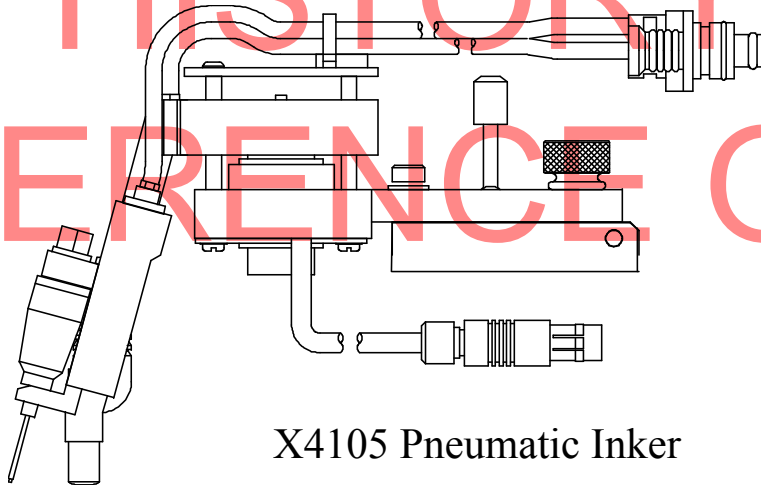




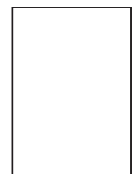
PNEUMATIC AUTO-Z INKER
Model X4105 and X4205
INSTALLATION AND OPERATION MANUAL

820-0002 Revision R
November, 2013

HISTORY
REFERENCE ONLY



X4105 Pneumatic Inker



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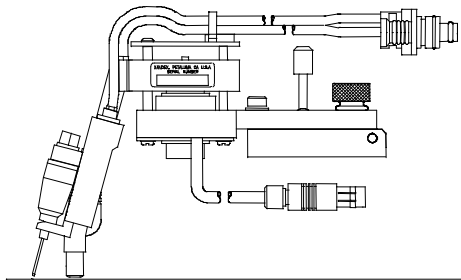
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HISTORY

REFERENCE ONLY

Section 1. Introduction

Theory of Operation



The X4105 and X4205 Pneumatic Auto-Z Inkers are designed for use as off-line inkers on Electroglas and KLA probers, respectively. The innovative X4000 Series includes an air sensor, which comes calibrated from the factory to perform automatic Z height adjustment.

The X4000 Series incorporates the convenience of DieMark™ cartridges with the reliability of a microprocessor-controlled pneumatic dispensing system for the ultimate inking solution.

Ink dots are deposited via pneumatic actuation of the inker shuttle mechanism and a simultaneous pulse of air into the cartridge reservoir. There is no filament and no direct contact with the wafer surface. A prober signal to the controller initiates the inking sequence, actuating the shuttle mechanism downward and sending an air pulse to the cartridge.

As the shuttle extends to the downward position, the air pulse to the cartridge forces ink out of the cartridge barrel and forms a drop at the end of the needle tip. When the shuttle is at its lowest position, the drop makes contact with the wafer surface and forms a dot.

After 25.1 milliseconds the shuttle returns to the normal position. After completion of each dot, a small amount of vacuum is developed in the cartridge by the closure of the valve, causing the ink to back up into the cartridge reservoir, preventing dripping.

If another dot sequence is not initiated within 10 seconds, a “puff” pulse of air that varies with the dot size setting duration (6.7-13 ms) will displace a small amount of ink back into the Teflon® tube to aid in maintaining proper dot size after long delays between dots.

The dot size is determined by cartridge air pulse duration. Adjust the controller setting to change the dot size - without changing the cartridge. Pneumatic cartridges are factory tuned, ensuring consistent dots and contain 40% more ink than standard DieMark™ cartridges.

Thank you for selecting ...



...as your inking choice.

Please spend a few minutes familiarizing yourself with the unit. Most questions you may have will be answered in this manual. If you would like further assistance, please contact your local Xandex distributor or call us at (707) 763-7799 or Toll Free in the U.S: (800) 767-9543. FAX (707) 763-2631. For more information about Xandex and our complete line of quality inking and interfacing products, visit us on the Internet at <http://www.xandexsemi.com/> or email: us at <mailto:info@xandex.com>.

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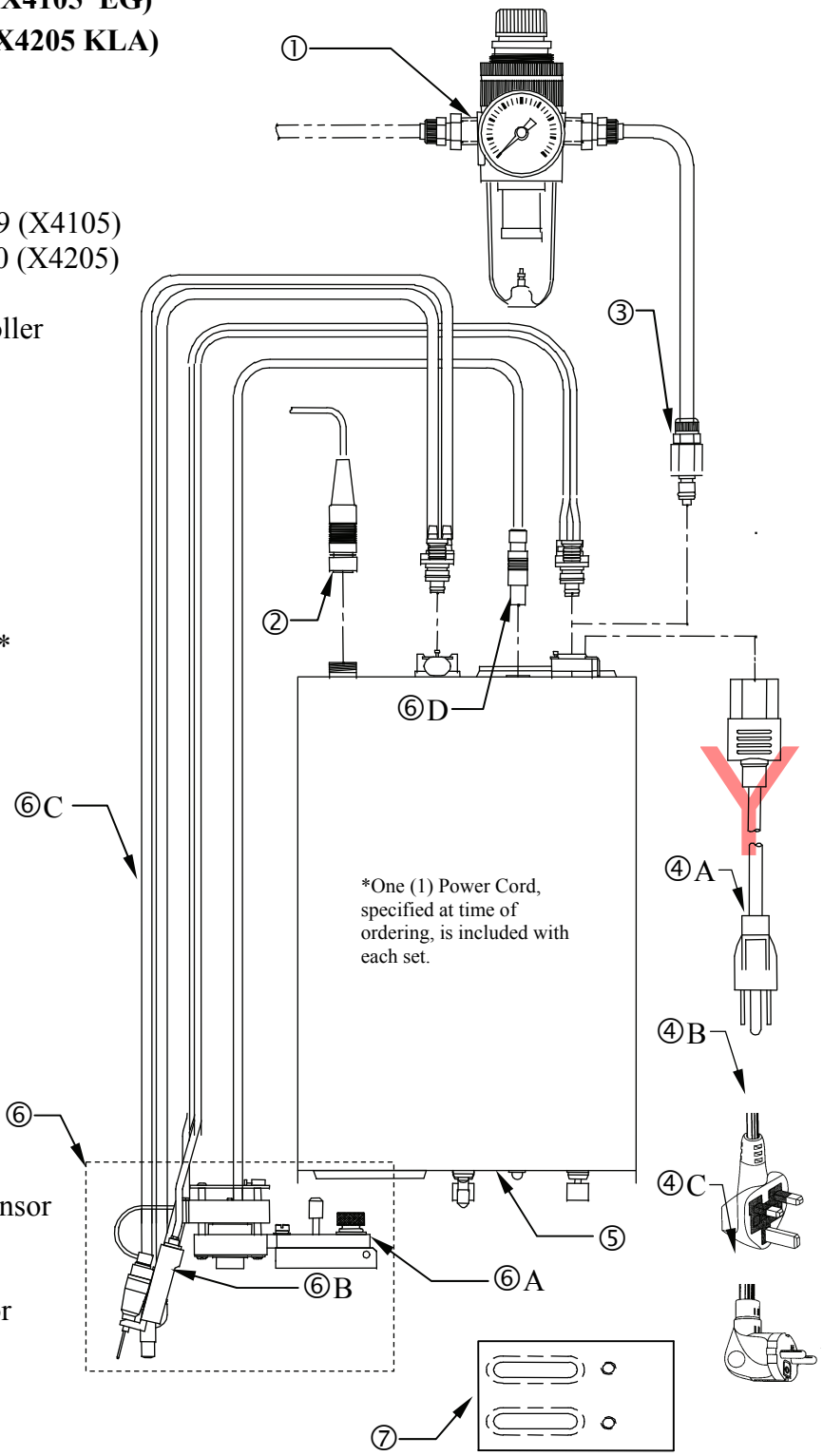
Section 2. System Overview

System Components

Set Part No. 340-4105 (X4105 EG)

Set Part No. 340-4205 (X4205 KLA)

1. Regulator Assembly
Part No. 220-0076
2. Cable/Connector Assembly
Type AC - Part No. 210-0109 (X4105)
Type CC - Part No. 210-0110 (X4205)
3. Air Hose Regulator > Controller
Part No. 210-2001
4. A. AC Power Cord (USA)*
Part No. 158-0051
B. AC Power Cord (UK)*
Part No. 158-0408
C. AC Power Cord (Europe)*
Part No. 158-0407
5. Pneumatic Controller
(Includes AC Power Cord)
Part No. 350-0006
6. Pneumatic Inker Assembly
 - A. Inker Base
Part No. 220-0031
 - B. Pneumatic Shuttle
Part No. 216-0001
 - C. Air Hose Controller > Sensor
Part No. 210-2008
 - D. 7 Pin Plug, Stepper Motor
Part No. 158-0008
7. Inker Mounting Plate
Part No. 120-0019 (X4205)



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Section 3. Installation

X4105 Inker Installation

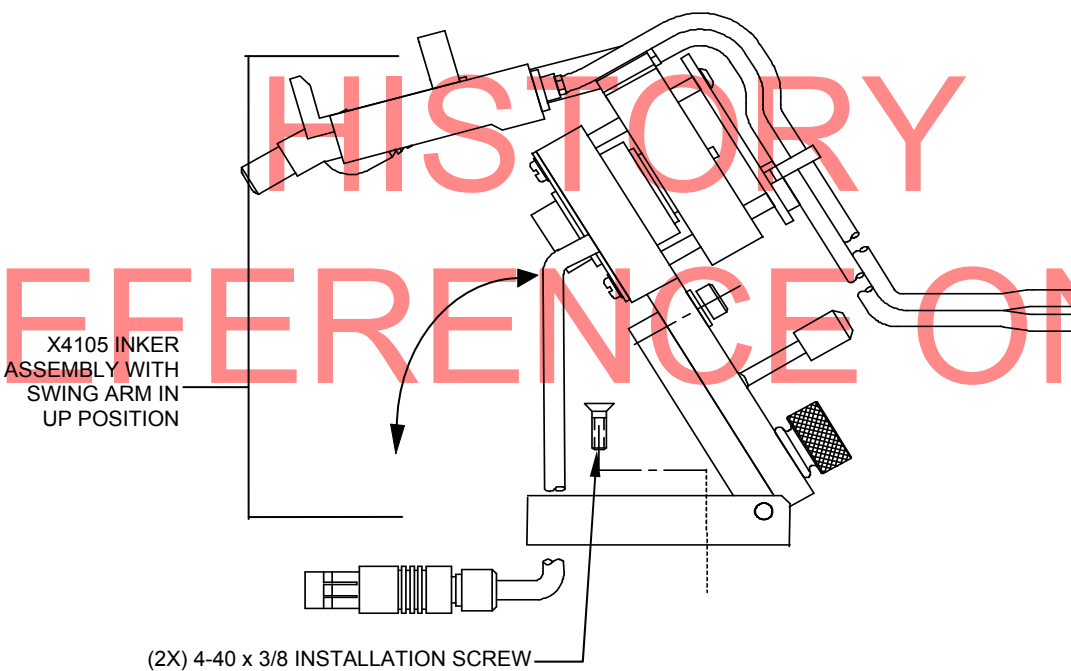
The X4105 pneumatic inker installs directly onto the insert ring on an Electroglas model 10XX, 20XX or 40X0 series prober.

1. If you are currently using another inker, remove it from the prober.



CAUTION: Move the chuck/wafer from underneath the inker when installing inker to prevent damage.

2. Lift the inker swing arm to the up position. The mounting holes in the inker base will now be visible.

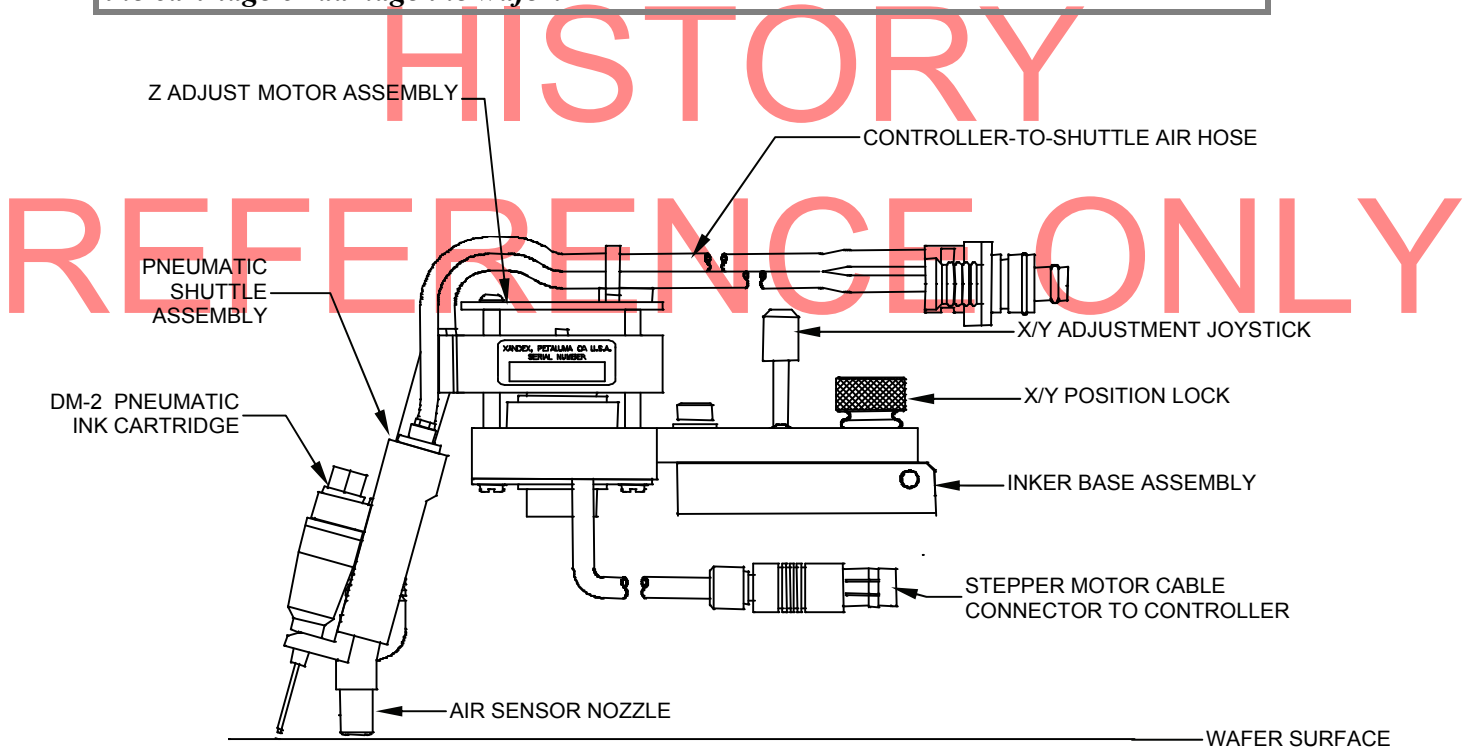


3. Install inker using two (2) 4-40 x 3/8 screws (supplied) into existing mounting holes on the prober insert ring.
4. Proceed to the “**Controller Installation**” portion of this Installation Section (3), and install the pneumatic controller per instructions for your application.

