



**JETINX INK RECIRC SYSTEM (V3)**  
**USER GUIDE**





**INX International Ink Co.**  
**Digital Division**



*JetINX Ink Recirc System (v3)*  
*User Guide*

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July 2017

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Patent applied for JetINX Ink Recirc System (v3) by INX International Ink Co. USPTO Application Number: 13777845

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## **PRODUCT INFORMATION AND SUPPORT**

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## REVISION HISTORY

REVISION	DATE	CHANGES
<b>E</b>	February 14, 2013	Initial draft for review
<b>F</b>	February 22, 2013	Added cabling diagram. Updated software API reference. Updated Troubleshooting section. Replaced missing content place holders with comments.
<b>G</b>	February 18, 2013	Added PM3 Application named pipe documentation.
<b>H</b>	March 4, 2013	Added instructions for setting up an ink system. Updated installation procedures to use flush procedure.
<b>I</b>	March 6, 2013	Updated for standby mode. Updated the application documentation for version 1.0.7 changes. Updated the instructions for installing and adding a module.
<b>J</b>	March 13, 2013	Updated product name. Removed API and Installation sections to a different document.
<b>K</b>	April 23, 2013	Updated cabling diagram.
<b>L</b>	May 10, 2013	Updated flushing procedures.
<b>M</b>	June 11, 2013	Updated pressure calculations.
<b>N</b>	July 1, 2013	Added packing for shipment section
<b>O</b>	July 8, 2013	Updated pressure calculations.
<b>P</b>	September 24, 2013	Updates related to certification testing.
<b>Q</b>	December 11, 2013	Updated word choice for clarity. Updated initial fill and filter replacement procedures.
<b>R</b>	January 20, 2014	Added Figure 6 Elevation Measurements, Added copyright to end
<b>S</b>	February 20, 2014	Added declaration of conformity
<b>T</b>	July 7, 2017	Added Ball Bearing and Flow Bypass, Updated System Diagram

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## OVERVIEW

This document contains instructions on operation and maintenance of a JetINX Ink Recirc System (v3).

## REQUIRED ITEMS



You will need the following items:

- Computer (See Software Overview and Installation - System Requirements)
- JetINX System Components

## REQUIRED TOOLS

None

## HAZARDS

 <b>DANGER</b>	High voltages present in system components can result in injury or death. Remove all power before working on any component of the system. Be sure to properly observe all installation instructions to insure operator safety.
 <b>WARNING</b>	Always use proper eye, inhalation and skin protection.

## SPECIAL NOTES

None

## PRODUCT INTENDED USE

The JetINX Ink Recirculation System is intended to supply ink to Piezo electric printheads requiring continuously circulating ink in a printing system. It is designed to work with the Xaar 1003 series of printheads. Other printheads with similar requirements may be used. The customer is solely responsible to determine the fitness of this product for use in their printing system. The customer is solely responsible for the printing performance of the final printing system.

Use of this product for any purpose other than its intended use is prohibited and may result in injury and death. Observe all hazard and safety information.

[Hazards](#)

[Safety Information](#)

## CERTIFICATIONS

The product fulfills the requirements of EN 60950-1:2006/A11:2009/A1:2010/A12:2011, CAN/CSA-C22.2 NO. 60950-1A-07, UL 60950-1-07

SGS Report Number: 3159473-02



# DECLARATION OF CONFORMITY

We,

Manufacturer: INX International Ink Co.  
111 Eastwood Circle  
Owens Cross Roads, Alabama 35763 USA  
Phone: 256-725-7750  
Fax: 256-725-7751

Declare under our sole responsibility that the products,

Product Name	Model Number
JetINX Ink Recirc System (v3) with Bulk Ink Attachment	99-14711-C
JetINX Power Box Assembly	99-22501-B

Conform to the following standards

Safety: EN 60950-1:2006 Information Technology Equipment (ITE)

EMC: EN 61000-6-2 Electromagnetic Immunity (Heavy Industrial)  
EN61000-6-4 Electromagnetic Emissions (Heavy Industrial)

Following the provisions of

Low Voltage Directive (2006/95/EC)  
EMC Directive (2004/108/EC)

**Authorized Signature:** *J. Randel LaCaze*

**Authorized Representative:** J. Randel LaCaze

**DATE OF ISSUE: FEBRUARY 18, 2014**

## SYSTEM OVERVIEW

A reliable industrial-strength printing system requires a high-performance recirculating ink supply system. The JetINX Ink Recirc System (v3) is a robust system that circulates ink through the printhead at a precisely controlled temperature and pressure. The system is designed to supply ink to one or two printheads continuously, from idle to all jets firing continuously. Precise pressure and temperature are also maintained during sustained periods of 100% jetting.

The system can be scaled to as many colors as desired, with each color channel controlled independently. A PC is used to configure the system and to monitor its operation. However, the PC is not in the control loop and can be rebooted without adversely affecting the ink system. The system will also retain ink holding pressure in the event of power loss. Detailed instructions for PC requirements and configuration can be found in the Software Overview and Installation section of this manual.

Each module in the system can be configured with its own pressure and temperature targets in order to accommodate differences in ink viscosity or printhead elevation. In addition, each channel includes a bulk tank with two-stage level sensing to permit continuous operation even during ink refilling. JetINX Ink Recirc System (v3) is designed for maximum chemical compatibility and minimal maintenance.

