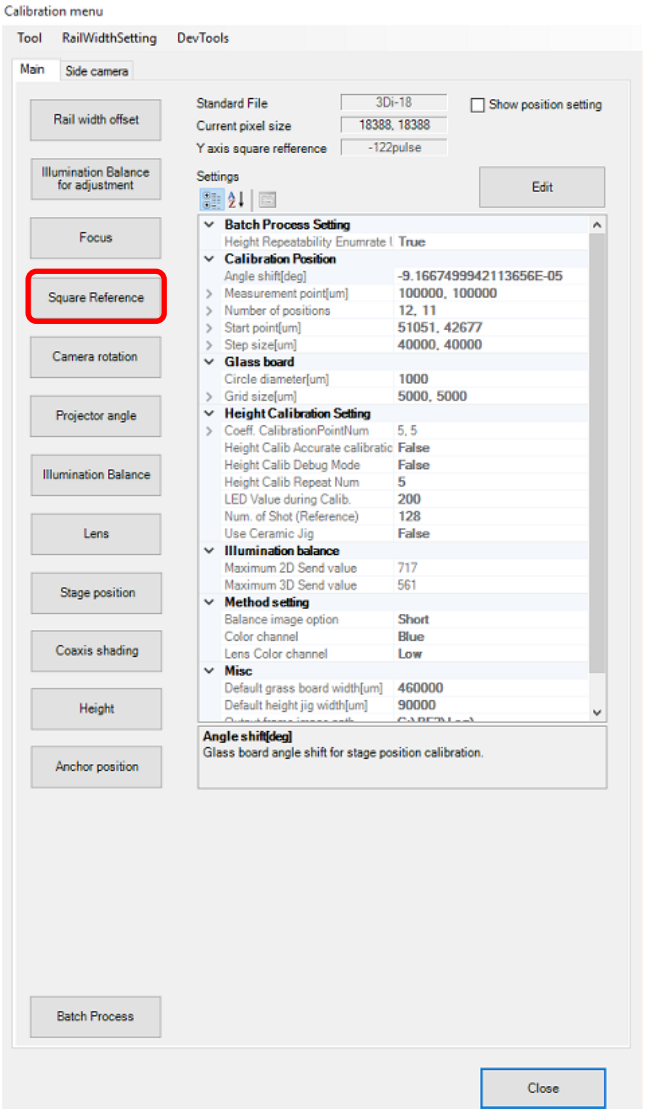
Figure: Adjust Focus 7

4.4 Square Reference

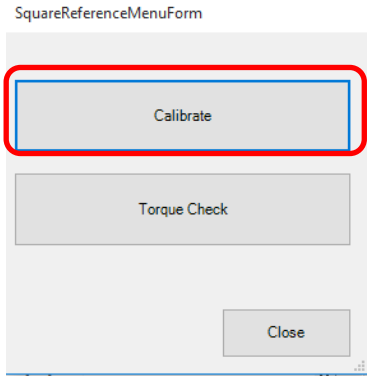
[Purpose]
To adjust tilts of the X- and Y-axes of the gantry and keep them at a right angle. Keeping that state is important to maintain measurement accuracy. Furthermore that controls loads on the motors and each driving part and prevents failures from occurring.

Step1 Start the adjustment with the L-size glass board set following the Focus adjustment.

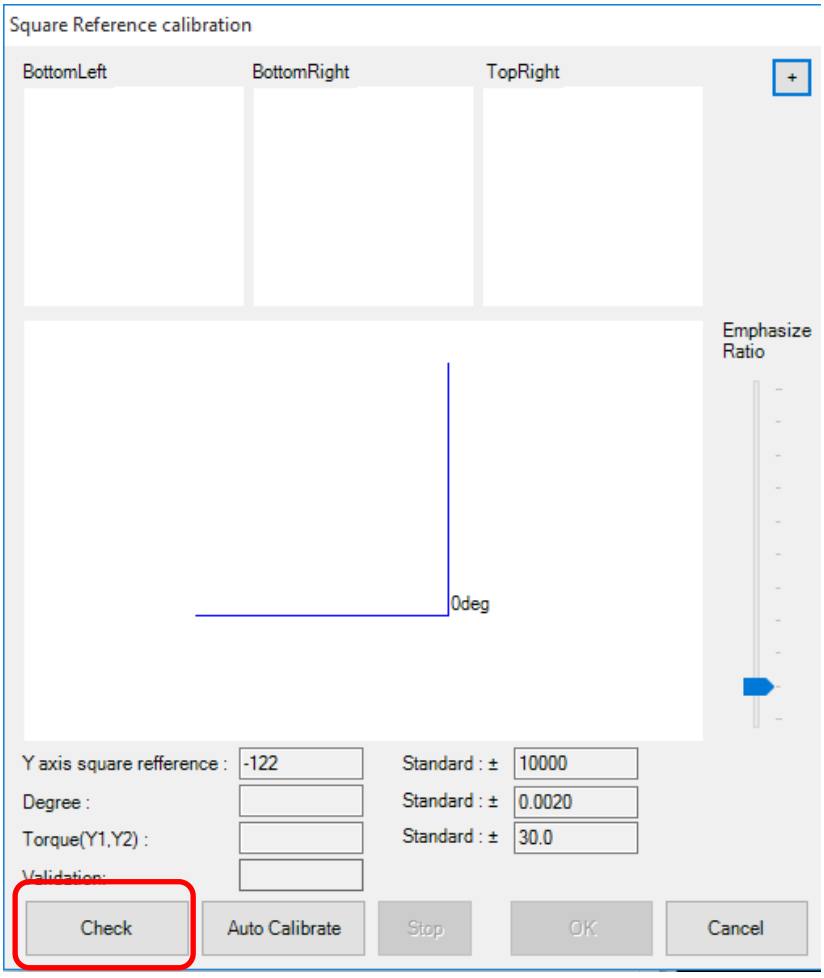
Step2 Click Square Reference from the calibration menu.



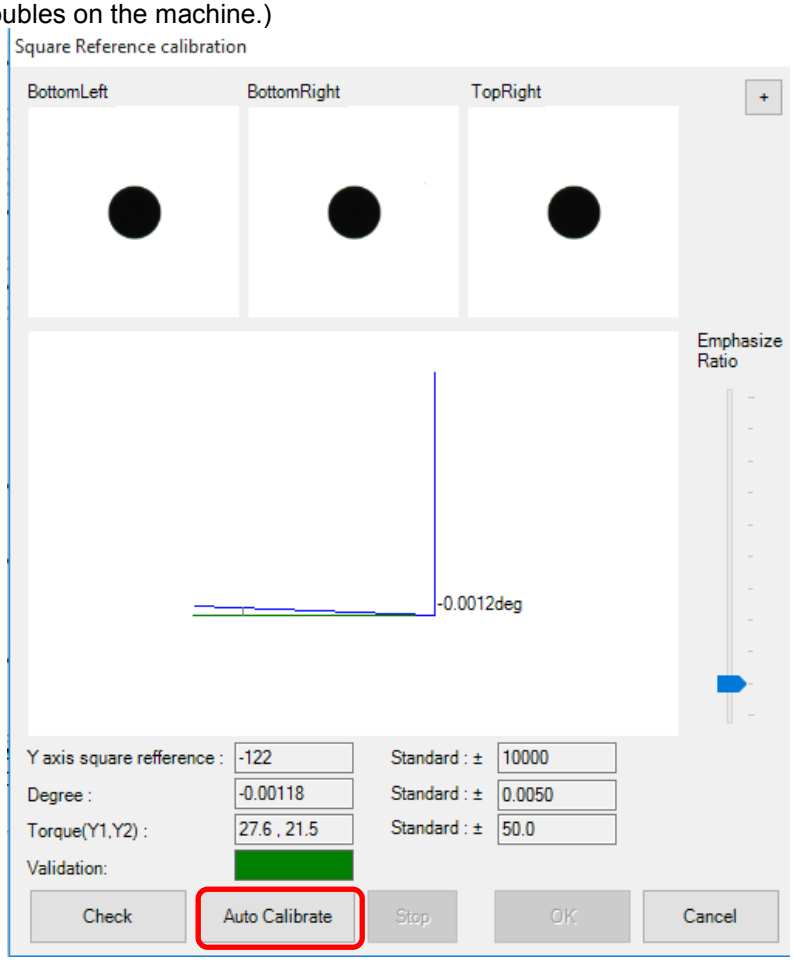
Step3 Click Calibrate from SquareReferenceMenuForm.



Step4 Click Check to measure a current gantry angle and torque load on the motors.

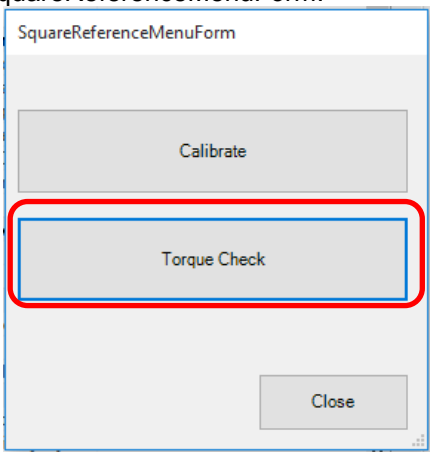


Step5 When the measurement values are equal to or lower than the standard values (θ0.005°or lower and 50% or lower for the motor load), Validation is shown in green.
In this case, no readjustment is required. Click Cancel to close the dialogue.
If it is shown in any other colors, click Auto Calibrate. If Validation is not shown in green even after Auto Calibrate is performed, apply grease to the gantry. If the condition is not improved even after the grease application, contact our SAKI support center.
(Even if the motor load is higher than 50%, this does not immediately affect the machine performance and cause troubles on the machine.)

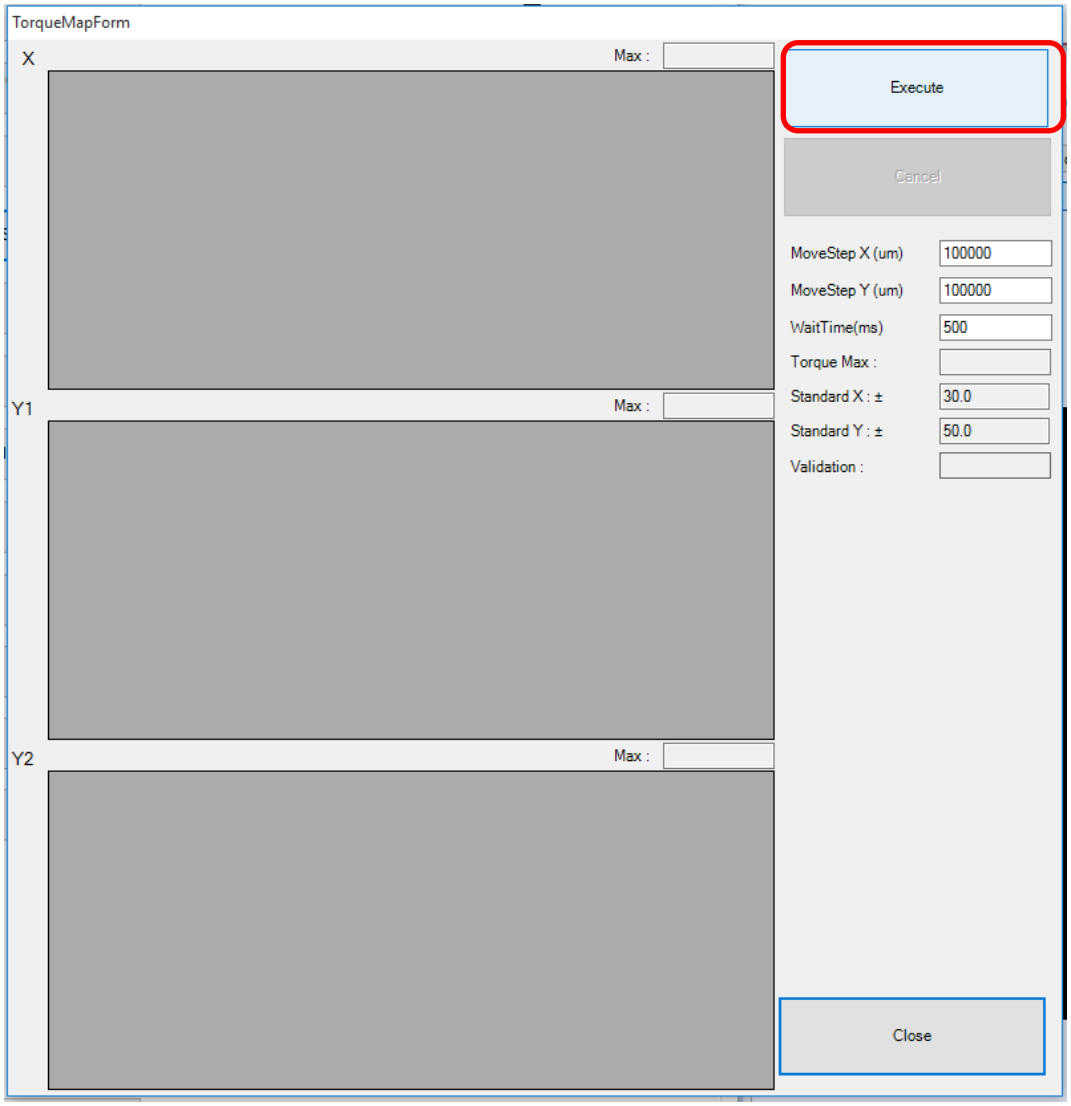


Step6 After the adjustment, click the OK button to register the new gantry setting values and close the screen. Click the Cancel button to close the screen without registering the new gantry setting values.

Step7 Perform a motor load test over the entire motion range of the gantry.
Click Torque Check from SquareReferenceMenuForm.

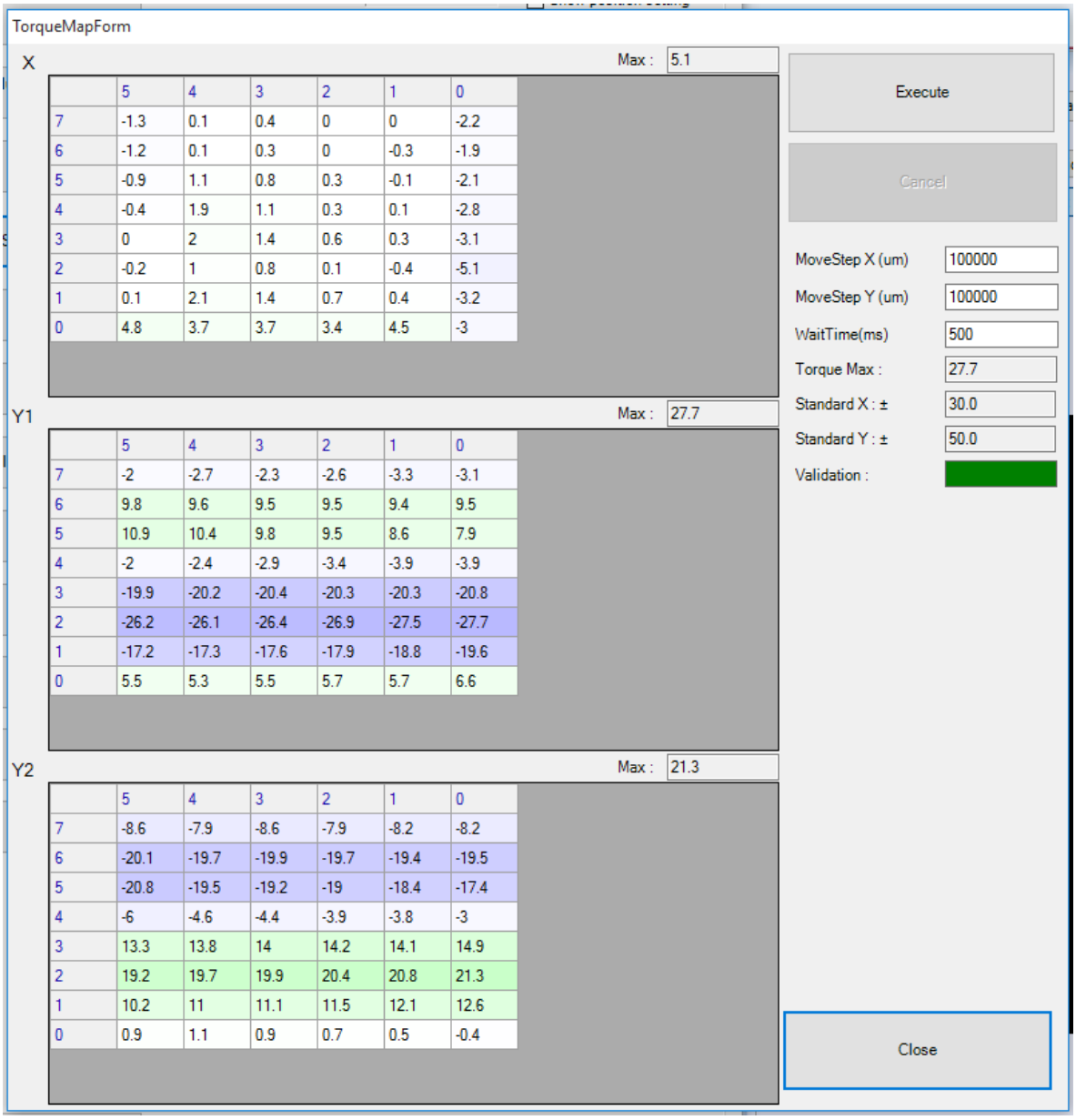


Step8 Click Execute to start a measurement.



Step9 X shows the motor load values of the X-axis, Y1 of the master axis on the right side viewed from the front of the machine, and Y2 of the slave axis on the left side.
When the measurement values are equal to or lower than the standard values (30% or lower for the X-axis and 50% or lower for the Y-axis), Validation is shown in green.

If it is not shown in green, apply grease to the gantry. If the condition is not improved even after the grease application, contact our SAKI support center.
(Even if the motor load is higher than 50%, this does not immediately affect the machine performance and cause troubles on the machine.)



	5	4	3	2	1	0
7	-1.3	0.1	0.4	0	0	-2.2
6	-1.2	0.1	0.3	0	-0.3	-1.9
5	-0.9	1.1	0.8	0.3	-0.1	-2.1
4	-0.4	1.9	1.1	0.3	0.1	-2.8
3	0	2	1.4	0.6	0.3	-3.1
2	-0.2	1	0.8	0.1	-0.4	-5.1
1	0.1	2.1	1.4	0.7	0.4	-3.2
0	4.8	3.7	3.7	3.4	4.5	-3

	5	4	3	2	1	0
7	-2	-2.7	-2.3	-2.6	-3.3	-3.1
6	9.8	9.6	9.5	9.5	9.4	9.5
5	10.9	10.4	9.8	9.5	8.6	7.9
4	-2	-2.4	-2.9	-3.4	-3.9	-3.9
3	-19.9	-20.2	-20.4	-20.3	-20.3	-20.8
2	-26.2	-26.1	-26.4	-26.9	-27.5	-27.7
1	-17.2	-17.3	-17.6	-17.9	-18.8	-19.6
0	5.5	5.3	5.5	5.7	5.7	6.6

	5	4	3	2	1	0
7	-8.6	-7.9	-8.6	-7.9	-8.2	-8.2
6	-20.1	-19.7	-19.9	-19.7	-19.4	-19.5
5	-20.8	-19.5	-19.2	-19	-18.4	-17.4
4	-6	-4.6	-4.4	-3.9	-3.8	-3
3	13.3	13.8	14	14.2	14.1	14.9
2	19.2	19.7	19.9	20.4	20.8	21.3
1	10.2	11	11.1	11.5	12.1	12.6
0	0.9	1.1	0.9	0.7	0.5	-0.4

Step10 Click Close to close the screen.

4.5 Camera rotation

[Purpose]
This section describes how to check the camera rotation angle is within tolerance or not and adjust it mechanically.

Step1. Adjust conveyor width according to Section 4.1.
Set a glass board on the machine conveyor. Click **Camera Rotation**.

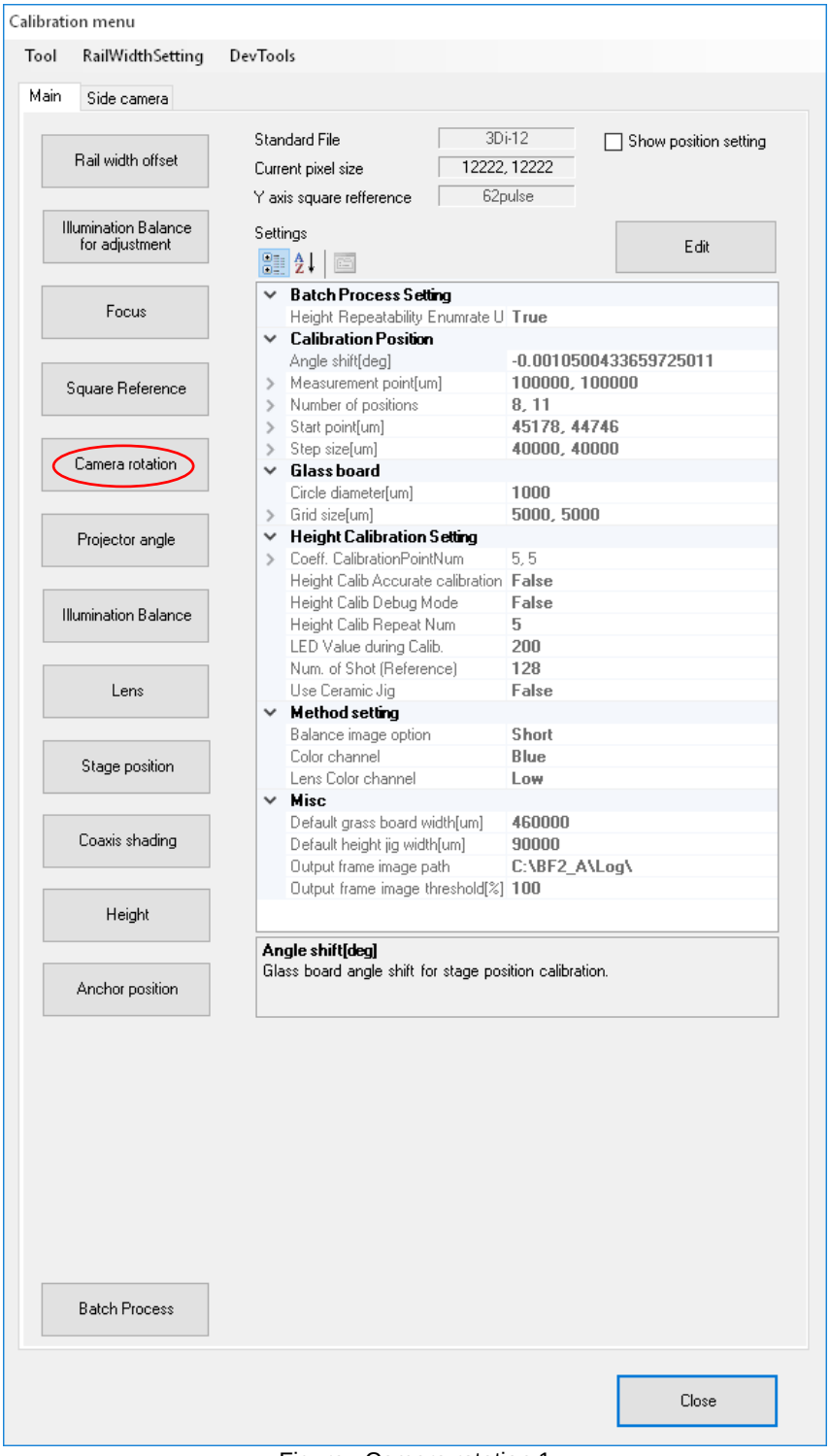


Figure : Camera rotation 1

Step2. The dialog shown below appears. Click **Measure Board Rotation**.

