Flying probe tester APT-9411 series

IC open test system CS-9500

Operator's Guide

TAKAYA

Preface

The IC Open test system CS-9500, one of exclusive options for Takaya Fixtureless Tester APT-9411 Series, enables to detect unsoldered IC leads of QFP, SOJ, so on while contacting the independently moving sensor probes on the IC's package.

This Operator's guide covers the functions, programming, operation, maintenance and specifications of the IC Open Test system CS-9500. Read this Operator's guide thoroughly before using this option in order to understand the features and keep this Operator's guide readily available for reference.

In addition, this Operator's guide also explains you on the Underside IC Open Test system CSU-9500 at the end of this Operator's guide.

If you have any question or thoughts you would like to share with us - we would like to hear from you.

(NOTE)

(1) This Operator's guide is based on the APT-9411 Series software Ver1.3-3.

(2) No portion of the contents of this publication may be reproduced or transmitted in any form or by any means without the express written permission of TAKAYA Corporation.

(3) The design of the product is under constant review and whilst every effort is made to keep this Operator's guide up to date, the rights is reserved to change specifications and equipment at any time without prior notice.

Introduction

Operation keys and SW

(1) All operation keys on the keyboard are begirt by [   ] mark such like [**Enter**] key, [**SP**] key.

(2) All SWs on the operation panel are also displayed like [**TEST START**].

(3) If some plural keys need to be depressed in order, they are combined with " > ".
For example, in case of [**A**] > [**3**] key, first depress [**A**] key then [**3**] key.

(4) If some plural keys need to be depressed at a time, they are combined with " + ".
For example, in case of [**Ctrl**] + [**Y**] key, depress [**Ctrl**] key and [**Y**] key at a time.

Safety symbols

The Operator's guide uses the following headings to display important safety information and so on. Strict adherence to the instruction next to these heading is required at all times.

Symbol	Explanation
⚠ **WARNING**	Calls attention to a procedure, practice, or condition that could possibly cause serious accident or death.
⚠ **DANGER**	Calls attention to a procedure, practice, or condition that could possibly cause bodily injury or damage to the product.
⚠ **CAUTION**	Calls attention to a procedure, practice, or condition that could possibly damage to the product.
(!)	Calls attention to general instruction. Failing to follow this could loss of data stored on disks, cause possibly misjudge the unit under test, or damage to the product.
Operate	Calls attention to especially key operation.
HINT	Calls attention to "One-point advice" which should be useful when you are at a loss to operate the products.

Safety precautions

Since this section summarizes the precautions to be observed to operate the IC Open Test system CS-9500 in safety, be sure to read it before operation.

⚠️ WARNING	**All instructions below are very important! Do not attempt to install and/or use the product unless you could understand any of them.**

1. Never modify or repair any part of the product by yourself. Otherwise it may possibly cause an electric shock or other bodily accident.

2. For safety reason, it is recommended that only one person operate the product. If not, the product may cause an unthought of action and a serious accident as the result.

3. Never attempt to put a part of your body in the working area of the product. Otherwise it may possibly cause a serious accident.

4. While using the product, be sure to close the safe cover of the tester. Otherwise it may possibly cause an electric shock or other bodily accident.

5. Once some smoke or bad smell came from the product, it may possibly cause a burning or electric shock and is very dangerous. In such case happened, switch the power off and stop operating the product on the spot, then consult to our local distributor for the solution. Do not use the product until safe operation can be verified by service-trained personnel.

6. Once some liquid or foreign material was put in the product, it may possibly cause a burning or electric shock and is very dangerous. In such case happened, unplug the product and stop your operation on the spot, then consult to our local distributor for the solution. Do not use the product until safe operation can be verified by service-trained personnel.

7. Once you felt something strange during the operation (i.e. noise, smell, malfunction, etc.), switch the power off, unplug the product and stop your operation on the spot, then consult to our local distributor for the solution. Do not use the product until safe operation can be verified by service-trained personnel.

8. The product power must be OFF and unplugged when the product is serviced for maintenance or cleaning. Needless to say, the service must be made by service trained personnel only who are familiar with electronic circuitry and understand the hazard involved.

9. The product power must be OFF and unplugged before replacing or maintenance any part of this option.

10. The manufacturer has no responsibility for such defect resulting from misuse or unauthorized modification by user, as well as operation outside of the environmental specifications for the product.

§ 1 General

This section provides fundamental information on the IC Open Test system CS-9500.
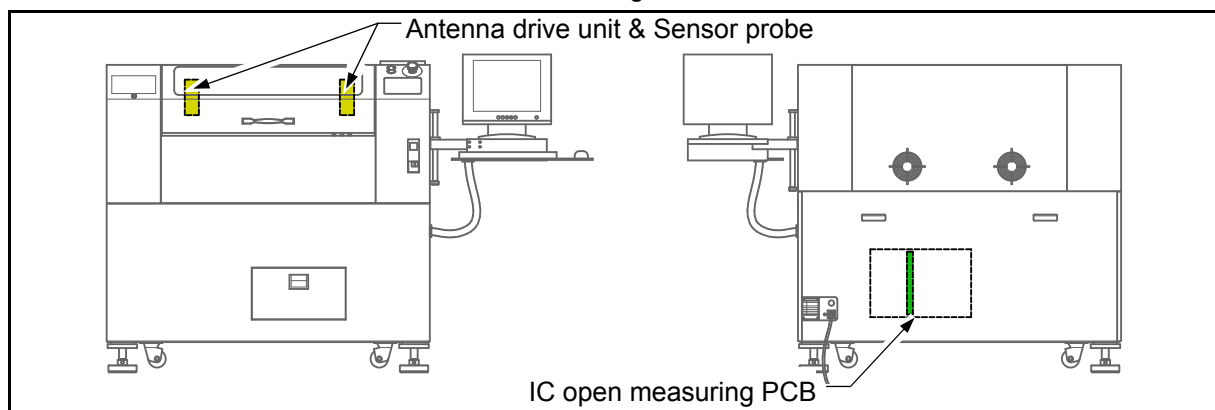
Outline

With this optional system built-in, the Takaya APT-9411CE Series (hereafter "Tester") enables to detect unsoldered IC leads of QFP, SOJ, so on while contacting the independently moving sensor probes on the IC's package. A unique spring-embedded sensor probe (hereafter "Sensor probe") contacts the IC leads directly in place of the probe, so that the test is unlikely to be falsely judged due to possible contact error. In addition, the test program is easily and automatically created in a very short period of time.

CS-9500 Hardware

(1) IC Open measuring PCB (TAKAYA TVX-11)
(2) Antenna drive unit and Sensor probe (Each one at Left/Right)
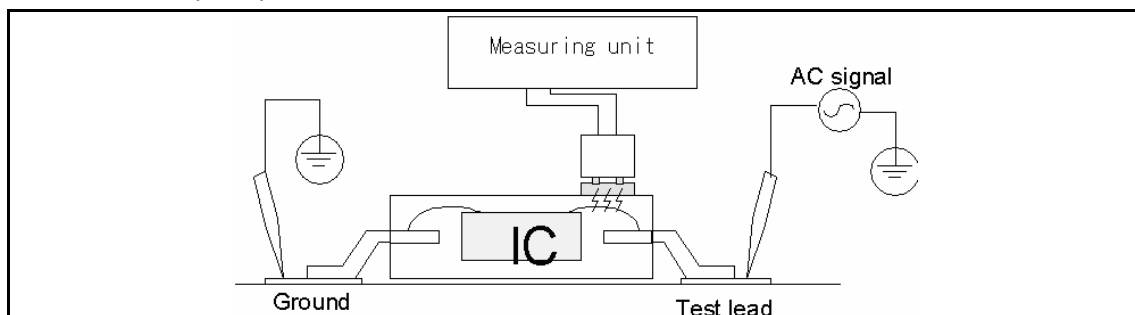
Hardware location

The hardware is installed in the tester as shown in Fig.1 below.

[Fig.1] Tester appearance

Measuring principle

The measurement principle is outlined below.

[Fig.2] Measuring principle

As Fig.2 introduce, the sensor probe is supposed to contact directly on the IC package under test while impressing AC measurement signal between an individual IC's lead and the GND point on the PC board. This sensor probe consists of a special antenna that can receive a signal radiated from the lead frame inside the IC through its mold package. If some IC's leads were improperly soldered otherwise open, the signal level becomes small so that their failure can be detected accordingly.

Antenna drive unit & Sensor probe installation

The antenna drive unit that includes the sensor probe is installed on the Z2 axis and the Z3 axis.

Contact position of Sensor probe and probe

As shown in Fig.3 below, the sensor probe which is equipped with a round sensor plate (diameter ϕ5mm) on the top steps on IC package where is nearby each IC lead to be measured. So their stepping position shifts sequentially according to the testing order.
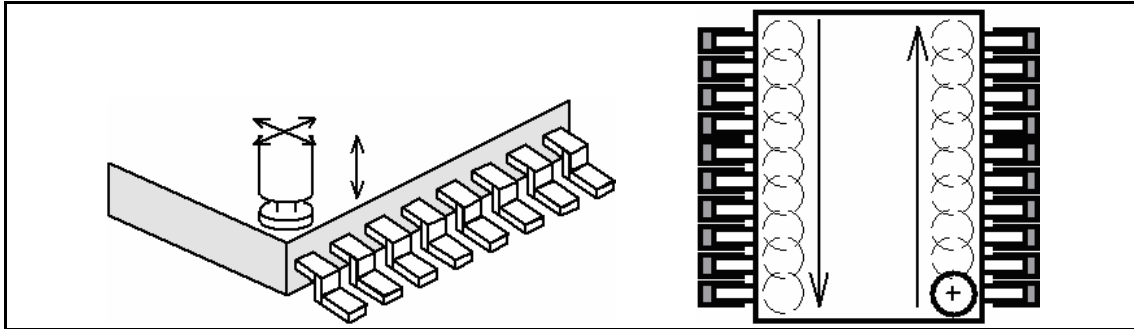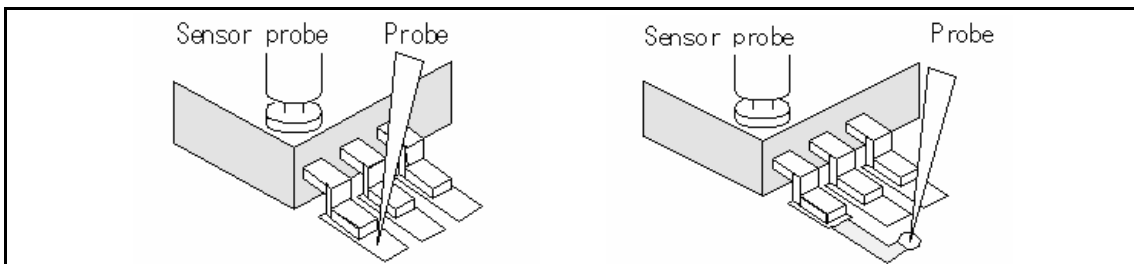

[Fig.3] Sensor probe's contact position

Meanwhile, the contact position for the probes which impress the necessary measurement signal should be properly selected depends on the IC solder pad.

Large solder pad

When there is enough space on the IC solder pad and a few possibilities that any probe may interfere with the IC lead, it should contact on the IC solder pad directly.

Small solder pad

When there is less space on the IC solder pad, in other words there is a risk for the probe to interfere with the IC lead, otherwise when the objective IC is PLCC-type which has no IC solder pad, the probe should contact any other point where is connected with the objective IC solder pad on the same circuit pattern.

[Fig.4] Probe's contact position

In addition, two GND points where to contact by another probe should be available on the left-hands and the right-hand corners on your PC board. If the GND point was set incorrectly, some of IC open test steps would not be created. (In this case, the VF measurement steps is created instead)

Reference Value for PASS/FAIL Judgment

The reference value for the IC open test is also learned from a good sample PC boards automatically as usually done to program the component steps.

Programming IC Open Steps

The tester allows easy programming of IC Open test as well. The user can use a CCD camera to directly input the XY coordinates where the sensor probe contacts or outsource the creation of test program to CAD data converters. Inputting the XY coordinates of all four corners on the IC package as well as the number of the IC leads, the tester can automatically create the XY coordinates for the sensor probes to contact.
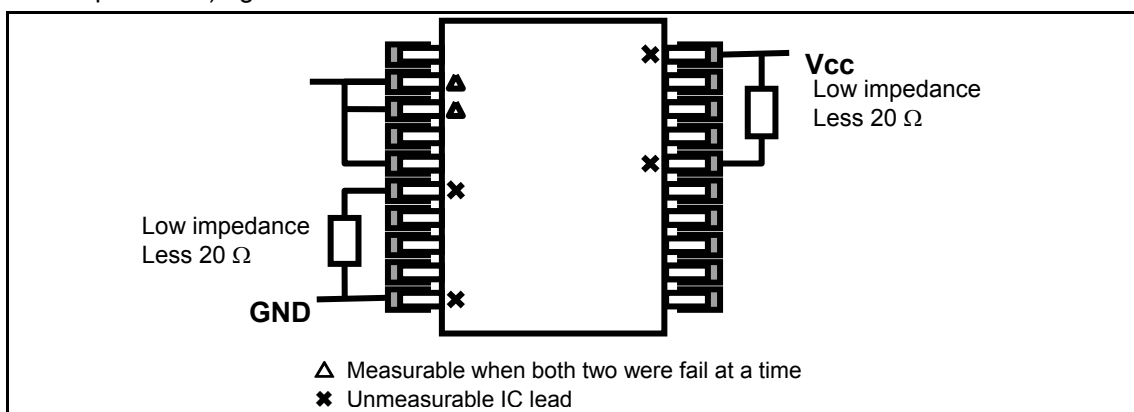
Measurable ICs and conditions

1. IC outward dimension is over 6mm each side (QFP, SOP, PLCC, LCC, MSP, so on)
2. IC mold thickness is less than 2.5mm from the lead frame. (It depends on the material and the frame area)
3. The probe is more than 2.8mm away from the sensor probe
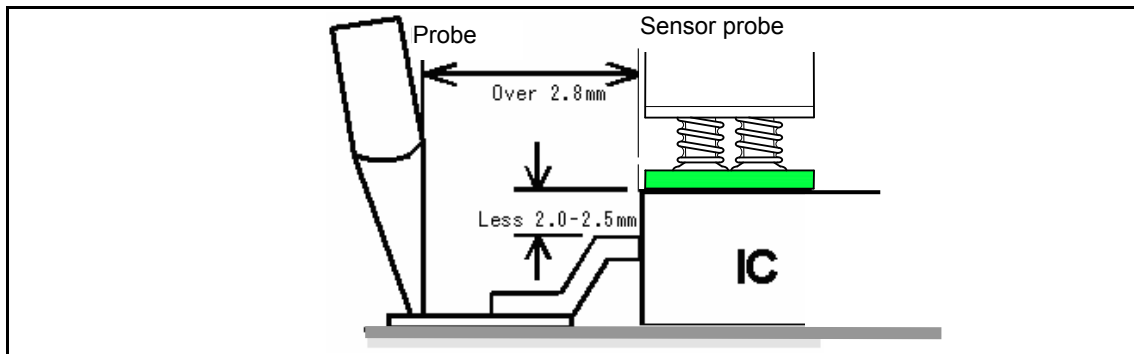
[Fig.5]

Unmeasurable ICs and conditions

1. Unmeasurable ICs
   - SIP and such ICs that has no or a very small lead frame inside the IC's package
   - ICs which mold thickness is more than 2.5mm from the lead frame
   - ICs in which shield plate or heat sink is installed over the lead frame

2. Unmeasurable conditions
   - GND line and Vcc line
   - IC's lead with very low impedance of less than 20 ohm (equivalent to approx. $0.9\mu F$ or more in Capacitance) against GND line or Vcc line.

△ Measurable when both two were fail at a time
✖ Unmeasurable IC lead

[Fig.6] Unmeasurable ICs and conditions

| ⚠	The IC open test of two adjacent IC leads on the same line is possible only when they got fail at the same time.
	Any breaking of the lead wire inside the ICs, any miss-orientation, or any miss-mount cannot be detected.
	There may be other cases that are unmeasurable due to the wiring (and mounting) condition on the boards or type of the ICs being tested.

Test speed

The test speed depends largely on travel distance of the test probes and the IC lead pitches. Let's say for instance that we test a QFP with 0.65mm pitch while directly contacting the IC lead pads. In this case, we can estimate max. 0.10 - 0.15 sec./point approximately.

Test area (Sensor probe's moving area)

APT-9411CE : W540 x D460 x H15 (mm)
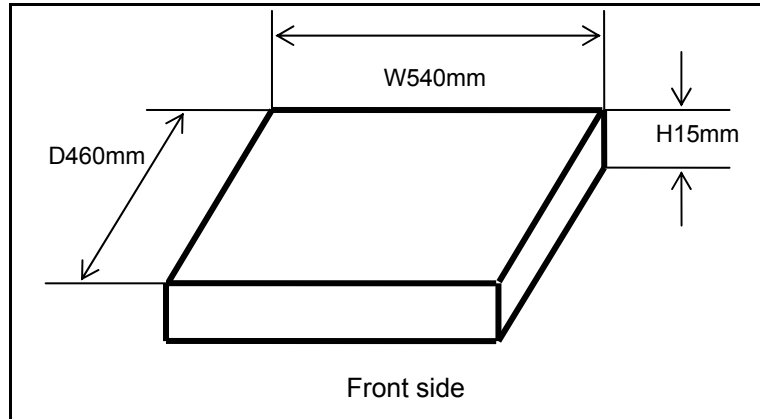
APT-9411SL : W635 x D609 x H15 (mm)
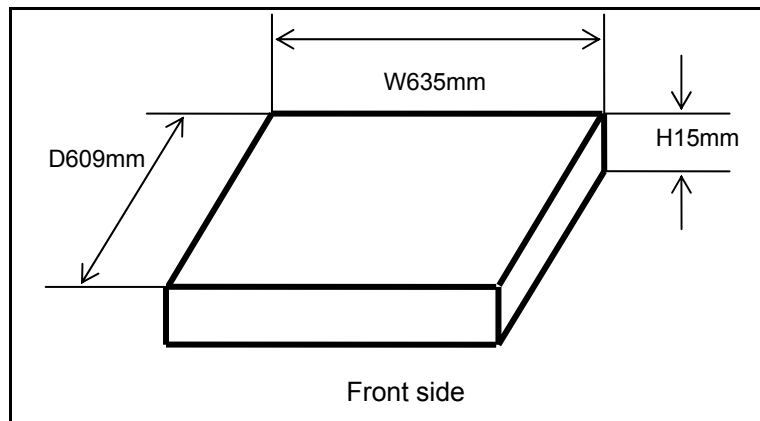
[Fig.7] Sensor probe's moving area

> **HINT** Movable area of the sensor probe is equal with the maximum PC board size to be set on the tester.

Other specifications

|	
Measurement signal	AC140mVrms (f=5KHz,10KHz)
Up/Down mechanism	Stepping servo motor & timing belt
Lowest position set	Programmable for 0-15mm per step
Maximum sensor stroke	Approx. 6mm
Initial spring pressure	Approx. 124g
Spring pressure under 1/2 stroke	Approx. 409g
Spring pressure under full stroke	Approx. 694g
Spring lifetime	More than 10 million strokes (at 1/2 stroke)

§ 2 Test Data programming

This section describes the procedure for preparing a program of the IC open test.

Initial setup

The sensor probe to probe offset must be adjusted carefully by the following operation. The tester requires this initial setup by the user at the time of first using the IC open test system and each time the sensor probe (also the sensor probe base) is replaced by new one.

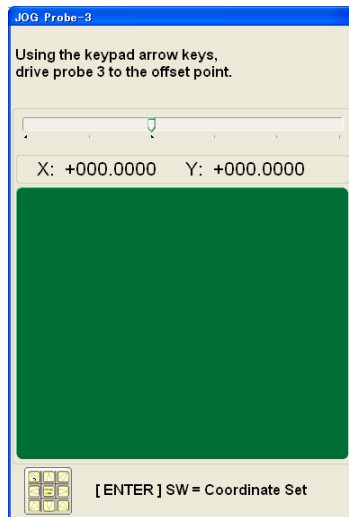1. Use your mouse to click Option Mode. (Tool > Mode Setting > Option Mode)
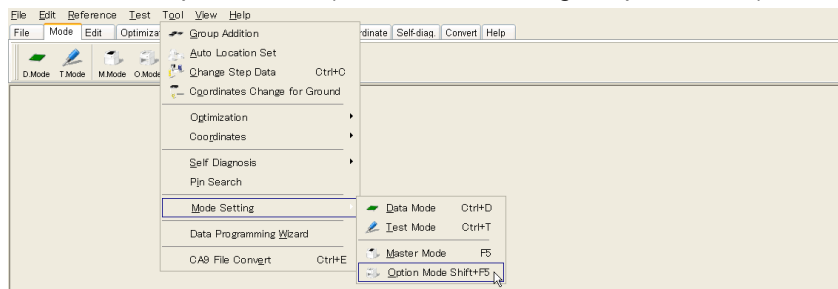
2. The Option Mode window is displayed on the screen.

