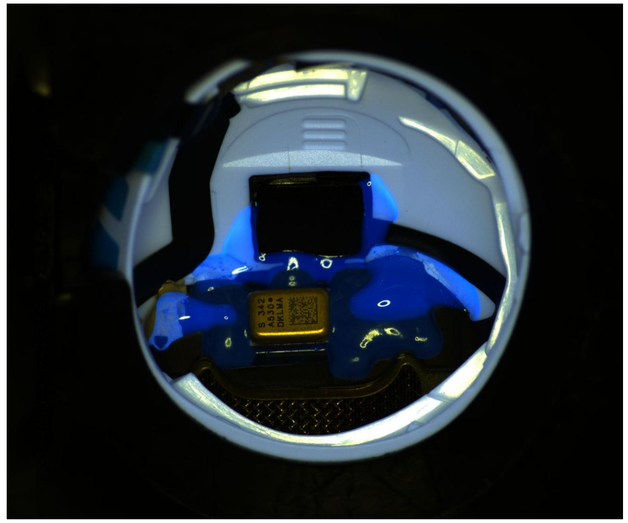
H593 SCUD Vision Flow Ver 1.0

H593 | Glue path AOI Vision flow change list

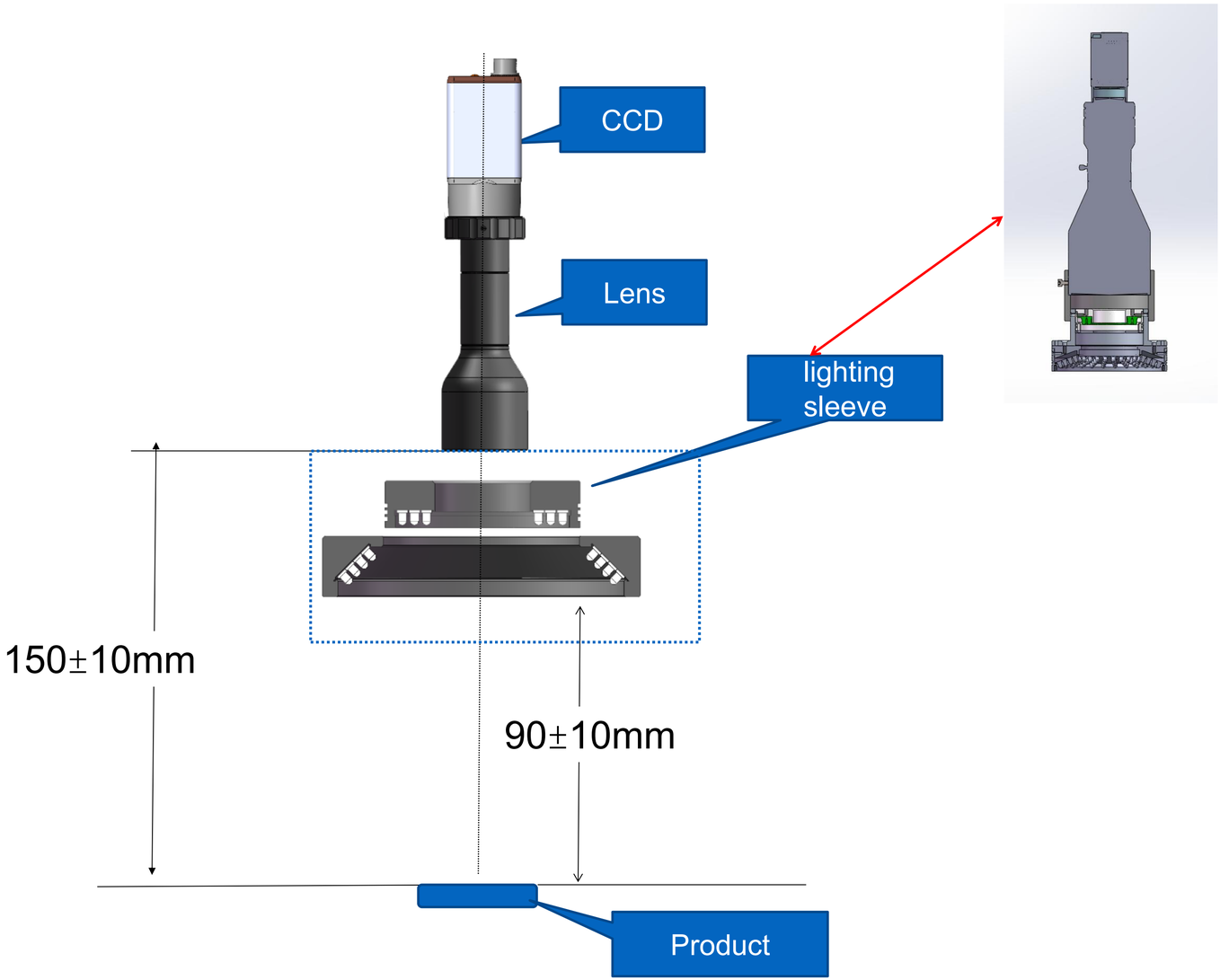
Station ID	Station Description	Vendor	Process Type		MIL
H593		COWAIN	Dispense		

Audio | H593 Vision Flow |Glue path information



ID	Type	CircleMoc	MX	MY	MZ	TX	TY	TZ	TR	TA	Speed	AccSpeed	IOStatus	StartDela	EndDelay	StartDela	EndDelay	Section
1	0	-1	-	-	-	-2.97	-0.15	0	0	0	10	10	0	0	0	0	0	2_1
2	0	-1	-	-	-	-4.23	0.61	0	0	0	25	25	0	0	0	0	0	2_1
3	0	-1	-	-	-	-4.43	1.91	0	0	0	25	25	1	0	0	0	0	2_1
4	0	-1	-	-	-	-3.05	1.04	0	0	0	10	10	0	0	0	0	0	2_1
5	0	-1	-	-	-	-3.21	0.94	0	0	0	25	25	0	0	0	0	0	2_1
6	0	-1	-	-	-	-2.06	0.95	0	0	0	15	15	1	0	0	0	0	2_1
7	0	-1	-	-	-	2.48	0.63	0	0	0	20	20	0	0	0	0	0	2_1
8	0	-1	-	-	-	4.51	0.63	0	0	0	10	10	1	0	0	0	0	2_1
9	0	-1	-	-	-	6.29	0.7	0	0	0	20	20	0	0	0	0	0	2_1
10	0	-1	-	-	-	4.65	-0.36	0	0	0	20	20	1	0	0	0	0	2_1
11	0	-1	-	-	-	3.05	-0.69	0	0	0	20	20	1	0	0	0	0	2_1
12	0	-1	-	-	-	-1.68	-0.57	0	0	0	30	30	0	0	0	0	0	2_1
13	0	-1	-	-	-	-2.94	-0.16	0	0	0	30	30	1	0	0	0	0	2_1
MinX	-999	MaxX	999	MinY	-999	MaxY	999	MinZ	-999	MaxZ	999	MinR	-999	MaxR	999	MinA	-99	MaxA

ID	Type	CircleMoc	MX	MY	MZ	TX	TY	TZ	TR	TA	Speed	AccSpeed	IOStatus	StartDela	EndDelay	StartDela	EndDelay	Section
1	0	-1	-	-	-	2.97	0.15	0	0	0	10	10	0	0	0	0	0	3_1
2	0	-1	-	-	-	4.23	-0.61	0	0	0	25	25	0	0	0	0	0	3_1
3	0	-1	-	-	-	4.43	-1.91	0	0	0	25	25	1	0	0	0	0	3_1
4	0	-1	-	-	-	3.05	-1.04	0	0	0	10	10	0	0	0	0	0	3_1
5	0	-1	-	-	-	3.21	-0.94	0	0	0	25	25	0	0	0	0	0	3_1
6	0	-1	-	-	-	2.06	-0.95	0	0	0	15	15	1	0	0	0	0	3_1
7	0	-1	-	-	-	-2.48	-0.63	0	0	0	20	20	0	0	0	0	0	3_1
8	0	-1	-	-	-	-4.51	-0.63	0	0	0	10	10	1	0	0	0	0	3_1
9	0	-1	-	-	-	-6.29	-0.7	0	0	0	20	20	0	0	0	0	0	3_1
10	0	-1	-	-	-	-4.65	0.36	0	0	0	20	20	1	0	0	0	0	3_1
11	0	-1	-	-	-	-3.05	0.69	0	0	0	20	20	1	0	0	0	0	3_1
12	0	-1	-	-	-	1.68	0.57	0	0	0	30	30	0	0	0	0	0	3_1
13	0	-1	-	-	-	2.94	0.16	0	0	0	30	30	1	0	0	0	0	3_1



