



BOISE STATE UNIVERSITY
ENVIRONMENTAL HEALTH, SAFETY
AND SUSTAINABILITY

STANDARD OPERATING PROCEDURE

DIMATIX MATERIALS PRINTER

College/Dept:	College of Engineering/Micron School of Materials Science and Engineering	Building/Room:	ENGR 106
Laboratory Name:	Idaho Microfabrication Laboratory	Revision:	
Principal Investigator:		Author:	Hanna Pagenkopf

Before the worked detailed in this procedure may begin, the intended user must read and understand this document. This document must be approved by the PI, the college's safety liaison, and EHSS. Any changes to this document, however minor, must be submitted for approval by the PI, the college's safety liaison, and EHSS. The "buddy system" will be in place whenever any work is conducted.

Approval			
Intended User:	_____	_____	_____
	Name, Title	Signature	Date
Reviewed and Approved by:	_____	_____	_____
	Name, Title	Signature	Date
	Pete Miranda - IML Director		9-27-17
	Name, Title	Signature	Date
	_____	_____	_____
	Name, Title	Signature	Date

Overview

The Dimatix Materials Printer (DMP) is a laboratory and limited production tool that enables researchers, scientists, and engineers to evaluate the use of ink jetting technology for new manufacturing and analytical processes. It is designed to be convenient and easy to use to carry out "proof of concept" and development work using ink jet technology. It does have extensive capabilities to allow increased experimental sophistication to optimize process parameters for the user's applications as the user gains familiarity with the system.

Scope

This SOP reviews all basic use of the Dimatix Materials Printer.

Potential Hazards

Chemical
 Thermal
 Hydraulic
 Electrical
 Slip/Trip
 Biological
 Mechanical
 Radiation
 Pneumatic
 Fire
 Fall
 Other

Hazard: Some inks may be hazardous. It is the user's responsibility to understand the dangers of the inks as well as supply the SDS for the ink before using the printer.

Engineering Controls (EC)

- Fume hood Biosafety Cabinet Other Local Exhaust Shielding Other

EC Specifics: Pinch hazards with moving parts on the printer. Thermal hazard with the plate.

Training Requirements – except for classroom lab safety, must be completed prior to performing the procedure

- Classroom Laboratory Safety Awareness Radiation Worker
 Online Safety Topics
 (specify):
 Lab/Work Group Specific Training
 (specify):
 Other (specify): Dimatix Inkjet Printer Training

Personal Protective Equipment (PPE)

- Safety glasses Safety goggles Face shield & safety glasses Face shield & safety goggles
 Lab coat Apron Tyvek suit Tyvek sleeves
 Gloves Leg coverings Hard hat Hearing protection
 Respirator Shoes Fall protection Other

- PPE Description:
- Impermeable protective Gloves - Regular Nitrile Gloves
 - Closed Toed Shoes
 - Leg Covering (Pants)
 - Chemicals may be an irritant to some people. A respirator may be requested if needed
 - Safety glasses required while filling inks

Equipment, Materials, Supplies, & Facility Requirements

- Dimatix Materials Printer
- Ink Cartridges
- Syringe
- Substrate
- Wipes (to wipe out syringe, spills)
- Cleaning pads
- Printing pattern if not using Dimatix supplied patterns

Handling, Work Area & Storage Requirements

- Cleaning the Substrate, filling Ink cartridge will be done in fume hood
- Filled Ink Cartridge will be transferred to Engineering 106
- Safety goggles and gloves will be worn while transferring the Cartridge
- Every item will be return to its original location after usage
- Appropriate cleaner will be use to clean any spills along with wipes

DIMATIX MATERIALS PRINTER SOP

- Store the unused ink appropriately
- Remove the cartridge after each use from the printer and store it in provided bags.
- Unclutter work space

Emergency Response Equipment & Supplies

- | | | | |
|---|--|---|---|
| <input checked="" type="checkbox"/> Eyewash | <input type="checkbox"/> Fire extinguisher | <input type="checkbox"/> First aid kit | <input type="checkbox"/> Calcium gluconate gel (HF use) |
| <input checked="" type="checkbox"/> Safety shower | <input type="checkbox"/> Fire blanket | <input checked="" type="checkbox"/> Spill kit | <input type="checkbox"/> Emergency gas shutoffs |
| <input type="checkbox"/> Drench hose | <input type="checkbox"/> Other: | | |

Description: Emergency eyewash and shower station will be used to flush eyes and rinse skin if contact with chemicals occurs. If eye/skin irritation still persists, get medical advice and attention. Notify IML Staff, they will assist in emergency situations.

Decontamination & Waste Disposal

Used gloves and wipes will be disposed in an appropriate chemical waste container. Any inks or fluid models filled with inks will need to have the SDS consulted for proper disposal. Some inks may need to be sent out for disposal through EHS&S. If there are any questions regarding disposal it is important to contact an IML supervisor or Chris Siepert, Lab Safety Specialist College of Engineering.

