Apt-9400 series

Flying Probe Tester

Programmable DC Power Supply Board

(PDC-9000) Operator's Guide

TAKAYA CORP.

Preface

The Programmable DC Power Supply Board (PDC-9000) is an option used together with the Takaya Fixtureless tester ***APT-940*CE/CJ*** to extend its capabilities.

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

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

NOTE: The design of the product and software are under constant review and while every effort is made to keep this manual up to date, we reserve the rights to change specifications and equipment at any time without prior notice.

Outline

With the PDC-9000 built-in the ***APT-940*CE/CJ***, you can apply the specified voltage (DC1.0V – 25.0V) on your PC boards, through the flying probes and/or bottom probes. Voltage and Current measurements can is made while power is applied to the PC boards.

System Configuration

The PDC-9000 consists of following items :

1. HARDWARE

   Programmable DC Power Supply Board (TAKAYA TVX-13M)

2. SOFTWARE

   The *APT-940*CE/CJ* system software (from V2.0-5) corresponds to this option as standard.

Additional Functions

With the PDC-9000 (TAKAYA TVX-13M) built-in the *APT-940*CE/CJ*, two additional functions are now available.

1. Apply Voltages

   Using probes (including bottom probes), voltage can be applied to the UUT (DC1.0V – 25.0V).

2. Measure Current

   Current can be measured while the voltage is applied to the UUT.

Applications

Examples of the types of tests that can be performed:

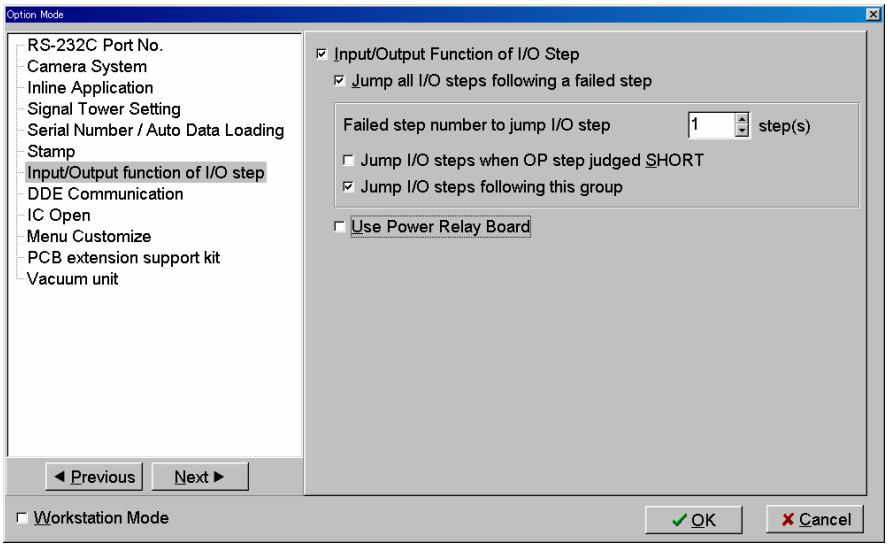
1. Relays (On/off test)
2. 3-terminal regulators (On test)
3. Small circuits (On test)

Specifications

Applied voltage	DC constant voltage: 1.0 – 25.0V (0.1V increments)
Max. Current	1A (current limit adjustable)
Current limit	7 ranges (5mA, 10mA, 25mA, 50mA, 100mA, 200mA, 500mA,1A)
Ammeter	4 ranges
	Range-1: 0.1 – 1.0mA Range-2: 1 – 10mA Range-3: 10 – 100mA Range-4: 100 – 1000mA

Software Settings

To use the PDC-9000, please set up the APT software properly as follows.



[Operating process]

1. Open the Option Mode window.
2. Select Input / Output function of I/O step menu.
3. Fill “Input / Output Function of I/O step” check box.
4. Click on [OK] button to close Option mode menu.

NOTE: If “Jump all I/O steps following a failed step” check box was filled, the tester will not execute any I/O step following the fail step.

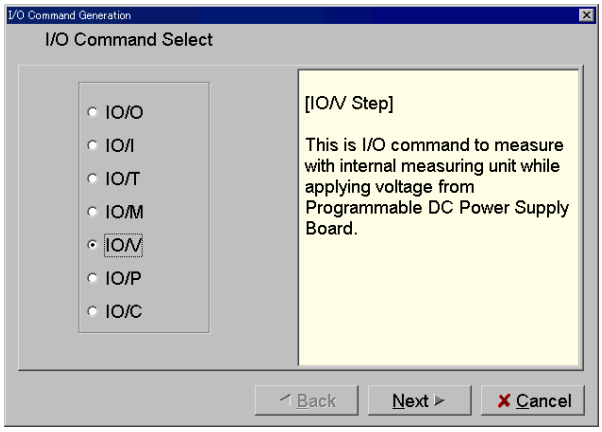
Available Functions

After set up Option mode properly, following functions become available:

1. Apply Voltage Function (IO/V command)
2. Power On Test Function (IO/P command)
3. Current Measurement Function (IO/C command)
4. Self-diagnosis for the PDC-9000

Function step (I/O command)

Using I/O command (IO/V, IO/P, or IO/C), the PDC-9000 can apply DC constant voltage to the UUT. The I/O command step can generate by “I/O Command Generation” menu available on either Step Edit or Step list menu.



