pcProbe^{II}

Micromanipulator

Documentation Package For pcProbe^{II} w/ Vision Extensions
Version 2.6.4
1 April 2003

P/N PCP2VX-MANUAL

Addendum: pcProbe^{II} VX Installation CD

20 May, 2005

Contents:

Overview

The installation of pcProbe^{II} VX is now from a single CD rather than from over 20 diskettes. There are some additional components provided on the CD which were not available on diskette. The CD components are as follows:

SETUP.EXE

Installs the pcProbe^{II} VX Suite. See the Installing pcProbe^{II} VX Suite section for more information.

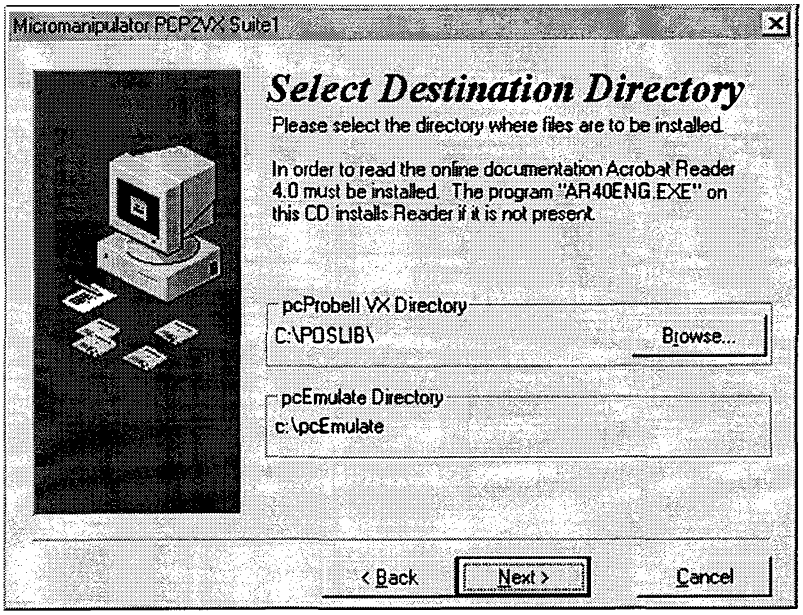
AR40ENG.EXE

Installs Adobe Acrobat Reader 4.0. The reader is required in order to read the online documentation installed in the pcProbe^{II} VX Docs directory. See the Online Documentation section of this addendum for more information.

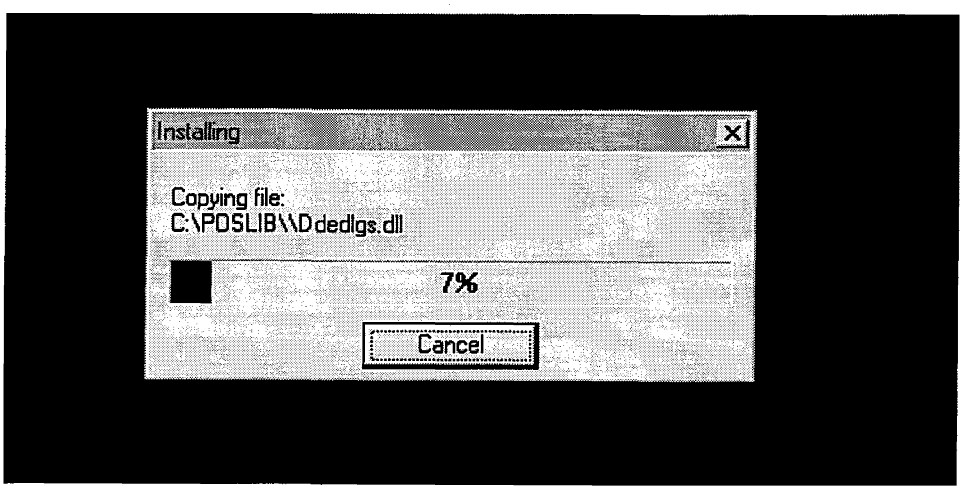
\Docs

Contains Adobe Acrobat Reader format manuals.

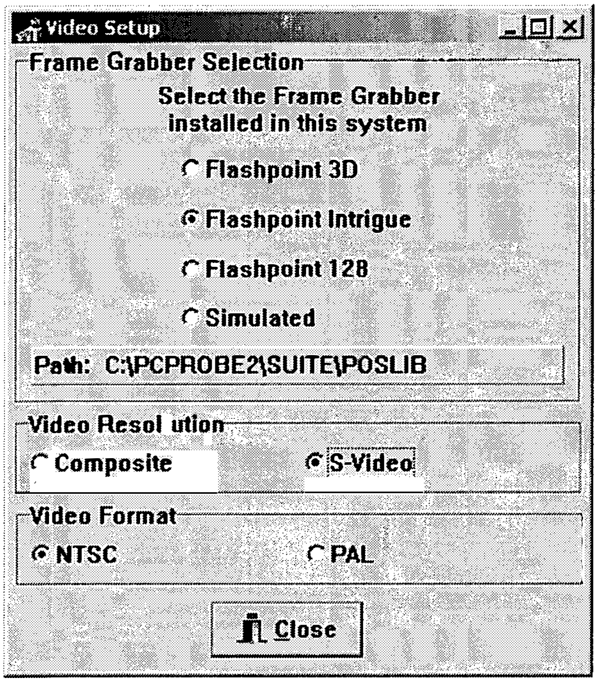
3. The main installation screen is now shown. Note the installation directory for pcProbe[II] . If this is not the desired location, it can be changed in the path selection dialog opened by the **Browse...** button. Select **Next >** to continue the installation.



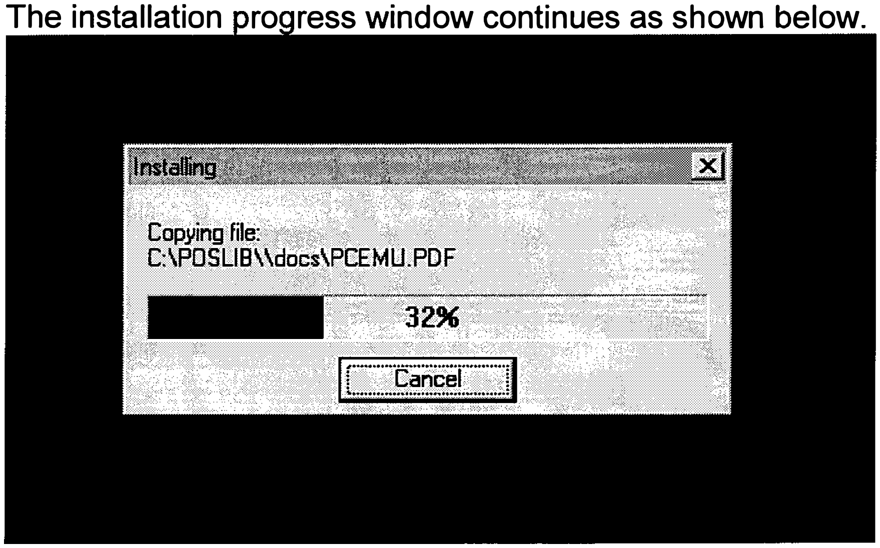
4. The installation progress window below is shown while files are being copied.



6. The Video Setup window appears next. Select the option matching the installed card and then select **<u>C</u>lose** to continue installation.



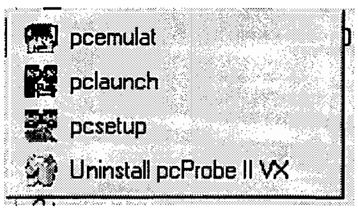
7. The installation progress window continues as shown below.



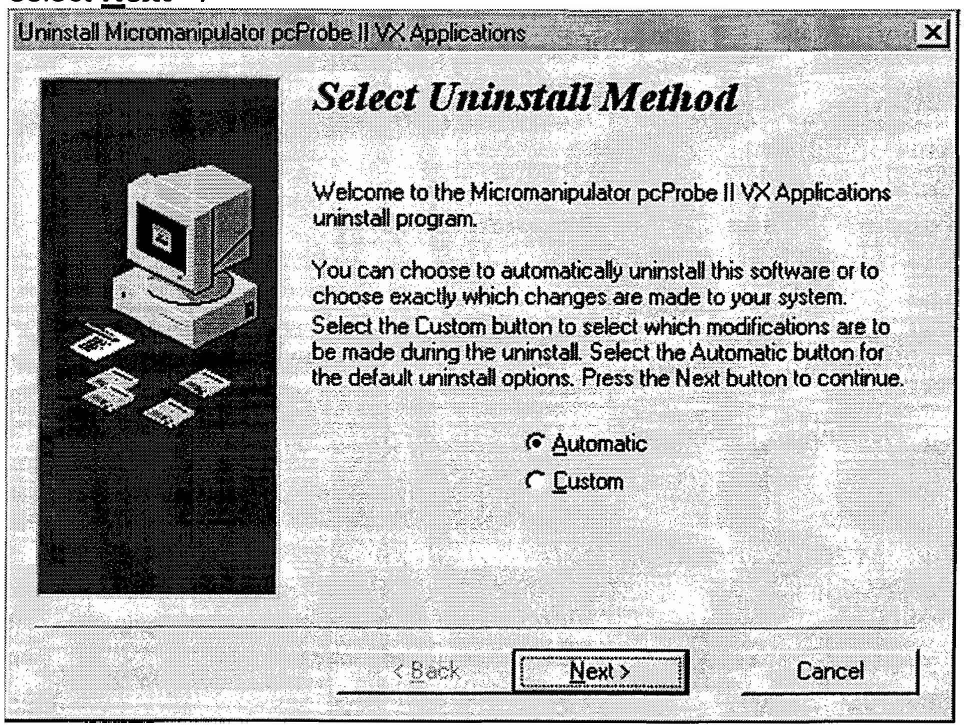
10. When the system is restarted the program icons for pcLaunch, pcSetup, and pcEmulate are available in the **Start/Programs/pcProbe II VX** menu group as well as on the Windows Desktop as shown below.

Removing pcProbe[II] VX

1. Select the **Uninstall pcProbe II VX** menu from the pcProbe II VX menu group as shown below.



2. The following screen below is shown. Select the Automatic option then select **Next >**.



3. Select **Finish** from the screen below. All components added by the CD installer are removed.

   NOTE: Files added after the installation, such as wafer or indie programs, calibration files, and configuration (.INI) files are not removed. Directories containing those files remain intact.

pcSetup User's Manual (PN: A1011320)

pcsttoc.pdf	Table of contents
pcstpman.pdf	Manual

pcEmulate 3 User Manual (PN: A1010799)

pcemulate.pdf

Wafer Handler Option (PN: A1013844)

waferhandler_clean.pdf

Back Side Option (PN: A1013878)

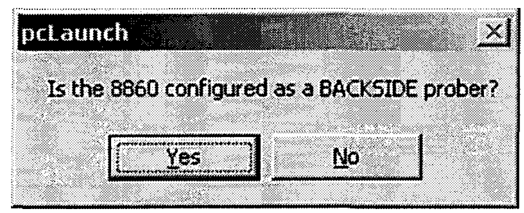
Backside Option Addendum.pdf

1 Configuring the Prober

The prober is prepared for backside probing by removing the DUT stage assembly.

2 Starting pcProbe

The backside option requires the operator to select the mode of operation for the prober. Start pcProbe for backside probing applications by double-clicking on the ***pcLaunch*** desktop icon. The dialog at right is shown. Select **Yes** to enable backside probing. The prober is re-configured and pcProbe continues to boot.



3 Navigation

Backside probing requires a change in perspective from "normal" probing. The operator point of reference for normal probing is from the top down. Probes make contact when they are lowered. The pcVideo image can be thought of as the birds-eye view of the DUT. All motion is as though the operator was flying over the surface of the DUT.

Backside probing, on the other hand, can be thought of as the car mechanic's view. The view is from the bottom up. Therefore, probes are raised to make contact with the DUT. All motion is as though the operator was sliding under the surface of the DUT.

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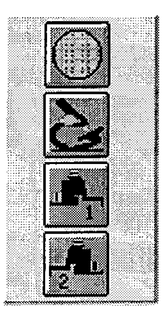
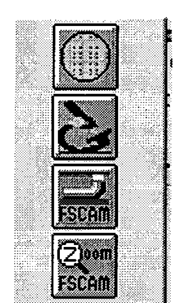
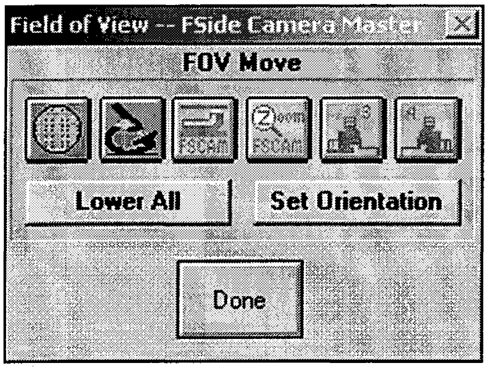
The positioning device icons displayed in pcProbe are different when running as a backside prober. The following table clarifies the differences between normal and backside mode.



Normal pcProbe Device	Backside
Stage	DUT stage X-Y Z = Platen probes ("up" = make contact)
Scope	Back side Scope – to second video monitor
Manip1	X-Y = Front side camera Z = Front side camera Focus.
Manip2	Z axis = Front side camera zoom



3.5 FOV operation



Field of view operation is the same as described in the user's manual for pcNav. The normal and backside device icons are different. Also, the FSCAM Zoom is not available since it involves only one non-programmable axis.

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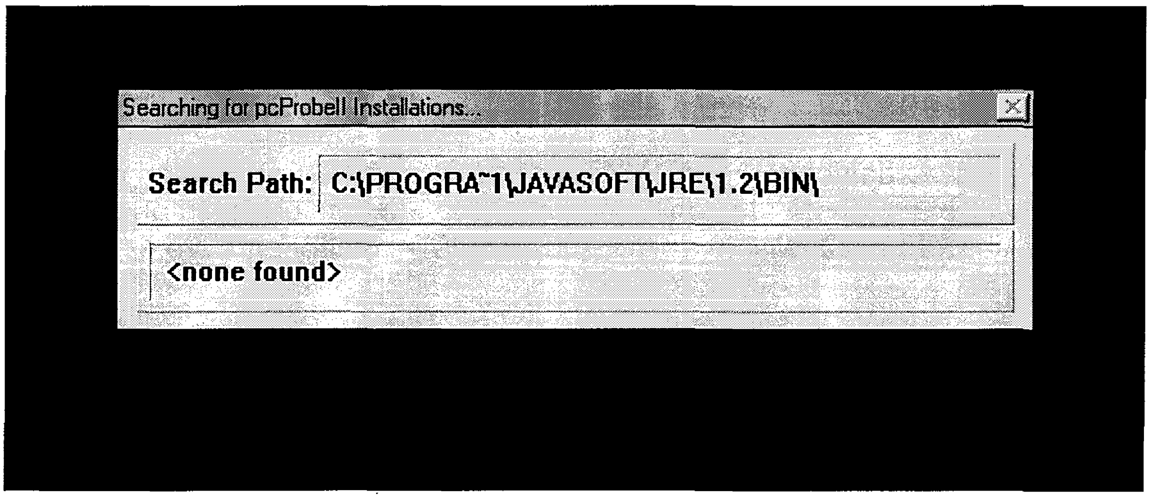
\Docs

Contains Adobe Acrobat Reader format manuals.

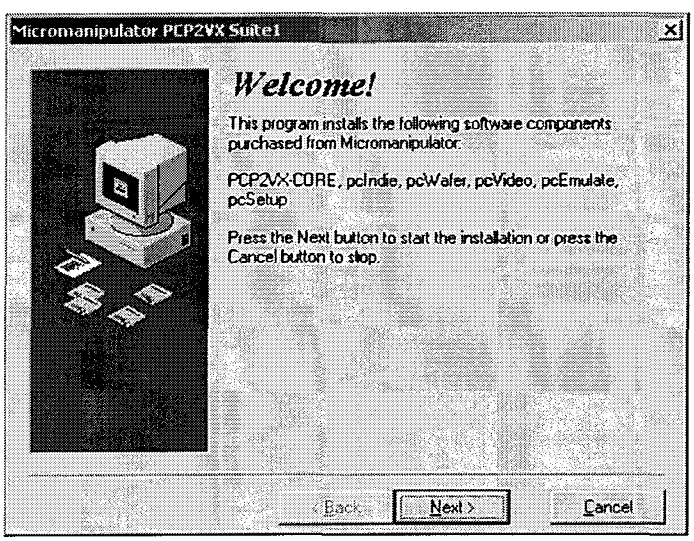
Installing pcProbe[II] VX Suite

1. Load the pcProbe[II] VX Suite installation CD in the CD-ROM drive. The installation program should automatically start. If this is a new installation or an upgrade of pcProbe, the installer searches for any previous installations of pcProbe. If one is found, that path is used as the default installation path.

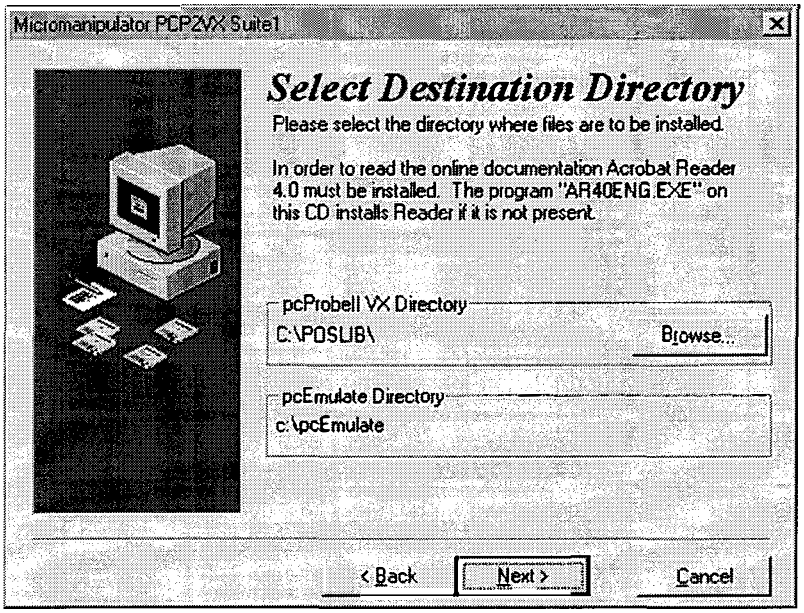


NOTE: If the setup program does not automatically start, it must be started as follows: Select **Start/Run...** from the task bar and run SETUP.EXE on the CD.

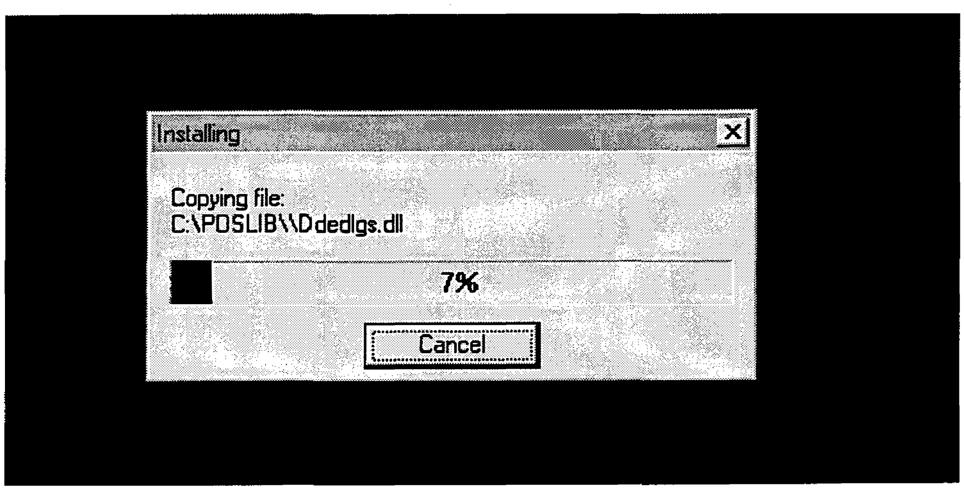
2. The following screen is shown once a path is found. Select the **Next >** button to continue.



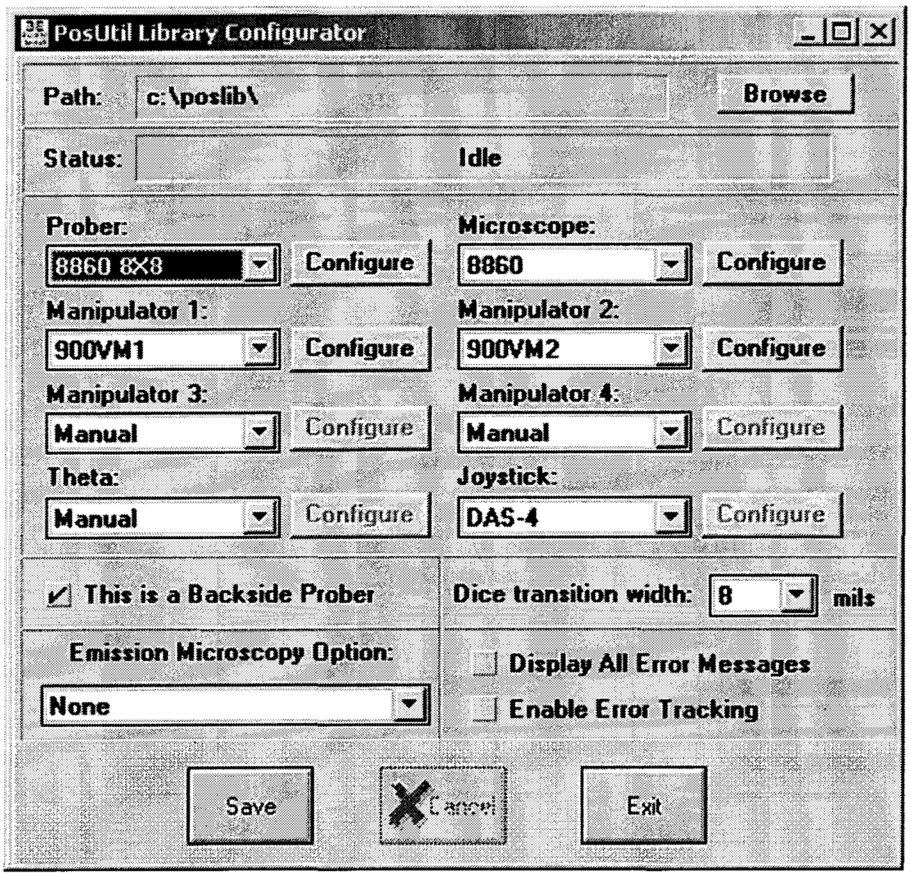
3. The main installation screen is now shown. Note the installation directory for pcProbe^{II}. If this is not the desired location, it can be changed in the path selection dialog opened by the **Browse...** button. Select **Next >** to continue the installation.



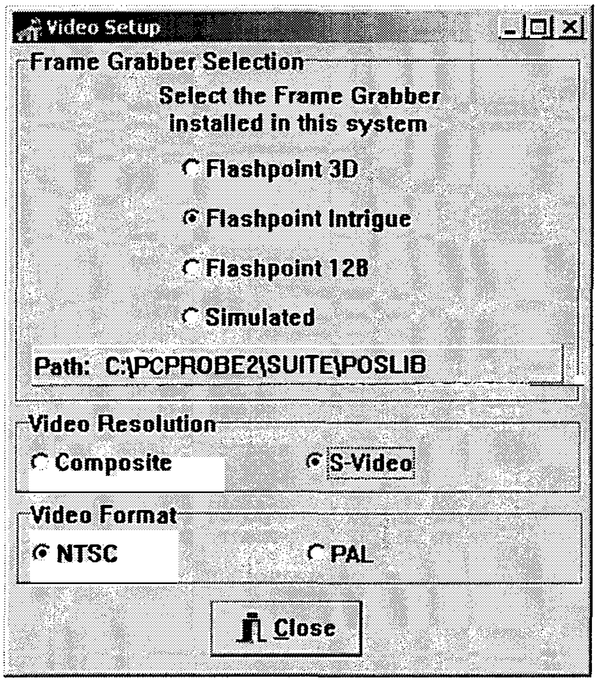
4. The installation progress window below is shown while files are being copied.



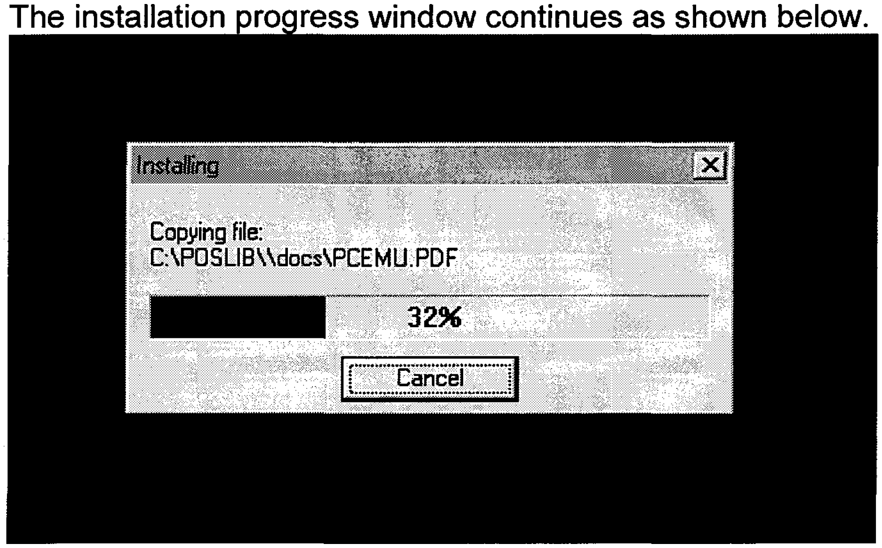
5. During the installation the system configuration setup screen is shown below. Reference the PosUtil VX Library Installation/Configuration Manual (PN: A1012673) for more information on settings and options. Select **Save** and then **Exit** to continue the installation.



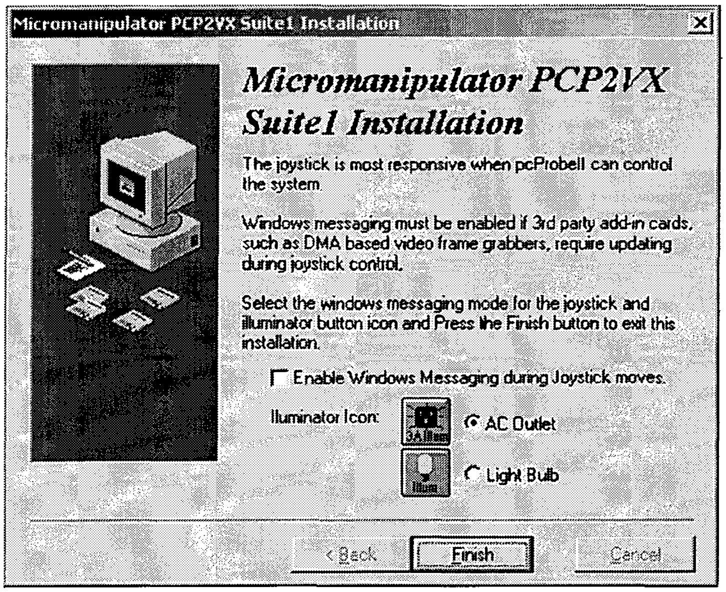
6. The Video Setup window appears next. Select the option matching the installed card and then select **Close** to continue installation.



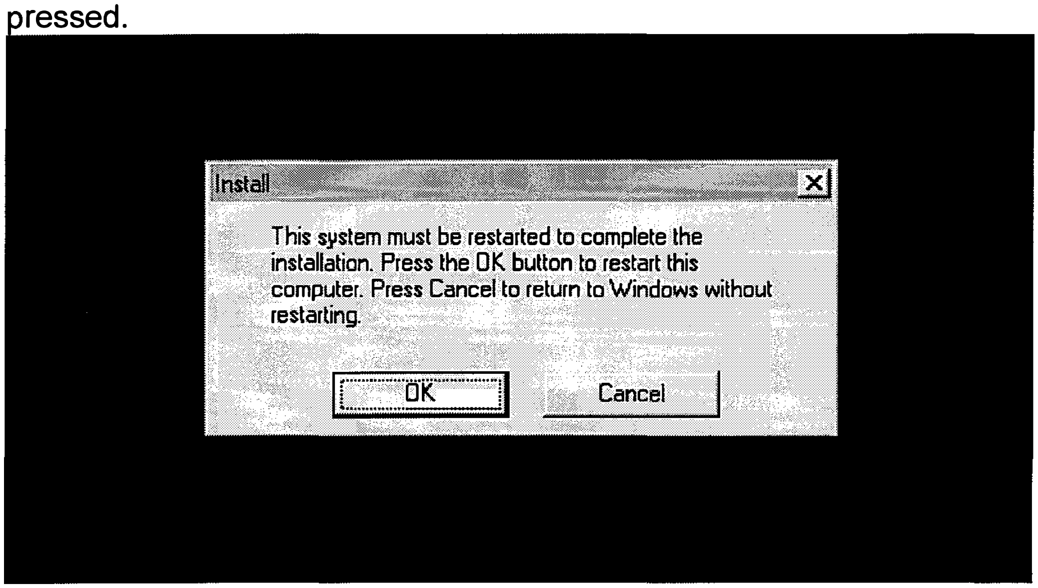
7. The installation progress window continues as shown below.



8. After all files have been copied and updated, the following screen is shown. Select the appropriate windows messaging mode for the joystick and the preferred illuminator icon.



9. Select **Finish** to complete the installation. The system must reboot in order for all system configuration changes to take effect. The dialog box shown below performs this function automatically when the **OK** button is pressed.



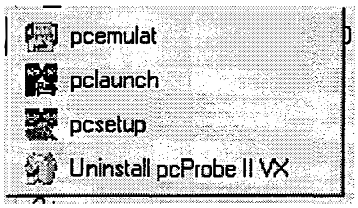
10. When the system is restarted the program icons for pcLaunch, pcSetup, and pcEmulate are available in the **Start/Programs/pcProbe II VX** menu group as well as on the Windows Desktop as shown below.

pcProbe[II] VX Suite Configurations

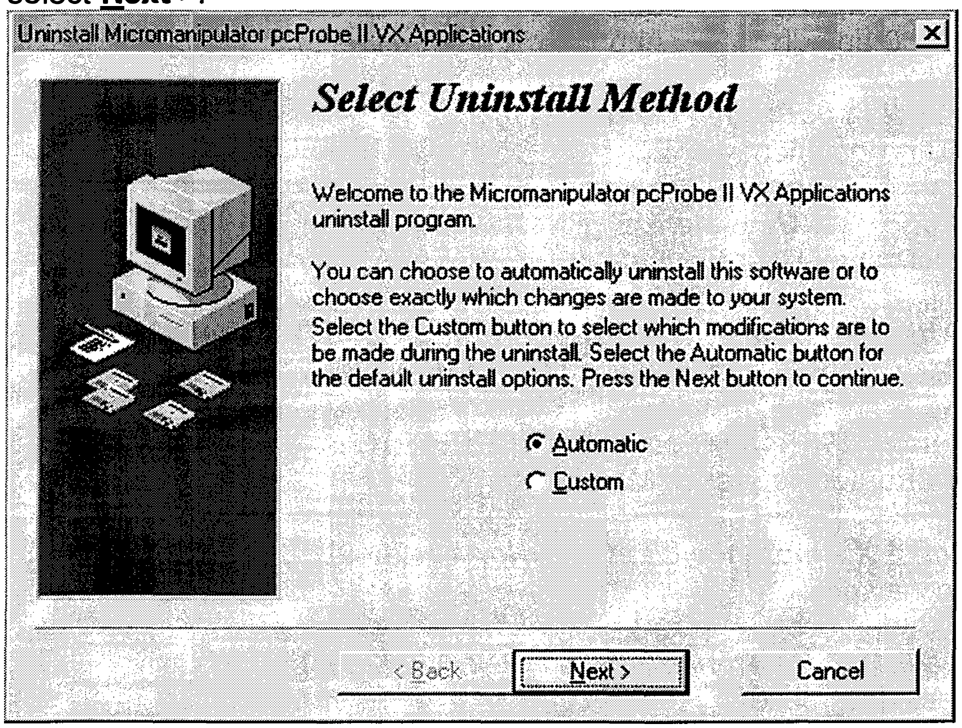
- PCP2VX Suite1
  - pcProbe[II] VX Core (PN: PCP2VX-CORE)
    - PosUtil VX (PN: A1012607)
    - pcRouter VX (PN: A1012630)
    - pcLaunch VX (PN: A1012633)
    - pcNav VX (PN: A1012636)
    - pcWafer VX (PN: A1012661)
    - pcIndie VX (PN: A1012664)
    - pcVideo VX (PN: A1012654)
  - pcEmulate (PN: A1011317)
  - pcSetup (PN: A1011314)
  -
- PCP2VX Suite 2
  - PCP2VX Suite 1
  - pcTurret (PN:A1011317)
- PCP2VX Suite 3
  - PCP2VX Suite 2
  - Pattern Recognition (PN: A1011316)
- PCP2VX Suite 4
  - PCP2VX Suite 3
  - Auto-handler
- PCP2VX DEMOSUITE
  - PCP2VX Suite 4 running with simulated hardware

Removing pcProbe^{II} VX

1. Select the **Uninstall pcProbe II VX** menu from the pcProbe II VX menu group as shown below.



2. The following screen below is shown. Select the Automatic option then select **Next >**.



3. Select **Finish** from the screen below. All components added by the CD installer are removed.

   NOTE: Files added after the installation, such as wafer or indie programs, calibration files, and configuration (.INI) files are not removed. Directories containing those files remain intact.

Online Documentation

All manuals shipped with the prober are accessible on the system using Adobe Acrobat Reader 4.0. The manuals are stored in PDF format in the \DOCS subdirectory of the CD. The manuals and their PDF equivalents are listed below.

8860/8065 User's Manual (PN: A1008221)

8860-cvf.pdf	Title Page
8860-toc.pdf	Table of Contents
8860-1.pdf	Section 1 – Introduction and Specification
8860-2.pdf	Section 2 – Installation and Setup Procedures
8860-3.pdf	Section 3 – Accessory Installation
8860-4.pdf	Section 4 – Maintenance
8860-ap.pdf	Appendix A – Drawings and Bills of Materials

Addendum pcProbeII CD (PN: A1013139)

This document.

pcProbe[II] VX User Manual (PN: A1012648)

PcProbeII User Manual.pdf

PosUtil VX Library Installation/Configuration (PN: A1012673)

MMCONFIG Configuration Utility.pdf

pcRouter VX Reference Manual (PN: A1012653)

PcRouter Reference Manual.pdf

pcNav VX Reference Manual (PN: A1012649)

pcnav.pdf

pcVideo VX Reference Manual (PN: A1012651)

pcvideo_vx.pdf

pcWfr VX Reference Manual (PN: A1012650)

pcwafer.pdf

pcIndie VX Reference Manual (PN: A1012652)

pcIndie.pdf

PCP2VX-Turret Setup User Manual (PN: A1011913)

turtitle.pdf	Title page
turtoc.pdf	Table of contents
turman.pdf	Manual

pcSetup User's Manual (PN: A1011320)

pcsttoc.pdf	Table of contents
pcstpman.pdf	Manual

pcEmulate 3 User Manual (PN: A1010799)

pcemulate.pdf

Wafer Handler Option (PN: A1013844)

waferhandler_clean.pdf

Back Side Option (PN: A1013878)

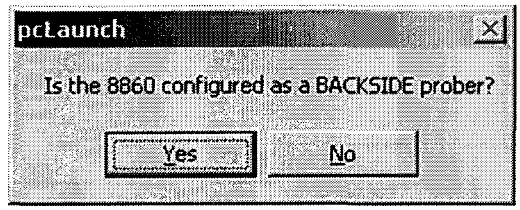
Backside Option Addendum.pdf

1 Configuring the Prober

The prober is prepared for backside probing by removing the DUT stage assembly.

2 Starting pcProbe

The backside option requires the operator to select the mode of operation for the prober. Start pcProbe for backside probing applications by double-clicking on the ***pcLaunch*** desktop icon. The dialog at right is shown. Select **Yes** to enable backside probing. The prober is re-configured and pcProbe continues to boot.



3 Navigation

Backside probing requires a change in perspective from "normal" probing. The operator point of reference for normal probing is from the top down. Probes make contact when they are lowered. The pcVideo image can be thought of as the birds-eye view of the DUT. All motion is as though the operator was flying over the surface of the DUT.

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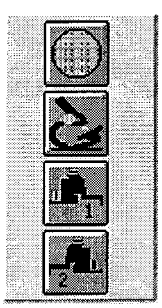
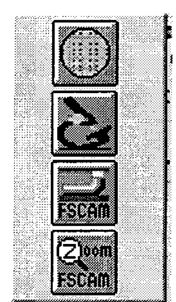
The positioning device icons displayed in pcProbe are different when running as a backside prober. The following table clarifies the differences between normal and backside mode.



Normal pcProbe Device	Backside
Stage	DUT stage X-Y Z = Platen probes ("up" = make contact)
Scope	Back side Scope – to second video monitor
Manip1	X-Y = Front side camera Z = Front side camera Focus.
Manip2	Z axis = Front side camera zoom



3.2 *Joystick*

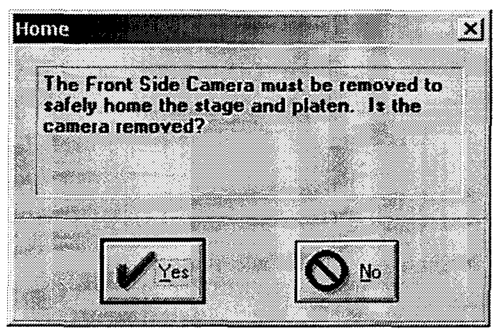
The Z joystick knob causes motion in the same direction for both backside and normal operation. Viewed from above, counterclockwise rotation of the joystick knob raises the Z axis, clockwise lowers the Z axis.

3.3 *Homing the prober*

The following table shows the homing operation for backside mode.

Backside Device	Homing directions (viewed from top front)
DUT stage X-Y and Platen	X-Y = rear left Platen = Down
Back side Scope	X-Y = rear left Z = Up
X-Y = Front side camera Z = Front side camera Focus.	X-Y = rear left Z Does not home
Z axis = Front side camera zoom	Z Does not home

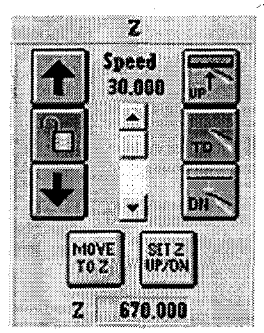
The most important requirement for homing a system in backside mode is removal of the front side camera from the stage. The front side camera collides with the platen if it is moved to the home position. The operator is always alerted with a dialog box as shown at right prior to homing the platen or the front side camera stage.



When the prober is NOT in backside mode the operator is still alerted prior to homing the stage.

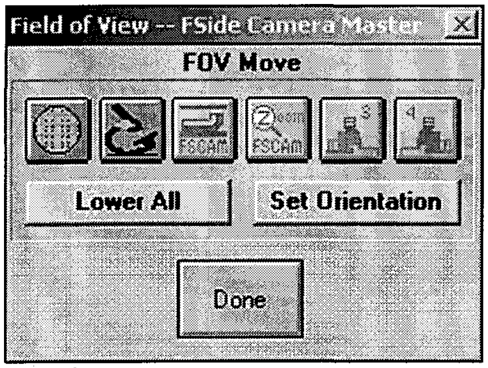
3.4 *pcNav control*

The Z navigation buttons in the pcNav application cause motion in the same direction for both backside and normal operation. The viewpoint is assumed to be from above the station. The z position for the platen is reversed when running in backside mode. This is because backside operation requires home to be all the way down to prevent running probe tips into the DUT. Normally the platen home direction is up.



In backside operation the X-Y navigation buttons are disabled when the FSCAM Zoom device is selected. Programmable Z functions are disabled for the FSCAM Focus and Zoom.

3.5 FOV operation



Field of view operation is the same as described in the user's manual for pcNav. The normal and backside device icons are different. Also, the FSCAM Zoom is not available since it involves only one non-programmable axis.

pcProbe^{II} VX User Manual

Version 2.6.4

PN: A1012648

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Printed in the USA

Table of Contents

1 Introduction

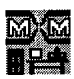
The pcProbe^{II} product is Windows based and as such requires basic knowledge of Windows operation including at least:

- **Start Windows**
- **Navigate within Windows**
- **Use of Windows Applications**

Refer to the *Microsoft™ Windows User Manual* for information on Windows usage and conventions.

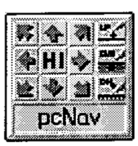
pcProbe^{II} is a suite of products designed to interact with each other as your probing needs change. New applications can be added without having to upgrade your entire software package. The suite of pcProbe^{II} products consists of pcLaunch, pcNav, pcWfr, pcIndie, pcVideo, and pcRouter. The only products required for operation of the basic functions are pcRouter and pcLaunch. Pcrouter manages communications between the pcProbeII applications. PcLaunch provides a starting point for all pcProbe applications and provides joystick and MicroTouch knob control.

1.1 PcLaunch



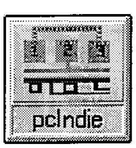
The pcLaunch program is used to start all the other applications used in the pcProbeII suite. Double clicking on the pcLaunch icon starts the pcLaunch application. System configuration and setup are saved from pcLaunch.

1.2 PcNav



The pcNav application provides positioning device navigation and setup functions. It is capable of controlling up to four manipulators, stage, microscope, and stage auto-theta. While navigating within pcProbe^{II} pcNav displays the position and control information for the active positioning device. Also available are device and system setup functions, operation sequence macros, touchdown sense setup, and advanced navigation functions.

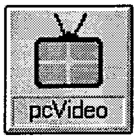
1.3 PcIndie



PcIndie is used to store a probing sequence within a die using any combination of positioning devices. Three sequence step modes are available: Learn mode, matrix mode, and macro playback mode.

Learn mode stores the location of all devices relative to a starting reference position. Matrix mode uses an array of regularly spaced positions. The X-Y size of the array element and the number of columns and rows in the array are defined by the user. Macro playback mode provides access to user defined macro sequences recorded in pcNav.

1.4 PcVideo

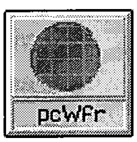


PcVideo brings a real-time image from the microscope to the PC screen. The mouse is used in conjunction with the live image to interactively position devices on the DUT. Images can be loaded, stored, and printed from pcVideo.

The Snap-To alignment feature provides a very fast method of aligning devices to a DUT. Positioners are aligned by drawing a line parallel to the vertical or horizontal axis of a feature on the DUT. The positioning devices are adjusted to the DUT. If the auto-theta option is installed, it is rotated to match the required orientation.

Options available with pcVideo include auto-focus, pattern recognition, and auto-turret.

1.5 PcWfr



PcWfr provides a continuous visual indication of the die selected and displays the exact coordinates of the die. A comprehensive set of icon-driven tools provide the ability to create, load, edit, and save die stepping programs by simply pointing and clicking with a mouse.

1.6 PcRouter

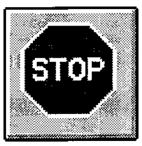
PcRouter manages communication between all the pcProbe^{II} applications as well as providing a comprehensive set of commands through the Windows Dynamic Data Exchange (DDE) interface. The DDE interface provides Windows programs with the ability to control the functions of pcProbe^{II} using simple command strings.

1.7 Commonly Used Icons

The icons used in all the pcProbe^{II} applications are color-coded. Icons with gray backgrounds cause a dialog box to be displayed. Icons with a green background cause a state or mode change, e.g. joystick mode, coordinate reference , etc. Icons with a blue background cause an action to occur in the system, e.g. jogging, raise/lower, illuminator on. Finally, icons with dark gray foregrounds and light gray backgrounds are not enabled for use.

Many icons are re-used in the pcProbe^{II} application suite. The function associated with a specific icon is consistent between all the pcProbe^{II} applications.

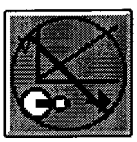
1.7.1 Emergency Stop Icon



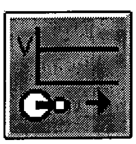
The **Emergency Stop icon** can appear in either a dialog box or a toolbar when a device is moving. This icon allows for the user to interrupt the move without losing position. This is unlike the large red EMO switch on the from of the test station, which powers off the motor drivers and causes the system to lose position.

1.7.2 Joystick Icons

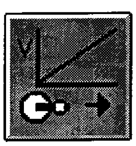
The **Joystick icons** indicate the current mode of the joystick and MicroTouch knobs.



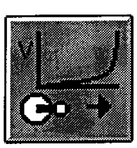
Joystick off disables the joystick and MicroTouch knobs.



Joystick constant causes the positioning device to move at a constant velocity regardless of joystick deflection or MicroTouch knob rotation. The behavior in this mode is just like that available from the pcNav navigation buttons.



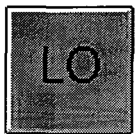
Joystick linear causes the positioning device to move at a velocity directly proportional to the deflection of the joystick or rotation rate of the MicroTouch knobs. The MicroTouch knobs operate best in this mode.



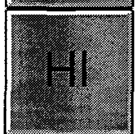
Joystick exponential causes the positioning device to move at a velocity equal to an exponential function of joystick deflection or MicroTouch knob rotation rate. The joystick operates best in this mode because the available velocity range is the greatest.

1.7.3 Navigation speed range icons

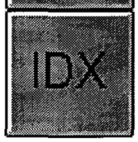
The following icons are used to set the speed range for the joystick, MicroTouch knobs, and pcNav navigation buttons.



Low speed range. This is 1/50th high speed range



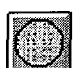
High speed range



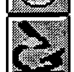
Index mode. In this mode the active device moves in increments of the index size in high speed, instead of in a continuous motion.

1.7.4 Device Icons

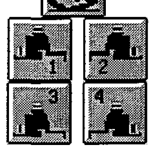
In pcProbe^{II} only one positioning device is controllable at a time. This device is referred to as the **Active Device.** The **Device icons** represent the currently active positioning device. A drop-down menu of available devices appears when the device icon is selected. Select the desired positioning device from the menu and that device becomes the active device.



Prober Stage/Platen

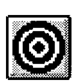


Microscope



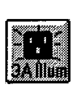
Manipulators

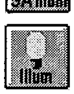
1.7.5 Set Reference Icon



The **Set Reference icon** displays a dialog box used to synchronize the physical location of the DUT with the pcProbe^{II} software. The X-Y and column, row position for the active device are definable by the user.

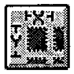
1.7.6 Auxiliary Power/Illuminator Icons





The illuminator icon turns the illuminator power outlet on or off. The illuminator must be plugged into the **Auxiliary Power** outlet on the back of the test station controller enclosure for it to operate. Either icon is available at install time for pcLaunch and pcNav.

1.7.7 Set Die Size icon

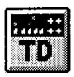


Selecting the **Set die size icon** causes a dialog box to be displayed which allows for keyboard entry of die size or two point calculation of die size using navigation.

1.7.8 Delay icon

The **Delay icon** is used to enable a delay between program moves in pcIndie and pcWfr.

1.7.9 Touchdown Icon



When the touchdown icon is selected, a dialog box is displayed showing current touchdown states for available manipulators and the stage. Touchdown can be reset from the dialog.

1.8 Where to find more information

This manual provides installation and configuration information. The following is a list of the pcProbe^{II} applications and their respective manuals.

Application	Manual
PcNav	PcNav Reference Manual
PcIndie	PcIndie Reference Manual
PcWfr	PcWfr Reference Manual
PcVideo	PcVideo Reference Manual
PcRouter	PcRouter Reference Manual

1.9 Getting Technical Support

If problems occur during the operation of any of the applications in the pcProbe^{II} application suite, contact technical support using the information in the **HOW TO CONTACT US** section below.

If the problem is in one of the applications in the pcProbe^{II} suite, fill out a copy of the Bug Report Form found in the back of this manual. Provide as much information about the problem as possible including at least:

- **pcProbe^{II} applications running when the problem occurred**
- **Application version as displayed in its About dialog box**
- **Station S/N, System configuration, e.g. 8860 prober, 8860 microscope, etc.**
- **Computer configuration including CPU, RAM, and disk storage.**
- **Description of the problem and all messages displayed when the problem occurred.**

Usually the more information provided, the higher the likelihood of diagnosing the problem. Please be as specific as possible.

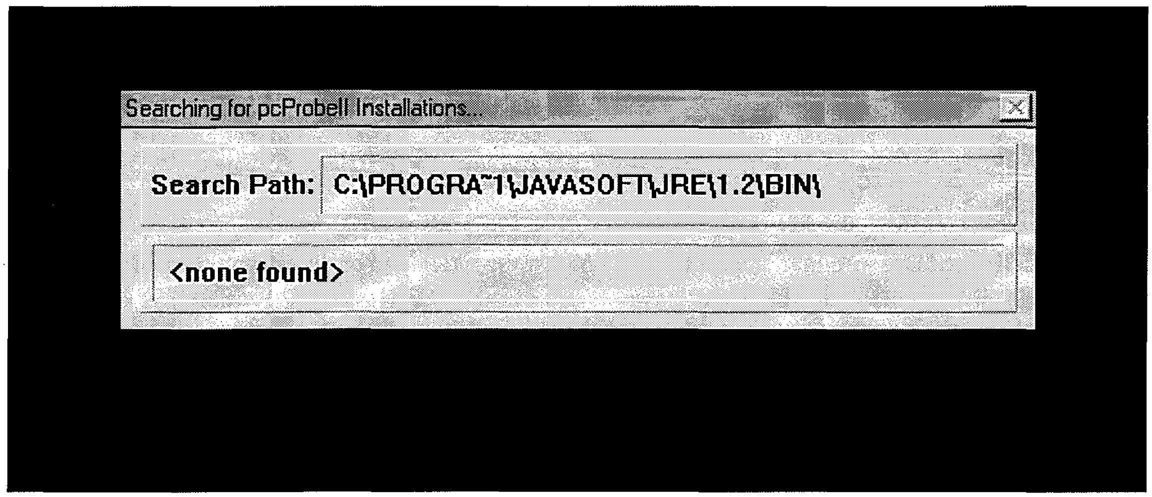
HOW TO CONTACT US			
Phone	(775)882-2400	Send your correspondence to:	The Micromanipulator Co., Inc Attn: Technical Support 1555 Forrest Way Carson City, NV 89706 USA
FAX	(775)882-7694		
E-mail	Sales@micromanipulator.com Service@micromanipulator.com		

2 Installing pcProbe^{II} applications

Although the typical system is delivered with pcProbe^{II} pre-installed, it may be necessary to re-install the pcProbe^{II} core applications. Backup copies of a station's configuration and calibration files are stored in c:\poslib\config.bak and on a floppy disk provided with the system. These files may be restored by copying them to the pcProbe^{II} Application Suite directory, usually C:\poslib.

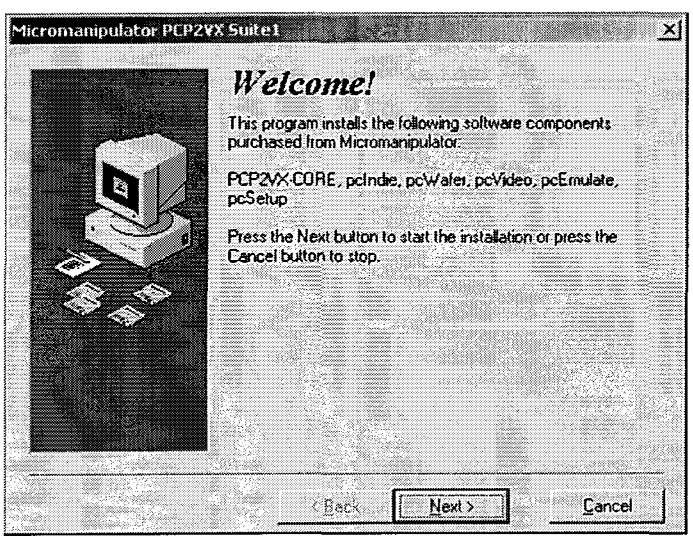
2.1 *Installing pcProbe^{II} VX Suite from CD (Version 2.6.3 and above)*

1. Load the pcProbe^{II} VX Suite installation CD in the CD-ROM drive. The installation program should automatically start. If this is a new installation or an upgrade of pcProbe, the installer searches for any previous installations of pcProbe. If one is found, that path is used as the default installation path.

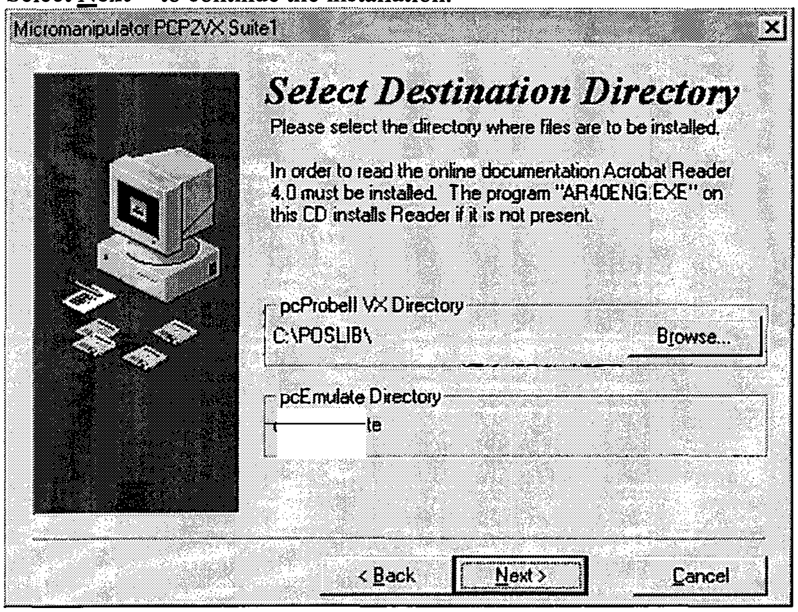


NOTE: If the setup program does not automatically start, it must be started as follows: Select **Start/Run...** from the task bar and run SETUP.EXE on the CD.

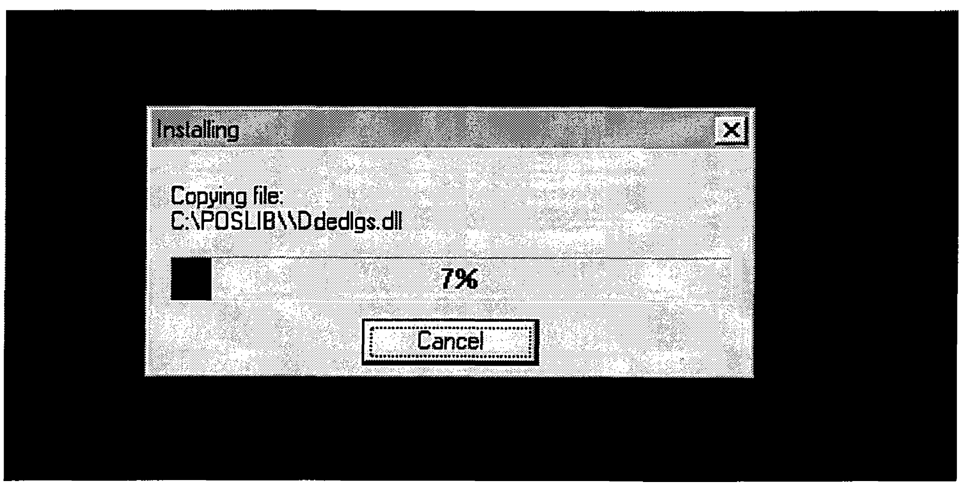
2. The following screen is shown once a path is found. Select the **Next** > button to continue.



