LAURIER®
INCORPORATED

DS-7000

SPEED Star™

High Speed
Automatic Die Sorter

Operating, Programming
&
Maintenance Manual

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1.0 Introduction
2.0 Safety

SECTION 1.0
INTRODUCTION AND INSTALLATION

1.1 INTRODUCTION

The Laurier DS-7000 is a high-speed, fully-automatic pick and place system for die sorting applications. In numerous installations throughout the IC industry, the DS-7000 has significantly reduced user costs through higher yields, increase productivity, and unmatched system reliability.

This manual includes instructional and reference material for the operator, programmer, and maintenance technician who works with the DS-7000.

Here is a quick summary of the sections of this manual:

Section 1.0 - Introduction and Installation

After some introductory information, this section includes a short tour of the main parts of the machine.

Section 2.0 - Safety

This section includes general safety procedures which should be followed while running the system, and during maintenance and service.

Section 3.0 - Warranty

Section 3 includes warranty information for the system.

Section 4.0 - Operation Instructions

This section includes instructions for running the machine once it has been set up.

Section 5.0 - Programming/Training

Section 5 explains how to prepare the machine to run a particular job. This section discusses the information required to create a detailed description of a wafer. This section also explains how to set up the vision system.

Section 5A - Waffle Pack Output

This section includes specific set-up instructions for the waffle pack output device. (If your machine includes this type of output, this section will be included in the manual.)

Section 5B - Film Frame Output

This section includes specific set-up instructions for the film frame output device. (If your machine includes this type of output, this section will be included in the manual.)

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Section 5C - Tape Reel Output

This section includes specific set-up instructions for the tape reel output device. (If your machine includes this type of output, this section will be included in the manual.)

Section 6.0 - Mechanical Adjustments

Section 6 describes some important mechanical adjustments which should be checked regularly.

Section 7.0 - Preventive Maintenance

This section lists routine procedures for maintenance, lubrication, and cleaning.

Section 8.0 - Troubleshooting

In Section 8, we include some suggestions for handling set-up and mechanical problems which may arise.

Section 9.0 - Parts and Engineering Drawings

This section includes all of the electrical and pneumatic schematics, as well as mechanical drawings with identification and parts lists.

If your machine has any optional accessories, information on these will be included at the end of this manual.

1.2 PARTS IDENTIFICATION

Most machine parts discussed in this manual are shown schematically and/or pictorially in the illustrations which are listed by drawing number in Section 9.0. Each print or schematic is preceded by a parts list describing the part. For each part, the list provides a part number and indicates the quantity used. When ordering replacement parts, use the information provided in Section 9.0.

1.3 SERVICE OFFICES

Laurier maintains a service staff that specializes in the installation and service of all Laurier equipment. If you have a service problem, contact Laurier at the following address:

10 Tinker Ave.
Londonderry, New Hampshire 03109
Telephone: 603 626-4700
Fax: 603 626-4242

1.4 INSTALLATION REQUIREMENTS

Once the machine has been installed, it will need the following power and air supplies:

Electrical input:

110 V AC ±10%, single-phase

208 V AC ±10%, single-phase

230 V AC ±10%, single-phase

50/60 Hz

10 Amps

Air:

85 to 100 psi Min.

10 CFM

Dimensions:

Footprint 6 ft. x 4 ft. (including tape reels)

Width - 5 ft.

Depth - 4 ft.

Height - 78 in.

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1.5 CONTROLS AND FEATURES

In this section, we will take a quick look at the main sections of this machine. See Figures 1-1 through 1-11. For detailed operating instructions, see Section 4.

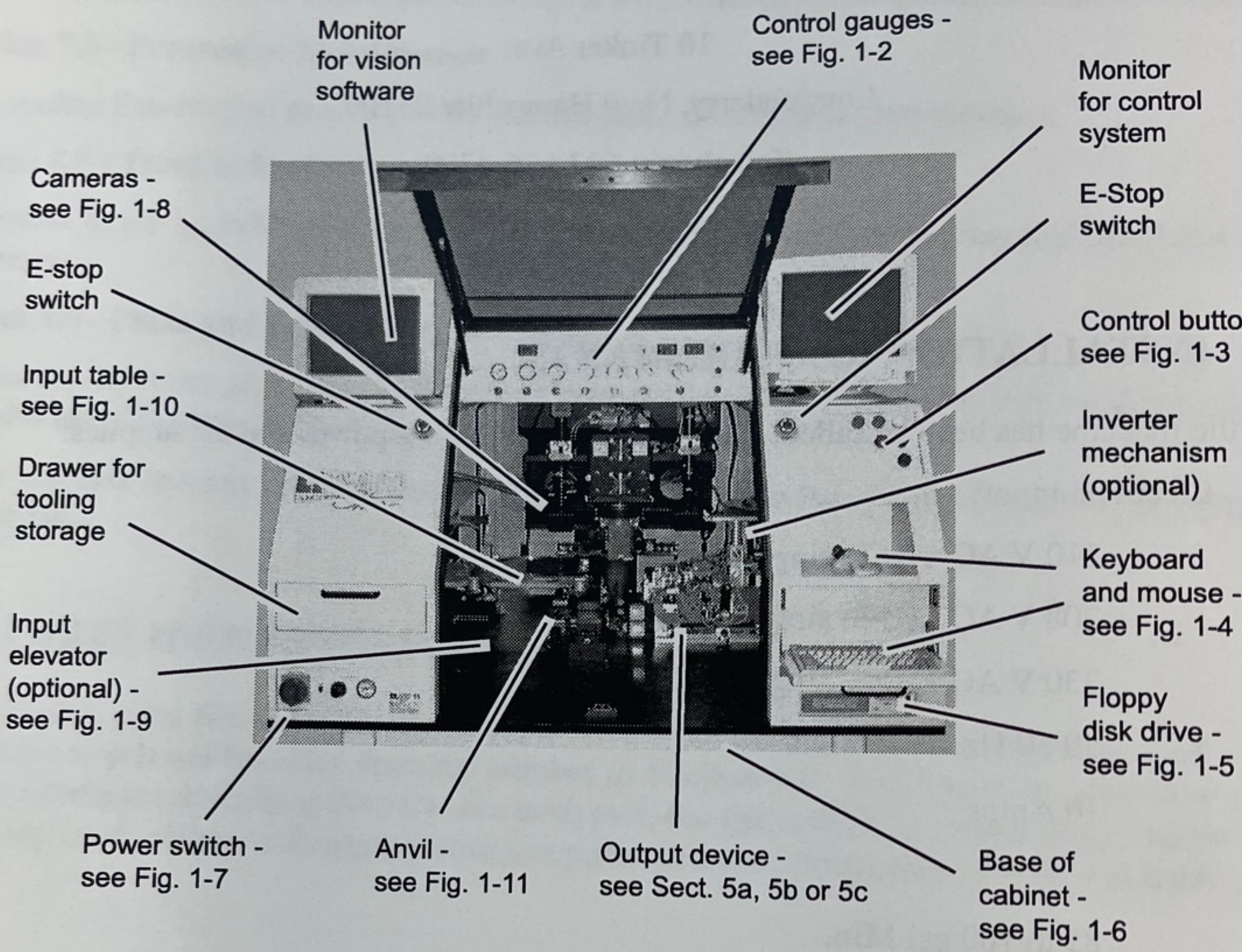


Fig. 1-1
Overall View of Machine

Status indicators -

The red indicator lights when the machine has dropped out of the "Ready to Run" mode. If the machine is running when this happens, it indicates a problem which should be corrected by the operator.

