Vision System TOS-4 / TOS-41

User's Guide

Preface

Vision System TOS-4/TOS-41, one of exclusive options for Takaya Fixtureless Tester **APT-940X Series** (such as APT-9400CE/CJ, APT-9401CE/CJ, ...), enables to display a crosshair (Target marker) on the camera monitor that plays an important role in inputting or modifying X,Y coordinates of the probe contact position, and offer Auto. Coordinates Alignment Function in order to have the accurate probes contact on the board under test.

Also, this option offers Simple Vision Test for such component that is not detected by electrical test.

Please read this manual before using this option. Then keep this manual handy for answers to any questions you may have.

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

(NOTE)

- 1) This User's guide is written about **System version [V2.0-1]** for the APT-940X series. As for further new system version, refer to our "Version up news" issued later on needed.
- 2) Windows®, Windows®NT is a resistered trademark of Microsoft Corporation. Also the company name and the product name listed in this User's guide are the trademark of each company.
- 3) 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 CORP.
- 4) The design of the product is under constant review and whilst every effort is made to keep this User's guide up to date, the rights is reserved to change specifications and equipment at any time without prior notice.

Operation keys and SW

- (1) All operation keys on the keyboard are enclosed 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

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.
	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.
	Calls attention to "One-point advice" which should be useful when you are at a loss to operate the products.

General

Vision System TOS-4/TOS-41 that is one of exclusive options for Takaya APT-940X Series.

Using this Vision system, the APT-940X Series (hereafter "Tester") ensures high accurate probing on the PC boards under test that tend to shift in X-Y direction, slant and expandable otherwise contract inconsistently, by aligning their XY coordinates with Board Reference Point and Auxiliary Reference Point(s) automatically. This Auto. Coordinates Alignment Function is also applicable per assigned components and test groups.

Followings are simple optical test available on this Vision system.

- 1. Presence check
- 2. Polarity check (Electrolytic capacitors, Tantalum capacitors, etc.)
- 3. Orientation check (ICs, CNs, etc.)

	1.	The reference object has no limitation in its shape, but the image processing area must be set larger than the object size so as the background of the object is included there. As for the details, refer to Page 11.
	2.	Occasionally your objects may not recognized depending on their kind, color, size, shape, color of polarity mark or letter, and so on.
	3.	By reason of the camera forcus, any tall component may not detected.

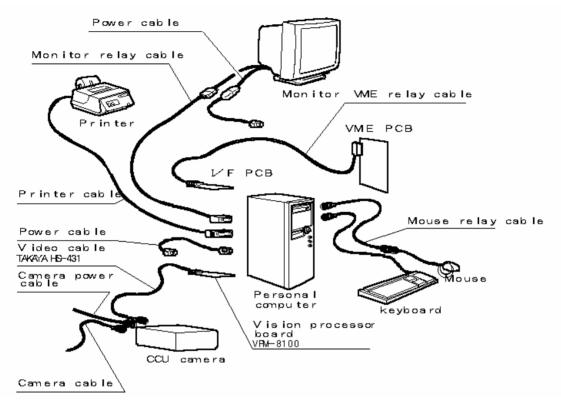
Specifications

Search method	:	Gray-scale pattern matching
		Geometric pattern matching (for TOS-4 only)
Measuring resolution	:	Approx. 2μm (Image processor unit)
		Approx. 2.5µm (while Tester works for position alignment)
Measuring repeatble accuracy	:	±2μm (Image processor unit)
		$\pm 50 \mu m$ (while Tester works for position alignment)
Pass/Fail judgement	:	By comparing the object image to the reference image learned from a
		known PCB, it judges pass when its correlation value was over 20% -
		100%.
Max. Scene number	:	240

- Gray-scale pattern matching is analyzing pixel-grid values, a process known correlation. This method locates objects by comparing a gray-level model (or reference image) of the object to the image. The X-Y position at which the model best matches the image is calculated and, from this, the object's location is determined.
- Geometric pattern matching looks at the geometric features of the object, to accurately locate an object despite changes in the object's angle, size, or appearance.

Installation

Connect the Camera Conctrol Unit (CCU) to the Image processor board (VPM-8100) that is slot-in the PC, using a dedicated video cable TAKAYA HS-431. (Refer to Fig.1)

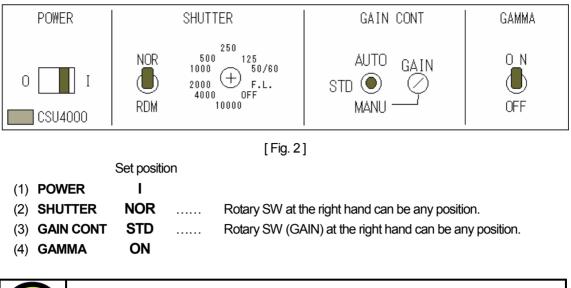


[Fig. 1] System connection diagram



Make sure that the tester is unplugged and the power switch is turned off before installing this option into the tester. Otherwise it could possibly causes bodily injury or mechanical trouble.

CCU (Front panel)



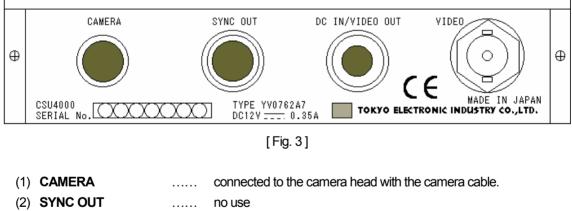


Be sure to set up the CCU as indicated above. Otherwise the image is not displayed correctly.

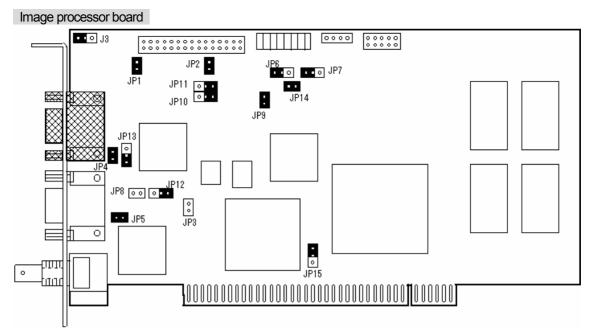


When power is turned on, the pilot lamp on the power switch will light.

CCU (Rear panel)



- (3) **DC IN/VIDEO OUT** connected to the power supply (DC12V).
- (4) **VIDEO** connected to the Image processor board (VPM-8100).



[Fig. 4] Image processor board (VPM-8100)



The connector drawn by shilling mark in Fig. 4 is connected to the Image processor board (VPM-8100). But the other connectors should not connect to anything else.

The Image processor board (VPM-8100) is equipped with various jumpers. If they were set incorrectly, the image is not displayed correctly.



In Fig. 4, the black-out terminals mean "short", and the others mean "open".

Option Mode Set

In case that Vision system TOS-4/TOS-41 is first used with the tester, it is necessary to set up the system software (Option Mode) correctly. This setting is conserved into Master mode file in the system directory.

[Operation steps]

(1) Click [Tool] on Menu bar, then select [Mode Setting] then [Option Mode] in order. After these operations, Option mode menu (Refer to Sample display-2) appears on the display.

🏐 APT-9400 2.0-1 (Teaching system)					⊐ ×
<u>File E</u> dit <u>R</u> eference <u>T</u> est		<u>A</u> bout		· · · · · · · · · · · · · · · · · · ·	
File Mode Edit Optimiza	<u>G</u> roup Addit Auto Locati			e Self-diag. Convert Help	
🗶 🧷 🐔 🗐	<u>Change</u> Ste		Ctrl+C		
D.Mode T.Mode M.Mode O.Mode		Change for Ground			
	Optimization	ı	•		
	Coo <u>r</u> dinates	3	•		
	<u>S</u> elf Diagno	sis	•		
	Pin Search				
	<u>M</u> ode Settir	ng	•	Data Mode Ctrl+D Test Mode Ctrl+T	
	<u>T</u> est Progra	•		Master Mode F5	
		ne test program		Option Mode Shift+F5	
	<u>C</u> A9 File Co	nvert	Ctrl+@		
Option Mode RS-232C Port No. Camera System Inline Application Signal Tower Setting Serial Number / Auto Dat Stamp Input/Output function of I DDE Communication IC Open Menu Customize PCB extension support I Vacuum unit	/O step	Measuring data No Use 9600 bps Barcode Settin No Use 9600 bps	▼ 8 bit/char g ▼	Y 1 bit Y Non Y Xon/Xoff Y	
<u> </u>					
□ <u>W</u> orkstation Mode				✓ <u>O</u> K × <u>C</u> ancel	

[Sample display-2] Option Mode menu

(2) Click on [Camera System], then fill "Optical System Installed" checkbox. (Refer to Sample display-3)

Option Mode		х
RS-232C Port No. Camera System Inline Application Signal Tower Setting	☐ Optical System Installed TOS- (PCI-TYPE) ☐ NTSC	
□ <u>W</u> orkstation Mode	✓ <u>O</u> K X Cance	

[Sample display-3] Camera System menu

- (3) Set up [Add recognition erros to the failure counter], [Visual test (WA) hold time (1-255sec)] and [Stanard PCB] as you like. As for their details, refer to the next section.
- (4) After then, click on [OK] button to close Option Mode menu.

Option Mode set for Camera

Optical System Installed

In case that Vision system TOS-4/TOS-41 is built-in the tester, fill "Optical System Installed" checkbox. Then specify either NTSC or PAL as your Color system.

Add recognition errors to the failure counter

In case that "Add recognition errors to the failure counter" checkbox was filled, when some recognition error for fiducial marks happened, the board is also counted as test and fail number.

Unless that checkbox was filled, such error is not regarded as test and fail number.

Visual test (WA) hold time (1-255sec)

In case that "Visual test (WA) hold time (1-255sec)" checkbox was filled, it is possible to preset the time to suspend the camera movement at Visual test step from 1 - 255 sec.

Unless that checkbox was filled, the camera does not move to the next step until any operation panel SWs ([ENTER] SW, [PROBE DOWN] SW, Left-arrow key) is depressed by the operator.



When the camera is suspended at Visual test step, pressing [ENTER] SW on the operation panel judges the step as PASS. And, pressing [PROBE DOWN] SW judges the step as FAIL.

If Left-arrow key was depressed, it returns back to the former Visual step.

Standard PCB

In case that "Standard PCB" checkbox was filled, Camera/Probe Offset value can be conserved in Option Mode.

Unless that checkbox was filled, Camera/Probe Offset value is conserved in Data Mode and needs to be managed in each test program.

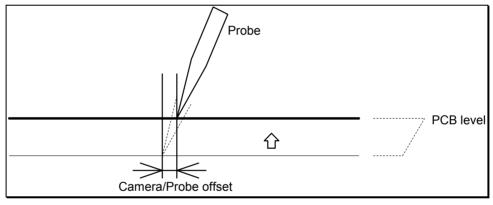


While "Standard PCB" checkbox is filled, Camera/Probe Offset menu does not appear on Data Mode.

About Camera/Probe Offset

To ensure minimum probe pitch, all moving probes are installed on Z-axis mechanism slantly. If the contact level on the board under test changes when *PCB Extension Support Kit* (option) is used, as a matter of fact, any probe does not contact the position where the camera read out, as shown in Fig. 5 below.

Whenever the contact level on every board is the same and unchanged, it is recommended that "Standard PCB" checkbox in Option Mode menu is filled in advance.







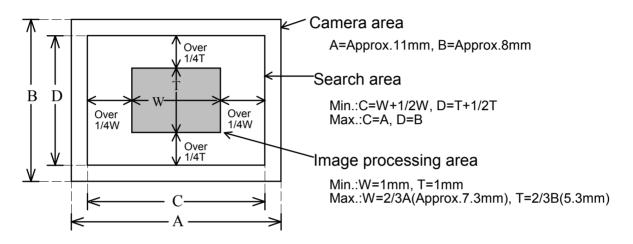
In case that Camera/Probe Offset value was input incorrectly, any probe may not contact the position where the camera read out.

Test Target

Fig. 6 below indicates each size of Camera area, Search area and Image processing area.

Please be assured that both Board reference point and Aux. Reference point for revising X-Y coordinates should be adequate size that is smaller than Image processing area shown in Fig. 6.

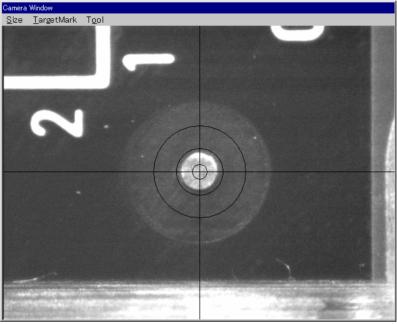
Also, in case of programming the step data for Presence check and Polarity check, please be assured that they should be adequate size that is smaller than Image processing area and Search area.



[Fig. 6] Area size

Camera Image Window

If Vision system TOS-4/TOS-41 was included in the tester, Camera window (Refer to Sample display-4 below) is displayed when the test program is created (X-Y coordinates input) and/or when the fiducial marks are adjusted.



