



The **Intelligent** **Autoloader**

Frequently **A**sksed **Q**uestions

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General

What is "The Intelligent Autoloader"?

The Intelligent Autoloader is hardware and software upgrade for the Smart and Automation autoloader. The upgrade consists of a new PC-based controller board, 256x128 pixel touchscreen interface, and new top, side, and front covers. All sensors on the loader remain unchanged.

Why did Stepper Equipment decide to produce the Intelligent Autoloader?

Stepper Equipment engineers have serviced countless steppers over the past 10 years. The most prevalent, re-occurring problems in all of the fabs we have visited have been autoloaders double loading and/or scratching wafers. There appears to be numerous causes for this situation.

Changes in processes over the years have produced wafers with bottom surfaces that change frictional properties from layer to layer. Hardwired belt speeds cannot compensation for wafer surface frictional and weight variations. Wafers 'bouncing' while loading cause scratches, and may sometimes slip under the gate, breaking on the rock surface below. New, advanced substrates have surfaces that the current loaders, designed in the 1980's, were not engineered to handle proficiently. Wafers with different reflective properties can cause havoc with reflective sensors on current systems, causing double loading of wafers at one level, while loading other levels without incident.

We believe the time has come to address this problem by producing an autoloader controller that can meet the diverse wafer handling requirements that exist in fabs today.

Hardware

What hardware is included with the Intelligent Autoloader?

The following items are shipped with the Intelligent Autoloader upgrade:

- A new top loader cover with an integrated industrial 32x16 chars touch-screen.
- Two new side covers, with integrated floppy disk, reset button, and speaker.
- A new front cover.
- Two side extender bars
- One Intelligent Autoloader controller board, with interfaces for Smart and Automation loaders.
- One Interface panel for connecting loader power, stepper logic signals, HPIB printer data, Serial printer data, and a parallel printer interface.
- Cabling for all of the above.
- Software diskettes.
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What items have to be rewired to work with the Intelligent Autoloader board?

Nothing. The Intelligent Autoloader board has an edge connector that plugs directly into the automation autoloader receptacle. It also contains all of the berg pin connectors, and mounting holes to accommodate the Smart autoloader.

What is the size difference between my current loader, and the Intelligent Autoloader?

The Intelligent Autoloader is 2 inches wider than the current Smart or Automation autoloader. The loader extends approximately 18 inches from the front of the granite surface. With the HP9826 stepper computer protruding approximately 25 inches from the front of the rock, the Intelligent Autoloader is well within the existing footprint for the stepper.

What hardware platform does the Intelligent Autoloader employ?

The Intelligent Autoloader runs on a PC-104 based 486SXLC-66 microprocessor, with 4MB of onboard RAM, and a 4MB Disk on Chip. This board contains an onboard floppy disk controller, IDE hard disk controller, 2 serial ports and 1 parallel port. Support boards include an HPIB interface board, Analog to Digital board, Stepper motor controller board.

Software

What language is the Intelligent Autoloader program written in?

The Intelligent Autoloader program is written in C++. It is written, owned, and fully supported by Stepper Equipment Inc.

How do I upgrade Intelligent Autoloader software to the latest version?

The Intelligent Autoloader was designed for easy software upgrades. By simply pressing the reset switch, and then inserting the 3.5" floppy upgrade disk into the disk drive, your revision of software will be checked and automatically upgraded if necessary.

Where are the loader configuration and program files stored?

The loader configuration files, program files, and the Paperless Printer data files, are stored on a 4MB DiskOnChip.

Can I secure my configuration files?

The Intelligent Autoloader software provides for full password protection when accessing the loader configuration menus.

Features

What is the difference between the way the Intelligent Autoloader loads wafers versus the smart or automation autoloader?

The Smart and Automation autoloaders employs a **two step** loading sequence.

- One hardwired belt speed to move the wafer out of the cassette and out to the flat find circuit
- One hardwired belt speed to detect the leading edge of the major flat

This method works for the majority of wafers, but cannot adapt very well to 'slippery', 'light', or 'sticky' wafers.

The Intelligent Autoloader employs a **four step** loading sequence.

- ❑ One *user adjustable* speed to move the wafer out of the cassette
- ❑ One *user adjustable* speed to move the wafer out to the flat find circuit
- ❑ One *user adjustable* speed to detect the leading edge of the major flat
- ❑ One *user adjustable* speed to perform precision flat alignment

The Intelligent Autoloader offers 100 different belt speed for you to select from for each step. In addition, the Integrated Recipe System allows you to save custom loading configurations to handle the varying wafer conditions that accompany certain processes and levels. With this type of flexibility, the Intelligent Autoloader can handle virtually all wafer conditions without damaging or scratching perimeter fields.

What are some of the benefits of a 4-stage user configurable wafer loading system.