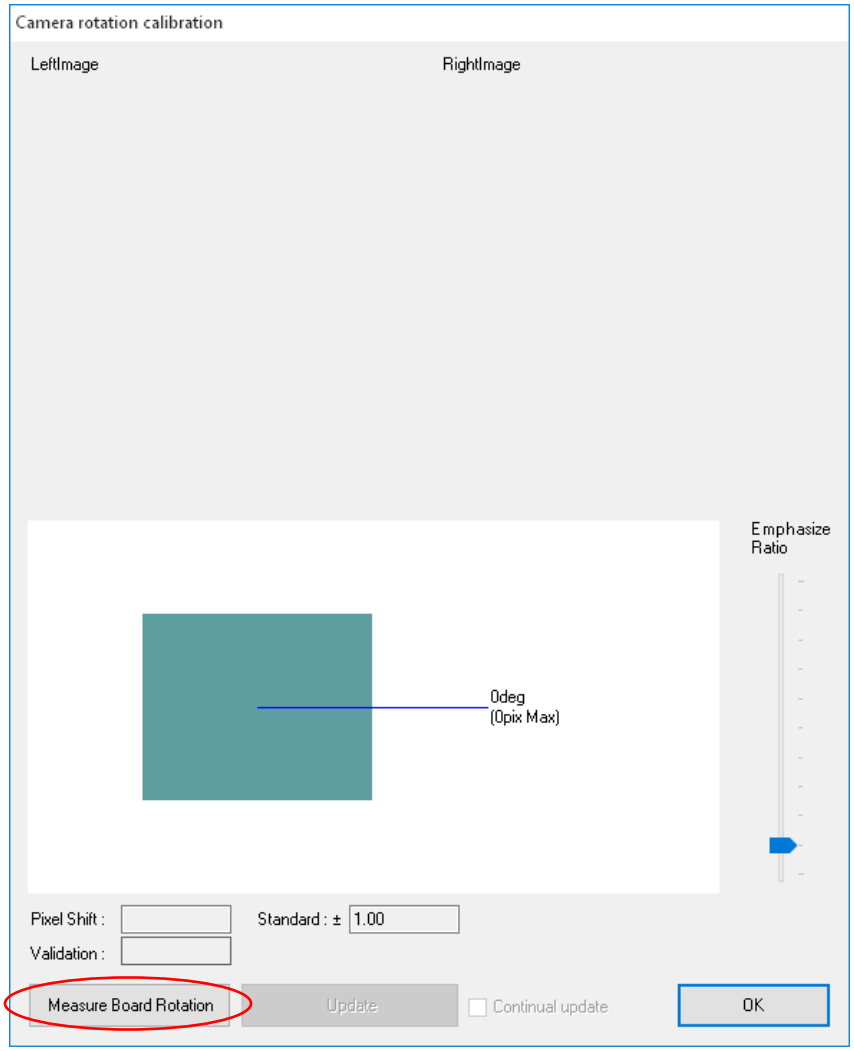


Figure : Camera rotation 2

Step3. The dialog shown below appears. Click **OK.**

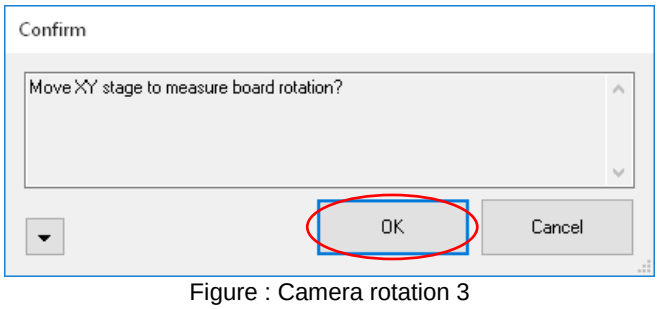


Figure : Camera rotation 3

Step4. Click **Update**. If sample value is within standard range(pix) and Validation is **GREEN**, click **OK**.
If not, adjust camera rotation mechanically. Loosen 4 M4 cap screws and 2 M4 nuts.
Check **Continual Update** and rotate M4 adjuster screws. Adjust the value within standard range.
After adjustment fix 4 M4 cap screws and 2nuts

Click **OK.**

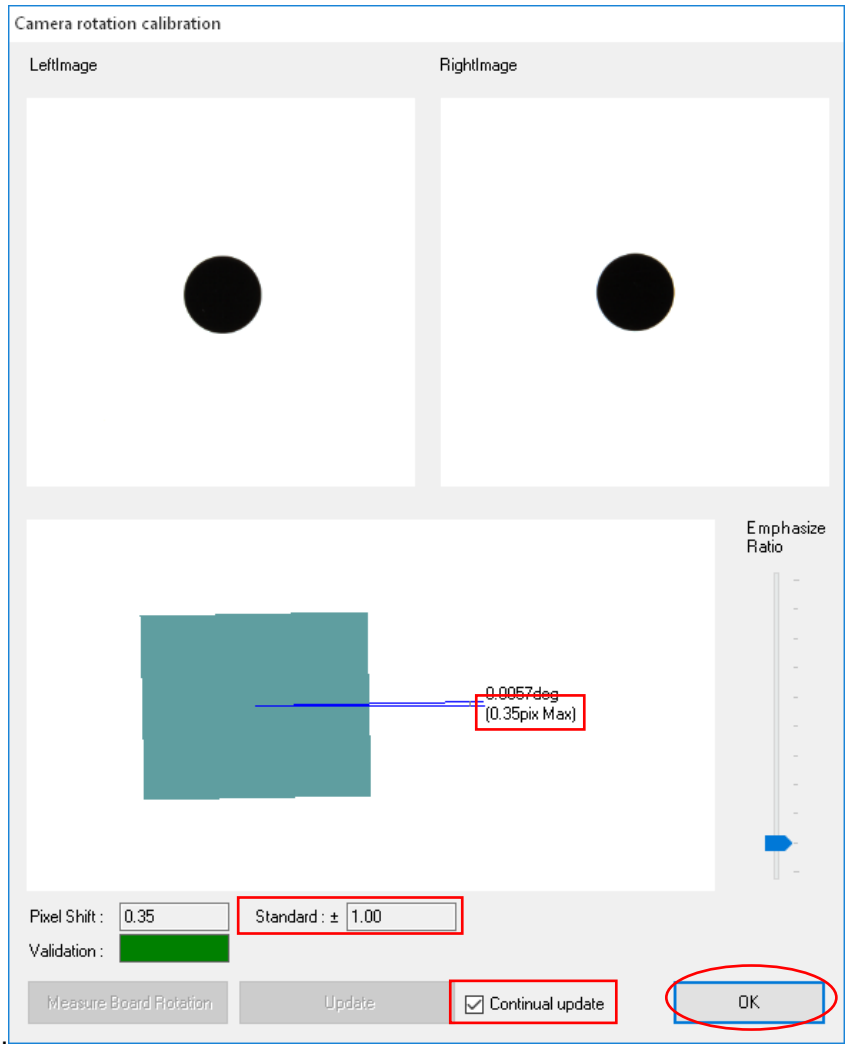


Figure : Camera rotation 4

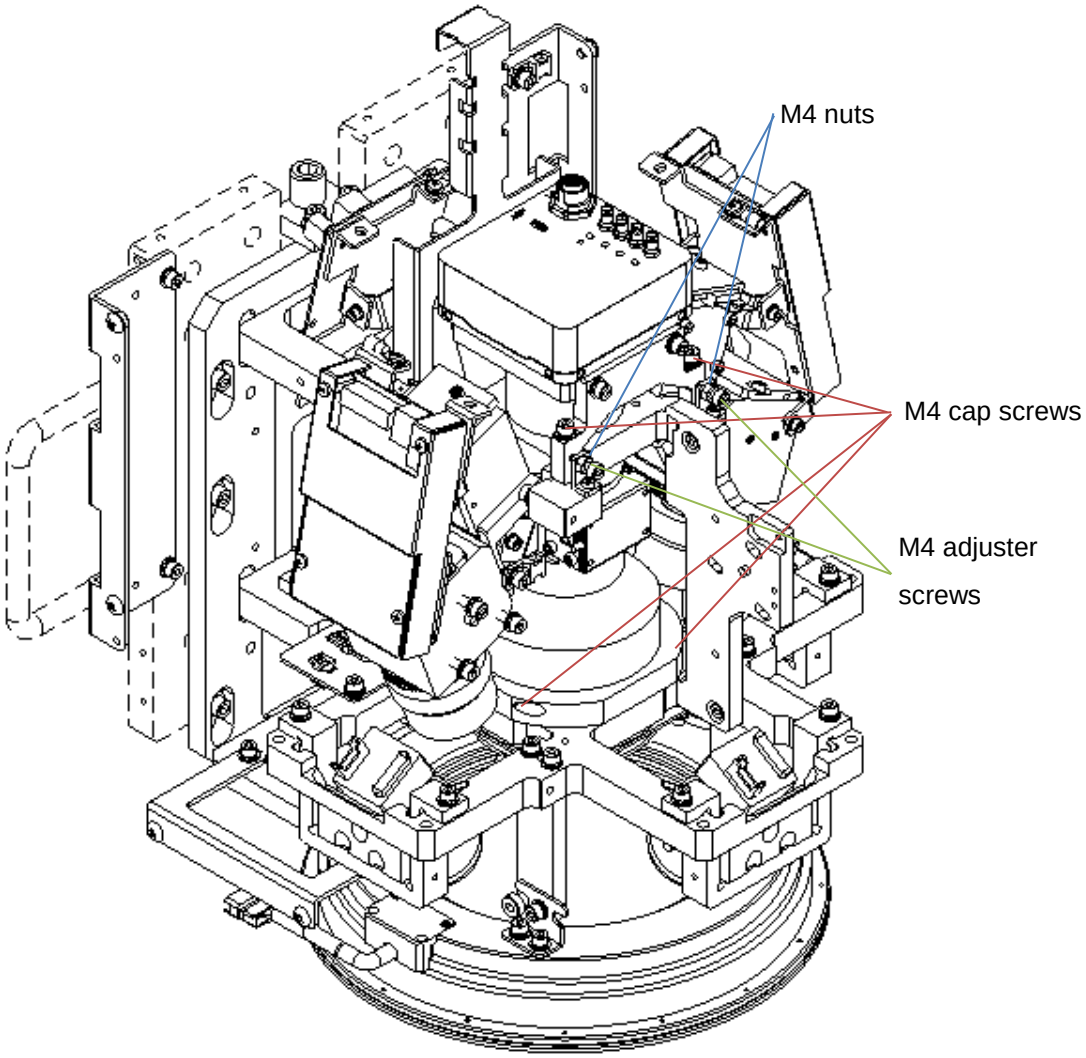


Figure : Camera rotation 5

4.6 Projector angle

[Purpose]
This section describes how to check the projector angle is within tolerance or not and adjust it mechanically.

Step1. Open the calibration unit cover and click **Projector angle**.

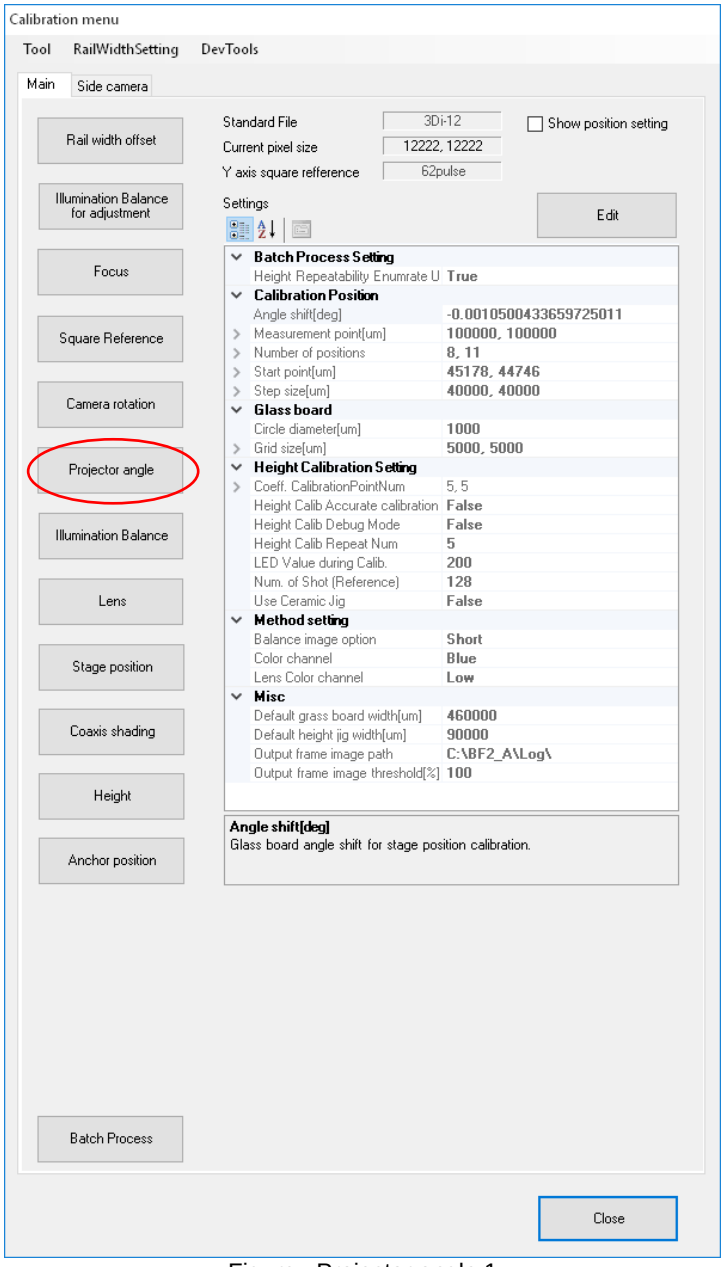


Figure : Projector angle 1

Step2. The dialog shown below appears. Click **OK**.

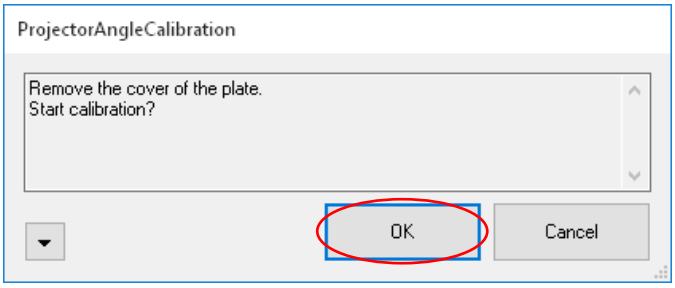


Figure : Projector angle 2

Step3. The dialog shown below appears. Click **OK**.

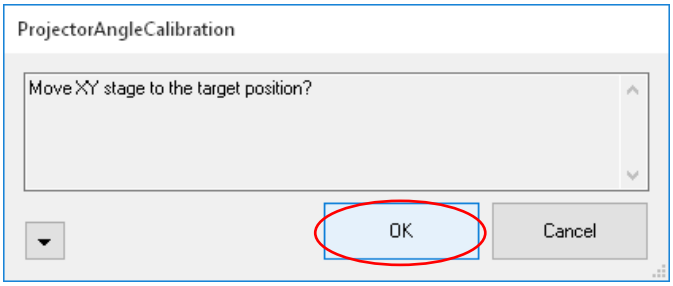


Figure : Projector angle 3

Step4. The dialog shown below appears. Click **Update**.

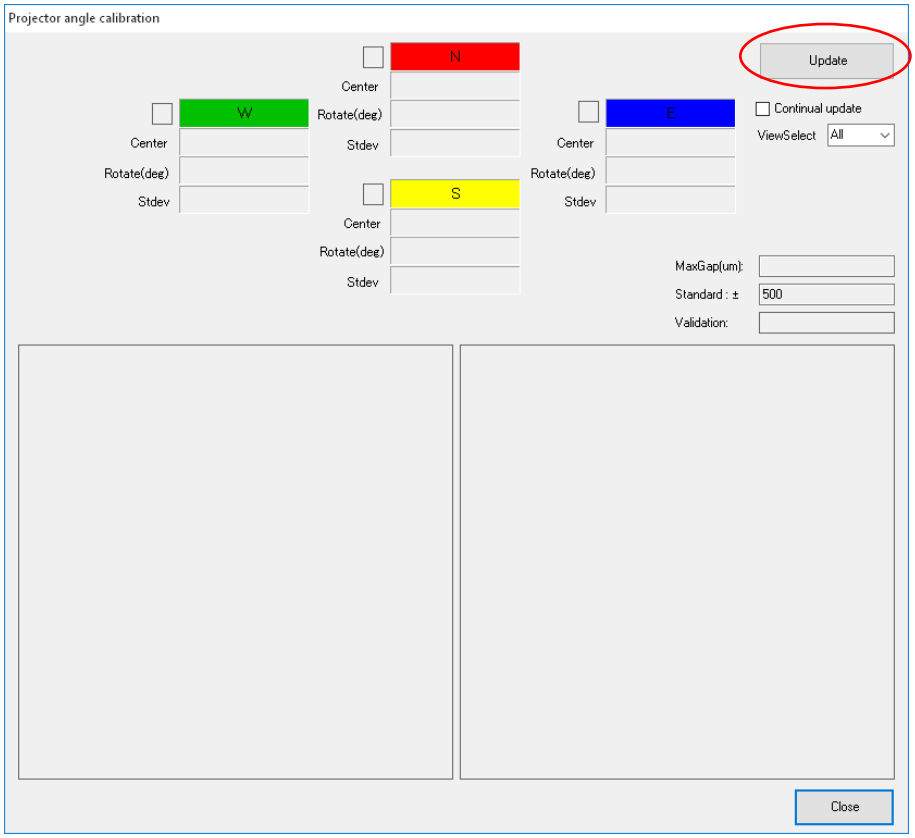


Figure : Projector angle 4

Step5. Check center position of all projector are within standard and Validation is **GREEN**, click **Close**.
If not, adjust it mechanically.

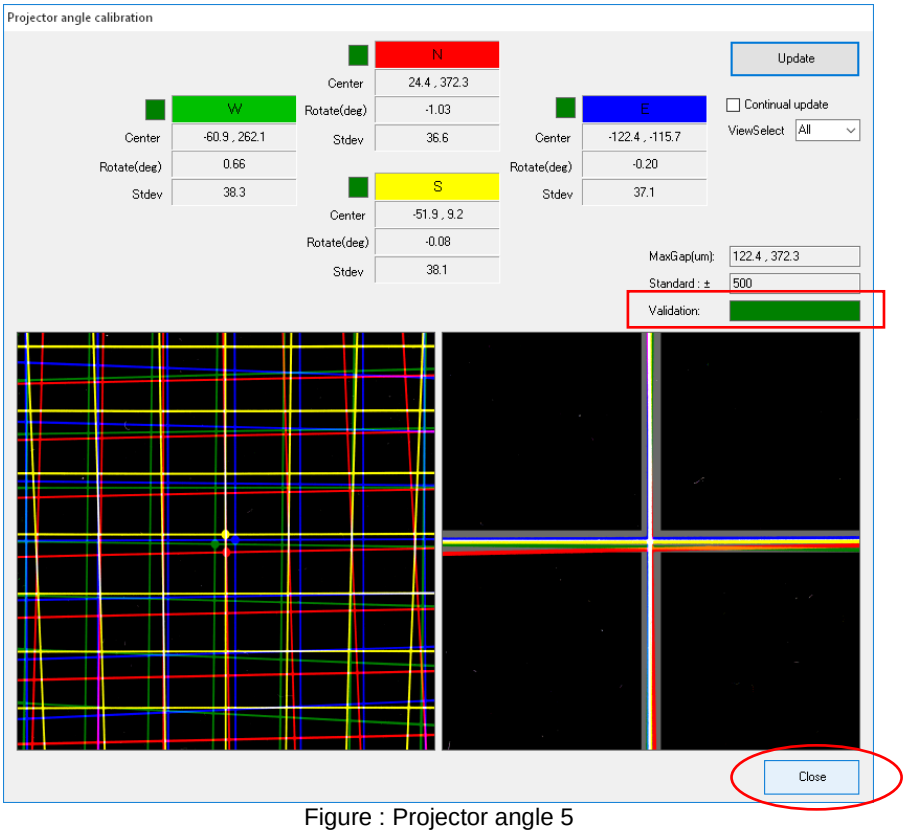


Figure : Projector angle 5

Step6. Select the direction of projector you want to adjust angle. Check **Continual update**.

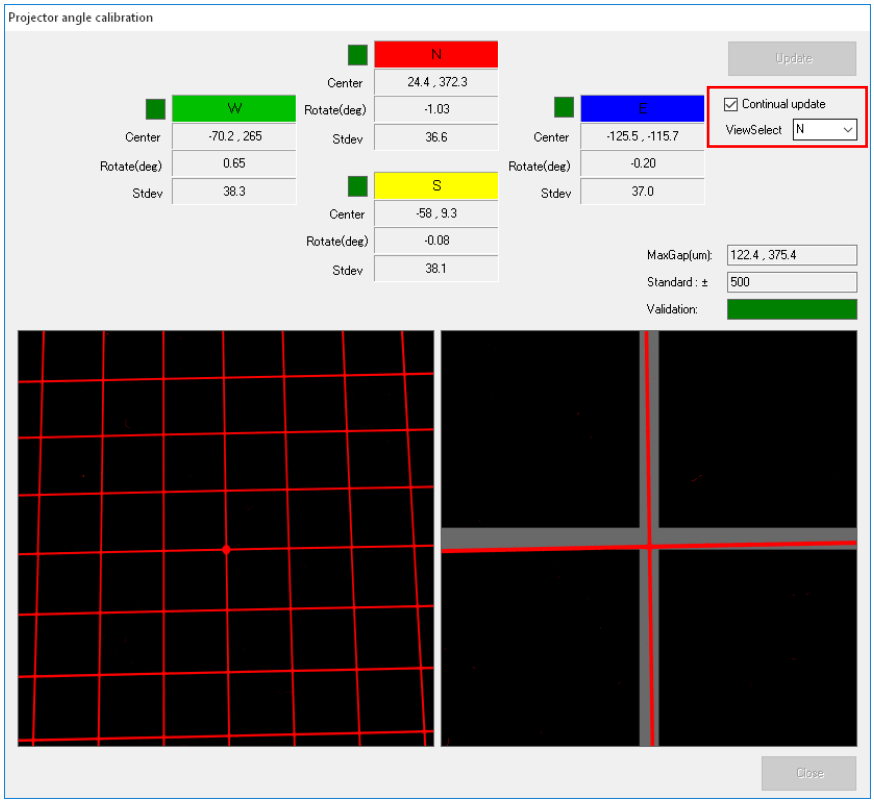


Figure : Projector angle 6

Step7. Loosen 3 M4 cap screws, you can adjust projector angle forward and backward direction.
After adjustment, fix 3 M4 cap screws.