# SYSTEM DIAGRAMS

## JetINX Printing System: Xaar 1003 (v3) System Diagram

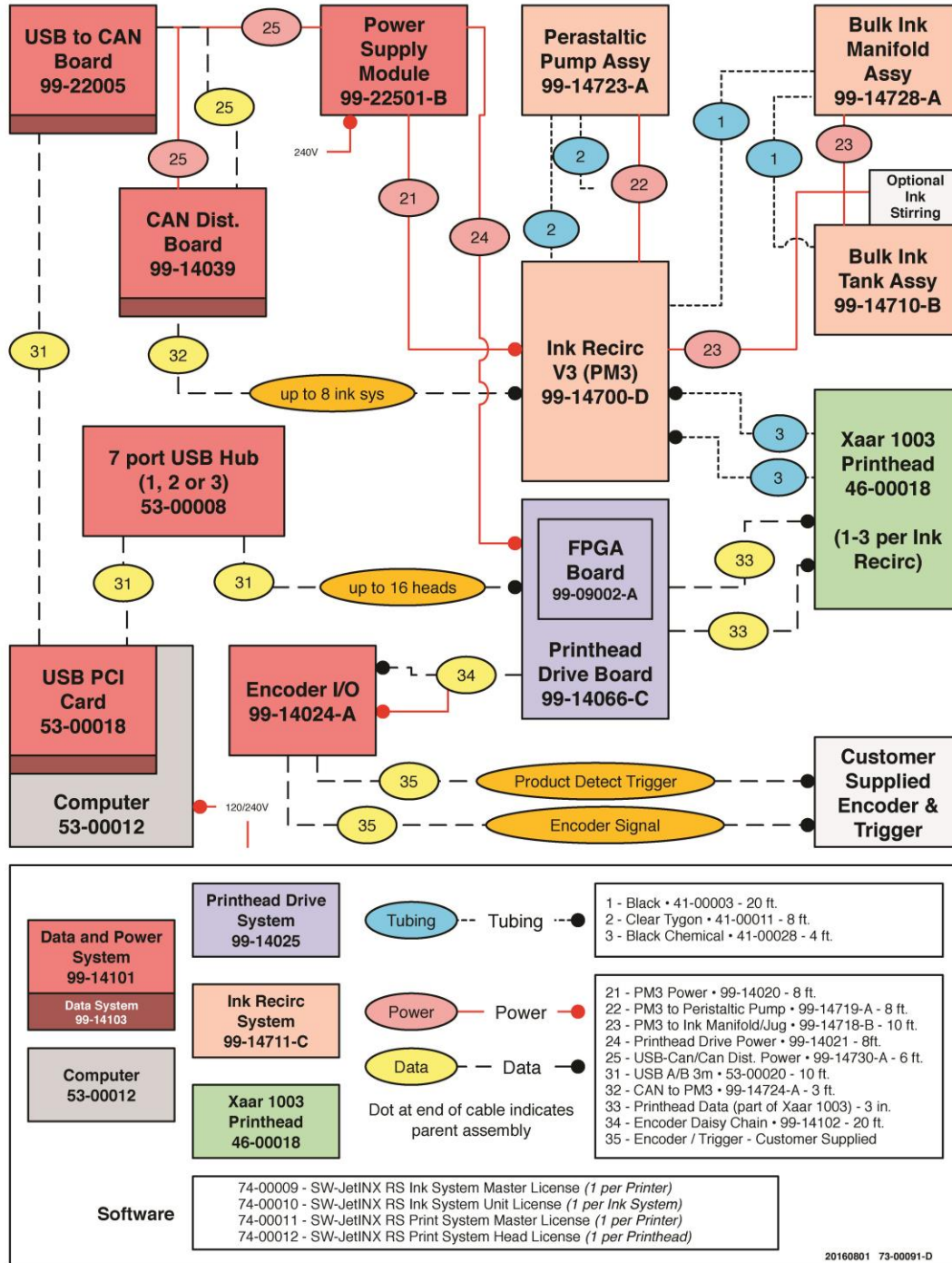
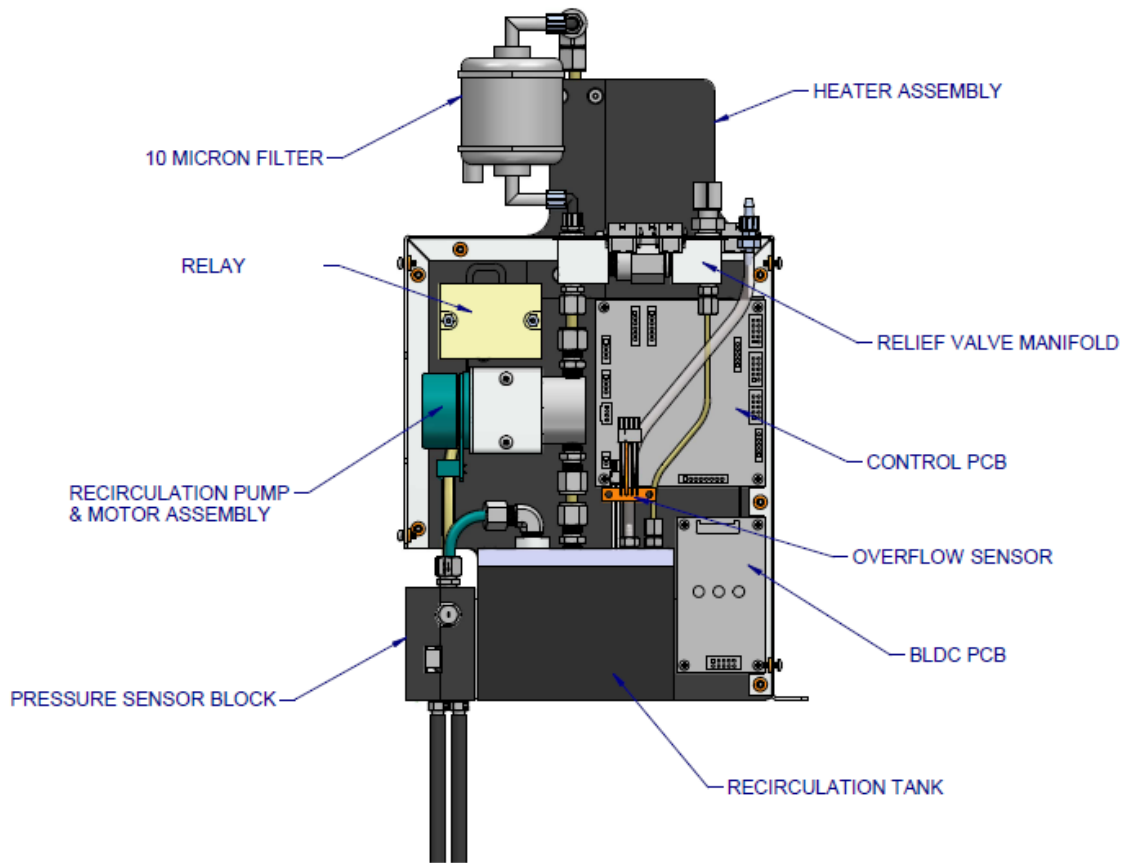
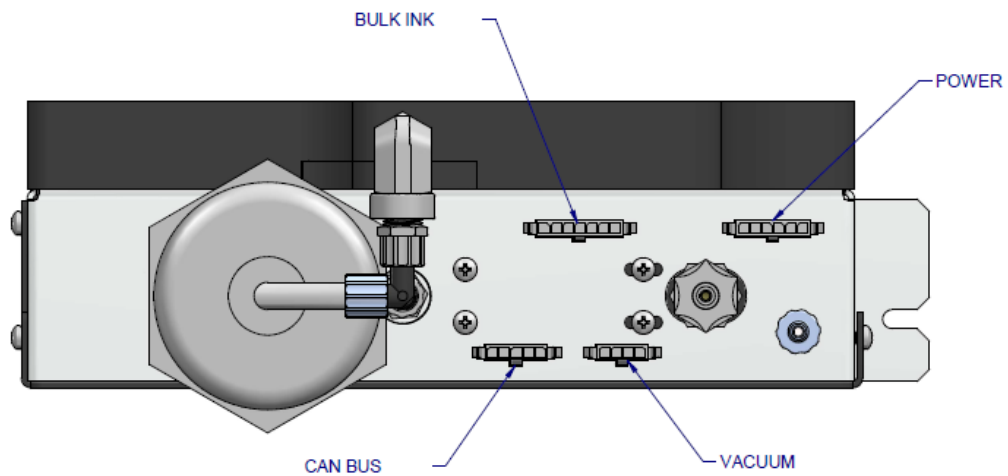


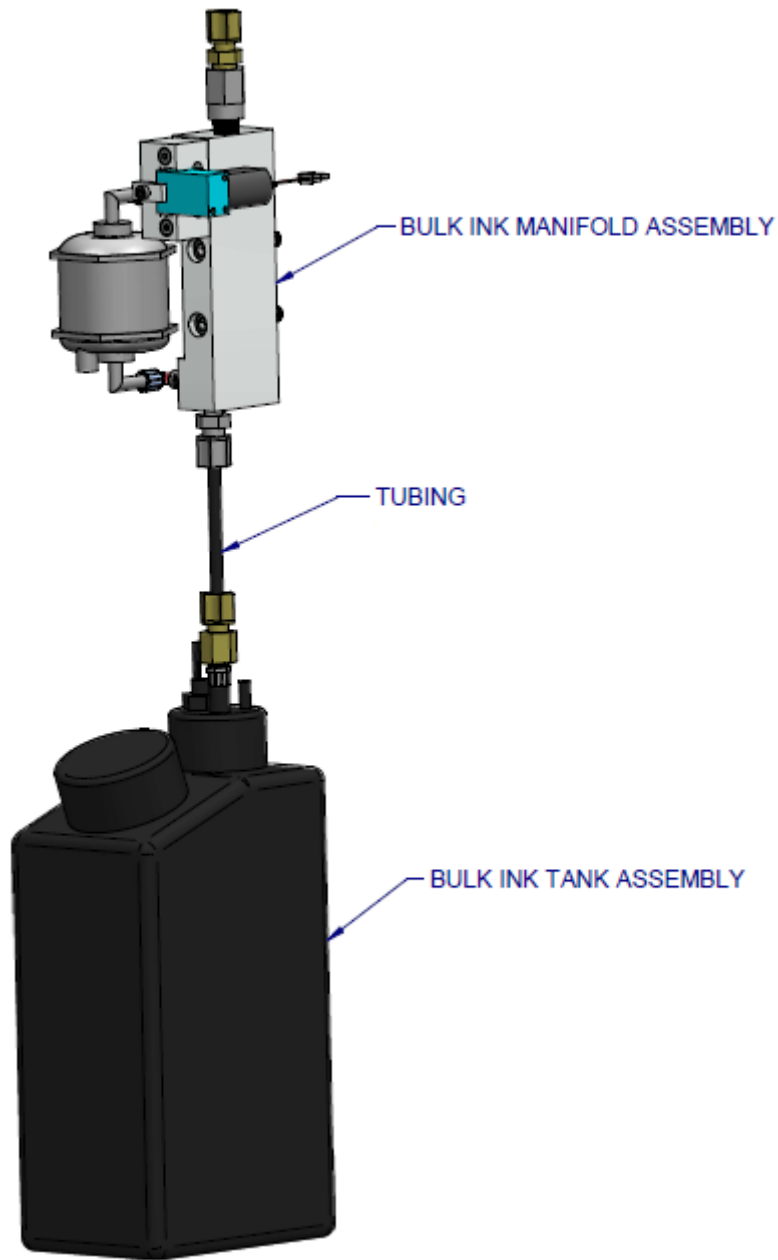
Figure 1 JetINX Ink Recirc System Block Diagram



