Operations Manual

IJ4000 Impulse Jet System

5765-016
Revision A

IJ4000 Impulse Jet
Ink Jet System
Operations Manual

5765-016

IJ4000 System

Warranty:

The IJ4000 Impulse Jet System, including all components unless otherwise specified, carries a limited warranty.

The inks and conditioners used with the IJ4000 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: Safety and Ink Usage

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 Centralized Ink Delivery System (Centralized-IDS) 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.
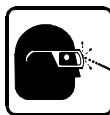
It is extremely important to:
- Clean up all spills with the appropriate conditioner immediately and dispose of all waste according to local and state regulations.
- Wear safety glasses and protective clothing, including gloves, when handling all inks and conditioners.
- Store inks and conditioners under the recommended conditions found on the SDS (Safety Data Sheet).

Section 2: Quick Start

The figure at right illustrates a typical installation with a controller and a print head. (Cables and ink lines are not shown.)

System Components:
- Bracketry Kit (Item 1)
- Print Head (Item 2)
- Centralized Ink Delivery System (Item 3)
- IJ4000-HMI Controller (Item 4)
- IJ4000 Connection HUB (Item 5)
- Power Cord (not shown)
- Serial Cable (not shown)
- Tubing (not shown)
- Software (not shown)

(Ink is not included.)

NOTE: See limitations in "Max Tubing Height From Centralized-IDS to Last Print Head." on page 13.

TYPICAL INSTALLATION
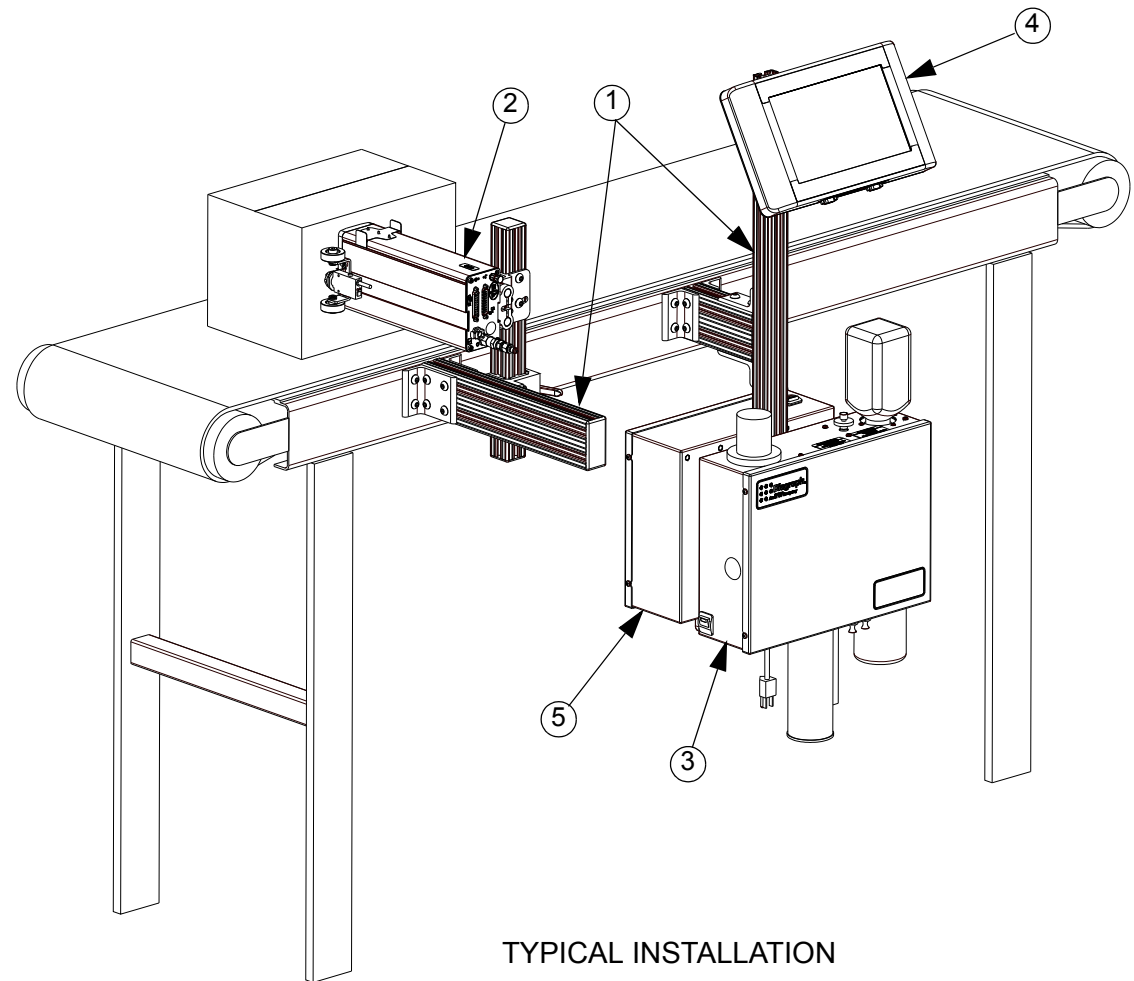
Step 1: Assemble Bracketry to Conveyor

NOTE: Mount bracketry as square and as level as possible.

PRINT HEAD
CONVEYOR MOUNT
(5765-246)

CONTROLLER /
CENTRALIZED-IDS
MOUNT
(5765-250)

OPTIONAL T-STAND
(5765-249)
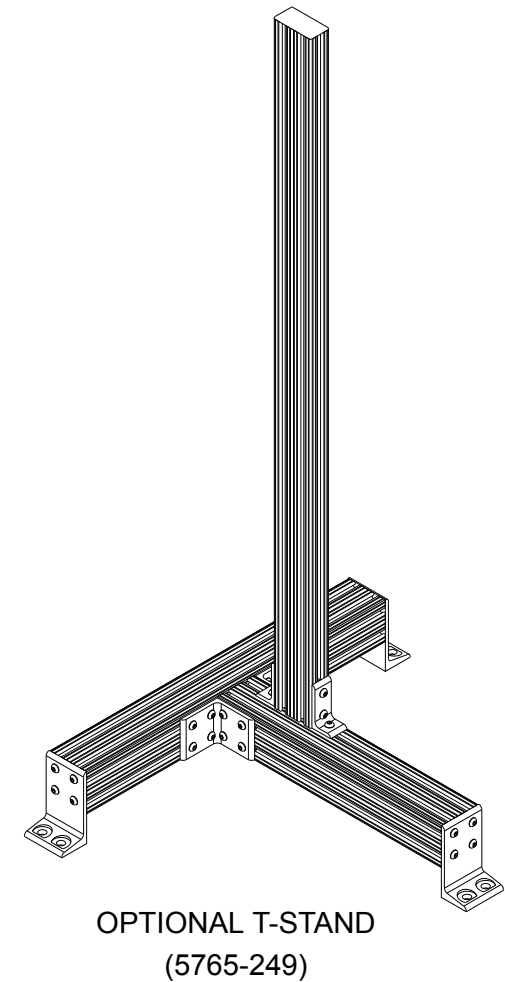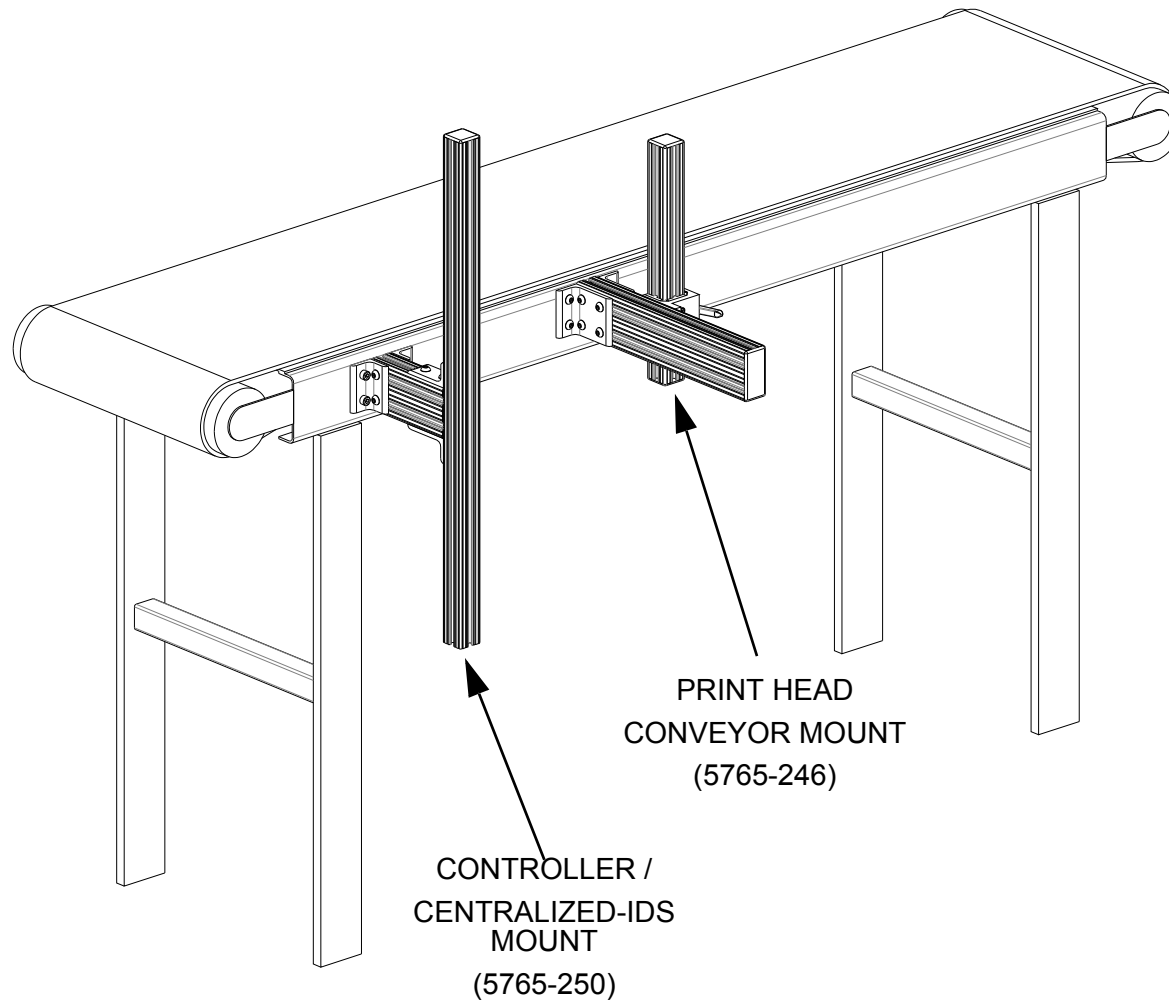
Step 2: Assemble Print Head onto Bracketry
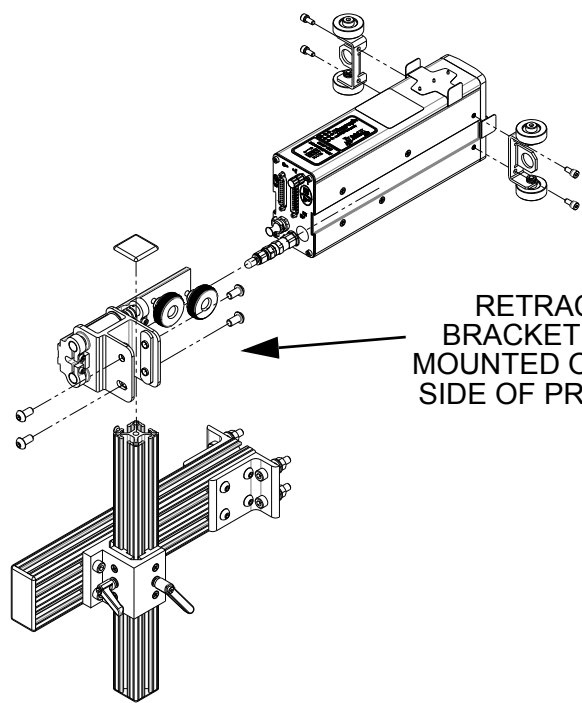
RETRACTING
BRACKET CAN BE
MOUNTED ON EITHER
SIDE OF PRINT HEAD

ROLLER / RETRACTING
BRACKET MOUNT FOR
384E PRINT HEAD

(5765-246)
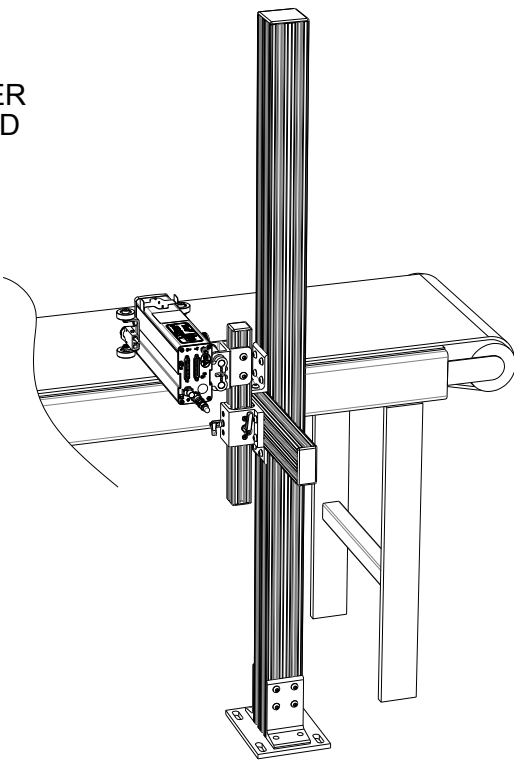
SINGLE-POLE FLOOR
MOUNT

(5760-355)
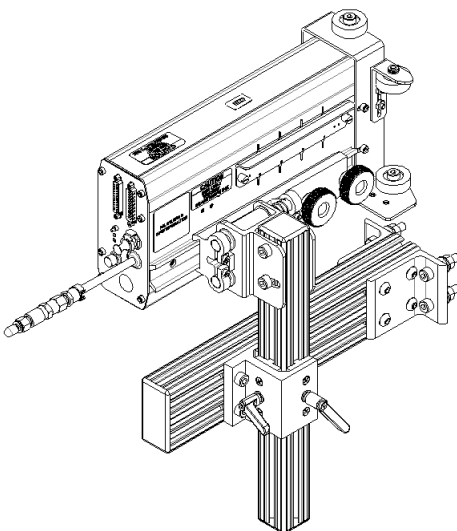
ROLLER / RETRACTING
BRACKET MOUNT FOR
768 PRINT HEAD

(5760-388)

Print Head Mounting Limitations

768 PRINT HEAD

ABCD

101,6m [4in] SOLID CHARACTER HEIGHT

27,2mm [1.07in] TO LOWEST ORIFICE

384E PRINT HEAD

ABC

50,8m [2in] SOLID CHARACTER HEIGHT

22,9mm [0.90in] TO LOWEST ORIFICE
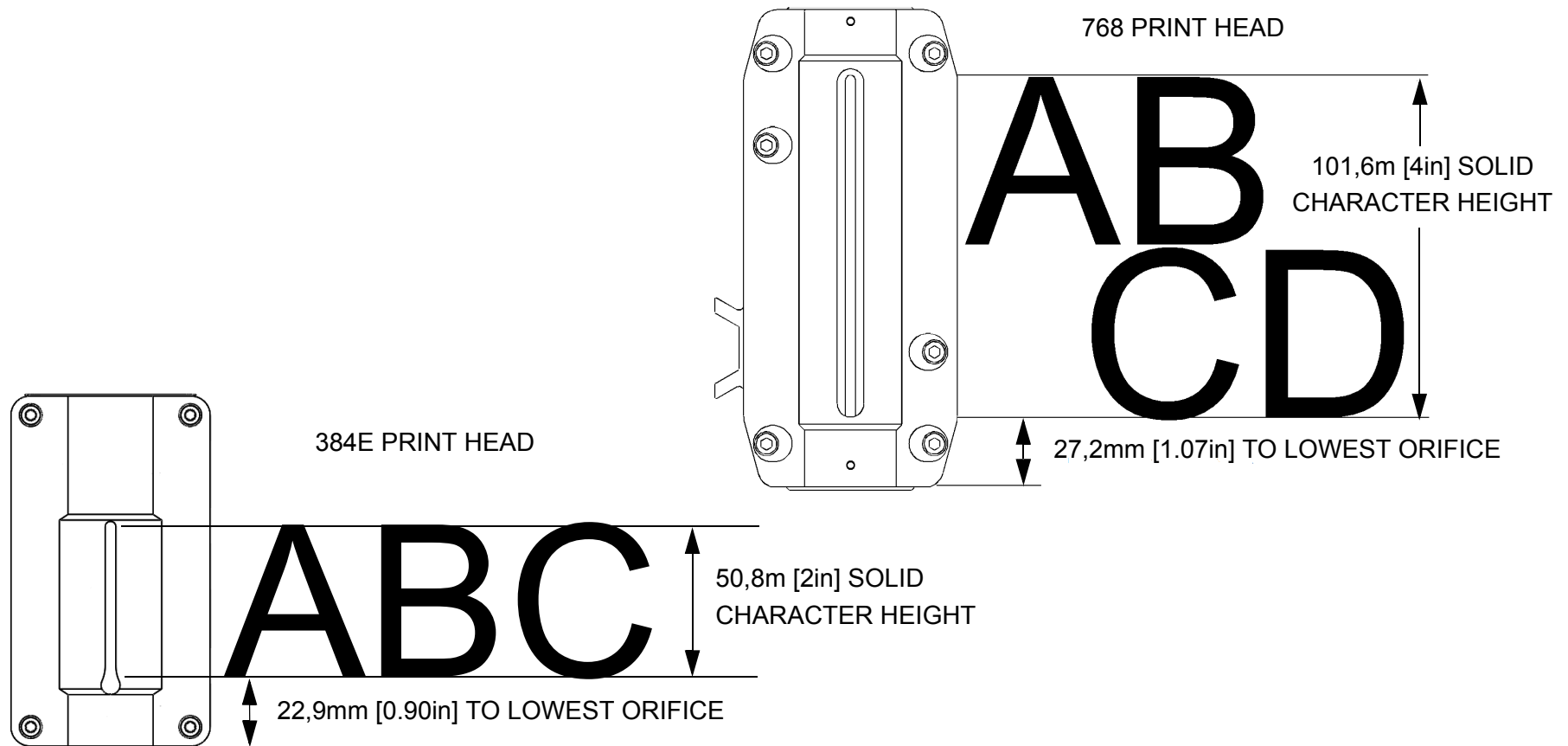
Print Head Tilt

Maximum Print Head Tilt:

• Clockwise Tilt: 5°
• Counterclockwise Tilt: 5°

NOTE: Tilt angles are given when looking at the rear of the print head. Front to rear tilt should be less than $\pm$ 1.5°, as indicated by the digital level LED readout on the top rear of the print head.

Step 3: Adjust Print Head to Substrate

Use the bracket handle to adjust print head vertically.