The amber indicator shows that assistance from the operator is needed to keep the machine running. It does not indicate an error condition.

The green indicator lights when the machine is in the "Run" mode.

Monitor for vision system -
This monitor shows the image seen by the vision system as it identifies and aligns the die on a wafer.

Monitor for control software -
This monitor allows you to work with the software which supervises the machine.

Control gauges -
This area includes gauges and adjustments for many of the pneumatic functions on the machine. See Fig. 1-2.

E-Stop switches -
Either switch can be used to stop the machine quickly in an emergency. See Section 4.7.

Control buttons -
This area includes the controls the operator will use most often. See Fig. 1-3.

Keyboard -
The operator or programmer can use the keyboard to enter various kinds of information. See Fig. 1-4.

Floppy disk drive -
The system includes a floppy disk drive which can be used to save or import files. See Fig. 1-5.

Base of cabinet -
The computer and driver drawer are mounted here. See Fig. 1-6.

Main power switch -
This switch is located on front left of the unit. See Fig. 1-7.

Cameras for vision system -
The machine includes a vision system which can be used for input and output alignment or inspection. See Fig. 1-8.

Input elevator (optional) -
On machines with this option, the elevator holds up to 25 wafers or 12 waffle pack trays. See Fig. 1-9.

Input table -
During picking, the wafer or waffle pack is supported by this table. See Fig. 1-10.

Anvil -
During picking, the anvil rises to support the underside of the wafer. See Fig. 1-11.

Inverter mechanism -
Machines with tape reel output have an optional "inverter" mechanism. This mechanism flips each die 180° before placing it on the output device.

Output device -
A DS-7000 unit may be equipped with three kinds of output devices: film frame, waffle pack, or tape reel. The detailed information for the output device(s) included with your machine will be included at the end of Section 5.

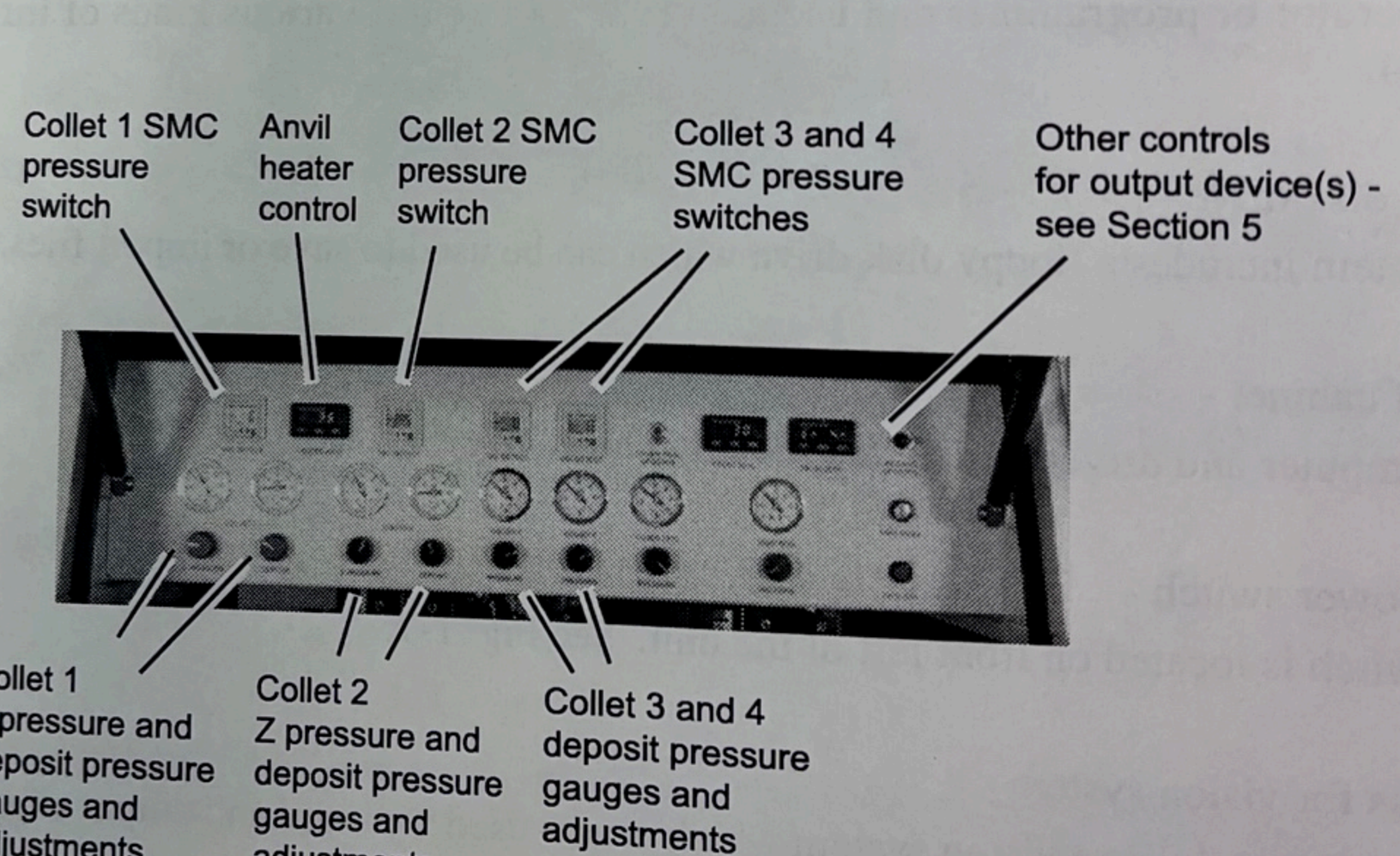


Fig. 1-2
Control Gauges

Collet 1 and 2 SMC pressure switches -

Collets 1 and 2 are mounted on the transfer arm. Each SMC pressure switch is used to detect the presence of a die on one of the collets. (The sensitivity is adjustable. See Section 6.)