Spill Response

If there is a spill consult the SDS sheets to see if any special precautions need to be taken. After any spill is cleaned up wipe off the spot with compatible cleaner and a wipe to ensure the area has been thoroughly cleaned

Additional Safety Information

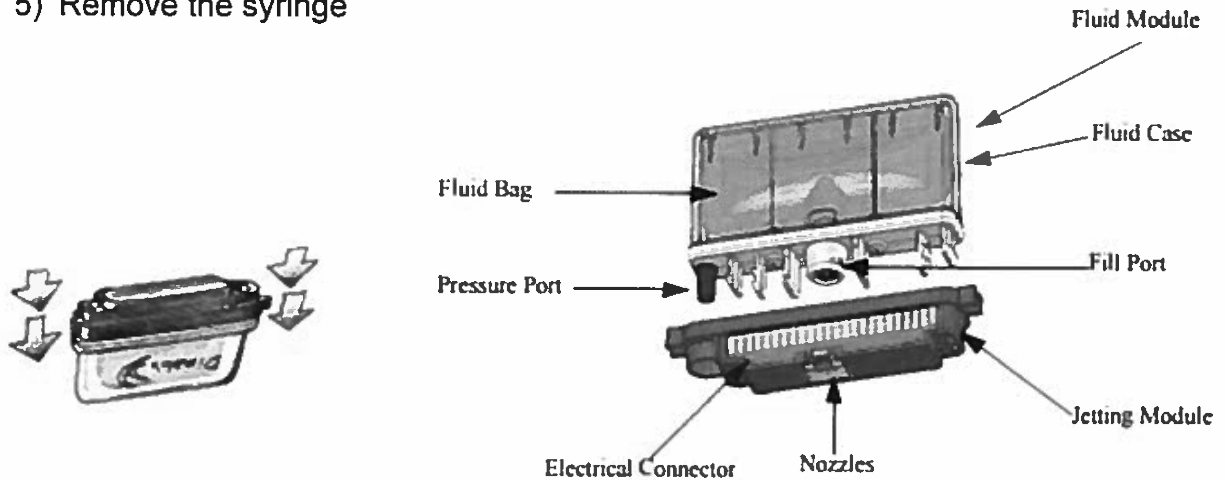
Review of applicable safety references such as SDS to ensure appropriate protective measures, spill supplies, and first aid procedures.

References

For Materials Specific Hazards, please refer to the SDS.

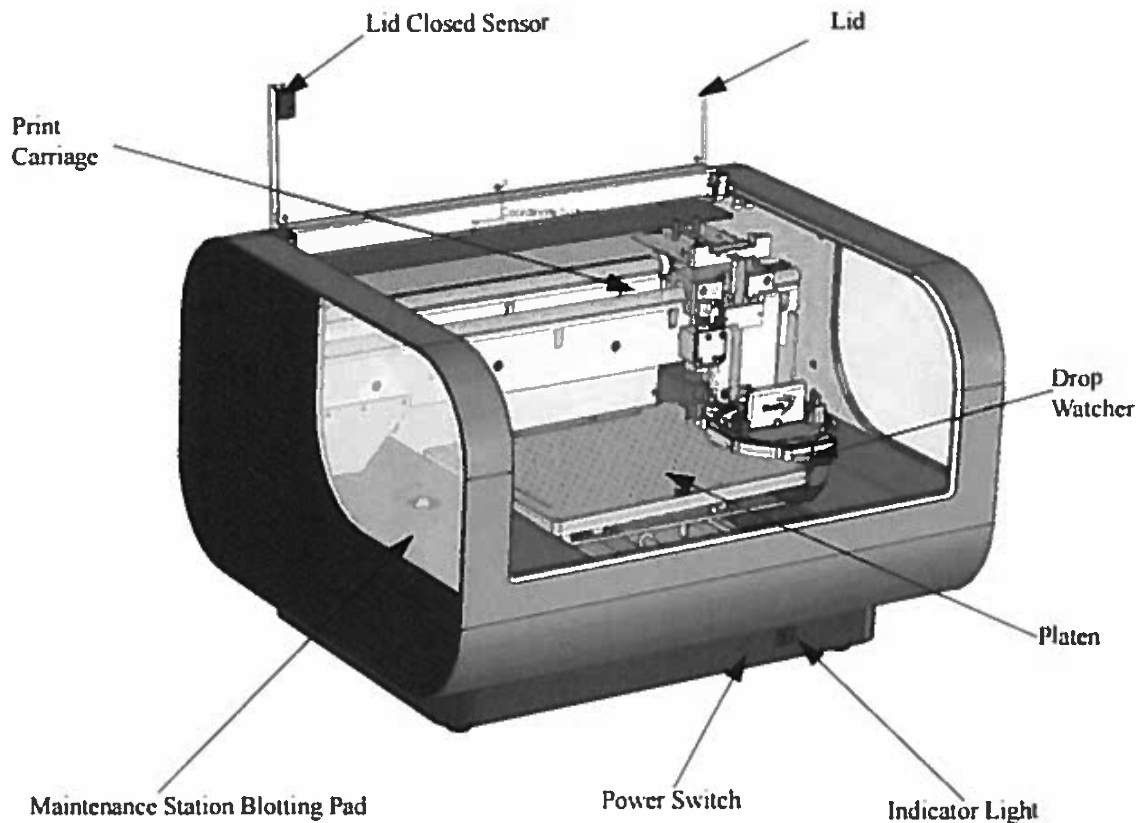
PREPARATION OF INK CARTRIDGES

- 1) Create a design pattern; use either pre-loaded patterns or create one in paint or a cam system
- 2) Using syringe, pull 1.5 mL of ink in fume hood
- 3) Insert the needle into center **fill port** without scraping the side
- 4) Slowly push the syringe plunger to fill the **fluid module**
- 5) Remove the syringe