3. Choose IC Open from the menu list.
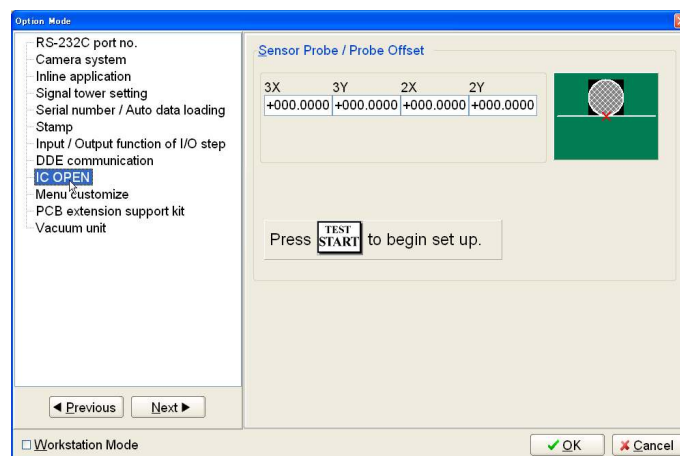
4. Let's say for example that you need to adjust the sensor probe to probe offset on Arm #3. In this instance, double click on the coordinates at the 3X box.

5. It displays the pop-up message "Press [TEST START] SW" on the screen.

6. Press [TEST START] SW on the operation panel.

7. The JOG window is displayed on the screen.

```
JOG Probe-3

Using the keypad arrow keys,
drive probe 3 to the offset point.

X: +000.0000    Y: +000.0000

[ ENTER ] SW = Coordinate Set
```
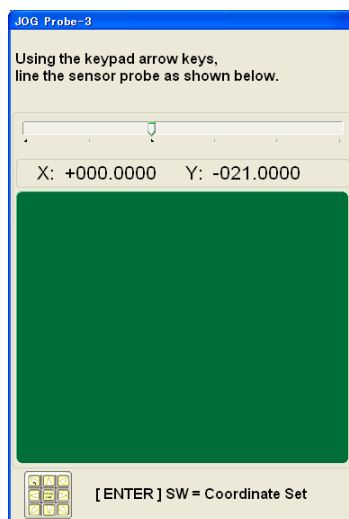
Use the keypad arrow keys to drive the 3Z arm and set the probe on any reference point on the horizontal line or any Via hole on your PC board. After the position was determined, press [Enter] SW to enter the X,Y coordinates.

Probe   Probe

Circuit pattern   Via hole
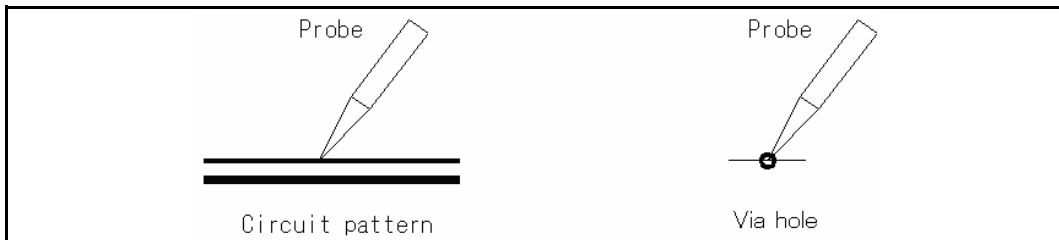
8. The next window appears on the screen. Press [TEST START] SW on the operation panel.

```
Sensor Probe / Probe Offset

3X-s.probe  3Y-s.probe
+000.0000  -021.0000

Press TEST START to begin set up.
```

9. The JOG window is displayed on the screen.

```
JOG Probe-3

Using the keypad arrow keys,
line the sensor probe as shown below.

X: +000.0000    Y: -021.0000

[ ENTER ] SW = Coordinate Set
```
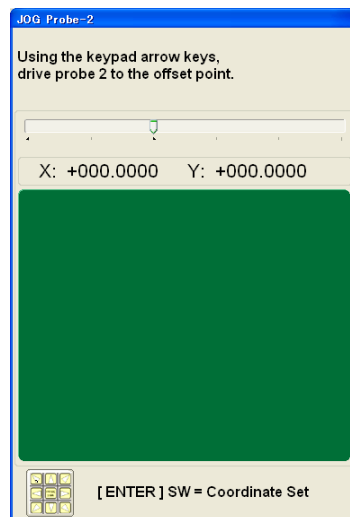
10. Use the keypad arrow keys to drive the 3Z arm and set the front side of the sensor plate for the X,Y coordinates assigned by Probe (3Z). After the position was determined, press [Enter] SW to enter the X,Y coordinates.

Sensor probe — Circuit pattern

Sensor probe — Via hole

11. The sensor probe moves to the Machine reference point automatically while displaying the following window on the screen.
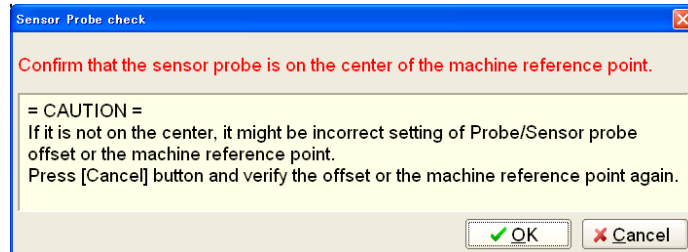
Sensor Probe check

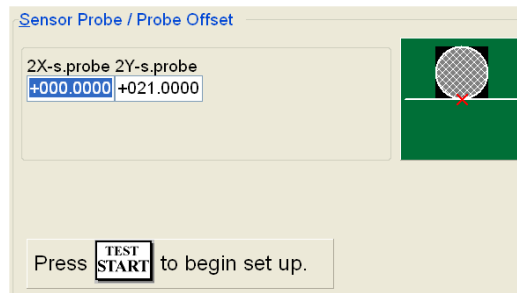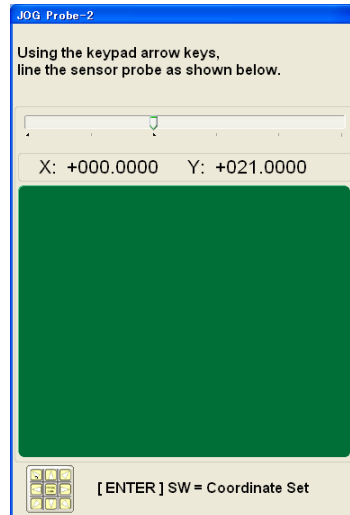Confirm that the sensor probe is on the center of the machine reference point.

= CAUTION =
If it is not on the center, it might be incorrect setting of Probe/Sensor probe offset or the machine reference point.
Press [Cancel] button and verify the offset or the machine reference point again.

✓ OK   ✗ Cancel

12. Ensure that the sensor probe is at the center of the Machine reference point and click on [OK] button. If the sensor probe has some deviations, click on [Cancel] button and repeat the same operation from Process 4.

13. The JOG window is displayed on the screen.
Now the sensor probe to probe offset on Arm #2 requires to be adjusted.

JOG Probe-2

Using the keypad arrow keys, drive probe 2 to the offset point.

X: +000.0000   Y: +000.0000

[ENTER] SW = Coordinate Set

14. Use the keypad arrow keys to drive the 2Z arm and set the probe on any reference point on the horizontal line or any Via hole on your PC board. After the position was determined, press [Enter] SW to enter the X,Y coordinates.
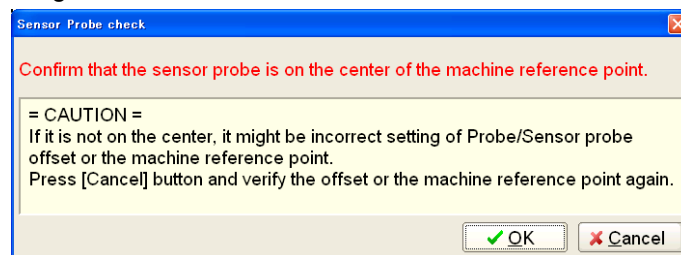

Probe — Circuit pattern

Probe — Via hole

15. The next window is displayed on the screen. Press [TEST START] SW on the operation panel.

Sensor Probe / Probe Offset

2X-s.probe 2Y-s.probe
+000.0000 +021.0000

Press [TEST START] to begin set up.

16. The JOG window is displayed on the screen.

JOG Probe-2

Using the keypad arrow keys,
line the sensor probe as shown below.

X: +000.0000   Y: +021.0000

[ENTER] SW = Coordinate Set

17. Use the keypad arrow keys to drive the 2Z arm and set the front side of the sensor plate for the X,Y coordinates assigned by Probe (2Z). After the position was determined, press [Enter] SW to enter the X,Y coordinates.

Sensor probe   Sensor probe

Circuit pattern   Via hole
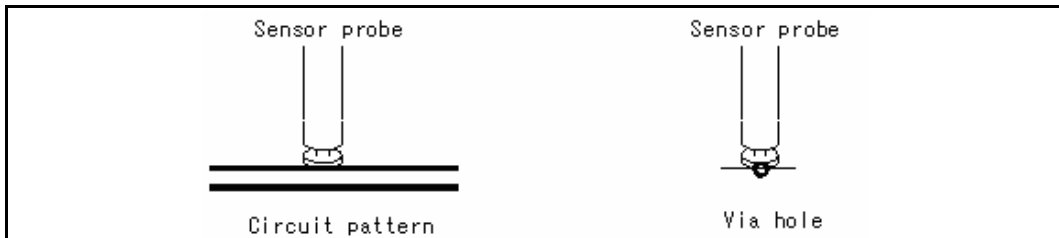
18. The sensor probe moves to the Machine reference point automatically.

19. It displays the following window on the screen.

Sensor Probe check

Confirm that the sensor probe is on the center of the machine reference point.

= CAUTION =
If it is not on the center, it might be incorrect setting of Probe/Sensor probe offset or the machine reference point.
Press [Cancel] button and verify the offset or the machine reference point again.

✓ OK   ✗ Cancel

20. Ensure that the sensor probe is at the center of the Machine reference point and click on [OK] button. Then the display goes back to the Option Mode window. If the sensor probe has some deviations, click on [Cancel] button and repeat the same operation from Process 13.

21. Click on [OK] button to quit the Option Mode window.

22. All that you need to do for Initial set was finished.

Automatic generation of IC open test

The tester offers two options to manage the XY coordinates in your test programs. One method is so-called "**Teaching system**" that utilizes the solder lands and the electrodes to test the UUT. Another one is so-called "**Point system**" that utilizes any test point from each circuit patterns. Those coordinate management systems are user-selectable on the Coordinates Management window in Data mode.
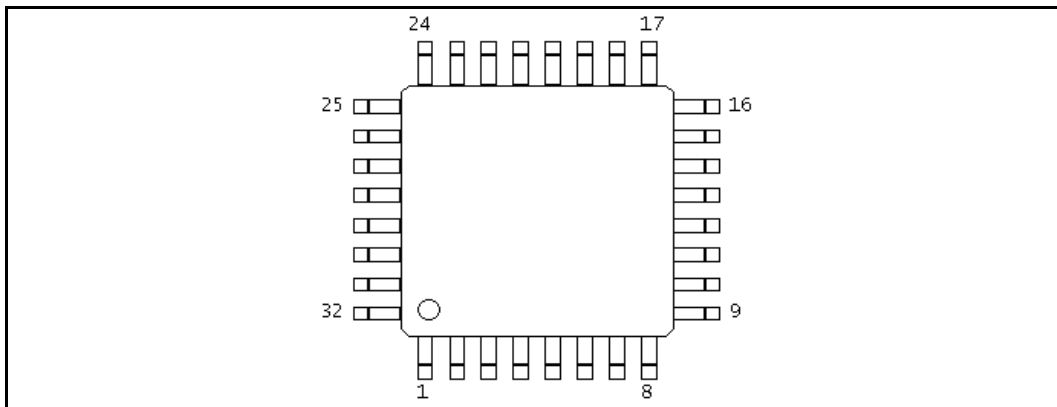
> ⚠ **Prior to start programming a test data, ensure that the box "Use Auxiliary Reference Point(s)" on the Auxiliary Reference Point(s) window (Tool > Mode setting > Data Mode) is selected.**

Practical operation in Teaching system

The IC open test is automatically created by using the Auto. Generation function available on Step Edit/List menu. (Tool > Step Edit/Step List > Auto. Generation)
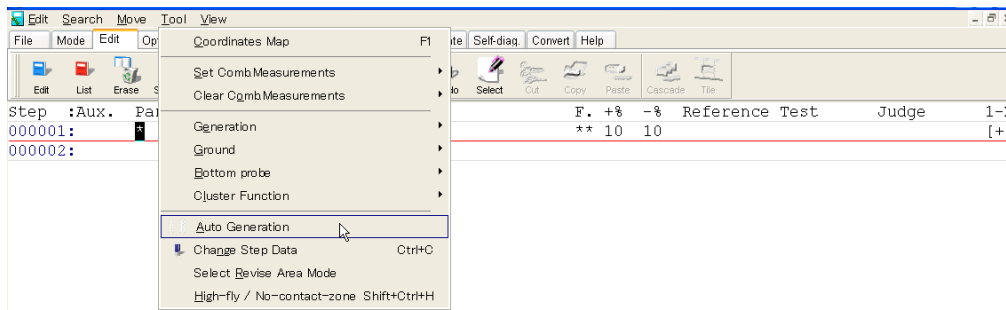
(Ex.1) How to program the IC open test for the following IC

Preparation

Coordinates Management system (Tool > Mode setting > Data Mode) should be specified to *Teaching system* in advance.

1) Select either Step Edit or Step List from Menubar.
2) It displays the Step Edit window or the Step List window.

Step List window

3) Select Auto. Generation function from the Menubar. (Tool > Auto. Generation)

4) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

5) Click on [Yes] button.

6) It displays the pop-up message "Press [TEST START] SW" on the screen.

7) Press [TEST START] SW on the operation panel.

8) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

9) It displays the Auto. Generation window.

Type "Parts name', 'Comment' and 'location' from the keyboard. Then click on [Next] button.

10) It proceeds to the next window where you can specify a preferable generation function.

Fill 'IC automatic generation' radio button and click on [Next] button.

11) It proceeds to the next window where you can specify a preferable generation style.

Fill 'IC open test only' radio button and click on [Next] button.

12) It proceeds to the next window where you can specify a preferable generation pitch.

Fill 'Regular pitch' radio button and click on [Next] button.

13) It proceeds to the next window where you can specify information on the IC lead number.
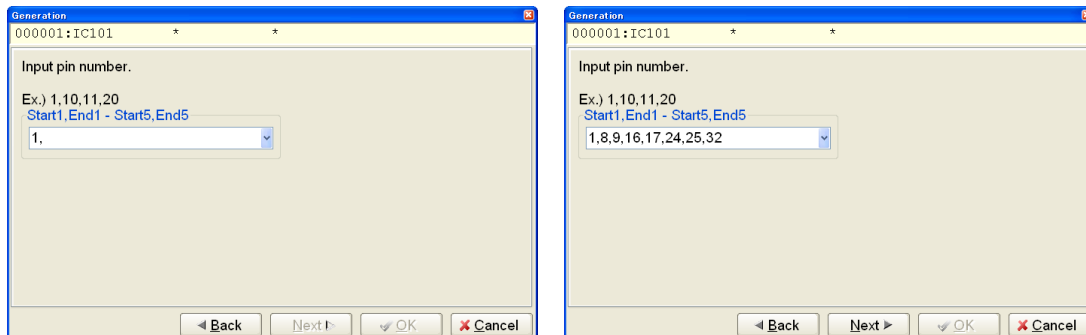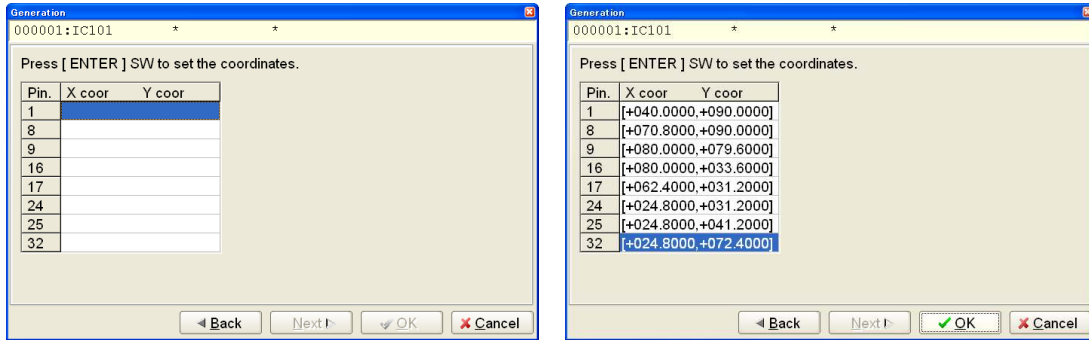

Type "8, 9, 16, 17, 24, 25, 32" from the keyboard and click on [Next] button.

14) It proceeds to the next window where you can specify GND pin number.
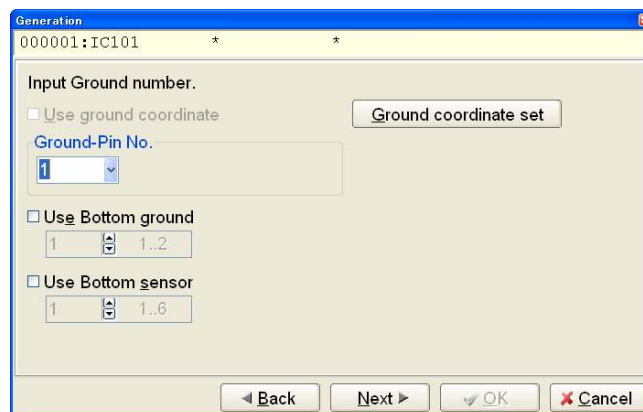
Type "7" from the keyboard and click on [Next] button.

15) It proceeds to the next window where you can input the XY coordinates for the IC leads you specified at Process #13.

