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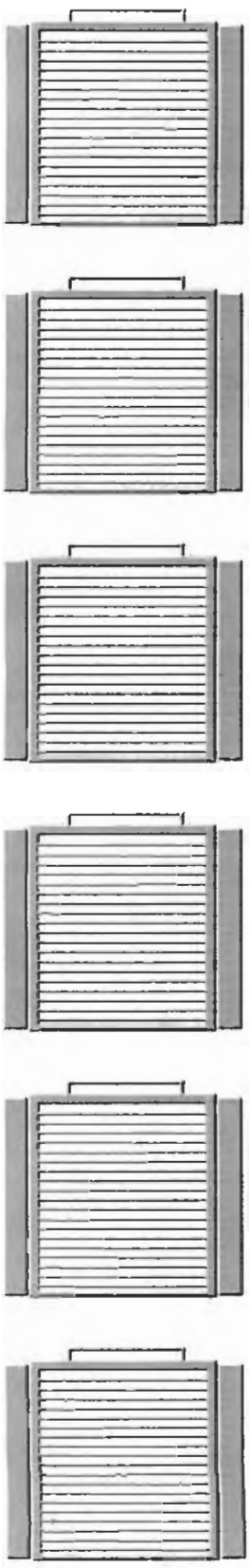
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MicroVision®



MVT 7080™ Wafer Sorter Operations Manual

MicroVision Corp.
7600 Quattro Drive
Chanhassen, MN 55317 U.S.A.

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fax **612.975.9922**
email **info@mvglobal.com**
internet **http://www.mvglobal.com**

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Manual Part # 170-000-011 Revision 4 / 99

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About the Wafer Sorter Operations Manual

This operations manual has been designed to assist you in understanding and operating your MicroVision MVT 7080™ Wafer Sorter - a high-performance, robotic wafer handling system that combines fast and safe wafer handling, the flexibility to accommodate a wide range of wafer sizes, and easy operation. To ensure that users realize and maintain optimal performance from their MVT 7080 Wafer Sorters, we have strived to provide easy-to-follow descriptions of both system setup procedures and troubleshooting measures for system technicians, and clear illustrations of the system graphical user interface and menu-to-menu descriptions of runtime setup & operating procedures for system operators.

This operations manual is comprised of eight main sections:

Section A: **Customer Information** includes a Wafer Sorter Order Configuration file that lists vital order information and profiles a system's installed components.

Section B: **System Overview** describes the features and options of the MVT 7080, provides a general overview and description of its capabilities, lists system specifications, introduces the user to the system's mechanical layout, and presents the system's variety of modular configurations. This section also provides system technicians with the basic information needed for initial system installation, power-up and power-down. In addition, illustrated descriptions of the various elements of the graphical user interface provide both technicians and operators with a valuable preview of the system's features and how to access them.

Section C: **Software Installation & Accounts Setup** provides system technicians with detailed, step-by-step instructions on installing system software and setting up user accounts.

Section D: **System Setup & Configuration** provides system technicians with detailed, step-by-step instructions on how to calibrate and fine tune a new or upgraded system for runtime setup and operation; these include using the HOST NT Software, setting up the controller, and performing system integration procedures for five different modular configurations.

Section E: **Runtime Setup** provides system technicians with step-by-step instructions on managing user access and creating wafer flow, reader ID, and bright light macroinspection recipes for use during actual runtime operation.

Section F: **Runtime Operation** provides system operators with step-by-step, illustrated guides to performing basic wafer sorting operations.

Section G: **Troubleshooting & Preventative Maintenance** provides system technicians with a detailed guide to diagnosing and correcting system problems, and includes a system preventative maintenance check list.

Section H: **Electrical Diagrams & Parts List**

The following pages include a customer satisfaction fax survey used to aid us in providing all of our customers with the highest levels of service possible. Please complete this survey and fax back to Microvision at your earliest convenience. Your time and cooperation are greatly appreciated.

To learn more about the MVT 7080 Wafer Sorter, or to request support, contact Microvision Corp. Sales, Application & Support:

phone: 612.975.9911 **fax:** 612.975.9922

email: info@mvglobal.com **internet:** http://www.mvglobal.com

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MicroVision Corp. • 7600 Quattro Drive • Chanhassen, MN 55317 USA • Tel (612) 975-9911 • Fax (612) 975-9922

Return to: MicroVision Corp.
Sales Application & Support

Phone: (612) 975-9911 x282
Fax: (612) 975-9922
E-Mail: info@mvglobal.com

From: _____

Phone: _____

Fax: _____

E-Mail: _____

Date: _____

Pages Sent (including this one): 2

RE: MicroVision Post-Marketing Customer Satisfaction Survey

Dear MicroVision Customer:

Congratulations on your purchase of a world-class MicroVision automated inspection solution. To aid us providing you and all our customers with the highest level of customer service possible please complete the following survey and fax it back to MicroVision at 612.975.9922. Your cooperation is greatly appreciated.

MicroVision Post-Marketing Customer Satisfaction Survey **Page 1 of 2**

1. Company: _____

Your Name: _____

Position: _____

Phone: _____

Fax: _____

Email: _____

System Type: (circle one)

MVT 1060	MVT 1080	MVT 5060	MVT 5080	MVT 7080
MVT 7080 SMIF	MVT 2080	MVT 2080 SMIF	Model 851	MV 851 NT
Model 881	MV 881 NT	MV 981 T	MV 981 I	

Other: _____

System Serial #: _____ - _____ - _____

Install Date: _____

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MicroVision Post-Marketing Customer Satisfaction Survey

2. How satisfied are you with the knowledge and responsiveness of your MicroVision Representative (5 indicates a high level of satisfaction, 1 indicates a low level of satisfaction).
1 2 3 4 5 (circle one)

Comment (optional): _____

3. Rate the quality of your interaction with MicroVision personnel during the System Specification Process (5 indicates very productive interaction, 1 indicates unproductive interaction).

1 2 3 4 5 (circle one)

Comment (optional): _____

4. How satisfied are you with the timeliness and accuracy of the System Quotation extended to you by MicroVision (5 indicates a high level of satisfaction, 1 indicates a low level of satisfaction).

1 2 3 4 5 (circle one)

Comment (optional): _____

5. Was your tool received by the promised delivery date?

Yes No (circle one)

6. Did your tool arrive intact?

Yes No (circle one)

Comment (optional): _____

7. Does the installed tool meet all agreed to specifications?

Yes No (circle one)

Comment (optional): _____

8. Rate the performance of MicroVision personnel during System Installation (5 indicates a very professional performance, 1 indicates an unprofessional performance).

1 2 3 4 5 (circle one)

Comment (optional): _____

9. Rate the quality of the system operations manual (5 indicates very informative, 1 indicates uninformative).

1 2 3 4 5 (circle one)

Comment (optional): _____

10. Have your personnel been adequately trained to safely and productively operate the tool?

Yes No (circle one)

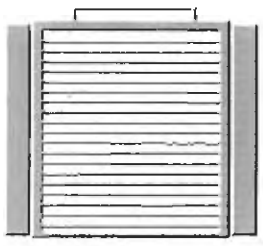
Comment (optional): _____

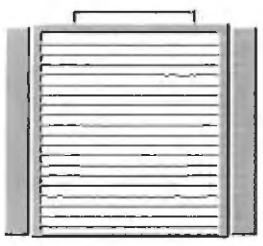
11. Suggestions (optional): _____

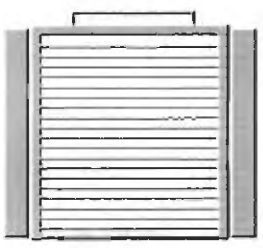
Upon completing this survey, please fax to Microvision Corp. 612.975.9922

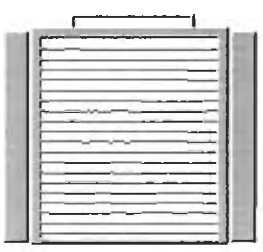
Thank you for your time and cooperation. Your completed response will aid us in providing you, our customer, with the highest levels of service possible.

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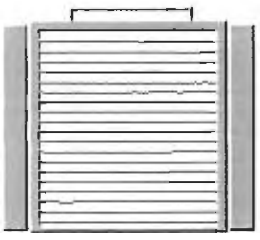












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Section B: System Overview

Fast, Safe and Easy Wafer Handling 2
System Overview 3
System Specifications 4
IEC Symbols 5
Caution Statements 5
Positioning the System 6
System Geography 7
Controller Cabling Scheme 12
Replacing the System Fuse 12
PC Cabling Scheme 13
System Power-Up Sequence 14
System Power-Down Sequence 14
The Graphical User Interface 15

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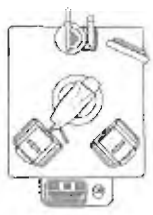
Introduction:

Fast, Safe & Easy Wafer Handling

MVT 7080
Wafer Sorter:

3-Cassette /
Bright Light

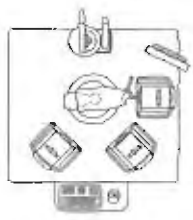




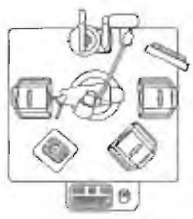
2-Cassette



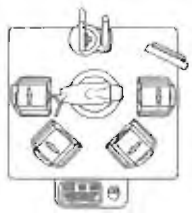
2-Cassette/
Bright Light



3-Cassette



3-Cassette/
Bright Light



4-Cassette

Congratulations on your purchase of a MicroVision MVT 7080™ Wafer Sorter, the first choice for the most advanced semiconductor facilities in the world. This high-performance wafer sorter combines the following features to provide fast and safe wafer handling, the flexibility to accommodate a wide range of wafer sizes, and easy operation.

- 3-axis robotic handler with integrated laser mapping system for sorting, splitting or randomizing wafer lots;
- High speed aligner;
- Integrated wafer ID reader with advanced illumination system for accurate and repeatable optical character recognition;
- Small footprint - 2, 3 or 4 cassette configurations available;
- Over 300 wafers per hour in sort mode;
- 75 to 200mm wafer capability;
- Optional integrated bright light macroinspection station;
- Recipe or manual control;
- Flat-screen color LCD or Super VGA display;
- Windows NT™ operating system.

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Introduction: System Overview

The MicroVision MVT 7080™ Wafer Sorter represents a new generation of high-performance robotic wafer handlers for semiconductor wafer fabs. It combines intelligent motion control with features such as laser mapping, advanced illumination and OCR, optional bright light macroinspection, and a Windows NT™ operating system to provide a complete wafer sorting and macroinspection solution in an extremely small footprint.

Available in 2, 3 or 4 cassette configurations, this system enables an operator to quickly and safely sort, split, merge or randomize 75 to 200mm wafer lots.

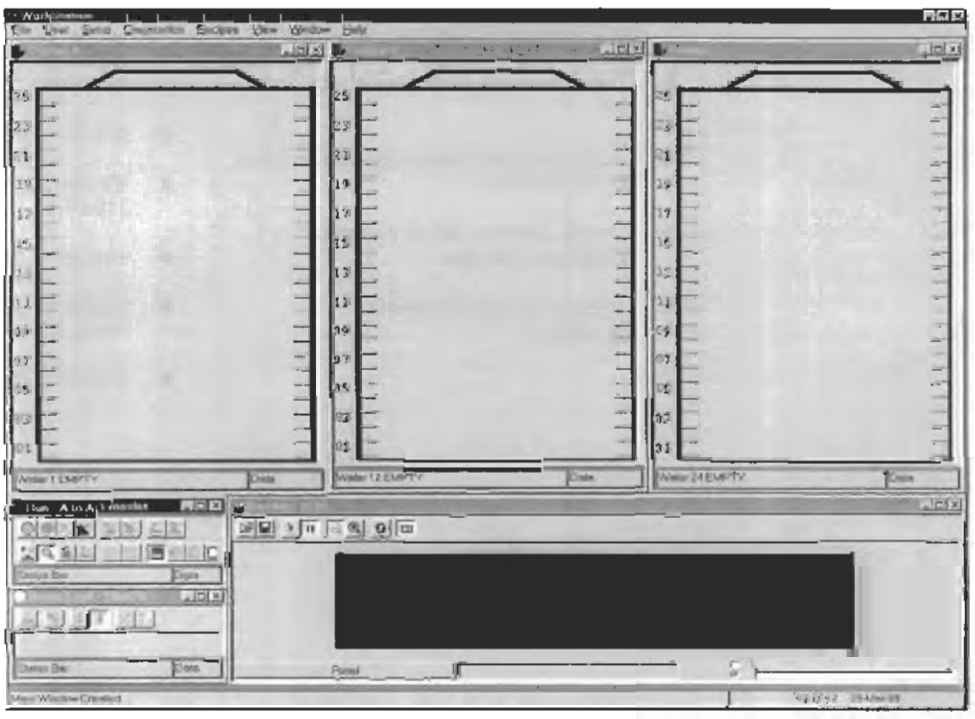
This system features the MicroVision robot with its integrated laser mapping system for safety and a dual paddle design for fast throughput. Closed-loop control of all axes, vacuum sensors on each handling element, and a backup vacuum reservoir provide additional assurance of secure handling.

Advanced illumination and OCR (Optical Character Recognition) is used for wafer ID reading at the system's high-speed aligner station.

The optional integrated bright light macroinspection module increases the utility of this system and allows macro defect inspection to be performed more efficiently. Macroinspection can be performed manually with joystick control or pre-programmed.

Easy-to-use, Windows NT™ based software allows operators to store wafer flows and comprehensive recipes or operate in manual mode. Scribe information, together with a graphical display of each wafer's status and program setup information are displayed in real time on either a flat screen or super VGA color monitor.

Communications packages are available for SECS / GEM, FTP and TCP/IP protocols.



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Introduction:
System Specifications

MVT 7080 Wafer Sorter

- 3-axis robotic handler with laser mapping system
- High speed aligner
- 2, 3 or 4 cassette stations
- 75 to 200 mm wafer capability
- Flat panel color monitor
- Integrated control electronics

Vision (OCR) System

- Integrally mounted electronics and vision processor
- High resolution CCD camera and optics
- Advanced illumination system

Optional Bright Light Macroinspection Module

- High intensity light (up to 250 watts) with ducted cooling fan
- User-definable tilt between -30° and 30°
- User-definable rotation speed and rate of tilt variation
- Configurations can be saved as inspection recipes
- Joystick or fully automatic operation

Software Configurations

- Sorter software
- Wafer ID reader (OCR) software
- Barcode reader software
- FABCOM software (SECS / GEM and TCP/IP communications)

Facility / Installation Requirements

- MVT 7080 Dimensions:
  965mm (w) x 1016mm (d) x 1397mm (h)

  38" (w) x 40" (d) x 55" (h)
- System Power

  USA: 110 VAC +/- 10%, 50/60 Hz, 15 Amps, single phase

  Europe: 220 - 240 VAC +/- 10%, 50/60 Hz, 5 Amps, single phase
- Installation Overvoltage Category: II
- Protection Against Electric Shock: Class 1
- Voltage Tolerance +/- 10% of normal rated line
- Vacuum: 84.3 KPa (25" Hg)
- Temperature: 5°C (41°F) to 40°C (104°F)
- Humidity: 10% to 90% non-condensing
- System classification: < Class 10 clean room environment
- Pollution Degree: 2

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IEC Symbols

IEC Symbols

The MVT 7080 Wafer Sorter utilizes the following IEC (International Electro-Technical Commission) symbols:



Earth (Ground) Terminal IEC 417, No. 5017)



Protective Conductor Terminal (IEC 417, No. 5019)

On - Power Supply (IEC 417, No. 5007)



Off - Power Supply (IEC 417, No. 5008)



CAUTION, risk of electric shock (ISO 3864, No. B.3.6)



CAUTION, outlet for use only with equipment supplied by manufacturer. Maximum Rating: 15 A, 125 VAC.

Cautions

CAUTION: Protection provided by the equipment may be impaired if it is used in a manner not specified by the manufacturer.

CAUTION: To ensure the safety of users and proper operation, the MVT 7080 Wafer Sorter must be connected to a properly grounded power source.

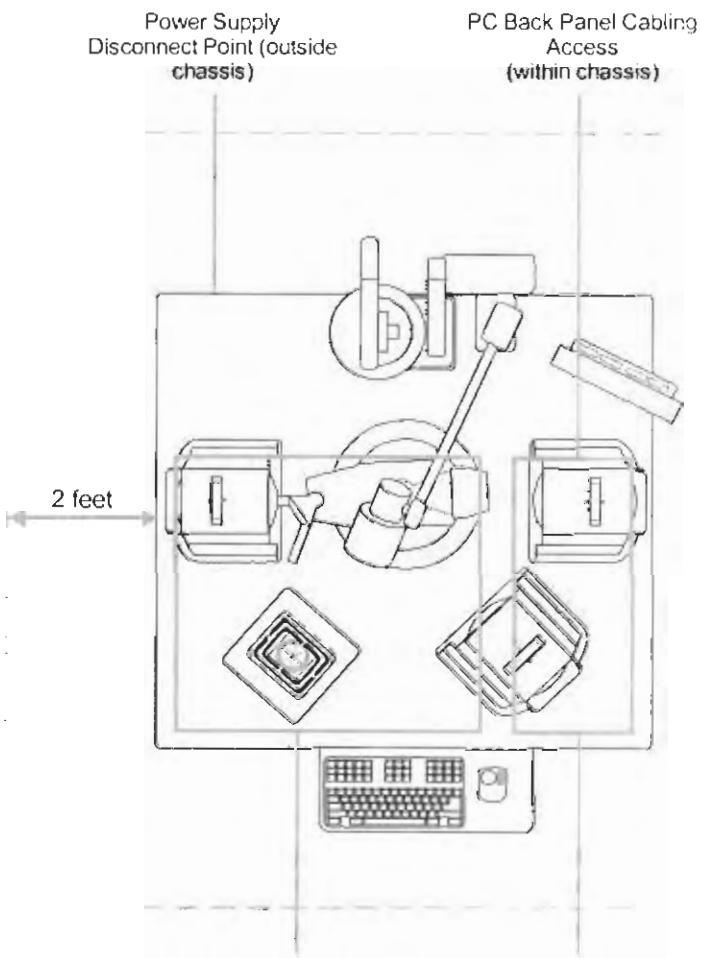
CAUTION: System users must wear a wrist strap for grounding purposes to prevent electric static discharge.

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Positioning the System

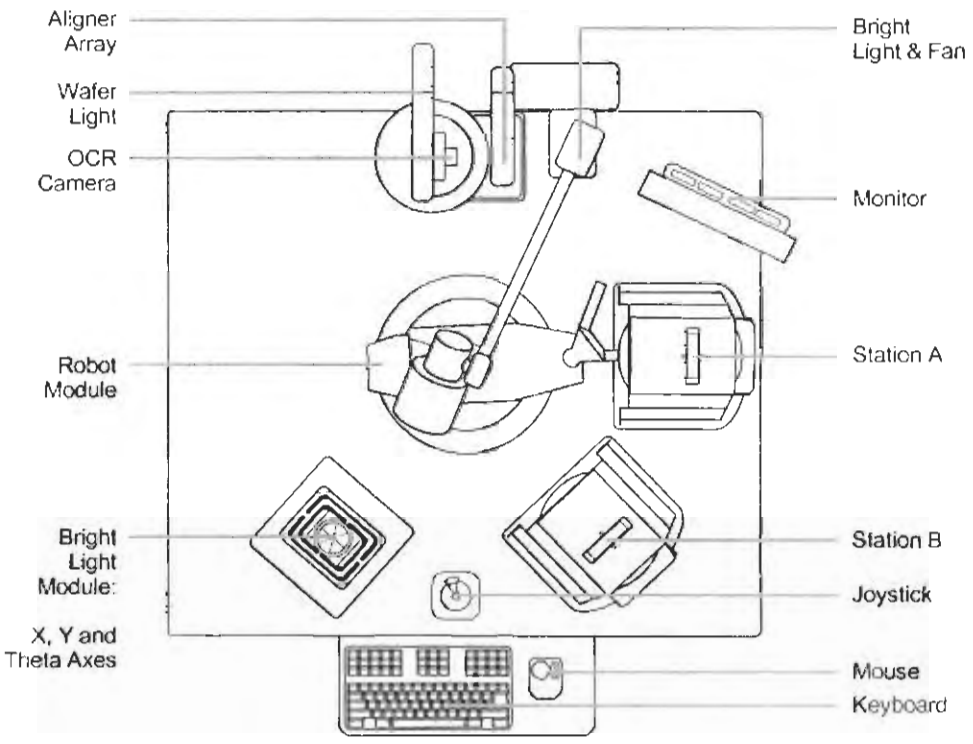
Positioning the System

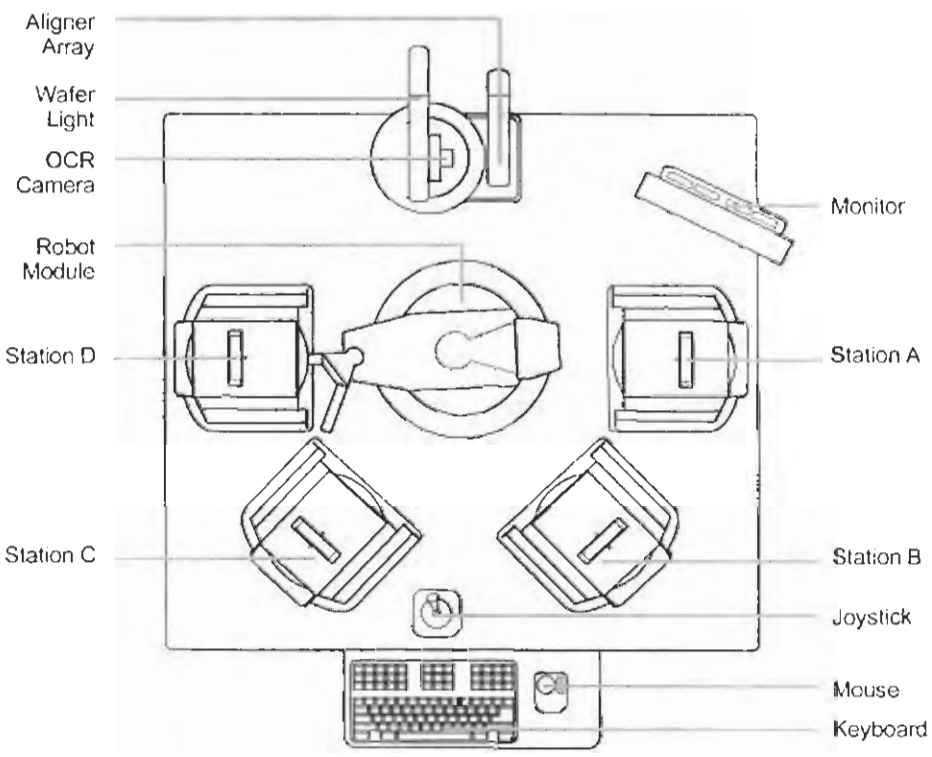
When installing an MVT 7080 Wafer Sorter, it is important to position the system in a manner that affords quick and easy access to the power supply disconnect point, the controller, the PC, and all system cabling located within the system chassis. For optimal accessibility to all internal components, an obstruction-free, 2-foot wide aisle should be maintained around the perimeter of the system, allowing easy unlatching and removal of the chassis outer panels on all four sides.



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System Geography: Wafer Sorter Layouts



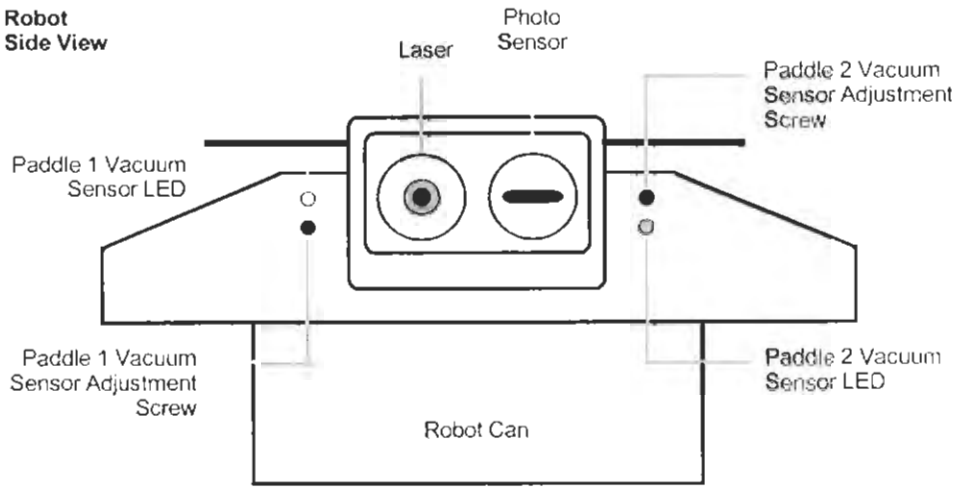


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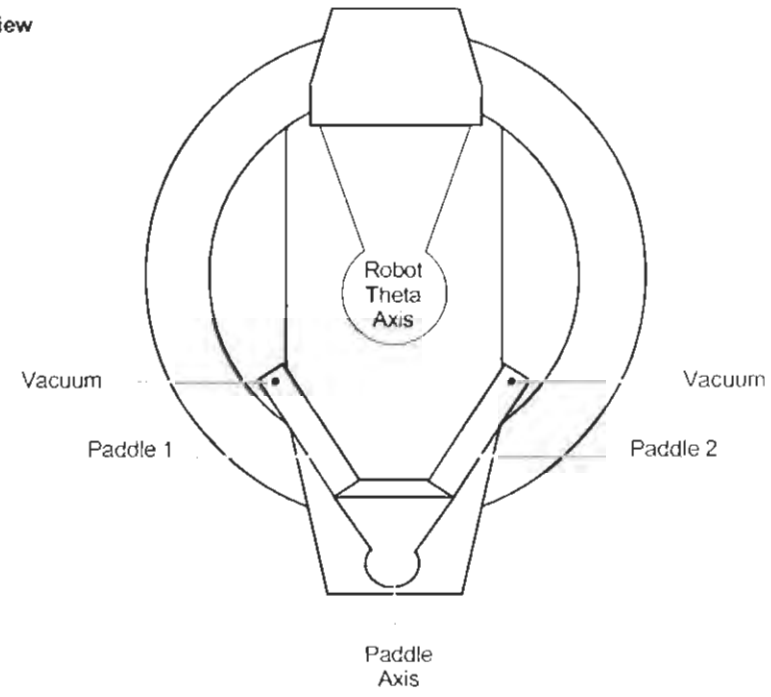
System Geography:

Robot Module

Robot Side View

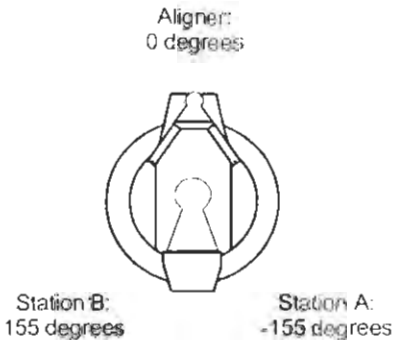


Robot Top View



Can Angle Map

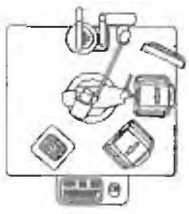




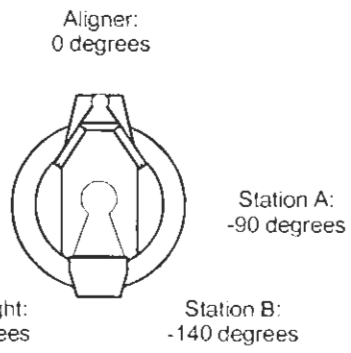
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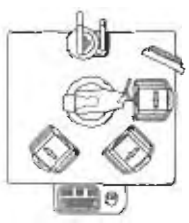
System Geography:

Robot Module

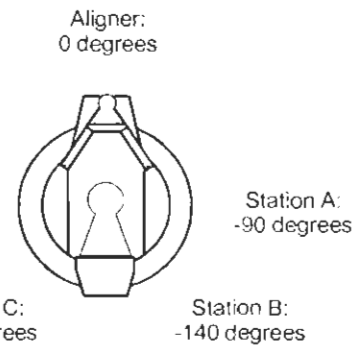


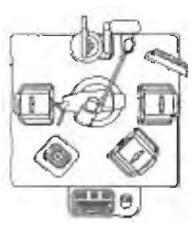
2-Cassette/
Bright Light



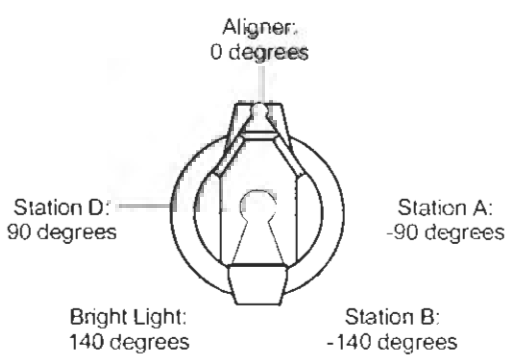


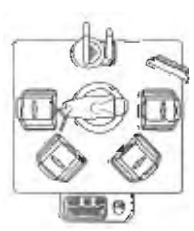
3-Cassette



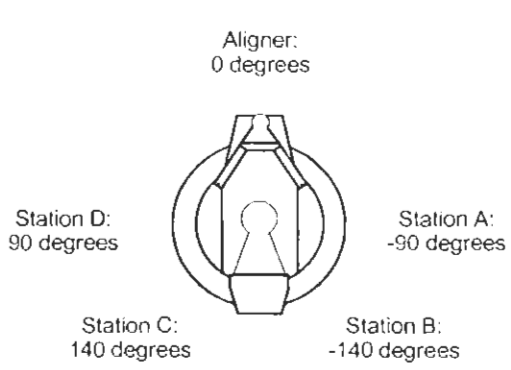


3-Cassette/
Bright Light





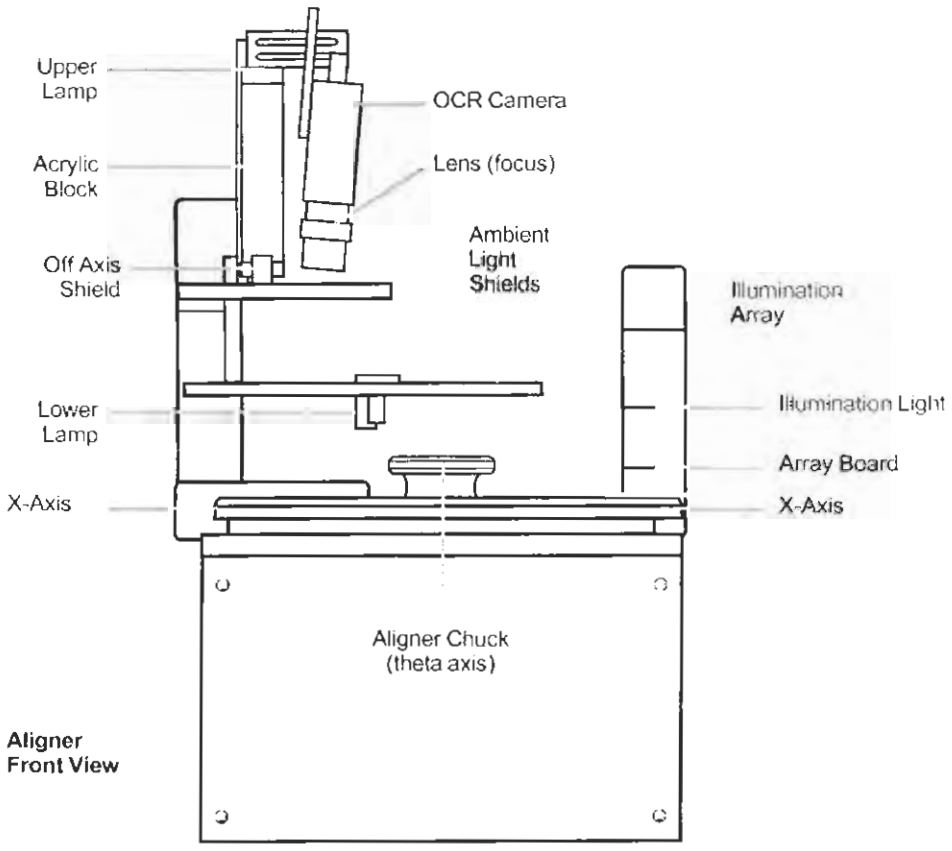
4-Cassette



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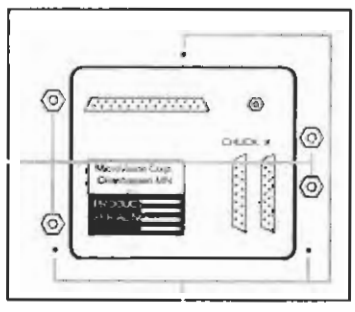
System Geography:

Aligner Module



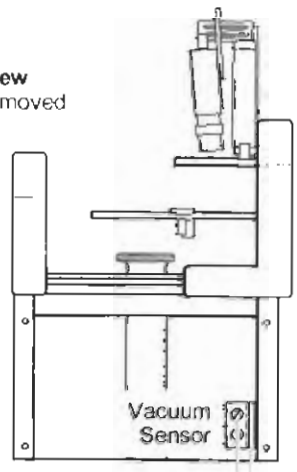
Aligner Front View

Aligner Bottom Panel

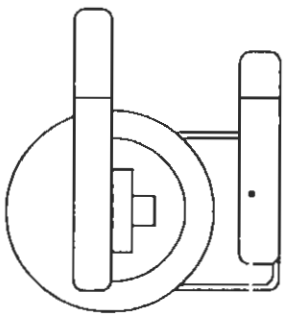


Aligner Module Leveling Screws

Aligner Back View cover removed



Aligner Top View

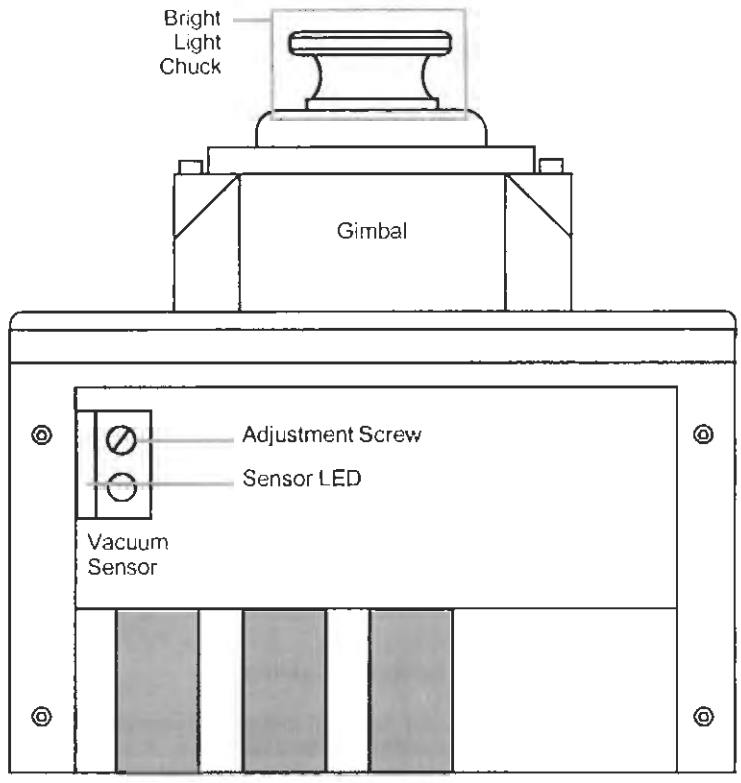


Potentiometer

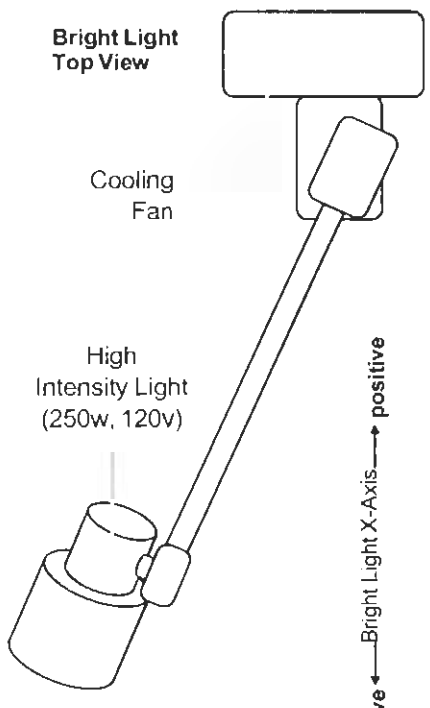
System Geography:

Bright Light Module

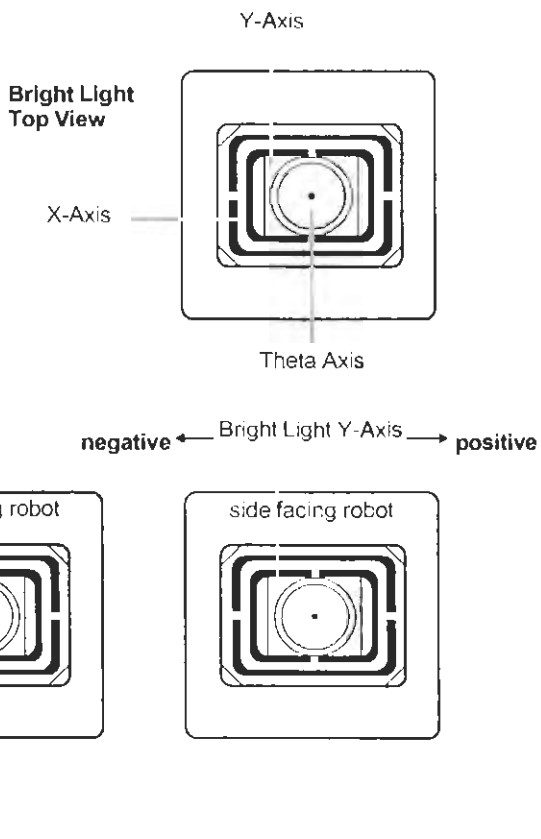
Bright Light Front View
cover removed



Bright Light Top View

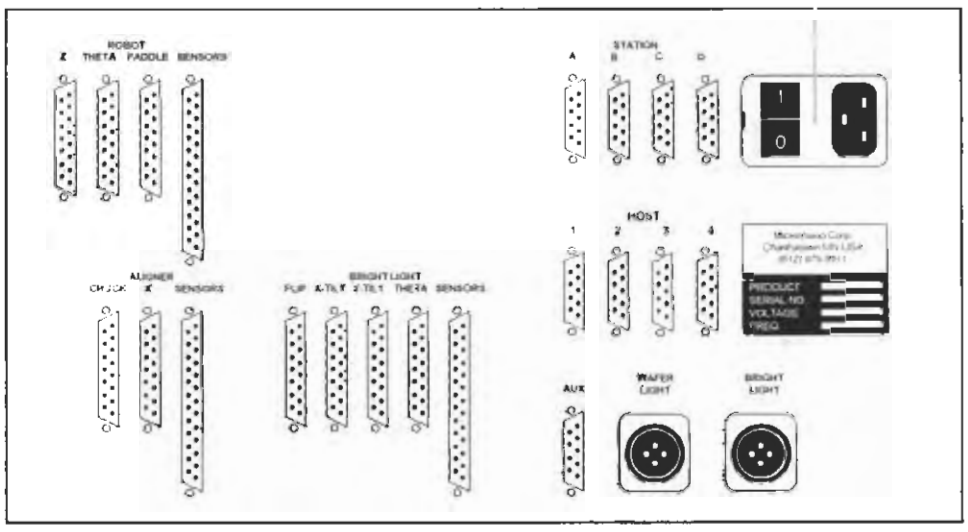


Bright Light Top View



Controller Cabling Scheme

Controller Back Panel



Controller Cabling

The system controller serves as the system's motion governor. It is linked via cabling to the PC, all cassette stations, and all module sensors and motorized axes. All prompts for mechanical motion are communicated first to the controller, which orchestrates their execution among the system's modules.

Refer to the diagram above and the chart to the right when connecting cables to the controller. Note that all system cables are labeled with cable numbers to prevent connection errors.

Controller Port	Cable #
Robot Z	740-000-215
Robot Theta	740-000-214
Robot Paddle	740-000-213
Robot Sensors	740-000-208
Station A	740-000-209
Station B	740-000-210
Station C	740-000-211
Station D	740-000-212
Host 1 (to PC)	740-000-222
Host 2 (to PC)	740-000-222
Host 3	not used
Host 4	not used
Aligner Chuck	740-000-216
Aligner X	740-000-217
Aligner Sensors	740-000-206
Bright Light X-Tilt	740-000-218
Bright Light Y-Tilt	740-000-219
Bright Light Theta	740-000-220
Bright Light Sensors	740-000-207
	740-351-100
Flip	740-351-090
Aux (to system vac sens)	740-000-226
Wafer Light	740-000-279
Bright Light	740-000-227

Replacing the System Fuse

System Fuse

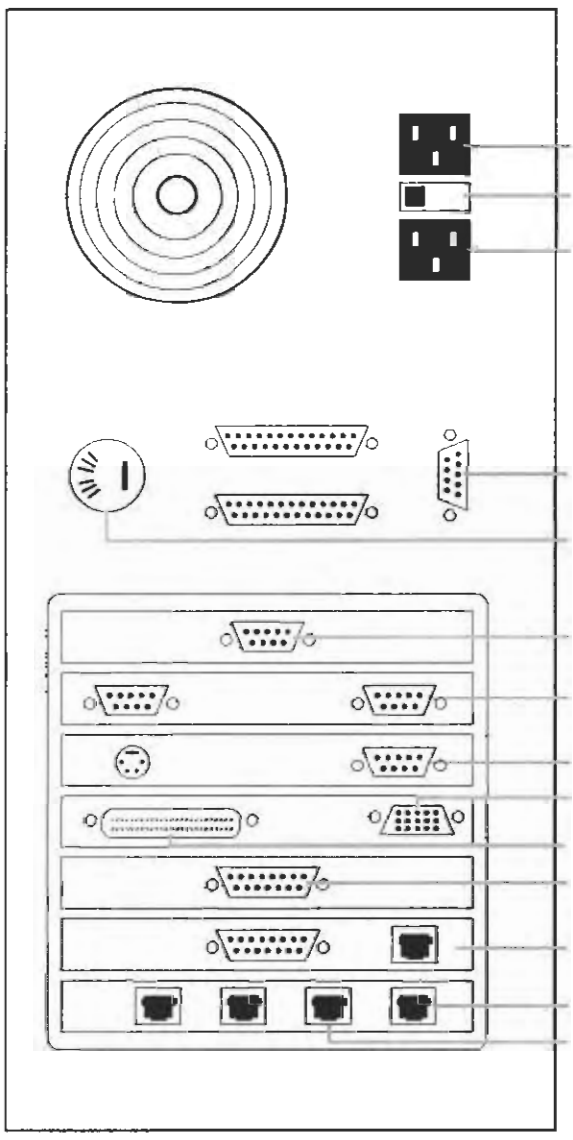
The 6 Amp System Fuse (802-626-001) is located at the back of the controller, beneath the cover of the On/Off switch and power receptacle.

To gain access to the system fuse, first unplug the power cord from the power receptacle, then use a flat head screw driver to pry up and open the left side of the cover. The fuse is located between the On/Off switch and the receptacle.

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PC Cabling Scheme

Sorter PC Back Panel



PC Cabling

The system PC, or computer, accommodates the system's various drivers, and the Windows NT and Workstation software programs. It serves as the user's interface with the controller, which orchestrates the execution of motion commands among the system's modules.

Refer to the diagram above and the chart to the right when connecting cables to the PC. Note that several cables are factory-supplied and therefore not labeled.

PC Port	Cable #
Monitor AC	factory
Input AC	factory
Mouse	factory
Keyboard	factory
UPS	factory
Video Power	740-111-000
Video Signal	740-111-000
VGA Monitor	factory
LCD Display	740-000-318
Joystick	factory
Network Serial	customer
Network Serial	customer
Host 1 Serial	740-000-222
Host 2 Serial	740-000-222

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System Power-Up Sequence

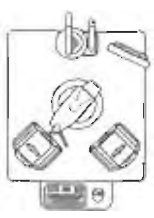
1. Turn the MVT 7080 Power Main Switch to the ON position.
2. Power-up the VGA color monitor if the system is equipped with one.
3. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.
4. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Program Manager window.
5. Set the Controller ON/OFF switch to the ON position. The operator will hear the sound of solenoids and cooling fans being activated.
6. Within the Windows NT Program Manager window, locate the MicroVision WorkStation window and select the MicroVision icon. The operator will be presented with a Logon window. Enter a user name and password in the appropriate boxes and select the OK button.
7. As the WorkStation program is launched, the operator will be presented with the MVT 7080 graphical user interface.

System Power-Down Sequence

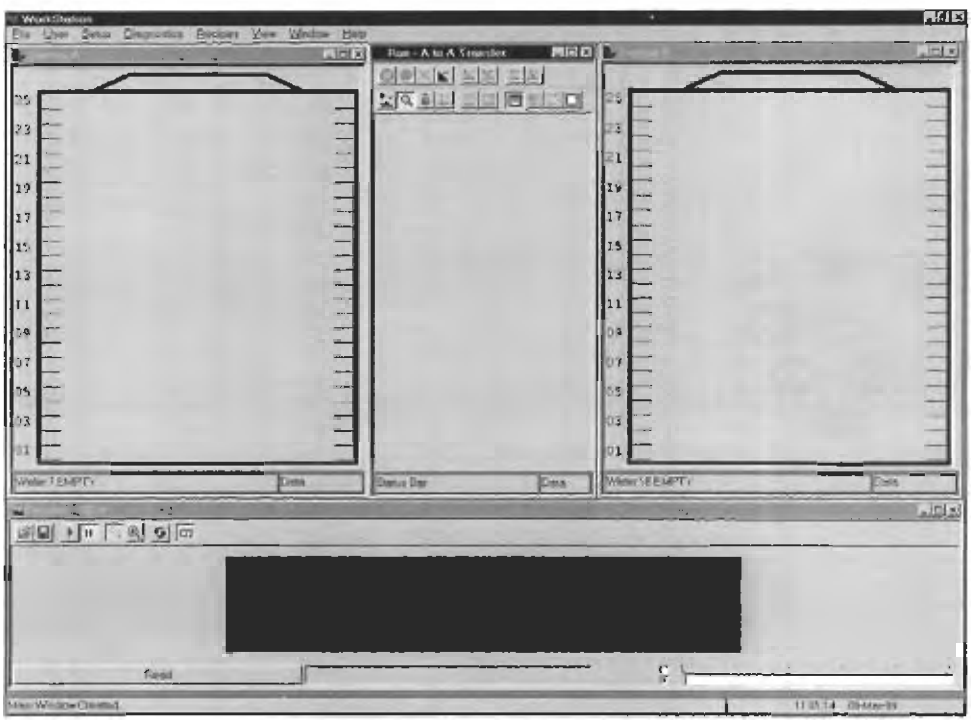
1. Make sure that all wafers are returned to cassettes and that all modules and the robot are empty.
2. Select File from the main window menu bar and Exit from the File pull-down menu to prompt the display of an Exit WorkStation window.
3. Within the Exit WorkStation window, enter a password where prompted and select Terminate Program from among the Select Exit Type options. Select the OK button to prompt the display of the Windows NT Program Manager window.
4. From within the Windows NT Program Manager window, select File from the menu bar and Exit from the File pull-down menu to prompt the display of a Shutdown Computer window.
5. From within the Shutdown Computer window, verify that the Shutdown option is selected and select the OK button. The operator will then be presented with another Computer Shutdown window that features a RESTART button - do not select it.
6. Set the Controller ON/OFF switch to the OFF position.
7. Power-down the PC.
8. Power-down the VGA color monitor if the system is equipped with one.
9. Turn the MVT 7080 Power Main Switch to the OFF position.

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Graphical User Interface

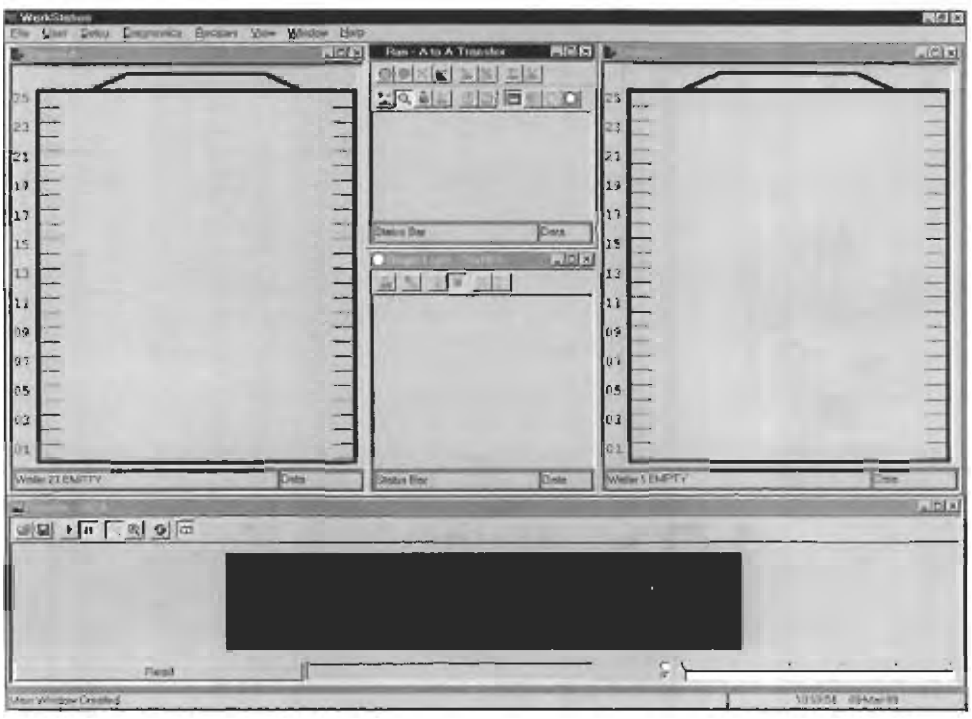


2-Cassette





2-Cassette/
Bright Light

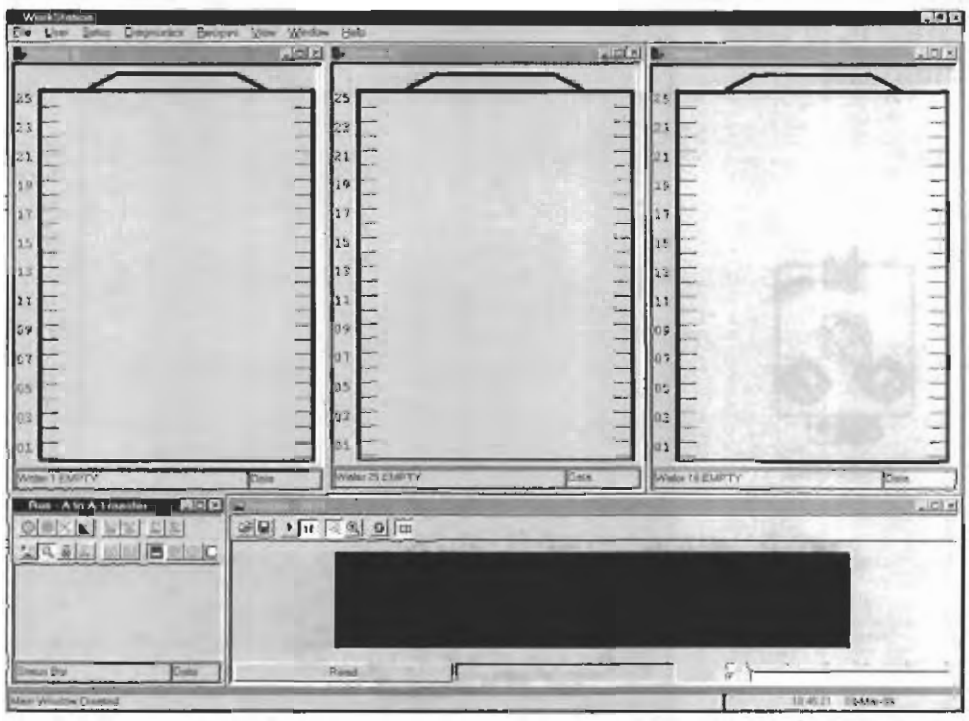


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Graphical User Interface

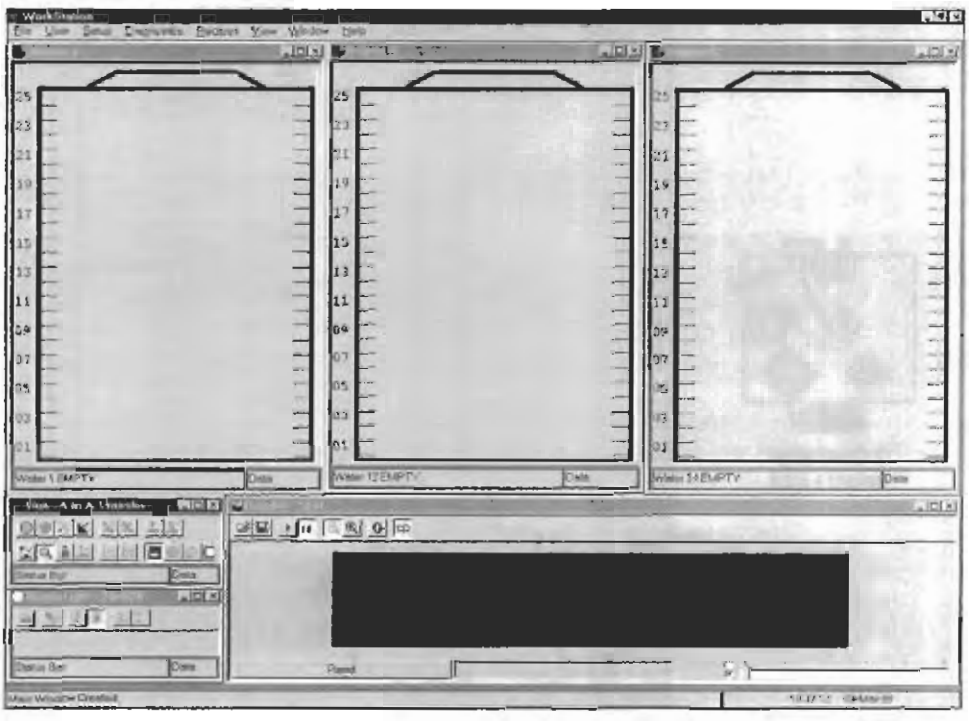


3-Cassette



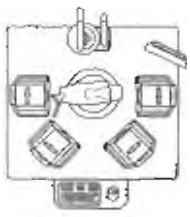


3-Cassette/
Bright Light

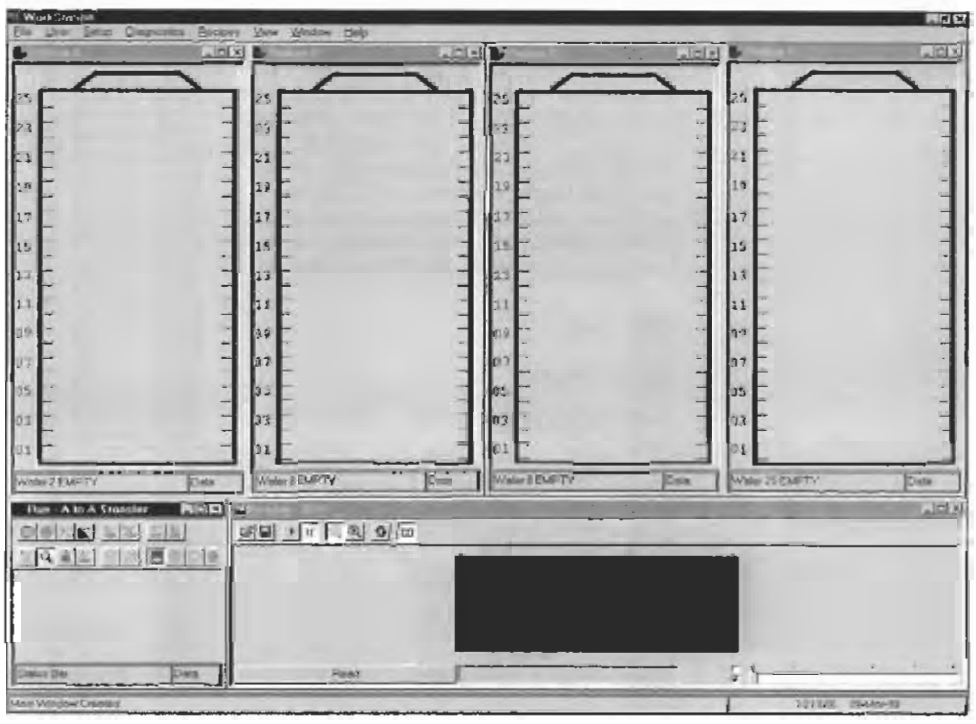


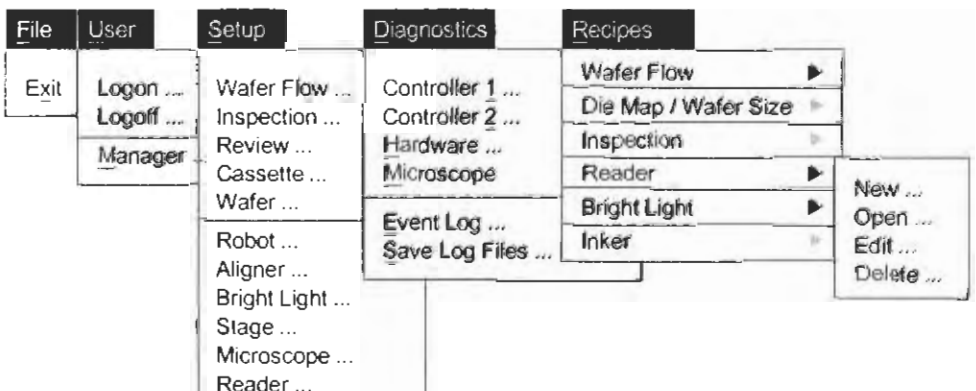
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Graphical User Interface



4-Cassette





Menu Bar & Pull-Down Menus:

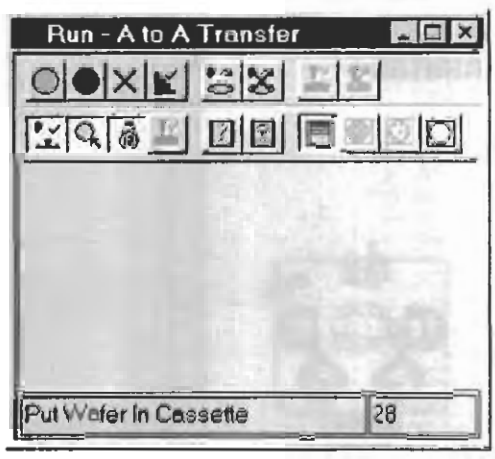
Utilized primarily for system setup and runtime setup, the main window menu bar and pull-down menus provide access to the user manager, setup, diagnostic, and recipe windows described in the following pages.

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Graphical User Interface

Run Window:

During runtime setup and operation, the scalable Run window serves as the system's main control panel. It contains selections that allow an operator to: initiate or abort a run; proceed in step mode; enable or disable Bright Light, Aligner and OCR options; accept or reject wafers; and choose a particular workspace. The following tool buttons are contained in the Run window:



- Run
- Stop Run
- Abort Run
- Step Mode
- Bright Light Accept
- Bright Light Reject
- Stage Accept (N/A)
- Stage Reject (N/A)
- Bright Light Enable
- Aligner Enable
- Reader Enable
- Stage Enable (N/A)
- Ask Destination for Accepts
- Ask Destination for Rejects
- Sorter Workspace
- Inspection Workspace (N/A)
- Defect Review Workspace (N/A)
- Bright Light Workspace

Station Windows: Cassette stations are represented by scalable station windows. After mapping, each window displays the location and status of each wafer sensed with a particular wafer icon:

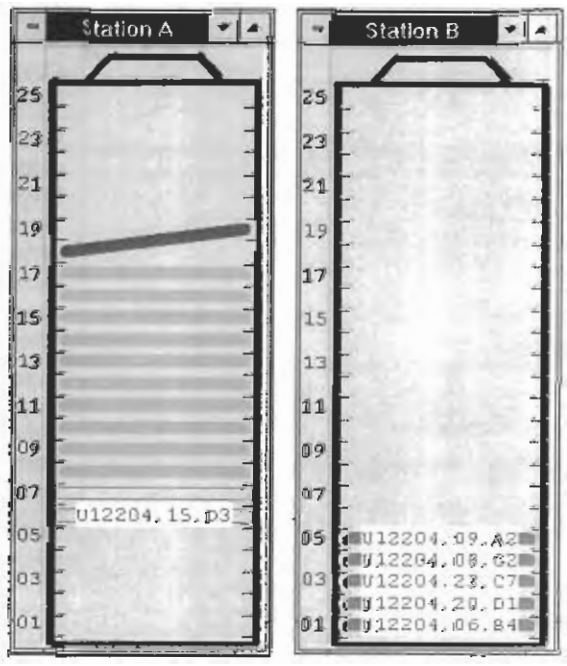
Black Solid: wafer sensed but not selected for processing.

Green Solid: wafer sensed and selected for processing.

Red Solid: wafer sensed as being cross-slotted in cassette.

Magenta Outline: wafer is out of cassette and being processed. If OCR read has been performed, the scribe characters will be displayed over the outlined icon.

Magenta Solid: wafer processed and deposited in its destination. If OCR read has been performed, the scribe characters will be displayed over the solid icon.



Graphical User Interface



Reader Window:

During runtime setup the scalable Reader window is used to train the system's cameras and calibrate its OCR to read a sample wafer's scribe.

After an OCR attempt, the window displays a live image of the scribe and all its characters surrounded by color-coded calibration boxes; green indicates OK, red indicates failure.

During runtime operation, this window will display a live image of each wafer's scribe.

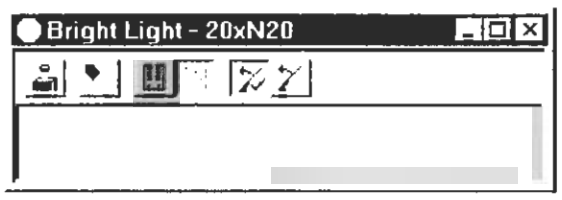
The tool buttons featured in this window are described at right.

- Open existing file
- Save file to diskette
- Play live image
- Pause live image
- Minimize image
- Maximize image
- Flip image
- Maximizes image in reader window only

Upper & lower light source intensity



Bright Light Window: The scalable Bright Light window allows an operator to perform front or backside bright light macroinspection under manual or recipe control. The following tool buttons are contained in the bright Light window.



