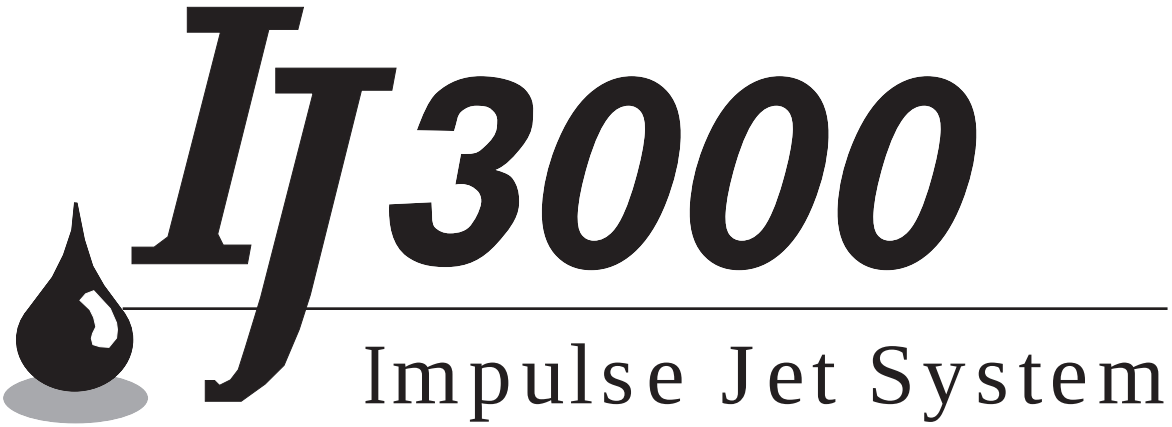
Operations Manual



5760-111
Revision L

1 Missouri Research Park Drive • St. Charles, MO 63304 • ServiceLine 1-800-526-2531

IJ3000 Impulse Jet
Ink Jet System
Operations Manual

5760-111
Revision L

Warranty:

IJ3000 Impulse Jet

The IJ3000 Impulse Jet system, including all components unless otherwise specified, carries a limited warranty.

The inks and conditioners used with the IJ3000 Impulse Jet system carry a limited warranty.

For all warranty terms and conditions, contact Diagraph an ITW Company for a complete copy of the Limited Warranty Statement.

Section 1: Introduction

IJ3000 Impulse Jet System Description

The IJ3000 Impulse Jet system consists of a controller, a Centralized Ink Delivery System (CIDS), and high resolution, piezoelectric, impulse jet print heads for printing text, graphics and bar codes.

The IJ3000 controller consists of printing interface electronics, a color display with touch screen, and a QWERTY style keypad, in a sealed industrial enclosure. The controller incorporates a Graphical User Interface with intuitive, easy to use control software. The controller can be used as a stand-alone device or networked through built-in Ethernet connectivity.

The IJ3000 Centralized Ink Delivery System (CIDS3000) consists of a large ink supply, reservoir, pressure pump, vacuum pump, power supply, electronic controller board, ink status beacon, and ink waste collection components, in a sealed industrial enclosure. The CIDS pumps ink from the large ink supply bottle to each of the print heads in the system. Ink status is monitored via a level detect in the CIDS reservoir to detect when the ink bottle needs replacing. The empty bottle status is reported to the controller and to an ink status beacon built into the system. The CIDS also includes a vacuum pump which pulls ink and debris back to a waste collection bottle as part of the Automatic Cleaning System (ACS). The vacuum pump is turned on when any of the print heads in the system run an ACS cleaning cycle. This allows for waste ink to be collected in one bottle for "clean hands" operation.

The IJ3000 Impulse Jet print head assembly consists of a piezoelectric impulse jet print engine, a small ink reservoir, solenoid valves, and an electronic controller board to control both printing and fluidic management functions of the print head. The piezoelectric impulse jet print engine ejects very small ink droplets to print high resolution images of text, barcodes and graphics. Each print head incorporates a small ink reservoir allowing ink to be supplied on demand from the Centralized Ink Delivery System. This allows ink from one source to be pumped to multiple print heads. The print head also incorporates an Automatic Cleaning System (ACS) to remove dirt and debris from the orifice plate. A small vacuum channel has been designed into the bottom of the nozzle plate. During an ACS cycle, a small amount of ink is pulsed through the orifices; the ink and debris is vacuumed off the nozzle plate and is drawn back to the waste collection bottle located in the CIDS.

NOTE: The NP (Non-Porous) system provides two important enhancements over the standard porous ink system. First, the AFS (Automatic Flushing System – patent pending) provides pressurized solvent to the most critical area of the print head which enhances the Automatic Cleaning System by breaking down difficult dried non-porous ink and debris. Secondly, the SCS (Smart Cleaning System) significantly enhances the quality of the first image printed after long rest periods of operation, a well-known issue of a non-porous inkjet system.

This manual describes hardware installation for the IJ3000 Impulse Jet System. The IJ3000 Controller operation is described in a separate manual: 5760-121 IJ3000 Controller Operation Manual.

Section 2: Safety

Following is a list of safety symbols and their meanings, which are found throughout this manual. Pay attention to these symbols where they appear in the manual.

Wear safety goggles when performing the procedure described!

Caution or Warning! Denotes possible personal injury and/or damage to the equipment.

Caution or Warning! Denotes possible personal injury and/or equipment damage due to electrical hazard.

NOTE: (Will be followed by a brief comment or explanation.)

CAUTION: The CIDS3000 Ink Delivery System contains hazardous voltage (115/230VAC). Turn off the equipment's main power before:

- Performing preventive maintenance.
- Performing any repairs to the unit.
- Servicing the equipment in any manner.

ESD protection should be worn when servicing internal printed circuit boards.

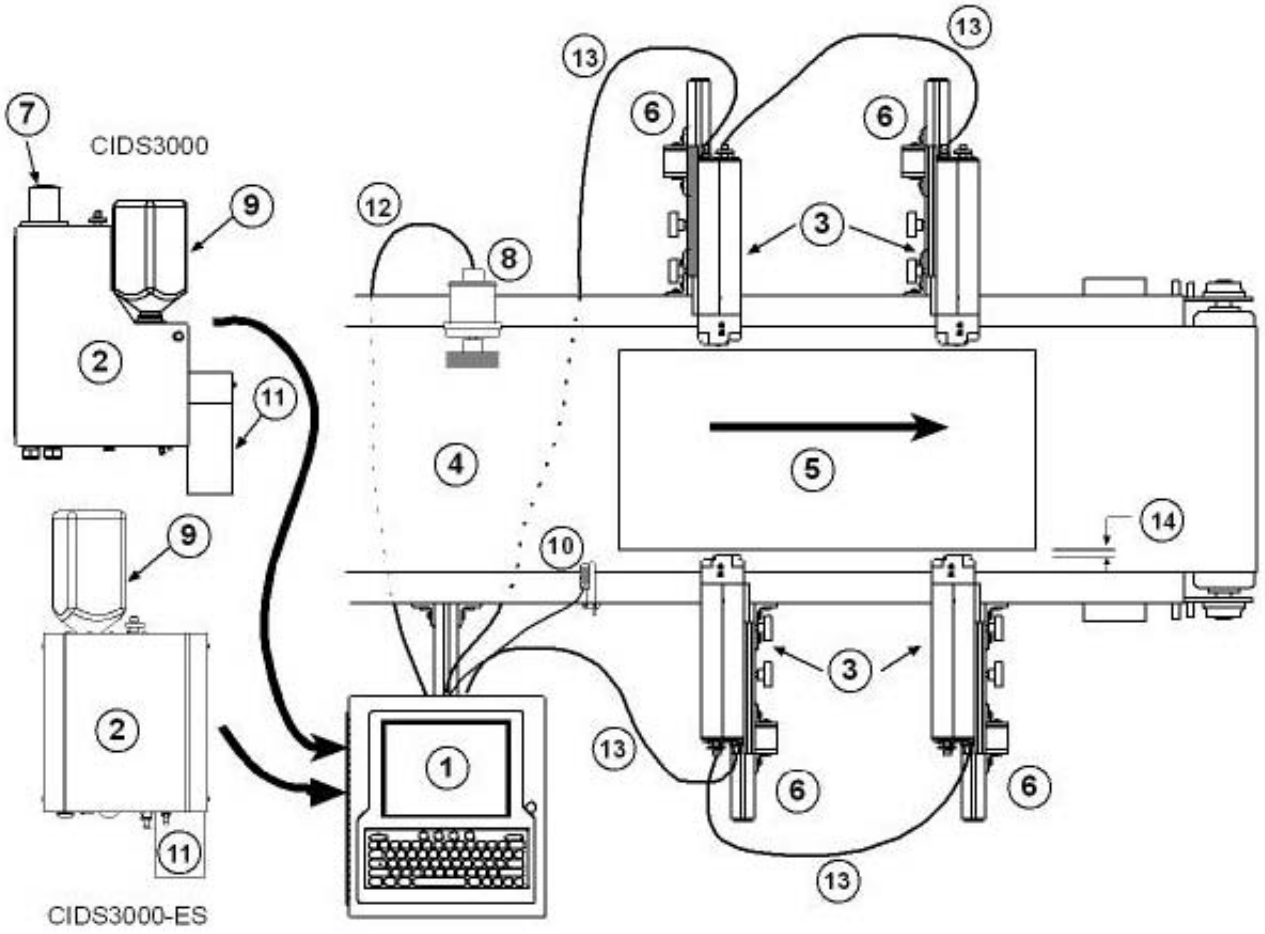
After service to the equipment is completed, replace all protective devices such as grounding cables and covers before operating the equipment.

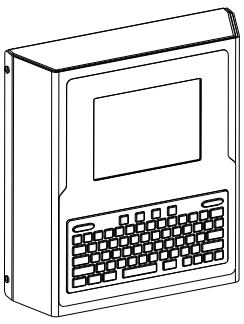
It is extremely important to:

- Clean up all spills with the appropriate conditioner immediately and dispose of all waste according to local and state regulations.
- Wear safety glasses and protective clothing, including gloves, when handling all inks and conditioners.
- Store inks and conditioners under the recommended conditions found on the MSDS (Material Safety Data Sheet).

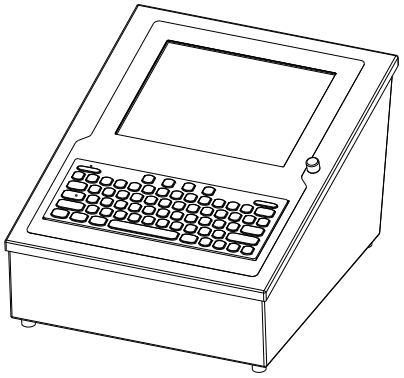
Section 3: System Components

1 IJ3000 Controller
2 CIDS3000
3 Print Heads
4 Conveyor
5 Product
6 Print Head Bracketry
7 Ink Status Beacon
8 Encoder
9 Ink Supply
10 Photo Sensor
11 Vacuum Waste Collector Bottle
12 Encoder Cable
13 Controller to Print Head Cable
14 Throw Distance (1/8" Recommended)





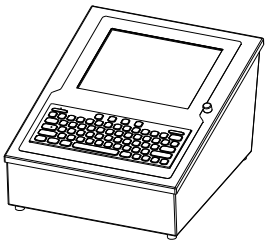
IJ3000-ES



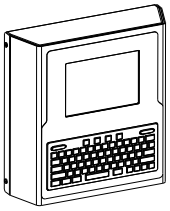
IJ3000-XLS

The Diagraph IJ3000 Impulse Jet System is available with the following components, options and service kits:

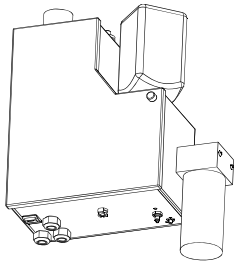
Part Number	Description
	IJ3000 XLS Controller Assemblies
5760-009SJ1D	Stainless Enclosure, Single Interface, Domestic
5760-009SJ2D	Stainless Enclosure, Dual Interface, Domestic
5760-009SJ1E	Stainless Enclosure, Single Interface, European
5760-009SJ2E	Stainless Enclosure, Dual Interface, European



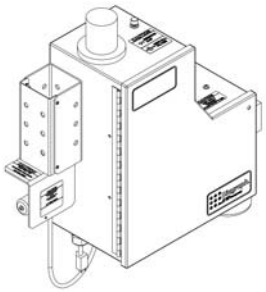
	IJ3000 ES Controller Assemblies
5765-001DJ	Painted Enclosure, Single Interface, Domestic
5765-001EJ	Painted Enclosure, Single Interface, European



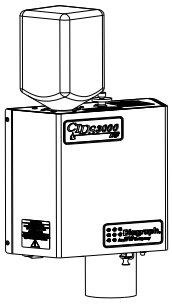
	CIDS3000 System w/ ACS (Includes Tubing Kit)
5760-015SDS2	Stainless Enclosure, Domestic, ScanTrue® II
5760-015SES2	Stainless Enclosure, European, ScanTrue® II



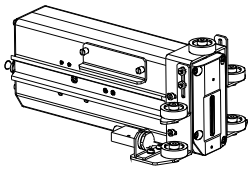
	CIDS3000 Non-Porous System w/SCS (Includes Tubing Kit
5760-025DNP	Stainless Enclosure, Domestic, Non-Porous, A5000



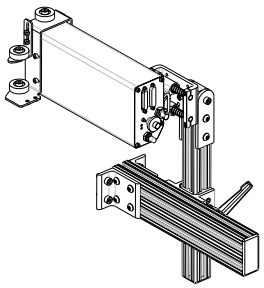
	CIDS3000 ES System w/ ACS (Includes Tubing Kit)
5765-002PDS2	Painted Enclosure, Domestic, ScanTrue® II
5765-002PES2	Painted Enclosure, European, ScanTrue® II



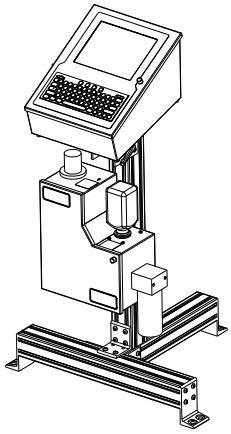
Part Number	Description
	Standard Impulse Jet Print Head w/ ACS
5760-019384S2	IJ384 Print Head, ScanTrue II®
5760-032384NP	IJ384 Print Head, AllWrite A5000
5760-017768S2	IJ768 Print Head, ScanTrue II®



	Print Head Bracketry
5760-810	Roller/Retracting Bracket, IJ384 (Includes 5760-366)
5760-388	Roller/Retracting Bracket, IJ768 (Includes 5760-366)
5760-366	Single Print Head Conveyor Mounting Kit
5760-354	Multi Print Head Conveyor Mounting Kit (Requires Single Print Head Kits)
5760-355	Print Head Floor Mounting Kit (Requires Single Print Head Kits)
5760-356	Multi Print Head Floor Mounting Kit w/24" Bar (Requires Single Print Head Kits)
5760-357	Multi Print Head Floor Mounting Kit w/44” Bar (Requires Single Print Head Kits)

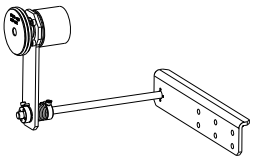


	Controller/CIDS Bracketry
5760-350	Controller/CIDS Conveyor Mounting Kit
5760-351	Controller/CIDS Pedestal Mounting Kit
5760-352	Controller/CIDS T-Base Mounting Kit
5760-362	Controller 90° Pivot Bracket Kit
5760-368	CIDS Mounting Kit
5765-200	IJ3000-ES Controller Mounting Kit

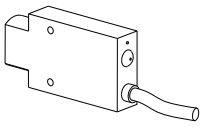


	Print Head Cables
5760-614-002	Print Head Cable Assembly, 2’
5760-614-010	Print Head Cable Assembly, 10’
5760-614-015	Print Head Cable Assembly, 15’
5760-614-025	Print Head Cable Assembly, 25’

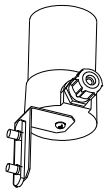
Part Number	Description
	Encoder
5760-820-IJ	Encoder Assembly w/Mounting Bracket & 25’ Cable
2464-182-010	Extension Cable, 10’
2464-182-025	Extension Cable, 25’



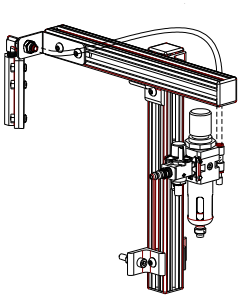
	Photosensor
5760-383	Photosensor, Diffuse Type & 20’ Cable
5760-871	Photocell, Smart Cleaning System (Non-porous systems only)
2464-182-010	Extension Cable, 10’
2464-182-025	Extension Cable, 25’



	Beacon
5760-345	Beacon, Remote, CID3000 and CIDS3000 ES



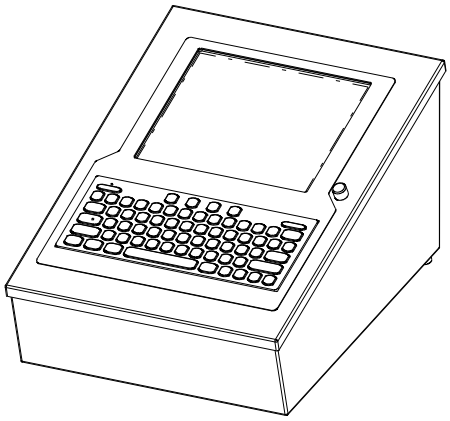
	Air Knife (For use w/ Non-Porous System)
5765-006	Air Knife, Single Sided System
5765-006D	Air Knife, Double Sided System



IJ3000 Controller

The controller gathers and stores all the information required for printing a message. This information can come from the following sources:

1. The user interface, which tells the controller what message to print on the product.
2. The photosensor, which tells the controller when to print.
3. The encoder, which tells the controller how fast to print. There are two types of encoders:
   - •A built-in **fixed speed encoder** is used when the conveyor speed does not change.
   - •An optional, conveyor-mounted **variable speed encoder** is used when the line speed varies or has frequent starts and stops.



With this information, the controller knows exactly when the leading edge of the product will reach the print head and at what rate of speed.

The controller is constructed of a stainless steel case that makes it splash-proof and resistant to electromagnetic interference. A hinged cover provides access to replaceable parts.

The IJ3000 Impulse Jet Controller can control the following print heads per interface board:

- (1) 5760-017768S2, 256-channel print heads, or
- (2) 5760-019384S2, 128-channel print heads.

NOTE: With the optional second controller interface board (part number 5760-334D), the system can control twice as many print heads.

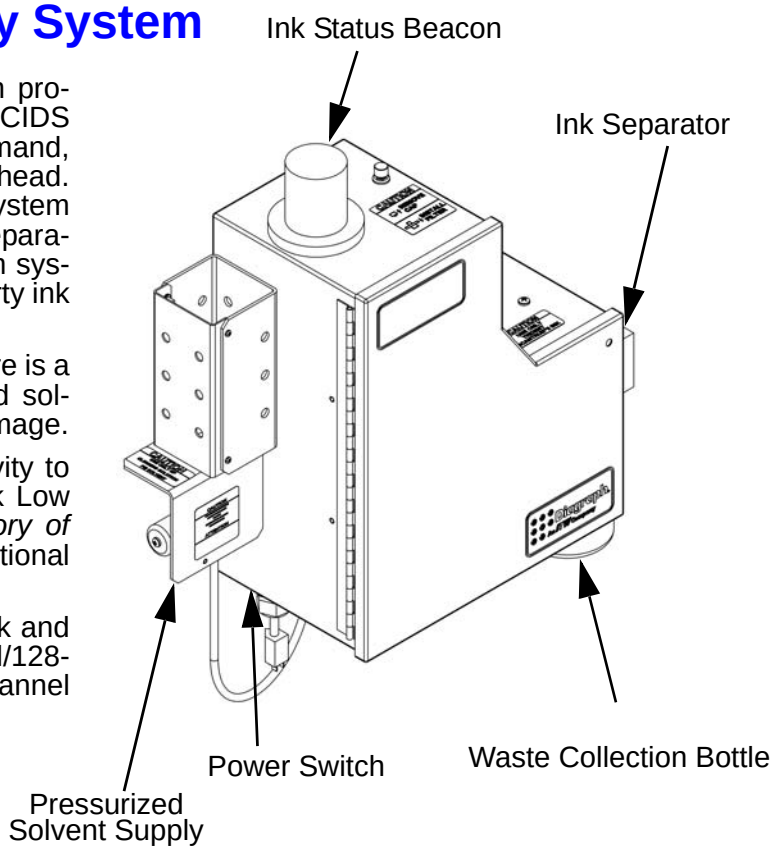
CIDS3000 Ink Delivery System

The Centralized Ink Delivery System provides ink to the print heads. The CIDS pumps ink to the print heads on demand, based on output signals from each head. The CIDS also contains a vacuum system consisting of a vacuum pump, ink separator, and collection bottle. The vacuum system provides a means of collecting dirty ink during an automatic cleaning cycle.

If this is a non-porous CIDS, then there is a modification to include a pressurized solvent supply as seen in the adjacent image.

The CIDS includes system connectivity to supply operational data including Ink Low and Ink Out. See *Appendix B, Theory of Operation*, for a complete operational description.

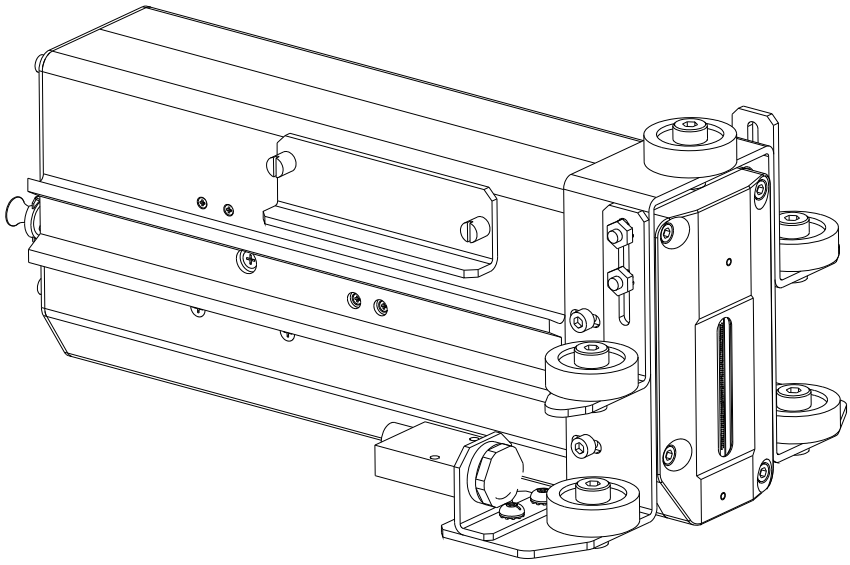
NOTE: The CIDS3000 can supply ink and vacuum for up to four 32-channel/128-channel print heads, or two 256-channel print heads.



IJ3000 Impulse Jet Print Head

The Impulse Jet print heads receive data signals from the IJ3000 controller in response to image data created for the print message. The head supplies voltage pulses to the piezo-electric impulse jet print engine to produce ink droplets required to form high resolution print images.

The print head houses the piezoelectric print engine, the drive electronics, and the ink system components. Ink is supplied to the head from the CIDS3000. The ink is pumped into a small reservoir in the head, which supplies the print engine ink. The head also contains intake, purge, and return solenoid valves to manage ink flow during printing, auto priming, and automatic cleaning cycles See *Appendix B: Theory of Operation* for a complete operational description.

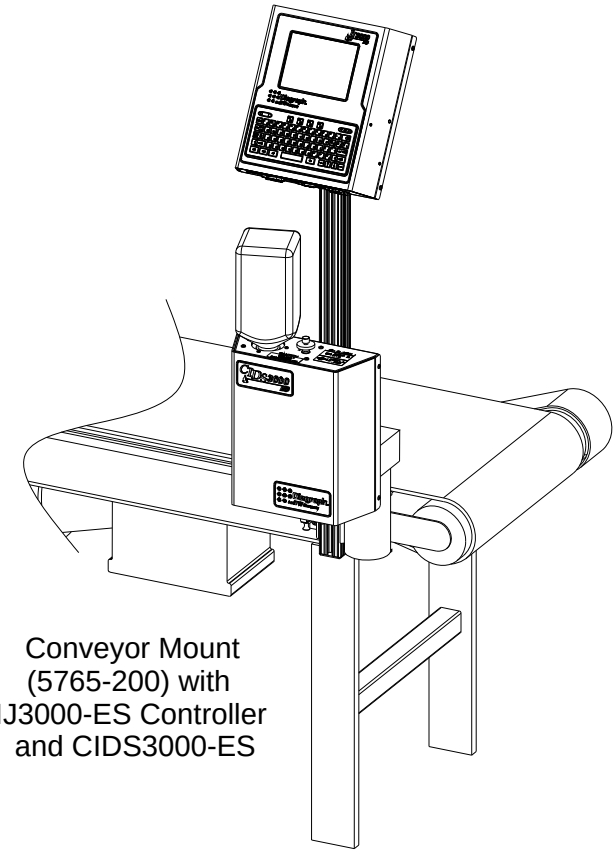


Print Head Model

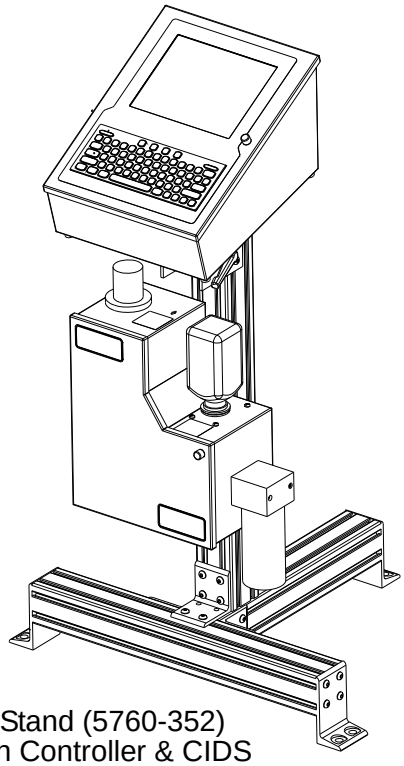
Part Number	Type	Characteristics	Ink Type
5760-019384S2	IJ384/128 ACS	2" Solid Print Height 128 Channels	ScanTrue® II
5760-017768S2	IJ768/256 ACS	4" Print Height 256 Channels	ScanTrue® II
5760-032384NP	IJ384/128ACS Non-Porous	2” Solid Print Height 128 Channels	Allwrite A5000

Bracketry

Bracketry is the structure that supports the controller, CIDS, print heads, and other accessories. This manual details instructions for mounting all system components to a conveyor. Other mounting options for the controller and CIDS include the pedestal and T-stand, shown below. Assembly instructions are included with parts kits.



Conveyor Mount (5765-200) with IJ3000-ES Controller and CIDS3000-ES

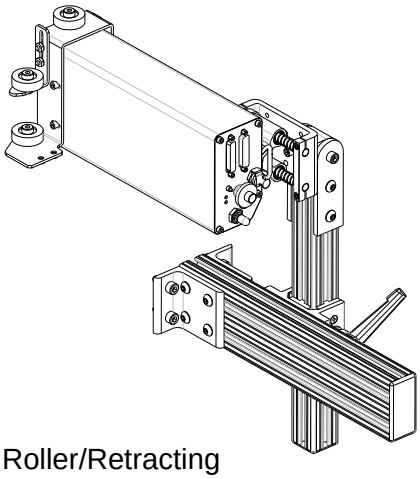


T-Stand (5760-352) with Controller & CIDS

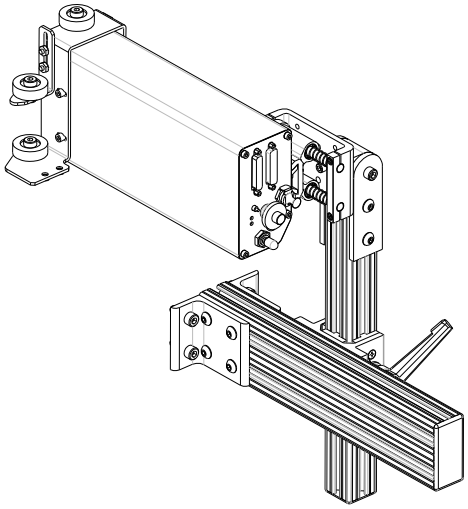
Print Head Bracketry

There are numerous options for mounting print heads. Diagraph bracketry is modular and can assume several configurations:

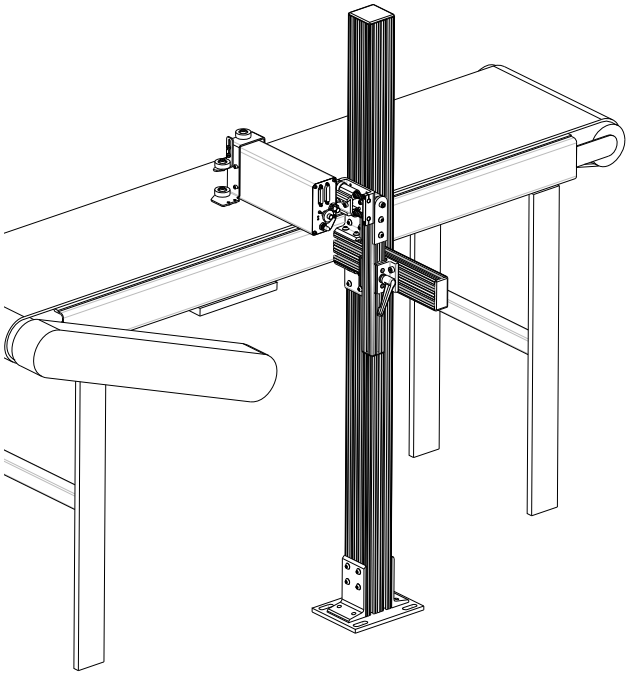
- Roller/retracting bracket mount
- Single-pole conveyor mount
- Multi-print head conveyor mount (not shown)
- Single-pole floor mount
- Double-pole floor mount



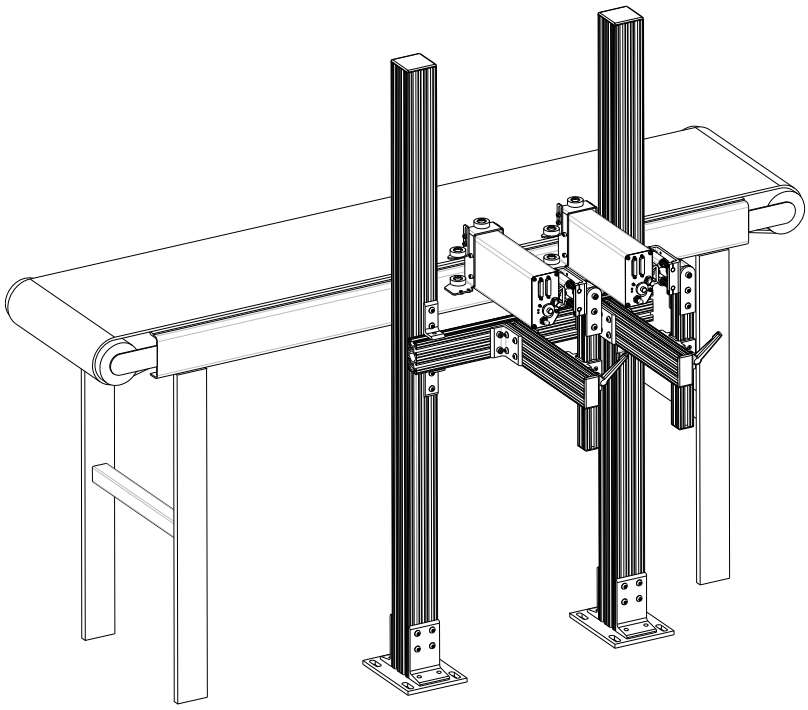
Roller/Retracting Bracket Mount for IJ384 Print Head (5760-810)



Roller/Retracting
Bracket Mount for IJ768
Print Head (5760-388)



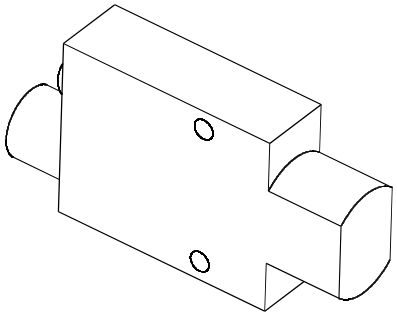
Single-Pole
Floor Mount
(5760-355)



Double-Pole Floor Mount
(5760-356 or 5760-357)

Print Trigger Photosensor

The photosensor (5760-383) is both a light source and a sensor. It emits light and detects the arrival of a product when the product reflects the light source back to the sensor. The sensor then sends a signal to the controller to start the printing cycle.