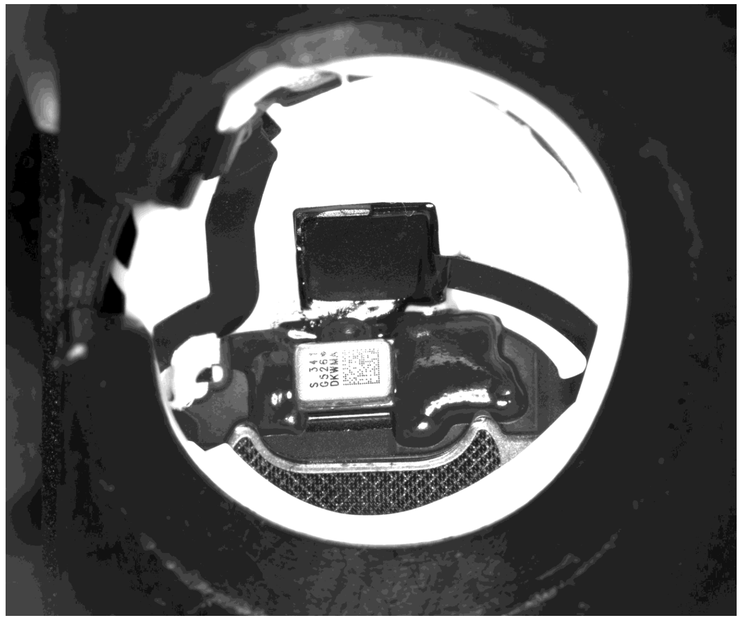
Vision System Diagram

Parameter			
Pixels	FOV	Resolution	DOF
2448*2048	21*17.5mm	0.008mm/pixel	2.5mm

BOM(for Dual_station)

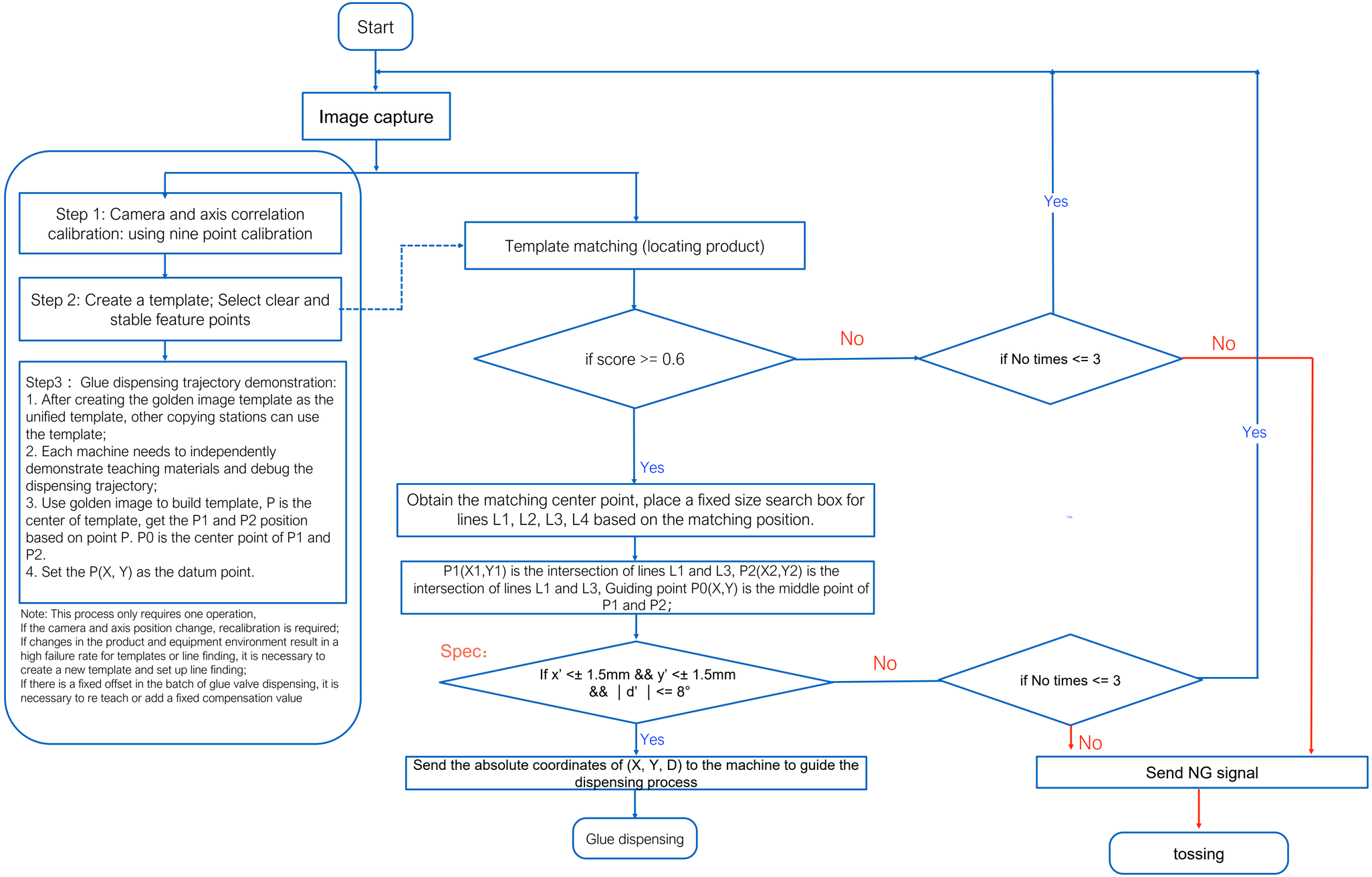
Item	Type	Description	Brand	Quantity
Camera	LY-H500C	5MP Color camera	Luster	2
Lens	EGXD-RDTD-150-04	Telecentric lens	Luster	2
Light1	LY-CLS-RS-25-EX-M-D28	lighting sleeve	Luster	2
License	VW-VA-SW-GLUE10	/	Luster	1

Glue path 1
Golden image1



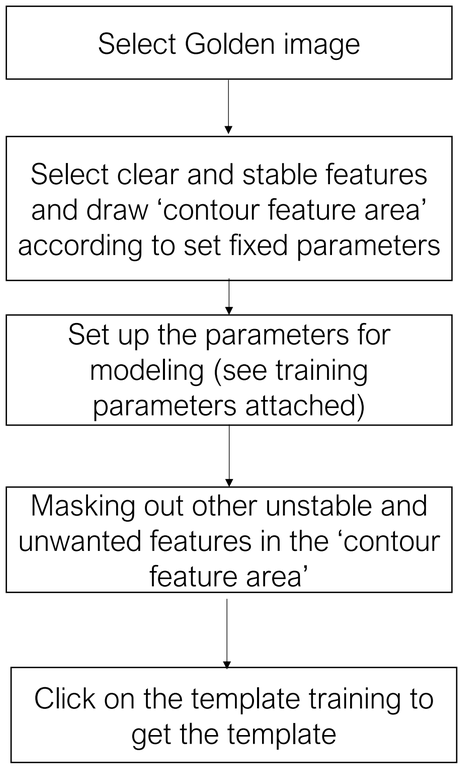
Detailed parameters of golden image1	
Pixel dimension	0.008mm
CCD resolution	2448*2048
Lens resolution	1000W, 1’
FOV	21mm*17.5mm
DOV	2.5mm
Lightning Brightness	200
Exposure time	20ms

Audio | H593 Vision Flow | Glue path – Workflow

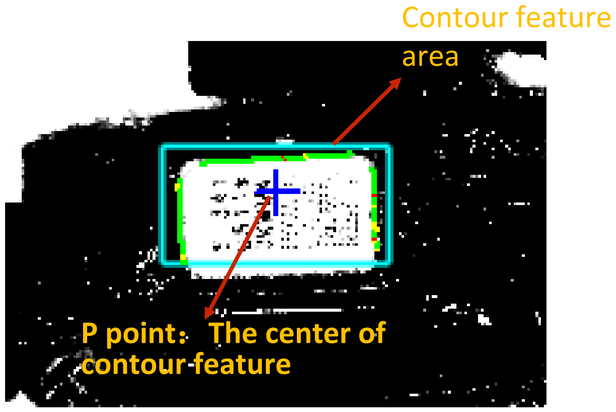


Pose 1 Vision Workflow

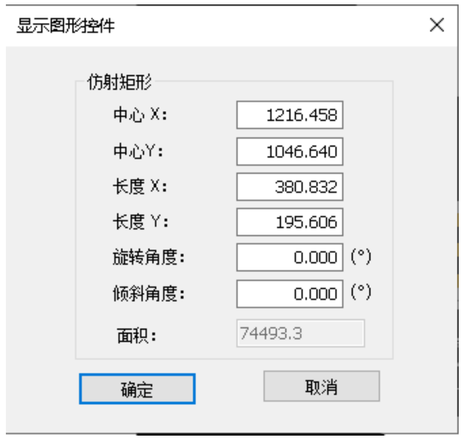
Step	Description	Page	Remark
1	Creating coarse finder templates Pose1	8	
2	Pattern Matching in Pose1	9	
3	Finding lines	10	
4	Glue path AOI Product Glue Path Edge	15	
5	Glue path AOI Glue Area Region	16	
6	FOF	23	



