

Subject	How to perform calibration	Written by
Model	BF-3Di-L1, BF-3Di-D1, BF-3Di-Z1	H.Tanaka 2016/04/18

Contents

■Objective

This calibration document is for setting the machine in the customer site.

NOTE

Calibration items in the customer site is different from in the factory.

■Machine

Model	S/N	Assembly	Software Ver
BF-3Di-L1	381016001 or later	[SJ38OPAD0]	BF2(3DiL)_2.0.0.8 or later
BF-3Di-D1	382016029 or later	[SJ38OPAD0]	BF2(3DiD)_2.0.0.8 or later
BF-3Di-Z1	383016001 or later	[SJ38OPAD0]	BF2(3DiL)_2.0.0.8 or later

■Tool

Prepare the following parts before the calibration.

- Glass board
 - BF-3Di-L1, BF-3Di-D1** : 510×460mm (P/N [SJG0A003-01])
 - BF-3Di-Z1** : 510×686mm (P/N [SJG0A012-01])
- Height calibration jig
(P/N [SJG1P000])

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Calibration menu

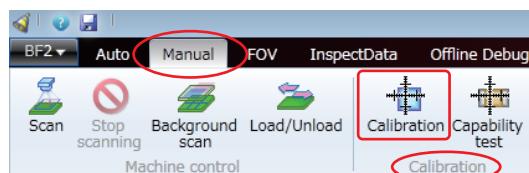
	Calibration item	Tool	Tolerance	Calibration Required		
				L1/Z1	D1 (Lane A)	D1 (Lane B)
1	Illumination Balance	Gray chart	Within ± 5	✓	✓	-
2	Focus	Glass board	Within -30 to +49	✓	✓	Only check
3	Camera Rotation	Glass board	Within ± 0.2 pixel	✓	✓	Only check
4	Pixel size	Glass board		✓	✓	-
5	Stage position	Glass board	Within 8 μ m	✓	✓	✓
6	Reference plane Height coefficient	Height calibration jig		✓	✓	Only check

CAUTION

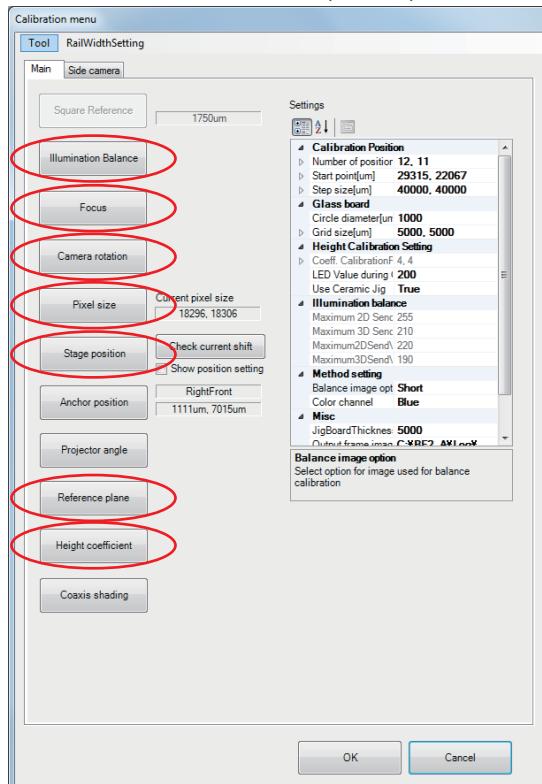
Projector angle, Anchor position, and Coaxis shading is setting in the factory.
Reference plane is not used in new height calibration.

From the ribbon, select the **Calibration group > Calibration**.

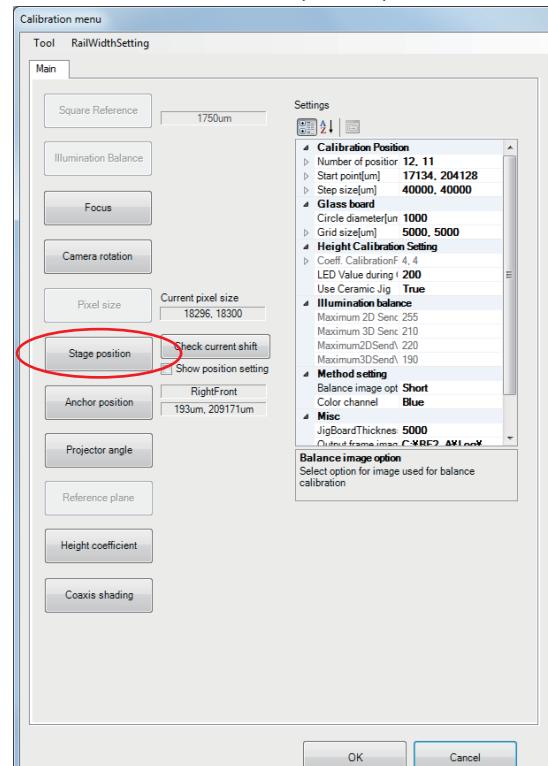
The calibration menu appears.



BF-3Di-L1/Z1, D1(A Lane)



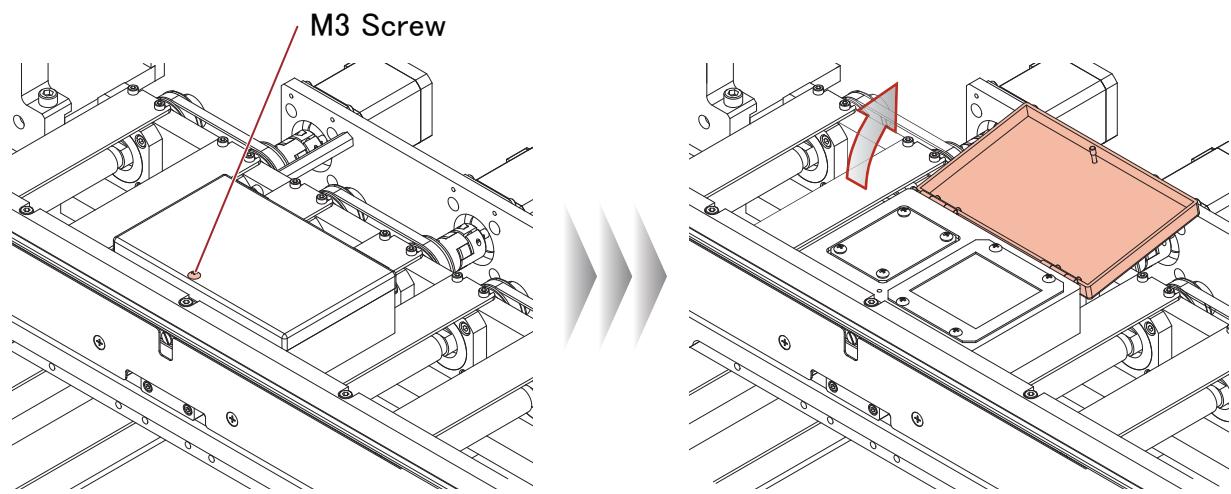
BF-3Di-D1(B Lane)



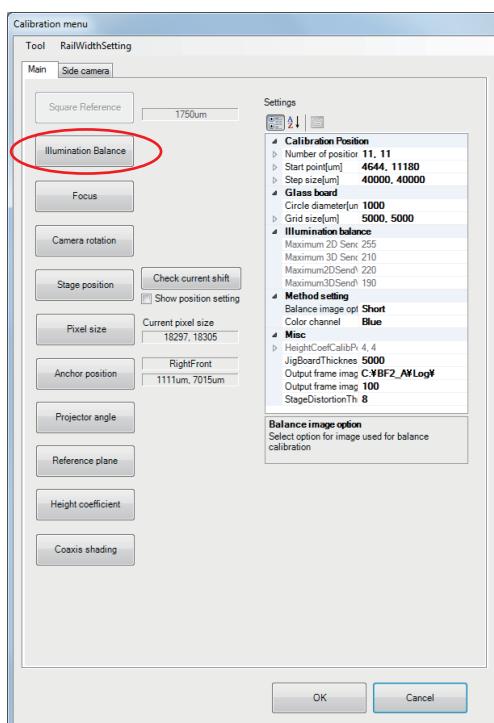
1 Adjust Luminance value of 2D and 3D LED

Before adjusting luminance value, make sure that any board is not set on the conveyor.

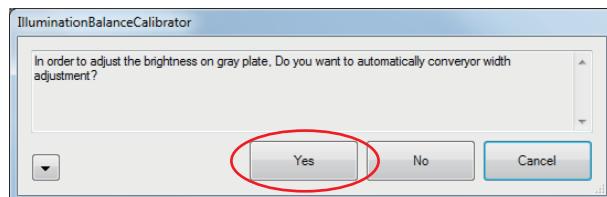
Loosen a M3 truss screw (anti-drop type) and open the cover to rear.



Step1: Click **Illumination Balance**.



Step2: The dialog shown below appears. Click **Yes** to move conveyor to 50mm width automatically.



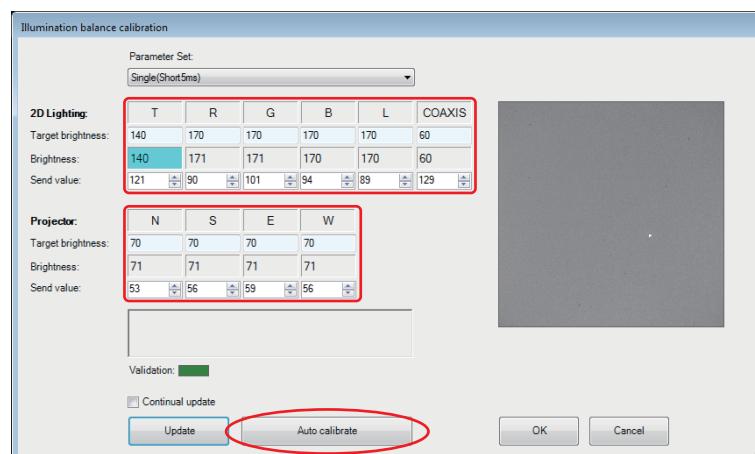
Step3: The target value list is below.