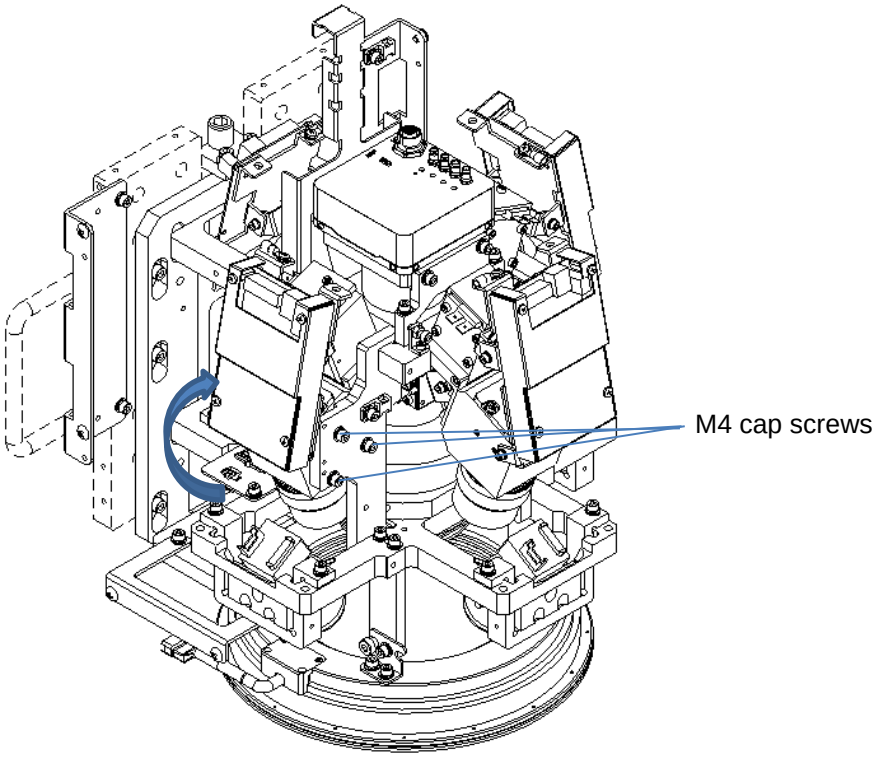


Figure : Projector angle 7

Step8. Loosen 2 M3 cap screws, you can adjust projector angle left and right direction.
After adjustment, fix 2 M3 cap screws.

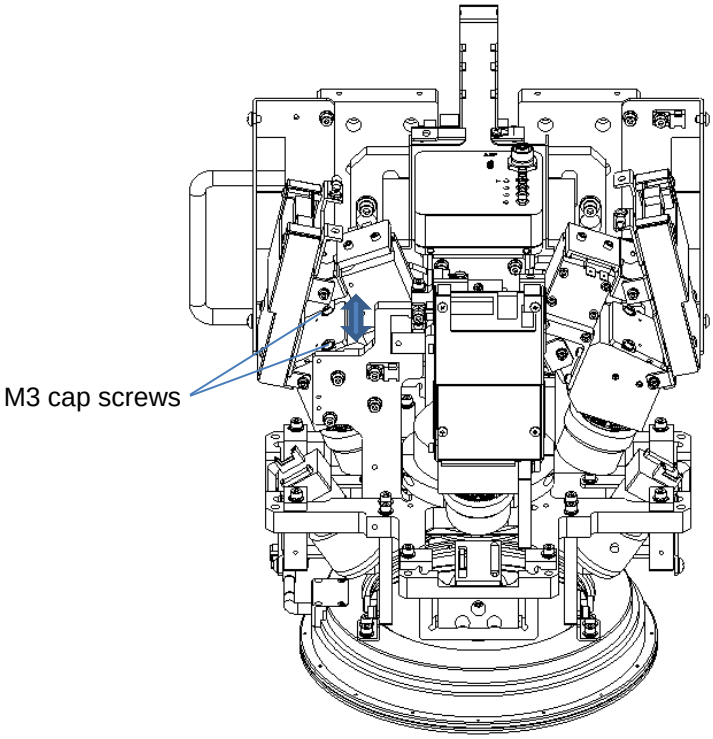


Figure : Projector angle 8

Step9. After adjustment NSEW direction and Validation is **GREEN**, click **Close**.

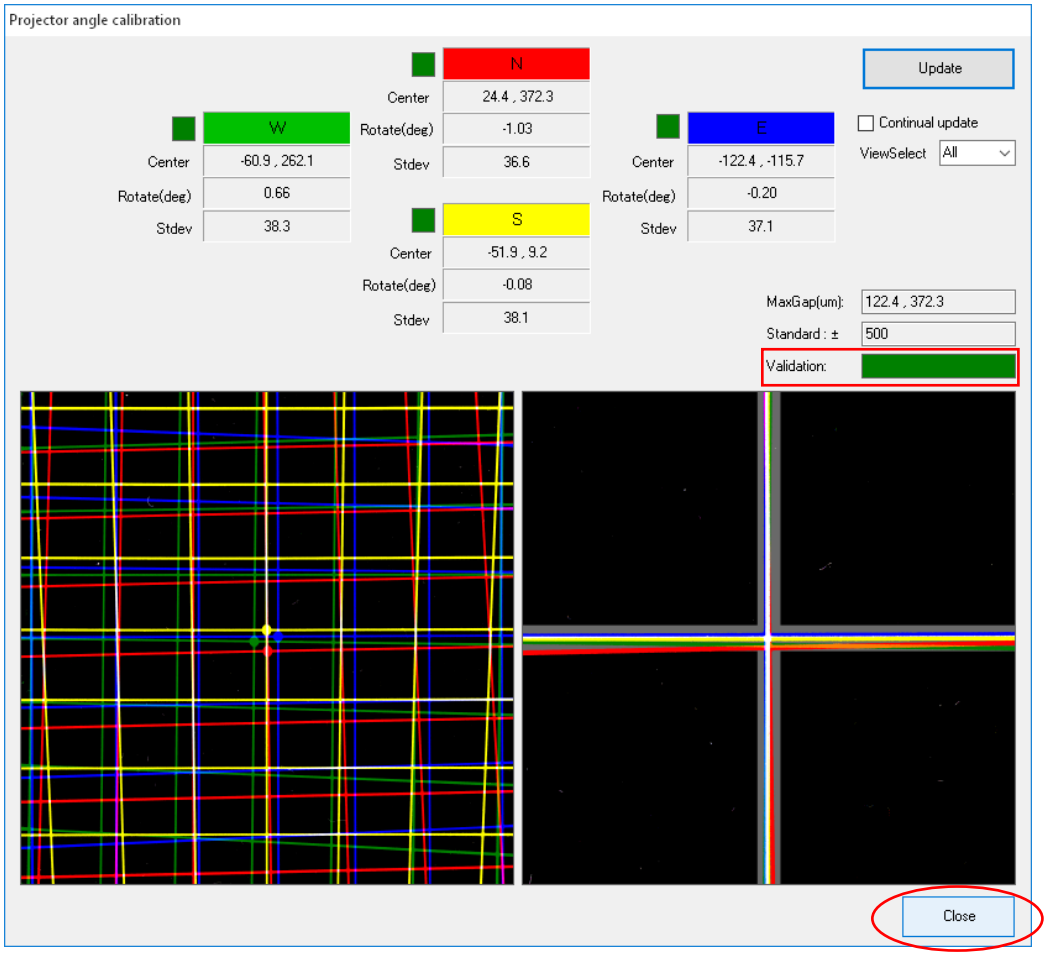


Figure : Projector angle 9

4.7 Lens

[Purpose]
This section describes how to adjust Lens distortion.

Step1. Adjust conveyor width according to Section 4.1.
Set a glass board on the machine conveyor.

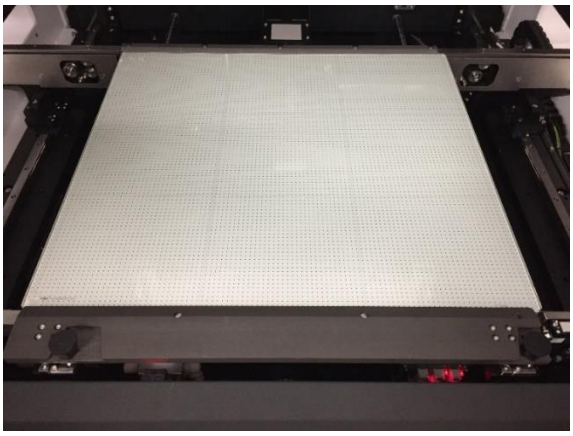


Figure: Lens distortion 1

Step2. Click **Lens** from Calibration menu.

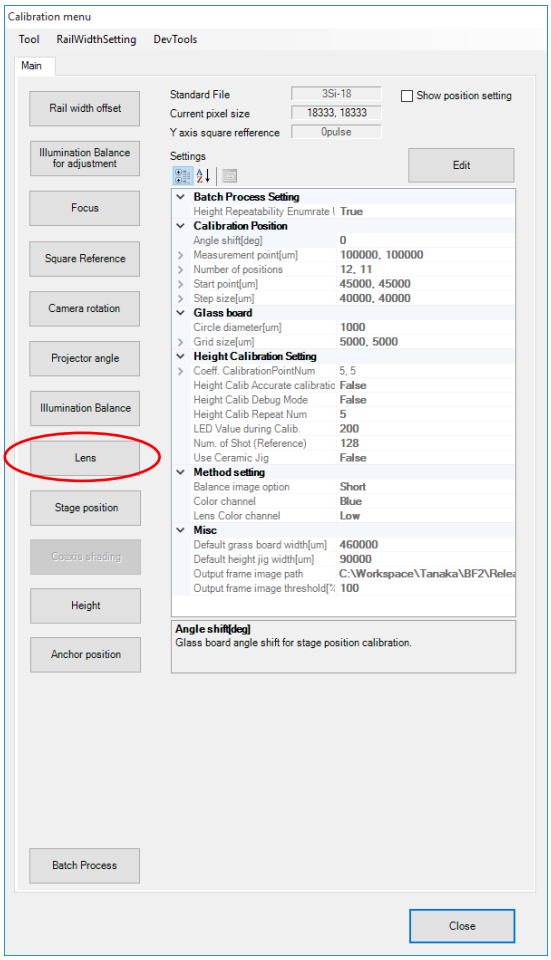


Figure: Lens distortion 2

Step3. The dialog shown below appears. Click **Yes**.

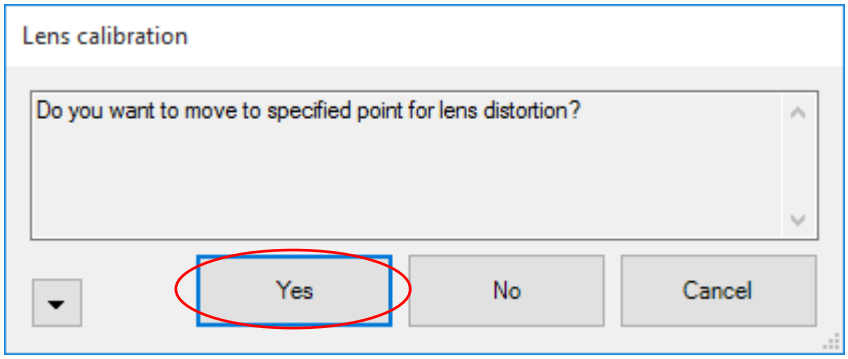


Figure: Lens distortion 3

Step4. The dialog shown below appears. Click **Check**.

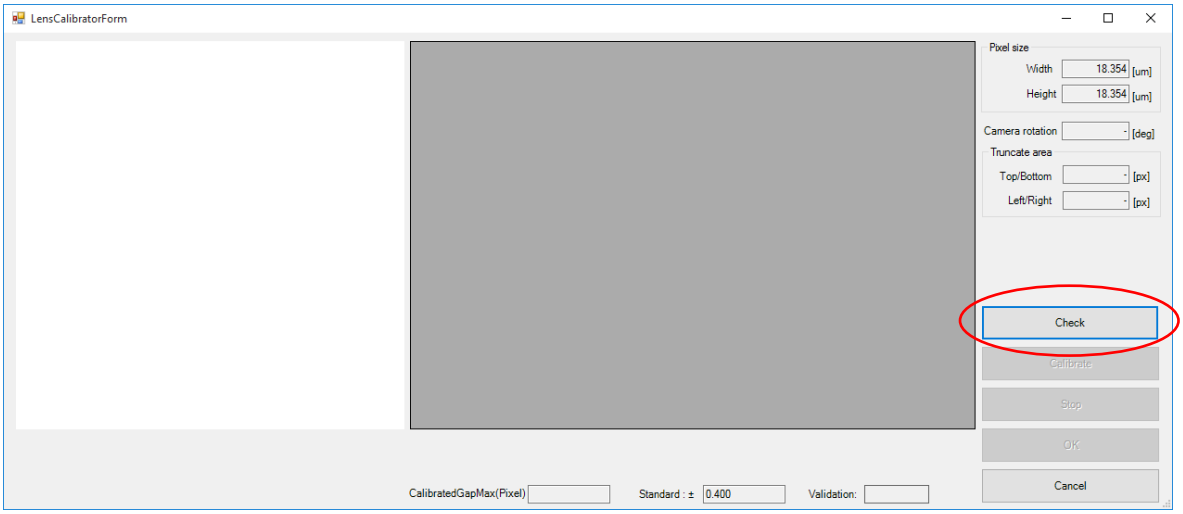


Figure: Lens distortion 4

Step5. When the validation is not green color, the result is bad. Click **Calibrate**.

NOTE When the validation is green color, the result is good. Click **Cancel**.

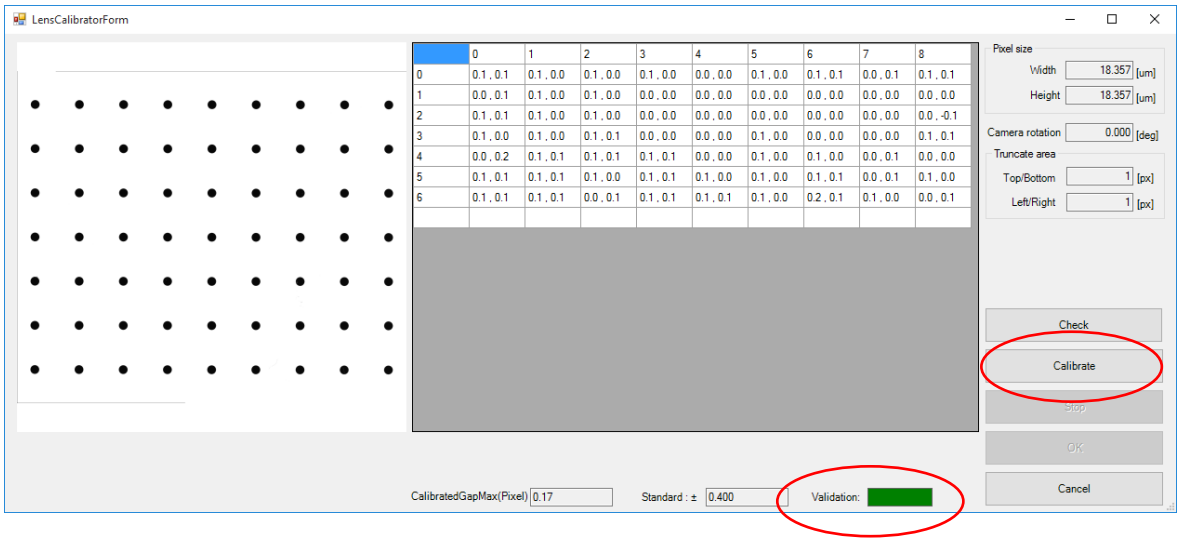


Figure: Lens distortion 5

Step6. When the validation is green color, the result is good. Click **OK**.

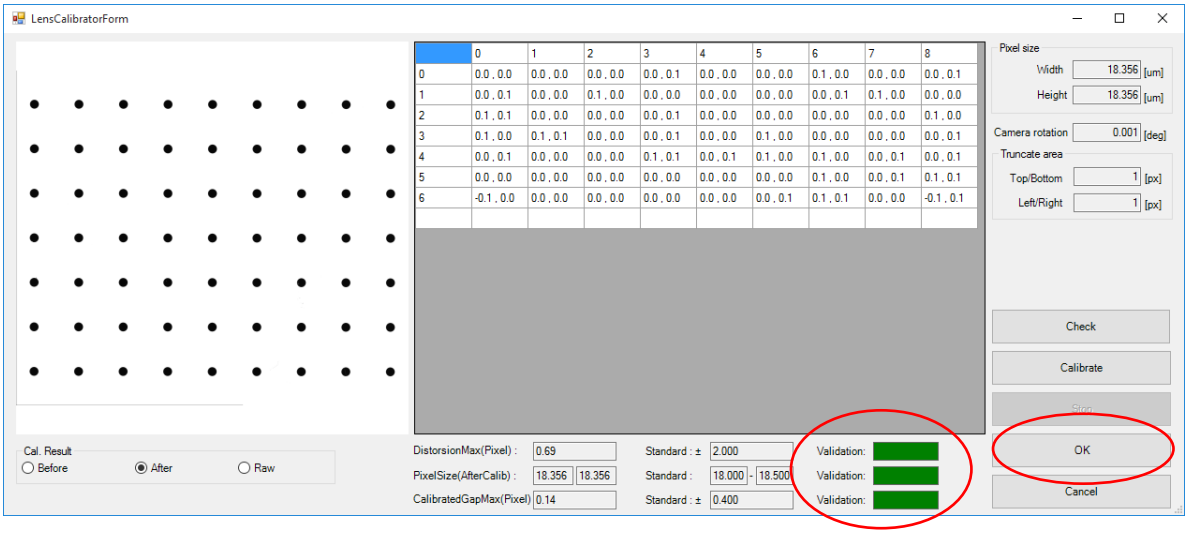


Figure: Lens distortion 6

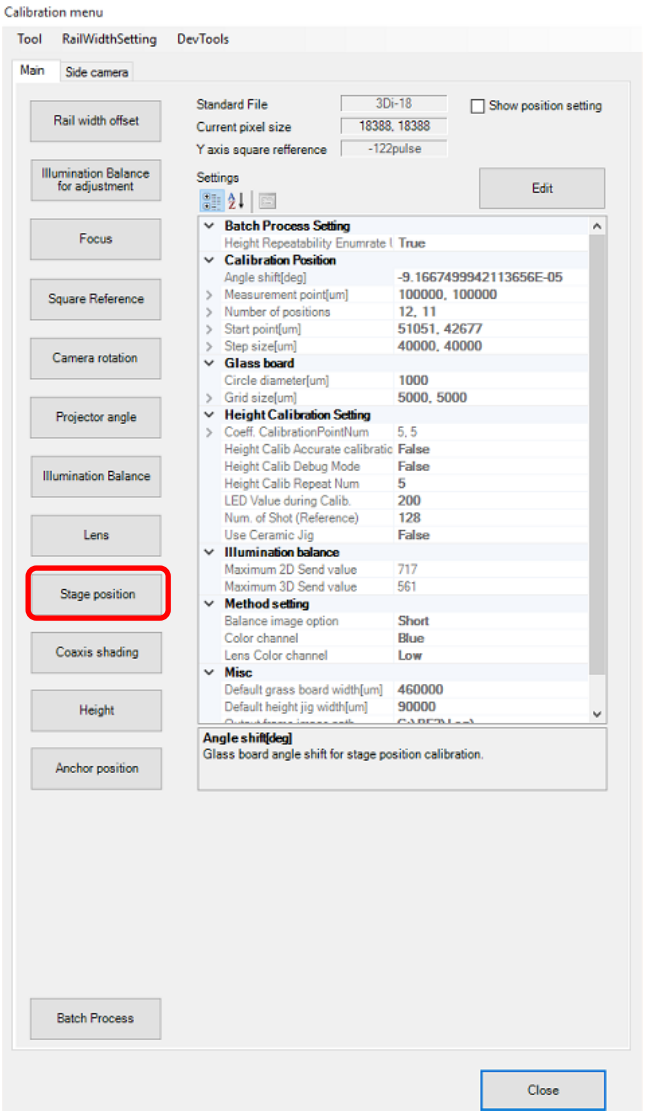
Item	Description
Cal.Result	**Before** means the result before calibration. **After** means the result after calibration. **Raw** means the lens distortion value
DistortionMax(Pixel)	This indicates the maximum value of lens distortion given from raw data.
PixelSize(AfterCalib)	This indicates the measurement value of pixel size
CalibratedGapMax(Pixel)	This indicates the difference between the maximum and minimum values from the calibration data.

4.8 Stage position

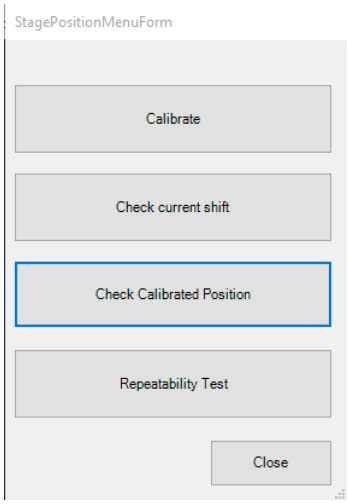
[Purpose]
To correct hardware distortions of the gantry with the software and form an X-Y coordinate with no distortions. (The hardware already has a high-accuracy and high-rigidity mechanism primarily through the high-accuracy linear scale, control of both axes for the Y-axis and Square Reference adjustment, however, the software corrects micro-level distortions to further improve the accuracy.)

Step1 Start the adjustment with the L-size glass board set following the Lens adjustment.