- ❑ Precise matching of belt speed to substrate is achieved, increasing flat-find accuracy and repeatability, virtually eliminating flat-find errors, z modes and alignment problems due to improperly loaded wafers.
- ❑ Wafer scratches due to bouncing at the input gate are minimized
- ❑ Particle generation attributed to wafers 'banging' the siderails while travelling to the flat find circuit is minimized
- ❑ Errors moving wafers out of the cassette, due to sticky wafers or warped cassettes are minimized
- ❑ Loader adaptation to new substrates is easily accomplished

What types of adjustments are available for loading wafers made of non-standard materials?

In addition to customizing the belt speeds for each loading step, as mentioned above, you can also:

- ❑ Customize the error timeout for each loading step
- ❑ Customize the voltage level at which the program will 'sense' a wafer at the flat find circuit
- ❑ Customize the voltage level at which the program will 'sense' a wafer at the loading platform
- ❑ Adjust the upper and lower voltage limits that determine when the leading edge of the major flat has been sensed
- ❑ Customize the number of attempts the program will make to find the major flat, before reporting automatically loading an alternate recipe, or reporting an error
- ❑ Customize the voltage level at which the program will 'sense' a wafer from the stepper, at the unload position

Can I operate the elevator motors, wafer gate, and belt motors manually?

Yes. The Intelligent Autoloader provides utilities for manually stepping, or turning on and off, all four stepper motors. You can also raise and lower the wafer gate manually. Buttons are available that allow you to change stepper motor speeds, and step sizes.

How can I customize wafer GATE operation?

You can customize the following gate parameters:

- ❑ Wafer gate UP delay. This delay occurs after the flat has been found, and the belts have stopped turning
- ❑ Wafer gate ERROR delay. This automation loader option is currently hardwired to about 1 second. With the Intelligent Autoloader, you can increase this time to allow for a slower gate rise. A slower gate rise will increase the accuracy of the flat find, as minimal disturbance of final wafer position is achieved

Note that Stepper Equipment Inc offers a gate sensor upgrade for a Smart autoloader upgrade to the Intelligent Autoloader.

Can I adjust the speed that the elevator platform moves up and down?

Yes. There are separate speed settings for the input elevator UP speed, input elevator DOWN speed, output elevator UP speed, and output elevator DOWN speed.

Can I have the loader automatically maintain wafer separation in split lot cassettes?

Yes. When the "Unload to Slot" configuration option is set to "Mirror input boat", wafers will be placed in the output cassette in the slot opposite from the one they were loaded from. For example, wafers loaded in slots 2 and 10 from the input cassette will be placed in slots 23 and 15 in the output cassette.

What other wafer unloading options are available?

You can set the "Unload to Slot" configuration option to skip from 0 to 12 slots for every wafer unloaded to the output cassette.

Safety and Yield Enhancement

What is "Wafer detection after pickup?"

Due to belt relaxation, stepper vibrations, or flawed mechanical setup of the loader, sometimes the wafer at the gate 'moves' slightly outward, causing the flat find sensors to lose sight of the wafer and initiate the loading of the next wafer. This is the classic 'double loading of wafers' problem.

"Wafer detection after pickup" is a safety feature that insures that the stepper has picked up the wafer at the input gate, before the loader moves the next wafer in the cassette onto the input platform for loading.

The "Wafer detection after pickup" feature works by moving the belts backwards for a user definable time and speed. While the belts are moving, the flat find sensors try to detect the wafer moving underneath them. If a wafer is detected, the loader moves the wafer towards the cassette, and then reloads the wafer.

What is "Wafer under gate detection"?

Some wafers at certain levels may have excessive 'bounce' while rotating at the input gate. Sometimes the bounce is so great that the wafer actually slips under the gate bearing. The wafer will almost always fall onto the rock at this point and break.

The "Wafer under gate detection" feature insures that the flat find sensors "see" the wafer while in the course and fine flat find mode. If the sensors lose track of the wafer at any time, the gate will raise and the belts will stop instantly, preventing wafer scratching by the gate bearings, and wafer breakage.

Can I set up the loader to automatically execute a different recipe if the current load fails?

Yes. The "Active Recipe List" is a user-defined list of recipes that the loader executes, in order, for each wafer. Should the first recipe fail, the loader will execute the next recipe in the list. This will continue until either the wafer has been loaded successfully, or there are no more recipes in the Active Recipe List. Each wafer always starts with the first recipe in the list.

How does the Intelligent Autoloader address cassette jams caused by premature removal of the cassette while it is moving upward?

While the cassette is moving, the program is constantly monitoring the cassette sensor. If the cassette comes off of the sensor, which usually happens during a cassette jam, the elevator immediately stops. What happens next depends on the "Cassette Missing" configuration parameter.

