Advanced Dicing Technologies Ltd.

Your Resource for Advanced Dicing Solutions

ADT 7100

Dicing Series

Vectus/Fortis Model Types

Operations Manual

Software Version 5.6.3



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Customer Support

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RECORD OF CHANGES

Item	New Part Number	New Page Number	Revision Date	Comments

SAFETY FIRST

Advanced Dicing Technologies Ltd. believes that the safety of personnel working with and around our Systems is the most important consideration. Please read all Safety information below before attempting to operate the System, and in the Maintenance Manual before attempting to perform any maintenance function.

Warnings

1 Obey and follow all warnings and cautions given in the manuals.

2 Comply with all approved and established precautions for operating electrical and mechanical equipment.

3 All maintenance tasks should be performed only by trained, authorized personnel.

4 Verify that all the power, air and water facilities are turned off before beginning any maintenance procedure, replacement, or repair of parts (including insertion or removal of connectors or boards).



Danger – Electrical Shock Hazard: High voltage is present at points throughout the System. Contact with high voltage can result in injury or death. Before opening the System Panels or attempting any maintenance task, ensure that there is no voltage present:

- Power down the System.
- Disconnect the AC power cord plug from the wall outlet and wait ten minutes for any remaining current to dissipate.
- Turn off the Uninterruptible Power Supply (UPS) on Systems where a UPS is present.



Danger – Moving Parts Hazard: There are two kinds of hazards presented by moving parts:

- Some components (e.g. Spindles and Blades) rotate at high speeds and can cause injury even after power has been turned off. Do **not** touch either the Spindle or the Blade while they are still in motion. Wait until the rotation stops completely before working on or near moving parts. Do **not** operate the System with any of the covers open.
- Beware of loose clothing, jewelry and other loose or dangling items which might get caught in moving or rotating parts.



Danger – Burn Hazard: Be careful not to touch the solenoid valves inside the System. Some solenoid valves may reach high temperatures; direct contact may cause burns.



Danger – Bodily Injury Hazard: Be careful not to drop any of the Covers while opening or closing them. Let go only once they are completely opened or closed. Failure to do so could cause bodily injury or damage to the Covers.



Danger – High Pressure Water and Air Hazards: Observe standard operating procedures to avoid contact with High Pressure Air and Water, which can present hazards, especially to eyes.



Danger – Ultraviolet Light (UVL) Tape Curing System: The UVL Tape Curing System makes use of potentially harmful levels of ultraviolet light. Although all reasonable safety precautions have been taken to overcome the potential dangers, those operating and servicing the UVL Tape Curing System should be aware of the existence of this inherently harmful light source. The UVL System can reach extremely high temperatures. Do not touch the UVL System while in operation and allow thirty minutes cooling time after operation.Personnel must wear UV-protective glasses which meet ANSI Z80.3 requirements when inspecting and replacing UV Lamps.

Safety Features

Our Systems are equipped with the following safety features. Look at them and get to know them.

- EMERGENCY STOP BUTTON: Pressing the red EMERGENCY STOP BUTTON stops ALL activities in the System and cuts off power to the System.
- CIRCUIT BREAKER SWITCH: Operate the CIRCUIT BREAKER SWITCH immediately if it becomes necessary to cut off power to the System.
- GROUNDING CABLES: Grounding Cables are attached to the inside of each System Panel and must be disconnected each time a System Panel is removed, and reconnected each time a System Panel is replaced. An Electrostatic Discharge Device (ESD) should be worn when handling the Grounding Cables.
- INTERLOCK COVERS: Lock the Covers so they cannot be opened during dicing.
    - **Spindle Interlock**

    The Spindle Interlock prevents injury to the User by:

        - Preventing the Spindle Cover from opening while the Spindle is rotating
        - Preventing the Axes from being moved while the Spindle Cover is open
        - Stopping an Axis if the Spindle Cover is opened while the Axis is moving

        Any attempt to move an Axis while the Spindle Cover is open results in an error message. An error message is also

displayed if the Spindle Cover is opened while an Axis is moving or when a bypass key is used. The Axes stop immediately and the spindle keep moving mechanically.

The Spindle Interlock is automatically engaged while the Dicer is initializing, and disengaged when initialization is completed. In addition, the Spindle Interlock is disengaged whenever the System is powered down. The Model 7100 cannot be powered down while the spindle is rotating.

During the Blade Change procedure, the Spindle Interlock automatically disengages when the Spindle is turned off by the System. At the end of the procedure, the Software reminds the User to close the cover before clicking **Finish**. The Spindle Interlock then re-engages automatically to protect the User while the Dicer initializes. For more information about changing the Blade, see Chapter 7.



Note: Once the **Blade Change** button is pressed, the Spindle Interlock is unlocked and cover can be opened. The user has 20 seconds to open the cover. If the cover has not been opened within 20 seconds, the interlock locks back and can be bypassed by means of a key.

The Spindle Interlock can be locked and unlocked from the Dicer screen in the Setup & Diagnostics workbook. Access rights to this function can be restricted. For more information about the Setup & Diagnostics workbook, see Chapter 2. For more information about access rights and Access Levels, see Chapter 4.

- **Load/Unload Interlock (7100*EUR* only)**

The Load/Unload Interlock prevents the Load/Unload Cover from being opened while the Model 7100 is operating. The Interlock is only disengaged when Workpieces are loaded or unloaded from the Cutting Chuck.

Unlike the Spindle Interlock, the Load/Unload Interlock is automatically engaged after initialization. It disengages only after the User initiates the Load procedure. X, Y and Theta Axes are initialized when the procedure is completed.

During the Load procedure, another message appears after the Workpiece has been accepted by the Cutting Chuck, reminding the User to close the Load/Unload Cover before continuing. (This enables the User to leave the cover open in cases where the Workpiece needs to be manually held in place by the User before it can be accepted by the Chuck.) An error message appears if the Load/Unload Cover is not closed within a reasonable time by the User.

The Load/Unload Interlock can be locked and unlocked from the Dicer screen in the Setup & Diagnostics workbook. Access rights to this function can be restricted. For more information about the Setup & Diagnostics workbook, see Chapter 2. For more information about access rights and Access Levels, see Chapter 4.



Note: Once the **Unload** button is pressed, the Load/Unload Interlock is unlocked and cover can be opened. The user has 20 seconds to open the cover. If the cover has not been opened within 20 seconds, the interlock locks back and can be bypassed by means of a key.

BEFORE YOU BEGIN

This Manual

Before you begin to work with the 7100 Dicing Series machine, please read this Manual. It explains how to work with the System, where and when to perform operations, and why to do them.

Please be sure to read the section on Conventions. This section makes it easier for you to perform procedures and understand concepts by explaining the standards used in this Manual.

The Model 7100 Glossary, explains the technical terms used in describing the System and System functions. Please use it as a reference tool while working with the Manual.

Reading Chapter 3, System Operation, and Chapters 4 through 10 will give you tools to perform the operation procedures.

Please read every procedure through to the end before starting the procedure, whether it effects the System hardware or software. Thorough understanding of what you are about to do will prevent unnecessary loss of time due to confusion while you are performing the procedure.



Note: After Power On, and before normal operation, it is recommended to warm up the system by running a simulated dicing session for thirty minutes. The User should place a Workpiece on the Cutting Chuck, define and assign a Recipe, and run simulated dicing for thirty minutes. The User must ensure that the Cut Depth is set so that the Blade does not enter the Workpiece and no Kerf Check or Cut Verification algorithm is selected. The spindle should rotate at typical speed (the speed used for dicing) with cutting water on.
This simulated dicing, in the system steady state, warms up the Model 7100 to prepare it for normal operation. Advanced Dicing Technologies Ltd. suggest creating a warm-up recipe.

Contents at a Glance

Chapter 1: Introduction

Chapter 2: System Description

Chapter 3: System Operation

Chapter 4: Administration

Chapter 5: Building Recipes

Chapter 6: Dicer Procedures

Chapter 7: Saw Procedures

Chapter 8: Special Features

Chapter 9: Configuration Options

Chapter 10: Troubleshooting

Appendices

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Reference Documents

- **ADT Model 7100 Semi-Automatic Dicing System Maintenance Manual**. It provides information and procedures to aid in the performance of preventative maintenance, as well as troubleshooting and repair procedures.
- **ADT Model 7100 Semi-Automatic Dicing System Large Area Option**

CONVENTIONS

This section explains basic symbols and conventions used in this Manual.

Symbols

The following symbols have been inserted on the left hand side of the text in order to make it easier to perform procedures:

Symbol	Description
	**Note:** Information given in a note describes how the Model 7100 functions or provides a tip on how best to use it.
	**Caution:** Information given in a message labeled caution refers to the safe operation of the Model 7100 and provides warnings where the possibility for loss of data or damage to the equipment exists.
	**Danger:** Information given in a message labeled danger warns of possible hazard to personnel and extreme hazard to the Model 7100.
	A wrench indicates that a procedure deals with hardware and requires physical User intervention.

Screen Navigation

The convention below is an example of how to follow the shortened instruction form for navigating to menu options.

Convention	Description
From the Manual menu, select **Manual** > **Dicer** > **Vision** > **Manual Alignment**	Click the Manual menu and select the **Dicer** submenu, followed by the **Vision** option within the **Dicer** submenu, followed by the **Manual Alignment** sub-option within the **Vision** option.

The convention below is an example of how to follow the shortened instruction form for navigating the Setup & Diagnostics tree and the Calibration tree in the Workbook workspace.

Convention	Description
From the Setup & Diagnostics tree, select **Saw** > **Dicer** > **Axes** > **Front Y**	From the Setup & Diagnostics tree, select the **Saw** branch and within the **Saw** branch, select the **Dicer** branch and within the **Dicer** branch, select the **Axes** branch and within the **Axes** branch, select **Front Y**.

Abbreviations and Acronyms

A	Amps
BBD	Broken Blade Detector
gf	Grams of force
GUI	Graphical User Interface
Hz	Hertz (frequency)
in.	Inch
in. Hg	Inch of Mercury (vacuum pressure unit)
kgf*cm	Kilograms of force times lever length, in centimeters (torque unit)
mil	0.001 inch
mm	Millimeter
MPU	Main Power Unit
ms	Millisecond
NCHD	Non-Contact Height Device
psi	Pounds per Square Inch
scfm	Standard Cubic Feet per Minute (gas flow unit)
UPS	Uninterruptible Power Supply
V	Volts
VAC	AC Voltage
VDC	DC Voltage

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1 INTRODUCTION

The Model 7100 Series is a semi-automatic dicing system, manufactured by Advanced Dicing Technologies Ltd. Semiconductor, glass, and plastic workpieces of all types can be automatically cut after the workpiece has been loaded by a user. Any part of the cutting process can also be performed manually by a user, if required. Each workpiece must be manually removed and cleaned after cutting. An optional **autoloader** enables fully automated loading and unloading of Workpieces with no user intervention other than changing cassettes as required.



Figure 1-1: Model 7100 ProVectus

1.1 Overview

The 7100 Series can be used to cut different types of Workpieces, each of which may need to be processed in a different way. The process applied to each Workpiece is determined by the Recipe assigned to it. Recipes can be assigned to an individual Workpiece or to a series of Workpieces.

Workpieces are placed individually by the User on the Cutting Chuck. The Model 7100 moves each Workpiece through the alignment and cutting procedures, according to the parameters and algorithms defined in the recipe assigned to that individual Workpiece. If required, any part of the operation (for example, Alignment) can be performed manually. After the process is complete, the Workpieces are manually removed by the User from the Cutting Chuck.

1.2 Standard Features

The Model 7100 Series includes the following features:

- **Single Head dicing machine**
- **Single Magnification Vision System**
- **Kerf Check Monitoring**
- **Brushless Spindle**:
  - DC, 60,000 RPM, speed controlled Front Mount Air Bearing 2" Spindle (7100 Vectus and 7100 ProVectus)
  - AC, 30,000 RPM, speed controlled Air Bearing 4" Spindle (7100 Fortis)
  - DC, 30,000 RPM, speed controlled Air Bearing 4" Spindle (7100 ProFortis)
- **Quick-Change Chucks** that hold Workpieces in place using vacuum suction
- **Load Monitoring:** enables the User to measure the load on the Spindle (measured in Amps) caused by resistance encountered by the blade during operation.
- **Daily Database Backup**
- **Water Cleaning Jets:** enables additional cleaning of the Workpiece.
- **Un-Interruptible Power Supply (UPS)** for the PC - used in case of an emergency stop to prevent abnormal computer shut down.

1.3 Modes of Operation

The Model 7100 Series is operable as follows:

- **Auto Mode:** Requires no User intervention once **Run** is clicked. Workpieces commonly used in the Customer's System are processed in Auto mode. The entire process, including Alignment, dicing, Kerf Checking and getting to the Unload station after the process is finished, is completely automatic.
- **Manual Mode:** This mode is used for dicing Workpieces that are difficult to process automatically, for example:
  - Damaged or partial Workpieces
  - Workpieces that are difficult to align automatically
  - Partially cut Workpieces
  - After the process is finished, the user needs to click the **Unload** button to remove the workpiece from the dicer.

- **Exhibition Mode**: This mode is intended for exhibition use and allows to operate the System without connecting to a water supply. For more information, refer to Appendix 5, "Exhibition Mode" of the Maintenance Manual.

1.4 Available Models

The 7100 Series includes four models:

- **4" Fortis** - 4" AC Spindle with Cable Type Turntable
- **4" Pro Fortis -** 4" DC Spindle with Closed Loot Theta
- **Vectus -** 2" DC Spindle with Open Loop Theta
- **Pro Vectus -** 2" DC Spindle with Closed Loop Theta



Note: For detailed hardware configurations refer to section 1.6

1.5 Options

The Model 7100 can include one or more of the following options:

- **Autoloader:** enables automatic loading and unloading of workpieces from cassettes.
- **Multi-Language Interface**: enables the GUI to switch between English and the local language. For more information about currently supported languages, refer to the latest Release Note.
- **Tilted Spindle**: This option enables the System to cut wafers at any angle that falls between 0 and 15 degrees by changing the orientation of the Spindle and the Microscope. Systems that include the Tilted Spindle option, are delivered pre-configured with all the settings necessary for cutting at both standard and tilted orientation.
- DC brushless, 30,000 RPM speed-controlled **4" Air Bearing Spindle**
- **Magnification:** x30 (Pro Vectus and Pro Fortis only), x60, x120 (standard), x240.
- **High Accuracy Theta Axis**
- **Dress Station** - intended to periodically reshape and/or clean the cutting blade in order to enhance the Kerf quality, without interrupting the cutting process.
- **Broken Blade Detector (BBD) -** Optional for 7100 Vectus and 7100 ProVectus (2")
- **Wash Pipe** - used in addition to the spray bars for washing during the dicing process.

1.6 Available Models

Several configurations of the 7100 Series are available, each offering different features and options, as described in Table 6-1.

Table 6-1: Available Models of the 7100 Dicing Series

Models/ Features	Vectus (2")	ProVectus (2")	Fortis (4")	ProFortis (4")
2" DC Spindle	Standard	Standard	NA	NA
4" AC Spindle	NA	NA	Standard	NA
4" DC Spindle	NA	NA	NA	Standard
Open Loop Theta Table	Standard	NA	Standard	NA
Closed Loop Theta Table	NA	Standard	NA	Standard
Closed Loop Theta Table (high accuracy)	NA	Optional	NA	Optional
Digital Camera	Commercial	Industrial	Commercial	Industrial
Covers	Window	Transparent	Window	Transparent
Non-Contact Height Device (NCHD)	Standard	Standard	Optional	Optional
Mechanical Height Button	Optional	Optional	Standard	Standard
2"/ 3"Cooling Block	Standard	Standard	NA	NA
4"/ 5”Cooling Block	NA	NA	Standard	Standard
Three-Flow Cooling Control	Standard	Standard	Standard	Standard
Cleaning Jets	Standard	Standard	Standard	Standard
Spray Bars	Standard	Standard	NA	NA

Table 6-1: Available Models of the 7100 Dicing Series

Models/ Features	Vectus (2")	ProVectus (2")	Fortis (4")	ProFortis (4")
High Cooling	NA	NA	Optional	Optional
Water Separator	Standard	Standard	Standard	Standard
Venturi Vacuum Pump	Standard	Standard	Standard	Standard
Y Axis Linear Encoder	Standard	Standard	Standard	Standard
Vacuum Sensor	Standard	Standard	Standard	Standard
High Definition Vision System with x120 Magnification	Standard	Standard	Standard	Standard
Vision Magnification x30	N/A	Optional	N/A	Optional
Vision Magnification x60, x240	Optional	Optional	Optional	Optional
Pattern Recognition System (PRS) with Vertical and Oblique LED Illumination	Standard	Standard	Standard	Standard
Pattern Recognition System (PRS) with Vertical and Oblique (Ring) Halogen Illumination	Optional	Optional	Optional	Optional
Load Monitor	Standard	Standard	Standard	Standard
Chuck Frame Adapter	Optional	Optional	Optional	Optional
Quick-Change Cutting Chuck	Optional	Optional	Optional	Optional
Broken Blade Detector (BBD)	Optional	Optional	Optional	Optional
Light Tower	Optional	Optional	Optional	Optional
Air Purification Kit	Optional	Optional	Optional	Optional

Table 6-1: Available Models of the 7100 Dicing Series

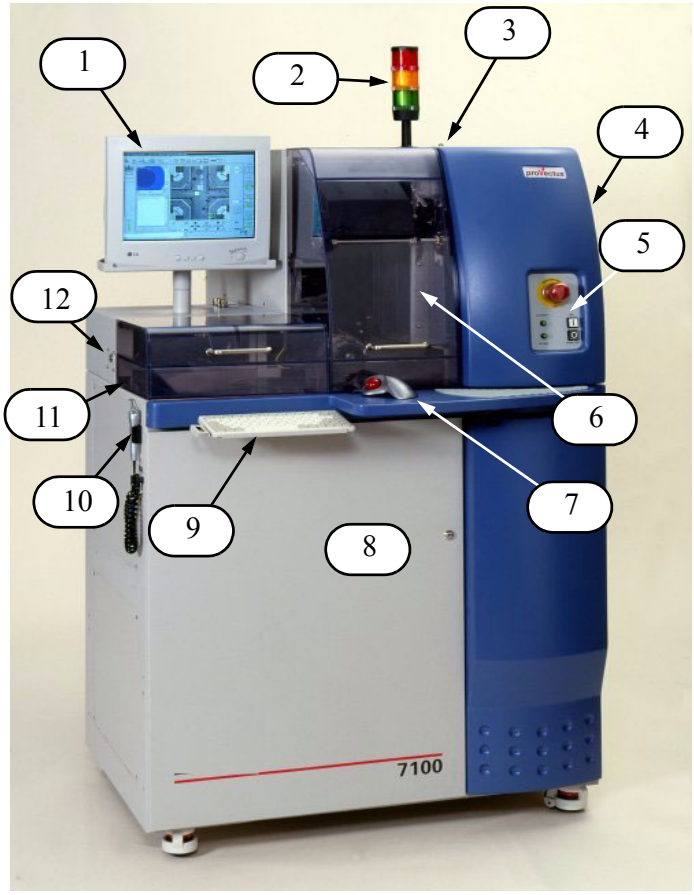
Models/ Features	Vectus (2")	ProVectus (2")	Fortis (4")	ProFortis (4")
CE Interlocks	Optional	Optional	Optional	Optional
Tilted Spindle (0 to 15 degrees)	NA	Optional	NA	NA
Autoloader Handling System	NA	Optional	NA	Optional

Additional Models: Tilted Spindle, Autoloader, Large Area (for dicing 300 mm circular or 12"x9"rectangular workpieces) on the Pro-type machines, according to the above configurations.

Note: Not all the configurations can be upgraded on the customer's site.

2 SYSTEM DESCRIPTION

This chapter describes the Model 7100 Series elements. The first section describes the main subsystems (Front Panel, Dicer and Vision System). The second section describes the Graphic User Interface of the Model 7100 Series software.



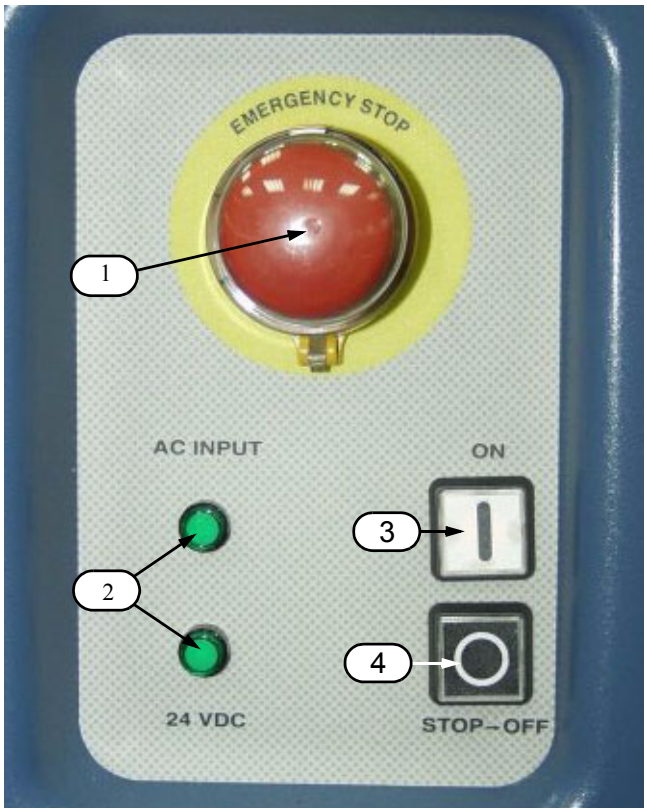
1 Monitor
2 Light Tower
3 Cut Cover Interlock Key
4 Main Circuit Breaker
5 Front Panel
6 Cut Cover
7 Mouse
8 Front Door
9 Keyboard
10 Air and Water Gun
11 Load/Unload Cover
12 Load/Unload Interlock Key (7100*EUR*)

Figure 2-1: Model 7100 External Parts at a Glance

2.1 Main Subsystems

2.1.1 Front Panel

The Front Panel is located on the front of the Model 7100 Series and includes the following controls and indicators:



1 Emergency Stop
2 Power Indicators
3 ON Button
4 STOP/OFF Button

Figure 2-2: Model 7100 Series Front Panel

2.1.1.1 Emergency Stop

The Emergency Stop button is used when a hazardous condition exists in the System or if the User needs to stop the System immediately.

Once the Emergency Stop button is pressed, the Main Circuit Breaker (see Figure 2-1) disconnects the power from the saw. The System immediately stops all Axes and disengages the Motor Drivers.

The PC UPS allows the software to shut down properly, preventing any harm to the computer hard drive.

To recover after an emergency stop, pull out the Emergency Stop button, rotate the Main Circuit Breaker to **ON** position and press the **ON** button.

2.1.1.2 ON/STOP > OFF Buttons

The ON and STOP > OFF buttons provide the following functionality:



The ON button powers on the Components and the PC, which then starts loading the software. When the ON button is pressed, it lights.



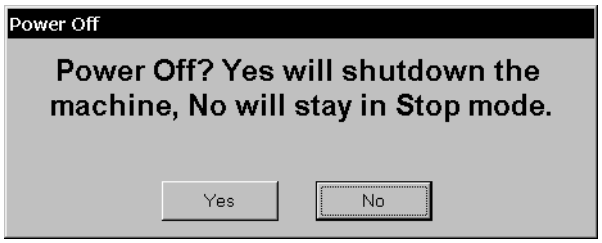
The STOP > OFF button stops the system operation (if pressed once) and shuts down the System (if pressed twice). To start the System up again, press ON and wait for the GUI screen asking for the User Password.

This button enables the operator to immediately stop any activity in order to prevent self-injury or damaging the material.

Note: The **STOP/OFF** button is spring-loaded to always be ready in its "out" position.

This feature is supported by the Model 7100 Series as follows:

- When pressed once, the system stops and a pop-up message appears on the screen:



- When pressed a second time (equivalent to clicking **Yes** in the pop-up message), the system shuts down.

Note: Wait at least one second between the first button press and the confirmation.

When the Stop button is pressed for the first time, the system stops at its current location in all axes, excluding the Z-axis, which moves up (if stop is pressed during the first init, the Z-axis also freezes). The user can also define in the Setup and Diagnostics parameters that the Spindle and the Cooling Block water should stop when the Stop button is pressed.

In order to resume operation, the system should be activated. Upon activation, the regular system logic takes effect. For example, if the Stop button was pressed during:

- Any Teach sequence: The process stops. It can be resumed by re-teaching the whole sequence.
- A cutting process: The process stops. It can be resumed by pressing **Auto Run** or **Full Wafer Cut**.

In systems with **Autoloader**, the Stop button behaves the same way as in a standard system. Upon Stop confirmation (the second press), the system becomes idle, while the Autoloader performs initiation. All buttons are disabled until the Autoloader initiation is completed.

Note: The user is prompted to manually remove all the workpieces that are not properly positioned in the cassette but are situated elsewhere between the Cassette Compartment and the Cutting Chuck. **The workpieces are to be removed before Stop confirmation**.

If the Stop button is pressed, while the system is in Auto Run mode, the system finishes the current process and brings the workpiece to the manual unload station. The user is prompted to manually unload the workpiece. In order to return to the Auto Run mode, press **Auto Run**.

The Stop button parameters can be defined under Cutting Block station (see Figure 2-3).

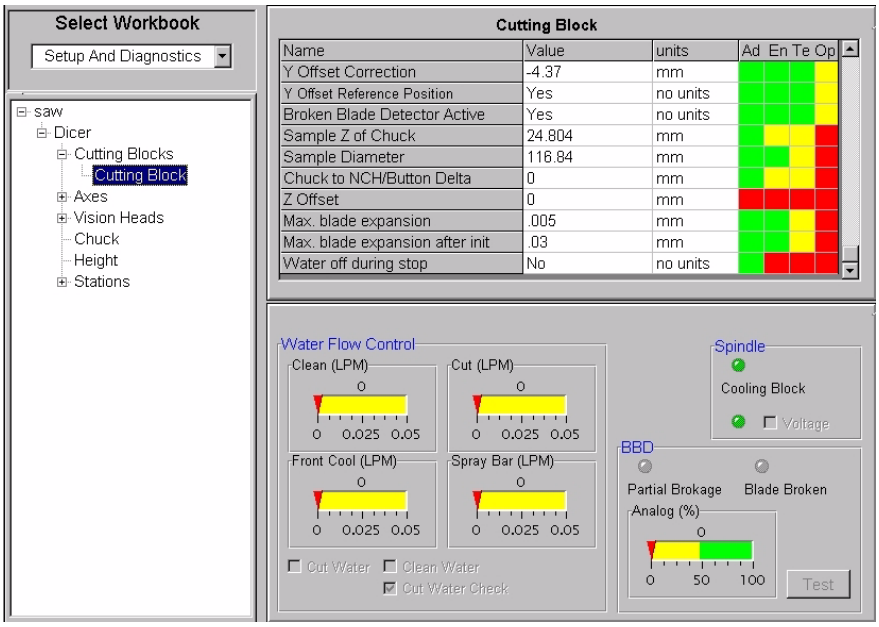


Figure 2-3: Stop Button Parameters

Note: Power Up the system only after the monitor LED indicator has gone off.

The system can be also stopped by clicking the stop icon  on the screen (see section 2.2.9).

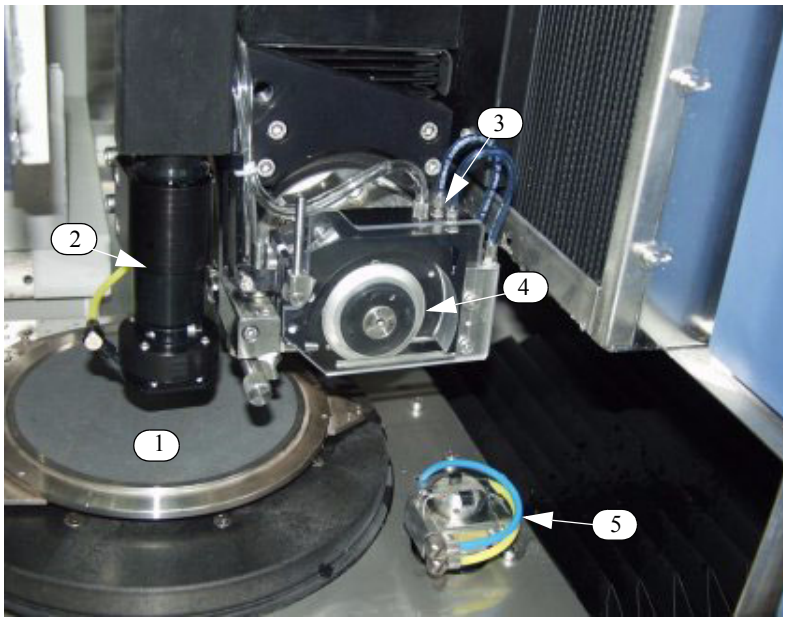
2.1.1.3 Power Lights

The two power lights indicate the power status in the Main Power Unit (MPU), as follows:

- The AC Input light is lit to indicate presence of AC power in the System.
- The 24 VDC light is lit when power is available in all outlets of the power supply.

2.1.2 Dicer

The Dicer is where Workpieces are aligned and then cut.



1 Cutting Chuck
2 Vision System
3 Cooling Block
4 Spindle Unit
5 Height Device

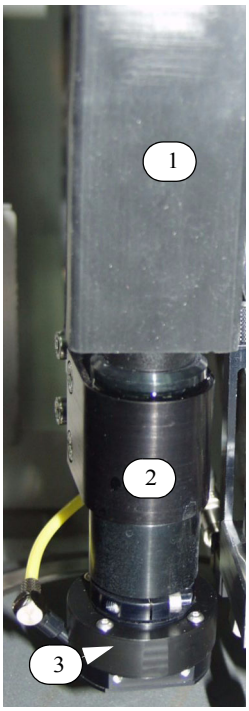
Figure 2-4: Dicer

The Dicer includes the following main components and sub-components:

1 Cutting Axes
   a. X-Axis
   b. Y-Axis
   c. Z-Axis
   d. Theta Axis
   e. Rotational Axis (Spindle)
2 Spindle Unit (2" or 4")
3 Cooling Block (2"/3" or 5")
4 Height Device (Non-Contact Height Device or Mechanical Button)
5 Vision System
6 Quick-Change Cutting Chuck

2.1.2.1 Vision System

The Model 7100 Series incorporates a high-performance Vision System that executes precise positioning of Workpieces for Alignment and Kerf Checking.



1 Camera
2 Microscope
3 Illumination Unit

Figure 2-5: Vision System

The Vision System includes the following Components:

- Camera
- Microscope
- LED Illumination Unit (Oblique and Vertical)

2.1.2.1.1 Microscope and Camera

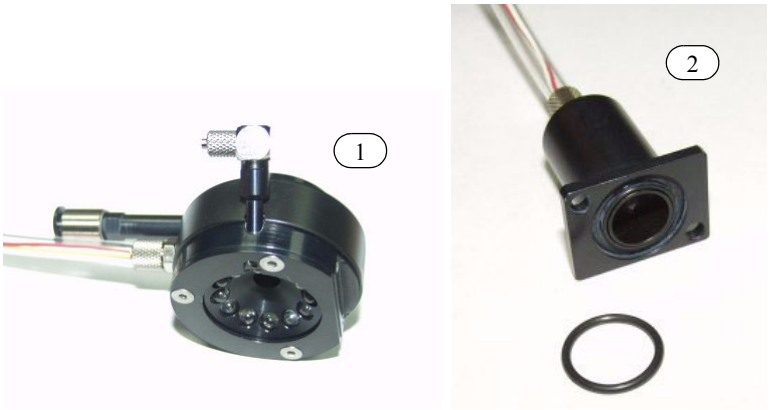
The Vision System of the Model 7100 Series includes a Camera with x30 (ProFortis and ProVectus only), x60, x120 (standard), or x240 magnification Microscope. Once the Model 7100 has been initialized, the Vision System provides real-time images from the Camera, displayed in the Field of View (FOV) of the Video Workspace. The images are supplied by a monochrome video acquisition board contained in the Model 7100 Series PC.

2.1.2.1.2 Illumination

The Microscope features two standard types of LED illumination:

- **Coaxial**: Vertical illumination passing through the Microscope, generally used on silicon Workpieces, which have reflective surfaces.
- **Oblique**: Surrounding illumination on the sides of the Microscope, generally used on Ball Grid Array (BGA) or metal Workpieces, which have diffusive surfaces.

Illumination of the Workpiece intensifies the display of each pixel viewed using a range of 0-255, where 0 produces a very dark (black) display, and 255 produces a very light (white) display.



1 Oblique
2 Coaxial

Figure 2-6: Illumination Accessories Attached to the Microscope

The 7100 Series machines can also be equipped with optional Halogen illumination accessories for Coaxial or Oblique illumination (see also Table 6-1).

2.1.3 Light Tower



The Light Tower indicates the status of the Model 7100. In general, a green light indicates normal system operation, yellow light indicates that there is a need of a user interference, while a red light indicates that an error has occurred. The Light Tower indications are given in Table 2-1.

Table 2-1: Light Tower States

Red	Yellow	Green	System State
Med Flash	Off	Off	Error.
Off	Off	Off	The system is not initiated.
Off	On	Off	The system is idle
Off	Med Flash	Off	Process paused, operator call.
Off	Off	On	The system is running in Auto mode
Off	Off	On	Manual Operation

Table 2-1: Light Tower States

Red	Yellow	Green	System State
Off	Off	On	The last workpiece is being processed (relevant for systems with Autoloader)
Off	Rapid Flash	Off	User interference required (operator call)
Off	Med Flash	Off	Wizard is displayed, operator action is required.

Note: The Light Tower indicators may vary since they can be configured to meet individual customer requirements.

2.1.3.1 Stand-alone Buzzer on Light Tower

The standard light tower has a buzzer installed above the red light (see Figure 2-7). This buzzer is wired to the red light and is activated whenever the red light illuminates. Software Version 5.6 or later support a stand-alone buzzer configuration. This means that the buzzer is wired separately and operates independently of the lights.



Figure 2-7: Buzzer in Light Tower

When this feature is enabled, the buzzer goes off **only** when the following events take place:

- Dress Block Change
- Alignment Failure
- Blade Change
- Cutting Cycle Completed

To Enable the Stand Alone Buzzer:

1 Configure the I/O PCB:

a. Open the main workspace Configuration screen.

b. In the value column, next to the parameter Digit I/O, select: **Yes**.

c. Click **Save** (see Figure 2-8).

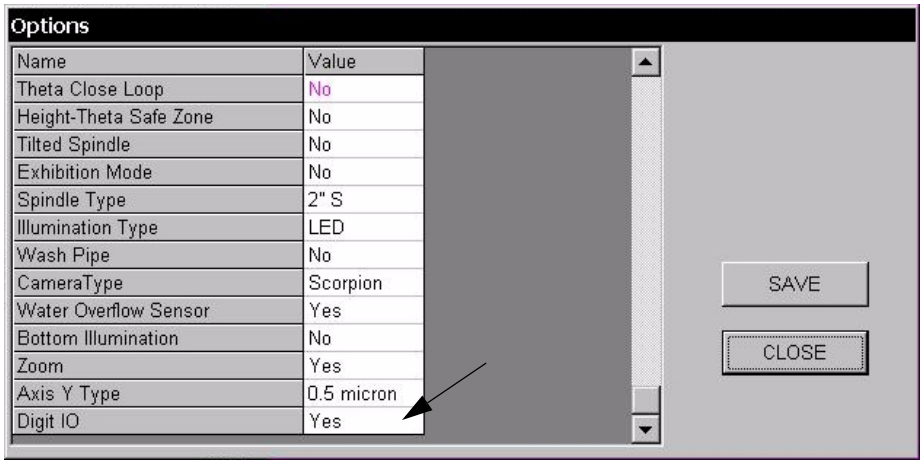


Figure 2-8: Enabling the Digital I/O PCB

2 Modify the buzzer wiring to accommodate the new feature.

2.1.4 Un-Interruptible Power Supply

The PC Un-Interruptible Power Supply assures that in case of an abnormal System stopping (such as pressing the **Emergency Stop** button or in case of a power failure) the computer still has an independent power input to shut down properly. The UPS is located inside the system bench.



Figure 2-9: UPS

Caution: As long as the UPS is connected to a power source, there is voltage on its outlet, even if the switch is in OFF position.

Note: If the system is shut down for a long period, it is recommended to manually turn off the UPS.

2.2 Graphical User Interface

When the software is launched, the following screen is displayed:

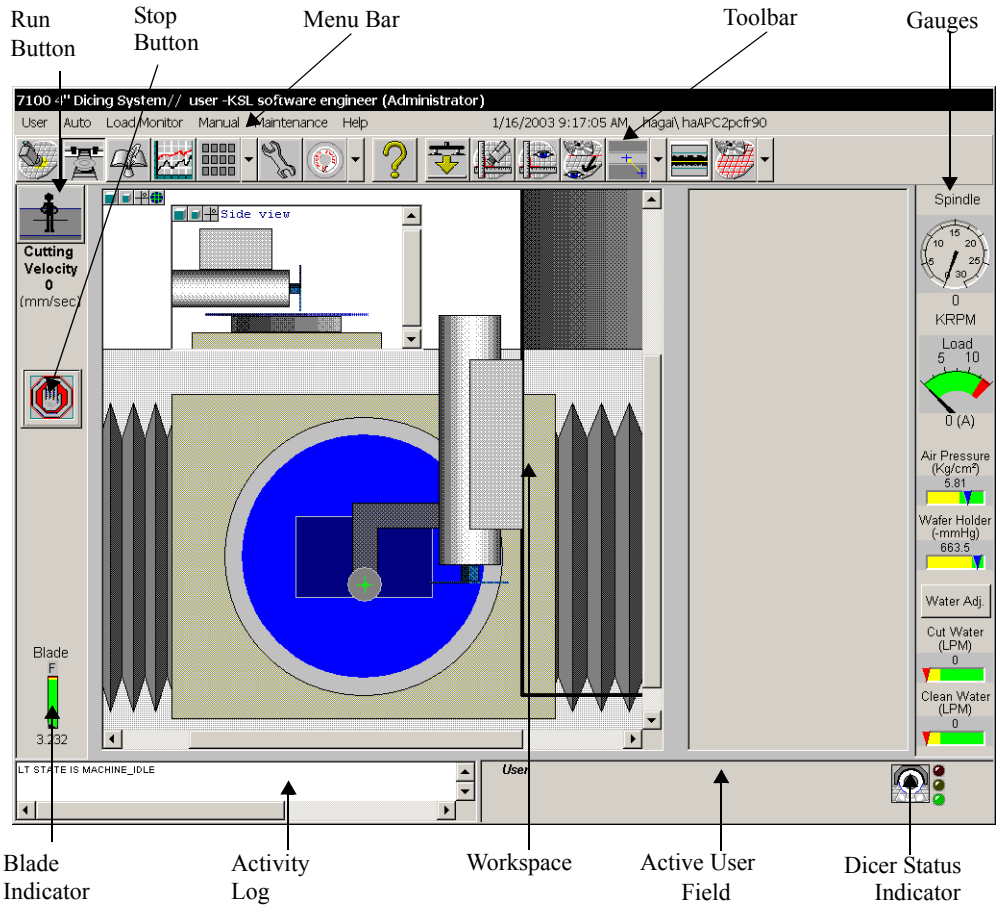


Figure 2-10: Model 7100 Series Opening Screen

Each element of the main window is described in the following sections:

- Menu Bar, section 2.2.1
- Toolbar, section 2.2.2
- Gauges, section 2.2.3
- Dicer Status Indicator, section 2.2.4
- Active User Field, section 2.2.5
- Activity Log, section 2.2.6
- Blade Indicator, section 2.2.7
- Run Button, section 2.2.8
- Stop Button, section 2.2.9
- Workspaces, section 2.2.10

2.2.1 Menu Bar

The menu bar in the main window contains seven menus, described on the following pages.

2.2.1.1 User Menu

The User menu contains the following options:

System Init	Initializes the System.
Logout & Login	Allows to log out the current user and log in a different one.
Registration	Defines new Users, their access level and password.
Configuration	Defines different system configuration options
Calculator	Provides access to an online calculator.
Language	Enables the User to change the interface language. For more information, see section 8.2.
Communication Status	Displays the status of communication between the PC and DSPs within the System.
Exit to Windows	Exits the Model 7100 Series software and returns to Windows.

2.2.1.2 Auto Menu

The Auto menu contains the following options:

Run	Starts the System running in Auto mode.
Define Job	Enables Recipes to be assigned to a Workpiece or group of Workpieces.
Auto Stop	Stops the operation of the System in Auto mode.

2.2.1.3 Load Monitor Menu

The Load Monitor menu contains the following options:

Control	Enables the user to specify upper and lower load limits.
Load	Displays graphs that represent the measured load on the Spindle during dicing.

For more information about Load Monitor menu options, see Chapter 8.

2.2.1.4 Manual Menu

The Manual menu contains the following options for carrying out manual operations:

Vision	Includes options for operating the Vision System.
Manual Alignment	Enables the Workpiece to be manually aligned. For more information, see Chapter 6.
Auto Alignment (execute)	Automatically aligns the Workpiece. For more information, see section 6.1.2.
Auto Kerf Check	Automatically checks the kerf. For more information, see section 6.3.4.
Cut	Includes an option for initiating the Partial Wafer Cut procedure.
Partial Wafer Cut	Enables the cutting of a partially cut Workpiece to resume, see section 6.5.1
Services	Includes options for Blade changing and placing Workpieces, and for performing Process Height.
Process Height	Executes the Blade Height procedure. For more information, see section 7.3.
Blade Change	Initiates the Blade Change procedure. For more information, see section 7.4.
Execute	
Place Workpiece	Enables a Workpiece to be placed on the Cutting Chuck. For more information, see section 3.5.
Remove Workpiece	Enables a Workpiece to be removed from the Cutting Chuck. For more information, see section 3.5.

Blade Treatment	Enables the selection of Override or Dressing as the mode for Dressing a Blade. For more information, see Chapter 7.
Dress on Dress Block	Enables manual dressing procedure on the Dress Block. Applicable only if the system configuration includes a Dress Station.
Change Dress Block	Enables manual Dress Block replacement. Applicable only if the system configuration includes a Dress Station.
Override	Displays the Override Workspace, as described in section 2.2.10.6.
Dressing	Displays the Dressing Workspace, as described in section 2.2.10.6.
Blade Info	Displays the Blade Info Workspace, as described in section 2.2.10.6.

2.2.1.5 Maintenance Menu

The Maintenance menu contains the following menu options:

Protection!	When selected in Workbook Workspace, enables a User with the necessary access rights to carry out operations in the selected workbook normally protected by the software.
Create Backup	Creates the database backup copy
Periodical Backup	Creates a backup of the current status of the System.
Restore Periodical Backup	Restores the database from the Backup.
Backup Access Rights	Displays access rights to backup.
Restore Access Rights	Displays access rights to database restoration.
Log File	Displays the Log File viewer. For more information, see section 3.8.

2.2.1.6 Help Menu

The Help menu contains the following menu options:

Books Online — Enables the User to open the soft copy of Model 7100 Series Operations Manual, Maintenance Manual, Pre-Installation Guide and the manuals for additional options (see Chapter 9).

About — Displays the version number of the Model 7100 Series software, DCE version and the Vision Card type (see Figure 2-11).

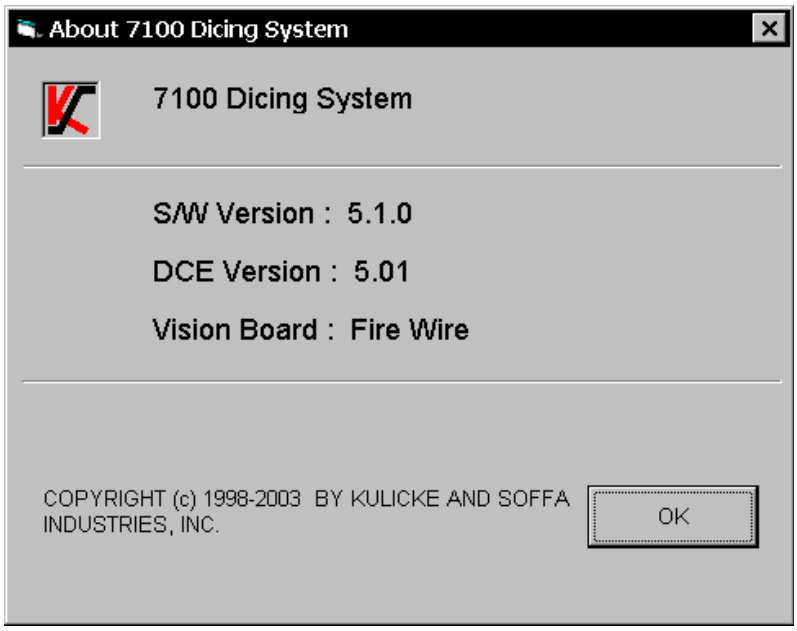


Figure 2-11: Help/About Screen

2.2.2 Toolbar

The toolbar changes according to the Workspace. In all Workspaces, the toolbar contains the following buttons:



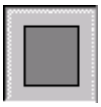
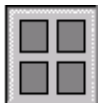
Video Workspace See section 2.2.10.2.



Main Workspace See section 2.2.10.1.



Programming Workspace See section 2.2.10.3.

	**Load Monitor Workspace**	See section 2.2.10.5.
	**Multiview 1, 4** or **12**	Displays the current Kerf Check.
		Displays the last four models found.
		Displays up to 12 Kerf Checks.
	**Workbook Workspace**	See section 2.2.10.4.
  	**Blade Info/ Override/ Dressing Workspace**	See section 2.2.10.6
	**Help**	Loads the Operation Manual file.

2.2.2.1 Additional Tools - Main & Video Workspace

In the Main Workspace and Video Workspace, the toolbar contains the following additional buttons:

 	**Load/Unload Wafer**	Enables a Workpiece to be placed on and removed from the Cutting Chuck. For more information, see Chapter 3.
	**Wafer Auto-Alignment**	Performs Auto Alignment on the selected Workpiece. For more information, see Chapter 6.
	**Wafer Manual Alignment**	Starts the Manual Alignment process. For more information, see Chapter 6.

	**Manual Y Offset**	Starts the Manual Y Offset procedure. For more information, see Chapter 6.
	**Auto/Manual Cut Verification**	Starts the Cut Verification process. For more information, see Chapter 6.
	**Manual Kerf Check**	Starts the Manual Kerf Check process. For more information about Kerf Checking, see Chapter 6.
	**Wafer Full/ Partial Cut**	Gives the user two options: Full Wafer Cut and Partial Wafer Cut. For more information, see Chapter 6.
	**Dress Station**	Gives the user two options: Dress on Dress Block and Change Dress Block. Applicable only if the system configuration includes a Dress Station.For more information, see Chapter 9
	**Unlock LU Cover**	Disengages the Load/Unload Cover Interlock. (Available on EUR and LA configured systems).

2.2.2.2 Additional Tools - Programming Workspace

In the Programming Workspace, the toolbar contains the following additional buttons:

	**Save**	Saves the current parameters defined in the Programming Workspace.
	**Cancel**	Cancels the last changes.
	**Delete**	Deletes any selected recipe except for the templates or the active recipe.
	**Apply**	Applies the last change.

2.2.2.3 Additional Tools - Workbook Workspace

In the Workbook Workspace, the toolbar contains the following additional buttons:



Save — Saves the current parameters defined in Workbook Workspace.

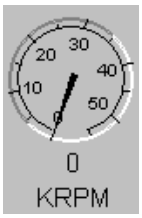


Cancel — Cancels the last changes.

2.2.3 Gauges

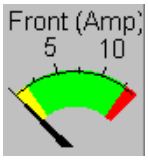
The Gauges on the right side of the main window indicate the speed of the Spindle, current load on the Spindle, Blade Cooling Water and Spray indication, Main Air Inlet Pressure and Vacuum level on the Workpiece Holder.

2.2.3.1 Spindle Speed Gauge



The speed of the Spindle (in KRPM) is indicated by the needle on the gauge. The Spindle can be activated or deactivated by right-clicking the Spindle gauge and selecting **Operate** from the menu that appears.

2.2.3.2 Load Gauge



The Load Gauge indicates the electrical current of the Spindle Motor during dicing, and represents the dicing behavior. Load Monitor indicates if the motor is overloaded with torque due to dicing failure or bad dicing parameters. For more information about Load Monitoring, refer to Chapter 8.

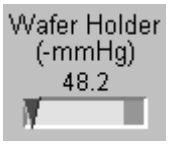
Note: On the Fortis machines (AC Spindle), the Load Gauge is not presented, because with the AC type of spindle, the load changes as a function of velocity and does not represent the load.

2.2.3.3 Air Pressure Gauge



Air Pressure Gauge indicates the Main Inlet Air Pressure supplied to X-axis, spindle and other subsystems of the machine.

2.2.3.4 Wafer Holder Gauge



Wafer Holder Gauge indicates the status of the wafer (substrate) Vacuum level.

2.2.3.5 Water Adjust



The Water Adjust Gauge indicates the flow rate and spray of the cutting water and cleaning jets.

Pressing the **Water Adj.** button activates the water flow.

2.2.4 Dicer Status Indicator

The lower right section of the main window displays the status of the Dicer.



Figure 2-12: Dicer Status Indicator

The status of the Dicer is indicated by the following LEDs:

- **Red**: An error/failure exists. The System stops working and an error message appears on the screen.
- **Yellow**: User assistance required. A message appears on the screen.
- **Green**: When blinking, the station is carrying out an operation. Otherwise, green indicates that the station is in idle mode.

For example, when placing a Workpiece on the Cutting Chuck, at the point when the User should load the Workpiece, the yellow light goes on.

The User can also initialize the Dicer by right-clicking the Dicer Status Indicator and selecting **(Dicer) Init** from the popup menu displayed. For further information about initialization, refer to Chapter 10.

Double-clicking on the Dicer Status Indicator displays the last error message.

2.2.5 Active User Field

The Active User field displays the current recipe file name assigned to the loaded workpiece, and the operations performed, according to the recipe.

2.2.6 Activity Log

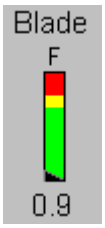
The Activity Log is located in the lower left corner. It provides a history log of activities performed by the system.



Figure 2-13: Activity Log

Events that have scrolled off the display can be reviewed using the scroll buttons.

2.2.7 Blade Indicator



The Blade Indicator on the left side of the main window displays the Blade exposure. The bar, which represents the Blade in the system, provides a guide as to the condition of the Blade based on the Blade parameters specified in the Blade properties and the current Recipe. The black pointer moves slowly up the guide as the Blade wears down.

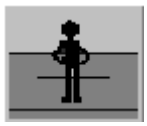
The colors in the Blade Indicator bar indicate the following:

- **Green**: Blade exposure satisfactory, cutting can continue
- **Yellow**: Blade exposure critical, cutting can only continue for a short time
- **Red**: Blade requires changing, no cutting possible

For more information about Blades and Blade changing, see Chapter 7.

2.2.8 Run Button

The **Run** Button serves both as a control and an indicator while the system is in Auto Mode.

	**Ready**	The system is idle. Press the button to run the process.
	**In Progress**	System is active. A process in progress.
	**Paused**	Process paused. The machine stops at the end of the current kerf.

2.2.9 Stop Button

The **Stop** Button  stops any activity in order to prevent self-injury or damaging the material.

The soft **Stop** button functions similarly to the Stop-Off button on

the Model 7100 Series Front Panel (see section 2.1.1.2). Clicking the Stop Button stops the system and a pop-up message appears on the screen:



At this point, after clicking **OK**, the User can either press the OFF button to power down the System, or continue the interrupted process from the point, at which the soft Stop button was clicked.

Note: Wait at least one second between the first button press and the confirmation.

Upon clicking the Stop Button, the system stops at its current location in all axes, excluding the Z-axis, which moves up (if Stop is clicked during the first init, the Z-axis also freezes) and the spindle, which turns off only if so defined in the recipe. Stopping the cooling block water can also be defined in the recipe.

If the Stop button is clicked, while the system is in Auto Run mode, the system finishes the current process and brings the workpiece to the manual unload station. The user is prompted to manually unload the workpiece. In order to return to the Auto Run mode, press **Auto Run**.

The Stop button parameters can be defined under Cutting Block station (see Figure 2-14).

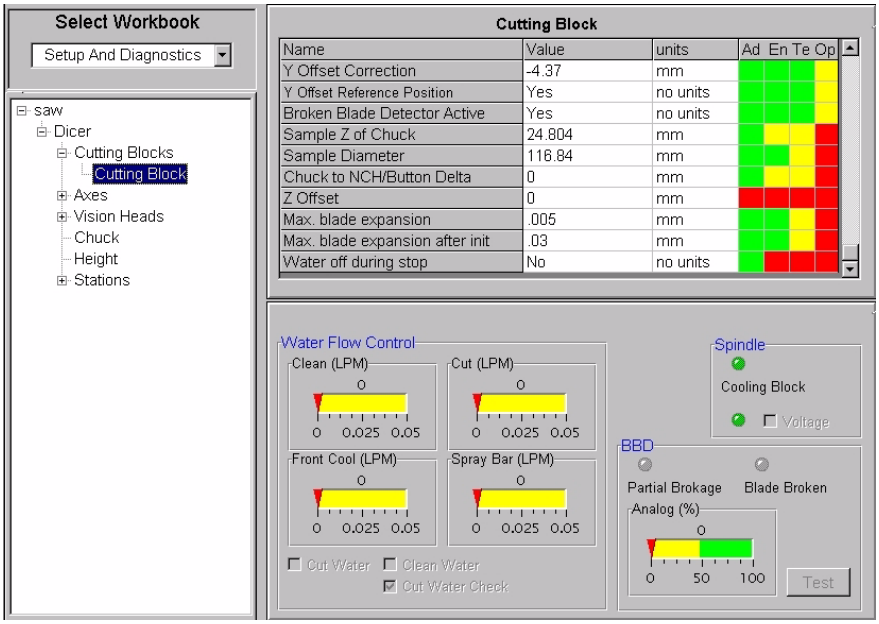


Figure 2-14: Stop Button Parameters

In systems with **Autoloader**, the Stop button behaves the same way as in a standard system. Upon Stop confirmation (clicking **Yes** in the pop-up message), the system becomes idle, while the Autoloader performs initiation. All buttons are disabled until the Autoloader initiation is completed.

Note: The user is prompted to manually remove all the workpieces that are not properly positioned in the cassette but are situated elsewhere between the Cassette Compartment and the Cutting Chuck. **The workpieces are to be removed before Stop confirmation**.

2.2.10 Workspaces

The central portion of the main window is called the Workspace. The Model 7100 software contains six Workspaces that are used to perform different tasks, as follows:

- **Main Workspace**: Displays a graphical representation of the Cutting Chuck, Spindle and Vision System, as well as a representation of the Cassette Compartment (only for Systems equipped with the optional Autoloader).

- **Video Workspace**: Displays a real-time video image of the Workpiece on the Cutting Chuck. The Video Workspace also displays the Cut Map and the Wizards that guide the User through selected procedures.
- **Programming Workspace:** Enables the User to create and edit Recipes assigned to Workpieces.
- **Workbook Workspace**: Displays a set of operations and parameters used to prepare the System for operation. There are two Workbooks, as follows:
  - Setup & Diagnostics Workbook
  - Calibration Workbook
- **Load Monitor Workspace**: Displays load monitoring statistics.
- **Blade Info/Override/Dressing Workspace**: Displays the Blade parameters and the set of operations and parameters used for Blade Dressing.

The Workspace displayed in the main window is selected by clicking one of the following buttons from the toolbar:

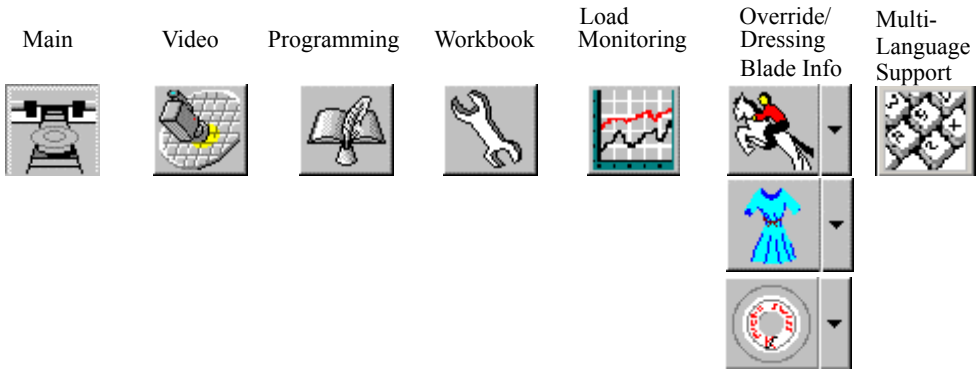


Figure 2-15: Workspace Buttons

2.2.10.1 Main Workspace

The Main Workspace is automatically displayed when the software is launched and can be redisplayed at any time by clicking the **Main Workspace** toolbar button. When selected, the Main Workspace displays the following:

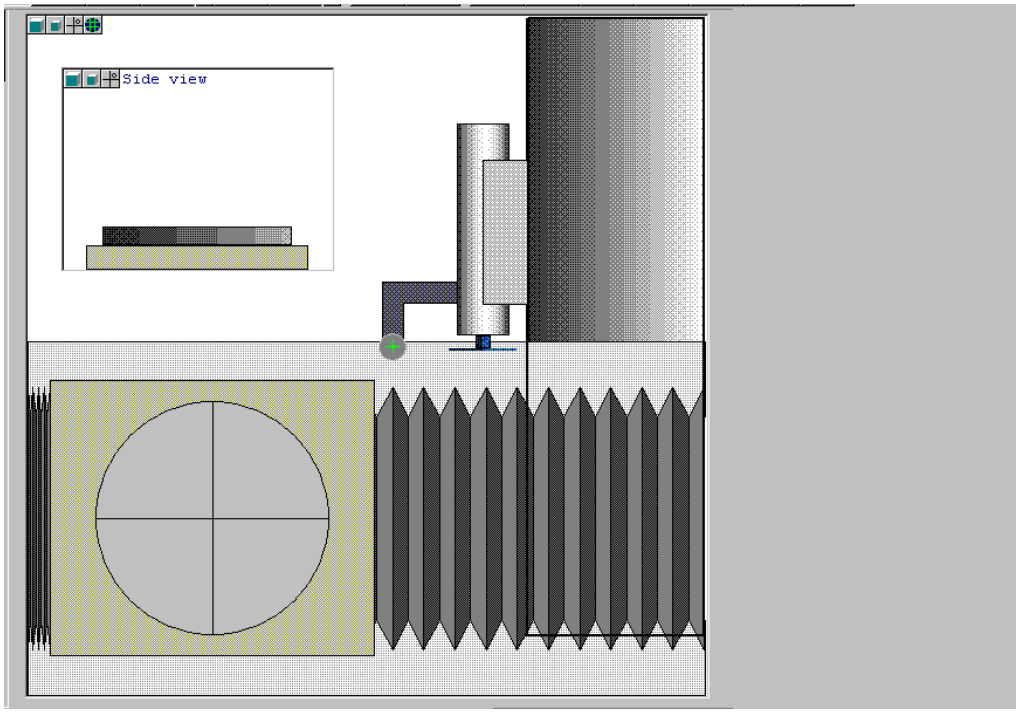
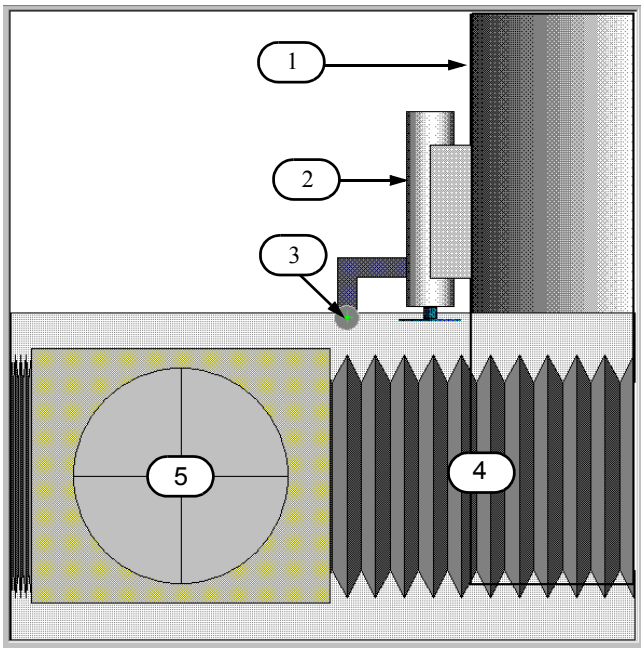


Figure 2-16: Main Workspace

The Main Workspace displays an animated graphical representation of the Workpiece being processed in real-time.

2.2.10.1.1 Top View Area

The Top View area depicts the System stations from above, including the Workpiece (if present), Spindle, Blade and Camera. When cutting is performed, the Blade is shown moving across the surface of the Workpiece.



1 Y-Axis
2 Spindle with Blade
3 Camera
4 X Bellows
5 Cutting Chuck

Figure 2-17: Top View Area

The presence of a Workpiece within the System is indicated by a blue disk on the Chuck.

Right-clicking anywhere in the Top View area displays the following popup menu:

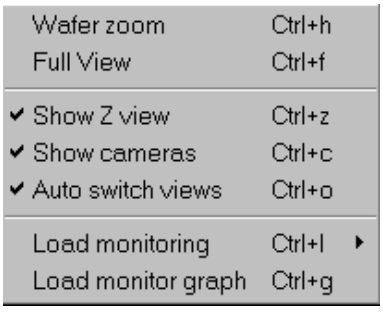
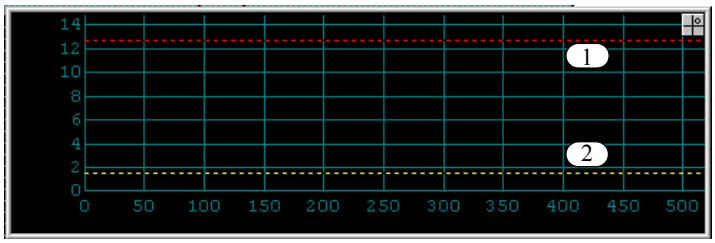


Figure 2-18: Top View Popup Menu

The options in the popup menu enable the Top View to be manipulated, as follows:

- **Wafer zoom**: Displays a close-up view of the Top View area.
- **Full View**: Displays the Top View area in full, along with an insert displaying the side view of the Theta Table.

- **Show Z view**: Toggles the display of the Side View area (see section 2.2.10.1.2).
- **Show Cameras**: Toggles the display of the Camera, Microscope, and Spindle with Blade in the Top View area.
- **Auto Switch Views**: The System automatically switches between Main Workspace and Video Workspace when necessary, for example, after Manual Alignment is completed in Video Workspace and the User clicks **Finish**, the Main Workspace is automatically displayed.
- **Load Monitoring**: Specifies whether the current on the load monitor is reflected in the color of the cuts displayed in the cut map.
- **Load Monitor Graph**: Displays a real-time Load Monitor graph at the bottom of the Top View area showing the current of the Spindle.



1 Upper Limit
2 Lower Limit

Figure 2-19: Load Monitor Graph

If the current is above the Upper Limit or below the Lower Limit, the Spindle stops.

The User can click in the Load Monitor graph to zoom in and click  to display the Load Monitor graph in full again. The graph can be resized by clicking and dragging its borders.

Additionally, the buttons at the top of the Top View area enable the Top View area to be manipulated as follows:

 Gradually zooms in on the Top View area.

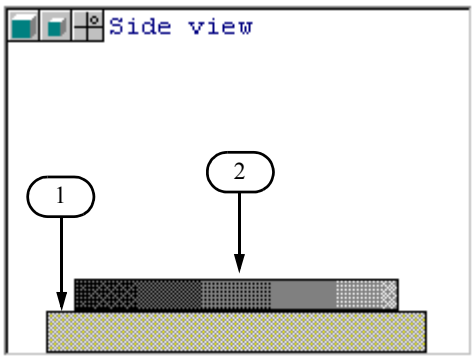
 Gradually zooms out of the Top View area.

 Displays the Top View area in full.

 Displays a close-up view of the Cut Map.

2.2.10.1.2 Side View Area

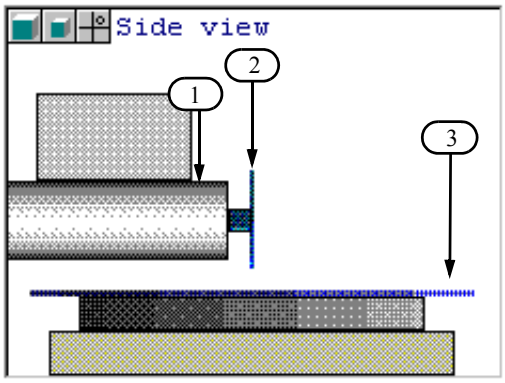
The Side View area depicts the Dicer from the side, showing the Dicer and Workpiece (if present).



1 Theta Table
2 Cutting Chuck

Figure 2-20: Side View Area

When Process Height is performed, the Blade is shown being lowered to the surface of the Cutting Chuck before returning to its previous position. When dicing is performed, the Blade is shown moving across the surface of the Workpiece, one cut index at a time, in the Y direction.



1 Spindle
2 Blade
3 Workpiece

Figure 2-21: Dicing from the Side View

The buttons at the top of the Side View area enable the Side View area to be manipulated as follows:

 Gradually zooms in on the Side View area.

 Gradually zooms out of the Side View area.

 Displays the Side View area in full.

2.2.10.2 Video Workspace

The Video Workspace is selected by clicking  in the main window toolbar.

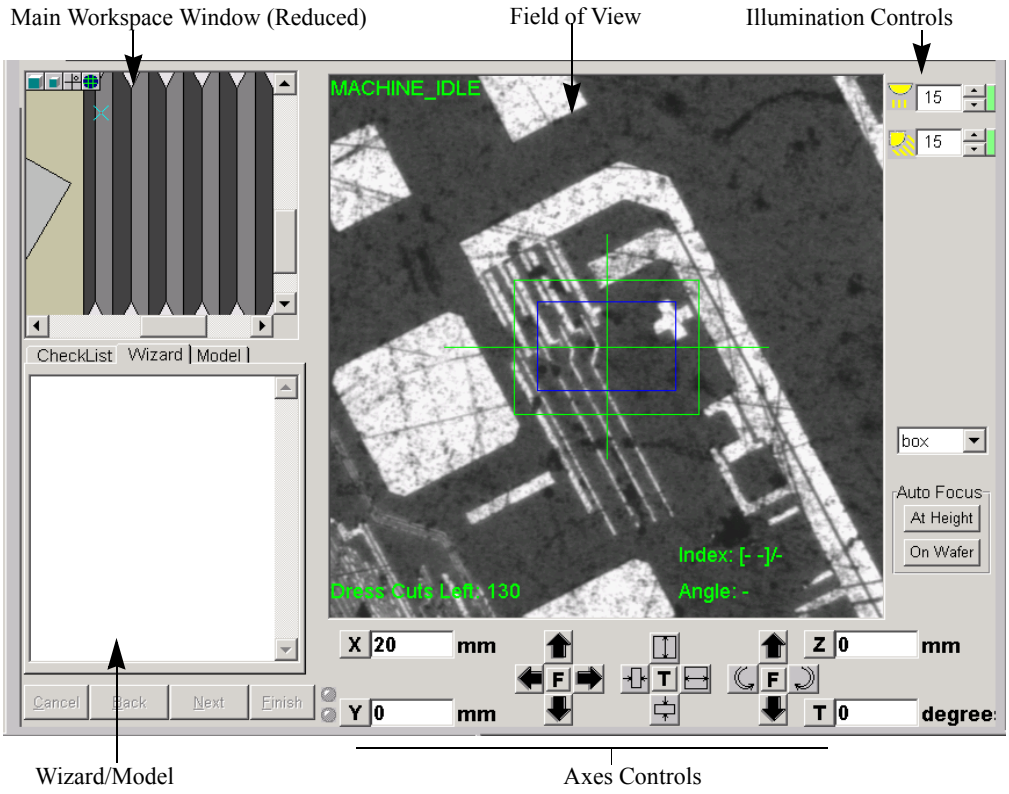


Figure 2-22: Video Workspace

The Video Workspace displays a real-time video image of the Cutting Chuck from the camera mounted on the Spindle. The area of the Video Workspace where the video image is displayed is called the Field of View (FOV). The portion of the Workpiece in focus in the FOV can be precisely positioned using the Display Controls.

Right-clicking in the Video Workspace enables the User to refresh the image, save it or load an image stored on the computer.

Illumination of the Workpiece is set with the Illumination Controls. These controls define the type of light used to illuminate the part of the Workpiece in focus and its intensity.

The Video Workspace contains tools for setting magnification levels (Zoom) used to display, align and cut objects, according to specific needs.

Note: The Zoom option is available only on machines that support a “Teli” camera type.

In other operation modes, the Video Workspace also contains additional tools for:

- Changing the type of Search Area used in the FOV
- Teaching and finding models
- Setting Auto Focus
- Setting illumination intensity

2.2.10.2.1 Field of View (FOV)

The FOV displays real-time video images of the Cutting Chuck, as viewed by the active camera. The FOV is used when doing any of the following procedures:

- Teaching Alignment
- Teaching Index
- Teaching Kerf Checking
- Inspection

Note: Procedures performed with the FOV are described in detail in Chapter 6.

The FOV includes three visual Guides that are used to precisely position a particular location of the Workpiece in the center of the FOV display:

- Reticle
- Search Area
- Teach Area

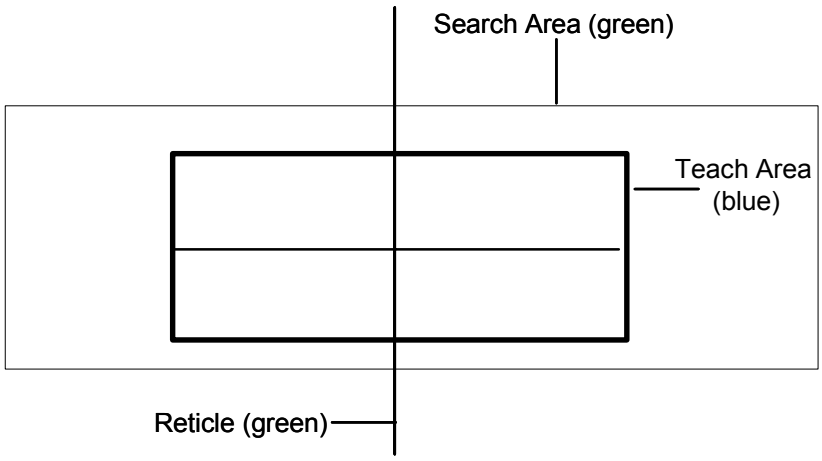


Figure 2-23: FOV Display Guides

Reticle

The Reticle consists of green crosshairs that are used to pinpoint a location on the part of the Workpiece displayed in the FOV. In addition, the horizontal line of the Reticle is used when teaching Alignment or performing Manual Alignment. The length of the lines of the Reticle can be adjusted by using the Guide Control (the central Display Control.)

Teach Area

The Teach Area is a blue box that is used when Teaching Alignment or Kerf Checking. The Teach Area defines the area to be taught to the system when performing these procedures. The size of the Teach Area can be adjusted by using the Guide Control (the central Display Control) or by clicking and dragging its borders with the mouse.

Search Area

The Search Area is used to define the field the Vision System will use to search for anything taught in the Teach Area box.

In addition, the Search Area is a guide that can be used to focus on a particular area of a Workpiece when performing certain operations. For example, when performing Alignment, the Search Area helps the User to focus on a particular street. The Search Area has a green outline, and its shape is selected from the following options in the drop-down list to the right of the FOV:

- **Box**: A box centered in the FOV.
- **Parallel**: Two horizontal parallel lines centered in the FOV.
- **Dashed**: Two dashed horizontal parallel lines centered in the FOV.

The size of the Search Area can be adjusted using the Guide Control (the central Display Control) or by clicking and dragging with the mouse.

2.2.10.2.2 Display Controls

The Video Workspace contains three Display Controls beneath the FOV that are used to move the X, Y, Z and Theta axes and to precisely position the image of the Workpiece displayed by the active camera.

X/Y-Axis Controls

The X/Y-Axis Controls (left Display Control) move the image displayed in the FOV along the X and Y Axes of the Workpiece.

The left and right arrows move the Cutting Chuck along the X-Axis. The exact position is displayed in the **X** field. The up and down arrows move the camera along the Y-Axis. The exact position is displayed in the **Y** field.

Clicking on an axis button turns the coordinate value on the current axis into a reference point (zero) as shown in Figure 2-24.

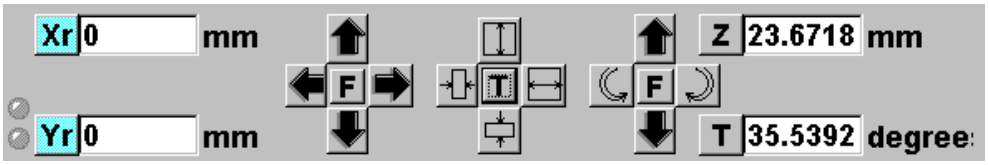
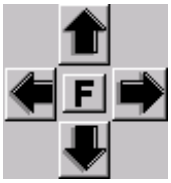


Figure 2-24: Zeroed Axis Buttons

The Axis buttons turn blue and an "r" (reference) letter appears next to the Axis letter.

Clicking the central box changes the type of movement, as follows:



F: Moves at the Fast Velocity, as defined in the X and Y Axes parameters in the Setup & Diagnostics workbook.

S: Moves at the Slow Velocity, as defined in the X and Y Axes parameters in the Setup & Diagnostics workbook.

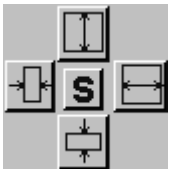
P: Moves one pixel at a time.

I: Moves Index by Index along the Y-Axis, using the Index value specified in the Recipe (relevant only if a Cut Map exists).

Note: The Workpiece and the Vision head can be moved along the X and Y Axes by double-clicking a location inside the FOV.

Guide Controls

The Guide Control (central Display Control) is used to change the size of the Guides (Reticle, Teach Area and Search Area) displayed in the FOV. Clicking the central box toggles the item to be resized, as follows:



S: Search Area

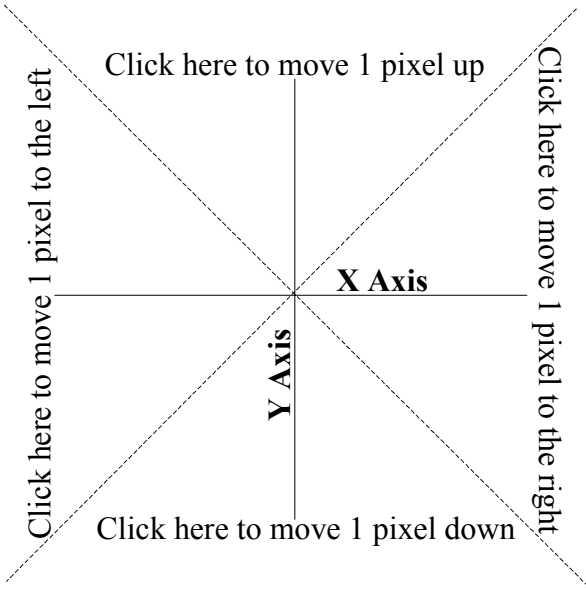
R: Reticle

T: Teach Area

The left and right buttons adjust the width of the selected Guide, while the up and down buttons adjust the height of the selected Guide.

Note: When the Search Area is **Parallel** or **Dashed**, the left and right buttons are disabled. Only the height can be changed when using these Search Areas.

Double-clicking any point in the FOV bring the FOV center to that point. Center-clicking moves the FOV center 1 pixel along the axes, depending on the zone clicked:



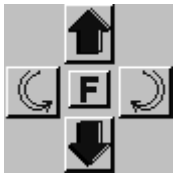
Note: The axes can also be moved by typing in coordinates values and pressing Enter.

Z/T Axis Controls

The Z/T Axis Controls (right Display Control) move the image displayed in the FOV along the Z and Theta Axes.

The left and right arrows rotate the Cutting Chuck along the Theta Axis. The exact position on the Theta Axis is displayed in the **T** field. The up and down arrows move the camera along the Z-Axis (change the focus of the camera on the Workpiece). The exact position on the Z-Axis is displayed in the **Z** field.

Clicking the central box changes the type of movement, as follows:



F: Moves at the Fast Velocity, as defined in the Z and T Axis parameters in the Setup & Diagnostics workbook.

S: Moves at the Slow Velocity, as defined in the Z and T Axis parameters in the Setup & Diagnostics workbook.

P: Moves one pixel at a time.

A: Toggles between the angles defined in the Recipe.

Note: For more information about the Setup & Diagnostics workbook, refer to the **ADT Model 7100 Semi-Automatic Dicing System Maintenance Manual**.

2.2.10.2.3 Zoom Controls

Note: The Zoom option is available only on machines that support a "Teli" camera type.

Digital Magnification enables using digital zoom to improve system performance regarding alignment and accuracy. The Video Workspace contains the tools for setting magnification levels used to display, align and cut objects, according to specific needs. The feature supports a continuous digital magnification range between **X0.5** and **X2.0**.

Note: This option is available only on machines supporting **Scorpion** cameras.

The user can set magnifications for a variety of applications, including:

- Inspection
- Y-Offset
- Teaching models
- Alignment Procedure
- Teaching Kerf Checking

To Enable the Zoom Option:

1 Open the main workspace Configuration screen by selecting **Configuration** from the **User** menu.

2 In the value column, next to the parameter Zoom, select: **Yes**.
The camera type automatically changes to **Teli** (see Figure 2-25).

3 Click **Save**.

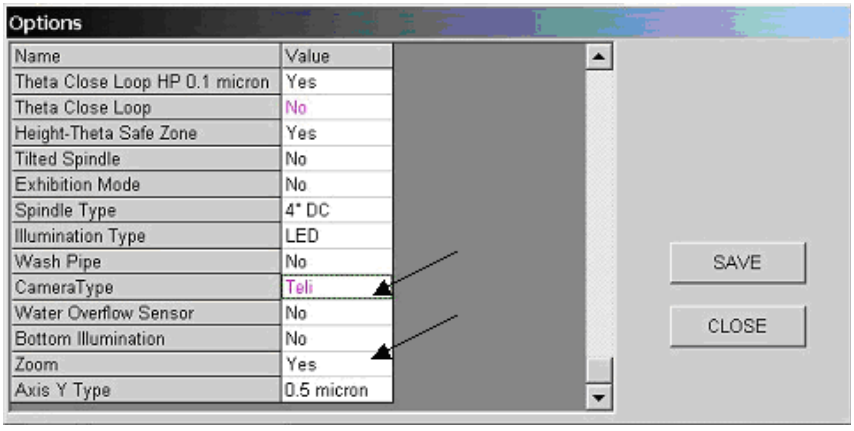


Figure 2-25: Zoom Option Configured

After configuring the Zoom option, magnification can be set in the Video Workspace by using the following controls (see Figure 2-26):

- Manually adjusting the Magnification/Zoom ComboBox control to x1, x2 or x4
- Clicking the +/- button in the video screen of the Video Workspace GUI

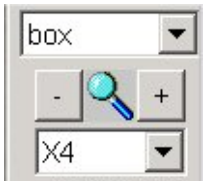


Figure 2-26: Zoom Controls

Note: During the Teach Align Mode Pre-Condition state, the user must choose the Magnification size. It is also possible to teach Magnification for each model individually.

To Enable Digital Magnification:

1 Open the main workspace Configuration screen.

2 In the value column, next to the parameter Zoom, select: **Yes**. The camera type automatically changes to **Scorpion**.

3 Click **Save** (see Figure 3).

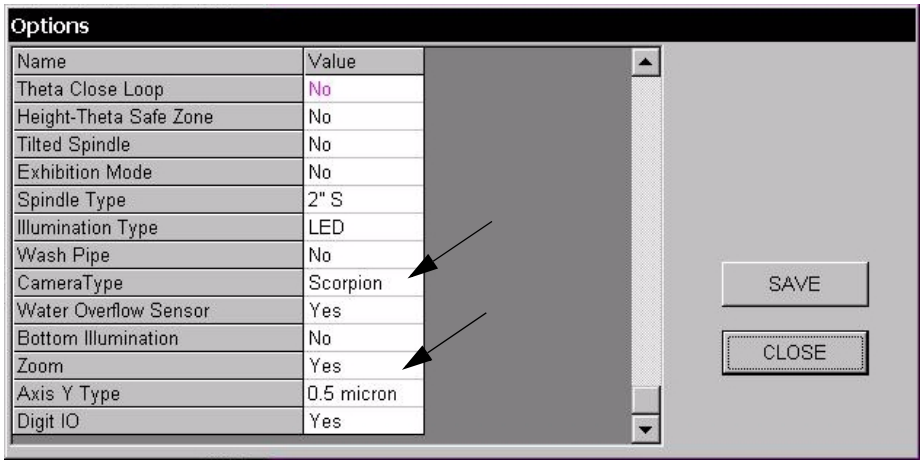


Figure 3: Enabling Digital Magnification

To Use Digital Magnification:

In the Video Workspace, magnification can be set according to the following:

Note: The magnification increment unit is **X0.1**.

- Manually entering a Magnification value between **X0.5** and **X2.0**.

- Clicking the "ticker" up and down arrows next to the magnification value in the Video Workspace GUI.

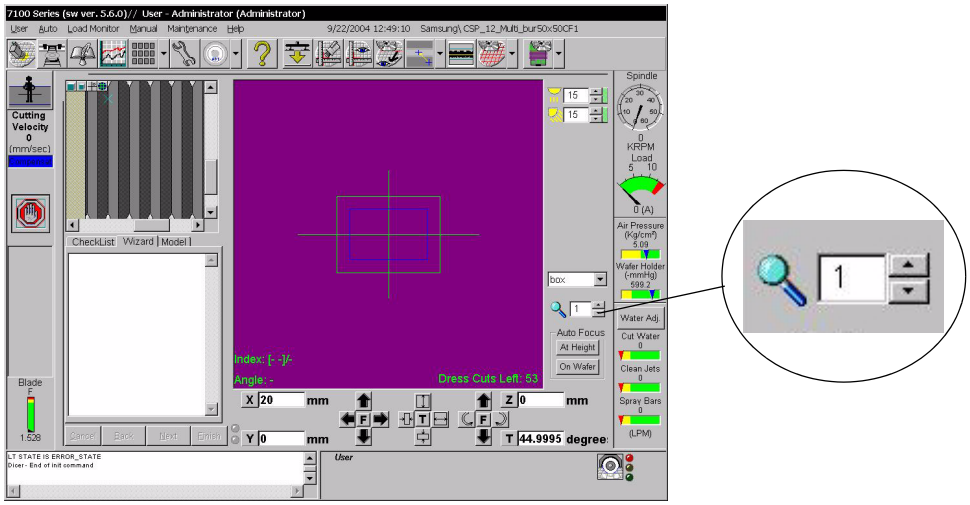


Figure 4: Using Digital Magnification

2.2.10.2.4 Illumination Controls

The two Illumination Controls to the right of the FOV are used to adjust the following display values:



The intensity of the Vertical (Coaxial) illumination used on the part of the Workpiece displayed in the FOV.



