XANDEX
INC.

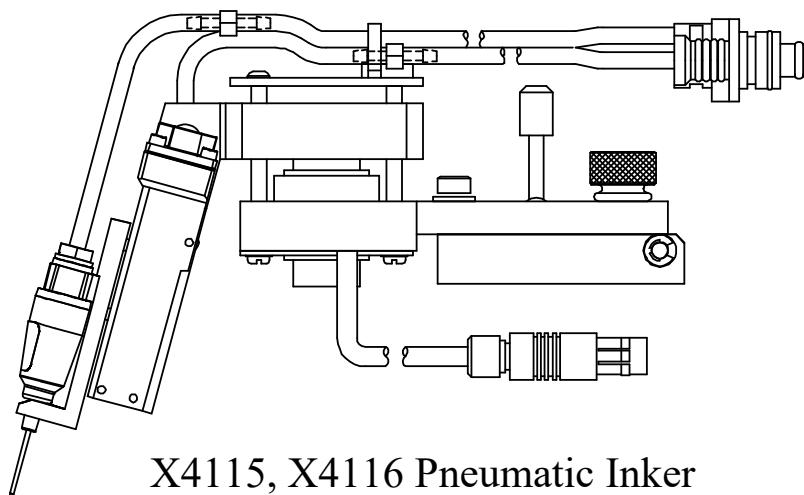# MOTORIZED Z SERIES PNEUMATIC INKER
with SMALL DOT FEATURE
INSTALLATION AND OPERATION MANUAL
Models X4115/X4116 (EG), X4215/X4217 (KLA)

820-0096   Revision   AD
May, 2022

X4115, X4116 Pneumatic Inker

IMPORTANT OPERATION NOTICE!
The Model 350-0018 Motorized Z Pneumatic Controller is designed to operate at **80 ± 5 PSI**.

FAILURE TO SET THE REGULATOR PROVIDING AIR TO THE CONTROLLER AT 80 PSI WILL RESULT IN INCONSISTENT SYSTEM OPERATION!

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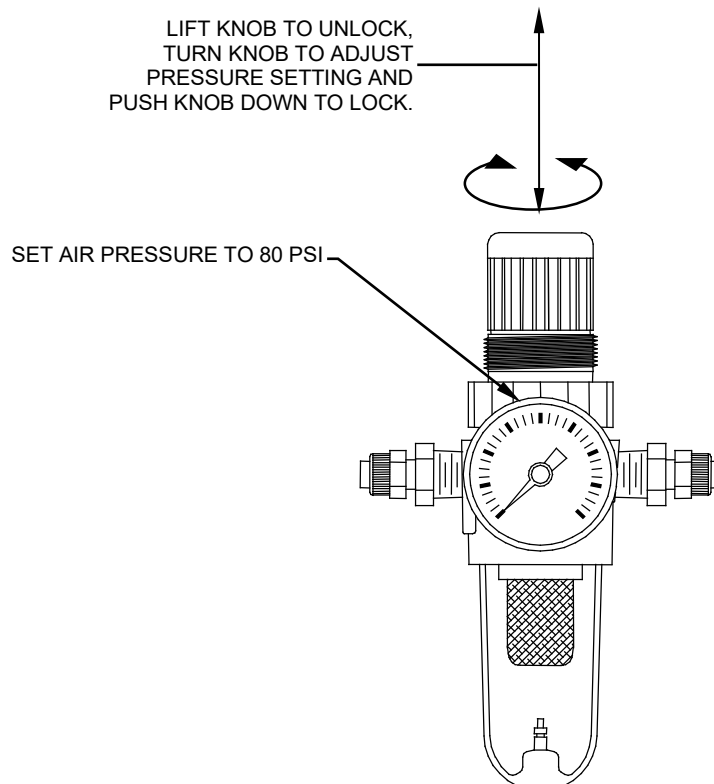
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820-0096

The Model 350-0018 Motorized Z Pneumatic Controller is designed to operate at **80 ± 5 PSI**. This setting is 10 PSI higher than the 70 PSI setting recommended for all other Xandex pneumatic controller units.

FAILURE TO SET THE REGULATOR PROVIDING AIR TO THE CONTROLLER AT 80 PSI WILL RESULT IN INCONSISTENT SYSTEM OPERATION!

LIFT KNOB TO UNLOCK, TURN KNOB TO ADJUST PRESSURE SETTING AND PUSH KNOB DOWN TO LOCK.

SET AIR PRESSURE TO 80 PSI

For more information contact Xandex Customer Service at (707) 763-7799 or Toll Free in the U.S at (800) 767-9543, FAX (707) 763-2631, or visit us on the Internet at www.xandexsemi.com

SAFETY INFORMATION

Safety and Hazard identification symbols used in this document are intended to be compliant with ANSI/NEMA Z 535.6 2006. The table below lists the symbols used in this document along with a description of each type of safety hazard. Failure to observe identified safety risks may result in serious injury or death.

Safety and Hazard Identification Symbols

SYMBOL	DESCRIPTION
⚠ DANGER	**DANGER = Indicates a hazardous situation which, if not avoided, will result in death or serious injury**
⚠ WARNING	**WARNING = Indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
⚠ CAUTION	**CAUTION = Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**NOTICE = Indicates a practice that is not related to personal injury, but may cause damage to equipment or property.**

⚠ WARNING	*Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*
⚠ WARNING	*Install the pneumatic controller in a location that is easily accessible to the operator. The ON/OFF switch is the pneumatic controller's main disconnecting device and must be easily accessible at all times.*
⚠ WARNING	*For your safety, the AC power cord set provided with your product has a grounded plug. Always use the power cord with a properly grounded wall outlet, to avoid the risk of electrical shock.*
⚠ WARNING	*Do not operate this product with a damaged AC power cord set. If the AC power cord set is damaged in any manner, replace it immediately. Damaged cords may result in user exposure to hazards.*

⚠ WARNING	*The power cord set received with the product meets the requirements for use in the country where you purchased the equipment. Use only the power cord provided with the unit or an authorized replacement power cord from Xandex Inc. or an approved Xandex distributor. Use of an inadequately rated power cord may result in shock or injury.*
⚠ WARNING	*Do not operate this product with a damaged DC power supply. If the DC power supply is damaged in any manner, replace it immediately. A damaged DC power supply may result in user exposure to hazards.*
⚠ WARNING	*The DC power supply received with the product meets the requirements for use in the country where you purchased the equipment. Use only the DC power supply provided with the unit or an authorized replacement power supply from Xandex Inc. or an approved Xandex distributor. Use of an inadequately rated power supply may result in shock or injury.*

INKER REDESIGN

The X41XX and X42XX Series Motorized-Z pneumatic inker assemblies documented in this manual, incorporate a design improvement:

- A new Precision Pneumatic Shuttle design.
  The Precision Shuttle provides improved dot placement accuracy and repeatability, and reduced friction surfaces that simplify and extend maintenance cycles.

What hasn't changed is the way the inker assembly operates and connects to the pneumatic controller. Inker assemblies can be used interchangeably with existing pneumatic controller versions. Please note that in order to obtain your desired dot size, you may have to adjust dot size settings used in your previous setup when using the redesigned inker and shuttle with your existing controller.

In a previous design improvement, Xandex DieMark® pneumatic controllers with serial numbers 4000 and higher replaced the controller's internal AC/DC transformer with a new, external AC/DC power supply. If you have a pneumatic controller with a direct AC input, please go to the product manuals section of the Xandex Semiconductor Products website at www.xandexsemi.com to locate the manual for your AC controller model.
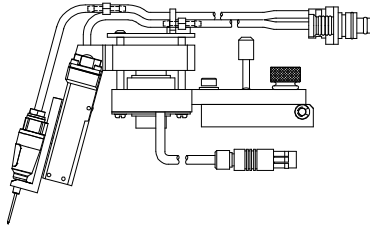
TABLE OF CONTENTS

Section 1. Introduction

The X4115/X4116, X4215/X4217 pneumatic Motorized Z inkers are designed for use as cabled-in, in-line and off-line inkers on Electroglas and KLA probers. The innovative Motorized-Z design combines operator friendly motorized Z movement capability, which provides fast, precise Z adjustment, with a dual air regulation system to provide the first dependable high speed small dot capability available in a pneumatic inker.

The Motorized Z series inker also 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 25.2 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 equal to 1/2 the dot 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 Xandex 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 www.xandexsemi.com or email: us at info@xandex.com.

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Section 2. System Overview

System Components

Set Part No. 340-4115/340-4116 (Model X4115/X4116 EG)
Set Part No. 340-4215/340-4217 (Model X4215/X4217 KLA)

1. Pneumatic Inker Assembly
   Part No. 320-4215 (All Models)
   A. Inker Base
      Part No. 220-0031
   B. Precision Pneumatic Shuttle
      Part No. 316-0014
      Mounting Bracket
      Part No. 120-0638 (not visible)
   C. 7 Pin Plug, Stepper Motor
      Part No. 158-0008

2. Inker Mounting Plate
   Part No. 120-0019 (X4215/
   X4217 for KLA)

3. Regulator Assembly
   Part No. 220-0076

4. Air Hose Regulator > Controller
   Part No. 210-2001

5. Cartridge Opening Tool Part No.
   200-0001

6. Cable/Connector Assembly
   Type AC - Part No. 210-0109
   (X4115/X4116 for EG)

   Type CC - Part No. 210-0110
   (X4215/X4217 for KLA)

7. Motorized Z Pneumatic Controller
   Part No. 350-0018 (X4115, X4215)
   Part No. 350-0022 (X4116, X4217)

8. 24VDC Power Supply Part No. 220-
   0078 (*Includes ONE AC Power
   Cord-Item 9)

9. *A. AC Power Cord (USA)
      Part No. 158-0051 OR
   *B. AC Power Cord (Europe)
      Part No. 158-0407 OR
   *C. AC Power Cord (UK)
      Part No. 158-0408
   D. AC Power Cord
      (PSE-Japan)*
      Part No. 158-0727
*One power cord is shipped with each
set and must be specified at ordering.
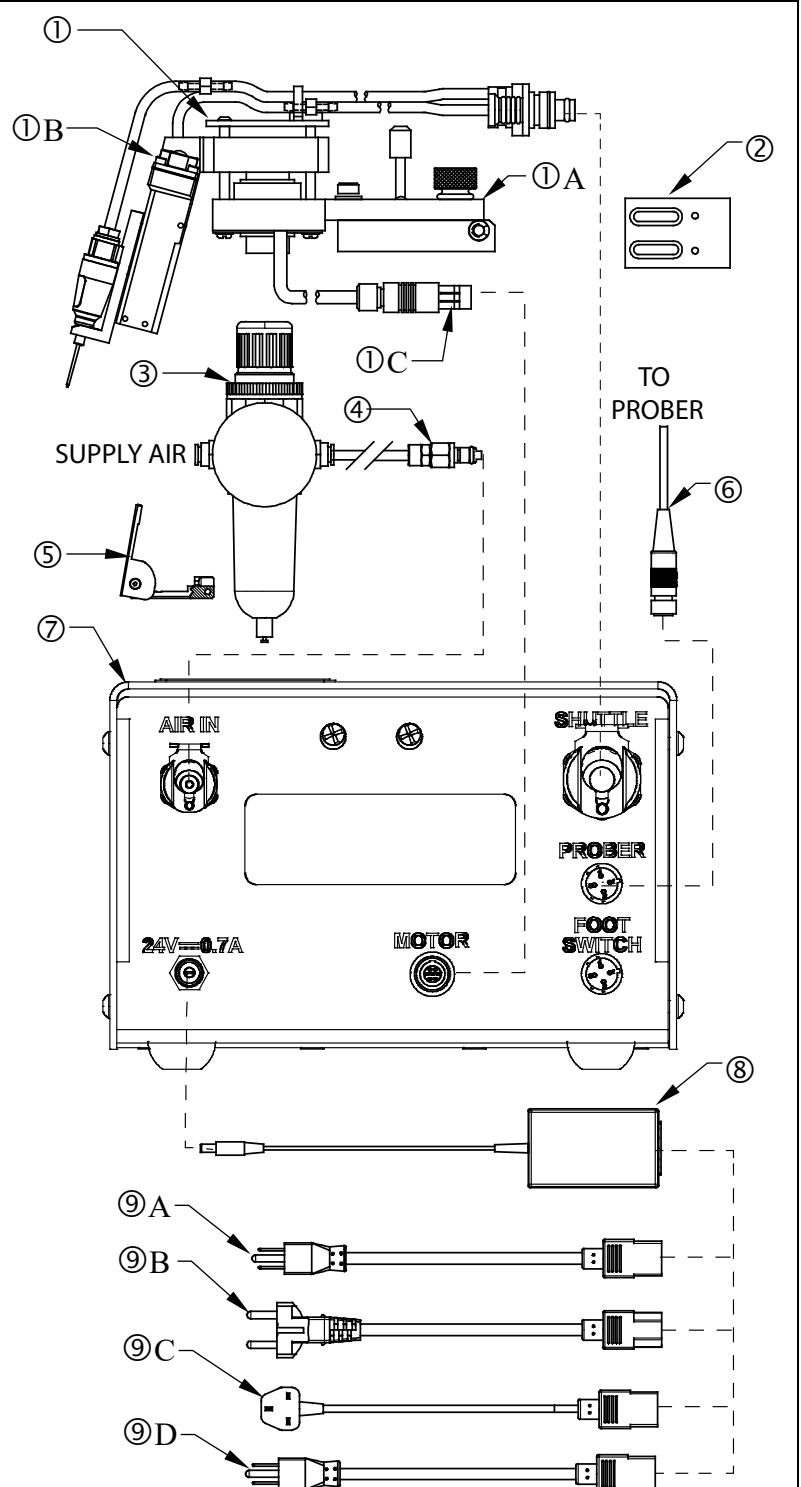
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Section 3. Installation