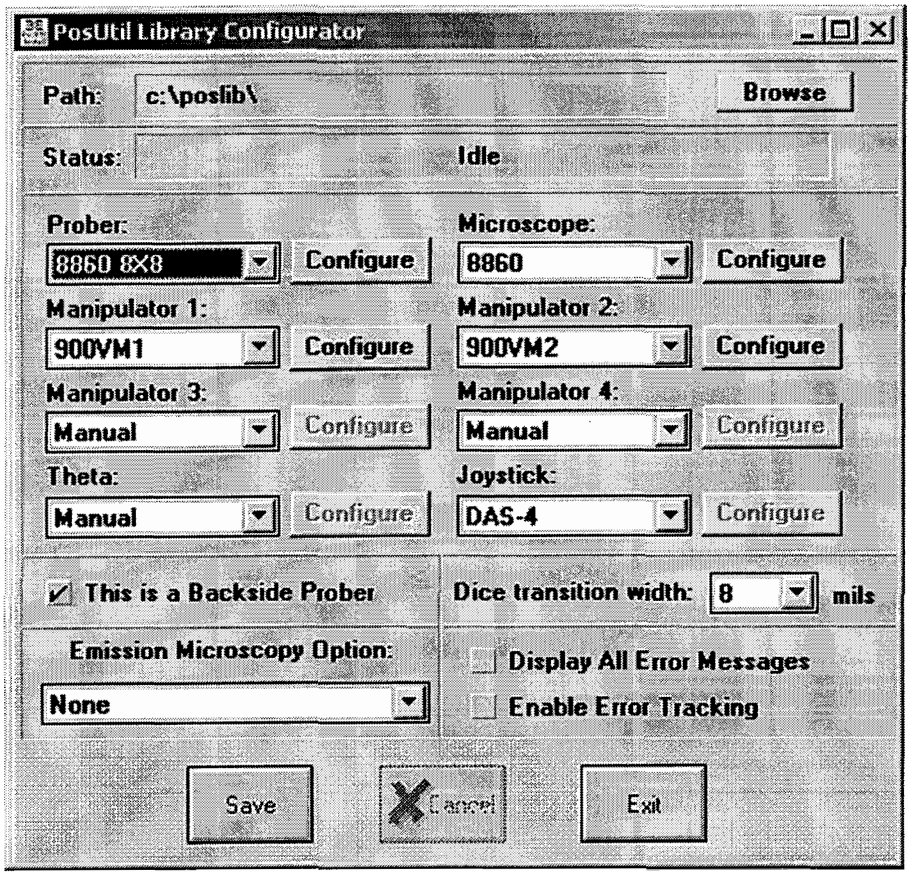
3. The main installation screen is now shown. Note the installation directory for pcProbe[II]. If this is not the desired location, it can be changed in the path selection dialog opened by the **Browse...** button. Select **Next** > to continue the installation.



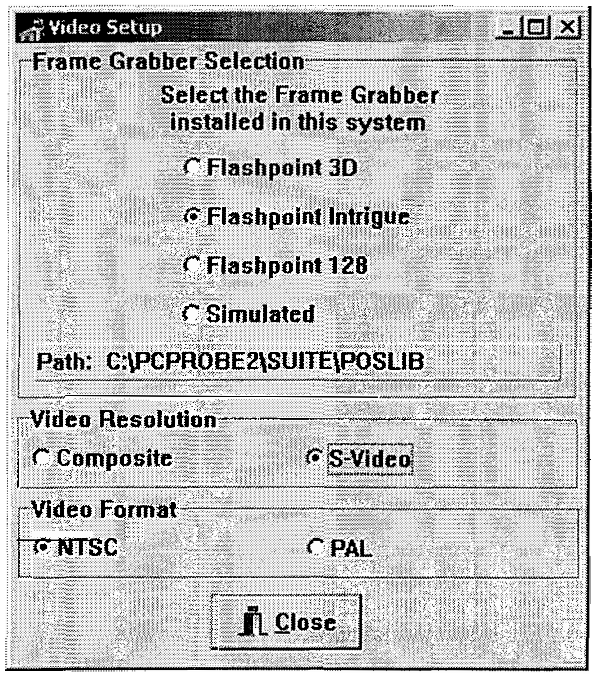
4. The installation progress window below is shown while files are being copied.



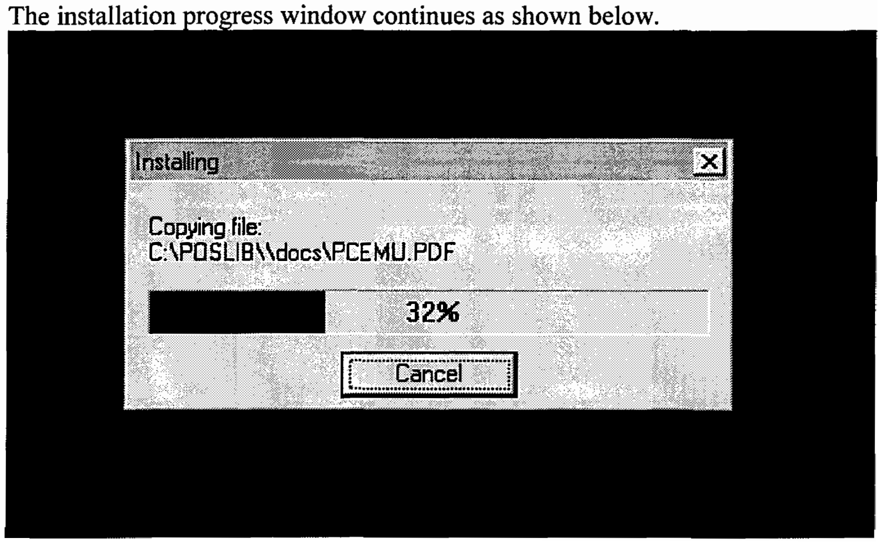
5. During the installation the system configuration setup screen is shown below. Reference the PosUtil VX Library Installation/Configuration Manual (PN: A1012673) for more information on settings and options. Select **Save** and then **Exit** to continue the installation.



6. The Video Setup window appears next. Select the option matching the installed card and then select **Close** to continue installation.

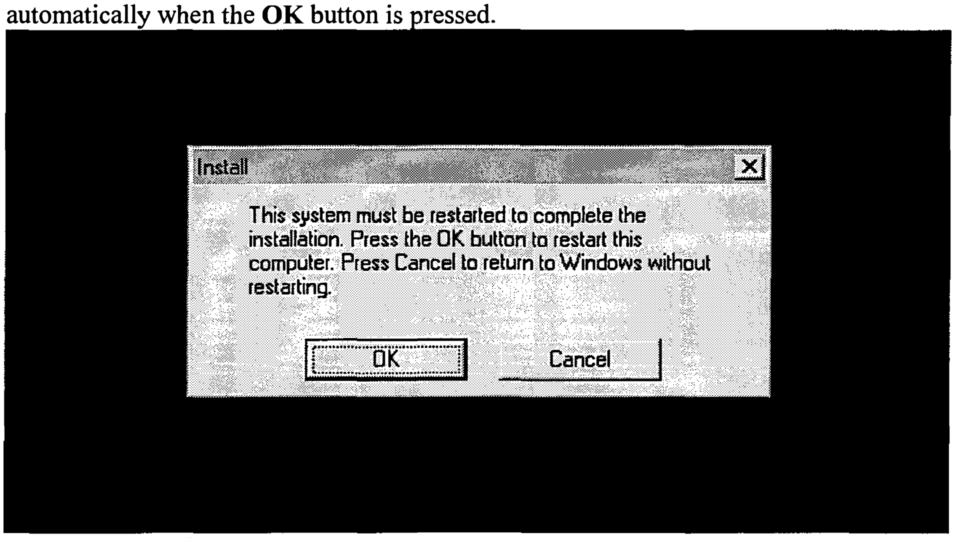


7. The installation progress window continues as shown below.



8. After all files have been copied and updated, the following screen is shown. Select the appropriate windows messaging mode for the joystick and the preferred illuminator icon.

9. Select **Finish** to complete the installation. The system must reboot in order for all system configuration changes to take effect. The dialog box shown below performs this function automatically when the **OK** button is pressed.



10. When the system is restarted the program icons for pcLaunch, pcSetup, and pcEmulate are available in the **Start/Programs/pcProbe II VX** menu group as well as on the Windows Desktop as shown below.

2.2 *Installing pcProbe^{II} VX from Diskette (Version 2.6.0 and older)*

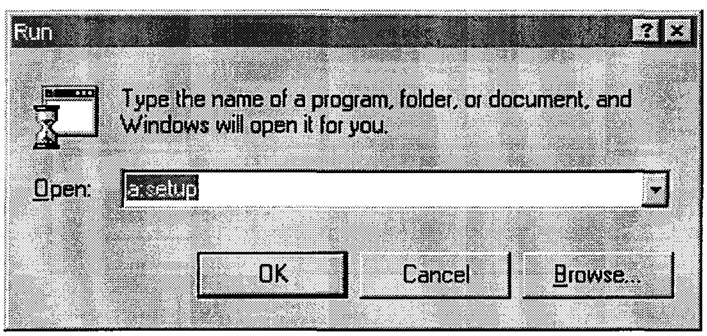
Install the applications in the following order:

1. PosUtil Library (TMC PN: A1009099)
2. pcLaunch (TMC PN: A1009515)
3. pcRouter (TMC PN: A1009514)
4. pcNav (TMC PN: A1009516)
5. pcProbe^{II} Utilities (TMC PN: A1010852)

Reference the PosUtil Library Installation/Reference manual at the back of the pcProbe^{II} manual binder for installation of that software.

The pcLaunch, pcRouter, and pcNav installations are all performed by following the following procedure:

1. Start Windows 98 if it is not running already.
2. If pcProbe^{II} is operating, shut it down by selecting **Shutdown/Exit** in pcLaunch.
3. Insert the application diskette in the floppy drive
4. Select **Start/Run...** from the Windows 98 taskbar. The following dialog is displayed:



5. Type **a:setup** in the **Open:** text box and then select **OK**.
6. Follow the instructions in the installation program.

Note: The default location for the pcProbe^{II} Application Suite is **c:\poslib.**

3 QuickStart Guide

3.1 Basic, User Directed Probing

This section is intended for users needing to make simple measurements and perform basic probing operations. The more advanced features and functions are described in sections 3.2, 3.3, and 3.5.

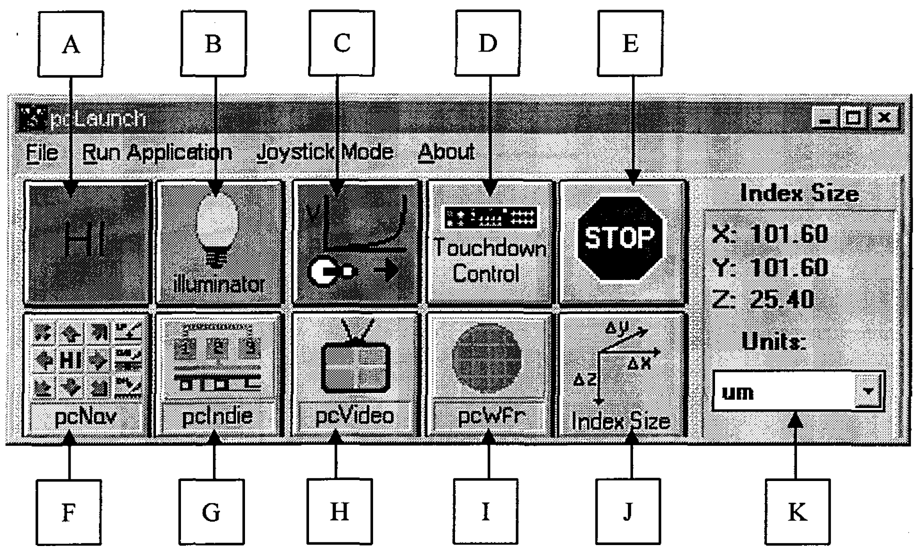
3.1.1 System Startup

- Booting from Scratch

1. Start **pcLaunch** by selecting **Start/Programs/pcProbe II /pcLaunch** from the Windows 98 taskbar. pcLaunch automatically starts pcRouter. The pcLaunch application window is shown below.

2. The joystick is operational when pcLaunch is running. See the next section for instructions on joystick operation.

3. Start any of the other applications in the pcProbe[II] suite by selecting the associated icon in pcLaunch or by selecting **Run Application** from the menu bar and selecting the application to run.



A	Navigation Speed Range	**G**	Run pcIndie
B	Illuminator Power Control	**H**	Run pcVideo
C	Joystick/MicroTouch Knob Jog Profile	**I**	Run pcWfr
D	Open Touchdown Control Dialog Box	**J**	Open Set Index Size Dialog
E	Stop all positioning systems (Soft EMO)	**K**	Select units of measurement
F	Run pcNav		

3.1.2 "Manual" Positioning

3.1.2.1 Selecting a Positioning Device from the Joystick

The joystick has six LED buttons used for device selection. The LED button associated with the active device is illuminated. A device is selected by pressing the LED button for that device. The following table shows device selection.

To Select...	Press LED button labeled...
Prober Stage/Platen	Stage
Microscope	Scope
900VM 1	#1
900VM 2	#2
900VM 3	#3
900VM 4	#4

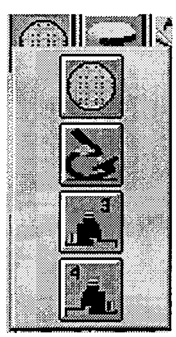
The joystick must be enabled in order to select devices from it. See the following page for joystick jog profile modes.

Hi or Lo speed may be selected by toggling the button on top of the joystick pendant.

3.1.2.2 Selecting a positioning device from pcNav

1. Activate **pcNav** from **pcLaunch.**

2. The **pcNav/Tools** window contains the device selection menu. The icon of the active device is always displayed. The title of the navigation window shows the name of the device. Click the left mouse button. The drop down device selection menu contains all defined positioning devices.



3. Select the desired device. All active applications in the pcProbe^{II} applications are updated to the new device.

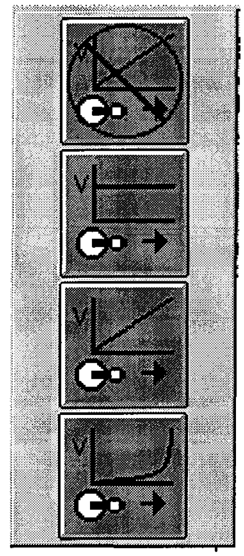
3.1.2.3 Navigation with the Joystick

The joystick provides a method of directly controlling X,Y and Z device speed and direction. Deflection of the joystick causes X-Y motion to occur. Rotation of the knob causes Z motion. The following table gives the direction of motion available with the joystick:

Deflection Direction	Causes this Positioner Motion…
Forward	+Y direction on DUT
Right	+X direction on DUT
Back	-Y direction on DUT
Left	-X direction on DUT
CCW (JS Knob)	Raises device (-Z)
CW (JS Knob)	Lowers device (+Z)

NOTE: The stage moves in the opposite direction of joystick deflection and pcNav jog button direction.

Jog Profile Menu



The joystick provides maximum control when placed in Exponential mode.

3.1.2.3.1 Setting Joystick Exponential Jog profile

1. Activate **pcLaunch.**

2. Locate the joystick/MicroTouch knob jog profile button. The jog profile menu is displayed as shown above.

3. Click the left mouse button. The jog profile menu is displayed as shown above.

4. Select the last menu item. This is **Exponential** mode.

3.1.2.3.2 Selecting Navigation speed range from the joystick

The button on top of the joystick knob is used to toggle between high speed and low speed range. The current range is always displayed in pcLaunch and pcNav. Low range is 1/50th of high range. If the speed range is set to IDX from pcNav or pcLaunch it toggles to LO speed range.

3.1.2.3.3 Initiating Joystick motion.

1. Select the device to move.

2. Select joystick exponential jog profile.

3. Select either HI or LO speed range.

4. Gently deflect the joystick in the direction of the desired location on the DUT. When the location is reached, just release the joystick to stop motion.

> **NOTE:** Use only very slight deflection of the joystick when performing precise positioning of a device with the joystick. There is a delay before noticeable motion occurs so be patient and don't over-deflect the joystick or else the device will overshoot the location.

3.1.2.4 Navigation with MicroTouch Knobs

The MicroTouch knobs combine the feel of manual knobs with the flexibility available through the joystick. The rotation rate of the knob translates directly to velocity of the device when Linear jog profile mode is selected. Three MicroTouch knobs are available as follows:

Knob Rotation Direction	Causes this Positioner Motion...
Left knob CW	+X direction on DUT
Left knob CCW	-X direction on DUT
Right knob CW	+Y direction on DUT
Right knob CCW	-Y direction on DUT
Front knob CW	Raise device (-Z)
Front knob CCW	Lower device (+Z)

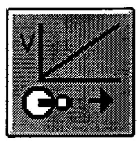
3.1.2.4.1 Setting MicroTouch Linear Jog Profile

1. Activate **pcLaunch.**

2. Locate the Joystick/MicroTouch knob jog profile button. The current profile is displayed. Move the mouse cursor over the button.

3. Click the left mouse button. The jog profile menu is displayed.

4. Select the third menu item. This is Linear profile mode as shown below.



3.1.2.4.2 Initiating MicroTouch Motion

1. Select the device to move from the joystick pendant or pcNav.

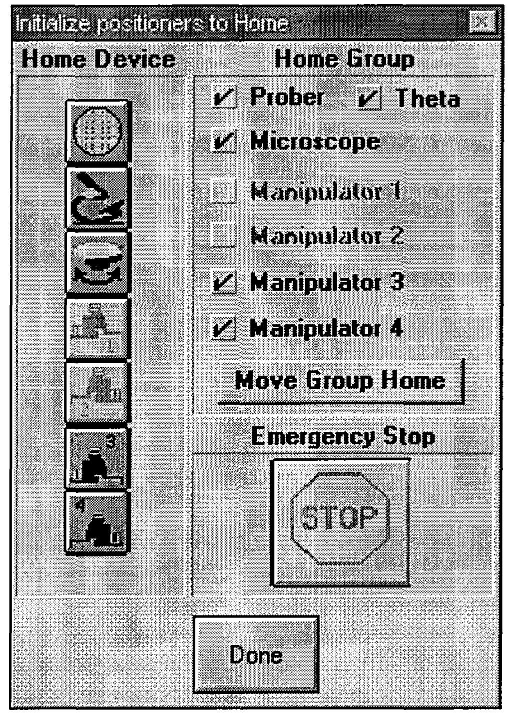
2. Select the Linear jog profile.

3. Select the HI or LO speed range either from pcLaunch or by pressing the button on the joystick.

4. Rotate the MicroTouch knob associated with the desired axis. The velocity of the selected axis is proportional to the rotation rate of the knob. When the destination is reached just stop rotating the knob.

3.1.3 Recommended Setup Sequence

3.1.3.1 Homing Positioning Devices



1. Select the Home icon in **pcNav/Tools**.

2. Select the devices to send home by clicking on the name of each device in the Home Group.

3. Check to be sure that the microscope home path (left rear) is clear and that probes will safely clear any obstacles or objectives.

4. Select ***Move Group Home*** to move all devices to the home position. During the home moves the ***Stop*** button is enabled. Clicking on this button stops all home moves.

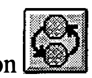
5. Click on ***OK*** when moves are completed.

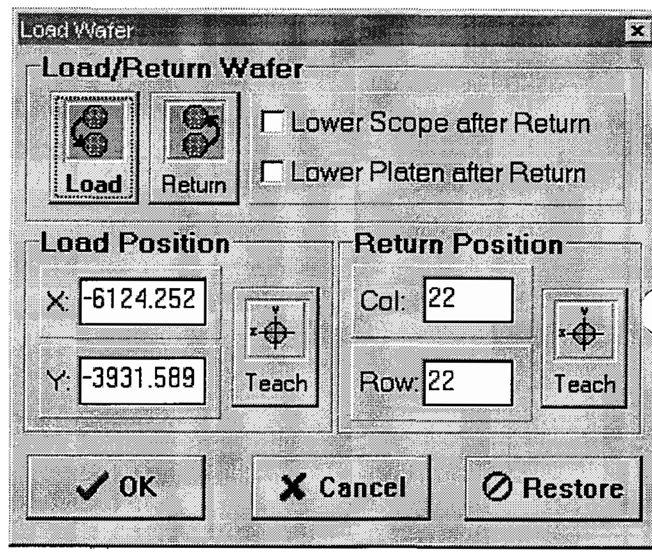
Note: To learn the purpose of homing devices, see section 3.1 of the pcNav Reference Manual.

3.1.3.2 Loading a Wafer or DUT

The load wafer utility raises the microscope and platen to a safe location at the top of their respective travels. The chuck then moves to the front center of travel for easy access. If the Auto Theta chuck option is installed it is rotated to the center of its travel to allow for maximum +/- theta adjustment. The chuck is moved back to the user-teachable C,R position after a wafer is loaded.

1. Deselect **pcNav/Tools** ***Auto Raise*** and ***Auto Lower*** as shown below.

2. Select the Load Wafer icon  from **pcNav/Tools.** The Load Wafer dialog box appears as shown at right.



3. Deselect the ***Lower Scope after Return*** and ***Lower Platen after Return*** as shown.

4. Select ***Load.*** The microscope and platen raise. If an Auto Theta chuck is present it moves to its center point. The chuck moves to the taught load position.

5. Turn off the stage vacuum. Remove the current wafer or DUT and place a new one in the center of the chuck in the desired orientation. Turn the vacuum back on.

6. Select ***Return.*** The chuck moves to the taught return positoin.

7. Select ***OK*** to exit the dialog box.

3.1.3.3 Manual Wafer Alignment

If the system is not equipped with an **Auto Theta** unit, and minimal computer compensated alignment is desired, use this procedure to align the wafer by manually rotating the chuck.

1. Select the Stage from the joystick or from **pcNav/Tools.**

2. Make sure the crosshair in **pcVideo** is enabled.

3. Select the lowest power objective on the microscope (usually 2X).

4. Look through the microscope eyepieces and use the manual theta adjustment knob to rotate the chuck until the wafer appears to be aligned.

5. Navigate to the bottom of a die near the left side of the wafer. Align the horizontal **pcVideo** crosshair exactly with the bottom edge of the die.

6. Move in the X (horizontal) direction only to the right side of the wafer. Do not move in the Y (vertical) direction. Keep aware of the bottom of adjacent die all the way across the wafer.

7. Observe the distance between the crosshair and the bottom edge of the die. Visually identify a point halfway between the crosshair and the bottom edge of the die.

8. Use the theta knob to rotate the wafer until the video crosshair is over the midpoint in step 7 .

9. Move the stage until the crosshair is aligned with the bottom edge of a die.

10. Move in the X (horizontal) direction only to the left side of the wafer. Do not move in the Y (vertical) direction. Keep aware of the bottom of adjacent die all the way across the wafer.

11. Observe the distance between the crosshair and the bottom edge of the die. Visually identify a point halfway between the crosshair and the bottom edge of the die.

12. Use the theta knob to rotate the wafer until the video crosshair is over the midpoint in step 7.

13. Move the stage until the crosshair is aligned with the bottom edge of a die.

14. If this alignment is close enough for the application, stop here. Otherwise select the next higher power objective and repeat steps 5 through 13 until the alignment is within the desired tolerance.

3.1.4 Advanced Setup sequence for Automated Functions

3.1.4.1 Home positioning devices

Perform the home operation as described in section 3.1.3.1 **Homing positioning devices.** Homing devices is required when accurate and repeatable system performance is required. Devices move to an electronic sensor during a home move. This home location is then used as the reference for all coordinate positioning for the device.

3.1.4.2 Load a wafer

Perform the Load Wafer operation as described in section 3.1.3.2 **Loading a Wafer or DUT.**

3.1.4.3 Wafer Alignment

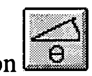
1. Make sure the crosshair in pcVideo is enabled.

2. Select the lowest power objective (usually 2X).

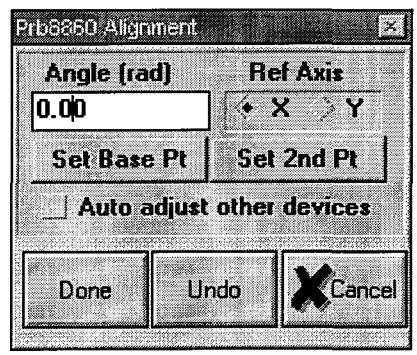
3. Look through the microscope eyepieces and use the manual theta adjustment knob to rotate the chuck until the wafer appears to be aligned. (If the test station has an Auto Theta unit, align the stage using the Wafer Alignment instructions in section 3.2.3.2.)

4. Select the prober stage device.

5. Select the highest power objective

6. Select the Align button  in **pcNav/Tools.**

7. Deselect ***Auto Adjust other devices*** as shown at right.



8. Select X as the alignment reference axis by selecting the **Ref Axis/X** check box as shown at right.

9. Navigate to the bottom of a die near the left side of the wafer. Align the horizontal pcVideo crosshair exactly with the bottom edge of the die. Be sure to approach the line from above to ensure the best possible alignment.

10. Select ***Set Base Pt.***

11. Move in the X (horizontal) direction along the bottom edges of the die to the right side of the wafer. Align the pcVideo crosshair to the bottom edge of the die. Be sure to approach the line from above.

12. Select ***Set 2nd Pt.***

13. Select ***Done.*** The software will now compensate using this alignment to provide correct wafer coordinates.

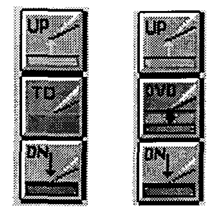
14. Select the microscope device and repeat steps 6 through 13.

> **NOTE:** Once the microscope and prober stage are aligned to each other their angular relationship is known and constant. Subsequent wafer alignments require only the stage with the ***Auto adjust other devices*** option enabled.

3.1.4.4 Z Setup

Correct Z settings are crucial for successful operation of the prober. Each positioning device has unique Preset Up and Preset Down positions and Raise/Lower modes. The Z settings are defined as outlined in the next section, and are used whenever automated raising and lowering of the device occurs. The Z settings are NOT accessed during Z jog operations from the joystick, MicroTouch knobs, or pcNav Z buttons. In other words, it is possible to jog above and below the set Up/Down positions.

pcNav Z Lower Modes
Touchdown Overdrive



1. Rotate the X, Y, and Z knobs on each manual manipulator until the X,Y, and Z positions appear to be near the center of available manipulator travel. This gives the broadest range of initial motion. (Similarly adjust 900VMs using computer control.)

2. Observe the Z probe tip positions on all the manipulators. If the Z height of all the probe tips vary by more than 100 mils (2540 microns) it may be necessary to adjust the probe tips in the probe holders until all the tips are close to the same height.

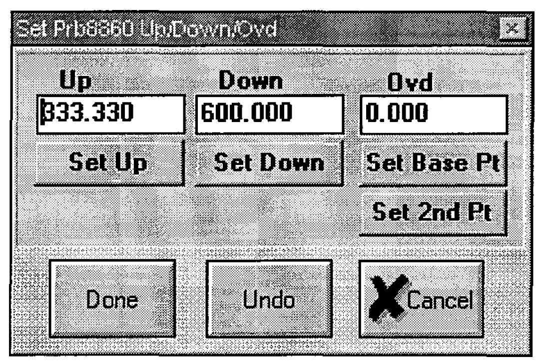
3. Note the manipulator with the lowest probe tip. If there is some doubt, lower one until it is clearly the lowest.

4. Place the manipulators approximately in the final configuration.

5. Select the **prober** device. If the Z lower mode is set to Overdrive, click on the overdrive button to select Touchdown as shown above.

6. Select the ***Set Z Up/Dn*** button 

in pcNav. The dialog box at right is shown.



7. Observe the Z distance between the probe tips and the surface of the wafer.

8. Lower the platen using either the joystick or MicroTouch knobs until the lowest probe tip is about 20 mils (500 microns) above the wafer. As the probe tips approach the wafer, be sure to slow the rate of descent to prevent unintentional probe contact with the wafer.

9. Select ***Set Down*** and ***Set Up*** and then ***Done***. (If a 900VM is present, select it and its ***Set Down*** and ***Set Up*** positions also. Reselect the prober.)

10. Place the lowest manipulator such that the tip is over its intended target.

11. Select the **microscope** device.

12. Select the lowest power objective (usually 2X).

13. Navigate the microscope over the manipulator from step 10.

14. Select the next highest objective and adjust the microscope position until the target is visible.

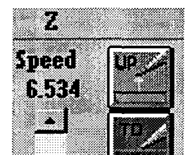
15. Focus on the surface of the wafer and select the ***Set Z Up/Dn*** button. Select ***Set Down***, ***Set Up*** and then ***Done.***

16. Select the **prober** device and select the ***Set Z Up/Dn*** button.

17. Select LO speed range.

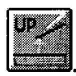
18. Slowly lower the platen until the probe tip contacts the target. Larger tipped probes usually start to scrub across the wafer when contact is made. Very small tipped probes tend to penetrate the surface. It may be necessary to adjust the X,Y position of the manipulator tip before contact is made to ensure that the probe tip contacts the target.

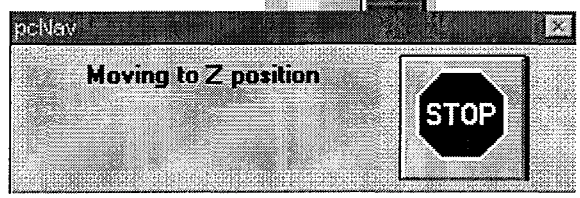
Z Speed Slider

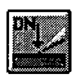


19. Select ***Set Down*** and the ***Done.***

20. Drag the **Z Speed slider** down to about ¼ full scale as shown at right.

21. Select the **Z Raise** button . A **Stop** dialog box as shown below is displayed until the move to the Z-up position is completed. The ***Stop*** button may be pressed at any time to halt Z motion.

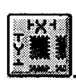


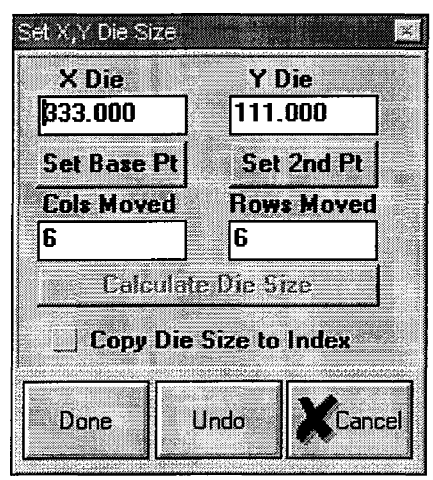
22. Select the **Z Lower** button  and observe the speed of descent for the probe tip. A **Stop** dialog box as shown above is displayed until the move to the Z-down position is completed. The ***Stop*** button may be pressed at any time to halt motion.

23. Adjust the **Z Speed Slider** as required to provide the best rate of descent.

24. Use the microscope to move to the remaining target sites. Place the platen in the Z-down position. Position each probe tip to its site and manually lower the probe tip until probe contact is established. (If a 900VM is present, set its Z-down to this position.)

3.1.4.5 Setting Die Spacing (Known values)

1. Select the pcNav **Set Die Size** button . The Set X,Y Die Size dialog is shown as at right.



2. Note the current units. If a different units base is required select it from the **Units** list.

3. Select the **X Die** entry field and enter the X die spacing.

4. Select the **Y Die** entry field and enter the Y die spacing.

5. Select ***Done***. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

3.1.4.6 Setting Die Spacing (Unknown values)

1. Select the **prober** device.

2. Select the lowest power objective.

3. Navigate to a die at the bottom left of the wafer.

4. Position the pcVideo crosshair on an easily locatable artifact on the die.

5. Select the next higher power objective.

6. Adjust the position of the stage until the crosshair is perfectly aligned with the artifact. Be sure to approach the artifact from the top right to ensure best accuracy.

7. Select the pcNav **Set Die Size** button.

8. Note the current units. If a different units base is required select it from the **Units** list.

9. Select ***Set Base Pt.***

10. Move the prober up and over at least 4 die. Count the number of rows and columns from the reference die to the new target die.

11. Adjust the position of the stage until the crosshair is perfectly aligned with the artifact from step 6.

12. Select ***Set 2nd pt.***

13. Enter the number of columns and rows moved from the reference die in the data fields labeled **Cols Moved** and **Rows Moved**.

14. Select ***Calculate Die Size.*** This calculates the average distance between the die. The calculated die size is placed in the **X Die** and **Y Die** fields.

15. Enable ***Copy Die Size to Index*** if indexing between die with the jog buttons is required.

16. Select ***Done*** to set the new die size and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

Hint: Use navigation to obtain an approximate die size by traversing across 1 die. Check the ***Copy Die Size to Index*** box and select ***Done***. Then follow the procedure above, using the jog buttons in ***index*** mode to traverse die in step 10. Select ***lo*** speed to perform the final adjustment in step 11. Then complete the procedure.

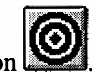
3.1.4.7 Setting X,Y and Column, Row Reference Origin

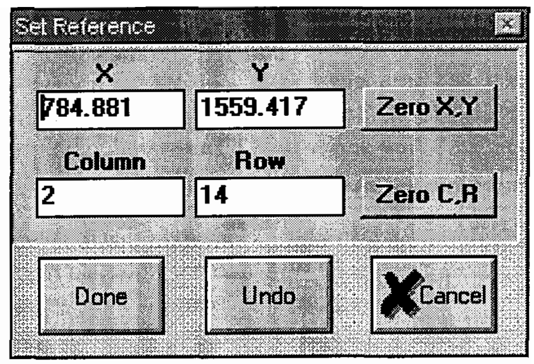
The purpose of setting the reference origin is to synchronize the coordinate positions in pcProbe[II] with the actual wafer or DUT coordinate positions.

3.1.4.7.1 Set X,Y Origin

1. Select the **prober** device.

2. Navigate to the reference location. Be sure to approach the location from the top right to ensure accuracy.

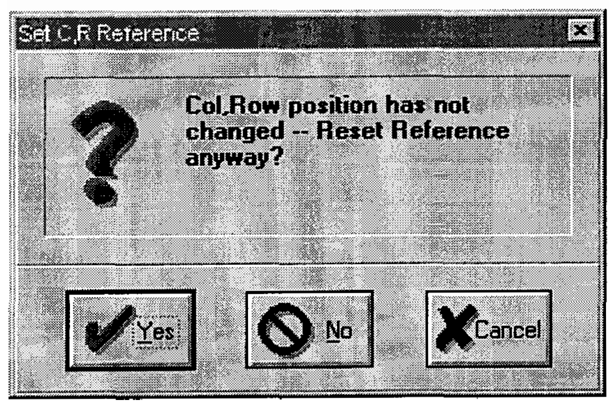
3. Select the **Set Reference** button . The Set Reference dialog is displayed as shown at right.



4. If this location is to be (0,0) select ***Zero X,Y.*** If the location is known, the X,Y values may be entered in the **X** and **Y** fields.

5. Select ***Done.*** Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

6. Since the **Column, Row** location did not change the dialog box shown at right is displayed. This is to determine if the Column and Row reference should be set to the current position. Select ***Yes*** to reset or ***No*** to leave it unchanged.



3.1.4.7.2 Set Column, Row Origin

1. Select the prober device.

2. Select the **Set Reference** button.

3. Navigate to the die reference location

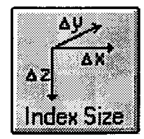
4. If this location is to be [0,0] select ***Zero C,R.*** If the location is known, the Column, Row values may be entered in the **Column** and **Row** fields.

5. Select ***Done.***

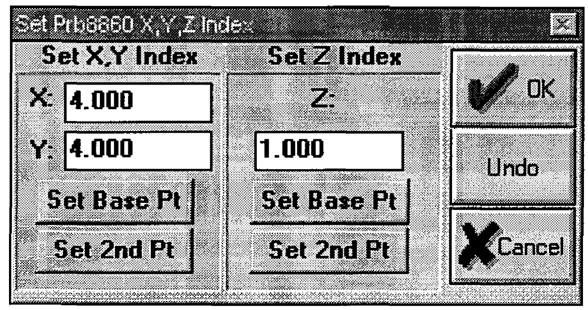
3.1.4.8 Setting an X,Y,Z Index Size

Indexing is used to move a programmed distance from a point. The indexing functions are accessed by selecting IDX as the jog mode and then using the pcNav jog buttons, joystick, or MicroTouch knobs to start an index move. Index sizes are unique to each positioning device (unlike die size, which is global).

3.1.4.8.1 Setting a known X,Y,Z Index Size



1. Select **pcLaunch.**
2. Select a positioning device from the joystick.
3. Select the required units from the **Units** list.
4. Select the **Index Size** button in **pcLaunch**. The **Set X,Y,Z Index** dialog box is shown as at right.
5. Enter the desired X,Y,Z values in the **X**, **Y**, and **Z** fields. Remember that Z values are used to move DOWN into the wafer, so large values (>10 mils) generally are not safe.
6. Select ***OK*** to store the values. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.



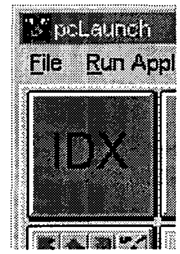
3.1.4.8.2 Setting an X,Y, or Z Index Size Visually

1. Select **pcLaunch.**
2. Select a positioning device from the joystick.
3. Select the required units from the **Units** list.
4. Select the **Index Size** button. The **Set X,Y,Z Index** dialog is show as above.
5. Position to the reference point for the index size.
6. Select ***Set Base Pt*** for X,Y (or Z).
7. Navigate the desired distance in X,Y (or Z).
8. Select ***Set 2nd Pt.*** The new index size is calculated and stored in the X,Y (or Z) fields.
9. Select ***OK*** to store the values. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

3.1.5 Coordinate Positioning

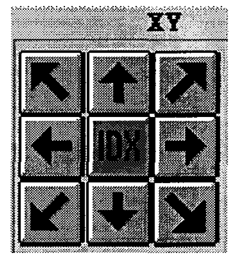
3.1.5.1 Selecting Index Jog Mode

3.1.5.1.1 Selecting Index mode from pcLaunch



1. Active **pcLaunch.**
2. Click on the LO/HI/IDX button until IDX is selected as shown at right.

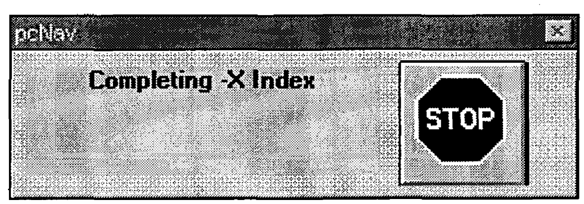
3.1.5.1.2 Selecting Index mode from pcNav



1. Activate **pcNav.**
2. Click on the LO/HI/IDX button until IDX is selected as shown at right.

3.1.5.2 Indexing with pcNav Jog Buttons

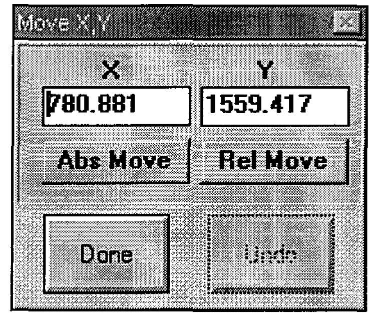
1. Set the Index Size as described in the previous section.
2. Select Index mode as described above.
3. Click and hold the left mouse on the jog button pointing in the required direction on the wafer or DUT. The device continues indexing until the button is released.
4. The index move completes when the jog button is released. The pcNav **Stop** dialog box shown at right is displayed until the move is complete. The ***Stop*** button may pressed at any time to halt motion.



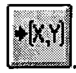
3.1.5.3 Indexing with the Joystick/MicroTouch Knobs

1. Set the Index Size as described in the previous section.
2. Select Index mode as described above.
3. Deflect the joystick or rotate the MicroTouch knob in the required direction of motion. The device continues indexing until the joystick or knob is released.
4. The index move completes when the joystick or knob is released. The pcLaunch **Stop** dialog box is displayed until the move is complete. The ***Stop*** button may be pressed at any time to halt motion.

3.1.5.4 Moving to a Specific X,Y Location

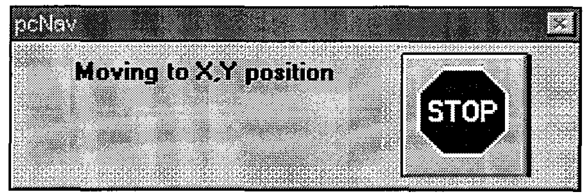


1. Activate **pcNav.**

2. Select the **Move X,Y** button . The **Move X,Y** dialog box is displayed as shown at right.

3. Enter the desired destination in the **X** and **Y** fields.

4. Select ***Abs Move***. A ***Stop*** dialog box as shown at right is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

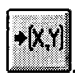


5. Select ***Undo*** to return to the previous position.

6. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

3.1.5.5 Moving by a specific X,Y distance

1. Activate **pcNav.**

2. Select the **Move X,Y** button . The **Move X,Y** dialog box is displayed as shown above.

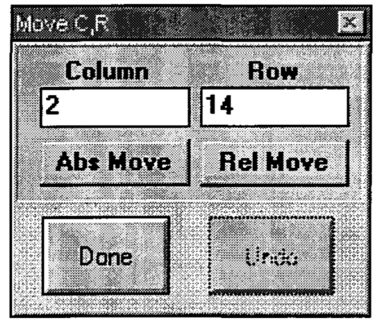
3. Enter the desired distance in the **X** and **Y** fields.

4. Select ***Rel Move***. A ***Stop*** dialog box is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

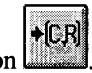
5. Select ***Undo*** to return to the previous position.

6. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

3.1.5.6 Moving to a Specific Column, Row Location

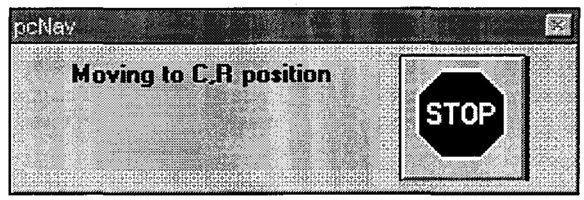


1. Activate **pcNav**.

2. Select the **Move Col,Row** button . The **Move C,R** dialog box is displayed as shown at right.

3. Enter the desired destination in the **Column** and **Row** fields.

4. Select ***Abs Move***. A **Stop** dialog box as shown at right is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

   Note: C,R moves always go to the lower left point of the die size area because this is the die's reference position.

5. Select ***Undo*** to return to the previous position.

6. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

3.1.5.7 Moving by a Specific Column, Row Distance

1. Activate **pcNav**.

2. Select the **Move Col,Row** button. The **Move C,R** dialog box is displayed as shown above.

3. Enter the desired distance in the **Column** and **Row** fields.

4. Select ***Rel Move***. A **Stop** dialog box as shown above is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

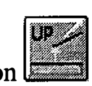
   Note: C,R moves always go to the lower left point of the die size area because this is the die's reference position.

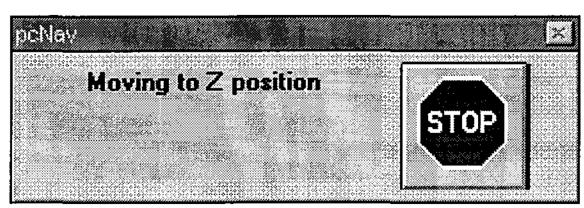
5. Select ***Undo*** to return to the previous position.

6. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

3.1.5.8 Raising a Device

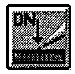
1. Set the Up/Down position as outlined earlier.

2. Select the Z Raise button  to raise the device. A **Stop** dialog box as shown at right is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.



3.1.5.9 Lowering a device

1. Set the Up/Down position as outlined earlier.

2. Select the Z Lower button 

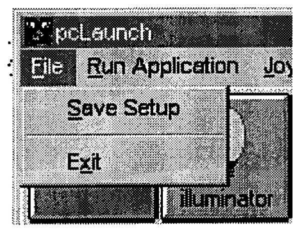
to lower the device. **A Stop** dialog box is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

3.1.6 Saving System Setup

The setup for the system is saved to disk for use by pcProbe^{II} at boot time and during operation. The setup is stored automatically when exiting pcLaunch. If power has not been turned off, the user may resume operation of the prober exactly where they left off during the last pcProbe^{II} session. The following setup information is stored for all positioning devices at exit:

X,Y Die Spacing	Z Up/Down Positions
X,Y,Z Index Sizes	Z Lower Mode (TD/OVD)
X,Y,Z Position	Alignment (Both Device and Auto Theta)

These parameters may be stored at any time as follows:



1. Activate pcLaunch.

2. Select the ***Shutdown/Save Setup*** menu as shown at right. This saves all setup information to disk immediately.

3.2 *Probe Card Applications including Auto-theta chuck*

This section explains how to install and utilize a probe card in the pcProbe^{II} environment. It covers planarizing the probe card, alignment of the DUT to the card, and step-and-repeat probing.

3.2.1 Installation of Probe Card Adapter and Card

1. Select the **microscope** in **pcNav/Tools.**

2. Raise the microscope to the top of its travel using the joystick or **pcNav** jog up button.

3. Select the **prober**.

4. Raise the platen to the top of its travel using the joystick or **pcNav** jog up button.

5. Install the probe card holder if one is not already present. It is easiest to start with the front two screws in their mounting holes and then insert and tighten the theta control knob block.

6. Loosen the probe card rail clamp screws and insert the probe card.

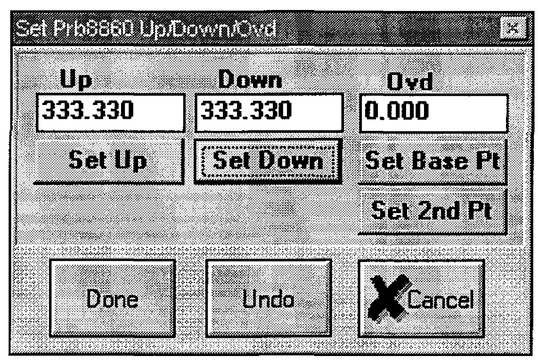
7. Attach cabling and tighten the clamp screws. Some adjustment may be required to ensure cables and card to not interfere with prober motion.

8. Observe the vertical (Z) distance between the wafer surface and the probe card probes.

9. Lower the platen until the probe card probes are just above the wafer surface. Slow the Z speed of the platen as the probes approach the surface of the wafer to prevent damage to the wafer and probe card.

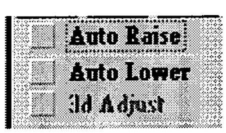
10. Select the **Set Z Up/Dn** button 

in **pcNav.** The dialog box is displayed at shown at right.



11. Set the Z up and down position to the current Z platen position by clicking on the ***Set Up*** and ***Set Down*** buttons as shown at right. Select ***Done*** to accept the new values.

12. Deselect ***Auto Raise*** and ***Auto Lower*** in the **pcNav/Tools** window as shown below.



3.2.2 Planarizing the Probe Card

1. Select the **microscope**.

2. Rotate the microscope turret to the 10X objective. Make sure the probe tips are far enough above the wafer to allow for Z planarity adjustment.

3. Focus on the probe card probe tips.

4. Move along a horizontal row of probes in the probe array. Use the front left and front right probe card holder planarity adjustment screws to raise or lower corners until probe tips are at the same focus point.

5. Move along a vertical column of probes in the probe array. Use the center back probe card adapter planarity adjustment screw to raise or lower the back until all probe tips are at the same focus point.

3.2.3 Wafer Alignment

3.2.3.1 Wafer Alignment with Manual Theta Present

Perform manual alignment of the wafer as outlined in section 3.1.3.3 **Manual Wafer Alignment.**

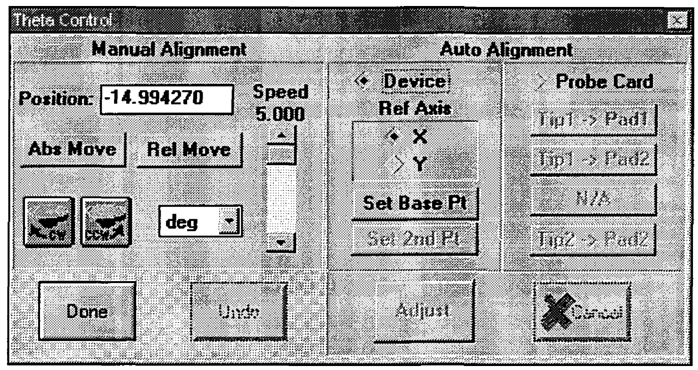
3.2.3.2 Wafer Alignment with Auto Theta Present

1. Focus on the wafer surface.

2. Make sure the crosshair in **pcVideo** is enabled.

3. Select the **prober.**

4. Select the **Auto Theta**  button in **pcNav/Tools**. The theta control box is displayed as shown at right.



5. Select *Device* in the **Auto Alignment** window.

6. Select a ***Ref Axis***, X or Y.

7. Position the prober such that the video crosshair is perfectly aligned with the bottom edge of a die on the middle left side of the wafer. Be sure to approach the point from the upper right to ensure accuracy.

8. Click on the ***Set Base Pt*** button to set the first alignment location.

9. Move the prober along the row of die to the right until the video crosshair is perfectly aligned with the bottom edge of a die on the right side of the wafer.

10. Click on ***Set 2nd Pt***.

11. Click on ***Adjust***. The theta chuck rotates the wafer to the correct alignment.

12. Verify the alignment by moving along the wafer and observing deviation. Perform steps 5 through 11 until the required accuracy is attained and then select ***Done***.

    Hint: For small theta adjustments, it is helpful to slow theta down using the speed slider.

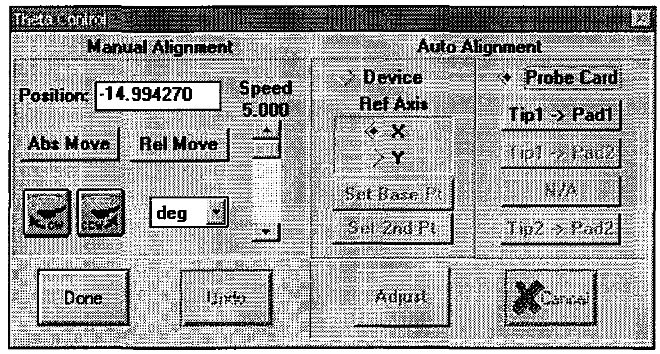
3.2.3.3 Microscope Alignment

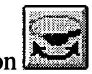
If the microscope has not been aligned to the stage, perform a wafer alignment with the microscope as outlined in section 3.1.4.3 **Wafer Alignment**.

3.2.4 Aligning the Wafer with the Probe Card

1. Select the prober.

2. Locate two pads diagonal to each other which line up with two probe tips on the probe card.



3. Click on the **Auto Theta** button  in **pcNav/Tools**. The **Theta Control** dialog is displayed as shown at right.

4. Select ***Probe Card*** in the **Auto Alignment** window.

5. Align the first pad to its associated probe tip on the probe card.

6. Click on ***Tip1->Pad1***.

7. Align the second pad with the probe tip from step 5.

8. Click on ***Tip1->Pad2***.

9. Align the second pad with its associated probe tip on the probe card.

10. Click on ***Tip2->Pad2***.

11. Click on ***Adjust***. If the platen is below its Z-up position, is raises. Theta adjusts to align the die pads to the probe tips on the probe card.

12. Click on ***Done*** to close the dialog box.

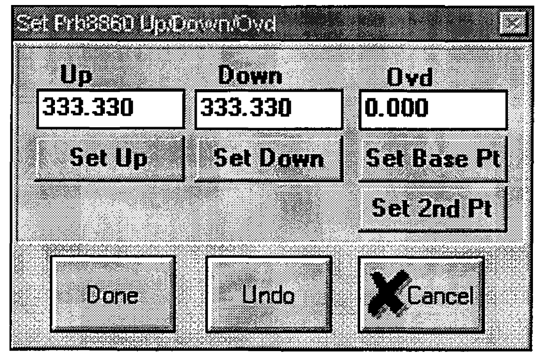
3.2.5 Setup for Probe Card Z Operation

3.2.5.1 Setting Z Up/Down Positions

1. Select the **prober**.

2. Select the ***Set Z Up/Dn*** button 

in **pcNav**. The Setup Up/Dn dialog appears as shown at right.



3. Observe the Z distance between the probe tips and the surface of the wafer.

4. Lower the platen using either the joystick or MicroTouch knobs until the probe card probe tips are about 20 mils (500 microns) above the wafer. As the probe tips approach the wafer be sure to slow the rate of descent to prevent unintentional probe contact with the wafer.

5. Select ***Set Down*** and ***Set Up*** and then ***Done***.

6. Select the **microscope** device.

7. Select the lowest power objective (usually 2X).

8. Navigate the microscope over the target probe.

9. Select the next higher objective and adjust the microscope position until the probe tip is visible in the center of view.

10. Focus on the surface of the wafer and select ***Set Z Up/Dn***. Select ***Set Down, Set Up*** and then ***Done.***

11. Select the **prober** device and select the ***Set Z Up/Dn*** button.

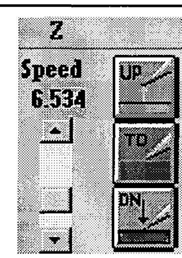
12. Select **LO** speed range. Adjust the X-Y offset of probes to pads as required.

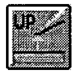
13. Slowly lower the platen until the probe tips contact the pad. Larger tipped probes usually start to scrub across the wafer when contact is made. Very small tipped probed tend to penetrate the surface.

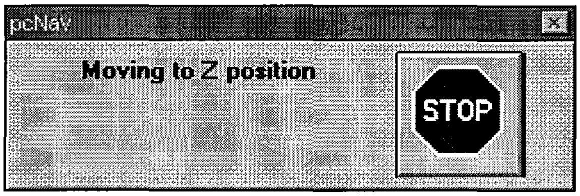
14. Select ***Set Down*** and then ***Done***.

15. Drag the **Z Speed Slider** down to about ¼ full scale as shown at right. This slows the rate of descent for the platen and ensures that probe tips contact the wafer surface in a non-destructive manner.

Z Speed Slider



16. Select the ***Z Raise*** button . A **Stop** dialog box is displayed as shown below until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.



17. Select the **Z Lower** button  and observe the speed of descent for the probe tip. A **Stop** dialog box is displayed as shown above until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

18. Adjust the **Z Speed Slider** as required to provide the best rate of descent.

3.2.5.2 Setting and Enabling Z Overdrive

Overdrive is used to move a probe tip past touchdown or the Z down position in order to establish better contact with the DUT. For example, if the overdrive is set to 1 mil, and the Z down position is set to 350 mils, the final Z position for the probe is 351 mils. If touchdown is sensed while lowering the platen, the platen moves 1 mil past the touchdown point. Overdrive is enabled by setting the Z lower mode to Overdrive.

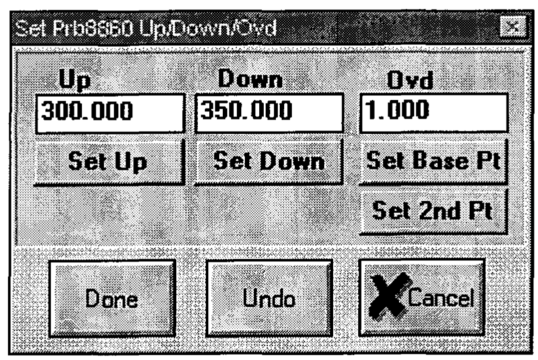
1. Select the **prober** device.

2. Select the **Set Z Up/Dn** button.

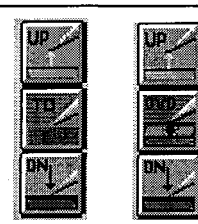
3. Enter the desired Z overdrive distance in the **Ovd** field as shown at right. A common value for probe card applications is 1 to 2 mils (25 to 50 microns).

4. Select ***Done***.

5. Enable overdrive operation by selecting the Z lower mode until **OVD** is displayed as shown at right.



pcNav Z Lower Modes
Touchdown Overdrive



3.2.5.3 Using Probe Card Edge Sense

All probing stations with motorized platens have a touchdown sensing BNC input. This input is above the back right side of the platen and is labeled **TD**. This input is essentially a switch. A closed circuit is OFF (no touchdown) and an open circuit is ON (touchdown sensed). It is used by the prober to stop downward Z motion and X,Y motion. This is useful when testing all die on a non-planar wafer, or when using thermal chucks, to ensure that adequate contact of probes and pads.

Many probe cards have edge sense probes on them. A common configuration is to have a straight probe with its tip adjusted to the same plane as other probes with a bent probe contacting it from underneath to form a closed switch. When the straight probe contacts the surface it is lifted off the bent probe and therefore breaks contact. If the pin numbers to these probes are known the probes can be connected to the TD BNC input and used to halt downward motion of the platen.

1. Connect the probe card edge sense probes to the shield and center conductor of a male BNC connector.

2. Plug the male BNC connector into the TD input on the back of the platen.

3. Set the Z Up/Down positions as outlined earlier.

4. Select the Z lower mode to be TD.

5. Use the joystick or MicroTouch Z knob to lower the platen past the Z down position. If the probes are properly connected to TD input the platen should abruptly stop Z down motion when the edge sense probe contacts the wafer.