5. With the controller and inker installed, connect the fitting on the *controller-to-shuttle air hose* into the pneumatic connection on the rear of the pneumatic controller labeled "SHUTTLE".
6. Connect the fitting on the *controller-to-sensor air hose* into the pneumatic connection on the rear of the pneumatic controller labeled "SENSOR".
7. Plug the jack from the inker stepper motor into the mating jack on the rear of the controller labeled "MOTOR".
8. Proceed to **Section 4 “System Operation”** for ink cartridge installation, inker setup, alignment and controller operation instructions.



CAUTION: After an ink cartridge is installed, the inker arm should **NOT** be lowered back into operating position with the Z height adjusted completely down. The cartridge may be positioned too low, and the Teflon® tube in the cartridge needle will impact the wafer when the arm is lowered. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!



X4205 Auto Z Inker Assembly Installation

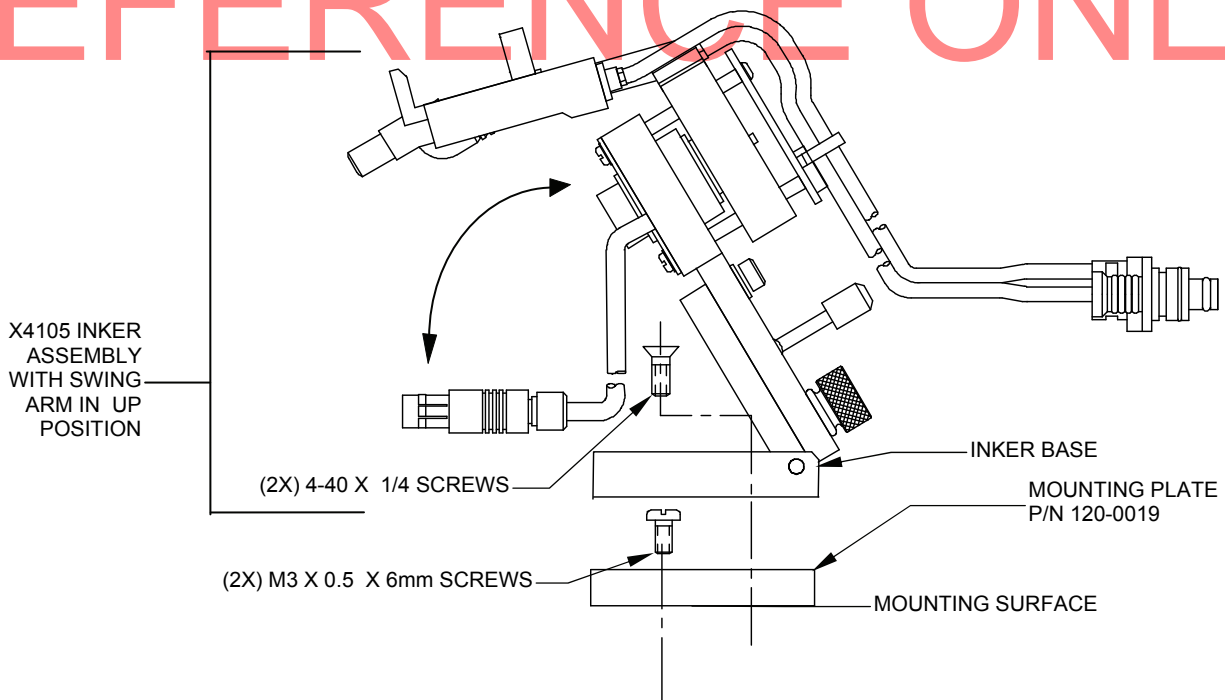
The X4205 pneumatic inker is for use with KLA 1007, 1011, 1200 and 1220 model probers. The X4205 installs directly onto the head plate of a KLA or TEL prober, using a mounting plate (P/N 120-0019, supplied).

1. If you are currently using another inker, remove it from the prober.



CAUTION: Move the chuck/wafer from underneath the inker when installing inker to prevent damage.

2. Align the mounting plate (P/N 120-0019) over the existing inker mounting holes on the prober.
3. Install the mounting plate using two M3 X 0.5 X 6mm screws ((P/N 510-9201 supplied).
4. Lift the inker swing arm into the up position. The inker base mounting screws should now be accessible.
5. Install the inker base onto the mounting plate using (2) 4-40 x 1/4 screws (P/N 510-3104).



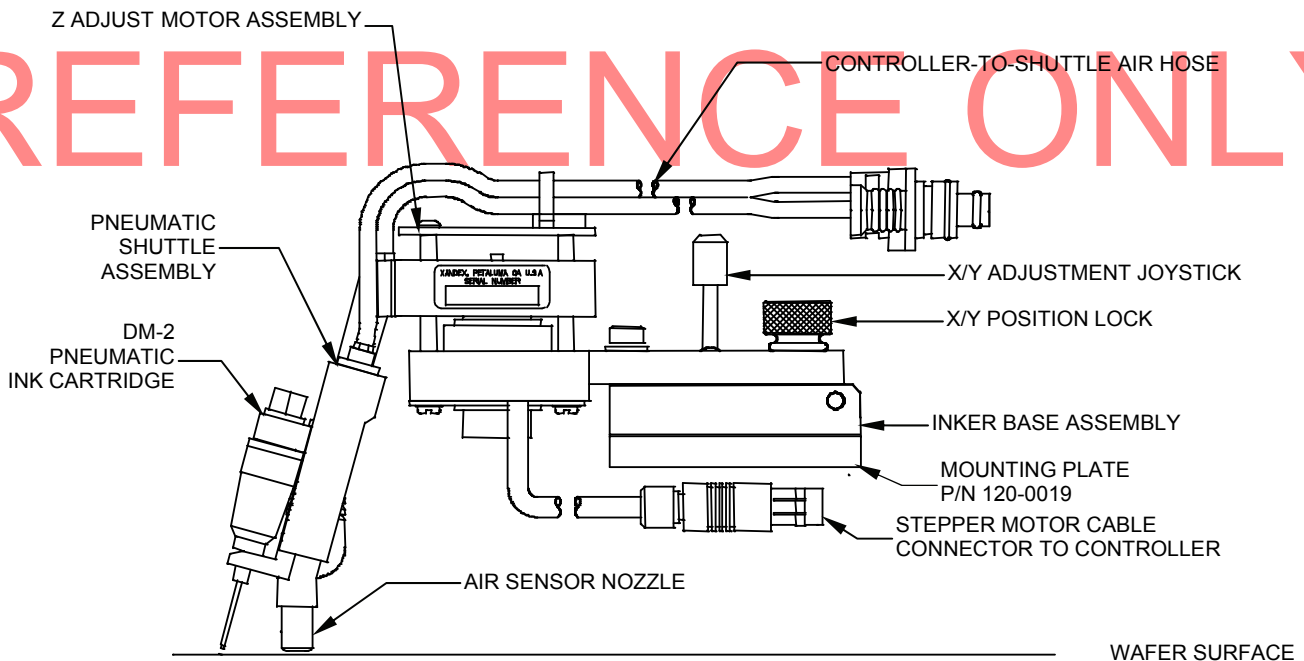
6. Proceed to the “**Controller Installation**” portion of this Installation Section (3), and install the pneumatic controller per instructions for your application.

7. With the controller installed, connect the fitting on the *controller-to-shuttle air hose* into the pneumatic connection on the rear of the pneumatic controller labeled "SHUTTLE".
8. Connect the fitting on the *sensor-to-controller air hose* into the pneumatic connection on the rear of the pneumatic controller labeled "SENSOR".
9. Plug the jack from the inker stepper motor into the mating jack on the rear of the controller labeled "MOTOR".
10. Proceed to **Section 4 "System Operation"** for ink cartridge installation, inker setup, alignment and controller operation instructions.



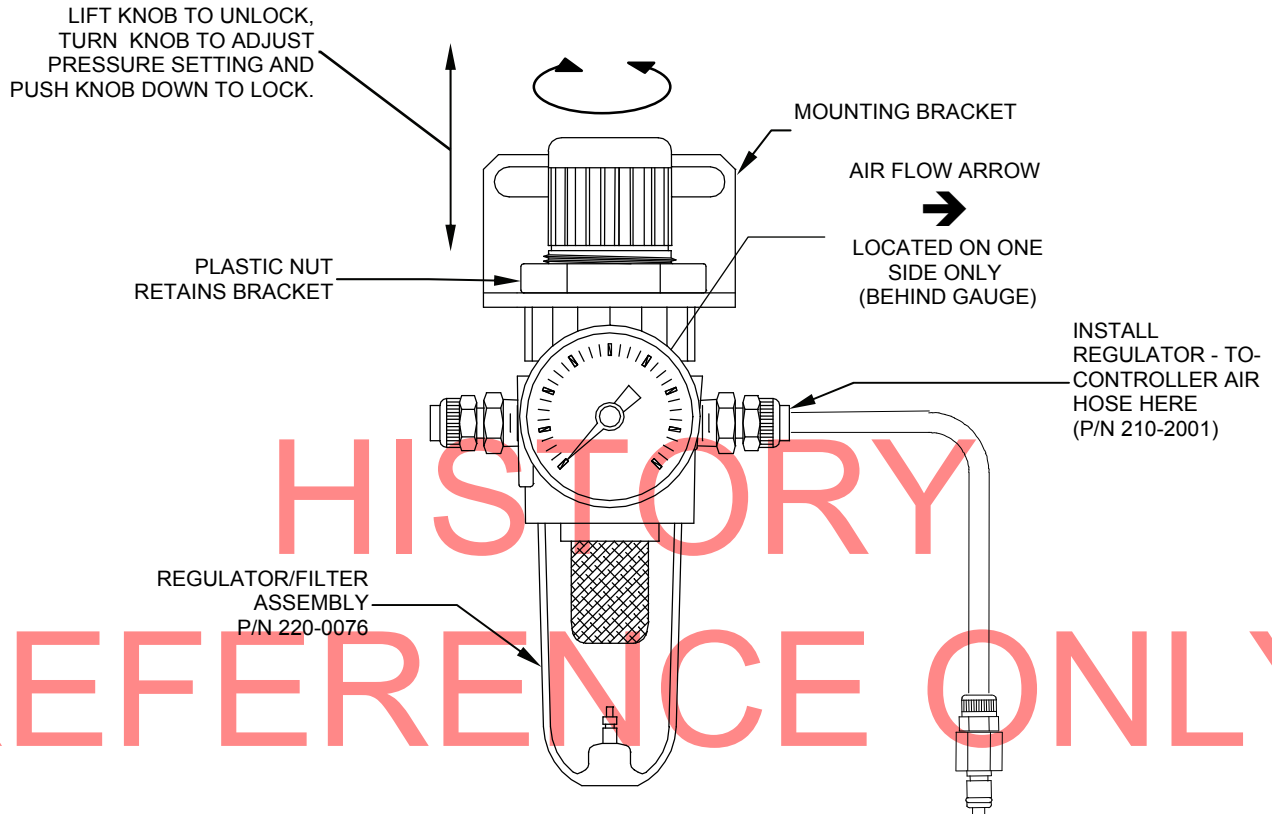
CAUTION: After an ink cartridge is installed, the inker arm should **NOT** be lowered back into operating position with the Z height adjusted completely down. The cartridge may be positioned too low, resulting in the Teflon® tube in the cartridge needle smashing into the wafer when the arm is lowered. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!

HISTORY
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Controller Installation

1. Remove the bracket from the regulator/filter assembly by removing the plastic retaining nut. Mount the regulator/filter bracket in a convenient location (mounting screws are not supplied). The regulator can be mounted to the bracket with the supplied nut after the bracket is installed.



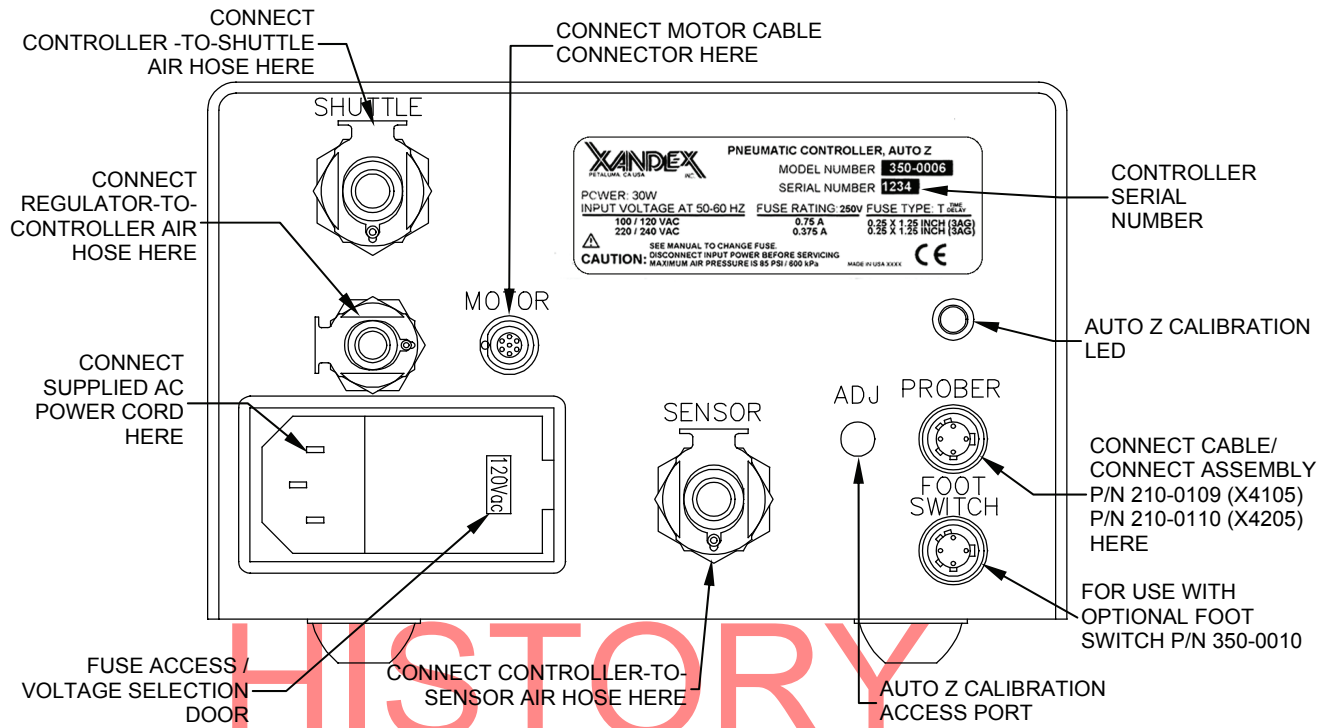
2. Install 1/4 O.D. x 0.170 I.D. polyethylene tubing (not supplied) to the main air source and then connect to the input fitting on the regulator. (The left side when facing the gauge.)
3. Connect the *regulator-to-pneumatic controller air hose* (P/N 210-2001 supplied) to the *output fitting* on the regulator. (The right side when facing the gauge.)

Note: The *regulator-to-pneumatic controller air hose* supplied by Xandex, is 6 feet long. If the distance (hose length) requirement exceeds this length, use 1/4 O.D. x 0.170 I.D. polyethylene tubing.

4. Plug the *regulator-to-controller air hose* into the **small** air connection on the rear of controller.

Note: The air hose connectors are spring locked. If the air hose connectors do not insert easily, make sure the spring lock is in the open position by pushing the metal snap-lock down until it clicks.