If the "Cassette Missing" parameter is set to "ERROR", the loader reports an error and waits for operator intervention.

If the "Cassette Missing" parameter is set to "DELAY", the loader waits a user programmable amount of time, and then starts an automatic initialization of the elevator.

How is the Intelligent Autoloader's initialization of the elevator platforms different than the Smart or Automation autoloader?

The Smart and Automation autoloader initialize the elevator platforms by moving in an upward direction until the upper limit switch is made. Then the platforms are moved to their home position.

The Intelligent Autoloader initializes the elevator platforms by first moving downward for a short amount of time. Then the platforms are initialized in the same manner as the Smart and Automation loaders. This initial downward movement provides two benefits:

- ❑ It prevents elevator motor and drive shaft damage when the elevator is initialized with the elevator flag above the upper limit sensor
- ❑ It allows operator removal of jammed boats caused by premature removal of the cassette before the platform has reached the home position

Why is the Intelligent Autoloaders' handling of warped cassettes superior to the smart and automation autoloader?

The Smart and Automation autoloader try to load wafers from warped cassettes by moving or 'jiggling' the cassette a small, hardwired amount of steps upwards and downwards. This works for slightly warped cassettes only.

The Intelligent Autoloader uses the same action to attempt to load a wafer from a warped cassette, with one major difference. The user can instruct the loader to move the platform a user-definable amount of steps, over a user-definable number of attempts, in order to extract the wafer from the warped cassette. This gives the Intelligent Autoloader the capability to handle cassettes that are severely warped.

How does the Intelligent Autoloader enhance yield by reducing particles generated around the stepper?

The Intelligent Autoloader reduces particles around your product wafers by

- ❑ Minimizing wafer 'banging' while wafers are being transported to and from the cassettes
- ❑ Eliminating particles generated by the stepper printer and printer paper with the Paperless Printer utility

Installation

How long does it take to upgrade a single autoloader to the Intelligent Autoloader?

It takes approximately one hour to install all of the hardware and one hour to configure and test loader operation.

How long does it take to upgrade additional autoloaders to the Intelligent Autoloader?

It takes approximately one hour to install all of the hardware, 10 minutes to import loader configuration files from the first loader, and 10 minutes to test loader operation.

Can I temporarily downgrade my loader to the smart or automation loader system, if necessary?

Yes. It takes approximately 15 minutes to remove the top, front and 2 side covers, and replace them with the original covers. It takes an additional 5 minutes to replace the controller board with the Smart or Automation board.

What parts are replaced and added when my loader is upgraded to the Intelligent Autoloader?

The following items are shipped with the Intelligent Autoloader upgrade:

- A new top loader cover with an integrated industrial 32x16 chars touch-screen
- Two new side covers, with integrated floppy disk, reset button, and speaker
- A new front cover
- Two side extender bars
- One Intelligent Autoloader controller board, with interfaces for Smart and Automation loaders
- One Interface panel for connecting loader power, stepper logic signals, HPIB printer data, Serial printer data, and a parallel printer interface
- Cabling for all of the above
- Software diskettes

Integrated Recipe System

What is the "Integrated Recipe System"?

The Integrated Recipe System consists of a database of recipes for loading and unloading wafers. Each recipe contains parameters, which determine belt speeds and error timeouts at various stages of the load and unload cycle. In addition, voltage thresholds for detecting wafers, flat find voltage tolerances, and flat find retries can be customized.

Recipes can be set up to automatically load when reticle data is loaded on the stepper. The Paperless Printer has a "text matching" feature that you can set up to recognize reticle title data. When the reticle title is printed during reticle data load on the stepper. The Paperless Printer intercepts each line and compares it to a list of user definable text strings. If a match occurs, and a loader recipe is stipulated for the match string, then the loader recipe will automatically load.

Why do I need different recipes?

Wafers today contain different frictional properties, which change at each level of wafer construction. Some wafers may require higher belt speeds to load properly, while others require slower belt speeds to minimize bounce and increase flat find accuracy.

In addition, new and varied substrates have different reflective properties which will change the way the loader 'sees' the wafer at different stages. Instead of making hardware changes and adjustments to compensate for this, you can simply set up a new recipe with different voltage thresholds for each sensor to match the type of substrate you are using.

What is the "Active Recipe List"?

The Active Recipe List is a user-defined list of recipes that the loader will execute, in order, for each wafer. If the first recipe in the list fails to locate the major flat properly, the next recipe in the list will load and execute automatically. This will continue until either the wafer loads successfully, or the Active Recipe List is exhausted, at which point an error will be reported. Note that the list pointer is reset to the first recipe in the list, for each wafer loaded.

Paperless Printer Utility

What is the "Paperless Printer"?