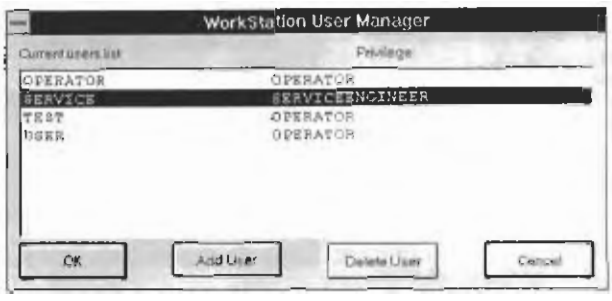
- Joystick
- Lamp
- Start Recipe
- Stop Recipe
- Flipper Enable
- Flip Wafer

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Graphical User Interface

User Manager Windows:

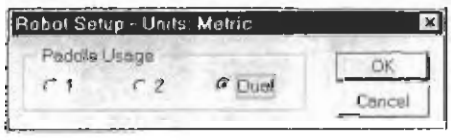
The MVT 7080 software is designed to accommodate users with wide ranging degrees of system knowledge, from operators to service engineers. User manager windows provide the primary means for controlling user access from within the system software. Accessed by selecting User from the main window menu bar, these windows enable a user to add or delete system users to or from the current users list, issue passwords, and specify each user's level of privilege.

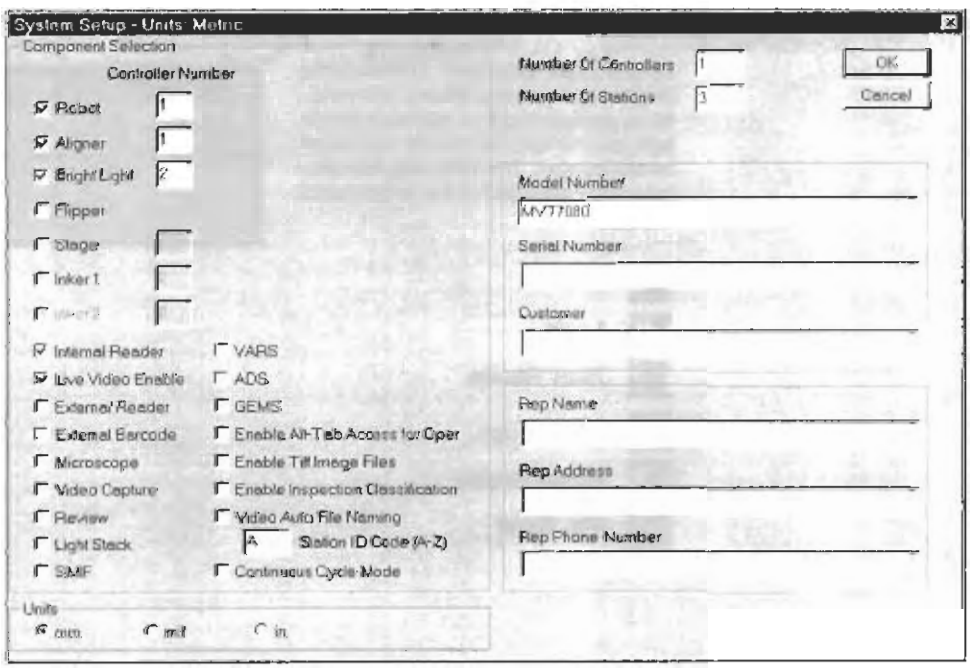


Setup Windows:

Used primarily during runtime setup, the setup windows are used to configure the software settings of a system's various modules to accurately reflect its modular configuration and the specific tasks it will be required to perform during runtime operation. The following windows are accessed by selecting Setup from the main window menu bar.

- System Setup
- Robot Setup
- Aligner Setup
- Bright Light Setup
- Reader Setup
- Joystick Setup



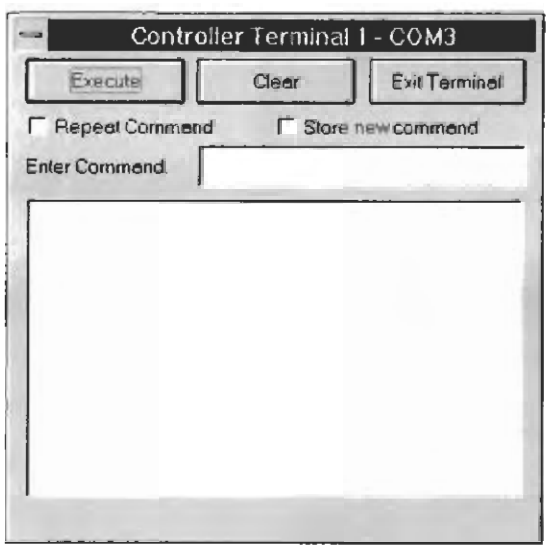


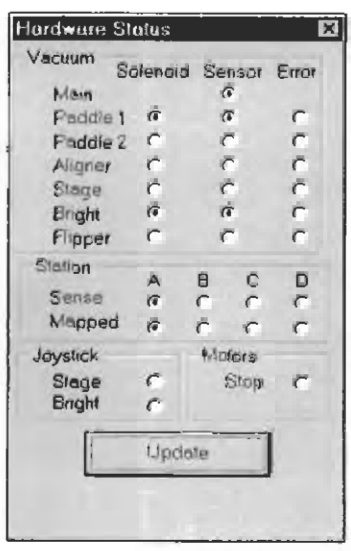
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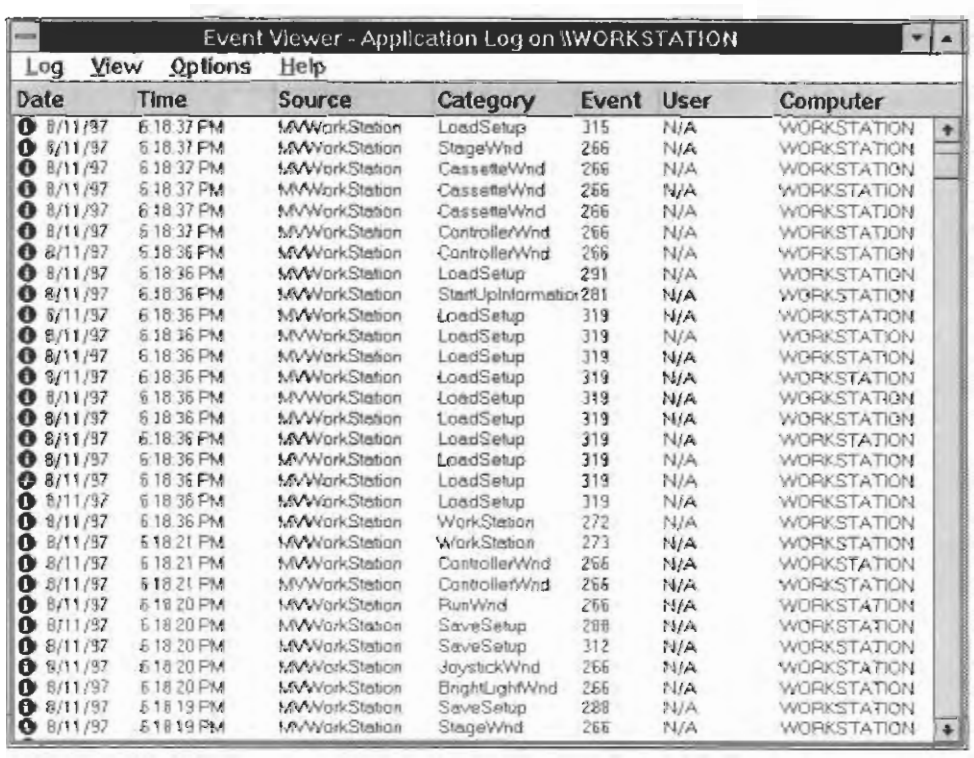
Graphical User Interface

Diagnostic Windows:

Used primarily for system setup and troubleshooting, the diagnostic windows serve to provide Host NT access to the system controller, display a chronological history of a system's use, and reveal a system's current hardware status. These windows are accessed by selecting Diagnostics from the main window menu bar.





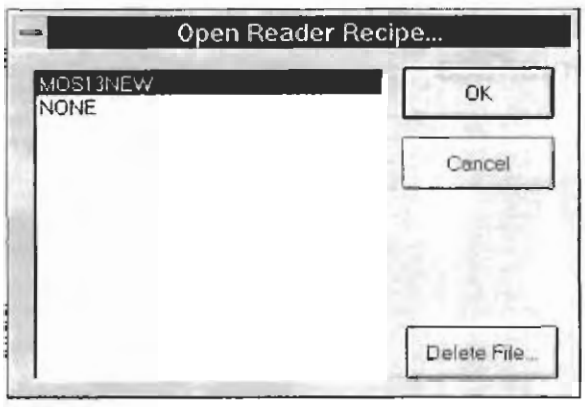


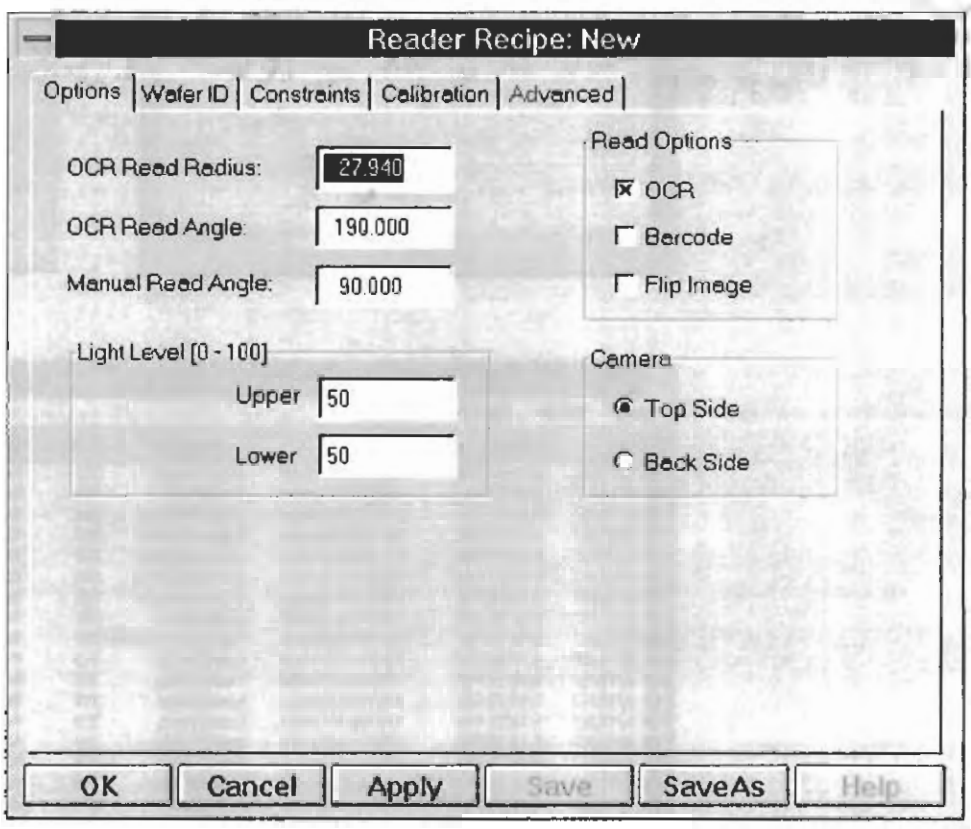
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Graphical User Interface

Recipe Windows:

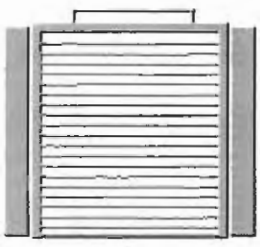
Used primarily during runtime setup, recipe windows enable users to select recipes for runtime operation, delete a recipes from the system, and create and edit new recipes. Wafer flow, reader, and bright light recipes can be accessed by selecting Recipes from the main window menu bar.





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MicroVision®



Section C: Software Installation

1.0. Copying and Saving Existing Files 2
2.0. Inserting Boot Floppy and Master CD 2
3.0. Preparing Hard Drive Partition for Formatting 2
4.0. Formatting Hard Drive Partitions 3
5.0. Windows NT Installation 3
6.0. Creating an Operator Account 3
7.0. Setting-up AutoAdminLogon 4
8.0. Changing Startup 4
9.0. Changing Event Log Settings 5
10.0. Rebooting 5
11.0. Installing Microsoft Internet Explorer 6
12.0. Changing Display Properties 7
13.0. Installing Joystick Drivers 8
14.0. Installing MicroVision Front End Software 8
15.0. Starting UPS Service 9
16.0. Changing Computer Name 9
17.0. Installing Computone Driver 10
18.0. Copying Saved Files 10
19.0. Changing to Magnified Cursors 10
20.0. Deleting Unwanted Icons 11
21.0. Auto-hide Start Bar 11
22.0. Adding WorkStation.exe to Startup 11
23.0. Adjusting Date, Time and Time Zone 11

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1.0. Copying and Saving Existing Files

1.1. This step needs to be completed only if machine is not a new build. Disregard if machine is a new build.

1.2. Copy all files needing to be saved from the hard drive to a blank floppy. Such files may include reader recipes, wafer recipes, inspection recipes, and host cfg files.

2.0. Inserting Boot Floppy and Master CD

2.1. **Make sure the network cable is unplugged from the back of the computer.**

2.2. Insert NT 4.0 boot floppy disk into disk drive.

2.3. Press **Ctrl+Alt+Delete** to reboot computer. Be sure floppy is already inserted into disk drive.

2.4. While the computer is booting, insert the master CD into the CDROM drive.

3.0. Preparing Hard Drive Partition for Formatting

3.1. Fixed Disk Setup Program (F disk) instructions: Enter the information listed below when prompted to do so. Note: Type **bold** information only.

3.2. Type **3** (Delete partition or Logical DOS Drive) in **[ ]** provided. **Enter** the selection.

3.3. Type **4** (Delete non DOS partitions) in **[ ]** provided. **Enter** the selection.

3.4. There should now be a warning dialogue box stating "**Warning! Data in the deleted Non-DOS partition will be lost. What Non-DOS partition do you want to delete?**" on the screen.

3.5. Type **1** (Delete partition on line 1) in **[ ]** provided. **Enter** the selection.

3.6. There should now be a "**Do you wish to continue?**" warning box on the screen.

3.7. Type **Y** in the **[ ]** provided. **Enter** the selection.

3.8. Press **Esc** (Escape) to return to the main menu.

3.9. Type **1** (Create DOS partition or Logical DOS Drive) in **[ ]** provided. **Enter** the selection.

3.10. Type **1** (Primary DOS Partition) in **[ ]** provided. **Enter** the selection.

3.11. There should now be a question box asking "**Do you wish to use the maximum available size for the Primary DOS Partition and make the partition active (Y/N).....?**" on the screen.

3.12. Type **Y** (Make it an active partition) in **[ ]** provided. **Enter** the selection.

3.13. At the prompt: "**Insert DOS system diskette in drive A: Press any key when ready**". Press **Enter**. The computer should now begin to reboot.

4.0. Formatting Hard Drive Partitions

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4.1. After rebooting to Fdisk, press **ESC**.

4.2. At the prompt: "**Proceed with format (Y/N)?**" type **Y**. **Enter** the selection.

4.3. After computer has finished formatting, the prompt "**Format complete**" should appear on the screen. Press **Enter**.

5.0. Windows NT Installation

5.1. Be sure to follow all instructions on the screen–**Never press any key other than Enter.**

5.2. Once Windows NT 4.0 WorkStation begins to copy files, **remove the floppy disk from the disk drive.**

At this point Windows NT 4.0 WorkStation will copy files, reboot, copy more files, reboot, convert to NTFS, and again reboot. After Windows NT 4.0 WorkStation Setup has completed the rest of the setup, the computer will again reboot. The computer will automatically logon as Administrator the first time and load service pack 4.

6.0. Creating an Operator Account

6.1. Click the **Start** button in the lower left corner of the NT Desktop.

6.2. Scroll up to, and select **Programs**.

6.3. Scroll right and select **Administrative Tools (Common)**.

6.4. Select **User Manager**.

6.5. Click **User** in the pull down at the top of the window.

6.6. Click **New User**.

6.7. The **New User** window opens. Type **operator** into blank next to **User Name**.

6.8. Do not enter any information into **Full Name** and **Description** blanks.

6.9. Type **operator** into blanks next to **Password** and **Confirm Password**.

6.10. Select check boxes next to **User cannot change password** and **Password never expires**.

6.11. Deselect check box next to **User must change password at next logon**.

6.12. Click the **Groups** button.

6.13. Click the **Add** button.

6.14. Click **OK** for Group Membership.

6.15. Click **OK** for New User.

6.16. Close the User Manager.

7.0. Setting-up AutoAdminLogon (Optional)

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7.1. Do this step if the customer wants the system to automatically logon as operator.

7.2. Click **Start** in the lower left corner of the NT Desktop.

7.3. Scroll up to and click **Run**.

7.4. The **Run** window opens. Type **regedit** into box next to **Open**.

7.5. Click **OK**. The **Registry Editor** window opens.

7.6. Click the plus sign + next to the **HKEY_LOCAL_MACHINE** folder.

7.7. Click the plus sign + next to the **Software** folder.

7.8. Click the plus sign + next to the **Microsoft** folder.

7.9. Click the plus sign + next to the **Windows NT** folder.

7.10. Click the plus sign + next to the **Current Version** folder.

7.11. Click **Winlogon** folder.

7.12. Double click **AutoAdminLogon** in the right pane of **Registry Editor** window.

7.13. Type **1** in the Edit string Box (AutoAdminLogon). Click **OK**.

7.14. Double click **DefaultPassword**.

7.15. Type **operator**

7.16. Click **OK**.

7.17. Double click **DefaultUser Name**.

7.18. Type **operator**

7.19. Click **OK**.

7.20. Exit **Registry Editor**.

8.0. Changing Startup

8.1. Right click **My Computer** icon in the upper left corner of the NT Desktop.

8.2. Select **Properties**.

8.3. Select **Startup\Shutdown** tab in the **System Properties** window.

8.4. Change the number in the "**Show list for** box **seconds**" to 0 (zero). Click **OK**.

9.0. Changing Event Log Settings

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9.1. Click **Start** in the lower left corner of the NT Desktop.

9.2. Scroll up to and select **Programs**.

9.3. Scroll over to **Administrative Tools (Common)**.

9.4. Scroll over to and click **Event Viewer**.

9.5. Click the **Log** pull down menu and scroll down to **Log Settings**.

9.6. The **Event Log Settings** window opens. Note: The "**Change settings for [ ] Log**" should be set to **System**.

9.7. Click **Overwrite Events as Needed** under the **Event Log Wrapping** section.

9.8. Repeat the previous step for both the **Security** and **Application** settings in the "**Change settings for [ ] Log**". These can be accessed through the pull down in this section.

9.9. Click **OK**. Close **Event Viewer**.

10.0. Rebooting

10.1. Click **Start** in the lower left corner of the NT Desktop.

10.2. Scroll up to and select **Shut Down**.

10.3. Select **Restart the computer** and click **Yes**. Note that the computer must be rebooted at this point.

10.4. If optional steps **7.0** though **7.20** are correctly followed, logon will be automatic.

10.5. If automatic logon fails to occur, logon as operator (password: operator).

11.0. Installing Microsoft Internet Explorer

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11.1. Click the **Start** button in the lower left corner of the NT Desktop.

11.2. Click **Run**.

11.3. Type **d:\ie4.bat**

11.4. Click **OK.**

11.5. The **Internet Explorer 4.01 SP1 Active Setup** window opens. Click **Next**.

11.6. Choose "**I accept the agreement**". Click **Next**.

11.7. **Installation Option** appears with **Standard Installation** highlighted. Click **Next**.

11.8. **Windows Desktop Update** appears asking, "Would you like to install it?" Choose **Yes.**

11.9. Click **Next**.

11.10. **Active Channel Selection** – United States is highlighted. Click **Next**.

11.11. **Destination Folder** window opens. **C:\Program Files\Plus!\Microsoft Internet** is the default. Click **Next**.

11.12. After the file copying is complete, click **OK**.

11.13. A message is displayed, "Setup must restart your computer". Click **OK**.

11.14. After rebooting, if automatic logon fails to occur, logon as operator (password: operator).

11.15. The Internet Explorer will finish installing before the desktop appears with a **Welcome – Microsoft Internet Explorer** window. Close this window now, and the next time this window appears (after rebooting), deselect the check box that says, "Show this next time you log in".

12.0. Changing Display Properties

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12.1. **Right click** in an open area of the Nt Desktop.

12.2. A pull down appears. Select **Properties**.

12.3. The **Display Properties** window opens. Click the **Background** tab.

12.4. Under the section **Wallpaper** click **Mvsplash**.

12.5. Click the **Screensaver** tab.

12.6. Under the section **Screen Saver** click either **Starfield** or **Beziers**. Note: These two selections are best since they cause less wear on the CPU and they are less prone to lockups than 3D screensavers

12.7. Click the **Web** tab.

12.8. Deselect the check box next to "View my Active Desktop as a web page".

12.9. Click the **Plus!** tab.

12.10. Select all possible choices listed in the **Visual Settings** section.

12.11. Click the **Settings** tab.

12.12. In the **Font Size** box select **Large Fonts**.

12.13. Click **OK** in message box for **Change System Font**.

12.14. Click **OK** in the **Display Properties** window.

12.15. Click **OK** for changes made in **Plus!**

12.16. Click **Yes** in the Change System Font.

12.17. Click **OK** for the **Insert Disk** message box.

12.18. Click **Browse** in the **Files Needed** dialogue box.

12.19. Click **Open** in the **Locate File** dialogue box.

12.20. Click **OK** in the **Files Needed** dialogue box.

12.21. Click **No** if asked to overwrite a newer file with an older file.

12.20. Click **Yes** (restart) in the **System Settings Change** message box.

13.0. Installing Joystick Drivers

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13.1. If there is no Joystick accompanying this machine, disregard this block of instructions.

13.2. Click the **Start** button in the lower left corner of the NT Desktop.

13.3. Click **Run**.

13.4. Type **D:\Joystick.bat**

13.5. Click **OK**.

13.6. The **Welcome** window opens. Click **Next**.

13.7. The **Installation Option** window opens. Deselect all options except **32 bit Universal Library and Instacal**

13.8. Click **Next**.

13.9. The **Choose Destination Location** window opens. Click **Next**.

13.10. The **Create Program Folder** window opens. Click **Next**.

13.11. Close the **Computer Boards** window.

13.12. A **Question** window opens after all files have been copied. Choose **No**.

13.13. A **Restarting Computer** window opens. Choose "**No, I will start my computer later**". Click **OK**.

14.0. Installing MicroVision Front End Software

14.1. Click **Start** in the lower left corner of the NT Desktop.

14.2. Scroll to and click **Run**.

14.3. Type **D:\MV375.bat.** Click **OK.**

14.4. The **Selected Components** window opens.

14.5. Select choices required by the customer and follow all directs on the screen.

14.6. After all selections have been made and all files have been copied a **Setup Complete** window opens.

14.7. "**Yes I want to restart my computer now**" is the default. Click **Finish**.

15.0. Starting UPS Service

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15.1. If UPS will not be used, disregard this section of instructions.

15.2. Click **Start** in the lower left corner of the NT Desktop.

15.3. Scroll to and select **Settings**.

15.4. Scroll to and select **Control Panel**.

15.5. Double click the **Services** icon.

15.6. The **Services** window opens. Highlight **MicroVision UPS Service**.

15.7. Click **Start Up**.

15.8. The **Service** window opens. Click **Automatic**.

15.9. Click **OK**.

15.10. The **Services** window opens once again. Click **Start**.

15.11. Click **Close**.

15.12. Close Control Panel.

16.0. Changing Computer Name

16.1. If installing on a new build skip this step. Click **Start** in the lower left corner of the NT Desktop.

16.2. Scroll to and select **Settings**.

16.3. Scroll to and select **Control Panel**.

16.4. Double click the **Network** icon.

16.5. Click the **Identification** tab. Click the **Change** button. The **Identification Changes** window opens.

16.6. Type the Tool ID Number into the space provided. Click **OK**.

16.7. The **Network Configuration** window opens. Click **OK**.

16.8. Skip to step 17.5.

17.0. Installing Computone Driver

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17.1. Click **Start** in the lower left corner of the NT Desktop.

17.2. Scroll to and select **Settings**.

17.3. Scroll to and select **Control Panel**.

17.4. Double click the **Network** icon.

17.5. Click the **Adapters** tab.

17.6. Click **Add**. The **Select Network Adapter** window opens.

17.7. Click **Have Disk...** The **Insert Disk** window opens.

17.8. Type **C:\win32app\mvdrvlib\computone** in the appropriate box.

17.9. Click **OK**. The **Select OEM Option** window opens.

17.10. Click **OK**. The **V4 Configuration** window opens.

17.11. Make the following selections:
Mode Enhanced
IRQ 5
IO Addr: 01x0
Serial 2
Com 3,
Note: The **Board 2** section should not be used.

17.12. Click **OK**. The **V4 Board Switch Setting** window opens.

17.13. All switches should be **Off** except 4 and 9, read from left to right. Click **OK**.

17.14. The **Network** window opens. Click **Close**.

17.15. The **Network Settings Changes** window opens. Click **Yes**.

18.0. Copying Saved Files

18.1. Copy all files saved on the floppy during Step 1.0 back to the appropriate directories.

19.0. Changing to Magnified Cursors (Optional)

19.1. Click **Start** in the lower left corner of the NT Desktop.

19.2. Scroll to and select **Settings**.

19.3. Scroll to and select **Control Panel**.

19.4. Double click the **Mouse** icon.

19.5. Click the **Pointers** tab.

19.6. Select **Magnified** from the **Scheme** box. Click **OK**.

20.0. Deleting Unwanted Icons (Optional)

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20.1. Delete unwanted icons from the desktop; the **Confirm Folder Delete** window will open for each.

20.2. Click **Yes**.

21.0. Auto-hide Start Bar (Optional)

21.1. Right click the bar at the bottom of the NT Desktop

21.2. Click **Properties** on the pull down menu that has appeared.

21.3. Click the **Task Bar** tab if it is not already selected.

21.4. Click **Auto Hide**.

21.5. Click **OK**.

22.0. Adding WorkStation.exe to Startup (Optional)

22.1. Right click **Start** in the lower left corner of the NT Desktop.

22.2. Click **Explore**. The **Exploring** window opens.

22.3. Click the plus sign **+** next to the **Programs** folder.

22.4. Click the **StartUp** folder.

22.5. Click **File** in the menu bar at the top of the window.

22.6. Select **New**. Select **Short Cut**. The **Create Shortcut** window opens.

22.7. Type **c:\win32app\workstation\workstation.exe** into the **Command** line.

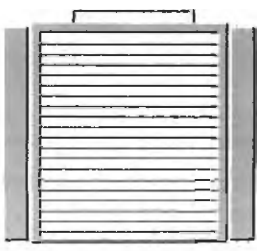
22.8. Click **Next**.

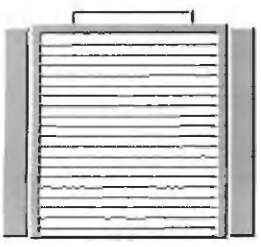
22.9. The **Select Title for the Program** window opens. Click **Finish**.

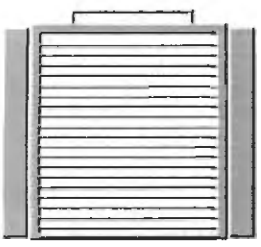
23.0. Adjusting Date, Time and Time Zone (Optional)

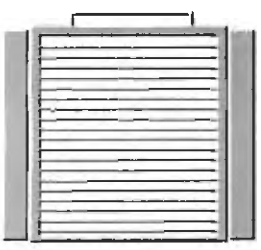
23.1. Double click the time displayed in the bottom right corner of the NT Desktop. Adjust the time, date, and time zone as needed. Click **OK**.

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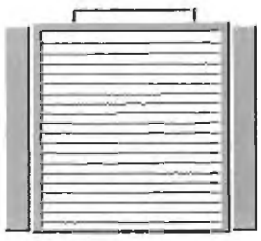












MicroVision®



Section D: System Setup & Integration

Using the Host NT Software 2

Controller Setup 7

System Integration:

- 2-Cassette 11
- 2-Cassette / Bright Light 27
- 3-Cassette 51
- 3-Cassette / Bright Light 69
- 4-Cassette 95

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Using the Host NT Software

Host Software Overview

The Host software serves as a system technician's primary means interfacing with the MVT 7080 controller, or motion governor. All controller setup, system integration and module testing procedures are performed using this command language. The following pages will describe how to access Host , provide a brief overview of the Host syntax, and define the ASCII command names that serve as the base of this language.

Accessing Host NT

Host commands can be issued to the controller via two different software interfaces: the Host interface, and the WorkStation interface. Each procedure described in this manual indicates which of these interfaces should be employed for its successful completion.

Host Interface:

From within the Windows NT desktop select (double click) the Host NT version 4.7 icon to prompt the display of the Host NT window. The system is now ready to accept Host commands at the command line.



Alternatively, a user may access Host NT software from within the workstation interface via Controller Terminal windows, shown to the right. This is done by selecting Diagnostics from the main window menu bar and Controller 1 (for controller channel 1) or 2 (for controller channel 2) from the Diagnostics pull-down menu.

Note that the host interface accessed from the Windows NT desktop should be used to perform most setup and integration procedures, while the controller terminal windows can be used to perform minor or fine adjustments.



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Using the Host NT Software

Host NTSyntax

Host commands issued to the controller must adhere to the following format:

[command] [object of reference] [parameter # or value] [parameter value or blank]

For example, using the above format, the command **WELR 11 1 1** can be interpreted in the following manner:

[**WELR** = pick up wafer] [**11** = cassette station B] [**1** = wafer # 1] [**1** = paddle 1]

Therefore, entering **WELR 11 1 1** at the Host NT command line would prompt the robot module to pick up wafer # 1 from cassette station B using robot paddle 1.

motor code	description
0	robot z axis
1	robot theta axis
2	robot paddle axis
3	aligner theta axis
4	aligner x axis
5	programmable stage x axis
6	programmable stage y axis
7	bright light x axis
8	bright light y axis
9	bright light theta axis
10	elevator (cassette station) a axis
11	elevator (cassette station) b axis
12	elevator (cassette station) c axis
13	elevator (cassette station) d axis
14	pod door a
15	pod door b
16	pod door c
17	pod door d
18	robot x axis
19	flipper axis

station code	description
1	robot module
2	aligner module
3	bright light module
4	programmable stage module
5	not used
6	not used
7	not used
8	not used
9	not used
10	cassette station a
11	cassette station b
12	cassette station c
13	cassette station d
14	cassette station e
15	cassette station f
16	cassette station g
17	cassette station h

Command	Description	Syntax	Example
ALNC	create aligner LUT for correcting magnification effect	ALNC 1	ALNC 1
ALND	read the aligner sensor array current value	ALND	ALND
ALNQ	get current number of pixels in aligner sensor array	ALNQ	ALNQ
	set number of pixels in aligner sensor array	ALNQ [value]	ALNQ 128
ALNW	align wafer	ALNW 0	ALNW 0
	align wafer and move to pick-up position	ALNW 1	ALNW 1
	align wafer and mov to read position	ALNW 2	ALNW 2
CFGR	save current configuration as file with specified filename	CFGR [filename]	CFGR SETUP.CFG
CFGS	receive new configuration file	CFGS [filename]	CFGS MOBL.CFG
CHAN	get current controller channel	CHAN	CHAN
	set controller channel	CHAN [1 or 2]	CHAN 1
CYCL	cycle stage between current position and target	CYCL [motor] [start position] [stop position] [time duration]	CYCL 3 180 -180 1000000
DNLD	receive new workstation software program	DNLD [filename]	DNLD MS.HEX
ECHO	send back received data for communictions check	ECHO [character string]	ECHO 1 2 3
ERAS	erase program or data from specified flash memory	ERAS [1or 2]	ERAS 2
FLIM	find and set positive and negative axis limit positions	FLIM [motor]	FLIM 4

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Using the Host NT Software

Command	Description	Syntax	Example
FVAC	find the robot height at which vacuum contact is made with a station	FVAC [station] 1	FVAC 10 1
FWLD	set the robot HPOS parameters for the theta zero position to be facing the aligner and for paddle 1 to be centered over the robot	FWLD [degrees]	FWLD 90
HPOS	get current axis home position	HPOS [motor]	HPOS 7
	set axis home position	HPOS [motor] [value]	HPOS 7 5
HWST	get hardware sensor/driver settings for vacuum, cassette presence, reference limit, and solenoids	HWST	HWST
INKR	activate the specified inker for specified time interval	INKR [8 or 9] [time duration]	INKR 9 1000
INPC	get input channel mapping list	INPC	INPC 58
	map an input channel to a hardware input	INPC [id] [channel] [controller]	INPC 58 10 0
KACL	get current motor acceleration	KACL [motor]	KACL 1
	set motor acceleration	KACL [motor] [value]	KACL 1 720
KDPR	get current motor KDPER parameter	KDPR [motor]	KDPR 1
	set motor KDPER parameter	KDPR [motor] [value]	KDPR 1 43
KDRV	get current motor KD parameter	KDRV [motor]	KDRV 1
	set motor KD parameter	KDRV [motor] [value]	KDRV 1 30
KINT	get current motor KI parameter	KINT [motor]	KINT 1
	set motor KI parameter	KINT [motor] [value]	KINT 1 100
KILM	get current motor KILM parameter	KILM [motor]	KILM 1
	set motor KILM parameter	KILM [motor] [value]	KILM 1 400
KJRK	get current motor JERK value	KJRK [motor]	KJRK 1
	set motor JERK value	KJRK [motor] [value]	KJRK 1 5000
KPRP	get current motor KP parameter	KPRP [motor]	KPRP 1
	set motor KP parameter	KPRP [motor] [value]	KPRP 1 320
LASG	get current laser gain (1, 4, 16, 64)	LASG	LASG
	set laser gain (1, 4, 16, 64)	LASG [value]	LASG 4
LASR	repeatedly strobes the mapper laser so spot is visible	LASR [0 or 1]	LASR 1
LIMN	get current stage negative travel limit	LIMN [motor]	LIMN 0
	set stage negative travel limit	LIMN [motor] [limit]	LIMN 0 -64
LIMO	get current stage torque overload count limit	LIMO [motor]	LIMO 0
	set stage torque overload count limit	LIMO [motor] [value]	LIMO 0 10
LIMP	get current stage positive travel limit	LIMP [motor]	LIMP 0
	set stage positive travel limit	LIMP [motor] [limit]	LIMP 0 6 0
LIMS	get current stage stall limit	LIMS [motor]	LIMS 0
	set stage stall limit	LIMS [motor] [value]	LIMS 0 075
LIMT	get current stage torque limit	LIMT [motor]	LIMT 0
	set stage torque limit	LIMT [motor] [value]	LIMT 0 1023
LIMV	get current stage velocity limit	LIMV [motor]	LIMV 0
	set stage velocity limit	LIMV [motor] [value]	LIMV 0 10
LITE	get current illumination level for specified source	LITE [source]	LITE 4
	set illumination level for specified source	LITE [source] [value]	LITE 4 100
LOAD	load configuration data from flash memory	LOAD	LOAD

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Using the Host NT Software

Command	Description	Syntax	Example
MAPA	get current wafer mapping algorithm	MAPA	MAPA
	set wafer mapping algorithm	MAPA [algorithm]	MAPA 2
MAPC	map wafers in specified station and returns wafer status	MAPC [station] [1 or 2]	MAPC 10 1
MAPH	optimize mapping start height	MAPH [station]	MAPH 10
MAPS	automatically determines optimal mapping setup angles / heights	MAPS [station]	MAPS 10
MCLR	clear errors for specified and associated stages	MCLR [motor]	MCLR 0
MEBL	enable or disable motor drive	MEBL [motor] [0 or 1]	MEBL 2 0
MLIM	get current limits of specified motor	MLIM [motor]	MLIM 0
MOTC	get motor hardware channels for all stages	MOTC	MOTC
	get the motor hardware channel for a specified stage	MOTC [motor]	MOTC 1
	set the motor hardware channel for a specified stage	MOTC [motor] [channel] [controller]	MOTC 1 1 1
MOVA	move to absolute position	MOVA [motor] [value]	MOVA 0 -35
MOVR	move relative to current position	MOVR [motor] [value]	MOVR 2 180
MPOS	get current stage position	MPOS [motor]	MPOS 1
MREF	reference a specified stage	MREF [motor]	MREF 4
MVPC	move paddle to center over the robot body	MVPC [1 or 2]	MVPC 1
OUTC	get output channels to all hardware drivers	OUTC	OUTC
	map an output channel to a hardware driver	OUTC [id] [channel] [controller]	OUTC 10 3 1
OUTP	set an output to a specified value	OUTP [id] [intensity]	OUTP 4 100
POFF	gets the paddle2 offset parameter	POFF	POFF
	sets the paddle2 offset parameter	POFF 1	POFF 1
QUIT	concludes host session	QUIT	QUIT
RPOS	get reference offset for home position (auto read axis position)	RPOS [motor]	RPOS 2
	set reference offset for home position (auto read axis position)	RPOS [motor] 1	RPOS 2 1
SAVE	save configuration data to flash memory	SAVE	SAVE
SCAL	get all current calibration values for specified station	SCAL [station]	SCAL 1
	get specified calibration value for specified station	SCAL [station] [parameter]	SCAL 1 1
	set station calibration values	SCAL [station] [parameter] [value]	SCAL 1 1 0
SCAN	map specified cassette within specified range of mapping angles	SCAN [station] [start position] [stop position] [increment]	SCAN 10 -2 4 2
SELF	gets results of self tests	SELF	SELF
SPRK	parks station at position defined by XPDS coordinates	SPRK [station]	SPRK 3
SREF	reference a stage	SREF [station]	SREF 3
SRFL	set/get referenced flag for station	SRFL [station] [0 or 1]	SRFL 1 1

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Using the Host NT Software

Command	Description	Syntax	Example
SVAC	turn vacuum on or off for aligner or programmable stage chucks	SVAC [station] [0 or 1]	SVAC 2 1
	turn vacuum on or off for robot paddle 1 or 2	SVAC [station] [paddle 1 or 2] [0 or 1]	SVAC 1 1 1
	turn vacuum on or off for bright light chuck or flipper	SVAC [station] [chuck=1 or flipper=2] [0 or 1]	SVAC 3 2 1
SVER	reset the wafer vacuum err for a station and/or paddle	SVER [station] [paddle 1 or 2] 0	SVER 1 1 0
TUNF	get motor parameters for up motion on robot Z axis	TUNF [1, 2, 3 or 4]	TUNF 4
	set motor parameters for up motion on robot Z axis	TUNF [1, 2, 3 or 4] [value]	TUNF 4 1023
TUNR	get motor parameters for down motion on robot Z axis	TUNR [1, 2, 3 or 4]	TUNR 1
	set motor parameters for down motion on robot Z axis	TUNR [1, 2, 3 or 4] [value]	TUNR 1 125
VACT	measure vacuum turn on time for aligner or programmable stage chucks	VACT [station] [0 or 1]	VACT 2 1
	measure vacuum turn on time for robot paddle 1 or 2	VACT [station] [paddle 1 or 2] [0 or 1]	VACT 1 1 1
	measure vacuum turn on time for bright light chuck or flipper	VACT [station] [chuck=1 or flipper=2] [0 or 1]	VACT 3 2 1
VERS	get controller hex version	VERS	VERS
WDOO	move robot z to drop-off height	WDOO [station] [wafer position] [paddle 1 or 2]	WDOO 10 2 1
WDEO	move robot z to drop-off height and extend paddle	WDEO [station] [wafer position] [paddle 1 or 2]	WDEO 10 1 1
WEOO	extend paddle	WEOO [station] [wafer position] [paddle 1 or 2]	WEOO 10 1 1
WEDO	extend paddle, drop off wafer	WEDO [station] [wafer position] [paddle 1 or 2]	WEDO 10 1 1
WEDR	extend paddle, drop off wafer, center paddle	WEDR [station] [wafer position] [paddle 1 or 2]	WEDR 10 1 1
WELO	extend paddle, lift wafer	WELO [station] [wafer position] [paddle 1 or 2]	WELO 10 1 1
WELR	extend paddle, lift wafer, center paddle	WELR [station] [wafer position] [paddle 1 or 2]	WELR 10 1 1
WLEO	move robot z to transfer height, extend paddle	WLEO [station] [wafer position] [paddle 1 or 2]	WLEO 10 1 1
WLOO	move robot z to transfer height	WLOO [station] [wafer position] [paddle 1 or 2]	WLOO 10 1 1
WODO	drop off wafer	WODO [station] [wafer position] [paddle 1 or 2]	WODO 10 1 1
WODR	drop off wafer, center paddle	WODR [station] [wafer position] [paddle 1 or 2]	WODR 10 1 1
WOLO	lift wafer	WOLO [station] [wafer position] [paddle 1 or 2]	WOLO 10 1 1
WOLR	lift wafer, center paddle	WOLR [station] [wafer position] [paddle 1 or 2]	WOLR 10 1 1
WOOR	center paddle	WOOR [station] [wafer position] [paddle 1 or 2]	WOOR 10 1 1
XPOS	get motor park position	XPOS [motor]	XPOS 4
	set motor park position	XPOS [motor] [value]	XPOS 4 0

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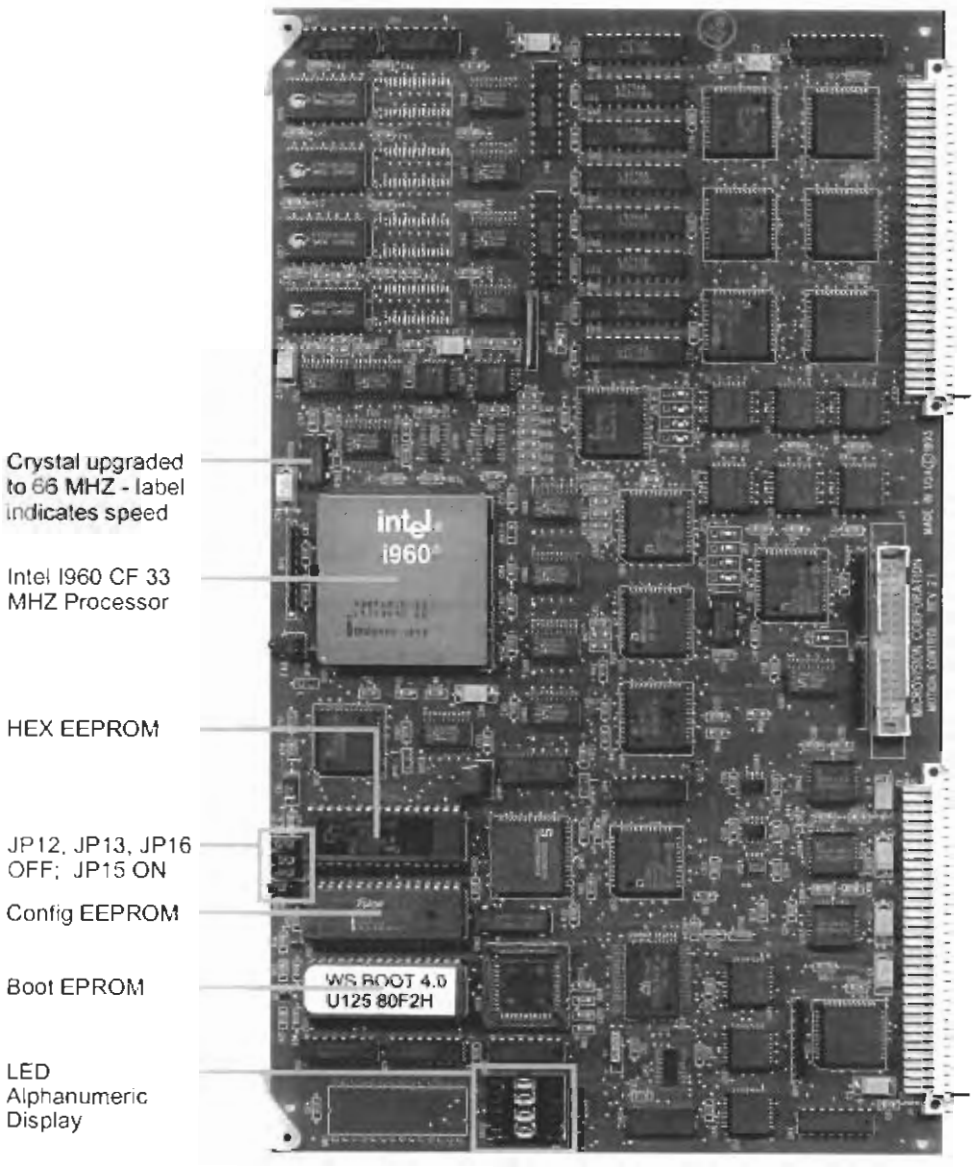
Controller Setup

Controller Setup

The controller governs the motion of all system modules. Before a system's modules can be integrated into a coordinated working unit, however, the controller's processor card must be checked, tested and loaded with the latest hex and configuration files, using the following procedures:

1. 0. Using the diagram below, visually check the processor card for the following:

- Crystal upgraded to 66 MHZ (label on chip states speed)
- Processor Intel I960 CF 33 MHZ chip
- JP15 in ON position (pins 1 and 2 jumpered)
- JP12, JP13 and JP16 in OFF position (pins 2 and 3 jumpered)
- Hex EEPROM
- Config EEPROM
- Boot EPROM



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Controller Setup

2.0. Power-up the Controller and verify that the 5 volt indicator on the distribution board flashes on then off.

3.0. Upgrade to current hex and boot version:

3.1. Enter the system's current version of Host software.

3.2. Initiate a self-diagnostic check to see if the computer and controller are communicating properly; a return of "0" indicates successful communication.
SELF

3.3. Record the system's current configuration file. The configuration file will be named SETUP.CFG and placed in the host directory.
CFGR SETUP.CFG

3.4. Exit the Host software and make sure SETUP.CFG was recorded successfully.
QUIT

3.5. Re-enter the Host software.

3.6. Erase the current configuration file stored on the Config EEPROM; this takes about 30 seconds.
ERAS 2

3.7. Erase the current hex code stored on the Hex EEPROM; this takes about 30 seconds.
ERAS 1

3.8. Turn off the controller and wait a minute, then turn it back on.

3.9. Copy the SETUP.CFG file to a floppy disk. Also copy any Workstation recipes and setup screens you want transferred over to the new software.

3.10. Follow the Workstation software installation procedures outlined in Section C: Installing Software to install new workstation software and the latest hex code and host versions.

3.11. Locate the Boot EPROM on the processor board; if it is not labeled Boot 4.0 a new Boot EPROM will have to be installed. Procedures 3.11.1. through 3.11.9. describe how to do this:

3.11.1. Power down the controller box and remove its lid.

3.11.2. Disconnect the cable going to the mapping board located in front of the processor board.

3.11.3. Use the white tabs to remove the processor board from the distribution board.

3.11.4. Place the processor board on a flat surface.

3.11.5. Use an EPROM extractor, or small screwdriver, to remove the obsolete device - be careful not to bend the leads while removing or installing EPROMs.

3.11.6. Install the new Boot EPROM (BOOT 4.0).

3.11.7. Making sure that the pin 1 location is facing up, install the processor board back into place with the cable going into the mapping board.

3.11.8. Power the controller box back up.

3.12. Open the Host software and initiate a self-diagnostic check; "0004" should be the response, meaning there isn't a hex file loaded.
SELF

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Controller Setup

3.13. Download the latest version of hex code to the EEPROM (this will change the baud rate automatically and install the hex code. this generally takes 3-4 minutes).
DNLD WS.HEX

3.14. Install the new configuration file. this takes 2-3 minutes. Be sure to designate the correct configuration: 2 cassette = 2c.cfg; 2 cassette / bright light = 2cbl.cfg; 3 cassette = 3c.cfg; 3 cassette / bright light = 3cbl.cfg; 4 cassette = 4c.cfg.
CFGS filename.CFG

3.15. Save the parameters and reset the controller (This will activate the new software code in the EEPROMs once the controller has been powered down and up).
SAVE

3.16. Once the controller has been powered up, open the Host software and initiate a self-diagnostic check; a "0" should be the response, indicating that the Hex and Config files were transferred correctly).
SELF

3.17. Insert the floppy disk containing the system's old configuration data, SETUP.CFG, into the computer's floppy disk drive. Double-click on the My Computer icon in the NT Desktop and display the contents of the floppy disk drive. Double-click on SETUP.CFG to open it in NOTEPAD. Size the NOTEPAD and Host windows so that they are displayed side by side.

3.18. In the Host software, set the following motor parameters in the new configuration (displayed in Host) to match those in the old configuration file (displayed in NOTEPAD).

KJRK 0 [value from NOTEPAD]
KPRP 0 [value from NOTEPAD]
KDRV 0 [value from NOTEPAD]
KINT 0 [value from NOTEPAD]

KJRK 1 [value from NOTEPAD]
KPRP 1 [value from NOTEPAD]
KDRV 1 [value from NOTEPAD]
KINT 1 [value from NOTEPAD]

KJRK 2 [value from NOTEPAD]
KPRP 2 [value from NOTEPAD]
KDRV 2 [value from NOTEPAD]
KINT 2 [value from NOTEPAD]

KPRP 3 [value from NOTEPAD]
KDRV 3 [value from NOTEPAD]
KINT 3 [value from NOTEPAD]

KPRP 4 [value from NOTEPAD]
KDRV 4 [value from NOTEPAD]
KINT 4 [value from NOTEPAD]

KPRP 7 [value from NOTEPAD]
KDRV 7 [value from NOTEPAD]
KINT 7 [value from NOTEPAD]

KPRP 8 [value from NOTEPAD]
KDRV 8 [value from NOTEPAD]
KINT 8 [value from NOTEPAD]

KPRP 9 [value from NOTEPAD]
KDRV 9 [value from NOTEPAD]
KINT 9 [value from NOTEPAD]

TUNF 1 [value from NOTEPAD]
TUNF 2 [value from NOTEPAD]
TUNF 3 [value from NOTEPAD]
TUNF 4 [value from NOTEPAD]

TUNR 1 [value from NOTEPAD]
TUNR 2 [value from NOTEPAD]
TUNR 3 [value from NOTEPAD]
TUNR 4 [value from NOTEPAD]

3.19. Save the parameters.
SAVE

3.20. Reference the robot, aligner and bright light modules toto ensure that the new parameter values were set correctly.
SREF 1
SREF 2
SREF 3

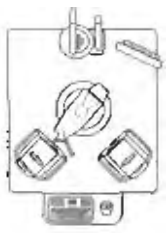
3.21. Proceed to integrate the sorter modules using the appropriate configuration-specific procedure set.

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System Integration:

2-Cassette



2-Cassette System Setup & Integration Sequence:

Initial Power-Up & Hardware Check:

1.1.0. System Power-Up 12

1.2.0. Controller Board Board 1 Test 12

1.3.1. Main System Vacuum Test 12
1.3.2. Robot Paddle Vacuum Test 13
1.3.3. Aligner Chuck Vacuum Test 13

1.4.1. Robot Module Reference 14
1.4.2. Aligner Module Reference 14
1.4.3. Aligner Array Board Check 14
1.4.4. Aligner Upper Light Source Check 14
1.4.5. Aligner Lower Light Source Check 14

System Integration:

2.1.0. Cassette Station Leveling 15

2.2.0. Robot Paddle Calibration 16
2.3.0. Robot Z Axis Calibration 17

2.4.0. Can Angle Calibration 18

2.5.0. Aligner Calibration 19
2.6.0. Setting Aligner Transfer Position 20
2.7.0. Aligner Sensor Array Calibration 21

2.8.0. Laser Offset Setup 22

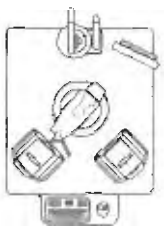
2.9.0. Mapping Setup: Cassette Station A 23
2.10.0. Mapping Setup: Cassette Station B 24

2.11.0. Transfer Positions: Cassette Station A 25
2.12.0. Transfer Positions: Cassette Station B 26

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System Integration:

2-Cassette



Initial Power-Up & Hardware Check: 2-Cassette

1.1.0. System Power-Up

1.1.1. Set the controller On/Off switch to the On position.

1.1.2. Make sure E-Stop is pulled out and turn the system On/Off switch clockwise as far as it will go to power up the controller – note that the On/Off switch will return to a position midway between the Off and On labels. Wait 20 seconds and again turn the system On/Off switch clockwise as far as it will go to activate system motor.

1.1.3. Power-up the VGA color monitor.

1.1.4. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

1.1.5. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Desktop window.

1.1.6. Within the Windows NT Desktop locate and select (double click) the Host NT icon to prompt the display of the Host NT window. The system is now ready to accept host commands at the command line.

1.2.0. Controller Board 1 (Master)

1.2.1. Perform self diagnostic test; a return of 0 ensures that serial connections to controller board 1 are sound.
SELF

1.3.1. Main Vacuum Test

1.3.1.1. Verify that the system vacuum sensor is connected to the AUX port on the controller back panel.

1.3.1.2. Detach the vacuum line from the back of the sorter chassis. Turn the sensor adjustment screw CW until the LED turns on, then CCW until the LED turns off.

1.3.1.3. Reattach the vacuum line to the back of the sorter chassis and verify that the LED turns on.

1.3.1.4. Prompt the current hardware sensor status of the controller.
HWST

1.3.1.5. Detach the main vacuum line from the sorter chassis.

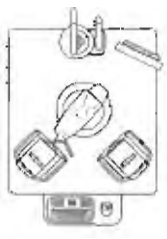
1.3.1.6. Again, prompt the current hardware sensor status of the controller; the returned values should be different than those returned in step 1.3.1.4.
HWST

1.3.2. Robot Paddle Vacuum Test

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System Integration:

2-Cassette



1.3.2.1. Activate paddle 1 vacuum.
SVAC 1 1 1

1.3.2.2. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.3. Deactivate paddle 1 vacuum.
SVAC 1 1 0

1.3.2.4. Activate paddle 2 vacuum.
SVAC 1 2 1

1.3.2.5. Adjust paddle 2 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.6. Deactivate paddle 2 vacuum.
SVAC 1 2 0

1.3.2.7. Place a small wafer on paddle 1 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 1

1.3.2.8. Turn paddle 1vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.2.9. Place a small wafer on paddle 2 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 2

1.3.2.10. Turn paddle 2 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.3. Aligner Chuck Vacuum

1.3.3.1. Activate aligner chuck vacuum.
SVAC 2 1 1

1.3.3.2. Remove the back cover of the aligner and adjust the vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.3.3. Deactivate aligner chuck vacuum.
SVAC 2 1 0

1.3.3.4. Place a small wafer on aligner chuck and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 2 1

1.3.3.5. Turn aligner vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

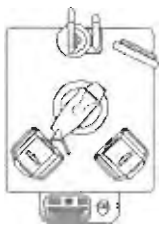
1.3.3.6. Replace aligner back cover.

1.4.1. Reference Robot Module

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System Integration:

2-Cassette



1.4.1.1. Reference robot theta axis.
MREF 1 (make sure it references in all four quadrants)

1.4.1.2. Disable robot paddle axis motor.
MEBL 2 0

1.4.1.3. Manually swing the robot paddle over the robot, record position, enable robot paddle axis motor, and reference robot paddle axis.
RPOS 2 1
MEBL 2 1
MREF 2

1.4.1.4. Reference robot z axis.
MREF 0

1.4.2. Reference Aligner Module

1.4.2.1. Reference aligner theta and x-axes motors.
MREF 3
MREF 4

1.4.3. Check Array Board

1.4.3.1. Turn on the illumination and check the pixels of the array.
OUTP 4 100
ALND (128 should scroll up and down the screen)

1.4.3.2. Stop the scrolling and turn off the illumination.
ESC (stops the scrolling)
OUTP 4 0

1.4.4. Check the upper light source on the wafer light

1.4.4.1. Turn on the light above the acrylic block.
OUTP 5 100

1.4.4.2. Turn off the light source.
OUTP 5 0

1.4.5. Check the lower light source on the wafer light

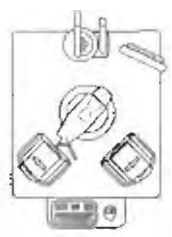
1.4.5.1. Turn on the light source below the light shield.
OUTP 10 100

1.4.5.2. Turn off the light source.
OUTP 10 0

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System Integration:

2-Cassette



System Integration: 2-Cassette

2.1.0. Cassette Station Leveling

2.1.1. On the underside of the sorter chassis, locate each cassette station's respective access port and loosen the four fasteners located there.

2.1.2. Remove the sensor cable clamps that cover up the set screw holes under the cassette stations.

2.1.3. Loosen the three set screws located under the cassette station until they are not touching the bottom of their station.

2.1.4. Raise the robot z axis.
MOVA 0 .35

2.1.5. Disable the robot theta and paddle motors.
MEBL 1 0
MEBL 2 0

2.1.6. Turn on robot paddle 1 vacuum and place a wafer over the vacuum port.
SVAC 1 1 1

2.1.7. Manually rotate the robot theta axis to swing paddle 1 and the wafer out over the cassette stations - note that the centerline of paddle 1 must point to the center of the robot for proper leveling. Using the wafer as a baseline, determine which cassette station is the highest; proceed to level that station first.

2.1.8. Place three leveling blocks around the edge of the highest cassette station. Manually swing the wafer over the cassette station. Lower the robot z axis until the underside of the wafer makes contact with one of the blocks.
MOVR 0 [- .001]

2.1.9. Adjust the three set screws under the station until the wafer makes equal contact with all three blocks. Once the station is level, rotate the set screw located closest to the robot clockwise (CW) 1/4 turn.

2.1.10. Manually swing paddle 1 and the wafer away from the station. Beginning with the two fasteners situated farthest from the robot and proceeding in small increments, retighten the four fasteners located on the underside of the pedestal.

2.1.11. Manually swing paddle 1 and the wafer back over the station and use the blocks to ensure that it is still level. Repeat the leveling procedure if necessary.

2.1.12. Manually swing paddle 1 and the wafer over the next station, keeping the same robot z height, and perform the leveling procedure described above (2.1.9. - 2.1.11.).

2.1.13. While supporting the wafer, turn off the vacuum to robot paddle 1 and remove the wafer.
SVAC 1 1 0

2.1.14. Enable the robot theta and paddle motors.
MEBL 1 1
MEBL 2 1

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System Integration:

2-Cassette



2.2.0. Robot Paddle Calibration

2.2.1. Reference the robot theta axis.
MREF 1

2.2.2. Reference the robot paddle axis.
MREF 2

2.2.3. Set the station reference flag for the robot.
SRFL 1 1

2.2.4. Rotate the robot paddle axis until paddle 1 is centered over the robot.
MOVR 2 [± degrees]

2.2.5. Place a calibration pin into the robot calibration pin hole.

2.2.6. Rotate the robot paddle axis until the inside edge of paddle 1 makes contact with calibration pin; as paddle one approaches the pin, decrease the increment of rotation.
MOVR 2 [± degrees]

2.2.7. Set the robot paddle reference position and paddle 1 calibration angle.
RPOS 2 1
MREF 2
SCAL 1 1 0

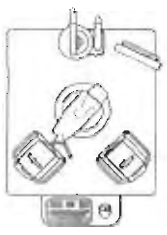
2.2.8. Check to see if robot paddle 1 centers properly over the robot.
MVPC 1

2.2.9. Save settings.
SAVE

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System Integration:

2-Cassette



2.3.0. Robot Z Axis Calibration

2.3.1. Center robot paddle 1 over the center of the robot and set the robot height (z axis) to .1 inches.
MVPC 1
MOVA 0 .1

2.3.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.3.3. Extend paddle 1 out over cassette station A.
MOVR 2 180

2.3.4. Adjust the robot z axis brake timeout value.
SCAL 1 6 10000000

2.3.5. Place a 1 inch calibration block adjacent to the tip of the extended robot paddle. Raise or lower the robot z axis until the height of the paddle's bottom edge matches that of the block - as paddle 1 approaches the block downward movement should be in increments of .001".
MOVR 0 [+/- .001]

2.3.6. Set the robot z axis motor reference position.
RPOS 0 1

2.3.7. Reference the robot z axis.
MREF 0

2.3.8. Move the robot z axis to the newly set zero position.
MOVA 0 0

2.3.9. Center paddle 1 over the robot, then extend it out over the cassette station A; use the calibration block to see if RPOS recorded properly.
MVPC 1
MOVR 2 180

2.3.10. Center paddle 2 over the robot, then extend it out over the cassette station A;
MVPC 2
MOVR 2 180

2.3.11. Raise or lower the robot z axis until the height of the paddle's bottom edge is equal to the height of the block - as paddle 2 approaches the block downward movement must be in increments of .001".
MOVR 0 [+/- .001]

2.3.12. Set the paddle offset and center paddle 1 over the robot.
POFF 1
MVPC 1

2.3.13. Set default limits for the robot Z, theta and paddle axes.
FLIM 0
FLIM 1
FLIM 2

2.3.14. Reset the robot z axis brake timeout value.
SCAL 1 6 2000000

2.3.15. Save settings.
SAVE

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System Integration:

2-Cassette



2.4.0. Can Angle Calibration

2.4.1. Center robot paddle 1 over the robot, prompt a reading of the robot z axis negative limit, and move the robot z axis to a height that equals its negative limit plus .1 inches.
MVPC 1
LIMN 0
MOVA 0 [negative limit + .1]

2.4.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.4.3. Center robot paddle 1 over the robot then extend it over cassette station A.
MVPC 1
MOVR 2 180

2.4.4. Place a calibration pin in the calibration hole on top of cassette station A. Rotate the robot theta axis in small increments until the paddle makes contact with the calibration pin.
MOVR 1 [± .12 degrees]

2.4.5. Define the world position and set the can angles for a sorter with two cassettes:
FWLD 155
SCAL 2 0 0
SCAL 10 0 -155
SCAL 11 0 155
XPOS 1 0
SCAL 1 7 55
SREF 1

2.4.6. Test the settings by rotating the paddle end of the robot to face the aligner.
SPRK 1

2.4.7. Save settings.
SAVE

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System Integration:

2-Cassette



2.5.0. Aligner Calibration

2.5.1. Reference all aligner axes.
SREF 2

2.5.2. Move aligner x axis until the chuck is positioned over the center of the module.
MOVR 4 [+/- .2 inches]

2.5.3. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.5.4. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.0

2.5.5. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.5.6. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.5.7. Lower the robot z axis until any part of the wafer makes contact with the aligner chuck. Do not proceed lower than the aligner chuck as this may damage the wafer.
MOVR 0 [± .005 inches]

2.5.8. Access the aligner's bottom panel and loosen the four shoulder bolts if they do not have springs. Adjust the three aligner leveling screws until the gap between the chuck and the wafer appears even from all vantage points. Retighten the shoulder bolts if they do not have springs.