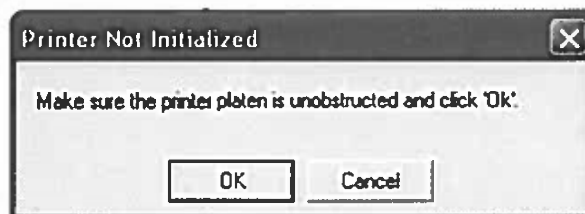


- 6) Attach **fluid module** to the **jetting module** by aligning the **pressure port**
- 7) Push the two halves straight together until second snap is felt/heard
- 8) This will be used later on for loading the substrate

DIMATIX MATERIALS PRINTER SOP
START-UP PROCEDURE

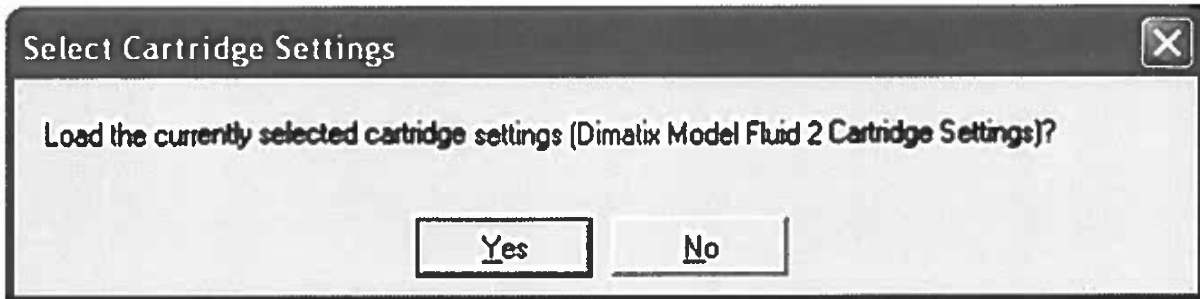


- 1) Make sure to remove anything left on the **Platen** and close the **Lid**
- 2) If not already on, press the **Power Switch** on the front side of the printer
- 3) Turn on the computer
 - a) Launch the “DMP 2800” Software
 - b) Once the software is launched, a “Print Not Initialized” dialog box will appear. Make sure the printer **Platen** is unobstructed and click “OK”. Initialization of the printer will begin.

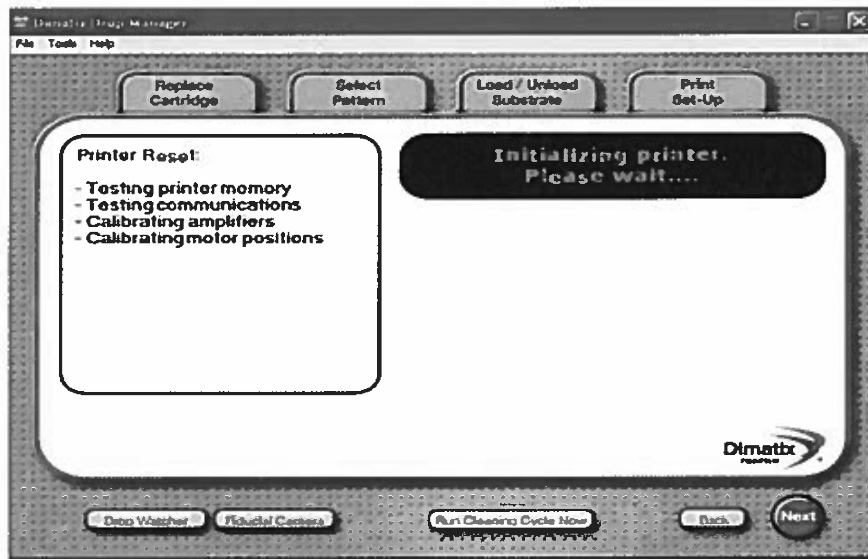


- 4) Wait until the initialization of the printer is done. Once the initialization is done press “Next”.

5) "Select Cartridge Settings" dialog box will appear



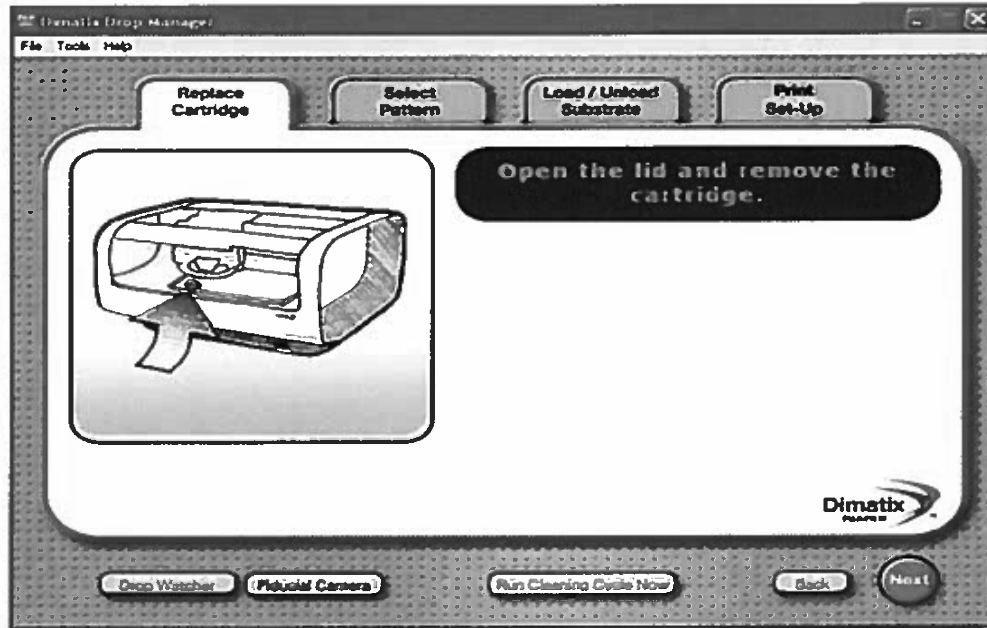
6) Select "Yes" if using silver ink, select "No" if using personal ink



