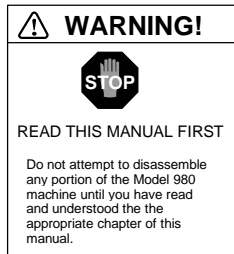


CHAPTER 1

OVERVIEW

1.1 INTRODUCTION

1.1.1 SCOPE



This manual contains setup, maintenance, descriptive and troubleshooting information for the K & S Model 980 Semiautomatic Dicing System.

No information concerning machine operation is included in this manual. For operating procedures, refer to Volume 1, the Model 980 Operation Manual.

1.1.2 MAINTENANCE MANUAL CONTENTS

The Model 980 Maintenance Manual is divided into several chapters and appendices as described below:

- **Chapter 1 Overview**

Contains description of manual contents, Technical Specifications of the 980 and general description of major subsystems.

- **Chapter 2 Mechanical Subsystems**

Contains descriptions and repair/replacement/adjustment procedures for the X-Cutting Axis Subsystem, the Y-Indexing Axis Subsystem, the Z-Height Axis, the Theta Rotary Axis and Chuck, the Optics Subassembly, Spindle Assembly (2" and 4" Machines), Pneumatic Systems and Cooling Water System.

- **Chapter 3 Electrical, Electronics and Optics Subsystems**

Contains description and repair/replacement/adjustment procedures for the Power Supply Subsystem, The Electronics Plug-in Card System, the individual printed Circuit Boards, The Spindle Assembly Electronic Controls, the Optics and Video Subsystem, the Vision (AISI) Subsystem^{*}, the Main MPU, Memory and Logic Boards, the Power Logic Board, Main Logic Board, the Microstepper Boards, PC Controller Board, VDG Board, and X Power Amplifier.

- **Chapter 4 Troubleshooting**

Provides an easy-to-follow chart, mapping the screen error codes and messages to a specific step-by-step procedure, designed to quickly locate and solve the associated problem.

- **Chapter 5 Preventive Maintenance**

Describes all recommended routine procedures, grouped according to the frequency of performance.

- **Appendices**

- **Appendix A Complete Parts List**

Provides a complete parts listing by item number and description for the Model 980.

- **Appendix B Recommended Spares List**

A list of parts, by item number and description that K & S recommends you stock on-site for 982-6 or 984-6 STD M/C's.

- **Appendix C Screw Tightening Guidelines**

A chart which shows the recommended tightening force, expressed in inch-pounds for screws and nuts as used in the Model 980.

- **Appendix D List of Acronyms and Abbreviations**

A complete listing of all abbreviations and acronyms used throughout this manual.

^{*}Optional

1.2 TECHNICAL SPECIFICATIONS

The following technical specifications are provided for both 982 and 984 Series Precision Dicing Systems.

The **982 Series**, intended for semiconductors and piezo-electric materials, is represented by the Models 982-6 and 982-10 having up to 6 inch chuck or 8 inch chuck, respectively. All models of the 982 Series are equipped with the 2 inch Spindle. The number after the dash (6, 10, etc.) represents the “Y” travel of the machine in inches.

The **984 Series**, intended for hard materials is represented by the Models 984-6, 984-10 and 984-14. The 984-6 is equipped with the 6 inch chuck. The 984-10 and 984-14 have a customer-specified chuck. All models of the 984 Series are equipped with the 4 inch Spindle.

The specifications which follow are taken to apply to all models of both the 982 and 984 Series unless specified otherwise.

1.2.1 STANDARD FEATURES

CUTTING AXIS (X)

Drive	DC Servo, lead screw, air bearing
Travel	11.3” ± 0.050 ” (292.1 mm ± 1.27 mm) 14” ± 0.050 ” (355 mm ± 1.27 mm) Model 984-14 only
Minimum Speed	0.0001”/sec (0.0025 mm/sec)
Maximum Speed	15.62”/sec (396.75 mm/sec)
Resolution	0.00015” (4 microns)

INDEX AXIS (Y)