[Sample display-4] Camera window

While the Camera window is displayed, the dedicated menubar (Refer to Sample display-5 below) appears.

Camera	Window		
<u>S</u> ize	<u>T</u> argetMark	T <u>o</u> ol	

[Sample display-5] Camera window menubar

Size

With this menubar, the image's magnification is changeable optionally in answer to the image size.

Menu	Explanation
200%	The image is magnified to 200% on the display.
100%	The image is magnified to 100% on the display.
50%	The image is demagnified to 50% on the display.

200%

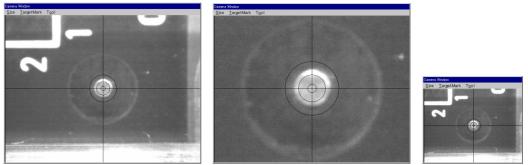
The image is magnified to 200% on the display. Use this magnification when the image size is so small that it is not possible read out X-Y coordinates accurately.

100%

The image is magnified to 100% on the display. As normal, this magnification is used to read our X-Y coordinates.

50%

The image is demagnified to 50% on the display.



[Sample display-6] Magnification size (100%, 200%, 50% from the lefthand)



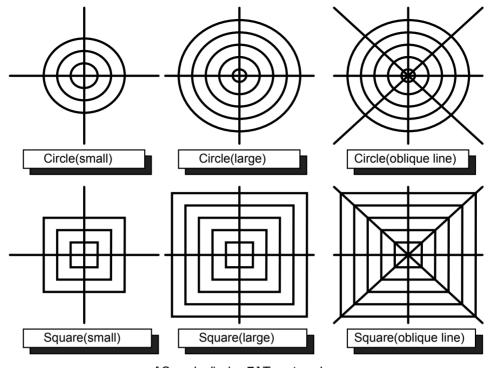
Any magnification change is conserved until the reference image input or test is executed. After these operation, it turns back to default (100%).

TargetMark

With this menubar, the target marker is changeable optionally in answer to the image color and/or shape.

Menu	Explanation
ON	Target marker is overlayed on the camera image. (Normal = ON)
OFF	Target marker is removed from the camera image.
Circle (small)	Target marker is changed to "Circle (small)" type.
Square (small)	Target marker is changed to "Square (small)" type.
Circle (large)	Target marker is changed to "Circle (large)" type.
Square (large)	Target marker is changed to "Square (large)" type.
Circle (oblique line)	Target marker is changed to "Circle (oblique line)" type.
Square (oblique line)	Target marker is changed to "Square (oblique line)" type.

Sample display-7 shows all available Target markers. Please choose the most desirable type in answer to the object shape on your PC board.



[Sample display-7] Target marker



This setting is managed by Data Mode and saved in the disk together with each test program.

Tool

This menubar includes two menus, "Mode 1 - Mode 4" and "Property".

Menu	Explanation
Mode 1 – Mode 4	You can choose the most desirable Mode (Mode 1 - Mode4), in which Target marker, Camera image and LED illumination was already reserved.
Property	Type of Target marker, Camera image and LED illumination can be allocated in each Mode (Mode 1–Mode 4) in advance.

Mode 1 - Mode 4

You can choose the most desirable Mode to use, in which Target marker (Shape, Color), Camera image (Gain, Offset) and LED illumination (Upper Blue, Side Red, Side Blue) was already reserved on Property menu.

Property

Your desirable Target marker (Shape, Color), Camera image (Gain, Offset) and LED illumination (Upper Blue, Side Red, Side Blue) can be allocated in each Mode 1 – Mode 4.

OMIPropertyForm	OMIPropertyForm
Target Mark Screen	Target Mark Screen
Mode	<u>S</u> hape
<u>G</u> ain ↓ O <u>f</u> fset ↓	Color
Upper Side Side Blue <u>R</u> ed <u>B</u> lue	Black Blue Red
	Magenta Green Cyan
□ Turn off the LEDs during in-circuit testing	Vellow White
<u>✓Q</u> K <u>×</u> <u>C</u> ancel	

[Sample display-8] Screen tab (left), Target Mark tab (right)

If choose [Tool] > [Property] in order, both Screen tab and Target Mark tab above appear.

Screen tab (Sample display-8)

This tab allows to set up Camera property (such as Gain, Offset) and LED illumination separately for Mode 1-4.

(1) Mode	Mode where your designated Camera property (such as Gain, Offset) and LED illumination are conserved.
(2) Gain	The Camera image is reproduced with the 256 gradations of 0 (black) - 255 (white). If Gain was adjusted to smaller, the whole image becomes more bright. On the other hand. if adjusted to bigger, it becomes more dark.
(3) Offset	If Gain was adjusted to so smaller that the brightness level exceeds the range of 256 gradations, occasionally the image adge cannot be distinguishable. In this case, it is recommendable to make Offser bigger so as the gradation of the whole imageb becomes dark and the image edge is distinguishable.
(4) Upper Blue	Blue LED illumination installed at the top of the image is adjustable.
(5) Side Red	Red LED illumination installed at the sides of the image is adjustable.
(6) Side Blue	Blue LED illumination installed at the sides of the image is adjustable.
(7) Tuen off the LEDs during in-circuit testing	If this checkbox is filled, all LED illuminations turns off, with the exception of when Board reference point/Auxiliary reference point is automatically alighen and when simple vision test is executed.

Target Mark tab (Sample display-8)

This tab allows to set upTarget marker (Shape, Color) as desired.

(1) Shape	Please choose the most desirable type in answer to the object shape on your PC board. (Refer to Fig. 13)
(2) Color	Please choose the most desirable color from Black, Blue, Red, Magenta, Green, Cyan, Yellow and White.

Differently from Screen tab, all setting in Target Mark tab applies equally to every Mode (Mode 1 - 4).
This setting is managed by Data Mode and saved in the disk together with each test program.

Inclination/Scale Alignment Function

The tester equipped with Vision system TOS-4/TOS-41 (option) can align any possible inclination and/or scale of PC boards each time before tested, by automatically detecting the center point of pulural fiducial marks provided on the PC boards through the CCD camera.

In this section, we hereunder introduce a sample operation how to input image reference data usable for aligning "Inclination" or "Inclination & scale" of the PC boards under test.

Inclination alignemnt set at new test programming

- (1) First set up "Conveyor Set Up", "Camera/Probe Offset", "Board Reference Point", "Coordinates Management" and "Fail Map" in Data Mode menu properly.
- (2) Fill "Use Auxiliary Reference Point(s)" checkbox in Auxiliary Reference Point(s). (Refer to Sample display-9)

Data mode	×
Conveyor Set Up Camera/Probe Offset Board Reference Point Coordinates Management Fail Map	└ Use Auxiliary Reference Point(s) ^ Inclination ^ Inclination & scale Input optical after setup X-BRP Y-BRP X-BRP Y-BRP X-BRP Y-BRP Yess TEST Yess TEST to begin set up.
	<u>✓ Q</u> K <u>× C</u> ancel

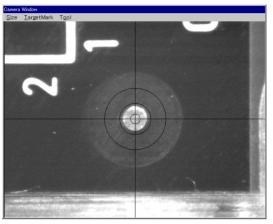
[Sample display-9] Coordinates Management (Data mode)



X-BRP/Y-BRP shown on Sample display-9 is for X-Y coordinates for Board Reference Point. And X-Aux/Y-Aux. is X-Y coordinates for Auxiliary Reference Point.

- (3) Fill "Inclination" radio-button (Sample display-9)
- (4) Fill "Reference image input" checkbox, then press [TEST START]SW on the operation panel. (Sample display-9)

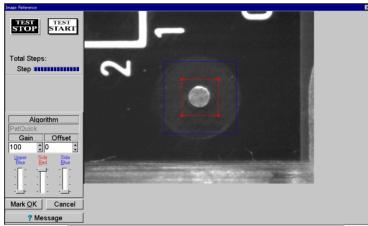
(5) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER]SW to enter the coordinates. (Sample display-10)



[Sample display-10] Camera Window

(6) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-11)

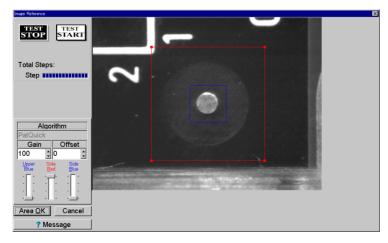
Enclose the Board reference point with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-11] Image processing area set

(7) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-12)

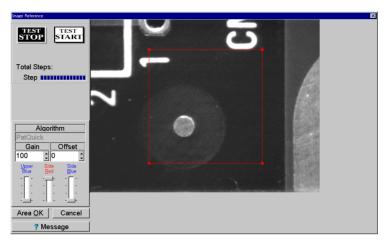
Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-12] Search area set

(8) The camera shifts 1mm toward the right-top side automatically. (Sample display-13) Shift your Search area (the red box) so as it encloses the Board reference point, then click on "Area OK" button.

With the above operation, the reference image is input.



[Sample display-13] Reference image input

- (9) Center the Target marker on the auxiliary reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-10)
- (10) Enclose the Auxiliary reference point with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-11)
- (11) The Image processing area box changes from red to blue, and Search area is shown by a red box.
 (Sample display-12)
 Specify your Search area with the red box, then click on "Area OK" button.
 With the above operation, the reference image is input.
- (12) All process to setup and input the Board reference point and the Auxiliary reference point finished, it returns back to Data Mode menu. (Sample display-9)



To align possible inclination of PC boards, it is enough to use two fiducial marks, Board reference point and Auxiliary reference point.

But in case of aligning their inclination and/or scale, it must use three fiducial marks, Board reference point ,and Auxiliary reference point-1 and Auxiliary reference point-2.

Inclinaiton & scale alignment set at new test programming

- (1) First set up "Conveyor Set Up", "Camera/Probe Offset", "Board Reference Point", "Coordinates Management" and "Fail Map" in Data Mode menu properly.
- (2) Fill "Use Auxiliary Reference Point(s)" checkbox in Auxiliary Reference Point(s). (Sample display-14)

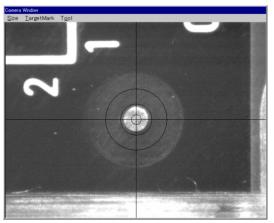
Pata mode	×
Ale mode Conveyor Set Up Camera/Probe Offset Board Reference Point Coordinates Management Fail Map Auxiliary Reference Point(s) Optical System Support Pin Bottom Probe Bottom Sensor Probe Probe's Lowest Position Top Position of Probe Index	Use Auxiliary Reference Point(s) Inclination Inclination & scale Input optical after setup X-BRP Y-BRP X-Aux. Y-Aux.
Previous Next ►	Press TEST to begin set up.

[Sample display-14] Coordinates Management (Data mode)



X-BRP/Y-BRP shown on Sample display-14 is for X-Y coordinates for Board Reference Point. X-Aux.1/Y-Aux.1 is X-Y coordinates for Auxiliary Reference Point-1 and X-Aux.2/Y-Aux.2 is X-Y coordinates for Auxiliary Reference Point-2

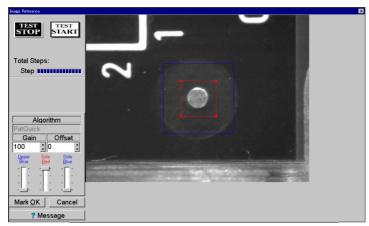
- (3) Fill "Inclination" radio button (Sample display-14)
- (4) Fill "Reference image input" checkbox, then press [TEST START] SW on the operation panel. (Sample display-14)
- (5) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-15)



[Sample display-15] Camera Window

(6) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-16)

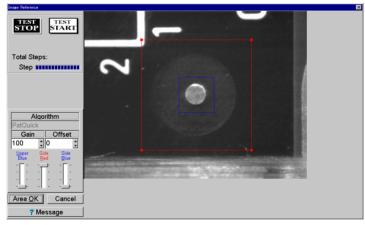
Enclose the Board reference point with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-16] Image processing area set

(7) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-17)

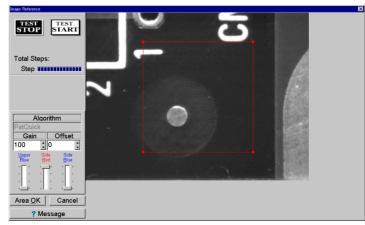
Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-17] Search area set

(8) The camera shifts 1mm toward the right-top side automatically. (Sample display-18) Shift your Search area (the red box) so as it encloses the Board reference point, then click on "Area OK" button.

With the above operation, the reference image is input.