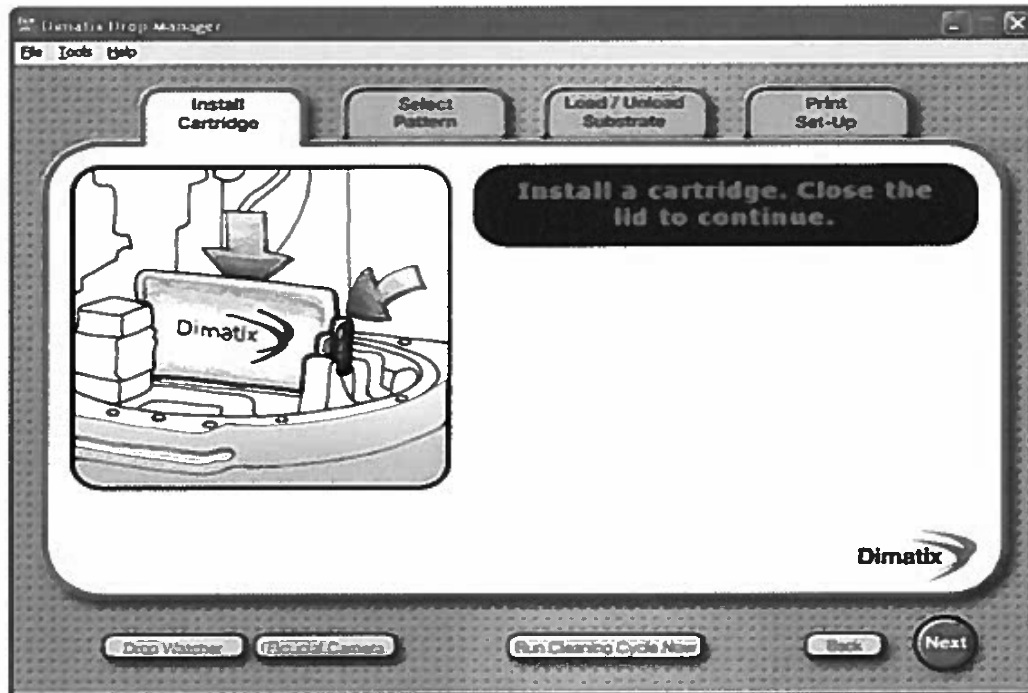
7) Dimatix drop manager dialog box will appear with the "Print Set-Up" tab selected

INK CARTRIDGE LOADING AND PRINTING

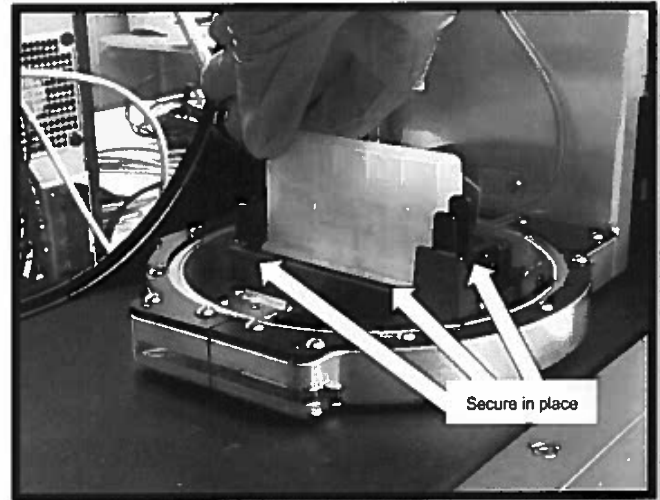
- 1) Manually open lid and remove the old cartilage if any



- 2) Install a filled ink cartridge. See following images and sub-steps



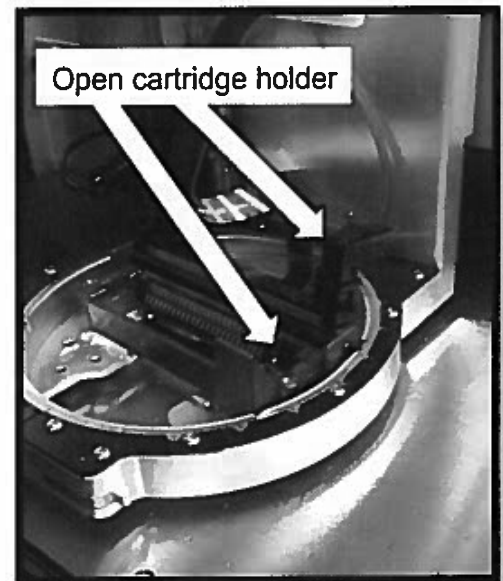
- A. Remove any old cartridges in the printer
 - I. Open the cartridge holder by pinching the release latch
 - II. Pull out the old cartridge