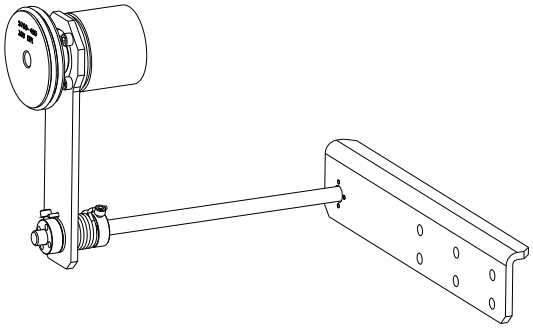


Encoder

The variable speed encoder assembly (5760-820-IJ) provides conveyor line speed information to the controller.

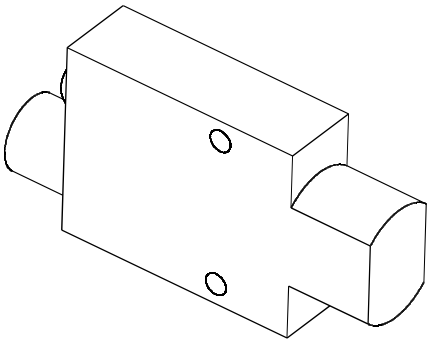
In addition to providing line speed information, an encoder also allows automatic disabling of printing when the line stops.

The Impulse Jet System uses a 2400 ppr open collector output encoder. The wheel is sized to provide the correct timing inputs to allow the Impulse Jet heads to print from 100 to 300 dpi.



SCS (Smart Cleaning System) Photosensor

The SCS photosensor (5760-871) is similar to the print trigger photosensor but functions as an integral part of the SCS (Smart Cleaning System) by assisting with quality enhancement of the first printed image after a delay between prints.



Air Knife

The air knife system is an optional device used to expedite drying on non-porous applications. Although results vary with application, half the dry time or better is typical when compared to without the air knife. Mounting bracketry for the side of a conveyor is included. The air knife is sold as a single side or dual side device.When ordering for dual side application, order one each of both the single and dual side part numbers.

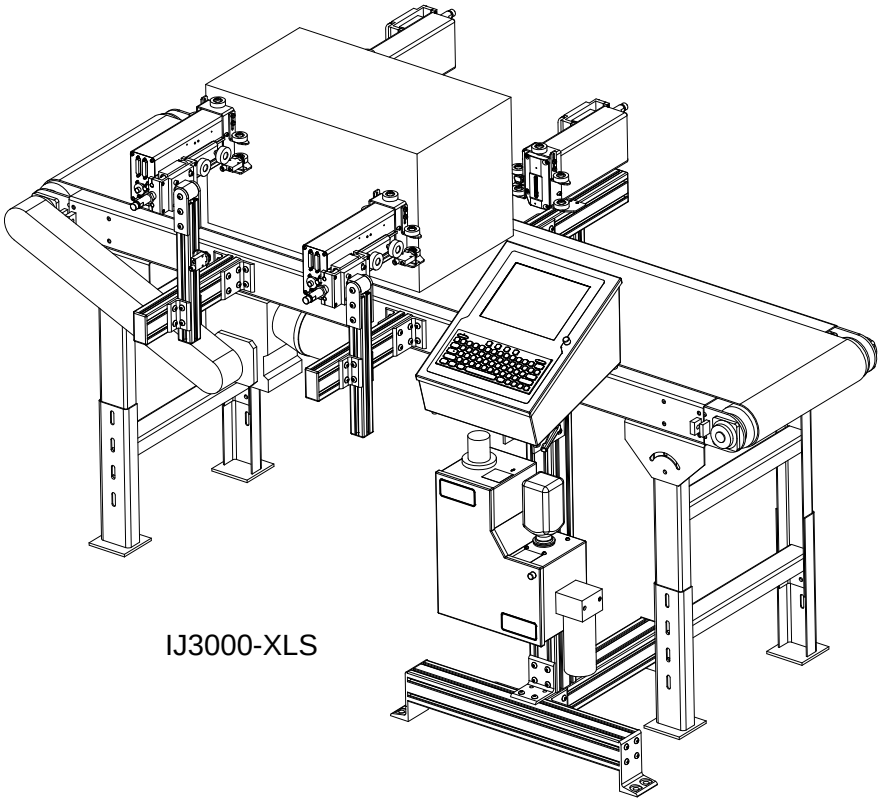
Ink

Ink is supplied via 500 mL or 1 liter plastic containers. Ink types include ScanTrue® II pigmented ink for high edge definition porous substrate and AllWrite A5000 non-porous surfaces or special coated cartons.

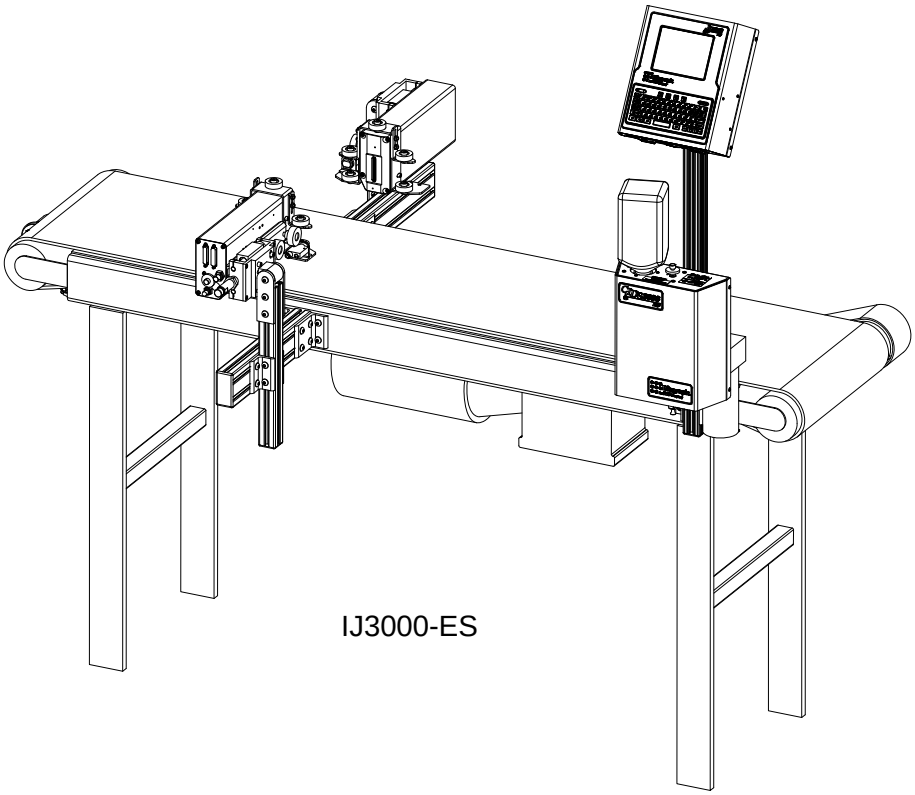
NOTE: Never mix ink types because they are not miscible. Irreversible internal damage will occur.

Section 4: Installation

The figure below illustrates a typical install with a controller and four print heads. (Cables and ink lines are not shown.)



IJ3000-XLS



IJ3000-ES

Material Handling Requirements

- The conveyor line must be a slider bed type
- The printing location must be in an area where the product travels past the printhead(s) smoothly. If the carton bounces or skips, the code will be wavy.
- Belt: Smooth, friction type, with endless splice or hidden lace. PVC 120 type preferred.
- Frame: Flat steel table top under belt.
- Drive: Direct or Timing Belt
- Guard rails on the conveyor must be installed to protect the printhead(s) from being bumped out of position while guiding the cartons smoothly within 1/8" of the printhead, and must keep the carton square to the printhead. Guard rails must provide protection from damaged cartons, out of square cartons or open flaps.
- Vibration: The print station should be free-standing. All vibration from other equipment or carton transfer must be isolated from the print station by bracing or modifying the conveyor system.
- Belt Tracking: Side to side motion must be elimiated. Inconsistent belt tracking will cause poor print quality and wavy bar codes.
- Incline: Maximum conveyor incline cannot exceed 30 degrees.
- A sufficent gap between products must be maintained for the item detect to function properly. This gap varies depending on speed of the conveyor line.
- To achieve maximum quality, the printhead(s) should be mounted as close to the substrate as possible.
- Where possible, the use of the Diagraph-supplied shock absorber roller brackets will provide for control and registration of the carton as it passes throught the printhead.
- **NOTE:** Glue machines and case formers tend to have glue strand (angel hair) buildup which will stick to the printhead because the head is heated to 140 degrees. The glue can cuase channels in the faceplate to become blocked, causing poor print quality. It is important that all glue machines be adjusted to eliminate excess glue. Brushes or rollers can be installed to prevent this glue from reaching the printhead(s).

Materials Required for Installation

- Lint-free wipes
- Level
- Tape measure

Use appropriate safety equipment and procedures. Leave print heads in their shipping cartons until all bracketry is in place and tightened down.

System Installation Overview

NOTE: The following steps give an overview of the procedure to properly install the IJ3000 Impulse Jet print system. Refer to the appropriate section for details.

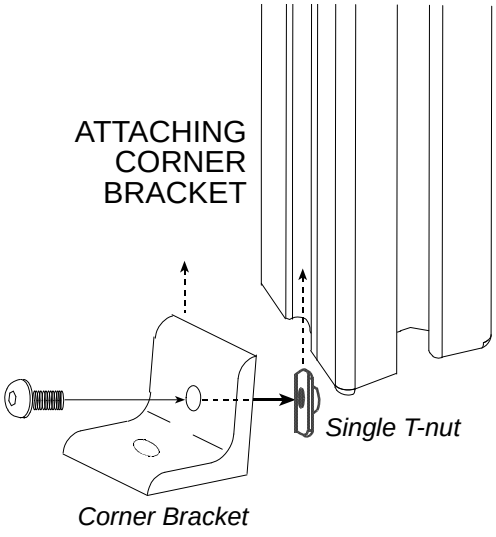
1. Carefully plan the mounting location of the equipment. Keep in mind bracketry hardware location and printer equipment size.
2. Remove equipment from packaging.
3. Assemble all bracketry to the floor, conveyor, or other bracketry per bracketry installation section.
4. Mount the IJ3000 and CIDS3000 to their appropriate bracketry. Do not connect to power outlet.
5. Assemble the optional retracting and roller bracket to each print head, if applicable.
6. Mount the print head(s) to their appropriate bracketry and in the approximate location relative to the carton.
7. Mount the photosensor, optional bracketry, and optional encoder per procedure.
8. Make all appropriate electrical cable connections to the inside of the IJ3000. Do NOT connect the print head cables to the print heads.
9. Power the IJ3000 and CIDS3000. Do NOT connect the print head cables to the print heads.
10. Install all plumbing lines, but do NOT insert quick-disconnect fittings into back of print heads.
11. Bleed all the ink lines per procedure.
12. Prime the print heads per procedure.
13. System is ready for first print.

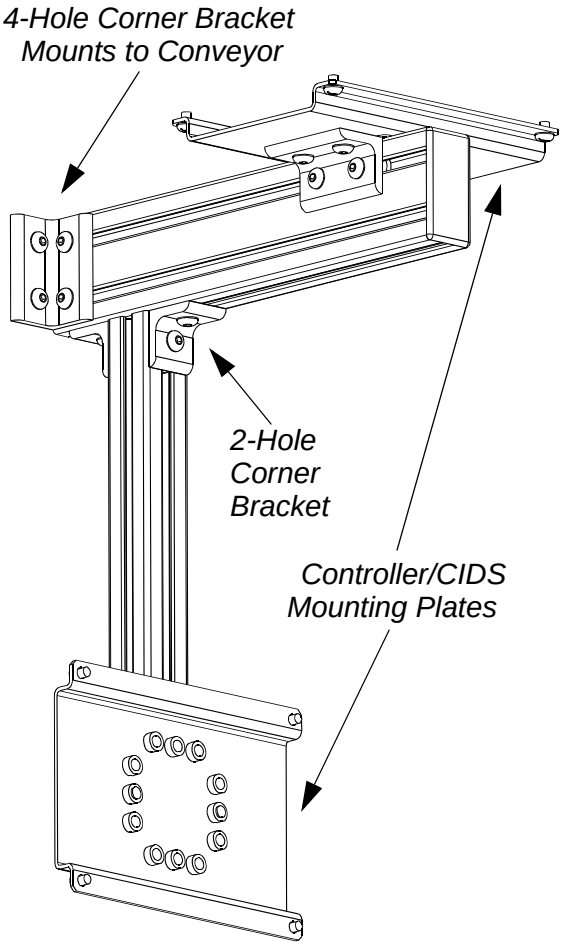
Installing Controller/CIDS Bracketry

This section shows controller/CIDS bracketry mounted to a conveyor. This is the most common mounting method, and the most stable, as all bracketry is bolted directly to the conveyor. Detailed assembly instructions are included with parts kit 5760-350.

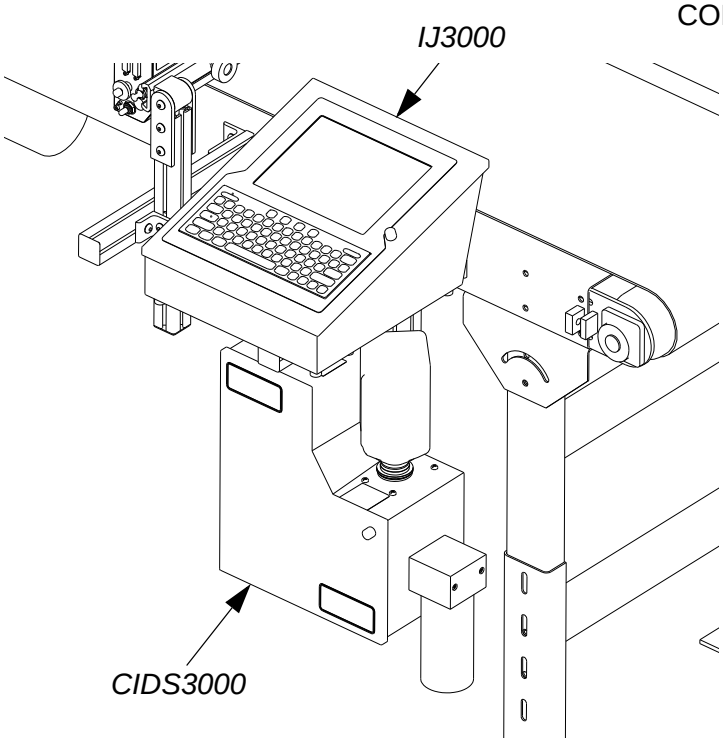
Other mounting options, including parts kit numbers, are illustrated in *Section 3, System Components*.

Corner brackets are attached to aluminum bars as shown.





CONTROLLER/CIDS BRACKETRY

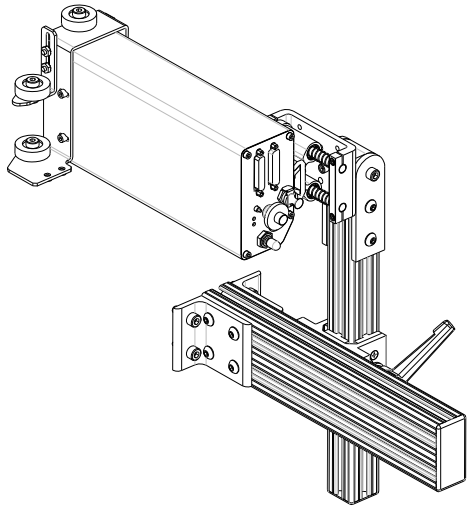


CONVEYOR-MOUNTED CONTROLLER AND CIDS

Print Head Bracketry

This section shows bracketry for a single, conveyor-mounted print head. See *Section 3, System Components*, for other print head bracketry options.

With all conveyor-mounted options, plant maintenance will need to drill holes in the conveyor for final attachment.



Mounting the Print Heads

Unpack the print head just before mounting on the bracketry.

Attach the print head to the bracketry with a print head mounting bracket as shown.

The Impulse Jet print head must be mounted in close proximity to the product. To maintain consistent print, the head should be mounted no more than 1/8" from the substrate. The IJ3000 Impulse Jet head is typically mounted to a conveyor using a dove-tail mounting bracket. An optional roller/retracting bracket is available to mount the head and control the distance from the head to the substrate. The roller/retracting bracket allows the head to bump the product and retract as required to maintain a consistent throw distance. The retracting bracket must be implemented for applications printing bar codes; however, it is recommended for all impulse jet applications.

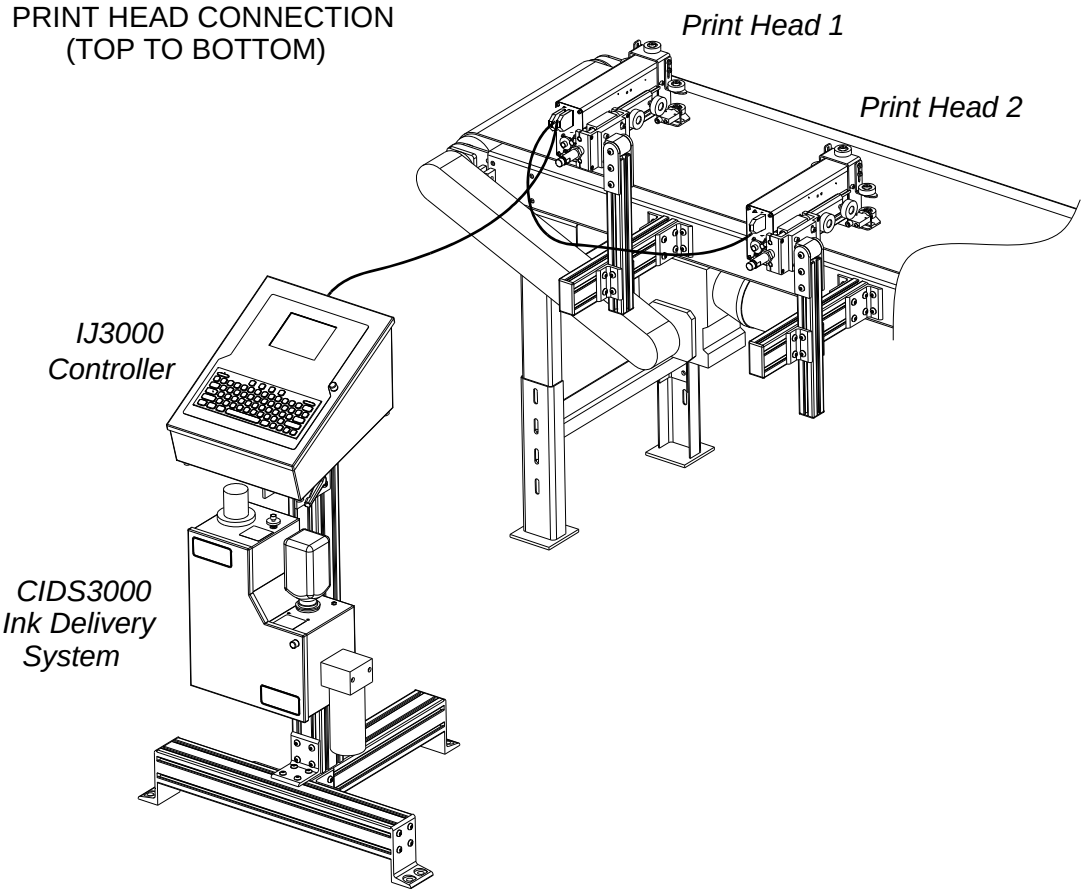
NOTE: Install optional retracting bracket kit on the print head prior to mounting the print head to the conveyor bracket. The roller/retracting bracket requires a tool to properly align it to the print head (Kit p/n: 5760-815).

It may be necessary to vertically adjust each bracket's horizontal bar later to fine-tune message placement. This is especially true when using multiple print heads, as message lines will need to be synchronized with each other.

NOTE: When adjusting the horizontal bar or print head mounting bracket, always support the print head with your hand to keep it from falling forward onto the conveyor.

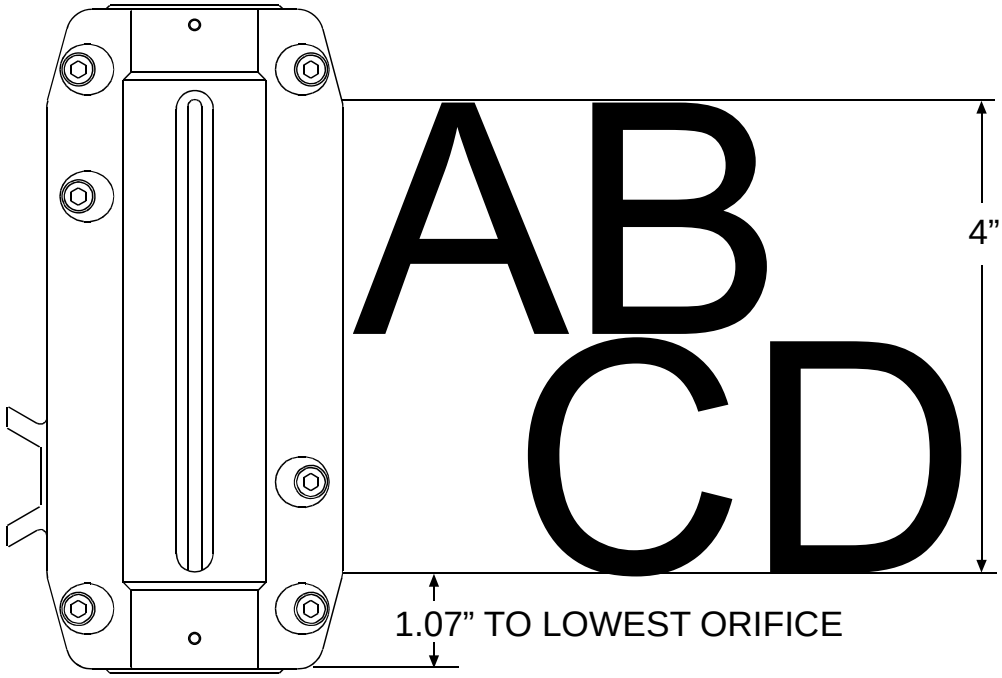
NOTE: The Impulse Jet heads work on gravity and capillary ink feed, internal in the print head. The head must be mounted in a level position from front to back or the head will leak.

The controller to print head cable must be connected to the highest vertical head. Print head to print head cables should be connected from the top head down, as shown in the following drawing. This diagram is for reference only. Do NOT plug the print head cables into the print heads at this time.

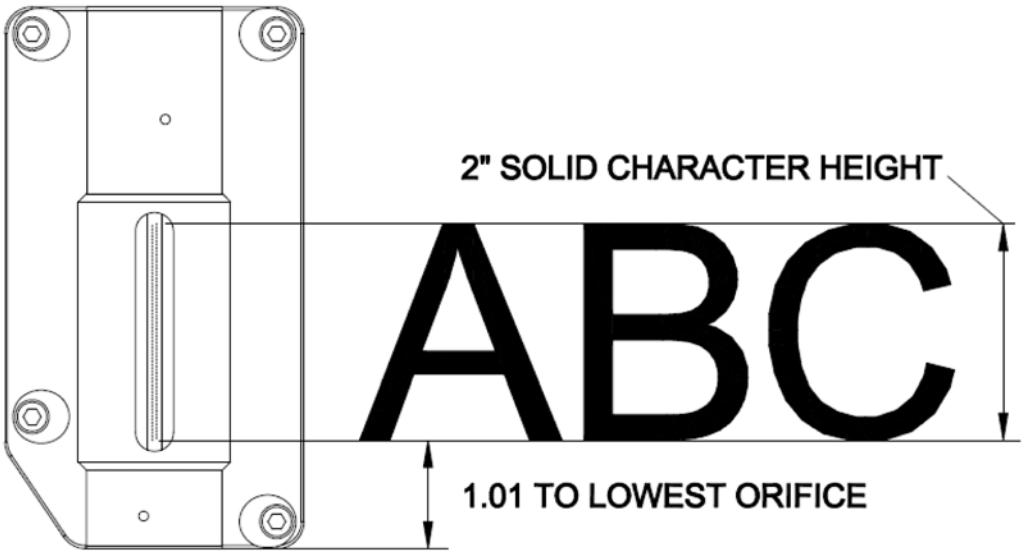


Standard Mounting Configurations

IJ768



IJ384



Print Head Tilt

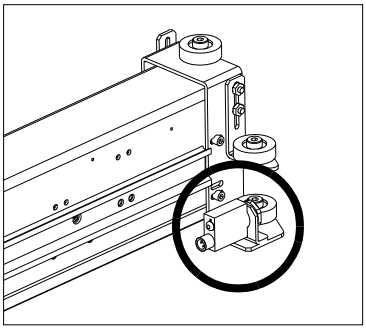
Maximum Print Head Tilt		
Print Head	Clockwise Tilt	Counterclockwise Tilt
IJ384 And NP384	5°	5°
IJ768	5°	5°

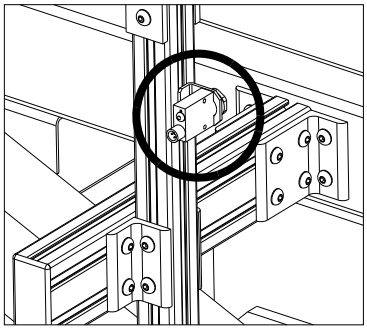
NOTE: Tilt angles are given when looking at the rear of the print head. Front to rear tilt should be less than ± 1°.

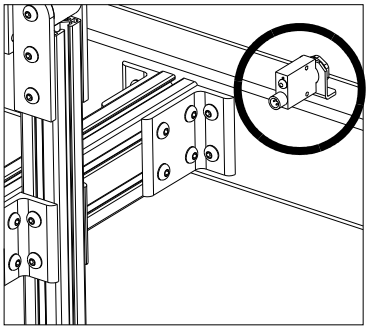
Mounting the Print Trigger Photosensor

1. Position the photosensor (5760-383) upstream from the first print head. The maximum placement distance is 27" from the photocell to the print head for an IJ384 and IJ768 Print Heads.
2. The photosensor depth range can be adjusted. The photosensor normally has a range of about 30", but can be adjusted down to about 6". (Refer to the photosensor manufacturer's instruction sheet for instructions on adjusting the range)

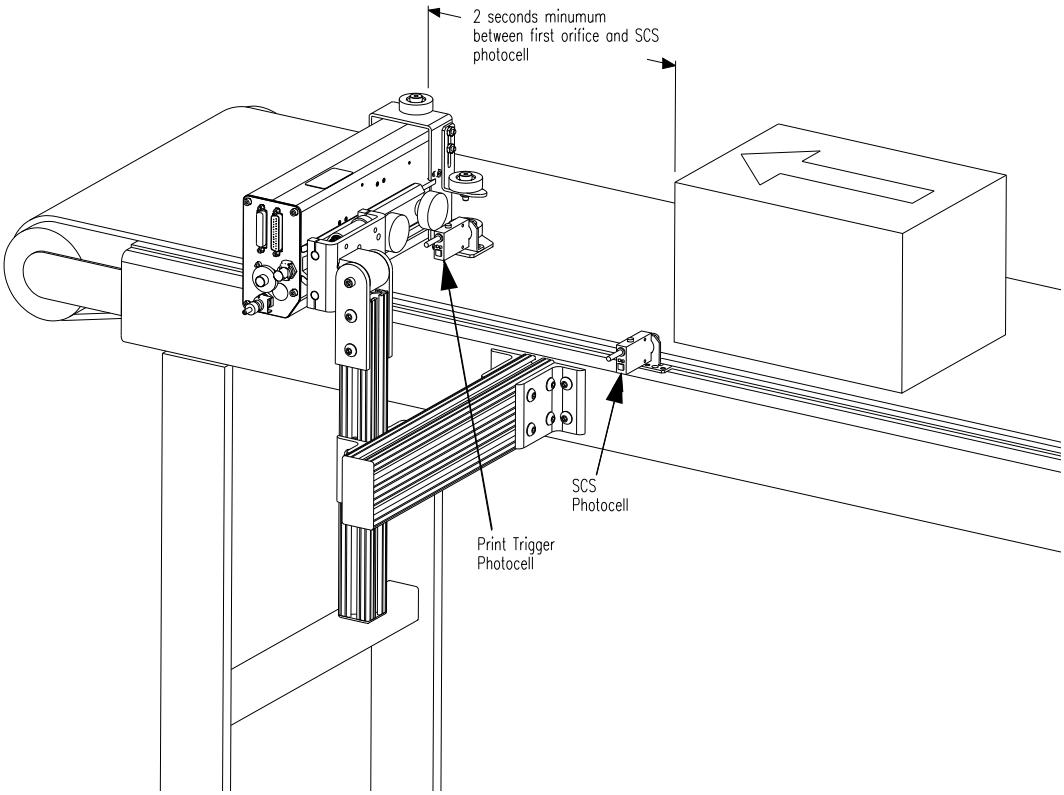
NOTE: The shorter the range, the more sensitive photosensor triggering is, increasing the possibility of false triggers from graphics on the product. It is best not to adjust sensitivity unless the 30" range is causing false triggers.


Print Head


Bracketry


Conveyor

Mounting the Smart Cleaning System Photosensor



1. Mount the SCS photosensor upstream from the first print head such that it will trigger at least two seconds prior to print on the product.
2. Plug the SCS photosensor into the outlet port of the last print head in the daisy chain.
3. The photosensor depth range can be adjusted. It normally has a range of about 15” (380 mm), but can be adjusted down to about .1” (2.5 mm). Refer to the manufacturer’s instruction sheet for instructions on adjusting the range.

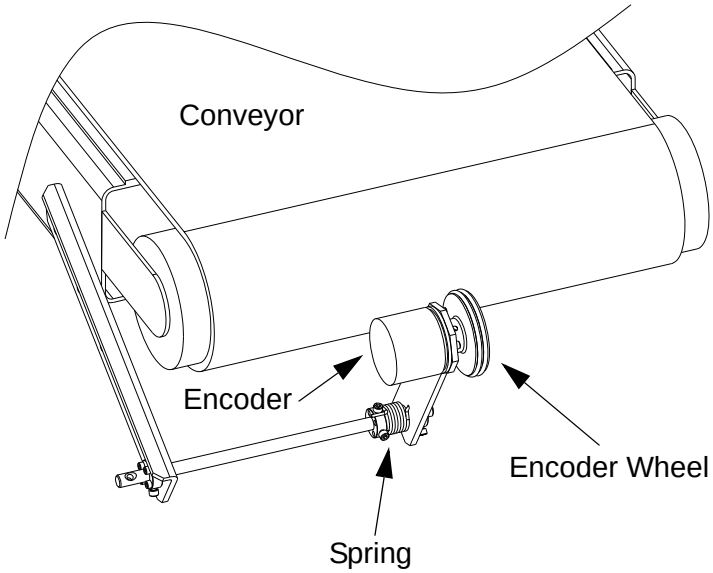
NOTE: This photosensor does not trigger print; therefore, there are no configuration parameters for this device on the controller. The print trigger photosensor shown in the figure below tells the controller when to initiate a print cycle. The print trigger photosensor has a configurable offset distance for each print head on the controller.