The intensity of the Oblique (Ring) illumination used on the part of the Workpiece displayed in the FOV.

Each setting is defined by entering a value in the box to the right of each control or by using the arrows. Illumination of the Workpiece intensifies the display of each pixel viewed using a range of 0-255, where 0 produces a very dark (black) display, and 255 produces a very light (white) display.



In addition, the vertical (coaxial) or oblique (ring) illumination can be turned on and off (set to zero) by clicking the small box next to the arrows. The box is green when the Illumination Control is activated and gray when it is deactivated.

2.2.10.2.5 Wizard/Model Area

The Wizard/Model area at the lower left of the Video Workspace helps guide the User through the steps needed to carry out a procedure, such as Manual Alignment or Removing a Workpiece, and displays a close-up of the Models being taught or searched for.

Wizard

The Wizard tab displays step-by-step instructions for carrying out a selected procedure.

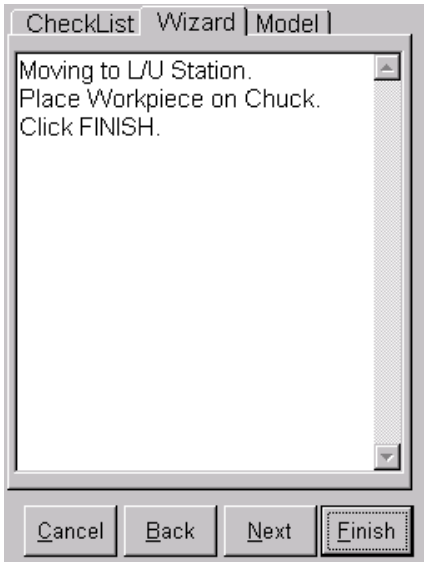


Figure 2-1: Wizard Tab

In the example given in Figure 2-1, the User would place the workpiece on the Cutting Chuck, and then click **Finish**.

The buttons located beneath the Wizard are used to do the following:

Cancel Aborts the current procedure.

Back Reverts to the previous step in a procedure.

Next Proceeds to the next step in a procedure.

Finish Instructs the System to complete the procedure.

When a step in a procedure includes a physical action that the User has to perform, the Wizard displays the appropriate instruction. For example, when placing or removing a Workpiece from the Cutting Chuck, the Wizard indicates when the User should perform the action before returning to the software to click **Finish**.

Model

After the Teach procedure has been performed, the Model tab displays the Model that was taught. During Alignment or Kerf Checking, the Model tab displays the Model currently being searched.

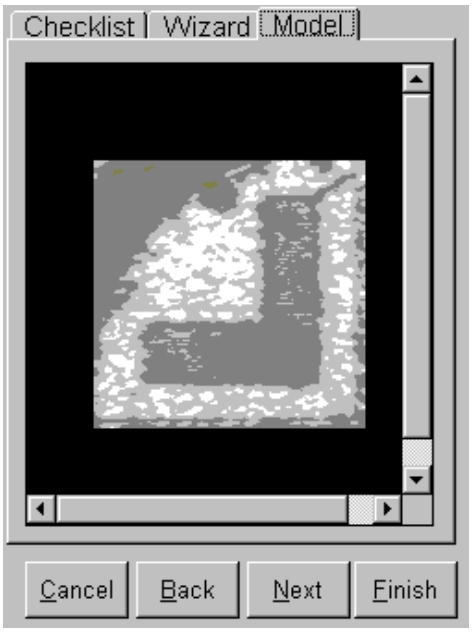


Figure 2-2: Model Tab

2.2.10.2.6 Main Workspace Window

The Main Workspace Window provides a small representation of the Main Workspace, as described in section 2.2.10.1. It depicts the Dicer from above, including the Workpiece (if present), the Spindle and the Blade.

The User can manipulate the Main Workspace Window the same way as in the Main Workspace. For example, right-clicking anywhere in the Main Workspace Window displays the popup menu shown in Figure 2-18 and described in section 2.2.10.1.1.

When working in the Video Workspace, it is useful if the Main Workspace Window displays a close-up of the Cutting Chuck showing the Cut Map of the current Workpiece (if one has been defined), including the position of all Index cuts.

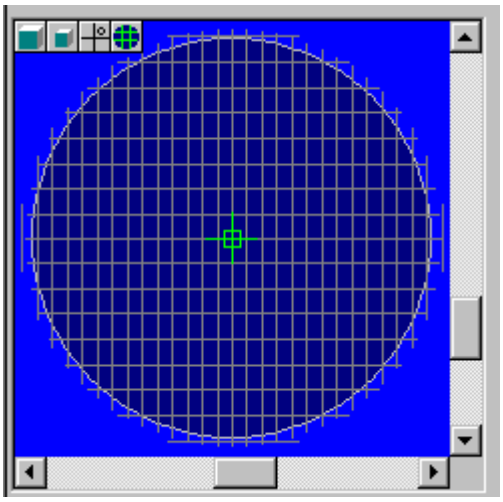


Figure 2-3: Main Workspace Window in Video Workspace

The colors of the Indexes on the Cut Map reflect the following:

- **Yellow (blinking)**: The Index currently being cut.
- **Green**: Completed Indexes.
- **Red**: Cuts that have failed.
- **Blue**: Indexes waiting to be cut.
- **Yellow**: Indexes that have been cut once but are waiting to be cut again, for example, Bevel cuts.

2.2.10.2.7 Other Buttons

The additional buttons that appear to the right of the FOV in the Video Workspace are used to focus the Camera automatically, as follows:



At Height: The System performs auto focus with the Camera at the current height.

On Wafer: The System performs auto focus according to the height of the Workpiece defined in the Recipe.

2.2.10.3 Programming Workspace

The Programming Workspace, selected by clicking  in the main window toolbar, enables the User to create and edit Recipes assigned to Workpieces.

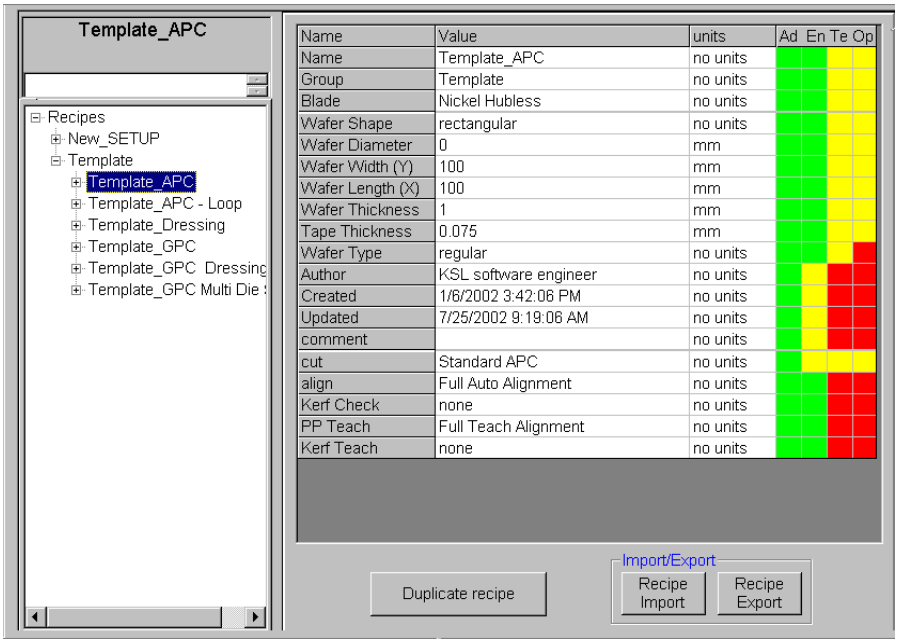


Figure 2-4: Programming Workspace

Selecting a Recipe in the Programming tree on the left of the Programming Workspace displays its properties on the right of the Workspace. For example, in the above figure, the properties for the TMPL_GPC Recipe are displayed. Properties are modified by double-clicking in the **Value** field and entering a value or selecting a value from a drop-down list.

Recipes include parameters that are divided into categories, listed below the Recipe in the Programming tree. Selecting a category displays the

parameters for that category on the right of the Programming Workspace, as follows:

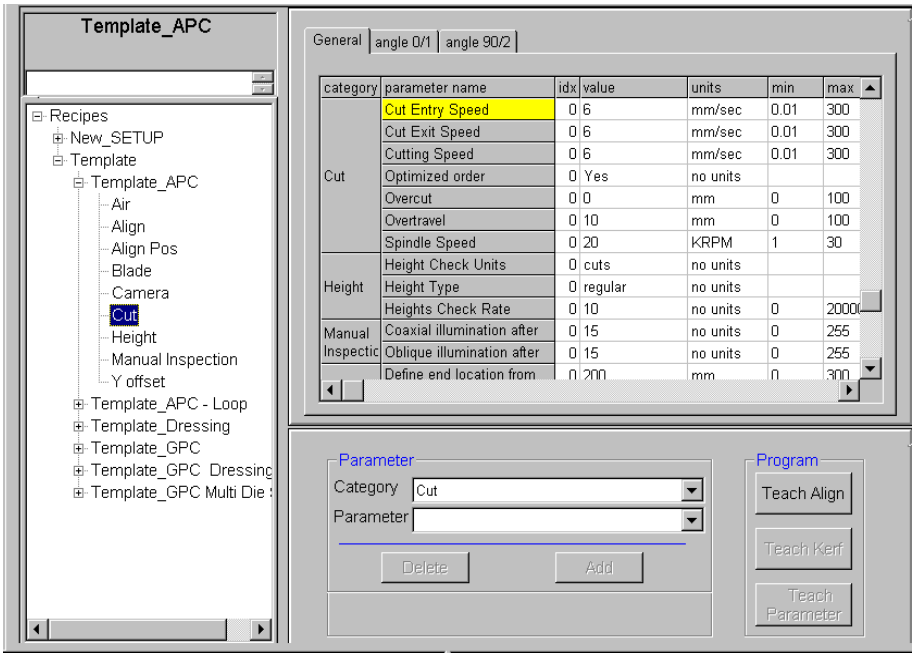


Figure 2-5: Recipe Parameters

Parameters are modified by double-clicking in the **Value** field and entering a value or selecting a value from a drop-down list.

The buttons (tools) in the lower pane of the Programming Workspace enable the User to perform the following operations:

- Add parameters to and delete parameters from a Recipe, for more details see Chapter 5.
- Import and export Recipes, for more details see Chapter 5.
- Teach Alignment, for more details see Chapter 6.
- Teach Kerf Checking, for more details see Chapter 6.
- Teach other parameters, for example, the Index, for more details see Chapter 6.

For a detailed description of the Programming Workspace, see Chapter 5. For a detailed description of Recipe parameters, refer to Appendix 3.

2.2.10.4 Workbook Workspace

The Workbook Workspace is selected by clicking  in the main window toolbar.

There are three workbooks, as follows:

- Setup & Diagnostics workbook, see section 2.2.10.4.1.
- Calibration workbook, see section 2.2.10.4.2.

The User can open workbooks by selecting them from the **Select Workbook** drop-down list or using the Explorer-style tree on the left of the Workbook Workspace.

2.2.10.4.1 Setup & Diagnostics Workbook

By default, the Setup & Diagnostics workbook is displayed after clicking the **Workbook Workspace** button in the main window toolbar, as follows:

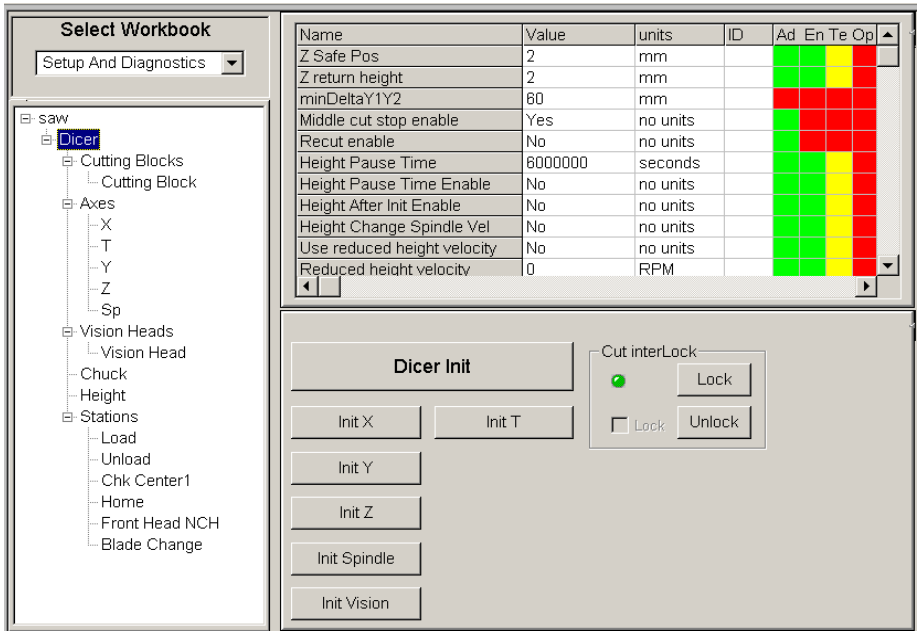


Figure 2-6: Setup & Diagnostics Workbook

The Setup & Diagnostics Workbook enables the User to perform setup and diagnostics procedures on all System components and sub-components. Selecting a station, or one of its elements, in the Setup & Diagnostics tree on the left of the workbook displays its setup parameters on the upper right of the workbook. The lower pane changes according to the selected axis.

For example, Figure 2-6 displays the setup parameters for the X Axis in the upper right pane of the workbook, as well as diagnostic functions relating to the X Axis in the lower right pane. Setup parameters are modified by double-clicking in the **Value** field and entering a value or by selecting a value from a drop-down list.

Overflow Sensor

In the Setup & Diagnostics tree, under Saw, the Overflow sensor is displayed. This sensor is intended to prevent the damage to the System due to the drain pan overflow, which may be caused by clogged drain outlet

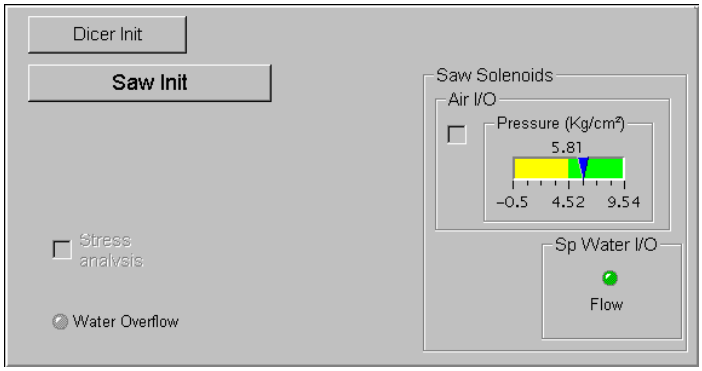


Figure 2-7: Overflow Sensor Indication

If the drain pan becomes overflown, the indicator (see Figure 2-7) changes its color from gray to red, and an error message appears (see Figure 2-8).

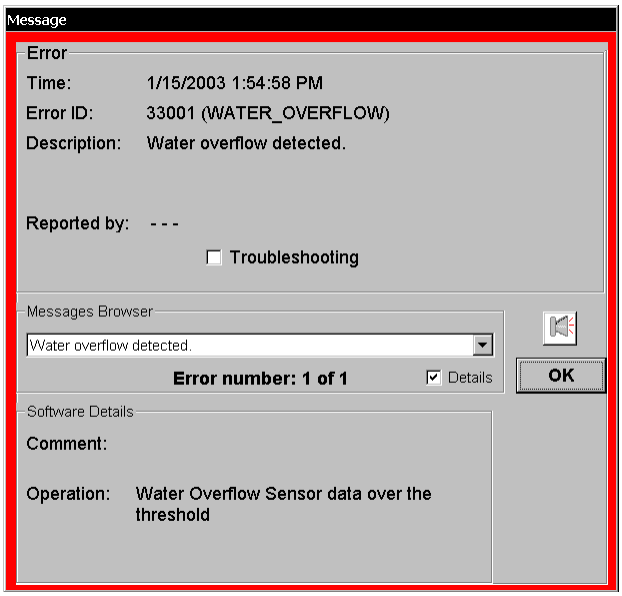


Figure 2-8: Water Overflow Message

Once an overflow is indicated the di-water supply to the cooling block and to the Non-Contact Height Device becomes disabled. During the time that the overflow sensor is on, the operator cannot operate the water. For more details about the Overflow sensor, refer to the 7100 Series Maintenance Manual.

For a detailed description of the setup parameters and diagnostic tests for each station, refer to the **ADT Model 7100 Semi-Automatic Dicing System Maintenance Manual**.

2.2.10.4.2 Calibration Workbook

The Calibration Workbook enables the User to calibrate specific elements in the System.

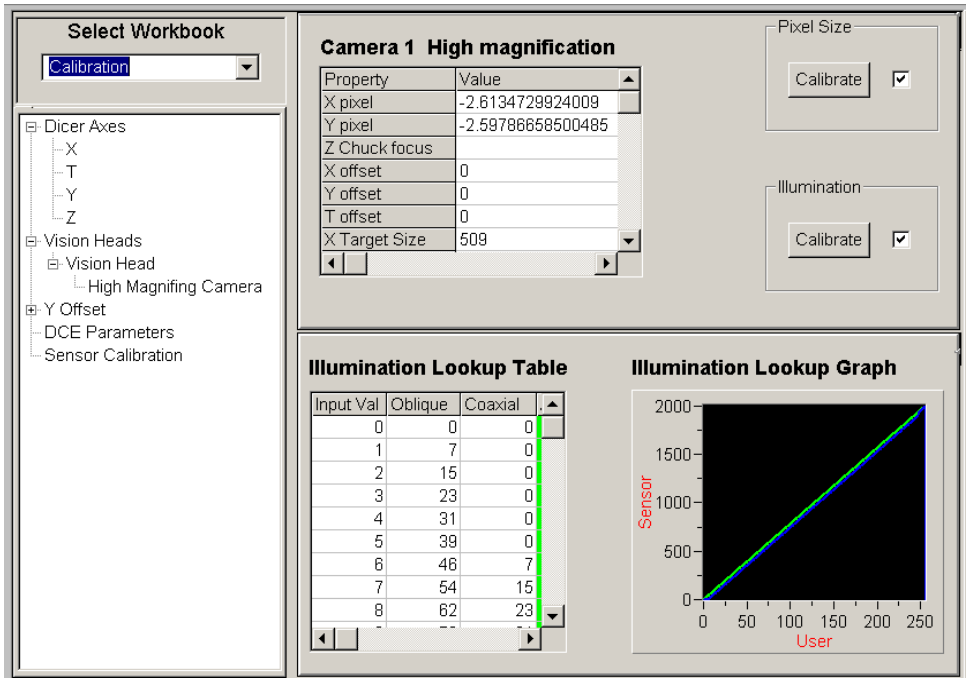


Figure 2-9: Calibration Workbook

The following elements of the System can be calibrated:

- Pixel Size
- Illumination
- Axes (Error Mapping)
- Sensors (see below)

Selecting the High Magnifying Camera for the Vision Head (Microscope) in the Calibration tree on the left of the workbook displays calibration parameters on the right of the workbook. The User can perform pixel size and illumination calibration by clicking the **Calibrate** buttons on the top right of the workbook.

Parameters can be modified by double-clicking in the **Value** field and entering a value.

Caution: Changing the calibration values can affect the performance of the Model 7100.

Sensors

The following sensors are listed under Sensor Calibration (see Figure 2-10):

- Main Air Sensor
- Wafer Holder Vacuum Sensor
- Chuck Holder Vacuum Sensor
- Theta Vacuum Sensor
- Theta Air Sensor

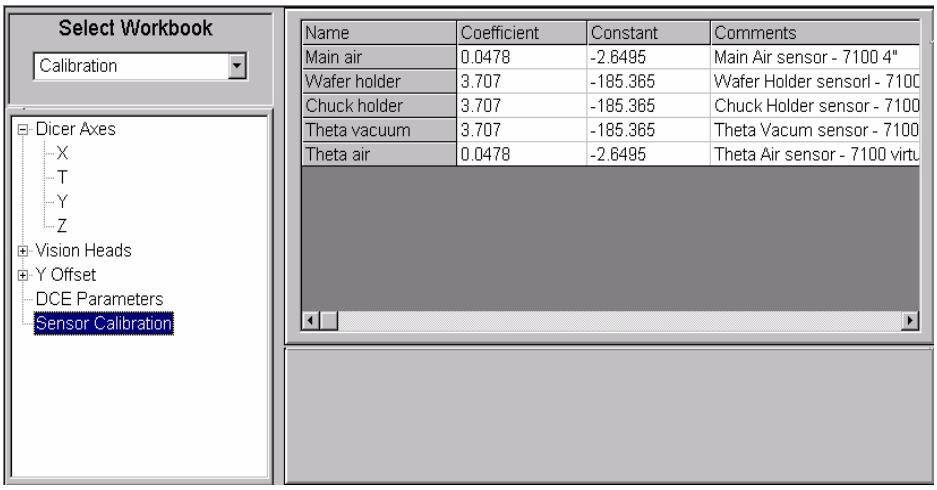


Figure 2-10: Calibration Workbook: Sensor Calibration

This section is designed for use by version 4.5.2 or later.

2.2.10.5 Load Monitor Workspace

The Load Monitor Workspace is selected by clicking  in the main window toolbar.

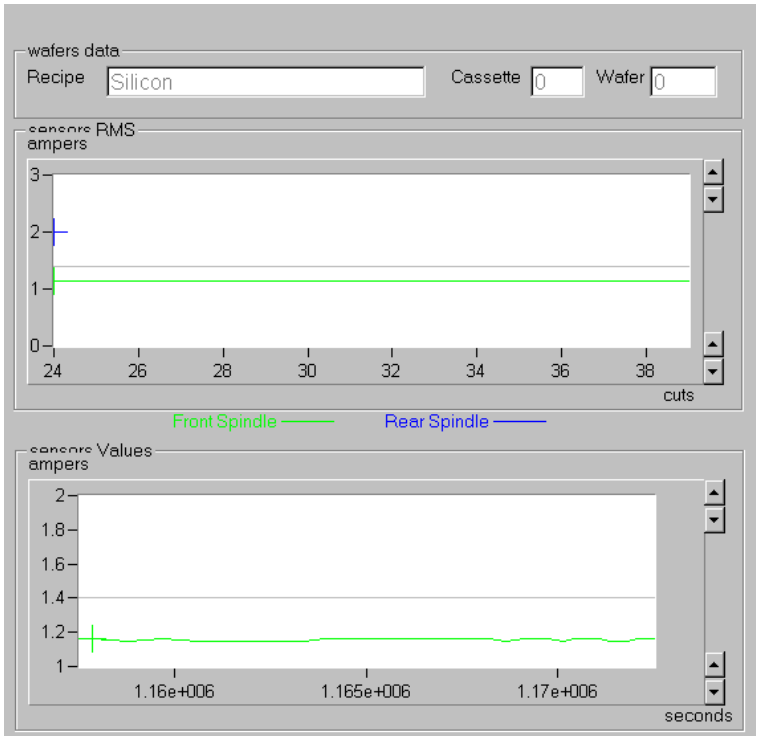


Figure 2-11: Load Monitor Workspace

The Load Monitor Workspace displays load monitoring statistics from different perspectives. For a detailed description of this Workspace, refer to Chapter 8.

2.2.10.6 Blade Info/Override/Dressing Workspace

The Blade Info/Override/Dressing Workspace is selected by clicking  or  in the main window toolbar. Toggle between these buttons by clicking the arrow next to the button and selecting either **Dressing**, **Override**, or **Blade Info** from the options displayed.

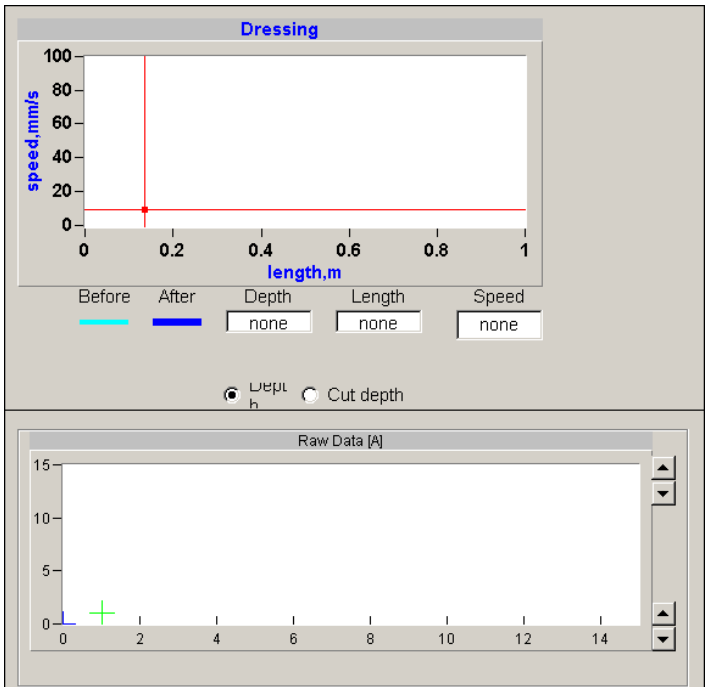


Figure 2-12: Dressing Workspace

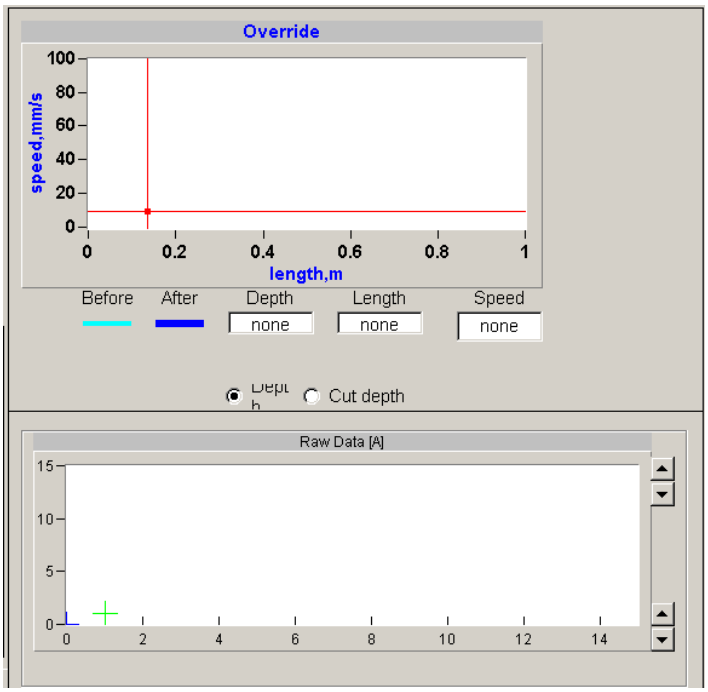


Figure 2-13: Override Workspace

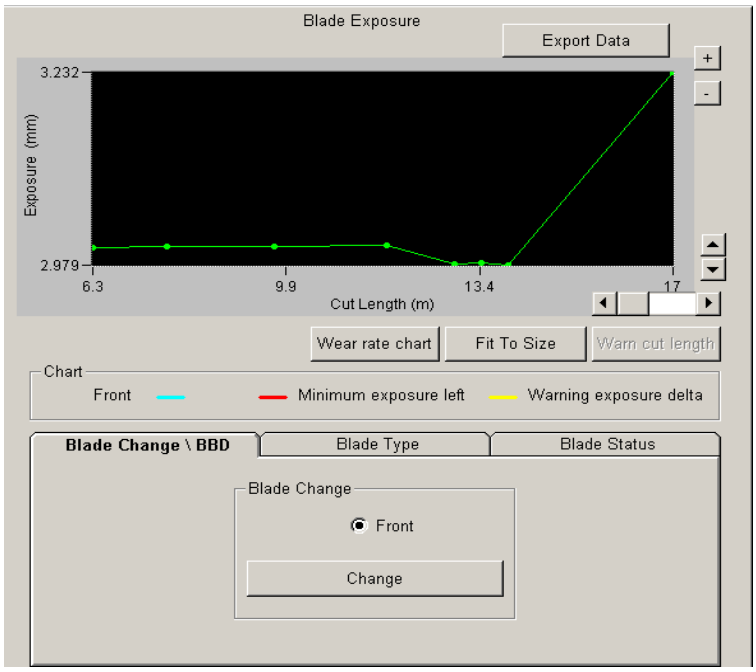


Figure 2-14: Blade Info Screen

The **Blade Info/Override/Dressing** Workspace enables the User to start and stop Blade Dressing and displays information about the Blade Dressing procedure. Blade Dressing is performed to prepare a Blade for use, either using a Dressing Workpiece or by Override cutting.

The **Blade Info/Override/Dressing** Workspace is described in section 7.4.3.

2.3 System Configuration

The Configuration Dialog box shown in Figure 2-15 enables the user to see what components are installed on the system. The user can update the system configuration if there are any changes (e.g. Height Device type change). Once configured, the System is aware of which features it is equipped with.

To Configure the System:

1 From the User Menu, select Configuration. The Configuration screen appears.

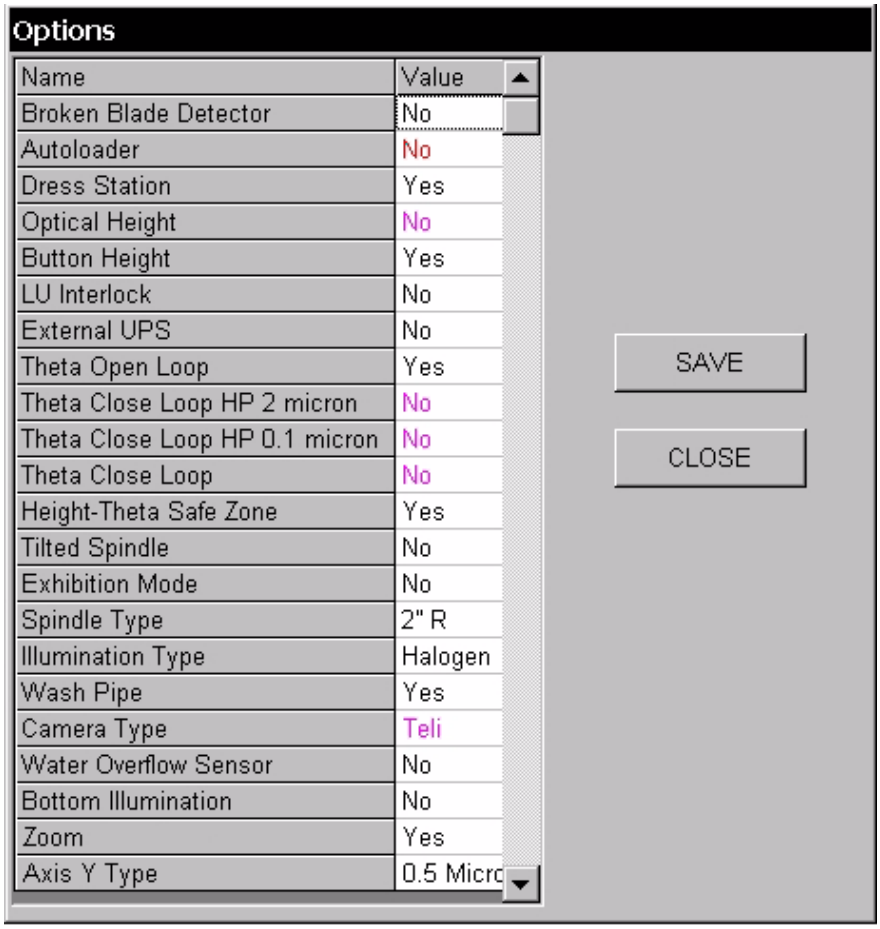
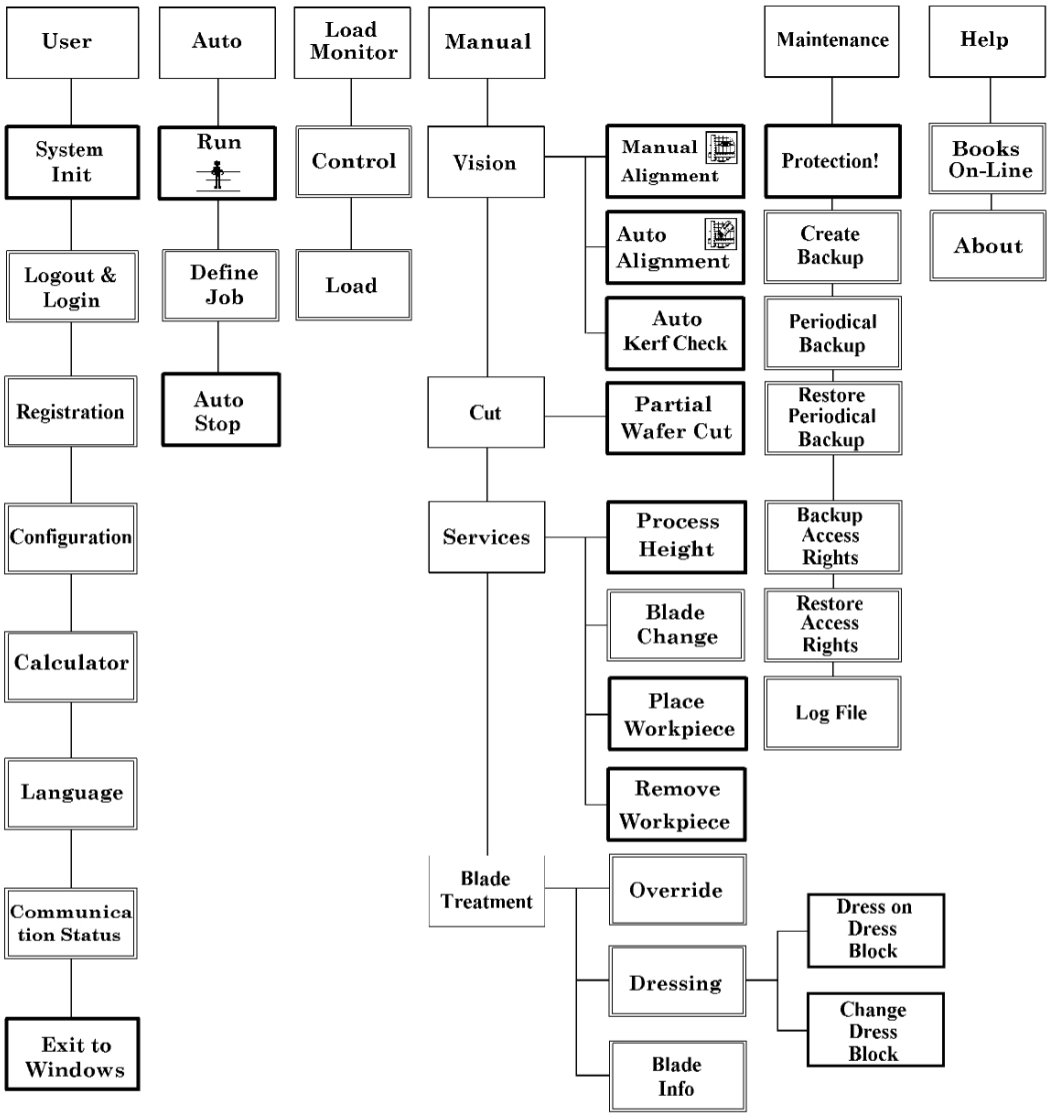


Figure 2-15: Configuration Dialog Box

2 Configure the features according to the System by double-clicking the Value cell of each feature and selecting Yes or No from the drop-down list.

3 Click **Save**. A pop-up dialog box appears informing the user that after saving the changes, the system will exit to Windows, and the user will need to restart the GUI.

2.4 Menu Navigation Chart



3 SYSTEM OPERATION

This chapter describes the Model 7100 operation in automatic and manual workflows and includes the following sections:

- Powering Up and Down, section 3.1
- Logging in, section 3.2
- System Initialization, section 3.3
- Defining Jobs, section 3.4
- Placing/Removing Workpieces, section 3.5
- Model 7100 Workflows, section 3.6
- Stopping System Operation, section 3.7
- Log File, section 3.8

3.1 Powering Up/Down Procedures

3.1.1 Powering Up the System

This section describes the procedure for powering up the Model 7100 at the beginning of a session. Once powered on, the Model 7100 can be run continuously. It only needs to be powered down in order to perform repair and maintenance procedures. For additional information about powering down the System, see section 3.1.2.

Note: Before powering up the system, make sure that both the computer and the monitor are powered off (monitor LED is off).

To Power Up the System:

1 Turn on the main Circuit Breaker at the right side of the System, if it has been turned off (normally it is left in the On position).

2 On the System Front Panel, press the **ON**  button. The PC inside the System turns on and automatically launches the Model 7100 software.

3.1.1.1 Powering Up After an Abnormal Shut Down

In case the System has abnormally shut down, the user has to restore the process database. Follow the on-screen instruction of the **Database**

Restore dialog window that appears on the monitor screen after an abnormal shut down:

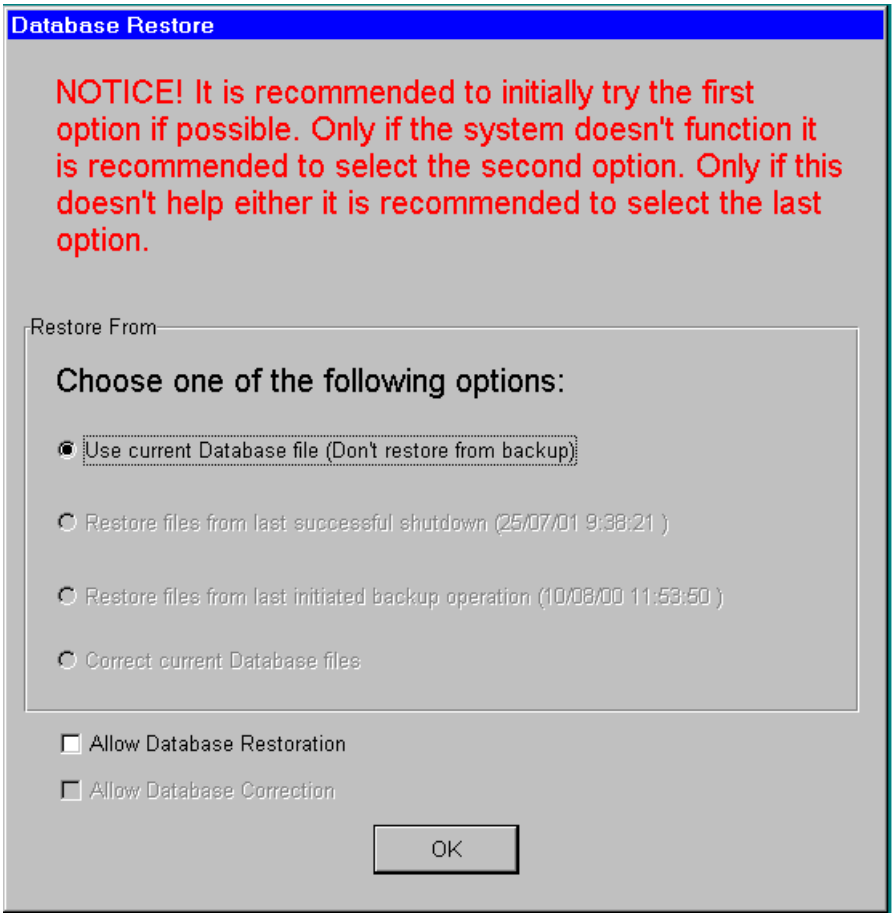


Figure 3-1: Database Restore dialog window

Checking the "Allow Database Restoration" checkbox enables the options of database restoration from backup.

Note: After Power On, and before normal operation, it is recommended to warm up the system by running a simulated dicing session for thirty minutes. The User should place a Workpiece on the Cutting Chuck, define and assign a Recipe, and run simulated dicing for thirty minutes. The User must ensure that the Cut Depth is set so that the Blade does not enter the Workpiece and no Kerf Check or Cut Verification algorithm is selected. The spindle should rotate at typical speed (the speed used for dicing) with cutting water on.
This simulated dicing, in the system steady state, warms up the Model 7100 to prepare it for normal operation. Advanced Dicing Technologies Ltd. suggest creating a warm-up recipe.

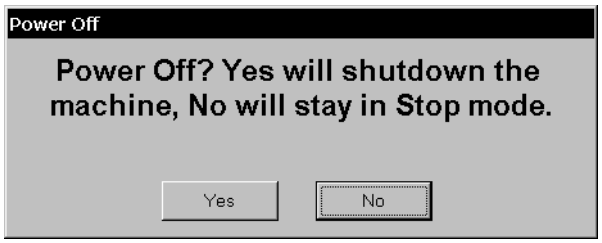
3.1.2 Powering Down the System

Powering down is required to perform maintenance on the Model 7100. Powering down the System every night is **not** required.

Note: It is recommended to stop System operation before initiating the power down procedure.

To Power Down the System:

1 Press the **Stop>OFF** button. The system stops and a pop-up message appears on the screen:



2 Press the **Stop>OFF** button a second time (equivalent to clicking **Yes** in the pop-up message), the system shuts down. For more details about the **Stop>OFF** button, refer to section 2.1.1.2,

Note: Wait at least one second between the first button press and the confirmation.

Danger: Voltage remains in the inlet of the Main Power Unit (MPU) even after completing the preceding Power Down procedure. Be sure to totally disconnect the System from the electricity supply before performing maintenance or repair procedures.

The system powers down in the following order:

1 The computer shuts down

2 The machine turns off

3 The monitor turns off in about 45 seconds after the machine.

The powering down process takes 1 to 1.5 minutes.

Note: Before powering the system up, make sure that both the computer and the monitor are powered off (monitor LED is off).

3.1.2.1 Lockout/Tagout

To Lockout/Tagout the System:

1 Shut down the main circuit breaker on the right side of the machine.

2 In order to lock the machine in power-off state, lock the main circuit breaker door.

3.2 Logging In

When the Model 7100 software is launched, the login dialog box is the first window displayed. The User Interface will not open unless a valid user name and password are entered.

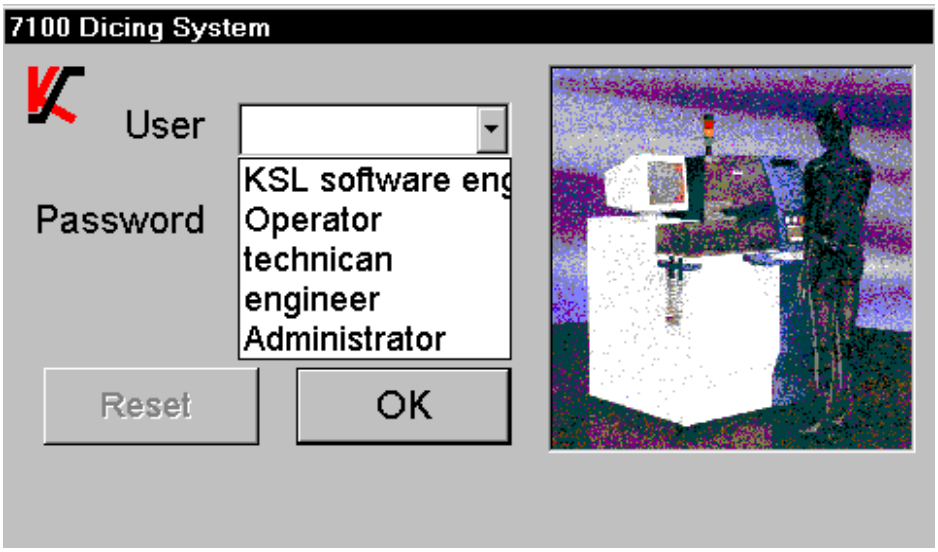


Figure 3-2: Login Dialog Box

To Log into the System:

1 Select a name from the **User** drop-down list.

2 Enter the password in the **Password** field. Asterisks are displayed in place of each character.

Note: Click **Reset** to clear the **User** and **Password** fields, if required.

3 Check the **Unit system** checkbox in order to have the System run its initialization routine immediately after displaying the 7100 Opening Screen.

Note: If the **Init system** checkbox is not checked, the System can be initialized manually by selecting **System Init** from the User menu. For further information, see Chapter 4 of the **ADT Model 7100 Semi-Automatic Dicing System Maintenance Manual.**

4 Click OK. The 7100 Graphic User Interface Opening Screen is displayed, and the System automatically begins running its initialization routine (unless the Init system checkbox has not been selected).

Note: For information about adding new Users and User access levels, see Chapter 4.

3.3 System Initialization

Once the machine is powered up and the user has logged in, the user can initialize the system.

When the System is successfully initialized, the green light is lit on the Dicer Status Indicator, in the lower right corner of the screen, as shown below:



Figure 3-3: Dicer Status Indicator

A red light indicates that the Dicer was not successfully initialized. For additional information, refer to the **ADT Model 7100 Semi-Automatic Dicing System Maintenance Manual.**

If initialization was not performed when the software was launched, it can be performed afterwards by selecting **System Init** from the User menu.

When initialization is complete, the System is ready for operation.

3.4 Defining the Job

Defining the job means defining specific recipe as active so that this recipe is assigned when the Workpiece is loaded.

To Assign a Recipe From the Auto menu:

1 Select **Define Job** to display the following:

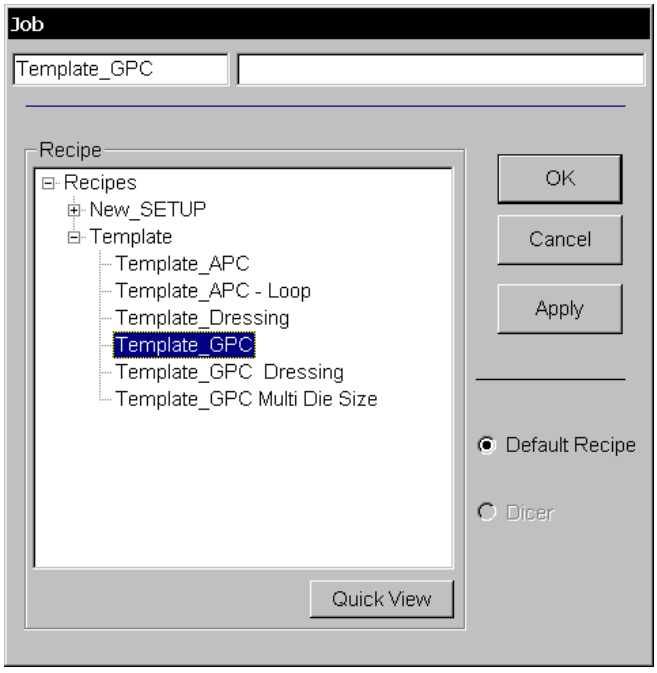


Figure 3-4: Job Dialog Box

2 The name of the currently assigned recipe is displayed in the field in the upper left corner. The adjacent field displays a description of the Recipe, if one has been defined.

Note: Check **Dicer** to assign the recipe to the Workpiece currently mounted on the cutting chuck. There is no need to unload the Workpiece and load it again. Check **Default Recipe** to define the chosen recipe as the active recipe. The system will remember this setting at the next power up.

3 Select a Recipe from the tree displayed in the **Recipe** area. (To view the properties of a particular Recipe in the Programming Workspace, click **Quick View**, then click **Cancel** to return to the **Define Job** screen.)

4 In the Job dialog box, click **Apply** to assign the Recipe without closing the dialog, or **OK** to assign the Recipe and close the dialog box.

To Assign a Recipe From the Setup & Diagnostics Workbook:

1 Click  in the toolbar to display the Setup & Diagnostics workbook. From the Setup & Diagnostics tree, select **Saw** to display the following:

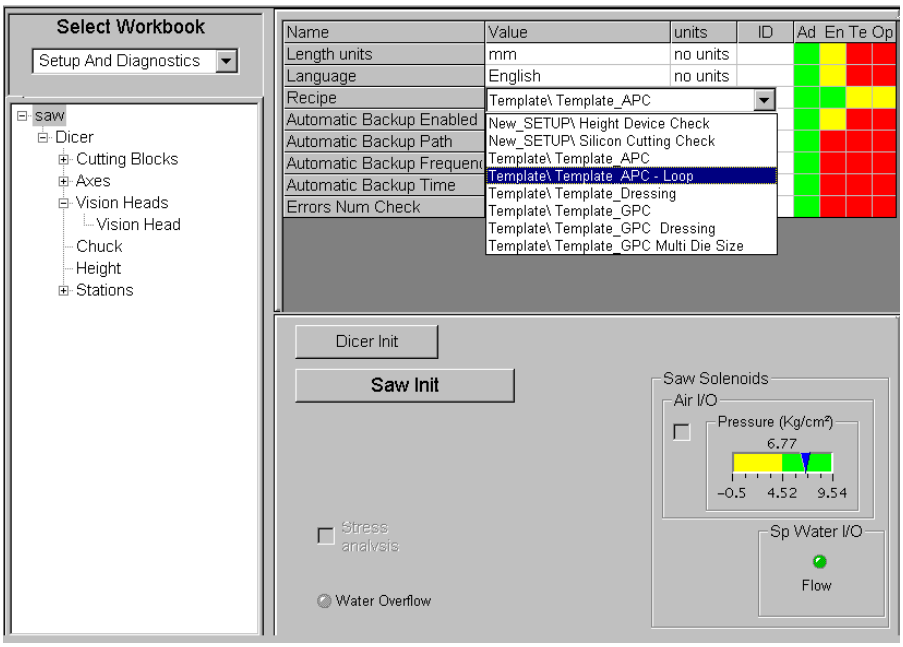


Figure 3-5: Assigning Recipe from Saw Screen

2 Double-click the **Value** cell for the **Recipe** parameter and select a Recipe from the drop-down list that appears in the cell.

3 Click **Save**  . The Recipe becomes active.

3.5 Placing/Removing a Workpiece

To Place a Workpiece on the Cutting Chuck in Auto Mode:

1 Click the **Run** button  in the toolbar.

2 Place a Workpiece on the Cutting Chuck, following the Wizard instructions.

3 Close the Load/Unload Cover and click **Finish** in the Wizard.

To Place a Workpiece on the Cutting Chuck in Manual Mode:

1 Click the **Load/Unload Wafer** button  , or from the Manual menu, select **Services > Place Workpiece,** or press **Ctrl+L.**

2 Place a Workpiece on the Cutting Chuck.

3 Close the Load/Unload Cover and click **Finish** in the Wizard.

To Remove a Workpiece from the Cutting Chuck in Auto Mode:

Note: Remove operation is available only after the machine has finished cutting the Workpiece.

1 Follow the Wizard instructions.

2 Click **Finish** in the Wizard, when prompted to do so by the System.

3 Remove the Workpiece from the Cutting Chuck.

A Workpiece can also be unloaded by pausing the process and clicking  , or using manual unload while the process is paused.

To Remove a Workpiece from the Cutting Chuck in Manual Mode:

1 Click the **Load/Unload Wafer** button  , or from the Manual menu, select **Services > Remove Workpiece,** or press **Ctrl+R**. The Load/Unload Cover disengages.

2 Click **Finish** in the Wizard.

3 Remove the Workpiece from the Cutting Chuck

3.6 Model 7100 Workflows

The workflows for operating the Model 7100 can be divided into two basic types:

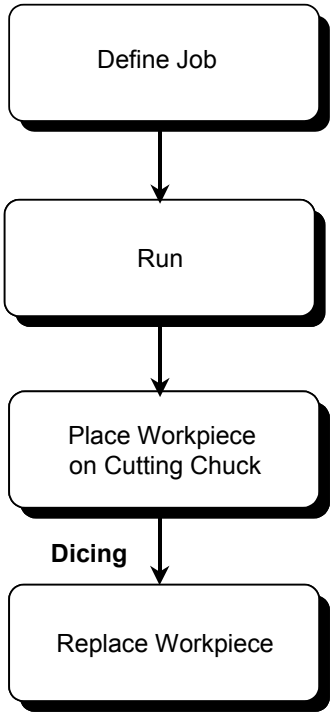
- Workflows for existing recipes
- Workflows for new recipes

The procedures included in the workflows are described in sections 3.6.4.1 through 3.6.4.6

3.6.1 Auto Mode Workflow - Existing Recipe

The Model 7100 has been designed so that once Recipes have been defined, Alignment taught and the Height procedure performed, the System can be operated merely by assigning the Recipe to be used, placing a Workpiece on the Cutting Chuck, and selecting the **Run** command.

The basic workflow when operating the Model 7100 in Auto mode is as follows:



Define Job: The Recipe contains the information about properties of the Workpiece to be cut and the Blade that will be doing the cutting. In addition, the Recipe includes the algorithms and parameters that define exactly how the cutting procedure will be carried out.

The procedure of assigning a Recipe to a Workpiece is known as defining the job. If the User does not assign a Recipe to a Workpiece, the last Recipe used is assigned.

For additional information about Defining Jobs, see section 3.4. For additional information about Recipes, see Chapter 5 and Appendix 3.

Run: Once the job has been defined, the System can be activated in Auto mode by clicking the **Run** button  on the toolbar. From that point on, System operation is entirely automatic. The User only needs to intervene when changing a Workpiece or replacing the Blade.

Auto mode is halted if an error occurs while a Workpiece is being processed or if the System detects any of the following:

- Alignment has not been taught
- Blade does not fit the assigned recipe
- Kerf Check has not been taught

Place Workpiece on Cutting Chuck: Each Workpiece must be properly placed on the Cutting Chuck in order for the System to function properly.

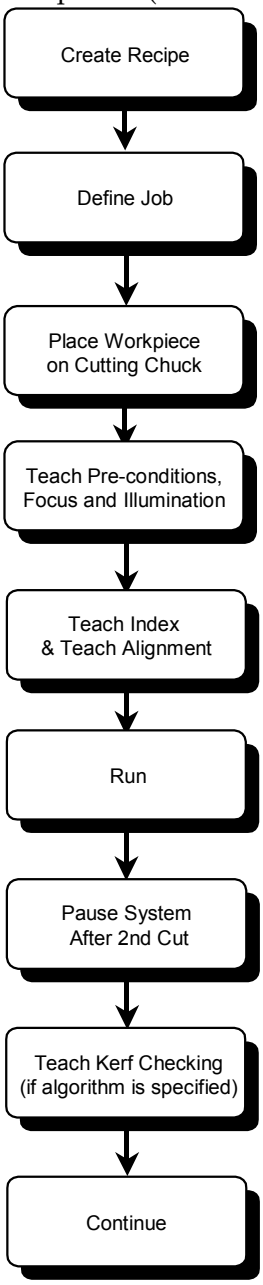
For additional information about placing Workpieces on the Cutting Chuck, see 3.6.4.2.

The User can perform the missing procedure, then continue running the System in Auto mode.

For additional information about performing Alignment and teaching the Index, see Chapter 6.

3.6.2 Auto Mode Workflow - New Recipe

Additional steps must be added to the Auto mode workflow when cutting the first in a new series of workpieces (First Work).



The additional steps are as follows:

Create Recipe: Creating the Recipe includes defining the Workpiece and Blade properties, as well as specifying algorithms and parameters that define exactly how the Workpiece will be processed by the System.

For additional information about creating a Recipe, see Chapter 5.

Inspection Illumination: Teaching the Inspection Illumination for the best view of the workpiece inspected. This setting is used later during Manual inspection and Y-offset operations. For the instruction as to how to teach the Inspection Illumination, refer to section 8.7.



Note: The above is correct for manual Mode Workflow as well

Teach Focus & Illumination: Teaching the Focus and Illumination for the best view of the workpiece to be diced. This setting is used later on for the Inspection mode.

Teach Index & Teach Alignment: Teaching the Index involves defining the exact distance between Streets on a Workpiece. Knowing the exact Index is essential to ensure accurate cuts. The Index is taught by defining a repetitive pattern on the Workpiece that can be used by the System as a Model. The index can be taught either automatically or manually.

Teaching alignment is performed for future manual or automatic alignment.

Teaching Alignment for auto-alignment involves teaching Models that enable the System to precisely align a Workpiece on the Cutting Chuck before cutting.

For additional information about teaching the Index and teaching Alignment, see Chapter 6.

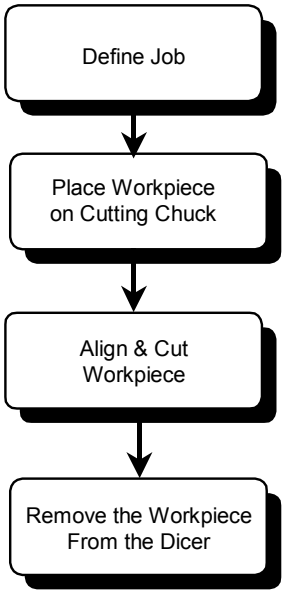
Teach Kerf Checking (if Kerf Check algorithm is specified): After the first cut has been performed on the First workpiece, the System must be paused to enable the User to teach Kerf Checking. This involves using the Vision System to examine the cut made by the Blade and to ensure that it falls along the center of the Street of the Workpiece. The kerf is usually checked at several points along the length of the cut to ensure that the cut quality and position are within the parameters specified in the Recipe. Once Kerf Checking has been successfully taught, the System can automatically perform Kerf Checking throughout the dicing process at regular intervals according to the parameters specified in the Recipe. All subsequent Workpieces assigned the same Recipe are kerf checked in the same way.

For additional information about Kerf Checking, see section 6.3.

After this full Auto workflow has been performed for the First workpiece, the basic Auto mode workflow can be used on Workpieces that share the same characteristics and Recipe as the First workpiece, as described in section 3.6.1.

3.6.3 Manual Mode Workflow

When operating entirely in Manual mode (for example, when cutting a single Workpiece), the typical workflow is as follows:



Each of these steps can be performed manually, using the commands available in the Manual menu or the toolbar icons.

3.6.4 Procedures Included in the Workflows

When operating the Model 7100, the most frequently used procedures include the following:

- Creating Recipes, Chapter 5.
- Defining Jobs, section 3.6.4.1
- Placing/Removing Workpieces, section 3.6.4.2
- Teaching Focus, Zoom and Illumination, sections 2.1.2.1.2, 8.6, 2.2.10.2.3
- Teaching the Index, section 3.6.4.4
- Teaching Alignment, section 3.6.4.3
- Manual Alignment, section 3.6.4.5
- Height Procedures, section 7.3
- Blade Changing, section 3.6.4.6
- Y-Offset, section 3.6.4.7
- Height Button Replacement, section 7.3.1.1

3.6.4.1 Defining Jobs

When defining jobs, the User selects a Recipe to be assigned to a Workpiece or series of Workpieces. The Recipe contains information about the Blade that will do the cutting, the Workpiece that will be cut and the algorithms and parameters that define exactly how the Workpieces are processed.

3.6.4.1.1 Assigning Recipes

When a Workpiece enters the System it is assigned the default Recipe, unless a new Recipe is assigned using the Define Jobs procedure.

The Define Jobs procedure is executed from the Auto menu by clicking **Auto > Define Job**.

3.6.4.2 Placing/Removing Workpieces

Once the recipe is created and assigned, the next step of operating the Model 7100 is to place a Workpiece onto the Cutting Chuck.

The actual instructions as to how to **place** and **remove** the Workpiece are given in section 3.5.

3.6.4.3 Teaching Alignment

When teaching Alignment, the User uses the Vision System to teach the System how to perform Manual or Auto Alignment on a particular type of Workpiece. Once Alignment has been successfully taught, the System is able to process any Workpiece to which the Recipe that includes that Alignment information, has been assigned.

For additional information about Teaching Alignment, see Chapter 6.

3.6.4.4 Teaching the Index

Along with Teaching Alignment (see section 3.6.4.3), Teaching the Index is required in order for the System to perform Auto Alignment.

When teaching the Index, the User operates the Vision System to teach the System the exact distance along the Y-Axis between Streets on the Workpiece. When teaching the Index, the User must first define a Model, which is a pattern that is repeated at regular intervals throughout the Workpiece. Teaching the correct Index is essential for creating a cut map and for dicing accuracy.

For additional information about Teaching the Index, see section 6.1.2.1.

3.6.4.5 Manual Alignment

When performing Manual Alignment, the User operates the Vision System to precisely align a Workpiece for cutting. This includes using the Vision System to ensure that the Streets on the Workpiece are parallel to the Blades, as well as defining a Cut Position as a reference point. Proper Alignment is required in order to cut Workpieces accurately.

Manual Alignment is often used when only one or two Workpieces require cutting.

For additional information about Manual Alignment, see section 6.1.1.

3.6.4.6 Blade Changing

The Model 7100 provides the User with several indicators when Blade replacement is required, including:

- Error messages displayed on the screen
- Flashing lights on the Light Tower

In addition, the User may decide to perform the Blade Change procedure at any time during operation.

For additional information about Blade Changing, see section 7.4.

3.6.4.7 Manual Y Offset

The Manual Y Offset procedure teaches the System the difference in position between the Blade and the Microscope in the Y direction, enabling the System to make the necessary adjustments during the dicing process.

The Manual Y Offset procedure is performed after a Blade change or before cutting a series of Workpieces. The User performs a single cut and then positions the Microscope exactly over the cut. The single cut can be performed within the cut map or outside the cut map on the tape.

The Y Offset is a parameter that can be automatically calculated and taught to the System during the Kerf Check process.

For more information about Y Offset, refer to section 6.4.

3.7 Stopping System Operation

System operation can be halted in different ways, depending on whether it is operating in Auto mode or Manual mode:

- Emergency Stop, see section 3.7.1
- Stop/OFF Button, see section 3.7.2
- Pausing Process in Auto mode, see section 3.7.3
- Manual Stop, see section 3.7.4

Each way of halting System operation has a different effect on the System and on the Workpiece currently being processed.

3.7.1 Emergency Stop

The Emergency Stop button on the System Front Panel is used to immediately stop all System operation to avert potential harm to the User or System.

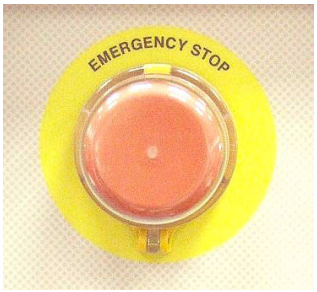


Figure 3-6: Emergency Stop Button

When the Emergency Stop button is pressed, the Main Circuit Breaker is turned off, cutting power to the System. All System operation comes to an immediate halt. The Air Tank continues to supply air to the Spindle for a short period of time in order to prevent damage to the Spindle.

To recover from an Emergency Stop, pull the plastic cover off the button, pull the button outward, and then turn the Main Circuit Breaker back on.

3.7.2 STOP/OFF Button and Soft Stop Button

The operator can immediately stop any activity in order to prevent self-injury or damaging the material. The system can be stopped

either by clicking the Stop icon  on the screen, or by pressing the **OFF** button on the control panel of the system (see also section 2.1.1.2 and section 2.2.9).

Note: The **STOP/OFF** button is spring-loaded to always be ready in its "out" position.

3.7.3 Pausing a Process

When running in Auto mode, System operation can be paused at any time by clicking the **Run** button  in the toolbar. The button's appearance changes to  . This is useful when the User needs to suspend System operation for a moment in order to check a component or perform a quick inspection on the substrate.

To resume System operation, click **Run** button again. The System resumes operation from the point at which it stopped.

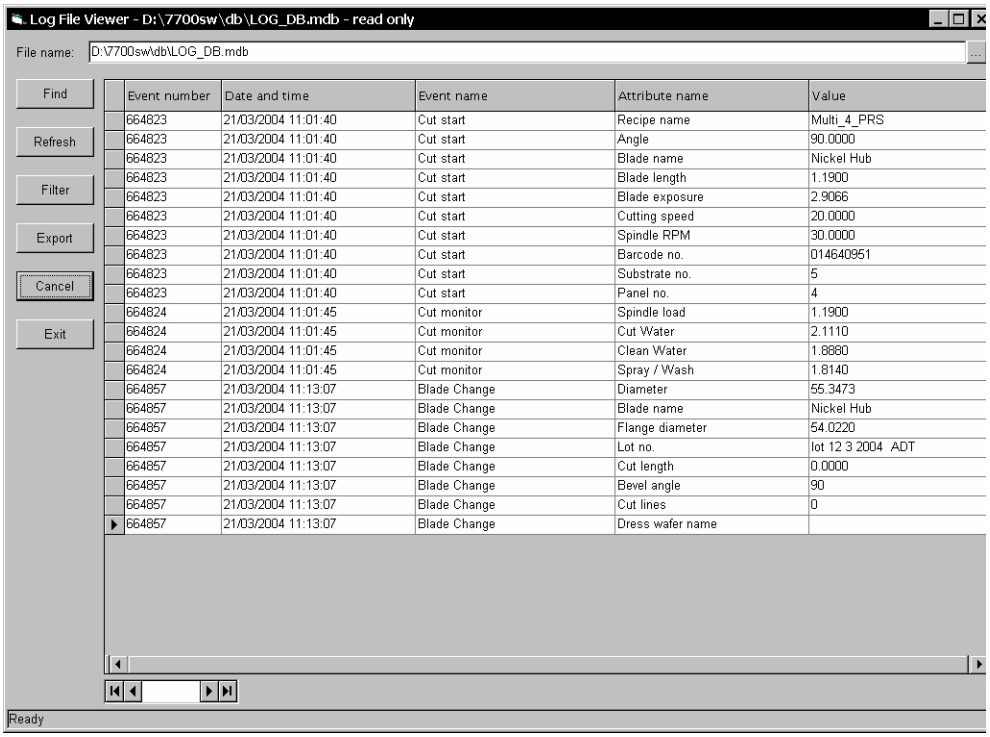
3.7.4 Manual Stop

When performing a manual operation using the Wizard/Model area in the Video Workspace, clicking the **Cancel** button aborts the manual operation. When running in Manual mode, the System operation can be paused any time by clicking on the **Full Wafer Cut** button  (The icon changes to ) or by clicking on the **Cancel** button below the Wizard/Model area.

3.8 Log File

The Model 7100 software generates a Log File that contains the main system events, the time of their occurance, their Attributes and values. The list of Events and Attributes is provided in Appendix 3.

To access the Log File, select **Log File** from the **Maintenance Menu**. The Log File Viewer appears:



Event number	Date and time	Event name	Attribute name	Value
664823	21/03/2004 11:01:40	Cut start	Recipe name	Multi_4_PRS
664823	21/03/2004 11:01:40	Cut start	Angle	90.0000
664823	21/03/2004 11:01:40	Cut start	Blade name	Nickel Hub
664823	21/03/2004 11:01:40	Cut start	Blade length	1.1900
664823	21/03/2004 11:01:40	Cut start	Blade exposure	2.9066
664823	21/03/2004 11:01:40	Cut start	Cutting speed	20.0000
664823	21/03/2004 11:01:40	Cut start	Spindle RPM	30.0000
664823	21/03/2004 11:01:40	Cut start	Barcode no.	014640951
664823	21/03/2004 11:01:40	Cut start	Substrate no.	5
664823	21/03/2004 11:01:40	Cut start	Panel no.	4
664824	21/03/2004 11:01:45	Cut monitor	Spindle load	1.1900
664824	21/03/2004 11:01:45	Cut monitor	Cut Water	2.1110
664824	21/03/2004 11:01:45	Cut monitor	Clean Water	1.8880
664824	21/03/2004 11:01:45	Cut monitor	Spray / Wash	1.8140
664857	21/03/2004 11:13:07	Blade Change	Diameter	55.3473
664857	21/03/2004 11:13:07	Blade Change	Blade name	Nickel Hub
664857	21/03/2004 11:13:07	Blade Change	Flange diameter	54.0220
664857	21/03/2004 11:13:07	Blade Change	Lot no.	lot 12 3 2004 ADT
664857	21/03/2004 11:13:07	Blade Change	Cut length	0.0000
664857	21/03/2004 11:13:07	Blade Change	Bevel angle	90
664857	21/03/2004 11:13:07	Blade Change	Cut lines	0
664857	21/03/2004 11:13:07	Blade Change	Dress wafer name	

Figure 3-7: Log File Viewer

Note: The following restictions apply while operating the Log File viewer:

- The Log File viewer can be opened only when the machine is idle.
- Whenever the **Auto Run** or **Manual Cut** buttons are pressed, the Log File viewer is closed automatically.
- Only one Log File viewer window can be opened.

File Name

The top line of the screen displays the name and path of the displyed Log File. By clicking the browse button (...), the user can select a different Log File to view (see section 3.8.3).

Time and Date Settings

By default, the Time and Date setting for the current Log File is twelve hours backwards and twelve forward in relation to the current time (defined by the current OS time settings).

Note: The user can view Log Files that are up to 1-year old.

3.8.1 Applying Log Filters

The user can set a filter for the Events for viewing only the events of interest. Click the Filter button to open the Filter configuration screen (Figure 3-8).

Note: By default, the Log data is presented according to the last Filter settings.

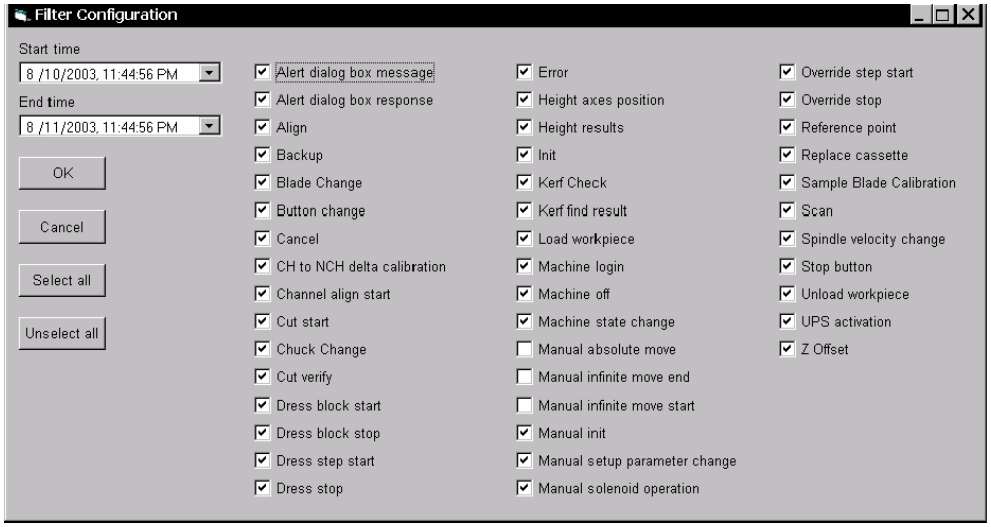


Figure 3-8: Log File Filter Configuration

The Log data can be filtered by using two types of filters:

- **Date filter**: set start and end time values to limit the log to a specific time period.
- **Event filter**: limit the events included in the log file by selecting their respective checkboxes.

3.8.2 Log File Find Feature

Use the find feature to locate specific values within a selected log column. To locate a numeric value, type in the full number in the Find dialog window.

3.8.3 Exporting Log Files

Log data can be exported as two different file types:

- *.mdb. The file will be exported according to the Time and Date data defined in the Log File, but ignoring the Event Filter. When this file type is used, the following folder and files are created:
  - **Log** - The Folder that contains the Log Files per day
  - **GUI_DB.mdb** - Database file
  - **PERS_DB.mdb** - Database file
  - **LOG_DBfile name.mdb** - Database file with the name of the exported Log file.



Note: The .mdb file type is used when sending the Log File for debugging purposes. Before sending the Log File for debugging, the user must create a zip file of all exported files and folders.

- *.csv. This type will export the Log File as a text file that can be imported into an Microsoft Excel file (*.xls). This exporting type exports the Log File according to the Time, Date and Event filter settings.

The Log Files are saved daily in the folder: **D:\7700sw\db\log**. The names of the files are **Log_machine serial number_date_time.mdb**

3.8.4 Periodical backup

When the Automatic Periodical Backup parameter is set to Yes (**Maintenance menu > Periodical Backup**), the Log Files are backed up with the rest of the database and can be found as zip files under the same location where the system Periodical Backups are stored, or under **D:\ 7700sw\db\Recent\Log** (default).

4 ADMINISTRATION

Access Levels are categories that provide security by enabling the Customer to determine which personnel (Users) are authorized to perform specific activities, including the viewing and modification of parameters in the Model 7100 software. Each User is registered in the System as a member of a particular level (group). Each level is configured to permit access to those activities and parameters that the Customer decides are appropriate for the specific tasks to be performed by the Users at that level.

This chapter includes the following sections:

- Access Levels, section 4.1
- Modifying Access Levels, section 4.2
- Adding and Removing Users, section 4.3

4.1 Access Levels

There are five Access Levels. Four of these allow for User designation by the Customer, while the highest level ("ADT software eng.") is intended for ADT personnel only.

The Customer levels in ascending order are as follows:

- **Operator**: Users who only perform basic operating procedures.
- **Technician**: Users who have received additional training and/or are more experienced in operating the System, and are authorized to perform mechanical repairs.
- **Engineer**: Users who have the authorization to perform high level tasks.
- **Administrator**: Users who manage and control the access rights of other Users and who have authorization to perform any task on the Model 7100, including adding and removing other Users.

The ADT level is as follows:

- **Software Engineer**: ADT software development personnel.

The color of the Model 7100 software title bar changes according to the Access Level of the current User, as follows:

- Operator: blue
- Technician: maroon
- Engineer: green
- Administrator: black

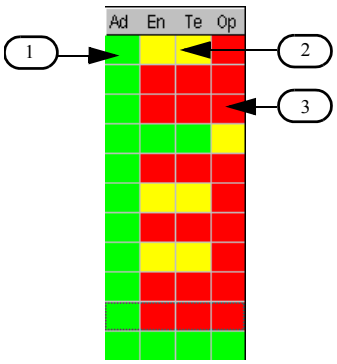
4.2 Modifying Access Levels

Users with read-write access to a parameter or software function can modify the access rights allowed to Users with a lower access level than themselves. The following can be modified:

- Process Program Parameters, section 4.2.1
- User Interface Elements, section 4.2.2
- Protected Mode, section 4.2.3

4.2.1 Process Program Parameters

Users with read-write access can limit access to Setup&Diagnostics, Calibration and Manual Functions, as well as to each parameter in a Recipe individually. Each parameter grid in the Workbook Workspace has four columns on the far right side that specify access rights, one for each Access Level.



1 Green
2 Yellow
3 Red

Figure 4-9: Access Rights Columns

The color of the square below each Access Level indicates the type of access that the User has to that specific parameter, as follows:

Table 4-1: Access Rights Color Codes

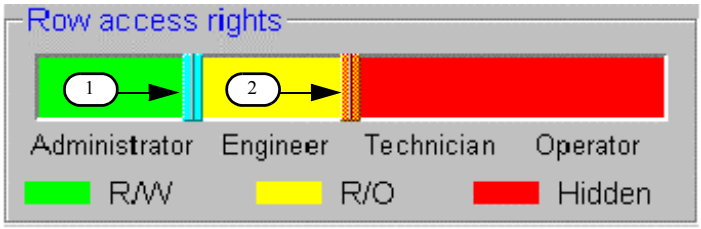
Color	Access	Explanation
Green	Read-write	User can see a parameter and modify it.
Yellow	Read-only	User can see a parameter but not modify it.
Red	Hidden	User cannot see or modify a parameter.

Users with read only access can see the detail of the parameters and the access rights columns. However, the parameters are disabled (grayed out) and cannot be modified.

Users with hidden access cannot see the parameters at all, including the access rights columns.

To Modify Access Rights to Parameters:

1 Double-click anywhere in the access rights columns of a grid row. The existing access rights for the row appear in a multi-colored bar, as follows:



1 Slider (blue)
2 Slider (orange)

Figure 4-10: Access Rights Bar

2 Drag the sliders to change the access rights for each User type. For example, drag the orange slider to the right to extend read only access to the Users defined as Technicians.



Figure 4-11: Extending Access Rights

3 Press **Enter**, or click outside the area of the multi-colored bar, to save the modified access rights
- or -
Click **Cancel** to cancel the last change.

4 Click **Save**  to save the modified access rights in the Recipe.

Note: When modifying access rights, a lower Access Level cannot have greater access rights than a higher Access Level. This means:

- The Administrator cannot have less access rights than the Engineer, Technician or Operator.
- The User cannot deprive him or herself of rights. For example, an Administrator cannot modify a parameter to be hidden or read-only for other Administrators.

4.2.2 User Interface Elements

Access to the following functions in the Model 7100 software User Interface can be restricted:

Adding and Deleting Parameters: Users with read-write access can determine which Users can add or delete parameters by limiting access to the **Add** and **Delete** buttons in the Parameters section of the Programming Workspace.

Importing and Exporting Recipes: Users with read-write access can determine which Users can import and export Recipes by limiting access to the **PP Import** and **PP Export** buttons in the Import/Export section of the Programming Workspace.

Teaching Options: Users with read-write access can determine which Users can execute the Teach Alignment, Teach Kerf Check and Teach Index functions by limiting access to the **Teach Align**, **Teach Kerf** and **Teach Parameter** buttons in the Program section of the Programming Workspace.

Adding and Moving Angles: Users with read-write access can determine which Users can add, move or delete angles by limiting access to the Angle tab popup menu in the Programming Workspace.

Workbook Workspace: Users with read-write access can limit access to the Workbook Workspace (including the Setup & Diagnostics and Calibration workbooks) by disabling the Workbook Workspace button  in the toolbar.

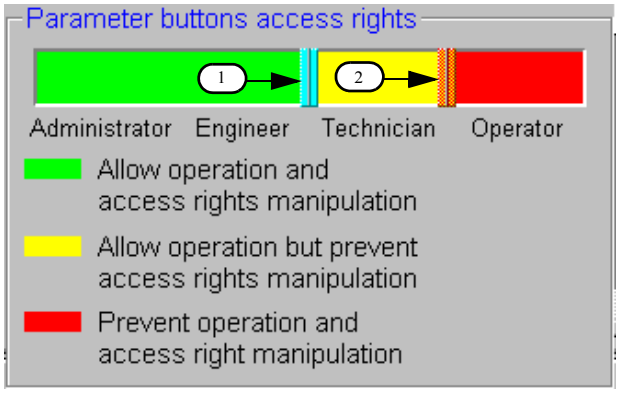
Note: Access to the Programming Workspace cannot be modified.

Lower Right Pane of the Workbook Workspace: Users with read-write access can limit access to the lower right pane of the Setup & Diagnostics workbook and Calibration workbook. When access is blocked to the lower right pane, it remains blocked for that workbook regardless of which element of the tree is selected.

To Modify Access Rights to User Interface Elements:

1 Right-click anywhere in the surrounding area of the User Interface element to be modified. For example, when modifying the access to the adding and deleting parameters buttons, right-click in the Parameters section of the Programming Workspace.

2 The existing access rights for the selected element appear in a multi-colored bar, as follows:



1 Slider (blue)
2 Slider (orange)

Figure 4-12: Access Rights Bar

3 The type of access for each User is indicated by color, as follows:

Table 4-2: User Interface Elements Access Color Codes

Color	Access
Green	User can operate the GUI elements inside the selected area and manipulate access rights to those GUI elements.
Yellow	User can operate the GUI elements inside the selected area but cannot manipulate access rights to those GUI elements.
Red	User cannot operate the GUI elements inside the selected area or manipulate access rights to those GUI elements.

4 Drag the sliders to change the access rights for each User type. For example, drag the orange slider to the left to disable the buttons for Technicians.

5 Press **Enter** on the keyboard, or click outside the area of the multi-colored bar to save the modified access rights.

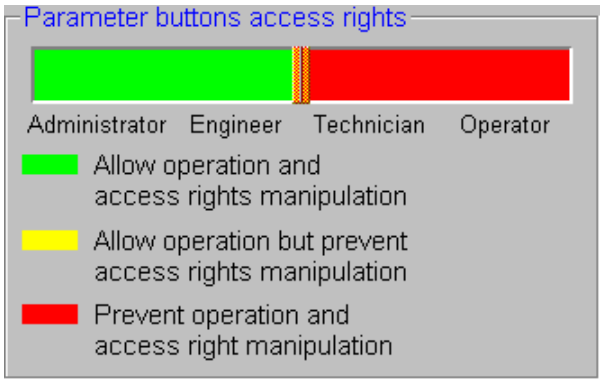


Figure 4-13: Access Rights to Parameter Buttons

Note: The access rights for **Sample Blade Calibration** are set separately, as it is a very delicate procedure.

4.2.3 Protected Mode

The Model 7100 software normally operates in Protected mode. The software prevents performing diagnostic operations. Switching to Unprotected mode enables such operations to be performed in the Setup & Diagnosis workbook, for example, on the flow of water to the Cooling Block.

When working in unprotected mode, the responsibility passes from the software to the User performing the task.

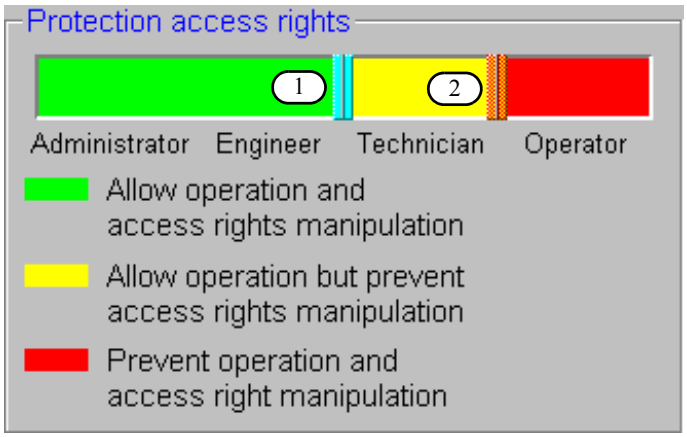
Danger: Care should always be taken when working in Unprotected mode that the User is very familiar with the operation of the Model 7100.

Users with read-write and read-only access can switch to Unprotected mode by selecting **Protection!** from the Maintenance menu or pressing **Ctrl+P** on the keyboard. Protected mode is automatically restored when the User leaves the screen on which Unprotected mode was used.

Users with read-write access can limit access to Unprotected mode, as described in the following procedure.

To Modify Access Rights to Unprotected Mode:

1 From the Maintenance menu, select **Protection access rights**. The existing access rights appear in a multi-colored bar, as follows:



1 Slider (blue)
2 Slider (orange)

Figure 4-14: Protection Access Rights Bar

2 The type of access for each User is indicated by color, as described in the table on the previous page.

3 Drag the sliders to change the access rights for each User type. For example, drag the blue slider to the left to change a Technician User's access from read-write to read only. This provides a Technician User

with access to unprotected mode but with no ability to modify the access rights of other Users to unprotected mode.