The X4115/ X4116 pneumatic inker installs directly onto the insert ring on an Electroglas model 10XX, 20XX or 40X0 series prober. The X 4115/X 4116 inker sets are identical except for pneumatic controller software. The X4116 inker set for EG probers comes with a pneumatic controller that incorporates the "No-Puff" software option (X4115 = Standard Motor-Z controller).

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

NOTICE	*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.

X4115 INKER ASSEMBLY WITH SWING ARM IN UP POSITION

(2X) 4-40 x 3/8 INSTALLATION SCREW
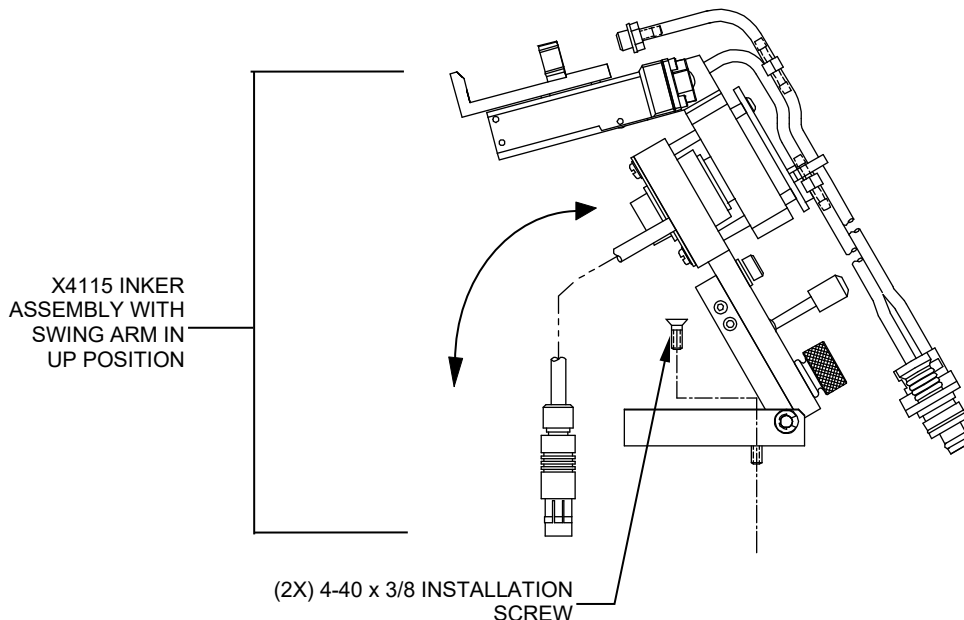
3. Install inker using two (2) 4-40 x 3/8 screws (supplied) into existing mounting holes on the prober insert ring.

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. Plug the jack from the inker stepper motor into the mating jack on the rear of the controller labeled "MOTOR".

7. Proceed to **Section 4 "System Operation"** for ink cartridge installation, inker setup, alignment and controller operation instructions.

NOTICE	**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 smash into the wafer when the arm is lowered. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!**

Z ADJUST MOTOR ASSEMBLY

CONTROLLER-TO-SHUTTLE AIR HOSE

CARTRIDGE FITTING
(RED HOSE)

X/Y ADJUSTMENT JOYSTICK

X/Y POSITION LOCK

DM-2 PNEUMATIC
INK CARTRIDGE

INKER BASE ASSEMBLY

STEPPER MOTOR CABLE
CONNECTOR TO CONTROLLER

PNEUMATIC
SHUTTLE
ASSEMBLY

WAFER SURFACE
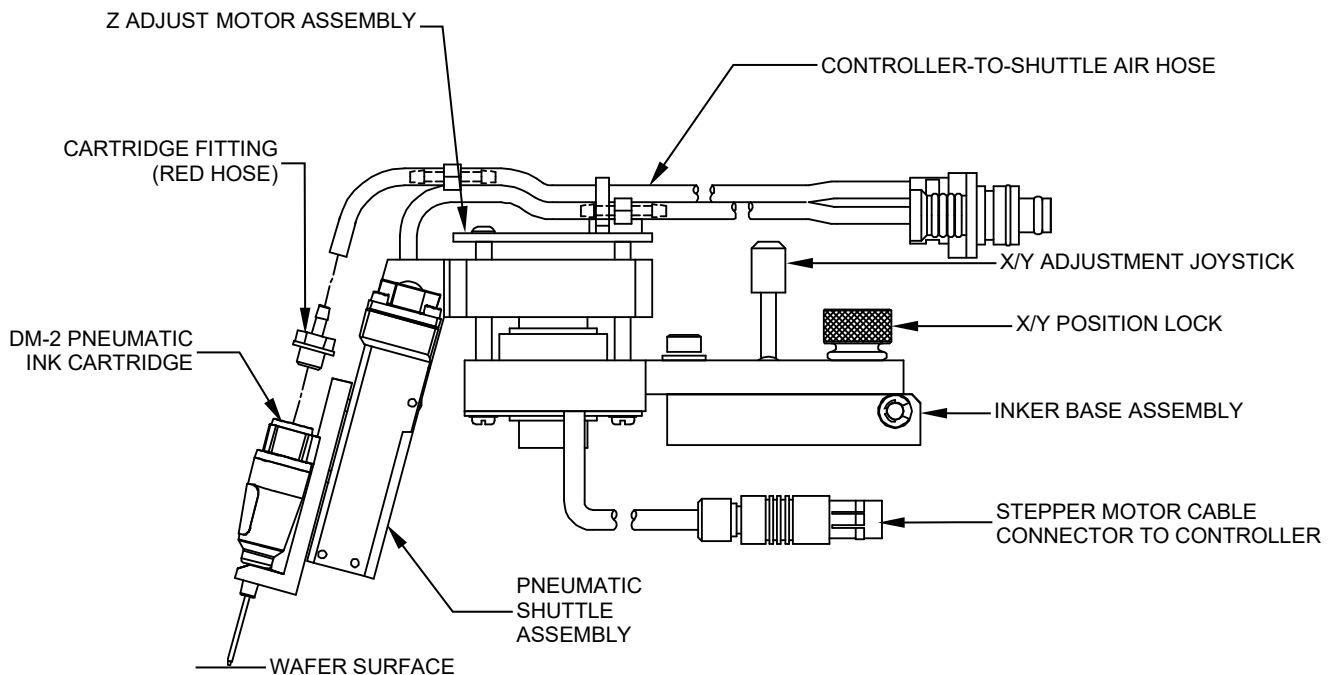
X4215/X4217 Motor Z Inker Installation

The X4215/X4217 pneumatic inker is for use with KLA 1007, 1011, 1200 and 1220 model probers. The X4215/X4217 installs directly onto the head plate of a KLA/TEL prober, using a mounting plate (P/N 120-0019, supplied). The X 4215/X 4217 inker sets are identical except for pneumatic controller software. The X4217 inker set for KLA probers comes with a pneumatic controller that incorporates the "No-Puff" software option (X4215 = Standard Motor-Z controller).

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

NOTICE	*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).

X4215 INKER ASSEMBLY WITH SWING ARM IN UP POSITION

(2X) 4-40 X 1/4 SCREWS

(2X) M3 X 0.5 X 6mm SCREWS

INKER BASE

MOUNTING PLATE P/N 120-0019

MOUNTING SURFACE

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. Plug the jack from the inker stepper motor into the mating jack on the rear of the controller labeled "MOTOR".

9. Proceed to **Section 4 "System Operation"** for ink cartridge installation, inker setup, alignment and controller operation instructions.