The tolerance is **within±5** for each.

Item		Target Value
T	TOP LED Lighting	140
R	SIDE LED Red Lighting	
G	SIDE LED Green Lighting	
B	SIDE LED Blue Lighting	170
L	LOW LED Lighting	
COAXIS	COAXIAL TOP LED Lighting	60
N	North Side Stripe Pattern Projector	
S	South Side Stripe Pattern Projector	
E	East Side Stripe Pattern Projector	70 or 40 (in case of Double(Short 1ms))
W	West Side Stripe Pattern Projector	

If the tolerance is not achieved, click **Auto calibrate**.

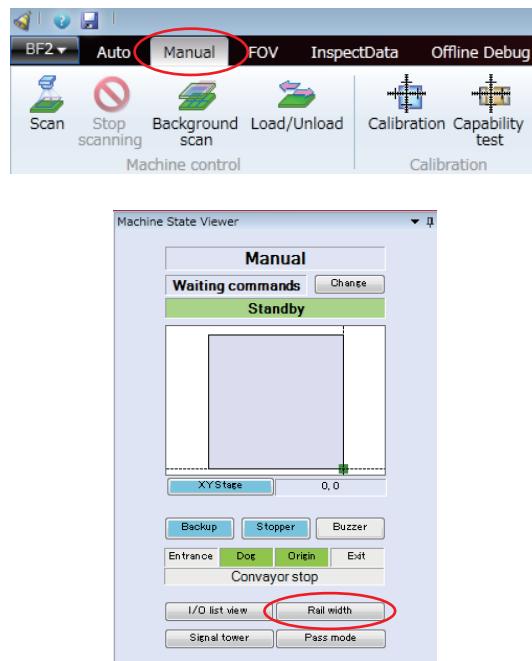
Each values will be adjusted automatically.



2 Adjust Focus

Step1: Change the rail width and set the glass board.

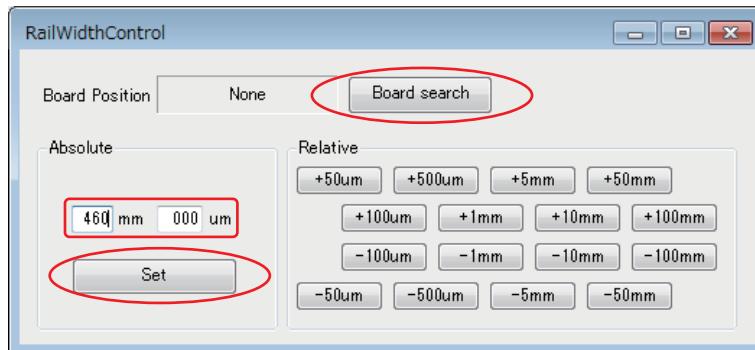
Select the **Manual** Tab and click **Rail Width** button.



Step2: Click **Board search**. If the board is inside the machine, remove the board.

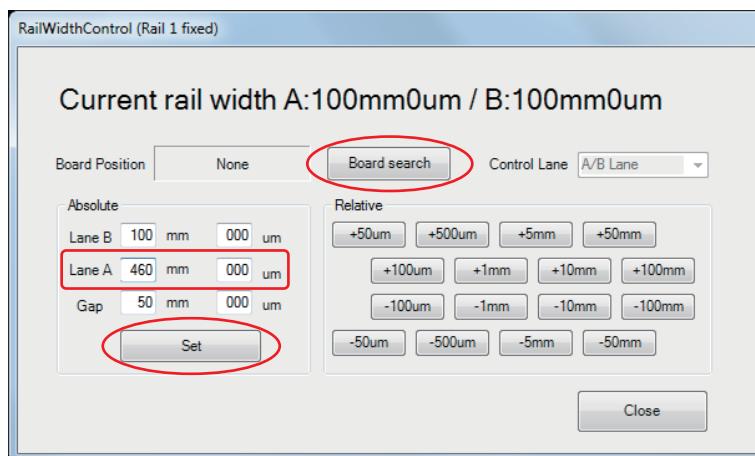
BF-3Di-L1/Z1:

Enter **460 mm, 000 um / 686 mm, 000 um** in **Absolute** and click **Set** to change the rail width.



BF-3Di-D1:

Enter **460 mm, 000 um** in **Absolute** and click **Set** to change the rail width.



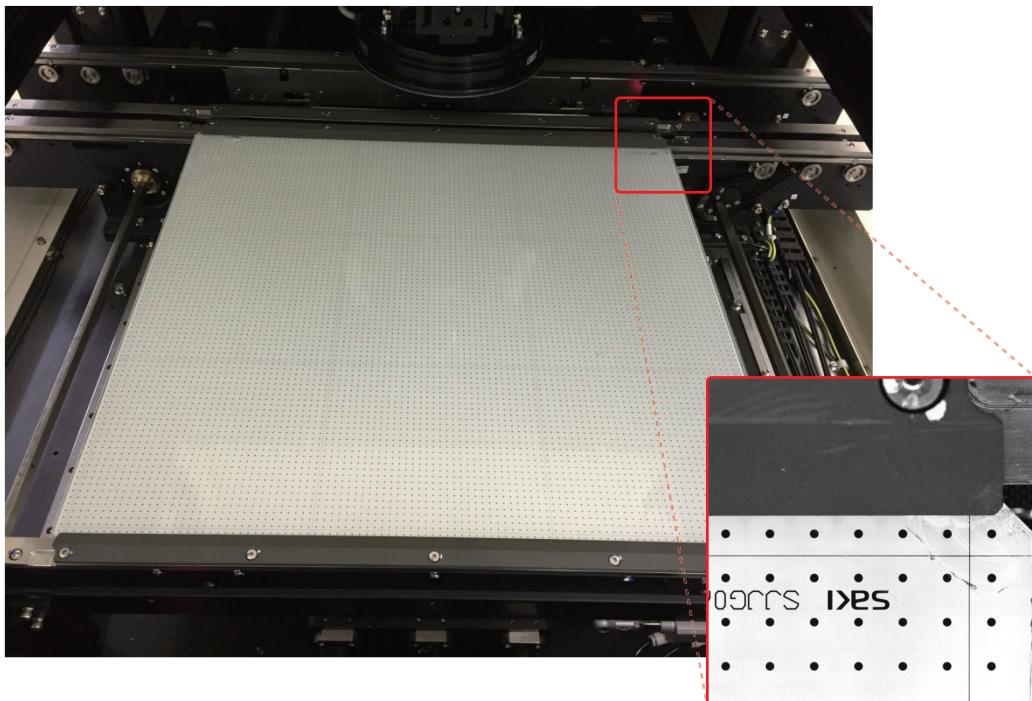
Step3: Set the glass board as shown below.

Glass board **BF-3Di-L1/D1** : 510×460mm
BF-3Di-Z1 : 510×686mm

CAUTION

Backup the conveyor.

Confirm that **Saki** mark is placed on the rear side of the conveyor.

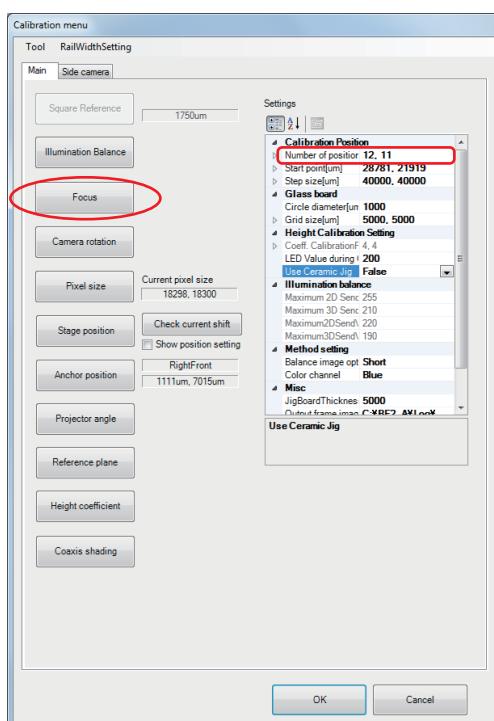


Step4: Set number of position.

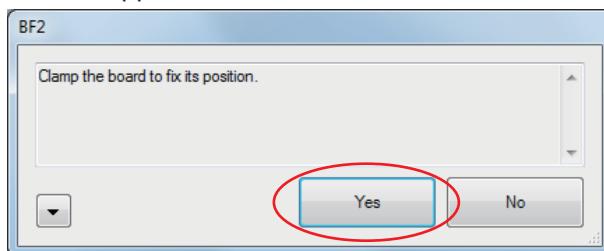
BF-3Di-L1/D1 : (X, Y) = (12, 11)

BF-3Di-Z1 : (X, Y) = (12, 16)

Click **Focus**.