Collet 1 and 2 Z pressure gauges and adjustments -

Each adjustment knob is used to adjust the air pressure used to move the collets on the transfer arm up and down. This adjusts the speed and force of the movement. The air pressure is indicated on the gauge above the adjustment. (20 p.s.i. is a typical setting.)

Collet 1 and 2 deposit pressure gauges and adjustments -

Each adjustment knob is used to set the deposit or "puff" pressure for one of the collets. The deposit pressure is indicated on the gauge above the adjustment.

Collet 3 and 4 SMC pressure switches (optional) -

On machines with tape reel output, collets 3 and 4 are mounted on the optional inverter. Each SMC pressure switch is used to detect the presence of a die on one of the collets. (The sensitivity is adjustable. See Section 6.)

Collet 3 and 4 deposit pressure gauges
and adjustments (optional) -

On machines with tape reel output, collets 3 and 4 are mounted on the optional inverter. Each deposit pressure adjustment knob is used to set the deposit or "puff" pressure for one of the collets. The deposit pressure is indicated on the gauge above the adjustment.

Other controls -

The other controls on this panel are used with the optional output device(s) installed on the machine. See Section 5a, 5b, and 5c.

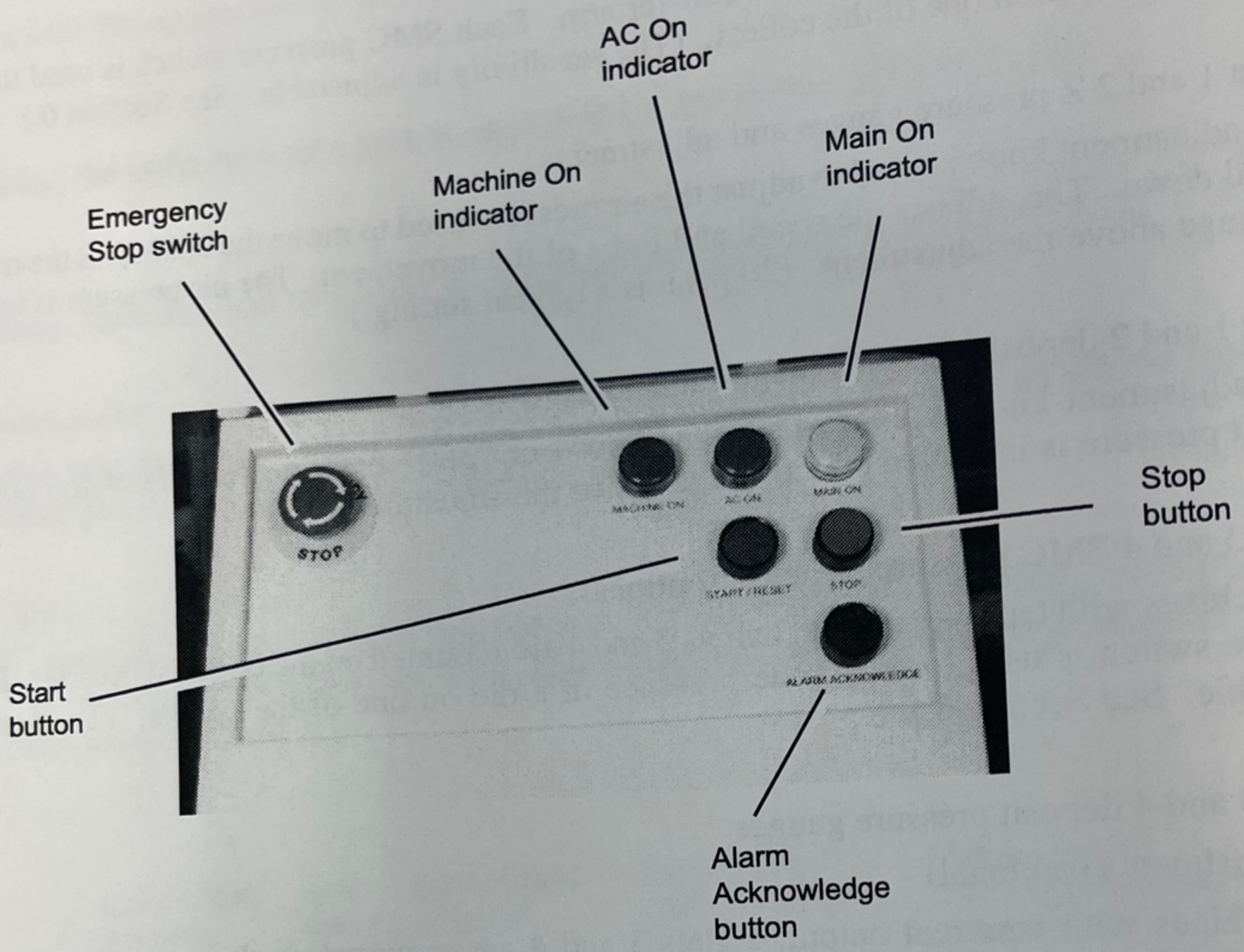


Fig. 1-3
Control Buttons

Emergency Stop switch (red) -

Press this switch to stop the machine suddenly in an emergency. Correct the cause of the problem. To reset, twist the top of the switch clockwise and pull it out.

Machine On indicator (green) -

When the start button has been pressed, and the machine is in a "Ready to Run" mode, this indicator will light. (The green indicator on top of the machine will also light.)

AC On indicator (green) -

This indicates that the main power has been switched through so that it can power the machine. The main power switch is located on the left side of the machine. See Fig. 1-7.

Main On indicator (white) -

This indicates that the machine is receiving power. The machine will not start until the main power switch is turned on and the Start button is pressed. (See Fig. 1-7).

Start button (green) -

As part of the start-up process, press the Start button to put the machine into a "Ready to Run" mode. The Start button powers up the system.

Stop button (red) -

When shutting down the machine, press this button to take the machine out of the "Ready to Run" mode. This button can also function as an Emergency Stop button.

Alarm Acknowledge button (black) -

Some machines have an alarm siren or buzzer. This will sound if the machine detects an error or makes an unplanned stop. The operator can press the black button to cancel the alarm sound. (The error message on the screen will continue, however.)

