Shown below are the windows of the two main programs that control and operate the AFPP system. The left window is the configuration program. It is used by the process engineer to setup and configure what measurements are to be taken. The right window is the measurement program. It is used by the operator to take measurements and print reports.

These two programs are usually never run at the same time and thus would never be seen on the same screen. In a typical installation, the computer would automatically run the measurement program at startup (power on). It is usually configured so that the operator actually needs to know a password to end the measurement program and is thus prohibited using the computer for any purpose other than taking measurements and printing reports.

Notice the top-left corner of each window is used to display the Configuration File Name. This is the key field that ties these two programs together. The process engineer creates configuration files and defines the system parameters that go into it. The fab technician must choose one of these previously created configuration files to run the measurement program.
When the configuration program starts, it will pop open the dialog box (see right). This is the same box that will appear when the OPEN button is clicked on the main program window. Use the mouse to select the previously created configuration then click on OK.

To create a new configuration click the NEW button and the dialog box shown on the right will appear. Type in the new configuration name and click OK.

These same two dialog boxes will appear when you click on the OPEN or NEW buttons in the program’s main window. Note that the currently selected configuration file name is always displayed.

The PRINT button just prints whatever is shown in the main window. The EXIT button will end the program. Clicking the What Is... button will cause question mark buttons to appear in various locations in the window. These are buttons that disappear after only 5 seconds. Clicking on one of these question mark targets will activate the help file program that may display useful information about the program.

The bottom part of the main window is a simulation of a tabbed notebook. Clicking on a topic tab will “open” the notebook to display the page containing that topic.
The following fields are within the WAFER section of the simulated tabbed notebook.

Define the overall outside DIAMETER of the wafer to be tested. You may use the drop down dialog listbox to select standard sizes or use the keyboard to type in a number. Values of 8 or below are assumed to be in inches; else the value is in mm.
Setback value is always mm.

Define the configuration of the probe head.

Some computed values (on report) require a value for the thickness of the wafer...
...and/or...
the thickness of the Epi Layer...
...and/or...
...the temperature of the wafer...

Measurements taken near the edge of the wafer tend to have a slightly higher resistivity. A precompiled table can mathematically adjust for this phenomenon.
There is one table for each wafer type. The tables are built using the diagnostic utility to take multiple measurements from a “model” wafer. You need to have previously built this table and know its name in order to use this feature.
The following fields are for the PATTERN page of the simulated tabbed notebook.

**Pattern**
- Center Only
- SEMI 5 Point
- SEMI 9 Point
- ASTM 5 Point
- ASTM 9 Point
- Radial Pattern
- Circular Pattern
- Grid
- N/P Test Only
- User defined (custom) pattern

Choose the measurement pattern. If Radial, Circular or Grid patterns are selected, then additional parameter fields become visible.

If User defined (custom) pattern is selected, the box below will become visible.

**Custom Pattern**
Click on circle to create a measurement point.

System can be configured for one or two measurements at the center (second reading taken after rotating wafer 90 degrees)

N/P test can be configured. This is optional and DOES take additional time.

Sometimes more accurate measurements may be obtained by taking more analog sample readings at each measurement point. (For conditioning probe heads, set this number to zero!)

**Warning!** It takes the equipment longer (possible much longer) if significantly more samples are taken.
A radial is edge-to-edge (same as a diameter.)

A 'radius' is a line starting at the center and going out. Points are specified as to the number per 'radius'.

Each circle has 8 more points than previous circle.
Operator Configuration

The following fields are on the OPERATOR page of the tabbed notebook.

Instructions to operator will appear on measure program's screen.

Circular test pattern
(center + 2 circles)

Leave a notice that the operator will see on the measurement program's window for any instructions or notes.

File creation options

- Measurement data is automatically saved to a file...
  - Allow operator to enter new file name (it could be a lot or batch number)
  - Do NOT allow operator to enter name (file name generated from date + time)
  - Use (or clear and reuse) file named TEMP (previous measurements are overwritten)

How new files are created and where their names come from is configured here.

Sometimes is necessary to go back and review an old measurement session and possibly print a report. This option must be configured to allow this.

The system can be configured to automatically delete old files

Measurement time is just an optional field in the measurement program's window that shows how many seconds have elapsed for the current measurement. It is usually turned off (could confuse the operator).

This optional field allows each configuration file to be password protected. The operator must enter the password (if defined here) in order to take measurements using this configuration.

Allow operator to load old files

Delete Files

Purge old data files that are this many days old:

Measurement Time

- Do NOT show time
- Show time used

Password

Leave blank if not used
The measurement program creates an output file with one row of text per measurement. This file can be imported to a spreadsheet or read by other programs to print reports. You must decide what the measurement program will put into this file. Put cursor on a topic, hold down left mouse button, and drag topic to column box.

To get more information on what each topic (number etc.) is, just put the cursor on the topic. A brief description will appear on the bottom of the screen. (Many of these topics are not used much but are sometimes useful in uncovering exactly how the equipment is functioning and deriving calculations.)

Special drag object. Measurement program displays only ONE field (per wafer location) on the bottom half of the screen. Drag and drop this field to configure what data is shown. (It will always be in one of the 12 boxes.)

Put the cursor on one of the above “topics” and drag (hold down left mouse button) it into one of the 12 column boxes.

Example of what it would look like after dragging the “V/I” topic and the “Op’s View” target into the “Column 1” box.
Configuring the Report

The following fields are for the REPORT page of the tabbed notebook.

Example of simulated paper with icons already arranged.

These are all the icons that appear near the bottom of the window. The program knows how to print these. Put the cursor on an icon and the cursor will change from an arrow to a hand. Hold down the left mouse button and move the icon to the simulated paper.

