Marksman Duo Vx

FOXJET®

High Resolution Printing
for the **Real World**

Operations Manual

5765-312
Revision A

1 Missouri Research Park Drive
St. Charles, MO 63304
Tel: 800-369-5384
Fax: 636-300-2188
©2007

FOXJET
AN ITW COMPANY
www.foxjet.com

Marksman Duo Vx
Ink Jet System
Operations Manual

5765-312

The information contained in this manual is correct and accurate at the time of its publication. ITW reserves the right to change or alter any information or technical specifications at any time and without notice.

©2007 Illinois Tool Works Inc
All rights reserved
Printed in the United States of America

Warranty:

The Marksman Duo Vx system, including all components unless otherwise specified, carries a limited warranty.

The inks and conditioners used with the Marksman Duo Vx system carry a limited warranty.

For all warranty terms and conditions, contact the Distributor for a complete copy of the Limited Warranty Statement.

Marksman Duo Vx

Section 1: Introduction

This manual covers the installation, operation, and maintenance of the Marksman Duo Vx Integrated Valve Ink Jet Printing System. Also included is a troubleshooting section, parts list and glossary.

Your Marksman Duo Vx Ink Jet System consists of:

- **Controller** - An ink jet controller with color display, touch screen, and full size QWERTY keyboard designed to work with VxJet print heads and Ink Supply.
- **VxJet Print Heads** - Print Heads designed for high-speed printing applications in harsh environments using porous and non-porous inks.
- **VxJet IS** - An ink supply capable of supplying porous and non-porous ink to a maximum of eight VxJet 18X or sixteen VxJet 9X Print Heads.
- **VxJet IS Duo** - An ink supply capable of supplying porous and non-porous ink to a maximum of one VxJet 18X or two VxJet 9X Print Heads.

Section 2: Safety

Following is a list of safety symbols and their meanings, which will be 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.)

Only trained personnel should operate and service the equipment.

CAUTION: The Ink Supply 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 equipment.

WARNING: This equipment contains ink under pressure. Be sure to depressurize the system before servicing.

TSO ink contains ethanol and isopropanol. MEK ink contains methyl ethyl keytone. TWP ink contains ethylene glycol. It is extremely important to:

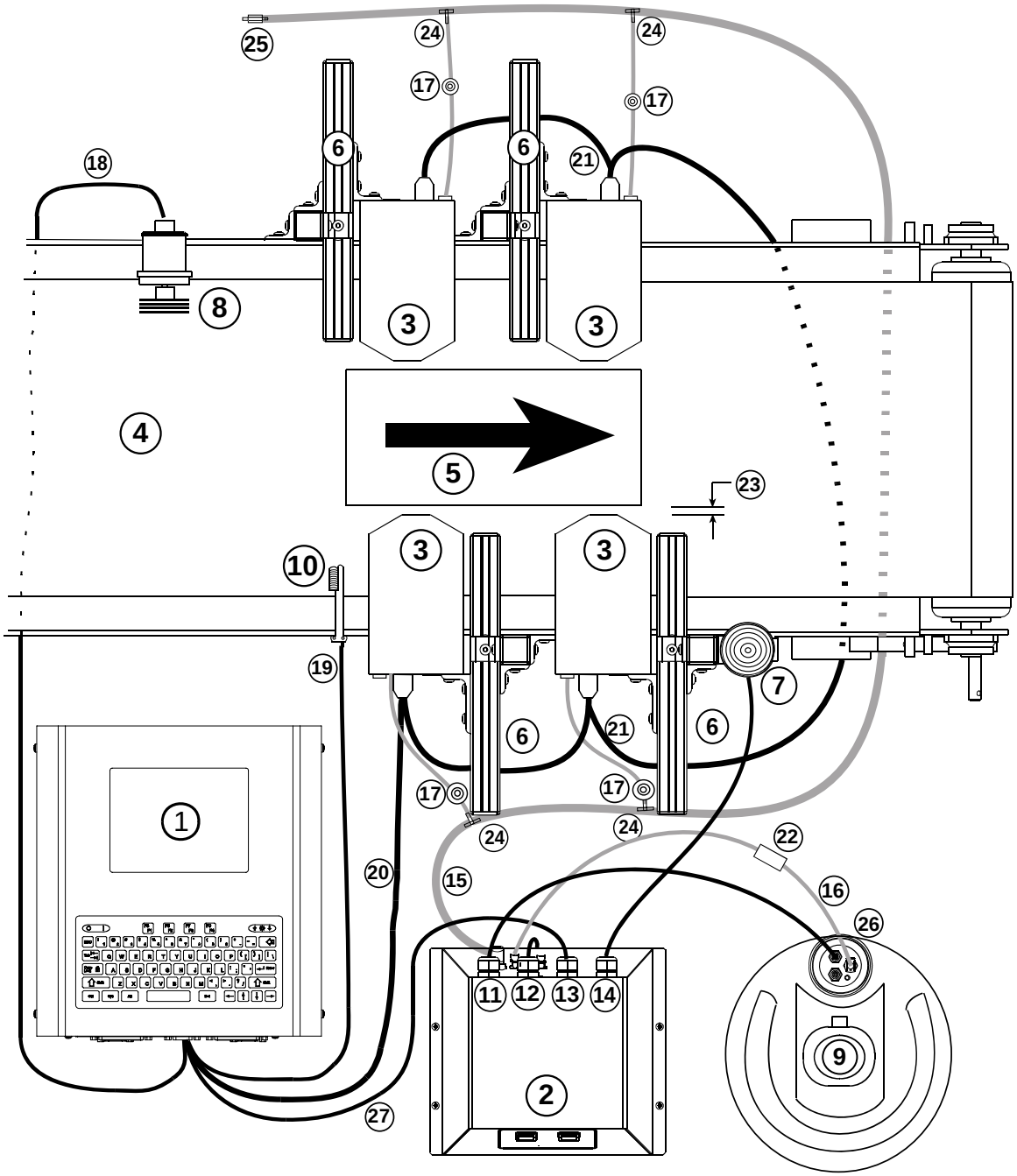
- Clean up all spills with the appropriate conditioners immediately and dispose of all waste according to local and state regulations.

- 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 Controller
2 Ink Delivery System
3 Print Heads
4 Conveyor
5 Product
6 Print Head Bracketry
7 Ink Status Beacon
8 Encoder
9 Ink Supply Container
10 Photosensor
11 Ink Level Detect
12 Power Cord
13 Ethernet Connection
14 Beacon Cable
15 Ink out to Print Heads
16 Ink Supply Tubing
17 Ink Regulator
18 Encoder Cable
19 Photosensor Cable
20 Controller to Print Head Cable
21 Print Head to Print Head Cable
22 Ink Filter
23 Throw Distance
24 Ink “T” Fitting
25 Male Quick Disconnect
26 Ink Supply Cap Assembly
27 Ethernet Cable



The VxJet Ink Jet System is available with the following components and options:

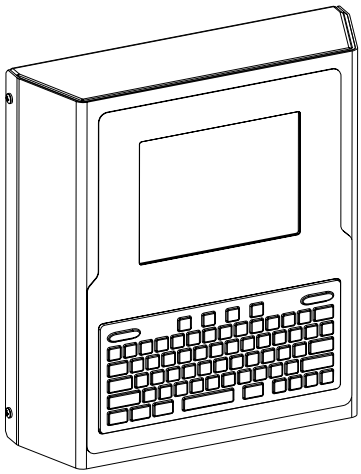
Part Number	Description
	Controller Assembly
5765001DVX	Marksman Duo VxJet, Domestic
5765001EVX	Marksman Duo VxJet, European
	Print Head
5770002P500FX	1/2" 9-Dot Print Head, Porous
5770002P875FX	7/8" 9-Dot Print Head, Porous
5770002N500FX	1/2" 9-Dot Print Head, Non-Porous
5770002N875FX	7/8" 9-Dot Print Head, Non-Porous
	Cabling
5700245-002	VxJet Print Head Cable, 2’ (when using IS)
5700245-010	VxJet Print Head Cable, 10’ (when using IS)
5700245-025	VxJet Print Head Cable, 25’ (when using IS)
5765311-010	Cable, DB15, M/F, 10’ (when using pressurinzed ink can)
5765311-025	Cable, DB15, M/F, 25’ (when using pressurized ink can)
2464182-010	Photocell & Encoder Extension Cable, 10’
2464182-025	Photocell & Encoder Extension Cable, 25’
	Ink Supply
5760012SDPFX	Ink Supply, Porous Ink
5760012SDNFX	Ink Supply, Non-Porous Ink
5770004PFX	Ink Supply, Pressurized Can, Porous Ink
5770004NPFX	Ink Supply, Pressurized Can, Non-Porous Ink
5760310	Tubing/Filter Kit
5750503	Effluent Bottle Kit
5760307	Ink Cap Assembly, 5 Gallon
5760309	Ink Cap Assembly, 30 Gallon
	Bracketry
5760821	VxJet Print Head Mounting Kit
2465220	Ink Supply Mounting Kit
2464563	Print System Floor Mounting Kit
5765200	Controller Conveyor Mounting Kit
	Controller Accessories
5760820-IJ	Encoder and Bracket Assembly (25’ Cable)
5760383	Photocell and Mounting Kit (20’ Cable)

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.

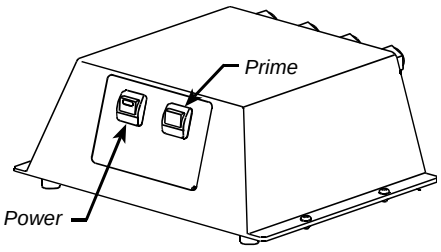
With this information, the controller knows exactly when the leading edge of the product will reach the print head and at what rate of speed.



Ink Supply (IS)

The IS provides ink to the print heads. The IS contains an Ink Pump, Accumulator, and Printed Circuit Board to control ink supply to the print heads. Ink is pumped into an internal accumulator to supply constant ink pressure to the print heads.

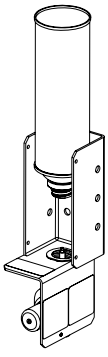
The IS includes system connectivity to supply operational data including Ink Low, Ink Out, and Broken Line safety information. See *Appendix B, Theory of Operation*, for a complete operational description.



VxJet IS Duo

The VxJet IS Duo ink delivery system provides ink to the print heads. The VxJet IS Duo regulates the pressure from a can of ink down to 15 psi to provide a constant ink pressure at the print heads.

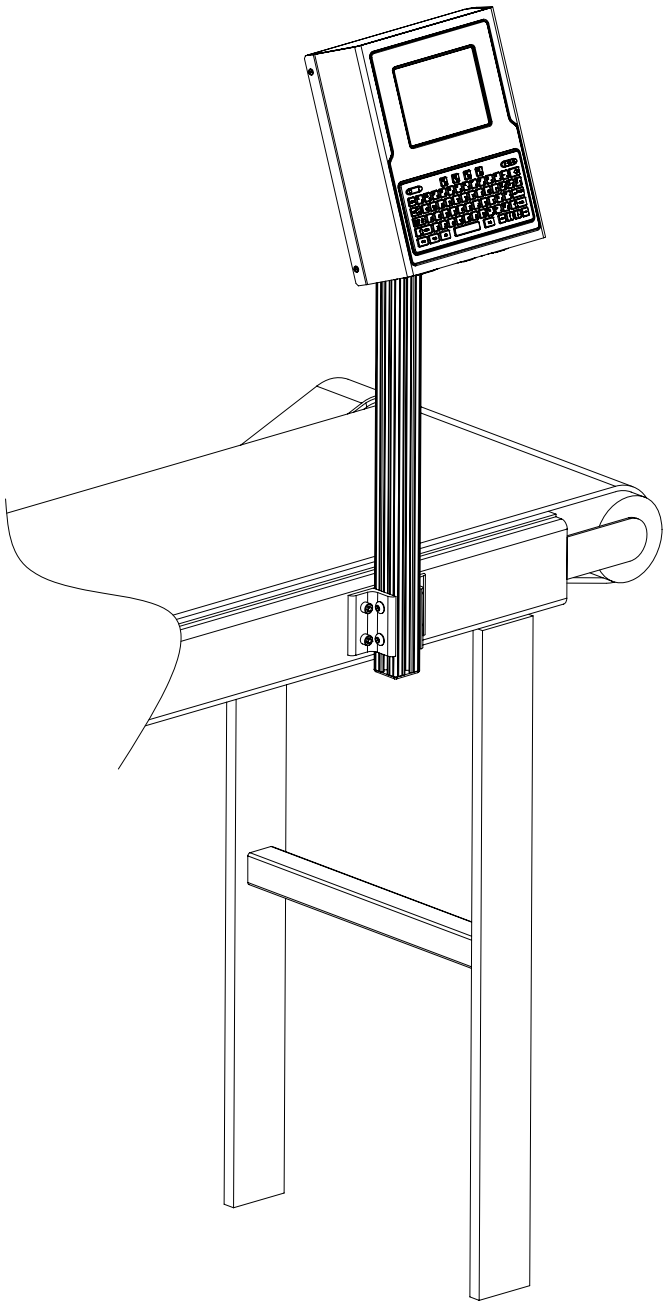
Ink low is detected from the pressure sensor internal to the print head. A signal is sent from the print head back to the controller warning that the can of ink needs to be replaced.



NOTE: Print head cables 5765-311-010 and/or 5765-311-025 must be used in conjunction with a VxJet IS Duo. The standard print head cables do not have enough conductors to carry the ink low signal from the print head back to the controller.

Bracketry

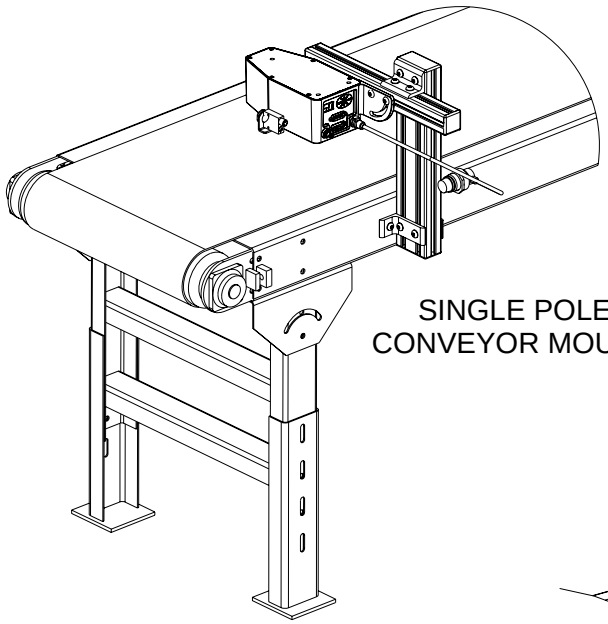
Bracketry is the structure that supports the controller, pinnt heads or ink supply. This manual details instructions for mounting all system components to a conveyor. Assembly instructions are included with parts kits.



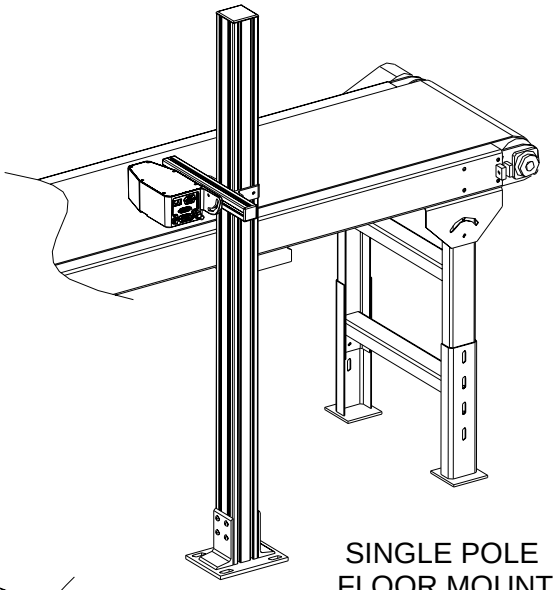
Print Head Bracketry

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

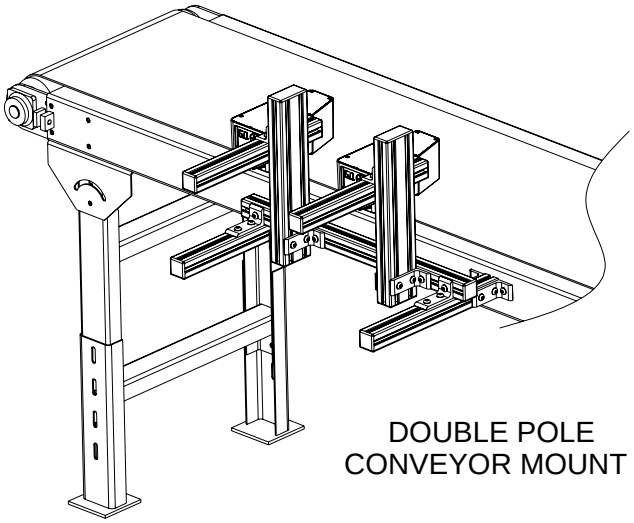
- Single-pole conveyor mount
- Double-pole conveyor mount
- Single-pole floor mount



SINGLE POLE
CONVEYOR MOUNT



SINGLE POLE
FLOOR MOUNT



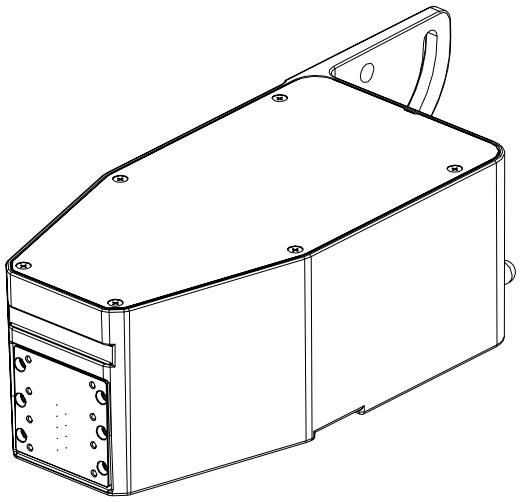
DOUBLE POLE
CONVEYOR MOUNT

Print Heads

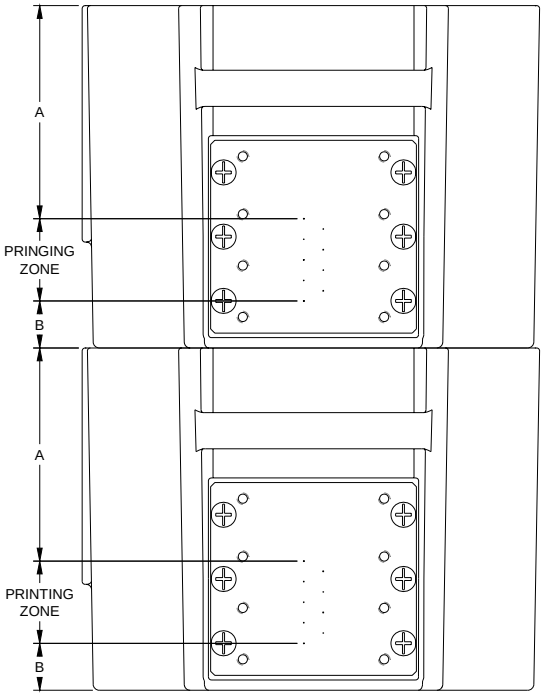
The VxJet Print Head uses a flexible membrane sandwiched between two plates, which propels ink droplets onto moving surfaces by solenoid activation.

This design keeps the ink between the front-plate and membrane, away from the solenoids.

The VxJet Print Head is capable of printing at very high line speeds with a minimum of required maintenance. It can produce highly legible ¼" to 2" tall alphanumerics, special characters and logos.



Each type of print head has specific distances above and below the orifices, spaces in which the print head cannot print. These non-printing zones are critical when designing print head layout in multi-head applications. The figure at right shows the print and non-print areas obtained when two 9-dot print heads are stacked on a vertical bracket, as in the "Single Pole Floor Mount" illustration on the previous page. See the table on the next page for specific non-printing zones for each print head model.



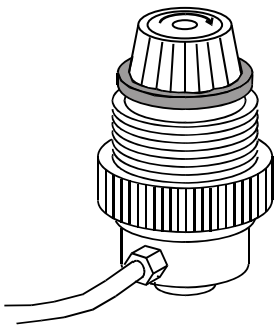
Print Head Models

The following table lists the VxJet print heads and their characteristics.