[Sample display-18] Reference image input

- (9) Enclose the Auxiliary reference point-1 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-15)
- (10) The Image processing area box changes from red to blue, and Search area is shown by a red box.
 (Sample display-17)
 Specify your Search area with the red box, then click on "Area OK" button.
 With the above operation, the reference image is input.
- (11) Enclose the Auxiliary reference point-2 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-15)
- (12) The Image processing area box changes from red to blue, and Search area is shown by a red box.
 (Sample display-17)
 Specify your Search area with the red box, then click on "Area OK" button.
 With the above operation, the reference image is input.
- (13) All process to setup and input the Board reference point and the Auxiliary reference point-1,2 finished, it returns back to Data Mode menu. (Sample display-14)



To align possible inclination and/or scale of PC boards, it must use three fiducial marks, Board reference point ,and Auxiliary reference point-1 and Auxiliary reference point-2. But in case of aligning their inclination only, it is enough to use two fiducial marks, Board reference point and Auxiliary reference point.

Inclination alignment set to an existing test program

- (1) After loaded an objective test program, first set up "Conveyor Set Up", "Camera/Probe Offset" and "Board Reference Point" in Data Mode menu properly.
- (2) Open Data mode menu (Tool > Mode Setting > Data Mode).

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<u>File E</u> dit <u>R</u> eference <u>T</u> est	T <u>o</u> ol <u>V</u> iew <u>A</u> bout		
File Mode Edit Optimiza	Auto Location Set	Ctrl+C	9 Self-diag. Convert Help
	O <u>p</u> timization Coo <u>r</u> dinates) 	
	<u>S</u> elf Diagnosis Pin Search	•	
	<u>M</u> ode Setting	•	Data Mode Ctrl+D
	Test Program Setup Speed <u>U</u> p the test program		Iest Mode Ctrl+T Master Mode F5 Option Mode Shift+F5
	<u>C</u> A9 File Convert	Ctrl+@	

[Sample display-19] Menu bar (Data Mode)

(3) Open Optical System menu, then fill the "Use optical system" checkbox. Also set up Camera Propeties, if necessary (Refer to Page 14)

Data mode	X
 Conveyor Set Up Camera/Probe Offset Board Reference Point Coordinates Management Fail Map Auxiliary Reference Point(s) Optical System Support Pin Bottom Probe Bottom Probe Bottom Sensor Probe Probe's Lowest Position Top Position of Probe Index 	⊭ Use optical system Camera Properties
	✓ <u>O</u> K <u>×</u> <u>C</u> ancel

[Sample display-20] Data Mode menu

(4) Open Image data input menu (Reference > Optical Reference Value Input), where you can input the image data for both Board reference point and Auxiliary reference point.

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<u>F</u> ile <u>E</u> dit	Reference Test Tool View At	pout .	
File Mor	<u>R</u> eference Value Input	ence Test Total Coordinate Self-diag. Convert Help	
	<u>D</u> ata Average		
	Open Data Generation		
D.Mode T	Reference Value Generation		
<u> </u>	Ogtical Reference Value Input		
	Auxiliary +		

[Sample display-21] Menu bar (Image data input menu)

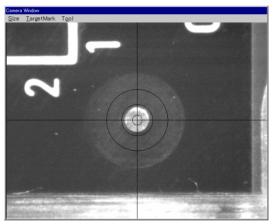
- (5) Press [TEST START] SW on the operation panel.
- (6) It shows "Use board ref.point and aux.ref.point for alignment ?" on the display. So click on [YES] button, then [TEST START] SW on the operation panel.

(7) It shows "Set the board reference point using the CCD camera" on the display. Then press [TEST START] SW on the display.

X-BRP	Y-BRP	X-Aux.	Y-Aux.	-	
1	1		μ		
_	TEST START to				
Press	START to	o beain si	et up.		

[Sample display-22] Board reference point set message

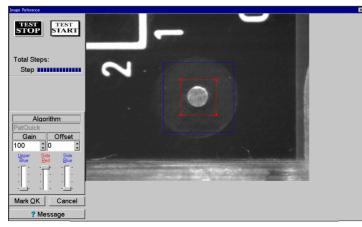
(8) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-23)



[Sample display-23] Camera Window

- (9) Next, center the Target marker on the Auxiliary reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-23)
- (10) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-24)

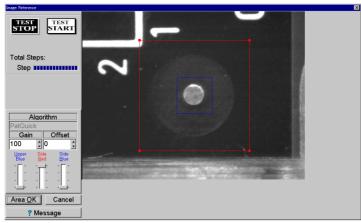
Enclose the Board reference point with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-24] Image processing area set

(11) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-25)

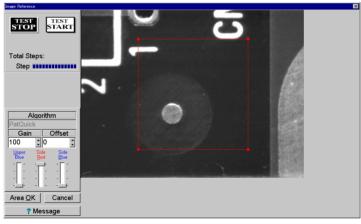
Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-25] Search area set

(12) The camera shifts 1mm toward the right-top side automatically. (Sample display-26) Shift your Search area (the red box) so as it encloses the Board reference point, then click on "Area OK" button.

With the above operation, the reference image is input.



[Sample display-26] Reference image input

- (13) Enclose the Auxiliary reference point with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-24)
- (14) The Image processing area box changes from red to blue, and Search area is shown by a red box.
 (Sample display-25)
 Specify your Search area with the red box, then click on "Area OK" button.
 With the above operation, the reference image is input.
- (15) "Image Reference" window is closed, your input operation of the image data for both Board reference point and Auxiliary reference point is now finished.

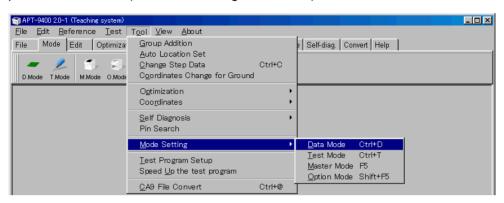


To align possible inclination of PC boards, it is enough to use two fiducial marks, Board reference point and Auxiliary reference point.

But in case of aligning their inclination and/or scale, it must use three fiducial marks, Board reference point ,and Auxiliary reference point-1 and Auxiliary reference point-2.

Inclinaiton & scale alignment set to an existing test program

- (1) After loaded an objective test program, first set up "Conveyor Set Up", "Camera/Probe Offset" and "Board Reference Point" in Data Mode menu properly.
- (2) Open Data mode menu (Tool > Mode Setting > Data Mode).



[Sample display-27] Menu bar (Data Mode)

(3) Open Optical System menu, then fill the "Use optical system" checkbox. Also set up Camera Propeties, if necessary (Refer to Page 14)

Data mode	×
 Conveyor Set Up Camera/Probe Offset Board Reference Point Coordinates Management Fail Map Auxiliary Reference Point(s) Optical System Support Pin Bottom Probe Bottom Sensor Probe Probe's Lowest Position Top Position of Probe Index 	⊽ Use optical system Camera Properties
	✓ <u>Q</u> K

[Sample display-28] Data Mode menu

(4) Open Image data input menu (Reference > Optical Reference Value Input), where you can input the image data for both Board reference point and Auxiliary reference point-1, 2.

APT-9400 2.	0-1 (Teaching system)	
<u>E</u> ile <u>E</u> dit	<u>Reference T</u> est T <u>o</u> ol <u>V</u> iew About	
File Mot	Reference Value Input ence T	est Total Coordinate Self-diag. Convert Help
	Data Average	
	Open Data Generation	
D.Mode T	Reference Value Generation	
	Ogtical Reference Value Input	
	Auxiliary •	

[Sample display-29] (Image data input menu)

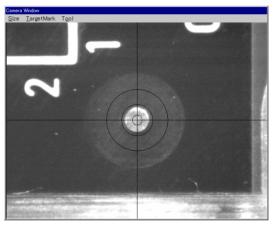
- (5) Press [TEST START] SW on the operation panel.
- (6) It shows "Use board ref.point and aux.ref.point for alignment ?" on the display. So click on [YES] button, then [TEST START] SW on the operation panel.

(7) It shows "Set the board reference point using the CCD camera" on the display. Then press [TEST START] SW on the display.

X-Aux.1	Y-Aux.1		
2			
		to begin set up.	

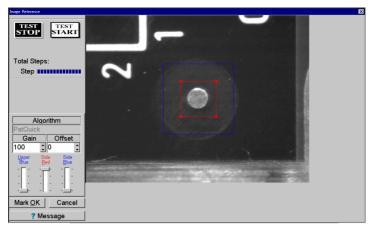
[Sample display-30] Board reference point set message

(8) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-31)



[Sample display-31] Camera Window

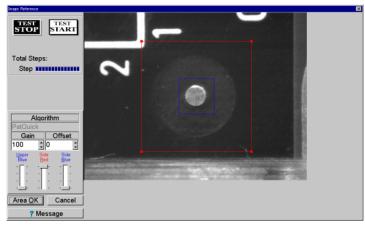
- (9) Center the Target marker on the Auxiliary reference point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-31)
- (10) Center the Target marker on the Auxiliary reference point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-31)
- (11) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-32)
 Enclose the Board reference point with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-32] Image processing area set

(12) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-33)

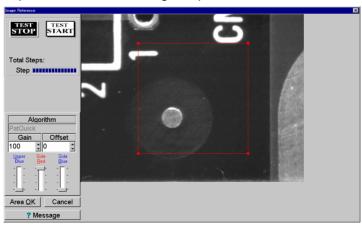
Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-33] Search area set

(13) The camera shifts 1mm toward the right-top side automatically. (Sample display-34) Shift your Search area (the red box) so as it encloses the Board reference point, then click on "Area OK" button.

With the above operation, the reference image is input.



[Sample display-34] Reference image input

(14) Enclose the Auxiliary reference point-1 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-32)

- (15) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-33)Specify your Search area with the red box, then click on "Area OK" button.With the above operation, the reference image is input.
- (16) Enclose the Auxiliary reference point-2 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-32)
- (17) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-33)Specify your Search area with the red box, then click on "Area OK" button.With the above operation, the reference image is input.
- (18) "Image Reference" window is closed, your input operation of the image data for both Board reference point and Auxiliary reference point-1, 2 is now finished.



To align possible inclination and/or scale of PC boards, it must use three fiducial marks, Board reference point and Auxiliary reference point-1 and Auxiliary reference point-2. But in case of aligning their inclination only, it is enough to use two fiducial marks, Board reference point and Auxiliary reference point.

Conditional Alignment Function

Auto. Coordinates Alignment Function is also applicable conditionally while specifying some part of area in your test program;

- * It revises after this step
- * It revises in only this group
- * It revises step data using this parts name

In this section, each revision function is explained based on their concrete operating procedures.

It revises after this step

Specifying "It revises after this step" function, the X,Y coordinates in all steps following this assignment step are aligned automatically. If this assignment was made, "After-correct" is substituted in the Comment column.

Followings are your operating procedures to set up "It revises after this step" function. (Ex.) X,Y coordinates after Test step #3 are aligned for possible inclinate & scale.

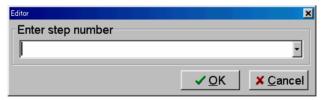


To align X,Y coordinates in some part of area against possible inclination and/or scale, it must use three fiducial marks. On the other hand, in case of the inclination only, it is enough to use two fiducial marks.

(Above excludes both Board reference point and Auxiliary reference point(s))

- (1) Open Step Edit menu (Edit > Step Edit) or Step List menu (Edit > Step List).
- (2) It shows "Enter step number" on the dialog box.

Then specify the top step number to be revised from the keyboard and click on [OK] button.



[Sample display-35] Step number input

(3) The step data list appears while showing the cursor on the specified step number (Test step #3).

😭 APT-9400 2.0-1 (T	Feaching system)	ta a ta ta a	n an			- 8 -
😸 Edit Search	-, -	_ool ⊻iew				_ 8 :
File Mode E	dit Optimizat	ion Tool Refer	ence Test Total Coordinate S	Self-diag. Convert Help		
	1	I	🌆 🔢 🖬 📭	1 8- 5		
Edit List		Change D.Edit		N 18	Paste	
Step :Aux.	Parts	Value	Comment	F. +% -%	Reference Test	1-Xcoor 🔺
00001:	C5214	103	T.CapaImage.	** 30 30	1089 UF 1084 UF	[-012.6425
00002:	IC3001	2-1P	TKY0123	** 50 50	0.539 V 0.538 V	****.***
00003:	IC3001	4-1P	TKY0123	JP 50 50	0.407 V	****.***
100004:	IC3001	5-1P	TKY0123	** 50 50	0.539 V 0.538 V	****.***
00005:	IC3001	6-1P	TKY0123	** 50 50	0.538 V 0.538 V	****.***
00006:	IC3001	7-1P	TKY0123	JP 50 50	0.46 0	****
00007:	IC3001	8-1P	TKY0123	** 50 50	0.539 V 0.537 V	****.***
00008:	IC3001	9-1P	TKY0123	** 50 50	0.539 V 0.538 V	****
00009:	IC3001	10-1P	TKY0123	JP 50 50	0.406 V	****
000010:	IC3001	11-1P	TKY0123	** 50 50	0.540 V 0.539 V	****

[Sample display-36] Step data list (Step No.3)

(4) Click on Tool to select Select Revise Area Mode.