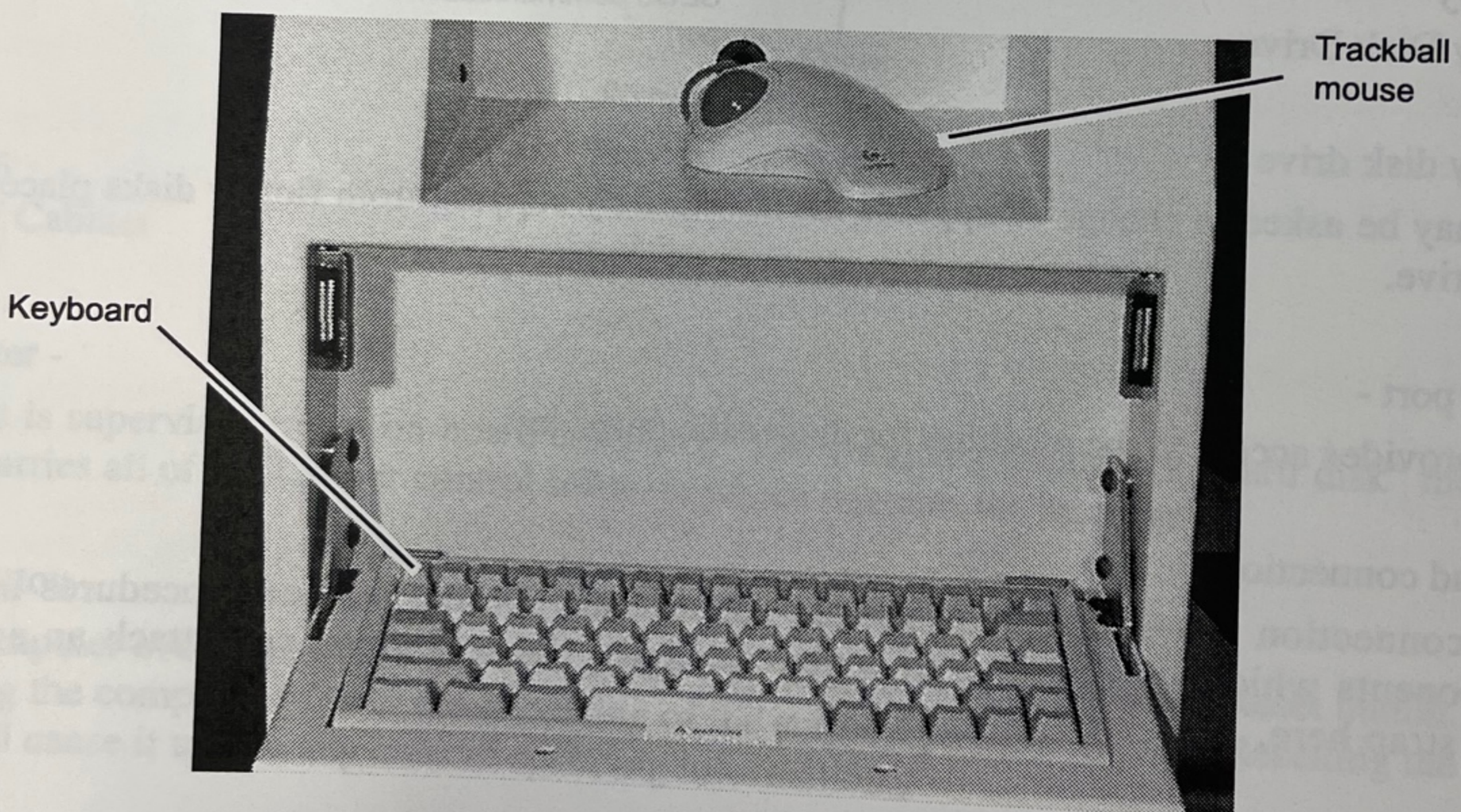


Fig. 1-4
Keyboard and Mouse

Keyboard -

Use the keyboard to enter commands and supply information for the computer which supervises the machine.

Trackball mouse -

Use the trackball to move the pointer or cursor on the display screen. Once the cursor is in the correct position, use the left-hand button to "click" or select the item you want.

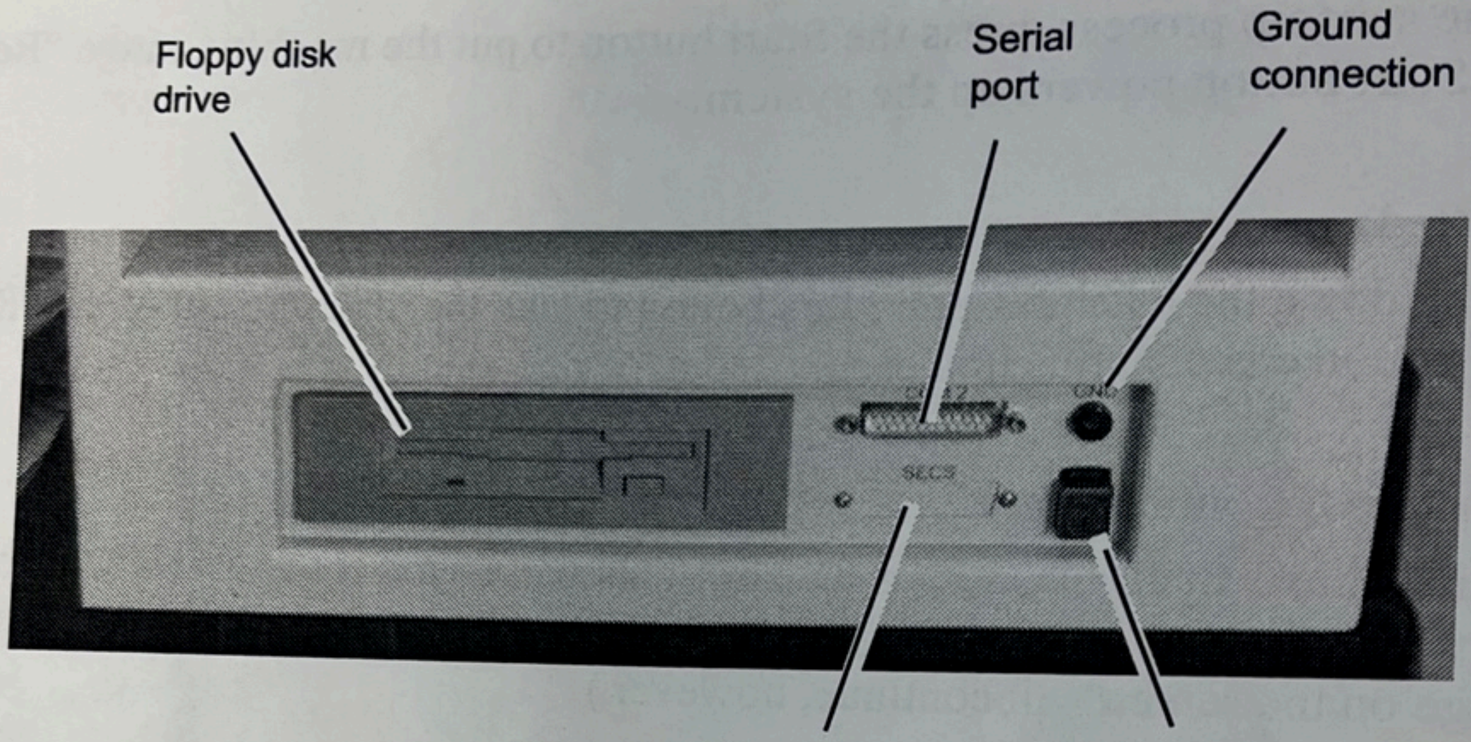


Fig. 1-5
Floppy Disk Drive

Floppy disk drive -

You may be asked to change or upgrade the software by copying from floppy disks placed in the disk drive.