Part Number	Type	Characteristics	Non-Print Base Area (B)	Non-Print Top Area (A)	Total Non-Print Area (A+B)
5770002P500FX	1/2" 9-Dot Porous	Prints 1/4", 5/16" and 1/2" tall characters on porous substrate	.86"	2.07"	2.93"
5770002N500FX	1/2" 9-Dot Non-Porous	Prints 1/4", 5/16" and 1/2" tall characters on non-porous substrate.	.86"	2.07"	2.93"
5770002P875FX	7/8" 9-Dot Porous	Prints 7/16", 5/8" and 7/8" tall characters on porous substrate.	.46"	2.07"	2.53"
5770002N875FX	7/8" 9-Dot Non-Porous	Prints 7/16", 5/8" and 7/8" tall characters on non-porous substrate.	.46"	2.07"	2.53"

Ink Regulator

The Ink Regulator, supplied with the print head, regulates ink pressure to the print head. The regulator is preset at the factory to the correct output pressure.



Photosensor

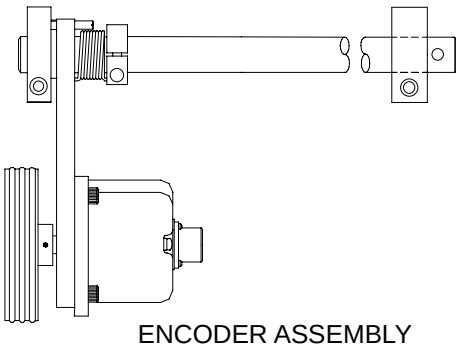
The Photosensor is both a light source and a sensor. It emits light and detects the arrival of a product when the product reflects the light source back to the sensor. The sensor then sends a signal to the controller to start the printing cycle. An LED on the back of the sensor illuminates when a reflective object is detected.

Encoder

The Encoder assembly provides conveyor line speed information to the controller. It also allows automatic disabling of printing when the line stops.

The variable speed encoder assembly 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.

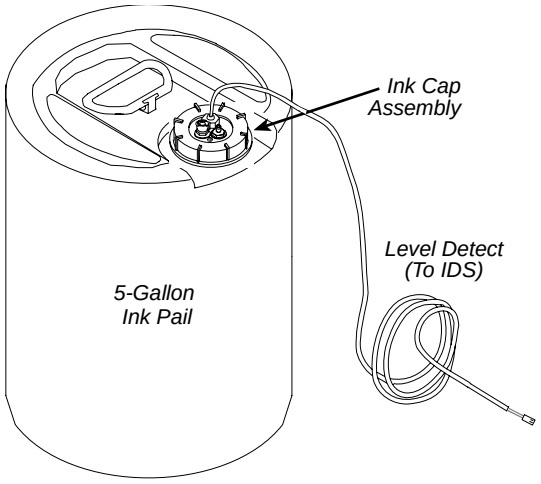


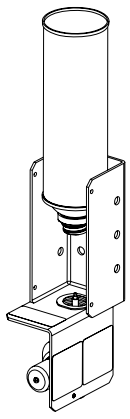
ENCODER ASSEMBLY

Ink Supply

Ink is supplied via 5-gallon plastic containers, 30-gallon plastic containers or 13 ounce pressurized cans. The ink cap assembly in the plastic containers contains a float mechanism that detects a low ink condition and sends this information to the ink supply. When using the Duo IS, the Low Ink and Out of Ink conditions are determined by measuring the pressure in the can.

NOTE: Check the label on the Print Head for correct ink type.

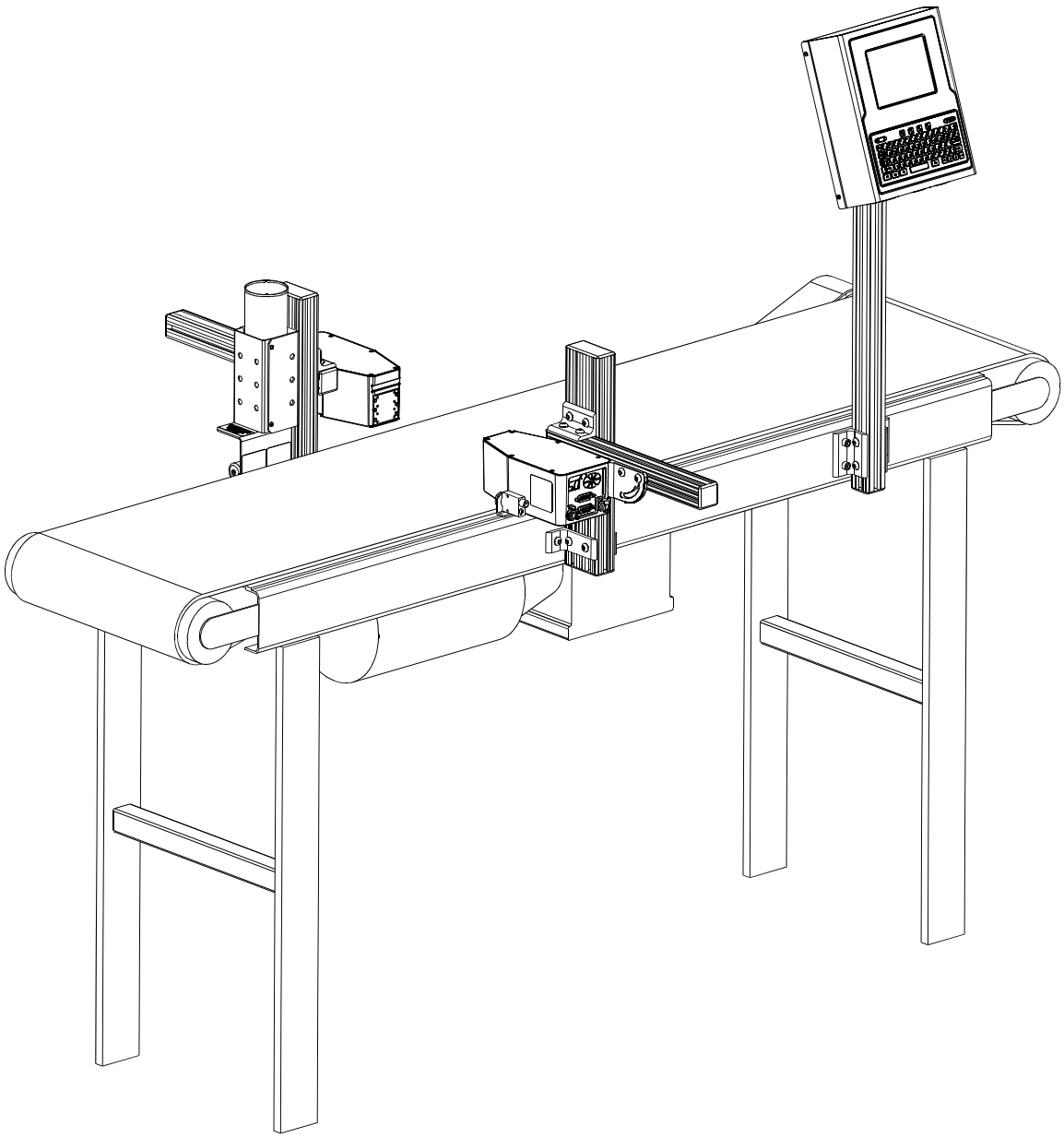




Pressurized Ink Can

Section 4: Installation

The figure below illustrates a typical install, with conveyor-mounted controller and two print heads. (Cables and ink lines are not shown.)



Testing the Electrical Outlet

CAUTION: The outlet must be installed near the equipment and must be easily accessible.

ATTENTION: On doit installer à côté de l'appareil une prise de courant facilement accessible.

Before installing the system, verify the integrity of the 115VAC sourced power, in accordance with the National Electric Code (NEC) and approved local electrical codes. If using a standard AC outlet, use the following procedure to verify the integrity of your outlet.

1. Place an outlet tester into the socket. (You can purchase an outlet tester at most hardware stores).
2. If the outlet tester indicates that the outlet is wired correctly, proceed with the installation.
3. If the outlet tester indicates that the outlet is wired incorrectly, inform plant maintenance immediately and do not use the outlet until it has been re-wired. See *Appendix G, Testing an Electrical Outlet,* for more information.

Electrical Line Transients

Transients on the incoming AC power line can be in the form of voltage spikes and transients, over- and under-voltage events, or noise caused by poor grounding or interference. Symptoms of power related problems can be unexplained loss of controller memory (loss of message), garbled print, and unexplained hardware resets.

The best way to eliminate these types of problems is to install the controller on a dedicated line with a line conditioner. A dedicated line refers to an AC line that only the system components are plugged in to. This is most effective when the source is at the building main service entrance.

Good quality line conditioners will provide protection against all AC line problems with the exception of power outages; if power outages are a problem at the installation, an uninterruptible power supply (UPS) should be installed.

CAUTION: Not for use in a computer room as defined in the Standard for the Protection of Electronic Computer/Data Processing Equipment, ANSI/NFPA 75.

ATTENTION: Ne peut être utilissé dans une salle d'ordinateurs telle que définie dans las norme ANSI/NFPA 75 Standard for Protection of Electronic Computer/Data Processing Equipment.

Materials Required for Installation

You will need the following items:

- Bottle of conditioner
- Lint-free wipes
- Safety goggles
- Level
- Tape measure
- Effluent bottle

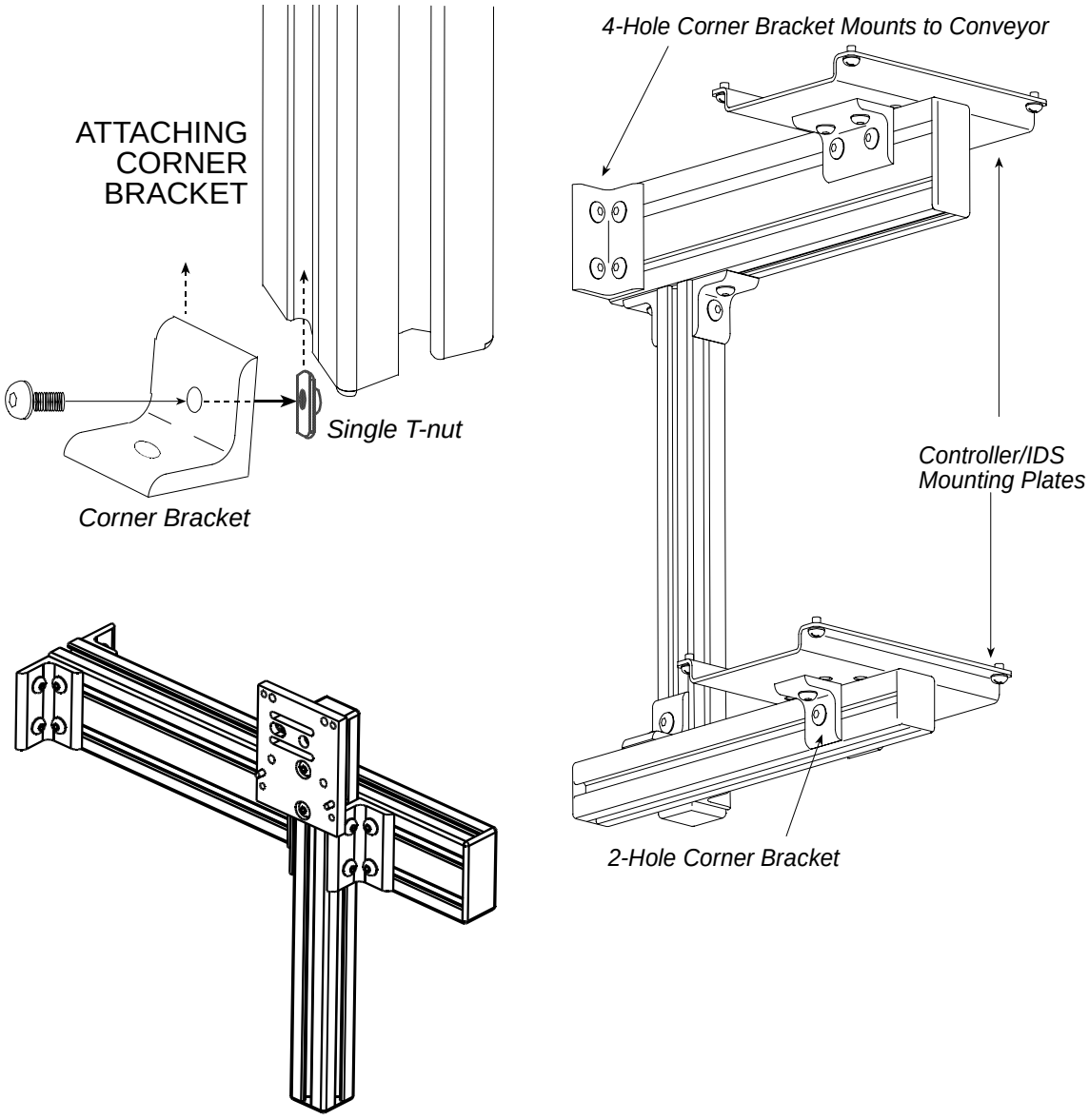
Use appropriate safety equipment and procedures. Leave print heads in their shipping cartons until all bracketry is in place and tightened down.

Installing Controller/Ink Supply Bracketry

This section shows controller/ink supply 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 the parts kit.

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

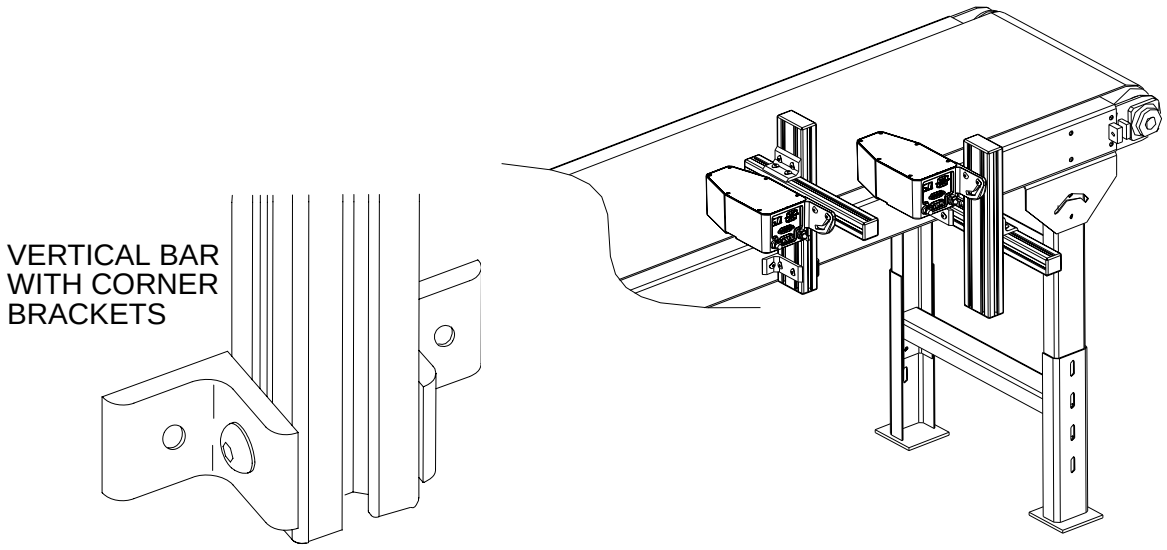
Corner brackets are attached to aluminum bars as shown.



Print Head Bracketry

This section shows bracketry for conveyor-mounted print heads. 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 to the bracketry.

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

You may need 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.

Mounting the Photosensor

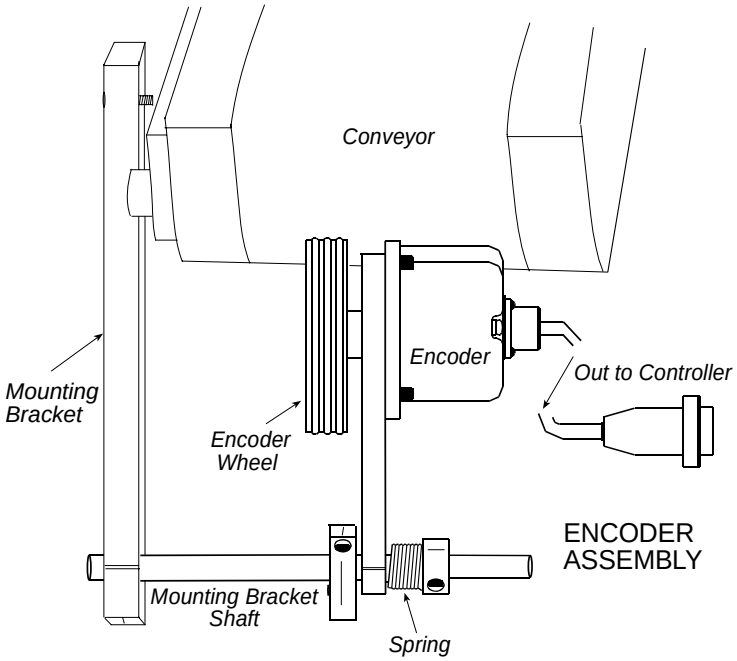
Position the photosensor upstream from the first print head. The maximum placement distance is 81 inches from the photocell to the print head. The mounting bracket is included.

The Encoder

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

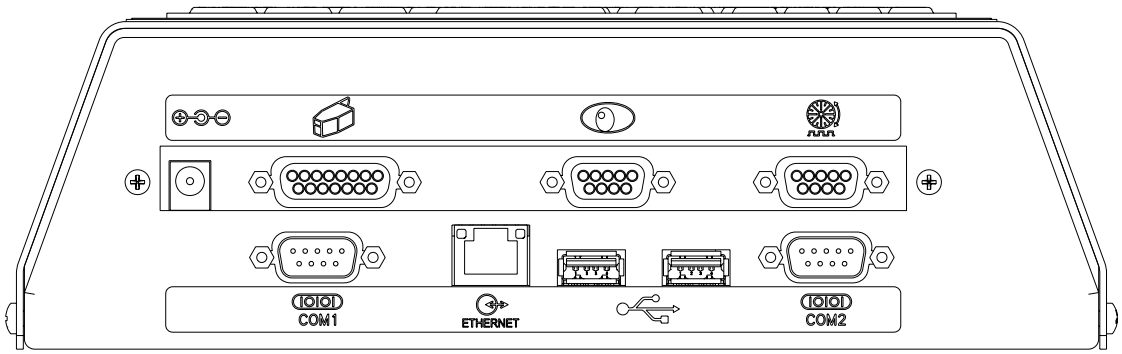
It is not necessary to install the encoder immediately adjacent to the print heads. It is more important to place it where it will accurately measure the speed of the conveyor. Install it in contact with the conveyor, or with a wheel or roller moving the same speed as the conveyor.

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



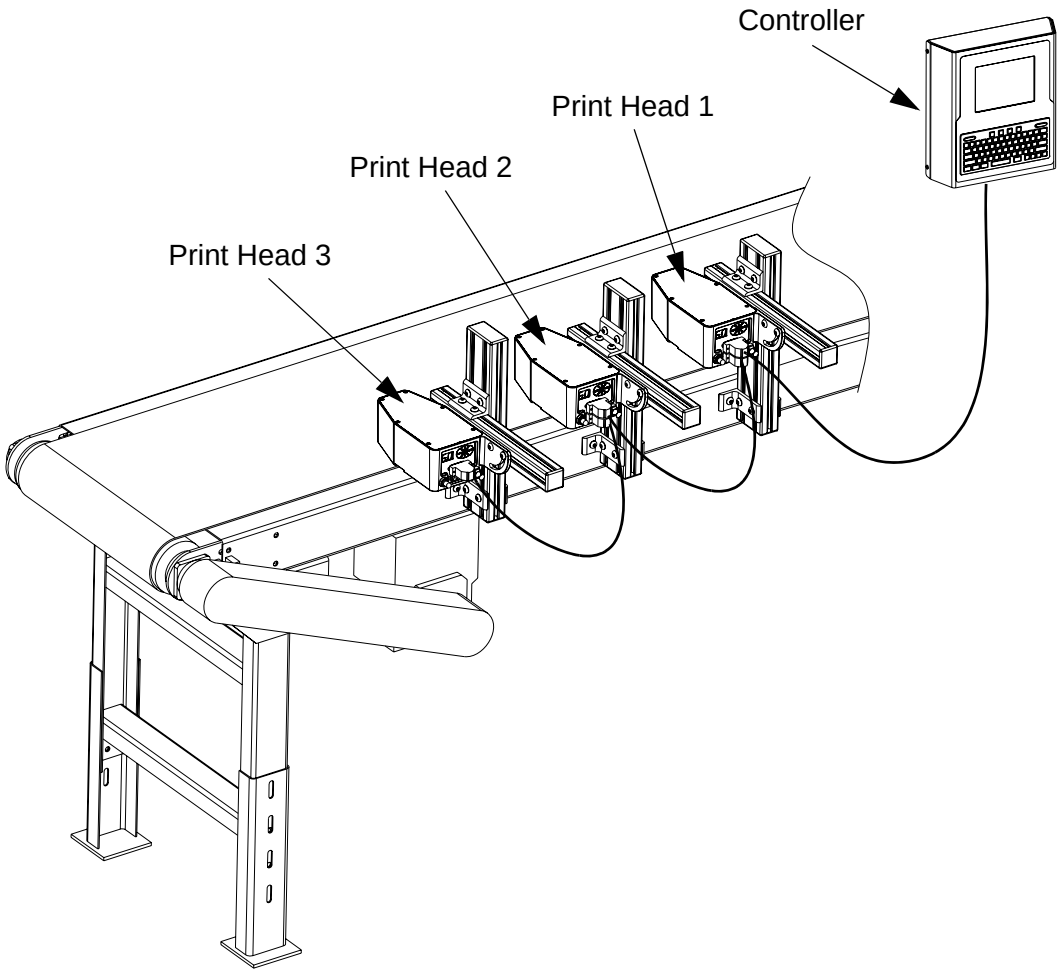
CAUTION: Do not excessively load the encoder wheel against the surface of the conveyor. A radial force of over 40 lbs. will reduce the life of the bearings.