😭 APT-9400 2.0-1	(Teaching system)	and set in the deep	general constraints								_ 8 ×
🚼 Edit Searc	h <u>M</u> oveto.	<u>T</u> ool <u>V</u> iew									_ 8 ×
File Mode	Edit Optimiz	<u>C</u> oordinates Map	F1	-	Self-diag	Conver	t Help				
Edit List	Erase Searc	G <u>e</u> neration <u>G</u> round <u>B</u> ottom probe		• • •	Select	Gut	Сору	Paste			
Step :Aux 000001:	. Parts C5214	Select <u>R</u> evise Area M	/lode			F. +%		Reference 1089 UF	Test 1084		-Xcoor
000002:	IC3001	<u>O</u> ptical Auto Generation		1		** 50	50	0.539 V			**** ****
000003:	IC3001	Change Step Data				JP 50		0.407 V			****.***
000004:	IC3001		ct-zone Shift+Ctrl+H			** 50		0.539 V	0.538		****.***
000005:	IC3001-		11(10120			** 50		0.538 V	0.538	ΥĽ	****.***
000006:	IC3001	7-1P	TKY0123			JP 50		0.46 0		[****.***
000007:	IC3001	8-1P	TKY0123			** 50	50	0.539 V	0.537	V [****.***
000008:	IC3001	9-1P	TKY0123			** 50	50	0.539 V	0.538	V E	**** ****
000009:	IC3001	10-1P	TKY0123			JP 50	50	0.406 V		Ē	****.***
000010:	IC3001	11-1P	TKY0123			** 50	50	0.540 V	0.539	ΥĒ	****.***

[Sample display-37] Select Revise Area Mode (Menu bar)

(5) It shows "Revision mode set" combobox. (Refer to Sample display-38)

OMISlopeSel	×
Release revise function	
	✓ <u>O</u> K X <u>C</u> ancel

[Sample display-38] Revision mode set

(6) Select "It revises after this step" from Revision mode set combobox.

OMISlopeSel			
It revises after this step	- Revise pos	sition and inclination of PC	B 🚽
Set the No. auxiliary point after	steps using the CCD ca	amera.	
Point1X Point1Y Point2X	Point2Y		
Press START to begin set	t up.		
		√ <u>o</u> ĸ	<mark>≭</mark> <u>C</u> ancel
		<u> </u>	

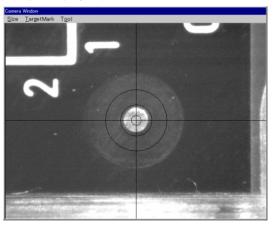
[Sample display-39] Revision area set

(7) Select "Revise position, scale, and inclination of PCB" from Revision area set combobox. (Refer to Sample display-40)

OMBlocasel It revises after this step Revise position, scale, and inclination of PCB	×
Set the No. auxiliary point after steps using the CCD camera.	ĩ
Point1X Point1Y Point2X Point3X Point3Y	
Press START to begin set up.	
✓ <u>OK</u> × <u>Cancel</u>	

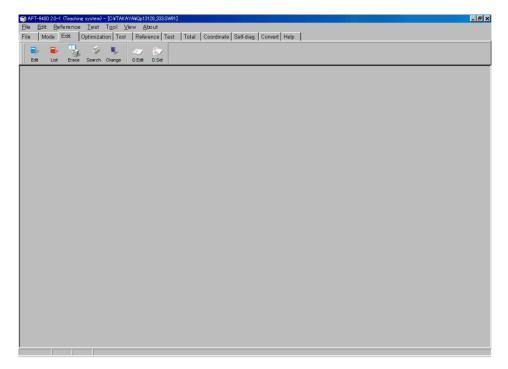
[Sample display-40]

- (8) Press [TEST START] SW on the operation panel.
- (9) After "Camera Window" appeared on the display, center the Target marker on the auxiliary point-1 for your assigned area using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-41)



[Sample display-41] Camera Window

- (10) Center the Target marker on the auxiliary point-2 for your assigned area using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-41)
- (11) Center the Target marker on the auxiliary point-3 for your assigned area using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-41)
- (12) After all auxiliary points were set, the menu returns back to the step data list, where "After-correct" is substituted in the Comment column.
- (13) Press [Esc]key on the keyboard to close the step data list.



[Sample display-42] Main Window

(14) Open Optical Reference Value Input menu. (Reference > Optical Reference Value Input)

APT-9400 2.0-1	1 (Teaching system)	*.		1919 - El Carlo III en la compañía de la compañía 📃	. 🗆 🗙
<u>File</u> dit <u>R</u> e	e <mark>ference <u>T</u>est T<u>o</u>ol <u>V</u>iew <u>A</u></mark>	bo ut	t		
The print -		enc	e Test	Total Coordinate Self-diag. Convert Help	
	Data Average				
<u> </u>	<u>O</u> pen Data Generation	-	N.		
D.Mode F F	Reference Value <u>G</u> eneration	de	Search		
	Optical Reference Value Input				
A	Auxiliary 🕨				

[Sample display-43] Menu bar (Optical Reference Value Input)

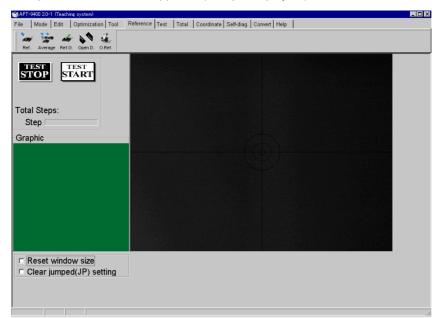
(15) Optical Reference Value Input window appears, where are all optical check assignement steps are displayed item by item.

The steps displayed in black has already input the optical data, but the steps displayed in blue has not yet input. Thus, please fill the checkbox which optical data should be input.

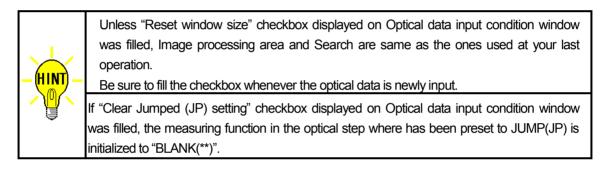
Input Optical Reference Value
Move Gard reference point
Move First auxiliary reference point
Move Second auxiliary reference point
Move R No.1 auxiliary point after 3 step
Move No.2 auxiliary point after 3 step
Move No.3 auxiliary point after 3 step
An image will be input for all checked points. Select OK when ready to begin.
Select All Release All

[Sample display-44] Optical Reference Value Input window

(16) Optical data input condition window appears. (Sample display-45)



[Sample display-45] Optical data input condition window



- (17) Press [TEST START] SW on the operation panel.
- (18) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.
- (19) After a message "Set board reference point using the CCD camera" appeared, press [TEST START] SW on the operation panel.

Revise	×
Set the board reference point using the CCD camera.	
X-BRP Y-BRP X-Aux.1 Y-Aux.1	
X-Aux.2 Y-Aux.2	
Press START to begin set up.	
✓ QK X Cancel	

[Sample display-46] Board reference point set

(20) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.

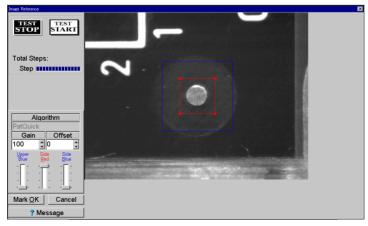
- (21) Center the Target marker on the Auxiliary reference point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (22) Center the Target marker on the Auxiliary reference point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (23) It shows "Set the No.1 auxiliary point after 3 steps using the CCD camera." Then press [TEST START] SW on the operation panel.

et the No.	auxiliary point after steps using the CCD camer	a.
Point1X	Point1Y Point2X Point2Y	
Point3X	Point3Y	
Press	TEST START to begin set up.	
	<u>√0</u> K	X <u>C</u> ancel

[Sample display-47] Auxiliary point set

- (24) After "Camera Window" appeared on the display, center the Target marker on the auxiliary point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (25) Center the Target marker on the auxiliary point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (26) Center the Target marker on the auxiliary point-3 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (27) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-16)

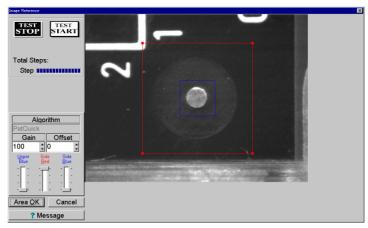
Enclose the auxiliary point-1 with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-48] Image processing area set

(28) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-49)

Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-49] Search area set

- (29) Enclose the auxiliary point-2 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-48)
- (30) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-49)Specify your Search area with the red box, then click on "Area OK" button.

- (31) Enclose the auxiliary point-3 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-48)
- (32) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-49)Specify your Search area with the red box, then click on "Area OK" button.
- (33) "Image Reference" window is closed, your input operation of the image data for the auxiliary point-1,2 and 3 is now finished.

It revises in only this group

Specifying "It revises in only this group" function, the X,Y coordinates in this specified test group are aligned automatically. If this assignment was made, "Group-correct" is substituted in the Comment column.

Followings are your operating procedures to set up "It revises in only this group" function. (Ex.) X,Y coordinates in Group #2 are aligned for possible inclinate & scale.



To align X,Y coordinates in some part of area against possible inclination and/or scale, it must use three fiducial marks. On the other hand, in case of the inclination only, it is enough to use two fiducial marks.

(Above excludes both Board reference point and Auxiliary reference point(s))

- (1) Open Step Edit menu (Edit > Step Edit) or Step List menu (Edit > Step List).
- (2) It shows "Enter step number" on the dialog box.

Then specify the top step number (in Group #2) to be aligned from the keyboard and click on [OK] button.

Editor		×
Enter step number		
		•
	✓ <u>O</u> K	× <u>C</u> ancel

[Sample display-50] Step number input

(3) The step data list appears while showing the cursor on the specified step number.

🏐 APT-9400 2.0	-1 (Teaching system) - [C	¥TAKAYA¥MM.SW	91]					_ 🗆 ×
🚼 <u>E</u> dit <u>S</u> ea	rch <u>M</u> ove to <u>T</u> ool	⊻iew						_ 8 ×
File Mode	Edit Optimization	Tool Referen	nce Test Total Coor	dinate Self-diag. Convert H	lelp			
Edit Lis	3 P		A.Gen. Print	No. Select Cut Cop				
Step :Au	ix. Parts	Value	Comment	F. +%	-% Ref	erence	Test	1-Xcoor 🔳
000416:	IC3001	207-1P	TKY0123		50 0.	37 0		[****.****
000417:	IC3001	208-1P	TKY0123	JP 50	50 0.	32 0		[****.****
000418:	C5208	10uF	*	** 30	30 11	79 UF	1128 UF	[-094.7250
000419:	C5214	103	*	** 30	30 10	189 UF	1054 UF	[-109.1200
000420:	IC3001	P1-2	*	JP 50	50			**** ****
000421:	IC3001	P2-3	TKY0123	OP 50	50 409	1.5 0	409.5 0	**** ****
000422:	IC3001	P3-4	TKY0123	OP 50	50 409	1.5 0	409.5 0	****.***
000423:	103001	P4-5	TKY0123	OP 50	50 409	1.5 0	409.5 0	****
000424:	IC3001	P5-6	TKY0123	OP 50	50 409	1.5 0	409.5 0	**** ****
000425:	IC3001	P6-7	TKY0123			1.5 0	409.5 0	****

[Sample display-51] Step data list (Step No. 418)

(4) Click on Tool to select Select Revise Area Mode.

🏐 APT-9400 2.0-1 (Te	aching system)	- [C:¥TAKAYA¥MM.SW91]								_	
<u> E</u> dit <u>S</u> earch	Move to	<u>Tool</u> ⊻iew								_	Ы×
File Mode Edi	it Optimiz	<u>C</u> oordinates Map	F1	-	Self-diag	Convert	Help	1			
Edit List F	Erase Searc	Generation Ground Bottom probe			Select	al de	-	Paste			
Step :Aux. 000416: 000417:	Parts IC3001 IC3001	Select <u>R</u> evise Area Mo Optical	ode			F. +% JP 50 JP 50	-% 50 50	Reference 0.37 0 0.32 0	Test	1-Xcoor [****.*** [****.***	
000418: 000419: 000420:	C5208 C5214 IC3001-	<u>A</u> uto Generation <u>C</u> hange Step Data <u>Hig</u> h-fly / No-contact	t-zone Shift+Ctrl+H	ŀ		** 30 ** 30 JP 50	30 30 50	1179 UF 1089 UF	1128 U 1054 U		ō
000421:	IC3001 IC3001 IC3001	P2-3 P3-4	TKY0123 TKY0123			OP 50 OP 50	50 50	409.5 0 409.5 0	409.5 0 409.5 0	****	*
000423: 000424: 000425:	IC3001 IC3001 IC3001	P4-5 P5-6 P6-7	TKY0123 TKY0123 TKY0123			OP 50 OP 50 OP 50	50 50 50	409.5 0 409.5 0 409.5 0	409.5 0 409.5 0 409.5 0		*

[Sample display-52] Select Revise Area Mode (Menu bar)

(5) It shows "Revision mode set" combobox. (Refer to Sample display-53)

OMISkopeSel	×
	✓ <u>O</u> K X <u>C</u> ancel

[Sample display-53] Revision mode set

(6) Select "It revises in only this group" from Revision mode set combobox.