When the cursor is on the simulated paper, RED digits will appear. This is the X Y (across & down) position of the cursor in inches.

Note there are two icons labeled TEXT. These are used to position user defined text for headings, etc. The icons labeled COL 1 to COL 12 are numbers generated for output to the file. See previous section of this manual for how they are configured. The icons labeled Point Pattern, Color Map, and Color Codes are images (pictures of wafer etc). The image size can be configured (see next page).
Double click on an icon and this dialog box will appear.

You can define the font size, font color and background color of the text printed for this section of the report (this icon).

This section defines how numerical data is printed (either ROWS or COLUMNS). Headings and summary totals may be printed.

Enter text here for column headings (see above) or for user-defined TEXT icons.

Double clicking the color code icon will also display the fields shown here. For the color contour map, the program will generate a default scale and a default set of colors. Nothing fancy needs to be done to generate default color contour map. Use this section of the dialog box to override the default values and customize the colors.

Use this to define the image size in inches. (Images are pattern map, contour map, or color codes.)

The color contour map can optionally have point numbers or measured values near the point location on the map (picture of the wafer.)
Configuring Error Handlers

Things happen...
...good equipment can try
to read a bad wafer...
...or...
...a probe head might be
worn out but need to
measure just one more
wafer...
...Use this section to
help keep you going when
the going gets tough.

This is a standard
reasonableness
check. Clicking
the last radio
button will make
visible a field
where you can
enter a value
different than the
default of point
one. Putting a
large value in will
mean ignore the
reasonableness
check.

So what happens when everything else that was configured above was
tried and there still is not a valid reading?
Put in your own text like “DARN” or “OOPS” or just stars “*****”.
Or you can fudge the text to be some default number.
There are two kinds of files:

**Configuration files** are where the configuration data is saved (includes wafer size, patterns, report format etc.). There is configuration file in a directory (directory has the same name as the configuration file.)

**Data files** are where the measurements are saved. There is one measurement file for each wafer that is measured. All the data files in a directory were measured using the same configuration.

As part of the normal setup procedure, it can be configured that data files will automatically be deleted when they reach a certain age, for example, deleted if older than 90 days. (See the section of this manual for the tabbed notebook page labeled OPERATOR.)

Obviously data files are just files and can also be deleted using the WIN95 file manager (if you are experienced enough with windows to know how to do this. Please don’t delete the configuration file.)

The page shown below provides a simple way to delete data files within a configuration (and safe since it will never allow you to delete a configuration file.)
This section explains the BACKUP page of the tabbed notebook.

Backup and Restore Configuration Files
(Water measurement data is NOT backed up here.)

The configuration editor can backup, restore, and rename configuration files (creating directories as necessary.) This works well within the limited space available on a floppy because there probably won't be a lot of configuration files and they are not very big (a few hundred bytes each).

The files that hold measurement data, however, can be much larger and there are typically a lot of these files. Backing up the measurement files is best done by a knowledgeable person (system administrator) using standard WIN95 backup utilities.

The backup and restore operations described below are only for configuration files. (Each configuration file MUST be contained in a directory that has the same name as the configuration file. These directories are automatically created when copying or creating configuration files.)

The listbox on the left side of the screen is what configuration information is already on the floppy. It initially appears blank. After you put in a floppy (or change floppies) click on the READ FLOPPY button to update the information shown.

The listbox on the right side of the screen shows what configuration information is on the hard drive. These are the same file/directory names listed when you OPEN a configuration.

Use the RESTORE button to copy data from the floppy to the hard disk.

Select files to be copied by clicking with the left mouse button. (Selected files appear with a blue background.) Multiple files can be selected by dragging the cursor with the left mouse button down.

Use the BACKUP button to copy configuration data from the hard disk to the floppy.

This section is used to rename a configuration on the hard drive. (It must NOT be the currently opened configuration.) The first selected configuration (see above) becomes the 'old' file name. Key in the new name and click on the DO...NOW button.
The window of the measurement program...

Clicking the WHAT IS button will cause question mark buttons to appear in various locations in the window. These are buttons that disappear after only 5 seconds. Clicking on one of these question mark targets will activate the help file program that may display useful information about the program.

The EXIT button will end the program. The measurement program can be set up so that a password is required to end the program (see below).

When the measurement program starts up (or the OPEN button is clicked), a dialog window pops up open and requires the operator select a configuration.

Only those configurations which have (p) after the name will require the operator to enter a password.
The START NEW FILE button will set all measurement points to unmeasured. Depending on the configuration, it may make visible the edit box (see right) asking for a file name.

The computer generates default file names based upon the current time and date. The format is (year month day hour minute second) YYYYMMDDHHMMSS

The measurement program can be configured to allow the operator to reload old files to print reports etc. Clicking the button will pop open the dialog window shown at the right.

The default configuration is that this is not allowed, so the LOAD button is normally invisible.

Clicking the MEASURE button will cause the system to automatically measure all unmeasured points.

The measurement values are viewed in the data boxes at the bottom of the window.

Clicking one of the points (data boxes) causes the REMEASURE button to appear. Clicking it will cause the system to measure just the one point specified.

Clicking the ABORT button will terminate the current measurement and reset the hardware.

The wafer image to the right of the button is used to see where the point is on the wafer.
Clicking the PRINT button will cause a report to print. (The EXIT button does not work while the report is being calculated)

Clicking this button will cause a contour map to be displayed in a new window.

This is a preview mode for how the contour map will be printed on the report.

The operator can interactively rotate and tilt the wafer image and select the optional grid pattern (fine or course.)

The default mode is NO rotation, tilt or grid.

Shows the average of all points measured so far. (Blank if no points have been measured.)

Displays total measurement time including remeasures. (The default for the configuration is that this field is not shown)