The Encoder

The encoder uses a wheel that rolls against the conveyor line to track the speed. It sends a signal to the controller, which makes adjustments for reported changes in the line speed.

It is not necessary to install the encoder immediately adjacent to the print heads. It is more important to place it where it will accurately measure the speed of the conveyor. Install it in contact with the conveyor, or with a wheel or roller moving the same speed as the conveyor.

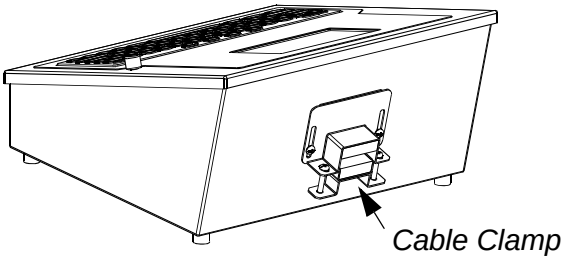
The encoder's mounting bracket is spring-loaded. Adjust the spring collar to ensure that the encoder maintains stable contact with the conveyor.



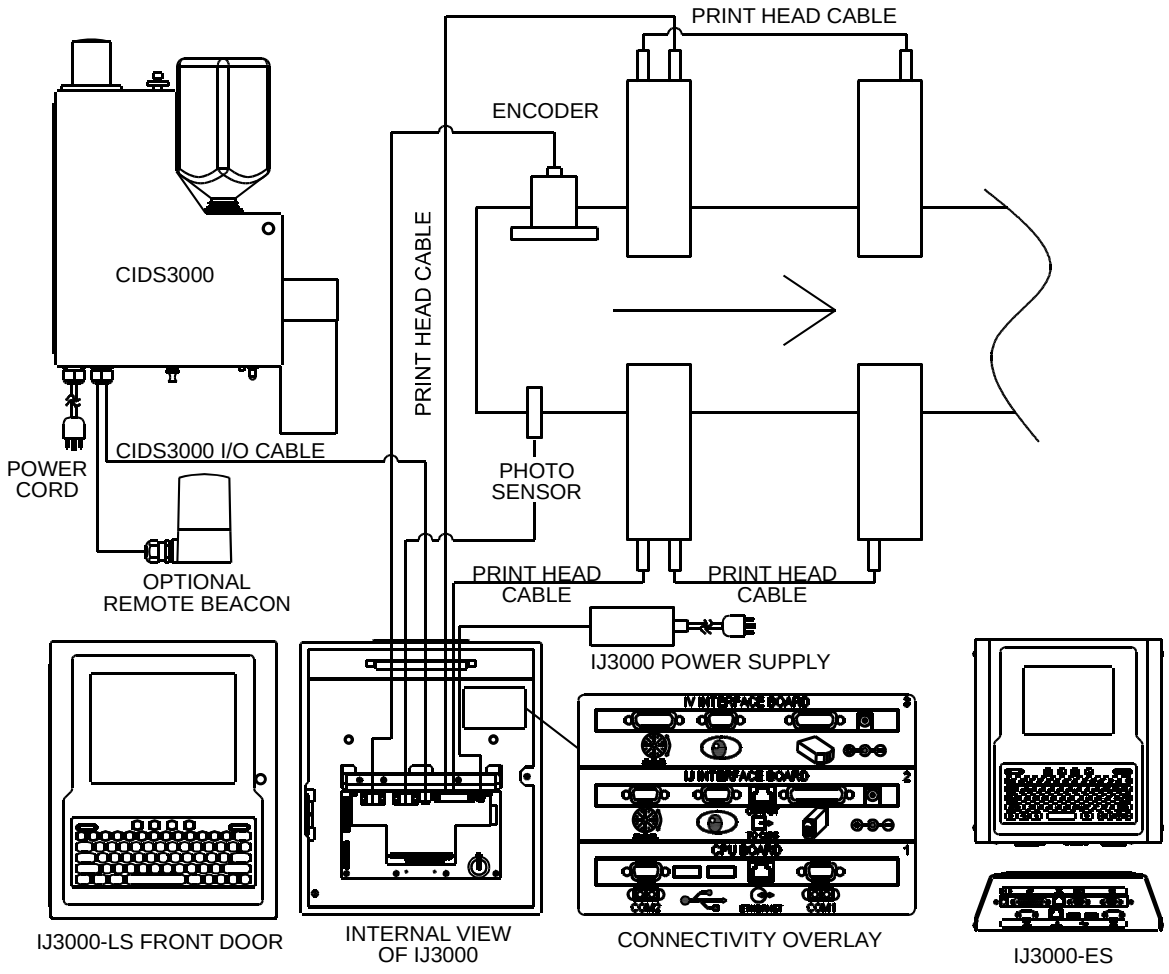
CAUTION: Do not jam the encoder wheel against the surface of the conveyor. A radial force of over 40 lbs. will reduce the life of the bearings.

Electrical Cable Connections

All controller cables must be routed through the strain relief cable clamp in the back of the controller.



1. Refer to the diagram below for typical electrical cable installation and routing.



2. Connect the power cord(s), photosensor(s), and encoder(s) to their appropriate sockets.
3. Connect the I/O cable from the CIDS3000 to the RJ45 port in the IJ3000 Impulse Jet Interface printed circuit board.

NOTE: To meet CE compliance, each power supply must have a separate, dedicated power line.

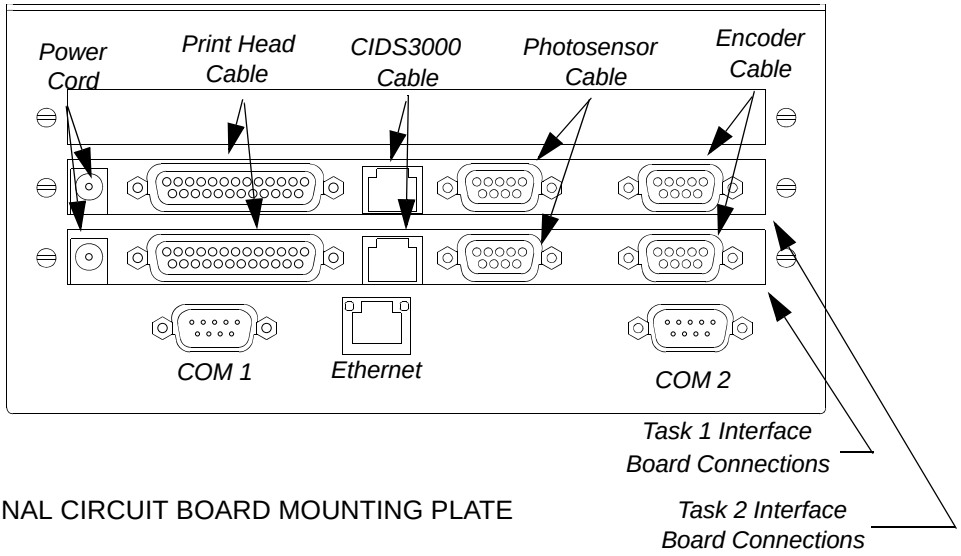
NOTE: Do not connect the CIDS3000 I/O cable to the mother board ethernet port.

4. Install the print head cable(s) to the appropriate interface board sockets. Route print head cable(s) under the conveyor for connection to the print head(s).

NOTE: Do not connect these cables to the print heads. This will be completed during the bleeding procedure.

5. Plug both the CIDS3000 and IJ3000 power supplies into appropriate outlets.
6. Toggle the CIDS3000 switch to the ON position.

Internal Circuit Board Mounting Plate



INTERNAL CIRCUIT BOARD MOUNTING PLATE

NOTE: When using two Impulse Jet tasks with one CIDS3000, the I/O cable will be connected to the lower interface board only.

Using the Optional Second Interface Board

The IJ3000 ships standard with one or two interface boards. A second interface requires a second power supply to operate.

Print heads connected to the second interface board comprise a separate print station, which will be referred to as Task 2 on the controller's user interface.

Sharing an Encoder and/or Photosensor

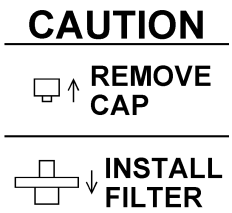
In many cases, it is possible to use the same encoder and/or photosensor to control both print stations. This is done by connecting the cables to the first interface board and directing Task 2 to share these components with Task 1.

Such sharing may not be possible where the second print station uses a separate conveyor, or where the distance between print stations is too great to allow triggering from the same photosensor.

Plumbing the System

NOTE: Do not attempt plumbing this system before all mechanical mounting is completed.

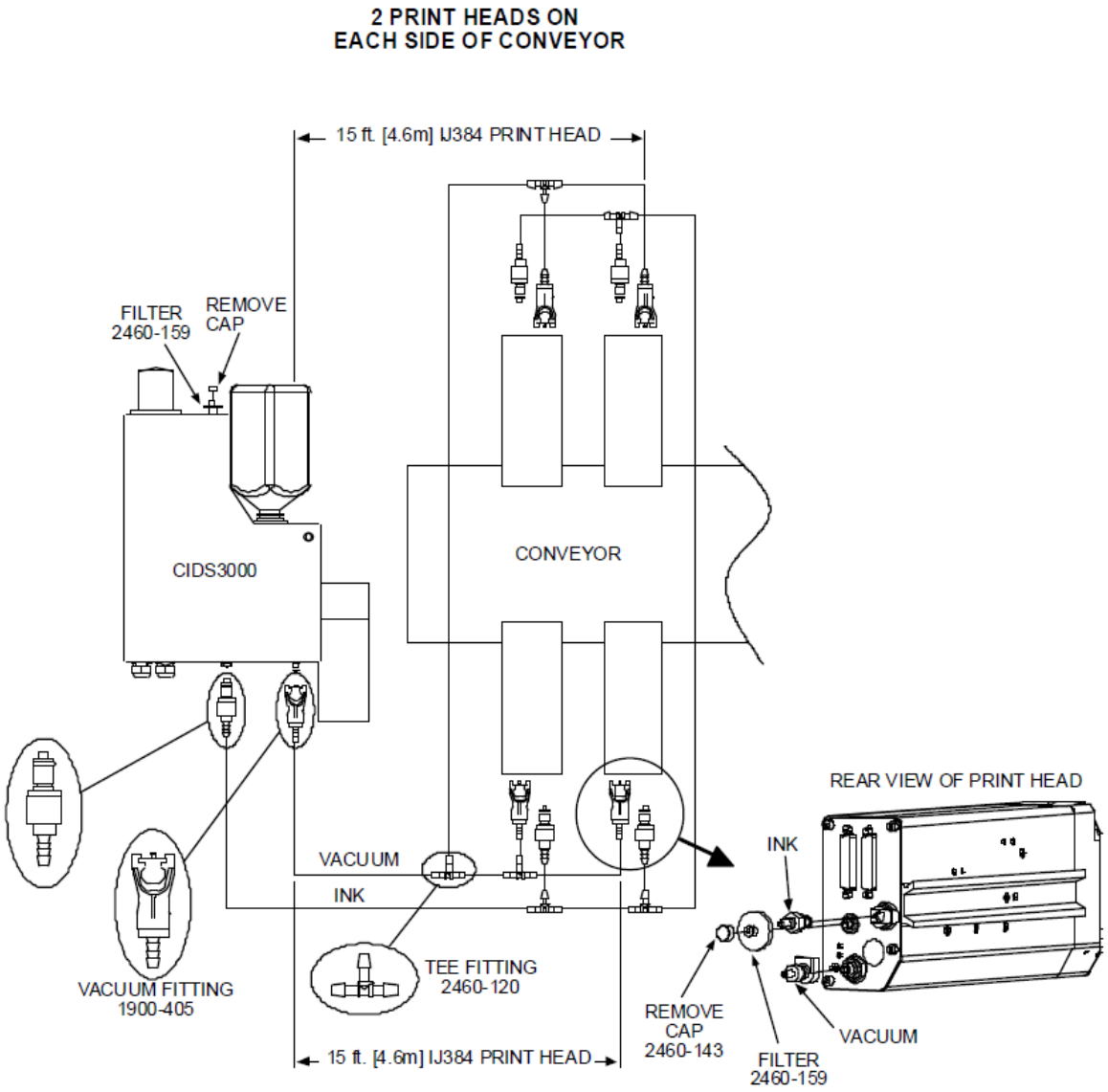
CAUTION: After mechanical mounting is completed for the CIDS3000 and the print heads, remove all vent caps and install the supplied filter.



CAUTION: Do not connect print head cables. This step will be completed during the ink tubing line bleed procedure.

1. Refer to the following diagrams for typical print head plumbing connections.

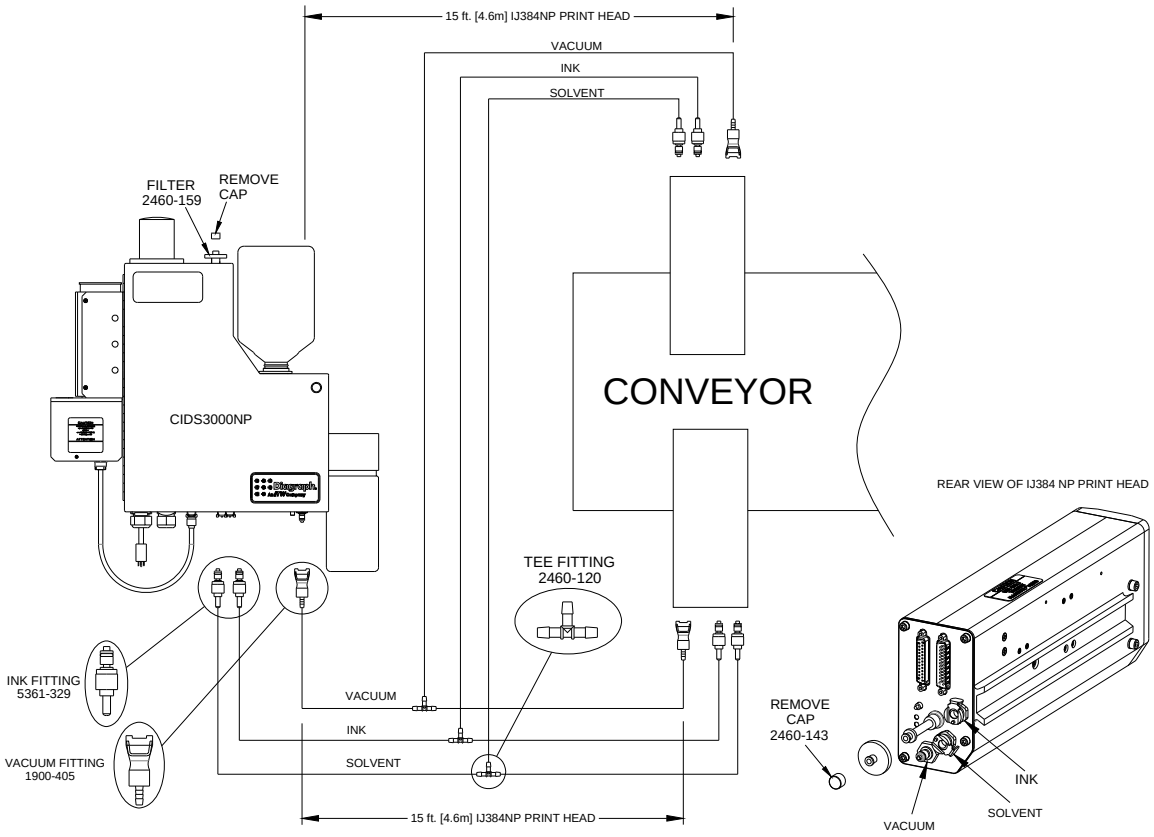
IJ384 Print Heads (Scantrue II)



NOTE: Dimensions are for total tubing length from CIDS3000 to farthest print head.

NP384 Print Heads (Non-Porous A5000)

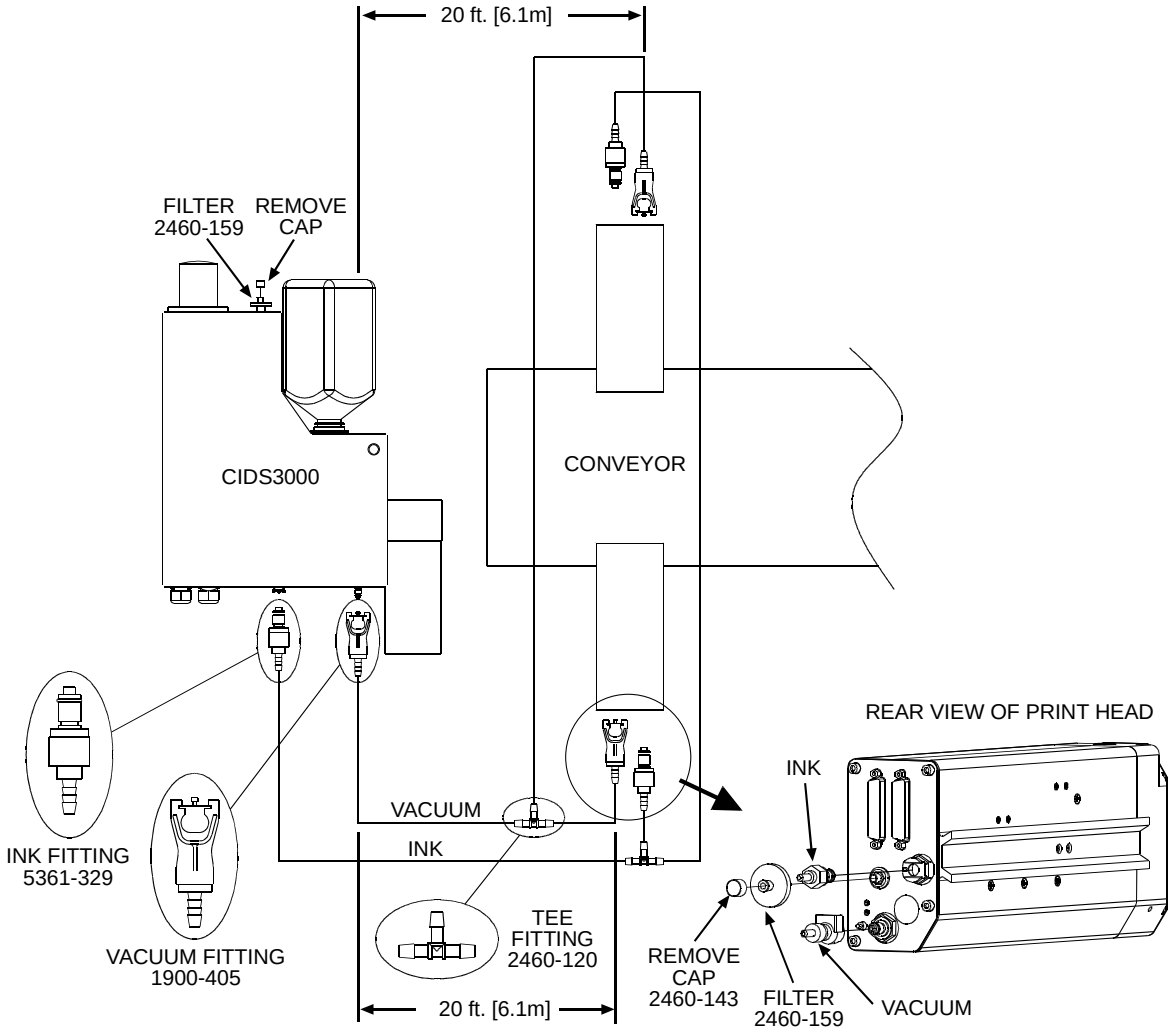
1 PRINT HEAD ON
EACH SIDE OF THE CONVEYOR



NOTE: Dimensions are for total tubing length from CIDS3000 to farthest print head.

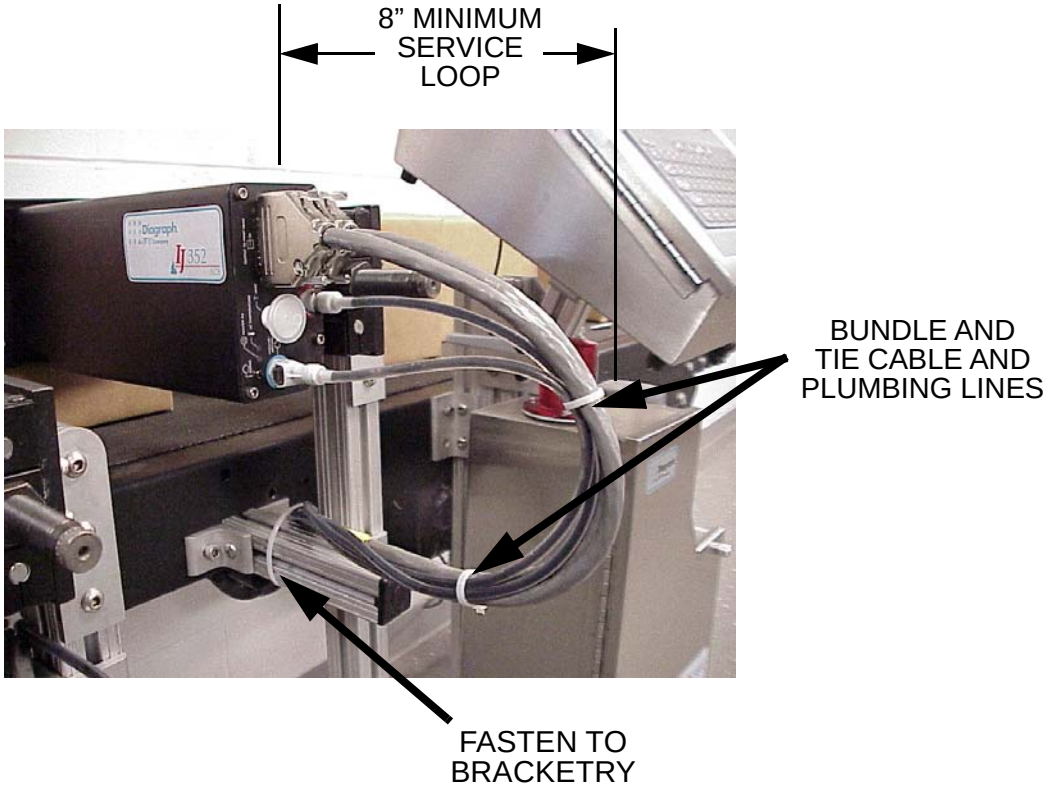
IJ768 Print Head

1 PRINT HEAD ON EACH SIDE OF CONVEYOR



NOTE: Dimensions are for total tubing length from CIDS3000 to farthest print head.

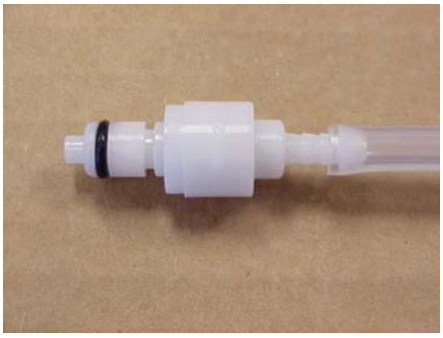
2. Route all tubing from the CIDS3000 loosely under the conveyor for later fastening. When teeing the tubing lines to the print head, ensure there is an ample amount of tubing to make a generous bend radius at the rear of the print head. See photo.



3. Cut all tubing to length as needed. Do not exceed the given tubing lengths specified in the diagrams for the particular application.

NOTE: Do not coil the vacuum tubing into multiple loops at either the CIDS3000 or the Print Heads as this inhibits waste ink flow.

4. Install all fittings into tubing per the supplied diagrams.



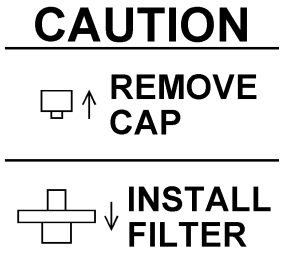
INCORRECT

CORRECT

5. Insert quick-disconnect fittings into the CIDS3000 per the diagrams.
6. Do not install the quick-disconnect fittings into the rear of each print head. This step will be completed during the ink tubing line bleed procedure.

Bleeding the CIDS3000 Ink Tubing Lines

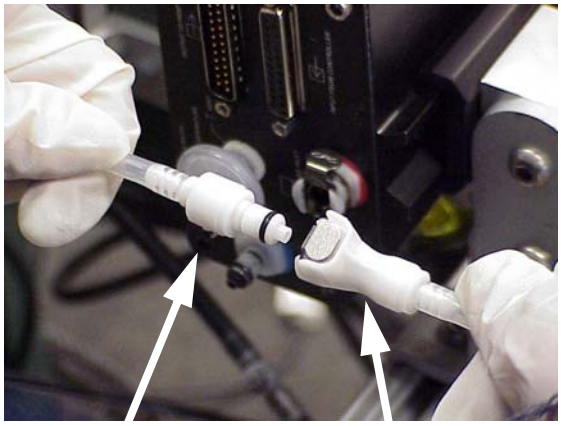
CAUTION: Ensure all vent caps have been removed from the print head(s) and CIDS3000.



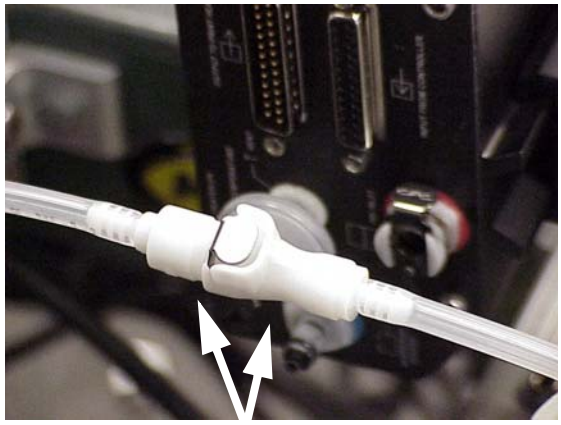
1. Ensure an ink bottle has been installed into the CIDS3000 reservoir.

NOTE: Never mix ink types because they are not miscible. irreversible internal damage will occur.

2. Ensure all tubing connections have been made, except for insertion of quick-disconnects into the rear of the print head.
3. Ensure all electrical cabling has been completed, except for plugging the print head cables into the back of the print heads; and both the IJ3000 and CIDS3000 are turned on.
4. Start at the print head located nearest the CIDS3000.
5. Insert the ink tubing line quick-disconnect into the vacuum tubing quick-disconnect at the first print head.



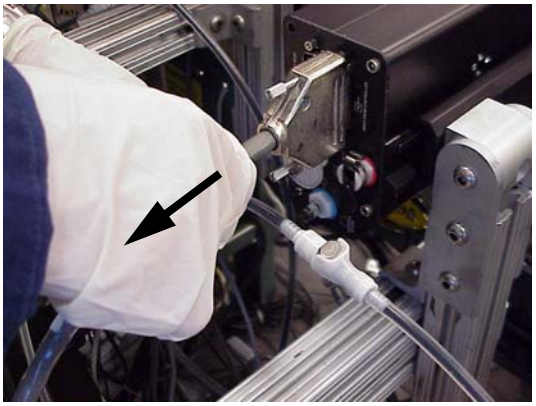
INK QUICK-DISCONNECT VACUUM QUICK-DISCONNECT



MATED

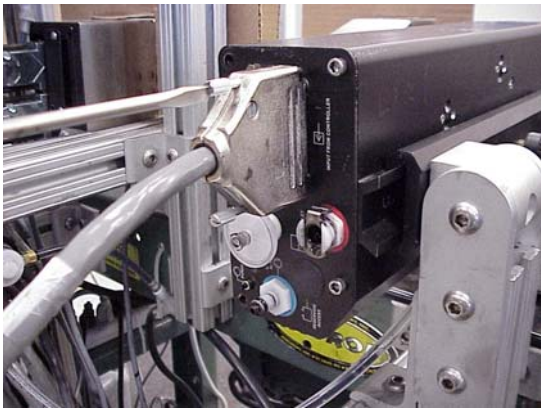
6. Loosely hand-connect the print head cable from the appropriate port in the IJ3000 to this print head. If the CIDS3000 pump turns on, wait for the ink to just pass through the quick-disconnect interface into the vacuum/waste line. After the ink has just pumped to the vacuum line, quickly pull the loosely connected print head cable. If the pump turns on, skip to Step 9.

BEFORE PRINT HEAD CABLE IS CONNECTED AND INK TUBING IS BLED



UNPLUG PRINT HEAD CABLE AFTER INK LINE IS BLED

7. If the pump does not turn on, fasten the print head cable to the rear of this print head. Do not over-tighten as this will damage the jackscrew threads.



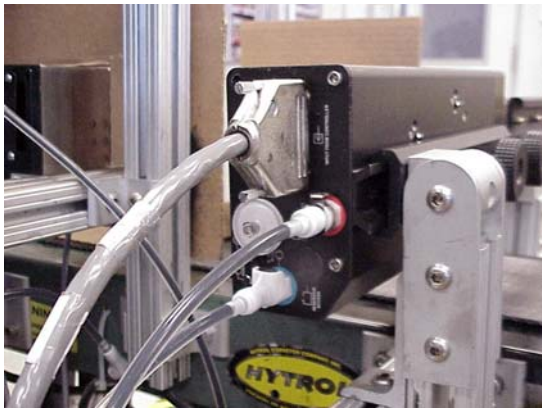
IF INK PUMP DOES NOT TURN ON, FASTEN PRINT HEAD CABLE

8. Press and hold the Purge button on the rear of this print head for approximately five seconds until the CIDS3000 ink pump turns on. After the ink has just pumped into the vacuum tubing line, quickly disconnect the ink and vacuum fittings.

PRESSING THE
PURGE BUTTON

AFTER INK LINE IS BLED

9. If this is a non-porous system, then the solvent quick-disconnect fitting can be plugged into the vacuum fitting to bleed the solvent line. Be aware that the solvent will rapidly bleed through this line. Again quickly disconnect the two fittings.
10. Install the two or three quick-disconnect fittings into their appropriate ports in the rear of this print head.



11. Repeat steps 6 through 9 for all remaining print heads, continuing to the next print head nearest to the CIDS3000.

NOTE: Continue on one side of the conveyor, then move to the opposite side of the conveyor.

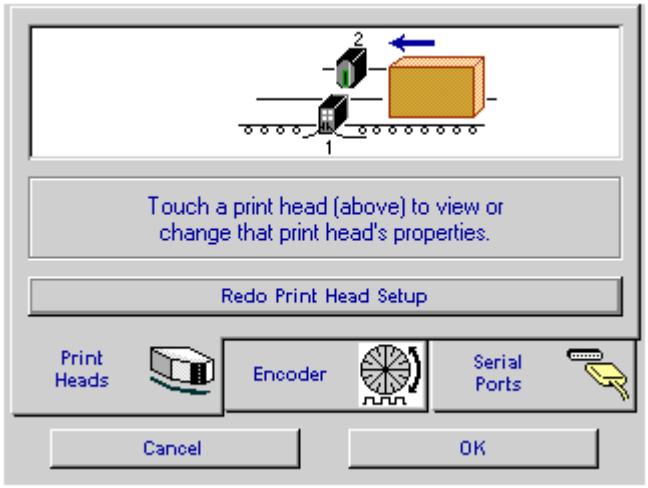
Configuring the Print Station

Print Head Setup Screen

On the **Home Screen**, touch **Show Menu**, **Control Panels**, then **System Setup**.