лицаюреает					
It revises in c	only this group	- Rev	vise position and inclir	nation of PCB	-
Set the No.	auxiliary point in group	using the CC	D camera.		
Point1X	Point1Y Point2X	Point2Y			
Press	TEST START to begin set	: up.			
				√ <u>О</u> К	<mark>≭</mark> <u>C</u> ancel

[Sample display-54] Revision area set

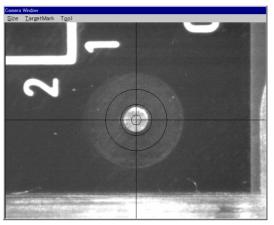
(7) Select "Revise position, scale, and inclination of PCB" from Revision area set combobox. (Refer to Sample display-55)

OMISlopeSel						×
It revises in o	only this group	•	Revise position,	scale, and inclinat	tion of PCB	•
Set the No.	auxiliary point in g	roup using the	e CCD camera.			
Point1X	Point1Y Point	2X Point2Y				
Point3X	Point3Y					
Press	TEST START to begin	set up				
	onner to bogh					
				√ <u>0</u> K	× <u>C</u> and	el

[Sample display-55]

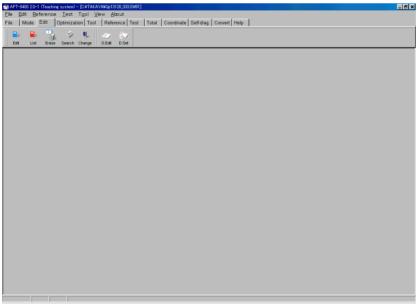
(8) Press [TEST START] SW on the operation panel.

(9) After "Camera Window" appeared on the display, center the Target marker on the auxiliary point-1 in Group #2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-56)



[Sample display-56] Camera Window

- (10) Center the Target marker on the auxiliary point-2 in Group #2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-56)
- (11) Center the Target marker on the auxiliary point-3 in Group #2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-56)
- (12) After all auxiliary points in Group #2 were set, the menu returns back to the step data list, where "Group-correct" is substituted in the Comment column.
- (13) Press [Esc]key on the keyboard to close the step data list.



[Sample display-57] Main Window

(14) Open Optical Reference Value Input menu. (Reference > Optical Reference Value Input)

APT-9400 2	20–1 (Teaching system)	
<u>F</u> ile <u>E</u> dit	<u>Reference</u> Test Tool View A	bout
File Moo	<u>R</u> eference Value Input	ence Test Total Coordinate Self-diag. Convert Help
	Data Average	
	Open Data Generation	
D.Mode T	Reference Value Generation	
	Optical Reference Value Input	
	Auxiliary •	

[Sample display-58] Menu bar (Optical Reference Value Input)

(15) Optical Reference Value Input window appears, where are all optical check assignement steps are displayed item by item.

The steps displayed in black has already input the optical data, but the steps displayed in blue has not yet input. Thus, please fill the checkbox which optical data should be input.

hput Optical Reference Value 🛛 🗙
Move G Board reference point
Move Board reference point
Move First auxiliary reference point
Move Second auxiliary reference point
Move No.1 auxiliary point in group 2
Move No.2 auxiliary point in group 2
Move Vo.3 auxiliary point in group 2
An image will be input for all checked points. Select OK when ready to begin.
Select All Release All

[Sample display-59] Optical Reference Value Input window

(16) Optical data input condition window appears. (Sample display-60)

🍘 APT-9400 2.0-1 (Teaching system)			
File Mode Edit Optimization Tool	Reference Test Total Coo	ordinate Self-diag. Convert Help	
Ref. Average Ref.G. Open D. O.Ref.			
TEST STOP START			
Total Steps: Step			
Graphic			
■ Reset window size			
Clear jumped(JP) setting			

[Sample display-60] Optical data input condition window

was filled, Image processing area and Search are same as the ones used at y operation. Be sure to fill the checkbox whenever the optical data is newly input. If "Clear Jumped (JP) setting" checkbox displayed on Optical data input condition was filled, the measuring function in the optical step where has been preset to JUM

- (17) Press [TEST START] SW on the operation panel.
- (18) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.

(19) After a message "Set board reference point using the CCD camera" appeared, press [TEST START] SW on the operation panel.

X-BRP	Y-BRP	X-Aux.1	Y-Aux.1	
X-BRP			T-Aux.1	
X-Aux.2	Y-Aux.2	_		
<u> </u>	1			
Drees	TEST START to			

[Sample display-61] Board reference point set

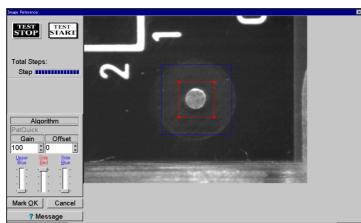
- (20) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (21) Center the Target marker on the Auxiliary reference point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (22) Center the Target marker on the Auxiliary reference point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (23) It shows "Set the No.1 auxiliary point in group 1 using the CCD camera." Then press [TEST START] SW on the operation panel.

Revise			×
Set the No.	auxiliary point in group	using the CCD camera.	
Point1X	Point1Y Point2X	Point2Y	
Point3X	Point3Y		
Press	START to begin se	ıt up.	
		✓ <u>O</u> K X <u>C</u> ancel	

[Sample display-62] Auxiliary point set

- (24) After "Camera Window" appeared on the display, center the Target marker on the auxiliary point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (25) Center the Target marker on the auxiliary point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (26) Center the Target marker on the auxiliary point-3 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (27) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-63)

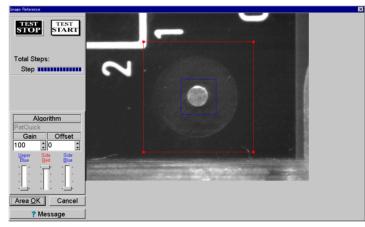
Enclose the auxiliary point-1 with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-63] Image processing area set

(28) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-64)

Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-64] Search area set

- (29) Enclose the auxiliary point-2 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-63)
- (30) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-64)Specify your Search area with the red box, then click on "Area OK" button.
- (31) Enclose the auxiliary point-3 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-63)
- (32) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-64)Specify your Search area with the red box, then click on "Area OK" button.
- (33) "Image Reference" window is closed, your input operation of the image data for the auxiliary point-1,2 and 3 is now finished.

It revises step data using this parts name

Specifying "It revises step data using this parts name" function, the X,Y coordinates in all steps with assigned parts name are aligned automatically. If this assignment was made, "Parts-correct" is substituted in the Comment column.

Followings are your operating procedures to set up "It revises step data using this parts name" function. (Ex.) X,Y coordinates of the step data which parts name is "IC5403" are aligned for possible inclinate & scale.



To align X,Y coordinates in some part of area against possible inclination and/or scale, it must use three fiducial marks. On the other hand, in case of the inclination only, it is enough to use two fiducial marks.

(Above excludes both Board reference point and Auxiliary reference point(s))

- (1) Open Step Edit menu (Edit > Step Edit) or Step List menu (Edit > Step List).
- (2) It shows "Enter step number" on the dialog box.

Then specify the top step number to be aligned from the keyboard and click on [OK] button.

Editor		×
Enter step number		
		•
	√ <u>О</u> К	X <u>C</u> ancel

[Sample display-65] Step number input

(3) The step data list appears while showing the cursor on the specified step number.

😭 APT-9400 2.0-1(Teaching system)			
🚼 Edit Search	<u>M</u> ove to <u>T</u> i	ool ⊻iew		_ _ _ _ ×
File Mode E	idit Optimizati	on Tool Referenc	ce Test Total Coord	dinate Self-diag. Convert Help
Edit List	Erase Search		Set A.Gen. Print	Undo Select Oct Copy Parte
Step :Aux.	Parts	Value	Comment	F.+% -% Reference Test 1-Xcoor 🔺
000101:	IC3001	102-1P	TKY0123	** 50 50 0.540 V 0.540 V [****.***
000102:	IC3001	103-1P	TKY0123	** 50 50 0.540 V 0.539 V [****.***
000103:	IC3001	104-1P	TKY0123	JP 50 50 0.405 V [****.****
000104:	IC3001	105-1P	TKY0123	** 50 50 0.540 V 0.538 V ****.***
000105:	IC3001	106-1P	TKY0123	** 50 50 0.540 V 0.539 V [****.***
000106:	IC3001	107-1P	TKY0123	** 50 50 0.540 V 0.539 V F****.***
000107:	IC3001	108-1P	TKY0123	** 50 50 0.540 V 0.539 V [****.***
000108:	IC3001	109-1P	TKY0123	** 50 50 0.645 V 0.641 V [****.***
000109:	IC3001	110-1P	TKY0123	** 50 50 0.645 V 0.642 V T****.***
000110:	IC3001	111-1P	TKY0123	** 50 50 0.541 V 0.540 V [****.***

[Sample display-66] Step data list (Step No.103)

(4) Click on Tool to select Select Revise Area Mode.

😭 APT-9400 2.0-1 (Teaching system)	em) e estado do e gonta en altitudo d		_ 8 ×
🚼 Edit Search Moveto.	Tool View	,	_ 8 ×
File Mode Edit Optim	_{iz} <u>C</u> oordinates Map F1	Self-diag. Convert Help	
Edit List Erase Sea	Generation Ground Bottom probe	p Select Cut Copy Paste	
Step :Aux. Parts 000101: IC300	Select <u>R</u> evise Area Mode	F. +% -% Reference Test ** 50 50 0.540 V 0.540 V	1-Xcoor
000102: IC300 000103: IC300	Auto Generation	** 50 50 0.540 V 0.539 V JP 50 50 0.405 V	[****.**** [****.****
000104: IC300 000105: IC300	Unange Step Data	** 50 50 0.540 V 0.538 V ** 50 50 0.540 V 0.539 V	[**** **** [**** ****
000106: IC300 000107: IC300	1 107-1P TKY0123	** 50 50 0.540 V 0.539 V ** 50 50 0.540 V 0.539 V	[**** **** [**** ****
000108: IC300 000109: IC300	1 109-1P TKY0123	** 50 50 0.645 V 0.641 V ** 50 50 0.645 V 0.642 V	[**** **** [**** ****
000110: IC300		** 50 50 0.541 V 0.540 V	[**** ****

[Sample display-67] Select Revise Area Mode (Menu bar)

(5) It shows "Revision mode set" combobox. (Refer to Sample display-68)

omskopesel	X
	✓ <u>O</u> K X <u>C</u> ancel

[Sample display-68] Revision mode set

(6) Select "It revises step data using this parts name" from Revision mode set combobox.

JMISlopeSel	×
It revises step data using this parts name	Revise position and inclination of PCB
Set the No. auxiliary point in parts :	using the CCD camera.
Point1X Point1Y Point2X Point2Y	
Press START to begin set up.	
	✓ <u>O</u> K ズ <u>C</u> ancel

[Sample display-69] Revision area set

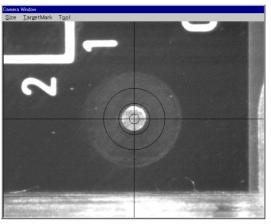
(7) Select "Revise position, scale, and inclination of PCB" from Revision area set combobox. (Refer to Sample-display-70)

OMISlopeSel					×
It revises ste	p data using	this parts n	ame	Revise position, scale, and inclination of PCB	-
Set the No.	auxiliary po	oint in parts	:: " C *	using the CCD camera.	
Point1X	Point1Y	Point2X	Point2Y		
Point3X	Point3Y	-			
Press	TEST START to	heain set	un		
11033		Segiri Set	up.		
				<u>✓ Q</u> K <u>× C</u> an	cel

[Sample display-70]

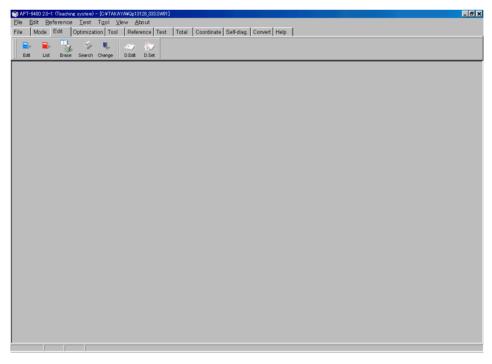
(8) Press [TEST START] SW on the operation panel.

(9) After "Camera Window" appeared on the display, center the Target marker on the auxiliary point-1 for your assigned area using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-71)



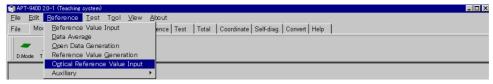
[Sample display-71] Camera Window

- (10) Center the Target marker on the auxiliary point-2 for your assigned area using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-71)
- (11) Center the Target marker on the auxiliary point-3 for your assigned area using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-71)
- (12) After all auxiliary points were set, the menu returns back to the step data list, where "Parts-correct" is substituted in the Comment column.
- (13) Press [Esc]key on the keyboard to close the step data list.