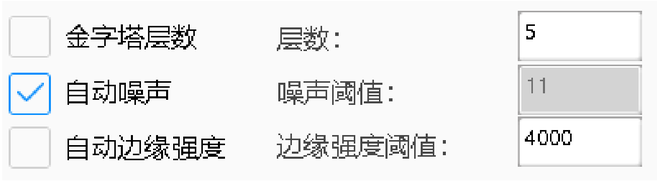
Modeling Process



Template



Contour feature area parameter



Training parameters

Modeling feature requirements：
1. Stable and clear outline edge, no dirty
2. Do not have multi-layer, complex contours
3. Search area, do not have a close shape of the edge of the contour

When modeling, make good use of the masking function to mask out the unwanted edge contour features. Leaving only stable and clear contour features

After the modeling is completed, need offline test with all the previous material images to confirm the compatibility of this template for all incoming materials.

Subsequent parameter changes need to be synchronized and updated to all other machines in this station.

Set matching parameter

↓

Take image for incoming product

↓

Search for the created template in the "Searching area"

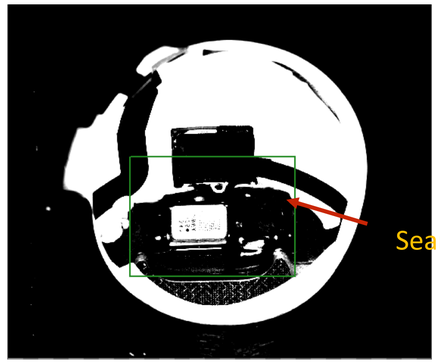
↓

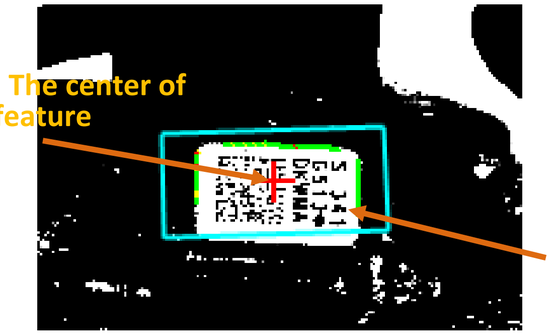
Compare all the contour features in the "search area" with the template for similarity, get all contours with scores greater than 0.5 , and sort all the scores from highest to lowest, then output the contour with the highest score

↓

The algorithm outputs the similarity score, position ("contour feature region" and centroid p), angle, and two-dimensional linear transformation matrix of this contour

Matching process





Actual Materials

ParameterList	
接受阈值	0.600000
对比度阈值	10.000000
重叠比例阈	0.800000
贪婪度	0.900000
搜索个数	1
是否开启全	否
⊞ 搜索区域	708.168558,
是否外部输	否
搜索模式	快速
开启支持边	否
任意极性	否
自动金字塔	否

Matching parameter

工位1定位_4196.搜索结果数组	[1]
[0]	{...}
二维线性变换	(-78.010565,181.570978),(0.985...
匹配点	(1100.795008,1218.578250)
角度	1.129471
分数	0.987555

Matching result

Base BFC build template, build the cordinate of material. According the location feature capture the position of searching box.

↓

Base the searching box position of finding line and finding circle and the parameter, find the correct line L1, L2, L3, L4

↓

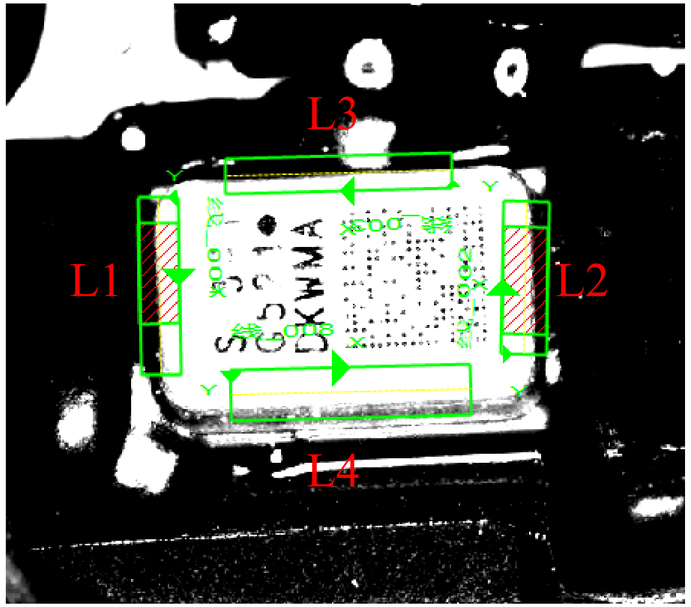
Point P1, P2, P3 is the intersection of line L1, L2, L3, L4

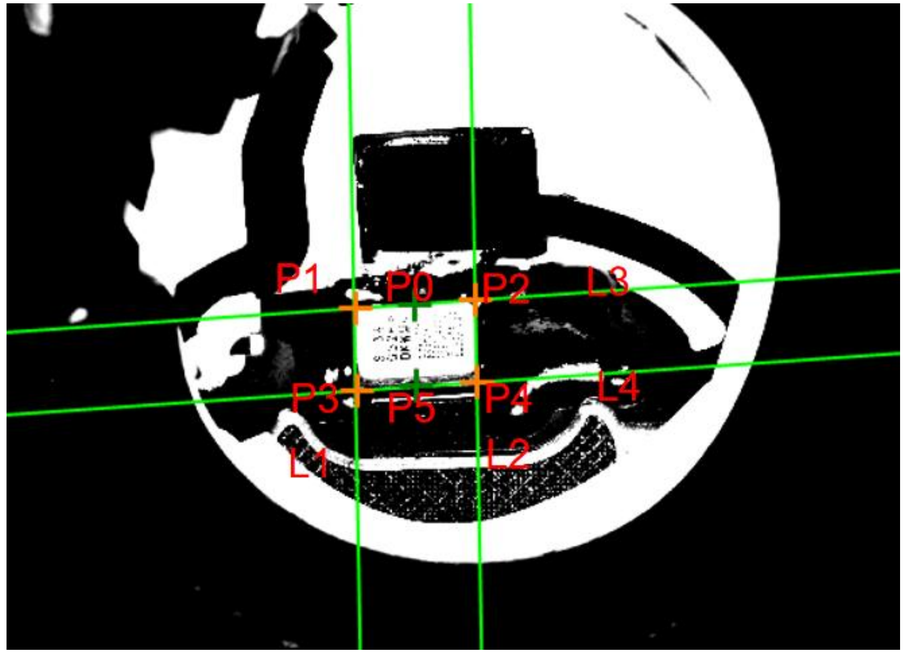
↓

Calculate the position of P1 and P2, P0 is the middle point.