VERTICAL
ADJUSTMENT

BRACKET HANDLE
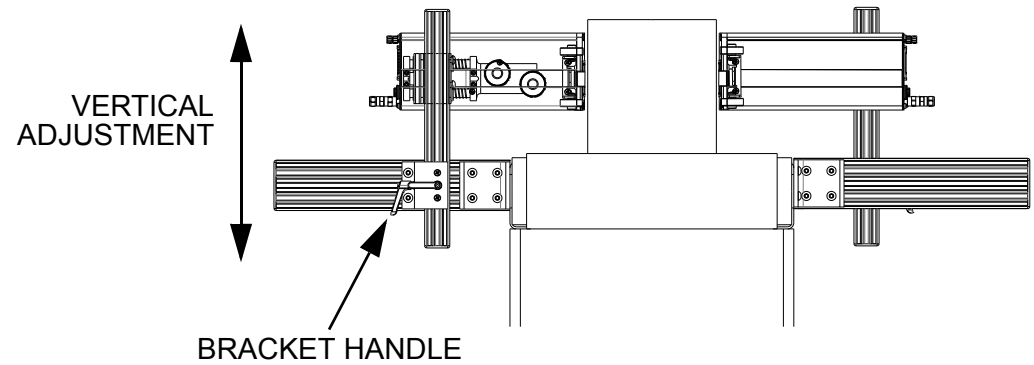
Loosen the adjustment knobs on the Retracting Bracket to slide the print head toward or away from substrate.

ADJUSTMENT
KNOBS

HORIZONTAL
ADJUSTMENT

3mm [.1in] GAP
RECOMMENDED
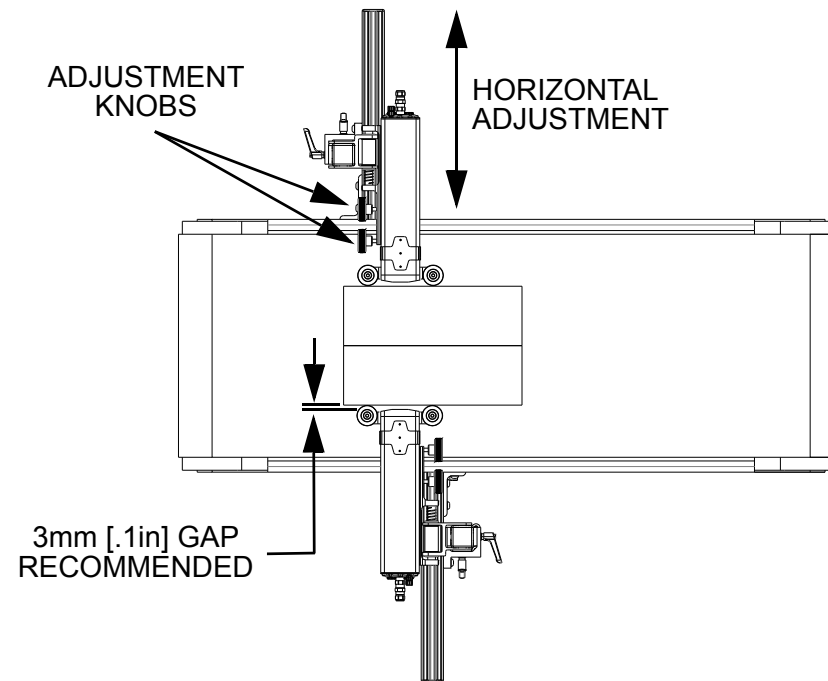
Step 4: Install Centralized Ink Delivery System (Centralized-IDS)
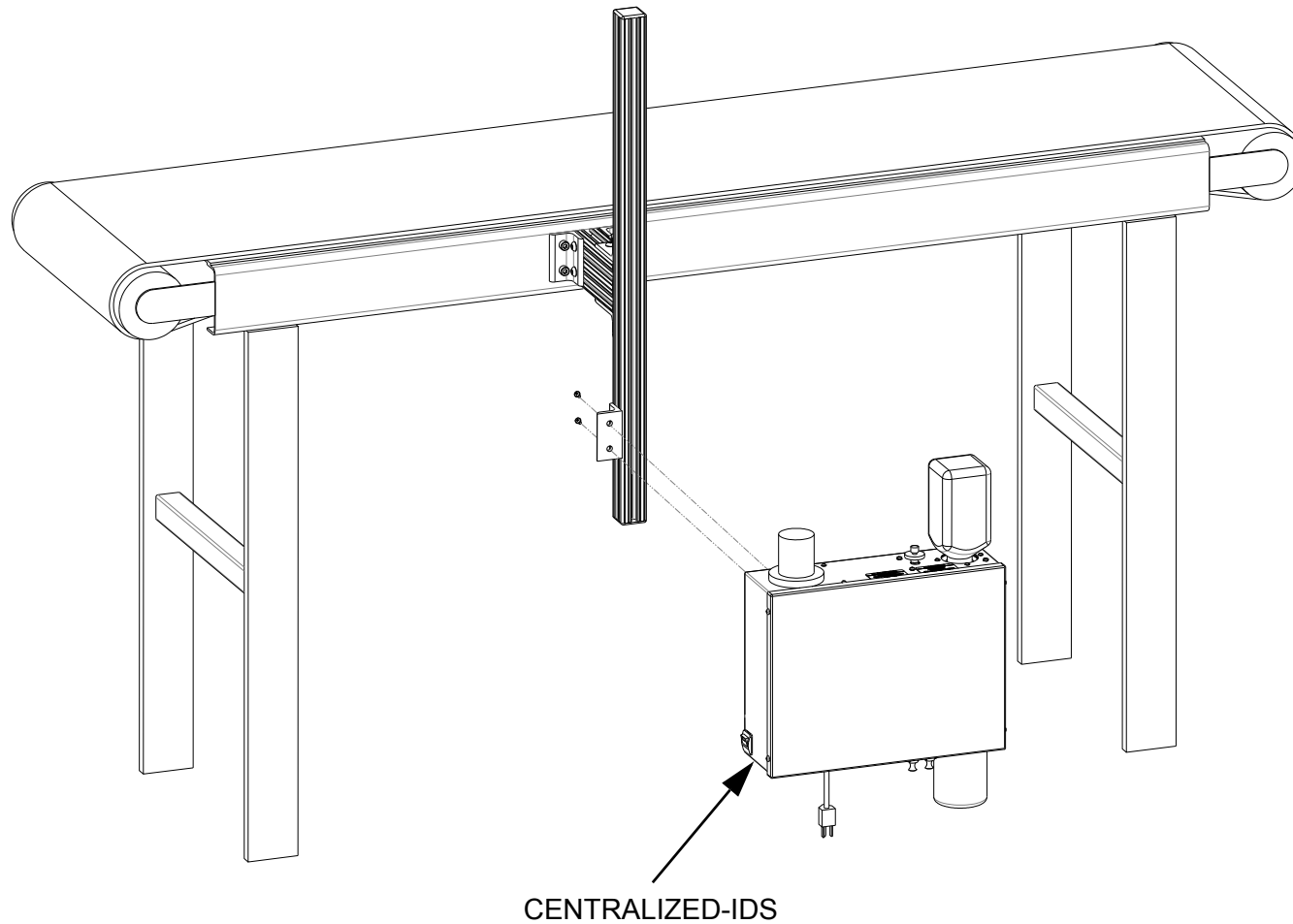
CENTRALIZED-IDS

Max Tubing Height From Centralized-IDS to Last Print Head.

Print Head Type	Number of Print Heads	Maximum Tubing Length from C-IDS
384	1	15,2m (50ft)
	2	9,1m (30ft)
	4	4,6m (15ft)
768	1	12,2m (40ft)
	2	6,1m (20ft)

Tubing limitations:
- Maximum vertical tube length (bottom of Centralized-IDS to bottom of highest print head) = 6,1m (20ft) (ink pump limitation).
- Maximum height of Centralized-IDS above print head(s) = 914,4mm (36in) (vacuum pump limitation).

Prohibited Conditions:
1. Do not run tubing up and over a conveyor at a height greater than 914,4mm (36in).
2. Do not coil excess tubing during installation (cut to length only).

914.4mm (36in) MAX
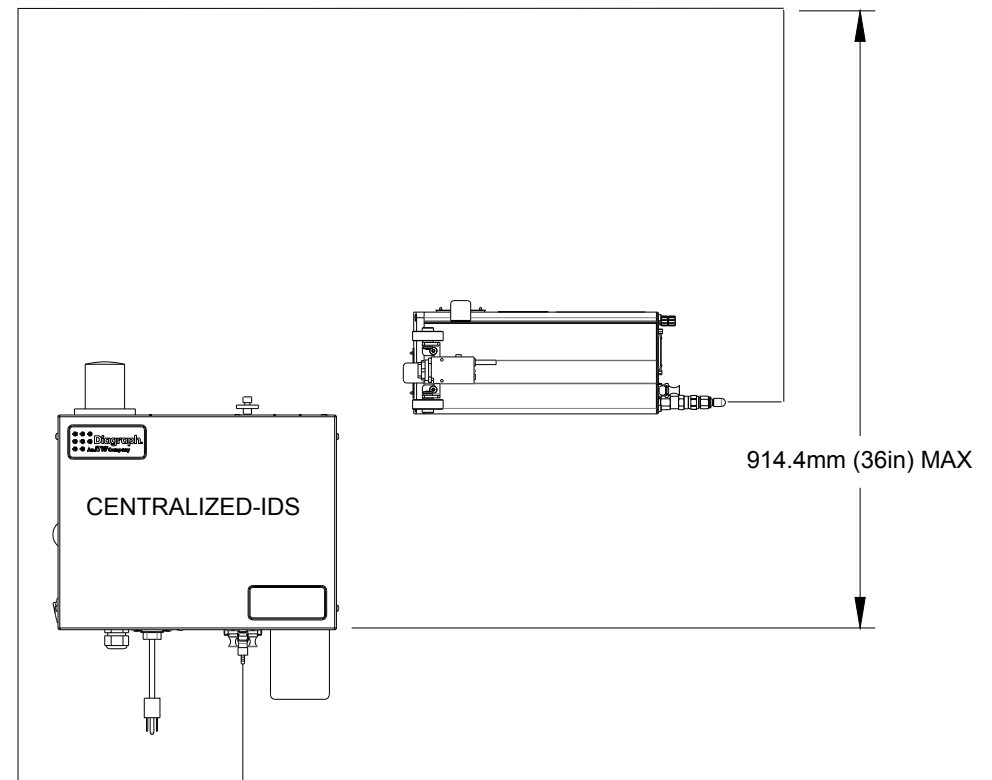
CENTRALIZED-IDS

Step 5: Install IJ4000-HMI Controller and IJ4000 Connection HUB

CONTROLLER

CONNECTION HUB

INTERNAL CIRCUIT BOARDS

CONNECTION HUB

I/O CABLE FROM CENTRALIZED-IDS

PRINT HEAD CABLE

PHOTOSENSOR CABLE

ENCODER CABLE

POWER CORD

TASK 2 INTERFACE BOARD CONNECTIONS

TASK 1 INTERFACE BOARD CONNECTIONS

INTERNAL CIRCUIT BOARDS
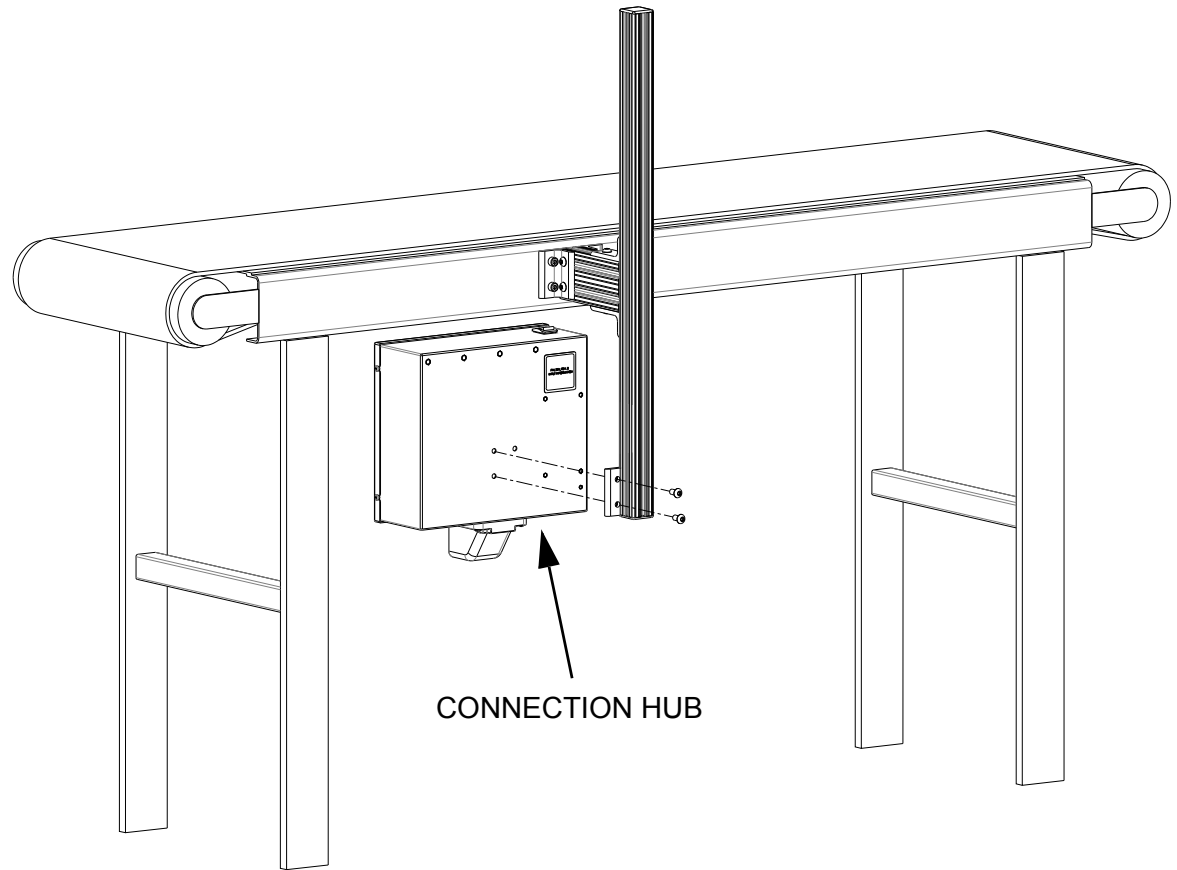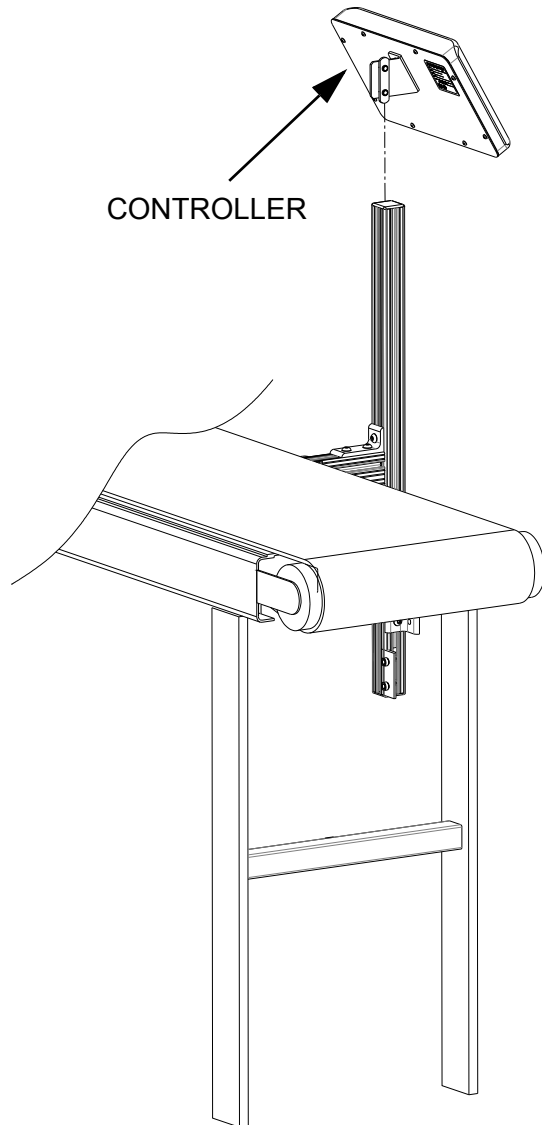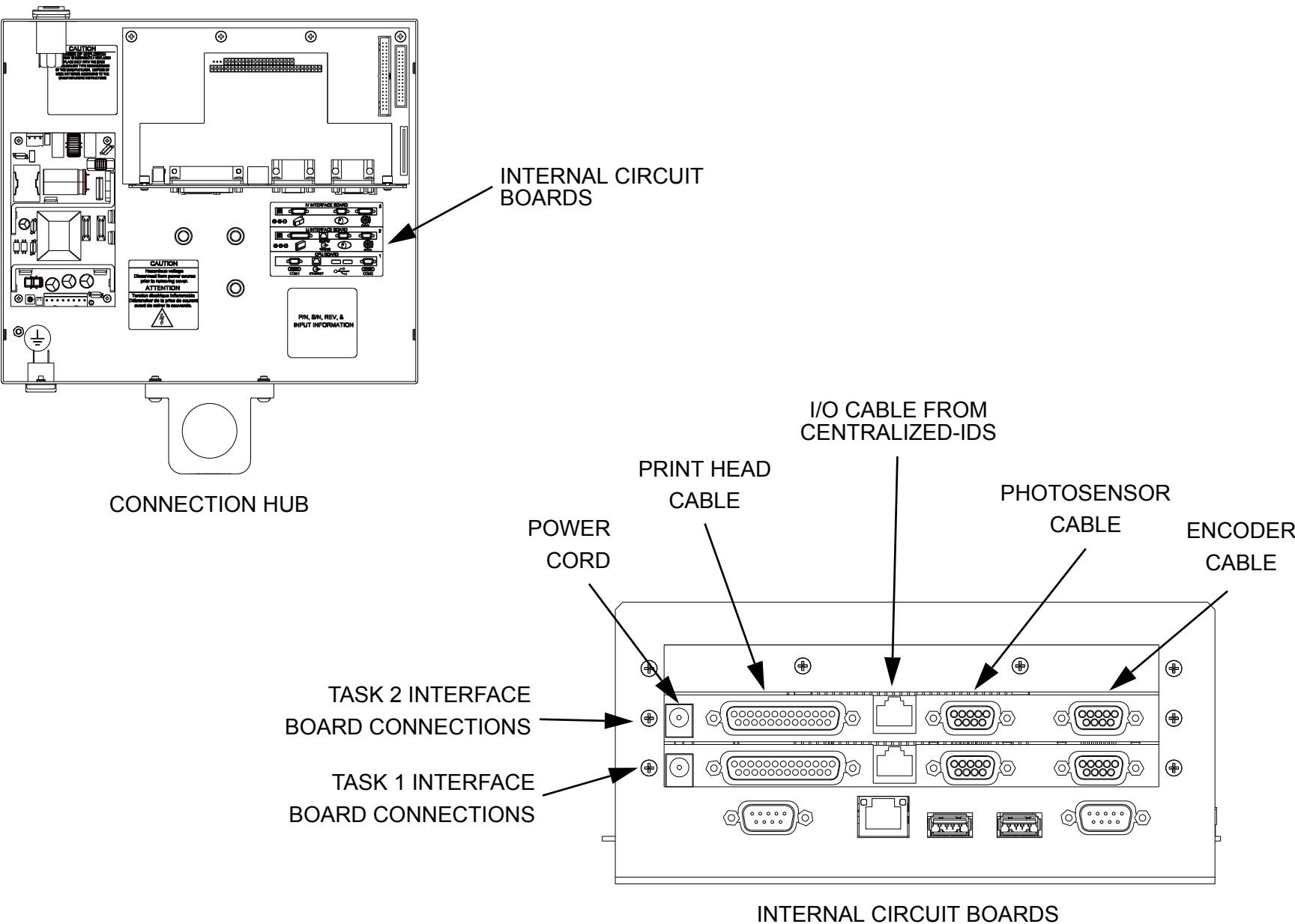
Step 6: Install Tubing

