Allwin21 Corporation

Tencor Instruments
m-gage™
with
AW-M300 Upgrade

Operations Manual

Allwin21 Corporation
1550 Norman Ave., Santa Clara, CA 95054

TENCOR INSTRUMENTS
M-GAGE™

WITH

ALLWIN21
AW-M300 UPGRADE

SHEET RESISTANCE MEASUREMENT SYSTEM

OPERATIONS MANUAL

Allwin21 Corporation
1550 Norman Avenue
Santa Clara, California, 95054

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PREFACE

INTENDED AUDIENCE

This manual has been written for engineers working with the AW-M300 Sheet Resistance Measurement System. It provides an overview of the system operation procedures. Please read this manual carefully before operating theAW-M300 system.

It is the intension of Allwin21 to show how to use the Tencor M-Gage™ while using the Allwin21 AW-M300 control software. Therefore, this document has referred to the Tencor M-Gage™ manual #038814 REV. C 9-85 extensively in many sections.

DOCUMENT CONVENTIONS

FONT CONVENTIONS

The following font conventions are used in this manual.

Bold

Software screen selections are represented in **bold** type.

Italic

Screen names are shown in *italic* type.

First Letter Capitalized

Operating modes are shown in normal type with the first letter capitalized.

For example:

"Select **Recipe** from the *Main Menu* screen to enter the Recipe Programming mode."

REFERENCES

Tencor M-Gage™ manual #038814 REV. C 9-85

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

1.1 SYSTEM OVERVIEW

The Tencor Instruments M-Gage™ with Allwin21 AW-M300 Upgrade Kit (Allwin21 System) is a Sheet Resistance Measurement System.

The M-Gage™ measures sheet resistance in ohms per square or milliohms per square. If specific resistivity is known, the thickness of the deposited film layer can be computed from the sheet resistance. The choice of measurement data is easily switch selectable, as is the choice of units.

The M-Gage™ can accommodate 150mm (6”) wafers as well as the standard 2", 3", 100mm (4"), and 125mm (5") wafers.

Allwin21 upgrade provides an easier way to operate and maintain this Sheet Resistance Measurement System.

- The system is controlled by a Pentium class PC computer running the AW-M300 control software, and interacts with the user through a touch screen display. The computer permits the user to operate the machine manually or automatically through a recipe that is programmable by the user.

- The AW-M300 software is an advanced control software standard on the Allwin21 system. This document provides a general discussion of the function and calibration of the control software.

- The AW-M300 allows calibration of the ohm and milliohm measurements within the software. This provides a much easier and faster method to calibrate the AW-M300 than by adjusting pots on the back of the m-gage™.

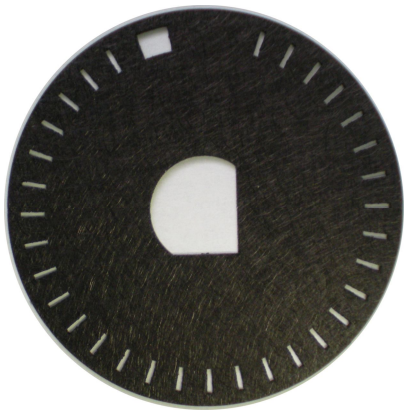


Figure 1.1: *AW-M300 Encoder Disk*

- There is only one encoder disk for all configurations with the Allwin21 AW-M300 Upgrade. The original Tencor M-Gage has multiple encoder disks depending on the wafer sizes and the number of test points to be tested. Each time the wafer size changes or the need to have different number of measuring points, the encoder disk has to be changed. There is no need to change the encoder disk with the Allwin21 AW-M300 Upgrade. The wafer size and the position of the test points are programmed into the recipe by the operator. The original Tencor encoder disks have fixed positions for the test points.

Throughout this manual, the user may be asked to refer to the original Tencor M-Gage™ manual for further information.

1.2 SOFTWARE FEATURES

The AW-M300 system is controlled by menu commands from the control software. This software allows a great deal of flexibility and control of the Allwin21 system.

The AW-M300 control software features the following:

- Automated calibration of all subsystems from within the control software. This allows faster and easier calibration, leading to enhanced process results.
- Recipe creation. It features a recipe editor to create and edit recipes to fully automate the processing of wafers on the Allwin21 system.
- Validation of the recipe so improper points will be revealed.
- Storage of multiple recipes, process data and calibration files so that process and calibration results can be maintained and compared over time.
- Passwords provide security for the system, recipe editing, diagnostics, calibration and setup functions.
- Simple and easy to use menu screens which allow an automatic cycle to be easily defined and executed.
- Troubleshooting features which allow engineers and service personnel to activate individual subassemblies and functions.

1.3 MEASUREMENT SEQUENCE

Wafers can be measured at a single point for greatest speed, or at multiple points for the most comprehensive analysis of wafer or film characteristics. In 5-point and 9-point measurements, data points are collected along two perpendicular; axes, as shown below.

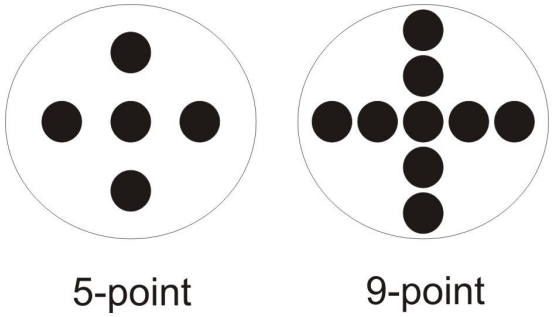


Figure 1.2: *Measurement Positions*

During multi-point measurement the wafer is carried beneath the measurement head in two passes. In a 5-point measurement sequence, three points are measured during the first pass. (in 9-point measurements, five points are measured on the first pass.) The wafer is then returned to the loading position, rotated 90°, and the process is repeated. However, the center point is measured only once.

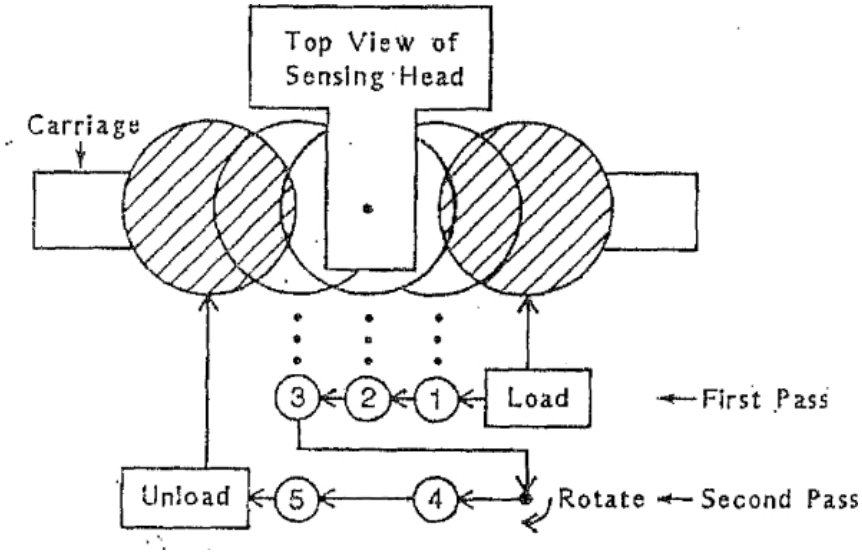


Figure 1.3: *Measurement Sequence, 5-point*

The measurement sequence is programmed by a user defined recipe. The recipe specifies the point for measurement.

> **NOTE**
>
> **It is <u>not</u> necessary to change the optical disk whenever the wafer size is changed or the number of measurement points is required. The optical disk in the m-gage from Allwin21 does not need to be changed.**

1.4 OPERATING MODES

The M-Gage has two modes of operation: Manual and Automatic. In Manual Mode the operator steps the wafer through the measurement sequence one point at a time, by pressing a single button. The resistance and the thickness of the measured points are displayed on the computer monitor.

In Automatic Mode the entire multi-point measurement sequence is initiated with the press of a button. The data output is recorded in the computer and can later be printed on a printer. Any serial printer having 20 or more columns can be used. See figure 1.3 for a sample print-out.

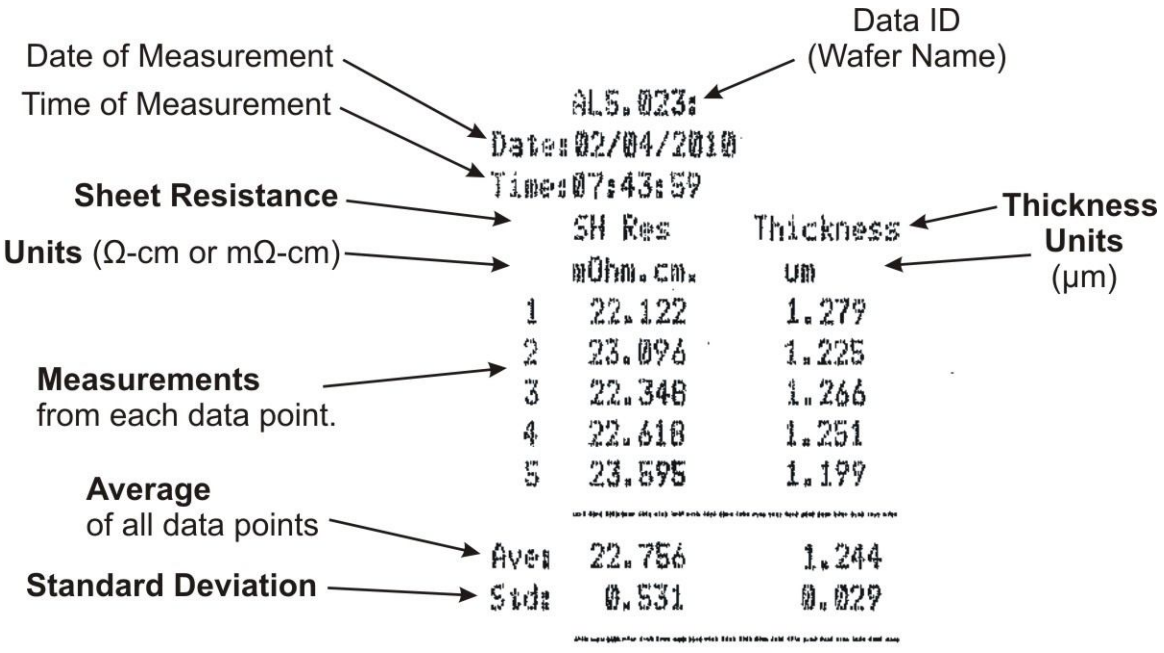


Figure 1.4: *comprehensive data print-out*

1.5 NOTES, CAUTIONS AND WARNINGS

When operating and maintaining the Allwin21 system, the following safety procedures and precautions must be followed to avoid certain hazards. Observe all warnings and cautions. Their purpose is to protect personnel from injury and long term health hazards and to protect the machine from damage.

Pay special attention to notes, cautions and warnings located in appropriate areas in this manual.

NOTE

Notes provide additional important information which requires special attention.

CAUTION

Cautions alert you to avoid system damage.

WARNING

Warnings are given for personnel safety to prevent bodily harm.

