

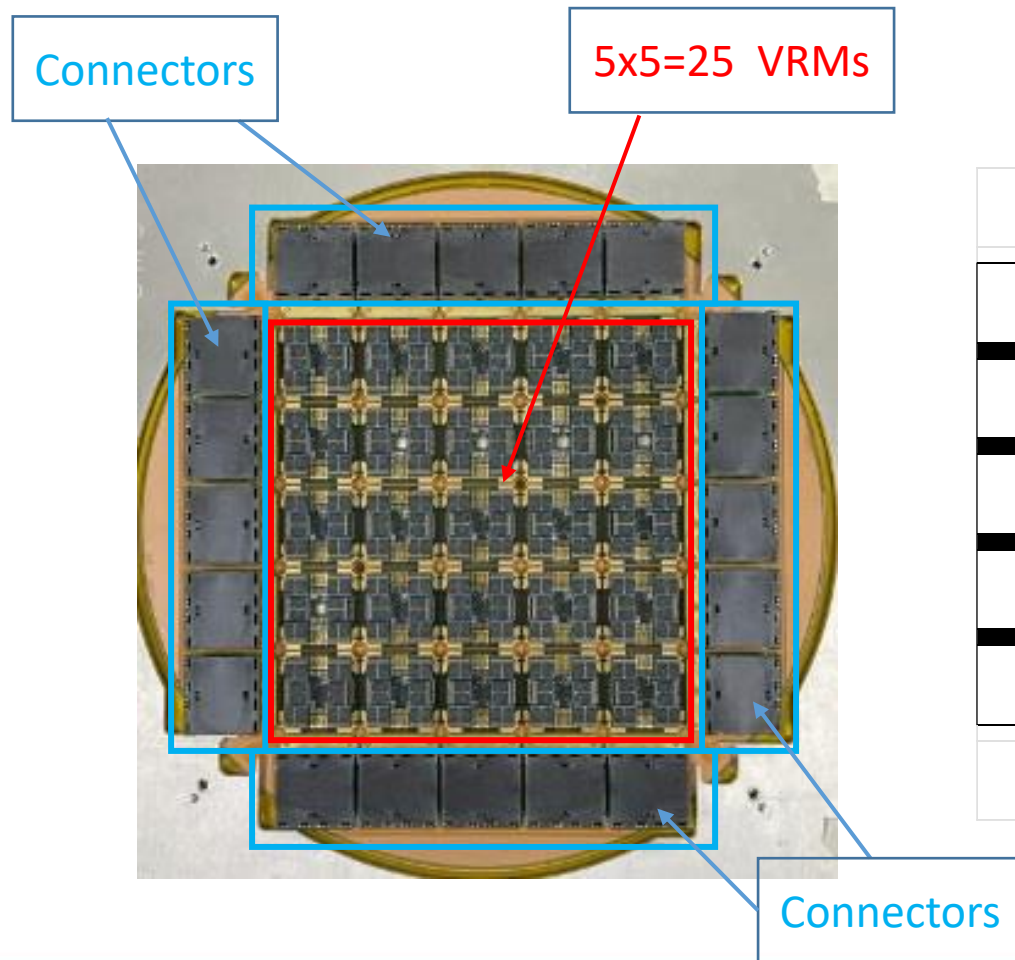
Camalot Prodigy Measure Function Issue Troubleshooting

(S/N 8300-21889)

September 27, 2023

Ken Wu

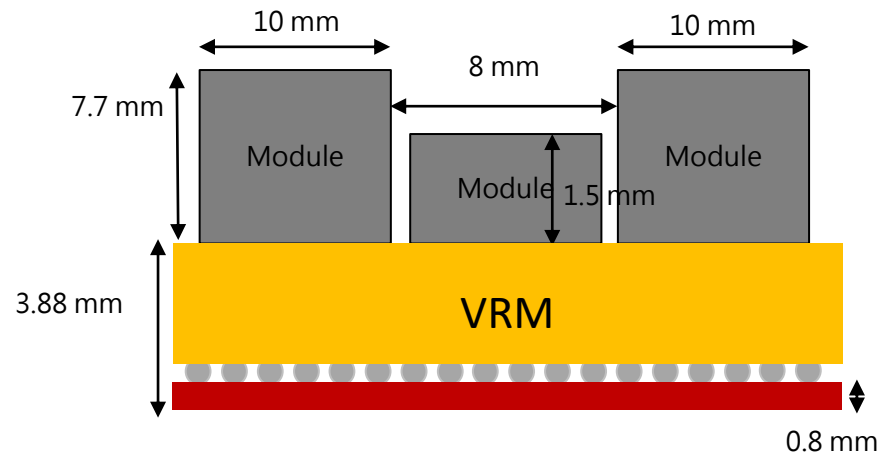
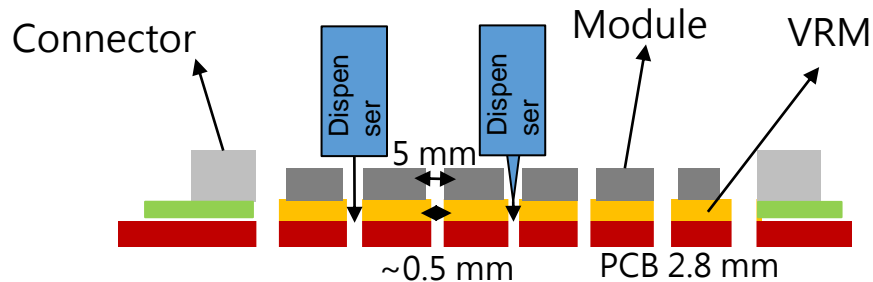
Real Wafer Mapping and Programming Paths



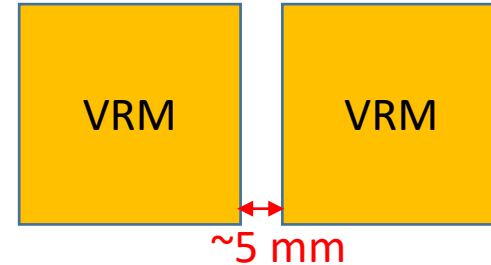
	c	c	c	c	c	
	1	2	3	4	5	
c	v	v	v	v	v	c
	10	9	8	7	6	
c	v	v	v	v	v	c
	11	12	13	14	15	
c	v	v	v	v	v	c
	20	19	18	17	16	
c	v	v	v	v	v	c
	21	22	23	24	25	
c	v	v	v	v	v	c
	30	29	28	27	26	
	c	c	c	c	c	

Passes sequence from 1 to 30

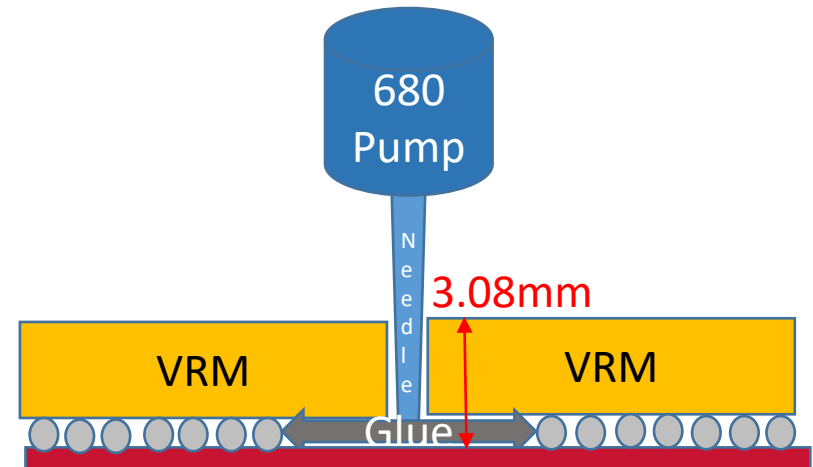
W company Underfill Process



Top view of two VRMs



Side view of two VRMs



Must add the measure function into the program to prevent the glue dispensing needle hitting & damaging the VRM components during the underfill process.