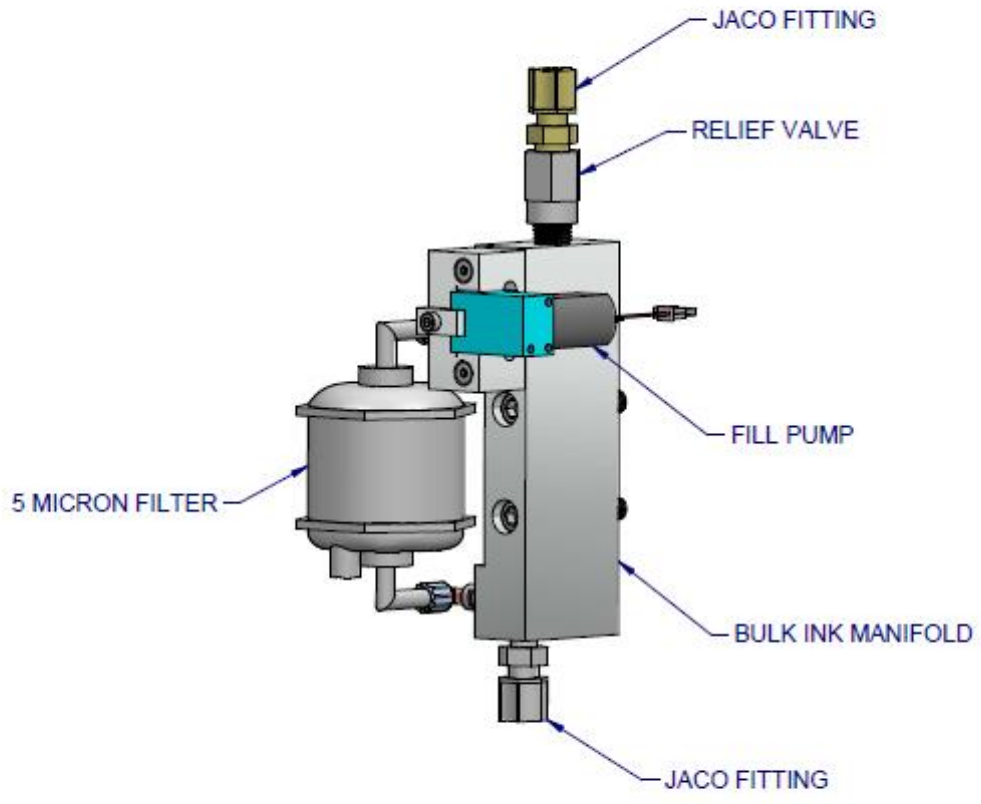
**Figure 2 Ink Recirc Module Subassemblies**



**Figure 3 Ink Recirc Module Connectors (Top View)**



**Figure 4 Bulk Ink Assembly**







**Figure 5 Bulk Ink Manifold Subassemblies**



## SAFETY INFORMATION

This section describes how to safely use your JetINX Ink Recirc System (v3). Please review and adhere to all safety precautions before operating any hardware associated with the ink system.

### INK SYSTEM SAFETY INFORMATION

 <b>WARNING</b>	<b>Thermal</b>	Avoid touching Ink Recirc Module heater assembly during or immediately after operation as they can be very hot.
 <b>WARNING</b>	<b>UV Light</b>	The ink system may be used with UV curing inks. UV light can be harmful to unprotected eyes and skin. Always wear UV protective eyewear. Never look directly into UV lights. Always cover skin that otherwise would be regularly exposed to UV light. Some UV lamps create ozone. The ozone smell is normal and some ventilation is recommended.
 <b>WARNING</b>	<b>Ink Exposure</b>	Avoid direct skin contact with the inks and related solvents. Wash skin immediately if you come in contact with the ink or solvent. UV curing inks can pose skin irritation, and even skin sensitization (allergic reaction) hazards to users. Proper ventilation, personal protective equipment, housekeeping and personal hygiene are important to minimize exposure to UV-curing inks. Do not drink or ingest any ink, wiping, flushing or waste fluids. Keep animals away from the ink system and all related fluids. Do not allow untrained personnel to handle inks or operate the ink system. If an emergency situation involving inks or solvents arises, contact local emergency services and have a copy of the MSDS available for emergency service personal.
 <b>WARNING</b>	<b>Electrical</b>	The Ink Recirc Module and associated components contain lethal voltages. Only qualified personnel should attempt to service the electrical system. Always use electrical disconnect during servicing. Never attempt to service the unit while power is applied.

## TECHNICAL SPECIFICATIONS

This section provides the technical and environmental specifications associated with the JetiNX Ink Recirc System (v3).

### INK RECIRC MODULE TECHNICAL SPECIFICATIONS

<b>POWER REQUIREMENTS (PER MODULE)</b>	24VDC .8A Typ. 1.5A Max 208-240VAC .6A @ 208VAC .7A @ 240VAC
<b>PHYSICAL SIZE (INCH/MM)</b>	211W x 395H x 84D mm
<b>WEIGHT (DRY)</b>	3.9 Kg / 8.5 lbs.
<b>WEIGHT (WET)</b>	4.2 Kg / 9.2 lbs.
<b>INK CAPACITY WITH FILTERS</b>	250 mL
<b>INK TEMPERATURE RANGE</b>	Ambient – 60 °C (Ambient – 140 °F)
<b>INK PRESSURE CONTROL</b>	+200 mb to -200 mb
<b>RECIRCULATION RATE</b>	0 – 380 mL/min

### OPERATIONAL ENVIRONMENTAL SPECIFICATIONS

<b>ROOM TEMPERATURE</b>	18.3 – 26.6 °C (65 – 80 °F)
<b>HUMIDITY</b>	30% – 80% non-condensing

# JETINX INK RECIRC SYSTEM (v3) APPLICATION SOFTWARE

This section describes the basic usage and functionality of the JetINX Ink Recirc System (v3) Application.



The JetINX Ink Recirc System (v3) software is used to configure, monitor and troubleshoot the JetINX Ink Recirc System (v3).




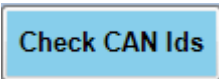


To run the application, click Start->Programs-> JetINX Ink Recirc System (v3)-> JetINX Ink Recirc System (v3).exe.

<b>NOTE:</b>	Once the ink system is configured and running, the monitor application is NOT required to be running in order for the ink system to be operational.
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## COMMUNICATIONS

The application communicates to each ink module via a USB to CAN interface. The USB to CAN board must be connected to the PC in order to use the monitor application. The driver for the USB interface was installed during the software installation and can be found in the INX-> JetINX Ink Recirc System (v3)->Driver directory in Program Files if the driver ever needs to be reinstalled.





