The Intelligent Autoloader

Operations / Maintenance Manual

Forward

The Intelligent Autoloader system is a major hardware and software upgrade for the smart and automation autoloader. Increasing lot and wafer yield by eliminating wafer breakage and scratches is the driving force behind this system.

Stepper uptime is increased due to the superior wafer handling capability. This capability minimizes the effects of varying wafer conditions, which cause downtime due to improper wafer loading.

Actual stepper throughput is increased through the use of the onboard "Status Light System". This system alerts operators of various stepper conditions through the use of highly visible "Tower Status Lights".

Die yield is further increased by the Paperless Printer utility. This feature eliminates the need to have the system printer turned on constantly, which generates paper particulate. Printer data is archived on a 4 megabyte DiskOnChip, and is available for viewing from the loader touchscreen interface.

Numerous safety features have been employed, which virtually eliminate double loading of wafers and jammed cassettes. Advanced flat find algorhythems provide successful loading of wafers with varying diameters. The integrated recipe system allows you to create and store different loading schemes for problem wafers, choosing from 100 different belt speeds for the 4 stage loading sequence.

The optional Reticle Data Network allows your loaders to be connected to a central server via Ethernet. Reticle data is stored on the server, and delivered via RS-232 to the stepper, through the Intelligent Autoloader. No stepper software changes are necessary, as the HPL Communications program runs alongside whatever stepper code you are running. Optional barcode wand input eliminates operator error when loading Reticle data.

In short, the Intelligent Autoloader is the most advanced autoloader upgrade available for your wafer stepper.

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Installation

This section describes how to install the Intelligent Autoloader retrofit kit on your existing Smart or Automation autoloader. Unless noted, all installation instructions pertain to both the Smart and Automation autoloaders.

NOTE: Do not apply power to the loader interface board, or to the loader itself until all installation steps have been completed!

Automation Upgrade Kit Parts List

Part Number	Qty	Description
		Automation Loader Exterior Panel Kit (Automation only)
AAEPK-LP-P	1	Left side panel, automation autoloader
AAEPK-LHSP-P	1	Left horizontal spacer panel, automation autoloader
AAEPK-LVSP-P	1	Left vertical spacer panel, automation autoloader
AAEPK-RP-P	1	Right side panel, automation autoloader
AAEPK-RHSP-P	1	Right horizontal spacer panel, automation autoloader
AAEPK-RVSP-P	1	Right vertical spacer panel, automation autoloader
AAEPK-UFSP-P	1	Upper front support panel
AAEPK-LFCP-P	1	Lower front cover panel
AAEPK-SO	3	Top Cover Standoff
AAEPK-SO1.5	4	1 ½ inch nylon standoffs
		Touchscreen Assembly
TA-TP-P	1	Touchscreen panel
TA-DTT	1	DesignTech Touchscreen
TA-TPWR-C	1	Touchscreen Power Cable
TA-STCA-C	1	Serial/Touchscreen Cable Assy
		Loader Interface Assembly
LIA-LIP-P	1	Loader Interface Panel
LIA-LPT-C	1	LPT Port Cable Assy
LIA-HPIB-C	1	HPIB Port Cable Assy (Optional)
LIA-SI-C	1	Stepper Interface Cable
LIA-PWR-C	1	Power Cable
LIA-SPCA-C	1	Serial Port Cable Assy
		Electronics Kit (preassembled)
EK-FDDA	1	3.5" 'Floppy disk drive assy, Black
EK-'INTELL-1	1	Intelligent Autoloader Motherboard
EK-CMi486SXLC66	1	Real Time Devices 486SX-66
EK-5936-2axis	1	Tech 80 2 Axis Stepper Motor Ctrl
EK-DM5210	1	Real Time Devices DM5210 A/D board
EK-GP488B/MM	1	Personal 488/MM (Optional)
EK-RSA	1	Reset Switch Assy
EK-SA	1	Speaker Assy
EK-LEDA	1	Red/Green +5vdc LED Assy
EK-MBC	2	Motherboard Bus Cover
EK-SMIC-C	2	Stepper Motor Interface Cable
EK-FDD-DAT-C	1	Floppy Disk Drive Data Cable
EK-FDD-PWR-C	1	Floppy Disk Drive Power Cable
EK-DM5210-50-C	1	Dm5210 50 Pin Interface Cable
EK-DM5210-10-C	1	DM5210 10 Pin Interface Cable

Smart Upgrade Kit Parts List

Part Number	Qty	Description
		Smart Loader Exterior Panel Kit (Smart only)
SAEPK-LP-P	1	Left side panel, smart autoloader
SAEPK-LHSP-P	1	Left horizontal spacer panel, smart autoloader
SAEPK-LVSP-P	1	Left vertical spacer panel, smart autoloader
SAEPK-RP-P	1	Right side panel, smart autoloader
SAEPK-RHSP-P	1	Right horizontal spacer panel, smart autoloader
SAEPK-RVSP-P	1	Right vertical spacer panel, smart autoloader
SAEPK-UFSP-P	1	Upper front support panel
SAEPK-LFCP-P	1	Lower front cover panel
SAEPK-SO	3	Top Cover Standoff
		Touchscreen Assembly
TA-TP-P	1	Touchscreen panel
TA-DTT	1	DesignTech Touchscreen
TA-TPWR-C	1	Touchscreen Power Cable
TA-STCA-C	1	Serial/Touchscreen Cable Assy
		Loader Interface Assembly
LIA-LIP-P	1	Loader Interface Panel
LIA-LPT-C	1	LPT Port Cable Assy
LIA-HPIB-C	1	HPIB Port Cable Assy (Optional)
LIA-SI-C	1	Stepper Interface Cable
LIA-PWR-C	1	Power Cable
LIA-SPCA-C	1	Serial Port Cable Assy
		Electronics Kit (preassembled)
EK-FDDA	1	3.5" 'Floppy disk drive assy, Black
EK-'INTELL-1	1	Intelligent Autoloader Motherboard
EK-CMi486SXLC66	1	Real Time Devices 486SX-66
EK-5936-2axis	1	Tech 80 2 Axis Stepper Motor Ctrl
EK-DM5210	1	Real Time Devices DM5210 A/D board
EK-GP488B/MM	1	Personal 488/MM (Optional)
EK-RSA	1	Reset Switch Assy
EK-SA	1	Speaker Assy
EK-LEDA	1	Red/Green +5vdc LED Assy
EK-MBC	2	Motherboard Bus Cover
EK-SMIC-C	2	Stepper Motor Interface Cable
EK-FDD-DAT-C	1	Floppy Disk Drive Data Cable
EK-FDD-PWR-C	1	Floppy Disk Drive Power Cable
EK-DM5210-50-C	1	Dm5210 50 Pin Interface Cable
EK-DM5210-10-C	1	DM5210 10 Pin Interface Cable

Preparing the Smart/Automation autoloader

Loader Removal

Smart and Automation:

- ❑ Disconnect the power plug from the Loader
- ❑ Disconnect the loader ground strap
- ❑ Disconnect the 20 pin stepper I/O ribbon cable
- ❑ Disconnect the loader from the stepper

Panel Removal

Smart and Automation:

- ❑ Remove the screws holding the front panel on the loader, and remove the front panel.
- ❑ Remove the screws holding the top panel on the loader, and remove the top panel.
- ❑ Remove the screws holding the left and right side panels on the loader, and remove the side panels.

Board Removal

Automation:

- ❑ Remove the two board retainers at the top left and right of the automation PCB.
- ❑ Remove the automation autoloader board from the loader backplane.

Smart:

- ❑ Remove all connectors, sensor, ribbon, and power, from the board.
- ❑ Remove the six mounting screws from the board, and remove the board.

Installing the Intelligent Autoloader Kit

Install new panels

Automation:

- ❑ Remove the four 2” nylon standoffs supporting the automation interface board.
- ❑ Remount the automation interface board using the supplied four 1 ½ inch nylon standoffs, PN AAEPK-SO1.5 Note that you may have to remove any tywrap anchors that may interfere with the automation interface board seating properly.

Smart and Automation:

- ❑ Install the left and right horizontal spacer panels using the six hex head mounting screws. Insure that the ends of the spacers are flush with the loader, as the screw holes are not centered about the spacer panel.

- ❑ Install the left and right vertical spacer panels using the six hex head mounting screws. Note that the mounting standoffs attached to each vertical spacer panel should be oriented towards the top and to the inside of the loader.
- ❑ Install the left and right side plates using the six hex head mounting screws.
- ❑ Install the front support bar using the four hex head mounting screws. Note that the disk drive assembly should be attached to this piece.
- ❑ Install the three top standoffs into the holes on top of the loader that were used to mount the old top covers.
- ❑ Install the three front standoffs into the holes on the front bottom of the loader that were used to secure the front panel cover on the old loader.

Loader Interface Panel Installation

NOTE: Do not plug the power cable into the loader interface panel until the Intelligent Autoloader installation is completely finished!

Smart and Automation

- ❑ Carefully place the loader down on its left side, so that the undercarriage of the loader is exposed.
- ❑ Remove the 20-pin ribbon connector at the bottom of the loader, under the loader mounting hole, and discard.
- ❑ Secure the panel assembly to the base of the loader, using the two mounting screw holes that were used for the 20-pin ribbon connector.
- ❑ Route the umbilical cables up and underneath the elevator motors, ending at the left front bottom of the PCB area. Secure the umbilical with the appropriate tie wraps.
- ❑ Route cable P6 (25 pin cable to printer port) along the back of the loader, to the top so that the cable will be behind the board when it is installed, and the cable comes out along the top right side of the loader
- ❑ Route cable P14 (24V Status Lights) along the back of the loader, to the top so that the cable will be behind the board when it is installed, and the cable comes out along the top right side of the loader.

HPIB Printer Interface (Model 900, 990, and 1000 steppers only)

- ❑ Route cable P1 (24 pin HPIB Interface) along the back of the loader, to the top so that the cable will be behind the board when it is installed, and the cable comes out along the top left side of the loader.
- ❑ Route the HPIB Interface cable between the back of the HP9826 and the Loader Interface panel, plugging the 24 pin 'D' type connector into the HPIB connector on the back of the 9826, and the 24 pin ribbon connector into the *Printer Data IN* socket on the Loader Interface panel.

RS-232 Printer Interface (Model 1100 and up)

- ❑ Route cable P5 along the back of the loader, to the top so that the cable will be behind the board when it is installed, and the cable comes out along the top left side of the loader.
- ❑ Remove the RS-232 cable from the 80 column system printer, and plug it into the *Printer Data IN* port on the Loader Interface panel.
- ❑ Unplug the 80 column system printer. Remove the printer cover, and remove the serial interface card. This will program the printer to use the parallel interface for print data.

- Plug one end of the supplied printer interface cable into the centronics connector on the back of the system printer, and the other end into the LPT connector on the Loader Interface panel.

NOTE: Do not plug the loader power cable into the Loader Interface panel at this time!!

Motherboard Installation

If your stepper is a model 1100 or above, you must remove the HPIB interface card from the motherboard. If this card is detected upon loader initialization, the loader will monitor it for incoming Paperless Printer data (model 900,990, 1000). If it is not detected, the loader will monitor serial port P5 for incoming Paperless Printer data. (model 1100 and above)

Smart:

- Place jumpers on jumper block W1 and W2 on the Intelligent Autoloader motherboard. This will set the correct gain for the smart autoloader flat find sensors.
- Insure that the existing nylon spacers for the old Smart Autoloader board remain on the loader.
- Align the bottom left and bottom right mounting holes with the existing nylon spacers on the loader, and secure LOOSELY using two hex head mounting screws.
- Connect the 9 pin power connector to J5 on the Intelligent Autoloader motherboard
- Connect the loader I/O plugs to the appropriate jacks on the motherboard. Refer to Appendix A for the location of the smart autoloader jacks.

Automation:

- Insure that jumper blocks W1 and W2 are NOT jumped. This will set the correct gain for the automation autoloader flat find sensors.
- Place the motherboard left and right bus connector into the left and right female bus socket on the loader. Press down firmly from the top of the motherboard to secure the board in the sockets.
- Connect the 9 pin power connector to the power connector on the automation I/O interface board

Smart and Automation:

- After insuring all cables behind the motherboard reach all appropriate connectors, align the top left and right side of the motherboard with the nylon spacers that are attached to the left and right vertical spacer bars, and secure using two 1/2 inch nylon standoffs. Tighten the bottom two standoffs on the smart autoloader.
- Connect the Printer port cable (P6) to the CMI486 board, J3.
- Connect the 20 pin stepper I/0 cable to JP1 on the motherboard
- Connect the 24 volt Status LED plug (P14) to p11 on the Intelligent Autoloader motherboard.
- Connect the Speaker/Battery cable (P7) to the CMI485 board, J6. (Pin#1, brown, to left)
- Connect the System RESET plug (P10) to p1 on the Intelligent Autoloader motherboard.

Model 900, 1000, 990

- Connect the HPIB interface cable (P1) to p1 on the HPIB interface card.

Model 1100 and above

- Connect the serial interface cable (P5) to j1 on the CMI486 card.

Floppy Drive Installation

Smart and Automation

- The floppy disk drive comes with the mounting bracket already mounted on the drive body.
- Secure the floppy disk drive to the left side of the upper front support panel using two hex head screws.
- Plug the floppy drive data cable (P9) into serial port J5 on the CMI486 board.
- Plug the floppy drive power cable (P12) into P7 on the Intelligent Autoloader motherboard. Note that P7 is located just to the left of the top center of the board, behind the HPIB cable you hooked up in the last section.

Touch-screen Installation

While connecting the touchscreen cables, it is recommended that you place bubble-wrap across the loader input and output elevators, and place the top touchscreen assembly upside down onto the bubble-wrap. This will protect the top cover from becoming scratched.

- The touch-screen comes pre-installed on the top cover. Place the top cover upside down on the bubble-wrap on the top of the elevators.
- Plug the Touchscreen power connector (P11) into P4 on the Intelligent Autoloader motherboard.
- Plug the Touchscreen Data connector (P8) into J2 on the CMI486 board. Note that J2 is located just above the floppy drive data connection. Orient P8 so that the brown wire (pin1) is towards the bottom of the board.
- Plug the Status 5V LED power connector (P13) into P7 on the Intelligent Autoloader motherboard.
- Place the top touchscreen assembly on the loader and secure using the supplied screws. Insure that the touchscreen umbilical cable rests on top of the floppy drive when placing the top on the loader.

Initial Power-up

Supplying power

Insure that all of the previous steps have been completed before proceeding!

Attaching the power cord

- INSURE THAT THE POWER TO THE STEPPER IS TURNED COMPLETELY OFF! **Never plug or unplug the autoloader power cable with the power to the stepper turned on.** Because the pins in the power connector plug do not make contact all at the same time, it is possible to blow a fuse on the motherboard, or damage one of the piggy-backed boards on the motherboard if the autoloader power socket is “live” when plugged into the receptacle on the loader interface panel.
- Plug the power cord coming from the stepper to the Loader Interface panel POWER IN connector.
- Turn the stepper ON.

- The loader touchscreen should come ON, and the program will boot up to the STOPPED screen after a short period of time
- Note that if the 5V-power supply on the stepper does not come up to voltage quick enough, the touchscreen may appear ‘garbled’. Simply press the red RESET button on the left side of the loader to reinitialize the loader and touchscreen.

Configuring the Loader

Upon initial startup, the loader must be configured for the appropriate hardware that it is attached to. Press the CONFIG button to access the Configuration menus.

Loader Configuration

- Press the CONFIG button from the “Config-Recipe-Zmode” screen to access the Loader Configuration menu.
- Press the "Loader Type" button to tell the Intelligent Autoloader what type of loader it is attached to, "Smart" or "Automation"
- Press the "Serial Number" button, and enter the stepper serial number.
- Press the "Wafer Size" button, and enter the appropriate wafer size.

Elevator Direction Check

Upon initial startup, the loader configuration may need to be changed to drive the elevator motors in the proper direction.

Testing for proper elevator direction

- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen.
- Press ZMODE / UTILITIES, and select the 'Elevator Controls' utility
- Press the 'Step Down' button and observe the direction the input elevator moves.
- Press the 'Step Up' button and observe the direction the input elevator moves.
- If it moves in the correct direction, you may skip the rest of this section, and proceed to the 'Belt Direction Check'

Setting proper elevator direction

- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen.
- Press CONFIG / INPUT
- Press the button next to 'Elev. Direction' to toggle the direction. You may have to use the UP and DOWN scroll arrows to access the correct screen that contains this parameter.
- Press the OUTPUT button.
- Press the button next to 'Elev. Direction' to toggle the direction.
- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen
- Shut down power to the loader by TURNING OFF THE STEPPER POWER. DO NOT ATTEMPT TO SHUT DOWN POWER TO THE LOADER BY REMOVING THE LOADER POWER PLUG!
- Remove the loader front cover, and locate jumpers W5 and W6. Pins 2&3 should be jumped on both plugs
- Remove the jumpers, and jumper pins 1&2 on W5 and W6 for reverse motor operation.

- Replace the loader front cover.
- Turn the stepper power back on.
- Reboot the loader and go back up to "Testing for proper elevator direction", and repeat.

Belt Direction Check

Upon initial startup, the loader configuration may need to be changed to drive the Belt motors in the proper direction.

Testing for proper Belt direction

- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen.
- Press ZMODE / UTILITIES, and select the 'Belt / Gate Controls' utility
- Press the 'Step Out' button and observe the direction the input belt moves.
- Press the 'Step IN' button and observe the direction the input belts moves.
- If the belts move in the correct direction, you may skip the rest of this section, and proceed to the 'Sensors Check'

Setting proper belt direction

- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen.
- Press CONFIG / INPUT
- Press the button next to 'Belt Direction' to toggle the direction.
- Press the OUTPUT button.
- Press the button next to 'Belt Direction' to toggle the direction.
- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen
- Go back up to "Testing for proper Belt direction" and repeat.

Sensors Check

This check will ensure that all sensors on the loader are operating properly. To view the sensor status on the touchscreen, Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen, and then press ZMODE / SENSORS display.