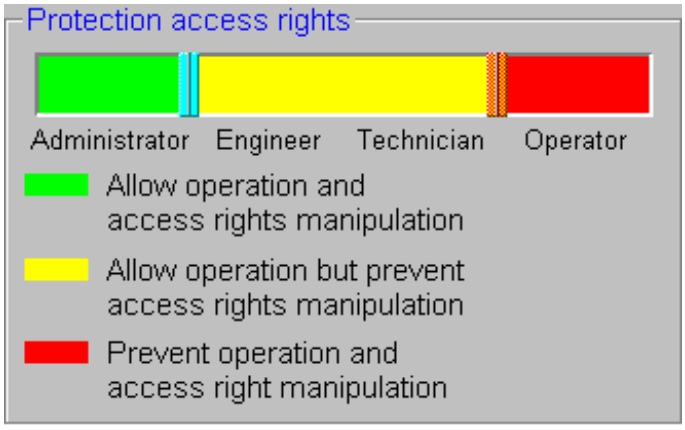


Figure 4-15: Access Rights to Unprotected Mode

4 Press **Enter** on the keyboard, or click outside the area of the multi-colored bar to save the modified access rights.

4.3 Adding and Removing Users

Administrators can add and remove Users using the **Registration** command in the User menu.

Note: Registration is enabled only when an Administrator is logged in. This option is disabled for Users with other Access Levels.

4.3.1 Adding Users

Administrators can add Users by performing the following procedure.

To Add a User:

1 From the User menu, select **Registration** to display the User Manager dialog box, as shown below:

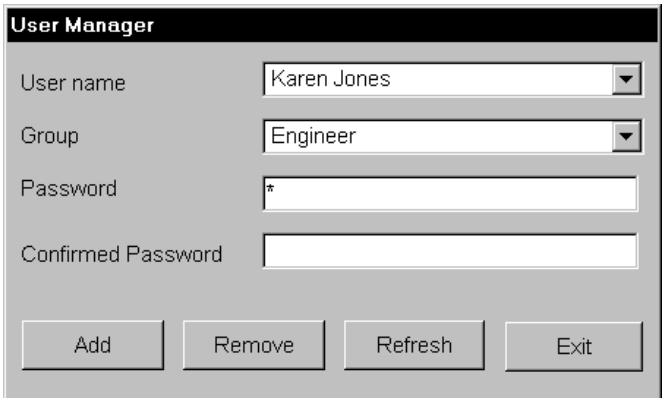


Figure 4-16: User Manager Dialog Box

2 Enter a name in the **User name** field.

3 Select an Access Level from the **Group** drop-down list.

4 Enter a password for the new User in the **Password** field, and retype it in the **Confirmed Password** field.

5 Click **Add**. The User is added to the selected Access Level group.

4.3.2 Removing Users

Administrators can remove Users by performing the procedure described below.

To Remove a User:

1 From the User menu, select **Registration** to display the User Manager dialog box.

2 Select a User from the **User name** drop-down list.

3 Click **Remove**. The User is immediately removed from the list of registered users.

5 BUILDING RECIPES

Recipes are the settings, algorithms and parameters that control the operation of the Model 7100. Recipes can either be assigned to an individual Workpiece, or used by an unlimited number of Workpieces that share the same characteristics. Usually, Recipes are assigned to Workpieces at the beginning of the dicing process. For more information about assigning Recipes to Workpieces, see section 3.4.

The Model 7100 has a number of Default Recipes that can be used as a base for creating further Recipes to meet the exact requirements of a particular dicing application. Some Recipes specify the details of every stage of the cutting process. Other Recipes may define only a few particular stages.

Recipes are organized into groups, enabling selected Recipes to belong to a particular category or a particular User. This logical grouping helps the User store and locate Recipes. When viewed in the tree display in Workbook Workspace, groups and Recipes appear as follows:

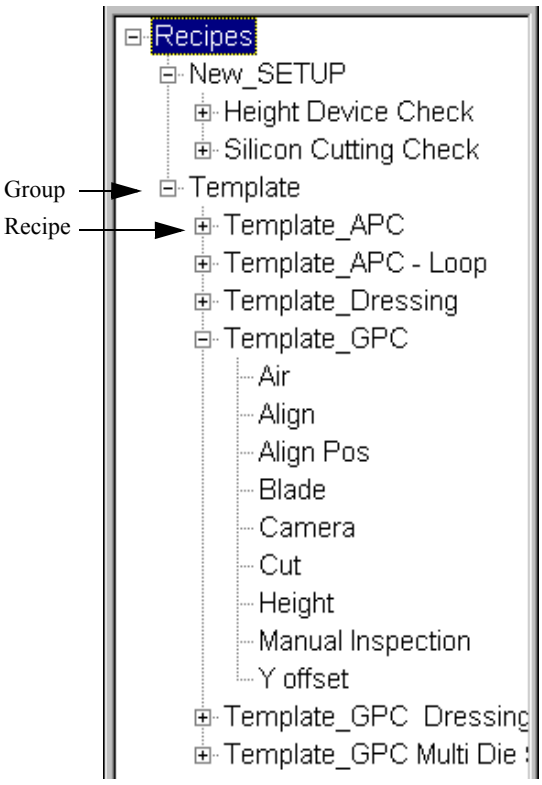


Figure 5-1: Groups and Recipes in Tree Display)

A Recipe is made up of the following:

- **Properties**: The properties of a Recipe define the following:
  - Recipe name.
  - Recipe group.

  - The type of blade to be used for this recipe, including the size, exposure, and thickness.
  - The type of Workpiece, its shape and its dimensions.
  - The algorithms that control the operation of the System.
  - The Author (see Table 5-1) of the Recipe, the date it was created, and the date it was updated.

- **Parameters**: The parameters included in a Recipe contain the essential information for operating the System. Parameters are divided into categories.

The following sections are included in this chapter:

- Building Recipes Workflow, section 5.1
- Creating a New Recipe, section 5.2
- Defining Recipe Properties, section 5.3
- Specifying Recipe Parameters, section 5.4
- Importing and Exporting Recipes, section 5.5
- Recipe Templates, section 5.6

5.1 Building Recipes Workflow

The workflow for building Recipes using the Model 7100 software is as follows:

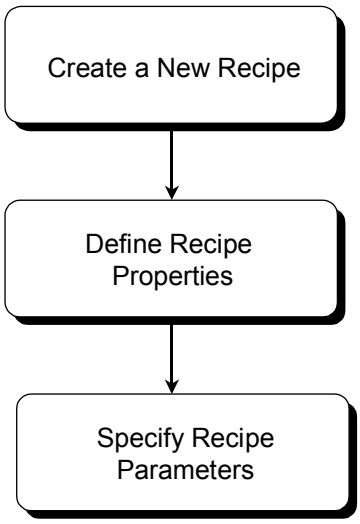


Figure 5-2: Building Recipes Workflow

Each step in the workflow is described in the following sections.

5.2 Creating a New Recipe

When first installed, the Model 7100 software contains the following Default Recipes:

- APC Standard Template (for details, see section 5.6.1)
- APC Loop Cut Template (for details, see section 5.6.2)
- GPC Standard Template (for details, see section 5.6.3)
- GPC Multi Die Size Template (for details, see section 5.6.4)
- Standard Dressing Template (for details, see section 5.6.5)
- GPC Dressing Template (for details, see section 5.6.6)

These Default Recipes cannot be deleted or changed. They can be used as is or as a template for new Recipes. New Recipes are created by duplicating an existing Recipe. The new Recipe initially has the same properties and parameters as the old one, but these can be modified as required.

To Create a New Recipe:

1 Click  to display the Programming Workspace.

2 Select an existing Recipe from the Programming tree.

3 Click the **Duplicate Recipe** button at the bottom of the Programming Workspace to display the following:

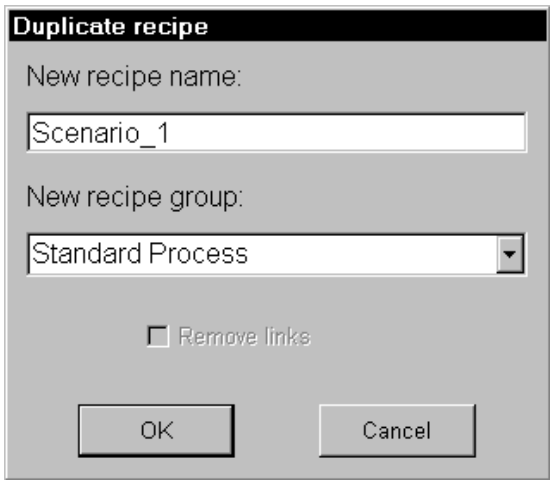


Figure 5-3: Duplicate Recipe Dialog Box

4 Enter a name for the new recipe in the **New recipe name** field and select or create a different group if required from the drop-down list. To

create a new Template Recipe that will be kept permanently, type "**Template_**" before the name of the recipe.

5 Click **OK**. The new Recipe is created based on the Recipe selected in Step 2, including all of its properties and parameters. When the save is complete, the new Recipe appears in the Programming tree.



Note: Recipes cannot be renamed. The only way to rename a recipe file is to duplicate it and assign a new name to the copy.

5.3 Defining Recipe Properties

When a new Recipe is created, it inherits the properties and parameters of the Recipe that was used as a base or template for the new Recipe. The User can modify the properties of the new Recipe, which are as follows:

Table 5-1: Recipe Properties

Property	Description	Editable
Name	The name of the recipe.	No
Group	The group to which the recipe belongs.	No
Blade	The name of the blade assigned to the recipe. Possible values: See section 5.3.	Yes
Wafer Shape	The shape of the Workpiece. Possible values: **Circular**, **Rectangular**.	Yes
Wafer Material	The material from which the Workpiece is made. Possible values: **Silicon**, **GA-AS** (gallium arsenide), **Glass**, **PZT**, **N/A**.	Yes
Wafer Diameter	The diameter of the Workpiece. This parameter is only applicable when the shape of the Workpiece is **Circular**.	Yes
Wafer Width (Y)	The dimension of the Workpiece along the Y-Axis. This parameter is not applicable when the shape of the Workpiece is **Circular**.	Yes
Wafer Length (X)	The dimension of the Workpiece along the X Axis. This parameter is not applicable when the shape of the Workpiece is **Circular**.	Yes
Wafer Thickness	The thickness of the Workpiece.	Yes
Tape Thickness	The thickness of the tape to which the Workpiece is attached.	Yes
Wafer Type	The type of Workpiece. Possible values: **Regular**, **Dressing Wafer**, **Dressing Block**, **Calibration** (a Workpiece with special targets to aid in calibration).	Yes

Table 5-1: Recipe Properties		
Property	**Description**	**Editable**
Author	The User Name of the creator of the Recipe. The creator is the person logged into the System at the time the Recipe is created (read-only).	No
Created	The creation date of the Recipe (read-only).	No
Updated	The date when the Recipe was last edited (read-only).	No
Comment	Optional description field.	Yes
Cut	The algorithm for cutting the Workpiece. Possible values: **Standard APC**, **Standard Dressing**, **Standard GPC**, **None**.	Yes
Align	The algorithm for aligning the Workpiece. Possible values: **Process Alignment**, **Dress Alignment**, **None**.	Yes
Kerf Check	The algorithm for performing Kerf Checking. Possible values: **Kerf Check algorithm**, **None**.	Yes
Recipe Teach	The algorithm that teaches Alignment to the System. Possible values: **Full Teach algorithm**, **None**.	Yes
Kerf Teach	The algorithm that teaches Kerf Checking to the System. Possible values: **Kerf Check Teach**, **None**.	Yes

To Define Recipe Properties:

1 Click  to display the Programming Workspace.

2 Select the Recipe from the Programming tree. The properties for the Recipe are displayed on the right.

Name	Value	units	Ad	En	Te	Op
Name	Scenario_1	no units				
Group	Standard Process	no units				
Blade	Resin Hubless	no units				
Wafer Shape	rectangular	no units				
Wafer Diameter	0	mm				
Wafer Width (Y)	100	mm				
Wafer Length (X)	100	mm				
Wafer Thickness	1	mm				
Tape Thickness	0.075	mm				
Wafer Type	regular	no units				
Author	The Dicer	no units				
Created	2/25/02 10:38:40 AM	no units				
Updated		no units				
comment		no units				
cut	Standard APC	no units				
align	Full Auto Alignment	no units				
Kerf Check	none	no units				
PP Teach	Full Teach Alignment	no units				
Kerf Teach	none	no units				

Figure 5-4: Recipe Properties

3 Double-click the **Value** cell for each property in turn and enter a value or select a value from a drop-down list.

Note: To add a descriptive comment to any Recipe, double-click the Comments cell and enter the desired text.

4 Click **Save**  . The new Recipe is saved to the System. The System checks which parameters are required in the Recipe according to the algorithms selected. If it is found that the Recipe does not include some of the required parameters, the Missing Parameters Report is displayed, as follows:

Missing parameters report

ID	Name	Category	Angle	Index	Value	Units	Status
21200	Recover Option	Kerf Che	General	0	Pause	no units	OK
21205	Auto Y-Offset Correction	Kerf Che	General	0	Yes	no units	OK
21280	Activate	Kerf Che	General	0	No	no units	OK
21600	Activate	Cut Dept	General	0	No	no units	OK
21220	Use Model-To-Kerf	Kerf Che	General	0	No	no units	OK
21260	Settling time	Kerf Che	General	0	0	sec	OK
25308	Kerf Check Algorithm	Kerf Che	General	0	Standard	no units	OK
21250	Max Failures per Cut	Kerf Che	General	0	0	cuts	OK
21318	Head1 no correction DYoffset	Kerf Che	General	0	0	mm	OK
21320	Head1 correction DYoffset	Kerf Che	General	0	0	mm	OK

Note: some of the added parameter's default values might not fit the desired process program. Please update them or refer to the programming panel.

CLOSE

Figure 5-5: Missing Parameters Report

5 Click **Close**. The missing parameters are added to the Recipe.

Note: The missing parameters are added with their default values, which might not fit the process program (recipe). Refer to the programming panel to modify the values so that they fit the recipe.

5.3.1 Defining Blade Properties

The blade property of the Recipe specifies the name of the blade that is used to cut the Workpiece. The User can select a blade from the drop-down list in the **Value** field, as described in the previous procedure. Additionally, the User can view detailed properties about the blade and add new blades to the System.

This section describes how the User can:

- Display the blade properties for the selected blade, section 5.3.2.
- Change blades, section 5.3.2.1.
- Define a new blade for the System, section 5.3.2.2.
- Modify the properties for a selected blade, section 5.3.2.3.
- Delete a blade from the System, section 5.3.2.4.

5.3.2 Displaying Blade Properties

Blade properties can be displayed by performing the procedure described below.

1 Click once in the **Value** cell of the blade property to display a browse button ….

2 Click the browse button to display the following:

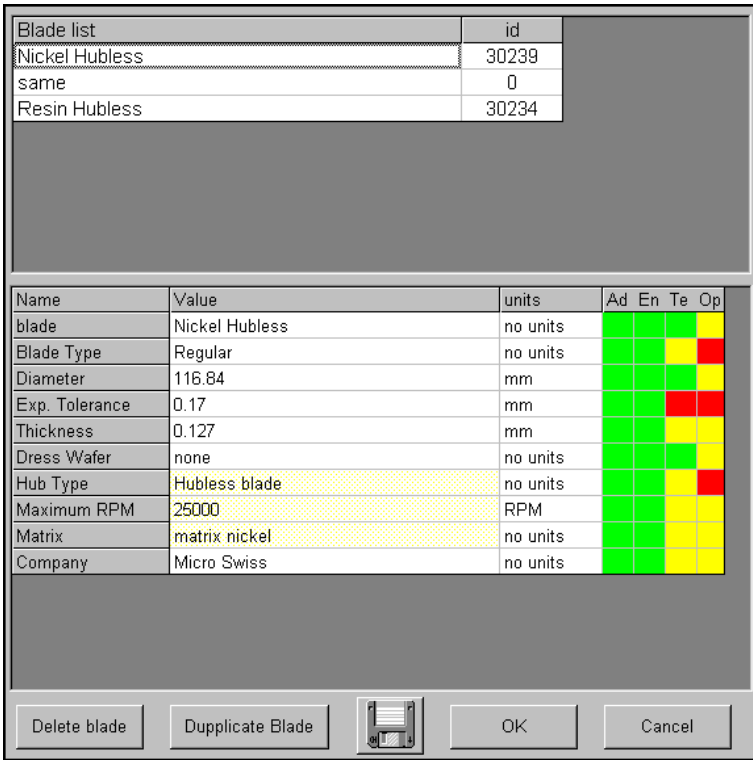


Figure 5-6: Blade Properties (2" Hub Blade)

A list of existing blades defined in the System is displayed in the upper pane.

The properties of the blade selected in the upper pane are displayed in the lower pane, as follows:

Table 5-2: Blade Properties

Parameter	Description
Blade	The name of the blade. Any name, up to 255 characters in length, can be entered.
Blade Type	The type of blade. Possible values: **Regular, Bevel, Step**.
Diameter	The diameter of the blade.
Exposure	The blade exposure nominal value. Relevant for hub blades only.
Exp. Tolerance	The exposure tolerance, within which the actual exposure can differ from the nominal value.
Thickness	The thickness of the blade.
Dress Wafer	Whether or not Dressing Workpieces are used for Dressing the specific blade. Possible values: **Name of the Dress Recipe assigned to the blade**, **None**.
Hub Type	Whether or not the blade is a hub or hubless blade. Possible values: **Hub Blade**, **Hubless Blade**.
Matrix	The Matrix of the blade. Possible values: **Matrix Nickel**, **Matrix Resinoid**.
Density	The concentration of diamonds. Possible values: **Density S**, **Density L**.
Size Diamond	The size of the diamonds. Possible values: **Size Diamond S**, **Size Diamond F**, **Size Diamond K**.
Bond	The matrix of the blade. Possible values: **Bond Q**, **Bond E**, **Bond L**, **Bond V**.
Company	The company that manufactures the blade.
Identifier	A unique Id number for the blade.

5.3.2.1 Changing Blades in a Recipe

A blade assigned to the recipe can be changed by performing the procedure described below.

To Change Blades:

1 Double-click the **Value** cell for the blade property to display a drop-down list arrow .

2 Click . The Blade Selection List appears.

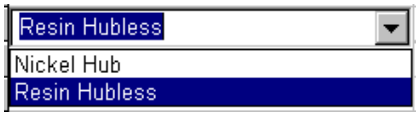


Figure 5-7: Blade Selection List

3 Select the desired blade.

4 Click **Save** .

5.3.2.2 Defining New Blades

A new blade can be added to the System by performing the procedure described below.

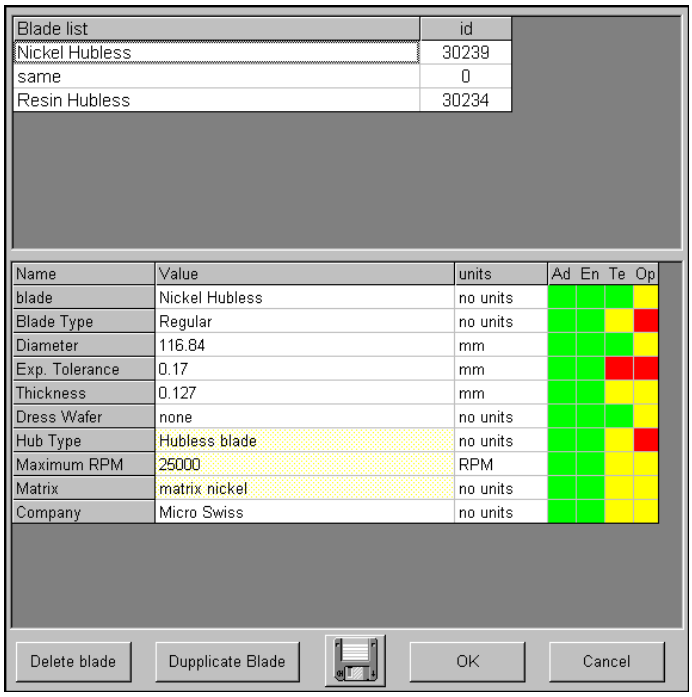


Figure 5-8: Blade Properties

To Define a new blade:

1 Click once in the **Value** cell of the blade property to display a browse button [...].

2 Click the browse button [...] to display the Blade Properties screen (see Figure 5-8).

3 Select a blade that has the most similar properties to the blade you want to define.

4 Click **Duplicate Blade.** The **Duplicate Blade** dialog box appears.

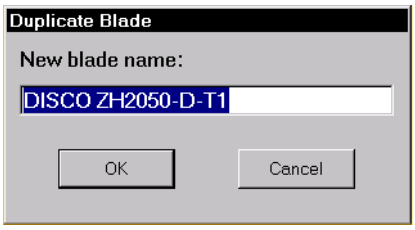


Figure 5-9: Duplicate Blade Dialog Box

5 Enter the name of the new blade and click **OK**.

6 Change the appropriate Values of the new blade.

7 Click **Save**  .

5.3.2.3 Modifying Blade Properties

The properties of a blade can be modified in the Blade Properties screen by performing the procedure described below.

To Modify Blade Properties:

1 In the Blade Properties screen, double-click the **Value** cell for a property and enter the appropriate value.

2 Repeat step 1 for as many properties as required.

Note: When properties are modified, a **Save** button  is displayed below the blade properties.

3 Click **Save**.

4 Click **OK** to return to the Recipe properties in the Programming Workspace.

5.3.2.4 Deleting Blades

Blades can be deleted from the System by performing the procedure described below.

To delete a blade:

1 Select a blade from the list in the upper pane of the Blade Properties screen.

2 Click **Delete blade** to display the following message.



Figure 5-10: Delete Blade Message

3 Click **Yes**. The selected blade is removed from the list in the upper pane and is no longer available as a selection for the **Blade** Recipe property in the Programming Workspace.

Note: If this blade is used in a different recipe a message notifies the User that they blade cannot be deleted.

5.4 Specifying Recipe Parameters

When a new Recipe is created, it inherits the properties and parameters of the Recipe that was used a base or template for the new Recipe. The User can modify the parameters of the Recipe, as required.

5.4.1 Accessing Parameters

Recipe parameters may be compulsory, optional or automatic:

- **Compulsory**: Parameters that must be included in the Recipe in order for an algorithm to function.
- **Optional**: Parameters that can be added by the User to further customize System operation.
- **Automatic**: Parameters that are automatically defined by the System.

Compulsory parameters must be added to the Recipe when a Recipe's properties are defined. When the Recipe is saved, the System checks which parameters are compulsory according to the algorithms selected. If any compulsory parameters are missing from the Recipe, the System displays them in the Missing Parameters Report and adds them with their default values (see section 5.3).

Recipe parameters are divided into categories, displayed beneath the Recipe in the Programming tree, as follows:

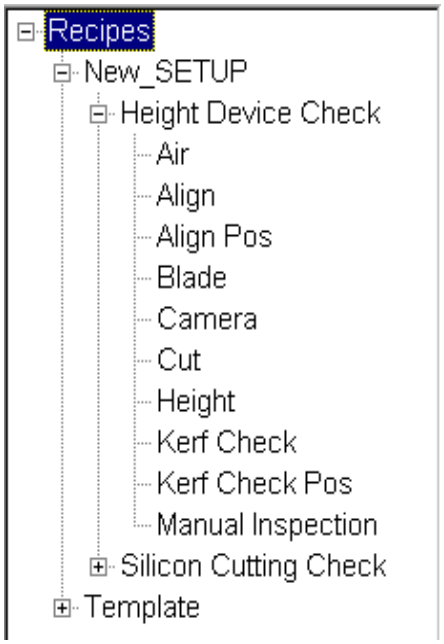


Figure 5-11: Parameter Categories in the Programming Tree

Each category includes parameters that define a particular aspect of System operation, as shown below. For a more detailed description of Recipe parameters and their categories, see Appendix 3.

Table 5-3: Parameter Categories	
Parameter Category	**Description**
Air	Defines the duration of the air puff used to release Workpieces from the Cutting Chuck.
Align	Defines how Alignment is performed.
Align Model	Contains the Kerf model options when the Align Kerf type models are used.
Align Pos	Defines the conditions under which Alignment is performed.
Average Index	Contains parameters required for Average Index calculation.
Blade	Defines the wear and exposure limits of the blade and the new blade treatment.
Camera	Defines settings for oblique and vertical illumination in the Camera.
Cut	Defines how Workpieces are cut, including the Index, Cut Depth and Cut Length.
Cut Depth Comp	Defines the Cut Depth Compensation procedure.
Cut Verify	Contains general parameters for the Cut-Verification procedure.
Cut Verify Limit	Contains the limit parameters for the Cut-Verification procedure.
Dress Block	Contains the Optional Dress Station parameters.
Dressing	Defines how the blade is dressed. Applicable when using the dressing wafer or dressing block mounted on the Chuck.
Height	Contains parameters, according to which the system performs the height procedure (rate, type and settling time).
Kerf Check	Defines how Kerf Checking is performed.
Kerf Check Limit	Contains the limit parameters for the Kerf Check procedure.
Kerf Check pos	Defines the Camera settings, Field of View settings and Model settings when performing Kerf Check.
LM Baseline	Defines how the Baseline load is monitored.
LM Cutting	Defines how the load is monitored during the cutting process. Refer to section 5.4.2 below.
LM Override and Dressing	Defines how the load is monitored during override and dressing.

Table 5-3: Parameter Categories	
Parameter Category	**Description**
Loop cut	Defines how to cut using repetitive patterns.
Manual Inspection	Defines the regularity of Automatic Inspection and the Inspection Illumination settings.
Model Processing	Contains parameters for special model processing models with a variation in gray levels.
Multi-panel	Contains parameters required for Multi-panel applications.
Override	Defines how the System performs Dressing Using Override.
Shrinkage	Contains parameters used when dicing substrates that suffer from shrinkage.
Teach Center	Defines whether the workpiece is centered on the Chuck.
Tilted Spindle	Contains parameters used by the Tilted Spindle Option.
Y Offset	Defines location and limits for Y Offset procedure.

To Display Recipe Parameters:

1 Expand the Recipe in the Programming tree to display its parameter categories.

2 Select any parameter category in the Programming tree. The parameters for the Recipe are displayed in the Parameter Table in the upper right pane of the Programming Workspace, as follows:

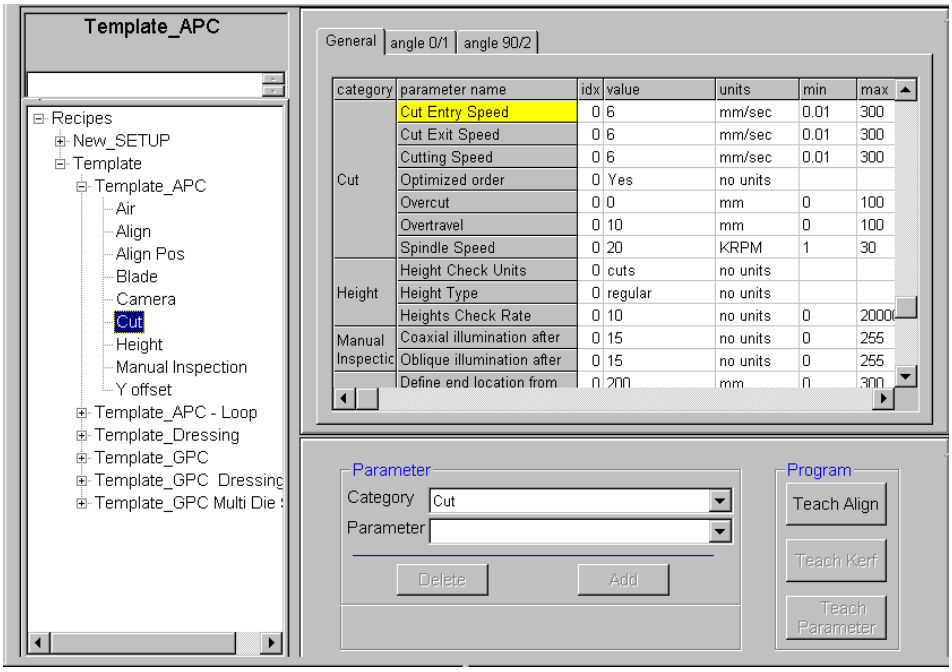


Figure 5-12: Recipe Parameters

Note: The Parameter Table is automatically scrolled to the category selected in the Programming tree.

5.4.2 Monitoring the Cutting Process

The load monitor feature allows data collection using the Log file. The load can be presented per cut or at the beginning of each angle. The Cut Monitor is defined in a recipe by the parameter: “Load Logging”, located under the LM Cutting Recipe Parameter category. This parameter has three states:

- “No” - don't execute cut monitoring
- “First cut” - execute cut monitoring on first cut in angle
- “Each cut” - execute cut monitoring on each cut in angle

When this feature is activeted, the monitoring data is collected and recorded in the Log File. Refer section 3.8 to for more information about the Log File.

5.4.3 General and Angle Parameters

Certain parameters in a Recipe are defined for each angle to be cut in the Workpiece, while others are considered general because they apply to the Workpiece as a whole. Angle parameters appear in the Angle tabs, and general parameters appear in the General tab. Before specifying parameters, define the angles along which the Workpiece will be cut.

Note: If a parameter is defined under both **General** and **angle** tabs, the value under an **angle** tab is the effective one.

5.4.3.1 Defining Angles

When defining a Recipe, the User must define the angles along which the Workpiece will be cut. The User can define as many angles as needed. Angles can be redefined or deleted at any time.

Note: Only positive values can be used to define the angles.

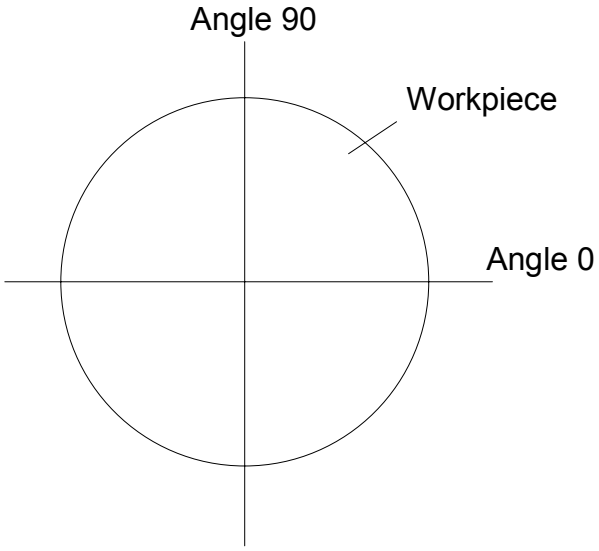


Figure 5-13: Workpiece with Two Defined Angles

5.4.3.1.1 Adding New Angles

New angles can be added to the Recipe by performing the procedure described below.

To Define New Angles:

1 In the Programming Workspace, right-click on any existing Angle tab to display the following popup menu:

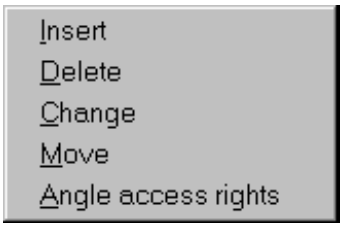


Figure 5-14: Angle Tab Popup Menu

2 Click **Insert** to display the following dialog box:

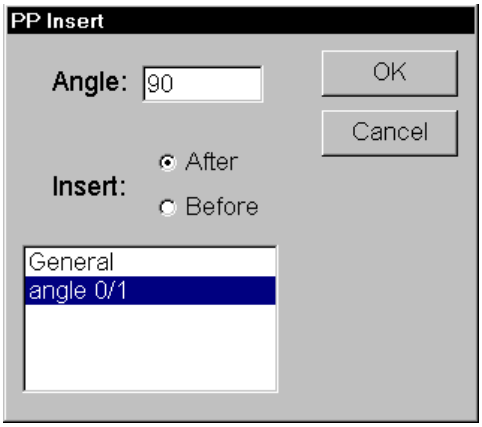


Figure 5-15: PP Insert Dialog Box

3 Enter the desired angle and select whether to have the parameter tab for the angle added **Before** or **After** the parameter tab selected in the text box.

4 Click **OK**. A tab for the angle is added to the Parameter Table, as shown below.



Figure 5-16: Angle Tab Added

The parameters defined in the tab will be the same as those for the existing angle. The parameters can then be modified, as described below in section 5.4.3.2.

5.4.3.1.2 Moving Angle Tabs

The order in which Angle tabs are displayed in the Parameter Table can be modified by performing the procedure described below.

Note: The order in which Angle tabs are displayed in the Parameter Table has no affect on the functionality of the Recipe.

To Move Angle Tabs in the Parameter Table:

1 In the Parameter Table, right-click the tab to be moved to display the popup menu (see Figure 5-14).

2 Click **Move** to display the following dialog box:

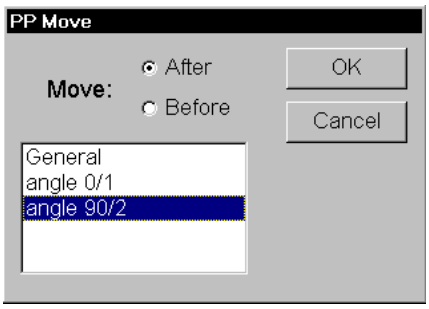


Figure 5-17: PP Move Dialog Box

3 Select the place to move the tab by selecting one of the parameter tabs displayed and then clicking **After** or **Before**.

4 Click **OK**. The Angle tab is moved to its new location in the Parameter Table.



Figure 5-18: Moving an Angle Tab

5.4.3.1.3 Modifying Angles

The angles defined for the Recipe can be modified at any time by performing the procedure described below.

To Modify Angles:

1 In the Parameter Table, right-click the tab to be modified to display the popup menu (see Figure 5-14).

2 Click **Change** to display the following dialog box:

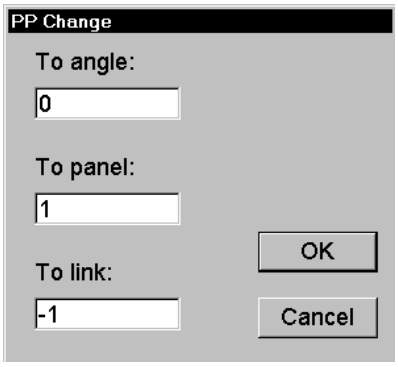


Figure 5-19: PP Change Dialog Box

3 Enter the new angle, then click **OK**. The angle is redefined in the Parameter Table. The parameters defined in the tab remain the same as before.

5.4.3.1.4 Angle Access Rights

Users with read-write access can determine which Users can add, move and modify angles by limiting access to the popup menu (see Figure 5-14). For further information on limiting access rights, refer to Chapter 4.

5.4.3.2 Specifying Parameters

After defining the cutting angles, Users with read-write access to parameters can add, modify and delete the parameters for each angle as needed. The User can also add, modify and delete the parameters in the General tab, which are applicable to all angles. The values defined for each parameter determine the way the algorithms in the Recipe control the operation of the System.

5.4.3.2.1 Adding Parameters

Parameters are added to the Recipe by selecting them from the relevant parameter category and adding them to the Parameter Table, as described below. It is recommended that parameters first be defined for the General tab, before adding parameters for each defined angle.

To Add Parameters to the General and Angle Tabs:

1 In the Parameter Table, click the General tab. The General tab displays those parameters that were defined for the Recipe from which this new Recipe was created (see section 5.2).

2 In the **Parameter** area below the Parameter Tree, select a parameter category from the **Category** drop-down list, as shown below:

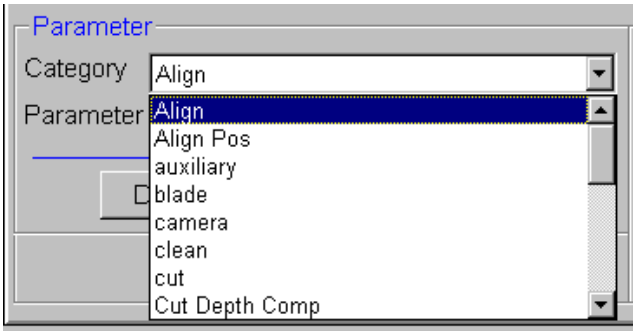


Figure 5-20: Parameter Category List

3 Select a parameter from the **Parameter** drop-down list, as shown below:

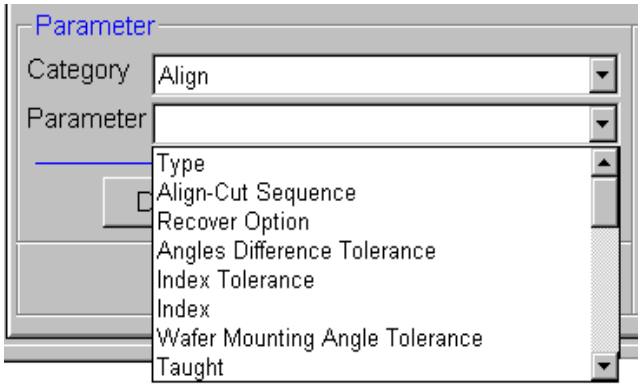


Figure 5-21: Parameter List

4 Click **Add**. The parameter is added to the Parameter Table with the default value for the parameter assigned. (For more information about default parameter values, see Appendix 1. To modify these values, see section 5.4.3.2.2.)

5 Repeat steps 2-4 until all the parameters required for the tab have been added.

6 Click  . The new settings are saved to the Recipe.

7 Click the first Angle tab and repeat steps 2 through 6 to define the parameters that are specific to that angle.

8 Repeat steps 2 through 6 for all additional Angle tabs.

5.4.3.2.2 Modifying Parameters

Users with read-write access can modify the values of parameters in the Recipe at any time by performing the procedure described below.

To Modify Parameter Values:

1 In the Parameter Table, double-click the **Value** cell of the parameter to be modified. If the User can choose from among a list of preset values, a drop-down list with those values appears in the cell. Otherwise, a blinking cursor appears.

2 Select a value from the drop-down list or enter the value directly. Only values within the **min** and **max** range are valid.

3 Click  . The new settings are saved to the Recipe.

5.4.3.2.3 Deleting Parameters

Parameters can be deleted from the Recipe by performing the following procedure.

To Delete Parameters from the Recipe:

1 Select a parameter in the Parameter Table. Any cell on the line, including the parameter name, can be selected.

2 In the **Parameter** area, click **Delete**. The selected parameter is deleted from the Parameter Table.

If more than one index was defined for the parameter, clicking **Delete** deletes the value for the selected index. (Click **Delete** additional times to delete other indexes, where applicable.)

3 Click  to confirm the deletion of the parameter or  to cancel the procedure and restore the parameter to its previous value.

5.5 Importing and Exporting Recipes

Recipes can be imported from other Systems or exported to other Systems, by using the network (if the System is connected to a network) or by using a diskette. This enables the same Recipe to be copied and used on multiple Systems.

To Export a Recipe:

1 In the Programming Workspace, click **Recipe Export** to display the following dialog box:

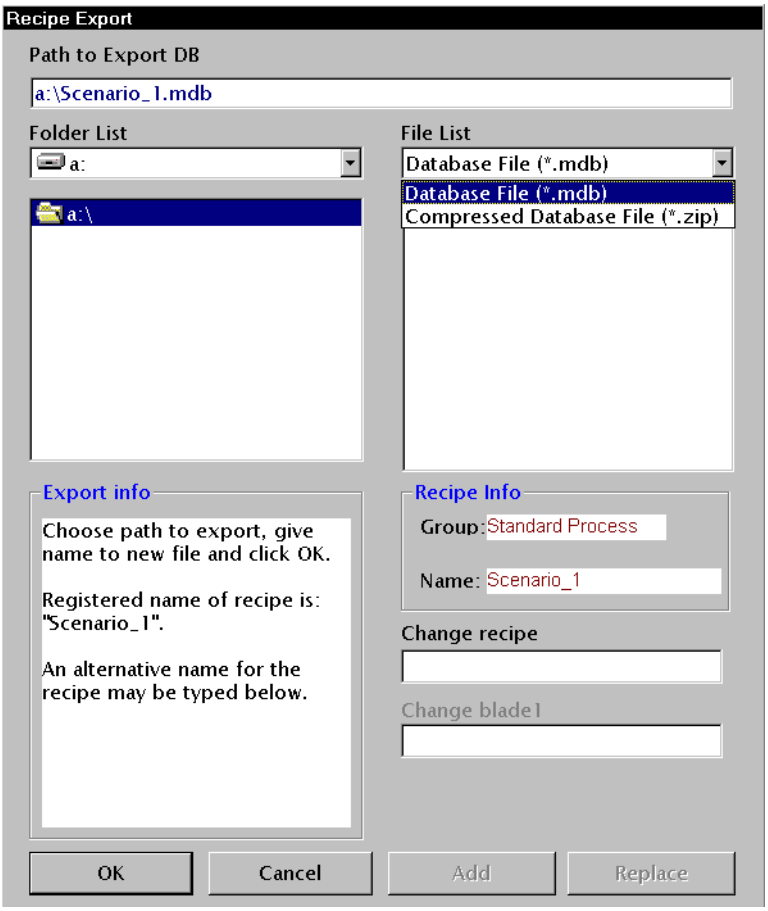


Figure 5-22: Recipe Export Dialog Box

The Export Info area displays instructions for continuing the procedure. The Name of the Recipe and the Group to which the Recipe belongs appear in the Recipe Info area.

2 Select the path to which to export the Recipe.

3 In the File List, select the type of the file to be exported (database or zip.)

4 [optional] Change the name of the Recipe by entering a new name in the **Change Recipe Name** field, if required.

5 Click **OK**. The Recipe is exported to the selected System.

Note: The exported recipe contains a file **pecipe**.mdb and a folder named "Blobs of **recipe**".

To Import a Recipe:

1 In the Programming Workspace, click **Recipe Import** to display the following dialog box:

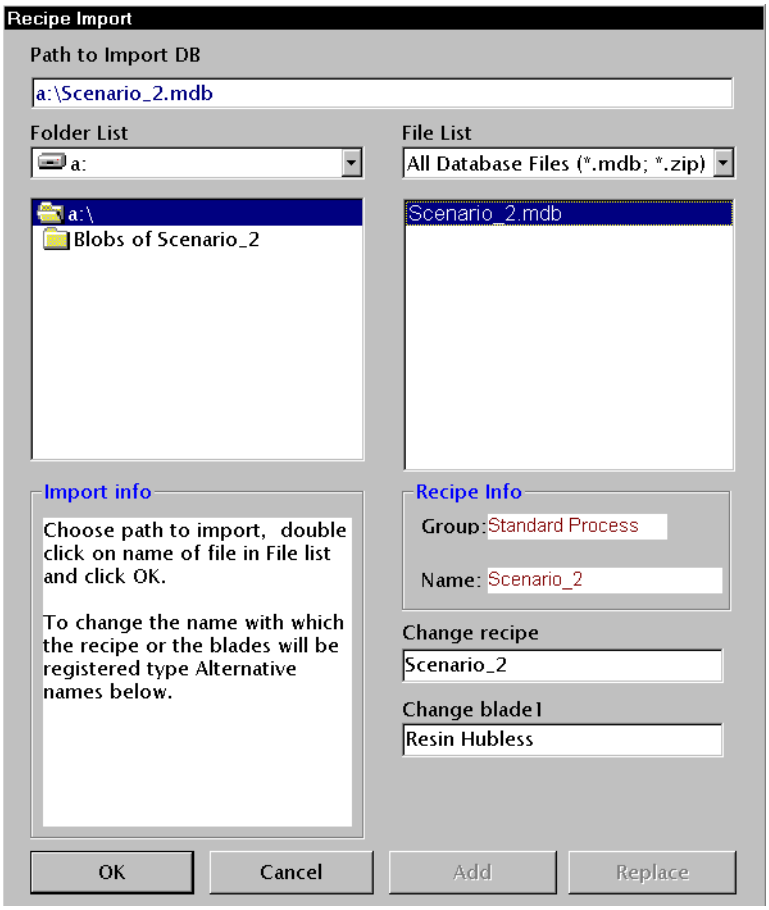


Figure 5-23: Recipe Import Dialog Box

The Import Info area displays instructions for continuing the procedure.

2 Select the path from which to import the Recipe. The Name of the Recipe and the Group to which the Recipe belongs appear in the Recipe Info area.

3 [optional] Change the name of the Recipe by entering a new name in the **Change Recipe Name** field, if required.

4 [optional] Change the name of the blades by entering a new name in the **Change Blade Name** fields, if required.

5 Click **OK**. The Recipe is imported into the System.

Note: If the recipe/blade being imported already exists in the System, a dialog box is displayed to give the user two options: add the recipe/blade, changing its name, or replace the existing recipe/blade, with the new one being imported.

5.6 Recipe Templates

As explained above, a new recipe is created by duplicating an existing recipe template file. This section contains the recipe templates of the Model 7100 and the cut maps based on these templates.

All the Model 7100 templates have the **Taught** parameter (**Align** category) set to "**Yes**". The user can create a cut map (see Figures 5-24, 5-25, 5-26 and 5-27) in three steps given below:

1 Load a workpiece.

2 Press the Auto Align button.

3 Follow the wizard instruction.

5.6.1 APC Standard Template

	Angle 0	**Angle 90**
Parameters		
Workpiece Shape	Rectangular	
Workpiece Size	100 x 100 mm	
Thickness	1 mm	
Blade	00777-6045-010-QIP	
Align type	Manual	N/A
Spindle speed	20 krpm	
Index	18 mm	15 mm
Sub index	N/A	
Cut count	5	6
Cut speed	6 mm/sec	20 mm/sec
Loop offset	NA	
Loop count	NA	
Depth	3 mm	

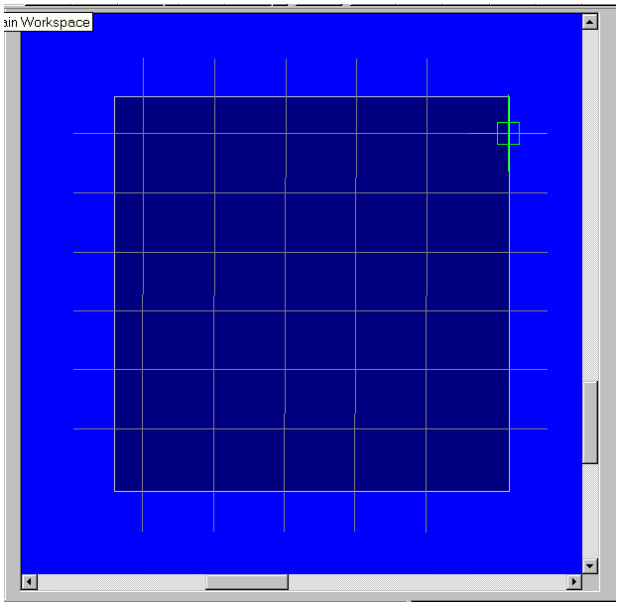


Figure 5-24: APC Standard Cut Map

5.6.2 APC Loop Cut Template

	Angle 0	**Angle 90**
Parameters		
Work piece Shape	Rectangular	
Work piece Size	100 x 100 mm	
Thickness	1 mm	
Blade	00777-6045-010-QIP	
Align type	Manual	N/A
Spindle speed	20 krpm	
Index	3 mm	20 mm
Sub index	N/A	
Cut count	5	5
Cut speed	10 mm/sec	10 mm/sec
Chop velocity	0.5 mm/sec	N/A
Loop	From Ang.1	to Ang.1
Loop offset	X=20mm	Y=22mm
Loop count	5	
Depth	3 mm	

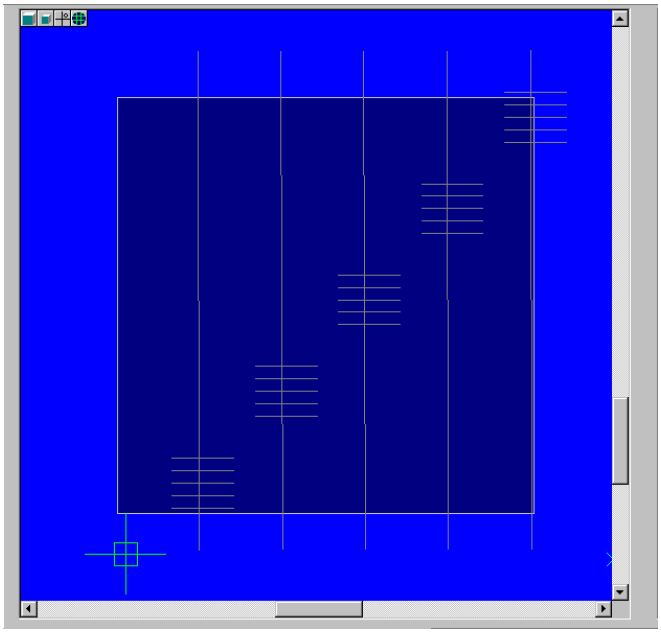


Figure 5-25: APC Loop Cut Map

5.6.3 GPC Standard Template

	Angle 0	**Angle 90**
Parameters		
Work piece Shape	Circular	
Work piece Size	150 mm	
Thickness	0.635 mm	
Blade	00777-6045-010-QIP	
Align type	Manual	
Spindle speed	20 krpm	
Index	18 mm	15 mm
Sub index	N/A	
Cut count	5	6
Cut speed	6 mm/sec	20 mm/sec
Loop offset	NA	
Loop count	NA	
Depth	3 mm	

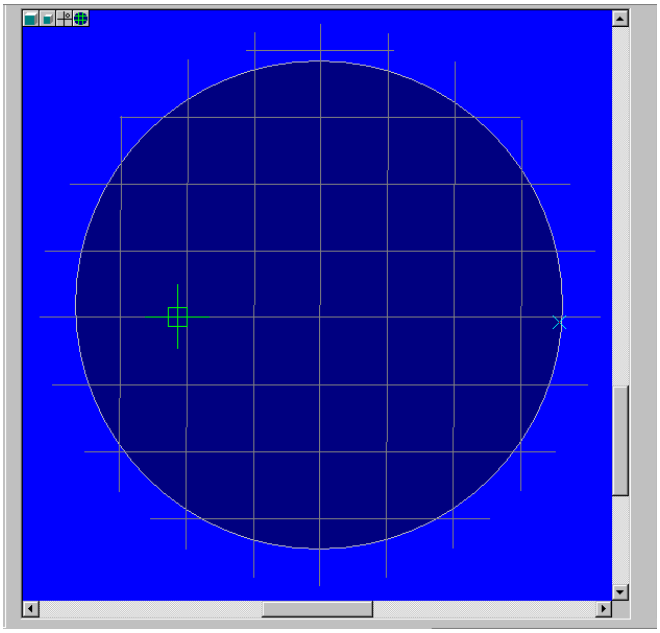


Figure 5-26: GPC Standard Cut Map

5.6.4 GPC Multi Die Size Template

	Angle 0	**Angle 90**
Parameters		
Workpiece Shape	Circular	
Workpiece Size	150 mm	
Thickness	0.635 mm	
Blade	00777-4300-050-BLO	
Align type	Manual	
Spindle speed	30 krpm	
Index	20 mm	20 mm
Sub index	5	N/A
	5	N/A
Cut count	5	6
Cut speed	45 mm/sec	
Loop offset	NA	
Loop count	NA	
Depth	3 mm	

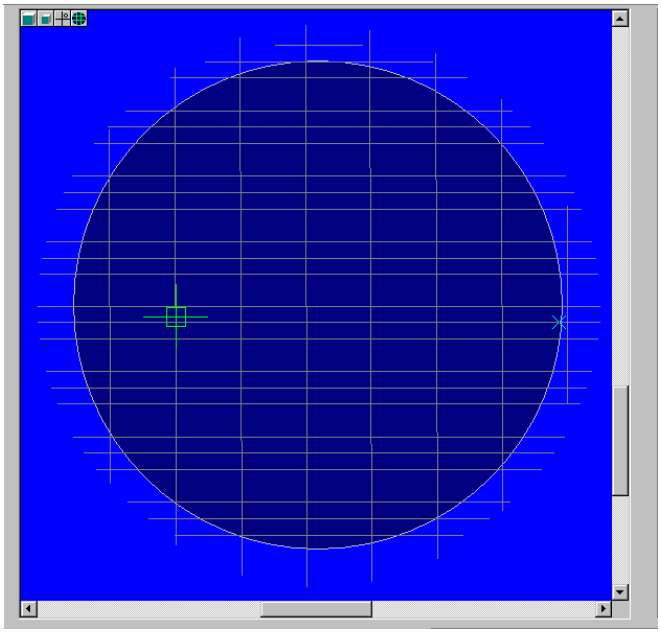


Figure 5-27: GPC Multi-Die Size Cut Map

5.6.5 Standard Dressing Template

	Angle 0	**Angle 90**
Parameters		
Workpiece Shape	Rectangular	
Workpiece Size	75 mm	75 mm
Thickness	0.635 mm	
Blade	00777-4300-050-BLO	
Align type	Manual Dress	
Spindle speed		
Index		
Sub index		
Cut count		
Cut speed		
Loop offset		
Loop count		
Depth		

5.6.6 GPC Dressing Template

	Angle 0	**Angle 90**
Parameters		
Workpiece Shape	Rectangular	
Workpiece Size	100 mm	100 mm
Thickness	1 mm	
Blade	00777-4300-050-BLO	
Align type	Manual	
Spindle speed	40 krpm	
Index	18 mm	15 mm
Sub index	N/A	
	N/A	
Cut count	5	6
Cut speed	30 mm/sec	
Loop offset	NA	
Loop count	NA	
Depth	3 mm	

6 DICER PROCEDURES

This chapter contains the instructions that deal with:

1 Workpiece Alignment, section 6.1

2 Cut Verification, section 6.2

3 Kerf Checking, section 6.3

4 Y-Offset, section 6.4

5 Special Cut Procedures, section 6.5

6.1 Workpiece Alignment

Alignment uses the Vision System to precisely align a Workpiece parallel to the Blade to ensure accurate cutting down the middle of each Street. The User has the option of choosing either Auto Alignment (performed automatically by the Pattern Recognition System - PRS) or Manual Alignment (performed by the User). In order to perform Auto Alignment, the System must first be taught Alignment. Once Alignment has been taught for a Recipe, the System automatically align all the Workpieces that have been assigned the same Recipe.

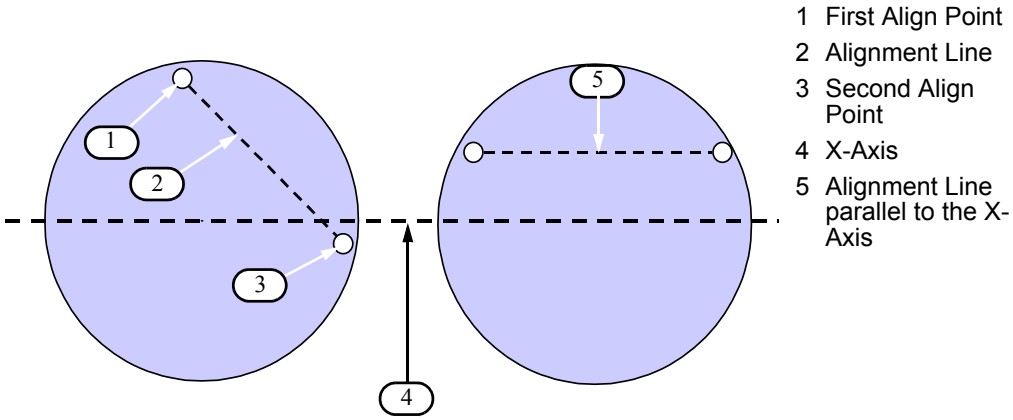


Figure 6-1: Workpiece Before and After Alignment

The idea of alignment is based on having the System remember two points on the workpiece. These two points define the baseline for adjusting the parallelism of the kerfs. Once the Workpiece has been aligned, the alignment is taught to the System. Afterwards, the System automatically updates (straightens) the substrate position on the Cutting Chuck by turning the Theta Axis.

This section provides information about the following alignment features:

- Manual Alignment - see section 6.1.1
- Auto Alignment - see section 6.1.2
- Teach Alignment - see section 6.1.3
- Model Types - see section 6.1.5
- Model Processing Filters - see section 6.1.6
- Rotational Shrinkage - see section 6.1.7
- Average Index - see section 6.1.8
- Updating the Workpiece Alignment - see section 6.1.9

6.1.1 Manual Alignment

Manual Alignment is generally used when there are no eyepoints for Auto Alignment. It may also be used when making one or two cuts on a single Workpiece in order to test the results of a Recipe before it is put into use. Likewise, Manual Alignment is a part of the Teach Alignment procedure (see section 6.1.3.2).

Note: As Manual Alignment is performed by the operator of the System, the accuracy achieved depends upon the skill of the operator and is therefore subject to human error.

Once Manual Alignment has been performed, the Workpiece can be cut, using the parameters defined in the Recipe.

Manual Alignment comprises the following steps:

- Aligning the Workpiece, to ensure the Streets are parallel to the Blade
- Defining the Cut Position.

6.1.1.1 Aligning a Workpiece

The first step in Manual Alignment is aligning the Workpiece parallel to the Blade, by aligning the Reticle in the Field of View (FOV) with a selected Street.

To Perform Manual Alignment:

1 From the Manual menu, select **Vision > Manual Alignment**,

or click  in the toolbar. The display automatically switches to the Video Workspace, where the first step to be performed by the User is displayed in the Wizard.

2 Follow the direction given in the Wizard**.**

Note: If a cut map for the wafer already exists, the system goes to the defined cut position. To perform the alignment manually click **Back**.

Note: Adjust focus and illumination

3 Position the horizontal line of the Reticle along the edge of a Street on the Workpiece using either the X/Y-Axis Controls or by double-clicking

the location in the FOV. Adjust the Theta Axis, if required, by using the Z/T Axis Controls.

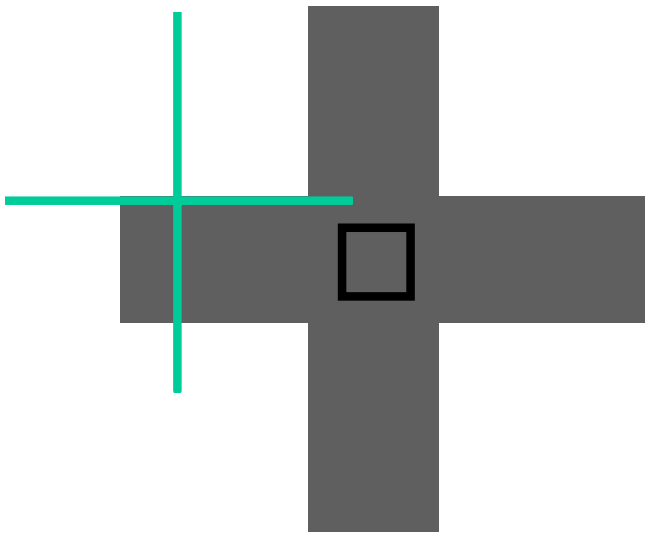


Figure 6-2: Aligning the Reticle

4 Click **Next**. The Workpiece moves along the X-Axis until the left side of the Workpiece is beneath the microscope. (This distance is limited by the **Area** parameter in the Align category.)

5 Position the Reticle on the same Street edge using the X/Y-Axis Control or by double-clicking the location in the FOV. Perform Theta correction and Y-Axis correction.

6 Click **Next**. The Workpiece moves along the X-Axis until the right side of the Workpiece is beneath the microscope. (This distance is limited by the **Area** parameter in the Align category.)

7 Repeat Steps 4 to 6 by clicking **Next** to move from one side of the Workpiece to the other and adjusting the position of the Reticle until the Reticle remains on the edge of the Street in both positions.

8 Click **Finish** to complete the first step in the Manual Alignment procedure. The Workpiece remains aligned until it is unloaded from the Cutting Chuck

Note: Even after clicking **Finish**, it is possible to return to previous steps in the procedure by clicking **Back**.

6.1.1.2 Defining Cut Position

The second step in Manual Alignment is defining a Cut Position, which is a reference point on the Workpiece. It is recommended to select a Cut Position at a well-defined point on the Workpiece.

To Define the Cut Position:

1 Use the X/Y-Axis Controls to move the Camera to the reference point.

2 Click **Finish**. The System automatically calculates and displays the cut map for that angle in the Main Workspace Window in the Video Workspace, according to the recipe parameters.

Note: For **APC** algorithm the defined cut position is normally the point where the blade enters the Workpiece. For **GPC** algorithm, the defined cut position is anywhere in a center of a street. The cut map is displayed according to the cut position referred to the chuck center.

When the User has completed the two steps that comprise Manual Alignment, the entire procedure is repeated for the other angles defined in the Recipe for that Workpiece. For instance, if Angles 0º and 90º have been defined, Manual Alignment is first performed at 0º then at 90º. Switch between the two angles by changing the Theta using the Z/T Axis Controls (selecting A then or).

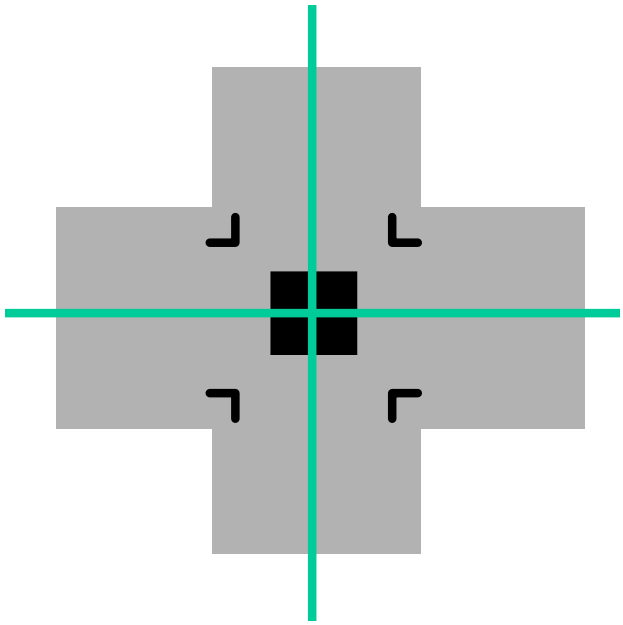


Figure 6-3: Sample Cut Position

6.1.2 Auto Alignment

During normal operation, the Model 7100 uses Auto Alignment when processing a large number of identical Workpieces. In order to use Auto Alignment, the following two procedures must first be performed:

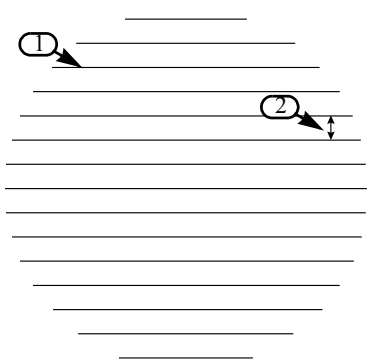
- Teach Index (obligatory for "Street" alignment type only)
- Teach Alignment

6.1.2.1 Teach Index

Note: Teach Index procedure for **Street** alignment type must be performed also to update the Align Index. This procedure is critical for the **Street** alignment type, because otherwise Teaching Alignment will not succeed.

Teaching the Index defines the exact distance along the Y-Axis between each Street on a Workpiece. Once defined, each cut to be performed along a Street is called a Main Index Cut. Although the Index can be entered directly into the Recipe, the exact value is usually not known, and is therefore taught using the following procedure. The Index must be specified for each angle defined in the Recipe.

Note: If the indexes are inconsistent, use also the Average Index feature (see section 6.1.8) for substrates with Shrinkage (see section 6.1.7) that use two-point alignment.



1 Cut
2 Index

Figure 6-4: Index

To Teach the Index:

1 Click  to display the Programming Workspace.

2 Expand the Recipe assigned to the Workpiece in the Programming tree and select the Cut parameter category of that Recipe. The parameter table for the Recipe is displayed on the right.

3 In the parameter table, select the tab for the first defined angle.

4 Scroll to the **Index** parameter and click the cell containing the value defined for the **Index** parameter. The **Teach Parameter** button in the lower right corner becomes enabled.

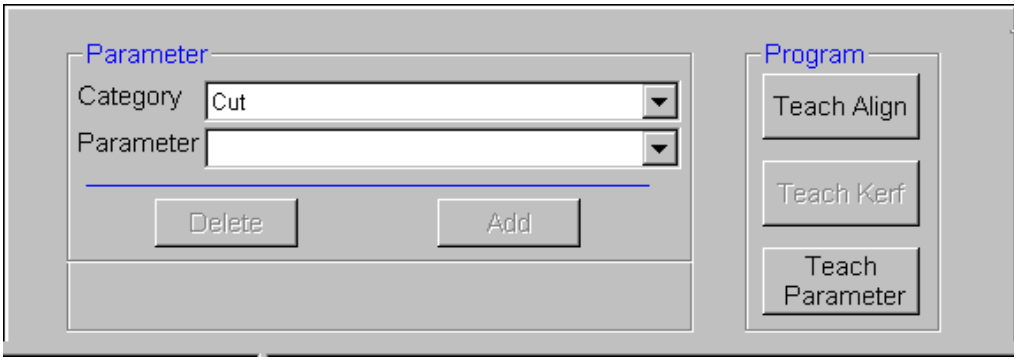


Figure 6-5: Teach Parameter Button Enabled

5 Click **Teach Parameter**. The following message box is displayed:

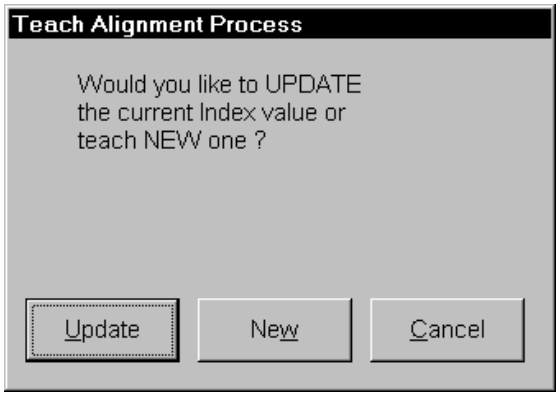


Figure 6-6: Teach Alignment Process Message Box

6 Click **Update** to modify a previously taught Index, or **New** to teach the Index for the first time.

Note: If a cut map for the wafer already exists, the system goes to the defined cut position. To perform the alignment manually click **Back**.

7 Perform Manual Alignment (see section 6.1.1). At the end, click **Finish**.

8 Define a Cut Position (see section 6.1.1.2). At the end, click **Finish**. The following dialog box is displayed:

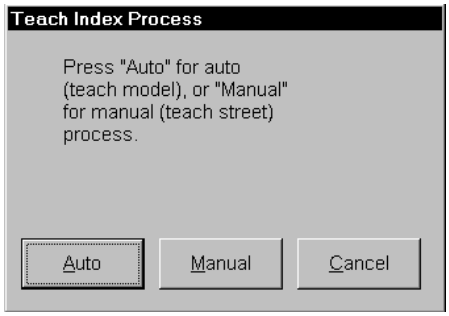


Figure 6-7: Teach Index Process Dialog Box

9 Click **Auto**.

Note: Click **Auto** if there are clearly visible models on the substrate. Clicking **Manual** enables the User to teach the Index manually as described in section 6.1.2.1.1.

10 Click **Next**. The Camera moves to the top of the Workpiece.

11 Select a Model to be taught by moving it to the center of the FOV using the X/Y-Axis Controls.

12 Toggle the center box of the Guide Control until **T** appears, then use the Guide Control to size the Teach Area.

13 Adjust the Focus and Illumination for the best view of the model.

14 Select the confidence level for the model.

15 Click **Teach**. If the Model selected is successfully taught to the System, the FOV will flash the message **Model Taught**, along with a score (based on a scale of 0-100). Click **Find** to test whether the System can correctly identify the Model.

16 Click **Next**. When updating an existing index, the System moves one Index along the Y-Axis, based on the value currently defined for the Index parameter in the Recipe and searches for the taught Model. When teaching a new index, the System moves one millimeter along the Y-Axis.

17 Use the X/Y-Axis Controls to adjust the position of the Reticle along the Y-Axis until the Model is approximately centered inside the Search Area.

Note: In order to verify the adjustment before completing the procedure, another manual Index move can be made by clicking **Next**.

18 Click **Finish**. The System automatically attempts to find the Model at each of five consecutive Index jumps. After each jump, the System

flashes a score indicating whether the Model has been successfully found and displaying the index distance.

Note: If a Model is not found, the System prompts the user to move to the next Model.

After the fifth Index jump, the Camera moves to the bottom of the cut map (80% of the number of cuts defined in that angle) and attempts to locate the Model again. If the attempt is successful, the System calculates the remaining Index positions along the selected angle. Once this is complete, a confirmation box appears asking the User whether to update the Index and Align Index parameters with the new values. (The Align Index parameter is the Cut Index for the opposite angle. For example, the Cut Index defined for Angle 0º is the same value as the Align Index for Angle 90º.)

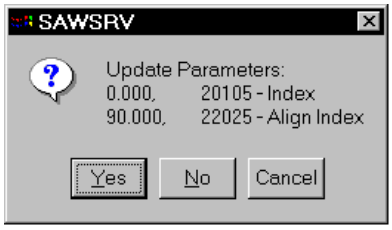


Figure 6-8: Update Parameters Dialog Box

19 Click **Yes**. The new values for the Index and Align Index parameters are saved to the Recipe.

6.1.2.1.1 Teaching the Index Manually

A Workpiece must contain a minimum of six streets in order for the System to be taught the Index automatically. If a Workpiece contains fewer than six streets, or in case the models are not clear or repeatable, the Index must be taught manually by performing the following procedure:

To Teach the Index Manually:

1 Perform steps 1 to 8, as described in section 6.1.2.1.1.

2 Click **Manual** in the Teach Index Process dialog box (see Figure 6-7).

3 Click **Next**. The Camera moves to the top of the Workpiece.

4 Move to an align point on a Street where a cut is required, using the X/Y-Axis Controls.

5 Click **Next** to move to the next align point.

6 Repeat steps 4 and 5 for each additional align point, as required. At the last align point, click **Finish**. The System calculates the Index and the

Index is defined and flashed on the screen. The Update Parameters dialog box, shown in Figure 6-8, is displayed.

7 Click **Yes**. The new values for the Index and Align Index parameters are saved to the Recipe.

6.1.3 Teach Alignment

In order to perform Auto Alignment on a group of Workpieces that share the same Recipe, Alignment must first be taught to the System, using a sample of the Workpieces to be cut. This procedure is known as Teach Alignment. Before performing Teach Alignment, an Align Type must be selected. The Align Type describes the method used by the System to align the Workpiece. Once the Alignment is taught, it can be updated for the whole Recipe or for a specific angle. For more details see section 6.1.9.

6.1.3.1 Selecting an Align Type

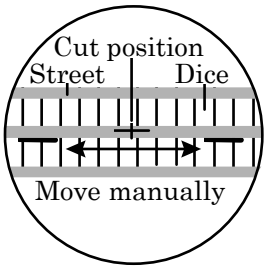
Before performing Teach Alignment, an Align Type must be selected for each angle of the Workpiece. The Align Type defines the way Alignment is performed by the System during the Auto Alignment process.

Note: The default for the Manual Alignment type is Horizontal. To perform Manual Vertical Alignment, under the Align category, set the parameter **Vertical Manual Alignment** to **Yes**. Then, select **Manual** as the Align Type.

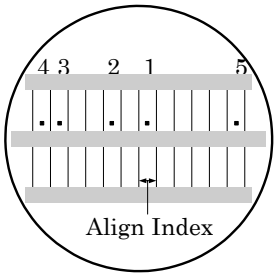
The following Align Types are available:

No: No Alignment is performed on the Workpiece; instead, the center of the Cutting Chuck is used by the System as a reference point. If Alignment has been previously taught and then set to "No", the last taught Alignment and reference point are used. This Align Type is useful when working with blank Workpieces.

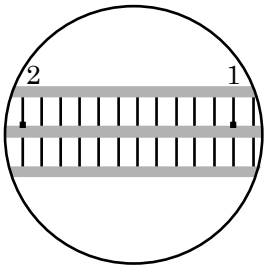
Note: The following diagrams illustrate the method of finding Models for the different Align Types.



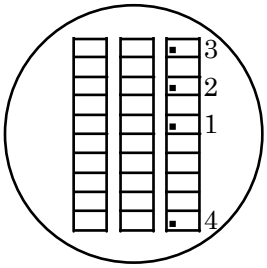
Manual: The System waits for the User to perform Manual Alignment before proceeding to cut the Workpiece.



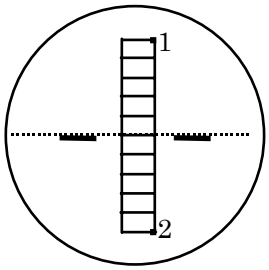
Street: Auto Alignment is performed by finding a Model (repeating pattern) along the Street.



2-Points: Auto Alignment is performed by finding two different Models at two pre-defined locations.
The accuracy depends on the accuracy of the Manual Alignment taught.



V-Street: Similar to the Street Align Type but performed on the vertical (Y) axis.
V-Street is only recommended when cutting a Workpiece that is vertically-oriented (that is, has a very short X-Axis), such as capacitors.



V-2-Points: Auto Alignment is performed by finding a Model on the vertical (Y) axis that is repeated at two defined locations.

Copy - From: Alignment and dicing are carried out using the results of the last alignment performed, according to the degrees in the angle. This option can be used for more than one additional angle.

Copy - From Ref: Alignment and dicing are carried out using the results of the last alignment performed, according to the degrees in the angle. The user has to define a cut position for this angle. This option can be used for more than one additional angle. For example, the alignment types can be defined as follows:

- angle 0/1 - **Manual**
- angle 0/2 - **Copy - From Ref**
- angle 0/3 - **Copy - From Ref**
- angle 90/4 - 2-Point Alignment

Note: In order for the entire cut map to be copied from one cut to another, the following parameters must be identical in both cuts:

- Index
- Number of cuts

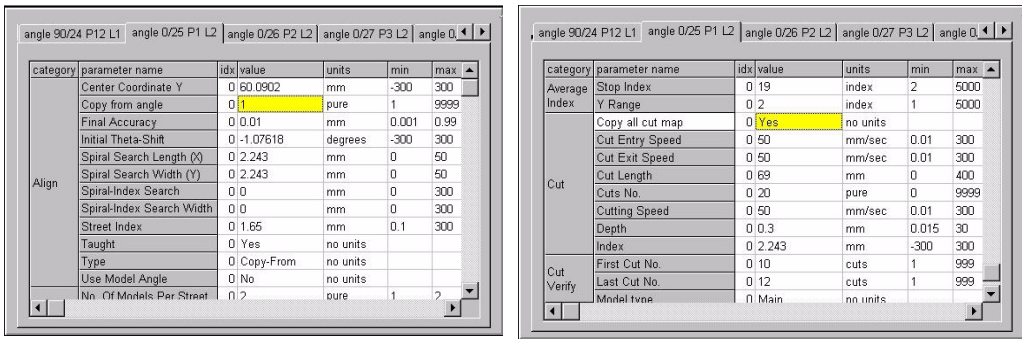


Figure 6-9: Copy From Angle - Enhancement Parameters

To Select an Align Type:

1 Click  to display the Programming Workspace.

2 Expand the Recipe assigned to the Workpiece in the Programming tree, and select the Align parameter category of that Recipe. The parameter table for the Recipe is displayed on the right, as shown in Figure 6-10.

3 In the parameter table, select the tab for the first defined angle.

4 Scroll to the cell containing the value defined for the Type parameter.

5 Select an Align Type from the drop-down list.

6 Click  . The new value is saved to the Recipe.

Note: Once Teach Alignment has been performed, as described in the following section, the Align Type should not be changed.

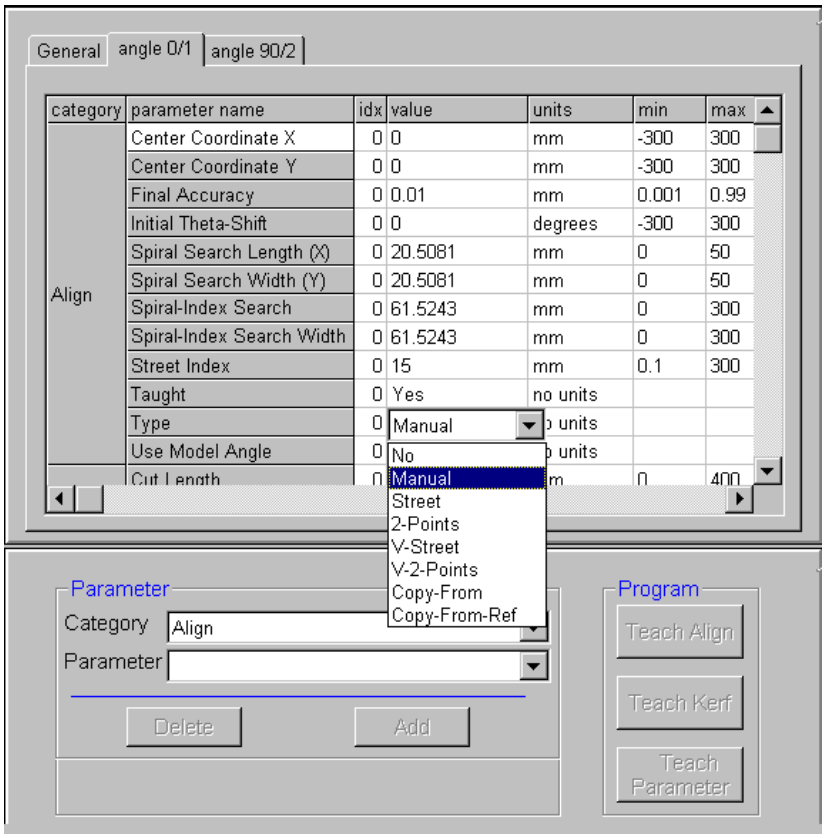


Figure 6-10: Selecting an Align Type

6.1.3.2 Performing Teach Alignment

After the Align Type has been selected and the Index has been taught, Teach Alignment can be performed for each angle defined in the Recipe.

The Teach Alignment procedure begins by setting the focus, zoom and illumination for the Vision System. Manual Alignment is then performed as described in section 6.1.1. The Model is taught in the process of alignment, so after Manual Alignment is complete, the Model is defined.

As it was mentioned above, the Models should be clear and repeatable. It is recommended to use crosses, rectangle angles or the Models imprinted with special material for alignment purposes.

The final step involves having the System test the Alignment to verify that it has been taught successfully.

After Alignment has been successfully taught, the System can process Workpieces using Auto Alignment.

Note: The procedure for teaching Alignment may vary according to the Align Type selected. The following procedure is used when the Align Type is set to **Street**.

To Perform Teach Alignment:

1 Click  to display the Programming Workspace.

2 Expand the Recipe assigned to the Workpiece in the Programming tree, and select any parameter category of that Recipe. The parameter table for the Recipe is displayed on the right.

3 In the parameter table, select the tab for the first defined angle.

4 Click **Teach Align** in the Program area of the lower right pane. The Wizard tab displays the first step to be performed in the procedure.

5 Click **Next.**

Note: A confirmation box is displayed if Alignment has already been taught for the selected angle. The User can decide whether to override the existing information or to cancel the procedure.

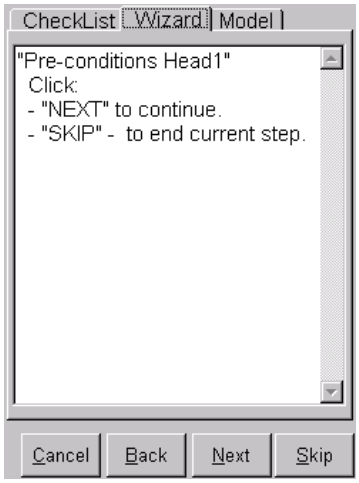


Figure 6-11: Teach Alignment Opening Wizard

6 Using the Illumination controls, Magnification settings and the Z/T Axis controls (see Chapter 2), define optimal illumination, zoom and focus settings for the Vision System, so these settings can be used later on for inspection.

7 Click **Next**. The Pre-Conditions are now completed.

8 Manually Align the Workpiece (see section 6.1.1.1). Click **Finish**.

Note: If a cut map for the wafer already exists, the system goes to the defined cut position. To perform the alignment manually click **Back**.

9 Define the Cut Position (see section 6.1.1.2). Click **Finish**, then click **Next.**

Note: For **APC** algorithm the defined cut position is normally the point where the blade enters the Workpiece. For **GPC** algorithm, the defined cut position is anywhere in a center of a street. The cut map is displayed according to the cut position referred to the chuck center.

10 Select the confidence level for the Model.

Note: Focus, Zoom and Illumination settings can be defined per Model.

11 Teach the Model by using the X/Y-Axis Control and the Guide Control to set the Search Area and Teach Window around the selected Model. Click **Teach**.

A flashing message is displayed indicating that the Model has been successfully taught. To test the Model, click **Find**. Another flashing message is displayed if the Model was successfully found by the System. The same message displays both the taught and the final scores.

12 Click **Next** to move to the next Model and follow the wizard.

Once the first angle for the Workpiece has been taught, the process is repeated for all additional angles defined in the Recipe.

Auto Alignment can now be performed on all Workpieces that have been assigned this Recipe, as part of the automatic cutting process. Auto Alignment can also be activated at any time by the User by clicking.

 in the toolbar or by selecting **Vision > Auto Alignment** from the Manual menu.

It is important to take into account, that **Final Accuracy** and **Maximum no. of iterations** settings depend on the camera magnification. In order to achieve higher Theta accuracy, set the **Maximum no. of iterations** to **9** and the **Final Accuracy** according to the table below:

Camera Magnification	Final Accuracy
X60	At least 0.08
X120	Up to 0.08
X240	Up to 0.05

6.1.3.3 Street Align Algorithm (Advanced)

To deal with the issue of corrupted models, allowing to complete Auto Alignment without the operator's interference, the Align algorithm searches for better models in two stages:

- Low Model Detection
- Main Model Detection

6.1.3.3.1 Low Model Detection

After the first low model is detected at the taught position, the system starts searching for the second model. If the search fails, the system performs an index spiral search (see Figure 6-12).