[Sample display-72] Main Window

(14) Open Optical Reference Value Input menu. (Reference > Optical Reference Value Input)



[Sample display-73] Menu bar (Optical Reference Value Input)

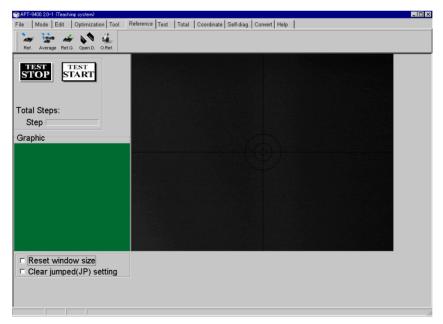
(15) Optical Reference Value Input window appears, where are all optical check assignement steps are displayed item by item.

The steps displayed in black has already input the optical data, but the steps displayed in blue has not yet input. Thus, please fill the checkbox which optical data should be input.

nput Optical Reference Value	X
Move Gard reference point	
Move First auxiliary reference point	
Move Second auxiliary reference point	
Move III 103 : IC3001 - No.1 auxiliary point in parts	
Move I⊂ 103 : IC3001 - No.2 auxiliary point in parts	
Move V 103 : IC3001 - No.3 auxiliary point in parts	
An image will be input for all checked points. Select OK when ready	to begin.
Select All Release All	<u>Cancel</u>

[Sample display-74] Optical Reference Value Input window

(16) Optical data input condition window appears. (Sample display-75)



[Sample display-75] Optical data input condition window



Unless "Reset window size" checkbox displayed on Optical data input condition window was filled, Image processing area and Search are same as the ones used at your last operation.

Be sure to fill the checkbox whenever the optical data is newly input.

If "Clear Jumped (JP) setting" checkbox displayed on Optical data input condition window was filled, the measuring function in the optical step where has been preset to JUMP(JP) is initialized to "BLANK(**)".

- (17) Press [TEST START] SW on the operation panel.
- (18) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.
- (19) After a message "Set board reference point using the CCD camera" appeared, press [TEST START] SW on the operation panel.

Revise	×
Set the board reference point using the CCD camera.	
X-BRP Y-BRP X-Aux.1 Y-Aux.1	
X-Aux.2 Y-Aux.2	
Press START to begin set up.	
✓ <u>O</u> K × <u>C</u> ancel	

[Sample display-76] Board reference point set

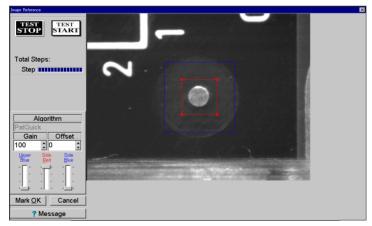
- (20) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (21) Center the Target marker on the Auxiliary reference point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (22) Center the Target marker on the Auxiliary reference point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (23) It shows "Set the No.1 auxiliary point in parts 103: IC5403 using the CCD camera." Then press [TEST START] SW on the operation panel.

Revise	×
Set the No. auxiliary point in parts : u	sing the CCD camera.
Point1X Point1Y Point2X Point2Y	
Point3X Point3Y	
Press START to begin set up.	
	✓ <u>O</u> K X Cancel

[Sample display-77] Auxiliary point set

- (24) After "Camera Window" appeared on the display, center the Target marker on the auxiliary point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (25) Center the Target marker on the auxiliary point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (26) Center the Target marker on the auxiliary point-3 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (27) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-78)

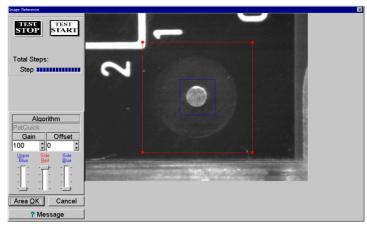
Enclose the auxiliary point-1 with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-78] Image processing area set

(28) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-79)

Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-79] Search area set

- (29) Enclose the auxiliary point-2 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-78)
- (30) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-79)Specify your Search area with the red box, then click on "Area OK" button.
- (31) Enclose the auxiliary point-3 with Image processing area shown by a red box, then click on "Mark OK" button. (Sample display-78)
- (32) The Image processing area box changes from red to blue, and Search area is shown by a red box.(Sample display-79)Specify your Search area with the red box, then click on "Area OK" button.
- (33) "Image Reference" window is closed, your input operation of the image data for the auxiliary point-1,2 and 3 is now finished.

Simple Vision Test Function

Uisng *Simple Vision Test Function* available in **Vision System TOS-4/TOS-41**, you can detect such component failure as omission, mis-placement, and mis-orientation, which could not be checked electrically. Undermentioned is their general applications.

Polarity check of Electrolytic capacitors

This is used for testing Electrolytic capacitors (orientation, presence, position), and their test step are discriminable by "E.Capa.-Image." in Comment column and also "IM-E." in Aux. column.

Polarity check of Tantalum capacitors

This is used for testing Tantalum capacitors (orientation, presence, position), and their test step are discriminable by "T.Capa.-Image." in Comment column and also "IM-T." in Aux. column.

Polarity check of Connectors

This is used for testing Connectors (presence, position), and their test step are discriminable by "Connec.-Image." in Comment column and also "IM-Co." in Aux. column.

Letter recognition check

This is used for testing printed letter on the devices, and their test step are discriminable by "Charac.-Image." in Comment column and also "IM-Ch" in Aux. column.

Presence check

This is used for some other components, like Resistance (SMT), Capacitance (SMT) so on. Their test steps are discriminable by "Parts-Image." in Comment column and also "IM-Pa" in Aux. column.

DATA PROGRAMMING PROCESS

1. Polarity check of Tantalum capacitors

(Ex.) C5208(10uF) at 518step

- (1) Open Step Edit menu (Edit > Step Edit) or Step List menu (Edit > Step List).
- (2) It shows "Enter step number" on the dialog box. Then input "518" from the keyboard and click on [OK] button.

Editor			×
Enter step number			
			•
	 ✓ 	<u>о</u> к	<mark>≭</mark> <u>C</u> ancel

[Sample display-80] Step number input

(3) The step data list appears while showing the cursor on the specified step number.

😭 APT-9400 2.0-1	(Teaching system) .				_ 8 ×
😾 <u>E</u> dit <u>S</u> earch	n <u>M</u> oveto <u>T</u>	ool <u>V</u> iew			_ <u>= 8 ×</u>
File Mode E	Edit Optimizat	ion Tool Referen	nce Test Total Coordinate Self-	diag. Convert Help	
		P	🎝 🔢 🛋 🇛 🗖	4 8 5 -	
Edit List			D.Set A.Gen. Print Undo Sel		
Step :Aux.	. Parts	Value	Comment	F. +% -% Reference Te	est 1-Xcoor 🔟
000516:	IC3001	P130-	P130-131 TKY0123)9.5 0 [****.***
000517:	IC3001	P131-	P131-132 TKY0123	OP 50 50 409.5 0 40)9.5 0 [****.****
000518:	C 5214	103	T.CapaImage.		084 UF [-012.6425
000519:	IC3001	2-1P	TKY0123	** 50 50 0.539 V 0.	.538 V [****.****
000520:	IC3001	P132-	P132-133 TKY0123	OP 50 50 409.5 0 40)9.5 0 [****.****
000521:	IC3001	P133-	P133-134 TKY0123	OP 50 50 409.5 0 40)9.5 0 [****.****
000522:	IC3001	P134-	P134-135 TKY0123	OP 50 50 409.5 0 40)9.5 0 [****.***
000523:	IC3001	P135-	P135-136 TKY0123	OP 50 50 409.5 0 40)9.5 0 [****.****
000524:	IC3001	P136-	P136-137 TKY0123	OP 50 50 409.5 0 40	9.5 0 [****.***
000525:	IC3001	P137-	P137-138 TKY0123	OP 50 50 409.5 0 40	9.5 0 [****.***

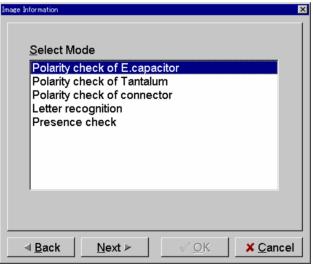
[Sample display-81] Step data list (Step No.518)

(4) Open Select Optical Test Mode menu. (Tool > Optical > Select Optical Test Mode)

MPT-9400 2.0-1 (Teaching system)	and the second sec						_ 6
<u> E</u> dit <u>S</u> earch <u>M</u> ove to 📘	ool <u>V</u> iew						_ 8
File Mode Edit Optimiz	<u>C</u> oordinates Map F1) Self-diag	g. Convert	Help	1		
🗖 🗖 🔟 🧹	Generation •	1			-		
-r -r 36 - r	Ground +		9 <u>–</u>	÷	-		
Edit List Erase Searc	Bottom probe	p Select	Cut Cr	opy F	Paste		
Step :Aux. Parts	Select Revise Area Mode		F. +%	-%	Reference	Test	1-Xcoor
100516: IC3001	Optical	Loo Relact (Shift+Otrl+I	409.5 0	****.***
100517: IC3001	Auto Generation			. Mode	Shirt+Gth+1	409.5 0	[****.****
00518: 05214		Scene F	Recycle		1000 01	∎ 1084 UF	-012.6425
000519: IC3001	Change Step Data		** 50	50	0.539 V	0.538 V	****.***
000520: IC3001	High-fly / No-contact-zone Shift+Ctrl+H	23	OP 50	50	409.5 0	409.5 0	****.***

[Sample display-82] (Tool > Optical > Select Optical Test Mode)

- (5) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.
- (6) The camera moves to the Board reference point, then to the Auxiliry reference point(s) to align inclination and/or scale of the board automatically.
- (7) It shows "Select Mode" menu (Sample display-83).After selected "Polarity check of Tantalum", click on [Next] button.



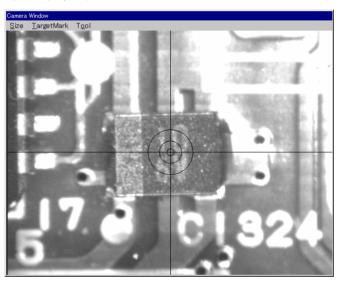
[Sample display-83] Select Mode menu

(8) It shows Sample display-84 below.

Press [TEST S	START] SW on th	ne operation panel.
---------------	-----------------	---------------------

Image Information
XPoint YPoint
Press START to begin set up.
▲ Back Next / ✓ OK X Cancel
[Sample display-84]

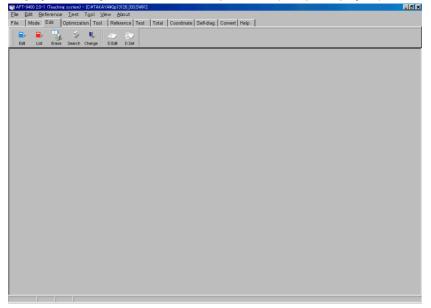
(9) After "Camera Window" appeared on the display, center the Target marker on the objective device (C5208) using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-85)



[Sample display-85] Camera Window

- (10) Camera Window is closed and it shows Sample display-84 again. Click on [OK] button to fix your asignemnt in "Select Mode" menu .
- (11) The menu returns back to the step data list. On your assigned test step (518 step), you see "T.Capa.-Image." is already substituted in Comment column and also "IM-T." in Aux. column.

(12) Press [Esc]key on the keyboard to close the step data list. (Sample display-86)



[Sample display-86] Main Window

(13) Open Optical Reference Value Input menu. (Reference > Optical Reference Value Input)

😭 APT-9400 2.0-1 (Teaching system)	_ 🗆 ×
Eile Edit Reference Test Tool View About	
File Mor Reference Value Input ence Test Total Coordinate Self-diag. Convert Help	
Data Average	
🖉 🖉 Open Data Generation	
D Mode T Reference Value Generation	
Ogtical Reference Value Input	
Auxiliary	

[Sample display-87] Menu bar (Optical Reference Value Input)

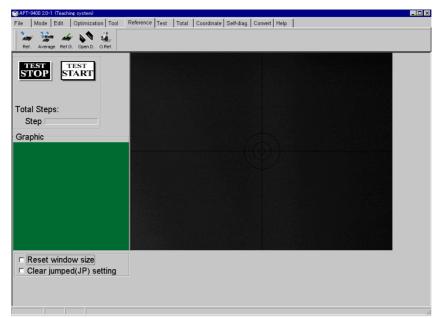
(14) Optical Reference Value Input window appears, where are all optical check assignement steps are displayed item by item.

The steps displayed in black has already input the optical data, but the steps displayed in blue has not yet input. Thus, please fill the checkbox which optical data should be input.