Drive the camera to enter the X,Y coordinates of the IC lead #1, 8, 9, 16, 17, 24, 25 and 32 in order and click on [OK] button.
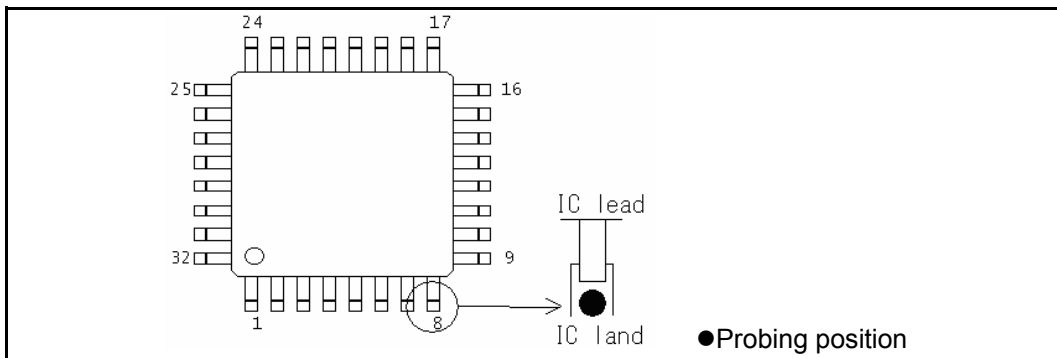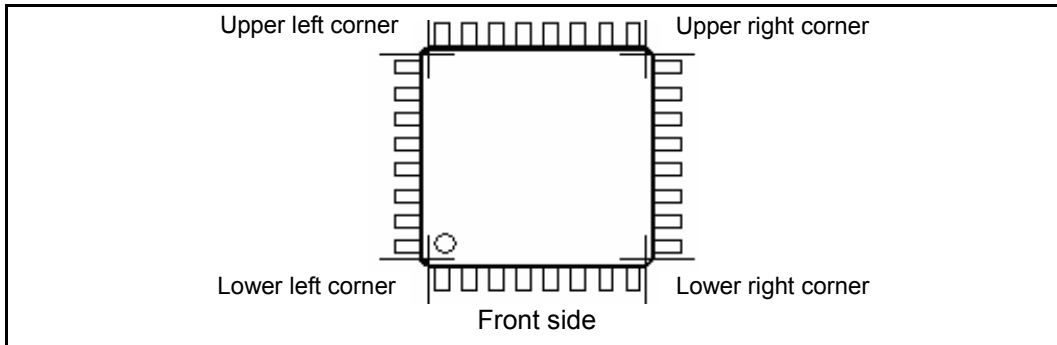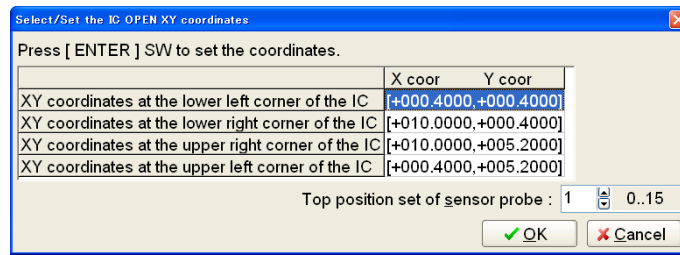

●Probing position

| ! | Ideally all probing position should be on the IC land, not directly on any IC leads. Otherwise it may possibly mislead the judgment, because the open circuit at IC lead can be touched by the probing pressure. |

16) It proceeds to the next window where you can input the XY coordinates for the two GND points that should set at the lower left and the upper right of the IC which is under way.
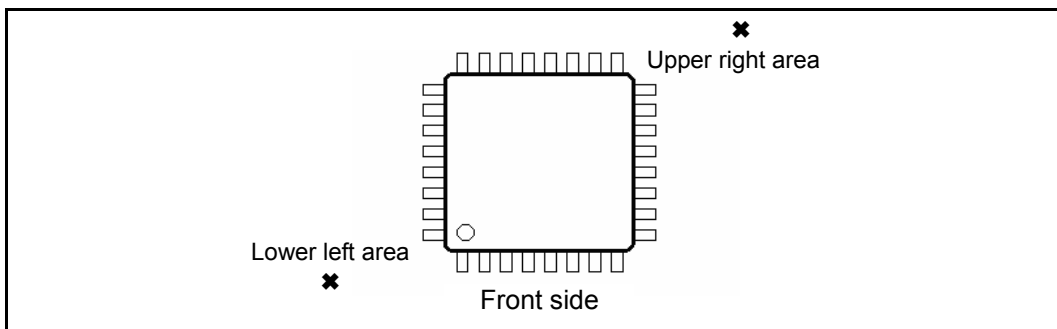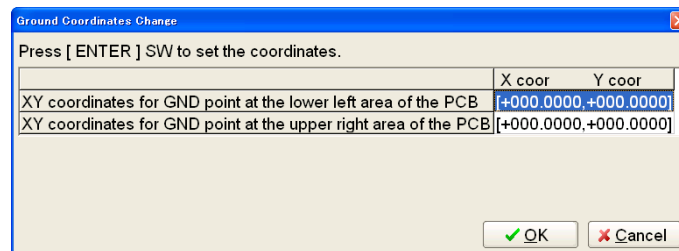
Drive the camera to enter the X,Y coordinates at the two GND points and click on [OK] button.

17) It proceeds to the next window where you can input the X,Y coordinates at each corners of the IC package.

Select/Set the IC OPEN XY coordinates

Press [ENTER] SW to set the coordinates.

	X coor	Y coor
XY coordinates at the lower left corner of the IC	[+000.4000,+000.4000]	
XY coordinates at the lower right corner of the IC	[+010.0000,+000.4000]	
XY coordinates at the upper right corner of the IC	[+010.0000,+005.2000]	
XY coordinates at the upper left corner of the IC	[+000.4000,+005.2000]	

Top position set of sensor probe : 1   0..15

✓ OK   ✗ Cancel

Upper left corner   Upper right corner

Lower left corner   Lower right corner

Front side

Drive the camera to enter the X,Y coordinates at the four corners of the IC package and click on [OK] button.

18) The IC Open test steps are generated on the list automatically.

⚠	**In case that the GND points for IC open test were set up incorrectly, otherwise when probe access was limited, IC open test steps may be not generated so that they are converted to normal VF measurement steps ('Pin to GND') automatically.**

| HINT	**The Auto. Generation window is also displayed by substituting "=" mark in Value column and hitting [Enter] key on the Step Edit menu and the Step List menu.**
	After IC open steps were generated, 'ICOP' is substituted in Aux. column of their test steps.

Practical operation in Point system

The IC open test is automatically created by using the Auto. Generation function available on Step Edit/List menu. (Tool > Step Edit/Step List > Auto. Generation)
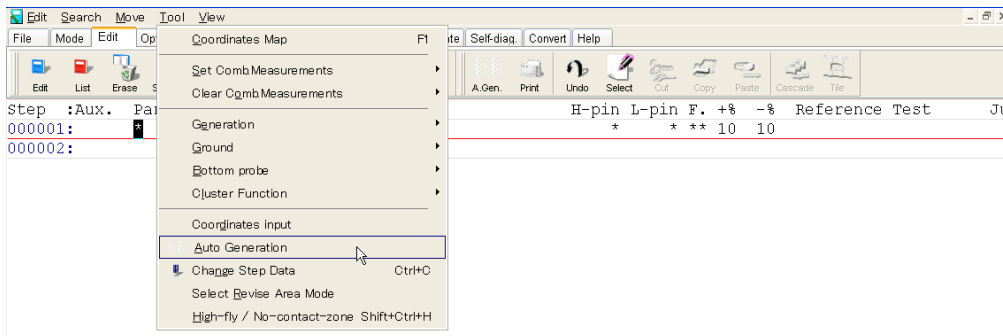
Undermentioned is a practical example to make IC Open test steps.

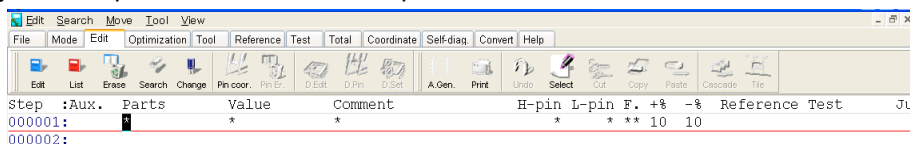## (Ex.2) How to program test steps only for the IC below
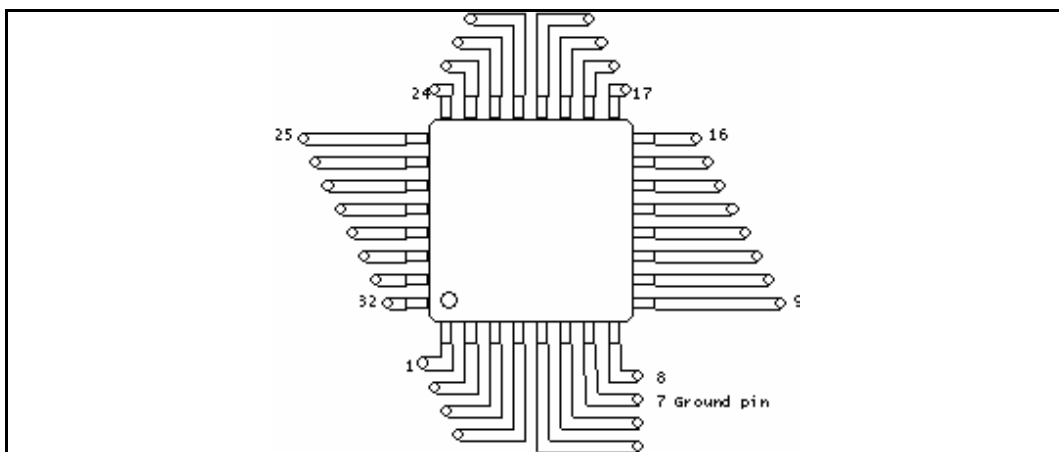
Preparation

Coordinates Management system (Tool > Mode setting > Data Mode) should be specified to **Point system** in advance.

1) Select either Step Edit or Step List from Menubar.

2) It displays the Step Edit window or the Step List window.

Step List menu

3) Select Auto. Generation function from the Menubar. (Tool > Auto. Generation)

4) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?"on the screen.

5) Click on [Yes] button.

6) It displays the pop-up message "Press [TEST START] SW" on the screen.

7) Press [TEST START] SW on the operation panel.

8) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

9) It displays the Auto. Generation window.

Type "Parts name', 'Comment' and 'location' from the keyboard. Then click on [Next] button.

10) It proceeds to the next window where you can specify a preferable generation function.

Fill 'IC automatic generation' radio button and click on [Next] button.

11) It proceeds to the next window where you can specify a preferable generation style.
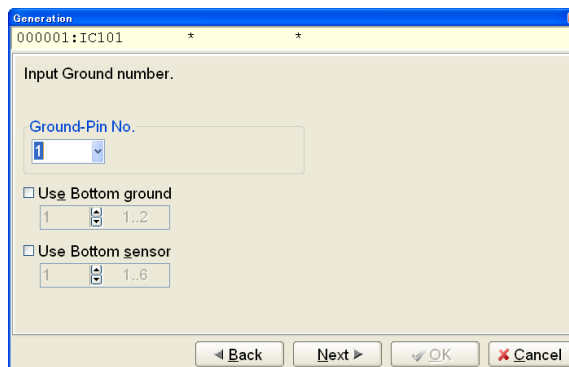
Fill 'IC open test only' radio button and click on [Next] button.

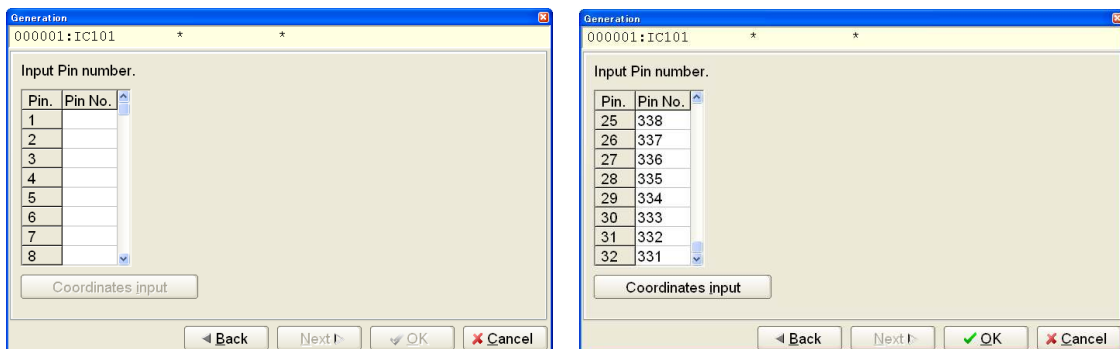12) It proceeds to the next window where you can specify information on the IC lead number.

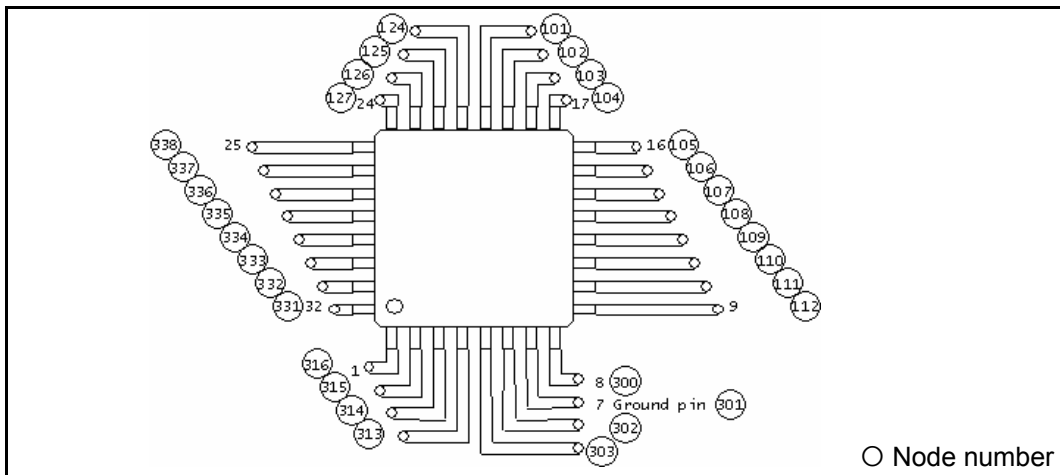Type "8, 9, 16, 17, 24, 25, 32" from the keyboard and click on [Next] button.

13) It proceeds to the next window where you can specify GND pin number.

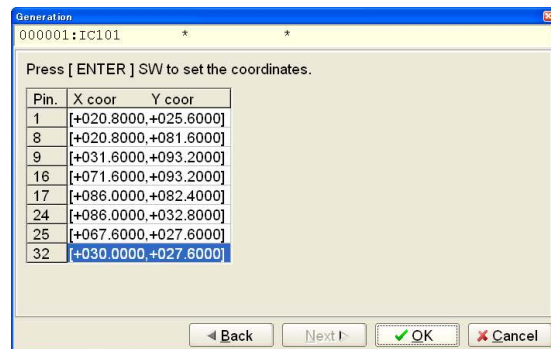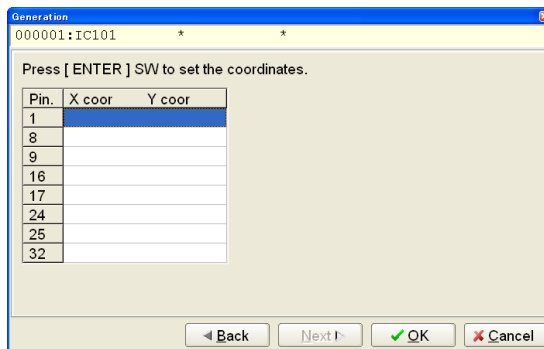Type "7" from the keyboard and click on [Next] button.

14) It proceeds to the next window where you can specify the Node number for the IC leads you specified at Process #12

○ Node number

Type the Node number for each IC leads from the keyboard and click on [OK] button.

15) Drive the camera to enter the X,Y coordinates of the IC lead #1, 8, 9, 16, 17, 24, 25 and 32 in order and click on [OK] button.
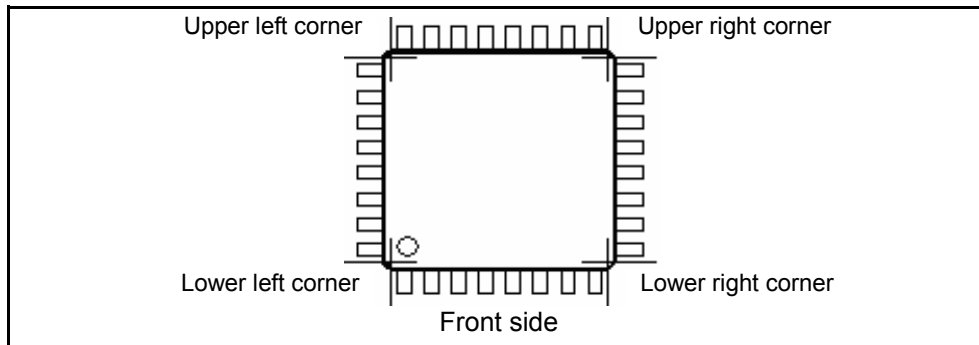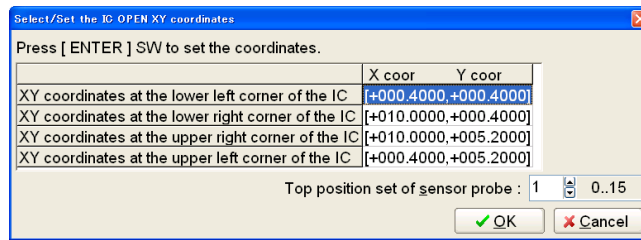

16) It proceeds to the next window where you can input the XY coordinates for the two GND points that should set at the lower left and the upper right of the IC which is under way.
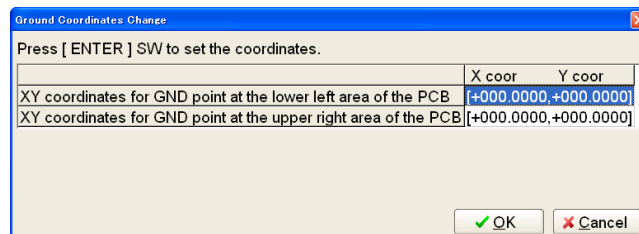
Drive the camera to enter the X,Y coordinates at the two GND points and click on [OK] button.
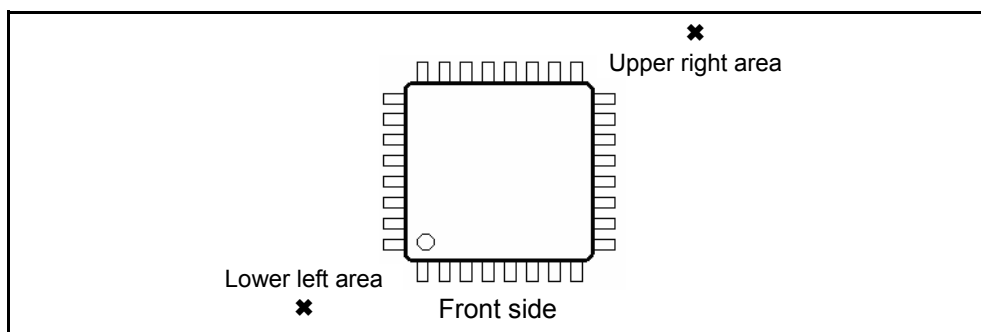
17) It proceeds to the next window where you can specify X,Y coordinates for each corners of the IC package.

Select/Set the IC OPEN XY coordinates

Press [ENTER] SW to set the coordinates.

	X coor	Y coor
XY coordinates at the lower left corner of the IC	[+000.4000,+000.4000]	
XY coordinates at the lower right corner of the IC	[+010.0000,+000.4000]	
XY coordinates at the upper right corner of the IC	[+010.0000,+005.2000]	
XY coordinates at the upper left corner of the IC	[+000.4000,+005.2000]	

Top position set of sensor probe : 1   0..15

✓ OK   ✗ Cancel

Upper left corner   Upper right corner

Lower left corner   Lower right corner

Front side

Drive the camera to enter the X,Y coordinates at the four corners of the IC package and click on [OK] button.

18) The IC Open test steps are generated on the list automatically.

Step	:Aux.	Parts	Value	H-pin	L-pin	Comment	Loc
000001:	ICOP	IC101	1-7P	316	301	*	1A
000002:	ICOP	IC101	2-7P	315	301	*	1A
000003:	ICOP	IC101	3-7P	314	301	*	1A
000004:	ICOP	IC101	4-7P	313	301	*	1A
000005:	ICOP	IC101	5-7P	303	301	*	1A
000006:	ICOP	IC101	6-7P	302	301	*	1A
000007:	ICOP	IC101	8-7P	300	301	*	1A
000008:	ICOP	IC101	9-7P	112	301	*	1A
000009:	ICOP	IC101	10-7P	111	301	*	1A
000010:	ICOP	IC101	11-7P	110	301	*	1A
000011:	ICOP	IC101	12-7P	109	301	*	1A
000012:	ICOP	IC101	13-7P	108	301	*	1A

Prior to generate IC open test steps, you are recommended to fill "Use Auxiliary Reference Point(s)" checkbox available in Data Mode menu. Otherwise it may give bad influence to the IC open test if the PC board under test is set with some inclination.

In case that the GND points for IC open test were set up incorrectly, otherwise when probe access was limited, IC open test steps may be not generated so that they are converted to normal VF measurement steps ('Pin to GND') automatically.

Auto. Generation menu is also displayed by substituting "=" mark in Value column and hitting [Enter] key on Step Edit menu or Step List menu.

After IC open steps were generated, 'ICOP' is substituted in Aux. column of their test steps.
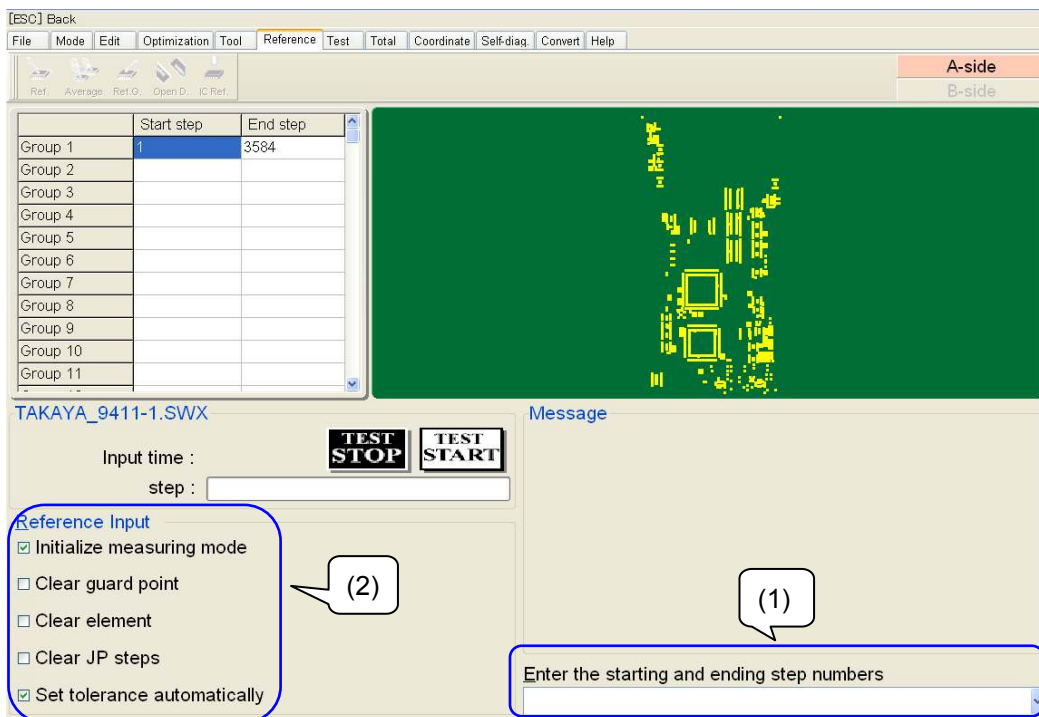
Reference Value Input & Examination

The important part begins here as you will need to input and examine the reference value for IC open test correctly.