The Paperless Printer is a utility that intercepts all print data coming from the stepper. This data is stored in a 1.3MB file on the internal solid state 4MB DiskOnChip. When the file fills up completely, it 'rolls over', and any new printer data overwrites the oldest data in the file. This size file will normally store approximately 3-6 months of printer data. With the Export utility, you can download this file to floppy diskette, and archive it.

Can I view the printer data on the touchscreen?

Yes. There are three main screens on the loader, Loader Status, Printer Data, and a split screen showing Loader Status and Printer data. In addition, there are navigation buttons that allow you to scroll through all of the stored printer data, and selectively print out data you require a hardcopy for.

Do I still need to use the Okidata 80 column or 32-column printer that came with my stepper?

No. The Intelligent Autoloader provides a standard parallel interface that will hook up to any IBM compatible printer. When printer data is stored on the internal disk, it is converted to plain text, and all formatting for the Okidata printer, or 32-column printer is discarded. If you wish to have a copy of the printed data, in the original format, you must have the Okidata printer model that was shipped with your stepper attached to the Intelligent Autoloader parallel port, and have the "Print Hardcopy" configuration parameter turned on. For 32-column printers using the HPIB bus, insure that the printer is attached to the HPIB bus, and is turned on when the data is received from the stepper.

Can I print a hardcopy of stored printer data?

Yes. While viewing the printer data on the touchscreen, simply press the printer icon, and a hardcopy of the screen will be sent to the system printer. Note that the system printer must be hooked up to the parallel interface provided to obtain a hardcopy. If you wish to have a printed hardcopy on the 32-column printer that came with your model 1000 stepper, you must have this printer turned on when the stepper sends the printer data.

Can I perform searches for historical printer data?

Yes. The Paperless Printer has a string search feature that enables you to find specific occurrences of any sequence of characters.

What is the "String Match" feature?

The String Match feature enables you to program the loader to look for certain sequences of characters from each line of printed data received from the stepper. The loader comes pre-programmed with most of the stepper error printouts. If a match occurs, you can have the loader automatically perform any or all of the following actions:

- Initialize the input and/or output elevators and belts
- Load a specific loader recipe
- Turn the Stepper Status lights to Green, Red, or alternate between green and red.
- Turn on the loader speaker, and play any of the preprogrammed sounds
- Change the loader display to either the Printer screen, Loader screen, or the Split screen

Can I view a printer data file at my desktop computer?

Yes. Using the integrated Export utility, you can download the loader data to floppy disk as a simple text file. It can then be viewed, searched, and archived on any IBM compatible computer.

Stepper Status System

What is the "Stepper Status System"?

The Stepper Status System is composed of a red, amber, and green 5volt LED attached to the loader top cover. These LED's indicate the status of the loader, incoming printer data, and the wafer currently being exposed on the stepper.

Can the loader drive an external stack of status lights that I have attached to the stepper?

Yes. There is a receptacle available to drive three 24vdc, 10 watt LED's. Stepper Equipment also sells an optional 3 light tower stack.

What events will trigger a status light change?

The following events will trigger status light changes:

- A Lost Wafer event.** You can program the loader to change to any status light condition when a wafer being exposed on the stepper does not return to the stepper within a user-determined time limit. This is useful for detecting Zmode or laser/servo error conditions.
- A Minimum Timeout event.** You can program the loader to change to any status light condition when a wafer on the stepper returns to the stepper within a user-determined time limit. This is useful in detecting "chuck vacuum and wafer alignment errors, preventing unexposed wafers from being mixed with exposed wafers in the output cassette.
- A String Match event.** If a string match occurs (see "What is the String Match feature?" above), you can program the loader to change to any status light condition.
- A Loader Event requiring operator intervention.** If an error occurs that requires operator intervention, you can program the loader to change to any status light condition.

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Throughput Measurement Utility

What is the "Throughput Measurement Utility"?

The Throughput Measurement Utility keeps track of how many wafers have passed through the loader, and how long each wafer took to be exposed by the stepper. This data is automatically stored in three sections:

- Throughput per cassette
- Throughput per user-defined cycle time
- Throughput for the life of the loader

Each section contains 6 statistical items:

- **Current.** Throughput statistic for the last wafer run
- **Count.** Total wafers processed.
- **High.** Highest throughput time measured.
- **Low.** Lowest throughput time measured.
- **Mean.** Mean throughput time
- **2Sigma.** 2sigma value for throughput time

Can I automatically print throughput data for each cassette?

Yes. By setting the "Print Cassette Data" item in the Throughput configuration menu, you can store throughput data for each cassette on the Paperless Printer.

Does the Throughput Utility add single wafer load statistics to the throughput database?

By default, the Throughput Utility does not count single wafers. However, by setting the "Count Single Wafers" item to ON in the Throughput configuration menu, the loader will track throughput for single wafers, as well as wafers loaded from cassette.