Main Program content with 30 Calls for 30 Paths

Benchmark - Loaded Process Program: C:\Camfiles\NEW1102\0209\New ALL VRM LINE 5 X 5_BVL

File Edit Tools Commands View Operations Maintenance Calibrate Help

← → ↺ ↻ 🔒 🔗 ↕ ⚙️ ? Edit Process Programs [C:\Camfiles\NEW1102\0209\New 1]

Creation Info | Properties | Temperatures | Load/Unload Boat | Commands

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	Command	X Positio	Y Positio	Theta	Name	Reference Designato	Use Centroi	Part
1	Call	133.082	302.523	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BCVL	1	<input type="checkbox"/>	<input type="checkbox"/>
2	Call	168.152	302.629	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BCVL	2	<input type="checkbox"/>	<input type="checkbox"/>
3	Call	203.139	302.660	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BCVL	3	<input type="checkbox"/>	<input type="checkbox"/>
4	Call	238.080	302.719	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BCVL	4	<input type="checkbox"/>	<input type="checkbox"/>
5	Call	273.061	302.830	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BCVL	5	<input type="checkbox"/>	<input type="checkbox"/>
6	Call	273.210	276.662	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	5	<input type="checkbox"/>	<input type="checkbox"/>
7	Call	238.223	276.563	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	4	<input type="checkbox"/>	<input type="checkbox"/>
8	Call	203.214	276.458	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	3	<input type="checkbox"/>	<input type="checkbox"/>
9	Call	168.296	276.460	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	2	<input type="checkbox"/>	<input type="checkbox"/>
10	Call	133.167	276.346	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	1	<input type="checkbox"/>	<input type="checkbox"/>
11	Call	133.296	240.299	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	10	<input type="checkbox"/>	<input type="checkbox"/>
12	Call	168.290	240.408	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	9	<input type="checkbox"/>	<input type="checkbox"/>
13	Call	203.243	240.473	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	8	<input type="checkbox"/>	<input type="checkbox"/>
14	Call	238.268	240.633	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	7	<input type="checkbox"/>	<input type="checkbox"/>
15	Call	273.243	240.634	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	6	<input type="checkbox"/>	<input type="checkbox"/>
16	Call	273.349	204.664	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	15	<input type="checkbox"/>	<input type="checkbox"/>
17	Call	238.421	204.547	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	14	<input type="checkbox"/>	<input type="checkbox"/>
18	Call	203.463	204.514	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	13	<input type="checkbox"/>	<input type="checkbox"/>
19	Call	168.417	204.543	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	12	<input type="checkbox"/>	<input type="checkbox"/>
20	Call	133.329	204.256	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	11	<input type="checkbox"/>	<input type="checkbox"/>
21	Call	133.543	168.106	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	20	<input type="checkbox"/>	<input type="checkbox"/>
22	Call	168.403	168.360	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	19	<input type="checkbox"/>	<input type="checkbox"/>
23	Call	203.408	168.481	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	18	<input type="checkbox"/>	<input type="checkbox"/>
24	Call	238.444	168.619	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	17	<input type="checkbox"/>	<input type="checkbox"/>
25	Call	273.323	168.557	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVL	16	<input type="checkbox"/>	<input type="checkbox"/>
26	Call	273.501	132.633	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVCL	16	<input type="checkbox"/>	<input type="checkbox"/>
27	Call	238.590	132.573	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVCL	17	<input type="checkbox"/>	<input type="checkbox"/>
28	Call	203.573	132.497	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVCL	18	<input type="checkbox"/>	<input type="checkbox"/>
29	Call	168.514	132.373	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVCL	19	<input type="checkbox"/>	<input type="checkbox"/>
30	Call	133.564	132.313	0	C:\Camfiles\new1102\New ALL WAFER LINE\VRM LINE BVCL	20	<input type="checkbox"/>	<input type="checkbox"/>
31	End							