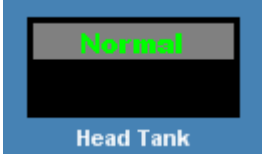
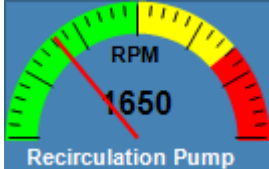
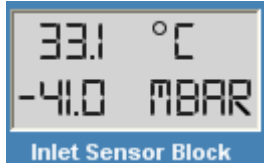
### COMMUNICATIONS GRAPHICAL INTERFACE

	<p>This icon shows the status of the USB to CAN network. If there is a problem with communications, the network will be red. If communications are operational, the network will be green. The name of the USB to CAN hardware is listed below the icon. Pressing this button will toggle the display the board action buttons below.</p> <p>If this icon does not appear in the upper left corner of the application, the application does not detect the USB to CAN hardware. Please make sure the USB to CAN hardware is plugged in and the driver is properly installed.</p>
	<p>This button will open a dialog that allows the user to rename the USB to CAN hardware. The displayed name will be formatted to USB2CAN.&lt;USB Index&gt;.&lt;Name Entered&gt;.</p>
	<p>This button will open a dialog to add a new ink channel. Select the color name, CAN device index, and if the module will be disabled. Click OK to create the new channel or Cancel to quit without adding a new channel.</p>
	<p>This button will try to communicate with Ink Recirc Modules on the CAN bus for all possible CAN index values. If a Ink Recirc Module responds to the message, the index will be listed. This is helpful for identifying the CAN indexes for devices in the ink system.</p>
	<p>This button will send the Start command to every ink channel that is not disabled.</p>
	<p>This button will send the Stop command to every ink channel that is not disabled.</p>

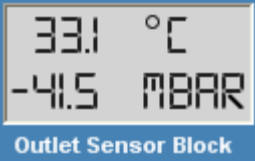
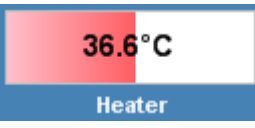


## INK CHANNEL MONITORING

The following section contains all of the controls for each individual ink channel.









### INK CHANNEL GRAPHICAL INTERFACE

	<p>This is the name of the ink channel. If the channel is enabled, there will be a green check mark in the left side of the label. If the channel is disabled, there will be a red X in the left side of the label. To enable/disable a channel click on the check/X.</p> <p>Single clicking the name of the channel will open a password dialog for support mode.</p> <p>To delete a channel, drag the label out of the application window and you will be prompted to verify that you wish to delete the channel.</p> <p>To reorder the channels, drag the label to desired position and drop.</p>
	<p>This button toggles the action menu for the ink channel.</p>
	<p>This button stops the Ink Recirc Module for emergency scenarios. This button should only be pushed to stop the Ink Recirc Module in an emergency situation and not used for normal shut down operations. When this button is pushed the heater, fill pump, and recirculation pump shut off immediately regardless of ink temperature. The vacuum is immediately adjusted for holding pressure.</p>
	<p>This shows the current state of the module. If an error has occurred, the error text will be displayed here.</p> <p>See the "Programmatically Interfacing with the Application" section for a list of the states and errors. Ink recirculation automatically stops when the Ink Recirc Module enters an error state in order to minimize the impact of any errors on the system.</p>
	<p>This gauge displays the state of the ink recirculation tank. Displayed state will be Low, or Normal. The recirculation tank is also referred to as the "Head Tank".</p>
	<p>This gauge displays the speed of the recirculation pump in revolutions per minute.</p>
	<p>This gauge displays the pressure in millibars and temperature in Celsius for the ink flowing into the printhead as measured in the sensor block.</p>

### INK CHANNEL GRAPHICAL INTERFACE

 <p>33.1 °C -41.5 MBAR</p> <p>Outlet Sensor Block</p>	<p>This gauge displays the pressure in millibars and temperature in Celsius for the ink flowing out of the printhead as measured in the sensor block.</p>
 <p>36.6 °C</p> <p>Heater</p>	<p>This gauge displays the heater temperature in Celsius. The background gives a visual indicator of the temperature of the heater. A bar across the bottom of the gauge indicates the current heater duty cycle.</p>
 <p>Fill Pump</p>	<p>When the fill pump is running, this gauge will rotate.</p>
 <p>Normal</p> <p>Bulk Ink</p>	<p>This gauge displays the state of the bulk ink tank. Displayed state will be Empty, Low, or Normal. Ink should be added as soon as Low status is displayed. The fill pump is disabled when the status is Empty to prevent pumping air into the system.</p>

### ACTIONS MENU GRAPHICAL INTERFACE

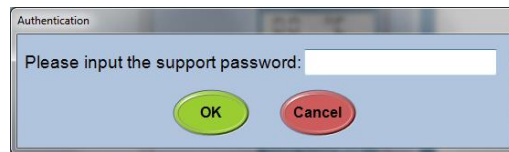
	<p>This button will send the Start command to the selected ink channel.</p>
	<p>This button will send the Stop command to the selected ink channel. When this button is pushed, the heater and fill pump are shut off. The recirculation pump remains in operation until the heater block is cooled to 45 degrees Celsius. The vacuum is then set for holding pressure.</p>
	<p>This button will send the Standby command to the selected ink channel. When in Standby mode, the ink is slowly recirculated and is kept at a temperature above 25C.</p>
	<p>This button will send the command to clear the errors to the selected ink or flush channel.</p>
	<p>This button will send the command to start the flush procedure. This fills the ink tank, heats the ink to 45C and then recirculates the ink for approximately 10 minutes. The flush function is only available when the module is stopped and is typically used during installation and maintenance. (See filling and maintenance procedures.)</p>
	<p>This button will command the module to purge the ink from the recirculation tank for 30 seconds while refilling the tank. The purge function is only available when the module is stopped. This function is typically used when filling an empty system or after a maintenance operation to expel air from the system. (See filling and maintenance procedures.)</p>
	<p>This button will command the module to purge the ink from the recirculation tank for 30 seconds without refilling it. The empty function is only available when the module is stopped. NOTE: This will set the holding pressure to 0mb to prevent pulling air into the printhead. If the empty cycle is stopped before the module is actually empty, reset the holding pressure to the desired amount to avoid releasing the remaining ink.</p>
	<p>This button toggles the entry form for pressure and temperature targets.</p>
<div style="background-color: #4a86e8; color: white; padding: 5px;"> <p><b>Inlet Pressure Target (mb):</b></p> <input style="width: 80px; height: 20px; border: none;" type="text"/> <span style="float: right; border: 1px solid white; border-radius: 50%; padding: 2px 5px; color: white;">Set</span> </div>	<p>This sets the target inlet pressure in millibars. This should be a number between -200mb and 200mb.</p>
<div style="background-color: #4a86e8; color: white; padding: 5px;"> <p><b>Outlet Pressure Target (mb):</b></p> <input style="width: 80px; height: 20px; border: none;" type="text"/> <span style="float: right; border: 1px solid white; border-radius: 50%; padding: 2px 5px; color: white;">Set</span> </div>	<p>This sets the target outlet pressure in millibars. This should be a number between -200mb and 200mb.</p>

## ACTIONS MENU GRAPHICAL INTERFACE

<p><b>Holding Pressure Target (mb):</b></p> <input type="text"/> <b>Set</b>	<p>This sets to the pressure target in millibars for holding the ink in the system. This should be a number between -200mb and 200mb.</p>
<p><b>Ink Temperature Target (C):</b></p> <input type="text"/> <b>Set</b>	<p>This sets the target temperature in Celsius for the ink supply. This should be a number between 0C and 60C.</p>

## SUPPORT MODE

To enter the support mode, click on the channel label for the module that is causing trouble. The application will prompt for a support password. The password for Support Mode is "4support".



In the support mode, you can change the Ink Recirc Module's CAN ID, change filter replacement dates, and upload new firmware to the module.

## OPERATIONAL AND MAINTENANCE PROCEDURES

### RECOMMENDED SETTINGS

Use of the ink system requires specific pressure and temperature settings. INX Digital technical support can assist you in figuring out appropriate settings for your specific system.

An ink temperature target can be found in the specification provided by the ink manufacturer. This temperature is considered to be a starting point, and the exact setting is determined by testing the system.