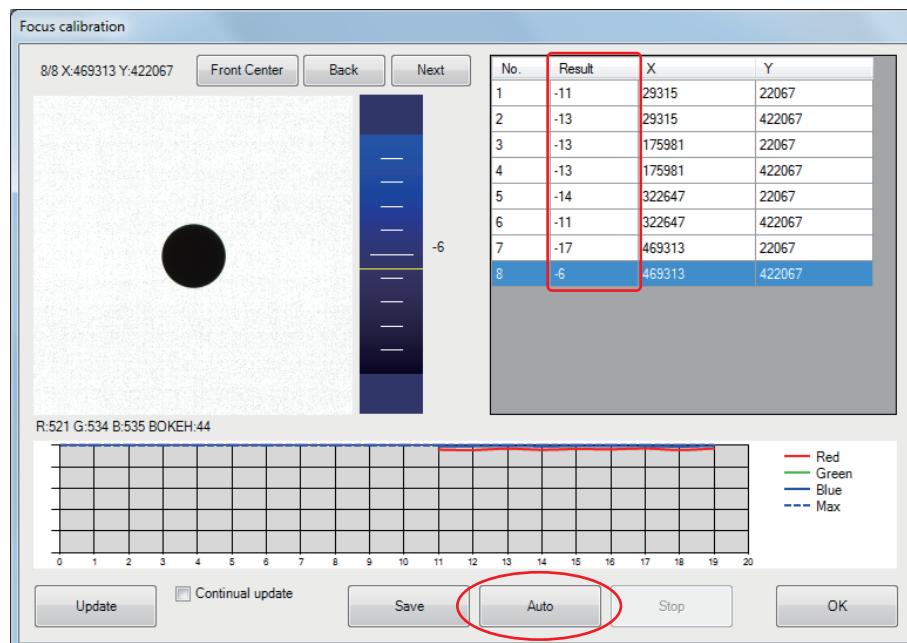


Step5: The dialog shown below appears. Click **YES**.



Step6: After adjusting the focus, click **Auto**.

Please check if all sample value is within the OK range **-30** to **+49**.



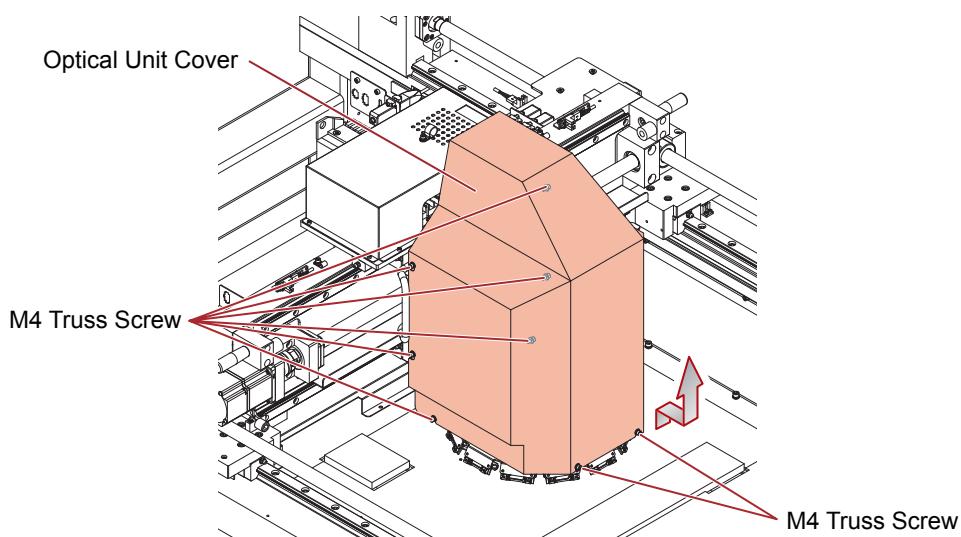
Step7: If sample value is not within tolerance (**-30** to **+49**), adjustment focus position of optical head is necessary.
Loosen the eight M4 truss screws (four on each side) and remove the optical unit cover.

CAUTION

The focus position of optical head is fixed in the factory.

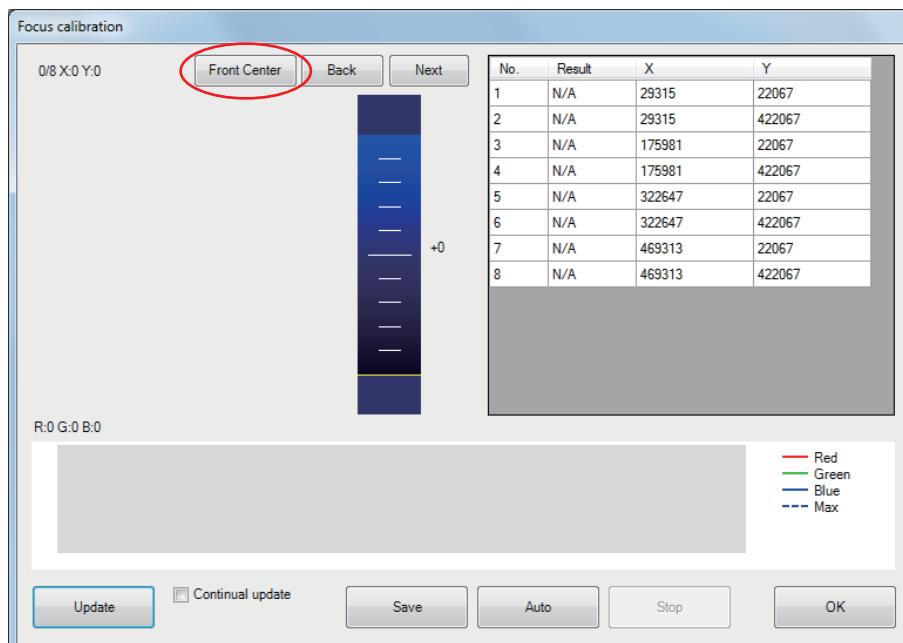
Basically, you don't need to adjust the position.

If you remove or change the optical head, you need to adjust it.



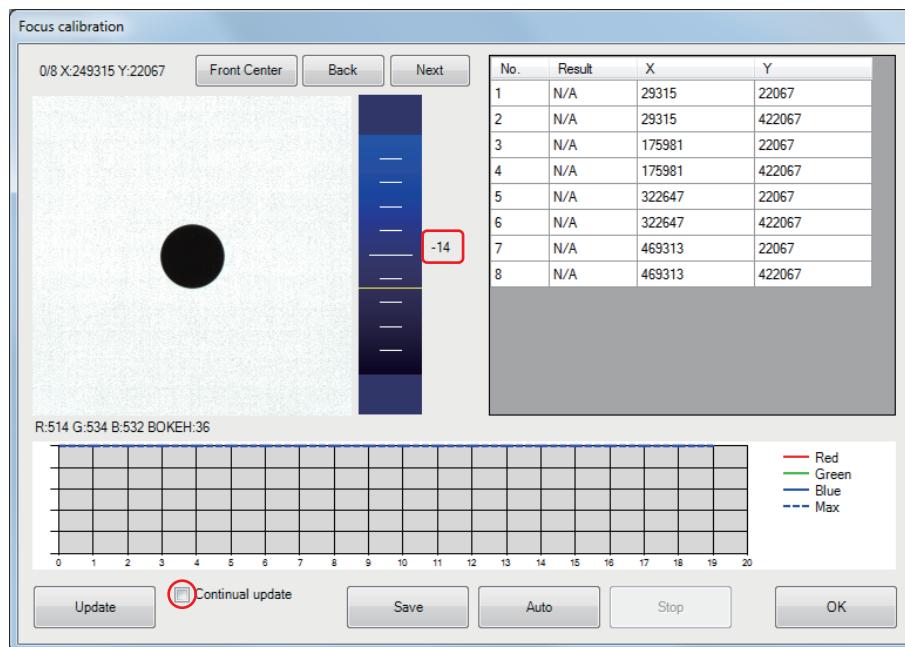
Step8: Click **Front Center**.

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



Step9: Check Continual Update.

Check the tolerance of focus value. Target value is **0**. Tolerance for this value is **-30** to **+49**.

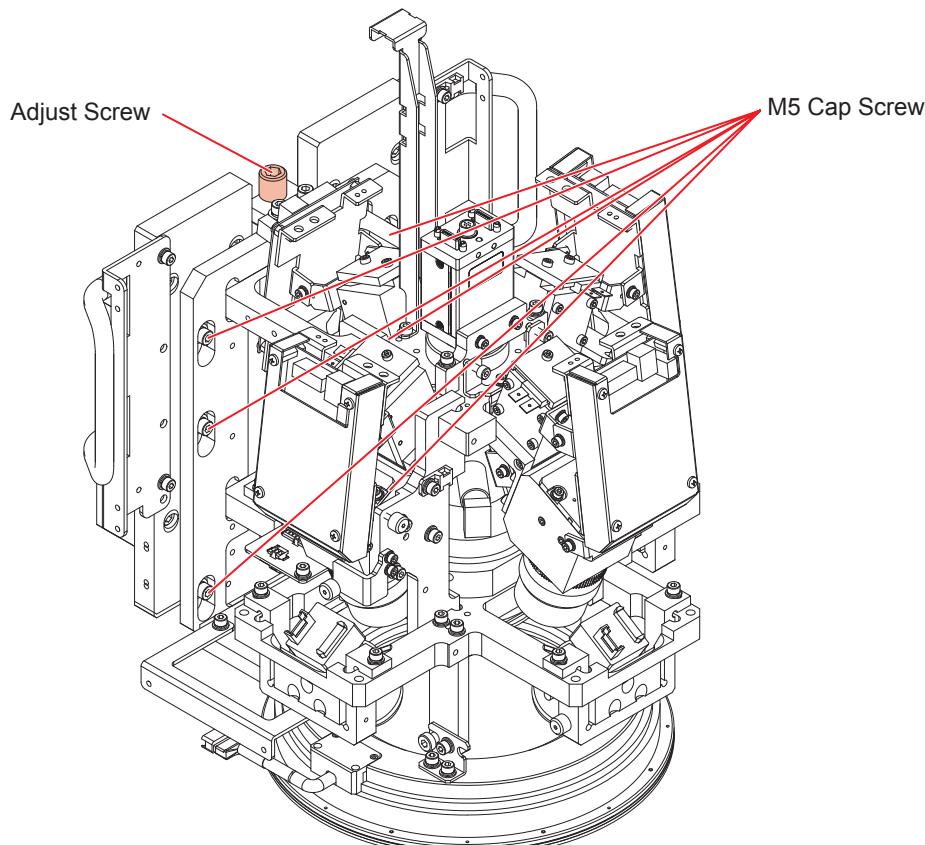


Adjust the focus of optical head mechanically at front center position.