- b. Push cartridge down firmly so that it makes a "click" into place

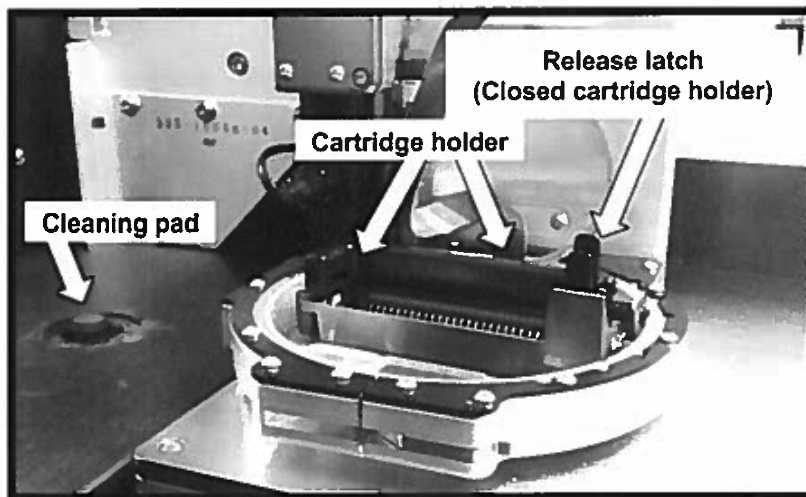
- c. Pull the cartridge holder latch forward and down until you hear it click and locks into place

- d. Make sure the cartridge is sitting flat in the holder

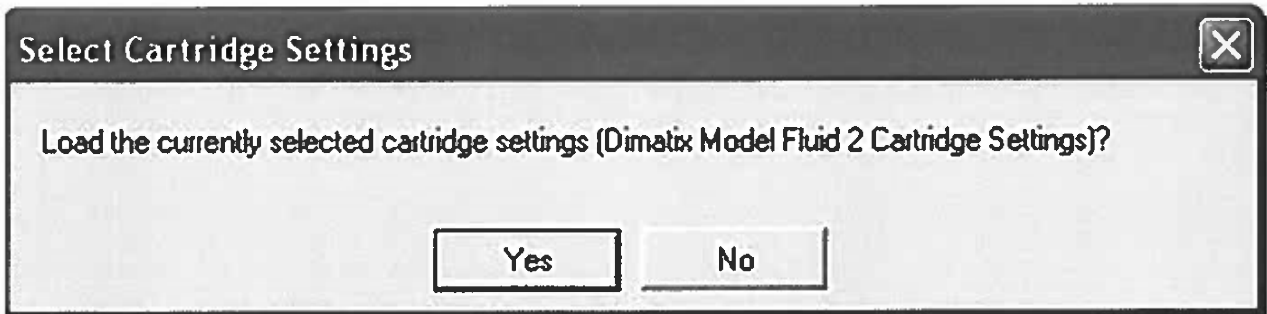


- e. Replace the Cleaning Pad (this is reviewed on page 16) every time the user changes inks, each ink should have its own pad