Drive	Micro-stepper, lead screw, air bearing
Travel	6.2" ± 0.050 " (160 ± 1.27 mm) Models 982-6 and 984-6 10" ± 0.050 " (254 ± 1.27 mm) Models 982-10 and 984-10 14" ± 0.050 " (355 ± 1.27 mm) Model 984-14
Resolution	0.000032" (0.80 micron)
Accuracy:	
Open Loop	± 0.0001 " (± 2.5 microns) Models 982-6 and 984-6 ± 0.0002 " (± 5 microns) Models 982-10 and 984-10 ± 0.0004 " (± 10 microns) Model 984-14
Closed Loop (option)	± 0.00004 " (± 1 micron) Models 982-6, 984-6 ± 0.00008 " (± 2 microns) Models 982-10, 984-10 ± 0.00016 " (± 4 microns) Model 984-14

VERTICAL AXIS (Z)

Drive	Micro-stepper, lead screw, Cross Roller Bearing
Travel	1" ± 0.050 " (25.4 mm ± 1.25 mm) 2" ± 0.040 " (50.8 mm ± 1 mm) optional
Resolution	0.000032" (0.80 micron)
Repeatability	± 0.0001 (± 2.5 microns)

ROTARY AXIS (THETA)

Drive	Micro-stepper
Speed	90 degrees at 2.5 seconds
Rotation range	0 to 170 degrees
Resolution	4 arc seconds
Repeatability	±6 arc seconds

SPINDLE (BLADE DIAMETER 2"/4")

Type	Air bearing, water cooled
Minimum speed	4,000 rpm
Maximum speed	40,000 rpm/30,000 rpm
Maximum output power	1,400 Watts/1,700 Watts
Speed Programmable Increment	140 rpm/100 rpm

OPTICS

Monitor	9" monochrome
Camera	CCD
Targeting System	Electronic crosshair
Optical magnification	x100 (x150, x200 optional for both models)
Illumination	256 programmable levels, 2800 Lux maximum
Resolution	±0.0001" (±2.5 microns) between two video lines

AIISI PATTERN RECOGNITION SYSTEM (OPTIONAL)

Functions	Auto Alignment by street or multiple eyepoints Automatic Kerf quality inspection (width and offset) Automatic Kerf location correction based on offset detection Auto Focus Capability Vertical Edge Locator Manual illumination control (vertical and oblique) - automatic illumination control for Kerf detection.
-----------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Technical Specifications:

Capture Range:	programmable, from 20x20 pixels to full screen
Eye point size:	60x60 pixels to 200x120 pixels
Resolution(pixel size):	
Search Range:	automatically adjusted to die size
Search method:	spiral
Recognition Repeatability	± 0.25 pixel @ 3 STD
Eye point detection time:	170 ms to 900 ms within capture range, depending on eye point size and capture range.
Typical alignment time:	15 to 20 seconds

Note: The above optical specifications refer to the standard x100 magnification.

OPTICS

Optical magnification	x 100 standard, optional per customer request
Illumination source	Fiberoptic
Illumination intensity	88,000 Lux
Workpiece illumination	Ring or pipe illuminator
Camera	CCD

1.2.2 GENERAL SPECIFICATIONS

1.2.2.1 UTILITIES

AIR

Pressure	80 psi (5.4 atm) 65-70 psi (4.6-4.9 atm), for machine types 982.
Pressure tolerance	±5%
Dew point	10 degrees C at 6.8 atm (50 degrees F, 100 psi)
Temperature	20 ± 5 degrees C
Oil mist removal	99.9% minimum
Filtration level	0.3 micron or better
Connection	1/2" Imperial-Eastman Poly-Flo tubing 88-P-12 or equivalent
Flow rate	10 scfm

WATER

Type	DI or tap water
Particle size	25 microns maximum
Pressure	40 psi (2.7 atm) - 100 psi (6.7 atm)
Flow rate	40 US gal/h (150 liters/h) maximum
Temperature	Room temperature ±1 degree C

SPINDLE WATER

Type	DI or tap water
Particle size	25 microns maximum
Pressure	40 psi (2.7 atm) - 100 psi (6.7 atm)
Flow rate	16 US gal/h (57 liters/h) maximum
Temperature	Room temperature ± 1 degree C

VACUUM

Flow rate	10.5 scfm (300 liter/h) minimum
Vacuum level	610 mm Hg (80%)