Controller Connections



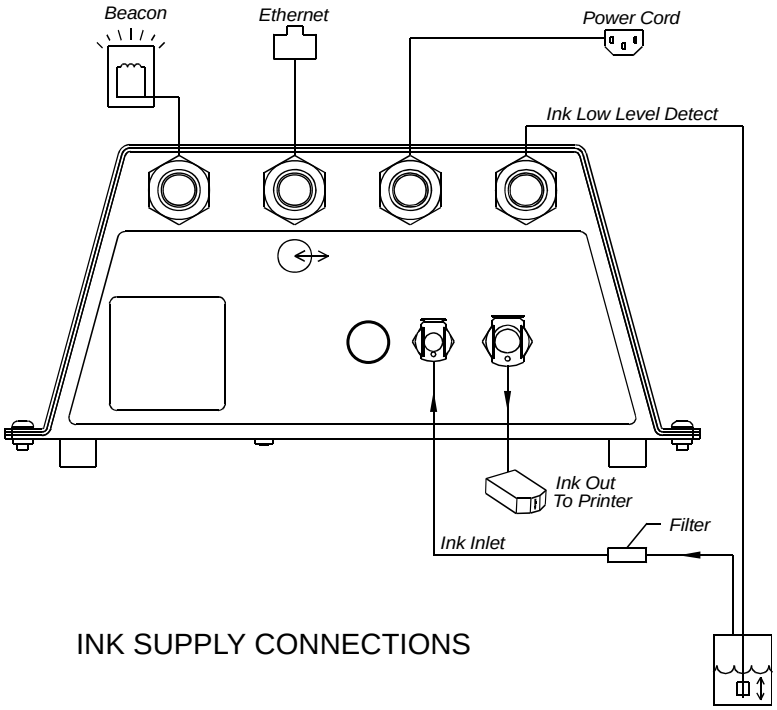
CPU Connections

Use the longest print head cable to connect the first print head to the controller. Additional heads can be added by connecting one head to another with a print head cable. When using the Duo IS, please make sure the proper print head cables are being used. Refer to the part number section to compare part numbers with the descriptions.



Configuring the IS (Ink Supply)

1. Remove the IS cover.
2. Install cables through their respective bulkhead fittings, leaving ¼" of the large cable jacket extending outside the bulkhead fitting.
3. Connect the beacon cable to Ink supply circuit board connector J5. Connect the level detect cable (from ink cap assembly) to J4. (See the wiring diagram in *Appendix B, Theory of Operation*.) Connect the ethernet cable to the appropriate receptacle.
4. Tighten bulkhead fittings by hand, then ½ turn with a wrench, and replace the ink supply cover.

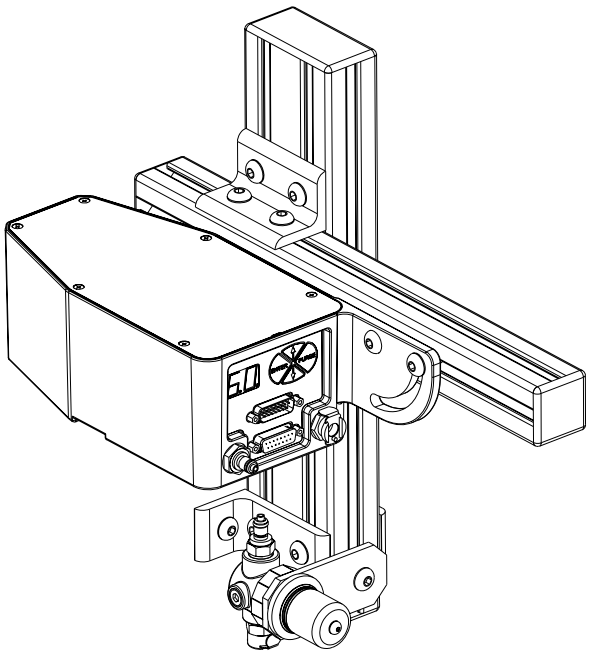


INK SUPPLY CONNECTIONS

5. Place the Ink Status Beacon where it can be seen by plant personnel, and attach it to bracketry with a T-nut.

Attaching Ink Regulators

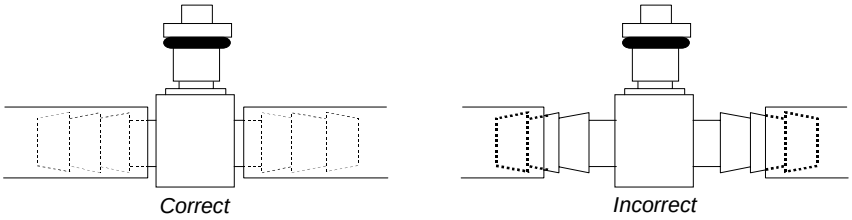
1. Attach a single T-nut loosely to the bottom side of the regulator bracket.
2. Slide the regulator bracket and T-nut into the slotted bar and tighten into place.



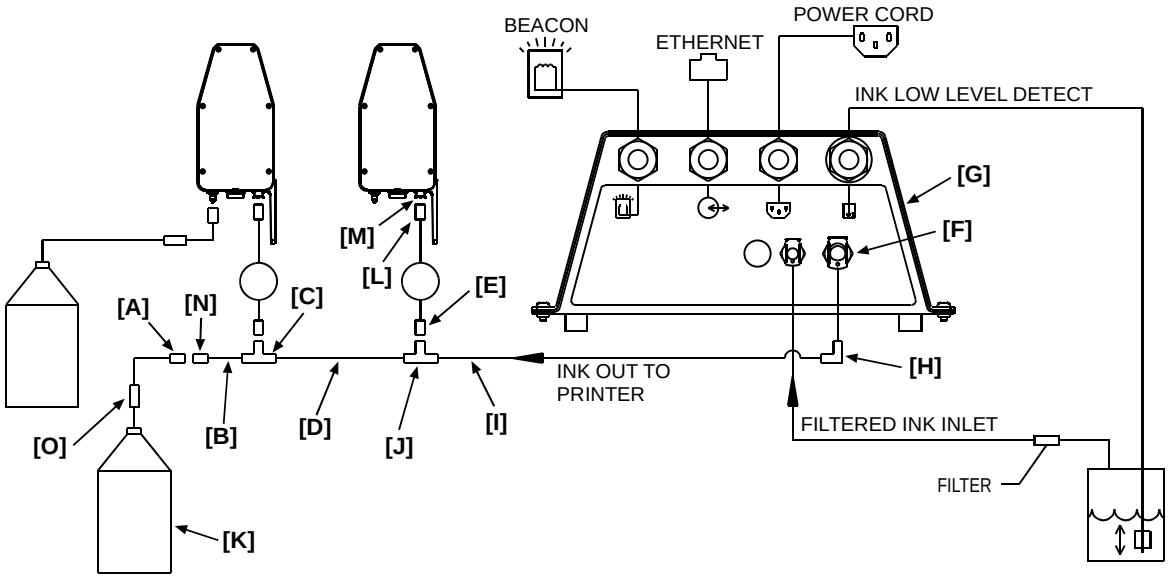
Plumbing the System

All ink line connections should be as short as possible. The IS may be located up to 100 feet from the print heads. Additional ink line can be purchased if necessary.

When installing ink line, be sure to slide the tubing completely over the exposed barbs on the fittings to prevent ink line leaks while under pressure.



1. Obtain a suitable length of ink line **[I]** fitted with the elbow connector **[H]**. Attach the elbow connector to the "Ink Out To Printer" quick-disconnect **[F]** on the ink supply **[G]**. Cut line to the length desired and insert over the barbed end of a T connector **[J]**.

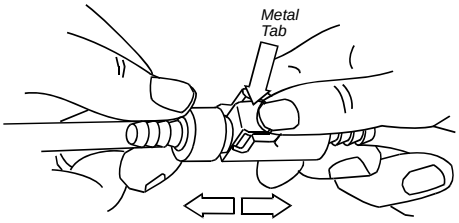


2. Insert the female connector end of the ink regulator **[E]** tubing assembly over the male fitting on the T connector. Attach the male connector end **[L]** of the ink regulator tubing assembly to the female connector **[M]** ink inlet port of the first print head.

NOTE: Listen for a click as you push the quick disconnects together **[A]**. The thumb tab on the female quick disconnect will be in its out position when successfully attached. Test the ink line's security by gently tugging on it.

3. Cut an ink line **[D]** to the desired length and connect one end to the other side of the T connector **[J]**. Add another T connector to this line and attach the second ink regulator and the second print head. Repeat with all remaining print heads.
4. Cut another line of tubing **[B]** to connect to the last T connector on the line **[C]**. Attach a male quick disconnect **[N]** to the other end of the tubing.

5. Attach the effluent bottle assembly **[K]**, with its female quick disconnect **[A]**, at the end of the line.



CLOSE SHUTOFF VALVE

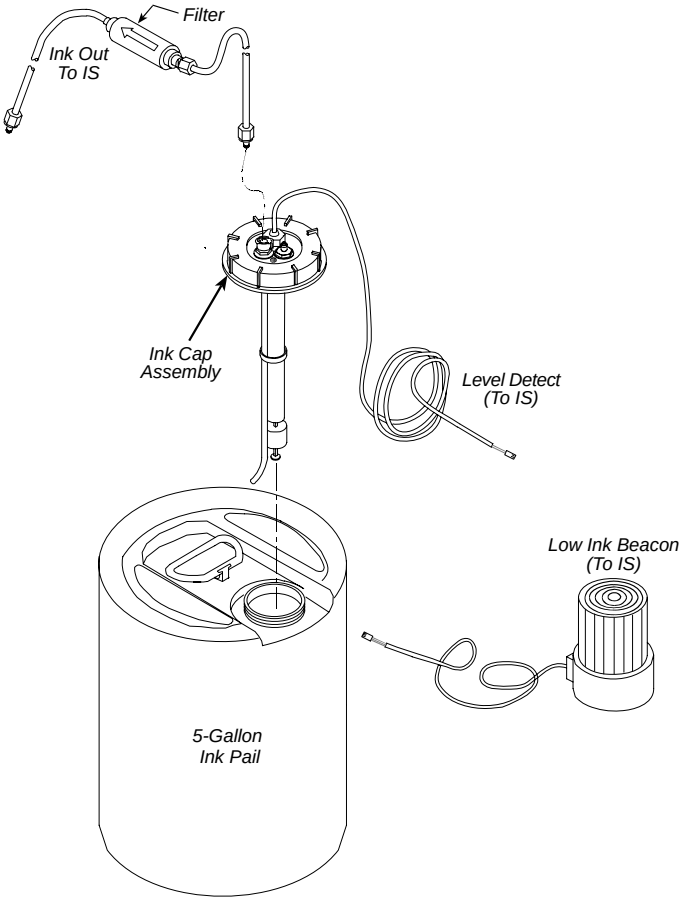
NOTE: Be sure the effluent shutoff valve **[O]** is off at this time. To close the shutoff valve, depress the metal tab on the valve; the connections will pop apart slightly but not disconnect.

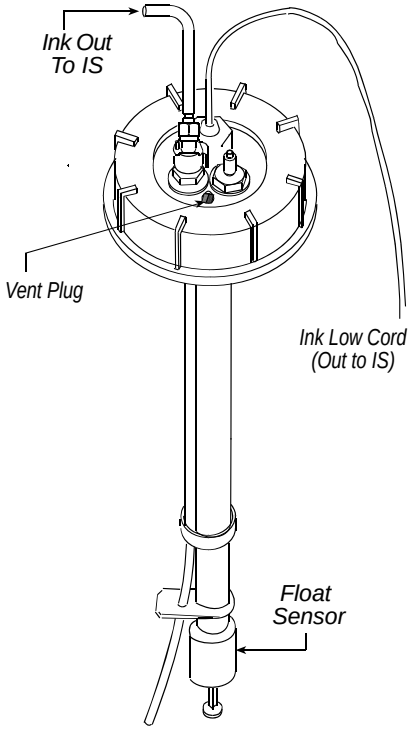
Connecting the Ink Supply

Wear eye protection and use appropriate safety equipment when working with ink.

1. Place a pail of ink within eight feet of the IS.
2. Unscrew the shipping cap from the pail. Insert the cap assembly and tighten snugly by hand.
3. Connect the 1/8" ink supply line from the "Filtered Ink Inlet" quick disconnect on the Ink Supply to the female coupling on the ink cap assembly.

CAUTION: Porous ink must be used with a porous ink supply. Non-porous ink must be used with a non-porous ink supply. The IS can not be flushed to use a different ink type.

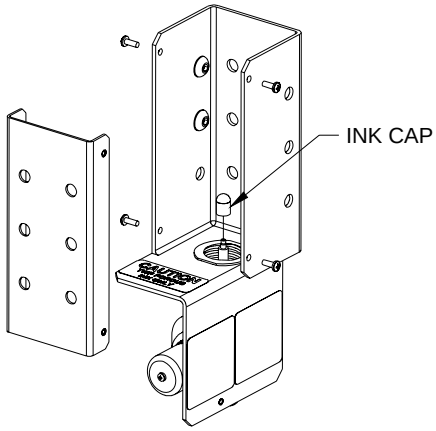




VxJet IS Duo Installation

All ink line connections should be as short as possible. TheVxJet IS Duo comes with enough tubing and fittings to connect two print heads.

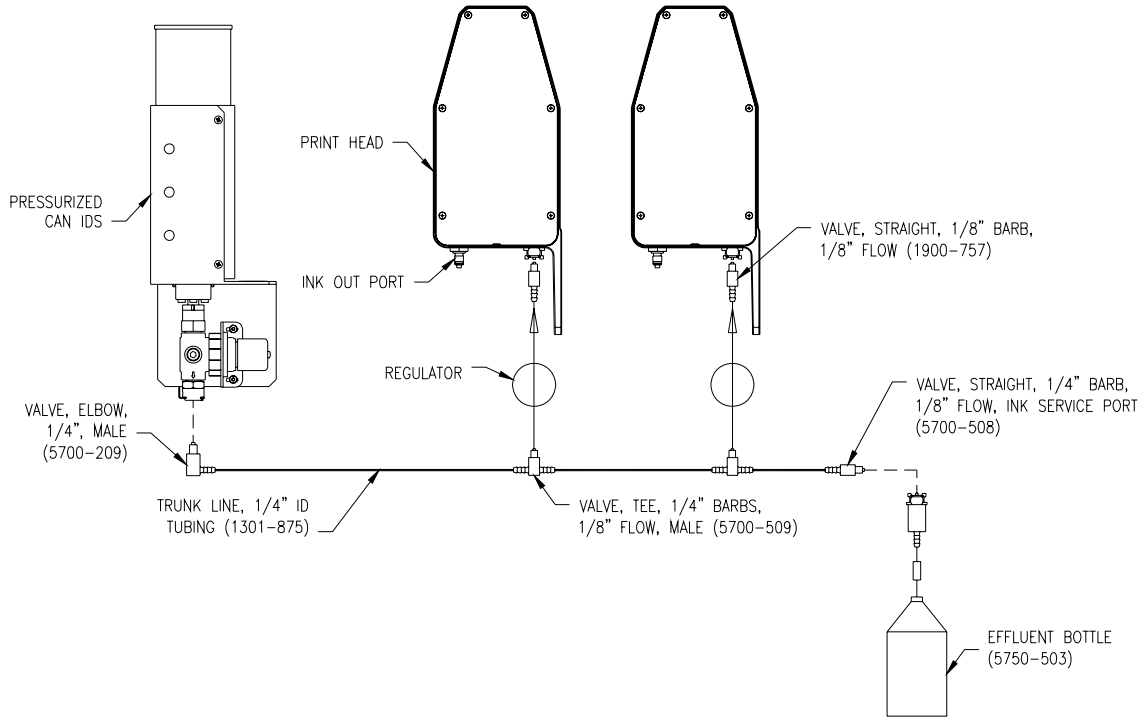
1. Mount the controller, VxJet IS Duo, and print heads to bracketry.
2. Plumb the system per Diagram A. Do not connect the print head regulator to the tee valve in the main trunk line. Air needs to be purged out of the main trunk line before connecting the print head regulator. If air is forced through the regulator then the regulator pressure can change causing printing issues.
3. Connect the effluent bottle to the service port (see diagram), make sure the effluent bottle shutoff valve is off at this time.
4. Remove the ink cap and insert a can of ink into the VxJet IS Duo.
5. Open the shutoff valve at the effluent bottle assembly by pushing together until the connections snap into place; this will allow air to flow out of the trunk line. As soon as ink begins flowing into the effluent bottle, close the shutoff valve and disconnect the assembly.
6. Move the effluent bottle assembly to the first print head in the line and connect it to the ink outlet port on the print head.



7. Open the shutoff valve at the effluent bottle assembly; this will allow air and conditioner to flow out of the ink line and print head. As soon as ink begins flowing into the effluent bottle, close the shutoff valve and disconnect the assembly. Repeat steps 6 and 7 for each print head.

NOTE: The regulator on the VxJet IS Duo comes pre-set at 15 PSI, no adjustment is required at installation.

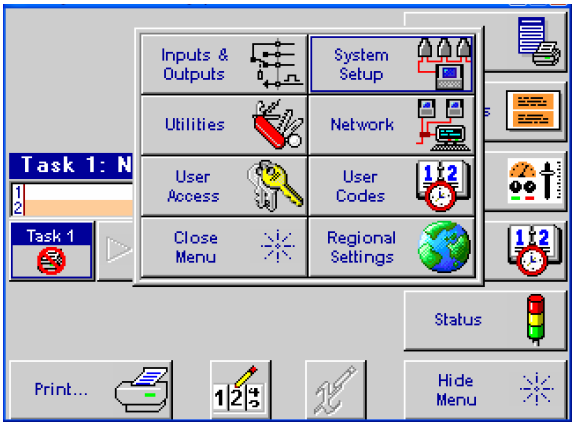
DIAGRAM A

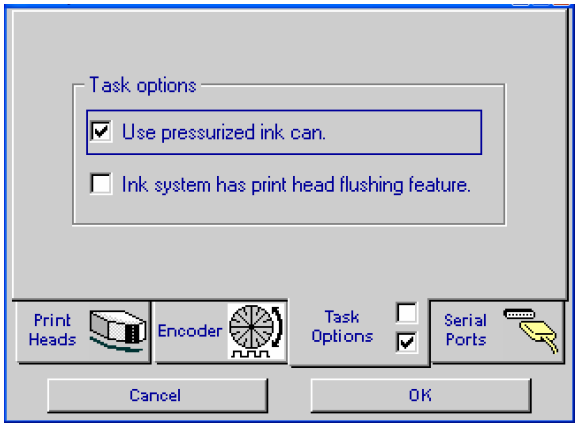


Controller Setup

On the controller at the home screen, touch the **Control Panel** button, the **System Setup** button, and then the **Task Options** tab. Check the **Use Pressurized ink can** box to allow access to the flushing system screen.

NOTE: The controller firmware must be at version 4.20 or newer and the 9-dot print head must be at revision D or newer.