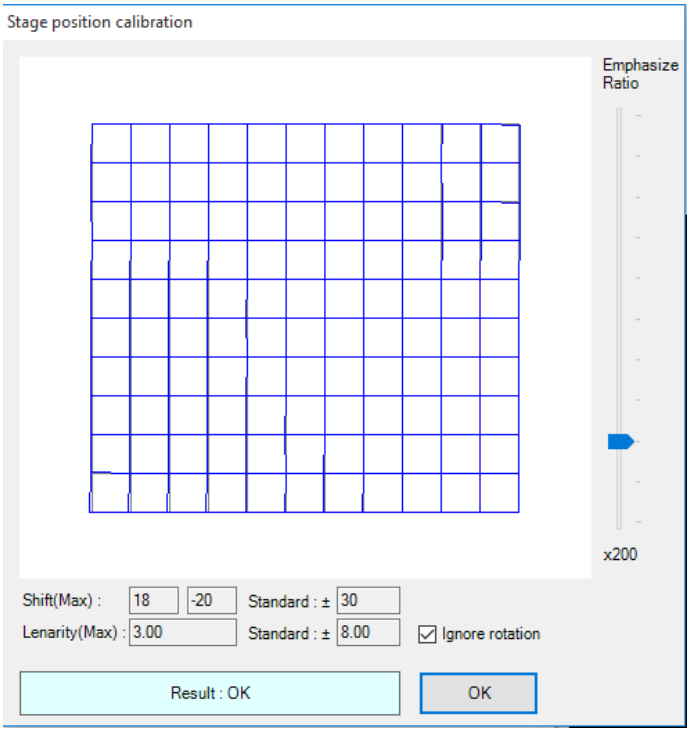
Step2 Select Stage position from the calibration menu.



Step3 Click Check Calibrated Position from StagePositionMenuForm.
Check the accuracy of the coordinate data with the current correction values.



Step4 When Check Calibrated Position is completed, the result is shown as below.



Shift(MAX)

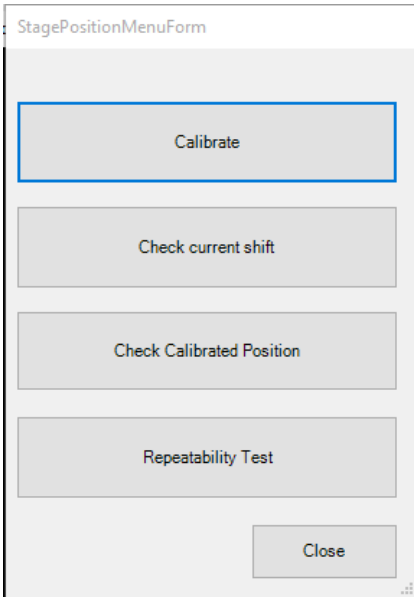
- Shows X and Y values that have maximum differences between the machine coordinate and glass board coordinate in various correction points. The standard value is 30 μ or lower here because of the difference values based on the correction values.

Lenarity(MAX)

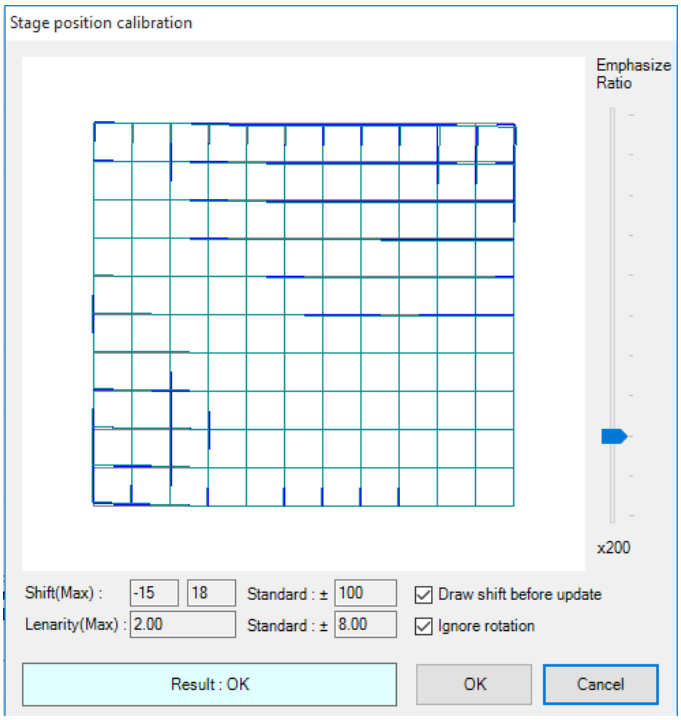
- Extracts differences between the machine coordinate and glass board coordinate of neighboring correction points, and shows the maximum value of the X and Y values. The standard value is 8 μ or lower.

Ignore rotation You can choose to display a coordinate drawing with tilts when the glass board is set, or display it with the tilts corrected. Even if the glass board is set with it tilting, this model automatically calculates the angle of the tilt and sets various correction point coordinates. Selecting this check box does not change internal coordinates and correction values.

Step5 If Result is "NG" for Check Calibrated Position, click Calibrate from StagePositionMenuForm. This captures the glass board and calculates new correction values. If Result is "OK", skip this step and move on to STEP7.



Step6 When Calibrate is completed, the result is shown as below.



Shift(MAX)

- Shows X and Y values that have maximum differences between the machine coordinate and glass board coordinate in various correction points. The standard value is 100 μ or lower here because of the difference values that are not corrected.

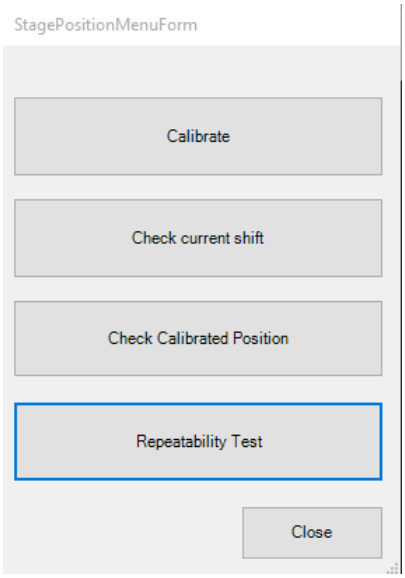
Lenarity(MAX)

- Extracts differences between the machine coordinate and glass board coordinate of neighboring correction points, and shows the maximum value of the X and Y values. The standard value is 8 μ or lower.

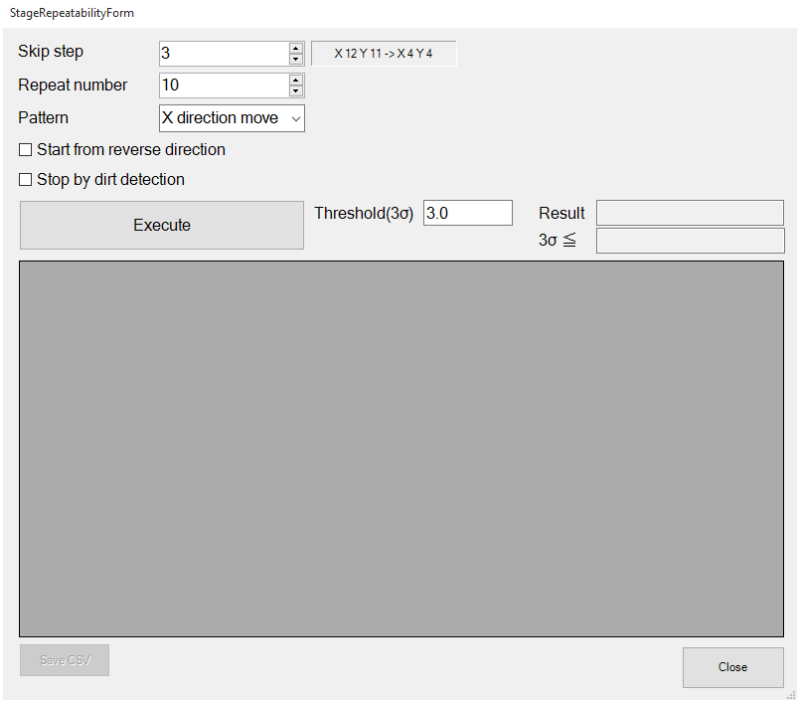
Click the OK button to register the new correction position. Click the Cancel button to restore the values to the previous ones.

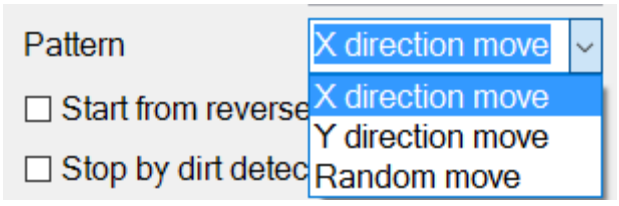
Draw shift before update This screen shows the machine coordinate before the correction. Selecting this check box simultaneously draws the machine coordinate obtained when it was corrected before and the one obtained this time and enables you to compare the coordinates.

Step7 Click Repeatability Test from StagePositionMenuForm.



Step8 Click Execute from StageRepeatabilityForm.



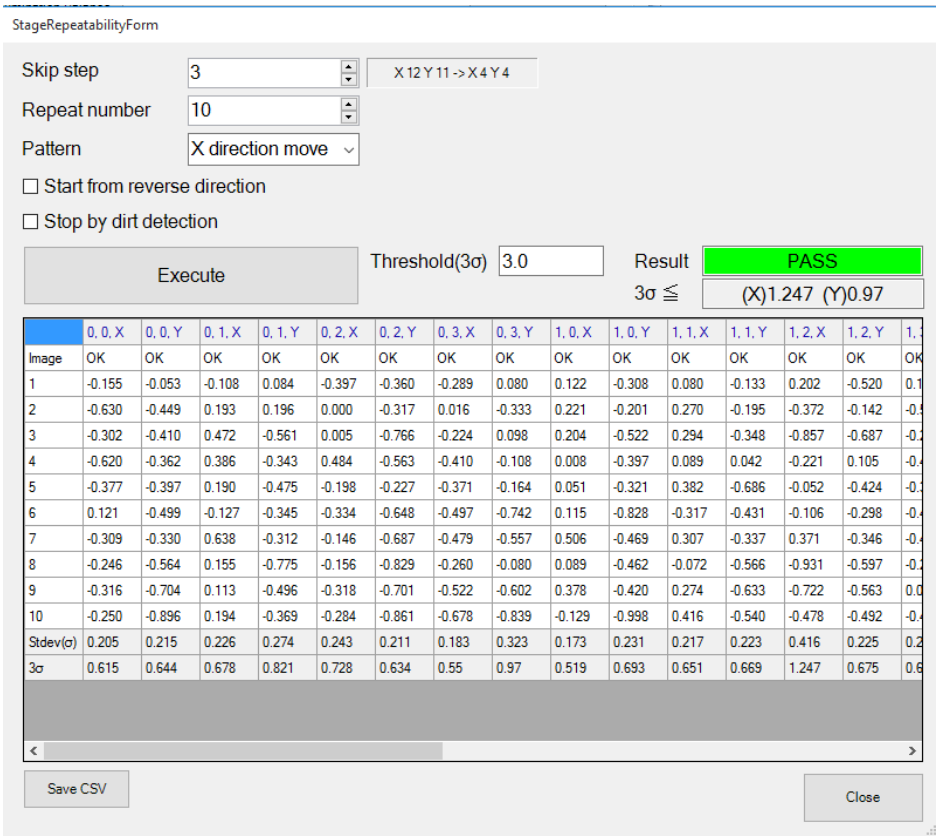


X direction move measures with the X direction a main axis.

Y direction move measures with the Y direction a main axis.

Since the main axis of this machine is the X-axis, select X direction move to measure.

Step9 When Repeatability Test is completed, the result is shown as below.



	0, 0, X	0, 0, Y	0, 1, X	0, 1, Y	0, 2, X	0, 2, Y	0, 3, X	0, 3, Y	1, 0, X	1, 0, Y	1, 1, X	1, 1, Y	1, 2, X	1, 2, Y	1,
Image	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
1	-0.155	-0.053	-0.108	0.084	-0.397	-0.360	-0.289	0.080	0.122	-0.308	0.080	-0.133	0.202	-0.520	0.1
2	-0.630	-0.449	0.193	0.196	0.000	-0.317	0.016	-0.333	0.221	-0.201	0.270	-0.195	-0.372	-0.142	-0.
3	-0.302	-0.410	0.472	-0.561	0.005	-0.766	-0.224	0.098	0.204	-0.522	0.294	-0.348	-0.857	-0.687	-0.
4	-0.620	-0.362	0.386	-0.343	0.484	-0.563	-0.410	-0.108	0.008	-0.397	0.089	0.042	-0.221	0.105	-0.
5	-0.377	-0.397	0.190	-0.475	-0.198	-0.227	-0.371	-0.164	0.051	-0.321	0.382	-0.686	-0.052	-0.424	-0.
6	0.121	-0.499	-0.127	-0.345	-0.334	-0.648	-0.497	-0.742	0.115	-0.828	-0.317	-0.431	-0.106	-0.298	-0.
7	-0.309	-0.330	0.638	-0.312	-0.146	-0.687	-0.479	-0.557	0.506	-0.469	0.307	-0.337	0.371	-0.346	-0.
8	-0.246	-0.564	0.155	-0.775	-0.156	-0.829	-0.260	-0.080	0.089	-0.462	-0.072	-0.566	-0.931	-0.597	-0.
9	-0.316	-0.704	0.113	-0.496	-0.318	-0.701	-0.522	-0.602	0.378	-0.420	0.274	-0.633	-0.722	-0.563	0.0
10	-0.250	-0.896	0.194	-0.369	-0.284	-0.861	-0.678	-0.839	-0.129	-0.998	0.416	-0.540	-0.478	-0.492	-0.
Stdev(σ)	0.205	0.215	0.226	0.274	0.243	0.211	0.183	0.323	0.173	0.231	0.217	0.223	0.416	0.225	0.2
3σ	0.615	0.644	0.678	0.821	0.728	0.634	0.55	0.97	0.519	0.693	0.651	0.669	1.247	0.675	0.6

Confirm that Result is "PASS". The standard value is 3σ ≤ 3μ.
If Result is "NG", confirm that the machine is made level and the fixing screws of the camera head are not loosened.

4.9 Coaxis shading

[Purpose]
This section describes how to calibrate the Coaxis shading. If you calibrated the **Illumination Balance** before, you have to calibrate it.

Step1. Open the calibration unit cover and click **Coaxis Shading**.

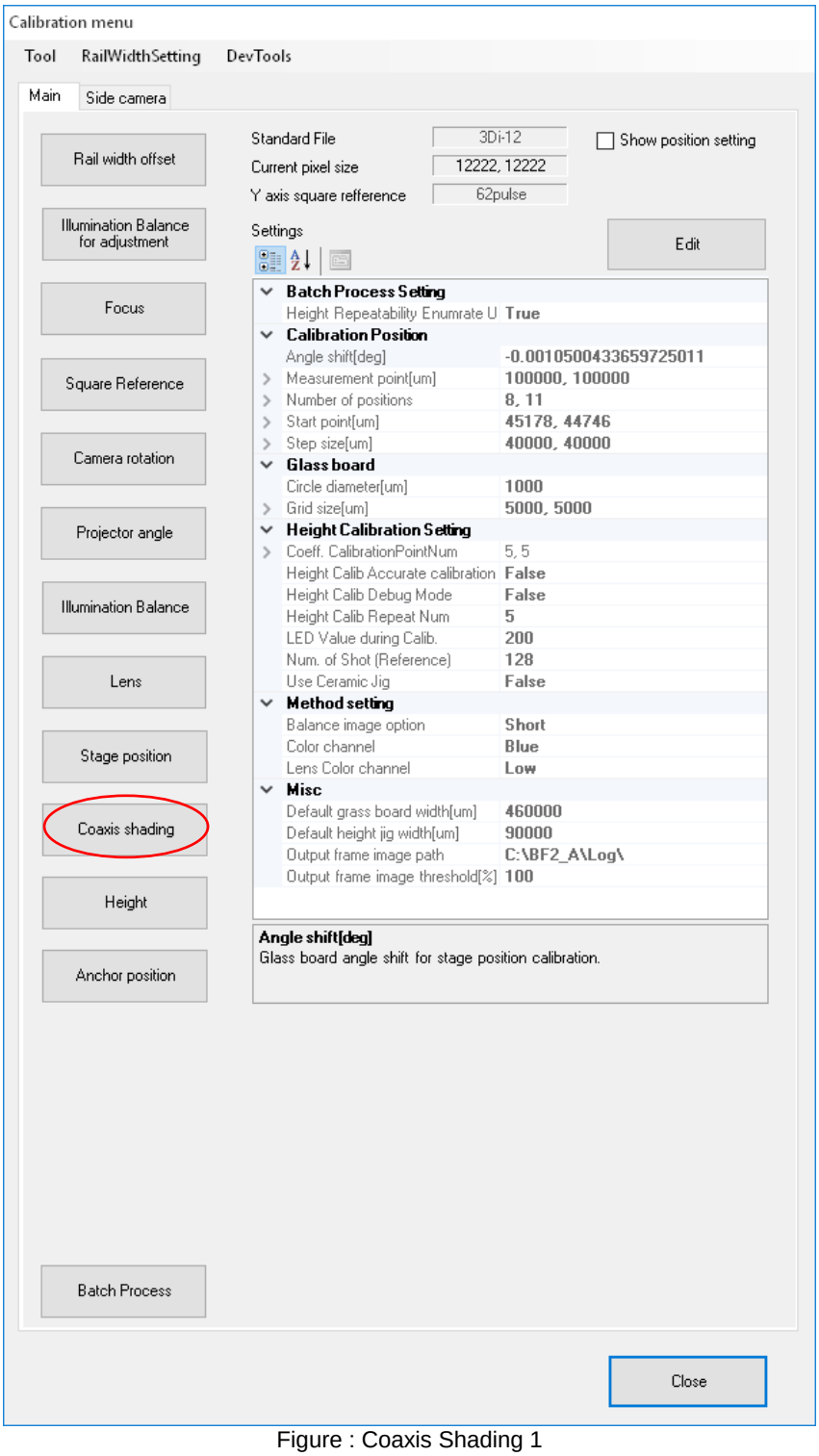


Figure : Coaxis Shading 1

Step2. The dialog shown below appears. Click **OK.**

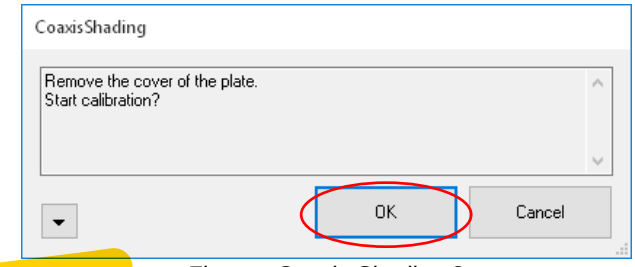
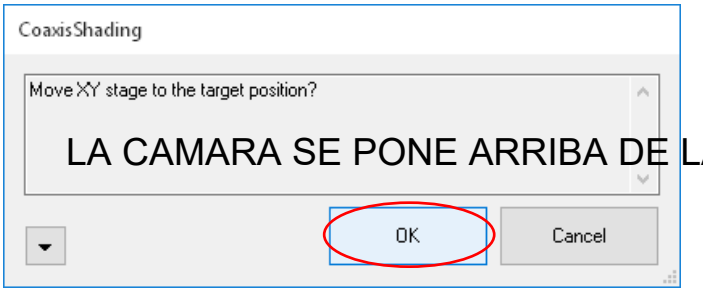


Figure : Coaxis Shading 2

Step3. The dialog shown below appears. Click **OK.**



LA CAMARA SE PONE ARRIBA DE LA TAPA NEGRA

Figure : Coaxis Shading 3

Step4. The dialog shown below appears. Click **Calibrate**

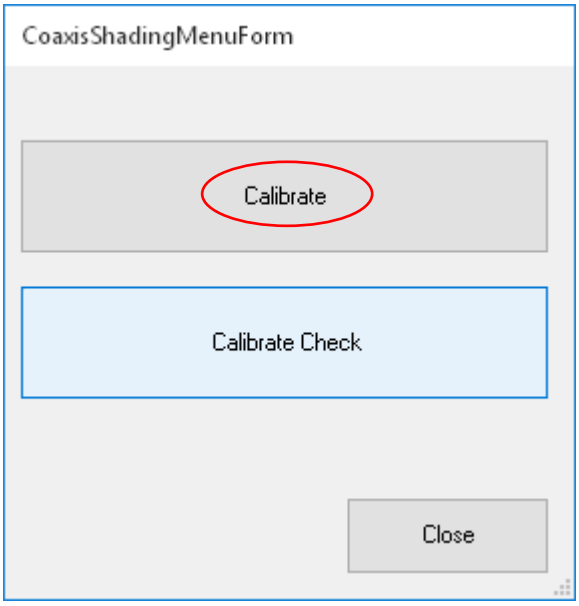


Figure : Coaxis Shading 4

Step5. The dialog shown below appears. Click **Reset Correction** and **Recalc Correction**. Click **OK.**