5. Turn on the main air and adjust the regulator until it reads 70 ± 10 PSI on the dial. To make regulator adjustments, pull up on the knob on the top of the regulator to unlock, then rotate the knob clockwise to increase or counter-clockwise to decrease. Push down on the knob after adjustment to lock it into position.
6. Check all connections for air leaks. If required, turn off the main air and make necessary repairs.
7. Install the *cable/connector* (P/N 210-0109 or 210-0110) to the inker port on the prober and the "PROBER" connector on the rear of the controller unit.
8. Move the toggle switch on front of the controller to "RUN" (mid) position.
9. The controller is factory set at 120 VAC @ 50-60 Hz. If your AC input voltage is different than 120V, follow the instructions in this Section (3) "**Voltage Selection and Fuse Replacement**" to change the controller to your requirement.
10. Install the *AC power cord* into the back of the controller. Plug the power cord into an AC supply outlet. At this point, the "INK ON" LED will flash once, while the "STATUS" LED will stay on. Proceed to **Section 4 "System Operation"** for ink cartridge installation, inker setup, alignment and controller operation instructions.



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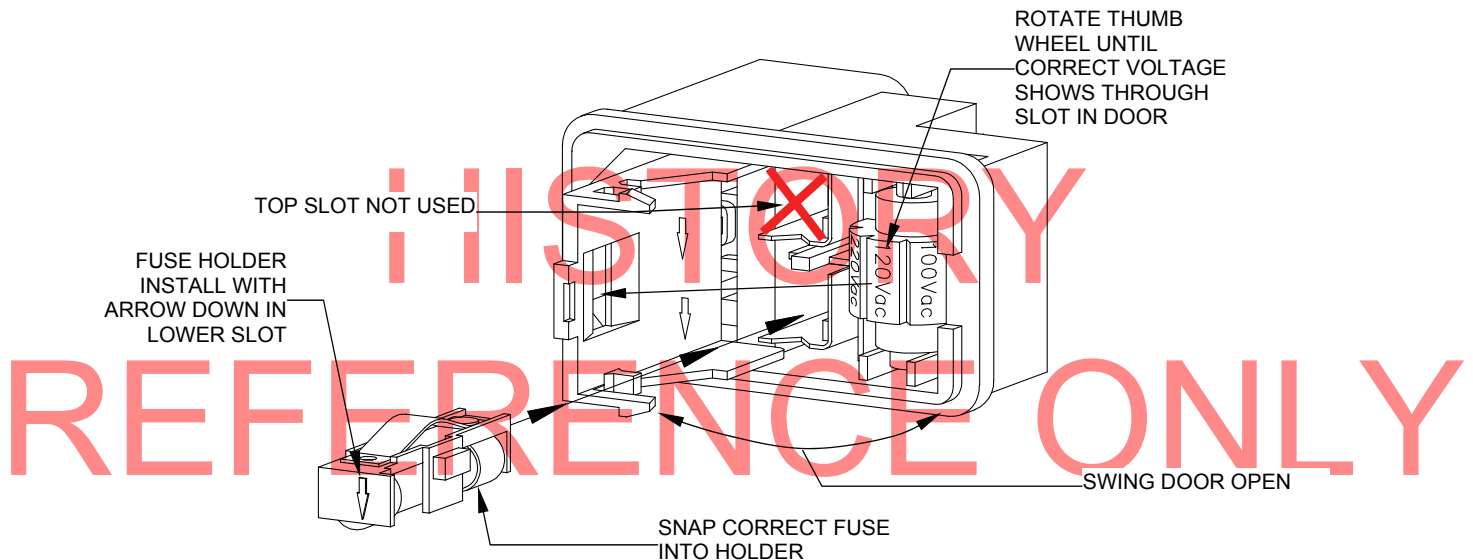
Voltage Selection & Fuse Replacement

Note: This unit is shipped with the voltage set for 120VAC. Two fuse types are included, one for 100/120VAC and one for 220/240VAC, however, **the controller unit is shipped without a fuse installed.** Select the correct fuse for your voltage rating from the chart below and install per instructions. Discard unused fuse.

1. Disconnect power cord from rear of controller (if connected).

Note: There is no power switch on this unit. If the unit loses power, memory of any hour or dot count programmed into the unit will be lost.

2. Swing open the fuse cover door by lifting on tab on the right side of the door. (A small screwdriver may be necessary.)

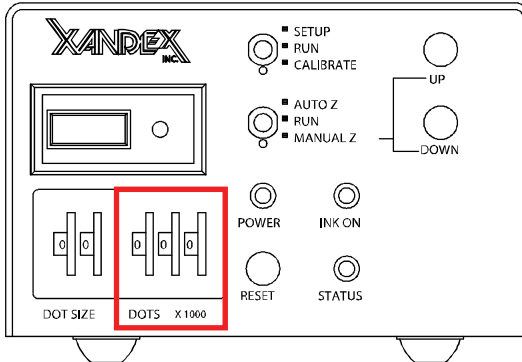


3. To change voltage setting, rotate the thumbwheel until correct voltage listed on the thumbwheel is facing out (visible through the slot in the door when the door is closed.)
4. To change the fuse, remove the fuse holder from the module by pulling it straight out. Carefully pry the fuse from the holder and replace (see fuse rating chart below.)
5. Insert the fuse holder into the **bottom** (lower) slot in the module with the arrow on the fuse holder pointed down.
6. CAREFULLY close fuse cover door. Verify that the correct voltage shows through the window on the module door. Reconnect power cord and verify controller power.

INPUT VOLTAGE AT 50-60HZ	FUSE RATING; 250 V	FUSE TYPE: T or Time Delay	XANDEX PART NUMBER
100/120VAC	0.75A	3AG (0.25" x 1.25")	158-0032
220/240VAC	0.375A	3AG (0.25" x 1.25")	158-0479

Section 4. System Operation

Controller Operation

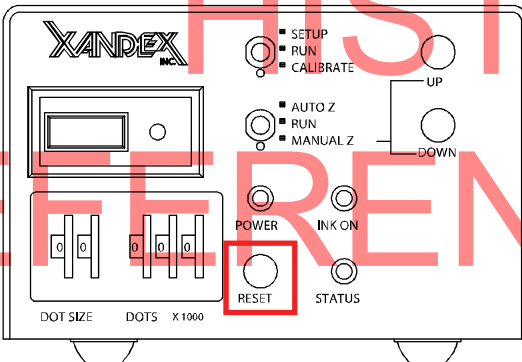


Programmable Thumbwheel Counter

Individual thumbwheel settings are available to monitor the number of Dots X 1000. These three thumbwheels are for monitoring the number of dots produced, with a maximum setting of 999,000 dots. A red STATUS LED* will be illuminated when the programmed limit is exceeded. For example, if you select 30,000 dots (turning the "DOTS X 1000" thumbwheel to 30) the STATUS

LED will light when 30,000 dots have been deposited. Upon installation of a new ink cartridge, it is recommended that the thumbwheels be reset to alert the operator when a cartridge is nearing replacement.

* Controllers with a serial number of 3000 or higher are also equipped with an audible alarm feature that will sound when the STATUS LED illuminates. The audio alarm feature is disabled by default. See **Enabling the Audio Alarm** in Section 6 for instructions on how to enable the audio alarm.



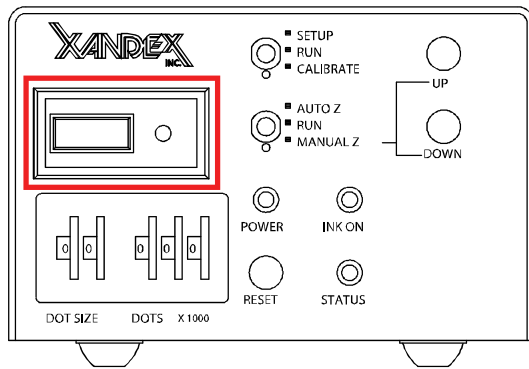
Reset Button:

A "RESET" button is located to the right of the thumbwheels for resetting the counters in the microprocessor. When the "RESET" button is depressed once, the "STATUS" LED will flash for 5 seconds. If the reset button is pressed a second time within the 5 second period, the controller will "read" the setting on the thumbwheel switches and load those values into the microprocessor. If the

"RESET" button is not pressed a second time within the 5-second flash time, the "STATUS" LED will stop flashing and the current set points and internal counts will not be changed.

Note: If the prober is running and the "RESET" button is pushed, the "STATUS" LED will flash intermittently. After 5 seconds, the "STATUS" LED will stop flashing and the unit will continue with the current programming. If the prober is running and the "RESET" button is depressed a second time within the 5 second flash time, INPUT SIGNALS FROM THE PROBER WILL BE INHIBITED AND THE UNIT WILL RESET AND RE-PROGRAM ITSELF.

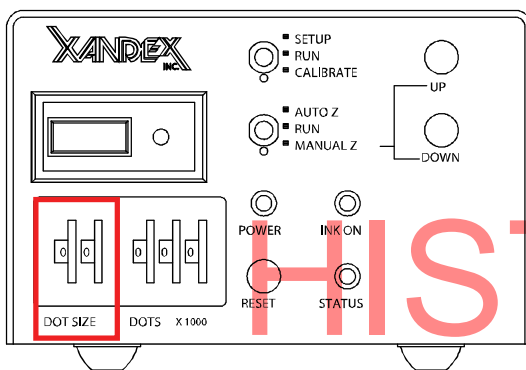
The "RESET" button is also used to enter the diagnostic mode when power is applied to the controller with the "RESET" button depressed. For details and descriptions of controller diagnostic tests see **"Controller Diagnostics"** in Section 6.



Dot Counter:

A separate LCD dot counter is located on the front panel above the thumbwheels. This counter has an internal Lithium battery with a nominal life of 10 years, and an integral reset button. Pressing the small red reset button next to the LCD window will reset the counter display only. It will have no effect on the counter circuits within the microprocessor. Upon installation of a new ink cartridge, it is

recommended that the counter be reset to accurately record the numbers of dots produced by that cartridge.



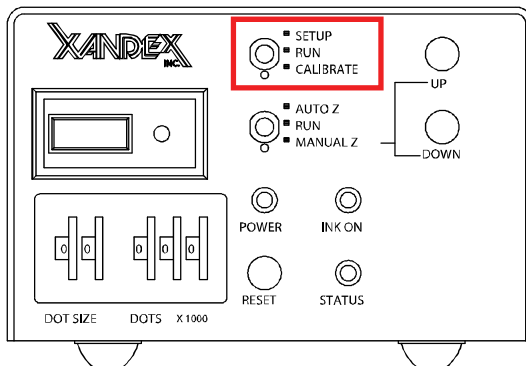
Dot Size Thumbwheels

The adjustable Dot Size Thumbwheels on the front panel are used to vary the size of the dot produced without affecting set-up or requiring additional operator steps. The microprocessor reads the thumbwheel settings and outputs a signal to enable the associated air valve for a predetermined amount of time. Higher settings enable the cartridge air valve for a longer time, producing a larger dot.

Depending on the type of ink cartridge (A5, A6, or A8) and ink used (Markem 6990, 6993, 6997 or Xandex 8103, 8104 7824 or 7824T), a 14 mil to 50 mil dot is possible. It is recommended that the proper dot size for the die be selected to maximize cartridge usage and minimize problems with too large or too small dots. *Refer to Section 7 for dot size specifications.*

Mode Selection Switches

There are two mode selection mode switches located on the front panel for selecting different inker operating modes. The following is a description of the functions of each switch position.



Top Mode Switch Positions

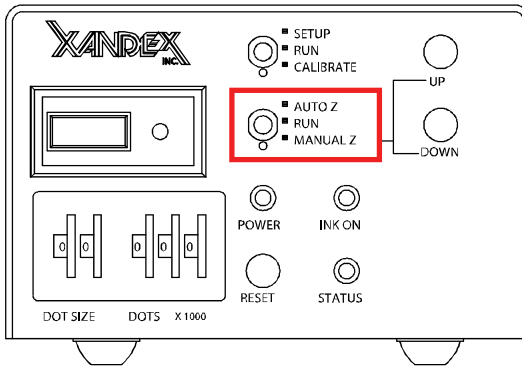
- SETUP = Shuttle air valve enabled for coarse Z height setup
- RUN = Normal Operation
- CALIBRATE = Used to calibrate inker Auto-Z function

When placed in the SET-UP position, the shuttle air valve (V2) is enabled, moving the shuttle (and ink cartridge) to the lower "inking" position for Z set-up adjustment.

While in the SET-UP mode, perform coarse Z height adjustment as detailed in the Set-Up and Alignment procedure. After five minutes in the SET-UP mode, the microprocessor will disable the shuttle air valve, returning the shuttle to the normal position. If set-up was not completed, return the switch to the RUN position, then back to SET-UP. In the RUN position, the system operates normally. The switch is placed in the RUN position for inking. The CALIBRATE position is used during calibration of the Auto-Z Sensor. See “**Auto-Z Calibration**” later in this section (4) for detailed instructions.

Bottom Mode Switch Positions

- AUTO = Auto-Z function is enabled
- RUN = Normal Operation
- MANUAL = Auto-Z function disengaged, UP and DOWN buttons active.



In the AUTO position, the Auto-Z function is enabled, allowing the automatic inker Z height cycle to begin. After a seven second delay, air will begin flowing from the sensor nozzle, the "INK ON" LED will flash rapidly and the

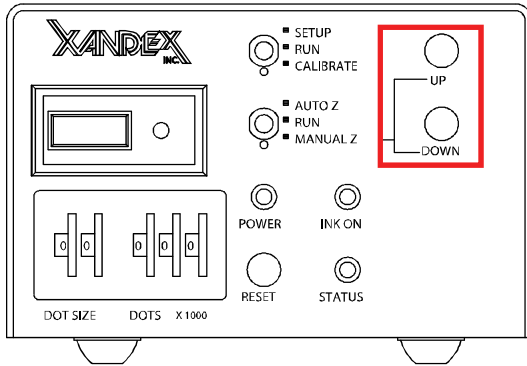
motor will first move the shuttle/sensor assembly up to the top limit of its travel (maximum Z height), and then down, stopping as the sensor nozzle reaches its pre-calibrated inking Z height. This function takes several minutes to complete, as the up and down movement of the shuttle/sensor assembly is very slow. The "STATUS" LED will light after the Auto-Z function has terminated and the shuttle/sensor assembly has reached the pre-calibrated Z height. The bottom mode switch is then switched to RUN position for inking.

The MANUAL position disengages the Auto-Z function and activates the UP and DOWN buttons located to the right of the mode switches. The UP and DOWN buttons allow manual adjustment of the inker height in 0.0005" increments each time either button is depressed. This minor manual adjustment of Z height may be necessary after changing an ink cartridge, due to slight manufacturing variations between cartridges. The UP and DOWN buttons may also be used to quickly move the inker up or down by depressing and holding down either button. This function is useful to quickly raise inker Z height when changing cartridges, but great care should be taken not to "run" the inker down into the wafer in this mode.

Note: After completion of either AUTO or MANUAL adjustment, always place the mode switch to RUN for normal operation.

Note: The specifications for the bipolar stepper motor installed on the Auto-Z inkers are listed in Section 7. The manufacturer's specification of 0.001" linear movement per step is correct. The motor is driven in 1/2 steps to achieve 0.0005" linear movements per activation.