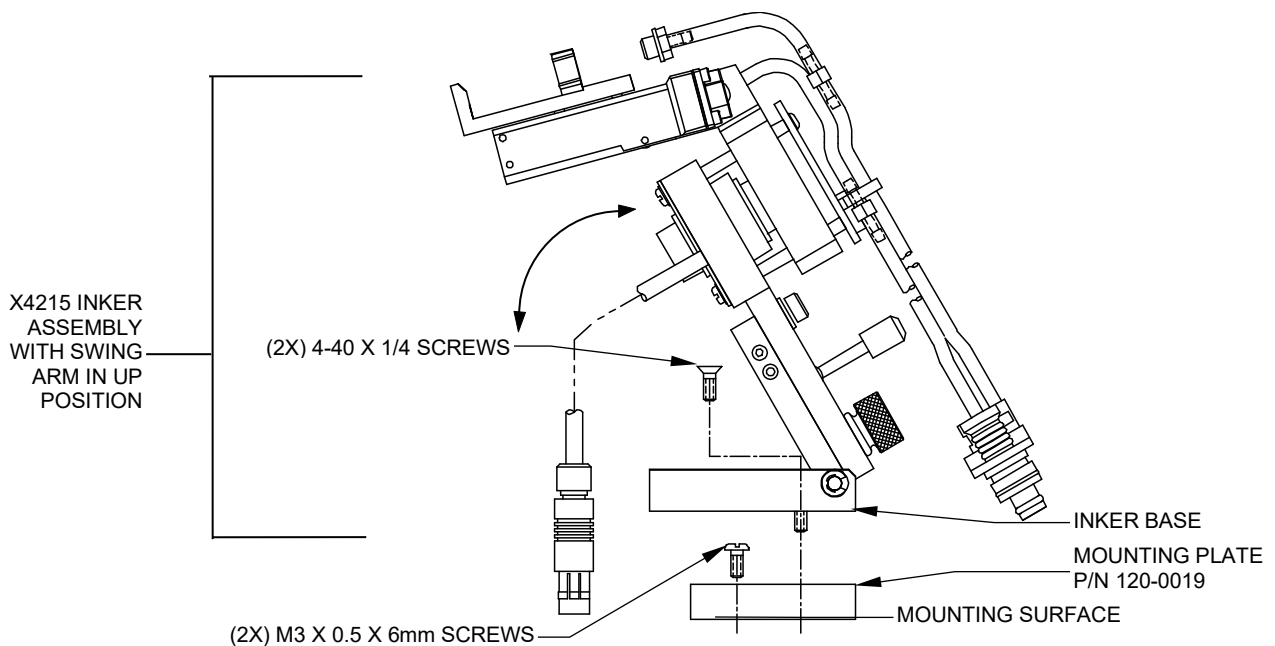|	
NOTICE	**After an ink cartridge is installed, the inker arm should NOT be lowered back into operating position with the Z height adjusted completely down. The cartridge may be positioned too low, and the Teflon® tube in the cartridge needle will smash into the wafer when the arm is lowered. This will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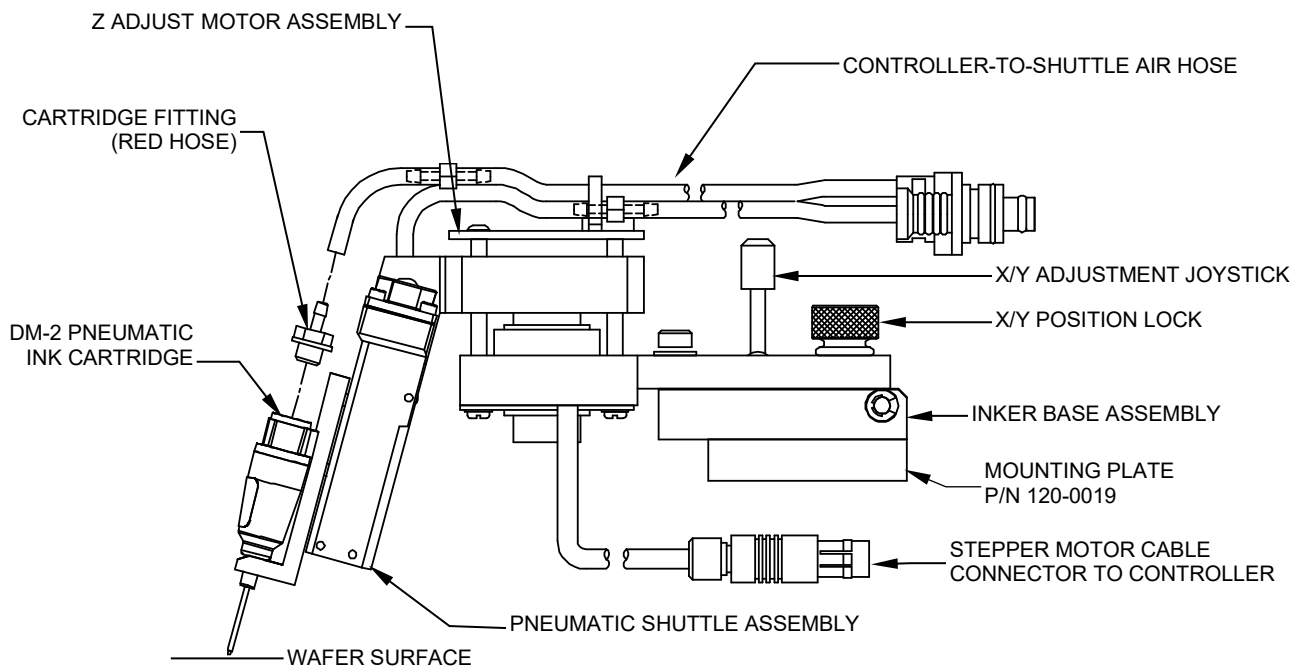
Controller Installation

NOTICE	**The Model 350-0018 and 350-0022 Motorized Z controller is designed to operate at 80 ± 5 PSI. This is 10 PSI higher than the 70 PSI setting recommended for all other Xandex pneumatic controllers. FAILURE TO SET THE REGULATOR PROVIDING AIR INPUT TO THE CONTROLLER AT 80 PSI WILL RESULT IN INCONSISTENT SYSTEM PERFORMANCE!**

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.

LIFT KNOB TO UNLOCK, TURN KNOB TO ADJUST PRESSURE SETTING AND PUSH KNOB DOWN TO LOCK.

MOUNTING BRACKET

AIR FLOW ARROW

PLASTIC NUT RETAINS BRACKET

LOCATED ON ONE SIDE ONLY (BEHIND GAUGE)

INSTALL REGULATOR - TO-CONTROLLER AIR HOSE HERE (P/N 210-2001)

REGULATOR/FILTER ASSEMBLY P/N 220-0076

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 IN 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 80 ± 5 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. Install the *AC power cord* into the back of the power supply. Connect the power supply cord to the 24V-.84A socket on the back of the controller. Plug the AC power cord into an AC supply outlet. Turn the ON/OFF switch on the front of the controller to ON. At this point, the "INK ON" LED and the "STATUS" LED will flash faintly once, and the "POWER" LED will stay on. Proceed to **Section 4 "System Operation"** for ink cartridge installation, inker setup, alignment and controller operation instructions.
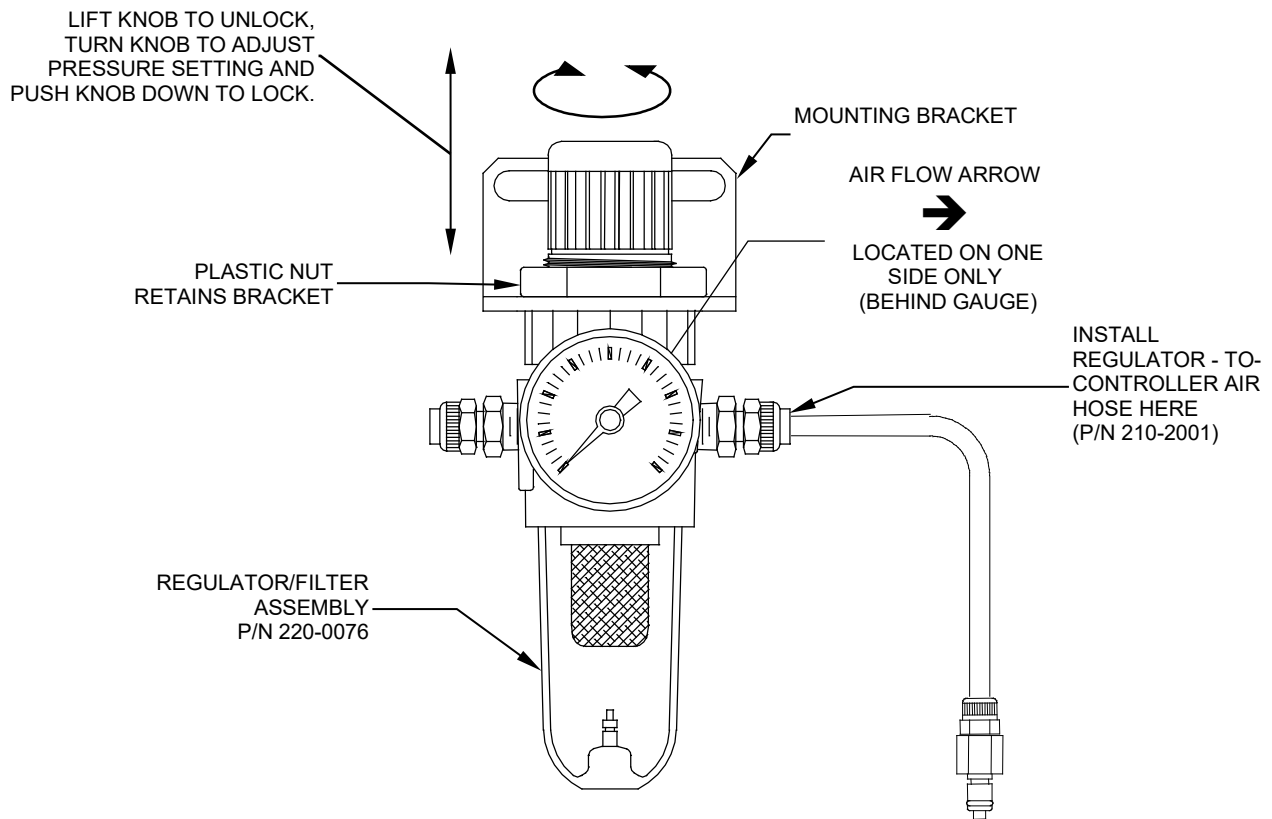
CONNECT
CONTROLLER -TO-
SHUTTLE
AIR HOSE HERE

CONNECT
REGULATOR-TO-
CONTROLLER AIR
HOSE HERE

AIR IN

SHUTTLE

TEXT

PROBER

CONNECT CABLE/
CONNECT
ASSEMBLY
P/N 210-0109
(X4115/X4116)
P/N 210-0110
(X4215/X4217)
HERE

CONNECT 24V DC
POWER SUPPLY
HERE

24V═0.84A

MOTOR

FOOT
SWITCH

FOR USE WITH
OPTIONAL
FOOT
SWITCH P/N
350-0010

CONNECT INKER
MOTOR CABLE
CONNECTOR
HERE
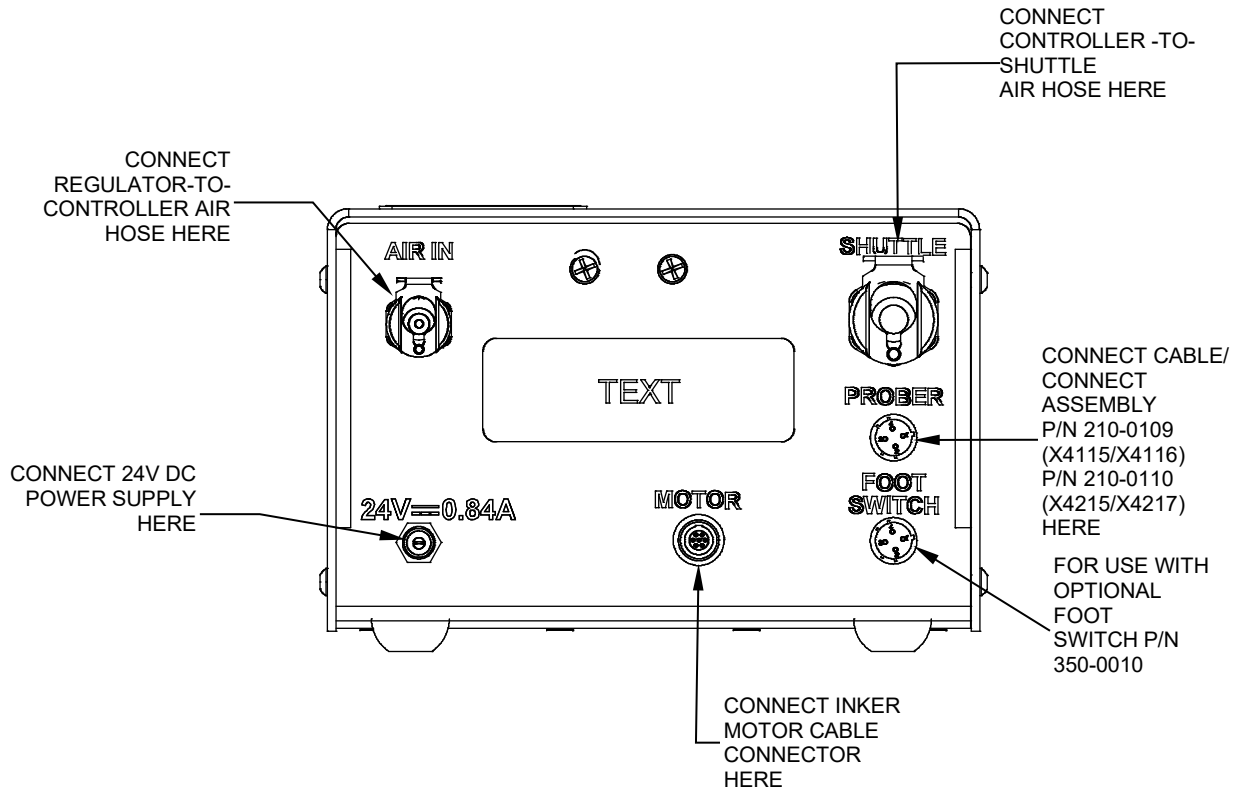
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Section 4. System Operation

Controller Operation

ON-OFF Switch:

The ON/OFF switch turns power to the controller ON and OFF.
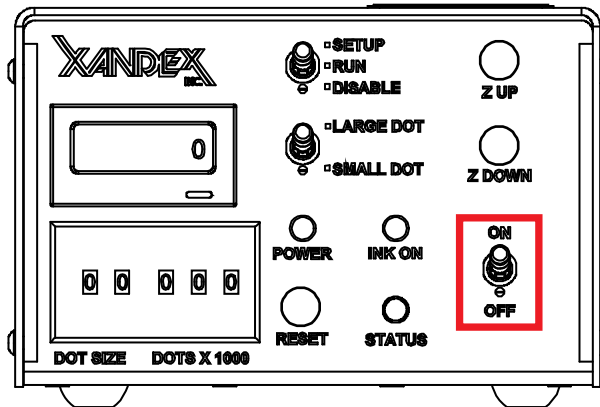
⚠ **WARNING**

Install the pneumatic controller in a location that is easily accessible to the operator. The ON/OFF switch is the pneumatic controller's main disconnecting device and must be easily accessible at all times.
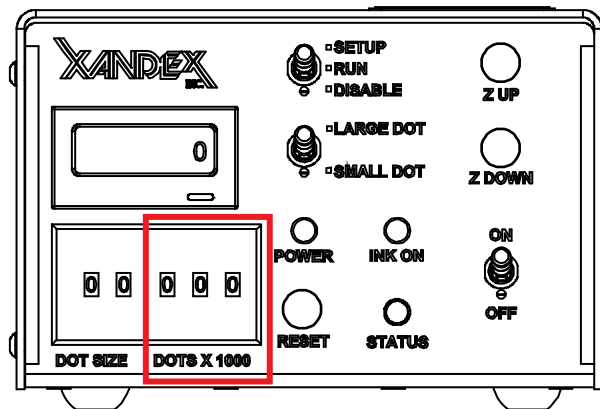
Programmable Thumbwheel Counter

Individual thumbwheel settings are available to monitor the number of Dots placed by an ink cartridge (Dots X 1000). These three thumbwheels can be set to any number of dots between 1,000 and 999,000. A red "STATUS" LED will be illuminated, and an audible alarm will sound 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. The "DOTS X 1000" setting is programmed by using the RESET button. See RESET button for programming the "DOTS X1000" setpoint.
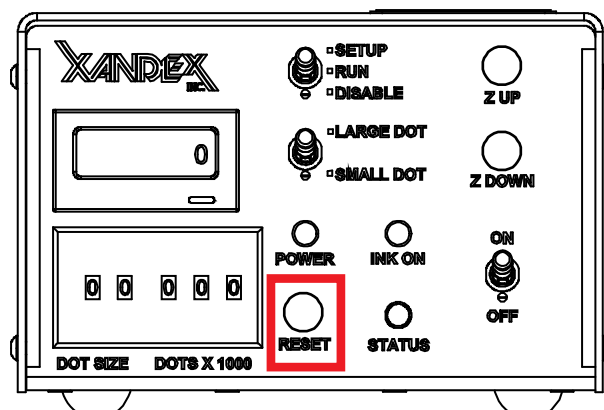
Reset Button:
A "RESET" button is located to the right of the thumbwheels for resetting the counters in the microprocessor. When the "RESET" button is depressed once, the "INK ON" LED will flash for 5 seconds. If it is pressed a second time within 5 seconds, it will "read" the setting on the Dots X 1000 thumbwheel counter and load those values into the microprocessor. If the "RESET" button is not pressed a second time and the 10-second flash time is exceeded, the "INK ON" LED will stop flashing and the current set points and internal counts will not be changed.

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.

Audible Alarm: An audible alarm is activated, along with the "STATUS" LED, whenever the "DOTS X 1000" thumbwheel setting has been reached. The alarm is silenced and reset by pausing the prober, resetting the "DOTS X 1000" thumbwheels if desired and depressing the "RESET" button twice within five seconds. The audio alarm may be disabled by means of an internal jumper on the controller PCA. See **Section 6 "Maintenance and Troubleshooting"** "Controller Internal Maintenance" for detailed instructions.
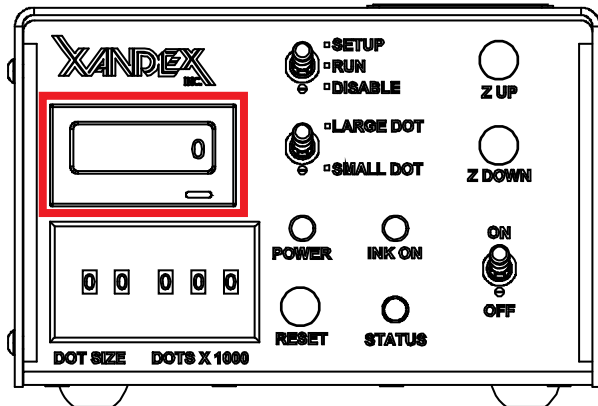
Dot Counter: A separate LCD dot counter is located on the front panel above the thumbwheels. This counter has an internal Lithium battery with a nominal life of 7 years, and an integral reset button. Pressing the small reset button below the LCD window will reset the counter display only. It will have 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.
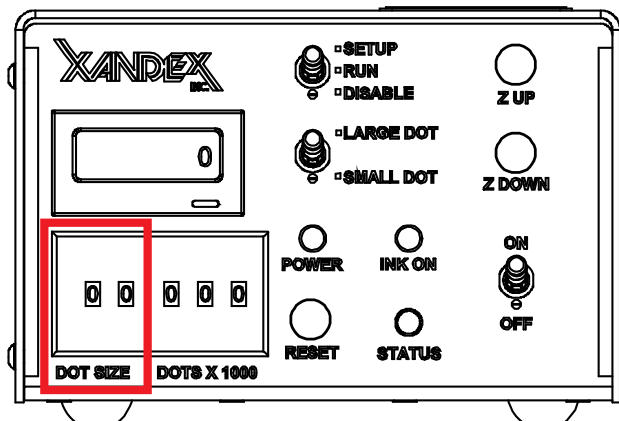
Dot Size Thumbwheels: The adjustable Dot Size Thumbwheels on the front panel are used to vary the size of the dot produced without affecting set-up or requiring additional operator steps. The microprocessor reads the thumbwheel settings and outputs a signal to enable the associated air valve for a predetermined 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 (6990, 6993, 6997, 8103, 8104, 7824 or 7824T), a wide range of dot sizes 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. See **Section 7. System Specifications** for a table of dot size guidelines in mils and microns.

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.
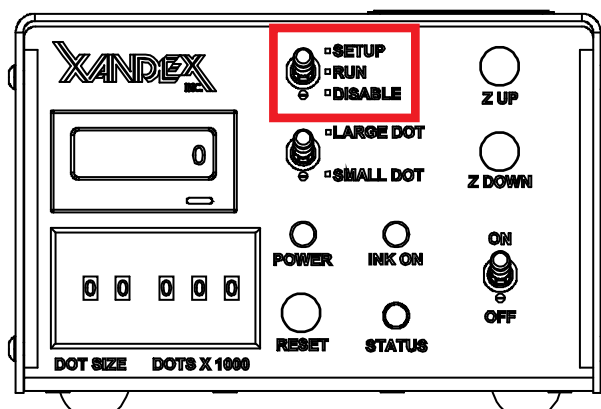
Top Mode Switch Positions

- SETUP = Shuttle air valve enabled for coarse Z height setup
- RUN = Normal Operation
- DISABLE = Shuttle air valve disabled (troubleshooting aid)

When placed in the SET-UP position, the shuttle air valve (V2) is enabled, moving the shuttle to the lower 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. When the toggle switch is placed in the DISABLE position, the shuttle air valve (V2) is disabled and the shuttle does not extend during inking. This mode is used in controller diagnostics, to place dots in hand-inking applications with the optional foot switch or when utilizing the prober Z function without actuating the shuttle.
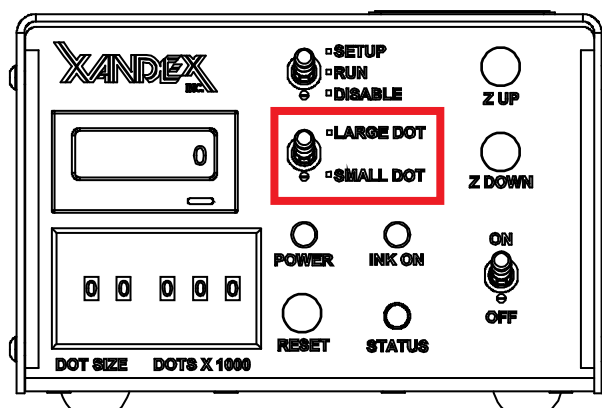
Bottom Mode Switch Positions

- LARGE DOT = Controller operates at external regulator pressure
- SMALL DOT = Cartridge valve operates at internal regulator pressure

Dot size is determined by the cartridge type (A5, A6 or A8), ink viscosity, air pressure supplied to the cartridge valve and the dot size thumbwheel setting, which regulates the duration of the air pulse to the cartridge. When the bottom switch is placed in LARGE DOT position, the controller operates at the air pressure setting of the external regulator (80 psi nominal). Average large dot size parameters for the three available cartridge types with different ink varieties in dot size thumbwheel increments of 5, are included in **Section 7 .** When the bottom switch is placed in SMALL DOT position, the controller operates the cartridge valve (V1) at an air pressure determined by a second, internal regulator, which is factory set at 20 psi. This regulator is not operator adjustable, but may be reset if necessary to optimize small dot production. See "Small Dot Configuration" later in this section (4) for detailed instructions on small dot mode.

Bottom Mode Selection Switches (cont'd): Dot Size Thumbwheels, Dot Counter and Motorized Z UP and Z DOWN buttons do not change function in SMALL DOT mode. Small dot production requires the use of the A5 cartridge type. Typical small dot size parameters for the A5 cartridge with available ink types are included in **Chapter 7**. For more information on the small dot capabilities of the motorized Z controller, see "Motorized Z Small Dot Configuration" later in this section (4).
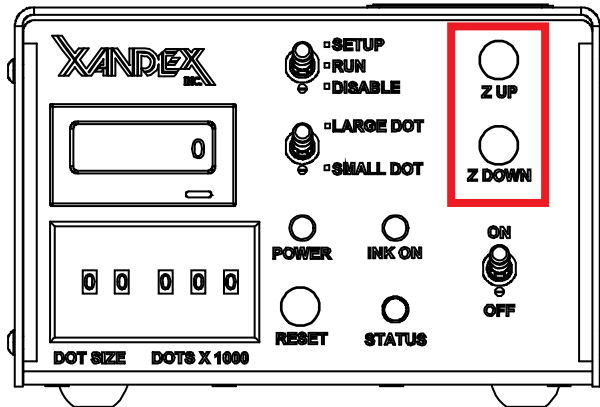
Z UP and Z DOWN Buttons:

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.
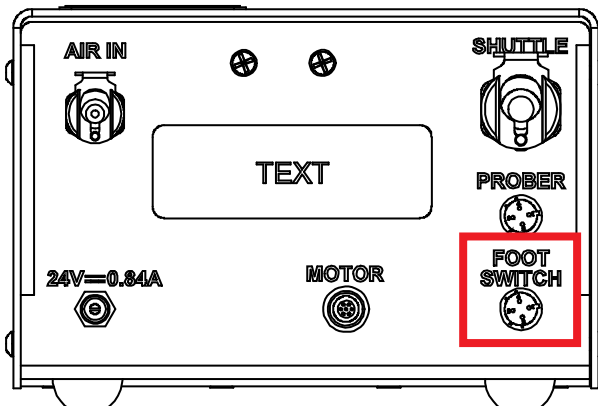
External Switch Input:
There is a second input on the rear of the unit for use with a foot switch. Upon activation, the foot switch sends a > 50mSec switch closure signal (across pins 1&3) to the controller, enabling an inking sequence. There is a 50-millisecond delay between the end of the sequence and the recognition of the next switch closure. No other adjustments or settings need to be made.