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

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

CAUTION

REMOVE CAP

INSTALL FILTER

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

1. Refer to diagram at right for typical print head plumbing connections.

INCORRECT

CORRECT

REMOVE AND SAVE CAP

FILTER

CENTRALIZED-IDS

REMOVE AND SAVE ALL 3 CAPS

VACUUM FITTING (1900-405)

INK

VACUUM

INK FITTING (5361.329)

TEE FITTING (2460-120)

4,6m [15 ft.] MAX

VACUUM

INK

PRINT HEAD

CONVEYOR

PRINT HEAD

DO NOT CONNECT TO PRINT HEAD YET
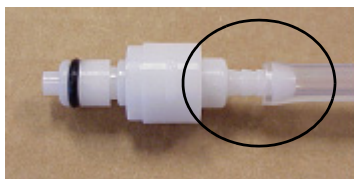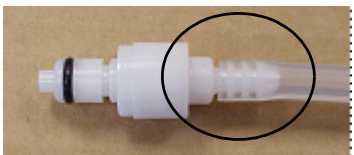
DO NOT CONNECT TO PRINT HEAD YET
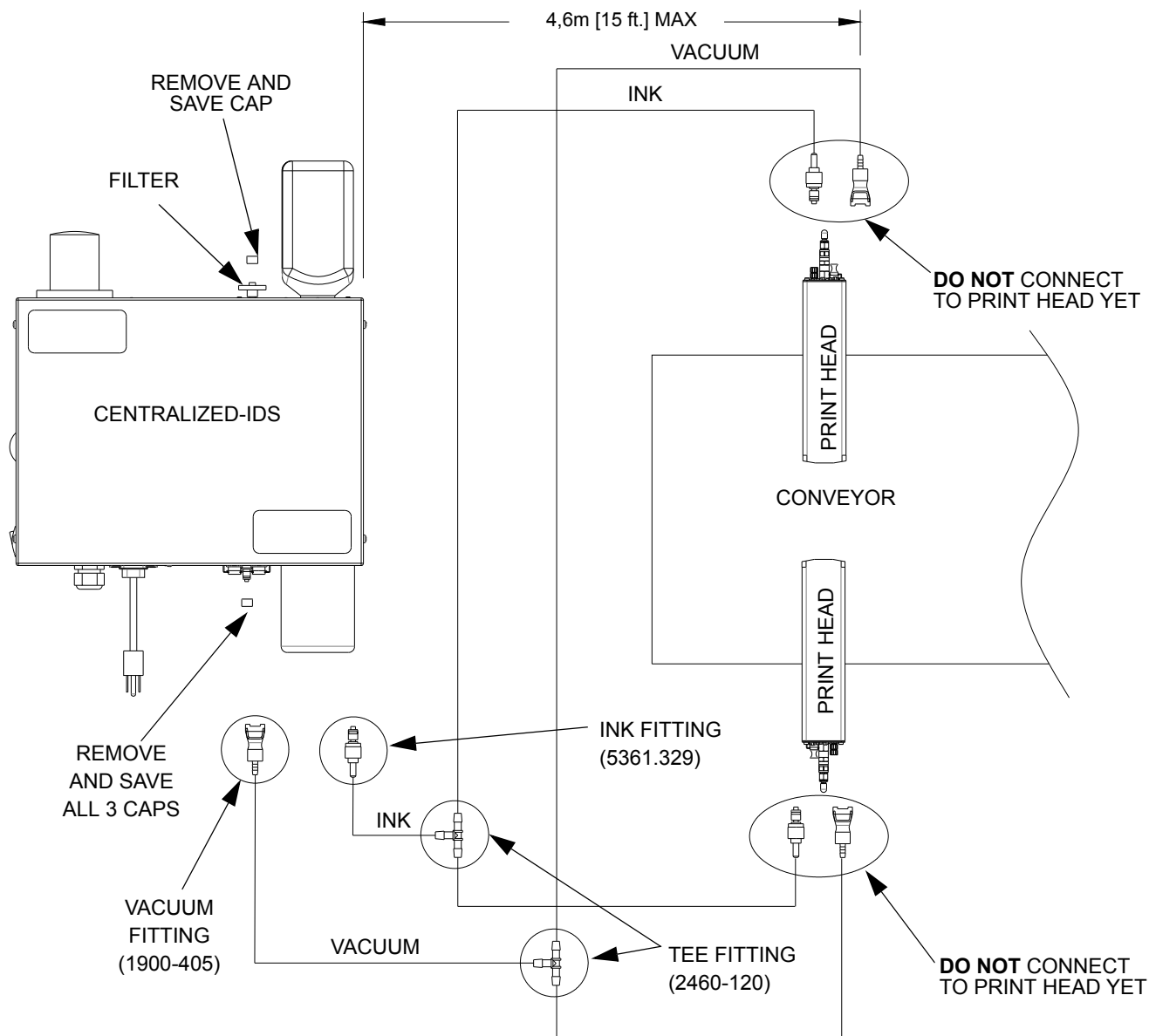
Step 7: Electrical Cable Connections

All controller cables must be routed through the Strain Relief Cable Clamp in the bottom of the IJ4000 Connection HUB.

1. Refer to the diagram 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 Centralized-IDS to the "Output to CIDS" port in the Task 1 Interface Board.

NOTE: Do not connect the Centralized-IDS 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: It is recommended that the Task 1 Print Head be closest to the IJ4000-HMI.

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

5. Plug both the Centralized-IDS and IJ4000 Connection HUB into appropriate outlets.
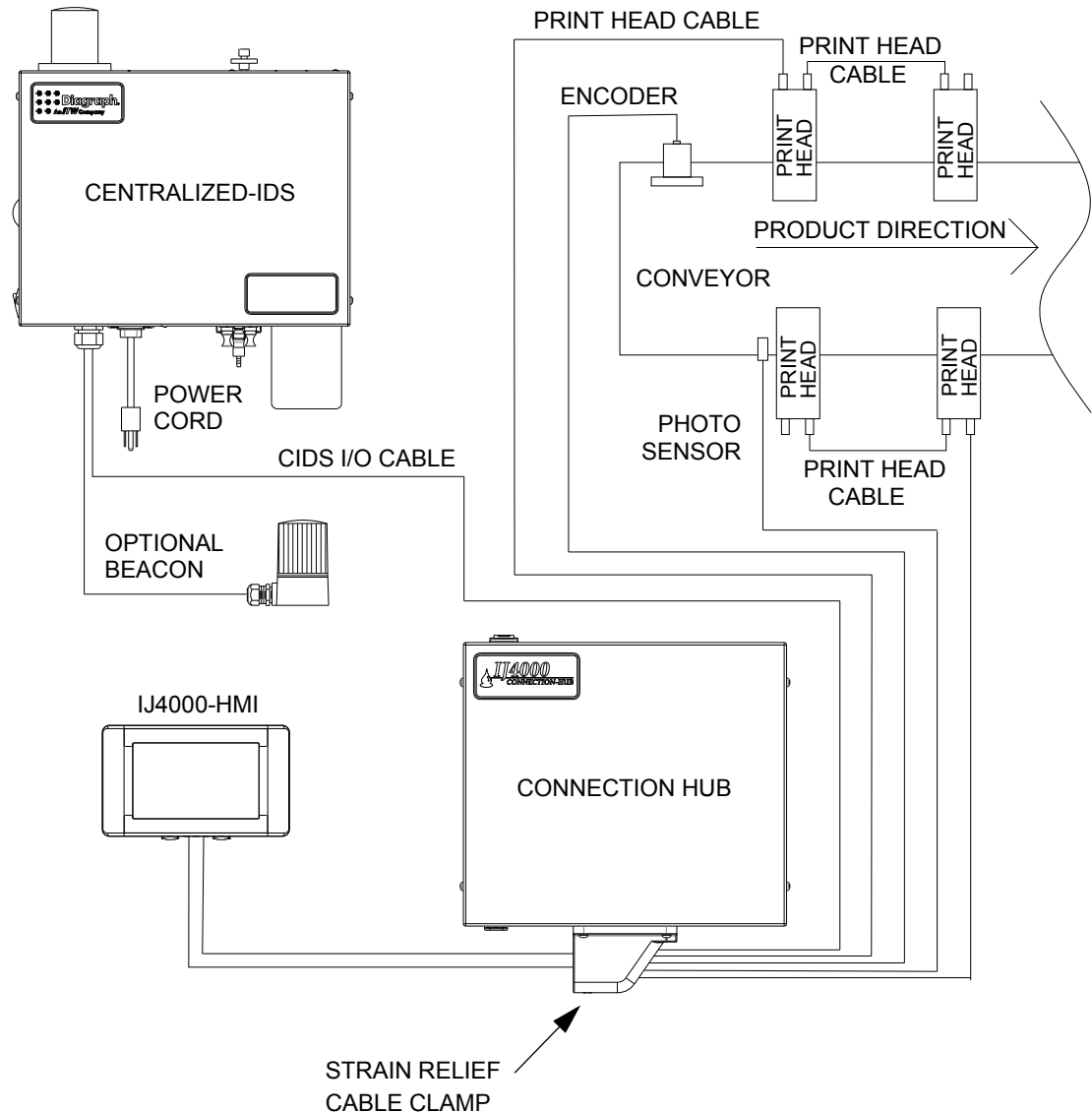
Step 8: Prime Ink Lines

⚠️ **CAUTION:**
- Ensure all vent caps, top and bottom, have been removed from the print head(s) and Centralized-IDS.
- Ensure no tubing is connected to the print heads.

1. Remove the foil seal on the ink bottle and install it into the Centralized-IDS reservoir. Clean and save the reservoir cap.

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

2. Turn on both the IJ4000 Connection HUB and Centralized-IDS.

3. At the print head located nearest the Centralized-IDS, connect the ink supply and vacuum fittings to form a loop.

4. The Centralized-IDS vacuum cycle will be running as the print heads come up to temperature.

5. Disconnect the loop as soon as ink has flowed through the connected fittings. Wipe off both connectors.

6. Plug in both fittings into the back of the first print head.

7. Form a loop for the next closest print head. If the vacuum cycle is still running, allow ink to pass through the loop. Follow steps 5 and 6.

8. If the vacuum cycle stops running and ink lines need to be primed, form the fitting loop at the next print head, then press and hold the **ACS/AutoPrime** button on the back of the print head for five (5) seconds. This starts an AUTOPRIME cycle. Follow steps 5 and 6.

9. Prime remaining ink supply tubing, following the steps above.

10. All print heads should have an ink supply and vacuum tubing connection.

CAUTION

⌷↑ **REMOVE CAP**

╬↓ **INSTALL FILTER**

INK QUICK-DISCONNECT   VACUUM QUICK-DISCONNECT

CONNECTED

11. For 384E print head, squeeze tabs to remove print head shipping cap and store on top of the print head.

SNAP SHIPPING CAP ON TOP OF PRINT HEAD

TABS
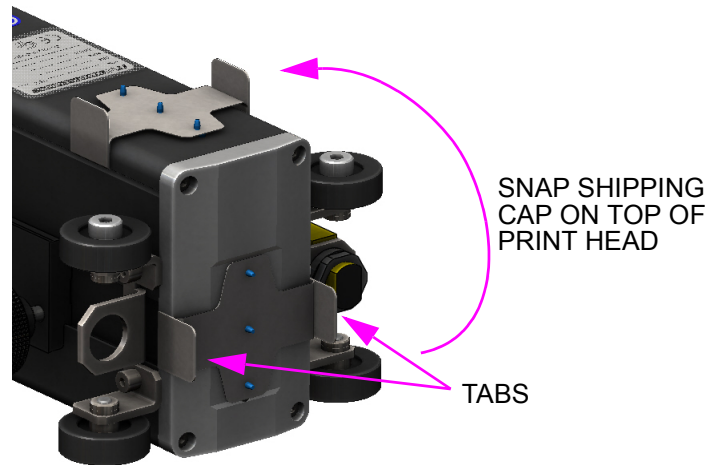
12. For 768 print head, loosen the two captive thumb screws, remove the shipping cover and store on side of the print head.

SHIPPING COVER STORAGE

THUMB SCREWS

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 Centralized-IDS reservoir and bottle.

Confirm the print head(s) are level. The green LED indicates head is level.

ONLY USE SCANTRUE®INK
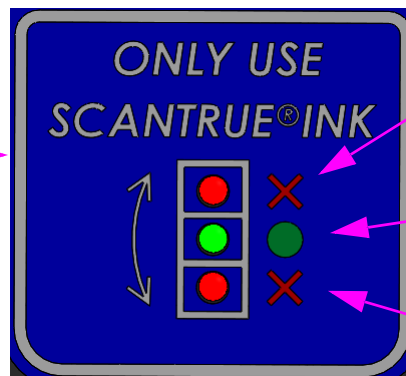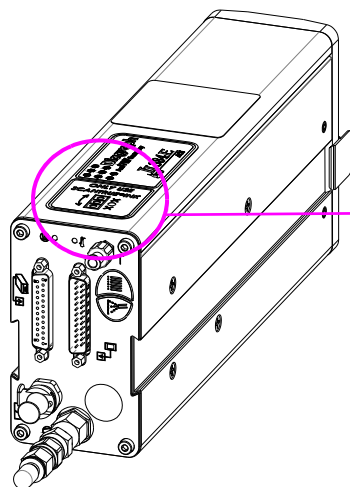
WHEN UPPER LED IS RED, PRINT HEAD IS POINTED UP TOO FAR

WHEN CENTER LED IS GREEN, PRINT HEAD IS READY TO PRINT

WHEN LOWER LED IS RED, PRINT HEAD IS POINTED DOWN TOO FAR
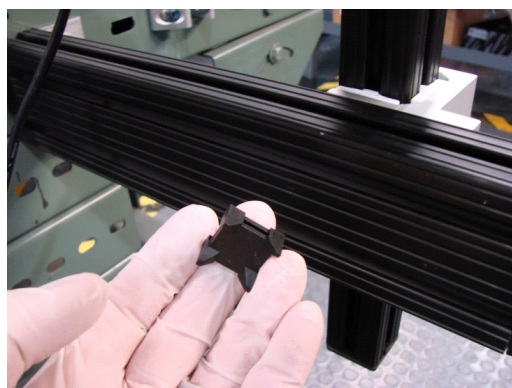
BRACKETRY KITS COME WITH TIE WRAP MOUNTS
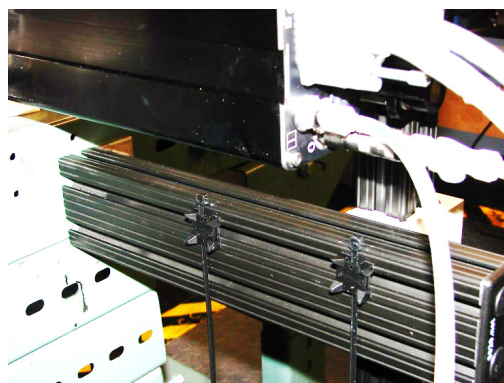
INSERT TIE WRAP MOUNT IN BAR AND TURN 90°. INSERT TIE WRAPS INTO MOUNTS.
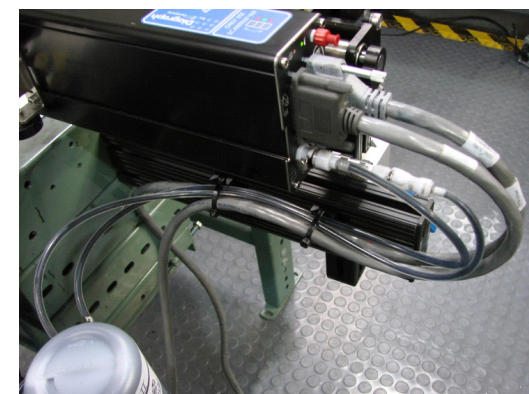
FORM AN 8" MINIMUM SERVICE LOOP FOR TUBING AND CABLE.

Step 9: Mount Photosensor and Encoder

Photosensor

1. Position the photosensor (5760-383) upstream from the first print head. The maximum placement distance is 685,9mm [27in] from the photocell to the print head.

2. The photosensor depth range can be adjusted. The photosensor normally has a range of about 762mm [30in], but can be adjusted down to about 152,4mm [6in]. (Refer to the photosensor manufacturer's instruction sheet for instructions on adjusting the range)
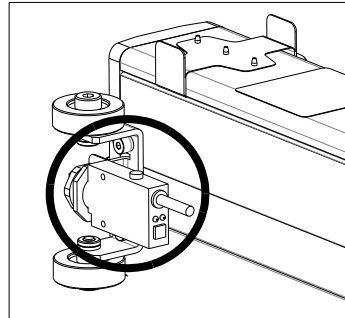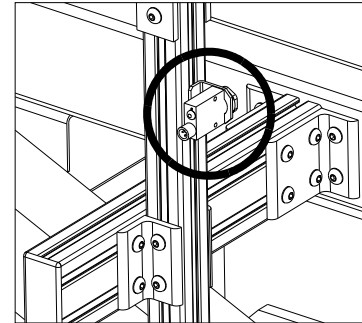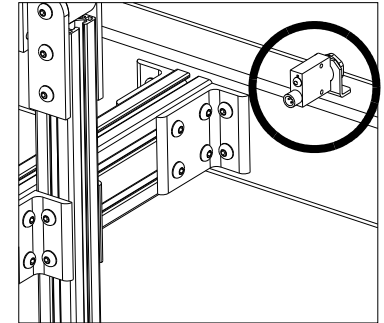
Print Head   Bracketry   Conveyor

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 762mm [30in] range is causing false triggers.

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 18,14 kg [40 lbs.] will reduce the life of the bearings.