2.5.9. While supporting the wafer turn off paddle 1 vacuum.
SVAC 1 1 0

2.5.10. Move the aligner x axis in a positive direction.
MOVR 4 .2

2.5.11. Place a calibration pin in the calibration hole on top of the aligner's surface. Make sure it is perpendicular to the top plate.

2.5.12. Move the aligner x axis in the negative direction until the calibration pin makes contact with robot paddle 1.
MOVR 4 [-.02 inches]

2.5.13. Record the aligner x axis reference position, set the aligner x axis transfer position, and reference the aligner module.
RPOS 4 1
XPOS 4 0
MREF 4

2.5.14. Pull the calibration pin out of the aligner's calibration hole and park the aligner.
SPRK 2

2.5.15. Check to see if the aligner parked at the correct position, then center robot paddle 1 over the robot.
MVPC 1

2.5.16. Set default limits for aligner x and theta axes.
FLIM 3
FLIM 4

2.5.17. Save settings.
SAVE

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System Integration:

2-Cassette



2.6.0. Setting Aligner Transfer Position

2.6.1. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.6.2. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.5

2.6.3. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.6.4. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.6.5. Set the aligner transfer position by repeatedly lowering the wafer until contact with the aligner chuck is sensed.
FVAC 2 1

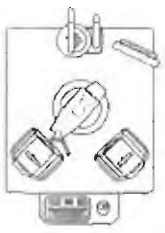
2.6.6. Set the default transfer heights.
SCAL 2 2 -.03
SCAL 2 3 -.005
SCAL 2 4 .015
SCAL 2 5 .03

2.6.7. Save settings.
SAVE

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System Integration:

2-Cassette



2.7.0. Aligner Sensor Array Calibration

2.7.1. Turn on the aligner sensor array illumination
OUTP 4 100

2.7.2. Use a small flathead screwdriver to gently turn the potentiometer to maximum brightness; be careful not to strip the potentiometer as its maximum range of motion is only 3/4 turn.

2.7.3. Move the aligner x-axis until the wafer edge is centered under the aligner sensor array.
MOVR 4 [± distance]

2.7.4. Prompt a display of the wafer edge location with respect to the sensor array; a properly positioned edge would read between 60 and 68. Select the ESC button to terminate the ALND display.
ALND

2.7.5. Adjust the aligner x-axis as needed.
MOVR 4 [± .05]

2.7.6. Repeat steps 7.4. and 7.5. until the ALND reading falls between 60 and 68.

2.7.7. Turn the potentiometer until ALND reading decreases by 1. Select the ESC button to terminate the ALND display.
ALND

2.7.8. Turn off aligner sensor array illumination.
OUTP 4 0

2.7.9. Autocalibrate the aligner sensor array.
ALNC 1

2.7.10. Support the wafer by hand, turn off the aligner chuck vacuum and manually remove the wafer.
SVAC 2 1 0

2.7.11. Save settings.
SAVE

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System Integration:

2-Cassette



2.8.0. Laser Offset Setup

2.8.1 Reference all robot axes.
SREF 1

2.8.2. Set wafer mapping algorithm.
MAPA 2

2.8.3. To determine the laser offset position, first place a calibration pin in the calibration hole on the top of cassette station A. Next, position a white card or slip of paper behind the pin, opposite the robot. Execute the following commands to position the robot z and theta axes so that the robot laser is aimed at the calibration pin.
LIMN 0 (returns negative limit)
MOVA 0 [negative limit + .05 inches]
MOVA 1 90

2.8.4. Turn on the laser and rotate the robot theta axis until the shadow of the pin falls directly in the center of the laser beam projected onto the paper.
LASR 1
MOVR 1 [± .2]

2.8.5. Prompt the current robot theta position and use it to set the laser offset.
MPOS 1 (returns current position)
SCAL 1 14 [90 - current position]

2.8.6. Turn the laser off.
LASR 0

2.8.7. Save the settings.
SAVE

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System Integration:

2-Cassette



2.9.0. **Mapping Setup: Cassette Station A**

2.9.1. Place a full cassette on cassette station A. Remove the wafer in slot 2.

2.9.2. Calibrate the mapping set up.
MAPS 10

2.9.3. Put the wafer back in slot 2.

2.9.4. Map the cassette.
MAPC 10

2.9.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 10 -2 4 .2

2.9.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	00000000000000000000000000
-1.8	00000000000000000000000000
-1.6	00000000000000000000000000
-1.4	00000000000000000000000000
-1.2	00000000000000000000000000
-1.0	00000000000000000000000000
-.8	00000000000000000000000000
-.6	00000000000000000000000000
-.4	00000000000001100000010000
-.2	00111010000011101000010010
1.0	10100011011001101001001000
1.2	10111010011111101001001111
1.4	11111111111111111111111111
1.6	11111111111111111111111111
1.8	11111111111111111111111111
2.0	11111111111111111111111111
2.2	11111111111111111111111111
2.4	11111111111111111111111111
2.6	11111111111111111111111111
2.8	11111111111111111111111111
3.0	11111111111111111111111111
3.2	11111111111111111111111111
3.4	10101110010111101001101111
3.6	00100110010011001101001000
3.8	00000000000000010001001000
4.0	00000000000000000000000000

2.9.7. Set the low mapping angle
SCAL 10 1 [low angle value]

2.9.8. Set the high mapping angle
SCAL 10 2 [high angle value]

2.9.9. Auto calibrate the best mapping start position.
MAPH 10

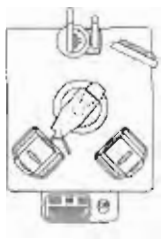
2.9.10. Map the cassette and check the accuracy of returned data.
MAPC 10

2.9.11. Save the settings
SAVE

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System Integration:

2-Cassette



2.10.0. Mapping Setup: Cassette Station B

2.10.1. Place a full cassette on cassette station B. Remove the wafer in slot 2.

2.10.2. Calibrate the mapping set up.
MAPS 11

2.10.3. Put the wafer back in slot 2.

2.10.4. Map the cassette.
MAPC 11

2.10.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 11 -2 4 .2

2.10.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000C000C00
-.6	000000000000000000000C000
-.4	000000000000011000C010000
-.2	001110100000111010001C010
1.0	101000110110011010010010O
1.2	101110100111111010010011
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110011010C100
3.8	000000000C000001000100100
4.0	000000000000000C0000000000

2.10.7. Set the low mapping angle
SCAL 11 1 [low angle value]

2.10.8. Set the high mapping angle
SCAL 11 2 [high angle value]

2.10.9. Auto calibrate the best mapping start position.
MAPH 11

2.10.10. Map the cassette and check the accuracy of returned data.
MAPC 11

2.10.11. Save the settings
SAVE

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System Integration:

2-Cassette



2.11.0. Setting Wafer Transfer Positions: Cassette Station A

2.11.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station A.

2.11.2. Map the cassette.
MAPC 10

2.11.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.11.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 10 1 1

2.11.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 10 1 (repeat until contact is made)

2.11.6. Remove paddle 1 from the cassette.
WOOR 10 1 1

2.11.7. Establish robot paddle 1 offset. Repeat the following procedure (11.8. - 11.13.) until paddle 1 is centered between wafers 1 and 2.

2.11.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 10 2 1

2.11.9. Disable the robot theta axis motor.
MEBL 1 0

2.11.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.11.11. Adjust paddle 1 offset position.
SCAL 10 6 [± .003]

2.11.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.11.13. Enable the robot theta axis motor.
MEBL 1 1

2.11.14. Check / adjust wafer pitch. Repeat the following procedure (11.15. - 11.21.) until paddle 1 is centered between wafers 24 and 25.

2.11.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 10 25 1

2.11.16. Disable the robot theta axis motor.
MEBL 1 0

2.11.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.11.18. Adjust the wafer pitch.
SCAL 10 17 [± .0001]

2.11.19. Manually swing paddle-axis out of cassette and center over robot.

2.11.20. Enable robot theta-axis.
MEBL 1 1

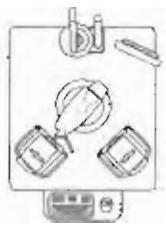
2.11.21. Map the cassette and check results for accuracy.
MAPC 10

2.11.22. Save Settings.
SAVE

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System Integration:

2-Cassette



2.12.0. Setting Wafer Transfer Positions: Cassette Station B

2.12.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station B.

2.12.2. Map the cassette.
MAPC 11

2.12.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.12.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 11 1 1

2.12.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 11 1 (repeat until contact is made)

2.12.6. Remove paddle 1 from the cassette.
WOOR 11 1 1

2.12.7. Establish robot paddle 1 offset. Repeat the following procedure (12.8. - 12.13.) until paddle 1 is centered between wafers 1 and 2.

2.12.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 11 2 1

2.12.9. Disable the robot theta axis motor.
MEBL 1 0

2.12.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.12.11. Adjust paddle 1 offset position.
SCAL 11 6 [± .003]

2.12.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.12.13. Enable the robot theta axis motor.
MEBL 1 1

2.12.14. Check / adjust wafer pitch. Repeat the following procedure (12.15. - 12.21.) until paddle 1 is centered between wafers 24 and 25.

2.12.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 11 25 1

2.12.16. Disable the robot theta axis motor.
MEBL 1 0

2.12.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.12.18. Adjust the wafer pitch.
SCAL 11 17 [± .0001]

2.12.19. Manually swing paddle-axis out of cassette and center over robot.

2.12.20. Enable robot theta-axis.
MEBL 1 1

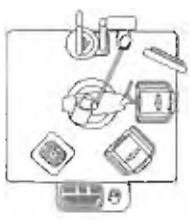
2.12.21. Map the cassette and check results for accuracy.
MAPC 11

2.12.22. Save Settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2-Cassette / Bright \ Light System Setup & Integration Sequence:

Initial Power-Up & Hardware Check:

1.1.0. System Power-Up 28

1.2.1. Controller Board Board 1 Test 28
1.2.2. Controller Board Board 2 Test 28

1.3.1. Main System Vacuum Test 28
1.3.2. Robot Paddle Vacuum Test 29
1.3.3. Aligner Chuck Vacuum Test 29
1.3.4. Bright Light Chuck Vacuum Test 30
1.3.5. Wafer Flipper Vacuum Test 30

1.4.1. Robot Module Reference 30
1.4.2. Aligner Module Reference 31
1.4.3. Aligner Array Board Check 31
1.4.4. Aligner Upper Light Source Check 31
1.4.5. Aligner Lower Light Source Check 31
1.4.6. Bright Light Module Reference 31
1.4.7. Bright Light Illumination Check 31

System Integration:

2.1.0. Cassette Station Leveling 32

2.2.0. Robot Paddle Calibration 33
2.3.0. Robot Z Axis Calibration 34

2.4.0. Can Angle Calibration 35

2.5.0. Aligner Calibration 36
2.6.0. Setting Aligner Transfer Position 37
2.7.0. Aligner Sensor Array Calibration 38

2.8.0. Laser Offset Setup 39

2.9.0. Mapping Setup: Cassette Station A 40
2.10.0. Mapping Setup: Cassette Station B 41

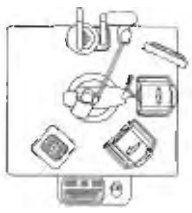
2.11.0. Transfer Positions: Cassette Station A 42
2.12.0. Transfer Positions: Cassette Station B 43

2.13.0. Joystick Calibration 44
2.14.0. Bright Light Leveling & Transfer Heights (without Wafer Flipper) 45
2.15.0. Bright Light Leveling & Transfer Heights (with Wafer Flipper) 47
2.16.0. Wafer Flipper Leveling & Transfer Positions 49

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System Integration:

2-Cassette / Bright Light



Initial Power-Up & Hardware Check: 2-Cassette with Bright Light

1.1.0. System Power-Up

1.1.1. Set the controller On/Off switch to the On position.

1.1.2. Make sure E-Stop is pulled out and turn the system On/Off switch clockwise as far as it will go to power up the controller – note that the On/Off switch will return to a position midway between the Off and On labels. Wait 20 seconds and again turn the system On/Off switch clockwise as far as it will go to activate system motor.

1.1.3. Power-up the VGA color monitor.

1.1.4. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

1.1.5. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Desktop window.

1.1.6. Within the Windows NT Desktop locate and select (double click) the Host NT icon to prompt the display of the Host NT window. The system is now ready to accept host commands at the command line.

1.2.1. Controller Board 1 (Master)

Switch to controller channel 1 and perform self diagnostic test; a return of 0 ensures that serial connections to controller board 1 are sound.

CHAN 1
SELF

1.2.2. Controller Board 2 (Slave)

Switch to controller channel 2 and perform self diagnostic test; a return of 0 ensures that serial connections to controller board 2 are sound. Switch back to controller channel 1.

CHAN 2
SELF
CHAN 1

1.3.1. Main Vacuum Test

1.3.1.1. Verify that the system vacuum sensor is connected to the AUX port on the controller back panel.

1.3.1.2. Detach the vacuum line from the back of the sorter chassis. Turn the sensor adjustment screw CW until the LED turns on, then CCW until the LED turns off.

1.3.1.3. Reattach the vacuum line to the back of the sorter chassis and verify that the LED turns on.

1.3.1.4. Prompt the current hardware sensor status of the controller.
HWST

1.3.1.5. Detach the main vacuum line from the sorter chassis.

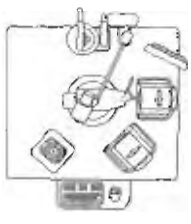
1.3.1.6. Again, prompt the current hardware sensor status of the controller; the returned values should be different than those returned in step 1.3.1.4.
HWST

1.3.2. Robot Paddle Vacuum Test

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System Integration:

2-Cassette / Bright Light



1.3.2.1. Activate paddle 1 vacuum.
SVAC 1 1 1

1.3.2.2. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.3. Deactivate paddle 1 vacuum.
SVAC 1 1 0

1.3.2.4. Activate paddle 2 vacuum.
SVAC 1 2 1

1.3.2.5. Adjust paddle 2 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.6. Deactivate paddle 2 vacuum.
SVAC 1 2 0

1.3.2.7. Place a small wafer on paddle 1 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 1

1.3.2.8. Turn paddle 1vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.2.9. Place a small wafer on paddle 2 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 2

1.3.2.10. Turn paddle 2 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.3. Aligner Chuck Vacuum

1.3.3.1. Activate aligner chuck vacuum.
SVAC 2 1 1

1.3.3.2. Remove the back cover of the aligner and adjust the vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.3.3. Deactivate aligner chuck vacuum.
SVAC 2 1 0

1.3.3.4. Place a small wafer on aligner chuck and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 2 1

1.3.3.5. Turn aligner vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

1.3.3.6. Replace aligner back cover.

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System Integration:

2-Cassette / Bright Light



1.3.4. Bright Light Vacuum

1.3.4.1. Remove the guard on the bright light by unscrewing the three m4 fasteners.

1.3.4.2. Remove the access panel from the bright light gimbal housing – this panel is distinguishable by its two threaded sensor access holes. The bright light vacuum sensor is located on the left side of the module while the flipper vacuum sensor is located on the right.

1.3.4.3. Position the bright light chuck until it appears level
MOVR 7 ±
MOVR 8 ±

1.3.4.4. Place a small wafer on the bright light chuck and initiate a vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 3 1

1.3.4.5. Turn bright light vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

1.3.5. Wafer Flipper Vacuum

1.3.5.1. Remove the access panel from the bright light gimbal housing – this panel is distinguishable by its two threaded sensor access holes. The bright light vacuum sensor is located on the left side of the module while the flipper vacuum sensor is located on the right.

1.3.5.2. Switch to controller channel 2.
CHAN 2

1.3.5.3. Move the flipper up until it clears the top surface of the bright light chuck.
MOVR 19 1

1.3.5.4. Place a wafer over the vacuum ports of the flipper and hold it into position with your hand.

1.3.5.5. Place a wafer over the vacuum ports of the flipper and hold it into position by hand. Initiate a vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 3 2

1.3.5.6. Turn flipper vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 50000 (± 5000); remove wafer.

1.3.5.7. Park the bright light module
SPRK 3

1.3.5.8. Switch to controller channel 1.
CHAN 1

1.4.1. Reference Robot Module

1.4.1.1. Reference robot theta axis.
MREF 1 (make sure it references in all four quadrants)

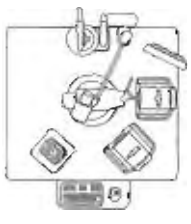
1.4.1.2. Disable robot paddle axis motor.
MEBL 2 0

1.4.1.3. Manually swing the robot paddle over the robot, record position, enable robot paddle axis motor, and reference robot paddle axis.
RPOS 2 1
MEBL 2 1
MREF 2

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System Integration:

2-Cassette / Bright Light



1.4.1.4. Reference robot z axis.
MREF 0

1.4.2. Reference Aligner Module

1.4.2.1. Reference aligner theta and x-axes motors.
MREF 3
MREF 4

1.4.3. Check Array Board

1.4.3.1. Turn on the illumination and check the pixels of the array.
OUTP 4 100
ALND (128 should scroll up and down the screen)

1.4.3.2. Stop the scrolling and turn off the illumination.
ESC (stops the scrolling)
OUTP 4 0

1.4.4. Check the upper light source on the wafer light

1.4.4.1. Turn on the light above the acrylic block.
OUTP 5 100

1.4.4.2. Turn off the light source.
OUTP 5 0

1.4.5. Check the lower light source on the wafer light

1.4.5.1. Turn on the light source below the light shield.
OUTP 10 100

1.4.5.2. Turn off the light source.
OUTP 10 0

1.4.6. Reference Bright Light Module

1.4.6.1. Reference all bright light and flipper axes.
MREF 7
MREF 8
MREF 9
MREF 19

1.4.6.2. Reference bright light station.
SREF 3

1.4.7. Bright Light Illumination Check

1.4.7.1. Turn high-intensity lamp on then off.
OUTP 6 100
OUTP 6 0

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System Integration:

2-Cassette / Bright Light



System Integration: 2-Cassette with Bright Light

2.1.0. Cassette Station Leveling

2.1.1. On the underside of the sorter chassis, locate each cassette station's respective access port and loosen the four fasteners located there.

2.1.2. Remove the sensor cable clamps that cover up the set screw holes under the cassette stations.

2.1.3. Loosen the three set screws located under the cassette station until they are not touching the bottom of their station.

2.1.4. Raise the robot z axis.
MOVA 0 .35

2.1.5. Disable the robot theta and paddle motors.
MEBL 1 0
MEBL 2 0

2.1.6. Turn on robot paddle 1 vacuum and place a wafer over the vacuum port.
SVAC 1 1 1

2.1.7. Manually rotate the robot theta axis to swing paddle 1 and the wafer out over the cassette stations - note that the centerline of paddle 1 must point to the center of the robot for proper leveling. Using the wafer as a baseline, determine which cassette station is the highest; proceed to level that station first.

2.1.8. Place three leveling blocks around the edge of the highest cassette station. Manually swing the wafer over the cassette station. Lower the robot z axis until the underside of the wafer makes contact with one of the blocks.
MOVR 0 [- .001]

2.1.9. Adjust the three set screws under the station until the wafer makes equal contact with all three blocks. Once the station is level, rotate the set screw located closest to the robot clockwise (CW) 1/4 turn.

2.1.10. Manually swing paddle 1 and the wafer away from the station. Beginning with the two fasteners situated farthest from the robot and proceeding in small increments, retighten the four fasteners located on the underside of the pedestal.

2.1.11. Manually swing paddle 1 and the wafer back over the station and use the blocks to ensure that it is still level. Repeat the leveling procedure if necessary.

2.1.12. Manually swing paddle 1 and the wafer over the next station, keeping the same robot z height, and perform the leveling procedure described above (2.1.9. - 2.1.11.).

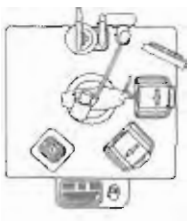
2.1.13. While supporting the wafer, turn off the vacuum to robot paddle 1 and remove the wafer.
SVAC 1 1 0

2.1.14. Enable the robot theta and paddle motors.
MEBL 1 1
MEBL 2 1

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System Integration:

2-Cassette / Bright Light



2.2.0. Robot Paddle Calibration

2.2.1. Reference the robot theta axis.
MREF 1

2.2.2. Reference the robot paddle axis.
MREF 2

2.2.3. Set the station reference flag for the robot.
SRFL 1 1

2.2.4. Rotate the robot paddle axis until paddle 1 is centered over the robot.
MOVR 2 [± degrees]

2.2.5. Place a calibration pin into the robot calibration pin hole.

2.2.6. Rotate the robot paddle axis until the inside edge of paddle 1 makes contact with calibration pin; as paddle one approaches the pin, decrease the increment of rotation.
MOVR 2 [± degrees]

2.2.7. Set the robot paddle reference position and paddle 1 calibration angle.
RPOS 2 1
MREF 2
SCAL 1 1 0

2.2.8. Check to see if robot paddle 1 centers properly over the robot.
MVPC 1

2.2.9. Save settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.3.0. Robot Z Axis Calibration

2.3.1. Center robot paddle 1 over the center of the robot and set the robot height (z axis) to .1 inches.
MVPC 1
MOVA 0 .1

2.3.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.3.3. Extend paddle 1 out over cassette station A.
MOVR 2 180

2.3.4. Adjust the robot z axis brake timeout value.
SCAL 1 6 10000000

2.3.5. Place a 1 inch calibration block adjacent to the tip of the extended robot paddle. Raise or lower the robot z axis until the height of the paddle's bottom edge matches that of the block - as paddle 1 approaches the block downward movement should be in increments of .001".
MOVR 0 [+/- .001]

2.3.6. Set the robot z axis motor reference position.
RPOS 0 1

2.3.7. Reference the robot z axis.
MREF 0

2.3.8. Move the robot z axis to the newly set zero position.
MOVA 0 0

2.3.9. Center paddle 1 over the robot, then extend it out over the cassette station A; use the calibration block to see if RPOS recorded properly.
MVPC 1
MOVR 2 180

2.3.10. Center paddle 2 over the robot, then extend it out over the cassette station A;
MVPC 2
MOVR 2 180

2.3.11. Raise or lower the robot z axis until the height of the paddle's bottom edge is equal to the height of the block - as paddle 2 approaches the block downward movement must be in increments of .001".
MOVR 0 [+/- .001]

2.3.12. Set the paddle offset and center paddle 1 over the robot.
POFF 1
MVPC 1

2.3.13. Set default limits for the robot Z, theta and paddle axes.
FLIM 0
FLIM 1
FLIM 2

2.3.14. Reset the robot z axis brake timeout value.
SCAL 1 6 2000000

2.3.15. Save settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.4.0. Can Angle Calibration

2.4.1. Center robot paddle 1 over the robot, prompt a reading of the robot z axis negative limit, and move the robot z axis to a height that equals its negative limit plus .1 inches.
MVPC 1
LIMN 0
MOVA 0 [negative limit + .1]

2.4.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.4.3. Center robot paddle 1 over the robot then extend it over cassette station A.
MVPC 1
MOVR 2 180

2.4.4. Place a calibration pin in the calibration hole on top of cassette station A. rotate the robot theta axis in small increments until the paddle makes contact with the calibration pin.
MOVR 1 [± .12 degrees]

2.4.5. Define the world position and set the can angles for a sorter with two cassettes and a bright light module:
FWLD 90
SCAL 2 0 0
SCAL 3 0 140
SCAL 10 0 -90
SCAL 11 0 -140
XPOS 1 0
SCAL 1 7 55
SREF 1

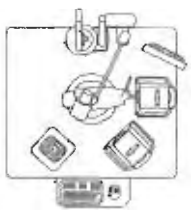
2.4.6. Test the settings by rotating the paddle end of the robot to face the aligner.
SPRK 1

2.4.7. Save settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.5.0. Aligner Calibration

2.5.1. Reference all aligner axes.
SREF 2

2.5.2. Move aligner x axis until the chuck is positioned over the center of the module.
MOVR 4 [+/- .2 inches]

2.5.3. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.5.4. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.0

2.5.5. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.5.6. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.5.7. Lower the robot z axis until any part of the wafer makes contact with the aligner chuck. Do not proceed lower than the aligner chuck as this may damage the wafer.
MOVR 0 [± .005 inches]

2.5.8. Access the aligner's bottom panel and loosen the four shoulder bolts if they do not have springs. Adjust the three aligner leveling screws until the gap between the chuck and the wafer appears even from all vantage points. Retighten the shoulder bolts if they do not have springs.

2.5.9. While supporting the wafer turn off paddle 1 vacuum.
SVAC 1 1 0

2.5.10. Move the aligner x axis in a positive direction.
MOVR 4 .2

2.5.11. Place a calibration pin in the calibration hole on top of the aligner's surface. Make sure it is perpendicular to the top plate.

2.5.12. Move the aligner x axis in the negative direction until the calibration pin makes contact with robot paddle 1.
MOVR 4 [-.02 inches]

2.5.13. Record the aligner x axis reference position, set the aligner x axis transfer position, and reference the aligner module.
RPOS 4 1
XPOS 4 0
MREF 4

2.5.14. Pull the calibration pin out of the aligner's calibration hole and park the aligner.
SPRK 2

2.5.15. Check to see if the aligner parked at the correct position, then center robot paddle 1 over the robot.
MVPC 1

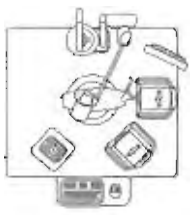
2.5.16. Set default limits for aligner x and theta axes.
FLIM 3
FLIM 4

2.5.17. Save settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.6.0. Setting Aligner Transfer Position

2.6.1. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.6.2. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.5

2.6.3. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.6.4. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.6.5. Set the aligner transfer position by repeatedly lowering the wafer until contact with the aligner chuck is sensed.
FVAC 2 1

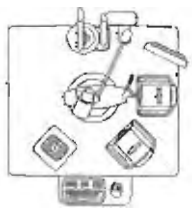
2.6.6. Set the default transfer heights.
SCAL 2 2 -.03
SCAL 2 3 -.005
SCAL 2 4 .015
SCAL 2 5 .03

2.6.7. Save settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.7.0. Aligner Sensor Array Calibration

2.7.1. Turn on the aligner sensor array illumination
OUTP 4 100

2.7.2. Use a small flathead screwdriver to gently turn the potentiometer to maximum brightness; be careful not to strip the potentiometer as its maximum range of motion is only 3/4 turn.

2.7.3. Move the aligner x-axis until the wafer edge is centered under the aligner sensor array.
MOVR 4 [± distance]

2.7.4. Prompt a display of the wafer edge location with respect to the sensor array; a properly positioned edge would read between 60 and 68. Select the ESC button to terminate the ALND display.
ALND

2.7.5. Adjust the aligner x-axis as needed.
MOVR 4 [± .05]

2.7.6. Repeat steps 7.4. and 7.5. until the ALND reading falls between 60 and 68.

2.7.7. Turn the potentiometer until ALND reading decreases by 1. Select the ESC button to terminate the ALND display.
ALND

2.7.8. Turn off aligner sensor array illumination.
OUTP 4 0

2.7.9. Autocalibrate the aligner sensor array.
ALNC 1

2.7.10. Support the wafer by hand, turn off the aligner chuck vacuum and manually remove the wafer.
SVAC 2 1 0

2.7.11. Save settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.8.0. Laser Offset Setup

2.8.1 Reference all robot axes.
SREF 1

2.8.2. Set wafer mapping algorithm.
MAPA 2

2.8.3. To determine the laser offset position, first place a calibration pin in the calibration hole on the top of cassette station A. Next, position a white card or slip of paper behind the pin, opposite the robot. Execute the following commands to position the robot z and theta axes so that the robot laser is aimed at the calibration pin.
LIMN 0 (returns negative limit)
MOVA 0 [negative limit + .05 inches]
MOVA 1 90

2.8.4. Turn on the laser and rotate the robot theta axis until the shadow of the pin falls directly in the center of the laser beam projected onto the paper.
LASR 1
MOVR 1 [± .2]

2.8.5. Prompt the current robot theta position and use it to set the laser offset.
MPOS 1 (returns current position)
SCAL 1 14 [90 - current position]

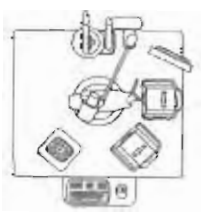
2.8.6. Turn the laser off.
LASR 0

2.8.7. Save the settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.9.0. Mapping Setup: Cassette Station A

2.9.1. Place a full cassette on cassette station A. Remove the wafer in slot 2.

2.9.2. Calibrate the mapping set up.
MAPS 10

2.9.3. Put the wafer back in slot 2.

2.9.4. Map the cassette.
MAPC 10

2.9.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 10 -2 4 .2

2.9.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	00000000000000000000000
-1.8	00000000000000000000000
-1.6	00000000000000000000000
-1.4	00000000000000000000000
-1.2	00000000000000000000000
-1.0	00000000000000000000000
-.8	00000000000000000000000
-.6	00000000000000000000000
-.4	00000000000001100000100
-.2	00111010000011101000100
1.0	10100011011001101001001
1.2	10111010011111101001001
1.4	11111111111111111111111
1.6	11111111111111111111111
1.8	11111111111111111111111
2.0	11111111111111111111111
2.2	11111111111111111111111
2.4	11111111111111111111111
2.6	11111111111111111111111
2.8	11111111111111111111111
3.0	11111111111111111111111
3.2	11111111111111111111111
3.4	10101110010111101001101
3.6	00100110010011001101001
3.8	00000000000000010001001
4.0	00000000000000000000000

2.9.7. Set the low mapping angle
SCAL 10 1 [low angle value]

2.9.8. Set the high mapping angle
SCAL 10 2 [high angle value]

2.9.9. Auto calibrate the best mapping start position.
MAPH 10

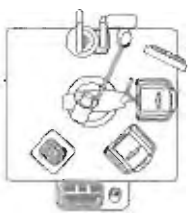
2.9.10. Map the cassette and check the accuracy of returned data.
MAPC 10

2.9.11. Save the settings
SAVE

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System Integration:

2-Cassette / Bright Light



2.10.0. Mapping Setup: Cassette Station B

2.10.1. Place a full cassette on cassette station B. Remove the wafer in slot 2.

2.10.2. Calibrate the mapping set up.
MAPS 11

2.10.3. Put the wafer back in slot 2.

2.10.4. Map the cassette.
MAPC 11

2.10.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 11 -2 4 .2

2.10.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000011000010000
-.2	001110100000111010010010
1.0	101000110110011010010010
1.2	101110100111111010010011
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110010010010
3.8	000000000000000100010010
4.0	000000000000000000000000

2.10.7. Set the low mapping angle
SCAL 11 1 [low angle value]

2.10.8. Set the high mapping angle
SCAL 11 2 [high angle value]

2.10.9. Auto calibrate the best mapping start position.
MAPH 11

2.10.10. Map the cassette and check the accuracy of returned data.
MAPC 11

2.10.11. Save the settings
SAVE

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System Integration:

2-Cassette / Bright Light



2.11.0. Setting Wafer Transfer Positions: Cassette Station A

2.11.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station A.

2.11.2. Map the cassette.
MAPC 10

2.11.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.11.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 10 1 1

2.11.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 10 1 (repeat until contact is made)

2.11.6. Remove paddle 1 from the cassette.
WOOR 10 1 1

2.11.7. Establish robot paddle 1 offset. Repeat the following procedure (11.8. - 11.13.) until paddle 1 is centered between wafers 1 and 2.

2.11.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 10 2 1

2.11.9. Disable the robot theta axis motor.
MEBL 1 0

2.11.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.11.11. Adjust paddle 1 offset position.
SCAL 10 6 [± .003]

2.11.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.11.13. Enable the robot theta axis motor.
MEBL 1 1

2.11.14. Check / adjust wafer pitch. Repeat the following procedure (11.15. - 11.21.) until paddle 1 is centered between wafers 24 and 25.

2.11.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 10 25 1

2.11.16. Disable the robot theta axis motor.
MEBL 1 0

2.11.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.11.18. Adjust the wafer pitch.
SCAL 10 17 [± .0001]

2.11.19. Manually swing paddle-axis out of cassette and center over robot.

2.11.20. Enable robot theta-axis.
MEBL 1 1

2.11.21. Map the cassette and check results for accuracy.
MAPC 10

2.11.22. Save Settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.12.0. Setting Wafer Transfer Positions: Cassette Station B

2.12.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station B.

2.12.2. Map the cassette.
MAPC 11

2.12.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.12.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 11 1 1

2.12.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 11 1 (repeat until contact is made)

2.12.6. Remove paddle 1 from the cassette.
WOOR 11 1 1

2.12.7. Establish robot paddle 1 offset. Repeat the following procedure (12.8. - 12.13.) until paddle 1 is centered between wafers 1 and 2.

2.12.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 11 2 1

2.12.9. Disable the robot theta axis motor.
MEBL 1 0

2.12.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.12.11. Adjust paddle 1 offset position.
SCAL 11 6 [± .003]

2.12.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.12.13. Enable the robot theta axis motor.
MEBL 1 1

2.12.14. Check / adjust wafer pitch. Repeat the following procedure (12.15. - 12.21.) until paddle 1 is centered between wafers 24 and 25.

2.12.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 11 25 1

2.12.16. Disable the robot theta axis motor.
MEBL 1 0

2.12.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.12.18. Adjust the wafer pitch.
SCAL 11 17 [± .0001]

2.12.19. Manually swing paddle-axis out of cassette and center over robot.

2.12.20. Enable robot theta-axis.
MEBL 1 1

2.12.21. Map the cassette and check results for accuracy.
MAPC 11

2.12.22. Save Settings.
SAVE

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System Integration:

2-Cassette / Bright Light



2.13.0. Joystick Calibration

2.13.1. Exit Host NT software and start workstation software.

2.13.2. Enable the bright light option in the system setup screen.

2.13.3. Exit and re-enter the workstation software.

2.13.4. Select setup from the main tool bar.

2.13.5. Click joystick.

2.13.6. Make sure the power curve is set to four and the dead band is between four and fifteen.

2.13.7. Click calibrate joystick.

2.13.8. Follow the eight instruction steps to calibrate the joystick.

2.13.9. Click yes to accept the joystick calibration and exit the window.

2.13.10. Exit Workstation software.

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System Integration:

2-Cassette / Bright Light



2.14.0. Bright Light Leveling & Transfer Heights (without Wafer Flipper)

2.14.1. Make sure guard has been removed and the vacuum sensitivity is set correctly. The mapping and transfer heights of the stations should already is set up. The robot can angles should also be set.

2.14.2. Increase the software limits:
LIMP 7 720
LIMP 8 720
LIMN 7 –720
LIMN 8 –720

2.14.3. Remove a wafer from a cassette with the robot.
WELR 10 2 1

2.14.4. Move the robot to the Z transfer position of the bright light.
WLOO 3 1 1

2.14.5. Position the bright light chuck until it appears level.
MOVR 7 ±
MOVR 8 ±

2.14.6. Disable the theta axis and manually move the wafer on paddle one over the bright light chuck.
MEBL 1 0

2.14.7. Raise or lower the Z axis of the robot until the bottom surface of the wafer is close to the top surface of the bright light chuck.
MOVR 0 ± .001

2.14.8. Make fine leveling adjustments of the bright light chuck. There should be an even gap between the surfaces of the chuck and wafer.
MOVR 7 ±
MOVR 8 ±

2.14.9. Manually move the wafer over the center of the robot.

2.14.10. Set the transfer positions of the bright light and reference the motors.
RPOS 7 1
RPOS 8 1
MREF 7
MREF 8

2.14.11. Check to see if the chuck parks itself at the correct position.
SPRK 3

2.14.12. Make sure the transfer positions are at their default positions:
SCAL 3 2 -.02
SCAL 3 3 -.01
SCAL 3 4 .01
SCAL 3 5 .03

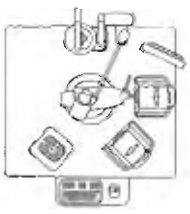
2.14.13. Manually move the wafer over the bright light chuck.

2.14.14. Set the bright light transfer height – repeat until contact is made.
FVAC 3 1

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System Integration:

2-Cassette / Bright Light



2.14.15. Enable the theta axis on the robot and remove the wafer from the bright light chuck.
MEBL 1 1
WOLR 3 1 1

2.14.16. Set the software limits back to their original default parameters.
FLIM 7
FLIM 8
FLIM 9

2.14.17. If the robot transfers the wafer cleanly to and from the bright light, save the parameters.
SAVE

2.14.18. Replace the bright light housing panel.

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System Integration:

2-Cassette / Bright Light



2.15.0. Bright Light Leveling & Transfer Heights (with Wafer Flipper)

2.15.1. Make sure guard has been removed and the vacuum sensitivity is set correctly. The mapping and transfer heights of the stations should already is set up. The robot can angles should also be set.

2.15.2. Switch to controller channel 2.
CHAN 2

2.15.3. Increase the software limits:
LIMP 7 720
LIMP 8 720
LIMN 7 –720
LIMN 8 –720

2.15.4. Switch to controller channel 1.
CHAN 1

2.15.5. Remove a wafer from a cassette with the robot.
WELR 10 2 1

2.15.6. Move the robot to the Z transfer position of the bright light.
WLOO 3 1 1

2.15.7. Switch to controller channel 2.
CHAN 2

2.15.8. Position the bright light chuck until it appears level.
MOVR 7 ±
MOVR 8 ±

2.15.9. Switch to controller channel 1.
CHAN 1

2.15.10. Disable the theta axis and manually move the wafer on paddle one over the bright light chuck.
MEBL 1 0

2.15.11. Raise or lower the Z axis of the robot until the bottom surface of the wafer is close to the top surface of the bright light chuck.
MOVR 0 ± .001

2.15.12. Switch to controller channel 2.
CHAN 2

2.15.13. Make fine leveling adjustments of the bright light chuck. There should be a even gap between the surfaces of the chuck and wafer.
MOVR 7 ±
MOVR 8 ±

2.15.14. Manually move the wafer over the center of the robot.

2.15.15. Set the transfer positions of the bright light and reference the motors
RPOS 7 1
RPOS 8 1
MREF 7
MREF 8

2.15.16. Check to see if the chuck parks itself at the correct position.
SPRK 3

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System Integration:

2-Cassette / Bright Light



2.15.17. Make sure the transfer positions are at their default positions:
SCAL 3 2 -.02
SCAL 3 3 -.01
SCAL 3 4 .01
SCAL 3 5 .03

2.15.18. Manually move the wafer over the bright light chuck.

2.15.19. Set the bright light transfer height – repeat until contact is made.
FVAC 3 1

2.15.20. Switch to controller channel 1.
CHAN 1

2.15.21. Enable the theta axis on the robot and remove the wafer from the bright light chuck.
MEBL 1 1
WOLR 3 1 1

2.15.22. Switch to controller channel 2.
CHAN 2

2.15.23. Set the software limits back to their original default parameters.
FLIM 7
FLIM 8
FLIM 9

2.15.24. If the robot transfers the wafer cleanly to and from the bright light, save the parameters.
SAVE

2.15.25. Switch to controller channel 1.
CHAN 1

2.15.26. Replace the bright light housing panel.

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System Integration:

2-Cassette / Bright Light



2.16.0. Wafer Flipper Leveling & Transfer Positions

2.16.1. Make sure the joystick has been calibrated and the robot transfers wafers to the bright light chuck cleanly.

2.16.2. Transfer a wafer to the bright light chuck with the robot.
WMOV 10 1 3 1

2.16.3. Switch to controller channel 2.
CHAN 2

2.16.4. Move the bright light chuck and the flipper until the top surface of the flipper makes evenly contact with the bottom surface of the wafer.
MOVR 7 ±
MOVR 8 ±
MOVR 19 ±

2.16.5. Prompt motor positions and record.
MPOS 7
MPOS 8
MPOS 19

2.16.6. Set transfer positions using recorded values.
XPOS 7 [MPOS 7 value]
XPOS 8 [MPOS 8 value]
XPOS 19 [MPOS 19 value]

2.16.7. Park the bright light.
SPRK 3

2.16.8. Test the new flip parameters.
FLIP

2.16.9. Return the wafer back to the bright light chuck.
FLIP

2.16.10. Save the settings and place the cover and guard back into position.
SAVE

2.16.11. Switch to controller channel 1.
CHAN 1

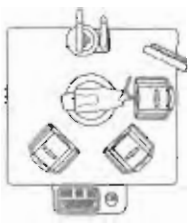
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System
Integration:

3-Cassette

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System Integration:
3-Cassette



3-Cassette System Setup & Integration Sequence:

Initial Power-Up & Hardware Check:

1.1.0. System Power-Up 52

1.2.0. Controller Board Board 1 Test 52

1.3.1. Main System Vacuum Test 52
1.3.2. Robot Paddle Vacuum Test 53
1.3.3. Aligner Chuck Vacuum Test 53

1.4.1. Robot Module Reference 54
1.4.2. Aligner Module Reference 54
1.4.3. Aligner Array Board Check 54
1.4.4. Aligner Upper Light Source Check 54
1.4.5. Aligner Lower Light Source Check 54

System Integration:

2.1.0. Cassette Station Leveling 55

2.2.0. Robot Paddle Calibration 56
2.3.0. Robot Z Axis Calibration 57

2.4.0. Can Angle Calibration 58

2.5.0. Aligner Calibration 59
2.6.0. Setting Aligner Transfer Position 60
2.7.0. Aligner Sensor Array Calibration 61

2.8.0. Laser Offset Setup 62

2.9.0. Mapping Setup: Cassette Station A 63
2.10.0. Mapping Setup: Cassette Station B 64
2.11.0. Mapping Setup: Cassette Station C 65

2.12.0. Transfer Positions: Cassette Station A 66
2.13.0. Transfer Positions: Cassette Station B 67
2.14.0. Transfer Positions: Cassette Station C 68

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System Integration:
3-Cassette



Initial Power-Up & Hardware Check: 3-Cassette

1.1. System Power-Up

1.1.1. Set the controller On/Off switch to the On position.

1.1.2. Make sure E-Stop is pulled out and turn the system On/Off switch clockwise as far as it will go to power up the controller – note that the On/Off switch will return to a position midway between the Off and On labels. Wait 20 seconds and again turn the system On/Off switch clockwise as far as it will go to activate system motor.

1.1.3. Power-up the VGA color monitor.

1.1.4. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

1.1.5. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Desktop window.

1.1.6. Within the Windows NT Desktop locate and select (double click) the Host NT icon to prompt the display of the Host NT window. The system is now ready to accept host commands at the command line.

1.2. Controller Board 1 (Master)

1.2.1. Perform self diagnostic test; a return of 0 ensures that serial connections to controller board 1 are sound.
SELF

1.3.1. Main Vacuum Test

1.3.1.1. Verify that the system vacuum sensor is connected to the AUX port on the controller back panel.

1.3.1.2. Detach the vacuum line from the back of the sorter chassis. Turn the sensor adjustment screw CW until the LED turns on, then CCW until the LED turns off.

1.3.1.3. Reattach the vacuum line to the back of the sorter chassis and verify that the LED turns on.

1.3.1.4. Prompt the current hardware sensor status of the controller.
HWST

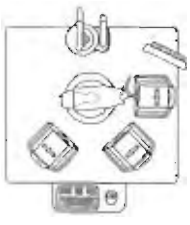
1.3.1.5. Detach the main vacuum line from the sorter chassis.

1.3.1.6. Again, prompt the current hardware sensor status of the controller; the returned values should be different than those returned in step 1.3.1.4.
HWST

1.3.2. Robot Paddle Vacuum Test

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System Integration:
3-Cassette



1.3.2.1. Activate paddle 1 vacuum.
SVAC 1 1 1

1.3.2.2. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.3. Deactivate paddle 1 vacuum.
SVAC 1 1 0

1.3.2.4. Activate paddle 2 vacuum.
SVAC 1 2 1

1.3.2.5. Adjust paddle 2 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.6. Deactivate paddle 2 vacuum.
SVAC 1 2 0

1.3.2.7. Place a small wafer on paddle 1 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 1

1.3.2.8. Turn paddle 1vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.2.9. Place a small wafer on paddle 2 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 2

1.3.2.10. Turn paddle 2 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.3. Aligner Chuck Vacuum

1.3.3.1. Activate aligner chuck vacuum.
SVAC 2 1 1

1.3.3.2. Remove the back cover of the aligner and adjust the vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.3.3. Deactivate aligner chuck vacuum.
SVAC 2 1 0

1.3.3.4. Place a small wafer on aligner chuck and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 2 1

1.3.3.5. Turn aligner vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

1.3.3.6. Replace aligner back cover.

1.4.1. Reference Robot Module

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3-Cassette



1.4.1.1. Reference robot theta axis.
MREF 1 (make sure it references in all four quadrants)

1.4.1.2. Disable robot paddle axis motor.
MEBL 2 0

1.4.1.3. Manually swing the robot paddle over the robot, record position, enable robot paddle axis motor, and reference robot paddle axis.
RPOS 2 1
MEBL 2 1
MREF 2

1.4.1.4. Reference robot z axis.
MREF 0

1.4.2. Reference Aligner Module

1.4.2.1. Reference aligner theta and x-axes motors.
MREF 3
MREF 4

1.4.3. Check Array Board

1.4.3.1. Turn on the illumination and check the pixels of the array.
OUTP 4 100
ALND (128 should scroll up and down the screen)

1.4.3.2. Stop the scrolling and turn off the illumination.
ESC (stops the scrolling)
OUTP 4 0

1.4.4. Check the upper light source on the wafer light

1.4.4.1. Turn on the light above the acrylic block.
OUTP 5 100

1.4.4.2. Turn off the light source.
OUTP 5 0

1.4.5. Check the lower light source on the wafer light

1.4.5.1. Turn on the light source below the light shield.
OUTP 10 100

1.4.5.2. Turn off the light source.
OUTP 10 0

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System Integration:
3-Cassette



System Integration: 3-Cassette

2.1. Cassette Station Leveling

2.1.1. On the underside of the sorter chassis, locate each cassette station's respective access port and loosen the four fasteners located there.

2.1.2. Remove the sensor cable clamps that cover up the set screw holes under the cassette stations.

2.1.3. Loosen the three set screws located under the cassette station until they are not touching the bottom of their station.

2.1.4. Raise the robot z axis.
MOVA 0 .35

2.1.5. Disable the robot theta and paddle motors.
MEBL 1 0
MEBL 2 0

2.1.6. Turn on robot paddle 1 vacuum and place a wafer over the vacuum port.
SVAC 1 1 1

2.1.7. Manually rotate the robot theta axis to swing paddle 1 and the wafer out over the cassette stations - note that the centerline of paddle 1 must point to the center of the robot for proper leveling. Using the wafer as a baseline, determine which cassette station is the highest; proceed to level that station first.

2.1.8. Place three leveling blocks around the edge of the highest cassette station. Manually swing the wafer over the cassette station. Lower the robot z axis until the underside of the wafer makes contact with one of the blocks.
MOVR 0 [- .001]

2.1.9. Adjust the three set screws under the station until the wafer makes equal contact with all three blocks. Once the station is level, rotate the set screw located closest to the robot clockwise (CW) 1/4 turn.

2.1.10. Manually swing paddle 1 and the wafer away from the station. Beginning with the two fasteners situated farthest from the robot and proceeding in small increments, retighten the four fasteners located on the underside of the pedestal.

2.1.11. Manually swing paddle 1 and the wafer back over the station and use the blocks to ensure that it is still level. Repeat the leveling procedure if necessary.

2.1.12. Manually swing paddle 1 and the wafer over the next station, keeping the same robot z height, and perform the leveling procedure described above (2.1.9. - 2.1.11.).

2.1.13. While supporting the wafer, turn off the vacuum to robot paddle 1 and remove the wafer.
SVAC 1 1 0

2.1.14. Enable the robot theta and paddle motors.
MEBL 1 1
MEBL 2 1

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System Integration:

3-Cassette



2.2. Robot Paddle Calibration

2.2.1. Reference the robot theta axis.
MREF 1

2.2.2. Reference the robot paddle axis.
MREF 2

2.2.3. Set the station reference flag for the robot.
SRFL 1 1

2.2.4. Rotate the robot paddle axis until paddle 1 is centered over the robot.
MOVR 2 [± degrees]

2.2.5. Place a calibration pin into the robot calibration pin hole.

2.2.6. Rotate the robot paddle axis until the inside edge of paddle 1 makes contact with calibration pin; as paddle one approaches the pin, decrease the increment of rotation.
MOVR 2 [± degrees]

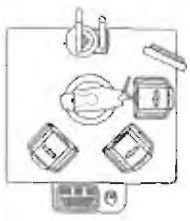
2.2.7. Set the robot paddle reference position and paddle 1 calibration angle.
RPOS 2 1
MREF 2
SCAL 1 1 0

2.2.8. Check to see if robot paddle 1 centers properly over the robot.
MVPC 1

2.2.9. Save settings.
SAVE

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System Integration:
3-Cassette



2.3. Robot Z Axis Calibration

2.3.1. Center robot paddle 1 over the center of the robot and set the robot height (z axis) to .1 inches.
MVPC 1
MOVA 0 .1

2.3.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.3.3. Extend paddle 1 out over cassette station A.
MOVR 2 180

2.3.4. Adjust the robot z axis brake timeout value.
SCAL 1 6 10000000

2.3.5. Place a 1 inch calibration block adjacent to the tip of the extended robot paddle. Raise or lower the robot z axis until the height of the paddle's bottom edge matches that of the block - as paddle 1 approaches the block downward movement should be in increments of .001".
MOVR 0 [+/- .001]

2.3.6. Set the robot z axis motor reference position.
RPOS 0 1

2.3.7. Reference the robot z axis.
MREF 0

2.3.8. Move the robot z axis to the newly set zero position.
MOVA 0 0

2.3.9. Center paddle 1 over the robot, then extend it out over the cassette station A; use the calibration block to see if RPOS recorded properly.
MVPC 1
MOVR 2 180

2.3.10. Center paddle 2 over the robot, then extend it out over the cassette station A;
MVPC 2
MOVR 2 180

2.3.11. Raise or lower the robot z axis until the height of the paddle's bottom edge is equal to the height of the block - as paddle 2 approaches the block downward movement must be in increments of .001".
MOVR 0 [+/- .001]

2.3.12. Set the paddle offset and center paddle 1 over the robot.
POFF 1
MVPC 1

2.3.13. Set default limits for the robot Z, theta and paddle axes.
FLIM 0
FLIM 1
FLIM 2

2.3.14. Reset the robot z axis brake timeout value.
SCAL 1 6 2000000

2.3.15. Save settings.
SAVE

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System Integration:

3-Cassette



2.4. Can Angle Calibration

2.4.1. Center robot paddle 1 over the robot, prompt a reading of the robot z axis negative limit, and move the robot z axis to a height that equals its negative limit plus .1 inches.
MVPC 1
LIMN 0
MOVA 0 [negative limit + .1]

2.4.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.4.3. Center robot paddle 1 over the robot then extend it over cassette station A.
MVPC 1
MOVR 2 180

2.4.4. Place a calibration pin in the calibration hole on top of cassette station A. rotate the robot theta axis in small increments until the paddle makes contact with the calibration pin.
MOVR 1 [± .12 degrees]

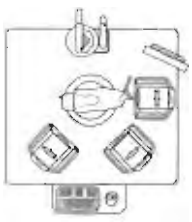
2.4.5. Define the world position and set the can angles for a sorter with three cassettes.
FWLD 90
SCAL 2 0 0
SCAL 10 0 -90
SCAL 11 0 -140
SCAL 12 0 140
XPOS 1 0
SCAL 1 7 55
SREF 1

2.4.6. Test the settings by rotating the paddle end of the robot to face the aligner.
SPRK 1

2.4.7. Save settings.
SAVE

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System Integration:
3-Cassette



2.5. Aligner Calibration

2.5.1. Reference all aligner axes.
SREF 2

2.5.2. Move aligner x axis until the chuck is positioned over the center of the module.
MOVR 4 [+/- .2 inches]

2.5.3. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.5.4. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.0

2.5.5. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.5.6. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.5.7. Lower the robot z axis until any part of the wafer makes contact with the aligner chuck. Do not proceed lower than the aligner chuck as this may damage the wafer.
MOVR 0 [± .005 inches]

2.5.8. Access the aligner's bottom panel and loosen the four shoulder bolts if they do not have springs. Adjust the three aligner leveling screws until the gap between the chuck and the wafer appears even from all vantage points. Retighten the shoulder bolts if they do not have springs.

2.5.9. While supporting the wafer turn off paddle 1 vacuum.
SVAC 1 1 0

2.5.10. Move the aligner x axis in a positive direction.
MOVR 4 .2

2.5.11. Place a calibration pin in the calibration hole on top of the aligner's surface. Make sure it is perpendicular to the top plate.

2.5.12. Move the aligner x axis in the negative direction until the calibration pin makes contact with robot paddle 1.
MOVR 4 [-.02 inches]

2.5.13. Record the aligner x axis reference position, set the aligner x axis transfer position, and reference the aligner module.
RPOS 4 1
XPOS 4 0
MREF 4

2.5.14. Pull the calibration pin out of the aligner's calibration hole and park the aligner.
SPRK 2

2.5.15. Check to see if the aligner parked at the correct position, then center robot paddle 1 over the robot.
MVPC 1

2.5.16. Set default limits for aligner x and theta axes.
FLIM 3
FLIM 4

2.5.17. Save settings.
SAVE

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System Integration:

3-Cassette



2.6. Setting Aligner Transfer Position

2.6.1. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.6.2. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.5

2.6.3. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.6.4. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

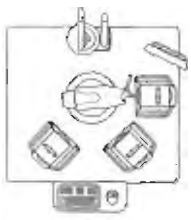
2.6.5. Set the aligner transfer position by repeatedly lowering the wafer until contact with the aligner chuck is sensed.
FVAC 2 1

2.6.6. Set the default transfer heights.
SCAL 2 2 -.03
SCAL 2 3 -.005
SCAL 2 4 .015
SCAL 2 5 .03

2.6.7. Save settings.
SAVE

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System Integration:
3-Cassette



2.7. Aligner Sensor Array Calibration

2.7.1. Turn on the aligner sensor array illumination
OUTP 4 100

2.7.2. Use a small flathead screwdriver to gently turn the potentiometer to maximum brightness; be careful not to strip the potentiometer as its maximum range of motion is only 3/4 turn.

2.7.3. Move the aligner x-axis until the wafer edge is centered under the aligner sensor array.
MOVR 4 [± distance]

2.7.4. Prompt a display of the wafer edge location with respect to the sensor array: a properly positioned edge would read between 60 and 68. Select the ESC button to terminate the ALND display.
ALND

2.7.5. Adjust the aligner x-axis as needed.
MOVR 4 [± .05]

2.7.6. Repeat steps 7.4. and 7.5. until the ALND reading falls between 60 and 68.

2.7.7. Turn the potentiometer until ALND reading decreases by 1. Select the ESC button to terminate the ALND display.
ALND

2.7.8. Turn off aligner sensor array illumination.
OUTP 4 0

2.7.9. Autocalibrate the aligner sensor array.
ALNC 1

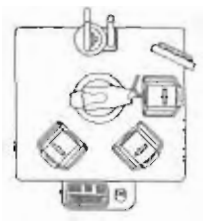
2.7.10. Support the wafer by hand, turn off the aligner chuck vacuum and manually remove the wafer.
SVAC 2 1 0

2.7.11. Save settings.
SAVE

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System Integration:

3-Cassette



2.8. Laser Offset Setup

2.8.1 Reference all robot axes.
SREF 1

2.8.2. Set wafer mapping algorithm.
MAPA 2

2.8.3. To determine the laser offset position, first place a calibration pin in the calibration hole on the top of cassette station A. Next, position a white card or slip of paper behind the pin, opposite the robot. Execute the following commands to position the robot z and theta axes so that the robot laser is aimed at the calibration pin.
LIMN 0 (returns negative limit)
MOVA 0 [negative limit + .05 inches]
MOVA 1 90

2.8.4. Turn on the laser and rotate the robot theta axis until the shadow of the pin falls directly in the center of the laser beam projected onto the paper.
LASR 1
MOVR 1 [± .2]

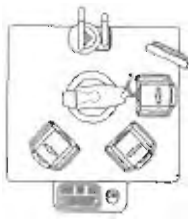
2.8.5. Prompt the current robot theta position and use it to set the laser offset.
MPOS 1 (returns current position)
SCAL 1 14 [90 - current position]

2.8.6. Turn the laser off.
LASR 0

2.8.7. Save the settings.
SAVE

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System Integration:
3-Cassette



2.9. Mapping Setup: Cassette Station A

2.9.1. Place a full cassette on cassette station A. Remove the wafer in slot 2.

2.9.2. Calibrate the mapping set up.
MAPS 10

2.9.3. Put the wafer back in slot 2.

2.9.4. Map the cassette.
MAPC 10

2.9.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 10 -2 4 .2

2.9.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000011000001000
-.2	001110100000111010001001
1.0	101000110110011010010010
1.2	101110100111111010010011
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110011010010
3.8	000000000000000100010010
4.0	000000000000000000000000

2.9.7. Set the low mapping angle
SCAL 10 1 [low angle value]

2.9.8. Set the high mapping angle
SCAL 10 2 [high angle value]

2.9.9. Auto calibrate the best mapping start position.
MAPH 10

2.9.10. Map the cassette and check the accuracy of returned data.
MAPC 10

2.9.11. Save the settings
SAVE

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System Integration:

3-Cassette



2.10. Mapping Setup: Cassette Station B

2.10.1. Place a full cassette on cassette station B. Remove the wafer in slot 2.

2.10.2. Calibrate the mapping set up.
MAPS 11

2.10.3. Put the wafer back in slot 2.

2.10.4. Map the cassette.
MAPC 11

2.10.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 11 -2 4 .2

2.10.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000C00
-1.6	000000000000000000000C00
-1.4	000000000000000000000C00
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000C00
-.6	000000000000000000000000
-.4	000000000000011000001000
-.2	001110100000111010001001O
1.0	101000110110011010010010O
1.2	101110100111111010010011
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110010010O
3.8	000000000000001000100100
4.0	000000000000000000000000

2.10.7. Set the low mapping angle
SCAL 11 1 [low angle value]

2.10.8. Set the high mapping angle
SCAL 11 2 [high angle value]

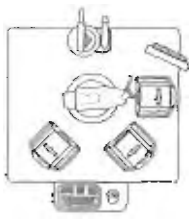
2.10.9. Auto calibrate the best mapping start position.
MAPH 11

2.10.10. Map the cassette and check the accuracy of returned data.
MAPC 11

2.10.11. Save the settings
SAVE

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System Integration:
3-Cassette



2.11. Mapping Setup: Cassette Station C

2.11.1. Place a full cassette on cassette station C. Remove the wafer in slot 2.

2.11.2. Calibrate the mapping set up.
MAPS 12

2.11.3. Put the wafer back in slot 2.

2.11.4. Map the cassette.
MAPC 12

2.11.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 12 -2 4 .2

2.11.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000011000001000
-.2	001110100000111010001001
1.0	101000110110011010010010
1.2	101110100111111010010011
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110011010010
3.8	000000000000001000100100
4.0	000000000000000000000000

2.11.7. Set the low mapping angle
SCAL 12 1 [low angle value]

2.11.8. Set the high mapping angle
SCAL 12 2 [high angle value]

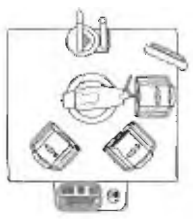
2.11.9. Auto calibrate the best mapping start position.
MAPH 12

2.11.10. Map the cassette and check the accuracy of returned data.
MAPC 12

2.11.11. Save the settings
SAVE

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System Integration:
3-Cassette



2.12. Setting Wafer Transfer Positions: Cassette Station A

2.12.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station A.

2.12.2. Map the cassette.
MAPC 10

2.12.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.12.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 10 1 1

2.12.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 10 1 (repeat until contact is made)

2.12.6. Remove paddle 1 from the cassette.
WOOR 10 1 1

2.12.7. Establish robot paddle 1 offset. Repeat the following procedure (12.8. - 12.13.) until paddle 1 is centered between wafers 1 and 2.

2.12.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 10 2 1

2.12.9. Disable the robot theta axis motor.
MEBL 1 0

2.12.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.12.11. Adjust paddle 1 offset position.
SCAL 10 6 [± .003]

2.12.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.12.13. Enable the robot theta axis motor.
MEBL 1 1

2.12.14. Check / adjust wafer pitch. Repeat the following procedure (12.15. - 12.21.) until paddle 1 is centered between wafers 24 and 25.

2.12.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 10 25 1

2.12.16. Disable the robot theta axis motor.
MEBL 1 0

2.12.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.12.18. Adjust the wafer pitch.
SCAL 10 17 [± .0001]

2.12.19. Manually swing paddle-axis out of cassette and center over robot.

2.12.20. Enable robot theta-axis.
MEBL 1 1

2.12.21. Map the cassette and check results for accuracy.
MAPC 10

2.12.22. Save Settings.
SAVE

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System Integration:
3-Cassette



2.13. Setting Wafer Transfer Positions: Cassette Station B

2.13.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station B.

2.13.2. Map the cassette.
MAPC 11

2.13.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.13.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 11 1 1

2.13.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 11 1 (repeat until contact is made)

2.13.6. Remove paddle 1 from the cassette.
WOOR 11 1 1

2.13.7. Establish robot paddle 1 offset. Repeat the following procedure (13.8. - 13.13.) until paddle 1 is centered between wafers 1 and 2.

2.13.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 11 2 1

2.13.9. Disable the robot theta axis motor.
MEBL 1 0

2.13.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.13.11. Adjust paddle 1 offset position.
SCAL 11 6 [± .003]

2.13.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.13.13. Enable the robot theta axis motor.
MEBL 1 1

2.13.14. Check / adjust wafer pitch. Repeat the following procedure (13.15. - 13.21.) until paddle 1 is centered between wafers 24 and 25.

2.13.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 11 25 1

2.13.16. Disable the robot theta axis motor.
MEBL 1 0

2.13.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.13.18. Adjust the wafer pitch.
SCAL 11 17 [± .0001]

2.13.19. Manually swing paddle-axis out of cassette and center over robot.

2.13.20. Enable robot theta-axis.
MEBL 1 1

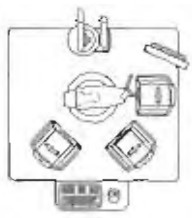
2.13.21. Map the cassette and check results for accuracy.
MAPC 11

2.13.22. Save Settings.
SAVE

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System Integration:

3-Cassette



2.14. Setting Wafer Transfer Positions: Cassette Station C

2.14.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station C.

2.14.2. Map the cassette.
MAPC 12

2.14.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.14.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 12 1 1

2.14.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 12 1 (repeat until contact is made)

2.14.6. Remove paddle 1 from the cassette.
WOOR 12 1 1

2.14.7. Establish robot paddle 1 offset. Repeat the following procedure (14.8. - 14.13.) until paddle 1 is centered between wafers 1 and 2.