Screen prompts guide the user through the step by step print head setup procedure. Once begun, the procedure may be aborted (by pressing Cancel or the Escape key) at any time without changing the current print head setup.

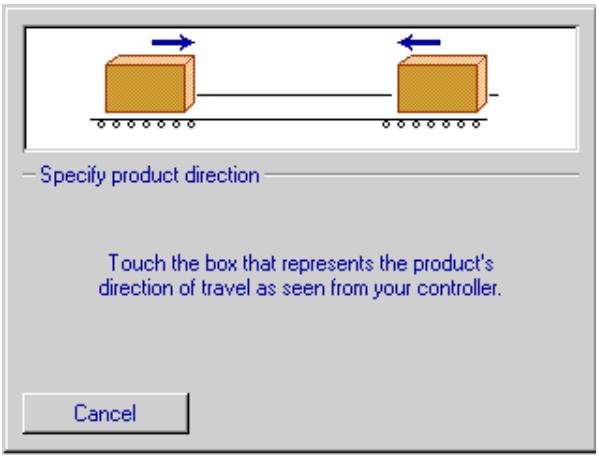
To begin the print head setup procedure, touch the **Redo Print Head Setup** button. The next screen prompts the user to specify product direction.



NOTE: The Print Head Setup cannot be redone unless the print buffer is empty, that is, the **Home Screen** message window header indicates "None." A Message Box with the message: "Can not change print head configuration while printing. Please cancel print." is displayed when the **Redo Print Head Setup** button is pressed and the print buffer is not empty.

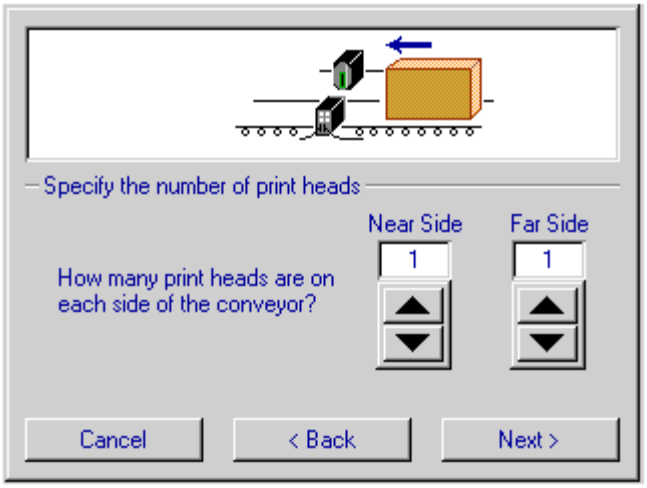
Specifying Product Direction

Touch the box that represents the direction the product will move on the conveyor. The next screen will appear automatically.



Specifying Number of Print Heads

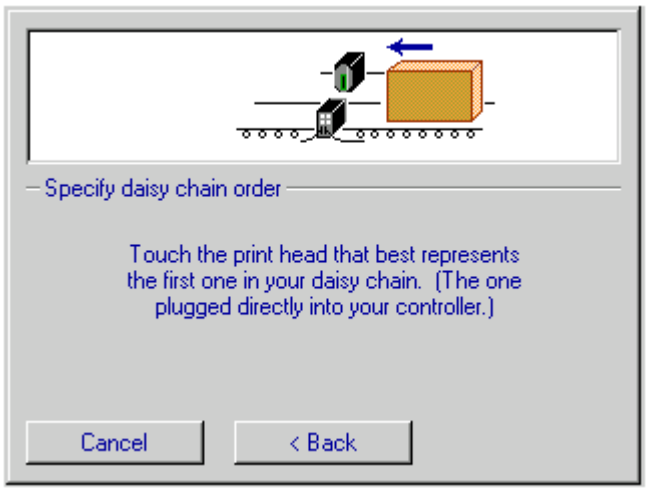
Touch the up/down arrows to set the number of print heads on each side of the conveyor. The illustration at the top of the screen will automatically change to reflect the choices. In the example, one print head has been specified on the near side and one on the far side of the conveyor. Touch the **Next>** button.



Setting Daisy Chain Order

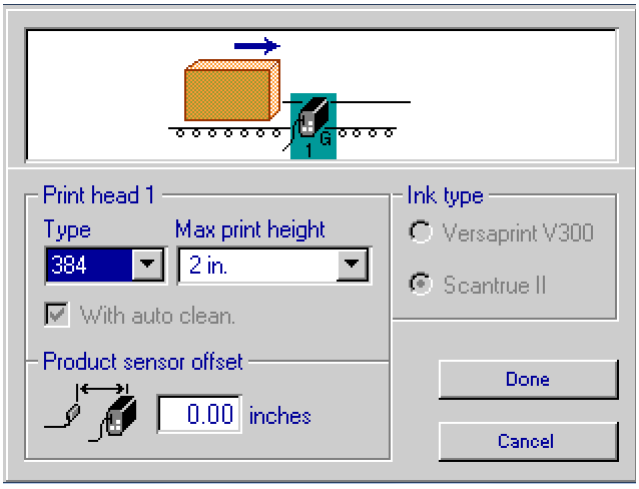
Both print heads are displayed, and the user is prompted to indicate the first print head in the daisy chain by touching it. (If there is only one print head, this step is bypassed.) Once this is done, the **Print Head Properties** screen appears.

NOTE: The first print head in the daisy chain should be the top print head in the system, as this one will be printing the top line of data and will be the first one prompted to enter data.



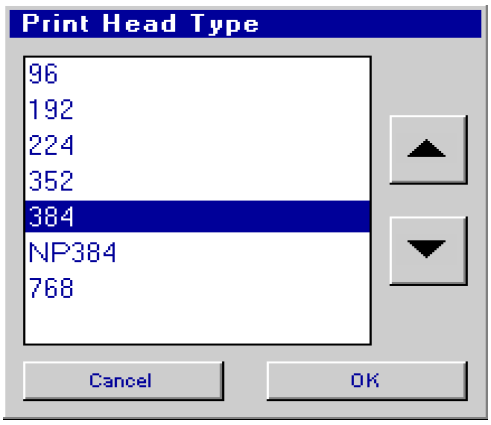
Defining Print Head Properties

The final step in print head configuration is defining the properties of the individual print heads.

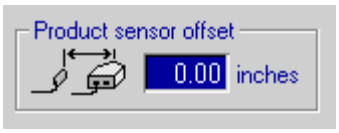


Beginning with print head number one and working in numerical order, the following will need to be defined:

- **Print head types:** Select the Print Head Type from the drop-down box.

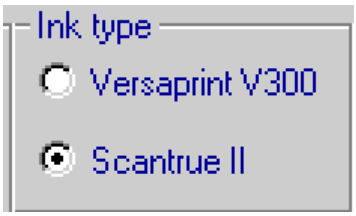


- **Product sensor offset:** Enter the distance between the photosensor and the print head (measured to the leading orifice), in inches. This may need to be fine-tuned after print setup. The maximum sensor offset for the IJ768, IJ384, and NP384 Print Head is 27".



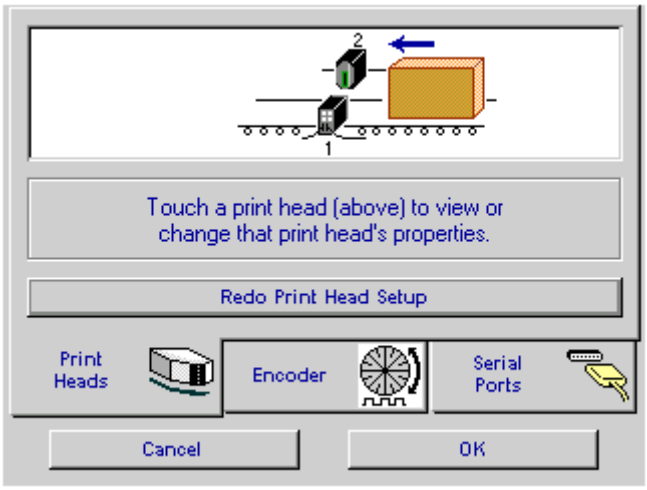
After a print head's properties are defined, touch the **Next Head** button to move to the next one; or just touch a print head on the display to highlight it.

- **Ink Type:** Select the Ink Type corresponding to the ink utilized.



- When selecting a NP384 print head the ink type will be automatically set as A5000

After the last print head is defined, touch the **Done** button to display the following screen. Print Head setup is now complete.

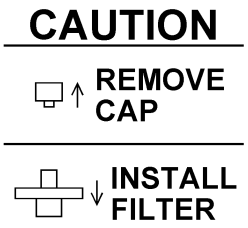


Touch any print head on the display to review or change the properties for that head. Touch the **Redo Print Head Setup** button to repeat the setup procedure using the new setup as the default. Touch **OK** to return to the **Home Screen**.

Priming the Print Heads Using the Auto-Prime and ACS Cycles

NOTE: The Print Station Configuration needs to be set up on the IJ3000 Controller prior to priming the print heads. (Refer to the previous pages.)

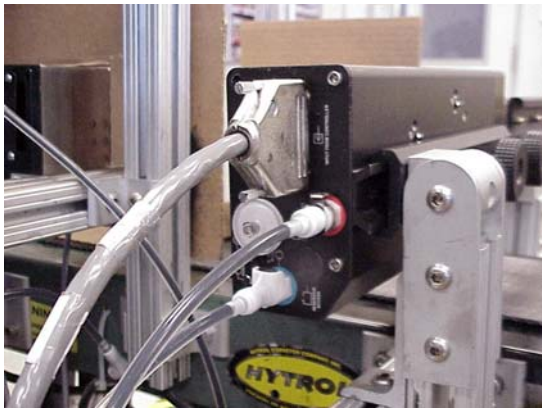
CAUTION: Ensure the vent cap has been removed and the vent filter is installed.



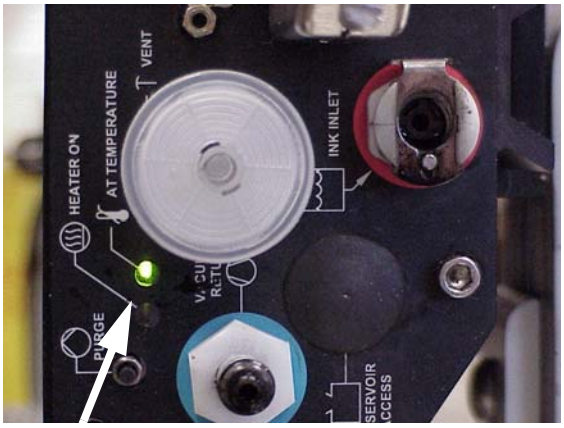
1. Remove the print engine shipping cap.

LOOSEN TWO CAPTIVE THUMB SCREWS TO REMOVE SHIPPING COVER

2. Ensure all the print head cables are installed and the system power is on.
3. Ensure the ink tubing lines have been bled and the quick-disconnect fittings installed to their appropriate ports. Also, ensure the vacuum line is connected to the correct port.



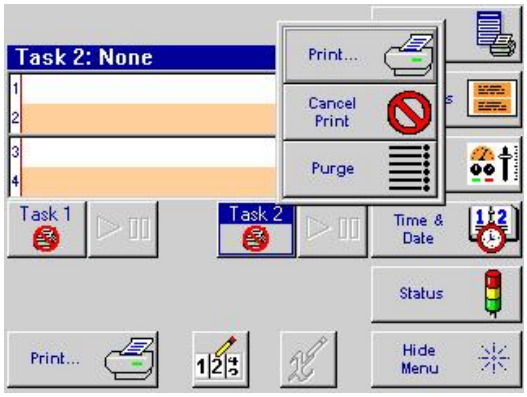
4. Wait until the print head is at temperature.

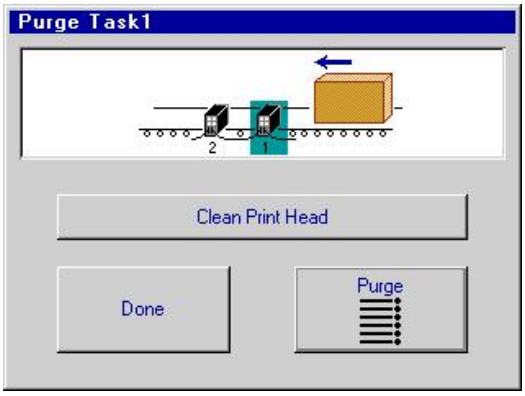


AT TEMPERATURE LIGHT
IS ILLUMINATED

NOTE: Print is disabled until the print head is fully heated. Wait until the "AT TEMPERATURE" LED is illuminated on the rear of the print head prior to any print sampling.

5. Wipe the front of the print head with a line-free cloth.
6. Swipe a print sample by running a channel purge from the IJ3000.
   - •On the IJ3000 Home Screen, touch the **Print** menu button to open the Print Menu.
   - •Touch the **Purge** button to open the Purge Screen.
   - •Select the print head you want to channel purge by touching that print head.
   - •Touch the **Purge** button to channel purge the selected print head.





   - •Swipe a sheet of cardboard or other material across the front of the print head, at about the normal printing distance, as the head purges. The print head purges for three seconds each time the **Purge** button is touched.
7. If channels are missing, hold the **Purge** button on the rear of the head for approximately .5 - 1 second. This will start an Automatic Cleaning System cycle (ACS).
8. If all channels are not printing, repeat steps 7 and 6 one more time.
9. If the print head is still missing channels, follow the procedure below. Otherwise, the print head is now ready for a print sample.
10. Hold an absorbent towel under the front of the print head to catch ink overflow.

11. Press and hold the PURGE button for five seconds (Auto Prime). The CIDS3000 beacon will flash and ink will flow continuously for two to four seconds. The vacuum pump will turn on and assist ink removal; however, overflow is likely.
12. If there are any air bubbles during ink flow, run another Auto Prime.
13. Repeat step 12 until the ink flows clear of air (typically one to two Auto Prime cycles).
14. Wipe off the excess ink from the front of the print head with a lint-free cloth.
15. If any channels are not printing after all air bubbles are purged, allow the print head to remain heated.
16. Occasionally, swipe a print sample until all channels are printing.

Controller Operation

This manual covers the IJ3000 System hardware installation. For detailed instructions on the operation of the IJ3000 Controller, refer to the IJ3000 Controller Operations Manual, part number 5760-121. When all heads have been successfully purge tested, the system is ready for programming and printing.

Section 5: Maintenance

Following are the recommended maintenance procedures to keep the IJ3000 Impulse Jet system printing cleanly and efficiently.

System Maintenance

Intermittent (as required):

1. Be sure the photosensor is clean and free of debris.
2. Be sure the O-rings on the encoder wheel are present and not worn.
3. Be sure the nuts and bolts holding the bracketry in place remain tight.

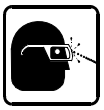
Annually:

Replace encoder O-rings (5765-206).

Recalibrate Touch Screen.

Print Head Maintenance, ScanTrue II Porous Ink

Daily/Shift Startup



Wear safety goggles when working with industrial inks or solutions!

Spray the appropriate cleaning solvent on a lint-free cloth and lightly wipe the front of the print head to remove foreign debris.

Inspect lines and connections for leaks. Make repairs if needed.

If system is equipped with the Automatic Cleaning System (ACS), run the cleaning cycle for each print head. This can be achieved via the button on the back of each head, or through the IJ3000 controller.

It is recommended that the system remain powered on for normal day to day operation.

Shutdowns of Seven Days or Longer

Shutdown:

1. Turn off the IJ3000 power switch from the keyboard.
2. Spray the appropriate cleaning solvent on a lint-free cloth and lightly wipe the front of the print head to remove foreign debris. Install long term shutdown gasket (Kit 5760-857) and ship cap on print head.

Startup:

1. Remove ship cap and log term shutdown gasket before power up and allow the print engines to heat up (approximately 5minutes). Spray the appropriate cleaning solvent on a lint-free cloth and lightly wipe the front of the print head to remove foreign debris.
2. If system is equipped with the Automatic Cleaning System (ACS), run the cleaning cycle for each print head. This can be achieved via the button on the back of each head, or through the IJ3000 controller

NOTE: The shipping cap must be removed, or the vacuum pull from the ACS cycle will corrupt print quality and potentially start an ink syphon of the CIDS3000 reservoir and bottle.

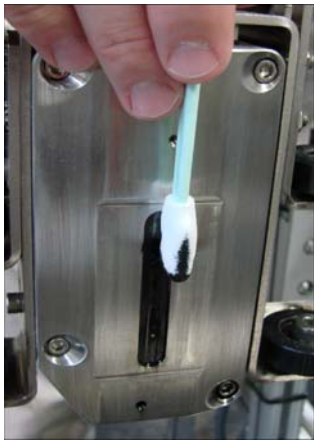
Print Head Maintenance, Non-Porous A5000 Ink

ACS – Automatic Cleaning System

- One automatic cleaning is recommended every **four** hours.

Daily/Shift Startup

- Excess corrugate debris, angel hair (glue), and dried ink must be removed from the stainless steel front plate. Use lint-free cloths and NP solvent spray.
- Once per shift / day, use a sponge swab during an ACS cycle.
  - Have a sponge swab ready.
  - Press the ACS button on the rear of the print head.
  - While the automatic solvent flushing system is dispensing, agitate the orifice plate with the side edge of the sponge swab. Do not scrub hard. Light agitation is all that is necessary.
    NOTE: **DO NOT** use anything but a sponge swab for agitation.
  - When the ink starts dispensing, stop sponge swab agitation. Discard the sponge swab.
  - With a lint-free cloth and spray solvent, spray the solvent into the lint-free cloth, and then wipe off any excess ink from the front stainless steel plate. Discard the lint-free cloth.



Shutdowns of Seven Days or Longer

- Remove the DB-25 print head cable from the rear of the head.
- Install orifice plate filler seal.
- Install orifice plate front storage cap.
- Install vent cap on the rear of the print head (male luer fitting).
- If the print head is removed from the print area, disconnected ink and solvent lines and mating fittings on the print head must be thoroughly cleaned with solvent spray.

Startup (short-term)

- If the equipment has not printed in hours / over night, then press the ACS button on the rear of the print head.
- Agitate with sponge swab during solvent dispensing.
- Stop when ink flows.
- If some channels are missing, an Auto-Prime can be performed. Press and hold the ACS button on the rear of the print head. Wait until the light on the CIDS flashes once, and then release the button. Ink only will flow through the orifices.

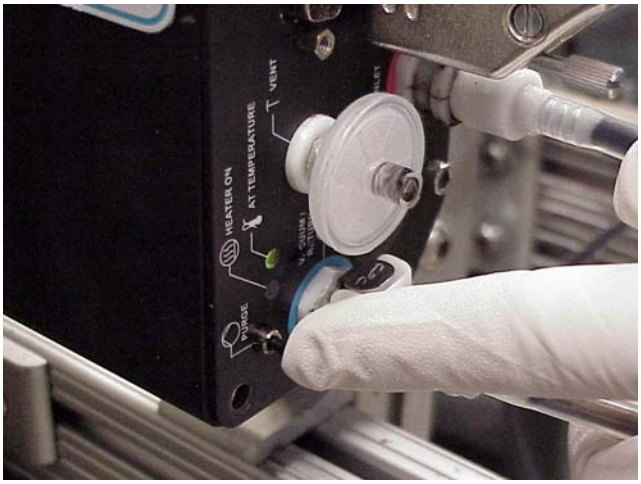
Startup (after long-term)

- Install any and all ink and solvent lines.
- Remove the vent cap from the rear of the print head.
- Remove the front storage cap and orifice seal.
- Install the DB-25 print head cable and allow to heat.
- Follow Startup (short-term) instructions.

Preventative Maintenance

1. Occasionally there will be debris build up on the front of the print engine face that will require more attention. Typically this debris comes in the form of corrugate, glue, or the like.
2. The method for flushing the debris down will require the Automatic Cleaning System (ACS), Impulse Jet Maintenance Spray (5760-695) for porous inks and (5760-861) for non-porous inks, a soft sponge swab (5760-832) and lint-free cloths (6600-171).
3. Wipe debris and "angel hair" glue off the front plate area with a lint-free cloth and Impulse Jet Maintenance Spray.
4. Lightly soak a sponge swab with maintenance spray and rub up and down in print channel.

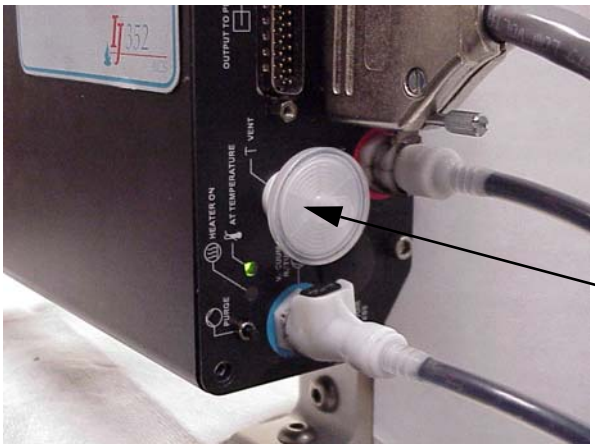
5. Press and hold the Purge button on the rear of the print head for .5 to 1 second. The ACS cycle will initiate.



6. Wipe the front of the print head with the lint-free cloth and maintenance spray to remove any excess ink.
7. Repeat steps 3 through 6 as required.

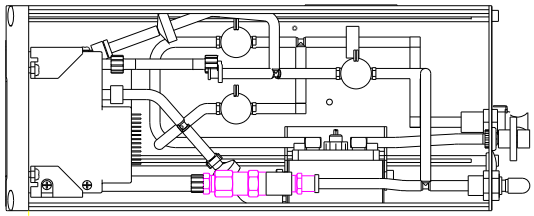
Annually

1. Replace the vent filter on the rear of the print head.

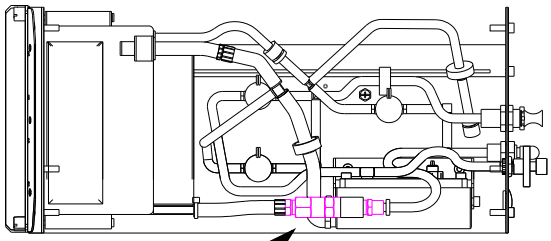


2. Depending on desired quality of print, print heads may need to be returned to the factory for ultrasonic cleaning of the orifice plate and review of the print head plumbing.
3. Clean the Combo Fitting in the vacuum line.

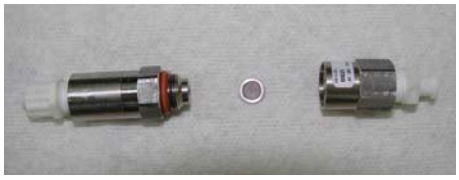
384 HEAD



768 HEAD



Disassemble the fitting (as shown), clean and re-assemble.



ACS - Automatic Cleaning System

NOTE: If the beacon on the CIDS3000 is in any way illuminated or flashing, the ACS will not activate. Make sure all ink faults are corrected before attempting an ACS.

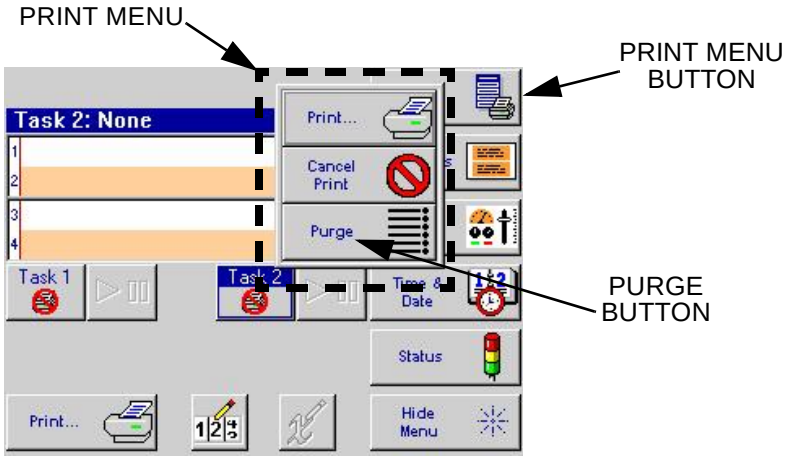
The ACS is an invaluable tool for routine cleaning of loose debris from the print engine face. The images below demonstrate print before and after the ACS.

BEFORE ACS

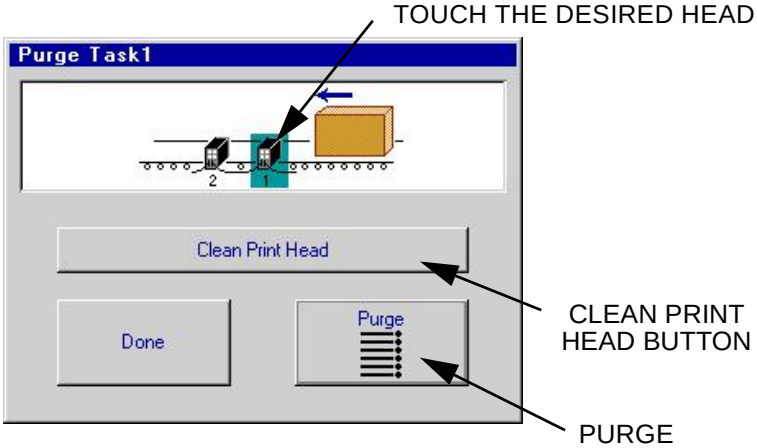
AFTER ACS

This feature can be accomplished by three methods.

1. From the print head: Press and hold the Purge button on the rear of the print head for .5 to 1 second. The ACS cycle will initiate.
2. From the controller **Purge Screen**:
   - •On the IJ3000 Home Screen, touch the **Print** menu button to open the Print Menu.
   - •Touch the **Purge Screen** button to open the Purge Screen.
   - •Select the print head to be cleaned by touching that print head.
   - •Touch the **Clean Print Head** button to clean the selected print head.



HOME SCREEN



PURGE SCREEN

Once a print head has been cleaned, verify that all channels are printing properly by touching the **Purge** button. Swipe a sheet of cardboard or other material across the front of the print head, at about the normal printing distance, as the head purges. The print head purges for three seconds each time the **Purge** button is touched.

3. From the controller **Auto Clean Setup**: The IJ3000 can also be programmed to automatically clean the print heads during regular down times in the production schedule.

CIDS Maintenance

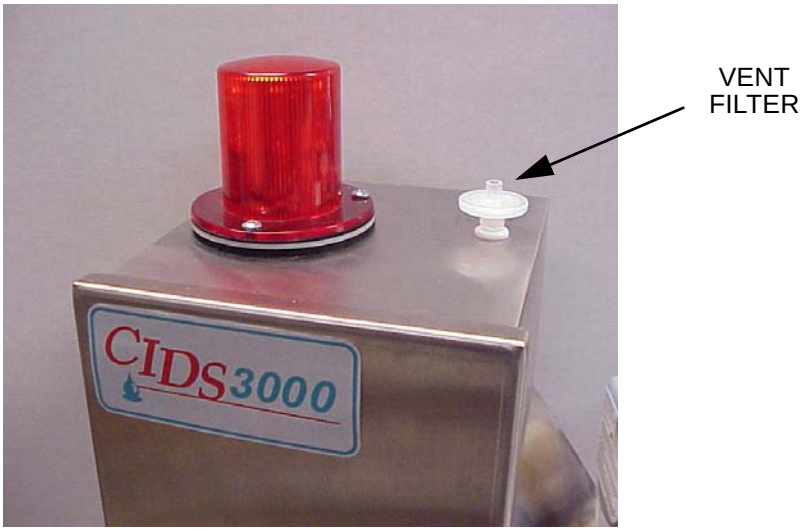
Changing Ink Containers

CAUTION: Replace ink only with the same type of ink as originally shipped with the unit.

The Ink Status Beacon illuminates when the ink bottle is empty, and the pump is disabled. This alerts the operator to ready a new bottle of ink, and allows the operator at least five minutes to change the bottle before printing is disabled. If the ink bottle is not replaced within five minutes, print will be disabled on all "Tasks" and the beacon will flash slowly.

Annually

Replace the vent filter on the Centralized Ink Delivery System (CIDS).



Section 6: Troubleshooting

The IJ3000 ink jet system incorporates advanced designs, both in hardware and in software. However, if the system ever fails to perform properly, some built-in indicators will help in troubleshooting. This section will help minimize system downtime and explain some of the diagnostic features built into the system.

Troubleshooting Tests

Purge Test

This test will determine if the print heads are functional.

1. Place a piece of cardboard in front of the print head front plate.
2. Select **Purge** from the GUI (Graphical User Interface) according to procedure in *Section 5: Maintenance.*
3. Move the cardboard horizontally in front of the print head while channels fire. Inspect printed pattern to determine if all channels are firing correctly.

NOTE: Encoder and photocell signals are not required for the purge function.

4. Purge each head separately to verify each is ready to print.

Print Test

This test will determine if the print heads are printing.

1. Place cloth in front of print head front plate.
2. Initiate print cycle by turning on conveyor and tripping photocell.
3. Check for ink on cloth.

Printed dots on cloth indicate that the system is printing. Check product sensor offset settings, product length, or product margins if print is not seen on carton.

No ink on cloth indicates that the system is not printing. Review system status to determine other possible causes of system not printing, including a test of the photosensor and encoder to ensure operation.

Print Quality Troubleshooting

This section shows examples of various print problems and actions which should be taken to improve the print.

Problem: Minor fractures in print channels.

Possible Cause: Debris on front plate, air in channel.

Action: Run Automatic Cleaning System. Add brushes to minimize debris build-up.

Problem: Missing Channels and Channel fractures in print channels.

Possible Cause: Excessive debris on front plate, air in channel.

Action: Wipe front plate and run Automatic Cleaning System. Add brushes to minimize debris build-up.

Problem: Missing print channels.

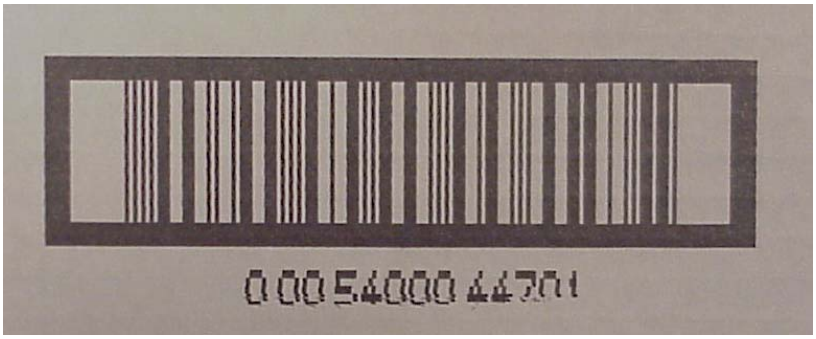
Possible Cause: Air in channel.

Action: Run Automatic Cleaning System. If air cannot be removed by running an ACS cycle, run an Auto-Prime Cycle per instructions in *Section 4: Installation*.

Problem: Missing bottom print channels.

Possible Cause: Ink build-up on lower orifices.