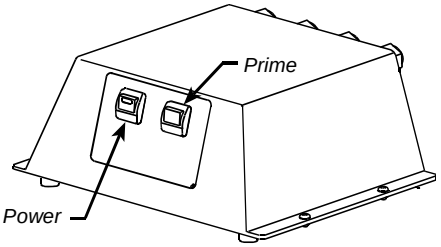
Replacing the Ink Can

As the ink can empties, ink pressure will drop below normal operating pressure. The controller will display an "**Ink Low**" warning when pressure at the print head drops below 5.8 PSI and an "**Ink Out**" warning when pressure drops below 3 PSI. There is no need to stop printing when the "**Ink Low**" warning is displayed. There is still enough ink in the delivery system to continue printing until a fresh can is installed. If the "**Ink Low**" warning is ignored, print quality will degrade and an "**Ink Out**" warning will be displayed.

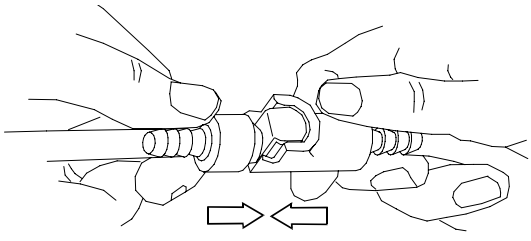
1. Unscrew the old can and set aside.
2. Install the new can making sure the can adapter and the receiver on the VxJet IS Duo are the same color.
   - •A black adapter and a black receiver indicate water-based, Porous.
   - •A red adapter and a red receiver indicate alcohol-based, Non-Porous.
3. Dispose of the old can in accordance with local, state and federal regulations.

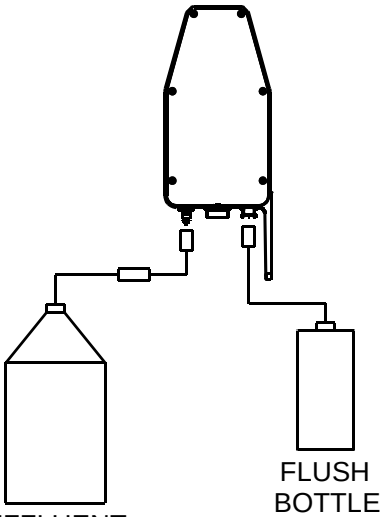
Priming the IS

1. To prime the IS for the first time after installation, hold the prime button and simultaneously depress the Power button. The pump will automatically start, and will run for up to 20 cycles, pushing ink into the lines. The pump will turn off when the accumulator reaches its normal operating pressure. (If there is excessive air in the lines, the process may need to be repeated, as the pump will turn off automatically after 20 cycles.)



2. It will still be necessary to bleed air from the lines. Open the shutoff valve on the effluent bottle assembly by pushing together until the connections snap into place; this will allow air to flow out of the main line. As soon as ink begins flowing into the effluent bottle, close the shutoff valve and disconnect the assembly. Keep a clean wipe handy to clean up any ink drips.


OPEN SHUTOFF VALVE



3. Move the effluent bottle assembly to the first print head in the line and connect it to the ink exit fitting on the head. Repeat Step 2 for each print head to remove all air from the lines.

Checking Ink Pressure

Variations in ink pressure produce different dot sizes; the higher the pressure, the larger the dot. However, over-pressurizing a print head can result in leakage, or cause ink to shoot across the conveyor. Under-pressurizing can cause ink to drip from the front plate while printing; the print head may also take a long time to print all the dots at morning start-up. (See *Print Head Ink Pressure Test* in *Section 10: Troubleshooting.*)

Setting Ink Pressure

(See *Setting Ink Pressure* in *Section 10: Troubleshooting.)*

Operational System Test

After the equipment installation is complete (including all ink line and electrical connections), a print head purge should be performed. Power On both the Marksman Duo Vx Controller and the IS (Ink System). Prior to purging the print heads, the Print Station Configuration needs to be set up on the Marksman Duo Vx Controller, per the following instructions.

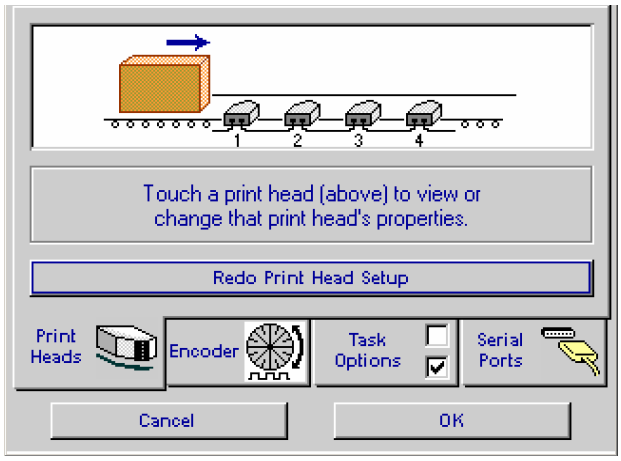
Configuring the Print Station

Print Head Setup Screen

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

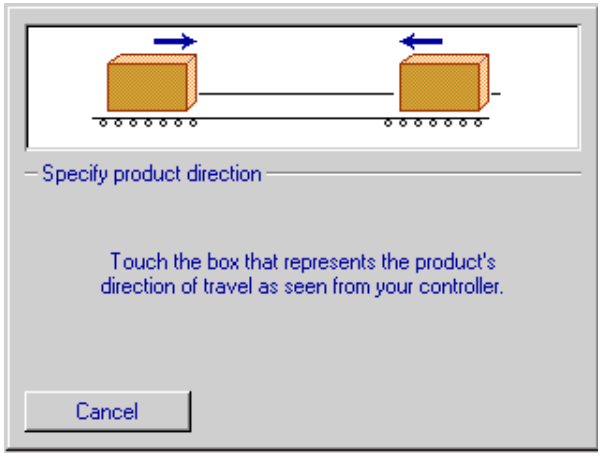
Screen prompts guide you through the step by step print head setup procedure. Once begun, the procedure may be aborted (by pressing Cancel or the Escape key) at any time without changing the current print head setup.

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



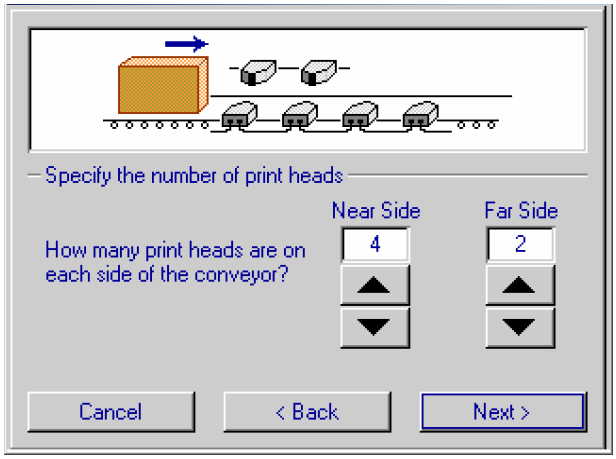
Specifying Product Direction

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



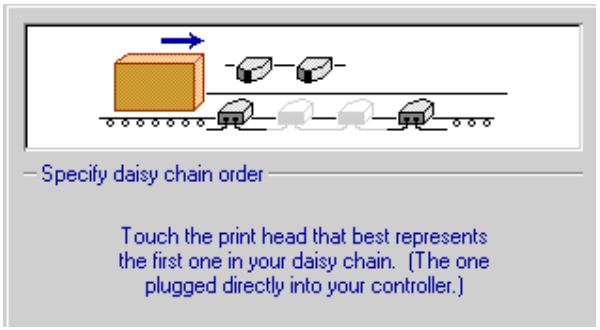
Specifying Number of Print Heads

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 your choices. In the example at right, four print heads have been specified on the near side and two on the far side of the conveyor. Touch the **Next>** button.

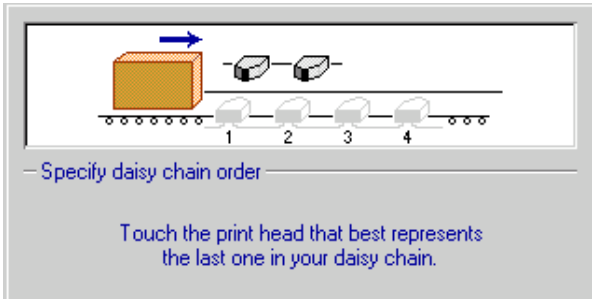


Setting Daisy Chain Order

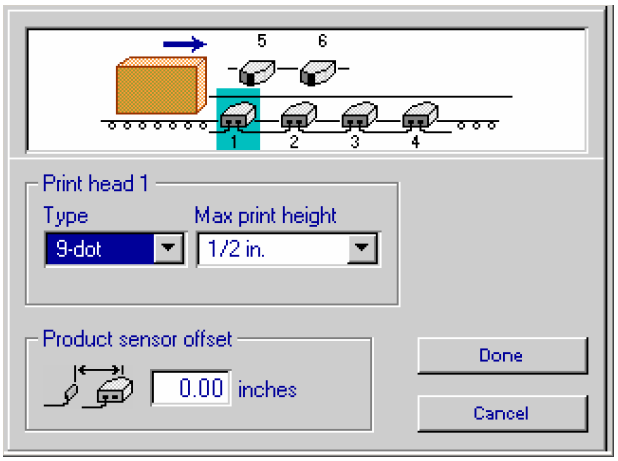
All six print heads are displayed, and you are prompted to indicate the first print head in the daisy chain by touching it. The "grayed-out" heads are not eligible as they are in the middle of the chain. (If there is only a single print head, this step is bypassed.)



In the example at right, you have chosen the far left print head on the near side as the first in your daisy chain. The rest of the print heads on this side have been assigned numbers automatically, and you are now prompted to indicate which of the print heads on the far side is the last in the chain. (Depending on the configuration, this step may be bypassed.) Once this is done, the **Print Head Properties** screen appears.



Defining Print Head Properties



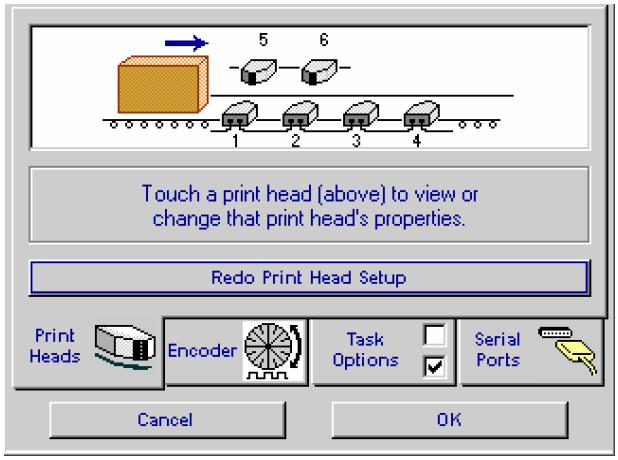
The final step in print head configuration is defining the properties of the individual print heads.

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

- **Print head type:** A list box shows the types available: 9 dot and 18 dot. Select the head type.
- **Product sensor offset:** Enter the distance between the center of the photosensor and the center of the print head, in inches. This may need to be fine-tuned after print setup. The maximum sensor offset is 81".
- **Maximum print height:** Select the maximum height of the print head type selected.

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. Repeat this process for each print head in your daisy chain until all heads have been defined.

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**.

Purging Print Heads

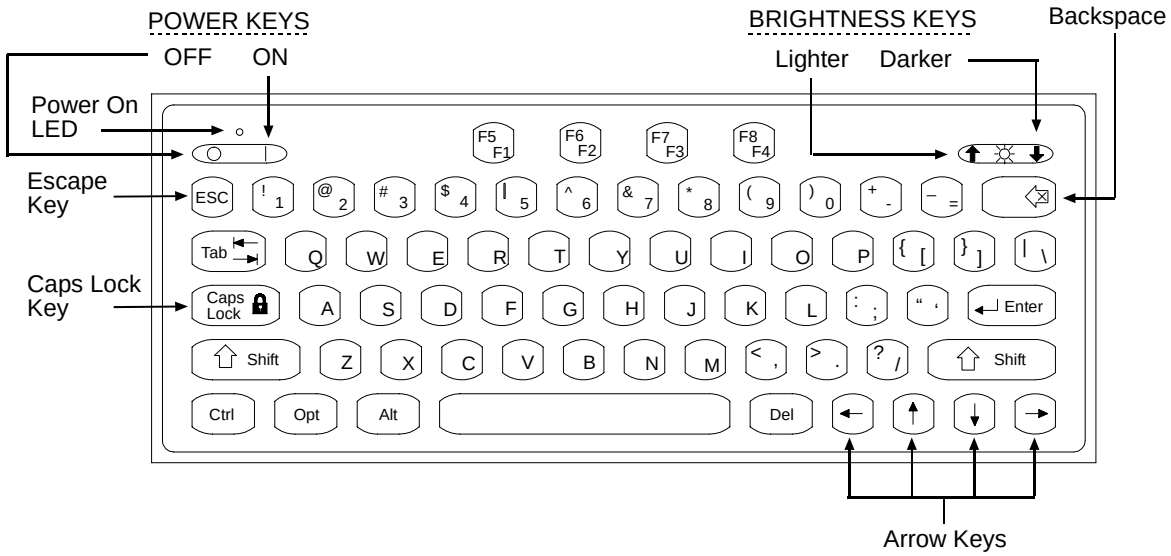
The **PURGE** button can be used in two different ways, one, to purge all channels at once, or two, to purge one channel at a time. From the Home Screen, press and hold the **PURGE** button on the rear membrane switch for one second. All of the channels will fire/ eject ink for two seconds. If you continue to hold the **PURGE** button, then the print head will purge ink until you release the button. To purge individual channels, press the **ENTER** button once then the up and down arrows to select the desired channel (e.g. 1 thru 9). Again, press and hold the **PURGE** button for one second. Ink will eject from the selected channel for two seconds. To return to the home screen, press the down arrow button until "Pr" is selected, and then press **ENTER**. Otherwise, the print head will automatically return to the home screen after 30 seconds of inactivity.

Purging Print Heads

The **PURGE** button can be used in two different ways, one, to purge all channels at once, or two, to purge one channel at a time. From the Home Screen, press and hold the **PURGE** button on the rear membrane switch for one second. All of the channels will fire/ eject ink for two seconds. If you continue to hold the **PURGE** button, then the print head will purge ink until you release the button. To purge individual channels, press the **ENTER** button once then the up and down arrows to select the desired channel (e.g. 1 thru 9). Again, press and hold the **PURGE** button for one second. Ink will eject from the selected channel for two seconds. To return to the home screen, press the down arrow button until "Pr" is selected, and then press **ENTER**. Otherwise, the print head will automatically return to the home screen after 30 seconds of inactivity.

Section 5: Getting Started

Keypad



Turning the Controller On

The power keys are located at the top left corner of the keypad. Press the **I** key to turn the controller on. Press the **O** key to turn it off. (To prevent accidental turn-off, the system will prompt for confirmation.)

CAUTION: If the system is in the Print mode when it is turned off, it will resume printing when it is turned back on. Anything that is in front of the print heads when printing resumes may get ink on it.

Adjusting Screen Brightness

The screen brightness control keys are at the top right corner of the keypad. Press the **Up Arrow** key to make the screen lighter; press the **Down Arrow** key to make the screen darker.

Auto Repeat

The keypad has an auto repeat feature that activates when a key is held down for more than one half second.

Commands

There are three main commands given in this manual: **Highlight, Press,** and **Touch.**

Highlight

Highlight a display control to select it for further action, or to give it input focus. Different types of display controls are highlighted differently. For example, highlighted text is displayed in inverse video (light characters on a dark background), while highlighted screen buttons and message fields are displayed with a box around them.

Inverse video example: 

Press

Press a keypad key to do or complete a particular action. Examples: Press **Enter**, press **ESC**, or press the **Up/Down Arrows** to scroll through the list of items.

Touch

Touch a screen control to do or complete a particular action. Examples: Touch the **Status** button to display the Status Screen or touch a print head to view or change that print head's properties.

Screen Controls

Buttons

There are three types of screen buttons, **Text**, **Bitmap**, and **Decorated**. Touch a button to actuate its function:

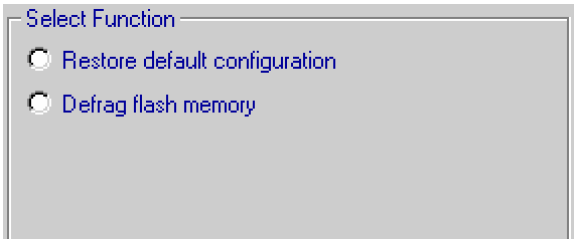
- Text button: contains a text description of its function.

- Bitmap button: contains a graphic illustrating its function.

- Decorated button: contains text and graphics.

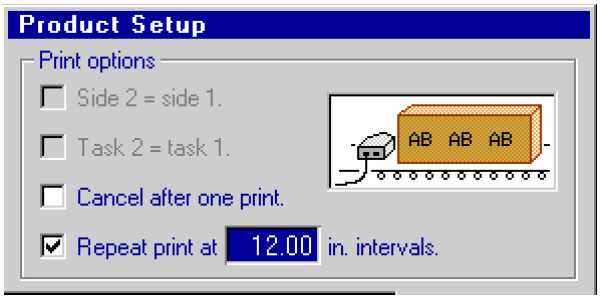
Radio Buttons

Touch a radio button or its text description to make a selection. A black dot indicates the current selection.



Check Boxes

Touch a check box or its text description to toggle an option or feature on and off. The feature or option is enabled when a checkmark appears in the box.



Value Entry Box

Touch a value entry box to highlight it, type in the desired value, and press **Enter**. Press **ESC** any time prior to pressing **Enter** to restore the original value. Touching another screen control or pressing an arrow key after entering a new value, but before pressing **Enter**, sets the new value just as if **Enter** had been pressed.

All value entry boxes have preprogrammed maximum and minimum allowable values. Enter a value greater than the allowable maximum and it automatically changes to the maximum. Enter a value less than the allowable minimum and it automatically changes to the minimum.

Depending on its usage, a value box may or may not allow decimals. When they are allowed, values are fixed at two decimal places.

Text Entry Box

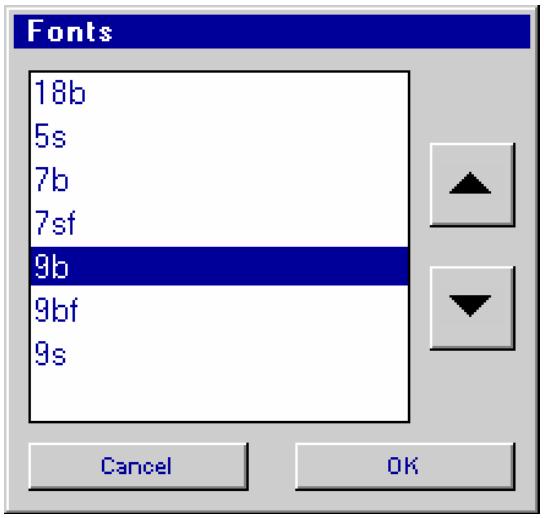
Touch a text entry box to highlight it, type in the desired text, and press **Enter**. Press **ESC** any time prior to pressing **Enter** to restore the original text. Touching another screen control or pressing the **Up** or **Down Arrow** keys after entering new text, but before pressing **Enter**, sets the new text just as if **Enter** had been pressed.

Existing text in a text entry box can be edited. Touch the box to highlight it, use the **Left** or **Right Arrow** keys to move the cursor to where text is to be added or removed, then use the **Backspace** or **Delete** key to remove unwanted text, or type in additional text.

List Box

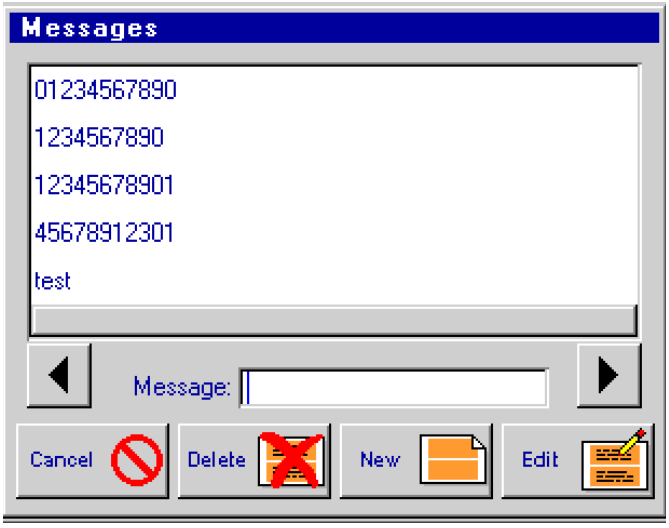
Use a list box to select an item from a number of related items, such as print heads, fonts, or date code formats. A list box is displayed in response to a button or other control being touched. (A vertical scroll bar will appear if the list contains more items than can be displayed in the list box.)