3.2.5.4 Using the PCS-4 Contact Sense Module (optional accessory)

The PCS-4 contact sense module provides a non-mechanical method of sensing when a measurement probe contacts a DUT. Up to 4 measurement probes can sense DUT contact at one time. The intent of contact sensing is to allow automatic operation without damage to DUTs and probes. Sensing can be enabled or disabled for selected probes. The test instrumentation is connected to the measurement probes whenever all enabled probes sense contact. This state is indicated by the **STAND-BY** light on the PCS-4 as well as by the **EOR** state in the **Touchdown Control** box. When contact is not sensed for an enabled probe, the test instrumentation is disconnected from all probes.

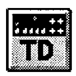
The PCS-4 signal output must be injected into the DUT in order to sense contact. There are two possible injection methods – through the chuck to the DUT substrate, or through a probe into the ground or power grid for the DUT.

The recommended setup sequence for the PCS-4 with pcProbe^{II} is as follows:

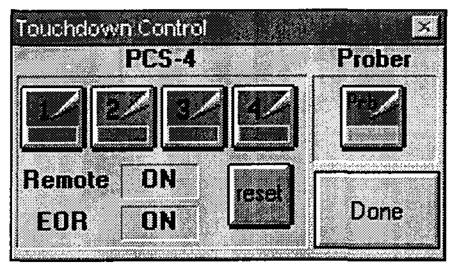
1. Connect the Measurement/contact sense probe to the PCS-4 BNC connection labeled PROBE.

2. Connect the signal injection probe to the PCS-4 BNC connection labeled OUTPUT.

3. Connect the measurement equipment to the PCS-4 BNC connection labeled TEST EQUIPMENT.

4. Select the **Touchdown Control** button 

in **pcNav/Tools.** The **Touchdown Control** dialog box is displayed as shown at right.



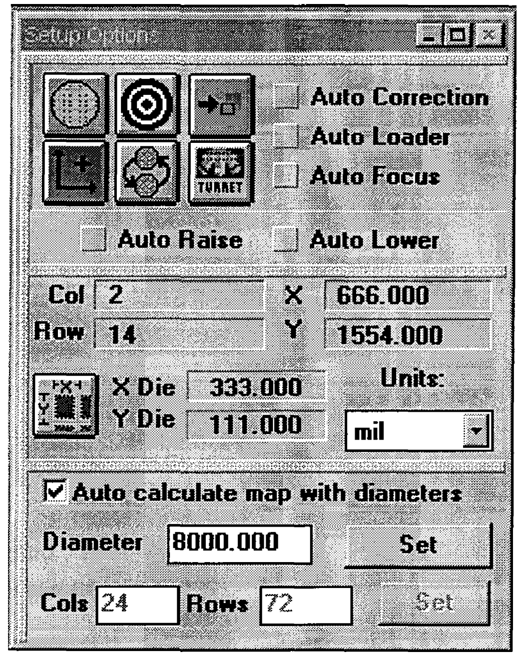
5. Enable the probes used to sense touchdown and deselect all other probes by clicking on the associated probe number. This dialog box should remain open as long as the PCS-4 is active. The reset button in the dialog box performs the same function as the reset button on the front of the PCS-4. It clears all touchdown sense states and enables a new touchdown sense cycle.

Note: For more information regarding the PCS-4 unit, see the PCS-4-V0 Probe Contact Sensing Module User Manual, P/N A1011523.

3.2.6 Step and Repeat Wafer Probing

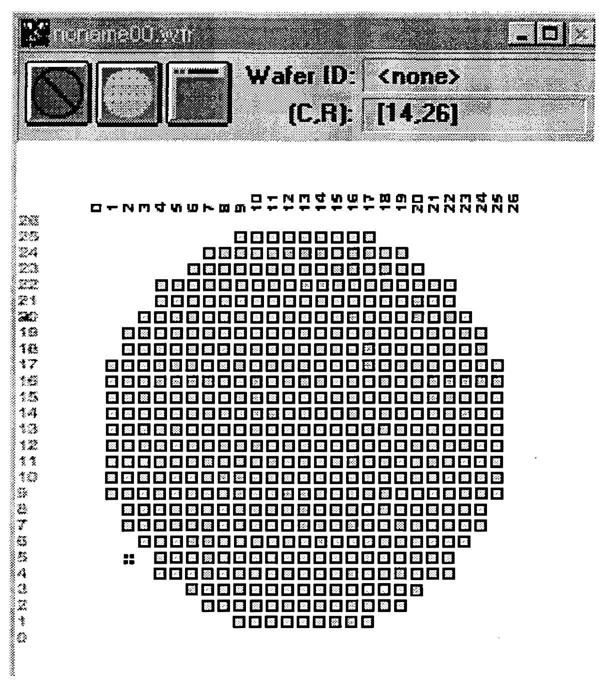
3.2.6.1 Setting up a wafer test

1. Activate **pcNav**.
2. Align the probe card and prober theta as outlined earlier.
3. Select the **prober** device.
4. Set the **Z** Up/Down positions.
5. Set the die spacing for the wafer.
6. Align probe card probes to device pads and set the Column, Row reference on the wafer.
7. Activate **pcWfr**.
8. Enable ***Auto calculate map with diameters.***
9. Enter the wafer diameter in the **Diameter** field of the **Setup Options** window as shown at right.
10. Select ***Set*** to set the wafer size.



3.2.6.2 Point and Shoot Navigation with the Wafer Map

1. Select the **prober** device.
2. Move the mouse cursor over the desired Column, Row destination on the wafer map as shown at right.
3. Click the RIGHT mouse button. The prober moves to the selected destination. A **Stop** dialog is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

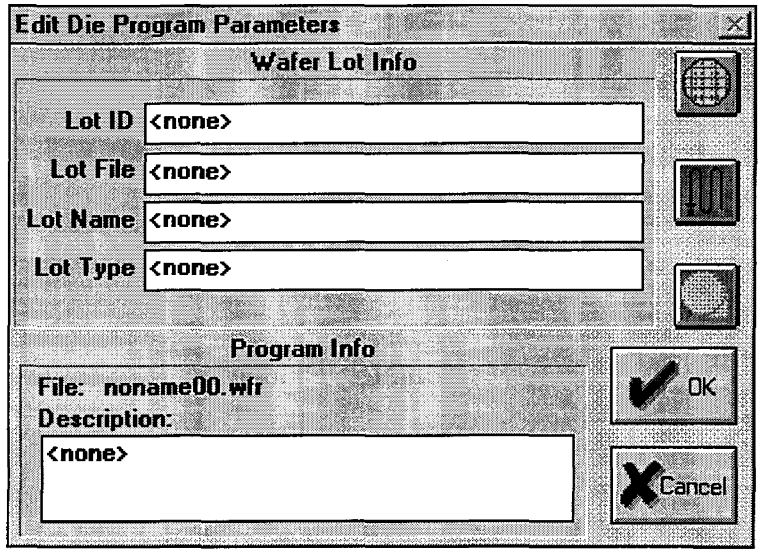


NOTE: The settings for the wafer outline may not allow movement to a die on the edge of the map.

3.2.6.3 Defining a Wafer Program

1. Activate **pcWfr.**

2. Select the **New Die Program** button. The **Edit Die Program Parameters** dialog box at right is displayed.



3. Enter the lot information and program description if desired. This information is not required.

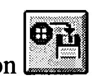
4. Select the device to use for the test device (typically the prober) at the top right of the dialog box. This device is used for the test regardless of the active device selected when the test is run.

5. Select the spline test pattern. This is usually a snake pattern starting from the top of the wafer.

6. Select a round or square wafer map.

7. Select ***OK*** to accept the parameters.

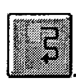
8. Die are added to or deleted from the die program by clicking the left mouse button. Click and drag the mouse over a range of die to select or deselect die for the test.

9. Select the **Save Die Program** button  in the **Die Program Tools** window to save the program.

3.2.6.4 Running a Wafer Test

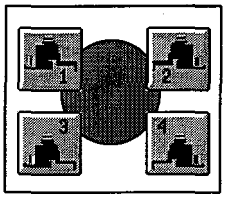
1. If Auto Z Raise/Lower is required, select those options in the **pcWfr/Setup Options** window.

2. If a delay is necessary, enable the use of delay by clicking on the delay button. Enter the desired number of seconds to delay in the edit window to the right of the delay button.

3. Select the **Run Die Program** button . The prober steps through all die in the die program. A **Stop** dialog box is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion and stop program execution.

3.3 Programmable Manipulator Applications

This section explains how to integrate programmable manipulators in the testing process.



3.3.1 Manipulator Placement

The placement and numbering of programmable manipulators on a platen should be as indicated in the diagram above. The manipulator bodies should be parallel to each other and stage travel. They should also be far enough away such that they do not contact each other during motion.

1. Initialize all positioning devices to home in **pcNav**.

2. Load a wafer.

3. Pre-align the wafer to the stage and then align the microscope to the wafer.

4. The probe holders should be placed in a normalized Z position to allow for maximum adjustability once the probe tips are in place.

5. Use the joystick to center the X,Y, and Z axis of all manipulators.

6. Carefully place each manipulator as shown in the diagram above. Rotate the probe holder such that probes are within 250 mils of their final X,Y configuration.

7. If a PCS-4 contact sense module is present, connect each installed probe to a PCS-4 probe input with the same designator.

3.3.2 Manipulator Alignment

This procedure provides a method of establishing the microscope to manipulators alignment. The alignment established in this procedure is valid as long as the manipulator bodies are not moved. Alignment to new wafers can be accomplished by either using the Auto Theta alignment, or aligning the stage or microscope with ***Auto adjust other devices***.

1. Activate **pcNav.**

2. If the wafer, stage, and microscope are not aligned, do that now.

3. Select the **microscope**.

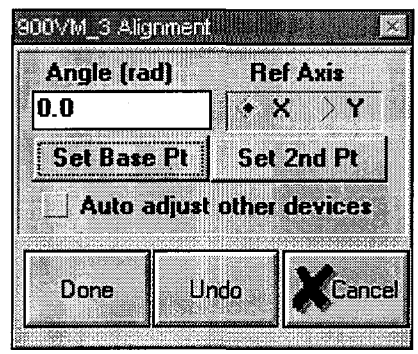
4. Select the 2x objective to provide the widest field of view.

5. Navigate to the first manipulator probe tip such that the video crosshair is directly over the probe tip.

6. Select the 20X objective and adjust the crosshair over the probe tip.

7. Select the **manipulator**.

8. Select the **Align** button in the **pcNav/Tools** window.



9. Select ***X*** as the reference axis and then ***Set BasePt.***

10. Select the **microscope**.

11. Navigate the microscope about 200 mils in the X direction ONLY.

12. Select the **manipulator**.

13. Navigate the manipulator such that the probe tip is centered under the crosshair.

14. Select ***Set 2nd Pt.***

15. Deselect ***Auto adjust other devices*** and then select ***OK.***

16. Repeat steps 3 through 15 for all installed programmable manipulators.

3.3.3 Z Setup

1. Set the Z Up/Down position for the platen

2. Move the platen down. This prevents the possibility of driving probes too far down into the test device.

3. Set the Z Up/Down for all installed manipulators using the same procedure as that used for the platen. The Z distance between Up and Down can be 5 to 10 mils.

3.3.4 Field of View Positioning

Field of View provides a method of synchronizing the positional configuration of all devices. This is particularly useful when positioning within a die with manipulators and the microscope.

1. Activate **pcNav**.

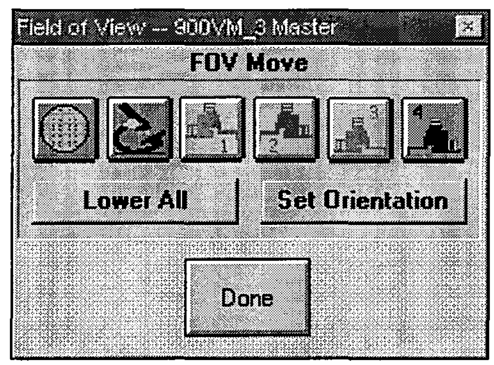
2. Set the Z Up/Down positions for all manipulators.

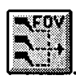
3. Place the manipulators in the required probing configuration.

4. Enable ***Auto Raise*** and deselect ***Auto Lower.***

5. Select the **microscope**.

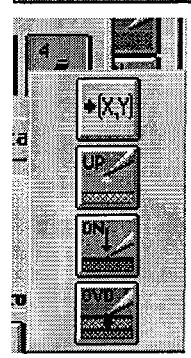
6. Position the video crosshair over a programmable manipulator probe tip.



7. Select the **Field of View** button  . The **Field of View** dialog box is displayed as shown at right.

8. Navigate to a desired probe location with the microscope.

9. Select the button of the manipulator to move. The menu at the right is displayed.



10. To cause the manipulator to follow the microscope's move in step 8, select the **Move X,Y** action in the menu. A **Stop** dialog box is shown until the move is completed.

11. If it is desired to lower the 900VM to its Z-down position, open the menu again and select the **Lower** action. A **Stop** dialog box is shown until the move is completed.

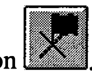
12. Select ***Done*** to quit FOV operation.

3.3.5 In Die Probing

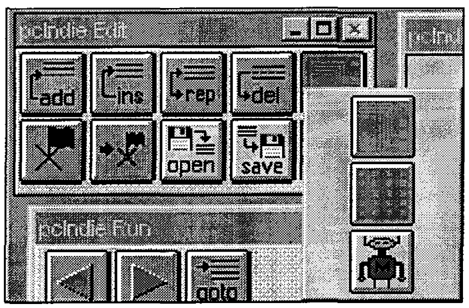
3.3.5.1 Learning Position Sequences

1. Activate **pcIndie**.

2. Select the **New In Die Program** button  from the **pcIndie/Edit** window.

3. Move all devices to their reference positions and Select the **Set In Die Reference** button .

4. Open the **Step Type** menu in the **Edit** window and select **Learn Step** as shown below.



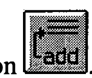
The pcIndie Step Type Menu

Learn Step icon

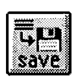
Matrix Step icon

Macro playback step icon

5. Position all devices for a test location.

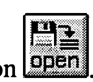
6. Select the **Add Step** button .

7. Repeat steps 5 and 6 until all locations for testing are in the program.

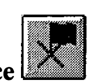
8. Select the **Save** button  to save the program on disk.

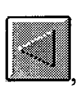
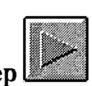
3.3.5.2 Playing Back Position Sequences

1. Activate **pcIndie**.

2. If the desired In-Die program is not in memory select the **Open** button .

3. Move all devices to the first test location.

4. Select the **Set In Die Reference**  button. A warning box comes up – select the **Y*es*** button.

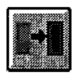
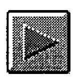
5. Use the **Back Step** , and **Forward Step**  buttons to move through the program.

3.4 Advanced Automation

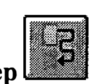
This section explains how to run In Die programs over an entire wafer and the use of pcNav macros.

3.4.1 Running In Die Tests on Multiple Die

3.4.1.1 Manual Stepping

1. Activate **pcWfr**.
2. Create a Wafer Die Program as described in section 3.2.6.3 **Defining a Wafer Program.**
3. Activate **pcIndie.**
4. Create an In Die program as described in section 3.3.5.1 **Learning Position Sequences.**
5. Select the pcIndie **Die Step** button  to move the stage to the first die program step.
6. Select the pcIndie **Forward Step** button  to move through the In Die program.
7. Repeat steps 5 and 6 until the test is complete.

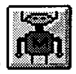
3.4.1.2 Automatic Stepping

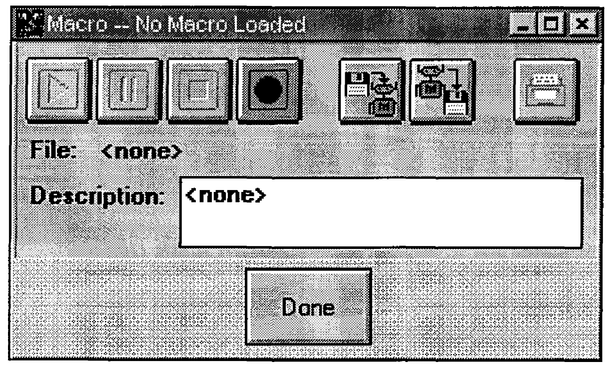
1. Activate **pcWfr**.
2. Create a wafer die program as described in section 3.2.6.3 **Defining a Wafer Program**.
3. Activate **pcIndie**.
4. Create an In Die program as described in section 3.3.5.1 **Learning Position Sequences**.
5. If needed, enable pcIndie **Delay** and enter the desired number of seconds.
6. Select the pcIndie **Auto Die Step**  button to initiate an automated In Die/Die Stepping sequence. The stage is moved through all the die in the wafer die program and the in-die program is executed on each die. Press ***Stop*** in either the pcIndie window or the move dialog box to halt motion and stop program execution.

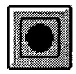
3.4.2 Using Macros for Frequently Performed Sequences

3.4.2.1 Recording and Saving a Macro

1. Activate **pcNav**.

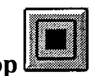
2. Select the **Tools/Macro**  button to open the Macro dialog box as shown at right.

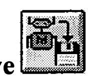


3. Select the **Macro Record**  button.

4. Perform the desired sequence of actions. Note that ONLY joystick and pcNav actions are recorded.

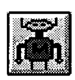
5. Select the **Tools/Macro** button.

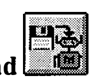
6. Select the **Macro Stop**  button.

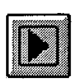
7. Select the **Macro Save**  button. Enter the name of the macro and enter a description of the macro function.

3.4.2.2 Loading and Running a Macro

1. Activate **pcNav**.

2. Select the **Tools/Macro**  button.

3. If the desired macro is not in memory already, select the **Macro Load**  button to access the desired macro.

4. Select the **Macro Play**  button. The macro executes. Select the **Macro Stop** button or the **Macro Pause**  button to halt macro execution. The macro will pause or stop after the step in progress completes.

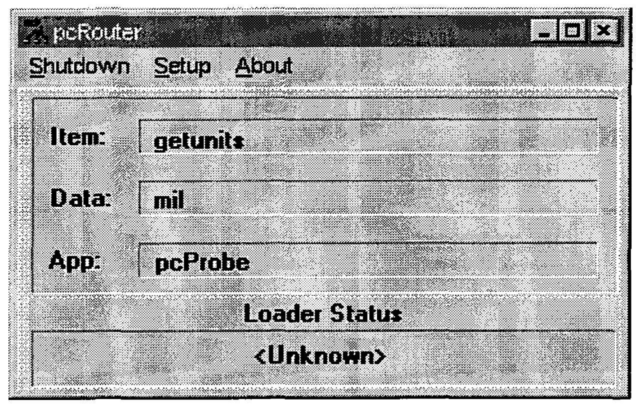
3.5 *Interfacing to Other software and Test Hosts*

This section describes how to connect to pcProbe^II from other programs and other computers.

3.5.1 DDE Communication through pcRouter

3.5.1.1 Requesting DDE Information from pcRouter

1. Set the DDE Application to "**pcProbe**"
2. Set the DDE Topic to "**data**".
3. Set the DDE Link mode to 2 (**COLD** mode) to open DDE conversation.
4. Set the DDE data format to **CF_TEXT**.
5. Set the DDE Item to the command request – e.g. "**getunits**".
6. Create the destination for the DDE data requested.
7. Perform the DDE Request.
8. Set the DDE Link mode to 0 (OFF) to terminate the conversation. The command is sent to pcRouter and the command status is displayed in the pcRouter window as shown at right.



3.5.1.2 Sending DDE Information to pcRouter

1. Set the DDE Application to "**pcProbe**"

2. Set the DDE Topic to "**data**".

3. Set the DDE Link mode to 2 (**COLD** mode) to open DDE conversation.

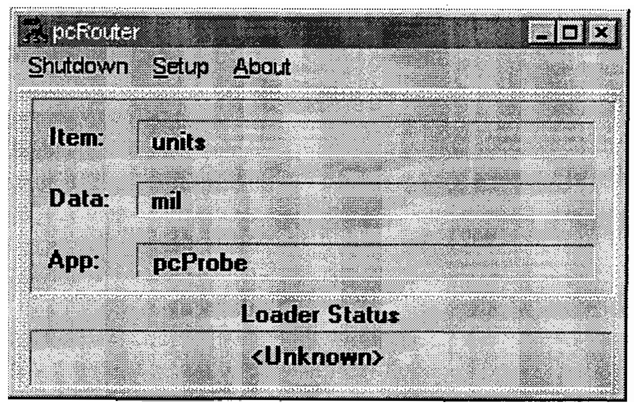
4. Set the DDE data format to **CF_TEXT**.

5. Set the DDE Item to the command request – e.g. "**units**".

6. Set the DDE data to the required value – e.g. "**mil**".

7. Perform the DDE Poke.

8. Set the DDE Link mode to 0 (OFF) to terminate the conversation. The command is sent to pcRouter and the command status is displayed in the pcRouter window as shown at right.



3.5.2 RS-232 and GPIB Communication through pcBridge

PcBridge is an optional software product designed to provide access to the pcProbe^{II} DDE commands from a remote computer. It is capable of interfacing to GPIB and RS-232. Contact the local Micromanipulator representative for more information on the product.

3.6 *Shutting Down pcProbe^II^*

1. Select **pcLaunch**.

2. Select ***Shutdown/Exit***.

3. All pcProbe^{II} applications are terminated. Note that any pcProbe^{II} applications running when pcLaunch exits are restarted the next time pcLaunch is run.

PcNav VX Reference Manual

Version 2.6.4

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Table of Contents

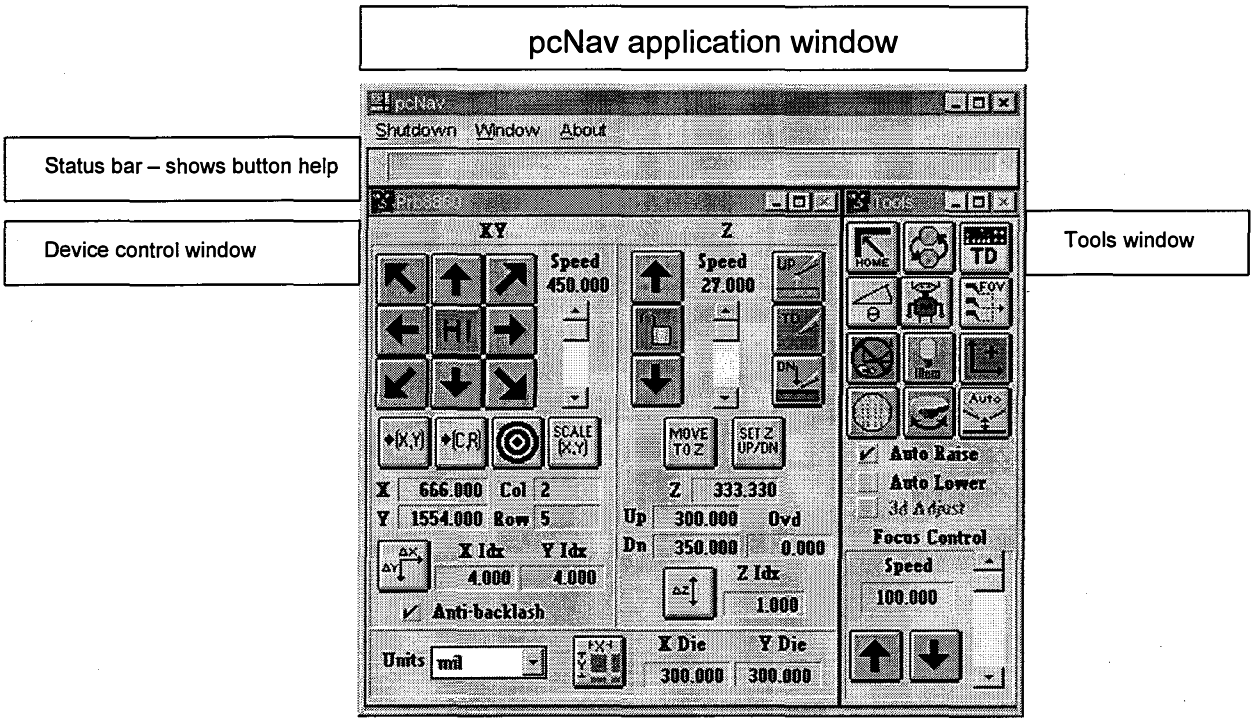
1 Introduction

The pcNav application is part of the pcProbe^{II} product. PcNav is normally used to perform system setup.

1.1 What is pcNav?

PcNav provides interactive positioning device management including control of up to four programmable manipulators, stage, microscope, and stage theta. During probing pcNav displays the position and control information for the active device. System setup, macros, and touchdown settings are also available.

PcNav consists of a menu, a **Status bar** that displays button help, and two main windows – **Device control**, and **Tools**.



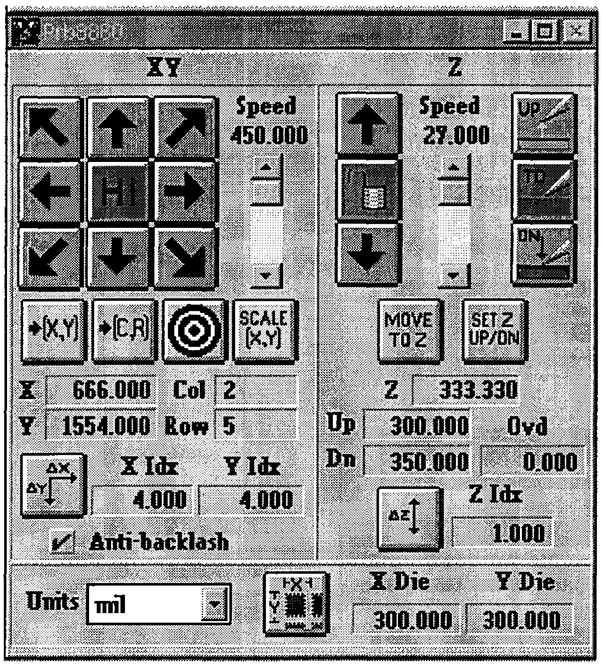
When the cursor is positioned over one of the buttons in pcNav, a "help mode" is activated and the **Status bar** describes the function of the button.

The **Device control window** allows the positioning of the currently selected device. It also provides the functions to set the reference position for X,Y and Column, Row; set the units, set the die size, and set the index size. The **Device control window** displays all of this information for the currently selected device, as well as the mode of the touchdown and overdrive.

The icons in the **Tools window** provide positioning device selection, device initialization, alignment, and joystick modes. Other functions include the ability to load a wafer, create macros, control the illuminator, and control auto theta (optional). In addition, access is provided to touchdown controls, field of view, axis orientation, and microscope focus.

2 Device control window

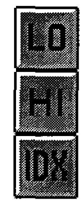
The **Device control window** provides interactive control of a positioning device and the device parameters. The title bar of the **Device control window** displays the name of the currently selected device.



2.1 X-Y navigation buttons

The jog direction buttons move the active device in the DUT coordinate direction shown on the button. All navigation functions in pcProbe^{II} are assumed to be in DUT coordinates. Motion is at a constant velocity, using the speed set with the **Speed control slider**. The value indicated above the slider is the speed in the current units per second. The **Jog speed icon** is a toggle. Each time it is selected it changes mode to one of the following – LO, HI, and IDX – as shown at right. Note that the speed slider setting is not saved when the system is rebooted. These settings are global to all pcProbe^{II} applications and are used for programmed moves as well. Index (**IDX**) mode causes the selected device to move the set index distance in the direction selected each time a jog direction button is pressed.

Jog speed icon



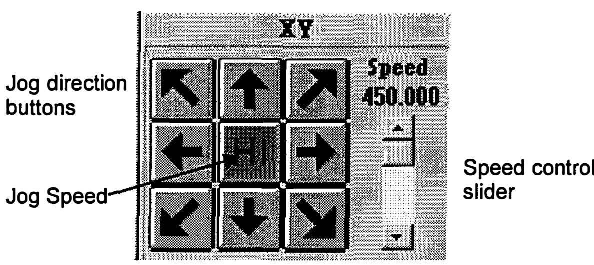
Low speed range. This is 1/50th high speed range.

High speed range

Index mode. In this mode the active device moves by the index size instead of a continuous motion.

NOTE: The physical direction of motion for the prober stage is opposite of the jog direction buttons. This is because the DUT moves with the stage.

X-Y Navigation Buttons



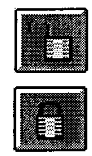
2.2 Z navigation buttons

The **Jog up** and **Jog down** buttons move the Z axis at a constant velocity based on the **Jog speed** in the **X-Y navigation buttons** and the Z **Speed control slider**. Note that the speed slider setting is not saved for re-use when the system is re-booted. The value indicated above the slider is the speed in current units per second. Z movement is enabled or disabled by selecting the **Z enable/disable button.** The button face changes to either the unlocked or locked button face each time this button is pressed.

The **Raise** button raises the device to the predefined up position. The **Lower** button lowers the device to the predefined down position. For information on setting the predefined Z up and down see section **2.8** Setting Z Up/Down and Overdrive.

The **Touchdown/Overdrive mode** button toggles the device between touchdown and overdrive modes. These modes affect the way the device performs a down move. When **Touchdown mode** is selected the device moves to its preset down position. If touchdown is sensed during the Z move the move immediately stops. When **Overdrive mode** is selected the device moves to the present down location or touchdown and then moves down past that location by the defined overdrive distance. Repeated selection of the Lower button in overdrive mode causes the device to increment down by the overdrive distance. For more information on setting the overdrive value, see section **2.8** Setting Z Up/Down and Overdrive.

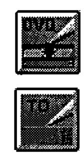
Z enable/disable modes



Enables Z movement

Disables Z movement

Touchdown/Overdrive mode



Z overdrive mode

Z touchdown mode

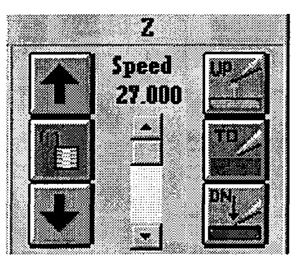
NOTE: The touchdown and contact sense signals are ignored if Z lower mode is set to **Overdrive,** so motion is not stopped.

Z navigation buttons

Jog up

Z enable mode

Jog down



Raise to predefined up position

Touchdown/Overdrive mode

Lower to predefined down position

Speed control slider

2.3 *Setting the X,Y and Column, Row reference origin*

The device's X,Y or Column, Row origin may be set at any time by selecting the **Set Reference icon.** Setting the reference synchronizes the pcProbe^{II} position with the position on the DUT. The function applies to the currently selected device and should correspond to some known reference on the DUT. The value for the reference position can be set to any value, and the column/row reference can be a location different from the X,Y reference.

Set Reference Icon

Normally, the X,Y reference is set to zero and the C,R reference is set to match the location on the wafer map. If pcWfr is not being used, then the C,R reference may also be set to zero. Setting the references to zero causes the artifact under the probe or crosshair to become the origin for all column,row and X,Y position.

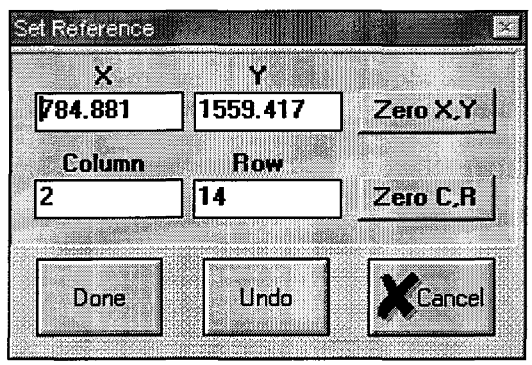
One strategy for in-die testing is to set the column, row to zero, but set the X,Y origin to the location of the device being tested. The pcWfr program uses column,row to move between die and pcIndie uses X,Y locations to test within the die.

NOTE: If the X,Y reference is reset, but the Column,Row reference is not, a dialog box is displayed to determine if the column,row reference should be reset to the current physical position. Select ***Yes*** to reset or ***No*** to leave it unchanged.

Set Reference dialog box

X,Y edit fields

Column,Row edit fields



Zero X,Y button places zeros in X,Y fields

Zero Column, Row places zeros in Column, Row fields

Undo resets edit fields back to the settings shown when dialog was first opened

2.3.1 Set X,Y Origin

1. Select the **prober** device.

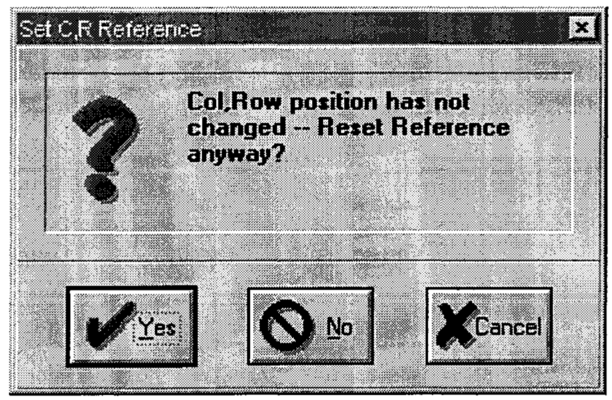
2. Navigate to the reference location. Be sure to approach the location from the top right to ensure accuracy.

3. Select the **Set Reference** button. The Set Reference dialog is displayed.

4. If this location is to be (0,0) select ***Zero X,Y***. If the location is known, the X,Y values may be entered in the **X** and **Y** fields.

5. Select ***OK***. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

6. Since the **Column, Row** location did not change the dialog box shown at right is displayed. This is to determine if the Column and Row reference should be set to the current position. Select ***Yes*** to reset or ***No*** to leave it unchanged.



2.3.2 Set Column, Row Origin

1. Select the prober device.

2. Select the **Set Reference** button.

3. Navigate to the die reference location

4. If this location is to be [0,0] select ***Zero C,R***. If the location is known, the Column, Row values may be entered in the **Column** and **Row** fields.

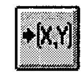
5. Select ***OK***.

2.4 *Move to X,Y position*

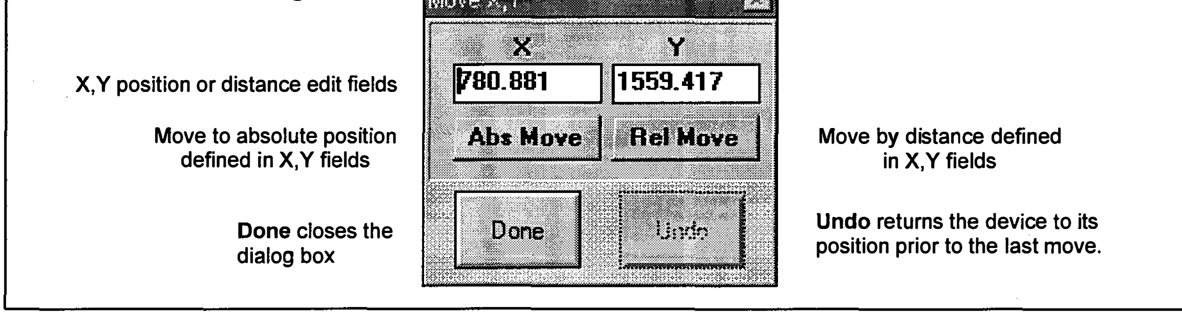
Use this function to move to a specific X,Y location on the DUT or by a known X,Y distance. Movement can be either to an absolute X,Y location or a relative position based on the current position plus the X,Y distance entered.

Set the reference position before using this function. For more information on setting a reference position see section **2.3 Setting the X,Y and Column, Row reference origin** on page 5.

Move to X,Y icon

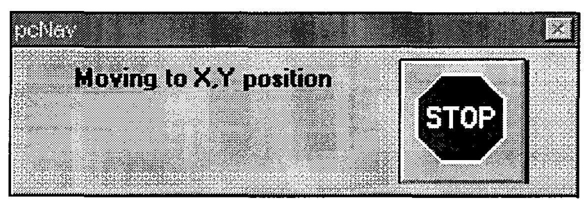


The Move X,Y dialog box



2.4.1 Moving to a Specific X,Y Location

1. Select the **Move X,Y** button. The **Move X,Y** dialog box is displayed.
2. Enter the desired destination in the **X** and **Y** fields.
3. Select ***Abs Move***. A ***Stop*** dialog box as shown at right is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.
4. Select ***Undo*** to return to the previous position.
5. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

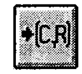


2.4.2 Moving by a specific X,Y distance

1. Select the **Move X,Y** button. The **Move X,Y** dialog box is displayed.
2. Enter the desired distances in the **X** and **Y** fields.
3. Select ***Rel Move***. A ***Stop*** dialog box is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.
4. Select ***Undo*** to return to the previous position.
5. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

2.5 *Move to Column, Row position*

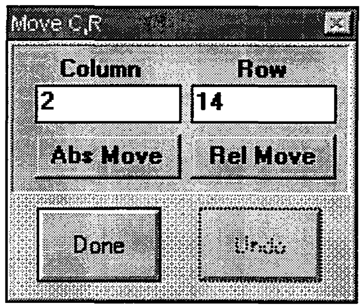
Move to Column, Row icon



Use this function to move to a specific Column, Row location on a DUT or to move by a known Column, Row distance. Movement can be either to an absolute Column, Row location or by a relative number of columns and rows from the current location.

Before using this function, set a reference position and die size. For more information on setting a reference position, see section 2.3 **Setting the X,Y and Column Row Reference Origin** on page 5. For more information on setting a die size, see section **2.11 Setting die size** on page 1.

The Move Column, Row dialog box



Column, Row edit fields

Move to absolute Column,Row location

Done closes the dialog box

Move relative number of columns and rows from current location

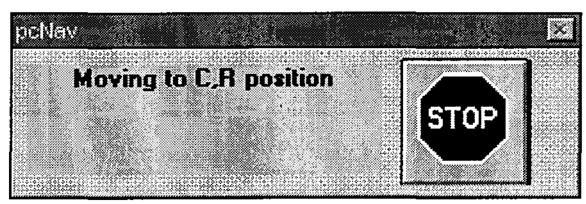
Undo returns the device its position prior to the last completed move.

2.5.1 Moving to a Specific Column, Row Location

1. Select the **Move Col,Row** button. The **Move C,R** dialog box is displayed.

2. Enter the desired destination in the **Column** and **Row** fields.

3. Select ***Abs Move***. A **Stop** dialog box is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.



4. Select ***Undo*** to return to the position of the last completed move.

5. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

2.5.2 Moving by a Specific Column, Row Distance

1. Select the **Move Col,Row** button. The **Move C,R** dialog box is displayed.

2. Enter the desired distances in the **Column** and **Row** fields.

3. Select ***Rel Move***. A **Stop** dialog box as shown at above is displayed until the move is completed. The ***Stop*** button may be pressed at any time to halt motion.

4. Select ***Undo*** to return to the position of the last completed move.

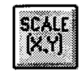
5. Select ***Done*** to exit the dialog box. This dialog box may be left open if it is required frequently.

2.6 Setting X,Y axis scaling

All positioning devices are calibrated at a temperature of 21° C (70°F) prior to shipment to ensure compliance with published positioning specifications. If the temperature in the test environment differs significantly from the calibration temperature is may exhibit apparent positioning inaccuracy due to thermal expansion of the mechanical system or the DUT itself. This inaccuracy usually increases linearly with displacement.

Use this function to compensate for the inaccuracy caused by temperature changes. Either set the X,Y scale manually or have it automatically calculated based on positions selected.

Set X,Y Scale icon



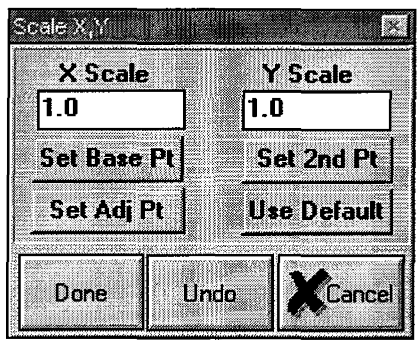
Note: Entering a scale value changes the current X,Y and Column, Row coordinates so these references may need to be reset.

The Scale X,Y dialog box

X,Y scale edit fields

Set point buttons for calculated method of scale entry

Done closes the dialog and sets the new scale factor



Use factory default scale values

Undo restores the scale values to those present when the dialog box was opened

2.6.1 Set X,Y scale manually

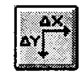
1. Select the **Scale X,Y icon** under the X-Y speed slider. The **Scale X,Y** dialog box is displayed.
2. Enter the X and Y scale values in the edit boxes.
3. Select **Done** to accept the new scale values.
4. Set new X,Y and Column, Row reference position as required.

2.6.2 Set X,Y scale using calculated method

1. Select the **Scale X,Y icon**.
2. Navigate to a known point.
3. Select **Set Base Pt.**
4. Navigate to where the next point **should** be using a programmed move tool like Move X,Y or index mode. Move along either the X or Y axis; do not move in both directions.
5. Select **Set 2nd Pt.**
6. Navigate to the corrected point using the joystick or jog buttons in HI/LO jog mode.
7. Select **Set Adj Pt.** The calculated scale values appear in the edit boxes.
8. Select **Done** to accept new scale values and close the dialog box.

2.7 *Setting X,Y index*

Set X,Y index icon



The X,Y index size is used by the **X,Y navigation buttons** when the **Jog speed** is set to **IDX.** For more information on the X,Y navigation buttons and jog speed see section **2.1 X-Y navigation buttons** on page 3. When the X,Y navigation buttons are used, the move corresponds to the defined index size.

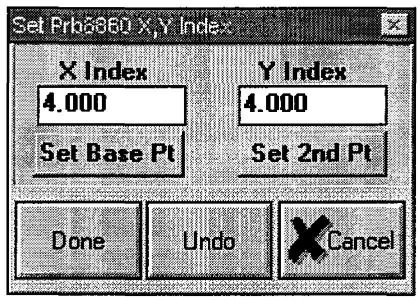
The X,Y index can be set manually if the desired index size is known. The index size can be calculated using navigation functions if the size is unknown.

The Set X,Y Index dialog box

X,Y Index edit fields

Set point buttons used for index calculation

Done sets the index size and closes the dialog box



Undo restores the current index settings in the X,Y index fields.

2.7.1 Setting a known X,Y Index Size

1. Select the **Set X,Y Index Size** button. The **Set X,Y Index** dialog box is displayed.
2. Enter the desired X,Y values in the **X,Y** fields.
3. Select ***Done*** to store the values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

2.7.2 Setting an X,Y Index Size Visually

1. Select the **Set X,Y Index Size** button. The **Set X,Y Index** dialog box is displayed.
2. Position to the first reference point for the index size.
3. Select ***Set Base Pt.***
4. Navigate the desired distance in X,Y.
5. Select ***Set 2^nd^ Pt.*** The new index size is calculated and stored in the X,Y fields.
6. Select ***Done*** to store the values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

2.8 Setting Z Up/Down and Overdrive

The Z Up and Down are user-defined position limits used by the software. Ideally, the Up position is defined such that the positioner raises the probe or the probe card to a safe height above the DUT. The Down position should be defined such that the probes make enough contact to perform a measurement at the test location without damaging it or the probe tips.

Set Z Up/Down and overdrive icon

The Overdrive distance is also a user defined limit. When the Z Overdrive mode is active, the positioner moves to the preset Down position or until touchdown is encountered and then moves the additional overdrive distance. See section **2.2 Z navigation buttons** on page 4 for more information.

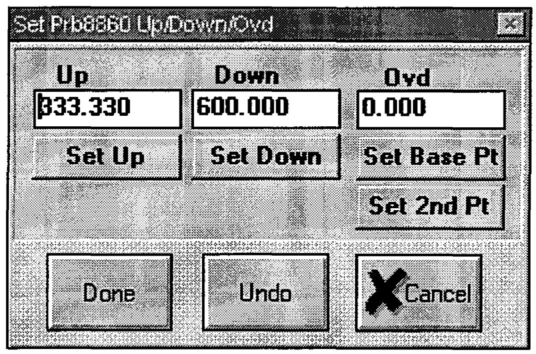
The Up and Down positions and Overdrive distance are set either manually or by calculating them based on visual navigation.

The Set Up/Down/Ovd dialog box

Z Up, Down, and Overdrive edit fields

Set Up/Set Down buttons set the field value to the current Z position

Done sets the Z Up, Down, and Overdrive values and closes the dialog box



Set point buttons for visual determination of overdrive distance

Undo sets the edit field values to the current device Z settings

2.8.1 Setting the Z Up, Down and Overdrive manually

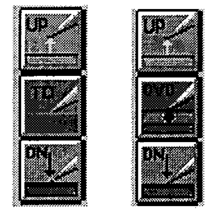
1. Select the **Set Z Up/Down and overdrive icon.** The **Set Up/Down/Ovd** dialog box is displayed.

2. Enter the desired Up, Down, and Overdrive values in the edit fields.

3. Select ***Done*** to store the values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

2.8.2 Setting the Z Up, Down and Overdrive using visual navigation

pcNav Z Lower Modes
Touchdown Overdrive



1. Rotate the X, Y, and Z knobs on each manual manipulator until the X,Y, and Z positions appear to be near the center of available manipulator travel. This gives the broadest range of initial motion. Note: For 900VM's, initialize each manipulator and then center each axis.

2. Observe the Z probe tip positions on all the manipulators. If the Z height of all the probe tips vary by more than 100 mils (2540 microns) it may be necessary to adjust the probe tips in the probe holders until all the tips are close to the same height.

3. Note the manipulator with the lowest probe tip. If there is some doubt, lower one until it is clearly the lowest.

4. Place the manipulators approximately in the final configuration.

5. Select the **prober** device. If the Z lower mode is set to Overdrive, click on the overdrive button to select Touchdown as shown above.

6. Select the ***Set Z Up/Dn*** button. The **Set Up/Down/Ovd** dialog box displayed.

7. Observe the Z distance between the probe tips and the surface of the wafer.

8. Lower the platen using either the joystick or MicroTouch knobs until the lowest probe tip is about 20 mils (500 microns) above the wafer. As the probe tips approach the wafer, be sure to slow the rate of descent to prevent unintentional probe contact with the wafer.

9. Select ***Set Down*** and ***Set Up*** and then ***OK***. Note: If the system has a 900VM, select it and set its ***Set Down*** and ***Set Up*** positions also. Reselect the prober.

10. Place the lowest manipulator such that the tip is over its intended target.

11. Select the **microscope** device.

12. Select the lowest power objective (usually 2X).

13. Navigate the microscope over the manipulator from step 10.

14. Select the next highest objective and adjust the microscope position until the target is visible.

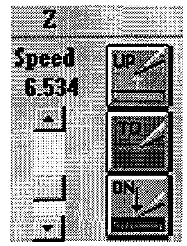
15. Focus on the surface of the wafer and select the ***Set Z Up/Dn*** button. Select ***Set Down***, ***Set Up*** and then ***OK***.

16. Select the **prober** device and select the ***Set Z Up/Dn*** button.

17. Select LO speed range.

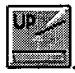
18. Slowly lower the platen until the probe tip contacts the target. Larger tipped probes usually start to scrub across the wafer when contact is made. Very small tipped probes tend to penetrate the surface. It may be necessary to adjust the X,Y position of the manipulator tip before contact is made to ensure that the probe tip contacts the target.

Z Speed Slider

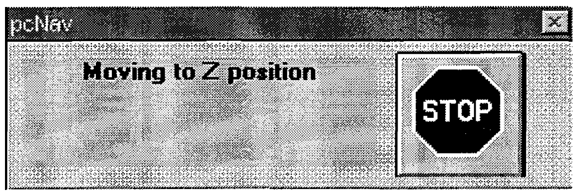


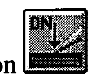
19. Select ***Set Down*** and then ***OK.***

20. Drag the **Z Speed slider** down to about ¼ full scale as shown at right.

21. Select the **Z Raise** button 

. A **Stop** dialog box as shown below is displayed until the move to the Z-up position is completed. The ***Stop*** button may be pressed at any time to halt Z motion.



22. Select the **Z Lower** button 

and observe the speed of descent for the probe tip. A **Stop** dialog box as shown above is displayed until the move to the Z-down position is completed. The ***Stop*** button may be pressed at any time to halt motion.

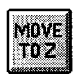
23. Adjust the **Z Speed Slider** as required to provide the best rate of descent.

24. Use the microscope to move to the remaining target sites. Place the platen in the Z-down position. Position each probe tip to its site and manually lower the probe tip until probe contact is established. Note: If a 900VM is being used, set ***Z-down*** to this position.

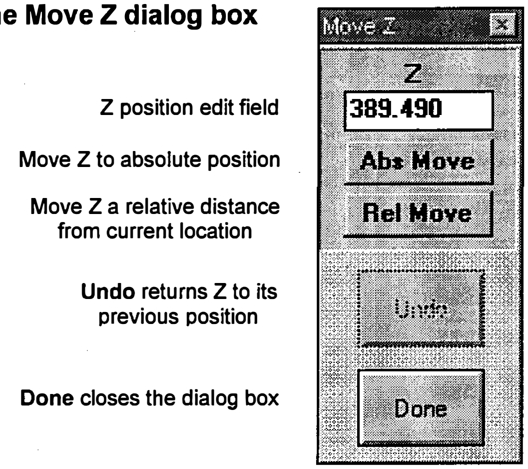
2.9 Move to Z Position

This function is used to move to an absolute Z location or by a Z distance relative to the current Z position.

Move to Z icon



The Move Z dialog box



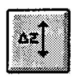
1. Select the **Move to Z icon**. The **Move Z** dialog box is displayed.
2. Enter the desired Z value in the edit field.
3. Select the **Abs Move** button to move to the Z position in the edit field. Select the **Rel Move** button to move by a relative Z distance from the current location.
4. Select ***Done*** to store the values and close the dialog box.

2.10 Setting Z index

The Z index size is used by the **Z navigation buttons** when the Jog speed is set to **IDX.** For move information on the Z navigation buttons see section **2.2 Z navigation buttons** on page 4. For more information on Jog speed, see section **2.1 X-Y navigation buttons** on page 1. When the Z navigation buttons are used, the move corresponds to the Z index size.

The index size is set either manually or calculated using visual navigation.

Set Z index icon



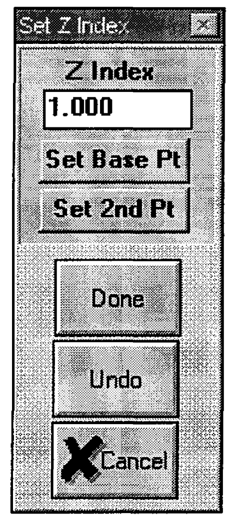
The Set Z Index dialog box

Z index edit field

Set base and 2nd locations for calculated index

Done sets the Z index size to the edit field value and closes the dialog box

Undo restores the edit field to the current Z index value for the device



2.10.1 Set Z index manually

1. Select the **Set Z index icon**. The **Set Z Index** dialog box is displayed.

2. Enter the Z index value in the edit field.

3. Select ***Done*** to store the values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

2.10.2 Calculate Z index using visual navigation

1. Select the **Set Z index icon.**

2. Navigate to the base point to be used to calculate the Z index value.

3. Select **Set Base Pt.**

4. Navigate by the required index distance.

5. Select **Set 2nd Pt.** The calculated distance is placed in the edit field.

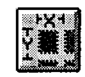
6. Select ***Done*** to store the values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

2.11 Setting die size

The X,Y die size is used to determine the Column, Row position referenced to the user defined origin as described in section **2.3 Setting the X,Y and Column, Row reference origin** on page 5.

The die size is entered either manually or calculated using visual navigation.

Set X,Y die size icon



The Set X,Y Die size dialog box

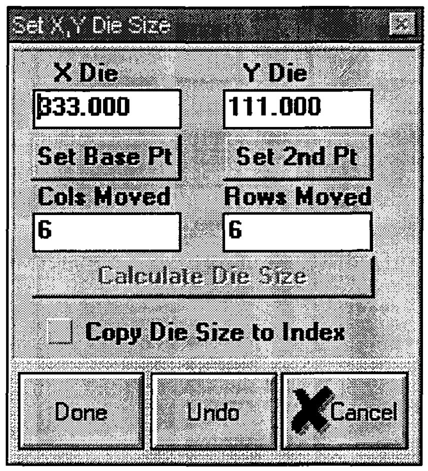
X,Y die size edit fields

Set base point for calculation of die size

Columns moved if using averaging method

Calculate die size using averaging method

Done sets the new die size and closes the dialog box.



Set 2[nd] point for calculation of die size

Rows moved if using averaging method

Sets the X,Y index values for the device to the die size when **Done** is selected

Undo restores all fields to the current device values

2.11.1 Setting Die size manually

1. Select the **Set Die Size** button. The Set X,Y Die Size dialog is displayed.
2. Note the current units. If a different units base is required select it from the **Units** list.
3. Select the **X Die** entry field and enter the X die spacing.
4. Select the **Y Die** entry field and enter the Y die spacing.
5. Select ***Done*** to set the new values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

2.11.2 Calculate die size using visual navigation and averaging

1. Select the **prober** device.

2. Select the lowest power objective.

3. Navigate to a die at the bottom left of the wafer.

4. Position to an easily locatable artifact on the die under the video crosshair or under a reference probe tip.

5. Select the next higher power objective.

6. Adjust the position of the stage until the crosshair or probe tip is perfectly aligned with the artifact. Be sure to approach the artifact from the top right to ensure best accuracy.

7. Select the **Set Die Size** button.

8. Note the current units. If a different units base is required select it from the **Units** list.

9. Select ***Set Base Pt.***

10. Move the DUT up and over at least 4 die. Count the number of rows and columns from the reference die to the new target die.

11. Adjust the position of the stage until the crosshair or probe tip is perfectly aligned with the artifact from step 6.

12. Select ***Set 2nd pt.***

13. Enter the number of columns and rows moved from the reference die in the data fields labeled **Cols Moved** and **Rows Moved**.

14. Select ***Calculate Die Size.*** This calculates the average distance between the die. The calculated die size is placed in the **X Die** and **Y Die** fields.

15. Enable ***Copy Die Size to Index*** if indexing between die with the jog buttons is required.

16. Select ***Done*** to set the new values and close the dialog box. Selecting ***Undo*** restores the previous values. Selecting ***Cancel*** exits with no change.

Hint: Use navigation to obtain an approximate die size by traversing across 1 die. Check the ***Copy Die Size to Index*** box and select ***Done***. Then follow the procedure above, using the jog buttons in ***index*** mode to traverse die in step 10. Select ***lo*** speed to perform the final adjustment in step 11. Then complete the procedure.

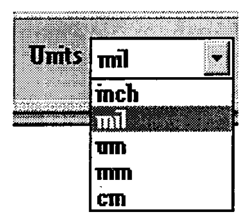
2.12 Setting Units

Five different units of measurement are available in pcProbe^{II} :

- **inches**
- **mils (1/10^3 inch)**
- **microns (1/10^6 meter)**
- **millimeters(1/10^3 meter)**
- **centimeter (1/10^2 meter)**

Units are set as follows:

1. Select the **Units** drop down list by clicking on the down arrow to the right of the current units as shown at right.
2. Click on the desired units base.



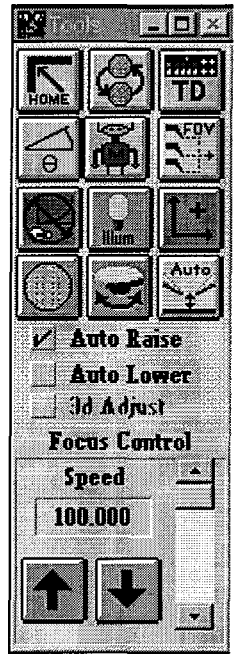
2.13 Enabling anti-backlash

The anti-backlash move is usually enabled and is required to minimize the effects of normal looseness in the mechanical system. Programmable manipulators, however, due to their extremely high resolution may not require anti-backlash. Another case where anti-backlash may not be desired is when positioning the stage or microscope under high magnification. In this case the anti-backlash motion is so large that it overshadows small computer controlled adjustments.

Anti-backlash is enabled and disabled by clicking on the **Anti-backlash** checkbox as shown below.