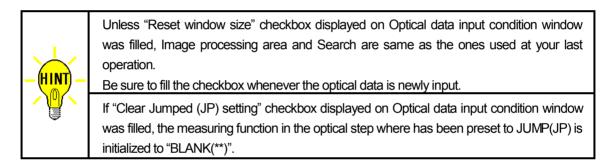
nput Optical Reference Value	<u>×</u>
Move Gard reference point	
Move First auxiliary reference point	
Move Gecond auxiliary reference point	ıt
Move F 518 : C5214 - Polarity check of	Tantalum
An image will be input for all checked points. Sel	lect OK when ready to begin.
Select All Release All	✓ <u>O</u> K

[Sample display-88] Optical Reference Value Input window

(15) Optical data input condition window appears. (Sample display-89)



[Sample display-89] Optical data input condition window



- (16) Press [TEST START] SW on the operation panel.
- (17) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.
- (18) After a message "Set board reference point using the CCD camera" appeared, press [TEST START] SW on the operation panel.

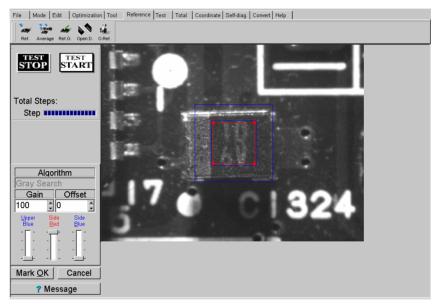
Revise					×
Set the boa	rd reference	point using	the CCD c	amera.	
X-BRP	Y-BRP	X-Aux.1	Y-Aux.1		
				-	
X-Aux.2	Y-Aux.2	,			
Press	START to	beain se	t up.		
		J			
				√ <u>0</u> K	X <u>C</u> ancel

[Sample display-90] Board reference point set

(19) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.

- (20) Center the Target marker on the Auxiliary reference point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (21) Center the Target marker on the Auxiliary reference point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (22) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-91)

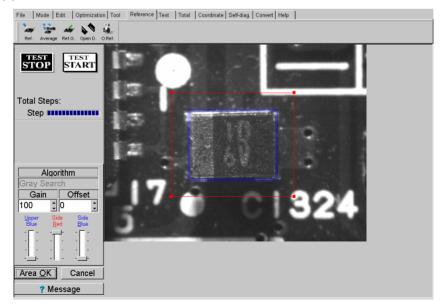
Enclose the objective device (C5208) with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-91] Image processing area set

(23) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-92)

Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-92] Search area set

(24) "Image Reference" window is closed, your input operation of the image data for the objective device (C5208) is now finished.

2. Presence check

(Ex.) C5214 (0.01uF) at 289 step

- (1) Open Step Edit menu (Edit > Step Edit) or Step List menu (Edit > Step List).
- (2) It shows "Enter step number" on the dialog box. Then input "289" from the keyboard and click on [OK] button.

Editor		×
Enter step number		
		•
	<u>✓ о</u> к	<mark>≭</mark> <u>C</u> ancel

[Sample display-93] Step number input

(3) The step data list appears while showing the cursor on the specified step number.

🛞 APT-9	9400 2.0-1	(Teachine	system)	13 . 10 m - 1														_ 8 ×
😸 Edit	t <u>S</u> earc	∶h <u>M</u> ov	e to	<u>T</u> ool <u>V</u> ie	w													_ <u>= = ×</u>
File	Mode	Edit	Optimiza	tion Tool	Refe	ence T	est Tota	il Coo	rdinate	Self-diag	. Con	/ert Hel	p					
			21	ų.,	42	\$ 7)		- <u>1</u>	Ą,	4		4	-					
Edit	List	Erase	Search	Change	D.Edit	D.Set	A.Gen.	Print	Undo	Select	Cut	Copy	Paste					
Step	:Aux		rts		alue		Comme					+% -		feren		Test		1-Xcoor 🔺
00028			1005		1-2		JE4NF					50 5		19.5 0		409.5		[****.***
00028			1005		2-3		JE4NF					50 51		19.5 0		409.5		[****.****
00028	39:	C5	214	1	03		T.Cap	a.–Im	age.		**	30 31) 1	089 U	F	1084	UF	-012.6425
00029	90:	IC	3001	2	-1P		TKY01:	23			**	50 5) ().	539 V	C	0.538	٧	[****.****
00029	91:	IC	1005	P	3-4		JE4NF	>			OP !	50 5) 40	9.5 0	- 4	409.5	0	****.***
00029	92:	IC	1005	P	4-5		JE4NF	C			OP !	50 5) 40	9.5 0	4	409.5	0	****.***
00029	93:	IC	1005	P	5-6		JE4NF)			OP !	50 5	0 40	9.5 0	4	409.5	0	****.***
00029	94:	IC	1005	PI	6-7		JE4NF	>			OP !	50 5) 40	9.5 0	4	409.5	0	****.***
00029	95 :	IC	1005	P	7-8		JE4NF	>			OP !	50 5) 40	9.5 0	4	409.5	0	****.***
00029	96:	IC	1005	P	8-9		JE4NF	>			OP !	50 5) 40	9.5 0	- 4	409.5	0	[****.****

[Sample display-94] Step data list (Step No.289)

(4) Open Select Optical Test Mode menu. (Tool > Optical > Select Optical Test Mode)

😭 APT-9400 2.0-1 (Teaching system 🔽 Edit Search Move to) Tool View	
File Mode Edit Optimiz	Coordinates Map F1	Self-diag. Convert Help
Edit List Erase Searc	Generation Ground Bottom probe	Select Diff Copy Paste
Step :Aux. Parts 000287: IC1005 000288: IC1005	Select Revise Area Mode	F. +% -% Reference Test 1-Xcoor ▲ Select Optical Test Mode Shift+Ctri+I 409.5.0 [*****.****
000288: 101005 000289: C5214 000290: 103001 000291: 101005	Auto Generation Change Step Data High-fly / No-contact-zone Shift+Ctrl+H	Scene Recycle 409.5 0 ****** 1084 UF -012.6425 ** 50 50 0.539 V 0.538 V ***** 0P 50 50 409.5 0 *****

[Sample display-95] (Tool > Optical > Select Optical Test Mode)

- (5) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.
- (6) The camera moves to the Board reference point, then to the Auxiliry reference point(s) to align inclination and/or scale of the board automatically.

(7) It shows "Select Mode" menu (Sample display-96).

After selected "Pre	sence check", click on [Next] button.
	Image Information
	<u>S</u> elect Mode

Polarity Polarity Letter re	check of E.ca check of Tant check of conr ecognition ce check	talum	

X

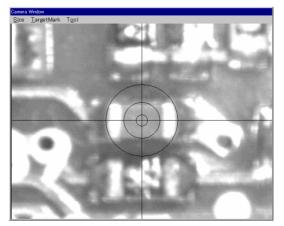
[Sample display-96] Select Mode menu

(8) It shows Sample display-97 below.

Press [TEST START] SW on the operation panel.

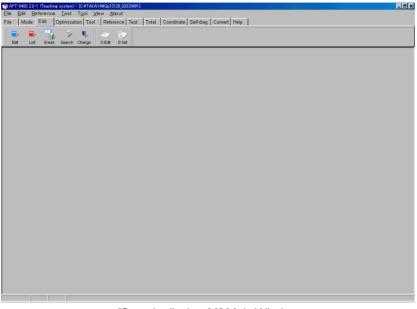
mage Information	×
XPoint YPoint	
Press START to begin set up.	
Press START to begin set up.	
▲ Back Next ► ✓ OK X Cance	1
[Sample display-97]	

(9) After "Camera Window" appeared on the display, center the Target marker on the objective device (C5214) using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates. (Sample display-98)



[Sample display-98] Camera Window

- (10) Camera Window is closed and it shows Sample display-97 again. Click on [OK] button to fix your asignemnt in "Select Mode" menu.
- (11) The menu returns back to the step data list. On your assigned test step (518 step), you see "Parts-Image." is already substituted in Comment column and also "IM-Pa" in Aux. column.
- (12) Press [Esc]key on the keyboard to close the step data list. (Sample display-99)



[Sample display-99] Main Window

(13) Open Optical Reference Value Input menu. (Reference > Optical Reference Value Input)

APT-9400 2	0-1 (Teaching system)		_ 🗆 ×
<u>E</u> ile <u>E</u> dit	<u>Reference</u> <u>T</u> est T <u>o</u> ol <u>V</u> iew Al	pout .	
File Mot	<u>R</u> eference Value Input	ence Test Total Coordinate Self-diag. Convert Help	
· · · · · · · · · · · · · · · · · · ·	<u>D</u> ata Average		
	Open Data Generation		
D.Mode T	Reference Value Generation		
	Optical Reference Value Input		
	Auxiliary 🔸		

[Sample display-100] Menu bar (Optical Reference Value Input)

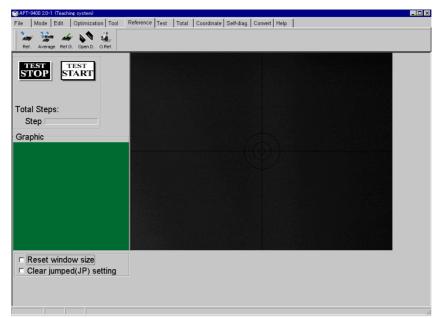
(14) Optical Reference Value Input window appears, where are all optical check assignement steps are displayed item by item.

The steps displayed in black has already input the optical data, but the steps displayed in blue has not yet input. Thus, please fill the checkbox which optical data should be input.

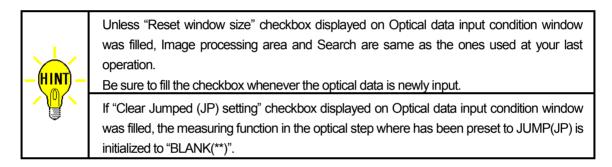
Move	Board reference point	
Move	First auxiliary reference point	
Move	Second auxiliary reference point	
Move	▼ 289 : C5214 - Polarity check of Tantalum	
An ima	age will be input for all checked points. Select OK when read	y to begin.

[Sample display-101] Optical Reference Value Input window

(15) Optical data input condition window appears. (Sample display-102)



[Sample display-102] Optical data input condition window



- (16) Press [TEST START] SW on the operation panel.
- (17) After a message "Use board ref. point and aux. ref. point for alignment?" appeared, click on [Yes] button then press [TEST START] SW on the operation panel.
- (18) After a message "Set board reference point using the CCD camera" appeared, press [TEST START] SW on the operation panel.

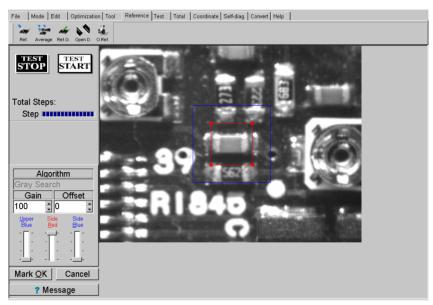
Revise					×
Set the boa	rd reference	point using	the CCD o	amera.	
X-BRP	Y-BRP	X-Aux.1	Y-Aux.1		
X-Aux.2	Y-Aux.2	_			
	TEST				
Press	START to	begin se	t up.		
				✓ <u>О</u> К	<mark>X</mark> <u>C</u> ancel

[Sample display-103] Board reference point set

(19) After "Camera Window" appeared on the display, center the Target marker on the Board reference point using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.

- (20) Center the Target marker on the Auxiliary reference point-1 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (21) Center the Target marker on the Auxiliary reference point-2 using the keypad arrow keys on the operation panel, then press [ENTER] SW to enter the coordinates.
- (22) It shows "Image Reference" window, where are two boxes indicating Image processing area and Search area. (Sample display-104)

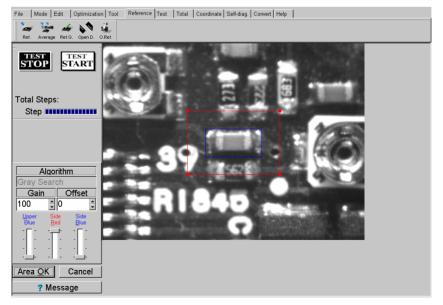
Enclose the objective device (C5214) with Image processing area shown by a red box, then click on "Mark OK" button.



[Sample display-104] Image processing area set

(25) The Image processing area box changes from red to blue, and Search area is shown by a red box. (Sample display-105)

Specify your Search area with the red box, then click on "Area OK" button.



[Sample display-105] Search area set

(26) "Image Reference" window is closed, your input operation of the image data for the objective device (C5214).

Optical data review / Optical data test

Using **Optical data review** or **Optical data test**, you can evaluate and/or change the measuring conditions so on in your image data.

These two menu are selectable from Sample display-106 below (Test > Review Step data). Optical data review menu is used for evaluating and/or changing the measuring conditions. Optical data test menu is used for assuring of the stability of the optical test.