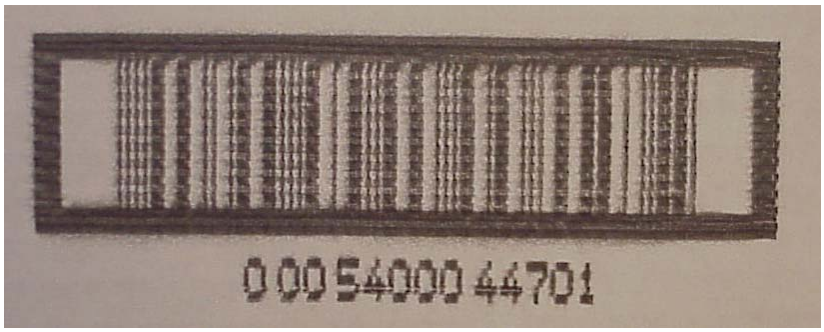
Action: Wipe front plate and run Automatic Cleaning System.



Problem: Fuzzy Print.

Possible Cause: Print head too far away from substrate.

Action: Move print head to within 1/8" from product.



Problem: Occasional checkerboard print pattern.

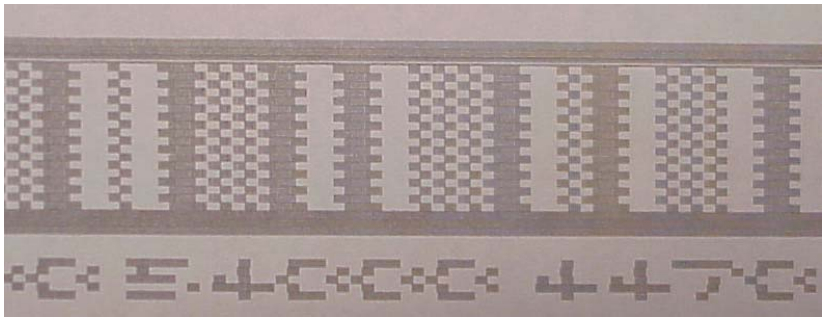
Possible Cause: Encoder slipping or bouncing on belt.

Action: Tighten encoder on belt; replace encoder o-rings, if required; replace conveyor belt with smooth seamless type belt.

Problem: Stretched out, light print, checkerboard pattern.

Possible Cause: Incorrect encoder, or incorrect line speed (set too low) if using internal encoder.

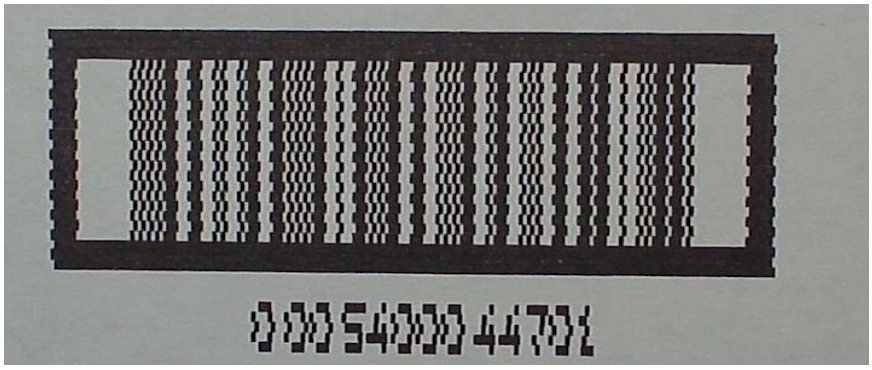
Action: Check for correct encoder (must use Diagraph Encoder, part # 5760-820-IJ).



Problem: Short image, dark print, checkerboard pattern.

Possible Cause: Incorrect encoder or wheel size, or incorrect line speed (set too high) if using internal encoder.

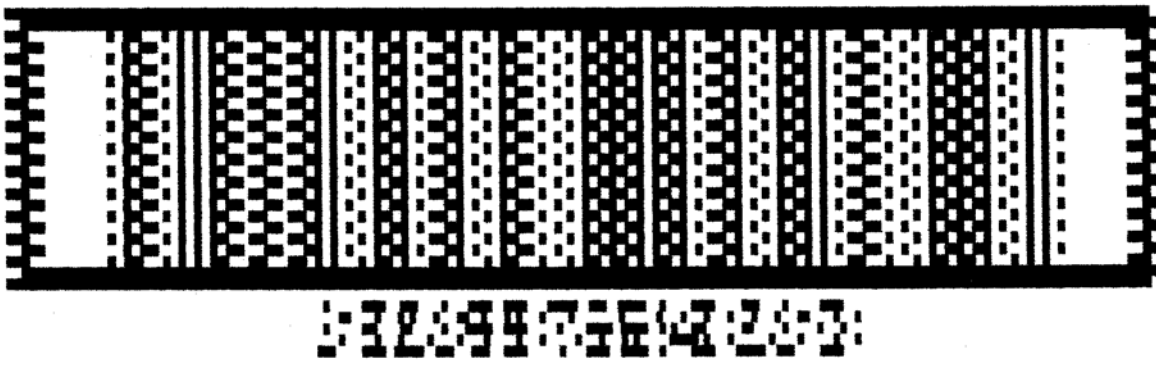
Action: Check for correct encoder (must use Diagraph Encoder, part # 5760-820-IJ).



Problem: Backwards print.

Possible Cause: Incorrect print direction specified in set-up.

Action: Re-do print head set-up to specify correct direction.



IJ/3000 Impulse Jet System Trouble-Shooting

CIDS3000:

System Symptom	Possible Cause	Operational Test Method
Ink not pumping to Print Head	Power Supply	Ensure CIDS switch is turned on. Check for Power LED on Internal Power Supply Board. If LED is illuminated, check power supply output on P2. It should be 12VDC.
	PC Board	Check the LED indicators and connector voltages on the board. LED4: Green; indicates a print head is signaling for the Liquid Pump to turn on. LED5: Red; indicates the Waste Bottle is full. LED7: Yellow; indicates ink is low in the CIDS Reservoir. J3: Liquid Pump connector; 12VDC when Liquid Pump is on.
	Liquid Pump	Check for 12VDC at the pump. If there is no pumping, or pump sounds weak, replace the pump.
No vacuum at Print Head during ACS Cycle. Ink is overflowing the Print Head	Power Supply	Ensure CIDS switch is turned on. Check for power LED on Internal Power Supply Board. If LED is illuminated, check power supply output on P2. It should be 12VDC.
	PC Board	Check the LED indicators and connector voltages on the board. LED3: Green; indicates a print head is signaling for the Vacuum Pump to turn on. LED5: Red; indicates the Waste Bottle is full. LED6: Red; turns on, off, and flashes with the beacon. Off indicates ink is OK, On indicates ink is low, Slow Flash (1Hz) indicates ink is out, and Fast Flash (6Hz) indicates that the Waste Bottle is full or the pump was turned on for more than 15 seconds. J4: Vacuum Pump connector; 12VDC when Vacuum Pump is on.
	Vacuum Pump	Ensure all tubing is connected between the Print Head and the CIDS. Make sure the Ink Separator Bottle is fully tightened. Open CIDS and remove any clogs in the line. Initiate an ACS Cycle, and listen for the pump. Check for 12VDC at Vacuum Pump.

CIDS3000 (continued)

System Symptom	Possible Cause	Operational Test Method
Liquid Pump and Vacuum Pump do not turn on, and light is off on power switch	Power Supply	Ensure CIDS switch is turned on. Check for power LED on Internal Power Supply Board. If LED is illuminated, check power supply output on P2. It should be 12VDC.
Beacon light does not illuminate at ink out	Power Supply	Ensure CIDS switch is turned on. Check for power LED on Internal Power Supply Board. If LED is illuminated, check power supply output on P2. It should be 12VDC.
	PC Board	Check the LED indicators and connector voltages on the board. LED5: Red; indicates the Waste Bottle is full. LED6: Red; turns on, off, and flashes with the Beacon. Off indicates ink is OK, On indicates ink is low, Slow Flash (1Hz) indicates ink is out, and Fast Flash (6Hz) indicates the Waste Bottle is full or the pump was turned on for more than 15 seconds. J5: Power connector; 12VDC when power is turned on. J1: Beacon connector; 12VDC when Beacon is on.
	12V Beacon Bulb	Unplug the Beacon from the board and check the resistance of the bulb. If the bulb is open, replace it.

Impulse Jet Print Head:

System Symptom	Possible Cause	Operational Test Method
ACS Cycle will not operate	No CIDS to Controller Cable connection. No CIDS power. No Controller to Print Head connection.	Inspect CIDS communication cable and ensure connection to Interface Board. See *Section 4: Installation, Electrical Cable Connections*.
	PC Board	Check the LED indicators on the board. LED1: Green; indicates Print Head is requesting IDS to turn Vacuum Pump on. LED2: Green; indicates Print Head is requesting IDS to turn Liquid Pump on. LED9: Green; indicates Intake Solenoid Valve is open. LED8: Green; indicates Print Head Reservoir is full. LED3: Green; indicates Print Head Reservoir is low and Ink Out Timer has expired.
Ink overfills and drips after ACS Cycle	Waste Bottle not tightened. Vacuum line disconnected, exceeded maximum vacuum line length, or vacuum line coiled.	Inspect Waste Bottle and ensure bottle is tight. Inspect vacuum line and connections. See *Section 4* for maximum line lengths and installation requirements.
Print Head will not heat, "At Temperature" LED never turns on	Trident Print Engine	Check the thermal fuse and heater resistance. The thermal fuse resistance should be 0 ohms and the heater resistor should be 33-48 ohms.
	PC Board	Check the LED indicators on the board. LED4: Yellow; indicates heater is on. LED5: Green; indicates Print Head has reached its operating temperature. The operating temperature is set via a resistor in the print engine.

Impulse Jet Print Head (continued)

System Symptom	Possible Cause	Operational Test Method
One or more channels will not fire after multiple Prime Cycles	Air in Print Head	Air in the Print Head is the most likely cause of missing channels. Refer to *Section 4: Installation, Configuring the Print Station, Priming the Print Heads* for bleeding procedures.
	Trident Print Engine	The piezoelectric crystals rarely fail unless the Print Head has been dropped or has sustained a severe impact. A cracked crystal will not allow the channel to fire, resulting in permanent loss of printing in the failed channel.
Ink Reservoir in Print Head does not refill, or no ink pumps out during an ACS or Auto-Prime Cycle.	Solenoids	Remove power from the Print Head. Disconnect solenoid cable harness. Purge, intake, and return solenoids are pinned on 1-2, 3-4, and 5-6, respectively. The Intake Valve controls ink into the Reservoir, and the Purge Valve controls ACS and Auto-Prime. Check the respective valve pins for resistance. An open coil should be replaced.
	PC Board	Check the LED indicators on the board. LED2: Green; indicates Print Head is requesting IDS to turn Liquid Pump on. LED9: Green; indicates Intake Solenoid Valve is open. LED8: Green; indicates Print Head Reservoir is full. LED3: Green; indicates Print Head Reservoir is low and Ink Out Timer has expired.
Print Head will not print.	PC Board	Make sure all print head cables and the print engine cable are seated at each end. Check the Test Points and LED indicators on the board. TP1: High voltage supply to driver IC (U9). The voltage level is set via a sense resistor in the print engine (40-150 VDC). LED6: Green; indicates high voltage is low.

Photosensor Sensitivity Test

This test will determine if the photosensor sensitivity is adjusted correctly for the application.

1. Place object approximately ¼ inch in front of photosensor; photosensor should sense object.
2. Place object near the center of the guide rails; photosensor should sense object.
3. Place object on far guide rail; photosensor should not sense object.
4. Check that objects on the far side of conveyor do not trip the photosensor.
5. Check that color differences in product do not cause multiple photosensor trips at the farthest sensing distance.

NOTE: The test object should be a sample of the actual product. For photosensor sensitivity adjustment procedure, refer to the photosensor manufacturer's instructions.

NOTE: If the red LED on the photosensor fails to illuminate when an object is placed in front of (but not touching) the photosensor, it indicates that the photosensor is disconnected, or the power supply or photosensor has failed.

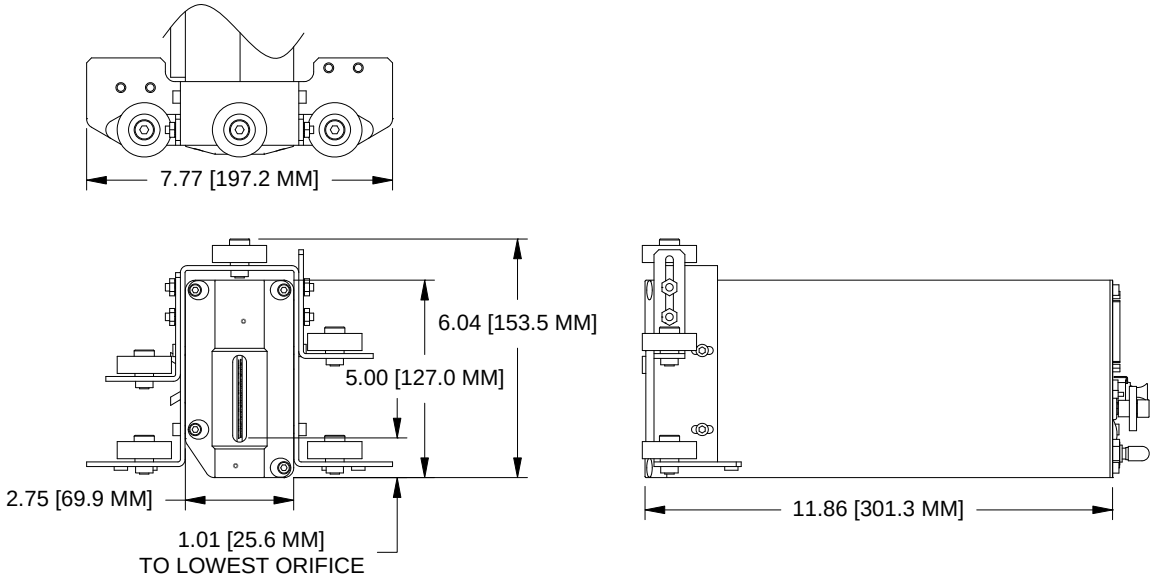
Encoder

Navigate the IJ3000 to the status screen. If the line speed displays a value comparable to the known line speed, then the encoder is functioning correctly. If the line speed displays "0", then check electrical connections to the encoder and IJ3000 PCB. Refer to *Appendix H: Encoder Functional Testing* for additional information.

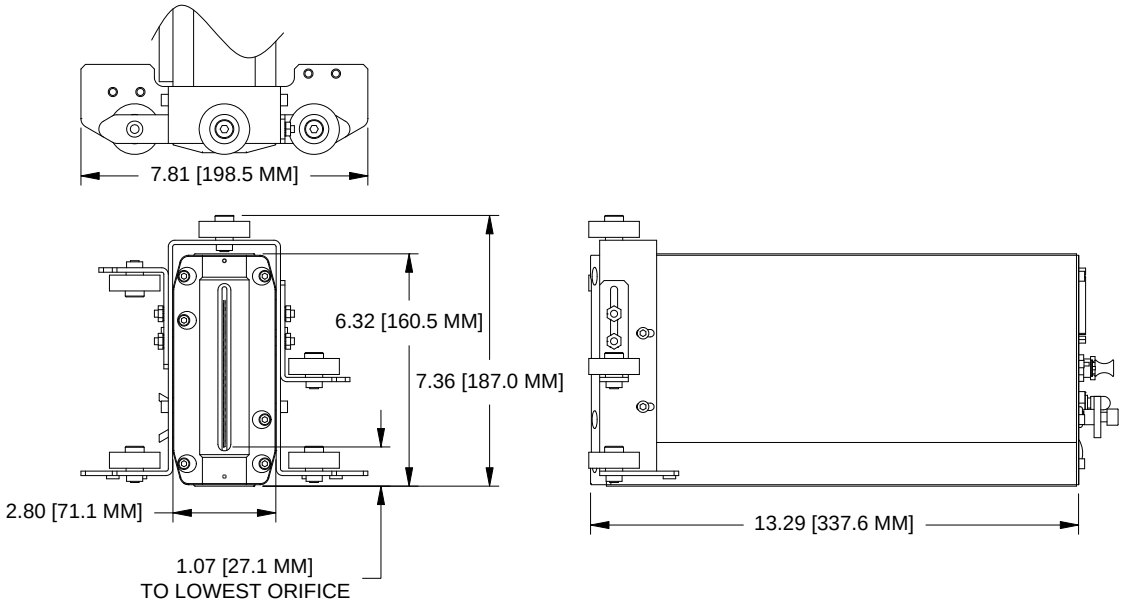
Appendix A: System Specifications

Impulse Jet Print Head

IJ384 Head (Porous and Non-Porous):



IJ768 Head:



Size - IJ384 Head
L: 11.84 [300.8mm]
W: 2.75" [69.9mm]
H: 5.0" [127.0mm]
Weight: 6 lbs [2.7kg]

Size - IJ768 Head
L: 13.29" [337.6mm]
W: 2.80" [71.1mm]
H: 6.32" [160.5mm]
Weight: 9.5 lbs [4.3kg]

Enclosure
Anodized aluminum

Electrical
24 VDC input from IJ3000 controller

Ink Filtration
25 micron in-line system inlet filter
10 micron built-in filter in print engine

Print Speed
Scan True II (Porous):
Alpha/ Numeric Text up to 200 fpm @ 200 dpi,
125 fpm @ 300 dpi. Barcoding up to 150 fpm.
AllWrite A5000 (Non-Porous)
Alpha/ Numeric text up to 150 fpm @ 200 dpi,
125 fpm @ 300 dpi. Barcoding 100 fpm.

Print Resolution
384/128 Head: 128 addressable channels, 2" solid print height
768/256 Head: 256 addressable channels, 4" solid print height

Throw Distance
Up to 1/8” (1/16” recommended for consistent print quality)

Ink Type
ScanTrue® II, Pigmented Ink for porous substrates, black
AllWrite A5000, Dye-based Ink for Non-porous substrates, black

Environment
Ambient operating temperature: 50°F to 104°F (10°C to 40°C)
Operating humidity: 5 - 80% non-condensing

Centralized Ink Delivery System (Scantrue II)

Size

Height: 20.42" [518.7mm]

Width: 14.61" [371.1mm]

Depth: 7.13" [181.1mm]

Weight: 18 lbs. [8.2 kg]

Cable and Tubing Clearance: 5" from the bottom of the enclosure

Enclosure

Sealed industrial enclosure, available in cold rolled steel (painted black) or stainless steel

Ink Filtration

25 micron built in supply reservoir

Electrical

Non-European: 103VAC to 122VAC, 60Hz, 1.0 Amp max.

European: 207VAC to 253VAC, 50Hz, 0.5 Amp max.

Normal Operating Pressure Range

0 psi to 30 psi (approximately) pump output when operating

Cable Ports

- Communication to controller
- Power cord
- Optional ink status beacon

Environment

Ambient operating temperature: 50°F to 104°F (10°C to 40°C)

Operating humidity:

- ScanTrue® II Ink: 5 - 80% non-condensing

Tubing Limitations

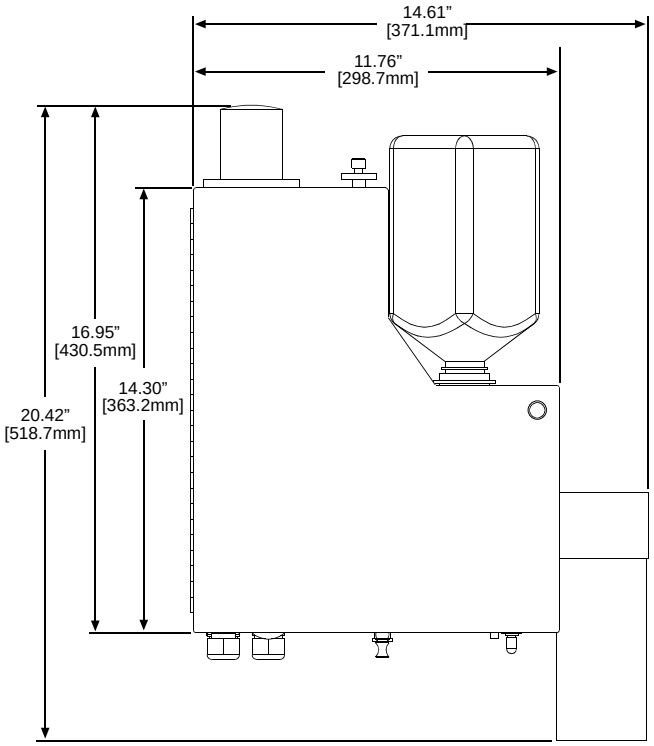
Maximum vertical tube length (bottom of CIDS to bottom of highest print head) = 20ft ink pump limitation.

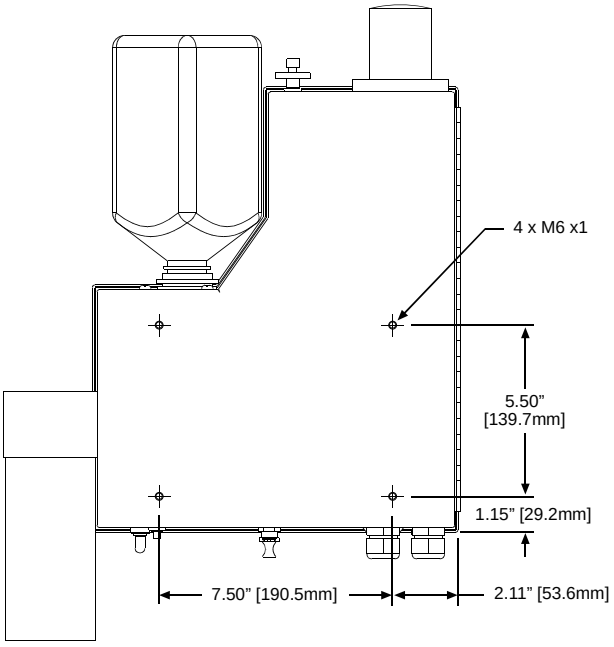
Maximum height of CIDS or tubing above print head= 3ft vacuum pump limitation.

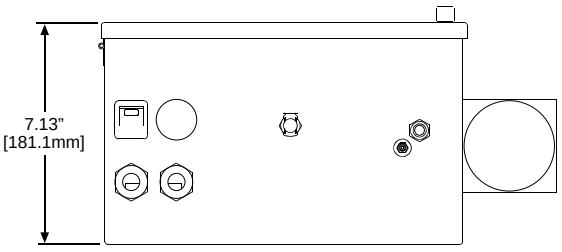
(See *Section 4: Installation, Plumbing the System.*)

Number of Heads Allowed

4







Centralized Ink Delivery System-NP (A5000)

Size

Height: 20.42" [518.7mm]

Width: 14.61" [371.1mm]

Depth: 7.13" [181.1mm]

Weight: 18 lbs. [8.2 kg]

Cable and Tubing Clearance: 5" from the bottom of the enclosure

Enclosure

Sealed industrial enclosure, available in cold rolled steel (painted black) or stainless steel

Ink Filtration

25 micron built in supply reservoir

Electrical

Non-European: 103VAC to 122VAC, 60Hz, 1.0 Amp max.

European: 207VAC to 253VAC, 50Hz, 0.5 Amp max.

Normal Operating Pressure Range

0 psi to 30 psi (approximately) pump output when operating

Cable Ports

- Communication to controller
- Power cord
- Optional ink status beacon

Environment

Ambient operating temperature: 50°F to 104°F (10°C to 40°C)

Operating humidity:

- AllWrite A5000 Ink: 5 - 80% non-condensing

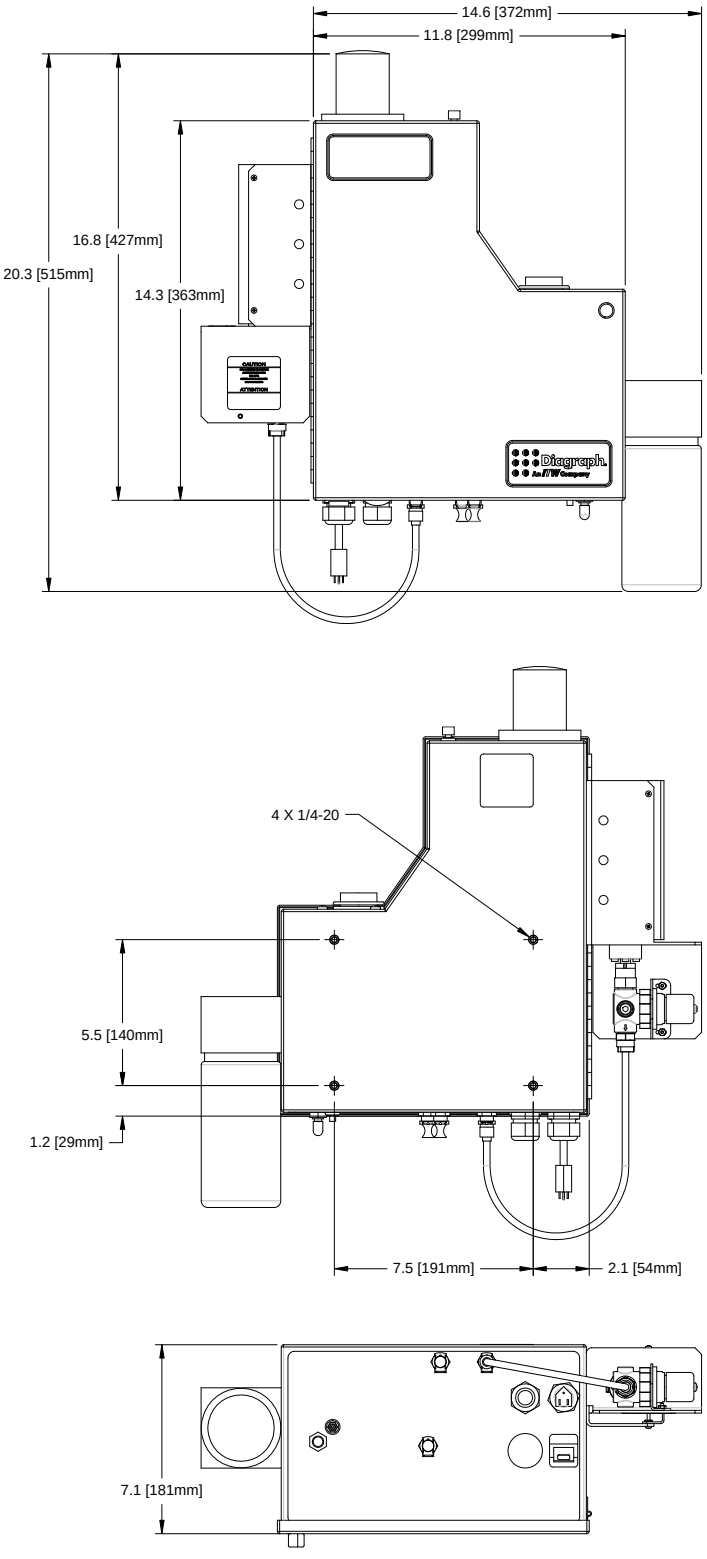
Tubing Limitations

Maximum vertical tube length (bottom of CIDS to bottom of highest print head) = 20 ft ink pump limitation.

Maximum height of CIDS or tubing above print head= 3ft vacuum pump limitation.

(See *Section 4: Installation, Plumbing the System.*)

Number of Heads Allowed



Centralized Ink Delivery System - ES

Size

Height:

21.6" [550mm] with 1L bottle

16.0" [406mm] with 500mL bottle

Width: 9.64" [244.9mm]

Depth: 6.90" [175.2mm]

Weight: 11 lbs. [5.0 kg]

Cable and Tubing Clearance: 5" from the bottom of the enclosure

Enclosure

Cold rolled steel (painted black)

Ink Filtration

25 micron built in supply reservoir

Electrical

Non-European: 103VAC to 122VAC, 60Hz, 1.0 Amp max.

European: 207VAC to 253VAC, 50Hz, 0.5 Amp max.

Normal Operating Pressure Range

0 psi to 30 psi (approximately) pump output when operating

Cable Ports

- Communication to controller
- Power cord
- Optional ink status beacon

Environment

Ambient operating temperature: 50°F to 104°F (10°C to 40°C)

Operating humidity:

- ScanTrue® II Ink: 5 - 80% non-condensing

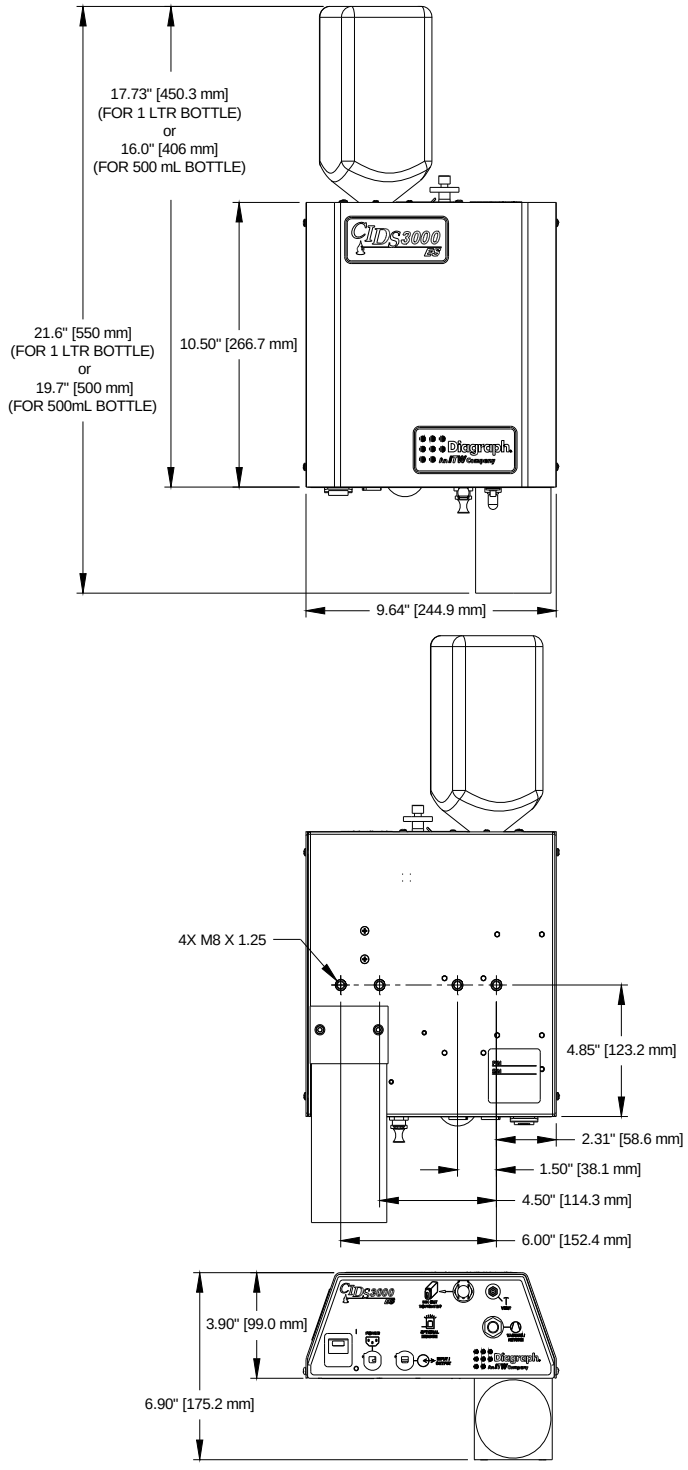
Tubing Limitations

Maximum vertical tube length (bottom of CIDS to bottom of highest print head) = 20ft ink pump limitations.

Maximum height of CIDS or tubing above print head= 3ft vacuum pump limitation.