Machine Status: Idle

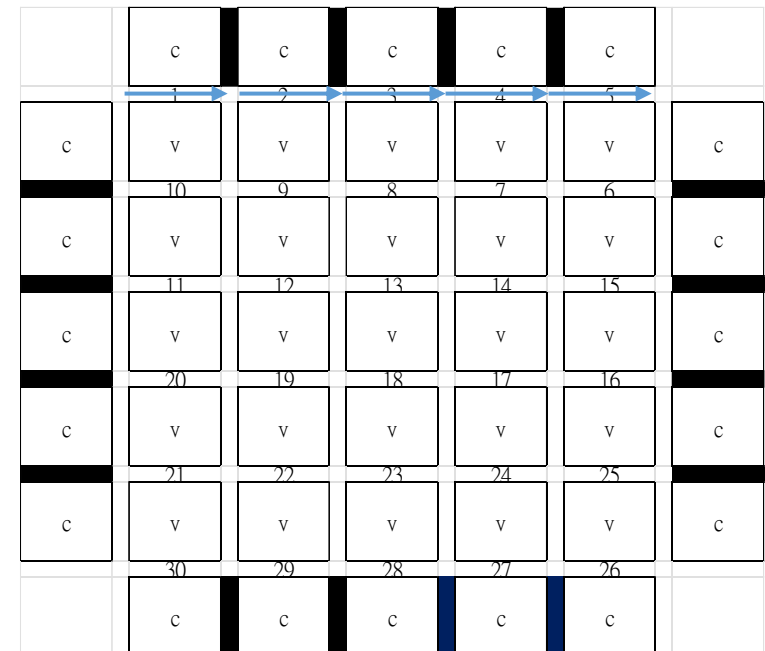
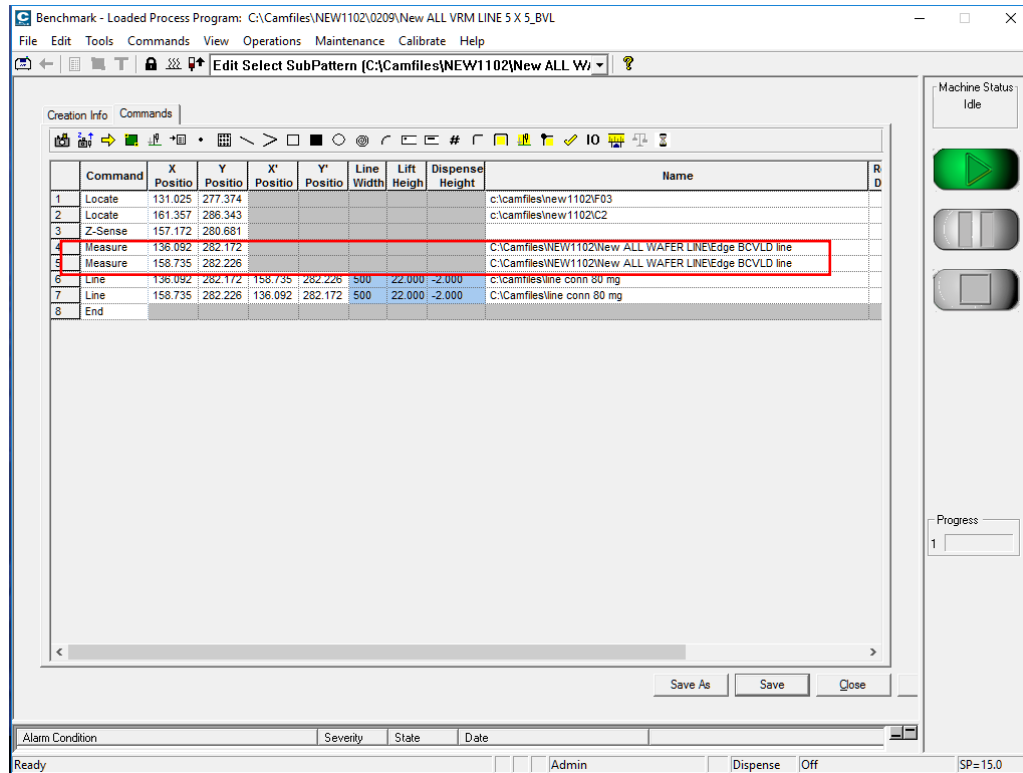
Progress: 1

Save As Save Close

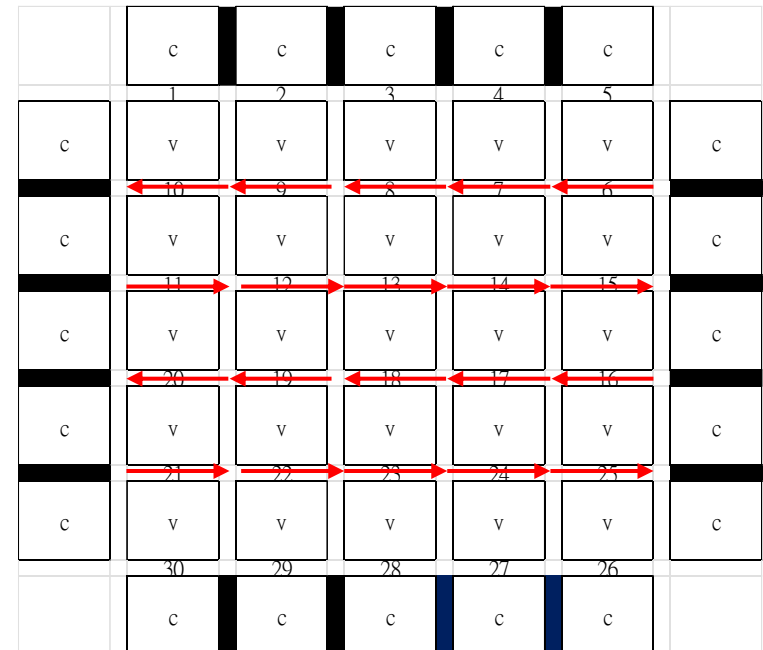
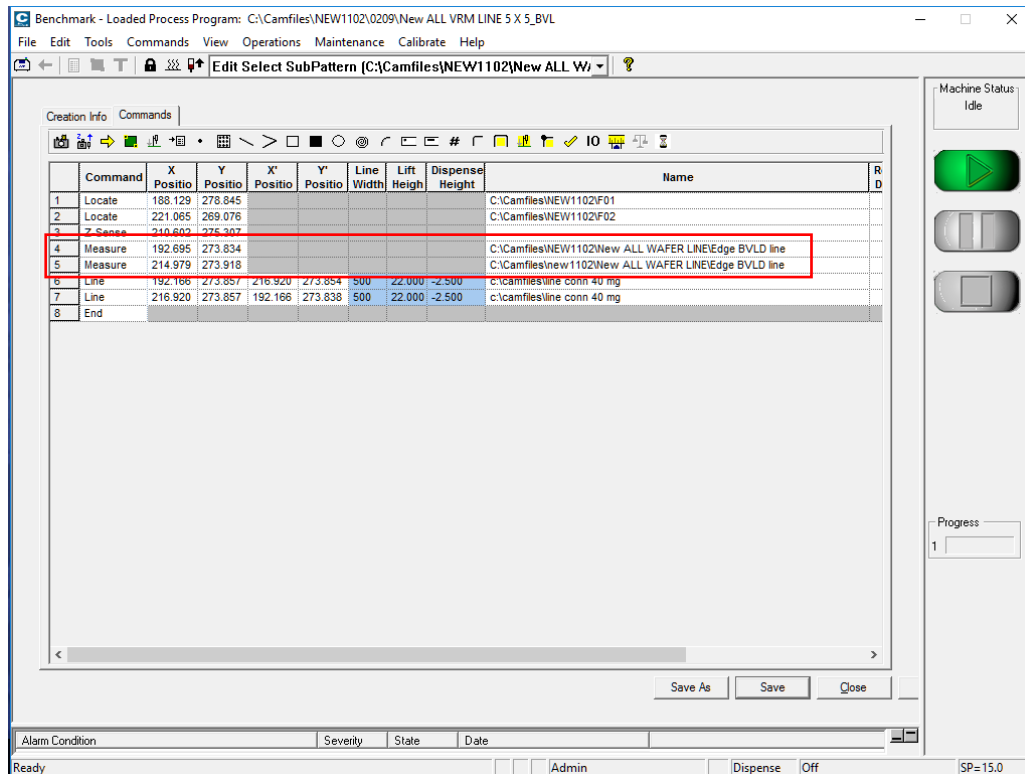
Alarm Condition Severity State Date