3 Tools window

The **Tools window** provides the following tools:



- **Initialize devices to home**
- **Load a DUT or wafer**
- **Modify touchdown settings**
- **Perform alignment (device specific)**
- **Create and run macros**
- **Perform field of view navigation**
- **Change joystick modes**
- **Turn illuminator power On/Off**
- **Set up coordinate references**
- **Select devices**
- **Perform auto theta alignment**
- **Set devices subject to Auto Raise/Auto Lower**
- **Focus the microscope**

3.1 *Initialize positioners*

Initialize icon

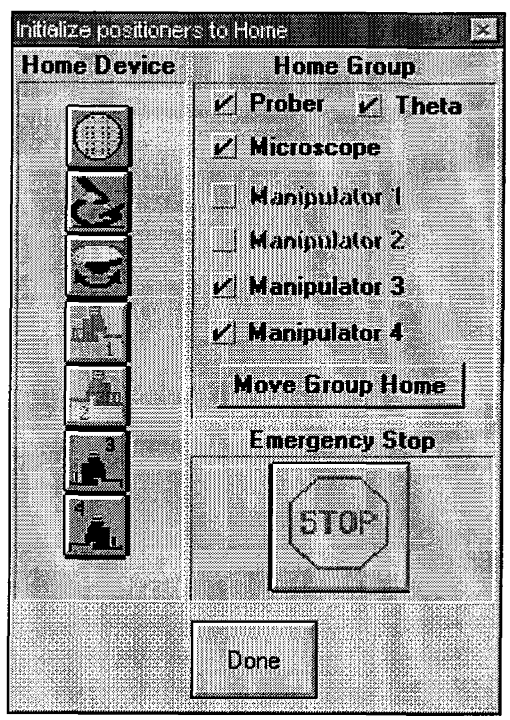
The best possible accuracy for all positioning devices can only be achieved when they are initialized to their respective home positions. Initialization is not required to perform most navigation functions, but any positioning requiring highly accurate absolute positioning will not work properly without first initializing.

Initialization is used to determine its mechanical position with respect to its limit switches. The point of contact with X,Y and Z limit switches is used as the internal zero reference of the positioning device. After initializing to the limits, the device moves to the user defined (0,0) position as set using the procedures in section **2.3 Setting the X,Y and Column, Row reference origin** page 5.

Positioners are initialized one at a time or as a group. If initializing one device at a time, be sure there is sufficient clearance for the device to complete its home move without colliding with and other devices or optics. If a higher power objective is selected, or if a probe card is installed, the scope lift arm should be properly adjusted to ensure probe tips do not collide with the objective. All device icons and selections which do not match an installed device are disabled (grayed) in the **Initialize positioners to Home** dialog box. A **STOP** button exists in the dialog box so that initialization can be halted at any time.

The Initialize positioners to Home dialog box

The **Home Device** icons are used to initialize devices one at a time. Click on the device icon to initialize only that device.



The **Home Group** moves all checked devices to their home positions when the **Move Group Home** button is pressed.

Use the **STOP** button to abort the initialization procedure at any time. All positioners stop immediately.

Done closes the dialog box.

3.1.1 Initialize an individual positioning device

1. Select the **Initialize icon**. The **Initialize positioners to Home** dialog box is displayed.

2. Select the icon of the device to send to its home position – for example the **prober**. All buttons except **STOP** are disabled while initialization is in progress.

3.1.2 Initialize a group of positioners

1. Select the **Initialize icon.**

2. Select the devices to send home by clicking on the name of each device in the **Home Group**.

3. Check to be sure that the microscope home path (left rear) is clear and that probes will safely clear any obstacles or objectives.

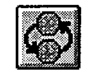
4. Select ***Move Group Home*** to move all devices to the home position. During the home moves the ***Stop*** button is enabled. Clicking on this button stops all home moves.

5. Click on ***Done*** when moves are completed to close the dialog box.

3.2 Loading a Wafer

The load wafer function provides a convenient method of safely loading and unloading wafers from the chuck. Two types of load sequence are available – **manual load** and **auto load**. The **manual load** sequence is used when the user must handle the wafer with a vacuum wand or tweezers. The **auto load** sequence is available only if the auto-handler robot and pre-aligner options are installed. The auto load option is enabled in pcWfr.

Load wafer icon



3.2.1 Load a wafer manually

The Load Wafer dialog box (Manual Load)

Select the **Load** button to move to the load position.

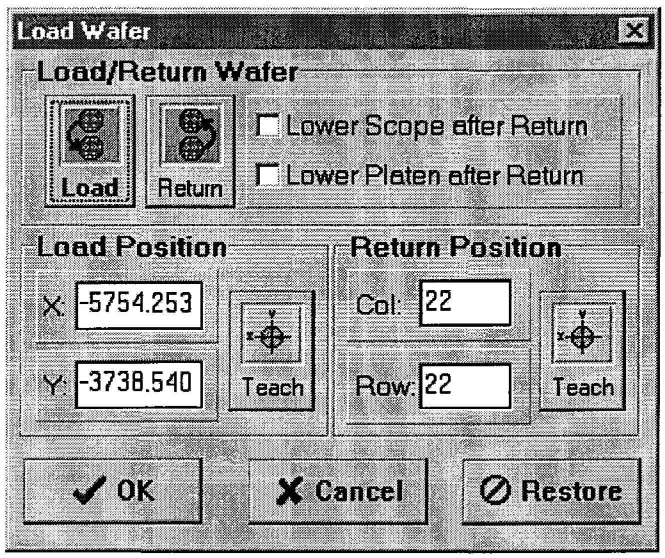
Select the **Return** button to return to the desired return location

The **Load Position** is the location most convenient for unloading and loading a wafer.

The **Teach** button is used to define a new load position.

Select **OK** to store options and close the dialog box.

Select **Cancel** to close the dialog without saving options.



The **Lower Scope** and **Lower Platen** options return the scope and platen to their pre-load positions.

The **Return Position** is the location most convenient for continuing wafer setup functions.

The **Teach button** is used to define a new return position.

Select **Restore** to return all options to the their states when the dialog was first opened.

1. Select the **Load wafer icon**. The **Load wafer** dialog box is displayed.
2. Enable the desired options for lowering the scope and platen after the return move.
3. Select the **Load** button. The following sequence occurs:
   - The microscope raises
   - The platen raises
   - If the auto-theta option is installed, the theta chuck rotates to the center of its travel
   - The chuck is moved to the **load position**

During the load operation a **Stop** dialog box is displayed. Select the **Stop** button at any time to halt the load operation.

4. Turn off the vacuum to the chuck and remove the wafer.

5. Place the new wafer on the chuck and turn on vacuum.

6. Select the **Return** button. The following sequence occurs:

   - The chuck is moved to the **return position**
   - If the auto-theta option is installed, the theta chuck rotates to its previous position.
   - If the **Lower Platen after return** option is enabled, the platen is lowered to the preset up position.
   - If the **Lower Scope after Return** option is enabled, the scope is lowered to its previous position.

7. Select **OK** to save option settings and close the dialog box or select **Cancel** to close the dialog box without saving changes.

3.2.2 Load a wafer automatically with the auto-handler (OPTIONAL)

The Auto Load Wafer dialog provides access to the auto-handler functions. It does not do any native data storage or manipulation. All handler, pattern recognition, and load functions are performed in or through pcRouter.

The Auto Load Wafer dialog box

The **Get a Wafer** button loads the next wafer from the cassette.

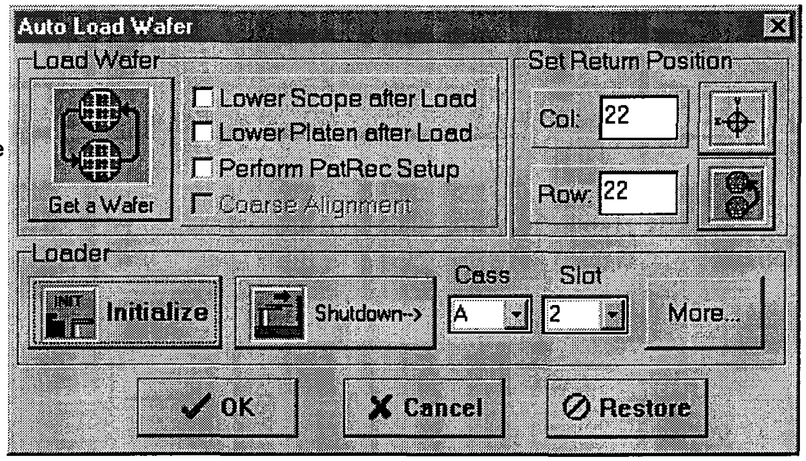
The **Lower Scope** and **Lower Platen** options return the scope and platen to their pre-load positions.

The **Perform PatRec Setup** option uses pattern recognition to automatically align the wafer and set column, row reference.

The **Coarse Alignment** option inhibits the scan align option in pattern recognition.

Initialize causes the handler and pre-aligner to initialize to home.

Shutdown unloads all wafers from the chuck and pre-aligner to the wafer cassette.



Select **OK** to store settings and close the dialog box. Select **Cancel** to close the dialog box without saving options. Select **Restore** to return all settings to their states when the dialog was first opened.

The **Set Return Position** is the location most convenient for continuing wafer setup functions.

The **Teach button** is used to define a new return position.

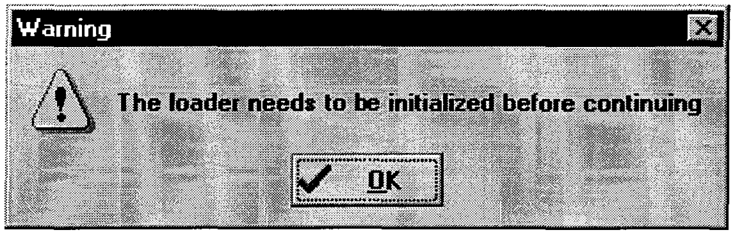
The **Move to Return** button causes the chuck to move to the return position.

The **Cass** and **Slot** define the current active wafer cassette and slot.

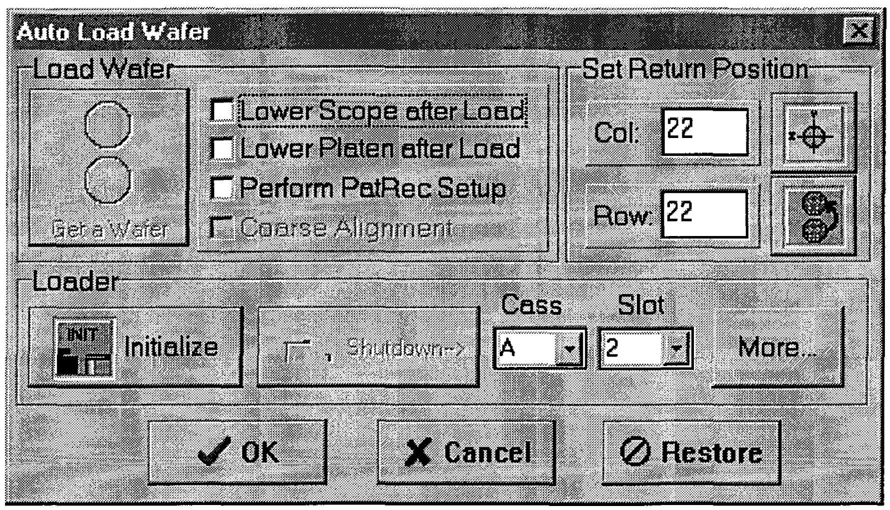
The **More...** button opens the **Loader I/O** dialog box. Reference the pcWfr manual for more information.

The following procedure Auto Loads a Wafer:

1. Select the **pcWfr** application.
2. Enable the ***Auto Loader*** and ***Auto Correction*** options in the **Setup Options** dialog box of pcWfr.
3. Select the **Load Wafer** button. The following dialog box appears:

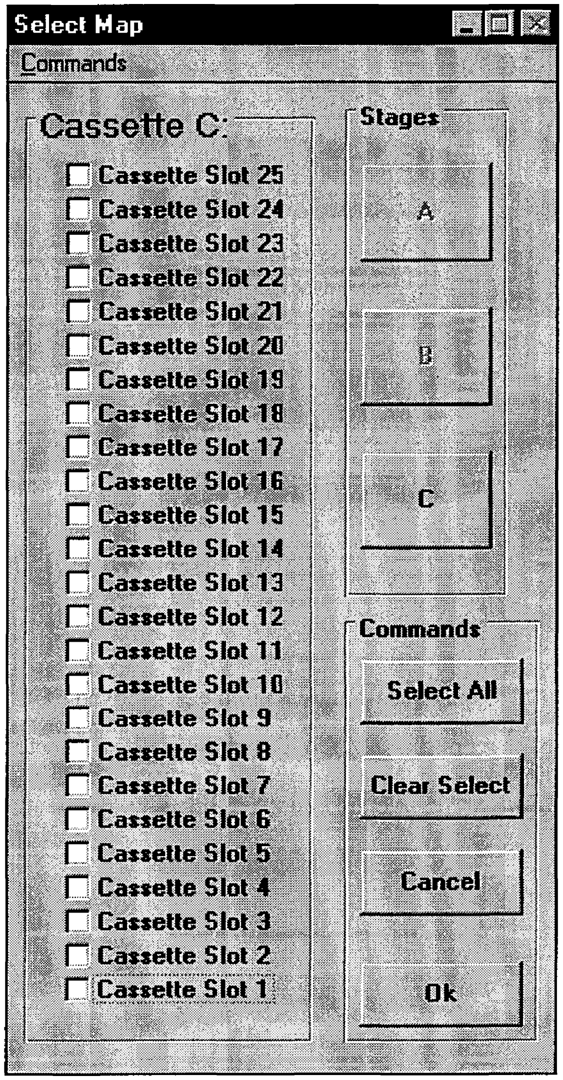


4. Select **OK**. The **Load Wafer** dialog box appears as follows:



5. Make sure that the prober chuck doesn't have a wafer on it and that the pre-aligner is empty. Place a wafer cassette on one of the stands and then select the ***Initialize*** button.

6. The **Auto Load Wafer** dialog box buttons are disabled and the handler robot and pre-aligner initialize to their respective home positions. This operation takes several minutes the first time this is performed after a power up. The cassette map selection window appears next:

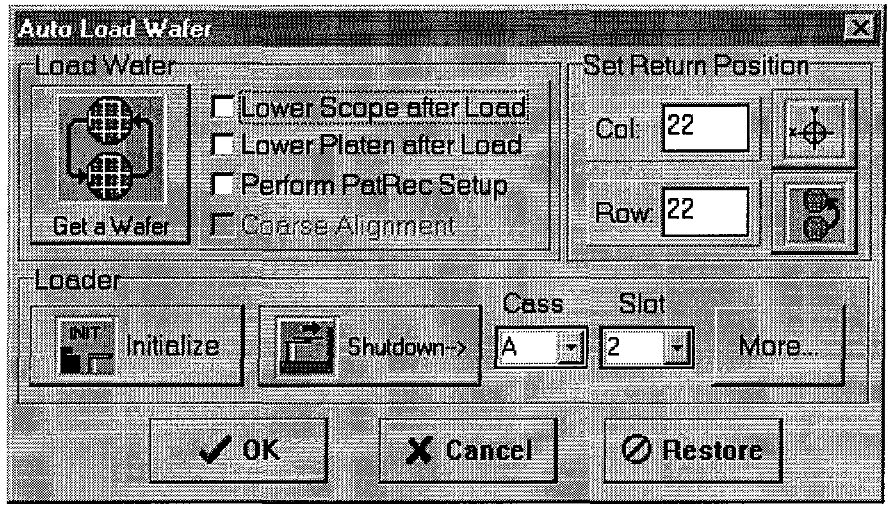


Enable the slots with wafers in them and then select **Ok**. The load wafer dialog controls are now enabled.

7. Select the ***Get a Wafer*** button as shown below. The following sequence occurs:

WARNING!!!!!!!

Do not operate other Windows applications while the ***Get a Wafer*** operation is active. There is a slight possibility that a software lockup could occur. Wait until the loader has completed prealigning the next wafer before interacting with applications.



*The microscope raises, the stage moves to the load position, and theta is adjusted to the load angle.

*The first selected wafer is loaded from the cassette to the pre-aligner and aligned.

*The wafer is placed on the chuck and the next wafer is loaded to the pre-aligner and aligned.

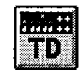
*The stage moves to the return position and theta is moved to its previous position.

*The platen and/or scope are lowered if these items were selected.

8. Select the ***Perform PatRec Setup*** option and then select **Ok** to exit the load dialog box.

3.3 Touchdown control

Touchdown control icon



The **Touchdown control** dialog provides access to the prober touchdown input and PCS-4 Contact Sense Module. There are two touchdown states for the prober and the PCS-4 inputs have three states. The dialog shows the constantly updated states of all PCS-4 inputs and prober touchdown.

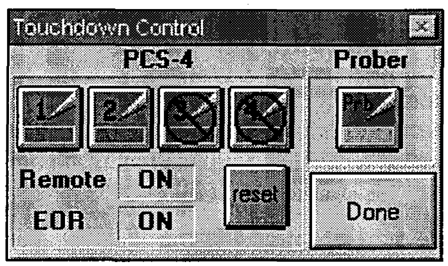
Touchdown sense for a PCS-4 input is enabled or disabled by clicking on the button associated with that input. The touchdown state for all PCS-4 inputs is cleared by pressing the **reset** button.

The Touchdown control dialog box

PCS-4 Input States

Position of PCS-4 remote switch

EOR is ON if all enabled PCS-4 channels indicate touchdown sensed

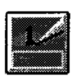


Prober touchdown state

Done closes the dialog box

Reset clears the latched touchdown states for all inputs.

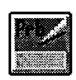
PCS-4 Touchdown states


Input touchdown not sensed


Input touchdown sensed


Input touchdown sense disabled

Prober Touchdown states


Prober touchdown not sensed


Prober touchdown sensed

Note: The local/remote switch on the PCS-4 must be in the **remote** position for pcProbe[II] to control it.

Use the following steps to enable touchdown sense with the PCS-4:

1. Select the **Touchdown control icon**. The touchdown dialog is displayed.

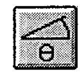
2. Select the button associated with the PCS-4 touchdown input channel. The button face toggles to either the disabled state or one of the touchdown sense states.

3. Select the **reset** button to clear any latched touchdown signals and update to the actual states.

4. Select **Done** to close the dialog box.

3.4 Alignment

Wafer alignment icon



The alignment functions are used to define the angular relationship between the X,Y axis of a positioning device that the X,Y axis of the DUT. Alignment must be performed to ensure accurate positioning of the DUT. Any alignment error between the wafer X,Y coordinates and those of the positioner can dramatically effect the apparent accuracy of the positioner.

Two methods are available for device alignment with the DUT. The first is to perform a two point alignment to calculate an offset angle of the current device with respect to the DUT. Pcprobe^{II} will then use that alignment angle for position calculations. The second is available with the optional auto-theta chuck – the chuck is rotated to match the DUT with the device axis. If an auto-theta chuck is installed go to section **3.11 Auto theta** on page 40 for more information on this second method.

All installed positioning devices should be aligned by the user when a system is first booted with a new wafer. Once this is performed the **Auto adjust other devices** option can automatically adjust the alignment angles of all devices to match a new DUT orientation by aligning only one of the devices to the DUT.

If the planarity option is installed in system alignment must be performed prior to doing the planarity setup. Refer to the pcPlanarity user manual for information on that option.

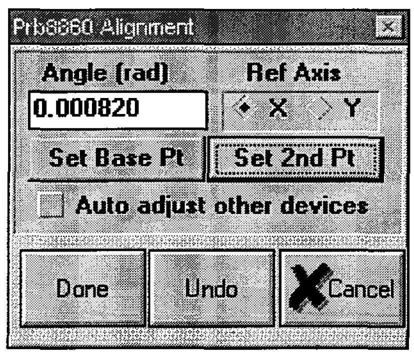
The Alignment dialog box

Alignment angle edit field

Set first alignment point

Automatically adjust all other device alignment by the alignment angle

Done closes the dialog and sets new alignment angle



Preferred alignment axis

Set second alignment point

Undo restores the angle edit field to the current device angle

Perform a two point alignment on a device as follows:

1. Select the lowest power objective (usually 2X).
2. Look through the microscope eyepieces and use the manual theta adjustment knob to rotate the chuck until the wafer appears to be aligned.
3. Select the prober stage device.
4. Select the highest power objective.
5. Select the **Wafer alignment** button.
6. Deselect ***Auto Adjust other devices***.

7. Select X as the alignment reference axis by selecting the **Ref Axis/X** check box.

8. Navigate to the bottom of a die near the left side of the wafer. Align the horizontal pcVideo crosshair or probe tip exactly with the bottom edge of the die. Be sure to approach the location from above and right to ensure the best possible alignment.

9. Select ***Set Base Pt.***

10. Move in the X (horizontal) direction along the bottom edges of the die to the right side of the wafer. Align the pcVideo crosshair or probe tip to the bottom edge of the die. Be sure to approach the line from above right.

11. Select ***Set 2nd Pt.***

12. Select ***OK*** to set new alignment angle and close the dialog box.

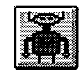
13. Select the microscope device and repeat steps 5 through 12.

> **NOTE:** Once the microscope and prober stage are aligned to each other their angular relationship is known and constant. Subsequent wafer alignments require only the stage with the ***Auto adjust other devices*** option enabled.

3.5 Macros

A macro is a recorded sequence of frequently repeated actions. A particularly useful macro would be to perform a system setup procedure. This is helpful if a number of different DUTs are tested on the same system.

Macro icon

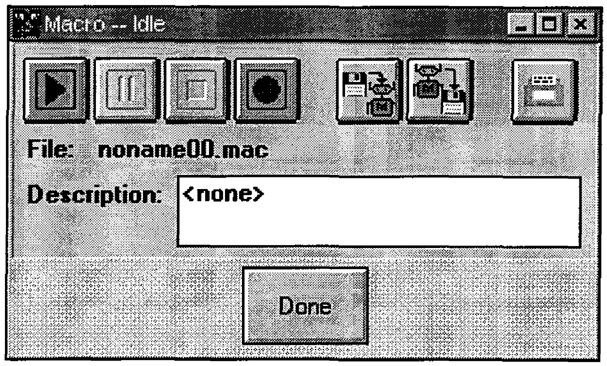


The Macro dialog box

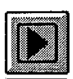
Macro dialog buttons

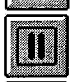
Name and description of current macro file

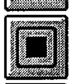
Done button closes macro dialog box

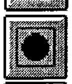


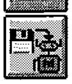
Macro dialog buttons

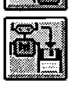
 Play macro

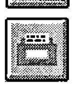
 Pause

 Stop

 Record

 Open macro

 Save macro

 View macro

3.5.1 Recording a Macro

1. Select the **Macro icon**. The **Macro** dialog is displayed.

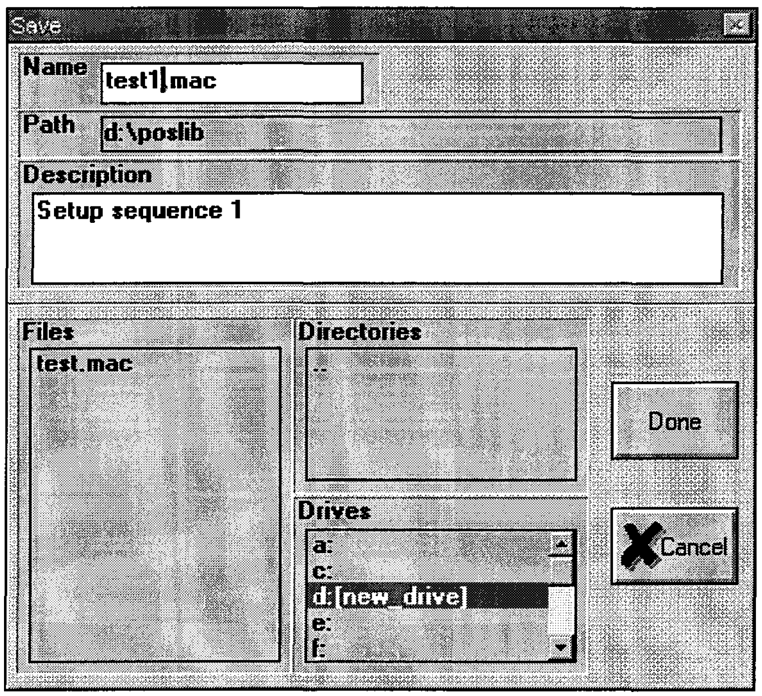
2. Select the **Record** button the **Macro** dialog box. The macro dialog box is hidden.

3. Perform the steps you wish saved in the macro. Note that the pcNav help line indicates the macro is recording.

4. When the procedure is complete, select the **Macro icon** again.

5. Select the **Stop** button in the **Macro** dialog box.

6. Select the **Save macro** button. The **Save macro** dialog box is displayed as shown below.



7. Select the drive and directory destinations for the file.

8. Enter the file name in the **Name** field or select a file name from the list of files.

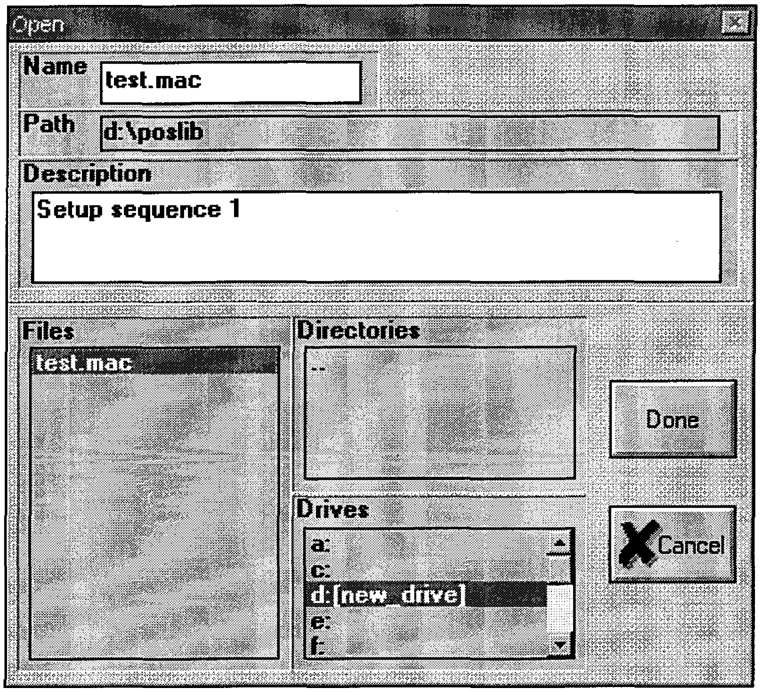
9. Enter a description for the macro in the **Description of Macro** field.

10. Select **Done** to save the macro.

3.5.2 Load and playback a macro

1. Select the **Macro** icon. The **Macro** dialog box is displayed.

2. Select the **Open macro** button. The **Open macro** dialog box is displayed as shown below.



3. Select the source drive and directory for the file.

4. Enter a file name in the **Name** field or select a file from the Files list.

5. Select **Done** to load the file.

6. Select the **Play** button. The macro is played.

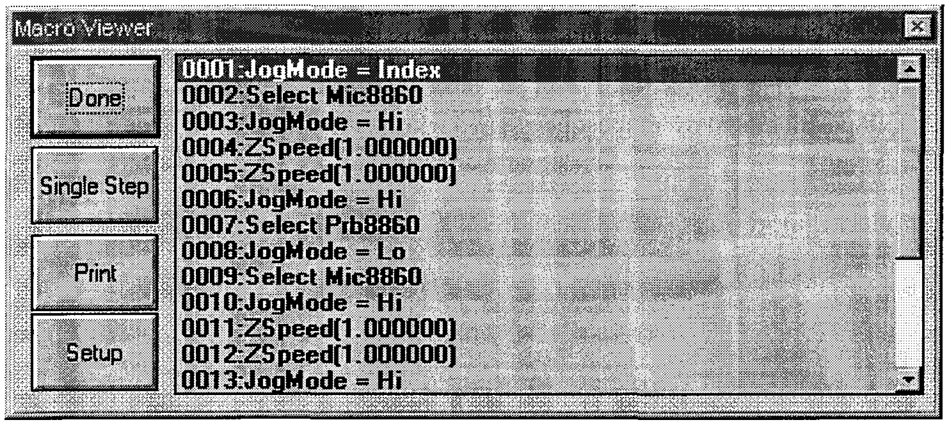
7. Select **Done** to close the macro dialog box.

3.5.3 Viewing and debugging macros

1. Select the **Macro icon.** The **Macro** dialog box is displayed.

2. If a macro is not already in memory, record one or load one from disk.

3. Select the **View macro** button. The **Macro Viewer** dialog is displayed as shown below.



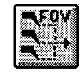
4. The macro sequence is displayed in the window. Select **Single Step** to execute one step of the macro at a time. Select **Print** to print the contents of the window. Select **Setup** to configure the printer.

5. Select **Done** to close the dialog box.

3.6 *Field of View*

Field of view function provides a convenient method of moving positioners from one site to another without having to navigate each of them manually. The field of view function can be activated at any time. The relative locations of all positioners are stored when the **Field of view** button is selected.

Field of view icon



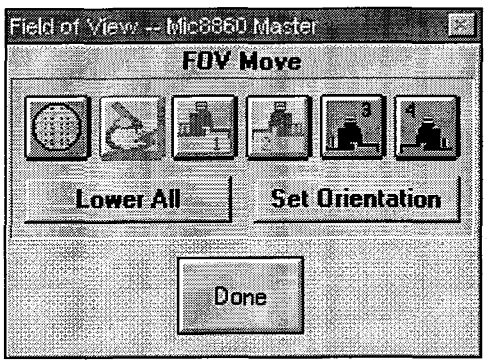
The currently selected device is the **Master device.** The **Master device** can be moved to any location. All other available positioners, or **Slave devices,** are enabled in the **Field of view** dialog box. Any motion of the master device can be duplicated by the slave device by clicking on the slave's icon. For all slave devices except the microscope, a **Slave option menu** is displayed. **Note that all positioning devices must be aligned with the DUT for field of view to correctly function.**

The Field of view dialog box

Slave device icons

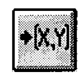
Lower all slave devices to their down positions

Done closes the dialog box

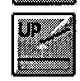


Set slave device position orientations relative to the master device

Slave option menu

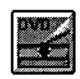


Follow master to X,Y location



Raise slave device to its up position

Lower the slave device to its down position



Lower the slave device by the overdrive distance

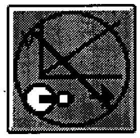
Perform a field of view move as follows:

1. Select the **Field of view icon**. The **Field of view** dialog box is displayed.
2. Move the master device (usually the microscope) to the desired location.
3. Select the slave device icon to move by clicking on its ***Move X,Y*** option. Select another device as required.

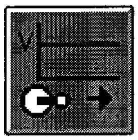
> **Warning:** If the selected slave device is not set to auto raise when using field of view Move X,Y, damage to probe and wafer may result.

3.7 Joystick modes

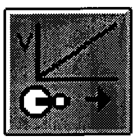
The **Joystick icons** indicate the current mode of the joystick.



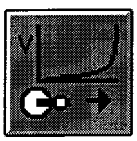
Joystick off disables the joystick and MicroTouch knobs.



Joystick constant causes the positioning device to move at a constant velocity regardless of joystick deflection or MicroTouch knob rotation. The behavior in this mode is just like that available form the pcNav navigation buttons.



Joystick linear causes the positioning device to move at a velocity directly proportional to the deflection of the joystick or rotation rate of the MicroTouch knobs. The MicroTouch knobs operate best in this mode.



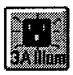
Joystick exponential causes the positioning device to move at a velocity equal to an exponential function of joystick deflection or MicroTouch knob rotation rate. The joystick operates best in this mode because the available velocity range is the greatest.

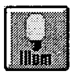
Change joystick mode as follows:

1. Select the **Joystick icon** with the left mouse button.

2. Select the desired joystick icon from the pop-up menu. The joystick icon in the **Tools** window changes to the selected mode.

3.8 Illuminator power



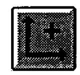


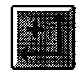
The illuminator icon turns the illuminator power outlet on or off. The illuminator must be plugged into the **Auxiliary Power** outlet on the back of the test station controller enclosure for it to operate. Either icon is available at install time for pcNav.

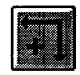
3.9 Coordinate reference

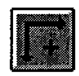
The **Coordinate reference icon** drop-down menu allows for definition of the coordinate system reference for a device. The arrows indicate positive travel.

Coordinate reference icons


Normal X,Y orientation

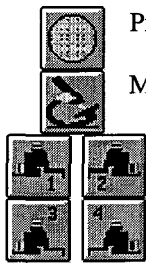

X axis reversed


X and Y axis reversed


Y axis reversed

3.10 Devices

In pcProbe^{II} only one positioning device is controllable at a time. This device is referred to as the **Active Device.** The **Device icon** displayed represents the currently active positioning device. A drop-down menu of available devices appears when the device icon is selected. Select the desired positioning device from the menu and that device becomes the active device.



Prober Stage/Platen

Microscope

Manipulators

3.11 Auto theta

Auto Theta icon

This function is used to adjust theta on a system with an Auto Theta unit. When the **Auto Theta icon** is selected, the **Theta control** dialog box is displayed. Alignment can be done either automatically or manually. Note that the Z platen is raised before **Theta** is moved. The software provides messages to confirm this operation if the platen is in an undetermined state.

The Theta Control dialog box

Theta **position** edit field in current theta units

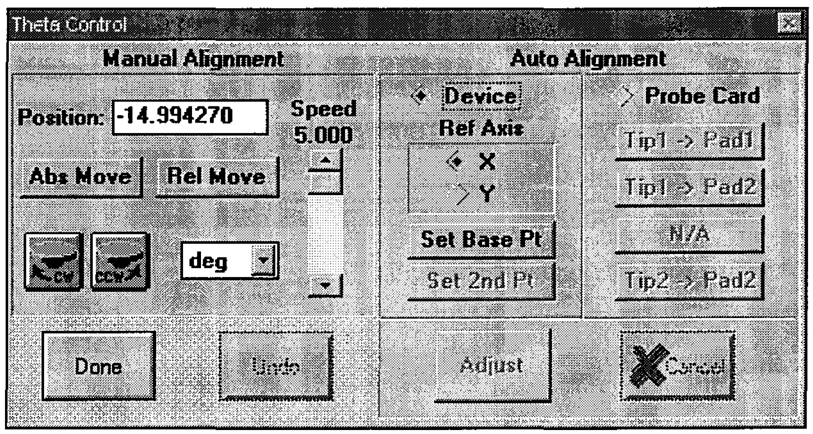
Abs Move moves to position in edit field

Rel Move moves by distance in edit field

CW and **CCW** jog buttons for manual adjustment

Theta **units** combo box

Theta **speed** slider with speed in current theta units



Device align method using two points.

Ref Axis defines reference axis for two points

Set point buttons for two point device alignment

Probe card align method using probe tip to pad alignment

Tip->Pad buttons for alignment

Done closes dialog box

Undo moves theta chuck to previous position.

Adjust button moves theta by calculated align angle

Cancel clears align values and aborts align sequence

3.11.1 Align theta using two point alignment

1. Focus on the wafer surface.
2. Select the **prober**.
3. Select the **Auto Theta** button. The theta control box is displayed.
4. Select ***Device*** in the **Auto Alignment** window.
5. Position the prober such that the video crosshair or reference probe tip is perfectly aligned with the bottom edge of a die on the middle left side of the wafer. Be sure to approach the point from the upper right to ensure accuracy. Select X as the Ref Axis.
6. Click on the ***Set Base Pt*** button to set the first alignment location.
7. Move the prober along the row of die to the right until the video crosshair or reference probe tip is perfectly aligned with the bottom edge of a die on the right side of the wafer.
8. Click on ***Set 2^nd^ Pt***.

9. Click on ***Adjust.*** The theta chuck rotates the wafer to the correct alignment.

10. Verify the alignment by moving along the wafer and observing deviation.

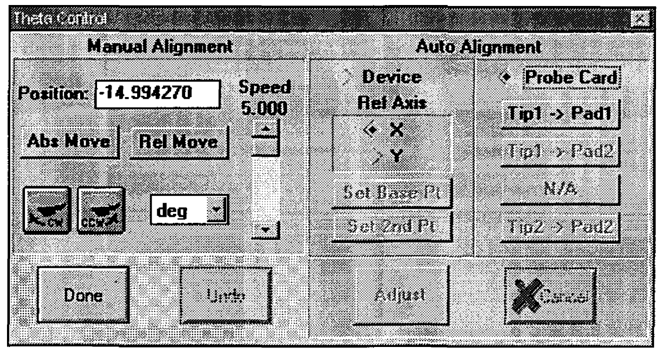
11. Perform steps 4 through 9 until the required accuracy is attained and then select ***Done*** to close the dialog box.

3.11.2 Align theta to a probe card

1. Select the **prober**.

2. Locate two pads diagonal to each other which line up with two probe tips on the probe card.

3. Click on the **Auto Theta** button. The **Theta Control** dialog is displayed as shown at right.



4. Select ***Probe Card*** in the **Auto Alignment** window.

5. Align the first pad to its associated probe tip on the probe card.

6. Click on ***Tip1->Pad1.***

7. Align the second pad with the probe tip from step 5.

8. Click on ***Tip1->Pad2.***

9. Align the second pad with its associated probe tip on the probe card.

10. Click on ***Tip2->Pad2.***

11. Click on ***Adjust.*** If the platen is below its **Z-up** position, it raises. Theta adjusts to align the die pads to the probe tips on the probe card.

12. Click on ***Done*** to close the dialog box.

3.11.3 Move theta to an absolute angle

1. Select the **Auto Theta icon.** The **Theta control** dialog is displayed.

2. Select the required theta units (deg/rad/grad).

3. Enter the desired position in the **Theta position** edit field.

4. Select the **Abs Move** button. The theta chuck rotates to the position in the edit field.

3.11.4 Move theta by an angle

1. Select the **Auto Theta icon.** The **Theta control** dialog is displayed.

2. Select the required theta units (deg/rad/grad).

3. Enter the desired distance to move in the **Theta position** edit field.

4. Select the **Rel Move** button. The theta chuck rotates by the distance in the edit field.

3.11.5 Jog theta

1. Select the **Auto Theta icon.** The **Theta control** dialog is displayed.

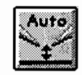
2. Select the move speed using the **Theta speed slider.**

3. Use either the **CW** (clockwise) or **CCW** (counter-clockwise) button to rotate the theta chuck to the required position.

3.12 Using auto raise/lower

Auto raise/lower allows selection of the devices to raise, lower, or both, when moved. To use auto raise/lower, choose the devices in the **Auto Lift/Lower List** dialog box and select **Auto Raise, Auto Lower,** or both, from the **Tools window.** When one of the devices from the **Auto Lift/Lower List** is moved in XY, it raises in Z if auto raise is selected, moves in X-Y, and then lowers if auto lower is selected. The destinations of Auto Raise and Auto Lower are the user-defined Z-up and Z-down locations.

Auto raise/lower icon



The Auto Lift/Lower dialog box

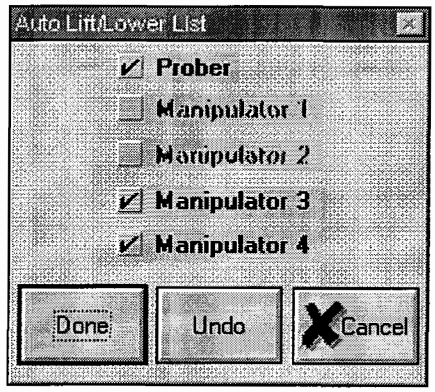
Available devices for list where checked enables the auto raise lower feature for that device

Grayed devices are not installed in the system and therefore are not available

Done closes the dialog and stores the list

Undo restores options to those present when the dialog box was opened

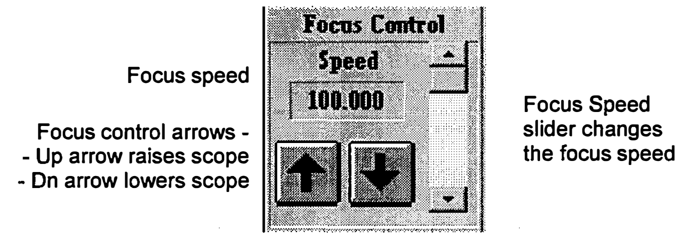
Cancel ignores changes and closes the dialog box



3.13 Using the focus controls

The **Focus control** section of the **Tools window** provide direct access to the microscope focus adjustment without having to change to the microscope device. The **Focus control** speed slider is independent of both the microscope's HI/LO/IDX mode and the microscope's Z speed slider.

The Focus control section of Tools window



PcWfr VX Reference Manual

Version 2.6.4

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Printed in USA

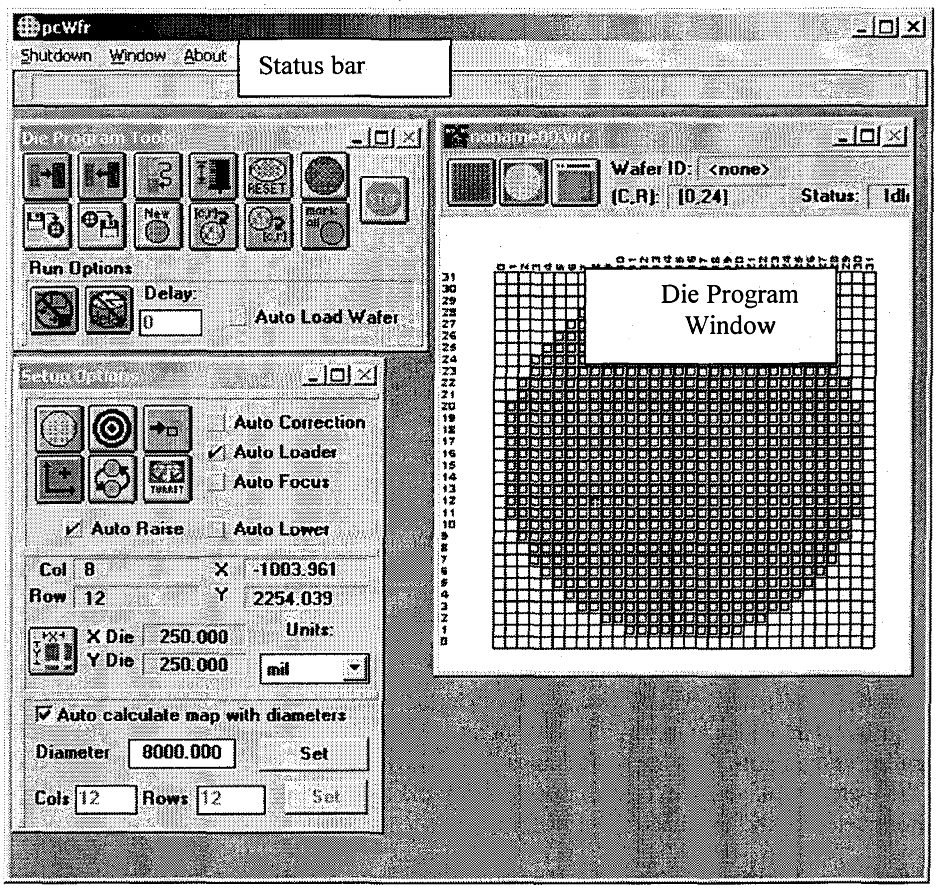
Table of Contents

1 Introduction

PcWfr is part of the pcProbe[II] application suite. PcWfr creates die programs that step from die to die and then run an in-die program A Dynamic Data Exchange (DDE) link is available between pcNav and pcIndie.

PcWfr provides a continuous visual representation of the die selected and displays the exact coordinates of that die. A comprehensive set of icon-driven tools provides program management by simply pointing and clicking the mouse.

PcWfr consists of a menu, a **status bar** that displays button help, and three separate windows: **Die Program, Die Program Tools,** and **Setup Options.** Each window can be minimized when not



needed. The entire pcWfr application can also be minimized.

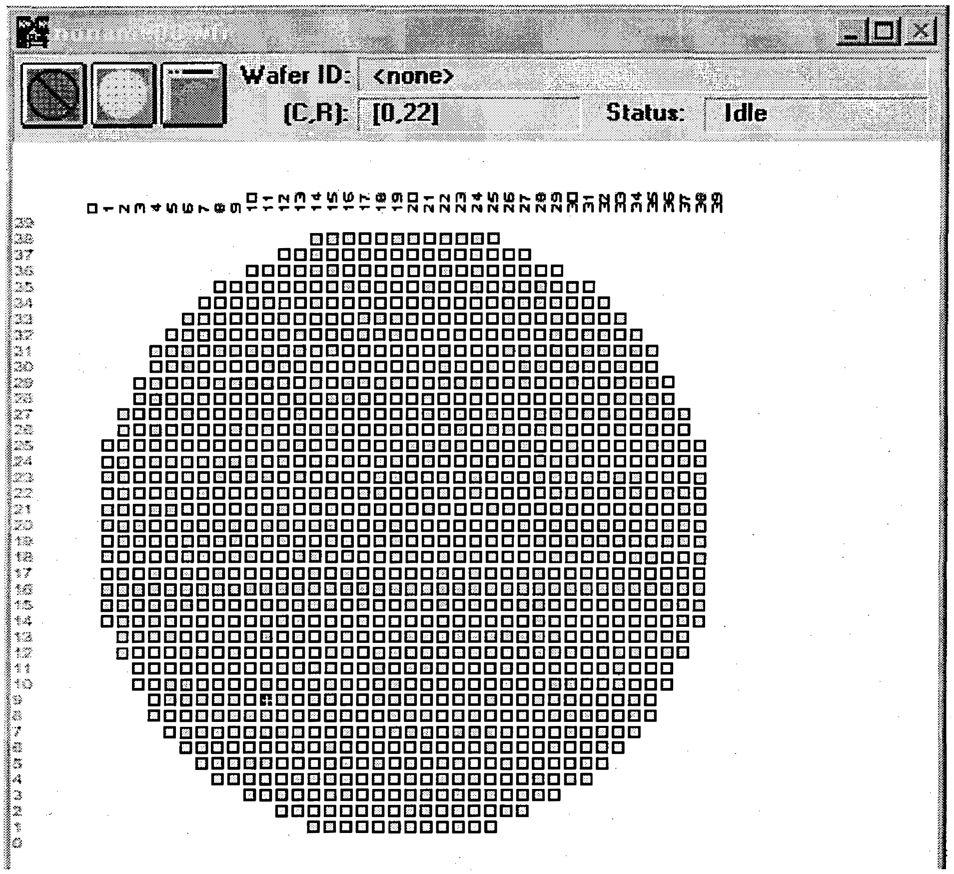
When the cursor is positioned over one of the buttons in pcWfr, a “help mode” is activated and the **Status Bar** describes the function of the button

The **Die Program** window shows the currently loaded die program. The current position on the wafer is displayed in column, row format. A status field provides current program information. A grid on the wafer map may be displayed and the wafer image of the program can be turned on or off. A zoom mode exists to provide a better visual perspective for locating die on a large wafer map with small die.

Die programs are created, loaded, saved, and run from **Die Program Tools**.

The **Setup Option** windows provides for all necessary setup before running a wafer program. Its functions include setting the device reference position; setting the coordinate reference; selecting a new device; entering die size; selecting system units; and entering wafer size.

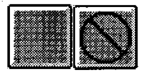
2 Die Program Window



The **Die Program** window is used when running a die program, doing wafer navigation, and creating or editing a die program. The wafer map can be edited at any time; there is no special edit mode. Point and click navigation is available with the wafer map. A group of wafer option buttons modifies the appearance of the wafer displayed. Individual die can be marked as normal, tested, test pattern die, ugly die, excluded from test die, and excluded from wafer map.

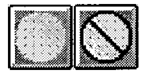
2.1 Using the wafer option icons

2.1.1 Using the wafer grid icon



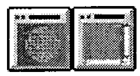
The grid icons enable or disable the display of grid lines on the wafer map. The displayed icon is the current state of the map. Selecting the icon toggles to the other state.

2.1.2 Using the wafer display icon



The Wafer icons enable or disable the display of the wafer outline behind the die on the wafer map. The displayed icon is the current state of the map. Selecting the icon toggles to the other state. This icon is enabled and disabled by the **Enable Wafer Outline** option in the **New** and **Edit Die Program** dialog box.

2.1.3 Using the wafer map zoom icon



The Zoom icons toggle between normal and zoomed view of the wafer map. The displayed icon is the current state of the map. Selecting the icon toggles to the other state.

2.2 Point and Shoot navigation

Point and shoot navigation is used to navigate with the wafer map. Use the right mouse button to select the destination die for the active device. While the device is moving to its column, row destination, the **Status** line in the **Die Program window** shows **Moving** and a dialog box with a **STOP** button is displayed throughout the move. If the location selected is incorrect, or a problem occurs, press the **STOP** button.

♦ **To navigate using point and shoot:**

1. From the **Wafer map display** area, locate the destination die on the wafer map for the active device. If necessary, use the scroll bars to move the wafer map in the **Wafer map display** area.

2. Select the die using the **right** mouse button and then release the mouse button. The active device starts to move and a dialog box with a **STOP** button is displayed.

3. If the speed of the move is too slow, or the wrong die was selected, press the **STOP** button.

> **NOTE:** Use the **STOP** button to abort the procedures at any time. All positioners stop immediately.

2.3 *Editing a die program*

A die program may be edited at any time; there is no special edit mode. Select die either individually or as a group. Die can also be marked as a specific type. The table below shows the different die types supported:

Type	Color
Normal die	Green
Tested die	White
Test pattern die	Blue
Ugly die	Red
Excluded from test	Yellow

♦ To select an individual die or multiple die:

1. On the wafer map in the **Wafer map display** area, locate the die or group of die to be selected. If necessary, use the scroll bars to move the wafer map in the wafer map display area.

2. Select single die by clicking once with the **left** mouse button. Select a group of die by holding the **left** mouse button and dragging the mouse. As the mouse moves, the selected group is shaded. Release the button when the grouping is correct.

3. The selected die appear green on the wafer map.

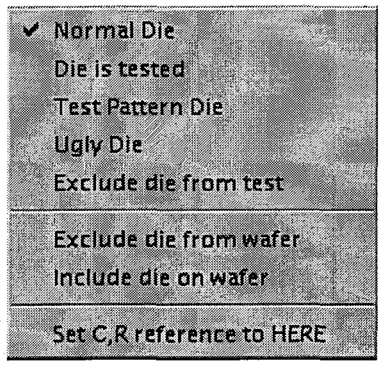
♦ To mark a single die or multiple die as a specific die type:

1. On the wafer map in the **Wafer map display** area, locate the die or group of die to be selected. If necessary, use the scroll bars to move the wafer map in the wafer map display area.

2. Select single die by pressing and holding the **shift** key and clicking once with the **left** mouse button. Select a group of die by pressing and holding the **shift** key and holding the **left** mouse button and dragging the mouse. As the mouse moves, the selected group is shaded. Release the button when the grouping is correct.

3. From the displayed menu of attributes, select the **Die Type**. The selected die change to the color of the selected type.

2.4 Additional Die Program functions



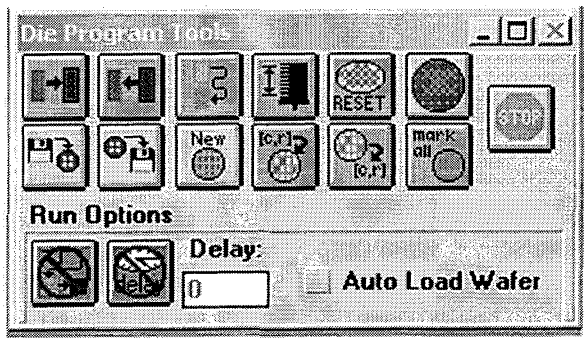
The die type pop-up menu available with the **shift/left mouse button** combination provides access to not only the die attributes, but to three additional functions: **Exclude die from wafer map, include die on wafer map**, and **Set C,R reference to HERE**.

Normally the pcWfr program calculates the locations of all die on the wafer using the wafer diameter and die size. Depending on the reticle used, the calculated die layout may not be correct. The exclude/include die functions are used to ensure that the displayed wafer map is identical to that of the physical wafer. These functions add or remove a die from the displayed wafer map. These functions are active only when the **Enable Wafer Outline** option in the **New** and **Edit Die Program** dialog box is checked.

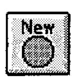
The Set C,R reference menu item forces the pcWfr column,row location to match the column,row location of the mouse on the pcWfr wafer map. This is a quick method of synchronizing the physical position of the wafer with the position calculated by pcWfr and other pcProbe^{II} applications.

3 Die Program Tools

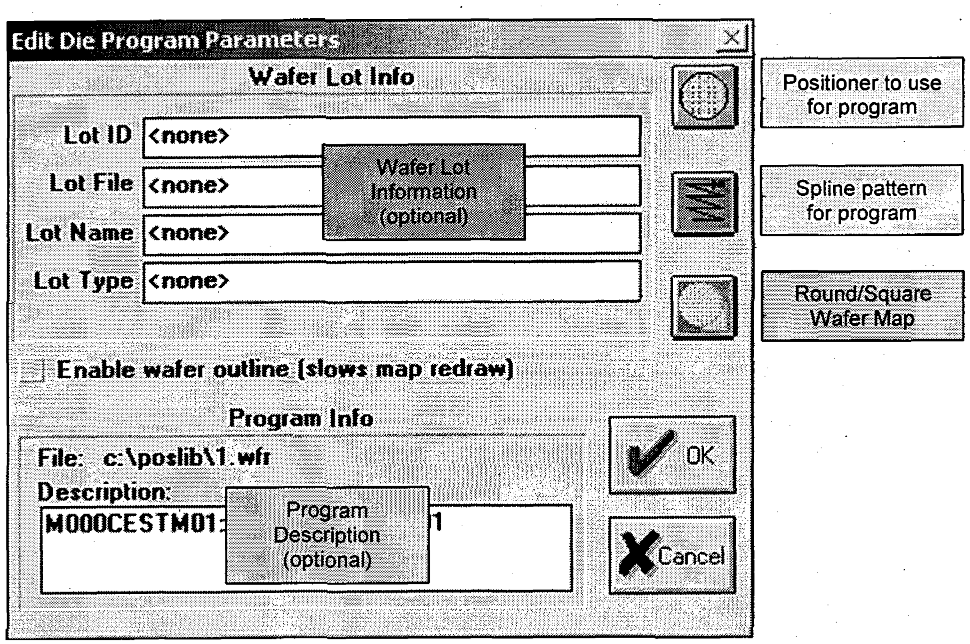
The **Die Program Tools** create, load, save, and run die programs. A die program can be run once, continuously, or single stepped. The die program tools dialog looks like this:



3.1 *Creating a die program*



Use this icon to create a new die program. This function displays a dialog box as shown below:

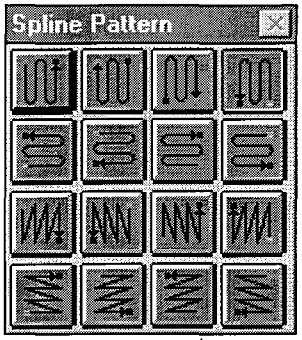


1. Select the **New Die Program** icon The **Edit Die Program Parameters** dialog is shown as above.

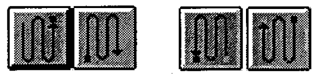
2. Fill in the wafer lot information as required

3. Select the active device to use for the die program

4. Select the spline pattern.



Spline patterns define the path followed by the die program. The available spline patterns are displayed as shown at left when the spline icon is pressed. Select the appropriate spline pattern for the test. The pattern assumes the presence of an even (0,2,4, etc) row or column. If the starting row or column is odd, select a spline pattern which mirrors the original choice. For example, the following pairs mirror each other:

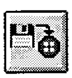


5. Use the Wafer Type icon to choose either a round or square wafer. The Wafer Type is a toggle between square and round.