Notes When Using I/O Commands

1. IO/P, IO/V and IO/C commands are to use for testing the PC board while applying the power voltage. So, if they were wrong used (ex. wrong location, polarity so on), it may heavily damage your PC boards or the measuring unit inside the APT-940*CE/CJ. Pay much attention to use this IO/W command under your responsibility.
2. The IO command steps must follow the normal RCLD measurement steps. If the board was power up while there are some misplacement or short failure, it may possibly damage the board or the components.
   Thus we prevent any I/O step following the fail step from its execution as described below.
   - ❑ when “Jump all I/O steps following a failed step” check box in Input/Output function of I/O step (Option mode) is filled, any I/O step following the fail step is not executed.
   - ❑ Using Group separation function, set up Group-1 for normal RCLD measurement steps and Group-2 for I/O command steps. And then, fill “Stop all testing” radio button (Master Mode > Failure Management > Stop testing when a group fail(s)). Under this condition, in case that Group-1 testing was judged fail, any I/O step in Group-2 is not executed.

3. When the Point system is used with the IO/V and IO/C commands, the maximum pin numbers allowed is limited to 32,000.
4. If I/O command step (IO/P, IO/V or IO/C) is substituted with one of the following types of tests, the step returns back to its original setup.
   - ❑ Optical steps
   - ❑ Combination test steps
   - ❑ Special generation steps
   - ❑ IC Open test steps
   - ❑ Digital transistor steps
   - ❑ FET steps
   - ❑ Pattern open check test
   - ❑ Opto coupler steps
   - ❑ Kelvin measurement steps
   - ❑ Zener steps
   - ❑ Coordinates revision steps
5. I/O command steps cannot be used at Coordinates Sort function.
6. I/O command steps cannot be used at Parts Sort function.
7. I/O command steps cannot be used at Combination Measurements.
8. Once the I/O command step was released, other than “Parts”, “Value” and “Comment” column are initialized and put back to the normal step.
9. In case that the test program was converted to APT-8000 series (SD8/TA8/SW8 file save), their I/O command steps (IO/P, IO/V, or IO/C) are released. Other than “Parts”, “Value” and “Comment” column are initialized and put back to the normal step.
10. The reference value (Reference Current) for an IO/P command step cannot be input automatically during the Reference Value Input function.
    It must be setup in the Step Review menu.
11. The Data Average function does not average the voltage and/or current of the I/O command steps (IO/P, IO/V, or IO/C).
12. The Reference Value Generation function does not create the reference value for the I/O command steps (IO/P, IO/V, or IO/C).
13. Location name in the I/O command steps (IO/P, IO/V, or IO/C) is not changeable at Change step data function.
14. Location name in the I/O command steps (IO/P, IO/V, or IO/C) is not changeable at Group Addition function.
15. Location name in the I/O command steps (IO/P, IO/V, or IO/C) is not changeable at Auto Location Set function.

IO/V Step

The IO/V command is used to apply DC voltage from the PDC-9000 to the UUT via two selected probes. And it can measure as a normal test step (RCLD) or a voltage using the other probes.

Any two of the four flying probes or the two bottom probes can be used to apply the voltage.

The IO/V command allows functional tests of relays, 3-terminal regulators, and other components on the UUT.

Supplements:

1. If you would like to use the IO/V command with the bottom probes, the IO/V function must first be applied to the flying probes and then changed to the bottom side.

   If a step is already setup to use the bottom probes, the bottom probe setting will be released automatically when it is changed to an IO/V command.
2. IO/V command can not be used with the guard function.
3. IO/V command is automatically input as “IO/V” in the “Loc.” and “Aux.” field.
4. The applied voltage is displayed in the “Volt” field of the Step Edit list.

CAUTION:

The IO/V command will apply voltage to the UUT.

If voltage is applied to the wrong location, if the wrong polarity is selected, or if the wrong voltage is used, the UUT, the component, and/or the measuring system of the tester may be seriously damaged. The user of this tester assumes all risks involved with using these commands.

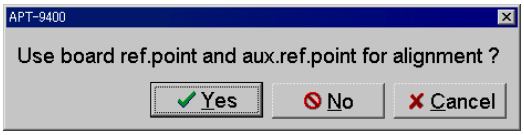
IO/V Command Flowchart

1. Probe down
2. Apply the specified voltage
3. Wait for specified time
4. Measure
5. Remove the voltage
6. Probe up

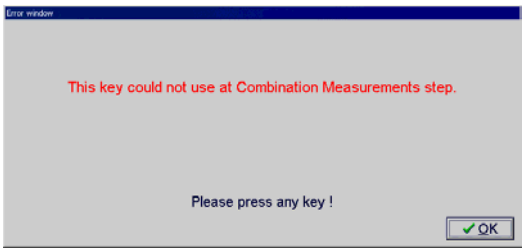
IO/V Command Setup (Teaching system)

1. Open Step Edit menu.
2. Move the cursor to the step that you want to convert to an IO/V step.
3. Select: **Tool → IO Function → IO Step**

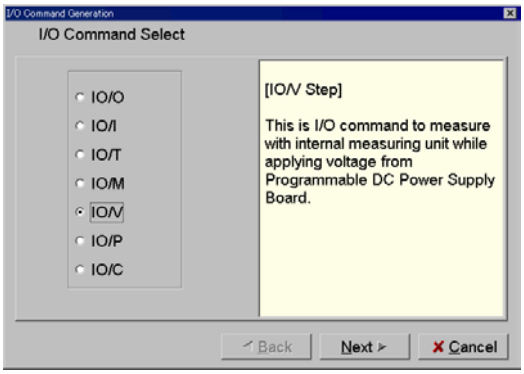
   Note: If you use the **Use auxiliary reference point(s)** function, the following window will be displayed:



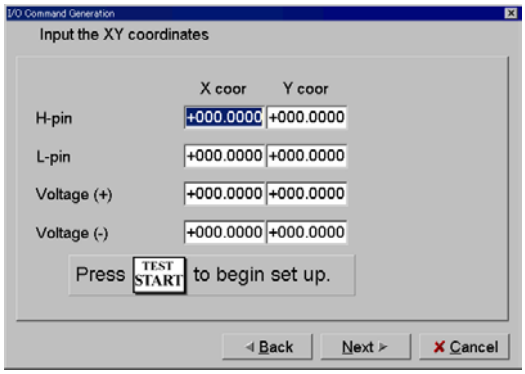
   If it is not possible to convert the selected step, the following error message will be displayed:



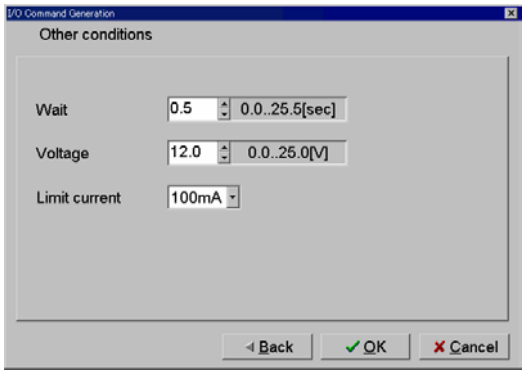
4. The I/O Command Generation window appears:



5. Click on **IO/V** radio button and then click on [Next] button..
6. The X/Y coordinates input window will be displayed. Press the [TEST START] SW. Input the X/Y coordinates, then click on [Next] button.



7. Input the **Wait** time (waiting time to start measuring), **Voltage** (applied voltage) and select the **Limit current**. Click on [OK] button.

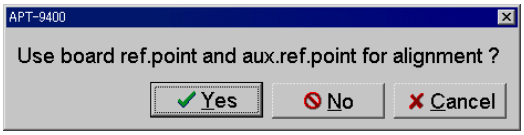


8. "IO/V" is now displayed in the "Aux." and "Loc." field.

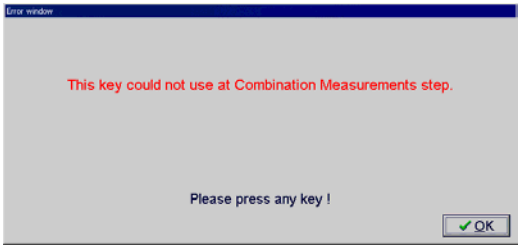
IO/V Step Setup (Point system)

1. Open Step Edit menu.
2. Move the cursor to the step that you want to convert to an IO/V step.
3. Select: **Tool → IO Function → IO Step**

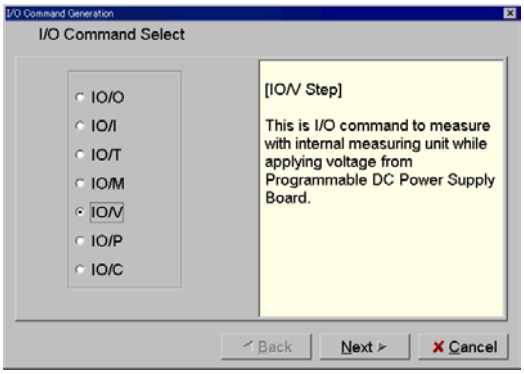
   Note: If you use the **Use auxiliary reference point(s)** function, the following window will be displayed:



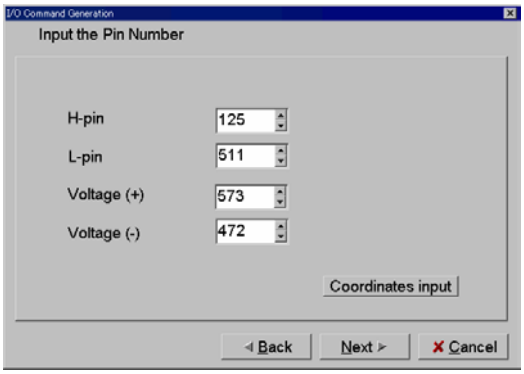
   If it is not possible to convert the selected step, the following error message will be displayed:



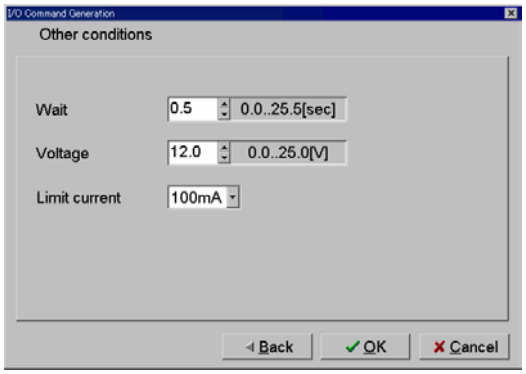
4. The I/O Command Generation window appears:



5. Click on **IO/V** radio button and then click on [Next] button.
6. The Pin Number Input window will be displayed. Input the pin number in each field. Click on [Next] button.



7. Input the **Wait** time (waiting time to start measuring), **Voltage** (applied voltage) and select the **Limit current**, then click on [OK] button.



8. "IO/V" is now displayed in the "Aux." and "Loc." field.

IO/P step

The IO/P command uses the PDC-9000 to apply DC voltage to the UUT via two bottom probes. The IO/P command allows multiple tests to be performed while the DC voltage is applied (Power on test).

The IO/P command can also be used to measure current. When using the Current Measurement Function (DC-IM), the current is measured after the voltage is applied to the UUT. If the current is above or below the specified tolerance, the tester immediately stops applying voltage.

Supplements:

1. The IO/P command is input as “IO/P” in the “Loc.” and “Aux.” field.
2. The following conditions will cause the tester to stop applying voltage:
   - ❑ Execute IO/P command with 0V
   - ❑ Testing finished or aborted
   - ❑ Current is out of tolerance
   - ❑ Use of the bottom probes
   - ❑ Execution of the IO/M, IO/T, IO/V, IO/C, or IO/U commands
3. If there is an IO/V step after an IO/P step, the IO/P command is stopped and the IO/V command is started automatically.
4. If a step is setup to use the bottom probes, the bottom probes are automatically released when the step is assigned the IO/P command.
5. The IO/P command cannot be used with the flying probes.
6. The applied voltage is listed in the “Volt” field of the Step Edit list.