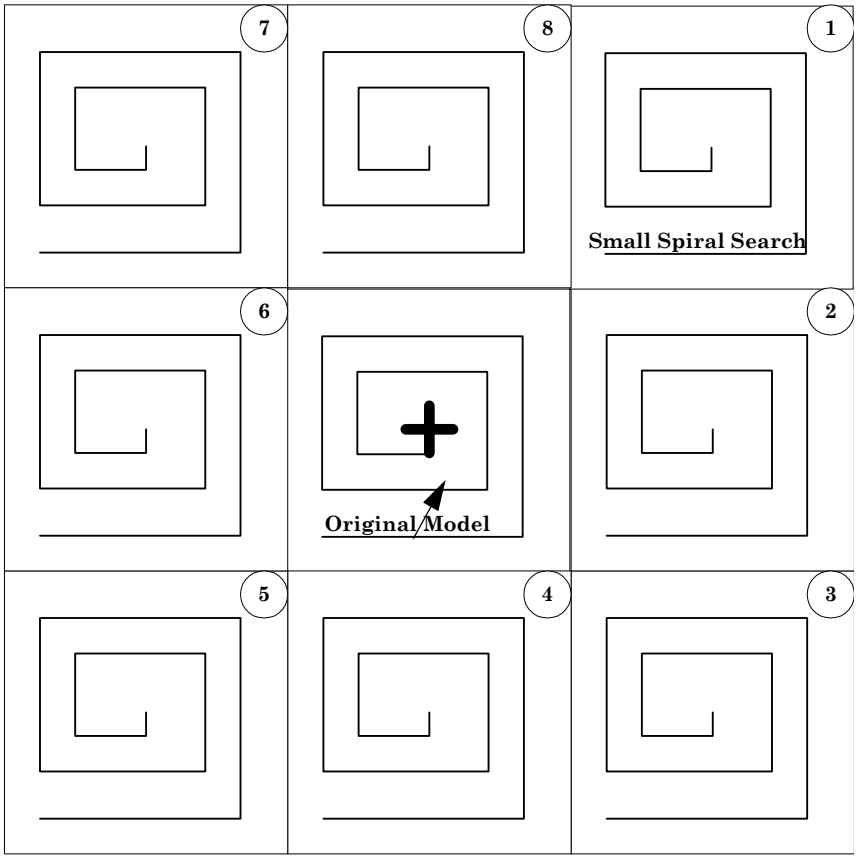


Figure 6-12: Spiral Search

In case the Index spiral search fails, the system performs a directional search as shown below.

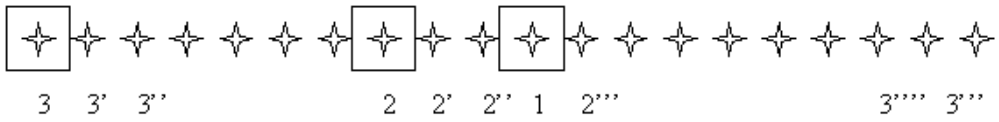


Figure 6-13: Directional Search

Note: A directional spiral search is a search in which the model is searched in positions whose X coordinates are advanced in a defined direction by an interval of the X align index. In each position a spiral search is performed.

After having found the second model (2), the system starts searching for the third model (3). If it fails, it performs both an index spiral search and a directional spiral search the same way as it does for the second model. The starting position of the first directional spiral search is the mirror model of the third model, which is related to the first model. The second directional

spiral search starts from the model situated after the third model. The search ending positions are the same as for the second model.

Note: The search for the second model is performed in the direction from the center to the edge and the search for the third model is performed from the edge towards the center.

In case both directional spiral searches for the second model fail, the system starts the whole alignment procedure again, on the upper $^1/_3$ of the wafer. This includes finding the first model again, and searching for the second and the third models using index spiral search and directional search if needed.

If the system still fails to find the second model, the alignment procedure is repeated again on the lower $^1/_3$ of the wafer. If finding the second model still fails, the whole alignment procedure fails and the user assistance is required.

The algorithm for finding the third model is identical to that for finding the second model, given above.

The directional search areas are limited by the align area of the wafer. The search is never performed outside the **Align Area** (parameter defined in the **Align** category).

This limitation may cause any of the directional spiral searches not to take place.

6.1.3.3.2 Main Model Detection

Once the low models have been found, the system starts looking for the main model to perform the fine alignment. If the main model is not found, the system performs an index spiral search..

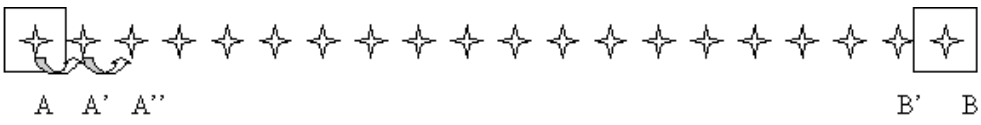


Figure 6-14: Main Model Search

If the index spiral search fails, the system performs one directional spiral search, starting from the model situated next to the first model, in the direction of the second model on the X-Axis, as long as the distance from the second model is more than ½ of the align area.

Unlike the search for low models, the search for main models is carried out in the direction from the workpiece periphery to the center as shown in Figure 6-14.

In case this search fails, the system begins the fine (main) alignment over again on the upper $^1/_3$ of the wafer. This includes a spiral search and a

directional search if needed. If the system still fails to find the second model, the fine (main) alignment procedure is repeated again on the lower $^1/_3$ of the wafer.

If finding the second model still fails, the whole fine (main) alignment procedure fails and the user assistance is required.

For the second main model the procedure is similar.

The directional search areas are limited by the align area of the wafer. The search is never performed outside the **Align Area** (parameter defined in the **Align** category).

As in low alignment, this limitation may cause any of the directional spiral searches not to take place.

Figure 6-15 below represents the Street Alignment algorithm as a whole.

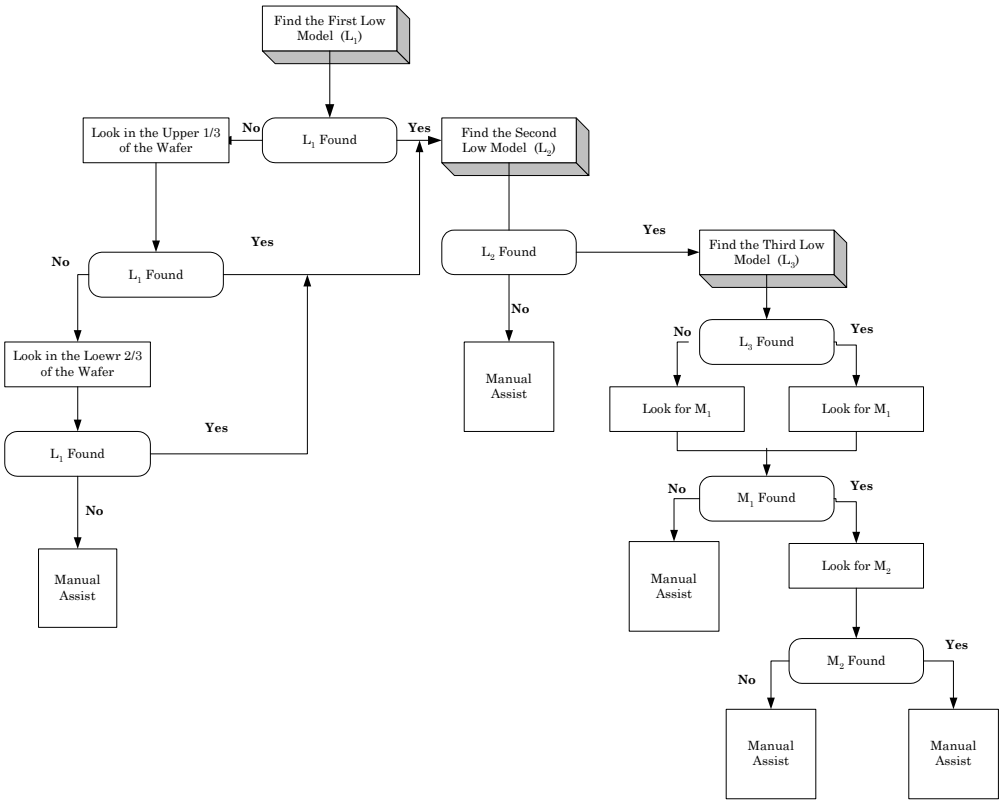


Figure 6-15: Alignment Algorithm

Note: The algorithm allows the user to find the models manually (Manual Assist) or perform Manual Alignment instead.

6.1.3.3.3 Alignment High/Low Score Parameters

The algorithm also uses the concept of **sub-model**. The sub-model is used for Main model verification purposes. For example, if the model is not

sharp enough, the user can teach a sub-model (clear model not on the same street), which will be used to verify the main models' thresholds.

Normally, the system is set up to use models, where the threshold would not be lower than 80%. When teaching alignment for a workpiece with corrupted models, models with threshold set between 65% and 80% are used. These models require verification against the sub-model.

When teaching alignment for a workpiece with corrupted models, the threshold for these models should be set to 65% - 70%. In the recipe, the high score parameter should be set to 80% or higher. It is also recommended to teach a sub-model for such a workpiece.

The algorithm is used in case the main model found has the threshold score between the taught score and the high score (65% - 80%). If it succeeds, and the found distance between the main and the low models is within tolerance (see **Main to Sub-model accuracy** values below), the main model is regarded as properly found.

The parameters are:

Use sub-model: Use the sub-model detection for low threshold main model detection or not. If not then no change is made to the algorithm.

Low model high score (%): The high score for low models, above which the low model is considered found, with no need to verify it through finding a sub-model.

Main model high score (%): The high score for main models, above which the main model is considered found, with no need to verify it through finding a sub-model (currently not in use).

Sub-model high score (%): The high score for sub-models, above which the sub-model is considered found.

Main to Sub-model accuracy: the maximum allowed distance (for both X and Y coordinates) of the found sub-model from the found main model in order for the detection to be considered successful. The recommended values for this parameter are:

- For x240 magnification systems: 2 microns.
- For x120 magnification systems: 4 microns.
- For x60 magnification systems: 7 microns.



Note: If parameter Use sub-model = Yes, the models should be taught with a 60%-70% threshold. Otherwise, they should be taught with a regular (80%) score

Note: If no sub-models are taught, this algorithm is not performed even if the parameter **Use Sub-model** is set to "**Yes**".

The low and sub-models are always found using the taught (low) threshold. Any score above it or equal to it is considered to be a success, so in these cases there is no use for this algorithm.

The algorithm is performed as follows:

1 Find the main model as in the usual algorithm (no change for low models).

2 Check the find score:

- If it is above the parametric high threshold, the find succeeded (no change).
- If it is below the taught low threshold, the find failed (no change).
- If it is between the high and the low thresholds:

3 Move the camera to the sub-model.

4 Find the sub-model.

5 Determine if the distance (X, Y) between the main model and the sub-model is within tolerance.

6 Move back to the main model and find it again.

In case the threshold score at which the sub-model was found, and the distance between the main model and the sub-model are within tolerance, the main model is regarded as successfully found. Otherwise, the model finding procedure is considered failed.

Note, that during spiral/directional searches the system searches for models with the taught (low) threshold. If the model with this low threshold is found, a regular find operation will be performed at the finding location, this time using the algorithm, described above. The new parameters - Low Model High Score, Main Model High Score and Sub Model High Score are given in the parameter tables in Appendix 3.

6.1.4 Choice of Cutting Angle by Panel

There are two viable options for aligning and cutting Multi-Panels, each appropriate for certain situations.

Standard: cut all angles on all panels either by:

- Cutting each angle on all panels in turn or
- Cutting all angles on each panel in turn.

For more information regarding the standard Multi-Panel option, see section 6.5.5.

The new option "**Choice of cutting angle by panel**" enables cutting in such a manner as to always have the debris-laden water directed to the outside of the workpiece, away from the other panels. This option does not interfere with any other feature supported by the software.

Figure 6-16 illustrates the concept of this new option. Between each view (A, B, C, and D), the workpiece has been rotated 90 degrees counterclockwise.

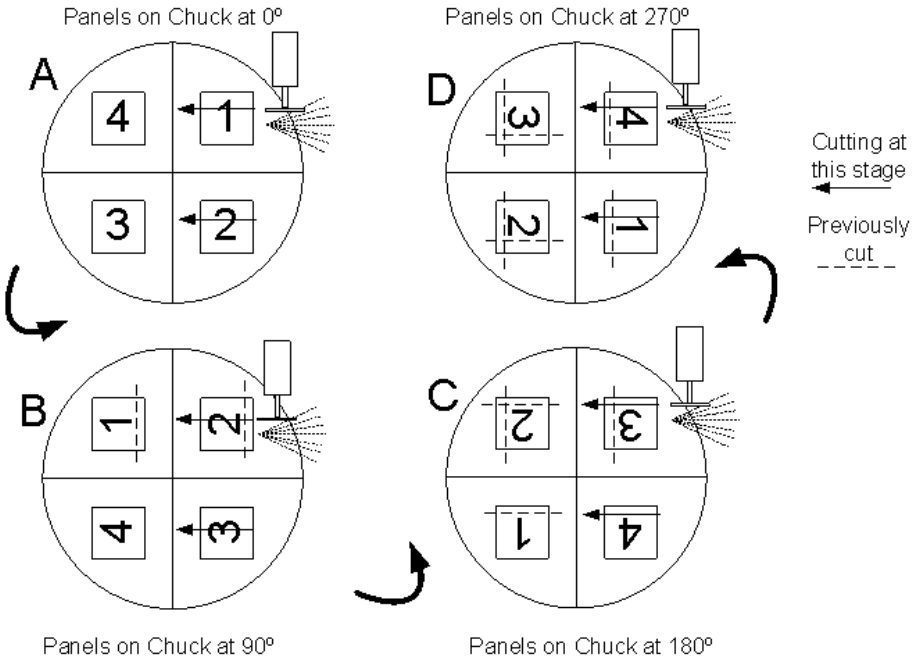


Figure 6-16: Conceptual Cutting by Angle diagram

In view "A"(at angle 0), panels 1 and 2 are cut at their idx0 angle.

In view "B" (at angle 90), panel 2 is cut at its idx1 angle and panel 3 at its idx0 angle.

In view "C" (at angle 180), panel 3 is cut at its idx1 angle and panel 4 at its idx0 angle.

In view "D" (at angle 270), panel 4 is cut at its idx1 angle and panel 1 at its idx1 angle, completing both angles for all four panels.

Note: The parameter idx contains the information regarding the Workpiece position. For more details, refer to Model 7100 Operation Manual.

This new option requires the use of new parameters and some changes in the Teach procedures. When performing the procedure "Creating a Multi-Panel", section 6.5.5, notice that four new parameters and four new tabs

are added to a recipe as shown in Figure 6-17. Before running the Teach Align, modify the recipe with the new parameters as shown in Figure 6-17.

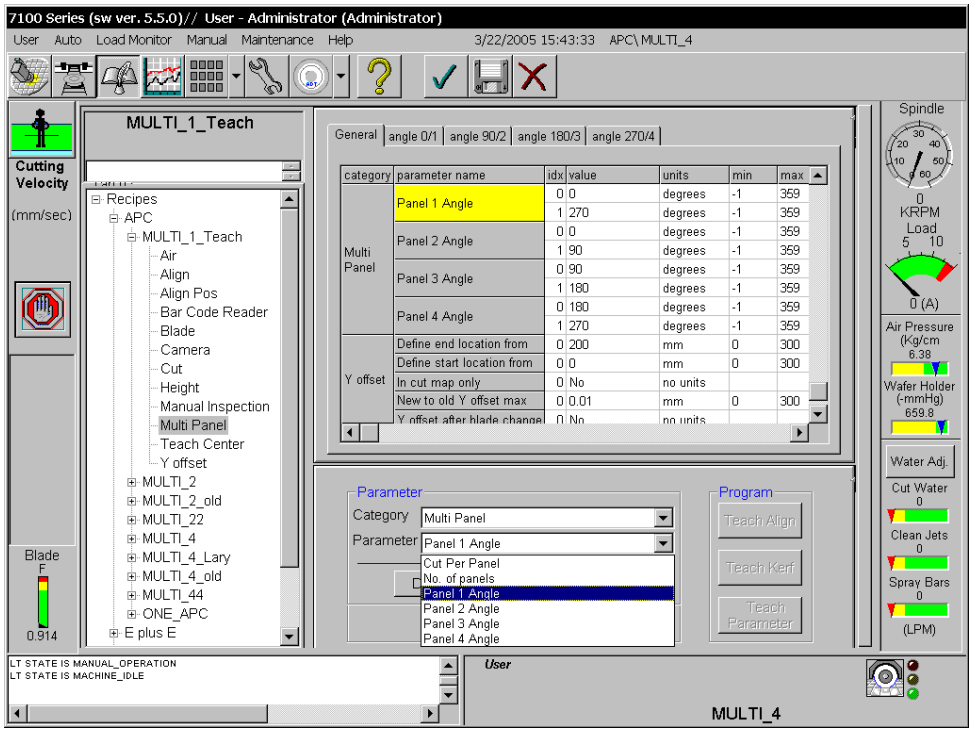


Figure 6-17: Multi-Panel Teach Screen

At the end of the teach process, there will be new tabs of angless, as shown in Figure 6-18.

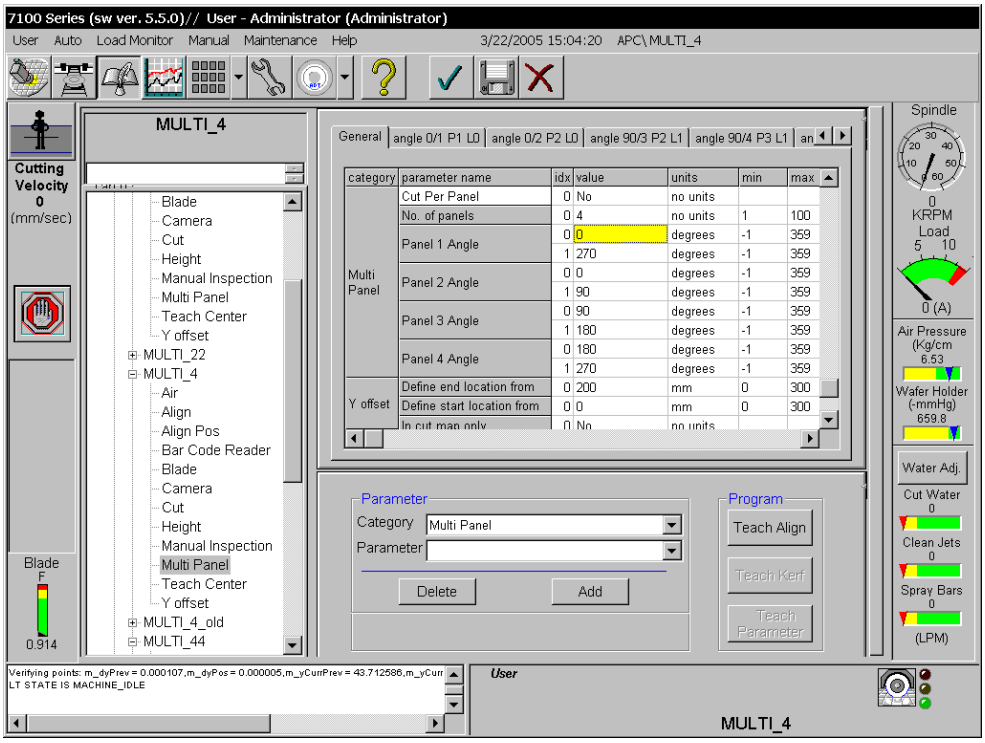


Figure 6-18: Multi angles View

6.1.4.1 Multi-Panel Bar Code Identification

The new option "**Choice of cutting angle by panel**" can synchronize with bar code reading ability to enable naming each of the panels according to the bar code identified with it. The panel name will be displayed on the animated cut map.

6.1.4.2 Teach Alignment Multi-Panel Adaptations

To adjust the Teach Alignment procedure in an existing recipe for a multi-panel application, conduct the following steps:

1 Add new angles to recipe, see Figure 6-17.

2 Define the number of panels (1 to 4).

3 Set the parameter values for each panel (angles, idx, etc.).

4 Follow the instructions of the Teach Align Wizard, similar to the standard Multi-Panel Teach Align process, only with Cut Position definition for the specific angles for the different panels.

6.1.5 Model Types

The 7100 Dicing Series machines use two major types of alignment models:

- Die Model, see section 6.1.5.1
- Align Kerf Model, see section 6.1.5.2

The model option can be selected from the drop-down menu to the right from the Video Workspace, as shown in Figure 6-19.

6.1.5.1 Die Model

The Die models are the models used for the traditional alignment based on having the System remember two eye-points on the workpiece. These two points define the baseline for adjusting the parallelism of the kerfs. Once the Workpiece has been aligned, the alignment is taught to the System. Afterwards, the System automatically updates (straightens) the substrate position on the Cutting Chuck by turning the Theta Axis.

The Die Models can be used as Main, Low or Sub-models. Before teaching alignment, add all the categories and parameters for each angle in the recipe, save the recipe, and then teach the alignment.

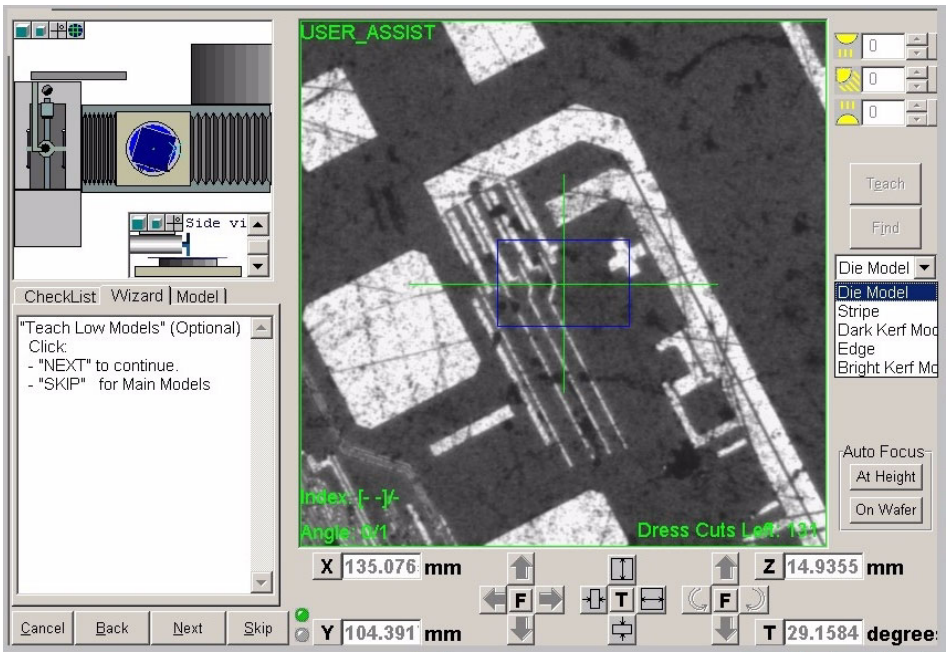


Figure 6-19: Model Options

6.1.5.2 Align Kerf Model

The Align Kerf Model is a standard alignment model that can be selected from the model list. It allows detection of black streets on white background.

These streets can be used as Main models or Sub-models (the Low model is always the die model). A model needs to be defined as an Align Kerf Model during every step of Teach Alignment procedure. The Align Kerf Model can be found only if the street width falls between the W-min and W-max values (see Table A-3). Before teaching alignment, add all the categories and parameters for each angle in the recipe, save the recipe, and then teach the alignment.

6.1.6 Model Processing Filters

The model preprocessing mechanism enables detecting the gray levels variation in the model images during the Teach Alignment process

When the "Model Processing" filter option is defined in the recipe, the Teach Model and Find Model processes activate the selected option and perform the defined number of iterations. The results of the preprocessing are displayed for the user to view.

Note: Activating this option requires the user to teach/re-teach alignment with the defined filter.

Each model can be preprocessed by using a different Processing Method. However, it is possible to assign one Method to all the models, by defining

the **Processing Method for All Models** parameter. This parameter provides the Vision with a capability to perform pre-processing for each model, i.e., sub, main, low.

The following is a list of possible filter options:

Horizontal Edge Filter - detects the horizontal edges of the model image by enhancing horizontal edges and removing the vertical ones. The recommended number of iterations is 1.

Vertical Edge Filter - detects the vertical edges of the model image by enhancing horizontal edges and removes the horizontal ones. The recommended number of iterations is 1.

Smooth Filter - reduces the random noise, and selectively smooths the model image; removes the edge information. Number of iterations may be one or more.

Open Morphology- removes small extraneous graphic information by taking all neighboring pixels into account. Makes the model cleaner. The recommended number of iterations is 3 to 6.

Close Morphology- fills in the gaps between the model image components by taking all neighboring pixels into account. Makes the model sharper. The recommended number of iterations is 3 to 6.

Edge Filter - emphasizes the boundaries of the Model that is to undergo preprocessing.

It is recommended to combine filters in order to improve the model image detection, especially because the models can vary slightly from one batch of substrates to the other.



Note: Define the "**No. of iteration**" parameter for every filter included in the recipe. The index that appears to the left of the parameter identifies the filter related to this parameter.

For example, in a ceramic application, the Close Morphology is usually the main filter with the number of iterations set to 5. The Smooth filter is added once to smooth the model image.

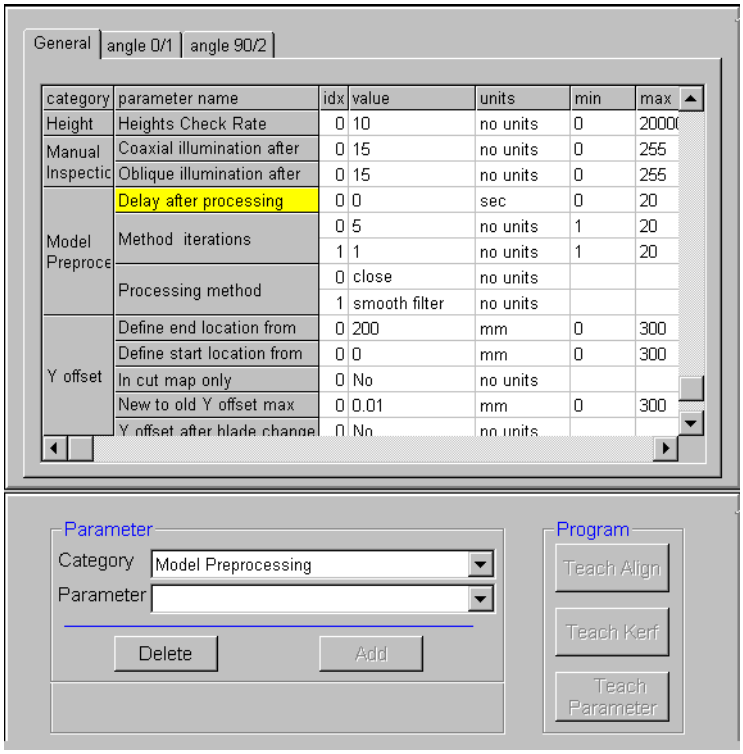


Figure 6-20: Model Processing Filter Parameters

6.1.7 Rotational Shrinkage

The Rotational Shrinkage feature is designed to solve the following cutting issues:

- Varying distance between streets
- Different Y coordinates of two models on the same street

This feature allows recalculating the Y coordinates and the Theta angle and updating the existing cut map. It supports two-point alignment and uses the Cut Verify option for calculation.

When the system is set up only to handle the varying distance between the streets, it calculates the new Y coordinate, and does not calculate the Theta angle. The system uses the first and second Cut Verify models to find their Y coordinates and calculate the average Y shift accordingly. The cut map is updated according to the new calculated Y value.

When the system is set up to handle two models that are on the same street but are not on the same Y coordinate, then it calculates both Y and Theta

coordinate values. The system uses the first and second Cut Verify models to find their Y coordinates and Theta angle (see Figure 6-21).

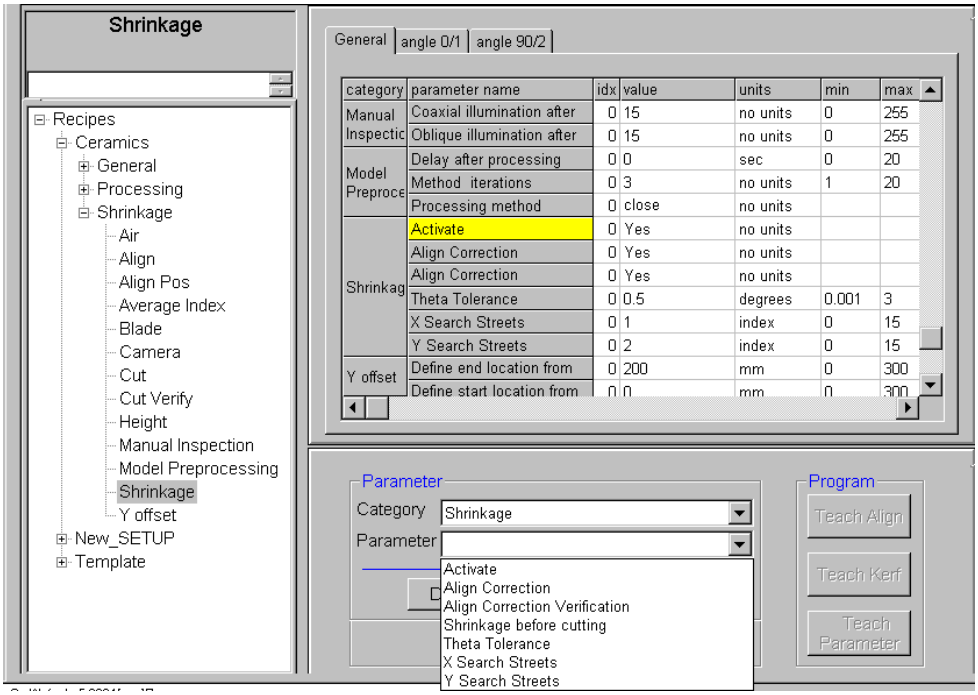


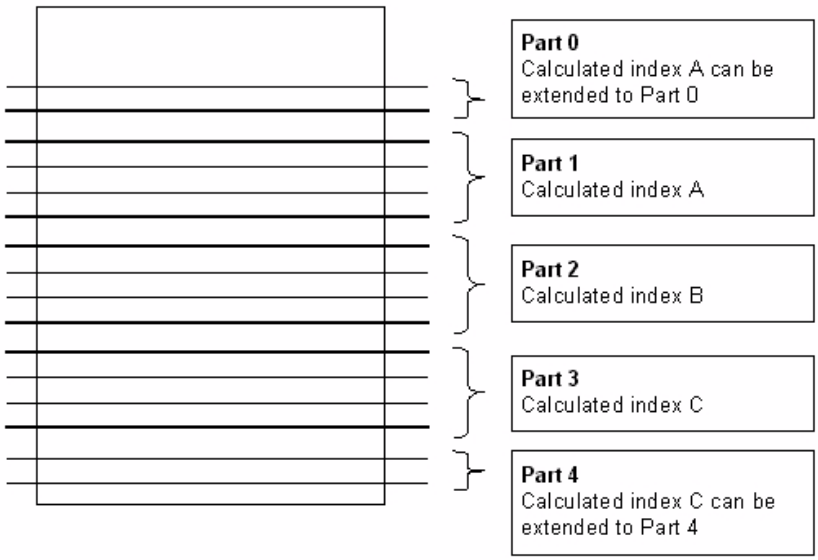
Figure 6-21: Rotational Shrinkage Parameters

Setting the Yes/No parameter called "Shrinkage before cutting" to **Yes** allows the shrinkage algorithm to be fully activated prior to the cutting stage.

6.1.8 Average Index

When the index in a part of the cut map changes, the system can be set up to calculate the average index. The system finds the first and the last model of each cut verification sequence and calculates the average index for each group of indexes.

When the nominal distance between the first and last index of an application is known, a Nominal Distance algorithm can be employed. Nominal Distance defines the assumed, or estimated, distance between the highest and lowest points along the Y-Axis, between which the streets are located. It enables measuring a vertical distance between two cut-verify models and calculating an average index. This feature is based on the existing average index State Machine.



If the new calculated index is within the allowed tolerance, the cut map is updated according to it. If required, the calculated index can be expanded for the entire workpiece (see Figure 6-22).

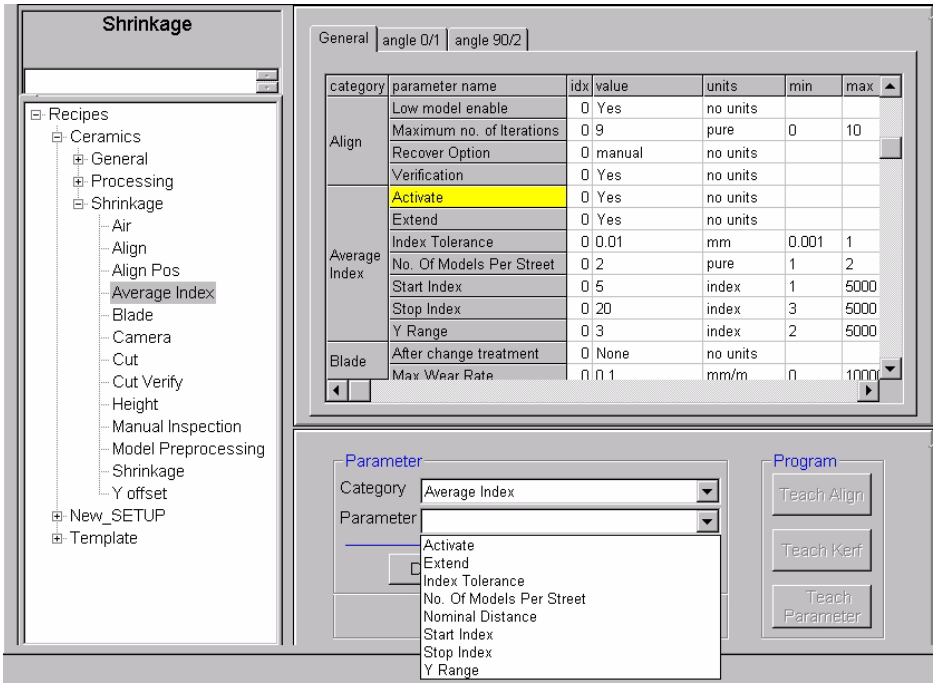


Figure 6-22: Average Index Parameters

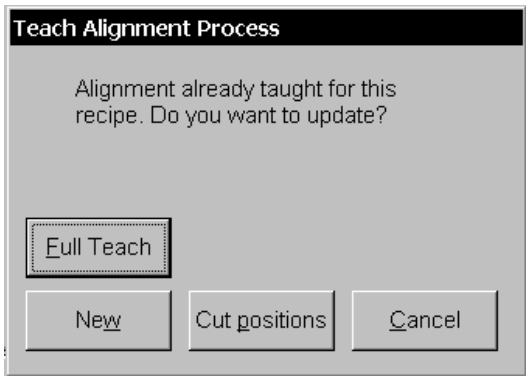
Note: The Average Index feature is applicable only for two-point alignment type.

6.1.9 Updating the Workpiece Alignment

Once the workpiece alignment has been taught, and there is a complete cut map, the operator can use the Align Update tool in order to update the existing cut map as required without having to reteach the whole sequence.

The Align Update tool allows the operator to choose which angle to modify and which angle to skip (leave as it is), should there be any changes to be done to the existing cut map. Likewise, the operator can modify specific parameters for each alignment angle.

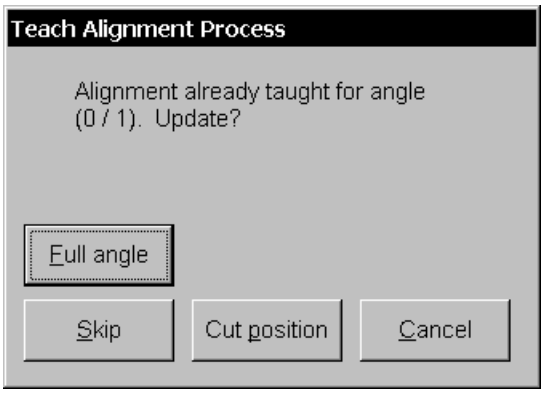
Clicking the Teach Align button pops up a dialog box:,



The operator can select one of the following:

- **Full Teach:** Update the whole cut map angle by angle
- **Cut Positions:** Update cut position only by moving the camera above the cut position and updating it. The operator is instructed to click **Finish** in the wizard once the cut position is updated.
- **New:** Teach a completely new alignment, i.e. create a new cut map
- **Cancel:** Cancel the procedure

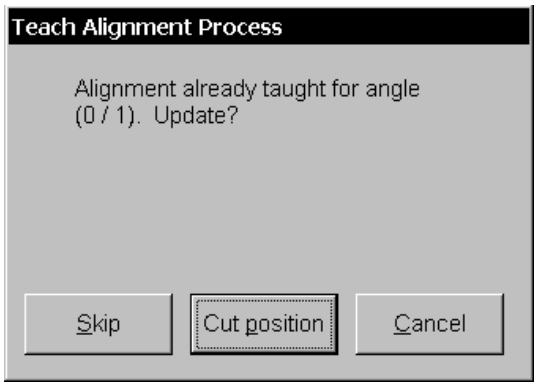
Clicking **Full Teach** pops up an additional dialog box:



This window refers to a specific angle in the recipe. At this stage, the operator can perform one of the following:

- **Full angle:** Re-teach all the settings for the current angle
- **Skip:** Skip the current angle
- **Cut Position:** Update only the cut position by moving the camera above the cut position and updating it
- **Cancel:** Cancel the procedure and return to the previous screen

Clicking **Cut Position** pops up the following dialog box:



The operator can click:

- **Skip:** To skip the current angle
- **Cut Position:** Update the cut position by moving the camera above the cut position and updating it
- **Cancel:** Cancel the procedure and return to the previous screen

6.2 Cut Verification

Cut Verification is a procedure that checks the position of the verification model in order to define the next cut position and update the Cut Map created during Alignment.

Cut Verification can be performed either automatically, as defined in the recipe, or manually, at any time during the dicing process to check the cut position and verify the Cut Map. The System finds the Model, and if the Model position is different from that found during Alignment, the System creates a new shifted Cut Map. The Cut Position is relative to the Model taught. The Cut Map is updated accordingly.



Note: In APC mode, the Model used for cut verification (Low, Main, Verification or Sub) should be as close as possible in the Y-Axis to the cut position. The system refers to the Cut Verification Models in the order they were taught. For example, in two-point alignment, if the right model was taught before the left model, during the Cut Verification, the system will search for the right model.

In case the selected model was not taught in the Teach Align Process the system automatically activates the Manual Cut Verification process.

In order for Cut Verification to be performed automatically on a Workpiece during dicing, the following parameters in the Cut Verify category must be specified in the Recipe assigned to the Workpiece:

- **Activate**: Whether to perform Cut Verification. This parameter must be set to **Yes**.
- **First Cut No**: The cut number where Cut Verification begins.
- **Last Cut No**: The cut number where Cut Verification ends.



Note: Multiple **First Cut** and **Last Cut** parameters can be defined, allowing the user to define different ranges for different areas on the cut map.

- **Use Y Shift**. This parameter influences the Cut Verification settings as follows:
  a. If it is set to "**Yes**" (default), the Cut Verify models are searched relatively to the cut position and Cut Map Y Shift.
  b. If it is set to "**No**", the Cut Verify models are searched relatively to the cut position only.
- **Rate**: The number of cuts between each instance of Cut Verification.

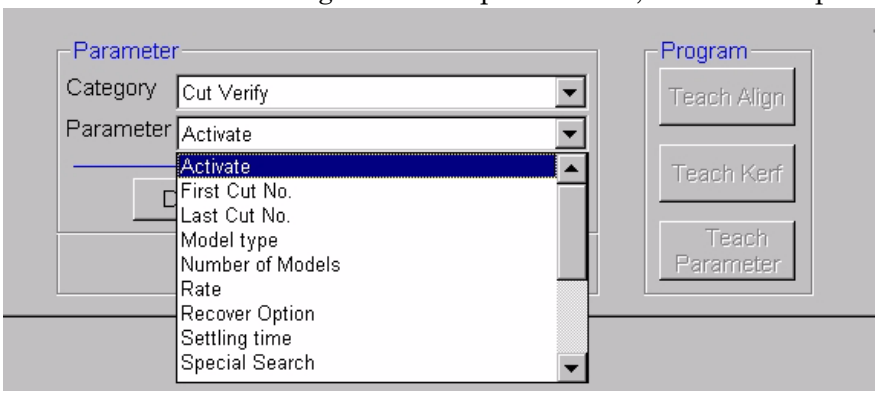


Note: Multiple **Rate** parameters can be defined, allowing the user to define different rates for different areas on the cut map.

- **Model Type**: The type of cut verification model used as main model.
- **Number of Models**: This feature enables the verification of two models to be used for the Average Index. Additionally, it defines the

required cut position and updates the Cut Map created during Alignment. Refer to section 6.1.8 for more information on the Avarage Index feature.

For information about setting the above parameters, refer to Chapter 5.



When the **Activate** parameter is set to **Yes**, the System dices the Workpiece as normal until it reaches the cut specified in **First Cut No**. After that cut, the System finds the Model and revises the Cut Map, if necessary. Subsequent cuts are diced according to the revised Cut Map. After every number of cuts specified in the **Rate** parameter, the System repeats the verification procedure until the cut specified in **Last Cut No.** is reached.

By defining additional **First Cut No**, **Last Cut No** and **Rate** parameters, Cut Verification can be performed several times at different areas on the cut map.

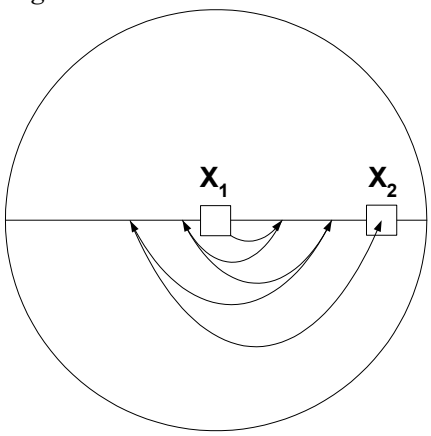
Cut Verification can also be activated manually at any time by clicking  in the toolbar.

Cut verification results are recorded in the Log File. For more information about this feature, refer to section 3.8.

6.2.1 Cut Verification: Special Search

The Special Search parameter should be used in order to enhance cut verification on partial wafers (see section 6.5.1) or wafers with poor models.

In case the system fails to detect a cut verification model (X_1 in the drawing below), it starts looking for a secondary cut verification model (X_2 in the drawing below), jumping one index at a time.



The next cut verification is performed according to the last X_2 model found. The X_2 position updates the Kerf Check coordinates according to the delta between X_1 and X_2. In case X_2 is not found, the system requests the user to perform manual cut verification.

6.2.2 Auto Cut Verification

Sometimes, due to model inconsistency or color variations, the Cut Verify process fails. When the **Auto Cut Verify** option is selected, the system automatically searches for a replacement Cut Verify model, if the expected one is not detected.

The system searches for the Cut Verify model in alternative positions. By default, it searches one street down from the current position, then another street down, and finally one street in the X direction towards the substrate center from the original position. If all the searches fail, the system activates the **Manual Cut Verification** procedure, which requires user assistance.

This function works only if the **Special Search** (Cut Verify category) option is deactivated.

The **Manual Cut Verification** procedure can be activated from either the User Menu or the Toolbar, under the **Cut Verify** entry.

6.2.3 Extended Cut Verification Limit

The Extended Limit allows the user to add additional value of Cut Verification Limit. First of all, the system matches the Cut Verification value with the Cut Verification Limit value. If the Cut Verification value is lower than the Cut Verification Limit value, the system starts to cut. If the Cut Verification value is higher than the Cut Verification Limit, the

system matches the Cut Verification value with the Extended Cut Verification Limit value.

Every time the Cut Verification value is higher than the Extended Cut Verification Limit value, the system clears the previous Cut Verification value and matches the new Cut Verification value with the Cut Verification Limit value. This can only be done twice, and afterwards, the system enables the Manual Cut Verification mode.

To add the Extended Cut Verification Limit option, the Activate parameter in Cut Verify Categoery should be added, as shown in Figure 6-23.

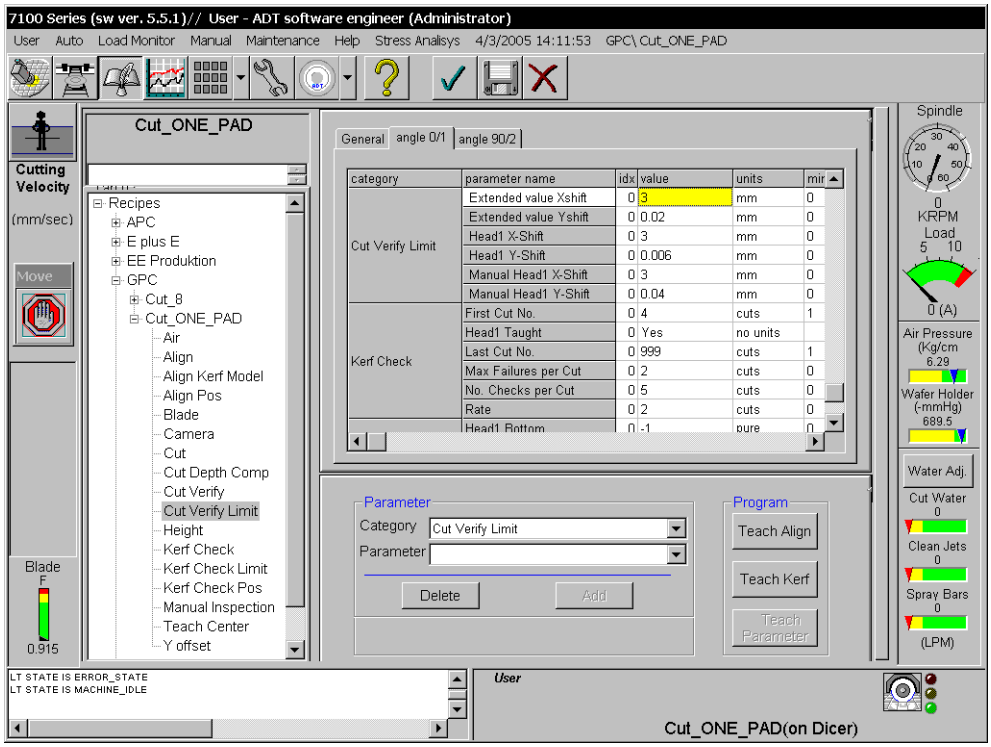


Figure 6-23: Extended Cut Verification Limit

6.3 Kerf Checking

Kerf Checking uses the Vision System to inspect the Kerf to check the quality and position of the cut. This section describes the various Kerf Check functions available in the 7100 Series.

6.3.1 Kerf Check Glossary

The following terms are used when describing Kerf Check functions:

Alignment Center: The position of the center of the Street as taught during Teach Alignment (see section 6.1.3).

Cut Center: The center of the actual Cut-line (Kerf).

Chipping Area: The area of chipping measured in either front (lower) or rear (upper) part of the Kerf.

dY: The deviation of the Blade center from the Alignment center (also called Y-Offset).

Rear Chipping: The maximum chipping measured from WMin to the rear-most (uppermost) chipped point.

Front Chipping: The maximum chipping measured from WMin to the front-most (lowermost) chipped point.

Center-to-Max Chipping: The maximum chipping from the Alignment center.

WMax: The maximum Kerf width.

WMin: The minimum Kerf width.

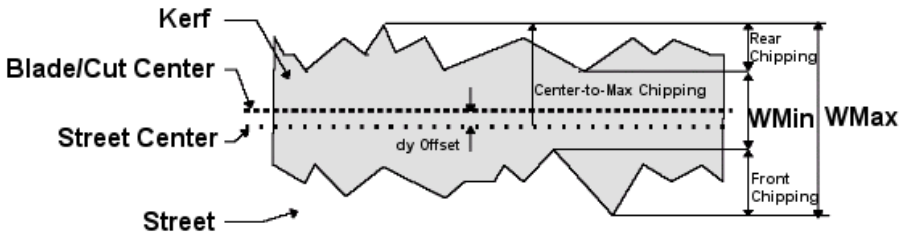
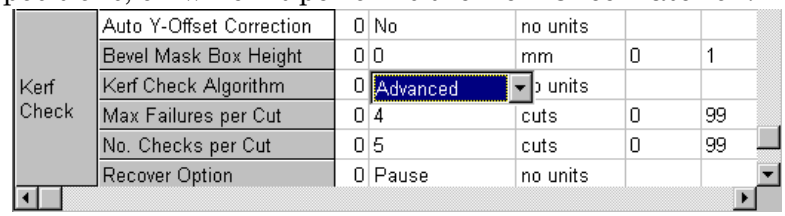


Figure 6-24: Kerf Check Glossary

6.3.2 Standard Kerf Check Algorithm

When the Kerf Check Algorithm parameter value is set to Standard, the Kerf Teach and Kerf Identification are performed according to the taught

black/white threshold. The system memorizes the number of checks per cut and the positions, on which it performs the Kerf Check later on.



The Kerf Check is performed on each position, until the system passes a sufficient number of Kerf Checks or until the number of allowed fails is reached.

The user should define the number of Kerf Checks per street and the number of check points, on which the Kerf Check is allowed to fail. For example, if the Kerf Check is performed on five points, and the user has defined that there can be no more than three fails, the system will perform the Kerf Check procedure until one of the two results is reached:

- The Kerf Check has failed three times - Fail
- The Kerf Check has been successful twice - Pass

If the Kerf Check fails, the system displays an error message. If the Kerf Check is successful, the system resumes dicing.

There are seven options of the **Kerf Check Algorithm**:

1 Standard Kerf Check Algorithm (see above)

2 Adaptive, see section 6.3.7.1

3 Advanced, see section 6.3.7.2

4 Adaptive Only, see section 6.3.7.3

5 Advanced Only, see section 6.3.7.4

6 Upper Bar, see section 6.3.7.5

7 Upper Bar, see section 6.3.7.6

6.3.3 Kerf Check Workflow

Kerf Checks are performed automatically by the Model 7100 according to the Kerf Check algorithm specified in the Recipe. If no Kerf Check algorithm has been specified, no Kerf Check is performed. In addition to the algorithm, Kerf Checks are influenced by Kerf Check parameters, defined for each angle in the Recipe. The Kerf Check parameters and algorithm are described in detail in Appendix 1 and Appendix 3. The Kerf Check Algorithm is specified in the main recipe screen shown in Figure 6-5, and can be activated or disabled by selecting "**Yes**" or "**No**" under the General tab of the recipe.

Kerf Checks are performed at defined intervals throughout the cutting process. The workflow is as follows:

Step 1: Cut *n* Streets: The number of Streets cut in Auto mode between Kerf Checks, where *n* is the number specified in the **Rate** parameter (Kerf Check category).

Step 2: Cutting Process Pauses: When n Streets have been cut, the automatic cutting process pauses.

Step 3: Kerf Check Taught?: If the Kerf Check has already been taught, a Kerf Check is performed automatically on the current cut. Automatic Kerf Checks are described in section 6.3.4. If the results of the Kerf Check are within the boundaries specified by the Kerf Check parameters, the automatic cutting process resumes.

If the Kerf Check has not been taught, a yellow error message is displayed instructing the User to perform the Teach Kerf Check procedure, as described in section 6.3.6. When the Kerf Check has been taught successfully, the automatic cutting process resumes.

Step 4: Final Cut Reached?: The automatic cutting process continues, pausing every *n* Streets, and a Kerf Check is performed until the final cut for the first angle has been completed.

Step 5: Move to Next Angle: When cutting of the first angle is completed, the cutting process automatically continues on the next

angle. The Kerf Check has to be taught for the second angle before automatic Kerf Checks can be performed on that angle.

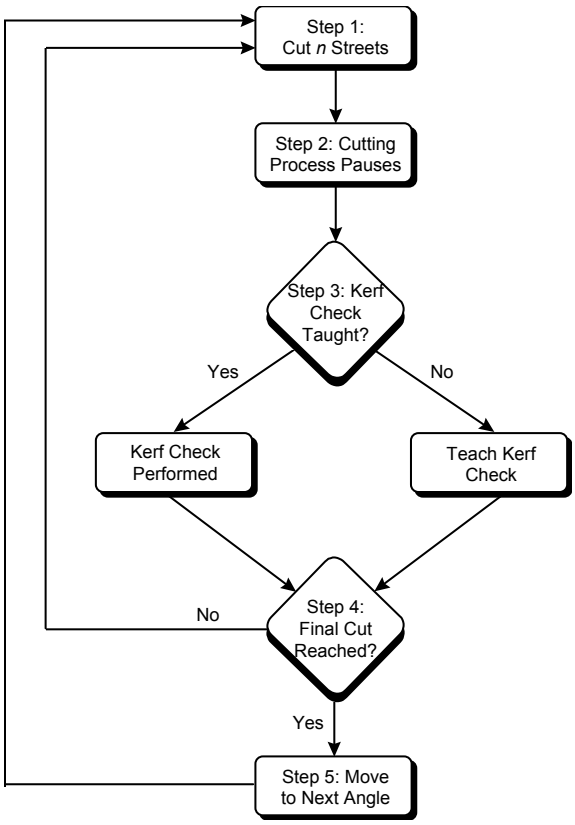


Figure 6-25: Kerf Check Workflow

6.3.4 Automatic Kerf Checking

After the Kerf Check has been taught, a Kerf Check is performed automatically after every interval of cuts specified in the **Rate** parameter in the Kerf Check category. The **No. Checks per Cut** parameter determines how many Kerf Checks are performed along the length of each Street. Performing three checks per Street is usually sufficient for most applications.

To Perform Automatic Kerf Checking:

- From the Manual menu, select **Vision > Auto Kerf Check**. The Video Workspace is displayed and the Camera moves to each check point and checks the Kerf.

  The measurements performed during an automatic Kerf Check include the following:

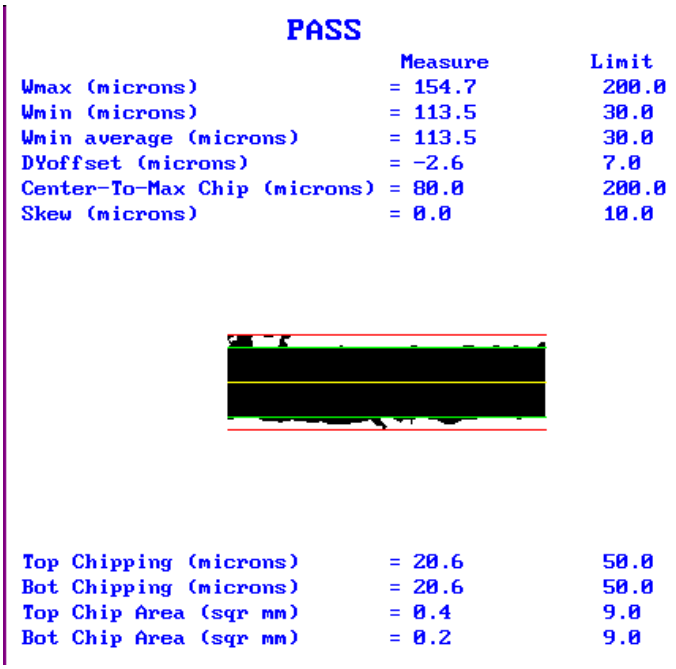


Figure 6-26: Kerf Check Measurements

The distance between the red lines is the maximum Kerf width (**Wmax** in Figure 6-26) and the distance between the green lines is the minimum Kerf width (**Wmin** in Figure 6-26). The yellow line is the center of the Kerf.

The results of each Kerf Check are displayed in the FOV.

If the limits are exceeded, the System's action depends on the option specified in the **Recover** parameter, as follows:

- **Pause**: An error is shown, and the automatic cutting process does not resume. The User then decides whether to continue the cutting procedure, change the Kerf Check parameters or cancel the cutting process.
- **Ignore**: No error is shown, and the automatic cutting process continues.
- **Report**: An error is shown, but the automatic cutting process continues.

The results of a Kerf Check are also displayed in the Top View Area and the Multiview-12.

6.3.4.1 Main Workspace Window

The Main Workspace Window, in the top left corner of the Video Workspace, shows the cut map for the current Workpiece.

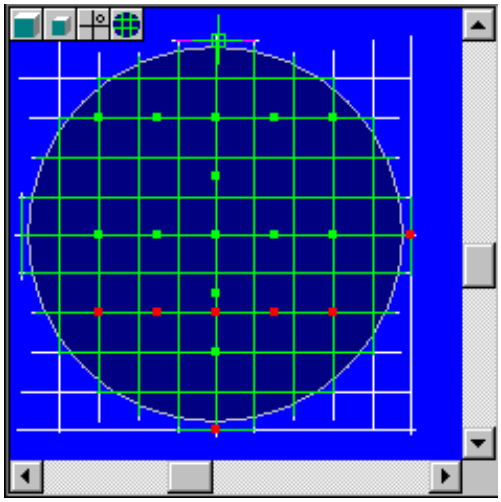


Figure 6-27: Main Workspace Window Showing Kerf Check Results

The Kerf Checks performed on each cut are marked by a small square. The color of the square indicates if the Kerf Check passed (cyan) or failed (red).

Clicking on a Kerf Check mark displays a close-up of the Kerf in the FOV, which may help the User understand why a Kerf Check failed.

Note: The Main Workspace Window is described in detail in Chapter 2.

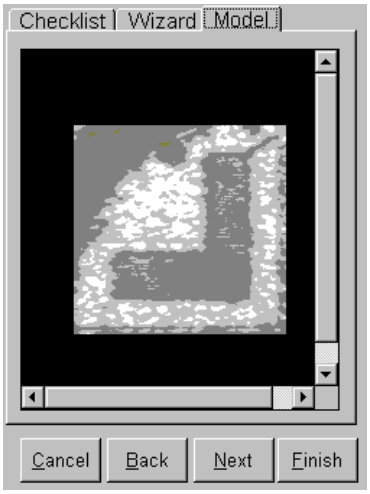


Figure 6-28: Model Tab Kerf Check Results

Clicking on a Kerf Check mark displays a close-up of the Model in the Model tab, in the lower left corner of the Video Workspace.

Double-clicking on the Model displays a close-up of the Kerf in the Multiview of the FOV, which may help the User to understand why a Kerf Check failed.

Note: The Model tab is described in detail in Chapter 2.

6.3.5 Manual Kerf Check

Although the Model 7100 automatically performs Kerf Checking according to the Kerf Check algorithm specified in the Recipe, once Kerf Check has been taught, Manual Kerf Checking can be performed at any time. For more information on Teaching Kerf Check, see section 6.3.6.

To Perform Manual Kerf Check:

1 Click  in the toolbar. The Wizard in the Video Workspace guides the User through each step of the procedure.

2 Click **Finish**.

6.3.5.1 Manual Cut Depth Compensation

This of Manual Kerf Check is applicable for systems that use Bevel-type blades. The option allows the user to manually adjust the Kerf Check using calculations or by visual confirmation. The Manual Kerf Check option can

be selected from the main screen by activating the pulldown menu next to the Automatic Kerf Check button, as shown in Figure 6-29.

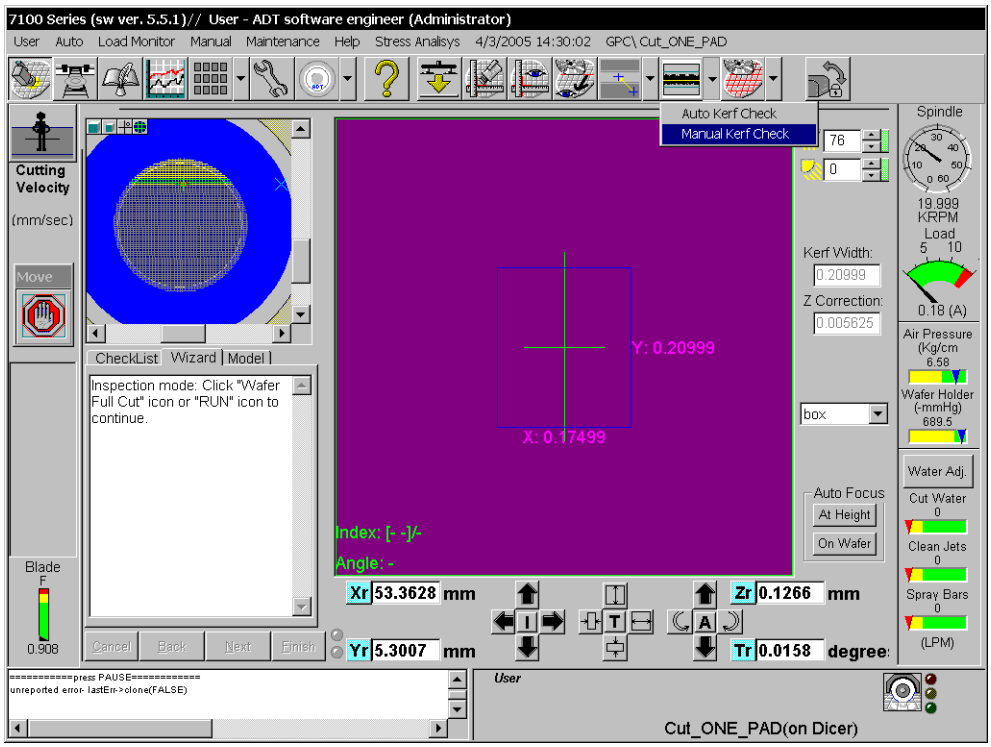


Figure 6-29: Manual Kerf Check and new parameters

This Manual Kerf Check option allows the user to manually adjust the kerf by moving the inner box and selecting the limit of the kerf. Another way of manually adjusting the kerf is by adding a numeric value to a new textbox titled Kerf Width. The inserted value changes the inner box according to the kerf paramters. After finishing the correction, clicking on Finish ends the Manual Kerf session. The screen options are shown in Figure 6-29

Note: The limits of the Automatic Kerf Check also apply for the Manual Kerf Check. Adjusting the box or inserting a value that is out of bounds will prompt an error message.

To activate the Manual Kerf Check option, the following steps should be completed:

1 Install a Bevel-type blade on the system.

2 Partially cut a wafer and leave it on the Cutting Chuck.

3 Add the Activate parameter in Cut Depth Compensation category.

4 Change the Activate option on the Cut Depth Compensation recipe list value to YES, as shown in Figure 7.

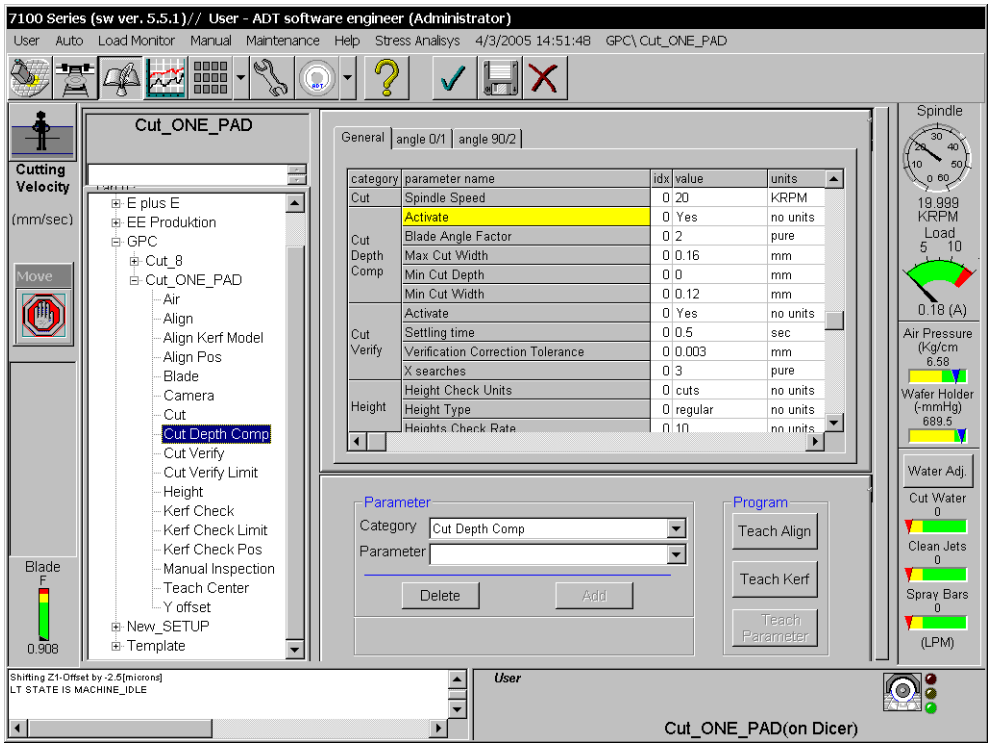


Figure 7: Cut Depth Compensation value list

There are two methods of conducting a Manual Kerf Check. The first one is selecting the Cancel option during dicing and stop the system after it had partially cut the Wafer. The second method is to define, in Manual Inspection Category, the Rate and Number of Cuts parameters, enabling the user to change the kerf, if needed, after the Wafer is partially diced.

6.3.6 Teach Kerf Check

The Teach Kerf Check procedure involves teaching the System a Model and sets the limits for the automatic Kerf Check. Models are taught for each check point along the Kerf.

The Teach Kerf Check procedure must be carried out separately for all angles defined in the Recipe.

Before the Kerf Check can be taught, it is recommended to modify the following Recipe parameters in the Kerf Check category:

- **No. Checks per Cut**, default is 5
- **Area**, default is 80%

The Teach Kerf-Check procedure is carried out according to the following attributes: **Pattern Type** and **Model Reference Position**.

To Define Teach Kerf Attributes:

1 Select a Model Reference Position (see Figure 6-1):

- Center (default)
- Lower Edge
- Upper Edge

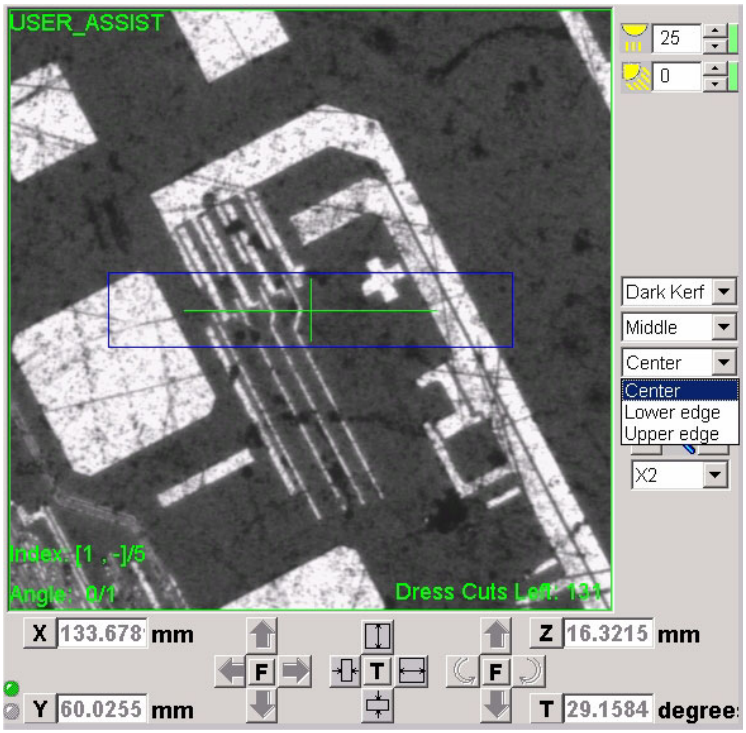


Figure 6-1: Reference Position Options

2 Choose a pattern type:

- **Kerf Up** - to force the reference position “Lower edge”
- **Kerf Down** - to force the reference position “Upper edge”
- **Middle** - to force the reference position “Center” (default)

Figure 6-2 below illustrates a user choosing a Reference Position: Lower Edge Model and Pattern Type: Kerf up during the Kerf Teach process.

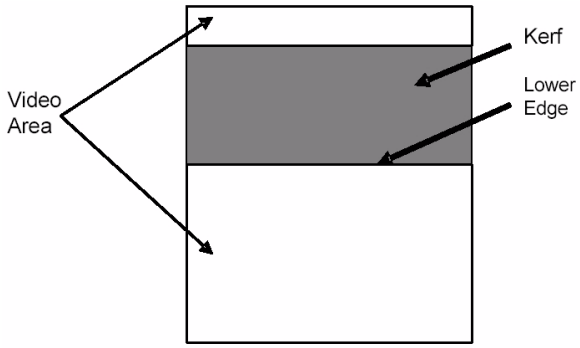


Figure 6-2: Pattern: "Kerf Up" with Reference Position: "Lower Edge"

Other parameters relating to Kerf Checks are either optional or are automatically specified by the Teach procedure.

For more information about Kerf Check parameters, see Appendix 3.

To Teach the Kerf Check:

1 Click **Run**  . The System starts dicing the Workpiece automatically, according to the parameters defined in the Recipe.

2 After two or three cuts, select **Auto Stop** from the Auto menu or click  .

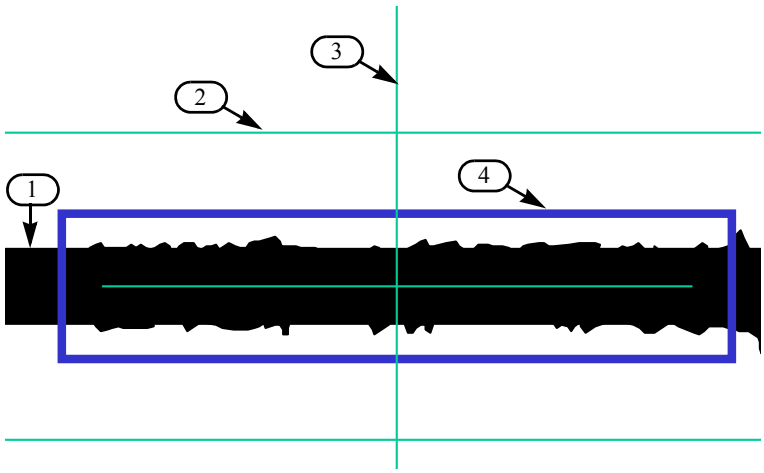
3 In the Programming Workspace, click **Teach Kerf**. The Video Workspace is displayed with a blue Teach Area in the Field of View (FOV). The Camera moves over the Cut Position defined during Alignment (see section 6.1.1.2).

4 Click **Next**. The Camera moves to the first check point.

5 Set the focus, zoom and illumination using the Z/T Axis, Zoom and Illumination Controls respectively, so that the image is clear. It is recommended to set illumination so that outside information on the edge of the Kerf is eliminated as much as possible. Ideally, the Kerf should appear as dark and the outside area as white/light as possible. Refer to section 2.2.10.2 for more information about setting these features.

6 Move to the Kerf center: using the Display Controls, position the Teach Window so that it fully surrounds a section of Kerf in the Y direction,

including some of the Workpiece beyond the edges of the Kerf, as shown below:



1 Kerf (Black)
2 Search Area (Green)
3 Reticle (Green)
4 Teach Window (Blue)

Figure 6-3: Teach Kerf Check

7 Set the value for Black/White threshold. (The threshold setting is located below the illumination setting windows on the right pane of the screen.)

Note: When teaching the Kerf for angle 0 degrees, make sure it does not cross the Kerf of 90 degrees.

8 Click **Teach**. The first Model is taught. The Wizard confirms whether the Model has been taught successfully.

9 Click **Next**. The **Find** button is enabled.

10 **[Optional]** Click **Find** to verify that the taught Model (Kerf) is satisfactory. The System searches for the taught Model in the FOV. The results of the Find procedure are displayed in the FOV, as follows:

- **Wmax**: Maximum Kerf Width.
- **Wmin**: Minimum Kerf Width.
- **DY**: Cut displacement (equivalent to Y Offset).
- **Center-To-Max Chip**: The distance from the center of the Kerf to the maximum chipped point.
- **Skew**: The maximum offset in the Y-Axis between the current Model and the last Model found.
- **Top Chipping**: The maximum chipping measured from Wmin to the front-most (lowermost) chipped point.
- **Bot Chipping**: The maximum chipping measured from Wmin to the rear-most (uppermost) chipped point.

- **Top Chip Area**: The area of all chipping measured from WMin to WMax at the front of the Kerf (ddY).
- **Bot Chip Area**: The area of all chipping measured from WMin to WMax at the rear of the Kerf (ddY).

Select the Model tab on the lower left of the Video workspace to see the taught Model.

11 Click **Next**. The System finds the current Model and moves the Camera to the next check point to learn the next Model (the distance of this move is the second angle Align Index). The parameters for the first Model (including Y, Z and Theta values) remain the same; only the X value must be learned. The User can only make adjustments in the X direction when setting up the second Model.

12 Repeat Step 10 for as many check points as specified in the **No. Checks per Cut** parameter in the Recipe.

13 Click **Finish**. The System finds the final Model, completing the Teach procedure.

14 Click **Run** to resume dicing. The System is now set to automatically check the kerf after every number of cuts, according to the values, defined in the Kerf Check parameter of the recipe.

15 After two or three cuts of the second angle (Angle 90/2), select **Auto Stop** from the Auto menu.

16 Repeat steps 3 through 13 for the Angle 90/2.

When the Teach procedure is completed, the User is prompted to save the Recipe. Click **Yes** to save the information learned during the Teach procedure.

6.3.7 Kerf Check Options

The parameter **Number of Steps per Check** defines whether the Kerf Check is performed in one step or in two steps. When set to 2, all Kerf Check parameters have two lines in the parameter table (as shown in

Figure 6-4) in order to enable the user to set values for each step of the process.

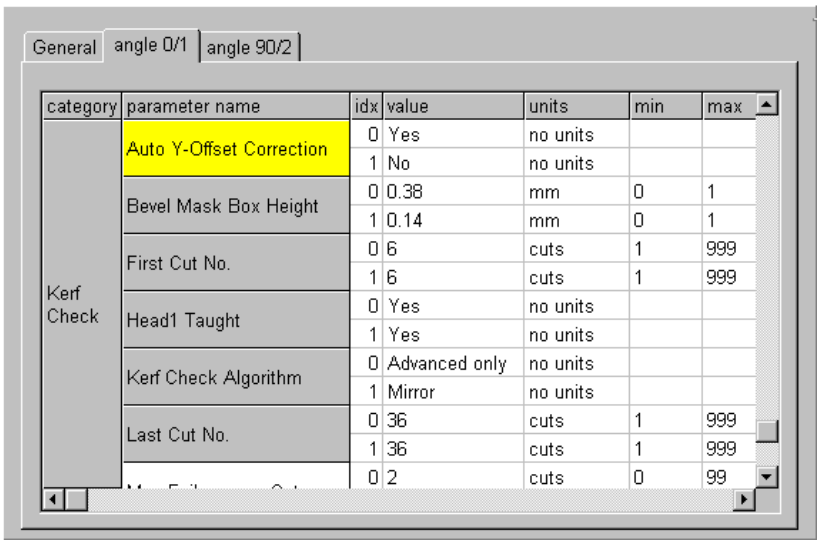


Figure 6-4: Two-step Kerf Check Parameter Table

This feature was developed for the applications that deal with two-layer workpieces and one-edged Kerfs (section 6.3.7.5 provides an example). The Kerf Check can be performed in two steps:

1 Y-Offset Correction

2 Z-Compensation, according to the measured Kerf width.

The two-Step Kerf Check is also referred to as **One-Edge Model Z Compensation**.

Teaching two-step Kerf Check is a longer procedure than that for a one-step Kerf-Check. Start the Teach Kerf Check procedure as usual and follow the wizard that gives guiding instructions throughout the process.

There are seven options of the **Kerf Check Algorithm** (see Figure 6-5):

1 Standard Kerf Check Algorithm (see above)

2 Adaptive

3 Advanced

4 Adaptive Only

5 Advanced Only

6 Upper Bar

7 Lower Bar

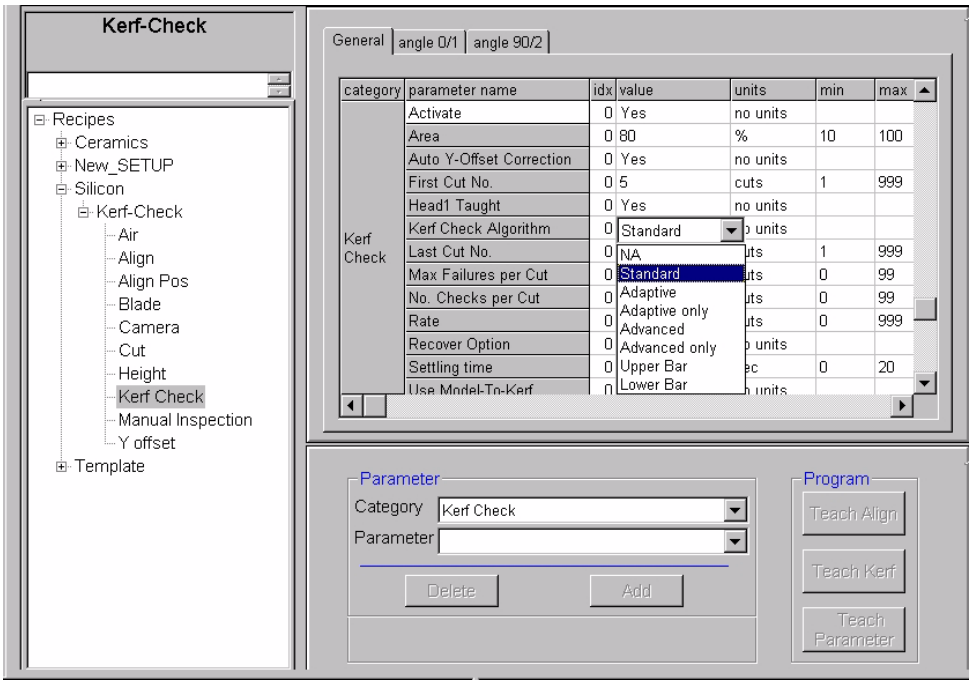


Figure 6-5: Kerf Check Algorithm Options

6.3.7.1 Adaptive

This option is intended to solve the issue of ink dots and dark areas situated close to the Kerf Areas. While performing Find Kerf, the system calculates the black/white threshold, disregarding the threshold data of the taught Kerf.

Note: In case the Adaptive option is selected, the system performs Standard Kerf Check first. If all the Kerf Check attempts fail, the system performs Kerf Check according to the Adaptive Kerf Check Algorithm for all the taught positions. If there is no problem, it continues dicing.

Whenever teaching Kerf Check on a dark area or on a ink-dotted area, open a larger search box. According to this algorithm, the system detects the ink dots and removes them from the taken picture. The Kerf width is measured after the picture is corrected.

6.3.7.2 Advanced

This option combines the Standard mode and Chipping Removal. Use this option to measure the Kerf width (W-min) in order to define the Y-Offset correction if necessary. The system uses only the W-min and Y-Offset correction parameters set in the Kerf Check limit parameters of the recipe.

6.3.7.3 Adaptive Only

This option is intended for ink dots removal. When the Adaptive Only option is selected, the system does not perform the standard Kerf Check procedure. The system calculates the black/white threshold according to

the current cut and not according to the taught one. All the Kerf Check tests are performed on the taught X-positions.

6.3.7.4 Advanced Only

When this option is selected, the system performs Chipping Removal only. Use this option to measure the Kerf width (W-min) in order to define the Y-Offset correction if necessary. The system uses only the W-min and Y-Offset correction parameters set in the Kerf Check limit parameters of the recipe. The found W-min value that falls between the W-min and W-max set in the recipe, will be taken by the system as legal.

6.3.7.5 Upper Bar

This option should be chosen when working with one side bar on the upper side of the street. It allows performing kerf check on one pad ignoring any "noise" that might appear on the opposite side of the pad.

6.3.7.6 Lower Bar

This option should be chosen when working with one side bar on the lower side of the street. It allows performing kerf check on one pad ignoring any "noise" that might appear on the opposite side of the pad.

6.4 Manual Y Offset

The Manual Y Offset procedure teaches the System the difference in position between the Blade and the Microscope in the Y direction, enabling the System to make the necessary adjustments during the dicing process.

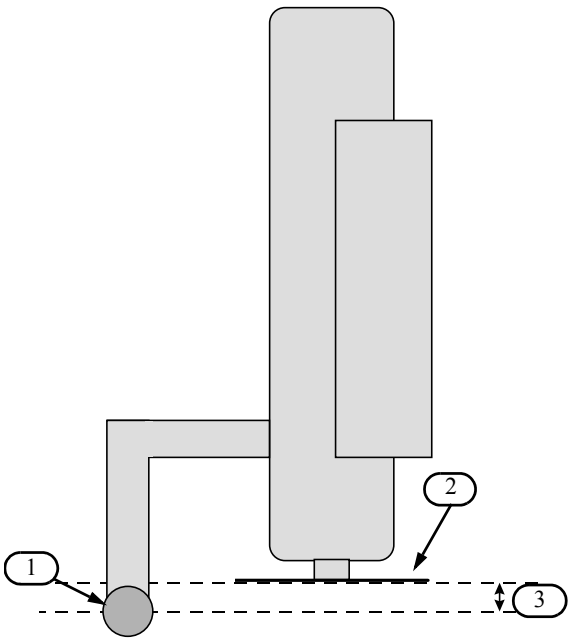


Figure 6-6: Y Offset Between Microscope and Blade

The Manual Y Offset procedure is normally performed after a Blade change or before cutting a series of Workpieces. The User performs a single cut and then positions the Microscope exactly over the cut. The single cut can be performed within the cut map or outside the cut map (for example, on the tape.)

The Y Offset is a parameter that can be automatically calculated and taught to the System during the Kerf Check process.

6.4.1 Required Recipe Parameters for Manual Y Offset

Before the Manual Y Offset adjustment can be performed, the System has to be taught where to place the single cut that will be used in the procedure. In order to teach this to the System, the current recipe must include the following parameters:

- **In cut map only**: (Y Offset category) Determines, whether to perform the single cut within the cut map (**Yes**), or outside of the cut map (**No**). If set to "**No**", the following two parameters must be defined:
  - **Define End Location from Edge**: (Y Offset category) The distance from the upper and lower edge of the Workpiece towards

the center of the Workpiece within which the single cut can be performed.

- **Define Start Location from Edge**: (Y Offset category) The distance from the upper and lower edge of the Workpiece towards the edge of the frame within which the single cut can be performed.

Note: For information regarding adding parameters to a recipe, see Chapter 5.

6.4.2 Performing Manual Y Offset

To Perform Manual Y Offset:

1 Make sure that the water flow is adjusted

2 Make sure the Workpiece is loaded onto the cutting chuck

3 Click **Manual Y Offset**  in the toolbar. The User is prompted to either perform a single cut or to abort the Manual Y Offset procedure. Click **Yes** to continue. The cut is performed and the User is prompted to find the center of the Kerf.

Note: If a single cut was performed before clicking **Manual Y Offset** in the toolbar, the Microscope automatically moves to the center of that cut.

4 Use the up and down arrows of the X/Y-Axis Controls to move the reticle (representing the Microscope position) to the center of the cut. Select **S** or **P** to move the Microscope slowly or one pixel at a time. Select **T** at the center of the Guide Controls, then use the Guide Controls to size the blue Teach Window around the cut so that its borders are aligned over the edges of the Kerf.

Note: The reticle can also be positioned over the center of the cut by clicking and dragging the blue borders of the Teach Window.