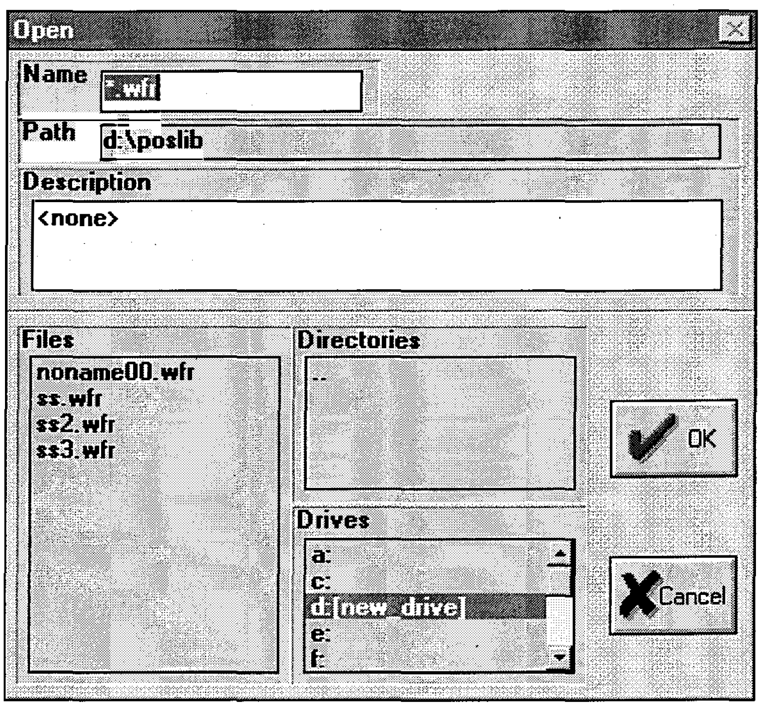
6. If the die map must display the outline of the wafer check the **Enable wafer outline** box. Be aware that when this box is checked the map redraw time is significantly slower – particularly with small die.

7. Click on the OK button.

3.2 Opening a die program



Select this icon to open an existing die program from disk. This function opens the following dialog box:



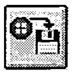
1. Select the **Open** die program icon.

2. Select the drive and directory where the file is found.

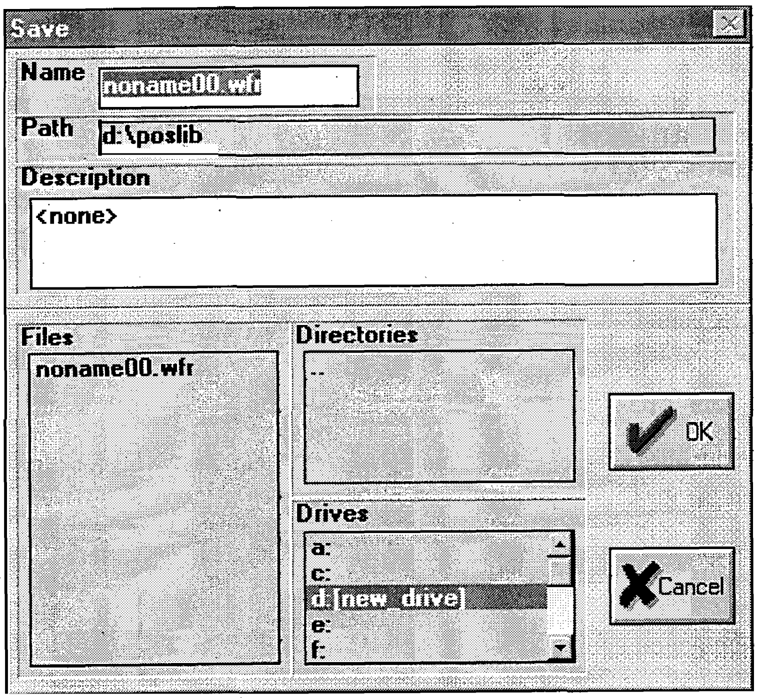
3. Enter a file name in the **Name** box or select it from the **Files** list. Note that when a name is selected from the **Files** list that the **Description** box displays the file description.

4. Click on the **OK** button to load the die program or **Cancel** to abort the process.

3.3 *Saving a die program*



Select this icon to save a die program. This function opens the following dialog box:



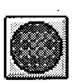
1. Select the **Save** icon.

2. Select the drive and directory for the file.

3. Enter the file name in the **Name** edit box or select it from the **Files** list.

4. Click on **OK** to save the program or **Cancel** to abort the process.

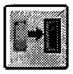
3.4 *Editing die program parameters*



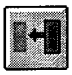
Use this function to change the parameters of the die program. Reference the **Creating a die program** section (3.1).

3.5 Running a die program

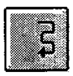
Several options are available for die program execution: backstep, forward step, run program from current step to end, and run die program for each wafer in a wafer cassette.



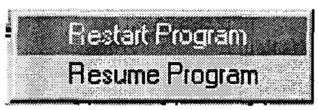
The forward step icon steps the die program to the next die in the spline pattern. If all the die are marked as tested then the next step is the first die in the program spline pattern.



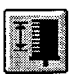
The back step icon steps the die program to the previous die in the spline pattern. If all die are marked as untested the device moves to the last die in the die program spline pattern.



This icon causes a die program to be executed from the current step to the end. If the die program is paused or not at the first die pressing this icon causes the following pop-up menu to appear:



Selecting **Restart Program** causes the die program to reset all die attributes and start over. Selecting **Resume Program** continues from the current die location.



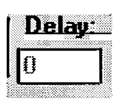
This icon causes the die program to be executed on every wafer in a cassette when the auto-loader option is installed. The **Auto Load Wafer** run option must be *checked* to automatically load another wafer. If the auto-loader option is not installed the user is prompted to manually load a wafer. If the **Auto Load Wafer** run option is *unchecked* the die program runs on the current wafer continously.

3.6 Using external trigger

Select this icon to enable or disable the external trigger TTL input on the test station. This function causes the die program to wait for a pulse on the external trigger input line before moving to the next step in the spline pattern.

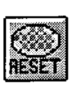
3.7 Using a delay

Use this function to enable or disable a time delay at each step of a die program. The delay period is in seconds and is defined in the **Delay** edit box as shown below:



A delay of up to 999999 seconds is possible (about 11.5 days)

3.8 Resetting the Die program

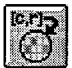


Select this icon to reset all the die attributes of the wafer to the untested state.

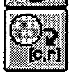
3.9 Marking all die on the wafer map

This icon adds all die on the wafer map to die program list.

3.10 Using column, row edit icons



Use this icon to add the current die position of the device to the die program list.



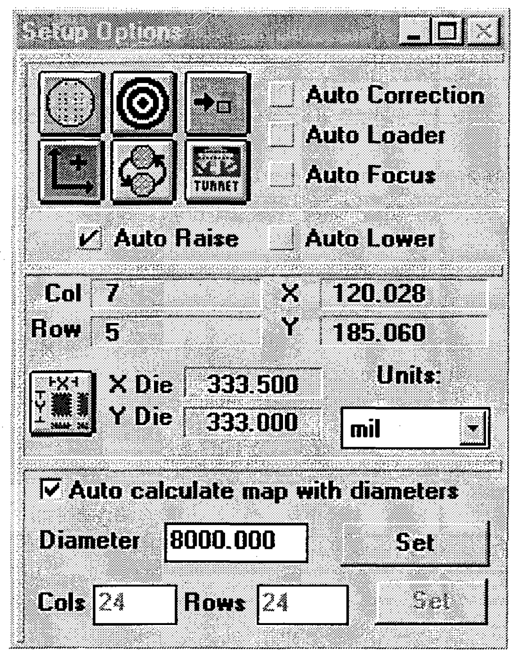
Use this icon to remove the current die location of the device from the die program list.

3.11 Auto Load Wafer

The Auto Load Wafer checkbox causes the die program to automatically request a new wafer from the auto-loader if that option is installed when it is *checked.* If an autoloader is not present the user is requested to manually load another wafer. If this option is *unchecked* the die program continuously runs on the current wafer.

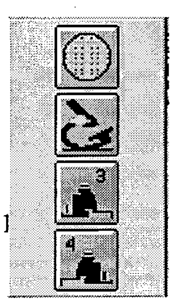
4 Setup Options Window

The **Setup Options** window performs all the setup necessary to run a die program. Functions include device selection, load wafer, set die size, set reference, pattern recognition options, turret control, auto-handler control, units, wafer sizing, and Z control.



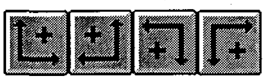
4.1 Selecting Devices

The **Device** icon represents the current active device. A drop down menu appears when this icon is pressed providing a choice of any of the installed pcProbe[II] devices. For example,



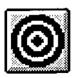
Note that the Column,Row location for each device is valid ONLY FOR THAT DEVICE. The positions of devices are NOT synchronized.

4.2 Coordinate references

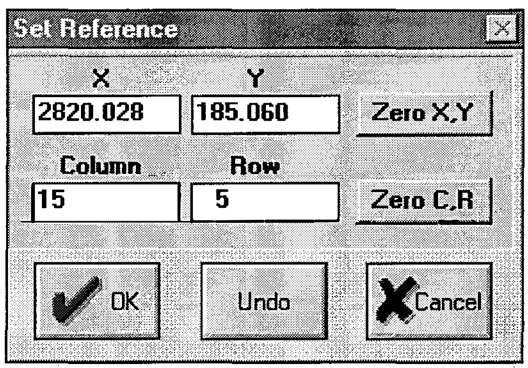


These icons change the reference corner for the zero position of the wafer coordinates. The arrows indicate the direction of positive coordinates in that coordinate system.

4.3 Setting Column,Row reference position

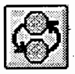


The Set Column,Row reference function is used to synchronize the known physical position of the wafer with the pcProbe[II] calculated position. Selecting this icon displays the following dialog box:



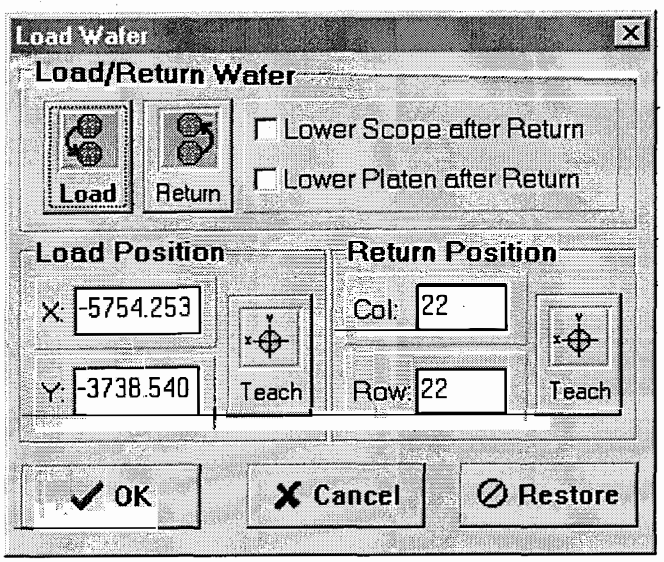
The values for X,Y and Column,Row may be set to any value, or the **Zero X,Y** and **Zero C,R** buttons can be used to reset the position. Select **OK** to accept the new values. Select **Undo** to restore the values to their values prior to opening the dialog box. Select **Cancel** to quit all changes.

4.4 Load Wafer



This icon accesses the load wafer functions. Two types of load wafer function are available: **Manual** and **Autoloader**.

4.4.1 Manual



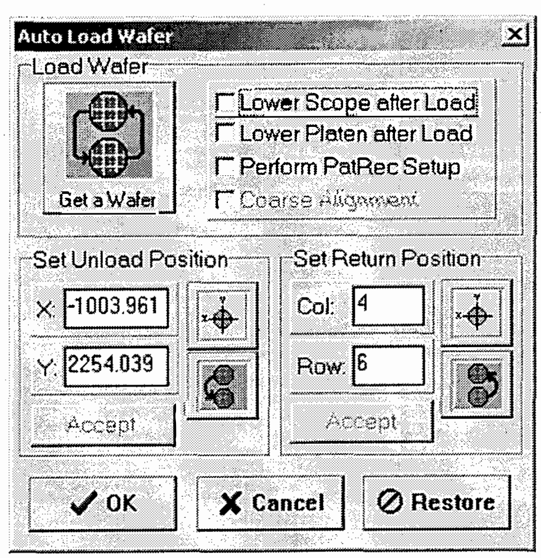
This dialog is used to perform a manual load wafer operation. Select the **Load** button to move to the load position. Use the **Return** button to return to the desired return location. The **Lower Scope** and **Lower Platen** options return the scope and platen to their pre-load positions.

The **Load Position** may be taught by navigating to the load location and selecting the **Teach** button.

The **Return Position** is taught by moving to the column and row and selecting the **Teach** button.

4.4.2 Autoloader

4.4.2.1 Loader Control



The Auto Load Wafer dialog provides access to the auto-handler functions. It does not do any native data storage or manipulation. All handler, pattern recognition, and load functions are perfomed by pcRouter and the Wafer Handler program.

4.4.2.1.1 Get a Wafer

This button loads the next wafer from the cassette. The following operations occur:

- The microscope raises, the stage moves to the load position, and theta is adjusted to the load angle.
- The next wafer is loaded from the cassette to the pre-aligner and aligned.
- The wafer is placed on the chuck and the next wafer is loaded to the pre-aligner and aligned
- The stage moves to the load position and theta is moved to its previous position.

4.4.2.1.2 Lower Scope after Load

This option causes the scope to return to its position prior to the load operation.

4.4.2.1.3 Lower Platen after Load

This option causes the platen to move to the preset up position after load operation.

4.4.2.1.4 Perform PatRec Setup

This option causes a pattern recognition setup operation to occur.

4.4.2.1.5 Coarse Alignment

This option is enabled only when pattern recognition setup is enabled. It causes only a pre-align operation to occur, rather than a pre-align and scan align during auto-setup.

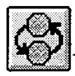
4.4.2.1.6 Set Unload Position

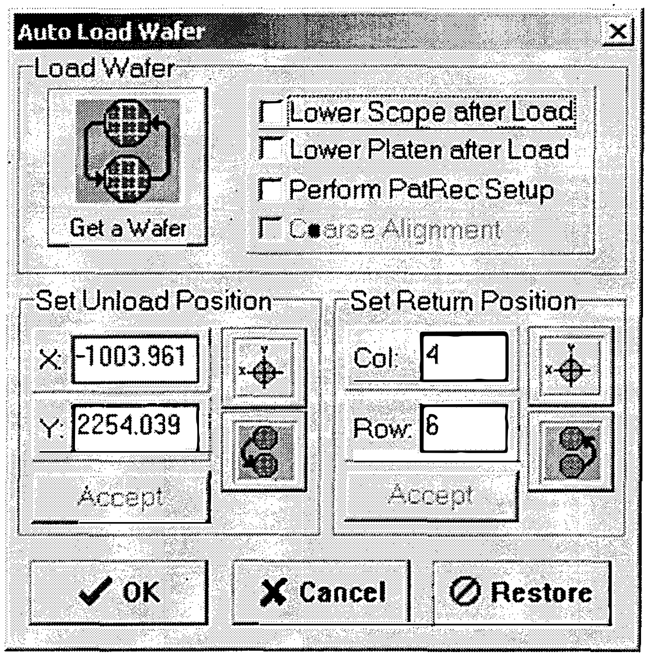
The X-Y positions displayed define the desired position of the stage in when unloading a wafer to the auto-handler.

4.4.2.1.7 Set Return Position

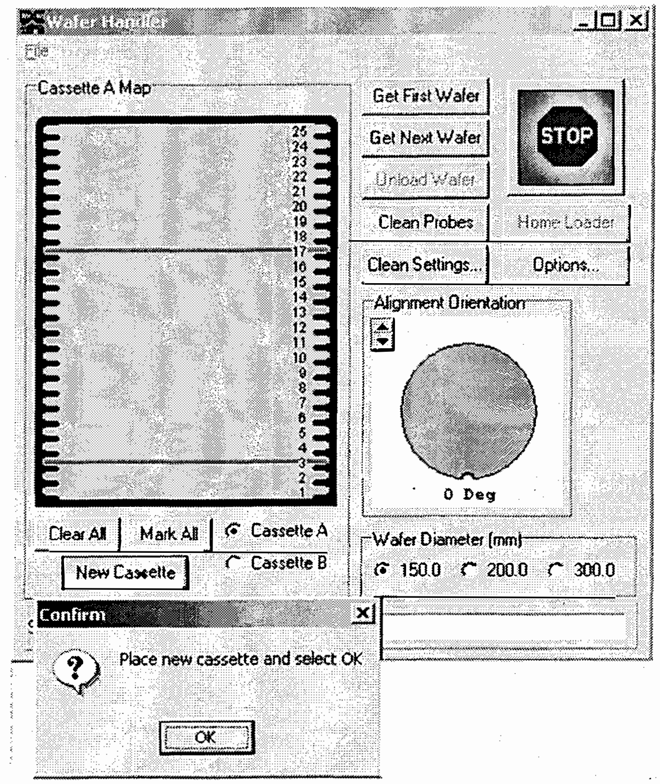
The Col, Row positions displayed define the desired position of the stage after a load operation.

4.4.2.2 Loading a Wafer

1. Select the **pcWfr** application. The wafer handler program starts automatically when pcProbe is started.
2. Enable the ***Auto Loader*** and ***Auto Correction*** options in the **Setup Options** dialog box of pcWfr.
3. Select the Load Wafer  button. The **Load Wafer** dialog box appears as follows:



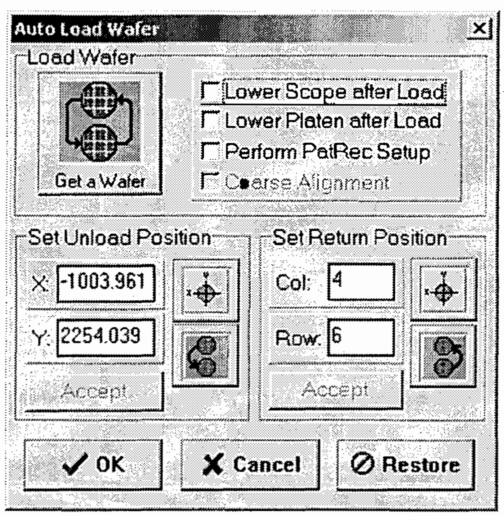
4. Make sure that the prober chuck doesn't have a wafer on it and that the pre-aligner is empty. Select the ***New Cassette*** button in the wafer handler program as shown at right..



5. Place a wafer cassette on one of the stands and then press OK in the confirmation dialog box.

6. Mark the slots in the cassette map containing a wafers. Select the wafer diameter and the alignment orientation for the wafer notch.

7. Select the ***Get a Wafer*** button as shown below.



WARNING!!!!!!!

Do not operate other Windows applications while the ***Get a Wafer*** operation is active. There is a slight possibility that a software lockup could occur. Wait until the loader has completed prealigning the next wafer before interacting with applications.

The following sequence occurs:

*The microscope raises, the stage moves to the load position, and theta is adjusted to the load angle.

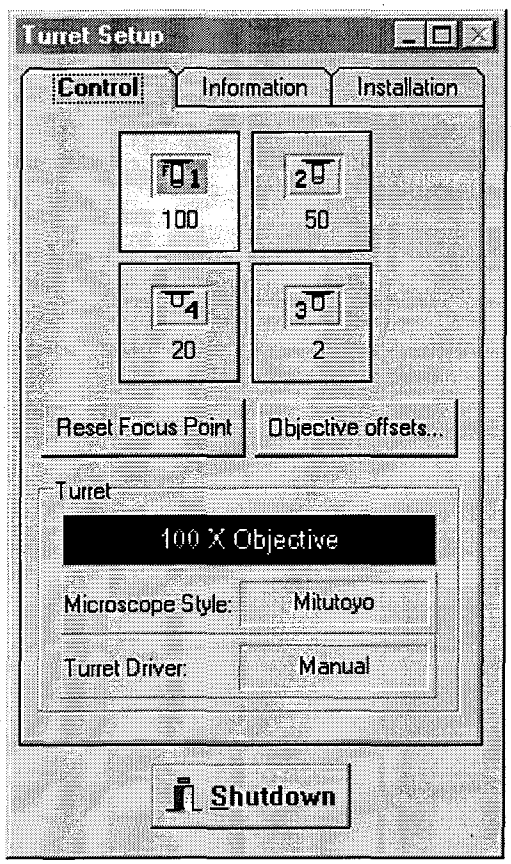
*The first selected wafer is loaded from the cassette to the pre-aligner and aligned.

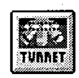
*The wafer is placed on the chuck and the next wafer is loaded to the pre-aligner and aligned

*The stage moves to the load position and theta is moved to its previous position.

8. Select the ***Perform PatRec Setup*** option and then select **Ok** to exit the load dialog box.

4.5 Turret





The turret option executes the Turret Setup program. This program provides a way to compensate for the X,Y,Z offsets between objectives as well as limit the objective selections to only those installed by the user. Once the turret objectives and offsets are set, pcVideo objective selection always uses those settings.

Reference the Turret Users Manual for instructions on installing and configuring objectives and turrets.

4.6 Auto Correction Option

This option causes the auto correction functions available through pattern recognition to be called whenever a move is initiated on the wafer map, or from a die program.

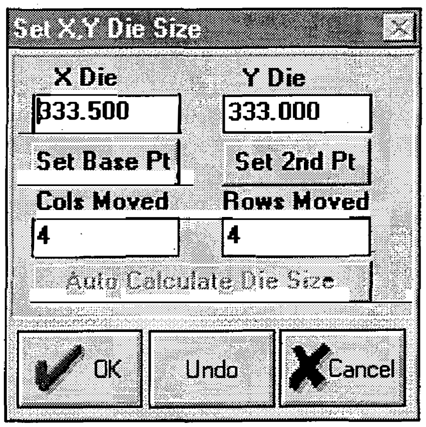
4.7 Auto Loader Option

This option indicates if an automatic wafer handling system is to be used when loading a new wafer. If an autoloader is not available the manual load operation is used.

4.8 Auto Focus

This option causes the auto focus functions available in pattern recognition to be called whenever a move is initiated on the wafer map or from a die program. This is normally off since autofocus significantly increases the amount of time required to complete a die move.

4.9 Setting die size



The X,Y die size is used to determine the column and row position relative to the column,row reference settings. The die size can be entered from the keyboard if it is know, or calculated from two points if it is not known. If the pattern recognition option is installed the die size can be automatically calculated.

The Set Die Size dialog box behaves slightly differently in pcWfr than in pcNav. Since pattern recognition is available, the **Set Base Pt** and **Set 2nd Pt** buttons use the stored correction model to position on a feature very accurately. The user doesn't need to manually position the crosshair to a feature. Instead, the desired feature need only be in the field of view. The accuracy of this method is typically higher than that attained by the user.

♦ Set the die size manually:

1. Disable **Auto Correction** in the **pcWfr/Setup** dialog box.
2. Select the **Set X,Y Die Size** icon.
3. Enter the values for the X and Y die size in the edit boxes.
4. Select **OK.**

♦ Set the die size using calculated method:

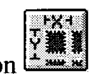
1. Disable **Auto Correction** in the **pcWfr/Setup** dialog box.
2. Select the **X,Y Die Size** icon. The **Set X,Y die size** dialog box is shown.
3. Navigate to one corner of a die.
4. Select **Set Base Pt** to set the first point for calculation.
5. Navigate diagonally to the same corner of an adjacent die.
6. Select **Set 2nd pt** to set the second point for calculation. The die size values are now displayed in the X,Y die edit boxes.
7. Select **OK** to accept the values.

♦ Die size averaging method:

1. Disable **Auto Correction** in the **pcWfr/Setup** dialog box.

2. Select the **X,Y Die Size** icon. The **Set X,Y die size** dialog box is shown.
3. Navigate to one corner of a die.
4. Select **Set Base Pt** to set the first point for calculation.
5. Navigate diagonally over several die to the same corner of another die.
6. Select **Set 2nd Pt** to set the second point for calculation.
7. Enter the number of diagonal die moved in the **Cols moved** and **Rows moved** edit boxes.
8. Select **Autocalculate** to calculated the averaged die size.
9. Select **OK** to accept the die size.

♦ Set the die size using auto-correction:

1. Enable **Auto Correction** in the **pcWfr/Setup** dialog box.
2. Select the Set Die Size button .
3. Navigate to a die towards the center of the wafer and make sure the entire correction model is visible in pcVideo. If the correction model for the reference location is not correct, re-teach it from pcVideo.
4. Select **Set Base Pt**. Auto-correction is performed to exactly place the model in the image.
5. Navigate diagonally by one die and make sure the entire correction model is visible in pcVideo. Select **Set 2nd Pt**. Auto-correction is performed to exactly place the model in the image.
6. The die size is calculated and place in the X Die and Y Die fields.
7. Make sure the stage speed is set to **HI.** Select **Auto Calculate Die Size**. The chuck moves by four die and automatically calculates the actual die size.
8. Select ***OK*** to close the Set X,Y Die Size dialog box.

NOTE: The **Auto Correction** option **must be enabled** to use the pattern recognition features described above.

4.10 Setting units

Five different units of measurement can be used: inch, mils (1/1000 inch), microns (10^{-6} meters), millimeters (10^{-3} meters), and centimeters (10^{-2} meters).

♦ To set units

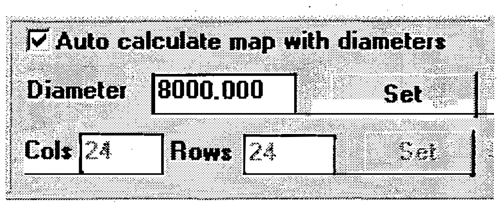
1. From the **Units** drop-down list box in **Setup Options window**, select the list arrow.

2. Hold down the left mouse button and the units list item highlights as the cursor is moved from one selection to the next. When the desired selection is highlighted, release the left mouse button.

4.11 Using auto raise/lower

The auto raise and auto lower options determine whether the active device automatically raises to the preset up position before moving in X,Y and then automatically lowers to the preset down position after the move is complete. During setup the auto lower option is typically off (*unchecked).* Under high power magnification it is sometimes desirable to turn off auto raise as well, however this should only be done while working in a small region. During normal die program operation the auto raise and auto lower options should both be *checked.*

4.12 Setting the wafer diameter



The wafer diameter is used to define the wafer map used by the die program. The die pattern may be defined in one of two ways: **Auto calculate wafer map,** and **Set Cols, Rows.**

4.12.1 Auto calculating the wafer map

When the **Auto calculate** option is *checked* the diameter of the wafer map is used to determine the die pattern in the wafer map. Once the die pattern is displayed, the wafer map pop-up menu items for **Exclude die from wafer** and **Include die on wafer** may be used to adjust the visual presentation of the map to match the wafer. Note that the wafer map type is forced to Round when this box is checked.

4.12.2 Setting wafer columns and rows

When the **Auto calculate** option is *unchecked,* the number of columns and rows for the wafer map may be directly entered to determine the die pattern in the wafer map. The wafer diameter is not used. Once the die pattern is displayed, the wafer map pop-up menu items for **Exclude die from wafer** and **Include die on wafer** may be used to adjust the visual presentation of the map to match the wafer. Note that the wafer map type is Square when this box is not checked.

PcVideo VX Reference Manual

Version 2.6.4

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Table of Contents

1 Introduction

PcVideo brings a real-time image of the device to the PC screen. In addition to controlling positioning devices interactively through the video window, pcVideo can capture, store, load, and print an image.

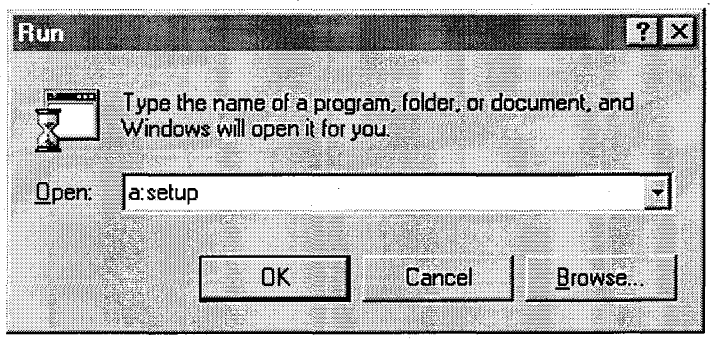
1.1 Installation from floppy diskettes (version 2.6.0 and earlier)

PcVideo supports the Integral Technologies Flashpoint 128, Flashpoint Intrigue and Flashpoint 3D frame grabber cards. PcVideo 2.6.X is compatible with PcProbe^{II} version 2.0. However, pcProbe^{II} version 2.6.X is required to support the pattern recognition or turret options. Follow the instructions for the selected card when installing it in the computer. Once the frame grabber card is installed, follow the following installation instructions:

1. If pcProbe^{II} is running, exit it by closing pcLaunch.

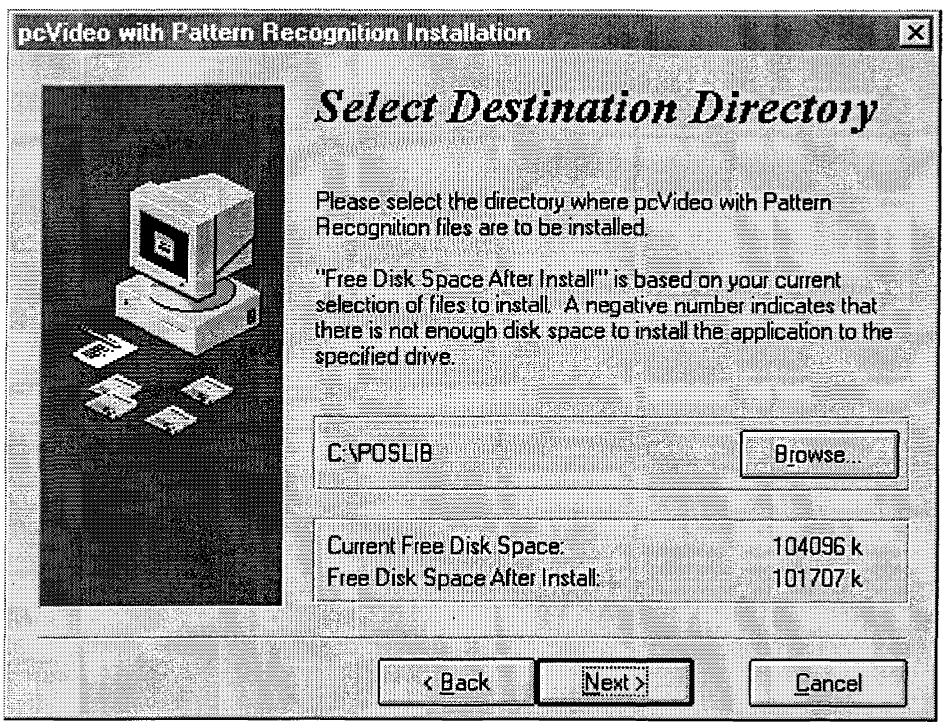
2. Insert the pcVideo installation diskette in the floppy drive.

3. Select ***Start/Run…*** on the **Windows 95** taskbar. The following dialog appears:



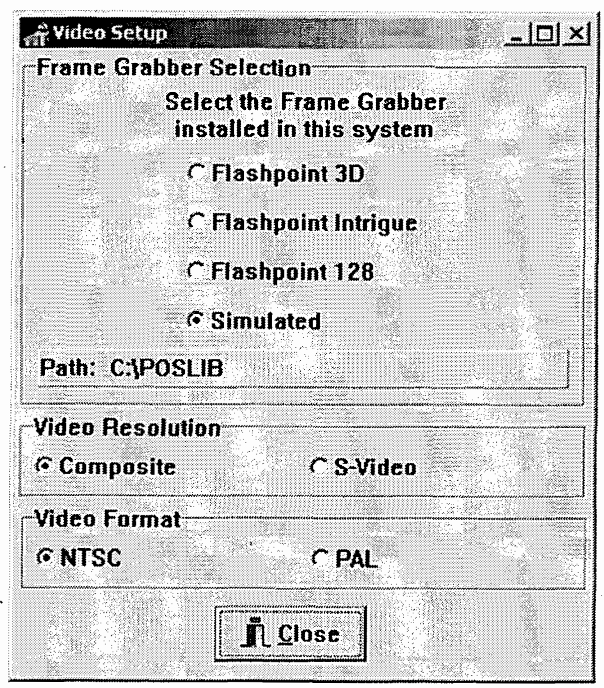
4. Type *a:setup* in the **Open:** edit box as shown and select **OK.** The following dialog appears after a while:

5. Select the **Next>** button to continue the installation. The following dialog appears:



6. Select **Next** > to install pcVideo to the selected directory. The following dialog appears:

7. Select the **Next** > button to install the pcVideo software. The installation progress is shown and then the following dialog box appears:



8. Select the card installed and select ***Close*** to exit the dialog. Normally, the Flashpoint Intrigue is installed. The Simulated option is intended as a demo mode for evaluation. The following dialog appears:

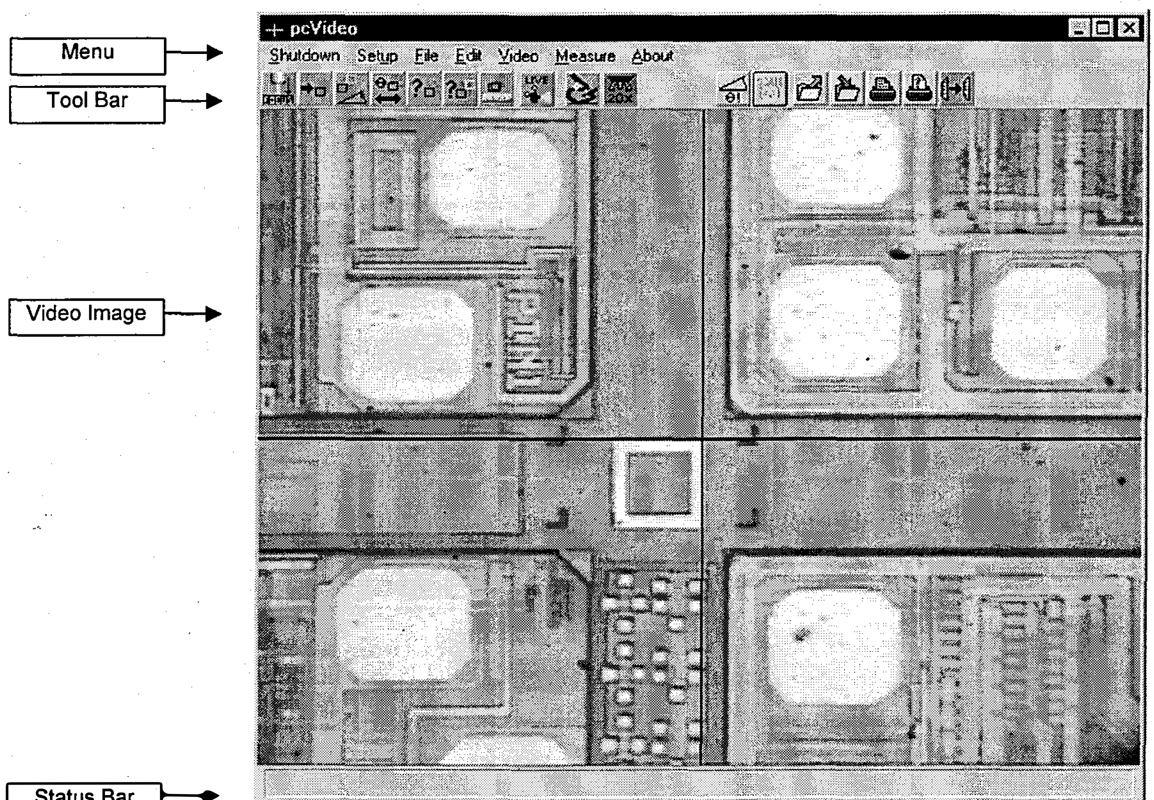
9. Select ***Finish*** to complete the pcVideo installation.

10. Restart pcProbe^{II} by running **pcLaunch**.

1.2 What is pcVideo?

PcVideo allows devices to be controlled via the video image. Devices can be moved by either click-and-drag or point-and-shoot. Alignment can be done with the snap-to alignment feature. Video images can be copied to the clipboard, copied from the clipboard, saved into a file, or loaded from a file.

PcVideo consists of a **menu**, a **Status bar** that displays button help, a **Tool bar**, and the **Video Image**. The pcVideo application video can be resized or minimized as needed.



When the cursor is positioned over one of the buttons on the **Tool bar**, a "help mode" is activated and the **Status bar** describes the function of the button. These buttons provide an alternate method to access the corresponding menu items.

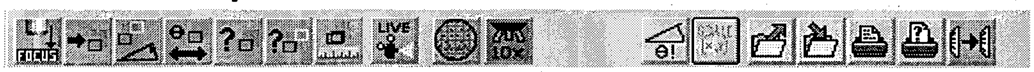
The **Tool bar** provides the ability to load and save images, copy and paste images, and print an image. Also provided is the ability to select the active device, select the objective, do Snap-To alignment, and calculate the video scale based on the objective and zoom. Additional functions are available if the pattern recognition and auto-turret option are installed.

From the **Video image window** the active device can be moved using either click and drag or point and shoot. When using click and drag, the distance is displayed on the status bar as you drag the mouse.

2 Video Tools

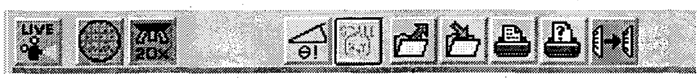
Many of the options found in the menu also exist as icons on the **Tool bar.** The main elements of the menu are **Setup, File, Edit,** and **Video.**

2.1 Toolbar Options

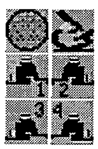


The **Toolbar** provides direct access to commonly used functions in pcVideo. The functions associated with the icons are available through menu items as well.

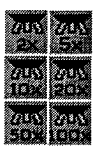
2.1.1 Standard Icons



These two icons show the current state of the video window. Select the icon to toggle between the frozen and live video state. Reference section 2.5.1.



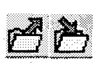
The current active positioning device is indicated using one of these icons. Selecting the indicated icon shows the drop-down menu of all installed positioning devices so a new one may be selected.



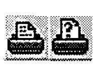
The active objectives is indicated using one of these icons. Selecting the indicated icon shows the drop-down menu of objective so a new one may be selected. If the turret option is present, only those objectives installed in turret setup are displayed. Reference sections 2.2.5 and 2.2.6 for more information.

The Snap-To alignment option is available through this icon. See section 2.2.2 for details.

The Scale X,Y icon provides a method of calibrating the physical device move to the video window. Reference section 2.5.3 for more information.



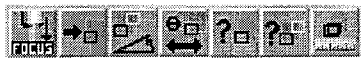
The Load and Save icons access the functions described in section 2.3.



The Print and Print Setup icons access the functions described in section 2.3.

The Copy icon is described in section 2.4 .

2.1.2 Pattern Recognition Option Icons



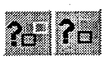
These icons are present only when the Pattern Recognition option is installed on the computer.

 The Auto-Focus icon operation is described in section 4.3.1.

 The Auto-Correction icon operation is described in section 4.3.2.

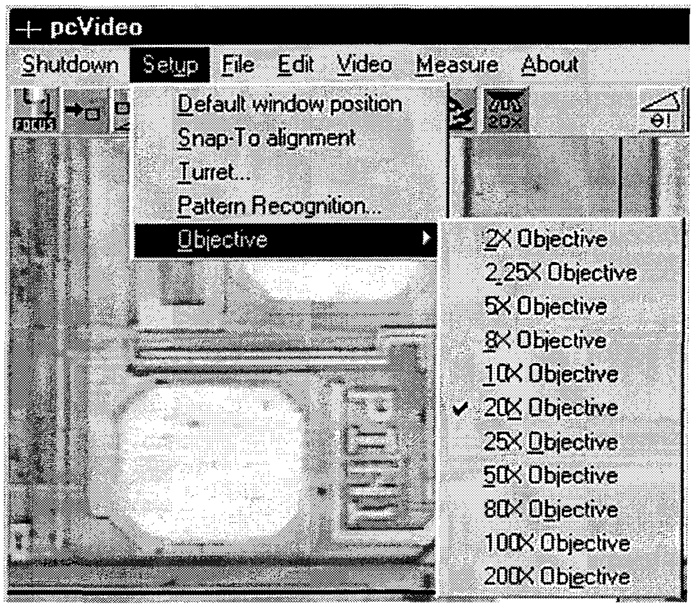
 The Pre-align Sample icon is described in section 4.3.3.

 The Auto-Setup icon is described in section 4.3.4.

 The Teach Model icons are described in sections 4.3.5 and 4.3.6.

 The Auto-Scale icon is described in section 4.3.7.

2.2 Setup menu options



The **Setup** menu provides program setup options and Snap-To alignment. When the **Setup** menu option is selected, a drop-down menu is displayed with the five items: **Default window position, Snap-To alignment, Turret, Pattern Recognition...** and **Objective.**

2.2.1 Default window position

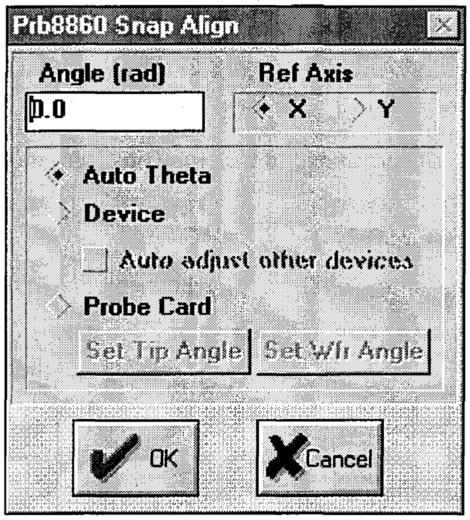
The **Default window position** menu item is a toggle between checked and unchecked. If the **Default window position** menu item is *checked*, the pcVideo application window is placed at the default position and size. If the menu item is *not checked*, the last location and size of the pcVideo window is used.

2.2.2 Snap-To alignment

Snap-To alignment allows alignment of a single device or all the devices using the video image window. Selecting this menu option causes the **Align** dialog box to be shown. The snap alignment is not intended for precise alignment since the resolution is only as good as the mouse resolution. If precise alignment is required use either the pcNav align function or pattern recognition. This mode is useable only with the prober and Auto-Theta.

NOTE: The alignment is calculated to the video image, not the actual wafer/stage orientation. Therefore the camera must be rotated to align with the X,Y axis of the prober for Snap-To alignment to operate properly.

♦ To do Snap-To alignment (Auto Theta Chuck)



1. Select the **Prober** device.

2. Select the **Setup/Snap-To alignment** menu item or the **Snap-To alignment** icon.

3. Select the **Auto Theta** option.

4. Select the **Reference Axis** desired for alignment.

5. Use the mouse to click and drag a line across a feature in the video window parallel to the reference axis. This calculates the angle and places it in the angle value box.

6. Select **OK**. This closes the dialog box and automatically adjusts the theta chuck.

♦ To do Snap-To alignment (Auto Theta to Probe Card)

1. Select the **Setup/Snap-To alignment** menu item or the **Snap-To alignment** icon.

2. Select the **Probe card** option.

3. Select the **Reference Axis** desired.

4. Drag a line between the two probe tips furthest apart along the chosen reference axis of the video window. Stay on the same side of the probe card.

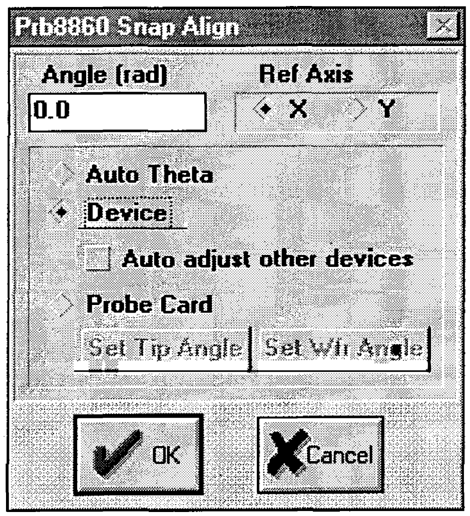
5. Select **Set Tip Angle.**

6. Drag a line between the pads on the wafer that correspond to the probe tips from step 5.

7. Select **Set Wfr Angle.**

8. Select **OK**. If the platen is below the Z-up position, it raises. The theta unit then rotates to align the wafer to the probe card.

♦ To do Snap-To alignment (No Theta Unit)



1. Select the Prober device.

2. Select the **Setup/Snap-To alignment** menu item or the **Snap-To alignment** icon.

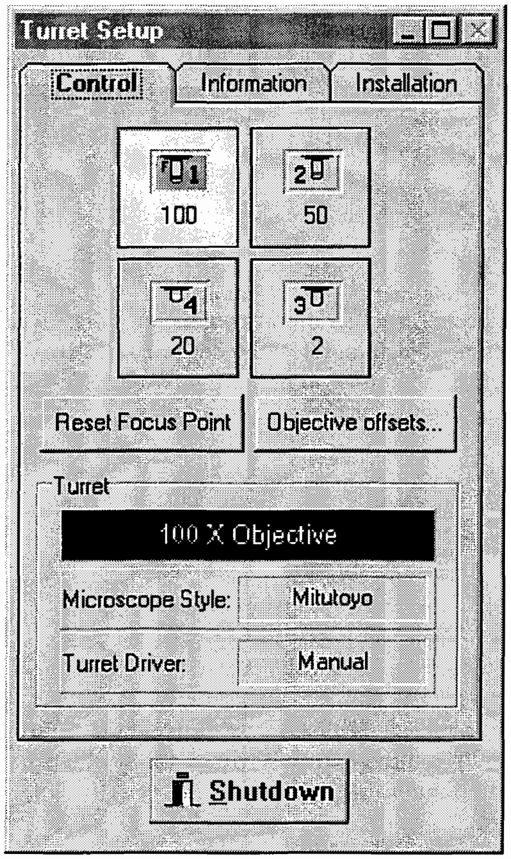
3. Select **Device**.

4. Select the **Reference axis** desired.

5. Use the mouse to click and drag a line across a feature in the video window that is parallel to the reference axis. This calculates the angle and places it in the angle value box.

6. Select **OK**. This closes the dialog box and sets the prober alignment angle.

2.2.3 Turret



The turret option executes the Turret Setup program. This program provides a way to compensate for the X,Y,Z offsets between objectives as well as limit the objective selections to only those installed by the user. Once the turret objectives and offsets are set, pcVideo objective selection always uses those settings.

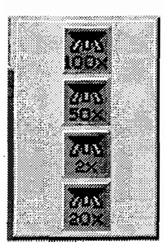
Reference the Turret Setup User Manual for instructions on installing and configuring objectives and turrets.

Note: The turret option uses optional Auto Turret hardware and software.

2.2.4 Pattern recognition

Reference section **4.2 Pattern Recognition Settings.**

2.2.5 Objective menu item (Turret option not present)



When the **Objective** menu item is selected from the Setup menu, another drop-down menu is displayed. Select the objective currently in use from this menu to enable pcVideo to make accurate calculations. Alternatively, select the objective icon on the toolbar, and choose the appropriate icon from the drop-down menu.

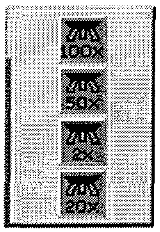
- **To change the objective**

1. Select the **Setup/Objective** menu item or the objective icon with the left mouse button.

2. Select the desired objective from the drop-down menu.

3. If the **Objective** drop-down is selected again, it shows the objective just selected as *checked* and all other items are *unchecked.* The **Objective icon** on the **Tool bar** also changes to the selected **Objective icon.**

2.2.6 Objective Menu Item (Turret option present)



When the **Objective** menu item is selected, another drop-down menu is displayed. To have the Auto Turret change the current objective, select the desired objective from this menu. Turret will change objectives according to its configuration. See the Turret Setup User Manual for information regarding Turret configuration.

- **To change the objective**

1. Select the **Setup/Objective** menu item or the objective icon with the left mouse button.

2. Select the desired objective from the drop-down menu. The turret will rotate if the Auto Turret hardware is installed and configured properly. The turret software will adjust the microscope's X, Y, & Z positions also according to its configuration.

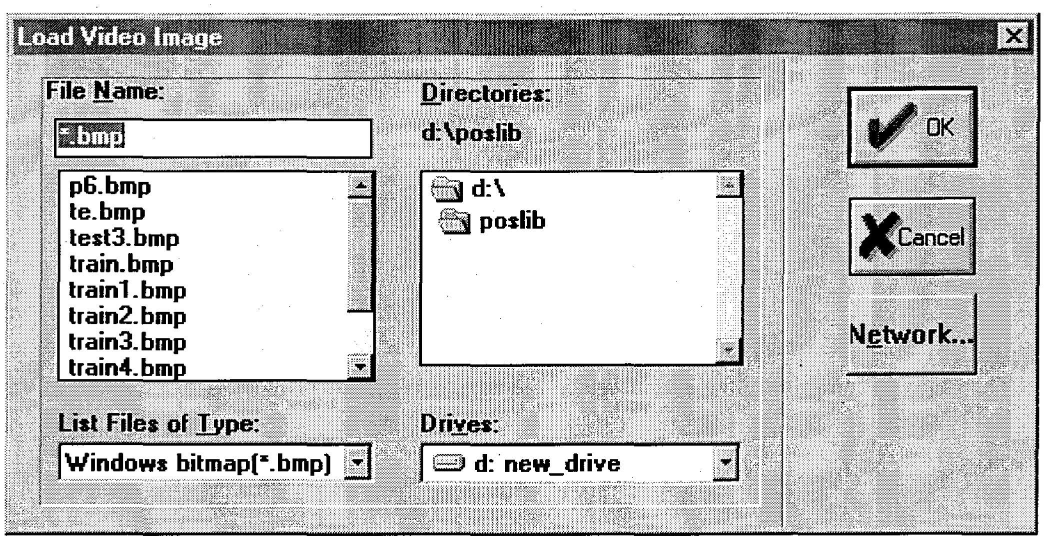
3. If the **Objective** drop-down is selected again, it shows the objective just selected as *checked* and all other items are *unchecked.* The **Objective icon** on the **Tool bar** also changes to the selected **Objective icon.**

2.3 *File Menu options*

2.3.1 Load video image menu item

This option allows a stored image to be loaded from disk. When this menu item or tool icon is selected, the **Open Video Image** dialog box is displayed. When the image is loaded, the **Video Image window** is frozen. To return to a live image, unfreeze the video window.

♦ To load a stored image:



1. Select the **Load Video image** icon.

2. Select the correct drive and path from the **Drives** and **Directories** lists.

3. Enter a file name in the **File Name** edit box or select a file name from the list box under the **File Name** edit box.

4. Select **OK**. The selected file is loaded into the video image window and the name of the file is printed over the top left corner of the image.

2.3.2 Save Video Image menu item

The **Save Video Image** option allows a video image to be saved to disk. When the menu item or tool is selected, the **Save Video Image** dialog box is displayed. These images can be used in reports or other documents. A saved image can be in excess of 1 MB, so adequate disk space should be verified beforehand.

♦ **To Save a video image:**

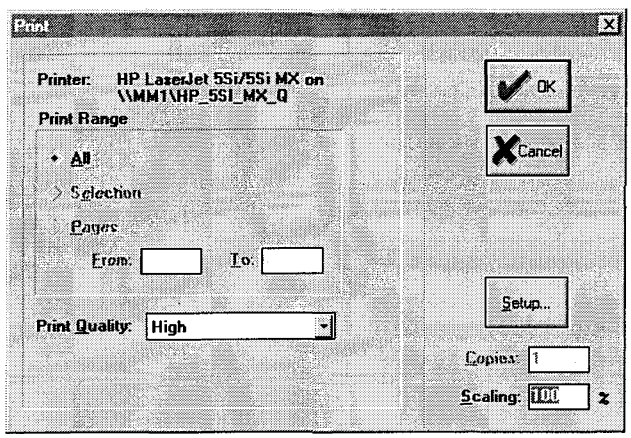
1. Select the **Save Video Image** menu item or icon.

2. Select the correct drive and directory from the **Drives** and **Directories** list boxes.

3. Enter the file name in the **File Name** edit box or select a name from the list box under the **File Name** edit box.

4. Select **OK.** The video freezes momentarily and the image is saved.

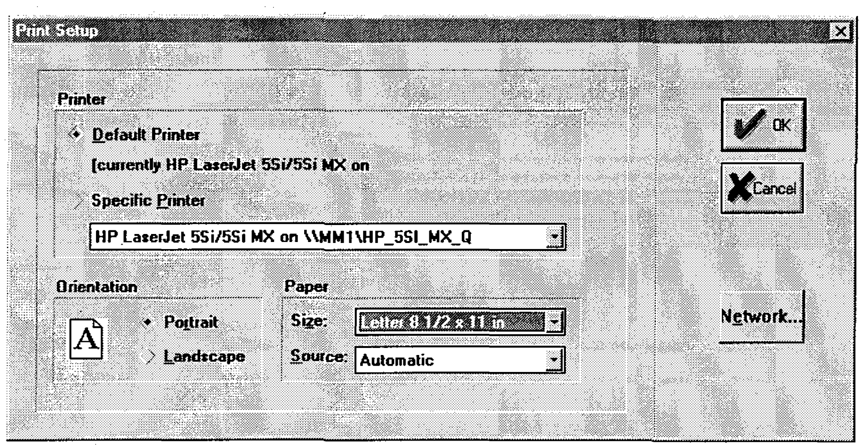
2.3.3 Print menu item



The **Print** option prints the video image on the default Windows printer. A video image is printed as follows:

1. Select the **Print** menu item or icon. The print dialog above is shown.

2. If the displayed printer is not correct, select the **Setup** button and make any required changes as shown below.



3. Select **OK** to accept any printer setup changes.

4. Enter the **Scaling** factor in the edit box. To enlarge the image, enter a number greater than 100%. Enter a number below 100% to reduce the image size.

5. Select **OK** to begin printing.

2.3.4 Print Setup menu item

To configure the default printer, use the **Print Setup** menu item or icon. The dialog box for the specific printer is displayed. Since many printer types are available consult your printer user manual for settings.

2.4 Edit menu options

The **Edit** menu gives access to the Windows clipboard. The entire video image can be copied or a rectangular area of interest can be copied.

NOTE: The image is copied to the clipboard using 16.8 million colors (16 and 24 bit display mode). Running Windows with 16 or 256 colors will result in significant degradation of the image when it is pasted into a document.

2.4.1 Copying the entire video image to the clipboard

Select the **Edit/Copy** option from the menu or the copy option from the toolbar. The video is frozen while the image is copied and is then returned to live video. The image can now be copied into any document capable of displaying bitmaps.

2.4.2 Copying a portion of the video image to the clipboard

1. Freeze the video image by selecting the **Video/Freeze** menu item or the Frozen/Live Icon. The freeze menu item and icon are toggles and give the current state of the video window. If the menu item is *checked* and the icon indicates frozen then the video is frozen. If the menu item is *unchecked* and the icon indicates live then the video is live.

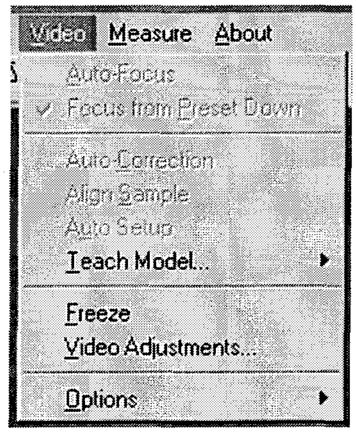
2. Draw a rectangle around the region of interest by clicking and dragging the mouse on the frozen video image.

3. Select the **Edit/Copy** menu item or the copy icon from the toolbar.

4. The information in the region of interest is copied to the clipboard.

5. Re-enable live video by selecting the **Video/Freeze** menu item or the frozen/live icon.

2.5 Video menu options



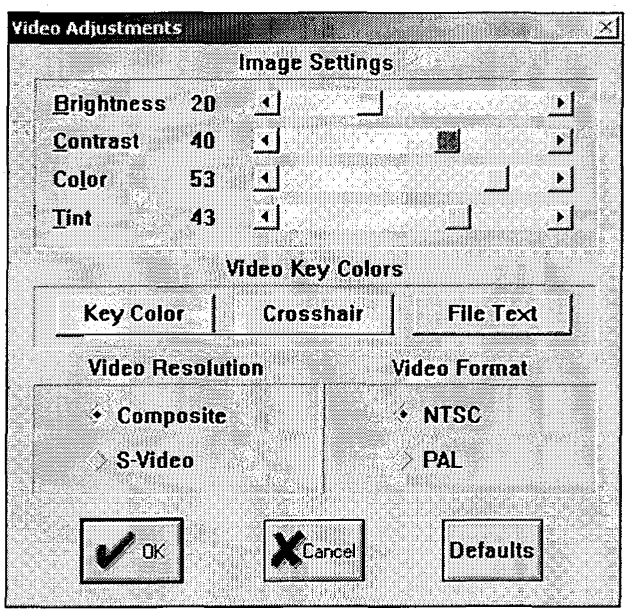
The video menu options access the display characteristics, freeze function, and the pattern recognition options.