Reference Value Input

Like usual test steps, use Reference value input window to input the reference value for the IC open test.

1) Select "Reference Value Input" from the Menubar. (Reference > Reference Value Input)

2) It displays the Reference Value Input window. It can input the reference value according to the set criteria in Reference Input area (2) and Enter the starting and ending step numbers box (1), as needed.

3) Press [TEST START] SW on the operation panel, and the reference value input starts automatically.

> **HINT**: **If you prefer to input reference value for IC open test steps only, use IC Open Reference Value Input function (Reference > Auxiliary > IC Open Reference Value Input).**

Reference Value Examination

Like usual test steps, use the Examination function (Step data review, Step data test) to examine and change the measurement condition for IC open test.

Reference value

The reference value of IC open test is something special and has no unit with it.

Pass/Fail judgment

The IC open test is judged PASS when it was measured within the tolerance (±30%) of the reference value which you learned from good sample board(s). The tolerance is assigned to ±30% automatically during the automatic reference input.

However, the reference value for IC open test may vary significantly depending on the IC components under test and/or due to the effect of the substrate, which occasionally causes misjudgment even though the tester is in good condition. In such case, you should make the proper adjustment of the tolerance through not a little sampling.

The operation below is just for convenience to save low tolerance (%) that is applied to the IC open test automatically depending on the reference value.

1) Select "Change Step Data" from the Menubar. (Tool > Change Step data)
2) It displays the Change Step Data window.
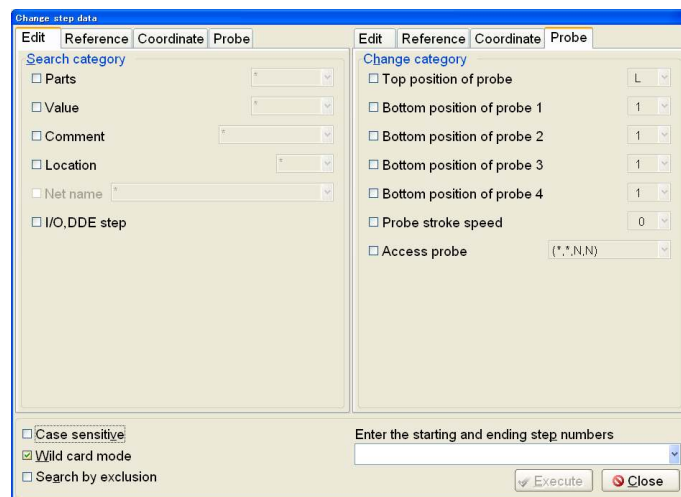
3) Fill "IC Open" checkbox in Search category on the Reference tab. After that, fill "IC Open" checkbox in Change category, then click on […] button on the right-hand.
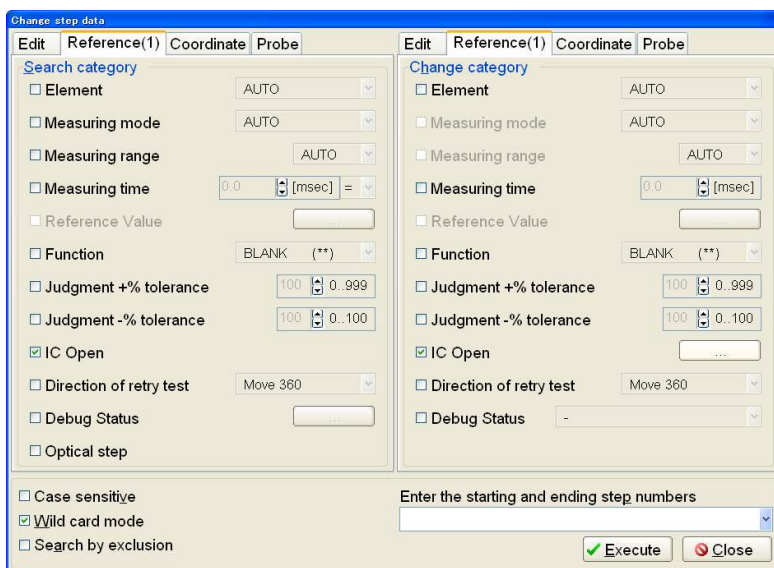
4) It displays the Set low tolerance from the Ref. value window. Specify the low tolerance (%) you want to set for each range of the reference value of the IC open test and then click on [OK] button.

Ref.Value	Low Tolerance(-%)
Over 130.0	50
120.0 - 129.9	50
110.0 - 119.9	50
100.0 - 109.9	50
90.0 - 99.9	50
80.0 - 89.9	50
70.0 - 79.9	50
60.0 - 69.9	50
50.0 - 59.9	50
40.0 - 49.9	50
30.0 - 39.9	50
20.0 - 29.9	50
10.0 - 19.9	50
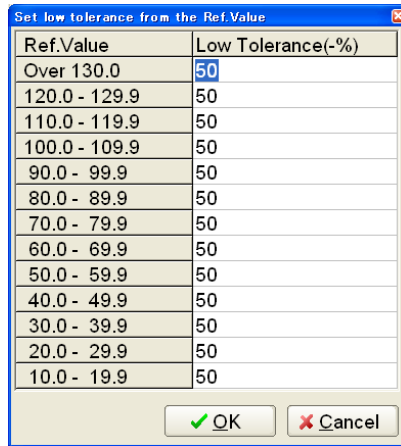
5) The display goes back to the Change Step Data window. Click on [Execute] button.

Unmeasurable condition

As for the unmeasurable cases which were described in a previous chapter, the Function (FC) column is automatically substituted by "JP" at the time of the automatic reference value input.

In addition, when either [Auto. Input] key or [Input] key was pressed on those steps in the Step data review, following error messages may be displayed.

"The IC open measurement is difficult!"
"The IC open measurement is impossible!"

In this case, the error messages are likely to be caused by the following facts:

Unmeasurable conditions or reasons
(1) ICs which mold thickness over the lead frame are thicker than 2.5mm.
(2) ICs in which shield plate or heat sink is installed over the IC's package or the lead frame.
(3) IC lead is on either GND line and Vcc line
(4) IC lead with very small impedance of less than 10 ohm (equivalent to approx. 0.9 μF or more in capacitance) against the Vcc or the GND line.
(5) IC lead wire breaks in the IC's package.
(6) The distance between the sensor probe and the probe pin is too near to measure. (Less 2.8mm approx.)

If any of cases above, it is recommended to change the step to "JP" (jump).

Data conversion

Electric test of the IC components (i.e. conventional Pin to GND steps) can be easily converted into the IC open test -- and vice versa.

The procedure of converting more than one electric test in series into the IC open test is outlined below.

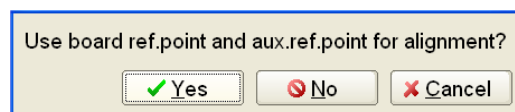(NOTE) The procedure below is the case for Teaching system.

1) Select either Step Edit or Step List from the Menubar.

2) It displays the Step Edit window or the Step List window.

3) Put your mouse pointer over the first step of the existing electric test.

```
Step  :Aux.  Parts   Value   Comment
000590:       IC12    1-8P    74HC192A
000591:       IC12    2-8P    74HC192A
000592:       IC12    3-8P    74HC192A
000593:       IC12    4-8P    74HC192A
000594:       IC12    5-8P    74HC192A
000595:       IC12    6-8P    74HC192A
000596:       IC12    7-8P    74HC192A
000597:       IC12    9-8P    74HC192A
```

4) Select "Convert" from the Menubar. (Tool > Generation > IC Open > Convert)
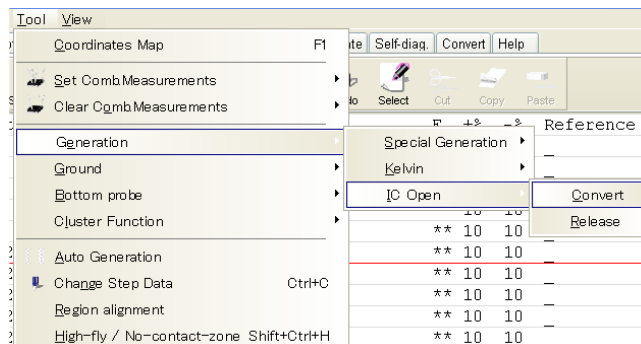
5) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

6) Click on [Yes] button.

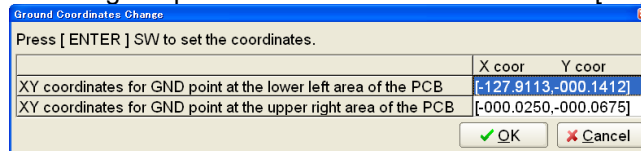7) It displays the pop-up message "Press [TEST START] SW" on the screen.

8) Press [TEST START] SW on the operation panel.

9) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

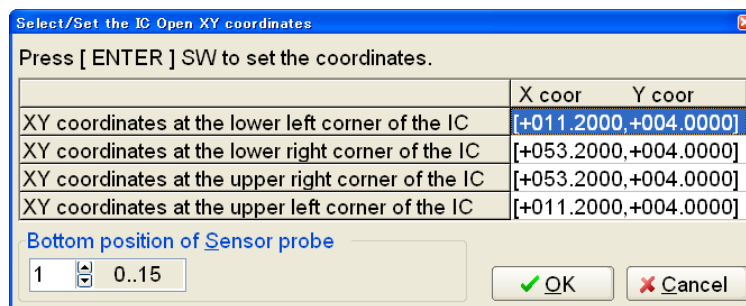10) It displays the pop-up message "Do you use the bottom sensor probe?" on the screen. Click on [No] button.

Do you use the bottom sensor probe?

✔ Yes   ⊘ No
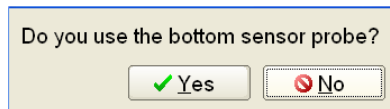
11) It displays the pop-up message "Is it irregular pitch?" on the screen. Click on [No] button.
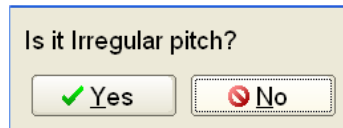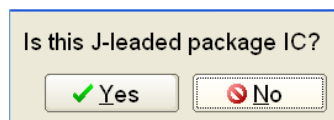
Is it Irregular pitch?

✔ Yes   ⊘ No

12) It displays the following window on the screen. Enter X,Y coordinates for two GND points at the left-bottom side and at the right-top side of the PC board and click on [OK] button.

Ground Coordinates Change

Press [ENTER] SW to set the coordinates.

	X coor	Y coor
XY coordinates for GND point at the lower left area of the PCB	[-127.9113,-000.1412]	
XY coordinates for GND point at the upper right area of the PCB	[-000.0250,-000.0675]	

✔ OK   ✘ Cancel

13) It displays the following window on the screen. Enter the X,Y coordinates for each corners of the IC package and click on [OK] button.

Select/Set the IC Open XY coordinates

Press [ENTER] SW to set the coordinates.

	X coor	Y coor
XY coordinates at the lower left corner of the IC	[+011.2000,+004.0000]	
XY coordinates at the lower right corner of the IC	[+053.2000,+004.0000]	
XY coordinates at the upper right corner of the IC	[+053.2000,+004.0000]	
XY coordinates at the upper left corner of the IC	[+011.2000,+004.0000]	

Bottom position of Sensor probe
1   0..15

✔ OK   ✘ Cancel

14) It displays the pop-up message "Is this J-leaded package IC?" on the screen. Click on [No] button.

Is this J-leaded package IC?

✔ Yes   ⊘ No

15) IC Open test steps are generated on the list automatically.

Step	:Aux.	Parts	Value	Comment
000590:	ICOP	IC12	1-8P	74HC192A
000591:	ICOP	IC12	2-8P	74HC192A
000592:	ICOP	IC12	3-8P	74HC192A
000593:	ICOP	IC12	4-8P	74HC192A
000594:	ICOP	IC12	5-8P	74HC192A
000595:	ICOP	IC12	6-8P	74HC192A
000596:	ICOP	IC12	7-8P	74HC192A
000597:	ICOP	IC12	9-8P	74HC192A

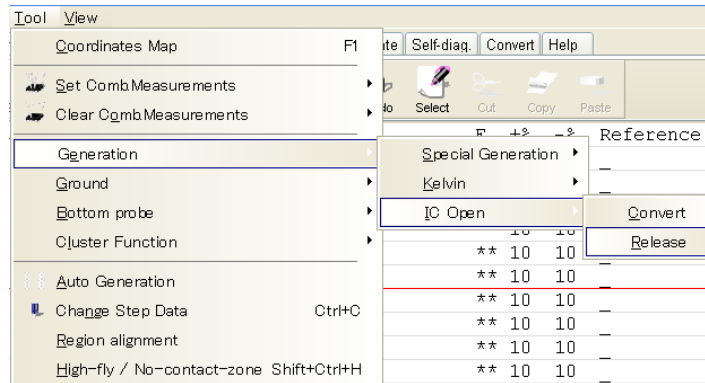| ⚠	**Make sure that you enter the reference value after the data conversion.**
	When the GND points for IC open test were set improperly or when the probe access is strictly limited, IC open test may be not generated so that they are converted to normal electric test (Pin to GND steps) automatically.
HINT	**After IC open test was generated, 'ICOP' is substituted in Aux. column of the test steps.**

The procedure of converting more than one IC open test in series into the electric test is outlined below.

Operate

1) Select either Step Edit or Step List from the Menubar.

2) It displays the Step Edit window or the Step List window.

3) Put your mouse pointer over the first step of the existing IC open test.

```
Step  :Aux.   Parts    Value   Comment
000590:ICOP   IC12     1-8P    74HC192A
000591:ICOP   IC12     2-8P    74HC192A
000592:ICOP   IC12     3-8P    74HC192A
000593:ICOP   IC12     4-8P    74HC192A
000594:ICOP   IC12     5-8P    74HC192A
000595:ICOP   IC12     6-8P    74HC192A
000596:ICOP   IC12     7-8P    74HC192A
000597:ICOP   IC12     9-8P    74HC192A
```

4) Select "Release" from the Menubar. (Tool > Generation > IC Open > Release)

5) It displays the pop-up message "Do you convert regular generation?"on the screen. Click on [Yes] button.

6) The electric test steps are generated on the list automatically.

```
Step  :Aux.   Parts    Value   Comment
000590:        IC12     1-8P    74HC192A
000591:        IC12     2-8P    74HC192A
000592:        IC12     3-8P    74HC192A
000593:        IC12     4-8P    74HC192A
000594:        IC12     5-8P    74HC192A
000595:        IC12     6-8P    74HC192A
000596:        IC12     7-8P    74HC192A
000597:        IC12     9-8P    74HC192A
```
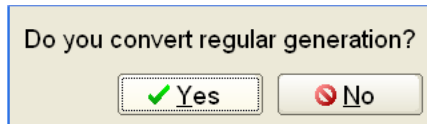
!	**Make sure that you enter the reference value after the data conversion.**

How to convert electric test to IC open test (One step only)

The procedure of converting one electric test into the IC open test is outlined below.

1) Select Review Step Data from the Menubar. (Test > Review Step Data)
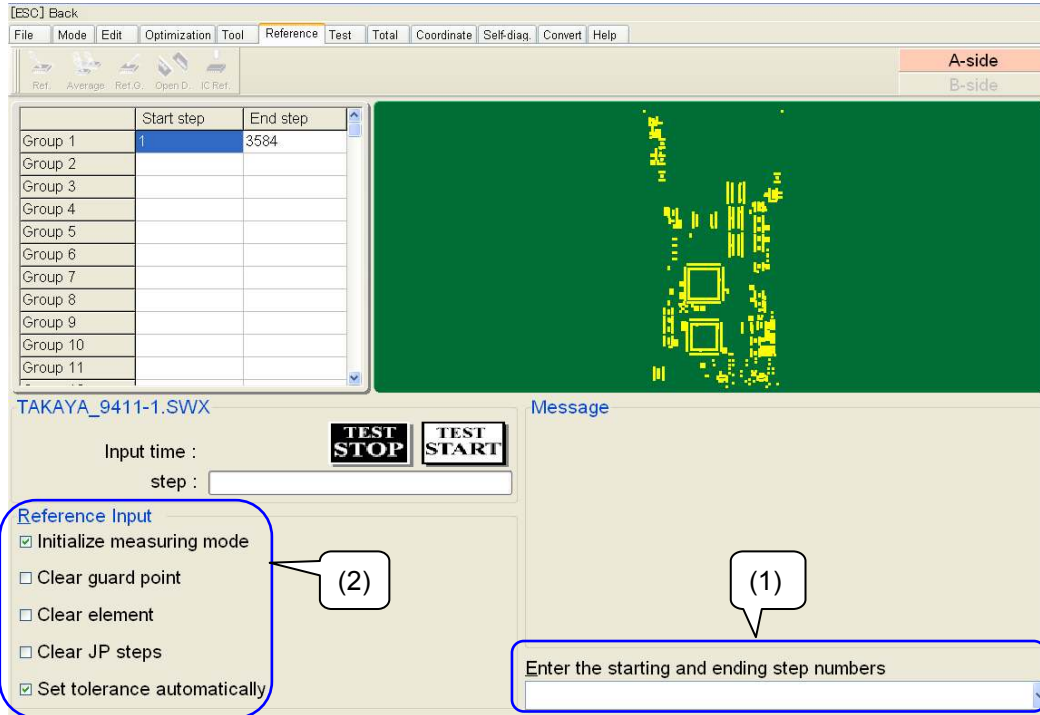

2) Fill the box "Evaluation of reference value" in the Examination Mode menu (2).

3) Use the input box (1) to specify the step number of the step to be converted into the IC open test.

4) Press [TEST START] SW on the operation panel.

5) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

6) Click on [Yes] button.

7) It displays the pop-up message "Press [TEST START] SW" on the screen.

8) Press [TEST START] SW on the operation panel.

9) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

10) It displays the Review Step Data window below.
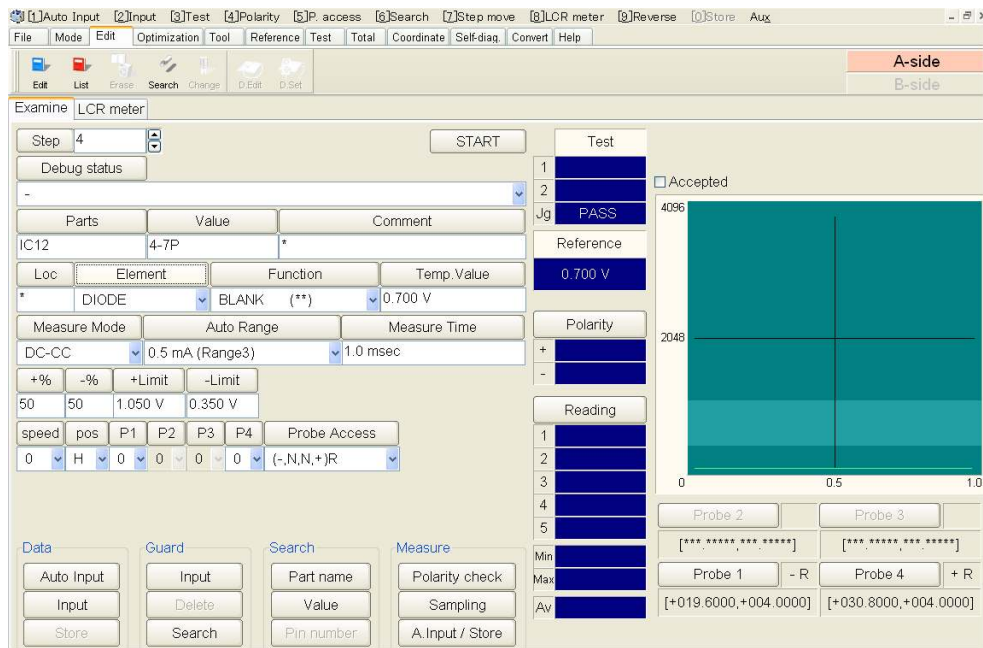
11) Assign 'LD-CN' to the Measure Mode box.
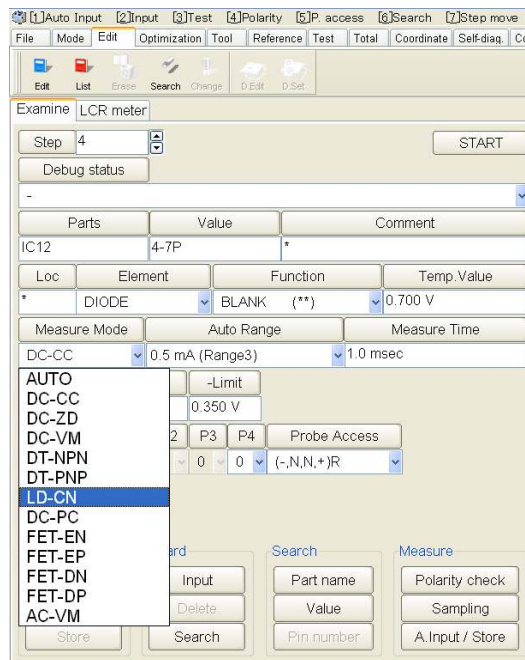
12) It displays the pop-up message "Do you use the bottom sensor probe?" on the screen. Click on [No] button.
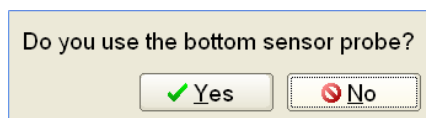
13) It displays the following window on the screen. Enter X,Y coordinates for two GND points at the left-bottom side and at the right-top side of the PC board and click on [OK] button.
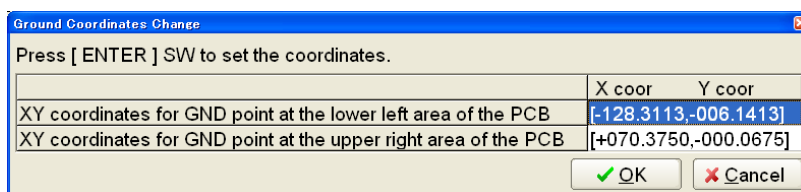
14) It displays the following window on the screen. Enter the X,Y coordinates and the top position of the Sensor probe. Then, click on [OK] button.
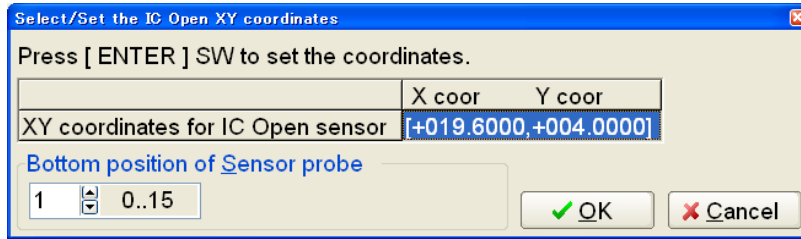
15) The display goes back to the Step data review window. Assign '30' to both +% edit box and -% edit box.

16) Click on [Auto Input] button to learn the reference value.

17) Hit [0] key to save the reference value.
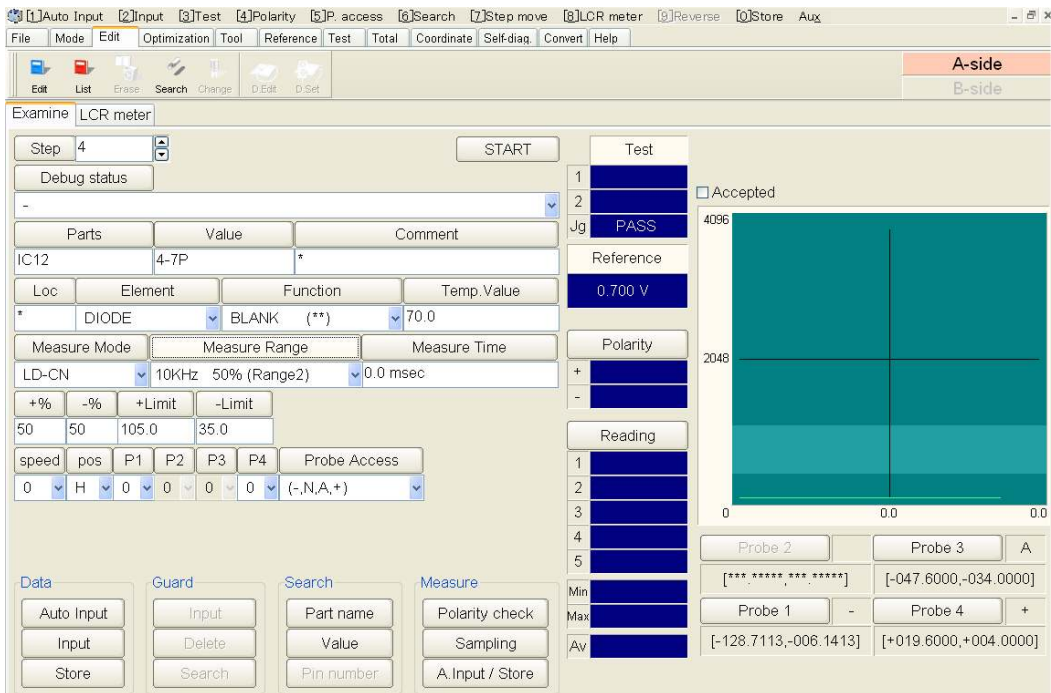
18) Now the original step was changed to IC open test.

How to convert IC open test to electric test (One step only)

The procedure of converting one IC open test into the electric test is outlined below.

1) Select Review Step Data from the Menubar. (Test > Review Step Data)
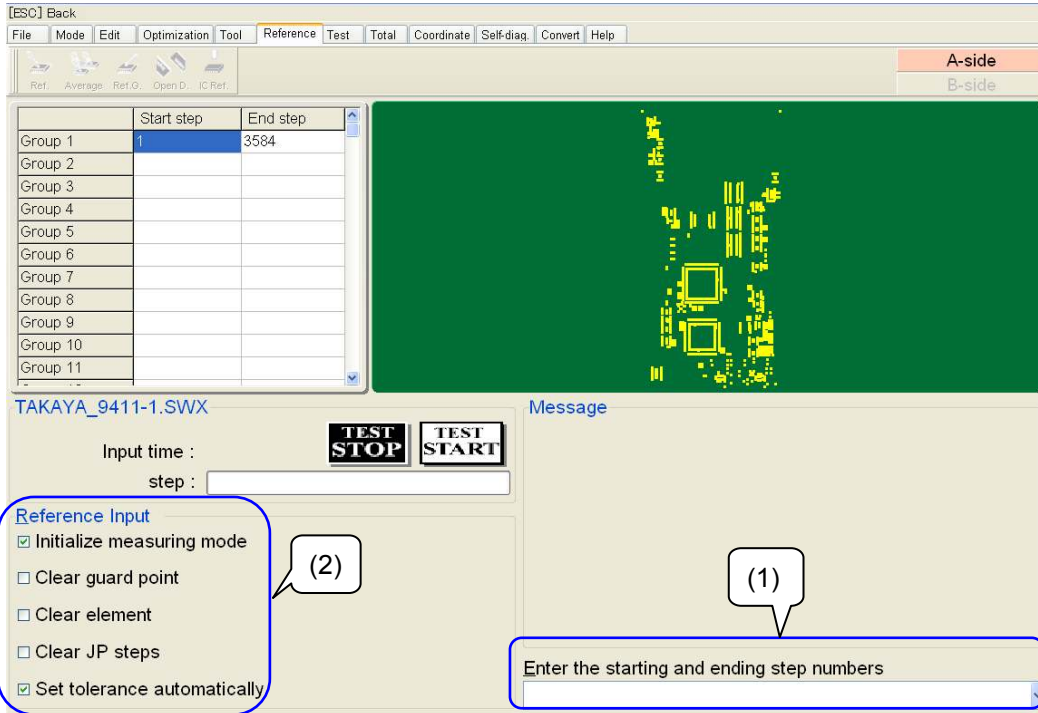
2) Fill the box "Evaluation of reference value" in the Examination Mode menu (2).

3) Use the input box (1) to specify the step number of the step to be converted into the electric test.

4) Press [TEST START] SW on the operation panel.

5) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

6) Click on [Yes] button.

7) It displays the pop-up message "Press [TEST START] SW" on the screen.

8) Press [TEST START] SW on the operation panel.

9) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

10) It displays the Review Step Data window below.
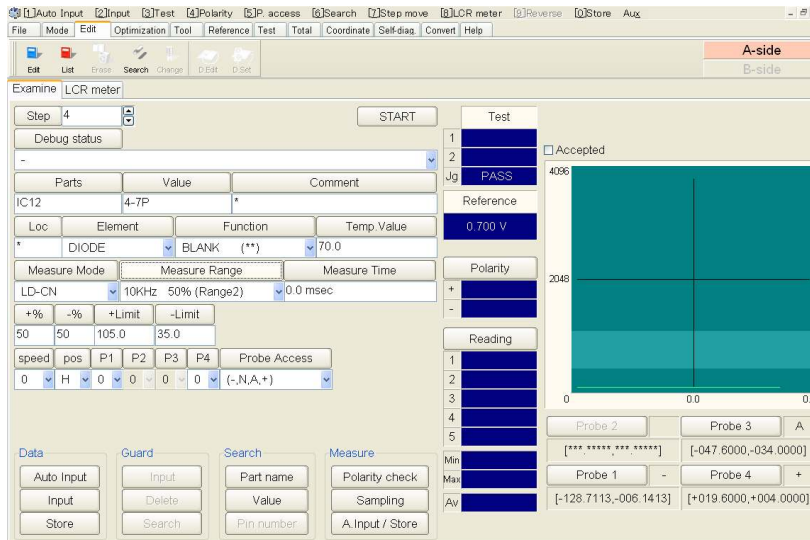
11) Assign 'DC-CC' to the Measure Mode box.
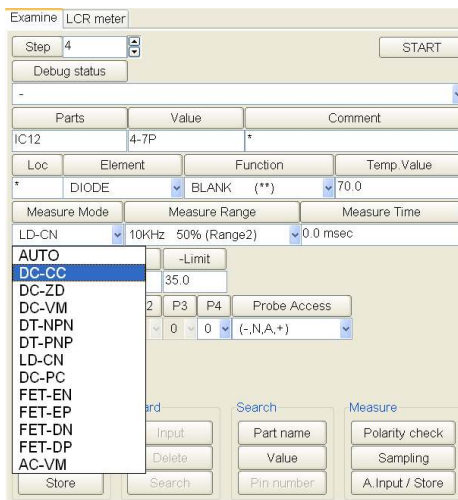
12) Assign '50' to both +% edit box and -% edit box.

13) Click on [Auto Input] button to learn the reference value.

14) Hit [0] key to save the reference value.
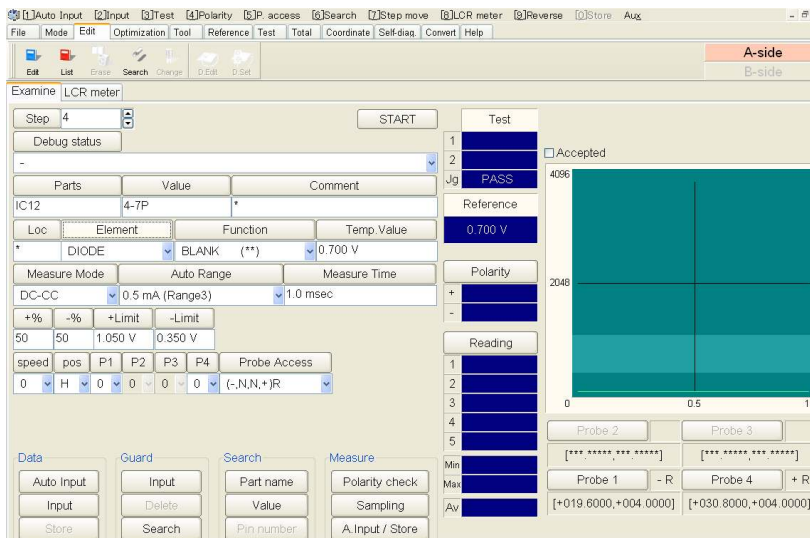
15) Now the original step changed to regular electric test.

Lowest position of Sensor probe

Sensor probe's stroke (the lowest position) for 2Z and 3Z axis is step by step changeable at "PL" column displayed in Step List menu. Also they are changeable in the block on Change step data window (Tool > Change Step Data).

The lowest position means a distance being lifted upward from the board surface and is regulated as shown in [List 1] below. In case of over stroke or short stroke, readjust this lowest position properly.

> ⚠ **Even if any Sensor probe had short stroke, it is adjusted automatically under Auto. reference value input of IC open test steps. However, their stroke is too much shorted, it would take longer time for readjusting the stroke.**

Value	Lowest position	Value	Lowest position
0	0 mm	8	8.0 mm
1	1.0 mm	9	9.0 mm
2	2.0 mm	A	10.0 mm
3	3.0 mm	B	11.0 mm
4	4.0 mm	C	12.0 mm
5	5.0 mm	D	13.0 mm
6	6.0 mm	E	14.0 mm
7	7.0 mm	F	15.0 mm

[List 1] Lowest position of Sensor probe
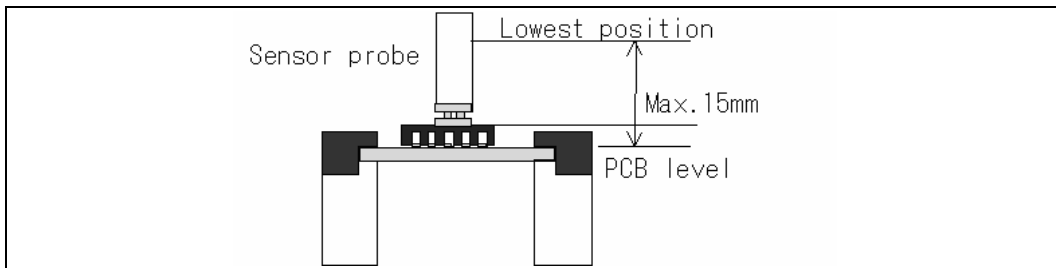
[Fig.1] Sensor probe stroke

1) Select either Step Edit or Step List from the Menubar.

2) It displays the Step Edit window or the Step List window.

3) Put your mouse pointer over the step to be changed.

4) Change 'PL' value for 2Z or 3Z axis on the list.

Probe 1,2,3,4 from the left
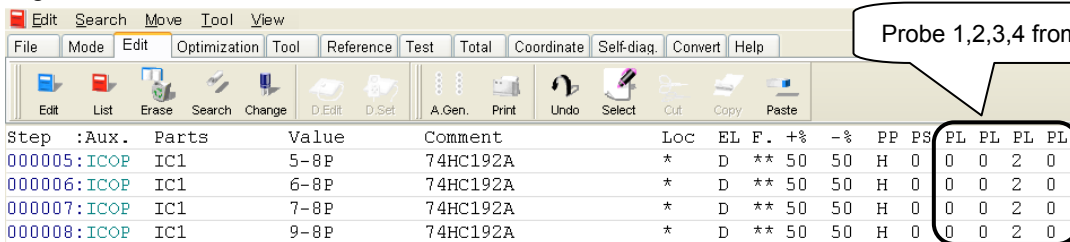
> ⚠ **PL (Lowest position) changed in the Step Edit/List menu is applicable when the reference value is input. At that time, the stroke shortage from the changed lowest position is aligned automatically.**

Top position of Sensor probe

The top position of the Sensor probe is managed by "H / M / L" in the same manner as the probe. The distance upward from the board surface is preset to 40.0mm(H), 16.4mm(M) and 6.4mm(L).

If the top position was lowered than the default (H), the rising time of the probe and the Sensor probe shorten, so that the test time is reduced.
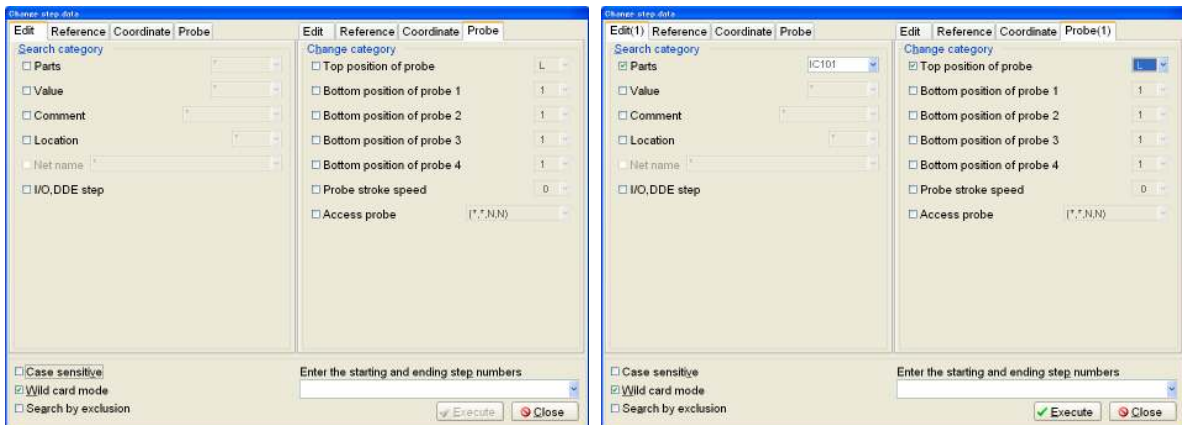
⚠ CAUTION	In case that the M / L stroke needs to be changed, be sure to leave some margin for height clearance to avoid the mechanical interference with the devices on the PC board. Otherwise this may damage the probes, the Sensor probes or the PC board.

💡 HINT	The M / L stroke is changeable on the Top Position of Probe window. (Tool > Mode Setting > Data Mode > Top Position of Probe)

Operate

1) Select Change step data from the Tool menu.

2) It displays the Change step data window.

3) Fill the box "Parts" in Search category and enter the name of the part which top position should be changed.

4) Fill the box "Top position of probe" in Change category and select your preferable top position (H/M/L) from the combo box there.

5) Click on [Execute] button on the bottom.

⚠ CAUTION	In case that top position of the probe or the Sensor probe needs to be changed, be sure to leave some margin for height clearance to avoid the mechanical interference with the devices on the PC board. Otherwise this may damage the probes, the Sensor probes or the PC board.

§ 3 Maintenance

This section describes a short guidance how to do maintenance and troubleshooting on the sensor probes.

Maintenance of Sensor Probe Base CS8000-S21

The Sensor probe base CS8000-S21 is a small round plate locates on the top of the Sensor probe and is absolutely consumable and needs to be replaced periodically.

The CS8000-S21 usually lasts more than 10 million times of the Sensor probe's stroke. As a guideline of your periodical inspection, you can take advantage of Sensor Probe tab (Tool > Self Diagnosis > Maintenance) where their stroke count is strictly managed.
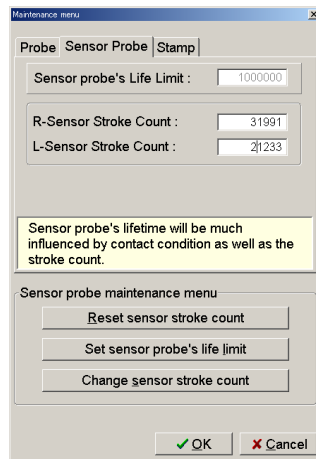
"Sensor probe's Life Limit" on this tab enables to preset the lifetime of the Sensor probes. After this entry, when the stroke count of any Sensor probe reached to the preset number, it displays a message ***"Now is time to maintenance S-probe"*** to alert you for inspection or replacement of the CS8000-S21. As for this setting process, refer to section 'Set sensor probe lifetime' in the next page.

> ⚠ The lifetime of CS8000-S21 much depends on your test condition, such like the stroke length, the type of IC package, flux applied over the PCB, so on. Especially the over stroke or the interference to the probe shortens the lifetime.

Set sensor probe lifetime

For the message *"Now is time to maintenance S-probe"* to be received during testing as soon as the system counted up the preset number of sensor strokes, you need to set 'Set sensor probe lifetime' according to the following procedure.