Ready Admin Dispense Off SP=15.0

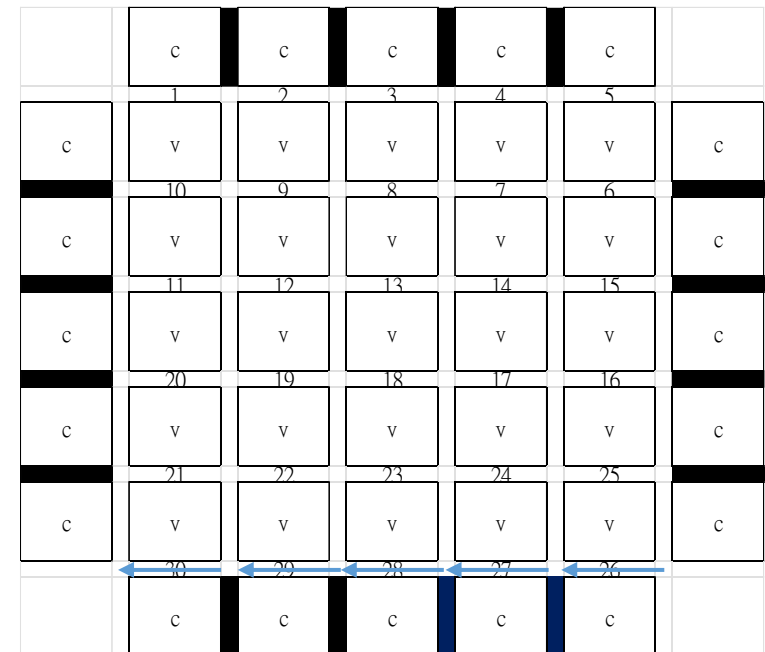
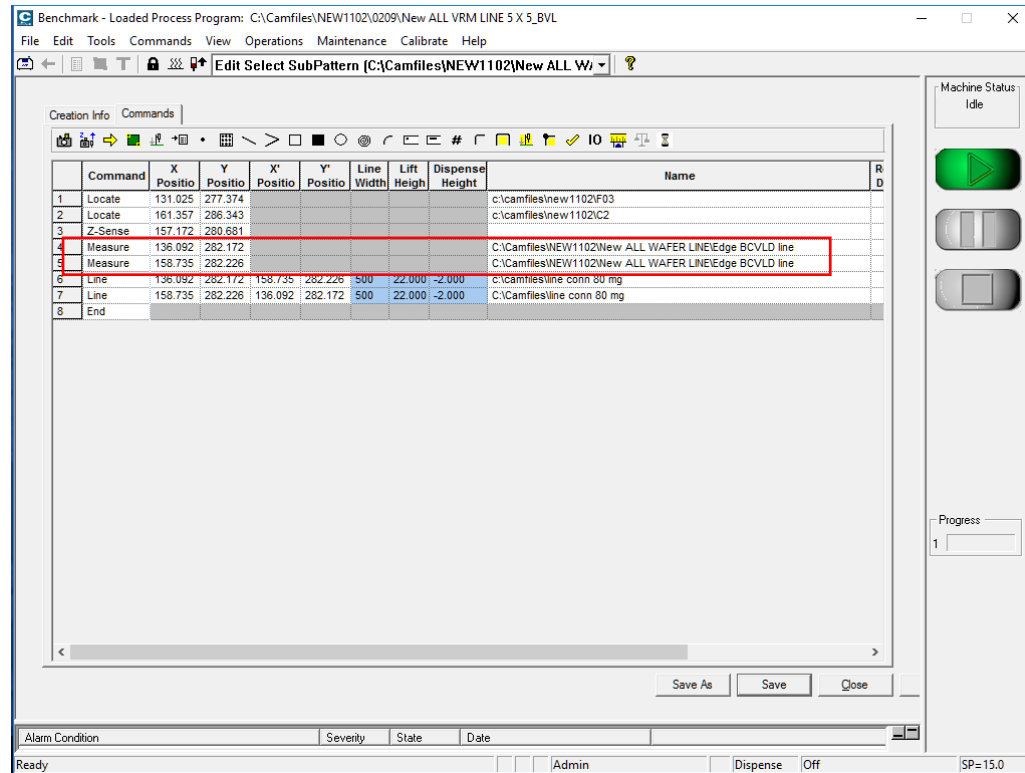
Sub Program 1 (5 Calls between Connectors & VRMs at the Top area)



Sub Program 2 (20 Calls between VRMs & VRMs at the central area)

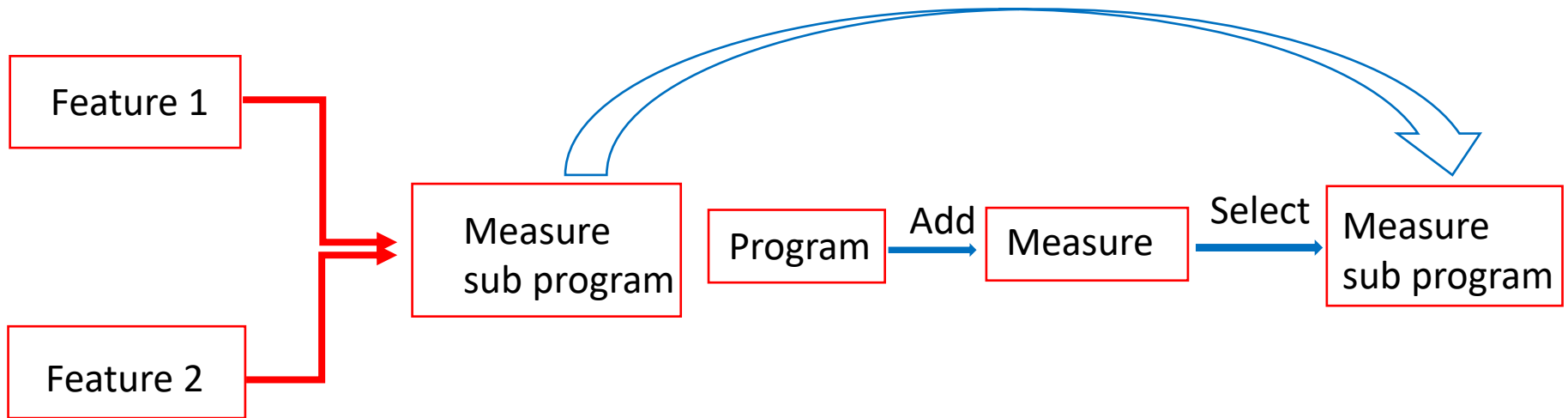


Sub Program 3 (5 Calls between VRMs & Connectors at the Bottom area)