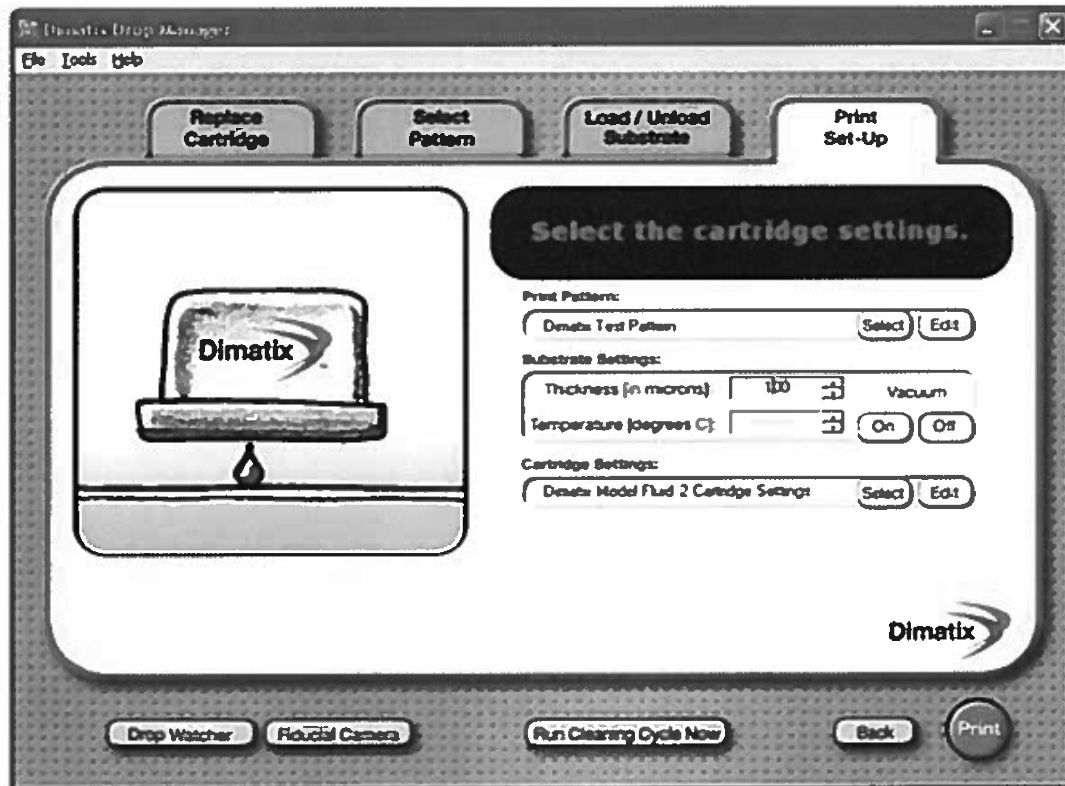
- f. Close the lid



- 3) "Select Cartridge settings" shows up again

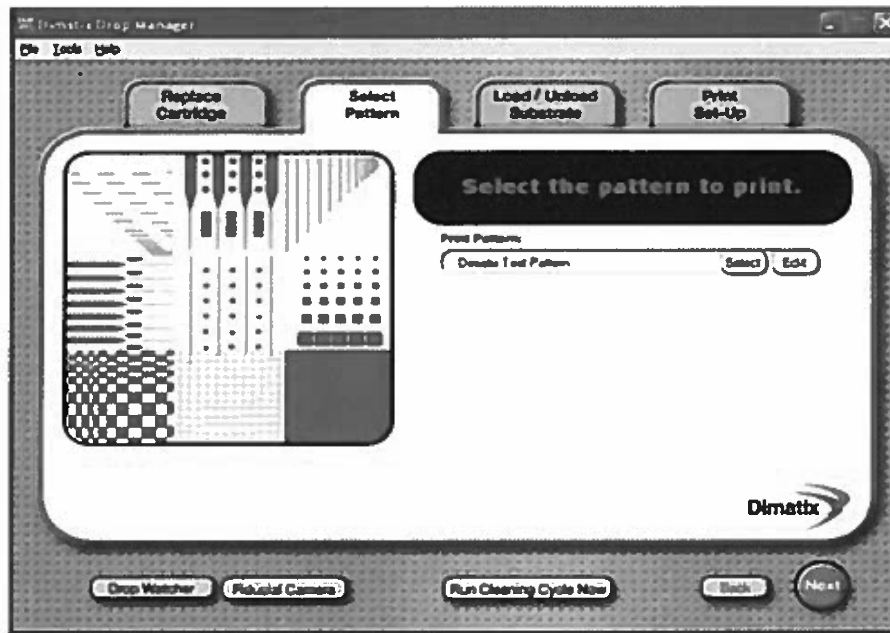


- 4) Click "Yes" if cartridge setting is correct and continue to next section
- 5) If cartridge setting is incorrect, click "No" and you will be prompted to make the correct selection
- 6) After confirming cartridge setting, "Printer Set-Up" screen will appear



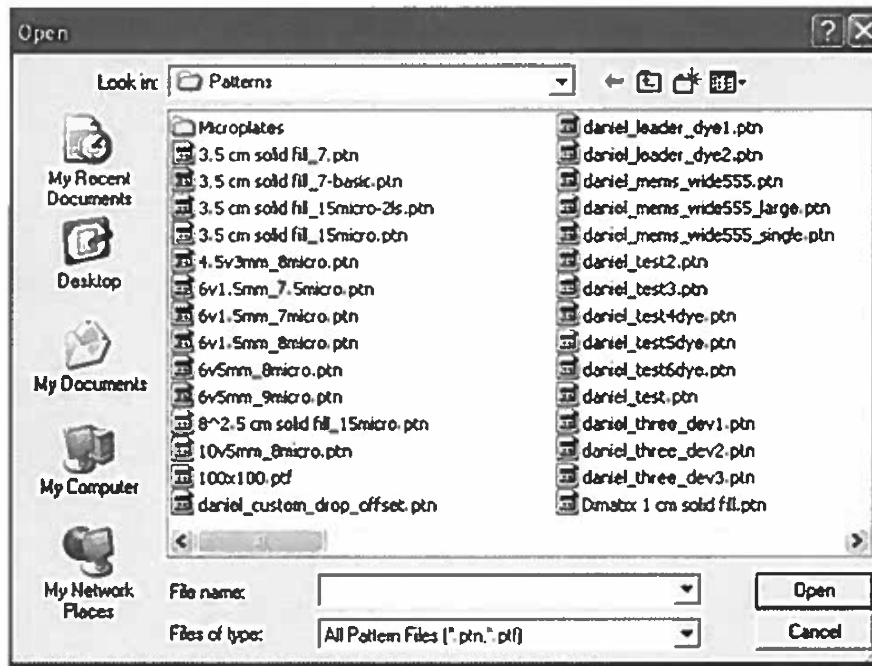
Loading Pattern

1) "Select the pattern to print" will appear on your screen as seen below.



2) Click the "Select" button, a pattern file will open

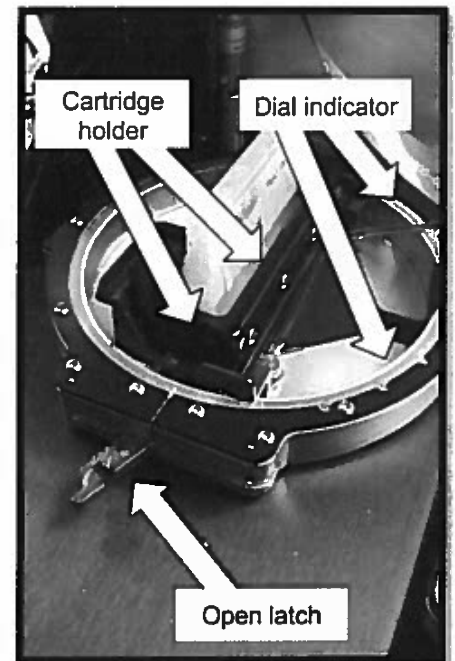
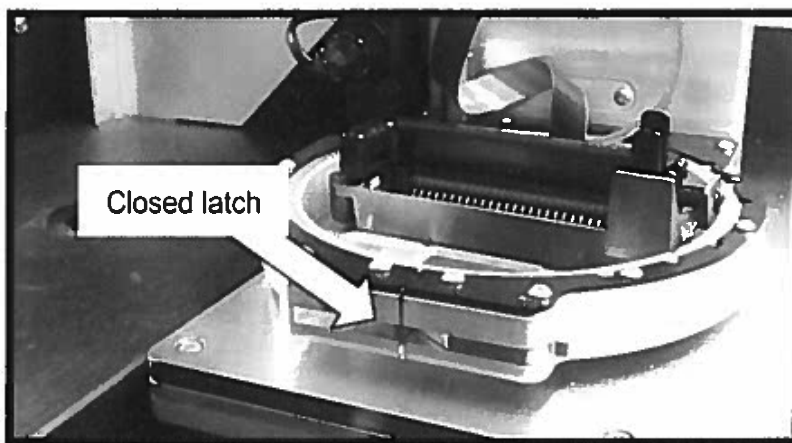
3) Choose the pattern file you want to print