CAUTION:

The IO/P Command will apply voltage to the UUT.

If voltage is applied to the wrong location, if the wrong polarity is selected, or if the wrong voltage is used, the UUT, the component, and/or the measuring system of the tester may be seriously damaged. The user of this tester assumes all risks involved with using these commands.

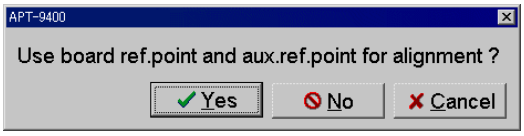
IO/P Command Flowchart

1. Apply the specified voltage
2. Wait for specified time
3. Measure the current (If “current check” is used)
4. Move to next step
5. Test finished or aborted
6. Stop applying the voltage

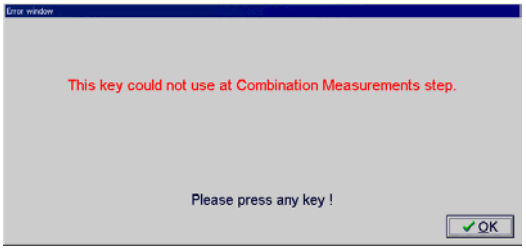
IO/P Step Setup

1. Open Step Edit menu.
2. Move the cursor to the step that you want to convert to an IO/P step.
3. Select: **Tool → IO Function → IO Step**

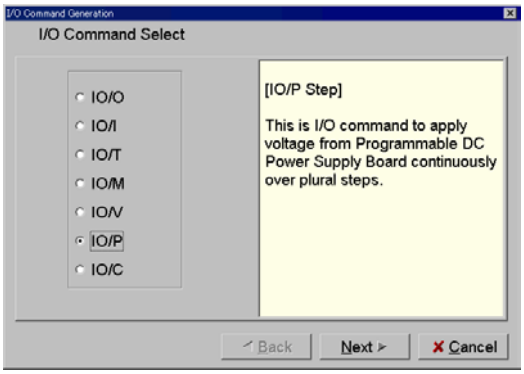
   Note: If you use the **Use auxiliary reference point(s)** function, the following window will be displayed:



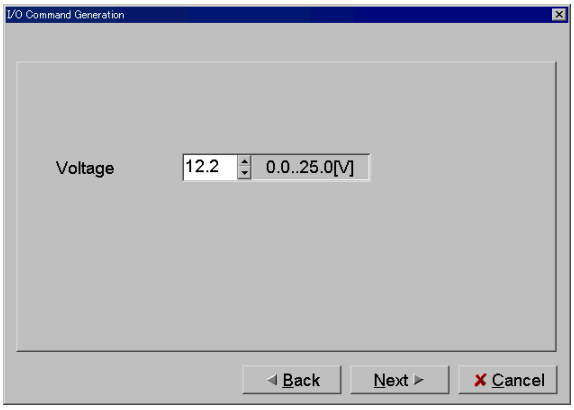
   If it is not possible to convert the selected step, the following error message will be displayed:



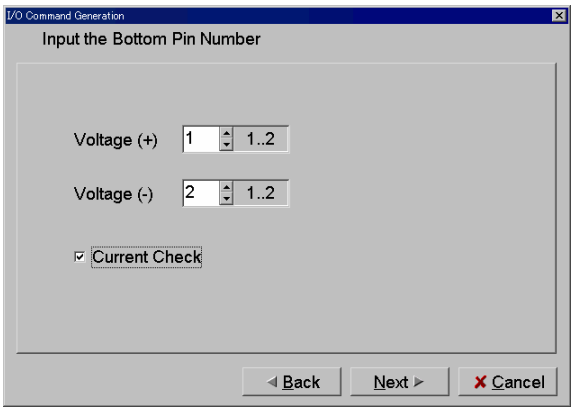
4. The I/O Command Generation window appears:



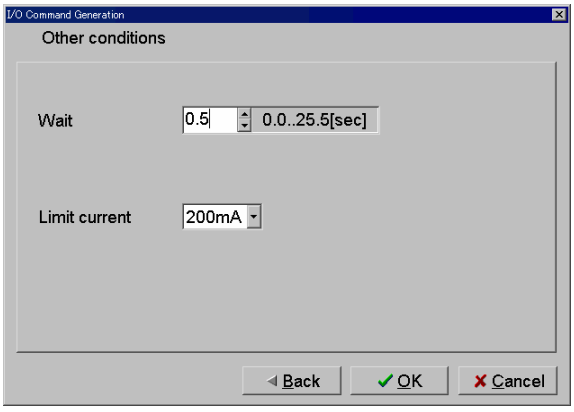
5. Click on **IO/P** radio button and then click on [Next] button.
6. The Impressed Voltage Input window appears.
   Input the **Voltage** and then click on [Next] button.



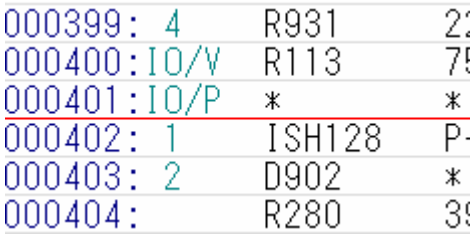
7. Select the **Bottom Probe Number** and then click on [Next] button.



   NOTE: If the wrong polarity is input, the UUT can be damaged.
   If you wish to use the Current Measurement function, fill **Current Check** check box.
8. Input the **Wait** time (waiting time to start the current measurement or move to next step) and select the **Limit current**. Click on [OK] button.



9. “IO/P” is now displayed in the “Aux.” and “Loc.” field.