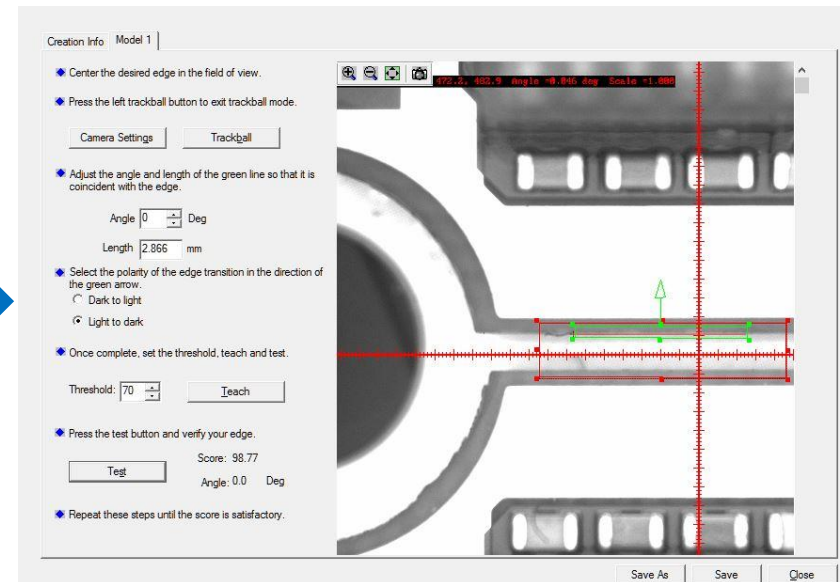
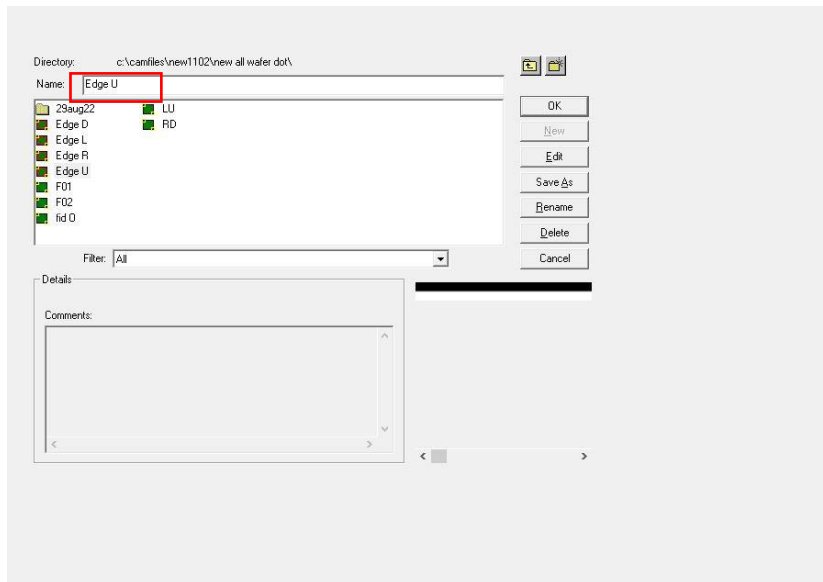
Measure Detect setting structure and procedure

1. Set the discerning features of measure detect, and set two sets of features according to the detection target.
2. Combine two sets of feature into a subroutine of measure detect



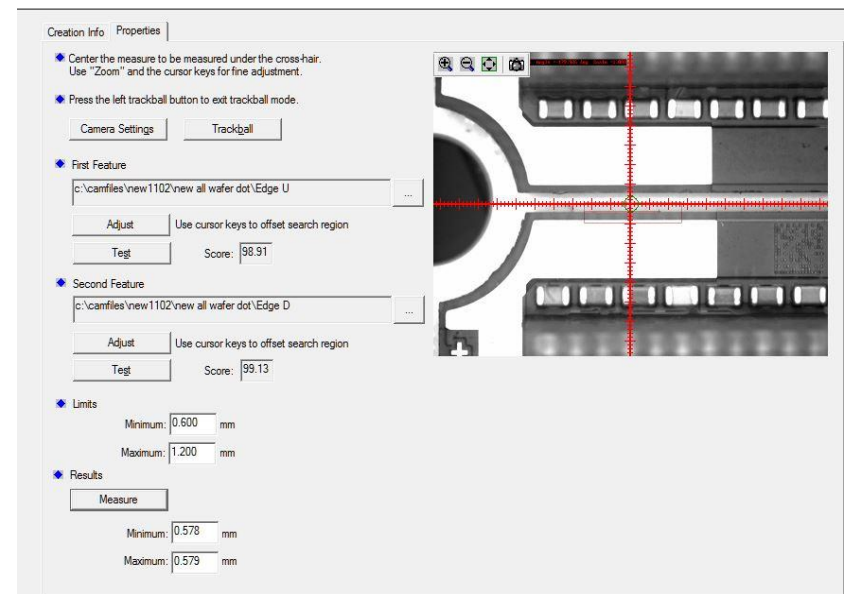
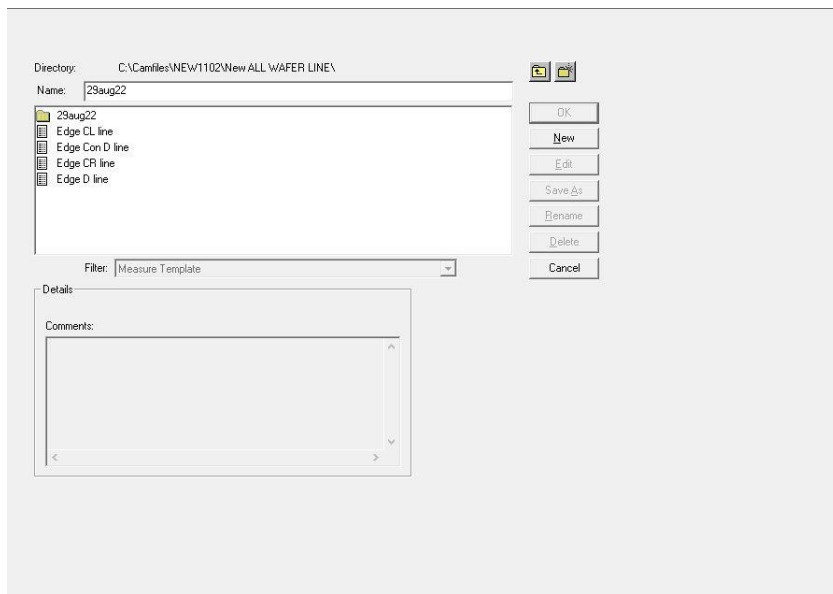
Feature setting:

1. Name the feature target, and then enter the feature point for teach and test, the setting method is to move the green box to the position to teach, as shown on the right in the figure below.
2. After Teach is completed, you can run test to see the score after teach, the higher the score, the better result.