1) Select Maintenance from the Tool menu. (Tool > Self Diagnosis > Maintenance)
2) Select the Sensor Probe tab.
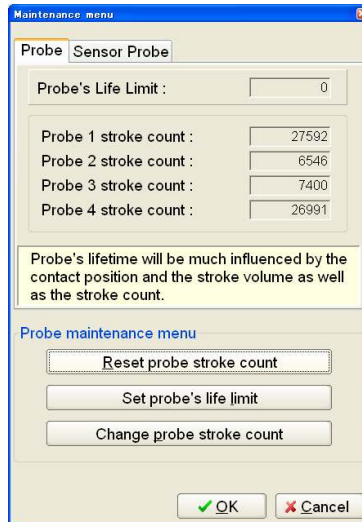
3) Click on "Set sensor probe's life limit" button.
4) The cursor moves in the box "Sensor probe's Life Limit".
5) Specify the stroke number and hit [Enter] key on the keyboard.
6) Click on [OK] button.
7) The Sensor Probe tab is closed.

⚠	**The Sensor probe's stroke count is saved automatically when your test data is saved in the disk and also when the system application is closed. So be sure to save or overwrite data before exchanging the test data.**
HINT	**Click "Reset sensor stroke count" button at above process 3 if you need to reset the stroke number.**

Sensor probe Inspection

List 1 below is our recommended check points and your action to be taken.

Check points	Failure	Action
Spring mechanism	> Transformation of spring > Smooth moving	Replace CS8000-S21 *1)
Sensor electrode surface	> Dust or smudge > Worn out surface	Cleaning *2) Replace CS8000-S21
Connector and wire	> Breaking of wire > Disconnect of connector	Replace Sensor probe CS9000-A24 Plug in the connector tightly
Appearance	> Warpage	Replace Sensor probe CS9000-A24

[List 1] Sensor probe inspection

⚠	1) Never lubricate oil to spring mechanism. It causes bad moving finally. 2) The cleaning of the electrode surface should be made softly by some using alcohol cotton stick.

Troubleshooting

When the IC open test is judged as unmeasurable or measures lower, the Sensor probe is considered to be unable to function normally. In addition, there may be other causes as indicated in List 2. Please check one by one carefully to find the root cause.

Possible cause 1	Countermeasure
Sensor probe to probe offset is not suitable.	Readjust Sensor probe to probe offset. (Option Mode>IC Open>Sensor Probe/Probe Offset)
Sensor probe's stroke is short.	Check either short-stroked or over-stroked.
Sensor probe position is displaced.	Check incorrect coordinates position, any bent Sensor probe, so on.
Sensor probe interferes with any probe.	Check the contact position is correct.

[List 2] IC open troubleshoot

If everything in List 2 were checked without no success or the same effects appears even after the Sensor probe was replaced with a new one, check the next possibilities as described in List 3.

Possible cause 2	Countermeasure
IC open measurement board is out of order.	Execute IC-Open Self Test (Tool > Self Diagnosis > IC Open) to verify if it judges good. If any failure was detected, please call to our local distributor.
IC open unit is defective.	Call to our local distributor.
Any connecting cable or its connector is corrupted.	Call to our local distributor.

[List 3] IC open troubleshoot (2)

Replacing Sensor probe CS9000-A24

⚠ WARNING	**Particular care should be paid to the keen-edged head of the probe. Otherwise it may be an injury to your body.**

The procedure below shows an example of replacing the Sensor probe which is located at Probe 3.

1) Select Adjust Probe from the Tool menu. (Tool > Self Diagnosis > Adjust Probe).

2) It shows Adjust Probe menu.
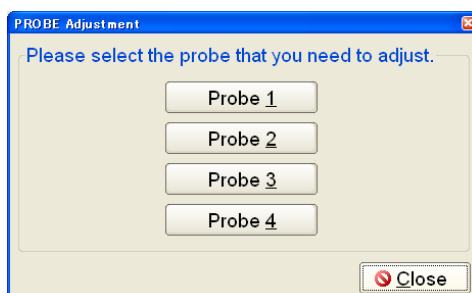
3) Click on [Probe 3] button on the screen.

4) It displays "Press [TEST START] SW". Press [TEST START] SW.

TEST START **Press [TEST START] SW**

5) The Probe 3 moves to the front side.

6) The pop-up window below appears on the screen.

PROBE Adjustment

It is now safe to open the safety cover in order to access the probe.

When finished, close the safety cover,
press [RESET] SW, then click on the [Continue] button.

Reset probe stroke count   Continue
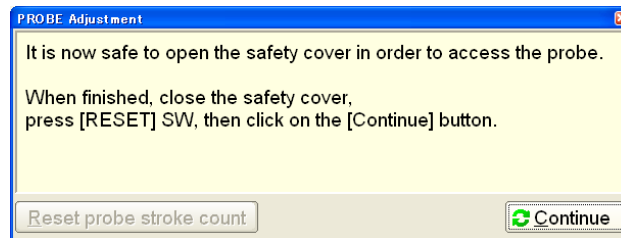
7) Open the Safety cover.

8) Disconnect a connecting cable of the Sensor probe. Then unscrew the hex-head screw and remove the Sensor probe.

9) Install a new Sensor probe on the Antenna drive unit and fix it with the Allen screw. In this case, pay attention to the Sensor plate's face so as the border between white and green is in parallel with X-direction. Also there should be no space between the Sensor probe and the Antenna holder.

Connector

Hex-head screw

Sensor probe
CS9000-A24

X-direction

Sensor probe

There is some space
Some space
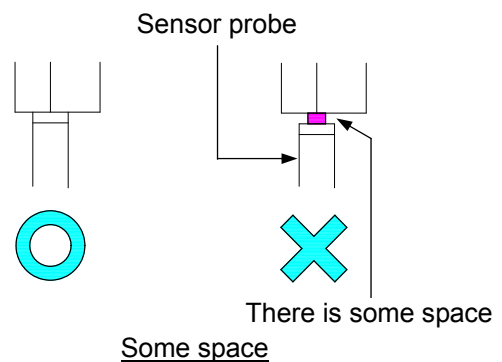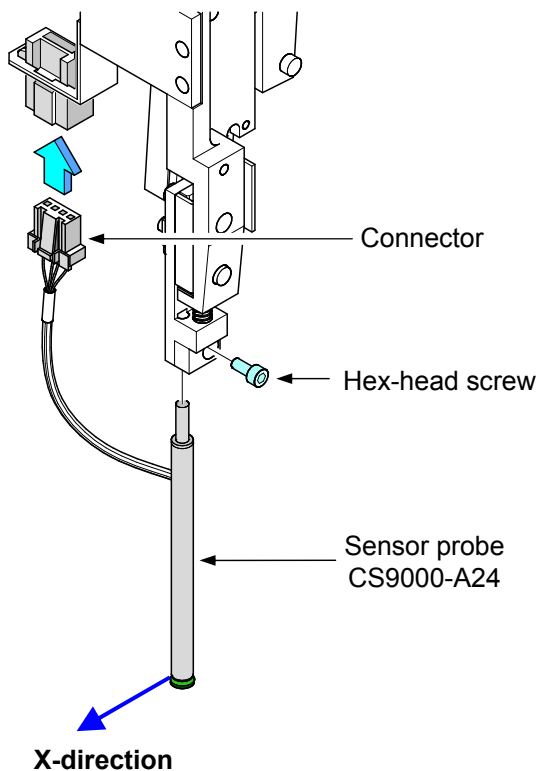
A border line between green side and white side should be in parallel with the X-direction.

X-direction

Direction of sensor probe
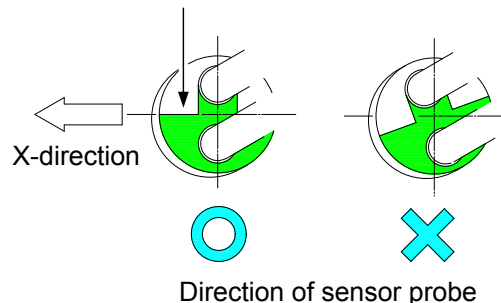
10) Joint the connector cable of the Sensor probe tightly.

11) Hook the connecting cable of the Sensor probe on Cable holder (Mini-clamp).

Hook the connecting cable on the Cable holder (Mini-clamp).

Cable holder (Mini-clamp)

Sensor probe
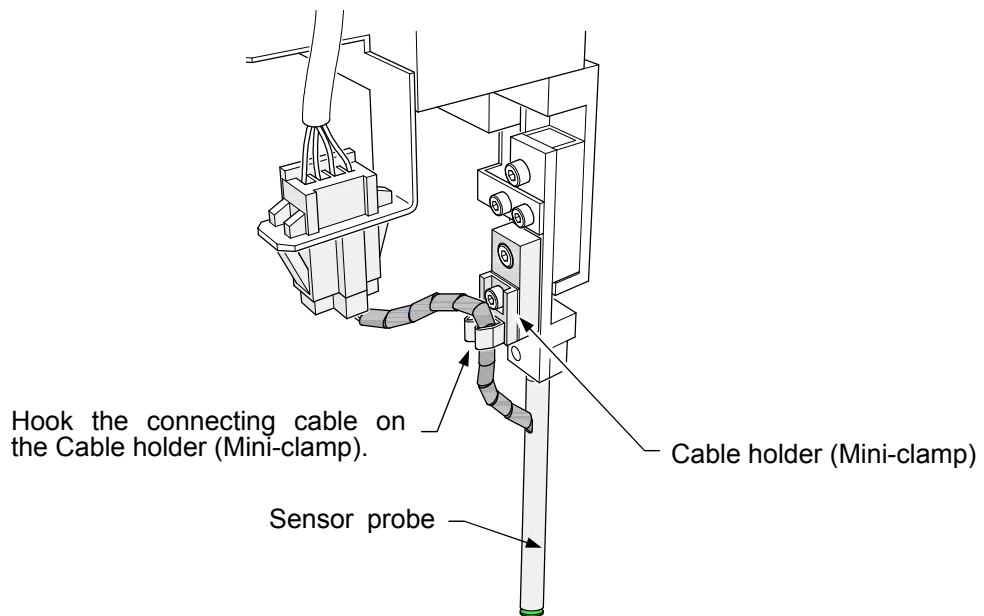
12) Close the Safety cover.

13) Press [RESET] SW.

14) Click on [Continue] button.

15) Click on [Close] button.

16) It displays "Press [TEST STOP] SW".

TEST STOP Press [TEST STOP] SW

17) Press [TEST STOP] SW.

18) Adjust Probe menu is closed.

19) All operation is finished.

⚠	After the CS9000-A24 was replaced, be sure to reset the Sensor probe to probe offset. (Refer to 'Initial Set' in Section 1)
	After the CS9000-A24 was replaced, be sure to reset Sensor Stroke Count. (Refer to 'Set sensor probe lifetime' in Section 3)
	When the sensor probe to probe offset changed, Probe access and/or measured value at the IC open steps in the test program that had been created before the Sensor probe was replaced may possibly change. In such case, please input their reference value again.

Replacing Sensor probe base CS8000-S21

The procedure below shows the way of replacing the Sensor probe base CS800-S21.

1) Operate the same procedures 1 ~ 8 as the Sensor probe CS9000-A24 to remove the Sensor probe.
2) Pull the CS8000-S21 straight out of the Sensor probe.

Sensor probe
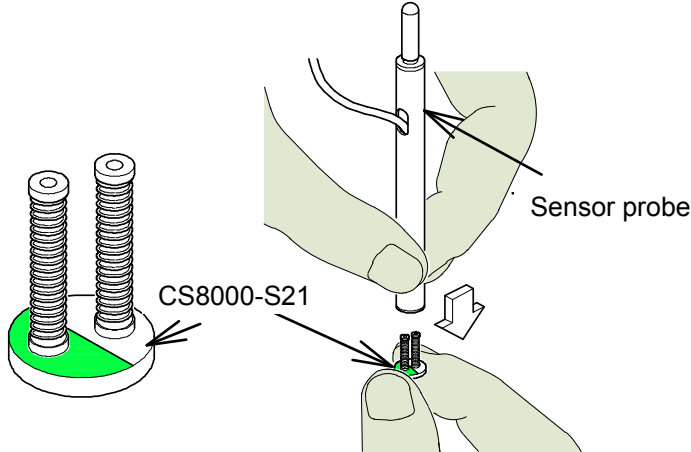
CS8000-S21

> ⚠ **Never try to pull the Sensor probe base in an oblique direction so hard the sensor probe is bent.**

3) Fit the CS8000-S21 in the pins at the sensor probe after faced its green side in the direction where the cable hole is. (Refer to Fig.-1,2)

4) Push up the CS8000-S21 straight tightly. (Refer to Fig.-3)
   When you do not go to the prescribed distance (1.5 ~ 2.5mm) or the CS8000-S21 is installed with some inclination, it has not been all the way seated. (Refer to Fig.-4)

Pin

Senor probe base CS8000-S21

Cable hole

Green

Push up

1.5 ~ 2.5mm

Inclined

Fig.-1   Fig.-2   Fig.-3   Fig.-4
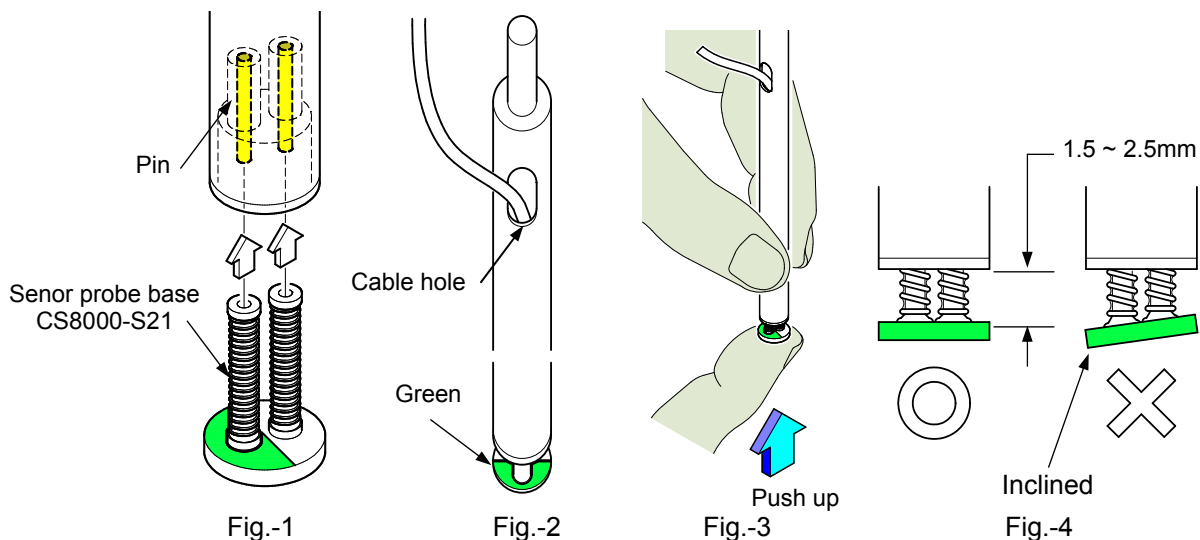
> ⚠ **Once the CS8000-S21 is pulled out of the Sensor probe, usually the springs is extended so that they can't reuse it any more. Also, pay much attention to the mounting direction (See below).**

§ 4 Underside IC Open test system

The tester is designed to use up to 6 Sensor plates (fixed type) on the bottom of the UUT while applying the measuring signal through the flying probes. This section gives an introduction to "Underside IC Open Test System CSU-9500" which is separately available as option of the CS-9500.

Outline

The Underside IC open test system CSU-9500 is equipped with 6 sensor blocks to be able to contact on the IC's package loaded on the bottom side of the UUT.

HINT	The Underside IC open test system is usable only while IC open test system CS-9500 (option) is installed on the tester.

Hardware construction

The Underside IC open test system CSU-9500 consists of the following parts.

#	Description	Model / Type	Q'ty
(1)	CSU block	P9071	6
(2)	Sensor & cable	SU9122 (22mm $\times$ 22mm)	6
(3)	Sensor & cable	SU9132 (32mm $\times$ 32mm)	6
(4)	Control cable 1	TAKAYA LS-441-01A (TVX-11~TVX-21)	1
(5)	Control cable 2	TAKAYA LS-441-02A (TVX-11~TVX-21)	1
(6)	Connection cable	TAKAYA LS-461-01A (TVX-21 ~ Tray)	6
(7)	Cable holding magnet	CH02	2

(4) (5)

(6)

(7)

(1) (3)   (2)
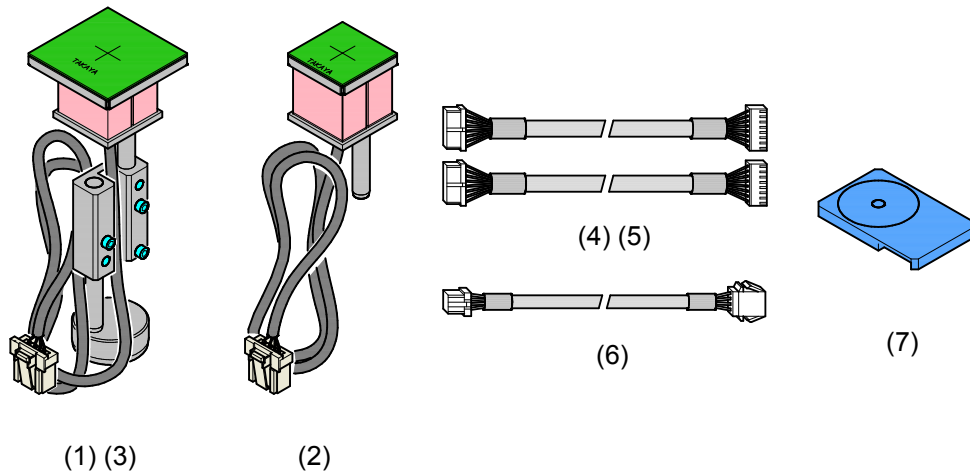
Installation area

Fig.1 below shows the area where the bottom sensor plates are placeable directly on the Tray.
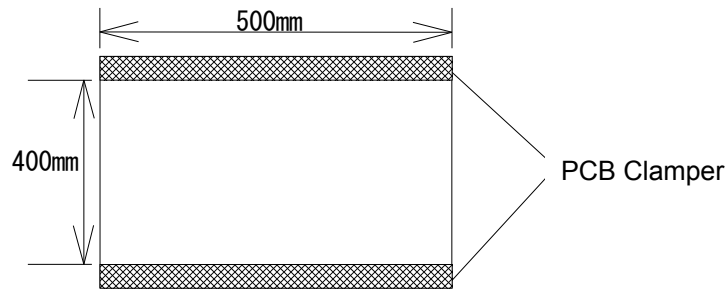
[Fig.1] Installation area (APT-9411)
(Note) Shaded portion is prohibited the bottom sensors from being placed.

Height limitation

The IC package where the bottom sensor plate can contact should be max.12mm height from the substrate. (Refer to Fig.2)
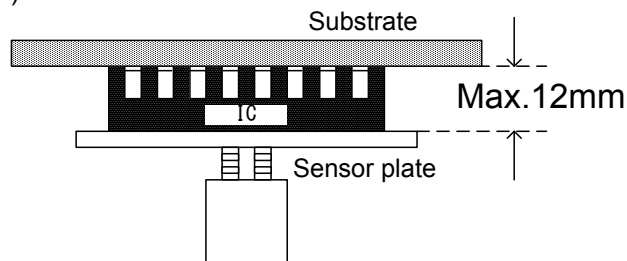
[Fig.2] Component height

⚠ Don't try to use the Underside IC open test system for any UUT which loads the component taller than 12mm. If it was wrong used, this may cause some damage to the bottom sensor plates or the UUT.

Test programming

You can prepare a test program with use of the Underside IC open test system as shown below.

Installation of bottom sensor plate

The procedure below shows the way to configure the XY coordinates of the bottom sensor plates.