Conveyor

Encoder

Encoder Wheel

Spring
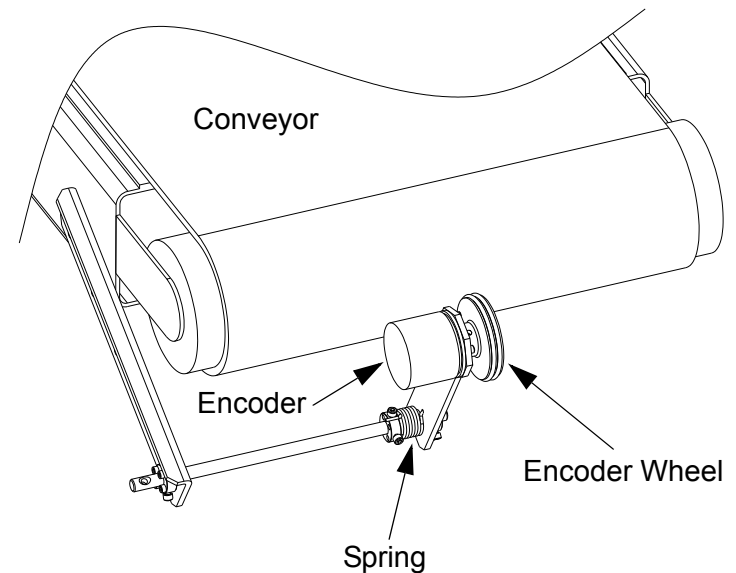
Step 10: Configure the Print Head via the Controller

NOTE: It is recommended that there is no message printing when re-doing the print head setup. If the warning message ("Changing the print head setup while printing may cause print problems. Continue?") is displayed, click **No**, then cancel the setup. Return to the Message Screen and cancel the print message before proceeding.

1. Select the **More** menu option, then select **Task Settings**,

2. Touch the **Redo Print Head Setup** button.

3. Touch the box that represents the direction the product will move on the conveyor (as seen while standing in from of the IJ4000-HMI or Task 1 Print Head).

4. Touch the up/down arrows to set the number of print heads on each side of the conveyor.

5. Touch the **Next>** button.

6. Touch the first print head in the daisy chain. (If there is only one print head, this step is bypassed.)
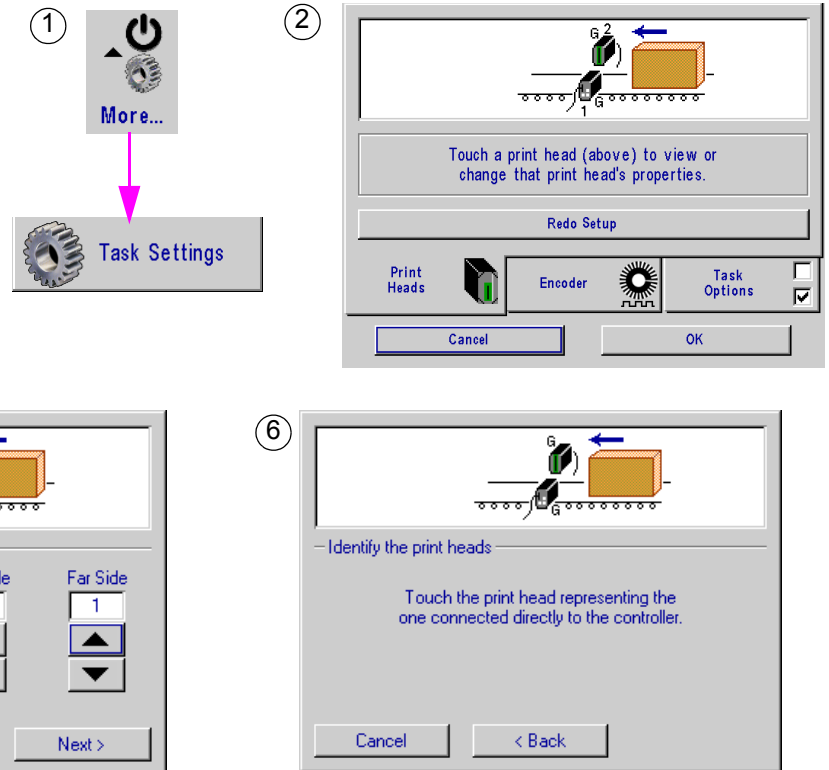
NOTES:

- 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.

- The procedure may be aborted by pressing Cancel or the Escape key at any time without changing the current print head setup.

- Repeat above steps for Task 2.

- Each Task can power up to two (2) IJ384E or one (1) IJ768 print heads.

7. Select the Print Head Type from the drop-down box.

8. Enter the distance between the photosensor and the vertical centerline of the print head. This may need to be fine-tuned after print setup. The maximum sensor offset for the IJ384E Print Head is 685,8mm (27in). If photosensor is mounted using a print head bracket, the offset is 53,3mm (2.1in).

9. Select the Encoder tab and touch the External Encoder icon.

10. If Internal Encoder is selected, type in the speed.

11. Touch the next head to highlight it and continue setup.

12. Touch the **OK** button. Print Head setup is now complete.
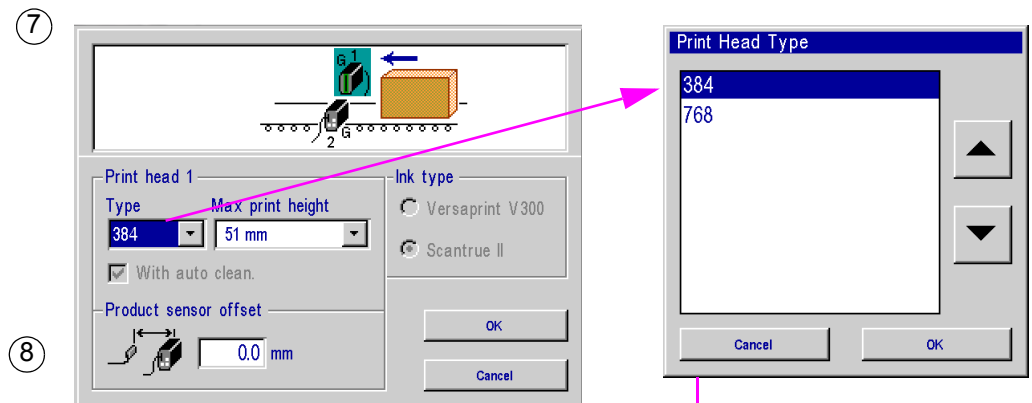
When the 384E Print Head is selected, the ink type automatically sets to Scantrue II.
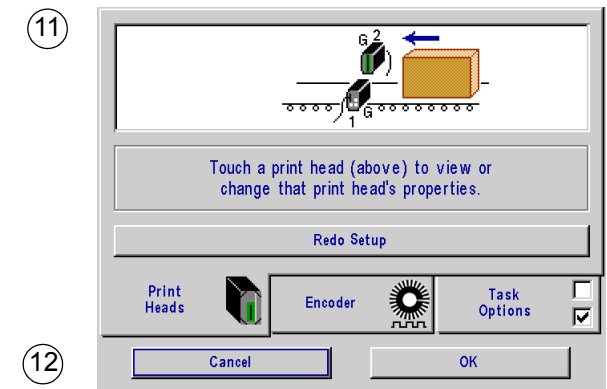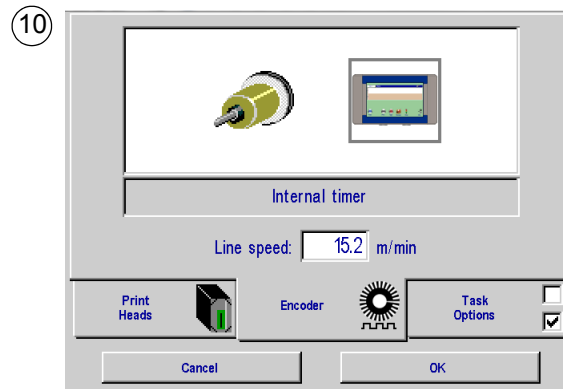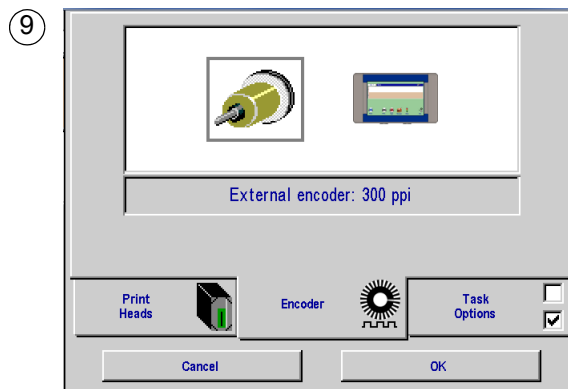
Touch any print head on the display to review or change the properties for that head. Touch the **Redo Print Head Setup** button to repeat the setup procedure using the new setup as the default. Touch **OK** to return to the **Home Screen**.

Step 11: Sample Print Quality

NOTE: Configuration needs to be set up on the IJ4000-HMI Controller prior to priming the print heads. (Refer to "Step 9: Mount Photosensor and Encoder" on page 21.)

384E PRINT HEAD
(See next page for 768 Print Head)

1. Ensure caps from the rear of the print head have been removed and stored.
2. Ensure the print engine shipping cap has been removed and stored.
3. Ensure all print heads are at operating temperature.

LEAVE THE RED VENT FILTER IN PLACE

REMOVE AND SAVE WHITE INK INLET PLUG

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.

REMOVE CAP

REMOVE AND SAVE ORANGE VACUUM CAP

NOTE: Do not use lint-free wipes in the print channel; use foam swabs instead.

4. Slowly pass a lint-free wipe horizontally across the front of the print head. For a 384E Print Head, press the **All Channel** purge button on the back of the print head. For a 768 Print Head, press the **All Channel** purge button on the HMI Controller. A 3-second print sample will result (see next page).

5. If the 384E sample is 50,8mm (2in) tall with no gaps, the print head is ready.

   If the 768 sample is 101,6mm (4in) tall with no gaps, the print head is ready.

HEATER ON

AT TEMPERATURE LIGHT IS ILLUMINATED

ALL CHANNEL PURGE BUTTON

ACS / AUTO-PRIME BUTTON

768 PRINT HEAD

REMOVE AND SAVE WHITE INK INLET PLUG

REMOVE AND SAVE ORANGE VACUUM CAP

REMOVE CAP, BUT LEAVE THE WHITE VENT FILTER IN PLACE

ACS / AUTO-PRIME BUTTON

AT TEMPERATURE LIGHT IS ILLUMINATED

HEATER ON

OUTPUT TO PRINT HEAD

INPUT FROM CONTROLLER

INK INLET

PURGE

AT TEMPERATURE

HEATER ON

VENT

VACUUM / RETURN

RESERVOIR ACCESS

Missing Print

1. Hold a light-colored, absorbent towel under the front of the print head to catch potential ink overflow. The light-colored towel will reflect light, making the face of the print head easier to see.

2. Press and hold the **ACS/AutoPrime** button for five (5) seconds until the Centralized-IDS beacon light flashes once. Observe the 1-second ink flow out of the print head.

3. Inspect for very small air bubbles flowing out of the top of the print head and down the face.

   a. If bubbles are evident, repeat steps 1 to 3 three times.

4. Perform an ACS cycle, then slowly swipe a cloth in front of the print head while pressing the **All Channel Purge** button on a 384E Print Head, or while pressing the **All Channel Purge** button on the HMI Controller for a 768 Print Head. 100% print should be 50,8mm (2in) tall for a 384E Print Head or 101,6mm (4in) tall for a 768 Print Head.

5. If any print is still missing after all air bubbles are purged, allow the print head to remain heated.

6. Every 15 minutes, run another **All Channel Purge** sample to confirm 100% print.

Step 12: Create a Message

NOTE: Additional information on messages can be found in the IJ4000-HMI Controller Manual (5765-355).

From the **Home Screen**, select the **Messages** button, then select the **New** button.
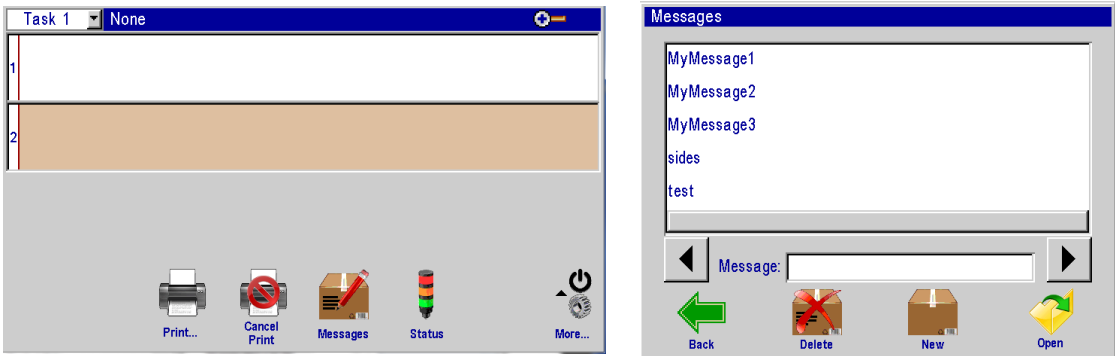
Create and save the message, then exit the message editor.

Labeled diagram showing the message editor interface with the following labels:

- Time Code
- Date Code
- Message Display Area
- Carton Ruler
- Message Info
- Next Field Button
- Cursor
- Field Properties
- Cursor / Field Coordinates
- Font Selection
- On-screen Keyboard
- Zoom
- Text
- Delete Button
- Quick Save
- Line Field
- Menu
- Product Side
- Product Setup
- Count Code
- Bar Codes
- Variable Field
- Logo

Step 13: Print a Message

1. From the **Home Screen**, press the **Print** button.

2. Select the desired message to print, and press the **Print** button.

3. The message will print on the next photosensor trigger.
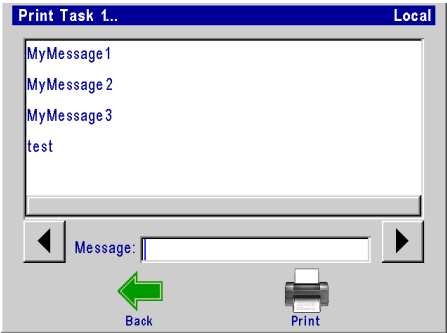
GREEN PAUSE INDICATOR =
READY TO PRINT

RED PLAY INDICATOR =
NOT READY TO PRINT

Section 3: Maintenance and Shutdowns

Following are the recommended maintenance procedures to keep the IJ4000 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

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.

Spray n-propanol on a clean foam swab to clean the slot in the front of the print head. Immediately follow-up with an ACS cycle.

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. (Refer to "ACS - Automatic Cleaning System" on page 31.)

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

Preventive Maintenance

Periodically

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, dust, 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), 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 **ACS/AutoPrime** button on the rear of the print head for 1/2 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.
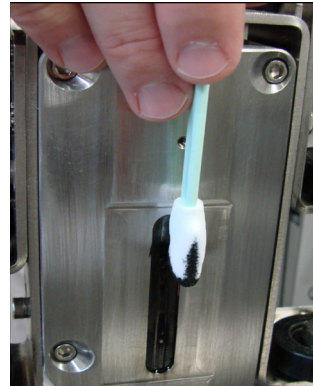
SWAB UP
AND DOWN
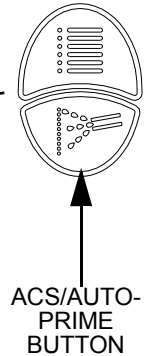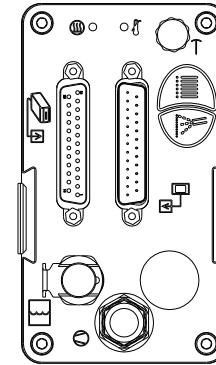
ACS/AUTO-
PRIME
BUTTON

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.
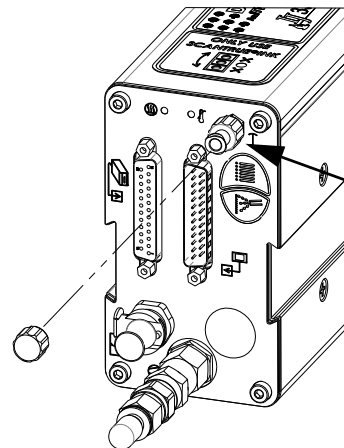
384E
VENT FILTER
(5765-241)
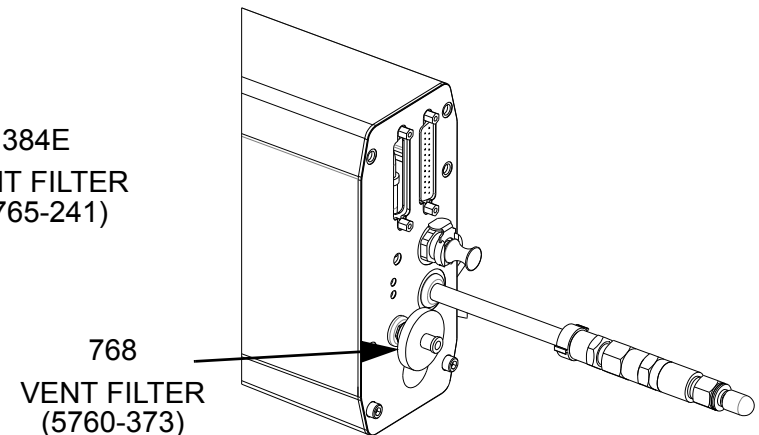
768
VENT FILTER
(5760-373)

3. Disassemble the Combo Fitting in the vacuum line as shown, clean and re-assemble.
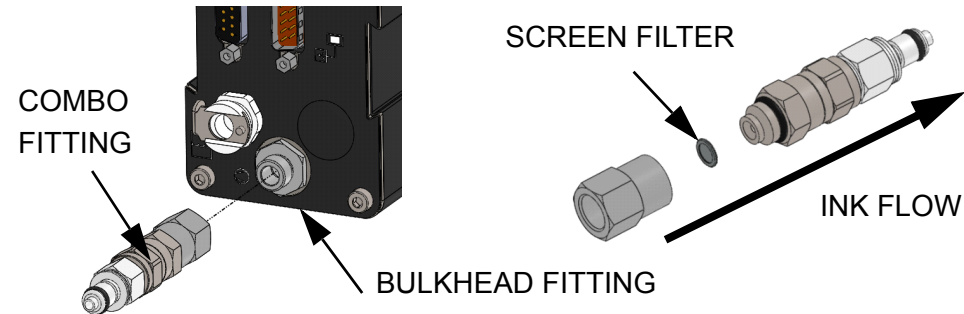
Shutdowns of Seven Days to 3 Months

Shutdown:

1. Turn off the IJ4000 Connection HUB.
2. Spray the appropriate cleaning solvent on a lint-free cloth and, before installing ship cap, lightly wipe the front of the print head to remove foreign debris. Install shipping cap (Kit: 5765-242) on print head.

Startup:

1. Remove shipping cap before power up and allow the print engines to heat up (approximately 5 minutes). Spray the appropriate cleaning solvent on a lint-free cloth and lightly wipe the front of the print head to remove foreign debris.
2. Run the Automatic Cleaning System (ACS) cycle for each print head.

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 Centralized-IDS reservoir and bottle.

Shutdowns of 3 Months or Longer

During planned long-term storage of 3 months or more, as well as when storing spare print heads:

1. Follow recommendations for Seven Days or Longer.
2. It is recommended that the print head system be flushed with ScanTrue Flush Solution and that ScanTrue Flush Solution be left in the print head during the storage period. (See "Consumables" on page 67 for part numbers.)