(See *Section 4: Installation, Plumbing the System.*)

Number of Heads Allowed



4

Appendix B: Theory of Operation

Functional Description

The IJ3000 ink jet system prints text, autocodes (such as product counts or time and date stamps), barcodes, and/or graphics onto products as they travel by conveyor past stationary print heads. Print can be on any one of, or a combination of, the product's sides. The conveyor speed is monitored using a variable speed encoder or a built-in fixed speed encoder. Products are detected using a photosensor. The information to be printed is defined as a message and is programmed into the controller via a user interface.

IJ3000 Impulse Jet Print Head

The IJ3000 Impulse Jet print head assembly consists of a piezoelectric impulse jet print engine, a small ink reservoir, intake, purge, and return solenoid valves, and an electronic controller board to control both printing and fluidic management functions of the print head.

The piezoelectric impulse jet print engine has a nozzle plate with an array of orifices and a corresponding array of piezoelectric crystals. Piezoelectric crystals expand and contract rapidly based on voltage being supplied to and removed from crystals. Very small ink droplets are ejected as a result of piezoelectric crystals expanding rapidly, creating a pressure pulse to force ink droplets out the orifices. The print engine also incorporates a heater to control the head temperature, allowing ink viscosity to be maintained over a wide spread of ambient temperatures. The head must be at the correct operating temperature before printing. The head temperature can be monitored via the LEDs located on the back of the print head. LEDs are provided to show when the heater is on and when the head is at appropriate temperature.

The print head electronics receive power, as well as clock, data, and latch signals from the controller, to in turn drive the heater and the imaging capabilities of the print engine. The print head electronics also control the ink management functions required to supply ink and run the Automatic Cleaning System (ACS).

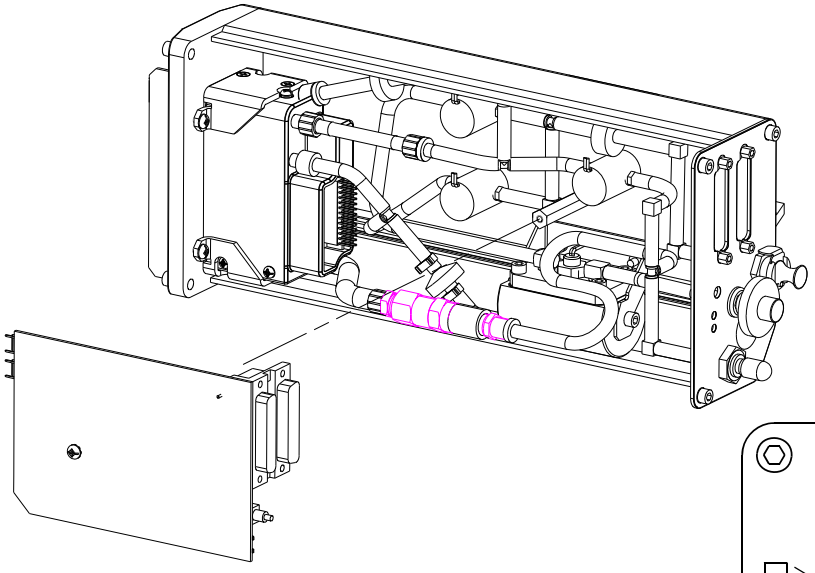
At the print head, ink flows in through the intake solenoid valve to fill a small print head reservoir. The ink level in the print head reservoir is maintained by a level detect, sensing the ink level and sending a signal to the CIDS to turn on/off the ink pump. The reservoir is vented allowing atmospheric pressure to be maintained inside the reservoir. The vent is located on the back of the print head and is filtered to ensure debris can not enter the ink reservoir. Ink is fed from the print head ink reservoir to the print engine via gravity. Capillary action is then utilized to supply the orifices in the nozzle plate with ink.

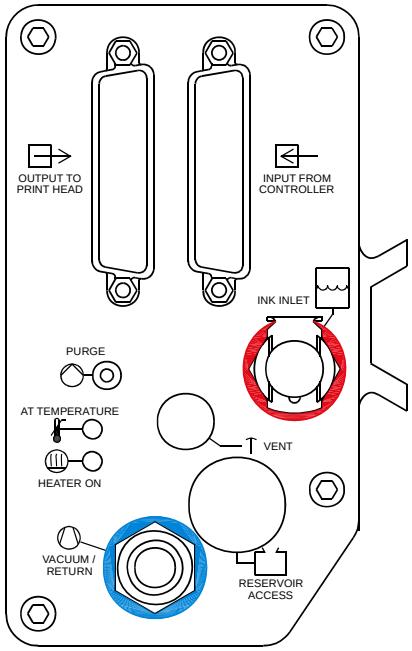
NOTE: Since ink is fed to the print engine via gravity, it is important to maintain the print head at a level position during operation.

The print head also incorporates an Automatic Cleaning System (ACS) to remove dirt and debris from the orifice plate. A small vacuum channel has been designed into the bottom of the nozzle plate. During an ACS cycle, a small amount of ink is pulsed through the orifices. The ACS cycle turns the vacuum pump on in the CIDS, and pulses both the ink pump and purge solenoid to control the flow of ink out the nozzle plate. The ink and debris is vacuumed off the nozzle plate, and drawn back to the waste collection bottle located in the CIDS. In a non-porous system pressurized solvent is supplied by the CIDS through an additional tubing connection at the rear of the print head. During an ACS cycle, a flush solenoid opens inside the print head to allow solvent flow. The flow is directed over the front of the orifice plate to help break down stubborn dried non-porous ink and debris. An ACS cycle can be manually initiated by pushing the purge button located on the back of the print head. The ACS can also be programmed to run at specified times by using the IJ3000 controller.

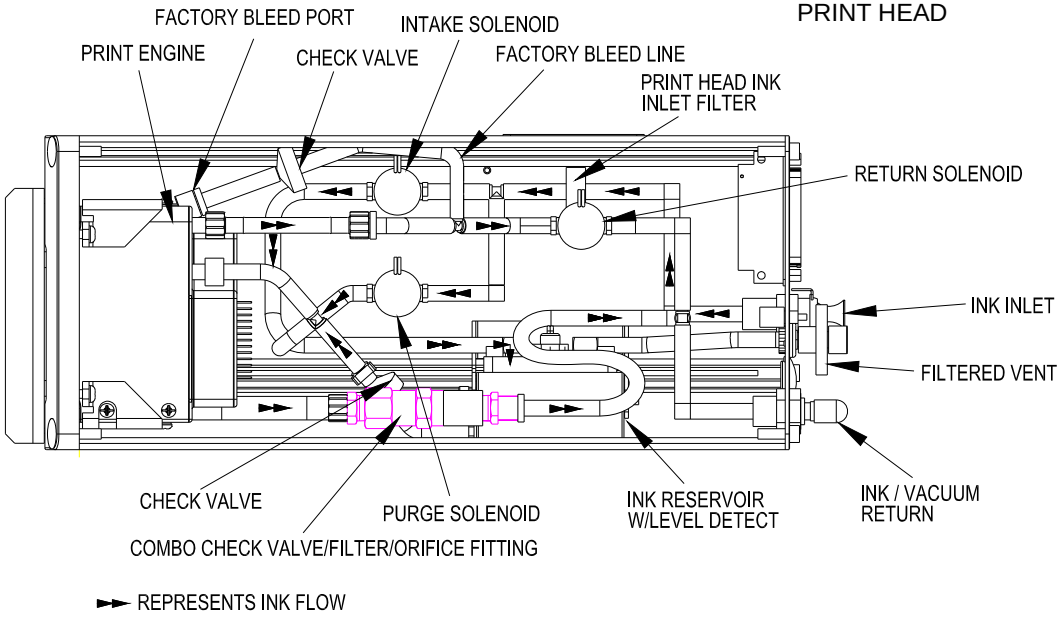
When print head purging is required, the ink is pumped directly into the print engine, through the purge solenoid, and out through the return solenoid valve, allowing air to be pushed out of the head. This is required only during initial set-up and when the print engine has been replaced. The ink is returned and collected in the CIDS waste collection bottle. This function can be initiated by pushing in and holding the Purge button located on the back of the head for 5 seconds.

IJ384 Head: (Scantrue II)

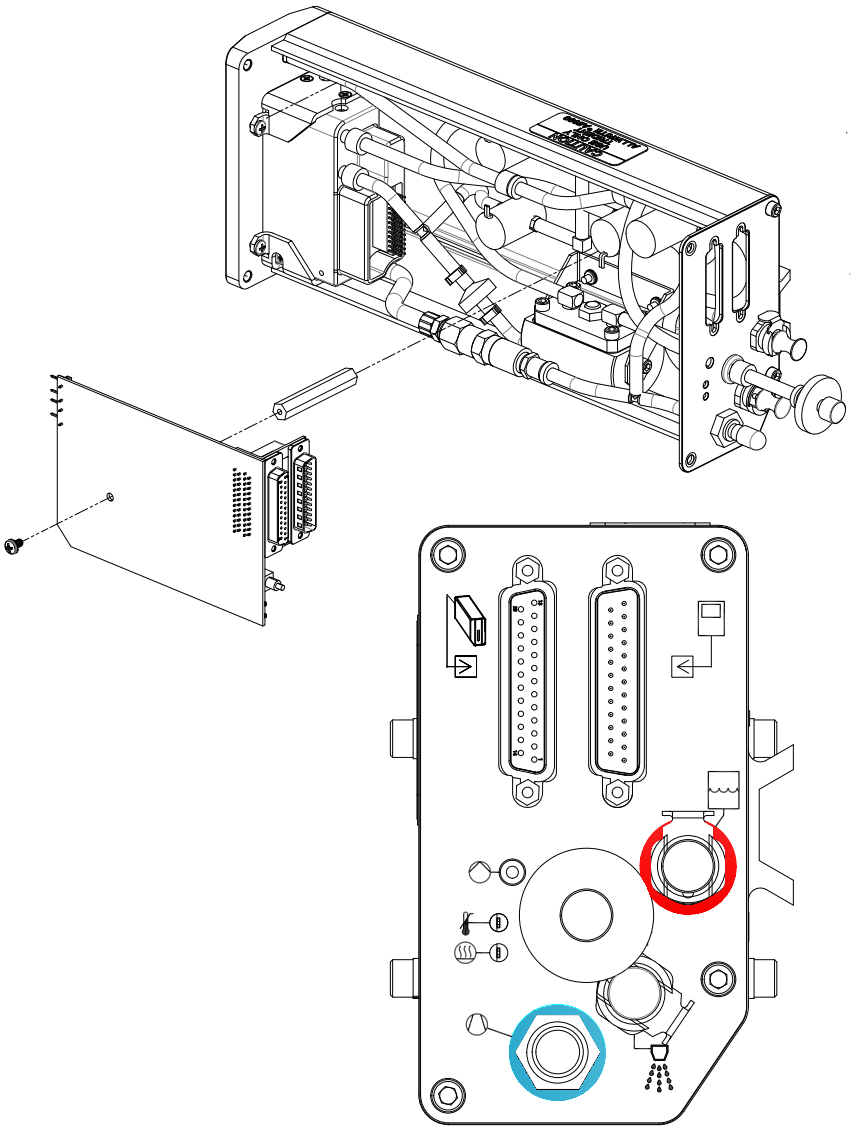


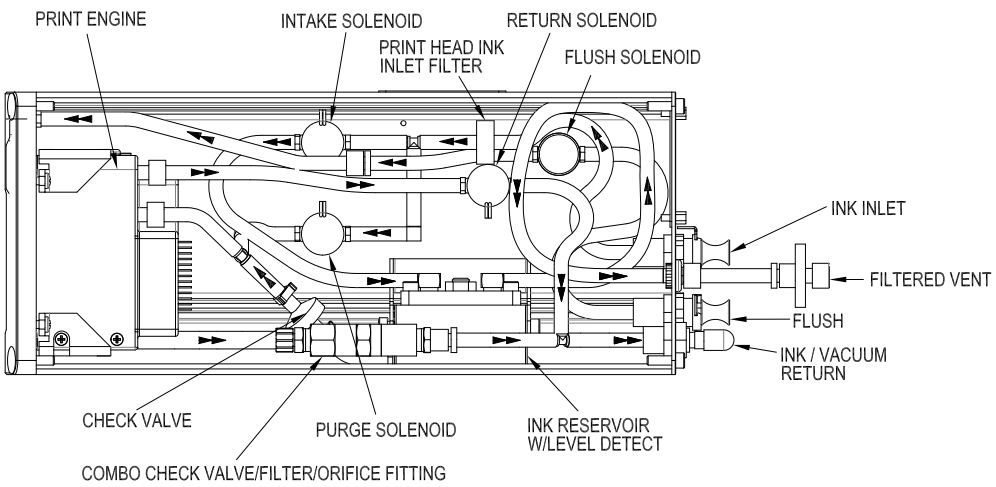


BACK VIEW OF PRINT HEAD



IJ384NP HEAD (A5000)





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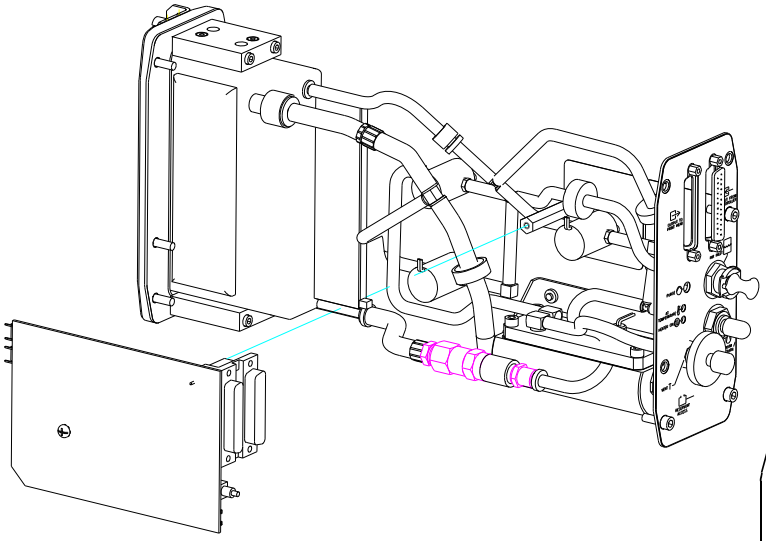
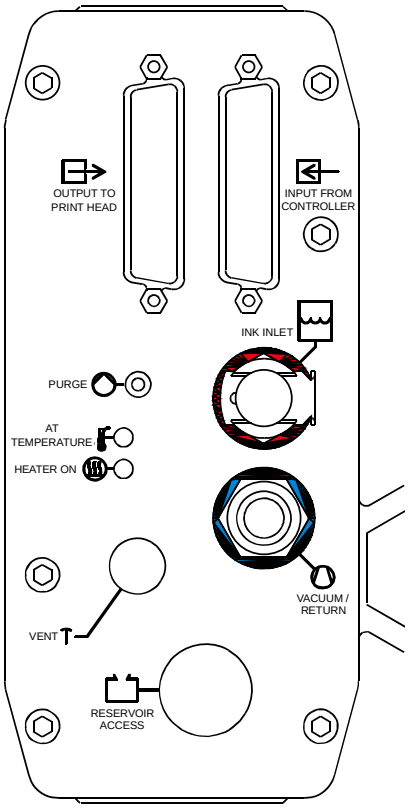
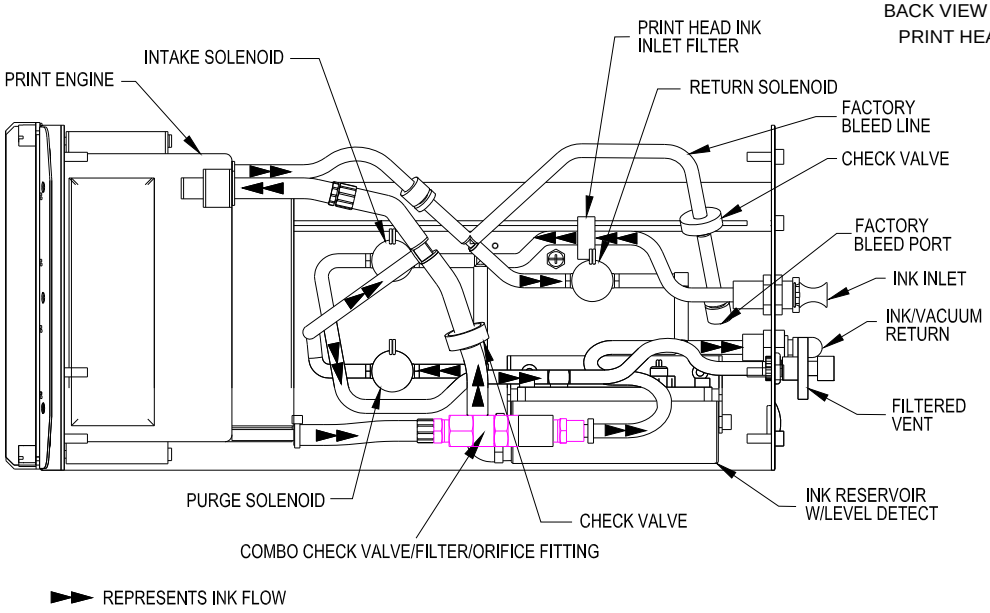
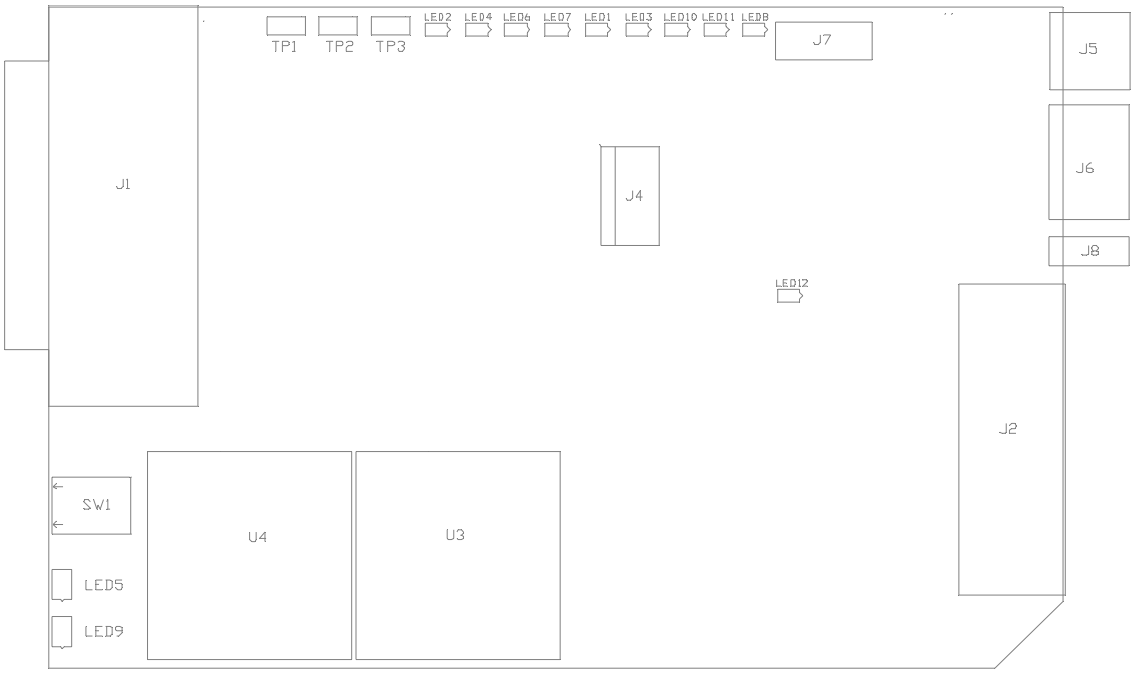




BACK VIEW OF PRINT HEAD



IJ384 and IJ768 Heads:



Test Points:	TP1:	LATCH; 5 volt logic signal. The column is printed on the rising edge of the LATCH signal.
	TP2:	CLOCK; 5 volt logic signal. Data is shifted into the shift register on the falling edge of the CLOCK signal.
	TP3:	DATA; 5 volt logic signal. Serial data input signal to shift register.
LEDs:	LED1:	Green; indicates print head is requesting CIDS to turn liquid pump on.
	LED2:	Green; indicates print head is requesting CIDS to turn vacuum pump on.
	LED3:	Green; indicates print head reservoir is low and the ink out timer has expired.
	LED4:	Green; indicates high voltage is low.
	LED5:	Green; indicates print head has reached its operating temperature. The operating temperature is set via a resistor in the print engine.
	LED6:	Green; indicates print head is in stand-by mode. Heater and high voltage are turned off.
	LED7:	Green; indicates print head reservoir is full.
	LED8:	Green; indicates intake valve is open.
	LED9:	Yellow; indicates heater is on.

	LED10:	Green; indicates return valve is open.
	LED11:	Green; indicates purge valve is open
Connectors:	SW1:	Purge switch.
	J1:	Print head I/O connector.
	J2:	Print engine connector.
	J4:	Programming port, for programming microcontroller via a PC.
	J5:	Reservoir float switch connector.
	J6:	Solenoid valve assembly connector.
	J7:	(Not used.)
	J8:	Flush Valve connector

Print Head Daisy Chain

Print heads attach to the IJ3000 in a daisy chain configuration. The first print head plugs into a Print Head Interface Board (P1), the second print head plugs into the first print head, the third print head plugs into the second, and so on, without exceeding the maximum number of print heads. The maximum number of print heads for an IJ224 daisy chain is three, the maximum for an IJ384 daisy chain is two, and the maximum for an IJ768 daisy chain is one. An IJ3000 can have one or two daisy chains (one for each Print Head Interface Board).

Electrically, a print head daisy chain is a shift register. A shift register moves bits of information along a line one bit at a time in step with a clocking signal. It works like this: A bit is placed at the entrance to the line of bits and waits for the clock (step) signal. When the clock signal is given, the bit steps into the first spot on the line. The bit that occupied the first spot in line steps to the second, the second steps to the third, the third to the fourth, and so on until the last bit in line steps off the end of the line and is lost. Repeat the process enough times and all of the information in the shift register is replaced. Repeat the process for all dots in the column. A latch (print) signal sent after the dots have been shifted prints the column.

All daisy chain signals - DATA, CLOCK and LATCH - are generated and controlled by circuitry in the FPGA (Field Programmable Gate Array, used as a print head driver chip) on the Print Head Interface Board.

Please note that power is applied to the print heads even when the IJ3000 is "turned off." The only way to remove power from the print heads is to pull the plug.

Print trigger Photosensor

The photosensor detects when a product is about to pass by the print heads and signals the IJ3000 controller to start a print cycle. The photosensor signal is active low, and it must remain low for at least one encoder pulse. Once a print cycle starts, it continues to completion regardless of what the photosensor signal does.

The IJ3000 is compatible with through-beam, retro-reflective, and diffused photosensors that work at 24VDC and have a current sinking (or open collector) output. The photosensor plugs into the Print Head Interface Board (P2).

SCS (Smart Cleaning System) Photosensor

The SCS photosensor should be mounted 2 - 3 seconds upstream of the first print head in the daisy chain. As the product passes in front of the SCS photosensor a signal is fed to the print head daisy chain to initiate the proprietary electric cleaning.

Encoder

The encoder determines the time period between the printing of individual columns, or the print speed. As a product's speed increases, the time period between columns must decrease, that is, the print speed must increase, to maintain consistent column-to-column spacing. The IJ3000 has two encoder options, external and internal. Use the external encoder when the conveyor speed fluctuates. Use the internal encoder when the conveyor speed is constant.

The **external encoder** is a 24VDC optical encoder. The encoder's wheel is sized such that the encoder outputs 300 pulses per inch of product travel. The external encoder plugs into the Print Head Interface Board (J4), and its signal goes to the FPGA where it is used to time the sending of column data to the print head.

The **internal encoder** signal is a constant frequency pulse stream generated on the Print Head Interface Board. A programmable counter circuit in the FPGA divides the board's 32 MHz clock by a value calculated from a line speed entered during system setup. When the user selects the internal encoder, a switch in the FPGA disconnects the external encoder signal from the print timing circuits and connects the output from the counter circuit.

CIDS3000

System Features

1. *Centralized ink delivery.* Ink is pumped from one location through a single tubing line that is subsequently teed downstream to all print heads in the system. As the print heads demand more ink, the liquid pump delivers ink to the requesting print head. Although the ink line is pressurized, a print head will not receive the ink unless its intake solenoid is opened. Each print head controls its own ink level in its own reservoir.
2. *Ink supply "low" detection.* When the CIDS3000 detects ink low via the float in the ink reservoir, it disables the ink pump, leaving a safe amount of ink. The CIDS then alerts the operator by turning on the attached beacon light, and by sending a signal via I/O to the IJ3000 controller.
3. *Ink supply "out" detection.* If the ink supply bottle is not replaced in a timely fashion, the next time that a print head requests ink, a timer in the print head will start. If the ink supply has not been replaced within five minutes, print will be disabled on all print heads, and a signal will be sent to the CIDS3000 that will cause a slow flashing of the beacon.
4. *Centralized vacuum and ink waste collector*. Like the centralized ink, vacuum is supplied to all the print heads via a single tubing line that is subsequently teed. The CIDS3000 is equipped standard with a heavy-duty vacuum pump to assist in the Automatic Cleaning System (ACS). Additionally, it will assist in the removal of waste ink while bleeding the tubing.
5. AFS (Automatic Flushing System): For non-porous CIDS3000's, the enclosure has been modified to accept an external pressurized solvent supply can. The solvent can is screwed into a receiver and shrouded by a heavy-duty stainless steel enclosure. This fluid then passes through a regulator and into the CIDS enclosure. A pressure sensor mounted to the solvent tubing inside the CIDS detects when the can's liquid level is low. The pcb then signals the beacon to illuminate steady. Note that one can determine when whether a steady-on beacon is ink or solvent by visually observing the ink bottle. The solvent exits the CIDS through a third tubing line. Like the ink and vacuum tubing lines, the solvent line is connected to the rear of the print head. A solvent solenoid inside the print head controls the flow of solvent on its way to supplying fresh cleaning fluid for ACS enhancement. The excess solvent and ink used during the ACS cycle is vacuumed off and returned to the CIDS waste collection system.
6. *Ink capacity.* Both the 500 mL and 1 L bottles are accommodated by the CIDS3000.
7. *Safety.* The on-board microcontroller will prevent an excessive duty cycle on the liquid pump. It also disables the liquid pump when ink is low, and both pumps when any ink anomaly is encountered such as ink out or ink faults.

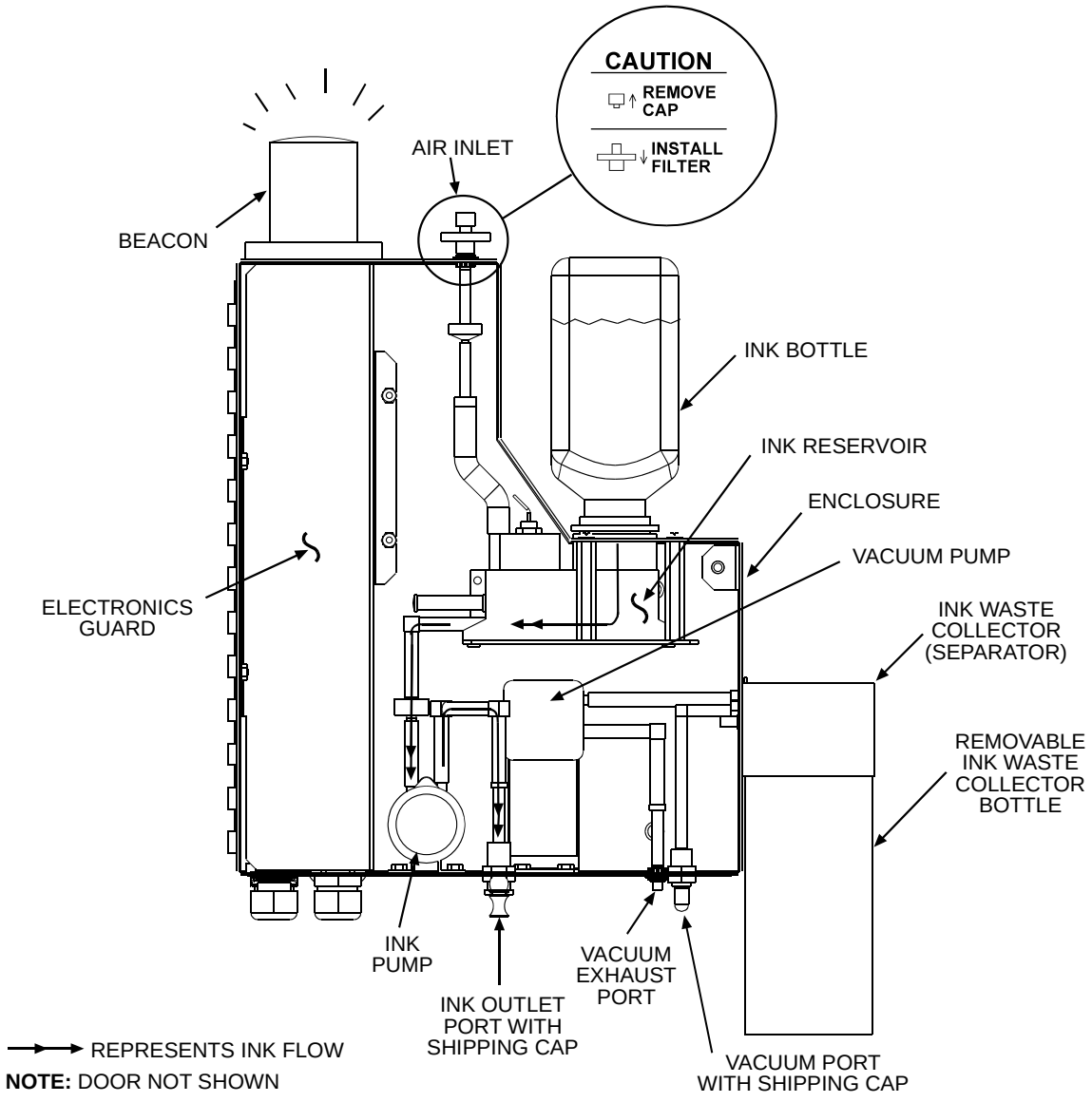
Startup Operation

After all plumbing and electrical connections have been made, toggling the power switch will initiate the CIDS3000. The system only responds to input from the I/O connection to the IJ3000. This I/O connection is essentially a pass through connection to the print head bus. In other words, the print heads control the ink pump and vacuum pump on/off states. If the print heads are not requesting ink for reservoir refill or vacuum from an ACS cycle, then the CIDS3000 will remain idle.