Input Sensors

- Wafer in Boat: Place a wafer over the input wafer in boat sensor (banner sensor for automation, Cap sensor for smart loaders). Verify that the voltage changes from 0V to 5V, or from 5V to 0V
- Gate Sensor (if applicable): Move the gate up and down manually. Verify that the voltage changes from 0V to 5V, or from 5V to 0V
- Upper Elevator Switch: Place a piece of paper between the elevator switch, verifying that the bit changes from a 1 to a 0, and vise versa.
- Lower Elevator Switch: Place a piece of paper between the elevator switch, verifying that the bit changes from a 1 to a 0, and vise versa.
- Left Flat Find: Place a piece of paper between the upper and lower sensor. Verify that the voltage changes from 0V to 5V, or from 5V to 0V

- Right Flat Find: Place a piece of paper between the upper and lower sensor. Verify that the voltage changes from 0V to 5V, or from 5V to 0V
- Cassette Sensor: Press the microswitch down, and release it. Verify that the bit changes from a 1 to a 0, and vise versa

Output Sensors

- Wafer in Boat: Place a wafer over the output wafer in boat sensor (banner sensor for automation, Cap sensor for smart loaders). Verify that the voltage changes from 0V to 5V, or from 5V to 0V
- Wafer from Stepper Sensor: Place a wafer at the output slot, blocking the output sensor. Verify that the voltage changes from 0V to 5V, or from 5V to 0V
- Upper Elevator Switch: Place a piece of paper between the elevator switch, verifying that the bit changes from a 1 to a 0, and vise versa.
- Lower Elevator Switch: Place a piece of paper between the elevator switch, verifying that the bit changes from a 1 to a 0, and vise versa.
- Cassette Sensor: Press the microswitch down, and release it. Verify that the bit changes from a 1 to a 0, and vise versa

Read Bits

- Before testing the read bits, place the STEPPER into ZMODE, and activate the READ BIT screen. **Note that the Bit State indicated on the loader is reversed from the Bit State displayed on the stepper.**
- R101 Wafer Ready: Select bit '1' on the STEPPER. On the touchscreen, press the button next to this bit. Press the ON and OFF button to toggle the state of this bit. Ensure that the bit also changes state on the stepper.
- R104 Clear to Unload: Select bit '4' on the STEPPER. On the touchscreen, press the button next to this bit. Press the ON and OFF button to toggle the state of this bit. Ensure that the bit also changes state on the stepper.
- R105 Loader Error: Select bit '5' on the STEPPER. On the touchscreen, press the button next to this bit. Press the ON and OFF button to toggle the state of this bit. Ensure that the bit also changes state on the stepper.
- R106 Gate Sensor: Select bit '6' on the STEPPER. On the touchscreen, press the button next to this bit. Press the ON and OFF button to toggle the state of this bit. Ensure that the bit also changes state on the stepper.
- R110 Output Cassette Switch: Select bit '10' on the STEPPER. On the touchscreen, press the button next to this bit. Press the ON and OFF button to toggle the state of this bit. Ensure that the bit also changes state on the stepper.

Write Bits

- Before testing the write bits, place the STEPPER into ZMODE, and activate the BIT CHANGE screen. Note that the Bit State indicated on the loader is reversed from the Bit State displayed on the stepper.
- W212 Loader Enable: Select bit '212' on the STEPPER. Change the state of this bit on the stepper. Ensure that the bit also changes state on the sensor display on the touchscreen.
- W213 Loader Reset: Select bit '213' on the STEPPER. Change the state of this bit on the stepper. Ensure that the bit also changes state on the sensor display on the touchscreen.
- W214 Miscellaneous: Select bit '214' on the STEPPER. Change the state of this bit on the stepper. Ensure that the bit also changes state on the sensor display on the touchscreen.

Lower Elevator Limit Switch Setup

The upper and lower elevator limit switches have different functionality when running in a Smart or Automation autoloader, as compared to the Intelligent Autoloader.

For the Smart and Automation autoloader, the upper limit switch is used as a reference to initialize the elevator platform *exactly 300* steps from where the first slot position is aligned with the wafer transport conveyor. The lower limit switch is used to indicate when the *last slot in the boat* is aligned with the wafer transport conveyor.

For the Intelligent Autoloader, the *upper limit switch* is used as a reference to initialize the elevator platform a *user definable amount of steps* from the upper limit switch. It is also used to determine *how many steps are* between the upper limit switch and where the first slot position is aligned with the wafer transport conveyor. The lower limit switch is used as *a true limit switch*. When this switch is made, the elevator *will automatically stop*, protecting the elevator drive system.

The purpose of adjusting the lower elevator limit switches is to allow the elevator to travel to the last slot in the cassette, without the lower switch activating and stopping the elevator. Perform the following adjustment for the input and output elevators.

Lower Elevator Limit Switch

- Turn the lower limit adjustment screw clockwise, raising the bottom flag as far UP as it will go.
- Move the elevator DOWN as far as it will go by turning the elevator counterbalance counterclockwise. Make sure that there are no tie-wraps or cables inhibiting the elevator from travelling to its lowest position.
- Move the elevator UP by turning the elevator counterbalance clockwise by 1/2 turn.
- While monitoring the elevator limit switch status in ZMODE / SENSOR DISPLAY, turn the lower limit adjustment screw counterclockwise, lowering the bottom flag until the status flag indicates "1". If you cannot lower the flag far enough to toggle the switch, check the length of the adjustment screw for the lower switch. It may be protruding from the bottom of the flag assembly, preventing the flag from moving downward. If this is the case, remove the flag assembly, and replace the screw with a shorter screw.

Elevator Setup

The Elevator setup utility will set up the variables used by the loader to properly align each slot on the cassette with the input and output belt transfer assembly.

Starting Elevator Setup

- From the ZMODE / UTILITIES menu, select the Elevator Setup utility.
- Press RUN ALL to automatically set up all variables used by the elevator. Refer to the ***Utilities*** section of this manual for more detail on running this test.
- Perform this test for both the Input and Output elevators.

Time and Date Setup

Since the loader is a PC based controller, the internal clock must be set to properly time and date stamp Paperless Printer data. Note that when the system battery is disconnected (P7) on the CMI486 board, the system date and time must be reset.

Setting the Time and Date

- From the ZMODE / UTILITIES menu, select the Time/Date Setup utility.
- Adjust the displayed time and date by pressing the appropriate arrows.
- Save the displayed time by pressing the SAVE button.

Flat Find Setup

The Intelligent Autoloader is designed to perform a successful flat find on wafers purchased from a variety of vendors, without having to realign the flat find circuit due to size variation. In order to ensure that the loader can handle all of your wafers, the flat find circuit must be set up in the following manner:

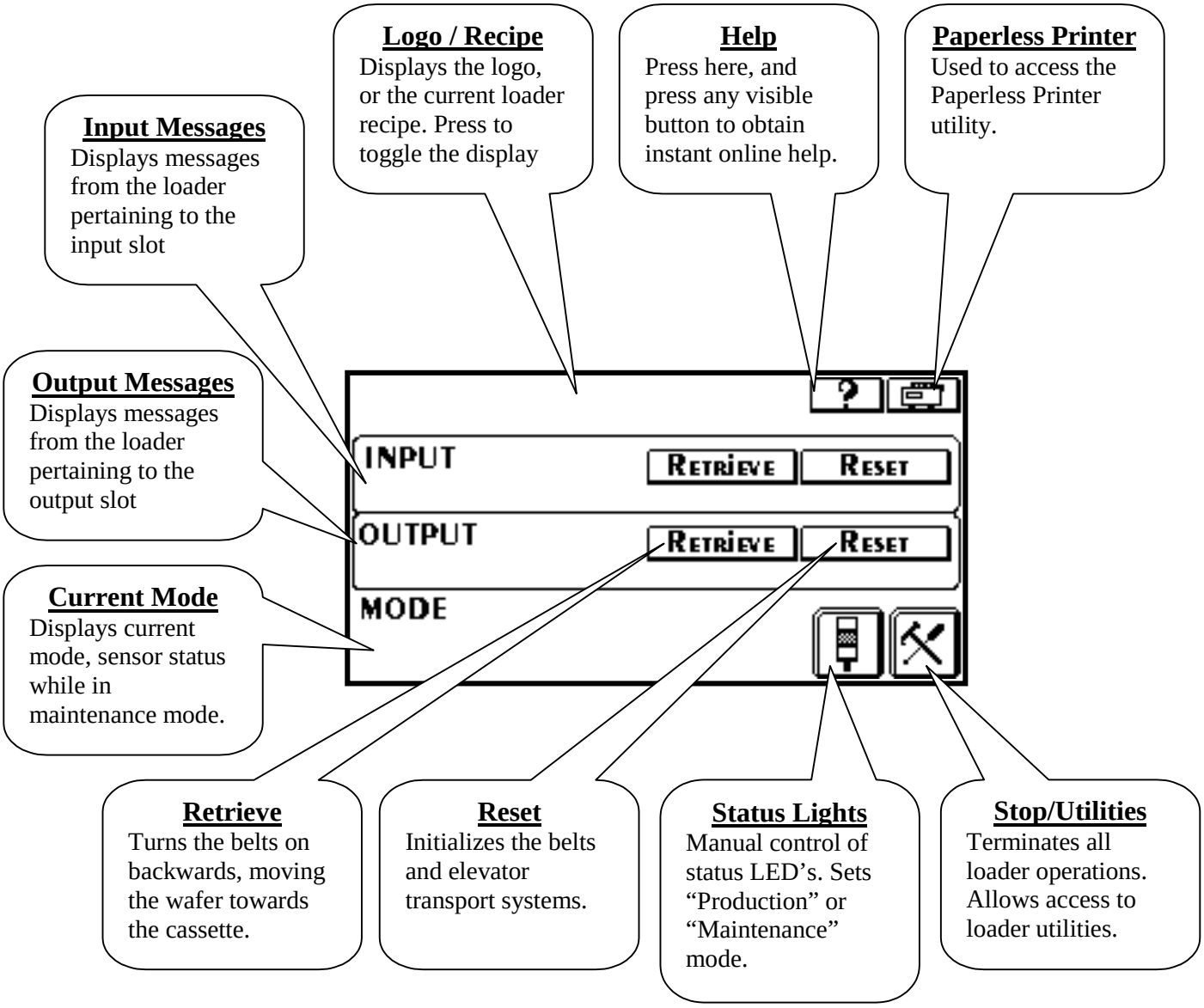
- Take a survey of your wafers, and find the wafer with the longest major flat (smallest size from the major flat to the top of the wafer)
- Press the 'X' button until you are at the 'CONFIG-RECIPE-ZMODE' screen
- Press ZMODE / UTILITIES to view the utilities menu
- Select the "Belts / Gate Controls" utility
- Press the GATE DOWN button to lower the gate.
- Press X to return to the utility menu.
- Select the "Flat Find Setup" utility.
- Place the wafer with the largest major flat (smallest diameter) on the belts at the gate, and move the wafer so the top of the wafer is contacting the gate bearings.
- Orient the major flat so that it is parallel with the crossbar holding the upper flat find board.
- Adjust the lower flat find board so that you are reading from 1.8 to 2.2 volts (smart loader) or 3.2 to 2.8 volts (automation loader) on the touchscreen display.
- Verify proper flat find operation by using the flat find utility to load a variety of wafers with minor differences in diameter.

Loader Operation Table of Contents

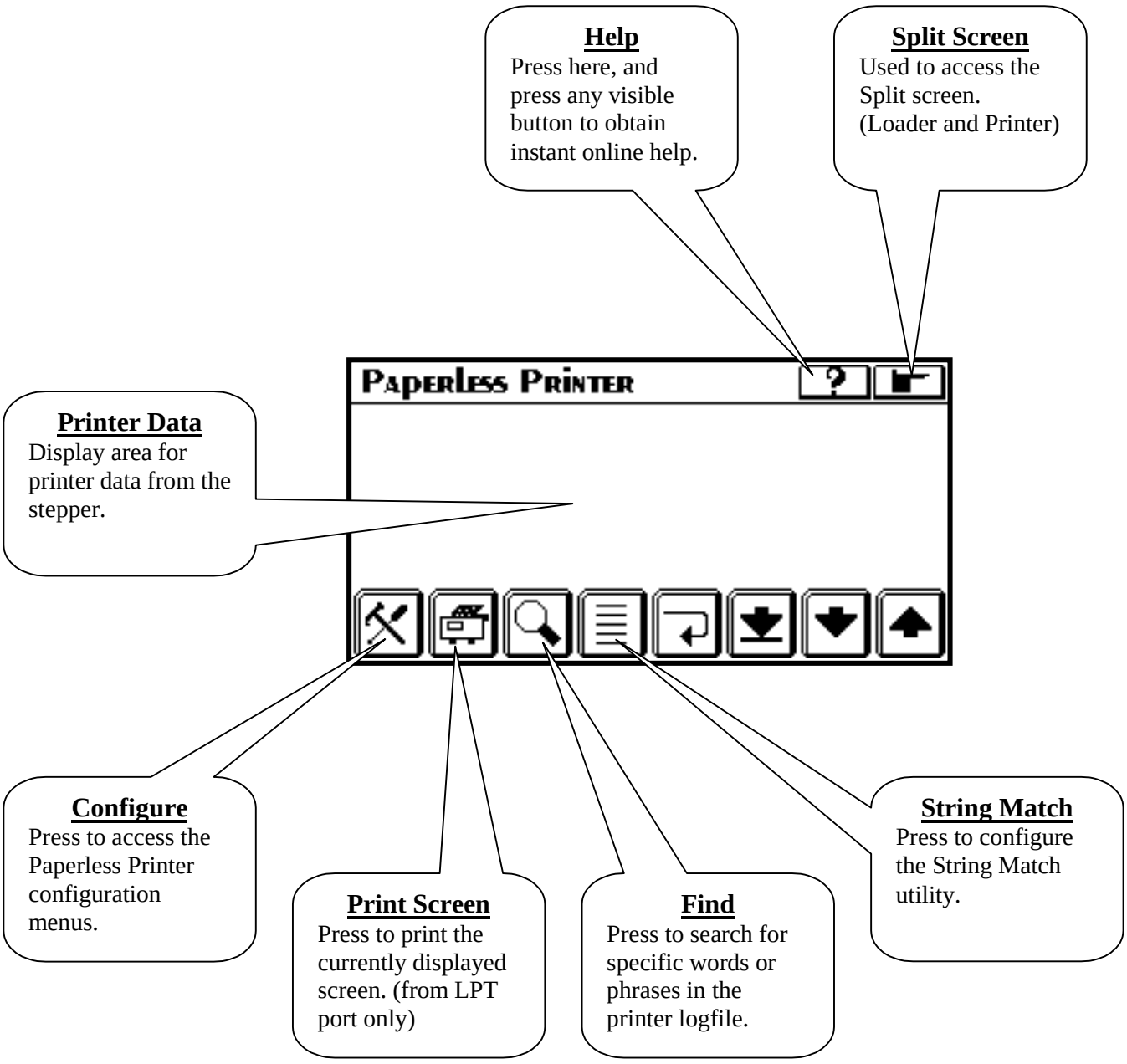
Intelligent Autoloader Operation

The Intelligent Autoloader has been designed to offer the user maximum loader control, without sacrificing ease of use .There are three main screens that can be accessed while the loader is running, the Loader screen, the Paperless Printer screen, and the Split screen. The following diagrams describe the button functions of each screen.

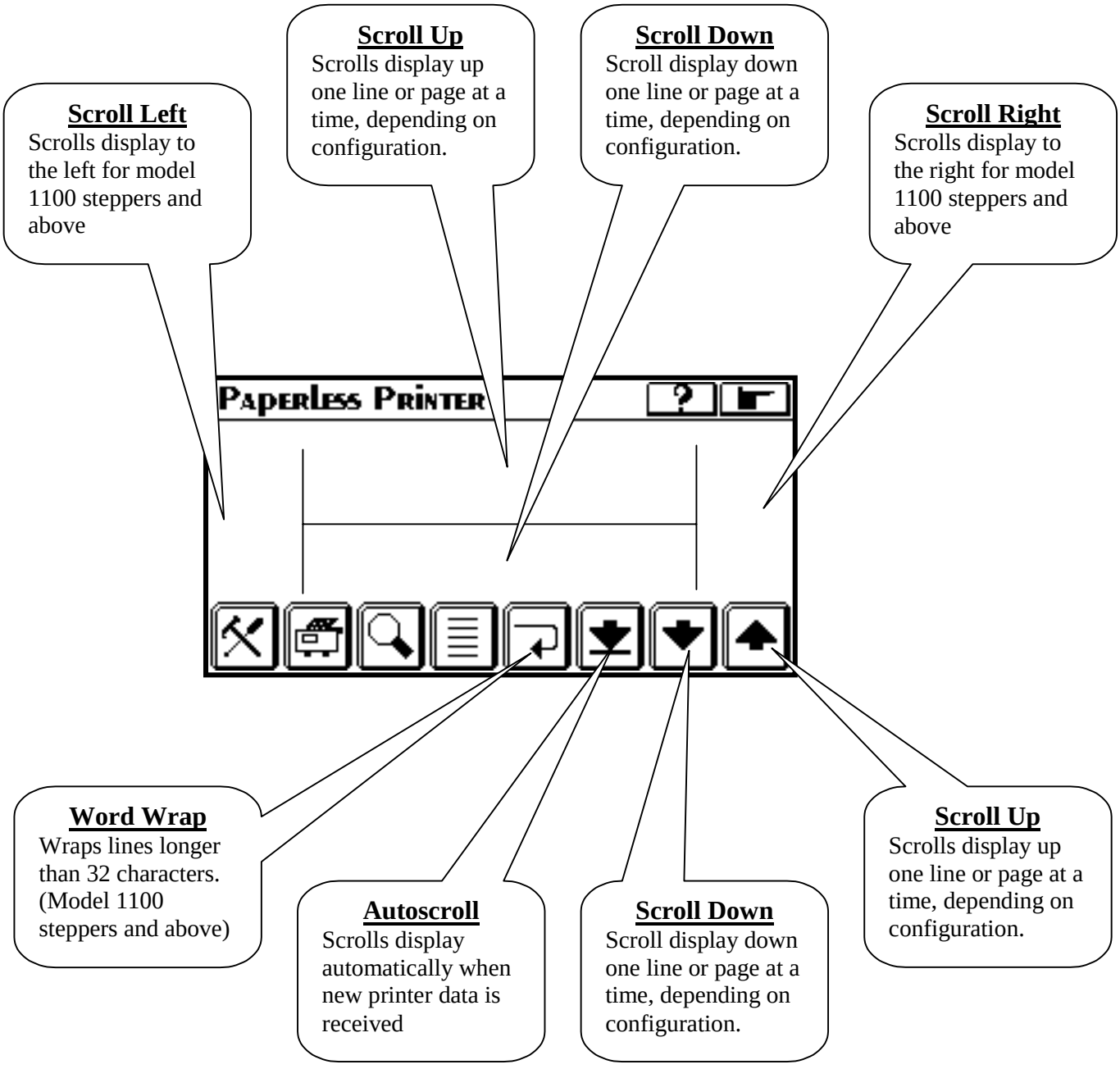
Loader Interface Button Descriptions



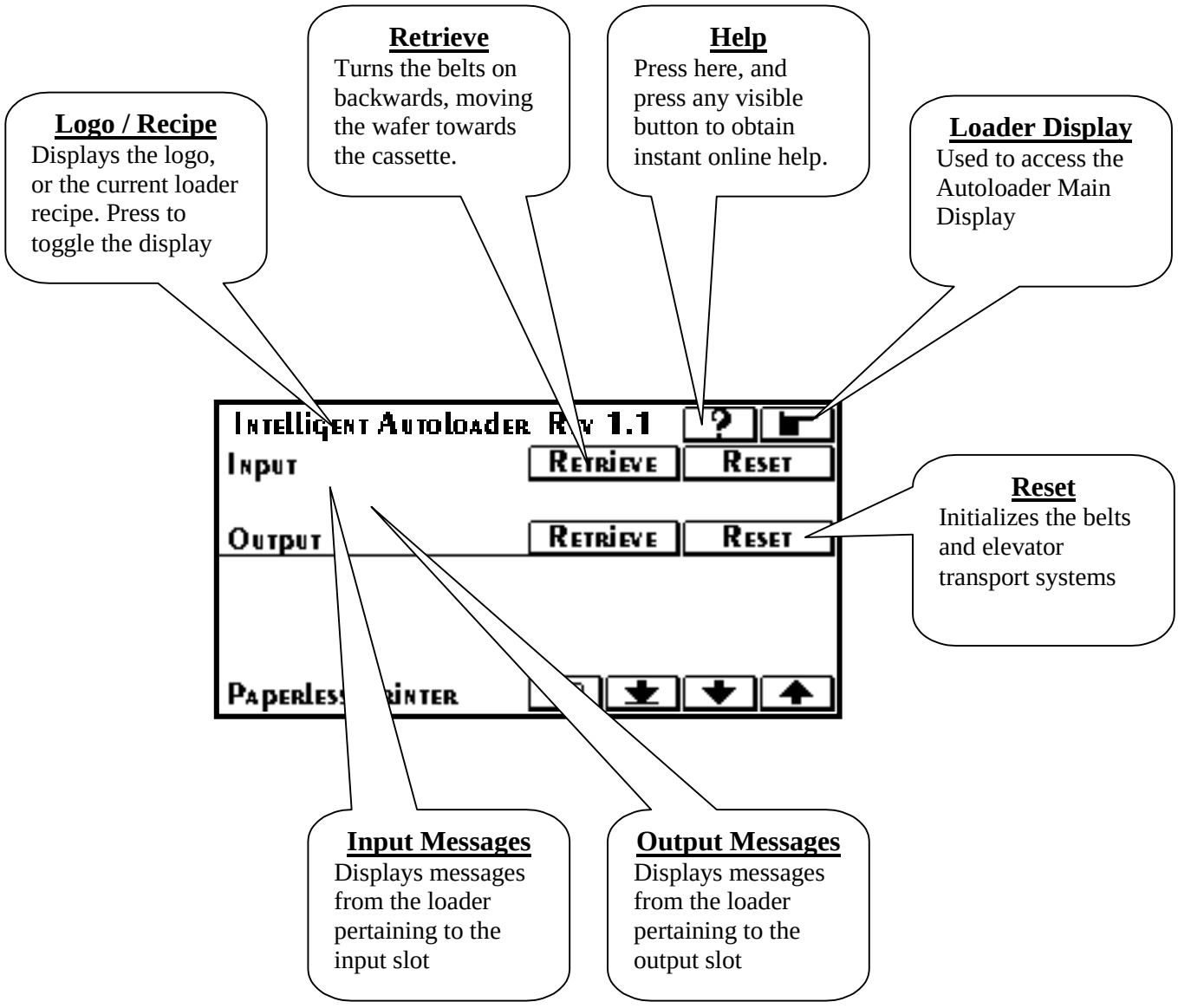
Paperless Printer General Button Descriptions