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

Rotate the adjust screw and check focus value.

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



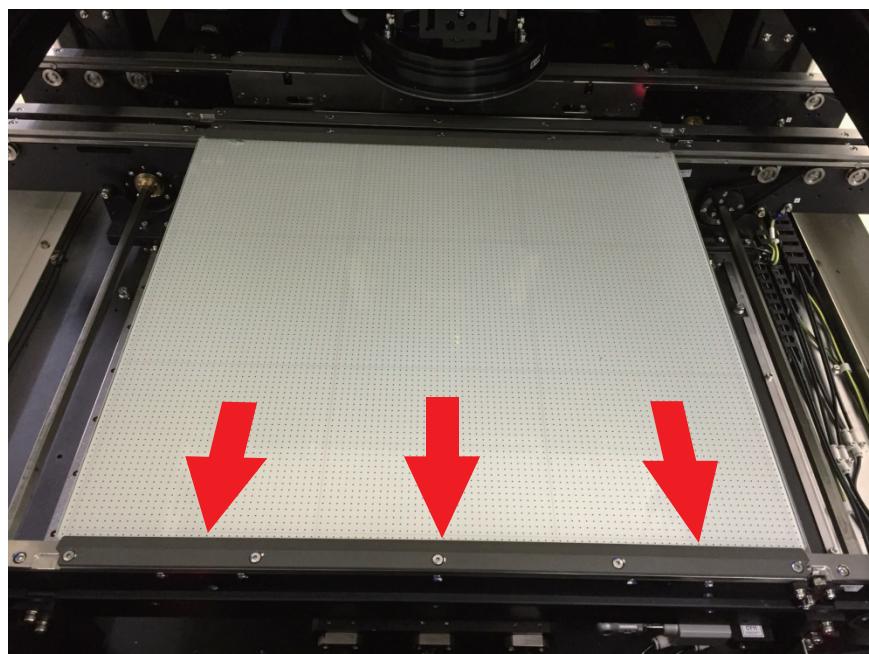
3 Camera rotation

CAUTION Hold the backup of the glass board until XY stage calibration is completed.

Step1: Set a glass board on the machine conveyor.

Push the glass board to the front conveyor rail not to have any small gap between the board and the front conveyor rail.

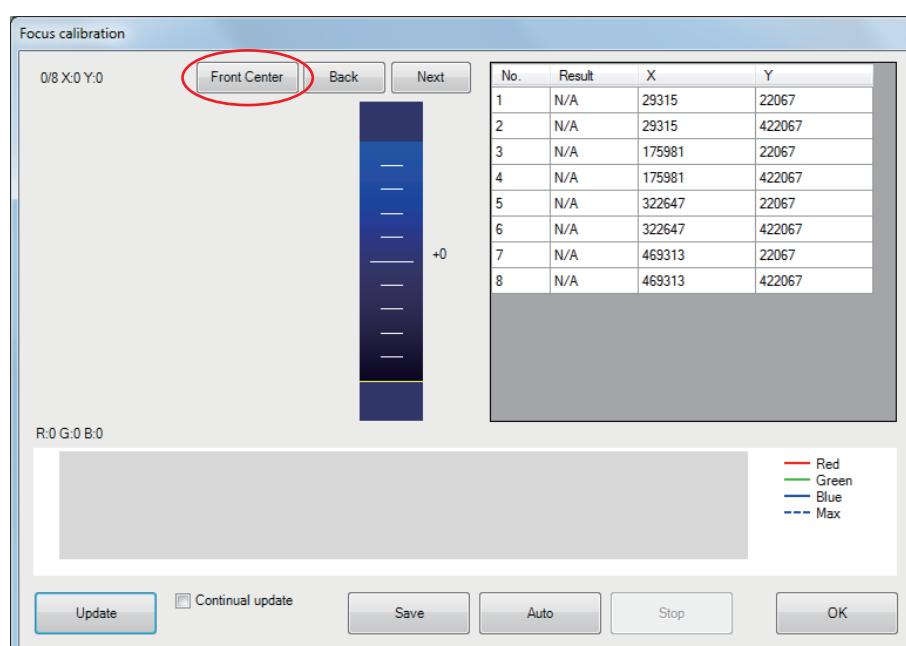
Then backup the glass board.



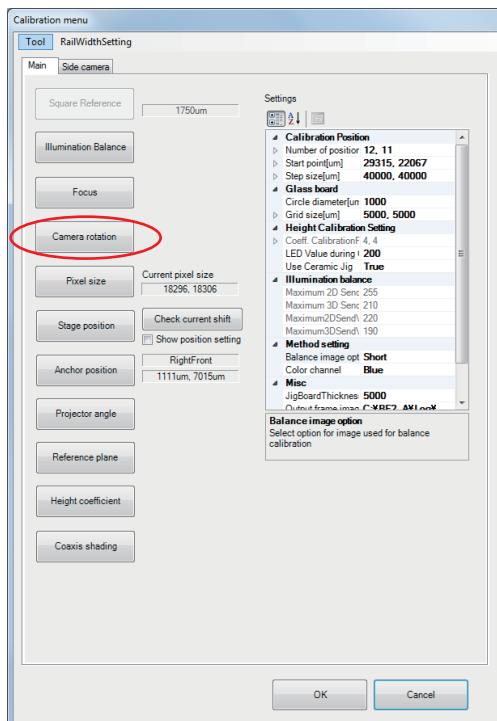
Step2: Click **Focus** from calibration menu to set XY-stage position.

The dialog shown below appears. Click **Front Center**.

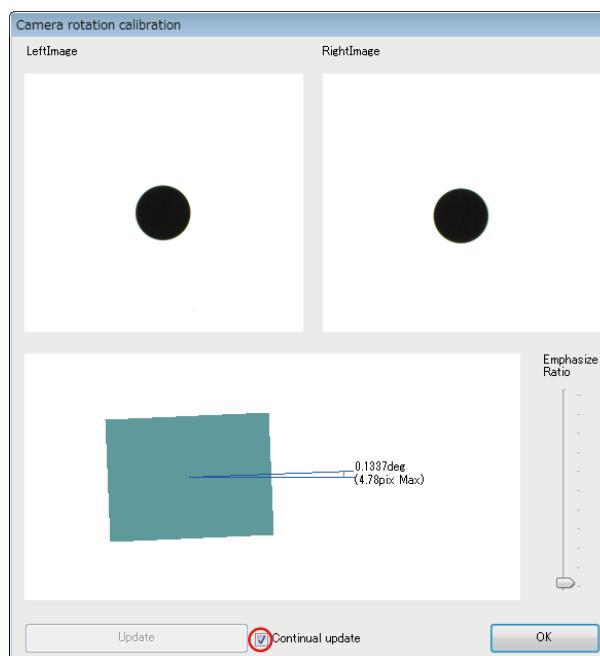
After click, optical head will move to front center position. Be careful about safety.



Step3: Click **Camera rotation** from the calibration menu and **Camera rotation calibration** dialog appears.



Step4: Check **Continual Update** and camera rotation result is displayed.
The tolerance of the camera rotation is **within 0.2 pixel**.



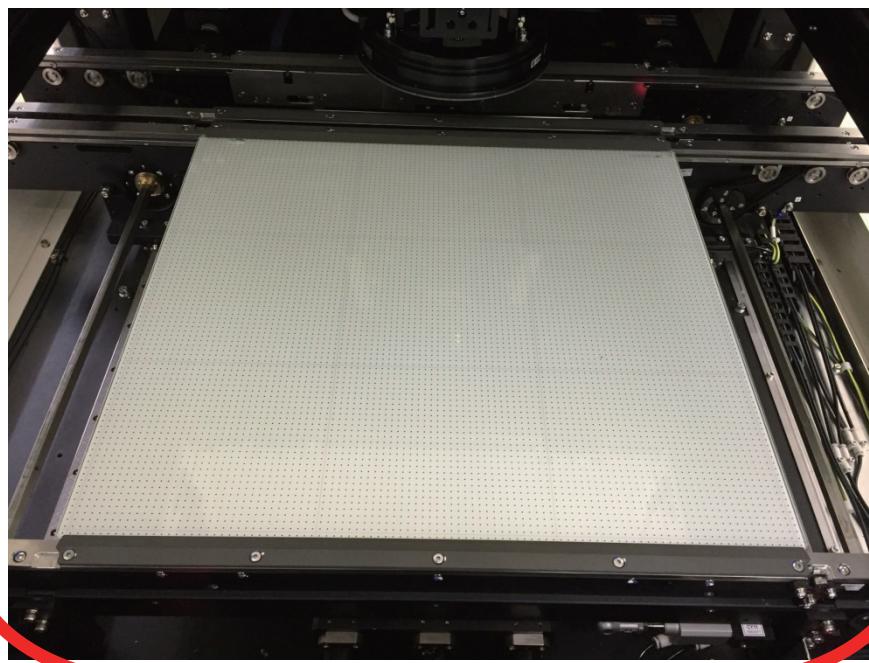
Step5: If the camera rotation is out of the tolerance, rotate the position of glass board.

CAUTION

The camera rotation of optical head is fixed in the factory.

Basically, you don't need to adjust the rotation.

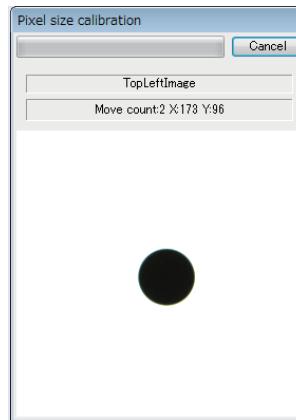
If you remove camera or lens, you need to adjust them.



Rotate glass board to adjust camera rotation

4 Pixel Size Calibration

Step1: Select **Pixel Size** from the calibration menu. This calibration is automatically performed.