2.14.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 12 2 1

2.14.9. Disable the robot theta axis motor.
MEBL 1 0

2.14.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.14.11. Adjust paddle 1 offset position.
SCAL 12 6 [± .003]

2.14.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.14.13. Enable the robot theta axis motor.
MEBL 1 1

2.14.14. Check / adjust wafer pitch. Repeat the following procedure (14.15. - 14.21.) until paddle 1 is centered between wafers 24 and 25.

2.14.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 12 25 1

2.14.16. Disable the robot theta axis motor.
MEBL 1 0

2.14.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.14.18. Adjust the wafer pitch.
SCAL 12 17 [± .0001]

2.14.19. Manually swing paddle-axis out of cassette and center over robot.

2.14.20. Enable robot theta-axis.
MEBL 1 1

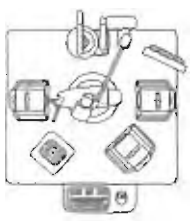
2.14.21. Map the cassette and check results for accuracy.
MAPC 12

2.14.22. Save Settings.
SAVE

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System Integration:

3-Cassette / Bright Light



3-Cassette / Bright Light System Setup & Integration Sequence:

Initial Power-Up & Hardware Check:

1.1.0. System Power-Up 70

1.2.1. Controller Board Board 1 Test 70
1.2.2. Controller Board Board 2 Test 70

1.3.1. Main System Vacuum Test 70
1.3.2. Robot Paddle Vacuum Test 71
1.3.3. Aligner Chuck Vacuum Test 71
1.3.4. Bright Light Chuck Vacuum Test 72
1.3.5. Wafer Flipper Vacuum Test 72

1.4.1. Robot Module Reference 73
1.4.2. Aligner Module Reference 73
1.4.3. Aligner Array Board Check 73
1.4.4. Aligner Upper Light Source Check 73
1.4.5. Aligner Lower Light Source Check 73
1.4.6. Bright Light Module Reference 74
1.4.7. Bright Light Illumination Check 74

System Integration:

2.1.0. Cassette Station Leveling 75

2.2.0. Robot Paddle Calibration 76
2.3.0. Robot Z Axis Calibration 77

2.4.0. Can Angle Calibration 78

2.5.0. Aligner Calibration 79
2.6.0. Setting Aligner Transfer Position 80
2.7.0. Aligner Sensor Array Calibration 81

2.8.0. Laser Offset Setup 82

2.9.0. Mapping Setup: Cassette Station A 83
2.10.0. Mapping Setup: Cassette Station B 84
2.11.0. Mapping Setup: Cassette Station C 85

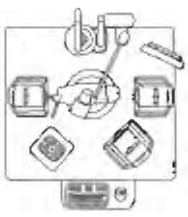
2.12.0. Transfer Positions: Cassette Station A 86
2.13.0. Transfer Positions: Cassette Station B 87
2.14.0. Transfer Positions: Cassette Station C 88

2.15.0. Joystick Calibration 89
2.16.0. Bright Light Leveling & Transfer Heights (without Wafer Flipper) 90
2.17.0. Bright Light Leveling & Transfer Heights (with Wafer Flipper) 92
2.18.0. Wafer Flipper Leveling & Transfer Positions 94

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System Integration:

3-Cassette / Bright Light



Initial Power-Up & Hardware Check: 3-Cassette with Bright Light

1.1. System Power-Up

1.1.1. Set the controller On/Off switch to the On position.

1.1.2. Make sure E-Stop is pulled out and turn the system On/Off switch clockwise as far as it will go to power up the controller – note that the On/Off switch will return to a position midway between the Off and On labels. Wait 20 seconds and again turn the system On/Off switch clockwise as far as it will go to activate system motor.

1.1.3. Power-up the VGA color monitor.

1.1.4. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

1.1.5. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Desktop window.

1.1.6. Within the Windows NT Desktop locate and select (double click) the Host NT icon to prompt the display of the Host NT window. The system is now ready to accept host commands at the command line.

1.2.1. Controller Board 1 (Master)

Switch to controller channel 1 and perform self diagnostic test; a return of 0 ensures that serial connections to controller board 1 are sound.

CHAN 1
SELF

1.2.2. Controller Board 2 (Slave)

Switch to controller channel 2 and perform self diagnostic test; a return of 0 ensures that serial connections to controller board 2 are sound. Switch back to controller channel 1.

CHAN 2
SELF
CHAN 1

1.3.1. Main Vacuum Test

1.3.1.1. Verify that the system vacuum sensor is connected to the AUX port on the controller back panel.

1.3.1.2. Detach the vacuum line from the back of the sorter chassis. Turn the sensor adjustment screw CW until the LED turns on, then CCW until the LED turns off.

1.3.1.3. Reattach the vacuum line to the back of the sorter chassis and verify that the LED turns on.

1.3.1.4. Prompt the current hardware sensor status of the controller.

HWST

1.3.1.5. Detach the main vacuum line from the sorter chassis.

1.3.1.6. Again, prompt the current hardware sensor status of the controller; the returned values should be different than those returned in step 1.3.1.4.

HWST

1.3.2. Robot Paddle Vacuum Test

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System Integration:

3-Cassette / Bright Light



1.3.2.1. Activate paddle 1 vacuum.
SVAC 1 1 1

1.3.2.2. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.3. Deactivate paddle 1 vacuum.
SVAC 1 1 0

1.3.2.4. Activate paddle 2 vacuum.
SVAC 1 2 1

1.3.2.5. Adjust paddle 2 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.6. Deactivate paddle 2 vacuum.
SVAC 1 2 0

1.3.2.7. Place a small wafer on paddle 1 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 1

1.3.2.8. Turn paddle 1 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.2.9. Place a small wafer on paddle 2 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 2

1.3.2.10. Turn paddle 2 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.3. Aligner Chuck Vacuum

1.3.3.1. Activate aligner chuck vacuum.
SVAC 2 1 1

1.3.3.2. Remove the back cover of the aligner and adjust the vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.3.3. Deactivate aligner chuck vacuum.
SVAC 2 1 0

1.3.3.4. Place a small wafer on aligner chuck and initiate a vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 2 1

1.3.3.5. Turn aligner vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

1.3.3.6. Replace aligner back cover.

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System Integration:

3-Cassette / Bright Light



1.3.4. Bright Light Vacuum

1.3.4.1. Remove the guard on the bright light by unscrewing the three m4 fasteners.

1.3.4.2. Remove the access panel from the bright light gimbal housing – this panel is distinguishable by its two threaded sensor access holes. The bright light vacuum sensor is located on the left side of the module while the flipper vacuum sensor is located on the right.

1.3.4.3. Position the bright light chuck until it appears level
MOVR 7 ±
MOVR 8 ±

1.3.4.4. Place a small wafer on the bright light chuck and initiate a vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 3 1

1.3.4.5. Turn bright light vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

1.3.5. Wafer Flipper Vacuum

1.3.5.1. Remove the access panel from the bright light gimbal housing – this panel is distinguishable by its two threaded sensor access holes. The bright light vacuum sensor is located on the left side of the module while the flipper vacuum sensor is located on the right.

1.3.5.2. Switch to controller channel 2.
CHAN 2

1.3.5.3. Move the flipper up until it clears the top surface of the bright light chuck.
MOVR 19 1

1.3.5.4. Place a wafer over the vacuum ports of the flipper and hold it into position with your hand.

1.3.5.5. Place a wafer over the vacuum ports of the flipper and hold it into position by hand. Initiate a vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 3 2

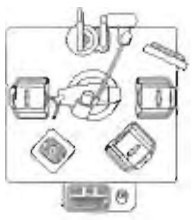
1.3.5.6. Turn flipper vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 50000 (± 5000); remove wafer.

1.3.5.7. Park the bright light module
SPRK 3

1.3.5.8. Switch to controller channel 1.
CHAN 1

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System Integration:
3-Cassette / Bright Light



1.4.1. Reference Robot Module

1.4.1.1. Reference robot theta axis.
MREF 1 (make sure it references in all four quadrants)

1.4.1.2. Disable robot paddle axis motor.
MEBL 2 0

1.4.1.3. Manually swing the robot paddle over the robot, record position, enable robot paddle axis motor, and reference robot paddle axis.
RPOS 2 1
MEBL 2 1
MREF 2

1.4.1.4. Reference robot z axis.
MREF 0

1.4.2. Reference Aligner Module

1.4.2.1. Reference aligner theta and x-axes motors.
MREF 3
MREF 4

1.4.3. Check Array Board

1.4.3.1. Turn on the illumination and check the pixels of the array.
OUTP 4 100
ALND (128 should scroll up and down the screen)

1.4.3.2. Stop the scrolling and turn off the illumination.
ESC (stops the scrolling)
OUTP 4 0

1.4.4. Check the upper light source on the wafer light

1.4.4.1. Turn on the light above the acrylic block.
OUTP 5 100

1.4.4.2. Turn off the light source.
OUTP 5 0

1.4.5. Check the lower light source on the wafer light

1.4.5.1. Turn on the light source below the light shield.
OUTP 10 100

1.4.5.2. Turn off the light source.
OUTP 10 0

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System Integration:

3-Cassette / Bright Light



1.4.6. Reference Bright Light Module

1.4.6.1. Reference all bright light and flipper axes.
MREF 7
MREF 8
MREF 9
MREF 19

1.4.6.2. Reference bright light station.
SREF 3

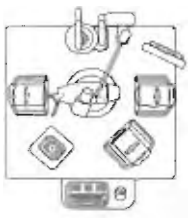
1.4.7. Bright Light Illumination Check.

1.4.7.1. Turn high-intensity lamp on then off.
OUTP 6 100
OUTP 6 0

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System Integration:

3-Cassette / Bright Light



System Integration: 3-Cassette with Bright Light

2.1. Cassette Station Leveling

2.1.1. On the underside of the sorter chassis, locate each cassette station's respective access port and loosen the four fasteners located there.

2.1.2. Remove the sensor cable clamps that cover up the set screw holes under the cassette stations.

2.1.3. Loosen the three set screws located under the cassette station until they are not touching the bottom of their station.

2.1.4. Raise the robot z axis.
MOVA 0 .35

2.1.5. Disable the robot theta and paddle motors.
MEBL 1 0
MEBL 2 0

2.1.6. Turn on robot paddle 1 vacuum and place a wafer over the vacuum port.
SVAC 1 1 1

2.1.7. Manually rotate the robot theta axis to swing paddle 1 and the wafer out over the cassette stations - note that the centerline of paddle 1 must point to the center of the robot for proper leveling. Using the wafer as a baseline, determine which cassette station is the highest; proceed to level that station first.

2.1.8. Place three leveling blocks around the edge of the highest cassette station. Manually swing the wafer over the cassette station. Lower the robot z axis until the underside of the wafer makes contact with one of the blocks.
MOVR 0 [- .001]

2.1.9. Adjust the three set screws under the station until the wafer makes equal contact with all three blocks. Once the station is level, rotate the set screw located closest to the robot clockwise (CW) 1/4 turn.

2.1.10. Manually swing paddle 1 and the wafer away from the station. Beginning with the two fasteners situated farthest from the robot and proceeding in small increments, retighten the four fasteners located on the underside of the pedestal.

2.1.11. Manually swing paddle 1 and the wafer back over the station and use the blocks to ensure that it is still level. Repeat the leveling procedure if necessary.

2.1.12. Manually swing paddle 1 and the wafer over the next station, keeping the same robot z height, and perform the leveling procedure described above (2.1.9. - 2.1.11.).

2.1.13. While supporting the wafer, turn off the vacuum to robot paddle 1 and remove the wafer.
SVAC 1 1 0

2.1.14. Enable the robot theta and paddle motors.
MEBL 1 1
MEBL 2 1

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System Integration:

3-Cassette / Bright Light



2.2. Robot Paddle Calibration

2.2.1. Reference the robot theta axis.
MREF 1

2.2.2. Reference the robot paddle axis.
MREF 2

2.2.3. Set the station reference flag for the robot.
SRFL 1 1

2.2.4. Rotate the robot paddle axis until paddle 1 is centered over the robot.
MOVR 2 [± degrees]

2.2.5. Place a calibration pin into the robot calibration pin hole.

2.2.6. Rotate the robot paddle axis until the inside edge of paddle 1 makes contact with calibration pin; as paddle one approaches the pin, decrease the increment of rotation.
MOVR 2 [± degrees]

2.2.7. Set the robot paddle reference position and paddle 1 calibration angle.
RPOS 2 1
MREF 2
SCAL 1 1 0

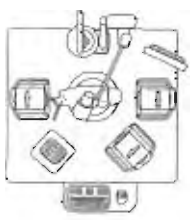
2.2.8. Check to see if robot paddle 1 centers properly over the robot.
MVPC 1

2.2.9. Save settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.3. Robot Z Axis Calibration

2.3.1. Center robot paddle 1 over the center of the robot and set the robot height (z axis) to .1 inches.
MVPC 1
MOVA 0 .1

2.3.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.3.3. Extend paddle 1 out over cassette station A.
MOVR 2 180

2.3.4. Adjust the robot z axis brake timeout value.
SCAL 1 6 10000000

2.3.5. Place a 1 inch calibration block adjacent to the tip of the extended robot paddle. Raise or lower the robot z axis until the height of the paddle's bottom edge matches that of the block - as paddle 1 approaches the block downward movement should be in increments of .001".
MOVR 0 [+/- .001]

2.3.6. Set the robot z axis motor reference position.
RPOS 0 1

2.3.7. Reference the robot z axis.
MREF 0

2.3.8. Move the robot z axis to the newly set zero position.
MOVA 0 0

2.3.9. Center paddle 1 over the robot, then extend it out over the cassette station A; use the calibration block to see if RPOS recorded properly.
MVPC 1
MOVR 2 180

2.3.10. Center paddle 2 over the robot, then extend it out over the cassette station A;
MVPC 2
MOVR 2 180

2.3.11. Raise or lower the robot z axis until the height of the paddle's bottom edge is equal to the height of the block - as paddle 2 approaches the block downward movement must be in increments of .001".
MOVR 0 [+/- .001]

2.3.12. Set the paddle offset and center paddle 1 over the robot.
POFF 1
MVPC 1

2.3.13. Set default limits for the robot Z, theta and paddle axes.
FLIM 0
FLIM 1
FLIM 2

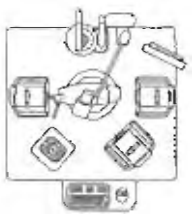
2.3.14. Reset the robot z axis brake timeout value.
SCAL 1 6 2000000

2.3.15. Save settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.4. Can Angle Calibration

2.4.1. Center robot paddle 1 over the robot, prompt a reading of the robot z axis negative limit, and move the robot z axis to a height that equals its negative limit plus .1 inches.
MVPC 1
LIMN 0
MOVA 0 [negative limit + .1]

2.4.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.4.3. Center robot paddle 1 over the robot then extend it over cassette station A.
MVPC 1
MOVR 2 180

2.4.4. Place a calibration pin in the calibration hole on top of cassette station A. rotate the robot theta axis in small increments until the paddle makes contact with the calibration pin.
MOVR 1 [± .12 degrees]

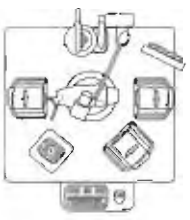
2.4.5. Define the world position and set the can angles for a sorter with three cassettes and a bright light module:
FWLD 90
SCAL 2 0 0
SCAL 3 0 140
SCAL 10 0 -90
SCAL 11 0 -140
SCAL 12 0 90
XPOS 1 0
SCAL 1 7 55
SREF 1

2.4.6. Test the settings by rotating the paddle end of the robot to face the aligner.
SPRK 1

2.4.7. Save settings.
SAVE

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System Integration:
3-Cassette / Bright Light



2.5. **Aligner Calibration**

2.5.1. Reference all aligner axes.
SREF 2

2.5.2. Move aligner x axis until the chuck is positioned over the center of the module.
MOVR 4 [+/- .2 inches]

2.5.3. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.5.4. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.0

2.5.5. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.5.6. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.5.7. Lower the robot z axis until any part of the wafer makes contact with the aligner chuck. Do not proceed lower than the aligner chuck as this may damage the wafer.
MOVR 0 [± .005 inches]

2.5.8. Access the aligner's bottom panel and loosen the four shoulder bolts if they do not have springs. Adjust the three aligner leveling screws until the gap between the chuck and the wafer appears even from all vantage points. Retighten the shoulder bolts if they do not have springs.

2.5.9. While supporting the wafer turn off paddle 1 vacuum.
SVAC 1 1 0

2.5.10. Move the aligner x axis in a positive direction.
MOVR 4 .2

2.5.11. Place a calibration pin in the calibration hole on top of the aligner's surface. Make sure it is perpendicular to the top plate.

2.5.12. Move the aligner x axis in the negative direction until the calibration pin makes contact with robot paddle 1.
MOVR 4 [-.02 inches]

2.5.13. Record the aligner x axis reference position, set the aligner x axis transfer position, and reference the aligner module.
RPOS 4 1
XPOS 4 0
MREF 4

2.5.14. Pull the calibration pin out of the aligner's calibration hole and park the aligner.
SPRK 2

2.5.15. Check to see if the aligner parked at the correct position, then center robot paddle 1 over the robot.
MVPC 1

2.5.16. Set default limits for aligner x and theta axes.
FLIM 3
FLIM 4

2.5.17. Save settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.6. Setting Aligner Transfer Position

2.6.1. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.6.2. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.5

2.6.3. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.6.4. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.6.5. Set the aligner transfer position by repeatedly lowering the wafer until contact with the aligner chuck is sensed.
FVAC 2 1

2.6.6. Set the default transfer heights.
SCAL 2 2 -.03
SCAL 2 3 -.005
SCAL 2 4 .015
SCAL 2 5 .03

2.6.7. Save settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.7. **Aligner Sensor Array Calibration**

2.7.1. Turn on the aligner sensor array illumination
OUTP 4 100

2.7.2. Use a small flathead screwdriver to gently turn the potentiometer to maximum brightness; be careful not to strip the potentiometer as its maximum range of motion is only 3/4 turn.

2.7.3. Move the aligner x-axis until the wafer edge is centered under the aligner sensor array.
MOVR 4 [± distance]

2.7.4. Prompt a display of the wafer edge location with respect to the sensor array; a properly positioned edge would read between 60 and 68. Select the ESC button to terminate the ALND display.
ALND

2.7.5. Adjust the aligner x-axis as needed.
MOVR 4 [± .05]

2.7.6. Repeat steps 7.4. and 7.5. until the ALND reading falls between 60 and 68.

2.7.7. Turn the potentiometer until ALND reading decreases by 1. Select the ESC button to terminate the ALND display.
ALND

2.7.8. Turn off aligner sensor array illumination.
OUTP 4 0

2.7.9. Autocalibrate the aligner sensor array.
ALNC 1

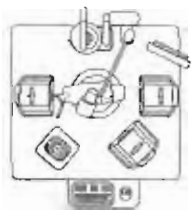
2.7.10. Support the wafer by hand, turn off the aligner chuck vacuum and manually remove the wafer.
SVAC 2 1 0

2.7.11. Save settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.8. Laser Offset Setup

2.8.1 Reference all robot axes.
SREF 1

2.8.2. Set wafer mapping algorithm.
MAPA 2

2.8.3. To determine the laser offset position, first place a calibration pin in the calibration hole on the top of cassette station A. Next, position a white card or slip of paper behind the pin, opposite the robot. Execute the following commands to position the robot z and theta axes so that the robot laser is aimed at the calibration pin.
LIMN 0 (returns negative limit)
MOVA 0 [negative limit + .05 inches]
MOVA 1 90

2.8.4. Turn on the laser and rotate the robot theta axis until the shadow of the pin falls directly in the center of the laser beam projected onto the paper.
LASR 1
MOVR 1 [± .2]

2.8.5. Prompt the current robot theta position and use it to set the laser offset.
MPOS 1 (returns current position)
SCAL 1 14 [90 - current position]

2.8.6. Turn the laser off.
LASR 0

2.8.7. Save the settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.9. Mapping Setup: Cassette Station A

2.9.1. Place a full cassette on cassette station A. Remove the wafer in slot 2.

2.9.2. Calibrate the mapping set up.
MAPS 10

2.9.3. Put the wafer back in slot 2.

2.9.4. Map the cassette.
MAPC 10

2.9.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 10 -2 4 .2

2.9.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

```
-2.0  00000000000000000000000000
-1.8  00000000000000000000000000
-1.6  00000000000000000000000000
-1.4  00000000000000000000000000
-1.2  00000000000000000000000000
-1.0  00000000000000000000000000
-.8   00000000000000000000000000
-.6   00000000000000000000000000
-.4   00000000000001100000010000
-.2   00111010000011101000010010
1.0   10100011011001101001001000
1.2   10111010011111101001001111
1.4   11111111111111111111111111
1.6   11111111111111111111111111
1.8   11111111111111111111111111
2.0   11111111111111111111111111
2.2   11111111111111111111111111
2.4   11111111111111111111111111
2.6   11111111111111111111111111
2.8   11111111111111111111111111
3.0   11111111111111111111111111
3.2   11111111111111111111111111
3.4   10101110010111101001101111
3.6   00100110010011001101001000
3.8   00000000000000010001001000
4.0   00000000000000000000000000
```

2.9.7. Set the low mapping angle
SCAL 10 1 [low angle value]

2.9.8. Set the high mapping angle
SCAL 10 2 [high angle value]

2.9.9. Auto calibrate the best mapping start position.
MAPH 10

2.9.10. Map the cassette and check the accuracy of returned data.
MAPC 10

2.9.11. Save the settings
SAVE

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System Integration:

3-Cassette / Bright Light



2.10. Mapping Setup: Cassette Station B

2.10.1. Place a full cassette on cassette station B. Remove the wafer in slot 2.

2.10.2. Calibrate the mapping set up.
MAPS 11

2.10.3. Put the wafer back in slot 2.

2.10.4. Map the cassette.
MAPC 11

2.10.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 11 -2 4 .2

2.10.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000011000001000
-.2	001110100000111010001001
1.0	101000110110011010010
1.2	101110100111111010010
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110011010
3.8	000000000000001000100
4.0	000000000000000000000000

2.10.7. Set the low mapping angle
SCAL 11 1 [low angle value]

2.10.8. Set the high mapping angle
SCAL 11 2 [high angle value]

2.10.9. Auto calibrate the best mapping start position.
MAPH 11

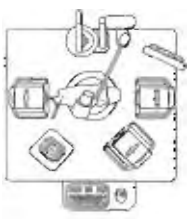
2.10.10. Map the cassette and check the accuracy of returned data.
MAPC 11

2.10.11. Save the settings
SAVE

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System Integration:

3-Cassette / Bright Light



2.11. Mapping Setup: Cassette Station C

2.11.1. Place a full cassette on cassette station C. Remove the wafer in slot 2.

2.11.2. Calibrate the mapping set up.
MAPS 12

2.11.3. Put the wafer back in slot 2.

2.11.4. Map the cassette.
MAPC 12

2.11.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 12 -2 4 .2

2.11.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000110000010000
-.2	001110100000111010001001O
1.0	101000110110011010010O100
1.2	101110100111111010010O111
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011O111
3.6	001001100100110011O100100
3.8	000000000000001000100100
4.0	000000000000000000000000

2.11.7. Set the low mapping angle
SCAL 12 1 [low angle value]

2.11.8. Set the high mapping angle
SCAL 12 2 [high angle value]

2.11.9. Auto calibrate the best mapping start position.
MAPH 12

2.11.10. Map the cassette and check the accuracy of returned data.
MAPC 12

2.11.11. Save the settings
SAVE

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System Integration:

3-Cassette / Bright Light



2.12. Setting Wafer Transfer Positions: Cassette Station A

2.12.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station A.

2.12.2. Map the cassette.
MAPC 10

2.12.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.12.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 10 1 1

2.12.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 10 1 (repeat until contact is made)

2.12.6. Remove paddle 1 from the cassette.
WOOR 10 1 1

2.12.7. Establish robot paddle 1 offset. Repeat the following procedure (12.8. - 12.13.) until paddle 1 is centered between wafers 1 and 2.

2.12.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 10 2 1

2.12.9. Disable the robot theta axis motor.
MEBL 1 0

2.12.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.12.11. Adjust paddle 1 offset position.
SCAL 10 6 [± .003]

2.12.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.12.13. Enable the robot theta axis motor.
MEBL 1 1

2.12.14. Check / adjust wafer pitch. Repeat the following procedure (12.15. - 12.21.) until paddle 1 is centered between wafers 24 and 25.

2.12.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 10 25 1

2.12.16. Disable the robot theta axis motor.
MEBL 1 0

2.12.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.12.18. Adjust the wafer pitch.
SCAL 10 17 [± .0001]

2.12.19. Manually swing paddle-axis out of cassette and center over robot.

2.12.20. Enable robot theta-axis.
MEBL 1 1

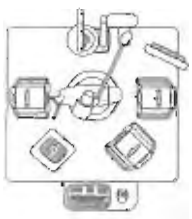
2.12.21. Map the cassette and check results for accuracy.
MAPC 10

2.12.22. Save Settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.13. Setting Wafer Transfer Positions: Cassette Station B

2.13.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station B.

2.13.2. Map the cassette.
MAPC 11

2.13.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.13.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 11 1 1

2.13.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 11 1 (repeat until contact is made)

2.13.6. Remove paddle 1 from the cassette.
WOOR 11 1 1

2.13.7. Establish robot paddle 1 offset. Repeat the following procedure (13.8. - 13.13.) until paddle 1 is centered between wafers 1 and 2.

2.13.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 11 2 1

2.13.9. Disable the robot theta axis motor.
MEBL 1 0

2.13.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.13.11. Adjust paddle 1 offset position.
SCAL 11 6 [± .003]

2.13.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.13.13. Enable the robot theta axis motor.
MEBL 1 1

2.13.14. Check / adjust wafer pitch. Repeat the following procedure (13.15. - 13.21.) until paddle 1 is centered between wafers 24 and 25.

2.13.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 11 25 1

2.13.16. Disable the robot theta axis motor.
MEBL 1 0

2.13.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.13.18. Adjust the wafer pitch.
SCAL 11 17 [± .0001]

2.13.19. Manually swing paddle-axis out of cassette and center over robot.

2.13.20. Enable robot theta-axis.
MEBL 1 1

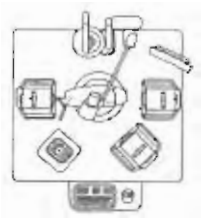
2.13.21. Map the cassette and check results for accuracy.
MAPC 11

2.13.22. Save Settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.14. Setting Wafer Transfer Positions: Cassette Station C

2.14.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station C.

2.14.2. Map the cassette.
MAPC 12

2.14.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.14.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 12 1 1

2.14.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 12 1 (repeat until contact is made)

2.14.6. Remove paddle 1 from the cassette.
WOOR 12 1 1

2.14.7. Establish robot paddle 1 offset. Repeat the following procedure (14.8. - 14.13.) until paddle 1 is centered between wafers 1 and 2.

2.14.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 12 2 1

2.14.9. Disable the robot theta axis motor.
MEBL 1 0

2.14.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.14.11. Adjust paddle 1 offset position.
SCAL 12 6 [± .003]

2.14.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.14.13. Enable the robot theta axis motor.
MEBL 1 1

2.14.14. Check / adjust wafer pitch. Repeat the following procedure (14.15. - 14.21.) until paddle 1 is centered between wafers 24 and 25.

2.14.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 12 25 1

2.14.16. Disable the robot theta axis motor.
MEBL 1 0

2.14.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.14.18. Adjust the wafer pitch.
SCAL 12 17 [± .0001]

2.14.19. Manually swing paddle-axis out of cassette and center over robot.

2.14.20. Enable robot theta-axis.
MEBL 1 1

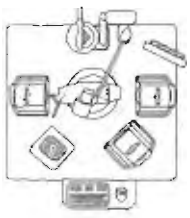
2.14.21. Map the cassette and check results for accuracy.
MAPC 12

2.14.22. Save Settings.
SAVE

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System Integration:

3-Cassette / Bright Light



2.15. Joystick Calibration

2.15.1. Exit Host NT software and start workstation software.

2.15.2. Enable the bright light option in the system setup screen.

2.15.3. Exit and re-enter the workstation software.

2.15.4. Select setup from the main tool bar.

2.15.5. Click joystick.

2.15.6. Make sure the power curve is set to four and the dead band is between four and fifteen.

2.15.7. Click calibrate joystick.

2.15.8. Follow the eight instruction steps to calibrate the joystick.

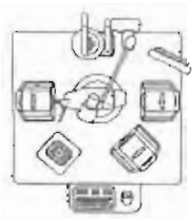
2.15.9. Click yes to accept the joystick calibration and exit the window.

2.15.10. Exit Workstation software.

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System Integration:

3-Cassette / Bright Light



2.16. Bright Light Leveling & Transfer Heights (without Wafer Flipper)

2.16.1. Make sure guard has been removed and the vacuum sensitivity is set correctly. The mapping and transfer heights of the stations should already is set up. The robot can angles should also be set.

2.16.2. Increase the software limits:
LIMP 7 720
LIMP 8 720
LIMN 7 –720
LIMN 8 –720

2.16.3. Remove a wafer from a cassette with the robot.
WELR 10 2 1

2.16.4. Move the robot to the Z transfer position of the bright light.
WLOO 3 1 1

2.16.5. Position the bright light chuck until it appears level.
MOVR 7 ±
MOVR 8 ±

2.16.6. Disable the theta axis and manually move the wafer on paddle one over the bright light chuck.
MEBL 1 0

2.16.7. Raise or lower the Z axis of the robot until the bottom surface of the wafer is close to the top surface of the bright light chuck.
MOVR 0 ± .001

2.16.8. Make fine leveling adjustments of the bright light chuck. There should be an even gap between the surfaces of the chuck and wafer.
MOVR 7 ±
MOVR 8 ±

2.16.9. Manually move the wafer over the center of the robot.

2.16.10. Set the transfer positions of the bright light and reference the motors
RPOS 7 1
RPOS 8 1
MREF 7
MREF 8

2.16.11. Check to see if the chuck parks itself at the correct position.
SPRK 3

2.16.12. Make sure the transfer positions are at their default positions:
SCAL 3 2 -.02
SCAL 3 3 -.01
SCAL 3 4 .01
SCAL 3 5 .03

2.16.13. Manually move the wafer over the bright light chuck.

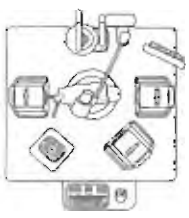
2.16.14. Set the bright light transfer height – repeat until contact is made.
FVAC 3

2.16.15. Enable the theta axis on the robot and remove the wafer from the bright light chuck.
MEBL 1 1
WOLR 3 1 1

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System Integration:

3-Cassette / Bright Light



2.16.16. Set the software limits back to their original default parameters
FLIM 7
FLIM 8
FLIM 9

2.16.17. If the robot transfers the wafer cleanly to and from the bright light, save the parameters.
SAVE

2.16.18. Replace the bright light housing panel.

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System Integration:

3-Cassette / Bright Light



2.17. Bright Light Leveling & Transfer Heights (with Wafer Flipper)

2.17.1. Make sure guard has been removed and the vacuum sensitivity is set correctly. The mapping and transfer heights of the stations should already is set up. The robot can angles should also be set.

2.17.2. Switch to controller channel 2.
CHAN 2

2.17.3. Increase the software limits:
LIMP 7 720
LIMP 8 720
LIMN 7 –720
LIMN 8 –720

2.17.4. Switch to controller channel 1.
CHAN 1

2.17.5. Remove a wafer from a cassette with the robot.
WELR 10 2 1

2.17.6. Move the robot to the Z transfer position of the bright light
WLOO 3 1 1

2.17.7. Switch to controller channel 2.
CHAN 2

2.17.8. Position the bright light chuck until it appears level.
MOVR 7 ±
MOVR 8 ±

2.17.9. Switch to controller channel 1.
CHAN 1

2.17.10. Disable the theta axis and manually move the wafer on paddle one over the bright light chuck.
MEBL 1 0

2.17.11. Raise or lower the Z axis of the robot until the bottom surface of the wafer is close to the top surface of the bright light chuck.
MOVR 0 ± .001

2.17.12. Switch to controller channel 2.
CHAN 2

2.17.13. Make fine leveling adjustments of the bright light chuck. There should be a even gap between the surfaces of the chuck and wafer.
MOVR 7 ±
MOVR 8 ±

2.17.14. Manually move the wafer over the center of the robot.

2.17.15. Set the transfer positions of the bright light and reference the motors
RPOS 7 1
RPOS 8 1
MREF 7
MREF 8

2.17.16. Check to see if the chuck parks itself at the correct position.
SPRK 3

2.17.17. Make sure the transfer positions are at their default positions:
SCAL 3 2 -.02
SCAL 3 3 -.01
SCAL 3 4 .01
SCAL 3 5 .03

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System Integration:

3-Cassette / Bright Light



2.17.18. Manually move the wafer over the bright light chuck.

2.17.19. Set the bright light transfer height – repeat until contact is made.
FVAC 3 1

2.17.20. Switch to controller channel 1.
CHAN 1

2.17.21. Enable the theta axis on the robot and remove the wafer from the bright light chuck.
MEBL 1 1
WOLR 3 1 1

2.17.22. Switch to controller channel 2.
CHAN 2

2.17.23. Set the software limits back to their original default parameters.
FLIM 7
FLIM 8
FLIM 9

2.17.24. If the robot transfers the wafer cleanly to and from the bright light, save the parameters.
SAVE

2.17.25. Switch to controller channel 1.
CHAN 1

2.17.26. Replace the bright light housing panel.

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System Integration:

3-Cassette / Bright Light



2.18. Wafer Flipper Leveling & Transfer Positions

2.18.1. Make sure the joystick has been calibrated and the robot transfers wafers to the bright light chuck cleanly.

2.18.2. Transfer a wafer to the bright light chuck with the robot.
WMOV 10 1 3 1

2.18.3. Switch to controller channel 2.
CHAN 2

2.18.4. Move the bright light chuck and the flipper until the top surface of the flipper makes evenly contact with the bottom surface of the wafer.
MOVR 7 ±
MOVR 8 ±
MOVR 19 ±

2.18.5. Prompt motor positions and record.
MPOS 7
MPOS 8
MPOS 19

2.18.6. Set transfer positions using recorded values.
XPOS 7 [MPOS 7 value]
XPOS 8 [MPOS 8 value]
XPOS 19 [MPOS 19 value]

2.18.7. Park the bright light.
SPRK 3

2.18.8. Test the new flip parameters.
FLIP

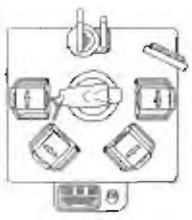
2.18.9. Return the wafer back to the bright light chuck.
FLIP

2.18.10. Save the settings and place the cover and guard back into position.
SAVE

2.18.11. Switch to controller channel 1.
CHAN 1

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System Integration: 4-Cassette



4-Cassette System Setup & Integration Sequence:

Initial Power-Up & Hardware Check:

1.1.0. System Power-Up 96

1.2.0. Controller Board Board 1 Test 96

1.3.1. Main System Vacuum Test 96
1.3.2. Robot Paddle Vacuum Test 97
1.3.3. Aligner Chuck Vacuum Test 97

1.4.1. Robot Module Reference 98
1.4.2. Aligner Module Reference 98
1.4.3. Aligner Array Board Check 98
1.4.4. Aligner Upper Light Source Check 98
1.4.5. Aligner Lower Light Source Check 98

System Integration:

2.1.0. Cassette Station Leveling 99

2.2.0. Robot Paddle Calibration 100
2.3.0. Robot Z Axis Calibration 101

2.4.0. Can Angle Calibration 102

2.5.0. Aligner Calibration 103
2.6.0. Setting Aligner Transfer Position 104
2.7.0. Aligner Sensor Array Calibration 105

2.8.0. Laser Offset Setup 106

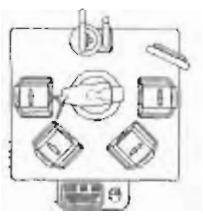
2.9.0. Mapping Setup: Cassette Station A 107
2.10.0. Mapping Setup: Cassette Station B 108
2.11.0. Mapping Setup: Cassette Station C 109
2.12.0. Mapping Setup: Cassette Station D 110

2.13.0. Transfer Positions: Cassette Station A 111
2.14.0. Transfer Positions: Cassette Station B 112
2.15.0. Transfer Positions: Cassette Station C 113
2.16.0. Transfer Positions: Cassette Station D 114

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System Integration:

4-Cassette



Initial Power-Up & Hardware Check: 4-Cassette

1.1. System Power-Up

1.1.1. Set the controller On/Off switch to the On position.

1.1.2. Make sure E-Stop is pulled out and turn the system On/Off switch clockwise as far as it will go to power up the controller – note that the On/Off switch will return to a position midway between the Off and On labels. Wait 20 seconds and again turn the system On/Off switch clockwise as far as it will go to activate system motor power.

1.1.3. Power-up the VGA color monitor.

1.1.4. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

1.1.5. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Desktop window.

1.1.6. Within the Windows NT Desktop locate and select (double click) the Host NT icon to prompt the display of the Host NT window. The system is now ready to accept host commands at the command line.

1.2. Controller Board 1 (Master):

1.2.1. Perform self diagnostic test; a return of 0 ensures that serial connections to controller board 1 are sound.
SELF

1.3.1. Main Vacuum Test

1.3.1.1. Verify that the system vacuum sensor is connected to the AUX port on the controller back panel.

1.3.1.2. Detach the vacuum line from the back of the sorter chassis. Turn the sensor adjustment screw CW until the LED turns on, then CCW until the LED turns off.

1.3.1.3. Reattach the vacuum line to the back of the sorter chassis and verify that the LED turns on.

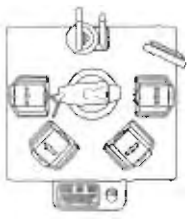
1.3.1.4. Prompt the current hardware sensor status of the controller.
HWST

1.3.1.5. Detach the main vacuum line from the sorter chassis.

1.3.1.6. Again, prompt the current hardware sensor status of the controller; the returned values should be different than those returned in step 1.3.1.4.
HWST

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System Integration:
4-Cassette



1.3.2. Robot Paddle Vacuum Test

1.3.2.1. Activate paddle 1 vacuum.
SVAC 1 1 1

1.3.2.2. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.3. Deactivate paddle 1 vacuum.
SVAC 1 1 0

1.3.2.4. Activate paddle 2 vacuum.
SVAC 1 2 1

1.3.2.5. Adjust paddle 2 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.2.6. Deactivate paddle 2 vacuum.
SVAC 1 2 0

1.3.2.7. Place a small wafer on paddle 1 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 1

1.3.2.8. Turn paddle 1vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.2.9. Place a small wafer on paddle 2 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 2

1.3.2.10. Turn paddle 2 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

1.3.3. Aligner Chuck Vacuum

1.3.3.1. Activate aligner chuck vacuum.
SVAC 2 1 1

1.3.3.2. Remove the back cover of the aligner and adjust the vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.3.3.3. Deactivate aligner chuck vacuum.
SVAC 2 1 0

1.3.3.4. Place a small wafer on aligner chuck and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 2 1

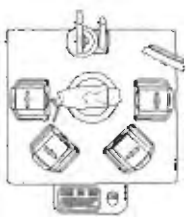
1.3.3.5. Turn aligner vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

1.3.3.6. Replace aligner back cover.

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System Integration:

4-Cassette



1.4.1. Reference Robot Module

1.4.1.1. Reference robot theta axis.
MREF 1 (make sure it references in all four quadrants)

1.4.1.2. Disable robot paddle axis motor.
MEBL 2 0

1.4.1.3. Manually swing the robot paddle over the robot, record position, enable robot paddle axis motor, and reference robot paddle axis.
RPOS 2 1
MEBL 2 1
MREF 2

1.4.1.4. Reference robot z axis.
MREF 0

1.4.2. Reference Aligner Module

1.4.2.1. Reference aligner theta and x-axes motors.
MREF 3
MREF 4

1.4.3. Check array board

1.4.3.1. Turn on the illumination and check the pixels of the array.
OUTP 4 100
ALND (128 should scroll up and down the screen)

1.4.3.2. Stop the scrolling and turn off the illumination.
ESC (stops the scrolling)
OUTP 4 0

1.4.4. Check the upper light source on the wafer light.

1.4.4.1. Turn on the light above the acrylic block.
OUTP 5 100

1.4.4.2. Turn off the light source.
OUTP 5 0

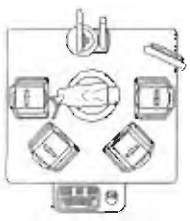
1.4.5. Check the lower light source on the wafer light.

1.4.5.1. Turn on the light source below the light shield.
OUTP 10 100

1.4.5.2. Turn off the light source.
OUTP 10 0

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System Integration:
4-Cassette



System Integration: 4-Cassette

2.1. Cassette Station Leveling

2.1.1. On the underside of the sorter chassis, locate each cassette station's respective access port and loosen the four fasteners located there.

2.1.2. Remove the sensor cable clamps that cover up the set screw holes under the cassette stations.

2.1.3. Loosen the three set screws located under the cassette station until they are not touching the bottom of their station.

2.1.4. Raise the robot z axis.
MOVA 0 .35

2.1.5. Disable the robot theta and paddle motors.
MEBL 1 0
MEBL 2 0

2.1.6. Turn on robot paddle 1 vacuum and place a wafer over the vacuum port.
SVAC 1 1 1

2.1.7. Manually rotate the robot theta axis to swing paddle 1 and the wafer out over the cassette stations - note that the centerline of paddle 1 must point to the center of the robot for proper leveling. Using the wafer as a baseline, determine which cassette station is the highest; proceed to level that station first.

2.1.8. Place three leveling blocks around the edge of the highest cassette station. Manually swing the wafer over the cassette station. Lower the robot z axis until the underside of the wafer makes contact with one of the blocks.
MOVR 0 [- .001]

2.1.9. Adjust the three set screws under the station until the wafer makes equal contact with all three blocks. Once the station is level, rotate the set screw located closest to the robot clockwise (CW) 1/4 turn.

2.1.10. Manually swing paddle 1 and the wafer away from the station. Beginning with the two fasteners situated farthest from the robot and proceeding in small increments, retighten the four fasteners located on the underside of the pedestal.

2.1.11. Manually swing paddle 1 and the wafer back over the station and use the blocks to ensure that it is still level. Repeat the leveling procedure if necessary.

2.1.12. Manually swing paddle 1 and the wafer over the next station, keeping the same robot z height, and perform the leveling procedure described above (2.1.9. - 2.1.11.).

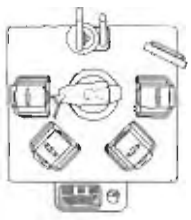
2.1.13. While supporting the wafer, turn off the vacuum to robot paddle 1 and remove the wafer.
SVAC 1 1 0

2.1.14. Enable the robot theta and paddle motors.
MEBL 1 1
MEBL 2 1

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System Integration:

4-Cassette



2.2. Robot Paddle Calibration

2.2.1. Reference the robot theta axis.
MREF 1

2.2.2. Reference the robot paddle axis.
MREF 2

2.2.3. Set the station reference flag for the robot.
SRFL 1 1

2.2.4. Rotate the robot paddle axis until paddle 1 is centered over the robot.
MOVR 2 [± degrees]

2.2.5. Place a calibration pin into the robot calibration pin hole.

2.2.6. Rotate the robot paddle axis until the inside edge of paddle 1 makes contact with calibration pin; as paddle one approaches the pin, decrease the increment of rotation.
MOVR 2 [± degrees]

2.2.7. Set the robot paddle reference position and paddle 1 calibration angle.
RPOS 2 1
MREF 2
SCAL 1 1 0

2.2.8. Check to see if robot paddle 1 centers properly over the robot.
MVPC 1

2.2.9. Save settings.
SAVE

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System Integration:
4-Cassette



2.3. Robot Z Axis Calibration

2.3.1. Center robot paddle 1 over the center of the robot and set the robot height (z axis) to .1 inches.
MVPC 1
MOVA 0 1

2.3.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.3.3. Extend paddle 1 out over cassette station A.
MOVR 2 180

2.3.4. Adjust the robot z axis brake timeout value.
SCAL 1 6 10000000

2.3.5. Place a 1 inch calibration block adjacent to the tip of the extended robot paddle. Raise or lower the robot z axis until the height of the paddle's bottom edge matches that of the block - as paddle 1 approaches the block downward movement should be in increments of .001".
MOVR 0 [+/- .001]

2.3.6. Set the robot z axis motor reference position.
RPOS 0 1

2.3.7. Reference the robot z axis.
MREF 0

2.3.8. Move the robot z axis to the newly set zero position.
MOVA 0 0

2.3.9. Center paddle 1 over the robot, then extend it out over the cassette station A; use the calibration block to see if RPOS recorded properly.
MVPC 1
MOVR 2 180

2.3.10. Center paddle 2 over the robot, then extend it out over the cassette station A;
MVPC 2
MOVR 2 180

2.3.11. Raise or lower the robot z axis until the height of the paddle's bottom edge is equal to the height of the block - as paddle 2 approaches the block downward movement must be in increments of .001".
MOVR 0 [+/- .001]

2.3.12. Set the paddle offset and center paddle 1 over the robot.
POFF 1
MVPC 1

2.3.13. Set default limits for the robot Z, theta and paddle axes.
FLIM 0
FLIM 1
FLIM 2

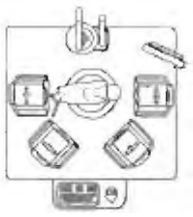
2.3.14. Reset the robot z axis brake timeout value.
SCAL 1 6 2000000

2.3.15. Save settings.
SAVE

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System Integration:

4-Cassette



2.4. Can Angle Calibration

2.4.1. Center robot paddle 1 over the robot, prompt a reading of the robot z axis negative limit, and move the robot z axis to a height that equals its negative limit plus .1 inches.
MVPC 1
LIMN 0
MOVA 0 [negative limit + .1]

2.4.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

2.4.3. Center robot paddle 1 over the robot then extend it over cassette station A.
MVPC 1
MOVR 2 180

2.4.4. Place a calibration pin in the calibration hole on top of cassette station A. rotate the robot theta axis in small increments until the paddle makes contact with the calibration pin.
MOVR 1 [± .12 degrees]

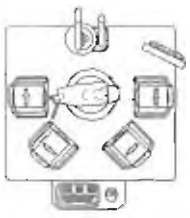
2.4.5. Define the world position and set the can angles for a sorter with four cassettes:
FWLD 90
SCAL 2 0 0
SCAL 10 0 -90
SCAL 11 0 -140
SCAL 12 0 140
SCAL 13 0 90
XPOS 1 0
SCAL 1 7 55
SREF 1

2.4.6. Test the settings by rotating the paddle end of the robot to face the aligner.
SPRK 1

2.4.7. Save settings.
SAVE

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System Integration:
4-Cassette



2.5. Aligner Calibration

2.5.1. Reference all aligner axes.
SREF 2

2.5.2. Move aligner x axis until the chuck is positioned over the center of the module.
MOVR 4 [+/- .2 inches]

2.5.3. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.5.4. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.0

2.5.5. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.5.6. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

2.5.7. Lower the robot z axis until any part of the wafer makes contact with the aligner chuck. Do not proceed lower than the aligner chuck as this may damage the wafer.
MOVR 0 [± .005 inches]

2.5.8. Access the aligner's bottom panel and loosen the four shoulder bolts if they do not have springs. Adjust the three aligner leveling screws until the gap between the chuck and the wafer appears even from all vantage points. Retighten the shoulder bolts if they do not have springs.

2.5.9. While supporting the wafer turn off paddle 1 vacuum.
SVAC 1 1 0

2.5.10. Move the aligner x axis in a positive direction.
MOVR 4 .2

2.5.11. Place a calibration pin in the calibration hole on top of the aligner's surface. Make sure it is perpendicular to the top plate.

2.5.12. Move the aligner x axis in the negative direction until the calibration pin makes contact with robot paddle 1.
MOVR 4 [-.02 inches]

2.5.13. Record the aligner x axis reference position, set the aligner x axis transfer position, and reference the aligner module.
RPOS 4 1
XPOS 4 0
MREF 4

2.5.14. Pull the calibration pin out of the aligner's calibration hole and park the aligner.
SPRK 2

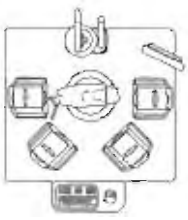
2.5.15. Check to see if the aligner parked at the correct position, then center robot paddle 1 over the robot.
MVPC 1

2.5.16. Set default limits for aligner x and theta axes.
FLIM 3
FLIM 4

2.5.17. Save settings.
SAVE

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System Integration:
4-Cassette



2.6. Setting Aligner Transfer Position

2.6.1. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

2.6.2. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.5

2.6.3. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

2.6.4. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

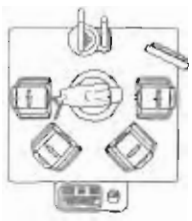
2.6.5. Set the aligner transfer position by repeatedly lowering the wafer until contact with the aligner chuck is sensed.
FVAC 2 1

2.6.6. Set the default transfer heights.
SCAL 2 2 -.03
SCAL 2 3 -.005
SCAL 2 4 .015
SCAL 2 5 .03

2.6.7. Save settings.
SAVE

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System Integration:
4-Cassette



2.7. Aligner Sensor Array Calibration

2.7.1. Turn on the aligner sensor array illumination
OUTP 4 100

2.7.2. Use a small flathead screwdriver to gently turn the potentiometer to maximum brightness; be careful not to strip the potentiometer as its maximum range of motion is only 3/4 turn.

2.7.3. Move the aligner x-axis until the wafer edge is centered under the aligner sensor array.
MOVR 4 [± distance]

2.7.4. Prompt a display of the wafer edge location with respect to the sensor array; a properly positioned edge would read between 60 and 68. Select the ESC button to terminate the ALND display.
ALND

2.7.5. Adjust the aligner x-axis as needed.
MOVR 4 [± .05]

2.7.6. Repeat steps 7.4. and 7.5. until the ALND reading falls between 60 and 68.

2.7.7. Turn the potentiometer until ALND reading decreases by 1. Select the ESC button to terminate the ALND display.
ALND

2.7.8. Turn off aligner sensor array illumination.
OUTP 4 0

2.7.9. Autocalibrate the aligner sensor array.
ALNC 1

2.7.10. Support the wafer by hand, turn off the aligner chuck vacuum and manually remove the wafer.
SVAC 2 1 0

2.7.11. Save settings.
SAVE

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System Integration:

4-Cassette



2.8. Laser Offset Setup

2.8.1 Reference all robot axes.
SREF 1

2.8.2. Set wafer mapping algorithm.
MAPA 2

2.8.3. To determine the laser offset position, first place a calibration pin in the calibration hole on the top of cassette station A. Next, position a white card or slip of paper behind the pin, opposite the robot. Execute the following commands to position the robot z and theta axes so that the robot laser is aimed at the calibration pin.
LIMN 0 (returns negative limit)
MOVA 0 [negative limit + .05 inches]
MOVA 1 90

2.8.4. Turn on the laser and rotate the robot theta axis until the shadow of the pin falls directly in the center of the laser beam projected onto the paper.
LASR 1
MOVR 1 [± .2]

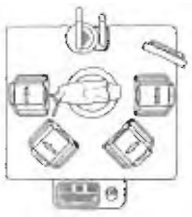
2.8.5. Prompt the current robot theta position and use it to set the laser offset.
MPOS 1 (returns current position)
SCAL 1 14 [90 - current position]

2.8.6. Turn the laser off.
LASR 0

2.8.7. Save the settings.
SAVE

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System Integration:
4-Cassette



2.9. Mapping Setup: Cassette Station A

2.9.1. Place a full cassette on cassette station A. Remove the wafer in slot 2.

2.9.2. Calibrate the mapping set up.
MAPS 10

2.9.3. Put the wafer back in slot 2.

2.9.4. Map the cassette.
MAPC 10

2.9.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 10 -2 4 .2

2.9.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	00000000000000000000000000
-1.8	00000000000000000000000000
-1.6	00000000000000000000000000
-1.4	00000000000000000000000000
-1.2	00000000000000000000000000
-1.0	00000000000000000000000000
-.8	00000000000000000000000000
-.6	00000000000000000000000000
-.4	00000000000001100000100000
-.2	00111010000011101000100010
1.0	10100011011001101001001000
1.2	10111010011111101001001111
1.4	11111111111111111111111111
1.6	11111111111111111111111111
1.8	11111111111111111111111111
2.0	11111111111111111111111111
2.2	11111111111111111111111111
2.4	11111111111111111111111111
2.6	11111111111111111111111111
2.8	11111111111111111111111111
3.0	11111111111111111111111111
3.2	11111111111111111111111111
3.4	10101110010111101001101111
3.6	00100110010011001101001000
3.8	00000000000000010001001000
4.0	00000000000000000000000000

2.9.7. Set the low mapping angle
SCAL 10 1 [low angle value]

2.9.8. Set the high mapping angle
SCAL 10 2 [high angle value]

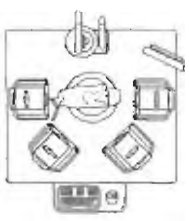
2.9.9. Auto calibrate the best mapping start position.
MAPH 10

2.9.10. Map the cassette and check the accuracy of returned data.
MAPC 10

2.9.11. Save the settings
SAVE

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System Integration:
4-Cassette



2.10. Mapping Setup: Cassette Station B

2.10.1. Place a full cassette on cassette station B. Remove the wafer in slot 2.

2.10.2. Calibrate the mapping set up.
MAPS 11

2.10.3. Put the wafer back in slot 2.

2.10.4. Map the cassette.
MAPC 11

2.10.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 11 -2 4 .2

2.10.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	00000000C00000C0000000000
-1.8	00000000000000000000000000
-1.6	00000000000000000000000000
-1.4	00000000000000000000000000
-1.2	00000000000000000000000000
-1.0	00000000000000000000000000
-.8	00000000000000000000000000
-.6	00000000000000000000000000
-.4	00000000000001100000010000
-.2	00111010000011101000010010
1.0	10100011011001101001001000
1.2	10111010011111101001001111
1.4	11111111111111111111111111
1.6	11111111111111111111111111
1.8	11111111111111111111111111
2.0	11111111111111111111111111
2.2	11111111111111111111111111
2.4	11111111111111111111111111
2.6	11111111111111111111111111
2.8	11111111111111111111111111
3.0	11111111111111111111111111
3.2	11111111111111111111111111
3.4	10101110010111101001101111
3.6	00100110010011001101001000
3.8	00000000000000010001001000
4.0	00000000000000000000000000

2.10.7. Set the low mapping angle
SCAL 11 1 [low angle value]

2.10.8. Set the high mapping angle
SCAL 11 2 [high angle value]

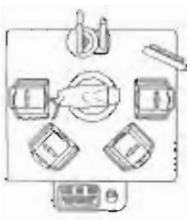
2.10.9. Auto calibrate the best mapping start position.
MAPH 11

2.10.10. Map the cassette and check the accuracy of returned data.
MAPC 11

2.10.11. Save the settings
SAVE

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System Integration:
4-Cassette



2.11. Mapping Setup: Cassette Station C

2.11.1. Place a full cassette on cassette station C. Remove the wafer in slot 2.

2.11.2. Calibrate the mapping set up.
MAPS 12

2.11.3. Put the wafer back in slot 2.

2.11.4. Map the cassette.
MAPC 12

2.11.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 12 -2 4 .2

2.11.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000011000001000
-.2	001110100000111010001001
1.0	101000110110011010010010
1.2	101110100111111010010011
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010011011
3.6	001001100100110010010000
3.8	000000000000001000100100
4.0	000000000000000000000000

2.11.7. Set the low mapping angle
SCAL 12 1 [low angle value]

2.11.8. Set the high mapping angle
SCAL 12 2 [high angle value]

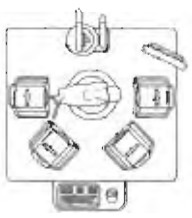
2.11.9. Auto calibrate the best mapping start position.
MAPH 12

2.11.10. Map the cassette and check the accuracy of returned data.
MAPC 12

2.11.11. Save the settings
SAVE

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System Integration:
4-Cassette



2.12. Mapping Setup: Cassette Station D

2.12.1. Place a full cassette on cassette station D. Remove the wafer in slot 2.

2.12.2. Calibrate the mapping set up.
MAPS 13

2.12.3. Put the wafer back in slot 2.

2.12.4. Map the cassette.
MAPC 13

2.12.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 13 -2 4 .2

2.12.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

```
-2.0    00000000000000000C000000
-1.8    00000000000000000C000000
-1.6    00000000000000000000000000
-1.4    00000000000000000000000000
-1.2    00000000000000000000000000
-1.0    00000000000000000000000000
-.8     00000000000000000000C00000
-.6     00000000000000000000000000
-.4     00000000000001100000010000
-.2     00111010000011101000010010
1.0     10100011011001101001C0100
1.2     10111010011111110100100111
1.4     11111111111111111111111111
1.6     11111111111111111111111111
1.8     11111111111111111111111111
2.0     11111111111111111111111111
2.2     11111111111111111111111111
2.4     11111111111111111111111111
2.6     11111111111111111111111111
2.8     11111111111111111111111111
3.0     11111111111111111111111111
3.2     11111111111111111111111111
3.4     10101110010111101001 10111
3.6     00100110010011001101001 00
3.8     00000000000000010001001 00
4.0     00000000000000000000000C00
```

2.12.7. Set the low mapping angle
SCAL 13 1 [low angle value]

2.12.8. Set the high mapping angle
SCAL 13 2 [high angle value]

2.12.9. Auto calibrate the best mapping start position.
MAPH 13

2.12.10. Map the cassette and check the accuracy of returned data.
MAPC 13

2.12.11. Save the settings
SAVE

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System Integration:
4-Cassette



2.13. Setting Wafer Transfer Positions: Cassette Station A

2.13.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station A.

2.13.2. Map the cassette.
MAPC 10

2.13.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.13.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 10 1 1

2.13.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 10 1 (repeat until contact is made)

2.13.6. Remove paddle 1 from the cassette.
WOOR 10 1 1

2.13.7. Establish robot paddle 1 offset. Repeat the following procedure (13.8. - 13.13.) until paddle 1 is centered between wafers 1 and 2.

2.13.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 10 2 1

2.13.9. Disable the robot theta axis motor.
MEBL 1 0

2.13.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.13.11. Adjust paddle 1 offset position.
SCAL 10 6 [± .003]

2.13.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.13.13. Enable the robot theta axis motor.
MEBL 1 1

2.13.14. Check / adjust wafer pitch. Repeat the following procedure (13.15. - 13.21.) until paddle 1 is centered between wafers 24 and 25.

2.13.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 10 25 1

2.13.16. Disable the robot theta axis motor.
MEBL 1 0

2.13.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.13.18. Adjust the wafer pitch.
SCAL 10 17 [± .0001]

2.13.19. Manually swing paddle-axis out of cassette and center over robot.

2.13.20. Enable robot theta-axis.
MEBL 1 1

2.13.21. Map the cassette and check results for accuracy.
MAPC 10

2.13.22. Save Settings.
SAVE

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System Integration:
4-Cassette



2.14. Setting Wafer Transfer Positions: Cassette Station B

2.14.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station B.

2.14.2. Map the cassette.
MAPC 11

2.14.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.14.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 11 1 1

2.14.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 11 1 (repeat until contact is made)

2.14.6. Remove paddle 1 from the cassette.
WOOR 11 1 1

2.14.7. Establish robot paddle 1 offset. Repeat the following procedure (14.8. - 14.13.) until paddle 1 is centered between wafers 1 and 2.

2.14.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 11 2 1

2.14.9. Disable the robot theta axis motor.
MEBL 1 0

2.14.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.14.11. Adjust paddle 1 offset position.
SCAL 11 6 [± .003]

2.14.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.14.13. Enable the robot theta axis motor.
MEBL 1 1

2.14.14. Check / adjust wafer pitch. Repeat the following procedure (14.15. - 14.21.) until paddle 1 is centered between wafers 24 and 25.

2.14.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 11 25 1

2.14.16. Disable the robot theta axis motor.
MEBL 1 0

2.14.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.14.18. Adjust the wafer pitch.
SCAL 11 17 [± .0001]

2.14.19. Manually swing paddle-axis out of cassette and center over robot.

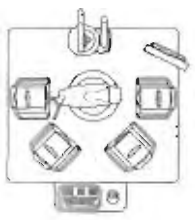
2.14.20. Enable robot theta-axis.
MEBL 1 1

2.14.21. Map the cassette and check results for accuracy.
MAPC 11

2.14.22. Save Settings.
SAVE

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System Integration:
4-Cassette



2.15. Setting Wafer Transfer Positions: Cassette Station C

2.15.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station C.

2.15.2. Map the cassette.
MAPC 12

2.15.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.15.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 12 1 1

2.15.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 12 1 (repeat until contact is made)

2.15.6. Remove paddle 1 from the cassette.
WOOR 12 1 1

2.15.7. Establish robot paddle 1 offset. Repeat the following procedure (15.8. - 15.13.) until paddle 1 is centered between wafers 1 and 2.

2.15.8. Move the robot z-axis to the wafer **2** drop-off height.
WDOO 12 2 1

2.15.9. Disable the robot theta axis motor.
MEBL 1 0

2.15.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.15.11. Adjust paddle 1 offset position.
SCAL 12 6 [± .003]

2.15.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.15.13. Enable the robot theta axis motor.
MEBL 1 1

2.15.14. Check / adjust wafer pitch. Repeat the following procedure (15.15. - 15.21.) until paddle 1 is centered between wafers 24 and 25.

2.15.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 12 25 1

2.15.16. Disable the robot theta axis motor.
MEBL 1 0

2.15.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.15.18. Adjust the wafer pitch.
SCAL 12 17 [± .0001]

2.15.19. Manually swing paddle-axis out of cassette and center over robot.

2.15.20. Enable robot theta-axis.
MEBL 1 1

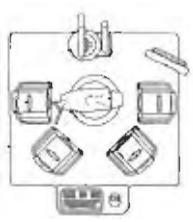
2.15.21. Map the cassette and check results for accuracy.
MAPC 12

2.15.22. Save Settings.
SAVE

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System Integration:

4-Cassette



2.16. Setting Wafer Transfer Positions: Cassette Station D

2.16.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station D.

2.16.2. Map the cassette.
MAPC 13

2.16.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

2.16.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 13 1 1

2.16.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 13 1 (repeat until contact is made)

2.16.6. Remove paddle 1 from the cassette.
WOOR 13 1 1

2.16.7. Establish robot paddle 1 offset. Repeat the following procedure (16.8. - 16.13.) until paddle 1 is centered between wafers 1 and 2.