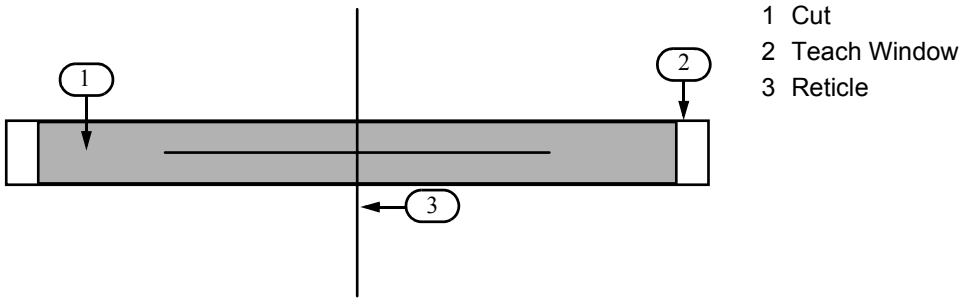


Figure 6-7: Manual Y Offset: Positioning the Microscope

5 Click **Finish**. The System is automatically updated.

6.4.3 Y-Offset Reference Positions

This feature enables Teaching the reference position (center, lower edge or upper edge) and the pattern type (middle, kerf up, kerf down, upper bar or lower bar) of each kerf model separately. Reference position refers to the part of the kerf model from which the Y coordinate result should be taken. The Y-coordinate can be based on the following options:

- **Lower Edge**: The Y coordinate result would be taken from the lower edge of the kerf.
- **Upper Edge**: The same as lower edge, only for the upper edge.
- **Center**: The Y coordinate result is taken from the kerf's center.

To set Y-Offset Reference Position

1 Under the General tab, locate the Y-Offset category.

2 Select a value for Y-Offset Reference Position parameter. The default value is “Center”. (see Figure 2-5).

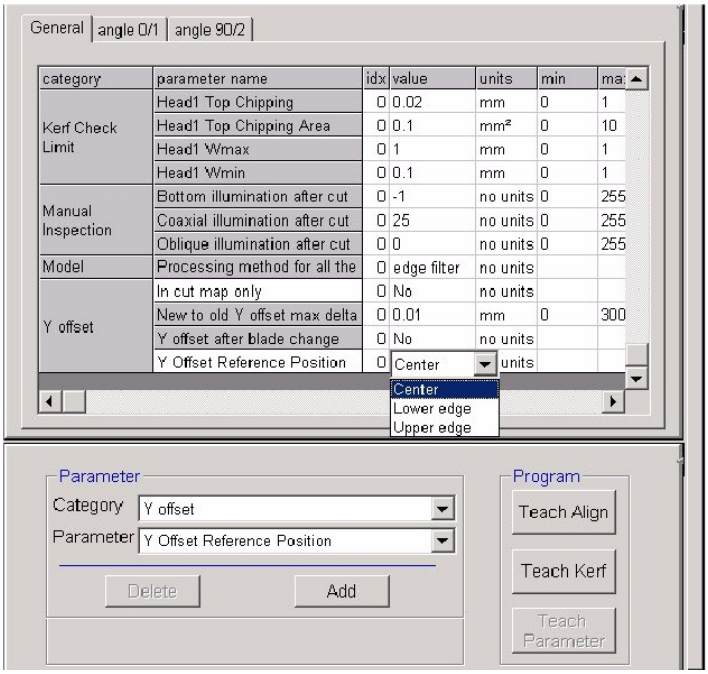


Figure 6-8: Y-Offset Reference Position

6.4.4 Y-Offset on Dress Block

Y-Offset can be performed either on the Workpiece or on the Dress Block. The Y-Offset location depends on whether or not a cut was already performed:

- If the previous cut was on the Workpiece, Y-Offset is performed on the Workpiece.

- If the previous cut was on the Dress Block, Y-Offset is performed on the Dress Block.
- If there is no previous cut, the Y-Offset location is determined by Cutting Location parameter.

6.5 Special Cut Procedures

This section contains instructions as to how to perform the special cut procedures, such as:

1 Partial Wafer Cut, section 6.5.1.

2 Sub-Index, section 6.5.2.

3 Loop Cut, section 6.5.3.

4 Chopping, section 6.5.4.

5 Multi-Panel Alignment, section 6.5.5

6 Cut Depth Compensation, section 6.5.6

7 Negative Index, section 6.5.7

6.5.1 Partial Wafer Cut

The Partial Wafer Cut option enables the user to:

- Resume cutting a Workpiece that has already been partially cut.
- Dice a partial substrate.

Note: The Kerf Check and Cut Verify positions are updated according to the Cut Verify model. In case X-position correction takes place, the new coordinate stays in the recipe up until the system fails to detect a model again.

The **Cut** command in the Manual menu enables the initiation of the Partial Wafer Cut procedure, as described below:

To Perform Partial Wafer Cut:

1 Load a partially cut Workpiece on the Cutting Chuck.

2 Press the **Wafer Cut** button and select the **Partial Wafer Cut** from the drop-down menu, or from the Manual menu, select **Cut > Partial Wafer Cut**. The software switches to the Video Workspace and displays the next step to be performed in the wizard.

3 Follow the wizard step-by-step instructions.

6.5.2 Sub-Index

The **Sub-Index** option enables the System to create a cut map, where there is one set of main indexes and one or more sets of sub-indexes.

To create a recipe with sub-indexes, add more indexes in the desired angle of the recipe.

Every index is indicated by **(idx)#** in the left column of the recipe.

The cut map and basic parameters for building sub-index recipes are given in section 5.6.

Note: After a cut map is generated, with all main and sub-indexes, the saw dices from rear to front, regardless of whether the next index is a main index or a sub-index.

6.5.3 Loop Cut

The Loop-Cut option enables the System to create a cut map, where the existing angles can be duplicated an unlimited number of times with fixed X/Y shift.

The User can configure the Loop-Cut so that different combinations of the angles existing in the recipe are looped.

The cut map and basic parameters for building Loop-Cut recipes are given in section 5.6.

To Create a Loop-Cut Recipe

1 In the **General** recipe field, add the Loop-Cut category (see Figure 6-9).

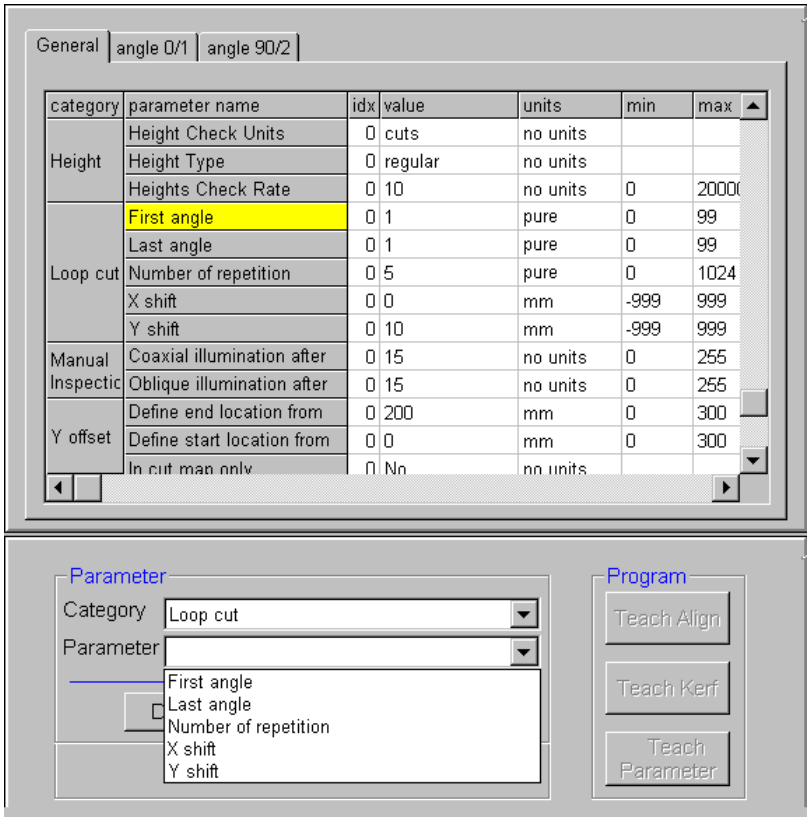


Figure 6-9: Loop Cut Screen

2 Define the **First Angle** parameter.

3 Define the **Last Angle** parameter.

4 Define the **Number of repetitions** parameter.

5 Set the **X-shift** value.

6 Set the **Y-shift** value.

7 Click **Save**.

The User can create several loops in the same recipe. In this case, there should be an additional set of the Loop-Cut parameters for each loop.

Note: Every loop is indicated by **(idx)#** in the left column of the recipe.

Table Table 6-1 and Figure 6-10 illustrate Loop Cut parameter set and a cut map.

Table 6-1: APC Loop Cut Parameters

Parameters	Angle 0	Angle 90
Work piece Shape	Rectangular	
Work piece Size	100 x 100 mm	
Thickness	1 mm	
Blade	00777-6045-010-QIP	
Align type	Manual	N/A
Spindle speed	20 krpm	
Index	3 mm	20 mm
Sub index	N/A	
Cut count	5	5
Cut speed	10 mm/sec	10 mm/sec
Chop velocity	0.5 mm/sec	N/A
Loop	From Ang.1	to Ang.1
Loop offset	X=20mm	Y=22mm
Loop count	5	
Depth	3 mm	

Note: In a Lop Cut recipe, the parameter **Optimized Order** (under **Cut** category) must be set to "**No**".

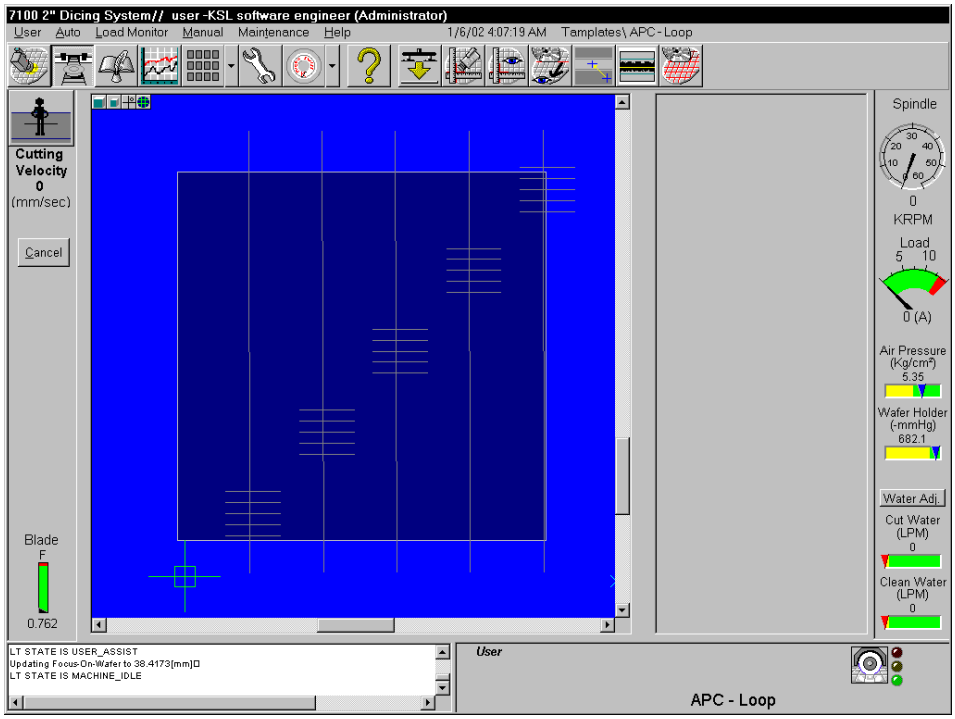


Figure 6-10: Loop Cut Map

6.5.4 Chopping

"Chopping" is cutting within the substrate, as opposed to the usual cutting that starts at the circumference.

To use this feature, the User should specify the **Chopping Z Start** (default value is 20 mil/0.5 mm above the substrate) and the **Chopping Velocity** parameters. After the saw reaches the cut position in X and Y axes, it descends to the **Chopping Z Start** height and from there slows down to **Chopping Velocity**.

If in a chopping recipe the **Cut Length** parameter value is set other than 0, the blade will descend and cut the workpiece at the defined length.

6.5.5 Multi-Panel Alignment

This option is intended for those applications that use multiple identical rectangular workpieces loaded on the same cutting chuck.

The idea is to teach the system to align and dice multiple workpieces, using one of them as a reference. The system is taught the models for the alignment of the first workpiece (panel). Once the first panel has been taught, the user should define the reference positions for the rest of the panels. The system is now capable of performing automatic alignment on all the panels loaded on the same chuck.

The Multi-Panel category can be added to a standard recipe (template).

This section contains the following features:

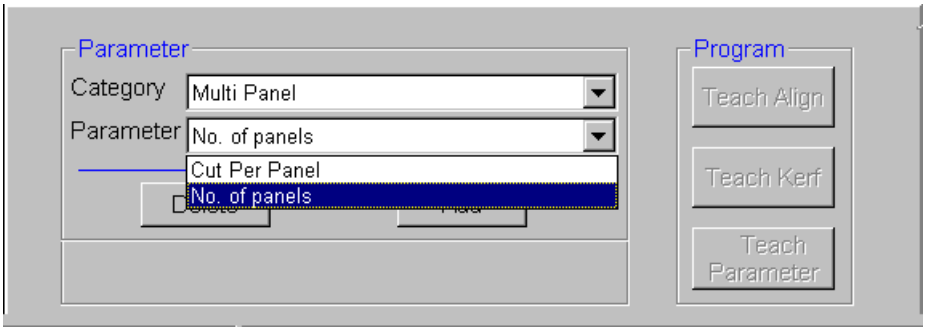
- Create a Multi-Panel Recipe
- Teach Multi-Panel Alignment
- Angle Tabs
- Multipanel Animation
- Deleting an Angle/Panel
- Multi-Panel Recipes with Loop Cuts
- Changing a Multi-Panel Recipe to a Regular Recipe
- Multi-Panel Cutting Sequences

To Create a Multi-Panel Recipe

1 Open an existing recipe or template.

2 Select the **Multi-Panel** category.

3 Under the **Multi-Panel** category, select **No. of panels.**



4 Add this parameter to the recipe.

5 Save the recipe. The **Multi-Panel** category and the **No. of panels** parameter will now appear in the recipe data field.

The difference between a standard recipe and a Multi-Panel recipe is in the Teach Alignment process.

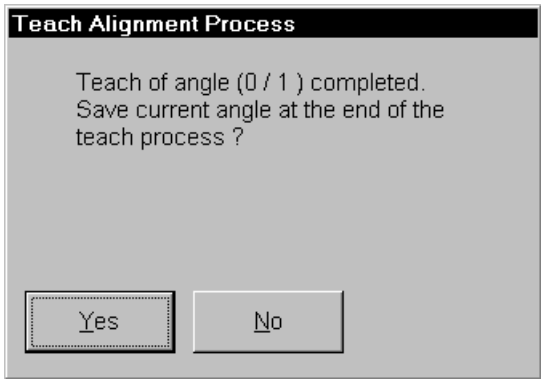
To Teach Multi-Panel Alignment

1 Open the Multi-Panel recipe (see above)

2 Select the Alignment type.

3 Click the **Teach Alignment** button to teach the 0/1 (0 degrees) angle on panel #1 (the reference workpiece), following the instructions given

by the wizard. At the end of teaching process the following message appears:



4 Click **Yes**.

Note: It is important to take into consideration, that the workpieces in the Multi-Panel applications must be rectangular unlike most wafers.

Figure 6-11 illustrates the alignment lines for the two alignment angles in a Multi-Panel application.

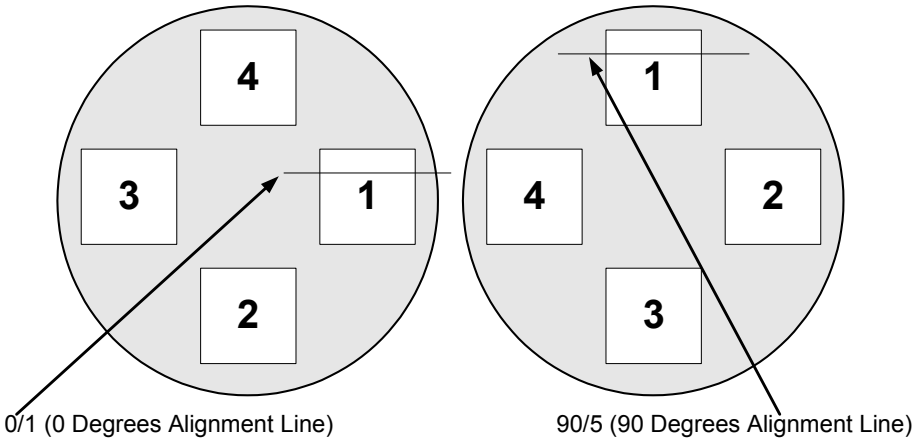
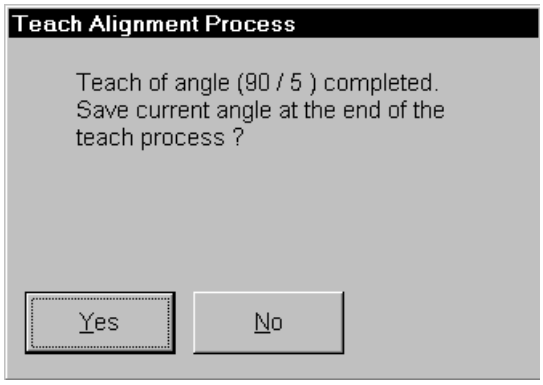


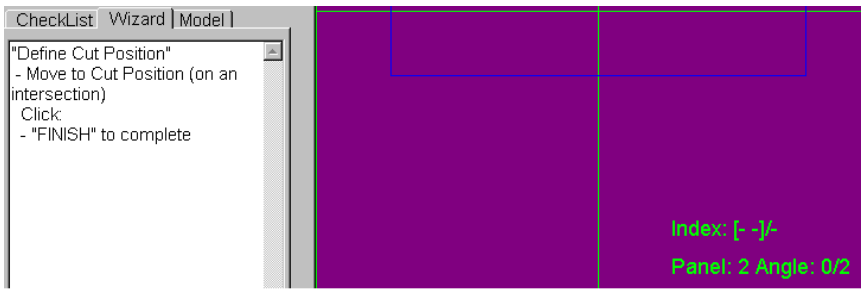
Figure 6-11: The Align Lines

5 Teach the 90/5 (90 degrees) angle on panel #1 (the reference workpiece), following the instructions given by the wizard. At the end of the teaching process, the following message appears:



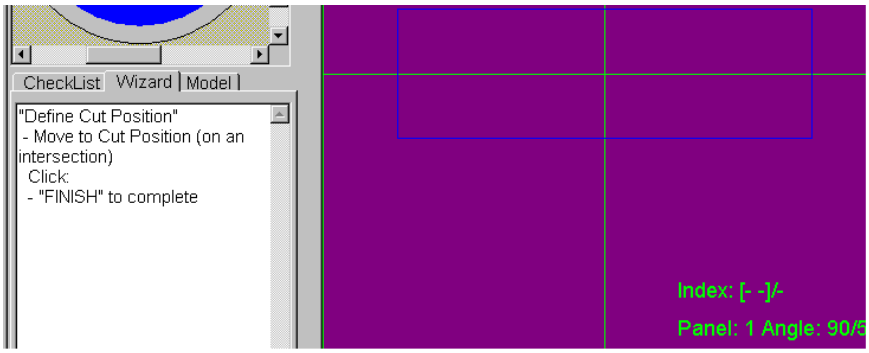
6 Click **Yes**. At this point the System performs automatic alignment of the reference panel.

7 Define the 0 degrees cut positions for all the panels.



Note: The angles' reference numbers and panel numbers appear in the lower-right corner of the video workspace. By default, after defining a cut position, the vision system returns to the first panel. Therefore, when moving to the next panel, the user has to move the camera manually.

8 Define the 90 degrees cut positions for all the panels.



Having defined cut position for all the panels, the System performs alignment and asks the user to define the exact cut positions for every angle. These cut positions are based on the previously taught models and alignment. Once the exact cut positions are assigned, the Teach Alignment process is completed. The alignment can now be performed automatically.

In case one of the alignment models is not found, the System stops the process and an error message asking for manual help appears on the screen. The wizard gives four options as shown in Figure 6-12.

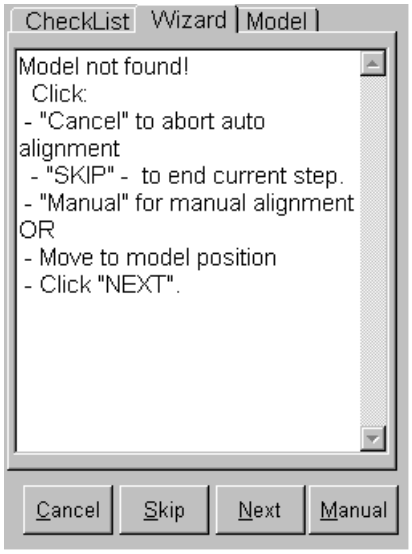


Figure 6-12: Wizard - Model Not Found

The User can now either find a model, or proceed with manual alignment, or skip alignment for this specific angle of this specific panel.

6.5.5.1 Angle Tabs

Once the number of panels is defined and the Teach Align procedure is completed, the number of tabs is updated accordingly. Figure 6-13 shows the angle tabs of a multi-panel recipe.

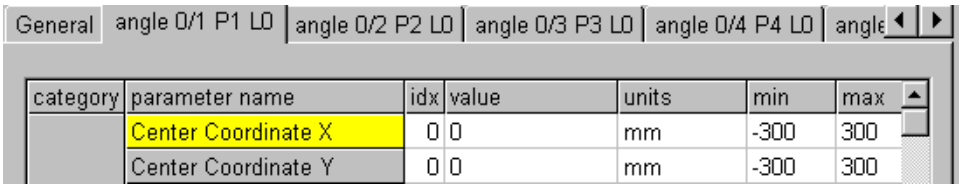


Figure 6-13: Multi-Panel Angle Tabs

Each angle is associated with a group of angles, which is reflected by **L0** or **L1**, appearing on each tab.

The tabs **P1 L0** and **P1 L1** are the master tabs (being those of first panel). Any parameter changes in either of the master angles result in parameter changes in all the angles of the same link. For example, changing the **Depth** parameter value in the angle **0/1 P1 L0** would result in changing the **Depth** parameter value in the angles **0/2 P2 L0**, **0/3 P3 L0, 0/4 P4 L0**.

6.5.5.2 Multipanel Animation

In the Simulation Workspace, the workpiece animation reflects the quantity and location of the workpieces on the Chuck, once the cut map has been built.

6.5.5.3 Deleting an Angle/Panel

To Delete an Angle or Panel:

1 Right-click on the angle tab.

2 Choose **Delete** from the pop-up menu. The specific angle/tab is deleted.

6.5.5.4 Multi-Panel Recipes with Loop Cuts

To Create a Multi-Panel Recipe with Loop Cuts

1 Create a Loop Cut recipe (see section 6.5.3).

2 Define the angles for the Lop Cut.

3 Save the links according to the Multi-Panel procedure.

Note: To delete one of the loops, insert an irrelevant value, such as "0", in the start/end loop cut index. The system will now disregard the loop.

6.5.5.5 Changing a Multi-Panel Recipe to a Regular Recipe

Do one of the following to change a Multi-Panel Recipe to a Regular Recipe:

- Duplicate the recipe and remove the links. The links can be removed during the duplication process, by checking the Remove Links checkbox as shown in Figure 6-14.

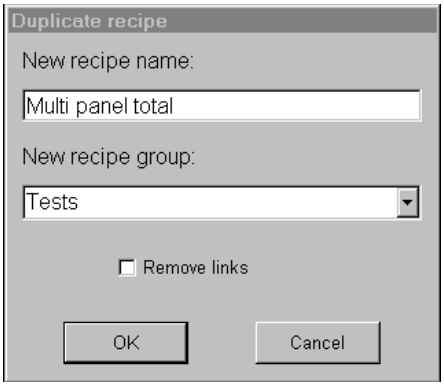


Figure 6-14: Removing Links

- Change the **No. of panels** under **Multi-Panel** category to 1.

6.5.5.6 Multi-Panel Cutting Sequences

The Multi-Panel cutting sequences can vary depending on the users requirements. Table 6-2 shows the cutting sequences according to the combination of the three parameter values:

- Cut per Panel
- Alignment Algorithm
- Optimize Order

Table 6-2: Multi-Panel Cutting Sequences

No.	Cut per Panel set to	Alignment Algorithm	Optimize Order set to	Cutting Sequence
1	No	AACC	Yes	Align: 0/1, 0/2, 0/3, 0/4, 90/5, 90/6, 90/7, 90/8 Cut: 90/8, 90/7, 90/6, 90/5, 0/4, 0/3, 0/2, 0/1
2	No	ACAC	Yes	Align: 0/1, 0/2, 0/3, 0/4 Cut: 0/4, 0/3, 0/2, 0/1 Align: 90/5, 90/6, 90/7, 90/8 Cut: 90/8, 90/7, 90/6, 90/5
3	No	AACC	No	Align: 0/1, 0/2, 0/3, 0/4, 90/5, 90/6, 90/7, 90/8 Cut: 0/1, 0/2, 0/3, 0/4, 90/5, 90/6, 90/7, 90/8
4	No	ACAC	No	Align: 0/1, 0/2, 0/3, 0/4 Cut: 0/1, 0/2, 0/3, 0/4 Align: 90/5, 90/6, 90/7, 90/8 Cut: 90/5, 90/6, 90/7, 90/8
5	Yes	AACC	Yes	Align: 0/1, 90/5; Cut: 90/5, 0/1 Align: 0/2, 90/6; Cut: 90/6, 0/2 Align: 0/3, 90/7; Cut: 90/7, 0/3 Align: 0/4, 90/8; Cut: 90/8, 0/4
6	Yes	ACAC	Yes	As above
7	Yes	AACC	No	Align: 0/1, 90/5; Cut: 90/1, 90/5 Align: 0/2, 90/6; Cut: 0/2, 90/6 Align: 0/3, 90/7; Cut: 0/3, 90/7 Align: 0/4, 90/8; Cut: 0/4, 90/8
8	Yes	ACAC	No	As above

6.5.6 Cut Depth Compensation

When Cut Depth Compensation category is activated, the System automatically lowers or raises the Z-Axis to ensure a uniform cut width of mid-way between the limits specified by the **Max Cut Depth**, **Max** and **Min Cut Width** parameters. The System measures the width of the Bevel cut during a Kerf Check. Cut Depth Compensation can only be performed when the Kerf Check algorithm is selected in the Recipe's properties and the System is performing Kerf Checks.

When the cut is deeper than the limit (the street is too wide), an error message appears and the cut depth is corrected for the next cut. After performing a Teach Kerf Check during the process, followed by a manual or automatic Kerf Check, the above correction is made based on the results from the most recent Kerf Check.

The Cut Depth Compensation parameters define values used as compensation when cutting with Bevel Blades. For more information, see Table A-8.

6.5.7 Negative Index

This feature enables cutting in both directions: front to back and back to front. Furthermore, it allows deciding the direction that the cut map is built. To enable this feature, define the required parameters under the Cut category. Refer to Table A-10 , located under Appendix 3: "Recipe Parameters".

7 SAW PROCEDURES

This chapter includes the topics related to:

1 Z-Axis Safety, section 7.1

2 Blade Expansion, section 7.2

3 Height Measurements, section 7.3

4 Blade Handling, section 7.4

5 Chuck Change, section 7.5

7.1 Z-Axis Safety

To ensure the Z-Axis safety, the System defines the Z Height Movement, which is the lowest point that Z-Axis can travel while the X and Y Axes are in motion. The Z Height Movement is the minimum of three values which are all parameters in the Setup and Diagnostics workbook. These parameters are entitled Z-Axis Safety Position, Z-Axis Return Height, Calibration Start Position, and Pre Non Contact Height.

7.1.1 Z-Axis Safety Position

The Z-Axis Safety Position is an area on the Z-Axis set with reference to the Workpiece used and its tape thickness. It is automatically calculated by the following formula: [Chuck position - Substrate thickness - tape thickness - Safe parameter].This parameter can be viewed in **Setup and Diagnostics > Dicer > Axes > Z > Axis Z Safety Position**. If this value is lower (from the top) than Calibration Safety Position or Pre Non Contact Height, it is used for the Z Height Movement.

7.1.2 Z-Axis Return Height

The Z-Axis Return Height is the height at which the blade should move above the workpiece while returning from the end of the finished cut to the beginning of the next one.

This parameter can be viewed in **Setup and Diagnostics > Dicer > Axes > Z > Z-Axis Return Height**. Its value should not be lower (from the top) than the Z-Axis Safety Position.

7.1.3 Calibration Start Position

Calibration Start Position is the parameter which determines the safety area above the Chuck that can be used for the Z Height Movement. This parameter is set by the User.

To set the Calibration Start Position:

1 Manually set the largest blade in use approximately 2 mm above the Chuck. (If the system uses more than one type of chuck, perform this step with the thickest chuck.)

2 In the Setup and Diagnostics workbook, select **Dicer > Axes > Z**.

3 Double-click Calibration Start Position. **Teach** is activated.

4 Click **Teach**. The Calibration Start Position is recorded as one of the possibilities for the Z Height Movement.

7.1.4 Pre Non Contact Height

Pre Non Contact Height is the parameter which determines the safety area above the NCHD/Mechanical Height Button (depending on what the System is equipped with) that can be used for the Z Height Movement. This parameter is set by the User.

To set Pre Non Contact Height:

1 Manually set the largest blade in use approximately 2 mm above the NCHD/Mechanical Height Button.

2 In the Setup and Diagnostics workbook, select **Dicer > Axes > Z**.

3 Double-click Non Contact Height Device. **Teach** is activated.

4 Click **Teach**. The Calibration Start Position is recorded as one of the possibilities for the Z Height Movement.



Note: The Z Height Movement is constantly updated according to which of the three values is the lowest (from the top).

7.2 Blade Expansion

There are three blade expansion parameters that are set in the Setup & Diagnostics workbook to monitor blade expansion.

To access the blade expansion parameters:

- In the Setup & Diagnostics workbook, select **Saw > Dicer > Cutting Block**. The blade expansion parameters appear on the parameters list.

The following is a list and explanation of the blade expansion parameters:

- **Max. Blade Expansion:** The amount that the blade is permitted to expand between Height procedures until a response is triggered.
- **Max. Blade Expansion after init:** The amount that the blade is permitted to expand between Height procedures after initialization until a response is triggered.
- **Button Height/NCHD Repetitions:** The number of times the Height procedure is repeated if the blade expansion value is beyond the Max. Blade Expansion or the Max Wear value.



Note: It is important to repeat the Height procedure in case the blade surpassed the maximum expansion on the first reading due to excess dirt or water on the blade.

If the Max. Blade Expansion parameter has been surpassed during the Height procedure more times than allowed by the Button Height/NCHD Repetitions parameter, a message with three options appears:

- **Retry:** The System performs the Height procedure again to measure the expansion of the blade.
- **Accept:** The System accepts the measured blade expansion as the new value for Max. Blade Expansion.
- **Cancel:** The error message "Blade is bigger than expected" appears. The User can continue the cutting process by pressing either Run or Full Wafer Cut.

7.3 Height Procedures

The Height procedure is performed in order to determine the Cutting Chuck position along the Z-Axis.

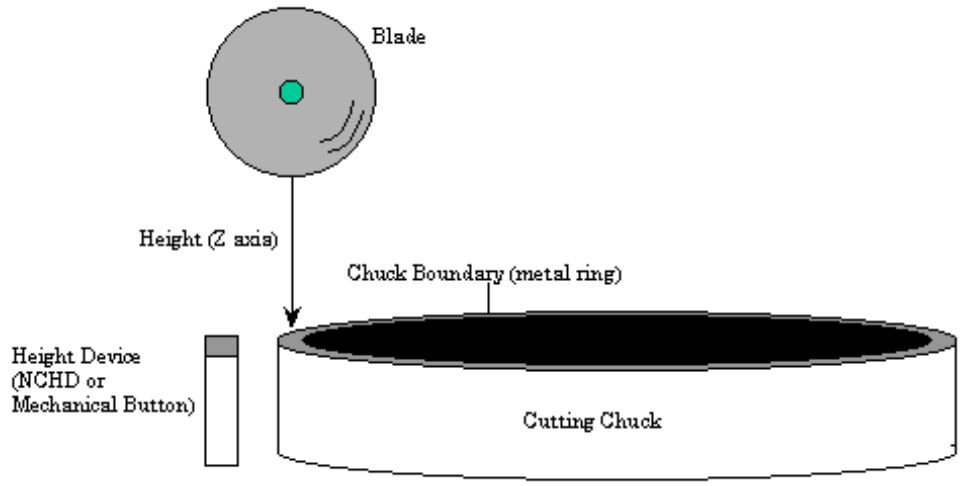


Figure 7-1: Height Procedure

Height is performed by lowering the Spindle until the edge of the Blade makes contact with either the Cutting Chuck (Contact Height) or the Height Device (Button Height). The Height Device, located next to the Cutting Chuck, can be either a Mechanical Button or an optical device (Non-Contact Height Device).

Height procedure performed during the cutting process is referred to as **Process Height**. Process Height is performed throughout the cutting process in order to compensate for changes in the Z position of the cutting edge due to the Blade wear. Process Height is usually a non-Chuck Height, meaning it is performed on the Height Device.

However, the User can configure the System so that Process Height is a Contact Height, meaning it is performed on the Cutting Chuck by changing the **Height Type** parameter in the Recipe from **Regular** (process height performed in the Height Device) to **Defer** (process height performed on the Cutting Chuck). This option is generally used in case there is a problem with the Height Device. It allows the user to keep using the machine, while the problem is being solved.

The User determines when Process Height is performed by configuring the following two parameters in the Height category of the Recipe:

- **Height Check Units**: Determines whether Process Height is performed after a defined number of cuts or after a defined cut length.
- **Height Check Rate**: Determines the number of cuts or the total cut length after which Process Height is performed.

Process Height can be performed manually at any point during the cutting process.

To Manually Perform Process Height:

Pause the dicing process, exit to Inspection. Then,

- Right-click on the spindle icon and select Height from the drop-down menu.

  or

- From the Manual menu, select **Services > Process Height**.

The System moves to the NCH station and lowers the Blade towards the Height Device. The System calculates the exact distance traveled. When completed, the message **"Button/Non-Contact Height completed"** appears in the Wizard.

Height can also be performed when dicing is not in progress using the Height tools in the Setup & Diagnostics Workbook in the Workbook Workspace, as follows:

- NCH/Button Height section 7.3.1
- Chuck Height, section 7.3.2
- Chuck to Non-Chuck (Height Device) Delta Measurement, section 7.3.3
- Sample Blade Calibration section 7.3.4

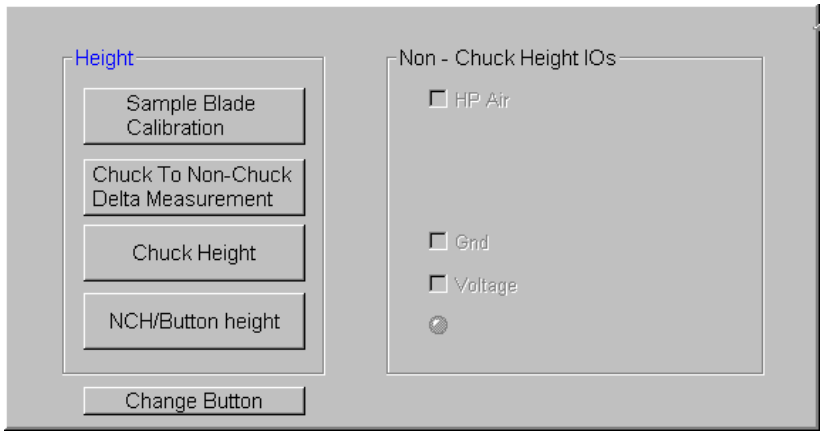


Figure 7-2: Button Height Procedure Tools in GUI

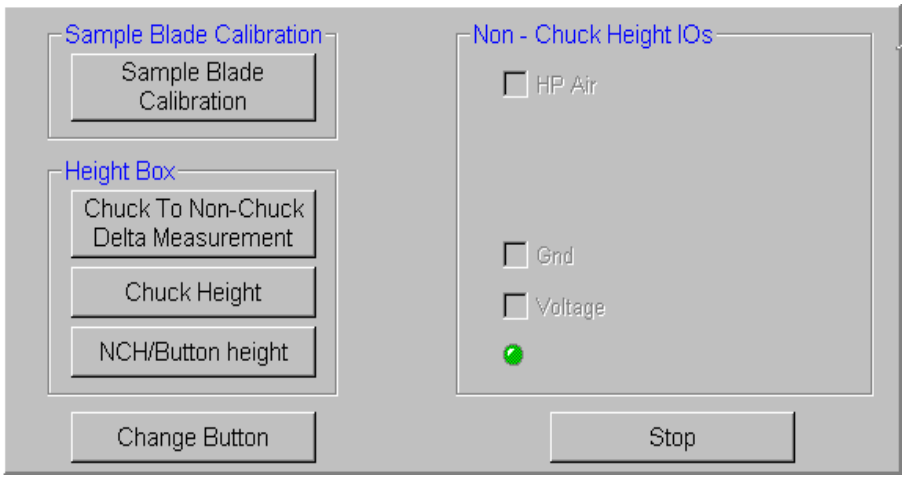


Figure 7-3: Non-Contact Height Procedure Tools in GUI

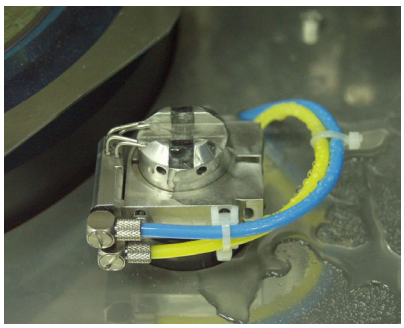
The user can configure the system to perform Height procedure upon every initialization by setting the **Height After Init** parameter to "**Yes**". This parameter, under **Saw > Dicer** in **Setup & Diagnostics** screen, determines whether to perform a Height procedure after saw initialization, regardless of the height rate value in the recipe.

7.3.1 Height Reference Device

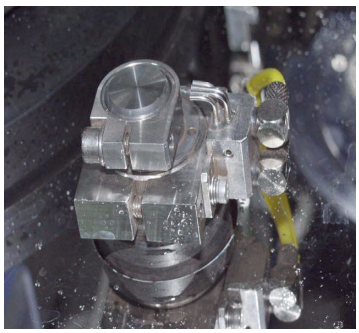
Height Device (height reference point) determines the Cutting Chuck position along the Z-Axis by lowering the Blade until the edge either makes contact with the Mechanical Button, or breaks the beam of light emitted by the Non-Contact Height Device (NCHD).

There are two advantages to performing the Height procedure on the Height Device rather than the Cutting Chuck:

- Can be performed with a Workpiece on the Cutting Chuck
- Does not damage the Chuck and the Blade
- Using a Non-Contact Height Device (NCHD), does not cause wear to the Blade



Non-Contact Height Device



Mechanical Button

Figure 7-4: Height Devices

To Perform Button Height:

1 In the Setup & Diagnostics Workbook, select **Saw > Dicer > Height** to display the Height tools, as shown in Figure 7-2.

2 Click **NCH/Button**. The System lowers the Blade to the Height Device and calculates the exact distance traveled. When completed, the message "Contact Height completed" appears in the Wizard.

7.3.1.1 Change Button Procedure

When using a Mechanical Button as the Height device, the System automatically tracks the number of Height procedures that can be performed before the Button must be replaced. This number is displayed after each Height procedure in the Activity Log at the lower left pane of the screen. When the limit is reached, the System displays a message instructing the User to perform the **Change Button** procedure to replace the worn Mechanical Button with a new one.



To Replace the Mechanical Button:



Note: Remove the Workpiece from the Cutting Chuck before performing the button replacement.

1 Clean the area around the Mechanical Button so that it is free of dust and water.

2 Click  in the toolbar to display the Setup & Diagnostics workbook.

3 From the Setup & Diagnostics tree, select **Saw > Dicer > Height**.

4 In the lower right pane, click **Change Button**. The software switches to the Video Workspace and displays the Wizard with instructions that guide the User step by step through the procedure.



Note: The instructions given in the wizard do not replace the instructions given in steps 5 through 16 of the present section.

5 On the Mechanical Button housing, loosen the screw securing the upper C-clamp and remove the C-clamp.

6 Remove the Mechanical Button by inserting a small screwdriver into any of the four slots and prying upwards to release the Button.

7 Insert the new Mechanical Button into its housing, leaving it slightly higher than it needs to be.

8 Replace and partially tighten the upper C-clamp.

9 Place a Straitness Block across the Chuck and Mechanical Button and use the Block to press firmly on the Mechanical Button to ensure that it is flat and parallel to the to the top surface of the Cutting Chuck.

10 Firmly tighten the upper C-clamp on the Mechanical Button housing.

11 In the Wizard in the Video Workspace, click **Next** and then **Finish** (according to the wizard). The System automatically performs a flatness check on the Mechanical Button and then performs the Chuck to Non-Chuck Delta Measurement procedure to calibrate the difference in height between the Mechanical Button and the Cutting Chuck. Several delta measurements can be carried out, as described in section 7.3.3.1.

7.3.2 Chuck Height

Chuck Height determines the Cutting Chuck position along the Z-Axis by lowering the Blade until it touches the surface of the Cutting Chuck boundary. This type of Height procedure is a contact Height, as physical contact is made between the Blade and the Cutting Chuck.



Note: The contact height can be performed on a ceramic chuck either on the left or right side of the chuck. This ip done by defining the **Chuck Height Side** parameter, located under **Diagnostics > Chuck**.

There are two disadvantages to using Chuck Height:

- Having the Blade make physical contact with the Cutting Chuck wears both Blade and the Chuck.
- Chuck Height can only be performed when no Workpiece is present on the Cutting Chuck.

To Perform Chuck Height:

1 In the Setup & Diagnostics Workbook, select **Saw > Dicer > Height** to display the Height tools, as shown in Figures 7-2 or 7-3.

2 Click **Chuck**. The System lowers the Blade to the Cutting Chuck and calculates the exact distance traveled. When completed, the message "Contact Height completed" appears in the Wizard.

7.3.3 Chuck to Height Device Delta Measurement

This procedure measures the difference between the Chuck Height, as performed on the Chuck, and the non-Chuck Height, as performed using a Height Device (NCHD or Button). This enables the System to calibrate the two measurements and use the non-chuck height device as reference point. Several delta measurements can be carried out, as described in section 7.3.3.1 below.

Chuck to Reference Point (Height Device) Delta Measurement is normally performed after changing the position of the Cutting Chuck relative to the Height Device, or vice versa. Because the procedure involves performing

contact Height, it can only be done when no Workpiece is present on the Cutting Chuck.

Note: This procedure should be performed using a dressed blade (especially, for the systems equipped with NCHD).

To Perform Chuck to Height Device Delta Measurement:

1 In the Setup & Diagnostics Workbook, select **Saw > Dicer > Height** to display the Height tools, as shown in Figures 7-2 or 7-3.

2 Click **Chuck to Height Device Delta Measurement**. The System performs Chuck Height, followed by Button Height, then calibrates the two values. When completed, the message "**Button/Non-Contact Height completed**" appears in the Wizard.

7.3.3.1 Multi-Delta/Contact Calculations

To increase chuck to non-chuck delta measurement validity and increase accuracy, several measurements can be performed and avaraged. This is done by checking the delta several times and comparing the current result to the previous one. The machine seeks two results that are within a defined tolerance. After this is established, the machine calculates the average of these two results and compares it to a second tolerance parameter. This logic is also used when performing Sample blade calibration, except that the calculated results are of the contact height and not the delta.

To Enable Multi-Delta/Contact Calculations:

1 Access the Workbook Workspace by clicking  in the main window toolbar.

2 Select the Height category.

3 Define the following parameters as required:

- Number of delta measurement: 1 to 10 measurements
- Chuck to non-chuck init tolerance: this value defines the initial tolerance between measuraments.
- Chuck to non-chuck tolerance: this value defines the calculated avarage tolerance.

7.3.4 Sample Blade Calibration

Sample Blade Calibration is performed using a new Blade of known diameter to set the benchmark spindle position value. This value is then used during operation to determine the accurate exposure of the current Blade when performing Process Height (e.g. using a high accuracy and high magnification microscope).

Sample Blade Calibration is performed at the factory and should be carried out after Spindle adjustment or replacement.

Note: Since this procedure is very delicate, it has its own access rights setting.

To Perform Sample Blade Calibration

1 Accurately Measure the blade diameter (e.g. using microscope.)

2 Go to **SetUp > Saw > Cutting Block > Sample Diameter,** enter the blade diameter value in the relevant field and click **Save**.

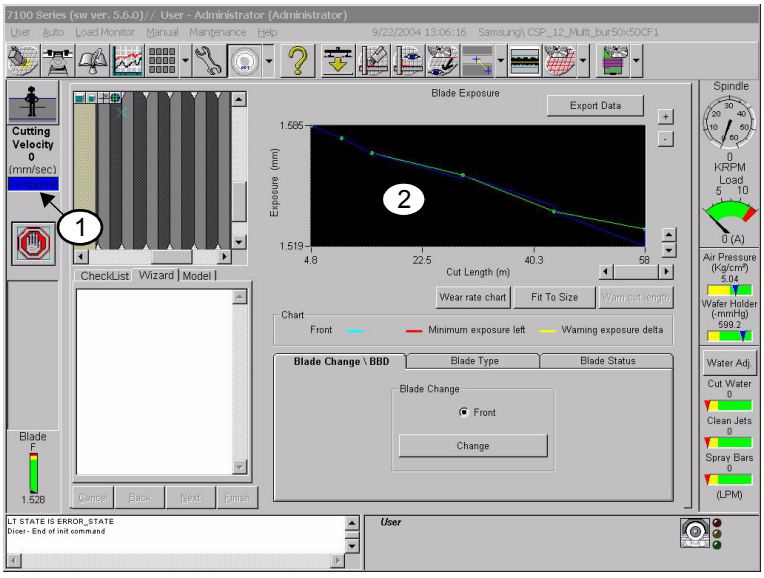
3 Click on the **Sample Blade Calibration** button. The system performs contact height on the chuck.

4 Wait until the wizard displays a message that calibration height is completed.

7.3.5 Auto Height Compensation

The Auto Height Compensation feature is used to calculate the rate of blade exposure and use this information to automatically adjust the blade height in order to compensate for the exposure.

When this feature is activated, the calculated blade exposure as a function of cut length is displayed in the exposure graph next to the actual exposure. In addition, whenever the ADT Model 7100 Semi-Automatic Dicing System uses the exposure calculation to automatically compensate for the exposure, a blue caption is displayed on screen (see Figure 7-5).



1 Compensation Indication

2 Exposure graphs:
green - actual
blue - calculated

Figure 7-5: Auto Height Compensation

7.4 Blade Handling

This chapter describes the software and hardware procedures related to Blade functions for the 7100 Series.

Note: Setting parameter values and selecting a blade per recipe are described in Chapter 5.

The following topics are discussed in this chapter:

- Blade Information, section 7.4.1
- Blade Replacement, section 7.4.2
- Blade Dressing, section 7.4.3

7.4.1 Blade Information

Information about the current Blade wear and exposure is displayed in the Blade Information screen.

To Display the Blade Information Screen:

Right-click the Blade Indicator in the left lower corner of the main window, and select **Blade Info** from the popup menu or click the **Blade Info** button in the toolbar. The Blade Information screen is displayed:

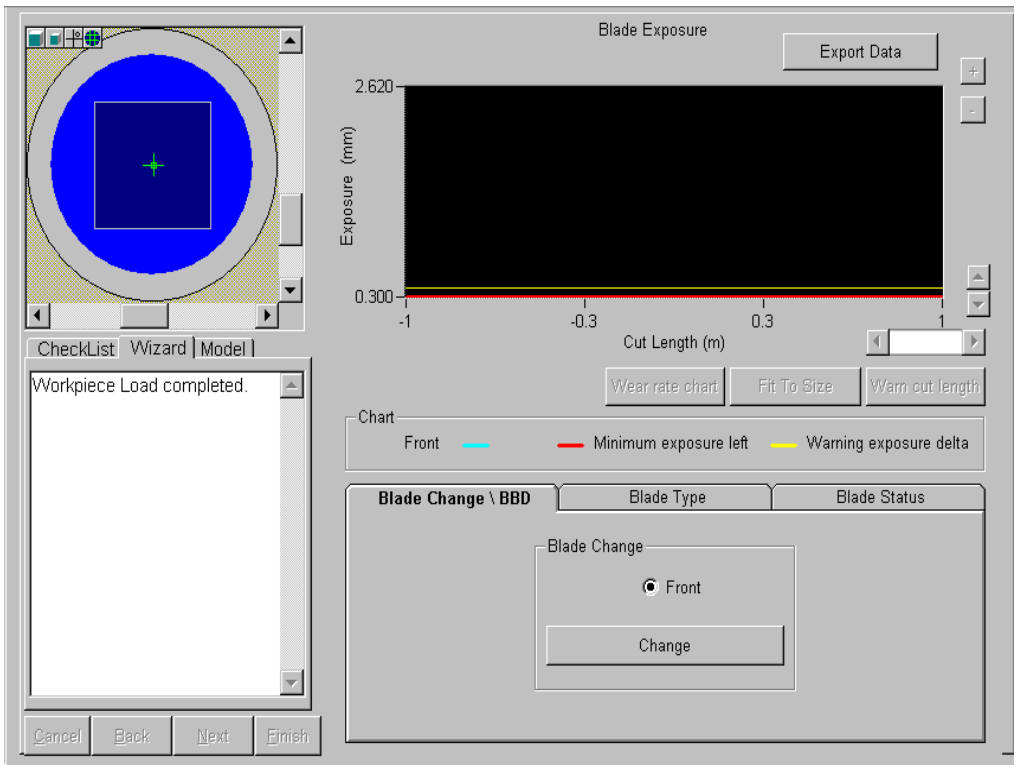


Figure 7-6: Blade Information Screen

The Blade Information screen includes the following sections:

- Blade Exposure Chart/Wear Rate Chart, section 7.4.1.1
- Export Data Tab, section 7.4.1.2
- Blade Change Tab, section 7.4.1.3
- Blade Type Tab, section 7.4.1.4
- Blade Status Tab, section 7.4.1.5

7.4.1.1 Blade Exposure Chart/Wear Rate Chart

In the upper half of the Blade Information screen, the User can toggle between a chart depicting Blade Exposure and a chart displaying information about the Blade Wear Rate.

7.4.1.1.1 Blade Exposure Chart

The Blade Exposure Chart shows changes in the Blade exposure during cutting as a function of the cut length.

To Display the Blade Exposure Chart:

- If not already displayed, click **Exposure chart** in the center of the Blade Information screen.

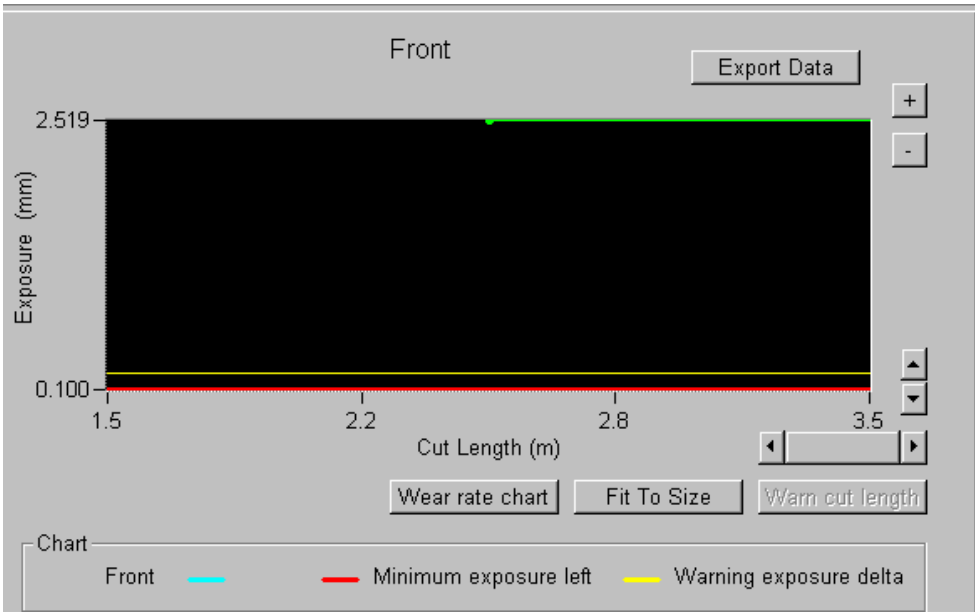


Figure 7-7: Blade Exposure Chart

The Blade Information screen cursor can be used as a graphic tool. To use this feature, double-click in the graph field. The graphic tool options are as follows:

- **Arrow-shaped cursor** - click on a point in the graph to get the Cut Length and Blade Exposure values
- **Cross-shaped cursor** - click and drag to zoom in
- **Arrowed Cross-shaped** cursor - click and drag to move the zoomed graph

The red line in the graph is the maximum Blade wear or minimum Blade exposure permitted, and the yellow line is a warning that Blade exposure has reached a critical level.

These values are specified in the Recipe in the following parameters:

Either,

- **Min Exposure Left**: The minimum blade exposure permitted before a blade stops cutting.
- **Min Exposure Warn Delta**: The minimum blade exposure that triggers a warning.

or

- **Max Wear**: The maximum amount of wear permitted on the Blade and after which the Blade has to be replaced.
- **Max Wear Warn Delta:** The maximum amount of wear on the Blade that triggers a warning.

For further information about Blade parameters, see Appendix 3.

7.4.1.1.2 Wear Rate Chart

The Wear Rate Chart displays the relation between the cut length and Blade wear.

To Display the Wear Rate Chart:

- If not already displayed, click **Wear rate chart** in the center of the Blade Information screen.

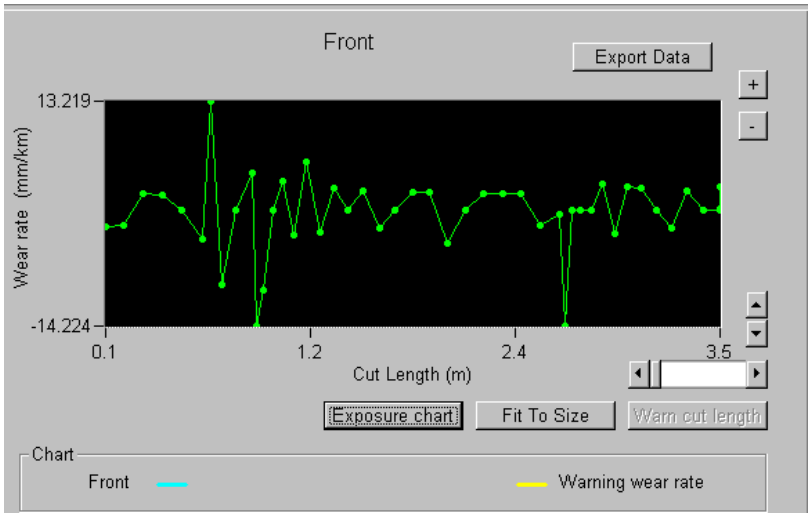


Figure 7-8: Wear Rate Chart

Note: The **Wear rate chart** button is only enabled when the Process Height procedure has been performed at least once.

The graph displays the Blade wear versus the cut length. A straight horizontal line indicates that the wear rate is consistent, whereas peaks stand for high wear within short distance.

7.4.1.2 Export Data

The Blade Exposure/ Wear Rate charts can be exported to a location selected by the user and saved as a text file.

The exported data can be used later on for blade behavior analysis.

To Export a Blade Exposure/ Wear Rate chart

1 Click Export Data.

2 In the **Export Blade Statistics Data** window, define the *.txt file name and location to be saved.

3 Click **Save**.

7.4.1.3 Blade Change Tab

The Blade Change tab is selected in the lower half of the Blade Information screen.

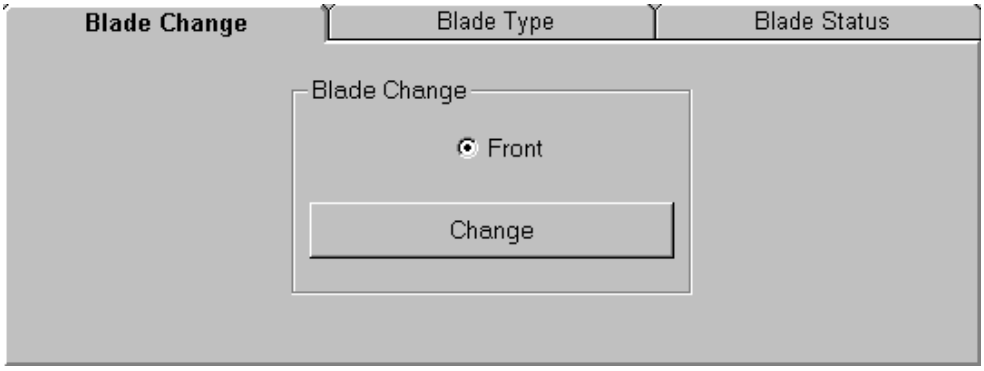


Figure 7-9: Blade Change Tab (2" and 4" Systems without BBD)

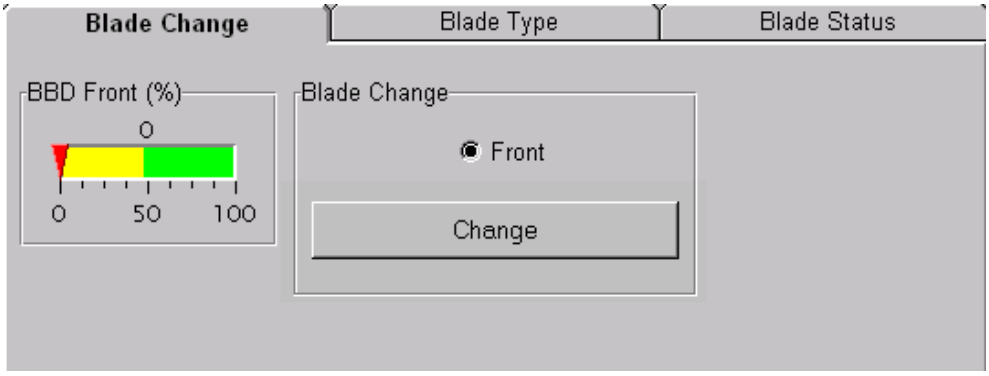


Figure 7-10: Blade Change Tab (2" Systems with BBD)

Note: The gauge in the Blade Change tab shows the tuning position of the BBD sensor (2" Spindle only). For further information, refer to BBD tuning, section 7.4.2.2.2.

The User can start the Blade Change procedure by clicking **Change** in the Blade Change tab. For further information, refer to the Blade Replacement procedure described in section 7.4.2.

7.4.1.4 Blade Type Tab

The Blade Type tab displays the properties for the currently mounted Blade, as follows:

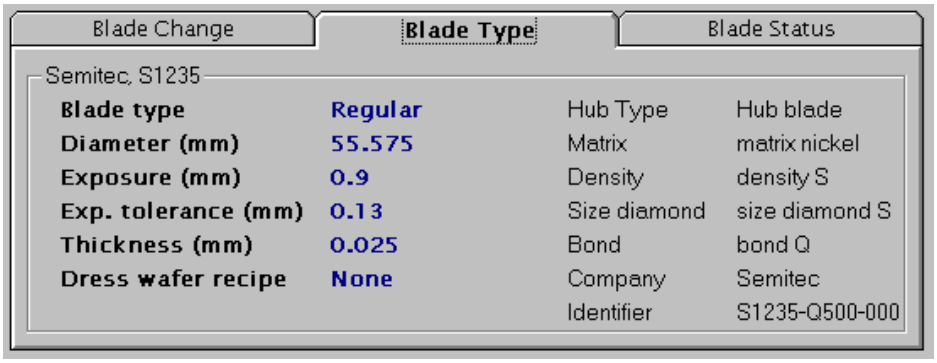


Figure 7-11: Blade Type Tab (Hub Blade)

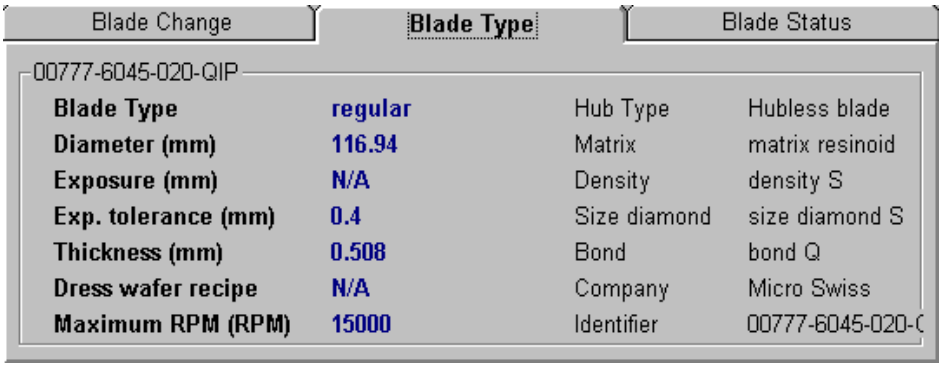


Figure 7-12: Blade Type Tab (Hubless Blade)

Blade properties are described in section 5.3.1.

7.4.1.5 Blade Status Tab

The Blade Status tab displays the following:

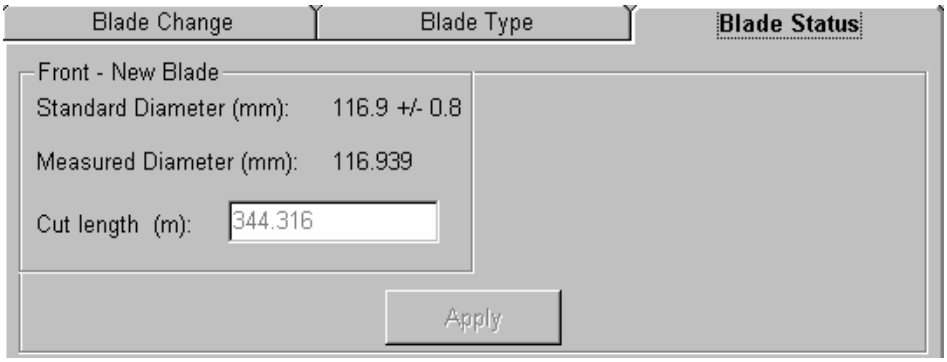


Figure 7-13: Blade Status Tab

- The Standard Diameter is the Blade diameter entered by the User in the Blade properties (see Chapter 5.)

- The Measured Diameter is the Blade diameter measured by the System during the Height Procedure. The measured diameter is a reference for the next Height procedure. This value is also displayed in the log window.
- When changing a blade, if the System detects that the measured blade diameter is smaller than the minimal standard diameter, the **Apply** button becomes active and the user is prompted to confirm the current blade usability by clicking **Apply**.

Note: If the System prompts the user to confirm the blade usability, this confirmation is obligatory. Having closed the Blade Status screen without clicking **Apply**, the user will have to go back to this screen by right-clicking on the Blade Gauge and selecting **Blade Info**.

7.4.2 Blade Replacement (Change)

Blades are replaced on the Model 7100 for a variety of reasons, including:

- Worn Blades
- Blade type or size is not appropriate for the required job
- Bad kerfs (which may indicate a problem with a Blade)
- Broken Blades

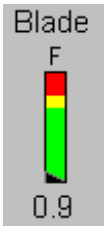
Danger: The Spindle and Blade rotate at extremely high speeds. Touching either of these components while the Spindle is rotating will cause bodily harm. For safety reasons, the Spindle Cover features an Interlock that prevents the Cover from opening while the Spindle is rotating. First, toggle the Spindle off and wait for it to stop rotating before opening the Spindle Cover and performing the procedures given in this chapter.

7.4.2.1 Conditions for Blade Change

The system detects that a Blade needs replacing in one of the following ways:

- Performing Process Height
- Detection by the BBD (2” Spindle only)
- Performing a Kerf Check

7.4.2.2 Blade Indicator



In addition, the Blade lifespan estimate is shown in the Blade Indicator on the lower left corner of the main window. The bar, representing the Blade in the system, provides a guide as to the condition of the Blade based on the Blade parameters specified in the Recipe. The black pointer moves slowly up the guide as the Blade is worn.

The colors in the Blade Indicator bar indicate the following:

Green: Blade exposure satisfactory, cutting can continue.

Yellow: Blade exposure critical, cutting can only continue for a short time. (The length of time is defined by the parameters in the Blade category of the Recipe, as described in Appendix 1.)

Red: Blade requires changing, no cutting possible.

The system provides the following indicators when Blade replacement is required:

- An error message is displayed on the screen
- The yellow light of the Light Tower flashes

7.4.2.2.1 Blade Change Detection by Performing Process Height

The System automatically performs the Process Height procedure during the cutting process at intervals specified in the Recipe, as described in Chapter 3. If the System calculates a Z position that is outside the boundaries set in the Recipe (indicating excessive Blade wear), the System displays an error message with details and troubleshooting instructions, which indicates that the Blade needs replacing.

7.4.2.2.2 Blade Change Detection Using the Broken Blade Detector (for Systems equipped with a 2" Spindle and BBD only)

The BBD uses an Optical Sensor to detect partial or total Blade breakage. The BBD Transmitter, which provides a light source, and the BBD Receiver are both located at the top of the Cooling Block.

The BBD should be adjusted whenever a Blade is changed or whenever the Blade exposure has changed due to wear. (The BBD may detect a Blade as broken when it is, actually, just worn.) Adjustment is not always necessary when the Blade is replaced with another of the same type; however, the BBD reading should be checked before using the new Blade.

The BBD is equipped with two Securing Nuts and an Adjustment Nut that allow manual adjustment and securing of the BBD position. The top securing nut is a limit nut (a split nut with a securing screw). It can be set at the required position and then locked in place. This securing nut position is pre-set at the factory. It is set so that it limits the BBD lowering and prevents the BBD form touching the Blade (hub type) or the Blade Flange (hubless type).

The Lower (Adjustment) Nut enables setting the BBD in correct position. Once the position is adjusted, the BBD is locked in place by the Middle

Securing Nut. This nut is intended for final locking the BBD in place after setting.

The BBD adjusting is performed automatically during the Blade Replacement procedure, as described in section 7.4.2.3. The user needs to adjust it manually so the readout of the analog sensor is between 12 and 18.

Periodic cleaning of the BBD with a cotton swab and isopropyl alcohol or water is required daily and at every blade change in order to eliminate false results due to muddy cutting debris on the Transmitter and Receiver.



To Manually Tune the BBD:

1 Stop the spindle.

2 Release the BBD Lower and Middle Nuts.

3 Tune the BBD by turning the Adjustment Nut of the BBD (see Figure 7-20) until the BBD Analog Sensor gauge in the Blade Change tab of the Blade Information screen reaches the maximum setting (see Figure 7-9).

4 Continue turning the Adjustment Nut until the reading in the gauge drops to approximately 12.

5 Raise the above value to 18.

6 Lock the Middle Securing Nut.

7.4.2.3 Replacing a Blade

A Blade can be replaced at any point during the cutting process, even in the middle of cutting a Workpiece. The procedure for replacing a Blade includes both software and hardware components. The following tools are required:



Figure 7-14: 4" Blade Removing Tool

- 4" Blade Removing Tool (see Figure 7-14)
- Blade Handling Toolkit for 2" Spindle (see Figure 7-15)



To Replace a Blade:

1 Initiate the Blade Change procedure in one of the following ways:

- Right-click the Blade Indicator and select **Blade Change.**
- From the Manual menu, select **Services > Blade Change**.
- In the Blade Change tab of the Blade Information screen (see Figure 7-9), click **Change**.



1 Blade Holder
2 Torque Wrench
3 Hex Wrench
4 Spanner Tool

Figure 7-15: Full Blade Handling Toolkit for 2" Spindle

The Spindle stops rotating and moves automatically to the Blade Change station to enable easy access to the Blade. The GUI displays the Define Blade screen.

The Spindle Interlock automatically unlocks, which enables the user to open the cover and change the blade.

Opening the cover disconnects the spindle and axes drivers from power. At the end of a regular Blade Change procedure the System automatically performs initialization.

The Flange diameter field of the Define Blade screen becomes active, when the blade type is defined as hubless.

Set the lot number in the **Set Lot Number** field. This information is later saved in the Log File. For more information about this feature, refer to section 3.8.

Check the **Leave current blade** checkbox, if the Blade is not being replaced, for example, if there was a false alarm.

The new exposure value is displayed once the process height is finished.

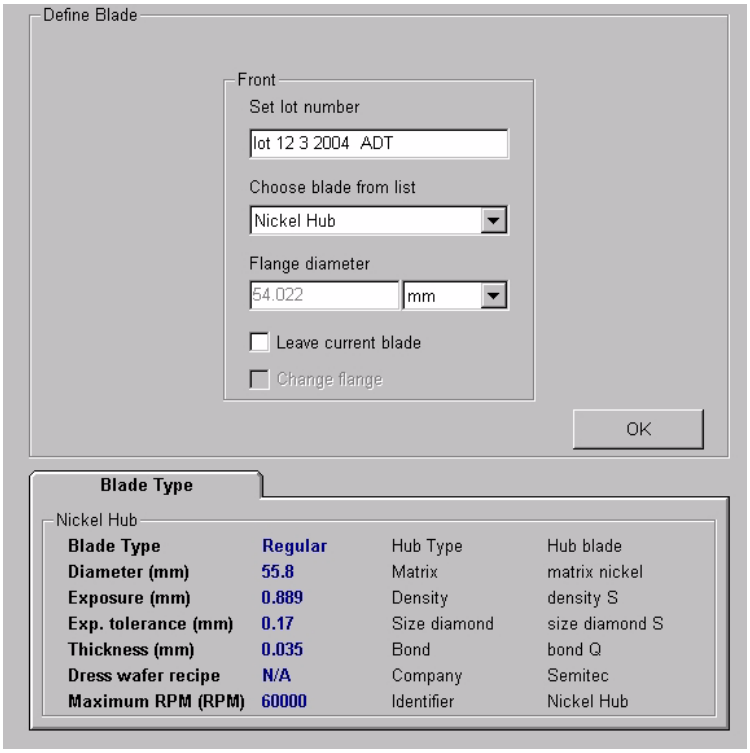


Figure 7-16: Define Blade Screen

2 Open the Cooling Block by unscrewing the Thumbscrew and lifting it away from the Spindle.

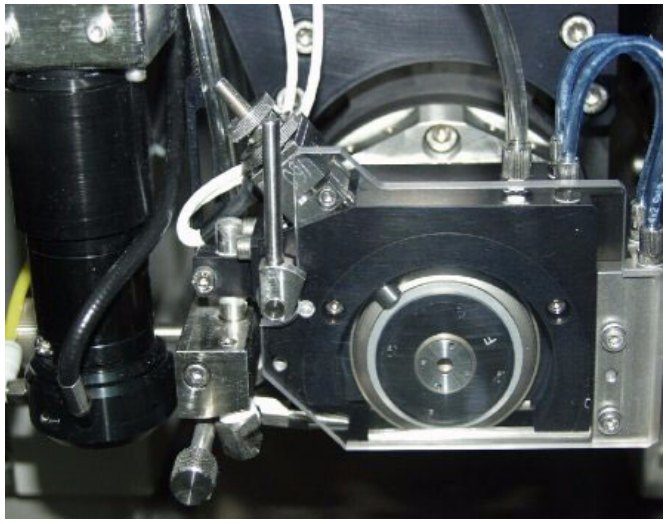


Figure 7-17: 2" Spindle with Cooling Block

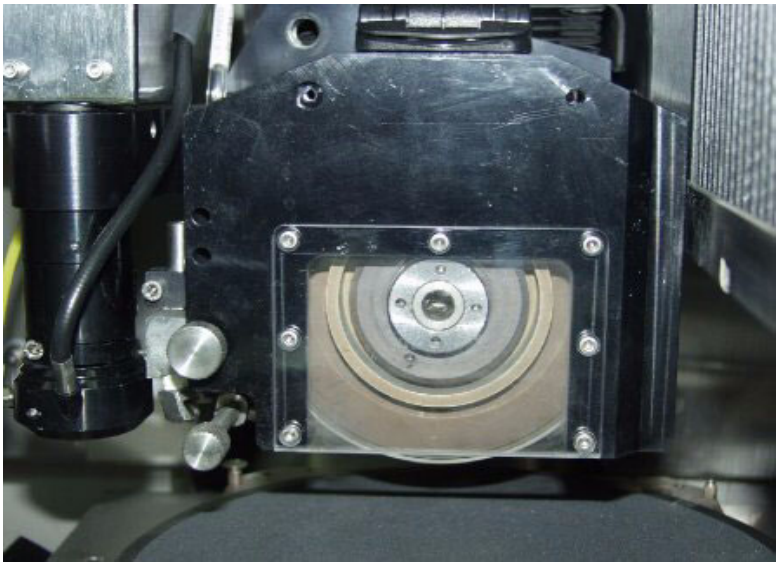


Figure 7-18: 4" Spindle with Cooling Block

3 Attach the Spanner Tool onto the Torque Wrench and remove the Holding Nut in the center of the Spindle by turning the Spanner Tool clockwise.

Note: [2" Spindle only] If the Holding Nut cannot be removed with the Torque Wrench, use the Hex Wrench (Allen Key).

Note: Steps 4, 6 and 7 refer to 2" spindles only.

4 Pull up the silver Release Ring on the Blade Holder and place the Blade Holder over the Blade.

5 Remove the Blade by pulling it off the Spindle.

6 Release the old Blade from the Blade Holder by pulling up on the silver Release Ring.

7 Insert the new Blade into the Blade Holder (the Blade must be face up).



Figure 7-19: 2" Blade Holder

8 Install the new Blade onto the Spindle.

9 Replace the Holding Nut and tighten it with the Torque Wrench (if available) until there is a click.

Note: For 2" spindles the Torque wrench is set to 2.2 Nm

10 Close the Cooling Block and tighten the Thumbscrew.

11 In the Define Blade screen, click **OK**.

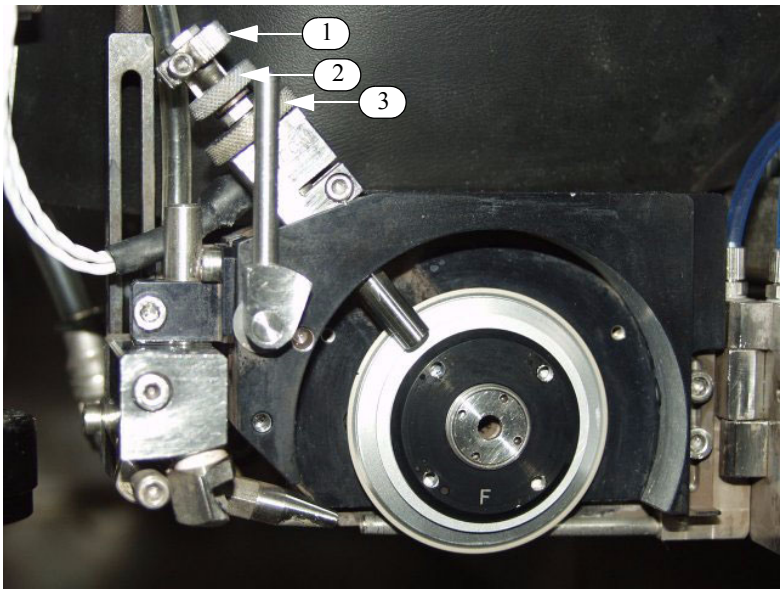
12 (2" Spindle only) Tune the BBD by turning the Adjustment Nut of the BBD (see Figure 7-20) until the BBD Analog Sensor gauge in the Blade Change tab of the Blade Information screen reaches the maximum setting (see Figure 7-9).

Note: Do not touch the Travel Securing Nut. It is preset in order to prevent BBD crashing into the Blade.

13 Continue turning the Adjustment Nut until the reading in the gauge drops to approximately 12.

14 Raise the above value to 18.

15 Lock the Middle Securing Nut.



1 BBD Travel Securing Nut
2 Middle Securing Nut
3 Adjustment Nut

Figure 7-20: Tuning the BBD

16 Close the cutting cover.

17 Click **Finish**. The Blade Information screen is displayed. The System performs initialization. The Spindle starts rotating and the System performs a Height procedure.

Note: It is recommended to perform manual Y Offset after changing the Blade. See Chapter 6 for details.

18 If Dressing or Override is specified in the **After Change Treatment** parameter in the Recipe, the System automatically starts the Dressing process.

7.4.2.4 Blade Change to a Different Type

When performing Blade Change to a different type of blade, the system performs either a standard height procedure or both standard and Chuck to Non-Chuck Delta Measurement. Several delta measurements can be carried out, to incease accuracy, as described in section 7.3.3.1.

If the system is configured with a Non-Contact Height Device, it performs only the Non-Contact Height procedure.

If the system is configured with a Button Height Device, during blade change (to a different type of blade) the system performs Contact Height on the Chuck, followed by a Button height.

This process updates the value of **Chuck to NCH/Button Delta** under **Saw > Dicer > Cutting Blocks** in **Setup and Diagnostics** screen.

Note: It is recommended to perform a Chuck to Non-Chuck Delta Measurement procedure only with a blade that has been dressed or worked with.

7.4.3 Blade Dressing

Blade Dressing is performed in order to prepare a Blade for use. Blade Dressing has three main purposes:

- Expose the new diamonds
- Shape the blade
- Reduce runout

There are three methods of Dressing a Blade:

- Using a Dressing Workpiece (wafer or block) mounted on the Cutting Chuck
- Performing Override cutting on the same substrate under process
- Using the Dress Station that enables the user to perform Blade dressing as part of the dicing process (For more details about this option, refer to section 9.3.)

When the Dressing algorithm has been selected in a Recipe and a Blade is changed, the System automatically performs Dressing according to the method specified in the **After Change Treatment** parameter (Blade category). If the **After Change Treatment** parameter is set to **None**, no automatic Dressing is performed, but the User can perform manual Dressing if required.

7.4.3.1 Comparison Between Dressing with a Dressing Workpiece and Override

The two major differences between dressing with a Dressing Workpiece and Override are:

- Dressing is performed on a specially designated workpiece, whereas Override is performed on a production workpiece
- Only one speed can be defined for the entire length of the cut in Override. That speed is less than the speed used for a normal cut.

Table 7-1 describes in detail the differences between the two methods.

Table 7-1: Dressing vs. Override		
Subject	**Dress Mode**	**Override**
Use	Usually used for performing Dressing on Dressing Block or Dressing wafers.	Usually used for Dressing on production Workpieces.
Setup	Assign a cutting algorithm for a specific Workpiece, and specify standard cutting parameters. Suitable for any Blade.	Blade Dressing parameters are defined for a normal Workpiece.
Steps	Unlimited	Unlimited
Increment	Increment is gradual. Each cut of every step is performed faster than the previous cut.	Increment is by steps. All cuts of a specific step are performed at the same speed.
Feed Rate	Feed rate during Dressing can be higher than the final Cutting Feed Rate.	Feed rate during Dressing cannot exceed the final Cutting Feed Rate.
Cut Depth	Each step can be performed at a different Cut Depth.	Cut Depth is the same for all steps.
Step Length	The length of each step can only be set as the Cutting Length.	The length of each step can only be set as the Cutting Length.
Step Feed Rate	The feed rate of each step is set as an absolute value.	The feed rate of each step is set as an absolute value.
Activation	With standard System configuration, Dressing is automatically activated after each Blade replacement, if there is **no** Workpiece on the Cutting Chuck.	With standard System configuration, Override is automatically activated after each Blade replacement, if there is a Workpiece on the Cutting Chuck.

7.4.3.2 Building a Dressing Recipe

Dressing Recipe is a special work program for dressing a new or used blade. Dressing Recipes use their own parameters as well as those taken from the main recipes.

Following is a step-by step instruction as to how to build a dressing recipe.

7.4.3.2.1 Creating a Dressing Program

Note: Dress recipes are based on GPC concept except for defining cut positions.

Once a new dressing recipe file is created, do the following:

1 Open the **first** recipe screen.

2 Define the wafer shape.

3 Define the wafer dimensions.

4 Define the wafer type (select either Dressing Wafer or Dressing Block).

5 Define the cut type as Standard Dressing.

6 Define the Align Type as Full Dress Alignment.

7 Click the **General** tab.

8 Define the height check rate.

9 Define the Y-Offset parameters.

10 Define the overcut and overtravel parameters for both **X** and **Y** Axes.

Note: The spindle speed value is taken from the main recipe.

11 Click the **Angle** tab.

12 Under the **Angle** tab, define the Align Type as **Dress_Manual_Once**.

13 Add parameter **Y Overtravel** under **Cut** category.

14 Define the **Y Overtravel** value (usually - negative).

Note: Since the dressing recipe is based on GPC concept, the Overtravel values are defined for both X and Y axes. In order to prevent cutting outside the workpiece, the Y Overtravel should be set negative.

15 Click **Save**.

7.4.3.2.2 Dressing Settings in the Main Recipe

Since the dressing recipes use a number of the main recipe parameters, it is necessary to do the following:

1 Open the main recipe.

2 In the recipe **General** screen, add the category **Dress** with all the relevant parameters.

3 Under the **General** tab, Open the **Blade** category.

4 Set the **After Change Treatment** parameter to **Dressing**.

5 Open the Blade properties, double-click the **Dress Wafer** parameter and enter the filename of the dressing recipe described in section 7.4.3.2.1.

Note: Dressing program does not create a cut map.

7.4.3.3 Performing Dressing Using the Override Option

In this method of Dressing, a production Workpiece is used to dress the Blade during the actual cutting process. Dressing using Override can be performed while continuing to cut the production Workpiece. There is no need to remove a partly cut Workpiece and replace it with a special Dressing Workpiece.

The cutting process changes while the Blade is Dressed, and operates according to the parameters in the Override category specified in the Recipe. Only one cutting speed can be defined when using Override.

Table 7-2: Override Parameters

Parameter	Description
Override Length	The length of the cut when performing Override.
Override Start Speed	The speed of the X-Axis at the beginning of the Override process.
Override End Speed	The speed of the X-Axis at the end of the Override process.

When dicing has been completed for the specified **Override Length**, the System automatically switches from Override mode to Auto mode and continues the dicing process.

7.4.3.3.1 Manual Dressing Using Override

The User can select Override mode manually at any time and perform Dressing using Override by performing the following procedure.

To Perform Dressing Using Override Manually:

1 Click **Pause** to pause the dicing process.

2 From the Manual menu, select **Blade Treatment > Override**. The OVERRIDE label is displayed below the **Run** button.

3 Click **Run** to resume dicing in Override mode.

7.4.3.3.2 Override Screen

Information about Dressing using Override is displayed in the Override Screen.