Ink Cartridge
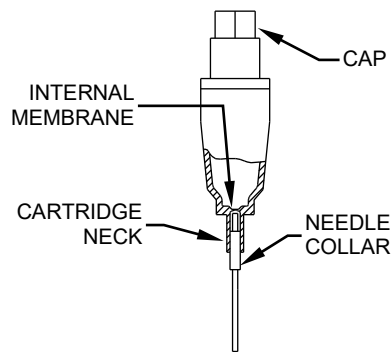
The ink cartridge used with the X4000 Series Inkers is a DM-2, available in A5, A6, and A8 types (designating 0.005″, 0.006″, and 0.008″ Teflon® tube I.D., respectively). DM-2 cartridges have a polypropylene reservoir (sealed at the bottom by a thin membrane) and a small Teflon® tube encased in a stainless 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 grams 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": 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
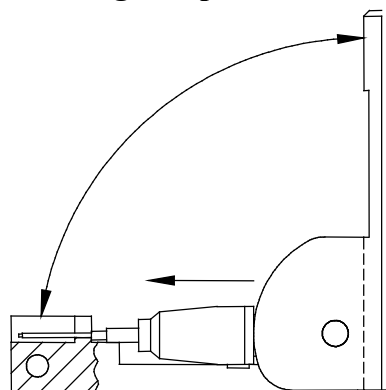
1. Place the cartridge into the cartridge preparation tool (Xandex Part No. 200-0001) as shown, exercising care to avoid damaging the Teflon® tip. The cartridge cap should be seated in the tool hinge with the needle resting in the slot.

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.

NEEDLE PUNCTURES MEMBRANE

NEEDLE COLLAR FLUSH WITH NECK
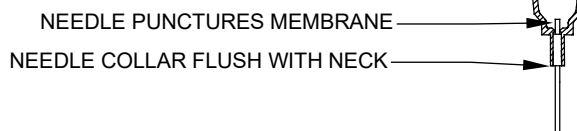
3. Open tool and remove cartridge. The needle should be straight and the needle collar flush with the cartridge neck.

NOTICE	*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

NOTICE	*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.
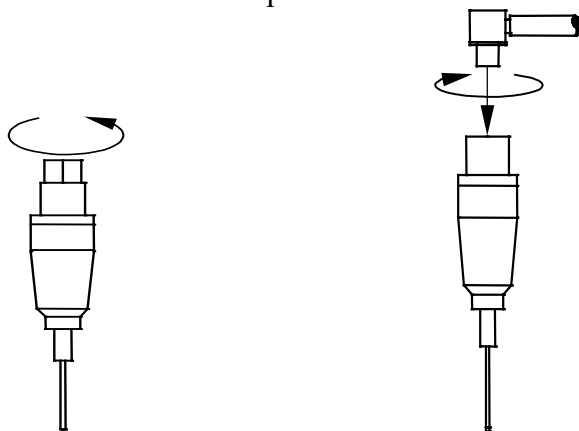
NOTE: Your inker/shuttle may have a straight cartridge fitting instead of the 90-degree fitting shown here. Cartridge installation is the same for both straight and angled cartridge fittings.

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.
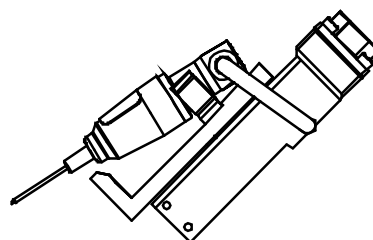
4. Press cartridge body into shuttle forks until the neck fully snaps into place.
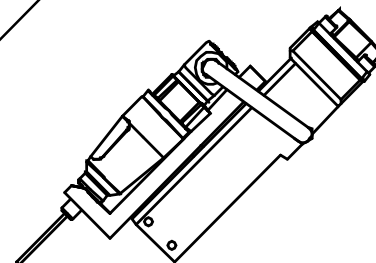
Cartridge is now ready for priming. (See "**Cartridge Priming**" later in this Section (4) for instructions)

⚠ CAUTION

Caution: Ink Cartridge needle can pierce skin when moved manually or when shuttle valve is actuated:

1. *Keep hands and fingers clear of the cartridge needle tip when tilting the inker swing arm down into inking position after cartridge change out and priming.*
2. *Never place hands or fingers under the cartridge needle when inker swing arm is tilted down in inking position.*
3. *Keep hands and fingers clear of needle tip during cartridge change out and priming. Always follow recommended cartridge priming procedure, which is performed with the inker swing arm tilted up. Place the controller toggle switch in RUN position and press the controller RESET button, which fires ONLY the cartridge valve to send ink to the needle tip. Priming using any other mode that actuates the shuttle valve during the priming process exposes the user to possible hand or finger puncture when the shuttle actuates.*

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!*

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.

Note: Cartridge priming is done with the inker arm in 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 begin to flash. At the end of 3 seconds the "INK ON" LED will light continuously and the 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. Cartridge is now ready for operation. Proceed to "**Inker Assembly Setup and Alignment**" in this section (4) to prepare the inker.

NOTICE	*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.*

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, 7824T, 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.

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
                            TM

CARTRIDGE LABEL WITH
    CARTRIDGE TYPE        TYPE
                          A5
```
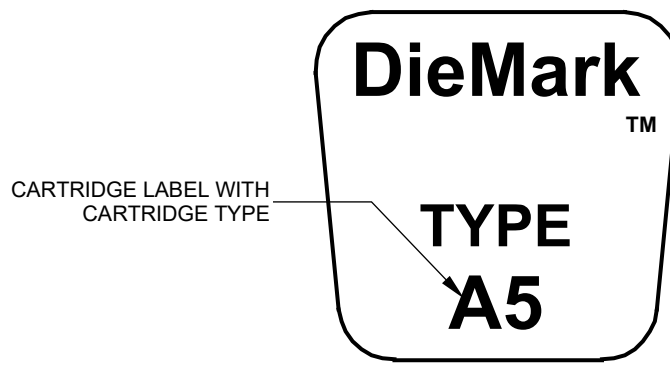
DieMark™ Cartridge Expiration Date Label

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.

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

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

```
            B4236A                    INK  BATCH
                                      NUMBER

            EXP.                      EXPIRATION DATE
                                      (DAY = DD  MONTH =
        01.OCT.22                     MMM, & YEAR =YY)
                                      I.E.: OCTOBER 01, 2022