5 Stage Position Calibration

Step1: Set number of position.

BF-3Di-L1 : (X, Y) = (12, 11)

BF-3Di-D1 : Lane A (X, Y) = (12, 11)

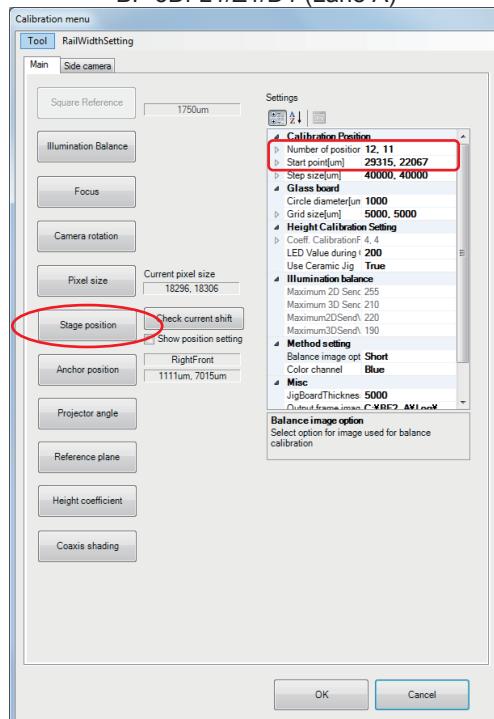
: Lane B (X, Y) = (12, 11)

BF-3Di-Z1 : (X, Y) = (12, 16)

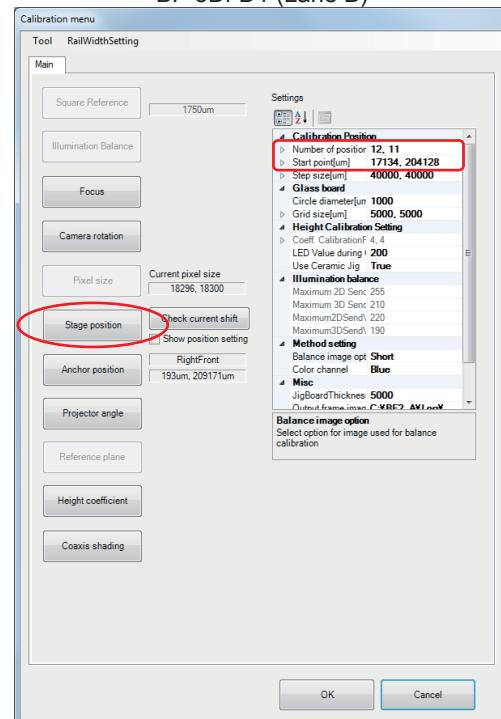
Click **Stage Position** from the calibration menu. This calibration is automatically performed.

NOTE In the case of D1, calibrate stage position not only lane A but also lane B.

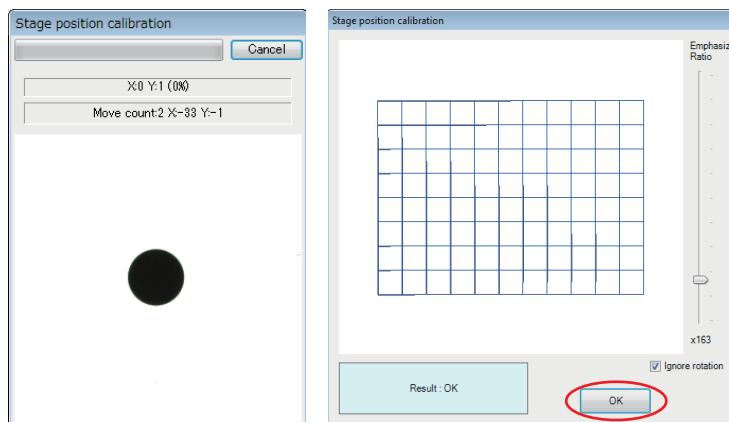
BF-3Di-L1/Z1/D1 (Lane A)



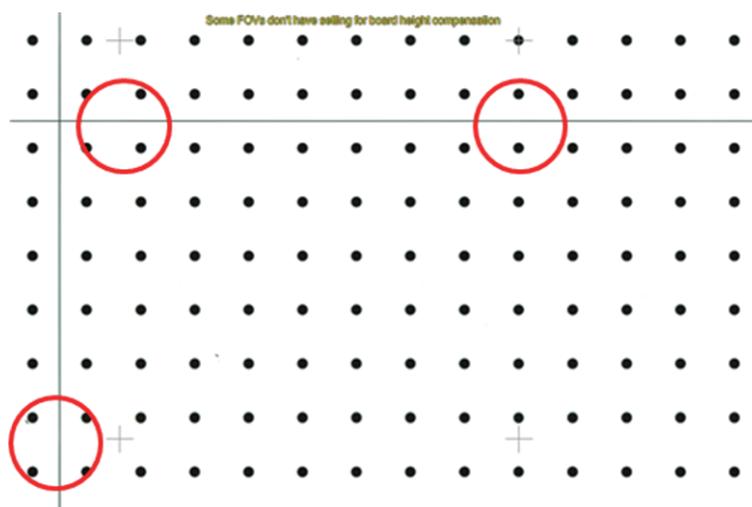
BF-3Di-D1 (Lane B)



Step2: After the result is displayed click **OK** to close the dialog.



Step3: Scan the glass board and check if there are no gaps on black lines between FOVs.

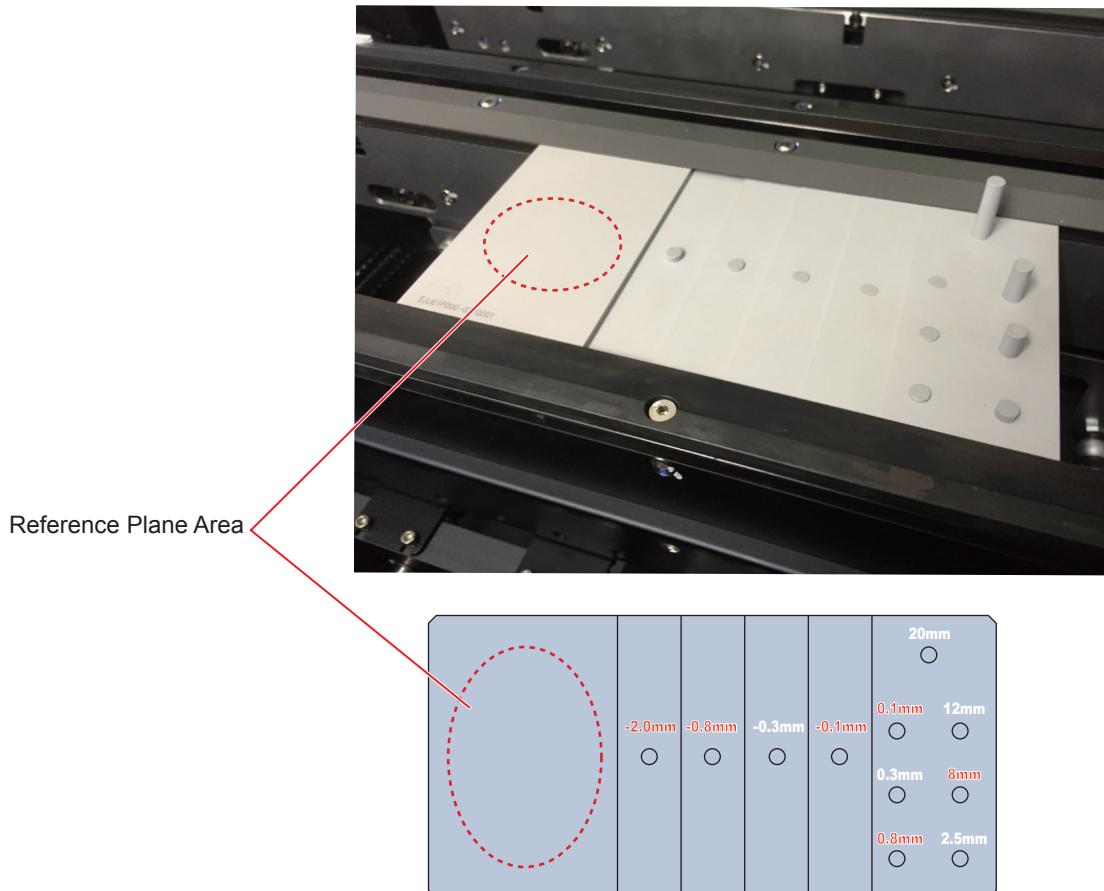


In case there is any gap as below, adjust camera rotation again.

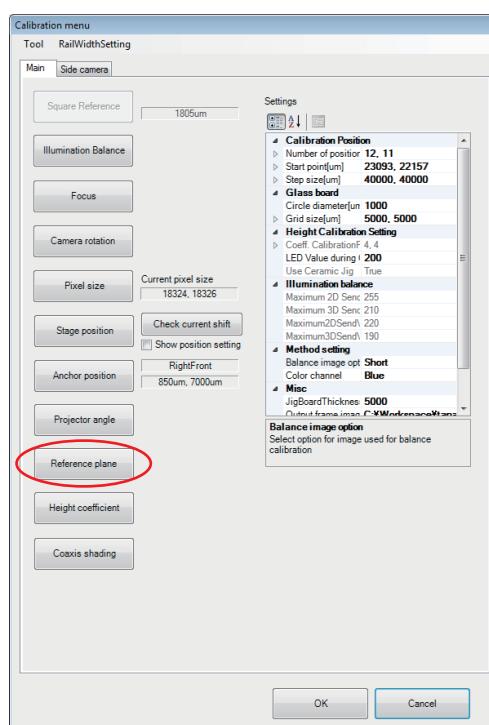


6 Reference Plane / Height Coefficient

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



Step2: Click **Reference plane** from the calibration menu.