- 4) Depending on pattern, dialog box pops up and requires the head angle adjustment

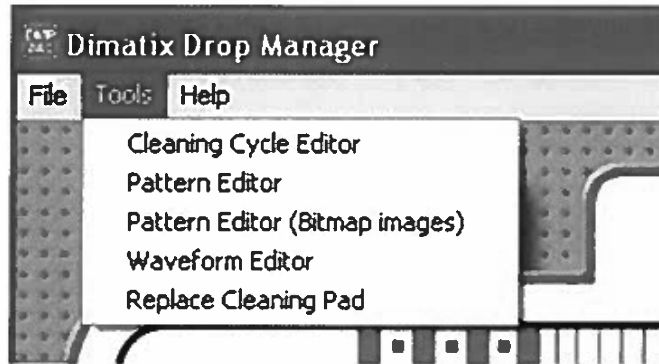


- 5) Open the lid and adjust head angle as dialog box says, adjusting the angle on the indicator dial
 - a) Open the latch to adjust the dial indicator
 - b) Swivel the cartridge holder to the appropriate angle
 - c) Close the latch
- 6) Close the lid
- 7) Click "Next" button on the startup screen

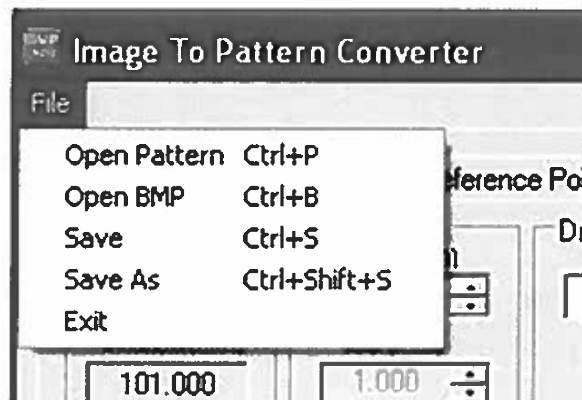


Bitmap File Printing – Optional (This is not needed to be done in order to complete the printing process)

- 1) Click "Tools" in the menu bar
- 2) Choose the "Pattern Editor (Bitmap images)" option from the drop-down menu



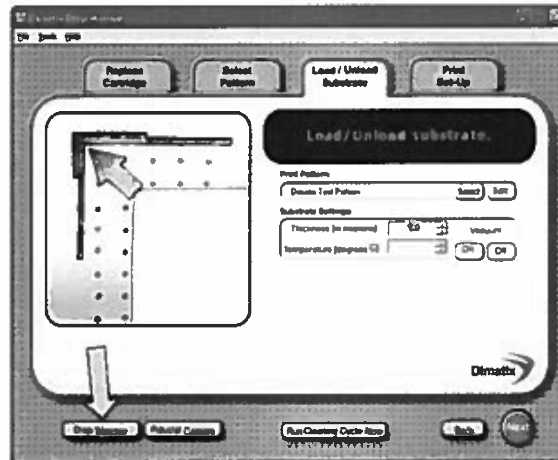
- 3) Click "File" on top of the window.
- 4) Choose the "Open BMP" from the drop-down menu.



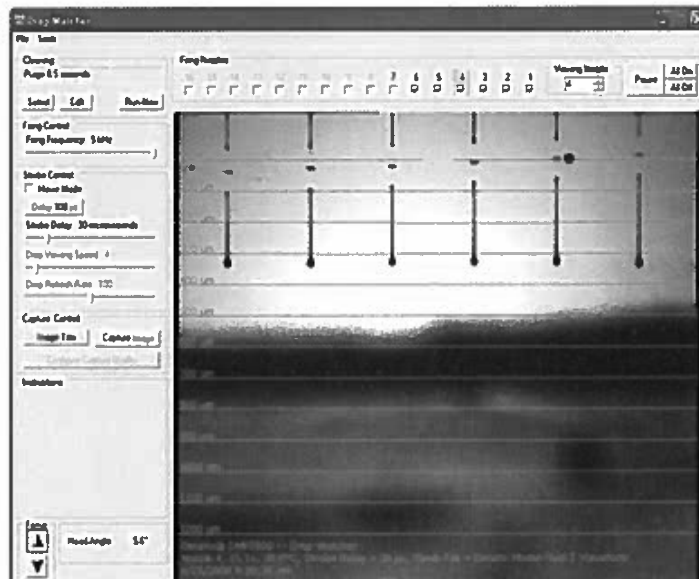
- 5) Load your BMP file from the file directory.
- 6) Your BMP pattern shows up in the screen
- 7) You can edit the parameters (See the detail of "Bitmap File Printing" screen in Dimatix Recipes)
- 8) When all of the parameters are correct, save your file as a .ptf pattern file
- 9) Continue to next section to begin printing