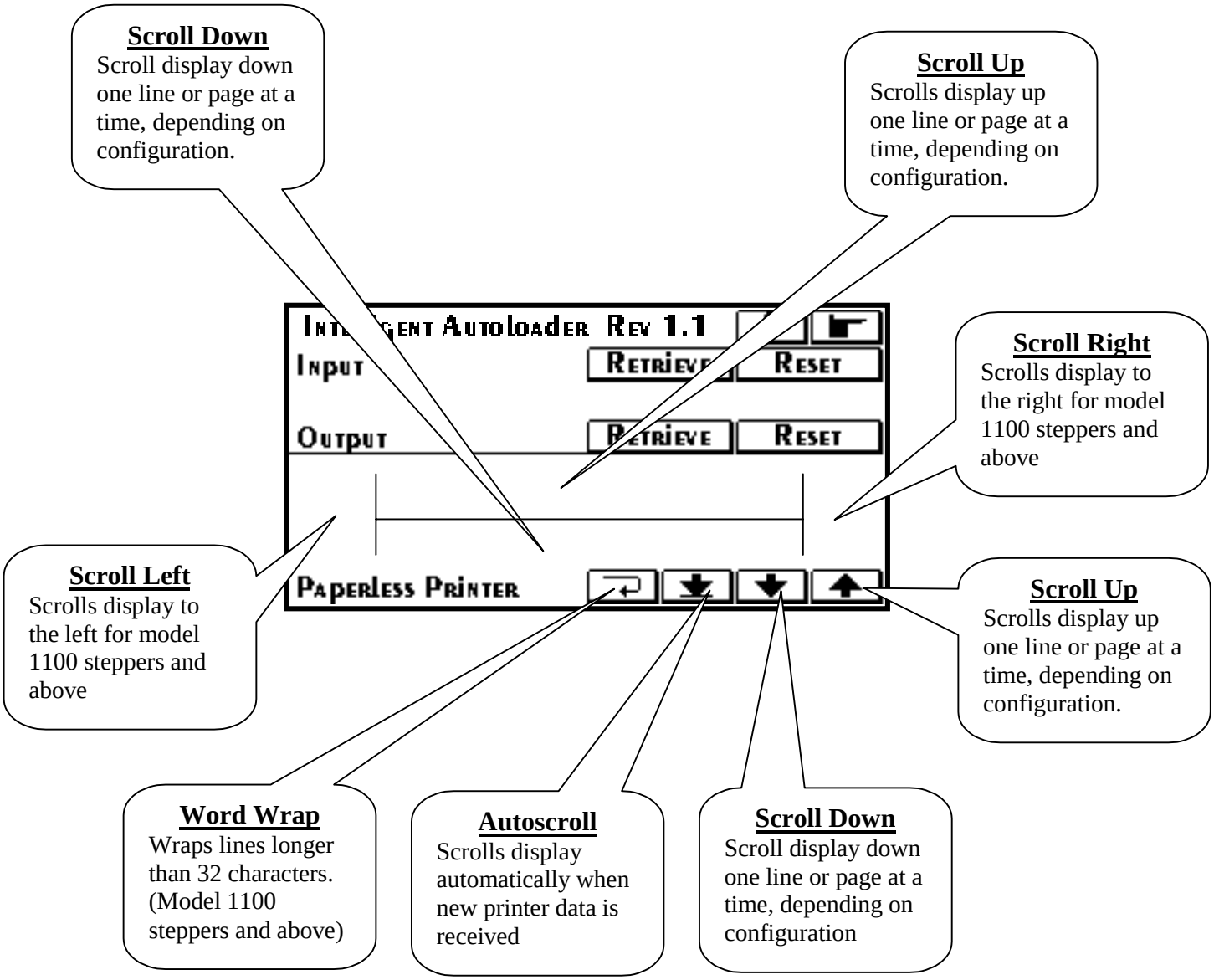
Paperless Printer Navigational Button Descriptions



Split Screen Loader Button Descriptions



Split Screen Paperless Printer Button Descriptions



Loader Messages

The Intelligent Autoloader has been designed to inform you of its current status, in plain English, at all times. The following is a list of the messages generated by the Intelligent Autoloader, and recommended course of action.

"**Checking Tolerances...**"

The loader is measuring the left and/or right flat find voltages, insuring that they are within the upper and lower tolerances specified in the loader recipe.

ACTION: None

"**ERROR: adjusting belt speed...**"

The loader experienced an error while trying to change the belt speed on the wafer transport system.

ACTION: Reset the appropriate slot. If error persists, contact Stepper Equipment Inc

"**ERROR: Cannot detect Flat!!**"

A timeout occurred while the loader was trying to detect and align the major flat.

ACTION: Insure that the "Speed FF Fast" and "Speed FF Slow" timeouts in the Loader Recipe are long enough for the programmed belt speed. Insure that the flat find LEDS are aligned correctly for your product wafers.

"**ERROR: Can't run Wafer Detect!**"

A wafer was detected at the input slot cap or banner sensor immediately after a wafer was picked up at the input gate by the stepper.

ACTION: Reset the slot. Do not place any wafers on the input slot while a wafer is at the input gate waiting to be picked up. If a cassette is on the elevator, insure that the cap or banner sensor is adjusted correctly so that the next wafer to be loaded is not sensed until the elevator has indexed the wafer down to the belt transport.

"**ERROR: Cassette missing...**"

The wafer cassette was removed prematurely while the elevator was indexing downward, or upward.

ACTION: Reset the slot. Do not remove the cassette while the elevator transports are moving upwards or downwards. You can disable this error and have the elevators automatically reinitialize by adjusting The "Cassette Missing" parameter in the Input and Output slot configuration menu

"**ERROR: Flat voltage out of spec!**"

The loader was unable to align the wafer flat so that the left and/or right flat find voltage was within the tolerances set in the loader recipe.

ACTION: Check for proper flat find LED alignment. Check problem wafer for improper major flat length. Check recipe upper and lower flat find tolerances for proper window for problem wafer.

"**ERROR: Input gate not sensed...**"

The gate sensor was not sensed in the DOWN position, in the allotted time.

ACTION: Reset the slot. Check for proper wafer gate operation. Increase the "Gate Error Delay" time parameter in the Input Configuration menu. Insure that the "Input Gate Sensor" parameter is set to FALSE in the Input Configuration menu if you do not have a gate sensor on your loader.

"**ERROR: Input gate still DOWN...**"

The gate sensor was not sensed in the UP position, in the allotted time.

ACTION: Reset the slot. Check for proper wafer gate operation. Increase the "Gate Up Delay" time parameter in the Input Configuration menu. Insure that the "Input Gate Sensor" parameter is set to FALSE in the Input Configuration menu if you do not have a gate sensor on your loader.

"**ERROR: Limit switch detected...**"

The lower elevator limit switch was detected while the elevator was moving downward.

ACTION: Run the "Elevator Setup" utility. Insure that the upper and lower limit switches are set for maximum elevator travel.

"**ERROR: Loading recipe...**"

The loader experienced an error while loading a recipe into memory from the recipe database file.

ACTION: Reset the slot. If the problem persists, contact Stepper Equipment Inc

"**ERROR: Moving elevator home...**"

The stepper motor controller board experienced an error while moving the elevator to the home position in Tune-up Test.

ACTION: Insure that the upper and lower limit switches are operating properly by using the "Sensor Display" menu in Z Mode. Reset the slot. If the problem persists, contact Stepper Equipment Inc.

"**ERROR: Moving elevator to slot.**"

The stepper motor controller board experienced an error while moving the elevator.

ACTION: Insure that the upper and lower limit switches are operating properly by using the "Sensor Display" menu in Z Mode. Reset the slot. If the problem persists, contact Stepper Equipment Inc.

"**ERROR: Nudging wafer...**"

The stepper motor controller board experienced an error while moving the input belts.

ACTION: Reset the slot. Insure that the belt transport system is working correctly by using the "Belts / Gate" utility in Z Mode. If the problem persists, contact Stepper Equipment Inc.

"**ERROR: Opening recipe list...** "

The loader experienced an error while trying to read the Recipe Database.

ACTION: Reset the loader by pushing the Loader Reset button on the left side panel. If the problem persists, contact Stepper Equipment Inc.

"**ERROR: Turning on belts...**"

The stepper motor controller experienced an error while trying to turn on the belts.

ACTION: Reset the slot. If the problem persists, contact Stepper Equipment Inc.

"**ERROR: Upper Limit Switch...**"

The upper limit switch was not detected while initializing the elevator.

ACTION: Insure that the upper and lower limit switches are operating properly by using the "Sensor Display" menu in Z Mode. Reset the slot. If the problem persists, contact Stepper Equipment Inc.

"**ERROR: Wafer at sensor!!!!**"

A wafer was detected at the input slot cap or banner sensor while the "Wafer Detect" check was running.

ACTION: Reset the slot. Do not place any wafers on the input slot while the belts are moving. If a cassette is on the elevator, insure that the cap or banner sensor is adjusted correctly so that the next wafer to be loaded is not sensed until the elevator has indexed the wafer down to the belt transport.

"**ERROR: Wafer detected at ELEV!**"

A wafer was detected at the input slot cap or banner sensor while the belts were moving.

ACTION: Reset the slot. Do not place any wafers on the input slot while the belts are moving. If a cassette is on the elevator, insure that the cap or banner sensor is adjusted correctly so that the next wafer to be loaded is not sensed until the elevator has indexed the wafer down to the belt transport.

"**ERROR: Wafer detected in boat.**"

A wafer was detected in a slot that the loader previously had not detected a wafer in.

ACTION: Insure that the cap or banner sensor is adjusted correctly so that the next wafer to be loaded is not sensed until the elevator has indexed the wafer down to the belt transport.

"**ERROR: Wafer not at flatfinder!**"

A Timeout error occurred while the wafer was moving from the cassette to the flat finder.

ACTION: Reset the slot. Insure that the wafer is moving correctly out to the flat find circuit. Increase the "Spd to FFfind Error Timeout" parameter in the current loader recipe. Insure the "FF Sense Thresh" parameter is set correctly in the current loader recipe.

"**ERROR: Wafer not sensed!**"

A timeout error occurred while the wafer was moving towards the cassette.

ACTION: Insure proper operation of the belt transport system. For the Output slot, increase the "Unload Speed Error Timeout" parameter in the current loader recipe. For the Input slot, increase the "Spd to FFfind Error Timeout" parameter in the current loader recipe.

"**ERROR: Wafer still at flatfinder**"

A timeout error occurred while the wafer was moving from the gate to the cassette.

ACTION: Check for proper operation of the belt transport system.

"**ERROR: Wafer still at sensor!**"

A timeout error occurred while the wafer was moving from the cap or banner sensor, towards the stepper.

ACTION: Check for proper operation of the belt transport system. Increase the "Spd to FFind timeout error" parameter in the current loader recipe.

"**ERROR: Wafer still in boat!**"

A timeout error occurred while the wafer was moving out of the cassette, towards the stepper.

ACTION: Check for proper operation of the belt transport system. Run the "Elevator Setup" utility. Increase the "Spd Exit Boat timeout error" parameter in the current loader recipe.

"**ERROR: Wafer under gate!!!!**"

The flat find sensors did not see the wafer while in the process of aligning the major flat.

ACTION: Insure that the wafer is not bouncing and slipping under the gate. Adjust the gate down position. Run the "Flat Find Setup" utility and insure that the upper and lower flat find boards are properly aligned. Insure the "FF Sense Thresh" parameter is set correctly in the current loader recipe.

"**Finished successfully!** "

The "Tune-up" test utility has successfully completed running.

ACTION: None

"Init Elev (COURSE UP)"

The elevator is currently initializing, moving towards the top of the loader.

ACTION: None

"Init Elev (COURSE DOWN)"

The elevator is currently initializing, moving towards the bottom of the loader.

ACTION: None

"Init Elev (HOME)"

The elevator is currently initializing, moving towards the "home" position.

ACTION: None

"Initializing BELTS..."

The belt transport system is currently initializing.

ACTION: None

"**Loading recipe file!**"

The loader is loading a recipe file from the recipe database.

ACTION: None

"**Loading wafer...**"

The wafer is moving from the cassette, towards the flat finder.

ACTION: None

"**Moving elevator to home..**"

The "Tune-up" test utility has completed, and the cassette is being moved to the "home" position.

ACTION: None

"**Moving wafer to sensor..**"

While running "Tune-up", the wafer in the output slot is being moved towards the "wafer from stepper" sensor.

ACTION: None

"**Placing wafer at sensor!**"

A wafer is being moved onto the banner or cap wafer sensor.

ACTION: None

"**Placing wafer in boat!**"

A wafer is being moved into the cassette.

ACTION: None

"**Printing results...**"

The "Tune-up" test utility is currently printing the results to the Paperless Printer.

ACTION: None

"Ready..."

The input slot is ready for the user to place a wafer on the cap sensor, or a cassette onto the elevator platform. The output slot is ready for the user to place a cassette onto the elevator platform. It is also ready to receive a wafer from the stepper.

ACTION: None

"Remove cassette please."

While initializing, a cassette was detected on the elevator.

ACTION: Remove the cassette.

"Remove wafer, please..."

While initializing, a wafer was detected at the cap or banner sensor.

ACTION: Remove the wafer.

"**Reloading wafer...**"

The current wafer on the input belt transport system failed to align properly, or moved after final alignment. The loader is attempting to realign the wafer automatically.

ACTION: None

"**Reset Loader aborted...**"

The user pressed the RESET button while the slot was initializing.

ACTION: Press the RESET button to reinitialize the slot.

"**Retrieve Wafer aborted...**"

The user pressed the RETRIEVE button while the belts were moving.

ACTION: Press the RETRIEVE or RESET button if necessary.

"**Searching for major flat...**"

The flat finder has seen the wafer pass under it, and is attempting to align the major flat.

ACTION: None

"**Unloading wafer...**"

The wafer is moving towards the cassette.

ACTION: None

"**Wafer at sensor..**"

While running the "Tune-up" utility, the wafer has been detected at the cap or banner sensor.

ACTION: None

"**Wafer detected at Flat Find!**"

A wafer has been detected at the flat find circuit, while the loader is in the "ready" state.

ACTION: Run Flat Find setup. Check for proper operation of the flat find LED's. Insure that the "Wfr Sense Threshold" parameter in the current loader recipe is set correctly.

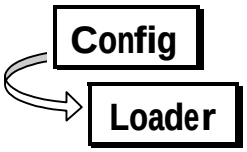
"**Wafer ready...**"

The current wafer's major flat has been found, and the stepper has been signaled to pick up the wafer.

ACTION: None

Loader Configuration Table of Contents

General Loader Configuration Options



The *General Loader Configuration Options* allow you to set up the Intelligent Autoloader to recognize and use the sensors and cassettes on the loader you are upgrading.

You can also customize the way the loader interacts with the stepper operator. The following parameters can be modified to meet your specific needs.

Loader Type

Default: AUTOMATION (AUTOM)

This button toggles the host loader type between SMART and AUTOMATION.

NOTE: The following Input and Output configuration settings will automatically change when the loader type is changed.

SMART:

- Input slot gate sensor is turned OFF
- Input slot wafer in boat sensor = CAP
- Output wafer in boat sensor = CAP
- Output wafer drop-off sensor = OPT

AUTOMATION:

- Input slot gate sensor is turned ON
- Input slot wafer boat sensor = BAN
- Output wafer boat sensor = BAN
- Output wafer drop-off sensor = SPY

Serial Number

Default: 0

This field should be set to the stepper serial number that the loader is attached to. The loader and paperless printer use the serial number when reading and writing to configuration and data files.

Wafer size

Default: 6 inches

This value should be set to the size of the wafers you are using.

Startup Mode

Default: Ready

The STARTUP mode determines whether the loader will boot up to the READY screen, or the STOPPED screen. Note that if you boot up to the STOP screen, the DEFAULT DISPLAY configuration item is disabled.

Initialize on Startup

Default: Initialize

The INIT ON STARTUP mode determines whether the loader initializes the Input slot and output slots upon startup. Note that if the STARTUP mode is set to STOP, the configuration item INIT ON STARTUP will automatically be set to OFF.

Default Display

Default: Split:

This button determines the default startup screen. It changes the startup screen to the LOADER screen, PAPERLESS PRINTER screen, or a combination of the LOADER and PAPERLESS PRINTER screens (SPLIT).

Display Recipe

Default: Off

This button sets the default data displayed at the top of the LOADER and SPLIT screen. The data displayed is either the current autoloader recipe, or the Intelligent Autoloader logo.

Steps per slot

Default: 300 steps

This value represents the number of 'steps' between each slot in the wafer cassettes you are using.

Slots per boat

Default: 25 slots

This value represents the maximum number of wafers that your cassettes can hold.