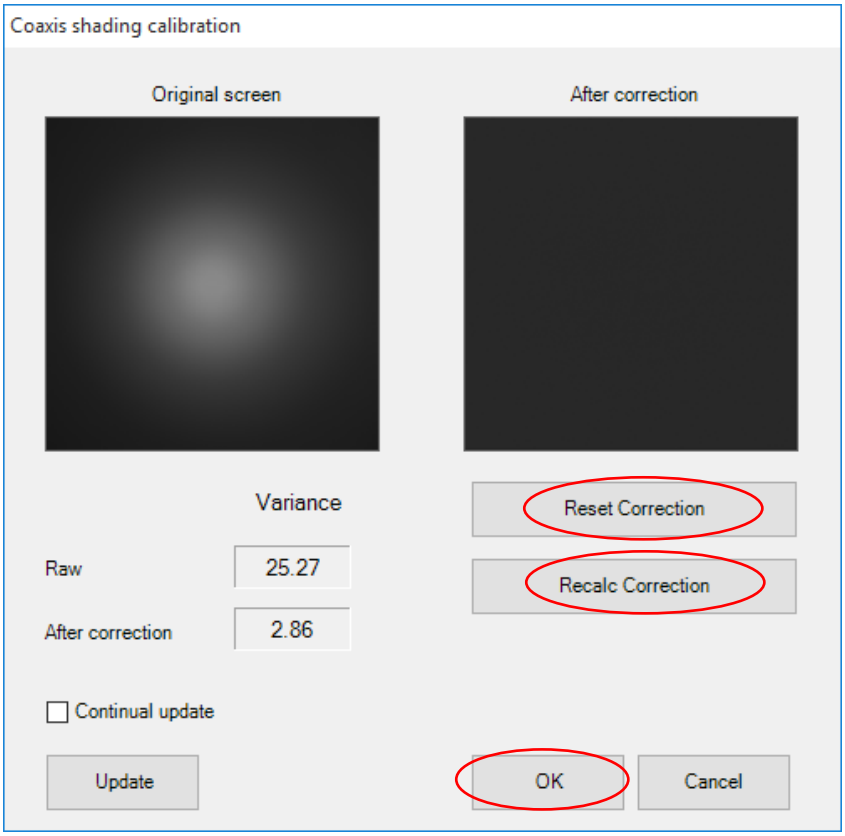


Figure : Coaxis Shading 5

Step6. The dialog shown below appears. Click **Calibrate Check.**

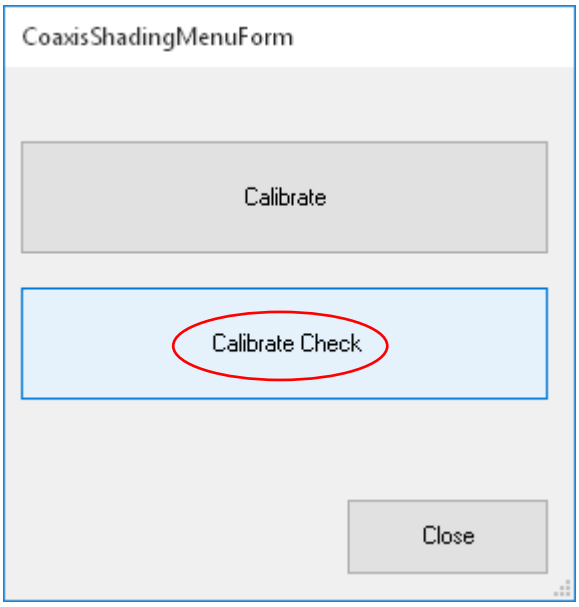


Figure : Coaxis Shading 6

Step7. The dialog shown below appears. Click **Check.**

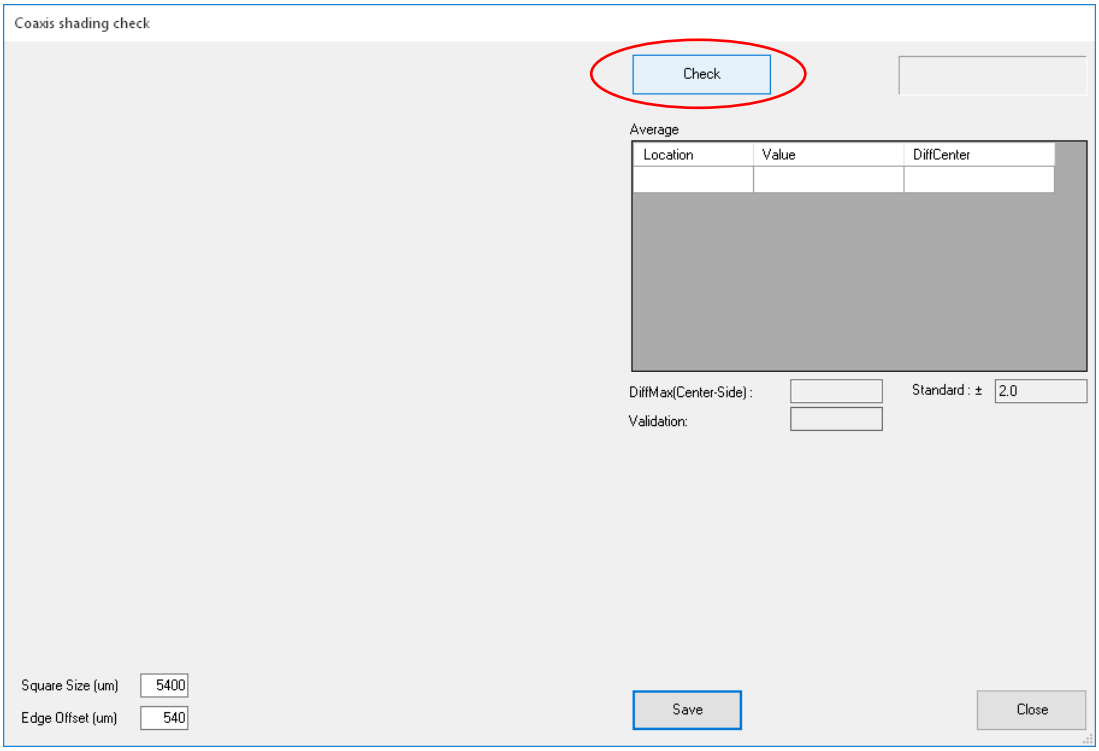


Figure : Coaxis Shading 7

Step8. Check the Validation is **GREEN**. Click **Close**.

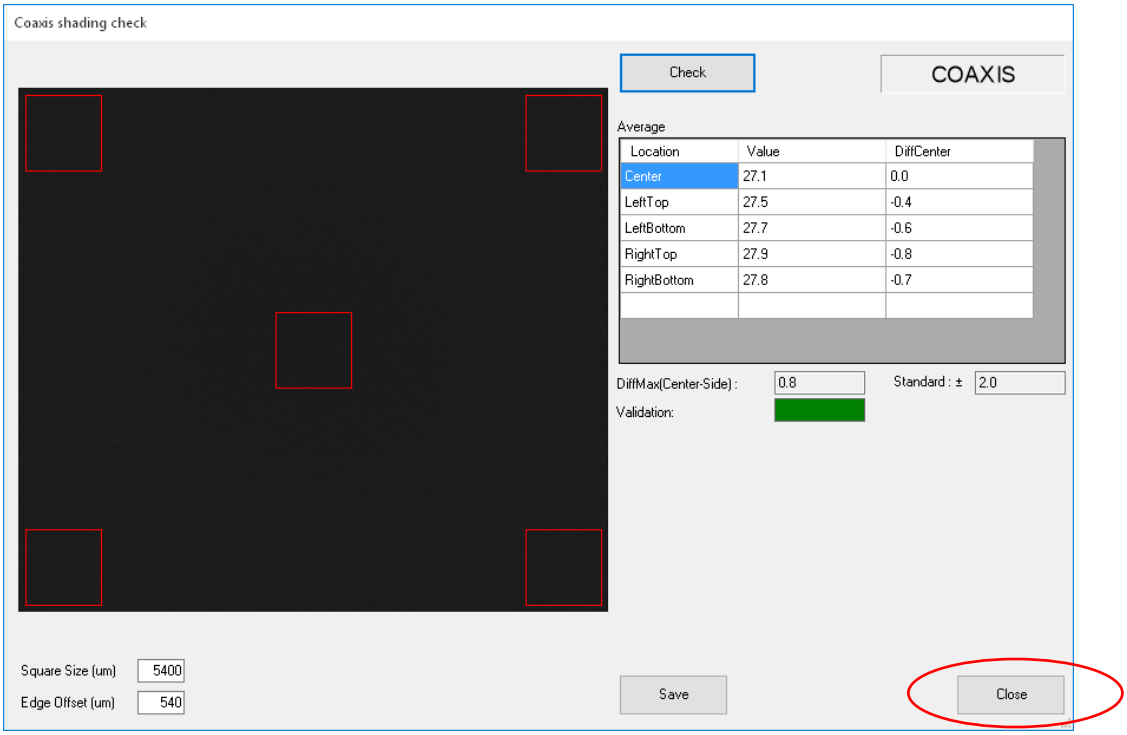


Figure : Coaxis Shading 8

4.10 Height

[Purpose]
This section describes how to adjust the height calibration.

Step1. Set height calibration jig at the center of conveyor.

CAUTION If it is dirty on the reference area, soak a dry and soft nonwoven fabric or lint-free wiper in absolute ethanol or IPA (Isopropyl Alcohol) and wipe them out.

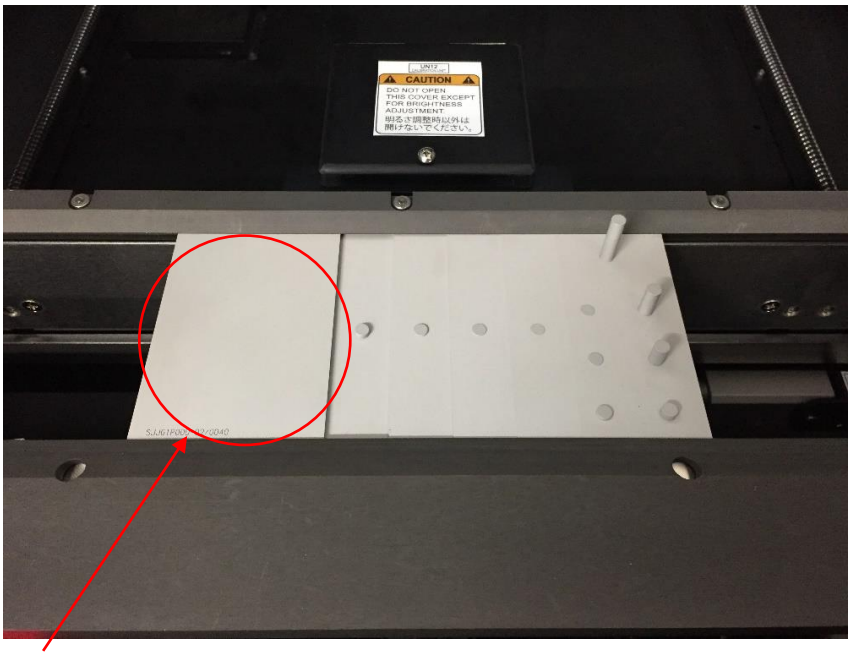


Figure: Height calibration jig

Step2. Click **Height** from the calibration menu. Left side image is A lane, and right side image is B lane.

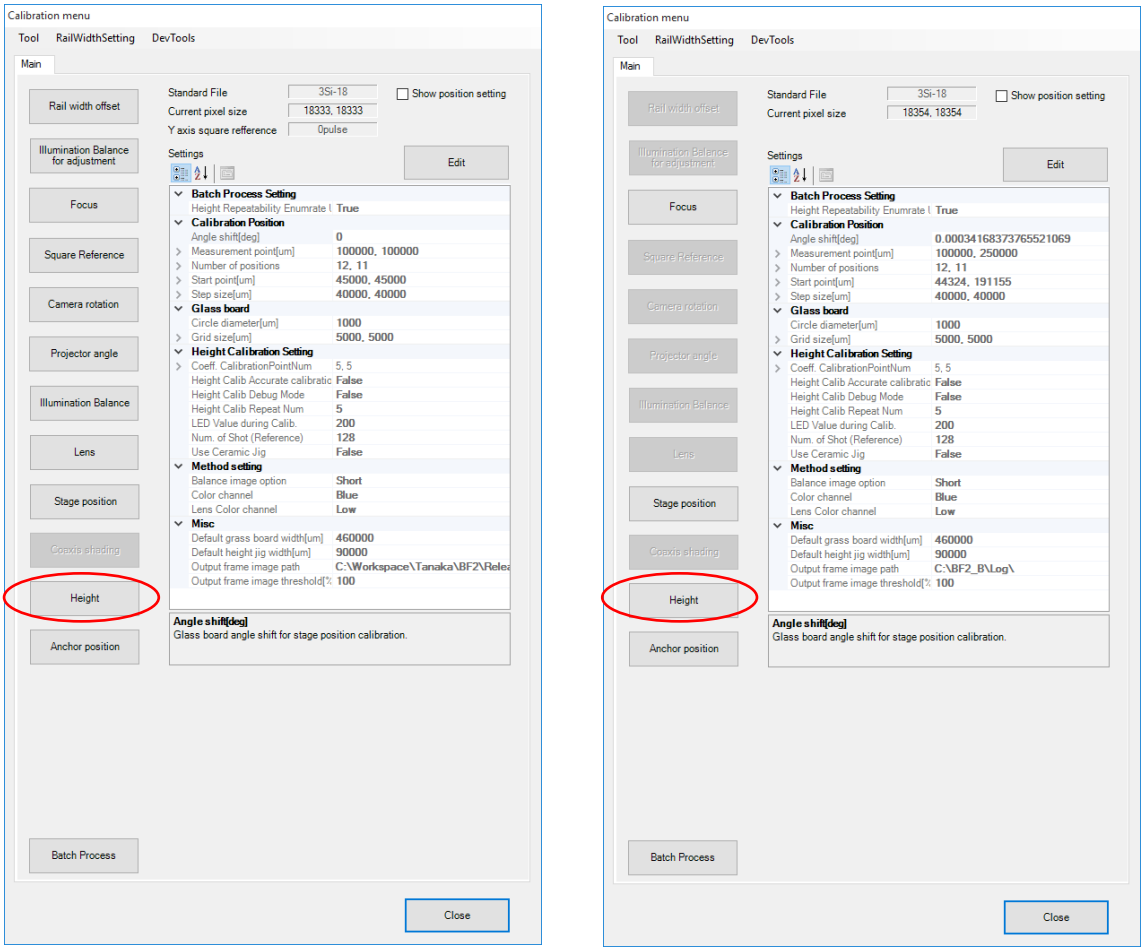
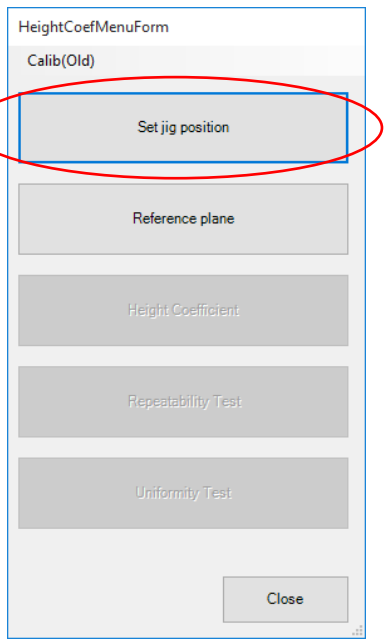


Figure: Calibration menu 1

Step3. The dialog shown below appears. Click **Set jig position** from the calibration menu.

A Lane



B Lane

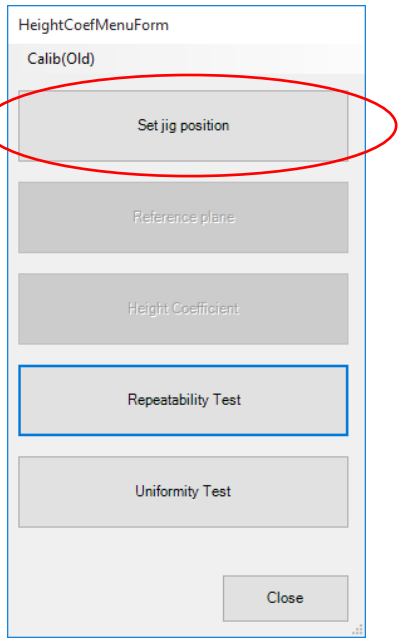


Figure: Calibration menu 2

Step4. The dialog shown below appears. Click **Load**.

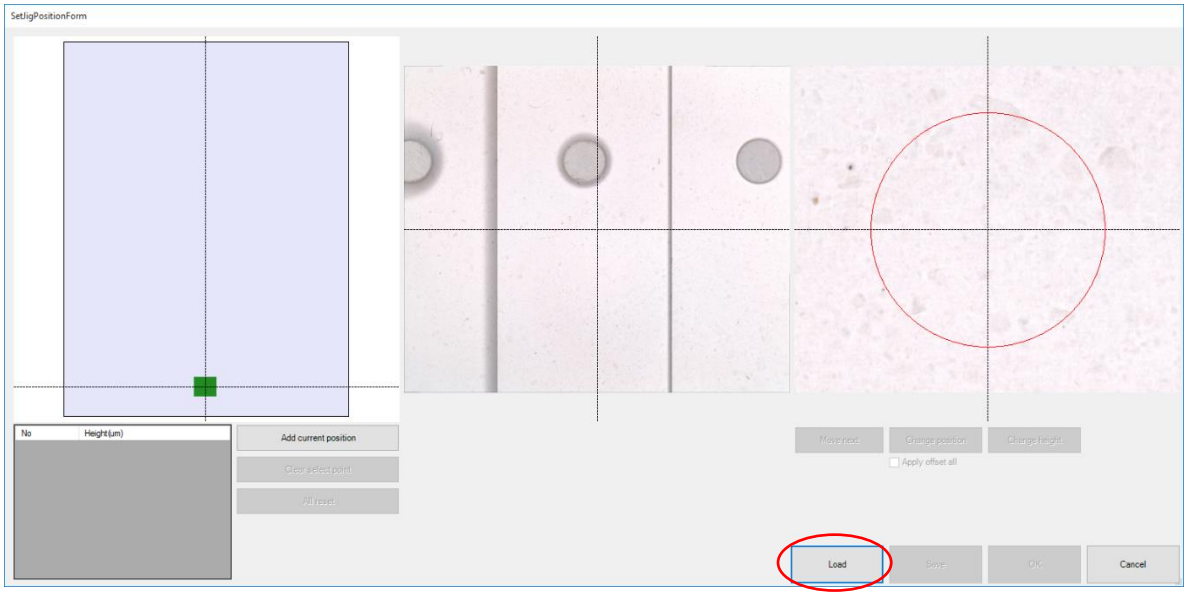


Figure: Set jig position 1

Step5. The dialog shown below appears.
In the case of 3Di-xx2, select **DefaultHeightJigSetting_3Di.txt** and click **OK**.
Jig data is -2000µm, -800µm, -100µm, 100µm, 800µm and 8,000µm.
In the case of 3Si-xx2, select **DefaultHeightJigSetting_3Si.txt** and click **OK**.
Jig data is -2000µm, -800µm, -100µm, 100µm, 800µm and 2,500µm.

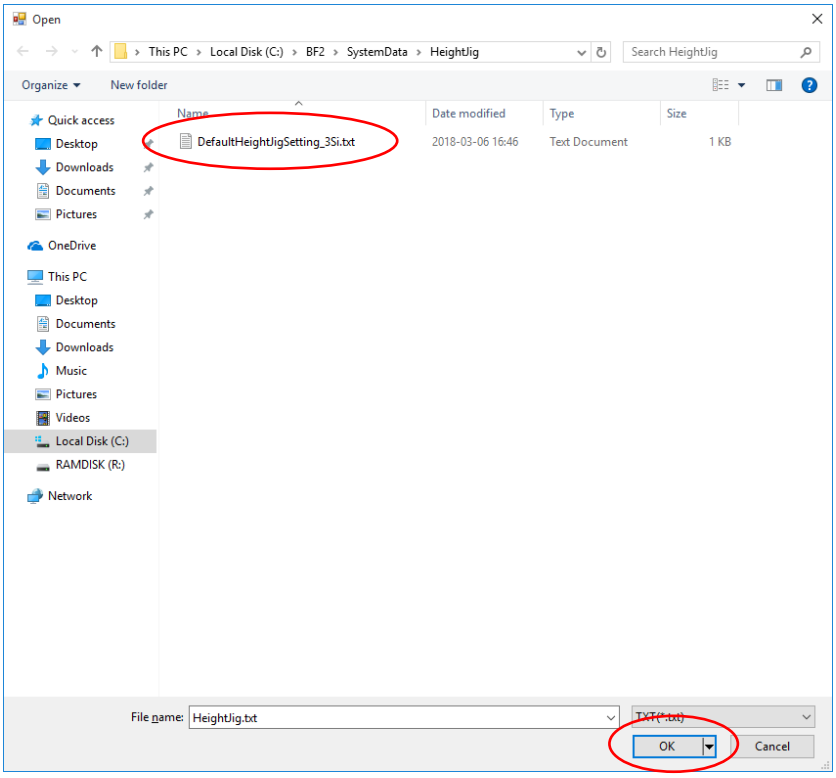


Figure: Set jig position 2

Step6. The jig data is output from **DefaultHeightJigSetting_3Di.txt** or **DefaultHeightJigSetting_3Si.txt**.

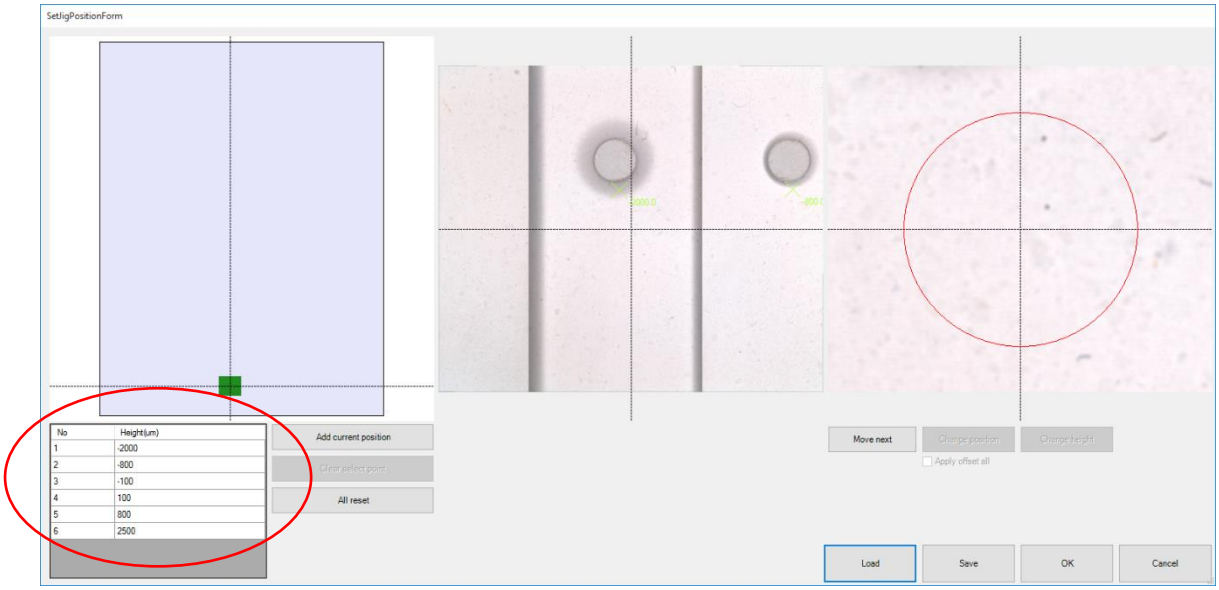


Figure: Set jig position 3

Step7. Check the position and measurement value of height block from inspection sheet for jig.
Set the value from the block height -2,000µm in order.

Part number : SJJG1P000-02
Part name : HEIGHT MEASUREMENT ASS'Y
Shipping date: 2016/7/5
Lot number: 0001

	No	Standard value [mm]	Measured value [mm]
Height	1	-2.0 ± 0.03	-2.003
Height	2	-0.8 ± 0.03	-0.801
Height	3	-0.3 ± 0.03	-0.296
Height	4	-0.1 ± 0.03	-0.096
Height	5	0.1 ± 0.03	0.094
Height	6	0.3 ± 0.03	0.292
Height	7	0.8 ± 0.03	0.792
Height	8	2.5 ± 0.03	2.497
Height	9	8.0 ± 0.03	7.994
Height	10	12 ± 0.03	11.992
Height	11	20 ± 0.03	19.997

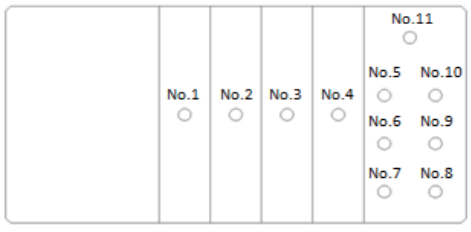


Figure: Set jig position 4

Step8. Click the center of block height -2,000µm. The FOV moves to the clicked position.