Serial port -

This provides access to the machine for diagnostic purposes.

Ground connection -

This connection provides a good ground connection. During service procedures involving components which are sensitive to static electricity, the technician can attach an anti-static wrist strap here.

Network connection -

This connection allows the DS-7000 to receive product information from a network or host computer.

Optional SECS port -

This port provides access for SECS communication.

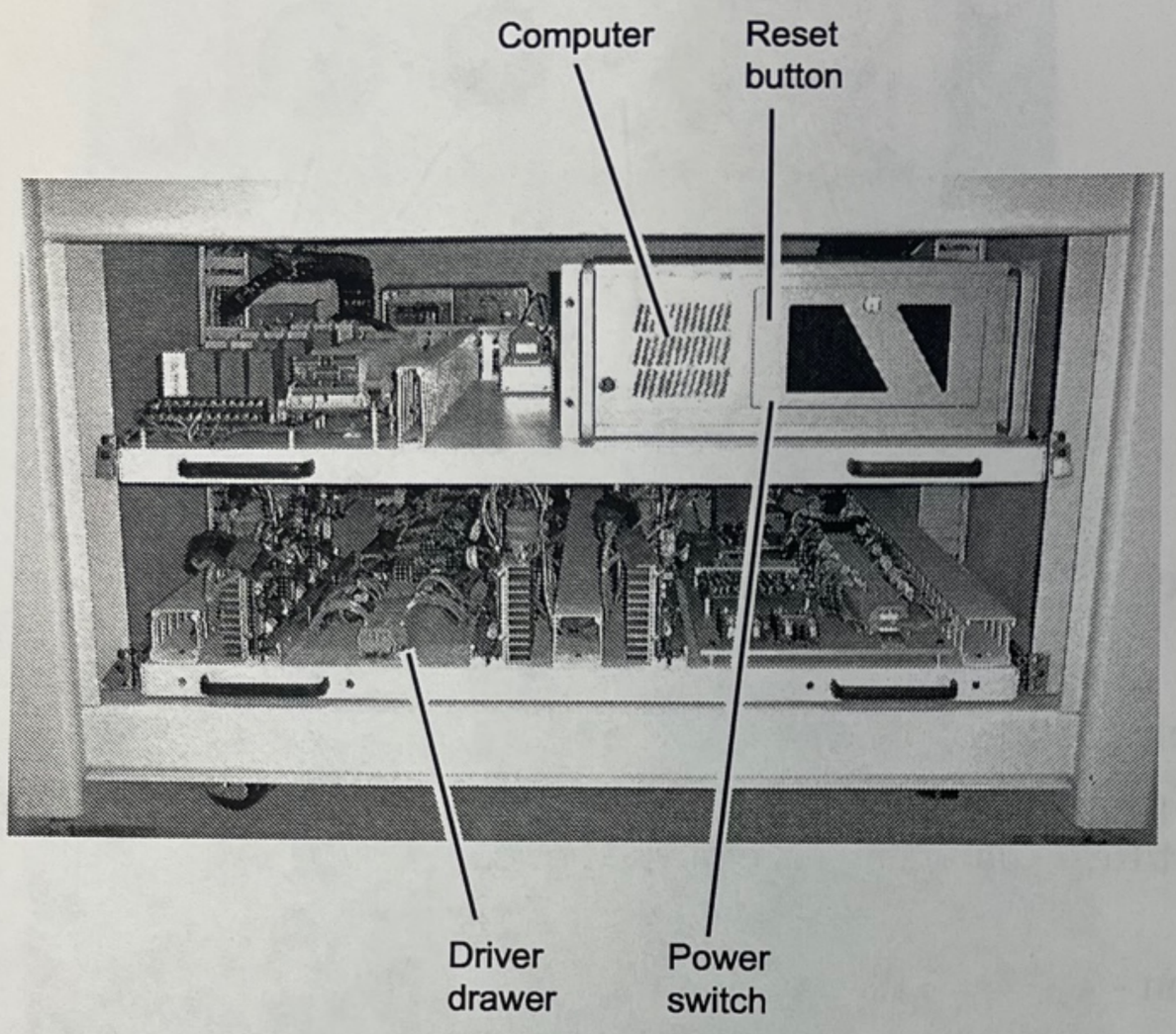


Fig. 1-6
Base of Cabinet

Computer -

The unit is supervised by an on-board computer. The computer includes a "hard disk" memory which carries all of the Laurier control software which operates the machine.

Reset button -

If the computer ever encounters a problem, one way to recover is to press the Reset button. This will bring the computer back to the beginning of the start-up process. (Note - Resetting the computer will cause it to lose any current operating information.)

Power switch -

This controls power to the computer only. It should normally be left on at all times.