ACS - Automatic Cleaning System

NOTE: If the beacon on the Centralized-IDS 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

The ACS feature can be accomplished by three methods.

1. From the rear of the print head: Press and hold the **ACS/AutoPrime** button for 1/2 to 1 second. The ACS cycle will initiate.

2. From the controller **Purge Screen**:

   •On the IJ4000 Home Screen, touch the **More** menu button to open the More Menu.

   •Touch the **Purge** 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.

   Once a print head has been cleaned, verify that all channels are printing properly by touching the **All Channel Purge** button located on the back of the 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 **All Channel Purge** button is touched.

3. From the controller **Auto Clean Setup**: The IJ4000 can also be programmed to automatically clean the print heads during regular down times in the production schedule in increments of 30 minutes..

HOME SCREEN

MORE MENU BUTTON

PRINT MENU BUTTON

PURGE BUTTON

MORE MENU

PURGE SCREEN

TOUCH THE DESIRED HEAD

CLEAN PRINT HEAD BUTTON

PURGE BUTTON
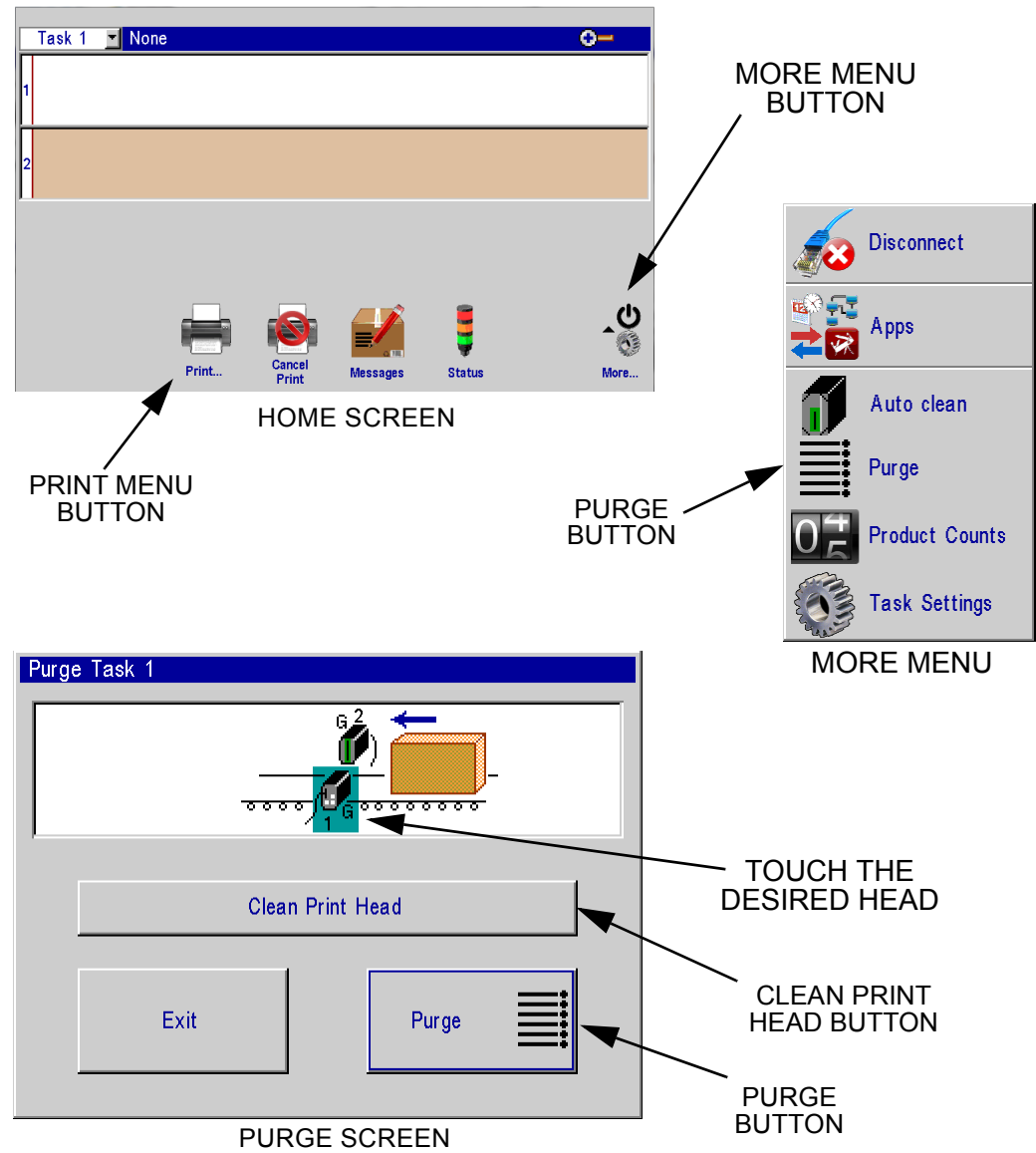
Centralized-IDS Maintenance

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.

Shutdowns of 1 Week to 3 Months

During planned shutdown periods of 1 week to 3 months, as well as when storing spare print heads:

1. Remove the ink bottle, close the reservoir vent cap and install the reservoir ship cap.
2. It is recommended that the shipping cap be installed on the print head orifice plate. This will prevent dust and debris from entering the print head, prevent scratches to the nozzle plate and prevent overexposure to high humidity conditions.

Annually

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

Storage Life of a FACTORY SEALED Bottle of Ink

- Recommended storage temperature: 4° to 40°C (40° to 104°F).
- Recommended storage relative humidity: 5 - 90% relative humidity with no condensation.

At these conditions, the ink will have a storage life of 12 months from the date of manufacture. Temperatures above the recommended storage temperature for a period greater than one week will reduce the storage life of the ink.

NOTE: Do not shake the bottle of ink before use. Agitating the ink may introduce air into the Print Head. If shaken, the bottle must sit for at least two hours before use.

Use Life of an OPENED Bottle of Ink

The life of an opened bottle of ink, or ink exposed in the ink reservoir, is less than the storage life (expiration date). Exposure to air, temperature and relative humidity, as well as flow of ink through the reservoir, will affect the useful life of the ink.

The ink can, under certain circumstances, absorb water; and a small percentage of water absorption can cause the ink to thicken or form a gel.

NOTE: The ink should be consumed within three months of opening the bottle.

Section 4: Troubleshooting

The IJ4000 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.

Print Quality

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 (ACS). 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 "Missing Print" on page 25.

Problem: Missing bottom print channels.

Possible Cause: Ink build-up on lower orifices.

Action: Wipe front plate and run Automatic Cleaning System.
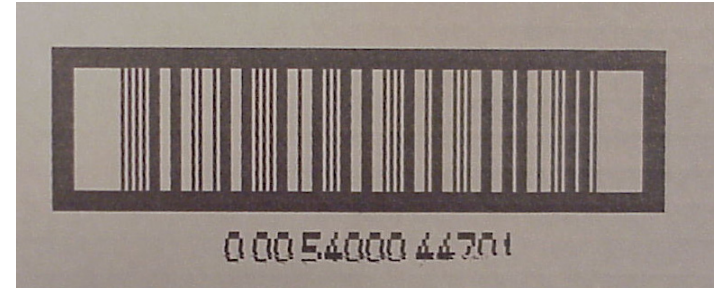
Problem: Fuzzy Print.

Possible Cause: Print head too far away from substrate.

Action: Move print head to within 1/8" from product.
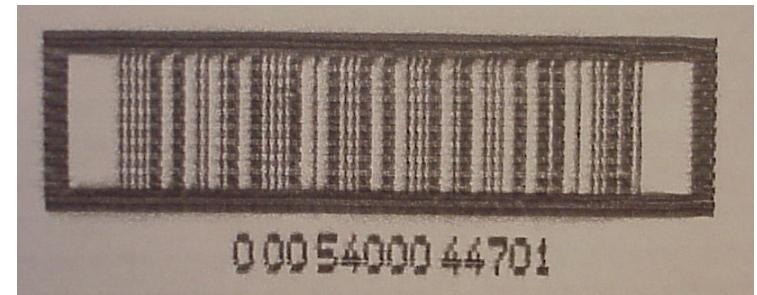
Problem: Occasional checkerboard print pattern.

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).
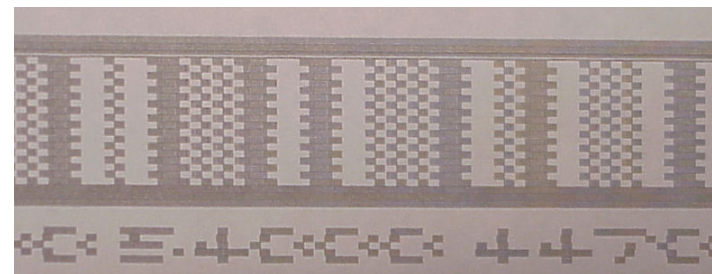
Problem: Short image, dark print, checkerboard pattern.

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).
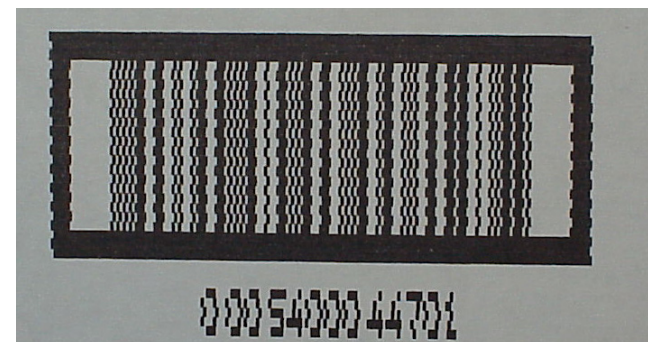
Problem: Backwards print.

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

Action: Re-do print head set-up to specify correct direction.
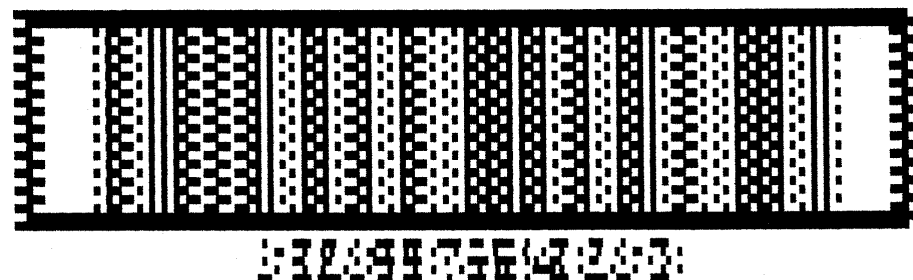
IJ4000 Impulse Jet System Trouble-Shooting

Centralized-IDS:

System Symptom	Possible Cause	Operational Test Method
Ink not pumping to Print Head	Power Supply	Ensure Centralized-IDS 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 Centralized-IDS 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 over-flowing the Print Head	Power Supply	Ensure Centralized-IDS 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 Centralized-IDS. Make sure the Ink Separator Bottle is fully tightened. Open Centralized-IDS and remove any clogs in the line. Initiate an ACS Cycle, and listen for the pump.
		Check for 12VDC at Vacuum Pump.

Centralized-IDS (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 Centralized-IDS 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 Centralized-IDS 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 Centralized-IDS to Controller Cable connection. No Centralized-IDS power. No Controller to Print Head connection.	Inspect Centralized-IDS communication cable and ensure connection to Interface Board. See "Step 7: Electrical Cable Connections" on page 17.
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 "ACS - Automatic Cleaning System" on page 31 for maximum line lengths and installation requirements.
	Combo Fitting/Filter needs to be Cleaned	Clean Combo Fitting. see "ACS - Automatic Cleaning System" on page 31.
Print Head will not heat, "At Temperature" LED never turns on	Print Engine or PC Board	Return print head to Diagraph.
Missing print.	Air in Print Head	Air in the Print Head is the most likely cause of missing channels. Refer to *"Missing Print" on page 25* for bleeding procedures.
Ink Reservoir in Print Head does not refill, or no ink pumps out during an ACS or Auto-Prime Cycle. (384E)	Solenoids or PC Board	Return print head to Diagraph.
Print Head will not print. (384E)	PC Board	Return print head to Diagraph.
Ink Reservoir in Print Head does not refill, or no ink pumps out during an ACS or Auto-Prime cycle. (768)	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.

Impulse Jet Print Head (continued):

System Symptom	Possible Cause	Operational Test Method
Ink Reservoir in Print Head does not refill, or no ink pumps out during an ACS or Auto-Prime cycle. (768) (Continued.)	PC Board	Check the LED indicators on the board.
		LED2: Green; indicates Print Head is requesting Centralized-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. (768)	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).
		LEFD6: 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 6,4mm (.25in) 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 IJ4000 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 IJ4000 PCB. Refer to "Encoder" on page 51 for additional information.

Appendix A: System Specifications

System
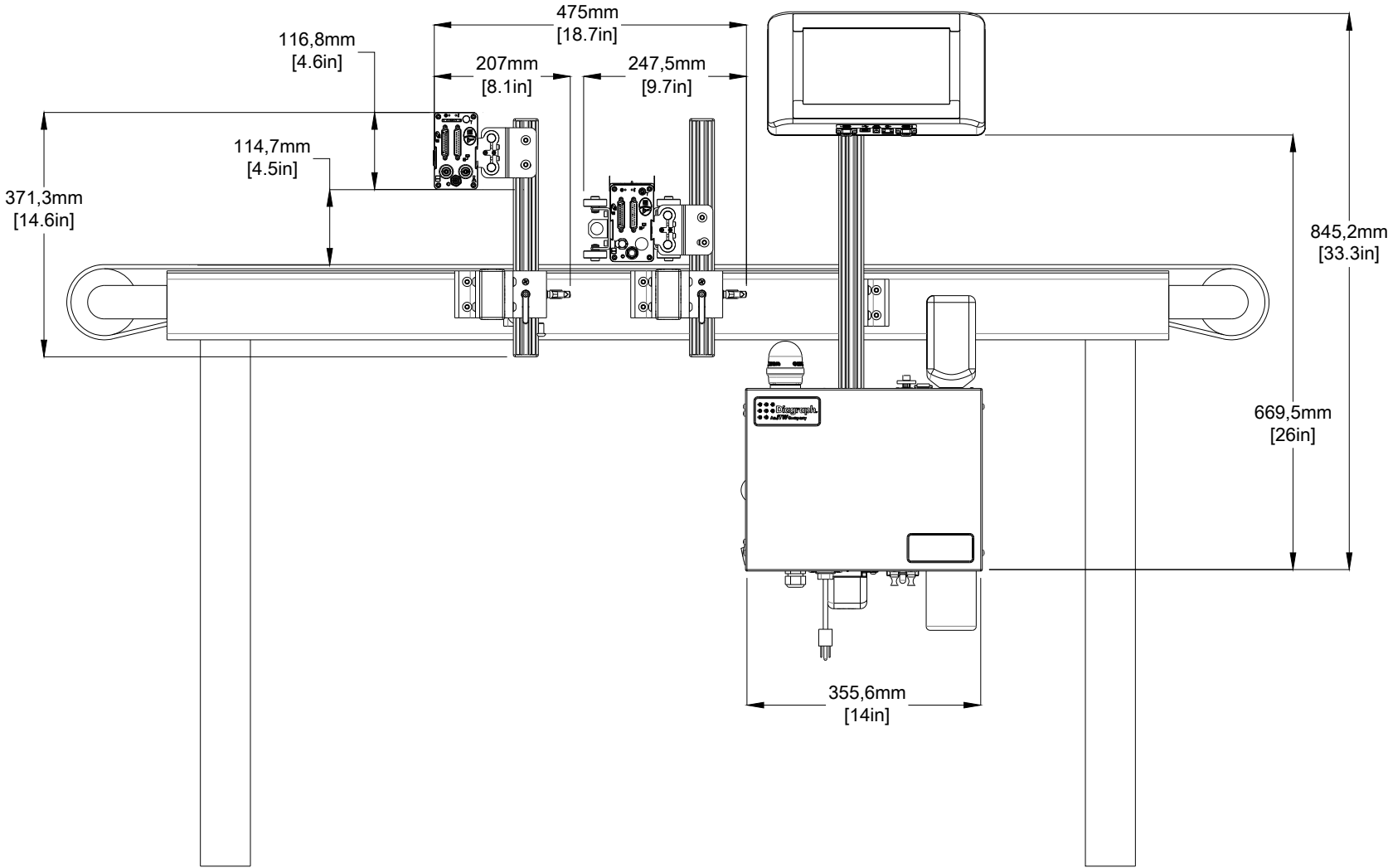
Centralized Ink Delivery

Size
Height: 518,7mm [20.42in]
Width: 371,1mm [14.61in]
Depth: 181,1mm [7.13in]
Weight: 8.2kg [18lbs]
Cable and Tubing Clearance: 127mm (5in) from the bottom of the enclosure

IP Rating
IP54 (estimated)

Enclosure
Sealed stainless steel industrial enclosure.

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: 10°C to 40°C (50°F to 104°F)
Operating humidity:
• ScanTrue II Ink: 5-80% non-condensing

Tubing Limitations
Maximum vertical tube length (bottom of Centralized-IDS to bottom of highest print head) = 6,1m (20ft) ink pump limitation.
Maximum height of Centralized-IDS or tubing above print head= 914,4mm (36in) vacuum pump limitation.
(See *"Step 6: Install Tubing" on page 16.*)

Number of Heads Allowed
4

IJ4000-HMI Controller

Size
Weight: 2,18kg [4.6lb]

Height: 196,1mm [7.72in]

Width: 330,7mm [13.02in]

Depth: 41,3mm [1.62in]

IP Rating
IP34 (estimated)

Enclosure
Stainless Steel

User Interface
Graphical User Interface

with on screen keyboard

Fonts
Unicode

Display
259,08mm [10.2in] LCD with touch screen, 800 x 480 pixels

Storage
512 MB flash memory

Ports
(2) RS-232 ports, 1 USB port,

(1) 100 Base-T Ethernet port

Electrical
15 VDC from power supply to controller. power supply: 90-260 VAC, 50/0 Hz, 1.5A max.

Environment
Ambient operating temperature: 5°C to 40°C (40°F to 104°F)

Operating humidity: 10% - 90%, non condensing

IJ4000 Connection HUB

Size

Weight: 5,22kg [11.5lb]
Height: 335,0mm [13.19in]
Width: 309,4mm [12.18in]
Depth: 119,1mm [4.69in]

IP Rating

IP54 (estimated)

Fonts

Unicode

Storage

512 MB flash memory

Ports

(2) RS-232 Ports, (1) USB Port
(1) 100 base-T Ethernet Port

Electrical

24 VDC, 100W, Internal Power Supply.
90-260 VAC, 50/0 Hz, 1.5A max.

Environment

Ambient operating temperature: 5°C to 40°C (40°F to 104°F)
Operating humidity: 10% - 90%, non condensing

384E Print Head

Size - IJ384E Head
L: 300,8mm [11.84in]
W: 69,9mm [2.75in]
H: 127,0mm [5.0in]
Weight: 2,7kg [6 lbs]

IP Rating
IP65 (estimated)

Enclosure
Anodized aluminum

Electrical
24 VDC input from Connection HUB

Ink Filtration
75 micron external ink filter

25 micron in-line system inlet filter

10 micron built-in filter in print engine

Print Speed
Alpha/Numeric Text: Up to 60,96 meters per minute [200 feet per minute] @ 200 dpi; 38,1 meters per minute [125 feet per minute] @ 300 dpi.