1) Select Data Mode from the Mode menu. (Tool > Mode Setting > Data Mode)
2) The Data mode window appears on the display.
3) Click on "Bottom tools" from the menu.
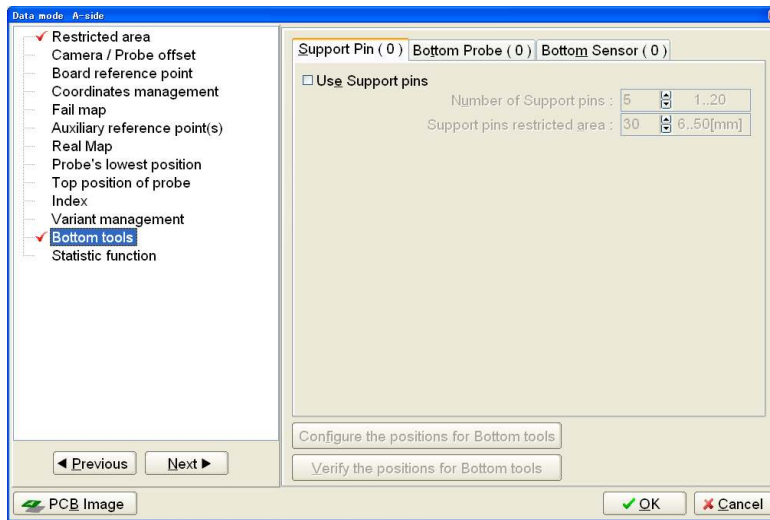
Data mode > Bottom tools

4) Click on the Bottom sensors tab and check the box "Use Bottom sensors".
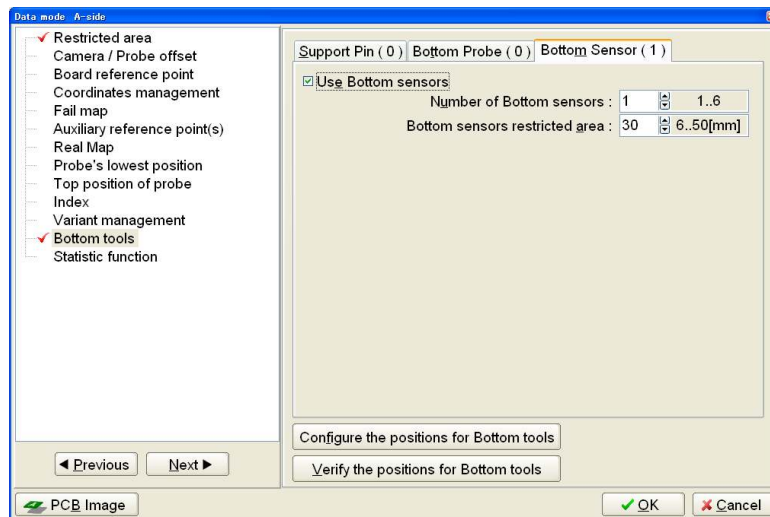
Bottom sensor

5) Configure both "Number of Bottom sensors" and "Bottom sensors restricted area".

6) Click on the Configure the position of Bottom tools button on the screen.

7) The Bottom Reference Point window appears on the display.

8) Flip the PC board over in Y-direction to specify the Bottom reference point from the bottom side.
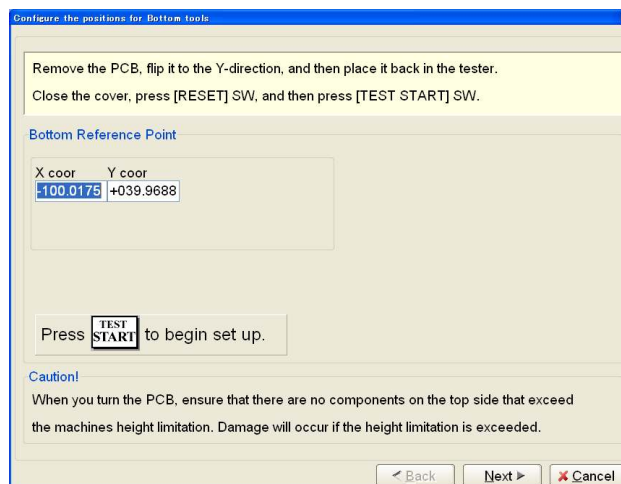
Bottom Reference Point

9)   Press [TEST START] SW, and it displays the JOG window below.
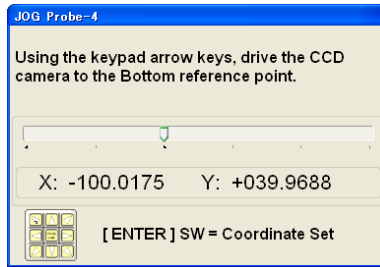
Put the target marker over the Bottom reference point where is visible from the top as well (ex. through-hole) and press [ENTER] SW on the operation panel. The display goes back to the Bottom Reference Point window.

10) Click on [Next] button, and it displays Configure the positions for Bottom tools window.
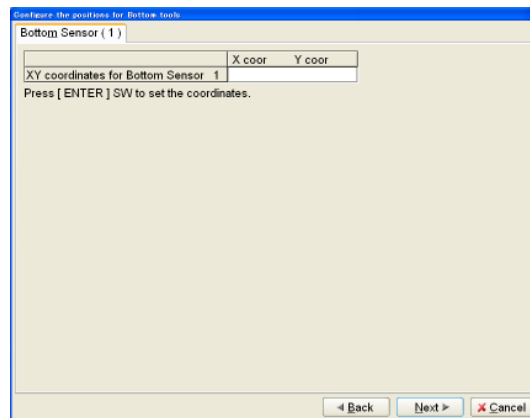
Configure the positions for Bottom tools

Press [ENTER] SW on the operation panel to specify the bottom sensor position, where is the left-bottom corner, the right-bottom corner and the right-top corner of the IC package.
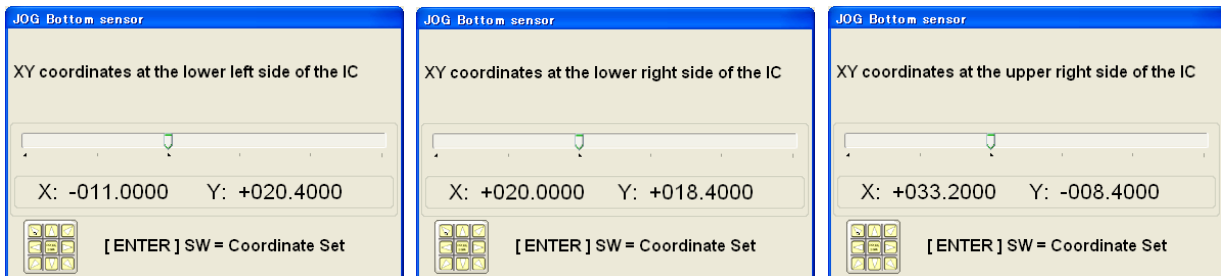
11) It displays the Configure the positions for Bottom tools window.
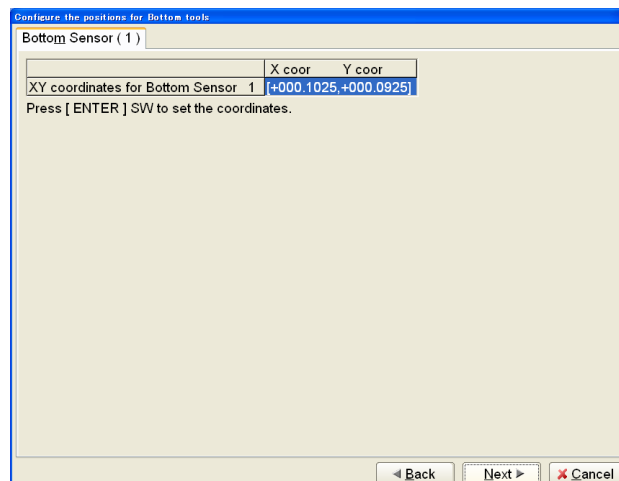
12) Click on [Next] button, and it displays the next window.
    Flip the PC board over in Y-direction to specify the Bottom reference point from the top side.
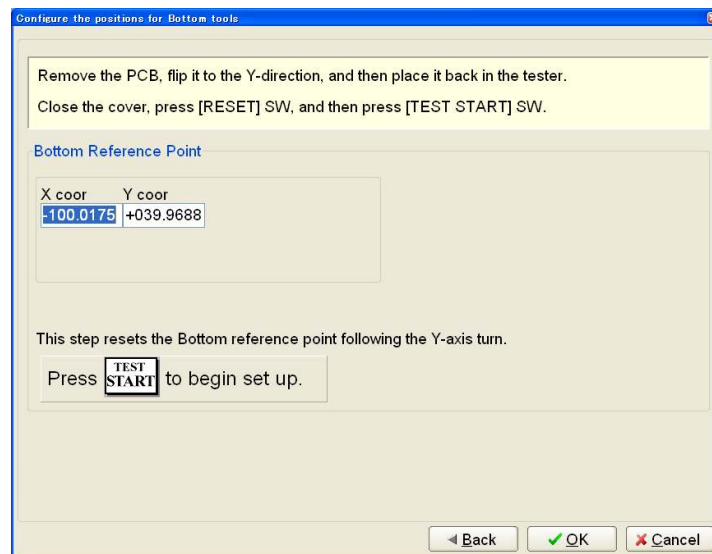

13) Press [TEST START] SW, and it displays the JOG window below.
    Put the target marker over the Bottom reference point and press [ENTER] SW on the operation panel. The display goes back to the previous window.
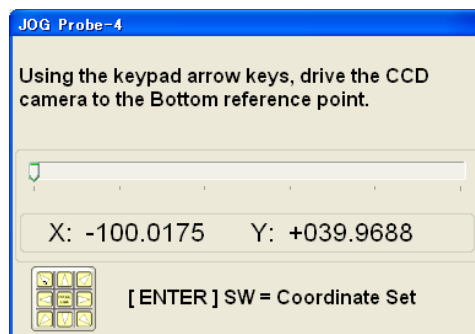
14) Click on [OK] button.
15) Your setup operation was finished.

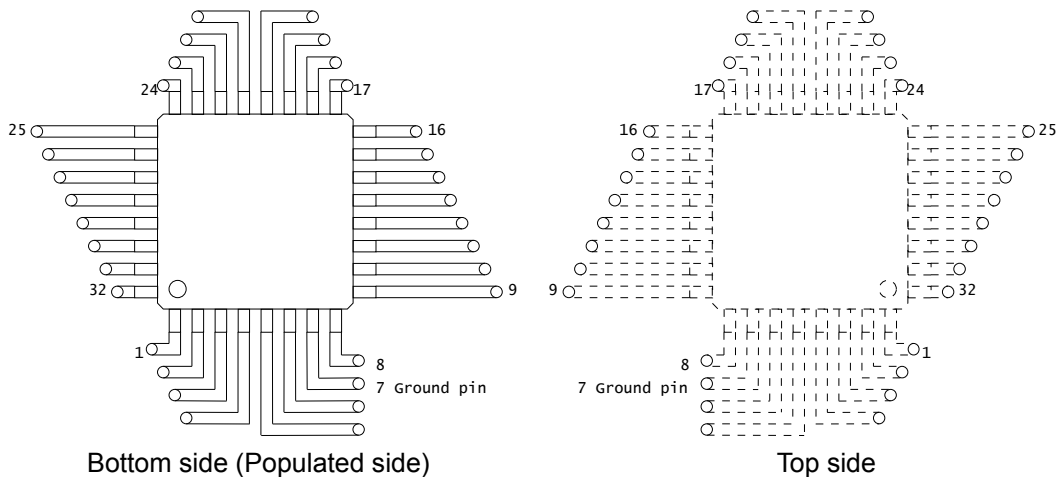| ⚠	**Be sure to take up some space between each bottom sensor plates, so as they are not touched each other. If they touched, it may cause ill effect to the IC open measurement.**

The procedure below shows the way to place the bottom sensor plates.

1) Select Data Mode from the Mode menu. (Tool > Mode Setting > Data Mode)
2) The Data mode window appears on the display.
3) Click on "Bottom tools" from the menu and click on the Bottom sensors tab.
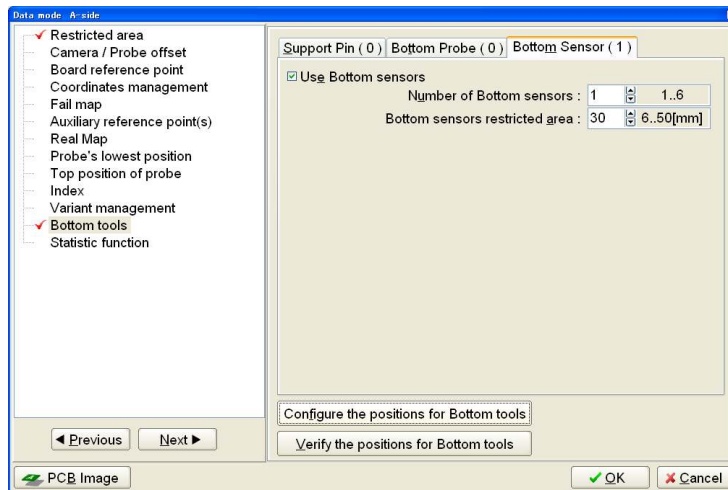
Data mode > Bottom tools

4) Click on the Verify the position of Bottom tools button on the screen.

5) It displays Bottom set check window.
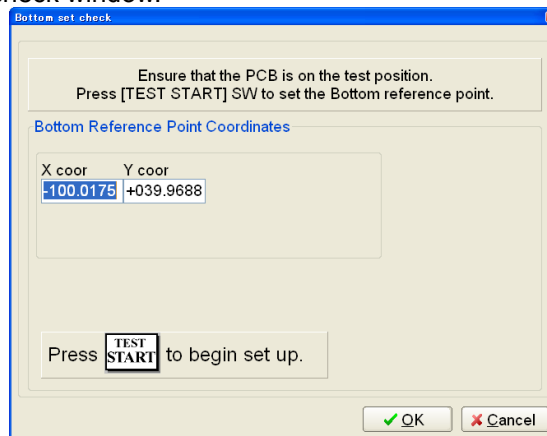
Bottom set check

5) Press [TEST START] SW, and it displays the JOG window below. Put the target marker over the Bottom reference point and press [ENTER] SW on the operation panel.
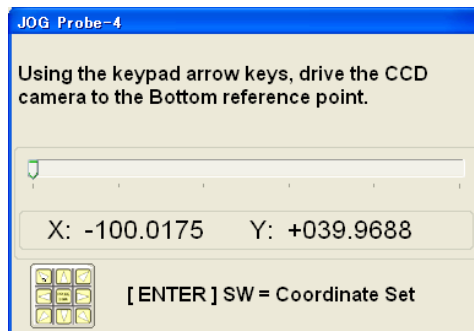
6) It displays [Fig.13]. Open the safety cover, remove the PC board and close the safety cover again. Press [RESET] SW and then [TEST START] SW on the operation panel.
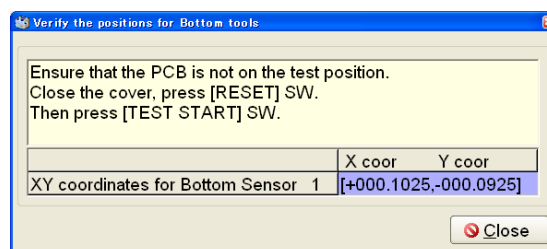
7) The camera moves over the XY coordinates of the bottom sensor plate-1 and Bottom Check window appears on the screen. Open the safety cover and install the bottom sensor plate-1 on the position where the cross-hair mark on the bottom sensor plate-1 fits with the target marker. After that, close the safety cover and press [RESET] SW and [TEST START] SW on the operation panel.

Bottom Check

8) The camera moves over the XY coordinates of the bottom sensor plate-2. Install the bottom sensor plate-2 in the same manner as done for the bottom sensor plate-1.
After all the bottom sensor plates were installed, the display goes back to the Bottom tools window.
9) Click on [OK] button.
10) Your installation of the bottom sensor plates was finished.

⚠	**Be sure to take up some space between each bottom sensor plates, so as they are not touched each other. If they touched, it may cause ill effect to the IC open measurement.**

Program creation

There are two kinds of coordinate management systems: "Teaching system" having the probes contact solder pads of the components and "Point system" managing node numbers to use one test point on behalf of the other ones connected on the same circuit.

Programming operation in Teaching system

We explain the programming operation with complete descriptions.

(Ex.1) How to program the bottom IC open test for the following IC

Bottom side (Populated side)   Top side

Preparation

Coordinates Management system (Tool > Mode setting > Data Mode) should be specified to *Teaching system* in advance.

1） Select either Step Edit or Step List from Menubar.
2） It displays the Step Edit window or the Step List window.

Step List window

3） Select Auto. Generation function from the Menubar. (Tool > Auto. Generation)
4） It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

5） Click on [Yes] button.
6） It displays the pop-up message "Press [TEST START] SW" on the screen.

7） Press [TEST START] SW on the operation panel.
8） Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).
9） It displays the Auto. Generation window.

10） Type "Parts name', 'Comment' and 'location' from the keyboard. Then click on [Next] button.

11） It proceeds to the next window where you can specify a preferable generation function.
Fill 'IC automatic generation' radio button and click on [Next] button.

12） It proceeds to the next window where you can specify a preferable generation style.
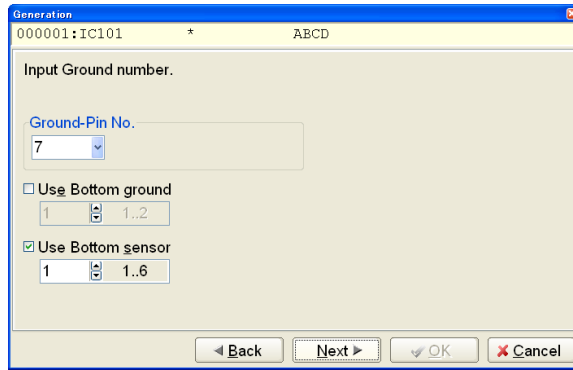Fill 'IC open test only' radio button and click on [Next] button.

13） It proceeds to the next window where you can specify a preferable generation pitch.
Fill 'Irregular pitch' radio button and click on [Next] button.
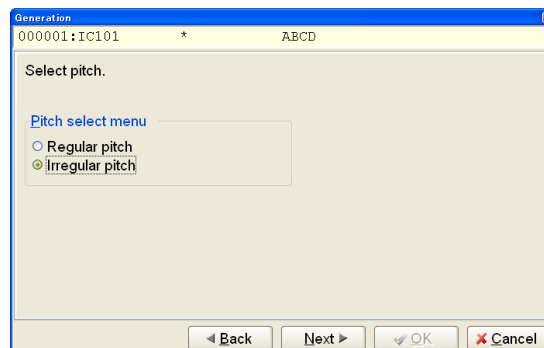
14） It proceeds to the next window where you can specify information on the IC lead number.
Type "32" from the keyboard and click on [Next] button.
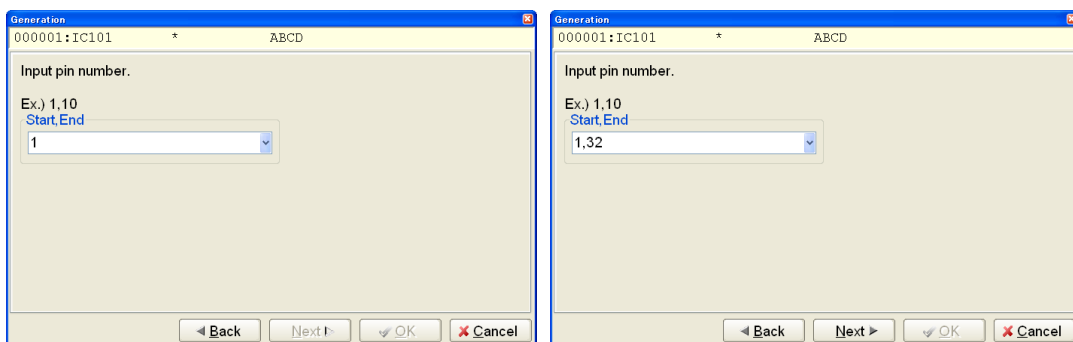
15） It proceeds to the next window where you can specify GND pin number.
Type "7" as GND pin number and fill "Use Bottom sensor" checkbox while specifying the Bottom sensor number to be used and click on [Next] button.