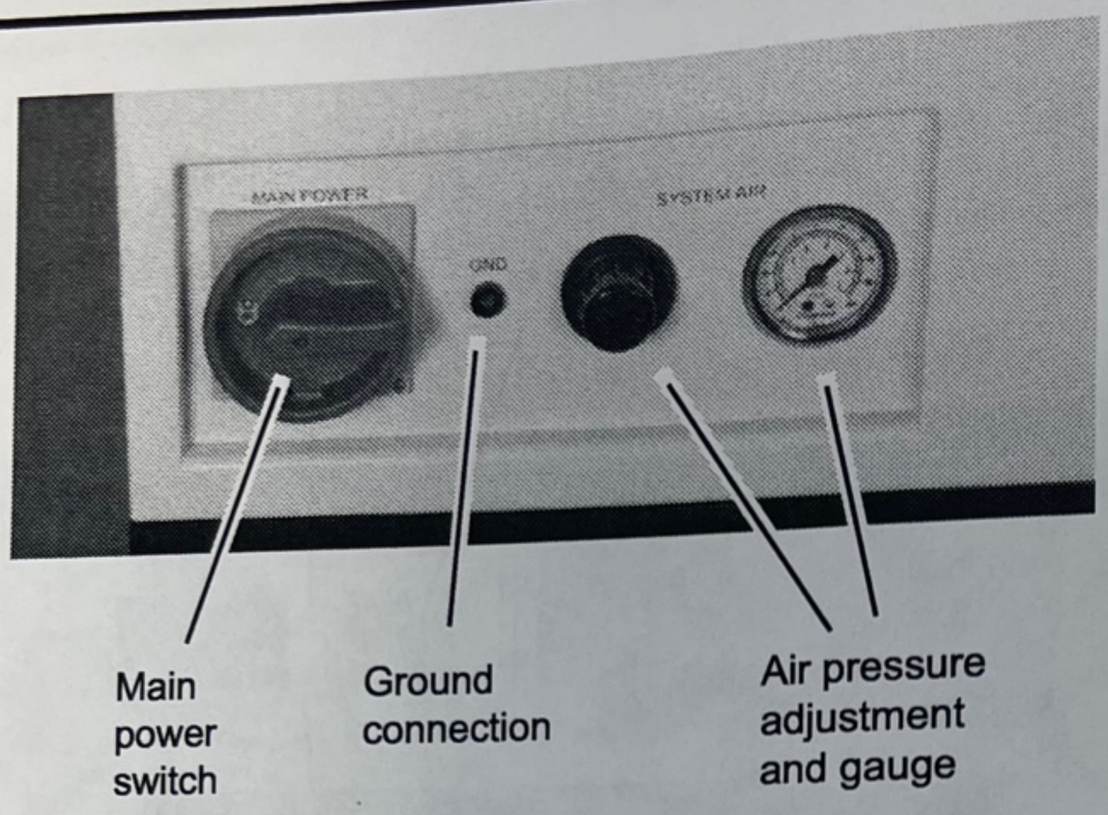


Fig. 1-7
Main Power Switch

Main power switch -

This controls the power to the machine. (Even if this switch is turned on, the machine will not operate. The Start/Reset button must be pressed first.)

Ground connection -

This connection provides a good ground connection. During service procedures involving components which are sensitive to static electricity, the technician can attach an anti-static wrist strap here.

System air regulator and gauge -

The regulator sets the air pressure used by the machine, and the gauge indicates the pressure. Normally, this adjustment should be set to 85 psi.

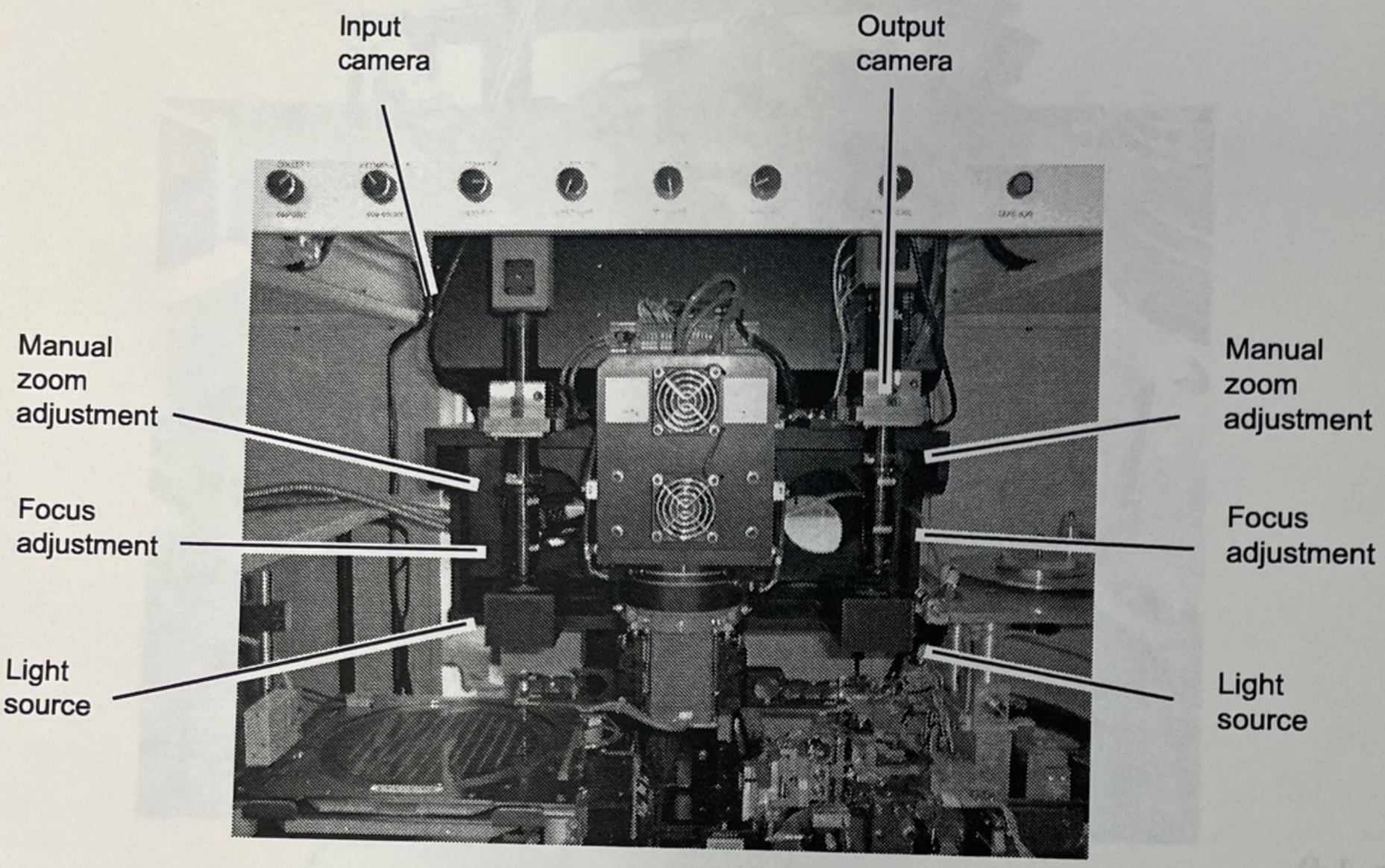


Fig. 1-8
Cameras for Vision System

Input and output cameras -

These are the lenses for the cameras used with the vision system. The lower adjusting ring on each camera controls the focus setting. The image enlargement or "zoom" can be adjusted using the upper adjusting ring on each lens.

Light source -

The area below each camera is lighted by an illumination source and a fiber-optic cable.