To Display the Override Screen

- Click the **Override** button  in the toolbar to display the following:

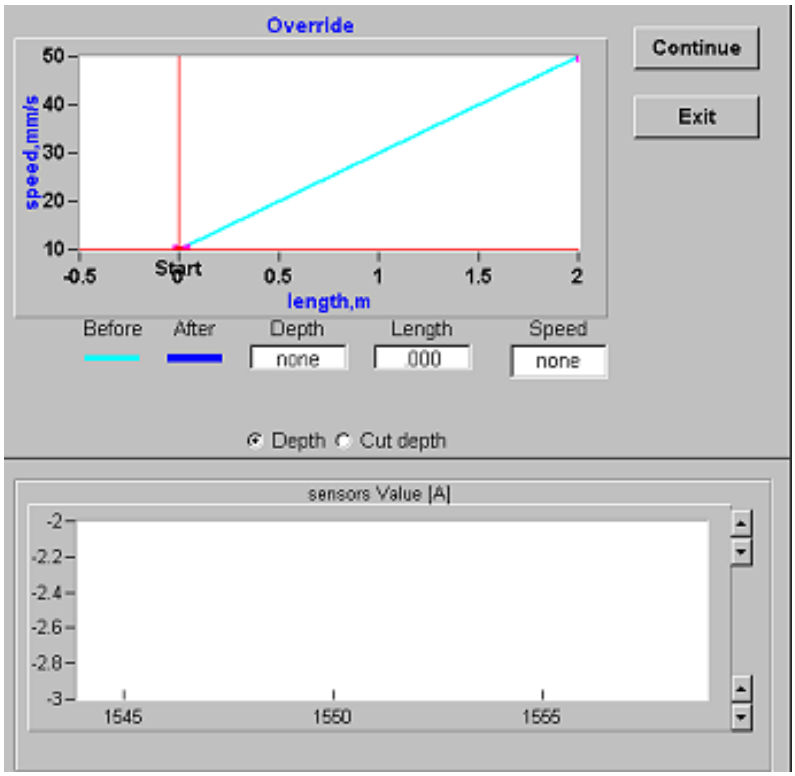


Figure 7-21: Override Steps Screen

Note: If the **Override** button is not displayed, click the arrow next to the **Dressing/Blade Info** button in the toolbar, and select **Override** to display the **Override** button.

The graph at the top shows the relation between the cutting speed and the cut length for the Blade.

The Sensor Values graph displays a load analysis according to the current pressure on the Spindle.

7.4.3.3.3 Override Manual Stop

To Stop the Override Dressing Process Manually

1 Click the **Override** button in the toolbar. The following dialog box is displayed:



2 Click **OK** to stop the Override sequence or **Cancel** to resume override.

7.4.3.4 Dressing with a Dressing Workpiece

A Dressing Workpiece is a special substrate used only to dress the Blade in order to condition it for cutting. The Blade is abraded by the special substrate, which can be either the Workpiece itself or a dedicated Dressing Block. When the **After Change Treatment** parameter in the Recipe is set to **Dressing**, the System automatically performs Dressing after a Blade is changed and Process Height performed.

The Dressing Workpiece is placed on the Cutting Chuck. After a blade change, the wizard instructs the user to do so. The Dressing Workpiece is then cut according to the parameters in the Dress Recipe and Dressing category specified in the main Recipe.

Table 7-3: Dressing Parameters

Parameter	Description
Dress Length	The total length of the cut to be performed. Blade Dressing can include multiple cut lengths. For every Dress Length defined, the User must define a Dressing Cut Depth (or Depth), Dressing Start Speed and Dressing End Speed.
Dressing Start Speed	The speed of the X-Axis at the beginning of the Dressing process.
Dressing End Speed	The speed of the X-Axis at the end of the Dressing process.
Dressing Depth	The distance along the Z-Axis between Chuck Level and the cutting edge of the Blade in its cutting position.

Table 7-3: Dressing Parameters	
Parameter	**Description**
Dressing Cut Depth	The distance along the Z-Axis between the top of the Dressing Workpiece (or Dressing Block) and the cutting edge of the Blade in its cutting position.
Dressing Index	The distance along the Y-Axis between adjacent cuts in a Workpiece.

Additionally, in the **Wafer Type** property of the Recipe, the type of Workpiece must be defined as a **Dressing Wafer** or a **Dressing Block**.

7.4.3.4.1 Manual Dressing With a Dressing Workpiece

Dressing is performed automatically after a Blade change when specified in the Recipe. The User can also initiate the Dressing process at any time by performing the following procedure.

To Perform Dressing Manually:

1 Place a Dressing Workpiece on the Cutting Chuck.

2 From the Manual menu, select **Blade Treatment > Dressing**. The DRESSING label is displayed below the **Run** button, and the user is prompted to load the dressing workpiece.

3 Perform manual Alignment following the instructions given by the wizard. After the Alignment is finished, the Dressing screen (Figure 7-22) is displayed.

4 Click **Continue** to perform Blade Dressing or **Exit** to quit.

When Dressing is in progress, selecting **Blade Treatment > Dressing** from the Manual menu, displays the Dressing Policy dialog box with the buttons **Abort, Retry and Ignore**. This enables the User to stop and restart the Dressing process.

7.4.3.4.2 Dressing Screen

Information about the Dressing process is displayed in the Dressing screen.

To Display the Dressing Screen:

- Click the **Dressing** button  in the toolbar to display the following.

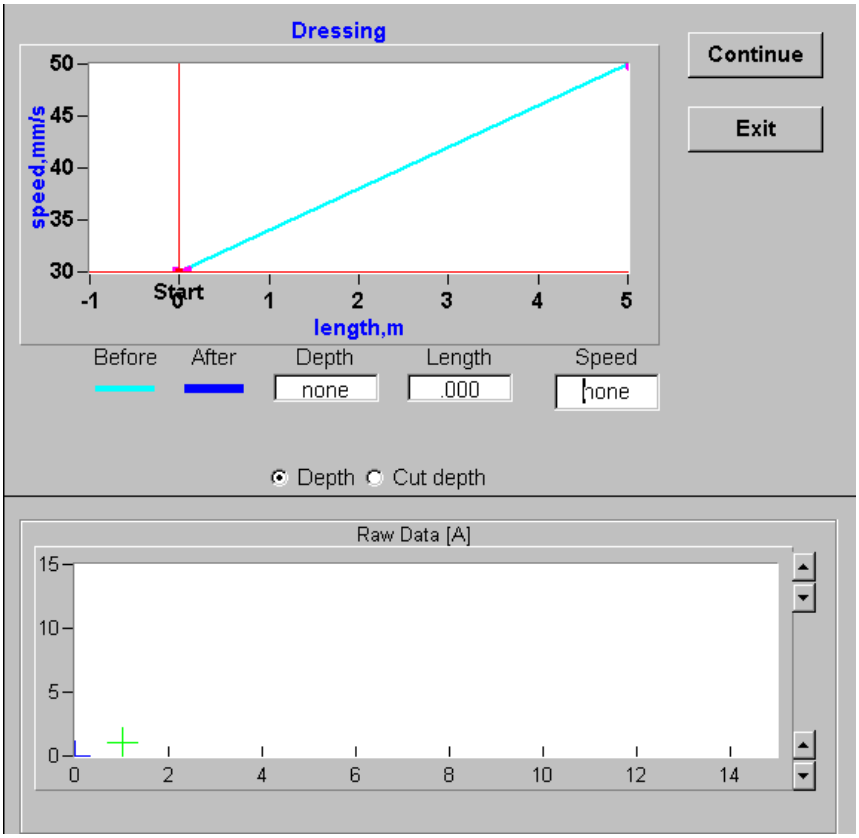


Figure 7-22: Dressing Screen

Note: If the **Dressing** button is not displayed, click the arrow next to the **Override/Blade Info** button in the toolbar, and select **Dressing** to display the **Dressing** button.

The graph at the top shows the relation between the cutting speed and the cut length for the Blade.

The Sensors Values graph displays a load analysis according to the current pressure on the Spindle.

7.4.3.4.3 Dressing Manual Stop

To Stop the Dressing Process Manually

1 Click the **Dressing** button in the toolbar. The following dialog box is displayed:



2 Click **Abort** to exit the Dressing sequence or **Retry** to resume Dressing.

7.4.3.5 Dressing on a Dressing Block

Another way to perform Blade dressing involves the Model 7100 optional Dress Station.

This option enables the dressing process to be done as part of the dicing process program. Dressing can be done during a workpiece dicing without unloading it. In a process program, the User can set the amount of cuts, after which the system performs a certain amount of dress cuts on the Dress Station.

For more information regarding the optional dress station, refer to section 9.3

7.5 Chuck Change

The Model 7100 can use various cutting chucks, designed for different production needs and applications. Chuck replacement can be carried out on-site and does not require ADT Field Service staff involvement.

The chuck replacement procedure is performed in two steps, completed in the following order:

1 Replacing the Chuck

2 Reteaching the Focus on the Chuck

7.5.1 Replacing the Chuck

When replacing a chuck on the 7100 dicing saw, there are three replacement options, depending on the chuck's thickness:

- replace a chuck of the same thickness
- replace a Thin chuck with a Thick one
- replace a Thick chuck with a Thin one

Note: the following rules apply to possible scenarios while replacing chucks:

- If both Thin and Thick Chucks are in use, ALWAYS set the saw for the Thick Chuck.
- If the system is equipped with the Dressing Station option, adjust it to the same level as the NCH / Button as described in this procedure.
- If the system is equipped with the Wash-pipe option, adjust it up/down by the measured difference of Chuck's thickness.

To replace a chuck of the same thickness

Note: When physically replacing the chuck, ensure that the Theta table is clean.

1 Access **Z-Axis** parameters: Workbook Workspace  > Saw > Dicer > Axes > Z.

2 Check the following **Z-Axis** parameters and verify that they are correct with regards to the new chuck:

- Pre Non Contact Height Position
- Calibration Start Position

3 Browse to **Chuck** screen (Workbook Workspace -> Saw -> Dicer -> Chuck) and click **Chuck Change** icon

4 Follow the Wizard instructions. Click **Next** to install a new chuck or **Finish** to leave the current chuck.

Note: After chuck replacement, set the Calibration Start Position according to the largest blade and the highest chuck.

Note: It is recommended to perform the Chuck to Non-chuck Height procedure using a dressed blade.

5 Update the Auto-Focus on dicer chuck, as described in section 7.5.2 below.

To replace a Thin chuck with a Thick one

Note: When physically replacing the chuck, ensure that the Theta table is clean.

1 Measure the thickness of the New and Old Chucks.

2 Access **Z-Axis** parameters: Workbook Workspace  > Saw > Dicer > Axes > Z.

3 Check and increase the following **Z-Axis** parameters according to the measured difference of Chuck thickness:

- Pre Non Contact Height Position
- Calibration Start Position

4 Browse to **Chuck** screen (Workbook Workspace  > Saw > Dicer > Chuck) and click **Chuck Change** icon

5 Replace the chuck and lift the NCH or Button device. Use the NCH/ Button Adjustment Bar to level the height device with the chuck top surface.

Note: For Vectus and Fortis series, lift the NCH or Button by lifting the whole assembly (Open screw on the X-table bracket). For older series, lift NCH or Button device. Make sure, that the device is not taken out from the internal O-ring of the device base.

6 Follow the Wizard instructions. Click **Next** to install a new chuck or **Finish** to leave the current chuck.

Note: After chuck replacement, set the Calibration Start Position according to the largest blade and the highest chuck.

Note: It is recommended to perform the Chuck to Non-chuck Height procedure using a dressed blade.

7 Update the Auto-Focus on dicer chuck, as described in section 7.5.2 below.

To replace a Thick chuck with a Thin one

Note: When physically replacing the chuck, ensure that the Theta table is clean.

1 Measure the thickness of the New and Old Chucks.

2 Access **Z-Axis** parameters: Workbook Workspace > Saw > Dicer > Axes > Z.

3 Check and decrease the following **Z-Axis** parameters according to the measured difference of Chuck thickness:

- Pre Non Contact Height Position
- Calibration Start Position

4 Browse to **Chuck** screen (Workbook Workspace > Saw > Dicer > Chuck) and click **Chuck Change** icon

5 Replace the chuck and lower the NCH or Button device. Use the NCH/ Button Adjustment Bar to level the height device with the chuck top surface.

Note: For Vectus and Fortis series, lower the NCH or Button by lowering the whole assembly (Open screw on the X-table bracket). For older series, lower NCH or Button device. Make sure, that the device is not taken out from the internal O-ring of the device base.

6 Follow the Wizard instructions. Click **Next** to install a new chuck or **Finish** to leave the current chuck.

Note: After chuck replacement, set the Calibration Start Position according to the largest blade and the highest chuck.

Note: It is recommended to perform the Chuck to Non-chuck Height procedure using a dressed blade.

7 Update the Auto-Focus on dicer chuck, as described in section 7.5.2 below.

7.5.2 Reteaching the Focus on the Chuck

To Re-Teach Focus on Chuck:

1 Click in the toolbar to display the Video Workspace.

2 Using the Z/T Axis Controls, manually focus the new Microscope on the Cutting Chuck.

3 Click to display the Setup & Diagnostics workbook.

4 From the Setup & Diagnostics tree, select **saw > Dicer > Axes > Z**.

5 In the upper right area of the screen, scroll to the Axis Points category.

6 Click on the field name **Autofocus on Dicer Chuck** to display the **Teach** button.

7 Click **Teach**.

8 Click **Apply**  in the toolbar to apply the new settings for the current work session.

9 Click **Save**  in the toolbar to save the new settings.

Perform the camera adjustment procedure as described in section 8.1.1 of the Model 7100 Maintenance Manual.

8 SPECIAL FEATURES

This chapter describes the special features available for the Model 7100, including:

- Load Monitoring, section 8.1.
- Multi-Language GUI, section 8.2
- Wafer Vacuum Check, section 8.3
- Open Loop Theta Accuracy Procedures, section 8.4
- Spindle Velocity, section 8.5.
- Focus Change, section 8.6
- Manual Inspection Illumination, section 8.7
- Daily Database Backup, section 8.8
- Theta Safety Limits on X-Axis, section 8.9
- Change of Length Unit Type, section 8.10

8.1 Load Monitoring

The Load Monitor consists of a sensor that measures the electrical current of the spindle motor and provides the relevant statistics that represent the cutting behavior.

8.1.1 Load Monitoring with DC or AC Spindle

If the system is equipped with a DC Spindle, the Load Monitor graph shows the change in current. The current is a function reflecting the spindle torque, i. e. if the Workpiece requires a greater torque, the spindle uses more current and this can be seen on the load monitor graph.

If the system is equipped with an AC Spindle, the Load Monitor graph shows the change in current as well, but in this case the current is a function of the Spindle Velocity. Therefore, if the spindle velocity is higher the current grows higher, thus the graph shows a higher value. It represents the load as well: if the workpiece requires a greater torque, the spindle should be rotating at a higher velocity, which is reflected by the load monitor graph.

Note: On the Fortis machines (AC Spindle), the Load Gauge is not presented. For more information about the Load Gauge, refer to section 2.2.3.2.

8.1.2 Online Monitoring

The Online Monitoring mode provides information and statistics about the load exerted during dicing of the current Workpiece. This monitoring is termed "Online" because it monitors the current Workpiece while the Spindle is operating and the cutting process is running.

Load monitoring statistics are viewed from the Load Monitor Workspace.

To Access the Load Monitor Workspace:

The User can access the Load Monitor Workspace in one of the following ways:

- Click the Load Monitor Workspace button  in the toolbar.
- From the Load Monitor menu, click **Load**
- On the right of the GUI main window, right-click the Load Monitor gauge.

The Load Monitor Workspace is divided into two graphs, the top measuring the Average Value per Cut and the bottom measuring the Raw Data.

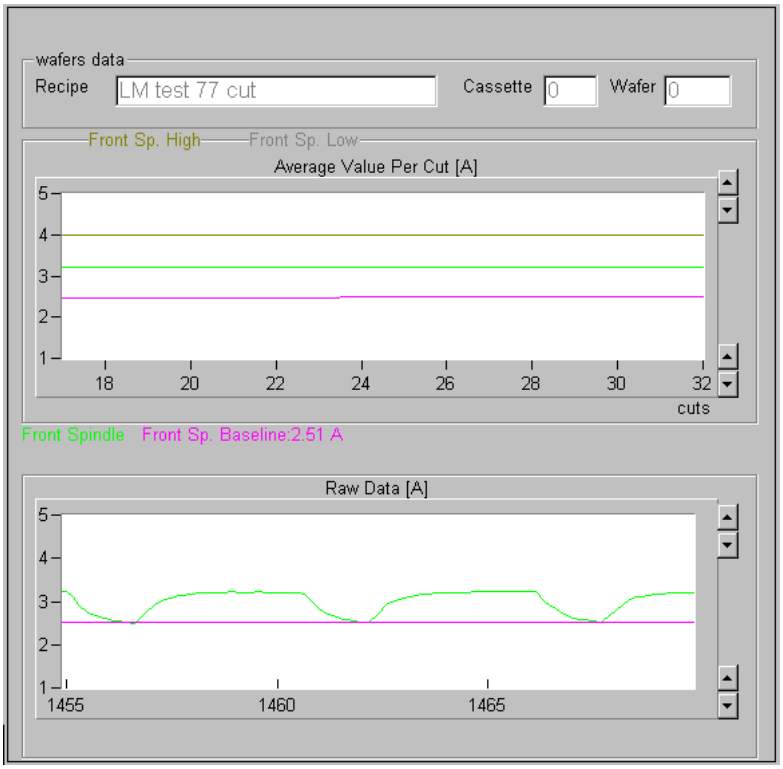


Figure 8-1: Load Monitor Workspace During Cutting

8.1.2.1 Average Value per Cut

This graph illustrates the current Workpiece's average load value for the last several cuts. The vertical axis measures the spindle current in Amps, while the horizontal axis displays the last several cuts. The graph displays four different lines:

- **High Average Load Limit:** set by the User in the High Average Limit Response parameter (see Table 8-1).
- **Low Average Load Limit:** set by the User in the Low Average Limit Response parameter (see Table 8-1).
- **Baseline Values:** The load of the Spindle when the blade is not cutting. During the process, these values are represented by a pink line (see Figure 8-1). The difference between the Average Load Value and the Baseline Values is the average load of the cutting itself and is referred to as the Net Value.
- **Average Load Values:** The average load values of each cut line during the cutting process of the current Workpiece. During cutting, these values are represented by a fluorescent green line as shown in Figure 8-1. These values should be between the High and Low Average Load Limits for the cut to proceed properly.

8.1.2.2 Raw Data

The Raw Data graph illustrates the load values during the cutting process. The vertical axis measures the spindle current value in Amps while the horizontal axis shows the progress of the current cut in seconds. This graph displays two lines, the Baseline Values and the Load Values. When cutting begins, the lower Raw Data graph displays the spindle current values for the current cut. If cutting pauses or stops, the line of the Raw Data graph continues as long as the Spindle is running.The Load Monitor gauges reflect the activity in the Raw Data graph.

Note: On both graphs, the User can change the interval of the vertical axis. The lowest value shown can be lowered by clicking the downward pointing arrow at the each graph's bottom right and raised by clicking the upward pointing arrow just above it. The highest value shown can be lowered by clicking the downward pointing arrow at the each graph's top right and raised by clicking the upward pointing arrow just above it (see Figure 8-1).

8.1.2.3 Displaying or Hiding Lines

The User can choose to display or hide any of the lines from the two graphs. Hiding lines helps to focus on the data that requires analysis.

To display or hide lines from the Average Value per Cut graph:

1 Right-click anywhere inside the Average Value per Cut graph. A popup menu appears.

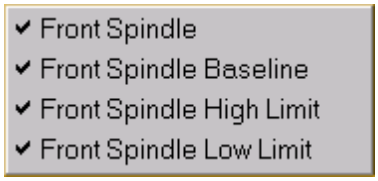


Figure 8-2: Display and Hide Lines Popup Menu (Top Graph)

2 Check or uncheck the lines you want to display or hide. The desired lines appear on the graph.

To display or hide lines from the Raw Data graph:

1 Right-click anywhere inside the Raw Data graph. A popup menu appears.

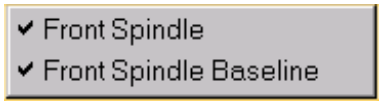


Figure 8-3: Display and Hide Lines Popup Menu (Bottom)

2 Check or uncheck the lines you want to display or hide. The desired lines appear on the graph.

Table 8-1: Parameters for Cutting	
Parameter Name	**Parameter Description**
F Sp High AVG Limit	The highest average load the Load Monitor allows until the response is triggered.
F Sp Low AVG Limit	The lowest average load the Load Monitor allows until the response is triggered.

8.1.2.4 Load Monitor Baseline Parameters

The Baseline is the load of the Spindle when the blade is not cutting. It includes the Spindle Idle Load and the drag force of the cooling water. If the Baseline measurements are taken incorrectly, the Net Load limit values will be inaccurate.

Table 8-2: Baseline Parameters	
Parameter Name	**Parameter Description**
F Sp Flow Control Stabilization Delay	The delay before measuring the Baseline which allows the System to stabilize the water flow rate (See section 8.1.2.4.1).

8.1.2.4.1 Flow Control Stabilization Delay

This parameter is set to ensure that the Baseline measurement taken is correct once the flow rates have stabilized. There may be a need to increase the Flow Control Stabilization Delay if the supply line water pressure is not steady.

8.1.2.5 Load Monitor Control Screen

The Load Monitor control Screen contains certain settings with which the User controls the variables of Load Monitor.

To Access the Load Monitor Control Screen:

- From the Load Monitor menu, click **Control**. The Control screen appears.

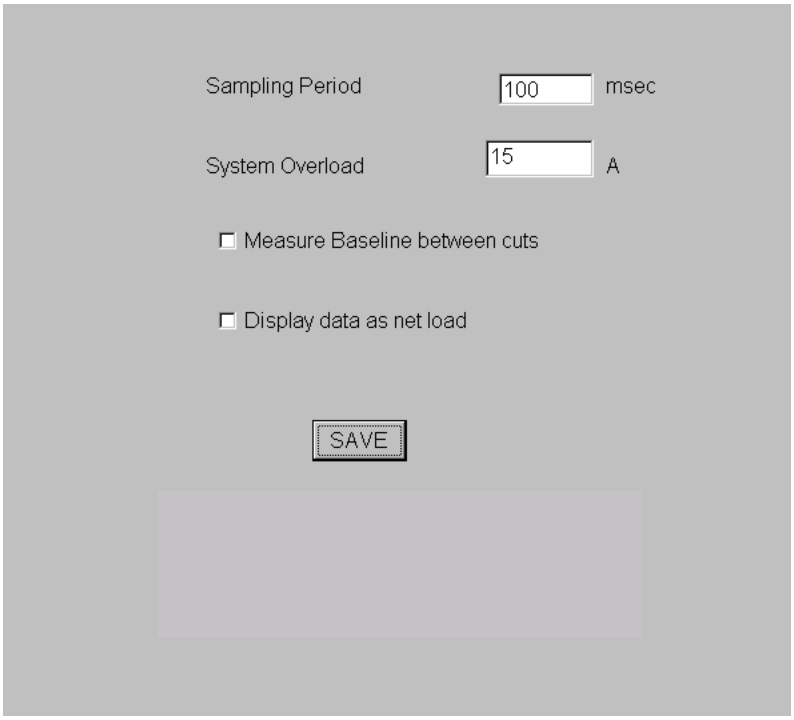


Figure 8-4: Control Screen

The Load Monitor Control screen contains the following features:

- **Sampling Period:** The frequency of load sampling. This value is pre-set to sample every 100 msecs. It is recommended not to change this value.
- **System Overload:** The maximum load value that Model 7100 can handle. If the load exceeds this value, the cutting stops. This value is also used as the max value for the analog gauge.
- **Measure Baseline:** Allows the User to check the baseline between cuts if required.
- **Display Data as Net Load:** Displays the Baseline on both graphs as zero. This feature causes the Load Monitor to illustrate the Net Load of the cut only.
- **Save:** Saves the changes made.
- Spindle's Idle Load Calibration: Sets the idle load characteristics of the Spindle to produce similar characteristics as that of the Spindle of another Model 7100.

8.2 Language Selection

The Model 7100 is supplied with an option to change the GUI language. The software supports one local language and English (default).

To Activate the Feature

1 In the menu bar click **User > Language**. The Language local selection screen is displayed (see Figure 8-5).

2 Set one of the local languages to **Yes**. The system is now set up to support English and another pre-defined language. The **Multi Language** button  is displayed on the Toolbar.

Pressing the **Multi Language** button switches between the languages.

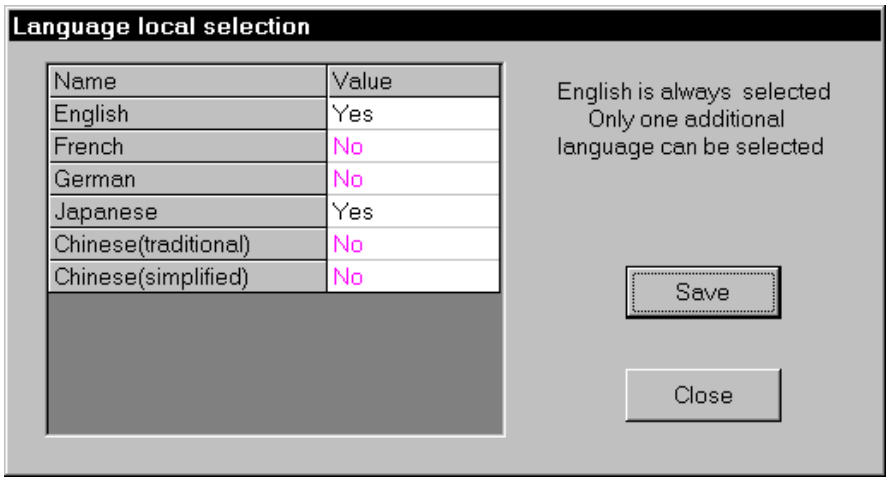


Figure 8-5: Language Local Selection Screen

To Switch Between the GUI Languages

1 Click  to enter the Maintenance mode.

2 Click the **Language Change** button in the toolbar  .

3 Select the required interface language.

4 Click **Save**. A pop-up dialog box appears informing the user that after saving the changes, the system will exit to Windows, and the user will need to restart the GUI.

Note: The changes will apply only after the computer is restarted. If the User decides not to restart the computer, the language setting will not change.

The active language is displayed in the Setup and Diagnostic workspace in both English and the local language (see Figure 8-6)

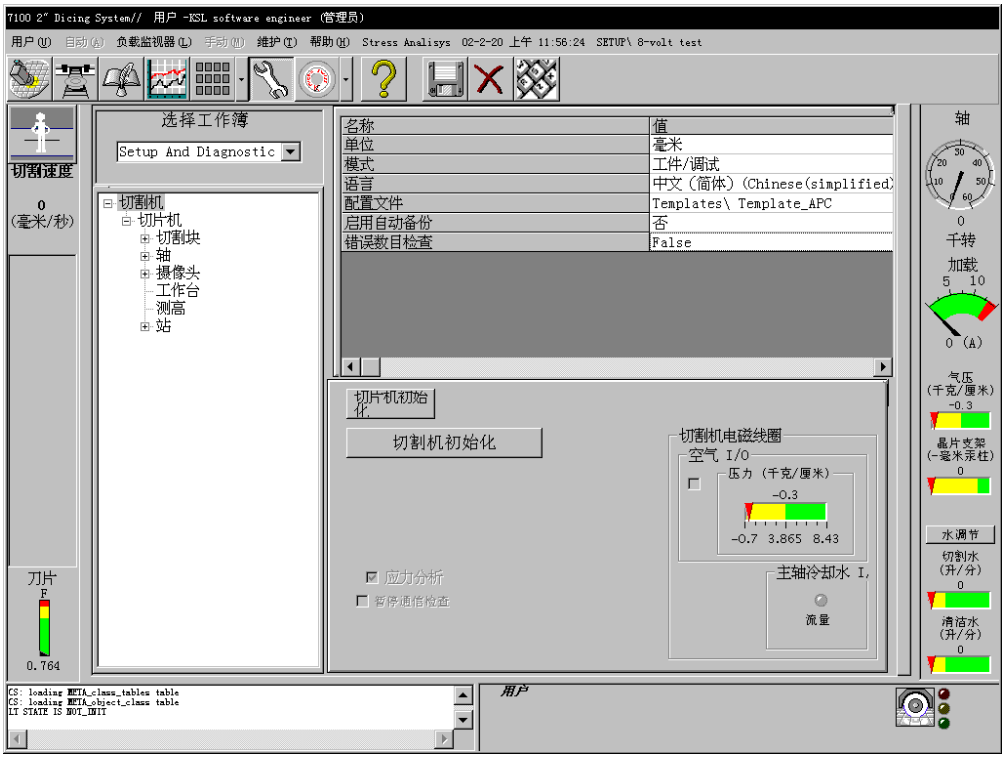


Figure 8-6: Simplified Chinese GUI

8.3 Wafer Vacuum Check

During initialization, the System checks if there is a Workpiece on the Chuck. The User can set exactly when this check takes place by setting the Vacuum Check Delay parameter. This parameter determines how much time in seconds elapses between the initial operation of the vacuum during initialization and performance of the check by the sensor. This parameter should be optimized according to the chuck type.

To set Vacuum Check Delay:

1 In the Setup & Diagnostics workbook, select **Saw > Dicer**. Vacuum Check Delay appears on the parameters list.

2 Double-click Vacuum Check Delay and type the amount of seconds desired.

8.4 Open Loop Theta Accuracy Procedures

8.4.1 Stress Release

This function, when enabled, serves to follow the Theta axis motions and detect when the Theta axis exceeds the defined limits (see below). If the Theta axis exceeds one of these limits, the system performs back and forth movement between the defined Theta Stress Release Left and Right coordinate points (see below) before any angle move or alignment. For instance, if the alignment procedure takes place for the first time after the Theta initiation (i.e. the Theta axis reaches the 0 degrees, which is less than **Theta Stress Right Crd**), the axis moves back and forth a number of times.

Changing the **Theta Align Stress Enable** parameter from "No" to "Yes" enables the following parameters:

- **Theta Stress Move Delay** - pause between the Theta movements while performing the Stress Release.
- **Theta Stress Right Limit** - the right-most point of the Theta axis motion. In case the Theta axis moves beyond this limit, the system performs Stress Release. This parameter value should be less than that of **Theta Stress Right Crd**. The default value for this parameter is 20 degrees.
- **Theta Stress Left Limit** - the left-most point of the Theta axis motion. In case the Theta axis moves beyond this limit, the system performs Stress Release. This parameter value should be greater than that of **Theta Stress Left Crd**. The default value for this parameter is 160 degrees.
- **Theta Stress Right Crd** (coordinate) - the right-most point of the process. The default value for this parameter is 40 degrees.
- **Theta Stress Left Crd** (coordinate) - the left-most point of the process. The default value for this parameter is 140 degrees.
- **Theta Number of SR Repetitions** - number of times the Theta axis moves between the left and right coordinates while

performing the Stress Release. The default value for this parameter is 3.

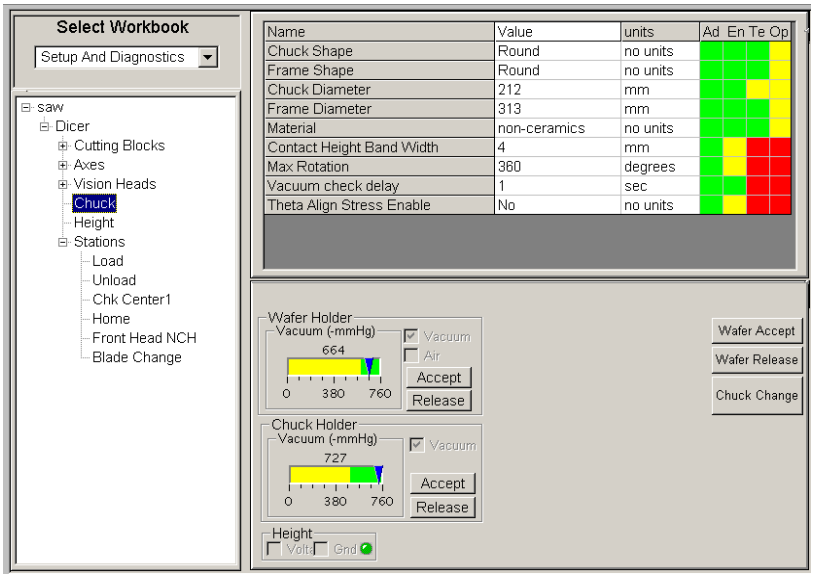


Figure 8-7: Theta Align Stress Disabled

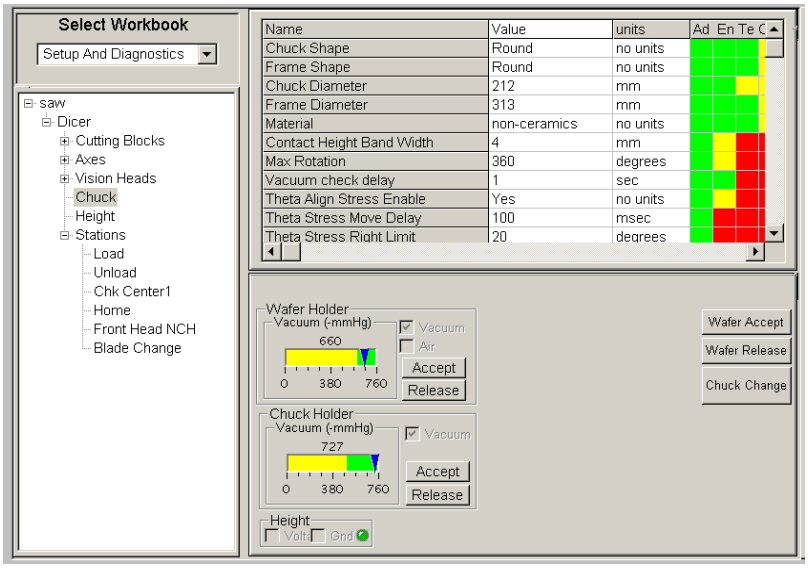


Figure 8-8: Theta Align Stress Enabled

8.4.2 Theta Motion Replay

While the system is being taught the Workpiece Alignment, it records every movement of the Theta axis. Once the **Theta Stress Release** is enabled, the system replays all the Theta motions, which had been taught for a specific workpiece, each time when performing angle move. Having

changed angles, the Theta axis may perform slight movements for final correction of the new position.

Note: Using this feature can significantly improve the Theta Axis accuracy. It should be used only with open loop Theta Axis (cable type).

It is important to take into account, that **Final Accuracy** and **Maximum no. of iterations** settings depend on the camera magnification. In order to achieve higher Theta accuracy, set the **Maximum no. of iterations** to **9** and the **Final Accuracy** according to the table below:

Camera Magnification	Final Accuracy
X60	At least 0.08
X120	Up to 0.08
X240	Up to 0.05

8.5 Spindle Velocity

The speed of the spindle rotation can be varied for different purposes.

8.5.1 Reduced Height Velocity

When the blade descends to the NCHD, it creates "mist" between the prisms due to high-speed spindle rotation. This phenomenon reduces the NCH accuracy, or prevents the photoelectric cell from properly registering the moment when the blade crosses the ray. The **Reduced Height Velocity** parameter is intended to solve this problem.

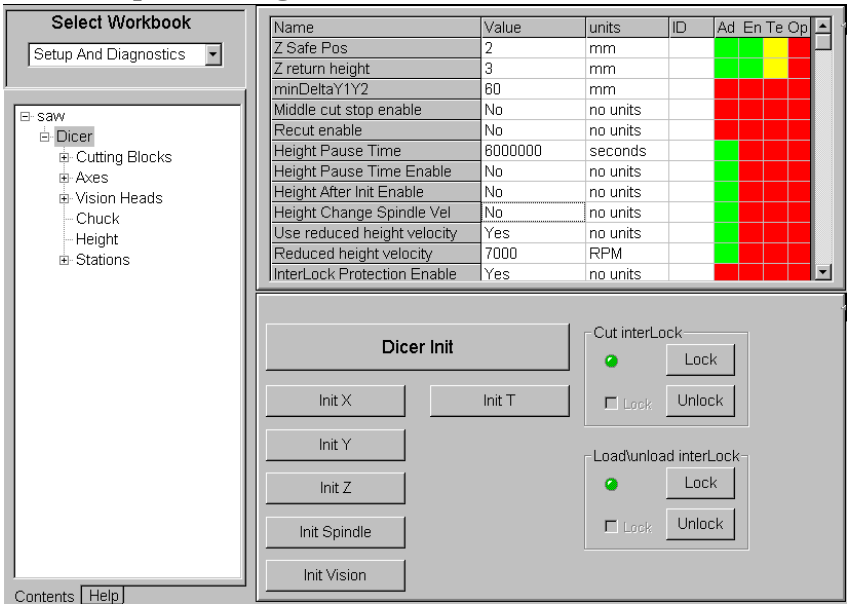
Once the Reduced Height Velocity parameter is defined, the system automatically reduces the revolting speed when performing the height procedure.

Note: This feature is intended for 4” systems only.

To Set the Reduced Height Velocity Parameter

1 Click  to open the Workbook Workspace

2 Select **Setup and diagnostics > Saw > Dicer**.



3 Under Dicer parameters, locate the **Use Reduced Height Velocity** parameter and set it to "Yes".

4 Locate the **Reduced Height Velocity** parameter and set it to 7000.

Note: Advanced Dicing Technologies Ltd. recommends the Reduced Height Velocity value falling between 6000 rpm and 8000 rpm as optimal.

8.5.2 Reduced Vision Spindle Velocity

This feature allows the user to set a different spindle speed to be used while the Vision Tasks (Inspection, Teaching Alignment, Auto/Manual Alignment, Kerf Teaching and Checking, Cut Verification) are performed. This feature is useful if the spindle vibration affects the image on the monitor. This may happen if the Blade and the Flange are not balanced.

If the image looks blurry:

- Ensure that the Blade and the Flange are balanced
- If possible, work at a different spindle speed.

If the problem of the blurry image still persists, use the Reduced Vision Spindle Velocity function. Upon setting the desired value in the Reduced Vision Spindle Velocity parameter, the spindle speed will be reduced to the defined value, while performing all Vision Tasks.

To Set the Reduced Vision Spindle Velocity Parameter

1 Click the  button in the toolbar to open the Workbook Workspace.

2 Select **Setup and Diagnostics > Saw > Dicer**.

3 Under the Saw parameters, set the **Use Reduced Vision Spindle Vel** parameter to "**Yes**".

4 Set the **Reduced Vision Spindle Vel** parameter to the appropriate value in rpm/krpm.

8.6 Focus Change (Initial Focus Position)

When the thickness of the Workpiece is changed after Alignment has been taught (for example, change in the tape thickness), instead of reteaching Alignment, there is a simpler and faster process of updating the **Initial Focus Shift** parameter (Align category). This parameter specifies a position of the Z-Axis that provides an acceptable default focus.

Note: This effect all the Z-Axis focus values, such as focus for models, etc.

To Teach the Initial Focus Shift:

1 Click  to display the Programming Workspace.

2 Expand the Recipe assigned to the Workpiece in the Programming tree and select the Align parameter category of that Recipe. The parameter table for the Recipe is displayed on the right.

3 In the General tab of the parameter table, scroll to the Align category, in the Programming tree, and click the cell containing the value defined for the Initial Focus Shift parameter. The **Teach Parameter** button becomes enabled.

4 Click **Teach Parameter**.

5 In the Wizard area of the Video Workspace, click **Next**.

6 Using the Z/T Axis Controls, set the optimal focus for the Camera. Click **Finish**. The Focus Position is now taught.

7 Click **Yes** to save the parameter to the Recipe.

8.7 Manual Inspection Illumination

To provide the best illumination for manual workpiece inspection, the user can pre-set the illumination parameters in the Manual Inspection category:

- **Coaxial Illumination After Cut** - Defines the Coaxial illumination intensity for the inspection that is done after the cut.
- **Oblique Illumination After Cut** - Defines the Oblique illumination intensity for the inspection that is done after the cut.
- **Inspection Focus Type Before Cut** - Defines the Z position for the inspection that is done before the cut.
- **Coaxial Illumination Before Cut** - Defines the Coaxial illumination intensity for the inspection that is done before the cut. (This parameter is inserted manually).
- **Oblique Illumination Before Cut** - Defines the Oblique illumination intensity for the inspection that is done before the cut. (This parameter is inserted manually).



Note: The Yes/No parameter "**Inspection before Cut**" allows performing inspection on the street prior to the cut.

The value for each parameter is the light intensity the saw will use during Manual Inspection. The values can be taught at any point during process.

To Teach the Manual Inspection Illumination

1 Pause the saw. The system switches to Inspection mode.

2 Set the best illumination for inspection.

3 Insert the **Before Cut** parameters, if required.

4 Right click in the main video screen and select "set illumination".

For more information, refer to Table A-21 in Manual Inspection Parameters.

8.8 Database Backup

The system can be set to perform automatic backup of the database files, to prevent data loss. Once set, the system performs the automatic backup according to the set Frequency and Time, unless it is in the middle of any auto-cycle or manual operation. In this case, the automatic backup is postponed until the operation is completed.

The default drive for the backup is drive D. Set the path to the CD-RW drive to store the backup on a CD-RW. Ensure that there is a CD-RW in the CD-RW drive.

To Perform Automatic Database Backup:

1 Click  to open the **Workbook Workspace**.

2 Select **Setup and Diagnostics > Saw**.

3 Under **Saw** parameters, locate the **Automatic Backup Enabled** parameter (see Figure 8-9).

Note: The default value for this parameter is "**Yes**". To change it, choose "**No**" from the drop-down list (see Figure 8-10). It is not recommended to change the **Automatic Backup** parameter value to **No**.
ADT recommends performing Backup procedure (**Create Backup**) after making major changes

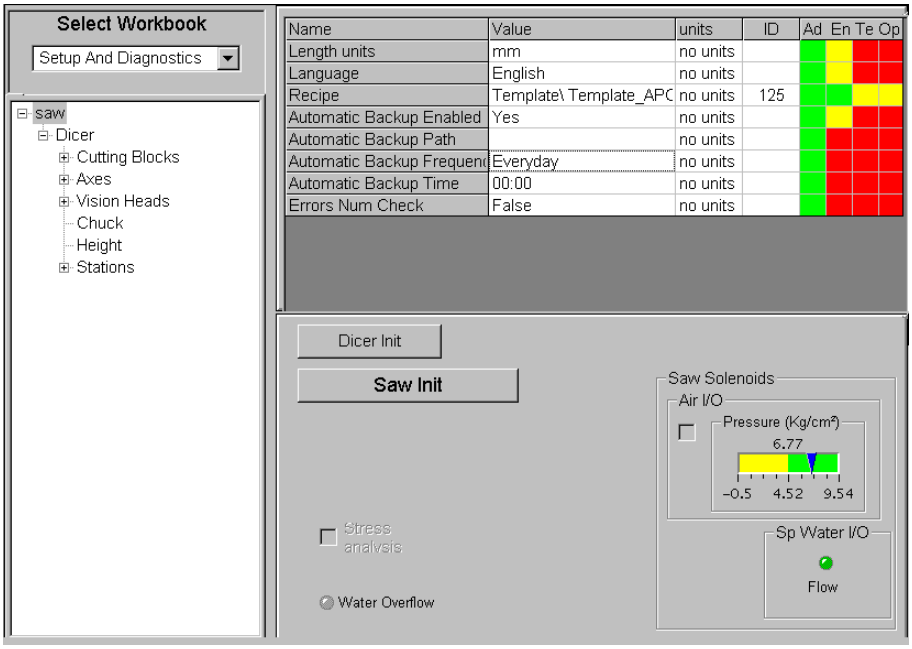


Figure 8-9: Automatic Backup Enabled

4 To perform the backup on a CD-RW, type the CD-RW drive (for example: E:\) in the **Value** line. If the user does not define the backup location, the system automatically saves the backup files on drive D:\.

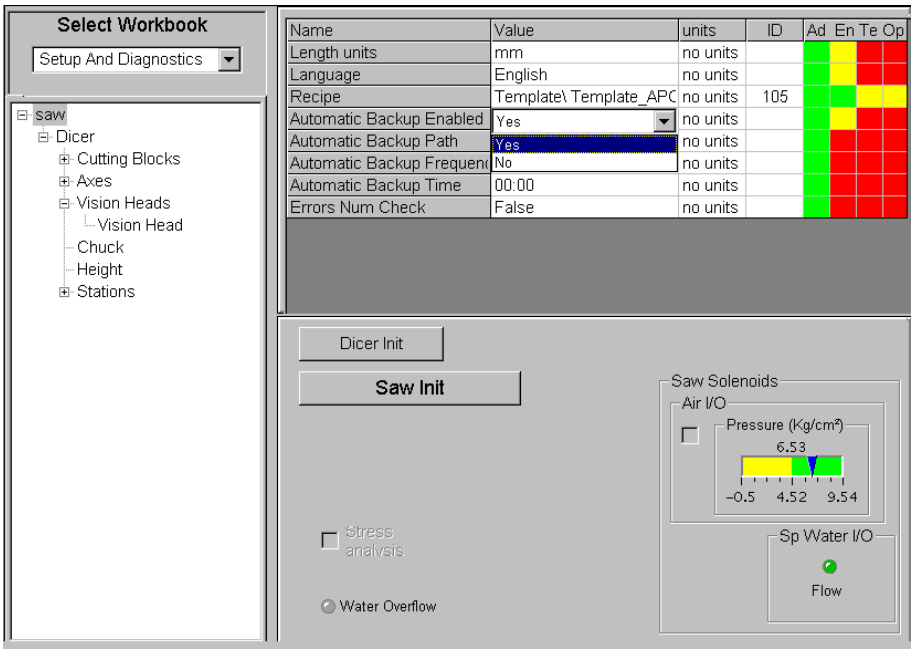


Figure 8-10: Backup Drop-Down List

8.9 Theta Safety Limits on X-Axis

When the **Height Theta Safety Zone** in system configuration is set to **Yes** (see Figure 2-15)**,** the following stations become enabled:

- **Theta Safety Right**
- **Theta Safety Left**

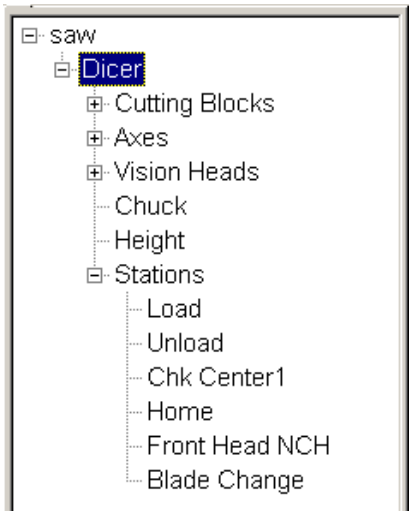


Figure 8-11: Dicer Tree

Note: Using this option requires a hardware change: additional hardware limit and a special double flag on the X-Axis.

Each of the stations contains only one parameter - **axX**, which is associated with the Model 7100 hardware X-Axis limits.

The **axX** values define the Right (see Figure 8-12) and Left (see Figure 8-13) X-limits respectively.

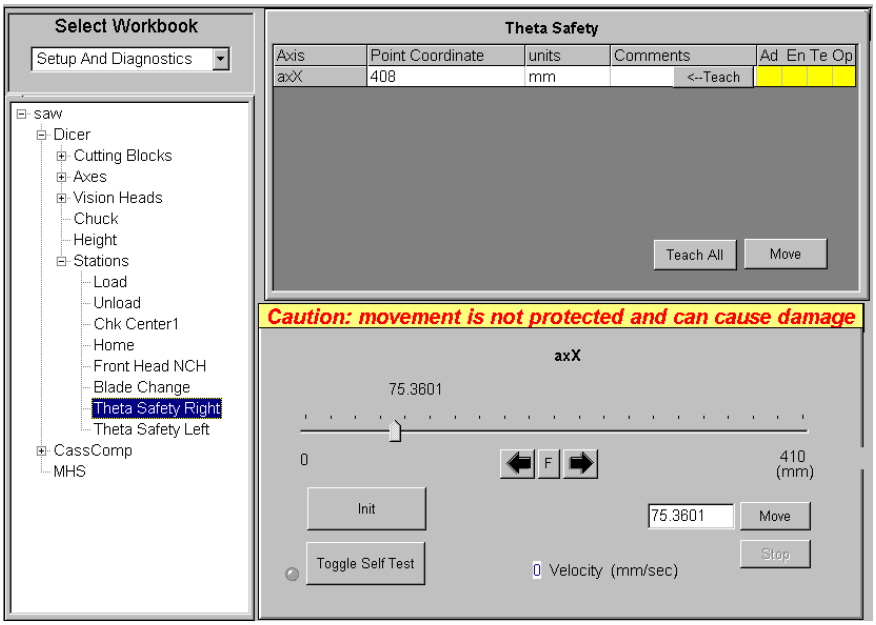


Figure 8-12: Right X Limit

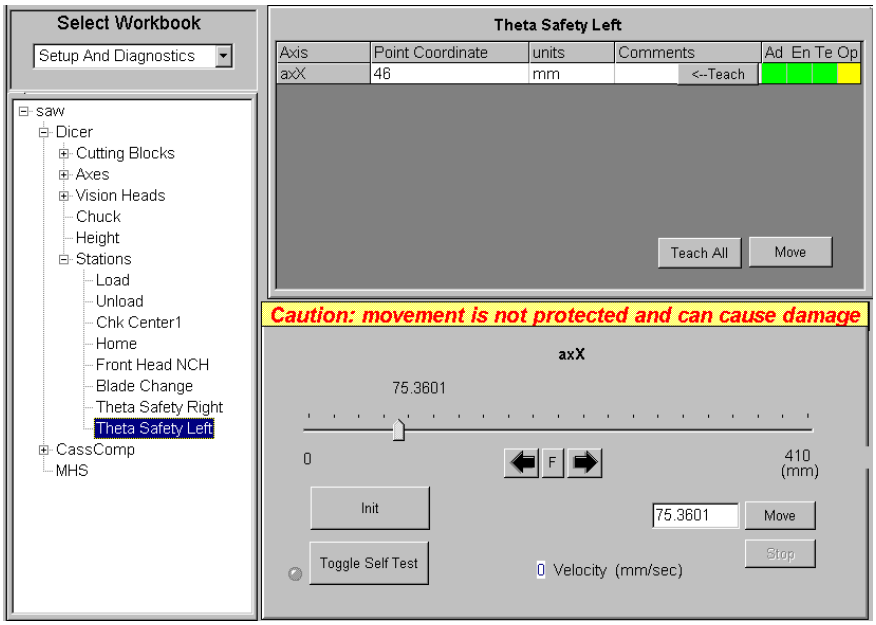


Figure 8-13: Left X Limit

The left limit is more critical for systems that use Autoloader option and square cutting chucks, because the frame/chuck can damage the curtain between the Model 7100 and the Autoloader.

8.10 Change of Length Unit Type

By default, all the length units used by the System are set in millimeters. The user can change the unit type to inches.

To Change the Length Unit Type

1 Click  to open the **Workbook Workspace**.

2 Select **Setup and Diagnostics > Saw**.

3 Under Saw parameters, double-click the **Length Units** parameter.

4 Select the desired option (mm/inch) from the drop-down menu.

5 Click **Save** in the toolbar.

When the change is completed, all the length units are converted to the new type.

Note: It is also possible to change the unit type for a specific parameter. To do so, double-click the **unit type box** and choose the desired type from the drop-down menu.

8.11 Multi-Panel Bar Code

The Bar Code feature allows tracking and monitoring of parts that are being processed in the machine. It logs the part number that is either manually typed in or scanned by using a bar code scanner (not supplied). This feature allows the user to use the log file data in order to understand or track process parameters.

This feature must be added to the current recipe before it can be uses.

8.11.1 Activating the Bar Code Feature

1 Access the Recipe Parameters screen.

2 Select the Align group of categories.

3 In the Bar Code category, toggle the Activate parameter to "Yes" (see Figure 8-14.)

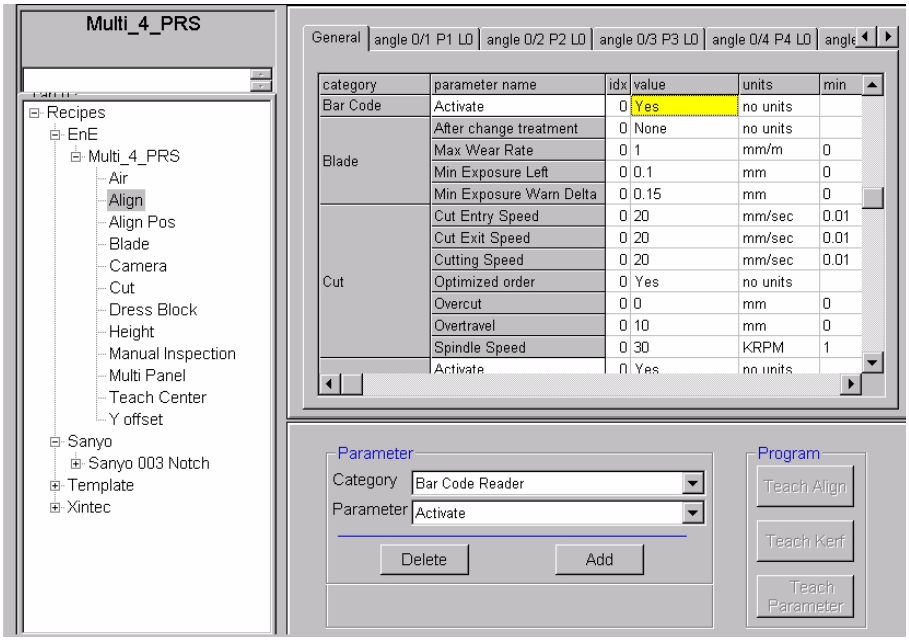


Figure 8-14: Activating the Bar Code Reader

8.11.2 Using the Bar Code Reader

While performing an Auto-Run operation or Wafer-Cut operation, the Bar Code screen appears (see Figure 8-15.).

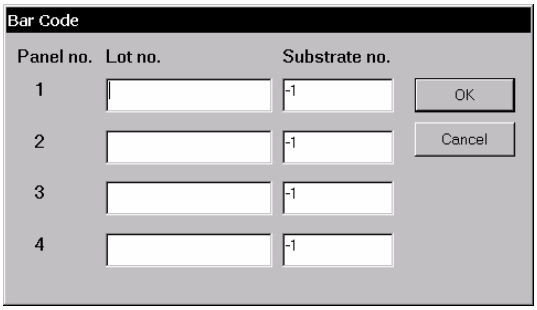


Figure 8-15: Bar Code Dialog Box

In the Lot column next to Panel 1, manually enter a number (the panel number is defined during the Teach Alignment procedure.) The system then automatically enters the same Lot number for the remaining three panels. If a different Lot number is entered, the system continues to enter that number for the remaining panels. The same procedure is followed when entering Substrate numbers.

Note: The system software automatically validates the lot number according to customer specifications. If the validation fails, the number appears in Red (see Figure 8-15.) To continue working, the user must enter a valid number.

Note: If Lot numbers are missing for specific applications, the user must return to the Bar Code Reader Screen and change the Activate parameter value to "No" for the relevant recipe.

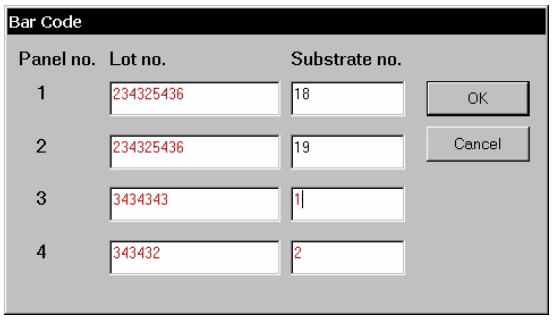


Figure 8-16: Bar Code Validation Failed

The following Bar Code attributes are recorded in the Log File:

- **Blade Change** - Lot number
- **Cut Start** - Bar Code, Substrate number, Panel number.

9 CONFIGURATION OPTIONS

This Chapter contains the descriptions and instructions for the following Model 7100 Series optional features:

- Autoloader, see section 9.1
- Tilted Spindle, see section 9.2
- Dress Station, see section 9.3
- Wash Pipe, see section 9.4

The 7100 Series Configuration Options can be divided by two categories:

- Machine Configuration Options available at the factory and unavailable as field retrofit (Autoloader, Tilted Spindle and Dress Station)
- Machine Configuration Option available both at the factory and as field retrofit (Wash Pipe)

9.1 Autoloader

The Autoloader option has been developed for the Model 7100 to meet the need for a system that automates the loading and unloading processes. This option enables the system to automatically load metal frames from a Cassette onto the Cutting Chuck, and later unload them from the Cutting Chuck back to the Cassette when the dicing procedure is complete.

Note: Plastic frames cannot be used in the Autoloader, as they are not sufficiently flat or reflective.



1 7100 model
2 Autoloader

Figure 9-1: Model 7100 with Autoloader

9.1.1 Autoloader Description

The Autoloader is attached to the Model 7100 and uses the internal power supply of the system. This means that turning the Model 7100 On or Off also turns the Autoloader On or Off, respectively.

The Autoloader consists of the following components:

- Mechanical Modules
  - Linear Arm (X Axis)
  - Elevator (Z Axis)
  - Finger (Y Axis)
- Dry System
- Cassette Compartment
- Curtain
- Utility and Electrical Compartment

The Autoloader uses its mechanical modules to move frames from the Cassette to the Cutting Chuck and back. The entire load/unload procedure is handled automatically by the Autoloader. The user is required only to change Cassettes when necessary.

Turning On the Model 7100 also turns On the Autoloader, and begins its initialization process: Each axis learns its limit position and the home location of the system. The Frame Scanner Sensor scans the Cassette to learn the location of each existing frame, and to ensure that all frames have been properly placed in the Cassette.

The Autoloader begins operation when the user presses the **RUN** button on the Model 7100's main window.

The operational steps carried out by the Autoloader are as follows:

1 The Elevator moves to the lowest slot of the Cassette that contains a frame to be processed.

2 The Finger moves towards the Cassette and grabs the frame.

3 The Finger pulls out the frame and places it on the Elevator Load/ Unload Station, then returns to its home position.

4 The Elevator rises to its Load/Unload Station to meet the Linear Arm and the Pick-Up Arm.

5 The Pick-Up Arm grabs the frame using four vacuum cups and holds it while the Linear Arm moves the frame from the Autoloader to the Cutting Chuck. After the Pick-Up Arm releases the Frame onto the Cutting Chuck, the Linear Arm returns to its home position.

6 The Curtain rises in order to prevent water from entering the Autoloader. The dicing procedure is then carried out as usual.

7 When the dicing procedure is complete, the Curtain is lowered and the Linear Arm moves into position above the Cutting Chuck. As the

Linear Arm moves into position, the Upper Dry System at the front of the Pick-Up Arm dries the top surface of the frame.

8 The Pick-Up Arm grabs the frame with its four vacuum cups and holds it while the Linear Arm returns the frame to the Autoloader. As the Frame passes over the lowered Curtain, the Lower Dry System attached to the Curtain dries the bottom surface of the frame.

9 The Linear Arm returns to its Load/Unload Station. The Pick-Up Arm places the frame on the Elevator.

10 The Elevator moves to the level of the slot from which the frame was taken.

11 The Finger grabs the frame and slides it into its slot.

These steps are automatically repeated on the remaining frames until all frames are processed. The system notifies the user when the Cassette needs to be replaced.

For more information regarding the Autoloader mechanical units, refer to the 7100 Series Maintenance Manual.

9.1.2 Autoloader User Interface

This section describes the features added to the Model 7100 user interface, in order to support the Autoloader.

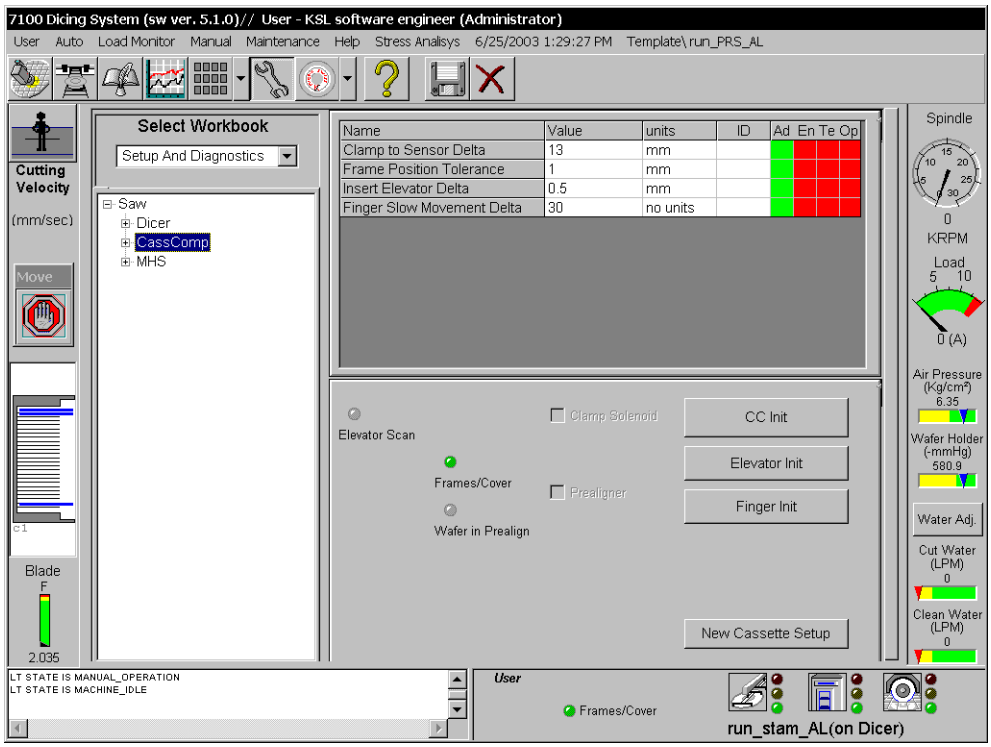


Figure 9-2: Autoloader Features in the Model 7100 User Interface

Most Autoloader features are implemented in two dedicated Workbooks: **MHS** (see section 9.1.2.2), which monitors and controls the Pick-Up Arm, and **CassComp** (see section 9.1.2.1), which monitors and controls all other aspects of the Autoloader.

In the **User** field two Status Indicators are added:



Linear Arm status indicator.



Cassette Compartment status indicator.



Cassette Compartment Simulation

Next to each Status Indicator there are three virtual LEDs:

- **Red**: An error/failure exists. The system stops working and an error message appears on the screen.
- **Yellow**: User assistance required. A message appears on the screen.
- **Green**: When blinking, the station is carrying out an operation. Otherwise, green indicates that the station is in idle mode.

9.1.2.1 CassComp Workbook

Select **CassComp** from the **Setup & Diagnostics** tree to display the following:

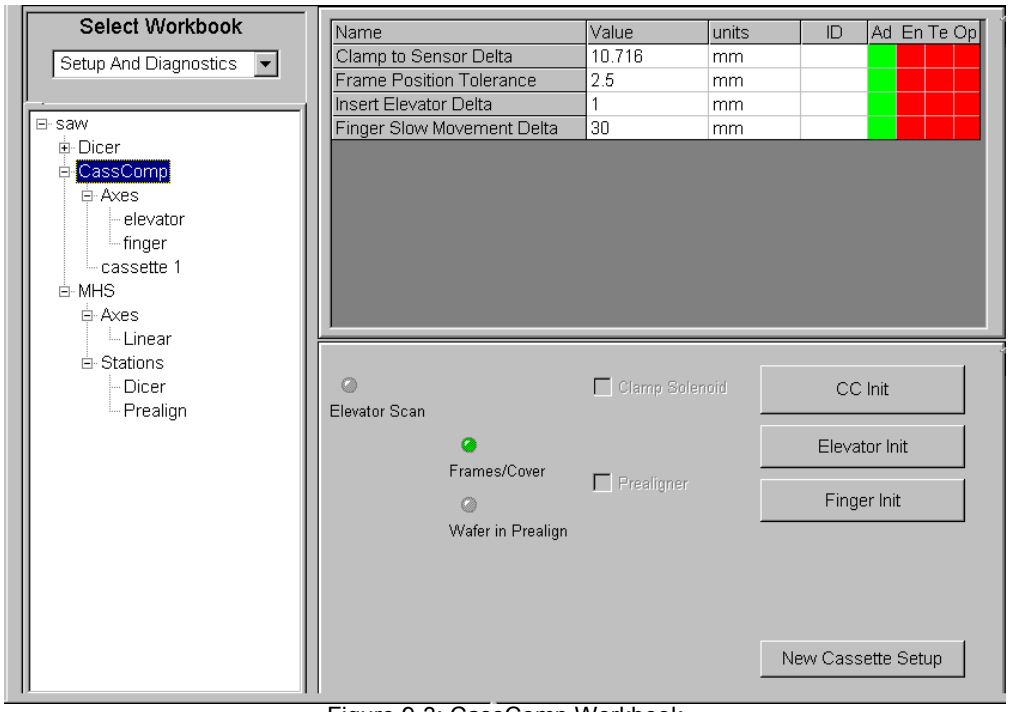


Figure 9-3: CassComp Workbook

The **CassComp** screen enables the user to do the following:

- Initialize the Autoloader Parts:
  - Cassettes Compartment
  - Elrvator
  - Finger
- Perform a New Cassette Setup

The **CassComp** section of the **Setup & Diagnostics** tree includes the following subsections:

- **Axes** (see section 9.1.2.1.1), used for positioning and teaching the axes (Elevator and Finger).
- **Cassette1**, (see section 9.1.2.1.2), used for elevating and lowering the Curtain and providing indications about the Cassette status.

9.1.2.1.1 Axes

The **Axes** subsection of the **CassComp** section of the **Setup & Diagnostics** tree includes the following:

- Elevator
- Finger

The Setup & Diagnostics screens for each axis are very similar. These screens enable the user to initialize the individual axes, perform self tests and manually position the axis at a specific location.

Elevator and Finger Axes

Select an axis from the **Setup & Diagnostics** tree to display the following:

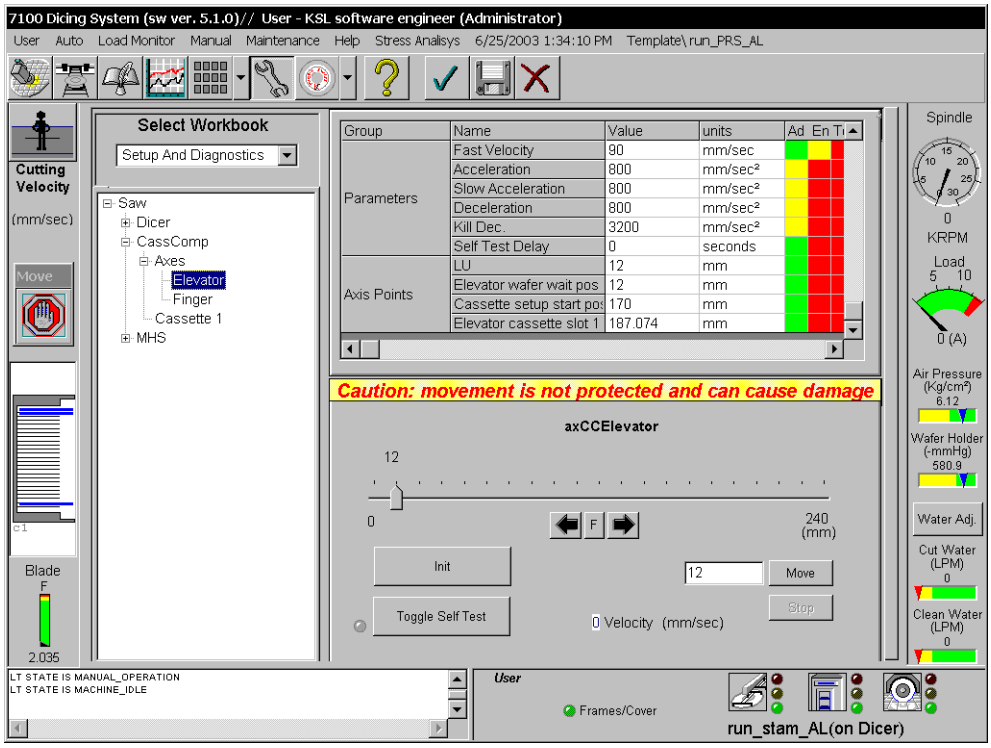


Figure 9-4: Elevator Screen

The lower right pane (identical for Elevator and Finger screens) displays a representation of the travel of the selected axis, with its home position on the left and the farthest distance it can travel on the right.

In the lower right pane (identical for Elevator and Finger screens), the user can do the following:

- **Position the axis manually**: Move the module along its axis in one of the following ways:
  - Click and hold one of the **arrow** buttons.
    Clicking the button between the arrows selects whether the slider moves fast **(**F) or slow **(**S), as defined by the **Fast Velocity** and **Slow Velocity** parameters in the upper pane.
  - Enter an axis position in the edit box (next to the **Move** button) and click **Mov**e.
- **Initialize the selected axis**: Click **Init**.
- **Perform a Self Test**: Click **Toggle Self Test** to have the axis move automatically between its home position and its limit. The axis continues to move back and forth until **Toggle Self Test** is clicked again.

The upper right pane includes parameters that define the Scale Factor, speed and travel of the selected axis.

The following parameters can be defined in the upper right pane of the Elevator screen:

- **Fast velocity** - velocity, at which the Elevator moves when the button between the arrows (see above) is set to (F).
- **Acceleration**
- **Slow acceleration**
- **Deceleration**
- **Kill deceleration**
- **Self test delay**
- **LU** - Elevator Load/Unload station coordinate
- **Elevator wafer wait position**
- **Cassette setup start pos** - Elevator position, when starting a New Cassette Setup
- **Elevator cassette slot 1** - Z-coordinate, to which the Elevator descends to pick up the frame from the lowest slot

The following parameters can be defined in the upper right pane of the Finger screen:

- **Fast velocity** - velocity, at which the Finger moves when the button between the arrows (see above) is set to (F).
- **Acceleration**

- **Slow acceleration**
- **Deceleration**
- **Kill deceleration**
- **Self test delay**
- **LU** - Finger Load/Unload station coordinate
- **Home**
- **Finger safety position**
- **Finger cassette slot 1** - Y-coordinate, to which the Finger moves to pick up the frame from the lowest slot

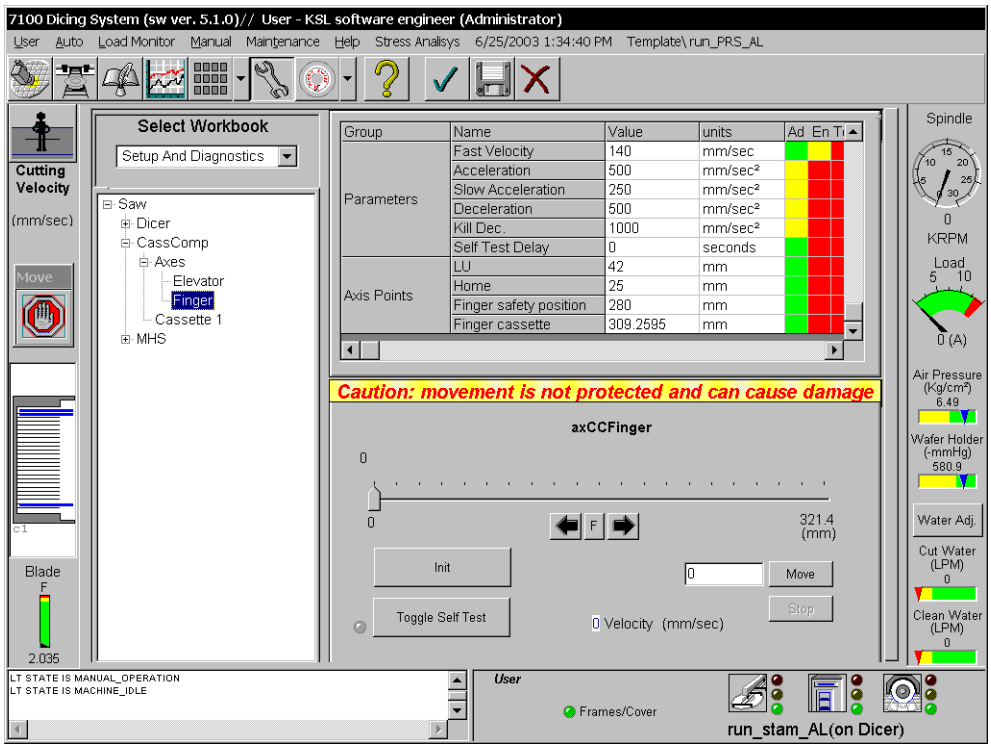


Figure 9-5: Finger Screen

9.1.2.1.2 Cassette1

Select **Cassette1** from the **Setup & Diagnostics** tree to display the following:

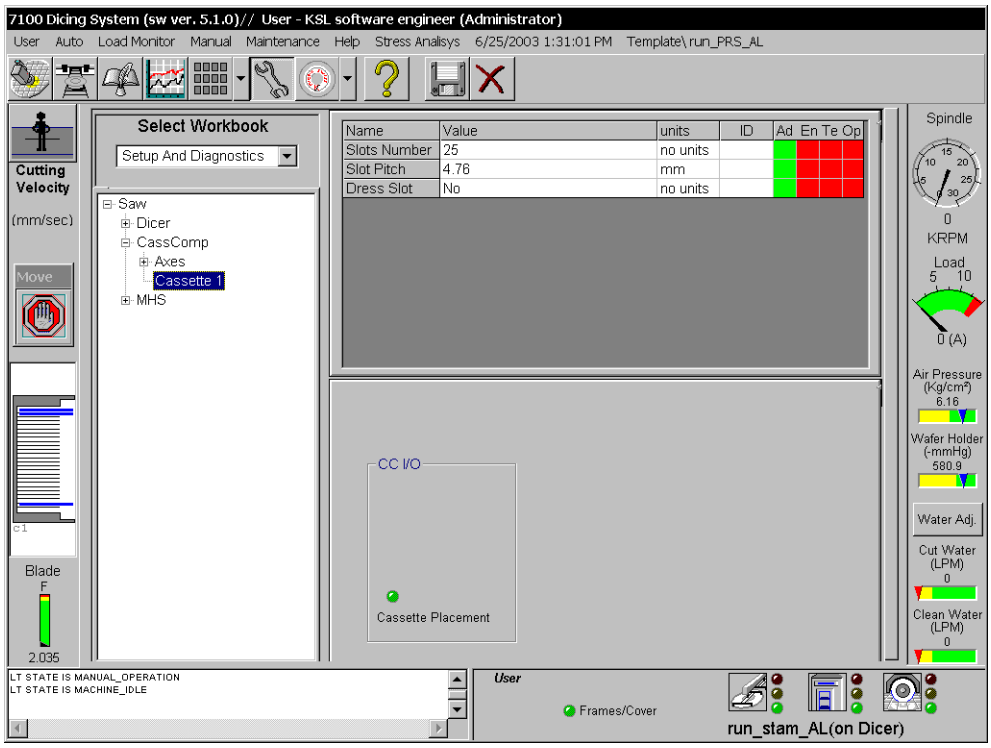


Figure 9-6: CassComp > Cassette1 Workbook

The upper right pane includes parameters that define the **number of slots**, and the **pitch** between the slots. It also contains the Dress parameter. The lower right pane displays the Cassette Compartment status.

If the **Dress** parameter is set to **Yes**, the user should define the Dress frame. The Dress frame turns grey in the Cassette simulation under the **Stop** button.

9.1.2.2 MHS Workbook

The Setup & Diagnostics screens for the MHS enable the user to initiate the MHS, release and engage vacuum, lower and elevate the Pick-Up Arm, accept or release frames, activate the Backside and Top Side Dry System, and define the Dry Speed settings.

Select **MHS** from the **Setup & Diagnostics** tree to display the following:

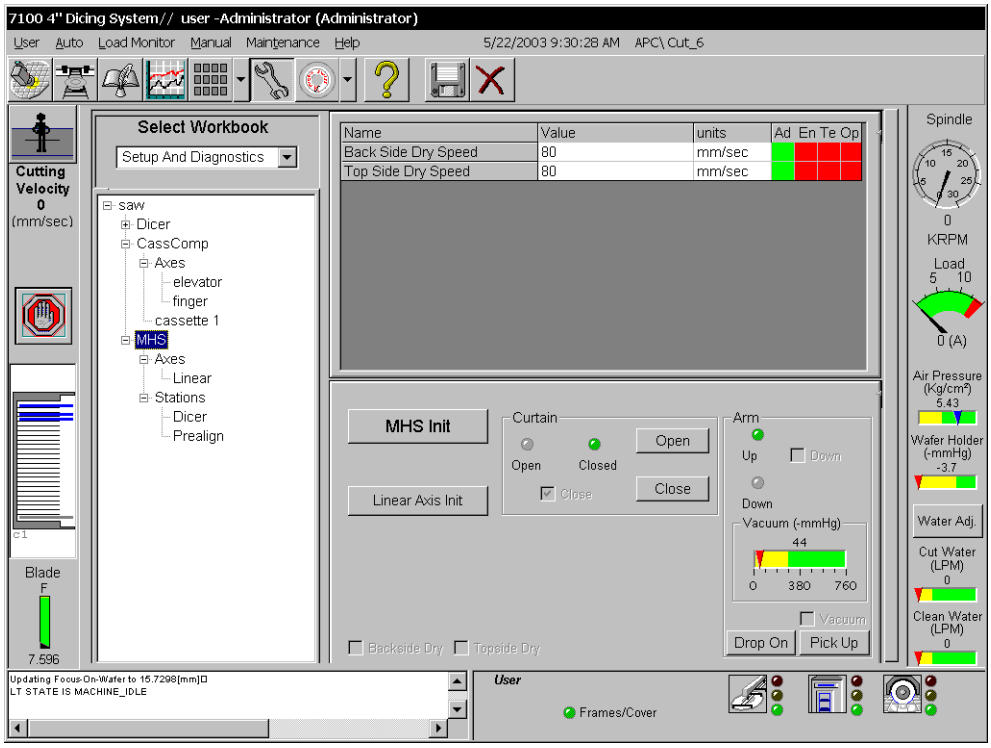


Figure 9-7: MHS General Screen

In the upper left pane of the MHS main screen, the user can define the values of Dry system speed. In the Software Version 5.1 or later, the **Top Side Dry Speed** parameter can be added to a Process Program a number of times so that the workpiece is dried several times before it is placed back into cassette.

In the lower right pane, the user can do the following:

- **Engage and release vacuum**:
  Clear the **Vacuum** check box to release the vacuum. Select the **Vacuum** check box to engage the vacuum in the Vacuum Cups.
  The gauge within the **Vacuum** area indicates the level of the vacuum when engaged. To set the vacuum level, press CTRL+P in order to enable the Vacuum gauge, then click within the green zone of the gauge and drag until the desired level is displayed above the gauge.
- **Activate and deactivate the Vacuum Cups**:
  Click **Pick Up** to activate the Vacuum Cups while elevating the Pick-Up Arm. Click **Drop On** to deactivate the Vacuum Cups while lowering the Pick-Up Arm.
- **Activate/Deactivate the backside Dry System**:
  Select the **Backside Dry** check box to activate the Dry System. Clear the **Backside Dry** check box to deactivate it.

- **Initiate the MHS**:
  Click **MHS Init** to initiate the the whole Material Handling System.
- **Initiate the Linear Axis**:
  Click **Linear Axis Init** to initiate the Linear Axis.
- **Elevate or Lower the Curtain**:
  - Click **Close** to elevate the Curtain.
  - Click **Open** to lower it.

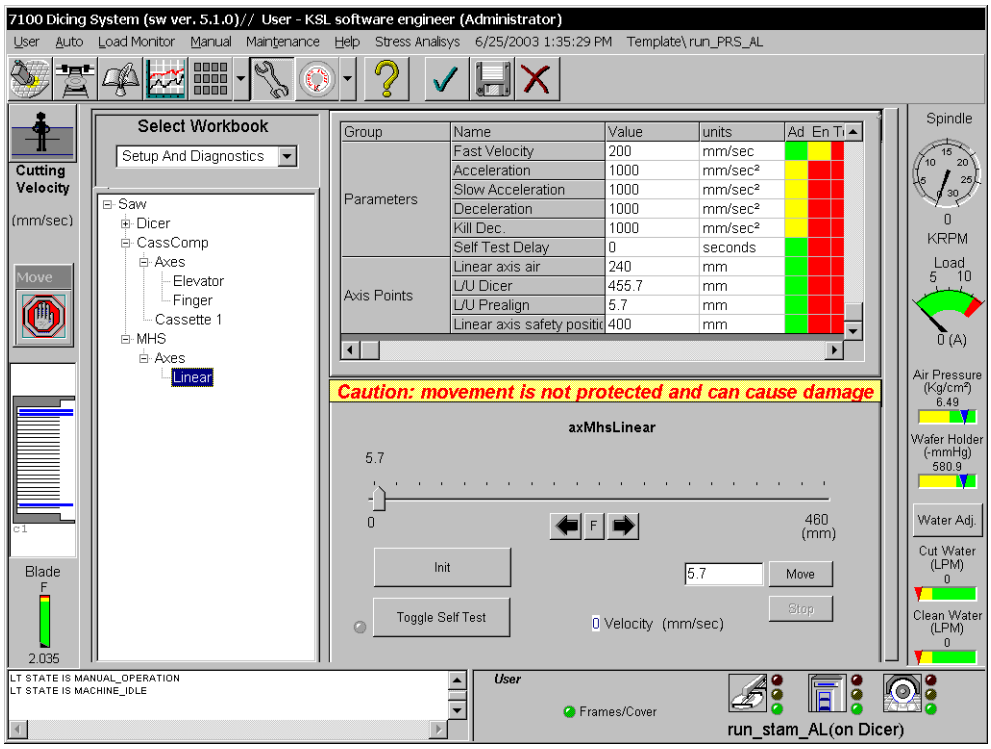


Figure 9-8: MHS Axes Screen

The following parameters can be defined in the upper right pane for the Linear Arm:

- **Fast velocity** - velocity, at which the Arm moves when the button between the arrows (see above) is set to (F).
- **Acceleration**
- **Slow acceleration**
- **Deceleration**
- **Kill deceleration**
- **Self test delay**
- **Linear axis air**

- **LU Dicer** - the Linear Arm Load/Unload position coordinate for the Dicer station
- **LU Prealign** - the Linear Arm Load/Unload position coordinate for the Prealign station

9.1.3 Autoloader Operation

This section describes the operation of the Model 7100 with the Autoloader, including the following topics:

- Loading and Unloading workpieces using the Autoloader (see section 9.1.3.1)
- Running the Model 7100 with the Autoloader (see section 9.1.3.2)
- Loading a Cassette to the Autoloader (see section 9.1.3.3)
- Disable / Enable the Autoloader (see ssection 9.1.3.4)
- Recovery Operations (see section 9.1.3.5)

9.1.3.1 Loading / Unloading a Workpiece

If the Model 7100 is equipped with Autoloader, the Load/Unload procedure can be carried out in three ways:

- Automatic Loading/Unloading a Workpiece using the Autoloader
- Manual Loading/Unloading from the Autoloader
- Manual Loading/Unloading without using the Autoloader

9.1.3.1.1 Automatic Loading/Unloading of a Workpiece

To Automatically Load/Unload a Workpiece:

Click the Run button. The system starts an Autorun cycle and performs Loading/Unloading automatically

9.1.3.1.2 Manual Loading/Unloading from the Autoloader

To Manually Load a Workpiece from the Autoloader:

In the Main Load screen, click the **Load** button (see Figure 9-9).