Printing

- 1) Go to “load/unload substrate”
- 2) Choose the thickness of your substrate
- 3) Set the temperature to 60 degrees C
- 4) Open the lid, place the substrate in. If the substrate is small, tape it down and use the print origin feature
- 5) Turn on the vacuum
- 6) Close the lid
- 7) Go to drop watcher button on the bottom left side of the screen

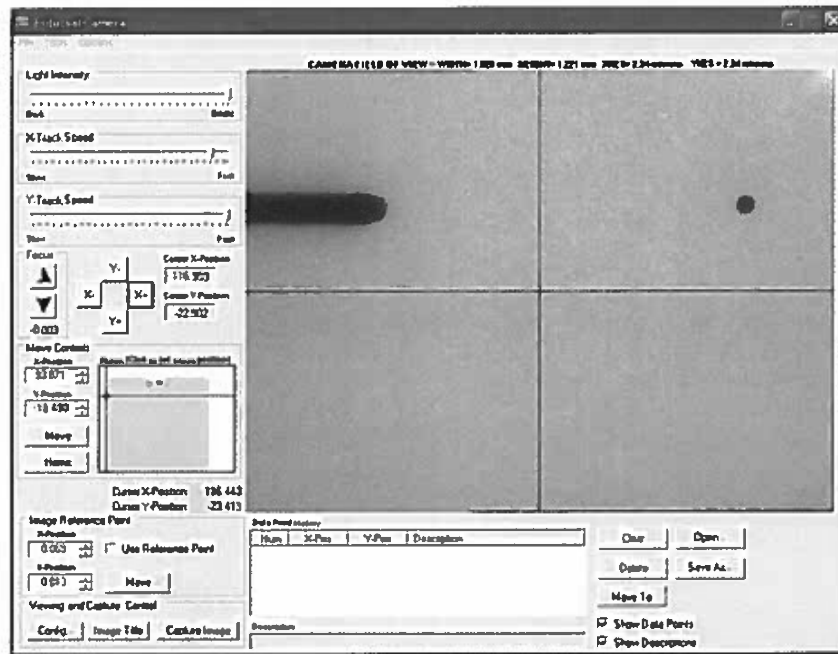


- 8) See the performance of each nozzle individually. Run the cleaning cycle to keep nozzles clear and functioning properly.
 - a. Increase or decrease the Jetting voltage to control the flow of ink drop, once jets are tuned, pick nozzles. Make sure to turn off the nozzle that are not working.
 - b. If only few nozzles are working, choose two consecutive nozzle



DIMATIX MATERIALS PRINTER SOP

- 9) Once the settings are selected, click file in the upper left corner and then save the cartridge settings
- 10) Go to Print Set-up menu
- 11) Make sure print pattern, substrate pattern, and cartridge settings are selected to desired options. If not, reconfigure to desired options.
- 12) Click on "Fiducial camera" button on the bottom of the main screen
- 13) Pick the position to print using fiducial camera. Move to position where you want to print on the substrate and set as print origin. Once set, take the yellow marker and click the reference point on screen.

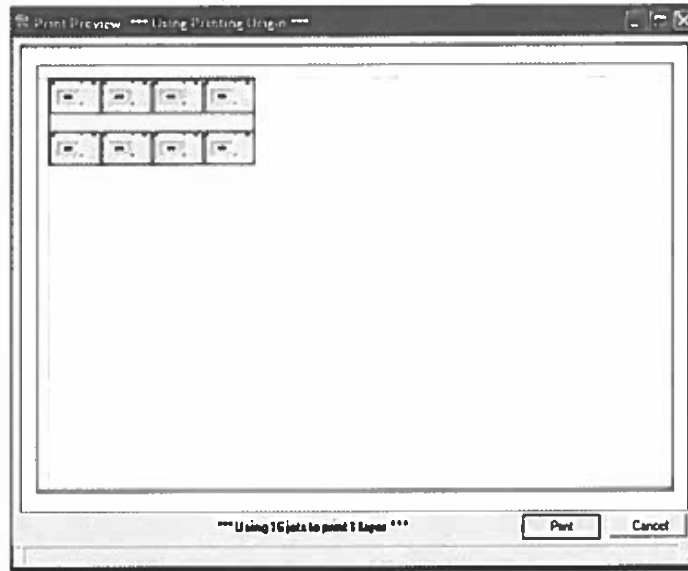


- 14) Make sure that "printer preview" is enabled on file menu on main screen



DIMATIX MATERIALS PRINTER SOP

- 15) Click "Print" on main screen
- 16) Print preview shows up, if it is ok, "Print"



- 17) Printing will start

Finishing Up

- 1) Set the temperature back to room temperature (about 20 C)
- 2) Open Lid, Take Substrate out
 - a. After printing the material may be hot, use caution
- 3) Remove ink Cartridge
- 4) Put in IPA fluid module that is particular to the ink used
 - a. Run test cleaning cycle multiple times
 - i. You can review if the printer is clean by checking the performance of each nozzle individually.
- 5) Close the lid

REPLACING THE CLEANING PAD

1. Taking the top clear cap of a new Cleaning Pad assembly and push it down on the old pad until you hear a click and then simply pull it out.
2. Insert the new pad and holder by pushing the pad and holder down into the spot where the old one was until you hear a click.
3. **Note:** You can also replace the cleaning pad when you click "Replace Cleaning Pad" in the drop-down menu of "Tools" on top of the screen.