Can I set a minimum and maximum time specification for the current wafer to be added to the Throughput database?

Yes. You can set minimum and maximum time limits for the current wafer to be included in the Throughput database.

Tune-up Test Utility

What is the "Tune-up Test Utility"?

Tune-up Test is a utility, which allows you to exercise the loader elevators and wafer transport system, to insure proper operation. In addition, this utility keeps statistics on the following items:

- Flat-find voltages after the major flat is found.
- Flat-find voltages after the gate is raised.

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- ❑ Flat-find voltages when the stepper is signaled to pick up the wafer
- ❑ Wafer transport time to and from the flat-finder, on the Input side.
- ❑ Wafer transport time to and from the wafer from stepper sensor, on the Output side.
- ❑ Elevator step accuracy on the Input and Output platforms.

For each statistic listed above, Tune-up Test keeps the following data:

- ❑ **Current.** Statistic for the current iteration
- ❑ **Count.** Total values processed.
- ❑ **High.** Highest value measured.
- ❑ **Low.** Lowest value measured.
- ❑ **Mean.** Mean value
- ❑ **2Sigma.** 2sigma value

Can I run Tune-up Test on just the input or output side?

Yes. Tune-up Test can be configured to run independently on either the Input or Output side, or both sides simultaneously.

Can I configure Tune-up Test to run differently on the Input versus the Output side?

Yes. The Tune-up Test configuration menu has separate parameters for the Input and Output sides of the loader.

What parameters does Tune-up Test use to determine if it has run successfully?

Tune-up Test uses the statistics listed above, under "What is Tune-up Test", to determine if it has run successfully.

Can I change the parameters that determine a successful Tune-up Test cycle?

Yes. You can program Tune-up Test to pass or fail based on any or all of the statistical items listed above, under "What is Tune-up Test".

Diagnostic Utilities

What type of visual feedback is available for confirming proper sensor operation?

The Intelligent Autoloader Sensor Display menu provides real time feedback on all sensors on the Smart and Automation autoloaders. In addition, each sensor's voltage can be displayed real-time, in a digital meter format, with large numbers and a graphical bar display.

What is the "Flat Find Setup" utility?

The Flat Find Setup utility provides an easy method to correctly align the upper and lower flat find boards. The display shows the left and right sensor voltages in a digital meter format, with large numbers and a graphical bar display. In addition, there is a "Find Flat" button which initiates a flat-find, and a "Unload Wafer" button that retrieves the wafer from the flat find circuit.

What is the "Banner/Cap Setup" utility?

The Banner/Cap Setup utility provides a way for the technician to set and measure the vertical position of the wafer sensors at the elevator platform. If set incorrectly, double loading of wafers can occur.

What is the Elevator Setup utility?

The Elevator Setup utility provides an automated method to set up the elevator limit sensors. This utility will automatically calculate the correct position of the elevator for each slot in the cassette. Adjusting the flag sensors is no longer needed to achieve accurate cassette slot to belt transport alignment.

What is the Touch-Screen adjustment utility?

The Touch-Screen adjustment utility provides a way for the user to adjust the screen contrast, to accommodate various lighting conditions. In addition, the user can choose between a blue background with white characters, and a white background with blue characters.

What is the "Loader Date and Time" utility?

The Loader Date and Time utility allows the user to set the time and date on the 486SXLC controller. This is necessary to insure proper time and date stamping on Paperless Printer data and SPC file data.

Onboard Help System

What is the "Onboard Help System"?

The Onboard Help System consists of a help button at the top of most screens and menus. By pressing this button, and then pressing any available button, the user will receive a text description of that button's function. This helps reduce particles by eliminating the need to have the Intelligent Autoloader manual at the stepper.

Cost Justification for Intelligent Autoloader

Yield Enhancement / Rework Reduction

Feature	Benefit
<i>Minimum Time Timeout</i>	Eliminates unexposed wafers in lots due to stepper errors at input gate , such as “chuck vacuum error”. When this error occurs under certain revisions of stepper software, the wafer is unloaded immediately, and the next wafer is loaded for processing.
<i>Gate Error Delay</i>	Allows for slower raising of gate after flat is found on systems with gate sensors. Slowly raising gate minimizes wafer movement, providing more accurate wafer placement on chuck
<i>Wafer Detect</i>	Double checks that wafer is not on belt transport before loading next wafer. Eliminates reworks due to double loading of wafers caused by flatfinder not “seeing” wafer after flat is found.
<i>Speed Exit Boat</i> <i>Speed to Flat Find</i> <i>Speed Flat Find Fast</i> <i>Speed Flat Find Slow</i>	Total control over belt speeds during all stages of loading eliminates wafer scratches due to excessive belt speeds . Provides precise flat orientation, eliminating reworks due to wafers loaded and processed with massive theta corrections.
<i>Unload Speed</i>	Total control over belt speeds during all stages of unloading eliminates wafer scratches due to excessive belt speeds.
<i>Balance Limit</i>	Gives users precise control over Flat Find voltage levels, at which the major flat is considered “found”.
<i>Paperless Printer</i>	Eliminates yield reducing particulates caused by the system printer and printer paper. This utility intercepts and stores all printed data from stepper on the internal hard disk., This data is available for viewing from the touchscreen interface, and from the any computer connected to the loader via Ethernet.