2.0 CONTROLS AND INDICATORS

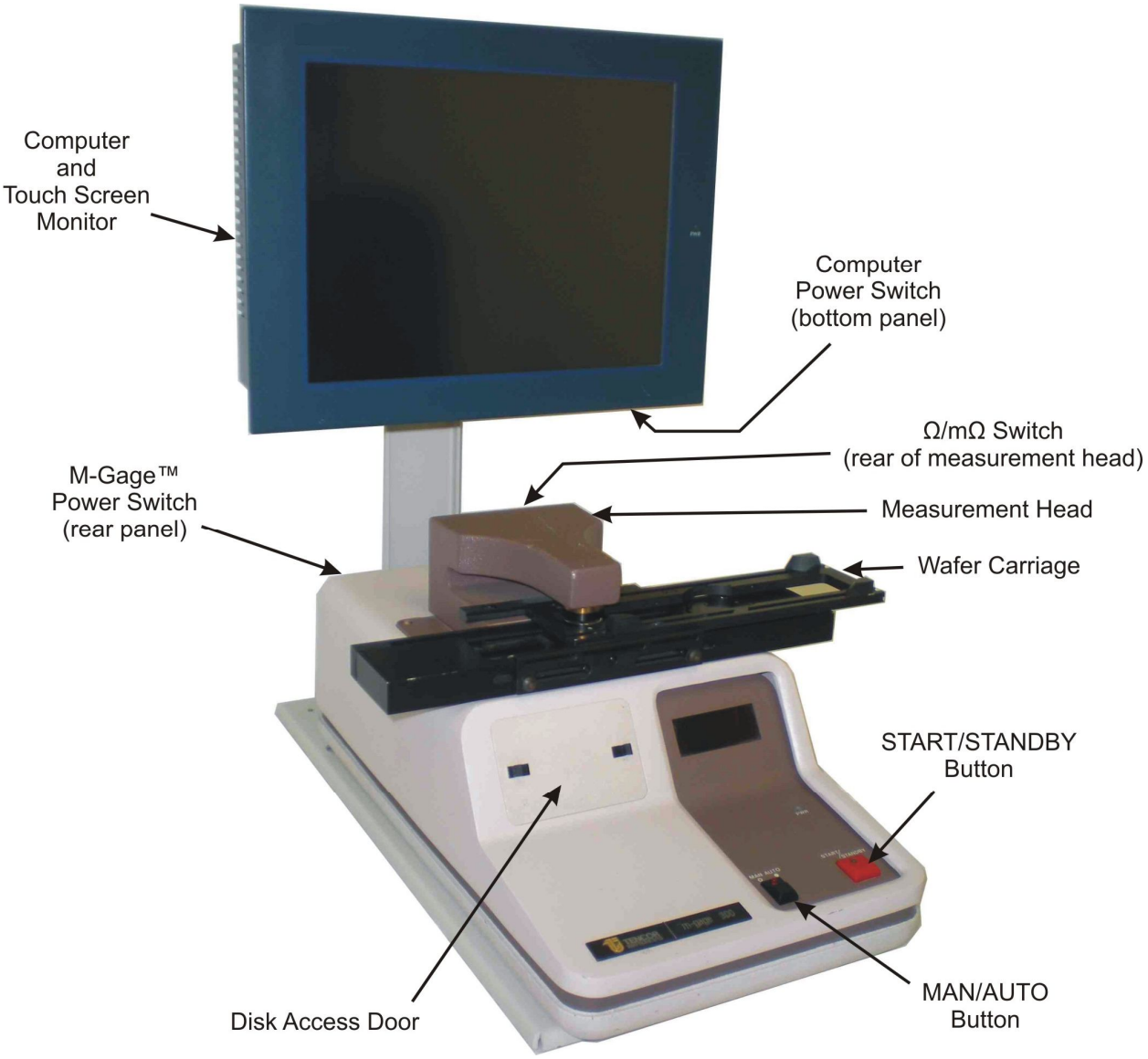


Figure 2.1: *Tencor M-Gage with AW-M300 Upgrade Kit*

> 🏷 NOTE
>
> **The controls and indicators are the same as the standard Tencor m-gage, except the computer controls all movements and measurements.**

2.1 DESCRIPTION OF M-GAGE FEATURES

Measurement Head – This houses the non-contact measurement system. Wafers pass between sensors in the upper and lower halves of the head. A gap between the halves allows clearance for wafers up to 1mm (40 mils) thick.

Wafer Carriage – The carriage moves the wafer under the measurement head, positioning it at each data point. It makes two passes under the head for multi-point (5-point, and 9-point) measurements.

- The carriage is ready to accept a wafer when it is in the loading position (to the right of the measurement head).
- The carriage moves to the unloading position (to the right of the measurement head) when measurement is complete. The wafer can then be removed.

Disk Access Door – This door allows access to the encoder disk. It is no longer necessary to change the encoder disk for different multi-point measurement sequences and wafer sizes. Only one encoder disk is required for all wafer sizes and measurement point positions. This is all controlled by the software.

Power Switch (rear panel) – In the up position this switch turns on the power to the M-Gage™. Allow 30 minutes warm-up time before making measurements. This switch may be left on indefinitely.

Computer Power Switch – This switch turns on the power to the computer and touch screen monitor.

Ω/mΩ Switch (rear of measurement head) – It is used to select units and range of sheet resistance measurements.

- mΩ: 1 to 1999 milliohms/sq.
- Ω: 1 to 1999 ohms/sq.

MAN/AUTO Button – It selects operational mode: LED on for Automatic Mode, LED off for Manual Mode.

START/STANDBY Button – It controls the entire measurement sequence. After loading a wafer onto the carriage, press this button to initiate measurement. (In Manual Mode press once for each point to measure in a 5-point or 9-point sequence.) When measurement is complete, unload the wafer and press once to return the carriage to the loading position.

Computer Monitor – The computer monitor is the user interface to the AW-M300 control software. While making measurements, it shows Sheet Resistance in ohms/square or milliohms/square, as selected by the switch on the rear of the measurement head, as well as thickness.

3.0 INSTALLATION

The Tencor Instruments M-Gage™ with Allwin21 AW-M300 Upgrade Kit (Allwin21 System) is a Sheet Resistance Measurement System. It is designed to be customer-installed and maintained.

3.1 UNPACKING

Carefully remove the instrument from the shipping carton. Grasp it from underneath--Do **not** lift by the wafer carriage.

Save the shipping carton. If the carton is visibly damaged, contact the shipper immediately. The shipper is responsible for all damage incurred during shipment. Save all packing materials as evidence of possible damage to the instrument.

Check to see that all parts of the system have been unpacked, including any options and accessories, such as printer paper.

3.2 OPERATING ENVIRONMENT

Place the instrument on a hard surface. Do not operate it on a cushioned surface -- this will block the air flowing underneath, preventing proper ventilation.

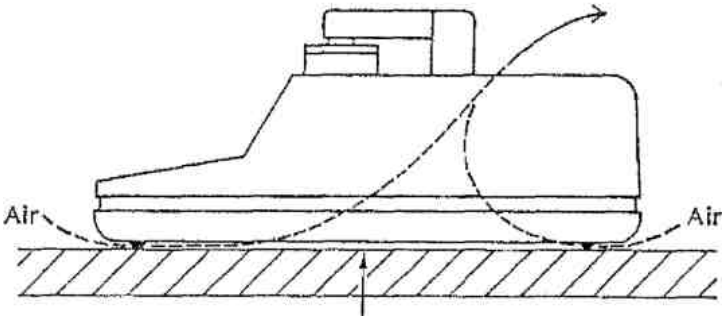


Figure 3.1: *Use Hard Surface*

- The room temperature should be close to 23° C for the greatest measurement accuracy.
- Avoid environments with high concentrations of particulates, especially abrasives such as glass and silicon dust.

3.3 SET UP

Before turning on the power to any device, connect everything together first.

- Connect the M-Gage™ unit to the parallel port on the computer.
- Connect the 20-column Printer to COM3 of the computer.
- Connect the power cable to the computer.

CAUTION

Connecting devices with the power on may cause serious damage.

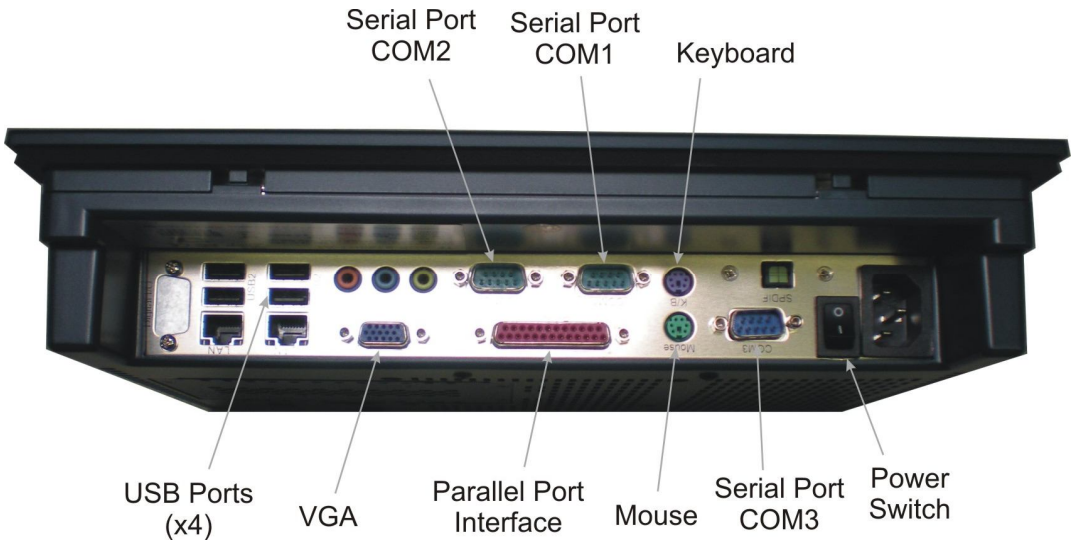


Figure 3.2: *Bottom Panel for the Touch Screen Computer*

The 20-column Printer can be connected directly to the computer with the serial printer cable. Make sure the printer cable has the correct connector for the printer in use. Connect the serial printer cable to COM3 of the computer.

4.0 MEASUREMENT

Turn on the power to the m-gage and the computer. Allow 30 minutes for warming up.

4.1 LOADING THE WAFER

- The carriage should be in the loading position, to the right of the measurement head.
    - If the carriage is not in the loading position, press the START/STANDBY button to move it there. The carriage will not return to the loading position if it contains a wafer.

- Place the wafer on the carriage between the four locator blocks. If the locator blocks must be moved to accommodate the wafer, see the' section "Wafer Size Set Up."

CAUTION

Load the wafer carefully. If it does not sit flat within the four locator blocks on the carriage, it may strike the sensing head, causing damage to the head and the wafer. Do not measure wafers thicker than 700pm (28 mils) unless the head gap has been adjusted to accommodate them.

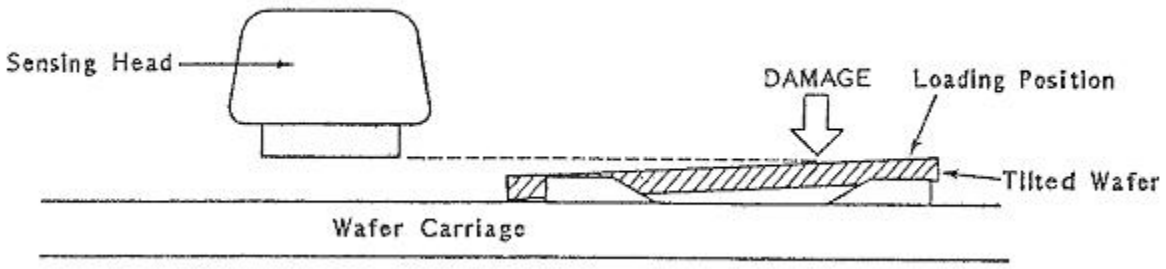


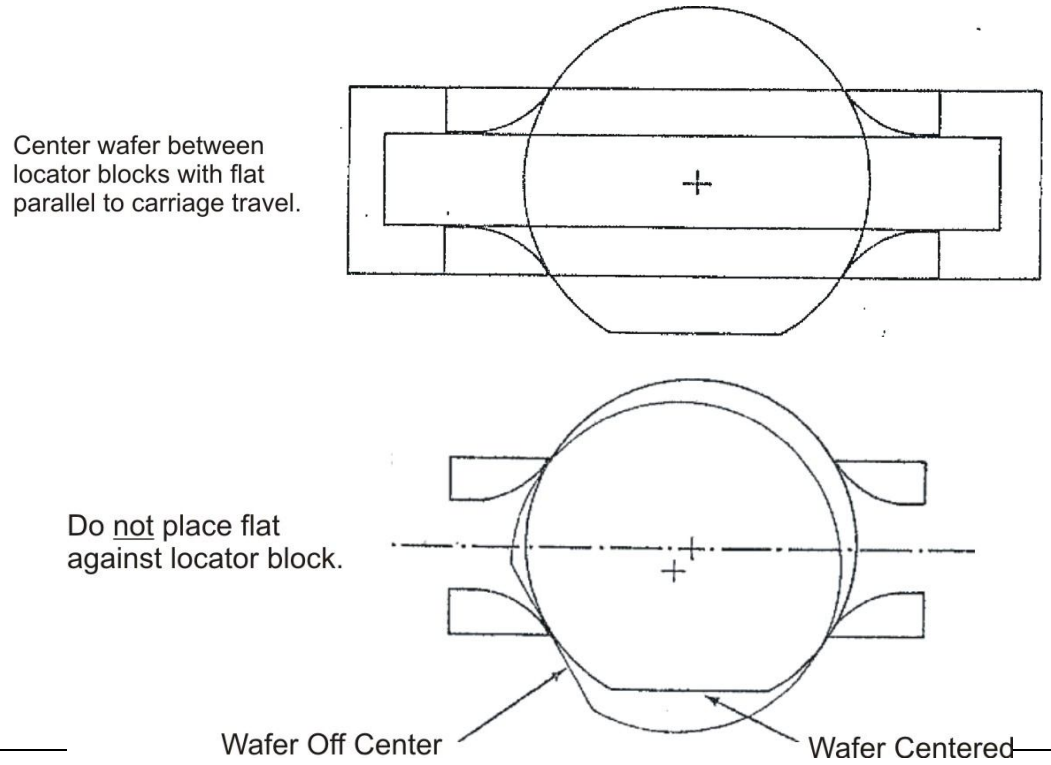
Figure 4.1: *Wafer is not sitting flat*

- Place the wafer between the locator blocks so that it is centered over the circular platform that rotates the wafer.

    - To assure that the wafer is properly centered, align the major flat with the direction of carriage motion.

> 🏷 NOTE
>
> **Placing the major flat against a locator block may position the wafer off center.**

> 🏷 NOTE
>
> **The AW-M300 can compensate for where the flat is on the carriage to locate the test points, but it is the operator's responsibility to make sure the wafer is centered over the rotating platform.**



4.2 MANUAL MODE

1) Select either ohms (Ω) or milliohms (m Ω). Use the switch on the rear of the measurement head.

2) Press the MAN/AUTO button so the LED is off. This indicates the m-gage is in manual mode.