Highlight the selection by touching it, or scroll through the list using the up and down screen buttons or the up and down keys on the keypad. After an item has been selected from the list, touch the **OK** screen button, or press **Enter** on the keypad.



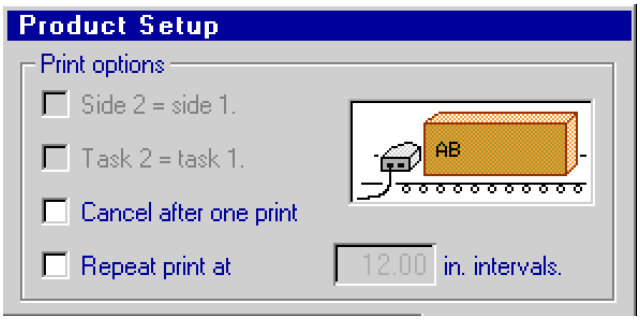
Message Selection Box

Use the message selection box to select a print message for printing, editing, deleting, etc. Select a print message by touching its name, by using the arrow keys on the keypad to move through the message names until the desired one is highlighted, or by typing the name in the box provided. After a message is selected, touch the screen button for the operation to be performed.

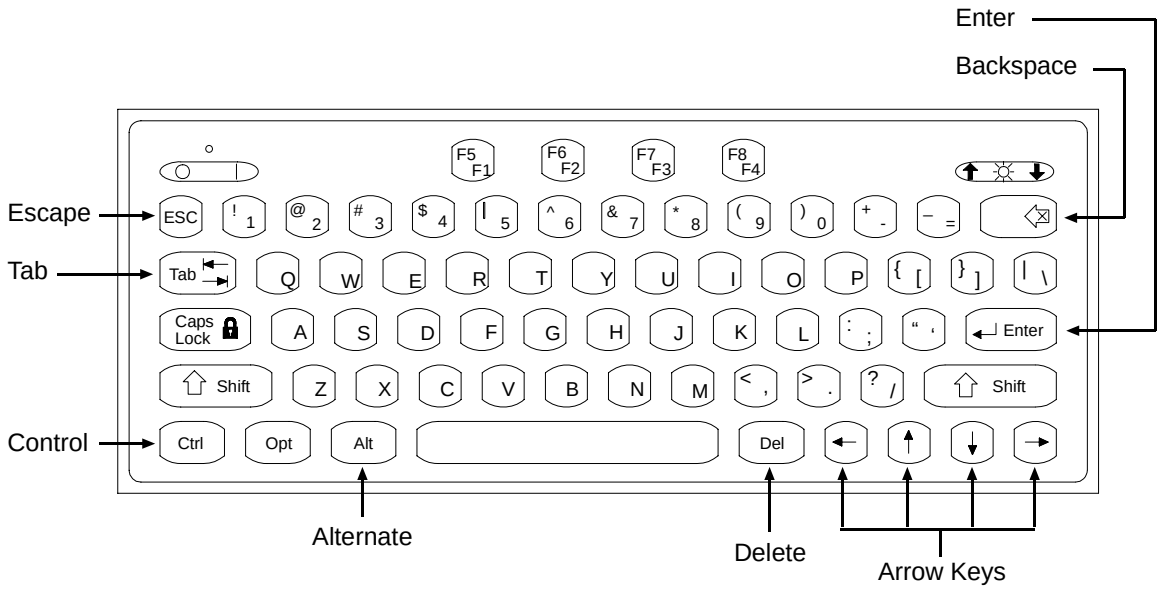


Inactive Controls

When a screen control has no function within the context of the current situation, it is made inactive or "grayed out" (the control is displayed entirely in shades of gray). For example, if the Marksman Duo Vx is set up for printing on one side of a product only, the **Side 2 = Side 1** check box on the Print Options screen has no function and is grayed out. Likewise, the repeat intervals value entry box is grayed out if repeat print is not selected.



Keypad Controls



The following keypad keys can be used to navigate through a screen:

ESC (Escape):

Press **ESC** to close the current window, dialog box, or menu. Any changes made in the window or dialog box that have not been saved will be discarded. Pressing **ESC** is the only way to close a menu without performing any of the menu's functions.

If a text entry box or value entry box has input focus and the existing contents of the box have been changed but not set (by pressing Enter), press **ESC** to restore the original contents. Press **ESC** again to close the window or dialog box that contains the text or value entry box.

Arrow Keys:

Press the **Arrow** keys to shift input focus from one screen control to another. Focus will shift to the next control in the general direction of the key pressed. If no control lies in that direction, input focus remains where it is.

When a text-type screen control has input focus, the **Left** and **Right Arrow** keys move the cursor through the text; the **Up** and **Down Arrow** keys will shift focus to the next screen control above or below the box.

Tab:

Press **Tab** to shift input focus from one screen control to another. Input focus shifts from control to control in the order in which they were added to the display.

Tab also frees the input focus when it gets "stuck" in a window. For example, when scrolling through the message list window on the Message Selection Box, the arrow keys cannot be used to leave the confines of the window. To shift input focus out of the window, press **Tab**.

Enter:

Enter key behavior is determined by the screen control that has input focus.

- Press **Enter** to actuate a Text button, Bitmap button, or Decorated button.
- Press **Enter** to choose a Radio button selection.
- Press **Enter** to toggle a Checkbox option on and off.
- Press **Enter** to terminate data entry on Text and Value Entry boxes.

Backspace or Delete:

Press the **Backspace** or **Delete** button to delete individual characters or entire text strings when editing text. **Backspace** removes characters to the left of the cursor, **Delete** removes characters to the right of the cursor.

Ctrl (Control):

The **Ctrl** key is used in the Edit Screen to amplify the action of the arrow keys (see *"Moving Around the Edit Screen" on page 38"*), and to alter the function of the Enter key.

Alt (Alternate):

The **Alt** key is used in the Edit Screen to alter the action of the arrow and Enter keys. (See *"Editing a Message" on page 61"*.)

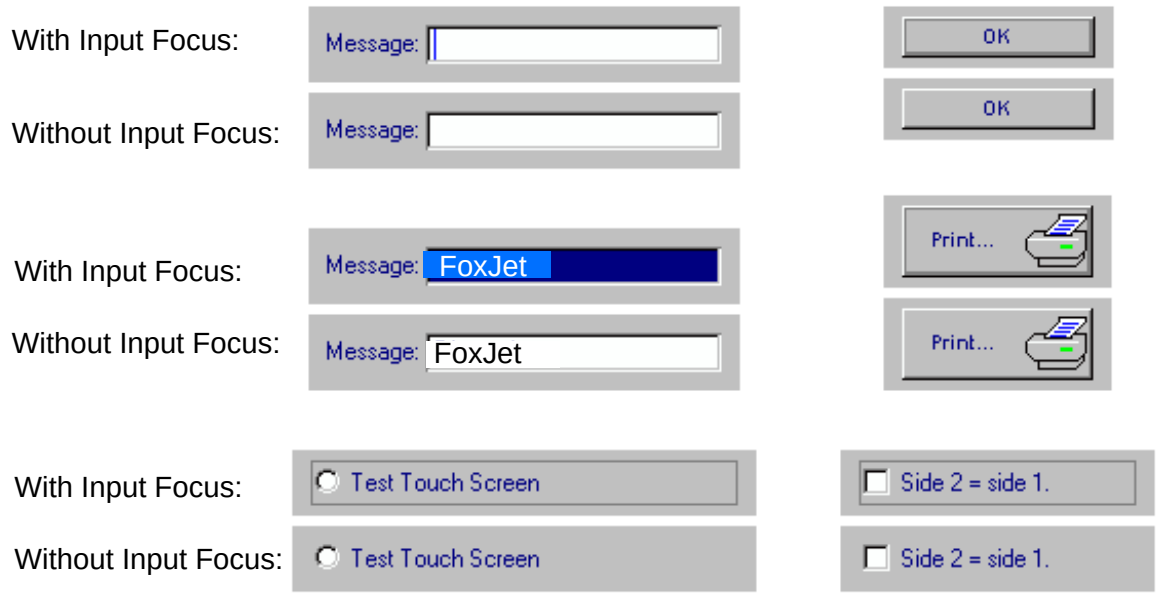
F4/F8:

The **F4/F8** key pulls up the extended characters dialog.

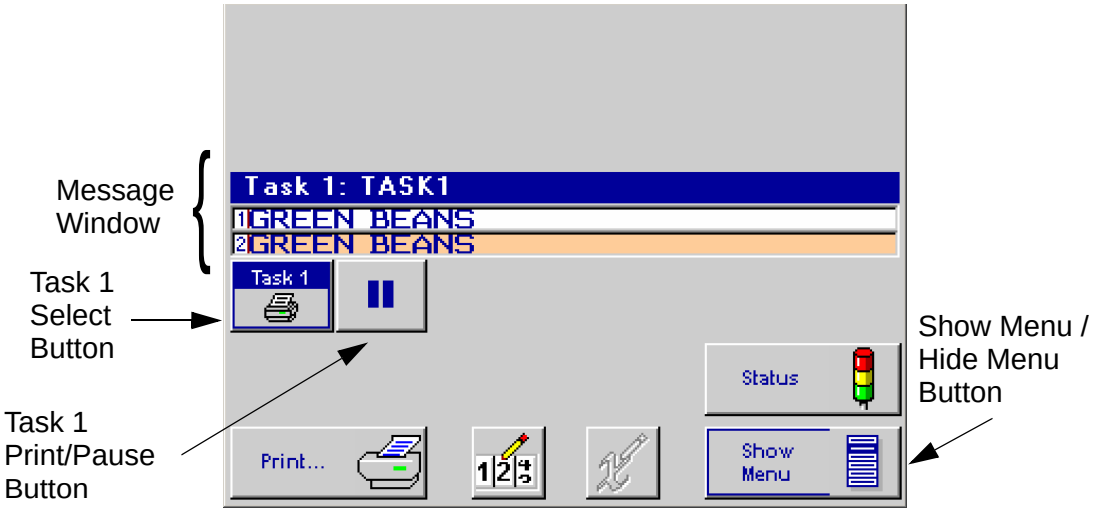
Input Focus

A screen control that receives keypad inputs has input focus. A screen control is assigned input focus by touching the control, or by using the Tab or arrow keys on the keypad to shift focus from control to control. A screen control that has input focus is highlighted in some way: text based controls display a cursor that indicates the text insertion point or are displayed in inverse video; buttons and message fields have a box around them.

Examples of screen controls with and without input focus:



Home Screen



The Home Screen is usually the first screen displayed at power on. The major parts of the Home Screen are the **Message Window**, the **Task 1** and **Task 2** control buttons, the **Show Menu / Hide Menu** button, and the system controls and access buttons. (The system controls and access buttons' functions are described later in this manual.)

NOTE: Task 2 buttons will not appear if only one interface board is connected.

Message Window

The Message Window displays the current print message as it will look the next time it is printed. If no message is loaded to print, the window is empty. The message window is updated approximately every seven seconds, so it likely will not show each print.

Long print messages that do not fit completely within the Message Window can be viewed by using the **F1** and **F2** keys to scroll the message left and right, respectively.

The appearance of the message window reflects the system setup. Each numbered white or beige bar represents a print head in the daisy chain. The text on a bar is the text printed by that print head. If printing on a single side of the product, only one window is shown. Two windows are displayed when utilizing two-sided printing, with the top window always being side 1 or the side closest to the Marksman Duo Vx controller.

The window's header displays which task the print message is being printed on and the file name of the message being printed. If no message is loaded to print, "**None**" is displayed.

Print/Pause Buttons

Touch a task's **Print/Pause** button to toggle the task between printing and not printing (paused). The icon on the button indicates what action will be taken when the button is touched. That is, if blue double bars are shown, touch the button to **pause** print. If a green arrow is shown, touch the button to **resume** printing. The **Print/Pause** button is always active; a task's message does not have to be displayed in the message window for its **Print/Pause** button to work.

When a task is empty (no message is loaded to print), its **Print/Pause** button displays both an arrow and the double bars, and is grayed out.

The Print/Pause button looks like this when the task is printing. Touch the button to pause printing.

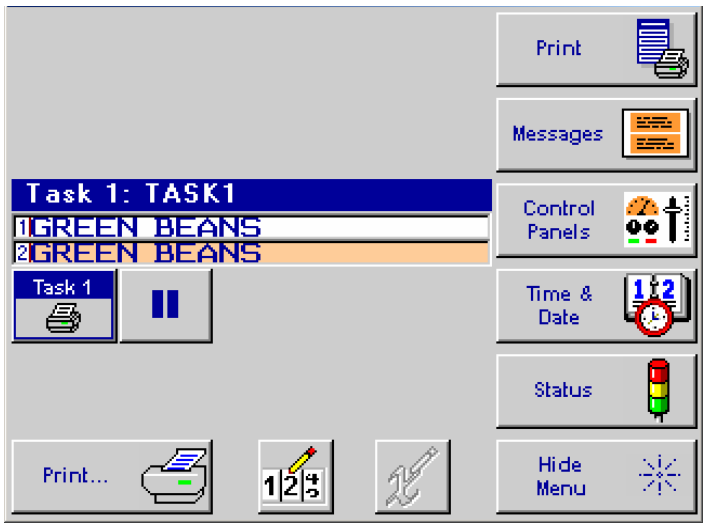
The Print/Pause button looks like this when the task is paused. Touch the button to resume printing.

The Print/Pause button looks like this when the task is empty.

The **Task 2 Print/Pause** button is not displayed if the system is set up to have only one daisy chain.

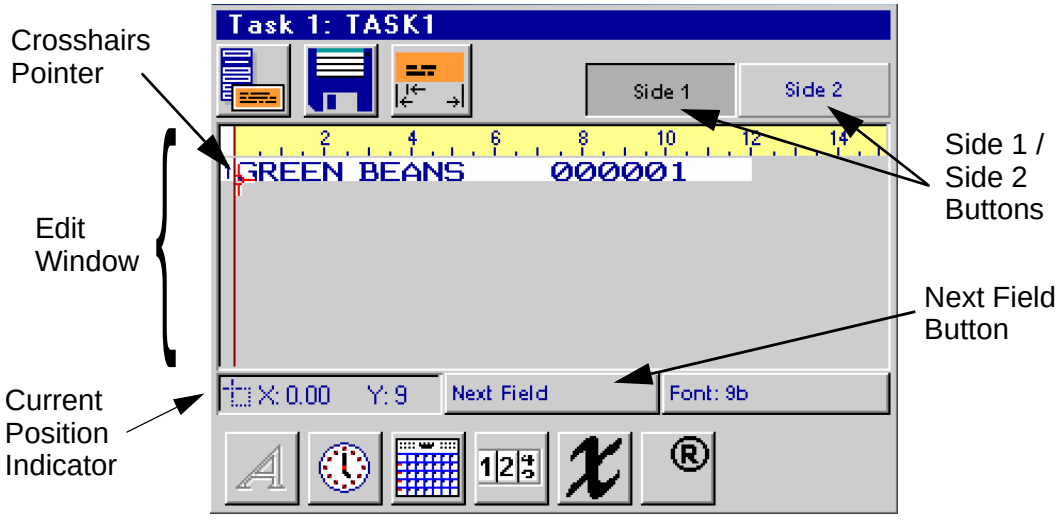
Show Menu/Hide Menu Button

Touch the **Show Menu/Hide Menu** button to show or hide the Home Screen menu. The functions associated with the menu buttons are described later in this manual.



Home Screen with Menu Displayed

Moving Around the Edit Screen



Edit Window:

Print messages are created and edited in the Edit Window. Unlike all other Marksman Duo Vx screens and dialog boxes, input focus on the Edit Screen remains in one place - the Edit Window. Buttons outside of the Edit Window do function when touched, but they can't be made to function from the keypad. For information on the layout and appearance of the Edit Window see *"Creating a Print Message" on page 53*.

Crosshairs Pointer:

The crosshairs pointer indicates where a new data field is placed when added to a print message. Use the keypad keys listed below to move the crosshairs pointer around the Edit Window.

Touching the screen inside the Edit Window can also move the crosshairs pointer. The pointer moves to where the screen is touched.

The color of the crosshairs pointer changes from black to red when it moves over a data field.

Integrated Valve:

Direction	Distance	Press keypad key
up/down	1 dot row	up/down arrow
up/down	9 dot rows	Shift + up/down arrow
down	9 dot rows	Enter (when no fields are highlighted and the crosshairs pointer is black)
left/right	1 print column	left/right arrow
left/right	9 print columns	Shift + left/right arrow
left/right	250 print columns	Ctrl + left/right arrow
left	1 print column	Backspace/Delete (when no fields are highlighted)
left	9 print columns	Shift + Backspace/Delete (when no fields are highlighted)
left	250 print columns	Ctrl + Backspace/Delete (when no fields are highlighted)
right	1 print column	Space Bar (when no fields are highlighted)
right	9 print columns	Shift + Space Bar (when no fields are highlighted)
right	250 print columns	Ctrl + Space Bar (when no fields are highlighted)

Next Field Button:

Touch the **Next Field** button to highlight or select the data fields in the order in which they were added to the print message. A selected field's color changes from dark blue to red and a box surrounds the field. Once a field is selected, it can be moved around the Edit Window or its contents can be edited. For instructions on editing an existing data field see *"Editing a Message" on page 61*. Use the keypad keys listed below to move a selected field around the Edit Window.

Fields cannot be moved over other fields, they must be moved around them. When a field is positioned appropriately, press **Enter** to de-select it.

A field can also be selected by moving the crosshairs pointer over it (as indicated by the crosshairs pointer turning red) and pressing **Enter**, or by touching the field directly.

Integrated Valve:

Direction	Distance	Press keypad key
up/down	1 dot row	up/down arrow
up/down	9 dot rows	Shift + up/down arrow
left/right	1 print column	left/right arrow
left/right	9 print columns	Shift + left/right arrow

Current Position Indicator:

The Current Position Indicator displays the current location of the crosshairs pointer, selected field, or edit cursor. The X position is given in inches from the left edge of the active print area. The Y position is given in dot rows from the top of the active print area.

Side 1/Side 2 Buttons:

Touch the **Side 1** or **Side 2** button to display side 1 or side 2 of the print message. The button that appears pressed or pushed indicates which side is currently displayed.

Section 6: Setup Functions

Tasks

A task consists of all operations associated with a single interface board. (All print heads connected in a daisy chain are part of one task.) If only one interface board is connected, or if an Marksman Duo Vx controller is being used, Task 2 will not be applicable and Task 2 buttons will not be displayed.

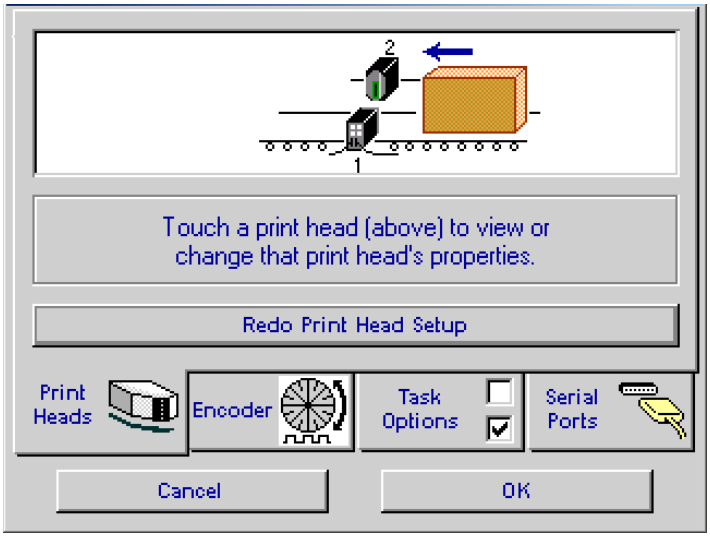
Configuring the Print Station

Print Head Setup Screen

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

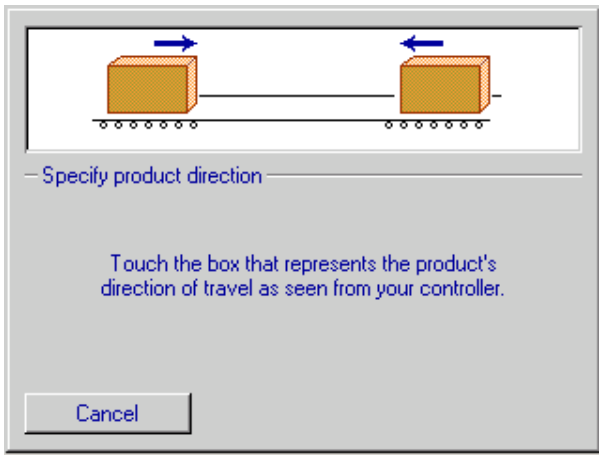
Screen prompts guide the user through the step by step print head setup procedure. Once begun, the procedure may be aborted (by pressing **Cancel** or the **Escape** key) at any time without changing the current print head setup.