2.5.1 Freeze menu item

This menu option is a toggle. Each time it, or the Frozen/Live icon, is selected the video state changes. The frozen video state is *checked.* The live video state is *unchecked.*

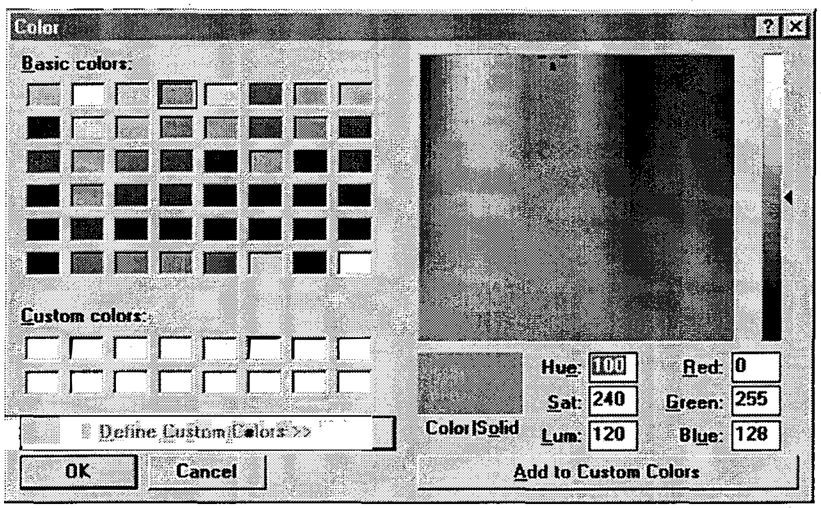
2.5.2 Video adjustments menu item

The video adjustments menu item allows adjustment of the video image attributes such as brightness, contrast, color, and tint. When the menu item is selected, the video adjustments dialog box is displayed as shown below:



The image settings are stored each time adjustments are made unless the dialog box is exited using the **Cancel** button. Selecting the **Defaults** button loads the factory defaults. Three key colors are available

– background overlay key color, crosshair, and file text. Any of these three buttons opens the Windows color selection dialog box shown below. The main constraint on use is that the crosshair color should not be the same color as the key color, otherwise the crosshair will not be visible when using live video.



This color selection box provides commonly used colors for the current Windows environment as well as the ability to define additional colors.

The **Key Color** is used by the video card when it overlays the live video image on the screen. The selection for this color should NOT be the same as the crosshair color.

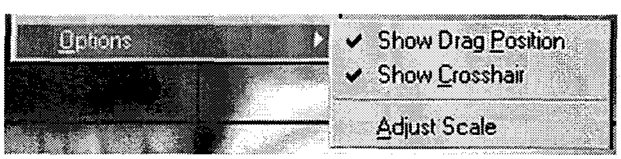
The **Crosshair** color is used to draw the crosshairs when that option is enabled. This color should not be the same as the key color.

The **File Text** color is used when a bitmap is loaded into the video window.

The **Video Resolution** options allow for selection of the Composite or S-Video input from the camera. When pattern recognition is installed S-Video must be selected if there is not a video splitter between the pattern recognition card and the video card.

The **Video Format** options allow for selection of the video format.

2.5.3 Options menu item



When enabled, the **Show Drag Position** option causes the click-and-drag move distance to be displayed in the status bar. The **Show Crosshair** option causes the crosshair to be shown.

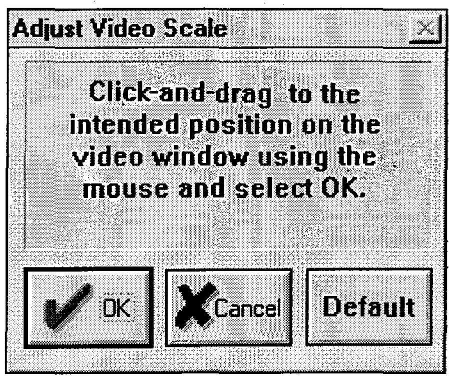
The **Adjust Scale** option is enabled only for click-and-drag mouse moves. It is used to synchronize the mouse movement with the physical device movement. Use the following procedure to adjust scale:

1. Verify that the Objective icon on the toolbar matches the current objective.

2. If the objective is not correct, select the correct objective.

3. Perform a diagonal click-and-drag move.

4. If the positioning device does not move to the correct location, select the **Adjust Scale** menu item or the **Scale X,Y** icon on the toolbar. The **Adjust Video Scale** dialog is shown below.



5. Use ONLY the click-and-drag mouse move to adjust the crosshair to the desired destination from the previous move.

6. Click on **OK** to accept the scale factors.

2.5.4 Pattern Recognition

Reference section 4 for pattern recognition functions.

3 Video image window

The video image window displays the image captured with the video camera. The window is also used for either click-and-drag navigation or point-and-click navigation as well as measurement and pattern recognition functions.

3.1 Click and Drag navigation

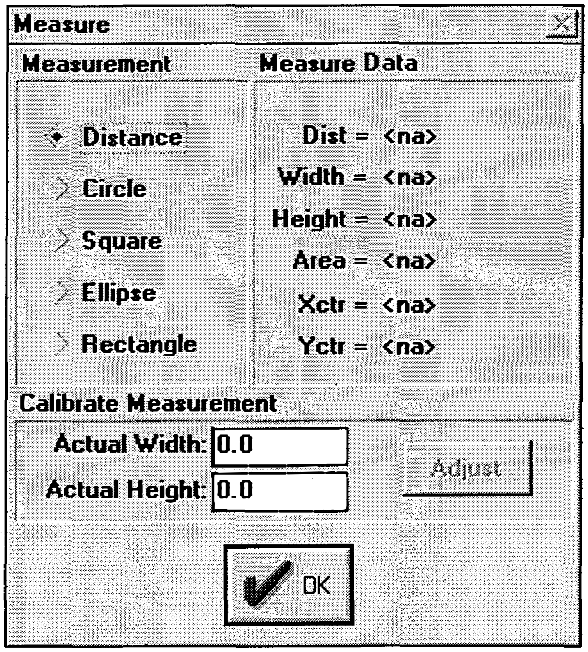
Click-and-drag navigation is used to move a device a desired distance by drawing a line from the crosshair to the destination, or by drawing from the tip of a probe to the destination. When video is live, select the device to move and draw a line from current position to the destination position. If the move is not correct the video scale may be adjusted as described in section 2.5.3.

3.2 Point and Shoot navigation

Point-and-shoot navigation is a way of navigating to a position using the crosshair as the reference. This navigation method is not recommended for use with manipulators since the crosshair is assumed to be the starting point for the move. Point-and-shoot is activated by moving the mouse to a feature in the video image window and clicking the right mouse button.

3.3 Measurement

The **Measurement** function is used to determine physical characteristics of a feature on the DUT. The following dialog is shown when measurement is selected:



The Measure Type defines the object to be measured.

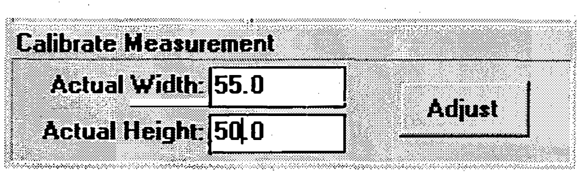
The **Measure data** is calculated from the information provided from the mouse measurement on the video image.

It is recommended that the video image be frozen while performing measurements.

NOTE: The measurements performed are approximate since the objective magnification displayed in pcVideo must match the physical objective selected and video scale must be very accurate. Use the **Calibrate Measurement/Adjust** function to adjust the measured data to the actual dimensions of the measurement. The video scale is updated to match the new settings.

Measurements are performed by selecting the measurement type and then clicking and dragging a line or shape until it matches the feature being measured. As soon as the measurement is complete the information is returned to the dialog box and the calculations for the shape are made. If the image is frozen while doing this, the line or shape will remain on the screen after the click and drag move is complete.

The **Calibrate Measurement** group is used to adjust the visually measured dimensions to the actual dimensions. For example, if the measured width and height was 54.1X49.2, but the actual width and height were 55.0X50.0, those values are entered as follows:



Select the **Adjust** button to recalculate the measured data to match the actual data. The video scale is also adjusted to match the values.

4 Pattern Recognition

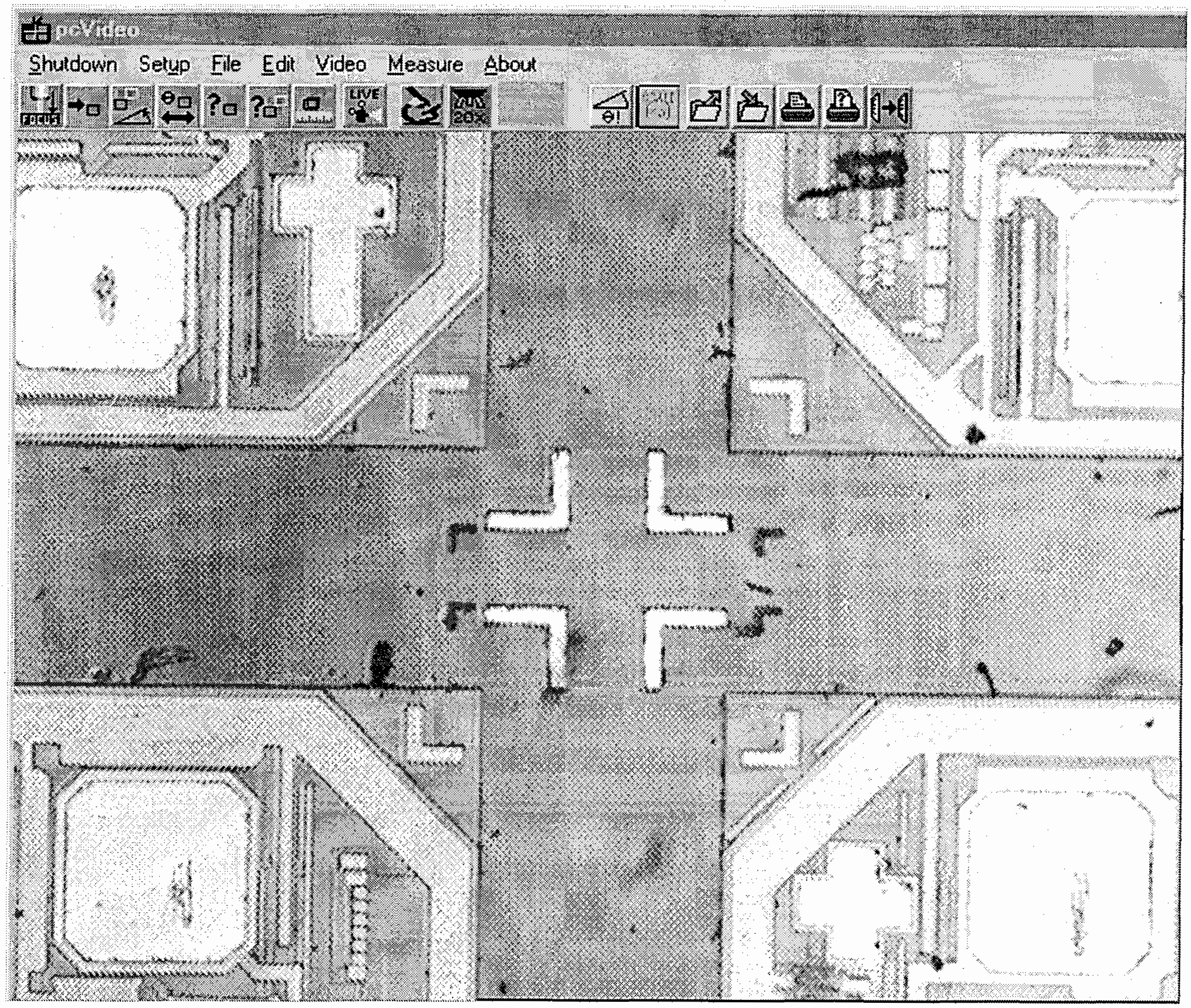
4.1 What is Pattern Recognition?

Pattern recognition is a set of mathematical functions which identify and locate reference patterns (models) in an image and characterize an image. Pattern matching is used to provide position correction and coarse wafer alignment. Image characterization is used to perform auto-focus.

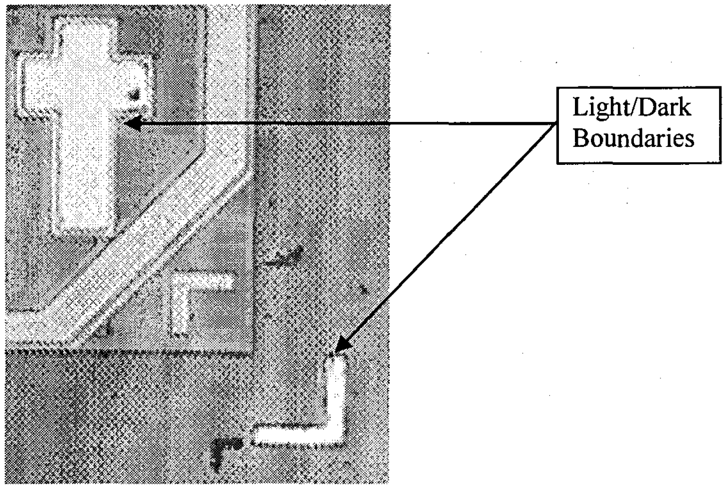
Pattern recognition requires that a model be defined before it can do any useful work. The pcProbe^{II} pattern recognition functions can be successful only when using the following model selection guidelines:

- The illumination level on the sample should be slightly brighter when viewed through the microscope. This minimizes the effects of chroma variation on pattern recognition.
- The defined model should contain a well defined (high contrast) light/dark boundary -- the edge of a die, for instance. This minimizes the effects of focus and illumination variations.
- The light/dark boundary in the model must occur once in the entire viewable image. Picking the edge of a pad would not be a good choice since there are usually multiple pads in the image.
- The model cannot depend on fine details for uniqueness. Details get mangled and lost when an image is slightly out of focus, causing the pattern recognition function to fail. For this reason, image enhancement add-ons should not be used with pattern recognition.
- Do not include stationary probes in the model since they do not move with the image.
- The model should be defined on features found on EVERY die. Defining a model containing scrapes or random debris will cause pattern recognition to fail.
- Models are valid only for the scope zoom and magnification settings used when the model is defined.
- Changing illumination levels after defining a model increases the likelihood of failures.
- Models should be towards the center of the field of view. This maximizes the likelihood of the model being in the field of view on another area of the wafer when doing alignment and correction.
- Auto alignment with the autoloader is set up with pattern recognition and requires the use of 10X or lower objectives to ensure correct operation. This is due to the repeatability of placement with the autoloader.
- Use a model of significant size (at least 10% of image area).
- Use unique objects for the alignment models, and not mirror images of each other.

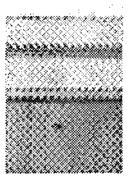
For example, assume the following image is displayed:



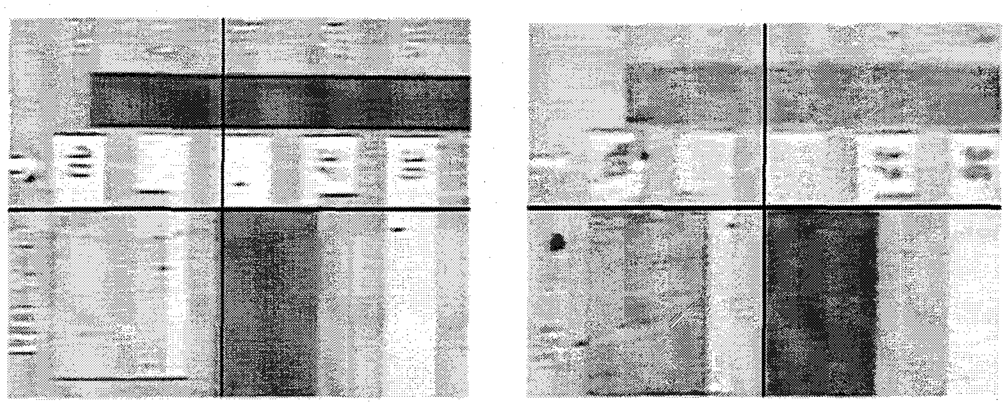
The following model would be good because it has a definite light/dark boundary and occurs once in the image:



The following model has a good light/dark boundary but is incorrect because it is not unique -- in fact it occurs hundreds of times along the lower edge of the die.

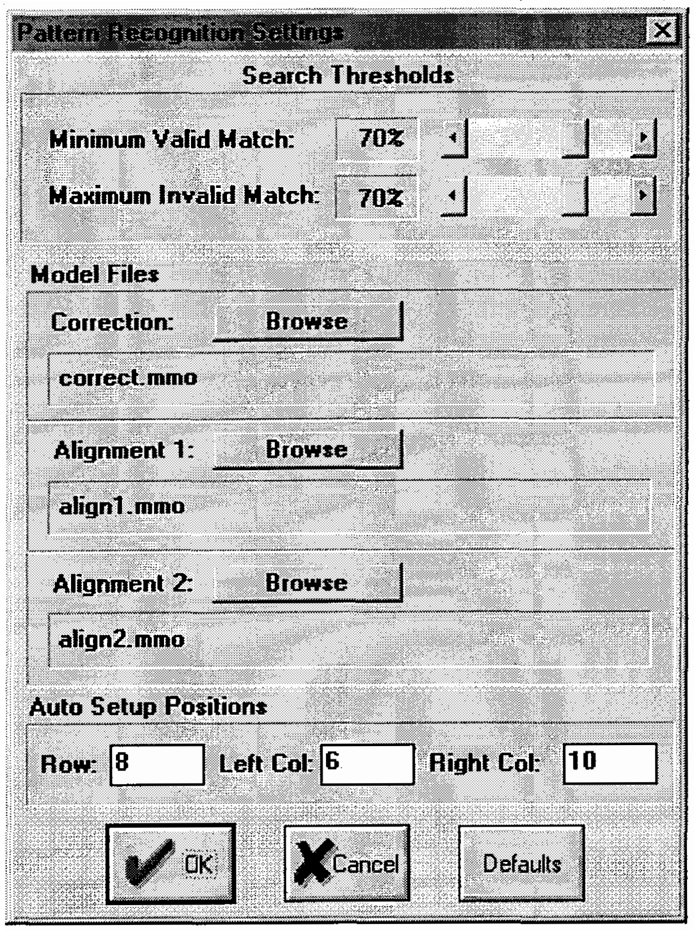


Sometimes the variances between supposedly identical sites can cause pattern recognition to fail. The images below demonstrate this. Notice how the left image has high contrast dark and light areas, whereas the image on the right has low contrast light/dark areas. The problems encountered can be fixed by increasing illumination, adjusting the focus so that small differences are not seen, and reducing the search threshold values.



4.2 Pattern Recognition Settings

Under normal operation, the default settings for pattern recognition should not require modification. If, however, it is necessary to store multiple models or adjust the image processing parameters, the Pattern Recognition Settings dialog box is available. This dialog box is accessed through the **Setup/Pattern Recognition...** menu. The following dialog is shown:



The **Search Thresholds** are used to validate the current image with the stored model. The higher the threshold, the more stringent the pattern match requirements. The **Model Files** are used for auto-correction and auto-alignment. The Correction model file is defined with **Teach Model/Correction**. The Alignment models are defined with **Teach Model/Align**. The pcWfr program makes use of these file settings when storing a wafer program. Change the file names to match a specific wafer lot to prevent overwriting a model whenever a new lot is tested.

The **Auto Setup Positions** are used when **Auto Setup** is selected. These positions define the alignment column,row locations for the auto-setup scan. When the auto-handler is installed and pcWfr is running, these values are ignored since pcWfr provides the correct alignment locations.

Select **Defaults** to restore all values to factory defaults.

4.3 Pattern Recognition Operation

4.3.1 Auto-Focus

The Auto-focus option relies on the information provided from the turret setup program. Réference the Turret Setup section for instructions on installing and configuring objectives. The focus function will not operate properly without setting up the turret.

If the **Auto Focus from Preset Down** option is enabled in the Turret application, the auto-focus function moves the microscope to its DOWN position. Otherwise focus is performed from the current position. The Z offset for the particular slot is used to ensure a better initial focus position when the turret driver is active. The microscope is moved up until the image is 20% less clear or fifteen moves occur. Next, the microscope moves back to the start position and then moves down until the image is 20% less clear or fifteen moves occur. The position associated with the clearest image is stored during the preceding process and the microscope is moved to that position.

The auto-focus function is extremely sensitive to light intensity, so a stable light source is required. The image as viewed through the camera should be slightly brighter than human viewing levels, but not so bright as to get video saturation.

4.3.2 Auto-Correction

The auto-correction function searches the current image for the taught correction model. This function will operate correctly only if the image magnification matches that of the model.

4.3.3 Align Sample

The align sample function searches the current image for the stored alignment models. This function operates correctly only if the image magnification matches that of the models.

4.3.4 Auto Setup

This function uses both the correction and alignment models to align and set the reference on a wafer. The alignment positions are retrieved from the pcWfr program if it is running, otherwise it uses defaults. Note that if the correction pattern cannot be found at either edge of the wafer the alignment position is moved towards the center by one die.

4.3.5 Teach Model... Correction

This model is used in the auto-correct and auto-setup functions. The model is defined by drawing a box around a feature to use as the pattern.

4.3.6 Teach Model... Align

These models are used in the auto-align and auto-setup functions.

4.3.7 Teach Model... Auto Scale

This function automatically scales the pattern recognition coordinates to match the physical position. This function is operated as follows:

1. Move diagonally by about 1/4 the field of view using point and shoot.

2. Select **Video/Teach Model.../Auto Scale**.

3. The device performs correction moves until the new scale factor is correct or a maximum number of repetitions is reached.

   Since the pattern recognition auto scaling function uses successive approximations to achieve its scaling, steps 1 – 3 may have to be repeated. The scaling is correct when the Auto Scale function returns to the starting point in two moves.

   NOTE: The pattern recognition scale factor is distinct from the video scaling discussed in section 2.5.3.

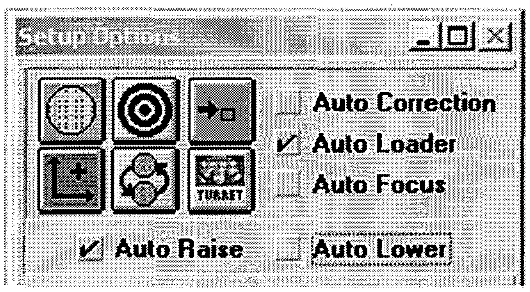
4.4 Pattern recognition operation with the Wafer Handler

4.4.1 Initial Setup

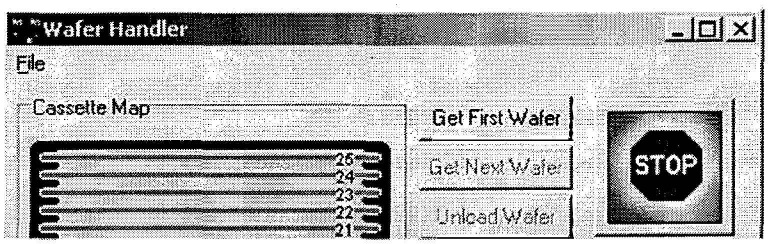
1. Open the Wafer Handler program if it is not currently running.

2. Open pcWfr if it is not currently running.

3. Turn the Auto Loader option On in pcWfr/Setup Options as shown below.



4. Load the first wafer of the cassette by selecting the Get First Wafer button of the Wafer Handler program as shown below.

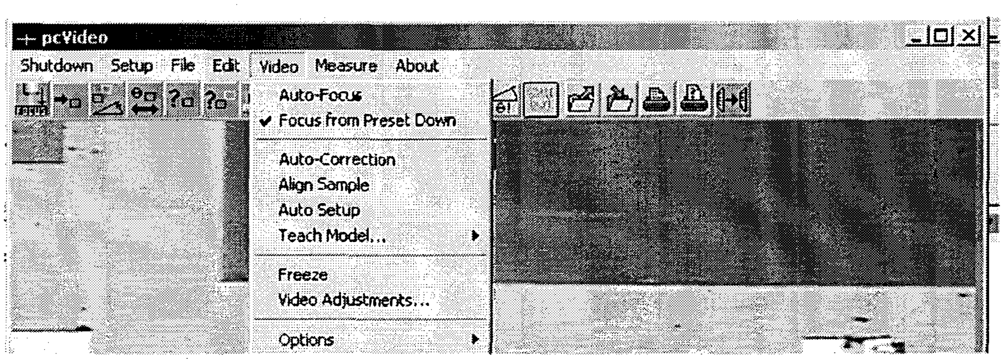


5. Focus the microscope on a feature of the wafer.

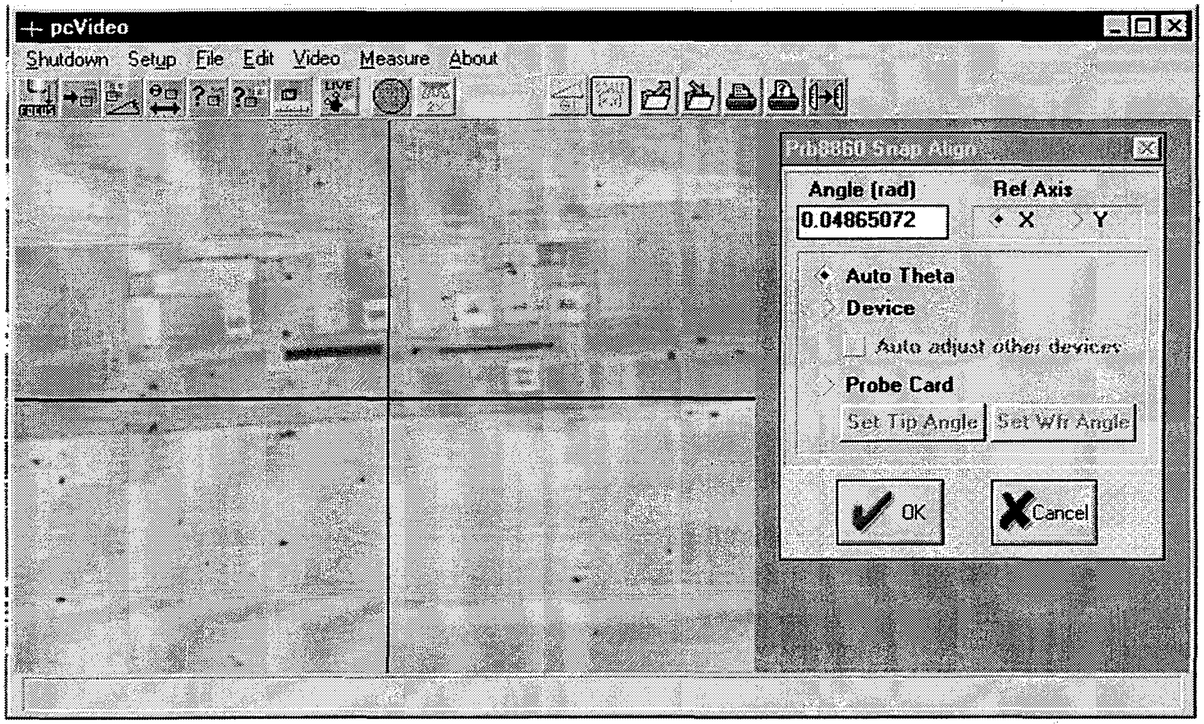
6. Set the microscope down position to the current position using pcNav.

7. Note the microscope zoom and objective settings. These are the settings which must **always** be used for pattern recognition.

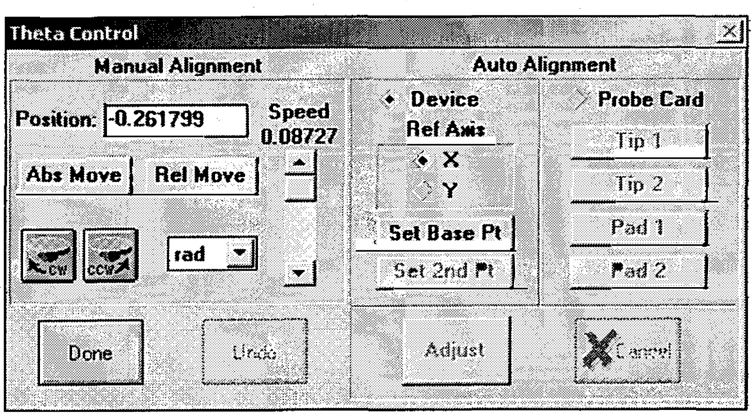
8. Select the pcVideo Focus from Preset Down option as shown below.



9. Perform a snap alignment to pre-align the wafer as shown below.



10. Precisely align theta using the Theta Control/Auto Alignment dialog in pcNav.



11. Verify that the click-and-drag scaling is correct using the procedure found in section 2.5.3.

12. Set die size using the pcNav Set Die Size procedure.

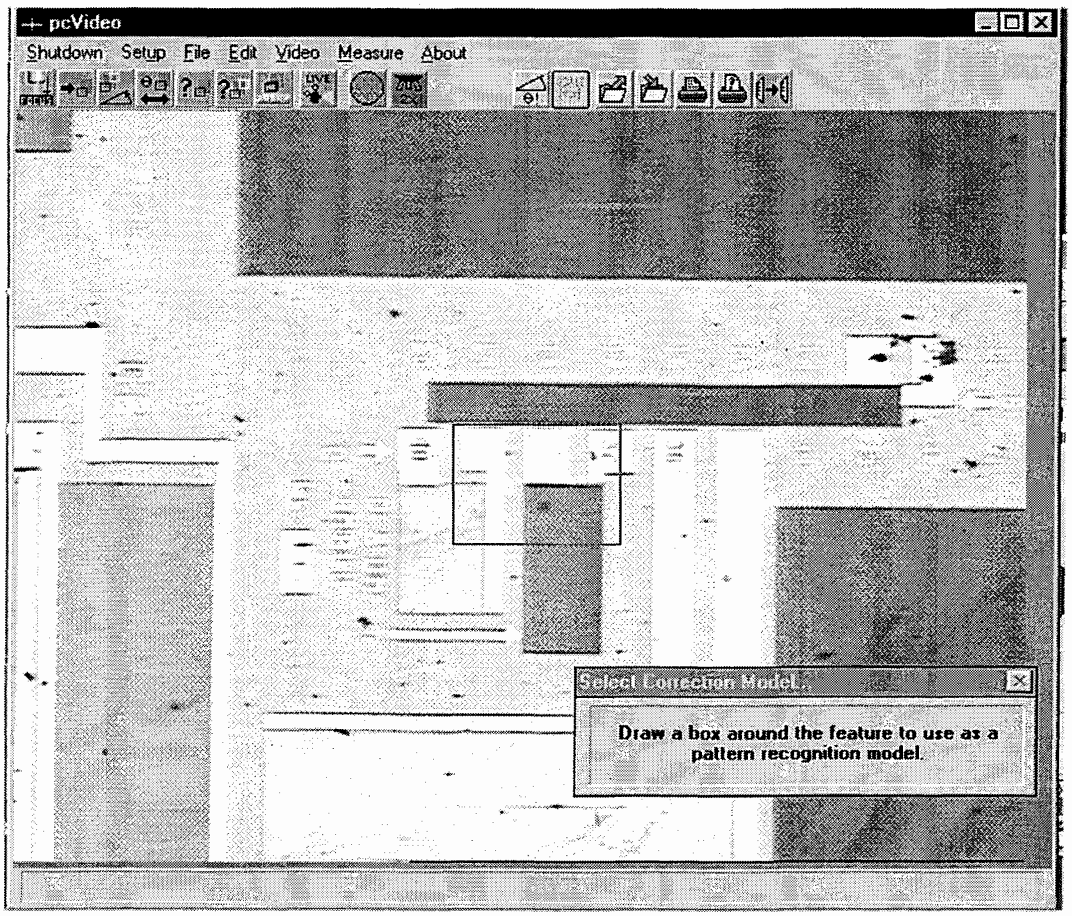
13. Move to the location to be used for pattern recognition.

14. Set the Col, Row reference for the location

4.4.2 Teaching the Correction Model

1. Move the stage to the location to be used for pattern recognition.

2. Select the Teach Correction Model button in pcVideo. The pattern recognition software takes a few seconds to acquire an image the first time this is used. A gray scale image is eventually displayed in the video window along with a message to select a model as follows:

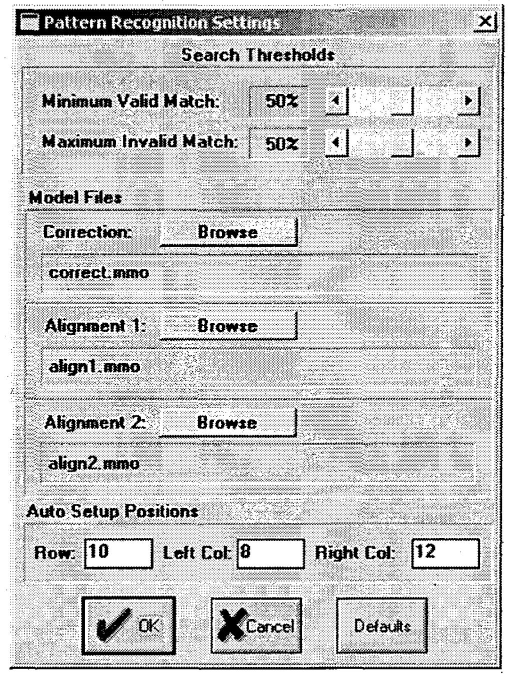


3. Draw a box around the desired model. The software draws a black crosshair at the top left corner of the model.

4. Select the ***Auto Correction*** button to validate the model. If the model is valid the stage moves slightly and returns to the original location. If an incorrect adjustment is made or a **Model Not Found** error occurs another model should be defined.

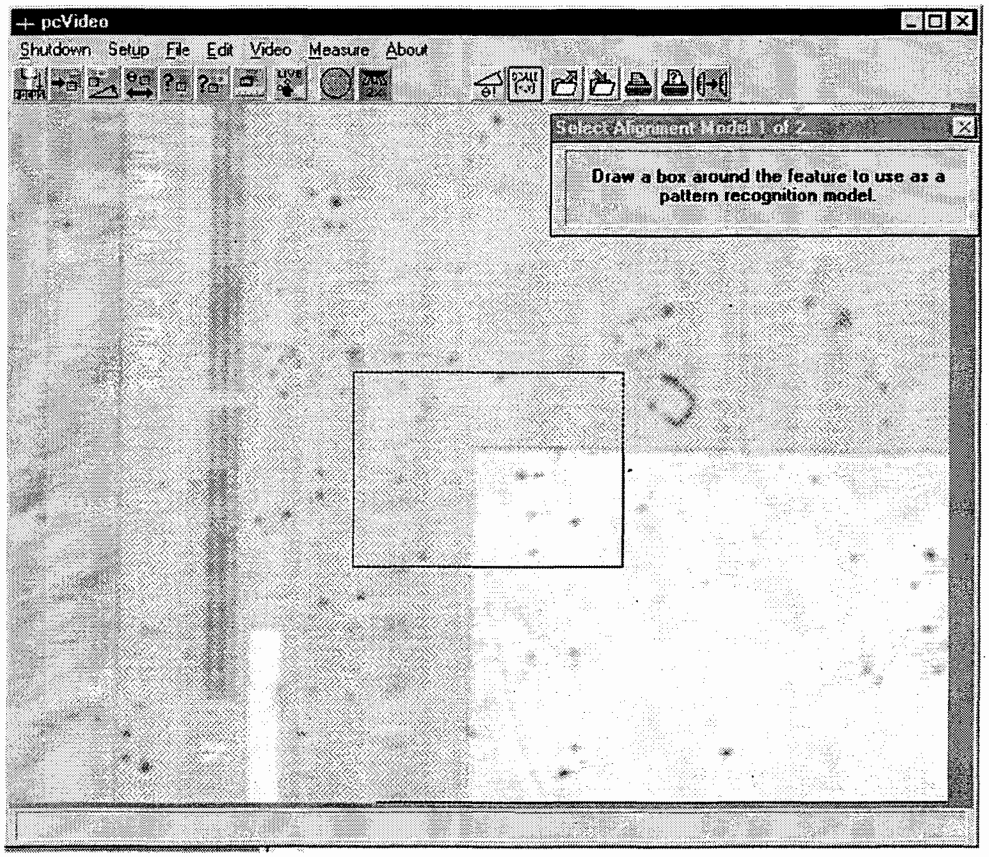
5. Verify the pattern recognition scaling as described in section 4.3.7.

6. Move to another die and re-test the correction model. If the **Model Not Found** error occurs the the pattern matching threshold values must be lowered as shown at right. The variances in color, debris, and damage between die are less significant to pattern recognition when the search threshold is lowered.

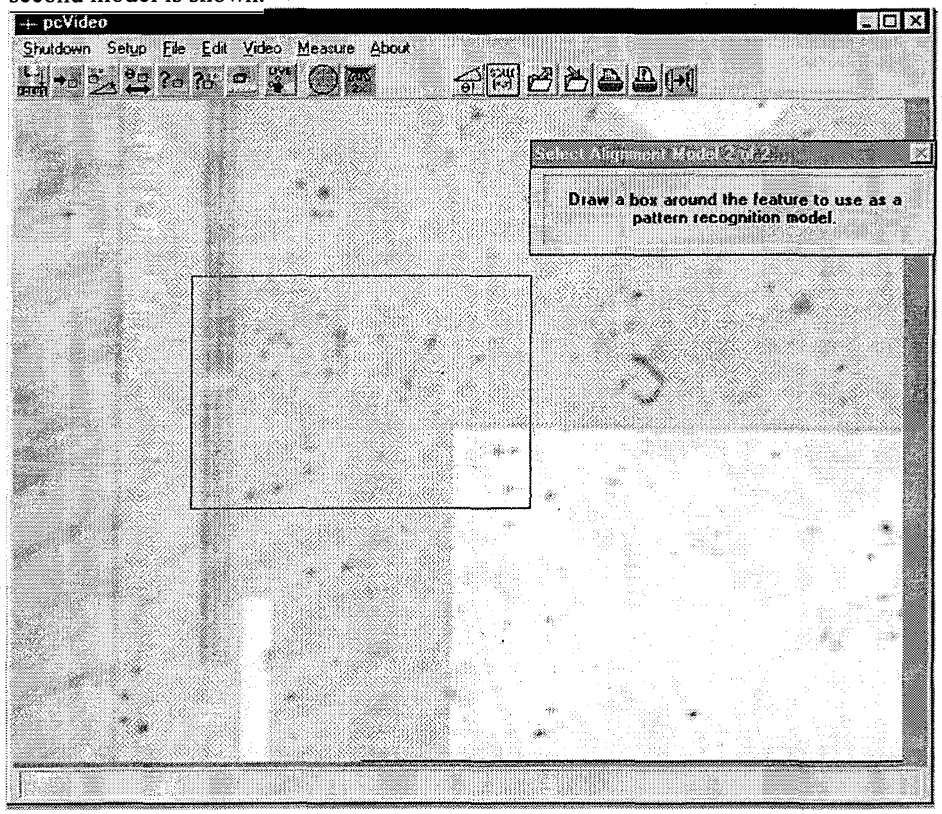


4.4.3 Teaching the Alignment Models

1. The software requires two models to determine an angle. The distance and angle between upper left corners of the models is used to pre-align wafers. Select the Teach Alignment Models button. A gray scale image is displayed as shown below.



2. Draw a box around the first of the two required alignment models. A message box requesting the second model is shown.



3. Select a second model by drawing another box.

4. Open the Theta Control dialog in pcNav and record the theta position.

5. Check that the models are correct by selecting the ***Auto Pre-align*** button. The chuck should not rotate if the models are correct.

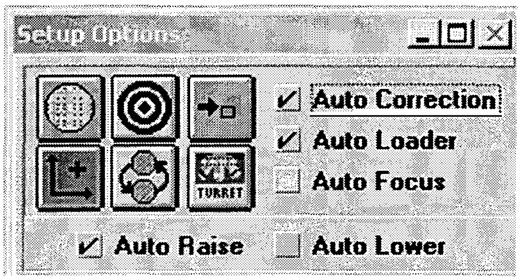
6. If it does rotate then it can be returned to the original position by entering the original theta angle in the Position text field of the **pcNav** ***Tools/Theta Control*** dialog and selecting **Abs Move**. Reteach the alignment models until the chuck does not rotate.

4.4.4 pcWfr Setup

1. Create a new die program in pcWfr. The current die size is always used.

2. Select the range of die to test on the Die Program map.

3. Turn the **Auto Correction** option ON in **pcWfr/Setup Options** as shown below.



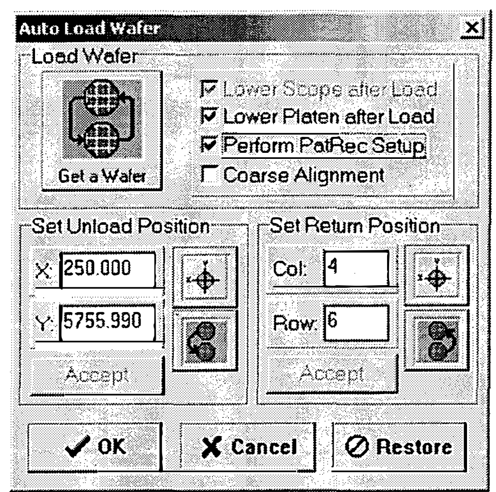
4. Save the die program.

5. Right click on several die on the wafer program map. The position should be corrected by pattern recognition at each die. If pattern recognition fails then the search thresholds may need to be lowered. If adjusting the thresholds fails to correct the problem it may be necessary to teach a new model.

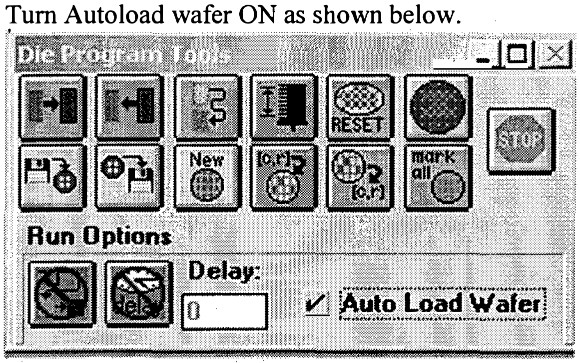
4.4.5 Automatically testing a cassette of wafers with pcWfr

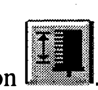
1. Open the Load Wafer dialog.

2. Select lower scope after load, lower platen after load, perform patrec setup as shown at right.



3. Turn Autoload wafer ON as shown below.



4. Select the Run die program continuously button . The Die Program is performed and a new wafer is automatically loaded until the last wafer is tested.

Note: Auto-handler functions are not available using pcEmulate.

PcIndie VX Reference Manual

Version 2.6.4

P/N A1012652

(OPTIONAL PRODUCT. NOT SUPPLIED WITH ALL SYSTEMS)

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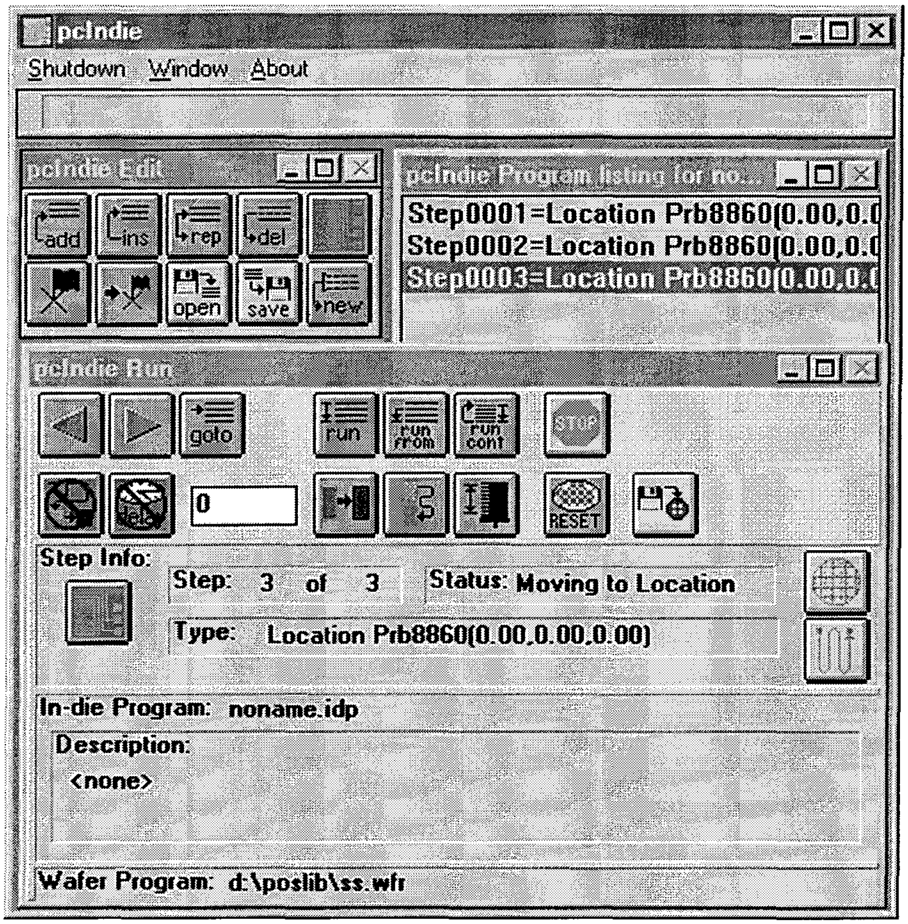
1 Introduction



PcIndie is used to establish a probing sequence within a die using any of three operations: **learn mode, matrix mode,** and **macro playback mode.** In **learn mode** each probing location is stored separately. Matrix mode defines a stepping program of regularly spaced positions by simply entering the X,Y coordinates, the number of columns and rows, and the test pattern type. Macro playback mode invokes a pcNav macro from the indie program. Stepping from die to die while performing a probing sequence within each die is done by running pcWfr with pcIndie.

PcIndie consists of a menu, a **Status bar** that displays button help, and three separate windows: **Program listing, Run,** and **Edit.** Each window can be minimized when not required.

When the mouse cursor is positioned over one of the buttons in pcIndie, a "help mode" is activated and the **Status bar** describes the function of the button.

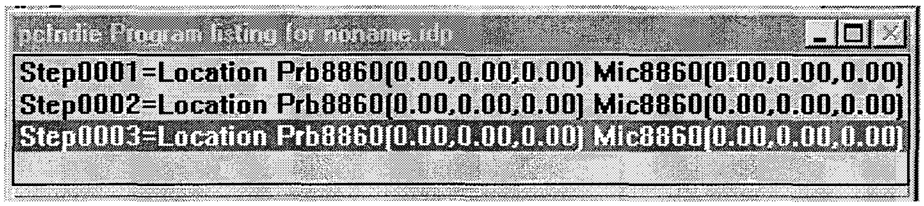
The **Program listing** window shows the listing of the indie program loaded. Steps may be selected in the window and, using the **Run window**, executed. As the indie program is executed, the step just completed is highlighted.

The **Run** window shows the indie program status and program control. While the indie program is running, a **STOP** button is available in the window.

The **Edit** window provides both edit and file control. Use this window to create, load, and save indie programs. Steps can be added, deleted, inserted, and replaced in individual programs. The steps can be any combination of the three step types described above.

> **NOTE:** Use the **STOP** button to abort a program run at any time. All positioners stop immediately.

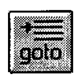
2 Program listing window



The **Program listing** window displays the program steps in the indie program. As the indie program is executing, the just completed step is highlighted. To go to a particular step or start execution from a particular step, simply select the desired step and the action in the **Run** window.

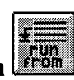
The **Program listing** window has four functions: display current indie program name, highlight just completed step, select a step for editing, and select a particular step to position all the devices to run from.

♦ To move the devices to a program step

1. Using the left mouse button select the step in the **Program listing.** The step is highlighted.
2. Select the **Goto** 

button from the **Run** window. The devices associated with that step move to their stored positions for that step.

♦ To start a program run at a program step

1. Using the left mouse button, select the step before the first step to be executed in the **Program listing** window. The step is highlighted.
2. Now select the **Run from** 

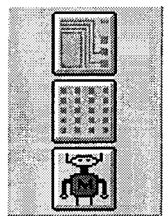
button in the **Run** window. Program execution begins with the step following the highlighted step.

3 Edit Window

The **Edit** window provides edit and file control. File management includes the ability to create, load, and save indie programs. Editing includes the abilities to choose the program step type, and to add, delete, insert, or replace a step in the current indie program.

3.1 Choosing the program step type

The program step type is chosen by selecting the program step type icon. When the icon is selected a drop-down menu of the available types is as shown below:



Learn step icon

Matrix step icon

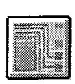
Macro playback step icon

Select the **Learn** step if selecting individual locations within a die. Use the **Matrix** step icon if setting up for arrays of test points. Select the **Macro playback** step to execute a macro sequence recorded with pcNav.

♦ To select a program step type

1. Using the left mouse button, select the **Program step type** icon as described above.
2. Place the mouse over the desired step type.
3. Click the left mouse button. The **Program step type** icon in the **Edit** window displays the icon face of the desired type.
4. From the main menu select **Window/Show Step Info** to show the current step information.

3.2 Using the Learn mode

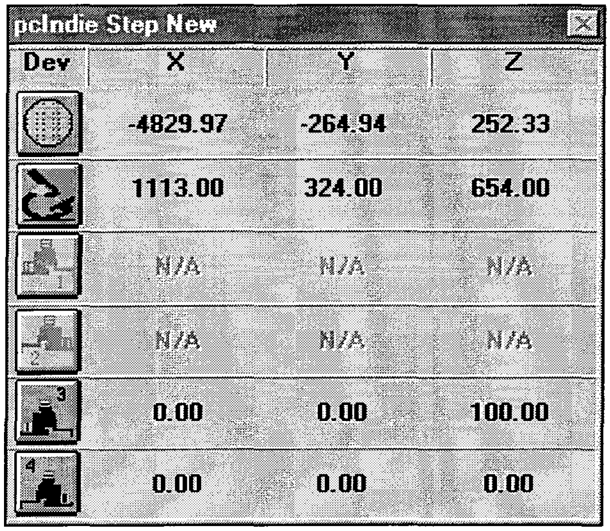


Learn mode records the position of all enabled devices when a step is added, inserted, or replaced in the indie program. In learn mode, the **Program step type** icon is the **Learn step** icon shown at left.

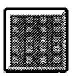
♦ To add, insert, or replace a learn step:

1. Verify that the **Program step type** icon in the **Edit** window is the **Learn step** icon. If not, see section 3.1.
2. Navigate all devices to the desired position in XY. There is no need to position in Z. pcIndie uses the pcNav Auto Raise/Auto Lower function along with the Z-up and Z-down coordinates to position each device in Z.
3. Select either the **Add, Insert,** or **Replace** icon in the **Edit** window.

4. If **Window/Show Step Info** is selected, a pcIndie Step New dialog box is shown as follows:



3.3 *Using the matrix mode*

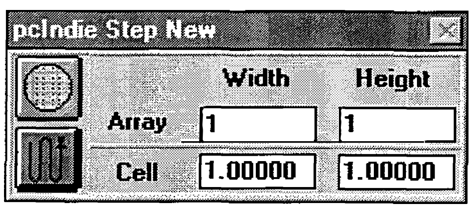


A matrix step is used when stepping through an array, such as a memory array. The array consists of a set width and height and cell X,Y size.

♦ To add, insert, or Replace a matrix step

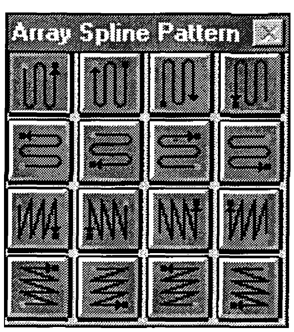
1. Verify that the program step type is set to matrix step. If not, see section 3.1.

2. Enable **Window/Show Step Info.** The **pcIndie Step New** dialog box is displayed as follows:



3. Select the device that performs the matrix test.

4. Select one of the spline patterns for the test as shown below:



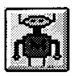
5. Enter the array width, height and the X,Y cell size.

6. Navigate all devices to the required positions for the first step of the array test. **The stored reference point is ALWAYS the LOWER LEFT corner of the array spline pattern.**

7. Select either **Add, Insert, or Replace**.

> **NOTE:** Spline patterns may appear to be reversed at run time depending on the number of rows and columns selected. If this happens, choose the mirror image of the spline pattern.

3.4 Using the macro playback mode

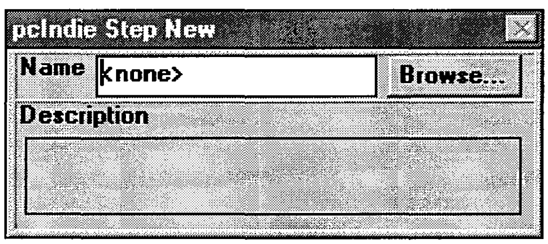


Use the **Macro playback** mode to incorporate a pcNav macro into an indie program.

♦ To add, insert, or replace a macro playback step:

1. Verify that the **Program step type** in the **Edit** window is the **Macro playback step** icon.

2. Enable **Window/Show Step Info**. The following dialog is shown:



3. Enter the name of the macro to use in the die program. If the name is not known, use the **Browse...** button to locate the file.

4. Select **Add, Insert,** or **Replace** from the **Edit** window.

3.5 Creating a new indie program

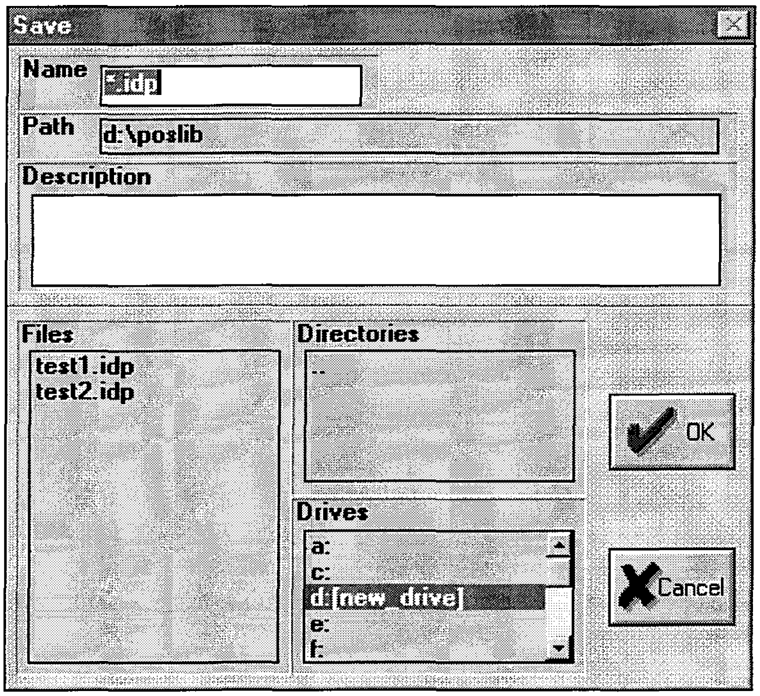
Use this function to create a new indie program. When the **New program** icon is selected, the **Program listing** window is cleared. If the current program has not been saved, the user is prompted to save it.

3.6 *Saving an indie program*

Use this function to save an indie program. The indie program and all the parameters associated with it are saved.

◆ To save an indie program:

1. Select the **Save indie program** icon. The **Save** dialog is shown as follows:

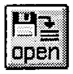


2. Select the drive and directory from the lists.

3. Enter the file name in the **Name** edit box or select it from the **Files** list.

4. Click on **OK** to accept the file name.

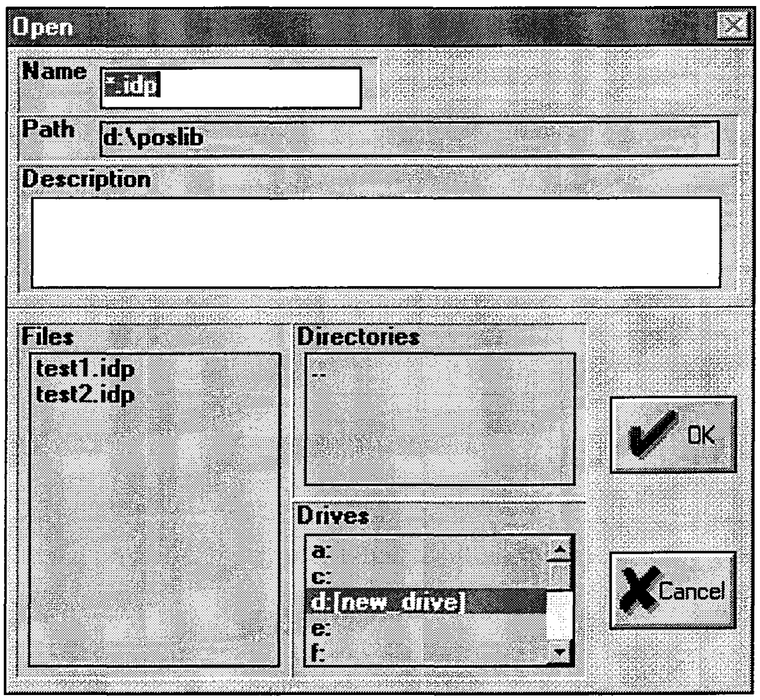
3.7 Opening an indie program



Select this icon to use an indie program that has been previously saved. This function opens the saved indie program and loads all the parameters associated with the program.