Lock Setup Access Password

Default: OFF

The “Lock Setup Access” Password button allows the user to set a 1 to 5 digit password to secure access to the loader configuration, recipe, and Z Mode menus. Setting this value to 0 will disable the password.

Lock Configuration Access Password

Default: OFF

The “Lock Configuration Access” Password button allows the user to set a 1 to 5 digit password to secure access to the loader configuration menus. Setting this value to 0 will disable the password.

Lock Default Display Password

Default: OFF

The “Lock Default Display” Password button allows the user to set a 1 to 5 digit password to secure access to the Loader, Paperless printer, or Split Screen displays. The display upon boot-up is determined by the “Default Display” setting in the Loader Configuration menu. You can keep the user from changing this display by setting a password for the “Lock Default Display”. Setting this value to 0 will disable the password

Lost wafer timeout

Default: OFF (sec)

The Lost Wafer Alarm is a timer that is activated when a wafer is picked up at the Input slot. If the wafer does not return to the output slot in *Lost Wafer Timeout* seconds the alarm is activated. Setting this field to 0 will disable the Lost Wafer Alarm.

Lost wafer ACTION

Default: OFF

This field determines what *Alarm Actions* are taken when a *Lost Wafer Timeout* occurs.

Loader Error ACTION

Default: OFF

This field determines what *Alarm Actions* are taken when a Loader Error occurs.

Minimum Time Timeout

Default: OFF (sec)

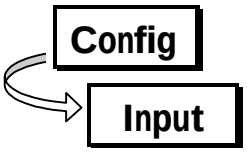
The Minimum Time Alarm is a timer that is activated when a wafer is picked up at the Input slot. If the wafer returns to the output slot in *Minimum Time Timeout* seconds the alarm is activated. This is useful in detecting chuck vacuum errors at the input slot, and not allowing unprocessed wafers to be 'lost' in the output cassette. Setting this field to 0 will disable the Minimum Time Alarm.

Minimum Time ACTION

Default: OFF

This field determines what *Alarm Actions* are taken when a *Minimum Time Timeout* occurs.

Input Slot Configuration Options



The *Input Slot Configuration Options* allow you to set up the Input (Load) slot on the Intelligent Autoloader to recognize and use the sensors and cassettes on the loader you are upgrading.

You can also customize the way the Input Slot interacts with the stepper operator. The following parameters can be modified to meet your specific needs.

Belt direction

Default: Normal

This switch determines which direction to drive the belt stepper motor when a positive move is requested. This is useful on some loaders, where the drive belt pulley arrangement is not standard.

Belt initialize speed

Default: 40%

This parameter is the speed at which the belts will move backwards when the Input or Output slot is initializing.

Belt initialize timeout

Default: 5000 ms

This parameter determines the amount of time the belts will spin backwards when the Input or Output slot is initialized.

Input slot Gate Sensor

Default: ON

This parameter is turned ON automatically when you set the *Loader Type* configuration parameter to AUTOMATION. It is turned OFF automatically when you set the *Loader Type* configuration parameter to SMART. If you purchase the Input slot gate sensor option from Stepper Equipment for your smart loader, you need to turn this parameter ON after you set the *Loader Type* configuration parameter to SMART.

Gate error delay

Default: 2000 ms

This value determines how long the loader will wait to sense the wafer gate switch before generating an error.

Gate Up delay

Default: 1000 ms

The GATE UP DELAY parameter determines the amount of time the gate stays in the down position after the major flat is found.

Elevator direction

Default: Normal

This switch determines which direction to drive the elevator stepper motor when a positive move is requested. This is useful on some loaders, where the elevator stepper motors are mounted on top of the base plate, instead of underneath.

Elevator speed UP

Default: 60%

This parameter determines how fast the elevator travels in the UP direction during normal operation.

Elevator speed DOWN

Default: 30%

This parameter determines how fast the elevator travels in the DOWN direction during normal operation.

Elevator Adjust Steps

Default: 80 steps

This value sets the total distance the elevator will travel while in the Elevator Jiggle routine. The *Elevator Adjust Steps* is divided by the *Elevator Adjust Cycles* to determine how many steps to move the elevator for each cycle.

The Elevator Jiggle routine moves the cassette up and down in small increments when trying to load and unload wafers from warped boats that do not line up correctly with the wafer transport system.

Elevator Adjust Cycles

Default: 5 cycles

This value is the number of attempts the Elevator Jiggle routine will try to load/unload the wafer from the cassette. The *Elevator Adjust Steps* is divided by the *Elevator Adjust cycles* to determine how many steps to move the elevator for each Elevator Jiggle cycle.

The Elevator Jiggle routine moves the cassette up and down in small increments when trying to Load and Unload Wafers from Warped Boats That Do Not Line Up Correctly with the Wafer Transport System.

Cassette Done Action

Default: Off

This field determines what actions are taken when the specified cassette is finished.

NOTE: When a cassette is finished, it is automatically initialized. If the INIT INPUT ELEVATOR action is specified, the belts will also be initialized along with the elevator.

Cassette START delay

Default: 2000 ms

This value is the delay time from when a cassette is first sensed, to when it will start indexing downward.

Cassette MISSING

Default: Delay

This value determines the action the loader will take if a cassette is removed from the elevator at any position other than the home position. When set to DELAY, the loader will stop the elevator, wait *Cassette Missing Delay* seconds, and then automatically initialize the elevator. When set to ERROR, the loader will stop the elevator, and report an error condition. Operator intervention is required to reset the elevator.

Cassette Miss delay

Default: 4000 ms

This value is the amount of time the loader will wait before initializing the elevator when a cassette is removed at any position other than the home position.

NOTE: The *Cassette Missing* parameter must be set to DELAY, for the *Cassette Missing Delay* to be activated.

Wafer in boat sensor

Default: Banner

This parameter tells the loader what type of cassette wafer sensor is in use.

When the *Loader Type* is set to SMART, this field is automatically set to CAPACITIVE. Some late versions of Smart loaders were equipped with BANNER wafer sensors. If your Smart loader is equipped with BANNER wafer sensors, set your *Loader Type* to SMART, then set this field to BANNER.

When the *Loader Type* is set to AUTOMATION, this field is automatically set to BANNER.

Wafer START Delay

Default: 2000 ms

This value represents a time delay from when a single wafer (no cassette loaded) is first sensed on the input wafer belts, until the belts start moving the wafer towards the wafer gate.

Wafer READY delay

Default: 2000 ms

This value represents a time delay from when the gate is raised, to when the loader signals the stepper that a wafer is ready for pickup. This value must have a minimum value of 1000 ms.

Wafer detect steps

Default: 400 steps

This value is the total number of steps the input belts will spin backwards when trying to determine if the stepper has picked up the wafer.

This feature prevents the double loading of wafers caused by the flat find sensors not 'seeing' the wafer, due to relaxation of the belts or stepper vibrations.

Wafer detect speed

Default: 40 steps

This value determines how fast the input belts will spin backwards when trying to determine if the stepper has picked up the wafer.

This feature prevents the double loading of wafers, caused by the flat find sensors not 'seeing' the wafer due to relaxation of the belts, or stepper vibrations.

Wafer under gate

Default: retry

This value determines what action is taken if the wafer is detected slipping under the gate while in the Flat Find mode. If set to RETRY, the loader will move the wafer back towards the cassette, and then try to load the wafer again. If set to error, the loader will stop and report an error at the gate.

Z Mode belt steps

Default: 200 steps

This value is the default step size when entering the *Belts/Gate Control Utility*. You can change the step size while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Z Mode belt speed

Default: 10%

This value is the default ON/OFF speed when entering the *Belts/Gate Control Utility*. You can change the belt speed while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Z Mode Elevator steps

Default: 300 steps

This value is the default step size when entering the *Elevator Control Utility*. You can change the step size while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Z Mode Elevator speed

Default: 50%

This value is the default ON/OFF speed when entering the *Elevator Control Utility*. You can change the speed while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Total Elevator Travel

Default: 7800 steps

This value represents the total travel of the elevator. It is calculated automatically in the *Elevator Setup Utility*. However, should you need to customize this value, you can change it here.

The total elevator travel should be set up for maximum travel by adjusting the upper and lower elevator limit switch flags.

Limit to Slot #1

Default: 300 steps

This value represents the total number of steps it takes the elevator to move from the upper elevator limit switch to place the wafer in slot#1 on the belt transport system. This value is automatically set in the *Elevator Setup utility*. However, should you need to customize this value, you can change it here.

Top>Center Slot#1

Default: 40 steps

This value is used by the *Elevator Setup Utility* when calculating the Limit to Slot#1 value. You should adjust this value so that the *Limit to Slot#1 function* calculates the *Limit to Slot #1 value* such that the wafer is perfectly centered in slot#1.

Limit to home position

Default: 20 steps

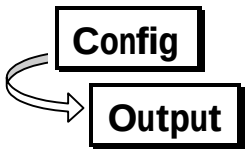
This value represents the number of steps from the top elevator limit switch, to the elevator initialized position. It should be set so that the cassettes can be easily placed on the elevator platform, and easily removed.

Print Cassette Stats

Default: Off

This value determines if cassette statistics are sent to the paperless printer after each cassette has finished processing

Output Slot Configuration Options



The *Output Slot Configuration Options* allow you to set up the Output (Unload) slot on the Intelligent Autoloader to recognize and use the sensors and cassettes on the loader you are upgrading.

You can also customize the way the Output Slot interacts with the stepper operator. The following parameters can be modified to meet your specific needs.

Belt direction

Default: Normal

This switch determines which direction to drive the belt stepper motor when a positive move is requested. This is useful on some loaders, where the drive belt pulley arrangement is not standard.

Belt initialize speed

Default: 40%

This parameter is the speed at which the belts will move backwards when the Input or Output slot is initializing.

Belt initialize timeout

Default: 5000 ms

This parameter determines the amount of time the belts will spin backwards when the Input or Output slot is initialized.

Elevator direction

Default: Normal

This switch determines which direction to drive the elevator stepper motor when a positive move is requested. This is useful on some loaders, where the elevator stepper motors are mounted on top of the base plate, instead of underneath.

Elevator speed UP

Default: 60%

This parameter determines how fast the elevator travels in the UP direction during normal operation.

Elevator speed DOWN

Default: 30%

This parameter determines how fast the elevator travels in the DOWN direction during normal operation.

Elevator Adjust Steps

Default: 80 steps

This value sets the total distance the elevator will travel while in the Elevator Jiggle routine. The *Elevator Adjust Steps* is divided by the *Elevator Adjust Cycles* to determine how many steps to move the elevator for each cycle.

The Elevator Jiggle routine moves the cassette up and down in small increments when trying to load and unload wafers from warped boats that do not line up correctly with the wafer transport system.

Elevator Adjust Cycles

Default: 5 cycles

This value is the number of attempts the Elevator Jiggle routine will try to load/unload the wafer from the cassette. The *Elevator Adjust Steps* is divided by the *Elevator Adjust cycles* to determine how many steps to move the elevator for each Elevator Jiggle cycle.

The Elevator Jiggle routine moves the cassette up and down in small increments when trying to load and unload wafers from warped boats that do not line up correctly with the wafer transport system.

Cassette Done Action

Default: Off

This field determines what actions are taken when the specified cassette is finished.

NOTE: When a cassette is finished, it is automatically initialized. If the INIT OUTPUT ELEVATOR action is specified, the belts will also be initialized along with the elevator.

Cassette START delay

Default: 2000 ms

This value is the delay time from when a cassette is first sensed, to when it will start indexing downward.

Cassette MISSING

Default: Delay

This value determines the action the loader will take if a cassette is removed from the elevator at any position other than the home position. When set to DELAY, the loader will stop the elevator, wait *Cassette Missing Delay* seconds, and then automatically initialize the elevator. When set to ERROR, the loader will stop the elevator, and report an error condition. Operator intervention is required to reset the elevator.

Cassette Miss delay

Default: 4000 ms

This value is the amount of time the loader will wait before initializing the elevator when a cassette is removed at any position other than the home position.

NOTE: The *Cassette Missing* parameter must be set to DELAY, for the *Cassette Missing Delay* to be activated.

Mirror Input boat

Default: ON

This feature, when enabled, instructs the loader to place the wafer in the same slot (mirrored) in the output cassette, that it received it from in the input boat. Thus, a wafer loaded from slot#5 in the input cassette will be unloaded in slot#20 in the output cassette.

Reset with Input

Default: On

When Reset with Input is turned on, the output cassette will automatically initialize when the last wafer from the input cassette has been unloaded.

Wafer in boat sensor

Default: Banner

This parameter tells the loader what type of cassette wafer sensor is in use.

When the *Loader Type* is set to SMART, this field is automatically set to CAPACITIVE. Some late versions of Smart loaders were equipped with BANNER wafer sensors. If your Smart loader is equipped with BANNER wafer sensors, set your *Loader Type* to SMART, then set this field to BANNER.

When the *Loader Type* is set to AUTOMATION, this field is automatically set to BANNER.

Wafer drop off sensor

Default: Spy

This parameter is set to SPY automatically when you set your *Loader Type* to AUTOMATION. If you have an automation loader with an OPTICAL wafer drop-off sensor, then you need to set this parameter to OPTICAL after you set the *Loader Type* to AUTOMATION.

It is set to OPTICAL automatically when you set your *Loader Type* to SMART.

Z Mode belt steps

Default: 200 steps

This value is the default step size when entering the *Belts/Gate Control Utility*. You can change the step size while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Z Mode belt speed

Default: 10%

This value is the default ON/OFF speed when entering the *Belts/Gate Control Utility*. You can change the belt speed while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Z Mode Elevator steps

Default: 300 steps

This value is the default step size when entering the *Elevator Control Utility*. You can change the step size while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Z Mode Elevator speed

Default: 50%

This value is the default ON/OFF speed when entering the *Elevator Control Utility*. You can change the speed while in the utility, but it will be restored to this value when you exit and re-enter the utility.

Total Elevator Travel

Default: 7800 steps

This value represents the total travel of the elevator. It is calculated automatically in the *Elevator Setup Utility*. However, should you need to customize this value, you can change it here.

The total elevator travel should be set up for maximum travel by adjusting the upper and lower elevator limit switch flags.

Limit to Slot #1

Default: 300 steps

This value represents the total number of steps it takes the elevator to move from the upper elevator limit switch to place the wafer in slot#1 on the belt transport system. This value is automatically set in the *Elevator Setup utility*. However, should you need to customize this value, you can change it here.

Top>Center Slot#1

Default: 40 steps

This value is used by the *Elevator Setup Utility* when calculating the Limit to Slot#1 value. You should adjust this value so that the *Limit to Slot#1 function* calculates the *Limit to Slot #1 value* such that the wafer is perfectly centered in slot#1.

Limit to home position

Default: 20 steps

This value represents the number of steps from the top elevator limit switch, to the elevator initialized position. It should be set so that the cassettes can be easily placed on the elevator platform, and easily removed.

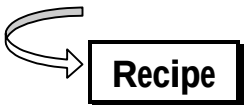
Print Cassette Stats

Default: Off

This value determines if cassette statistics are sent to the paperless printer after each cassette has finished processing

Recipe System Table of Contents

Active Recipe List



The *Active Recipe List* menu allows you set up a list of recipes for the loader to use. The loader will always start with the first recipe in the list, for each wafer. Should an error occur that the loader could recover from, it will then load in the next recipe in the list and try again to load the wafer. The loader will not require operator intervention unless all recipes in the list fail to load the wafer properly, or an unrecoverable error occurs. The *Recipe Editor* allows you to generate and customize unlimited recipes for various wafer conditions.

Insert a new recipe into the Active Recipe List

To insert a new recipe in the Active Recipe List:

- Press the *Change Mode* button until the word "INSERT" is visible in the title bar.
- Press the button next to the position in the Active Recipe List that you want to insert a recipe into.
- Select a recipe from the Recipe database menu.
- The selected recipe is now in the Active Recipe List. All other recipes at or below the selected position are shifted downward one position.

Update a recipe in the Active Recipe List

To update a recipe in the Active Recipe List:

- Press the *Change Mode* button until the word "UPDATE" is visible in the title bar.
- Press the button next to the recipe in the Active Recipe List that you want to update.
- Select a recipe from the Recipe database menu.
- The recipe in the Active Recipe List has now been replaced with the selected recipe.

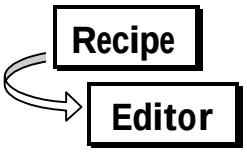
Delete a recipe from the Active Recipe List

To delete a recipe from the Active Recipe List:

- Press the *Change Mode* button until the word "DELETE" is visible in the title bar.
- Press the button next to the recipe in the Active Recipe List that you want to remove.

- The selected recipe has now been removed from the Active Recipe List. All recipes below the selected recipe are shifted upward one position.

The Recipe Editor



The recipe editor is used to create, edit, save, and delete wafer-loading configurations. Once you have created a new recipe using the Recipe Editor, activate it by placing it in the *Active Recipe List.* After editing a recipe, make sure that you save it to make the changes permanent.

The following parameters can be modified in a Loader Recipe to permit proper loading and unloading of different types of wafers.

Speed exit boat (INPUT)

Default: 30%

This setting determines the belt speed when the wafer is moved out of the cassette towards the flat finder. This speed is in effect from the time the input wafer sensor detects the wafer, until the sensor does not "see" the wafer anymore. (Plus the transition delay)

Exit Boat Transition Delay (INPUT)

Default: 250 ms

This value determines the ADDITIONAL amount of time the current belt speed remains active after the input wafer sensor no longer "sees" the wafer exiting the cassette.

Exit Boat Error Timeout (INPUT)

Default: 4000 ms

This value is the total time allowed for the wafer to exit the cassette or loading platform, before a timeout error is generated. This timer begins when the input wafer sensor "sees" the wafer and the belts start moving.

Speed to Flat Finder (INPUT)

Default: 20%

This value is the belt speed in effect, from the time the wafer has moved out of the cassette, until it reaches the flat-finder. (Plus the transition delay)

Moving to Flat Find Transition Delay (INPUT)

Default: 5000 ms

This value determines the ADDITIONAL amount of time the current belt speed remains active after the left or right flat-find sensor "sees" the incoming wafer. Set this parameter sufficiently long enough to allow the leading edge of the wafer to contact the gate bearings, but no longer. Beware that if this parameter is set too long and the gate fails to come down, the loader will not automatically detect the wafer moving under the gate, and will not stop the belts. Wafer under gate protection starts when the FLAT FIND FAST mode is entered.

Moving to Flat Find Error Timeout (INPUT)

Default: 5000 ms

This value is the total time allowed for the wafer to reach the flat find detectors before a timeout error is generated. This timer starts when the wafer sensor "loses sight" of the wafer in the cassette, as the wafer moves towards the flat finder.

Speed FLAT FIND fast (INPUT)

Default: 20%

This setting represents the belt speed from the time the flat find sensor detects the incoming wafer, (plus the transition delay), until the leading edge of the major flat is detected.

Flat Find Fast Error Timeout (INPUT)

Default: 30000 ms

This value is the total time allowed for the loader to detect the leading edge of the major flat, before a timeout error is generated. This timer starts when the flat find detectors "see" the wafer moving into the gate. Allow enough time for the wafer to make at least 2 complete rotations in the flat find area.