3) Momentarily press the START/STANDBY button. The carriage will move the wafer under the measurement head to the first point in the measurement sequence.

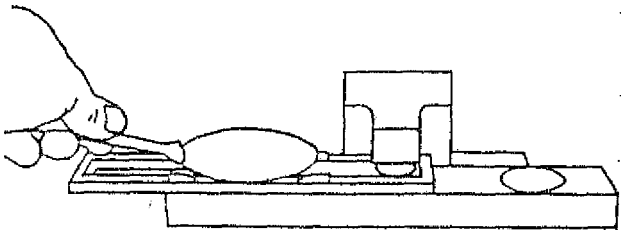
    - The sheet resistance and the thickness of the measured point will be displayed on the computer monitor.

4) For multi-point measurements--press START/STANDBY once for each point in the measurement sequence. The wafer will be advanced to the next point and the data for this location will be displayed.

    - Multi-point measurements (5-point and 9-point) are made along two axes. After the measurements are completed on the first axis, the carriage will return to the starting position, the wafer will be rotated 90°, then measurements will resume along the other axis.

5) When the measurement sequence is complete the carriage will move to the right until the wafer is out from under the measurement head in the loading/unloading position. The wafer can be removed from the carriage after it has reached this position.

Carefully remove the wafer from the carriage.



4.3 AUTOMATIC MODE

Automatic mode allows the m-gage to go to all of the measurement points and take measurements without stopping. After the last measurement point has been measured, the carriage will move to the unload position. All data measurements are recorded in the computer for later retrieval, inspection and, if desired, a print-out of the measured points can be printed on an external printer.

1) Select the desired recipe in the **Process for Production** screen or the **Process for Engineer** screen.

2) Make sure the MAN/AUTO LED is on. Press the MAN/AUTO button on the M-Gage control panel until the LED comes on.

3) Press the START/STANDBY button. The entire measurement sequence will be performed without further operator intervention. When the sequence is complete, the wafer will be moved to the unloading position.

    - The wafer will pass under the head two times. After the first pass it will be returned to the starting position, rotated 90°, and then carried under the head a second time.

NOTE
Do not touch the wafer until the measurement is finished and it is in the unloading position.

4) Carefully remove the wafer.

5) If similar wafers are to be measured, repeat Steps 1 through 4 for each wafer.

5.0 THE SCREENS

5.1 USING THE MENU SCREENS

This section is a general description of how to use the controls of the AW-M300 Control Software. It will cover the use of buttons, editable fields, data display fields and filename lists.

5.1.1 BUTTONS

Buttons are rectangular boxes with a phrase on them describing their function. They may also have a value on them describing its current state. The color of a button is also important. It also defines the current state of the function of the button. The color, however, is defined by the function of the button. Buttons that are gray in color are inactive and cannot be selected.

Clicking on a button changes its state. Thus, the button may change color and the value describing the current state will change.

5.1.2 EDITABLE FIELDS

Editable Fields are data entry fields where the operator can enter information into the control software.

To edit the field, the operator must first select it by clicking on it. This enables the ability to edit the field. The operator now types in the desired information and presses ENTER when finished. The information now is displayed in the field, replacing what was there previously.

5.1.3 DATA DISPLAY FIELDS

Data Display Fields are very similar to Editable Fields, except the operator cannot change the information being displayed in them. They look just like Editable Fields, except they are like a pushbutton that is always down. Also, when the operator clicks on them, nothing happens.

5.1.4 FILENAME LISTS

Filename Lists display a list of filenames or directories pertaining to the type of information the file contains in a List Box. For example, filenames of files which contain recipes are only displayed in Recipe Filename Lists.

The number of filenames the Filename List can display is limited to its size on the screen. However, there may be more filenames for that type of list than can be displayed at one time. The operator can scroll through the list of filenames by using the slider to the right of the list, or using the up and down arrow keys on the keyboard.

A selected filename is highlighted in red. It may be selected by clicking on the name. It is also displayed in the field above the list of filenames. The operator can also select a filename by manually typing in the filename into the field above the list (see Editable Fields above).

A filename can also be deleted. The operator would first select the filename to be deleted. Then the operator would either click on the red box with an 'X' in it (located in the upper right corner of the List Box) or press the **Delete** key on the keyboard.

NOTE
Deleting a filename will remove the filename and all information it contains permanently.

5.1.5 EXIT A SCREEN

Exit the screen by clicking on the 

button or pressing **ESC** on the keyboard.

Many screens allow the user to change the values for parameters, such as the *Recipe Editor* and the *System Setup*. The user needs to save the information before exiting the screen. However, if the user didn't save the information before exiting the screen, a dialog box will appear asking if the information should be saved.

Click **Yes**	(or press **Y** on the keyboard) to save the information.
Click **No**	(or press **N** on the keyboard) to discard all changes since the last save.
Click **Cancel**	(or press **ESC** on the keyboard) to go back to the editing screen and continue editing. It does not save any changes.

5.2 SCREEN ORGANIZATION

The AW-M300 control software is designed to make the M-Gage™ easier to use. A PC with a touchscreen monitor allows the user to interface with the AW-M300 control software.

The AW-M300 control software allows full control and diagnostics of the Allwin21 system. In addition, it allows the creation of recipes for automated control of the position of the test points.

The operation of the M-Gage™ system is by using the graphical user interface (GUI) menu screens of the AW-M300 control software. The easy-to-use menu-driven display enhances reliability and greatly reduces the learning process.

The menu screens are designed to allow straightforward operation. Figure 5-1 illustrates the menu organizational map. It outlines the overall AW-M300 screen architecture.

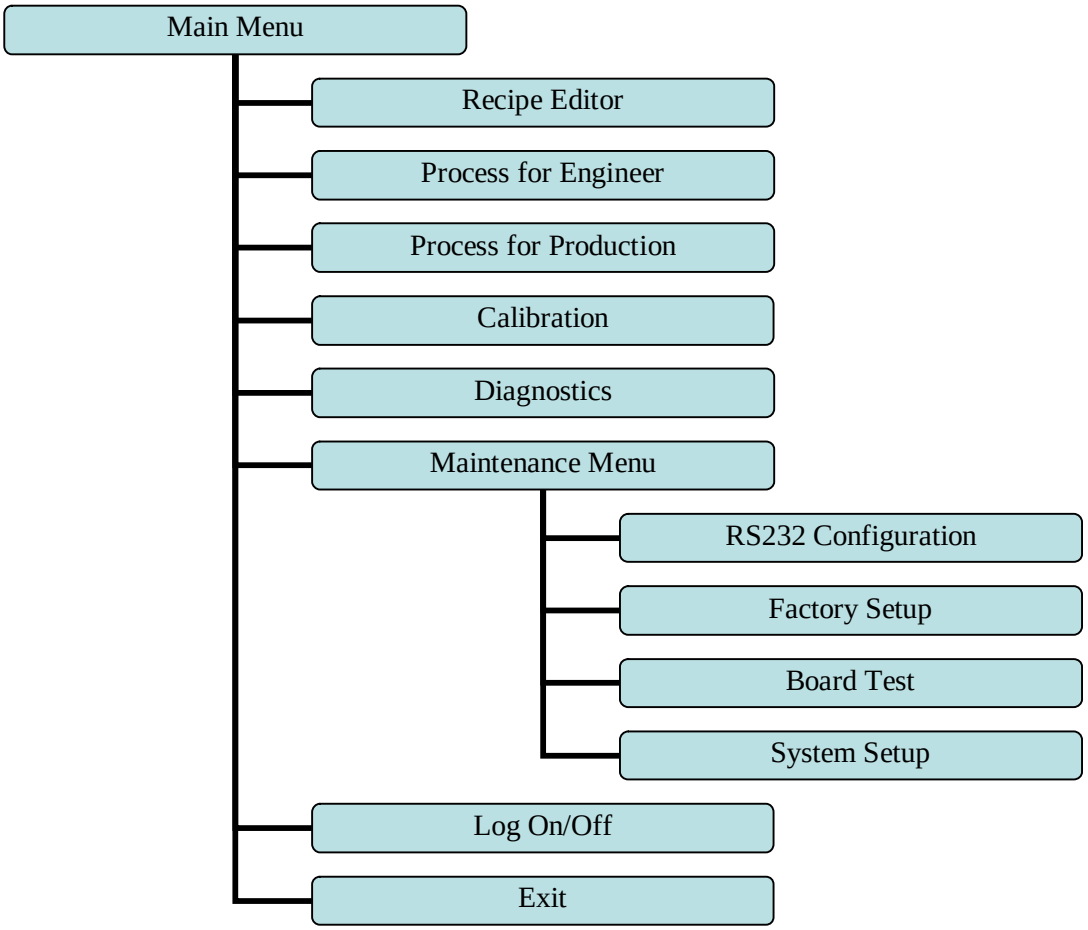


Figure 5.1: *Menu Organizational Map*

There are global parameters that need to be setup and defined. These parameters are normally set during factory testing and machine installation and never need to be changed, unless an option is added or removed. They can be accessed from several screens in the *Maintenance Menu* and are divided into categories.

5.3 MAIN MENU

After a successful power-up, the controller displays the *Main Menu* screen, figure 5.2. From this screen, any mode of operation can be accessed by using the mouse to click on the desired button.

Figure 5.2: *Main Menu screen*

5.4 RECIPE PROGRAMMING

The control software allows the creation of recipes for automated control of the test point positions.

It uses a set of operating instructions known as recipes to automatically control the M-Gage™ system. These recipes are created by the Process Engineer to determine where to position the wafer under the sensor head to measure the sheet resistance. The Operator then uses the software to select and run the recipe.

The AW-M300 software is also used to create, delete, copy, modify and store the recipes.

The recipe editor allows the process engineer to create and edit testing recipes.

5.4.1 CREATE AND MODIFY A RECIPE

The procedures for creating a new recipe and editing an existing recipe are very similar. These procedures essentially involve loading an existing recipe, editing the recipe's parameters, and then saving the changes. The differences between creating a new recipe and editing an existing recipe occur when the changes are saved. Creating a new recipe also involves changing the **Recipe Name** field, as discussed later in this section.

The steps to create or edit a recipe would be:

Step 1. Select a pre-existing Recipe.

Step 2. Edit it. (If a new Recipe is to be created, also change the **Recipe Name** field before saving.)

Step 3. Validate the Recipe.

Step 4. Save the Recipe.

5.4.2 RECIPE SELECTION

The *Recipe Selection* screen, figure 5.3, allows the engineer to select an existing recipe and load it into the recipe editor. The recipe can then be modified or a new recipe can be created based on this recipe.

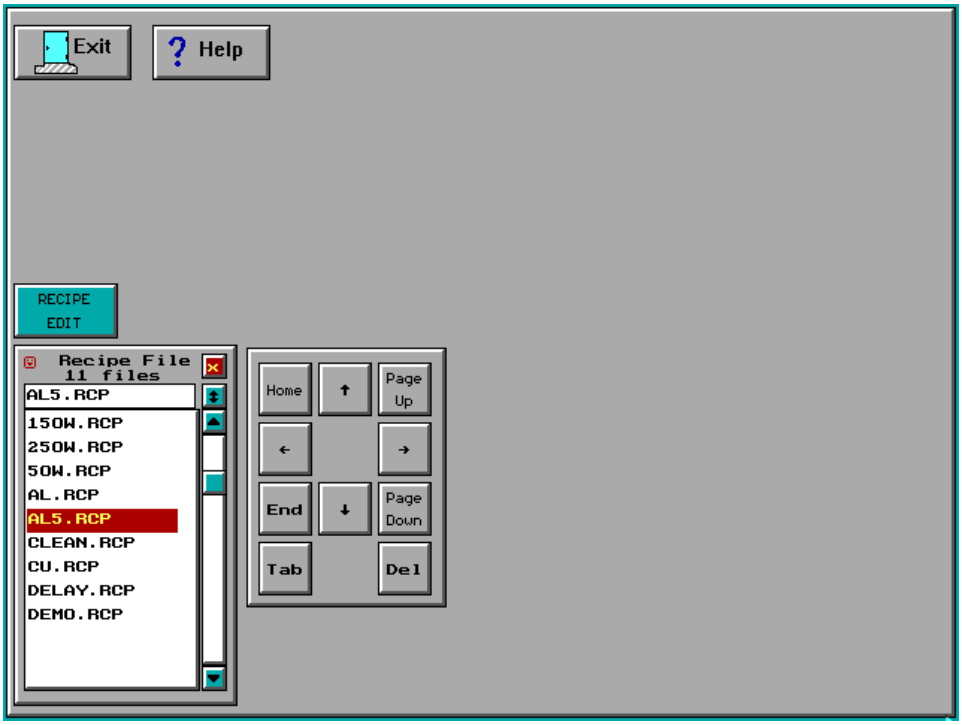


Figure 5.3: *Recipe Selection screen*

Location: Main Menu ➔ Recipe

Select a Recipe. Use the slider to the right of the list to display Recipes that are not visible in the list window. Click on the Recipe to select it. Click on the **Recipe Edit** button to display the Recipe Editor.

Alternatively, a Recipe can be created or modified from the *Process for Engineer* screen, figure 5.6. First, select a recipe from the "Recipe File" list. Then click on the **Recipe Edit** button to display the Recipe Editor.