♦ To open a saved indie program

1. Select the **Open indie program** icon. The **Open** dialog is shown as follows:



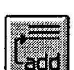
2. Select the drive and directory from the lists.

3. Enter the file name in the **Name** edit box or select it from the **Files** list.

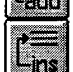
4. Click on **OK** to accept the file name.

3.8 Using the step edit buttons

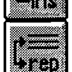
The step edit buttons are used to edit an indie program.



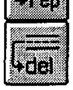
The **Add** button adds a program step to the end of the indie program.



Insert inserts a program step before the highlighted program step.

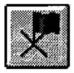


The **Replace** button replaces the highlighted program step with another step of any type.



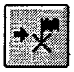
The **Delete** button deletes the highlighted program step.

3.9 Setting indie program reference



The **Set reference** function establishes an initial reference point for the indie program to use. All positions of the indie program are calculated relative to this initial reference position. Changing the reference position changes the locations for all steps in the indie program.

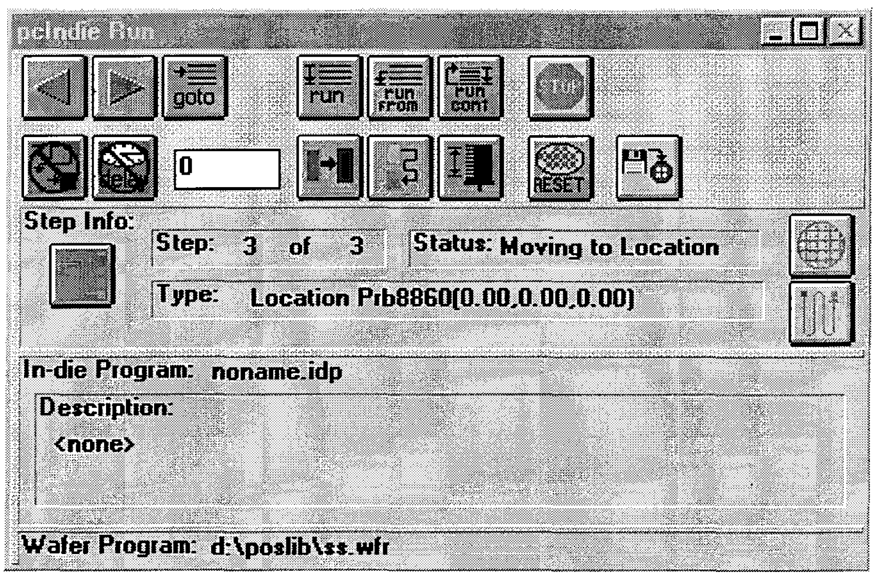
3.10 Moving to the indie program reference



The **Move to reference** function moves all devices to the indie program reference position.

4 Run Window

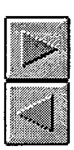
The **Run** window provides program control over an indie program. The status of the running program is continually updated in this window. This window also allows a pcWfr die program to be loaded and executed with the indie program. Delay, External TTL Trigger, and pcWfr control functions are also available in this window.



4.1 Understanding the program status display

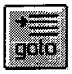
The **Status display** in the **Run** window shows step information and execution status of the indie program. The step information consists of the step number, type, and the program list line. The **Device** and **Spline pattern** are shown when the step is a **Matrix mode step.**

4.2 Single stepping through an indie program



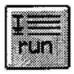
To run an indie program in single step mode, use the **Single Step** buttons. These buttons allow forward and backward stepping through the indie program. **Forward step** always proceeds to the next instruction in the program. If the program is at the last step it wraps around to the first step. **Backward step** always goes to the previous step and wraps around to the first step after executing the last step.

4.3 Using the goto button

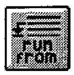


The **goto** function moves all devices to the step highlighted in the **Program listing** window.

4.4 Running an indie program



This icon runs the indie program from the first step to the last step.



This icon runs the indie program from the highlighted step in the **Program listing** to the last step.

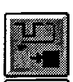
This icon runs the indie program continuously from the beginning until the user selects the **Stop** button..

> **NOTE**: During execution, the program just completed is always the highlighted step in the program list. The program can be stopped at any time by selecting the STOP button.

4.5 Using a delay

Use this function to enable or disable time delay between each program step of the indie program. The **Delay** icon is a toggle. When selected, the **Delay** icon toggles between delay on (top left) and delay off (bottom left). When delay is enabled, the time delay value is used between each step. The delay value is in seconds.

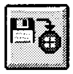
4.6 Using External TTL Trigger



This function enables the external trigger TTL input on the test station. It causes the indie program to wait for a pulse on this input before moving to the next step. The **External trigger** icon is a toggle. It toggles between trigger on (top left) and off (bottom left). When the **External trigger** icon is toggled the indie program waits for a pulse on the external trigger TTL input on the back of the test station rack mount enclosure before moving to the next step.

4.7 Running an indie program with a die program

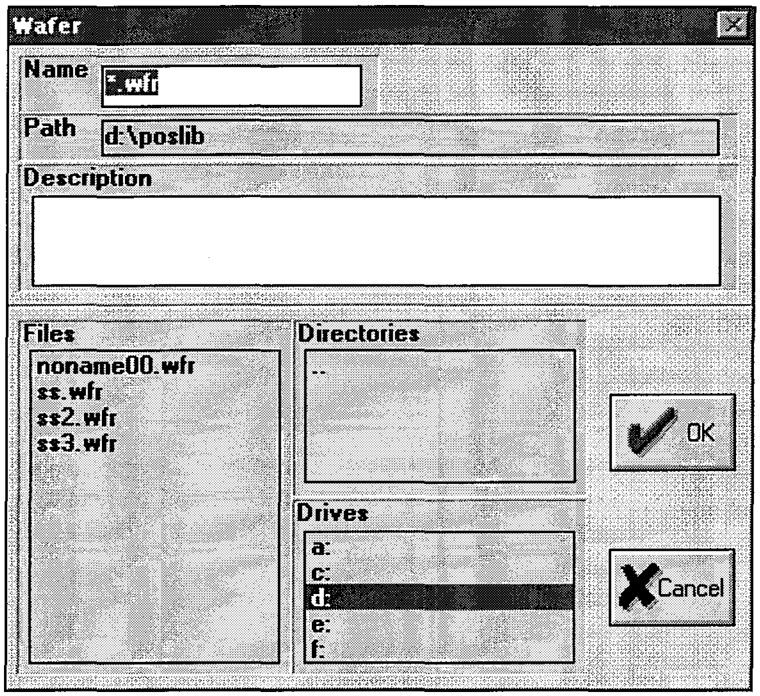
4.7.1 Opening a die program



Use this function to load a pcWfr die program to be used in conjunction with an indie program. PcWfr must be running before attempting to open a pcWfr die program.

- **To open a saved die program**

1. Select the **Open die program** icon. The **Open** dialog box is displayed as shown below:

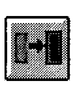


2. Select the drive and directory from the **Drives** and **Directories** lists.

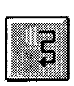
3. Enter a file name in the **Name** edit box or select a file from the **Files** list.

4. Click on **OK** to accept the die program name and load the file into pcWfr.

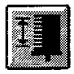
4.7.2 Running a die program with the indie program



The **Single step** icon causes pcWfr to step to the next die in the die program spline pattern. If all die are marked as untested, single step moves to the first die in the die program spline pattern.

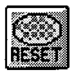


To automatically run an indie program with a die program once, select the **Run** icon. The selected device moves to the first die of the pcWfr die program spline pattern and then runs the indie program for each die in the die program.



This icon causes the indie program to be executed on all die of all wafers in a cassette when the autoloader option is installed. If the autoloader option is NOT installed, the user is prompted to manually load another wafer.

4.7.3 Resetting the die program



This icon causes the die program to reset all die to the untested state.

PcRouter VX Reference Manual
Version 2.7

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Table of Contents

1. Introduction

The intent of the pcRouter is to provide a DDE command link between pcProbe^{II} and other Windows applications.

1.1. DDE Overview

DDE communications between programs can be compared to RS-232 or GPIB communications between a test host and test instruments. For example, when a test host communicates to an instrument on the GPIB it must follow a sequence like:

1. Address the instrument
2. Select Talk or Listen
3. Transfer command or data
4. Unaddress instrument

The same general communications actions take place using the DDE communications protocol within Windows:

1. Select DDE server and topic
2. Select item for conversation
3. Transfer command or data
4. Terminate conversation

- **Requesting DDE Information from pcRouter**

1. Set the DDE server to "pcProbe".
2. Set the DDE topic to "data" or whichever topic is required for the command set.
3. Set the DDE link mode to 2 (**COLD** mode) to open a DDE conversation.
4. Set the DDE data format to **CF_TEXT**.
5. Set the DDE item to the command – e.g. "getunits".
6. Create the destination for the DDE data requested.
7. Perform the DDE request.
8. Set the DDE link mode to 0 (off) to terminate the DDE conversation. The command is sent to pcRouter and the command status is shown.

- **Sending DDE Information to pcRouter**

1. Set the DDE server to "pcProbe".
2. Set the DDE topic to "data" or whichever topic is required for the command set.
3. Set the DDE link mode to 2 (**COLD** mode) to open a DDE conversation.
4. Set the DDE data format to **CF_TEXT**.
5. Set the DDE item to the command – e.g. "units".
6. Set the DDE data to the required value – e.g. "mil".
7. Perform the DDE poke.
8. Set the DDE link mode to 0 (off) to terminate the DDE conversation. The command is sent to pcRouter and the command status is shown.

1.2. Additions to version 2.6.X

This application is extensively changed from version 2.1.X and below. It is the central point of control for the turret, loader, and pattern recognition and therefore must be running to use these options. The following features are added:

- Z Lock function enabled with [*dev*]**tdm** command
- **RSTWFR** Reset Wafer command now works when only pcWfr is running rather than requiring the use of pclndie.
- Auto-handler control and DDE interface
- Turret control and DDE interface
- Pattern recognition DDE interface

1.3. Language Interface Examples

The Basic code presented in this section operates properly with pcRouter. The examples given in the DDE command sections assume the use of these routines.

Microsoft Visual Basic

```
'   In the following code it is assumed that Text1, Text2, and Text3 are Text
Controls --
'   Text1 is the DDE Command (item)
'   Text2 is the DDE Data
'   Text3 is the DDE Server and Topic of the form:
'       <server>|<topic>
'   e.g. -- Text3.Text = "pcProbe|loader"
'           Text1.Text = "debug"
'           Text2.Text = "1"
'
Sub DDE_Poke
    Dim szMsg As String

    If Text2.LinkMode = 0 Then
        Text2.LinkTopic = Text3.Text
    End If

    Text2.LinkTimeout = 3000
    On Error Resume Next
    Text2.LinkMode = 2
    If Err Then
        szMsg = "Unable to connect to " + Text3.Text
        MsgBox szMsg
        On Error GoTo 0
        Exit Sub
    End If
    Text2.LinkItem = Text1.Text
    Text2.LinkPoke
    If Err Then
```

```
        szMsg = "Unable to Complete command " + Text1.Text
        MsgBox szMsg
    End If
    Text2.LinkMode = 0
    On Error GoTo 0
End Sub

Sub DDE_Request
    If Text2.LinkMode = 0 Then
        Text2.LinkTopic = Text3.Text
    End If

    Text2.LinkTimeout = 3000
    On Error Resume Next
    Text2.LinkMode = 2
    If Err Then
        szMsg = "Unable to connect to " + Text3.Text
        MsgBox szMsg
        On Error GoTo 0
        Exit Sub
    End If

    Text2.LinkItem = Text1.Text
    Text2.LinkRequest
    If Err Then
        szMsg = "Unable to Complete command " + Text1.Text
        MsgBox szMsg
    End If
    Text2.LinkMode = 0
    On Error GoTo 0
End Sub
```

2. Command Reference

2.1. pcProbe commands

Service: pcProbe
Topic: data

Item	DDE	Description
?extrig	request	Get external trigger state
atd	request	Get the touchdown sensed state for the PCS-4 and prober
autorl	poke	Set auto raise/lower settings
chdir	poke	Set the data directory
dev	request	Get the active positioner
diesize	poke	Set the die size
dumpprog	request	Get program name list
extrig	poke	Set external trigger
getautorl	request	Get auto raise/lower settings
getdiesize	request	Get the die size
getdir	request	Get the data directory
getillum	request	Get the on/off state of the illuminator
gettd	request	Get the PCS-4 enable/disable touchdown sense states
getthunits	request	Get theta units
getunits	request	Get the current units
goto	poke	Execute a specific indie step
homeref	request	Move to indie program reference
idpauto	request	Run indie program and step pcWfr program at end
idpdump	request	Get all available indie programs
idpload	poke	Load an indie program
idpname	request	Get name of indie program
idpnext	request	Move to next indie program step
idprun	request	Run indie program from beginning to end
illum	poke	Turn illuminator on or off
indiestep	request	Execute next indie program step
ink	poke	Actuate inker
joystick	poke	Set joystick mode
loadprog	poke	Load the requested program
lotfile	request	Get lotfile
lotid	request	Get lot id
lotname	request	Get lot name
lottype	request	Get lot type
miccr	poke	Move the microscope to a Col,Row position
micdn	request	Move the microscope to the down position
micga	request	Get alignment angle
micgetidx	request	Get XYZ index sizes
micgetjm	request	Get microscope jog mode
micgetjs	request	Get microscope jog scale
micgetudo	request	Get Up/Down for microscope
micgetxyscl	request	Get microscope XY jog scale
micgetzscl	request	Get microscope Z jog scale
micidx	poke	Set XYZ index size

micjgxy	poke	Jog microscope in X,Y
micjgz	poke	Jog the microscope at the defined speed
micjm	poke	Set microscope jog mode
micjs	poke	Set microscope jog scale
micor	poke	Set coordinate orientation
micor?	request	Get coordinate orientation
micpos	request	Get the microscope X,Y,Z,C,R position
micposno	request	Get microscope raw XYZ position
micrefcr	poke	Set CR reference
micref	poke	Set X,Y reference position
micrpos	request	Get raw X,Y,Z position
micrxy	poke	Move to raw X,Y position
micrz	poke	Move to raw Z position
micsa	poke	Set alignment angle
micstat	request	Get the microscope move status
micstop	request	Stop microscope jog motion
mictrav	request	Get XYZ travel
micudo	poke	Set Up/Down for microscope
micup	request	Move the microscope to the up position
micxy	poke	Move the microscope to X,Y position
micxyno	poke	Move to raw XY position
micxyscl	poke	Set microscope XY jog scale
micz	poke	Move the microscope to Z position
miczscl	poke	Set microscope Z jog scale
nextdie	request	Step to next pcWfr die location
open	poke	Open an indie program
pos1cr	poke	Move positioner 1 to Col,Row position
pos1dn	request	Move positioner 1 to down position
pos1ga	request	Get alignment angle
pos1getidx	request	Get XYZ index sizes
pos1getjm	request	Get manipulator jog mode
pos1gettdm	request	Get manipulator touchdown mode
pos1getudo	request	Get Up/Down/Overdrive for manipulator
pos1getxyscl	request	Get manipulator XY jog scale
pos1getzscl	request	Get manipulator Z jog scale
pos1idx	poke	Set XYZ index sizes
pos1ini	request	Get the initialized to home state for the positioner
pos1jgxy	poke	Jog manipulator in X,Y
pos1jgz	poke	Jog manipulator in Z
pos1jm	poke	Set manipulator jog mode
pos1or	poke	Set coordinate orientation
pos1or?	request	Get coordinate orientation
pos1pos	request	Get positioner 1 X,Y,Z,C,R position
pos1posno	request	Get raw XYZ position
pos1ref	poke	Set X,Y reference position
pos1rpos	request	Get raw X,Y,Z position
pos1rxy	poke	Move to raw X,Y position
pos1rz	poke	Move to raw Z position
pos1refcr	poke	Set CR position
pos1sa	poke	Set alignment angle
pos1stat	request	Get positioner 1 move status
pos1stop	poke	Stop manipulator
pos1tdm	poke	Set manipulator touchdown mode

pos1trav	request	Get XYZ travel
pos1udo	poke	Set Up/Down/Overdrive for manipulator
pos1up	request	Move positioner 1 to up position
pos1xy	poke	Move positioner 1 to X,Y position
pos1xyno	poke	Move to raw XY position
pos1xyscl	poke	Set manipulator XY jog scale
pos1z	poke	Move positioner 1 to Z position
pos1zscl	poke	Set manipulator Z jog scale
pos2cr	poke	Move positioner 2 to Col,Row position
pos2dn	request	Move positioner 2 to down position
pos2ga	request	Get alignment angle
pos2getidx	request	Get XYZ index sizes
pos2getjm	request	Get manipulator jog mode
pos2gettdm	request	Get manipulator touchdown mode
pos2getudo	request	Get Up/Down/Overdrive for manipulator
pos2getxyscl	request	Get manipulator XY jog scale
pos2getzscl	request	Get manipulator Z jog scale
pos2idx	poke	Set XYZ index sizes
pos2ini	request	Get the initialized to home state for the positioner
pos2jgxy	poke	Jog manipulator in X,Y
pos2jgz	poke	Jog manipulator in Z
pos2or	poke	Set coordinate orientation
pos2or?	request	Get coordinate orientation
pos2jm	poke	Set manipulator jog mode
pos2pos	request	Get positioner 2 X,Y,Z,C,R position
pos2posno	request	Get raw XYZ position
pos2refcr	poke	Set CR position
pos2ref	poke	Set X,Y reference position
pos2rpos	request	Get raw X,Y,Z position
pos2rxy	poke	Move to raw X,Y position
pos2rz	poke	Move to raw Z position
pos2sa	poke	Set alignment angle
pos2stat	request	Get positioner 2 move status
pos2stop	poke	Stop manipulator
pos2tdm	poke	Set manipulator touchdown mode
pos2trav	request	Get XYZ travel
pos2udo	poke	Set Up/Down/Overdrive for manipulator
pos2up	request	Move positioner 2 to up position
pos2xy	poke	Move positioner 2 to X,Y position
pos2xyno	poke	Move to raw XY position
pos2xyscl	poke	Set manipulator XY jog scale
pos2z	poke	Move positioner 2 to Z position
pos2zscl	poke	Set manipulator Z jog scale
pos3cr	poke	Move positioner 3 to Col,Row position
pos3dn	request	Move positioner 3 to down position
pos3ga	request	Get alignment angle
pos3getidx	request	Get XYZ index sizes
pos3getjm	request	Get manipulator jog mode
pos3gettdm	request	Get manipulator touchdown mode
pos3getudo	request	Get Up/Down/Overdrive for manipulator
pos3getxyscl	request	Get manipulator XY jog scale
pos3getzscl	request	Get manipulator Z jog scale
pos3idx	poke	Set XYZ index sizes

pos3ini	request	Get the initialized to home state for the positioner
pos3jgxy	poke	Jog manipulator in X,Y
pos3jgz	poke	Jog manipulator in Z
pos3jm	poke	Set manipulator jog mode
pos3or	poke	Set coordinate orientation
pos3or?	request	Get coordinate orientation
pos3pos	request	Get positioner 3 X,Y,Z,C,R position
pos3posno	request	Get raw XYZ position
pos3refcr	poke	Set CR position
pos3ref	poke	Set X,Y reference position
pos3rpos	request	Get raw X,Y,Z position
pos3rxy	poke	Move to raw X,Y position
pos3rz	poke	Move to raw Z position
pos3sa	poke	Set alignment angle
pos3stat	request	Get positioner 3 move status
pos3stop	poke	Stop manipulator
pos3tdm	poke	Set manipulator touchdown mode
pos3trav	request	Get XYZ travel
pos3udo	poke	Set Up/Down/Overdrive for manipulator
pos3up	request	Move positioner 3 to up position
pos3xy	poke	Move positioner 3 to X,Y position
pos3xyno	poke	Move to raw XY position
pos3xyscl	poke	Set manipulator XY jog scale
pos3z	poke	Move positioner 3 to Z position
pos3zscl	poke	Set manipulator Z jog scale
pos4udo	poke	Set Up/Down/Overdrive for manipulator
pos4cr	poke	Move positioner 4 to Col,Row position
pos4dn	request	Move positioner 4 to down position
pos4ga	request	Get alignment angle
pos4getidx	request	Get XYZ index sizes
pos4getjm	request	Get manipulator jog mode
pos4gettdm	request	Get manipulator touchdown mode
pos4getudo	request	Get Up/Down/Overdrive for manipulator
pos4getxyscl	request	Get manipulator XY jog scale
pos4getzscl	request	Get manipulator Z jog scale
pos4idx	poke	Set XYZ index sizes
pos4ini	request	Get the initialized to home state for the positioner
pos4jgxy	poke	Jog manipulator in X,Y
pos4jgz	poke	Jog manipulator in Z
pos4jm	poke	Set manipulator jog mode
pos4or	poke	Set coordinate orientation
pos4or?	request	Get coordinate orientation
pos4pos	request	Get positioner 4 X,Y,Z,C,R position
pos4posno	request	Get raw XYZ position
pos4refcr	poke	Set CR position
pos4ref	poke	Set X,Y,Z reference position
pos4rpos	request	Get raw X,Y,Z position
pos4rxy	poke	Move to raw X,Y position
pos4rz	poke	Move to raw Z position
pos4sa	poke	Set alignment angle
pos4stat	request	Get positioner 4 move status
pos4stop	poke	Stop manipulator
pos4tdm	poke	Set manipulator touchdown mode

pos4trav	request	Get XYZ travel
pos4up	request	Move positioner 4 to up position
pos4xy	poke	Move positioner 4 to X,Y position
pos4xyno	poke	Move to raw XY position
pos4xyscl	poke	Set manipulator XY jog scale
pos4z	poke	Move positioner 4 to Z position
pos4zscl	poke	Set manipulator Z jog scale
prbcr	poke	Move prober to Col,Row position
prbdn	request	Move prober to down position
prbga	request	Get alignment angle
prbgetidx	request	Get XYZ index sizes
prbgetjm	request	Get prober jog mode
prbgettdm	request	Get prober touchdown mode
prbgetudo	request	Get Up/Down/Overdrive for prober
prbgetxyscl	request	Get prober XY jog scale
prbgetzscl	request	Get prober Z jog scale
prbidx	poke	Set XYZ index sizes
prbini	request	Get the initialized to home state for the prober
prbjgxy	poke	Jog prober in X,Y
prbjgz	poke	Jog prober in Z
prbjm	poke	Set prober jog mode
prbor	poke	Set coordinate orientation
prbor?	request	Get coordinate orientation
prbpos	request	Get prober X,Y,Z,C,R position
prbposno	request	Get raw XYZ position
prbrefcr	poke	Set CR position
prbref	poke	Set X,Y reference position
prbrpos	request	Get raw X,Y,Z position
prbrxy	poke	Move to raw X,Y position
prbrz	poke	Move to raw Z position
prbsa	poke	Set alignment angle
prbstat	request	Get prober move status
prbstop	poke	Stop prober
prbtd	request	Get the prober touchdown state
prbtdm	poke	Set prober touchdown mode
prbtrav	request	Get XYZ travel
prbudo	poke	Set Up/Down/Overdrive for prober
prbup	request	Move prober to up position
prbxy	poke	Move prober to X,Y position
prbxyno	poke	Move to raw XY position
prbxyscl	poke	Set prober XY jog scale
prbz	poke	Move prober to Z position
prbzscl	poke	Set prober Z jog scale
progdesc	request	Get program description
progname	request	Get current active die program
rstwfr	request	Reset wafer program
rst	poke	Reset the PCS-4 touchdown module and prober touchdown
setdev	poke	Set current active device
setref	request	Set current location as indie program reference
settd	poke	Set the PCS-4 enable/disable touchdown sense states
step	request	Step the die program to the next position
stepinfo	request	Get the current step information from pcindie

thetagetjs	request	Get the jog scale for theta
thetaini	request	Get the initialized state for the theta chuck
thetajog	poke	Jog theta
thetajs	poke	Set Theta Jog scale
thetamove	poke	Move theta
thetapos	request	Get theta position
thetastop	request	Stop Theta
thetaunits	poke	Set theta units
units	poke	Set units
updt	request	Get update list
winmsgs	poke	Set windows messaging flag

2.1.1. ?extrig

Description: Get the external trigger state and time until timeout

Item: ?extrig

Data: Returned data is of the form: <extrig>,<timeleft> where extrig = 1(received) or 0(waiting) and timeleft is the time remaining to extrig timeout in milliseconds

E.G. -- 0,12333 indicates waiting for extrig with 12333 milliseconds until timeout.

Type: DDE Request

2.1.2. atd

Description: Get the touchdown sensed state for the PCS-4

Item: atd

Data: Returned data is of the form: <ch1>,<ch2>,<ch3>,<ch4> where ch1 is contact sense channel 1 and so on. Values of 1 indicate that touchdown is sensed.

E.G. -- 1,1,0,0 indicates channels 1 and 2 sense touchdown.

Type: DDE Request

2.1.3. autorl

Description: Set the autoraise/lower flags

Item: autorl

Data: Auto raise and auto lower flags in the form <autoraise>,<autolower> with 0=off 1=on

E.G. -- 1,1 indicates autoraise and autolower both on

Type: DDE Poke

2.1.4. chdir

Description: Set the data directory for programs. Note that all paths and file names must follow the "8.3" MS-DOS file naming format.

Item: chdir

Data: <drive:><\dir...\>

E.G. -- c:\poslib\

Type: DDE Poke

2.1.5. dev

Description: Get the active positioner

Item: dev

Data: Get the currently active device. Valid returns are:

prb pos1 pos2 pos3 pos4 mic

Type: DDE Request

2.1.6. diesize

Description: Set die size using current units

Item: diesize

Data: Die size to <X>,<Y> in current units. E.G. 100.1,200.2

Type: DDE Poke

2.1.7. dumpprog

Description: Get program name list with .wfr file extension. Continue sending this command until the "---done---" string is returned.

Item: dumpprog

Data: Returned data is of the form: <drive:><\dir..\><file><.ext>. When no more files of type .wfr are available the string "---done---" is returned. Note: The directory searched is returned by Getdir and may be changed with Chdir.

Type: DDE Request

2.1.8. extrig

Description: Set the external trigger state and timeout

Item: extrig

Data: Data is of the form: <state>,<timeout> where state is the logic level matching the external trigger active state (1 or 0) and timeout is the time in milliseconds to wait for external trigger.

E.G. -- 0,50000 indicates waiting for extrig input = 0 with a 50000 millisecond timeout.

Type: DDE Poke

2.1.9. getautorl

Description: Get the autoraise/lower flags

Item: getautorl

Data: Returned data is the auto raise and auto lower flags in the form <autoraise>,<autolower> with 0=off 1=on

E.G. -- 1,1 indicates autoraise and autolower both on

Type: DDE Request

2.1.10. Getdiesize

Description: Get current die size

Item: getdiesize

Data: Returns current die size in current units as X,Y.

E.G – 100.123,92.112

Type: DDE Request

2.1.11. getdir

Description: Get the program directory

Item: getdir

Data: Returned string is of the form <drive:><\dir...\>

E.G -- c:\poslib\

Type: DDE Request

2.1.12. getillum

Description: Get the on/off state of the illuminator

Item: getillum

Data: 1 = ON   0 = OFF

Type: DDE Request

2.1.13. gettd

Description: Get the PCS-4 enable/disable touchdown sense states

Item: gettd

Data: Returned data is of the form: <ch1>,<ch2>,<ch3>,<ch4> where ch1 is contact sense channel 1 and so on. Values of 1 indicate that touchdown sense is enabled.

E.G. -- 1,1,0,0 indicates channels 1 and 2 touchdown sense enabled.

Type: DDE Request

2.1.14. getthunits

Description: Get theta units

Item: getthunits

Data: Return is a string descriptor for current theta angle units as follows:

rad = radians **deg** = degrees   **grad** = grads

Type: DDE Request

2.1.15. getunits

Description: Get the current units

Item: getunits

Data: Return is a string descriptor for current units as follows:

inch = inches **mil** = mils **micron** = microns

mm = millimeters **cm** = centimeters

Type: DDE Request

2.1.16. goto

Description: Execute a specific indie step

Item: goto

Data: Step number n. E.G -- 3

Type: DDE Poke

2.1.17. homeref

Description: Moves all devices to home reference position of indie program

Item: homeref

Data: Returns " (DDE) HomeRef is called " if no error

Type: DDE Request

2.1.18. idpauto

Description: Execute next indie program step and wafer program step as required

Item: idpauto

Data: Returns "(DDE) IdpRun is executing ...." if no error occurs and not at the end of the program, or returns "(DDE) IdpRun is done!" when the program run is complete

Type: DDE Request

2.1.19. idpdump

Description: Get program name list with .idp file extension. Continue sending this command until the "---done---" string is returned. Note that the file path follows the "8.3" MS-DOS naming format.

Item: idpdump

Data: Returned data is of the form: <drive:><\dir..\><file><.ext>. When no more files of type .idp are available the string "---done---" is returned.

E.G -- c:\poslib\test.idp

Type: DDE Request

2.1.20. Idpload

Description: Load the requested program. Note that the file path must follow the "8.3" MS-DOS naming format.

Item: idpload

Data: Program name in the form: <drive:><\dir...\><file><.ext>

Type: DDE POKE

2.1.21. Idpname

Description: Get current active indie program. Note that the file path follows the "8.3" MS-DOS naming format.

Item: idpname

Data: Active program name in form <drive:><\dir..><file><.ext>

Type: DDE Request

2.1.22. Idpnext

Description: Step to next indie program step. Note that idpnext should be used in conjunction with the goto command. The programmer should goto the desired starting point of the indie program and then step forward from there using idpnext.

Item: idpnext

Data: Returns "idpnext" at each step. The last step returns "---done---".

Type: DDE Request

2.1.23. Idprun

Description: Execute next indie program step

Item: idprun

Data: Returns "(DDE) IdpRun is executing ...." if no error occurs and not at the end of the program, or returns "(DDE) IdpRun is done!" when the program run is complete

Type: DDE Request

2.1.24. illum

Description: Turn illuminator on or off

Item: illum

Data: 1 = ON   0 = OFF

Type: DDE Poke

2.1.25. indiestep

Description: Execute next indie program step. Note that indiestep should be used in conjunction with the goto command. The programmer should goto the desired starting point of the indie program and then step forward from there using indiestep.

Item: indiestep

Data: Returns "indiestep" if no error occurs

Returns "---done---" after last step is completed

Type: DDE Request

2.1.26. ink

Description: Activate inker number n

Item: ink

Data: Inker number n where n = 1..4

Type: DDE Poke

2.1.27. joystick

Description: Set the joystick mode

Item: joystick

Data: Joystick mode n with 0 = Off 1=Constant 2=Linear 3=Exponential

Type: DDE Poke

2.1.28. loadprog

Description: Load the requested program

Item: loadprog

Data: Program name in the form: <drive:><\dir...\><file><.ext>

Type: DDE POKE

2.1.29. lotfile

Description: Get lotfile

Item: lotfile

Data: Returns the lot file up to 32 characters

Type: DDE Request

2.1.30. lotid

Description: Get lot id

Item: lotid

Data: Returns the lot id up to 32 characters

Type: DDE Request

2.1.31. lotname

Description: Get lot name

Item: lotname

Data: Returns the lot name up to 32 characters

Type: DDE Request

2.1.32. lottype

Description: Get lot type

Item: lottype

Data: Return the lot type up to 32 characters

Type: DDE Request

2.1.33. micgetjs

Description: Get microscope Z jog scale

Item: micgetjs

Data: Returns a value in the range 0.01 through 10.0

Type: DDE Request

2.1.34. micjs

Description: Set microscope jog scalar for both XY and Z.

Item: micjs

Data: Jog Scalar in range 0.01 through 10.0

Type: DDE Poke

2.1.35. open

Description: Open an indie program. Note that the file path must follow the "8.3" MS-DOS naming format.

Item: open

Data: File name of form <drive:><\dir...\><file><.ext>

Type: DDE Poke

2.1.36. [mic][pos1..4][prb]cr

Description: Move device to Col,Row position

Item: [mic][pos1..4][prb]cr E.G. -- prbcr

Data: <Col>,<Row> E.G -- -3,1

Type: DDE Poke

2.1.37. [mic][pos1..4][prb]dn

Description: Move device to down position

Item: [mic][pos1..4][prb]dn E.G -- prbdn

Data: Return [pos1..4][prb]dn if command ok

Type: DDE Request

2.1.38. [mic][pos1..4][prb]ga

Description: Get alignment angle and enabled flag

Item: [mic][pos1..4][prb]ga E.G -- prbga

Data: Return data is in the form <angle>,<enabled> where angle is in radians and flag is 1(enabled) or 0(disabled)

Type: DDE Request

2.1.39. [mic][pos1..4][prb]getidx

Description: Get the XYZ index sizes

Item: [mic][pos1..4][prb]dn E.G -- prbgetidx

Data: Return data in form <xidx>,<yidx>,<zidx> in current units

Type: DDE Request

2.1.40. [mic] [pos1..4][prb]getjm

Description: Get jog mode

Item: [pos1..4][prb]getjm

Data: Returns jog mode as follows: **lo hi idx**

Type: DDE Request

2.1.41. [pos1..4][prb]gettdm

Description: Get touchdown mode

Item: [pos1..4][prb]gettdm

Data: Returns touchdown mode for the device as follows: **td ovd locked**

Type: DDE Request

2.1.42. [mic][pos1..4][prb]getudo

Description: Get Up/Down/Overdrive settings

Item: [mic][pos1..4][prb]getudo

Data: Returns up/down/overdrive using current units in form
<up>,<down>,<overdrive>

Type: DDE Request

2.1.43. [mic] [pos1..4][prb]getxyscl

Description: Get XY jog scale

Item: [mic][pos1..4][prb]getxyscl

Data: Returns xy jog scalar in range 0.001 to 1.0

Type: DDE Request

2.1.44. [mic] [pos1..4][prb]getzscl

Description: Get Z jog scale

Item: [mic][pos1..4][prb]getzscl

Data: Returns Z jog scalar in range 0.001 to 1.0

Type: DDE Request

2.1.45. [mic][pos1..4][prb]getidx

Description: Set the XYZ index sizes

Item: [mic][pos1..4][prb]dn E.G -- prbgetidx

Data: Data in form <xidx>,<yidx>,<zidx> in current units

Type: DDE Poke

2.1.46. [mic] [pos1..4][prb][theta]ini

Description: Get the initialized to home state

Item: [mic][pos1..4][prb]ini

Data: 1 = Initialized to home 0 = Not initialized

Type: DDE Request

2.1.47. [mic] [pos1..4][prb]jgxy

Description: Jog in X,Y

Item: [mic][pos1..4][prb]jgxy

Data: X,Y jog direction in form <+/-/0>,<+/-/0> where 0 indicates no jog move.

Type: DDE Poke

2.1.48. [mic] [pos1..4][prb]jgz

Description: Jog in Z

Item: [mic][pos1..4][prb]jgz

Data: Jog Z in desired direction in the form <+/-[#]> where [#] is optional and used only to determine direction of jog.

Type: DDE Poke

2.1.49. [mic] [pos1..4][prb]jm

Description: Set jog mode

Item: [mic][pos1..4][prb]jm

Data: Jog mode string as follows: **lo hi idx**

Type: DDE Poke

2.1.50. [mic] [pos1..4][prb]or

Description: Set coordinate orientation

Item: [mic][pos1..4][prb]or

Data: Quadrant orientation n as shown below. Arrows indicate positive direction.

0 = Quadrant 1

1 = Quadrant 4

2 = Quadrant 3

3 = Quadrant 1

4 = Quadrant 2

Type: DDE Poke

2.1.51. [mic] [pos1..4][prb]or?

Description: Get coordinate orientation

Item: [mic][pos1..4][prb]or?

Data: Return quadrant orientation n as in the set command above

Type: DDE Request

2.1.52. [mic] [pos1..4][prb]pos

Description: Get X,Y,Z,C,R position

Item: [mic][pos1..4][prb]pos

Data: Return position in form <X>,<Y>,<Z>,<Column>,<Row>

Type: DDE Request

2.1.53. [mic] [pos1..4][prb]posno

Description: Get raw X,Y,Z position

Item: [mic][pos1..4][prb]posno

Data: Return position in MILS in the form <X>,<Y>,<Z>

Type: DDE Request

2.1.54. [mic] [pos1..4][prb]refcr

Description: Set current position to column/row position

Item: [mic][pos1..4][prb]refcr

Data: Column/Row position in form <col>,<row>

Type: DDE Poke

2.1.55. [mic] [pos1..4][prb]ref

Description: Set current position to X,Y position.

Item: [mic][pos1..4][prb]ref

Data: X,Y position in form <x>,<y>

Type: DDE Poke

2.1.56. [mic] [pos1..4][prb]rpos

Description: Get current raw position without X,Y,Z offsets

Item: [mic][pos1..4][prb]rpos

Data: Position in form <x>,<y>,<z>

Type: DDE Request

2.1.57. [mic] [pos1..4][prb]rxy

Description: Move to raw X,Y position without using X,Y,Z offsets

Item: [mic][pos1..4][prb]rxy

Data: Position in form <x>,<y>

Type: DDE Poke

2.1.58. [mic] [pos1..4][prb]rz

Description: Move to raw Z position

Item: [mic][pos1..4][prb]rz

Data: Position in form <z>

Type: DDE Poke

2.1.59. [mic] [pos1..4][prb]scale

Description: Set the X,Y global scale for positioning

Item: [mic][pos1..4][prb]scale

Data: Axis position scale in form <xscale>,<yscale>

Type: DDE Poke

2.1.60. [mic] [pos1..4][prb]scale?

Description: Get the X,Y global scale for positioning

Item: [mic][pos1..4][prb]scale?

Data: Axis position scale in form <xscale>,<yscale>

Type: DDE Request

2.1.61. [mic] [pos1..4][prb]sa

Description: Set alignment angle and enabled flag

Item: [mic][pos1..4][prb]sa

Data: Alignment angle (radians) and enabled flag in the form <angle>,<flag>

Type: DDE Poke

2.1.62. [mic] [pos1..4][prb]stat

Description: Get move status

Item: [mic][pos1..4][prb]stat

Data: Status string as follows:

@ = Command complete

P = Device jogging

Type: DDE Request

2.1.63. [mic] [pos1..4][prb]stop

Description: Stop jog motion

Item: [mic][pos1..4][prb]stop

Data: None

Type: DDE Poke

2.1.64. [pos1..4][prb]tdm

Description: Set touchdown mode

Item: [mic][pos1..4][prb]tdm

Data: Touchdown mode string as follows: **td ovd locked**

Type: DDE Poke

2.1.65. [mic] [pos1..4][prb]trav

Description: Set device XYZ travel in mils

Item: [mic][pos1..4][prb]trav

Data: Return data in form <xtravel>,<ytravel>,<ztravel>

Type: DDE Request

2.1.66. [mic] [pos1..4][prb]udo

Description: Set Up/Down/Overdrive

Item: [mic][pos1..4][prb]udo

Data: Up/Down/Overdrive in currents units in form
<up>,<dn>,<ovd>

Type: DDE Poke

2.1.67. [mic] [pos1..4][prb]up

Description: Move to Up position

Item: [mic][pos1..4][prb]up

Data: Returns [pos1..4][prb]up if command ok. E.G -- prbup

Type: DDE Request

2.1.68. [mic] [pos1..4][prb]xy

Description: Move to X,Y position

Item: [mic][pos1..4][prb]xy

Data: X,Y destination in form <X>,<Y> using current units

Type: DDE Poke

2.1.69. [mic] [pos1..4][prb]xyno

Description: Move to raw XY position in mils

Item: [mic][pos1..4][prb]xyno

Data: XY position in form <x>,<y>

Type: DDE Poke

2.1.70. [mic] [pos1..4][prb]xyscl

Description: Set XY jog scale

Item: [mic][pos1..4][prb]xyscl

Data: XY jog scalar in range 0.001 to 1.0

Type: DDE Poke

2.1.71. [mic] [pos1..4][prb]z

Description: Move to Z position

Item: [mic][pos1..4][prb]z

Data: Z location in current units

Type: DDE Poke

2.1.72. [mic] [pos1..4][prb]zscl

Description: Set Z jog scale

Item: [mic][pos1..4][prb]zscl

Data: Z jog scalar in range 0.001 to 1.0

Type: DDE Poke

2.1.73. prbtd

Description: Get the prober touchdown state

Item: prbtd

Data: 1 = prober touchdown sensed 0 = not sensed

Type: DDE Request

2.1.74. progdesc

Description: Get program description

Item: progdesc

Data: User defined program description up to 256 characters

Type: DDE Request

2.1.75. progname

Description: Get current active die program. Note that the file path uses the "8.3" MS-DOS naming format.

Item: progname

Data: Active program name in form <drive:><\dir..><file><.ext>

Type: DDE Request

2.1.76. rst

Description: Reset the PCS-4 touchdown module and prober touchdown

Item: rst

Data: None

Type: DDE Poke

2.1.77. rstwfr

Description: Resets the wafer program

Item: rstwfr

Data: Returns "rstwfr" if no error

Type: DDE Request

2.1.78. setdev

Description: Set current active device

Item: setdev

Data: Device string as follows: **mic prb pos1 pos2 pos3 pos4**

Type: DDE Poke

2.1.79. setref

Description: Sets current position of all devices as the reference position of indie program

Item: setref

Data: Returns " (DDE) SetRef is called " if no error

Type: DDE Request

2.1.80. settd

Description: Set the PCS-4 enable/disable touchdown sense states

Item: settd

Data: <ch1>,<ch2>,<ch3>,<ch4> where ch1 is channel 1 and 1=enabled 0 = disabled.

E.G -- 1,1,0,0 enables channels 1 and 2 for touchdown sensing

Type: DDE POKE

2.1.81. step

Description: Step the die program to the next position

Item: step

Data: Returns "step" until last step in program; then returns "---done---"

Type: DDE Request

2.1.82. stepinfo

Description: Get the current step information from pcindie

Item: stepinfo

Data: Returns current step info as shown in pcIndie program list

Type: DDE Request

2.1.83. thetajog

Description: Jog theta

> **Note:** Unlike direct interaction with pcNav, the thetajog command does not automatically raise the platen. Also, <u>always</u> follow the thetajog command with a thetastop command.

Item: thetajog

Data: Direction of rotation where + = CW - = CCW

Type: DDE Poke

2.1.84. thetajs

Description: Set Theta Jog scale

Item: thetajs

Data: theta jog scalar in range 0.001 to 1.0

Type: DDE Poke

2.1.85. thetagetjs

Description: Get Theta Jog scale

Item: thetagetjs

Data: Get theta jog scalar in range 0.001 to 1.0

Type: DDE Request

2.1.86. thetamove

Description: Move theta to the specified angular position using current theta units.

Item: thetamove

Data: Theta destination in current units. E.G -- 0.1233

Type: DDE Poke

2.1.87. thetapos

Description: Get theta position

Item: thetapos

Data: Theta position in current units.

Type: DDE Request

2.1.88. thetastop

Description: Stop Theta jog motion

Item: thetastop

Data: None

Type: DDE Poke

2.1.89. thetaunits

Description: Set theta units

Item: thetaunits

Data: Theta unit string as follows: **rad deg grad**

Type: DDE Poke

2.1.90. units

Description: Set units

Item: units

Data: String descriptor for units as follows:

inch = inches	**mil** = mils	**micron** = microns
mm = millimeters	**cm** = centimeters	

Type: DDE POKE

2.1.91. updt

Description: Get the system data to update

Item: updt

Data: Update flags are as follows:

Bit Value (Hex)	Update Data
0000	No Change
0001	XYZ Position
0002	Die Size
0004	Reference
0008	Device
0010	Alignment
0020	Home
0040	Jog mode
0080	Z settings
0100	Units
0200	Touchdown settings
0400	Scale
0800	Joystick mode
1000	XY jog starting
2000	Z jog starting
4000	Jog stopped

E.G. A value of 0101h (257 decimal) indicates units and XYZ position changed.

Type: DDE Request

2.1.92. winmsgs

Description: Set winmsgs flag for pcLaunch

Item: winmsgs

Data: 0=Disabled 1=Enabled

Type: DDE POKE

2.2. Stop DDE Command

Service: pcProbe
Topic: stop

2.2.1. Stopall

Description: Stop all motion commands. This command can be sent while another pcProbe DDE command is performing moves. Without it, there is no way to remotely stop a move.

Item: stopall

Data: None

Type: DDE POKE

2.3. *Loader DDE Commands:*

Service: pcProbe
Topic: loader

DDE Item	DDE Xact	Description
?eol	Request	Get End Of Lot state from the loader
?error	Request	Get the most recent error
?init	Request	Get the initialized flag
?ldpos	Request	Get the current load position
?ldunld	Request	Get the load unload positions
?manload	Request	Get manual load flag
?patrec	Request	Get the pattern recognition setup flag
?platen	Request	Get the platen lower flag
?scope	Request	Get the scope lower flag
?theta	Request	Get the theta position for loading
?unldpos	Request	Get the current unload position
?wafer	Request	Get the current waferid, cassette, and slot
?wfralign	Request	Get the align points for the wafer
Clean	Poke	Start clean sequence
Getwfr	Poke	Load the next wafer
Init	Poke	Initialize the loader
Ldunld	Poke	Set the load (return) and unload positions
Load	Poke	Load a wafer to the chuck
Loadwfr	Poke	Load the wafer without moving chuck to load (return) position
Manload	Poke	Set manual load flag
Moveld	Poke	Move to the load(return) position
Moveunld	Poke	Move to the unload position
Patrec	Poke	Set pattern recognition setup flag
Platen	Poke	Set platen lower flag
Rstmap	Poke	Reset the cass map
Scope	Poke	Set scope lower flag
Shutdown	Poke	Save loader setup and quit loader control
Teachld	Request	Set the load position (x,y)
Teachunld	Request	Set the unload position (c,r)
Theta	Poke	Set the theta position for loading
Unldwfr	Poke	Unload the wafer without moving

2.3.1. ?eol

Description: Get End Of Lot state from the loader. The EOL state occurs when the last selected wafer of the cassette has been tested.

Type: Request

Data: 0 = Not end of lot 1 = End of lot

See Also: getwfr

Visual Basic Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?eol"
DDE_Request
```

2.3.2. ?error

Description: Get the most recent error condition message.

Type: Request

Data: String in the form '<Error <Error #>:<Error Condition>>'

Visual Basic Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?error"
DDE_Request
```

2.3.3. ?init

Description: Get the loader initialized flag. If this flag is not set the loader will not execute commands.

Type: Request

Data: 0 = Not initialized 1 = Initialized

See Also: init

Visual Basic Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?init"
DDE_Request
```

2.3.4. ?ldpos

Description: Get the current Column,Row load positions. This is the destination for the chuck when a new wafer has been loaded.

Type: Request

Data: <column>,<row> position e.g. - 3,5

See Also: ?ldunld, ?unldpos, ?theta, ?wfralign, ldunld, teachld, teachunld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?ldpos"
DDE_Request
```

2.3.5. ?ldunld

Description: Get the load unload positions. These are the X,Y unload position and Column,Row load destination.

Type: Request

Data: <x unload>,<y unload>,<col>,<row> e.g.- - 123.32,111.23,5,3

See Also: ?ldpos, ?theta, ?unldpos, ?wfralign, ldunld, teachld, teachunld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?ldunld"
DDE_Request
```

2.3.6. ?manload

Description: Get manual load flag. This flag is used to determine the type of load/unload operation to perform. If manual load is selected the user is prompted to load another wafer on the chuck at the end of a wafer test or when a load operation is requested. When Auto load is selected the loader performs all load operations.

Type: Request

Data: 0 = Auto Load 1 = Manual Load

See Also: manload, getwfr

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?manload"
DDE_Request
```

2.3.7. ?patrec

Description: Get the pattern recognition setup flag. Pattern recognition routines are used to align and set reference if this flag is enabled, otherwise the user has to manually align and set reference.

Type: Request

Data: 0 = Manual Setup 1 = Pattern Recognition Setup

See Also: ?platen, ?scope, getwfr, patrec, platen, scope

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?patrec"
DDE_Request
```

2.3.8. ?platen

Description: Get the platen lower flag. This flag is used during the wafer unload/load operation. If it is True (1) then the platen is returned to its pre-unload position when the chuck returns to the load position.

Type: Request

Data: 0 = Leave platen at top 1 = Lower platen

See Also: ?patrec, ?scope, getwfr, patrec, platen, scope

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?platen"
DDE_Request
```

2.3.9. ?scope

Description: Get the scope lower flag. This flag is used during the wafer unload/load operation. If it is True (1) then the microscope is returned to its pre-unload focus position.

Type: Request

Data: 0 = Leave scope at top 1 = Lower scope

See Also: ?patrec, ?platen, getwfr, patrec, platen, scope

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?scope"
DDE_Request
```

2.3.10. ?theta

Description: Get the theta position for loading. The position is used by the unload routine to rotate the chuck to an orientation which does not allow the robot loader end-effector to hit the chuck pins.

Type: Request

Data: Theta position in range 0.0..-30.0 degrees

See Also: ?ldpos, ?ldunld, ?unldpos, ?wfralign, ldunld, teachld, teachunld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?theta"
DDE_Request
```

2.3.11. ?unldpos

Description: Get the unload position using the current units. This position is always referenced to the user defined 0,0 for the chuck. The value can change when the user redefines the X,Y reference, even though the physical destination does not.

Type: Request

Data: <xposition>,<yposition> e.g. -- -2000.00,2000.00

See Also: ?ldpos, ?theta, ?unldpos, ?wfralign, ldunld, teachld, teachunld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?unldpos"
DDE_Request
```

2.3.12. ?wafer

Description: Get the current wafer number for the cassette.

Type: Request

Data: 1..24

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?wafer"
DDE_Request
```

2.3.13. ?wfralign

Description: Get the align points for the wafer. These locations are used when automatically setting up the wafer with pattern recognition. Usually the values are automatically generated by pcWfr, however the user can override them when calling the 'getwfr' command. The values are the left and right columns and the row.

Type: Request

Data: <left col>,<right col>,<row> e.g. -- 3,12,8

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?wfralign"
DDE_Request
```

2.3.14. clean

Description: Initiates the clean wafer sequence. This may vary depending on the wafer handler server. Reference the documentation for the wafer handler.

Type: Poke

Data: None

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "clean"
DDE_Poke
```

2.3.15. getwfr

Description: Loads the next wafer. The operations performed depend on the settings of the manual load, pattern recognition, platen and scope lower flags. The following descriptions include related DDE commands in brackets.

1. Microscope and Platen Raise.
2. Chuck moves to unload position [unldpos, ?unldpos, ldunld, ?ldunld].
3. Chuck rotates to theta position [theta, ?wfralign]
4. Chuck pins raise.
5. If the auto loader is disabled [manload, ?manload = 1] the user is prompted to load another wafer on the chuck. If the auto loader is enabled [manload, ?manload = 0] the loader performs following operations:

   a. Unload wafer from chuck to cassette.

   b. Move wafer from pre-aligner to chuck.

   c. Move wafer from next enabled cassette slot to pre-aligner

   d. Pre-align wafer.
6. Chuck pins lower
7. Chuck moves to load position [ldpos, ?ldpos, ldunld, ?ldunld]
8. Chuck theta rotates to previous position.
9. If platen lower flag is set [platen, ?platen = 1] then platen lowers to previous position.
10. If scope lower flag is set [scope, ?scope = 1] then scope lowers to previous position.
11. If pattern recognition (PR) is disabled [patrec, ?patrec = 0] then the user is prompted to perform manual alignment and set reference. If PR is enabled [patrec, ?patrec = 1] then the following auto-setup functions are performed :

    a. Chuck moves to midpoint between the left and right align position. [?wfralign]

b. Chuck moves to PR adjusted position using the taught correction model.

c. Chuck rotates by PR adjusted angle using the taught alignment models.

d. Chuck moves to PR adjusted midpoint position.

e. Chuck moves to left alignment position and is PR adjusted.

f. Chuck is rotated by calculated error and PR adjusted. If error is below defined threshold then alignment is completed.

g. Chuck moves to right alignment position and PR adjusted.

h. Chuck is rotated by calculated error and PR adjusted. If error is below defined threshold then alignment is completed.

i. Repeat steps e through h until completed.

Type: Poke

Data: <left column>,<right column>,<row> e.g. -- 3,12,8

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "getwfr"
Text2.Text = "3,12,8"
DDE_Poke
```

2.3.16. init

Description: Initialize the loader. If the loader is not present this command does nothing. This command should be sent FIRST before attempting any communication with the loader control functions. If the auto-loader is enabled, the handler and pre-aligner robots initialize to their home positions. This may take from a few seconds to a few minutes depending on their initial positions.

Type: Poke

Data: None.

See Also: ?init

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "?status"
DDE_Poke
```

2.3.17. ldunld

Description: Set the load and unload positions.

Type: Poke

Data: <x unload>,<y unload>,<column load>,<row load>

See Also: ?ldpos, ?ldunld, ?theta, ?unldpos, ?wfralign, unldteachld, teachunld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "ldunld"
Text2.Text = "-3333.33,7822.00,10,10"
DDE_Poke
```

2.3.18. manload

Description: Set manual load flag. This flag is used to determine the type of load/unload operation to perform. If manual load is selected the user is prompted to load another wafer on the chuck at the end of a wafer test or when a load operation is requested. When Auto load is selected the loader performs all load operations.

Type: Poke

Data: 0 = Auto Load   1 = Manual Load

See Also: ?manload, getwfr

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "manload"
Text2.Text = "0"
DDE_Poke
```

2.3.19. moveld

Description: Move to the Load (Return) Position. This command is intended for use by applications which require direct control of the unload/load sequence.

Type: Poke

Data: None

See Also: moveunld, rstmap

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "moveld"
DDE_Poke
```

2.3.20. moveunld

Description: Move to the unload position. This command is intended for use by applications which require direct control of the unload/load sequence.

Type: Poke

Data: None

See Also: moveld, rstmap

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "moveunld"
DDE_Poke
```

2.3.21. patrec

Description: Set pattern recognition setup flag. This flag is used during the 'getwfr' operation to determine if auto-setup of the wafer is required.

Type: Poke

Data: 0 = Disabled 1 = Enabled

See Also: ?manload, ?platen, ?scope, getwfr, platen, scope

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "patrec"
Text2.Text = "0"
DDE_Poke
```

2.3.22. platen

Description: Set platen lower flag. This flag is used during the wafer unload/load operation. If it is True (1) then the platen is returned to its pre-unload position when the chuck returns to the load position.

Type: Poke

Data: 0 = Leave platen at top 1 = Lower platen

See Also: ?patrec, ?platen, ?scope, getwfr, patrec, scope

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "platen"
Text2.Text = "0"
DDE_Poke
```

2.3.23. rstmap

Description: Reset the cassette map. This command resets the cassette slot counter to slot 1, so it is imperative that the pre-aligner and chuck have been unloaded. This command is intended for use by applications which require direct control of the unload/load sequence.

Type: Poke

Data: None

See Also: moveld, moveunld

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "ldunld"
DDE_Poke
```

2.3.24. scope

Description: Set scope lower flag. This flag is used during the wafer unload/load operation. If it is True (1) then the microscope is returned to its pre-unload focus position.

Type: Poke

Data: 0 = Leave scope at top 1 = Lower scope

See Also: ?patrec, ?platen, ?scope, getwfr, patrec, platen

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "scope"
Text2.Text = "1"
DDE_Poke
```

2.3.25. shutdown

Description: Save loader setup. This command should always be called from the controlling program if any parameters have been changed.