Speed FLAT FIND slow (INPUT)

Default: 5%

This setting represents the belt speed from the time the leading edge of the major flat is detected, until both flat find sensor voltages are in specification, and the flat is considered "found".

Flat Find Slow Error Timeout (INPUT)

Default: 10000 ms

This value represents the total time allowed for the loader to bring both flat find sensor voltages into spec, before a timeout error is generated. This timer starts when the left flat find detector "sees" the leading edge of the major flat.

Speed in Boat (INPUT)

Default: 15%

This value represents the belt speed that will be used when the wafer sensor detects a wafer moving into the cassette.

Time into Boat (INPUT)

Default: 1500 ms

This value represents the amount of time the belts will remain ON, while moving the wafer into the cassette. This timer starts when the wafer sensor detects a wafer moving into the cassette.

Speed at sensor (INPUT)

Default: 5%

This value represents the belt speed when the wafer is moving onto the elevator platform. This belt speed starts when the wafer sensor detects a wafer moving onto the platform, with no cassette present.

Time at sensor (INPUT)

Default: 2000 ms

This value represents the amount of time the belts will remain ON, while moving the wafer onto the elevator platform. This timer starts when the wafer sensor detects a wafer moving onto the platform.

Unload Speed (OUTPUT)

Default: 30%

This value represents the belt speed while the wafer is moving from the Wafer Drop-off Sensor towards the elevator platform.

Unload Error Timeout (OUTPUT)

Default: 15000 ms

This value is the total time allowed for the wafer to reach the cassette, or elevator platform, before a timeout error is generated. This timer starts when the Wafer Drop-off Sensor "sees" the wafer coming from the stepper, and the belts start moving.

Speed in Boat (OUTPUT)

Default: 15%

This value represents the belt speed that will be used when the wafer sensor detects a wafer moving into the cassette.

Time into Boat (OUTPUT)

Default: 1500 ms

This value represents the amount of time the belts will remain ON, while moving the wafer into the cassette. This timer starts when the wafer sensor detects a wafer moving into the cassette.

Speed at sensor (OUTPUT)

Default: 5%

This value represents the belt speed when the wafer is moving onto the elevator platform. This belt speed starts when the wafer sensor detects a wafer moving onto the platform, with no cassette present

Time at sensor (OUTPUT)

Default: 2000 ms

This value represents the amount of time the belts will remain ON, while moving the wafer onto the elevator platform. This timer starts when the wafer sensor detects a wafer moving onto the platform.

Wafer sensor threshold

Default: 2500 mV

This is the lowest voltage at which the Wafer Sensor (at the platform) will generate a "wafer sensed" condition. You can customize this setting to allow loaders equipped with “banner sensors” to "see" a wide variety of wafer substrates without making any mechanical adjustments.

Output detect threshold

Default: 2500 mV

This is the lowest voltage at which the Output detect Sensor (at the end of the output conveyor) will generate a "wafer sensed" condition. You can customize this setting to allow the loader to "see" a wide variety of wafer substrates without making any mechanical adjustments.

FLAT FIND sensor threshold

Default: 4000 mV (automation), *1000mV* (Smart)

This value is the threshold point at which the flat finder will "see" the wafer. The left or right flat find sensor voltage must be at or below this value for *an automation* loader to generate a "wafer present" condition. The left or right flat find sensor voltage must be at or above this value for *a smart* loader to generate a "wafer present" condition.

FLAT FIND balance limit

Default: 250 mV

This value represents the maximum difference between the left and right flat find voltages, from which the major flat will be considered “found” while in the “flat find slow” mode.

FLAT FIND upper limit

Default: 3500 mV

This value determines the acceptable "upper limit" at which the leading edge of the major flat will be considered "detected".

FLAT FIND lower limit

Default: 1500 mV

This value determines the acceptable "lower limit" at which the leading edge of the major flat will be considered "detected".

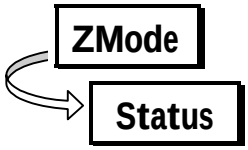
Flat Find Retries

Default: 2

This value represents the number of times that the loader will attempt to find the major flat with the current recipe

Utilities Table of Contents

Sensor Display



The *Sensor Display* menu reports real-time voltage levels and status of all sensors on your loader. This allows you to quickly locate and correct defective electronic parts on the loader.

In addition, a digital and graphical voltmeter is available for all sensors that indicate a voltage level. The following sensors and status bits on the Smart and Automation autoloaders are reported.

Wafer in cassette (LOAD)

0 vdc = No wafer

5 vdc = Wafer present

This sensor detects wafers that are placed on the input platform and in the input cassette.

Gate sensor (LOAD)

0 vdc = Gate DOWN

5 vdc = Gate UP

This sensor detects whether the wafer gate on the input slot is up or down. This sensor is standard on all Automation loaders. It is not shipped on Smart loaders. Stepper Equipment offers an Input Gate Sensor upgrade for your smart loader. Contact S.E.I for more information.

Upper elevator switch (LOAD)

1 = Flag detected

0 = No Flag detected

The Upper Elevator switch is an optical limit switch, which defines the maximum upward travel permitted for the elevator.

Lower elevator switch (LOAD)

1 = Flag detected

0 = No Flag detected

The Lower Elevator switch is an optical limit switch, which defines the maximum downward travel permitted for the elevator.

Left flat find (LOAD)

0 vdc = Wafer detected

5 vdc = No wafer detected

This sensor is located on the left side of the upper flat-find board. It is used for final positioning of the major flat on the wafer.

Right flat find (LOAD)

0 vdc = Wafer detected

5 vdc = No wafer detected

This sensor is located on the right side of the upper flat-find board. It is used to detect the leading edge of the major flat during a flat find attempt. It is also used for final positioning of the major flat on the wafer.

Cassette sense (LOAD)

1 = No cassette

0 = Cassette detected

This micro switch detects when a cassette is present on the Input elevator platform.

Wafer in Cassette (UNLOAD)

0 vdc = No wafer

5 vdc = Wafer present

This sensor detects wafers that are moving onto the elevator platform, or are moving into the output cassette.

Wafer Sensor (UNLOAD)

0 vdc = No wafer detected

5 vdc = Wafer detected

This sensor detects wafers that are placed on the output wafer transport belts by the stepper. On Smart loaders and some early revisions of Automation loaders, this sensor is an optical sensor. On most Automation loaders, this sensor is a reflective (SPY) sensor.

Upper elevator switch (UNLOAD)

1 = Flag detected

0 = No Flag detected

The Upper Elevator switch is an optical limit switch, which defines the maximum upward travel permitted for the elevator.

Lower elevator switch (UNLOAD)

1 = Flag detected

0 = No Flag detected

The Lower Elevator switch is an optical limit switch, which defines the maximum downward travel permitted for the elevator.

Cassette Sense (UNLOAD)

1 = No cassette

0 = Cassette detected

This micro switch detects when a cassette is present on the Output elevator platform.

R101 Wafer Ready

1 = Wafer NOT READY

0 = Wafer READY

This bit is used to signal the stepper that the wafer at the INPUT gate is ready for pickup. (Stepper read bit #101)

R104 Clear to Unload

1 = CLEAR to Unload

0 = NOT CLEAR to Unload

This bit is used to signal the stepper that the OUTPUT slot is ready to accept a wafer. (Stepper read bit #104)

R106 Gate Sensor

1 = Gate DOWN

0 = Gate UP

This bit is used to signal the stepper the current position of the INPUT gate (Stepper read bit #106)

R110 UNLOAD Cassette Sense Switch

1 = Output cassette PRESENT

0 = Output cassette NOT PRESENT

This bit tells the stepper if there is a cassette present on the OUTPUT elevator. (Stepper read bit #110)

W212 Loader Enable

1 = Loader ENABLED

0 = Loader DISABLED

This bit is used by the stepper to signal the loader to begin processing wafers. (Stepper write bit #212)

W213 Loader Reset

1 = RESET loader

0 = XXX

This bit is used by the stepper to signal the loader to begin initializing the input and output slots. (Stepper write bit #213)

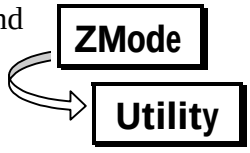
W214 Miscellaneous

1 = Rejected Output wafer

0 = XXX

This bit is used by the stepper to signal the loader that the wafer in the output slot is a Rejected wafer. (Stepper write bit #214)

Belts/Gate Control



The *Belts/Gate* Control utility allows the user to manually control the input and output belts on the loader. This eliminates operators having to use tweezers or their fingers to manually move wafers, if necessary. The belts can be stepped at user definable increments, or turned on and off at different speeds.

There is also a control for manually moving the wafer gate up and down. The following controls are available to the user:

Load

This Button Selects the Input or Left Elevator and Wafer Transport Assembly for the Active Utility.

Unload

This Button Selects the Output or Right Elevator and Wafer Transport Assembly for the Active Utility.

Step Out

This button steps the belts for the selected slot away from the operator by the number of steps indicated on the screen.

Step In

This button steps the belts for the selected slot towards the operator by the number of steps indicated on the screen.

Turn On Out

This button turns the belts On or Off for the selected slot, with the belts moving away from the operator, by the speed indicated on the screen.

Turn On In

This button turns the belts On or Off for the selected slot, with the belts moving towards the operator, by the speed indicated on the screen.

Gate UP

This button raises the wafer gate on the INPUT slot.

Gate Down

This button lowers the wafer gate on the Input slot.

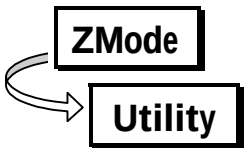
Speed

This button allows you to change the stepper motor speed. The default value for this item can be set in the *Config/Input* or *Config/Output* lists.

Steps

This button allows you to change the number of steps sent to the selected stepper motor for every press of the Out, In, Up, and Down buttons. The default value for this item can be set in the *Config/Input* or *Config/Output* lists.

Elevator Control



The *Elevator* Control utility allows the user to manually control the input and output cassette elevators on the loader. This eliminates operators having to shut off the stepper to disable the elevator motors if a cassette somehow gets jammed.

The elevators can be stepped at user definable increments, or turned on and off at different speeds. The following controls are available to the user:

Load

This Button Selects the Input or Left Elevator and Wafer Transport Assembly for the Active Utility.

Unload

This Button Selects the Output or Right Elevator and Wafer Transport Assembly for the Active Utility.

Step Up

This button steps the selected elevator in the Up direction by the number of steps indicated on the screen.

Step Down

This button steps the selected elevator in the Down direction by the number of steps indicated on the screen.

Turn On Up

This button turns the elevator for the selected slot On or Off, with the elevator moving Up, by the speed indicated on the screen.

Turn On Down

This button turns the elevator for the selected slot On or Off, with the elevator moving Down, by the speed indicated on the screen.

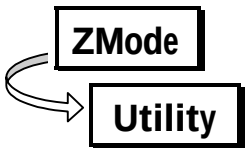
Speed

This button allows you to change the stepper motor speed. The default value for this item can be set in the *Config/Input* or *Config/Output* lists.

Steps

This button allows you to change the number of steps sent to the selected stepper motor for every press of the Out, In, Up, and Down buttons. The default value for this item can be set in the *Config/Input* or *Config/Output* lists.

Flat Find Setup Utility



The *Flat Find Setup* utility provides the technician with a quick, accurate method for setting up the upper and lower flat find boards. A digital voltmeter with bar graph and extra large display shows the left and right sensor voltages in real-time.

The *Find Flat* and *Unload* functions allow for quick testing of the circuit board alignment. The *Editor* function allows the user to change flat find recipe parameters easily, and then test these parameters in the Flat Find Setup utility. The following functions are available with this utility:

Find Flat

This button starts the Input wafer loading sequence. The default recipe is loaded. Then the gate is lowered, and the wafer is moved out towards the flat. The loader will attempt to find and align the major flat on the wafer. Flat-find voltages can be monitored at this time.

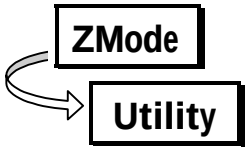
Unload

This button causes the loader to move the wafer in the INPUT slot away from the gate, towards the elevators.

Editor

This button allows access to the Recipe Editor. From the editor, you can quickly change wafer loading parameters, save them, and then exit back directly to the Flat Find Setup utility to test your changes.

Import / Export Utility



The *Import/Export* utility allows the user to rapidly configure multiple Intelligent Autoloader systems, after setting up one system manually. The user can export the loader's configuration files to the 3.5" floppy drive, and then import those files to another system.

Additionally, the *Paperless Printer* data files can be exported to floppy for archiving and examination on any PC based computer system. Future releases of software will also support the exporting of SPC data files.

The following options are available in this utility:

Import All configuration/recipe files

The "Import all config/recipe files" menu selection copies all of the loader configuration and recipe files from the floppy drive to the loader's internal hard drive. After performing this procedure, it will be necessary to reset the loader's serial number (*Config/Loader),* and recalculate the input and output elevator variables *(ZMode/Utilities/Elevator Setup).*

Import Recipe Database

The "Import Recipe Database" menu selection copies the *Recipe database* file from the floppy drive to the loader's internal hard drive.

Import Recipe Active List

The "Import Recipe Active List" menu selection copies the *Recipe Active List* file from the floppy drive to the loader's internal hard drive.

Import Loader Configuration

The "Import Loader Configuration" menu selection copies the *Loader Configuration* file from the floppy drive to the loader's internal hard drive. After performing this procedure, it will be necessary to reset the loader's serial number (*Config/Loader).*

Import Input Configuration

The "Import Input Configuration" menu selection copies the *Input Configuration* file from the floppy drive to the loader's internal hard drive. After performing this procedure, it will be necessary to recalculate the input elevator variables *(ZMode/Utilities/Elevator Setup).*

Import Output Configuration

The "Import Output Configuration" menu selection copies the *Output Configuration* file from the floppy drive to the loader's internal hard drive. After performing this procedure, it will be necessary to recalculate the output elevator variables *(ZMode/Utilities/Elevator Setup).*

Import Tune-up Configuration

The "Import Tune-up Configuration" menu selection copies the *Tune-up Test* Configuration file from the floppy drive to the loader's internal hard drive.

Import Statistics Configuration

The "Import Statistics Configuration" menu selection copies the *Loader Statistics* Configuration file from the floppy drive to the loader's internal hard drive.

Import Throughput Configuration

The "Import Throughput Configuration" menu selection copies the *Throughput Configuration* file from the floppy drive to the loader's internal hard drive.

Import Printer Configuration

The "Import Printer Configuration" menu selection copies the *Printer Configuration* file from the floppy drive to the loader's internal hard drive.

Import Match String Configure

The "Import Match String Configuration" menu selection copies the *Match String Configuration* file from the floppy drive to the loader's internal hard drive.

Export All configuration/recipe files

The "Export All config/recipe files" menu selection copies all of the loader configuration and recipe files to the floppy drive. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Recipe Database

The "Export Recipe Database" menu selection copies the *Recipe Database* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Recipe Active List

The "Export Recipe Active List" menu selection copies the *Recipe Active List* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Loader Configuration

The "Export Loader Configuration" menu selection copies the *Loader Configuration File* from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Input Configuration

The "Export Input Configuration" menu selection copies the *Input Slot Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Output Configuration

The "Export Output Configuration" menu selection copies the *Output Slot Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Tune-up Configuration

The "Export Tune-up test Configuration" menu selection copies the *Tune-Up Test Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Statistics Configuration

The "Export Loader Statistics Configuration" menu selection copies the *Loader Statistics Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Throughput Configuration

The "Export Loader Throughput Configuration" menu selection copies the *Loader Throughput Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Printer Configuration

The "Export Printer Configuration" menu selection copies the *Printer Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

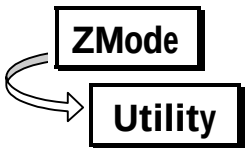
Export Match String Configure

The "Export Match String Configuration" menu selection copies the *Match String Configuration* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Export Printer Data File

The "Export Printer Data File" menu selection copies the *Printer Data* file from the loader's internal hard disk to the 3.5" floppy diskette. Make sure you have a MS-DOS 3.5" formatted diskette in the drive before activating this function.

Touch Screen Setup



The Touch Screen setup utility allows you to set the contrast and background color of the touch-screen. It is best not to adjust the touch-screen until it has been on for at least 10 minutes. It takes this long for the cold cathode florescent backlight to stabilize.

The following controls are available in this utility:

Increase Contrast

This button increases the contrast of the blue and white colors of the touch-screen.

Decrease Contrast

This button decreases the contrast of the blue and white colors of the touch-screen.

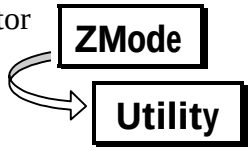
White Background / Blue Text

This button changes the background color to white, and the text color to blue.

Blue Background / White Test

This button changes the background color to blue, and the text color to white.

Elevator Setup



The Elevator Setup utility automatically calculates the input and output elevator variables for precise elevator positioning. The elevator setup variables eliminate the need to manually set up the elevator upper and lower limit flags. The following functions are available in this utility:

Load

This Button Selects the Input or Left Elevator and Wafer Transport Assembly for the Active Utility.

Unload

This Button Selects the Output or Right Elevator and Wafer Transport Assembly for the Active Utility.

Stop

This button aborts the current setup or calculation in progress.

Run All

This button automatically runs all of the Elevator Setup functions, in proper order.

Top>Center Slot#1

Default: 40 Steps

This value is used when calculating the Limit to Slot#1 value. You should change this value to adjust fine centering of the wafer in slot#1. This value can also be set in *Config/Input* and *Config/Output.*

Limit to home position

Default: 20 Steps

This value represents the number of steps from the top elevator limit switch, to the elevator-initialized position. It should be set so that the cassettes can be easily placed on the elevator platform, and easily removed. This value can also be set in *Config/Input* and *Config/Output.*

Total Elevator Travel

Default: 7800 Steps

This utility automatically calculates the total travel capabilities of the selected elevator. Remove all cassettes and wafers before starting this setup utility.

The elevator limits should be set up for maximum travel by adjusting the upper and lower elevator limit switch flags. This value can also be set manually in *Config/Input* and *Config/Output.*

Limit to Slot #1

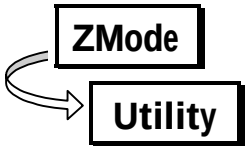
Default: 300 Steps

This value represents the total number of steps it takes the elevator to move from the upper elevator limit switch to place the wafer in slot#1 on the belt transport system.

To start this test, place a wafer in the first slot of a cassette, place the cassette on the loader platform, and press this button. The platform will be moved downward in course steps, until a wafer is sensed. Then, the platform will move down in fine increments, while the belts attempt to move the wafer out of the cassette. When the wafer finally moves out of the boat, the loader calculates the *Limit to Slot#*1 position by adding the *Top to Center, Slot#1* variable to the current elevator position.

This value can also be set manually in *Config/Input* and *Config/Output.*

Tune-up Test



This utility exercises the loader by cycling wafers in and out of the Input and/or the Output cassettes at different slot positions.

The test is completely user configurable. In addition, statistics are kept for flat find voltages, timing statistics for wafer transport time to and from the cassettes, and elevator stepper motor step loss (equivalent to S-Test) . The following options are available from the Tune-up Test screen:

Starting / Ending Tune-up Test

There are two buttons, for the Input and Output slot, which start or end Tune-up Test. If Tune-up is not running on the Input or Output slot, the button for that slot will display "Start". If Tune-up test is currently running on the Input or Output slot, the button for that slot will display "Stop". Tune-up test can be run with or without a cassette.