5.4.3 RECIPE EDITOR

The *Recipe Editor*, figure 5.4, allows the engineer to modify and validate the recipe. This editor allows the engineer to specify the position of the test points on the wafer to measure.

The *Recipe Editor* is used to create and edit recipes to be run on the M-Gage™ system with the AW-M300 control software.

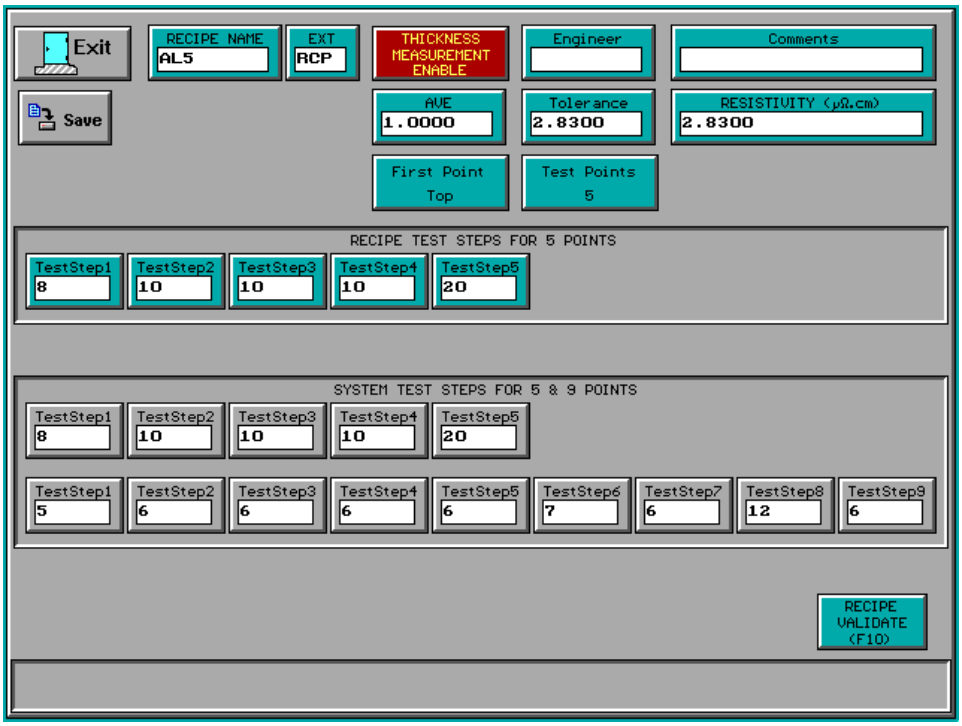


Figure 5.4: *5 Point Test*

Location: Main Menu ➔ Recipe ➔ Recipe Edit
Location: Main Menu ➔ Process for Engineer ➔ Recipe Edit

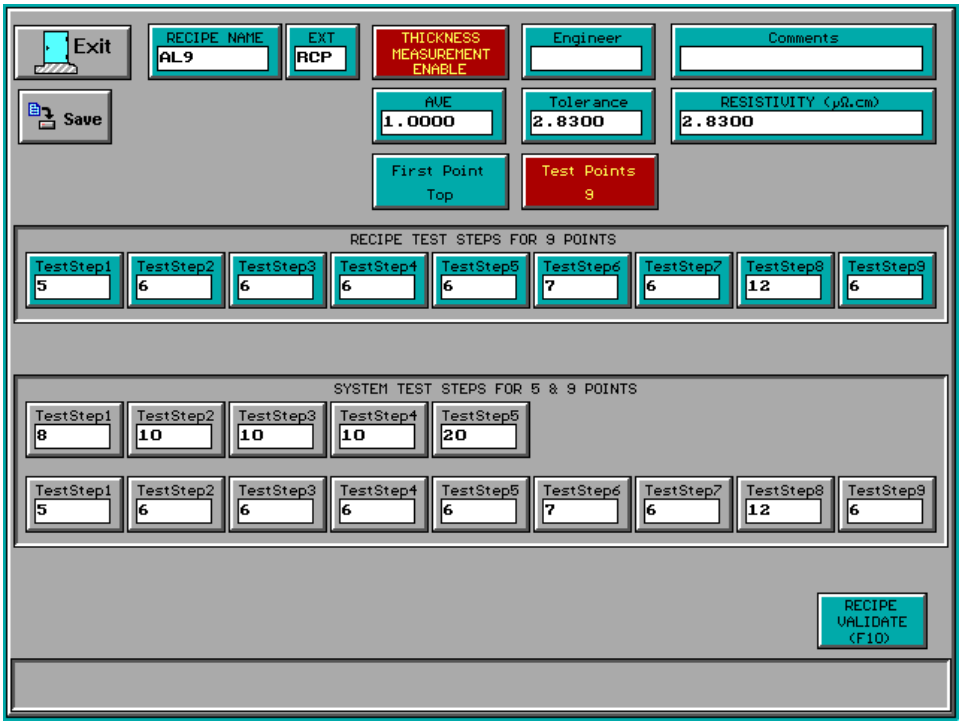


Figure 5.5: *9 Point Test*

Location: Main Menu ➔ Recipe ➔ Recipe Edit
Location: Main Menu ➔ Process for Engineer ➔ Recipe Edit

	The name of the recipe when it is saved to the hard disk. The Recipe Name can be edited. This should be done if a new recipe is to be created.
	Leave the EXT field as RCP. This is the filename extension and the AW-M300 software expects it to be RCP for a recipe.
	Enable / Disables the measuring of the film thickness.
	
	

	The known resistivity for the film. This is used to calculate the film thickness.
	The major flat or notch on the wafer is considered the bottom of the wafer. This button tells the software where on the wafer the first test point will be (Top, Right, Bottom or Left) in relation to the flat.
	The number of test points to measure, 5 or 9.
	The position of the measuring point from the previous measuring point. TestStep1 is from the home position.
	Validates the recipe. This function makes sure the test positions are within range of the wafer carriage.

5.5 PROCESS SCREENS

5.5.1 PROCESS FOR PRODUCTION

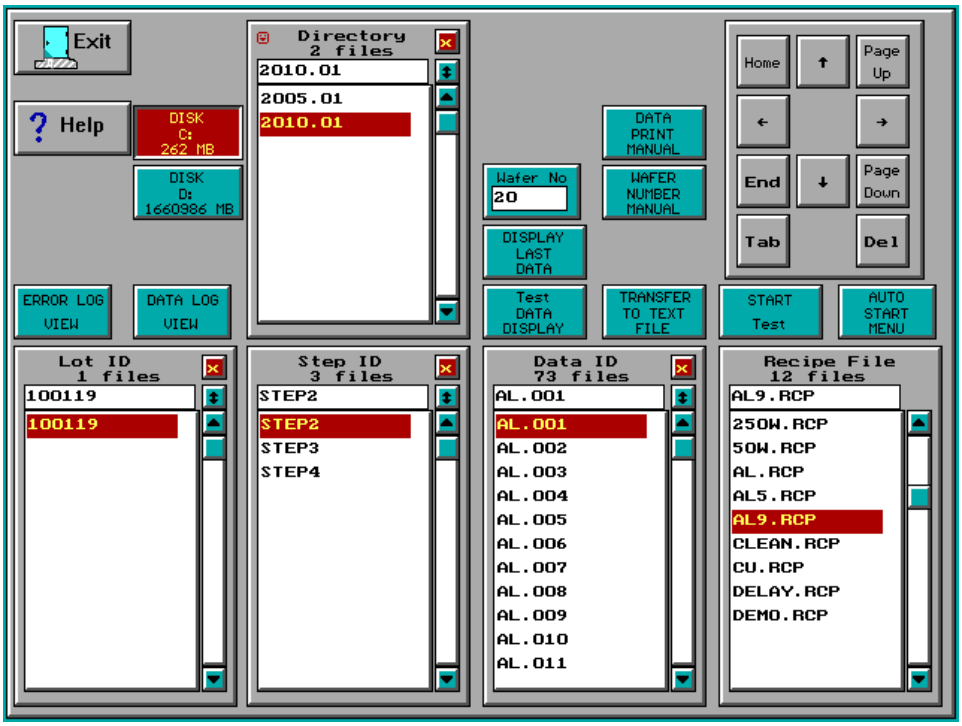


Figure 5.6: *Process for Production screen*

Location: Main Menu ➔ Process for Production

(See below for Button Definitions)

5.5.2 PROCESS FOR ENGINEER

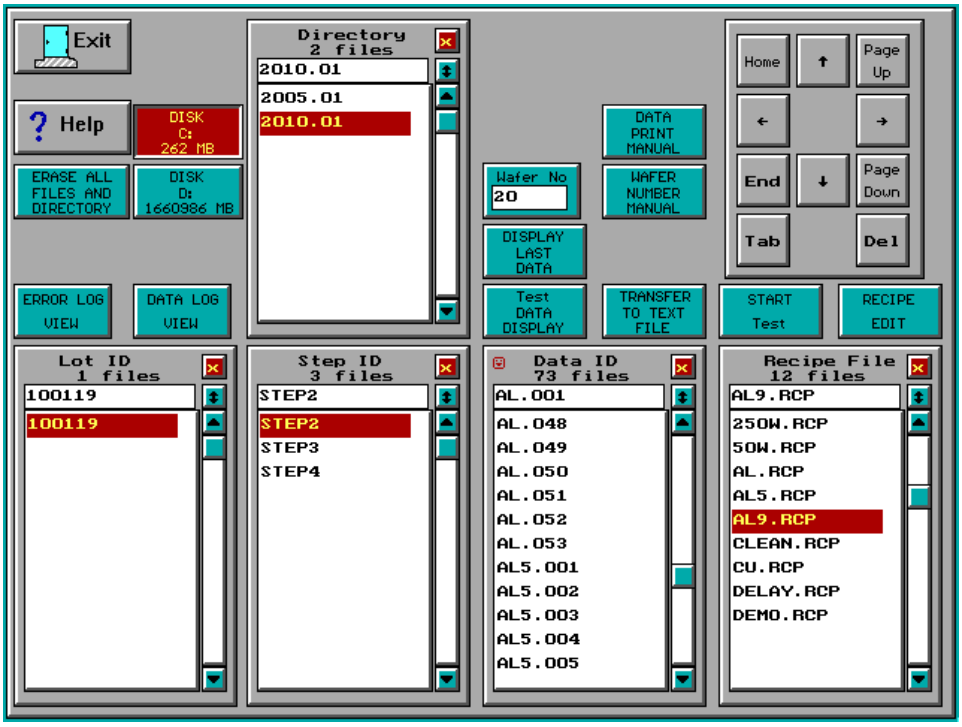
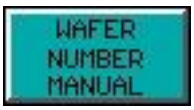


Figure 5.7: *Process for Engineer screen*

Location: Main Menu ➔ Process for Engineer

5.5.3 BUTTON DEFINITIONS

	The number of wafers that have been processed for the selected recipe. This will be used for the wafer ID for the next wafer that will be processed with the selected recipe.
	Automatically increment the "Wafer No." (process wafer number) for the selected recipe, or the user has to manually change the wafer number. **Auto** Automatically increment the process wafer number **Manual** User manually changes the wafer number
	View the process data graphically of the last wafer that was measured on the *Process Data* screen.

	Display the selected test data graphically on the *Process Data* screen.
	This button creates a translation of the selected process data file to text and copies it to a floppy disk (drive A:), precede the filename with A:.
	Loads the selected recipe file into the *Recipe Editor.* This allows the engineer to modify the recipe.
	Start testing the wafer that is on the wafer carriage, using the recipe that is selected.
	
	List the recipe and data files and directories that are on drive C: The number on the bottom of the button shows the amount of free space available on the drive.
	List the recipe and data files and directories that are on drive D: The number on the bottom of the button shows the amount of free space available on the drive.
	Erase all data files and directories on the selected drive.
	View the Error Log.
	View all data in the Log.

 *(delete)*	Delete Recipes, Data files, Lots and Directories. The delete button is located on each of the list boxes. (Refer to **Filename Lists** in the "How to Use the Menu Screens" section.) It is used to delete the selected item in the list box. Example: To delete a Data File, select the Data File and then click on the red box in the Data File list box. Note: Recipes cannot be deleted from this screen. Only from the *Recipe Edit Selection* screen.

Dir ID	This groups certain types of lots together.
Lot ID	The user defined lot ID. All process data pertaining to this lot should be kept under here.
Data ID	The process data from each wafer is stored here. The operator can review the process of each of the process data.
Recipe File	The list of recipes which are available to be used to process wafers in the process chamber.

5.6 TEST DATA DISPLAY

The *Test Data Display* screen shows the resistivity at the test points.