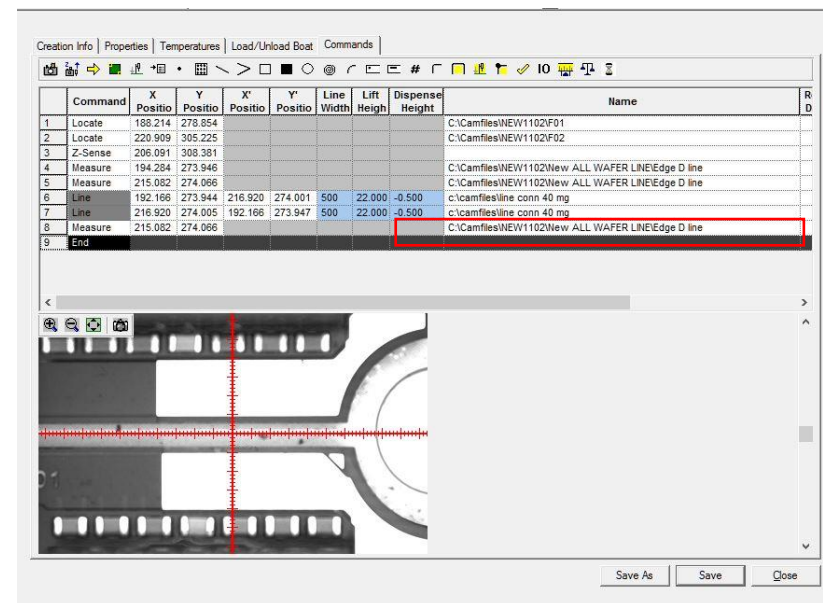
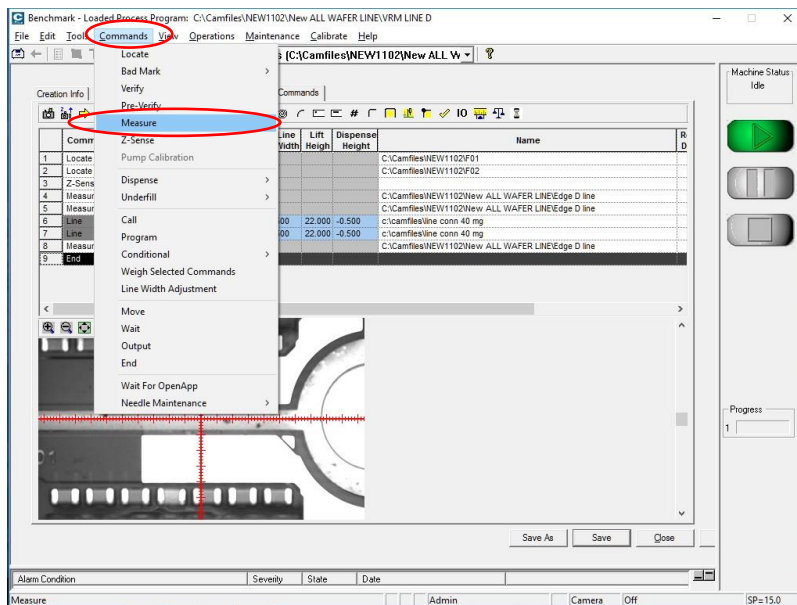


Measure subprogram settings:

1. Create a name for the measure detect subprogram, then enter the subprogram setting screen, bring in the completed feature points for teaching and test respectively.
2. Set the Limit range according to the customer's specification, and after completion, you can measure and get the reading value of the current teaching position.

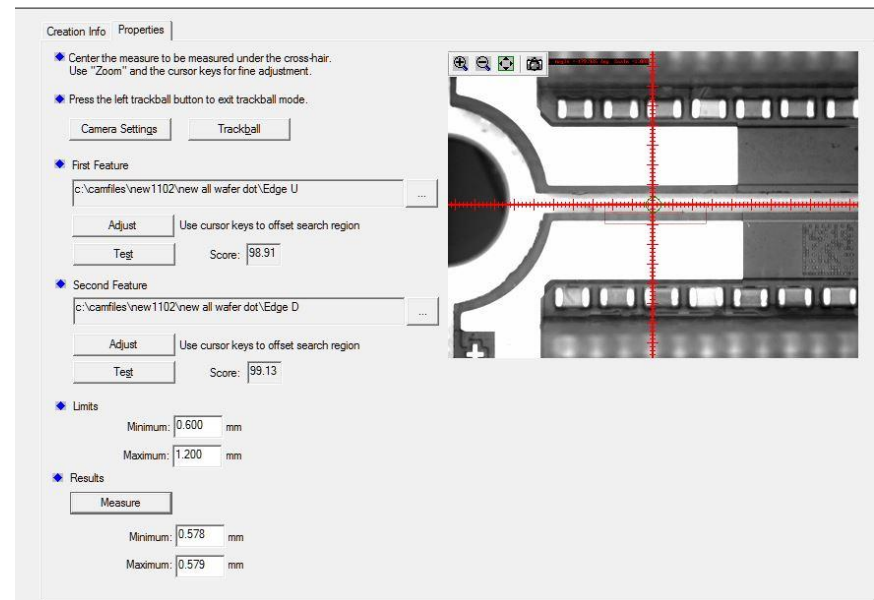
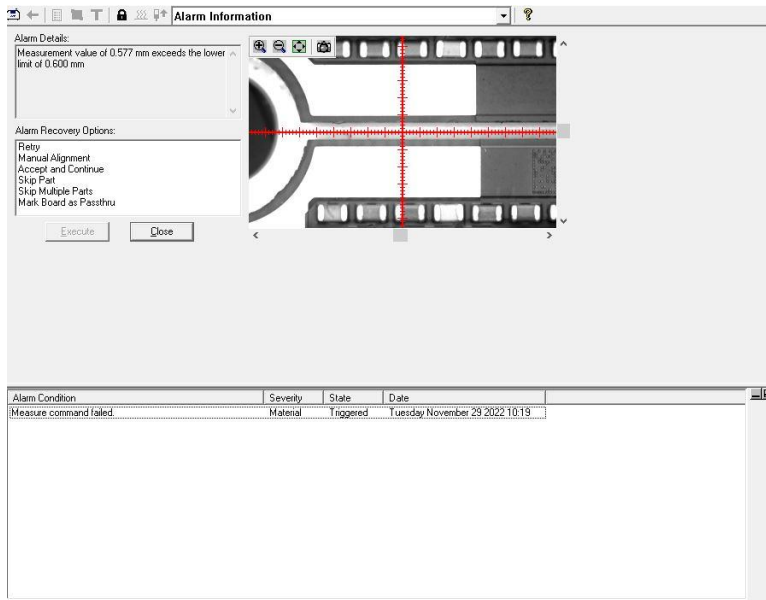


Add a new measure command to the program interface, move the camera to the target position of the detection measure detect, and bring the measure Detect subroutine