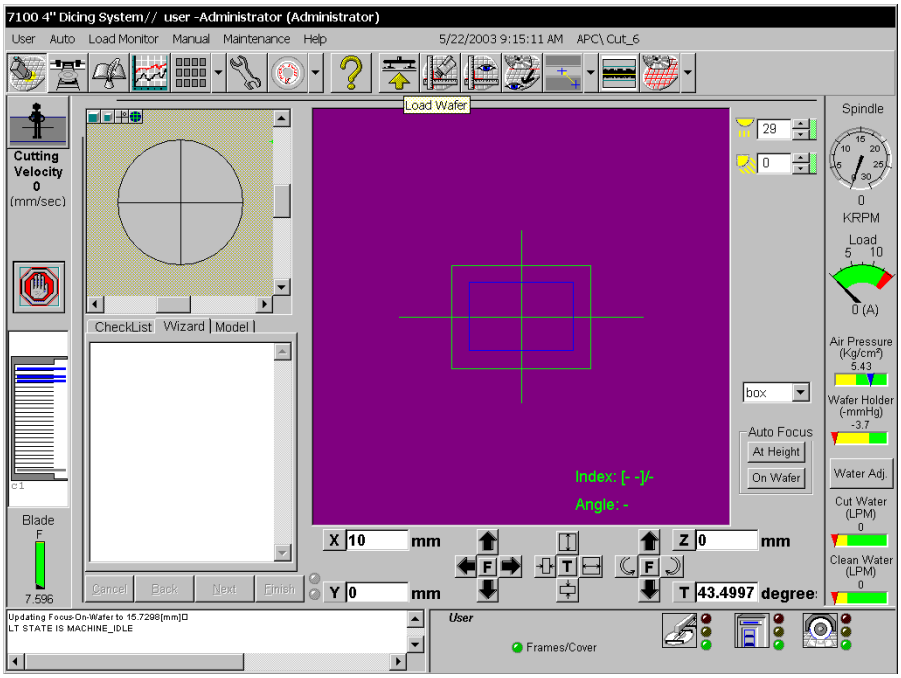


Figure 9-9: Main Load Screen

To Manually Unload a Workpiece to the Autoloader:

In the Main Unload screen, click the **Unload** button (see Figure 9-10).

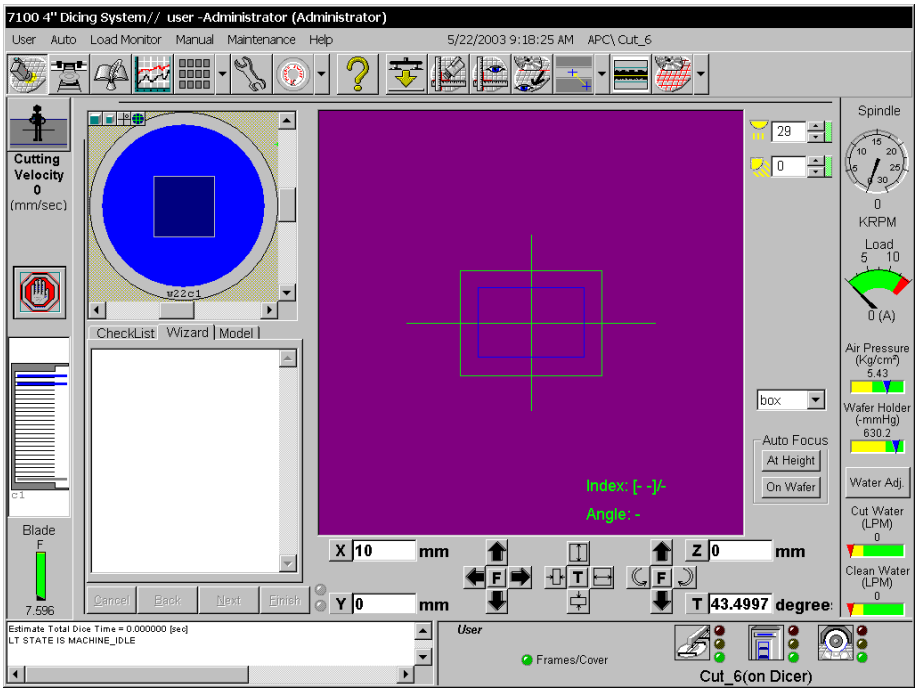


Figure 9-10: Main Unload Screen

9.1.3.1.3 Manual Loading/Unloading a Workpiece

To Manually Load a Workpiece:

Press **Ctrl+L** to neutralize the Autoloader and enable the Manual Load procedure. The Manual Load screen appears:

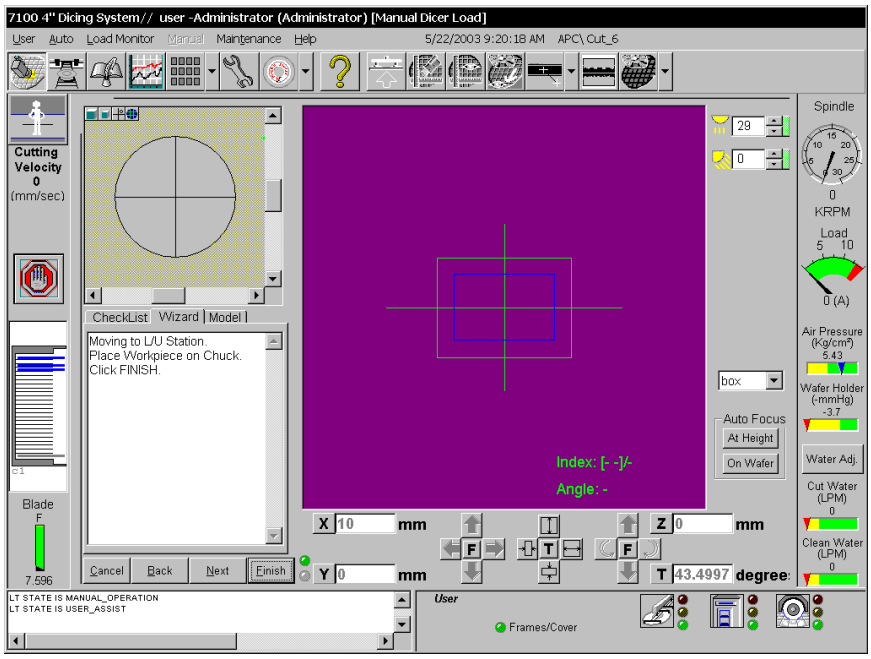


Figure 9-11: Manual Load Screen

To Manually Unload a Workpiece:

Press **Ctrl+R** to neutralize the Autoloader and enable the Manual Unload procedure. The Manual Unload screen appears:

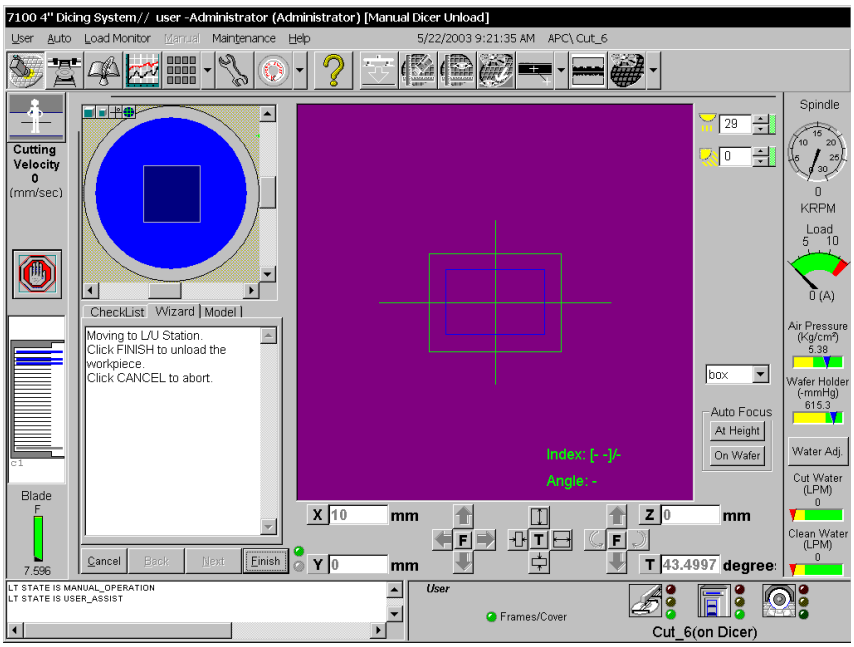


Figure 9-12: Manual Unload Screen

9.1.3.2 Running the Model 7100 with the Autoloader

The 7100-Autoloader model operates exactly as a regular Model 7100, except for loading and unloading frames automatically by the Autoloader.

It is possible, however, to **disable** the Autoloader option and operate a 7100-Autoloader model as if it was a regular Model 7100, loading and unloading wafers manually. This option is described in section 9.1.3.4.

To Run the 7100 Auto Mode with the Autoloader:

1 Load a Cassette into the Cassette Compartment, as instructed in section 9.1.3.3.

2 Select the desired recipe and click the Run icon.

3 The Autoloader moves the first frame from the Cassette to the Cutting Chuck.

4 Once the Frame has been diced, the Autoloader returns it to the Cassette and proceeds to the next frame, and so on.

5 Once the system has processed all the frames in the Cassette and returned them to their slots, the system displays the message “Change Cassette”.

6 Unload the processed Cassette.

7 If there are more Cassettes to be processed, load the next Cassette into the Cassette Compartment, as instructed in section 9.1.3.3, and click the Run icon.

8 Repeat steps 3-4 until all Cassettes are processed.

To Run the 7100 Manual Mode with the Autoloader:

1 Load a Cassette into the Cassette Compartment, as instructed in section 9.1.3.3.

2 Make sure that the Autoloader scans the Cassette.

3 Select the desired recipe and click the Manual icon.

4 The Autoloader moves the first frame from the Cassette to the Cutting Chuck.

5 Click the (Auto or Manual) Alignment icon.

6 Click the Full Wafer Cut icon. The wafer is processed.

7 Click the Unload icon. The Autoloader returns the wafer to the Cassette.

9.1.3.3 Loading Cassettes to the Autoloader

Before the Autoloader can be operated, you must load a Cassette, as follows:

To Load the Cassette:

1 Fill the Cassette with frames, as needed. Not all slots need to be filled in order to operate the Autoloader.

2 Open the Cassette Compartment Cover.

3 Place the Cassette on the Adapter (see Figure 16). Make sure that the two placement-pins at the bottom of the Cassette are fitted into the corresponding voids at the rear of the Adapter.

4 Close the Cassette Compartment Cover.

9.1.3.4 Disabling/Enabling the Autoloader

To Disable/Enable the Autoloader (Administrator only):

1 Select **User > Configuration**. The **Options** window opens:

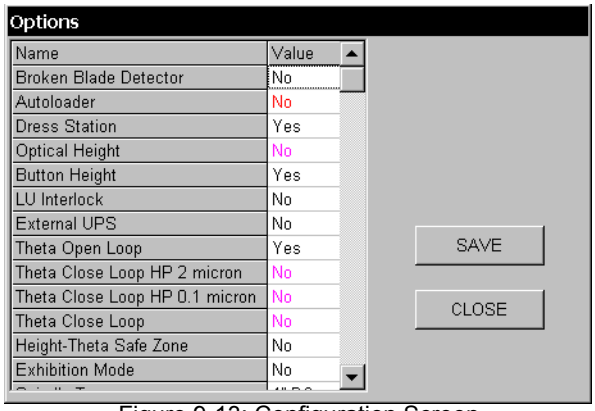


Figure 9-13: Configuration Screen

2 Change the Autoloader parameter value to Yes or to No, depending on whether it should be enabled or disabled

3 Click Save.

9.1.3.5 Recovery Operations

The procedure for recovering from a system failure when using the Model 7100 with Autoloader option depends on the severity of the problem.

9.1.3.5.1 Recovering After a System Failure

A failure such as a loss of vacuum or a frame improperly positioned inside the Cassette causes the system to suspend operation.

The system notifies the user by

- Displaying an error message
- Flashing the yellow light on the Light Tower
- Indicating the fault location by illuminating the appropriate virtual LEDs on the Model 7100 window.

The system does not resume operation until the problem is corrected, following the steps outlined below.

To Recover From a System Failure:

1 Remove the frame that was being processed at the time the failure occurred. The frame must be removed regardless of its location in the system.

Note: In the case of a frame improperly positioned in the Cassette, the frame may be repositioned without removing it from the system.

2 In the error message box, click **OK**. The Model 7100 initiates.

3 Click **Run.**

Note: The system resumes operation with the **next** available frame.

4 If the problem persists, use the **Troubleshooting Flow Diagram** given in section 14.9 of the Maintenance Manual to isolate the problem and correct it.

9.1.3.5.2 Recovery After a Severe System Failure

A severe failure, such as the loss of air or water pressure, causes the system to immediately suspend operation.

The system notifies the user by flashing the red light on the Light, but will not necessarily display an error message on the screen.

Once the problem has been corrected, the system restarts the programmed cutting procedure from the **first** available frame in the Cassette (and **not** from the frame that was being processed when the severe failure occurred).

To Recover From a Severe System Failure:

1 Remove the frame that was being processed at the time the failure occurred. The frame must be removed regardless of its location in the system.

2 Use the Troubleshooting Flow Diagram given in the Autoloader section of the Model 7100 Maintenance Manual to isolate the problem and correct it.

3 In case a error message is displayed, click **OK** to close it and initiate the Model 7100.
Otherwise, click **Init** on the Model 7100 GUI main window.

4 Click **Run**.

9.2 Tilted Spindle

This option enables the System to cut wafers at any angle that falls between 0 and 15 degrees by changing the orientation of the Spindle and the Microscope. Proximity sensors, controlled by the software, detect whether the Spindle and the Microscope are correctly positioned at the selected angle. Systems that include the Tilted Spindle option, are delivered pre-configured with all the settings necessary for cutting at both standard and tilted orientation.

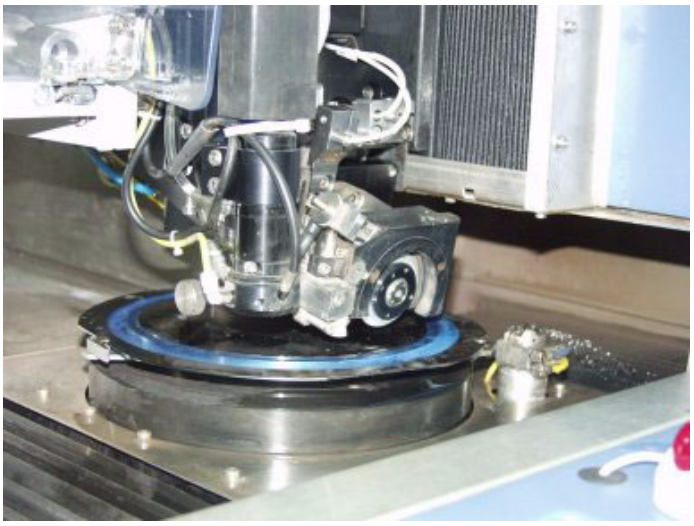


Figure 9-14: Tilted Spindle

9.2.1 Changing the Spindle Angle in a Recipe

Once the Spindle Angle is changed in the Setup screen, it should be changed in the relevant recipes.

To Change the Spindle Angle in a Recipe

1 Locate the relevant recipe on the programming screen.

2 Select the **Spindle Angle** parameter under the **Titled** category and type the new Spindle Angle value (see Figure 9-15).

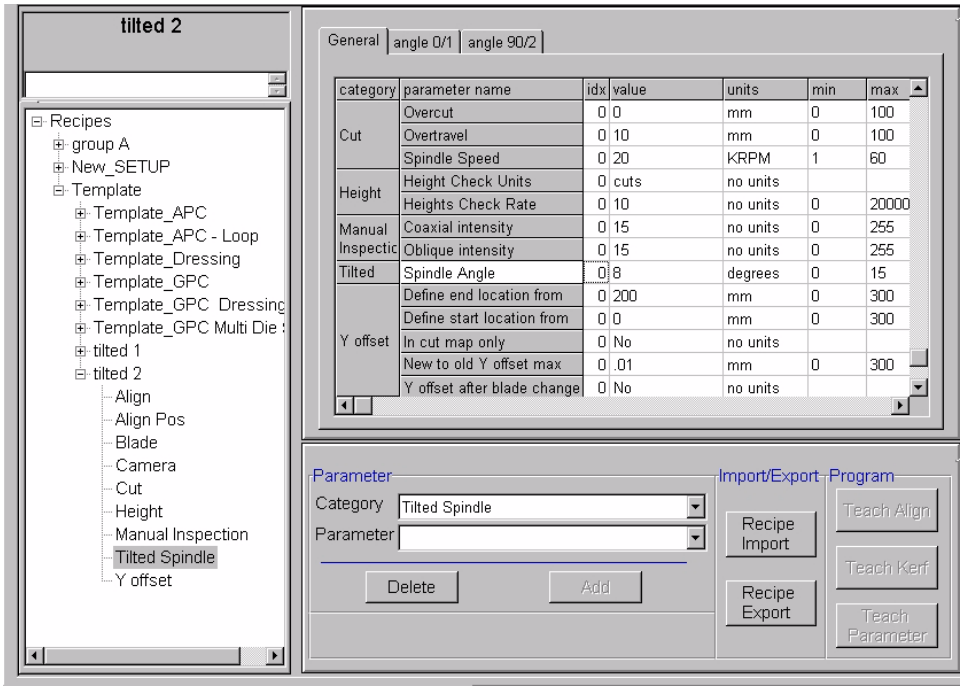


Figure 9-15: Programming Screen

Before any cutting process starts, the Model 7100 Software verifies that the Spindle Angle is set according to the parameters of the specific process program.

9.2.2 Height Procedure Changes

Since in the tilted position the blade wear causes the Y-Offset to change, the new option has been added to the Software: the System can be programmed to perform Y-Offset after every Height procedure.

To Define Y-Offset After Each Height Procedure

1 In the Programming screen, locate the relevant recipe.

2 Locate the Tilted Spindle parameter category.

3 Set the Y Offset After Height parameter value to **Yes**.

4 Click **Save**.

9.2.3 Changing the Spindle Angle

Changing the Spindle Angle on Model 7100 does not require powering down the System. Follow the instructions given in this chapter in order to perform the Spindle Angle change.

It is **important not to** change the blade, while changing the Spindle Angle. If, for any reason, a new blade was installed, while changing the Spindle Angle, run **Sample Blade Calibration** before operating the System.

The procedures given in this chapter use the Spindle Angle parameter values (0 and 15) as sample values. The Tilt Angle may be set to any value between 0 and 15.

Changing the Spindle Angle From Level to Tilted Position

Once a recipe that involves Tilted Spindle has been assigned to the System, the Spindle Angle should be adjusted accordingly, by carrying out the procedure given below.

To Change the Spindle Angle From Level to Tilted Position

1 Click on the **Change** button (see Figure 9-16). The yellow light on the Light Tower lights, and the "**Spindle Angle change in progress**" message appears in the lower left corner of the screen.

Note: This message and the Light Tower indication remain until the Y-Offset procedure is performed.

2 In the wizard click **Next**. The GUI returns to the **Setup** screen.

3 In the **Setup** screen, locate the **Spindle Angle** parameter and change the angle value from 0 to 15, by selecting the new value from the drop-down list.

4 Click **Save**.

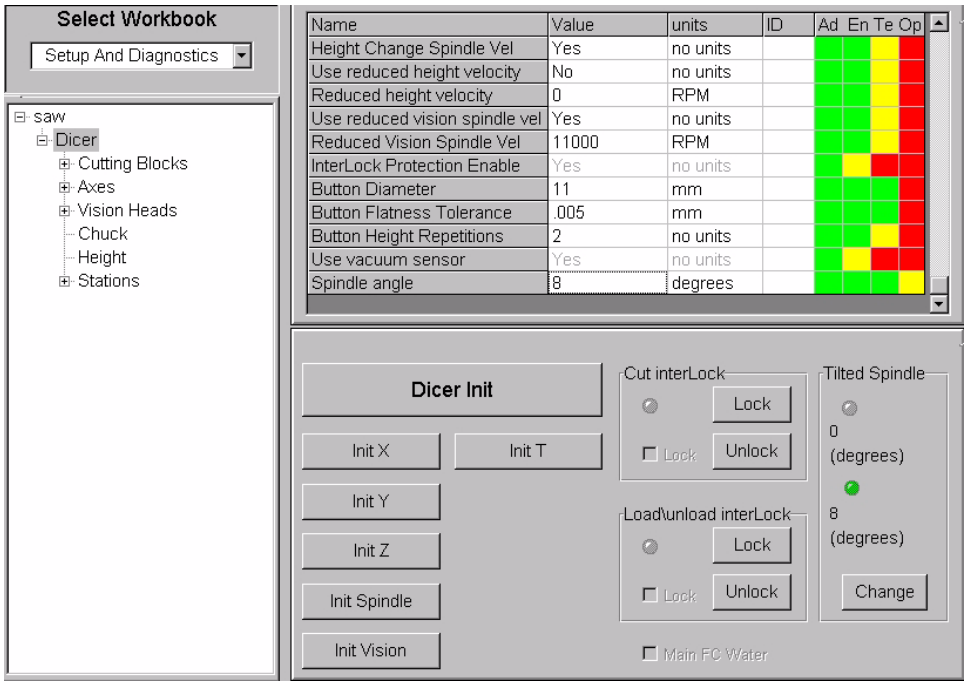
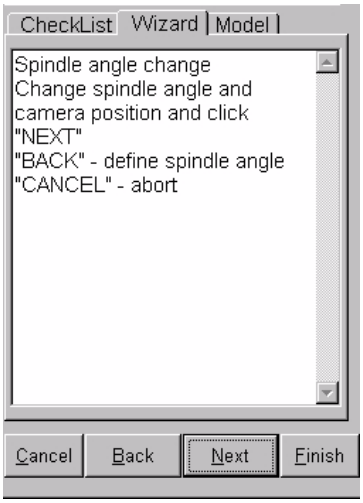


Figure 9-16: Setup Screen

5 In the wizard click **Finish**. The dicer moves to the **Change** station. The following message appears:



6 Use an 8 mm socket wrench to release the three Spindle holding screws shown in Figure 9-17.

7 Change the angle using the 8 mm socket wrench (keep rotating the tool until it reaches the stopper).

8 Secure the Spindle holding screws.

1 Spindle Holding Screws

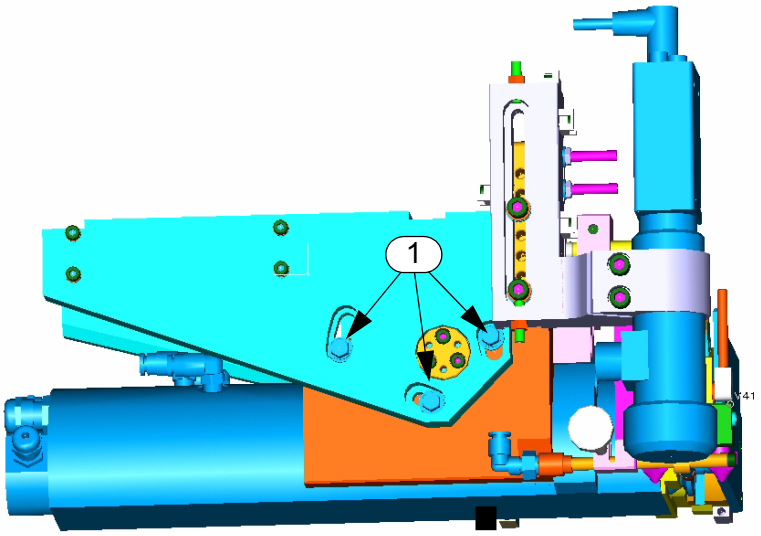


Figure 9-17: Spindle Holding Screws

9 Release the Camera holding screws (see Figure 9-18) using 5 mm alien wrench.

1 Camera Holding Screws

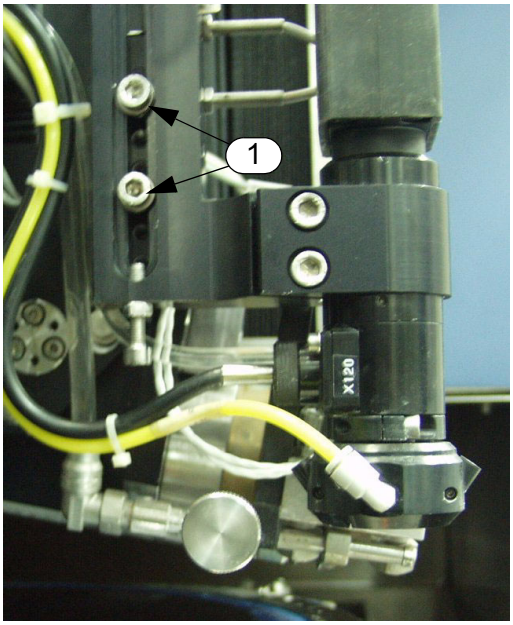


Figure 9-18: Camera Holding Screws

10 Manually set the camera height by sliding the Camera downwards.

11 Secure the Camera holding screws.

12 Click **Next** in the wizard. The System performs the Init procedure and Chuck-to-Non-Chuck Height procedure.

13 Click **Finish** in the wizard.

14 Before running any working cycle, perform Y-Offset procedure.

If one of the sensors detects that the Spindle or the Camera is at a wrong angle, no angle indicator illuminates and an error message is displayed (see Figure 9-19).

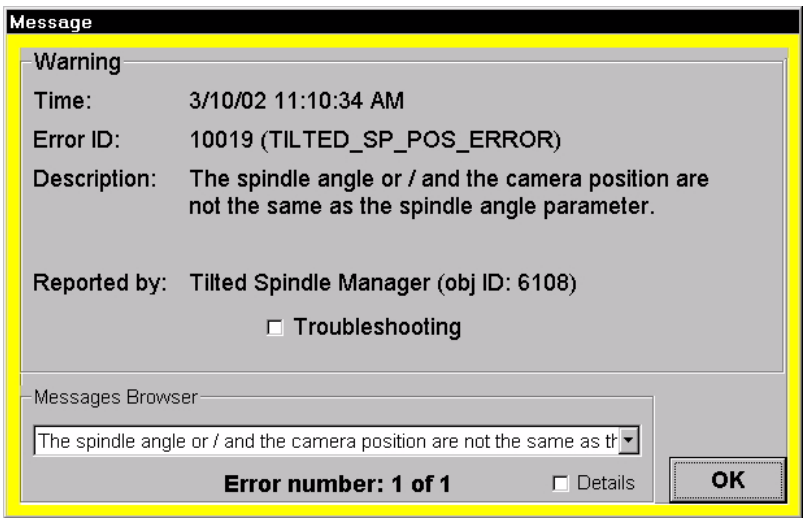


Figure 9-19: Error Message

9.2.3.1 Changing the Spindle Angle From Tilted to Level Position

To Change the Spindle Angle From Tilted to Level Position

1 Click on the **Change** button (see Figure 9-16). The dicer moves to the **Change** station. The yellow light on the Light Tower lights, and the "**Spindle Angle change in progress**" message appears in the lower left corner of the screen.

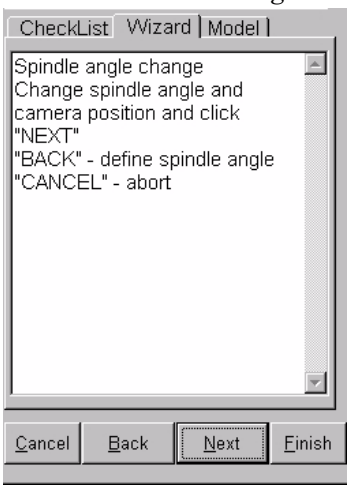
Note: This message and the Light Tower indication remain until the Y-Offset procedure is performed.

2 In the wizard click **Next**. The GUI returns to the **Setup** screen.

3 In the **Setup** screen, locate the **Spindle Angle** parameter and change the angle value from 15 to 0, by selecting the new value from the drop-down list.

4 Click **Save**.

5 In the wizard click **Finish**. The following message appears:



6 Use 8 mm socket wrench to release the three Spindle holding screws shown in Figure 9-17.

7 Change the angle using the 8 mm socket wrench (keep rotating the tool until it reaches the stopper).

8 Secure the Spindle holding screws.

9 Release the Camera holding screws (see Figure 9-18) using 5 mm alien wrench.

10 Manually set the camera height by sliding the Camera upwards.

11 Secure the Camera holding screws.

12 Click **Next** in the wizard. The System performs the Init procedure and Chuck-to-Non-Chuck Height procedure.

13 Click **Finish** in the wizard.

14 Before running any working cycle, perform Y-Offset procedure.

9.2.4 Mechanical Adjustments

This chapter documents mechanical adjustments and additional teaching procedures required for modifying and fine tuning of the Spindle Angle.

9.2.4.1 Fine Adjustment of the Spindle Angle

Use this procedure in two cases:

- Fine-tuning for an existing Spindle Angle
- Modifying the existing Spindle Angle (for example, changing the Tilted Angle from 8 to 15 degrees

Before performing any of the procedures given below, verify that the System setup is corresponding the angle being adjusted.

To Adjust the Spindle Angle

1 Release the three spindle holding screws.

2 Release the Spindle upper stopper lock.

3 Move the Spindle up or down, using an 8 mm socket wrench, so that it does not rest on the stopper.

4 Rotate the stopper clockwise to reduce the angle or counterclockwise to increase it.

5 Lock the stopper.

6 Rotate the adjusting screw until the Spindle reaches the stopper.

7 Secure the holding screws.

9.2.4.2 Adjusting the Camera position.

To Adjust the Camera position

1 Release the two Camera holding screws.

2 Release the securing nut of the relevant stopper.

3 Rotate the relevant (upper or lower) adjusting screw to set the camera height.

4 Close the securing nut.

5 Secure the holding screws.

6 Release the securing nut of the Camera position sensor.

7 Move the sensor in the direction of adjustment until the sensor LED goes on.



Caution: After the saw and the Camera have been adjusted to the tilted angle, they are lower than they were in the level position. Move them carefully and only in manual mode.

Once the mechanical parts have been adjusted to the new angle, initiate the System and teach the new stations.

9.2.4.3 Modifying the Spindle Angle

Follow the instructions given in this section only when modifying the Spindle Angle value.

To Modify the Tilted Spindle Angle

1 Open the Setup and Diagnostic screen.

2 Locate the **Spindle Angle** parameter under **Saw > Dicer**.

3 Update this parameter value according to the mechanical change.

4 Click **Save**.

9.2.4.4 Tilted Spindle Stations Setup

9.2.4.4.1 Teaching the Chuck center

To Teach the Chuck center

1 Open the Calibration screen.

2 Locate the Dicer station.

3 Manually bring the Camera to the Chuck center.

4 Click the **Chuck Center** parameter and then click **Teach**.

5 Click **Save.**

9.2.4.4.2 Teaching the Auto Focus on Dicer Chuck Under Z

To Teach the Auto Focus on Dicer Chuck

1 Focus the Camera on the Chuck center.

2 Locate the **Z-Axis** screen.

3 Click on the **Auto focus** Parameter.

4 Click **Teach**.

5 Click **Save**.



Note: If the Z-Axis does not reach the desired height, change the Z travel value and click **Apply**. Then check if the new value fits and teach again.

9.2.4.4.3 Teaching the NCH Station

To Teach the NCH Station

1 Manually bring the blade over the NCHD slit center.

2 In the **Setup** screen locate the NCH station and click on it.

3 Click **Teach**.

4 Click **Save**.



Note: After changing the Spindle Angle, the Y-Offset has also changed. This might influence the blade-to-Height device contact position.

9.2.4.4.4 Sample Blade Calibration

Note: Before performing Sample Blade Calibration, update the Z Calibration start position according to the new Blade height.

To Perform Sample Blade Calibration

1 Open the **Blade** screen.

2 Enter the current Blade diameter as the Sample Blade diameter.

3 Open the **Height** screen.

4 Perform Sample Blade Calibration.

5 Click **Save**.

9.2.4.4.5 Chuck to Non-Chuck Height

To Perform Chuck to Non-Chuck Height Procedure

1 In the Height screen, click Chuck to Non-Chuck Height.

2 Click **Save**.

Note: Several Chuck to Non-Chuck measurements can be carried out, to increase accuracy, as described in section 7.3.3.1.

9.2.4.4.6 Teaching the New Y-Offset

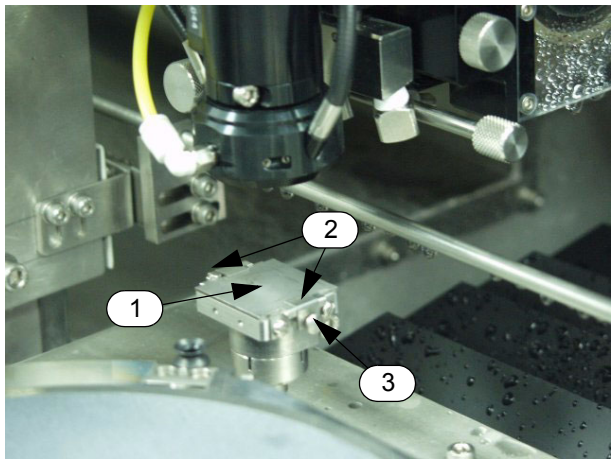
To Teach the New Y-Offset

1 Perform a single cut.

2 Click the Y-Offset calibration icon.

9.3 Dress Station

The Dress Station is intended to periodically clean and reshape the cutting blade in order to enhance the Kerf quality, without interrupting the cutting process, i.e. without having to unload the workpiece from the Cutting Chuck (see Figure 9-20)



1 Dressing Block
2 Holding Clamps
3 Clamp-Opening Button

Figure 9-20: Dress Station

This option enables the dressing process to be done as part of the dicing process program. Dressing can be done during a workpiece dicing without unloading it. In a process program, the user can set the amount of cuts, after which the system performs a certain amount of dress cuts on the Dress Station.

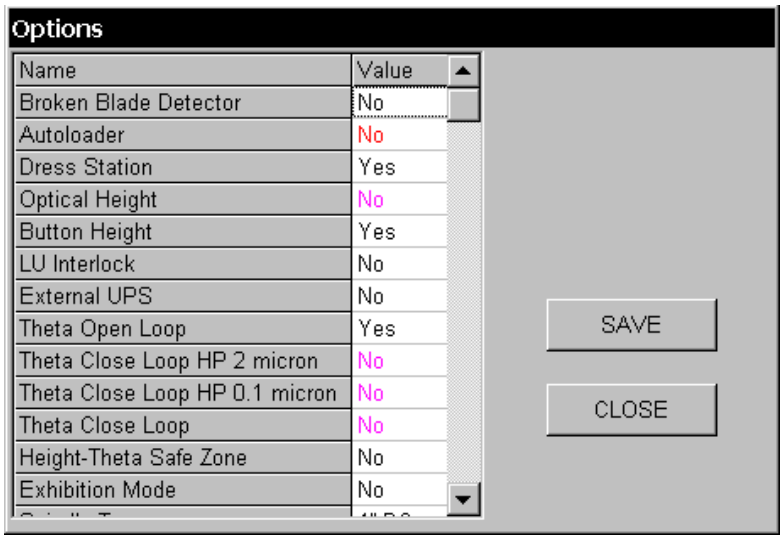
9.3.1 Configuring the Dress Station

In order to enable the Dress Station option the System configuration should be changed as follows:

To Configure the Dress Station

1 Run the Model 7100 GUI.

2 In the Menu Bar click **User** > **Configuration**. Configuration screen appears.



3 Set the **Dress Station** value to **Yes**.

4 Click **Save**.

Once the Dress Station is enabled, it can be setup in the recipes so that the System performs Blade Dressing as required by the process. Dressing procedure can also be run by the user regardless of the process program settings, by clicking the **Dress Station** arrow button and selecting **Dress on Dress Block**:



9.3.2 Teaching the Dress Station

The Model 7100 supports two types of Dressing Blocks:

- 8” Cutting Chucks can be used with 1”x 1” Dressing Blocks
- 6” Cutting Chucks can be used with 1”x 3” Dressing Blocks

The new Dress Station position parameters (see Figure 9-21) are automatically updated upon running the Changing Dress Block procedure.

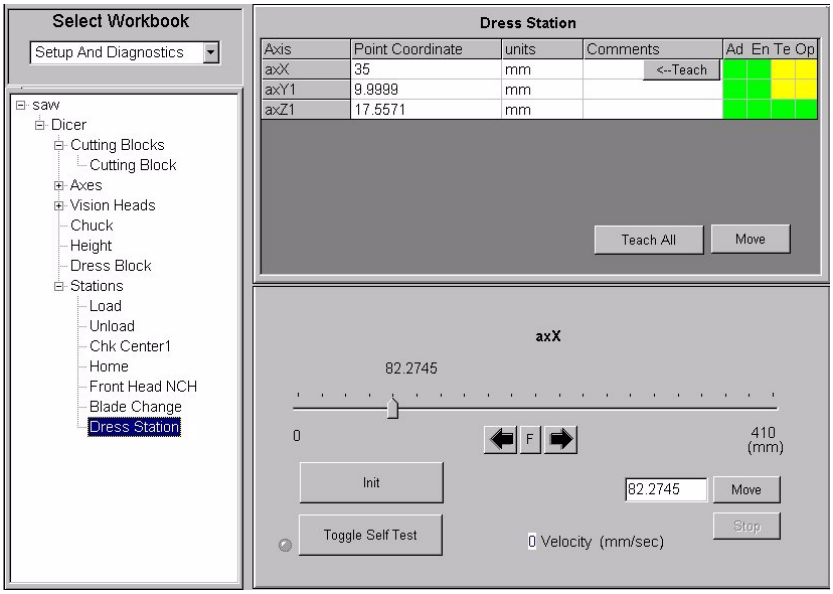
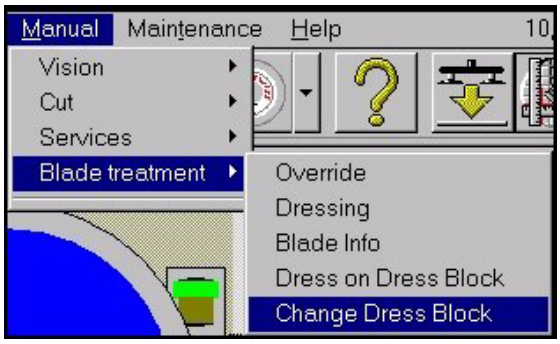


Figure 9-21: Dress Station Screen

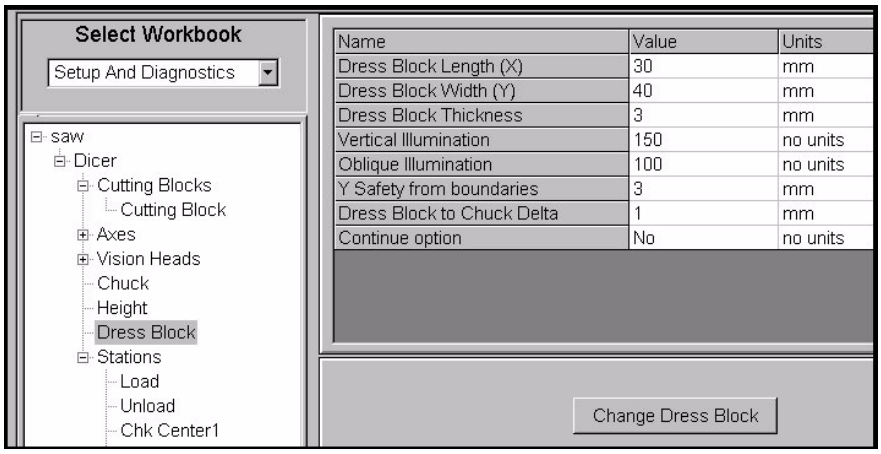
- By selecting **Manual > Blade Treatment > Change Dress Block** from the Menu Bar;



- By clicking the **Dress Block** button in the Toolbar and selecting **Change Dress Block** from the drop-down menu;



- By clicking the **Change Dress Block** button in the Dicer setup screen.



Once the Change Dress Block procedure is started, follow the Wizard instructions. Perform the following procedure when asked to physically replace the Dressing Block:

To Replace the Dressing Block

1 Push the Clamp-Opening buttons as shown in Figure 9-22. The Clamps open.

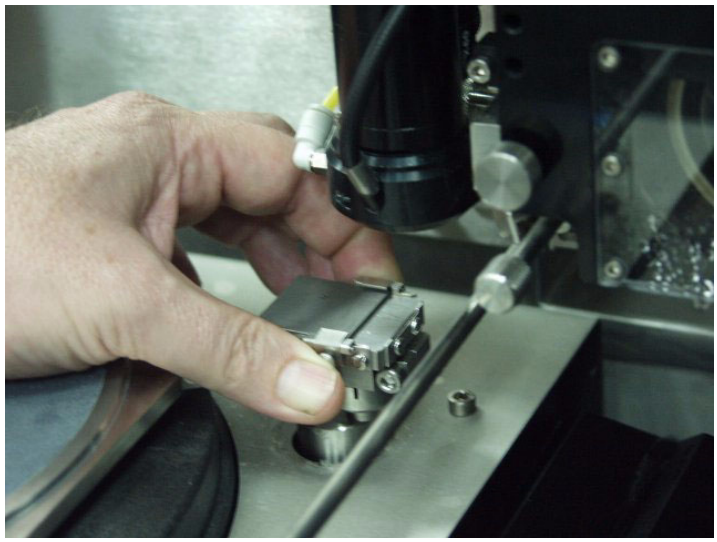


Figure 9-22: Replacing the Dressing Block

2 Slide the Dressing Block to the right and remove it from the Dress Station.

3 Slide in the new Dressing Block into the Dress Station.

4 Release the buttons.

5 Click **Finish** in the wizard.

At this point, the System asks the User to define the upper-left corner of the Dressing Block. This location is saved under Dress Station parameters and serves for building the Dressing Block Cut Map.

To Teach the Dressing Block Lower-left Corner Location

1 Manually bring the Camera over the Dressing Block lower-left corner.

2 Focus the Camera on the Dressing Block.

3 Click **Finish** in the Wizard.

Running the Change Dress Block procedure updates the Dress Station parameters that are taught in the Dress Station setup screen.

9.3.3 Dress Station Setup

After the Dress Station location has been taught, the following dressing block parameters can be setup:

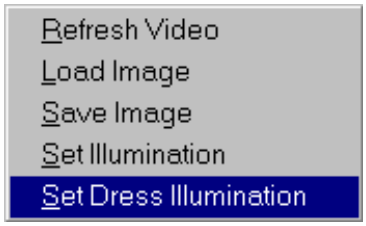
Dressing Block size and **Height** parameters

- Dress Block Length (X)
- Dress Block Width (Y)
- Dress Block Thickness
- Dress Block to Chuck Delta

The **Y Safety from Boundaries** parameter serves to prevent the blade from collision into the Dressing Block holding clamps. The fine adjustment of this value can be performed manually, so that the user can visually ensure that there is enough distance between the clamps and the first/last cut line of the Dressing Block Cut Map.

The **Continue Option** enables the user to decide what to do after the Dressing Block is finished: continue cutting without dressing or replace the Dressing Block and resume cutting.

The **Illumination** parameters define the illumination type used for the Dressing Block inspection. The illumination parameters can be updated by right clicking in the video workspace and selecting Set Dress Illumination.



For more information about specific parameters, see Table 9-1.

Table 9-1: Dressing Block Parameters

Parameter	Description
axX	Defines the Dressing Block upper-left corner position on the X-Axis
axY1	Defines the Dressing Block upper-left corner position on the Y-Axis
axZ1	Defines the Z-Axis height above the Dressing Block (focus).
Y Safety From Boundaries	Defines the distance taken from the Dressing Block holding clamps on two sides of the Dressing Block. **Default = 3 mm**
Dress Block Length (X)	Defines the Dressing Block length along the X-Axis. **Options: 1”**
Dress Block Width (Y)	Defines the Dressing Block length along the X-Axis. **Options: 1”; 3”**
Dress Block Thickness	Defines the Dressing Block Thickness. **Options: 1 - 3 mm**
Dress Block to Chuck Delta	Defines the height delta between the Dress Station surface (does not include the Dressing Block thickness) and the Cutting Chuck surface. For example, if this parameter value is set to **1**, the Dress Station is 1 mm higher than the Cutting Chuck. **Default = 0**
Continue Option	When set to **Yes**, when the dressing block is finished while running a cutting process, the user is prompted to select one of the two options: continue cutting without dressing or replace the Dressing Block and resume cutting. When set to **No**, the System automatically starts the Dressing Block replacement, when the dressing block is finished. **Options: Yes (Default), No**

9.3.4 Dressing Modes

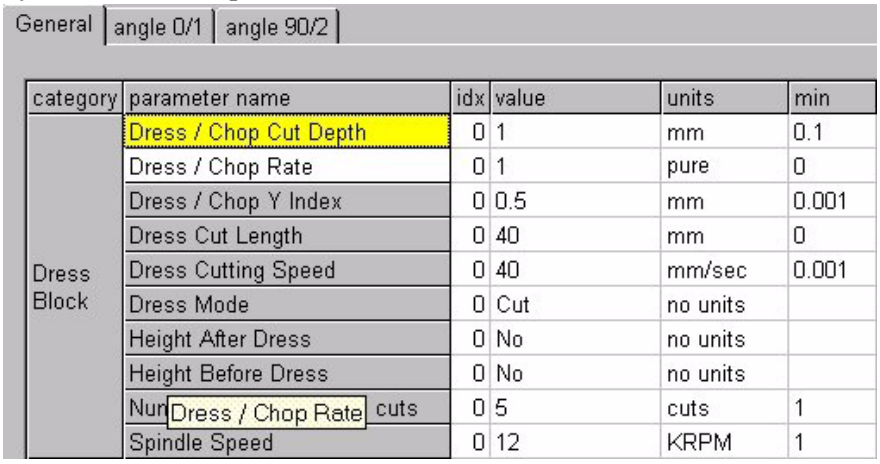
The dressing mode should be selected **before** setting the parameter values, in order to ensure that only the relevant parameters are updated. The System also enables the user to change the Dressing parameters (Dress Mode or any other) while the Cutting process is paused for inspection.

The blade dressing on a Dressing Block can be performed in one of the two modes:

- Cut, see section 9.3.4.1
- Chop, see section 9.3.4.2

9.3.4.1 Cut Mode

When the selected dressing mode is **Cut**, the recipe programming screen displays the relevant parameters:



For detailed information about specific parameters, refer to Table A-13.

9.3.4.2 Chop Mode

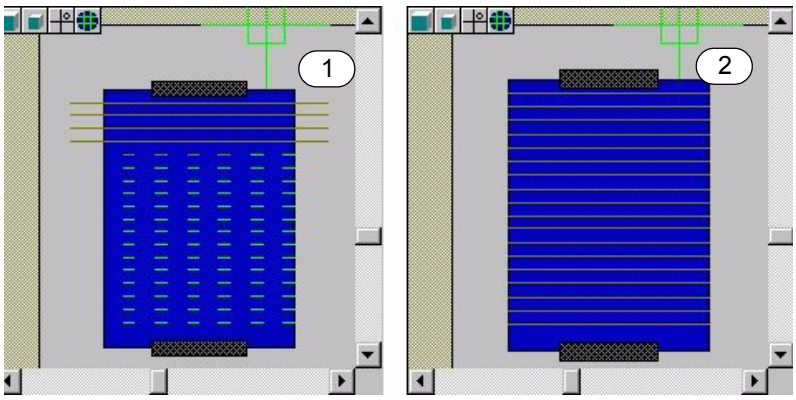
When the selected dressing mode is **Chop**, the recipe programming screen displays the relevant parameters:



For detailed information about specific parameters, refer to Table A-13.

9.3.4.3 Dressing Block Cut Mapping

Once the Dressing parameters (see section 9.3.4.1 and section 9.3.4.2) have been setup, follow the **Dress Block Change** Wizard instructions in order to build the dressing Cut Map, which is displayed in the Simulation window as shown in Figure 9-23



1 Chop Mode Cut Map
2 Cut Mode Cut Map

Figure 9-23: Dressing Cut Map Animation

Note: The Dressing Cut Maps are built in different directions: when in Cut Mode, the System builds the Cut Map from the top of the Dressing Block to the bottom, whereas in the Chop mode it builds the Cut Map from the bottom of the Dressing block to its top ("Top" and "Bottom" are as related to the animation displayed). The animation is updated as the current cut is completed.

After replacing a dress block, click **Finish** in the **Dress Block Change** Wizard to maintain the previous dress block setup.

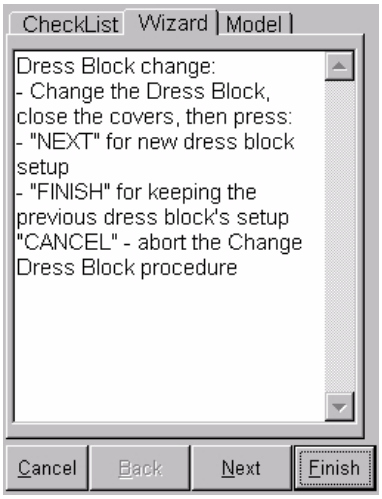


Figure 9-24: Dress Block Change Wizard

9.4 Wash Pipe

The Wash Pipe is an optional feature that enhances the ability to clean the workpiece during or after cutting. The wash pipe is a metal pipe with spray nostrils that can be mounted on the Dicer as shown in Figure 9-25.

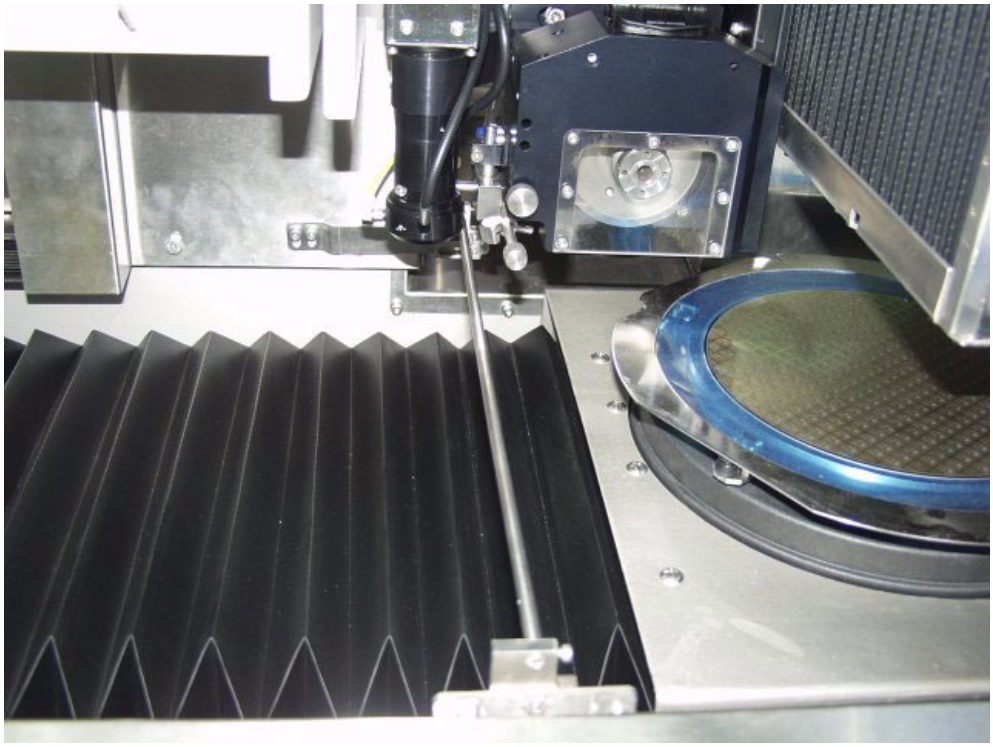
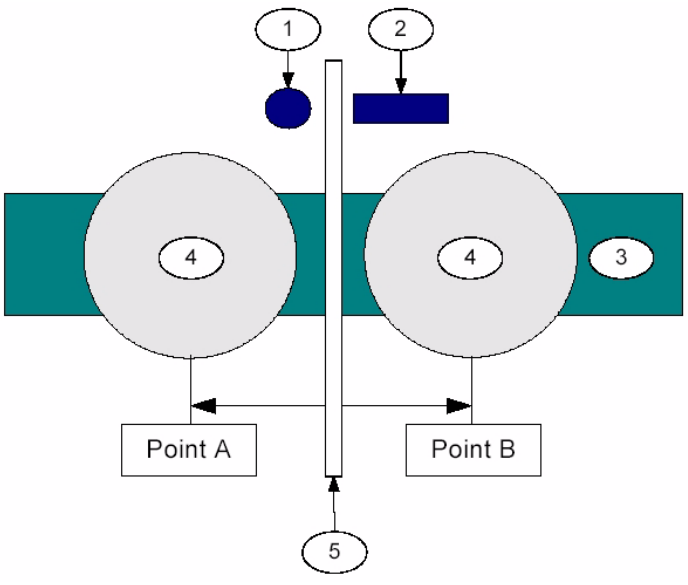


Figure 9-25: Wash Pipe

For the Wash Pipe mounting instructions refer to the Model 7100 Series Maintenance Manual.



1 Dicing Blade
2 Camera
3 X-Axis
4 Cutting Chuck
5 Wash Pipe

Figure 9-26: Wash Pipe Feature Schematic Diagram

The washing mechanism is based on the Wash Pipe and a toggle move of the X axis between the two points - A and B (see Figure 9-26).

The Wash Pipe can be retrofitted into an existing machine or installed at the factory. In order to enable the Wash Pipe, the corresponding option in the Model 7100 configuration screen should be set to **Yes** (refer to the following procedure). The Wash Pipe water supply works simultaneously with the Cooling Block.

The following Setup and Diagnostics parameters, that reside under the Axis Point Category, need to be defined (see Figure 9-27 below):

- **Left Washing Position** - defines the position of point A, shown in Figure 9-26.
- **Right Washing position** - defines the position of point B, shown in Figure 9-26.

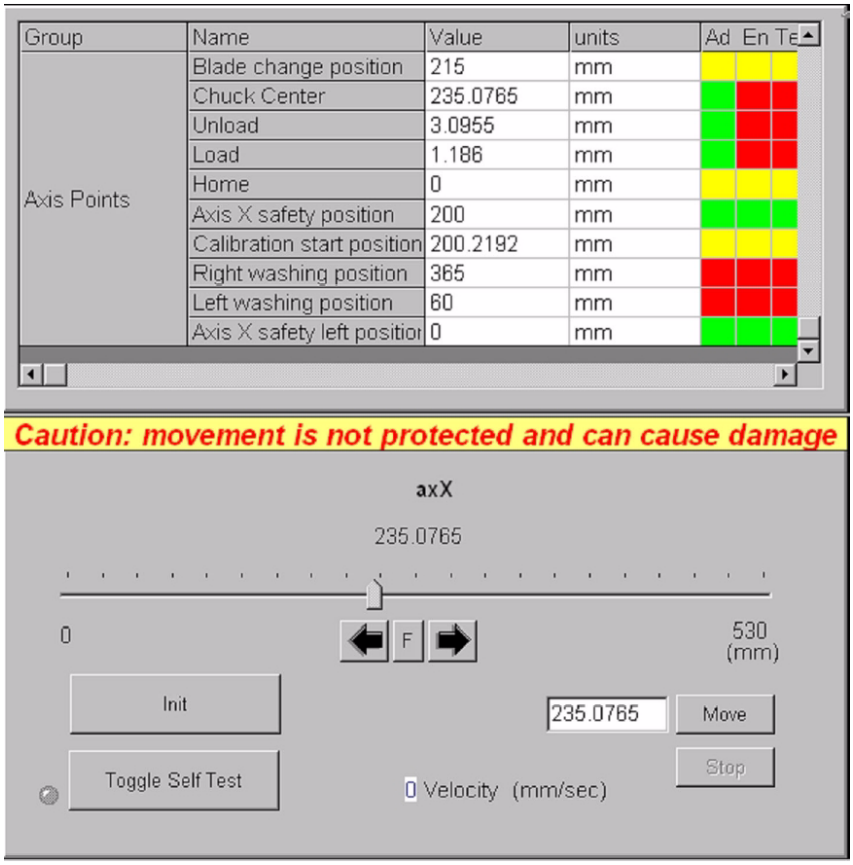
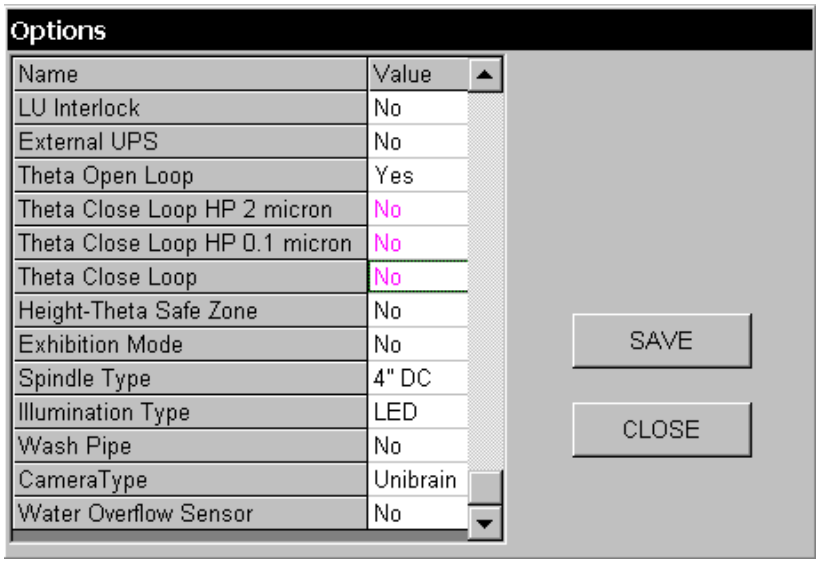


Figure 9-27: Wash Pipe Setup and Diagnostic Parameters

Refer to Table A-29 in Appendix 3 for a list of Wash Pipe program parameters that have to be defined before using this feature.

To Activate the Wash Pipe

1 Click **User** > **Configuration**. The Configuration screen appears.



2 Scroll down to the **Wash Pipe.**

3 Set the value to **Yes**.

4 Click Save. The **Wash Pipe** option is now active.

9.4.1 Manual Operation

The Wash Pipe feature can be activated manually, using the Wash Pipe icon (see Figure 9-29) in the GUI Toolbar. Once this icon is pressed, the washing procedure is activated.

The following operation options are available through the wash pipe activation window (see Figure 9-28):

- **Pause** - Stops the wash pipe activation and restarts the countdown to the next activation
- **Stop** - Cancels the wash pipe activation until the next cut is performed.

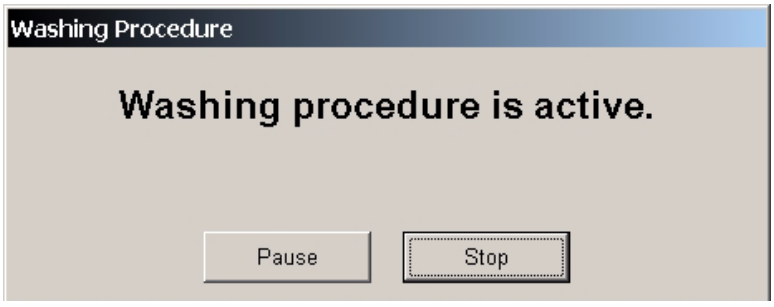


Figure 9-28: Stop and Pause Wash Pipe Operation

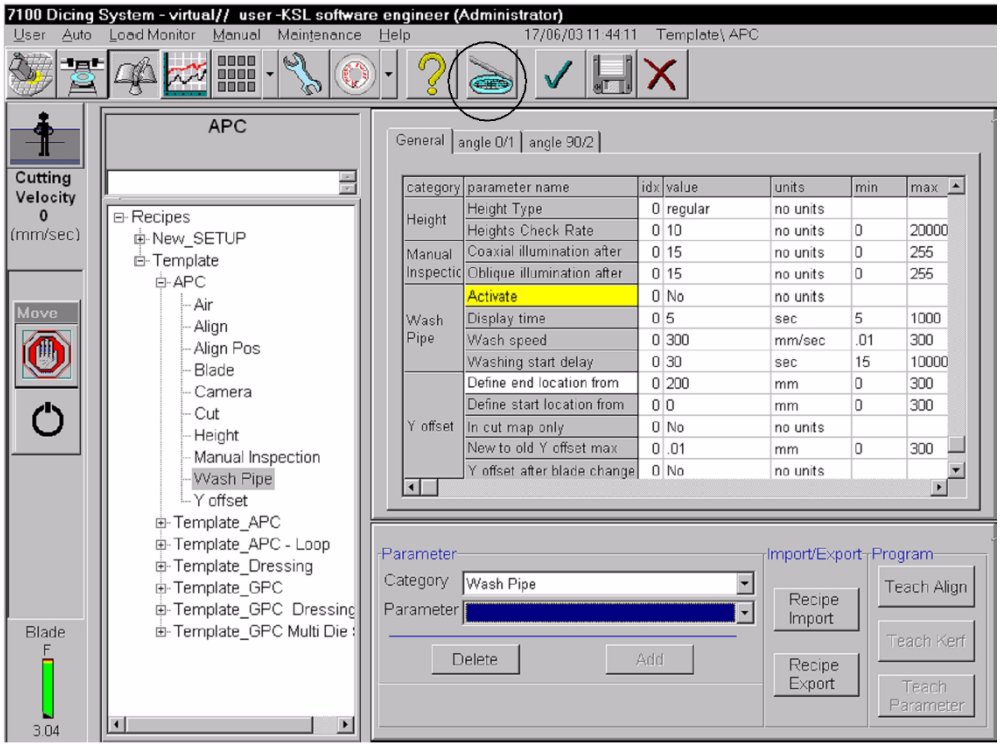


Figure 9-29: Wash Pipe Activation Icon

9.4.2 Model 7100 *Vectus* and *ProVectus*

The Model 7100 *Vectus/ProVectus* standard configuration uses the standard Spray Bars. Optionally, the user can also enable the Wash Pipe option. Once the Wash Pipe option is enabled, the GUI displays a sensor or the water flow on both Spray Bars and optional Wash Pipe (see Figure 9-30).

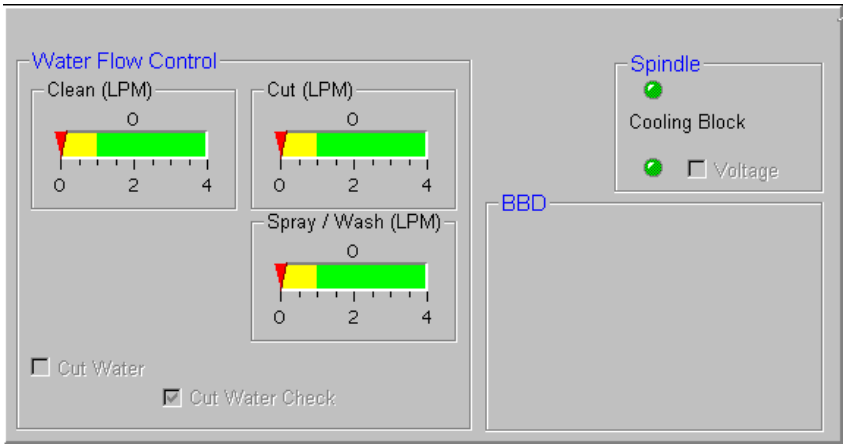


Figure 9-30: Spray/Wash Indicator

9.4.3 Model 7100 *Fortis* and *ProFortis*

The optional Wash Pipe is not included in the Model 7100 *Fortis/ProFortis* default configuration, so the sensor is not connected to the System, and no GUI indication is provided (see Figure 9-31).

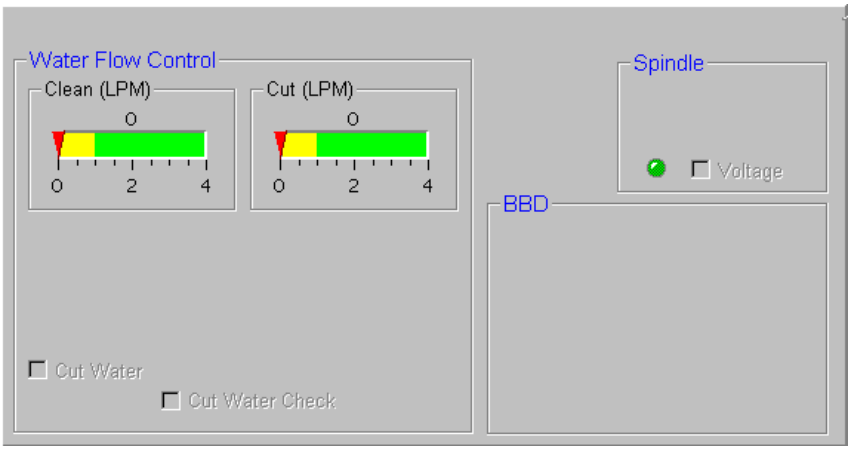


Figure 9-31: No Water Flow Indicator

However, the optional Wash Pipe can be installed on the Model 7100 *Fortis/ProFortis* as an option. In this case, once the water flow sensor is connected to the System, the GUI indicator is displayed as shown in Figure 9-32.

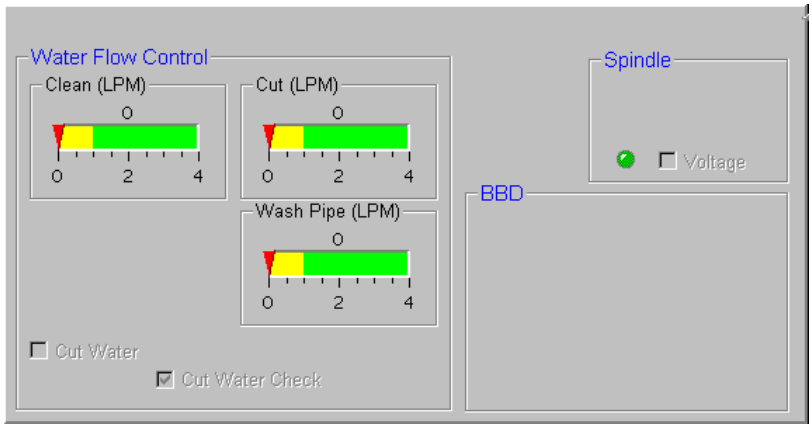


Figure 9-32: Wash Pipe Water Flow Indicator

10 TROUBLESHOOTING

The Model 7100 provides several options for troubleshooting problems that may occur while operating the System, including:

- Error Message Information, Section section 10.1.
- Recipe Problems, section 10.2
- Initializing the System, section 10.3
- Height Problem, section 10.4
- Database Restoration, section 10.5
- Camera Installation After Emergency Stop, section 10.6
- If Nothing Helps, section 10.7
- KMI and Database, section 10.7.1
- UPS Bypass, section 10.8



Note: For more detailed information about diagnostic and maintenance procedures for the Model 7100, refer to the **ADT Model 7100 Semi-Automatic Dicing System Maintenance Manual**.

10.1 Error Message Information

Error messages, described in the Model 7100 Maintenance Manual, can be used to help diagnose problems that occur while operating the System.

Each error message is divided by three fields:

- Main Field
- Details Field
- Troubleshooting

The user can identify the problem source using the data given in the Main Screen and the Details Screen. The Troubleshooting Screen contains specific steps that may help solving the problem. The Troubleshooting steps are numbered as separate tasks. The first step is the most likely to solve the problem.

The color of the error massage frame indicates to which type the error belongs:

- **Green** - user interference is required (e.g. change blade)
- **Yellow** - user interference is required to verify if the system is functioning properly
- **Red** - user interference is required due to a serious problem (e.g. software, machinery)

The errors are also indicated by the Light Tower (if installed). For more details about the Light Tower states, see section 2.1.3.

If a problem occurs that cannot be resolved using the details and/or troubleshooting information, write down the information displayed in the **Error Details** field of the error message and the Details pane before contacting the ADT service representative.



Note: If there is an error, the Light Tower indicator in the lower-right corner of the GUI screen blinks red. To display an error message, double-click the indicator.

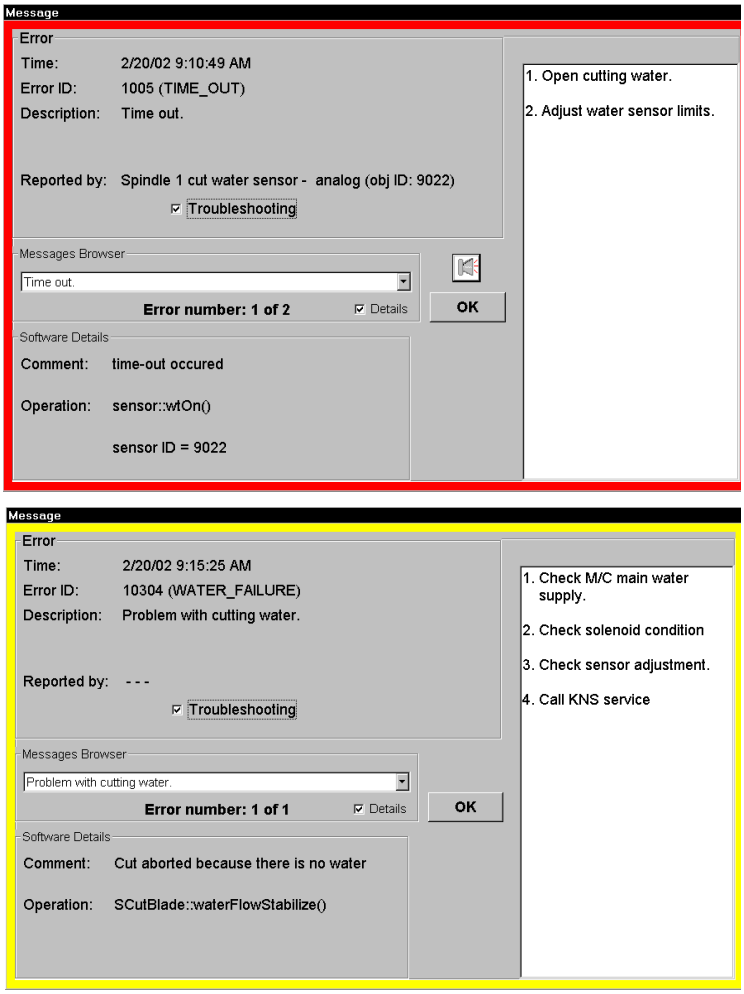


Figure 10-1: Sample Error Messages

Note: To view Troubleshooting, select the **Troublehooting** checkbox. To view the Error Details, select the **Details** checkbox.

The Error Messages Browser, located at the bottom of the error message window, is useful when several errors occur simultaneously. Instead of having all of them display at once, the System enables the User to use the drop-down list to select the error message to display.

The error messages displayed by the System can be saved for reference as follows:

1 Once an Error message is displayed, check the **Detail** and **Troubleshooting** boxes.

2 Press the **Print Screen** key on the keyboard.

3 Press **Ctrl+Esc** on the keyboard.

4 Scroll to: **Programs > Accessories > Paint**.

5 Paste (**Ctrl+V**) the copied screen.

6 Save the file.

7 Compress the file using the Zip program.

10.2 Recipe Problems

If the system reports a recipe problem (e.g. missing model message), the user can try doing the following:

- Check the recipe parameters.
- Ensure that the active recipe and the workpiece on Dicer fit. If they do not fit, either redefine the job, or unload and reload the workpiece.
- Reteach Alignment.
- Recreate the recipe (in some cases, the user has to create the recipe from scratch because the file itself is corrupted). It is important to use a working recipe or template, and not the corrupted file for duplication.

10.3 Initializing the System

When a problem occurs in the Model 7100, the user can try to solve the problem by re-initializing the System. This will often solve the problem and enable normal operation to resume.

Before re-initializing the whole system, it is recommended to first try re-initializing a specific system component (see section 10.3.1), then the Dicer, and only if the problem persists, the whole system.



Caution: It is recommended to remove the Workpiece, if present, from the Cutting Chuck before running the initialization routine.



Note: For systems equipped with an Autoloader, refer to the Autoloader Manual.

To Initialize the System:

- From the User menu, select **System Init**.



Note: The System can also be initialized by clicking **Dicer Init** in the Saw screen of the Setup & Diagnostics workbook, or by right-clicking the Dicer Status Indicator (see Chapter 2) and selecting **(Dicer) Init** from the popup menu displayed.

10.3.1 Initializing Dicer Components

When a problem occurs in a component of the Model 7100, the User can try to solve the problem by reinitializing that particular component. This will often solve the problem and enable normal operation to resume.

To Initialize Dicer Components:

1 Remove the Workpiece, if present, from the Cutting Chuck.

2 Click  in the toolbar to display the Setup & Diagnostics workbook.

3 From the Setup & Diagnostics tree, select **Saw > Dicer** to display the following:

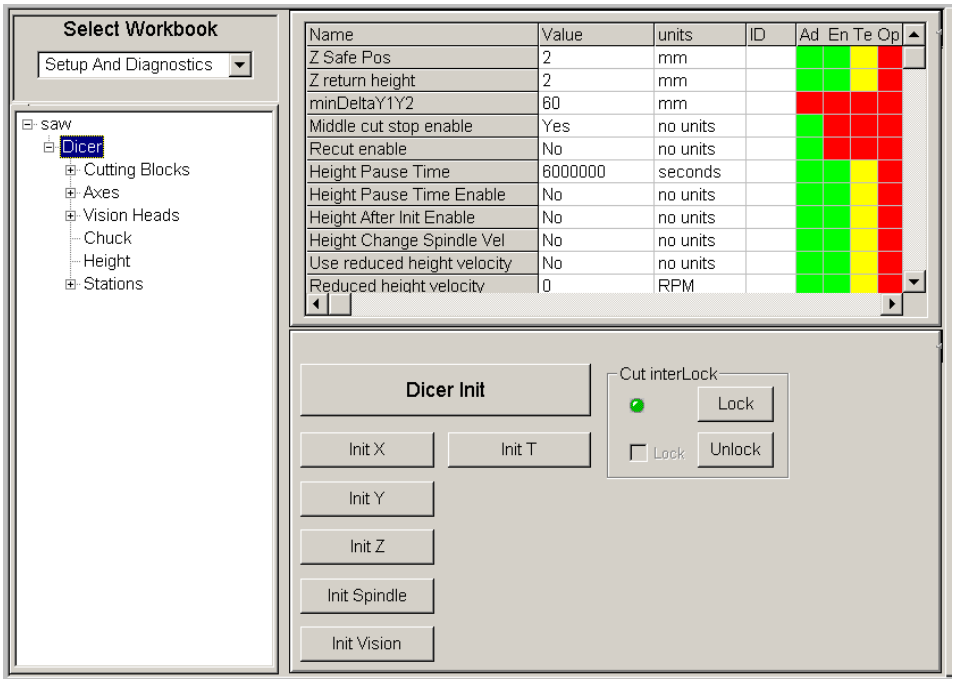


Figure 10-2: Subsystem Initialization Screen

4 Click **Init Z** initialize the Z-Axis.

5 Initialize the X, Y and T (Theta) axes by clicking the buttons provided. The X, Y and T axes may be initialized in any order.

6 Click **Init Spindle** to initialize the Spindle.

7 Click **Init Vision** to initialize the Vision System

Note: While Dicer components must be initialized in the order described above, there is no need to wait for one initialization procedure to finish before performing the next one.

10.4 Height Problem

If there is a problem with performing a Height process, and it can neither be solved by Blade Change, nor it is a hardware problem (the Height device is functioning properly), then try performing a sample Blade Calibration procedure.



Note: Carefully read the instructions on how to perform this procedure.

10.5 Database Restoration and PC Recovery

If when powering up the system, the Database Restore screen is displayed, use the instructions given in section 3.1.1.1.

All the 7100 Series machines starting from version 4.3 are supplied with an Image disc, providing a complete backup of the PC hard drives (including the database). The Image disc, together with the Ghost software (supplied on a floppy disc), enables the user to restore the Software and the Operating System in case of a crash.

If the database problem persists, use instructions given in the Model 7100 Maintenance Manual, regarding the PC recovery and the Database restoration. Contact ADT field service.

10.6 Camera Installation After Emergency Stop

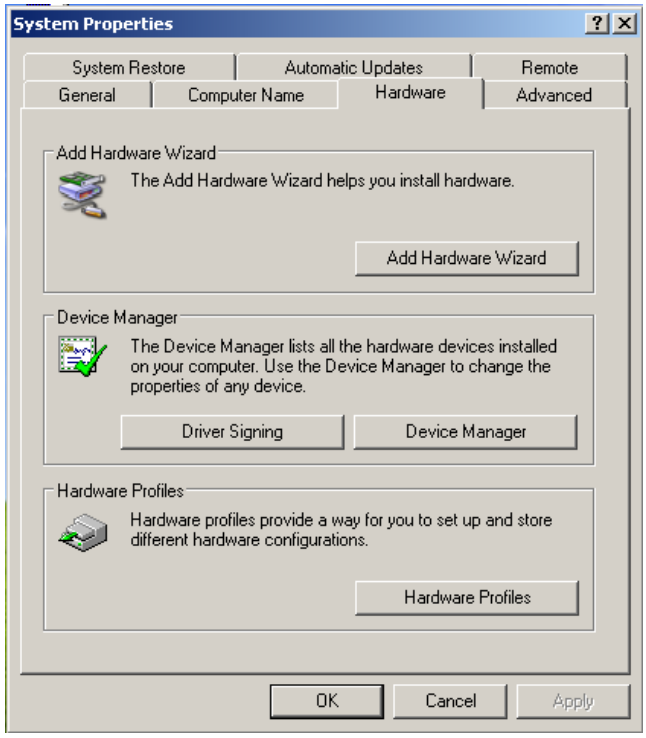
After using the Emergency Stop, the following message may appear:



For correct and proper functioning of the System, follow the camera installation procedure given below:

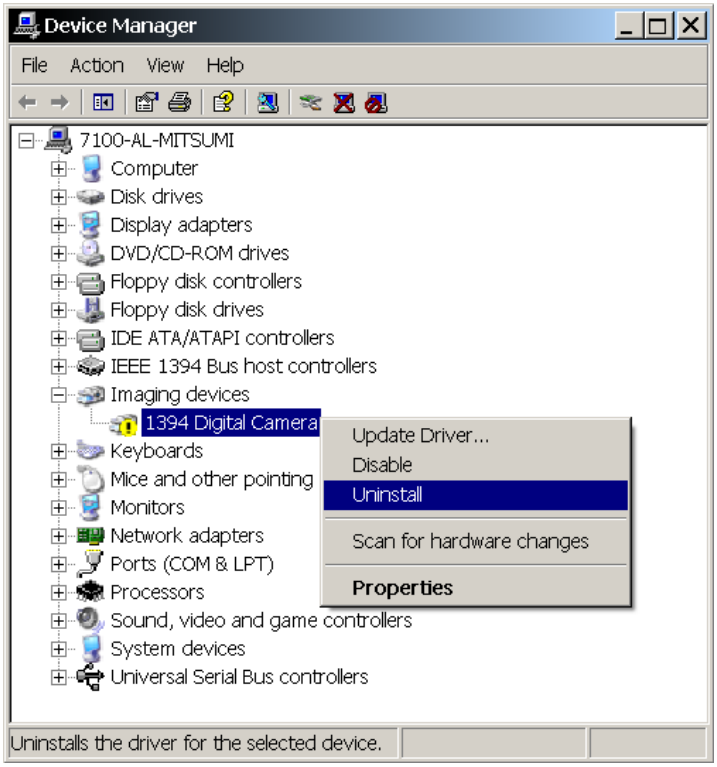
1 Click No on the **MIL DLL Message** and Exit to Windows.

2 On the Desktop, right-click the **My Computer** icon and select **Properties**. **System Properties** window appears:

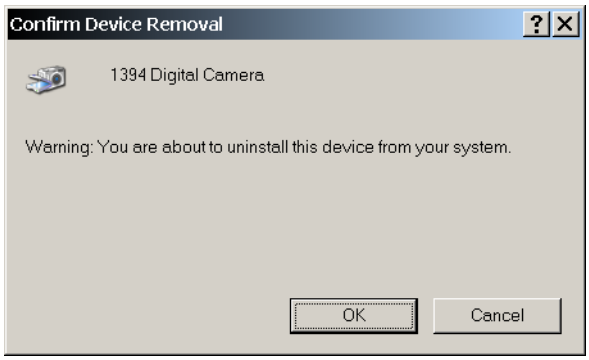


3 Select **Hardware > Device Manager**.

4 In the **Device Manager**, double-click **Imaging Devices**.



5 Right-click on **1394 Digital Camera** and select **Uninstall**. The **Confirm Device Removal** dialog box appears.

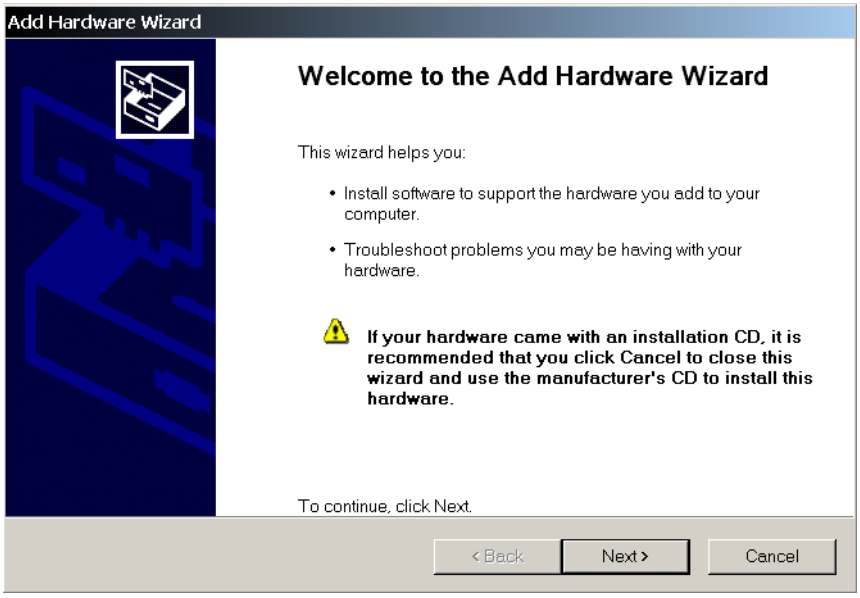


6 Click OK.

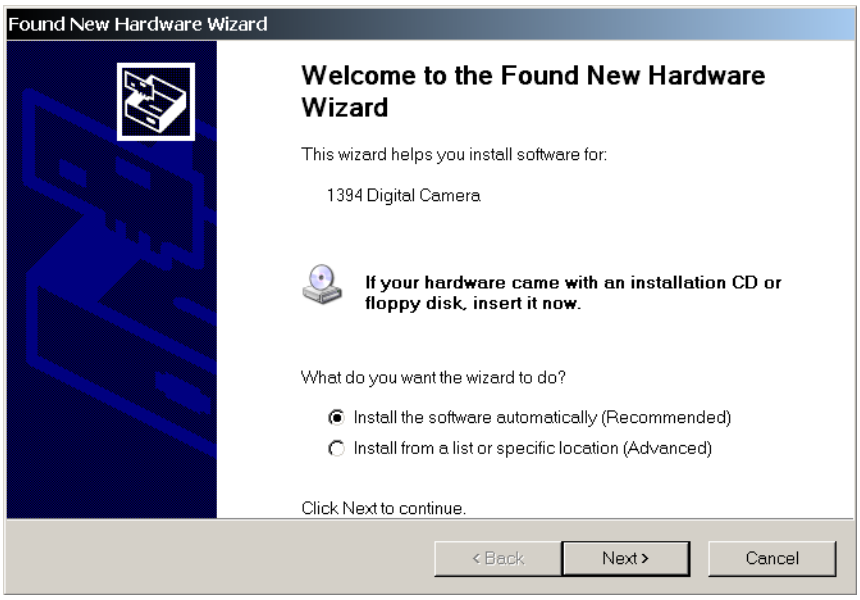
7 Close all the windows.