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



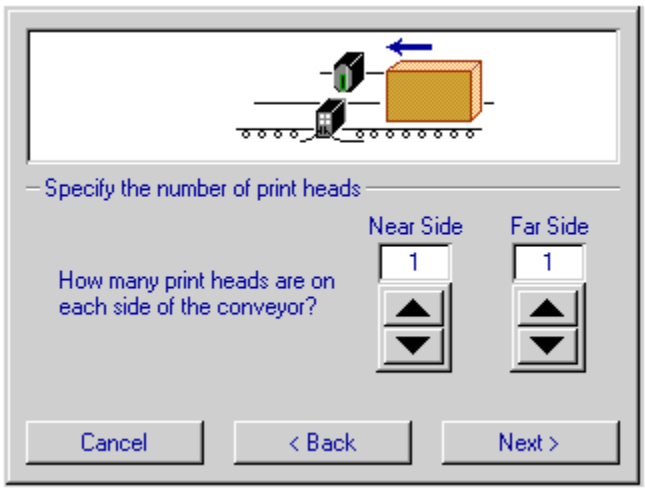
Specifying Product Direction

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



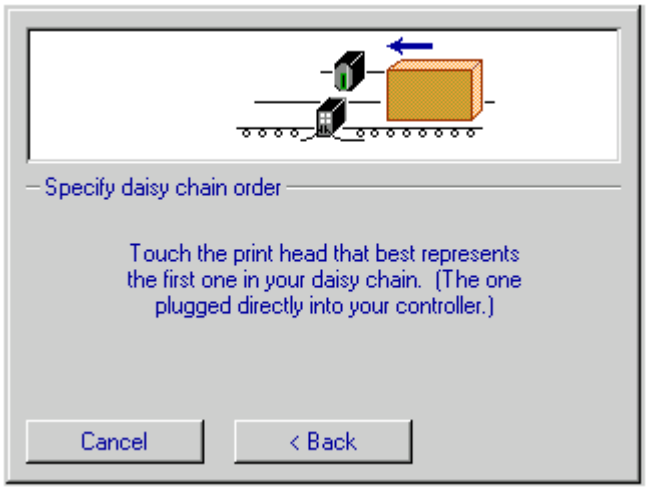
Specifying Number of Print Heads

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 below, 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

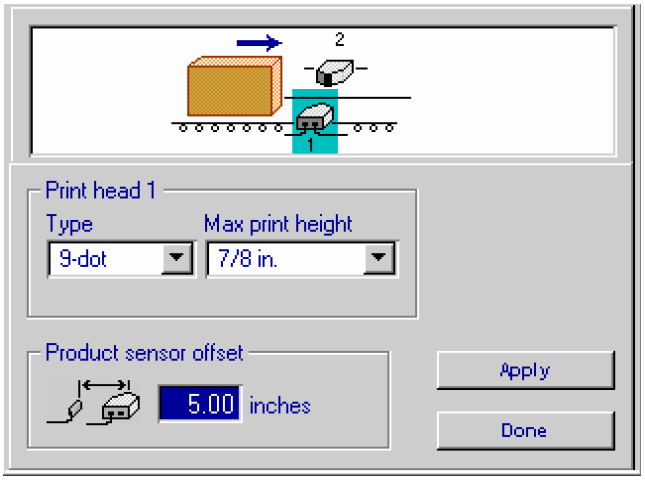
Both print heads are displayed, and the user is prompted to indicate the first print head in the daisy chain by touching it. (If there is only one print head, this step is bypassed.) Once this is done, the **Print Head Properties** screen appears.



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.

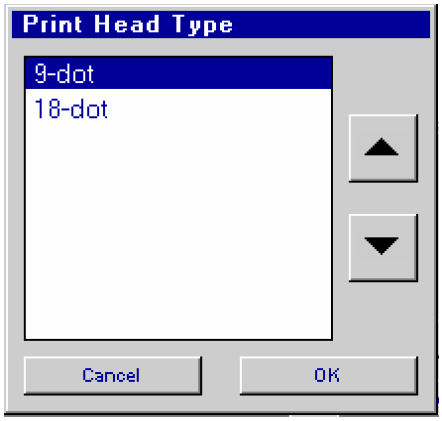
Defining Print Head Properties

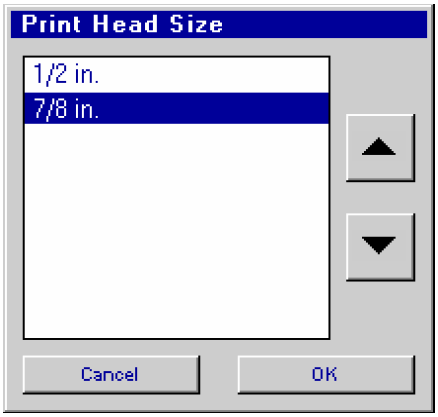
The final step in print head configuration is defining the properties of the individual print heads.



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

- **Print head type and size:**



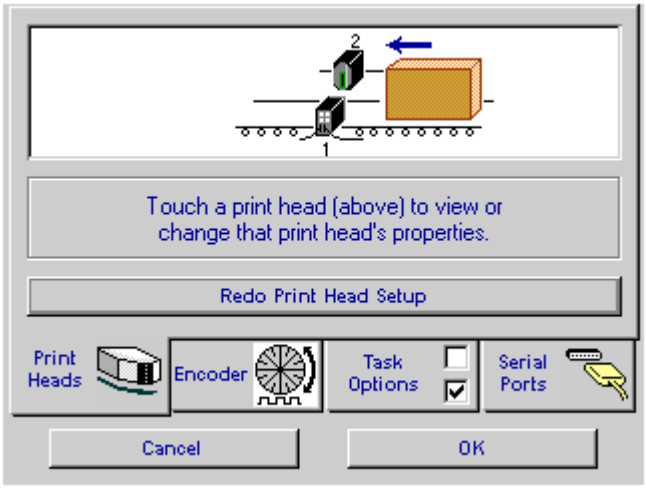


- **Product sensor offset:** Enter the distance between the photosensor and the print head, in inches. This may need to be fine-tuned after print setup. The maximum sensor offset is 81".

- **Ink Type** indicates the type of ink used for the selected print head.

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.

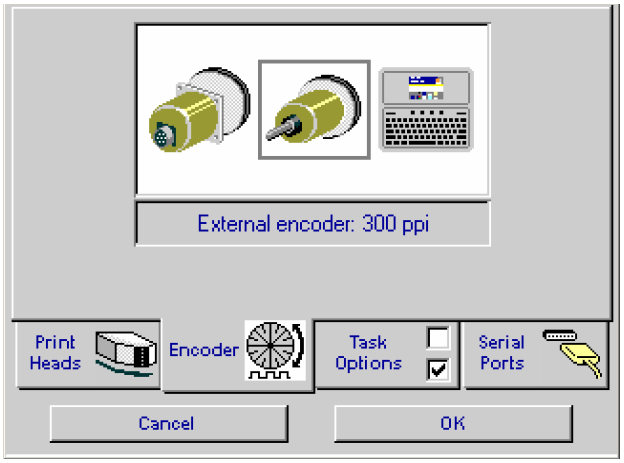
After the last print head is defined, touch the **Done** button to display the following screen. Print Head setup is now complete.



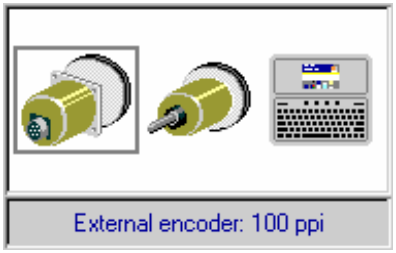
Touch any print head on the display to review or change the properties for that head. Touch the **Redo Print Head Setup** button to repeat the setup procedure using the new setup as the default. Touch **OK** to return to the **Home Screen**.

Encoder Setup

Touch the **Encoder** tab at the bottom of the **System Setup** screen to access encoder options.



Select from the 100 ppi external encoder at left, 300 ppi external encoder at center or internal timer at right.



A gray box surrounds the current encoder selection.

Use an external encoder if the line speed varies or the line makes frequent starts and stops.

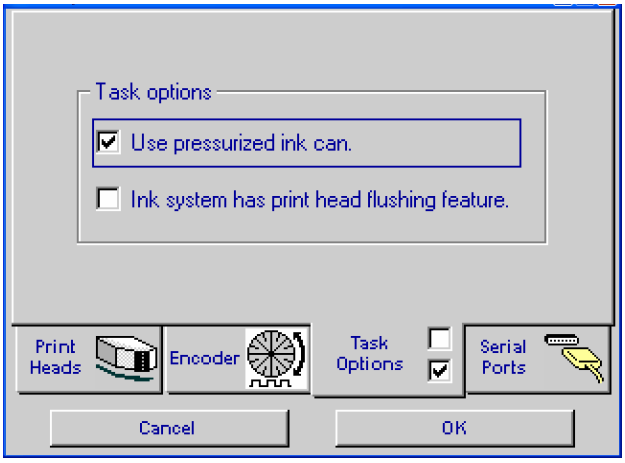
Use the internal timer if the line speed is constant, with a minimum of starts and stops. When choosing the internal timer, enter the conveyor's speed into the **Line Speed** box. (See *"Appendix D: Maximum dpi Calculation for a Given Line Speed" on page 101* for maximum line speeds.)

Touch **OK** to return to the **Home Screen**.

Print Head Flushing Feature

To configure a Marksman Duo Vx to work with an IS that has the Print Head Flushing Feature:

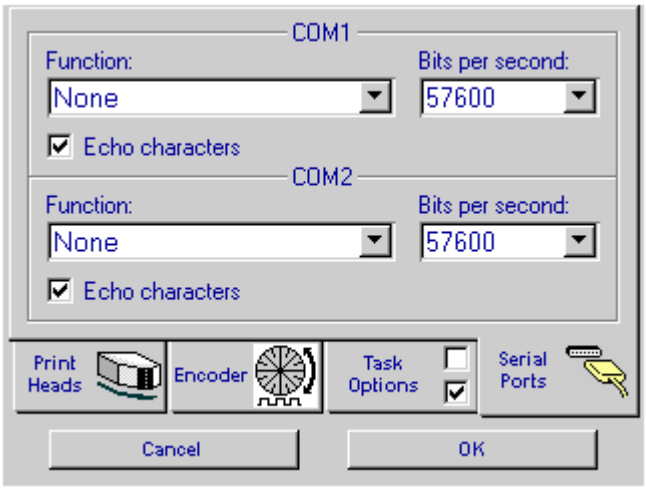
1. On the **Home screen**, go to **Task 1** and touch the **Control Panels** button to open the Control Panels Menu.
2. Touch the **System Setup** button on the Control Panels Menu to open the System Setup screen.
3. Touch the **Task Options** tab.
4. Check the **Ink System has print head flushing feature** box. Checking the box places a **Flush Print Heads** button on the Print menu on the Home screen.



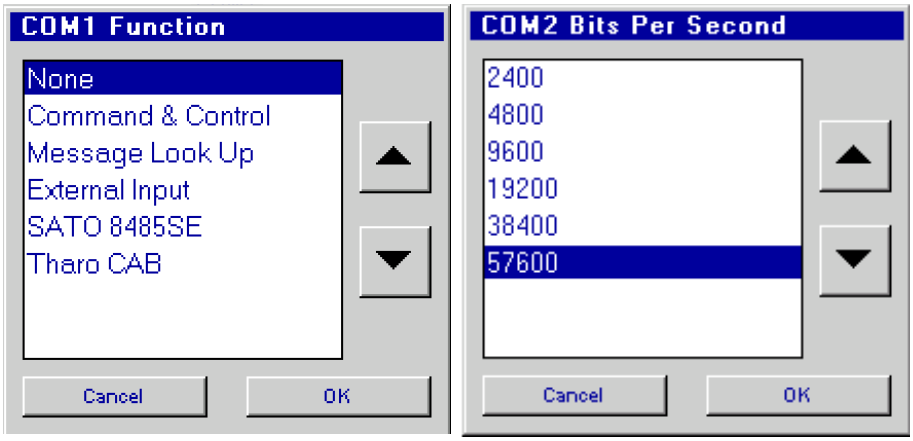
Serial Port Setup

To set the COM1 and COM2 serial port device type and baud rate:

1. On the **Home screen**, touch the **Control Panels** button to open the Control Panels Menu.
2. Touch the **System Setup** button on the Control Panels Menu to open the System Setup screen.
3. Touch the **Serial Ports** tab on the System Setup screen to display the Serial Ports page.



4. Touch the COM1 or COM2 **Function** box to open a list box and select a device for the related port.
5. Touch the COM1 or COM2 **Bits per second** box to open a list box and select a baud rate for the related port.



NOTE: The following settings are fixed on the Marksman Duo Vx and cannot be changed. Any device connected to a Marksman Duo Vx serial port must be configured to match these settings:

Data Bits: 8

Stop Bits: 1

Parity: None

Flow Control: None

Using a Bar Code Scanner

A bar code scanner attached to a serial port can be used for message lookup, that is, loading a message for printing, or to insert variable field data into a printing message.

- **Command & Control:** When this function is utilized, the controller will use predefined scripts to modify various parameters of the controller. (See the Software Interface Document, item number 5760-113.)
- **Message Look Up**: When used for message lookup, a scanner attached to COM1 will load print messages into Task 1. To configure a serial port for message lookup, select **Message Look Up** as the port device and set the baud rate to match that of the scanner.

NOTE: The name of the print message scanned must *exactly* match the name of a print message stored in the Marksman Duo Vx. If it does not, or no message with the name scanned exists, the current print message is cancelled and printing stops.

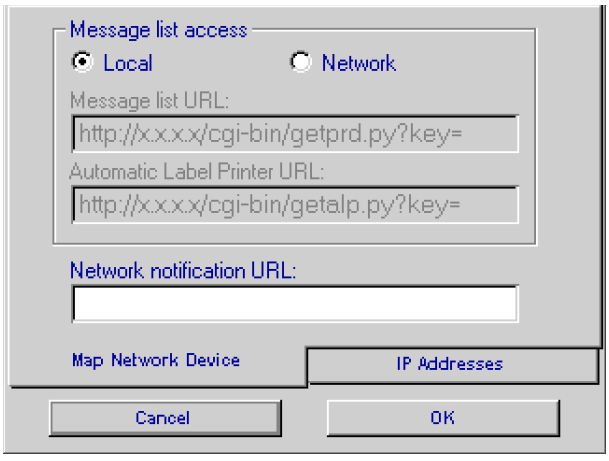
- **Variable Field Data Input**: When used to input variable field data, a scanner (or scale, or other external device) on either serial port will work with messages printing on either task. The serial port used must match the one specified when the message and variable field are created (see *"Adding a Variable Field" on page 59*). To configure a serial port for variable field data input, select **External Input** as the port device and set the baud rate to match that of the device.

Network Setup

If the Marksman Duo Vx system is being used in a network application, the factory programmed network settings may need to be changed. If the network application is not being utilized, this section can be skipped.

To display the Network Setup screen:

1. On the **Home Screen**, touch the **Control Panels** button to open the Control Panels Menu.
2. Touch the **Network** button on the Control Panels Menu to open the Network Setup screen.



The controls on the Map Network Device page of the Network Setup Screen apply only if the Marksman Duo Vx is running on a network controlled by a PC using the Marksman Duo Vx network software.

Message List Access

The **Message list access** controls determine whether the print messages listed in the Print...Message Selection box are local (stored in the Marksman Duo Vx's internal memory) or on the network. Touch the radio button appropriate to the application.

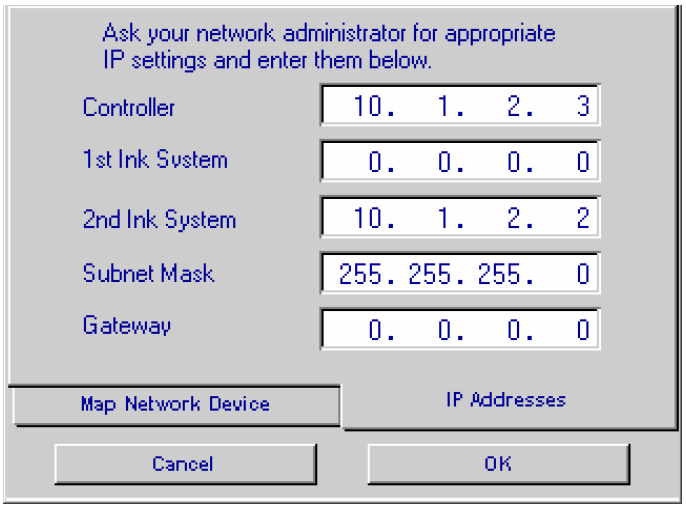
If **Network** is chosen, the **Network message list URL** and **Automatic Label Printer URL** text entry boxes become active. Enter the address where the Marksman Duo Vx will find the network-stored messages and, if applicable, enter the address where the Marksman Duo Vx will find files for the Automatic Label Printer. For more details, see the Network Software Documentation Manual (part number 5760-005N).

Network Notification URL

If this text entry box is filled in, the controller will send out a packet on the network to the host specified. This packet will be sent at controller boot up and at each photocell trigger input. For more details, see the Software Interface Document (part number 5760-113).

Setting IP Addresses

Touch the **IP Addresses** tab to display the IP Addresses page.



An IP address has four segments. The value of each segment may be from 0 to 255. Touch the entry box for the address to be set, use the Left/Rght Arrow keys to highlight the desired segment, and then type in its value. After the third digit of each segment is entered, input focus automatically shifts to the next segment to the right. When a segment has less than three digits, move to the next segment by pressing the "**.**" (period) key.

NOTE: The Network IP settings shown for the first and second IS apply only to FoxJet's Integrated Valve (IV) system. The Impulse Jet Ink System (IS) does not contain ethernet connectivity.

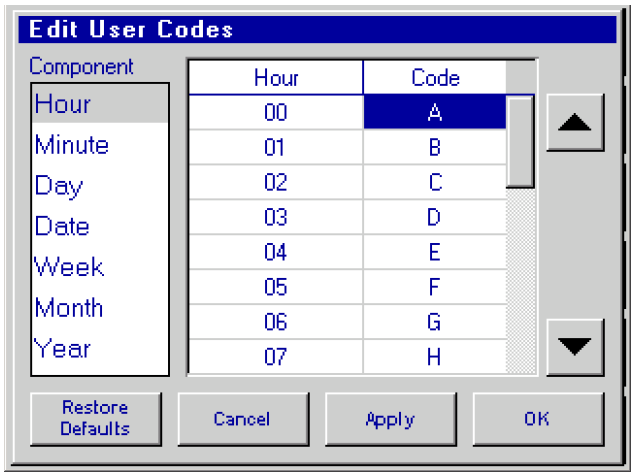
Touch the **OK** button to save the changes and return to the Home Screen. To discard any changes made and return to the Home Screen, touch the **Cancel** button or press **ESC** on the keypad.

Defining User Codes

User Codes are user-defined time and date codes for printing hour, minute, date, month, and week of the year information. Each code may be up to four characters long.

To display the Edit User Codes screen:

1. On the **Home Screen**, touch the **Control Panels** button to open the Control Panels Menu.
2. Touch the **User Codes** button on the Control Panels Menu to open the Edit User Codes screen.



To define or edit codes:

1. Touch the radio button for the appropriate component.
2. Highlight the code to be defined or edited. If the code is not visible, touch the screen **Up/Down Arrow** buttons to scroll it into view.
3. Type in the new code and press **Enter**.
4. Repeat steps 1 through 3 as desired.
5. Touch the **OK** button to save the code definitions and return to the Home screen.

Touch the **Apply** button to save the code definitions and remain on the Edit User Codes screen.

Touch the **Cancel** button or press **ESC** on the keypad to return to the Home screen without saving any changes.

Touch the **Restore Defaults** button to restore the default codes for the selected component. The default codes are:

- Hours: 24 single letter codes A through Z, except the letters I and O (which may be confused with the numbers 1 and 0).
- Minutes: 60 two-letter codes AA through AZ, then BA through BZ, then CA through CM. The letters I and O are not used.
- Date: 31 two letter codes AA through AZ, then BA through BG. The letters I and O are not used.
- Week: 53 two-letter codes AA through AZ, then BA through BZ, then CA through CE. The letters I and O are not used.
- Month: 12 three-letter abbreviations, JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, and DEC.
- Year: 99 two-letter codes AA through AZ, then BA through BZ, then CA through CZ, then DA through DZ, then EA through ED. The letters I and O are not used.