Z UP and Z DOWN Buttons



The Z UP and Z DOWN buttons allow motorized adjustment of the inker Z height in 0.0005" (.5mil) increments each time either button is depressed. The buttons should be pressed no faster than one time per second as the unit cannot react to faster use and such use will result in zero movement. This fast, precise method of setting inker Z height simplifies operator/inker interface and shortens initial setup time. Minor adjustment

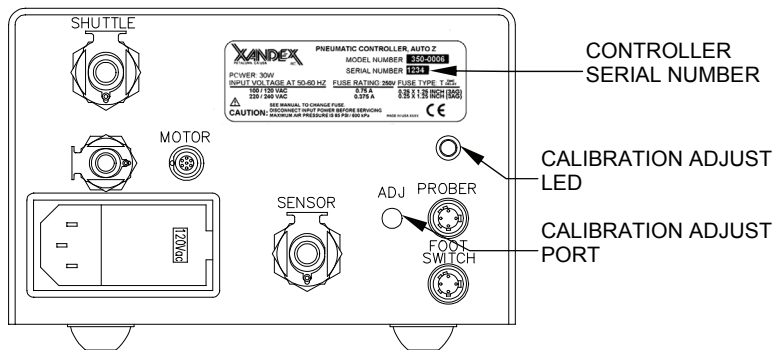
of Z height may also be necessary after changing an ink cartridge, due to slight manufacturing variations between cartridges. The Z UP and Z DOWN buttons can be used to quickly move the inker up or down by depressing and holding down either button. This function is useful to quickly raise inker Z height when changing cartridges, but great care should be taken not to “run” the inker down into the wafer in this mode.

External Switch Input

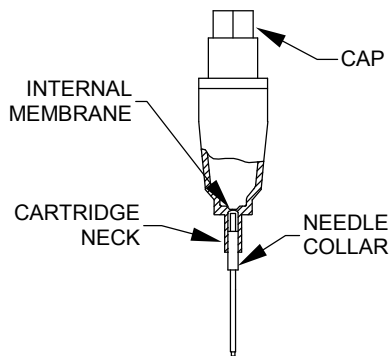
There is a second input on the rear of the unit for use with a foot switch. Upon activation, the foot switch sends a > 50mSec switch closure signal (across pins 1 & 3) to the controller, enabling an inking sequence. There is a 50-millisecond delay between the end of the sequence and the recognition of the next switch closure. No other adjustments or settings need to be made. This input is not used with the X4000 Series inkers.

Adjust Port

The adjust port, located on the rear of the controller, is used with the supplied 1.5mm hex key (P/N 520-0304) to set the calibration point of the Auto-Z air sensor. Each Auto-Z inker and pneumatic controller pair is calibrated to operate together at the factory as part of final test and inspection verification. Re-calibration should be performed at the time of initial installation to fine tune the Auto-Z function to your specific inking requirements. Re-calibration of Auto-Z function is also necessary if the position of the inker sensor nozzle is changed, or if the controller is used with an inker assembly other than the one it is calibrated to. See “Auto Z Calibration“ later in this section for calibration instructions.



Ink Cartridge

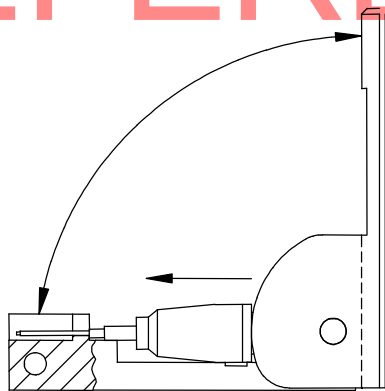


The ink cartridge used with the X4000 Series Inkers is a DM-2, available in A5, A6, and A8 types (designating 0.005", 0.006", and 0.008" Teflon® tube I.D., respectively). DM-2 cartridges have a polypropylene reservoir (sealed at the bottom by a thin membrane) and a small Teflon® tube encased in a stainless steel needle. When the cartridge is opened, the needle punctures the membrane to provide ink flow through the Teflon® tube.

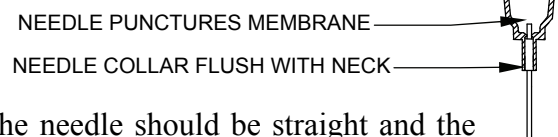
Each cartridge holds 1.0 gram minimum of ink, and can produce a wide range of dot sizes. Dot size is controlled by changing the duration of the air pulse into the cartridge reservoir, which determines how much ink is forced through the Teflon® tube to create the ink drop at the needle tip. A5 and A6 cartridge types will produce an average of 30,000 dots*, while the A8 averages 10,000 dots*. For more information see **Section 5 "Ink"** and "Ink Cartridge Specifications" in **Section 7 "System Specifications."**

** Averages exclude 8104 ink type. Dot production figures are averages and as such, are not guaranteed. Testing is performed at ambient temperature of 70 degrees F, relative humidity of 50% on polished, unetched silicon wafers (no passivation) and based on pneumatic controller operating at "MIDDLE" dot size setting (standard controller = dot size knob centered between "MIN" and "MAX": Auto-Z/Motor-Z Controller = dot size thumbwheel setting of 50). Dot production figures represent an average of results for multiple ink types. Your yield may be higher or lower depending on the ink type and dot size setting you use. Average figures are based on complete cartridge use within cartridge open shelf life periods (5 days maximum or 3 days maximum) as stated for each specific ink type.*

Cartridge Preparation



1. Place the cartridge into the cartridge preparation tool (Xandex Part No. 200-0001) as shown, exercising care to avoid damaging the Teflon® tip. The cartridge cap should be seated in the tool hinge with the needle resting in the slot.
2. Firmly squeeze the tool fully closed with a smooth, quick motion. This will push the cartridge body forward, causing the needle to puncture the internal membrane.



3. Open tool and remove cartridge. The needle should be straight and the needle collar flush with the cartridge neck.



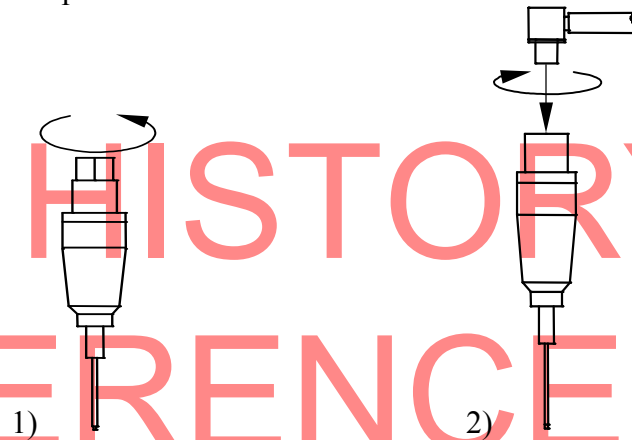
CAUTION: Do not shake the cartridge at any time, as air bubbles may be introduced into the reservoir and restrict the flow of ink. If mixing of the ink in the reservoir is desired, roll the cartridge between thumb and forefinger (or between palms) for 1-2 minutes prior to installation.

Cartridge Installation



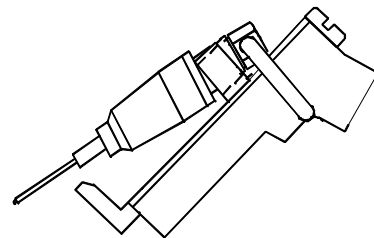
CAUTION: Move the inker arm to the UP position when installing or changing cartridges to prevent damaging the cartridge tip.

1. Use the slotted section of the cartridge preparation tool and a *counter-clockwise* motion to remove cap.

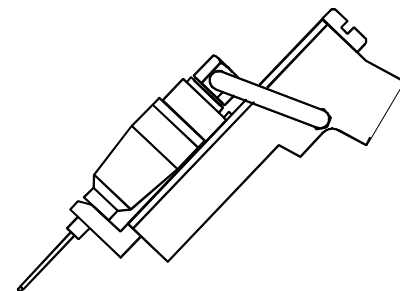


2. Thread the cartridge onto the brass air fitting of the RED AIR HOSE, turning the cartridge *clockwise* until snug.

3. Press top of cartridge into shuttle spring clip.



4. Press cartridge body into shuttle forks until the neck fully snaps into place.



Cartridge is now ready for priming. (See “**Cartridge Priming**” later in this Section (4) for instructions)

Changing the Cartridge

1. Lift the inker swing arm to the UP position.
2. Place thumb and forefinger on each side of the cartridge and gently pull up to remove cartridge.
3. Unthread the cartridge from the air fitting and discard in the proper manner.
4. Inspect the air fitting and air hose for ink contamination and clean or replace as necessary.
5. Install a new cartridge per installation instructions.

Cartridge Priming



CAUTION: Always wear protective eyeglasses when handling an active pneumatic inking system!

Note: Cartridge priming is done with the inker arm in the UP position.

1. Prepare a cartridge per the “Cartridge Preparation” section of this manual.
2. Install a cartridge to the inker per the “Cartridge Installation” section of this manual.
3. Lift the inker swing arm to the UP position.
4. Move the controller switch to “RUN”.
5. Push the “RESET” button on the controller for at least 3 seconds and hold down until ink appears at the needle tip.

Note: When the “RESET” button is initially pushed the “INK ON” LED will not be lit and the “STATUS” LED will begin to flash. At the end of 3 seconds both the “INK ON” and “STATUS” LED will light continuously and the cartridge air valve will begin to pulse, priming the cartridge.

6. Once priming is completed, clean excess ink from the needle tip with a lint free cloth or swab. Cartridge is now ready for operation. Proceed to “**Inker Assembly Setup and Alignment**” in this section (4) to prepare the inker.

Note: Always use the RESET button to pulse the cartridge valve when priming a cartridge with the inker swing arm in the up position. The RESET button fires **only** the inker's cartridge valve. If the shuttle valve is fired with the swing arm in the up position, (by using the prober's test inker function for example) ink may be forced into the cartridge air fitting and air hose, contaminating both.

Cartridge Priming and Use Tips**Tips to avoid common problems with DieMark Pneumatic Ink Cartridges.**

DO NOT attempt to refill Xandex DieMark Ink Cartridges. Cartridges are disposable and designed for single use only. Using a refilled cartridge will have an adverse effect on functionality and performance. Please note, Xandex does not warranty refilled cartridges.

Handling Tips:

Handle cartridges with care to avoid damaging the exposed Teflon tube at the tip of the needle

When removing the cartridges from the clamshell package, lift the cartridge straight up to avoid bending the needle or damaging the Teflon tube.

Allow the cartridge to reach optimal temperature of 18-25C (65-78F) before priming the cartridge. Never attempt to prime and use cartridges that are not at optimal temperature.

Priming Tips:

Wipe off any excess ink on the outside of the needle using a lint free cloth or swab before use.

DO NOT use the cartridges beyond the recommended open time for the ink type in the cartridge. Recommended open time is three (3) days for 7824, 8103 and 8104 and five (5) days for 6990, 6993, and 6997.

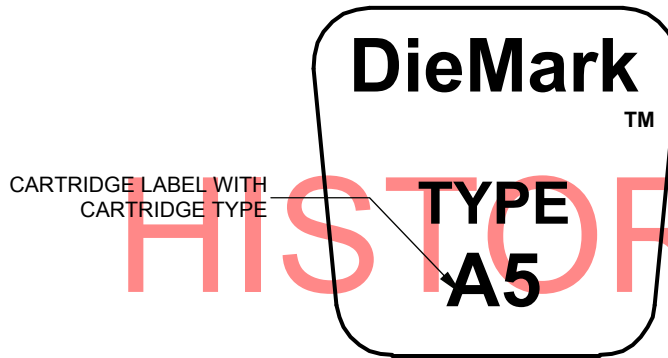
Ink Cartridge Labeling

DieMark™ ink cartridges are individually labeled with two distinct labels. One label shows the cartridge type and the other label indicates the ink batch number, ink type and expiration date of the cartridge. Cartridge type labels are color coded to provide “at a glance” visual indication of cartridge type.

Do not remove the labels from the cartridges as this can cause cartridge type and ink types to be confused at cartridge installation, resulting in improper performance. Removal of cartridge labels will also void the cartridge warranty.

DieMark™ Cartridge Type Label

This label contains the cartridge type, (either **A5**, **A6** or **A8**).

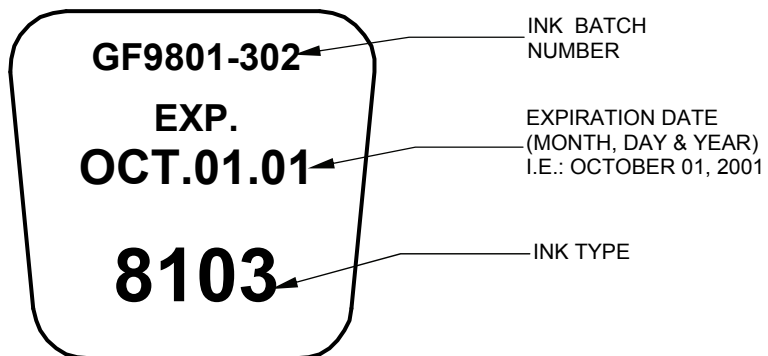


DieMark™ Cartridge Expiration Date Label




This label indicates the ink type and batch number of the ink contained in the cartridge and the cartridge expiration date. Expiration dates shown are for *unopened* cartridges.

- ◆ Markem® 6990, 6993, 6997 and Xandex 8103, 8104 = Four (4) months.
- ◆ Xandex 7824 and 7824T = Four (4) months.

After the cartridge is opened, consistent ink flow can only be expected for up to five (5) days for Markem® 6990, 6993, 6997 and three (3) days for Xandex 7824, 7824T, 8103 and 8104.



Cartridge Type Label Color Coding**DM-2 & DM-2.3 PNEUMATIC CARTRIDGE LABELS**

LABEL	DESCRIPTION
 A red rectangular label with rounded corners. It contains the text "DieMark" in a bold sans-serif font, "TYPE" in a smaller font below it, and "A5" in a large bold font at the bottom.	A5 = RED
 A blue rectangular label with rounded corners. It contains the text "DieMark" in a bold sans-serif font, "TYPE" in a smaller font below it, and "A6" in a large bold font at the bottom.	A6 = BLUE
 A yellow rectangular label with rounded corners. It contains the text "DieMark" in a bold sans-serif font, "TYPE" in a smaller font below it, and "A8" in a large bold font at the bottom.	A8 = YELLOW

HISTORY
REFERENCE ONLY

Auto-Z Calibration

Each Auto-Z inker and controller pair is calibrated at the factory as part of final test, inspection and verification. Calibration should be performed at installation to fine tune the Auto-Z function to your specific inking requirements. At any time during operation, re-calibration of the Auto-Z function should be performed if any of the following occur.

- Loosening of the sensor nozzle in the holder bracket
- The Auto-Z function fails to position the inker within 0.005 inches of additional manual adjustment (manual adjustment of up to 0.005 inches up or down may be required to accommodate tolerance variations encountered in the ink cartridge manufacturing process.) Manual adjustment of 0.005 inches will result from pressing either the "UP" or "DOWN" button ten times.
- Using an inker base with a controller other than the inker base that the controller was calibrated with.

In any of these cases it is important to perform the calibration procedure before the Auto-Z function is re-engaged.