ELECTRICAL

Voltage	200VAC - 240VAC ($\pm 10\%$), Single Phase
Frequency	50 or 60 Hz (± 3 Hz)
Power consumption	3,000 Watts
Current	15A

1.2.2.2 PHYSICAL DIMENSIONS

Height	59" (1500 mm)
Depth	47" (1200 mm)
Width	38.7" (985 mm) 47.2" (1200 mm) Model 984-14 only
Weight	990 lb (450 kg) 1,030 lb (468 kg) Model 984-14 only

Figure 1-1. Precision Dicing System Model 980

1.3 GENERAL DESCRIPTION

The Model 980 Precision Dicing System is a semi-automatic system for cutting a wide variety of substrate types.

The Model 980 includes both the 982 Series and 984 Series machines, described as follows:

- **982 Series** intended for dicing semiconductor and piezo-electric materials, provides superior dicing, cutting and slotting functions with the 2 inch blade. Chuck sizes available are 6 inch or 8 inch. Standard chucks are grooved or porous. Other chuck styles and types are available per customer order.
- **984 Series** intended for sawing hard materials with the 4 inch blade. Chuck sizes available are 6 inch or customer special order.

This Maintenance Manual provides information relevant for the troubleshooting, maintenance and repair of all models of the 980 machine - both the 982 and 984 Series.

In the Model 980, the operator places and removes substrates from the chuck. The Model 980 then aligns and performs a number of specific pre-programmed cuts on the substrate. Several machine subsystems are involved in this process, all of which are directed by electrical/electronic control system. The major subsystems are grouped in two larger categories: Mechanical Subsystems and Electrical/Electronic/Optics Subsystems. The major machine subsystems are described in the following subsections.

1.3.1 MECHANICAL SUBSYSTEMS

Grouped under Mechanical Subsystems are the following machine subsystems:

- X-Cutting Axis Subsystem
- Y-Indexing Axis Subsystem
- Z-Height Axis Subsystem
- Theta Rotary Axis and Chuck
- Microscope Assembly
- Spindle Assembly (2" and 4")
- Pneumatic Subsystems
- Cooling Subsystem

The **X-Cutting Axis Subsystem** positions and aligns substrates prior to sawing (cutting) operations, then cuts the substrate according to the individual process program (or manual cut). Substrate “streets” are sawed by moving the vacuum-secured substrate into the rotating saw blade. The saw blade spindle (**Spindle Assembly**) is held stationary during a cut. After a cut is completed, the blade is raised and moved in the **Y-Axis** to the next location. The substrate is then moved in the X Axis to the starting position. The blade is lowered to cutting height (**Z-Height Axis**) and the substrate is again moved into the blade. The cutting sequence is repeated until all streets aligned parallel to the machine X-Axis have been cut. The substrate is then rotated (**Theta Rotary Axis and Chuck**) to align the remaining substrate streets parallel to the machine X-Axis. The same procedure described above is repeated completing the sawing operation. The **Pneumatic** and **Cooling Subsystems** provide utility controls to assist these operations.

1.3.2 ELECTRICAL, ELECTRONIC AND OPTICS SUBSYSTEMS

Grouped under Electrical and Electronics Subsystems are the following:

- Power Supply Subsystem
- Electronics Plug-In Card System
- Spindle Assembly Electronic Controls
- Optics and Video Subsystem
- Vision Subsystem
- Main Master Processing Unit
- Memory, Logic and Power Boards

The **Power Supply Subsystem** accepts incoming mains power and supplies the various voltage levels (AC/DC) required by all parts of the machine. The **Electronics Plug-In-Card System** operates the other subsystems in the machine by driving servo motors, stepper motors and solenoids in each of these subsystems. Positional information is returned to the control system from limit sensors, position sensors as well as linear and rotational encoders. The sequence and extent of motions is recorded in the machine operating software, executed by the **Main Master Processing Unit** of the control system. Motions are modified for processing of a particular type of substrate by a set of machine control parameters that are programmed by the user and are stored in a process program.

Control of motors and solenoids is exercised by the Main Master Processing Unit through interface **Memory, Logic and Power Boards**, configured for their specific functions.