Step3: The dialog shown below appears.

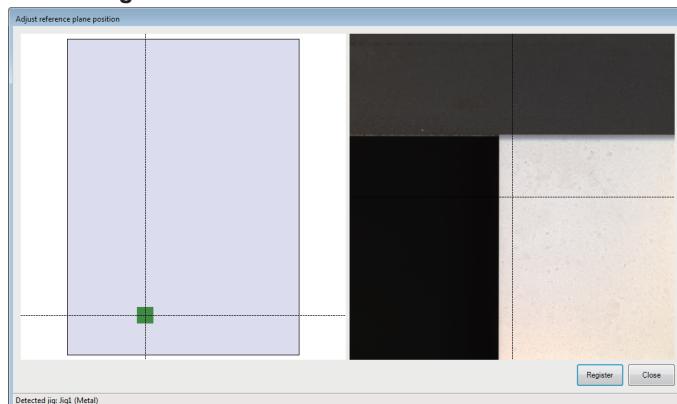
Click the reference plane area. The FOV moves to the clicked position.

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

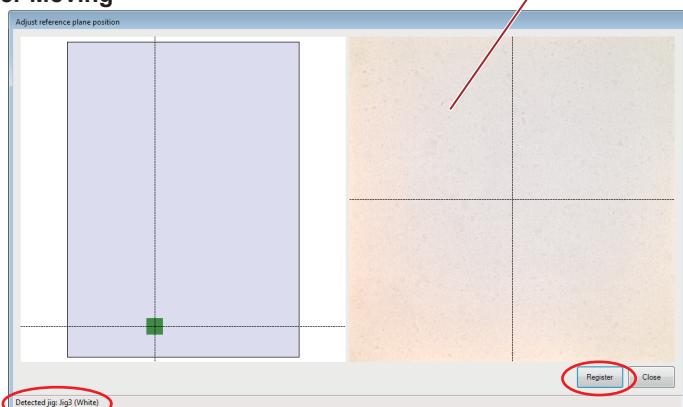
CAUTION

After FOV moved to reference plane area, check the message **Detected Jig:Jig3(white)**.

Before Moving

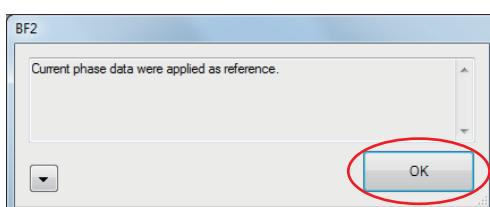


After Moving

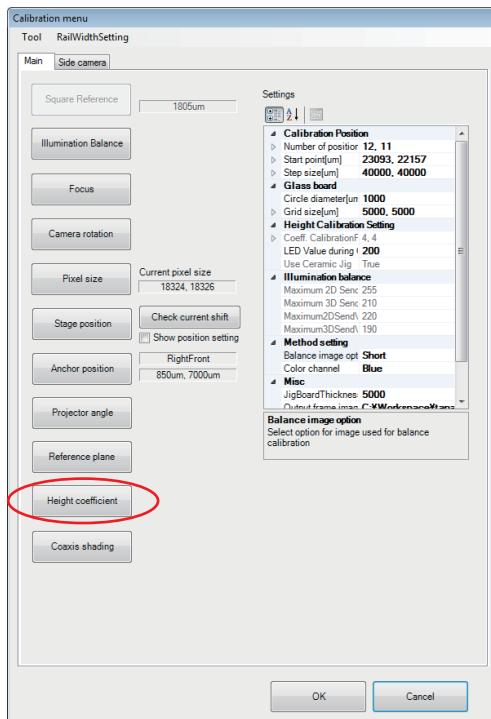


Step4: The dialog shown below appears. Select **OK**.

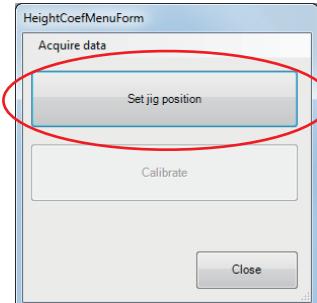
Reference register is completed.



Step5: Click **Height coefficient** from the calibration menu.



Step6: The dialog shown below appears. Click **Set jig position**.



Step7: Check the measurement value of inspection sheet for jig. Set the measurement value from the block height -2000 μm in order.

Repeat the following process.

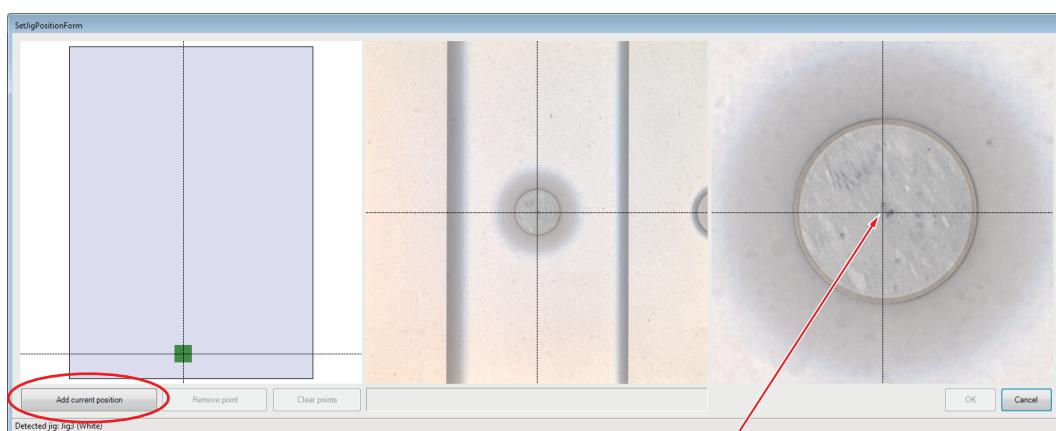
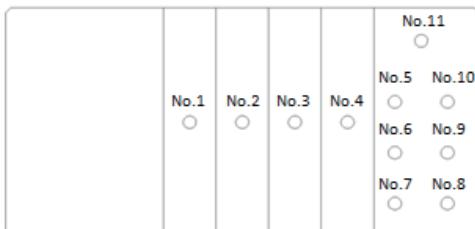
Move to the center of the block > Click **Add current position** > Set the measurement value
 > Move to the center of the next block

After finishing to set -2000 μm , -800 μm , -100 μm , 100 μm , 800 μm and 8000 μm , go to step 8.

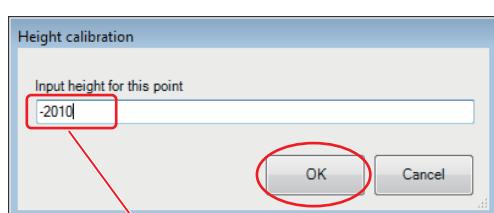
Don't need to set -300 μm , 300 μm , 2500 μm , 12000 μm and 20000 μm .

Part number : SJHG1P000-02
 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



The FOV moves to the clicked position.
 Set cross line at the center of the block.



Unit of this value is [μm]

Step8: Set the zero position.

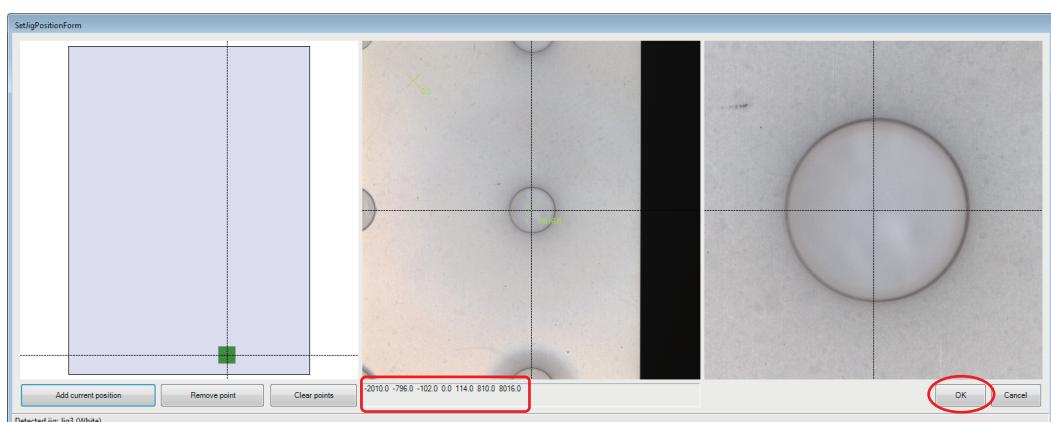
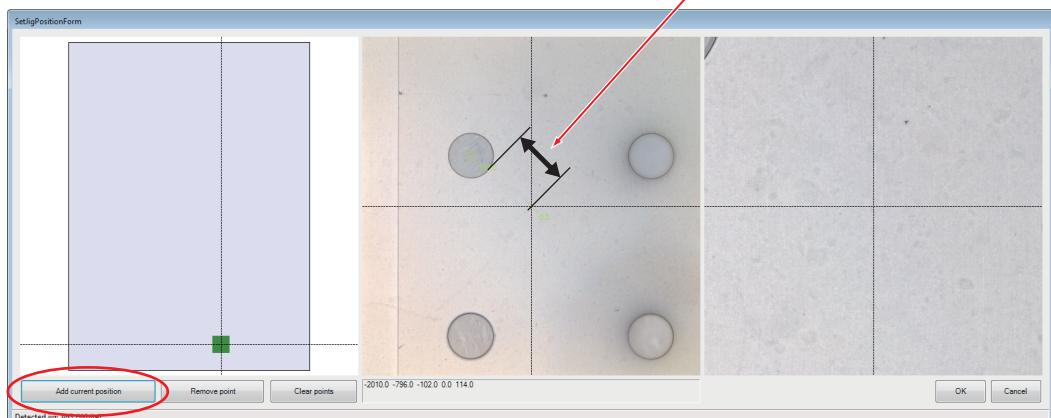
Click the position away about 5mm to the bottom right from the edge of the block (Height:100μm).