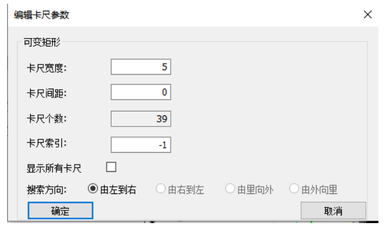
↓

Set the P0(X, Y) as the datum point





Result



L1 finding line parameters

L2 finding line parameters

L3 finding line parameters

L4 finding line parameters

According to the template, establish the coordinate system, use the p point as a fixed offset, get the search box's center of finding line tool and finding contour tool

↓

According to the set parameters and caliper parameters, find the correct line L1 and correct line L2

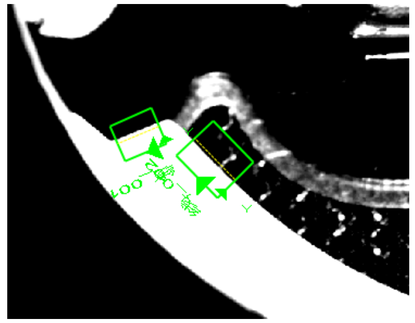
↓

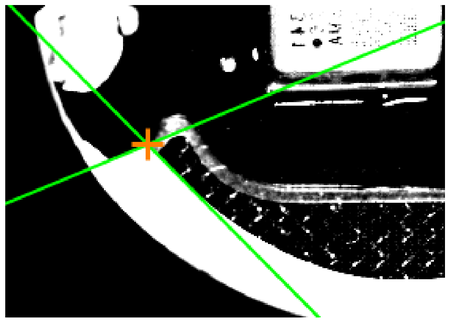
Get intersection P as the demonstrate point by L1 and L2

↓

Point P is the guiding point

Point demonstration process





L1 Caliper parameters

L2 Caliper parameters

Incoming material requirements:
1. to ensure that the difference between the material and the modeled material can not be too large (visual inspection can not have obvious differences in the structure)
2. dirty, foreign matter also can not have a lot, can not obscure the modeled features;

Glue Path AOI MSOP

The algorithm, inspection definition and spec of the glue path AOI.

H593 | Glue path AOI Product Glue Path Edge

No Glue

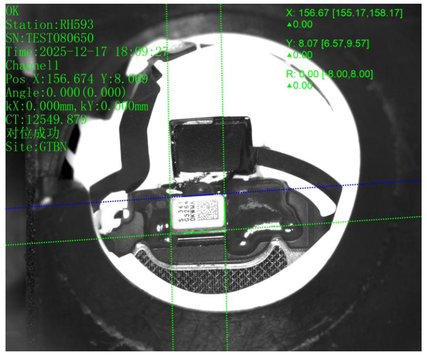
The areas of the glue > 0mm²

Glue Coverage-Shift

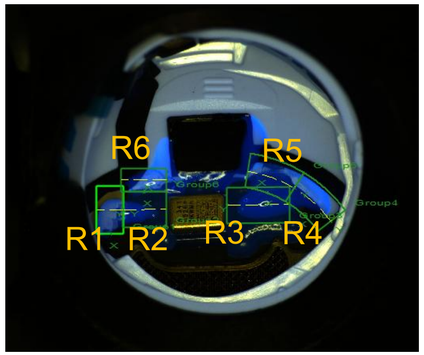
The R1/R2 coverage line should be >=100 % covered by glue path

Glue Missing

Pre-dispense image



Post-dispense image



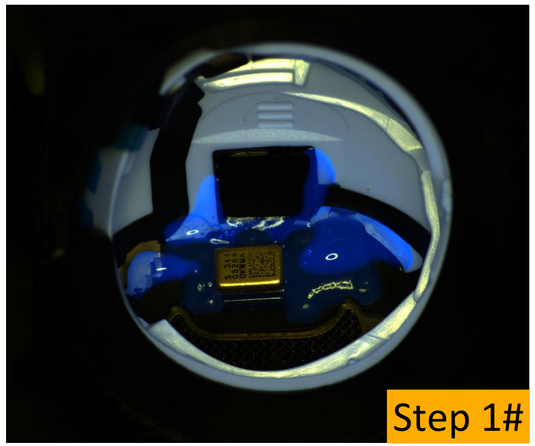
Legend:

- Glue Path Edge
- Glue Coverage Line
- Glue Area Region
- Keep out zone

Pix accuracy:0.0086mm/pix

Region	No Glue	Glue Coverage-Shift	Glue Missing-Area
R1	Glue area > 0mm²	/	Glue area > 0.92mm²
R2	Glue area > 0mm²	/	Glue area > 1.15mm²
R3	Glue area > 0mm²	/	Glue area > 2.18mm²
R4	Glue area > 0mm²	/	Glue area > 1.36mm²
R5	Glue area > 0mm²	/	Glue area > 1.22mm²
R6	Glue area > 0mm²	/	Glue area > 0.82mm²

Audio | Glue path AOI Product Glue Path Edge



Source image (post-dispense)

extract glue color

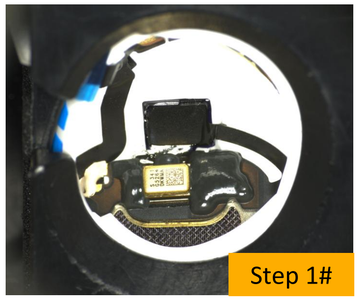
extract result

missing
Step 2#

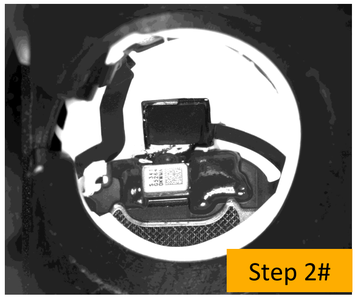
The purpose of this process is used to extract the Glue path

Step 1# Capture pose1 source image
Step 2# Extract the color of glue path
Step 3# Inspect the glue path

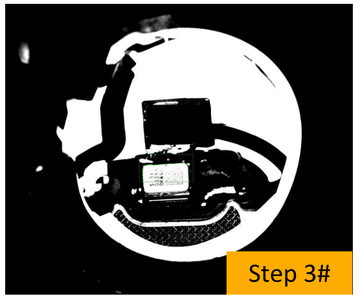
Audio | Glue path AOI Glue Area Region



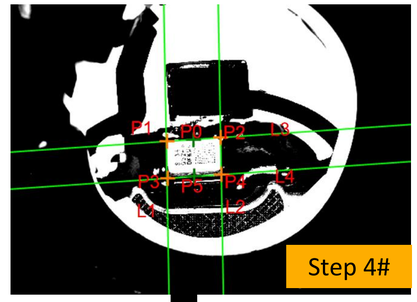
RGB to gray



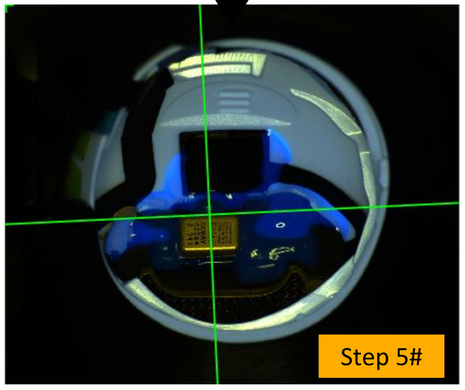
pattern match

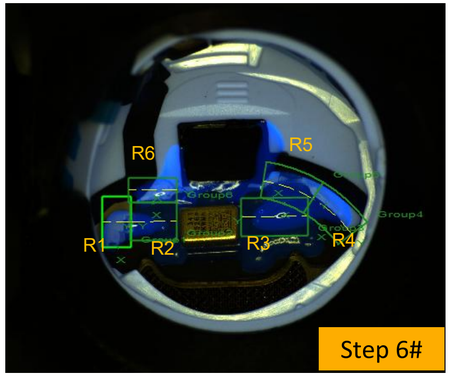


find line/circle



Create coordinate system





R1

Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	6.196	11.703	--	180.000	--	2.383	1.334

R2

Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	6.168	9.605	--	359.512	--	1.776	2.155

R3

Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	11.327	9.395	--	359.284	--	1.776	3.113

R4

Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	11.458	14.786	323.437	-22.500	5.475	1.690	2.482

R5

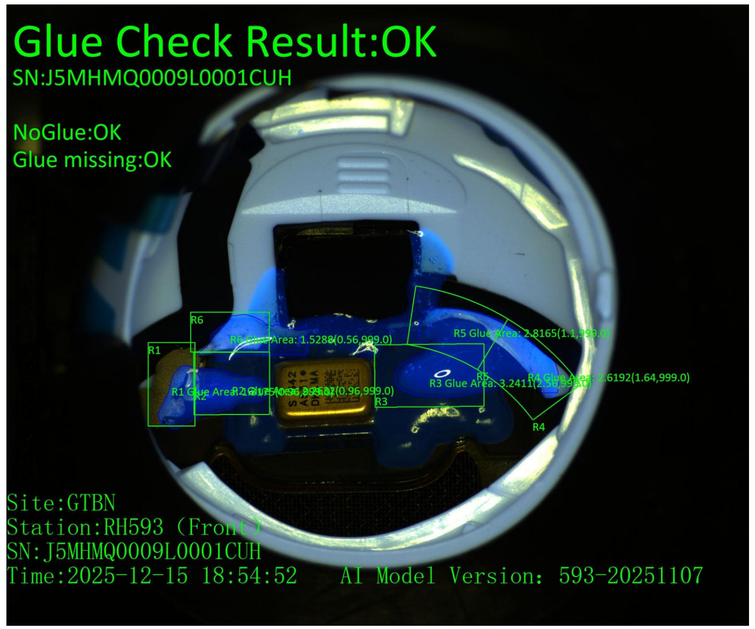
Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	11.458	14.786	300.937	-22.500	5.475	1.690	2.482