2.16.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 13 2 1

2.16.9. Disable the robot theta axis motor.
MEBL 1 0

2.16.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

2.16.11. Adjust paddle 1 offset position.
SCAL 13 6 [± .003]

2.16.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

2.16.13. Enable the robot theta axis motor.
MEBL 1 1

2.16.14. Check / adjust wafer pitch. Repeat the following procedure (16.15. - 16.21.) until paddle 1 is centered between wafers 24 and 25.

2.16.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 13 25 1

2.16.16. Disable the robot theta axis motor.
MEBL 1 0

2.16.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

2.16.18. Adjust the wafer pitch.
SCAL 13 17 [± .0001]

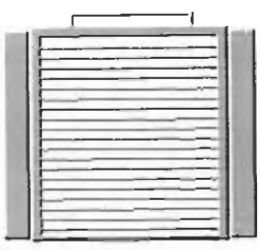
2.16.19. Manually swing paddle-axis out of cassette and center over robot.

2.16.20. Enable robot theta-axis.
MEBL 1 1

2.16.21. Map the cassette and check results for accuracy.
MAPC 13

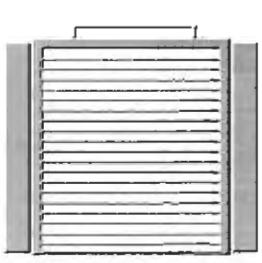
2.16.22. Save Settings.
SAVE

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MicroVision®



Section E: Runtime Setup

Section Overview 2

Power-Up & Power Down 3

User Access Management 4

System / Module Setup:
- System Setup 5
- Robot 6
- Aligner 6
- Bright Light 7
- Reader 7
- Joystick 9

Selecting and Creating Runtime Recipes:
- Wafer Flow 10
- Reader 14
- Bright Light 26

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Runtime Setup

CAUTION: Protection provided by the equipment may be impaired if it is used in a manner not specified by the manufacturer.

CAUTION: System users must wear a wrist strap for grounding purposes to prevent electric static discharge.

Section Overview

Runtime setup is the process through which system technicians prepare an operational MVT 7080 Wafer Sorter for runtime operation. This section is designed to serve as a guide to that process by providing detailed descriptions and step-by-step instructions for the topics and procedures described below. Note that these procedures are considered restricted, and should only be performed by persons with Maintenance, Engineer, or Service Engineer access privilege.

1.1. - 1.2. **Power-Up & Power Down Sequences** describes how to safely turn the system on and off.

2.0. **Managing User Access** defines the four degrees of system access, or privilege, and describes how to grant privilege, add users and delete users.

3.0. **System / Module Setup** describes how to correctly enter module software settings to accurately reflect a system's particular modular configuration.

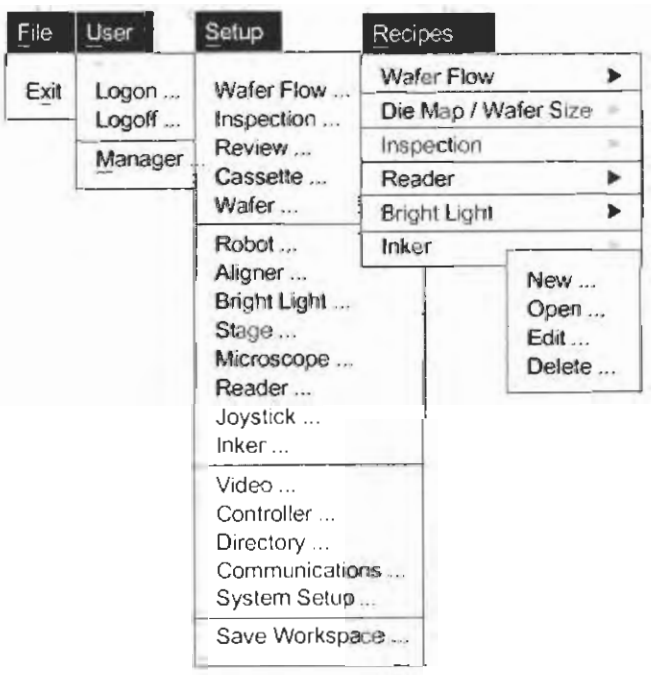
4.0. **Selecting and Creating Wafer Flow Recipes** describes how to select, delete, create and edit recipe files that serve to determine the flow of wafers during runtime operation.

5.0. **Selecting and Creating Reader Recipes** describes how to select, delete, create and edit recipe files that contain ID reader settings customized to accommodate a specific wafer style's size, scribe location, scribe font, and scribe quality.

6.0. **Selecting and Creating Bright Light Recipes** describes how to select, delete, create and edit recipe files used to determine the tilt and rotation of wafers during bright light macroinspection.

Note on System Pull-Down Menus

The procedures described in this section require considerable use of the interface's pull-down menus, accessed via the Workstation Main window menu bar. Users are advised to become familiar with the contents of the pull-down menus prior to undertaking runtime setup procedures, noting that options displayed in a subdued manner are not active on the MVT 7080 Wafer Sorter.



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Power-Up & Power-Down

1.1.0. Power-Up Sequence

1.1.1. Turn the MVT 7080 Main Power Switch to the ON position.

1.1.2. Power-up the VGA color monitor if the system is equipped with one.

1.1.3. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

1.1.4. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Program Manager window.

1.1.5. Set the Controller ON/OFF switch to the ON position. The operator will hear the sound of solenoids and cooling fans being activated.

1.1.6. Within the Windows NT Program Manager window, locate the MicroVision WorkStation window and select the MicroVision icon. The operator will be presented with a Logon window. Enter a user name and password in the appropriate boxes and select the OK button.

1.1.7. As the WorkStation program is launched, the operator will be presented with the MVT 7080 graphical user interface.

1.2.0. Power-Down Sequence

1.2.1. Make sure that all wafers are returned to cassettes and that all modules and the robot are empty.

1.2.2. Select File from the WorkStation menu bar and Exit from the File pull-down menu to prompt the display of an Exit WorkStation window.

1.2.3. Within the Exit WorkStation window, enter a password where prompted and select Terminate Program from among the Select Exit Type options. Select the OK button to prompt the display of the Windows NT Program Manager window.

1.2.4. From within the Windows NT Program Manager window, select File from the menu bar and Exit from the File pull-down menu to prompt the display of a Shutdown Computer window.

1.2.5. From within the Shutdown Computer window, verify that the Shutdown option is selected and select the OK button. The operator will then be presented with another Computer Shutdown window that features a RESTART button - do not select it.

1.2.6. Set the Controller ON/OFF switch to the OFF position.

1.2.7. Power-down the PC.

1.2.8. Power-down the VGA color monitor if the system is equipped with one.

1.2.9. Turn the MVT 7080 Power Main Switch to the OFF position.

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Managing User Access



2.0. Managing User Access

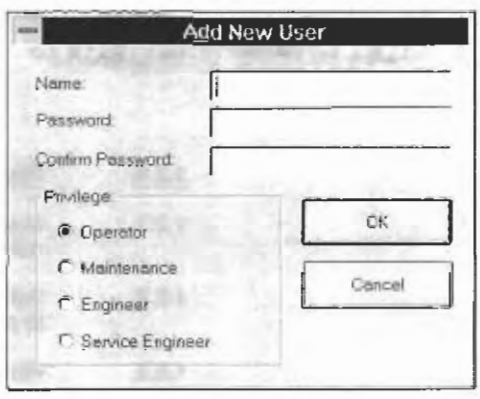
The MVT 7080 software is designed to accommodate users with wide ranging degrees of system knowledge, from operators to service engineers. To ensure the integrity of system files, recipes and settings, access to the MVT 7080 is divided into 4 degrees of privilege: Operator, Maintenance, Engineer, and Service Engineer. An operator is granted the least degree of system access while a service engineer is granted the greatest degree of system access.

The following windows provide the primary means for managing user access from within the system software:

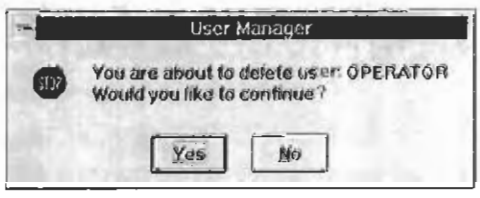
2.1. Select User from the Workstation Main window menu bar, then Manager from the User pull-down menu. This will prompt the display of the Workstation User Manager window, which shows the complete list of system users and their levels of privilege. From this window, users can be granted or denied access by being added or deleted from the list.



2.2. To add a new user, select the ADD USER button to prompt the display of the Add User window. Enter the user's name and password, confirm the password, set the user's level of privilege, and select the OK button.



2.3. To delete a user, scroll to and highlight the user in the Current Users List. Select the DELETE USER button. At the User Manager window, select the YES button.



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System/ Module Setup



3.0. Setting Up the System & System Modules

This portion of runtime setup serves to ensure that all module software settings are correctly selected and entered to reflect a system's particular modular configuration and the specific tasks it will be required to perform during runtime operation.

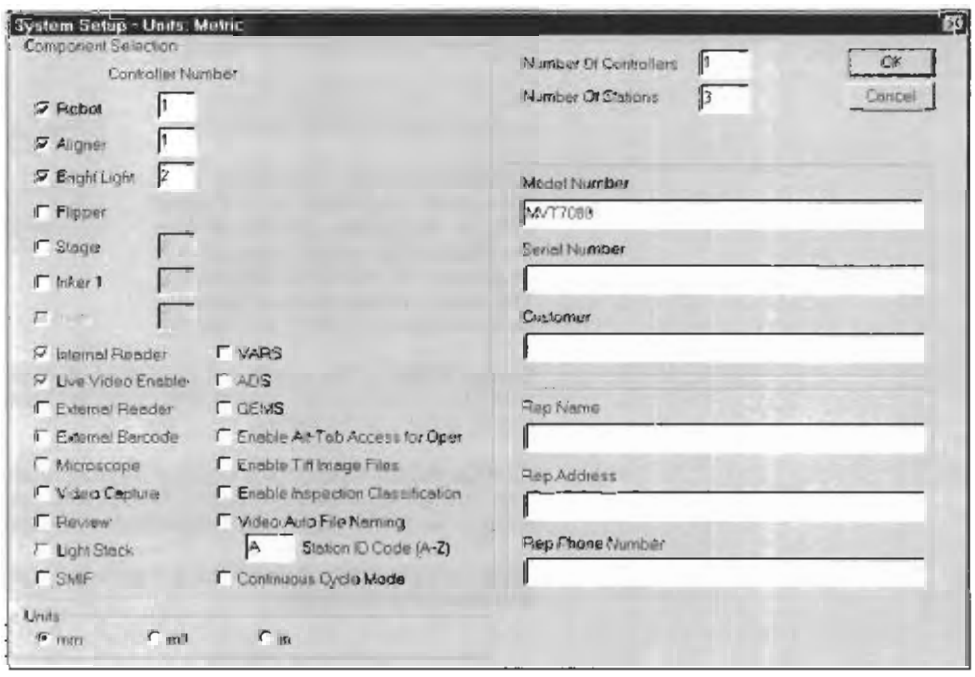
3.1.0. System Setup

3.1.1. Select Setup from the Workstation Main window menu bar, then System Setup from the Setup pull-down menu to prompt the display of the System Setup window, shown below.

3.1.2. Within the System Setup window, verify that all applicable modules are selected, i.e., Robot, Aligner, Bright Light or Reader. Select the OK button.

3.1.3. Exit and then reenter Workstation program to activate the menu selections.

3.1.4. Verify that all applicable module screens are accessible. If the wafer ID reader is to be used during Runtime Setup, verify that the reader screen is active and that the system can capture video from the reader camera. If the camera cover is on, it will need to be taken off for setup.

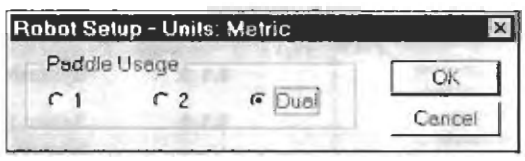


System/ Module Setup



3.2.0. Robot Setup

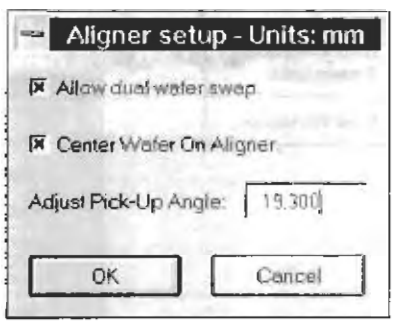
3.2.1. Select Setup from the Workstation Main window menu bar, then Robot from the Setup pull-down menu to prompt the display of the Robot Setup window. This window provides access to the following options and settings:



Paddle Usage - On all systems the dual paddle option should be on. The only reason to select the paddle 1 or 2 options are when there is a problem with one of the paddles. In this case the good paddle should be turned on.

3.2.2. Verify that all appropriate options are selected and correct settings are entered and select the OK button.

3.3.0. Aligner Setup



3.3.1. Select Setup from the Workstation Main window menu bar, then Aligner from the Setup pull-down menu to prompt the display of the Aligner Setup window. This window provides access to the following options and settings:

Dual Wafer Swap - This box enables the system to perform a dual wafer swap on the aligner. For this to work the dual paddle usage option should be turned on in the Robot Setup menu. This option should always be turned on for sorters and off for workstations.

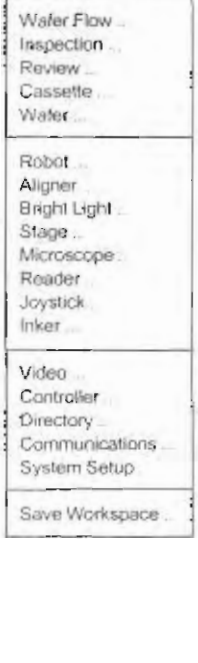
Center Wafer - This option will jog the position of the wafer on the aligner to perfectly center the wafer before transfer to the destination cassette. This option should always be turned on.

Pick-Up Angle - This is the angle in degrees that a wafer is rotated to before being picked up from the aligner. For sorters this angle is determined by the angle at which the flat or notch is desired in the destination cassette.

3.3.2. Verify that all appropriate options are selected and correct settings are entered and select the OK button.

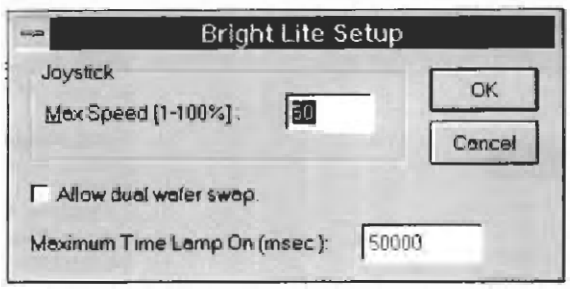
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System/ Module Setup



3.4.0. Bright Light Setup

3.4.1. Select Setup from the Workstation Main window menu bar, then Bright Light from the Setup pull-down menu to prompt the display of the Bright Light Setup window. This window provides access to the following options and settings:



Joystick Control - This is the maximum speed that the x, y, and theta-axis will move at on the bright light with relation to each motor's velocity limit. The recommended value for this setting is 50%.

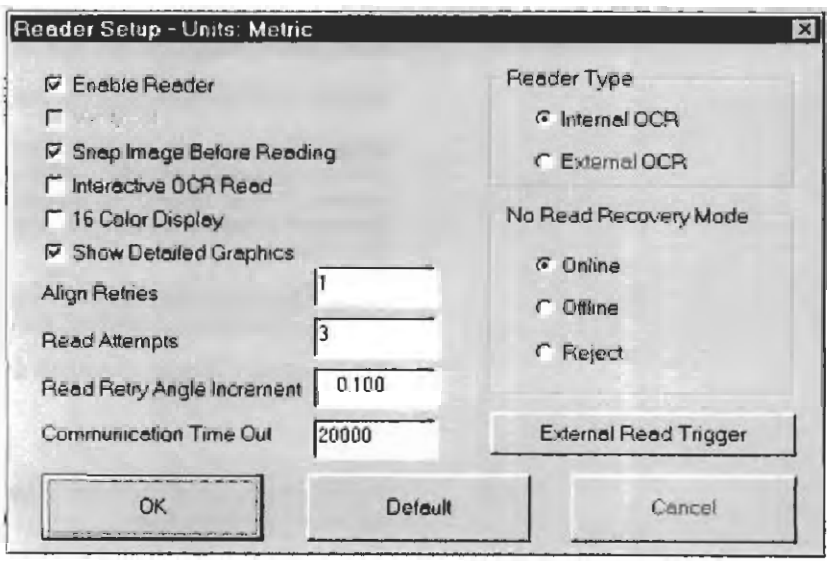
Allow Dual Wafer Swap - This box allows the system to perform a dual wafer swap on the bright light module. This option can only be used on systems using 6 inch wafers.

Maximum Time Lamp On - This is the maximum time that the bright light lamp will stay on before automatically shutting off. The lamp can be reactivated by clicking on the lamp box in the bright light window. The value in this box is in milliseconds. The typical values are between 30,000 and 60,000.

3.4.2. Verify that all appropriate options are selected and correct settings are entered and select the OK button.

3.5.0. Reader Setup

3.5.1 Select Setup from the Workstation menu bar, then Reader from the Setup pull-down menu to prompt the display of the Reader Setup window. This window provides access to the options and settings described in detail on the following page:



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System/ Module Setup



Enable Reader - This option enables OCR operation.

Verify Lot - When this option is selected the system verifies that all the wafers in a given cassette have the same lot ID.

Snap Image Before Reading - This option prompts the system to capture and display in the Reader window images of the wafer IDs being read from wafers positioned on the aligner; it must be selected to perform real-time OCR reading on wafers. If this option is not selected, the system can only perform OCR reading on previously saved wafer ID images displayed in the Reader window, which can be loaded from the hard drive using the icons at the top of the reader window.

Interactive OCR Read - When this option is selected the Message From OCR Read window will appear after a read is attempted. This window displays the characters read in each scribe position and the scores for those characters; also displayed is the overall score for that particular read attempt.

16 Color Display - When this option is selected, the system will display the graphics in the reader window in a 16 color gray scale; this is only used on LCDs that are using a 16 color gray scale graphics mode driver.

Show Detailed Graphics - This option prompts the display of detailed reader graphics in the Reader window after each read attempt, showing where the reader located individual characters of the scribe

OCR Reader Type - This option the specific OCR software to be employed and must always be set to Internal OCR.

Align Retries - This setting specifies the number of times the aligner will try to relocate the position of the scribe on the wafer after all read attempts have failed. This value is typically set to 1.

Read Attempts - This setting specifies the number of times the reader will attempt to read the scribe before an align retry is attempted. This value is typically set between 3 and 9 attempts.

Read Retry Angle Increment - This setting specifies the number of degrees that the wafer is rotated after each failed read attempt. This value is typically set from .100 to .500 degrees.

Communications Timeout - This setting specifies the time limit in milliseconds for the system to respond to a command. If the system fails to respond within the set limit, a timeout error message will be generated.

No Read Recovery Mode - This group of options specifies what is done with a wafer after all Read Attempts and Align Retries have failed.

Online - Prompts the operator to manually enter the unreadable wafer's scribe.

Offline - Puts the unreadable wafer back in the source cassette and continues with the next wafer selected. After attempting to read all selected wafers, the system will then reselect all initially unreadable wafers, attempt to read them again, and ,if unable to read a second time, prompt the operator to manually enter the scribe.

Reject - Returns the unreadable wafer to the source cassette. To retry OCR, the operator must manually reselect the wafer.

External Read Trigger - Acquires a snap image from either Siemens barcode reader or Acumen reader.

3.5.2. Verify that all appropriate options are selected and correct settings are entered and select the OK button.

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System/ Module Setup

3.6.0. Joystick Setup

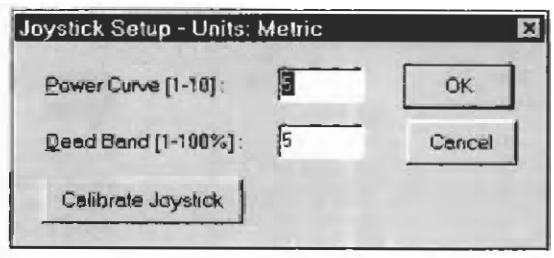
3.6.1. Select Setup from the Workstation Main window menu bar, then Joystick from the Setup pull-down menu to prompt the display of the Joystick Setup window. This window provides access to the following options and settings:

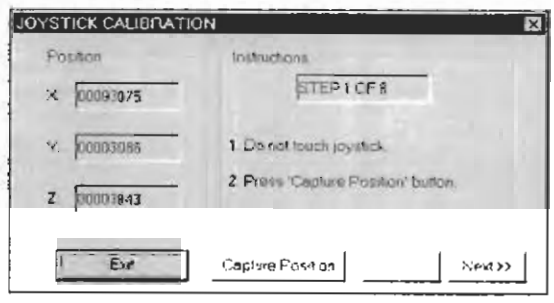


Power Curve - This setting defines the velocity curve of an axis controlled by the joystick from 0 to maximum speed. The recommended setting for this value is 4.

Dead Band - This setting determines how far from center the joystick has to be moved before a stage or bright light axis will begin to move. The larger this value the farther from center the joystick has to be moved before motion occurs. Typical values are 15-30%.

Calibrate Joystick - Selecting this button will prompt the Joystick Calibration window; follow the eight-step instruction set.





3.6.2. Verify that all appropriate options are selected and correct settings are entered and select the OK button.

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Wafer Flow Recipes



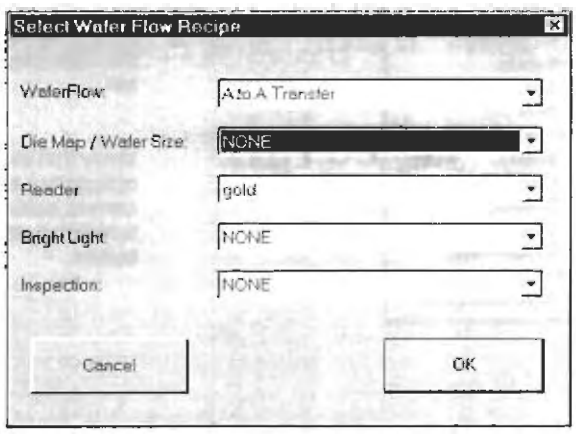
4.0. Selecting & Creating Wafer Flow Recipes

Wafer flow recipes are saved files of instructions that determine the flow of wafers during runtime operation by specifying the source and destination cassette for each transfer. The following instructions describe how to select a wafer flow recipe for runtime operation, delete a recipe from the system, and create and edit new recipes.

To proceed, first select Recipes from the Workstation Main window menu bar, then Wafer Flow from the Recipes pull-down menu. This will prompt the display of a window featuring the options: New, Open, Edit and Delete.

4.1.0. Select a Wafer Flow Recipe:

4.1.1. To select a recipe for runtime operation, select Open from the options window to display the Select Wafer Flow Recipe window.

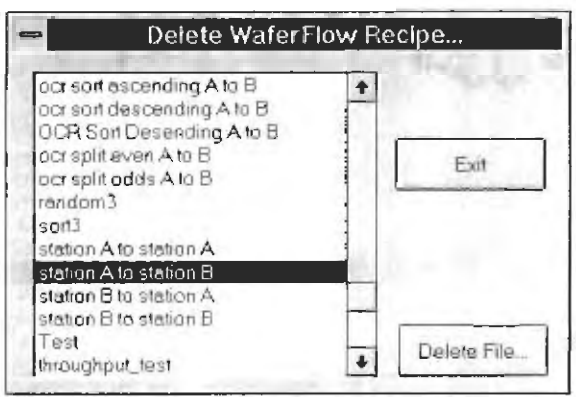


4.1.2. Highlight the desired wafer flow recipe and select the OK button. Reader and bright light recipes can also be selected at this time if they are made available from within the Linked Recipes window.

4.2.0. Delete a Wafer Flow Recipe:

4.2.1. To delete a recipe from the system, select Delete from the options window to display the Delete Wafer Flow Recipe window.

4.2.2. Highlight the desired recipe and select the DELETE FILE button.



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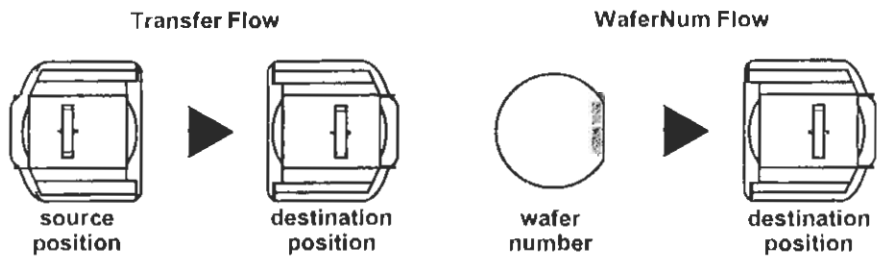
Wafer Flow Recipes



4.3.0. Creating a Wafer Flow Recipe

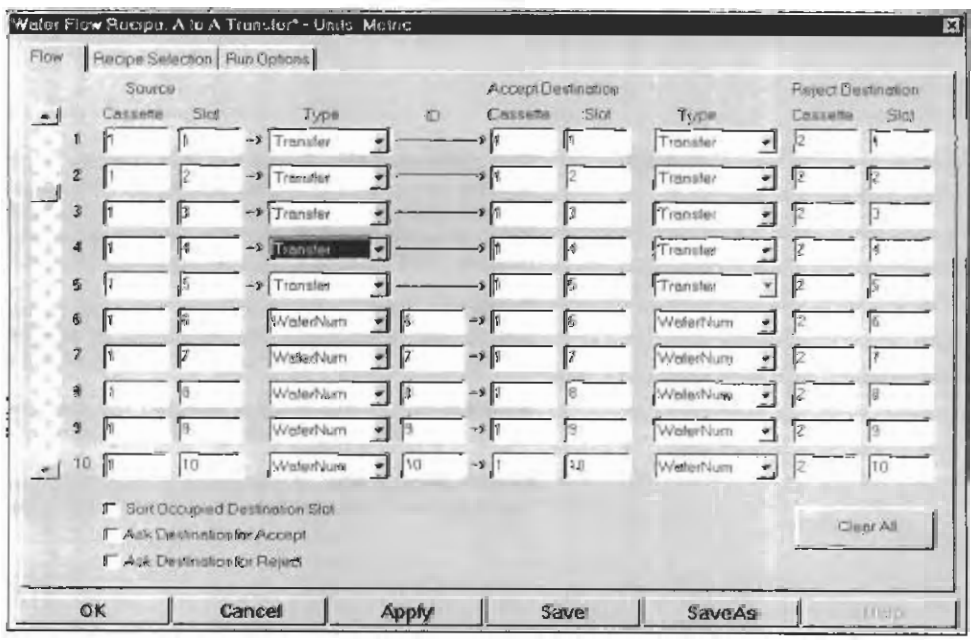
To create a wafer flow recipe, select New from the options window to prompt the display of the Wafer Flow Recipe window. This window enables a user to create and edit custom wafer flow recipes based on either a wafer's source cassette or its ID number, and link them to specific reader and bright light recipes.

4.3.1. **Flow Tab:** Select the Flow tab from the Wafer Flow Recipe window to prompt the display of the Flow window. Next, choose between the two different methods of dictating wafer flow by accessing the pull-down windows in the Type column.



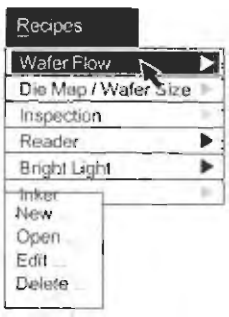
4.3.1.1. **Transfer Flow**: This method of dictating wafer flow uses a wafer's source cassette and slot position to determine its destination cassette and slot. Within the Flow window, users must select Transfer in the Type column, and then specify a source cassette and slot and its corresponding destination cassette and slot. When run, this type of recipe prompts the robot to transfer any viable wafer from the specified source position its corresponding destination position.

4.3.1.2. **WaferNum Flow**: This method of dictating wafer flow is scribe oriented, using a wafer's OCR-read number to determine its destination cassette and slot. Within the Flow window, users must select WaferNum in the Type column, and then specify a series of wafer numbers and their corresponding destination cassettes and slots. When run, this type of recipe employs the system OCR to read a wafer's scribe and determine its number. It then prompts the robot to deposit the wafer in the destination cassette and slot that correspond to its number.



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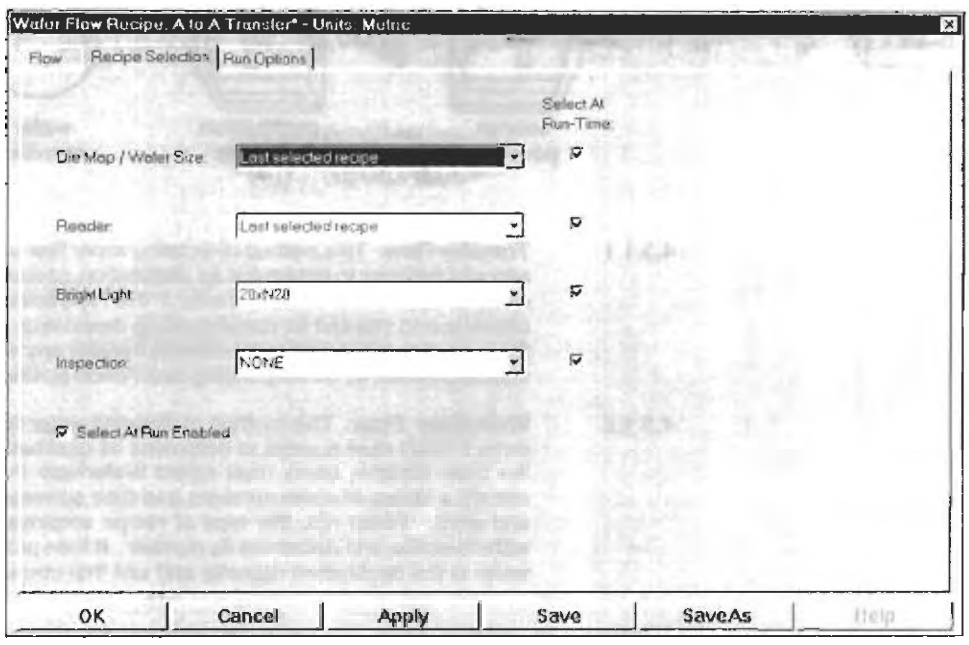
Wafer Flow Recipes



4.3.2. **Recipe Selection Tab:** Select the Recipe Selection tab from the Wafer Flow Recipe window to prompt the display of the Recipe Selection window. This window enables specific reader and bright light recipes to be linked to the wafer flow recipe. When initiating a run, the operator will be prompted to select from among these recipes. This window also provides access to the following options:

Select at Run Time - At the initiation of each run the operator is prompted to choose a specific wafer flow recipe. When the Select at Run Time option is selected for either the reader or bright light, the operator is also allowed to select from among their respective lists of recipes. If it is not selected, the operator is limited to the recipe linked to the selected wafer flow recipe.

Select at Run Enabled - This option enables or disables the Select at Run Time option described above.



4.3.3. **Run Options Tab:** Select the Run Options tab from the Wafer Flow Recipe window to prompt the display of the Run Options window. This window enables specific reader and bright light recipes to be linked to the wafer flow recipe. When initiating a run, the operator will be prompted to select from among these recipes. This window also provides access to the following options:

PreSelect Wafers - If this option is selected, all viable mapped wafers listed on source side of the wafer flow recipe will be selected for processing. If it is not selected, the operator will have to manually select all wafers for processing.

Select at Run - If this option is selected, the operator will be prompted to manually select all wafers for processing at the beginning of the run.

Enter Cassette IDs - If this option is selected, the operator will be prompted to manually key in a cassette's ID or scan its barcode with a barcode wand.

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Wafer Flow Recipes



Bright Light Enable - If selected, this option allows the bright light module to be employed by an active recipe.

Aligner Enable - If selected, this option allows the aligner module to be employed by an active recipe.

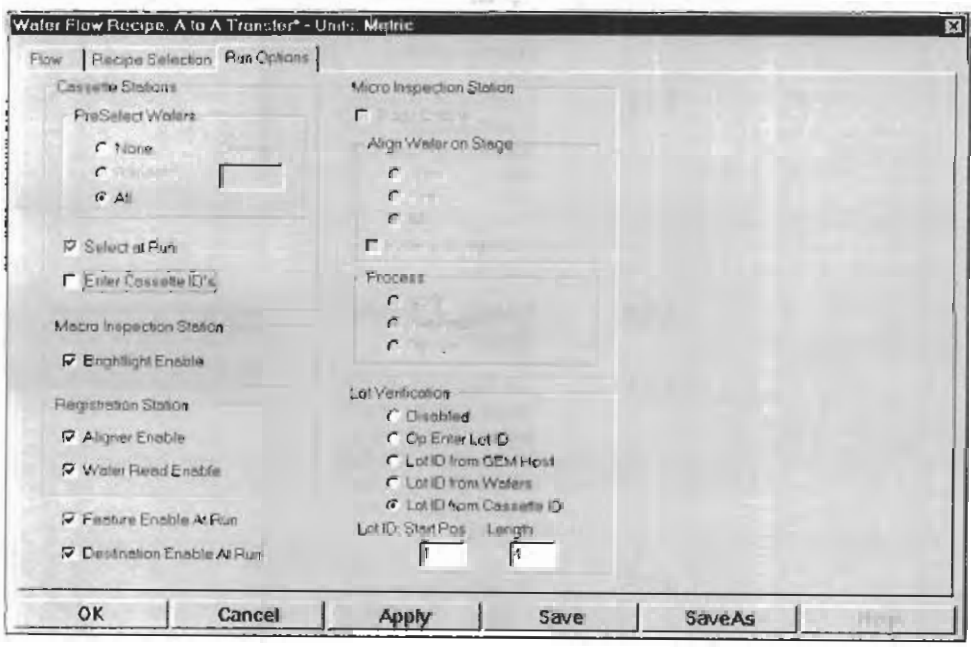
Wafer Read Enable - If selected, this option allows the reader (OCR) module to be employed by an active recipe.

Feature Enable at Run - If this option is selected an operator can immediately enable or disable the various features of the Run window by clicking on their respective icons.

Destination Enable at Run - If this option is selected an operator is prompted for each wafer's destination cassette and slot after ID or barcode reading.

MicroInspection Station - This array of options is not available for an MVT 7080 Wafer Sorter.

Lot Verification - If this option is selected the system will alert an operator to the presence of wafers with incongruous lot numbers.



4.3.4. **Save Wafer Flow Recipe:** Verify that all flow parameters, link settings and options are set correctly, then save the recipe using the following sequence:

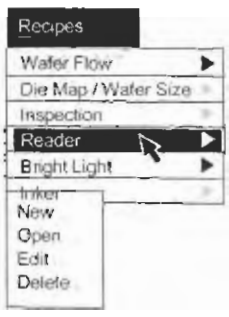
4.3.4.1. Select the SAVE AS button.

4.3.4.2. When prompted, type in the wafer flow recipe name (for this example, NEW) and select the ENTER button.

4.3.4.3. Select the OK button.

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Reader Recipes



5.0. Selecting & Creating Reader Recipes

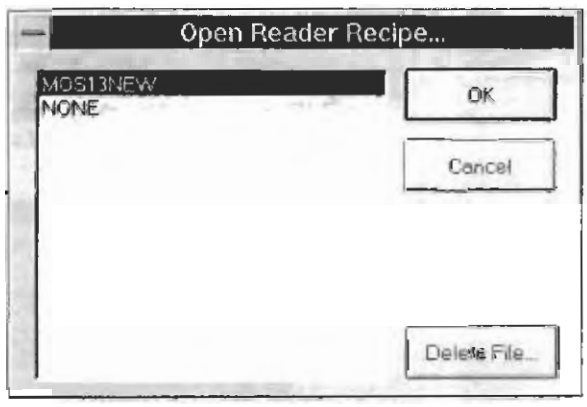
Reader recipes are saved files of ID reader settings that are customized to accommodate a specific wafer style's size, scribe location, scribe font and scribe quality. The following instructions describe how to select a reader recipe for runtime operation, delete a recipe from the system, and create and edit new recipes.

To proceed, first select Recipes from the Workstation Main window menu bar, then Reader from the Recipes pull-down menu. This will prompt the display of a window featuring the options: New, Open, Edit and Delete.

5.1.0. Select a Reader Recipe:

5.1.1. To select a recipe for runtime operation, select Open from the options window to display the Open Reader Recipe window.

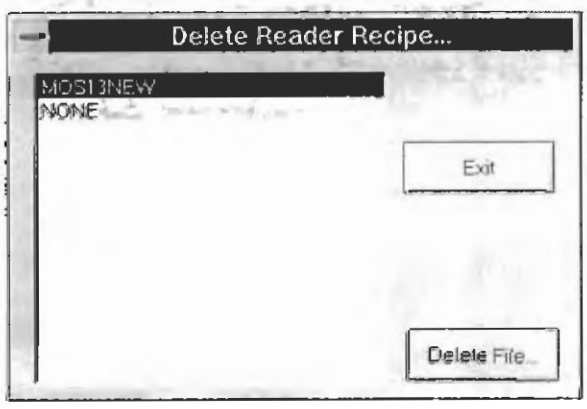
5.1.2. Highlight the desired recipe and select the OK button.



5.2.0. Delete a Reader Recipe:

5.2.1. To delete a recipe from the system, select Delete from the options window to display the Delete Reader Recipe window.

5.2.2. Highlight the desired recipe and select the DELETE FILE button.



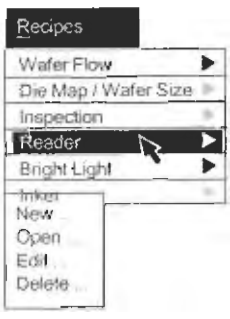
5.3.0. Creating a Reader Recipe:

To create a reader recipe, select New from the options window to prompt the display of the Reader Recipe window, shown on the facing page. This window enables a user to create and edit reader recipes that are customized to accommodate a specific wafer style's size, scribe location, scribe font and scribe quality.

5.3.1. **Options Tab:** Select the Options tab from the Reader Recipe window to prompt the display of the Options window, which lists the settings used to properly position the wafer under the camera and the wafer light intensities needed to accurately read the scribe.

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Reader Recipes



OCR Read Radius - This is the distance in millimeters from the aligner dropoff position that the aligner x-axis must move to place the scribe in the camera view. This value will depend upon the size of wafer and the location of scribe on the wafer.

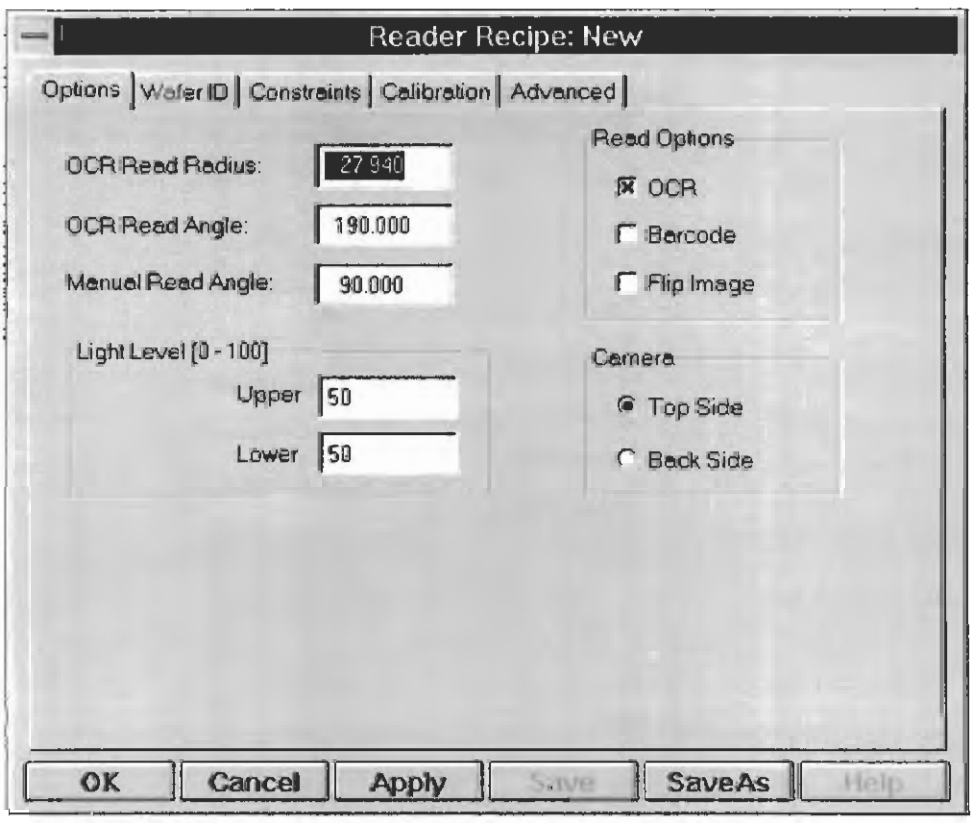
OCR Read Angle - This is the number of degrees from where the array detects the notch or flat that the wafer needs to be rotated to place the scribe under the reader camera. This value will depend upon the size of wafer and the location of the scribe on the wafer.

Manual Read Angle - This is the number of degrees from where the array detects the notch or flat that the wafer needs to be rotated to place the scribe in position for visual inspection. Typically, this value is set to 90 degrees.

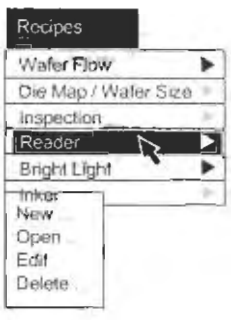
Light Levels - These settings specify the lamp intensities for the two wafer ID reader light sources used to illuminate the scribe on the wafer. These values range from 0 to 100 percent.

Read Options - These options specify the type of read method used on the wafer: OCR enables the reading of alphanumeric scribe characters; Barcode enables the reading of barcode patterns; and Flip Image prompts the system to rotates the scribe 180 degrees before it a read is attempted - it is used when the scribe appears upside down in Reader window when the play button is pressed.

Camera - These settings specify which camera, top or back, will be employed to capture scribe or barcode images. The top side option is used when the scribe or barcode is situated on the top of the wafer; the back side option is used when the scribe or barcode is situated on the back, or bottom, of the wafer.



Reader Recipes



5.3.2. **Wafer ID Tab:** Select the Wafer ID tab from the Reader Recipe window to prompt the display of the Wafer ID window. This window lists the settings used to specify the length of the scribe and the locations of the individual components of the scribe.

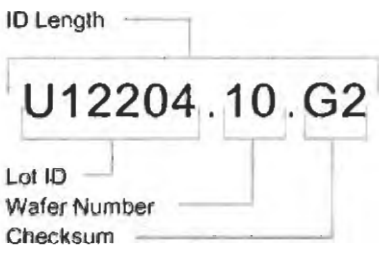
Wafer ID Length - This value represents the total number of characters contained in the scribe, including the lot ID, wafer number and checksum if present.

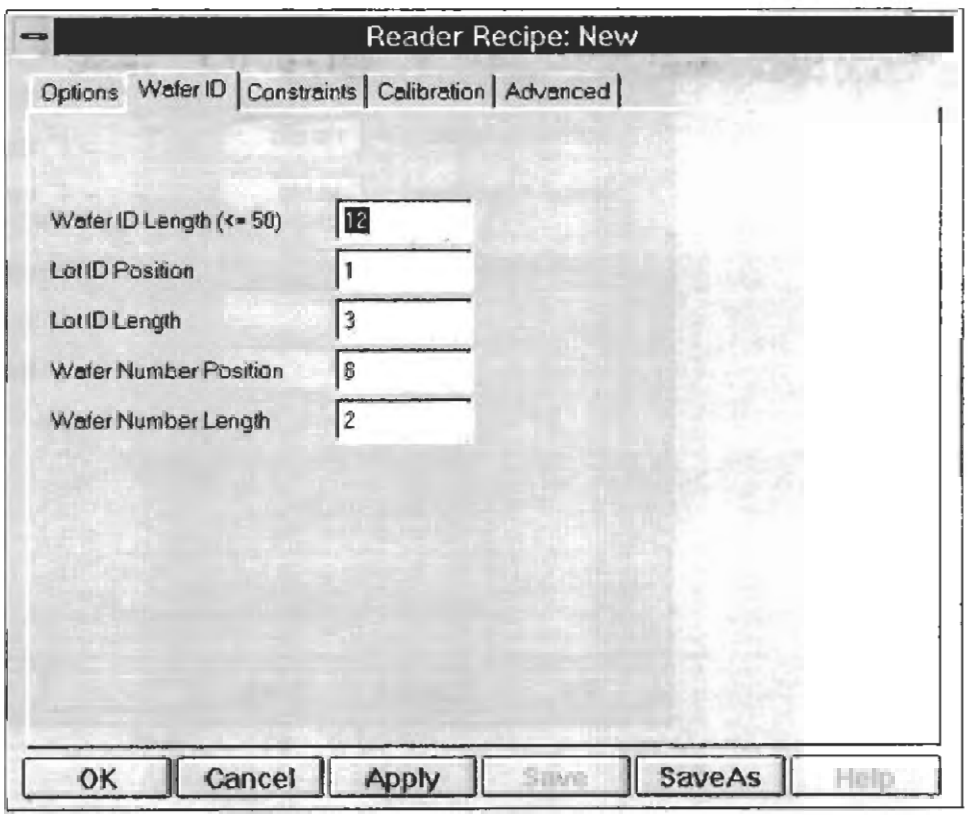
Lot ID Position - This value represents the location of the first character in the lot ID. Typically, this value is set to 1.

Lot ID Length - This value represents the total number of characters contained in the lot ID.

Wafer Number Position - This value represents the location of the first character in the wafer number.

Wafer Number Length - This value represents the total number of characters contained in the wafer number. Typically, this value is set to 2.





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Reader Recipes

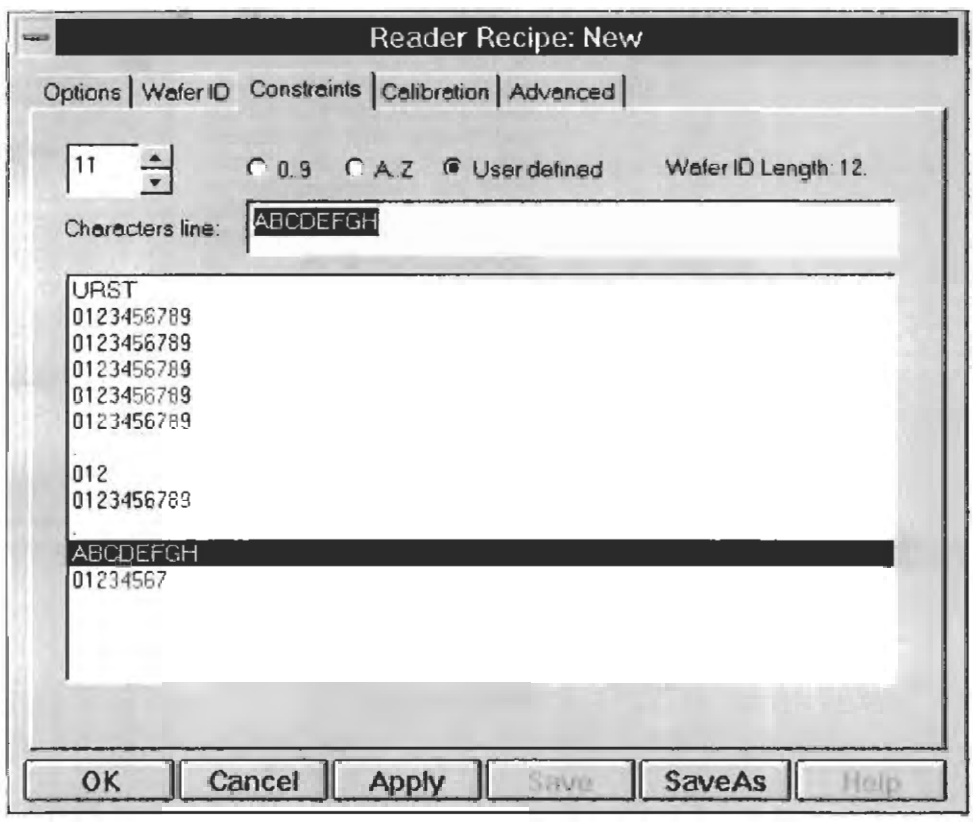


5.3.3. **Constraints Tab:** Select the Constraints tab from the Reader Recipe window to prompt the display of the Constraints window. This window is used to define the possible valid characters for each character position of the scribe.

Character Constraints box - Located at the bottom of the window, this box lists a line of valid characters for each character position of the scribe.

Characters Line - This box displays the set of possible valid characters included in the highlighted line in the Character Constraints box at the bottom of the window.

Character Options - Three sets of character options are displayed above the Characters Line box. These are the 0-9 option, the A-Z option, and the User Defined option. To perform the fastest, most accurate OCR read, it is recommended that the User Defined option be employed.



5.3.4. **Save Reader Recipe:** Verify that all entered characters are apropriate and correctly reflect all scribe possibilities, then perform the following save sequence:

5.3.4.1. Select the SAVE AS button.

5.3.4.2. When prompted, type in the reader recipe name (for this example, NEW) and select the ENTER button.

5.3.4.3. Select the OK button.

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Reader Recipes



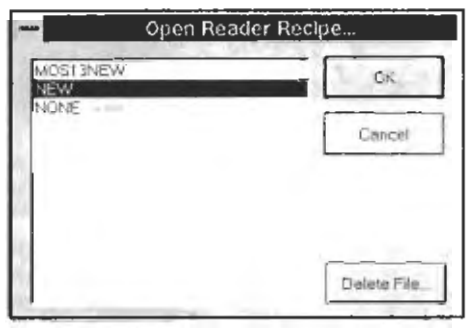
5.3.5. Position Wafer on Aligner: Use the following instructions to setup a wafer on the aligner in preparation for OCR calibration:

5.3.5.1. Within the Run window, verify that only the Aligner and Wafer Reader options are selected.



5.3.5.2. Place a wafer in the cassette for calibration. Note that the best OCR results are achieved when the wafer, and especially its scribe, are clean and free of any dirt or dust. In addition, when setting up reader recipes, choose as a subject the scribe with the highest quality characters.

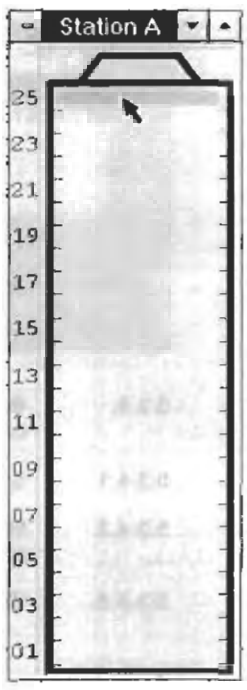
5.3.5.3. From the Workstation Main Menu, select Recipes from the menu bar and Reader from the Recipes pull- down menu. Select Open from the options window to prompt the display of the Open Reader Recipe window. Highlight the newly created reader recipe and select the OK button.



5.3.5.4. Select the Run button from within the Run window.

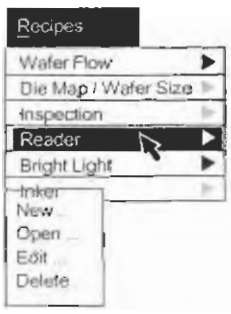
5.3.5.5. After the cassette is mapped, select a wafer for calibration by positioning the pointer over the wafer icon within the mapped cassette station window and clicking the left button of the pointer device.

5.3.5.6. Select the Run button from within the Run window.

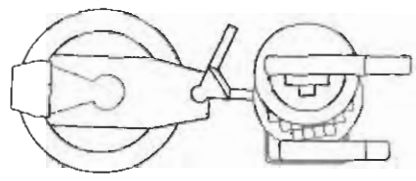


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Reader Recipes



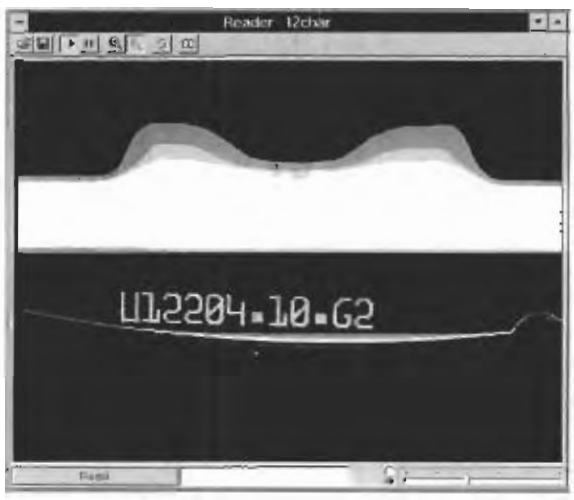
5.3.5.7. As the robot picks up the wafer and is transferring it to the aligner select the Step Mode option from within the Run window.





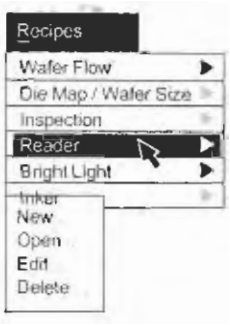
5.3.5.8. Repeatedly select the Run button from within the Run window until the wafer ID is rotated to the read position under the camera.

5.3.5.9. From within the Reader window, select the magnify button to enlarge the image viewing area. Then, select the play button to prompt the display of the live wafer / scribe image from the camera.



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Reader Recipes



5.3.5.10. Select Diagnostics from the Workstation Main window menu bar, and Controller 1 from the Diagnostics pull-down menu to prompt the display of the Controller Terminal window.

Proceed to fine tune the position of the scribe within the Reader window via Controller Terminal 1 by entering the MOVR 3 command to rotate the wafer and the MOVR 4 command to adjust the aligner x-axis. Note that the amount of rotation should match the OCR Read Angle setting in the Options window. Next, set the upper and lower light intensities to optimize the contrast between the ID and its background.

If necessary, adjust the camera mount and focus the camera to attain optimal positioning of the wafer edge and scribe in the Reader window - to maintain a live image on the screen, it may be necessary to select the pause and play buttons. Adjust the bar on the acrylic block to block direct lighting of the scribe from the upper wafer light.



5.3.6. **Calibration Tab:** Access the new reader recipe saved in procedure 4 by selecting Edit from the options window. Select the Calibration tab from the Reader Recipe window to prompt the display of the Calibration window, shown below. This window lists the settings used to describe the size and appearance of the scribe's characters and the minimum read acceptance score for each OCR attempt.

Character Type - This setting describes the contrast scheme of the scribe image displayed in the Reader window. Direct lighting displays the scribe as black characters on a white background. Indirect lighting displays the scribe as white characters on a black background. Typically, the best OCR results are attained using indirect lighting.

Calibrate Font - This button is used to perform an OCR calibration and display its results. This effectively determines the actual scribe size and character spacing values that appear in the Advanced window.

Checksum Enable - This option is used to activate the checksum feature. When activated, the operator is prompted to verify the lot number of the first wafer read; all subsequent wafers that do not share that lot number are then rejected. This setting should not be activated during calibration.

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Reader Recipes

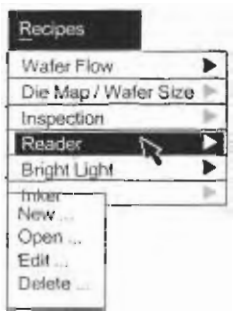


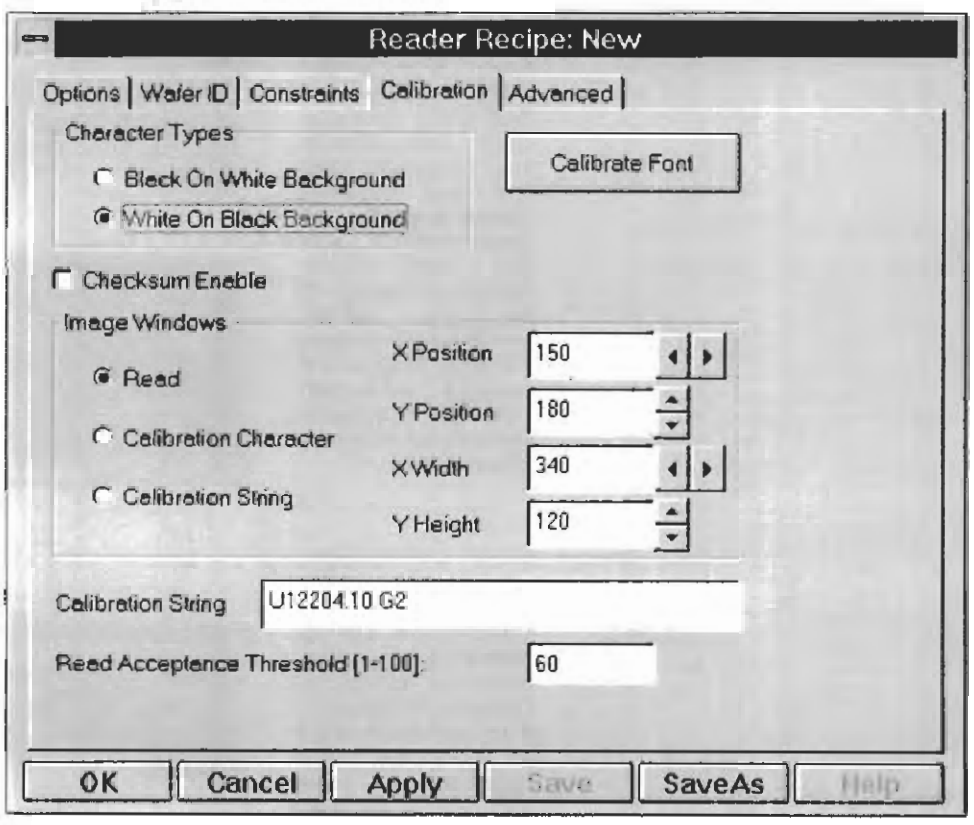
Image Windows - This box contains the settings used to adjust the dimensions of the read box, character calibration box, and the calibration string box in the reader window. Adjustments are made by selecting the button next to each setting and manipulating its size while observing the changes in the reader window. The calibration character and calibration string boxes should be very tight around their respective character or characters. The read box should be at least 4 characters wider than the entire scribe and 2 to 3 times its height; the scribe should be centered inside of read box.

Calibration String - The calibration string is the series of characters that the sample image will be compared to during calibration. Enter the scribe characters from the sample wafer in this box.

Read Acceptance Threshold - This value represents the minimum acceptance score required for each character to be considered valid.

5.3.6.1. In the Character Types box select the option that best describes how the scribe's characters contrast with the background of the wafer.

5.3.6.2. Verify that the Checksum option is not enabled.

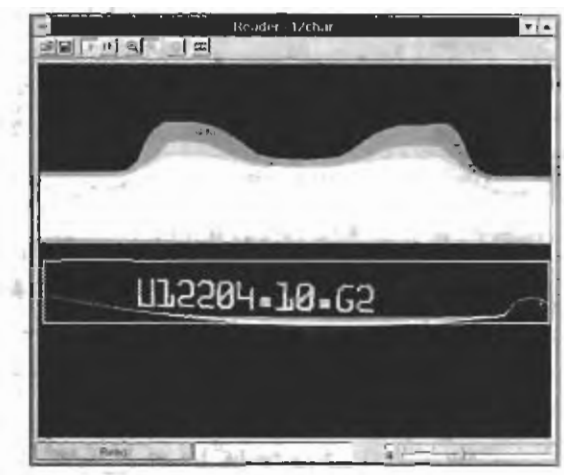


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Reader Recipes



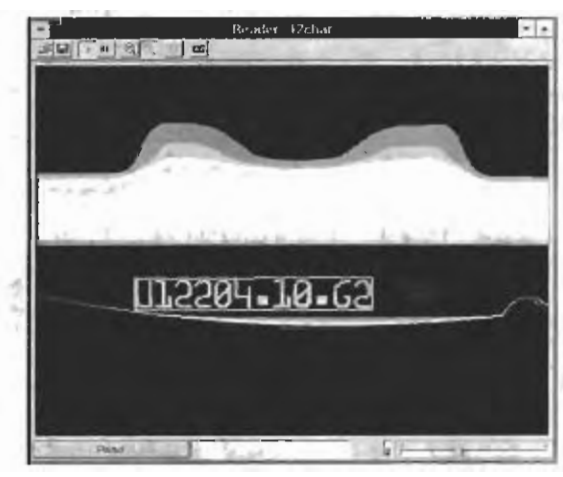
5.3.6.3. **Read:** Within the Image Windows box select the Read option. Then, use the X and Y position, width and height arrows to move and size the read box to encompass all characters of the scribe. The best OCR read can be obtained when the read box extends nearly all the way across the reader window and approximately one half of a character above and below the scribe characters.



5.3.6.4. **Calibration Character:** Within the Image Windows box select the Calibration Character option. Then, use the X and Y position, width and height arrows to move and size the calibration character box so that it tightly encompasses one character of the scribe - the box should actually overlap the outer pixels of the character. For the best OCR read, field service recommends using the zero character.



5.3.6.5. **Calibration String:** Within the Image Windows box select the Character String option. Then, use the X and Y position, width and height arrows to move and size the character string box so that it tightly encompasses all characters of the scribe - the box should be positioned approximately one pixel from the outer edges of the scribe and not touch any of the characters.

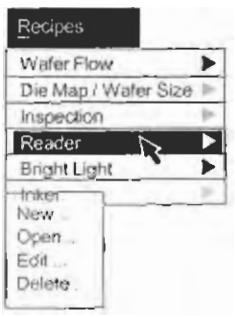


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Reader Recipes

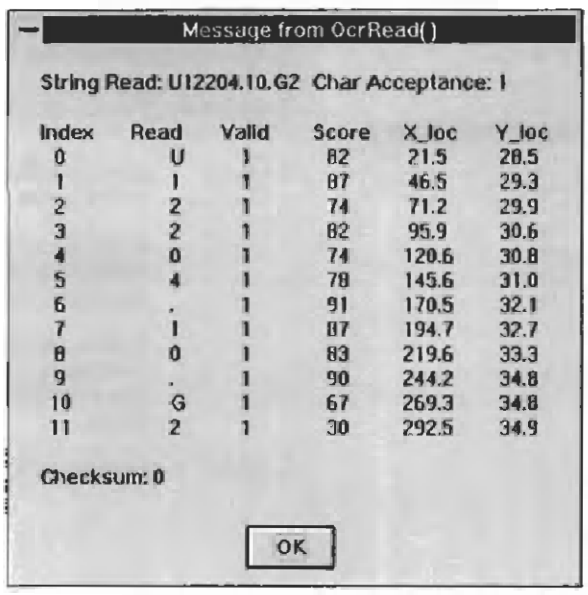
5.3.6.6. Enter the scribe characters in the box labeled Calibration String:.