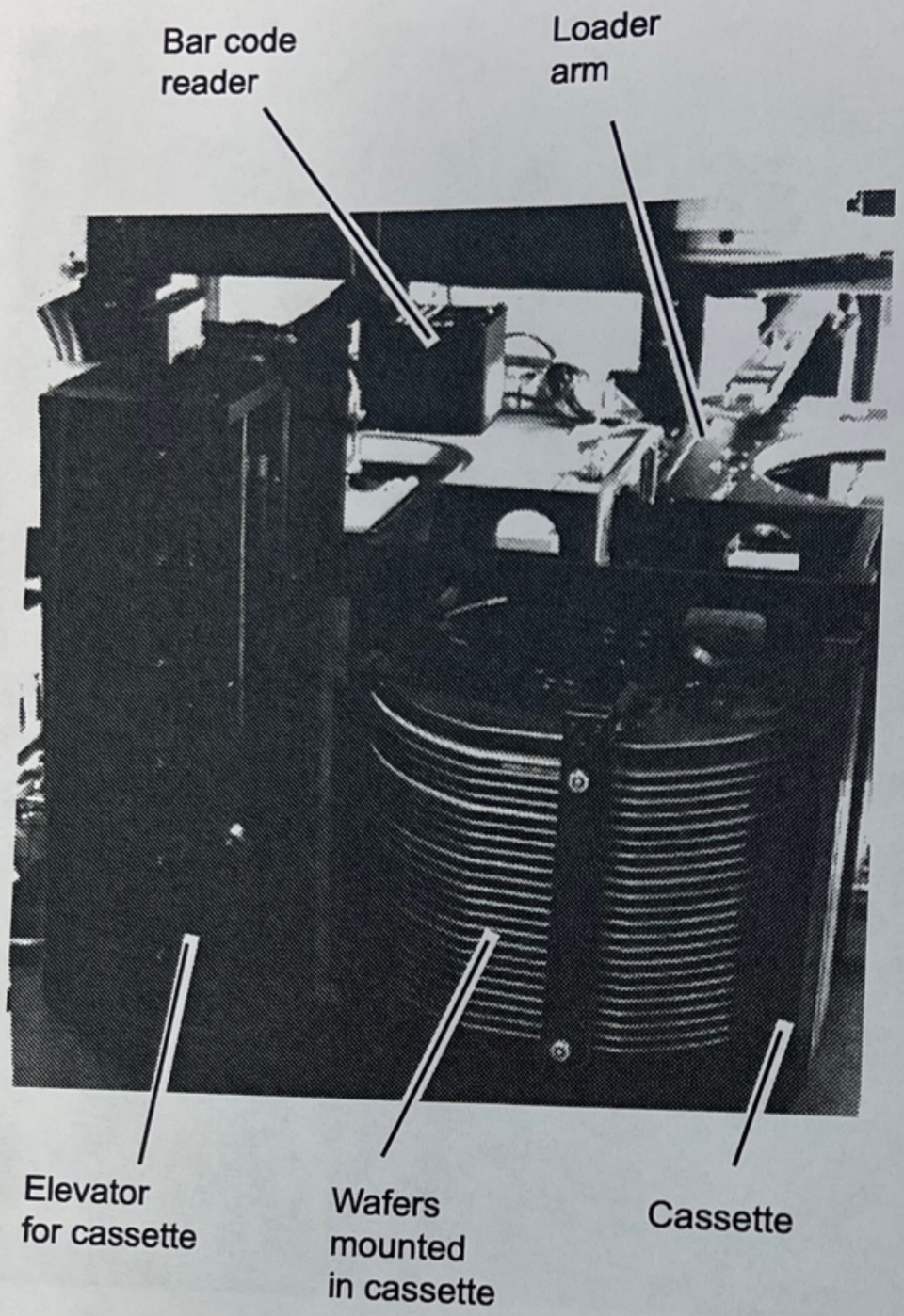


Fig. 1-9
Elevator and Cassette (Optional)

Cassette -

The wafers are mounted in a carrier called a "cassette." Each cassette can hold up to 25 wafers.

Elevator -

As the unit selects different wafers, the elevator moves the cassette up or down. This places the desired wafer at the correct height where it can be reached by the loader arm.

Bar-code reader -

The left edge of each wafer frame can carry a bar code. This can identify the die on that particular wafer. The machine uses the bar code information to call up the correct wafer map from the network or hard disk drive.

Loader arm -

After a wafer frame is positioned at the correct height by the elevator, the loader arm grips the wafer frame. The loader arm then pulls the wafer frame back, and places the wafer on the input

table. When a wafer has been picked completely, the loader arm unloads the wafer and places it back in the cassette.