Calibration Procedure

Note: *Numerous safety features have been built into the Auto-Z software to minimize the occurrence of any problems. The operator, however, should be alert to the following warning signs that indicate a possible problem:*

- ◆ *If there is no air flowing from the sensor nozzle during engagement of the Auto-Z function, the cartridge will impact the wafer.*
- ◆ *If the sensor nozzle is not positioned over the wafer surface during engagement of the Auto-Z function, the cartridge will impact the wafer.*
- ◆ *If the supply air is plugged in, but the air line to the sensor is not, you will be able to hear air rushing from the back of the controller. This acts as an audible alarm. If this occurs, switch the Auto-Z off immediately by moving the bottom mode switch to "RUN". Re-engage Auto-Z by moving the bottom mode switch to "AUTO" only after the sensor air hose is connected correctly.*
- ◆ *If the main air supply is not plugged into the controller when Auto-Z is engaged, the unit is programmed to run the mechanism to the top of its travel, stop, and flash the "INK ON" and "STATUS" LEDS simultaneously. If this occurs, set the bottom mode switch to "RUN", connect the main air and re-engage Auto-Z by setting the mode switch to "AUTO".*

1. Set the mode switches on the front of the controller to "RUN" and "MANUAL".
2. Depress the "UP" button and run the mechanism all the way up until it stops against the top plate of the mechanism.



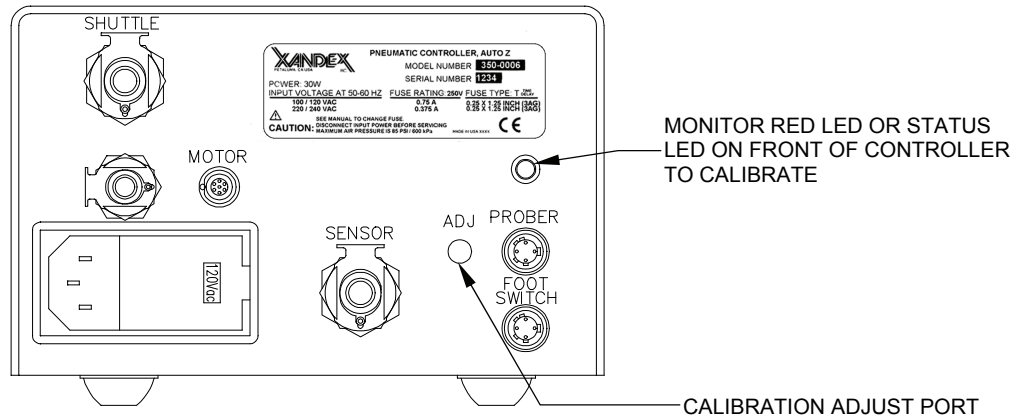
CAUTION: *If the sensor nozzle is off the wafer surface when the Auto-Z function is engaged, the cartridge will crash into the wafer.*

3. Position the chuck/wafer under the inker, making sure the sensor nozzle is over the wafer surface.
4. Stage the prober chuck to nominal inking height (Z height of the chuck when the ink dot is deposited). Press the inker test button on prober to create a droplet of ink at end of cartridge.
5. Set top mode switch to "SETUP". This extends the inker shuttle. Push the "DOWN" button on the controller **once per second** until the ink drop is deposited on the wafer surface.
6. Set top mode switch to "RUN", fire the inker several times and check the size and roundness of the ink dots. **It is recommended that during calibration, several rows of dots be placed and inspected for consistency. If skipped dots are detected, lower inker Z height until consistent dots are achieved.**
7. If adjustment is necessary, use the "UP" or "DOWN" buttons to adjust inker Z height until the desired dots are achieved.
8. Verify that the chuck is at nominal inking height and set top mode switch to "CALIBRATE".
9. Insert the 1.5mm hex key (P/N 520-0304, supplied) into the adjustment hole in the rear of the controller labeled "ADJ" until the wrench is securely engaged. There will be a slight "clicking" noise when the wrench is turned, along with a fair amount of resistance. The switch can now be adjusted by monitoring either the "STATUS" LED on the front of the controller or the red indicator LED on the rear of the controller.

Note: *If the pressure switch has inadvertently been turned excessively out of calibration, the adjustment can be turned quickly back and forth until the "STATUS" LED comes on. This can be used as a rough adjustment for beginning the calibration procedure.*

Otherwise, the pressure switch should always be adjusted slowly in steps consisting of two or three clicks each, allowing 10 to 15 seconds between

steps for the switch to equalize internal pressure. If the adjustment is turned rapidly in either direction, allow one minute for the switch to equalize before continuing with the calibration procedure. **Adjusting the switch too quickly will result in inaccurate calibration.**



10. If the "STATUS" LED is ON, turn the hex wrench clockwise (facing the rear of the controller) three clicks at a time until the "STATUS" LED goes out.
11. Turn the wrench counter-clockwise in steps consisting of three clicks each, pausing 15 seconds between each step until the "STATUS" LED comes back on.
12. Fine tune this adjustment point by turning the wrench clockwise in steps consisting of three clicks each, pausing 15 seconds between each step until the "STATUS" LED goes out. Then turn the wrench counter-clockwise in three click steps, pausing 15 seconds between each step until the "STATUS" LED comes back on.
13. This is the new calibration point for the Auto-Z function.
14. If the "STATUS" LED is OFF, slowly turn the hex key counter-clockwise three clicks at a time until the "STATUS" LED comes on.
15. Turn the wrench clockwise in steps consisting of three clicks each, pausing 15 seconds between each step until the "STATUS" LED comes turns off.
16. Turn the wrench counter-clockwise in steps consisting of three clicks each, pausing 15 seconds between each step until the "STATUS" LED comes turns on.
17. Fine tune this adjustment point by turning the wrench clockwise in steps consisting of three clicks each, pausing 15 seconds between each step until the "STATUS" LED goes out. Then turn the wrench counter-clockwise in three click steps, pausing 15 seconds between each step until the "STATUS" LED comes back on.

18. This is the new calibration point for the Auto-Z function.
19. Set the top mode switch to "RUN" and the lower mode switch to "RUN" or "MANUAL" to begin inking.
20. To check the new Auto-Z calibration, verify that the chuck is at inking Z height and set the lower mode switch to "AUTO". The inker should return to the same calibration point every time the Auto-Z function is engaged. No other calibration should be required (manual adjustment of up to 0.005 inches up or down may be required to accommodate tolerance variations encountered in the ink cartridge manufacturing process.)
21. If the unit fails to operate as specified, please contact Xandex Customer Service for assistance at (707) 763-7799 or toll free in the United States at (800) 767-9543. Email <mailto:info@xandex.com>

HISTORY
REFERENCE ONLY

Auto-Z Function Setup & Alignment

Note: Numerous safety features have been built into the Auto-Z software to minimize the occurrence of any problems. The operator, however, should be alert to the following warning signs that indicate a possible problem:

- ◆ *If there is no air flowing from the sensor nozzle during engagement of the Auto-Z function, the cartridge will impact the wafer.*
- ◆ *If the sensor nozzle is not over the wafer surface during engagement of the Auto-Z function, the cartridge will impact the wafer.*
- ◆ *If the supply air is plugged in, but the air line to the sensor is not, you will be able to hear air rushing from the back of the controller. This acts as an audible alarm. If this occurs, switch the Auto-Z off immediately by moving the bottom mode switch to "RUN". Re-engage Auto-Z by moving the bottom mode switch to "AUTO" only after the sensor air hose is connected correctly.*
- ◆ *If the main air supply is not plugged into the controller when Auto-Z is engaged, the unit is programmed to run the mechanism to the top of its travel, stop, and flash the "INK ON" and "STATUS" LEDs simultaneously. If this occurs, set the bottom mode switch to "RUN", connect the main air and re-engage Auto-Z by setting the mode switch to "AUTO".*

1. Prepare, install and prime an ink cartridge per the instructions in this section (4).
2. Once priming is completed, verify that the inker is at maximum Z height adjustment, set both mode switches to "RUN", then lower the inker arm and snap into place.
3. Position the chuck/wafer under the inker, making sure that the sensor nozzle is over the wafer surface.
4. Set the prober chuck to nominal inking Z height (Z height of the chuck when the ink dot is deposited).



CAUTION: *If the inker height is adjusted with the chuck stage in a position other than nominal inking Z height, the cartridge may be positioned too low and the cartridge needle will impact the wafer when you begin inking. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!*

5. With the upper mode switch on "RUN" set the lower mode switch to "AUTO".

- The Auto-Z function has now been engaged and will adjust inker height automatically. There will be a 7-second delay before the mechanism begins actuation.
- Air will begin flowing from the sensor nozzle. The "INK ON" LED will flash rapidly as the mechanism moves up. The "INK ON" LED will then flash once every second as the mechanism moves down. Each LED "flash" signifies a movement of 0.0005 inches.



CAUTION: *If the sensor nozzle is off the wafer surface, the cartridge will crash into the wafer.*

- When the inker has reached its pre-calibrated inking height, the "STATUS" LED will come on and the Auto-Z function will be terminated. The mechanism movement is extremely slow in order to achieve precise repeatability. Inker movement will not be visible to the naked eye. Because the mechanism is starting from the top of its travel initial setup may take a several minutes.

Note: *The setup time may be shortened by moving the bottom mode switch to MANUAL and using the DOWN button to move the sensor to within 0.10" of the wafer surface, then setting the switch to AUTO to engage the Auto-Z function. The Auto-Z function will take only 30 to 45 seconds to adjust when re-engaged if the sensor nozzle is moved to within 0.10" of the wafer. This feature allows for quick, precise, automatic adjustment to varying wafer thickness.*

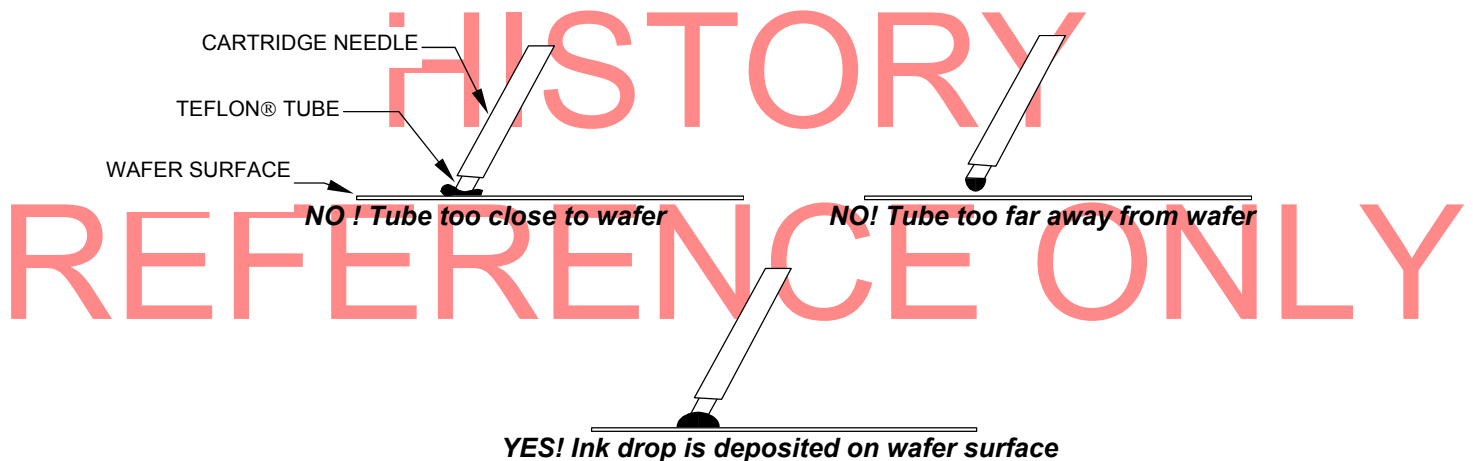
- Move both of the mode switches to "RUN". Index and test fire the inker a few times to check dot roundness. Each time the inker fires, the "INK ON" LED flashes.
- Loosen the *X-Y lockdown knob* on the inker sufficiently to allow X-Y movement of the cartridge tip when the *joystick* is manipulated. The *X-Y lockdown knob* should be tightened to give spring tension to the *joystick* at all times to maintain X-Y position. Use the *joystick* to adjust the X-Y position of the cartridge tip.
- Using the "DOT SIZE" thumbwheels, change the setting until the desired dot size is achieved (see the tables in **Section 7**). If you have problems, refer to "Inker Troubleshooting" in **Section 6 "Maintenance & Troubleshooting"** of this manual.



CAUTION: *Do not let the Teflon® cartridge tube contact the wafer surface. This may crush the tip preventing ink flow and damaging the cartridge!*

12. Due to the unavoidable incidence of slight manufacturing variations from cartridge to cartridge, additional Z height adjustment of the inker may be necessary. **It is recommended that during setup, several rows of dots be placed and inspected for consistency. If skipped dots are detected, lower inker Z height until consistent dots are achieved.**
13. If adjustment is required, set the lower mode switch to "MANUAL" and use the "UP" and "DOWN" buttons on the front of the controller to make the final adjustments until round dots are achieved. Pressing either the "UP" or "DOWN" button results in a movement of approximately 0.0005 inches for each time pressed. The "INK ON" LED will flash each time either button is pressed.
14. If the dots are round and of proper size, basic installation is complete.

Note: *If manual adjustments must be made in excess of 0.005 inches, or if the cartridge tip is contacting the wafer surface, re-calibration of the unit may be required. See "Auto-Z Calibration" immediately following this section.*



CAUTION: *Extreme care should be taken when using the "UP" and "DOWN" buttons in the "MANUAL" mode. The buttons should be pressed no faster than one time per second. The switch cannot react to faster use and such use will result in zero movement. Pressing and holding down either of the "UP" or "DOWN" buttons will cause the motor to "RUN", moving the inker rapidly up or down. The "UP" and "DOWN" buttons should be used in this manner only when it becomes necessary to quickly move the mechanism up or down a considerable distance (i.e., cartridge replacement).*

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HISTORY
REFERENCE ONLY

Section 5. Ink

General Information

Semiconductor manufacturers use the vision system of automatic pick and place equipment during the assembly process to detect damaged and/or rejected die. This is done by shining a combination of different lights on the wafer surface to create a “white” background. Ink dots and defects such as chipped corners are easily recognizable against this background.

Xandex 8103, 8104, 7824, 7824T and Markem[®] 6993 inks are opaque and easily recognizable under all lighting conditions. Xandex Glycol Free 8103 ink is thick in viscosity and delivers opaque dots ranging from 6 to 40 mils. Xandex 8104 is not as viscous as 8103 and provides thinner dots with excellent geometry and adhesion in a larger dot range up to 86 mils. Markem[®] 6990 and 6997 are less opaque and may not offer sufficient contrast under all lighting conditions.

Xandex 8103 ink is certified to contain less than 10 ppm of Sodium (Na) and Chloride (Cl). Xandex 8104 ink is certified to contain less than 20 ppm of Sodium (Na) and Chloride (Cl). Both 8103 and 8104 premium inks are free of glycol ethers, which are identified reproductive hazards and carcinogens. Xandex 7824 and 7824T inks are certified by Xandex to contain less than 10 ppm of Na and Cl. Markem[®] 6990 is certified by Markem[®] to contain less than 25 ppm of Na and Cl. Analysis reports are available upon request from Xandex Customer Service.

Although Markem[®] 6993 and 6997 are not contaminant controlled, periodic test data indicates that these inks typically contain less than 100 ppm of Sodium (Na) and 300 ppm of Chloride (Cl). These levels are not certified or guaranteed by Markem or by Xandex¹.