CAUTION Set the block area within the red line area.

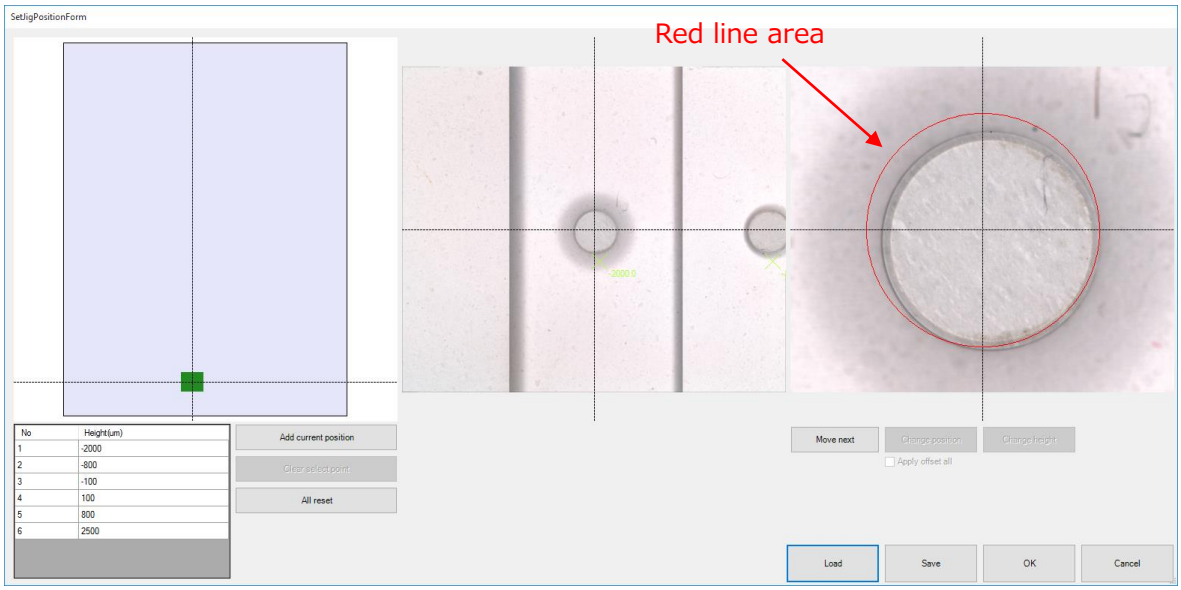


Figure: Set jig position 5

Step9. Select -2000um from the list. Check **Apply offset all** check box and click **Change position**.

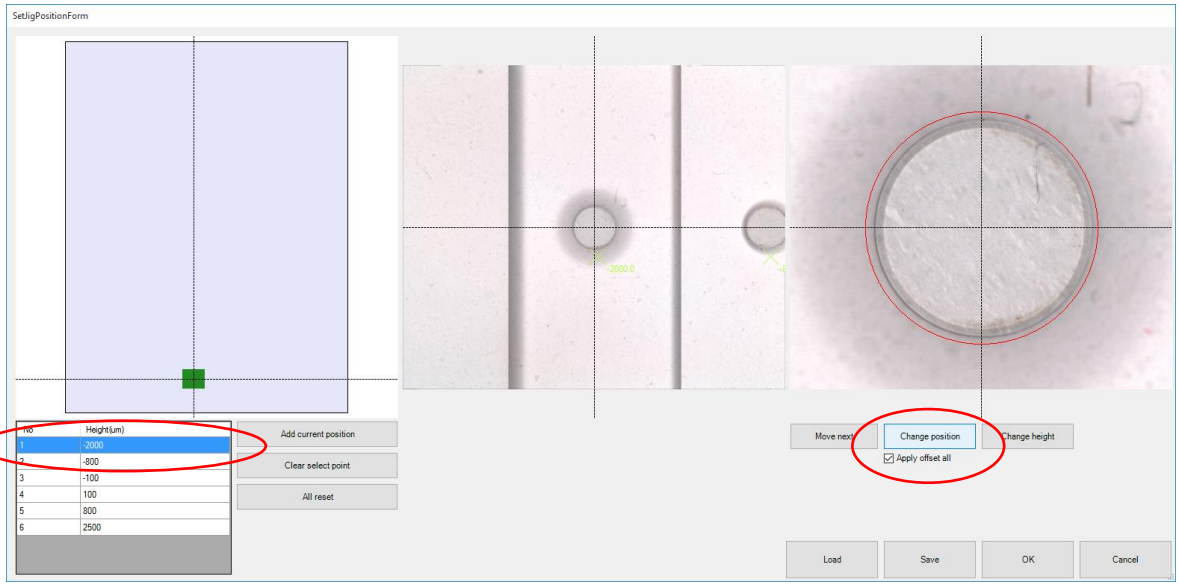


Figure: Set jig position 6

Step10. Height value written in green color is moved in the center of height block.
Click **Move next**. XY-stage is moved next position.

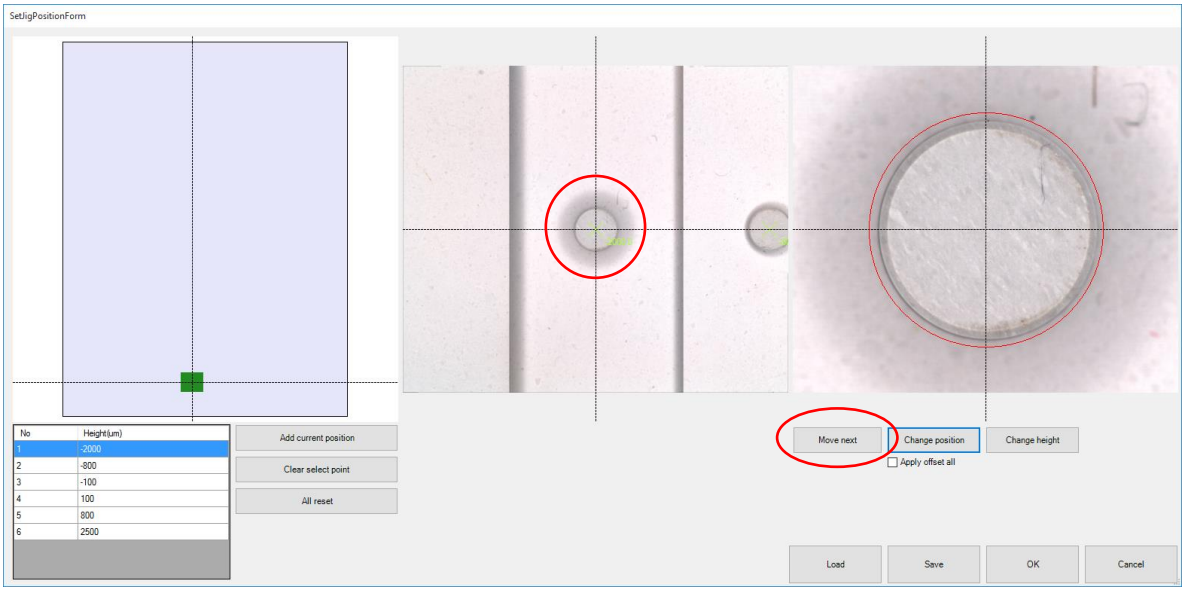


Figure: Set jig position 7

Step11. Repeat the following process.
Move to the center of the block > Check the red line area > Click **Move next**.
If the block area is outside the red line area, modify the FOV position and click **Change position**.

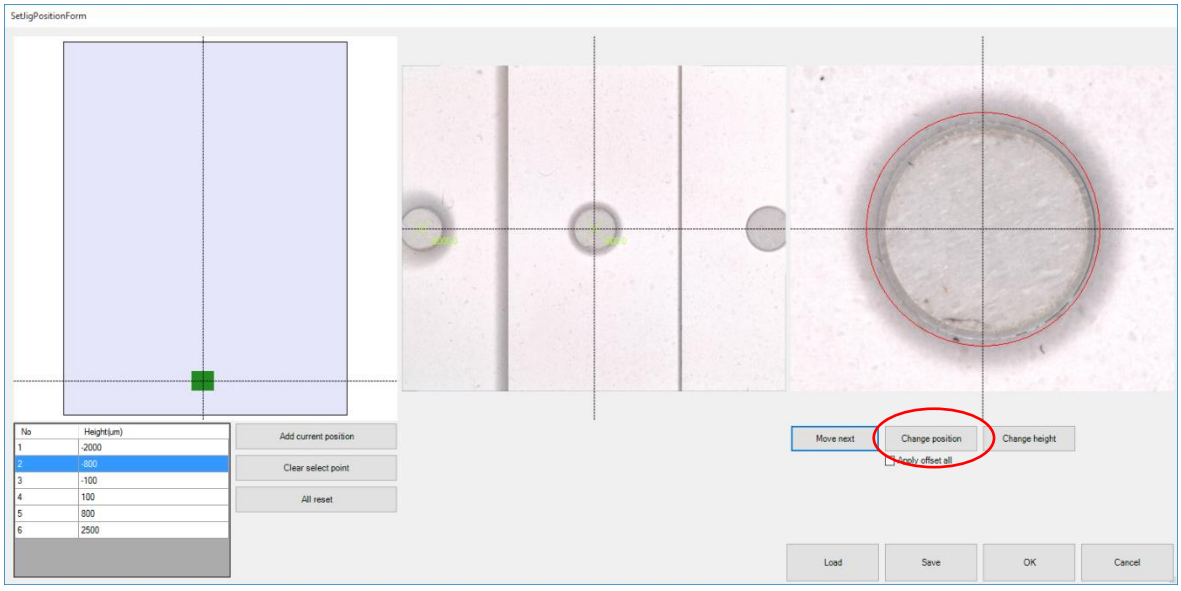


Figure: Set jig position 8

Step12. Click -2000 from the list and click **Change height**.

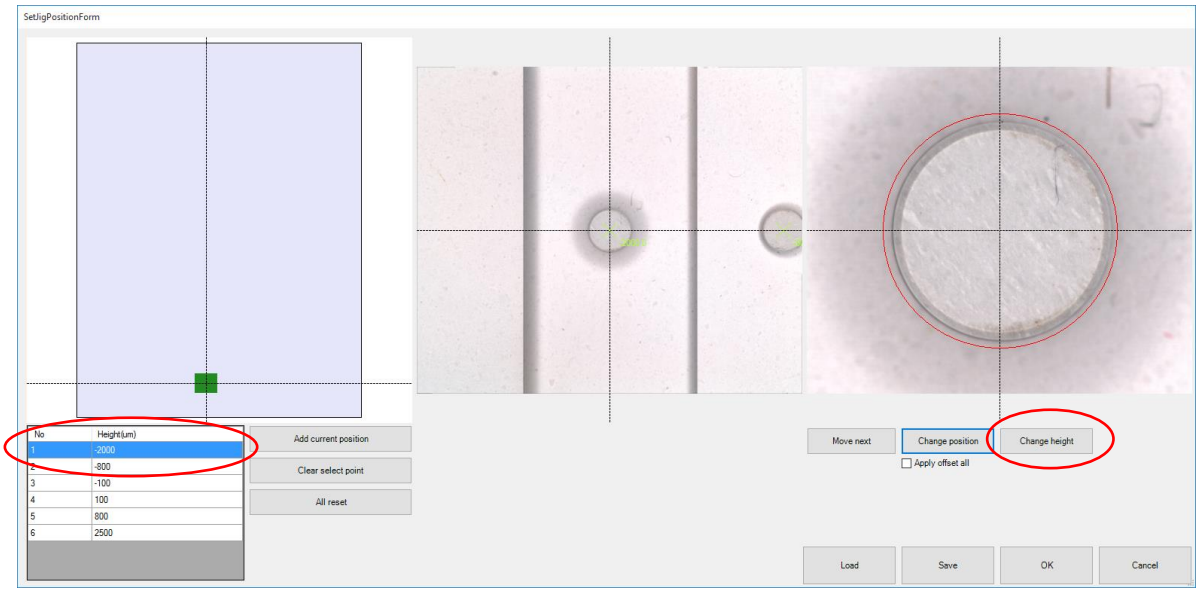


Figure: Set jig position 9

Step13. The dialog shown below appears.
Input the measurement value from inspection sheet(Refer to step7) and click **OK**.

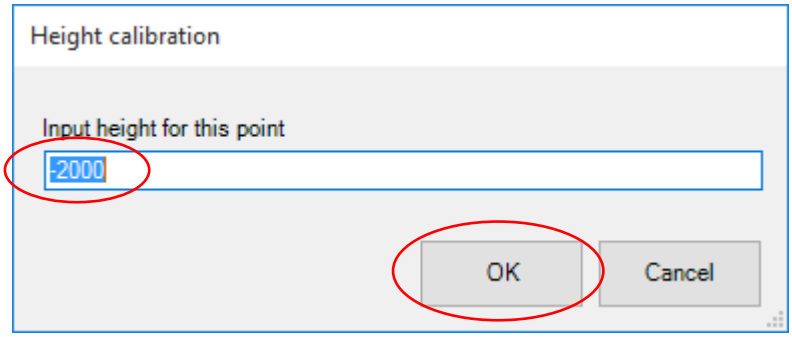


Figure: Set jig position 10

Step14. The dialog shown below appears. Click **OK**.

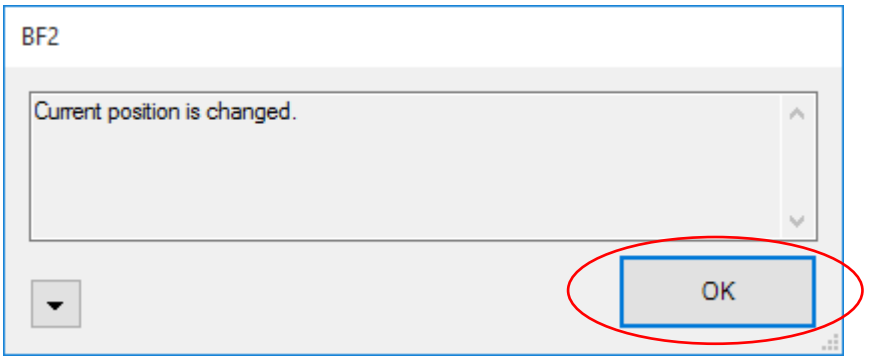


Figure: Set jig position 11

Step15. Repeat the following process.
Click height value from the list > Click **Change height** > Input the measurement value

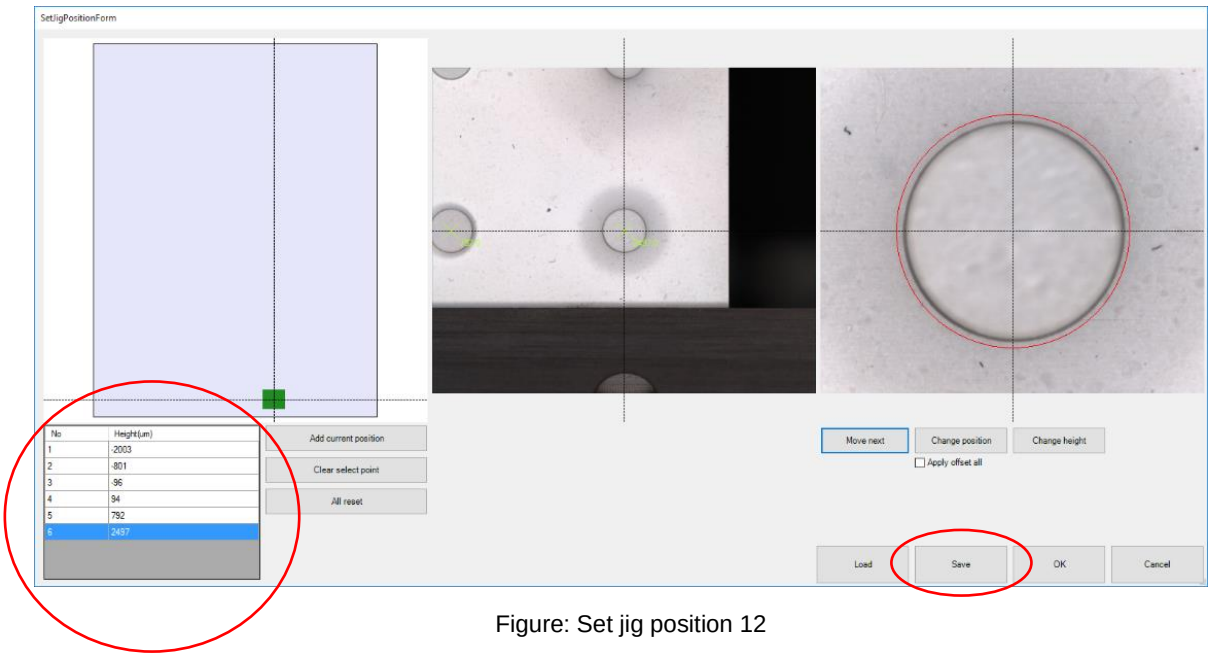


Figure: Set jig position 12

Step16. Type **HeightJigSetting_3Di_LotXXXX** or **HeightJigSetting_3Si_LotXXXX**. Click **Save**.

NOTE If you use same height jig again, load this file.

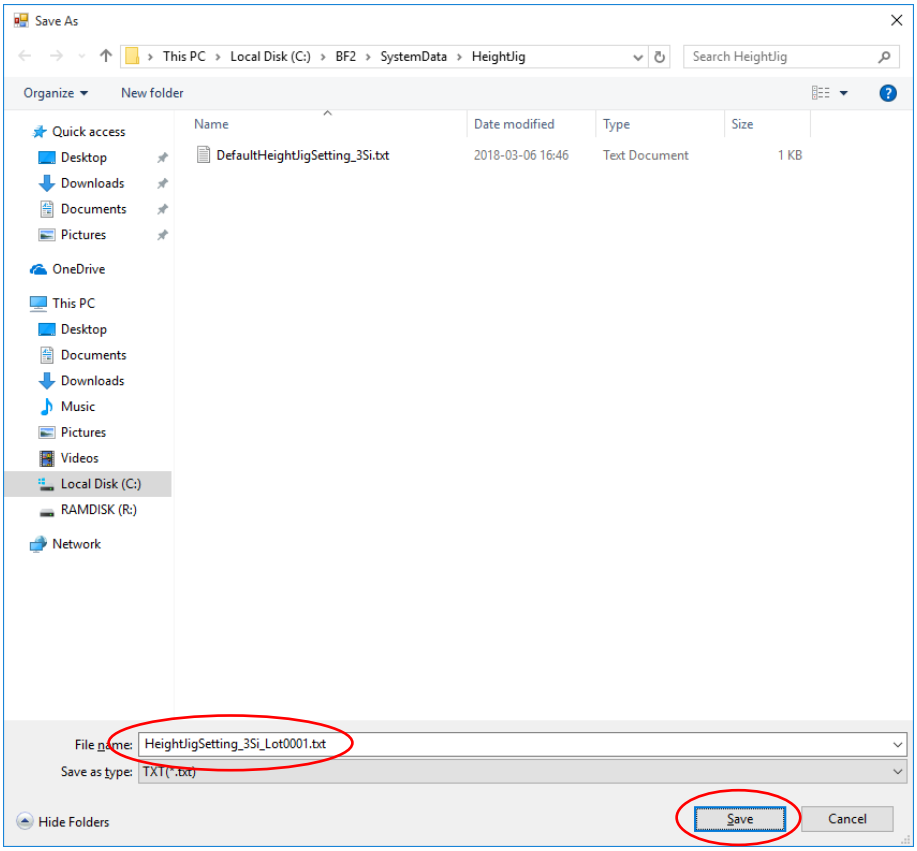


Figure: Set jig position 13

Step17. The dialog shown below appears. Click **OK**.

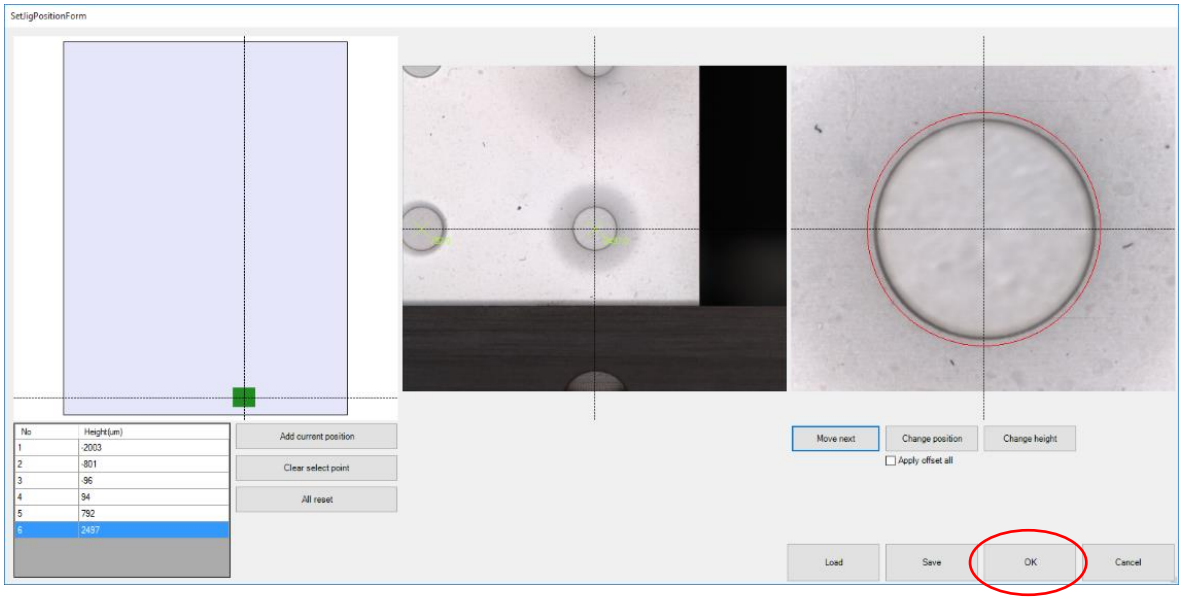


Figure: Set jig position 14

Step18. Click **Reference plane**.