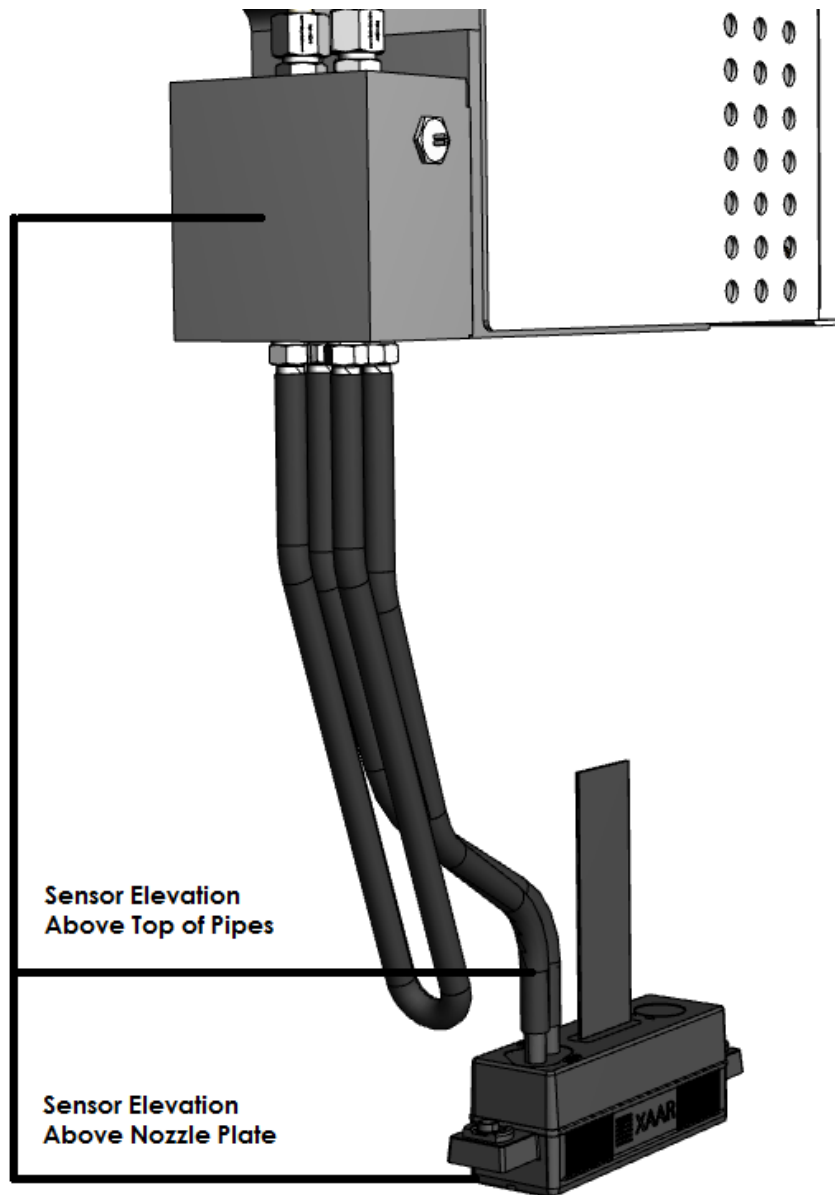
Pressure targets for ink system will vary according to the specific printhead, ink and elevation from the sensor to the print head. In the following examples, we calculate target pressures for a typical Xaar 1003 printhead based on INX MUFX ink at several different sensor elevations. Due to the differences in density, white ink is calculated separately from color and clear.

**Note: Only Luer couplers from INX are appropriate for the head connection. Pressure drops through other couplers can be very different.**



### EXAMPLE PRESSURE ADJUSTMENT CALCULATIONS

<b>INK DENSITY (G/ML)</b>	This can be found in the ink specification.
<b>TARGET PRESSURE AT PIPE INLET (MB)</b>	26/(Ink Density)
<b>TARGET PRESSURE AT PIPE OUTLET (MB)</b>	-68*(Ink Density)
<b>INCHES WATER TO MILLIBARS CONVERSION FACTOR</b>	2.490889083
<b>TARGET PRESSURE FOR STANDBY (MB)</b>	-25
<b>ELEVATION OF NOZZLES TO PIPE TOPS (IN)</b>	2.35
<b>PRESSURE DROP THROUGH INX LUER CONNECTORS (MB)</b>	6.714
<b>PRESSURE DROP PER INCH OF TUBING (MB/IN)</b>	0.608888
<b>SENSOR ELEVATION ABOVE NOZZLE PLATE (IN)</b>	The examples below create data for multiple sensor elevations from 3 in to 23 in (see Figure 6)
<b>SENSOR ELEVATION ABOVE TOP OF PIPES (IN)</b>	Sensor Elevation Above Nozzle Plate – Elevation of Nozzles to Pipe Tops (see Figure 6)
<b>ELEVATION PRESSURE ADJUSTMENT (MB)</b>	Sensor Elevation Above Top of Pipes * Ink Density * Inches Water to Millibars
<b>SUPPLY SENSOR PRESSURE TARGET (MB)</b>	Target Pressure at Pipe Inlet – Elevation Pressure Adjustment + (Sensor Elevation Above Top of Pipes * Pressure Drop Per Inch of Tubing)
<b>SUPPLY SENSOR PRESSURE TARGET WITH LUERS (MB)</b>	Supply Sensor Pressure Target + Pressure Drop Through Luer Connectors
<b>RETURN SENSOR PRESSURE TARGET (MB)</b>	Target Pressure at Pipe Outlet – Elevation Pressure Adjustment – (Sensor Elevation Above Top of Pipes * Pressure Drop Per Inch of Tubing)
<b>RETURN SENSOR PRESSURE TARGET WITH LUERS (MB)</b>	Return Sensor Pressure Target – Pressure Drop Through Luer Connectors
<b>HOLDING PRESSURE TARGET (MB)</b>	(-Sensor Elevation Above Nozzle Plate*Ink Density*Inches Water to Millibars)+Target Pressure for Standby



**Figure 6 Elevation Measurements**

**EXAMPLE CALCULATIONS FOR MUFX COLOR AND CLEAR INK WITH XAAR 1003**

<b>AVERAGE INK DENSITY</b>	1.018
<b>TARGET AT PIPE INLET (MB)</b>	25.54027505
<b>TARGET AT PIPE OUTLET (MB)</b>	-69.224

<b>SENSOR ELEVATION ABOVE NOZZLE PLATE</b>	<b>SUPPLY SENSOR PRESSURE TARGET</b>	<b>SUPPLY SENSOR TARGET (LUERS)</b>	<b>RETURN SENSOR PRESSURE TARGET</b>	<b>RETURN SENSOR TARGET (LUERS)</b>	<b>HOLDING PRESSURE TARGET</b>
<b>3.00</b>	24.29	31.00	-71.27	-77.98	-32.61
<b>3.50</b>	23.32	30.04	-72.84	-79.55	-33.88
<b>4.00</b>	22.36	29.07	-74.41	-81.13	-35.14
<b>4.50</b>	21.40	28.11	-75.98	-82.70	-36.41
<b>5.00</b>	20.43	27.15	-77.56	-84.27	-37.68
<b>5.50</b>	19.47	26.18	-79.13	-85.84	-38.95
<b>6.00</b>	18.51	25.22	-80.70	-87.42	-40.21
<b>6.50</b>	17.54	24.26	-82.27	-88.99	-41.48
<b>7.00</b>	16.58	23.29	-83.85	-90.56	-42.75
<b>7.50</b>	15.62	22.33	-85.42	-92.13	-44.02
<b>8.00</b>	14.65	21.37	-86.99	-93.71	-45.29
<b>8.50</b>	13.69	20.40	-88.56	-95.28	-46.55
<b>9.00</b>	12.73	19.44	-90.14	-96.85	-47.82
<b>9.50</b>	11.76	18.48	-91.71	-98.42	-49.09
<b>10.00</b>	10.80	17.51	-93.28	-99.99	-50.36
<b>10.50</b>	9.84	16.55	-94.85	-101.57	-51.63
<b>11.00</b>	8.87	15.59	-96.42	-103.14	-52.89
<b>11.50</b>	7.91	14.62	-98.00	-104.71	-54.16
<b>12.00</b>	6.95	13.66	-99.57	-106.28	-55.43
<b>12.50</b>	5.98	12.70	-101.14	-107.86	-56.70
<b>13.00</b>	5.02	11.73	-102.71	-109.43	-57.96