Xandex Glycol Free 8103 and 8104 inks have a 4 month shelf life, rapidly air dry at ambient conditions and will give consistent flow for 3 days after cartridge opening. Markem[®] 6990, 6993 and 6997 inks have a 4 month shelf life, require heat curing to be permanent, and will give consistent flow for 5 days after cartridge opening. Xandex 7824 and Xandex 7824T inks have a 4 month shelf life and will give consistent flow for 3 days after cartridge opening. Xandex 7824 and 7824T can be air or “heat set” cured.

Xandex Glycol Free 8103 and 8104 inks are thermally stable at temperatures up to 150° C and can be used in hot chuck or oven drying applications without cracking or loss of adhesion. Use of either Markem[®] 6990, 6993 and 6997 or Xandex 7824 and 7824T inks in hot chuck applications is not recommended as the elevated ambient temperature in the probing area can reduce cartridge life and cause inconsistent ink flow. However, use of a hot chuck to heat set dots during offline inking has reportedly been successful when employed by some customers. All of the inks offered by Xandex are non-magnetic.

Material Safety Data Sheets (MSDS) are available for all inks offered by Xandex. To obtain MSDS or information about choosing the appropriate ink for your application please contact your local distributor or Xandex Customer Service. ¹ Test results are dependant on test method

Ink Curing

The procedure for curing will depend on the type of ink used. Markem® 6990, 6993, and 6997 should be cured/baked within 2 hours of inking due to the evaporation of solvents in the ink over time. If a wafer (or boat of wafers) is left uncured for an extended period of time, the dots may crack and/or flake after the baking process.

Markem® 6990, 6993, and 6997 inks, which are air-dried, will not smear when touched. They are not permanent, however, and will not withstand most post-probe handling or processes. Conversely, Xandex 7824 and 7824T inks air cure within 2.5 hours (≤20 mil, up to 8 hours for >20 mil dots). Xandex 7824 and 7824T may also be “heat set” at 120°C for 10 minutes.

Xandex 8103 and 8104 Glycol Free inks hard cure under ambient conditions in the least time of any of the inks offered by Xandex. Ink dots of ≤25 mil air dry to a hard cure in 45 minutes. Dot sizes >25 mil may require significantly longer to cure. An ambient cure time of up to 6 hours may be needed for larger dot sizes. Continuous air flow across the wafer surface will reduce the amount of time required for curing. The following table provides specifics for each type of ink:

INK CURING			
CURE TYPE	TEMPERATURE	CURE TIME	RESULT
Markem® 6990, 6993, and 6997			
Soft Cure	100-150°C	5-15 minutes	Ink is semi-permanent and will not withstand wash of alcohol, acetone, or photoresist removers
Hard Cure	150-185°C	30-60 minutes	Ink is permanent and resistant to wash process
Xandex 7824, 7824T			
Hard Cure	Air dry, ambient conditions	2.5 hours ± 0.25 hrs for ≤20 mil, up to 8 hrs >20 mil.	Ink is permanent and may only be removed with great difficulty
Hard Cure	150 watt heat lamp at 5-6 inches OR oven at 110-120°C	5-10 minutes	Ink is permanent and may only be removed with great difficulty
Xandex 8103 and 8104 Glycol Free			
Hard Cure	Air dry, ambient conditions	5-15 minutes for 5-15 mil 15-45 minutes for 15-25 mil 45-min-6 hours for 25-40 mil	Ink is permanent and may only be removed with great difficulty

Note: Longer drying times are required for larger dot sizes.

Note: Markem® is a registered trademark of Markem Corporation, Keene, NH

Ink Removal Information

A rinse with isopropyl alcohol or acetone generally removes ink completely if the wafer is washed shortly after inking (within 5 minutes). An ultrasonic bath is recommended to ensure complete removal of ink residue. Ink dots, which have been air dried or hard cured, require the application of an ink remover.

DieMark Remover 8000

Xandex has developed DieMark Remover 8000 specifically for the semi-conductor industry. DieMark Remover 8000 thoroughly removes all inks supplied by Xandex, including oven baked ink dots. DieMark Remover 8000 has very low levels of organic and inorganic contaminants and is an efficient and thorough ink remover when used in simple bench top cleaning methods. Due to its high flash point, DieMark Remover 8000 is also safe and effective when used in ultrasonic, temperature/pressure cycling under vacuum and deep bath heating and agitation ink removal processes.

DieMark Remover 8000 is carcinogen free (NTP, OSHA) and all ingredients used are TSCA listed. For an MSDS or more information on using DieMark Remover 8000 in your specific ink removal process, contact Xandex Customer Service.

Ink Removal Procedure

The following is the recommended bench top procedure for removing ink from wafers using DieMark Remover 8000. *



CAUTION: All procedures should be performed under a laboratory hood, following the proper safety precautions (protective goggles, gloves and clothing).

1. Apply sparingly with an eyedropper to a localized area of the wafer.
2. Allow 2-3 minutes for the DieMark Remover 8000 to begin solvating. Time required will vary depending on the degree that the ink was cured.
3. For highly cured ink dots, use longer soak times, then wipe gently with a clean lint-free cloth to facilitate removal. If necessary, repeat steps 1 and 2.
4. For large areas or removal of ink from entire wafer, soak a clean lint-free cloth with DieMark Remover 8000, then lay the wet cloth over the entire surface and allow time to soak/solvate ink, then remove wet cloth. Repeat as necessary.
5. After dots are removed, clean wafer via standard procedures, such as vapor degreasing, and/or rinse with a clean solvent (Isopropyl Alcohol) followed by a bake cycle at 65° C to dry.

* The following ink removers may be substituted for DieMark Remover 8000, however, Xandex does not guarantee that satisfactory results will be obtained. None of the following solvents or ink removers are available from Xandex.

- ◆ Aptek 6515 Ink Remover
- ◆ Markem® 540
- ◆ P-300 Resist Remover
- ◆ 712-D Resist Remover
- ◆ Uresolve Resist Remover
- ◆ Methyl Ethyl Ketone (MEK)
- ◆ N-Methyl-2-Pyrrolidone (M-Pyrrol)

HISTORY
REFERENCE ONLY

Section 6. Maintenance & Troubleshooting

This Troubleshooting section for the X4000 Pneumatic Inker is divided into three parts. The first part covers ink and the DM-2 ink cartridge. The second part covers the Inker Assembly, and the third part covers the Pneumatic Controller. Additional troubleshooting information is available in the “Support” section at <http://www.xandexsemi.com/>.

Ink Troubleshooting

Problem	Solution
Some ink dots tend to crack after baking using Xandex recommended cure cycles.	This occurrence is related to the ink surface tension, the wafer surface conditions and too long a delay time between inking and curing. To remedy this situation, the curing cycle has to be modified (reduce time and temperature). See Section 5 “Ink Curing.”
Runny, blobbing ink or skipping dots.	<ol style="list-style-type: none"> <li>1. Check ink shelf life. Markem[®] 6990, 6993, 6997 inks should be used within 4 months or 5 days of cartridge opening. Xandex 8103 and 8104 inks should be used within 4 months or 3 days of cartridge opening. Xandex 7824 and Xandex 7824T air-dry ink within 4 months or 3 days after cartridge opening. <li>2. Check for exposure to extreme temperatures. Cartridges should be stored at 25°C. DO NOT refrigerate the cartridges. Occasionally, ink is subjected to much higher temperatures (40-50° C) for an extended time during transport. This could break down the ink such that its viscosity and surface tension are altered permanently. Contact Xandex Customer Service. <li>3. Z height adjustment is incorrect. After cartridge replacement, occasional manual Z height adjustment may be required. See Section 4 “Inker Assembly Setup and Alignment.” <li>4. Chuck top or wafer surface not planar. Verify planarity of both. <li>5. Improper Auto-Z calibration. Re-calibrate Auto-Z function as detailed in Section 4 “Auto-Z Calibration.” and re-adjust Z Height.

Problem	Solution
<p>After changing the controller dot size settings, the dots are too small or the ink blobs at the tip of the needle.</p>	<ol style="list-style-type: none"> 1. The cartridge tip may be damaged. Examine cartridge and replace if necessary. 2. Whenever dot size is changed there may be minor Z height adjustments required. The inker should be set so that just the bottom of the ink drop touches the wafer.
<p>Small, inconsistent, or no ink dots.</p>	<ol style="list-style-type: none"> 1. Soft Teflon[®] tip of the cartridge tube is clogged or damaged. Change ink cartridge. 2. The dot size setting may be too low. Increase dot size setting. 3. Wrong cartridge type. Change cartridge type. 4. Air pressure too low. Verify that controller regulator setting is 70 ± 10 PSI. 5. Z height adjustment is incorrect. After cartridge replacement, occasional manual Z height adjustment may be required due to the unavoidable incidence of slight manufacturing variations from cartridge to cartridge. It is recommended that at setup, several rows of dots be placed and inspected for consistency. See Section 4 “Inker Assembly Setup and Alignment.” 6. Verify that the inker swing arm is all the way down and locked in position. 7. Shuttle mechanism may be binding. See “Shuttle Maintenance” in this section.

HISTORY
REFERENCE ONLY

Inker Assembly Troubleshooting

Problem	Solution
<p>Cartridge tip does not reach wafer surface.</p>	<ol style="list-style-type: none"> 1. Check Z height by switching the controller into "SETUP" mode, which will extend the shuttle downward into the "inking position". The cartridge tip should be 1-2 mil from the wafer surface. Adjust Z height per "Inker Assembly Setup and Alignment" in Section 4 "System Operation" of this manual. 2. SETUP mode switch was not used when inker was calibrated. Re-calibrate inker per Section 4 "Auto-Z Calibration." 3. Sensor nozzle may have become loose or has been moved from its calibration point. Inspect the sensor nozzle mounting and correct if sensor is loose. After any adjustment of the sensor nozzle, the Auto-Z function must be re-calibrated. See Calibration procedure in Section 4 "System Operation" of this manual.
<p>Unit functions normally, no dots, no shuttle movement.</p> <p>Auto-Z not working</p>	<ol style="list-style-type: none"> 1. Verify that the Controller-Shuttle air hose connector is plugged into the controller. 2. Verify that the Controller-shuttle air hose is not kinked, clogged or pinched closed. 3. Check Main Air pressure setting (verify 70 ± 10 PSI air input). <hr/> <ol style="list-style-type: none"> 1. Verify that the inker stepper motor is plugged into the "MOTOR" connection on the back of the Controller. 2. Verify that the Controller-Sensor air hose is properly connected and that the hose is not kinked or pinched closed.

Inker Assembly Troubleshooting Maintenance & Troubleshooting

Problem	Solution
Unit functions normally, shuttle moves, no dots.	<ol style="list-style-type: none">1. Check air hose to top of cartridge to be sure it is connected and not clogged, kinked or pinched.2. Verify cartridge preparation, insuring Needle Collar is flush with the Cartridge Neck and the internal membrane is broken. See Section 4 “Ink Cartridge.”3. Check the Teflon® tip of cartridge tube to confirm that it is not clogged or damaged.4. Verify rubber washer on cartridge air hose connector is installed.
Inker produces dots during “puff pulse” or ink flows out of cartridge with toggle switch in “SETUP”.	<ol style="list-style-type: none">1. Verify that the air hoses from the controller to the inker are connected properly:<ul style="list-style-type: none">◆ RED AIR HOSE connects to the ink cartridge. (Air in)◆ BLUE AIR HOSE connects to the shuttle connection on the shuttle mechanism. (Exhaust)

Shuttle Maintenance

Schedule and Preventive Maintenance Kits

Periodic preventive maintenance of the shuttle mechanism is recommended to insure continued, trouble free operation of your Xandex pneumatic inking system. The recommended maintenance schedule is as follows;

- Off-line use = 6 month intervals
- In-Line / Post Probe use = Once per year

Shuttle preventive maintenance kits are available, which include all parts necessary for one normal shuttle maintenance procedure. These kits may be ordered direct from Xandex or through your local Xandex distributor. All Auto-Z model inkers require kit number 370-0001.

X4000 Shuttle Maintenance

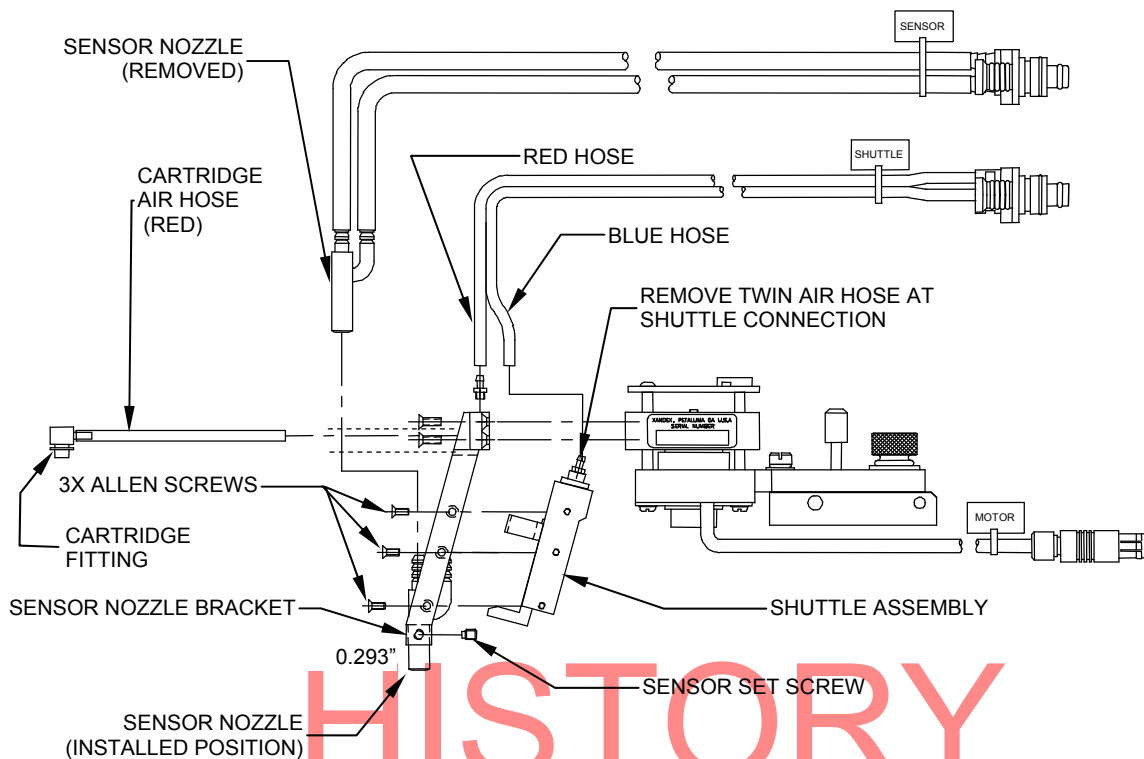
The following describes the procedure for disassembly and reassembly of the Pneumatic Shuttle for maintenance purposes. Reference Drawing 320-4205 and 216-0001 on the Drawings CD included with this manual for part identification and associated part numbers. This shuttle maintenance procedure requires removal of the sensor nozzle. Auto-Z calibration will be lost and the inker and controller must be re-calibrated before the Auto-Z function will operate correctly. See **Section 4 “Auto-Z Calibration”** for calibration procedure.