To start the Tune-up Test without a cassette:

- Place a wafer on the Input and/or Output slot
- Press the Start button for the appropriate axis.

To start the Tune-up Test with a cassette:

- Place a single wafer in any slot in the cassette, and place on the elevator platform
- Press the Start button for the appropriate axis

Configuring Tune-up Test

Tune-up test can be configured to operate according to user defined specifications. The following configuration options are available:

Tune-up cycles (LOAD)

Default: 5 (cycles)

This value determines how many cycles Tune-up Test will run for the Input slot. To determine the total number of wafers run, multiply *Tune-up Cycles* by *Wafers/Cycle*.

Wafers/cycle (LOAD)

Default: 25 (wafers)

This value determines how many times the tune-up test wafer will be moved into and out of the cassette for each cycle for the Input slot. To determine the total number of wafers run, multiply *Tune-up Cycles* by *Wafers/Cycle*.

Slot order (LOAD)

Default: Random

This value determines what cassette slot(s) the tune-up test wafer is cycled into and out of. The choices are:

- RANDOM: Slots are chosen randomly.
- OUT IN: Slots change starting with the two outer slots (1,25) and work their way inward to the two innermost slots (12,13).
- 1 WAFER: A single slot is chosen (*Single Slot #*) to be used for the entire test.
- TOP->BOTTOM: Slot order is from the uppermost slot (25) to the lowest slot (1).
- BOTTOM->TOP: Slot order is from the lowest slot (1) to the uppermost slot (25).

Single slot # (LOAD)

Default: 1 (slot)

This value determines what cassette slot is used when the *Slot Order* configuration value is set to 1 Wafer.

Move Delay (LOAD)

Default: 2000 (ms)

This value determines how long the tune-up test wafer remains at it's current position, before the next move occurs.

Print Results

Default: Print

This value determines whether the tune-up test results are printed. The available choices are:

- PRINT: The results are sent to the paperless printer. A hardcopy is printed if the paperless printer configuration setting *Print Hardcopy* is set to ON.
- OFF: The results are not printed.

Tune-up cycles (UNLOAD)

Default: 5 (cycles)

This value determines how many cycles Tune-up Test will run for the Output slot. To determine the total number of wafers run, multiply *Tune-up Cycles* by *Wafers/Cycle*.

Wafers/cycle (UNLOAD)

Default: 25 (wafers)

This value determines how many times the Tune-up Test wafer will be moved into and out of the cassette for each cycle for the Output slot. To determine the total number of wafers run, multiply *Tune-up Cycles* by *Wafers/Cycle*.

Slot order (UNLOAD)

Default: Random

This value determines what cassette slot(s) the tune-up test wafer is cycled into and out of. The choices are:

- RANDOM: Slots are chosen randomly.
- OUT IN: Slots change starting with the two outer slots (1,25) and work their way inward to the two innermost slots (12,13).
- 1 WAFER: A single slot is chosen (*Single Slot #*) to be used for the entire test.
- TOP->BOTTOM: Slot order is from the uppermost slot (25) to the lowest slot (1).
- BOTTOM->TOP: Slot order is from the lowest slot (1) to the uppermost slot (25).

Single slot # (UNLOAD)

Default: 1 (slot)

This value determines what cassette slot is used when the *Slot Order* configuration value is set to 1 Wafer.

Move Delay (UNLOAD)

Default: 2000 (ms)

This value determines how long the tune-up test wafer remains at its current position, before the next move occurs.

Statistics from Tune-up Test

While Tune-up Test is running, it is measuring and storing statistics on many facets of loader operation. This data can be used to trigger preventive maintenance procedures, such as belt changes, based on actual loader wear and tear. It is also used to determine whether Tune-up Test passes or fails. The following statistics are tracked for Tune-up Test:

Left Flat-Find Gate Down (vdc)

This value is the initial voltage reading taken from the left flat find sensor for the current wafer after the major flat is "found", and the belts have stopped turning, but before the gate is raised.

Left Flat-Find Gate Up (vdc)

This value is the voltage reading taken from the left flat find sensor for the current wafer immediately after the wafer gate has moved to the UP position. A major change in voltage when compared to the *Left FF Gate-Down* voltage may indicate that the gate is moving the wafer when it is rising. This may be caused by the loader input slot being out of level, or from residual resist on the gate bearings.

Left Flat-Find Final (vdc)

This value is the voltage reading taken from the left flat-find sensor for the current wafer immediately after the *Wafer Ready* signal is sent to the stepper. A major change in voltage when compared to the *Left FF Gate-Up* voltage may indicate that the belts are "relaxing" excessively, and may need cleaning and/or changing.

Right Flat-Find Gate Down (vdc)

This value is the initial voltage reading taken from the right flat-find sensor for the current wafer after the major flat is "found", and the belts have stopped turning. but before the gate is raised.

Right Flat-Find Gate Up (vdc)

This value is the voltage reading taken from the right flat find sensor for the current wafer immediately after the wafer gate has moved to the Up position. A major change in voltage when compared to the *Right FF Gate-Down* voltage may indicate that the gate is moving the wafer when it is rising. This may be caused by the loader input slot being out of level, or from residual resist on the gate bearings.

Right Flat-Find Final (vdc)

This value (vdc) is the voltage reading taken from the right flat find sensor for the current wafer immediately after the *Wafer Ready* signal is sent to the stepper. A major change in voltage when compared to the *Left FF Gate-Up* voltage may indicate that the belts are "relaxing" excessively, and may need cleaning and/or changing.

Elevator>Flat-Find (LOAD)(sec)

This value represents the time for the current wafer to move from the Input cassette or elevator platform, to the flat find sensors.

Flat-Find>Elevator (LOAD)(sec)

This value represents the time for the current wafer to move from the flat find sensors to the Input cassette or elevator platform.

Elevator>Sensor (UNLOAD)(sec)

This value represents the time for the current wafer to move from the Output cassette or elevator platform, to the *Wafer from Stepper* sensor.

Sensor>Elevator (UNLOAD)(sec)

This value represents the time for the current wafer to move from the *Wafer from Stepper* sensor to the Output cassette or elevator platform.

Elevator Offset (LOAD)

This value represents the difference (steps) between the calculated elevator position, and the measured elevator position, using the upper elevator limit switch as a reference. If this value is out of specification, check the elevator stepper motor, drive belt, and the mechanical elevator assemblies for wear.

Elevator Offset (UNLOAD)

This value represents the difference (steps) between the calculated elevator position, and the measured elevator position, using the upper elevator limit switch as a reference. If this value is out of specification, check the elevator stepper motor, drive belt, and the mechanical elevator assemblies for wear.

Tune-up Test Statistics Properties

The Tune-up Test Statistics properties are used by the program to determine if the loader passes or fails Tune-up Test. To access the statistics properties, press the button next to the statistic you would like to view the properties for.

While viewing the statistics properties, you can set a high and low tolerance for a particular property by pressing the button next to the property. You can also enable automatic print outs for any property of any statistic after test completion.

A (T) after a particular statistic property indicates that a tolerance has been set for this statistic, and that this statistic will be evaluated in determining if Tune-up Test passes or fails. A (P) after the statistic property indicates that this value will be printed out upon completion of Tune-up Test.

The following properties are available for all Tune-up Test statistics:

Count

This value represents the total samples taken since Tune-up Test started.

Current

This value represents the current or last reading for the selected statistic.

High

This value represents the highest reading taken for the selected statistic since Tune-up Test started.

Low

This value represents the lowest reading taken for the selected statistic since Tune-up Test started.

Mean

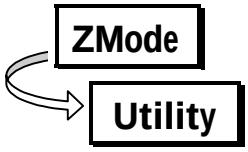
This value represents the Mean Value for the selected statistic since Tune-up Test started.

Sigma

This value represents the 2sigma Value for the selected statistic since Tune-up Test started.

Throughput Utility

The Throughput Utility provides a highly accurate, objective method for measuring how long it takes the stepper to process each wafer. In addition, it keeps statistics on how many wafers are processed. This is useful in determining preventive maintenance scheduling based on need versus time.



Statistics generated by this utility are kept for the following categories:

- Current Cassette
- User Cycle
- Life of loader

Viewing Throughput Data for the Current Cassette

To view throughput data for the Current Cassette, press the Cassette button on the right side of the screen. These statistics are reset whenever a new cassette is placed on the output elevator.

Viewing Throughput Data for the User Cycle

The User Cycle throughput data can be configured to calculate and print throughput data every XXX minutes, from 1 to 1440 minutes (0 to 24 hours). To view throughput data for the User Defined Cycle, press the User Defined button on the right side of the screen. These statistics are reset when the Cycle time has expired.

Viewing Throughput Data for the Life of the Loader

The Life of Loader throughput data can be viewed by pressing the "Life of Loader" button on the right side of the screen. These statistics are initialized when the Intelligent Autoloader is installed, and cannot be reset.

Printing Throughput Data

To print throughput data to the Paperless Printer, display the appropriate data to print by pressing the "Current Cassette", "User Cycle", or "Life of Loader" button on the right side of the screen. Select the data you would like to print by pressing the button to the right of the data. A '(P)' will appear next to the item, indicating that this will be printed. Press the "Print Data" button at the top of the screen, and the currently displayed data will be sent to the Paperless Printer. You can obtain a hardcopy of this data in the Paperless Printer utility. Additionally, you can configure the utility to automatically print out the Cassette Data at the end of each cassette, and the User Cycle data when the cycle time has expired.

Configuring the Throughput Utility

The Throughput Utility can be configured to operate according to user defined specifications. The following configuration options are available:

Upper Limit (sec)

This value represents the maximum amount of time a wafer can be processed on the stepper, and have it's throughput time entered into the throughput database.

Lower Limit (sec)

This value represents the minimum amount of time a wafer can be processed on the stepper, and have it's throughput time entered into the throughput database.

User Cycle (sec)

This value represents the amount of time the User Cycle throughput statistics will accumulate data, before reinitializing the User Cycle database.

User Start (sec)

This value represents the amount of time, from 12:00am, from which the loader will begin collecting User Cycle throughput data. For example, if you wish to collect throughput data every 8 hours, beginning at 7.am, you would set the User Start time to 420 (7 hours * 60 minutes), and the User Cycle time to 480 (8 hours * 60 minutes).

Print User Data

This value determines whether User Cycle throughput data is printed upon completion of the User Cycle time. The available choices are:

- PRINT: The results are sent to the paperless printer. A hardcopy is printed if the paperless printer configuration setting *Print Hardcopy* is set to ON.
- OFF: The results are not printed.

Print Cassette data

This value determines whether Cassette throughput data is printed upon completion of the Cassette. The available choices are:

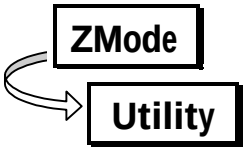
- PRINT: The results are sent to the paperless printer. A hardcopy is printed if the paperless printer configuration setting *Print Hardcopy* is set to ON.
- OFF: The results are not printed.

Count Single Wafers

This item determines whether the loader will enter throughput data for single wafers loaded without using a cassette.

Time/Date Utility

The Time/Date utility allows the user to set the time and date on the internal clock of the loader PCB. This is necessary for proper time and date stamping of Paperless Printer data.



Setting the System Time

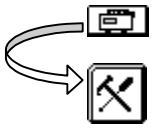
To decrement the hours, minutes, and seconds, press the left arrow next to the appropriate item. To increment the hours, minutes, and seconds, press the right arrow next to the desired item. When you have adjusted the time correctly, press the SAVE button to update the system clock.

Setting the System Date

To decrement the year, month, and day, press the left arrow next to the appropriate item. To increment the year, month, and day, press the right arrow next to the desired item. When you have adjusted the time correctly, press the SAVE button to update the system clock.

Paperless Printer Table of Contents

Configuration



The Paperless Printer configuration menu allows you to customize the operation of the Paperless Printer utility. Note that the Paperless Printer line size defaults to 80 characters per line (model 1100 and above).

If an HPIB interface board is detected on the Intelligent Autoloader motherboard upon power up, the Paperless Printer will configure itself to 32 characters per line. (model 900 through 1000). The following items are available for customization:

Word Wrap

When turned ON, all print data will be 'wrapped' so that all data is displayed in the touch-screen display area. When turned OFF, the arrow keys and the Invisible Display Navigation buttons must be used to see all of the characters on a line. This feature is only active when the Paperless Printer is configured to 80 characters per line (see above).

Automatic Scroll

When turned ON, the screen will 'scroll' down to the last line of printer data received from the stepper, automatically. If you wish to browse printer data, turn this feature OFF. Otherwise, the screen will scroll while you are browsing.

Scroll Delay (ms)

This value determines how quickly the touch-screen is updated with new, incoming printer data. This value has no effect if Automatic Scroll is turned OFF.

Scroll Left/Right

This value determines how many characters the touch-screen will scroll to the left or right when the left and right arrow buttons are pressed. Note that this value has no effect if your Paperless Printer is set to 32 character mode (no HPIB board present).

Arrow Mode

LINE: Each press of the up or down arrow moves the display one line. Each press of the top and bottom Invisible Display Navigation button moves the display one page.

PAGE: Each press of the up or down arrow moves the display one page. Each press of the top and bottom Invisible Display Navigation button moves the display one line.

Print Hardcopy

When this item is turned ON, any printer data received is also sent to the system printer that is attached to the LPT port on the Loader Interface panel. If your system has an HPIB printer, you must have the printer turned on at the time the data is received to obtain a hardcopy.

Del Blank Lines

When this item is turned ON, the Paperless Printer will only save a line of data if that line contains any valid characters in addition to a SPACE or LINEFEED

.

Date Stamp (sec)

This is the minimum time that must elapse between incoming printer data packets, before the loader will insert a system time/date stamp. Setting this value to 0 will disable the automatic date/time stamp.

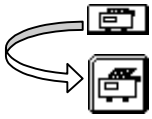
Beep on new data

This item allows you to select a sound to indicate new, incoming printer data. Pressing the button next to this item will scroll you through the available system sounds.

Set Match Strings

This items allows you to preconfigure the match string table to detect errors printed out by your model stepper, and change the status lights. Note that when you use this function, any match strings you have programmed will be erased. You should use this function first, before you program custom printer match strings.

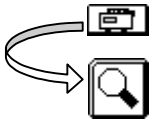
Printing Print Data



To print out a hardcopy of data from the Paperless Printer, simply display the data you would like to print, and press the PRINT icon.

The data will be printed out to the printer attached to the LPT port on the Loader Interface panel.

Search Utility



The Search Utility provides a method for the user to find all occurrences of user defined printer data. When the search utility is entered, the user is prompted to enter a sequence of characters to search for.

The following keys can then be used to navigate through all occurrences of the user defined character sequence.

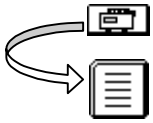
Search Up

To search backwards in the Paperless Printer og-file, press the Search Up button.

Search Down

To search forwards in the Paperless Printer log-file, press the Search Down button.

String Match Utility



The String Match utility is a feature that comes with the Paperless Printer. It enables you to compare incoming printer data with user-defined text strings, and have the loader perform a user-defined action should a match occur.

Inserting a New String

To INSERT a new user-defined text string,

- Press the CHANGE MODE button at the top of the screen until the title bar indicates that you are in the Insert Mode.
- Press the button where you would like to insert the match string in the match string list.
- Enter the text for your match string, and press ENTER.
- Enter the desired action(s) for your match string using the String Properties list, and press the EXIT button at the top right of the screen.

Updating an Existing String

To UPDATE an existing user-defined text string,

- Press the CHANGE MODE button at the top of the screen until the title bar indicates that you are in the Update Mode.
- Press the button next to the match string you would like to update.
- Enter the text for your match string, and press ENTER.
- Modify the desired action(s) for your match string using the String Properties list, and press the EXIT button at the top right of the screen.

Deleting a String

To DELETE an existing user-defined text string,

- Press the CHANGE MODE button at the top of the screen until the title bar indicates that you are in the Delete Mode.
- Press the button next to the match string you would like to delete in the match string list.

String Properties

Whenever you enter a match string in the Update or Insert mode, the screen will display a list of actions that you can have the loader perform if a match occurs. The following actions / properties are available:

Case Sensitive

When this item is set to ON, a case-sensitive text comparison is performed between the match string, and the incoming printer data.

Action: Load Recipe

This action allows the user to automatically load in a specific loader recipe. This can be very useful when you load reticle data on the stepper, and print out the reticle title to the Paperless Printer. The loader can be programmed to recognize text in the reticle data title, and automatically load in the appropriate wafer loading recipe, which has been developed for a specific layer.

Action: Screen Mode

This action will change the currently displayed screen to the screen defined by this property. The available screens are:

- Loader screen
- Paperless Printer screen
- Split screen

Note that the current screen must be one of the above screens for this property to have any effect.

Action: Status Lights

This action allows the user to have the loader's internal and external status lights change to one of the following configurations:

- Red ON
- Green ON
- Blink

Action: Initialize Input Slot

This action will cause the Input elevator and belts to initialize. This has no effect when the loader is in the STOPPED state.

Action: Initialize Output Slot

This action will cause the Output elevator and belts to initialize. This has no effect when the loader is in the STOPPED state.

Action: Speaker Sound

This parameter determines the type of sound played when a *String Match* occurs. As you toggle this button through the various beeps, they will be played on the system speaker.

Action: Speaker Cycles

This parameter determines the number of times that the Sound is played when a *String Match* occurs.

Action: Speaker Cycle Delay

This parameter is the delay time between cycles, while playing the *String Match* Sound.

Action: SPC Export

This parameter allows the user to save a group of printer data lines in an ASCII text file on the loader's internal hard disk. These files can be then be downloaded to floppy disk, or transferred over a network to the appropriate database.

Display Controls

The Paperless Printer Display controls consist of 4 buttons on the bottom right of the Paperless Printer main screen, and the Loader/Printer split screen. In addition, there are 4 invisible 'touch-sensitive' areas in the printer display that can be used for screen navigation. The following functions are available to the user:

Word wrap

When turned ON, all print data will be 'wrapped' so that all data is displayed in the touch-screen display area. When turned OFF, the arrow keys and the Invisible Display Navigation buttons must be used to see all of the characters on a line. This button is only active when the Paperless Printer is configured to 80 characters per line.

Auto scroll

When turned ON, the screen will 'scroll' down to the last line of printer data received from the stepper, automatically. If you wish to browse printer data, turn this feature OFF. Otherwise, the screen will scroll while you are browsing.

UP arrow

Touching this button will scroll the display 'backwards' 1 line, or 1 page at a time, depending on the Paperless Printer configuration setting 'Arrow Mode'.