IO/C step

The IO/C command is used to measure current. The PDC-9000 is used to apply DC voltage to the UUT via two selected probes.
The value of the measured current is used to judge the step.
This command can be used to measure the current consumption on the net or to verify over-current when there is a failure in the circuit on the UUT.

Supplements:

1. If you would like to use the IO/C command with the bottom probes, the IO/C function must first be applied to the flying probes and then changed to the bottom side.
   If a step is already setup to use the bottom probes, the bottom probe setting will be automatically released when it is changed to an IO/C command.
2. IO/C command cannot be used with the guard function.
3. IO/C command is automatically input as “IO/C” in the “Loc.” and “Aux.” field.
4. The applied voltage is displayed in the “Volt” field of the Step Edit list.

CAUTION:

The IO/C Command will apply voltage to the UUT.
If voltage is applied to the wrong location, if the wrong polarity is selected, or if the wrong voltage is used, the UUT, the component, and/or the measuring system of the tester may be seriously damaged. The user of this tester assumes all risks involved with using these commands.

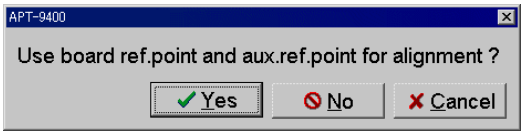
IO/V Command Flowchart

1. Probe down
2. Apply the specified voltage
3. Wait for specified time
4. Measure the current
5. Judgement
6. Remove the voltage
7. Probe up

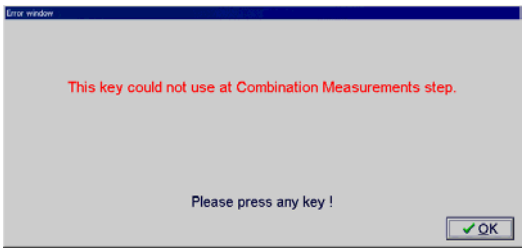
IO/C Step Setup (Teaching system)

1. Open Step Edit menu.
2. Move the cursor to the step that you want to convert to an IO/C step.
3. Select: **Tool → IO Function → IO Step**

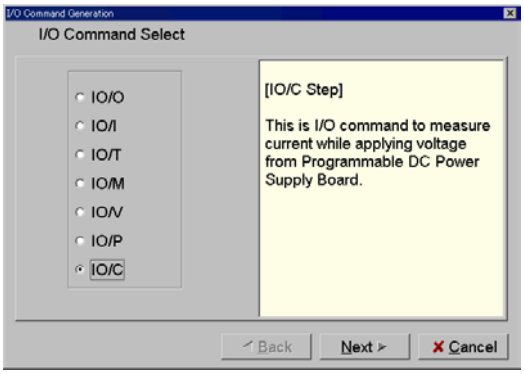
   Note: If you use **Use auxiliary reference point(s)** function, the following window will be displayed:



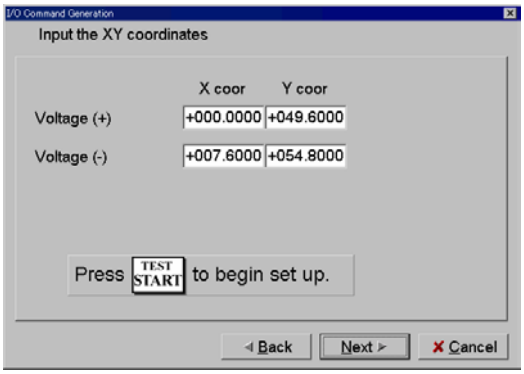
   If it is not possible to convert the selected step, the following error message will be displayed:



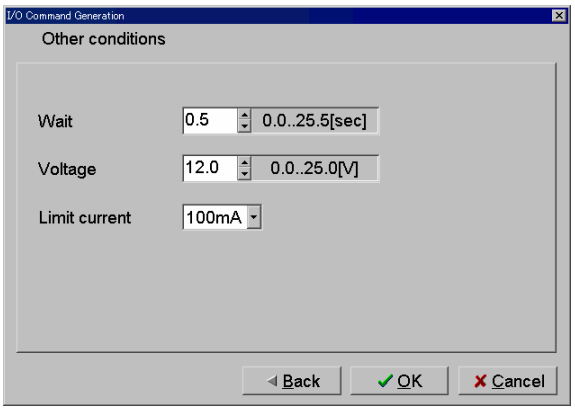
4. The I/O Command Generation window appears:



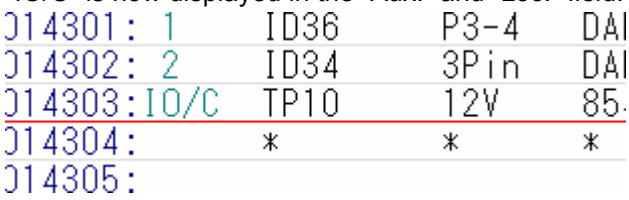
5. Click on **IO/C** radio button and then click on [Next] button.
6. The X/Y coordinates input window will be displayed. Press the [TEST START] SW. Input the X/Y coordinates, then click on [Next] button.



7. Input **Wait** time (waiting time to start measuring), **Voltage** (applied voltage) and select the **Limit current**, then click on [OK] button.



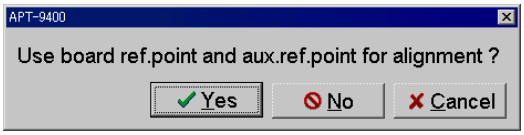
8. "IO/C" is now displayed in the "Aux." and "Loc." field.