Safety Features

Feature	Benefit
<i>Input Gate Sensor (Smart)</i>	Provides an input for a gate sensor for smart autoloaders (optional from SEI). This prevents broken wafers due to gate solenoid failure during loading.
<i>Cassette START delay</i>	This programmable delay prevents damage to wafers in cassettes that are improperly placed on the elevator by allowing enough time for the operator to center the boat before elevator movement occurs.
<i>Cassette MISSING action</i>	This feature will freeze the elevator if the cassette is removed while the elevator is in motion, preventing damage to wafers and cassettes, and injury to operators. The loader can be set to report an error, or automatically initialize after X seconds if premature cassette removal occurs.
<i>Wafer START delay</i>	Programmable delay that prevents damage to wafers that are improperly placed on the elevator by allowing enough time for the operator to center the wafer on the elevator before belt

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movement occurs.

<i>Speed / Time into Cassette</i>	This feature allows you to set the belt speed and movement duration while the wafer is being placed into the cassette. This control insures that all wafers are placed completely in the cassette, minimizing the possibility of wafers falling out of the cassette during cassette removal.
<i>Belts / Gate Control</i>	This utility allows the user to manually control the belt transport system, eliminating the need to use vacuum wands or tweezers to remove wafers at the flatfinder.
<i>Elevator Control</i>	This utility allows the user to manually control the elevator platforms, eliminating the need to use their hands to extract a cassette that may be jammed.
<i>Wafer Under Gate Detection</i>	This safety feature eliminates wafer breakage due to the wafer ‘slipping’ under the gate during flat find. If the flat finder does not ‘see’ the wafer during final flat find, the belts are stopped and the gate is raised to prevent wafer scratching.
<i>Wafer at Elevator Detection</i>	Double loading of wafers is eliminated by constantly monitoring the elevator wafer sensor during a wafer load.

Throughput Enhancement

Feature	Benefit
<i>Lost Wafer Timeout</i>	Automatically alerts operators, through the use of Status Lights, to steppers that have stopped processing wafers due to a ‘z mode’ or stepper error condition.
<i>Loader Error Action</i>	Automatically alerts operators, through the use of Status Lights, to steppers that have stopped processing wafers due to an autoloader error condition.
<i>Elevator AutoAdjust</i>	This feature gives you control over how far the elevator will move a warped cassette to successfully load or unload the wafer , decreasing operator intervention.
<i>Cassette DONE Action</i>	Automatically alerts operators, through the use of Status Lights, to steppers that have completed processing wafers.
<i>Reset with INPUT</i>	Resets the output cassette when the Input cassette is finished processing wafers , so both cassettes are ready for removal at the same time, increasing operator efficiency.
<i>Recipe System</i>	Provides a method to store and automatically use different wafer loading parameters and belt speeds, minimizing operator intervention and stepper down time for problem wafers.
<i>Stepper Throughput Utility</i>	Provides a method to automatically track, store, and print actual stepper throughput, by cassette, user cycle, and life of loader. This utility alerts you to problem steppers and can trigger preventive maintenance procedures to maximize throughput.
<i>Flat Find Retries</i>	User definable parameter that can minimize operator intervention on problem wafers by forcing the loader to retry a failed flat find routine until successful.

Maximizing Stepper Uptime

Feature	Benefit
<i>Real-time Sensor Voltage Display</i>	Provides a method for rapidly verifying proper sensor operation and detecting intermittent connections via the graphical integrated voltmeter.
<i>Paperless Printer</i>	Provides detailed history of all printed errors from the stepper, allowing the technician to quickly determine the exact error that occurred on the stepper, and quickly implement the proper procedures to correct the error condition
<i>Flat Find Setup Utility</i>	Provides the tech with a method to monitor sensor voltages when adjusting the flat find boards, minimizing the time it takes to perform this adjustment and maximizing the accuracy of the adjustment.
<i>Banner / Cap Setup Utility</i>	This utility measures the accuracy of the vertical position of the wafer sensors at the elevators, eliminating double loading of wafers due to mis-positioned sensors
<i>Elevator Setup Utility</i>	Automatically calculates ‘cassette slot at belt’ position referenced from the upper limit switch, eliminating loading and unloading errors due to improper setup of the upper limit switch.
<i>Autoloader Tune-up Test</i>	Provides a method to verify proper loader operation, eliminating reoccurring downtime due to insufficient testing of the loader during the repair.
<i>Import / Export Utility</i>	This utility allows the tech to quickly verify and/or duplicate loader programming.
<i>Online Help</i>	Allows the user to make use of the online diagnostics and features in a quick and efficient manner , without constantly referring to manuals.