Barcode: Up to 45.72 meters per minute [150 feet per minute].

* Higher line speeds achievable with reduction of dpi.

Print Resolution
384/128 Head: 128 addressable channels, 50,8mm [2in] solid print height

Throw Distance
Up to 12,7mm [1/2in]. (1,6mm [1/16in] recommended for best print quality.)
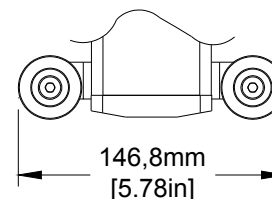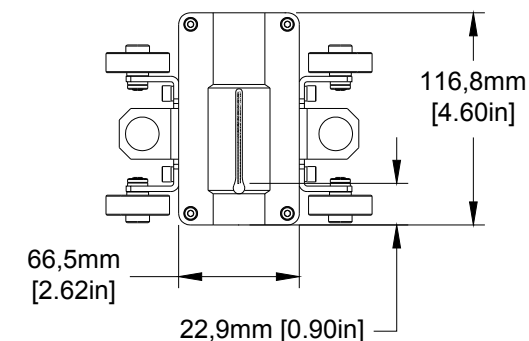
Ink Type
ScanTrue® II, Pigmented Ink for porous substrates, black

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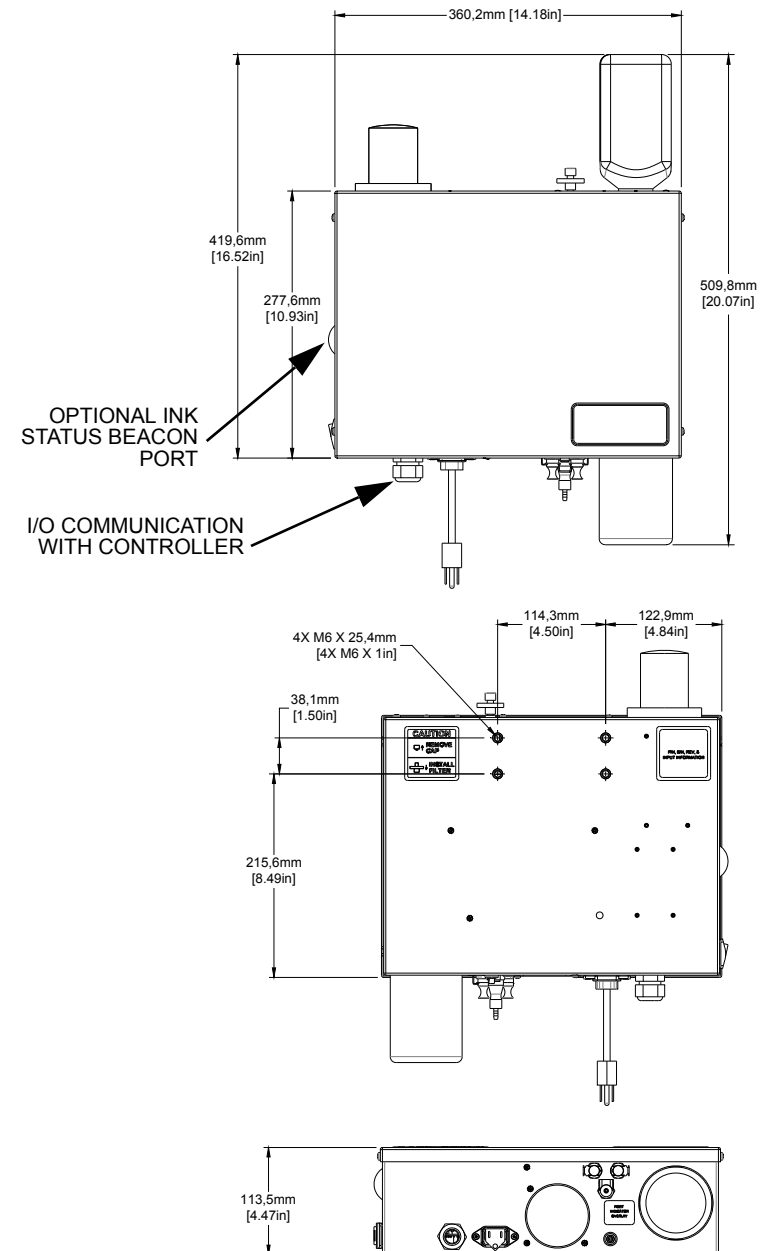
Operating humidity: 5 - 80% non-condensing

ACS (Automatic Cleaning System) Consumable usage
ScanTrue II Ink: .38mL

768 Print Head

Size - IJ768 Head
L: 337,6mm [13.29in]
W: 71,1mm [2.80in]
H: 160,5mm [6.32in]
Weight: 4,3kg [9.5 lbs]

IP Rating
IP54 (estimated)

Enclosure
Anodized aluminum

Electrical
24 VDC input from Connection HUB

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

198,5mm [7.81in]

160,5mm [6.32in]

187,0mm [7.36in]

71,1mm [2.80in]

27,1mm [1.07in]
TO LOWEST ORIFICE

337,6mm [13.29in]

Print Speed
Alpha/Numeric Text: Up to 60,96 meters per minute [200 feet per minute] @ 200 dpi; 38,1 meters per minute [125 feet per minute] @ 300 dpi.

Barcode: Up to 45.72 meters per minute [150 feet per minute].

* Higher line speeds achievable with reduction of dpi.

Print Resolution
768/256 Head: 256 addressable channels, 101,6mm [4in] solid print height

Throw Distance
Up to 3,2mm [1/8in]. (1,6mm [1/16in] recommended for best print quality.)
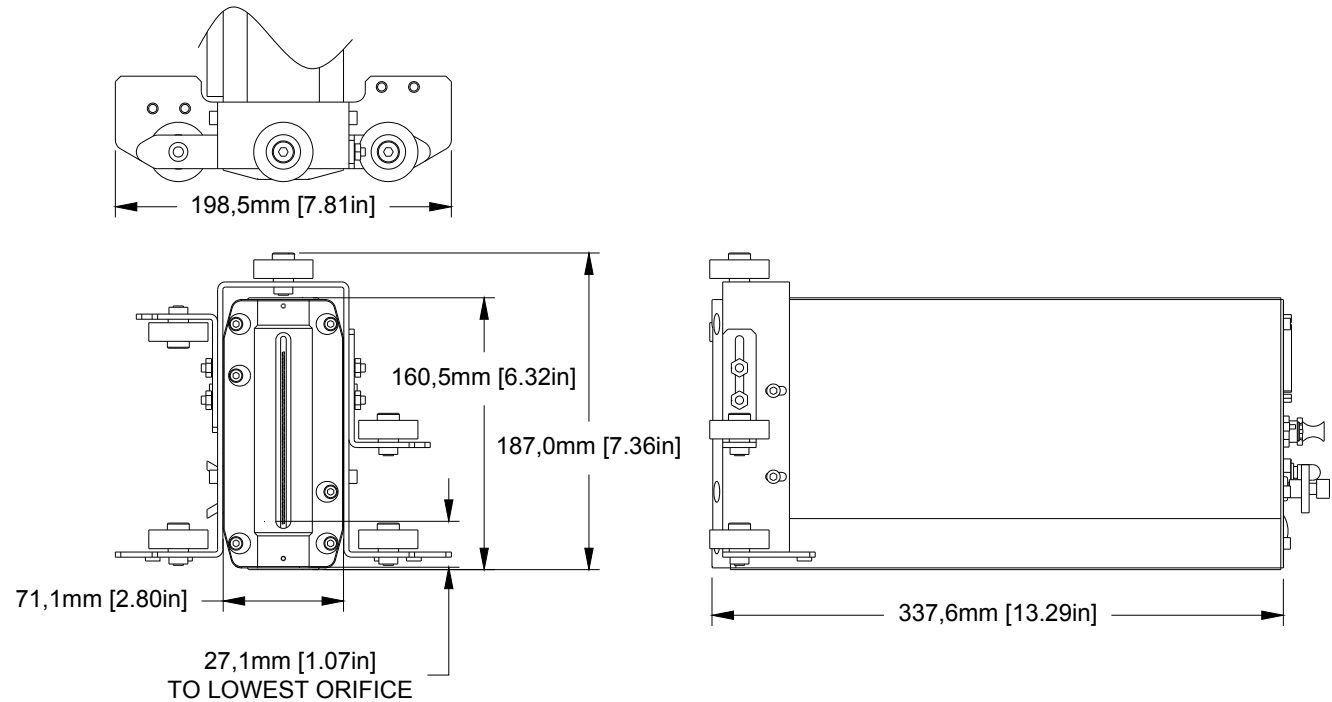
Ink Type
ScanTrue® II, Pigmented Ink for porous substrates, black

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

ACS (Automatic Cleaning System) Consumable usage
ScanTrue II Ink: .38mL
Solvent: .18mL

System Interconnect Diagram

1. IJ4000 HMI-Controller
2. Centralized Ink Delivery System
3. Print Head
4. Conveyor
5. Product
6. Print Head Bracketry
7. Ink Status Beacon
8. Encoder
9. Ink Supply
10. Photosensor
11. Vacuum Waste Collector Bottle
12. Encoder Cable
13. Print Head Cable
14. IJ4000 Connection HUB
15. Throw Distance (3mm [1/8in] Recommended)
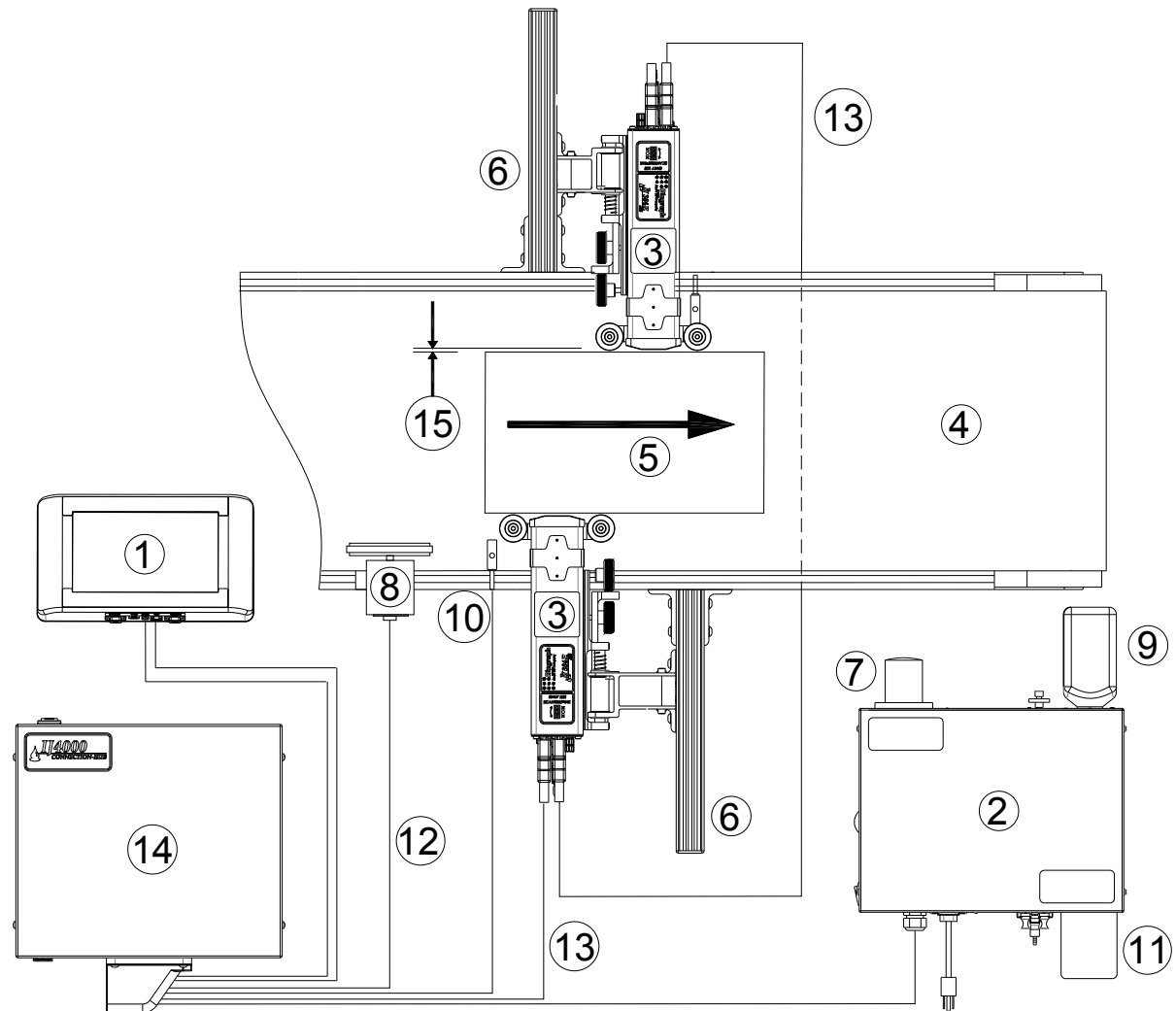
Appendix B: Theory of Operation

Functional Description

The IJ4000 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.

Impulse Jet 384E Print Head

The IJ4000 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 drive the heater and the imaging capabilities of the print engine. The print head electronics also control the ink management functions.

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 Centralized-IDS 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 Centralized-IDS, 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 Centralized-IDS. An ACS cycle can be manually initiated by pushing the **ACS/AutoPrime** button located on the back of the print head. The ACS can also be programmed to run at specified times by using the IJ4000-HMI Controller.

When print head priming 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 Centralized-IDS waste collection bottle. This function can be initiated by pushing in and holding the **ACS/AutoPrime** button located on the back of the head for 5 seconds.

Another function is the ability to check for 100% print from the print head. This function can be performed by momentarily pressing the **All Channel Purge** button on the rear of the print head while passing a substrate in front of it in a horizontal direction.

A digital level indication is provided by three LEDs located on the top rear of the enclosure. The print head is considered level, as indicated by a central green LED, when it is within +/- 1.5° front-to-back, level to the horizon. The digital level is factory calibrated to within 0.2° absolute.

The print head is sealed at many points to protect against liquid ingress that could damage internal components.

Print Head Daisy Chain

Print heads attach to the IJ4000 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 a 384E daisy chain is two. An IJ4000-HMI Controller 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 IJ4000 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 IJ4000-HMI 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 IJ4000 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).

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 IJ4000 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.

Centralized Ink Delivery System (Centralized-IDS)

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 Centralized-IDS detects ink low via the float in the ink reservoir, it disables the ink pump, leaving a safe amount of ink. The Centralized-IDS then alerts the operator by turning on the attached beacon light, and by sending a signal via I/O to the IJ4000-HMI 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 Centralized-IDS 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 Centralized-IDS 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. *Ink capacity.* Both the 500 mL and 1 L bottles are accommodated by the Centralized-IDS.

6. *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 Centralized-IDS. The system only responds to input from the I/O connection to the IJ4000. 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 Centralized-IDS 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 Centralized-IDS, 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 Centralized-IDS 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 Centralized-IDS operates in this state until it encounters a different ink status.

If the Centralized-IDS 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 Centralized-IDS. A pressurized can of solvent is the main source of solvent. The solvent flows through a regulator into the Centralized-IDS. 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.

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 Centralized-IDS 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.

REPRESENTS INK FLOW
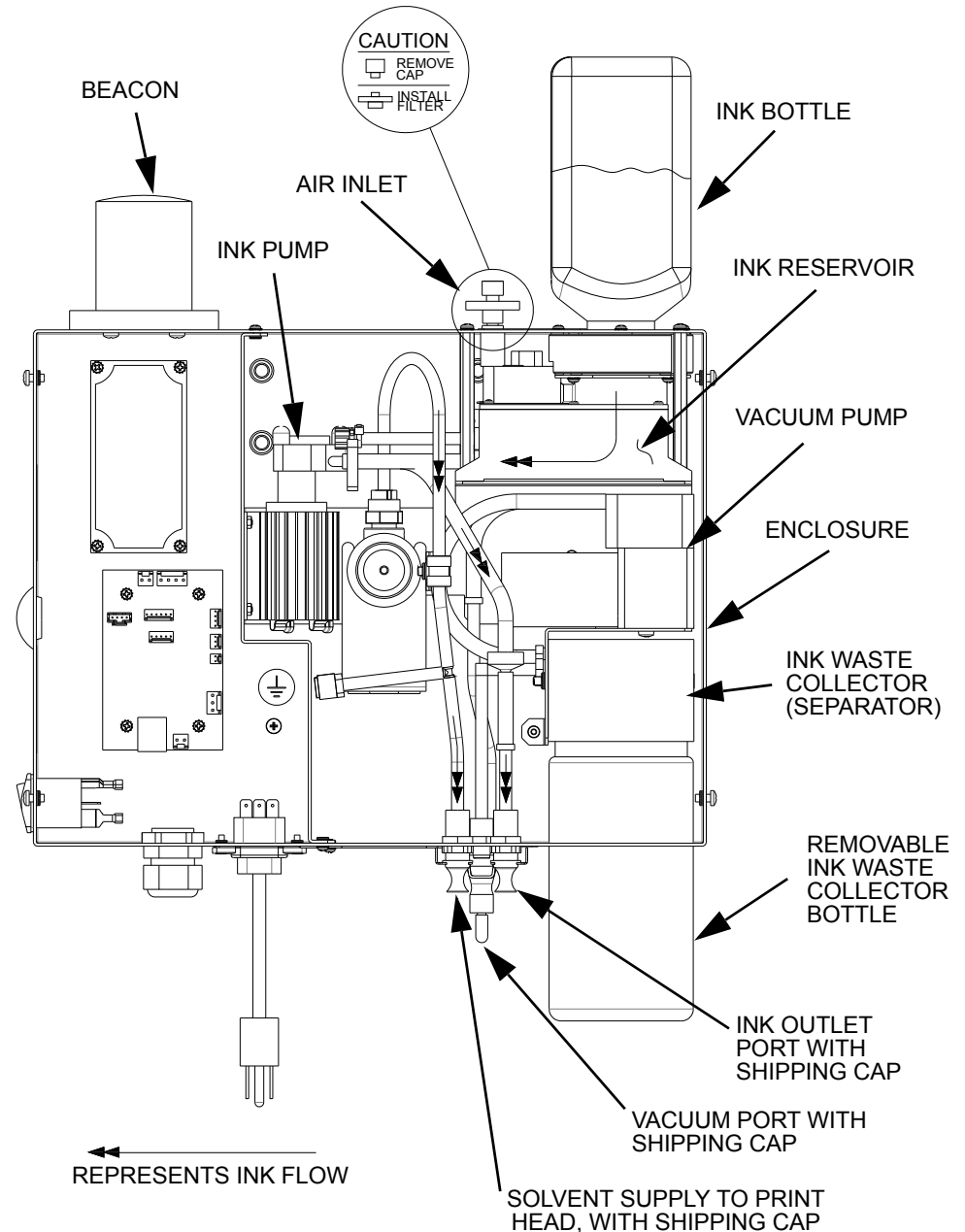
NOTE: DOOR NOT SHOWN.