Figure: Reference plane 1

Step19. The dialog shown below appears. XY-stage moves to the clicked position. Click the reference plane area. (Refer to Step1)

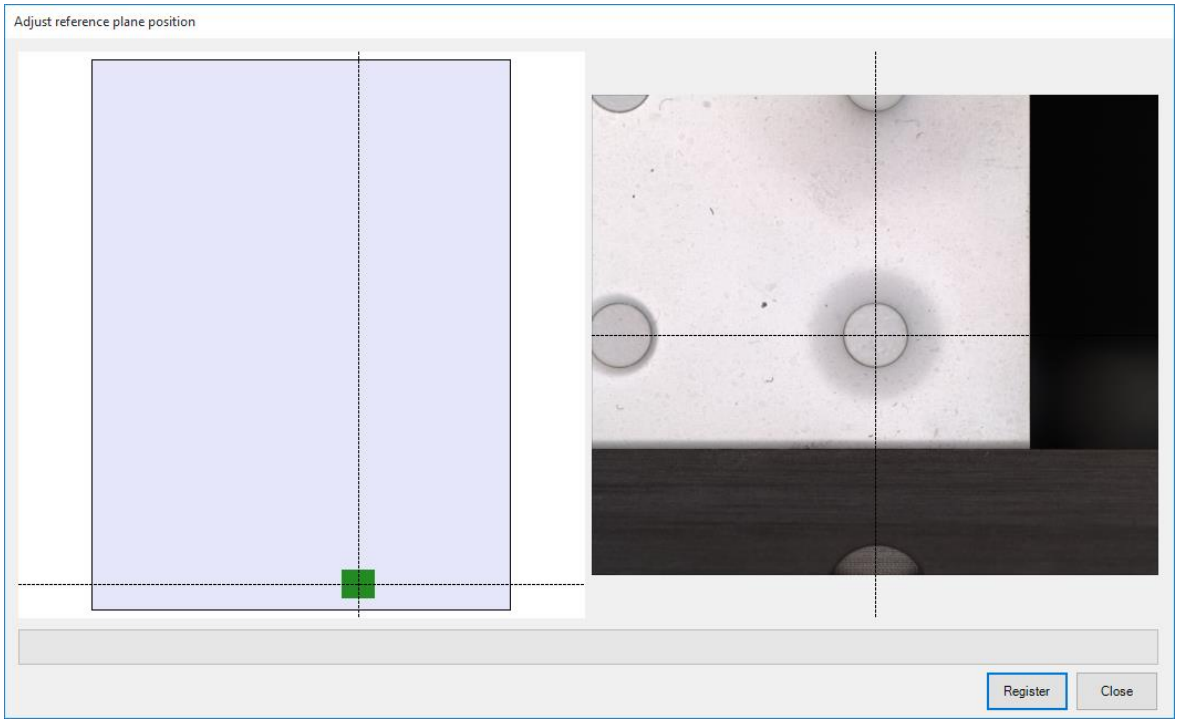


Figure: Reference plane 2

Step20. After FOV moved to reference plane area, make sure the block is not present and click **Register**.

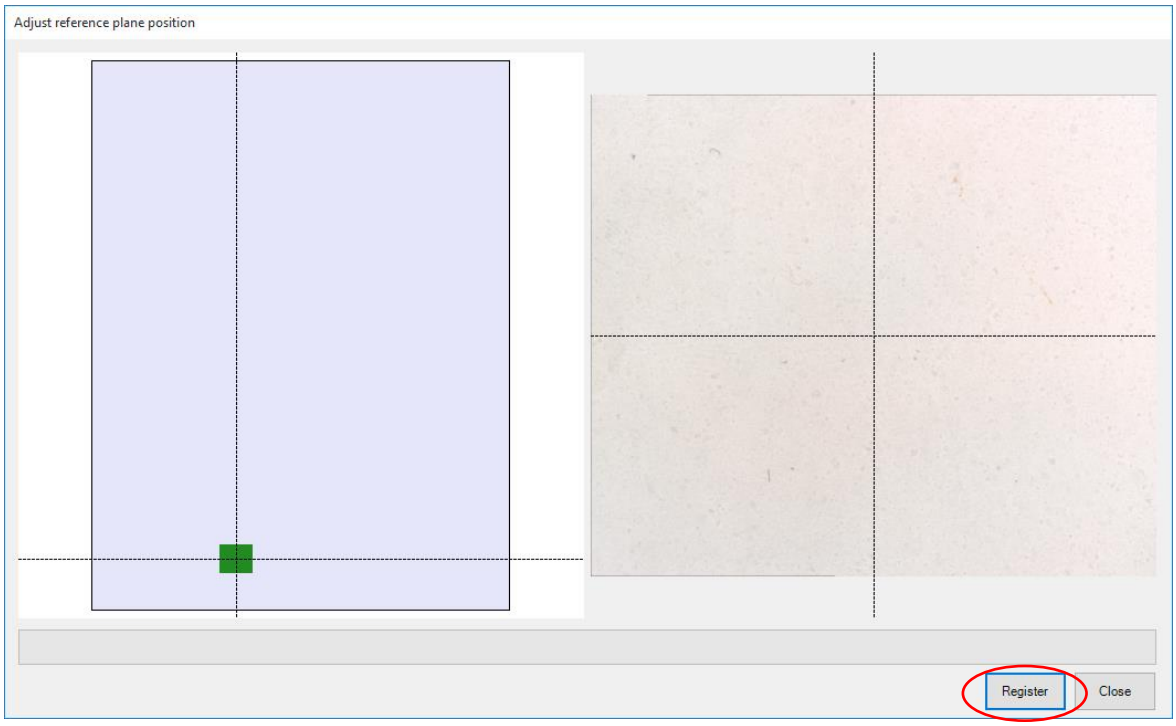


Figure: Reference plane 3

Step21. The dialog shown below appears. Click **OK**.

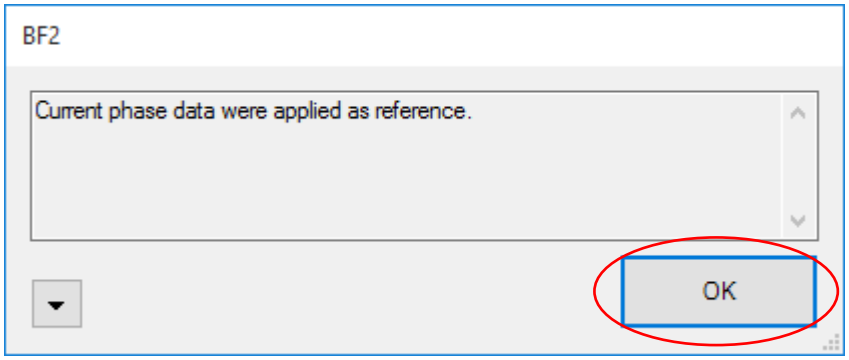


Figure: Reference plane 4

Step22. Click **Height Coefficient**.

Figure: Height Coefficient 1

Step23. The dialog shown below appears.

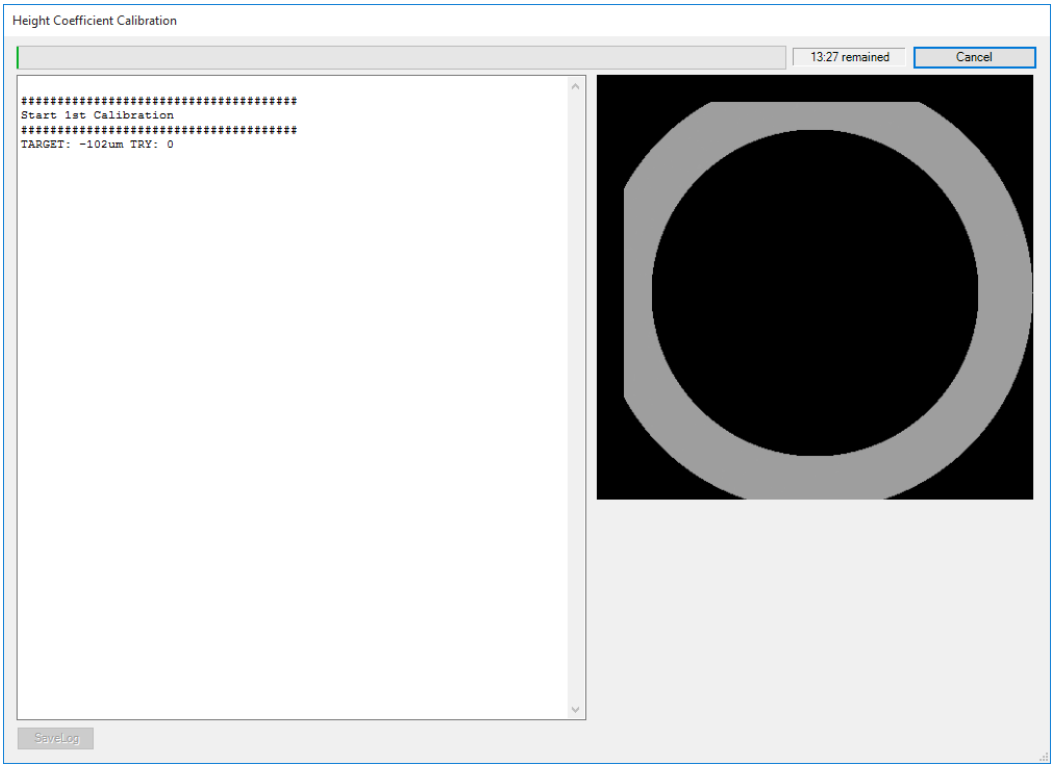


Figure: Height Coefficient 2

Step24. After finishing calibration, click **Close**.

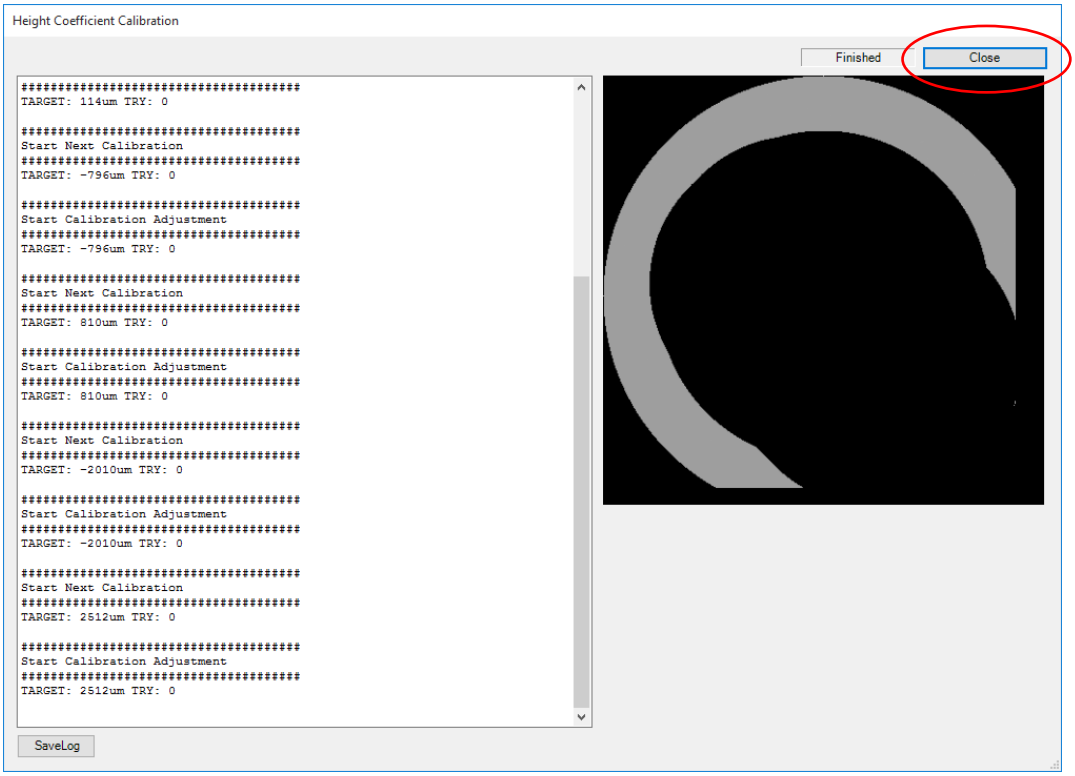


Figure: Height Coefficient 3

Step25. Click **Repeatability Test**.

Figure: Repeatability Test 1

Step26. The dialog shown below appears. Input repeat number is 10. Click **OK**.

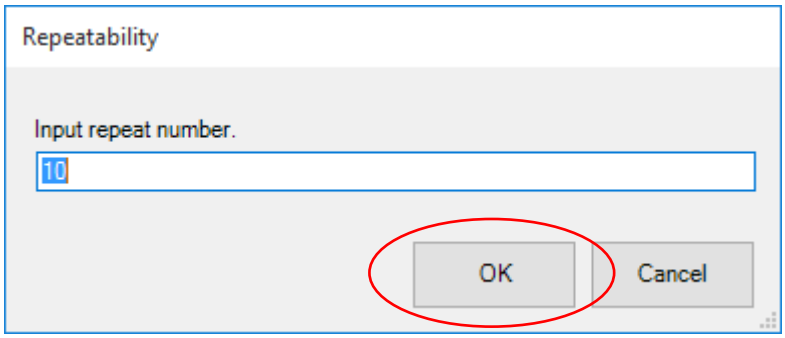


Figure: Repeatability Test 2

Step27. The dialog shown below appears.

Figure: Repeatability Test 3

Step28. Make sure all results are PASS and click **Close**.

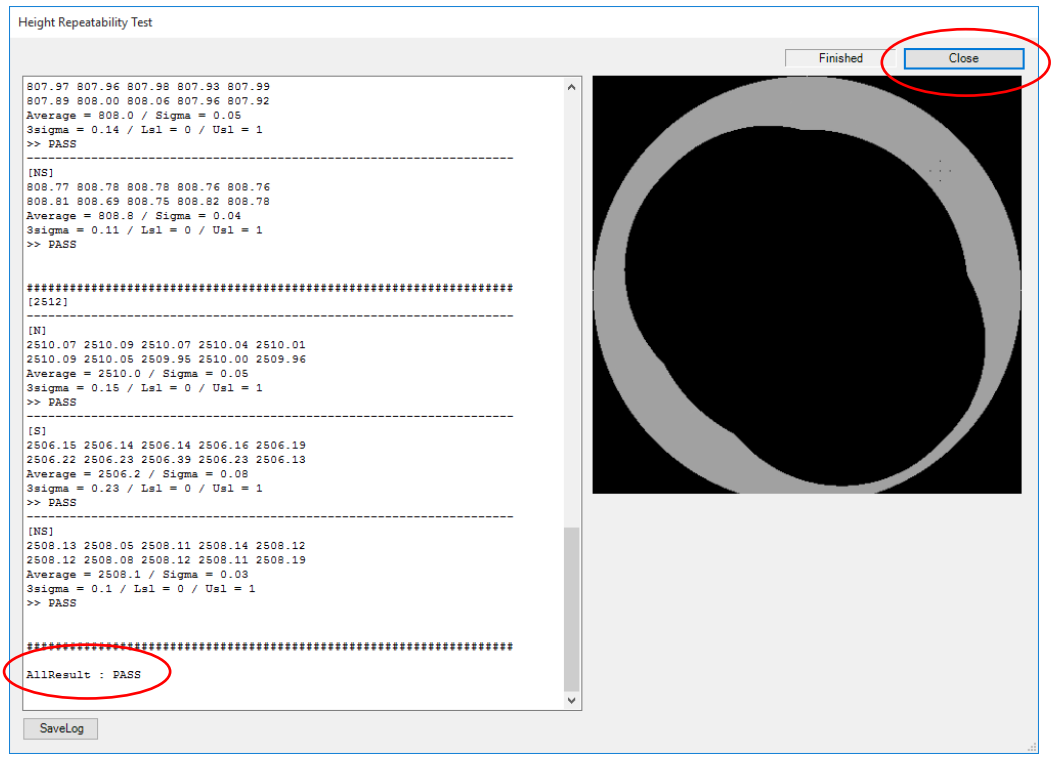


Figure: Repeatability Test 4

Step29. Click **Uniformity Test**.

Figure: Uniformity Test 1

Step30. The dialog shown below appears. Make sure all results are PASS and click **Close**.

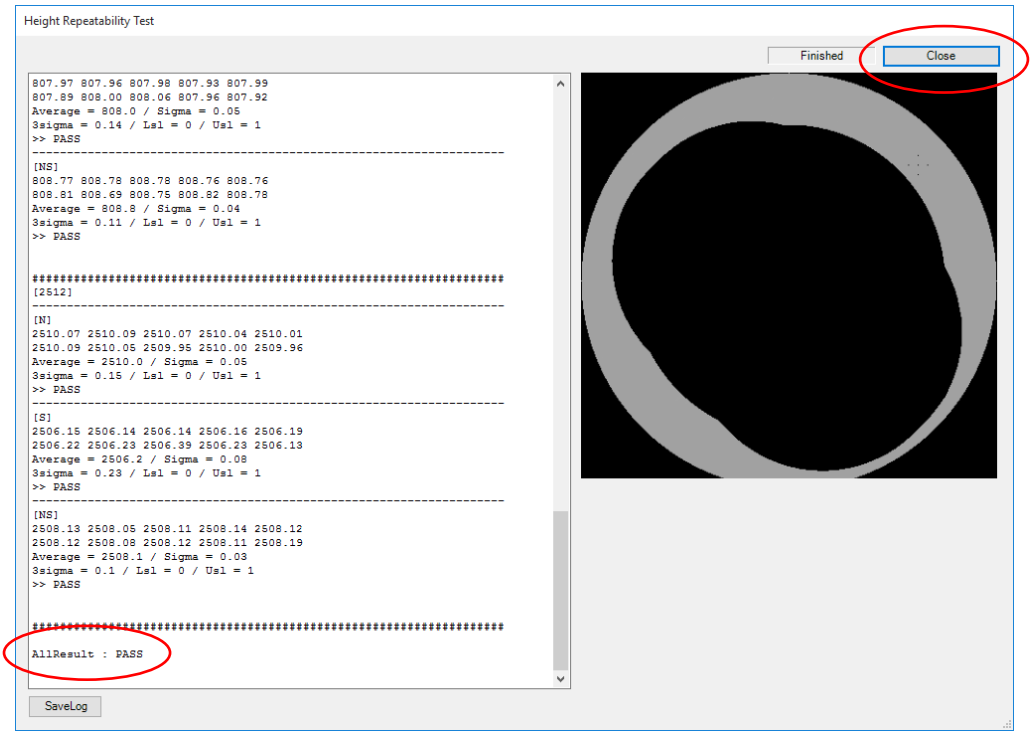
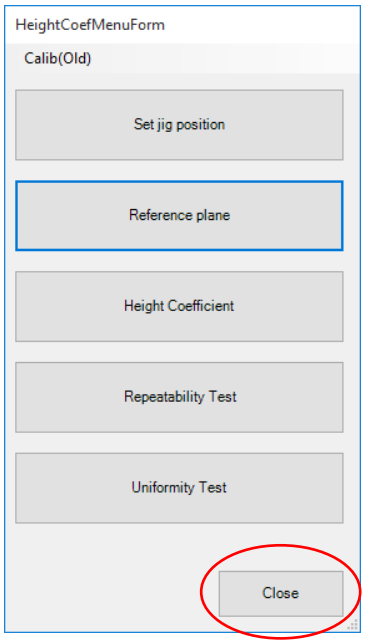


Figure: Uniformity Test 2

Step31. Click **Close**

A Lane



B Lane

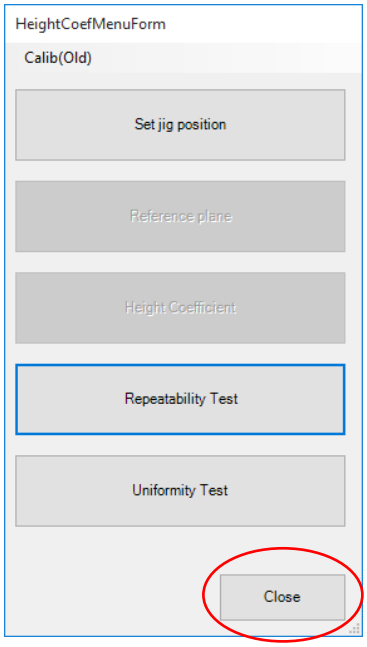


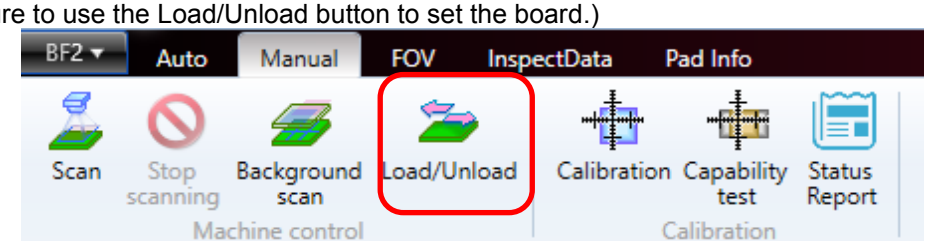
Figure: Uniformity Test 3

4.11 Anchor position

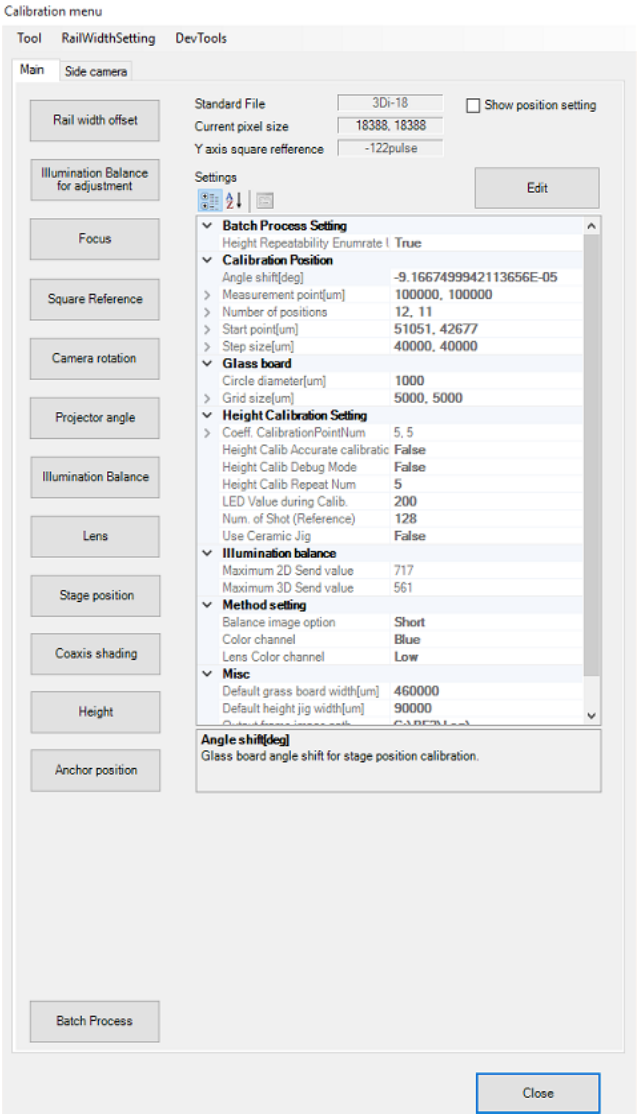
[Purpose]
To register a board stop position and set an origin when inspection data is opened.
Perform this procedure when installing the machine or replacing the board detection sensor because of its failure. Do not perform it in other cases. We recommend that you perform the procedure using a production board borrowed from the customer during the machine installation and you use the same board for readjustment. (Because a minor error can be caused in the stop position depending primarily on the types of boards)

Step1 Set a rail width according to the size of the board to use.