R6

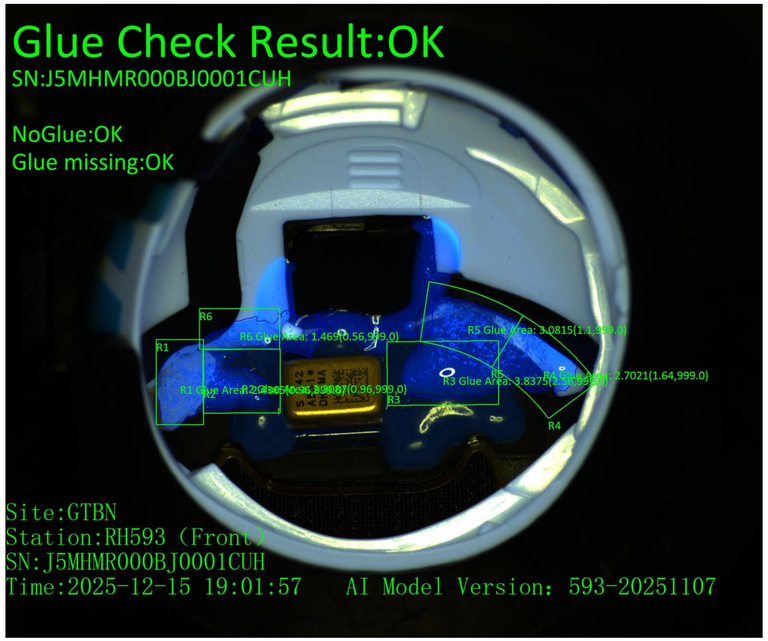
Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	8.322	9.587	--	180.000	--	1.135	2.244

The purpose of this process is used to find the position for dispense and region for coverage inspection:
Step 1# Capture pos1 source image
Step 2# RGB image to gray image
Step 3# Pattern match to get the place of the product
Step 4# Grab the product characteristics of line/circle to obtain L1, L2, L3, L4, P1, P2, P0 is middle point of P1&P2.
Step 5# Establish a product coordinate system by using P0 and L3.
Step 6# Place the glue inspection region according to product coordinate system

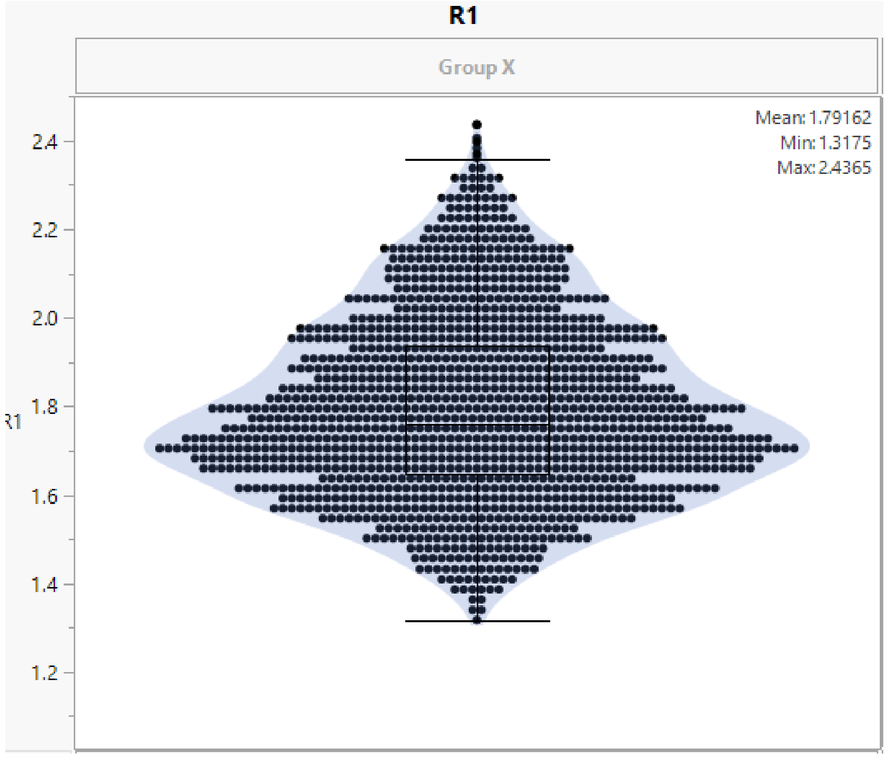
Pose1_Missing_R1 MIN: 1.3175



Pose1_Missing_R1 MAX: 2.4365



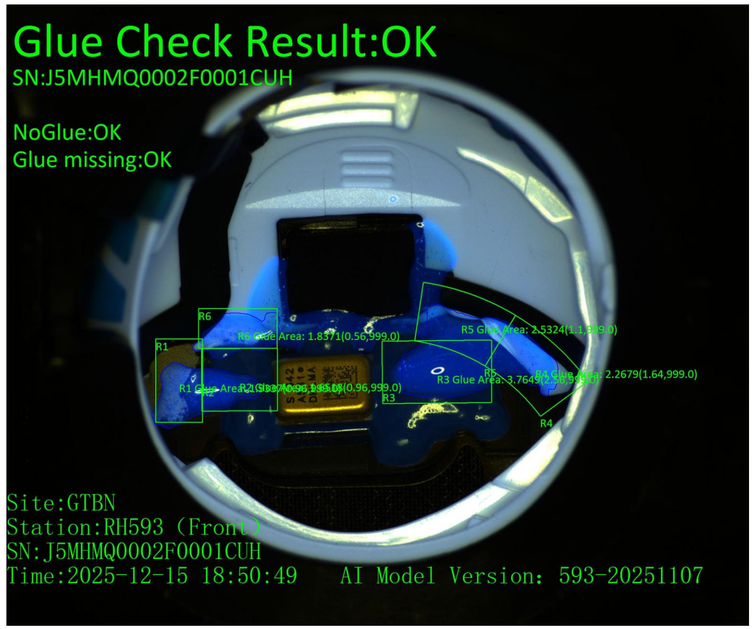
Pose1_Missing_R1 Data



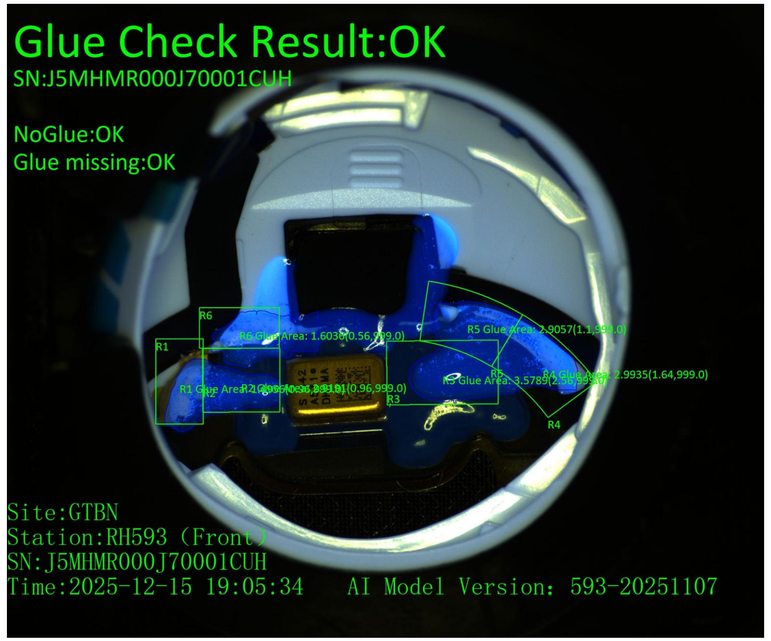
R1 Missing spec= Pose1_Missing_R1 MIN*0.7=1.3175*0.7=0.92