When defining user codes, avoid extremes in the number of characters for different codes within a component. For example, avoid defining hour 00 as 'A' and hour 03 as 'AAAA.' If print codes like 'A' and 'AAAA' must be printed, be sure to reserve enough room in the print messages so that the longest codes don't overlap adjacent fields when they print.

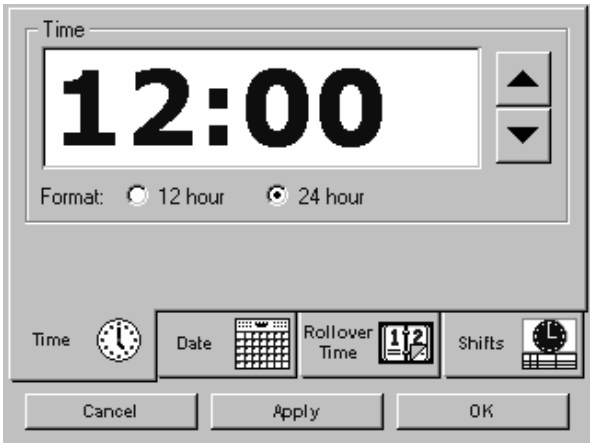
Time & Date Screens

Time and Date screens need to be properly set in order for time- and date-related auto-codes to be used.

Touch the **Time & Date** button on the **Home Screen**. The **Time** screen will appear with tabs along the bottom to set Time, Date, Rollover Time, and Shifts.

The Time Screen

Touch the **hour** or **minute** display to highlight the hour or minute and enable the Up/Down Arrows. Touch the **Up/Down Arrows** to adjust the hour or minute. Touch the **12 hour** or **24 hour** radio button to select the desired format. The time display changes immediately to reflect the selection. Note that this only sets the format for the time as it is displayed on the screen, and does not affect time-type autocodes. Touch **Apply** to save the new time, or **OK** to save and return to the **Home Screen**.

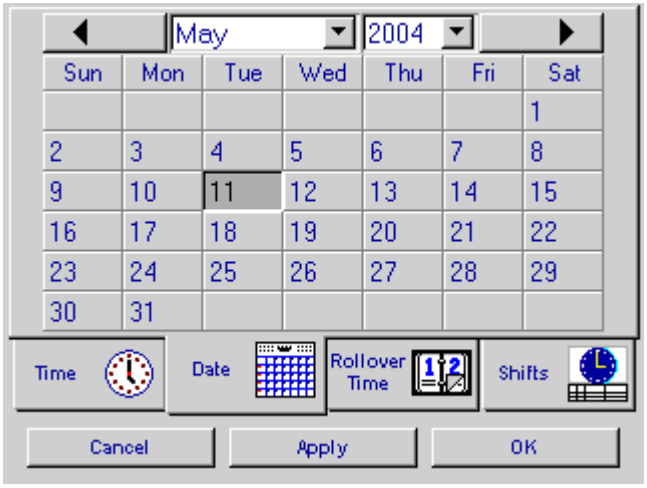


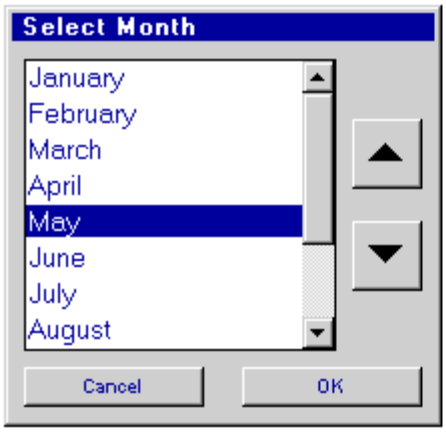
The Date Screen

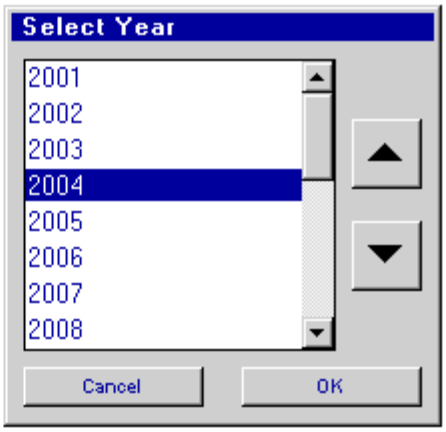
The Date Screen displays the Marksman Duo Vx's current month and year settings and the days for that month and year. The selected date is the current date setting.

To change the date within the current month, touch the desired date.

To change the month, touch the **Left** or **Right Arrow** buttons at the upper left and right to move backward or forward through the calendar, or select the month from the list displayed when the **Month** control at the top left center of the screen is touched (see below left).







To change the year, touch the **Year** control at the top right center of the screen and select the year from the list displayed (see above right).

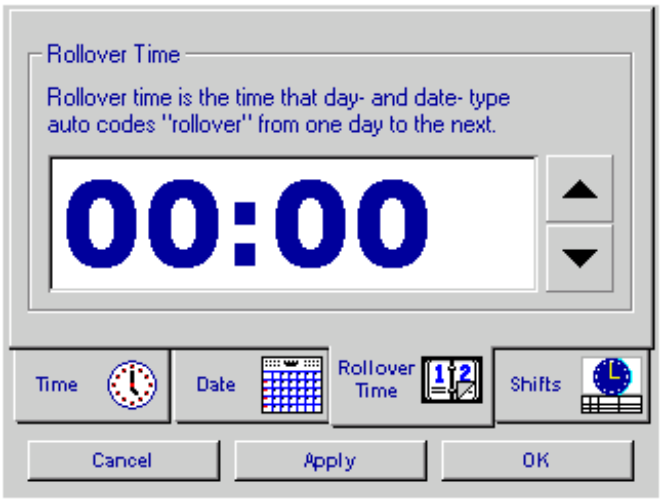
Touch the **Apply** button to save any changes made to the date.

Touch the **OK** button to save the new date and return to the Home Screen.

Touch the **Cancel** button to return to the Home Screen without saving any changes.

The Rollover Time Screen

Touch the **hour** or **minute** display to highlight the hour or minute and activate the Up/Down Arrows. Touch the **Up/Down Arrows** to adjust the hour or minute. Touch **Apply** to save the new time, or **OK** to save and return to the **Home Screen**. (AM or PM will show only if a 12-hour clock is chosen on the **Time** screen.)

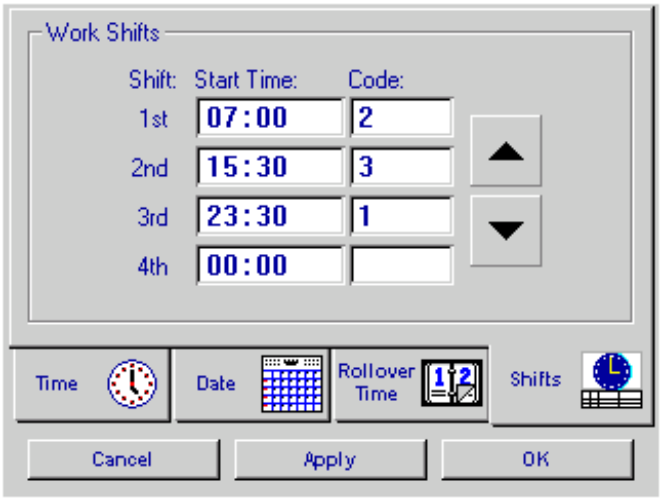


NOTE: Rollover times between 12:00 PM and 11:59 PM will change the day/date of autocodes before midnight; rollover times between 12:00 AM and 11:59 AM will change the day/date of autocodes on or after midnight.

The default rollover time is 12:00 AM (00:00 on the 24-hour clock.)

Shifts

Use this screen to assign autocodes to work shifts. For a shift to be valid, the code boxes must be filled in; shifts with empty code boxes are ignored. Shifts may be entered in any order, but will be sorted by the Marksman Duo Vx and displayed chronologically the next time this screen is accessed.



Section 7: Message Functions

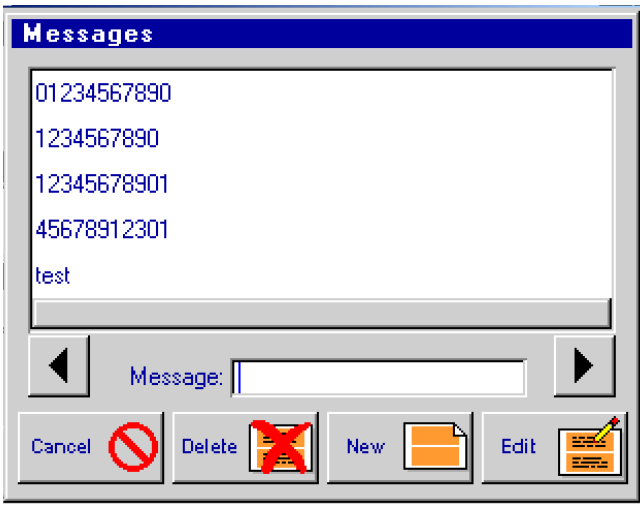
Creating a Print Message

A print message has one or more data fields containing a text or graphic element. Text fields may contain fixed text, variable text, a date code, a time code, or a product count. Graphic fields contain either a logo or a bar code.

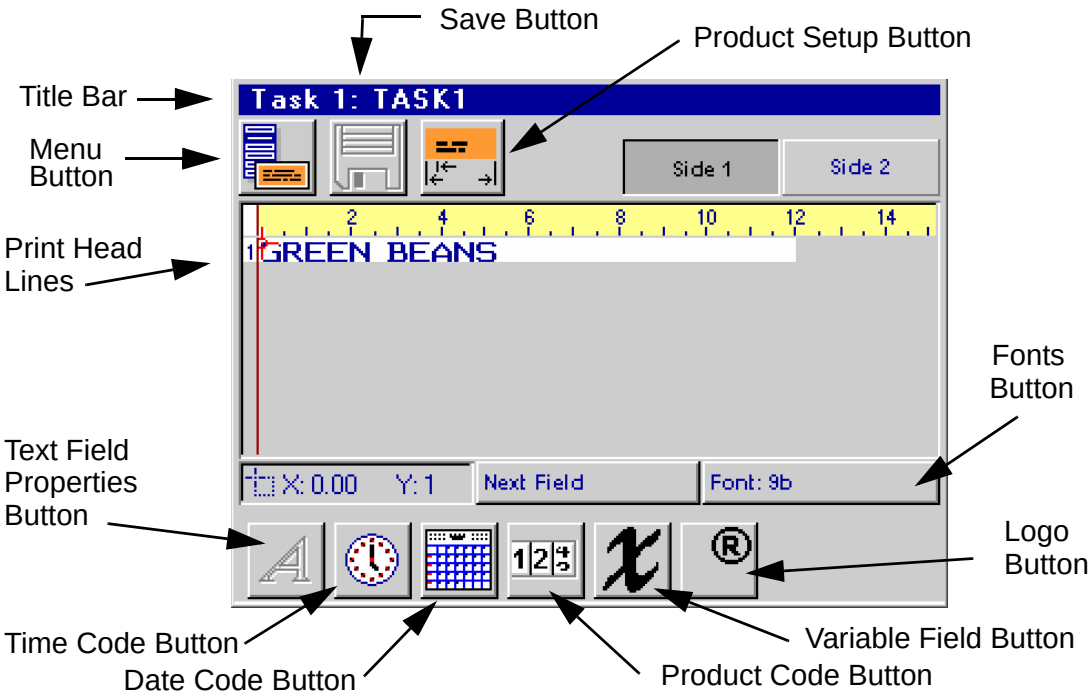
NOTE: Please read *"Moving Around the Edit Screen" on page 38* before continuing.

To create a print message:

Step 1: On the **Home Screen**, touch the **Messages** button. The Messages dialog box is displayed.



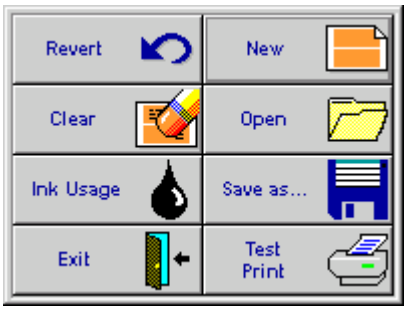
Step 2: On the Messages dialog box, touch the **New** button. The Edit Screen is displayed.



Edit Screen Controls and Features

Title Bar: The Title Bar shows the task for which the message is being created (in this case Task 1) and the name of the message. All new messages have the name "New" until they are saved.

Menu Button: Touch the **Menu** button to display the Message menu. From the Message menu, the user can:



- Create a new message.
- Open an existing message for editing or viewing.
- Save a message.
- Do a test print of a message.
- Undo all changes made to a message (Revert).
- Delete all fields from a message (Clear).
- Compute a message's ink consumption (Ink Usage).
- Return to the Home Screen (Exit).

Save Button: Touch the **Save** button to save any changes made to the print message currently in the editor. A dark blue **Save** button indicates changes made to the message have not yet been saved. The button is "grayed out" when no changes have been made or the changes have been saved.

Product Setup Button: Touch the **Product Setup** button to:

- Set the product's length.
- Set the print margins.
- Set the print resolution (dpi).
- Select print options.

Status Indicators:


Displayed when **Test Print** is selected from the Message menu.


Displayed when the message in the editor is configured for repeat print.


Displayed when the message in the editor is configured to apply a bar code label via a print and apply label applicator attached to the Marksman Duo Vx.

Side 1/Side 2 Buttons: Touch **Side 1** or **Side 2** to switch the editor to the corresponding side of the print message. The button that appears pressed or pushed indicates which side is currently displayed. If the Marksman Duo Vx is not configured for two-sided printing the Side button that is not needed is "grayed out" and inactive.

NOTE: When the Marksman Duo Vx is properly configured, **Side 1** is always the near side of the conveyor, **Side 2** is always the far side.

Print Head Lines: A print message being created or edited is displayed on the Print Head Lines. One line is shown for every print head in the Marksman Duo Vx's configuration. All fields or parts of a field on a print head line are printed by the line's corresponding print head.

Fonts Button: Touch the **Fonts** button to select the font for the next field to be added to the print message, or to change the font of an existing field. The name of the current font selection is displayed on the button.

Text Field Properties Button: Touch the **Text Field Properties** button to change the properties of a new or existing fixed text field. This button is active and functional only when a fixed text field is selected.

Time Code Button: Touch the **Time Code** button to add a time code to a print message, or to edit an existing time code.

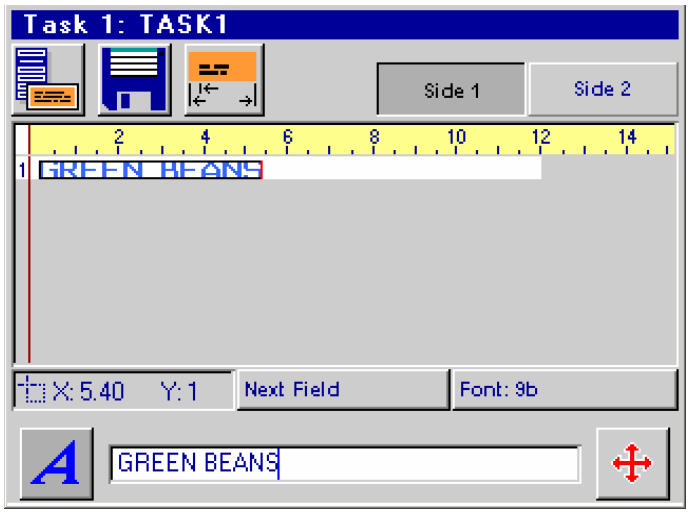
Date Code Button: Touch the **Date Code** button to add a date or expiration date code to a print message, or to edit an existing date or expiration date code.

Product Count Button: Touch the **Product Count** button to add an incrementing or decrementing product count or pallet count to a print message, or to edit an existing count.

Variable Field Button: Touch the **Variable Field** button to add a variable field to a print message, or to edit an existing variable field.

Logo Button: Touch the **Logo** button to add a logo to a print message, or to exchange an existing logo for another one.

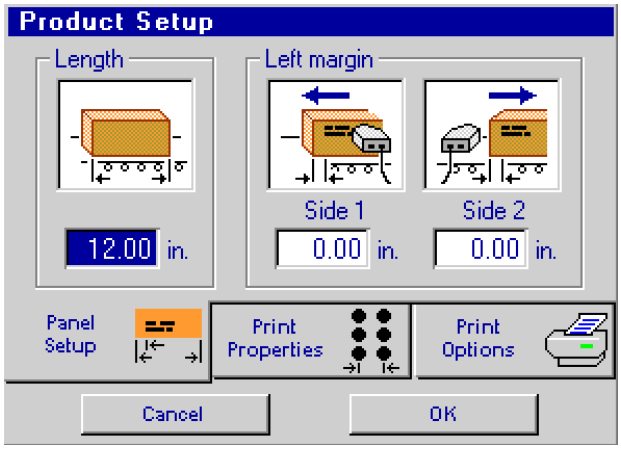
For all fields except the Logo a button, the text box will show the actual text content of the highlighted field.



Next Field Button: Touch the **Next Field** button to select a field for review or editing. The fields are selected one after another in the order in which they were added to the print message. See *"Editing Fields" on page 61* for more information.

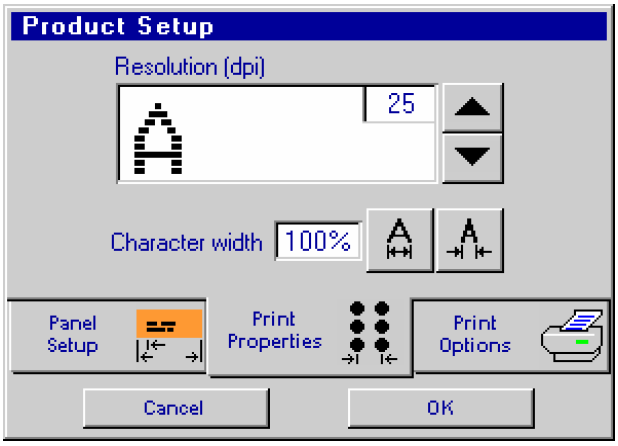
Step 3: Set up your product. Touch the **Product Setup** button to display the Product Setup dialog box:

Enter the product's length, and the left margin for side one and two, if applicable.



Touch the **Print Properties** tab. Use the up/down arrows to select the desired print resolution of 4 to 25 dpi (dots per inch).

Character Width is used to change the width of all text fields within the message.

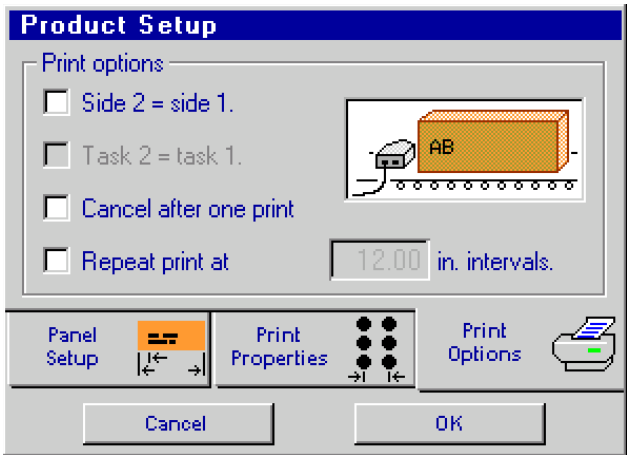


Touch the **Print Options** tab to select the desired print options.

Select **Side 2 = side 1** to automatically copy to side 2 all fields entered on side 1. The **Side 2 = side 1** option is available only when both sides have the same number of vertical print dots.

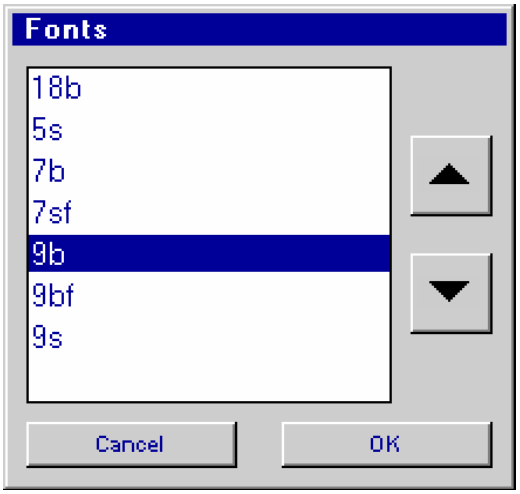
Select **Cancel after one print** to self-cancel the message after printing only once. This option is typically used with Message Lookup. See *"Serial Port Setup" on page 46* for an explanation of Message Lookup.