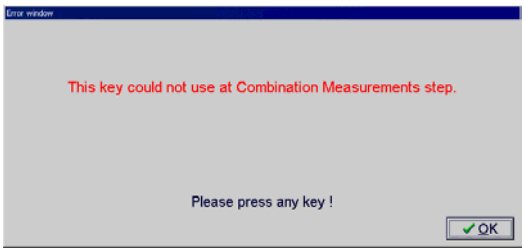
IO/C Step Setup (Point system)

1. Open Step Edit menu.
2. Move the cursor to the step that you want to convert to an IO/C step.
3. Select: **Tool → IO Function → IO Step**

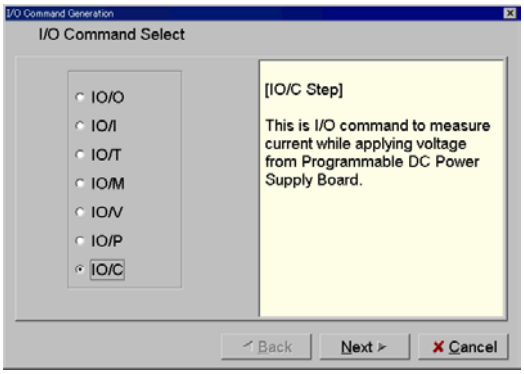
   Remarks: If you use the **Use auxiliary reference point(s)** function, the following window will be displayed:



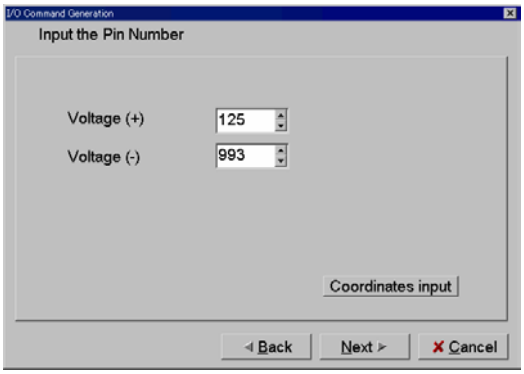
   If it is not possible to convert the selected step, the following error message will be displayed:



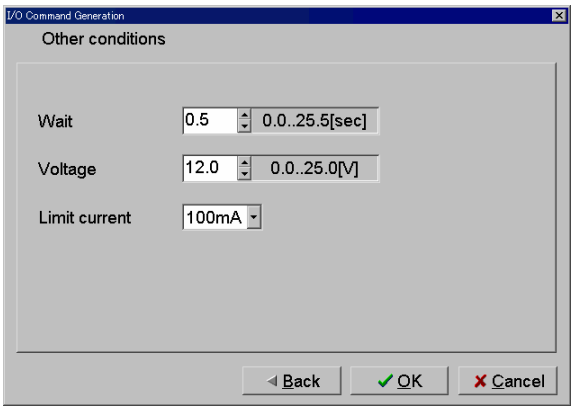
4. The I/O Command Generation window appears:



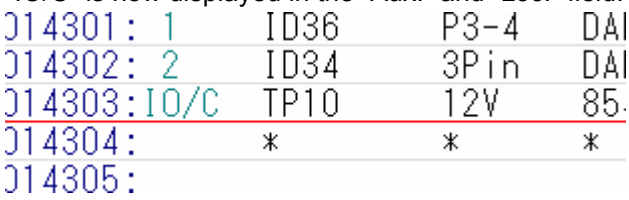
5. Click on **IO/C** radio button and then click on [Next] button.
6. The Pin Number Input window is displayed. Input the **Pin Number** in each field, then click on [Next] button.



7. Input **Wait** time (waiting time to start measuring), **Voltage** (applied voltage) and select the **Limit current**, then click on [OK] button.



8. "IO/C" is now displayed in the "Aux." and "Loc." field.

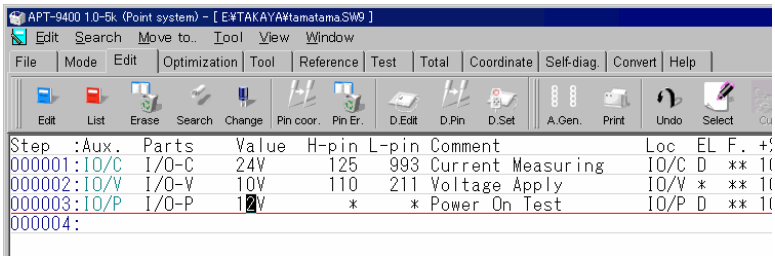


Display on Step List

We hereunder explain the I/O command step displayed on the step list.

1. **“Aux.” field**

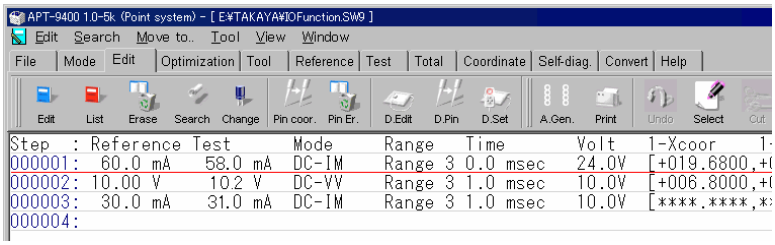
   The “Aux.” field will appear as shown in the image below:



   Clicking on the **Value field** of an I/O step will display the **Limit current** and **Wait time**.

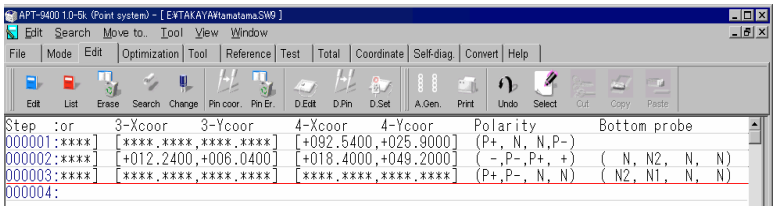
2. **“Volt” field**

   The “Volt” field will display the applied voltage for the I/O step.