Normal Operation

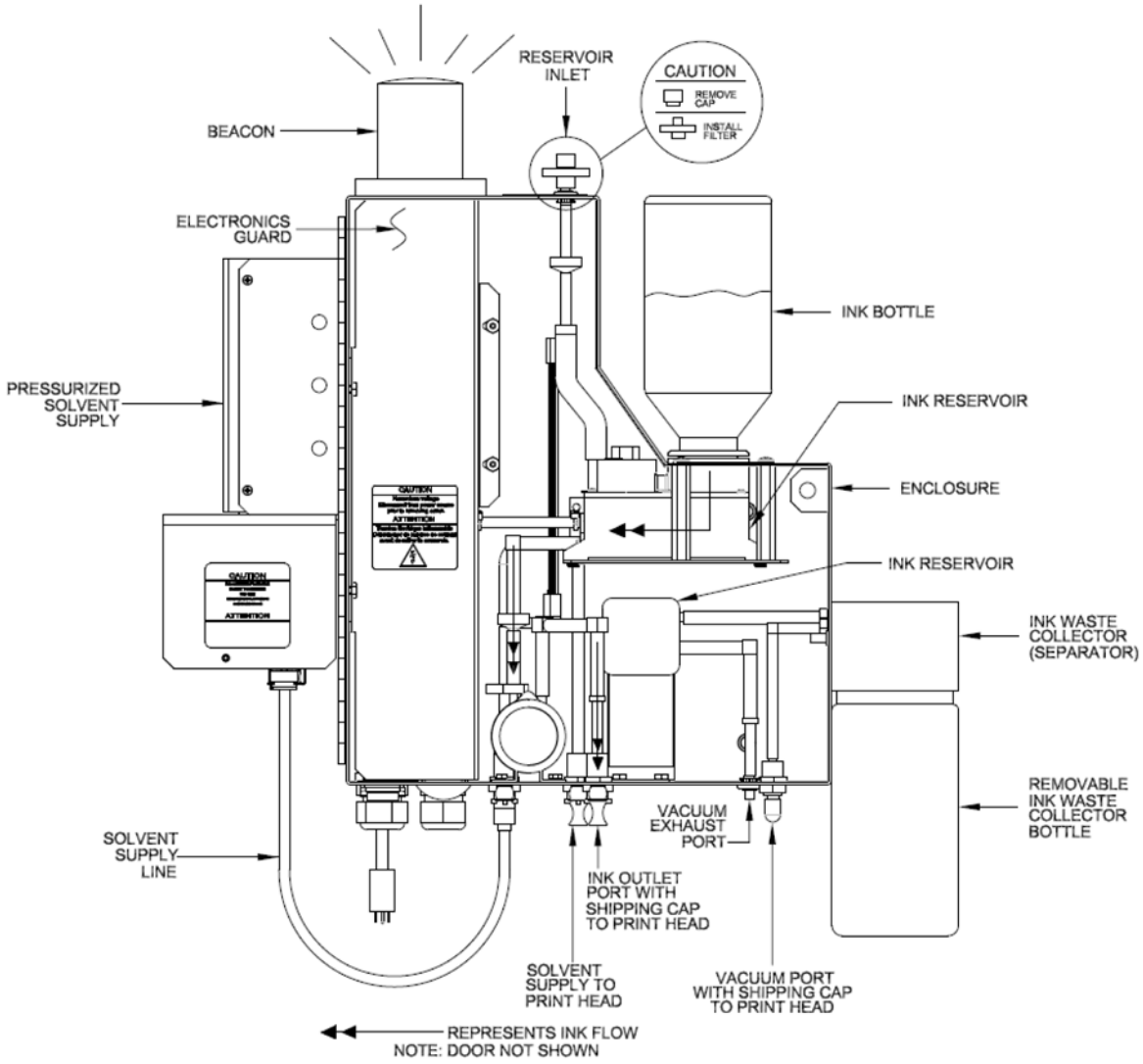
The ink bottle supplies the open-vented reservoir. The reservoir creates the first of three stages of ink filtration. When the print head demands ink from the CIDS3000, the ink pump turns on. The ink is pulled through the reservoir filter through a check valve and into the pump. As the ink is pulled from the reservoir, a vacuum is created in the bottle. To equalize this pressure differential, air is pulled through the vent into the reservoir. In order to prevent ink from spilling out the vent, the CIDS3000 incorporates a long vent tube with an in-line check valve.

The pump will then push the ink to the print head that is requesting ink until the float in the print head reservoir is satisfied. Each print head controls its own ink level by opening and closing an intake solenoid. The CIDS3000 operates in this state until it encounters a different ink status.

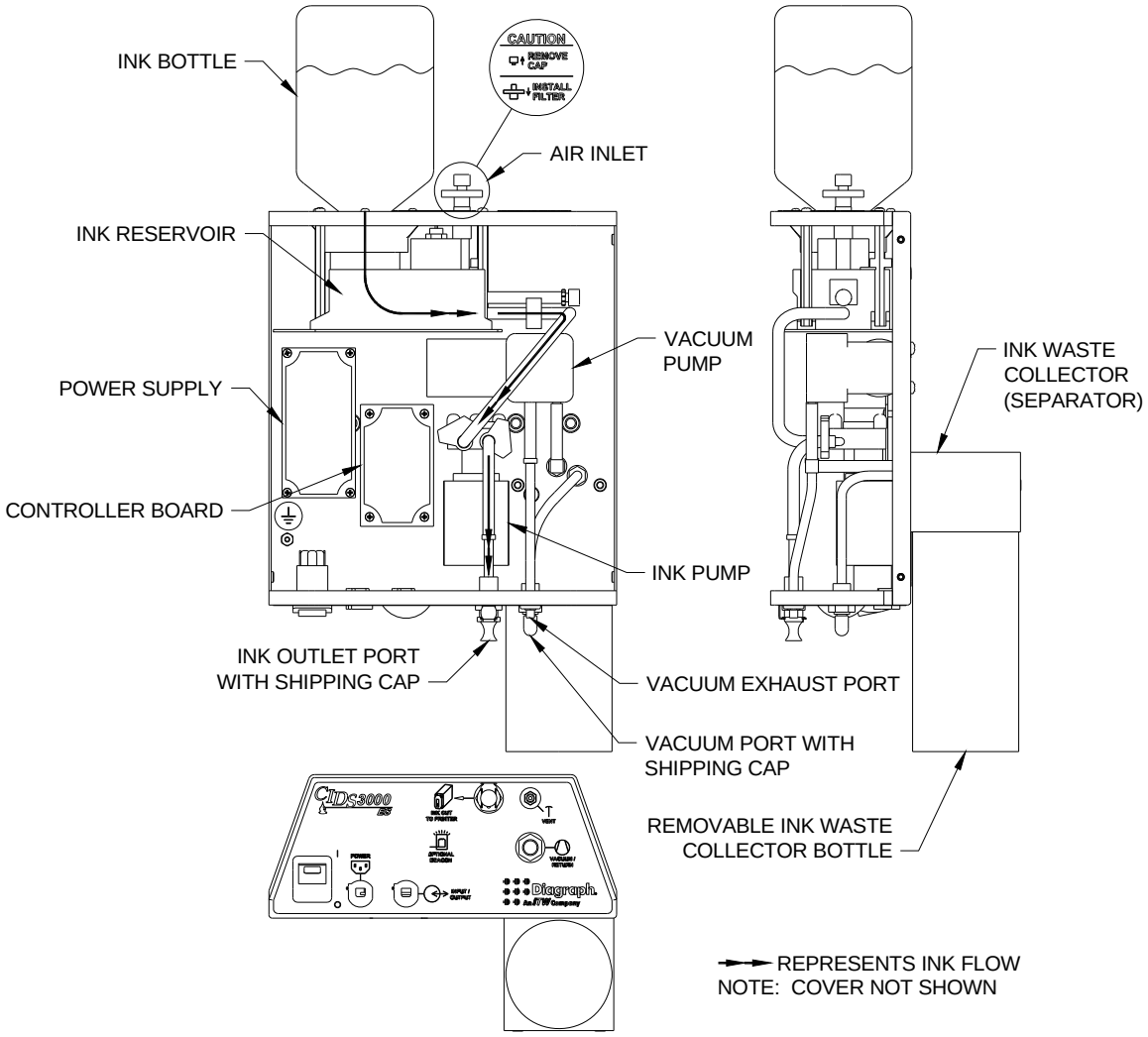


CIDS3000 with out Pressurized Solvent.

If the CIDS3000 includes the pressurized solvent supply, the print head will open and close an internal solenoid to allow flow of solvent down the face of the print head. As with ink and vacuum, a separate tubing line is required from the CIDS3000. A pressurized can of solvent is the main source of solvent. The solvent flows through a regulator into the CIDS. This supply line has a pressure sensor to detect when the pressurized solvent can is empty. When the can is empty, the beacon light will illuminate steady. One must determine the state of the beacon lamp by determining whether the ink supply is visually empty or the solvent can is empty, and then replace the appropriate material.



CIDS3000 With Pressurized Solvent.



CIDS3000-ES

Ink Low Detection

When the ink bottle empties into the ink reservoir, a float will drop in the reservoir. After the float drops in the reservoir, the microcontroller will disable the liquid pump and turn on the beacon steady. This alerts the operator that it is time to replace the ink bottle. When the ink bottle has been replaced, the CIDS3000 will automatically extinguish the beacon light.

NOTE: The ink pump is disabled in order to inhibit an ink / air-bubble mixture from getting into the impulse jet print engines.

Ink Out Detection

If the steady beacon light is ignored and a print head requests ink, a timer is started in the print head microcontroller. If the ink bottle is not replaced within five minutes, then the beacon changes to a slow flash. In addition, print is disabled on all print heads on both IJ3000 tasks.

Ink Waste Collector Full

Upon filling the ink waste collector (separator) bottle, a float level detect raises inside the separator assembly. The feature disables both pumps inside the CIDS3000 and illuminates the beacon with a fast flash. By disabling the pumps, overflow is not only prevented at the separator bottle, but also at the print head by disabling the ACS feature. Additionally, the vacuum pump is prevented from pulling the ink into itself.

Once the ink separator bottle has been replaced or emptied, the CIDS3000 power switch must be toggled off then on to reset.

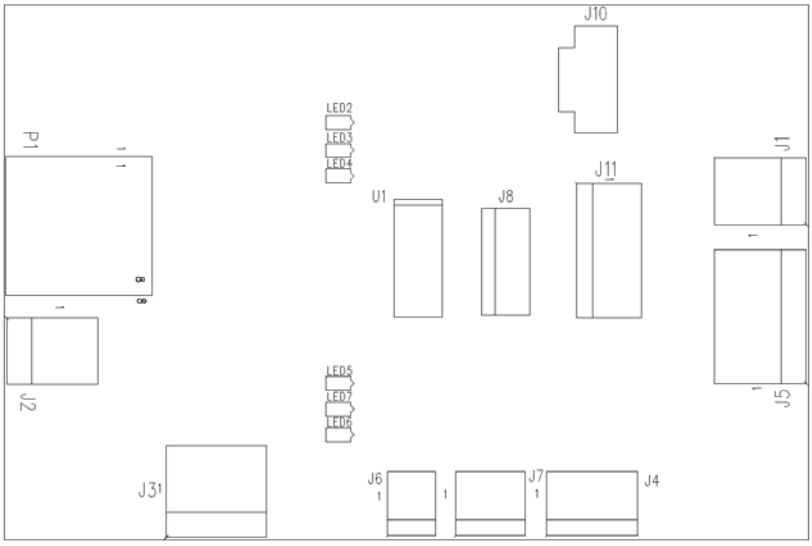
Ink Fault Detection

If an ink line is not plugged into a port or is broken, the pump will turn on for twenty seconds, when requested, and then turn off. After the pump cycle, the beacon will flash quickly. Functionality will emulate Ink Waste Collector Full.

Once the ink fault has been remedied, the CIDS3000 power switch must be toggled off then on to reset.

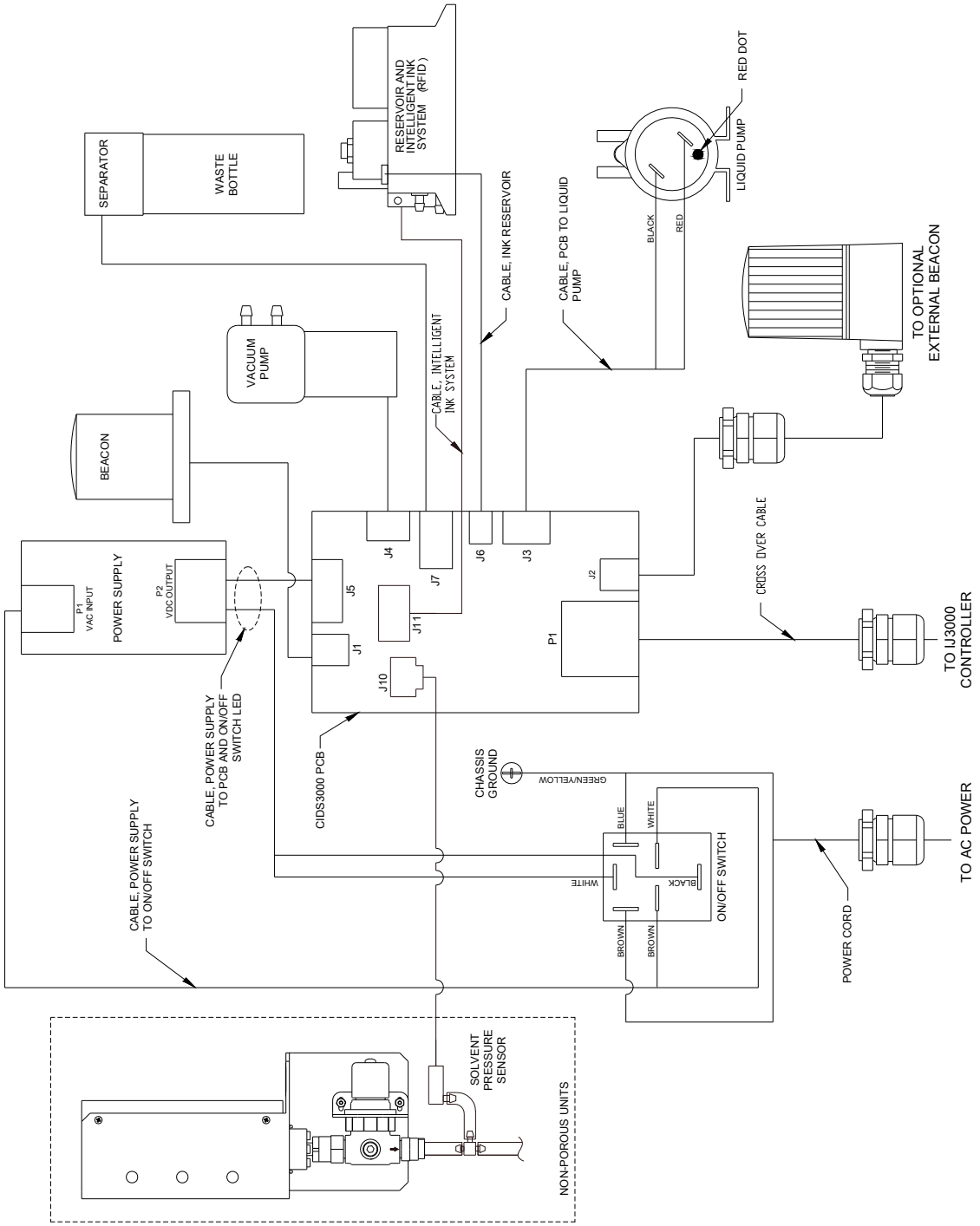
NOTE: Never mix ink types because they are not miscible. Irreversible internal damage will occur.

CIDS Board

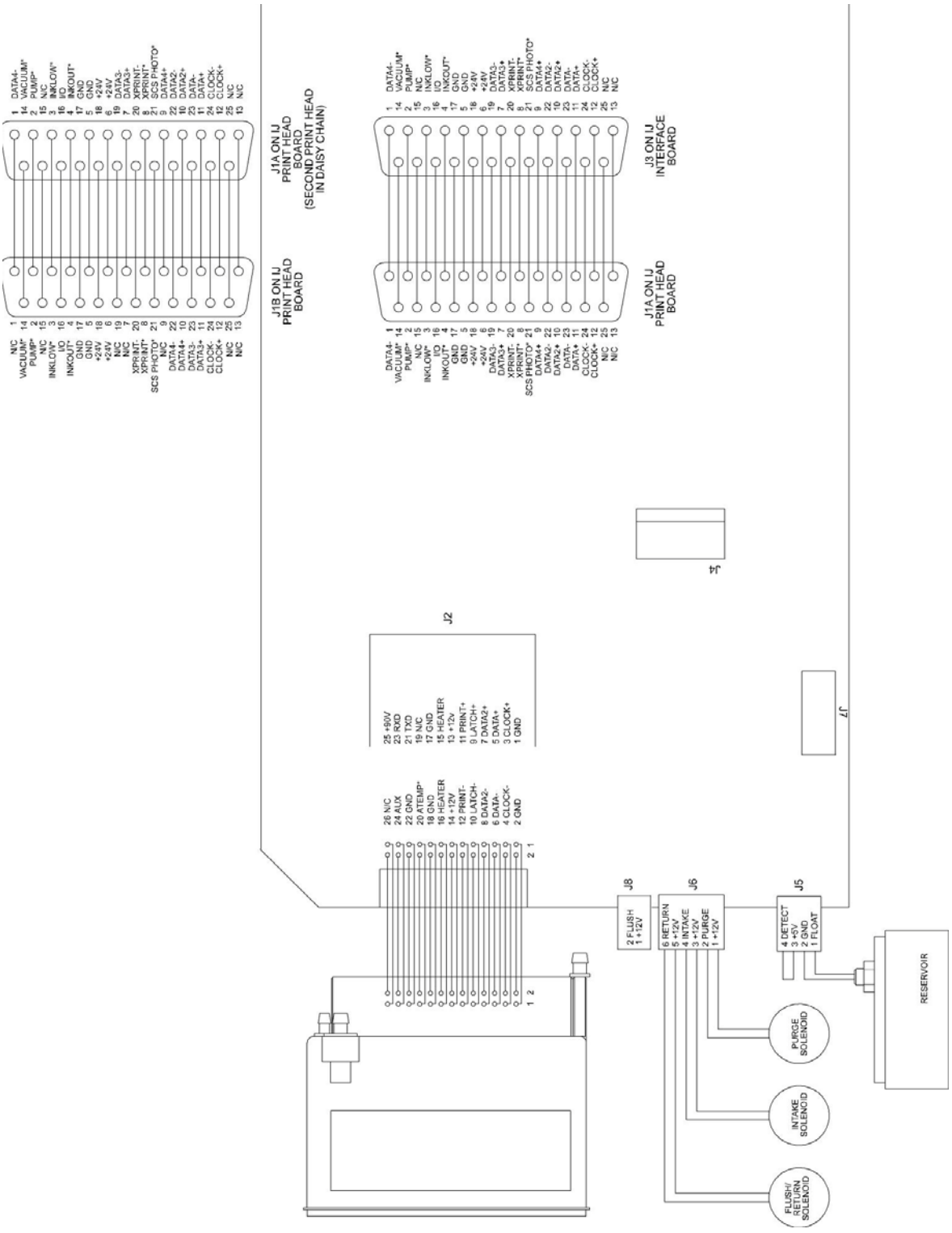


LEDs:	LED1:	NOT DEFINED.
	LED2:	Red; indicates a print head is signalling that the print head reservoir is low and the ink out timer has expired.
	LED3:	Green; indicates a print head is signalling for the vacuum pump to turn on.
	LED4:	Green; indicates a print head is signalling for the liquid pump to turn on.
	LED5:	Red; indicates that the waste bottle is full.
	LED6:	Red; turns on, off, and flashes with the beacon. Off indicates ink is OK, on indicates ink is low, slow flash (1 Hz) indicates ink is out, and fast flash (6 Hz) indicates that the waste bottle is full or the pump was turned on for more than 10 seconds.
	LED7:	Yellow; indicates ink is low in the CIDS reservoir.
Connectors:	SW1:	NOT DEFINED.
	P1:	CIDS I/O connector.
	J1:	Beacon.
	J2:	External beacon.
	J3:	Liquid pump.
	J4:	Vacuum pump.
	J5:	Power (12V).
	J6:	Reservoir float switch.
	J7:	Waste bottle float switch.
	J8:	Programming port, for programming U1 via a PC.
	J10:	Pressure sensor for flushing solvent
	J11:	RFID communication

CIDS3000 Interconnect Diagram



IJ384 and IJ768 Print Head Interconnect Diagram



Appendix C: Parts and Supplies

Consumables

Ink

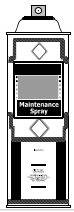
The following ink is currently offered by Diagraph. A Diagraph sales representative can advise the proper ink for a particular application.

Part No.	Description	Type	Color	Size
001-0598-01	ScanTrue® II	Pigmented Oil Based for Porous Media	Black	500mL
001-0813-01	ScanTrue® II	Pigmented Oil Based for Porous Media	Black	1 Liter
001-0921-01	AllWrite A5000	Dye-Based For Non-Porous Media	Black	500mL

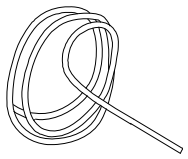
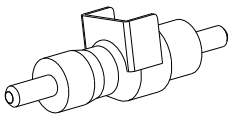
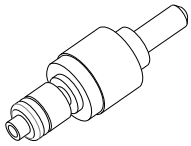
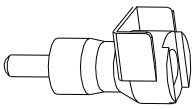
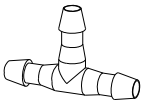
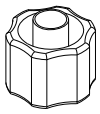
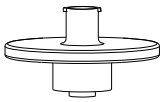
NOTE: Use only the same type of ink that shipped with the system. Never mix ink types.

Print Head Cleaning

PART NO.	DESCRIPTION	CONTENTS	WHERE USED
5760-800	Start Up / Cleaning Kit	Gloves, Lint-Free Wipes, and Foam Swabs	Assists in cleaning Impulse Jet Print Heads
5760-695	Impulse Jet Maintenance Spray for ScanTrue® II	2 Pack	
5760-832	Sponge Swabs	100 Sponge Swabs	
5760-860	Impulse Jet Cleaning Solution for AllWrite A5000	2 Pack	
5760-861	Impulse Jet Maintenance Spray for AllWrite A5000	2 Pack	

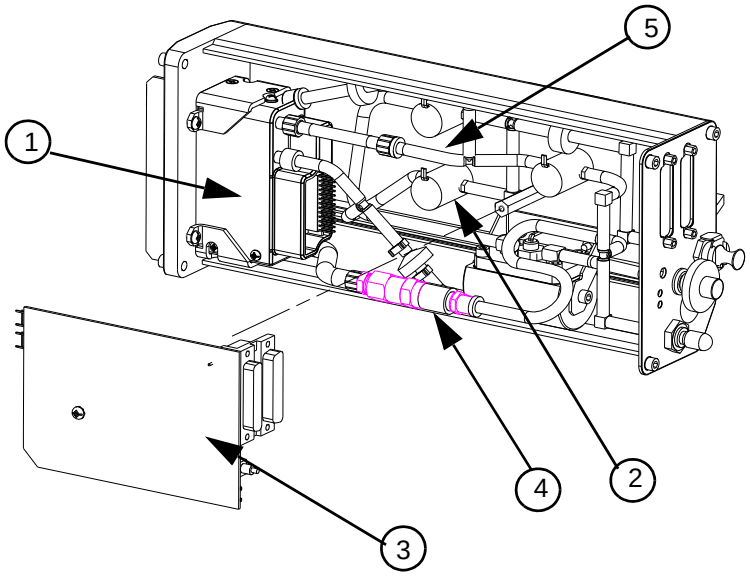


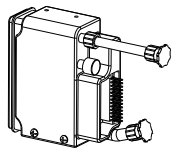
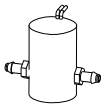
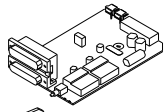
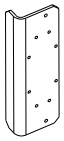
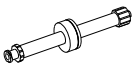
Fittings and Tubing

PART NO.	DESCRIPTION	CONTENTS	WHERE USED	
1301-468	Tubing, 1/8" ID x 1/4" OD	50 foot roll	External plumbing of impulse jet products	
5770-224	Fitting 1301-699, 1/8 Barb x 1/8 Barb In-Line Shut-off Valve	5 fittings per kit	Effluent bottle	
5765-207	Fitting 5361-338, 1/8 Barb x 1/8 Flow Bulk-Head Male Valve	5 fittings per kit	Vacuum port on rear of print head and bottom of CIDS	
5765-208	Fitting 5361-329, 1/8 Barb x 1/8 Flow In-Line Male	5 fittings per kit	Connects to print head ink port and CIDS ink port, or any female fitting	
5770-226	Fitting 1900-405, 1/8 Barb x 1/8 Flow In-Line Female Valve	5 fittings per kit	Connects to print head vacuum port and CIDS vacuum port, or any male fitting	
5765-209	Fitting 2460-120, 1/8 Barbed Tee	5 fittings per kit	Ink and vacuum supply lines	
5765-210	Fitting 2460-143, Luer Cap, Male	5 fittings per kit	Cap for vent ports on the print head and CIDS	
5760-373	Filter 2460-159, Luer, 74 Micron	5 filters per kit	Vent port on back of print head and top of CIDS	

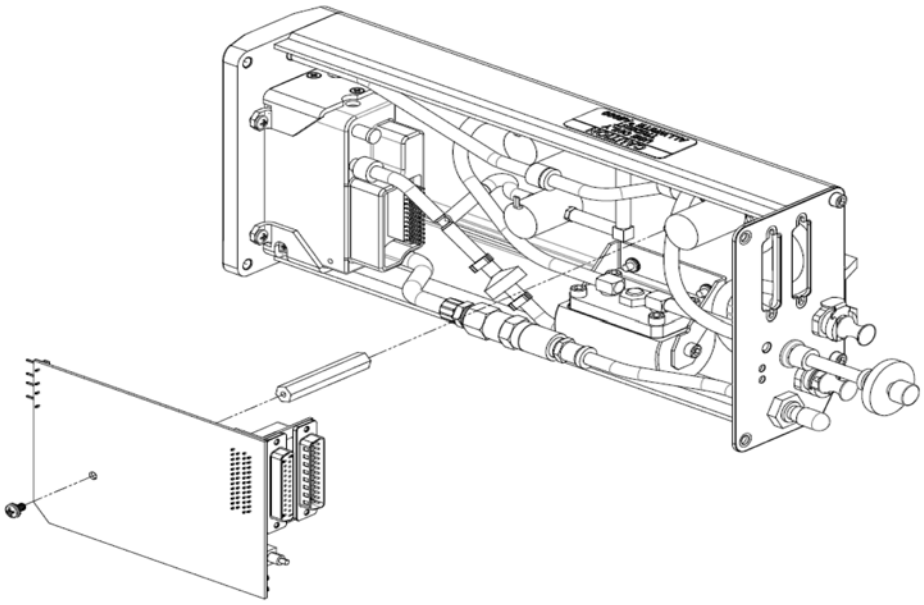
Print Head Assembly Kits

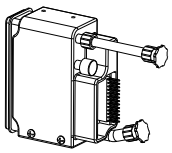
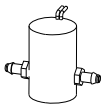
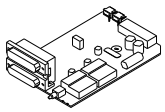
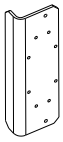
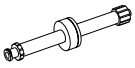
IJ384 Head:



ITEM	PART NO.	DESCRIPTION	CONTENTS	
1	5760-398	IJ384 Print Engine Replacement, ScanTrue® II, ACS	Print engine 5760-664 - 1; Gasket 5760-686 - 1; Screw, M3 x 8, 5101-601 - 4; Screw, #6-32 x 3/8, 5151-126 - 4	
2	5760-347	Solenoid Replacement	Solenoid w/crimp pins 5760-611 - 1; Fitting, 10-32 to 1/8 barb, SS, 1902-260 - 2; Screw, #2-56 x 1/4, 5101-001 - 2	
3	5760-386	Print Head PCB Replacement, IJ384 and IJ768	PCB 5760-523 - 1	
not shown	5760-807	IJ384 Orifice Cover Plate	Orifice cover plate assembly 5760-690 - 1	
not shown	5760-806	Vacuum Line Filter (used in Rev H and older)	Vacuum line filter assembly - 5	
4	5760-856 *	Combo Fitting/Filter	Combo Fitting/Filter 5760-185 - 1	
5	5760-399	IJ384 Internal Tubing and Fitting Replacement	Viton tubing, 1/8 ID and 3/16 ID; Fitting 5361-338 - 1; Fitting 1900-758 - 1; Fitting 1902-260 - 7; Fitting 2460-120 - 4; Fitting 2460-141 - 1; Fitting 2460-143 - 1; Fitting 2460-144 - 1; Fitting 2460-145 - 1; Fitting 2460-159 - 1; Fitting 5361-307 - 5; Fitting 5361-321 - 2; Fitting 5361-322 - 3; Fitting 5361-323 - 1; Fitting 5361-326 - 1; Check valve 2460-165 - 2; Filter 5760-629 - 1; Hose clamp 2460-166 - 2; Combo Fitting/Filter 5760-185 - 1	

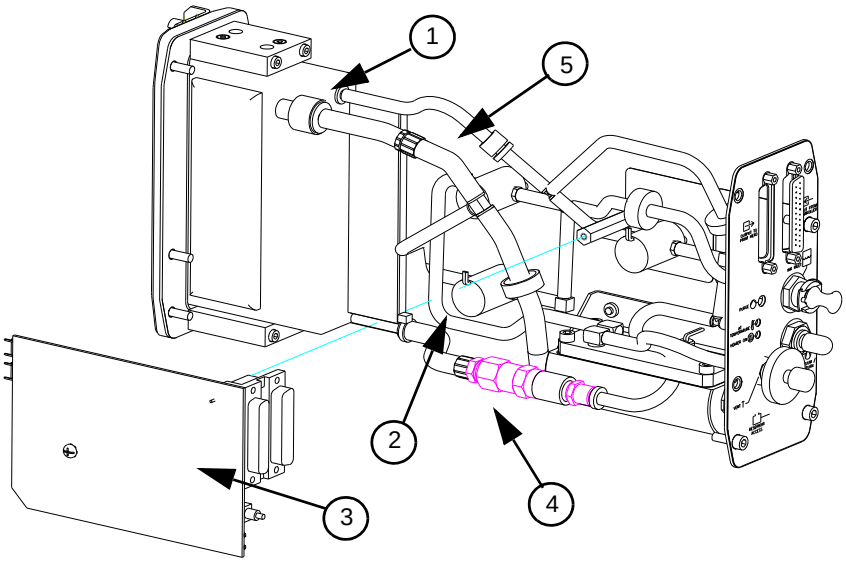
IJ384 Head (Non-Porous):

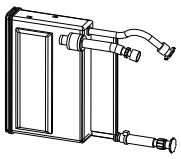
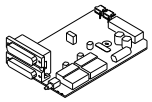
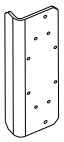
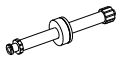


ITEM	PART NO.	DESCRIPTION	CONTENTS	
1	5760-866	IJ384 Print Engine Replacement, AllWrite A5000	Print engine 5765-516 - 1; Gasket 5760-686 - 1; Screw, M3 x 8, 5101-601 - 4; Screw, #6-32 x 3/8, 5151-126 - 4	
2	5760-347	Solenoid Replacement	Solenoid w/crimp pins 5760-611 - 1; Fitting, 10-32 to 1/8 barb, SS, 1902-260 - 2; Screw, #2-56 x 1/4, 5101-001 - 2	
3	5760-386	Print Head PCB Replacement, IJ384 and IJ768	PCB 5760-523 - 1	
not shown	5760-807	IJ384 Orifice Cover Plate	Orifice cover plate assembly 5760-690 - 1	
not shown	5760-806	Vacuum Line Filter (used in Rev H and older)	Vacuum line filter assembly - 5	
4	5760-856 *	Combo Fitting/Filter	Combo Fitting/Filter 5760-185 - 1	
5	5760-867	Non-porous IJ384 Internal Tubing and Fitting Replacement	Viton tubing, 1/8 ID and 3/16 ID; Fitting 5361-338 - 1; Fitting 1900-758 - 2; Fitting 1902-260 - 9; Fitting 2460-120 - 2; Fitting 2460-141 - 1; Fitting 2460-143 - 1; Fitting 2460-144 - 1; Fitting 2460-145 - 1; Fitting 2460-159 - 1; Fitting 5361-307 - 1; Fitting 5361-321 - 2; Fitting 5361-322 - 3; Fitting 5361-323 - 1; Fitting 5361-326 - 1; Check valve 2460-165 - 1; Filter 5760-629 - 1; Hose clamp 2460-166 - 2; Combo Fitting/Filter 5760-185 - 1 Orifice .01" 5361-308 - 1	