5.3.6.7. In the box labeled Read Acceptance Threshold [1 - 100]:, enter 60.



5.3.6.8. Select the CALIBRATE FONT button. The system will perform the calibration and then display the results within the message window shown to the right.

First, ensure that all characters were correctly read by checking the Read column. Then, check the score returned by each character - a score of 60 or above is considered optimal, while a score below 30 is unacceptable.



5.3.6.9. If the data displayed in the message window are unacceptable, select the OK button to exit the window and perform one or all of the following corrective measures:

- verify that the information in the Wafer ID and Constraints tabs is correct;
- verify that the scribe is of sufficient quality and free of dust;
- adjust camera focus;
- adjust camera aperture;
- adjust illumination;
- adjust calibration character and calibration string boxes;
- move character calibration box to a different character.

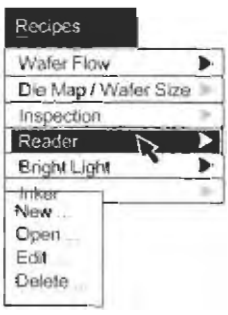
5.3.6.9.1. Reselect the CALIBRATE FONT button.

5.3.6.9.2. When the calibration window displays acceptable data, select the OK button and proceed to the next step.

5.3.6.10. Select the SAVE button, then select the APPLY button.

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Reader Recipes





5.3.6.11. Select the READ button from within the Reader window to perform an OCR read on the scribe.

If the scribe passes, the scribe displayed in the live image window will be surrounded by a green box, and each character of the scribe will be encompassed by a green character box.

If the scribe does not pass, the scribe displayed in the live image window will be surrounded by a red box, all passed characters will be encompassed by green character boxes, and all failed characters will be encompassed by red character boxes.

5.3.6.12. Deselect Step Mode from within the Run window.

5.3.7. Advanced Tab: Select the Advanced tab from the Reader Recipe window to prompt the display of the Advanced window. This window contains options used to specify scribe search and image preprocessing methods used to locate and optimize the scribe image, and settings used to adjust the calculated character dimensions of the scribe.

Search Method: This box allows the user the option of choosing between two different methods of locating the wafer scribe:

Standard - Faster, default method for locating scribe; used when the scribe is situated on a clean background.

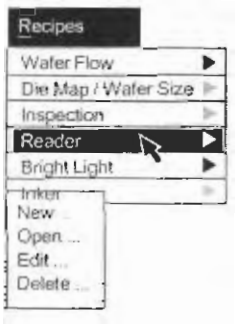
Pattern - Slower, more rigorous method for locating scribe; used when scribe is on imperfect, noisy background.

Create Search Pattern - This button is used to initiate the pattern search method described above. Its use requires the tight setting of a character string box, described in procedure 6, around the character string.

Preprocess: This box allows the user the option of specifying the combination of different image processing methods used to optimize the scribe image before an OCR read is attempted.

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Reader Recipes



Standard - Fastest, default method for optimizing the scribe image; used when the scribe is comprised of clean, well-defined characters. When this option is selected, only standard image preprocessing is performed.

Enhance - When this option is selected, an enhanced image processing routine is employed in addition to the standard method. It is used when the scribe is comprised of characters on a noisy background, requiring more rigorous processing.

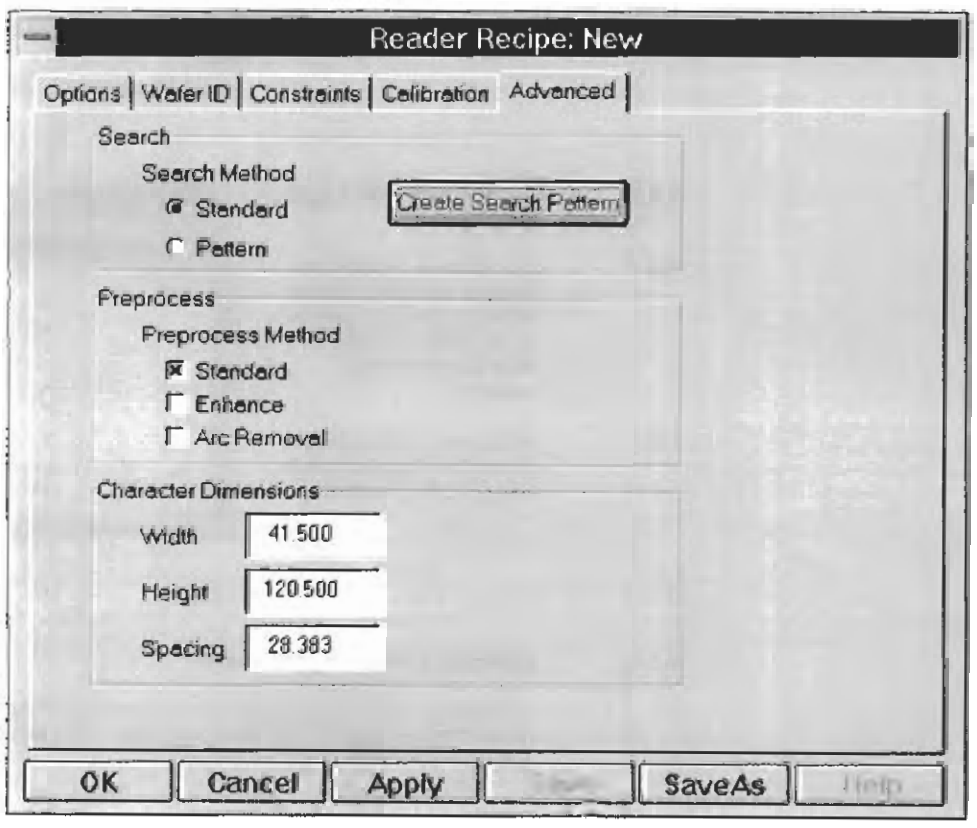
Arc Removal - When this option is selected, an arc removal routine is employed in addition to the standard and enhanced methods. It is used when the scribe is comprised of characters on a very noisy background that contains arc patterns caused by clamp rings.

Character Dimensions: The settings contained in this box represent the character dimensions calculated when the Calibrate Font button is pressed in the Calibration window. These settings can be adjusted to improve OCR read scores.

Width - This value represents the width of each character in the scribe.

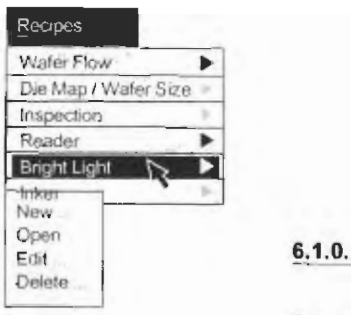
Height - This value represents the height of each character in the scribe.

Spacing - This value represents the horizontal distance from the start of one character to the beginning of the next.



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Bright Light Recipes



6.0. Selecting & Creating Bright Light Recipes

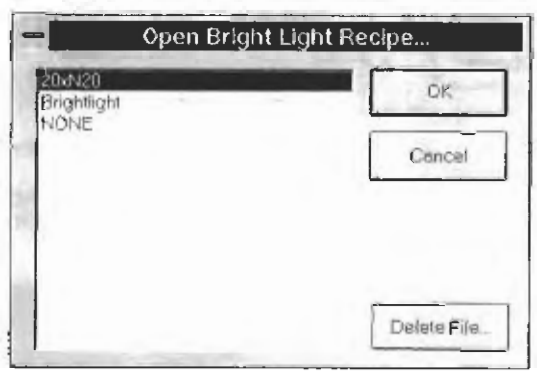
Bright light recipes are saved files of bright light settings that dictate a wafer's degree of x and y tilt and rotation speed while undergoing bright light macroinspection on the bright light chuck. The following instructions describe how to select a bright light recipe for runtime operation, delete a recipe from the system, and create and edit new recipes.

To proceed, first select Recipes from the Workstation Main window menu bar, then Bright Light from the Recipes pull-down menu. This will prompt the display of a window featuring the options: New, Open, Edit and Delete.

6.1.0. Select a Bright Light Recipe:

6.1.1. To select a recipe for runtime operation, select Open from the options window to display the Open Bright Light Recipe window.

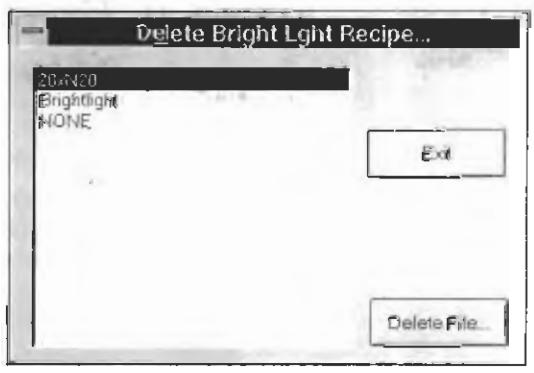
6.1.2. Highlight the desired recipe and select the OK button.



6.2.0. Delete a Bright Light Recipe:

6.2.1. To delete a recipe from the system, select Delete from the options window to display the Delete Bright Light Recipe window.

6.2.2. Highlight the desired recipe and select the DELETE FILE button.



6.3.0. Creating a Bright Light Recipe:

To create a bright light recipe, select New from the options window to prompt the display of the Bright Light Recipe window. This window enables a user to create and edit custom bright light recipes.

6.3.1. **Options:** Select the Options tab from the Bright Light Recipe window to prompt the display of the Options window, shown below. This window lists the following settings:

X Tilt - This setting specifies the tilt of the bright light chuck's X-axis; values can range from -30 to 30 degrees.

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Bright Light Recipes



X Y Tilt - This setting specifies the tilt of the bright light chuck's Y-axis; values can range from -30 to 30 degrees.

Theta - This setting specifies the bright light chuck's rate of rotation; values can range from 0 to 100.

Duration - This setting specifies the time set for flipper auto-flip; 1000 = 1 second, 2000 = 2 seconds.

Flipper Disabled - This setting disables the wafer flipper.

Flip After Key Hit - When this setting is selected, the operator must select the flipper key to flip wafer to its back side orientation.

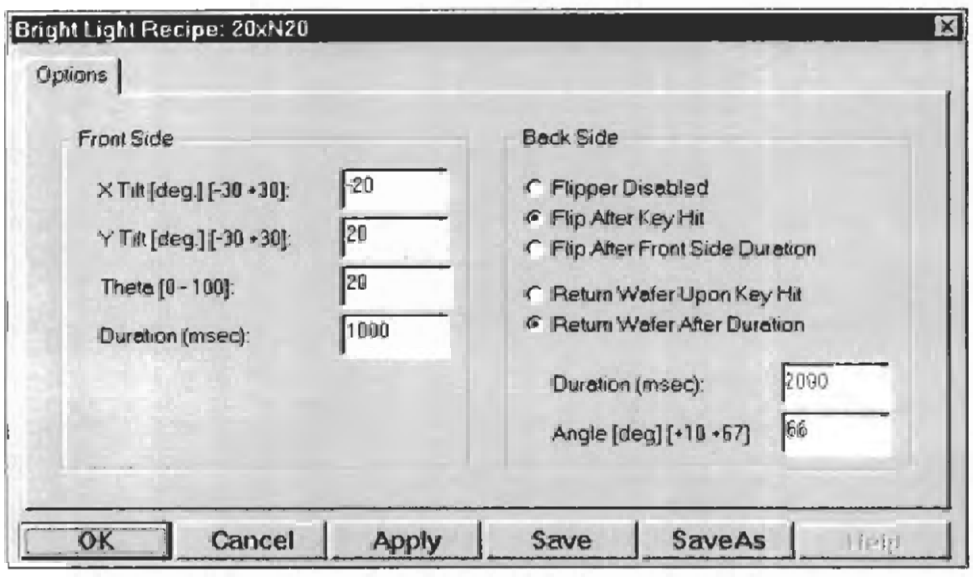
Flip After Front Side Duration - Wafer flipped automatically after duration.

Return Wafer Upon Key Hit - When this setting is selected, the operator must select the flipper key to return wafer to its front side orientation.

Return Wafer After Duration - Wafer returned automatically after duration.

Duration - This setting specifies the time set for flipper auto-flip; 1000 = 1 second, 2000 = 2 seconds.

Angle [deg] [+10 +67] - This setting specifies the angle at which the flipper presents the wafer's back side.



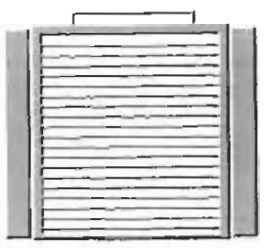
6.3.2. **Save Bright Light Recipe:** Verify that all tilt and rotation settings are correctly entered, then save the recipe using the following sequence:

6.3.2.1. Select the SAVE AS button.

6.3.2.2. When prompted, type in the bright light recipe name (for this example, NEW) and select the ENTER button.

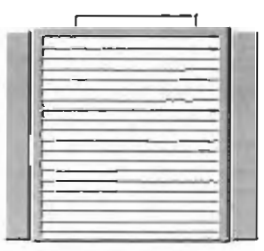
6.3.2.3. Select the OK button.

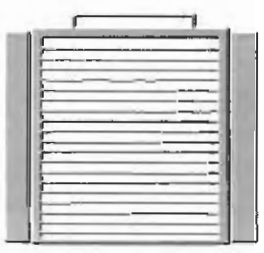
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MicroVision®



Section F: Runtime Operation

Section Overview 2
Loading Cassettes 5
Initiating the Run 5
Selecting Wafers 6
Bright Light Macroinspection 7
Alignment & OCR 8
Concluding a Run 9

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Runtime Operation

CAUTION:
Protection provided by the equipment may be impaired if it is used in a manner not specified by the manufacturer.

CAUTION:
System users must wear a wrist strap for grounding purposes to prevent electric static discharge.

Section Overview

This section provides system operators with a basic, step-by-step guide to performing runtime operation procedures on the MVT 7080 Wafer Sorter. Operators should note that the bright light macroinspection and optical character recognition procedures apply only to systems on which these optional modules are installed and enabled in the System Setup window and the Settings box of the Run window. Runtime operation procedures are covered in the following sequence:



1. **Loading Cassettes**

   Describes how to safely load full wafer cassettes onto stations A, B, C or D of the sorter.



2. **Initiating the Run**

   Explains how to enable all necessary modules in the Run window, select appropriate recipes, and proceed with laser mapping of the cassettes.



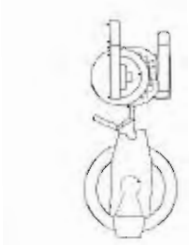
3. **Selecting Wafers**

   Describes how to interpret the meaning of wafer icons in station windows after laser mapping and select wafers for processing.



4. **Bright Light Macroinspection**

   Outlines the bright light macroinspection sequence of runtime operation, including how to engage the joystick to perform manual macroinspection.



5. **Alignment & OCR**

   Covers the alignment and OCR sequence of runtime operation, including how to interpret a successful read and responding to no-read recovery (unsuccessful read).



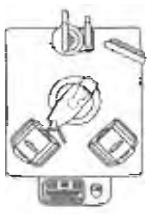
6. **Concluding the Run**

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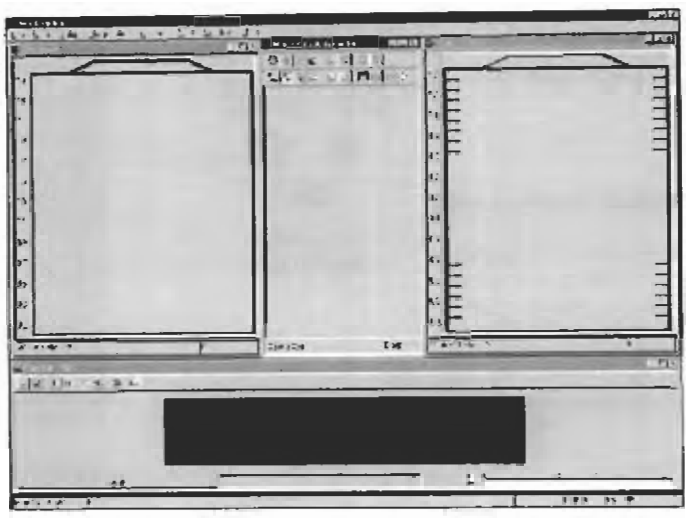
Runtime Operation

Modular Configuration

The layout of the system main interface window (i.e., the arrangement of its module and station windows) is determined by its particular modular configuration.

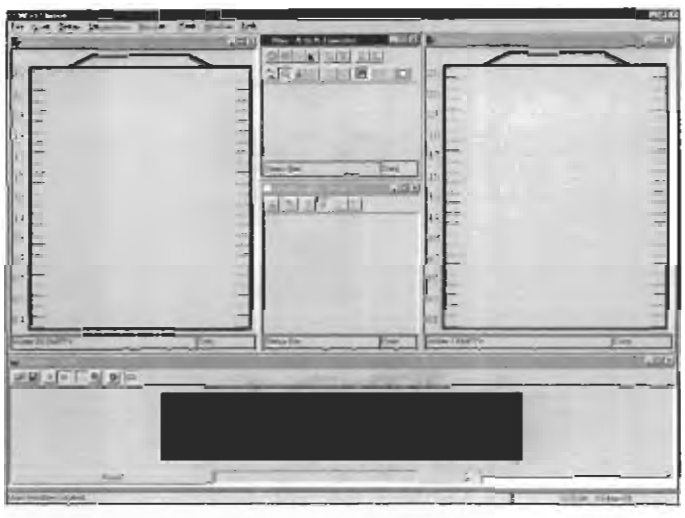


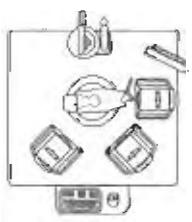
2-Cassette





2-Cassette/
Bright Light





3-Cassette

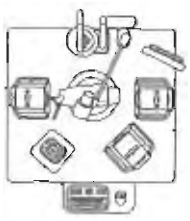


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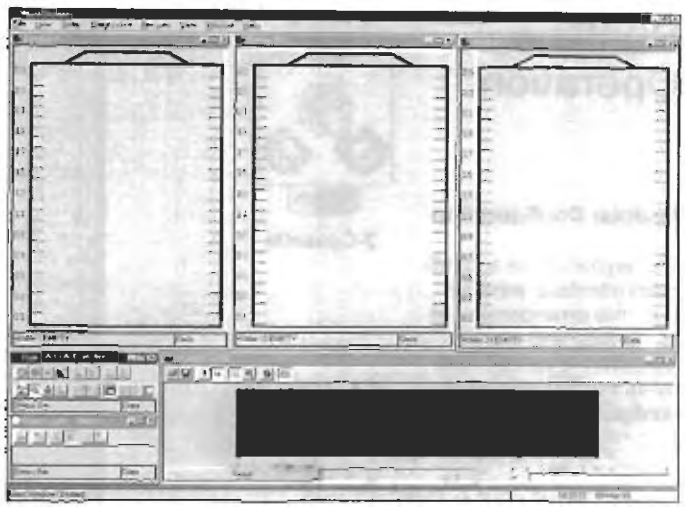
Runtime Operation

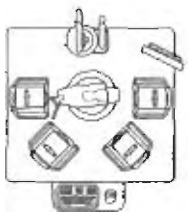
Modular Configuration

The layout of the system main interface window (i.e., the arrangement of its module and station windows) is determined by its particular modular configuration.

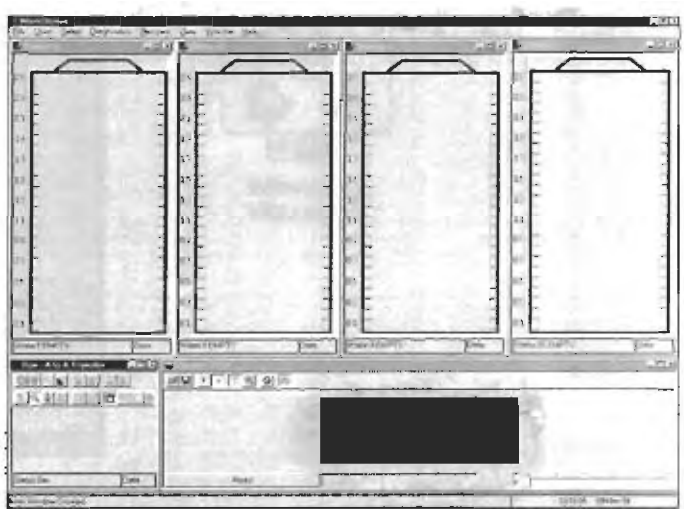


3-Cassette/
Bright Light





4-Cassette



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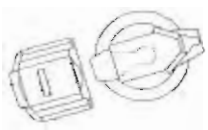
Loading Cassettes



1.0. Loading Cassettes onto the MVT 7080

To load a cassette onto the MVT 7080, place it on the station platform, slightly tilting it back, and slide its lower back edge up against the heel of the platform. Gently let the front of the cassette down, allowing the H-bar to fit between the pins. The spring loaded sensor on the center of the platform will detect the presence of the cassette; this sensor will also abort all operations on the cassette if it detects that it has been lifted.

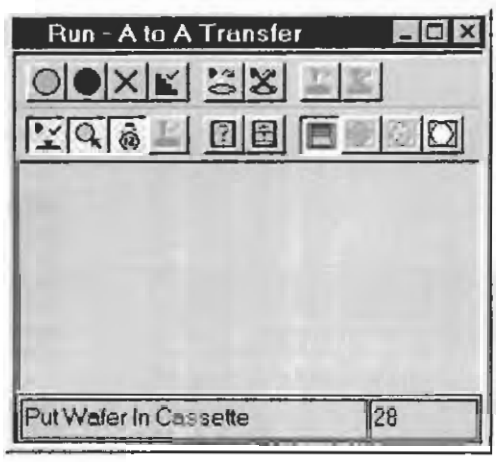
Initiating the Run



2.0. Initiating the Run

2.1. Verify that all necessary options within the Run window are enabled.

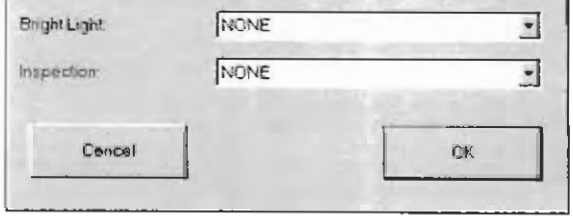
2.2. Select the Run button from the Run window. The following tool buttons are also contained in the Run window:



- Run
- Stop Run
- Abort Run
- Step Mode
- Bright Light Accept
- Bright Light Reject
- Stage Accept (N/A)
- Stage Reject (N/A)
- Bright Light Enable
- Aligner Enable
- Reader Enable
- Stage Enable (N/A)
- Ask Destination for Accepts
- Ask Destination for Rejects
- Sorter Workspace
- Inspection Workspace (N/A)
- Defect Review Workspace (N/A)
- Bright Light Workspace

2.3. If no runtime recipes are active, the operator is presented with the Select Wafer Flow Recipe window. Highlight the appropriate wafer flow, reader and bright light recipes and select the OK button.

If the system has just been reset, it will first reference all active modules then proceed with laser mapping of the cassettes.



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Selecting Wafers



3.0. **Selecting wafers from mapped cassettes**

Each cassette station present on the system is represented by a station window. After laser mapping, each station window displays the location and status of every wafer sensed in its corresponding cassette. A wafer's status is indicated by the character of its icon:

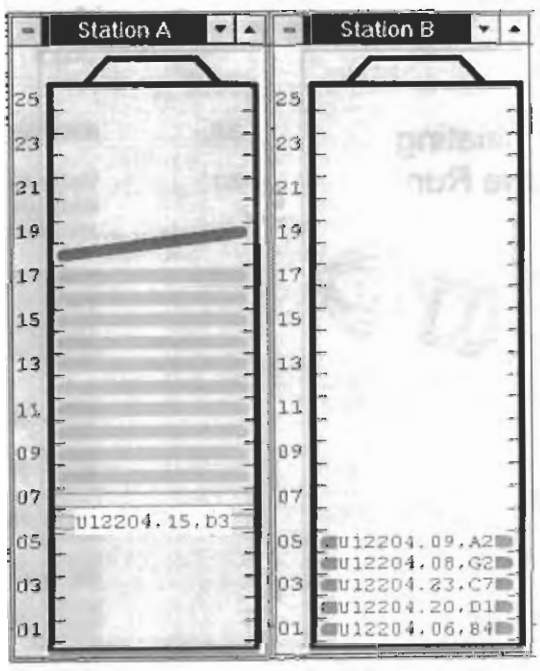
Black Solid: wafer sensed but not selected for processing.

Green Solid: wafer sensed and selected for processing.

Red Solid: wafer sensed as being cross-slotted in cassette.

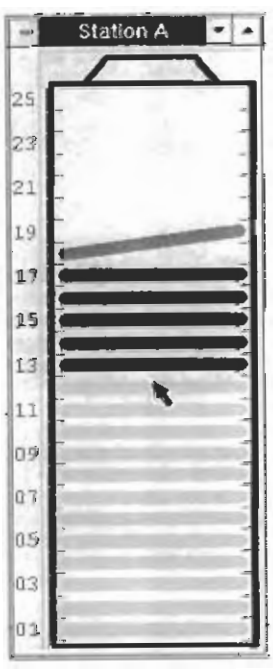
Magenta Outline: wafer is out of cassette and being processed. If OCR read has been performed, the scribe characters will be displayed over the outlined icon.

Magenta Solid: wafer has been processed and deposited in its destination. If OCR read has been performed, the scribe characters will be displayed over the solid icon.



3.1. Select viable wafers for processing by positioning the pointer over their corresponding icons within the station windows and clicking the left button of the pointing device. Multiple wafers can be selected by clicking and holding the left button down and dragging the pointer across other wafer icons. Selected icons will change from black to green.

3.2. Choose the Run button from the Run window to proceed.



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Bright Light Macro-inspection



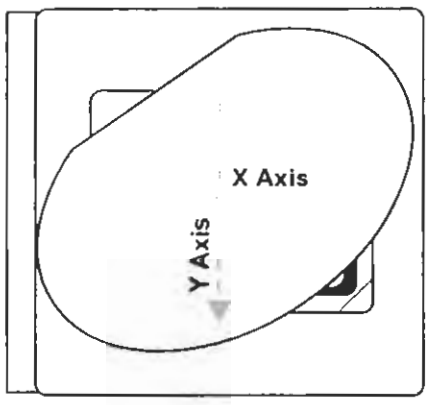
4.0. **Bright Light Macroinspection**

If the system is equipped with a bright light module and the bright light option is enabled in the Run window, the robot will proceed to transfer a selected wafer from the source cassette to the bright light chuck. There the wafer is rotated and tilted under a high-intensity lamp at the rate and angle dictated by the active bright light recipe. If the system is not equipped with a bright light module, or if the bright light option is not enabled in the Run window, the robot will proceed to transfer a selected wafer to the aligner chuck.

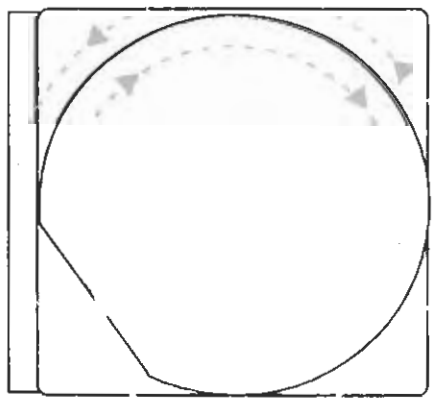


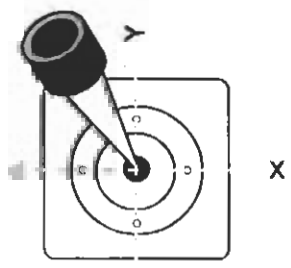


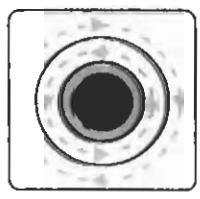
Wafer Tilt Control:
Bright X & Bright Y Axes



Wafer Rotation Control:
Bright T (theta) Axis







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Alignment & OCR





5.0. Alignment & OCR

From the bright light chuck, the wafer is transported to the aligner chuck, where it is passed over the aligner array to locate its edge. If the Wafer Reader option is selected in the Settings box of the Run window, the robot will proceed to center the wafer on the aligner chuck, rotate it to locate its flat or notch, and then position it under the camera for OCR reading of the scribe, as specified in the active reader recipe. Selecting the PLAY button from the Reader window will prompt the display of a live OCR image. Reader window buttons are described to the right. If the wafer reader option is not selected, the wafer is aligned only.

 Open existing file.

 Save file to diskette.

 Play live image.

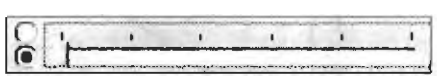
 Pause live image.

 Minimize image.

 Maximize image.

 Flip image.

 Maximizes image in reader window only.

 Upper & lower light source intensity.

5.1. **Successful Read**

5.1.1. If OCR reading of the scribe is successful, the status bar in the Reader window displays an OK message, the scribe displayed in the live image window is surrounded by a green box, and each character of the scribe is encompassed by a green character box. The scribe text and its score are also displayed in the window.

5.1.2. The robot then lifts the passed wafer from the aligner chuck and transfers it to the destination cassette specified in the active wafer flow recipe. The wafer's ID and a solid magenta wafer icon are then displayed in the destination cassette's corresponding station window.

5.1.3. If the Ask Destination option is selected in the Settings box of the Run window, the operator will be prompted to specify the destination cassette and slot into which the passed wafer should be placed. This is accomplished by placing the pointer over the appropriate wafer slot in the desired station window and clicking the mouse button.

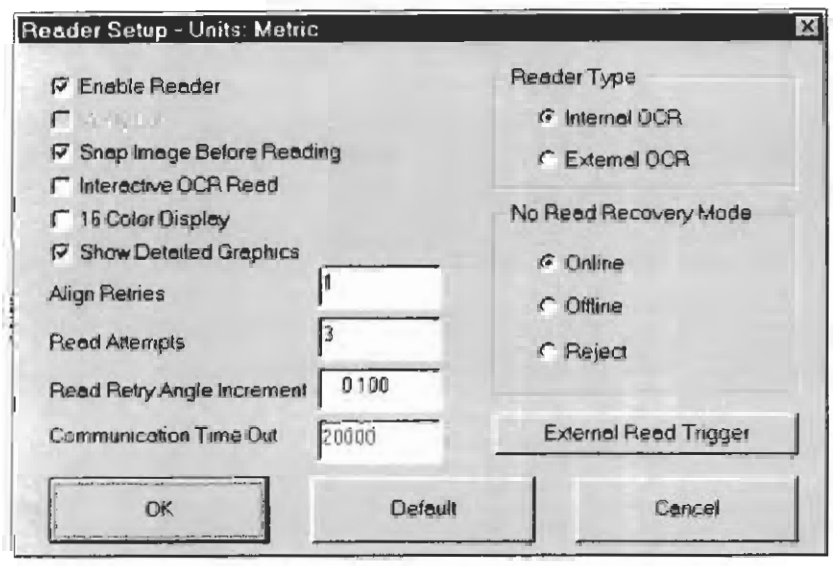
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Alignment & OCR



5.2. **No Read Recovery**

If an OCR reading of the scribe is not successful (i.e., No Read), the status bar in the Reader window displays a FAILED message, the scribe displayed in the live image window is surrounded by a red box, all passed characters are encompassed by green character boxes, and all failed characters are encompassed by red character boxes. The system's response to a failed read depends upon how the No Read Recovery Mode is defined within the Reader Setup window (not accessible from Operator mode).



5.2.1. **Online -** If the No Read Recovery Mode is set to Online and all read attempts and realign attempts have failed, the system will prompt the operator to manually enter the scribe, which can be read directly from the image presented in the Reader window. The wafer will then be deposited in the destination cassette as specified in the wafer flow recipe. If manual entry is declined the wafer will be returned to its source location.

5.2.2. **Offline -** If the No Read Recovery Mode is set to Offline and all read attempts and realign attempts have failed, the system will return the wafer to the source cassette and continue with the next wafer. After attempting to read all wafers, the unreadable wafers will be reselected and a second attempt to read them will commence. This time the system will act like the online option is selected and prompt the operator to enter the scribe if all read attempts and realign attempts fail again.

5.2.3. **Reject -** If the No Read Recovery Mode is set to Reject and all read attempts and realign attempts have failed, the system will return the wafer to the source cassette and continue with the next wafer. Nothing further will be done to the rejected wafer unless reselected by the operator.

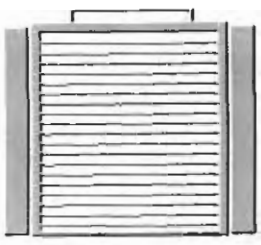
Concluding a Run

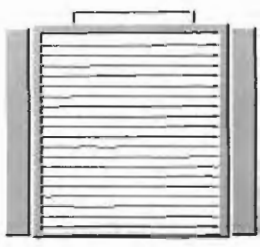


6.0. **Concluding a Run**

When all selected wafers have been processed, the robot will move to its park position; the operator can then remove processed cassettes and load new ones for the next run.

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Section G: Troubleshooting & Preventative Maintenance

Section Overview 2

Troubleshooting Interfaces 2

Troubleshooting Tables:
- Aligner Module 4
- Robot Module 4
- Bright Light Module 5
- Cassette Stations 5
- General System 5

Module Testing:
- Aligner 6
- Robot 11
- Bright Light 17

Preventative Maintenance Checklist 25

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Trouble-shooting & Preventative Maintenance

Section Overview

This section is intended to provide system technicians with a general guide to detecting, diagnosing and correcting system problems. It is divided into the following four subsections:

1. **Interfaces -** describes the various interface windows used to perform troubleshooting measures, monitor a system's current hardware status, and review a chronological history of a system's use.
2. **Trouble Tables -** list common system problems and their remedies.
3. **Module Tests -** list aligner, robot, and bright light module tests used to pinpoint system problems.
4. **Preventative Maintenance Checklist.**

Trouble-shooting Interfaces

Host NT Interface:

When performing troubleshooting measures, it is recommended that Host commands be issued to the controller via the Host NT interface. This interface is accessed by selecting the Host NT version 3.0 icon from within the Windows NT Main window.

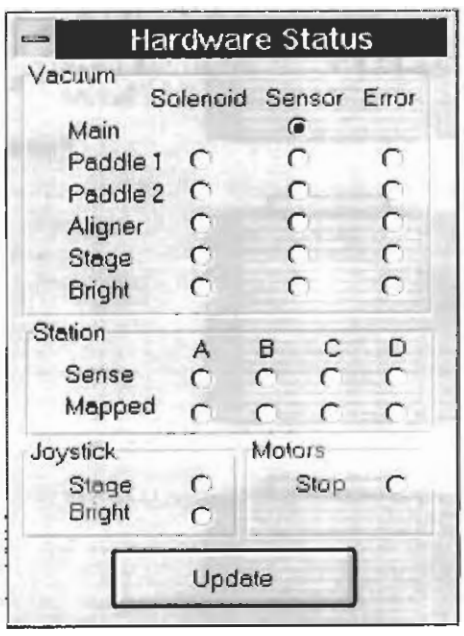


CAUTION: Protection provided by the equipment may be impaired if it is used in a manner not specified by the manufacturer.

CAUTION: System users must wear a wrist strap for grounding purposes to prevent electric static discharge.

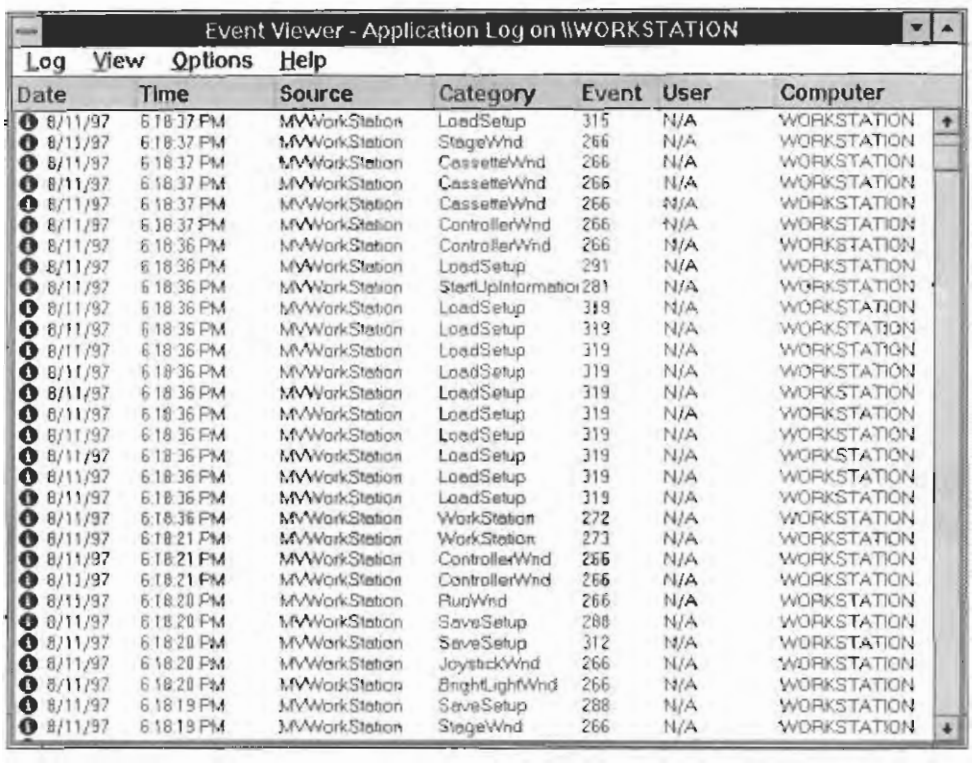
Hardware Status:

The Hardware Status window displays the current status of all cassette stations and enabled modules, and is accessed by selecting Diagnostics from the main windo menu bar, and Hardware from the Diagnostics pull-down menu. It allows a technician to determine the following: whether or not a module's vacuum is operational and able to sense wafers; whether or not a cassette is present on a station and if it has been mapped; whether or not the joystick is active; and whether or not an emergency stop has been initiated.



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Trouble-shooting Interfaces



Event Viewer:

The Event Viewer window serves to provide system technicians with a detailed chronological history of the system's use. This is useful in determining when and why error messages were generated, and how individual users are utilizing the system. The Event Viewer window is accessed by selecting Diagnostics from the main window menu bar, and Event Log from the Diagnostics pull-down menu. Additional detail about an error occurrence can be gained by double clicking on its item line in the Event Viewer window to prompt the display of the Event Detail window.



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Aligner Module

Refer to Aligner Module Testing on page 6 of this section.

Aligner Module: Indications of Need for Maintenance/Repair

Problem Indication	Remedies
Notch or flat misalignment.	Aligner array light intensity needs adjustment. Aligner array needs recalibration.
Wafer not placed on aligner properly.	Check transfer parameters. Check orange nut on aligner x-axis.
Wafer reader out of alignment.	Make sure wafer matches wafer reader recipe. Make sure camera did not move. Make sure scribe did not move on wafer.

Robot Module

Refer to Robot Module Testing on page 11 of this section.

Robot Module: Indications of Need for Maintenance/Repair

Problem Indication	Remedies
Err ref drag robot while referencing theta axis.	Check integrity of 16-pin theta-axis connector. Check motor terminals for loose connections.
Err ref drag robot while referencing paddle-axis.	Check integrity of 16-pin paddle-axis connector. Check motor terminals for loose connections.
Err ref limit width bad.	Adjust opto sensor for theta axis.
Noise when robot rotates.	Inner and outer cans are rubbing: loosen upper and lower can mounts, realign and tighten.
Noise when robot moves up or down.	Realign, clean and lubricate z-axis lead screw.
Robot theta not parking properly.	Check theta-axis encoder. Check for broken theta axis belt. Check set screws on pulleys.
Paddle axis drifting.	Check for loose set screws on pulleys. Paddle axis encoder needs realignment.
Vacuum sensed on arm when no wafer present.	Test and adjust vacuum sensor. Check vacuum channel - it may have collapsed.
Vacuum will not turn off.	Particle lodged in vacuum solenoid - remove and clean.
Vacuum sense lost during transfer.	Adjust and clean vacuum sensor; check for leaks. Check wiring to solenoid.
Vacuum error when picking up or dropping off wafer to modules.	Check level between paddles and module. Check pickup and drop-off transfer heights. Check vacuum sensors on robot and module.

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Bright Light Module

Bright Light Module: Indications of Need for Maintenance/Repair

Problem Indication	Remedies
Vacuum errors to bright light module.	Check level to bright light module and re-reference. Realign encoder on axis that was off. Adjust park position.
Gimbal loose when in the park position and motors enabled.	Tighten loose connecting rod screws.
Bright light gimbal or stage wandering. No control when joystick active.	Joystick driver lost: Exit and rerun workstation program (no need to reboot). Rerun joystick calibration routine.
Bright light gimbal or stage drifting slightly. Have some control with the joystick.	Rerun joystick calibration routine.

Refer to Bright Light Module Testing on page 17 of this section.

Cassette Stations

Cassette Stations: Indications of Need for Maintenance/Repair

Problem Indication	Remedies
System always indicates cassette presence.	Cassette sensor stuck down. Cassette sensor flag needs adjusting (too long). Slotted sensor needs replacing.
System not recognizing cassette presence.	Check cassette placement and platform pins. Cassette sensor flag needs adjusting (too short). Wiring problem to slotted sensor.

General System

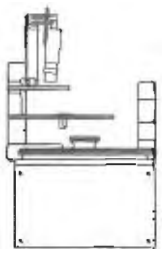
General System: Indications of Need for Maintenance/Repair

Problem Indication	Remedies
Motor not selected.	Module or motor connected to wrong controller port: Check host 1 connector.
Motor torque limit.	Check motor wiring. Check axis encoder wiring; realign encoder.
Motor stall limit.	Check encoder wiring; realign encoder. Check for loose pulley between motor shaft and encoder.
Referencing error limit stuck.	Check slotted sensor to that axis.
Index mark not found on rotary encoders.	Check red and black wire on encoder cabling. Realign encoder.
House vacuum not detected.	Check house vacuum pressure. Check house vacuum sensor adjustment. Check power to controller (fuse). Check aux port connector on controller.

Refer to applicable module tests within this section.

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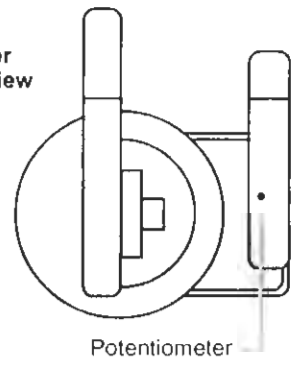
Module Testing: Aligner



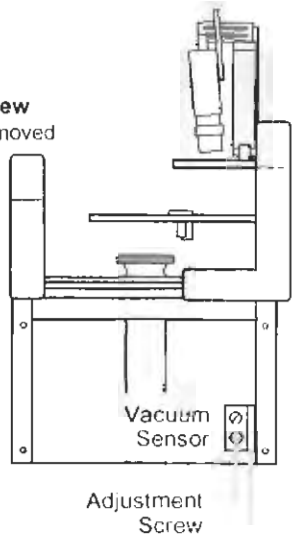
Aligner Module Tests:

1.1.0. Theta Encoder Test 7
1.2.0. Theta Motor Test 7
1.3.0. X-Axis Encoder Test 8
1.4.0. X-Axis Motor Test 8
1.5.0. Vacuum Setup & Test 9
1.6.0. Illumination Assembly Test & Setup 9
1.7.0. Wafer Light Test 10
1.8.0. Station Reference 10
1.9.0. ALNC Aligner Array Setup 10

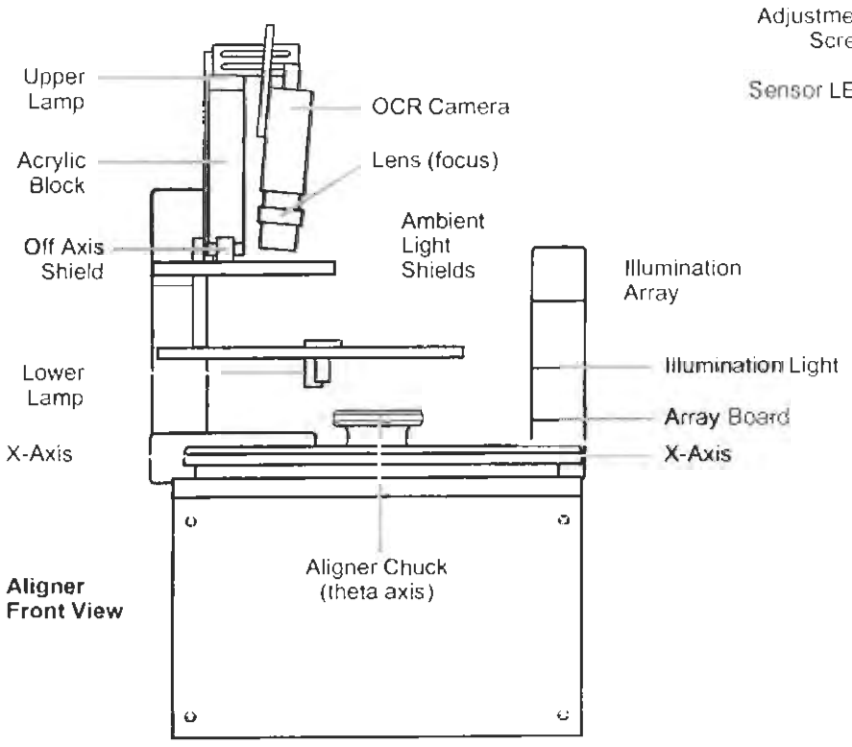
Aligner Top View



Aligner Back View
cover removed



Aligner Front View



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Module Testing: Aligner



1.1.0. Theta Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the aligner theta-axis.

1.1.1. Switch to controller channel 1.
CHAN 1

1.1.2. Set encoder to 0.
MPOS 3 0

1.1.3. Disable theta-axis motor.
MEBL 3 0

1.1.4. Prompt continuous reading of encoder position.
CPOS 3

1.1.5. Manually rotate theta one full rotation in CCW direction; this should prompt a reading of 360 degrees (+/- 3 degrees).

1.1.6. Manually rotate theta one full rotation in CW direction; this should prompt a reading of 0 degrees (+/- 3 degrees).

1.1.7. Return to prompt.
ESC

1.1.8. Enable theta-axis motor.
MEBL 3 1

1.1.9. Reference theta-axis motor.
MREF 3

1.2.0. Theta Motor Test

This procedure verifies that the aligner theta motor can properly rotate the aligner theta axis in a clockwise and counter-clockwise direction.

1.2.1. Switch to controller channel 1.
CHAN 1

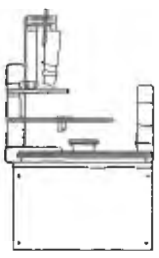
1.2.2. Reference theta-axis motor.
MREF 3

1.2.3. Rotate theta-axis 90 degrees in CCW direction.
MOVR 3 90

1.2.4. Rotate theta-axis 90 degrees in CW direction.
MOVR 3 -90

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Module Testing:
Aligner



1.3.0. X-Axis Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the aligner x-axis.

1.3.1. Switch to controller channel 1.
CHAN 1

1.3.2. Set encoder to 0.
MPOS 4 0

1.3.3. Disable x-axis motor.
MEBL 4 0

1.3.4. Prompt continuous reading of encoder position.
CPOS 4

1.3.5. Manually move x-axis approximately 1 inch; this should prompt a return value of approximately 1 inch.

1.3.6. Return to prompt.
ESC

1.3.7. Disable x-axis motor.
MEBL 4 1

1.3.8. Reference x-axis motor.
MREF 4

1.4.0. X-Axis Motor Test

This procedure verifies that the aligner x-axis motor can properly move the aligner x-axis in both the right and left directions.

1.4.1. Switch to controller channel 1.
CHAN 1

1.4.2. Reference x-axis motor.
MREF 4

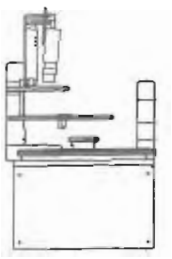
1.4.3. Move x-axis to encoder position 1.5.
MOVA 4 1.5

1.4.4. Move x-axis .5 inches in left direction.
MOVR 4 .5

1.4.5. Move x-axis .5 inches in right direction.
MOVR 4 -.5

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Module Testing: Aligner



1.5.0. Vacuum Setup & Test

This procedure calibrates the aligner vacuum sensor.

1.5.1. Switch to controller channel 1.
CHAN 1

1.5.2. Activate vacuum.
SVAC 2 1 1

1.5.3. Remove back cover of aligner and adjust vacuum sensor: 1) turn the vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

1.5.4. Deactivate vacuum.
SVAC 2 1 0

1.5.5. Initiate vacuum test; this will prompt a turn-on value (left) and turn-off value (right).
VACT 2 1

1.5.6. Adjust turn-on value to 35,000 (repeat until turn-on value is within 5,000).

1.6.0. Illumination Assembly Test & Setup

This procedure calibrates the intensity of the aligner wafer array light.

1.6.1. Switch to controller channel 1.
CHAN 1

1.6.2. Activate illumination light.
OUTP 4 100

1.6.3. Adjust potentiometer to see illumination light.

1.6.4. Prompt continuous reading of pixel data.
ALND

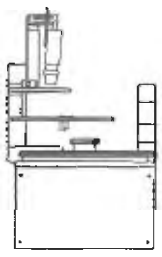
1.6.5. Adjust potentiometer to lowest possible setting while maintaining full array reading of 128.

1.6.6. End continuous read.
ESC

1.6.7. Deactivate illumination light.
OUTP 4 0

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Module Testing: Aligner



1.7.0. Wafer Light Test (if OCR is installed)

This procedure verifies that the aligner wafer light is functioning properly.

1.7.1. Switch to controller channel 1.
CHAN 1

1.7.2. Activate upper wafer light LEDs.
OUTP 5 100

1.7.3. Deactivate upper wafer light LEDs.
OUTP 5 0

1.7.4. Activate lower wafer light LEDs.
OUTP 10 100

1.7.5. Deactivate lower wafer light LEDs.
OUTP 10 0

1.8.0. Station Reference with Backlash Test

This procedure orients the aligner, theta, and x axes with respect to encoder positions.

1.8.1. Switch to controller channel 1.
CHAN 1

1.8.2. Reference theta-axis motor.
MREF 3

1.8.3. Reference x-axis motor.
MREF 4

1.8.4. Reference both axes and initiate vacuum test.
SREF 2

1.9.0. ALNC Aligner Array Setup

This procedure calibrates the aligner array to properly detect and align wafers.

1.9.1. Switch to controller channel 1.
CHAN 1

1.9.2. Activate vacuum.
SVAC 2 1 1

1.9.3. Manually place a wafer on the center of the chuck.

1.9.4. Activate illumination light.
OUTP 4 100

1.9.5. Move wafer back and forth across array 5 times.
ALNC 1

1.9.6. Save parameter data.
SAVE

1.9.7. Deactivate illumination light.
OUTP 4 0

1.9.8. While supporting wafer, deactivate vacuum and remove wafer.
SVAC 2 1 0

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Module Testing:

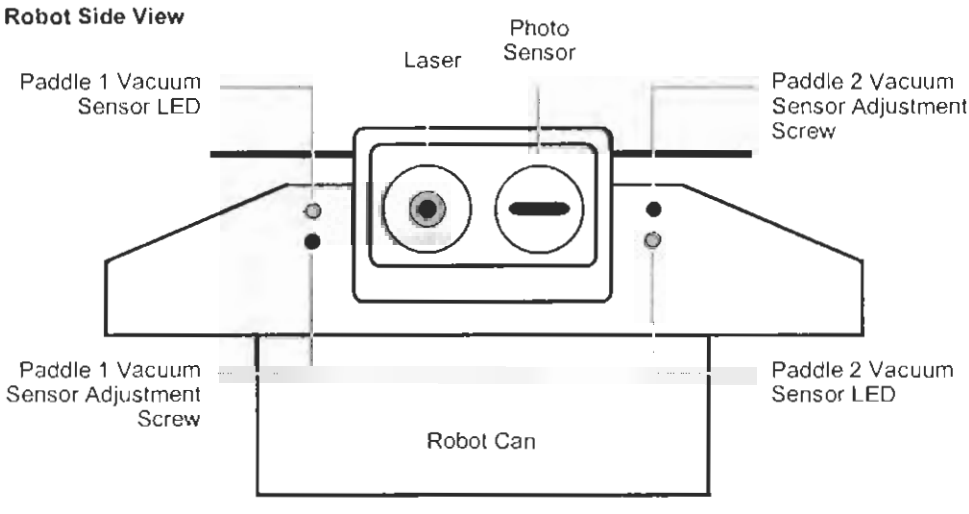
Robot



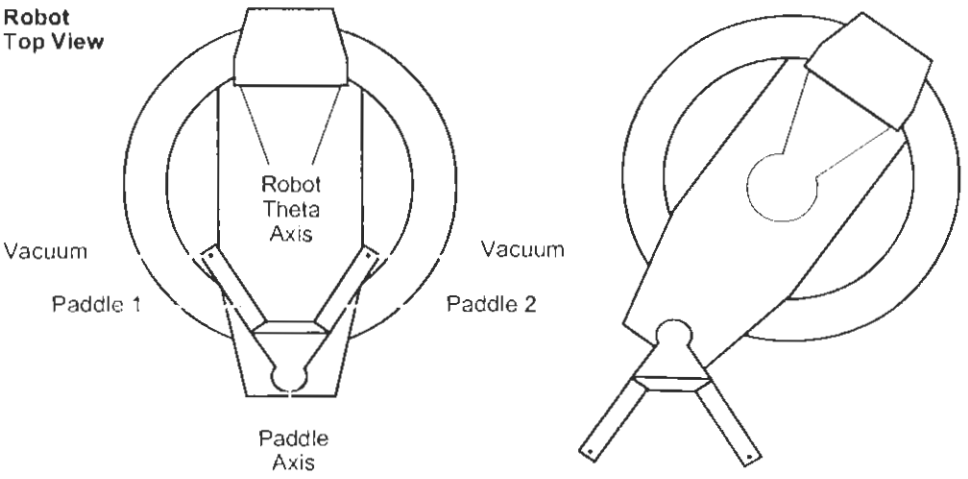
Robot Module Tests:

2.1.0. Laser Module Test 12
2.2.0. Paddle Vacuum Test 12
2.3.0. Theta Encoder Test 13
2.4.0. Theta Motor Test 13
2.5.0. Paddle Encoder Test 14
2.6.0. Paddle Motor Test 14
2.7.0. Z Axis Motor & Encoder Test 15
2.8.0. Station Reference 15
2.9.0. Z-Axis Travel Limit Test & Setting of Software Limits 16
2.10.0. Final Module Checks 16

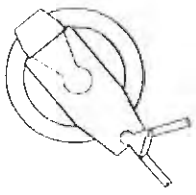
Robot Side View



Robot Top View



Module Testing: Robot



2.1.0. Laser Module Test

This procedure verifies that both the robot laser and the robot photo sensor are functioning properly.

2.1.1. Switch to controller channel 1.
CHAN 1

2.1.2. Activate laser.
LASR 1

2.1.3. Deactivate laser.
LASR 0

2.1.4. Increase gain to 16.
LASG 16

2.1.5. Prompt continuous reading of laser sensor module.
LASD

2.1.6. Place a piece of paper 3 inches in front of laser; this will prompt a continuous reading of 255.

2.1.7. Return to prompt.
ESC

2.2.0. Paddle Vacuum Setup & Test

This procedure calibrates the robot paddle 1 and robot paddle 2 vacuum sensors.

2.2.1. Switch to controller channel 1.
CHAN 1

2.2.2. Activate paddle 1 vacuum.
SVAC 1 1 1

2.2.3. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

2.2.4. Deactivate paddle 1 vacuum.
SVAC 1 1 0

2.2.5. Activate paddle 2 vacuum.
SVAC 1 2 1

2.2.6. Adjust paddle 2 vacuum sensor: 1) turn the vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

2.2.7. Deactivate paddle 2 vacuum.
SVAC 1 2 0

2.2.8. Initiate paddle 1 vacuum test; this prompts turn-on value (left) and turn-off value (right).
VACT 1 1

2.2.9. Adjust turn-on value to 35,000 (repeat until turn-on value is within 5,000).

2.2.10. Initiate paddle 2 vacuum test; this prompts turn-on value (left) and turn-off value (right).
VACT 1 2

2.2.11. Adjust turn-on value to 35,000 (repeat until turn-on value is within 5,000).

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Module Testing: Robot



2.3.0. Theta Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the robot theta-axis.

2.3.1. Switch to controller channel 1.
CHAN 1

2.3.2. Reference all robot axes.
SREF 1

2.3.3. Set encoder to 0.
MPOS 1 0

2.3.4. Disable theta-axis motor.
MEBL 1 0

2.3.5. Link paddle axis to theta-axis.
LINK 1

2.3.6. Prompt continuous encoder reading.
CPOS 1

2.3.7. Rotate theta axis one full rotation in CCW direction; this prompts a reading of 360 degrees (+/- 3 degrees).

2.3.8. Rotate theta axis one full rotation in CW direction; this prompts a reading of 0 degrees (+/- 3 degrees).

2.3.9. Return to prompt.
ESC

2.3.10. Enable theta-axis motor.
MEBL 1 1

2.3.11. Reference theta-axis motor.
MREF 1

2.4.0. Theta Motor Test

This procedure verifies that the robot theta motor can properly rotate the robot theta axis in a clockwise and counter-clockwise direction.

2.4.1. Switch to controller channel 1.
CHAN 1

2.4.2. Reference all robot axes.
SREF 1

2.4.3. Link paddle axis to theta-axis.
LINK 1

2.4.4. Rotate theta-axis 90 degrees in CCW direction.
MOVR 1 90

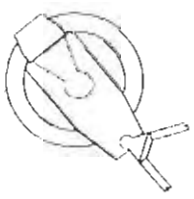
2.4.5. Rotate theta-axis 90 degrees in CW direction.
MOVR 1 -90

2.4.6. Unlink paddle axis from theta-axis.
LINK 0

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Module Testing:

Robot



2.5.0. Paddle Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the robot paddle axis.

2.5.1. Switch to controller channel 1.
CHAN 1

2.5.2. Set encoder to 0.
MPOS 2 0

2.5.3. Disable paddle axis motor.
MEBL 2 0

2.5.4. Prompt continuous encoder reading.
CPOS 2

2.5.5. Manually rotate paddle axis one full rotation in CCW direction; this prompts a reading of 360 degrees (+/- 3 degrees).

2.5.6. Manually rotate paddle axis one full rotation in CW direction; this prompts a reading of 0 degrees (+/- 3 degrees).

2.5.7. Return to prompt.
ESC

2.5.8. Enable paddle axis motor.
MEBL 2 1

2.5.9. Reference paddle axis motor.
MREF 2

2.6.0. Paddle Motor Test

This procedure verifies that the robot paddle motor can properly rotate the robot paddle axis in a clockwise and counter-clockwise direction.

2.6.1. Switch to controller channel 1.
CHAN 1

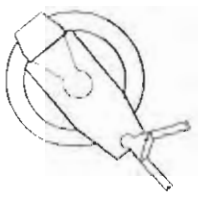
2.6.2. Reference all robot axes.
SREF 1

2.6.3. Rotate paddle axis 10 degrees in CCW direction.
MOVR 2 10

2.6.4. Rotate paddle axis 10 degrees in CW direction.
MOVR 2 -10

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Module Testing: Robot



2.7.0. Z-Axis Motor & Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the robot z-axis, and that the robot z-axis motor can properly move the robot up and down along the z-axis.

2.7.1. Switch to controller channel 1.
CHAN 1

2.7.2. Reference all robot axes. Ensure that paddle is centered over robot; if not, paddle must be calibrated.
SREF 1

2.7.3. Raise robot z-axis to encoder position 1.
MOVA 0 1

2.7.4. Disable z-axis motor. Listen for "click", which indicates brake engagement.
MEBL 0 0

2.7.5. Enable z-axis motor. Listen for "click", which indicates brake disengagement.
MEBL 0 1

2.7.6. Set encoder to 0.
MPOS 0 0

2.7.7. Raise z-axis .5 inches.
MOVR 0 .5

2.7.8. Prompt encoder reading. Returns reading of .5
MPOS 0

2.7.9. Lower z-axis .5 inches.
MOVR 0 -.5

2.7.10. Prompt encoder reading. Returns reading of 0.
MPOS 0

2.7.11. Reference all robot axes.
SREF 1

2.8.0. Station Reference

This procedure orients the robot theta and paddle axes with respect to encoder positions.

2.8.1. Switch to controller channel 1.
CHAN 1

2.8.2. Reference theta-axis motor.
MREF 1

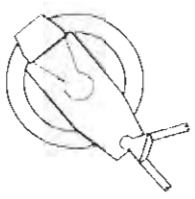
2.8.3. Reference paddle axis motor.
MREF 2

2.8.4. Reference all robot axes.
SREF 1

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Module Testing:

Robot



2.9.0. Z-Axis Travel Limit Test & Setting of Software Limits

This procedure determines the up and down travel limits of the robot z-axis hardware and establishes software protection limits.

2.9.1. Switch to controller channel 1.
CHAN 1

2.9.2. Set negative limit beyond hardware limit.
LIMN 0 -7

2.9.3. Move z-axis to encoder position .1
MOVA 0 .1

2.9.4. Move z-axis to lower travel limit. Repeat until torque limit error is encountered.
MOVR 0 -.02

2.9.5. Prompt lower Z height position reading.
MPOS 0

2.9.6. Set software negative limit. Obtain Z height position from system response to previous command.
LIMN 0 [Z height position + .02]

2.9.7. Set positive limit beyond hardware limit.
LIMP 0 7

2.9.8. Move z-axis to encoder position 6.4
MOVA 0 6.4

2.9.9. Lower z brake delay.
SCAL 1 6 300

2.9.10. Moves z-axis to upper travel limit. Repeat until torque limit error is encountered.
MOVR 0 .02

2.9.11. Prompts upper Z height position reading.
MPOS 0

2.9.12. Set software positive limit. Obtain Z height position from system response to previous command.
LIMP 0 [Z height position - .02]

2.9.13. Set z brake delay to normal setting.
SCAL 1 6 2499840

2.9.14. Save settings for brake delay.
SAVE

2.10.0. Final Module Checks

2.10.1. **Interference -** Check for interference between moving parts. Ensure that all wiring is secure and cannot be damaged in any way by moving parts.

2.10.2. **Lubrication -** Check lubrication of z-axis; lubricate with NSK #1 grease if necessary.

2.10.3. **Grounding -** Make sure that the robot ground cable is attached to the robot.