Audio | Glue path AOI Glue Coverage Region

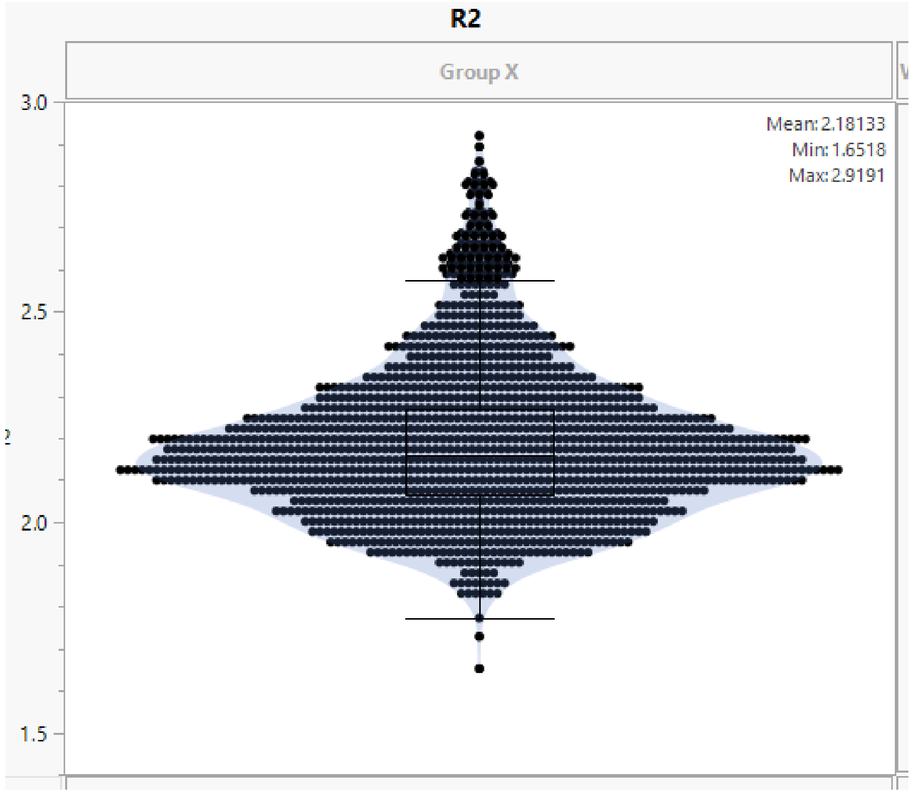
Pose1_Missing_R2 MIN: 1.6518



Pose1_Missing_R2 MAX: 2.9191



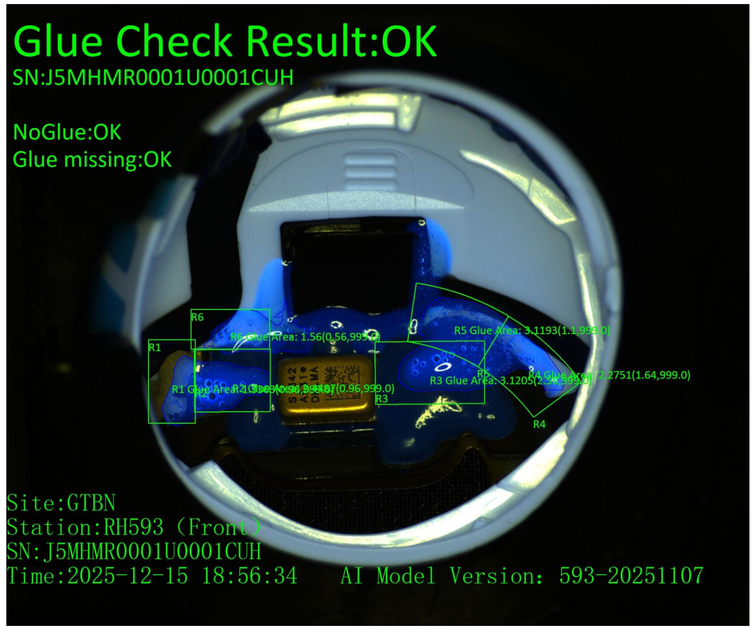
Pose1_Missing_R2 Data



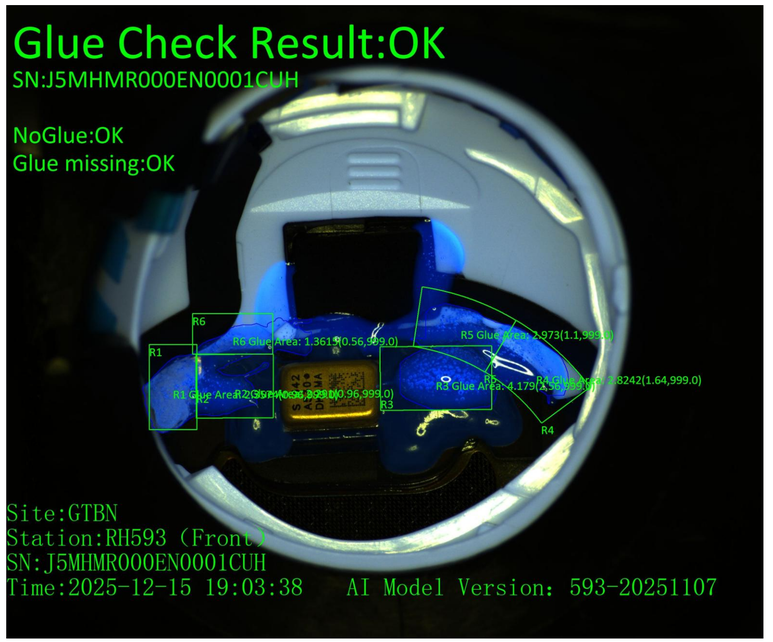
R2 Missing spec= Pose1_Missing_R2 MIN*0.7=1.6518*0.7=1.15