CAUTION: *Damage to the ink cartridge needle and the wafer may occur if the inker is operated before the calibration procedure is performed!*

Shuttle Removal (Reference Drawing 320-4205)

1. Remove the ink cartridge (if installed). See **Section 4 “Changing the Cartridge.”**
2. Remove the set screw (Item 11) located at the bottom of the *shuttle/sensor mounting arm* (Item 1), which attaches the sensor to the *shuttle/sensor mounting arm* (Item 1), and remove the *sensor nozzle* from the *shuttle/sensor mounting arm*.
3. Disconnect the *twin pneumatic hose* at the shuttle connection (grasp, do not crush, the hose with needle nose pliers over the fitting point and pull gently to disconnect, being careful not to damage hose).
4. Remove the *three Allen screws* (Item 9) securing the *shuttle assembly* (Item 6) to the *shuttle/sensor mounting arm* (Item 1) and remove the *shuttle assembly* (Item 6) for maintenance.



Shuttle Disassembly (Reference Drawing 216-0001)

1. Loosen the two *Allen Screws* (Item 6) at the top corners of the *bracket* (Item 1), then unscrew the *cylinder/adaptor* assembly (Items, 3, 4 & 9) from the *bracket* (Item 1) and remove.
2. Carefully lift and remove the *pneumatic holder* (Item 2) from the *bracket* (Item 1), paying close attention to the *spring* (Item 9) located in the bottom of the *holder* (Item 2).

Shuttle Maintenance

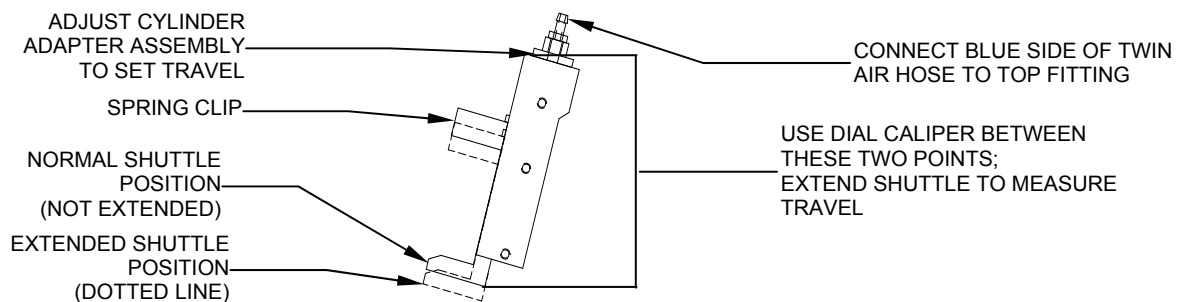
With the Shuttle removed and disassembled, perform the following checks to verify condition/operation.

1. Clean both the *pneumatic holder* (Item 2) and *bracket* (Item 1) with Isopropyl Alcohol and a clean lint free cloth. Inspect the *pneumatic holder* (Item 2) and *bracket* (Item 1) for wear or physical deformation. Replace as necessary.
2. Inspect the *cylinder/adaptor assembly* (Items, 3, 4 & 9). Apply/remove 40-80 PSI to the *cylinder/adaptor assembly* and verify operation. The cylinder should extend/retract, as the air signal is applied/removed. If problems are noted in operation (air leak, cylinder sticking, etc.) replace the assembly.

3. Inspect the *spring* (Item 9) for fatigue or physical deformation. Free length of the *spring* is 0.250" nominal. Replace as needed.
4. Remove the two *Allen screws* (Item 6) that lock the *cylinder/adapter assembly* (Items, 3, 4 & 9) in place in the *bracket* (Item 1). Replace with new screws.
5. Inspect the *cartridge fitting* and the *red cartridge air hose* for ink contamination. Clean fitting as necessary and replace the *washer* on the *cartridge fitting*. Replace the hose if necessary.
6. Inspect the *spring clip* (Item 7). Remove and replace the *spring clip* (Item 7) if it is bent or deformed.

Shuttle Re-Assembly

1. Apply a thin film of lubrication (Item 12, Magnalube-G) to the *pneumatic holder* (Item 2) and *bracket* (Item 1) as detailed in Note 2 on Drawing 216-0001.
2. Install the *spring* (Item 9) in the bottom of the *pneumatic holder* (Item 2), then carefully install the *holder* (Item 2) in the *bracket* (Item 1). Verify that the *spring* (Item 9) is in the proper position and the *holder* (Item 2) moves freely in the *bracket* (Item 1).
3. Install the *cylinder/adapter assembly* (Items 3, 4 & 9) into the *bracket* (Item 1). Using a Dial Caliper, measure the stroke of the *holder* (Item 2) from normal to extended position. Adjust the *cylinder/adapter assembly* (Items 3, 4 & 9) until the stroke is between 0.050" and 0.060".



4. Tighten the two *Allen screws* (Item 6) in the *bracket* (Item 1) to lock down the *cylinder/adapter assembly* (Items 3, 4 & 9). Apply 40-80 PSI air signal to the pneumatic connection on *shuttle assembly* and verify operation of *shuttle*.
5. Re-install the *shuttle assembly* on the *shuttle/sensor arm* using the three *Allen screws* previously removed.
6. Insert the *sensor nozzle* into the round retaining ring at the bottom of the *shuttle/sensor mounting arm* and adjust to 0.293" \pm 0.005". Lock into place

with the *set screw* previously removed. Apply a dab of *Loctite 222* (Item 8) to the screw before installing. Reconnect the twin pneumatic hose.

7. After the *sensor* has been removed and replaced the Auto-Z function must be re-calibrated before the Auto-Z function will operate correctly. See **Section 4 “Auto-Z Calibration”** for calibration procedure.

HISTORY
REFERENCE ONLY

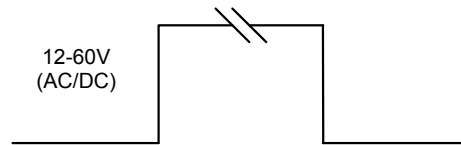
Controller Maintenance

Controller Sequence of Operation

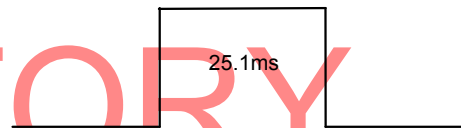
To initiate an ink dot, the Prober sends a 12-60 V (AC/DC unregulated) active-high signal to the Controller. After receipt of the signal, the microcontroller performs various checks of system status prior to firing the pneumatic valves.

Upon completion of the status checks, a 25.1ms pulse is sent to the Shuttle Valve (V2), while at the same time a 6.85-27ms pulse (depending on position of Dot Size knob) is sent to the Cartridge Valve (V1).

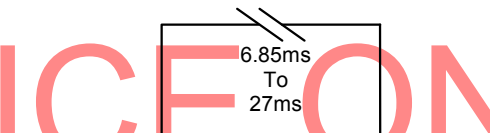
Signal from Prober



Shuttle Valve (V2)



Cartridge Valve (V1)



HISTORY
REFERENCE ONLY

As the shuttle extends to the lower position, the air pulse from Valve 1 forces ink out of the cartridge barrel and forms a drop at the end of the needle tip. When the shuttle is at its lowest position, the drop makes contact with the wafer surface and forms a dot. The shuttle then returns to the normal position.

At the completion of each dot, a small amount of vacuum is developed in the cartridge by the closure of the valve, preventing dripping. If another dot sequence is not initiated within 10 seconds, a short “puff” pulse that varies with the dot size duration (6.7-13ms) is sent to the cartridge to displace a small amount of ink back into the Teflon® tube to aid in maintaining proper dot size after a long delay between dots.

Controller Diagnostics

There are five internal diagnostic tests available for testing the Controller. To enter the Diagnostics mode, apply power to the Controller with the “RESET” button to the right of the thumbwheels depressed. All references to “mode switch” in the following tests refer to the top mode (toggle) switch. The bottom mode switch should be set to RUN during testing.

A. Test Thumbwheels

1. Place the mode switch on the front panel to SETUP, set the DOTS X1000 thumbwheels to 12345, then reset the LCD Counter.
2. Press the RESET button and verify that the counter increments 15 counts.
3. Place the toggle switch to RUN, set the thumbwheels to all 1's, reset the LCD Counter, and press RESET. The counter should increment one count.
4. Repeat the procedure for the rest of the digits (2 through 9). With the thumbwheels set for 00000, the counter increments 10 counts.

B. Test Cartridge Valve

To test fire the Cartridge Valve 20 times:

1. Set the DOT SIZE thumbwheels to 02
2. Place the mode switch to CALIBRATE
3. Reset the LCD Counter
4. Press RESET.

The cartridge valve fires 20 times, each time incrementing the LCD Counter.

C. Test Shuttle Valve

To test fire the Shuttle Valve 20 times:

1. Set the DOT SIZE thumbwheels to 03
2. Place the mode switch to CALIBRATE
3. Reset the LCD Counter
4. Press RESET.

The shuttle valve fires 20 times, each time incrementing the LCD Counter.

D. Test Sensor Valve

To test fire the Sensor Valve 20 times:

1. Set the DOT SIZE thumbwheels to 09
2. Place the mode switch to CALIBRATE
3. Reset the LCD Counter
4. Press RESET.

The sensor valve fires 20 times, each time incrementing the LCD Counter.

E. Life Test

This test will continuously fire the Cartridge and Shuttle valves for a predetermined number of cycles as set on the thumbwheels.

1. Place the mode switch to CALIBRATE
2. Set the DOTS X1000 thumbwheels for the desired number of cycles X1000 (i.e.: 250 Equals 250,000 cycles).
3. Reset the LCD Counter.
4. Press RESET.

The Controller begins continuous firing, incrementing the Counter each cycle. To discontinue the Life Test prior to reaching the set amount, remove power.

Controller Troubleshooting

Problem	Solution
The Unit is plugged in but the "Power" LED is off.	Make sure that the outlet has power. The requirement is 100/120/220/240 volts. Check controller fuse to be sure it is still good. See Section 3 "Fuse Replacement."
Unit powers up okay but will not respond to prober signal.	<ol style="list-style-type: none"> 1. Verify input cable is plugged into the prober input on the Controller. 2. Verify input cable is plugged into inker jack on prober. 3. Check continuity of cable. Replace /repair if defective. 4. Perform system diagnostics checks to verify Controller operation. See Section 6 "Controller Diagnostics."
Unit powers up okay, responds to prober input but the shuttle does not move.	<ol style="list-style-type: none"> 1. Check that shuttle toggle switches on the front of the controller are in the RUN position. 2. Check that the air hose "quick disconnects" on the back of the controller are correctly oriented and connected. 3. Place top mode switch to SETUP. The shuttle should extend. If it does not, and all air hose connections are correct, the problem may be that the shuttle mechanism is binding. See "Shuttle Maintenance" in this section (6)

Problem	Solution
<p>“STATUS” & “INK ON” LED's Flashing</p>	<ol style="list-style-type: none"> 1. Verify that there is air input to the controller. 2. Unacceptable mode switch combination. Review “Controller Operation” in Section 4. 3. Sensor Nozzle is “out of range” of wafer and requires calibration. See Section 4 “Auto Z Calibration” of this manual.
<p>Dot size does not change with adjustment of Dot Size Thumbwheels</p>	<ol style="list-style-type: none"> 1. Verify that the air hoses from the controller to the inker are connected properly: <ul style="list-style-type: none"> ◆ RED AIR HOSE connects to the ink cartridge. ◆ BLUE AIR HOSE connects to the shuttle connection on the shuttle mechanism. 2. Run diagnostic test “A.” Test Thumbwheels described in “Controller Diagnostics” in this section (6). If test results are not within parameters, consult Xandex Customer Service. 3. Replace ink cartridge.

HISTORY REFERENCE ONLY

Internal Maintenance**Controller Logic Board Removal**

CAUTION: Use appropriate ESD precautions when working inside of the controller!

With Power and Main Air removed:

1. Remove the cover of the Controller.
2. Disconnect the *Molex connectors* (P2 through P7) from the **top** of the *controller logic board*. (See wiring diagram 350-0006 on the Drawings CD included with this manual)
3. Push back both locking devices on the card guides to unlock position, then lift the *logic board* from the mounting location.
4. Disconnect the P1 *connector* from the *logic board* and remove the *logic board* from the *controller*.
5. Place the *logic board* on ESD protective surface or store in ESD protective anti-static bag.

Reverse this procedure for installation of *logic board*.

Turn Audible Alarm ON/OFF

Auto-Z controller units (P/N 350-0006) with serial numbers higher than 3000 are equipped with an audible alarm feature. When enabled, an audio alarm will sound (in addition to the STATUS LED illuminating) when the programmed number of dots is reached. The controller is shipped with the audio alarm feature disabled.

With the logic board removed:

1. Locate JP7 on the 250-1219 daughter card mounted on the 250-1166 printed circuit board. In the default factory condition, JP7 is populated with a jumper on pin 1 only. This is the default audio alarm disabled condition.
2. To enable the audio alarm remove the jumper from pin 1 on JP7 and install the jumper onto pins 1 and 2. This is the audio enabled condition.
3. After enabling/disabling the alarm, re-install the *logic board* by reversing the procedure outlined in the “Controller Logic Board Removal” above.

Before returning the unit to service:

1. Install the cover, apply power and main air, and perform controller diagnostics, as documented in this chapter, to verify operation. If problems are noted, review the installation of audio alarm jumper to insure installation is correct, none of the component leads are bent, and verify connection of P1 through P7 connectors on the *logic board*.

HISTORY
REFERENCE ONLY

Preventive Maintenance

Pneumatic Controller Preventive Maintenance Schedule and Sets

The two solenoid driven air valves used in Xandex pneumatic controllers to drive the Pneumatic Shuttle and Ink Cartridge are identical. Valve one (V1) supplies air to the ink cartridge, and is also referred to as the Cartridge Valve. Valve two (V2) supplies air to the pneumatic shuttle and is also called the Shuttle Valve.

Xandex Auto Z and Motorized Z controllers contain a third valve (V3) that is identical to the Shuttle and Cartridge valves. The Auto Z controller uses this valve only when the Auto Z function is engaged. The Motorized Z uses this valve to change the air pressure supplied to the cartridge valve when inking in small dot mode. In normal operation, the third valve (V3) in either the Auto Z or Motorized Z controller will not need replacement for the life of the unit.

Preventive maintenance for Xandex pneumatic controllers requires replacement of just the Cartridge Valve, or of both the Cartridge and Shuttle valves at the intervals specified below.

Controller Model	Replace	Interval
All Models	Cartridge Valve	Continuous High Speed / Small Dot Use = 6 months All other applications = 12 months
All Models	Cartridge Valve, Shuttle Valve and internal tubing	Every 24 months

Two valve replacement kits are available from Xandex to facilitate controller preventive maintenance.

- Cartridge Valve Set, containing a single valve assembly, electrical connectors and replacement instructions. This set is used for 6/12 month cycle controller preventive maintenance. Order part number 370-0100.
- Dual Valve Set containing two valve assemblies, electrical connectors, adequate tubing to replace all internal controller pneumatic routes in all Xandex pneumatic controllers and replacement instructions. Replacement of the polyurethane tubing is recommended as the internal operating temperature within the controller enclosure can cause the tubing to shrink slightly over time. This can result in leaking connections at the valve and coupling connections. This set is used for 24 month controller preventive maintenance. Order part number 370-0101.

For more information or to order pneumatic controller PM Sets, contact Xandex Customer Service at (707) 763-7799, (800) 767-9543 (toll free in the US), FAX (707) 763-2631; email <mailto:info@xandex.com> or order online at <http://www.xandexsemi.com/>.