<b>SENSOR ELEVATION ABOVE NOZZLE PLATE</b>	<b>SUPPLY SENSOR PRESSURE TARGET</b>	<b>SUPPLY SENSOR TARGET (LUERS)</b>	<b>RETURN SENSOR PRESSURE TARGET</b>	<b>RETURN SENSOR TARGET (LUERS)</b>	<b>HOLDING PRESSURE TARGET</b>
<b>13.50</b>	4.06	10.77	-104.29	-111.00	-59.23
<b>14.00</b>	3.09	9.81	-105.86	-112.57	-60.50
<b>14.50</b>	2.13	8.84	-107.43	-114.15	-61.77
<b>15.00</b>	1.17	7.88	-109.00	-115.72	-63.04
<b>15.50</b>	0.20	6.92	-110.58	-117.29	-64.30
<b>16.00</b>	-0.76	5.95	-112.15	-118.86	-65.57
<b>16.50</b>	-1.72	4.99	-113.72	-120.43	-66.84
<b>17.00</b>	-2.69	4.03	-115.29	-122.01	-68.11
<b>17.50</b>	-3.65	3.06	-116.86	-123.58	-69.38
<b>18.00</b>	-4.61	2.10	-118.44	-125.15	-70.64
<b>18.50</b>	-5.58	1.14	-120.01	-126.72	-71.91
<b>19.00</b>	-6.54	0.17	-121.58	-128.30	-73.18
<b>19.50</b>	-7.50	-0.79	-123.15	-129.87	-74.45
<b>20.00</b>	-8.47	-1.75	-124.73	-131.44	-75.71
<b>20.50</b>	-9.43	-2.72	-126.30	-133.01	-76.98
<b>21.00</b>	-10.40	-3.68	-127.87	-134.59	-78.25
<b>21.50</b>	-11.36	-4.64	-129.44	-136.16	-79.52
<b>22.00</b>	-12.32	-5.61	-131.02	-137.73	-80.79
<b>22.50</b>	-13.29	-6.57	-132.59	-139.30	-82.05
<b>23.00</b>	-14.25	-7.53	-134.16	-140.87	-83.32

### EXAMPLE CALCULATIONS FOR MUF<sub>X</sub> WHITE INK WITH XAAR 1003

<b>INK DENSITY</b>	1.14
<b>TARGET AT PIPE INLET</b>	22.80701754
<b>TARGET AT PIPE OUTLET</b>	-77.52

<b>SENSOR ELEVATION ABOVE NOZZLE PLATE</b>	<b>SUPPLY SENSOR PRESSURE TARGET</b>	<b>SUPPLY SENSOR TARGET (LUERS)</b>	<b>RETURN SENSOR PRESSURE TARGET</b>	<b>RETURN SENSOR TARGET (LUERS)</b>	<b>HOLDING PRESSURE TARGET</b>
<b>3.00</b>	21.36	28.07	-79.76	-86.48	-33.52
<b>3.50</b>	20.24	26.96	-81.49	-88.20	-34.94
<b>4.00</b>	19.13	25.84	-83.21	-89.92	-36.36
<b>4.50</b>	18.01	24.72	-84.93	-91.65	-37.78
<b>5.00</b>	16.90	23.61	-86.66	-93.37	-39.20
<b>5.50</b>	15.78	22.49	-88.38	-95.10	-40.62
<b>6.00</b>	14.66	21.38	-90.11	-96.82	-42.04
<b>6.50</b>	13.55	20.26	-91.83	-98.55	-43.46
<b>7.00</b>	12.43	19.15	-93.56	-100.27	-44.88
<b>7.50</b>	11.32	18.03	-95.28	-101.99	-46.30
<b>8.00</b>	10.20	16.92	-97.00	-103.72	-47.72
<b>8.50</b>	9.09	15.80	-98.73	-105.44	-49.14
<b>9.00</b>	7.97	14.69	-100.45	-107.17	-50.56
<b>9.50</b>	6.86	13.57	-102.18	-108.89	-51.98
<b>10.00</b>	5.74	12.46	-103.90	-110.62	-53.40
<b>10.50</b>	4.63	11.34	-105.63	-112.34	-54.82
<b>11.00</b>	3.51	10.23	-107.35	-114.06	-56.24
<b>11.50</b>	2.40	9.11	-109.07	-115.79	-57.66
<b>12.00</b>	1.28	7.99	-110.80	-117.51	-59.08
<b>12.50</b>	0.17	6.88	-112.52	-119.24	-60.50
<b>13.00</b>	-0.95	5.76	-114.25	-120.96	-61.91

<b>SENSOR ELEVATION ABOVE NOZZLE PLATE</b>	<b>SUPPLY SENSOR PRESSURE TARGET</b>	<b>SUPPLY SENSOR TARGET (LUERS)</b>	<b>RETURN SENSOR PRESSURE TARGET</b>	<b>RETURN SENSOR TARGET (LUERS)</b>	<b>HOLDING PRESSURE TARGET</b>
<b>13.50</b>	-2.07	4.65	-115.97	-122.68	-63.33
<b>14.00</b>	-3.18	3.53	-117.70	-124.41	-64.75
<b>14.50</b>	-4.30	2.42	-119.42	-126.13	-66.17
<b>15.00</b>	-5.41	1.30	-121.14	-127.86	-67.59
<b>15.50</b>	-6.53	0.19	-122.87	-129.58	-69.01
<b>16.00</b>	-7.64	-0.93	-124.59	-131.31	-70.43
<b>16.50</b>	-8.76	-2.04	-126.32	-133.03	-71.85
<b>17.00</b>	-9.87	-3.16	-128.04	-134.75	-73.27
<b>17.50</b>	-10.99	-4.27	-129.76	-136.48	-74.69
<b>18.00</b>	-12.10	-5.39	-131.49	-138.20	-76.11
<b>18.50</b>	-13.22	-6.51	-133.21	-139.93	-77.53
<b>19.00</b>	-14.33	-7.62	-134.94	-141.65	-78.95
<b>19.50</b>	-15.45	-8.74	-136.66	-143.38	-80.37
<b>20.00</b>	-16.57	-9.85	-138.39	-145.10	-81.79
<b>20.50</b>	-17.68	-10.97	-140.11	-146.82	-83.21
<b>21.00</b>	-18.80	-12.08	-141.83	-148.55	-84.63
<b>21.50</b>	-19.91	-13.20	-143.56	-150.27	-86.05
<b>22.00</b>	-21.03	-14.31	-145.28	-152.00	-87.47
<b>22.50</b>	-22.14	-15.43	-147.01	-153.72	-88.89
<b>23.00</b>	-23.26	-16.54	-148.73	-155.45	-90.31

## REGULAR MAINTENANCE SCHEDULE

- Replace recirculation filter every six months.
- Replace bulk filter every six months.
- Check bulk tanks for excess sediment and clean every six months.
- Replace vacuum pump tubing annually.

## ADJUSTING FLOW VIA BYPASS

A small hole is present in the front of the sensor block. Inserted into this hole is an adjustable hex screw that is used to increase and decrease flow through an internal bypass. The adjustment tool needed is a 3/32 SAE hex key, which is provided in the spare parts kit. Turning the screw clockwise will close down the bypass and decrease the recirculation pump's rpm, turning it counterclockwise will open it further and increase RPM. If the bypass is fully closed and the RPM is still 1000 or greater, then it should remain fully closed. Take care not to force the screw further once the bypass is fully closed or fully open, as this may damage the adjuster. On delivery, the bypass will be set about 1.5 turns open, which should allow the unit to start normally regardless of number or type of print heads that are attached. After the PM3 reaches the target temperature in 'run' mode, the bypass can be adjusted to the desired RPM. Around 1000 rpm is a good target. All PM3s that contain the internal flow bypass will also use the max capacity recirculation pump with the ball bearing modification. This modification corrects an issue that was causing the pump to lock up and function correctly.