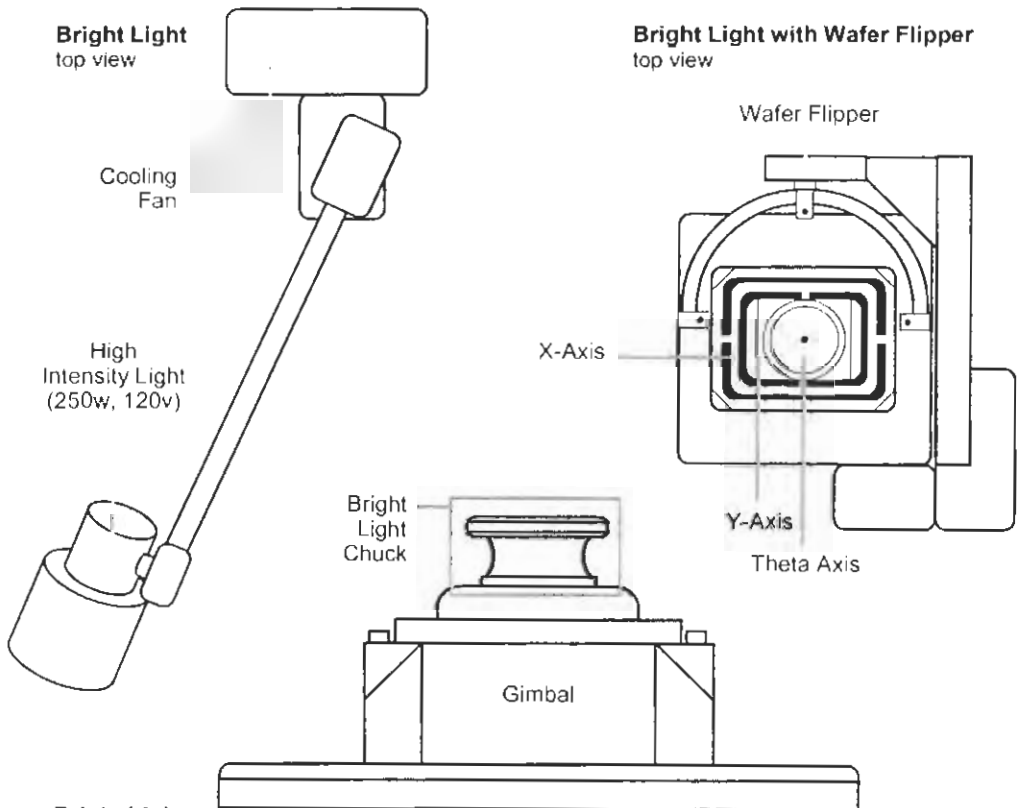
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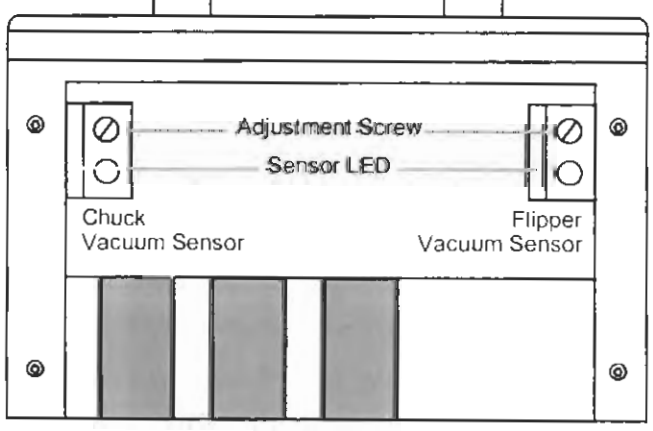
Module Testing:
Bright Light



Bright Light Module Tests:

3.1.0. Theta Encoder Test 18
3.2.0. Theta Motor Test 18
3.3.0. X- Axis Motor & Encoder Test 19
3.4.0. Y- Axis Motor & Encoder Test 19
3.5.0. Vacuum Setup & Test 20
3.6.0. Station Reference 20
3.7.0. Leveling of Bright Light Chuck & Setting Axes Limits 21
3.8.0. Inspection Light Test 22
3.9.0. Flipper Encoder & Motor Test 22
3.10.0 Flipper Vacuum Test 23
3.11.0 Flipper Upper & Lower Limit Test 24





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Module Testing: Bright Light



3.1.0. Theta Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the bright light theta-axis.

3.1.1. Switch to controller channel 1.
CHAN 1

3.1.2. Set encoder to 0.
MPOS 9 0

3.1.3. Disable theta-axis motor.
MEBL 9 0

3.1.4. Prompt continuous encoder reading.
CPOS 9

3.1.5. Manually rotate theta axis one full rotation in CCW direction. Reading of 360 degrees (should be within 3 degrees).

3.1.6. Manually rotate theta axis one full rotation in CW direction. Reading of 0 degrees (should be within 3 degrees).

3.1.7. Return to prompt.
ESC

3.1.8. Enable theta-axis motor.
MEBL 9 1

3.1.9. Reference theta-axis motor.
MREF 9

3.2.0. Theta Motor Test

This procedure verifies that the bright light theta motor can properly rotate the bright light theta axis in a clockwise and counter-clockwise direction.

3.2.1. Switch to controller channel 1.
CHAN 1

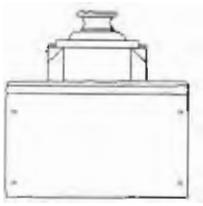
3.2.2. Reference theta-axis motor.
MREF 9

3.2.3. Rotate theta-axis 90 degrees in CCW direction.
MOVR 9 90

3.2.4. Rotate theta-axis 90 degrees in CW direction.
MOVR 9 -90

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Module Testing: Bright Light



3.3.0. X-Axis Motor & Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the bright light x-axis, and that the bright light x-axis motor can properly move the bright light x-axis back and forth.

3.3.1. Switch to controller channel 1.
CHAN 1

3.3.2. Reference x-axis motor.
MREF 7

3.3.3. Move x-axis to encoder position 0.
MOVA 7 0

3.3.4. Set encoder to 0.
MPOS 7 0

3.3.5. Rotate x-axis 10 degrees in positive direction.
MOVR 7 10

3.3.6. Prompt encoder reading.
MPOS 7

3.3.7. Rotate x-axis 10 degrees in negative direction.
MOVR 7 -10

3.3.8. Prompt encoder reading.
MPOS 7

3.3.9. Reference x-axis motor.
MREF 7

3.4.0. Y-Axis Motor & Encoder Test

This procedure verifies that the encoder is properly interpreting the position of the bright light y-axis, and that the bright light y-axis motor can properly move the bright light y-axis back and forth.

3.4.1. Switch to controller channel 1.
CHAN 1

3.4.2. Reference y-axis motor.
MREF 8

3.4.3. Move y-axis to encoder position 0.
MOVA 8 0

3.4.4. Set encoder to 0.
MPOS 8 0

3.4.5. Rotate y-axis 10 degrees in positive direction.
MOVR 8 10

3.4.6. Prompt encoder reading.
MPOS 8

3.4.7. Rotate y-axis 10 degrees in negative direction.
MOVR 8 -10

3.4.8. Prompt encoder reading.
MPOS 8

3.4.9. Reference y-axis motor.
MREF 8

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Module Testing: Bright Light



3.5.0. Vacuum Setup & Test

This procedure calibrates the bright light vacuum sensor.

3.5.1. Switch to controller channel 1.
CHAN 1

3.5.2. Activate vacuum sensor.
SVAC 3 1 1

3.5.3. Remove front cover of bright light module and adjust vacuum sensor: 1) turn the vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

3.5.4. Deactivate vacuum sensor.
SVAC 3 1 0

3.5.5. Initiate vacuum test. Adjust turn-on value until equal to turn-off value.
VACT 3 1

3.6.0. Station Reference

This procedure orients the bright light x, y and theta axes with respect to encoder positions.

3.6.1. Switch to controller channel 1.
CHAN 1

3.6.2. Reference x-axis.
MREF 7

3.6.3. Reference y-axis.
MREF 8

3.6.4. Reference theta-axis.
MREF 9

3.6.5. Reference all bright light axes.
SREF 3

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Module Testing:
Bright Light



3.7.0. Leveling of Bright Light Chuck & Setting Axes Limits

This procedure levels the bright light chuck and establishes software protection limits for the bright light x and y axes.

3.7.1. Switch to controller channel 1.
CHAN 1

3.7.2. Set x-axis offset to 0.
HPOS 7 0

3.7.3. Set y-axis offset to 0.
HPOS 8 0

3.7.4. Set x-axis negative limit.
LIMN 7 -700

3.7.5. Set y-axis negative limit.
LIMN 8 -700

3.7.6. Set x-axis positive limit.
LIMP 7 700

3.7.7. Set y-axis positive limit.
LIMP 8 700

3.7.8. Reference all bright light axes.
SREF 3

3.7.9. Rotate x-axis. Repeat until chuck is level.
MOVR 7 [+/- degrees]

3.7.10. Rotate y-axis. Repeat until chuck is level.
MOVR 8 [+/- degrees]

3.7.11. Prompt encoder reading.
MPOS 7

3.7.12. Set x-axis offset. Obtain position from previous command.
HPOS 7 [position]

3.7.13. Prompt encoder reading.
MPOS 8

3.7.14. Set y-axis offset. Obtain position from previous command.
HPOS 8 [position]

3.7.15. Reference all bright light axes.
SREF 3

3.7.16. Move all bright light axes to drop-off position. Make sure chuck is level.
SPRK 3

3.7.17. Set x-axis positive limit.
LIMP 7 60

3.7.18. Set x-axis negative limit.
LIMN 7 -60

3.7.19. Set y-axis positive limit.
LIMP 8 60

3.7.20. Set y-axis negative limit.
LIMN 8 -60

3.7.21. Save settings.
SAVE

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Module Testing:
Bright Light



3.8.0. Inspection Light Test

This procedure verifies that the bright light thermostat and shut-off are functioning properly.

CAUTION: This is not a routine test; it should only be performed when a malfunction of the bright light thermal cut-off is suspected.

3.8.1. Switch to controller channel 1.
CHAN 1

3.8.2. With cooling fan unplugged, turn on bright light.

3.8.3. Activate high-intensity light. Leave the light on for 4-5 minutes. Within 5 minutes, the thermostat should open and shut the light off.
OUTP 6 100

3.8.4. When light shuts off, plug in the cooling fan. For proper cool down, run the fan for at least 5 minutes.

3.8.5. Deactivate high-intensity light.
OUTP 6 0

3.9.0. Flipper Encoder and Motor Test

This procedure verifies that the bright light thermostat and shut-off are functioning properly.

3.9.1. Switch to controller channel 2.
CHAN 2

3.9.2. Reference the flipper module.
MREF 19

3.9.3. Park the bright light module.
SPRK 3

3.9.4. Move the flipper module to its zero position.
MOVA 19 0

3.9.5. Prompt an encoder reading of the flipper module - it should be "0".
MPOS 19

3.9.6. Move the flipper module five degrees in the positive direction.
MOVR 19 5

3.9.7. Prompt an encoder reading of the flipper module - it should be "5".
MPOS 19

3.9.8. Park the bright light module.
SPRK 3

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Module Testing:
Bright Light



3.10.0. Flipper Vacuum Test

This procedure calibrates the flipper vacuum sensor.

3.10.1. Remove the access panel from the bright light gimbal housing – this panel is distinguishable by its two threaded sensor access holes. The bright light vacuum sensor is located on the left side of the module while the flipper vacuum sensor is located on the right.

3.10.2. Switch to controller channel 2.
CHAN 2

3.10.3. Move the flipper up until it clears the top surface of the bright light chuck.
MOVR 19 1

3.10.4. Place a wafer over the vacuum ports of the flipper and hold it into position with your hand.

3.10.5. Place a wafer over the vacuum ports of the flipper and hold it into position by hand. Initiate a vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 3 2

3.10.6. Turn flipper vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 50000 (± 5000); remove wafer.

3.10.7. Park the bright light module
SPRK 3

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Module Testing:
Bright Light



3.11.0. Flipper Upper & Lower Limit Test

This procedure verifies that the flipper upper and lower limit opto sets are functioning properly.

3.11.1. Switch to controller channel 2.
CHAN 2

3.11.2. Park the bright light module.
SPRK 3

3.11.3. Prompt reading of flipper lower limit optos. A return of "1" indicates that the optos correctly sense the presence of flag.
INPV 59

3.11.4. Move the flag above the lower limit optos.
MOVR 19 10

3.11.5. Prompt reading of flipper lower limit optos. A return of "0" indicates that the optos correctly sense the absence of flag.
INPV 59 0

3.11.6. Park the bright light module.
SPRK 3

3.11.7. Prompt reading of flipper upper limit optos. A return of "0' indicates that the optos correctly sense the absence of flag.
INPV 60

3.11.8. Raise the flipper positive travel limit.
LIMP 19 70

3.11.9. Move the flipper to its positive travel limit - disregard the resulting error message.
MOVA 19 70

3.11.10. Prompt reading of flipper upper limit optos. A return of "1" indicates that the optos correctly sense the presence of flag.
INPV 60

3.11.11. Park the bright light module.
SPRK 3

3.11.12. Reset flipper travel limits.
FLIM 19

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MVT 7080 Wafer Sorter

Preventative Maintenance Checklist

Customer: _____ **Fab:** _____

Date: _____ **Contact:** _____

Serial Number: _____ **Tool Location:** _____

Start Time: _____ **Stop Time:** _____

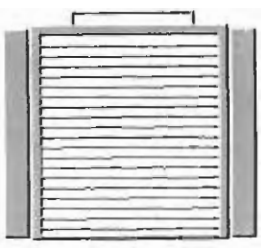
- ☐ Check the robot pick-up position angles for each module.
- ☐ Check the level of the cassette platforms to the robot paddles.
- ☐ Check the mapping of the cassette stations.
- ☐ Check paddle 1 and paddle 2 insertion into the cassette between wafers 1 and 2 and wafers 24 and 25.
- ☐ Check pickup lift, extraction and drop-off for wafers 1, 2, 24 and 25 for each cassette platform.
- ☐ Check the level of the aligner to the robot paddles.
- ☐ Adjust the pickup and drop-off positions of the robot to the aligner.
- ☐ Check the level of the bright light chuck to the robot paddles.
- ☐ Adjust the pickup and drop-off positions of the robot to the bright light module.
- ☐ Check the vacuum sensor sensitivity on the robot paddles 1 and 2, bright light chuck, and aligner chuck.
- ☐ Check the OCR reader alignment and the reader calibration recipes.
- ☐ Check joystick calibration.
- ☐ Cycle 50 wafers through each cassette station with all options turned on (bright light, aligner, and reader).
- ☐ Wipe and clean interior and exterior of machine using 70-100% IPA solution and cleanroom approved wipes. DO NOT USE ACETONE.

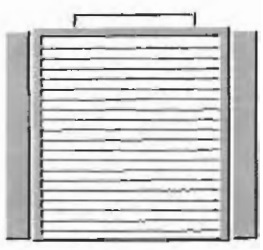
Other issues addressed : _____

Parts Used : _____

Service Engineer: _____

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MicroVision®

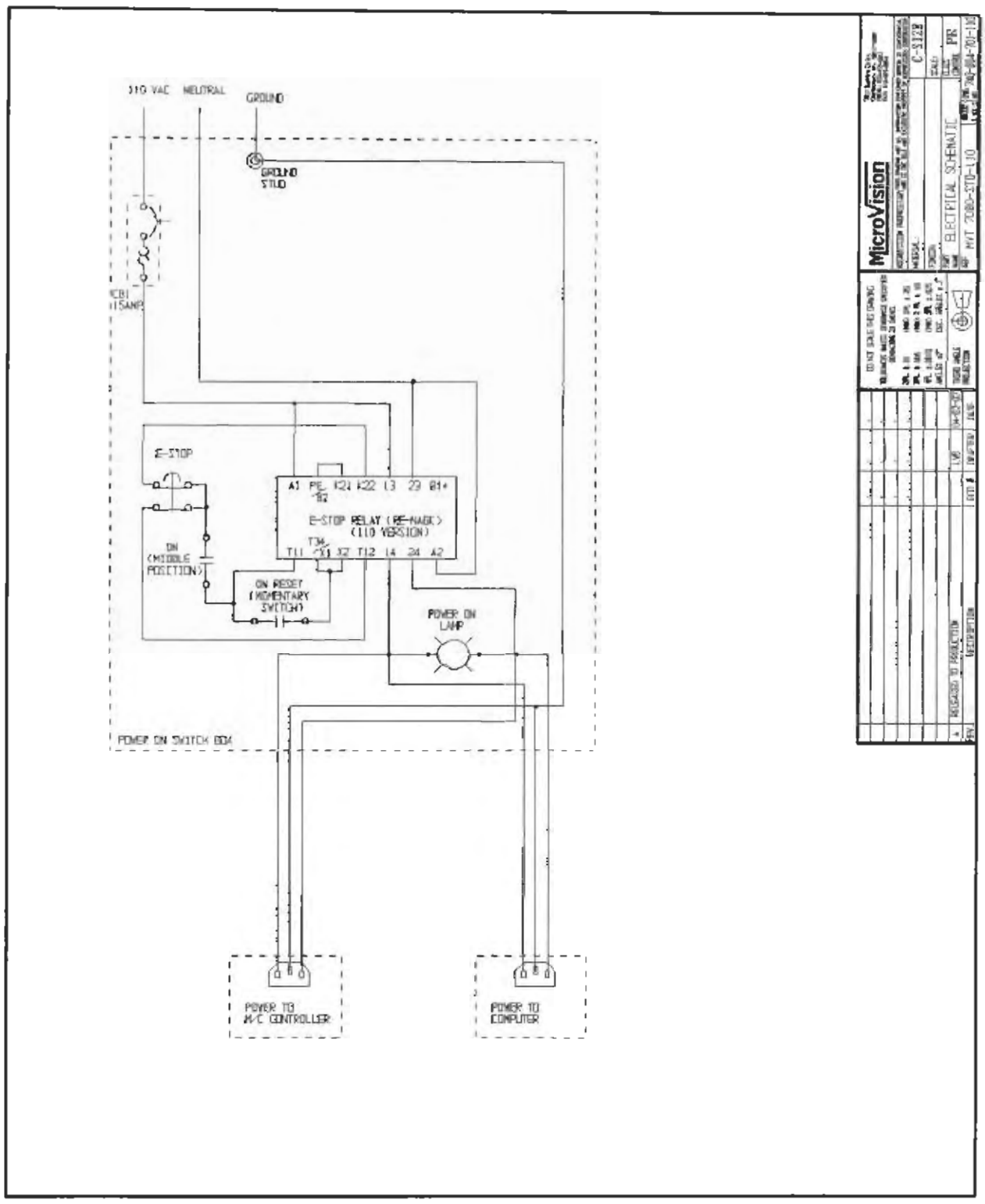


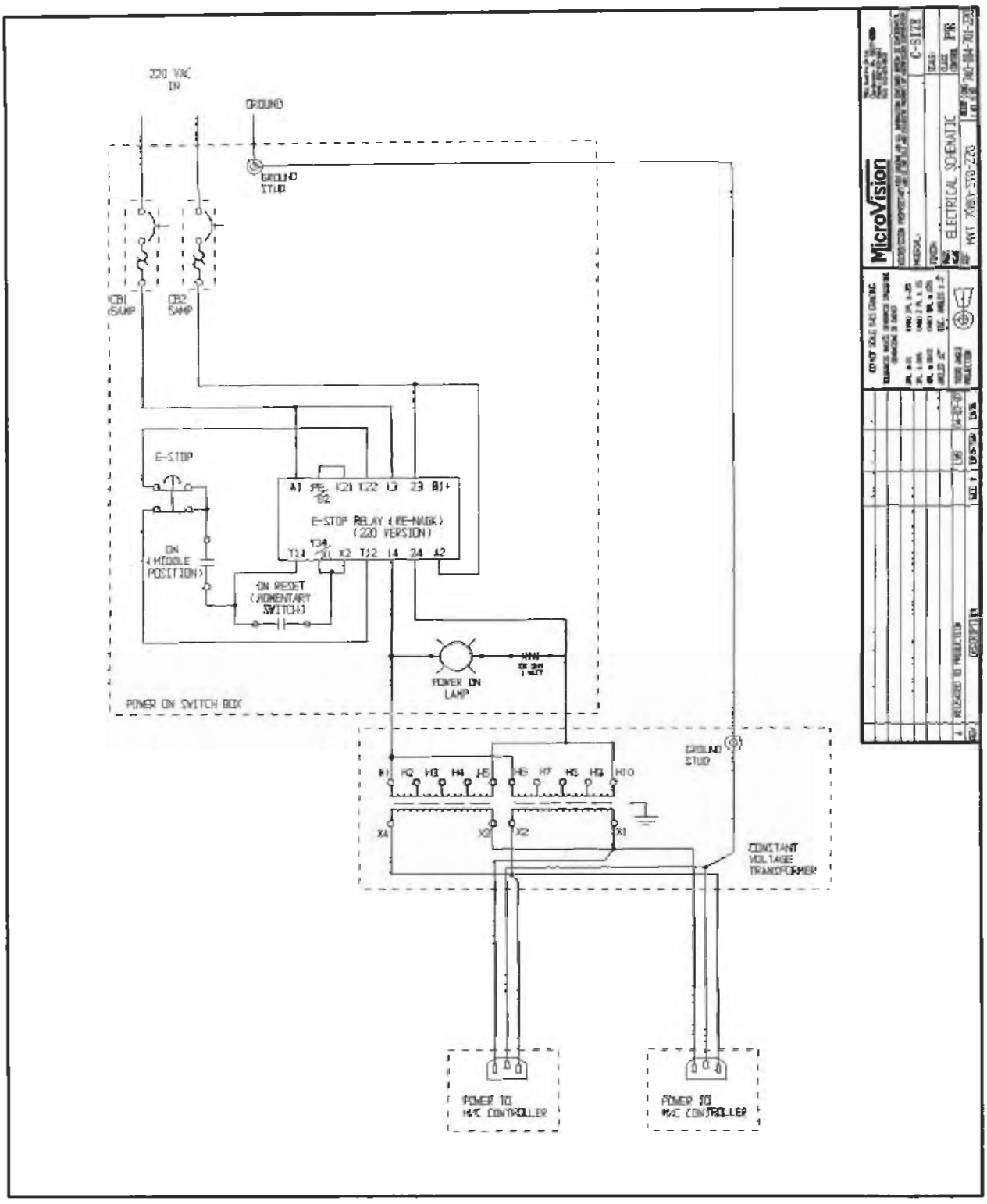
Section H: Diagrams & Parts

740-004-701-110 2
740-004-701-220 3
740-004-701-702 4
740-004-701-703 5
740-004-701-704 6
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740-004-701-706 8
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740-004-174-702 11

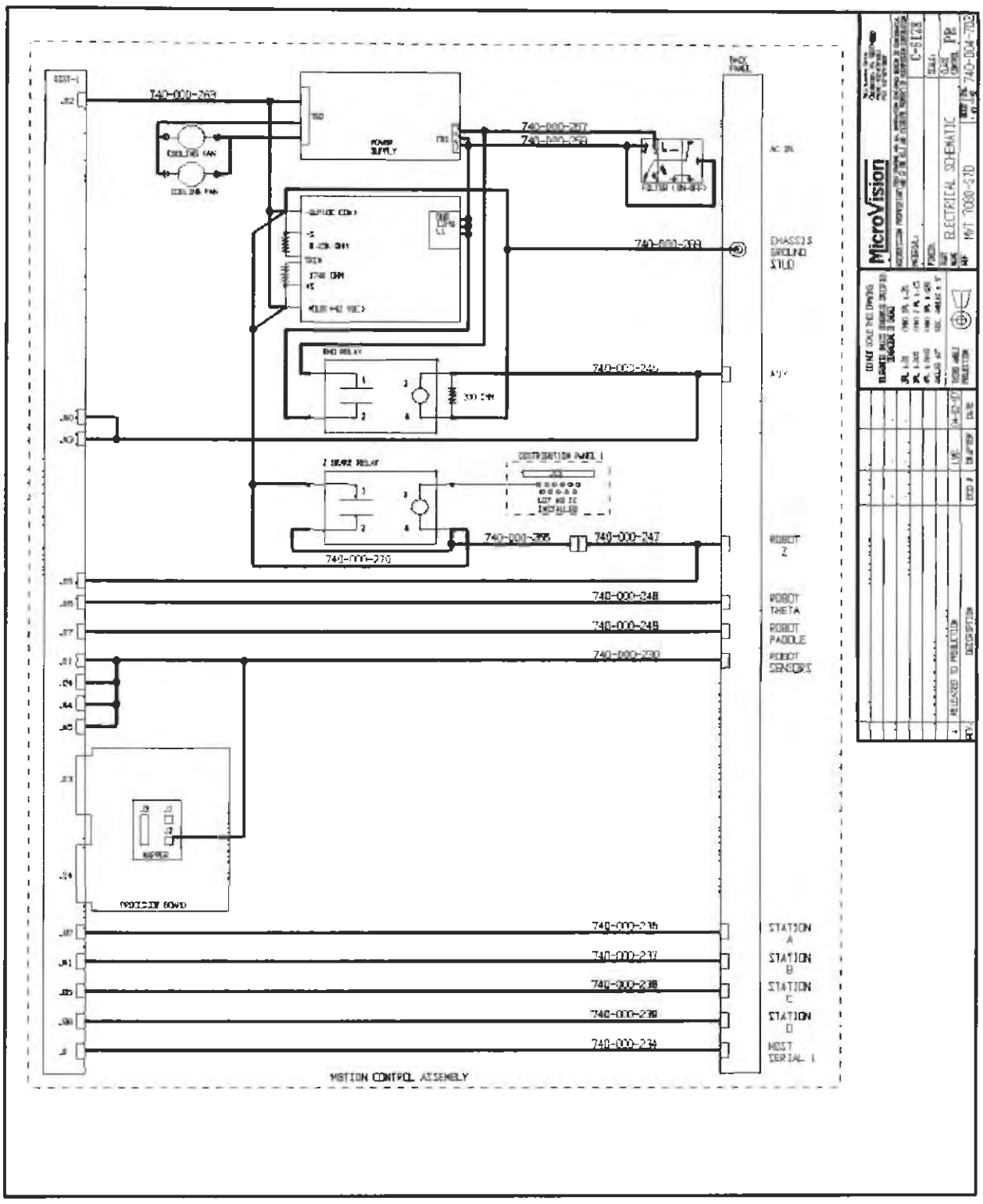
Parts List 12

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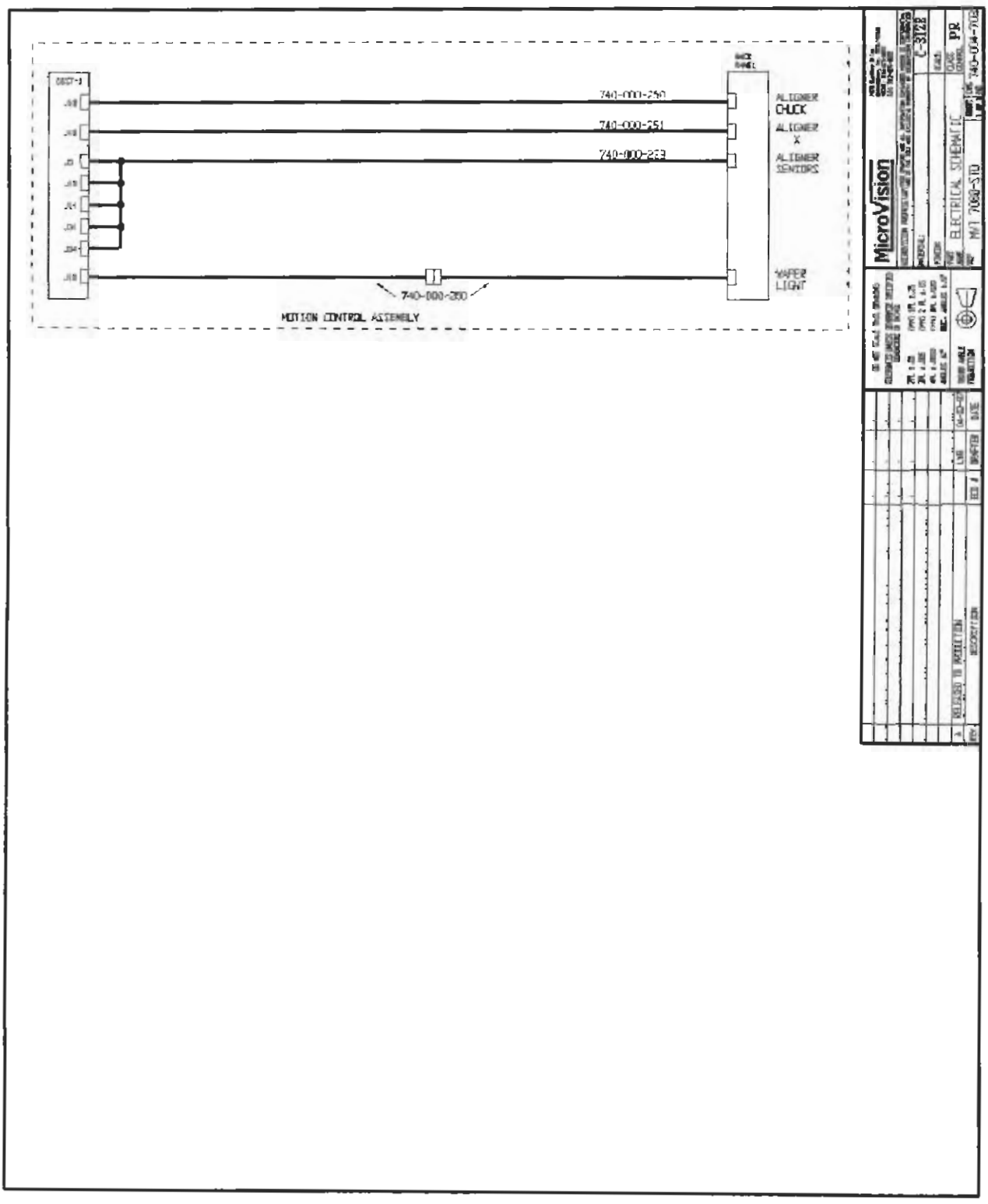

110 VAC NEUTRAL
GROUND
GROUND STUD
E-STOP
A1 PE 21 22 13 23 81
E-STOP RELAY (RE-MADE)
(110 VERSION)
T34
T11 X1 X2 T12 14 24 A2
ON (MIDDLE POSITION)
ON RESET (MOMENTARY SWITCH)
POWER ON LAMP
POWER ON SWITCH BOX
POWER TO M/C CONTROLLER
POWER TO COMPUTER
MicroVision
ELECTRICAL SCHEMATIC
MVT 7080-STD-110

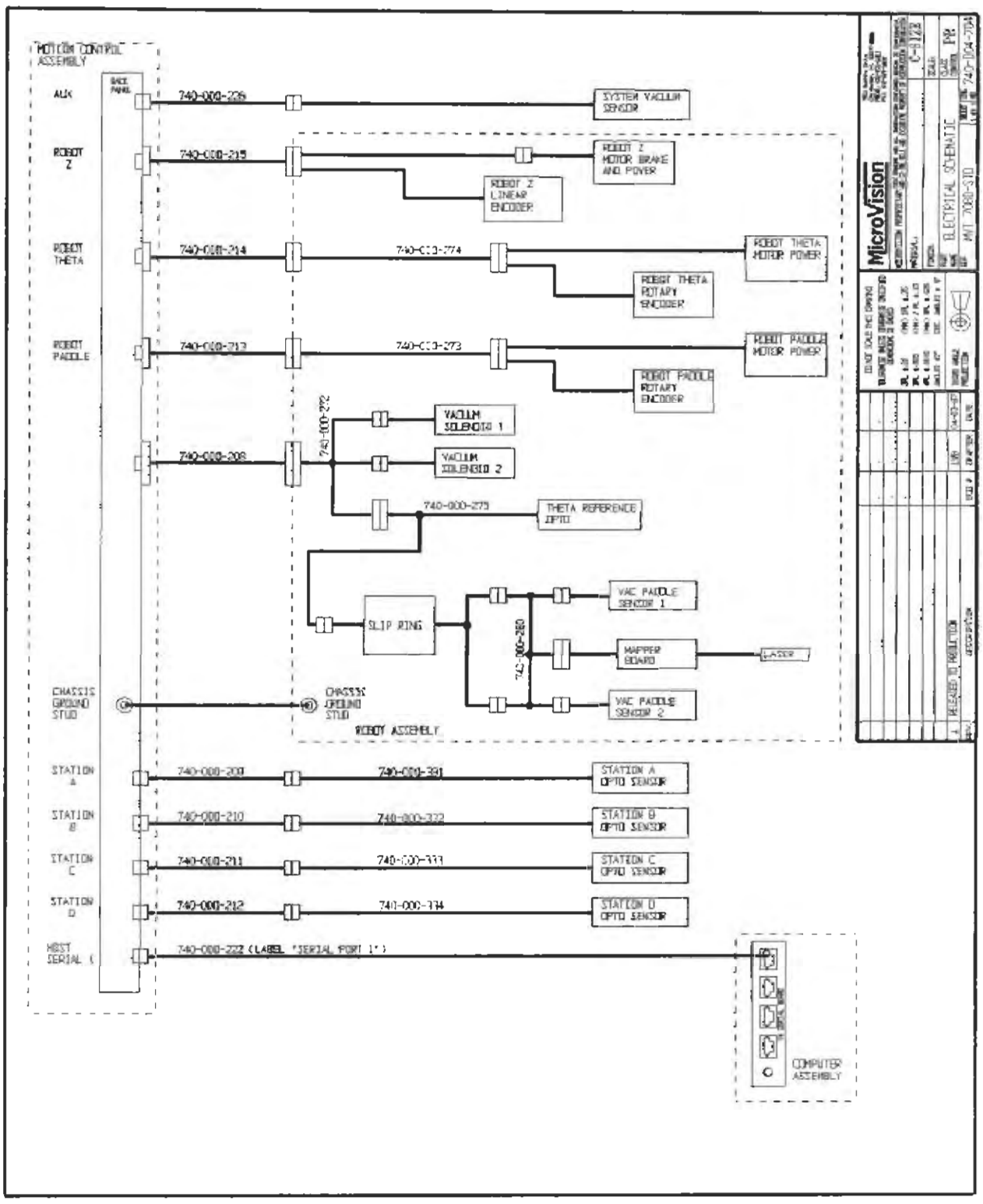


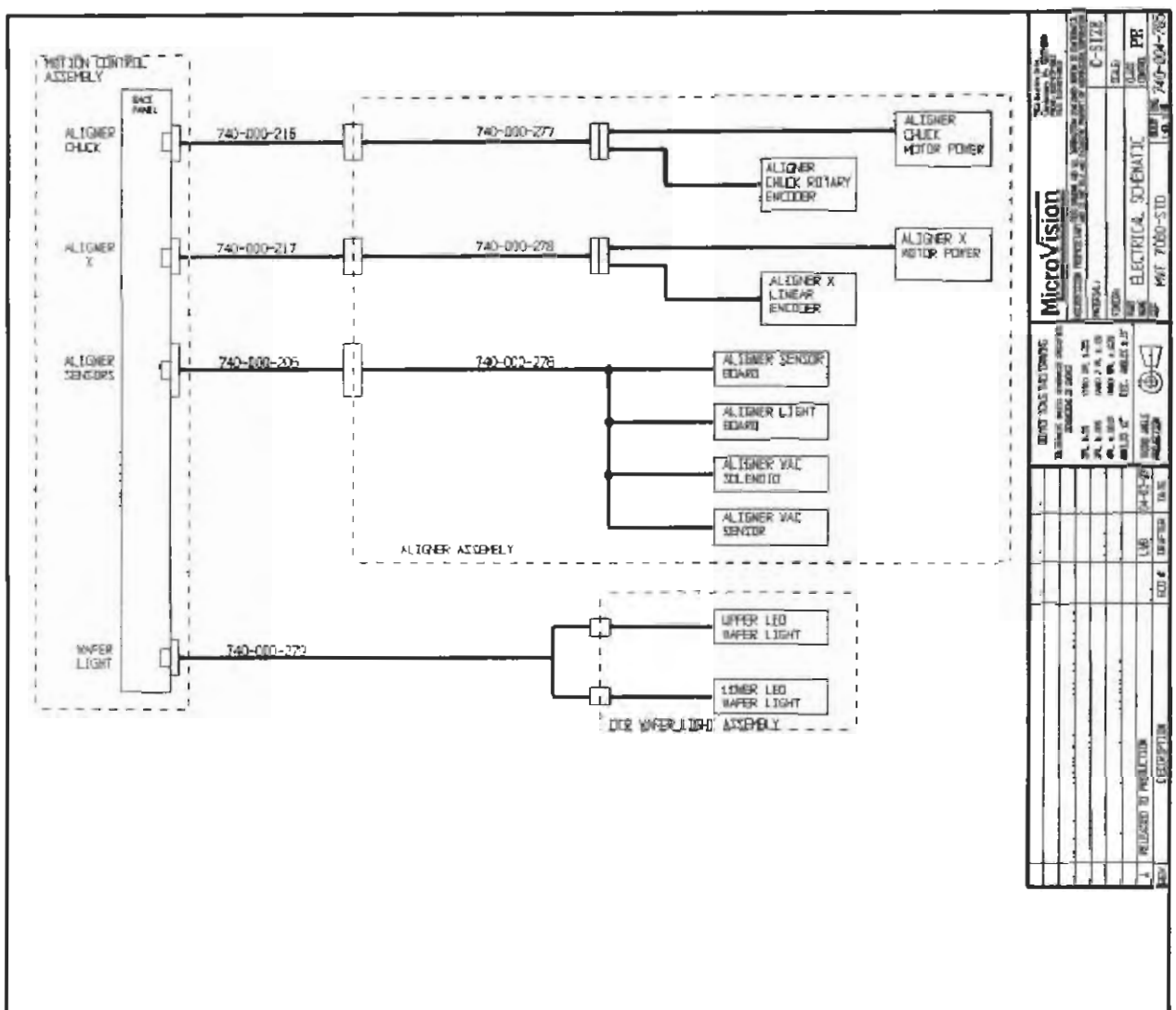
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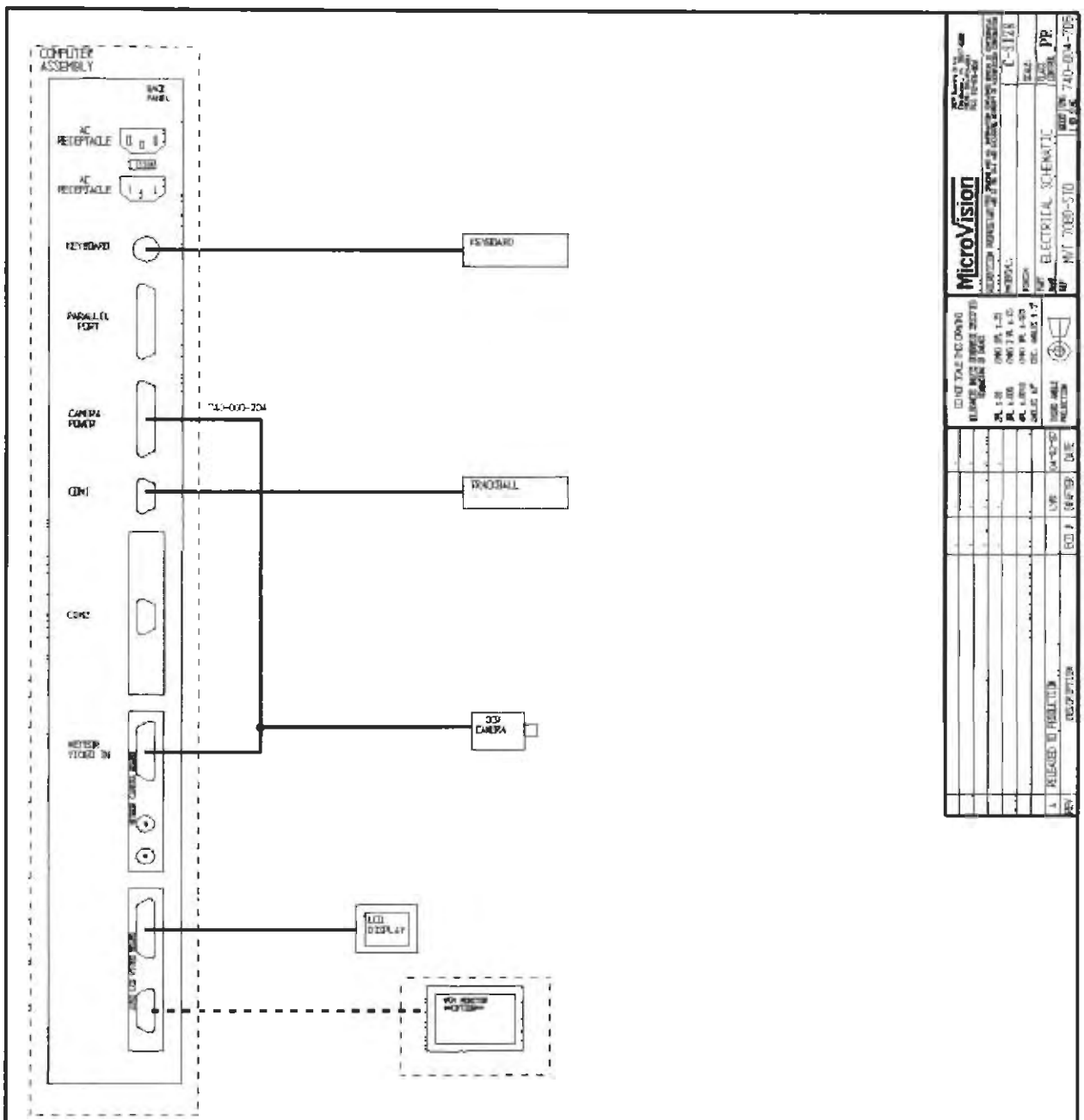


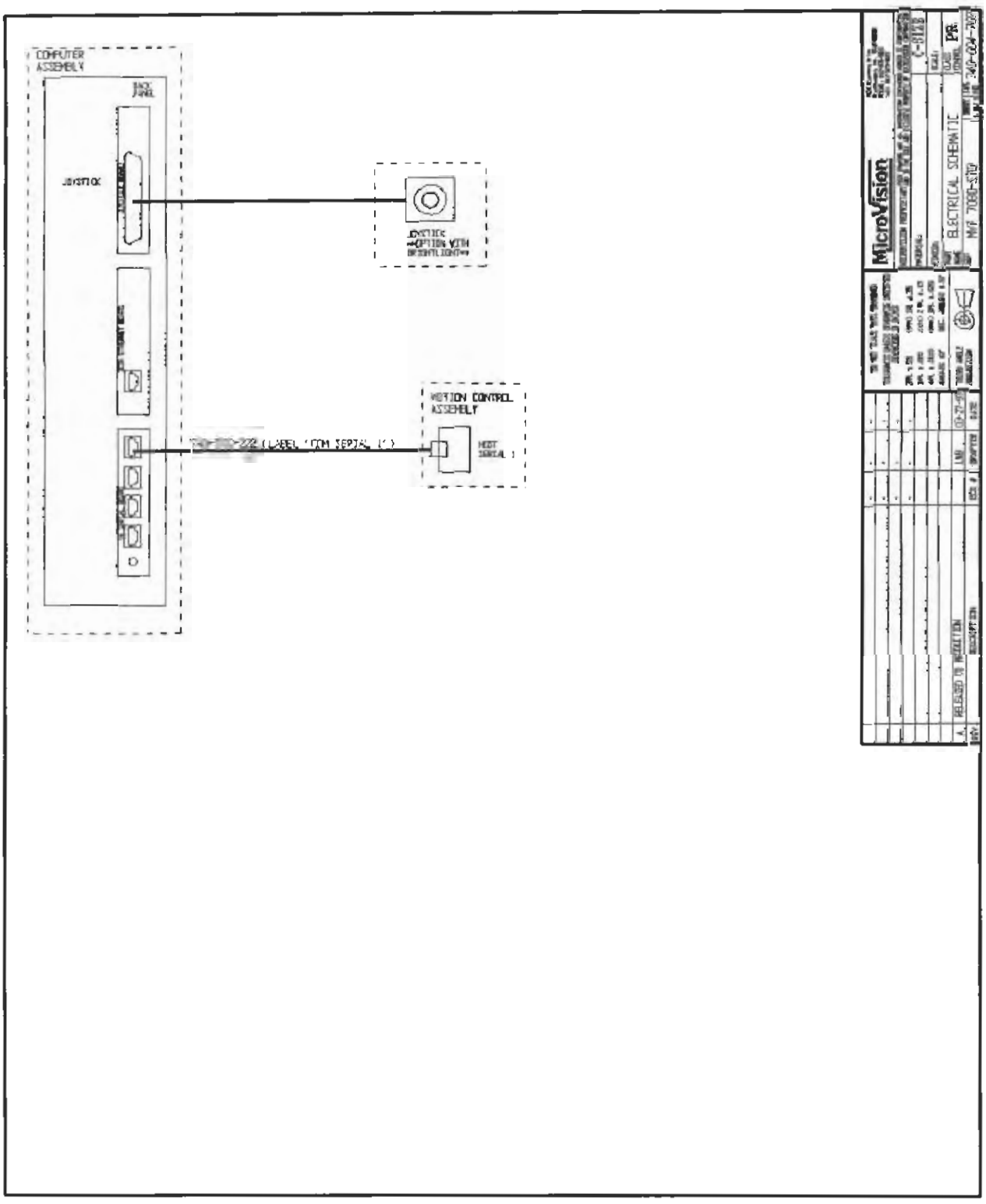
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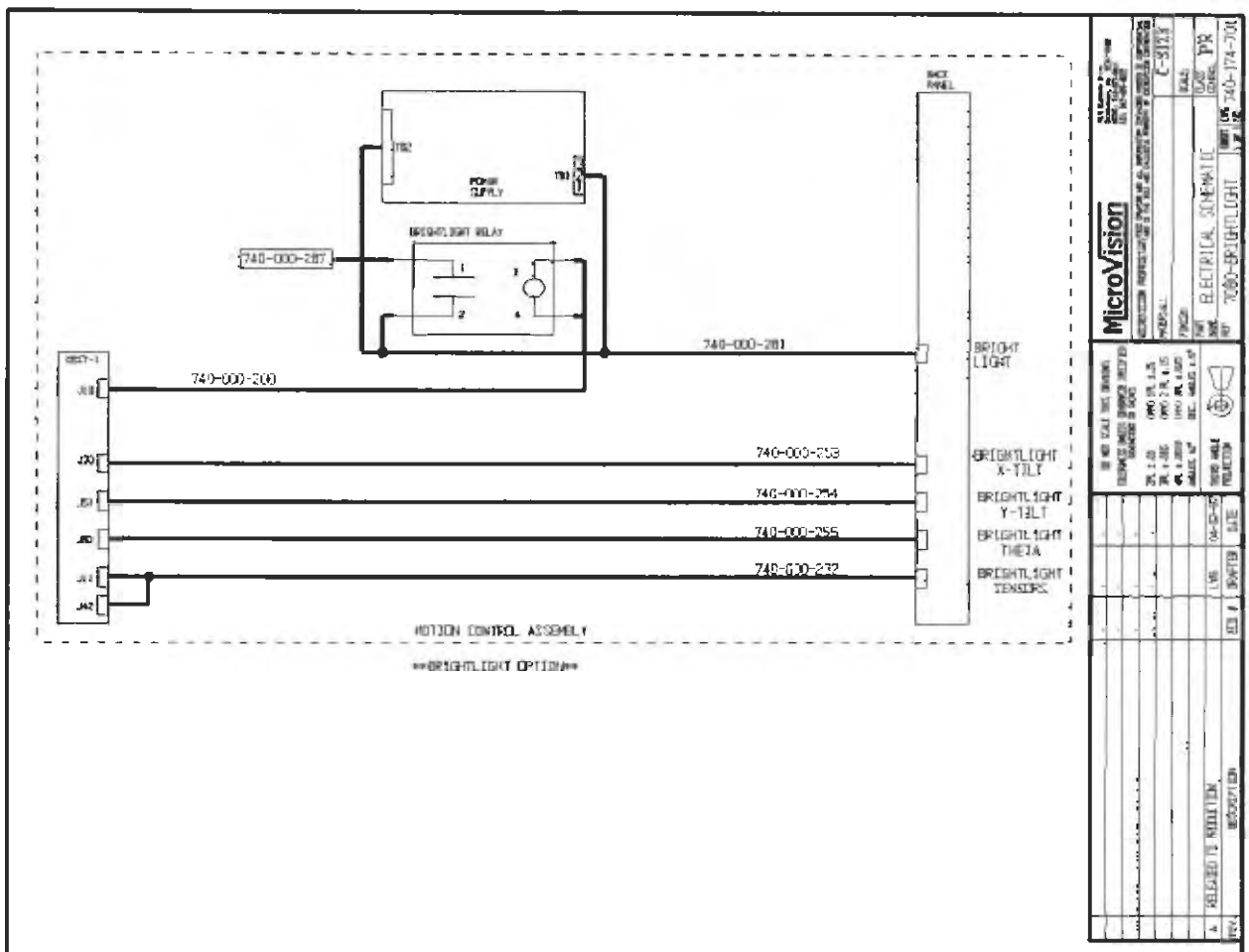

740-000-250
740-000-251
740-000-253
ALIGNER CHUCK
ALIGNER X
ALIGNER SENSORS
WAFER LIGHT
740-000-350
MOTION CONTROL ASSEMBLY
MicroVision
ELECTRICAL SCHEMATIC
MVI 7000-STD

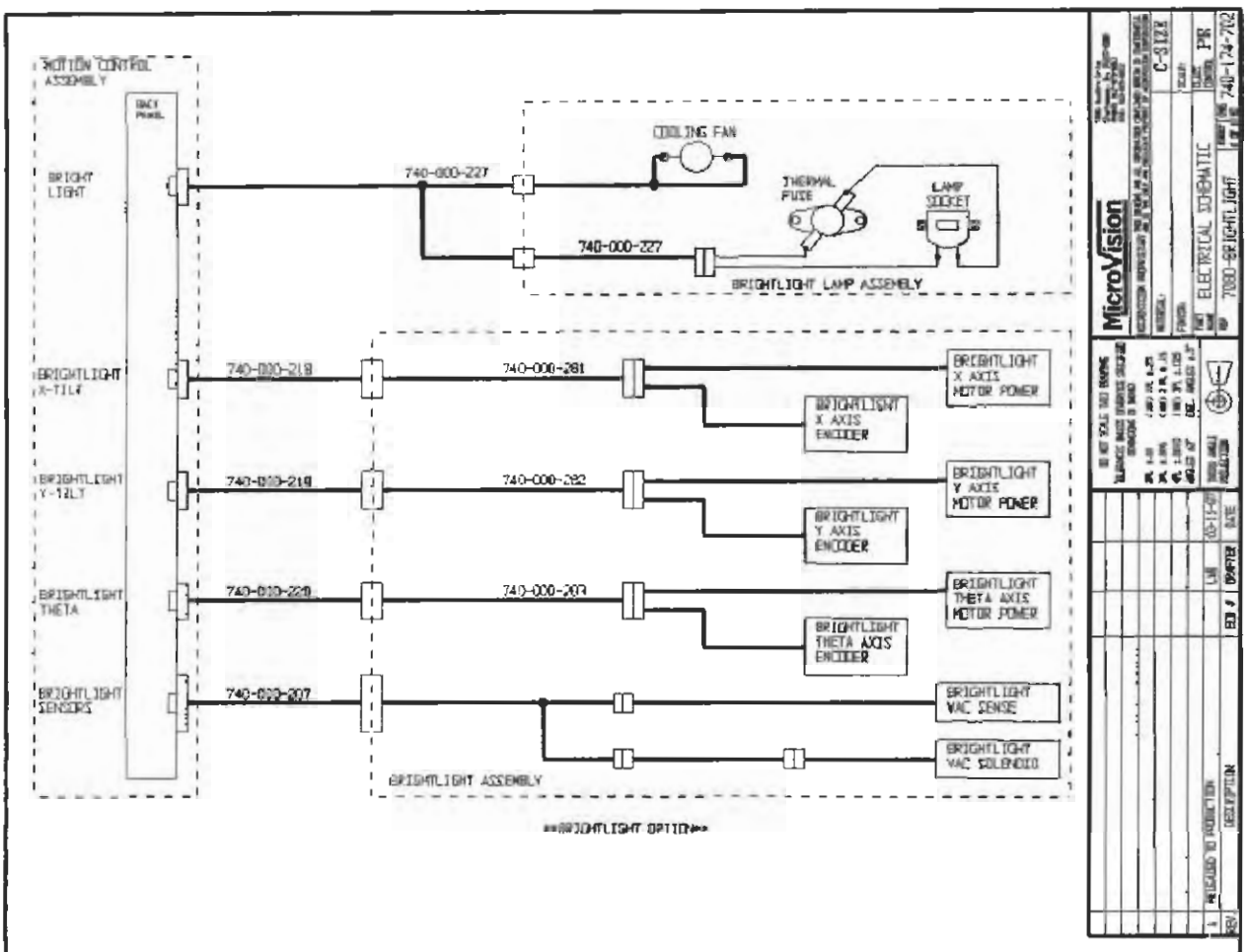

MOTION CONTROL ASSEMBLY
BACK PANEL
AUX
740-000-226
SYSTEM VACUUM SENSOR
ROBOT Z
740-000-215
ROBOT Z MOTOR BRAKE AND POWER
ROBOT Z LINEAR ENCODER
ROBOT THETA
740-000-214
740-000-274
ROBOT THETA MOTOR POWER
ROBOT THETA ROTARY ENCODER
ROBOT PADDLE
740-000-213
740-000-273
ROBOT PADDLE MOTOR POWER
ROBOT PADDLE ROTARY ENCODER
740-000-272
VACUUM SOLENOID 1
740-000-208
VACUUM SOLENOID 2
740-000-275
THETA REFERENCE OPTO
SLIP RING
740-000-280
VAC PADDLE SENSOR 1
MAPPER BOARD
LASER
VAC PADDLE SENSOR 2
CHASSIS GROUND STUD
CHASSIS GROUND STUD
ROBOT ASSEMBLY
STATION A
740-000-209
740-000-391
STATION A OPTO SENSOR
STATION B
740-000-210
740-000-392
STATION B OPTO SENSOR
STATION C
740-000-211
740-000-393
STATION C OPTO SENSOR
STATION D
740-000-212
740-000-394
STATION D OPTO SENSOR
HOST SERIAL
740-000-222 (LABEL "SERIAL PORT 1")
COMPUTER ASSEMBLY
MicroVision
ELECTRICAL SCHEMATIC
MVT 7080-STD
740-004-704
RELEASED TO PRODUCTION


MOTION CONTROL ASSEMBLY
BACK PANEL
ALIGNER CHUCK
740-000-215
740-000-277
ALIGNER CHUCK MOTOR POWER
ALIGNER CHUCK ROTARY ENCODER
ALIGNER X
740-000-217
740-000-278
ALIGNER X MOTOR POWER
ALIGNER X LINEAR ENCODER
ALIGNER SENSORS
740-000-205
740-000-276
ALIGNER SENSOR BOARD
ALIGNER LIGHT BOARD
ALIGNER VAC SOLENOID
ALIGNER VAC SENSOR
ALIGNER ASSEMBLY
WAFER LIGHT
740-000-272
UPPER LED WAFER LIGHT
LOWER LED WAFER LIGHT
LED WAFER LIGHT ASSEMBLY
MicroVision
C-SIZE
ELECTRICAL SCHEMATIC
MVI 7080-STD
740-004-705


COMPUTER ASSEMBLY
AC RECEPTACLE
AC RECEPTACLE
KEYBOARD
PARALLEL PORT
CAMERA POWER
COM1
MONITOR VIDEO IN
MicroVision
ELECTRICAL SCHEMATIC
MVT 7080-510


COMPUTER ASSEMBLY
JOYSTICK
MOTION CONTROL ASSEMBLY
MicroVision
ELECTRICAL SCHEMATIC


740-000-287
740-000-281
740-000-200
740-000-253
740-000-254
740-000-255
740-000-232
BRIGHT LIGHT
BRIGHTLIGHT X-TILT
BRIGHTLIGHT Y-TILT
BRIGHTLIGHT THETA
BRIGHTLIGHT SENSORS
MOTION CONTROL ASSEMBLY
BRIGHTLIGHT OPTION
MicroVision
ELECTRICAL SCHEMATIC
7080-BRIGHTLIGHT
740-174-701


MOTION CONTROL ASSEMBLY
BACK PANEL
BRIGHT LIGHT
740-000-227
COOLING FAN
THERMAL FUSE
LAMP SOCKET
740-000-227
BRIGHTLIGHT LAMP ASSEMBLY
BRIGHTLIGHT X-TILT
740-000-218
740-000-281
BRIGHTLIGHT X AXIS MOTOR POWER
BRIGHTLIGHT X AXIS ENCODER
BRIGHTLIGHT Y-TILT
740-000-218
740-000-282
BRIGHTLIGHT Y AXIS MOTOR POWER
BRIGHTLIGHT Y AXIS ENCODER
BRIGHTLIGHT THETA
740-000-220
740-000-209
BRIGHTLIGHT THETA AXIS MOTOR POWER
BRIGHTLIGHT THETA AXIS ENCODER
BRIGHTLIGHT SENSORS
740-000-207
BRIGHTLIGHT VAC SENSE
BRIGHTLIGHT VAC SOLENOID
BRIGHTLIGHT ASSEMBLY
BRIGHTLIGHT OPTION
MicroVision
C-SIZE
ELECTRICAL SCHEMATIC
7000-BRIGHTLIGHT
740-124-702
RELEASED TO PRODUCTION
DESCRIPTION

Component	Description	Manufacturer	Part Number
801-206-001	POWER SUPPLY-MAP130-4001 W/COVER	CONTACT MICROVISION CORP.	MAP130-4001
801-209-001	SENSOR-OPTO	CONTACT MICROVISION CORP.	HOA6981-T51
801-221-001	LENS-COSMICAR-25MM F1.4 SMALL	CONTACT MICROVISION CORP.	C22525
801-234-001	CAMERA-CCD VIDEO-XC-75	CONTACT MICROVISION CORP.	XC-75
801-244-001	FLOPPY DRIVE-3 1/2 IN. 1.44MB	CONTACT MICROVISION CORP.	193077772-91
801-289-001	TRANSFORMER-50/60 HZ 220-110	CONTACT MICROVISION CORP.	TF2-17437S
801-311-001	NETWORK ADAPTER-3COM-ETHERLINK III	CONTACT MICROVISION CORP.	MFG 3C509B-TP
801-332-001	IO-RELAY OPTO MODULE DC-AC SOLID ST	CONTACT MICROVISION CORP.	120D10
801-346-001	MONITOR-17 IN. NOKIA MULTIGRAPH	CONTACT MICROVISION CORP.	447XI
801-446-001	BEARING-ID 5/8 IN.	CONTACT MICROVISION CORP.	E9-S3
801-447-001	BEARING-BALL SHLD .375X.875 AB7	CONTACT MICROVISION CORP.	E1-15
801-448-001	PULLEY-.080P-60 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6A16-060NF2508
801-449-001	PULLEY-.080P-15 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6A16-015DF2506
801-451-001	PULLEY-.080P-22 GROOVE-.375W-.1875B	CONTACT MICROVISION CORP.	A6A16-022DF3706
801-452-001	BELT-.080P-100 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6Z16-100025
801-454-001	SENSOR-ENCODER-70MM TRAVEL LINEAR	CONTACT MICROVISION CORP.	LS323C 70MM
801-455-001	SENSOR-ENCODER-ROTARY	CONTACT MICROVISION CORP.	ERO 1421
801-458-001	NUT-0.5 IN. LEAD 0.50 IN. DIA.	CONTACT MICROVISION CORP.	SN20B
801-460-001	RAILS-R3150 AC3 X 22 ROLLERS-GA3	CONTACT MICROVISION CORP.	NSR 3150-AC3
801-466-001	SOLENOID-VACUUM 12 VDC-.039 ORIFACE	CONTACT MICROVISION CORP.	D162202
801-467-001	SWITCH-VACUUM	CONTACT MICROVISION CORP.	NZSE2-T1-15
801-482-001	RAILS-R3175 AC3 X 18 ROLLER-GB3	CONTACT MICROVISION CORP.	NSR 3175 AC3 18
801-526-001	OUTLET STRIP-6 POSITION	CONTACT MICROVISION CORP.	UL24RA6
801-563-001	BEARING-BALL SEALED .25X.625X.2	CONTACT MICROVISION CORP.	GEN-99R4
801-746-001	POWER CORD-AMC-7.5 FT. SVT 18/3	CONTACT MICROVISION CORP.	C-3119-008-BL
802-001-001	PULLEY-.080P-40 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6A16-040DF2508
802-002-001	PULLEY-.080P-80 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6A16-040DF2508
802-007-001	PULLEY-.080P-22 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6A16-022DF2506
802-009-001	BELT-.080P-235 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6Z16-235025
802-010-001	BELT-.080P-101 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6Z16-101025
802-014-001	BEARING-8MM BORE-MBG6-6	CONTACT MICROVISION CORP.	MBG6-6
802-015-001	BEARING-1IN BORE-ABEC 3	CONTACT MICROVISION CORP.	E12-S3
802-016-001	BEARING-1/2IN BORE-ABEC 7	CONTACT MICROVISION CORP.	E7-S7
802-017-001	BEARING-1/2IN BORE THIN-ABEC 5	CONTACT MICROVISION CORP.	E5-2
802-170-001	HARD DRIVE-IDE	CONTACT MICROVISION CORP.	ST31276A
802-255-001	LCD MODULE-PASSIVE COLOR 10.4 IN.	CONTACT MICROVISION CORP.	LM64C35P
802-396-001	FAN-ELINA 24VDC, 18 CFM, 70 M AMP	CONTACT MICROVISION CORP.	HDF6025L-24HB
802-441-001	BELT-.080P-80 GROOVE-.25 IN.	CONTACT MICROVISION CORP.	A6Z16-080025
802-449-001	MOTOR-DC 42V-90W	CONTACT MICROVISION CORP.	RE-035-071-34EAX2015 W/FLAT V1
802-468-001	BRAKE-POWER OFF 48V	CONTACT MICROVISION CORP.	1701-5121
802-469-001	POWER SUPPLY-400W 48V VICOR	CONTACT MICROVISION CORP.	VI-MA4-EQ
802-555-001	INTERFACE ADPTR KIT-SHARP LM64C35P	CONTACT MICROVISION CORP.	RT-45-3
802-626-001	FUSE-5 AMP	CONTACT MICROVISION CORP.	
802-632-001	PLUG-HUBBELL ISOLGRIP DEAD FRONT P	CONTACT MICROVISION CORP.	HBL5266C
802-786-001	PROTECTIVE RING-E-STOP	CONTACT MICROVISION CORP.	800T-N310
802-787-001	KEYBOARD-SPACE SAVER-TRAY-STD 5P	CONTACT MICROVISION CORP.	TIRUC
802-788-001	COVER PANEL-LCD-8.7 X 6.6 X .0625	CONTACT MICROVISION CORP.	P/N 06-000-97MO-1075
802-995-001	OPTICS-LENS CONDENSING MAP & ALIGN	CONTACT MICROVISION CORP.	17.1022
803-027-001	VALVE-CHECK 10-32 MALE/FEMALE	CONTACT MICROVISION CORP.	80-0503-01
803-086-001	CD ROM-INTERNAL-IDE	CONTACT MICROVISION CORP.	290151
803-090-001	BELT-.080P-65 GROOVE-.375 IN.	CONTACT MICROVISION CORP.	A6Z16-065037
803-091-001	PULLEY-.080P-32 GROOVE-.375 IN.	CONTACT MICROVISION CORP.	A6A16-032DF3708
803-100-001	LAMP-QUARTZLINE 120V 250W	CONTACT MICROVISION CORP.	ENH120V250W
803-102-001	FILTER-POWER ENTRY-110VAC-6A	CONTACT MICROVISION CORP.	6EDL1SC
803-103-001	POWER SERVER-3 AMP-SOLID ST RELAY	CONTACT MICROVISION CORP.	DC60S3
803-105-001	IO BOARD-MED SPEED-8 CHAN-ANALOG IN	CONTACT MICROVISION CORP.	CIO-DAS08/JR
803-109-001	CARD-VIDEO-METEOR PCI FRAME GRABBER	CONTACT MICROVISION CORP.	METEOR-CLR/MONO
803-111-001	JOYSTICK, DISPLACEMENT	CONTACT MICROVISION CORP.	521Z
803-201-001	CARD-SERIAL-4 PORT	CONTACT MICROVISION CORP.	V4-ISA-550IRJ
803-202-001	SOCKET-ENH LAMP-F59	CONTACT MICROVISION CORP.	350-F59 SOCKET
803-254-001	MOTOR-DC 42V-20W	CONTACT MICROVISION CORP.	RE-025-055-37EBX2-008
803-276-001	GROMMET-15/32 MOUNT HOLE	CONTACT MICROVISION CORP.	91103
803-362-001	SWITCH-3 POSITION ALLEN BRADLEY	CONTACT MICROVISION CORP.	800T-J5KE7B
803-363-001	SWITCH-LEGEND PLATE OFF/ON	CONTACT MICROVISION CORP.	800T-X529
803-364-001	CIRCUIT BREAKER-THERMAL 15A ROUND	CONTACT MICROVISION CORP.	KD1-15
803-406-001	CARD-VIDEO-ATI 4MB MACH64 PRO TURBO	CONTACT MICROVISION CORP.	ATI-25500
803-421-001	SENSOR-ENCODER-170MM TRAVEL LINEAR	CONTACT MICROVISION CORP.	LS323C 170MM
803-437-001	SOLENOID-VACUUM 12 VDC-.089 ORIFICE	CONTACT MICROVISION CORP.	D192202
803-569-001	PULLEY-2.03MMP-14 GROOVE-6MM	CONTACT MICROVISION CORP.	A6A16-M014DF6003
803-571-001	PULLEY-4MMP-30 GROOVE	CONTACT MICROVISION CORP.	MF20G4-30