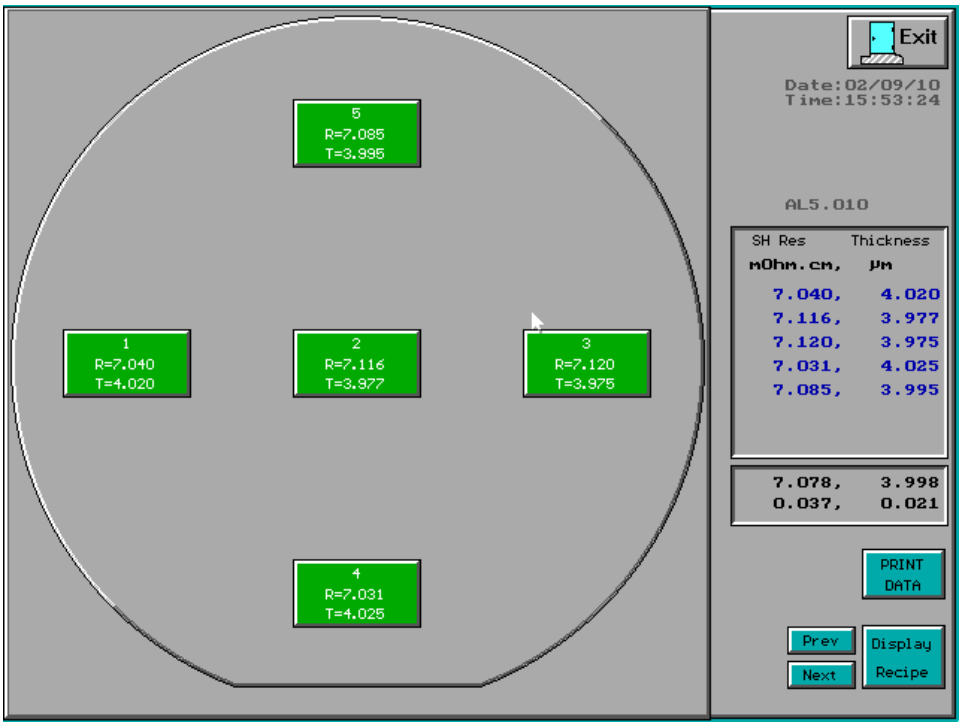


Figure 5.8: *Test Data Display screen*

Location: Main Menu ➔ Process for Engineer ➔ Test Data Display

PRINT DATA	Print the data of the measured points to the printer that is connected to the computer.
Display Recipe	Show the recipe that was used to collect the data. The recipe will be READ only and cannot be edited.
Prev	View the previous test data in the Data ID list.
Next	View the next test data in the Data ID list.

5.7 CALIBRATION

Calibration of the M-Gage™ system with the AW-M300 control software is done entirely from within the software for maximum performance and accuracy. The calibration functions are automated which means less time is spent calibrating the system. There are calibration routines for Ohm and mOhm (figure 5.9).

Calibration is done at the factory and does not need to be repeated for installation. Nor does it need to be repeated unless something that affects the head measurement has changed, such as the control board.

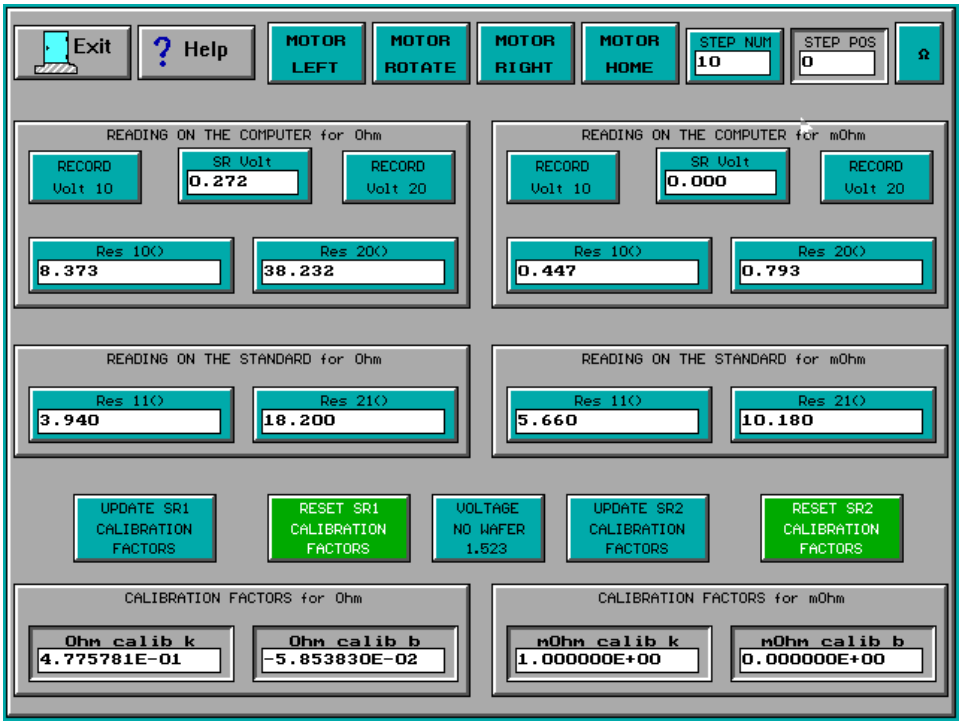


Figure 5.9: *Calibration screen*

Location: Main Menu ➔ Calibration

MOTOR LEFT	Move the wafer carriage to the left the number of steps that is indicated in **Step Num**.

	Activate the wafer rotation mechanism. The wafer will be rotated 90° clockwise.
	Move the wafer carriage to the right the number of steps that is indicated in **Step Num**.
	Move the wafer carriage to the Home position.
	The number of steps to move the wafer carriage, when **MOTOR LEFT** or **MOTOR RIGHT** is pressed.
	Indicates the position of the wafer carriage from the HOME position.
	This indicates the position of the Ω/mΩ switch on the rear of the measurement head.

The resistivity measurement calibration is used to help the software understand the characteristics of the analog circuit. This needs to be re-calibrated only if the main control board has been changed.

The *Calibration* screen, figure 5.9, is used to correct for any offset that might develop in the analog circuitry. There are 2 kinds of offset: the zero offset (k) and the linear offset (b).

The control software uses the following equation to correct the offsets:

$$y = (k * x) + b$$

where x is the reading from the A/D converter, and y is the calibrated reading.

The following procedure calibrates the software with the LED display.

Step 1. Turn on the M-Gage™ and let it warm up. This usually takes at least 30 minutes.

Step 2. Go to the *Calibration* screen, figure 5.9, by clicking on the **Calibration** button from the *Main Menu*, figure 5.2.

Step 3. Move the Ω/mΩ switch on the rear of the measurement head to the Ω scale.

The 

indicator should indicate the Ohm range. First, the calibration will be for the Ω scale, which uses the left side of the *Calibration* screen.

Step 4. Click on the 

button to reset the factors to k=1 and b=0.

Step 5. Move the wafer transport carriage to the HOME position.

Step 6. Press the **VOLTAGE NO WAFER** button.

Step 7. Load a standard wafer that has the same characteristics as the "Reading on the Standard for Ohm" field **Res 11().**

Step 8. Move the wafer to the center position by pressing the **MOVE LEFT** or **MOVE RIGHT** button until the center of the wafer is under the sensor head.

Step 9. Press the **RECORD Volt 10** button "Reading on the Standard for Ohm".

Step 10. Move the wafer transport carriage to the HOME position and exchange wafers with one that has the same characteristics as the "Reading on the Standard for Ohm" field **Res 21().**

Step 11. Move the wafer to the center position by pressing the **MOVE LEFT** or **MOVE RIGHT** button until the center of the wafer is under the sensor head.

Step 12. Press the **RECORD Volt 20** button.

Step 13. Click on the 

button to calculate the factors.

Step 14. Check the result of the Calibration.

Step 15. Move the Ω/mΩ switch on the rear of the measurement head to the mΩ scale.

Step 16. Repeat steps 4 through 14 for the mΩ scale (the right side of the *Calibration* screen).

5.8 DIAGNOSTICS

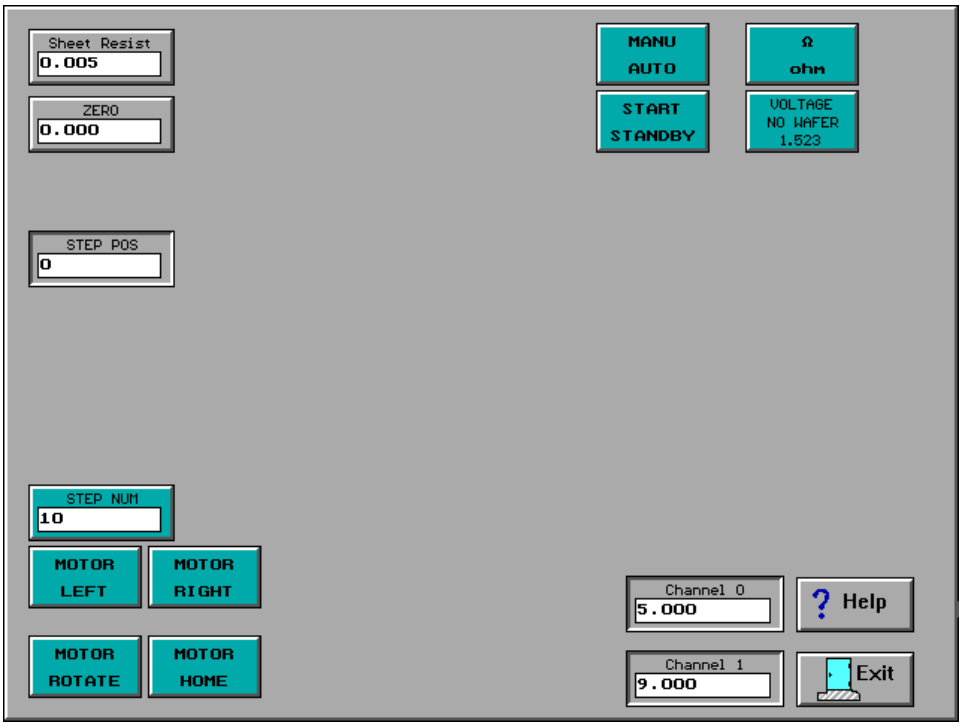
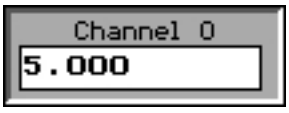
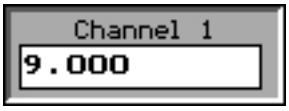


Figure 5.10: *Diagnostics screen*

Sheet Resist 0.005	
ZERO 0.000	
STEP POS 0	Indicates the position of the wafer carriage from the HOME position.
STEP NUM 10	The number of steps to move the wafer carriage, when **MOTOR LEFT** or **MOTOR RIGHT** is pressed.
MOTOR LEFT	Move the wafer carriage to the left the number of steps that is indicated in **Step Num**.

	Move the wafer carriage to the right the number of steps that is indicated in **Step Num**.
	Activate the wafer rotation mechanism. The wafer will be rotated 90° clockwise.
	Move the wafer carriage to the Home position.
	Indicates the position of the MAN/AUTO pushbutton.
	Indicates the position of the START/STANDBY pushbutton.
	This indicates the position of the Ω/mΩ switch on the rear of the measurement head.
	
	
	

5.9 MAINTENANCE MENU

The AW-M300 control software allows the user to customize the configuration of the software. This section will guide and explain the many choices to setup the software.

Many of these settings will never be changed once the system has been setup, and many of them have been setup at the factory.

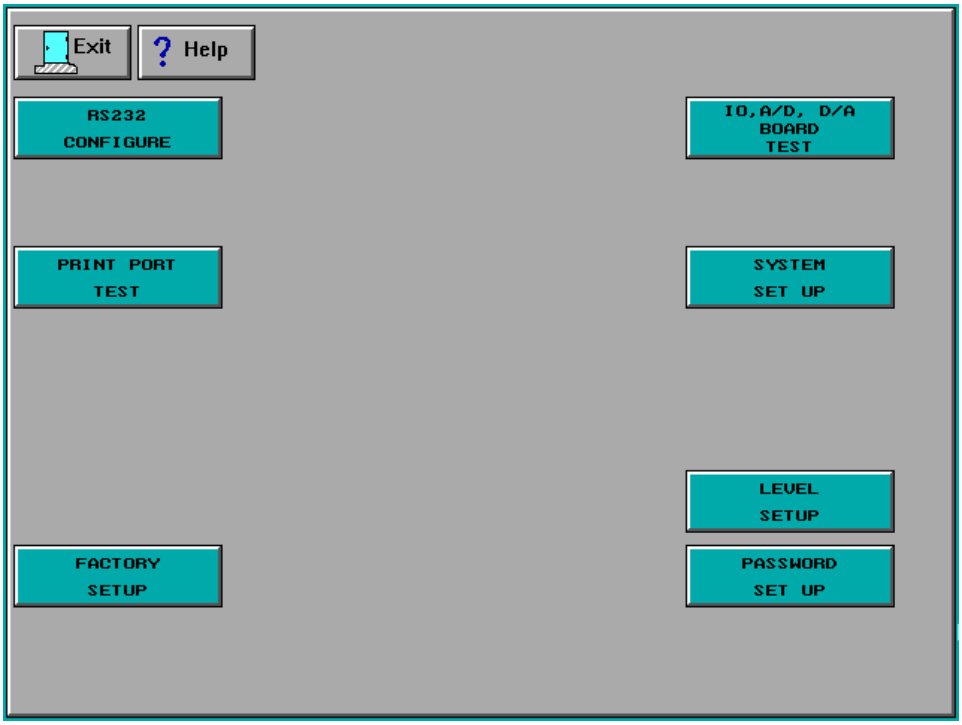


Figure 5.11: *Maintenance Menu*

Location: Main Menu ➔ Maintenance Menu

The *Maintenance Menu,* figure 5.11, allows access to the screens that allow changing and configuring settings.