## PRINTHEAD CONTAMINATION AND INK FILTER CONCERNS

One of the most common causes of printhead failures is contamination. Many of these failures occur when starting up a new ink system or replacing the filters. Once a printhead is contaminated, it can be difficult or impossible to recover the affected nozzles. The nozzles and fluid channels inside the printhead are extremely small and when partially or completely blocked, nozzle performance will be adversely affected. For this reason, **do not take shortcuts or bypass the recommended startup and filter flushing procedures.**

Even the best high quality filters sometimes contain a few stray particles or fibers upstream of the element. These are left behind from the manufacturing process and nearly impossible to completely eliminate. Filters are usually not pre-flushed by the manufacturer due to the difficulty of removing the residual flush and the potential problem of chemical incompatibility with the customers fluids that are unknown to the filter manufacturer. Virtually all of these stray particles will be flushed from the filter within the first hour of use, therefore, INX strongly recommends circulating ink without the printhead installed any time a new system is started or a recirculation filter is replaced. **NOTE: Skipping this process can immediately contaminate your printhead and render it unusable.**

Note that filters provided by INX are pre-flushed with INX UV Monomer for use with this system; however, we still recommend circulating ink without the printhead installed any time a new system is started or a recirculation filter is replaced. Pre-flushed filters from INX are strongly recommended.

If using non INX provided filters or fluids, we recommend that precautions recommended above be fully maintained. INX cannot be responsible for printhead contamination.

## PRE-INSTALL COMPATIBILITY FLUSH PROCEDURE

This procedure is necessary when the ink being used is not compatible with INX UV Flush.

**WARNING: PRINTHEAD MUST NOT BE CONNECTED DURING THIS PROCEDURE.**

1. Connect power, communication, and vacuum pump electrical and air connections as normal.
2. Verify loopback tubing with drain cap is installed below pressure sensor block.
3. Install 5  $\mu$  flushing filter in recirculation path. **(FLOW DIRECTION MUST BE UP)**
4. Install 5  $\mu$  flushing filter in ink fill path. **(FLOW DIRECTION MUST BE UP)**
5. Install customer ink compatible flush into bulk tank. (Fluid must be compatible with ink and printhead used in final application.)
6. Turn power on to JetINX Ink Recirc System (v3) and start JetINX Ink Recirc System (v3) Application.
7. Open the support screen by clicking on the name of the ink channel being flushed.
8. Click the Start Flush button.
9. Press the back button. The flush procedure will fill the tank and recirculate the flushing fluid for approximately 10 minutes after it has reached 45C.
10. After the flushing procedure has ended and the module is in stopped mode, empty the Ink Recirc Module.
11. Place drain pan below Ink Recirc Module sensor block and remove the drain cap.
12. Press "Stop" button on the JetINX Ink Recirc System (v3) application.
13. Press the "Empty" button on the JetINX Ink Recirc System (v3) application and wait for the Ink Recirc Module to eliminate the flushing fluid. (Complete drain of system will require multiple presses of the "Empty" button)
14. Power the unit down.
15. Remove the flushing filter from the recirculation loop. Cap ends of the filter and store for reuse later.
16. Install a new filter in recirculate position. (10 micron) **(FLOW DIRECTION MUST BE UP)**
17. Remove the flushing filter from the file line. Cap ends of the filter and store for reuse later.
18. Install a new filter in fill position. (5 micron) **(FLOW DIRECTION MUST BE UP)**
19. Continue with normal installation procedure.

## INSTALLATION AND INITIAL FILL PROCEDURE

**WARNING: PRINTHEAD MUST NOT BE CONNECTED TO BEGIN THIS PROCEDURE.**

1. Connect power, communication, and vacuum pump electrical and air connections as normal.
2. Verify loopback tubing with drain cap is installed below pressure sensor block.
3. Attach bulk ink tank filled with proper ink.
4. Be sure new bulk filter is installed. (5 micron) **(FLOW DIRECTION MUST BE UP)**
5. Be sure new recirculation filter is installed. (10 micron)



6. Turn power on to JetINX Ink Recirc System (v3) and start JetINX Ink Recirc System (v3) application.
7. Open the support screen by clicking on the name of the ink channel being filled.
8. Click the Start Flush button (runs with ink, not flush).
9. Press the back button. The flush procedure will fill the tank and recirculate the flushing fluid for approximately 10 minutes after it has reached 45C.
10. When the flush has completed, the Ink Recirc Module will enter the Stopped state.
11. Uncap the loopback drain and press Purge repeatedly until the ink and flush mixture is expelled.
12. Remove the ink loopback tubing below the sensor block and attach to your printheads with INX or other compatible tubing.
13. Printheads should already be prepped, including possible flushing. (See printhead manufacturer information related to possible chemical compatibility and fluid content of new printheads.)
14. With printheads installed, press Purge Button repeatedly while air is pushed out the printhead nozzles. (Usually 2-3 times). Continue only after ink without bubble or foam is flowing from printhead nozzles.
15. Press Run button and allow the ink system to begin recirculation and warming. (5-10 minutes)
16. Once Run state is achieved, wipe printhead nozzles with a lint free wipe and test. (Note: A low level of flush remains so the ink density may be slightly reduced for a short time).
17. Repeat for all other ink channels in your system.

## RECIRCULATION FILTER REPLACEMENT PROCEDURE

1. Materials needed:
2. Chemically compatible gloves.
3. Lint-free clean room grade wipes.
4. New filter (10 micron). **WARNING: USE ONLY PRE-FLUSHED FILTERS FROM INX**
5. Filter caps. (plugs made from tubing)
6. JetINX Ink Recirc System (v3) should be powered down or in Stopped state.
7. Wearing gloves and with wipes positioned to catch drips, remove the old filter and cap immediately.
8. Install the new filter. **(FLOW DIRECTION MUST BE UP)** Minimize possibility of contamination by performing installation immediately with minimal exposure of system to dust (and light if UV cured ink).
9. Power up and purge the system repeatedly until bubbles and foam are pushed out of the nozzles. Continue purge cycles until bubbles and foam stop and normal ink is expelled from the nozzles.
10. Press Run and wait for system to start normally. (Note: Sometimes a Recirc/filter error will occur on the initial start due to air in the system. Retrying usually resolves this issue.)
11. It is possible that trapped air from the new filter will flow thru the system for the next several hours. This air can cause momentary nozzle drop outs. This air will be eliminated from the system over several hours of running. INX recommends that the ink system be left in the run state to speed this process. Any printing done during this time may experience these nozzle drops outs. This should not be considered an ink system failure or problem.

## BULK INK FILTER REPLACEMENT PROCEDURE

1. Materials needed:
2. Chemically compatible gloves.
3. Lint-free clean room grade wipes.
4. New filter (5 micron) **WARNING: USE ONLY PRE-FLUSHED FILTERS FROM INX**
5. Filter caps. (plugs made from tubing)
6. JetINX Ink Recirc System (v3) should be powered down or in Stopped state. (Filling disabled)
7. Wearing gloves and with wipes positioned to catch drips, remove the old filter and cap immediately.
8. Install the new filter. **(FLOW DIRECTION MUST BE UP)** Minimize possibility of contamination by performing installation immediately with minimal exposure of system to dust (and light if UV cured ink).
9. Press Run and wait for system to start normally.
10. Air that is trapped in the new filter will be expelled from the system over the next 21-30 fill cycles. This process can cause the fill pump to run excessively as air is being pumped instead of ink as normal. This air may cause a fill pump or fill filter alarm which can safely be ignored in light of the recent filter replacement. This should not be considered an ink system failure.

## PREPARING A MODULE FOR PACKING AND SHIPMENT

The objective is to get most of the ink out of the module and seal it so that no ink leaks out in shipment. If ink leaks out during shipment, it will damage the wiring and circuit boards inside the module. **Please be sure all caps and seals are in place and tight as you pack the module.**

Materials needed:

- Chemically compatible gloves.
- Clamps (hemostats) for clamping ink lines.
- Male and female luer caps.
- A waste ink container of at least 500ml capacity.

### If your module is functional:

1. If the unit is running, click on the red "stop" button in the JetINX control application, and wait until "stopped" is displayed in the blue status field.
2. Clamp the flexible tubing on each side of the luer fittings that go to the print head. Disconnect the luers and cap the line coming from the module using a female luer cap. Cap the line going to the print head with a male luer cap. Use the same procedure for the line that returns from the print head to the module. Repeat for other head if you have a dual head installation.
3. Remove the clamps from the lower section (print head) set of tubes.
4. Remove the luer caps from both lines of the module, then remove the clamps, directing the tubes into a waste ink container.
5. If the unit is running, click on the blue "Actions" button and then the blue "Empty" button in the JetINX control application. It may be necessary to have one person do this while another holds

the waste ink container in place. Continue clicking on the “Empty” button until mostly just air comes out of the lines.