Select **Add current position** and enter 0 in **Height calibration** dialog.

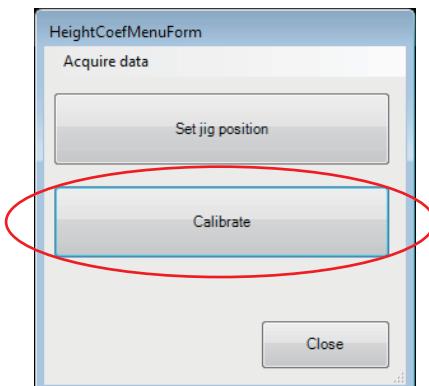
The setting of 5mm may be the approximate position.

Click **OK**.

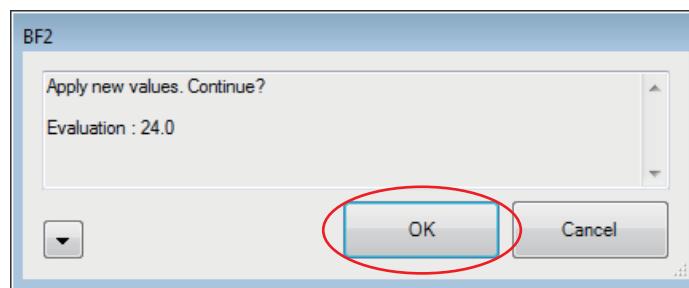
The distance is about 5mm



Step9: Click **Calibrate**.



Step10: The dialog shown below appears. Click **OK**. This completes the calibration.

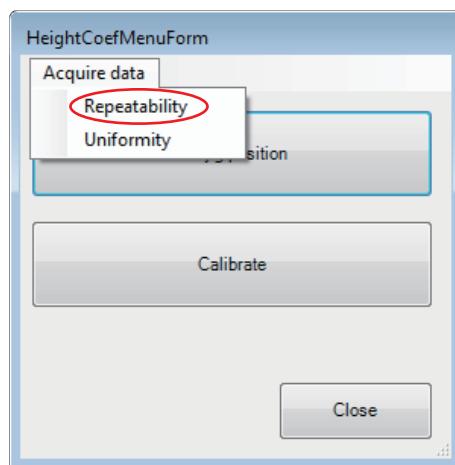


7 Repeatability/Uniformity

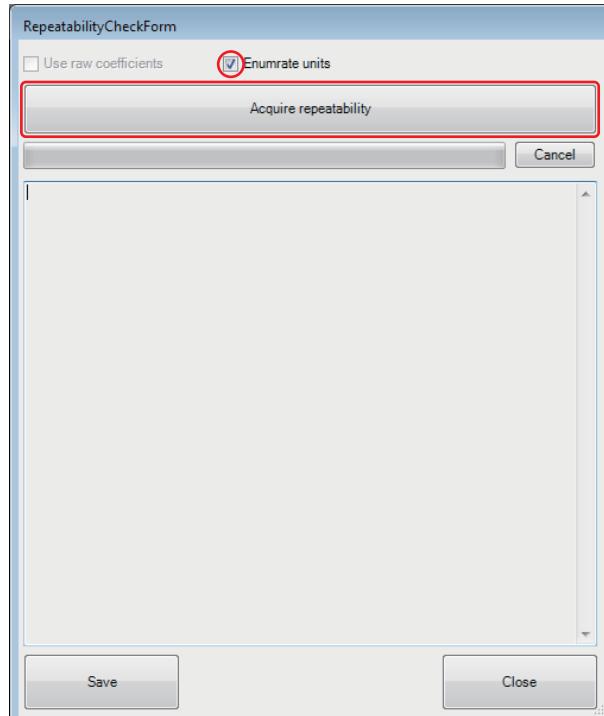
7.1 Repeatability

NOTE After calibrating, check the repeatability and uniformity performance.

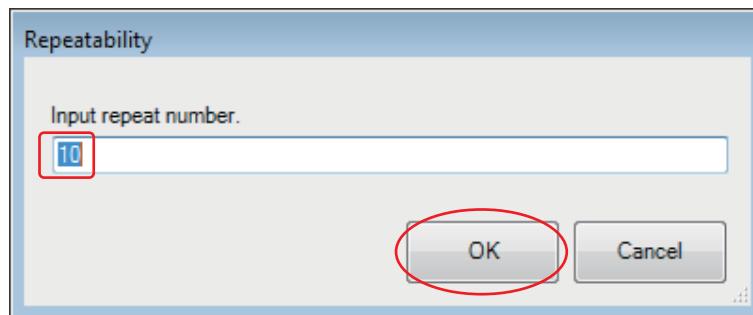
Step1: Select **Acquire data tab > Repeatability**.



Step2: The dialog shown below appears. Check **Enumrate units** and click **Acquire repeatability**.



Step3: The dialog shown below appears. Enter **10** in **Input repeat number** field and click **OK**.



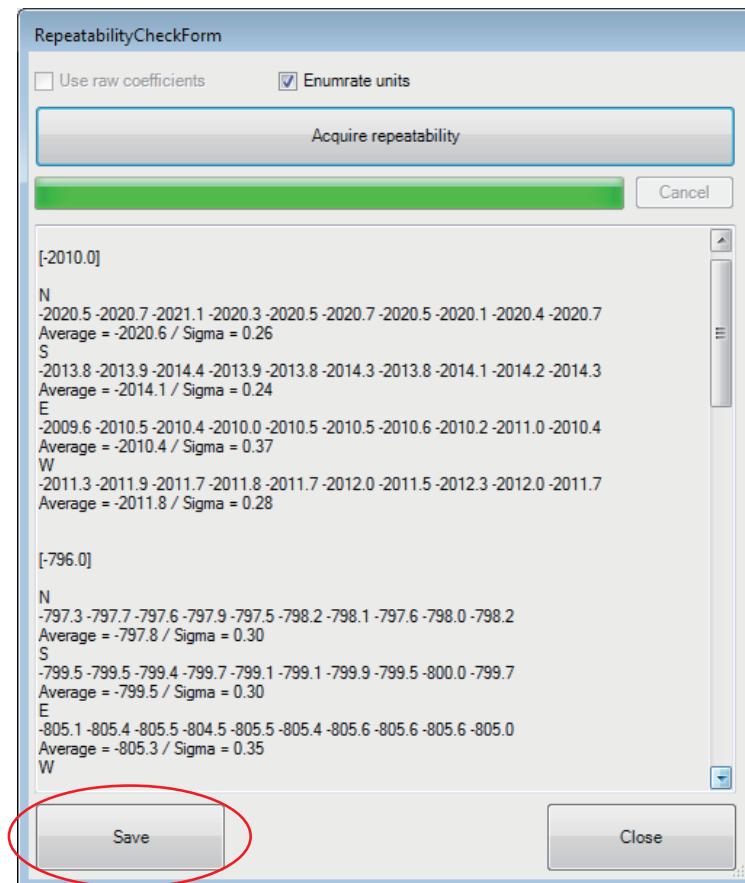
Step4: Check the repeatability performance

Standard Specification (Sigma):

When using the height calibration jig between -2000um and 2500um : 0.66 μ m or less

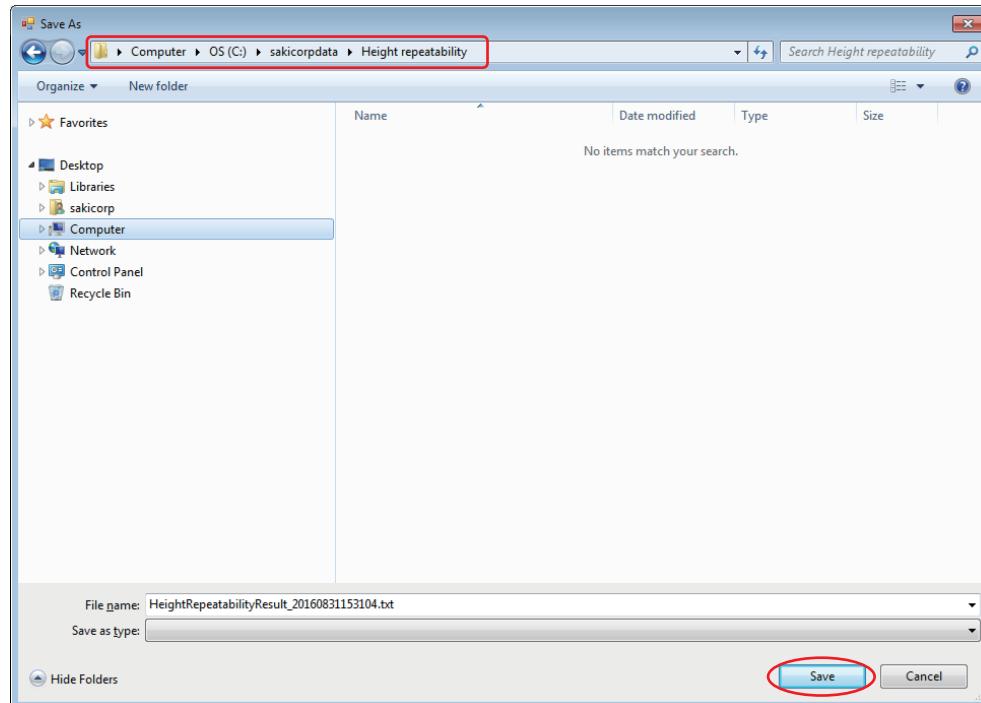
When using the height calibration jig of 8000 μ m : 3.33 μ m or less

After checking the data, click **Save**.