          8103                        INK TYPE
```
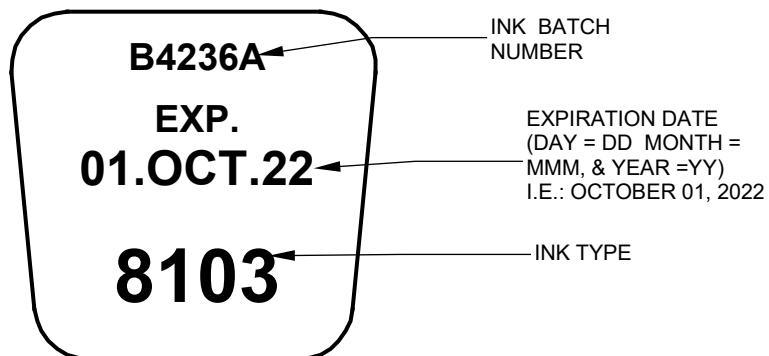
Cartridge Type Label Color Code

DM-2 & DM-2.3 PNEUMATIC CARTRIDGE LABELS	
LABEL	**DESCRIPTION**
DieMark TM TYPE A5	**A5 IS RED**
DieMark TM TYPE A6	**A6 IS BLUE**
DieMark TM TYPE A8	**A8 IS YELLOW**

Inker Assembly Setup & Alignment

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 the top mode switch to "RUN", then lower the inker arm and snap into place.

3. Position the chuck/wafer under the inker and set the prober chuck "Z Up".

NOTICE	*If the inker height is adjusted with the prober stage "Z Down" the cartridge will be positioned too low and the cartridge needle will smash into the wafer when you begin inking. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!*

4. Move the top mode switch to "SETUP". The shuttle will extend to its lowest position. Create a droplet of ink at the needle tip by pressing the prober "TEST INKER" button twice.

Note: *The Controller can remain in the "SETUP" mode for a maximum of 5 minutes. After 5 minutes, the Controller will disable the shuttle air valve and return the shuttle to normal position. If this happens, move the toggle switch to "RUN" then back to "SETUP" to complete alignment.*

5. 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 to the center of the die.

6. Press the Z DOWN button once per second to lower the shuttle until the ink droplet at the needle tip touches the wafer surface. The Teflon® tube will be 1-2 mil from the wafer surface.

NOTICE	*Extreme care should be taken when using the "Z UP" and "Z DOWN" buttons. 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 "Z UP" or "Z DOWN" buttons will cause the motor to "RUN", moving the inker rapidly up or down. The "Z UP" and "Z 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), as damage to the wafer and cartridge may occur it the cartridge crashes into the wafer surface.*

TEFLON® TUBE   CARTRIDGE NEEDLE   WAFER SURFACE

NO ! Tube too close to wafer   *NO! Tube too far away from wafer*

YES! Ink drop is deposited on wafer surface
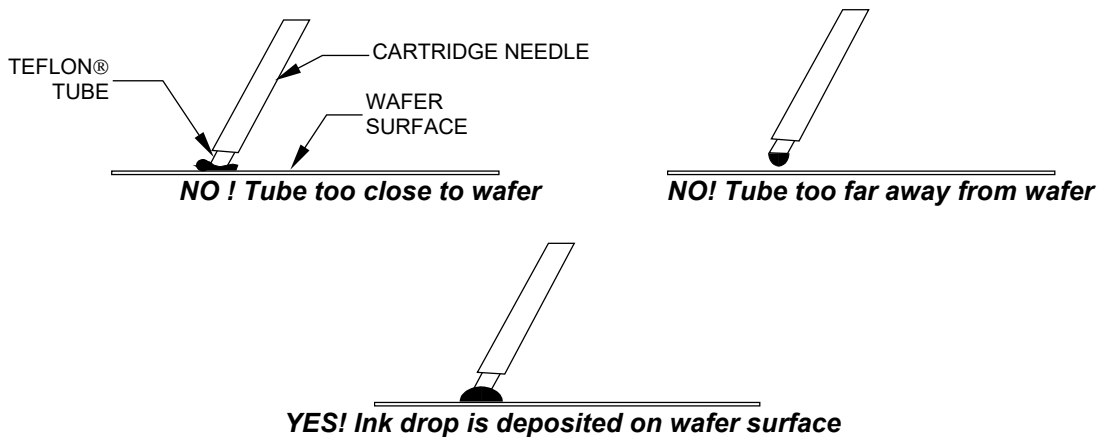
NOTICE	*Do not let the Teflon® cartridge tube contact the wafer surface. This may crush the tip preventing ink flow and damaging the cartridge or the wafer!*

7. Set the top mode switch to "RUN" to retract the shuttle. Index and test fire the inker a few times and check the dots for size and roundness. Each time the inker fires, the "INK ON" LED flashes.

8. 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. **It is recommended that during initial 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.**

Note: *Due to the unavoidable incidence of slight manufacturing variations from cartridge to cartridge, additional Z height adjustment of the inker may be necessary after changing cartridges.*

9. If the dots are round and of proper size, basic installation is complete.

10. If adjustment is required, use the Z UP and Z DOWN buttons on the front of the controller to make the final adjustments until round dots are achieved. Pressing either the Z UP or Z DOWN button results in a movement of approximately 0.0005 inches up or down for each time pressed. The "INK ON" LED will flash each time either button is pressed. If the Z UP or Z DOWN buttons are pressed during inking, the prober signal will be inhibited and the shuttle will move.

11. 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.

Motorized Z Small Dot Configuration

When the mode switch on the front of the controller is switched to SMALL DOT, the air supplied to the cartridge valve, (V1) is routed through a second, internal regulator, which reduces the air pressure sent to the cartridge. This regulator is not operator adjustable but may be internally reset to optimize controller small dot performance. See "Controller Internal Regulator Adjustment" in **Section 6 "Maintenance and Troubleshooting".**

Small dot production with the Motorized Z pneumatic inking system requires use of the A5 cartridge type. Tables are provided in Section 7 that show average dot size results for different ink types in thumbwheel setting increments of 5. These tables indicate average results from testing preformed on un-etched wafers with no passivation and are intended for use as guidelines only.

All controller functions, UP and DOWN buttons, LED dot counter, programmable dot counter and dot size thumbwheels, SETUP, RUN and DISABLE toggle positions, have the same function in SMALL DOT mode as they do in LARGE DOT mode. For more information or assistance in optimizing small dot production using the Motorized Z small dot feature, contact Xandex Customer Service at (707) 763-7799 or Toll Free in the U.S: (800) 767-9543. FAX (707) 763-2631. Internet: www.XandexSemi.com or email : info@xandex.com

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.

DieMark 8103, 8104, 7824, 7824T and 6993 inks are opaque and easily recognizable under all lighting conditions. Glycol Free 8103 ink is thick in viscosity and delivers opaque dots ranging from 6 to 40 mils. 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. 6990 and 6997 are less opaque and may not offer sufficient contrast under all lighting conditions.

8103 ink is certified to contain less than 10 ppm of Sodium (Na) and Chloride (Cl). 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. 7824 and 7824T inks are certified to contain less than 10 ppm of Na and Cl. 6990 is certified to contain less than 25 ppm of Na and Cl. Analysis reports are available upon request from Xandex Customer Service.

Although 6993 and 6997 are not contaminant controlled, periodic test data indicates that these inks typically contain less than 100 ppm of Sodium (Na) and 400 ppm of Chloride (Cl). These levels are not certified or guaranteed.[1]

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. 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. 7824 and 7824T inks have a 4 month shelf life and will give consistent flow for 3 days after cartridge opening. 7824 and 7824T can be air or "heat set" cured.

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 6990, 6993 and 6997 or 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 the inks offered by Xandex are non-magnetic.

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

Ink Curing

The procedure for curing will depend on the type of ink used and other factors such as dot size and spacing (see "General Notes on Ink Curing", below). Xandex guidelines are developed under laboratory conditions using single wafers and are intended as a baseline to develop a curing process that meets your specific needs.

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.

6990, 6993, and 6997 inks, when air-dried, will not smear when touched. They are not permanent, however, and will not withstand most post-probe handling or processes. Conversely, 7824 and 7824T inks air cure within 2.5 hours (≤20 mil, up to 10 hours for >20 mil dots). 7824 and 7824T may also be heat cured at up to 150°C for 10 minutes.

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 typically 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. 8103 and 8104 may also be heat cured at up to 150°C for 10 minutes if a faster cure is desired.

General Notes on Ink Curing

Several factors have greater influence on the time required to get a full cure in the shortest amount of time, either when heat curing or curing at room temperature:

➢ **Dot Size**: Larger dot sizes will require longer cure times.

➢ **Dot Spacing**: Large numbers of closely spaced ink dots will require a longer cure time than small numbers of widely spaced dots.

➢ **Air Flow:** Continuous air flow across the wafer surface will reduce the amount of time required for ink curing. This is especially important when air curing at ambient temperatures.

➢ **Wafer/Die Surface**: Both the surface chemistry and degree of patterning on the die affect how the ink spreads on the wafer. If the ink does not spread as much, the dots will be thicker. And if the dots are thicker, they will require a longer cure time.

➢ **Temperature**: Higher temperatures will lead to faster ink cure times.

➢ **Wafer Boat / Cassette**: Wafers stacked in a boat / cassette will require increased cure time compared to single wafers.

Ink Curing Guidelines

The following table provides guidelines for curing each type of ink sold by Xandex:

INK CURING GUIDELINES			
CURE TYPE	TEMPERATURE	CURE TIME	RESULT
6990, 6993, and 6997			
Soft Cure	70-100°C	5-30 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
7824, 7824T			
Hard Cure	Air dry, ambient conditions*	1-3 hours for ≤20 mil 3-4 hours for 20-25 mil 4-10 hours for 25-40 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 110-150°C	5-10 minutes	Ink is permanent and may only be removed with great difficulty
8103 and 8104 Glycol Free			
Hard Cure	Air dry, ambient conditions*	5-15 minutes for ≤ 15 mil 15 minutes – 3 hours for 15-25 mil 3-6 hours for 25-40 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 110-150°C	5-10 minutes	Ink is permanent and may only be removed with great difficulty

*Ink cure testing performed on single, (not stacked in a wafer boat/cassette) polished silicon wafers with dot spacing of 50 mil (1270 μm) with moderate air flow at 70-72°F (21.1-22.2°C).

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 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)

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Section 6. Maintenance & Troubleshooting

This Troubleshooting section for the Motorized Z 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. More troubleshooting information is available in the "Support" section at 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.	1. Check ink shelf life. 6990, 6993, 6997 inks should be used within 4 months or 5 days of cartridge opening. 8103 and 8104 air dry glycol free inks should be used within 4 months or 3 days of cartridge opening. 7824 and 7824T air-dry ink within 4 months or 3 days after cartridge opening. 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. 3. Z height adjustment is incorrect. After cartridge replacement, minor Z height adjustment may be required. See **Section 4 "Inker Assembly Setup and Alignment."** 4. Chuck top or wafer surface not planar. Verify planarity of both.
After changing the controller dot size settings, the dots are too small or the ink blobs at the tip of the needle.	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.

Problem	Solution
Small, inconsistent or no ink dots.	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 80 ± 5 PSI. 5. Z height adjustment is incorrect. After cartridge replacement, occasional 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.

Problem	Solution
Cartridge tip does not reach wafer surface.	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 initially aligned. See **"Inker Assembly Setup and Alignment"** in **Section 4.**
Unit functions normally, no dots, no shuttle movement.	1. Verify that the Controller-to-Shuttle air hose connector is plugged into the controller. 2. Verify that the Controller-to-shuttle air hose is not kinked, clogged or pinched closed. 3. Check Main Air pressure setting (verify 80 ± 5 PSI air input).
Unit functions normally, shuttle moves, no dots.	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.

Problem	Solution
Motorized Z not working.	1. Verify that the inker stepper motor is plugged into the "MOTOR" connection on the back of the Controller. 2. Verify that there is AC power connected to the power supply, that the power supply is connected to the controller and that the ON/OFF switch on the controller is in the ON position.