Audio | Glue path AOI Glue Coverage Region

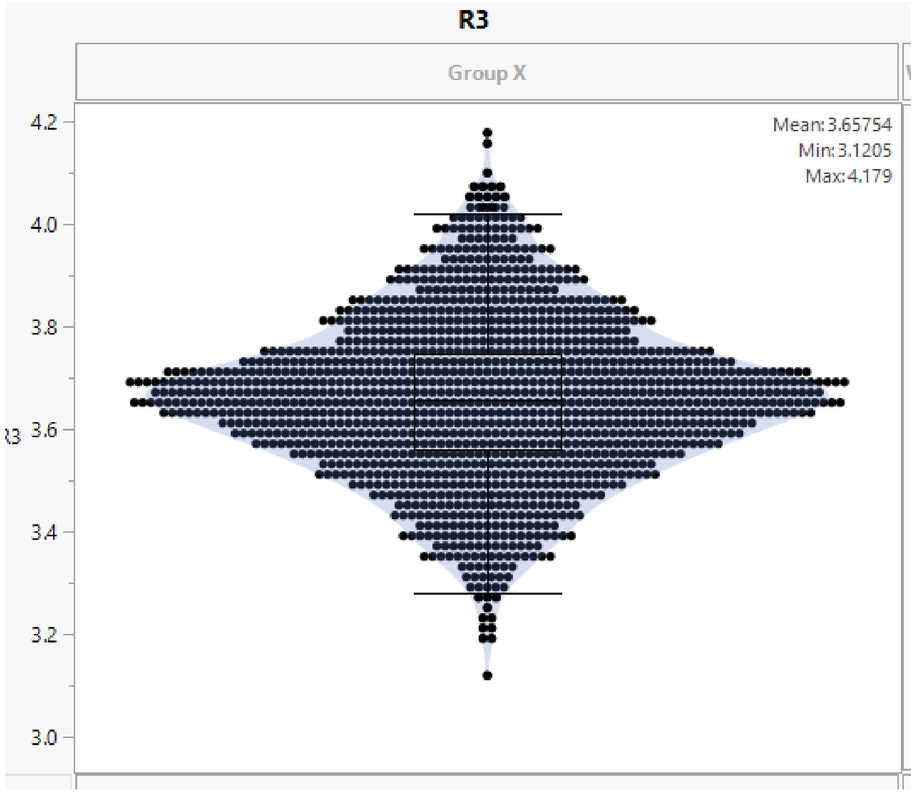
Pose1_Missing_R3 MIN: 3.1205



Pose1_Missing_R3 MAX: 4.179



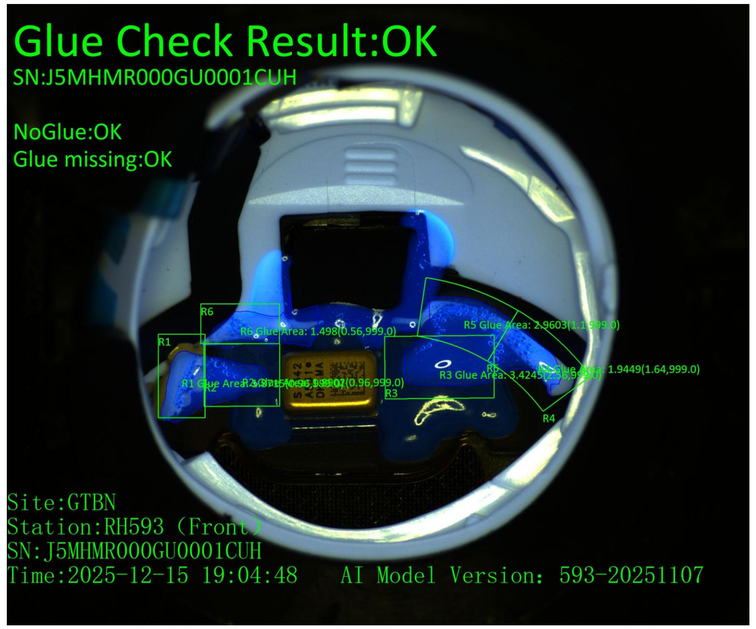
Pose1_Missing_R3 Data



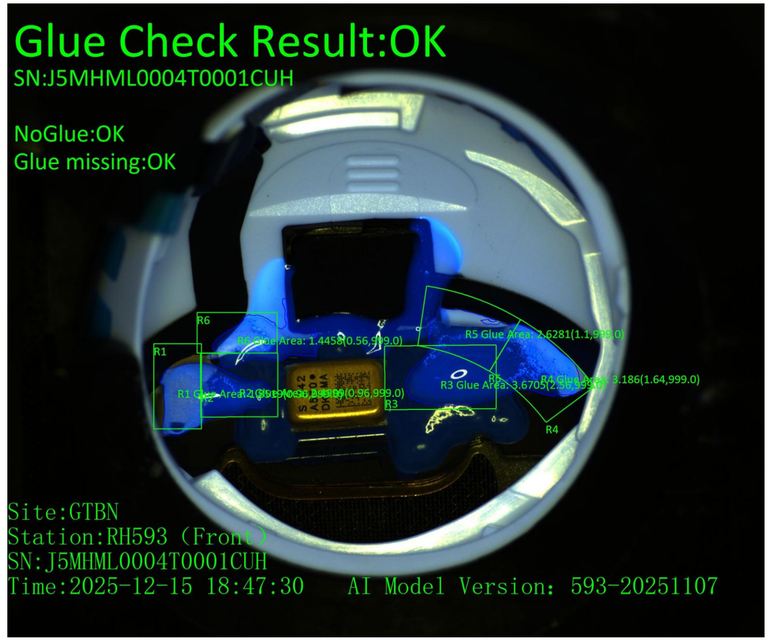
R3 Missing spec= Pose1_Missing_R3 MIN*0.7=3.1205*0.7=2.18

Audio | Glue path AOI Glue Coverage Region

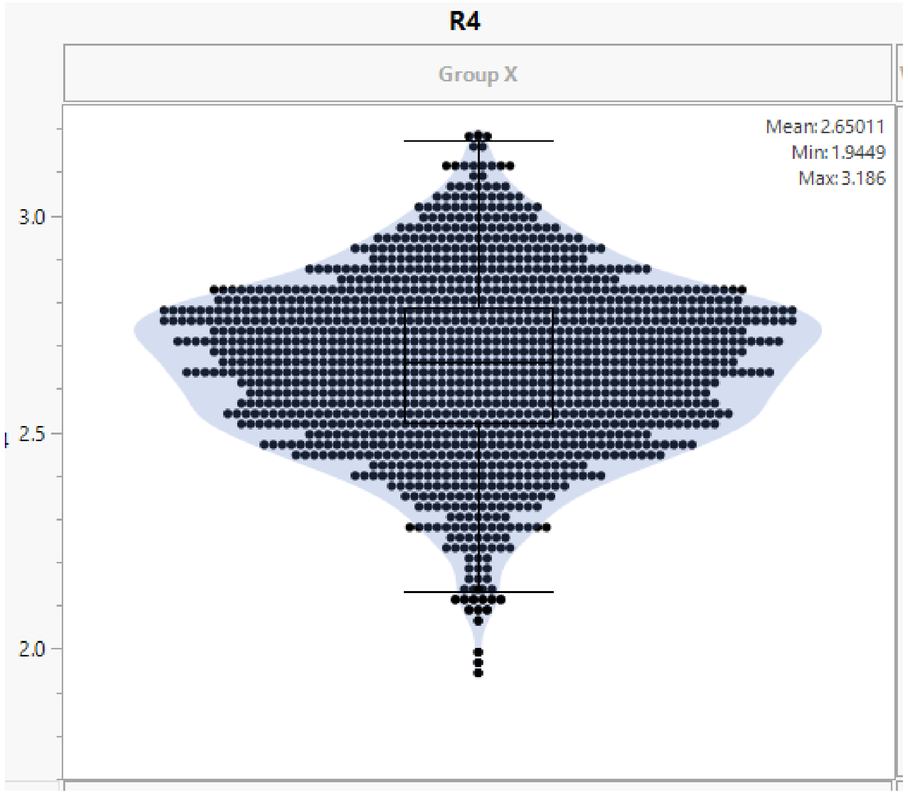
Pose1_Missing_R4 MIN: 1.9449



Pose1_Missing_R4 MAX: 3.186



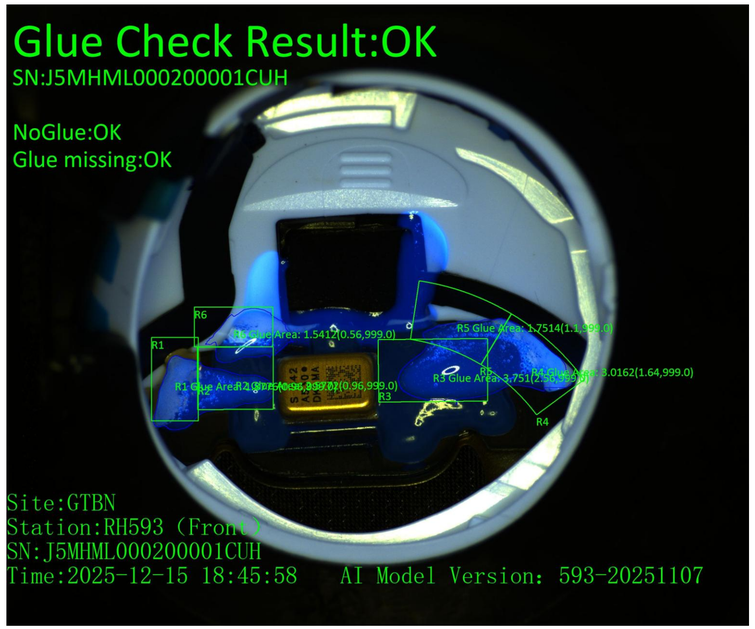
Pose1_Missing_R4 Data



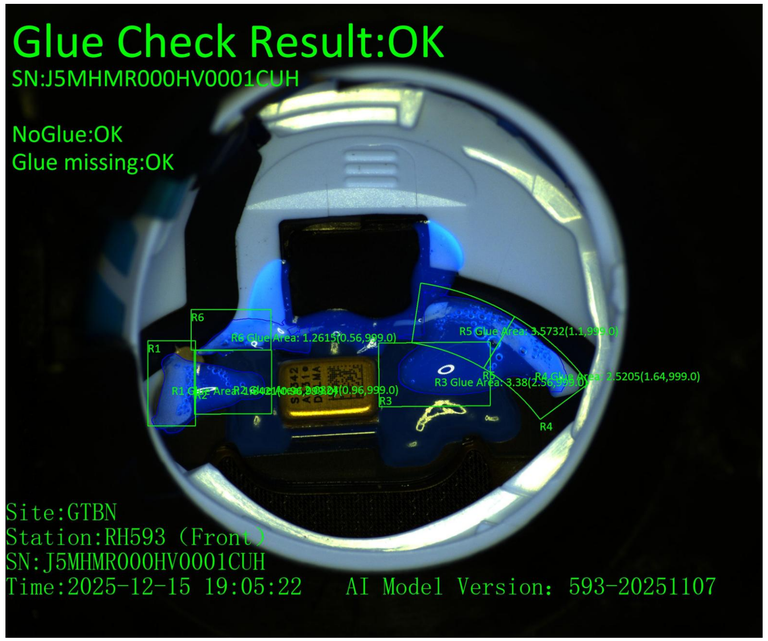
R4 Missing spec= Pose1_Missing_R4 MIN*0.7=1.9449*0.7=1.36