Cartridge (V1) or Shuttle (V2) and Sensor (V3) Valve Replacement

 *This procedure is to be used for replacement of all three valves, as they are identical.*

Note: *Controller units manufactured before June, 1999 used a soldered wire splice covered by heat shrink tubing for valve electrical connections, instead of the snap plug connectors used in the current build. The replacement valve assembly P/N 240-0261 is shipped with post-end snap plug connectors. To order crimp on receptacle connectors to retrofit an older controller unit, contact Xandex Customer Service and order snap on receptacle connector P/N 519-0031*

With Power and Main Air removed:

1. Remove the four (4) cover screws from each side of the controller and remove the controller cover.
2. Disconnect the input and output pneumatic hoses from the defective valve by depressing the colored fitting collar and pulling on the pneumatic hose simultaneously.
3. Disconnect the two snap in connectors that connect the valve wires to the controller.
4. Remove the two Phillips mounting screws securing the valve to the Controller base and remove the valve.

Installation:

1. Remove appropriate fittings from old valve and install on new valve assembly using Teflon thread sealant tape (not supplied).
2. Install the replacement valve assembly (P/N 240-0261) in the *controller base*, securing with the two Phillips screws previously removed.
3. Connect the two snap in connectors on the valve wires to the receptacle connectors on the controller. Polarity does not matter.
4. Install the pneumatic lines accordingly, insuring that each hose is firmly seated in the valve fitting.
5. Apply power and main air.
6. Refer to “**Controller Diagnostics**” in this section and perform appropriate valve functional and diagnostic tests.
7. Re-install the controller cover.

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HISTORY
REFERENCE ONLY

Section 7. System Specifications

Controller Specifications

Part No. 350-0006

Size:	10.5" x 6.25" x 4.25" (267mm x 159mm x 108mm)
Weight:	8.0 lbs (3.7 kg)
Power Requirement:	100/120/220/240 Volts AC @ 50/60 Hz
Foot Switch Input	Contact Closure >50 msec
Air Consumption:	70 PSI ±10 PSI Instrument Air per ISA 7.3 specification <0.5 cfm @ 750 cycles/minute
Cycle Rate:	Exceeds 750 cycles/minute
On-Time Range:	Cartridge Air Feed - Continuously Variable Pulse (Dot Size 6.87-27 ms) Shuttle Air Feed - Fixed @ 25.1 ms
Control Circuits:	Atmel Corporation ATMEGA325-16AU Microprocessor
Counters:	Six Digit with External Reset (Independent of Microprocessor)
External Regulator/Filter:	5.0 micron Air Filtration
Prober Input:	12 - 59 volts @ minimum 30 ms pulse width. The input circuit presents approximately 1 K Ω - 700 Ω input resistance. Typical current as a function of input voltage is listed in the following table:

10 V	10 mA
15 V	25 mA
20 V	45 mA
40 V	65 mA
60 V	85 mA (Maximum input)

Environmental Range:	<ul style="list-style-type: none">➤ Indoor use➤ Altitude up to 2,000 m➤ Temperature range 5° C to 40° C➤ Maximum relative humidity 80 % for temperatures up to 31°C decreasing linearly to 50 % relative humidity at 40 °C➤ Mains supply voltage fluctuations not to exceed ±10 % of the nominal values➤ Transient overvoltages according to INSTALLATION CATEGORY II➤ POLLUTION DEGREE 2
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On our sole responsibility we declare this product is in conformity to the following EU directives;

- EMC Directive 89 / 336 / EEC
- Low Voltage Directive 73 / 23 / EEC

Standards to which conformity is declared:

EN50081-2, EN50082-2, EN61010-1

Stepper Motor Specifications

Part No.158-0010

Operating Voltage:	12 VDC
Resistance Per Phase:	118 Ω
Insulation Resistance:	20 M Ω
Power Consumption:	2.4 Watts
Nominal Force at 100 PPS:	26 oz. minimum
Linear Travel Per Step:	0.001"
Direction of Travel:	Bi-directional
Bearings:	Ball Thrust
Weight:	1.0 oz.
Operating Temperature:	-40° C to +65° C
Storage Temperature:	-40° C to +100° C
Maximum Travel:	1.875"

Ink Cartridge Specifications

Models:	DM-2, Type A5, A6, A8
Teflon Tube I.D.:	A5 - 0.005" / A6 - 0.006" / A8 - 0.008"
Reservoir Capacity:	1.0 grams minimum
Available Inks:	6990, 6993, 6997, 7824, 7824T, 8103, 8104
Dot Sizes:	Dot sizes ($\pm 10\%$) consistent for speeds of 12 dots/second to 1 dot/2 minutes

Ink and Cartridge Availability

The following table illustrates ink and cartridge configurations. The information in this table is accurate as of the time of publication but is subject to change without notice. Consult Xandex Customer Service

Ink Type	Pneumatic Cartridge Types						Filament Cartridge Types										
	DM-2			DM-2.3			DM-1						DM-1.25			DM-S	
<i>Markem Inks</i>	A5	A6	A8	A5	A6	A8	5 mil	8 mil	10 mil	15 mil	25 mil	30 mil	10 mil	15 mil	25 mil	10 mil	15 mil
6990 Black	+	+	+	+	+	+	T,F	+	+	+	+	+	+	+	+	+	+
6990 Red	0	0	0	0	0	0	T	0	0	0	0	0	0	0	0	0	0
6993 Black	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6993 Green	+	+	+	+	0	0	T,F	+	+	+	+	0	+	+	+	+	+
6993 Red	+	+	+	+	0	0	T,F	+	+	+	+	+	+	+	+	+	+
6997 Black	+	+	+	+	+	+	T,F	+	+	+	+	+	+	+	+	+	+
6997 Red	+	+	+	+	+	+	T	+	+	+	+	+	+	+	+	+	+
Empty (no ink)**	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Xandex Inks</i>																	
7824 Black	+	+	+	+	+	+	T,F	+	+	+	+	+	0	+	+	0	0
7824T Black	+	+	+	+	+	+	T	+	+	+	+	+	0	0	+	0	0
8103 Black	+	+	+	+	+	+	T	+	+	+	+	+	0	0	0	0	0
8103 Red	+	+	+	+	+	0	T	+	+	+	+	+	0	0	0	0	0
8103 White	+	+	+	+	+	+	T	+	+	+	+	+	0	0	0	0	+
8104 Black	+	+	+	+	+	+	X	X	X	X	X	X	X	X	X	X	X

- + = Available standard cartridge and ink configuration.
- 0 = Not yet qualified by Xandex. Available as a special order and subject to limited warranty conditions.
- T = available with Tungsten filament
- F = available with Mono-Filament
- ** = Empty cartridge warranty is for workmanship only. Performance with non-Xandex approved inks is not warranted.
- X = Not available in filament cartridge configurations.

HISTORY REFERENCE ONLY

Inker Warranty

Seller warrants as follows:

All material supplied will conform to the description stated. All products will be free of defects in materials and workmanship under normal use for the following periods:

Stated shelf life of DM-2 Ink Cartridges:

- ◆ Markem® 6990, 6993, 6997 = Four (4) months. Five (5) days after cartridge opening
- ◆ Xandex 8103 and 8104 = Four (4) months. Three (3) days after cartridge opening.
- ◆ Xandex 7824 and 7824T = Four (4) months. Three (3) days after cartridge opening.

Pneumatic Controller = One (1) year only when clean, dry, filtered air is used, and when product is installed and operated per manufacturer's recommendations and instructions.

Ninety (90) days from the date of delivery to the customer for all other products.

Xandex makes no other warranty, express or implied, including without limitation any warranty of merchantability or of fitness for a particular purpose. Customer, OEM or Distributor's exclusive warranty shall be, at Xandex's option, to have defective product repaired or replaced, or to receive a refund of purchase price.

Xandex may, upon request, furnish to buyer such technical advice, as it may be able to supply with reference to the use by buyer of any materials delivered. Xandex assumes no liability for the advice given or results obtained. Buyer expressly agrees that it will implement any advice thus given at its own risk and agrees to indemnify and hold Xandex harmless against any liabilities, costs or expense resulting therefrom.

Xandex makes no warranty for performance, service or support of any products unless they are purchased directly from Xandex or through an authorized Xandex Distributor.

Exclusions: This warranty shall not apply to defects or damage resulting from;

- Improper or inadequate maintenance by customer, including failure to perform preventive maintenance per manufacturer's specified schedule
- Misuse or unauthorized modification
- Operation outside the environmental specifications for the product
- Improper site preparation and maintenance

Some states and provinces do not allow limitations on how long an implied warranty lasts, so the limitation or exclusion contained in this warranty may not apply to you. However, any implied warranty of merchantability or fitness is limited to the duration period of this written warranty.

If you have any questions or need further assistance please contact your authorized Xandex distributor or contact our Customer Service Group.



Customer Service

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Petaluma, California 94954 U.S.A.

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<http://www.xandexsemi.com/> email: <mailto:info@xandex.com>

Dot Size Tables in Mils (0.001 inch)

INK TYPE: 8103			
DOT SIZE	DOT SIZE		
SETTING	A5	A6	A8
05	15	16	26
10	17	19	27
15	19	20	27
20	20	21	31
25	20	22	32
30	20	23	35
35	22	23	35
40	22	24	35
45	22	24	35
50	23	25	36
55	23	25	36
60	23	26	37
65	23	26	37
70	24	27	38
75	24	27	38
80	25	27	39
85	25	28	40
90	25	29	40
95	25	29	40

INK TYPE: 7824			
DOT SIZE	DOT SIZE		
SETTING	A5	A6	A8
05	18	22	29
10	21	23	34
15	23	29	34
20	25	30	39
25	26	31	41
30	27	32	41
35	27	32	42
40	27	33	43
45	28	33	44
50	28	33	45
55	29	36	48
60	30	37	49
65	31	37	49
70	31	37	50
75	32	37	51
80	32	37	52
85	33	38	53
90	33	38	53
95	33	39	53

INK TYPE: 6990			
DOT SIZE	DOT SIZE		
SETTING	A5	A6	A8
05	16	19	23
10	18	21	25
15	19	25	31
20	24	26	35
25	25	27	38
30	26	28	39
35	27	29	40
40	27	29	40
45	27	30	41
50	27	30	41
55	27	30	42
60	28	31	43
65	28	32	44
70	29	32	45
75	29	32	46
80	29	32	46
85	30	33	47
90	30	33	48
95	30	33	49

INK TYPE: 6993			
DOT SIZE	DOT SIZE		
SETTING	A5	A6	A8
05	13	18	23
10	17	20	25
15	19	26	33
20	24	28	34
25	25	30	36
30	26	32	38
35	27	32	38
40	28	33	39
45	28	35	40
50	28	35	40
55	28	35	41
60	28	35	42
65	28	35	42
70	28	35	43
75	28	35	44
80	28	36	44
85	29	36	45
90	29	36	45
95	30	36	46

NOTE: Characterization testing performed at ambient temperature of 70° degrees F, relative humidity of 50% on polished, unetched silicon wafers (no passivation). Air pressure 70 PSI minimum with 36 inch long air hose (Controller to Shuttle). Dot size may be set at any value between 1 and 99. Table dot size settings and resulting dot sizes are given in increments of 5. When a range of thumbwheel settings indicate the same dot size, choosing a thumbwheel setting in the middle of the range will provide the most consistent dot size. For example; to place a 27 mil dot with ink type 6990 in an A5 cartridge, a dot size thumbwheel setting of 45 should produce the best results.

Dot Size Tables in Microns

INK TYPE: 8103			
DOT SIZE SETTING	A5	A6	A8
05	381	406.4	660.4
10	431.8	482.6	685.8
15	482.6	508	685.8
20	508	533.4	787.4
25	508	558.8	812.8
30	508	584.2	889
35	558.8	584.2	889
40	558.8	609.6	889
45	558.8	609.6	889
50	584.2	635	914.4
55	584.2	635	914.4
60	584.2	660.4	939.8
65	584.2	660.4	939.8
70	609.6	685.8	965.2
75	609.6	685.8	965.2
80	635	685.8	990.6
85	635	711.2	1016
90	635	736.6	1016
95	635	736.6	1016

INK TYPE: 7824			
DOT SIZE SETTING	A5	A6	A8
05	457.2	558.8	736.6
10	533.4	584.2	863.6
15	584.2	736.6	863.6
20	635	762	990.6
25	660.4	787.4	1041.4
30	685.8	812.8	1041.4
35	685.8	812.8	1066.8
40	685.8	838.2	1092.2
45	711.2	838.2	1117.6
50	711.2	838.2	1143
55	736.6	914.4	1219.2
60	762	939.8	1244.6
65	787.4	939.8	1244.6
70	787.4	939.8	1270
75	812.8	939.8	1295.4
80	812.8	939.8	1320.8
85	838.2	965.2	1346.2
90	838.2	965.2	1346.2
95	838.2	990.6	1346.2

INK TYPE: 6990			
DOT SIZE SETTING	A5	A6	A8
05	406.4	482.6	584.2
10	457.2	533.4	635
15	482.6	635	787.4
20	609.6	660.4	889
25	635	685.8	965.2
30	660.4	711.2	990.6
35	685.8	736.6	1016
40	685.8	736.6	1016
45	685.8	762	1041.4
50	685.8	762	1041.4
55	685.8	762	1066.8
60	711.2	787.4	1092.2
65	711.2	812.8	1117.6
70	736.6	812.8	1143
75	736.6	812.8	1168.4
80	736.6	812.8	1168.4
85	762	838.2	1193.8
90	762	838.2	1219.2
95	762	838.2	1244.6

INK TYPE: 6993			
DOT SIZE SETTING	A5	A6	A8
05	330.2	457.2	584.2
10	431.8	508	635
15	482.6	660.4	838.2
20	609.6	711.2	863.6
25	635	762	914.4
30	660.4	812.8	965.2
35	685.8	812.8	965.2
40	711.2	838.2	990.6
45	711.2	889	1016
50	711.2	889	1016
55	711.2	889	1041.4
60	711.2	889	1066.8
65	711.2	889	1066.8
70	711.2	889	1092.2
75	711.2	889	1117.6
80	711.2	914.4	1117.6
85	736.6	914.4	1143
90	736.6	914.4	1143
95	762	914.4	1168.4

NOTE: Characterization testing performed at ambient temperature of 70° degrees F, relative humidity of 50% on polished, unetched silicon wafers (no passivation). Air pressure 70 PSI minimum with 36 inch long air hose (Controller to Shuttle). Dot size may be set at any value between 1 and 99. Table dot size settings and resulting dot sizes are given in increments of 5. When a range of thumbwheel settings indicate the same dot size, choosing a thumbwheel setting in the middle of the range will provide the most consistent dot size. For example; to place a 686 µm dot with ink type 6990 in an A5 cartridge, a dot size thumbwheel setting of 45 should produce the best results.

System Drawings

The drawings in the list below are available in Adobe PDF format on the CD included with this manual.

Description	Drawing Number
X4105 Auto-Z Pneumatic Inker Set, (EG detent)	340-4105
X4205 Auto-Z Pneumatic Inker Set, (KLA detent)	340-4205
Inker Assembly, Auto Z Pneumatic (detent)	320-4205
Pneumatic Shuttle, Overhead	216-0001
Inker Base Assembly	220-0031
Pneumatic Controller Assy	350-0006
Controller Logic Board PC Assy	250-1166
Schematic, Logic Board	950-1166
PCA, Pneumatic Controller, Daughter Card 2	250-1219
Schematic, Daughter Card	950-1219
Harness, Pneumatic Controller, Auto-Z	240-0271
Auto Z Inker Pneumatic Dimensions	900-0133

HISTORY
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