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 IJ4000 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 Centralized-IDS 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 Centralized-IDS 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 a maximum of twenty seconds and then shut itself off if the print head float sensor has signalled for shut 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 Centralized-IDS 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.

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

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

COMPANY XYZ 04:00 PM
PRODUCT NAME 04/01/03
PRODUCT SIZE
0 00 123456789 5
maximum field stack

Task1:Side1

0 00 123456789 5
maximum field stack

Task1:Side2

The absolute maximum line speed for an Impulse Jet task is 200 fpm. 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 152,4mm [6in] message printing at 200 dpi horizontal resolution.

Line Speed (meters per minute)	Line Speed (feet per minute)	20% - 40% Density # of Images per Sec.	Above 70% Density # of Images per Sec.
15,24	50	2	2
30,48	100	2	2
45,72	150	2	1
60,96	200	2	1

Centralized-IDS 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 Centralized-IDS reservoir.

Connectors:
    SW1:   NOT DEFINED.

    P1:   Centralized-IDS I/O connector.

    J1:   Beacon.

    J2:   External beacon.

    J3:   Liquid pump.

    J4:   Vacuum pump.

    J5:   Power (12V).

    J6:   Reservoir float switch.
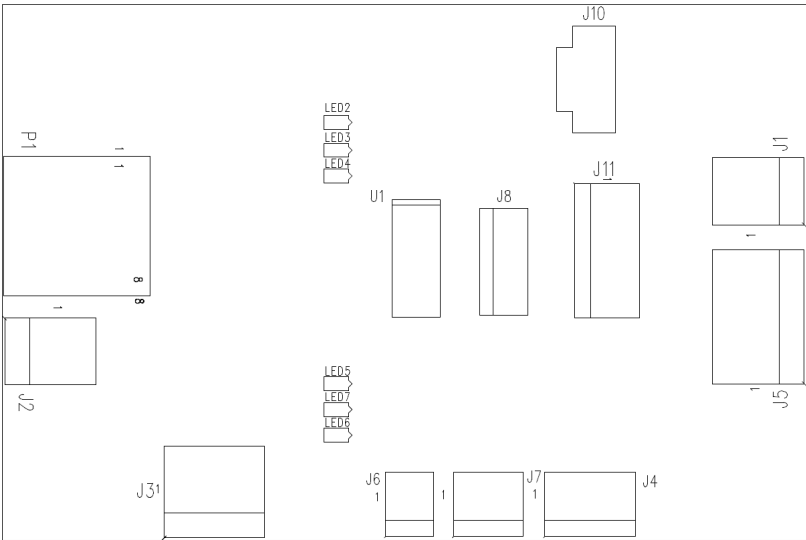
    J7:   Waste bottle float switch.

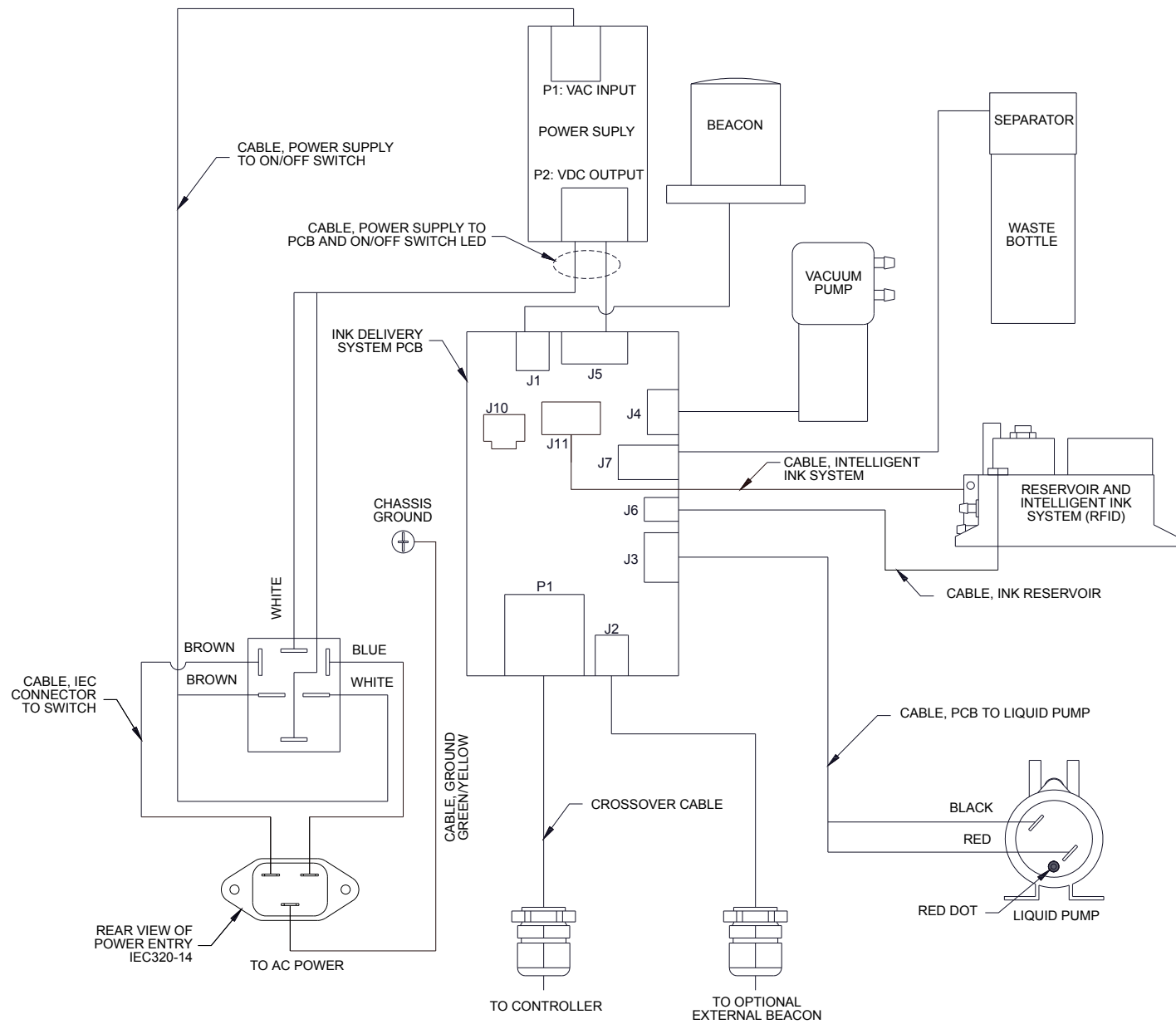   J8:   Programming port, for programming U1 via a PC.

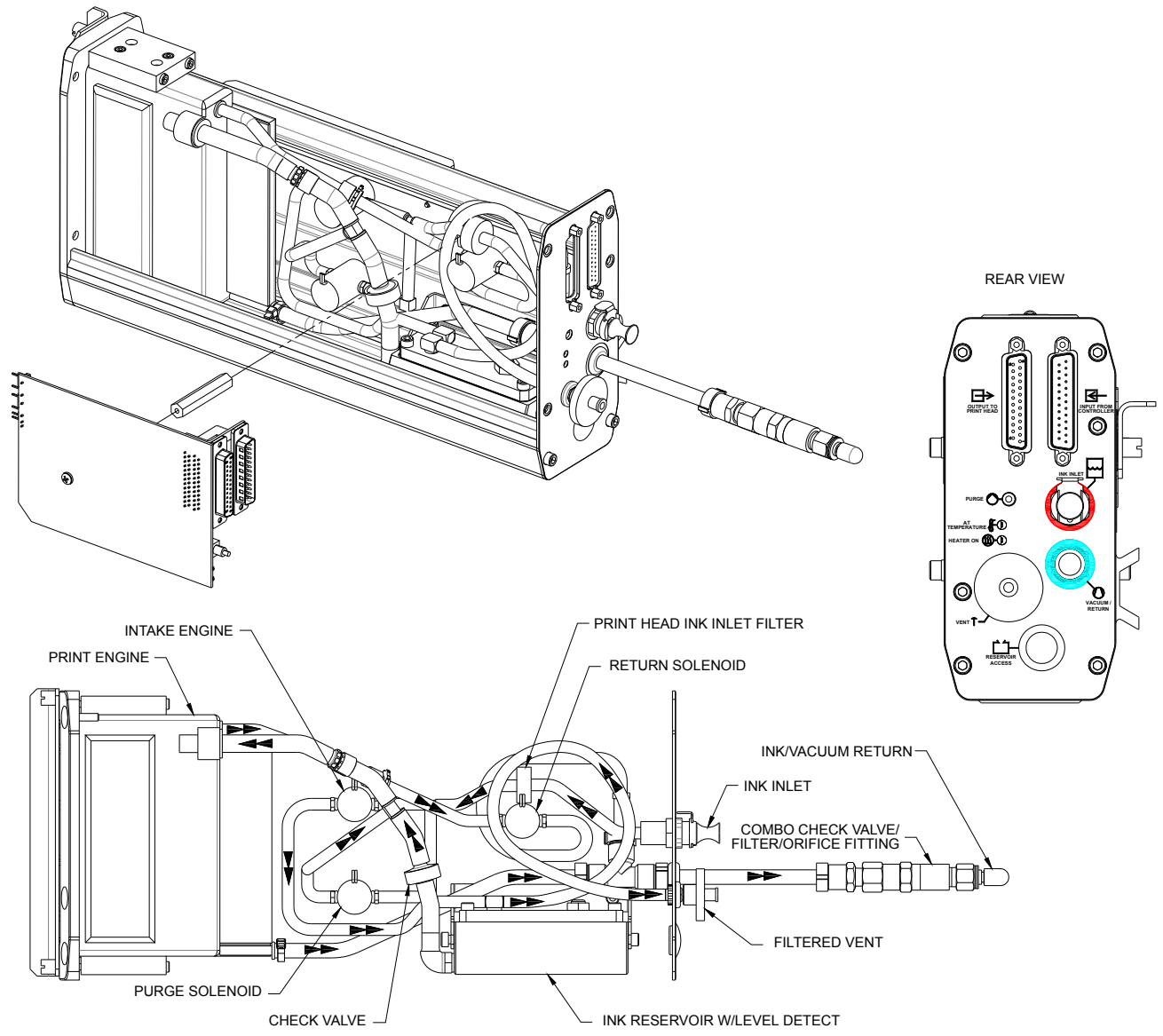   J10:   Pressure sensor for flushing solvent

    J11:   RFID communication

Centralized-IDS Interconnect Diagram

IJ768 Print Head

REAR VIEW

OUTPUT TO PRINT HEAD

INPUT FROM CONTROLLER

PURGE

AT TEMPERATURE

HEATER ON

INK INLET

VACUUM / RETURN

VENT

RESERVOIR ACCESS

INTAKE ENGINE

PRINT ENGINE

PRINT HEAD INK INLET FILTER

RETURN SOLENOID

INK/VACUUM RETURN

INK INLET

COMBO CHECK VALVE/ FILTER/ORIFICE FITTING

FILTERED VENT

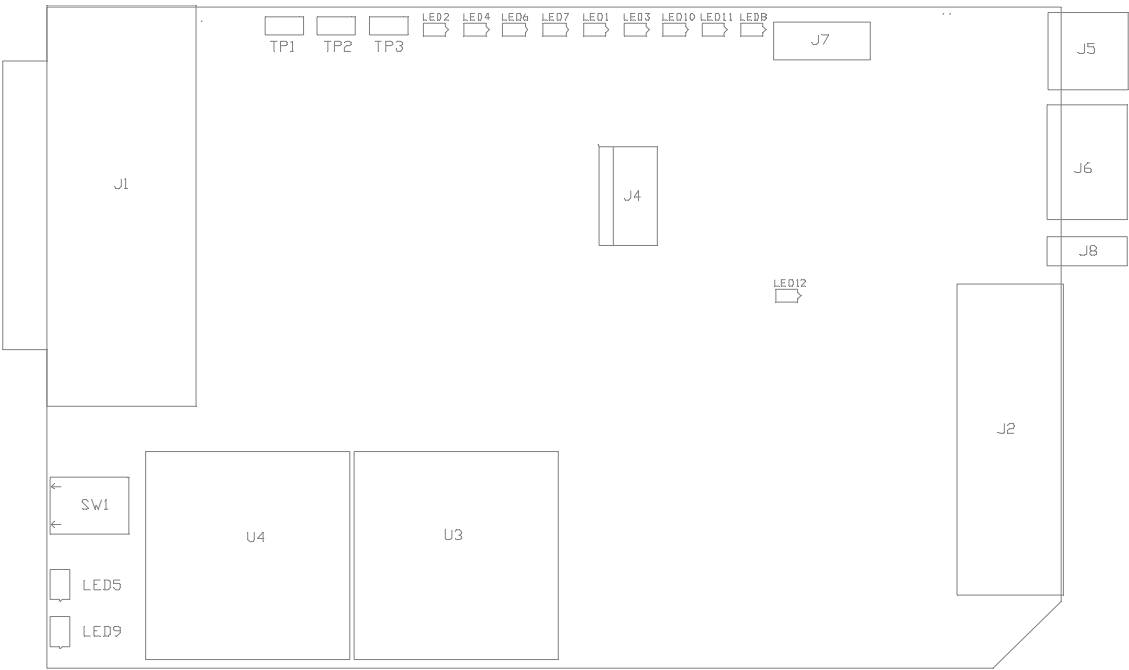PURGE SOLENOID

CHECK VALVE

INK RESERVOIR W/LEVEL DETECT

IJ768 Print Head

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 Centralized-IDS to turn liquid pump on.

LED2:   Green; indicates print head is requesting Centralized-IDS 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.

IJ768 Print Head Interconnect Diagram
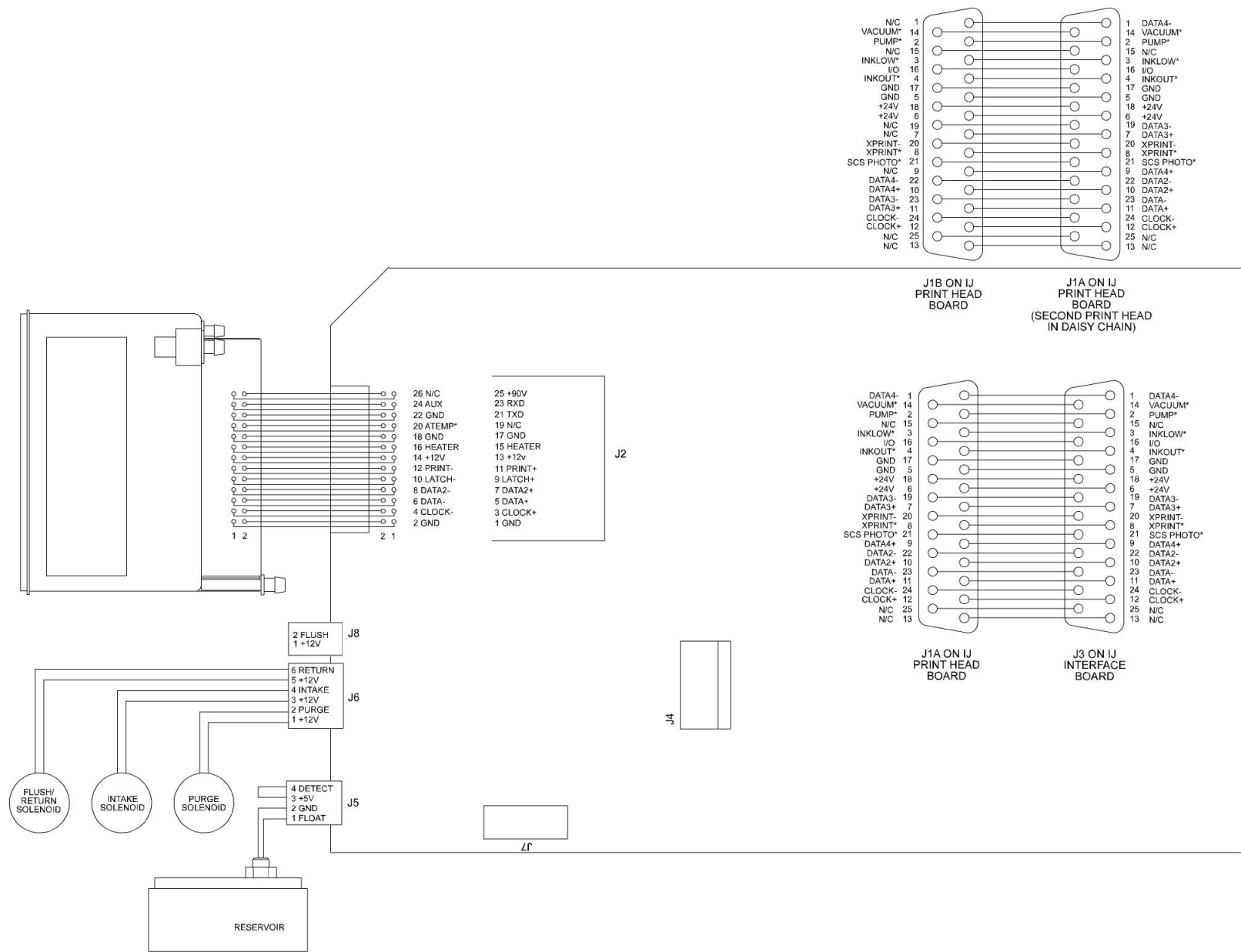
Appendix C: Part Numbers