3. **“Polarity” field**

   The “Polarity” field will display the probe’s polarity while the voltage is applied.



P+ : + (High pin)

P– : – (Low pin)

N1 : Bottom Probe-1

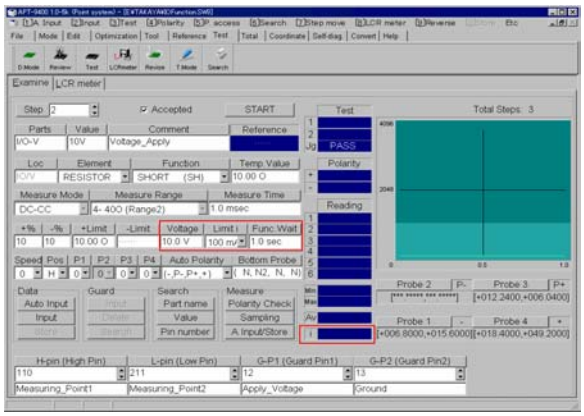
N2 : Bottom Ptobe-2

Display on Step Review menu

The I/O command step is displayed on Step Review menu as follows.

1. **IO/V step**

   The voltage is applied via the two selected probes (P+, P-) and measured with the other two probes.



   The following fields have been added to the Step Review window:

   ❑ **Voltage**

   Displays the applied voltage of 0.1 – 25.0V (adjustable in 0.1V increments)

   ❑ **Limit i**

   Displays the limit current of 5, 10, 25, 50, 100, 250, 500mA or 1A

   ❑ **Func. Wait**

   Displays the waiting time of 0 – 25.5s (adjustable in 0.1s increments)

   ❑ **i**

   Displays the measured current following the wait time.

   Warning Function for the Limit Current Over

   The “Limit Current Over” error is displayed whenever the measured current exceeds the limit current.

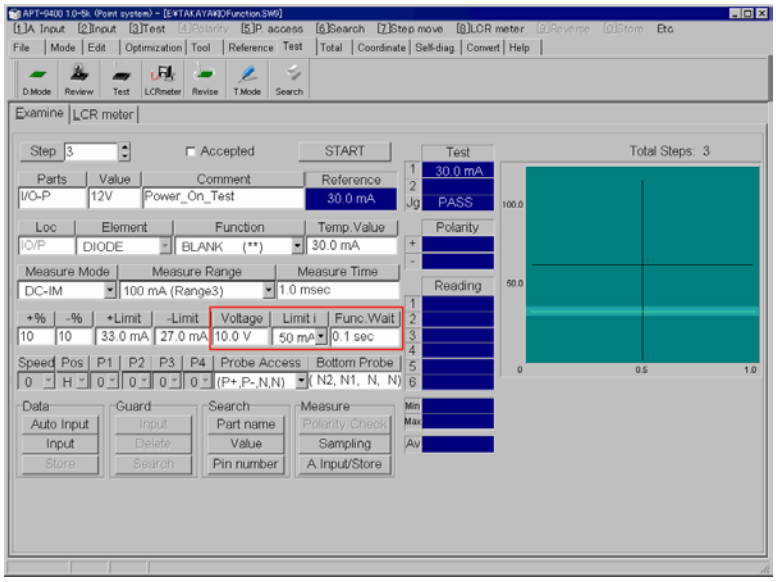
   If the waiting time is not long enough, it is possible that an irregular current will be measured (current that flows through the circuit immediately after applying voltage).

   It is recommended that you adjust the waiting time accordingly so that this type of irregular current is not measured.

2. **IO/P step**

Voltage is applied from the bottom probes during multiple test steps.

If the Current Measurement function is used, the current is then measured following the specified wait time. If the measured current is not within the specified tolerance, the applied voltage is removed and the test moves to the next step.



If the measuring mode changes from “DC-IM” to “No-Use”, this indicates that the Current Measurement function is not being used.

In that case, voltage will be applied and then the test will move to the next step.

The following fields have been added to the Step Review window.

❑ **Voltage**

Displays the applied voltage of 0.1 – 25.0V (adjustable in 0.1V increments)

❑ **Limit i**

Displays the limit current of 5, 10, 25, 50, 100, 250, 500mA or 1A

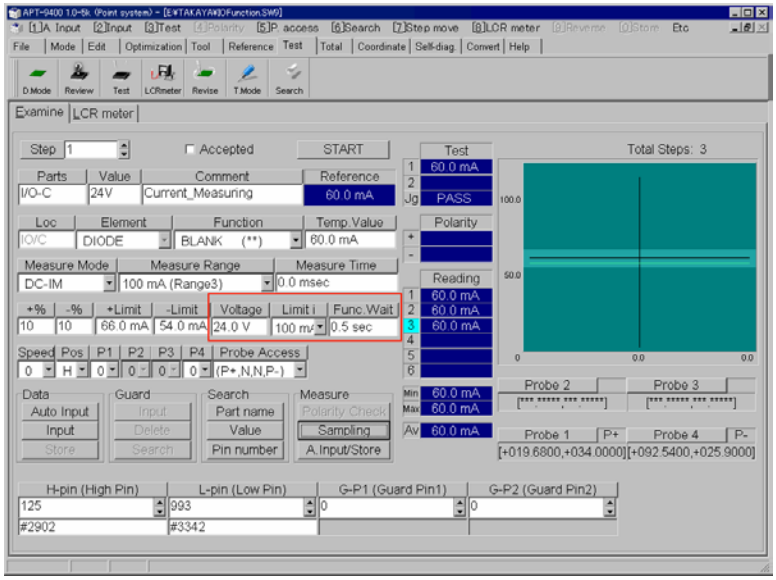
❑ **Func. Wait**

Displays the waiting time of 0 – 25.5s (adjustable in 0.1s increments)

3. **IO/C step**

Voltage is applied and current is measured via two probes.