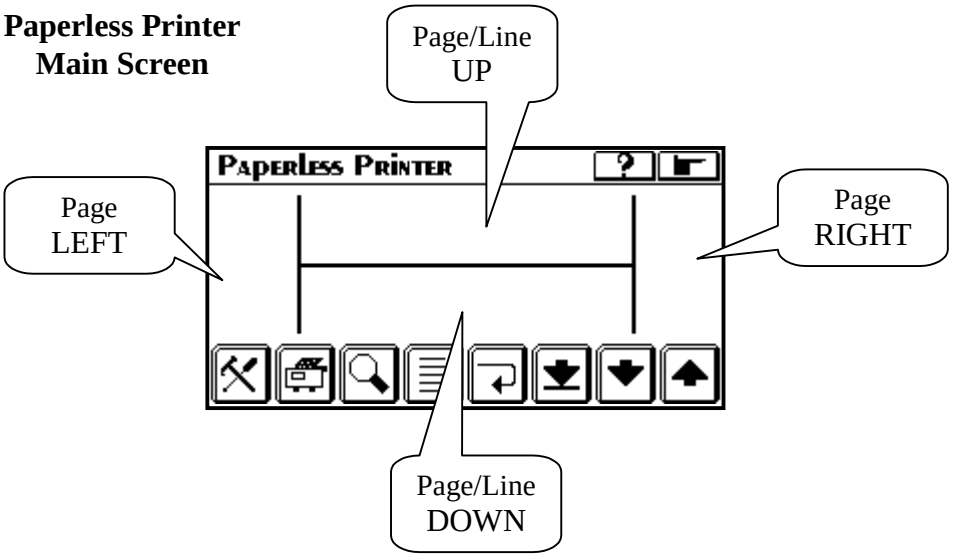
DOWN arrow

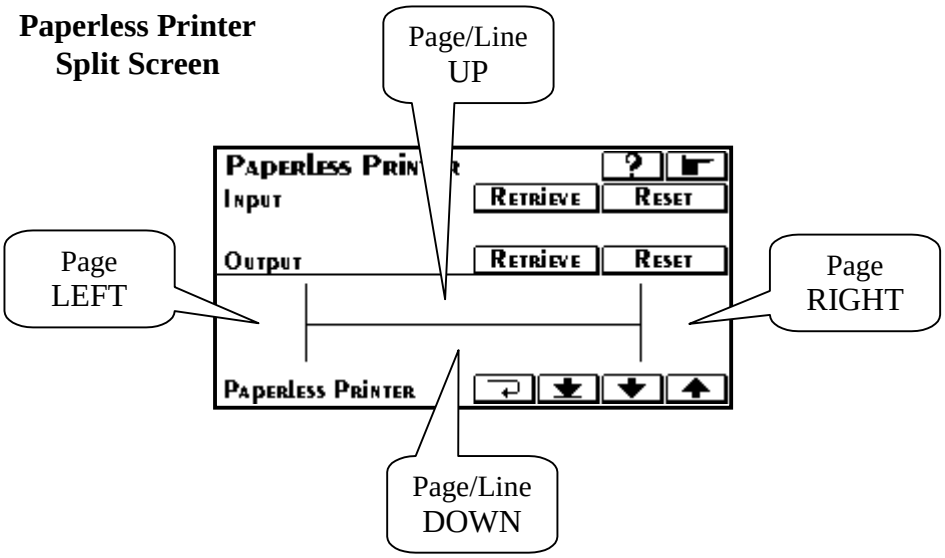
Touching this area will scroll the display ' 1 line, or 1 page at a time, depending on the Paperless Printer configuration setting 'Arrow Mode'.

Invisible Display Navigation Buttons

The Invisible Display Navigation buttons consist of 4 'hidden' touch sensitive areas on the Paperless Printer main screen, and Loader/Paperless Printer split screen. These areas are used to navigate through the Paperless Printer logfile. The following diagrams show approximately where these touch-sensitive areas are located:

Paperless Printer Main Screen





Line/Page UP

Touching this area will scroll the display 'backwards' 1 line, or 1 page at a time, depending on the Paperless Printer configuration setting 'Arrow Mode'.

Line/Page DOWN

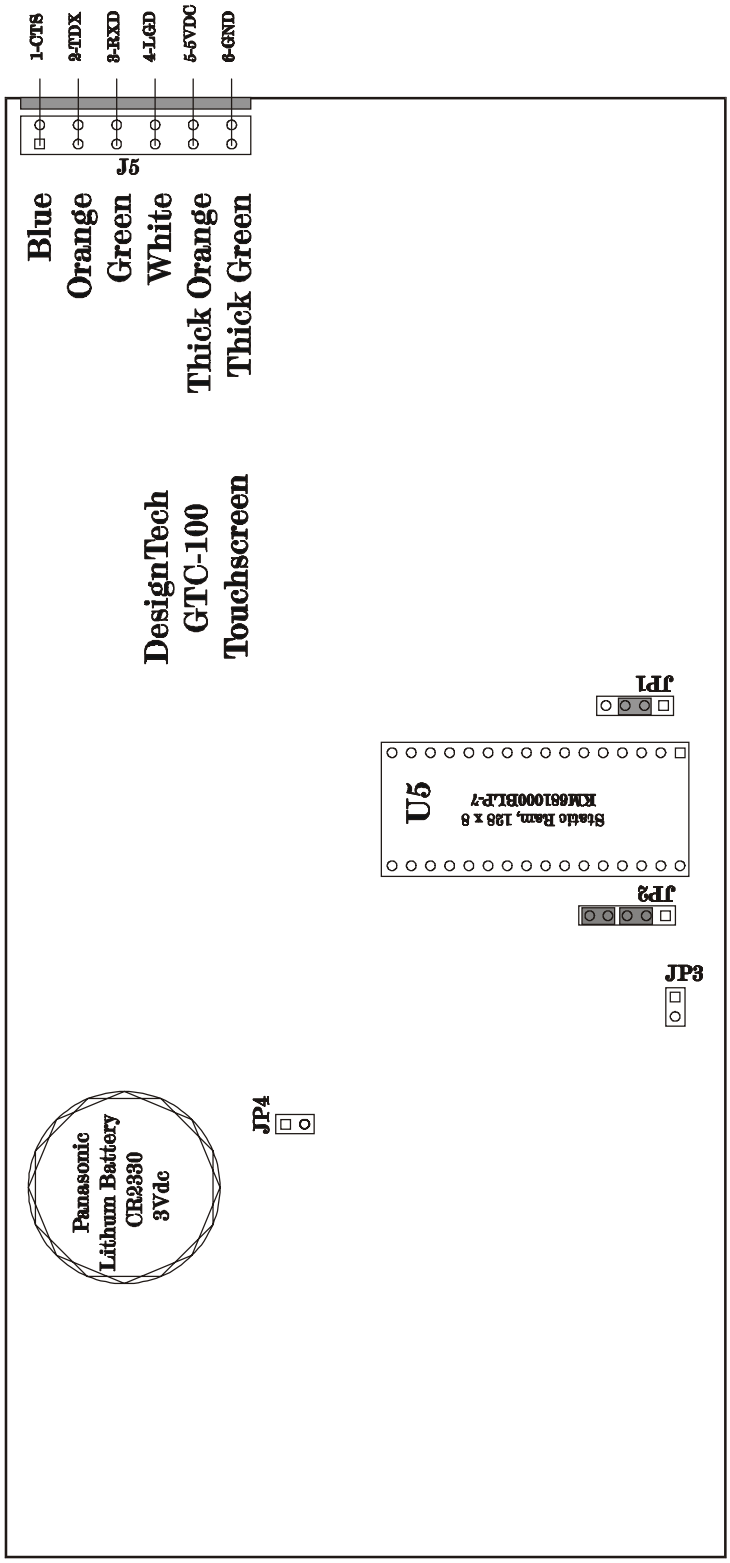
Touching this area will scroll the display ' 1 line, or 1 page at a time, depending on the Paperless Printer configuration setting 'Arrow Mode'.

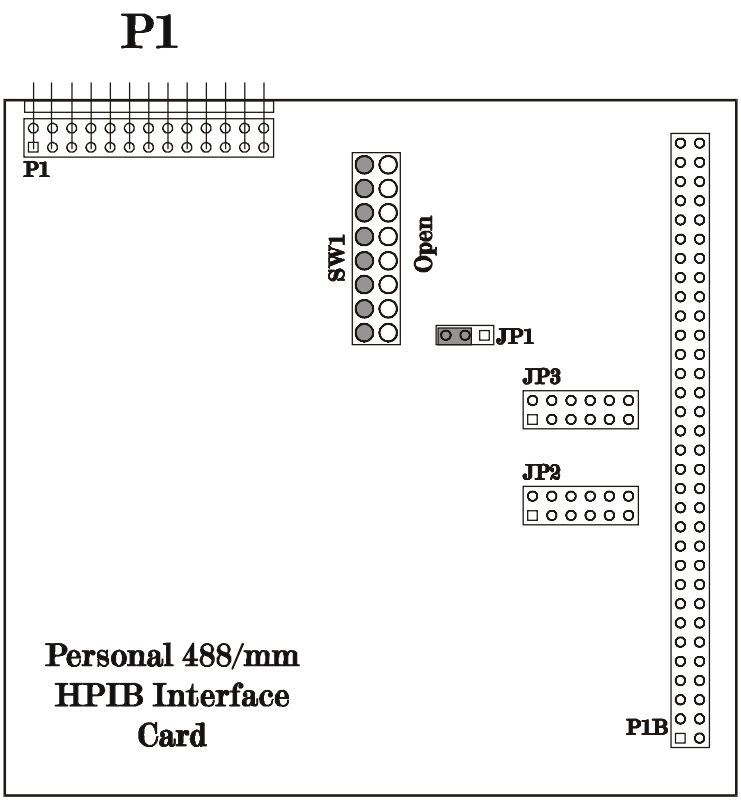
Scroll LEFT

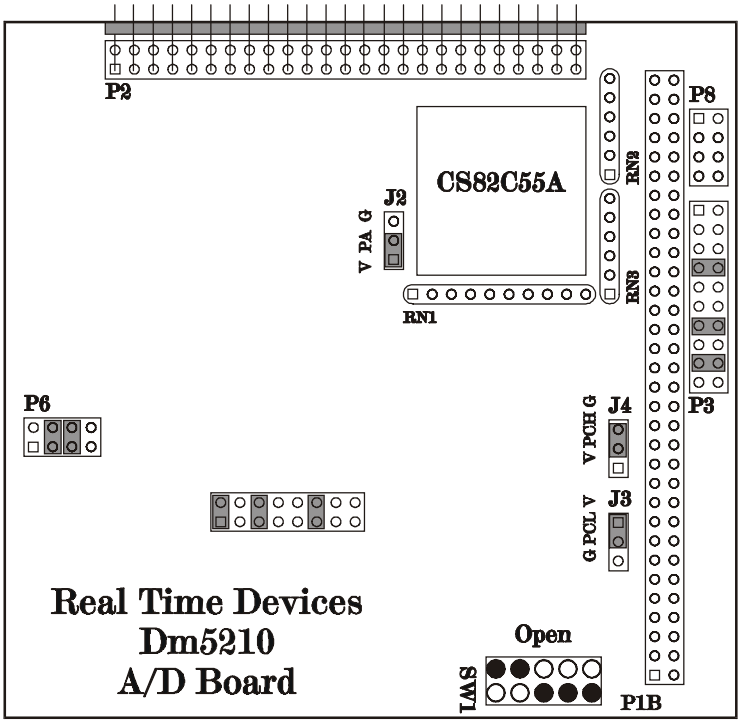
Touching this area will scroll the display towards the BEGINNING of the line, XXX characters, depending on the Paperless Printer configuration setting 'Scroll left/right'. Note that this area has no effect if your Paperless Printer is set to 32 character mode (no HPIB board present).

Scroll RIGHT

Touching this area will scroll the display towards the END of the line, XXX characters, depending on the Paperless Printer configuration setting 'Scroll left/right'. Note that this area has no effect if your Paperless Printer is set to 32 character mode (no HPIB board present).

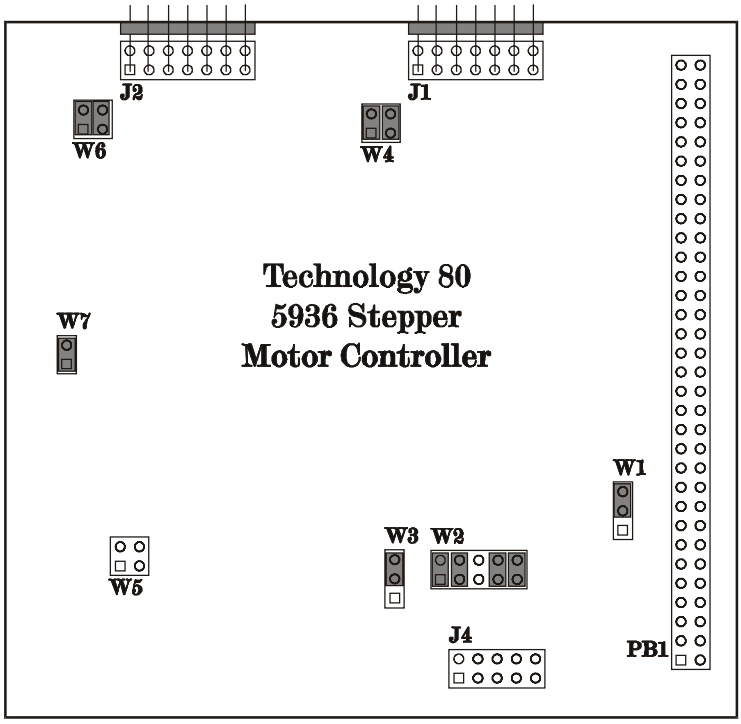

1-CTS
2-TDX
3-RXD
4-LGD
5-5VDC
6-GND
J5
Blue
Orange
Green
White
Thick Orange
Thick Green
DesignTech
GTC-100
Touchscreen
JP1
U5
Static Ram, 128 x 8
KM6810008LP-7
JP2
JP3
JP4
Panasonic
Lithum Battery
CR2330
3Vdc