* Combo Filter is cleanable; refer to the *Annual Print head Maintenance Section*

IJ768 Head:

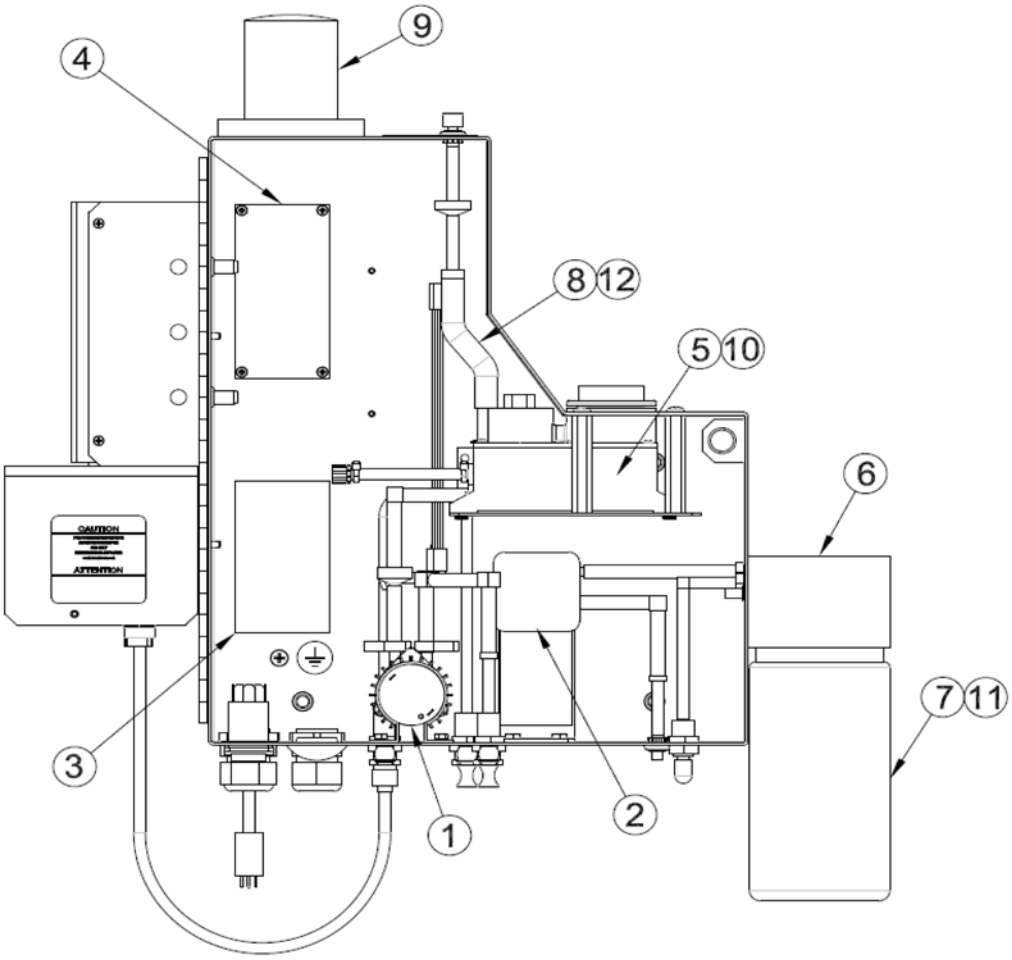


ITEM	PART NO.	DESCRIPTION	CONTENTS	
1	5760-387	IJ768 Print Engine Replacement, ScanTrue® II, ACS	Print engine 5760-387 - 1; Gasket 5760-660 - 1; Screw, M3 x 10, 5081-003 - 4; Screw, #6-32 x 2, 5081-316 - 4	
2	5760-347	Solenoid Replacement	Solenoid w/crimp pins 5760-611 - 1; Fitting, 10-32 to 1/8 barb, SS, 1902-260 - 2; Screw, #2-56 x 1/4, 5101-001 - 2	
3	5760-386	Print Head PCB Replacement, IJ384 and IJ768	PCB 5760-523 - 1	
not shown	5760-813	IJ768 Orifice Cover Plate, ScanTrue II	Orifice cover plate assembly - 1	
not shown	5760-806	Vacuum Line Attached to Print Engine (used in Rev M and older)	Vacuum line filter assembly - 5	
4	5760-856 *	Combo Fitting/Filter	Combo Fitting/Filter 5760-185 - 1	
5	5760-385	IJ768 Internal Tubing and Fitting Replacement	Viton tubing, 1/8 ID, 1303-552; Viton tubing, 1/4 ID, 1303-560; Fitting 5361-338 - 1; Fitting 1900-758 - 1; Fitting 2460-165 - 1; Fitting 5760-656 - 1; Fitting 1902-260 - 6; Fitting 2460-120 - 3; Fitting 2460-141 - 1; Fitting 2460-143 - 1; Fitting 2460-144 - 1; Fitting 2460-145 - 1; Fitting 5361-307 - 2; Fitting 5361-321 - 2; Fitting 5361-322 - 3; Fitting 5361-327 - 1; Fitting 5361-330 - 1; Fitting 6105-149 - 1; Filter 2460-159 - 1; Filter 5760-629 - 1; Combo Fitting/Filter 5760-185 - 1	

* Combo Filter is cleanable; refer to the *Annual Print head Maintenance Section*

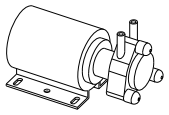
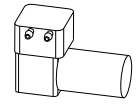
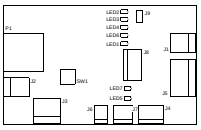
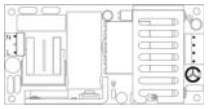
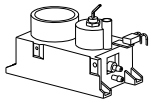
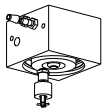
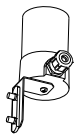
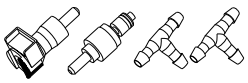
CIDS Assembly Kits

CIDS3000

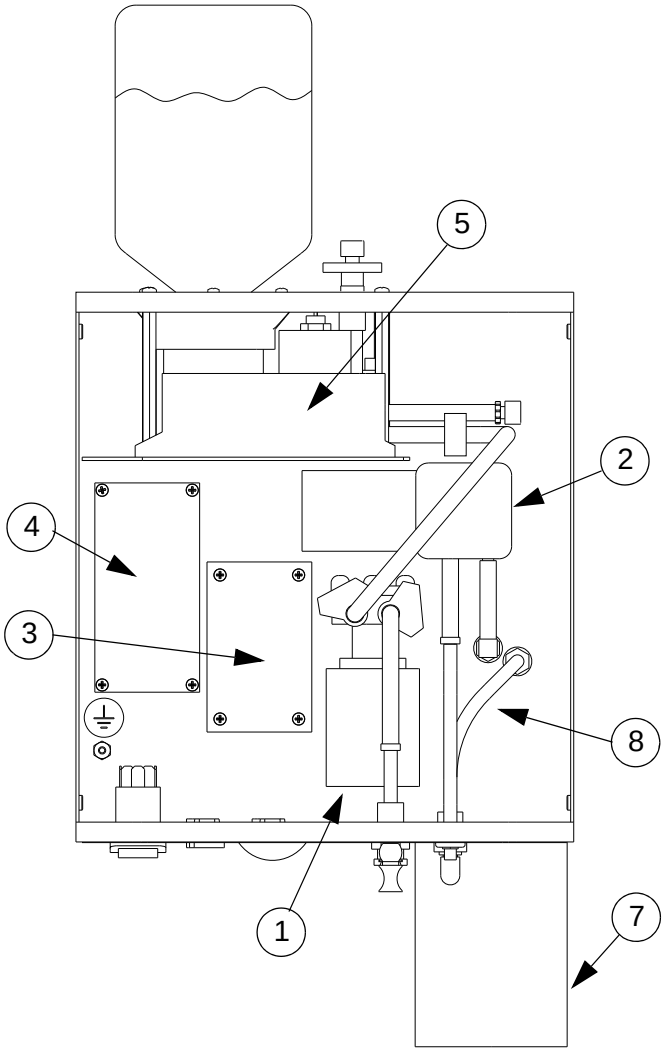


ITEM	PART NO.	DESCRIPTION
1	5760-335	CIDS Liquid Pump Replacement
2	5760-336	CIDS Vacuum Pump Replacement
3	5760-337	CIDS PCB Replacement
4	5760-338	CIDS Power Supply Replacement
5	5760-339	CIDS Reservoir Replacement, ScanTrue® II
6	5760-340	CIDS Separator Replacement
7	5760-342	CIDS Waste Bottle Replacement, ScanTrue® II
8	5760-343	CIDS Internal Tubing & Fitting Replacement, Non-Flushing
9	5760-372	CIDS Beacon Replacement
10	5760-868	CIDS Reservoir Replacement, AllWrite A5000
11	5760-869	CIDS Waste Bottle Replacement, AllWrite A5000
12	5760-870	CIDS Internal Tubing & Fitting Replacement, Flushing
See next page for kit contents and drawings		

Item list for CIDS3000 Assembly on previous page and CIDS3000-ES Assembly on next page:

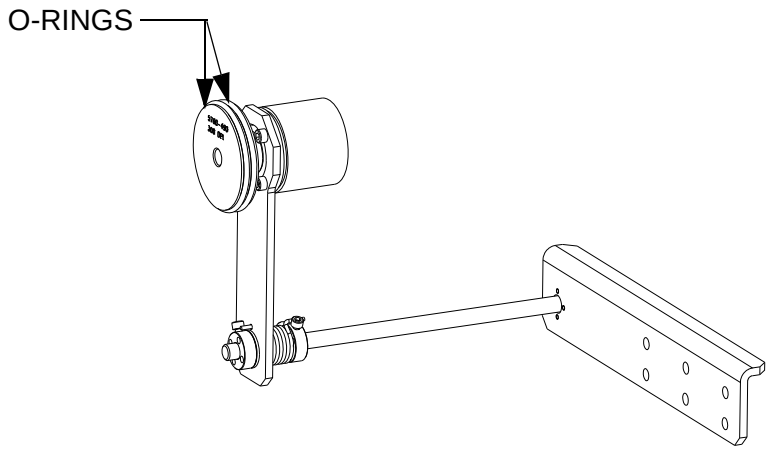
ITEM	PART NO.	DESCRIPTION	CONTENTS	
1	5760-335	Liquid Pump Replacement	Liquid pump 2460-230 - 1; Hose clamp 5760-519 - 2	
2	5760-336	Vacuum Pump Replacement	Vacuum pump 5760-516 - 1	
3	5760-337	CIDS PCB Replacement	PCB 5765-520 - 1	
4	5760-338	CIDS Power Supply Replacement	Power supply 5760-507 - 1	
5	5760-339	Reservoir Replacement, ScanTrue® II	Reservoir 5760-524 - 1	
6	5760-340	Separator Replacement	Separator 5760-526 - 1; Screw 5151-001 - 2	
7	5760-342	Waste Bottle Replacement, ScanTrue® II	Waste Bottle 5760-523 - 2	
11	5760-869	AllWrite A5000	Waste Bottle 5760-543 - 2	
8	5760-343	Internal Tubing & Fitting Replacement	Tubing, 1/8 ID, 1301-468; Tubing, 3/16 ID, 1301-871; Tubing, 3/8 ID, 1303-559; Fitting 5361-338 - 1; Fitting 1900-758 - 1; Fitting 2460-141 - 2; Fitting 2460-144 - 2; Fitting 2460-145 - 2; Fitting 5361-307 - 1; Fitting 5361-310 - 1; Fitting 5361316 - 4; Fitting 5361-318 - 1; Fitting 5361-317 - 2; Fitting 5361-320 - 1; Filter 2460-159 - 2; Check valve 2460-165 - 1; Check valve X40081-001 - 1; Hose clamp 5760-519 - 2	
9	5760-372	CIDS3000 Beacon Replacement (For CIDS3000 only)	Beacon 5760-511 - 1	
not shown	5760-345	CIDS Optional Remote Beacon	Beacon 5760-520 - 1; Strain relief 5760-222 - 1; Mounting bracket 5760-234 - 1; Screw, 10-32, 5151-121 - 1; Screw, 5/16-18, 5082-001 - 2; T-nut, double 5760-405 - 1	
not shown	5760-344	CIDS External Fitting Kit	Fitting 1900-405 - 1; Fitting 5361-329 - 1; Fitting 2460-120 - 2	
not shown	5760-341	CIDS Replacement Bulb Kit, 12 VDC	Bulb 2470-142 - 2	

CIDS3000-ES



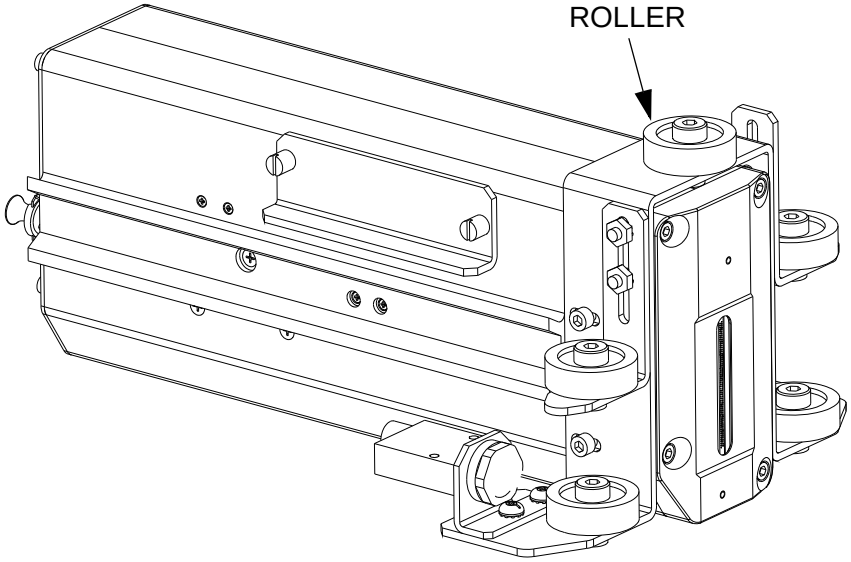
ITEM	PART NO.	DESCRIPTION
1	5760-335	CIDS Liquid Pump Replacement
2	5760-336	CIDS Vacuum Pump Replacement
3	5760-337	CIDS PCB Replacement
4	5760-338	CIDS Power Supply Replacement
5	5760-339	CIDS Reservoir Replacement, ScanTrue® II
(not shown)	5760-340	CIDS Separator Replacement
7	5760-342	CIDS Waste Bottle Replacement, ScanTrue® II
8	5760-343	CIDS Internal Tubing & Fitting Replacement
See previous page for kit contents and drawings		

Encoder Replacement Part Kit



PART NO.	DESCRIPTION	CONTENTS
5765-206	Encoder O-Ring Replacement Kit	O-ring, 2-7/8 ID x 3-1/8 OD x 1/8 W - 3; O-ring, 4-7/8 ID x 1/8 W - 3; O-ring, 2.175 ID x .103 W - 2

Roller Replacement Part Kit

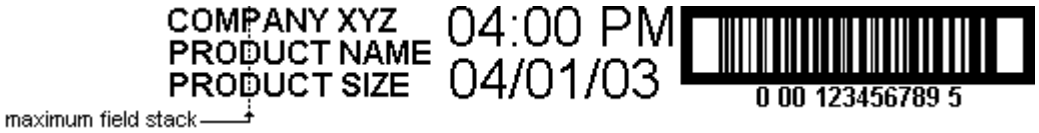


PART NO.	DESCRIPTION	CONTENTS
5760-835	Roller Replacment Kit	Roller 5760-476 - 5
5760-815	Roller Bracket Alignment Kit	Roller Bracket Alignment Tool - 1

Appendix D: Performance Parameters of an Impulse Jet Controller

The performance of an Impulse Jet controller is limited by the DPI setting and the sum of the maximum field stacks on each side of a message. The maximum field stack for a side is defined as the maximum number of vertically aligned fields. In the following example, Task1:Side1 has a maximum field stack of three fields and Task1:Side2 has a maximum field stack of two fields. Thus, the sum of the maximum field stacks for Task1 is five fields.

(Task1:Side1) + (Task1:Side2) = 3 + 2 = 5 fields



Task1:Side1

Task1:Side2

If Task1 and Task2 are printing this same message, the sum of the maximum field stacks of Task1 and Task2 is ten fields. Thus, the maximum field stack the controller has to process is ten fields.

(Task1) + (Task2) = 5 + 5 = 10 fields

The absolute maximum line speed for an Impulse Jet task is 200 ft/min. The following table can be used to determine the maximum line speed of a controller given a maximum field stack and dpi.

Max. Field Stack of Controller	Max. Line Speed @ 100 dpi	Max. Line Speed @ 150 dpi	Max. Line Speed @ 200 dpi
10	200	200	200
11	200	200	181
12	200	200	166
13	200	200	153
14	200	190	142
15	200	177	133
16	200	166	125
17	200	156	117
18	200	148	111
19	200	140	105
20	200	133	100

The Impulse Jet Print head operational through-put (the maximum print speed) is determined by the density and resolution of the printed message. The print density is defined as the amount of printed dots in a given area, with a solid black image having a density of 100%. The higher the density, the higher the ink flow demand is in the print head. A typical alpha-numeric message has a print density of about 20%, while a 100% magnification I- 2 of 5 bar code, has a print density of about 40%. A full-scale logo with a heavy background can have a density of up to 70%. The following tables identify the image rate versus print speed for various densities. The data shown is based on a 6" message printing at 200 dpi horizontal resolution.

Line Speed (fpm)	20% - 40% Density # of Images per Sec.	Above 70% Density # of Images per Sec.
50	2	2
100	2	2
150	2	1
200	2	1

Appendix E: Font Samples

Character appearance is affected by weight and dots per inch (dpi). Character weights available are single dot and bold.

Fonts for 384 and 768 Print Head at 200 dpi:

Arial 126 Bold:

Arial 126:

Arial 96 Bold:

Arial 96:

Arial 63 Bold:

Arial 63:

Arial 48 Bold:

Arial 48:

Arial 30 Bold:

Arial 30:

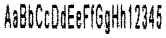
Arial 24 Bold:

Arial 24:

Arial 15 Bold:

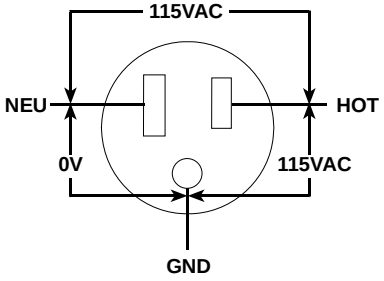
Arial 15:

Arial 9:

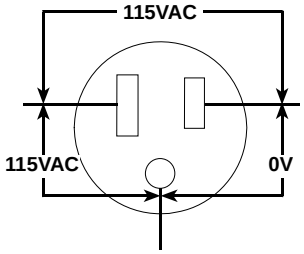


Appendix F: Testing an Electrical Outlet

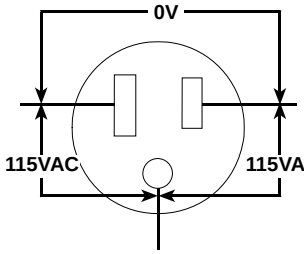
An outlet tester is the preferred method of checking an electrical outlet, although a voltmeter can also be used.



CORRECTLY WIRED OUTLET



INCORRECTLY WIRED HOT AND NEUTRAL REVERSED



INCORRECTLY WIRED HOT AND GROUND REVERSED

BACKGROUND INFORMATION ABOUT AC WIRING

Equipment running at 115VAC must have one hot wire and one neutral wire. Additionally, a separate ground wire runs to non-current carrying parts of most loads.

THE WIRES IN AN AC OUTLET (115VAC)

WIRE	DESCRIPTION	FUNCTION
LINE	Usually black. Cannot be white or green.	Carries the live voltage and current to the equipment.
NEUTRAL	White or natural gray.	Grounded at the service equipment* only. Serves as the return for 115 volts.
GROUND	Bare, green, or green with yellow stripes. May be metal armor or metal conduit.	Grounded at the service equipment* and every metal box or cabinet. Runs to non-current, carrying parts of most loads.

*The service equipment is defined as "the equipment used to disconnect the entire building and overcurrent device to protect the entire installation, but not the branch circuits individually."

At the service equipment, a single ground wire connects both the neutral and ground to earth. The NEC calls this wire the "ground electrode conductor."

Appendix G: Electrostatic Discharge (ESD)

What is ESD?

Electrostatic Discharge (ESD) is a triboelectric charge generated by separating or rubbing together two non-conductive materials.

What causes ESD?

Friction can cause ESD. Friction can be generated by walking across a floor, removing tape from a tape dispenser, pulling a work order from a plastic work order holder, rolling the wheels of a push-cart across the floor, sitting on a foam cushion such as a stool or blowing air across a nonconductive surface.

Source	70-90% Relative Humidity Volts	10-20% Relative Humidity Volts
Walking across a carpet	1,500	35,000
Working at a bench	100	12,000
Sitting on a foam cushion	600	20,000
Removing plastic bag from bench	12,000	20,000
Removing work-order from plastic pouch	600	7,000

ESD at the print station can be caused by the product rubbing against ungrounded guide rails, conveyor belt static voltage build-up, or a residual static charge on the product from earlier processing.

Generally, ESD problems are more prevalent in the winter months. Heated air has a much lower relative humidity than the cold air had prior to heating. In many instances ESD problems appear in the fall when the outside temperature drops, and go away in the spring when the outside temperature begins to rise.

What are the effects of ESD?

Unexplainable system resets, controller lockups, and multiple prints on the product can be signs of static discharge to the system. When static electricity is discharged to an electronic circuit (components or printed circuit boards), permanent damage may also occur. This damage may be in the form of reduced functionality, reduced life, or complete non-functionality.

The static charge does not have to be noticeable to the human touch in order to cause problems in an electronic system. A human being does not start to feel the effects of static electricity until the voltage reaches or exceeds 4000 volts. Voltage as small as 100 volts can cause problems with some sensitive electronic components.

What prevents ESD?

Prevention begins with training and knowledge. The use of wrist straps, heel straps, workbench mats, floor mats, and monitoring systems for electronic devices will drastically reduce the ill effects of ESD when handling circuit boards. ESD wrist straps should be used when handling electronic components or printed circuit boards.

If static discharge is suspected of causing controller problems at the print station, check the grounding of the conveyor and print station components. Nonconductive or ungrounded guide rails are the most common cause of static discharge. Ionized air blowers and static dissipating material have proven effective in eliminating many static problems.

Appendix H: Encoder Functional Testing

In the event of print quality problems that point to variations in encoder performance or location with an IJ3000 Impulse Jet System, this procedure will help to verify proper encoder function.

Tools:

- Tachometer or tape measure and stop watch
- Oscilloscope

All measurements depend on an accurate measurement of the line speed.

If a tachometer is not available, line speed can be determined with a stopwatch and tape measure. Measure a known length (the longer the better) and place a mark at the beginning and at the end of the measurement. Then use the stopwatch to time the passage of the leading edge of the product from the first to last mark. Take three readings to get an average.

For example: An eight (8) foot distance was measured that passes from the leading edge mark to the end mark in 24 seconds = 8 ft./24 sec. = .33 ft./sec.

Multiply by 12 to convert to in./sec. = .33 ft./sec. x 12 = 4 inches per second. Remember this number.

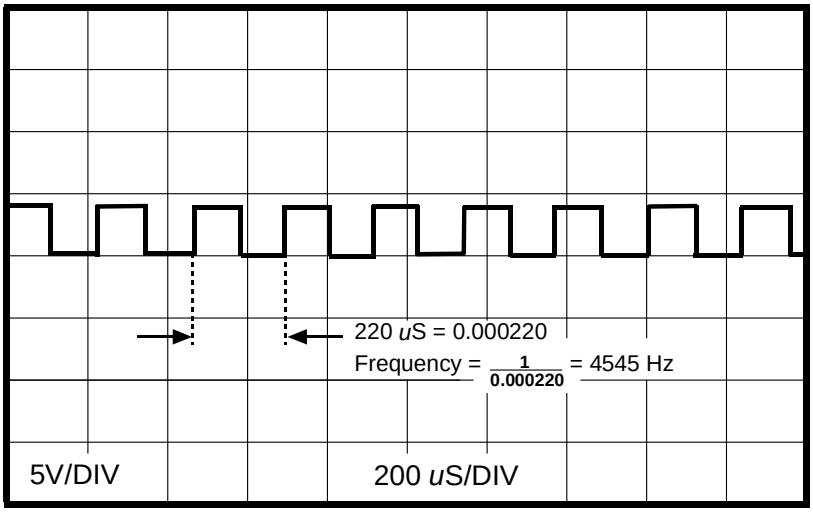
MEASUREMENTS

Now make some measurements with the oscilloscope on the system to be tested. Set the vertical resolution of the scope to 5 volts per division and set the horizontal resolution to 1 millisecond.

Connect the scope ground to TP4 on the interface board. Connect the voltage probe to TP23. The 5760-820-IJ encoder has a resolution of 300 dots per inch.

Evaluate the waveform as follows:

Review the 5-volt square waves, as in the illustration on the next page. These waves generally compress and expand across the width of the display at regular, rhythmic intervals. If they compress sporadically, the encoder is not tracking consistently. For example, when it "bumps" over a seam in the conveyor belt, a momentary compression of the waveform on the display will occur. If there is a question on the difference between rhythmic and intermittent sporadic appearance of the 5-volt square waves, and the conveyor has no seam, tape a small object (such as a washer or nut) onto the conveyor belt such that it will be hit by the encoder wheel, and observe the difference it makes in the waveform appearance.



When satisfied that the encoder is tracking normally, calculate the encoder frequency as follows:

Measure the time from the leading edge of one of the 5-volt square waves to the leading edge of the one next to it.

Divide 1 by the time measured. For example, there was one square between the leading edges of the 5 volt square waves, and the horizontal sweep was set to 200 *u*S/DIV: 1/ .000200 = 5000 Hz.

The previous example was moving at 4 inches per second using a 300 dpi encoder. Multiplying 4 by the 300 dpi expected gives a result of 1200 Hz.

Referring to the scope screen, since it's set to a 200 *u*S/DIV, measure 220 *u*S between the leading edges of the 5 volt square waves. The calculation is as follows: 1/.000220 = 4545 Hz.

To sum up the process for checking encoder accuracy:

Determine the line speed in inches per second (accomplished by dividing speed in feet per minute by 5 or multiplying feet per second by 12).

Determine encoder resolution (300 dpi for the 5760-820-IJ encoder).

Multiply the encoder resolution by the line speed in inches per second to determine what the frequency should be.

Measure the actual frequency with a scope and compare it to the expected value.

These two numbers will not agree exactly, but should be within plus or minus 1%.

Most of the time, encoder tracking problems are due to tracking on irregular surfaces. These problems are characterized by rapid, inconsistent, jerking movements of the 5-volt square waves on the scope. The remainder of encoder tracking problems are usually due to the wheel contacting a drive wheel or other surface and not the belt. In these cases, the 5-volt square wave motion may be uniform, but the measured frequency will not agree with the expected value calculated.

A failed disk within the encoder will generally appear as large and erratic pulse width differences from one encoder pulse to the next, or no output from the encoder.

Appendix I: Glossary of Terms

ACS - Automatic Cleaning System. An ACS cycle is used to clean and prime the print head. Ink flow is controlled to flood the orifice plate. The small amount of ink is then vacuumed off to remove debris from the orifice plate.

Autocode - A field entered into a message to print a variable such as date, time, pallet count, or plant location.

Auto-Prime - Automated Priming Cycle. An Auto-Prime cycle is used to remove air from the print head. A large amount of ink is circulated through the print head to push air out.

Bracketry - Mounting hardware for ink jet system components.

Broken Message - A message that is broken into two or more pieces, usually from the encoder slipping.

Check Valve - A valve that allows air or liquid to flow in only one direction.

CIDS - The Centralized Ink Delivery System consists of a number of components working together to transfer ink from the ink bottle to the printed product.

Columns Out of Alignment - Dot columns line up in a zigzag pattern.

COM - Abbreviation for a serial communications port on a computer. Usually expressed as "COM port" or associated with a number, "COM 1" or "COM 2."

Conditioner - A non-pigmented ink solvent designed for flushing and cleaning print heads and ink line components.

Controller - The heart of the inkjet system, this unit gathers information from the computer, the photosensor, and the encoder, and facilitates the printing of messages by the print heads.

Daisy Chain - A series of print heads connected to one interface board. The IJ3000 can control one or two daisy chains.

Debris - Small, solid material particles which collect on the orifice plate, causing orifice blockage.

dpi - Dots Per Inch.

Dynamic Seepage - Ink seepage from orifices only during printing.

Encoder - This device gathers line speed information via a wheel rolling against a conveyor belt. The controller uses this information to determine when to send print signals to the print heads.

ESD - Electrostatic Discharge is a charge generated by separating or rubbing together two non-conductive materials. ESD can result in print problems or even damage to the ink jet system.

ESD Protection - Wrist straps, floor mats, and other devices used when handling electronic components to minimize ESD.

Ethernet Port Server - A communications standard; connects asynchronous serial ports to an unshielded twisted pair (UTP) 10BASE-T ethernet connection at a baud rate of 230 Kbps.

Extra Dots - Dots printed outside the designated dot columns.

Font - A complete set of characters - alphabetic, numeric, and punctuation - in one typeface. The font used in this glossary is Arial.

fpm - Feet Per Minute.

GUI - Graphic User Interface.

Impulse Jet - The branch of ink jet technology where droplets are produced by a rapid pressure pulse created in an ink chamber causing the expulsion of an ink droplet through the orifice plate. In piezo-based impulse ink jet systems, this disturbance is caused by a rapid small change in the volume of the ink chamber behind the orifice plate. (Sometimes also erroneously referred to as drop-on demand type of ink jet printing.)

Ink Filter - A filter located in the ink line to remove any impurities from the ink before it reaches the print head.

Interface Board - The power entry point for the IJ3000, and connection point for the print head daisy chain, photosensor, and encoder. A second interface board is optional.

Jumper - A small plug or wire that alters a hardware configuration by connecting different points in an electronic circuit.

LED - Light Emitting Diode. There are several LEDs in the IJ3000 system, and they either illuminate or extinguish to indicate various operating conditions.

MSDS - A Material Safety Data Sheet contains federally mandated safety, environmental and disposal information about an ink or other potentially hazardous material.

Photosensor - A device that emits a beam of light, and sends a print signal to the controller when light is reflected back to it by a product passing on a conveyor.

Piezoelectric - A physical phenomenon exhibited by certain crystals which change their dimensions when subject to an E-field (has an electrical field impressed across it). Conversely, when subjected to mechanical stress, it creates an electrical signal. This type of transducer is the driving element in a piezoelectric impulse system and frequently is the “stimulator” in a continuous ink jet system.

ppi - Pulses Per Inch.

ppr - Pulses Per Revolution.

Prime - The art of pushing ink into a system to expel air.

Print Head - A solenoid-activated mechanism that propels ink droplets onto a moving surface.

Print Station - One or more print heads set up to mark a given product in a specified location.

psi - Pounds per Square Inch, a measure of pressure.

Pulse Width - The amount of time a print head solenoid is on, one of the factors controlling the size of a printed dot.

Purge - The art of pushing ink into a system to expel air. This term is used to define the firing of all channels to verify that air has been expelled from the print heads.

QWERTY - The universal computer keyboard character arrangement, named for the first six letters in the top alphabet row.

Winsock FAQ http://tangentsoft.net/wskfaq/

Unix socket FAQ http://www.developerweb.net/sock-faq/