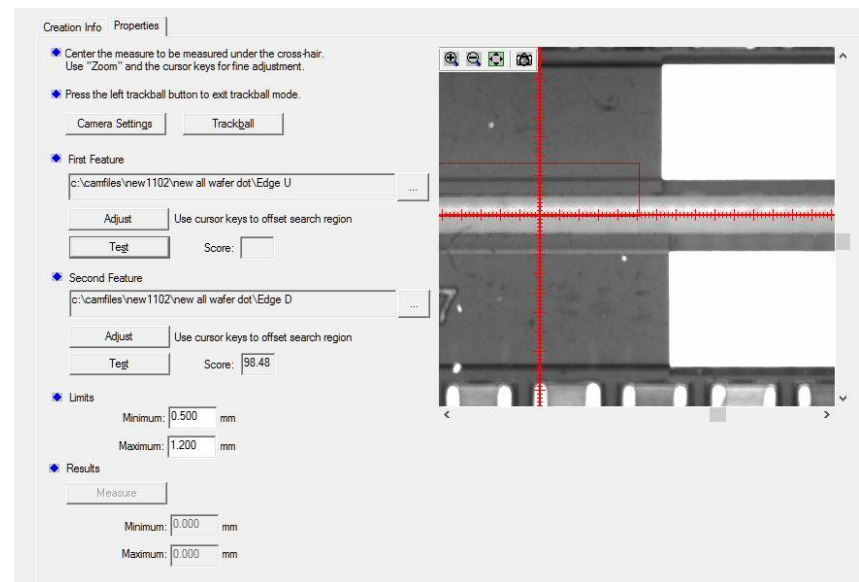
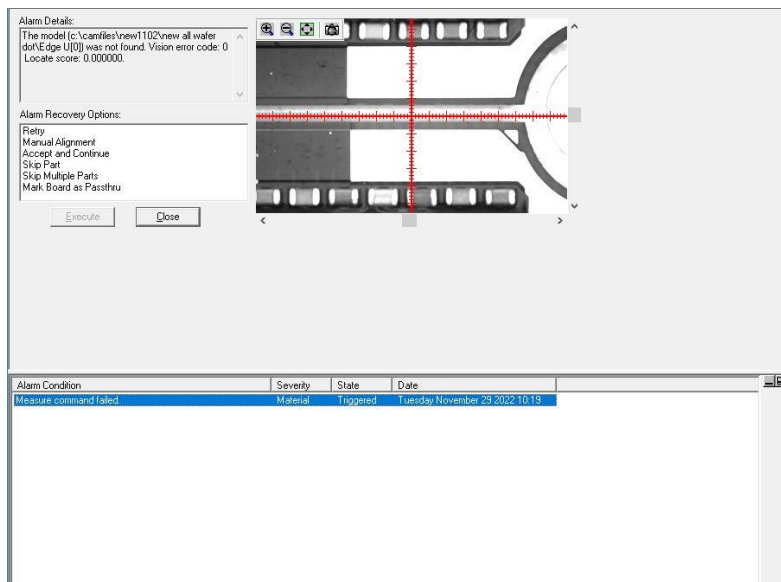
1. When executing Auto Run, if measure detect that the gap is greater than the set limit minimum, the machine will directly perform the next point detection.
2. When executing Auto Run, if the measure detect that the gap is less than the set Limit minimum, the machine will report an error and prompt the test result, which is judged by the operator.

EX : As shown in the figure below, the measure value is 0.577mm, the set Limit value is 0.6mm, $0.578 < 0.6$ mm, the machine will report an error and prompt the test result for operator to make the proper action.



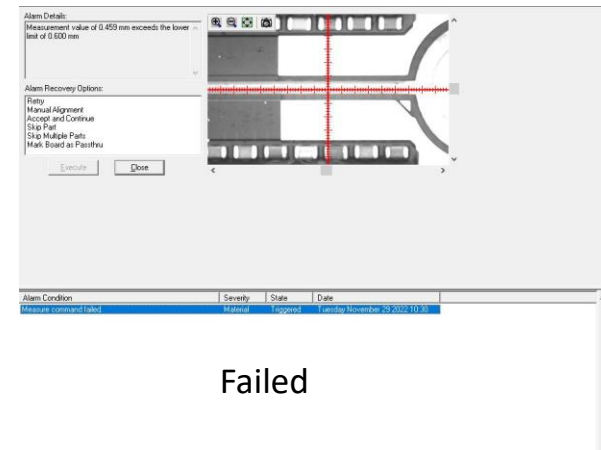
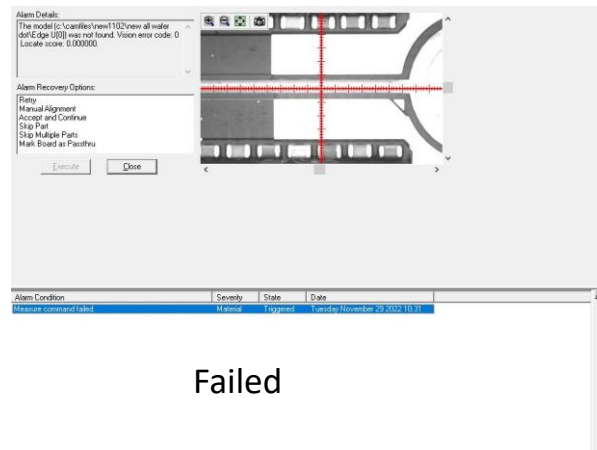
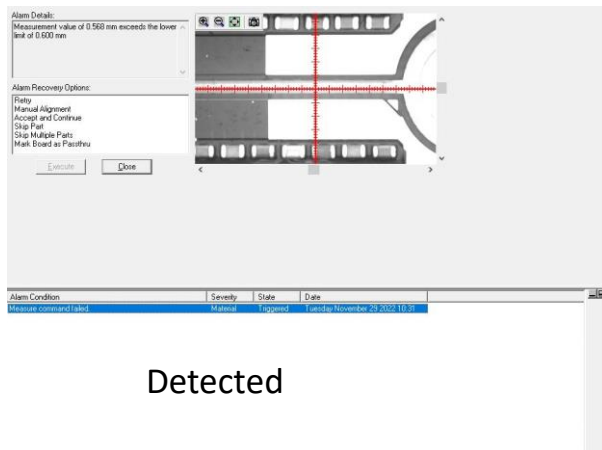
EX: As shown in the figure below, when measure detect cannot detect the setting edge feature, the machine will report an error and prompt the detection result.

- The first feature can't be detected.



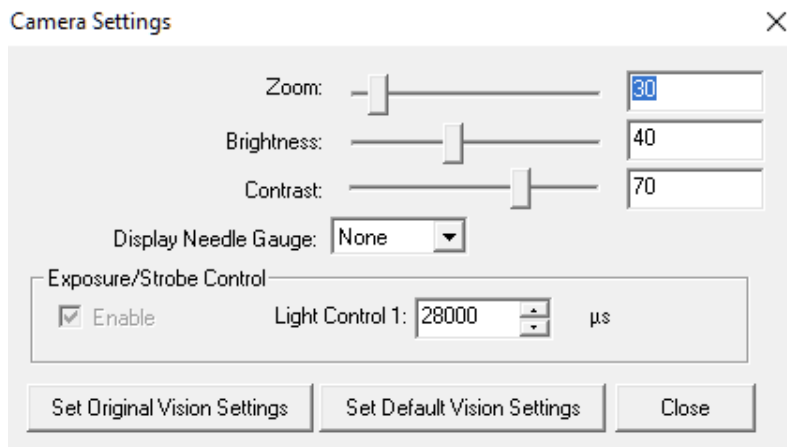
After setting up and repeating measure detection, the failure rate of measure detect was too high in W compnay, it's about more than **30%** due to the edge can't be found or caught the wrong edge issue.

The respective gap between each group of VRM & VRM modules or VRM & Connector modules, the feature edges are not clear or cut unevenly, resulting in no catching & wrong grasping.