5.10 RS232 CONFIGURE

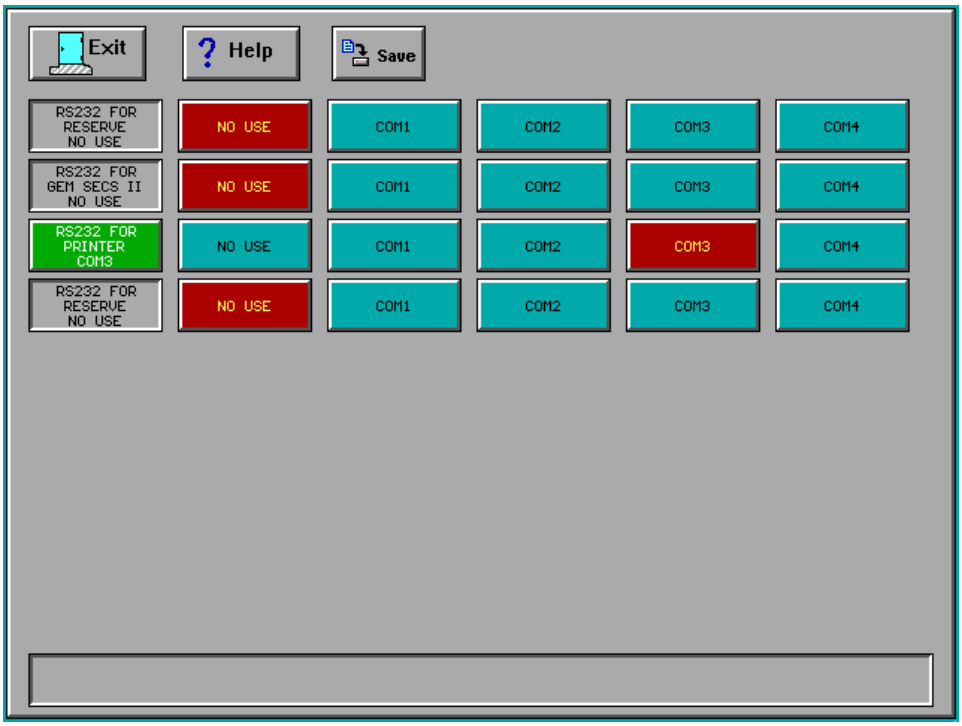


Figure 5.12: *RS232 Configuration screen*

Location: Main Menu ➔ Maintenance Menu ➔ RS232 Configure

The *RS-232 Configuration screen* allows the control computer RS-232 communication ports to be re-configured, depending on the cable setup. There is no need to swap cables, just redefine which port the external equipment are connected to. This also makes it more flexible to reconfigure equipment ports if one goes bad or a particular port has to be used by some other special equipment.

The *RS-232 Configuration screen* allows the user to setup the communication ports between the control computer and the system equipment. The normal settings are:

(reserved)	NONE
GEM-SECS II	NONE
Printer	COM3
(reserved)	NONE

RS-232 Equipment Setup

🏷 NOTE

Whenever the RS-232 configuration has changed, the system must be rebooted to have the values take effect.

Press CTRL-ALT-DEL simultaneously.

5.11 FACTORY SETUP

The *Factory Setup* screen, figure 5.13, allows configuring the system to settings the factory deems proper for the system.

> **NOTE**
>
> **Changing of these parameters is not recommended except by factory personnel. It is possible the M-Gage™ may become inoperable if any of these settings are changed.**

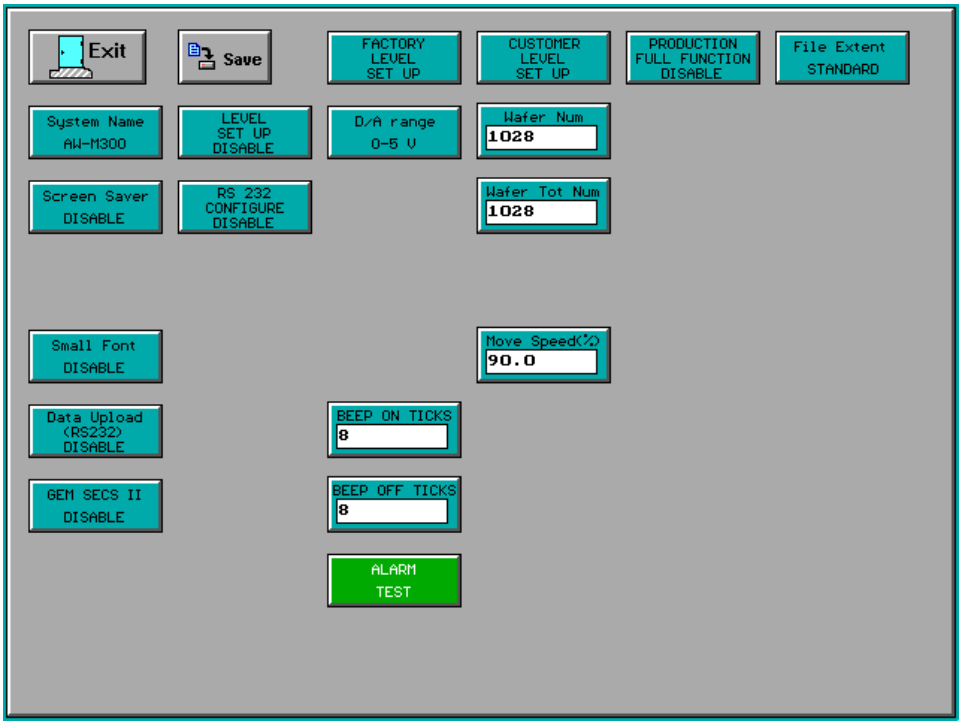


Figure 5.13: *Factory Setup screen*

Location: Main Menu ➔ Maintenance Menu ➔ Factory Setup

5.12 BOARD TEST

The *Board Test* screen, figure 5.14, allows the maintenance person to inspect each individual A/D, D/A and digital channel in the system. It can also be used to diagnose problems at the digital or analog channel level. This is the lowest level of the software to control and monitor the hardware. This is very helpful to determine if a device and its cabling are working properly.

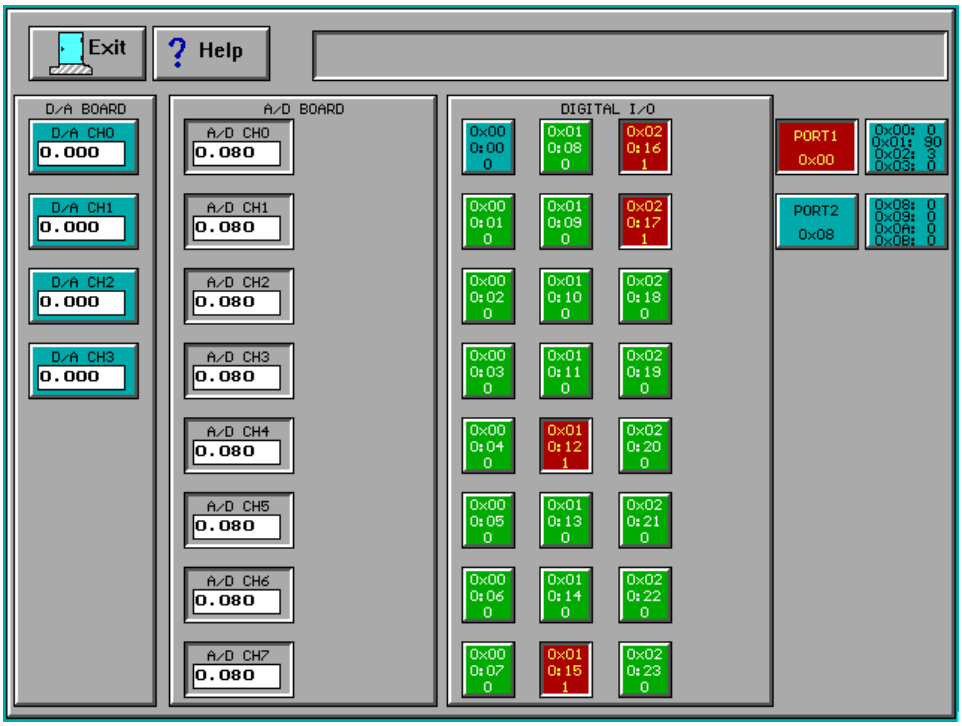


Figure 5.14: *I/O, A/D, D/A Board Test screen*

Location: Main Menu ➔ Maintenance Menu ➔ Board Test

5.13 SYSTEM SETUP

The *System Setup* screen, figure 5.15 and 5.16, contains global settings which can be changed for the desired system setup. The settings are the 5 point and 9 point test positions for wafer sizes 2, 3, 4, 5, 6, and 8 inches.

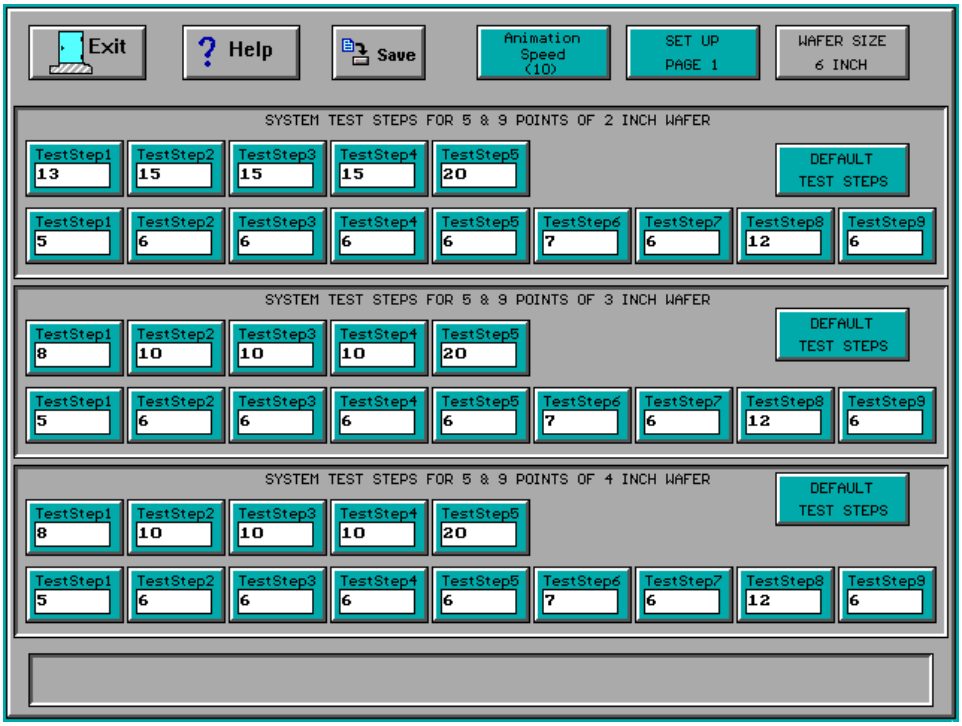


Figure 5.15: *System Setup (Page 1) screen*

Location: Main Menu ➔ Maintenance Menu ➔ System Setup (screen #1)

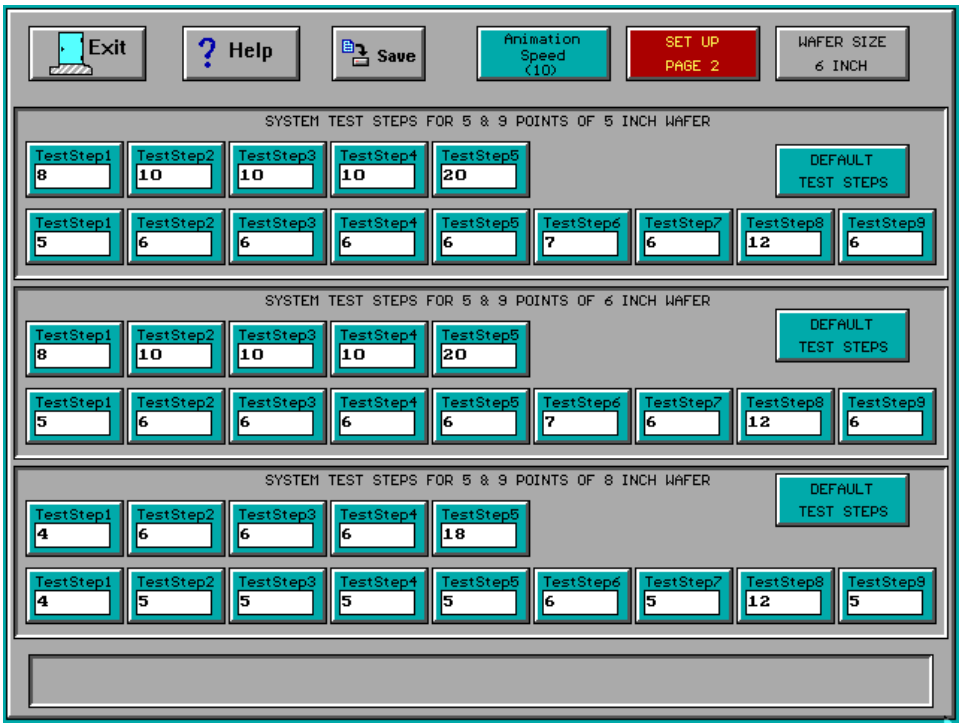


Figure 5.16: *System Setup (Page 2) screen*

Animation Speed (10)	This controls the speed of the animated bitmap buttons in the main menu. The larger the number, the slower the animation. (10 = no animation)
SET UP PAGE 2	Switches between Page #1 and Page #2. Page #1 is for wafer sizes 2, 3, and 4 inches. Page #2 is for wafer sizes 5, 6, and 8 inches.
WAFER SIZE 6 INCH	Determines the wafer size that will be tested on the M-Gage™. If this is changed, then the hardware must be changed to accommodate the selected wafer size.
DEFAULT TEST STEPS	Changes the test point positions to factory default settings.