8 Right click **My Computer** icon and select **Properties**. **System Properties** window appears.

9 Select **Hardware > Add Hardware Wizard**. **Add Hardware Wizard** appears.

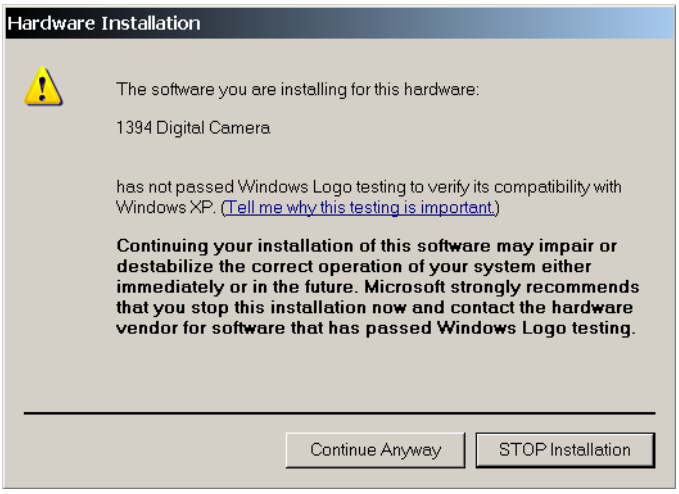


10 Click **Next**. **Found New Hardware Wizard** appears.



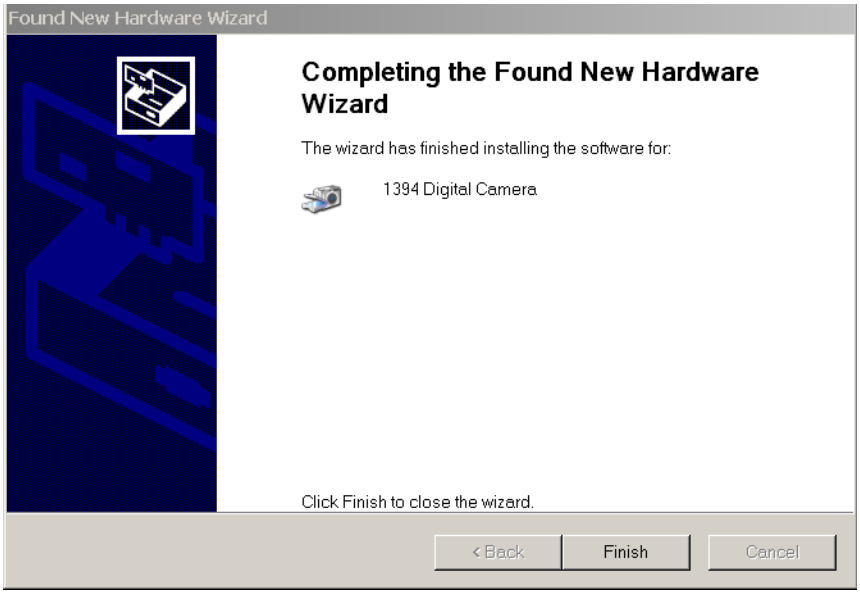
Note: Make sure, that **Install the software automatically (Recommended)** check box is checked.

11 Click **Next**. **Hardware Installation** dialog box appears.

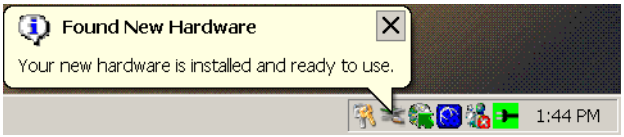


12 Click Continue **Anyway**.

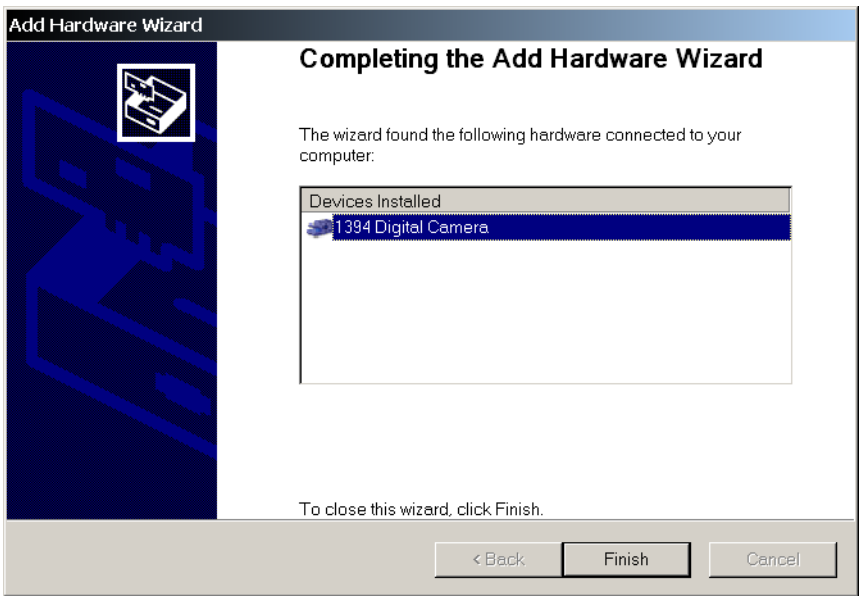
13 In the **Completing the Found New Hardware Wizard** window, click **Finish**.



During the installation process, the **Found New Hardware** label appears in the Taskbar.



Once the installation process is completed, the **Completing the Add Hardware Wizard** window appears.



14 Click **Finish**.

15 Close all windows.

16 Restart the computer.

If Nothing Helps

As in most computerized systems, not all the problems, which occur while running the Model 7100, are identifiable. If the steps, suggested in the Troubleshooting field of the error messages do not solve the problem, powering the system down and then back up can be a solution.

KMI and Database

The Model 7100 software has two fundamental components: the KMI software and the Model 7100 Database. Higher level troubleshooting may require access to these components. Contact ADT for details.

10.7 If Nothing Helps

As in most computerized systems, not all the problems, which occur while running the Model 7100, are identifiable. If the steps, suggested in the Troubleshooting field of the error messages do not solve the problem, powering the system down and then back up can be a solution.

10.7.1 KMI and Database

The Model 7100 software has two fundamental components: the KMI software and the Model 7100 Database. Higher level troubleshooting may require access to these components. Contact ADT for details.

10.8 UPS Bypass

The following procedure covers the situations of UPS battery Discharge or Failure.

Caution: if the UPS is bypassed the PC may be damaged by a loss of power.

This procedure defines the steps that should be taken to bypass the UPS in the 7100 Software.

Caution: This process must be finished within 110 seconds.

To Bypass the UPS in case of its Discharge or Failure

1 Verify that the Windows is UP.

2 Start the 7100.

3 Press **Alt+Ctrl+Delete** to open the Windows Task Manager.

4 Click the **Application** Tab.

5 Mark "**7000 Dicing System**" and click **End Task** (see Figure 10-3).

6 Click **End Task** in the additional dialog window.

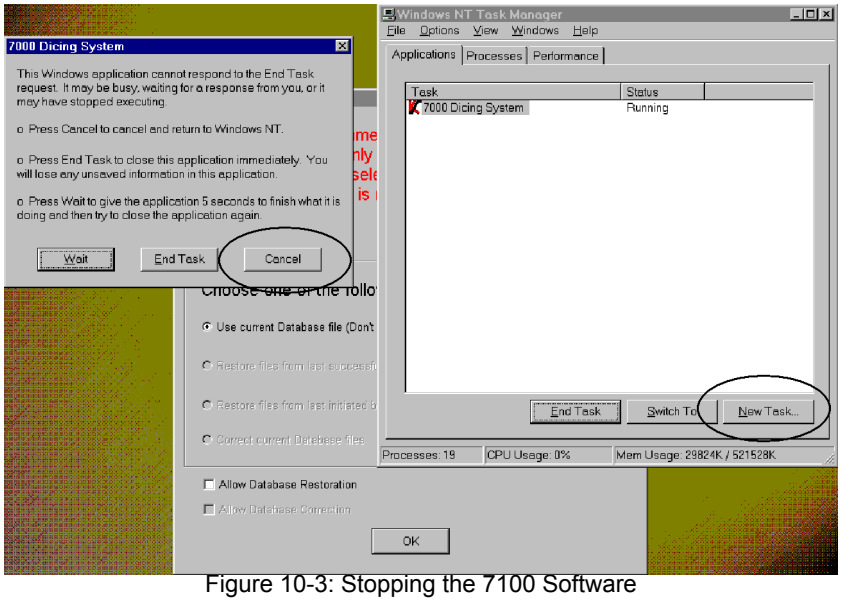


Figure 10-3: Stopping the 7100 Software

7 Click **Start > Settings > Control Panel > Services**.

8 In the Services screen, mark **PowerMon II** and click **Stop** (see Figure 10-4). The status changes from "**Started**" to " __ " (empty).

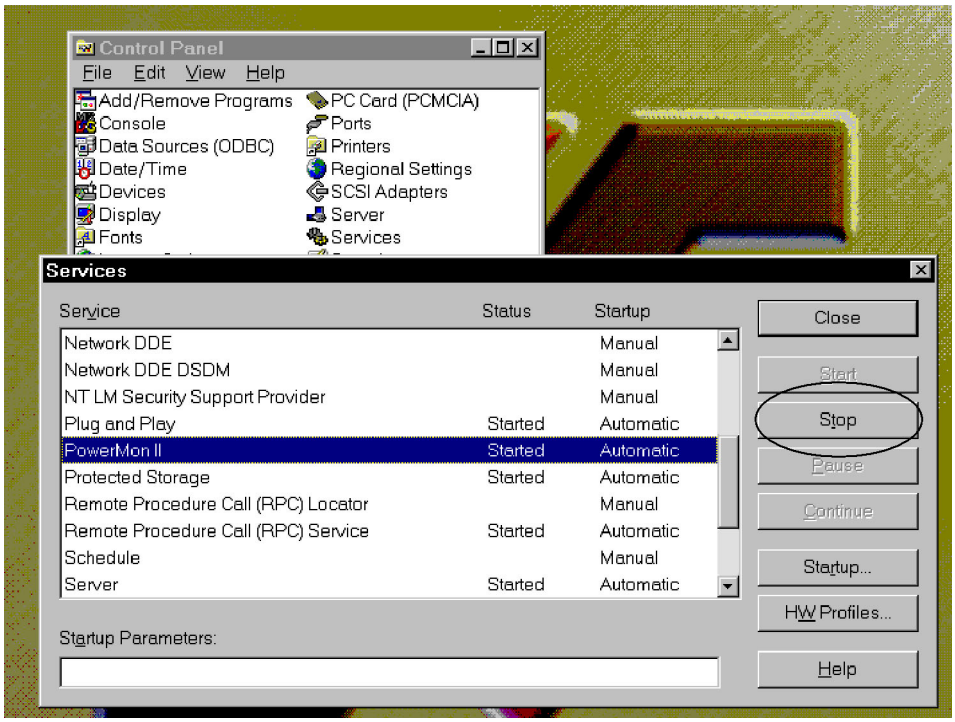


Figure 10-4: Stopping the PowerMon II

9 Click **Start** in the Services window.

10 Change the Startup Type from Automatic to Disable (see Figure 10-5).

11 Click **OK**.

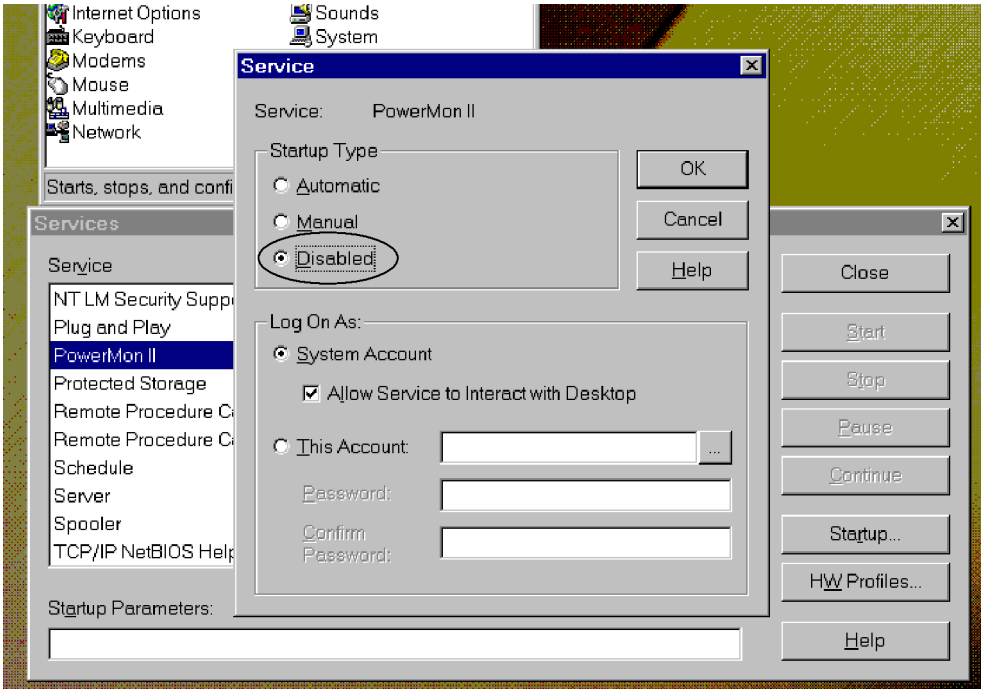


Figure 10-5: Changing the Startup Type

12 Click the Dicing System icon in the Desktop to start the 7100 GUI and operate the machine.

13 After replacing the UPS, change the Startup Type (see step 10 and Figure 10-5) back from Disable to Automatic.

14 Click **Start** in the Services window (services control will pop up and the status will change from "_____" to **Started**).

15 Click Close to close the Service windows.

A APPENDICES

This chapter includes the following appendices:

- Appendix 1: “The Model 7100 Glossary”
- Appendix 2: “Algorithms”
- Appendix 3: “Recipe Parameters”

Appendix 1: The Model 7100 Glossary

Access Level
Categories that permit or deny to Users the right to perform specific activities, view or change program specific parameters.

Administrator
The highest Access Level. See also Access Level.

Align Kerf Model
Orientational referencing model based on a performed cut position and not on the eye-points, as opposed to Die Model.

Alignment
Precise rotation of the Workpiece in relation to the X-Axis (on the Cutting Chuck) in preparation for cutting.

Alignment Types
Classification of alignment conditions by category.

Angle
A set of parallel streets on a Workpiece. See Channel.

Auto Mode
Semi-automatic System operation which requires no User intervention during processing, other than placing and removing the Workpiece on the Cutting Chuck.

Axis
(plural: Axes)

Coordinates along which System components move; as well as the (Axis) components themselves.

Blade
A sharp sawing tool that cuts Workpieces by rotating at high speed in an upright position. Blades are classified into two main categories: see Hub Blade and Hubless Blade.

Blade Center
The center of the Cut-line (Kerf).

Blade Exposure
See Exposure.

Blade Properties

The characteristics of a particular Blade.

Block
A series of cuts which are defined in a recipe (0/1, 90/2, 90/3 etc).

Button Height
See Height.

Channel
Set of parallel streets. There are usually two channels (CH1 and CH2) on each Workpiece, located at 90-degree angles to each other. The Workpiece is completely cut in one channel and then the Cutting Chuck is rotated 90 degrees to enable cutting in the other channel. See Angle.

Chipping Area
The area of chipping measured on either side of the Kerf.

Chuck
Rotating table on which a Workpiece is mounted and held in place by vacuum during processing.

Chuck Height
See Height.

Configuration
Defines the particular arrangement, presence or absence of System components (such as Mechanical Height Button or Non-Contact Height Device).

Cross-Point
Street center intersection.

Cut Depth
The depth to which the Blade is inserted into the Workpiece measured from its top surface.

Cut-Line
The cutting path; the Kerf.

Cutting Chuck
The table on which the Workpiece is mounted and held by vacuum during cutting.

Cutting Table
See Cutting Chuck.

Developer
ADT software development personnel.

DI Water
De-ionized water.

Dice
(1) To cut a Workpiece into segments. (2) Plural of die (see Die).

Die

(plural: Dice)

That portion of a Workpiece which has been cut into a segment separate from the Workpiece.

Die Model
Reference eye-point used in two-point alignment.

Downcut
The Blade enters the Workpiece from the top and exits from the bottom.

Dress
To prepare a Blade for use by cutting it into a dedicated Dressing block in order to condition the Blade for cutting.

Dress Station
An optional Dicer component intended to Dress the Blade as part of a process program.

Engineer
The second-highest Access Level. See also Access Level.

Exposure
The amount of the Blade edge that is usable for cutting.

Feed Rate
The speed at which the Workpiece on the Cutting Chuck is moved into the Blade.

Flange
The wheel that holds a Hubless Blade in place on the Spindle Shaft.

Flow Control
The rate at which the s sprays water on the blades to cool and clean them in preparation for cutting.

Frame
The ring that holds the tape on which a Workpiece is mounted.

Height
The Height procedure is performed in order to determine Chuck position along the Z-Axis. Height is performed by lowering the Spindle until the edge of the Blade makes contact with either the Cutting Chuck or the Height Device. Height is updated regularly by the System in order to compensate for differences in Z position due to Blade wear.

There are four types of Height procedures:

1 **Chuck Height** determines Chuck position by lowering the Blade onto theCutting Chuck.

2 **Button Height** determines Chuck position by lowering the Blade until the makes contact with the Mechanical Button and the System detects an electrical shortage.

3 **Non-Contact Height Secondary Device** detects if the beam is obstructed by the Blade.

4 **Chuck to Non-Chuck Delta Measurement** measures the difference between Chuck Height and Button Height/NCHD.

5 **Sample Blade Calibration**, performed after Spindle adjustment or replacement, uses a new Blade of known diameter to set the benchmark Chuck position value, which is then used during operation to determine the accurate exposure of the current Blade by performing Chuck or Button Height.

Hub Blade
A circular Blade that has an integral center section and which therefore does not need a flange to hold it in place.

Hubless Blade
A circular Blade that consists only of a cutting surface and which must be held to the Spindle Shaft with an external flange.

Initialization
Also known as homing

The act of finding the specific points for the different Axes and components.

Inspection
The act of stopping the cutting process for the purpose of inspecting the quality of the cut.

Kerf
The cut made in a Workpiece by a Blade.

Kerf Check
Visual inspection of the Kerf. Can be performed manually or automatically by the Pattern Recognition System (PRS).

Load Monitoring
Enables the User to measure the load on the Spindle (measured in Amps) caused by resistance encountered by the Blade during operation.

Login
Enables use of the System according to the designated Access Level.

Loop Cut
A repetition of a cut or Block.

Manual Mode
Requires User intervention for procedures, for example, Manual Alignment.

Mechanical Button
A Height Device onto which the Blade is lowered while performing Button Height. The Blade height is computed at the point where the Blade makes contact with the flat surface of the Mechanical Button.

Mixed
The workpiece is cut in both directions, i.e. it is fed in the right-to-left direction at one index and left-to-right at the next index.

Model
(also known as eyepoint or fiducial)

A set of points which constitute a pattern, located on the Workpiece, and used by the Vision System for locational and orientational referencing. See also Die Model and Align Kerf Model.

Model Scoring
Rating an Alignment Model in order to determine reliability of the recognizable patterns.

Model Teaching
See Teaching.

Non-Contact Height (Optical)
The Blade is lowered into a light beam emitted from the Non-Contact Height Device. The Blade height is computed at the point where the light beam is blocked.

Operator
The lowest Access Level; can perform only basic operations. See also Access Level.

Override
Dressing a Blade while cutting a regular Workpiece. Initial cutting speed is reduced and gradually returns to regular cutting speed in accordance with the steps programmed by the User.

Pattern Recognition System (PRS)
The aspect of the Vision System that learns and identifies patterns to be used as locational reference points.

Recipe
Setting algorithm or parameter that controls the operation of the Model 7100. Recipe can be either assigned to an individual Workpiece, or to an unlimited number of Workpieces that share the same characteristics.

Setup
(1) The preparation and adjustment of the System or any of its components to perform its assigned tasks. (2) The set of parameters that are defined for components in order to prepare and adjust them to perform their assigned tasks.

Street
Usually the path in which to cut. Streets are physically predefined during Workpiece manufacture.

Substrate
See Workpiece.

Supplier
ADT production personnel, field engineers and customer support personnel.

Table
Rotating platform on which a Workpiece is mounted and held in place by vacuum during processing.

Teaching
The System is taught Models. In Teach Alignment, the System is taught to find the center of the streets to be cut and in Teach Kerf Check, the System is taught which part of the kerf to inspect.

Technician
(formerly known as Keeper)

Middle-rank Access Level. Technicians have received training and are experienced in performing the maintenance of the System. See also Access Level.

Theta (T) Axis
Theta components rotate around the T Axis. See also Axis. Also referred to as **Turntable**, on which the cutting chuck is mounted.

UPS
(Un-interrupted Power Supply)

The backup power source that allows completion of the currently running operation in the case of power failure.

Uni-directional Cutting
All cutting is performed in one direction (the Workpiece is fed into the rotating Blade from left to right).

Upcut
The Blade enters the Workpiece from the bottom and exits from the top.

User
A general term to describe any person who operates, adjusts or maintains the System, regardless of Access Level. See also Access Level.

Wash Pipe
A metal pipe mounted on the Dicer and intended for cleaning the Workpiece before, after or while dicing.

WMax
Maximum Kerf width.

WMin
Minimum Kerf width.

Work
Workpiece(s).

Workpiece
Also known as a wafer, substrate, semiconductor material or work.

X-Axis
X-Axis components move left and right. See also Axis.

Y-Axis
Y-Axis components move front and back. See also Axis**.**

Y Offset
The deviation of the Blade Center from the Camera/Vision System Center.

Y Offset Correction
Automatic compensation and correction for deviation of the Blade center from the Camera/Vision System Center.

Z-Axis
Z-Axis components move up and down. See also Axis.

Appendix 2: Algorithms

The Model 7100 software contains the algorithms described in the following sections. Each section describes an algorithm and the compulsory parameters that must be defined in order for the algorithm to function. For more information about the function of algorithms and selecting algorithms in Recipes, see Chapter 5. For a detailed description of each parameter, see Appendix 3. The following algorithms are described in this appendix:

- Cut Algorithms
- Align Algorithms
- Kerf Check Algorithm
- Bright Kerf Algorithm
- Full Teach Alignment Algorithm
- Kerf Check Teach Algorithm

Cut Algorithms

The Cut algorithm controls the manner in which cutting is performed by the System. The following Cut algorithms can be selected:

- Standard APC
- Standard Dressing
- Standard GPC

Standard APC

The Standard APC algorithm offers an advance method for dicing complex Workpieces. Workpieces diced with this algorithm can include multiple angles (blocks), with each angle containing a defined series of cuts. For each series of cuts, the User can define:

- Cut position (reference point)
- Cut length
- Cut index
- Number of repetitions

The Standard APC algorithm makes this level of definition possible by making use of loop cutting. Loop cutting involves the repetition of a cut or series of cuts. For this reason, the Standard APC algorithm is often used to control the cutting process when working with irregular shaped Workpieces, multiple Workpieces on a single frame or Workpieces that require special processing. The Standard APC algorithm can also be used

to cut regular round or rectangular Workpieces placed in the center of the Cutting Chuck.

Standard Dressing

The Standard Dressing algorithm is used to control the Blade Dressing procedure. It is used for both dressing Workpieces and dressing blocks. For more information about Blade Dressing, see Chapter 7.

Note: The Standard Dressing algorithm is applicable only when using a dressing block or workpiece mounted on the Chuck as the dressing medium.

Standard GPC

The Standard GPC algorithm is used to control the cutting process when working with round or rectangular Workpieces placed in the center of the Cutting Chuck. In Standard GPC, once the Index and reference point have been defined for a Workpiece, it is possible to perform all the necessary cuts in that Workpiece.

Align Algorithms

The Align algorithms control the manner in which the System performs Auto Alignment and Alignment on a Workpiece. The following Align algorithms can be selected:

- Full Auto Alignment
- Full Dress Alignment

Full Auto Alignment

The Full Auto Alignment algorithm is used to control the Auto Alignment procedure. Auto Alignment can only be performed once Alignment has been taught. There are no compulsory parameters that have to be included in the Recipe in order for Auto Alignment to be performed, since all necessary parameters are generated by the Full Teach Alignment procedure. However, it is recommended that the default values assigned to the parameters when they are generated be modified as necessary.

Note: Do not change the following parameters: Alignment X-Shift, Alignment Y-Shift, Align Exact Angle, Align Points No and Alignment Taught.

Full Dress Alignment

The Full Dress Alignment algorithm is used to control the Alignment procedure on a Dressing Workpiece. Full Dress Alignment can only be performed once Alignment has been taught. In order for Full Dress

Alignment to be performed, the **Align Type** parameter must be specified as **Dress Manual Once**.



Note: The Full Dress Alignment algorithm is applicable only when using a dressing block or workpiece mounted on the Chuck as the dressing medium.

Kerf Check Algorithm

The Kerf Check algorithm controls the manner in which the System performs Kerf Checking on Workpieces. Kerf Checking can only be performed once the Teach Kerf Check procedure has been completed. There are no compulsory parameters that have to be included in the Recipe in order for Kerf Checking to be performed, since all necessary parameters are generated by the Teach Kerf Check procedure. However, it is recommended that the default values assigned to the parameters when they are generated be modified as necessary.

There is no need to change the values of the **Head Taught** parameter.



Note: The values of the following parameters can only be adjusted downwards: **Kerf Checks Per Cut** and **Kerf Checks per Area**.

Bright Kerf Algorithm



Note: This algorithm is available only when a specially designed Illuminated Chuck is installed and configured on the system.

By means of this algorithm, the Model 7100 software causes the system to search for the cutting area according to dark-bright-dark sections, which means once the system receives a pattern of dark section-bright section-dark section on the wafer, the system knows how to process the image. In order for the Bright Kerf algorithm to function, **Bottom Illumination** must be installed on the system and enabled under the **User Configuration Options**.

Full Teach Alignment Algorithm

The Full Teach Alignment algorithm controls the manner in which Alignment is taught to the System. In order for the Full Teach Alignment algorithm to function, the following parameters must be included in the Recipe:

- **Align category**
  - Align-Cut Sequence
  - Angle Difference Tolerance
  - Index

- Type
- Wafer Mounting Angle Tolerance

Once the Full Teach Alignment procedure has been performed, some parameters are automatically generated and included in the Recipe, and default values assigned. These default values can be changed before performing the Alignment procedure.

Kerf Check Teach Algorithm

The Kerf Check Teach Algorithm controls the manner in which Kerf Checking is taught to the System. For more information about Kerf Checks, see Chapter 6. There are no compulsory parameters that have to be included in the Recipe in order for Kerf Check Teach to be performed, however, it is recommended that the following two parameters be included in the Recipe:

- **Kerf Check category**
  - Area
  - No. Checks per Cut

Once the Teach Kerf Check procedure has been performed, the following parameters are automatically generated and included in the Recipe, and assigned default values. These default values can be changed before performing the Kerf Check procedure.

Appendix 3: Recipe Parameters

The Model 7100 software contains the parameters described in the following sections. Parameters are listed alphabetically by category.

For information about how to specify parameters and adding parameters to Recipes, see Chapter 5.

Note: When defining parameters in a Recipe (for example, Index), the User can select a different unit of measurement for each parameter, including:

- millimeters
- inches
- mils
- centimeters
- meters
- microns
- degrees
- radians

The Possible Values provided for each parameter in this Appendix are rendered in millimeters, unless otherwise specified.

Air Parameters

Table A-1 lists the Air parameter available in the Model 7100. This parameter is used for the air puff feature employed by the System when unloading Workpieces from the Cutting Chuck.

Table A-1: Air Parameters

Category	Parameter	Description
Air	Stop Air After Air Puff	Defines whether or not to stop the air puff after the Unload Air Puff time has elapsed. **Possible Values**: **Yes (Default); No**
Air	Unload Air Puff	The duration (in sec.) of the air puff used for releasing Workpieces from the Cutting Chuck. **Possible Values**: min = **0**, max = **100**, Default = **2**

Align Parameters

Table A-2 lists the Align parameters available in the Model 7100. Align parameters are used to define how Alignment is performed.

Table A-2: Align Parameters

Category	Parameter	Description
Align	Align-Cut Sequence	The sequence of the cutting process. **Possible Values**: **Align, Align Cut, Cut (default)**: Align all angles and then cut all angles (A,AC,C). **Align, Cut, Align, Cut**: Align first angle and cut it, align second angle and cut it, and so on (A,C,A,C).
Align	Angles Difference Tolerance	The maximum acceptable deviation (in degrees) between the X, Y and Theta axes. **Possible Values**: min = **0.001**, max = **10**
Align	Area	The percentage length of the Workpiece where Alignment is performed. **Possible Values**: min = **10**, max = **100**, Default = **80**
Align	Center Co-ordinate X	The place where the User defines the center of the substrate along the x-axis (used by the camera in Teach Center, see Table A-27). **Possible Values:** min = **-300**, max = **300**, Default = **0**
Align	Center Co-ordinate Y	The place where the User defines the center of the substrate along the y-axis (used by the camera in Teach Center, see Table A-27). **Possible Values**: min = **-300**, max = **300**, Default = **0**
Align	Copy From Angle	Defines from which previous angle the cut information is copied.
Align	Final Accuracy	The maximum misalignment (in microns) permitted after Alignment. This amount represents the final accuracy to be achieved by Alignment procedure. **Possible Values**: min =**.001**, max =**.99**, Default =**.01**

Table A-2: Align Parameters		
Category	**Parameter**	**Description**
Align	Index Tolerance	The permitted variation between the index found during Alignment and the index specified in the Recipe. **Possible Values**: min =**.001**, max = **900**, Default =**.01**
Align	Initial Focus-Shift	The relative position of the Z-Axis that provides an acceptable default focus. (This can be used when the thickness of the Workpiece is changed after Alignment has been taught. Instead of reteaching Alignment, the User can use the simpler and faster process of updating the focus.) **Possible Values**: min = **-20**, max = **20**, Default = **0**
Align	Initial Theta-Shift	The difference in the Theta Axis position (in degrees) between the current Workpiece and the taught Workpiece. **Possible Values**: min = -**300**, max = **300**, Default = **0**
Align	Initial X-Shift	The difference in the X-Axis position between the current Workpiece and the taught Workpiece. **Possible Values**: min = **-300**, max = **300**, Default = **0**
Align	Initial Y-Shift	The difference in the Y-Axis position between the current Workpiece and the taught Workpiece. **Possible Values**: min = **-300**, max = **300**, Default = **0**
Align	Low Alignment Verification	When set to **Yes**, the System performs Alignment by Low Model until the final accuracy value is reached. It is recommended to set this parameter to **Yes**, when the Align Kerf Model is used as the Main Model. Default value: **No**
Align	Low Model Enabled	If set to "**Yes**", the option to teach and use the Low Models in the second angle is enabled. **Possible Values**: "**Yes**", "**No**" **Should be set to "Yes"**
Align	Low Model High Score (%)	The threshold value after which the verification of the model is not required **Possible Values**: **50%** - **100%** **Should be set to 70%**

Table A-2: Align Parameters		
Category	**Parameter**	**Description**
Align	Main Model High Score (%)	The threshold value after which the verification of the model is not required **Possible Values**: **50%** - **100%** **Should be set to 70%**
Align	Main to Sub model accuracy	It defines the accuracy to accept low threshold model as a valid model based on the sub model. **Possible values**: **1 - 50 μm** **Default - 2 μm**
Align	Maximum No. of Iterations	The amount of times the system will repeat the alignment in order to enter Align - Final Accuracy. **Possible Values**: min = **0**, max = **10**, Default = **0**
Align	Recover Option	The action taken by the 7100 if Alignment fails or the Model is not found. **Possible Values**: **Manual; Reject** **Manual (default)**: Waits for User intervention, for example, for the User to find the Model.
Align	Settling Time	The amount of time the Workpiece is allowed to dry before Alignment begins. **Possible Values**: min = **0**, max = **20**, Default = **0**
Align	Spiral Search Length (X)	The length of the spiral search area within the Index. Defined per Angle. **Possible Values**: min = **0**, max = **50**, Default = **5**
Align	Spiral Search Width (Y)	The width of the spiral search area within the Index. Defined per Angle. **Possible Values**: min = **0**, max = **50**, Default = **5**
Align	Spiral-Index Search Length (X)	The length of the spiral search area outside the Index. When the System fails to find a Model, it makes a spiral search around the area. The parameter is defined per Angle. **Possible Values**: min = **0**, max = **300**, Default = **50**

Table A-2: Align Parameters		
Category	**Parameter**	**Description**
Align	Spiral-Index Search Width (Y)	The width of the spiral search area outside the Index. When the System fails to find a Model, it makes a spiral search around the area. The parameter is defined per Angle. **Possible Values**: min = **0**, max = **300**, Default = **50**
Align	Street Index	During the Teach Index procedure, this parameter is updated according to the Cut Index of the second angle. Only relevant if Street is selected as the Align Type. **Possible Values**: min = **0.1**, max = **300,** Default = **1**
Align	Sub Model High Score (%)	The threshold value which serves for model verification **Should be set to 80% or higher**
Align	Taught	Whether Alignment has been taught. If Alignment has already been taught, the User can teach it again and override or update existing parameters. Defined per Angle. **Possible Values**: **Yes, No (default)**

Table A-2: Align Parameters		
Category	**Parameter**	**Description**
Align	Type	The way Auto Alignment is performed. Defined per Angle. **Possible Values**: **No (default)**: No Alignment is performed on the Workpiece. The center of the Cutting Chuck is used as a reference point or the previous taught alignment. **Manual**: The User must perform Manual Alignment. **Street**: Auto Alignment is performed by finding a Model (repeating pattern) along a Street. **2-Points**: Auto Alignment is performed by finding two different Models at two pre-defined locations. **V-Street**: Similar to the **Street** Align Type but performed on the vertical Y-Axis. **V-2-Points**: Auto Alignment is performed by finding a Model on the vertical Y-Axis that is repeated at two defined locations. **Dress Manual Once**: Type of Manual Alignment performed on a Dressing Workpiece (relevant only for dressing recipes). **Copy-From**: Dicing is performed using the same Cut Position defined for the previous Angle. **Copy-From Ref**: The user has to define a cut position for this angle.
Align	Use Model Angle	Whether to roughly align the Workpiece using the first Model found before continuing with the Alignment process. This option is used (1) when the mounting angle is unknown or is larger than the Wafer Mounting Angle Tolerance or (2) when the model is clear and has a defined orientation. **Possible Values**: **Yes (default), No**
Align	Verification	Whether the Model 7100 should confirm Alignment by finding two Models to re-check Alignment accuracy. **Possible Values**: **Yes, No (default)**
Align	Verify All Models	Whether the Model 7100 should confirm Alignment by bringing each Model in turn to the center of the FOV and performing Find. This option is rarely used unless there is a problem with the axes or pixel. **Possible Values**: **Yes, No (default)**

Table A-2: Align Parameters		
Category	**Parameter**	**Description**
Align	Vertical Manual Alignment	When a vertical Alignment Type is specified, whether manual Alignment is still horizontal. **Possible Values**: **Yes, No (default)**
Align	Verification	Whether the Model 7100 should confirm Alignment by finding two Models to re-check Alignment accuracy. **Possible Values**: **Yes, No (default)** For **Cree** purposes this parameter should be set to **Yes**.
Align	Wafer Mounting Angle Tolerance	The maximum acceptable deviation (in degrees) between horizontal Streets and the horizontal edge of the frame holding the Workpiece. **Possible Values**: min = **0.01**, max = **30,** Default = **3**

Align Kerf Model Parameters

Table A-3 lists the parameters in the Align Keft Model category.

Table A-3: Align Keft Model Parameters		
Category	**Parameter**	**Description**
Align Keft Model	Kerf Model Mask Box Width*	Defines the Kerf model masking width (Y direction value). Should be added to each angle in the recipe. **Units [mm], Min = 0, Max=1 default=0**
Align Kerf Model	Kerf Model W-min*	Defines the minimum allowed kerf width for "Align Kerf Model". If the actual kerf width is below the defined value, the software fails to find the "Align Kerf Model" and displays an error message. Should be added to each angle in the recipe. **Units [mm], Min = 0.005, Max = 1, Default 0.01**
Align Kerf Model	Kerf Model W-max*	Defines the maximum allowed kerf width for "Align Kerf Model". If the actual kerf width is above the defined value, the software fails to find the "Align Kerf Model" and displays an error message. Should be added to each angle in the recipe. **Units [mm], Min = 0.005, Max = 1, Default 0.02**
Align Kerf Model	Kerf Model Processing Iteration	Defines the number of iterations for each filter defined in the Processing Method. This feature follows the same principles as those of sub-indexes. **Possible Values**: min = **1**, max = **20**, Default = **1**

Table A-3: Align Keft Model Parameters		
Category	**Parameter**	**Description**
Align Kerf Model	Kerf Model Processing Methods	Defines the algorithm to be used. It works like sub indexes. Read the chapter describing each filter. **Optional values: Close Morphology, Open Morphology, Vertical Edge Filter, Horizontal Edge Filter, Smooth Filter.**
Align Kerf Model	Cut Position Centering	Configures the machine to cut in the center of the kerf and ignore the learned cut position. (The default value is No).

* These parameters are available for each module (Low, Main, Sub, and Verification) separately.

Auto Height Compensation

Table A-4 lists the parameters are involved in activating and using the Auto Height Compensation feature.

Table A-4: Auto Height Compensation Parameters		
Category	**Parameter**	**Description**
Height Compensation	Activate	Activates the exposure calculation and teaching process. The information is used only if the Compensate parameter is enabled. **Possible values:** **Yes, No (default)**
Height Compensation	Compensate	Toggles the compensation process ON/OFF. **Possible values:** **Yes, No (default)**
Height Compensation	Cut Depth Tolerance	Determines the depth tolerance in microns by which the calculations take place. A high tolerance value means that the exposure calculations are more easily made, at the expense of accuracy. **Possible values:** **5 - 500 microns, default: 10**
Height Compensation	Rate	Determines the rate in which non contact height procedure is performed, by effecting the **Height Rate** parameter. The non contact height results are used to calculate blade exposure. **Possible values:** **1 (default) - 3**

Average Index Parameters

Table A-5 lists the parameters in the Average Index category.

Table A-5: Average Index Parameters		
Category	**Parameter**	**Description**
Average Index	Active	When set to **Yes**, the system calculates the Average Index between the Start Index and Stop Index and defined category **Optional values**: **Yes, No (default)**
Average Index	Extend	When set to **Yes**, the system uses the calculated Average Index throughout the cut map. The cut map can be extended to cover unmapped areas. The extension is based on the closest mapped area, for which the Average Index was calculated (see Figure 6-22). **Optional values**: **Yes, No (default)**
Average Index	Index Tolerance	Defines the tolerance for acceptable value of calculated index based on original value (defined by the user in the cutting index for each angle in the recipe). If the calculated value exceeds the tolerance value, the system fails to build a cut map, and an error message is displayed. The user should check the actual index and update the value of the expected index or tolerance. **Possible values**: **min=.001, max=1, Default=.015**
Average Index	Nominal Distance	Defines the assumed, or estimated, distance between the highest and lowest points along the Y-Axis, between which the streets are located. It enables measuring a vertical distance between two cut-verify models and calculating an average index. This feature is based on the existing Average Index State Machine. **Possible values**: **min=0, max=300, Default=95**
Average Index	No. of models per street	Defines the number of Cut Verify models used to calculate the Average Index. Since the measurement takes place between a single high point and a single low point along the Y-Axis, the user selects the value: 1 Two Cut Verify models can be taught only if the Rotational Shrinkage category is activated. **Optional values**: **1, 2 (default)**

Table A-5: Average Index Parameters		
Category	**Parameter**	**Description**
Average Index	Start Index	Defines the position, from which the system will start calculating the Average Index using the Cut Verify models. **Units**: **Index** **Possible Values**: min = **1**, max = **5000**, Default = **1**
Average Index	Stop Index	Defines the position, from which the system will stop calculating the Average Index using the Cut Verify models. **Units**: **Index** **Possible Values**: min = **3**, max = **5000**, Default = **3**
Average Index	Y Range	Defines the subgroups within the area between the Start Index and Stop Index, according to which the system calculates the Average Index for the specific group. **Possible Values**: min = **1**, max = **5000**, Default = **2**

Bar Code Parameters

Table A-6 lists the Bar Code parameters. Blade parameters are used to define the permitted wear of the Blade.

Table A-6: Bar Code Reader Parameters		
Category	**Parameter**	**Description**
Bar Code Reader	Activate	Activates the Bar Code feature for Multi-Panel. **Possible Values**: **No (default), Yes**

Blade Parameters

Table A-7 lists the Blade parameters. Blade parameters are used to define the permitted wear of the Blade.

Table A-7: Blade Parameters

Category	Parameter	Description
Blade	After Change Treatment	Whether to perform Dressing, Override or neither after a Blade Change. **Possible Values**: **None (default), Override, Dressing**
Blade	Max Wear Rate	The maximum amount the Blade can wear down within a specified cut length. **Possible Values**: min = **0**, max = **100**, Default = **0**
Blade	Min Exposure Left	The minimum exposure permitted before a Blade stops cutting. A value must be specified for this parameter and **Min Exposure Warn Delta** OR **Max Wear** and **Max Wear Warn Delta**. **Possible Values**: min = **0**, max = **100**, Default =**.1**
Blade	Min Exposure Warn Delta	The minimum exposure on the Blade that triggers a warning. This parameter should be specified with **Min Exposure Left**. **Possible Values**: min = **0**, max = **100**, Default =**.1**
Blade	Warn Cut Length	The maximum cut length permitted before the Blade must be changed. **Possible Values**: min = **0**, max = **1E+06**, Default = **1E+06**

Cut Depth Comp

Table A-8 lists the Cut Depth Comp parameters. The Cut Depth Comp parameters define values used as compensation when cutting with Bevel Blades.

Table A-8: Cut Depth Comp Parameters

Category	Parameter	Description
Cut Depth Comp	Activate	Whether to perform Cut Depth Compensation. **Possible Values**: **Yes**, **No (default)**
Cut Depth Comp	Blade Angle Factor	The number by which you divide the amount of compensation in order to determine by how much you need to lower the Z-Axis. **Possible Values**: min = **0**, max = **10**, Default = **0**
Cut Depth Comp	Min Cut Depth	The minimum permitted variation in cut depth. **Possible Values**: min = **0**, max = **1**, Default = **0**
Cut Depth Comp	Max Cut Width	The maximum permitted cut width. **Possible Values**: min = **0**, max = **1**, Default = **0**
Cut Depth Comp	Min Cut Width	The minimum permitted cut width. **Possible Values**: min = **0**, max = **1**, Default = **0**
Cut Depth Comp	Shift Depth Every Angle	The amount by which the Z-Axis is moved during the Turntable rotation to compensate for shifts in the Cutting Chuck. The default value of 0 is recommended. **Possible Values**: min = **-1**, max = **1**, Default = **0**

Cut Parameters

Table A-9 lists the parameters in the Cut category. Cut parameters define the way Workpieces are cut in the Model 7100.

Table A-9: Cut Parameters		
Category	**Parameter**	**Description**
Cut	Chopping Velocity	The speed of the Z-Axis (mm/sec) when performing a chop into a Workpiece. Usually performed with the Standard APC algorithm. **Possible Values**: min =**.05**, max = **2**, Default =**.1**
Cut	Chopping Z Start	The height above the workpiece, at which the spindle switches to the chopping velocity. **Default = 20 mil (0.5 mm)**
Cut	Copy All Cut Map	When set to **Yes**, all the cut information, including shrinkage, average index and cut angle are copied and used. When set to **No**, only the absolute angle is copied and used (this is similar to the method before the feature update).
Cut	Cut Depth	The distance along the Z-Axis between the top of the Workpiece and the cutting edge of the Blade in its cutting position. **Possible Values (mm)**: min =**.001**, max = **8**, Default =**.1**
Cut	Cut Entry Speed	The speed of the Cutting Chuck (mm/sec) in the X direction during the entry to the Workpiece. (See Figure A-1.) **Possible Values**: min =**.01**, max = **300**, Default = **10**
Cut	Cut Exit Speed	The speed of the Cutting Chuck (mm/sec) in the X direction during the exit from the cut. (See Figure A-1.) **Possible Values**: min =**.01**, max = **300**, Default = **10**
Cut	Cut Length	The length of each cut. This parameter is relevant when cutting using the Standard APC algorithm. **Possible Values**: min = **0**, max = **400**, Default = **200**

Table A-9: Cut Parameters		
Category	**Parameter**	**Description**
Cut	Cut Map Build Direction	Defines the direction in which the Cut Map is built. **Possible Values**: **Front to Back, Back to Front (default)**
Cut	Cut Map - X Shift	Defines an offset in the X direction for determining the cut position used to draw the Cut Map. **Possible Values**: min = -**200**, max = **200**, Default = **0**
Cut	Cut Map - Y Shift	Defines an offset in the Y direction for determining the cut position used to draw the Cut Map. **Possible Values**: min = -**200**, max = **200**, Default = **0**
Cut	Cut Type	The cutting direction. **Possible Values**: **Normal (default)**: The direction of the Chuck during cutting is from left to right. **Back**: The direction of the Chuck during cutting is from right to left. **Mixed**: The direction of the Chuck during cutting alternates after each cut.
Cut	Cuts No.	The number of cuts. This parameter is relevant when cutting using the Standard APC algorithm. **Possible Values**: min = **0**, max = **9999**, Default = **16**
Cut	Cutting Direction	Defines the cutting direction. **Possible Values**: **Front to Back, Back to Front (default)**
Cut	Cutting Speed	The speed of the Cutting Chuck (mm/sec) in the X direction during the cut. (In effect, this is the speed at which the Blade moves through the Workpiece.) (See Figure A-1.) **Possible Values**: min =**.01**, max = **300**, Default = **10**
Cut	Depth	The distance along the Z-Axis between Chuck Level and the cutting edge of the Blade in its cutting position. **Possible Values**: min =**.015**, max = **30**, Default =**.045**

Table A-9: Cut Parameters		
Category	**Parameter**	**Description**
Cut	Entry Overcut	The distance for which the entry speed is maintained to ensure the Blade enters the Workpiece at the specified speed. **Possible Values (μ/sec)**: min = **0**, max = **30**, Default = **0**
Cut	Exit Overcut	The distance the exit speed is maintained to ensure the Blade actually exits the Workpiece at the specified speed. **Possible Values (μ/sec)**: min = **0**, max = **30**, Default = **0**
Cut	From Index	The number of the Index in the Cut Map at which to start cutting. **Possible Values**: min = **1**, max = **999**, Default = **1**
Cut	Index	The distance along the Y-Axis between adjacent cuts in a Workpiece. Multiple Indices of various lengths can de defined for a Workpiece. The first Index is the Main Index and subsequent Indices are subindices. Each Index can have a different Cut Depth and Speed. **Possible Values**: min =-**300**, max = **300**, Default =**.1**
Cut	Optimized Order	The cutting sequence. If set to "**Yes**" the cutting starts from the last alignment angle. **Possible Values**: **No**: Align Angle 0, align Angle 90, cut Angle 0, cut Angle 90 **Yes**: Align Angle 0, align Angle 90, cut Angle 90, cut Angle 0
Cut	Overcut	The distance for which the entry and exit speed is maintained to ensure the Blade enters and exits the Workpiece at the specified speed. **Possible Values**: min = **0**, max = **100**, Default = **0**

Table A-9: Cut Parameters		
Category	**Parameter**	**Description**
Cut	Overtravel	The distance along the X-Axis that is added to the cut to ensure that all cuts begin from beyond the edge of the Workpiece. For APC, this distance is added only to the start cut. The cut length should compensate for this addition. For GPC, this distance is added to both X and Y. (See Overtravel - Y-Axis.) This value compensates for any inaccuracies in placement of the Workpiece on the Cutting Chuck. **Possible Values**: min = **0**, max = **100**, Default = **10**
Cut	Overtravel - Y-Axis	The distance along the Y-Axis that is added to the cuts to ensure that all cuts begin from beyond the edge of the Workpiece. This value compensates for any inaccuracies in placement of the Workpiece on the Cutting Chuck. **Possible Values**: min = **-100**, max = **100**, Default = **10**
Cut	Spindle Speed (KRPM)	The rotational speed of the Spindle (in KPRM). **Possible Values**: min = **1**, max = **30**, Default = **4**
Cut	To Index	The number of the Index in the Cut Map at which to stop cutting. **Possible Values**: min = **1**, max = **999**, Default = **999**

The following diagram illustrates the velocity and travel of the X-Axis during cutting:

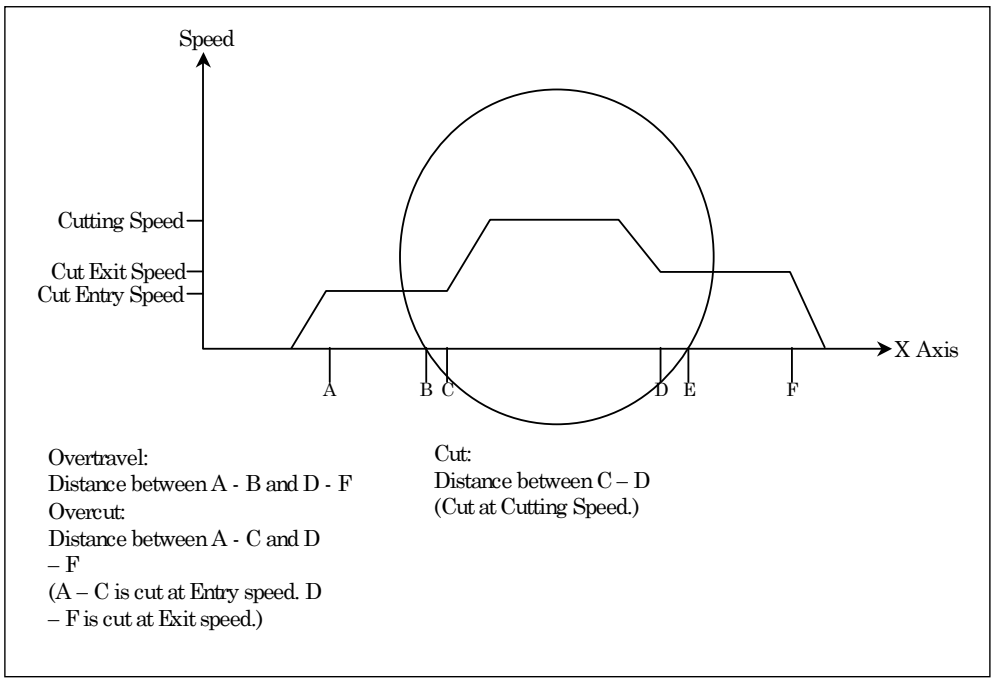


Figure A-1: Velocity of X-Axis

Cut Verify Parameters

Table A-10 lists the parameters in the Cut Verify category. The Cut Verify parameters define the Cut Verification procedure.

Table A-10: Cut Verify Parameters

Category	Parameter	Description
Cut Verify	Activate	Whether to perform Cut Verification. **Possible Values**: **Yes**, **No (default)**
Cut Verify	First Cut No.	The cut number where Cut Verification begins. **Possible Values**: min = **1**, max = **999**, Default = **0**
Cut Verify	Last Cut No.	The cut number where Cut Verification ends. **Possible Values**: min = **1**, max = **999**, Default = **999**
Cut Verify	Model Type	Allows to select the type of the model used for Cut Verification. **Possible Values**: **Main, Low, Sub, Verification.**

Table A-10: Cut Verify Parameters		
Category	**Parameter**	**Description**
Cut Verify	Number of Models	Enables the verification of two models to be used for Average Index with Nominal Distance. While performing the Average Index procedure with two models, the value of this parameter should be: 2 **Optional values**: **1 (default), 2**
Cut Verify	Rate	The number of cuts between each instance of Cut Verification. **Possible Values**: min = **0**, max = **999**, Default = **10**
Cut Verify	Recover Option	When Pause is selected, if model detection fails, the system displays an error message and forces the user to repeat the Cut Verify sequence, using automatic Cut Verify or manual cut verify, until it passes. If Report is selected, the system displays an error message, but continues cutting according to the original index, until the next cut verification, defined by the Cut Verify rate. **Optional values**: **Pause (default), Report**
Cut Verify	Settling Time	The amount of time the Workpiece is allowed to dry before the Cut Verification begins. **Possible Values**: min = **0**, max = **20**, Default = **0.5**
Cut Verify	Special Search	If "Yes" is selected and in case the original model has not been found, the system performs a search along the X-Axis for Cut Verification Models. **Possible Values**: **Yes**, **No (default)**
Cut Verify	Use Y Shift	If it is set to **Yes**, the Cut Verify models are searched relatively to the cut position and Cut Map Y Shift. If it is set to **No**, the Cut Verify models are searched relatively to the cut position only. **Optional values**: **Yes (default), No**
Cut Verify	Verification Offset Tolerance	This parameter defines the acceptable offset deviation during cut. This parameter is used when the X Search parameter value is greater than 1.

Table A-10: Cut Verify Parameters		
Category	**Parameter**	**Description**
Cut Verify	X Pos	The position on the X-Axis where Cut Verification is performed. This value is automatically specified. **Possible Values**: min = **0**, max = **300**, Default = **0**
Cut Verify	X Searches	The number of places for which the machine will search. These points are taught in the “Teach Align” procedure.
Cut Verify	Y Pos	The position on the Y-Axis where Cut Verification is performed. This value is automatically specified. **Possible Values**: min = **0**, max = **300**, Default = **0**

Cut Verify Limit Parameters

Table A-11 lists the Cut Verify Limit parameters. The Cut Verify Limit parameters define limits for the Cut Verification procedure.

Table A-11: Cut Verify Limit Parameters		
Category	**Parameter**	**Description**
Cut Verify Limit	Head1 X-Shift	The maximum shift of the new cut position in the X direction. Used for Auto Cut Verification. **Possible Values**: min = **0**, max = **600**, Default = **3**
Cut Verify Limit	Head1 Y-Shift	The maximum shift of the new cut position in the Y direction. Used for Auto Cut Verification **Possible Values**: min = **0**, max = **600**, Default = **3**
Cut Verify Limit	Manual Head1 X-Shift	The maximum shift of the new cut position in the X direction. Used for Manual Cut Verification. **Possible Values**: min = **0**, max = **600**, Default = **3**
Cut Verify Limit	Manual Head1 Y-Shift	The maximum shift of the new cut position in the Y direction. Used for Manual Cut Verification. **Possible Values**: min = **0**, max = **600**, Default = **3**

Diagnostisc Parameters

Table A-13 lists the parameters in the Dressing category. Dressing parameters define how the Blade is dressed.

Table A-12: Dressing Parameters		
Category	**Parameter**	**Description**
Diagnostics > Chuck	Chuck height side	**Possible Values**: **Left, Right (default)**
Diagnostics	Chuck to non chuck tolerance	**Possible Values**: min = **0**, max = **-**, Default = **10**
Diagnostics	Chuck to non chuck Init Tolerance	**Possible Values**: min = **0**, max = **-**, Default = **30**
Diagnostics	Number of delta measurement	**Possible Values**: min = **1**, max = **10**, Default = **1**

Dressing Parameters

Table A-13 lists the parameters in the Dressing category. Dressing parameters define how the Blade is dressed.

Table A-13: Dressing Parameters		
Category	**Parameter**	**Description**
Dressing	Dress Length	The total length of the cut to be performed. Blade Dressing can include multiple Cut Lengths. For every Cut Length defined, the User must define a Cut Depth (or Depth), Begin Speed and End Speed. **Possible Values**: min = **0**, max = **200000**, Default = **5000**
Dressing	Dressing Cut Depth	The distance along the Z-Axis between the top of the dressing Workpiece (or Dressing Block) and the cutting edge of the Blade in its cutting position. **Possible Values**: min = **0**, max = **18**, Default = **0**
Dressing	Dressing Depth	The distance along the Z-Axis between Chuck Level and the cutting edge of the Blade in its cutting position. **Possible Values**: min =**.015**, max = **30**, Default =**.05**

Table A-13: Dressing Parameters		
Category	**Parameter**	**Description**
Dressing	Dressing End Speed	The speed of the X-Axis (mm/sec) at the end of the Dressing process. **Possible Values**: min = **1**, max = **200**, Default = **30**
Dressing	Dressing Index	The distance along the Y-Axis between adjacent cuts in a Dressing Workpiece. **Possible Values**: min =**.05**, max = **100**, Default = **2**
Dressing	Dressing Start Speed	The speed of the X-Axis (mm/sec) at the beginning of the Dressing process. **Possible Values**: min = **1**, max = **200**, Default = **30**

Dress Block Parameters

Table A-14 lists the parameters in the Dress Block category. Dress Block parameters define the Dress Block settings for the Model 7100 applications

Table A-14: Dress Block Parameters		
Category	**Parameter**	**Description**
Dress Block	Activate	Defines if the Dress Block is activated. **Options**: **Yes (Default), No**
Dress Block	Animation Chop Length	Defines the animation lines displayed after every chop. **Options**: **1- 30 mm**. **Default = 2**
Dress Block	Chop X-Index	Defines the X-Index at which the saw jumps between the chops within the X-Axis. **Options**: **0.1 - 30 mm**. **Default = 5**
Dress Block	Chop Z-Start	Defines the Z-Axis position above the Dressing Block, at which the Chopping Velocity is applied. **Options**: **0.1 - 5 mm**. **Default = 0.3**
Dress Block	Chopping Velocity	Z-Axis velocity at the last stage of chopping. **Options**: **0.001 - 5 mm/sec**. **Default = 0.2**
Dress Block	Dress/Chop Cut Depth	Cut depth to which the blade enters the Dressing Block. **Options**: **0.1 - 5 mm**. **Default = 1**

Table A-14: Dress Block Parameters		
Category	**Parameter**	**Description**
Dress Block	Dress/Chop Depth	Cut depth to which the blade enters the Dressing Block as related to the Dress Station surface. **Options**: **0.1 - 5 mm**. **Default = 1**
Dress Block	Dress/Chop Rate	Defines the number of wafer cuts, after which the System performs blade dressing. **Options**: **0 - 100 cuts**. **Default = 0**
Dress Block	Dress After a No. of Heights	Defines the number of Height procedures, after which the System performs blade dressing. **Options**: **0 - 100 Height Procedures**. **Default = 0**
Dress Block	Dress Cut Length	Defines the total cut length of the Dressing Block, including the over-travel. **Options**: **0 - 60 mm. Default = 40**
Dress Block	Dress Cutting Speed	Defines the X-Axis speed in dressing process (relevant only for Cut mode). **Options**: **0.001 - 100 mm/sec. Default = 1**
Dress Block	Dressing Mode	Defines the dressing mode used in a specific recipe. It is important to select the mode before setting the other parameter values. **Options**: **Cut (Default), Chop**
Dress Block	Height After Dress	Defines if dressing should be followed by Height procedure. **Options**: **Yes (Default), No**
Dress Block	Height Before Dress	Defines if dressing should be preceded by Height procedure. **Options**: **Yes, No (Default)**
Dress Block	Number of Dress/ Chop Cuts	Defines the number of cuts in either dressing mode, required for sufficient blade dressing. **Options**: **1-100, Default = 2**
Dress Block	Dress Spindle Speed	Defines the Dressing process spindle speed. **Options**: **1 - 60 KRPM, Default = 10**

Height Parameters

Table A-15 lists the parameters in the Height category. Height parameters define the way the Model 7100 performs the Height procedure.

Table A-15: Height Parameters

Category	Parameter	Description
Height	Height Check Units	The unit of measurement for height checks. **Possible Values**: **Length**, **No of Cuts (default)**
Height	Height Type	Whether to postpone the Process Height procedure for the normal Blade. **Possible Values**: **Regular (default)**: Perform the Process Height procedure as normal. **Defer**: Postpone the Process Height procedure after cutting the current Workpiece. (Used to perform height only after the Workpiece is removed.)
Height	Settling Time	Time delay between the time the saw reaches the NCH/Button station and the beginning of blade descending to perform the Height procedure. This gives more time for the air to clean and dry the workpiece. **Possible Values**: min = **0**, max = **20**, Default = **0.5**
Height	Height Check Rate	How often a height check is performed. **Possible Values**: min = **1**, max = **2x10^{6}**, Default = **10**

Kerf Check Parameters

Table A-16 lists the parameters in the Kerf Check category. Kerf Check parameters define the way the Model 7100 performs Kerf Checks, which examine the quality and position of cuts performed on a Workpiece.

Table A-16: Kerf Check Parameters

Category	Parameter	Description
Kerf Check	Active	Enables/disables the Kerf Check function. **Possible Values**: **Yes**, **No**
Kerf Check	Area	The percentage area of the cut map that should be checked. **Possible Values**: min = **10**, max = **100**, Default = **80**
Kerf Check	Auto Y Offset Correction	Whether to correct the Y Offset automatically. **Possible Values**: **Yes (default)**, **No**
Kerf Check	Bevel Mask Box Height	The size of the mask that covers the center of the Kerf when cutting with a Bevel Blade. Without a mask, the variation in color of a Bevel cut may lead the System to misjudge the cut (for example, find two cuts) during the Teach Kerf Check procedure. The parameter should be about 25% less than the width of the Kerf. **Possible Values**: min = **0**, max = **1**, Default = **0**
Kerf Check	Check Main Street Only	Defines whether the Kerf Check should check only the main street (Yes) or all the streets (No). **Possible Values**: **Yes**, **No (default)**
Kerf Check	First Cut No.	The Street where Kerf Checking begins. **Possible Values**: min = **1**, max = **999**, Default = **1** The default value of **0** means a Kerf Check is performed on the first cut.
Kerf Check	Head1 Taught	Whether Kerf Checking has been taught. **Possible Values**: **Yes**, **No (default)**
Kerf Check	Kerf Check Algorithm	**Possible values**: **N/A, Standard (default)**, **Adaptive**, **Advanced**, **Adaptive Only**, **Advanced Only, Upper Bar, Lower Bar** (see section 6.3)

Table A-16: Kerf Check Parameters		
Category	**Parameter**	**Description**
Kerf Check	Last Cut No.	The Street where Kerf Checking ends. **Possible Values**: min = **1**, max = **999**, Default = **999** The default value of **999** means Kerf Checking is performed to the last cut.
Kerf Check	Max. Failures per Cut	The number of Kerf Check failures permitted per cut. If more than this number of Kerf Checks fail, the Recover option comes into play. **Possible Values**: min = **0**, max = **99**, Default = **10**
Kerf Check	No. Checks per Cut	The number of Kerf Checks performed on each cut. **Possible Values**: min = **0**, max = **99**, Default = **5**
Kerf Check	Number of Steps per Check	Defines whether the Kerf Check will be performed in one step or in two steps. When set to 2, all Kerf Check parameters have two lines in the parameter table (see Figure 6-4) **Possible Values**: **1-2** **Default value**: **1**
Kerf Check	Perform Y-Offset in Step	Defines the Kerf Check step, in which the Y-Offset procedure is performed. **Options**: **1 (Default), 2**
Kerf Check	Perform Z-Compensation in Step	Defines, according to which Kerf Check step the System performs Z-Compensation. **Options**: **1, 2 (Default)**
Kerf Check	Rate	The number of Streets cut before a Kerf Check is performed. **Possible Values**: min = **0**, max = **999**, Default = **5**
Kerf Check	Recover Option	The action taken by the Model 7100 should the Kerf Check fail. **Possible Values**: **Pause (default)**: Machine stops and waits for User intervention, for example, for the user to find a Model. **Report**: Failure reported, machine continues cutting. **Ignore**: Failure ignored, machine continues cutting.

Table A-16: Kerf Check Parameters		
Category	**Parameter**	**Description**
Kerf Check	Settling Time	The amount of time the Workkpiece is allowed to dry before the Kerf Check begins. **Possible Values**: min = **0**, max = **20**, Default = **0.5**
Kerf Check	Use Model-to-Kerf	Whether the System checks the Model during a Kerf Check and uses the Model-to-Kerf distance to check the position of the cut. If the Kerf Check finds that the Model to Kerf distance is more or less than a specified value, dicing stops. This method is used when the Index is not constant (Y-Axis offset is based on the Index), or the Workpiece is not stable and moves during cutting (for example, ceramic Workpieces). In order for this method to be used, the Kerf Check algorithm must be selected in the Recipe's properties and the **Activate** parameter in the Cut Verify category must be **No**. **Possible Values**: **Yes**, **No (default)**

Kerf Check Limit Parameters

Table A-17 lists the parameters in the Kerf Check Limit category. Kerf Check Limit parameters define the range of acceptable Kerf Check results.

Table A-17: Kerf Check Limit Parameters		
Category	**Parameter**	**Description**
Kerf Check Limit	Head1 Bottom Chipping	The maximum distance permitted from the lowest point of a chip to the tip of the largest chip on the lower-cut edge. If this figure is exceeded, even for one Kerf Check on a cut, the entire cut fails and the Recover option comes into effect. **Possible Values**: min = **0**, max = **9999**, Default = **0**
Kerf Check Limit	Head1 Bottom Chipping Area	The maximum area permitted for the total chipping area on the lower edge of the cut. If this figure is exceeded, even for one Kerf Check on a cut, the entire cut fails and the Recover option comes into effect. **Possible Values**: min = **0**, max = **1**, Default = **0**

Table A-17: Kerf Check Limit Parameters		
Category	**Parameter**	**Description**
Kerf Check Limit	Head1 Center-To-Max Chip	The maximum distance permitted from the center of the cut to the tip of the largest chip. **Possible Values (mm)**: min = **0**, max = **1**, Default = **0**
Kerf Check Limit	Head1 Correction DY Offset	When the Kerf Check finds a dY Offset above this value, no automatic Y Offset correction is performed but an error is found. When the Kerf Check finds a dY Offset below this value, automatic Y Offset correction is performed. This parameter only takes effect when **Auto Y Offset Correction** is **Yes**. **Possible Values (mm)**: min = **0**, max = **1**, Default = **0**
Kerf Check Limit	Head1 No Correction DY Offset	When the Kerf Check finds a dY Offset below this value, no automatic Y Offset correction is performed. When the Kerf Check finds a dY Offset above this value, automatic Y Offset correction is performed. This parameter only takes effect when **Auto Y Offset Correction** is **Yes**. **Possible Values**: min = **0**, max = **9999**, Default = **0**
Kerf Check Limit	Head1 Skew	The maximum offset permitted in the Y-Axis between the first and last Model found. **Possible Values**: min = **0**, max = **1**, Default = **0**
Kerf Check Limit	Head1 Top Chipping	The maximum distance permitted from the lowest point of a chip to the tip of the largest chip on the upper-cut edge. **Possible Values (mm)**: min = **0**, max = **1**, Default = **0**
Kerf Check Limit	Head1 Top Chipping Area	The maximum area permitted for the total chipping area on the upper edge of the cut. **Possible Values**: min = **0**, max = **9999**, Default = **0**
Kerf Check Limit	Head1 WMax	The maximum allowed cut width. **Possible Values**: min = **0**, max = **1**, Default = **0**
Kerf Check Limit	Head1 WMin	The minimum allowed cut width. **Possible Values**: min = **0**, max = **1**, Default = **0**

Load Monitor Cutting Parameters

Table A-18 lists the parameters in the Load Monitor Cutting category. Load Monitor parameters define the way Model 7100 monitors the electrical charge required to spin the Spindle and allow the blades to function for cutting.

Note: Load Monitor Cutting Parameters apply to future versions of the Model 7100 only.

Table A-18: Load Monitor Cutting Parameters

Category	Parameter	Description
LM Cutting	F Sp High AVG Limit	The highest average load the Load Monitor allows until the response is elicited. **Possible Values**: min = **0** max = **15** Default = **13**
LM Cutting	F Sp Low AVG Limit	The lowest average load the Load Monitor allows until the response is elicited. **Possible Values**: min = **0** max= **15** Default= **0**
LM Cutting	Load Logging	Defines cut monitoring. **Possible Values**: **First Cut, Each Cut, No (default)**

Load Monitor Baseline

Table A-19 lists the parameters in the Load Monitor Baseline category. Load Monitor parameters define the way Model 7100 monitors the load of the Spindle excluding the load of the actual cutting process.

Note: Load Monitor Baseline Parameters apply to future versions of the Model 7100 only.

Table A-19: Load Monitor Baseline Parameters

Category	Parameter	Description
LM Baseline	F Sp Flow Control Stabilization Delay	The delay before measuring the Baseline which allows the water flow rate to stabilize. **Possible Values**: min = **0** max= **100** Default= **2**

Loop Cut Parameters

Table A-20 lists the parameters in the Loop Cut category. Loop Cut parameters define the way the Model 7100 cuts using the Standard APC algorithm and repetitive patterns.

Table A-20: Loop Cut Parameters

Category	Parameter	Description
Loop Cut	First Angle	The angle where the loop starts. **Possible Values (Pure)**: min = **0**, max = **99**, Default = **0**
Loop Cut	Last Angle	The angle where the loop ends. **Possible Values (Pure)**: min = **0**, max = **99**, Default = **0**
Loop Cut	Number of Repetition	The number of times a loop is performed. **Possible Values**: min = **0**, max = **1024**, Default = **0**
Loop Cut	X Shift	The offset from the last cut position in the X direction, between the loop repetitions. **Possible Values**: min = -**990**, max = **999**, Default = **0**
Loop Cut	Y Shift	The offset from the last cut position in the Y direction, between the loop repetitions. **Possible Values**: min = -**990**, max = **999**, Default = **0**

Manual Inspection Parameters

Table A-21 lists the parameters in the Manual Inspection category.

Table A-21: Manual Inspection Parameters

Category	Parameter	Description
Manual Inspection	Activate	Defines whether or not the Manual Inspection feature is activated. **Optional Values**: **Yes, No (Default)**
Manual Inspection	Coaxial Illumination After Cut	Defines the Coaxial illumination intensity for the inspection that is done after the cut. (This parameter value is inserted manually). **Possible Values**: min = **0**, max = **255**, Default = **0**

Table A-21: Manual Inspection Parameters		
Category	**Parameter**	**Description**
Manual Inspection	Coaxial Illumination Before Cut	Defines the Coaxial illumination intensity for the inspection that is done before the cut. (This parameter value is inserted manually). **Possible Values**: min = **0**, max = **255**, Default = **0**
Manual Inspection	First Cut No.	**Possible Values**: min = **1**, max = **999**, Default = **1**
Manual Inspection	Focus on Kerf Step After Cut	Defines what focus settings are used for manual inspection after cut. The focus setting are taught at the Teach Kerf Check stage for every step of Kerf Check. **Options**: **1 (Default); 2**
Manual Inspection	Focus on Kerf Step Before Cut	Defines what focus settings are used for manual inspection before cut. The focus setting are taught at the Teach Kerf Check stage for every step of Kerf Check. **Options**: **1 (Default); 2**
Manual Inspection	Inspection Before Cut	When set to Yes, enables performing inspection on a cut map street prior to the cut. **Optional Values**: **Yes, No (Default)**
Manual Inspection	Inspection Focus Type After Cut	Defines the Z position for the inspection that is done after the cut. **Possible Values**: **Wafer (Default), Align, Kerf**
Manual Inspection	Inspection Focus Type Before Cut	Defines the Z position for the inspection that is done before the cut. **Possible Values**: **Wafer (Default), Align, Kerf**
Manual Inspection	Last Cut No.	**Possible Values**: min = **1**, max = **999**, Default = **1**
Manual Inspection	Oblique Illumination After Cut	Defines the intensity of Coaxial Illumination for the Manual Inspection after cut. **Possible Values**: min = **0**, max = **255**, Default = **0**

Table A-21: Manual Inspection Parameters		
Category	**Parameter**	**Description**
Manual Inspection	Oblique Illumination Before Cut	Defines the intensity of Coaxial Illumination for the Manual Inspection before cut. **Possible Values**: min = **0**, max = **255**, Default = **0**
Manual Inspection	Rate	**Possible Values**: min = **0**, max = **255**, Default = **124**

Model Precessing Parameters

Table A-22 lists the parameters in the Model Processing category.

Table A-22: Model Processing Parameters		
Category	**Parameter**	**Description**
Model Preprocessing	Delay After Preprocessing	Defining the delay enables the user to review the models after preprocessing. The delay is used only for defining the preprocessing parameters for the specific process. **Optional values**: **0 - 20, default = 0. Units [Sec]**
Model Preprocessing	Method Iterations	Defines the number of iterations for each filter defined in the Processing Method. This feature follows the same principles as those of sub-indexes. **Possible Values**: min = **1**, max = **20**, Default = **1**
Model Preprocessing	Processing Method	Defines the algorithm to be used. It works like sub indexes. Read the chapter describing each filter. **Optional values: Close Morphology, Open Morphology, Vertical Edge Filter, Horizontal Edge Filter, Smooth Filter, Edge Filter.**
Model Preprocessing	Processing Method for All Models	Provides the Vision a capability to perform the pre-processing for each model, i.e., sub, main, low. **Optional values: Close Morphology, Open Morphology, Vertical Edge Filter, Horizontal Edge Filter, Smooth Filter, Edge Filter.**

MHS Parameters

Table A-23 lists the parameters in the MHS (Material Handling System) category.

Table A-23: MHS Parameters		
Category	**Parameter**	**Description**
MHS	Top Side Dry Speed	This parameter defines how many times and at what speed the Top Side drying will be performed. **Optional values: Min=1, Max=200, Default 50**

Multi-Panel Parameters

Table A-24 lists the parameters in the Multi-Panel category.

Table A-24: Material Handling System Parameters		
Category	**Parameter**	**Description**
Multi-Panel	Cut Per Panel	Defines whether the Multi-Panel application will cut the substrates per Panel or per Angle. **Optional values: Yes, No (Default)**
Multi-Panel	No. of Panels	Defines the number of substrates in a Multi-Panel application. **Min = 1, Max = 10, Default 1**

Override Parameters

Table A-25 lists the parameters in the Override category. Override parameters define how the Model 7100 performs Override on a production Workpiece as a means of dressing a new Blade.

Table A-25: Override Parameters		
Category	**Parameter**	**Description**
Override	Override End Speed	The speed of the X-Axis (mm/sec) at the end of the Override process. **Possible Values**: min = **1**, max = **200**, Default = **30**

Table A-25: Override Parameters		
Category	**Parameter**	**Description**
Override	Override Length	The total length of the cut when performing Override. **Possible Values**: min = **0**, max = **200000**, Default = **5000**
Override	Override Start Speed	The speed of the X-Axis (mm/sec) at the beginning of the Override process. **Possible Values**: min = **1**, max = **200**, Default = **30**

Shrinkage Parameters

Table A-26 lists the parameters in the Rotational Shrinkage category.

Table A-26: Shrinkage Parameters		
Category	**Parameter**	**Description**
Shrinkage	Activate	When **Yes** is selected, the rotational option is activated. The Rotational Shrinkage options are: 1. Performing Y Correction for specific street, according to two Cut Verify models (relevant only for two-point alignment). The software calculates the average Y cut position, based on the Cut Verify model detection. The "Align Correction" parameter should be set to **No**. 2. The second option is to perform full two-point alignment according to the Cut Verify models (The "Align Correction" parameter should be set to **Yes**. The "Align Correction Verification" can also be activated in order to verify this alignment.) **Optional values**: **Yes, No (default)**
Shrinkage	Align Correction	When **Yes** is selected, the system performs two-point alignment on the specific street, using the Cut Verify models. When No selected, and Active is set to Yes, the system performs only Y correction without Theta correction. **Optional values**: **Yes, No (default)**

Table A-26: Shrinkage Parameters		
Category	**Parameter**	**Description**
Shrinkage	Align Correction Verification	When **Yes** is selected, and Align Correction is set to **Yes**, the system performs alignment using the cut verify models. Then the system performs verification using the Final Alignment Accuracy, defined under Align category (General tab). When using this parameter, the Iteration(s) under Align category (General tab) should be set to **No**. **Optional values**: **Yes, No (default)**
Shrinkage	Shrinkage Before Cutting	Defines if to perform the Shrinkage algorithm during Alignment, prior to dicing. **Optional values**: **Yes (default), No**
Shrinkage	Theta Tolerance	Defines the tolerance allowed between original alignment Theta position (as defined in the recipe) and the actual Theta position observed in the cut verify procedure. This parameter is used in order to prevent the system from aligning the workpiece according to the model fount in the wrong street (one street below). **Default = 0.5, Units [degree], Min = 0.001, Max = 3**
Shrinkage	X Search Streets	Defines the numbers of streets on which the system will perform a search if the model has not been found and the Y search also failed. The logic is as follows: when a Cut Verify cannot be found, the system looks for additional models one street below in the Y direction, if this search still fails, the system starts searching the next street below in the Y direction, and finally it looks on street into the substrate according to the defined X Search Streets. **Optional values: 0 - 15; Default =1. Units [index]**
Shrinkage	Y Search Streets	Defines the numbers of streets on which the system will perform a search if the model has not been found in the Y direction. The logic is as follows: when a Cut Verify cannot be found, the system looks for additional models one street below in the X direction, if this search still fails, the system starts searching the next street below in the X direction, and finally it looks on street into the substrate according to the defined Y Search Streets. **Optional values: 0 - 15; Default =2. Units [index]**

Teach Center Parameters

Table A-27 lists the parameters in Teach Center category. Teach Center is the category which allows the User to define the edges of Substrates when working in multi panel mode.

Table A-27: Teach Center		
Category	**Parameter**	**Description**
Teach Center	Taught	Shows if the Center has been taught. **Possible Values:** **Yes, No (default)**
Teach Center	Workpiece's Center on Chuck Center	If yes is selected, the camera finds the center of the substrate by locating the center of the Chuck. Correlated by using the Align parameters, Center Co-ordinate X, Center Co-ordinate Y, and Number of Substrates (See Table A-2). **Possible Values**: **Yes (default)**, **No**

Tilted Spindle Parameters

Table A-28 lists the parameters in the Tilted Spindle category.

Table A-28: Tilted Spindle Parameters		
Category	**Parameter**	**Description**
Tilted Spindle	Tilted Spindle Angle	Defines the Spindle tilt angle value. **Options**: **0 - 15 degrees. Default = 2**
Tilted Spindle	Y-Offset After Height	Defines if the System is to perform Y-Offset after every Height procedure. **Options**: **Yes; No (Default)**

Wash Pipe Parameters

Table A-29 lists the parameters in the Wash Pipe category.

Table A-29: Wash Pipe Parameters

Category	Parameter	Description
Wash Pipe	Activate	Defines whether the wash pipe is active or not. **Options**: **Yes; No (Default)**
Wash Pipe	Display time	defines the time that elapses between displaying the wash delay message and the activation of the washing procedure. **Possible Values**: min = **1**, max = **1000 (sec)**, Default = **10**
Wash Pipe	Wash Pipe After Cut	Once set to yes will perform a washing action after the cut and before the next vision action. **Options**: **Yes; No (Default)**
Wash Pipe	Wash Pipe After Cut No.	Number of wash actions after the cut and before the next vision action. **Possible Values**: min = **1**, max = **10 (times)**, Default = **1**
Wash Pipe	Wash speed	Defines the X-Axis speed while washing. **Possible Values**: min = **0.01**, max = **300 (mm/sec)**, Default = **10**
Wash Pipe	Washing start delay	Defines the time that passes after the dicing stops and before the washing procedure is activated. **Possible Values**: min = **6**, max = **10000 (sec)**, Default = **30**

Y Offset Parameters

Table A-30 lists the parameters in the Y Offset category. The Y Offset parameters define how the Model 7100 performs the Y Offset procedure that measures the difference between the Blade and the Microscope in the Y direction.

Table A-30: Y Offset Parameters

Category	Parameter	Description
Y-Offset	Cutting Location	Defines the Y-Offset location in cases where there is no previous cut. **Next Cut (default)**: the next Y-Offset cut location (Workpiece or Dress Block) is determined by the user's choice. **Workpiece**: the next Y-Offset cut is performed on the Workpiece. **Dress Block**: the next Y-Offset cut is performed on the Dress Block.
Y Offset	Define End Location from Edge	The distance from the upper and lower edge of the Workpiece towards the center of the Workpiece within which the single cut can be performed. This parameter is relevant when Manual Y Offset is performed outside the cut map, meaning **In Cut Map Only** is set to **No**. **Possible Values**: min = **0**, max = **300**, Default = **10**
Y Offset	Define Start Location from Edge	The distance from the upper and lower edge of the Workpiece towards the edge of the frame within which the single cut can be performed. This parameter is relevant when Manual Y Offset is performed outside the cut map, meaning **In Cut Map Only** is set to **No**. **Possible Values**: min = **0**, max = **300**, Default = **3**
Y Offset	In Cut Map Only	Whether the Y Offset procedure can be performed outside the Cut Map. **Possible Values**: **Yes**, **No (default)**
Y Offset	New to Old Y Offset Max Delta	Maximum allowable change between current Y Offset and previous Y Offset. **Possible Values**: min = **0**, max = **300**, Default = **0.01**

Table A-30: Y Offset Parameters		
Category	**Parameter**	**Description**
Y Offset	Y Offset After Blade Change	Whether the Y Offset procedure should be automatically performed after each Blade change. **Possible Values**: **Yes**, **No (default)**
Y Offset	Y Offset Reference Position	Enables Teaching the reference position (center, lower edge or upper edge) and the pattern type (middle, kerf up, kerf down, upper bar or lower bar) of each kerf model separately. **Possible Values**: **Lower Edge**, **Upper Edge, Center (default)**

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