System

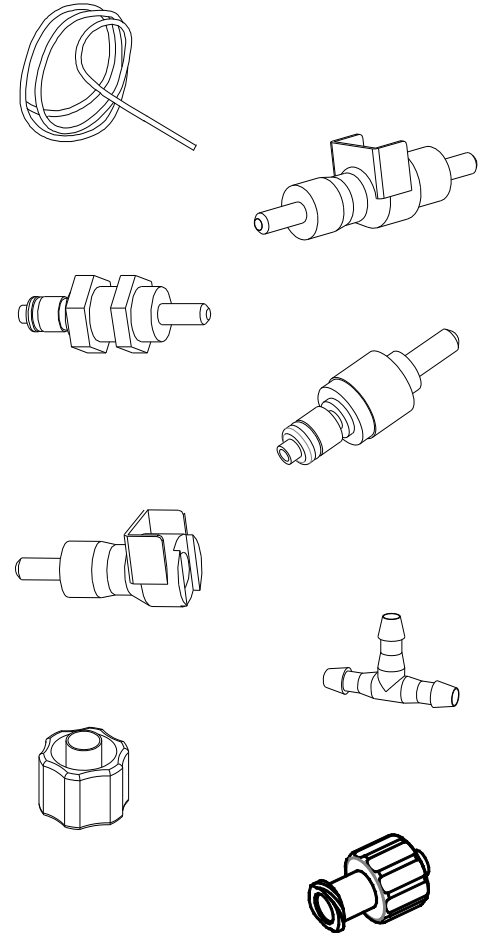| Item	Part No.	Description
1	5765-004J	IJ4000-HMI Controller, Stainless Enclosure, 10.2 inch Touchscreen
2	5765-013384S2	IJ4000 384E Print Head, Scantrue II®
	5765-013384S2FL	IJ4000 384E Print Head, Scantrue II®, Flushed
3	5765-017768S2	IJ3000 768Jet Print Head, Scantrue II®
	5765-017768S2FL	IJ3000 768Jet Print Head, Scantrue II®, Flushed
4	5765-014DJ1	IJ4000 Connection HUB, Domestic, 1 Interface Board, Domestic
	5765-014DJ2	IJ4000 Connection HUB, Domestic, 2 Interface Boards, Domestic
	5765-014DJ1-S	IJ4000 Connection HUB, Domestic, 1 Interface Board, I/O Card, Domestic
	5765-014DJ2-S	IJ4000 Connection HUB, Domestic, 2 Interface Boards, I/O Card, Domestic
	5765-014EJ1	IJ4000 Connection HUB, Domestic, 1 Interface Board, European
	5765-014EJ2	IJ4000 Connection HUB, Domestic, 2 Interface Boards, European
	5765-014EJ1-S	IJ4000 Connection HUB, Domestic, 1 Interface Board, I/O Card, European
	5765-014EJ2-S	IJ4000 Connection HUB, Domestic, 2 Interface Boards, I/O Card, European
5	5765-011S2	Centralized-IDS, Stainless Enclosure, Domestic, Scantrue II®
	5765-011ES2	Centralized-IDS, Stainless Enclosure, European, Scantrue II®
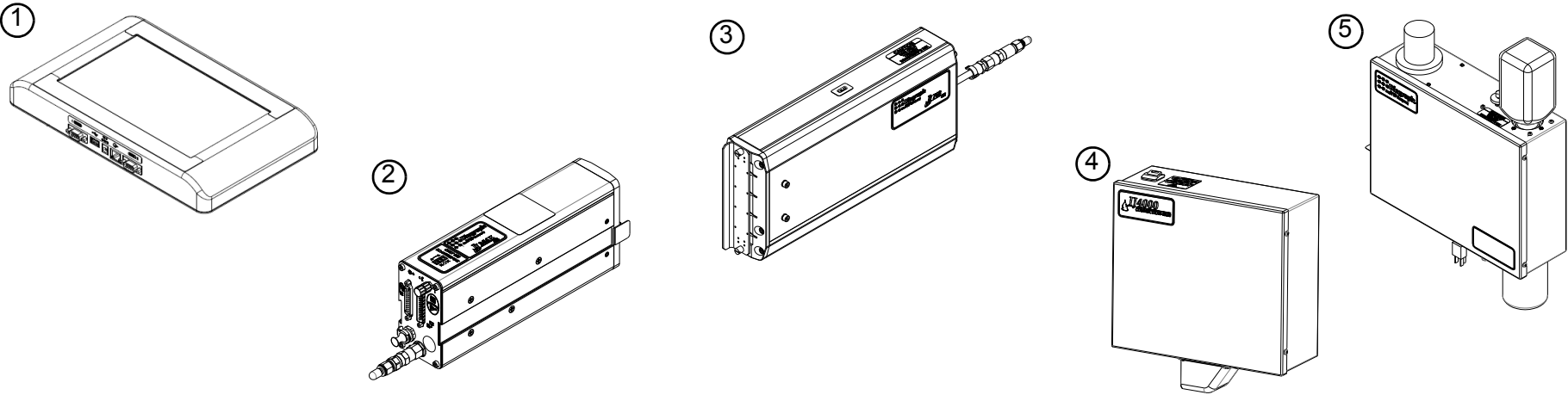
Bracketry

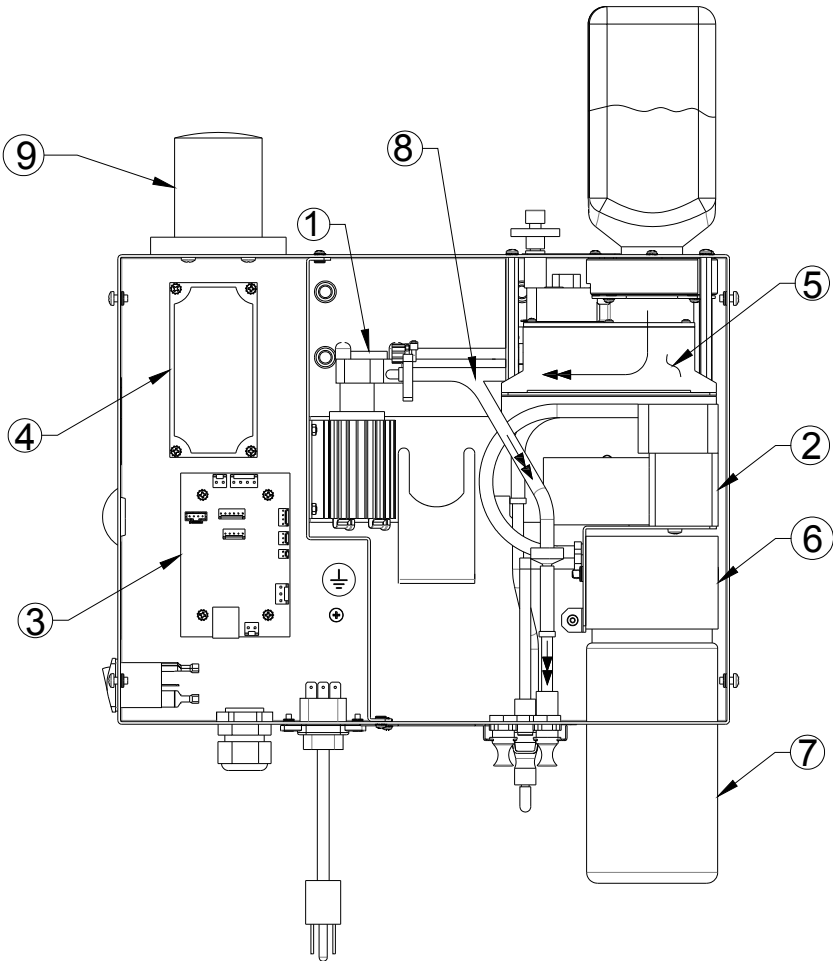| Item	Part No.	Description
1	5765-245	IJ4000 Retracting Bracket Kit, 384E Print Head
2	5780-253	IJ3000 Retracting Bracket Kit, 768 Print Head
3	5765-246	IJ4000 Print Head Roller/Retractor Mounting Bracket Kit, 384E Print Head
4	5760-388	IJ3000 Print Head Roller Mounting Bracket Kit, 768 Print Head
5	5765-249	IJ4000 T-Base Stand Kit
6	5765-250	IJ4000 Conveyor Mounting Bracket Kit
7	5760-354	Multi Print Head Conveyor Mounting Kit *
8	5760-355	Print Head Floor Mounting Kit *
9	5760-356	Multi Print Head Floor Mounting Kit w/24" Bar *
	5760-357	Multi Print Head Floor Mounting Kit w/44" Bar *
* Requires Single Print Head Kits		
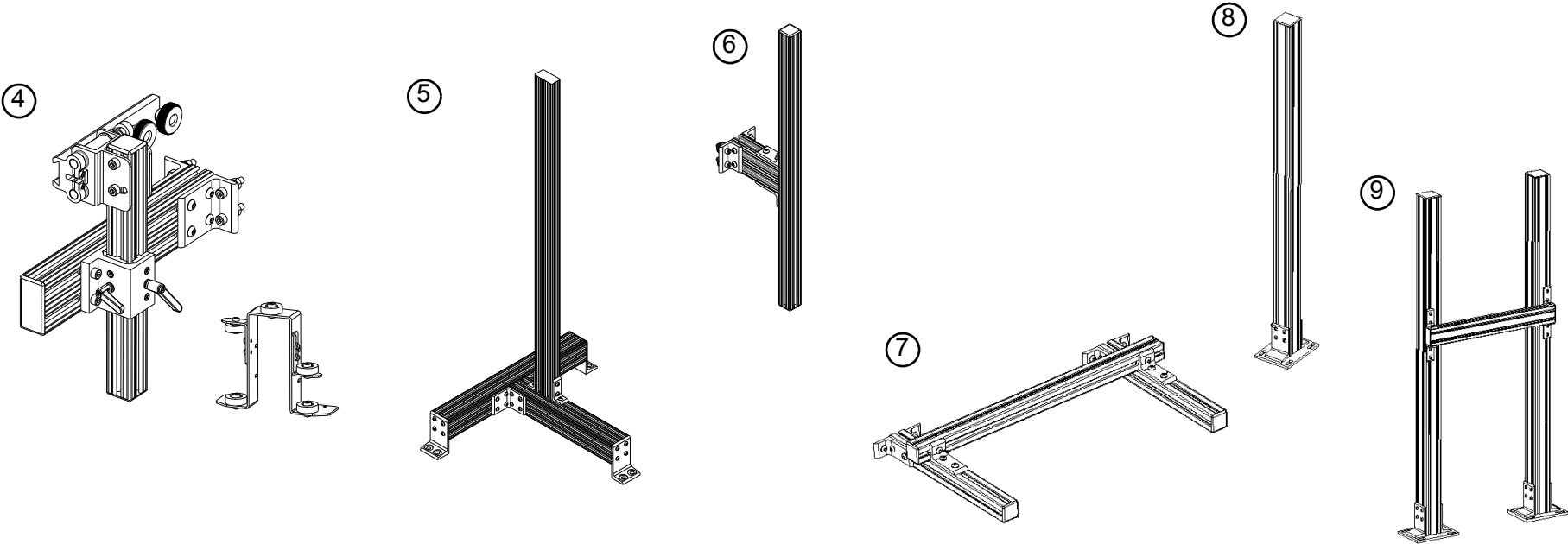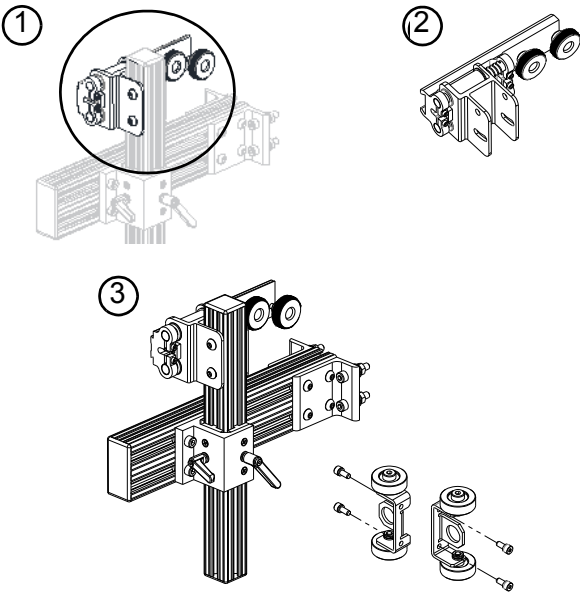
Fittings and Tubing

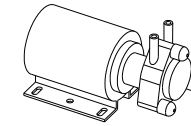| Part No.	Description	Contents	Where Used
1301-468	Tubing, 1/8" ID x 1/4" OD	50 foot roll	External plumbing of impulse jet products
5770-224	Fitting 1301-699, 1/8 Barb x 1/8 Barb In-Line Shutoff Valve	5 fittings per kit	Effluent bottle
5765-207	Fitting 5361-338, 1/8 Barb x 1/8 Flow Bulk-Head Male Valve	5 fittings per kit	Vacuum port on rear of print head and bottom of Centralized-IDS
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 Centralized-IDS 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 Centralized-IDS 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 Centralized-IDS
5765-241	Fitting 5765-562, Luer, 74 Micron, Male	5 fittings per kit	Filter for vent port on back of print head and top of Centralized-IDS

Centralized-IDS Assembly Kits

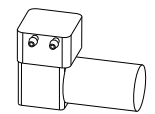| Item	Part No.	Description
1	5760-335	Liquid Pump Replacement
2	5760-336	Vacuum Pump Replacement
3	5760-337	PCB Replacement
4	5760-338	Power Supply Replacement
5	5760-339	Reservoir Replacement, ScanTrue® II
6	5760-340	Separator Replacement
7	5760-342	Waste Bottle Replacement, ScanTrue® II
8	5760-343	Internal Tubing & Fitting Replacement, Non-Flushing
	5760-870	Internal Tubing & Fitting Replacement, Flushing
9	5760-372	Beacon Replacement
See next page for kit contents and drawings		

Item list for Centralized-IDS Assembly on previous page:

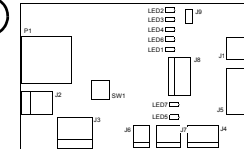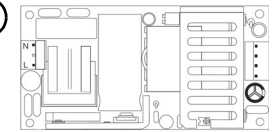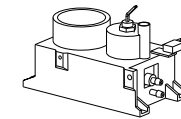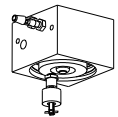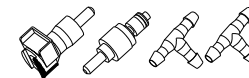| Item	Part No.	Description	Contents
1	5760-335	Liquid Pump Replacement	Liquid pump 2460-230 - 1; Hose clamp 5760-519 - 2
2	5760-336	Vacuum Pump Replacement	Vacuum pump 5760-516 - 1
3	5760-337	PCB Replacement	PCB 5765-520 - 1
4	5760-338	Power Supply Replacement	Power supply 5760-507 - 1
5	5760-339	Reservoir 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
8 (see previous page)	5760-343 (Non-Flushing) or 5760-870 (Flushing)	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	Beacon Replacement	Beacon 5760-511 - 1
(shown at right)	5760-344	External Fitting Kit	Fitting 1900-405 - 1; Fitting 5361-329 - 1; Fitting 2460-120 - 2
(not shown)	5760-345	Optional Remote Beacon	Beacon 5760-520 - 1; Strain relief 5760-222 - 1; Mounting bracket. Mounting hardware
(not shown)	5760-341	Replacement Bulb Kit, 12 VDC	Bulb 2470-142 - 2

Print Head Replacement Parts

384E PRINT HEAD
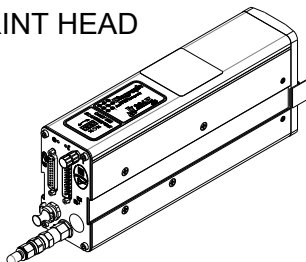
768 PRINT HEAD
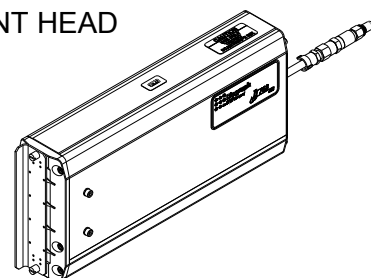
ITEM	PART NO.	PRINT HEAD	DESCRIPTION
1	5765-238	384E	IJ4000 Roller Bracket Kit
2	5760-823	768	IJ768 Roller Bracket Kit
3	5760-835	384E & 768	Roller Replacement Kit (5 Rollers)
4	5765-242	384E	Orifice Cover Plate
5	5760-813	768	Orifice Cover Plate
6	5765-239	384E	Combo Fitting/Filter
7	5760-220	768	Combo Fitting/Filter

① ② ③ ROLLER ④ ⑤ ⑥ ⑦
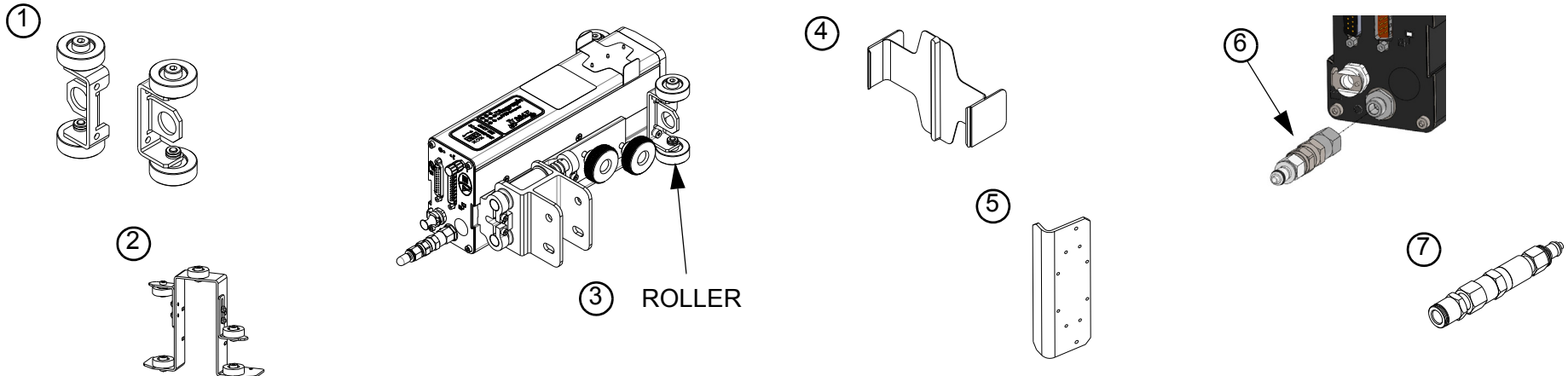
Consumables

Inks, Conditioners, Maintenance Sprays and Print Head Cleaning

Part No.	Description	Contents
001-0598-01D	ScanTrue® II, Pigmented Oil Based for Porous Media, Black	1 Bottle, 500mL
001-0813-01D	ScanTrue® II, Pigmented Oil Based for Porous Media, Black	1 Bottle, 1L
001-0899-01	ScanTrue® II, Flush/Storage Solution	1 Bottle, 500mL
5760-876	Impulse Jet Cleaning Solution for ScanTrue© II	2 Pack, Spray Can
5760-695	Impulse Jet Maintenance Spray for ScanTrue© II	2 Pack, Spray Can
5760-800	Start Up / Cleaning Kit	Gloves, Lint-Free Wipes and Foam Swabs
5760-832	Sponge Swabs	100 Sponge Swabs
5760-891	ScanTrue© II Flushing / Re-inking Kit	2 Bottles Flush Solution, 1 Waste Bottle, 1 Syringe and 1 Reservoir Ship Cap
6000-171	Lint-Free Wiping Cloths	300 Cloths

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

Service Parts and Optional Equipment

Item	Part No.	Description
1	5760-820-IJ	Encoder Assembly w/Mounting Bracket & 25' Cable
2	5760-383	Photosensor, Diffuse Type w/ 20' Cable
3	5760-345	Beacon, Remote and Centralized-IDS
(not shown)	2464-182-010	Extension Cable, 10' - for Encoder or Photosensor
	2464-182-025	Extension Cable, 25' - for Encoder or Photosensor
4	5760-614-002	Print Head Cable Assembly, 2'
	5760-614-006	Print Head Cable Assembly, 6'
	5760-614-010	Print Head Cable Assembly, 10'
	5760-614-015	Print Head Cable Assembly, 15'
	5760-614-025	Print Head Cable Assembly, 25'
5	5765-206	Encoder O-Ring Replacement Kit, contains: 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

①

②

③

④

⑤ O-RINGS