Inker produces dots during "puff pulse" or ink flows out of cartridge with toggle switch in "SETUP".	1. Verify that the air hoses from the controller to the inker are connected properly: ♦ RED AIR HOSE connects to the ink cartridge. ♦ BLUE AIR HOSE connects to the shuttle connection on the shuttle mechanism.
Cartridge crashes into wafer surface after setup.	1. Controller SETUP mode (switch), which extends the cartridge to inking depth, was not used when the inker was initially setup. Replace cartridge and repeat inker setup per **"Inker Assembly Setup and Alignment"** in **Section 4.** 2. Chuck was not set to "Z up" position when the inker was initially setup. Replace cartridge and repeat inker setup per **"Inker Assembly Setup and Alignment"** in **Section 4.**

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.

With the introduction of the Precision Shuttle in spring of 2022, shuttle maintenance has been dramatically simplified. The new Precision Pneumatic Shuttle X4215 PN 316-0014 is used on all X41XX and X42XX model Motorized-Z inker bases and can be serviced without disassembly or removal from the Inker Base.

The Maintenance Kit for your X41XX and X42XX model Motorized-Z inker bases with Precision Shuttle, is Precision Shuttle Maintenance Kit Part Number 370-0010.

All previous Motorized Z model inkers not retrofitted with the Precision Shuttle require Shuttle Maintenance Kit Part Number 370-0001.

New Precision Shuttle Replacement (Retrofit) Kits

The new Precision Pneumatic Shuttle incorporates design and materials improvements that reduce friction, which in turn, enables tighter part tolerances that improve repeatability and dot placement accuracy and simplify preventive maintenance. In addition, end of stroke dampening has been added to reduce vibration at shuttle end of stroke, which also enhances placement accuracy and helps to eliminate ink "splatter".

Beginning in Spring 2022, Xandex will implement two models of the Precision Pneumatic Shuttle that will replace existing Pneumatic Shuttles in all inker models.

Existing inker bases can be modernized through installation of the Precision Shuttle, by purchasing Precision Shuttle Retrofit Kits. Precision Shuttle Retrofit Kits include a new shuttle mounting arm to install the Precision Shuttle on the inker base and the shuttle assembly.

All X41XX and X42XX Motorized-Z Inker Bases can be retrofitted by ordering Precision Shuttle Retrofit Kit 355-1121.

Controller Sequence of Operation

To initiate an ink dot, the Prober sends a 12-60 V (AC/DC unregulated) active-low 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 25.2 ms pulse is sent to the Shuttle Valve (V2), while at the same time a 6.85-27 ms pulse (depending on position of Dot Size knob) is sent to the Cartridge Valve (V1).

Signal from Prober

12-60V
(AC/DC)

Shuttle Valve (V2)

25.2ms

Cartridge Valve (V1)

6.85 - 27 mS
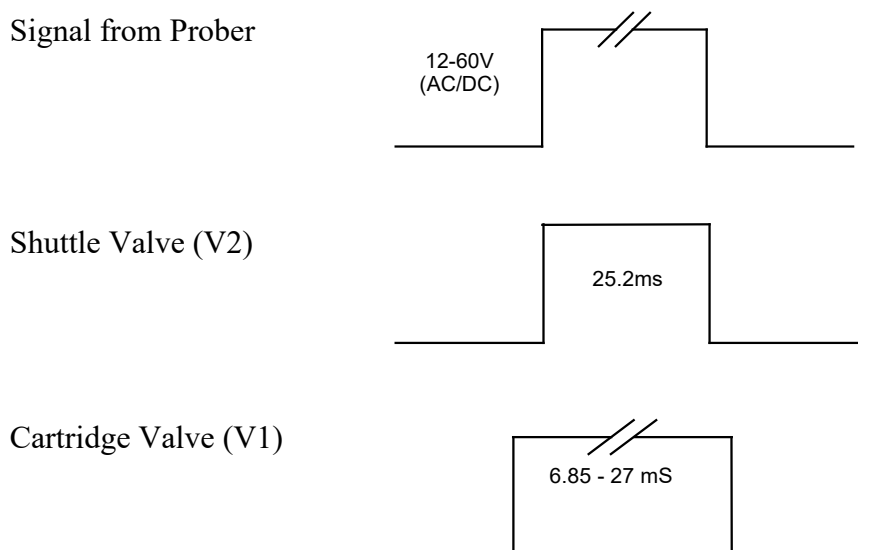
As the shuttle extends to the lower position, the air pulse from Valve 1 forces ink out of the cartridge barrel and forms a drop at the end of the needle tip. When the shuttle is at its lowest position, the drop makes contact with the wafer surface and forms a dot. The shuttle then returns to the normal 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 equal to 1/2 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 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 DISABLE

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 DISABLE

3. Reset the LCD Counter

4. Press RESET.

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

D.   Test Pressure Valve

To test fire the Pressure Valve 20 times:

1. Set the DOT SIZE thumbwheels to 09

2. Place the mode switch to DISABLE

3. Reset the LCD Counter

4. Press RESET.

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

E.   Alarm Test

This tests the audio alarm.

1. Set the DOT SIZE thumbwheels to 06

2. Place the mode switch to DISABLE

3. Press RESET twice to turn on the alarm. After initial ALARM ON state is active, pressing RESET once will change the state of the alarm to OFF or ON.

The alarm alternately is on and off.

Note: The alarm test is used to verify that the audible alarm is functional, not to enable or disable the alarm in normal operation. To enable or disable the alarm function, a jumper must be moved on the controller PCB. See the Internal Maintenance section of this chapter for instructions.

F.   Life Test

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

1. Set the DOT SIZE thumbwheels to 10

2. Place the mode switch to DISABLE

3. Set the DOTS X1000 thumbwheels for the desired number of cycles X1000 (i.e.: 250 Equals 250,000 cycles). If the thumbwheel count is zero, the valves cycle 6,553,600 times.

4. Reset the LCD Counter.

5. Press RESET.

The Controller begins continuous firing, incrementing the LCD Counter each cycle. To discontinue the Life Test prior to reaching the set amount, turn the POWER switch OFF.

Controller Troubleshooting

Problem	Solution
The Unit is plugged in but the "Power" LED is off.	1. Make sure that the AC outlet has power. Requirement is 100-240 VDC @ 47-63Hz. 2. Verify that the power supply is connected to the 24V input on the back of the controller and that the ON/OFF switch on the controller is in the ON position.
Unit powers up okay but will not respond to prober signal.	3. 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.	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
"STATUS" & "INK ON" LED's Flashing	1. Verify that there is air input to the controller. 2. Unacceptable mode switch combination. Review **"Controller Operation" in Section 4.**
Dot size does not change with adjustment of Dot Size Thumbwheels	1. Verify that the air hoses from the controller to the inker are connected properly: ♦ 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.

Internal Maintenance

NOTICE	*Use appropriate ESD precautions when working inside of the controller!*

⚠ **WARNING**	*Making any modifications to the controller circuitry or components other than Xandex recommended maintenance procedures may void your controller warranty, disable protections provided by the manufacturer and expose the user to electric shock hazard.*

With Power and Main Air removed:

Turn Audible Alarm ON/OFF

Motor-Z controller units (P/N 350-0018) with serial numbers higher than 4000 are equipped with an audible alarm feature. When enabled, an audio alarm will sound (in addition to the INK ON LED illuminating) when the programmed number of dots set point is reached. The Motor-Z controller is shipped with the audio alarm feature enabled.

1. Remove the cover by removing the 8 screws on the left and right sides of the controller (4 screws per side) and lifting the cover off the controller assembly.

2. Locate J16 on the 250-1226 controller printed circuit board. In the default factory condition, J16 is populated with a jumper on pin 1 only. This is the default audio alarm enabled condition.

3. To disable the audio alarm remove the jumper and install the jumper onto pin 1 and pin 2 on J16. This is the audio disabled condition.

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 the audio alarm jumper to insure installation is correct, none of the component leads are bent, and verify connection of J2 through J6 connectors on the printed circuit board.

CONTROLLER WITH
COVER REMOVED

J6

J2   J3   J5   J4

JP16 TO DISABLE ALARM,
PLACE JUMPER ON PINS 1
& 2.

FRONT OF
CONTROLLER
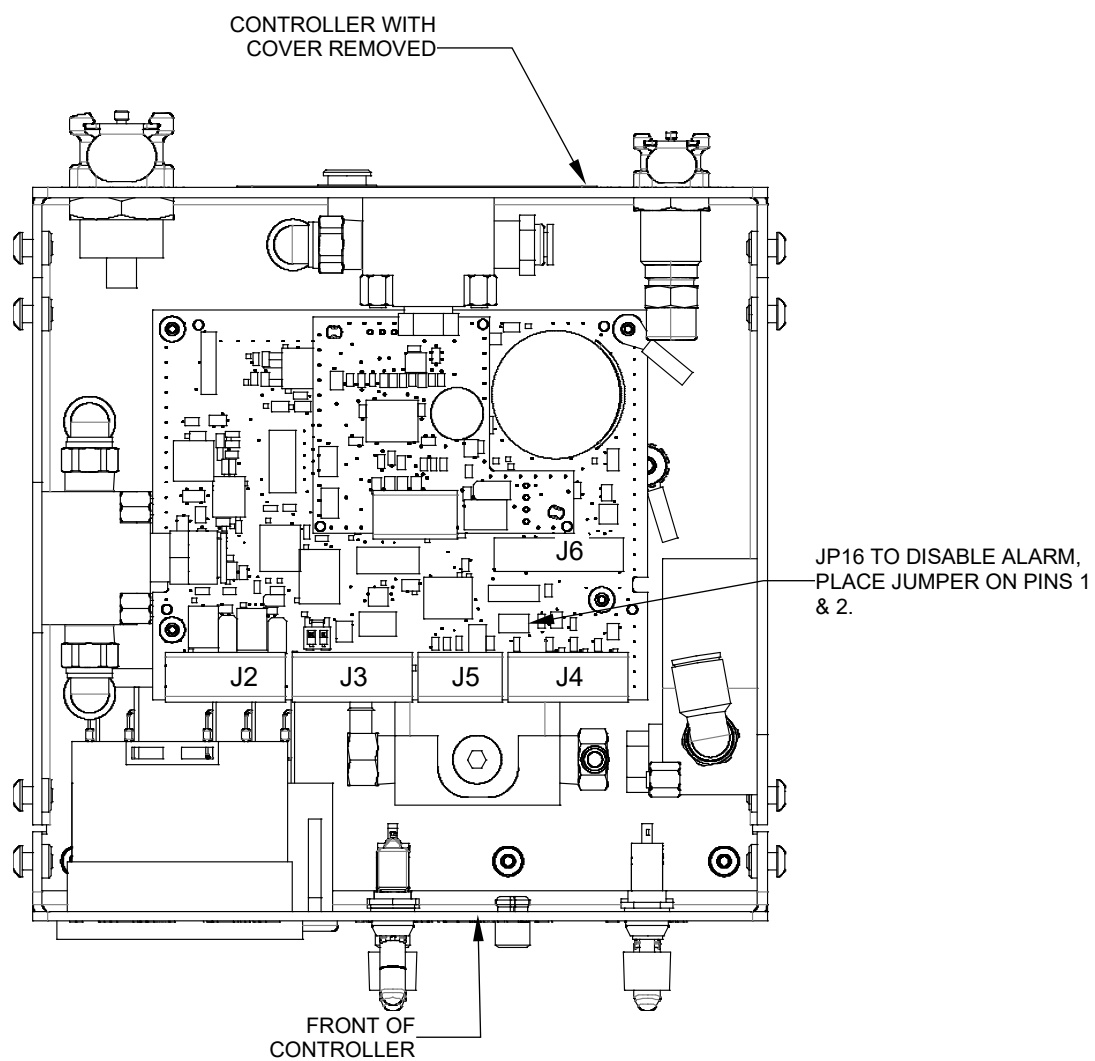
Pneumatic Controller Preventive Maintenance Schedule and Kits

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

Xandex Motorized Z controllers contain a third valve (V3) that is identical to the Shuttle valve. 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 the 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 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 sets are available from Xandex to facilitate controller preventive maintenance.*

- Cartridge Valve Set, containing a single cartridge valve assembly, pneumatic and electrical connectors and replacement instructions. This set is used for 6/12 month cycle controller preventive maintenance that replaces the cartridge valve. Order part number 370-0105.

- Dual Valve Set containing one cartridge valve assembly and one shuttle valve assembly, pneumatic and electrical connectors, adequate tubing to replace all internal controller pneumatic routes in all Xandex pneumatic controllers and replacement instructions. This set is used for 24 month controller preventive maintenance that replaces both the cartridge valve and the shuttle valve. Order part number 370-0106.

The kits listed here are compatible with Xandex pneumatic controllers with serial numbers over 4000 that use an external AC/DC power transformer (brick). If your controller plugs directly into the wall socket without an external power transformer, order Cartridge Valve Set 370-0100 and Dual Valve Set 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 info@xandex.com or order online at www.xandexsemi.com.

Cartridge (V1) or Shuttle (V2) Valve Replacement

Note: This generic procedure can be used for replacement of either the Cartridge or Shuttle valves.

NOTICE	*The Cartridge Valve and the Shuttle Valve have the same form factor but are NOT INTERCHANGEABLE. The Cartridge Valve is a 12VDC valve and the Shuttle Valve is a 24VDC valve. Failure to install the correct valve at either location will result in a non-operational controller.*

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 wiring harness.

4. Remove the two Phillips mounting screws and two stand-off's (504-1404) securing the valve to the Controller base and remove the valve.

Installation:

1. Match fittings from the kit to the ones installed on the old valve and install them on new valve assembly using Teflon thread sealant tape (not supplied).

2. Install the replacement valve assembly in the *controller base*, securing with the two Phillips screws and stand-offs 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, ensuring 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.

Controller Internal Regulator Adjustment

The internal regulator steps down the air pressure to the Pressure Valve (V3) that feeds the Cartridge Valve when the unit is in small dot mode. The regulator is factory set and should only be adjusted after all other options have failed to provide adequate small dot performance or when non-standard installation (i.e., a controller-to-shuttle air hose length exceeding 60″ for example) is required.

The procedure for adjusting the internal regulator is detailed below. It is recommended that only qualified maintenance personnel perform this procedure.

NOTICE	*Use appropriate ESD precautions when working inside of the controller!*

1. Disconnect the controller from main air and power supply.

2. Remove the cover by removing the 8 screws on the left and right sides of the controller (4 screws per side) and lifting the cover off the controller assembly.

3. Reference drawing 350-0018 and the figure on the following page and locate the internal regulator (item 20).

4. Carefully remove the hose from the center port of V3 (small dot valve) and attach a graduated pressure gauge to the tubing.

5. Locate the locking nut on the regulator adjustment shaft. Using a 3/8 inch wrench, loosen the locking nut to allow adjustment of the regulator.