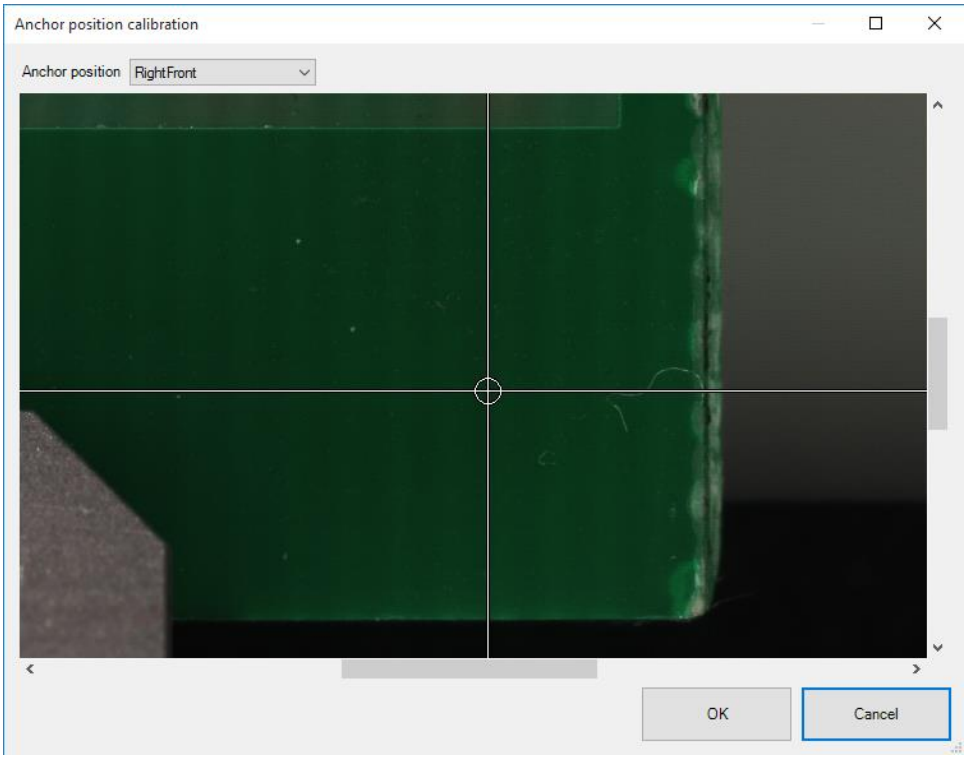
Step2 Place the board on the entrance side of the conveyor, and click the Load/Unload button to move the board to the imaging position.
(Be sure to use the Load/Unload button to set the board.)



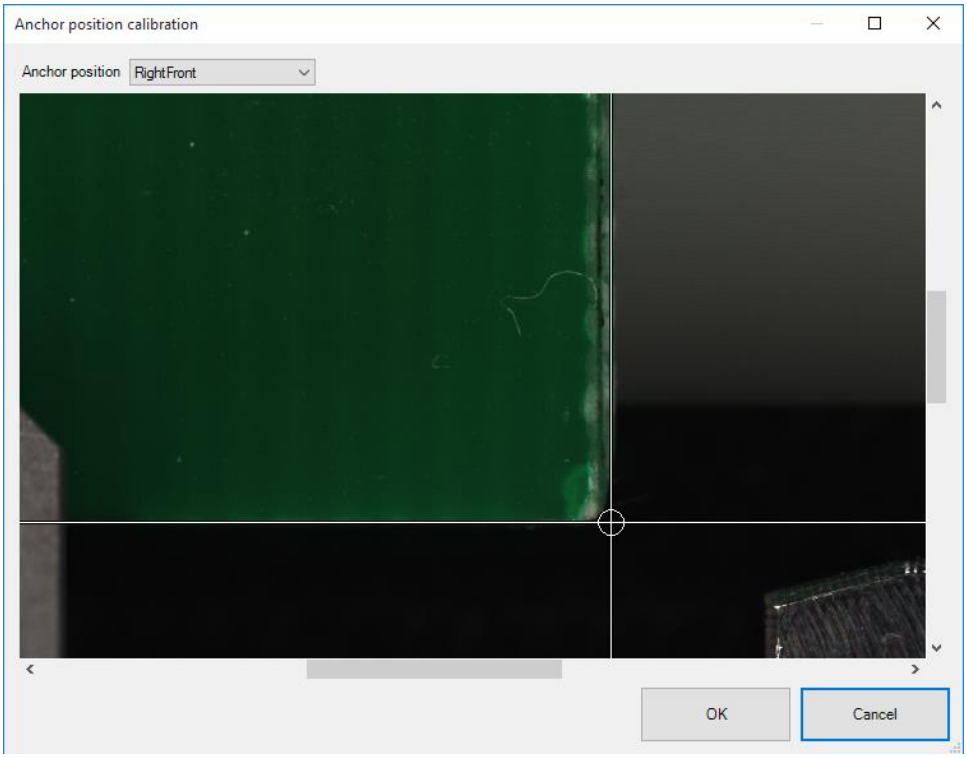
Step3 Select Anchor position from the calibration menu.



Step4 Drag the center of the circle and move it to the corner of the board.



（Before adjustment）



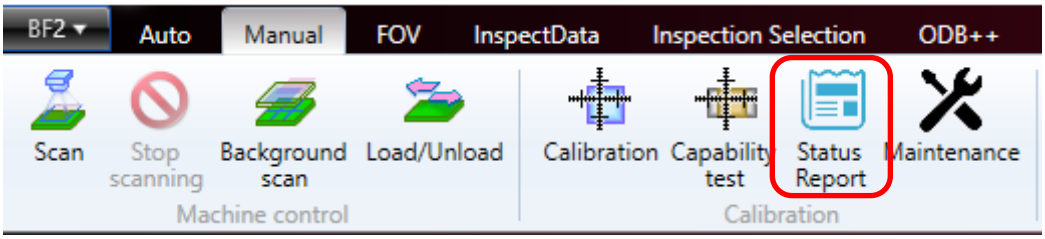
（After adjustment）

Step5 Click the OK button to complete the adjustment. Click the Cancel button not to register the new correction value.

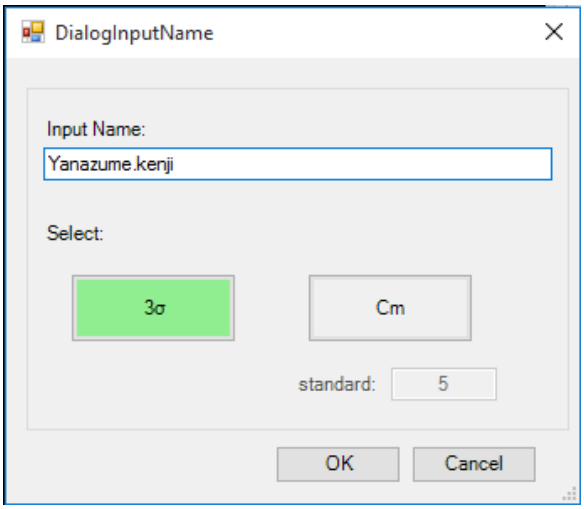
5. StatusReport

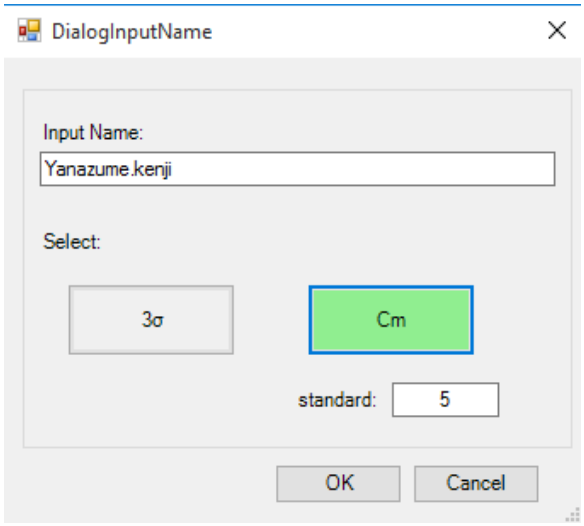
[Purpose]
To offer a customer a report showing the successful completion of calibration and adjustments and no problems with the machine performance when the machine installation or regular maintenance is finished.
* The report is created based on the result of Check for the calibration that was performed last or of Batch Process.

Step1 Click Status Report.



Step2 Register the name of a person in charge of the installation or maintenance in the Input Name box. Select 3σ or Cm and click OK. (Depending on this selection, the result of "Distance XY Repeatability" is shown in 3 sigma or Cm in the report.)





Step3 The following report is created. Confirm that each item has the "PASS" result.

StatusReport

Save

Machine Capability Report

saki The Future in Focus

Date time	4/9/2018 5:07:37 PM		
Machine Type	3Di-LS2-18-F	SW Version	3.0.0.0rc rev.0
Serial Number	N618307	Input Name	Yanazume.kenji

1. Distance XY

Calibration Pass Date:2018-0409-131035

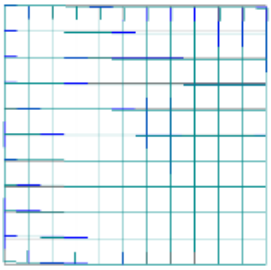
Item	Value	LSL	USL	Result
StageShiftMax_X	9	-100	100	Pass
StageShiftMax_Y	20	-100	100	Pass
StageShiftLinearityMax	3	-8	8	Pass

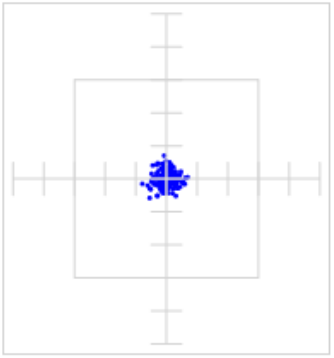
Repeatability Pass (N=4*4*10) Date:2018-0407-151425

Item	3σ	USL	Result
3Sigma_X	1.247	3	Pass
3Sigma_Y	0.97	3	Pass

3σX	3	2	1	0
3	0.8	0.8	0.6	0.6
2	1.1	0.6	1.2	0.7
1	0.8	0.5	0.7	0.7
0	0.9	0.8	0.5	0.6

3σY	3	2	1	0
3	0.6	0.8	0.6	1.0
2	0.7	0.9	0.7	0.6
1	0.7	0.6	0.7	0.8
0	0.5	1.0	0.7	0.6





2. Brightness

Calibration Pass Date:2018-0330-111337

Item	Value	USL	Result
SendValue_T	434	560	Pass
SendValue_R	217	560	Pass
SendValue_G	171	560	Pass
SendValue_B	244	560	Pass
SendValue_L	240	560	Pass
SendValue_COAXIS	418	716	Pass
SendValue_N	234	390	Pass
SendValue_S	218	390	Pass
SendValue_E	214	390	Pass
SendValue_W	214	390	Pass

Brightness Pass Date:2018-0330-111348

Item	Value	LSL	USL	LSL USL	Result
T	140.9	125	155		Pass
R	166	155	185		Pass
G	166.3	155	185		Pass
B	167.5	155	185		Pass
L	164.9	155	185		Pass
COAXIS	108.4	40	110		Pass
N	73.7	50	80		Pass
S	75.4	50	80		Pass
E	73.7	50	80		Pass
W	74.2	50	80		Pass

3. Height

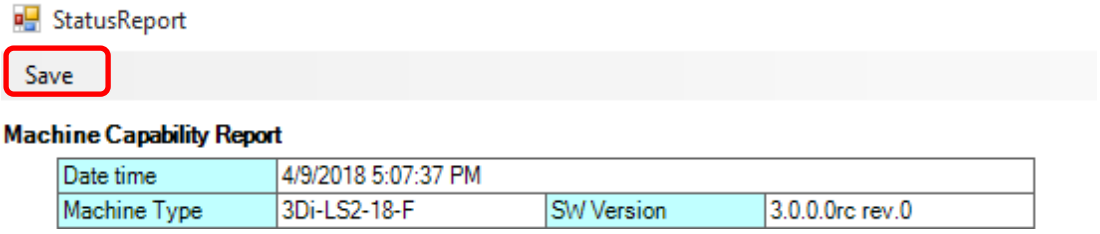
Calibration Pass

Item	time
RefPlaneCalib	2018-0330-115217
CoefficientCalib	2018-0330-121258

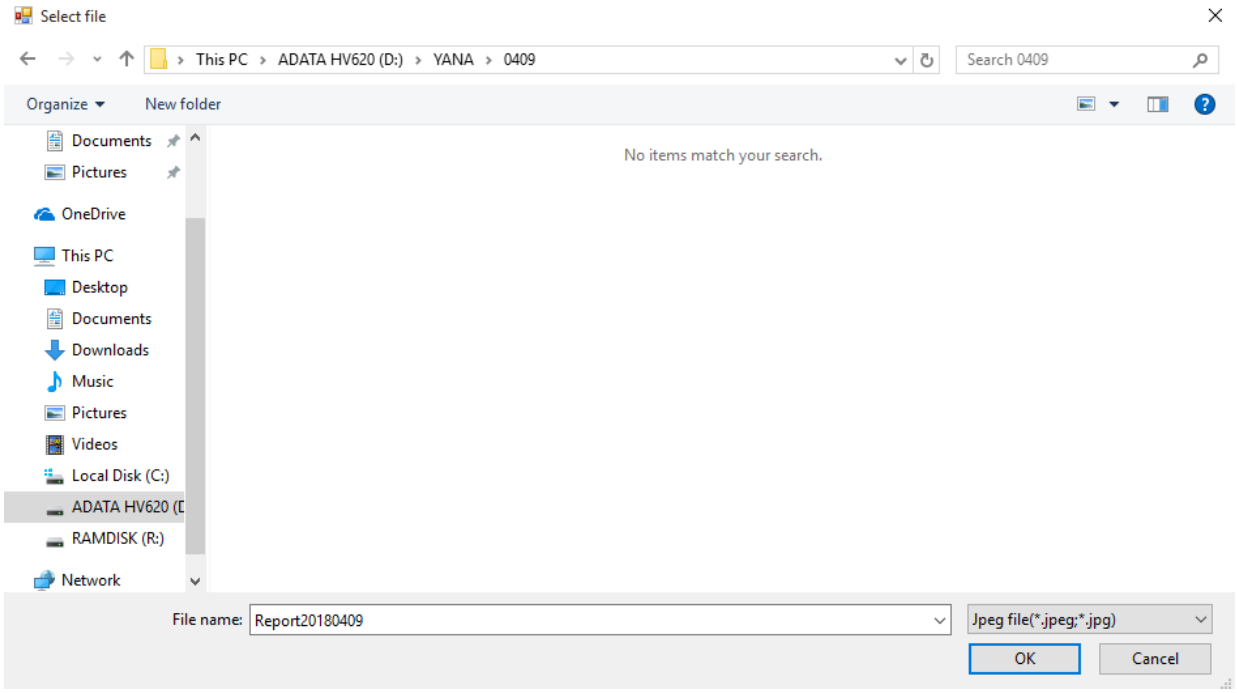
Repeatability Pass Date:2018-0330-121517

Height	3σ	LSL USL	Result
-2000	0.79		Pass
-800	0.39		Pass
-100	0.51		Pass
100	0.51		Pass
800	0.54		Pass
8000	0.62		Pass

Step4 Click Save.



Step5 Select a destination to save, and save the report. (Only JPEG is available for a saving format.)



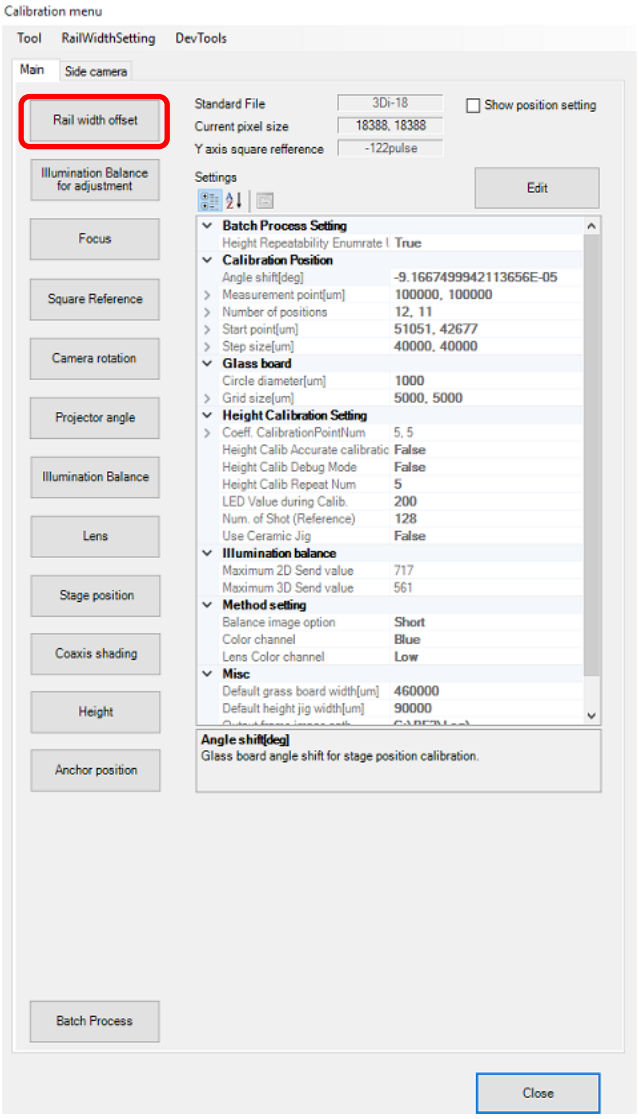
Step6 Provide the saved data for the customer, and ask him/her to print it out.
Ask the customer to check the report, and get his/her signature on the report.
Make a copy of the report with the signature. Provide the original for the customer, and save the copy in the SAKI database.

6. Reference

6.1 Rail width Offset

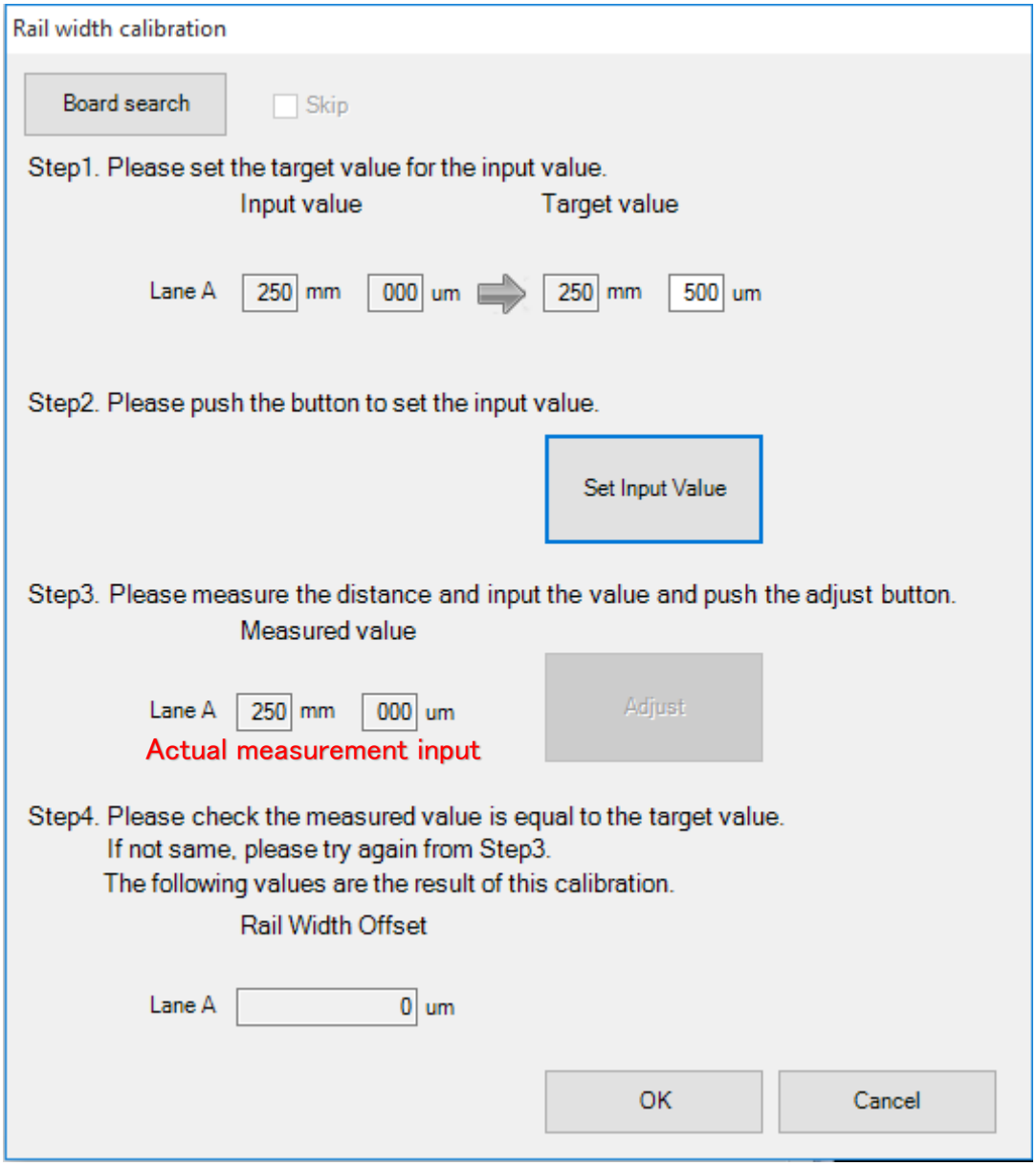
[Purpose]
To adjust the offset value of the conveyor rail width. If there is a difference between the width specified during the automatic width adjustment and the actual rail width, adjust it here. (Since the width has been already adjusted before shipment, the adjustment is not necessary unless the rail width has any failure.)

Step1 Click Rail width offset from the calibration menu.



Step2 Execute Boardsearch and confirm that there are no boards in the machine.

Step3 Set a Target value. It has been set 500 um wider than the Input value before shipment.



Step4 Click Set Input Value to automatically adjust the rail width.

Step5 Measure the rail width using a tool such as a vernier caliper, and enter the measured value. Then, click Adjust.

Step6 Clicking Adjust automatically calculates an offset value and adjusts the rail width. Measure the rail width again using a tool such as a vernier caliper. When a difference between the measured value and the Target value is within +/- 100 um, you can complete the adjustment. If it is over +/- 100 um, go back to STEP3, enter the value measured in STEP4 and click Adjust again. Repeat STEP3 and STEP4 until the difference can be within the standard value.

Step7 After the adjustment, click the OK button to register the new offset value and close the screen. Click the Cancel button to close the screen without registering the new offset value.

7. Revision History

Revision	Date	Contents	Written by
01	2018/05/04	Release	K.Yanazume