Customization

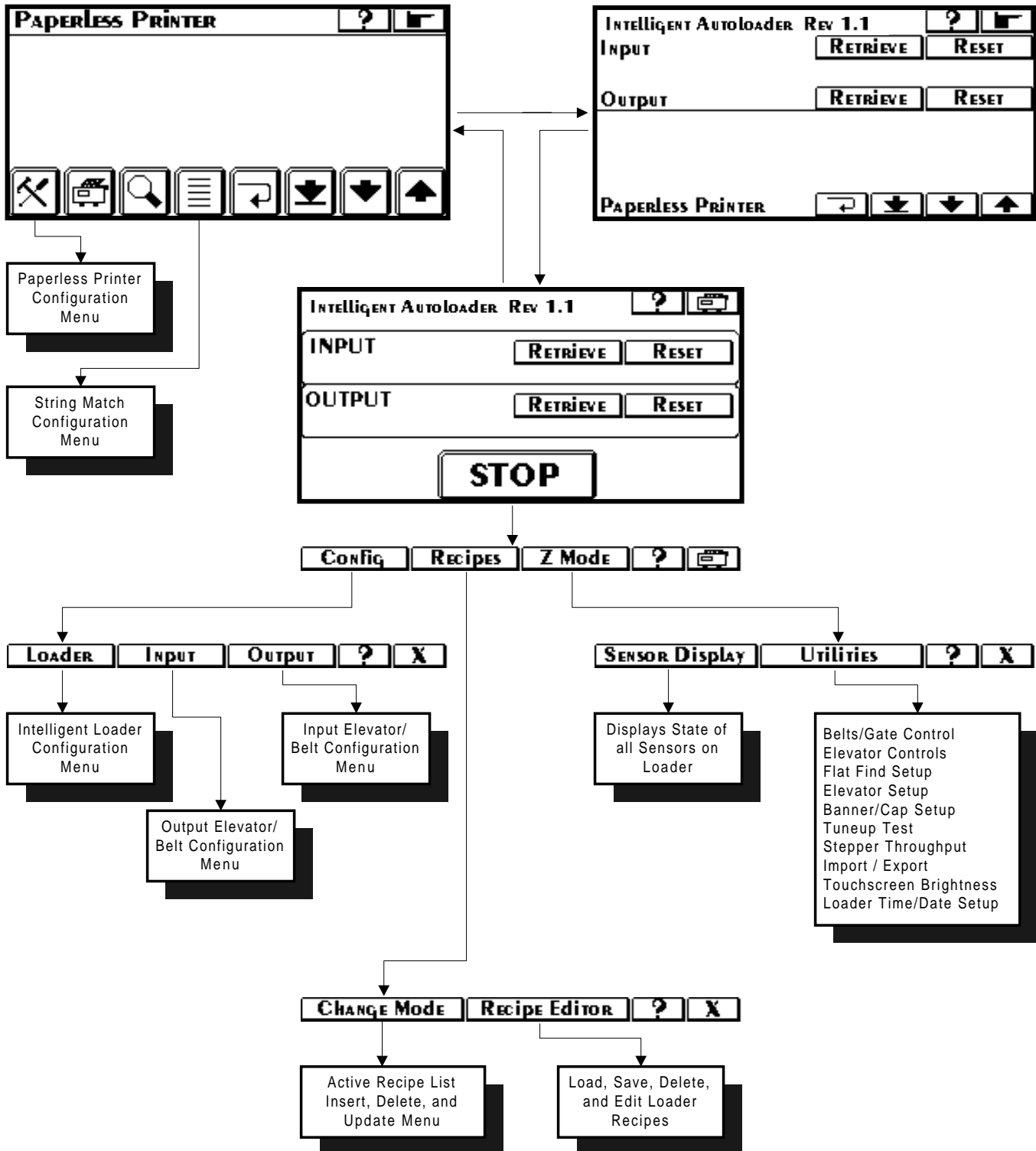
Feature	Benefit
<i>Loader Type</i>	Provides a means to automatically configure an Intelligent Autoloader system for a Smart or Automation upgrade
<i>Serial Number</i>	Used to identify the stepper the loader is attached to when the loader is connected via Ethernet to a central server.
<i>Steps per Slot</i>	Allows the user to have the flexibility of using non-standard cassettes on the loader
<i>Slots per Cassette</i>	Allows the user to have the flexibility of using non-standard cassettes on the loader
<i>Password System</i>	Protects the loader configuration menus from unauthorized access.
<i>Elevator UP-DOWN speed</i>	Allows the user to customize elevator UP/DOWN speeds for smooth operation for standard and non-standard cassettes.
<i>Output Cassette Wafer Placement</i>	Allows the user to have the loader place the wafers in the output boat in a particular order, such as ‘mirror input boat’, ‘every 2 nd slot’, ‘every 3 rd slot’, or ‘next available slot’