6.0 SECURITY

6.1 PASSWORD SETUP

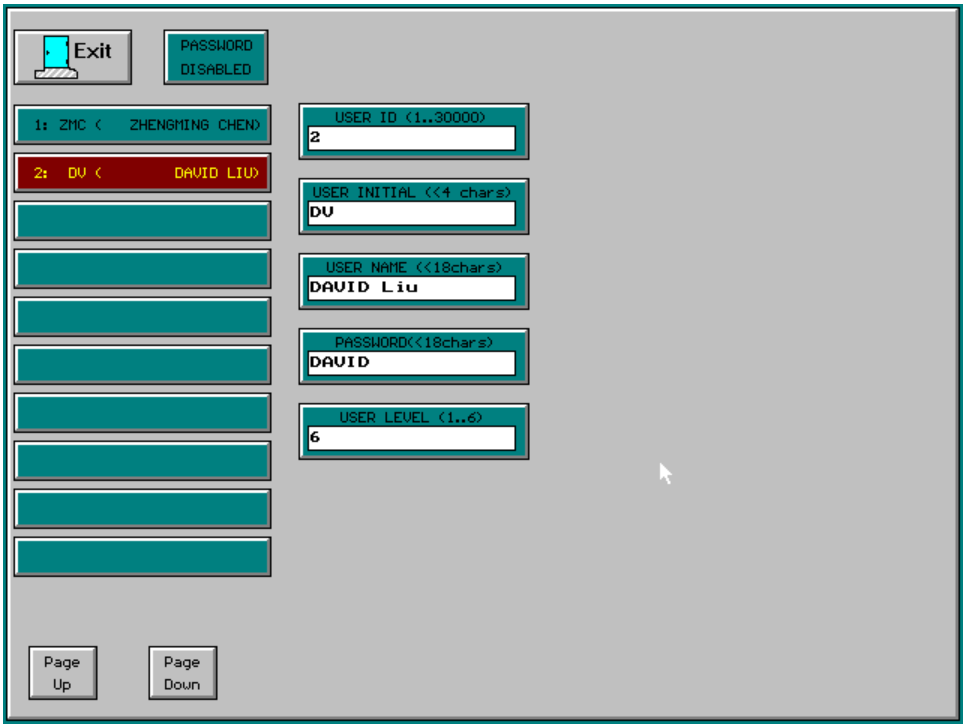


Figure 6.1: *Password Setup screen*

Location: Main Menu ➔ Maintenance Menu ➔ Password Setup

The *Password Setup* screen, figure 6-1, allows setup of user accounts. A user account consists of the USER ID, USER NAME, PASSWORD and USER LEVEL.

There are 7 password levels available to manage user accounts. (Refer to the "Level Setup" section for an explanation on the levels.)

Click on the **PASSWORD DISABLE / ENABLE** button to disable or enable the password protection. When password protection is enabled, users have to logon on before access to the software is allowed. In the disable mode, there is no need to log on and everyone has access to **all** parts of the control software.

6.2 LEVEL SETUP

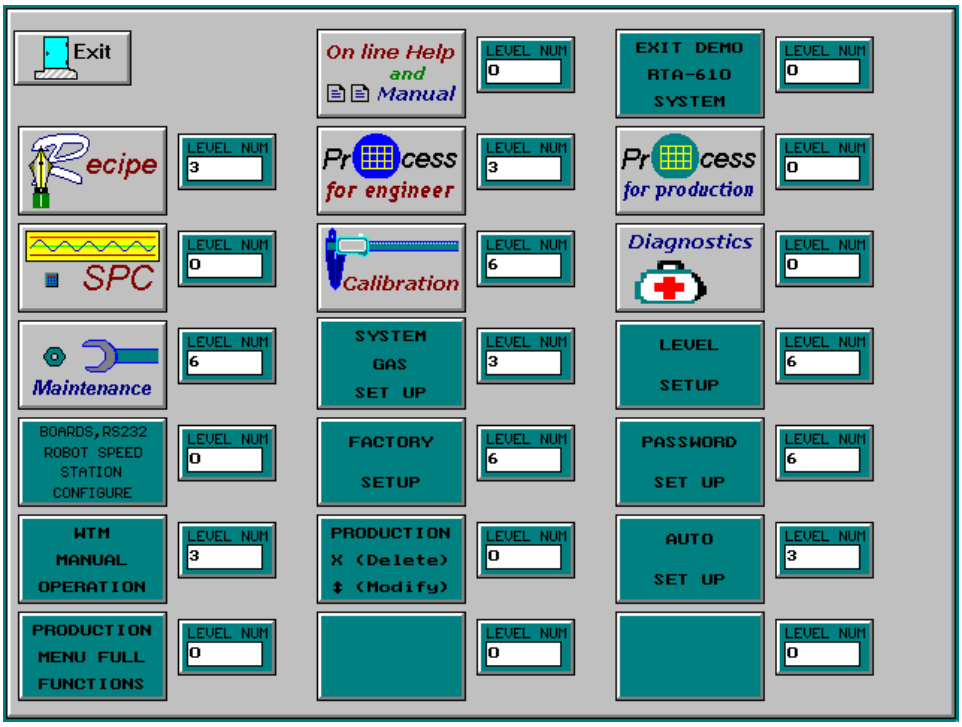


Figure 6.2: *Level Setup screen*

Location: Main Menu ➔ Maintenance Menu ➔ Level Setup

The *Level Setup* screen, figure 6-2, allows system administrators to change the degree of level for different screens. There are 7 levels of password protection. Level 0 allows anyone access to that item. Level 6 allows only system administrator access.

User Access Level	User's Accessibility
0	Can only access level 0
1	Can access levels 1 and 0
2	Can access levels 2, 1 and 0
3	Can access levels 3, 2, 1 and 0
4	Can access levels 4, 3, 2, 1 and 0
5	Can access levels 5, 4, 3, 2, 1 and 0
6	System Administrator... Can access levels 6, 5, 4, 3, 2, 1 and 0

After the levels have been changed, the control software has to be re-booted.

If the user tries to access a function that has a level which he is not allowed to enter, the control software will display the message:

“You don’t have the right level for this function”.

The user must log on with an appropriate level. Either the user logs on with another user name and password with the appropriate level or have the system administrator change the level for the user.

7.0 MAINTENANCE

See the Tencor M-Gage™ manual for maintenance procedures.

8.0 PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY
1	AW-M300-001	Main Control PCB Board	1
2	A5-0045	DC Power Supply	1
3	042-0003-1	IDC26 to DB25 ribbon cable, computer interface to Main Control Board	1
4		Touch Screen Computer, AAEON	1
5	033-0255	Encoder Disk	1
6	A5-0113	Keyboard, PS2	1
7	033-0251	Base Plate	1
8	033-0252	Vertical Stand	1
9	033-0253	Computer Mounting Bracket	1
10	033-0254	Bracket, Power Supply	1
11	DPV-414	Printer, Thermal, RS232, DB9F, Seiko Instruments	1
12	A5-0111-B	Printer Cable, RS232, DB9M to DB9F, Straight	1
13	A5-0111-C	Printer Cable, RS232, DB9M to DB25F, Straight	1
14	A5-0111-E	NULL Modem, DB25M to DB25F	1
15	A5-0111-D	Printer Cable, RS232, DB9M to DB25F, NULL Modem	1
16	A5-0115-D	Computer Power Cable	1
17	(obsolete)	DIP16 to DIP16 ribbon cable (obsolete)	1
18	033-0400-A	DIP16 to DIN16 ribbon cable, 16 in. long	1
19	1406-0070	Rubber Feet, #8-32	4
20	033-0401	Screw, 1/4-20x1/2" Truss Socket Head, Mounting, M-Gage™ to Base Plate	4
21	033-0404	Washer, Flat, 1/4" ID x 1/2 OD, Mounting, M-Gage™ to Base Plate	4
22	033-0402	Screw, M3-.5x5mm Phillips Pan Head, Power Supply Mounting	4
23	033-0403	Screw, #4-40x3/8" Phillips Pan Head, Power Supply Bracket Mounting	2
24	033-0405	Washer, Flat, #4 ID, Power Supply Bracket Mounting	2
25	A5-0154	Nuts, Hex, SST, 1/4"x20, Vertical Stand to Base Plate	4
26	033-0404	Washers, Flat, 1/4" ID x 1/2" OD, Vertical Stand to Base Plate	4
27	A5-0181	Screw, M4-.7x10mm phillips pan head, Computer Mounting Bracket to Computer	4

ITEM	PART NUMBER	DESCRIPTION	QTY
28	033-0406	Washer, Flat, M4 ID, Computer Mounting Bracket to Computer	4
29	A5-0164	Screw, #10-32x3/8", pan head, Vertical Stand to Computer Mounting Bracket	4
30	A5-0350	Washer, Flat, #10 ID, Vertical Stand to Computer Mounting Bracket	4

APPENDIX

A: DOS COMMANDS AT A GLANCE

Refer to a DOS manual for a full explanation of these and other DOS commands.

A.1 FILENAMES

- Filenames have no more than eight characters.
- Contain only the letters A – Z, the numbers 0 – 9.
- Cannot contain spaces, commas, backslashes, or periods.

A.2 PATH

In DOS, you list the path where a file is stored by separating the directory names with the backslash (\).

For example:

\doc\info

The first backslash represents the root directory. The second backslash separates the INFO directory from its parent directory, DOC.

A.3 WILDCARDS (*, ?)

If you want to perform the same task for a group of files, you don't have to use the same command repeatedly for each filename in the group. You can use wildcards to specify groups of files. A wildcard acts as a substitute for a name or extension.

There are two wildcards:

- The asterisk (*) represents a whole word or group of characters.
- The question mark (?) represents a single character.

For example, list all of the files and directories in the current directory that start with the letter 'c':

dir c*.*

A.4 COPY FILES

copy *source destination*

Copies one or more files from the same directory to another location.

source
Specifies the location and name of a file from which you want to copy.

destination
Specifies the location and name of a file to which you want to copy.

A.5 XCOPY

xcopy *source destination /s*

Copies files and directories, including subdirectories. This is more powerful than **copy**. It is able to copy subdirectories.

source
Specifies the location and names of the files you want to copy. Source must include either a drive or a path.

destination
Specifies the location and names of the files you want to copy.

/s
Copies directories and subdirectories.

A.6 DELETE FILES

del *filename*

Deletes specified files.

filename
Specifies the name of the file you want to delete.

A.7 LIST DIRECTORY

dir

Display a list of a directory's files and subdirectories.

A.8 CHANGE DIRECTORY

cd *path*

Changes the current directory.

path
Specifies the directory to which you want to change.

A.9 MAKE DIRECTORY

md *path*
or
mkdir *path*

Create a new directory.

path
Specifies the name of the new directory.

A.10 CHANGE CURRENT DRIVE

To change the current drive, type the letter of the drive followed by a colon (**:**).

For example, to change the current drive to E, type the following:

e:

A.11 SYS

sys *drive:*

Copies DOS system files and the DOS command interpreter (COMMAND.COM) to the disk in the drive you specify.

drive:
Specifies the drive to which you want to copy the system files. These files can only be copied to the root directory and not to a subdirectory.

A.12 FORMAT

format *drive: /s*

Formats the disk in the specified drive to accept DOS files.

drive:
Specifies the drive containing the disk you want to format.

/s
Copies the operating system files after the disk has been formatted. This works as if you typed the command **sys**.

B: DETERMINING THE PROPER USB DRIVE LETTER

Insert a USB drive into a USB port and then reboot the computer. The USB drive will be assigned one of the following drive letters: A:, B:, D: or E:

Use the DOS command **DIR** to determine which drive the USB is assigned.

DIR X:

where X is the drive letter. If the drive letter is correct, then the root directory of the USB drive will be listed. However, if the message "**Invalid Drive Specification**" or "**Drive not Ready**" appears then try another drive letter.

C: UPDATING THE CONTROL SOFTWARE

The version of the control software is made up of 2 parts: the major and the minor. These parts are separated by a decimal point. The minor part of the version (the right side) follows the decimal point. It is made up of 3 characters. Each character position has a specific meaning as described in the following table.