16) It proceeds to the next window where you can input the XY coordinates for the IC leads you specified at Process #14. Drive the camera to enter the X,Y coordinates of the IC lead #1, 8, 9, 16, 17, 24, 25 and 32 in order and click on [OK] button.
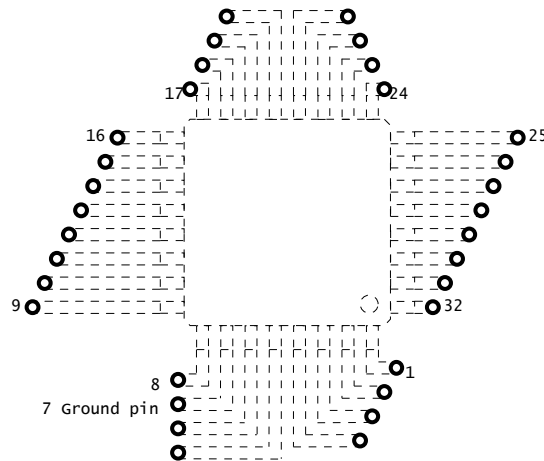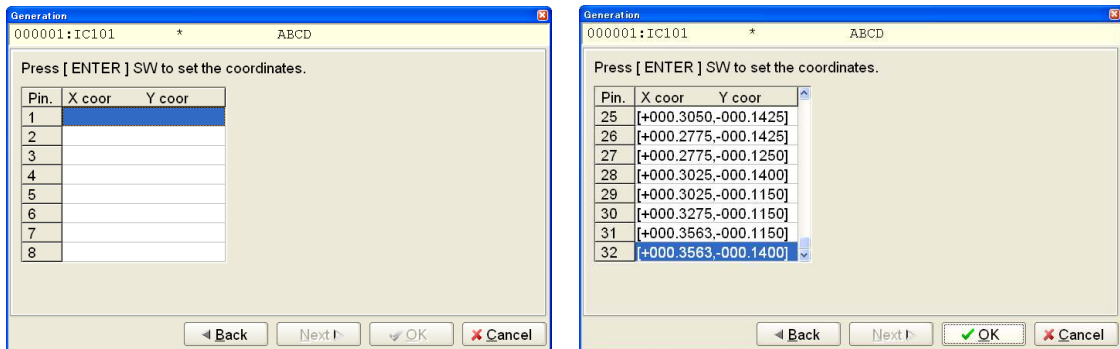
○ means the XY coordinates to read out by the camera

17) The IC Open test steps are generated on the list automatically. The Bottom probe column indicates the probe access information. "A1" indicates the Bottom sensor 1.

```
Step   :Aux.   Parts     Value      Comment           F. +%  -% Polarity      Bottom probe
000006:ICOP   IC1       1-8P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000007:ICOP   IC1       2-8P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000008:ICOP   IC1       3-8P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000009:ICOP   IC1       4-7P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000010:ICOP   IC1       5-8P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000011:ICOP   IC1       6-8P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000012:ICOP   IC1       7-8P       74HC192A          ** 50  50 ( +, N, A, -)   ( N,  N, A1,  N)
000013:ICOP   IC1       9-8P       74HC192A          ** 50  50 ( -, N, A, +)   ( N,  N, A1,  N)
```

HINT	The Auto. Generation window is also displayed by substituting "=" mark in Value column and hitting [Enter] key on the Step Edit menu and the Step List menu.
	After IC open steps were generated, 'ICOP' is substituted in Aux. column of their test steps.

Programming operation in Point system

We explain the programming operation with complete descriptions.

(Ex.2) How to program the bottom IC open test for the following IC

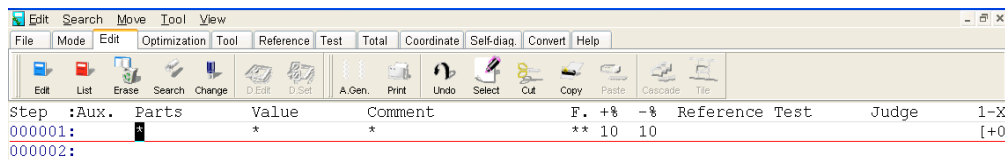Bottom side (Populated side)   Top side

Preparation

Coordinates Management system (Tool > Mode setting > Data Mode) should be specified to *Point system* in advance.

1) Select either Step Edit or Step List from Menubar.
2) It displays the Step Edit window or the Step List window.

Step List window

3) Select Auto. Generation function from the Menubar. (Tool > Auto. Generation)
4) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

5) Click on [Yes] button.
6) It displays the pop-up message "Press [TEST START] SW" on the screen.

7) Press [TEST START] SW on the operation panel.
8) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

9) It displays the Auto. Generation window.

10) Type "Parts name', 'Comment' and 'location' from the keyboard. Then click on [Next] button.
11) It proceeds to the next window where you can specify a preferable generation function.
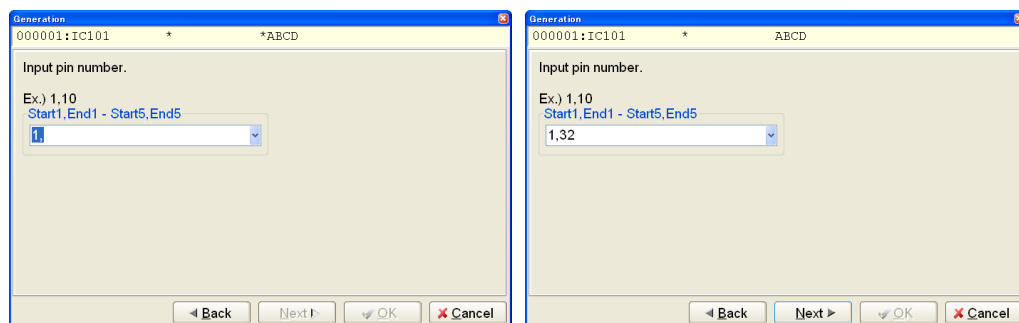   Fill 'IC automatic generation' radio button and click on [Next] button.

12) It proceeds to the next window where you can specify a preferable generation style.
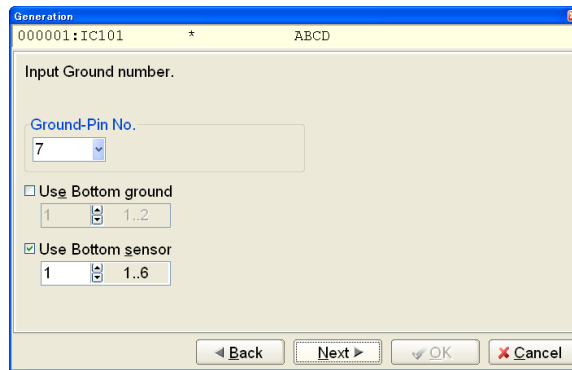   Fill 'IC open test only' radio button and click on [Next] button.

13) It proceeds to the next window where you can specify information on the IC lead number.
    Type " 32" from the keyboard and click on [Next] button.

14) It proceeds to the next window where you can specify GND pin number.
    Type "7" as GND pin number and fill "Use Bottom sensor" checkbox while specifying the Bottom sensor number to be used and click on [Next] button.

15) It proceeds to the next window where you can input the Pin numbers for the IC leads you specified at Process #13. After entered the Pin numbers (#1, 8, 9, 16, 17, 24, 25 and 32), click on [OK] button.
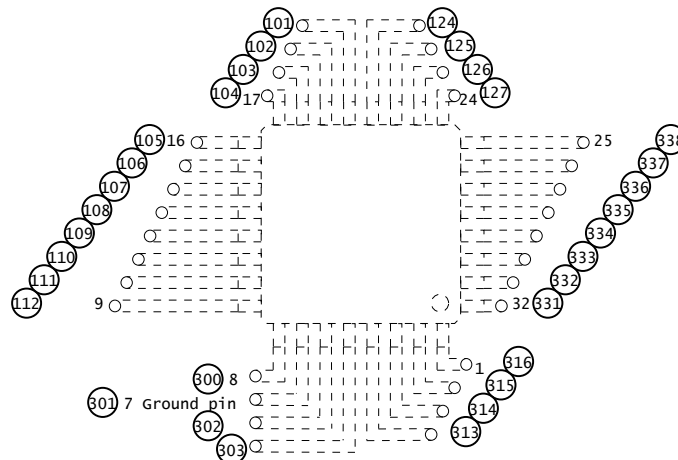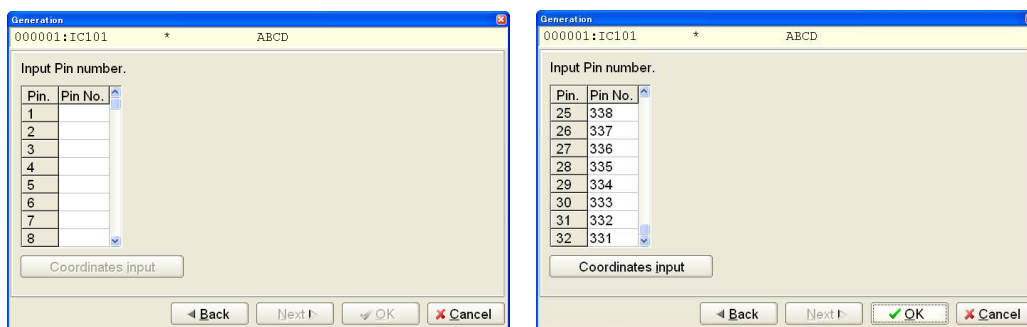
○ means the XY coordinates to read out by the camera

16) The IC Open test steps are generated on the list automatically. The Bottom probe column indicates the probe access information. "A1" indicates the Bottom sensor 1.

```
Step   :Aux.   Parts      Value     Comment          H-pin L-pin Polarity       Bottom probe
000001:ICOP    IC101      1-7P      ABCD               316   301 ( -, N, A, +)   (  N,  N, A1,  N)
000002:ICOP    IC101      2-7P      ABCD               315   301 ( -, N, A, +)   (  N,  N, A1,  N)
000003:ICOP    IC101      3-7P      ABCD               314   301 ( -, N, A, +)   (  N,  N, A1,  N)
000004:ICOP    IC101      4-7P      ABCD               313   301 ( -, N, A, +)   (  N,  N, A1,  N)
000005:ICOP    IC101      5-7P      ABCD               303   301 ( -, N, A, +)   (  N,  N, A1,  N)
000006:ICOP    IC101      6-7P      ABCD               302   301 ( -, N, A, +)   (  N,  N, A1,  N)
000007:ICOP    IC101      8-7P      ABCD               300   301 ( +, N, A, -)   (  N,  N, A1,  N)
```

HINT	The Auto. Generation window is also displayed by substituting "=" mark in Value column and hitting [Enter] key on the Step Edit menu and the Step List menu.
	After IC open steps were generated, 'ICOP' is substituted in Aux. column of their test steps.

Reference Value Input

Refer to Reference Value Input on Page 19.

Reference Value Examination

Refer to Reference Value Examination on Page 19.

Data conversion

Electric test of the IC components (i.e. conventional Pin to GND steps) can be easily converted into the bottom IC open test -- and vice versa.

**How to convert electric test to the bottom IC open test (Plural steps)**

The procedure of converting more than one electric test in series into the bottom IC open test is outlined below.

1) Select either Step Edit or Step List from the Menubar
2) It displays the Step Edit window or the Step List window.
3) Put your mouse pointer over the first step of the existing electric test.

Step	:Aux.	Parts	Value	Comment
000001:		IC101	1-7P	ABCD
000002:		IC101	2-7P	ABCD
000003:		IC101	3-7P	ABCD
000004:		IC101	4-7P	ABCD
000005:		IC101	5-7P	ABCD

4) Select "Convert" from the Menubar. (Tool > Generation > IC Open > Convert)
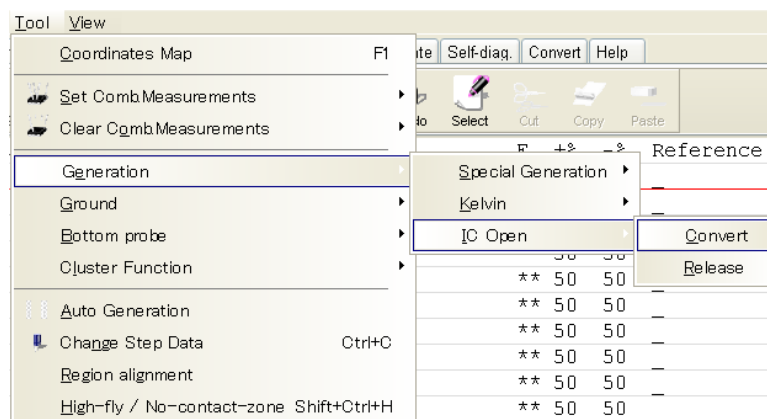
5) It displays the pop-up message "Use board ref. point and aux. ref. point for alignment?" on the screen.

6) Click on [Yes] button.
7) It displays the pop-up message "Press [TEST START] SW" on the screen.

| TEST START | Press [TEST START] SW |

8) Press [TEST START] SW on the operation panel.

9) Align the inclination and/scale of the PC board by manually centering the camera target on the board reference point and auxiliary reference point(s) or automatically using the image processing unit (option).

10) It displays the pop-up message "Do you use the bottom sensor probe?" on the screen. Click on [Yes] button.

Do you use the bottom sensor probe?

✓ Yes   ⊘ No
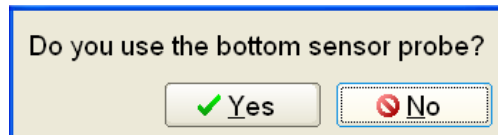
11) It displays the pop-up message box below.
Use your keyboard to enter the bottom sensor probe number. (Example "1")

Bottom Sensor Probe
Set the bottom sensor probe number(1 - 6)?
1

✓ OK   ✗ Cancel
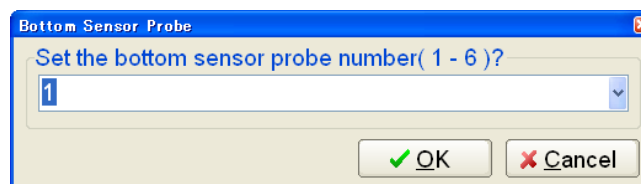
12) The bottom Open test steps are generated on the list automatically.
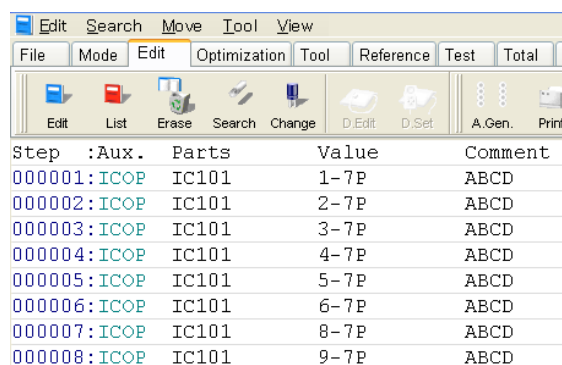
⚠	**Make sure that you enter the reference value after the data conversion.**
💡 HINT	**After IC open test was generated, 'ICOP' is substituted in Aux. column of the test steps.**

How to convert bottom IC open test to the electric test (Plural steps)

The procedure of converting more than one bottom IC open test in series into the electric test is outlined below.

Operate

1) Select either Step Edit or Step List from the Menubar.

2) It displays the Step Edit window or the Step List window.

3) Put your mouse pointer over the first step of the existing bottom IC open test.

Edit	Search	Move	Tool	View
File	Mode	Edit	Optimization	Tool	Reference	Test	Total	C
Edit	List	Erase	Search	Change	D.Edit	D.Set	A.Gen.	Print

Step	:Aux.	Parts	Value	Comment
000001:	ICOP	IC101	1-7P	ABCD
000002:	ICOP	IC101	2-7P	ABCD
000003:	ICOP	IC101	3-7P	ABCD
000004:	ICOP	IC101	4-7P	ABCD
000005:	ICOP	IC101	5-7P	ABCD
000006:	ICOP	IC101	6-7P	ABCD
000007:	ICOP	IC101	8-7P	ABCD
000008:	ICOP	IC101	9-7P	ABCD

4) Select "Release" from the Menubar. (Tool > Generation > IC Open > Release)
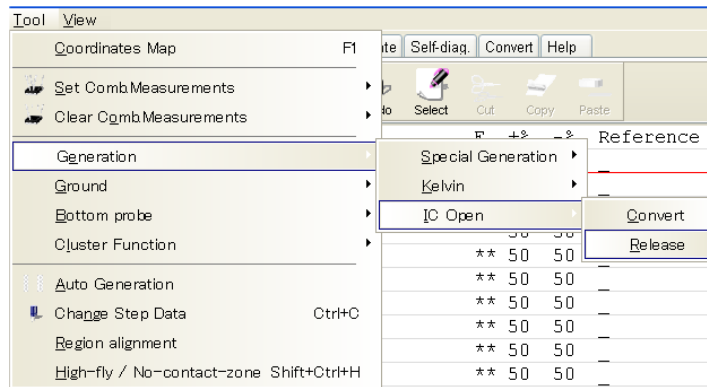
5) It displays the pop-up message "Do you convert regular generation?"on the screen. Click on [Yes] button.
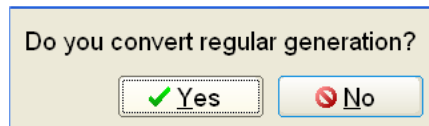
6) The electric test steps are generated on the list automatically.

| ⚠	Make sure that you enter the reference value after the data conversion.

Maintenance

Refer to §3 Maintenance.

Replacement of bottom sensor plate

Be sure to close your active job before you start replacing the bottom sensor plate. The active job is suspended with an error as soon as the safety cover is open.

1) Open the safety cover.
2) Pull the clamp lever toward to take the pc board out of the tester.
3) Disconnect the bottom sensor cables as shown below.

Interface connector
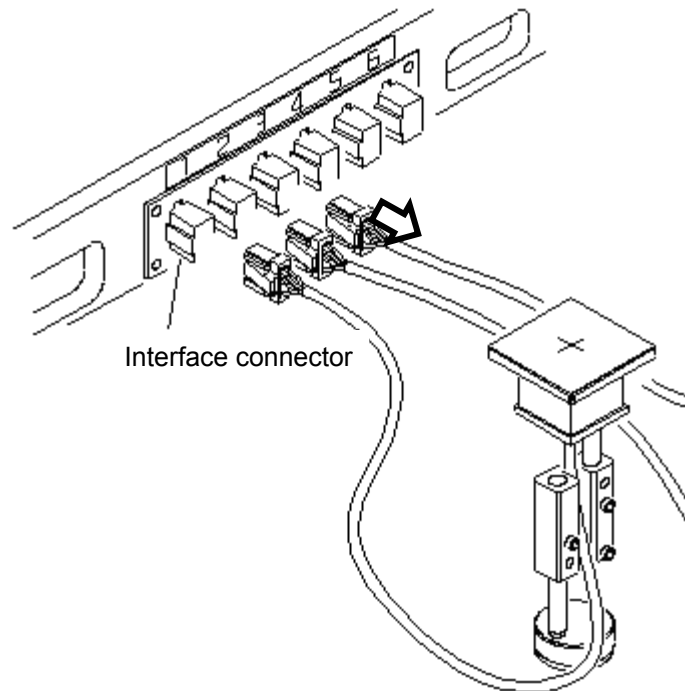
You need to release a locking mechanism when you disconnect the bottom sensor cable. If you try to disconnect the bottom sensor cables with brute force, you may cause damage to the cables.

4) Take the bottom sensor unit out of the Tray.
5) Loose the set screw to remove the bottom sensor plate. And put a new bottom sensor plate in the bottom sensor unit. Then tighten the set screw to fix the bottom sensor plate.

Bottom sensor plate

Set screw
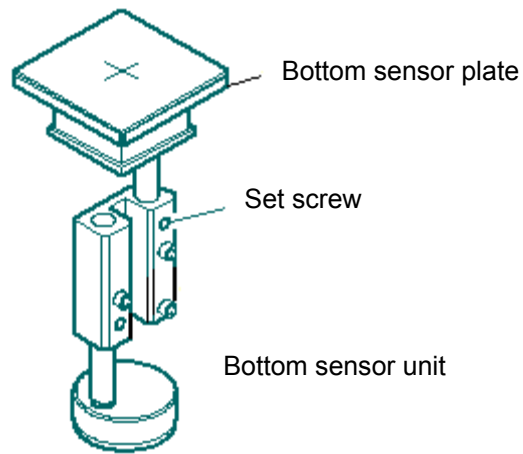
Bottom sensor unit

6） Plug the bottom sensor cables in the interface connectors as they were.

Interface connector
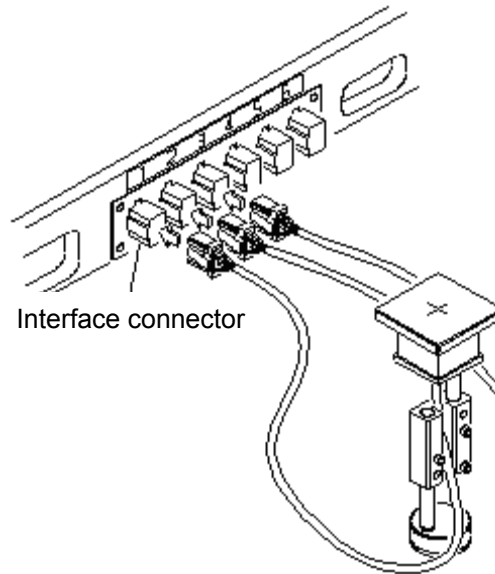
> ⚠ **The interface connector is equipped with a locking mechanism. Push the bottom sensor connector into the interface connector until it is locked tightly. Unless the bottom sensor cable is fixed, this may effect the IC open test.**

7） Put the bottom sensor unit back on the Tray.

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TAKAYA Corporation