Type: Poke

Data: None.

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "shutdown"
DDE_Poke
```

2.3.26. teachld

Description: Set the load position (C,R). The current column,row position of the chuck is stored as the load position when this command is sent. It returns the load position.

Type: Request

Data: <column>,<row>

See Also: ?ldpos, ?ldunld, ?theta, ?unldpos, ?wfralign, ldunld, teachunld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "teachld"
DDE_Request
```

2.3.27. teachunld

Description: Set the unload position (x,y). The current **X,Y** position is set as the unload position when this command is sent. The new unload position is returned.

Type: Request

Data: <x unload>,<y unload>

See Also: ?ldpos, ?ldunld, ?theta, ?unldpos, ?wfralign, ldunld, teachld, theta

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "teachunld"
DDE_Request
```

2.3.28. theta

Description: Set the theta position for loading. The position is used by the unload routine to rotate the chuck to an orientation which does not allow the robot loader end-effector to hit the chuck pins.

Type: Poke

Data: Theta position in range 0.0..-30.0

See Also: ?ldpos, ?ldunld, ?theta, ?unldpos, ?wfralign, ldunld, teachld, teachunld

Example:

```
Text3.Text = "pcProbe|loader"
Text1.Text = "ldunld"
Text2.Text = "-10.21"
DDE_Poke
```

2.4. *Turret DDE Commands:*

Service: pcProbe
Topic: turret

Command	Type	Description
?adjxyz	Request	Get the XYZ objective offsets
?autofocus	Request	Get the autofocus flag
?autolower	Request	Get the autolower flag
?autoraise	Request	Get the autoraise flag
?init	Request	Get initialized flag
?obj	Request	Get current objective
?objinfo	Request	Get the information for the current objective
?objlist	Request	Get list of installed objectives
?objscale	Request	Get objective jog scale flag
?setup	Request	Get setup mode
?slotlist	Request	Get list of slots and the objective installed
?turret	Request	Get turret type
?turrerr	Request	Return the most recent turret error
Autofocus	Poke	Set the autofocus mscope flag
Autolower	Poke	Set the autolower mscope flag
Autoraise	Poke	Set the autoraise mscope flag
Focus	Poke	Focus the scope
Init	Request	Initialize the scope driver
Moveobj	Poke	Move to the adjusted XYZ position for the objective
Obj	Poke	Select objective and adjust XYZ
Objinfo	Poke	Set objective information with specified parameters
Objscale	Poke	Set objective jog scale flag
Setadj	Poke	Set the current XYZ position as ref for the objective
Setup	Poke	Set the Objective Setup flag
Turret	Poke	Set the turret type
Zoom	Poke	Set the zoom factor

2.4.1. ?adjxyz

Description: Get the XYZ objective offset adjustments in current units

Type: Request

Data: <objective>,<xoffset>,<yoffset>,<zoffset> e.g. 1,10.2,-3.1,2.3

Example:
Text3.Text = "pcProbe|turret"
Text1.Text = "?adjxyz"
DDE_Request

2.4.2. ?autofocus

Description: Get autofocus microscope flag. This flag is used to force the microscope to focus after an objective change.

Type: Request

Data: 0 = Don't autofocus 1 = Autofocus

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?autofocus"
DDE_Request
```

2.4.3. ?autolower

Description: Get flag used to force autolower microscope after an objective change

Type: Request

Data: 0 = Don't lower 1 = Lower

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?autolower"
DDE_Request
```

2.4.4. ?autoraise

Description: Get flag used to force auto-raise of microscope before switching objectives

Type: Request

Data: 0 = Don't raise 1 = Raise

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?autoraise"
DDE_Request
```

2.4.5. ?init

Description: Get turret driver initialized flag. The "init" function MUST be called before any action commands are issued.

Type: Request

Data: 0 = Not Initialized 1 = Initialized

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?init"
DDE_Request
```

2.4.6. ?obj

Description: Get current objective number

Type: Request

Data: 0..MAX-1 where MAX is the number of slots in the microscope turret.

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?obj"
DDE_Request
```

2.4.7. ?objinfo

Description: Gets the information for the current objective

Type: Request

Data: <slot#>,<magnification>,<lens length>,<numerical aperature>, <working distance>,<focal length>, <resolution>,<Depth of focus>,<Field of View>

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?objinfo"
DDE_Request
```

2.4.8. ?objlist

Description: Gets list of software defined objectives

Type: Request

Data: <obj0>[mag0]<obj1>[mag1]... e.g. 0[2.0]1[10.0]2[20.0]

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?objlist"
DDE_Request
```

2.4.9. ?objscale

Description: This command gets the current setting for the autoscale jog speed to magnification flag.

Type: Request

Data: 0=disabled or 1=enabled

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?objscale"
DDE_Request
```

2.4.10. ?setup

Description: Get setup mode. Setup mode is used when a user is setting new objective offsets.

Type: Request

Data: 0 = OFF 1 = ON

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?setup"
DDE_Request
```

2.4.11. ?slotlist

Description: Get list of slots and the objective installed in each slot.

Type: Request

Data: <slot0>[<obj#>,<mag>]<slot1>[<obj#>,<mag>]...

e.g. -- 0[1,2.0]1[3,10.0]2[5,20.0]3[7,50.0]

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?slotlist"
DDE_Request
```

2.4.12. ?turrerr

Description: This command gets the most recent error from the turret driver.

Type: Request

Data: 0=no error
1=invalid objective
2=no microscope available
3=operation failed
4=turret driver not initialized

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?turrerr"
DDE_Request
```

2.4.13. ?turret

Description: Get turret type

Type: Request

Data: <turret type>,<commport> with turret type 0=manual 1=auto, commport is 0..3 for COM1, COM2, COM3, COM4

e.g. 1,2 for auto turret connected to COM3:

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "?turret"
DDE_Request
```

2.4.14. autofocus

Description: Set the autofocus scope flag. When enabled, the scope refocuses after a new objective is selected.

Type: Poke

Data: 0 = Do not focus 1 = Perform focus

Example:

```
Text3.Text = "pcProbe"
Text1.Text = "autofocus"
Text2.Text = "0"
DDE_Poke
```

2.4.15. autolower

Description: Set the autolower mscope flag. When enabled the scope lowers to its previous position afer a new objective is selected.

Type: Poke

Data: 0 = Do not lower 1 = Lower

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "autolower"
Text2.Text = "1"
DDE_Poke
```

2.4.16. autoraise

Description: Set the autoraise mscope flag. When enabled the scope is raised prior to selecting a new objective.

Type: Poke

Data: 0 = Do not raise 1 = Raise

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "autoraise"
Text2.Text = "1"
DDE_Poke
```

2.4.17. focus

Description: Focus the scope. Note that the focus operation assumes that the Z set down position corresponds to the focus position for the fixed objective. The focus operation moves +/- 15 increments about the calculated focus position.

Type: Poke

Data: None

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "focus"
DDE_Poke
```

2.4.18. init

Description: Initialize the scope driver. This must occur before commands are sent.

Type: Request

Data: None.

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "init"
DDE_Request
```

2.4.19. moveobj

Description: Move to the adjusted XYZ position for the objective relative to the fixed slot

Type: Poke

Data: None

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "moveobj"
DDE_Poke
```

Note: This command requires the Setup flag to be ON (1).

2.4.20. obj

Description: Select objective slot and adjust XYZ

Type: Poke

Data: <obj#> e.g. -- 1

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "obj"
Text2.Text = "1"
DDE_Poke
```

2.4.21. objinfo

Description: Set objective to slot map. This is used to remap the installed objectives.

Type: Poke

Data: <slot#>[<obj#>] where slot# is 0(fixed)...3 and obj# is the objective definition according to the [Mitutoyu] section of pcRouter.ini.

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "objinfo"
Text2.Text = "0[2]"       ;Maps slot0 to objective definition 2
DDE_Poke
```

Note: This change will not display in pcTurret until pcTurret is restarted.

2.4.22. setadj

Description: Sets the current XYZ position as ref for the objective

Type: Request

Data: None

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "setadj"
DDE_Request
```

Note: This command requires the Setup flag to be ON (1).

2.4.23. setup

Description: Set the objective setup flag. Setup mode is used when a user is setting new objective offsets. Turning setup mode on automatically selects the fixed objective.

Type: Poke

Data: 0 = OFF 1 = ON

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "setup"
Text2.Text = "0"
DDE_Poke
```

To set up the objective offsets, perform the following sequence of commands:

Command	Description
setup 1	Turn setup mode ON
obj 1	Select objective slot
setadj	Record XYZ adjustment for objective
	Repeat previous 2 commands for each installed objective. If the auto-turret is present it will verify each XYZ location.

2.4.24. turret

Description: Set the turret type

Type: Poke

Data: <turret type>,<commport> with turret type 0=manual 1=auto, commport is 0..3 for COM1, COM2, COM3, COM4

e.g. 1,2 for auto turret connected to COM3:

Example:

```
Text3.Text = "pcProbe|turret"
Text1.Text = "turret"
Text2.Text = "1,2"
DDE_Poke
```

2.5. *Pattern Recognition DDE Commands:*

Service: pcProbe
Topic: patrec

Command	Type	Description
?accept	Request	Get acceptance threshold in range 0.01 to 1.00
?align1	Request	Get alignment model 1 filename
?align2	Request	Get alignment model 2 filename
?confuse	Request	Get confusion threshold in range 0.01 to 1.00
?correct	Request	Get correction model filename
?error	Request	Get last error
?focuserr	Request	Get last focus error
?measure	Request	Get shape measurement from pcVideo
?measurestatus	Request	Get shape measure status
?prefocus	Request	Get use preset down with focus flag
?preonly	Request	Get Prealign only flag for setup
Accept	Poke	Set acceptance threshold in range 0.01 to 1.00
Align1	Poke	Set alignment model 1 to filename
Align2	Poke	Set alignment model 2 to filename
Autoalign	Poke	Do pattern recognition pre-alignment
Autocorr	Poke	Do pattern correction for image
Autofocus	Request	Do pattern recognition setup
Autosetup	Poke	Do wafer setup: auto alignment and set reference
Confuse	Poke	Set confusion threshold in range 0.01 to 1.00
Correct	Poke	Set correction model to filename
Measure	Poke	Initiate a shape measurement in pcVideo
Measureabort	Request	Stop a shape measurement
Measurecal	Poke	Calibrate the shape measurement to known values
Prefocus	Poke	Use preset down position as start when focusing
Preonly	Poke	Set Prealign only flag for setup

2.5.1. ?accept

Description: Get acceptance threshold in range 0.01 to 1.00

Type: Request

Data: <None>

Example:

Text3.Text = "pcProbe|patrec"
Text1.Text = "?accept"
DDE_Request

2.5.2. ?align1

Description: Get alignment model 1 filename

Type: Request

Data: <None>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?align1"
DDE_Request
```

2.5.3. ?align2

Description: Get alignment model 2 filename

Type: Request

Data: <None>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?align2"
DDE_Request
```

2.5.4. ?confuse

Description: Get confusion threshold in range 0.01 to 1.00

Type: Request

Data: <None>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?confuse"
DDE_Request
```

2.5.5. ?correct

Description: Get acceptance threshold in range 0.01 to 1.00

Type: Request

Data: <None>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?correct"
DDE_Request
```

2.5.6. ?error

Description: Get last error

Type: Request

Data: Error description up to 256 characters as follows:

<PatRec Error 0x0001: Invalid model>
<PatRec Error 0x0002: Model not found>
<PatRec Error 0x0003: Invalid Align Length>
<PatRec Error 0x0004: Bad Acquire>
<PatRec Error 0x0005: Cancelled>
<PatRec Error 0x0006: Invalid Alignment>
<PatRec Error 0x0007: Invalid Correction>
<PatRec Error 0x0008: Invalid Model Archive File Name>
<PatRec Error 0x0009: Invalid Parameters Passed>
<PatRec Error 0x000a: Unable to Initialize PatRec DLL>
<PatRec Error 0x000b: Unknown Error>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?error"
DDE_Request
```

2.5.7. ?focuserr

Description: Get the most recent autofocus error

Type: Request

Data: 0 = No Error

1 = Available only under Windows 95

2 = Scope cannot perform focus

3 = Focus Failed

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?focuserr"
DDE_Request
```

2.5.8. ?measure

Description: Get video measurement

Type: Request

Data: <type>,<units>,<x1>,<y1>,<x2>,<y2>

Where: Type is as requested from the measure command

Units are a numeric code for the units for x-y values:

0 = inches

1 = mil

2 = microns

3 = millimeters

4 = centimeters

X,Y coordinates describe the bounds of the shape

Or if pcVideo is not in measure mode the following is returned

<No measurement available>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?measure"
DDE_Request
```

2.5.9. ?measurestatus

Description: Get current video measurement status

Type: Request

Data: 0 = Not in measure mode
1 = Measurement in process
2 = Measurement completed

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?measurestatus"
DDE_Request
```

2.5.10. ?prefocus

Description: Get flag forcing move to preset down when focusing

Type: Request

Data: 0 = Focus from current position

1 = Focus from preset down position

Examples:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?prefocus"
DDE_Request
```

2.5.11. ?preonly

Description: Get flag forcing only prealign with no scan align during autosetup

Type: Request

Data: 0 = Perform pre-align and scan align during autosetup operation

1 = Perform only pre-align operation for autosetup

Examples:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?preonly"
DDE_Request
```

2.5.12. ?prmeas

Description: Get the pattern correction distance for the current model.

Type: Request

Data: <x>,<y>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "?prmeas"
DDE_Request
```

2.5.13. accept

Description: Set acceptance threshold in range 0.01 to 1.00

Type: Poke

Data: <value>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "accept"
DDE_Poke
```

2.5.14. align1

Description: Set alignment model 1 to filename

Type: Poke

Data: <filename>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "align1"
DDE_Poke
```

2.5.15. align2

Description: Set alignment model 2 to filename

Type: Poke

Data: <filename>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "align2"
DDE_Poke
```

2.5.16. autoalign

Description: Do pattern recognition pre-alignment

Type: Poke

Data: None

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "autoalign"
DDE_Poke
```

2.5.17. autocorr

Description: Do pattern correction for image

Type: Poke

Data: None

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "autocorr"
DDE_Poke
```

2.5.18. autofocus

Description: Do pattern recognition setup

Type: Request

Data: Status byte matching the following:

0 = No Error

1 = Available only under Windows 95

2 = Scope cannot perform focus

3 = Focus Failed

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "autofocus"
DDE_Request
```

2.5.19. autosetup

Description: Do wafer setup: auto alignment and set reference

Type: Poke

Data: Requires alignment reference locations in the form:

<left column>,<right column>, <row>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "autosetup"
Text2.Text = “3,10,5”
DDE_Request
```

2.5.20. confuse

Description: Set confusion threshold in range 0.01 to 1.00

Type: Poke

Data: <value>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "confuse"
DDE_Poke
```

2.5.21. correct

Description: Set correction model to filename

Type: Poke

Data: <filename>

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "confuse"
DDE_Poke
```

2.5.22. measure

Description: Start a video measurement for a specific shape

Type: Poke

Data: 0 = Distance measurement
1 = Circle
2 = Square
3 = Ellipse
4 = Rectangle

Example:

```
'   Start a measurement
Text3.Text = "pcProbe|patrec"
Text1.Text = "measure"
DDE_Poke

'   Wait for completion of measurement
Do
    Text3.Text = "pcProbe|patrec"
    Text1.Text = "?measurestatus"
    DDE_Request
Loop Until Text2.Text <> "1"

'   Get the measurement
Text3.Text = "pcProbe|patrec"
Text1.Text = "?measure"
DDE_Request
Meas$ = Text2.Text
```

2.5.23. measureabort

Description: Aborts a measure command

Type: Request

Data: "measureabort"

Example:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "measureabort"
DDE_Request
```

2.5.24. measurecal

Description: Calibrates video measurement to intended measurement

Type: Poke

Data:
<measured width>,<measured height>,<intended width>,<intended height>

Example:

```
' Start a measurement
Text3.Text = "pcProbe|patrec"
Text1.Text = "measure"
DDE_Poke
' Wait for completion of measurement
Do
    Text3.Text = "pcProbe|patrec"
    Text1.Text = "?measurestatus"
    DDE_Request
Loop Until Text2.Text <> "1"
' Get the measurement
Text3.Text = "pcProbe|patrec"
Text1.Text = "?measure"
DDE_Request
Meas$ = Text2.Text
'
' Take apart Meas$ here to get the Width and Height and place
' the values in variables iWidth and iHeight
'
' Assume actual measurement is supposed to be 100X100 and
send it
Text3.Text="pcProbe|patrec"
Text1.Text="measurecal"
```

```
Text2.Text=Str$(iWidth)+","+Str$(iHeight)+",100.0,100.0"
DDE_Poke
```

2.5.25. prefocus

Description: Set flag forcing move to preset down when focusing

Type: Poke

Data: 0 = Focus from current position

1 = Focus from preset down position

Examples:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "prefocus"
Text2.Text = "1"
DDE_Poke
```

2.5.26. preonly

Description: Set flag forcing only prealign with no scan align during auto

Type: Request

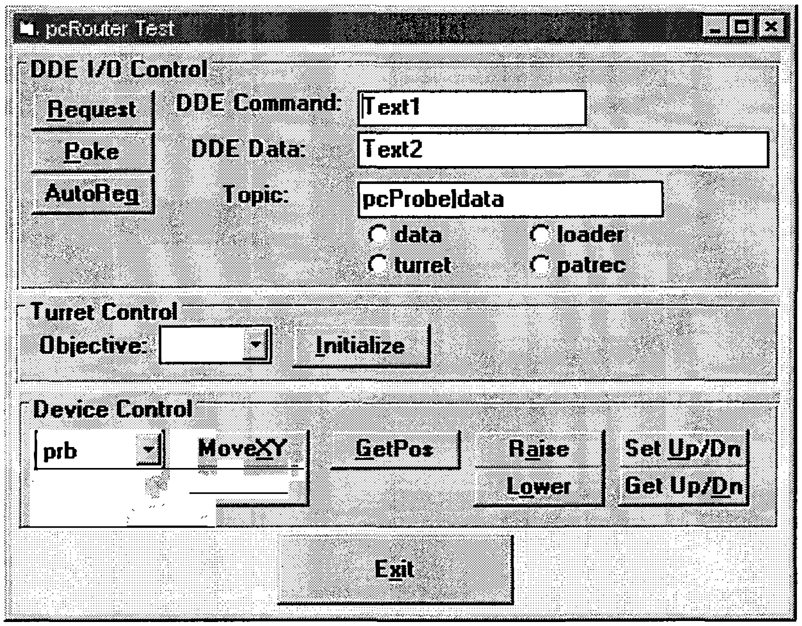
Data: 0 = Perform pre-align and scan align during autosetup operation

1 = Perform only pre-align operation for autosetup

Examples:

```
Text3.Text = "pcProbe|patrec"
Text1.Text = "preonly"
Text2.Text = "0"
DDE_Poke
```

3. Visual Basic DDE Test Program TSTRTR.MAK




```
Sub Combo2_Click()
    Text3.Text = "pcProbe|turret"
    Text1.Text = "obj"
    Text2.Text = Combo2.Text
    DDE_Poke
End Sub

Sub Command1_Click()
    DDE_Poke
End Sub

Sub Command2_Click ()
    DDE_Request
End Sub

Sub Command3_Click ()
    End
End Sub
```

```
Sub Command4_Click ()
    Text3.Text = "pcProbe|turret"
    Text1.Text = "init"
    DDE_Request

End Sub

Sub Command5_Click ()
    Dim szTmp As String
    szTmp = Text1.Text
    Text1.Text = "?" + Text1.Text
    DDE_Request
    Text1.Text = szTmp
End Sub

Sub DDE_Poke ()
    Dim szMsg As String

    If Text2.LinkMode = 0 Then
        Text2.LinkTopic = Text3.Text
    End If

    Text2.LinkTimeout = 3000
    On Error Resume Next
    Text2.LinkMode = 2
    If Err Then
        szMsg = "Unable to connect to " + Text3.Text
        MsgBox szMsg
        On Error GoTo 0
        Exit Sub
    End If
    Text2.LinkItem = Text1.Text
    Text2.LinkPoke
    If Err Then
        szMsg = "Unable to Complete command " + Text1.Text
        MsgBox szMsg
    End If
    Text2.LinkMode = 0
    On Error GoTo 0
End Sub
```

```
Sub DDE_Request()
    If Text2.LinkMode = 0 Then
        Text2.LinkTopic = Text3.Text
    End If

    Text2.LinkTimeout = 3000
    On Error Resume Next
    Text2.LinkMode = 2
    If Err Then
        szMsg = "Unable to connect to " + Text3.Text
        MsgBox szMsg
        On Error GoTo 0
        Exit Sub
    End If

    Text2.LinkItem = Text1.Text
    Text2.LinkRequest
    If Err Then
        szMsg = "Unable to Complete command " + Text1.Text
        MsgBox szMsg
    End If
    Text2.LinkMode = 0
    On Error GoTo 0
End Sub

Sub Form_Load()
    Combo1.AddItem "prb"
    Combo1.AddItem "mic"
    Combo1.AddItem "pos1"
    Combo1.AddItem "pos2"
    Combo1.AddItem "pos3"
    Combo1.AddItem "pos4"
    Combo1.ListIndex = 0
    Combo2.AddItem "0"
    Combo2.AddItem "1"
    Combo2.AddItem "2"
    Combo2.AddItem "3"
    Combo2.ListIndex = -1
End Sub

Sub Option1_Click (Index As Integer)
    Select Case Index
        Case 0
            Text3.Text = "pcProbe|data"
        Case 1
            Text3.Text = "pcProbe|turret"
        Case 2
            Text3.Text = "pcProbe|patrec"
        Case 3
            Text3.Text = "pcProbe|loader"
    End Select

End Sub
```

```
Sub pbGetPos_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text
    Text1.Text = Combo1.Text + "pos"
    Text3.Text = "pcProbe|data"
    DDE_Request
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub

Sub pbGetUpDn_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text
    Text3.Text = "pcProbe|data"
    Text1.Text = Combo1.Text + "getudo"
    DDE_Request
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub

Sub pbLower_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text
    Text3.Text = "pcProbe|data"
    Text1.Text = Combo1.Text + "dn"
    DDE_Request
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub

Sub pbMoveCR_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text
    Text3.Text = "pcProbe|data"
    Text1.Text = Combo1.Text + "cr"
    DDE_Poke
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub

Sub pbMoveXY_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text

    Text3.Text = "pcProbe|data"
```

```
    Text1.Text = Combo1.Text + "xy"
    DDE_Poke
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub

Sub pbRaise_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text
    Text3.Text = "pcProbe|data"
    Text1.Text = Combo1.Text + "up"
    DDE_Request
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub

Sub pbSetUpDn_Click ()
    Dim szTmp, szTmp1 As String

    szTmp = Text3.Text
    szTmp1 = Text1.Text

    Text3.Text = "pcProbe|data"
    Text1.Text = Combo1.Text + "udo"
    DDE_Poke
    Text1.Text = szTmp1
    Text3.Text = szTmp
End Sub
```

MMCONFIG PcProbe^{II} VX
Configuration Utility

Version 2.7

PN: A1012673

Micromanipulator

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Carson City, Nevada 89706

Phone: (775)882-2400
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Printed in USA

Table of Contents

1 Introduction

The MMCONFIG PcProbe^{II} VX Configuration Utility is used to install and modify the configuration files used by the PosUtil Library DLLs in pcProbe^{II}. The PosUtil DLLs are designed as flexible software drivers for multiple hardware configurations.

2 Getting Started

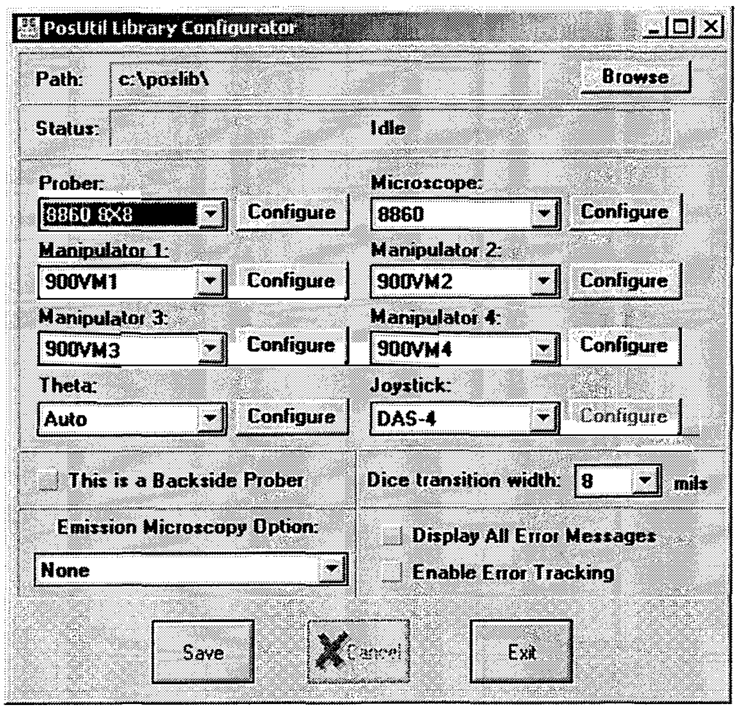
2.1 Running MMCONFIG

Note: Always shut down pcLaunch before running the configuration program.

1. Select **Start/Run...** from the Windows toolbar.

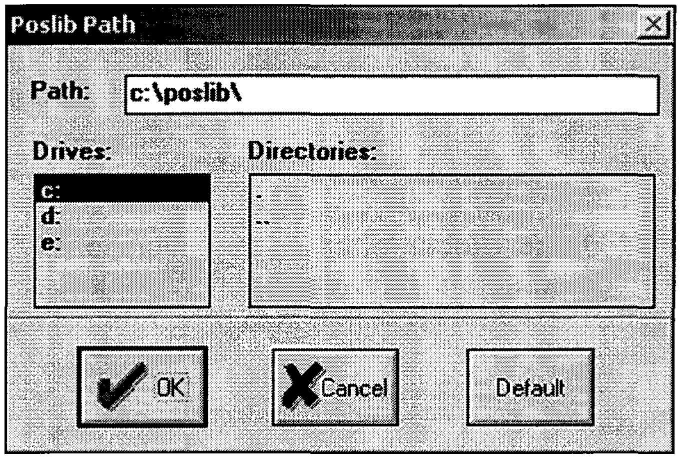
2. Enter ***C:\POSLIB\MMCONFIG*** in the **Open** text box.

3. Select **OK** to start the program. The program screen appears as shown below.



4. Use the information is sections to make any required changes.

5. Usually the default installation path is preferable, however if a different directory is desired select the ***Browse*** button. Select the desired destination for installation and select ***OK.***



6. Select ***Save.*** The library is installed and the configuration files generated. A backup of any existing files in the installation directory is made in a subdirectory in case there is a need to Uninstall the software.

7. Select ***Exit*** to quit the installation program.

If there is a change to the hardware configuration of a system it is possible to modify the existing configuration using the installer program. Examples requiring re-configuration include addition of programmable manipulators and an auto-theta chuck. The install screen is as shown below. Select the ***Save*** button when re-configuration is complete. A backup of the previous setup is made to a file named **POSLIB.000**.

2.2 Installing Positioning Devices

The installer provides access to all pcProbe[II] supported positioning devices. Select the device to install and the installer automatically loads the default configuration. All device selections include a **Manual** option if the device is indeed manual or not present. If a previous installation of pcProbe[II] is present, that configuration is used. Otherwise, the pcProbe 1.X.X configuration is used.

2.2.1 Prober

Select the ***8860 8X8*** or ***8860 6X6*** prober for all 88XX test stations with 8 or 6 inch programmable X,Y stage and programmable Z platen. Select the ***PRB6640*** prober for all 66XX test stations with 6 inch programmable X,Y stage and vacuum platen.

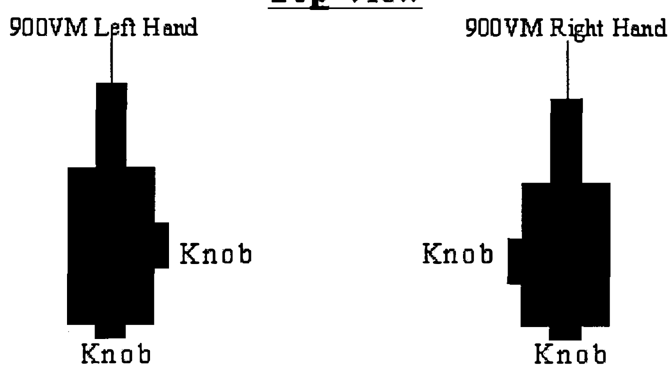
2.2.2 Microscope

Select ***6100*** for an FS-60 style microscope, ***6640*** for an FS-50 style scope, ***8860*** for the 4 inch travel 8860 style microscope, and ***Nikon*** for the Nikon scope.

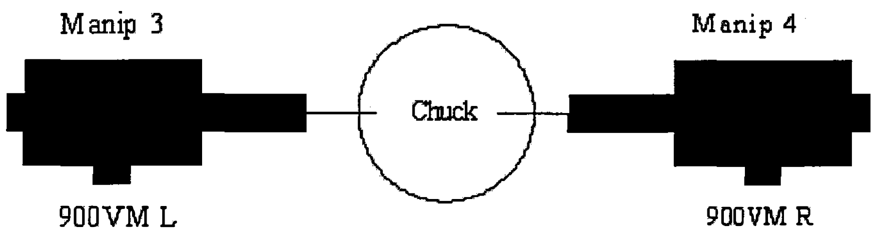
2.2.3 Manipulators

The manipulator types available are 900VM right hand and 900VM left hand. The diagram below shows the difference between the two.

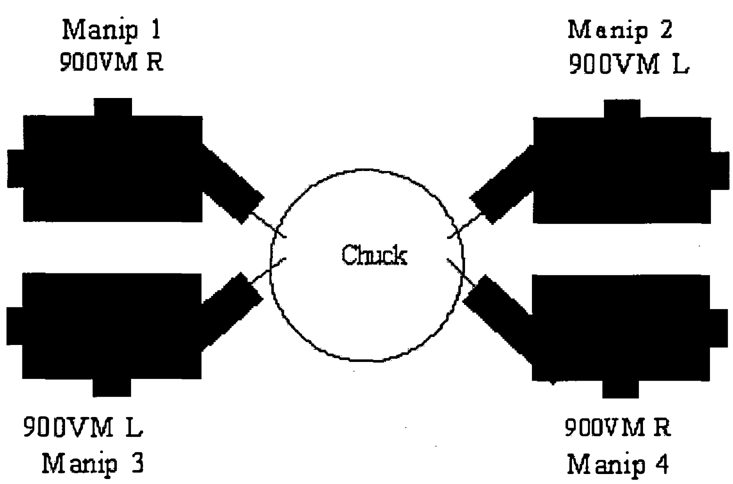
Top View



Select the appropriate manipulator for each position. A typical two (2) manipulator setup is as follows:



A typical four (4) manipulator setup is as follows:



2.2.4 Theta

There is an auto-theta option available for 8860 style test stations. Select ***Auto*** if one is present on the system.

2.3 Joystick

Four joystick options are available on pcProbe^{II} systems. The following shipping date table shows the likely configuration for the joystick:

Jovstick card	Use Date
ADA-300	05/91 through 10/93
ADA-310	The RTD ADA-310 was never released for production, however it is the designated replacement for the discontinued ADA-300 should one need replacement.
DAS-4	10/93 through 12/01
DAS-800	12/01 through Current

2.4 Backside Probing

The backside probing option changes the settings necessary to run the prober in either backside or normal mode. This is set at the factory and should not be changed. Note that the Manip1 and Manip2 settings are reserved for the Frontside camera XYZ and Frontside zoom.

2.5 Emission Microscopy

There are some options which are used in a standard configuration which are undesirable in an emission microscopy application. Select the appropriate vendor for this option from the list provided. In standard operation the speed of the positioning device is scaled by the axis speed scalars found in pcNav. In emission microscopy the scale is ignored except for jog moves.

2.6 Dice Transition Width

This option lets the operator define a zone around a die which can still be considered part of the die. This is useful when doing wafer map navigation because minor adjustments around the die reference no longer make the column, row location change. The value entered should be the distance between the end of one die and the beginning of another.

2.7 *Error Reporting Options*

2.7.1 Enable Error Tracking

Usually this option is disabled, however if there is anomalous system behavior this option should be enabled. All errors are stored in an error log file named ***Poslib.Err.*** This file is stored in the installation directory. The format for errors reported in this file is:

<date/time>
--> <error message>

For Example:

```
  Wed Mar 08 09:06:49 1995
  --> Error 0x0027 on device Mic8860 in MIC8860.DLL : Move exceeds
physical limit.
```

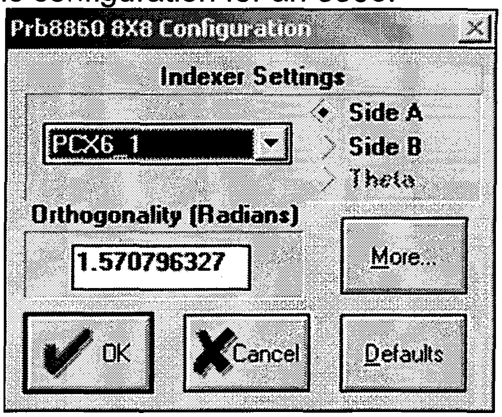
2.7.2 Display All Error Messages

This option causes an error box to be displayed whenever a system error occurs. It is necessary for the operator to close the error box before any other actions can continue. This option is NOT recommended when controlling pcProbe^{II} via DDE or through pcBridge.

3 Advanced Use

3.1 Device Configuration

The device configuration is accessed by selecting the ***Configure*** button associated with each device. For example the following dialog box gives the basic configuration for an 8860:



3.1.1 Indexing Card Selection

The list box gives a selection of indexing cards. The default for the device is usually sufficient. If there are no indexing cards in the system then select SIMULATOR to simulate an indexing card. The following table outlines the configuration options for a fully configured system:

Device	Indexer	Side
Prober	PCX6_1	Side A
Microscope	PCX6_1	Side B
Manip 3	PCX6_2	Side A
Manip 4	PCX6_2	Side B
Manip 1	PCX6_3	Side A
Manip 2	PCX6_3	Side B
Theta	PCX6_4	Side A

Note: These assignments may vary for systems that are not fully configured.

3.1.2 Orthogonality

The orthogonality angle compensates for any X-Y axis registration error. Ideally the angle between the X-Y axis of mechanical system should be at an angle of pi/2 radians (1.570796327). If the X-Y axes are NOT perfectly orthogonal, it is necessary to adjust for the error. The orthogonality angle is calculated as follows:

$$\theta = \arctan(\Delta Y/\Delta X)$$

where

θ = Orthogonality angle
ΔY = Y distance moved
ΔX = X distance error over Y distance

For example, suppose that after mechanically aligning the X axis of the positioner perfectly to the DUT, it is discovered that an X deviation occurs when moving in the Y direction. The orthogonality angle is determined by finding a reference along the Y axis and then moving a distance along the Y axis as far as possible and then correcting in the X axis an amount. Assume that the Y axis was moved 3000 mils and the X error was 1.4 mils. The orthogonality angle would be calculated as follows:

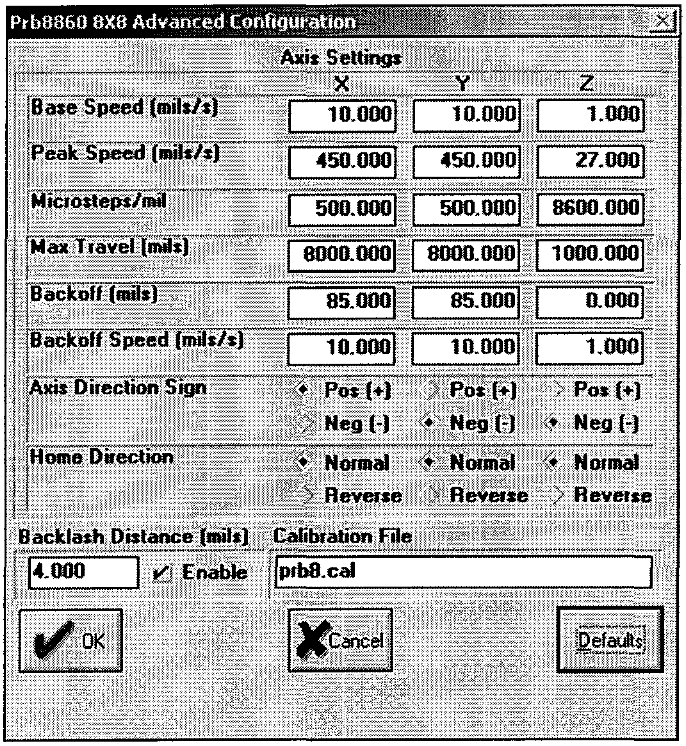
$$= \tan^{-1}(3000/1.4)$$
$$= 1.570329660 \text{ radians}$$

It is very important that there be at least 8 significant digits after the decimal point to ensure accurate compensation for error.

Enter the new orthogonality number in the text box and select ***Ok*** when done modifying the setup. The ***Defaults*** button causes the factory defaults for that device to be loaded.

3.2 Low Level Device Configuration

Select the ***More***... button to access low level configuration parameters. The following dialog box appears:



3.2.1 Base Speed

The starting speed for a device is limited by the motor torque, inertia, motor drivers, and static mechanical friction. There is no set criteria for determining this value, however if a motor base speed is too high it may not be able to move the stage.

Device	X (mils/s)	Y (mils/s)	Z (mils/s)
8860 Prober	10.5	10.5	1.5
8860 Mscope	10.5	10.5	1.5
6640 Prober	10.5	10.5	N/A
6100/Nikon/6640 Mscope	10.5	10.5	1.5
900VM	1.5	1.5	1.5
Theta (deg/s)	0.05	N/A	N/A

3.2.2 Peak Speed

The top speed for a device is limited by the motor torque speed characteristics, motor drivers, inertia, and dynamic mechanical friction. There are methods of determining these values for a given system using some fairly involved techniques. The empirical method provides a much faster and most likely correct solution. The value provided with the system is usually correct. If a given axis is binding at high speed that speed should be lowered until the binding stops. **X and Y need to have the SAME speed for correct software operation.** Typical values are:

Device	X (mils/s)	Y (mils/s)	Z (mils/s)
8860 Prober	450	450	27
8860 Mscope	450	450	200
6640 Prober	500	500	N/A
6100/6640 Mscope	50	50	30
900VM	20	20	20
Theta (deg/s)	5	N/A	N/A

3.2.3 Determining Microsteps per Mil

Each axis of the positioner has its own defined positioning constant calculated as Microsteps per Mil. In the case of theta, the calculation is in microsteps per Degree. This value is calculated as follows:

$$\text{Steps\_per\_Unit} = \frac{\text{Gear\_Ratio} * \text{Screw\_Turns\_per\_Unit} * \text{Motor\_Driver\_Microsteps\_per\_Pole} * 360.0}{\text{Motor\_Step\_Angle\_per\_Pole}}$$

For example, assume the following:

Gear_Ratio = 1:1
Motor Step Angle per Pole = 1.8 degrees
Motor Driver Microsteps per Pole = 125
Screw Turns per Unit = 20 turns per 1000 mils

The Microsteps per Mil constant is calculated as follows:

Steps_per_mil = (20/1000 * 125 * 360)/1.8
= 500 microsteps per mil

Typical values for systems are:

Device	X	Y	Z
8860 Prober	500	500	8600
8860 Mscope	500	500	605
6640 Prober	500	500	N/A
6100/6640 Mscope	2500	2500	3200
Nikon Mscope	2500	2500	680
900VM	5000	5000	5000
Theta	6944	N/A	N/A

3.2.4 Axis Travel

This number is different for each positioning system. The following table provides a summary.

Device	X (mils)	Y (mils)	Z (mils)
8860 Prober	8000	8000	1000
8860 Mscope	4000	4000	2000
6640 Prober	6000	6000	N/A
6100/6640 Mscope	1000	1000	1000
900VM	500	500	500
Theta (deg)	30	N/A	N/A

3.2.5 Backoff Distance and Velocity

The backoff number is used when a positioning system is initialized. The purpose of backoff is to clear the hardware limit switches. Typical numbers are in the following table:

Device	X (mils) @ mils/s	Y (mils) @ mils/s
8860 Prober	85 @ 10	85 @ 10
8860 Mscope	85 @ 10	85 @ 10
6640 Prober	85 @ 10	85 @ 10
6100/6640 Mscope	50 @ 10	85 @ 10
900VM	10 @ 2	10 @ 2
Theta (deg) @ deg/s	0.1 @ 1	N/A

3.2.6 Direction

The direction is used to correct positioning direction of a system to cartesian coordinates of the DUT. This means that when a positive X,Y move is performed the positioner in use moves in a positive X,Y direction referenced to the DUT. The positioners and microscope move over the surface of the wafer and are therefore easily verified. The prober stage, on the other hand, appears to move in the OPPOSITE direction in order to attain correct DUT motion because the DUT is mounted on the prober stage. The following table gives the defaults.

Device	X	Y	Z
8860 Prober	+	-	-
8860 Mscope	-	+	-
6640 Prober	+	+	N/A
6100 Mscope	+	-	-
6640 Mscope	-	-	+
900VM 1	-	+	-
900VM 2	+	+	-
900VM 3	-	-	-
900VM 4	+	-	-
Theta	+	N/A	N/A

3.2.7 Home Direction

Some systems require that the home direction be reversed to prevent the Z axis from moving down during initialization. If you discover that your system initialized down, change this setting. The devices which requires **reverse** home direction are the 6100/6640 microscopes and backside stage.

3.2.8 Backlash Distance

The backlash option causes the positioner to always approach locations from the same direction. This typically increases the repeatability of a system. Usually this option is ON with a default value of 4 mils. The backlash can be disabled safely on 900VMs to prevent the annoyance of the backlash move during fine positioning.

3.2.9 Calibration File

Each device is calibrated at the factory, and the resultant data is stored on the controller's hard drive. The default files containing calibration information are as follows:

Device	File
8860 Prober	prb8.cal
6640 Prober	prb6.cal
All microscopes	micr.cal
Theta	theta.cal
Positioners 1..4	pos1..4.cal

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775-882-2400
fax: 775-882-7694
e-mail: sales@micromanipulator.com

SOFTWARE FEATURE REQUEST

USER INFORMATION

(Please Complete and Give to Your **MICROMANIPULATOR** Contact)

NAME:____________ **COMPANY:**____________

ADDRESS:____________ **PHONE: ( ) --**

E-MAIL ADDRESS:____________

PRODUCT:

❑ **pcPROBE** ❑ **OTHER**________

*SERIAL NUMBER:*________

*MODULE (e.g. pcNav):*________

*FOUND IN RELEASE:*________

*OTHER INFO:*________

HARDWARE CONFIGURATION:

*COMPUTER BRAND/MODEL:*________

*CPU TYPE:*______ *ROM TYPE:*______

*DISK INFO:*______ *MEMORY:*______

*MONITOR:*______ *MOUSE:*______

*PRINTER:*______ *OP. SYS.:*______

*RESIDENT S/W:*______ *NETWORK:*______

DESCRIPTION OF REQUESTED FEATURE

(Please Be Specific)

NOTES:

MICROMANIPULATOR CONTACT

NAME:________ **EXTENSION:**________

POSITION:________ **DATE RECEIVED:**________

PRIORITY:________

QUALITY CONTROL USE

SUBMISSION DATE:________

DATABASE ID:________

❑ **ENTERED INTO DATABASE**

❑ **IN DATABASE - ADD CONTACT**

ASSIGNED TO:________

CHECK ONE OF THE BOXES BELOW

❑ **CAPABILITY ALREADY THERE**

❑ **IMPLEMENT NOW**

❑ **IMPLEMENT IN FUTURE REL.**

❑ **NOT TO BE IMPLEMENTED**

THE MICROMANIPULATOR COMPANY, INC.
1555 Forrest Way
Carson City, Nevada 89706
Tel : 702 / 882-2400
Fax: 702 / 882-7694

(E-MAIL: SALES@MICROMANIPULATOR.COM or SERVICE@MICROMANIPULATOR.COM)

SOFTWARE BUG REPORT

USER INFORMATION

(Please Complete and Give to Your **MICROMANIPULATOR** Contact)

NAME:____________ **COMPANY:**____________

ADDRESS:____________ **PHONE: ( ) --**

____________ **E-MAIL ADDRESS:**____________

____

PRODUCT:

❑ **pcPROBE** ❑ **OTHER**________

*SERIAL NUMBER:*________

*MODULE (e.g. pcNav):*________

*FOUND IN RELEASE:*________

*OTHER INFO:*________

HARDWARE CONFIGURATION:

*COMPUTER BRAND/MODEL:*________

*CPU TYPE:*______ *ROM TYPE:*______

*DISK INFO:*______ *MEMORY:*______

*MONITOR:*______ *MOUSE:*______

*PRINTER:*______ *OP. SYS.:*______

*RESIDENT S/W:*______ *NETWORK:*______

DESCRIPTION/STEPS TO REPRODUCE

(Please Be Specific So We Can Reproduce The Bug)

NOTES:

MICROMANIPULATOR CONTACT

NAME:____________ **EXTENSION:**____________

POSITION:____________ **DATE RECEIVED:**____________

PRIORITY:____________

QUALITY CONTROL USE

SUBMISSION DATE:____________

DATABASE ID:____________

❑ **ENTERED INTO DATABASE**

❑ **IN DATABASE - ADD CONTACT**

ASSIGNED TO:____________

CHECK ONE OF THE BOXES BELOW

❑ **REPRODUCED**

❑ **CANNOT REPRODUCE**

❑ **HARDWARE PROBLEM**

❑ **AS INTENDED**

A1008967 REV. A (3SEPT97)

pcProbe™ Family of Software Products

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Versions 2.0 (and subsequent 2.X releases)

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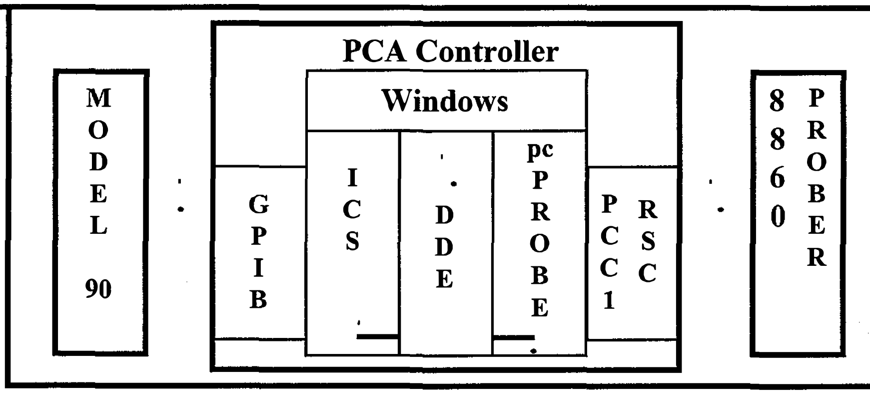
THE MICROMANIPULATOR COMPANY, INC.



Application

A schematic of an operational system is shown above. The pcProbe™ based probe stations feature an integral Pentium™ based CPU. pcProbe™ operates within the Windows™ environment on the CPU as does the ICS-Metrics™ control software. pcProbe™ contains an extensive library of DDE control commands through which control of the pcProbe program is accomplished by ICS-Metrics™. Links to the Keithley Model 90 and the probe station (and other programmable accessories) are accomplished through GPIB and dedicated interface cabling respectively.

Equipment Setup

1. The user starts in the pcProbe™ program. Device load, two-point alignment and reference positions are set. A wafer stepping program is then defined using the wafer map "point and shoot" and stored under an appropriate name. Probes or the probe card are positioned on contact points on the sample and touchdown verified visually or by using Touchdown Sensing™.
2. The user then switches to the ICS-Metrics™ program (via minimizing the pcProbe™ window or using the Control-Escape Windows™ key sequence).
3. Using ICS-Metrics™, the Model 90 tester is setup. The instrument is chosen and GPIB polling is accomplished. The user then selects a device type from the ICS-Metrics™ device library and assigns SMUs to each connection of the device. The SMUs are then programmed from the ICS-Metrics™ window.
4. The link to pcProbe™ is now established by using a pull-down menu (located in the ICS-Metrics™ window) and selecting the prober interface. If desired, a probing stepping program can be loaded directly from the ICS-Metrics™ menu which allows access to the pcProbe™ directory of created and stored programs.

Operation

With the link established, the user can operate both the prober and the parametric tester from the ICS-Metrics™ window. The user simply selects the ICS-Metrics™ measure icon. ICS-Metrics™ then automatically sends a step command via DDE to pcProbe™. The prober is activated, moves to the proper position and the probes are placed. The model 90 tester is then activated and the test or test sequence performed. Data is received by ICS-Metrics™ and stored for reduction and analysis.

The test session can then continue interactively by the user simply selecting the measure icon or through the execution of an auto sequence. pcProbe™ will move to the next programmed position, place the probes and the parametric test will be accomplished automatically.

If the user wishes to investigate results at a particular probe site in more detail, it is possible to switch to the pcProbe™ window and make use of its features. Interactive probing using the video window and directional controls may be accomplished. When ready to resume the program, the user selects the "continue" icon, returns to ICS-Metrics™ and resumes the stepping and testing session.

Once test data has been generated, ICS-Metrics™ data reduction and graphical analysis tools may be invoked to analyze the test results. Finally, using the ICS-Metrics™ project storage feature and the pcProbe™ stepping program storage directory, the prober stepping program, test instrument setup and data reduction and analysis sequences may be stored for later retrieval and use for a similar device probing requirement.

Summary

The setup described provides an easy to use integration of the Micromanipulator Semi-automatic probe station and the Keithley Model 90 I-V test system.

In addition to providing tester control and data analysis from the Windows™ environment with the ICS-Metrics™ software, the accuracy and repeatability of the Micromanipulator Semi-automatic probe stations (i.e., the programmable manipulator has 0.05μm resolution and + 0.5 μm combined accuracy and repeatability error and the stage drive has 0.1um resolution and + 1.5μm combined accuracy and repeatability error) and the high accuracy (0.03%), low noise (0.001%) and fast measurement speed of the Keithley Model 90 I-V test system are realized.

Integrating Semi-automatic Probe Stations with Keithley Parametric Test Systems

Application Note

Introduction

This application note explains how to integrate a Micromanipulator 8860 Semi-automatic probing station with a Keithley Model 90 I-V Parametric tester and Metrics ICS software. An engineer will want to integrate the prober, measurement hardware and automation software together to enhance throughput and data analysis. This application note assumes the reader is familiar with the 8860 pcProbe II based prober, ICS and the Keithley Model 90 I-V tester.

Today's failure analysis, product test and device characterization engineers and technicians are constantly faced with the need to maintain efficiency, productivity and flexibility in the use of their laboratory equipment.

Complicating this task is the fact that equipment from multiple vendors is often present in the lab and the integration of various pieces of equipment is left up to the ingenuity and effort of the user.

Through the use of the pcProbe™ Windows™ based Prober Control System, Keithley Model 90 I-V Parametric Test Equipment and ICS-Metrics™ Graphical User Interface, the integration of prober and parametric tester is accomplished easily and cleanly.

pcProbe

The pcProbe ™ Prober Control System is a graphical user control system for semi-automatic probing equipment. pcProbe provides remote interactive or programmable control of the prober wafer stage or device holder, probe platen, microscope positioning and focus.

Control is provided via a wafer map with "Point and Shoot" capability, via X, Y, Z positional inputs and via an interactive live video window with "click and drag" positioning capability. Joystick control of all motorized components is also provided.

Touchdown sensing, auto focus, a condensation-free temperature environment and a shielded low current (fA) environment may be added to the pcProbe™ controlled prober to further enhance the efficiency of the prober and accessories.

Keithley Test System

The Keithley Model 90 I-V Test system is a flexible parametric test system offering multiple configurations in one integrated instrument.

The system features four industry-standard Model 236 SMUs or can be configured with an optional Model 237 High Voltage SMU and a Model 238 High Current SMU. Each instrument can source a voltage and measure current (or vice versa) with 10fA and 10uV measurement sensitivity at reading rates as fast as 1mS.

The system contains the Model 2361 Trigger Control Unit (TCU) which can synchronize the source and measure activity of each SMU without the need to specify any triggering configurations. Also included is the Model 213 Quad Voltage Source (QVS) four channels of voltage bias capability. Each channel can apply ±10 volts to device pins. Channels may be stacked to achieve dual ±20 volt sources or a single ±40 volt source.

ICS-Metrics Software

The ICS-Metrics™ Graphical User Interface Software is a Windows™ based setup and control program for parametric testers.

From the ICS-Metrics™ environment, device types may be selected, SMUs assigned and programmed, GPIB polling accomplished and prober interface established.

In addition to setup of the test equipment, ICS-Metrics™ provides powerful data reduction and graphical analysis features. Curve Fittings, Extrapolations and Smoothing may be accomplished with the ICS-Metrics™ control program.

Through the Windows™ Dynamic Data Exchange (DDE) facility, ICS-Metrics™ can also communicate with other Windows™ based programs, including Microsoft Excel™ and pcProbe™.

Micromanipulator

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www.micromanipulator.com Made in the USA

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Specifications subject to change without notice.

PCA/PCB HARDWARE/ SOFTWARE SN TRACKING

SYSTEM MODEL NUMBER:____________________ SYSTEM SERIAL NUMBER:____________________

SALES ORDER NUMBER:____________________

SOFTWARE SHIPPED

SOFTWARE	SERIAL NUMBER
MS-DOS ON 3.5" DISKETTE________VER.# _____	____________________
MS-WINDOWS ON CD________VER# _____	____________________
pcPROBE VER:_______ BACKUP DIR:______________	____________________
netPROBE VER:_______ BACKUP DIR:______________	____________________
OTHER ____________________ VER:__________	____________________

HARDWARE SHIPPED

CPU:____________________ MODEL & S/N____________________

RAM:____________________ MODEL & S/N____________________

HARD DRIVE:______________ MODEL & S/N____________________

GRAPHIC CARD

MODEL ____________________

S/N____________________

MONITOR

MODEL ____________________

S/N____________________

ADDITIONAL CARDS	MODEL & S/N
☐ DG96	____________________
☐ DASXX	____________________
☐ VIDEO FRAME GRABBER	____________________
☐ GPIB	____________________

MISC	MODEL & S/N
☐ KEYBOARD	____________________
☐ MOUSE	____________________

INDEXING CARDS	PART NUMBER	SERIAL NUMBER	DEVICE ASSIGNMENT
☐ ONE	____________	____________	____________
☐ TWO	____________	____________	____________
☐ THREE	____________	____________	____________
☐ FOUR	____________	____________	____________

NOTE: PLACE COMPLETED FORM IN PROBE STATION S/N FOLDER WITH OTHER DATA

PCA/PCB HARDWARE/ SOFTWARE SN TRACKING

SYSTEM MODEL NUMBER:____________________ SYSTEM SERIAL NUMBER:____________________

SALES ORDER NUMBER:____________________

SOFTWARE SHIPPED

SOFTWARE	SERIAL NUMBER
MS-DOS ON 3.5" DISKETTE________VER.# _____	____________________
MS-WINDOWS ON CD________VER# _____	____________________
pcPROBE VER:_______ BACKUP DIR:______________	____________________
netPROBE VER:_______ BACKUP DIR:______________	____________________
OTHER ____________________ VER:__________	____________________

HARDWARE SHIPPED

CPU:____________________ MODEL & S/N____________________

RAM:____________________ MODEL & S/N____________________

HARD DRIVE:______________ MODEL & S/N____________________

GRAPHIC CARD

MODEL ____________________

S/N____________________

MONITOR

MODEL ____________________

S/N____________________

ADDITIONAL CARDS	MODEL & S/N
❑ DG96	____________________
❑ DASXX	____________________
❑ VIDEO FRAME GRABBER	____________________
❑ GPIB	____________________

MISC	MODEL & S/N
❑ KEYBOARD	____________________
❑ MOUSE	____________________

INDEXING CARDS	PART NUMBER	SERIAL NUMBER	DEVICE ASSIGNMENT
❑ ONE	____________	____________	____________
❑ TWO	____________	____________	____________
❑ THREE	____________	____________	____________
❑ FOUR	____________	____________	____________

NOTE: PLACE COMPLETED FORM IN PROBE STATION S/N FOLDER WITH OTHER DATA