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Component	Description	Manufacturer	Part Number
803-572-001	PULLEY-4MMP-60 GROOVE	CONTACT MICROVISION CORP.	MF20G4-60
803-573-001	BELT-4MMP-50 GROOVE-SS CORE	CONTACT MICROVISION CORP.	F20TS-50
803-574-001	BELT-4MMP-80 GROOVE-SS CORE	CONTACT MICROVISION CORP.	F20TS-80
803-579-001	NUT-0.20 IN. LEAD 0.625 IN. DIA	CONTACT MICROVISION CORP.	RB30-2
803-582-001	BEARING-BALL .25 X .375 FLANGED	CONTACT MICROVISION CORP.	E2-11-3
803-598-001	BEARING-LINK BODY 4-40 TAPPED	CONTACT MICROVISION CORP.	87A
803-599-001	BEARING-FASTN-#4-40 SLOTTED SCREW	CONTACT MICROVISION CORP.	11001
803-600-001	BEARING-FASTN-CON STANDOFF #4 X .25	CONTACT MICROVISION CORP.	78A03
803-601-001	BEARING-BALL .250 X #4 HOLE	CONTACT MICROVISION CORP.	78A04
803-609-001	PAD-HEAT SINK SP600 .75IN X .85FT	CONTACT MICROVISION CORP.	SP600
803-610-001	GLASS-FLOAT 1.000+/-X3.470+/-.005	CONTACT MICROVISION CORP.	GROUND GLASS
803-613-001	LENS EXTENDER 1MM STAINLESS+/-.003	CONTACT MICROVISION CORP.	N/A
803-695-001	MIRROR-HOT 2 INCH X 2 INCH X 3MM	CONTACT MICROVISION CORP.	03 MGH 007
803-696-001	GLASS-SCHOTT 2 X 2 X 3MM YLW FLTR	CONTACT MICROVISION CORP.	03 FCG 065
803-776-001	FAN-SPINNAKER DC BLOWER 24VDC	CONTACT MICROVISION CORP.	SPD24B1
803-783-001	THERMOSTAT-250 DEGREE OPEN	CONTACT MICROVISION CORP.	OA-250
803-842-001	CONTROLLER-LCD	CONTACT MICROVISION CORP.	AV548-PCI-LM64C35P
803-913-001	BRD-PENTIUM 133MHZ W/32 MB MEMORY	CONTACT MICROVISION CORP.	4MX32EDO-60
804-046-001	TRACKBALL-SORTER	CONTACT MICROVISION CORP.	TRACKMAN VISTA
804-052-001	CASE-BABY VERT W/PS II TYPE-CE MARK	CONTACT MICROVISION CORP.	CF-8502S
804-069-001	RELAY-EMERGENCY STOP CONTROL 115VAC	CONTACT MICROVISION CORP.	RS-NAGK/115VAC
804-071-001	FERRITE-CYLINDRICAL-0.200 ID	CONTACT MICROVISION CORP.	28B0375-300
804-161-001	CIRCUIT BREAKER-THERMAL 5A ROUND	CONTACT MICROVISION CORP.	29F1605
804-173-001	LASER DIODE MODULE-LINE OPTIC	CONTACT MICROVISION CORP.	902429238 PMT01
804-195-001	BUTTON-E STOP-RED-2 CONTACTS	CONTACT MICROVISION CORP.	800T-FX6A5
804-221-001	LED-PANEL MOUNT INDICATOR	CONTACT MICROVISION CORP.	1091M5-125VAC
804-254-001	RELAY-EMERGENCY STOP CONTROL 230VAC	CONTACT MICROVISION CORP.	RS-NAGK/230VAC
804-261-001	FILTER-POWER H SERIES-110VAC-6A	CONTACT MICROVISION CORP.	6311
804-262-001	SWITCH-LEGEND PLATE- 0 1 -CE	CONTACT MICROVISION CORP.	800T-X642
804-263-001	POWER CORD-14 GAUGE-3 COND-0.38 OD	CONTACT MICROVISION CORP.	1601125 H05VV-F3G2.5
170-300-061	LARGE BOAT STOP PIN	MICROVISION CORP.	170-300-061
170-300-062	SMALL BOAT STOP PIN	MICROVISION CORP.	170-300-062
170-300-200	VACUUM BULKHEAD SPACER	MICROVISION CORP.	170-300-200
170-300-201	BOAT SENSOR-CAP	MICROVISION CORP.	170-300-201
170-300-203	BOAT SENSOR-TRIGGER PIN	MICROVISION CORP.	170-300-203
170-300-204	BOAT SENSOR-HOUSING	MICROVISION CORP.	170-300-204
170-301-101	MOTION CONTROL PROC BRD-REV 2.1	MICROVISION CORP.	170-301-101
170-301-102	MOTION CONTROL DIST PNL-REV 2.2	MICROVISION CORP.	170-301-102
740-200-001	ALIGNER-CHASSIS-TOP PLATE	MICROVISION CORP.	740-200-001
740-200-002	ALIGNER-CHASSIS-PEDESTAL-BOTTOM	MICROVISION CORP.	740-200-002
740-200-004	ALIGNER-CHASSIS-BASE PLATE	MICROVISION CORP.	740-200-004
740-200-005	ALIGNER-CHASSIS-SET SCREW COVER	MICROVISION CORP.	740-200-005
740-200-010	ALIGNER-CHASSIS-PEDESTAL-FRONT	MICROVISION CORP.	740-200-010
740-200-011	ALIGNER-CHASSIS-PEDESTAL-REAR	MICROVISION CORP.	740-200-011
740-200-012	ALIGNER-CHASSIS-PEDESTAL-RIGHT	MICROVISION CORP.	740-200-012
740-200-013	ALIGNER-CHASSIS-PEDESTAL-LEFT	MICROVISION CORP.	740-200-013
740-200-014	ALIGNER-CABLE CLAMP PLATE	MICROVISION CORP.	740-200-014
740-200-015	ALIGNER-CABLE CLAMP-UPPER	MICROVISION CORP.	740-200-015
740-200-016	ALIGNER-CABLE CLAMP-LOWER	MICROVISION CORP.	740-200-016
740-200-017	ALIGNER-CABLE CLAMP-UPPER TOP	MICROVISION CORP.	740-200-017
740-200-020	ALIGNER-ANODIZING PLUG	MICROVISION CORP.	740-200-020
740-200-021	ALIGNER-THETA-DRIVE HOUSING	MICROVISION CORP.	740-200-021
740-200-022	ALIGNER-THETA-CHUCK	MICROVISION CORP.	740-200-022
740-200-023	ALIGNER-THETA-SHAFT	MICROVISION CORP.	740-200-023
740-200-024	ALIGNER-THETA-ENCODER MOUNT PLATE	MICROVISION CORP.	740-200-024
740-200-027	ALIGNER-THETA MOTOR MOD	MICROVISION CORP.	740-200-027
740-200-030	ALIGNER-X-SUPERNUT HOUSING	MICROVISION CORP.	740-200-030
740-200-031	ALIGNER-X-SUPERNUT CLAMP	MICROVISION CORP.	740-200-031
740-200-033	ALIGNER-X-LEAD SCREW	MICROVISION CORP.	740-200-033
740-200-034	ALIGNER-X-DRIVE HOUSING	MICROVISION CORP.	740-200-034
740-200-038	ALIGNER-X-MOTOR PULLEY	MICROVISION CORP.	740-200-038
740-200-039	ALIGNER-X-DRIVE HOUSING COVER	MICROVISION CORP.	740-200-039
740-200-052	ALIGNER-ARRAY BOARD HOUSING	MICROVISION CORP.	740-200-052
740-200-054	ALIGNER-ARRAY BOARD HOUSING COVER	MICROVISION CORP.	740-200-054
740-200-061	ALIGNER-ILLUMINATION ARM	MICROVISION CORP.	740-200-061
740-200-062	ALIGNER-ILLUMINATION MOUNT BLOCK	MICROVISION CORP.	740-200-062
740-200-063	ALIGNER-CYLINDRICAL LENS HOLDER	MICROVISION CORP.	740-200-063
740-200-064	ALIGNER-CYLINDRICAL LENS	MICROVISION CORP.	740-200-064
740-200-073	ALIGNER-CAMERA ARM-UPPER	MICROVISION CORP.	740-200-073
740-200-074	ALIGNER-SUPPORT-ILL. BLOCK, LWR	MICROVISION CORP.	740-200-074

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Component	Description	Manufacturer	Part Number
740-200-075	ALIGNER-CAMERA ARM-LOWER	MICROVISION CORP.	740-200-075
740-200-076	ALIGNER-CLAMP-ILL. BLOCK, LWR	MICROVISION CORP.	740-200-076
740-200-077	ALIGNER-AMBIENT SHIELD-TOP MOUNT	MICROVISION CORP.	740-200-077
740-200-078	ALIGNER-AMBIENT SHIELD-TOP	MICROVISION CORP.	740-200-078
740-200-079	WAFER LIGHT-ACRYLIC BLOCK	MICROVISION CORP.	740-200-079
740-200-081	WAFER LIGHT-MOUNT BLOCK-LED BOARD	MICROVISION CORP.	740-200-081
740-200-082	WAFER LIGHT-CAMERA PLATE-XC-75	MICROVISION CORP.	740-200-082
740-200-083	WAFER LIGHT-CAMERA ADJUST PLATE	MICROVISION CORP.	740-200-083
740-200-084	WAFER LIGHT-CAMERA MODULE MNT PLAT	MICROVISION CORP.	740-200-084
740-200-086	WAFER LIGHT-GLASS HOLDER	MICROVISION CORP.	740-200-086
740-200-087	WAFER LIGHT-CAMERA COVER	MICROVISION CORP.	740-200-087
740-200-088	ALIGNER-SHIELD - OFF AXIS	MICROVISION CORP.	740-200-088
740-200-089	ALIGNER-SUPPORT SHIELD AMBIENT	MICROVISION CORP.	740-200-089
740-200-090	ALIGNER-SHIELD AMBIENT LOWER	MICROVISION CORP.	740-200-090
740-200-092	ALIGNER-SHIELD AMBIENT UPPER	MICROVISION CORP.	740-200-092
740-300-001	ROBOT-CHASSIS-TOP PLATE	MICROVISION CORP.	740-300-001
740-300-002	ROBOT-CHASSIS-BOTTOM PLATE	MICROVISION CORP.	740-300-002
740-300-003	ROBOT-CHASSIS-CONNECTOR MOUNT PLAT	MICROVISION CORP.	740-300-003
740-300-006	ROBOT-CHASSIS-CENTER VAC HOUSING	MICROVISION CORP.	740-300-006
740-300-010	ROBOT-CHASSIS-LINEAR BEARING HOUS	MICROVISION CORP.	740-300-010
740-300-012	ROBOT-CHASSIS LOWER CAN	MICROVISION CORP.	740-300-012
740-300-013	ROBOT-CHASSIS LOWER CAN MNT FRM	MICROVISION CORP.	740-300-013
740-300-014	ROBOT-CHASSIS UPPER CAN	MICROVISION CORP.	740-300-014
740-300-015	ROBOT-CHASSIS-UPPER CAN MNT FRM	MICROVISION CORP.	740-300-015
740-300-016	ROBOT-SLIP RING 8 COND	MICROVISION CORP.	740-300-016
740-300-017	ROBOT-CHASSIS-LOWER STOP	MICROVISION CORP.	740-300-017
740-300-018	ROBOT-CHASSIS-UPPER STOP	MICROVISION CORP.	740-300-018
740-300-021	ROBOT-ARM DRIVE-GEAR HOUSING	MICROVISION CORP.	740-300-021
740-300-022	ROBOT-ARM DRIVE-LIN. BEARING MNT	MICROVISION CORP.	740-300-022
740-300-023	ROBOT-ARM DRIVE-LIN. ENC. MNT BAR	MICROVISION CORP.	740-300-023
740-300-024	ROBOT-ARM DRIVE-ENCODER MOUNT PLATE	MICROVISION CORP.	740-300-024
740-300-026	ROBOT-ARM DRIVE SHAFT	MICROVISION CORP.	740-300-026
740-300-028	ROBOT-ARM DRIVE-DRIVE PULLEY	MICROVISION CORP.	740-300-028
740-300-029	ROBOT-ARM DRIVE/THETA MOTOR PULLEY	MICROVISION CORP.	740-300-029
740-300-030	ROBOT-Z-SUPERNUT HOUSING	MICROVISION CORP.	740-300-030
740-300-031	ROBOT-Z-SUPERNUT CLAMP	MICROVISION CORP.	740-300-031
740-300-032	ROBOT-Z-BRAKE MOUNT HUB	MICROVISION CORP.	740-300-032
740-300-034	ROBOT-Z-DRIVE HOUSING	MICROVISION CORP.	740-300-034
740-300-035	ROBOT-Z-LEAD SCREW PULLEY	MICROVISION CORP.	740-300-035
740-300-036	ROBOT-Z-MOTOR PULLEY	MICROVISION CORP.	740-300-036
740-300-037	ROBOT-Z-BRAKE MOUNT PLATE	MICROVISION CORP.	740-300-037
740-300-039	ROBOT-Z-LEAD SCREW, .625 DIA	MICROVISION CORP.	740-300-039
740-300-040	ROBOT-THETA-MOTOR MOUNT PLATE	MICROVISION CORP.	740-300-040
740-300-041	ROBOT-THETA-MOTOR CLAMP	MICROVISION CORP.	740-300-041
740-300-044	ROBOT-THETA-ENCODER MOUNT HOUSING	MICROVISION CORP.	740-300-044
740-300-046	ROBOT-THETA-SHAFT	MICROVISION CORP.	740-300-046
740-300-049	ROBOT-THETA-SHAFT SPACER	MICROVISION CORP.	740-300-049
740-300-050	ROBOT-THETA-LIMIT FLAG	MICROVISION CORP.	740-300-050
740-300-054	ROBOT-UPPER VAC MANIFOLD	MICROVISION CORP.	740-300-054
740-300-055	ROBOT-LOWER VAC MANIFOLD	MICROVISION CORP.	740-300-055
740-300-059	ROBOT-ARM-UPPER BEARING MOUNT	MICROVISION CORP.	740-300-059
740-300-060	ROBOT-ARM-SPINDLE VAC HOUSING	MICROVISION CORP.	740-300-060
740-300-061	ROBOT-ARM-LOWER BEARING MOUNT	MICROVISION CORP.	740-300-061
740-300-062	ROBOT-LOWER BEARING COVER	MICROVISION CORP.	740-300-062
740-300-063	ROBOT-ARM-SPINDLE	MICROVISION CORP.	740-300-063
740-300-065	ROBOT-LOWER ARM-5/8 INCH	MICROVISION CORP.	740-300-065
740-300-066	ROBOT-ARM-UPPER	MICROVISION CORP.	740-300-066
740-300-068	ROBOT-ARM-SPINDLE PULLEY	MICROVISION CORP.	740-300-068
740-300-069	ROBOT-ARM-CENTER DRIVE PULLEY	MICROVISION CORP.	740-300-069
740-300-070	ROBOT-ARM-VAC CHANNEL COVER	MICROVISION CORP.	740-300-070
740-300-072	ROBOT-ARM-MOUNT PLATE	MICROVISION CORP.	740-300-072
740-300-074	ROBOT-ARM-LOWER-4 INCH	MICROVISION CORP.	740-300-074
740-300-081	ROBOT-UPPER CABLE CLAMP HOLDER	MICROVISION CORP.	740-300-081
740-300-082	ROBOT-UPPER CABLE GUIDE	MICROVISION CORP.	740-300-082
740-300-083	ROBOT-CABLE CLAMP PLATE	MICROVISION CORP.	740-300-083
740-300-084	ROBOT-UPPER INNER CLAMP PLATE	MICROVISION CORP.	740-300-084
740-300-085	ROBOT-LOWER COVER PLATE	MICROVISION CORP.	740-300-085
740-300-093	ROBOT-MAPPING-LOWER COVER	MICROVISION CORP.	740-300-093
740-300-097	ROBOT-MAPPING-UPPER COVER	MICROVISION CORP.	740-300-097
740-300-099	MAPPING-LASER HOLDER	MICROVISION CORP.	740-300-099

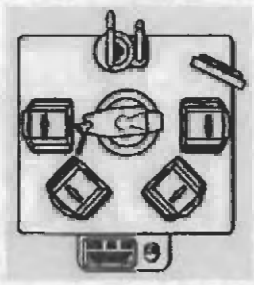
Component	Description	Manufacturer	Part Number
740-300-145	ROBOT-THETA-LONG ENCODER SHAFT	MICROVISION CORP.	740-300-145
740-300-235	ROBOT-THETA-60 TOOTH SPROCKET	MICROVISION CORP.	740-300-235
740-300-237	ROBOT-THETA-15 TOOTH SPROCKET	MICROVISION CORP.	740-300-237
740-300-239	ROBOT-THETA MOUNT HUB	MICROVISION CORP.	740-300-239
740-300-241	THETA-ENCODER SPROCKETS	MICROVISION CORP.	740-300-241
740-300-242	THETA-MOTOR HUB	MICROVISION CORP.	740-300-242
740-400-008	SORTER-POWER DISTRIBUTION PANEL	MICROVISION CORP.	740-400-008
740-400-010	SORTER-ALIGNER SUPPORT RAILS	MICROVISION CORP.	740-400-010
740-400-011	SORTER-ALIGNER SUPPORT PAD	MICROVISION CORP.	740-400-011
740-400-015	SORTER-SUPPORT-RELAY,DIN RAIL	MICROVISION CORP.	740-400-015
740-400-019	SORTER-ROBOT COLUMN SHIM	MICROVISION CORP.	740-400-019
740-400-020	SORTER-ROBOT SUPPORT PLATE	MICROVISION CORP.	740-400-020
740-400-021	SORTER-ROBOT SUPPORT COLUMNS	MICROVISION CORP.	740-400-021
740-400-022	SORTER-ROBOT TAP PLATES	MICROVISION CORP.	740-400-022
740-400-026	SORTER-FILTER COVER	MICROVISION CORP.	740-400-026
740-400-030	SORTER-ELECTRONICS CASE	MICROVISION CORP.	740-400-030
740-400-031	SORTER-ELECTRONICS CASE-TOP	MICROVISION CORP.	740-400-031
740-400-032	SORTER-EL CASE-BACK PLATE-CONTROL	MICROVISION CORP.	740-400-032
740-400-033	SORTER-ELECTRONICS CASE-FRONT	MICROVISION CORP.	740-400-033
740-400-035	SORTER-EL CASE-FRAME-LEFT RAIL	MICROVISION CORP.	740-400-035
740-400-036	SORTER-EL CASE-END RAIL	MICROVISION CORP.	740-400-036
740-400-037	SORTER-EL CASE-FRAME-RIGHT RAIL	MICROVISION CORP.	740-400-037
740-400-038	SORTER-EL CASE-FOOT	MICROVISION CORP.	740-400-038
740-400-042	EL CASE-HEAT SINK-MOTOR DRIVER	MICROVISION CORP.	740-400-042
740-400-059	SORTER-LCD STAND-CABLE CLAMP	MICROVISION CORP.	740-400-059
740-400-060	SORTER-LCD STAND LOWER TUBE	MICROVISION CORP.	740-400-060
740-400-061	SORTER-LCD STAND-SWIVEL TUBE	MICROVISION CORP.	740-400-061
740-400-062	SORTER-LCD STAND-MOUNTING FLANGE	MICROVISION CORP.	740-400-062
740-400-063	SORTER-LCD STAND-KNOBS	MICROVISION CORP.	740-400-063
740-400-064	SORTER-LCD STAND-LOWER KNOB SHAFT	MICROVISION CORP.	740-400-064
740-400-065	SORTER-LCD STAND-TILT BRACKET	MICROVISION CORP.	740-400-065
740-400-066	SORTER-LCD STAND-PIVOT PIN	MICROVISION CORP.	740-400-066
740-400-069	SORTER-LCD STAND-UPPER KNOB SHAFT	MICROVISION CORP.	740-400-069
740-400-072	SORTER-LCD FRONT PANEL	MICROVISION CORP.	740-400-072
740-400-073	SORTER-LCD BACK PANEL	MICROVISION CORP.	740-400-073
740-400-075	SORTER-LCD INTERFACE CARD MOUNT PL	MICROVISION CORP.	740-400-075
740-400-076	SORTER-LCD MOUNT TAB	MICROVISION CORP.	740-400-076
740-400-077	SORTER-BOAT SUPP PLATE 3,4,6,8,A	MICROVISION CORP.	740-400-077
740-400-078	SORTER-BOAT SUPPORT PEDESTAL	MICROVISION CORP.	740-400-078
740-400-079	SORTER-BOAT BACK STOP	MICROVISION CORP.	740-400-079
740-400-080	SORTER-BOAT SUPP PLATE 3,4,5,6,A	MICROVISION CORP.	740-400-080
740-400-084	SORTER-BOAT SUPP PLATE 3,4,6,8,B	MICROVISION CORP.	740-400-084
740-400-085	SORTER-BOAT SUPP PLATE 3,4,6,8,C	MICROVISION CORP.	740-400-085
740-400-086	SORTER-BOAT SUPP PLATE 3,4,6,8,D	MICROVISION CORP.	740-400-086
740-400-094	SORTER-BOAT SUPP PLATE 3,4,5,6,B	MICROVISION CORP.	740-400-094
740-400-095	SORTER-BOAT SUPP PLATE 3,4,5,6,C	MICROVISION CORP.	740-400-095
740-400-096	SORTER-BOAT SUPP PLATE 3,4,5,6,D	MICROVISION CORP.	740-400-096
740-400-100	FRAME-ESTOP/P SWITCH-220V (CE)	MICROVISION CORP.	740-400-100
740-400-101	SORTER-MAIN SUPPORT PLATE-MACH	MICROVISION CORP.	740-400-101
740-400-102	SORTER-MAIN SUPPORT PLATE-F.C.	MICROVISION CORP.	740-400-102
740-400-103	SORTER-SUPPORT FRAME	MICROVISION CORP.	740-400-103
740-400-104	FRAME-ESTOP/P SWITCH-110V (CE)	MICROVISION CORP.	740-400-104
740-400-107	SORTER-FRONT PANEL	MICROVISION CORP.	740-400-107
740-400-108	SORTER-SIDE PANEL	MICROVISION CORP.	740-400-108
740-400-110	SORTER-REAR PANEL	MICROVISION CORP.	740-400-110
740-400-112	SORTER-BOTTOM PLATE	MICROVISION CORP.	740-400-112
740-400-113	SORTER-TABLE TOP	MICROVISION CORP.	740-400-113
740-400-117	SORTER-FRAME - POWER PANEL	MICROVISION CORP.	740-400-117
740-400-130	SORTER-K.D.-PLATE	MICROVISION CORP.	740-400-130
740-400-131	SORTER-K.D.-RAILS	MICROVISION CORP.	740-400-131
740-400-132	SORTER-K.D.-STOPS	MICROVISION CORP.	740-400-132
740-400-133	SORTER-K.D.-UPPER BRACKETS	MICROVISION CORP.	740-400-133
740-400-135	SORTER-K.D.-HANDLE MOUNT	MICROVISION CORP.	740-400-135
740-400-155	SORTER-TOP SUB-FRAME	MICROVISION CORP.	740-400-155
740-400-165	SORTER-BOTTOM SUB-FRAME - 2 CASS.	MICROVISION CORP.	740-400-165
740-400-172	SORTER-POST-RIGHT FRONT CORNER	MICROVISION CORP.	740-400-172
740-400-173	SORTER-POST-LEFT REAR CORNER	MICROVISION CORP.	740-400-173
740-400-174	SORTER-POST-LF FT RT RR CORNER	MICROVISION CORP.	740-400-174
740-400-175	SORTER-CORNER POST TAB	MICROVISION CORP.	740-400-175
740-400-199	ADAPTOR PLATE MONITOR STAND	MICROVISION CORP.	740-400-199

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Component	Description	Manufacturer	Part Number
740-430-082	SORTER-BLANK STATION COVER	MICROVISION CORP.	740-430-082
740-430-101	SORTER-MAIN SUPPORT PLATE-MACH	MICROVISION CORP.	740-430-101
740-430-102	SORTER-MAIN SUPPORT PLATE	MICROVISION CORP.	740-430-102
740-430-103	SORTER-SUPPORT FRAME	MICROVISION CORP.	740-430-103
740-430-107	SORTER-FRONT PANEL	MICROVISION CORP.	740-430-107
740-430-108	SORTER-SIDE PANEL	MICROVISION CORP.	740-430-108
740-430-110	REAR PANEL	MICROVISION CORP.	740-430-110
740-430-112	SORTER-BOTTOM PLATE	MICROVISION CORP.	740-430-112
740-430-113	SORTER - TABLE TOP	MICROVISION CORP.	740-430-113
740-430-133	SORTER-K.D.-UPPER BRACKET-RIGHT	MICROVISION CORP.	740-430-133
740-430-134	SORTER-K.D.-UPPER BRACKET-LEFT	MICROVISION CORP.	740-430-134
740-430-137	SORTER-K.D.-SIDE PLATE	MICROVISION CORP.	740-430-137
740-430-155	SORTER-TOP SUB-FRAME	MICROVISION CORP.	740-430-155
740-430-165	SORTER-BOTTOM SUB-FRAME-3/4 CASS.	MICROVISION CORP.	740-430-165
740-500-017	WS-JOYSTICK HOUSING	MICROVISION CORP.	740-500-017
740-500-018	WS-JOYSTICK HOUSING-BOTTOM PLATE	MICROVISION CORP.	740-500-018
740-500-080	WS-MONITOR STAND-MOUNT RING	MICROVISION CORP.	740-500-080
740-500-081	WS-MONITOR STAND-LONG TUBE	MICROVISION CORP.	740-500-081
740-500-083	WS-MON. STAND-MONITOR PLATE	MICROVISION CORP.	740-500-083
740-500-084	WS-MON. STAND-CLAMP	MICROVISION CORP.	740-500-084
740-500-085-001	MONITOR STAND-UPPER TUBE	MICROVISION CORP.	740-500-085-001
740-500-086	BUSHING - MONITOR STAND	MICROVISION CORP.	740-500-086
740-500-090	MONITOR STAND-TOP PLATE	MICROVISION CORP.	740-500-090
740-800-003	BRITELITE-CHASSIS-TOP PLATE	MICROVISION CORP.	740-800-003
740-800-004	BRITELITE-CHASSIS-BOTTOM PLATE	MICROVISION CORP.	740-800-004
740-800-005	BRITELITE-CHASSIS-SIDE PLATE	MICROVISION CORP.	740-800-005
740-800-006	BRITELITE-CHASSIS-FRONT PLATE	MICROVISION CORP.	740-800-006
740-800-007	BRITELITE-CHASSIS-BACK PLATE-SORTE	MICROVISION CORP.	740-800-007
740-800-009	BRITELITE-CHASSIS-CONN MOUNT BAR	MICROVISION CORP.	740-800-009
740-800-010	BRITELITE-CHASSIS-CONNECTOR BRACKE	MICROVISION CORP.	740-800-010
740-800-011	BRITELITE-CHASSIS-CORNER MNT BLOCK	MICROVISION CORP.	740-800-011
740-800-014	BRITELITE-SORTER MOUNT BLOCK	MICROVISION CORP.	740-800-014
740-800-015	BRITELITE-CHASSIS-UPPER COVER PLAT	MICROVISION CORP.	740-800-015
740-800-016	BRITELITE-CHASSIS-X TILT BLOCK	MICROVISION CORP.	740-800-016
740-800-017	BRITELITE-CHASSIS-Y TILT BLOCK	MICROVISION CORP.	740-800-017
740-800-018	BRITELITE-CHASSIS-X TILT END PLATE	MICROVISION CORP.	740-800-018
740-800-019	BRITELITE-CHASSIS-Y TILT MNT BLOCK	MICROVISION CORP.	740-800-019
740-800-020	BRITELITE-CHASSIS-THETA CHUCK	MICROVISION CORP.	740-800-020
740-800-021	BRITELITE-CHASSIS-THETA SPINDLE	MICROVISION CORP.	740-800-021
740-800-023	BRITELITE-BRIGHTLIGHT GUARD	MICROVISION CORP.	740-800-023
740-800-036	BRITELITE-X-MOUNT BLOCK	MICROVISION CORP.	740-800-036
740-800-037	BRITELITE-X-CONNECTING ROD	MICROVISION CORP.	740-800-037
740-800-050	BRITELITE-AXIS-MOUNT PLATE	MICROVISION CORP.	740-800-050
740-800-051	BRITELITE-AXIS-ENCODER MOUNT BLOCK	MICROVISION CORP.	740-800-051
740-800-052	BRITELITE-AXIS-MOTOR CLAMP	MICROVISION CORP.	740-800-052
740-800-053	BRITELITE-AXIS-MOTOR MOUNT BLOCK	MICROVISION CORP.	740-800-053
740-800-054	BRITELITE-TILT-ENCODER MOUNT SHAFT	MICROVISION CORP.	740-800-054
740-800-055	BRITELITE-TILT-ENCODER PULLEY	MICROVISION CORP.	740-800-055
740-800-057	BRITELITE-Y-CONNECTING ROD	MICROVISION CORP.	740-800-057
740-800-074	BRITELITE-THETA-ENCODER MOUNT SHAF	MICROVISION CORP.	740-800-074
740-800-075	BRITELITE-THETA-ENCODER PULLEY	MICROVISION CORP.	740-800-075
740-800-090	BRITELITE-CONNECTOR MOUNT BLOCK	MICROVISION CORP.	740-800-090
740-800-096	BRITELITE-EXTENDER BLOCK	MICROVISION CORP.	740-800-096
740-800-097	BRITELITE - FAN BACK PLATE	MICROVISION CORP.	740-800-097
740-800-098	BRITELITE - FAN MOUNT BLOCK	MICROVISION CORP.	740-800-098
740-800-100	BRITELITE-LOWER MOUNT BLOCK	MICROVISION CORP.	740-800-100
740-800-101	BRITELITE-LOWER OUTER TUBE	MICROVISION CORP.	740-800-101
740-800-102	BRITELITE-LOWER-INNER TUBE	MICROVISION CORP.	740-800-102
740-800-103	BRITELITE-UPPER TUBE-SORTER	MICROVISION CORP.	740-800-103
740-800-105	BRITELITE-INNER TILT BLOCK	MICROVISION CORP.	740-800-105
740-800-106	BRITELITE-OUTER TILT BLOCK	MICROVISION CORP.	740-800-106
740-800-107	BRITELITE-ELBOW - 90 DEG	MICROVISION CORP.	740-800-107
740-800-110	BRITELITE-LIGHT HOUSING-BACK PLATE	MICROVISION CORP.	740-800-110
740-800-111	BRITELITE-LIGHT HOUSING	MICROVISION CORP.	740-800-111
740-800-112	BRITELITE-LIGHT HOUSING-FRONT COVE	MICROVISION CORP.	740-800-112
740-800-115	BRITELITE-FILTER CLAMP PLATE	MICROVISION CORP.	740-800-115
740-800-116	BRITELITE-BULB CLAMP PLATE	MICROVISION CORP.	740-800-116
740-800-118	BRITELITE-FAN FINGER GUARD	MICROVISION CORP.	740-800-118
740-800-119	BRITELITE-STANDOFFS	MICROVISION CORP.	740-800-119

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7.0. 4-Cassette Setup & Integration



Click on the Topic List hyperlink above to browse 4-Cassette sub-topics.

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7.1.1. System Power-Up

7.1.1.1. Set the controller On/Off switch to the On position.

7.1.1.2. Make sure E-Stop is pulled out and turn the system On/Off switch clockwise as far as it will go to power up the controller – note that the On/Off switch will return to a position midway between the Off and On labels. Wait 20 seconds and again turn the system On/Off switch clockwise as far as it will go to activate system motor.

7.1.1.3. Power-up the VGA color monitor.

7.1.1.4. Power-up the system PC. The computer will scan for a keyboard, mouse and viruses, check the integrity of the hard drive, and load Windows NT.

7.1.1.5. Once Windows NT has loaded, a Welcome window will appear, prompting the operator for a user name and password; enter these in the appropriate boxes and verify that WORKSTATION is displayed in the box labeled From:. Select the OK button to prompt the display of the Windows NT Desktop window.

7.1.1.6. Within the Windows NT Desktop locate and select (double click) the Host NT icon to prompt the display of the Host NT window. The system is now ready to accept host commands at the command line.

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7.1.2. Controller Board 1 (Master)

7.1.2.1. Perform self diagnostic test; a return of 0 ensures that serial connections to controller board 1 are sound.
SELF

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7.1.3.1. Main Vacuum Test

7.1.3.1.1. Verify that the system vacuum sensor is connected to the AUX port on the controller back panel.

7.1.3.1.2. Detach the vacuum line from the back of the sorter chassis. Turn the sensor adjustment screw CW until the LED turns on, then CCW until the LED turns off.

7.1.3.1.3. Reattach the vacuum line to the back of the sorter chassis and verify that the LED turns on.

7.1.3.1.4. Prompt the current hardware sensor status of the controller.
HWST

7.1.3.1.5. Detach the main vacuum line from the sorter chassis.

7.1.3.1.6. Again, prompt the current hardware sensor status of the controller; the returned values should be different than those returned in step 7.1.3.1.4.
HWST

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7.1.3.2. Robot Paddle Vacuum Test

7.1.3.2.1. Activate paddle 1 vacuum.
SVAC 1 1 1

7.1.3.2.2. Adjust paddle 1 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

7.1.3.2.3. Deactivate paddle 1 vacuum.
SVAC 1 1 0

7.1.3.2.4. Activate paddle 2 vacuum.
SVAC 1 2 1

7.1.3.2.5. Adjust paddle 2 vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

7.1.3.2.6. Deactivate paddle 2 vacuum.
SVAC 1 2 0

7.1.3.2.7. Place a small wafer on paddle 1 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 1

7.1.3.2.8. Turn paddle 1vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

7.1.3.2.9. Place a small wafer on paddle 2 and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 1 2

7.1.3.2.10. Turn paddle 2 vacuum adjustment screw and repeat vacuum test until turn-on value is 35000 (± 5000); remove wafer.

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7.1.3.3. Aligner Chuck Vacuum

7.1.3.3.1. Activate aligner chuck vacuum.
SVAC 2 1 1

7.1.3.3.2. Remove the back cover of the aligner and adjust the vacuum sensor: 1) turn vacuum adjustment screw CW until LED turns off; 2) turn vacuum adjustment screw CCW until LED turns on; 3) turn vacuum adjustment screw CW until LED turns off.

7.1.3.3.3. Deactivate aligner chuck vacuum.
SVAC 2 1 0

7.1.3.3.4. Place a small wafer on aligner chuck and initiate vacuum test to prompt turn-on value (left) and turn-off value (right).
VACT 2 1

7.1.3.3.5. Turn aligner vacuum sensor adjustment screw and repeat vacuum test until turn-on and turn-off values are 35000 (± 5000); remove wafer.

7.1.3.3.6. Replace aligner back cover.

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7.1.4.1. Reference Robot Module

7.1.4.1.1. Reference robot theta axis.
MREF 1 (make sure it references in all four quadrants)

7.1.4.1.2. Disable robot paddle axis motor.
MEBL 2 0

7.1.4.1.3. Manually swing the robot paddle over the robot, record position, enable robot paddle axis motor, and reference robot paddle axis.
RPOS 2 1
MEBL 2 1
MREF 2

7.1.4.1.4. Reference robot z axis.
MREF 0

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7.1.4.2. Reference Aligner Module

7.1.4.2.1. Reference aligner theta and x-axes motors.
MREF 3
MREF 4

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7.1.4.3. Check Array Board

7.1.4.3.1. Turn on the illumination and check the pixels of the array.
OUTP 4 100
ALND (128 should scroll up and down the screen)

7.1.4.3.2. Stop the scrolling and turn off the illumination.
ESC (stops the scrolling)
OUTP 4 0

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7.1.4.4. Check the Upper Light Source on the Wafer Light

7.1.4.4.1. Turn on the light above the acrylic block.
OUTP 5 100

7.1.4.4.2. Turn off the light source.
OUTP 5 0

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7.1.4.5. Check the Lower Light Source on the Wafer Light

7.1.4.5.1. Turn on the light source below the light shield.
OUTP 10 100

7.1.4.5.2. Turn off the light source.
OUTP 10 0

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7.2.1. Cassette Station Leveling

7.2.1.1. On the underside of the sorter chassis, locate each cassette station's respective access port and loosen the four fasteners located there.

7.2.1.2. Remove the sensor cable clamps that cover up the set screw holes under the cassette stations.

7.2.1.3. Loosen the three set screws located under the cassette station until they are not touching the bottom of their station.

7.2.1.4. Raise the robot z axis.
MOVA 0 .35

7.2.1.5. Disable the robot theta and paddle motors.
MEBL 1 0
MEBL 2 0

7.2.1.6. Turn on robot paddle 1 vacuum and place a wafer over the vacuum port.
SVAC 1 1 1

7.2.1.7. Manually rotate the robot theta axis to swing paddle 1 and the wafer out over the cassette stations - note that the centerline of paddle 1 must point to the center of the robot for proper leveling. Using the wafer as a baseline, determine which cassette station is the highest; proceed to level that station first.

7.2.1.8. Place three leveling blocks around the edge of the highest cassette station. Manually swing the wafer over the cassette station. Lower the robot z axis until the underside of the wafer makes contact with one of the blocks.
MOVR 0 [- .001]

7.2.1.9. Adjust the three set screws under the station until the wafer makes equal contact with all three blocks. Once the station is level, rotate the set screw located closest to the robot clockwise (CW) 1/4 turn.

7.2.1.10. Manually swing paddle 1 and the wafer away from the station. Beginning with the two fasteners situated farthest from the robot and proceeding in small increments, retighten the four fasteners located on the underside of the pedestal.

7.2.1.11. Manually swing paddle 1 and the wafer back over the station and use the blocks to ensure that it is still level. Repeat the leveling procedure if necessary.

7.2.1.12. Manually swing paddle 1 and the wafer over the next station, keeping the same robot z height, and perform the leveling procedure described above (7.2.1.9. - 7.2.1.11.).

7.2.1.13. While supporting the wafer, turn off the vacuum to robot paddle 1 and remove the wafer.
SVAC 1 1 0

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7.2.1.14. Enable the robot theta and paddle motors.
MEBL 1 1
MEBL 2 1

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7.2.2. Robot Paddle Calibration

7.2.2.1. Reference the robot theta axis.
MREF 1

7.2.2.2. Reference the robot paddle axis.
MREF 2

7.2.2.3. Set the station reference flag for the robot.
SRFL 1 1

7.2.2.4. Rotate the robot paddle axis until paddle 1 is centered over the robot.
MOVR 2 [± degrees]

7.2.2.5. Place a calibration pin into the robot calibration pin hole.

7.2.2.6. Rotate the robot paddle axis until the inside edge of paddle 1 makes contact with calibration pin; as paddle one approaches the pin, decrease the increment of rotation.
MOVR 2 [± degrees]

7.2.2.7. Set the robot paddle reference position and paddle 1 calibration angle.
RPOS 2 1
MREF 2
SCAL 1 1 0

7.2.2.8. Check to see if robot paddle 1 centers properly over the robot.
MVPC 1

7.2.2.9. Save settings.
SAVE

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7.2.3. Robot Z Axis Calibration

7.2.3.1. Center robot paddle 1 over the center of the robot and set the robot height (z axis) to .1 inches.
MVPC 1
MOVA 0 .1

7.2.3.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

7.2.3.3. Extend paddle 1 out over cassette station A.
MOVR 2 180

7.2.3.4. Adjust the robot z axis brake timeout value.
SCAL 1 6 10000000

7.2.3.5. Place a 1 inch calibration block adjacent to the tip of the extended robot paddle. Raise or lower the robot z axis until the height of the paddle's bottom edge matches that of the block - as paddle 1 approaches the block downward movement should be in increments of .001".
MOVR 0 [+/- .001]

7.2.3.6. Set the robot z axis motor reference position.
RPOS 0 1

7.2.3.7. Reference the robot z axis.
MREF 0

7.2.3.8. Move the robot z axis to the newly set zero position.
MOVA 0 0

7.2.3.9. Center paddle 1 over the robot, then extend it out over the cassette station A; use the calibration block to see if RPOS recorded properly.
MVPC 1
MOVR 2 180

7.2.3.10. Center paddle 2 over the robot, then extend it out over the cassette station A;
MVPC 2
MOVR 2 180

7.2.3.11. Raise or lower the robot z axis until the height of the paddle's bottom edge is equal to the height of the block - as paddle 2 approaches the block downward movement must be in increments of .001".
MOVR 0 [+/- .001]

7.2.3.12. Set the paddle offset and center paddle 1 over the robot.
POFF 1
MVPC 1

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7.2.3.13. Set default limits for the robot Z, theta and paddle axes.
FLIM 0
FLIM 1
FLIM 2

7.2.3.14. Reset the robot z axis brake timeout value.
SCAL 1 6 2000000

7.2.3.15. Save settings.
SAVE

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7.2.4. Can Angle Calibration

7.2.4.1. Center robot paddle 1 over the robot, prompt a reading of the robot z axis negative limit, and move the robot z axis to a height that equals its negative limit plus .1 inches.
MVPC 1
LIMN 0
MOVA 0 [negative limit + .1]

7.2.4.2. Rotate the robot theta axis until the robot faces cassette station A.
MOVR 1 [± degrees]

7.2.4.3. Center robot paddle 1 over the robot then extend it over cassette station A.
MVPC 1
MOVR 2 180

7.2.4.4. Place a calibration pin in the calibration hole on top of cassette station A. Rotate the robot theta axis in small increments until the paddle makes contact with the calibration pin.
MOVR 1 [± .12 degrees]

7.2.4.5. Define the world position and set the can angles for a sorter with two cassettes:
FWLD 90
SCAL 2 0 0
SCAL 10 0 -90
SCAL 11 0 -140
SCAL 12 0 140
SCAL 13 0 90
XPOS 1 0
SCAL 1 7 55
SREF 1

7.2.4.6. Test the settings by rotating the paddle end of the robot to face the aligner.
SPRK 1

7.2.4.7. Save settings.
SAVE

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7.2.5. Aligner Calibration

7.2.5.1. Reference all aligner axes.
SREF 2

7.2.5.2. Move aligner x axis until the chuck is positioned over the center of the module.
MOVR 4 [+/- .2 inches]

7.2.5.3. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

7.2.5.4. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.0

7.2.5.5. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

7.2.5.6. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

7.2.5.7. Lower the robot z axis until any part of the wafer makes contact with the aligner chuck. Do not proceed lower than the aligner chuck as this may damage the wafer.
MOVR 0 [± .005 inches]

7.2.5.8. Access the aligner's bottom panel and loosen the four shoulder bolts if they do not have springs. Adjust the three aligner leveling screws until the gap between the chuck and the wafer appears even from all vantage points. Retighten the shoulder bolts if they do not have springs.

7.2.5.9. While supporting the wafer turn off paddle 1 vacuum.
SVAC 1 1 0

7.2.5.10. Move the aligner x axis in a positive direction.
MOVR 4 .2

7.2.5.11. Place a calibration pin in the calibration hole on top of the aligner's surface. Make sure it is perpendicular to the top plate.

7.2.5.12. Move the aligner x axis in the negative direction until the calibration pin makes contact with robot paddle 1.
MOVR 4 [-.02 inches]

7.2.5.13. Record the aligner x axis reference position, set the aligner x axis transfer position, and reference the aligner module.
RPOS 4 1
XPOS 4 0
MREF 4

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7.2.5.14. Pull the calibration pin out of the aligner's calibration hole and park the aligner.
SPRK 2

7.2.5.15. Check to see if the aligner parked at the correct position, then center robot paddle 1 over the robot.
MVPC 1

7.2.5.16. Set default limits for aligner x and theta axes.
FLIM 3
FLIM 4

7.2.5.17. Save settings.
SAVE

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7.2.6. Setting Aligner Transfer Position

7.2.6.1. Center robot paddle 1 over the robot and rotate the robot theta axis until the robot's paddle end faces the aligner.
MVPC 1
MOVA 1 0

7.2.6.2. Raise the robot z axis to a height above the aligner chuck.
MOVA 0 3.5

7.2.6.3. Extend robot paddle 1 over the aligner chuck and turn on robot paddle 1 vacuum.
MOVR 2 180
SVAC 1 1 1

7.2.6.4. Manually place a wafer onto robot paddle 1. Make sure it is centered over the chuck.

7.2.6.5. Set the aligner transfer position by repeatedly lowering the wafer until contact with the aligner chuck is sensed.
FVAC 2 1

7.2.6.6. Set the default transfer heights.
SCAL 2 2 -.03
SCAL 2 3 -.005
SCAL 2 4 .015
SCAL 2 5 .03

7.2.6.7. Save settings.
SAVE

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7.2.7. Aligner Sensor Array Calibration

7.2.7.1. Turn on the aligner sensor array illumination.
OUTP 4 100

7.2.7.2. Use a small flathead screwdriver to gently turn the potentiometer to maximum brightness; be careful not to strip the potentiometer as its maximum range of motion is only 3/4 turn.

7.2.7.3. Move the aligner x-axis until the wafer edge is centered under the aligner sensor array.
MOVR 4 [± distance]

7.2.7.4. Prompt a display of the wafer edge location with respect to the sensor array; a properly positioned edge would read between 60 and 68. Select the ESC button to terminate the ALND display.
ALND

7.2.7.5. Adjust the aligner x-axis as needed.
MOVR 4 [± .05]

7.2.7.6. Repeat steps 7.2.7.4. and 7.2.7.5. until the ALND reading falls between 60 and 68.

7.2.7.7. Turn the potentiometer until ALND reading decreases by 1. Select the ESC button to terminate the ALND display.
ALND

7.2.7.8. Turn off aligner sensor array illumination.
OUTP 4 0

7.2.7.9. Autocalibrate the aligner sensor array.
ALNC 1

7.2.7.10. Support the wafer by hand, turn off the aligner chuck vacuum and manually remove the wafer.
SVAC 2 1 0

7.2.7.11. Save settings.
SAVE

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7.2.8. Laser Offset Setup

7.2.8.1. Reference all robot axes.
SREF 1

7.2.8.2. Set wafer mapping algorithm.
MAPA 2

7.2.8.3. To determine the laser offset position, first place a calibration pin in the calibration hole on the top of cassette station A. Next, position a white card or slip of paper behind the pin, opposite the robot. Execute the following commands to position the robot z and theta axes so that the robot laser is aimed at the calibration pin.
LIMN 0 (returns negative limit)
MOVA 0 [negative limit + .05 inches]
MOVA 1 90

7.2.8.4. Turn on the laser and rotate the robot theta axis until the shadow of the pin falls directly in the center of the laser beam projected onto the paper.
LASR 1
MOVR 1 [± .2]

7.2.8.5. Prompt the current robot theta position and use it to set the laser offset.
MPOS 1 (returns current position)
SCAL 1 14 [90 - current position]

7.2.8.6. Turn the laser off.
LASR 0

7.2.8.7. Save the settings.
SAVE

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7.2.9. Mapping Setup: Cassette Station A

7.2.9.1. Place a full cassette on cassette station A. Remove the wafer in slot 2.

7.2.9.2. Calibrate the mapping set up.
MAPS 10

7.2.9.3. Put the wafer back in slot 2.

7.2.9.4. Map the cassette.
MAPC 10

7.2.9.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 10 -2 4 .2

7.2.9.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000110000010000
-.2	001110100000111010010010
1.0	101000110110011010100100
1.2	101110100111111010100111
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010010111
3.6	001001100100110010100100
3.8	000000000000001000100100
4.0	000000000000000000000000

7.2.9.7. Set the low mapping angle.
SCAL 10 1 [low angle value]

7.2.9.8. Set the high mapping angle
SCAL 10 2 [high angle value]

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7.2.9.9. Auto calibrate the best mapping start position.
MAPH 10

7.2.9.10. Map the cassette and check the accuracy of returned data.
MAPC 10

7.2.9.11. Save settings.
SAVE

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7.2.10. Mapping Setup: Cassette Station B

7.2.10.1. Place a full cassette on cassette station B. Remove the wafer in slot 2.

7.2.10.2. Calibrate the mapping set up.
MAPS 11

7.2.10.3. Put the wafer back in slot 2.

7.2.10.4. Map the cassette.
MAPC 11

7.2.10.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 11 -2 4 .2

7.2.10.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	00000000000000000000000000
-1.8	00000000000000000000000000
-1.6	00000000000000000000000000
-1.4	00000000000000000000000000
-1.2	00000000000000000000000000
-1.0	00000000000000000000000000
-.8	00000000000000000000000000
-.6	00000000000000000000000000
-.4	00000000000001100000010000
-.2	00111010000011101000010010
1.0	10100011011001101001001000
1.2	10111010011111101001001111
1.4	11111111111111111111111111
1.6	11111111111111111111111111
1.8	11111111111111111111111111
2.0	11111111111111111111111111
2.2	11111111111111111111111111
2.4	11111111111111111111111111
2.6	11111111111111111111111111
2.8	11111111111111111111111111
3.0	11111111111111111111111111
3.2	11111111111111111111111111
3.4	10101110010111101001101111
3.6	00100110010011001101001000
3.8	00000000000000010001001000
4.0	00000000000000000000000000

7.2.10.7. Set the low mapping angle.
SCAL 11 1 [low angle value]

7.2.10.8. Set the high mapping angle
SCAL 11 2 [high angle value]

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7.2.10.9. Auto calibrate the best mapping start position.
MAPH 11

7.2.10.10. Map the cassette and check the accuracy of returned data.
MAPC 11

7.2.10.11. Save settings.
SAVE

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7.2.11. Mapping Setup: Cassette Station C

7.2.11.1. Place a full cassette on cassette station C. Remove the wafer in slot 2.

7.2.11.2. Calibrate the mapping set up.
MAPS 12

7.2.11.3. Put the wafer back in slot 2.

7.2.11.4. Map the cassette.
MAPC 12

7.2.11.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 12 -2 4 .2

7.2.11.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	000000000000000000000000
-1.8	000000000000000000000000
-1.6	000000000000000000000000
-1.4	000000000000000000000000
-1.2	000000000000000000000000
-1.0	000000000000000000000000
-.8	000000000000000000000000
-.6	000000000000000000000000
-.4	000000000000011000010000
-.2	001110100000111010010010
1.0	101000110110011010100100
1.2	101110100111111010100111
1.4	111111111111111111111111
1.6	111111111111111111111111
1.8	111111111111111111111111
2.0	111111111111111111111111
2.2	111111111111111111111111
2.4	111111111111111111111111
2.6	111111111111111111111111
2.8	111111111111111111111111
3.0	111111111111111111111111
3.2	111111111111111111111111
3.4	101011100101111010010111
3.6	001001100100111001101001
3.8	000000000000001000100100
4.0	000000000000000000000000

7.2.11.7. Set the low mapping angle.
SCAL 12 1 [low angle value]

7.2.11.8. Set the high mapping angle
SCAL 12 2 [high angle value]

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7.2.11.9. Auto calibrate the best mapping start position.
MAPH 12

7.2.11.10. Map the cassette and check the accuracy of returned data.
MAPC 12

7.2.11.11. Save settings.
SAVE

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7.2.12. Mapping Setup: Cassette Station D

7.2.12.1. Place a full cassette on cassette station D. Remove the wafer in slot 2.

7.2.12.2. Calibrate the mapping set up.
MAPS 13

7.2.12.3. Put the wafer back in slot 2.

7.2.12.4. Map the cassette.
MAPC 13

7.2.12.5. Prompt a return of the mapping data over a specified range of mapping angles.
SCAN 13 -2 4 .2

7.2.12.6. Study the returned mapping angles and their corresponding data. Determine at which mapping angles the cassette was correctly mapped. From among the angles that mapped correctly, select a 1 degree range that lies midway between the highest and lowest angles (lowest = 1.4 and highest = 3.2). Use the high and low angles from within this range (low = 1.8 and high = 2.8) in the following procedures.

-2.0	00000000000000000000000
-1.8	00000000000000000000000
-1.6	00000000000000000000000
-1.4	00000000000000000000000
-1.2	00000000000000000000000
-1.0	00000000000000000000000
-.8	00000000000000000000000
-.6	00000000000000000000000
-.4	00000000000001100000010000
-.2	00111010000011101000010010
1.0	10100011011001101000100100
1.2	10111010011111101000100111
1.4	11111111111111111111111111
1.6	11111111111111111111111111
1.8	11111111111111111111111111
2.0	11111111111111111111111111
2.2	11111111111111111111111111
2.4	11111111111111111111111111
2.6	11111111111111111111111111
2.8	11111111111111111111111111
3.0	11111111111111111111111111
3.2	11111111111111111111111111
3.4	10101110010111101000110111
3.6	00100110010011001100100100
3.8	00000000000000010001001000
4.0	00000000000000000000000000

7.2.12.7. Set the low mapping angle.
SCAL 13 1 [low angle value]

7.2.12.8. Set the high mapping angle
SCAL 13 2 [high angle value]

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7.2.12.9. Auto calibrate the best mapping start position.
MAPH 13

7.2.12.10. Map the cassette and check the accuracy of returned data.
MAPC 13

7.2.12.11. Save settings.
SAVE

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7.2.13. Setting Wafer Transfer Positions: Cassette Station A

7.2.13.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station A.

7.2.13.2. Map the cassette.
MAPC 10

7.2.13.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

7.2.13.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 10 1 1

7.2.13.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 10 1 (repeat until contact is made)

7.2.13.6. Remove paddle 1 from the cassette.
WOOR 10 1 1

7.2.13.7. Establish robot paddle 1 offset. Repeat the following procedure (7.2.13.8. - 7.2.13.13.) until paddle 1 is centered between wafers 1 and 2.

7.2.13.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 10 2 1

7.2.13.9. Disable the robot theta axis motor.
MEBL 1 0

7.2.13.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

7.2.13.11. Adjust paddle 1 offset position.
SCAL 10 6 [± .003]

7.2.13.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

7.2.13.13. Enable the robot theta axis motor.
MEBL 1 1

7.2.13.14. Check / adjust wafer pitch. Repeat the following procedure (7.2.13.15. - 7.2.13.21.) until paddle 1 is centered between wafers 24 and 25.

7.2.13.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 10 25 1

7.2.13.16. Disable the robot theta axis motor.
MEBL 1 0

7.2.13.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

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7.2.13.18. Adjust the wafer pitch.
SCAL 10 17 [± .0001]

7.2.13.19. Manually swing paddle-axis out of cassette and center over robot.

7.2.13.20. Enable robot theta-axis.
MEBL 1 1

7.2.13.21. Map the cassette and check results for accuracy.
MAPC 10

7.2.13.22. Save settings.
SAVE

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7.2.14. Setting Wafer Transfer Positions: Cassette Station B

7.2.14.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station B.

7.2.14.2. Map the cassette.
MAPC 11

7.2.14.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

7.2.14.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 11 1 1

7.2.14.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 11 1 (repeat until contact is made)

7.2.14.6. Remove paddle 1 from the cassette.
WOOR 11 1 1

7.2.14.7. Establish robot paddle 1 offset. Repeat the following procedure (7.2.14.8. - 7.2.14.13.) until paddle 1 is centered between wafers 1 and 2.

7.2.14.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 11 2 1

7.2.14.9. Disable the robot theta axis motor.
MEBL 1 0

7.2.14.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

7.2.14.11. Adjust paddle 1 offset position.
SCAL 11 6 [± .003]

7.2.14.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

7.2.14.13. Enable the robot theta axis motor.
MEBL 1 1

7.2.14.14. Check / adjust wafer pitch. Repeat the following procedure (7.2.14.15. - 7.2.14.21.) until paddle 1 is centered between wafers 24 and 25.

7.2.14.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 11 25 1

7.2.14.16. Disable the robot theta axis motor.
MEBL 1 0

7.2.14.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

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7.2.14.18. Adjust the wafer pitch.
SCAL 11 17 [± .0001]

7.2.14.19. Manually swing paddle-axis out of cassette and center over robot.

7.2.14.20. Enable robot theta-axis.
MEBL 1 1

7.2.14.21. Map the cassette and check results for accuracy.
MAPC 11

7.2.14.22. Save settings.
SAVE

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7.2.15. Setting Wafer Transfer Positions: Cassette Station C

7.2.15.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station C.

7.2.15.2. Map the cassette.
MAPC 12

7.2.15.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

7.2.15.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 12 1 1

7.2.15.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 12 1 (repeat until contact is made)

7.2.15.6. Remove paddle 1 from the cassette.
WOOR 12 1 1

7.2.15.7. Establish robot paddle 1 offset. Repeat the following procedure (7.2.15.8. - 7.2.15.13.) until paddle 1 is centered between wafers 1 and 2.

7.2.15.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 12 2 1

7.2.15.9. Disable the robot theta axis motor.
MEBL 1 0

7.2.15.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

7.2.15.11. Adjust paddle 1 offset position.
SCAL 12 6 [± .003]

7.2.15.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

7.2.15.13. Enable the robot theta axis motor.
MEBL 1 1

7.2.15.14. Check / adjust wafer pitch. Repeat the following procedure (7.2.15.15. - 7.2.15.21.) until paddle 1 is centered between wafers 24 and 25.

7.2.15.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 12 25 1

7.2.15.16. Disable the robot theta axis motor.
MEBL 1 0

7.2.15.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

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7.2.15.18. Adjust the wafer pitch.
SCAL 12 17 [± .0001]

7.2.15.19. Manually swing paddle-axis out of cassette and center over robot.

7.2.15.20. Enable robot theta-axis.
MEBL 1 1

7.2.15.21. Map the cassette and check results for accuracy.
MAPC 12

7.2.15.22. Save settings.
SAVE

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7.2.16. Setting Wafer Transfer Positions: Cassette Station D

7.2.16.1. Place a cassette with wafers in positions 1, 2, 24 and 25 onto cassette station D.

7.2.16.2. Map the cassette.
MAPC 13

7.2.16.3. Find the negative limit and move the robot z axis to a position slightly above it.
LIMN 0
MOVA 0 [negative limit + .1]

7.2.16.4. Extend robot paddle 1 into the cassette below wafer 1.
WEOO 13 1 1

7.2.16.5. Repeatedly raise robot height until vacuum contact with wafer 1 is sensed.
FVAC 13 1 (repeat until contact is made)

7.2.16.6. Remove paddle 1 from the cassette.
WOOR 13 1 1

7.2.16.7. Establish robot paddle 1 offset. Repeat the following procedure (7.2.16.8. - 7.2.16.13.) until paddle 1 is centered between wafers 1 and 2.

7.2.16.8. Move the robot z-axis to the wafer 2 drop-off height.
WDOO 13 2 1

7.2.16.9. Disable the robot theta axis motor.
MEBL 1 0

7.2.16.10. Manually swing robot paddle 1 into cassette between wafers 1 and 2.

7.2.16.11. Adjust paddle 1 offset position.
SCAL 13 6 [± .003]

7.2.16.12. Manually swing robot paddle 1 out of the cassette and center it over the robot.

7.2.16.13. Enable the robot theta axis motor.
MEBL 1 1

7.2.16.14. Check / adjust wafer pitch. Repeat the following procedure (7.2.16.15. - 7.2.16.21.) until paddle 1 is centered between wafers 24 and 25.

7.2.16.15. Move the robot z-axis to the wafer 25 drop-off height.
WDOO 13 25 1

7.2.16.16. Disable the robot theta axis motor.
MEBL 1 0

7.2.16.17. Manually swing robot paddle 1 into the cassette between wafers 24 and 25.

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7.2.16.18. Adjust the wafer pitch.
SCAL 13 17 [± .0001]

7.2.16.19. Manually swing paddle-axis out of cassette and center over robot.

7.2.16.20. Enable robot theta-axis.
MEBL 1 1

7.2.16.21. Map the cassette and check results for accuracy.
MAPC 13

7.2.16.22. Save settings.
SAVE

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