🍘 APT-9400 2.0-1 (Teaching system) -		_ D >
T [ESC] Back		_8>
File Mode Edit Optimization Tool Reference Test Total Coo	rdinate Self-diag. Convert Help	
🗢 🎿 🛲 🚚 🥭 🏏		
D.Mode Review Test LCRmeter Revise T.Mode Search		
Message	Coordinates Graphic	
Total Steps:		
Steps START		
 Step data review 	Evaluation of Reference Value	
 Step data test 	Initialize examined mark	
c Evaluation of reference value		
 Evaluation of jump steps 	Select the examination tolerance (%)	
 Evaluation of debug steps 		
 Optical data review 		
 Optical data test 	Enter the starting and ending step numbers:	
		•

[Sample display-106] Data Examintion menu (Main display)

Optical data review

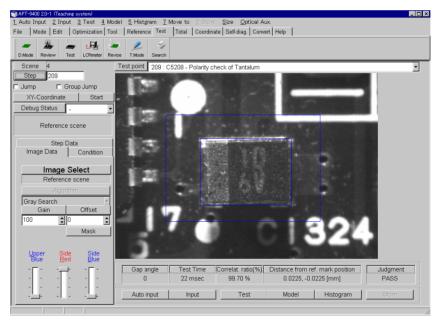
Selecting "Optical data review" from Sample display-106 then pressing [TEST START] SW on the operation panel, a message "Use board ref. point and aux. ref. point for alignment?" appears.

Then click on [Yes] button and align possible inclination/scale of the board using [TEST START] SW and the keypad arrow keys on the operation panel, so that [Sample display-107] appears.

nput Optical Reference Value	×
Move Goard reference point	
Move First auxiliary reference point	
Move Second auxiliary reference point	
Move 1 : C5214 - Presence check	
Move 209 : C5208 - Polarity check of Tantalum	
An image will be input for all checked points. Select OK when rea	dy to begin
Select All Release All	<mark>X</mark> <u>C</u> ancel

[Sample display-107] Optical Reference Value Input window

After selected the objective image point from Sample display-107, click on [OK] button then press [TEST START] SW on the operation panel. (Sample display-108)



[Sample display-108] Optical data review menu

Optical data test

Selecting "Optical data test" from Sample display-106 then pressing [TEST START] SW on the operation panel, a message "Use board ref. point and aux. ref. point for alignment?" appears.

Then click on [Yes] button and align possible inclination/scale of the board using [TEST START] SW and the keypad arrow keys on the operation panel, so that Sample display-109 appears.

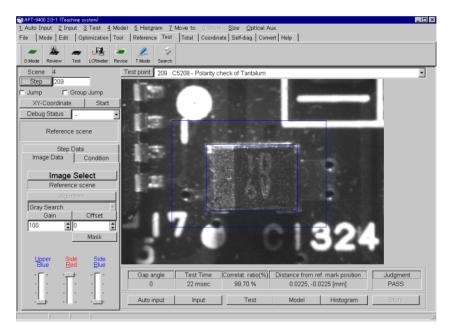
Optical Data Test	×
Set movement volume at your evaluation	0.102.00[mm]
<u>✓ Q</u> K	X <u>C</u> ancel

[Sample display-109] Camera movement volume set

While evaluating Coordinates alignment points (Board reference point and Auxiliary reference point), in fact the CCD camera can move toward each four directions (right-top, right-bottom, left-bottom, left-top) with the distance specified in [Sample display-109] as if the board under test shifted its position.

As for Polarity check and Presence chack, the objective device is tested to evaluate the measuring stability.

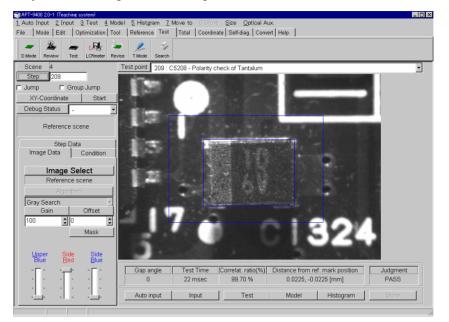
When some optical data was judged inadequate under Optical data test, Sample display-110 appears to ask your correction.



[Sample display-110] Optical data test menu

Optical data examination menu

Optical data review menu (Sample display-111) allows you to learn the optical data again, check the measuring stability and also change the measuring conditions.



[Sample display-111] Optical date review menu

The combobox on the upside of Sample display-111 screen shows Step number, Parts name and the testing category of the optical data under evaluation. From this combobox, yu can select another optical data step to be jumped, if necessary.

Scene number and Step number so on are also displayed at the left-top side of the same screen. (Sample display-112)

Scene	4	
Step		
🗖 Jump	🗖 Group	o Jump
XY-Coordinate		Start
Debug St	atus	•

[Sample display-112]

Scene	:	Scene number of optical data under evaluation (not changeable)
Step	:	Step number of optical data under evaluation
		In case of the board reference point or the auxiliary reference point, their step
		number is not displayed. After specified any step number and hit [Enter] key, the
		menu jumps to the optical data review for the specified step.
Jump	:	If this checkbox was filled, the optical test is skipped (no test).
Group Jump	:	If this checkbox was filled, when this optical step was judged fail at test, all steps
		following the fail step is skipped and it starts testing from the next group.
XY Coordinate	-	The center coordinates of the objective device is changeable using the keypad arrow keys.
Start	:	Clicking on [Start] button, Optical data test is continued automatically.
Debug status	:	It shows Debug category in the combobox.

Explanation of menu button

Menu button (Sample display-113) which is on the downside of the optical data review menu is used to display the evaluation result, reinput the objective image data, and so on.

Gap angle	Test Time	Correlat. ratio(%)	Distance from ref. mark position		Judgment
Auto input	Input	Test	Model	Histogram	Store

[Sample display-113] Menu button (Optical data review menu)

Gap angle

This shows how much the object under evaluation is slant against the reference image.

Test Time

This shows the time how long it took to disposal the object under evaluation.

Correlat. Ration (%)

This shows how the object under evaluation correlates to the reference image.

Distance from ref. mark position

This shows how the object under evaluation is far from the reference image.

Judgement

This shows the judgement result made under Simple vision test.

- PASS :The test passed.
- Agre-ER : The correlation rate was lower than the threshold.
- Angl-ER : The object under test is slant.
- M.OFFS : The object under test is not positioned well.
- **INV-NG** : The object under test highly correlates to the reference image with opposite polarity.

Auto input

The existing reference data (Reference image, Measuring condition) under evaluation is once initialized, then a new reference data is input again. To do this, it is necessary to specify the Image processing area and the Search area again.

Input

Reference data is input again without initializing the Image processing area and the Search area and Measuring condition.

Test

It tests the measuring stability of the optical data.

Its result is displayed on each combobox of "Gap angle", "Test time", "Correlat. ratio", "distance from ref. mark position" and "Judgement".

Model

Reference image is displayed on the screen.

Histogram

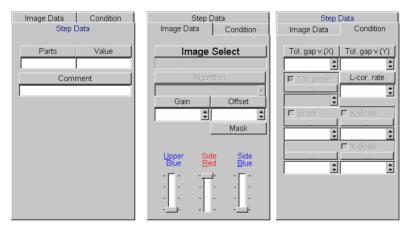
The comparison is made to the histogram value (parameter) of both the object under test and the reference image. With the histogram the gray value ratio is displayed by a graph.

Save

All changes (ex. new reference image, measuring conditions, so on) at Optical data review menu can be saved into the disk.

Auxiliary Menu Tab

There are three Menu tabs ("Step Data", "Image Data" and " Condition") at the lefthand of Optical data review menu. (Sample display-114)



[Sample display-114] Auxiliry Menu Tab

Step Data

"Parts", "Value" and "Comment" from the test step is displayed and changeable. To save your change into the disk, be sure to click on [Save] button.

Image Data

"Image Select", "Camera Gain", "Offset", "Mask" and "LED lights" used for the object under evaluation aredisplayed and changeable.

Image Select combobox enables to save max. 9 auxiliary scenes. These auxiliary scenes are used together with the reference image under test. In case that the measured object image could agree with the reference image otherwise any of these auxiliary scenes, it judges PASS. Usually these auxiliary scenes are used for Porality check, which device condition changes inconsistently board by board.

To add any auxiliary scene, click on Image Select bar then click on [Add] button. And if double-clicking on the auxiliary scene name added on the list, the optical data can be input.

To erase any auxiliary scene, click on [Delete] button on the downside of the auxiliary scene list.



The auxiliary scene is erasable in order of bigger scene number.

Using Mask, some region of the reference image can be out of pass/fail judgement. For example, some character drawn on the device are different every production lot and this may cause misjudgement, we can put the character out of pass/fail judgement.



If you would set mask size too large, this causes possibly misjudgement.

Condition

Codnition of pass/fail judgement is displayed and changeable.

"Tol. Gap V.(X)" and "Tol. Gap V.(Y)" enable to set the tolerance of the device position. (unit : mm)

If "Tol. Angle" checkbox was filled, you can specify the tolerance of slant angle of the object under test. (unit:degree)

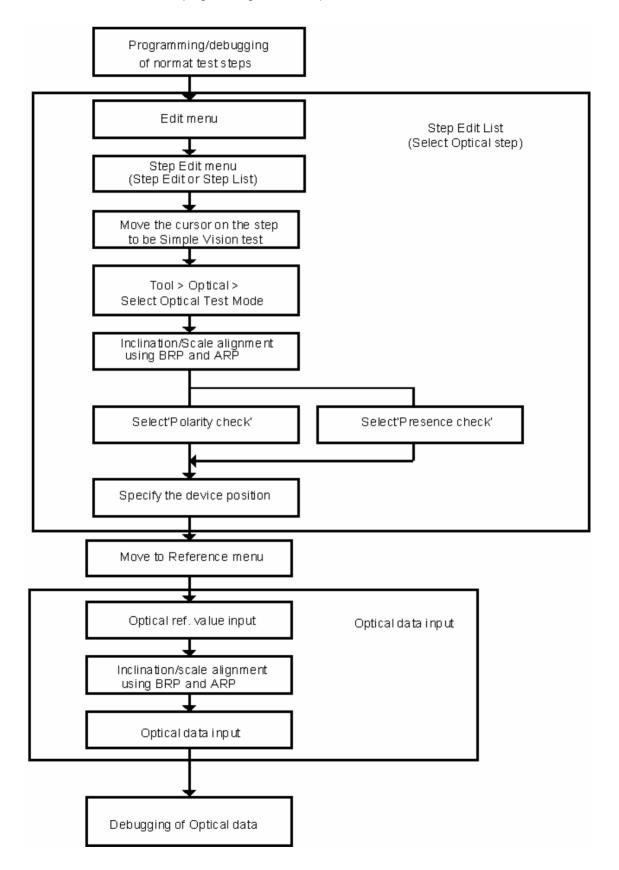
"L-cor.rate" enables to set the tolerance for PASS/FAIL judgement based on the reference image. (unit :%) "Scale", "X-Scale" and "Y-Scale" enables to set the tolerance of measured object size. (unit : %)



As for the tester equipped with the TOS-41 system, you cannot change any of "Tol. Angle", "Scale", "X-Scale" and "Y-Scale".

Simple Vision Test Programming flow

Undermensioned is test data programming flow for Simple vision test.



Sample Setting Optical Data

In this section we describe the basic programming know-how, introducing how to step the window frame and area.

Object (Test mode)	Good sample	Bad sample	Remarks
Fiducial marks	Window		Any mark with varied shape is
	Test area		not proper. (i.e. solder land)
			
	Fiducial mark (no solder) is	Similar marks locate near	
	best to use.	around.	
Electrolytic capacitors			Tall component may not be
(Polarity check)			tested. The judgment owe to a
			black bar of polarity.
	Tightly enclosed by the	Much opening between the	
	window.	object and the window.	
Tantalum capacitors			The judgment owe to the
(Polarity check)			difference color on the surface.
	Tightly enclosed by the	Much opening between the	
	window.	object and the window.	
Connectors			When misplaced or
(Polarity check)			mis-oriented, it shows
			incompatibility error.
	Unti-contrast point (top -		
	bottom, left – right is	Contrast point is enclosed	
10-			Anne latter is not recommend
ICs (Letter recognition)			Any letter is not recognized actually.
(Letter recognition)	TAKAYA	TAKAYA	actually.
	T710830	<u>T710830</u>	
	Stable point is enclosed.	Varied point is enclosed.	
ICs			
(Polarity, Presence)	TAKAYA		
	T710830	1710830	
	Oriented point only is	Mis-orientation sometimes	
	enclosed	may not detected.	
Chip transistor			Reference value should be
(Presence check)			learned from some known
			good PC boards.
	All area including leads is	only package unit is	<m. mode=""></m.>
	enclosed.	enclosed.	Gray search

Object (Test mode)	Good sample	Bad sample	Remarks
Test pin / Test point (Presence check)			
	Whole test pin including	Test pin only is enclosed.	
	possible moving area is		
	enclosed.		
Others (Presence check)			
	Whole device is enclosed	Only device package is	
	together with the soldering	enclosed, not the pc board	
	part.	part	

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User's guide for Vision System TOS-4/TOS-41 Vol.1

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