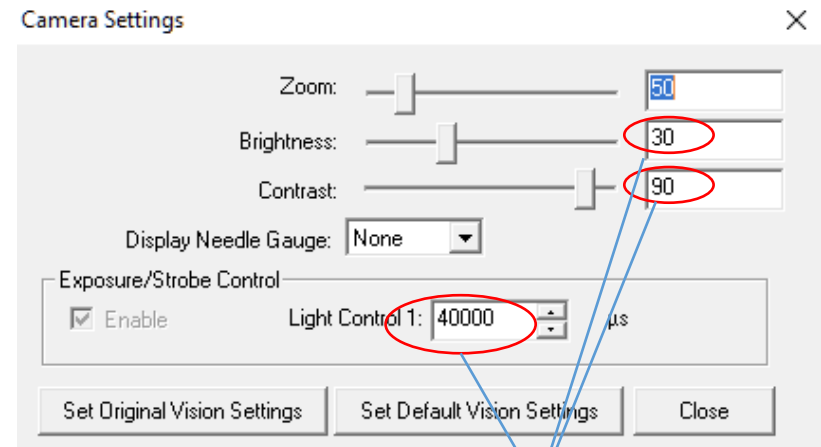


Troubleshooting 1st step:

- Adjusting camera setting brightness & contrast matching, the measure failure rate from **30%** reduced to around **10%**. (Customer's measure detect failure rate requirement specification **< 2%**)
- W company was complained the camera vision device capacity issue and requested it need to be changed to another type for the complete VRMs & Connectors edge detection function requirement.



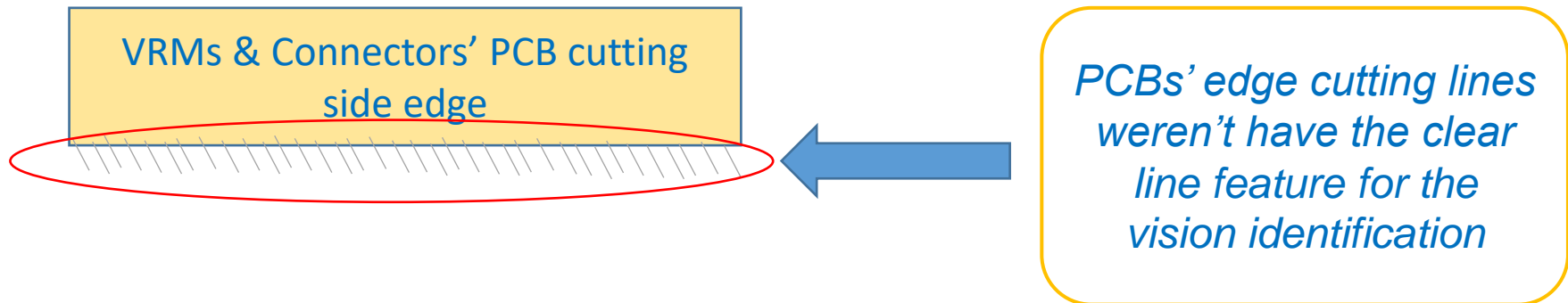
Original camera setting parameters



New camera setting parameters matching

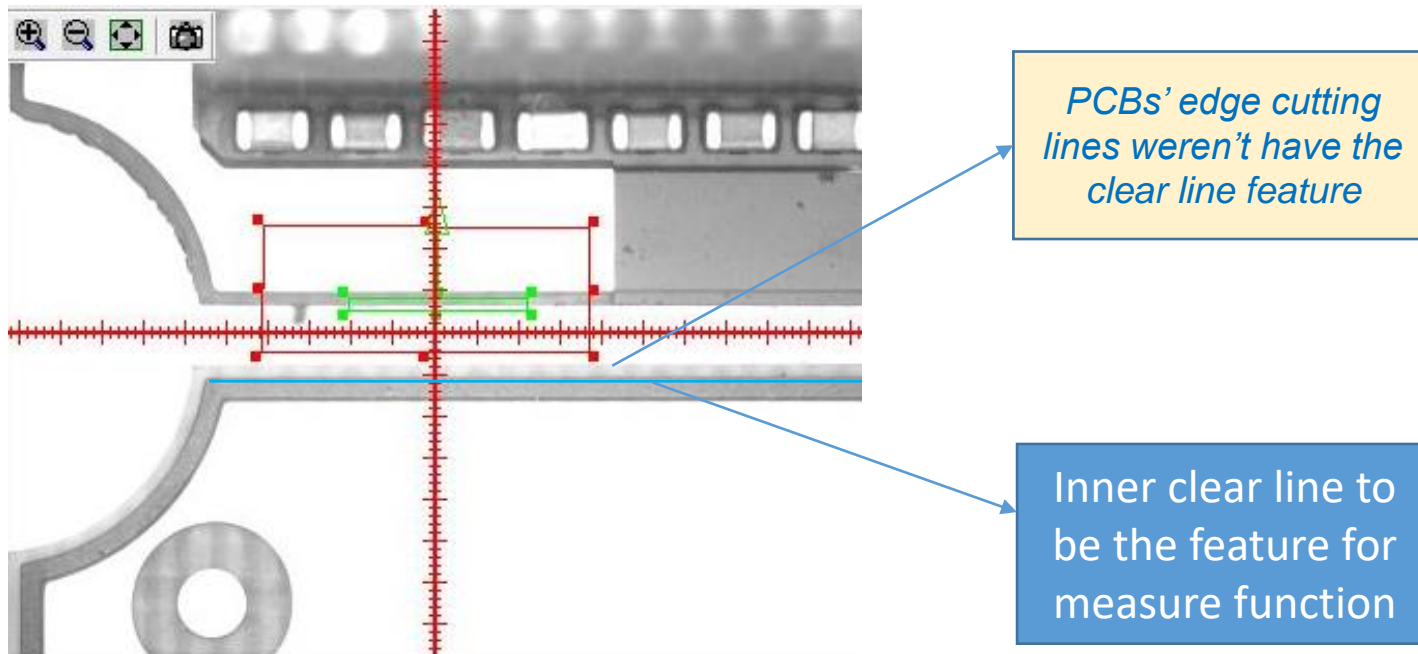
Troubleshooting 2nd step (root cause):

- Gaps between each group of VRM & VRM modules or VRM & Connector modules, the edge line of features were not clear or cut unevenly, color inconsistency, resulting in features were no capturing or wrong feature captured.



Troubleshooting 2nd step actions:

1. Used the **inner clear line** which is just beside the edge to be the edge detect feature.
2. Increasing the low limit (5 + 3mm). (3mm is the gap from the edge to inner clear line pattern)
3. Increasing the high limit (8 + 3mm). (3mm is the gap from the edge to inner clear line pattern)



Measure Function Testing Result Success

1. After changing the inner clear line to be the measure feature and re-defined the Low & High limit the measure function detect failure rate from 10% **reduced to 1%**. (Customer's measure detect failure rate requirement specification **< 2%**)
2. Three full wafers testing which with measure function and real dispensing the glue were success, the detected failure rate which no feature captured or wrong feature detection **< 1%**.

Thank you !