6. Reconnect main air to the controller and adjust internal regulator pressure by adjusting the knob on the regulator. Factory default setting is 20 psi. Clockwise adjustment of the knob increases pressure, counter-clockwise decreases pressure.

7. When regulator adjustment is complete, disconnect controller main air supply first and then remove the gauge from the V3 tubing. Tighten down the regulator locking nut and reconnect the tubing to V3 center port.

8. Reconnect main air and power and verify controller operation, making sure to check for air leaks. Replace the controller cover before returning the unit to service.

CONTROLLER WITH
COVER REMOVED

PRINTED CIRCUIT
ASSEMBLY

REMOVE TUBING FROM V3
FITTING AND ATTACH
GAUGE TO TUBING

FRONT OF
CONTROLLER

SIDE VIEW OF 350-
0018 CONTROLLER
WITH COVER
REMOVED

PRINTED CIRCUIT
ASSEMBLY

ADJUST KNOB TO
CHANGE REGULATOR
OUTPUT WHILE
MONITORING GAUGE.
REGULATOR FACTORY
SETTING IS 20 PSI

LOOSEN LOCK NUT TO
ADJUST REGULATOR.
RE-TIGHTEN AFTER
ADJUSTMENT IS
COMPLETE

INTERNAL
REGULATOR

Section 7. System Specifications

DC Power Supply Requirements

Input Power Requirement:	100-240 VAC @ 50-60Hz
Output Power Requirement:	24V ▬▬ (VDC) / 0.8A or greater
Approvals:	UL / FCC / PSE / CCC / CE / WEEE / ROHS
Protection:	Overvoltage/Short Circuit
Output Pin Assignments:	Center: +V Outside: Return Rtn —(●— +V
Output Plug Size:	Outside Diameter: 5.5mm Inside Diameter: 2.5mm Barrel Length: 9.5mm

The DC power supply received with your DieMark inking system meets these requirements. Use only the DC power supply provided with the unit or an authorized replacement power supply from Xandex Inc. or an approved Xandex distributor. For the exact specification of your power supply, request the "24VDC Power Supply" drawing listed in your product manual drawing package from [Xandex Customer Service](#).

Pneumatic Controller Specifications

Size:	6" x 6" x 4" (152mm x 152mm x 102mm)
Weight:	3.25 lbs (1.8 kg)
Input Power Requirement:	24V ▬ (VDC) 0.84A
Foot Switch Input:	Contact Closure >50 msec
Air Consumption:	80 PSI ±5 PSI Instrument Air per ISA 7.3 specification <0.5 cfm @ 10 dots/second
Cycle Rate:	Exceeds 750 cycles/minute
On-Time Range:	Cartridge Air Feed - Continuously Variable Pulse (Dot Size 6.85 - 27 mS) Shuttle Air Feed - Fixed @ 25.2 ms
Counters:	Eight Digit with External Reset (Independent of Microprocessor)
External Regulator/Filter:	5.0 micron Air Filtration

Prober Input:	12 - 60 volts @ minimum 30 ms pulse width. The input circuit presents approximately 1 KΩ - 700 Ω input resistance. Typical current as a function of input voltage is listed in the following table:

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

Environmental Range:	➢ 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

Certifications:

C E **MARK**	Standards to which conformity is declared: EN61010-1 / EN61326-1 Marked for LVD and EMC
RoHS	RoHS Compliant with EU Directive 2011/65/EU
UK CA	Conforms to UK Directives: 2016 No.1101 Electrical Equipment (Safety) 2016 No.1091 Electromagnetic Compatibility 2012 No.3032 RoHS Standards to which conformity is declared: BS EN IEC 61010-1:2010 BS EN 61326-1:2013
FC	This device complies with FCC Rules Part 15. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference that may be received or that may cause undesired operation.
	Xandex Inc. has labeled its branded electronic products with the WEEE Symbol to alert our customers that products bearing this label should not be disposed of in a landfill or with municipal or household waste in the EU.

Inker Specifications

Ink Cartridge Model	DM-2
Ink Cartridge Type	A5, A6, A8
Available Inks	Standard Xandex Inks
Dot Sizes	Dot sizes (± 10%) consistent for speeds of 10 dots/second to 1 dot/2 minutes.
Dot Size Range	6 mil to 50 mil (with currently available inks)
Shuttle Stroke Length	0.050"- 0.060" factory set, user adjustable
Z Adjustment Resolution	0.0005" motorized adjustment
Z Adjustment Range	±0.18" motorized adjustment
X Adjustment Range	±0.093" manual joystick
Y Adjustment Range	±0.125" manual joystick

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 (±10%) consistent for speeds of 12 dots/second to 1 dot/2 minutes

Cartridge Availability

The following table illustrates ink and cartridge configurations. Configurations designated with a 0 are available as a Customer Specific Product (CSP) but have not been tested by Xandex and are subject to limited warranty conditions. The information in this table is accurate as of the time of publication but is subject to change without notice.

Ink Type	Pneumatic Cartridge Types DM-2 A5	A6	A8	DM-2.3 A5	A6	A8	Filament Cartridge Types DM-1 5 mil	8 mil	10 mil	15 mil	25 mil	30 mil	DM-1.25 10 mil	15 mil	25 mil	DM-S 10 mil	15 mil
6990 Black	+	+	+	+	+	+	T,F	+	+	+	+	+	+	+	+	+	+
6993 Black	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6993 Red	+	+	+	+	+	+	T,F	+	+	+	+	+	+	+	+	+	+
6997 Black	+	+	+	+	+	+	T,F	+	+	+	+	+	+	+	+	+	+
Empty (no ink)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
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, subject to limited warranty conditions.
T = with Tungsten filament
F = with Mono-Filament
X = Not available in filament cartridge configurations.

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:
- 6990, 6993, 6997 = Four (4) months. Five (5) days after cartridge opening
- 8103 and 8104 = Four (4) months. Three (3) days after cartridge opening.
- 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.

XANDEX INC.

Customer Service
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Dot Size Guidelines in Mils (0.001 inch)

Dot production figures are averages and as such, are not guaranteed. All ink dot characterization testing performed at ambient temperature of 70° degrees F, relative humidity of 50% using polished, unetched silicon wafers (no passivation).

INK TYPE			X1000 & X901 Series DM-2		X5000 Series DM-2.3		Motorized-Z S = Small Dot Mode / L = Large Dot Mode DM-2		
								S	L
I N K T Y P E	**8103**	A5	Min.	12 mil	Min.	13 mil	Min.	*	10 mil
			Mid.	21 mil	Mid.	23 mil	Mid.	*	19 mil
			Max.	24 mil	Max.	27 mil	Max.	*	22 mil
		A6	Min.	15 mil	Min.	17 mil	Min.	*	11 mil
			Mid.	25 mil	Mid.	27 mil	Mid.	*	23 mil
			Max.	29 mil	Max.	30 mil	Max.	*	28 mil
		A8	Min.	22 mil	Min.	23 mil	Min.	*	17 mil
			Mid.	37 mil	Mid.	39 mil	Mid.	*	32 mil
			Max.	42 mil	Max.	43 mil	Max.	*	38 mil
								S	L
	6990 6993 6997	A5	Min.	16 mil	Min.	17 mil	Min.	9 mil	12 mil
			Mid.	28 mil	Mid.	29 mil	Mid.	12 mil	23 mil
			Max.	32 mil	Max.	33 mil	Max.	16 mil	28 mil
		A6	Min.	20 mil	Min.	18 mil	Min.	8 mil	14 mil
			Mid.	32 mil	Mid.	32 mil	Mid.	16 mil	28 mil
			Max.	36 mil	Max.	36 mil	Max.	19 mil	34 mil
		A8	Min.	29 mil	Min.	27 mil	Min.	12 mil	21 mil
			Mid.	52 mil	Mid.	50 mil	Mid.	24 mil	41 mil
			Max.	60 mil	Max.	57 mil	Max.	29 mil	50 mil
								S	L
	7824	A5	Min.	19 mil	Min.	18 mil	Min.	10 mil	15 mil
			Mid.	33 mil	Mid.	33 mil	Mid.	18 mil	29 mil
			Max.	38 mil	Max.	38 mil	Max.	21 mil	34 mil
		A6	Min.	25 mil	Min.	20 mil	Min.	13 mil	22 mil
			Mid.	44 mil	Mid.	36 mil	Mid.	24 mil	41 mil
			Max.	50 mil	Max.	41 mil	Max.	29 mil	46 mil
		A8	Min.	37 mil	Min.	29 mil	Min.	20 mil	31 mil
			Mid.	59 mil	Mid.	50 mil	Mid.	34 mil	55 mil
			Max.	69 mil	Max.	56 mil	Max.	40 mil	63 mil
								S	L
	8104	A5	Min.	26 mil	Min.	24 mil	Min.	14 mil	23 mil
			Mid.	49 mil	Mid.	44 mil	Mid.	25 mil	47 mil
			Max.	54 mil	Max.	50 mil	Max.	30 mil	53 mil
		A6	Min.	33 mil	Min.	27 mil	Min.	20 mil	30 mil
			Mid.	56 mil	Mid.	50 mil	Mid.	34 mil	56 mil
			Max.	65 mil	Max.	56 mil	Max.	39 mil	63 mil
		A8	Min.	51 mil	Min.	54 mil	Min.	38 mil	54 mil
			Mid.	80 mil	Mid.	85 mil	Mid.	59 mil	85 mil
			Max.	90 mil	Max.	93 mil	Max.	67 mil	89 mil

* Contact Xandex Customer Service for information on using 8103 ink in small dot applications.

Dot Size Guidelines in Microns

Dot production figures are averages and as such, are not guaranteed. All ink dot characterization testing performed at ambient temperature of 70° degrees F, relative humidity of 50% using polished, unetched silicon wafers (no passivation).

INK TYPE			X1000 & X901 Series DM-2		X5000 Series DM-2.3		Motorized-Z S = Small Dot Mode L = Large Dot Mode DM-2		
								S	L
	8103	A5	Min.	304.8 μm	Min.	330.2 μm	Min.	*	254 μm
			Mid.	533.4 μm	Mid.	584.2 μm	Mid.	*	482.6 μm
			Max.	609.6 μm	Max.	685.8 μm	Max.	*	558.8 μm
		A6	Min.	381 μm	Min.	431.8 μm	Min.	*	279.4 μm
			Mid.	635 μm	Mid.	685.8 μm	Mid.	*	584.2 μm
			Max.	736.6 μm	Max.	762 μm	Max.	*	711.2 μm
		A8	Min.	558.8 μm	Min.	584.2 μm	Min.	*	431.8 μm
			Mid.	939.8 μm	Mid.	990.6 μm	Mid.	*	812.8 μm
			Max.	1066.8 μm	Max.	1092.2 μm	Max.	*	965.2 μm
								S	L
	6990 6993 6997	A5	Min.	406.4 μm	Min.	431.8 μm	Min.	228.6 μm	304.8 μm
			Mid.	711.2 μm	Mid.	736.6 μm	Mid.	304.8 μm	584.2 μm
			Max.	812.8 μm	Max.	838.2 μm	Max.	406.4 μm	711.2 μm
		A6	Min.	508 μm	Min.	457.2 μm	Min.	203.2 μm	355.6 μm
			Mid.	812.8 μm	Mid.	812.8 μm	Mid.	406.4 μm	711.2 μm
			Max.	914.4 μm	Max.	914.4 μm	Max.	482.6 μm	863.6 μm
		A8	Min.	736.6 μm	Min.	685.8 μm	Min.	304.8 μm	533.4 μm
			Mid.	1320.8 μm	Mid.	1270 μm	Mid.	609.6 μm	1041.4 μm
			Max.	1524 μm	Max.	1447.8 μm	Max.	736.6 μm	1270 μm
								S	L
	7824	A5	Min.	482.6 μm	Min.	457.2 μm	Min.	254 μm	381 μm
			Mid.	838.2 μm	Mid.	838.2 μm	Mid.	457.2 μm	736.6 μm
			Max.	965.2 μm	Max.	965.2 μm	Max.	533.4 μm	863.6 μm
		A6	Min.	635 μm	Min.	508 μm	Min.	330.2 μm	558.8 μm
			Mid.	1117.6 μm	Mid.	914. μm	Mid.	609.6 μm	1041.4 μm
			Max.	1270 μm	Max.	1041. μm	Max.	736.6 μm	1168.4 μm
		A8	Min.	939.8 μm	Min.	736.6 μm	Min.	508 μm	787.4 μm
			Mid.	1498.6 μm	Mid.	1270 μm	Mid.	863.6 μm	1397 μm
			Max.	1752.6 μm	Max.	1422.4 μm	Max.	1016 μm	1600.2 μm
								S	L
	8104	A5	Min.	660.4 μm	Min.	609.6 μm	Min.	355.6 μm	584.2 μm
			Mid.	1244.6 μm	Mid.	1117.6μm	Mid.	635 μm	1193.8 μm
			Max.	1371.6 μm	Max.	1270 μm	Max.	762 μm	1346.2 μm
		A6	Min.	838.2 μm	Min.	685.8 μm	Min.	508 μm	762 μm
			Mid.	1422.4 μm	Mid.	1270 μm	Mid.	863.6 μm	1422.4 μm
			Max.	1651 μm	Max.	1422.4 μm	Max.	990.6 μm	1600.2 μm
		A8	Min.	1295.4 μm	Min.	1371.6 μm	Min.	965.2μm	1371.6 μm
			Mid.	2032 μm	Mid.	2159 μm	Mid.	1498.6 μm	2159 μm
			Max.	2286 μm	Max.	2362.2 μm	Max.	1701.8 μm	2260.6 μm

* Contact [Xandex Customer Service](#) for information on using 8103 ink in small dot applications.

System Drawings

The Inker Assembly Dimensional Drawings are available via link from
www.xandexsemi.com The remaining drawings in the list below are available on
request, in Adobe PDF format, from Xandex Customer Service.

Description	Drawing Number
X4115 Motorized Z Pneumatic Inker Set (EG)	340-4115
X4116 Motorized Z Pneumatic Inker Set (EG)	340-4116
X4215 Motorized Z Pneumatic Inker Set (KLA)	340-4215
X4217 Motorized Z Pneumatic Inker Set (KLA)	340-4217
Harness, Pneumatic Controller, Motor Z	240-0512
X4115/X4116 Motorized Z Pneumatic Inker (EG) Dimensions	900-0224
X4215/X4217 Motorized Z Pneumatic Inker (KLA) Dimensions	900-0226
24 VDC Power Supply	220-0078
Pneumatic Controller Assy, Motorized Z*	350-0018
Controller Logic Board PC Assy	250-1226
Schematic, Logic Board	950-1226
PCA, Daughter Card, Motor Z	250-1227
Schematic, Daughter Card, Motor Z	950-1227
Inker Assembly, Motorized Z, Pneumatic	320-4215
Inker Base Assembly, 4000 Series	220-0031
Pneumatic Shuttle, Precision X4215	316-0014
Overall Dimensions Precision Pneumatic Shuttle	900-0220

*The 350-0018 and 350-0022 Pneumatic controllers are identical except
for firmware. The 350-0022 programing eliminates the "puff pulse" that
is standard in the 350-0018 controller.

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