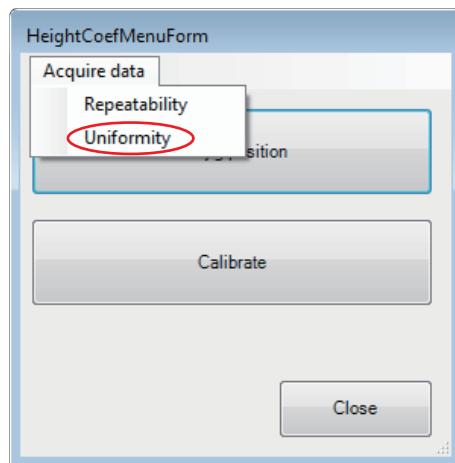
Step5: The dialog shown below appears.

Save the repeatability data in C:\sakicorpdata\Height repeatability.

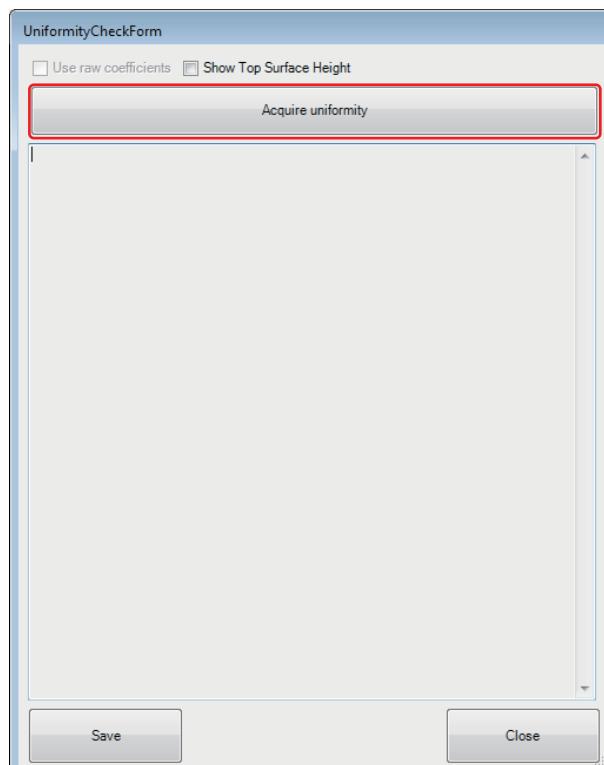


7.2 Uniformity

Step1: Select **Acquire data** tab > **Uniformity**.



Step2: The dialog shown below appears. Click **Acquire uniformity**.

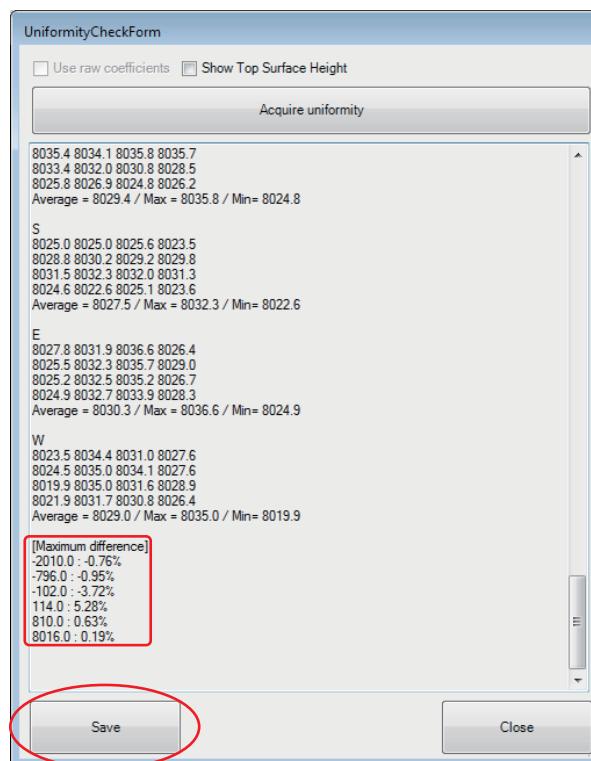


Step3: Check the uniformity performance.

Standard Specification (Maximum difference) :

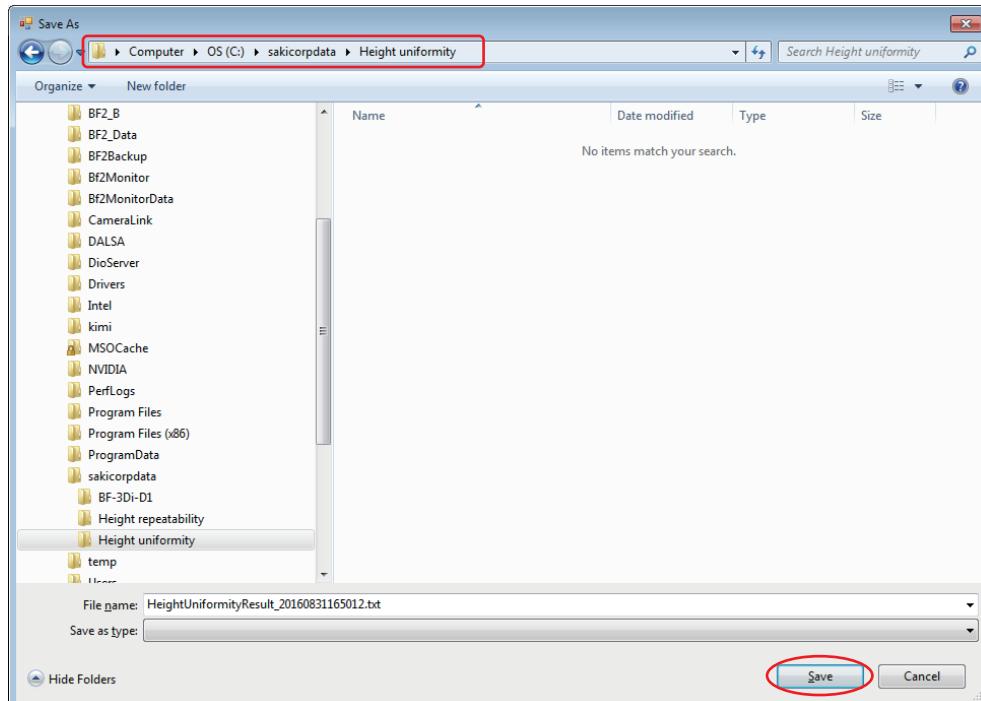
When the height calibration jig is -100um and 100um : Within 10%

After checking the data, click **Save**.

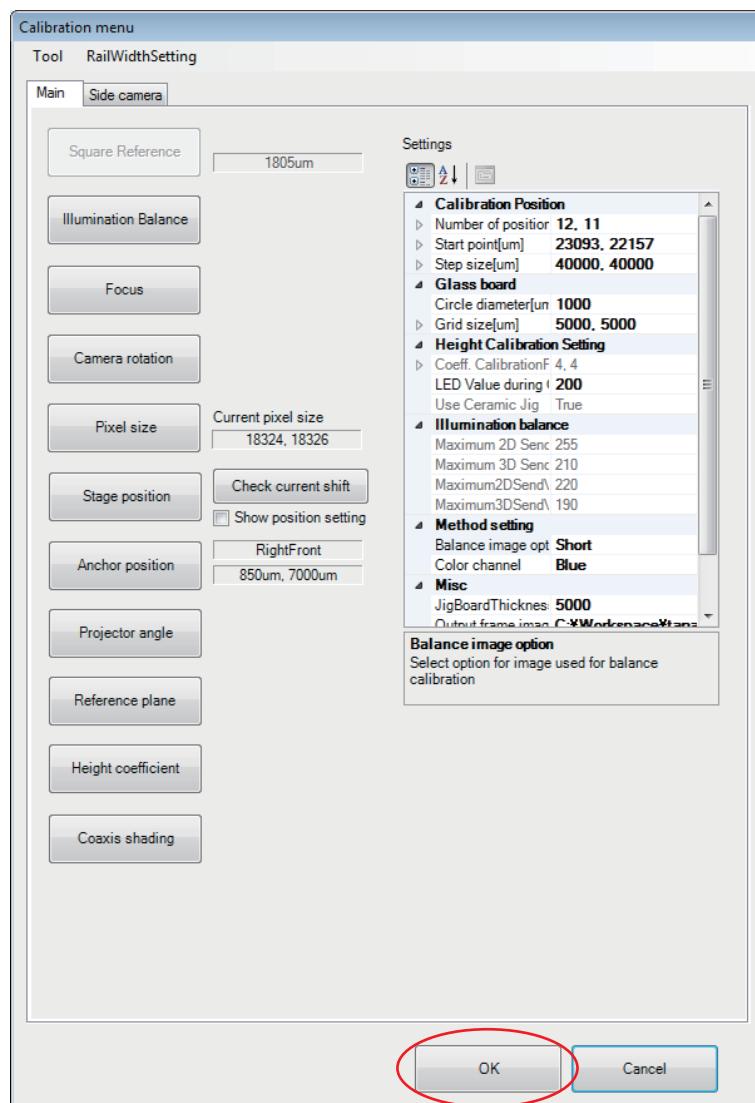


Step4: The dialog shown below appears.

Save the uniformity data in C:\sakicorpdata\Height uniformity.



Step5: After all procedures are completed, click **OK** on the calibration menu to apply the calibration.



Revision	Date	Contents	Written by
01	2016/04/18	Release	H.Tanaka
02	2016/09/01	<ul style="list-style-type: none"> - Changed level to A from C - Remove metal height jig - Adoption of White ceramic jig - Remove step for setting of “Use ceramic jig” in 6 Reference Plane / Height Coefficient - Added Uniformity to 7 Repeatability - Added P/N of Glass board - Added target value in case of Double(short 1ms) for N, S, E, and W in 1 Adjust Luminance value of 2D and 3D LED 	H.Tanaka