Character Position	Meaning	Format	Example
1	year	hexadecimal	6=2006 A=2010
2	month	hexadecimal	1=January 2=February 3=March 4=April 5=May 6=June 7=July 8=August. 9 = September A=October B=November C=December
3	release number	hexadecimal	1 - F

Whenever an updated version of the control software has been received, the extension of the filenames will be coded the same as the version of the control software.

For example: If the filename is AW-M300.7B2, then the minor version of the control software is 7B2.
7 = 2007
B = November
2 = variant #2

This software was released in November, 2007. It is the second variant for the month.

If a notification has been sent that there is an update of the control software, download the files onto your computer. After downloading the files, copy them onto a USB drive that is 2 GB or smaller. Take the USB drive with these files to the machine and load them into the same directory as the control software.

Step 1. From the Main Menu screen, **note** what the 3 character minor part of the version is.

Step 2. Press the 'Q' key to exit the control software and go into DOS.

Step 3. Copy your existing control software with the file extension being the minor part of the version code. Use the following command substituting the minor part of the version, that was noted as described above. For example, if the minor part of the version number is **123**, then type the following command line.

COPY AW-M300.EXE AW-M300.123

Substitute the proper minor part of the version number for **123**.

Step 4. Plug in the USB drive into a USB port and reboot the computer.

Step 5. From the Main Menu screen, press the 'Q' key to enter into DOS.

Step 6. Determine the USB drive letter (see appendix "Determining the Proper USB Drive Letter").

Step 7. Copy the files from the USB drive (ie. drive E:) into the control software directory. For example:

If the USB drive is E:, then type the following command:

COPY E:AW-M300.* C:AW-M300.*

Step 8. Change the extension of the new filenames to EXE. Use the following command substituting 123 for the minor part of the version, as described above.

COPY AW-M300.123 AW-M300.EXE

Step 9. If the computer asks you to overwrite a file, type "**a**" for "All" and press ***ENTER*** to replace the old files.

Step 10. You have just updated your control software. Now reboot the computer to have it take effect.

D: BACKING UP AND RESTORING THE SOFTWARE

D.1 OVERVIEW

It is always advisable to make a backup copy of the control software. It may be needed in the event that the system is damaged, and problems develop on the computer which necessitates reloading the software.

Refer to this section for information on how to make a backup copy of the system. Make as many copies of the system software as you deem necessary. Store the backups in separate places in case the software must be reloaded in the future.

The procedures listed below will backup all information from the hard drive to a USB drive that is 2 GB in size.

D.2 BACK UP PROCESS DATA, RECIPES, CONTROL SOFTWARE

This procedure will backup the process data, recipes and control software to a USB drive. These files can be archived on a server. They can also be viewed on your office computer that is running the AllWin21 control software in demo mode.

Step 1. Connect the USB drive to the USB port on the machine's computer.

Step 2. Reboot the computer. (DOS is not a plug-n-play operating system. It only recognizes new devices at the time the computer was booted.)

Step 3. When the computer has booted and is idle at the Main Menu, exit the control software. (Refer to the appendix section "Exiting the Program".)

Step 4. Change drive to the USB drive (see appendix "Determining the Proper USB Drive Letter"). For example, if it is drive "e:", then type the following DOS command:

e:

Step 5. Create a directory for the backup data (if it has not been created). For example, if the directory name is "backup", then type the following DOS command:

mkdir backup

Step 6. Change to that directory. For example, if the directory name is “backup”, then type the following DOS command:

cd backup

Step 7. Type the following DOS command:

xcopy c:*.* . /s

D.3 BACK UP THE ENTIRE DRIVE C:

Drive C: contains the operating system, drivers and the control software and generated files (i.e. recipes, calibration data and process data on drive C:) that the machine is depended on.

This procedure will backup all files that reside on drive C:.

Step 1. Connect the USB drive to the USB port on the machine’s computer.

Step 2. Reboot the computer. (DOS is not a plug-n-play operating system. It only recognizes new devices at the time the computer was booted.)

Step 3. When the computer has booted and is idle at the Main Menu, exit the control software. (Refer to the appendix section “Exiting the Software”.)

Step 4. Change the drive to drive “C:” by typing the following DOS command:

c:

Step 5. Change to the root directory of drive “C:” by typing the following DOS command:

**cd **

Step 6. Change the drive to the USB drive (see appendix “Determining the Proper USB Drive Letter”). For example, if it is drive “E:”, then type the following DOS command:

e:

Step 7. Create a directory for the backup data (if it has not been created). For example, if the directory name is “backupAW”, then type the following DOS command:

mkdir backupAW

Step 8. Change to that directory with the following DOS command:

cd backupAW

Step 9. Type the following DOS command:

xcopy c:*.* . /s

This will backup all files to your USB drive. These files can be archived on a server.

D.4 BACK UP DRIVE D:

Drive D: usually contains only process data. The amount of process data is usually dependent on the amount of wafers being processed.

To back up this drive, follow the procedure “Back Up the Entire Drive C:”, but substitute “D” for “C”.

D.5 RESTORING THE HARD DRIVE

Allwin21 uses DOS 7.10 as the operating system for the control software. It has a size limit of 100 GB per drive. However, some of our functions were made before this time using DOS 6.22 which has a size limit of 2 GB per drive. Therefore, drive C: is partitioned to 2000 MB, while drive D: uses the rest of the drive space.

The following procedure will restore the hard drive and will destroy all information and data on the hard drive.

Step 1. Partition the hard drive using the DOS utility **fdisk**. Partition it so the Primary DOS Partition is 2000 MB in size and the Extended DOS Partition uses the rest of the disk space. Partition the Extended DOS Partition with one Logical DOS Drive, which will use the entire Extended DOS Partition.

Step 2. Exit **fdisk** and reboot the computer. This will make the partitions permanent.

Step 3. Format and copy the system files to the first partition as drive C: by typing the DOS command:

format c: /s

Step 4. Format the second partition as drive D: by typing the DOS command:

format d:

Step 5. Using the USB drive that has the files that you backed up when you backed up the **Entire Drive C:**, attach it to the computer. Reboot the computer.

Step 6. Copy the files that you backed up when you backed up the entire drive C:. If the USB drive is drive E: (see appendix “Determining the Proper USB Drive Letter”) and the directory name is “backupAW”, then type the following DOS command:

xcopy e:\backupAW*.* c:*.* /s

E: SOFTWARE STARTUP

E.1 OVERVIEW

The control software is already installed on the hard disk of the control computer. All you need to do is power-up the system and make sure the monitor is on. At this point, the *Main Menu* will appear on the screen. Refer to Figure 7-2.

It is always advisable to make a backup copy of the control software. It may be needed in the event that the system is damaged, and problems develop on the computer which necessitates reloading the software.

Refer to the section "Backing Up and Restoring the Software" of this software manual for information on how to make a backup copy of the system. Make as many copies of the system software as you deem necessary. Store the backups in separate places in case the software must be reloaded in the future.

E.2 STARTING THE PROGRAM

To start the program, at the DOS prompt (C:\>), type:

CD \AW-M300 <CR>
AW-M300 <CR>

This will load the control software. When the program has loaded and ready to use, the *Main Menu* screen (shown in Figure 7-2) is the first screen displayed.

To use the control program with the system, refer to the appropriate sections of this manual.

E.3 EXITING THE PROGRAM

Press 'Q' (or 'q') on the keyboard from the *Main Menu* to exit the control software and go to DOS.

To abort and reset the software program at any time, simultaneously press and hold down the [**CTRL**, **ALT** and **DEL**] keys on the PC keyboard. This will reboot the computer and reload DOS -- This procedure could not be used if there is no response from the keyboard.

Alternately, the system can be powered down and then powered up.

F: HOW TO ORDER / RETURN EQUIPMENT

The information contained in this appendix includes the following:

- How to order equipment and parts
- How to return parts
- How to exchange parts
- What to do when the system is down
- Service Agreements

F.1 HOW TO ORDER EQUIPMENT AND PARTS

To order parts from Allwin21 Corporation, call:

Allwin21 Corporation
Customer Service
Phone: 1-408-988-5188

To obtain a quote and information concerning part availability, please have the following information ready:

- System model number (example: AW-M300)
- Serial number of the system
- Part number of the required part
- Purpose of order (spares, failed part, etc.)
- "Ship To:" address
- "Bill To:" address
- Purchase order number

F.2 HOW TO RETURN PARTS

> 🏷 NOTE
>
> **An RMA (Return Material Authorization) number must be obtained from AllWin21 prior to shipping any parts back to AllWin21.**

A Return Material Authorization (RMA) Number is required in order to return or exchange system parts. To obtain an RMA number, call:

Allwin21 Corporation
Customer Service
Phone: 1-408-988-5188

Return any failed parts to the following address:

Allwin21 Corporation
1550 Norman Ave.
Santa Clara, CA 95054
Attn: RMA # _____

Ensure that the RMA (Return Material Authorization) number is included with any returned part(s). Include the following information with the part:

- System model number (example: AW610)
- Part number of failed part
- Detailed failure information
- Serial number of system and of the failed parts (if applicable)
- "Ship To:" address
- "Bill To:" address
- Purchase order number
- RMA (Return Material Authorization) number

As the customer, it is your responsibility to return the part(s) in a proper packing container. Failure to return the part properly could result in further damage to the part.

> 🏷 NOTE
>
> **The RMA (Return Material Authorization) number must be visible on the outside of the package when returning a failed part. Allwin21 Corporation will not accept returned parts without an RMA number. This could result in the sender being billed for the full purchase price.**

F.3 HOW TO EXCHANGE PARTS

After troubleshooting to isolate a failed part, replace the part with a site spare if one is available. If the system is down due to an isolated failed part and no site spare is available, call:

Allwin21 Corporation
Customer Service
Phone: 1-408-988-5188

Contact Allwin21 Field Service to properly identify the failed part. Allwin21 will issue an RMA (Return Material Authorization) number to you which must be included when the failed part is returned. The failed part MUST be returned to Allwin21 within ten (10) days in the proper packing container or the full purchase price will be billed. Replacement parts under warranty are shipped out in the timeliest manner possible.

All returned parts must be shipped in the same packing material as the replacement part. Failure to return the part in the proper packing container could result in further damage to the part.

G: TROUBLESHOOTING TIPS

G.1 WHAT TO DO WHEN SYSTEM IS DOWN

If the system is down and you cannot isolate or fix the problem within a reasonable period of time, call Allwin21 Corporation Customer Service for telephone assistance or a service visit. Telephone numbers are staffed by trained Allwin21 Corporation technicians, who can provide on-the-spot help with difficult problems and advice on repairs.

Allwin21 Corporation
Customer Service
Phone: 1-408-988-5188

G.2 TIPS FOR TROUBLESHOOTING

- Solve the real problem. Do not create one or more new problems to solve existing problem.
- Face the problem. Do not escape from the problem.
- Find the problem (if you find the problem, the problem is already 50% resolved)
- Find the root causes and reasons the problem exists.
- Follow the protocol and standards.
- Follow the documents.
- Double check, triple check.
- Ask if you are not sure.

G.3 RULES TO THE EQUIPMENT MAINTENANCE

1) Treat all the connectors like eggs. Never “drop” the connector on the ground or on any other hard surface.
2) Pull out a PCB board at least 30 seconds after turning off the machine.
   dU=dI/dt,
   Even at a very low leakage current, the voltage will be very high when the PCB is removed too soon. Many boards are damaged due to this phenomenon.
3) Turn on the machine at least 10 seconds after turning it off. This is because the inductance circuit is still at a high voltage after the machine was turned off. Many machines get problems after being shut down and then turned on too quickly.
4) Always check facility condition before turning on the machine.

G.4 EQUIPMENT TROUBLESHOOTING EXPERIENCES

1) >80% of equipment down time is caused by connectors. There are many kinds of reasons for bad connections:
   a. loose connectors
   b. corroded or oxidized pins of the connectors
   c. broken wires in the cable
2) >90% of RF problems are caused by the RF cable and connectors.
3) >75% of machine down time is caused by wafer transport.
4) >95% wafer breakage problems is caused by wafer transport.
5) Do not think there is a big issue in the problem first; always think and start from small issue first.

H: MAINTENANCE PLANS

H.1 EXTENDED MAINTENANCE PLANS

AllWin21 commitment to customer support carries on past the warranty period. By offering a choice of extended maintenance plans, we can satisfy most of your service requirements. Contact Allwin21 Field Service or Sales Administration for more details.

H.2 SERVICE TRAINING

System uptime may be increased dramatically by having trained in-house personnel and spare parts kits. Operator and Service training (a one day course) are available at Allwin21 for a fee. These courses cover the following types of information:

- System overview
- Operation
- Software use
- Recipe construction
- Temperature control and optimization
- Preventive maintenance
- Electronics operation and troubleshooting
- Temperature monitoring using the thermocouple and pyrometer

Students are usually Applications Specialists, Equipment Engineers, System Operators and Maintenance Technicians. Emphasis is on hands-on work, as the classes are small and allow personalized instruction.

I: MANUAL REVISION HISTORY

Date	Rev.	Description
03/2/10	A	Initial Release
03/24/10	B	added picture of AW-M300 encoder disk