Audio | Glue path AOI Glue Coverage Region

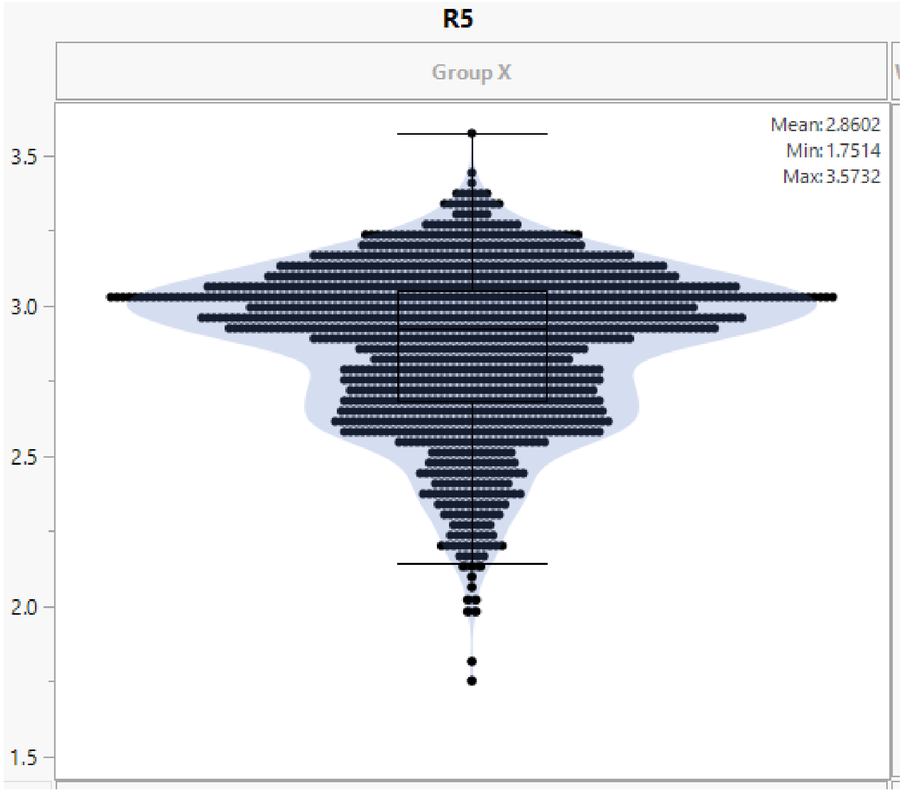
Pose1_Missing_R5 MIN: 1.7514



Pose1_Missing_R5 MAX: 3.5732

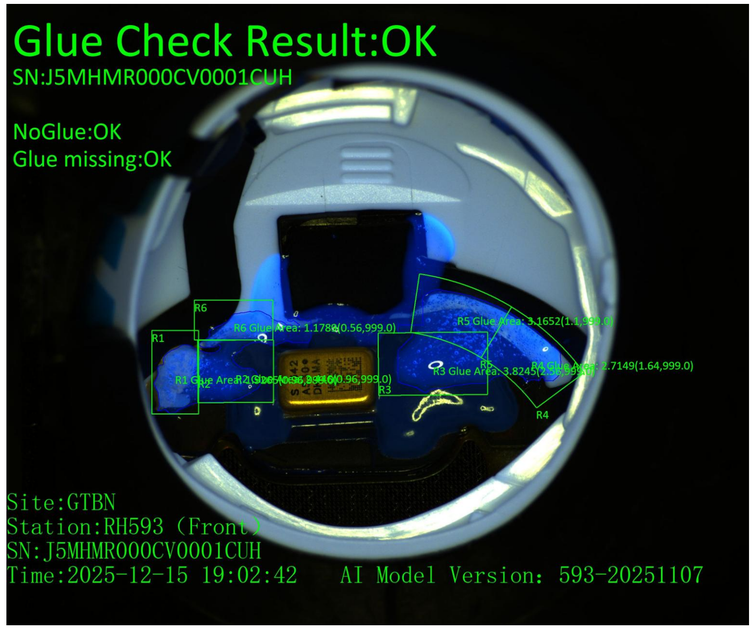


Pose1_Missing_R5 Data

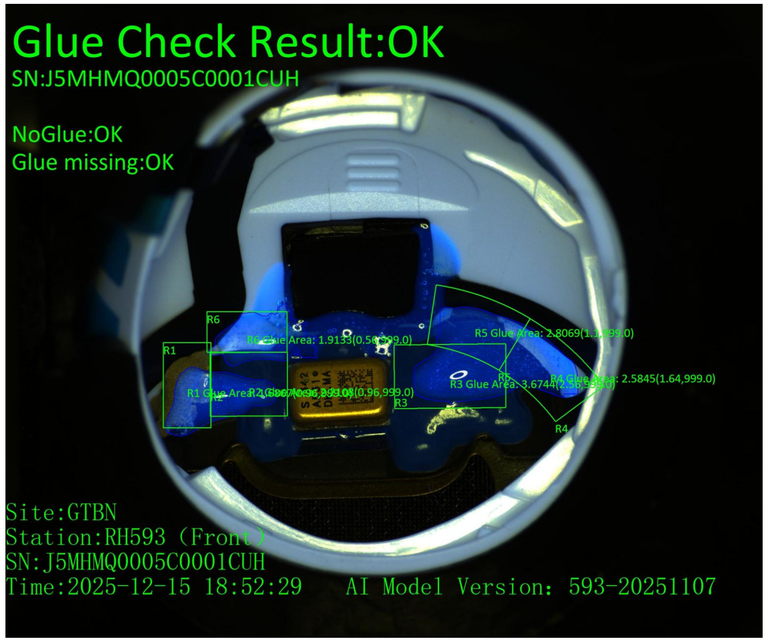


R5 Missing spec= Pose1_Missing_R5 MIN*0.7=1.7514*0.7=1.22

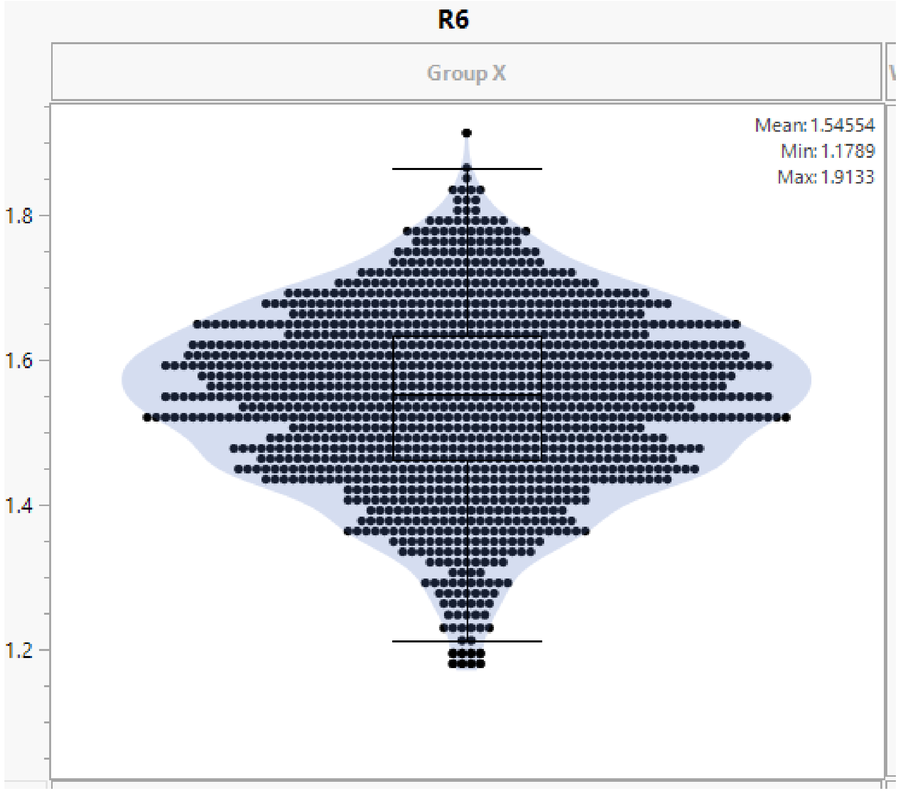
Pose1_Missing_R6 MIN: 1.1789



Pose1_Missing_R6 MAX: 1.9133



Pose1_Missing_R6 Data



R6 Missing spec= Pose1_Missing_R6 MIN*0.7=1.1789*0.7=0.82

H593 | Glue path AOI Product Glue Compensation - Pos1