The test is judged a “fail” if the measured current is not within the specified tolerance.



The following fields have been added to the Step Review window.

❑ **Voltage**

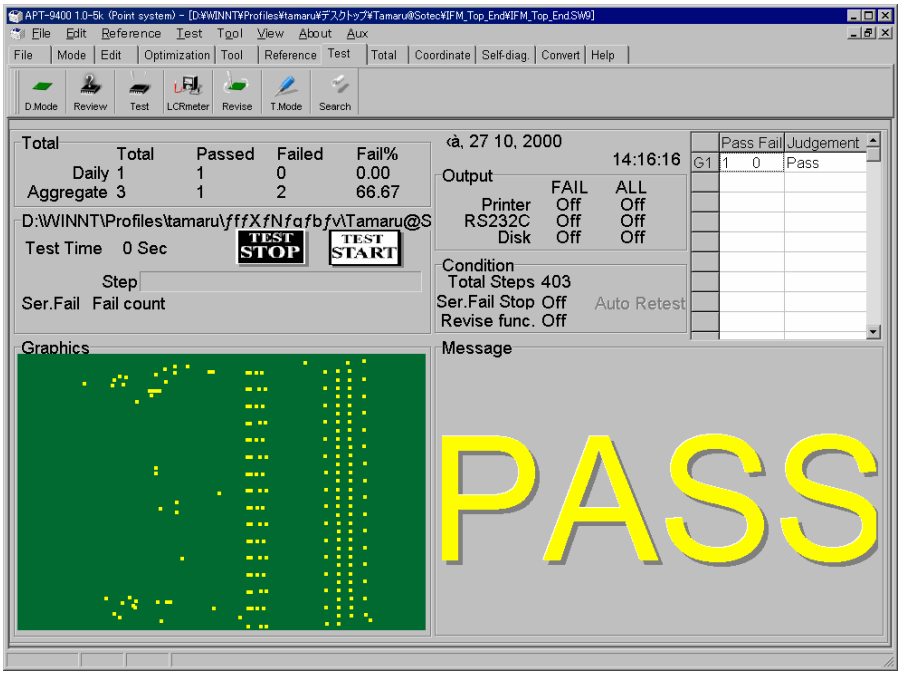
Displays the applied voltage of 0.1 – 25.0V (adjustable in 0.1V increments)

❑ **Limit i**

Displays the limit current of 5, 10, 25, 50, 100, 250, 500mA or 1A

❑ **Func. Wait**

Displays the waiting time of 0 – 25.5s (adjustable in 0.1s increments)



When using the IO/P and IO/C Command, the following judgements are used during normal testing.

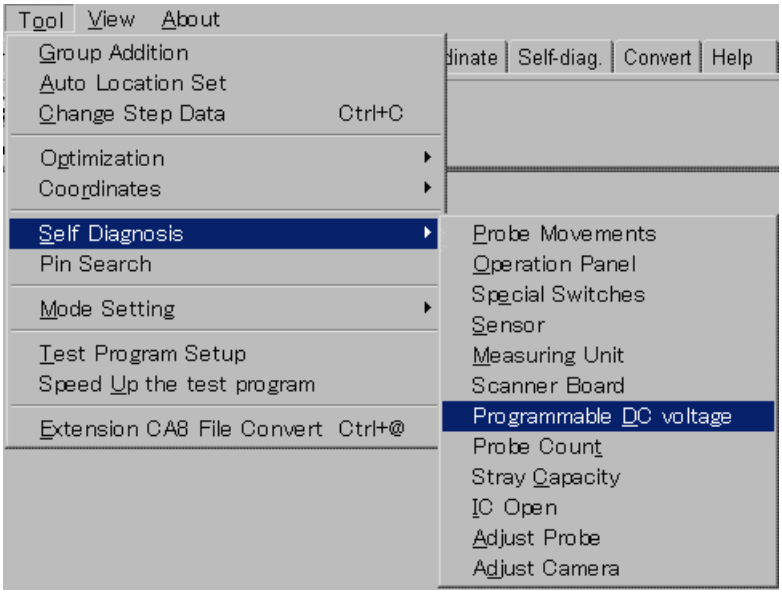
1. When the measured current exceeds the +% tolerance
   The judgment is **UP-NG**
2. When the measured current is less than the –% tolerance
   The judgment is **LOW-NG**
3. When the measured current exceeds its limit current
   The judgment is **L.OVER** (limit over)

Supplements:

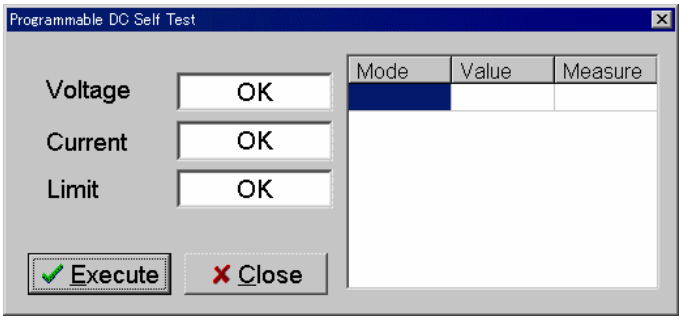
1. If there is an IO/P and/or IO/C step in the test program, the **Retest function** is automatically disabled.
2. If the limit current (Limit i) value is less than “+% tolerance” value, and the measured current is within the +% tolerance, the test might be judged as **L.OVER**.
   Please make sure that the limit current exceeds the +% tolerance.

The self-diagnosis function for the PDC-9000 is available in the following menu:

Tool → Self Diagnosis → Programmable DC voltage



Click on [Execute] button to begin the self-diagnosis.



APT-940* Programmable DC Power Supply Board (VOL.2)

TAKAYA CORP.

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