6. Replace the luer caps on the module side set of tubes, and dispose of the used ink properly.
7. Turn off power to the module, and remove all tubes and wires that are connected at the top.
8. Remove the filter and place male luer caps on it, and place female luer caps where it was removed.
9. Place a male luer cap where the clear vacuum line was removed.
10. Place a ¼" stub of poly tubing with a heat sealed end in the white ink inlet port on the top of the module. A piece of tubing like this was shipped with the module.
11. Remove fasteners that hold the unit in place, slide it out, and package it for shipment using the original packing materials if possible.

**If your module is non-functional:**

1. Turn off power to the module, and remove all tubes and wires that are connected at the top.
2. Remove the filter and place male luer caps on it.
3. Clamp the flexible tubing on each side of the luer fittings that go to the print head. Disconnect the luers and cap the line coming from the module using a female luer cap. Cap the line going to the print head with a male luer cap. Use the same procedure for the line that returns from the print head to the module.
4. Remove the clamps from the lower section (print head) set of tubes.
5. Remove the luer caps from both lines of the module, then remove the clamps, directing the tubes into a waste ink container.
6. Let the ink drip into the waste container until it stops, and then replace the luer caps on the module side set of tubes. Dispose of the used ink properly.
7. Place female luer caps where the filter was removed, and a male luer cap where clear vacuum line was removed.
8. Place a ¼" stub of poly tubing with a heat sealed end in the white ink inlet port on the top of the module. A piece of tubing like this was shipped with the module.
12. Remove fasteners that hold the unit in place, slide it out, and package it for shipment using the original packing materials if possible.

# TROUBLE SHOOTING GUIDE

## FILL PUMP RUN ERROR

A fill pump run error occurs when the fill pump runs for an extended period of time and is unable to achieve a full status in the recirculation tank. This can occur during initial filling or after bulk filter replacement due to excessive air in the system. If the error occurs at any other time, a fill pump run error would normally indicate that the bulk ink filter should be replaced.

To troubleshoot a fill pump running error check the following:

1. Verify that fill pump is actually running. If it is not running, check the wiring connecting it to the pressure module.
2. Verify that there is sufficient ink in the bulk tank so that the pickup tube is submerged and the system shows low or normal ink level in the bulk tank.
3. Inspect for leaks around the bulk filter, fill pump, and tube feedings on the manifold and at the top of the Ink Recirc Module.

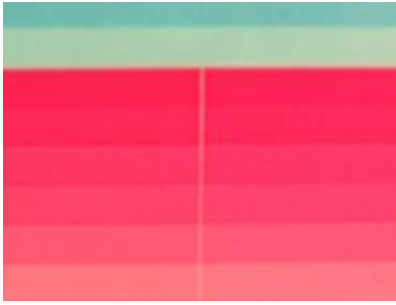
## RECIRCULATION PUMP RUN ERROR

In the event of a recirculation pump run error, the module will immediately go into stopped mode and the recirculation pump will stop. Here is a list of possible causes for this error:

1. **Recirculation Filter Clogged** – If the recirculation filter is clogged, ink flow through the filter is restricted so that the target pressure at the sensor block cannot be achieved despite the recirculation pump running at its maximum speed. To correct, replace the recirculation filter. The Recirculation Filter Replacement Procedure can be found in the Operational and Maintenance Procedures section of this manual.
2. **Printhead Not Connected** – If there is no printhead attached below the sensor block, the target pressure cannot be achieved. Without the normal flow resistance provided by a printhead, the supply-side target pressure cannot be achieved despite the recirculation pump running at its maximum speed. To resolve the error, install at least one printhead. Do NOT bypass a single printhead by connecting the tubing intended for the second printhead.
3. **Printhead Blocked** – If the printhead is blocked, ink flow through the printheads is restricted so that the target pressure is achieved at a very low pump speed. This condition could also be caused by a clamped, kinked or clogged tube anywhere below the sensor block. Check to remove blockages or restrictions.

## PRINTHEAD NOZZLE BLOCKAGE

Sometimes a nozzle can become partially or fully blocked due to contamination. The picture below illustrates a test print with a blocked nozzle:



### **EXERCISE THE PRINTHEAD**

The easiest method for unblocking a nozzle is to exercise the printhead. To exercise the printhead, perform the following steps:

1. Press the Actions / Start button and wait for module to achieve a running state.
2. Lower or raise the printhead to allow enough clearance to place your hand under the printhead.
3. Put on protective gloves and fold a lint free cloth in to quarters. Hold the cloth below the printhead.
4. Using the printhead control software, jet ink through the head for approximately 3 seconds.
5. When the jetting stops, wipe the printhead with the lint free cloth.
6. Raise/Lower the printhead into printing position and print a test page.

If the nozzle is still clogged, try exercising the head 2-3 times. If it remains clogged, next try reversing the ink flow as described in the steps below.

### **REVERSE THE FLOW THROUGH THE PRINTHEAD**

If exercising the printhead did not unclog the nozzle, it is helpful to reverse the flow of ink through the printhead (\*\*if the printhead supports this method. Consult with INX personnel before performing this procedure.) Reversing the flow can often move the contamination back to the recirculation tank and eventually to the filter, thus eliminating it as a problem. To reverse the flow of ink through the printhead, perform the following steps:

1. Press the Actions / Stop button and wait for module to achieve stopped state.
2. Place drip pan or lint free cloth under printhead as some weeping may occur when is stopped.
3. Locate the two Luer fittings in the tubing between the sensor block and the printhead through which you want to reverse the flow.
4. Pinch both lines above the Luer fittings with INX provided hemostats.
5. Simply disconnect the Luer fittings and reconnect swapping the lower section of tubing so that flow through the printhead is reversed.
6. Remove hemostats and check black tubing for any sharp bends or kinks before starting the ink system.
7. Press the Actions / Run button and wait for module to achieve running state.

Most recirculating printheads operate equally well flowing normal or reversed so there is usually no need to restore flow to its original direction. Consult your printhead manufacturer to determine if this is the case for your printhead.

## CONNECTOR PIN OUTS

### INK RECIRC MODULE CONNECTOR PINOUTS

<b>POWER IN CONNECTOR</b>	<ul style="list-style-type: none"> <li>1 +24VDC</li> <li>2 24VDC Return</li> <li>3 N/C</li> <li>4 Earth Ground</li> <li>5 230VAC L1</li> <li>6 230VAC L2</li> </ul>
<b>CAN BUS CONNECTOR</b>	<ul style="list-style-type: none"> <li>1 24VDC Return</li> <li>2 CAN Low</li> <li>3 Shield</li> <li>4 CAN High</li> <li>5 +24VDC</li> </ul>
<b>VACUUM PUMP OUT CONNECTOR</b>	<ul style="list-style-type: none"> <li>1 Vacuum pump +</li> <li>2 Vacuum pump -</li> <li>3 N/C</li> <li>4 N/C</li> </ul>
<b>BULK INK I/O CONNECTOR</b>	<ul style="list-style-type: none"> <li>1 Fill Pump +</li> <li>2 Fill Pump -</li> <li>3 Bulk Low Out</li> <li>4 Bulk Low In</li> <li>5 Bulk Empty Out</li> <li>6 Bulk Empty In</li> <li>7 N/C</li> </ul>

### USB -CAN CONNECTOR PINOUTS

<b>POWER/CAN BUS CONNECTOR (J2)</b>	<ul style="list-style-type: none"> <li>1 24VDC Return</li> <li>2 CAN Low</li> <li>3 Shield</li> <li>4 CAN High</li> <li>5 +24VDC</li> </ul>
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**POWER SUPPLY CONNECTOR PINOUTS**

<b>INK MODULE POWER DISTRIBUTION BOARD</b>	1 +24VDC 2 24VDC Return 3 N/C 4 Earth Ground 5 230VAC L1 6 230VAC L2
<b>PRINthead POWER DISTRIBUTION BOARD</b>	1 +36VDC 2 36VDC Return 3 +12VDC 4 12VDC Return 5 Earth Ground
<b>USB HUB POWER</b>	1 +5VDC 2 +5VDC 3 5VDC Return 4 5VDC Return



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