Frequently Asked Questions

<i>Wafer Drop-off Sensor</i>	Allows the user to change the output sensor from “OPTICAL make/break” to the more reliable “SPY Reflective” type.
<i>Tune-up Test</i>	This utility is fully user configurable.
<i>Paperless Printer</i>	This utility is fully user configurable.
<i>Wafer Sense Threshold</i>	Allows the user to change the voltage point at which the elevator sensors “see” the wafer. This is very useful when setting up the loader to handle different substrates.
<i>Output Detector Threshold</i>	Allows the user to change the voltage point at which the output detector sensor “sees” the wafer. This is very useful when setting up the loader to handle different substrates.
<i>Flat Find Sense Threshold</i>	Allows the user to change the voltage point at which the flat find sensors “see” the wafer. This is very useful when setting up the loader to handle different substrates.
<i>Flat Find Upper/Lower Voltage Limit</i>	Allows the user to change the voltage point at which the flat find sensors detect the leading edge of the wafer. This is very useful when setting up the loader to handle wafers with varying flat lengths.

Intelligent Autoloader User Interface Menu Tree

The following diagram illustrates the operator interface of the Intelligent Autoloader.

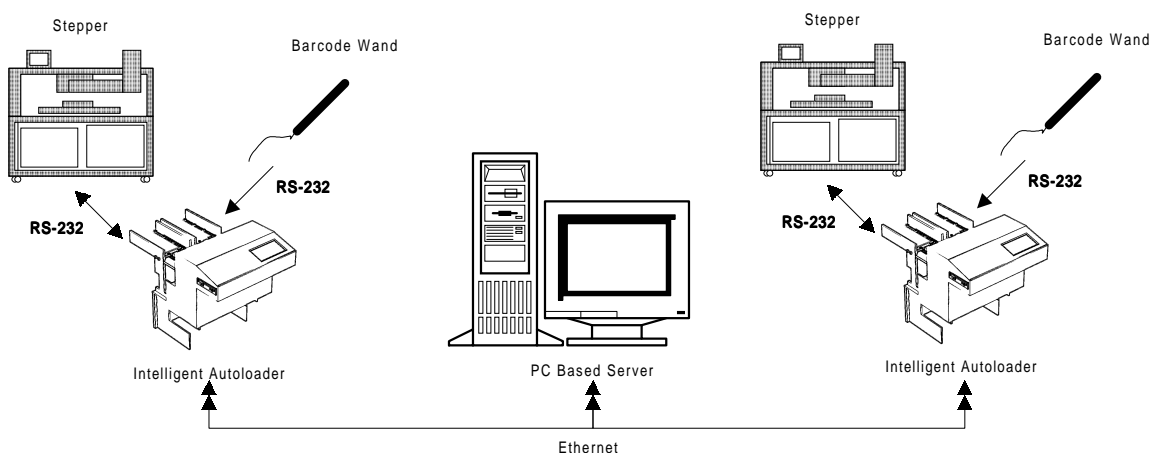


Intelligent Server Network

Revision 2.0 software for the Intelligent Autoloader, scheduled for release in March of 1998, will support a PC based Reticle Data network. Designed as an optional accessory for the Intelligent Autoloader, this network will allow the user to upload and download stepper reticle data from a PC based server. Additionally, the server will also automatically archive Paperless Printer data stored on each Intelligent Autoloader.

The server program runs in Windows 95 on the PC. It has the following capabilities:

- *Send reticle data to any stepper on the network*
- *Receive reticle data from any HP9826/332 on the network (password required)*
- *Receive, view, print, and archive Paperless Printer data from any stepper on the network*
- *Parse printer data for diagnostic test results and stepper operating conditions, and save in the appropriate database*
- *Monitor actual stepper throughput by using throughput data sent from the loader*
- *Display and record what product is currently running on which stepper*



Also included with this system is a special HPL boot program which handles the uploading and downloading of reticle data. This program is loaded before the stepper operating program. It sets up an interrupt on the 9826, which is triggered whenever commands are received from the server. **By using this method to transfer reticle data, no changes are required to your stepper operating software, and any software modification restrictions you have agreed to via software licensing remain intact.**

By connecting the server to your company network, it is possible to examine and manipulate all data on the server, right from your office computer! Custom drivers can be designed to upload archived server data to your in-house equipment maintenance system.

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