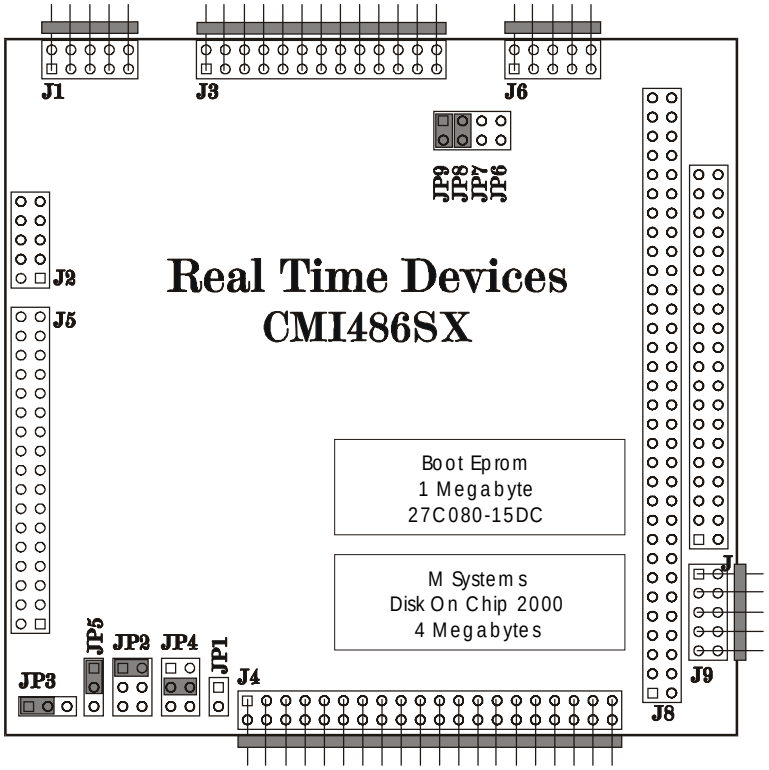


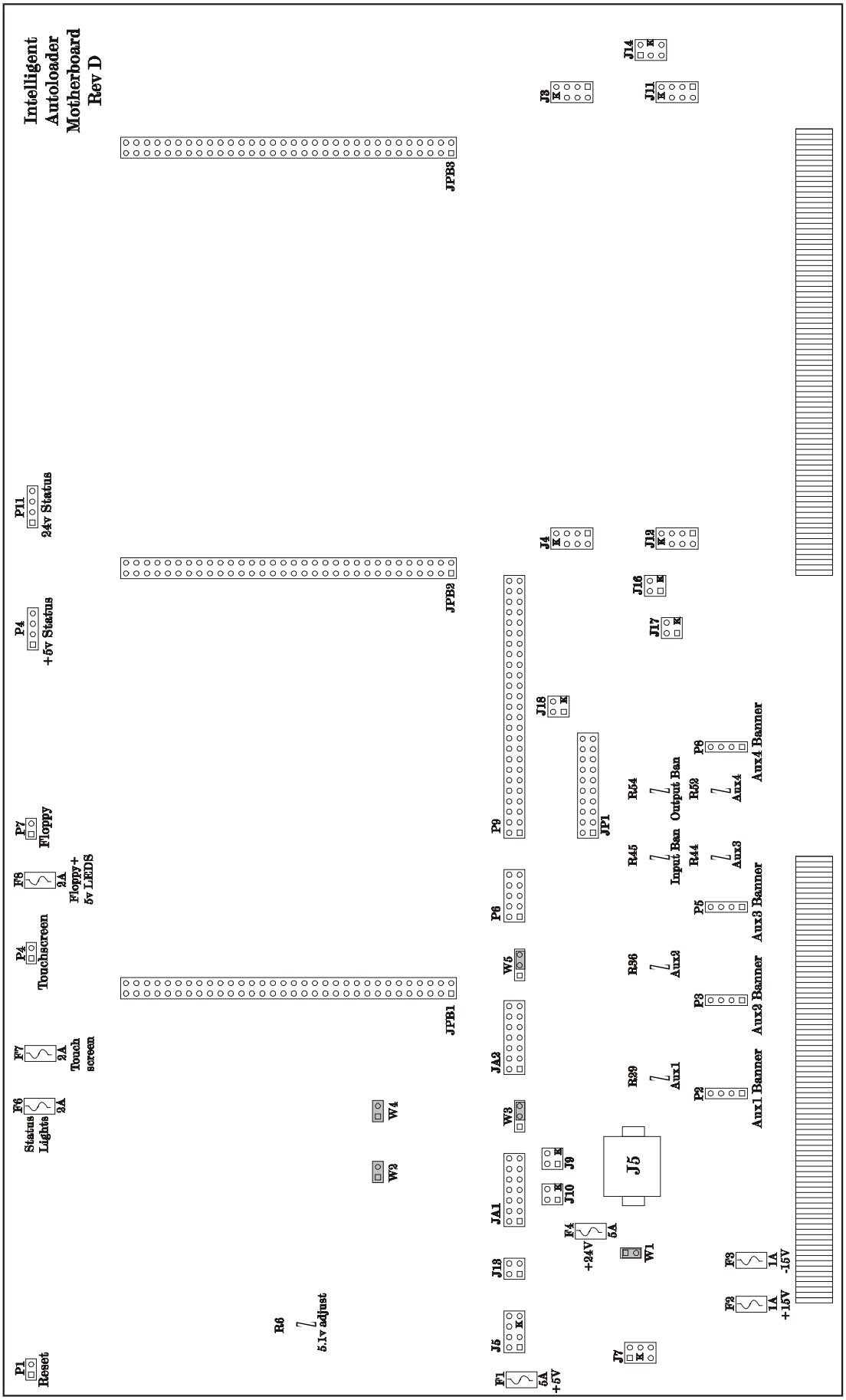


RN1 = 10 resistor 4.9K resistor pak

RN2,RN3 = 5 resistor 4.9K resistor pak

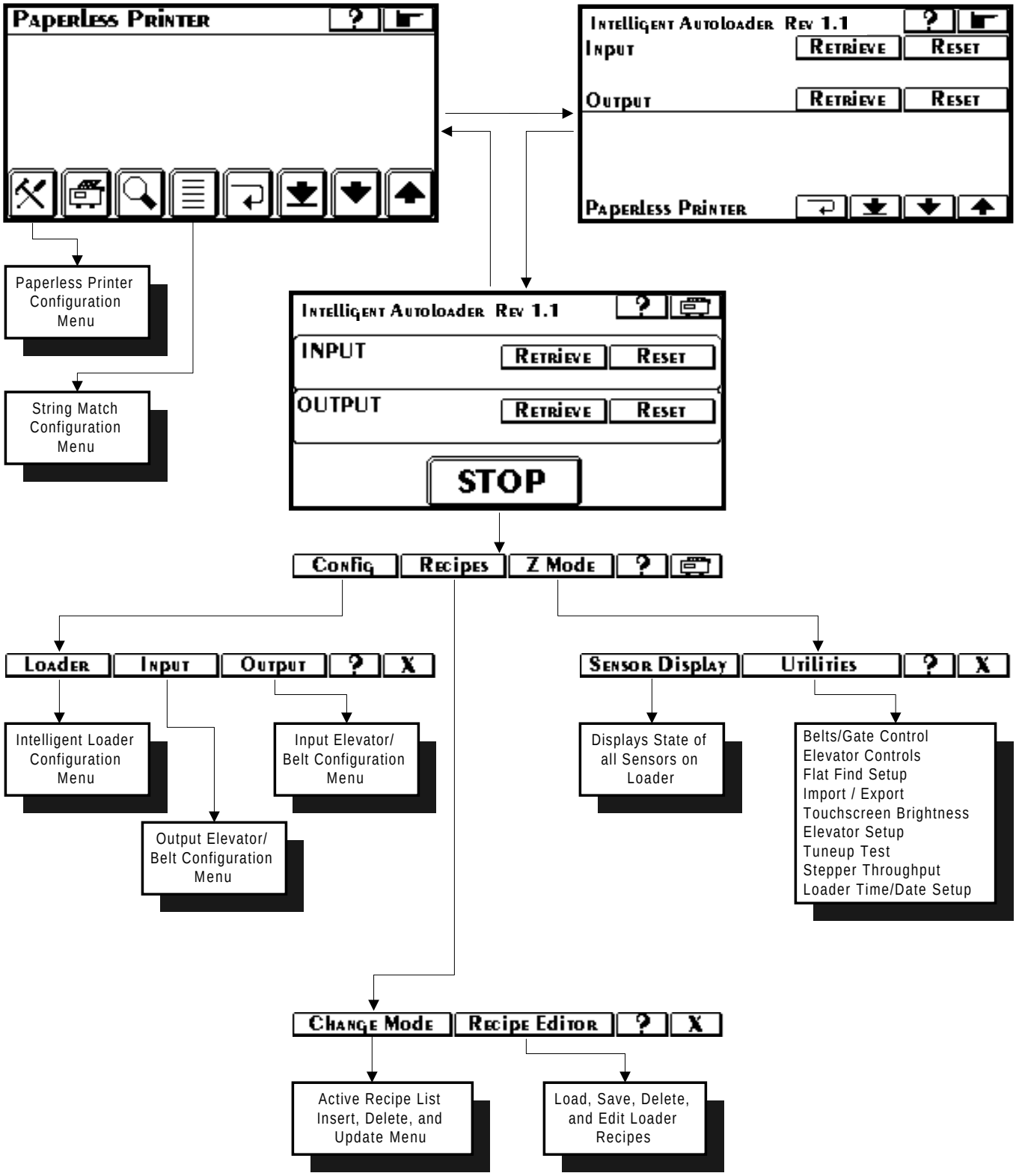

J2
J1
W6
W4
Technology 80
5936 Stepper
Motor Controller
W7
W1
W3
W2
W5
J4
PB1


J1
J3
J6
JP9
JP8
JP7
JP6
J2
Real Time Devices
CMI486SX
J5
Boot Eprom
1 Megabyte
27C080-15DC
M Systems
Disk On Chip 2000
4 Megabytes
JP5
JP2
JP4
JP1
JP3
J4
J8
J9

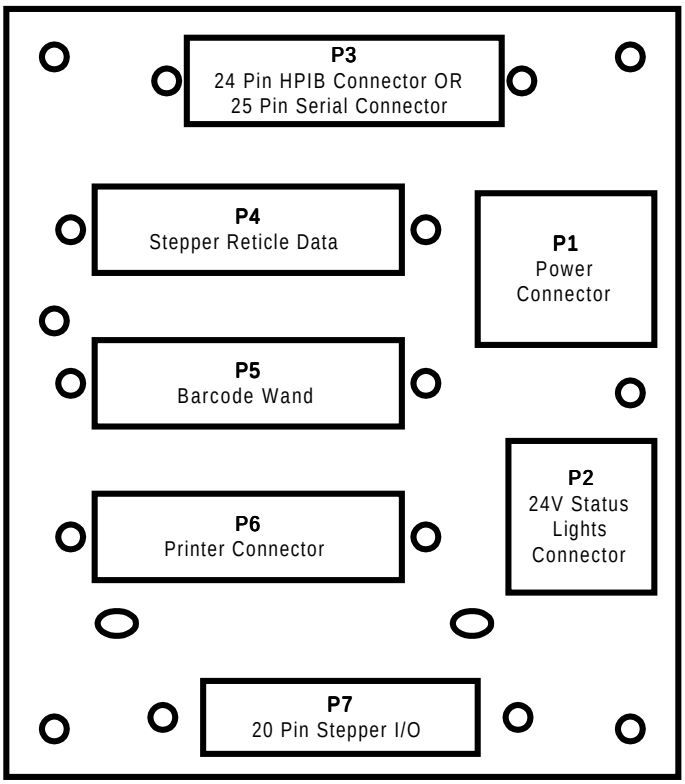


W2, W4: Flatfind Gain, Jumper for smart autoloader. No jumper for automation
W3: Activates +24 volts to motherboard
W4: Jumper pins 2&3 for OUTPUT NORMAL elevator motor direction, Jumper pins 1&2 for OUTPUT REVERSE elevator motor direction
W5: Jumper pins 2&3 for INPUT NORMAL elevator motor direction, Jumper pins 1&2 for INPUT REVERSE elevator motor direction

Intelligent Autoloader Menu Tree



Loader Interface Panel Layout



Loader Interface Panel

Smart Loader I/O Pin Descriptions

Jack	Pin#	Board Desc	Description
J2	13	RUN	20 pin ribbon cable to STEPPER
J2	5	IN RDY	20 pin ribbon cable to STEPPER
J2	17	IN ERR	20 pin ribbon cable to STEPPER
J2	20	OUT RDY	20 pin ribbon cable to STEPPER
J3	8	KEY	Input Belt stepper motor
J3	3	A	Input Belt stepper motor
J3	4	B	Input Belt stepper motor
J3	2	C	Input Belt stepper motor
J3	1	D	Input Belt stepper motor
J3	5	COM	Input Belt stepper motor
J3	6	COM	Input Belt stepper motor
J4	3	A	Input Elevator Stepper Motor
J4	4	B	Input Elevator Stepper Motor
J4	2	C	Input Elevator Stepper Motor
J4	1	D	Input Elevator Stepper Motor
J4	5	COM	Input Elevator Stepper Motor
J4	6	COM	Input Elevator Stepper Motor
J4	8	KEY	Input Elevator Stepper Motor
J1	1	(+) 15VDC	Power Plug from Stepper
J1	2	24V RET	Power Plug from Stepper
J1	3	(+) 24VDC	Power Plug from Stepper
J1	4	(-) 15VDC	Power Plug from Stepper
J1	6	24V RET	Power Plug from Stepper
J1	7	15V RET	Power Plug from Stepper
J1	8	(+) 5VDC	Power Plug from Stepper
J1	9	5V RET	Power Plug from Stepper
J11	8	KEY	Output Belt stepper motor
J11	3	A	Output Belt stepper motor
J11	4	B	Output Belt stepper motor
J11	2	C	Output Belt stepper motor
J11	1	D	Output Belt stepper motor
J11	5	COM	Output Belt stepper motor
J11	6	COM	Output Belt stepper motor
J12	3	A	Output Elevator Stepper Motor
J12	4	B	Output Elevator Stepper Motor
J12	2	C	Output Elevator Stepper Motor
J12	1	D	Output Elevator Stepper Motor
J12	5	COM	Output Elevator Stepper Motor
J12	6	COM	Output Elevator Stepper Motor
J12	8	KEY	Output Elevator Stepper Motor

Jack	Pin#	Board Desc	Description
J14	2	WAF SENSE	Output Wafer @ Cassette Sense
J14	6	CARR SW	Output Cassette Detect Microswitch
J14	1	(+) 24VDC	(+) 24VDC
J14	4	LGND	LGND
J14	5	24V RET	24V RET
J14	3	KEY	KEY
J18	3	KEY	Output Wafer Sensor
J18	1	A	Output Wafer Sensor
J18	2	C	Output Wafer Sensor
J18	4	LGND	Output Wafer Sensor
J17	3	KEY	Upper Output Limit Sw.
J17	1	A	Upper Output Limit Sw.
J17	2	C	Upper Output Limit Sw.
J17	4	LGND	Upper Output Limit Sw.
J16	3	KEY	Lower Output Limit Sw.
J16	1	A	Lower Output Limit Sw.
J16	2	C	Lower Output Limit Sw.
J16	4	LGND	Lower Output Limit Sw.
J5	5	KEY	Lower Flat Find Board
J5	6	C1	Lower Flat Find Board
J5	4	C2	Lower Flat Find Board
J5	8	SC	Lower Flat Find Board
J5	1	(+) 5VDC	Lower Flat Find Board
J5	3	(+) 24VDC	Lower Flat Find Board
J5	2	SOL	Lower Flat Find Board
J5	7	LGND	Lower Flat Find Board
J7	2	WAF SENSE	Input Wafer @ Cassette Sense
J7	6	CARR SW	Input Cassette Detect Microswitch
J7	4	LGND	LGND
J7	5	24V RET	24V RET
J7	3	KEY	KEY
J10	3	KEY	Upper Input Limit Sw.
J10	1	A	Upper Input Limit Sw.
J10	2	C	Upper Input Limit Sw.
J10	4	LGND	Upper Input Limit Sw.
J9	3	KEY	Lower Input Limit Sw.
J9	1	A	Lower Input Limit Sw.
J9	2	C	Lower Input Limit Sw.

Automation AutoLoader I/O Pin Descriptions

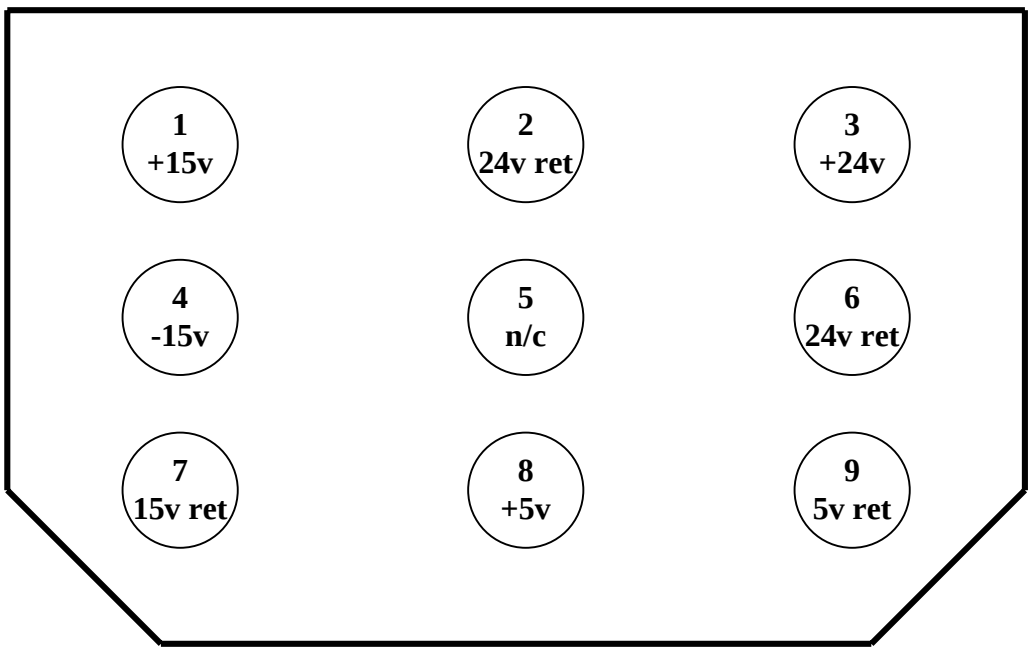
Board #	Board Description	I/O Pin#	I/O Description
N/A	N/A	7	Automation Connector (INPUT)(BLACK)
161	EMIT 3	53	Automation Connector (INPUT)(BLACK)
172	GND	31	Automation Connector (INPUT)(BROWN)
141	INAUT	32	Automation Connector (INPUT)(RED)
158	(+5VDC)	58	Automation Connector (INPUT)(RED)
N/A	N/A	8	Automation Connector (INPUT)(WHITE)
169	LED 3	59	Automation Connector (INPUT)(WHITE)
N/A	N/A	11	Automation Connector (OUTPUT)(BLACK)
163		54	Automation Connector (OUTPUT)(BLACK)
172	GND	29	Automation Connector (OUTPUT)(BROWN)
139	OUAUT	30	Automation Connector (OUTPUT)(RED)
158	(+5VDC)	58	Automation Connector (OUTPUT)(RED)
N/A	N/A	12	Automation Connector (OUTPUT)(WHITE)
171	LED 4	60	Automation Connector (OUTPUT)(WHITE)
172	GND	37	Automation Connector(INPUT)(GREEN)(YELLOW)
172	GND	38	Automation Connector(OUTPUT)(GREEN)(YELLOW)
172	GND	37	Gate Sensor (BLACK)
18	(+) 15VDC	3	Gate Sensor (RED)
135	CAP SENS OUT	48	Gate Sensor (WHITE)
157	EMIT 1	50	Input Banner Sensor (BLACK)
172	GND	49	Input Banner Sensor (GREEN,WHITE)
158	(+5VDC)	55	Input Banner Sensor (RED)
165	LED 1	56	Input Banner Sensor (WHITE)
172	GND	33	Input Cassette Switch (BROWN)
143	OUCAR	34	Input Cassette Switch (RED)
15	(+) 5VDC	2	Lower Flat Find Board (BLACK)
112	GND	27	Lower Flat Find Board (WHITE)
115	INDN	18	Lower Input Limit (GREY)
112	GND	19	Lower Input Limit (PURPLE)
123	INDN (LED)	24	Lower Input Limit (WHITE)
112	GND	25	Lower Output Limit (BLACK)
125	OUDN (LED)	26	Lower Output Limit (PINK)
117	OUDN	20	Lower Output Limit(BEIGE)
63	(+) 24VDC	9	OPEN
100	DC5	10	OPEN
63	(+) 24VDC	13	OPEN
96	DC4	14	OPEN
127	AN	39	OPEN
132	????	43	OPEN
131	CAP SENS COM	44	OPEN
134	CAP SENS PWR (+24VDC)	45	OPEN
133	CAP SENS IN	46	OPEN
136	CAP SENS PWR (+24VDC)	47	OPEN
159	EMIT 2	51	Output Banner Sensor (BLACK)
172	GND	52	Output Banner Sensor (GREEN,WHITE)

Automation AutoLoader I/O Pin Descriptions

Board #	Board Description	I/O Pin#	I/O Description
158	(+5VDC)	55	Output Banner Sensor (RED)
167	LED 2	57	Output Banner Sensor (WHITE)
172	GND	35	Output Cassette Switch (BLUE)
145	INCAR	36	Output Cassette Switch (PURPLE)
172	GND	40	Output Wafer Sensor (BLACK)
18	(+) 15VDC	3	Output Wafer Sensor (RED)
129	COL	41	Output Wafer Sensor (WHITE)
		87	Push Button Switch LED (RED)
		88	Push Button Switch LED (BLK)
137	PB	28	Push Button Switch
172	GND	42	Push Button Switch
19	FF 1	6	Upper Flat Find Board (BLUE)
17	FF 2	4	Upper Flat Find Board (BROWN)
20	GND	5	Upper Flat Find Board (ORANGE)
18	(+) 15VDC	3	Upper Flat Find Board (RED)
16	(-) 15VDC	1	Upper Flat Find Board, (GREEN)
112	GND	16	Upper Input LImit (BROWN)
119	INUP (LED)	21	Upper Input Limit (ORANGE)
111	INUP	15	Upper Input Limit (RED)
121	OUUP (LED)	23	Upper Output Limit (BLUE)
113	OUUP	17	Upper Output Limit (GREEN)
112	GND	22	Upper Output LImit (YELLOW)
110	GATE	92	Gate, +24V
	GND	93	Gate, Gnd

AutoLoader Power Cable Pin Descriptions

(Connector on cable facing you)



P20 ribbon cable to stepper pin descriptions

PIN #	DESCRIPTION	CONNECTION	STEPPER BIT	LOGIC STATE
13	RUN, Enable loader for operation	APA0	W212	= 1 (enabled)
14	Used for track interface	APA2	W214	0
16	Input Carrier detected	APC5	R109,R107	= 1 (detected)
17	IN ERR, Input load error	APC6	R105	= 0 (error)
18	GATE DOWN	APB6	R106	= 1 (gate down)
19	Output Carrier detected	APB7	R110	= 1 (detected)
20	OUT RDY, Clear to unload wafer	APB5	R104	= 0 (Clear)
3	Resets autoloader	APA1	W213	= 1 (Reset)
5	INRDY, Input wafer ready for pickup	APB4	R101	= 0 (Ready for PU)

Automation Autoloader Elevator Limit Switch Interface Terminal Strip

PIN #	DESCRIPTION
1 (Top)	Upper Input, Black/Green
2	Upper Input, White
3	Upper Input, Red
4	Upper Output, Black/Green
5	Upper Output, White
6	Upper Output, Red
7	Lower Input, Black/Green
8	Lower Input, White
9	Lower Input, Red
10	Lower Output, Black/Green
11	Lower Output, White
12	Lower Output, Red

Automation Stepper Motor Wiring

	Input Belts	Input Elev	Output Belts	Output Elev
White	61	67	73	79
Black	62	68	74	80
Green/White	63	69	75	81
Red/White	64	70	76	82
Green	65	71	77	83
Red	66	72	78	84

How to Reverse Elevator or Stepper Motor Direction

Swap RED and GREEN pin positions on connector.
Swap RED/WHITE and GREEN/WHITE pin positions on connector

Gate Sensor, substituting EE-SX670

+	L	Out	-
Red	Red	White	Black

Automation Autoloader Cassette Switch passthrough

(from board side of panel)

Red (input)	Purple (output)
Brown (input)	Blue (output)