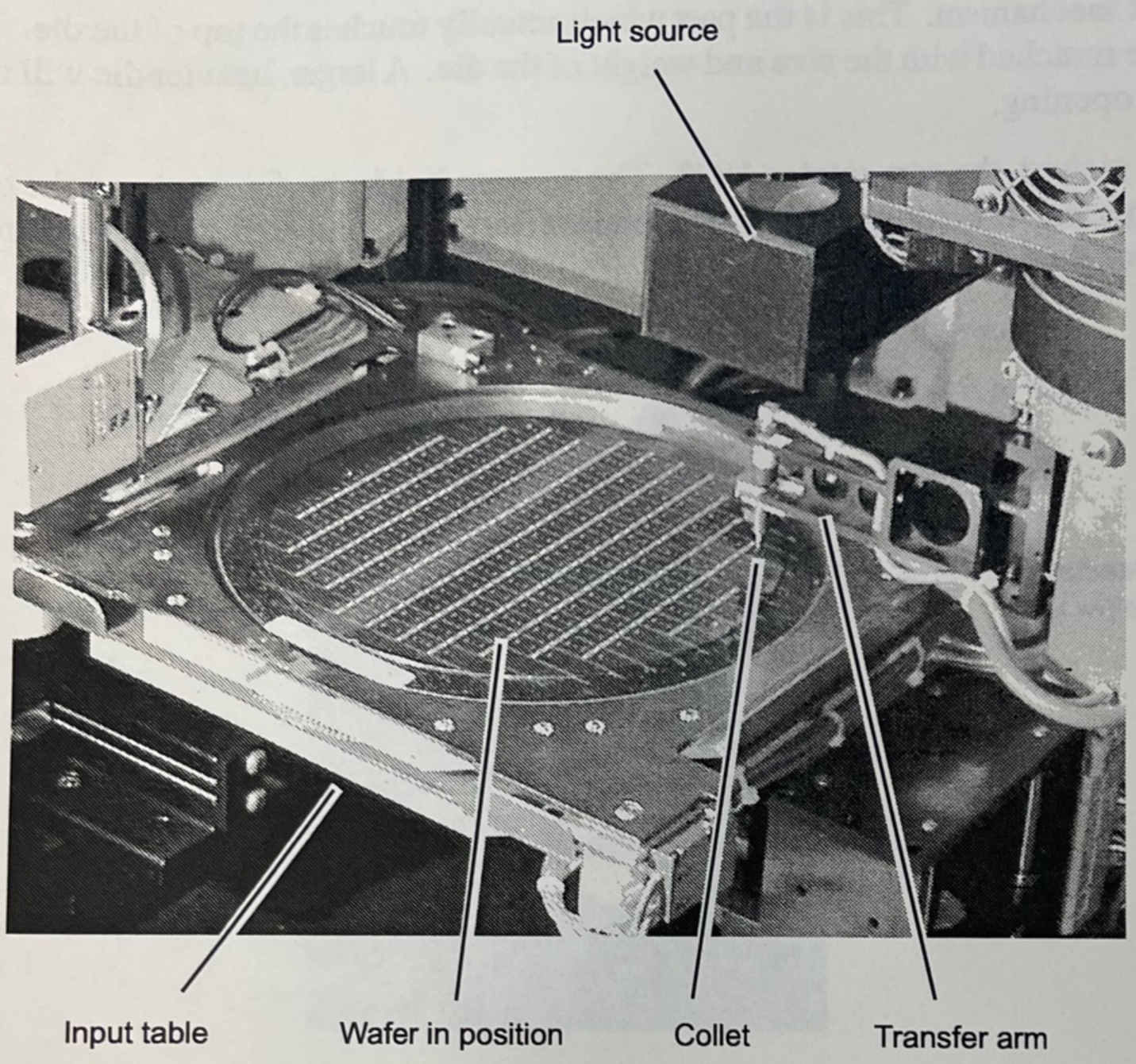


Fig. 1-10
Input Table

Input table -

As the machine operates, the wafer frames are placed on this table by the loader arm. This table can move very precisely in the X and Y directions. The top of the table can also turn or rotate to correct for any mis-alignment of a wafer. (This is called "Theta correction.") The top of the table includes a "stretcher" mechanism. Once a wafer is in place, the stretcher plate clamps down to stretch the wafer so the die can be removed easily.

Circular hard limit switch -

To the left of the input table, there is a large ring with a position limit switch. This switch provides a "hard limit" which prevents the input table from moving beyond its normal range.

Transfer arm -

At the beginning of the transfer process, one side of the transfer arm picks up each die. The die is picked and held by a vacuum operating through a "collet." The “collet” is a small hollow tube at the tip of the pick mechanism. This is the part which actually touches the top of the die. The size of the collet must be matched with the size and weight of the die. A larger, heavier die will require a collet with a larger opening.

After a die is picked, the arm rotates 180°. The vacuum holds the die firmly on the collet. Finally, the collet is lowered into the place position, and the vacuum is shut off. A puff of air releases the die onto the output device.

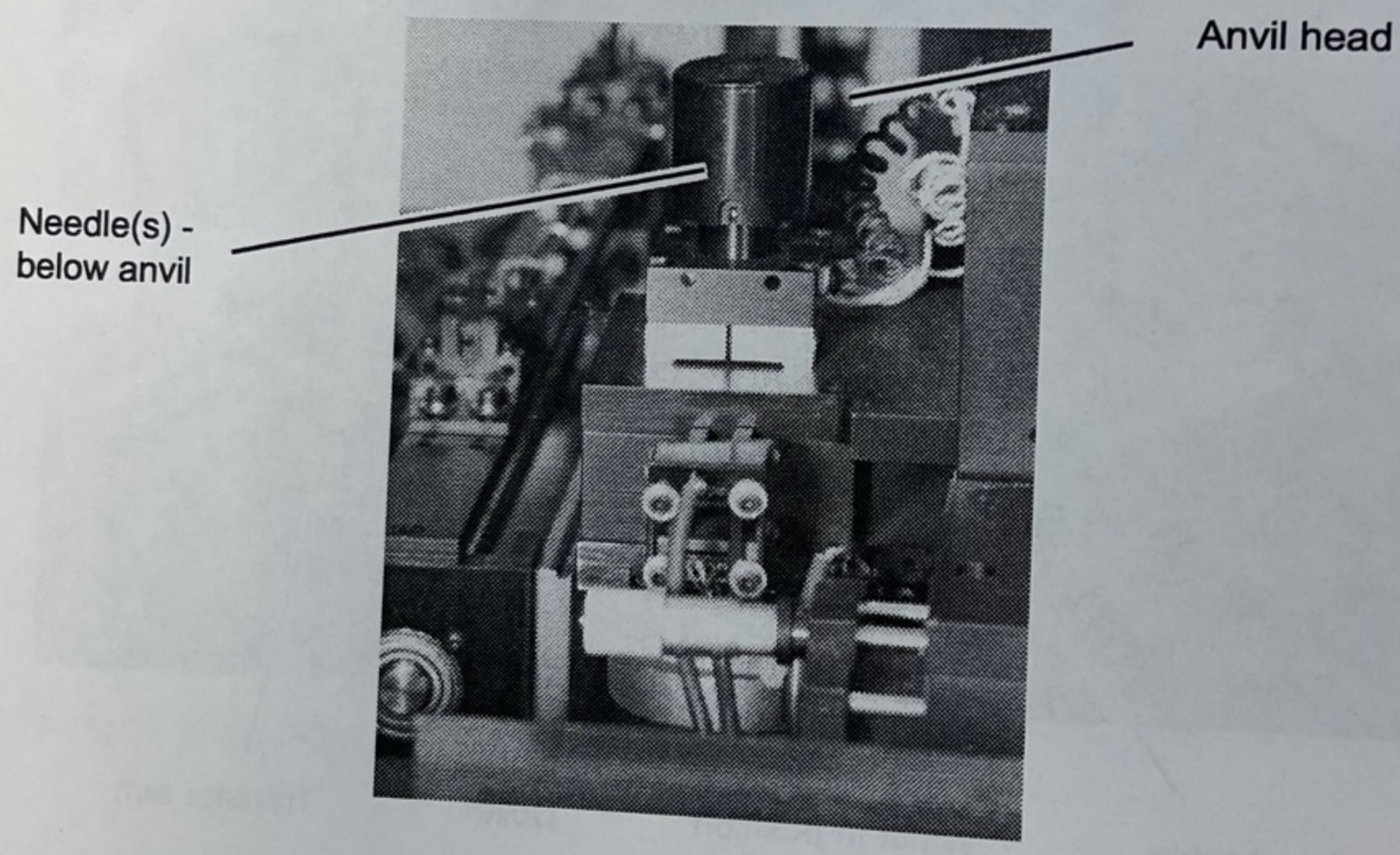


Fig. 1-11
Anvil Mechanism

Anvil and needle assemblies -

During picking, the anvil is designed to move up and support the bottom of the wafer. At the center of the anvil, one or more needles rise up to lift the die away from the wafer film. The anvil assembly may be fitted with one or more needles. These are chosen to match the size and weight of the die being picked. (A larger die usually requires more needles to provide the correct lifting action.)