Select **Repeat print at…** when printing on continuous material, and specify the print interval (the interval box becomes active when **Repeat print** is selected). The print interval is defined as the distance from the start of one print to the start of the next.



Touch the **OK** button to save the settings and close the Product Setup dialog box.

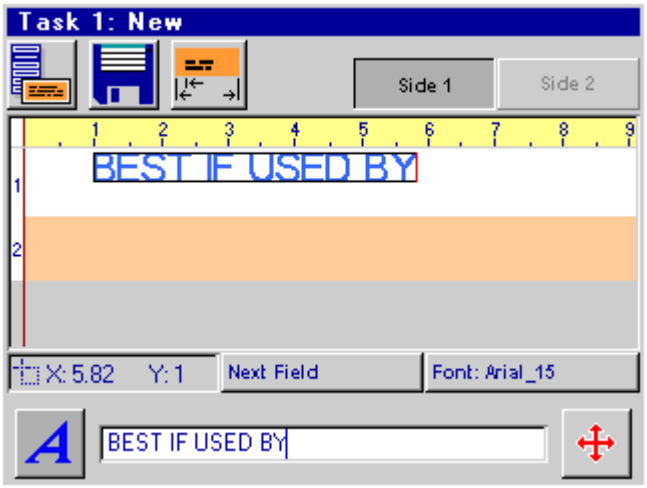
Step 4: Select the desired font for the first field. Touch the **Font** button to display the list of available fonts, highlight the selection, and touch the **OK** button.



Step 5 Add data fields to the print message, changing the font (as needed) before the addition of each new field.

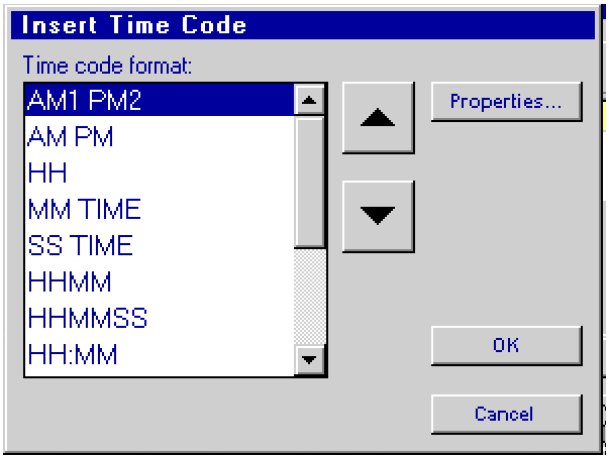
Adding a Text Field

To add a text field to the print message, move the crosshairs pointer to the desired field location and begin typing. The text is displayed (in light blue) on the Edit Screen as it is typed. It is also displayed in a box that appears at the bottom of the screen. To start a new line (a text field may have up to ten lines of text), press and hold the **Ctrl** key and press **Enter**. When finished, press **Enter.** (The field's color changes to red.) If the field is not exactly where it should be, use the arrow keys to reposition it. Press **Enter** again when the field is at the desired location. (The field's color is now dark blue.)

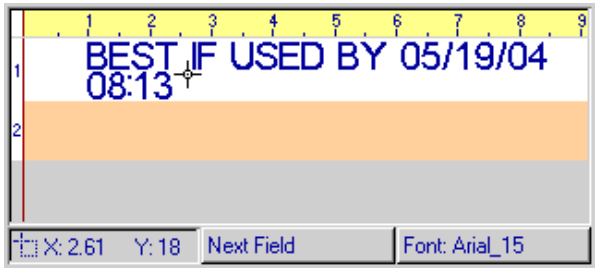


Adding a Time Code

To add a time code to the print message, move the crosshairs pointer to the desired location and touch the **Time Code** button; the Insert Time Code dialog box is displayed. Select a format for the time code from the list, then touch the **OK** button to close the dialog box and insert the time code into the print message.



If the time code is not exactly where it should be, use the arrow keys to reposition it. Press **Enter** when the time code is at the desired location.

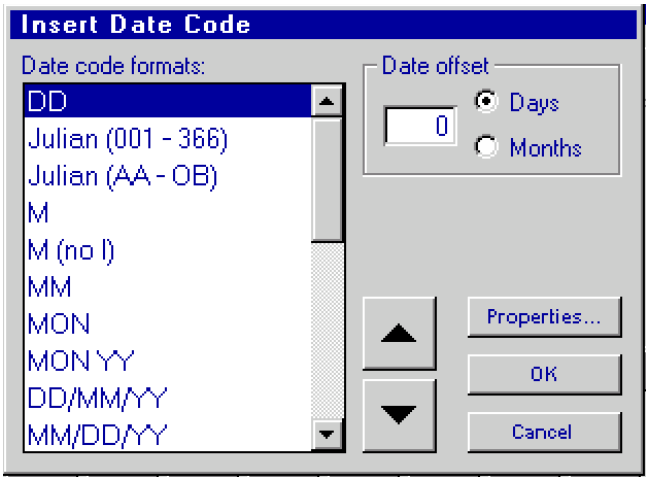


Message with time code

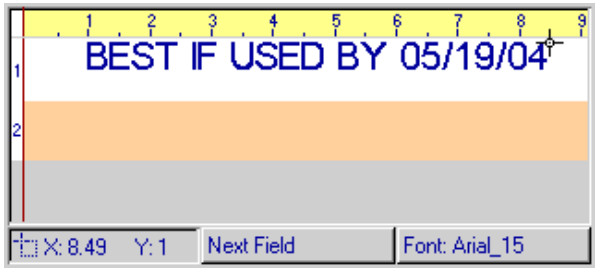
Adding a Date Code

To add a date code to the print message, move the crosshairs pointer to the desired location and touch the **Date Code** button; the Insert Date Code dialog box is displayed. Select a format for the date code from the list and, if the date code is for a future date, enter the number of days or months until that date in the **Date offset** box.

Touch the **OK** button to close the dialog box and insert the date code into the print message.



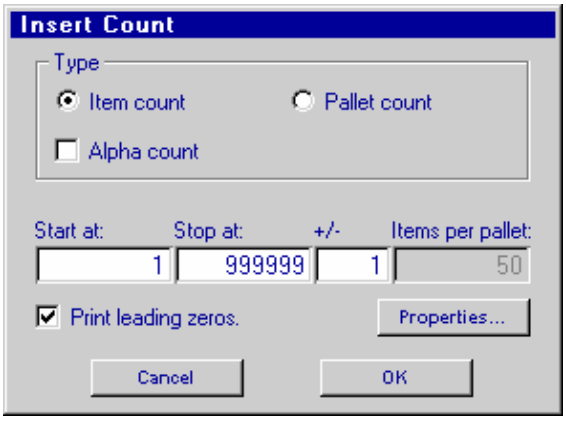
If the date code is not exactly where it should be, use the arrow keys to reposition it. Press **Enter** when the date code is at the desired location.



Message with date code

Adding a Product or Pallet Count

The Marksman Duo Vx can print increasing or decreasing item and pallet counts, with or without leading zeros, in numeric or alpha format. A numeric count may be up to nine digits long; an alpha count may be up to seven digits long.



Product count: To add a product count to the print message, move the crosshairs pointer to the desired location and touch the **Product Count** button; the Insert Count dialog box is displayed.

Increasing count: Enter a **Stop at** value that is greater than the **Start at** value.

Decreasing count: Enter a **Start at** value that is greater than the **Stop at** value.

Pallet count: Touch the **Pallet count** radio button and enter the number of items per pallet. A pallet count is incremented or decremented every *n* items, where *n* is the number of items per pallet.

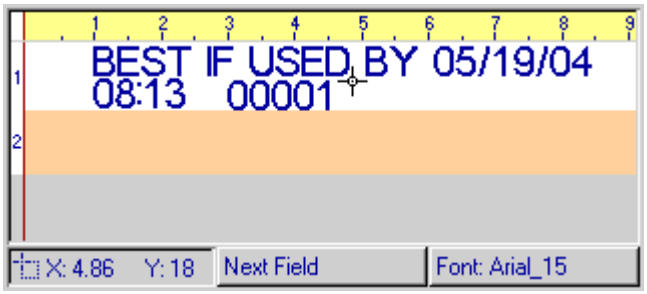
Alpha count: To count with letters instead of numbers touch the **Alpha count** check box. When **Alpha count** is checked, the contents of the **Start at** and **Stop at** boxes change from numbers to their equivalent alpha values.

There are two alpha count formats. Use the **Print leading zeros** check box to select the format desired.

1. **Print leading zeros** checked. When printing leading zeros, A = 0 by definition, so B = 1, C = 2, etc. The counting sequence is AB, AC, AD, … AY, AZ, BA, BB, BC, …
2. **Print leading zeros** not checked. Without leading zeros, A = 1, B = 2, C = 3, etc. The counting sequence is A, B, C, … Y, Z, AA, AB, AC, …

The +/- box: A product count is normally increased or decreased by 1 after every print cycle. To increase or decrease the count by a value other than 1, enter that value in the **+/-** box.

Touch the **OK** button to close the dialog box and insert the product count into the print message. If the count is not exactly where it should be, use the arrow keys to reposition it. Press **Enter** when the count is at the desired location.

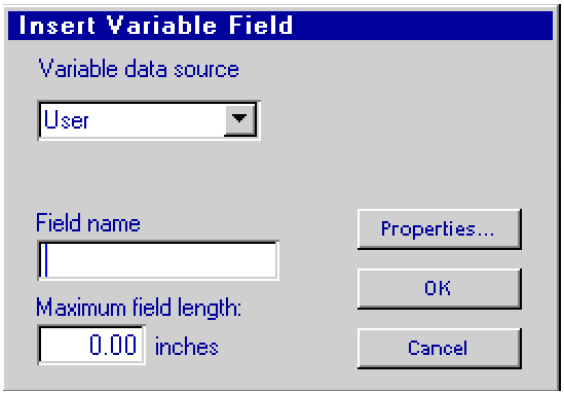


Message with product count

Adding a Variable Field

A variable field is a text field whose contents may change from use to use or print to print. The data printed may be specified by the user, or come through the COM1, COM2, or Ethernet port.

To add a variable field to the print message, move the crosshairs pointer to the desired location and touch the **Variable Field** button; the Insert Variable Field dialog box is displayed.



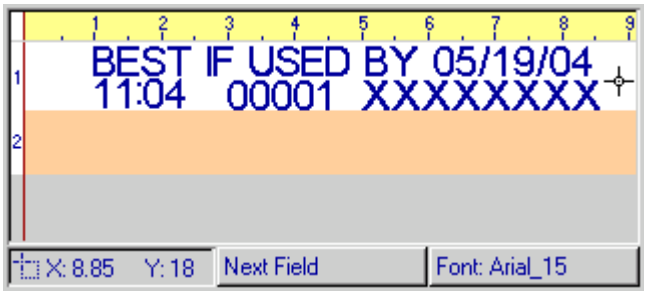
- Select the data source:

  User: The user is prompted to enter the data to be printed when the message is loaded to print.

  Data 1 - Data 10: Select Data 1 through Data 10 to use a common variable field in multiple locations. Data (1-10) can be selected and assigned a field name. This variable field can be placed multiple times in a message. When the message is printed, the field name will be prompted once for input, and will print the variable data in all locations where Data (1-10) was placed. The field length must be set for each location, as the font size can be changed for each data field. Up to ten different data fields can be placed in multiple message locations.

COM1, COM2: Select **COM1** or **COM2** when the data to be printed is from an external device such as a scale or bar code scanner. Multiple variable fields can use COM1 or COM2, but all will have the same information.

- Enter a field name. The field name identifies which variable field gets what data when **User** or **Data** is selected as the data source. It is not required for COM1 or COM2. For data variable fields, only one of each data lot can have a name.
- Enter a maximum field length to reserve space within the print message for the variable field.
- Touch the **OK** button to close the dialog box and insert the variable field into the print message. Variable fields are represented on the Edit Screen by a string of Xs. If the field is not exactly where it should be, use the arrow keys to adjust its position. Press Enter when the field is at the desired location.



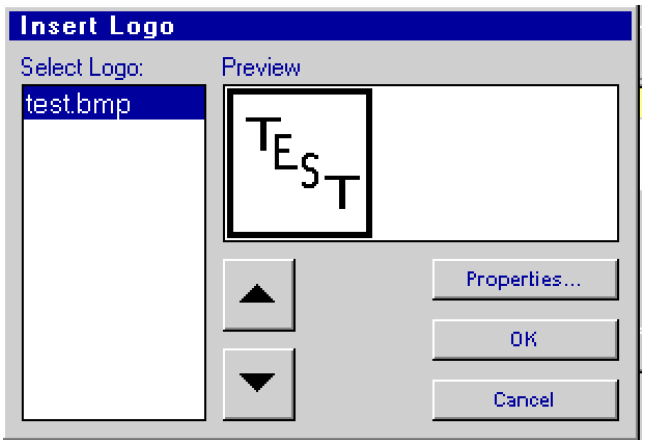
Message with variable field

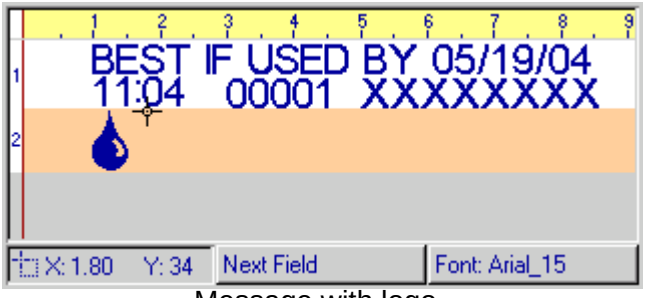
Adding a Logo

To add a logo to the print message, move the crosshairs pointer to the desired location and touch the **Logo** button; the Insert Logo dialog box is displayed.

Use the up/down arrows to select a logo. Touch the **OK** button to close the dialog box and insert the logo in the print message.

If the logo is not exactly where it should be, use the arrow keys to reposition it. Press **Enter** when the logo is at the desired location.





Message with logo

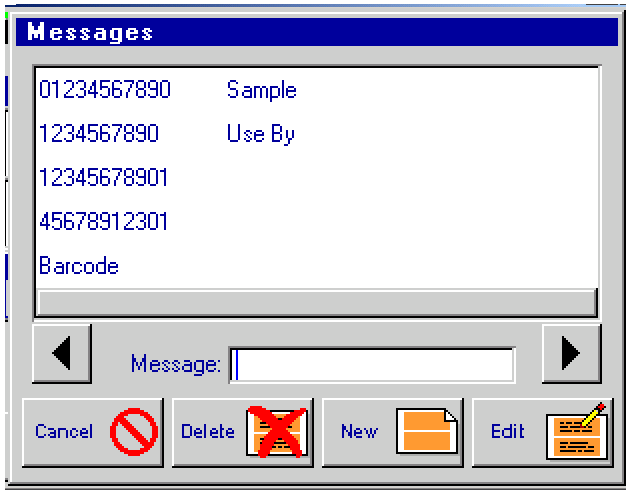
Editing a Message

From the Home Screen:

1. Touch the **Messages** button. The Messages dialog box is displayed.

2. Select the message you wish to edit from the list, or type the message name in the **Message** box.

3. Touch the **Edit** button. The Messages dialog box closes and the Edit Screen is displayed with the selected message in the edit window.



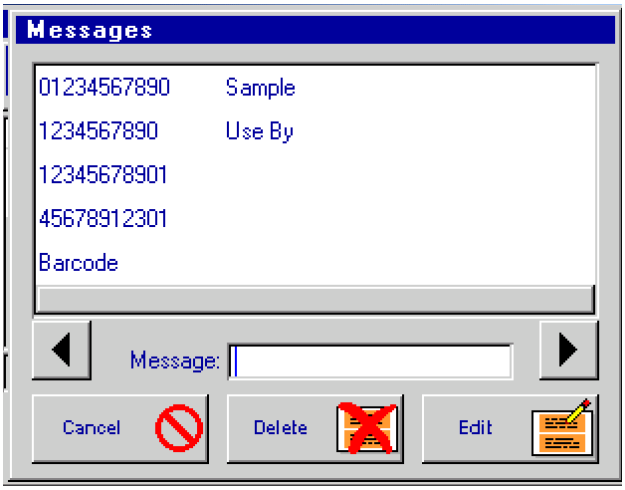
From the Edit Screen:

1. Touch the **Menu** button.

2. On the menu, touch the **Open** button. The Messages dialog box is displayed.

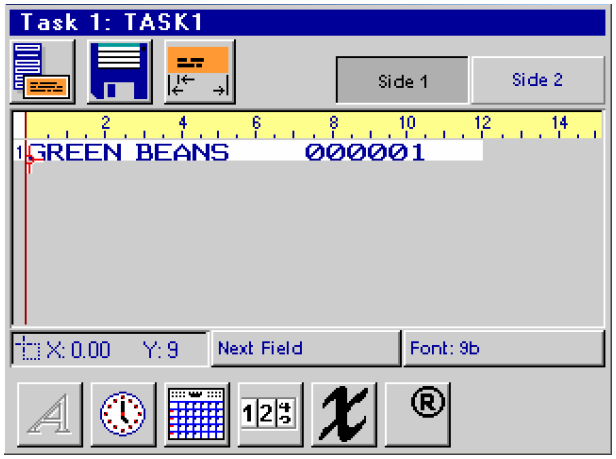
3. Select the message you wish to edit from the list, or type the message name in the **Message** box.

4. Touch the **Edit** button. The Messages dialog box closes and the message selected is displayed in the edit window.



Editing Fields

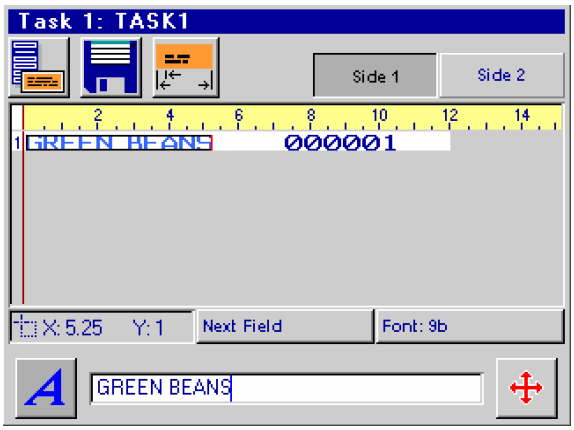
A field must be selected before it can be edited. When selected, all field types, except text fields, are displayed in red and outlined by a black box. When a text field is selected, it is first displayed in light blue. The light blue color indicates the text in the field can be edited. Press **Enter** and the field color changes to red, indicating the field can be moved.



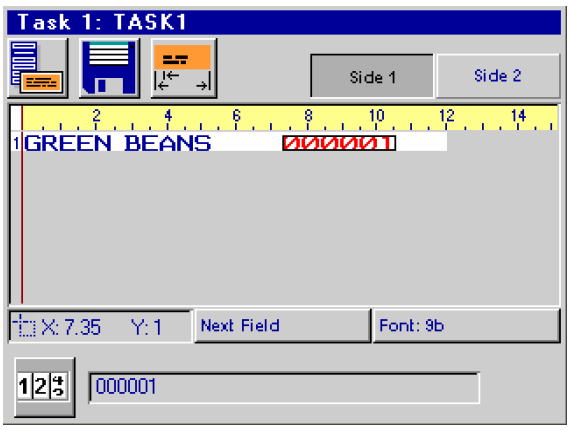
A field can be selected by touching the **Next Field** button, by pressing the **Tab** key, or by touching the field directly. When using the **Next Field** button or **Tab** key, the fields are selected one after another in the order in which they were added to the print message.

When a field is selected, the background of its corresponding field type button becomes dark gray to identify the field type. If the field contains text, the field type button moves to the left side of the display and a text box containing the field's text is displayed at the bottom of the screen. (See the following examples.)

Release a selected field by pressing the **Enter** key, or by selecting another field.



Text field selected



Count field selected

Editing a Text Field:

1. Select the field; its color changes from dark blue to light blue.
2. To edit the existing text:
   - •Use the **Left** and **Right Arrow** keys to move the cursor to the edit point.
   - •Press the **Backspace** key to delete characters to the left of the cursor.
   - •Press the **Delete** key to delete characters to the right of the cursor.
   - •Insert new text at the cursor point by typing.
3. To completely replace the existing text:
   - •Press the **Enter** key or touch the **Move** button at the lower right corner of the screen; the field's color changes from light blue to red.
   - •Type the new text. The new text replaces the old text.
4. To change a text field's color from red to light blue so that its text may be edited, touch the **Edit** button at the lower right corner of the screen.
5. To release the field, press the **Enter** key once if its color is red; press it twice if its color is light blue.


MOVE

EDIT

Editing All Other Field Types:

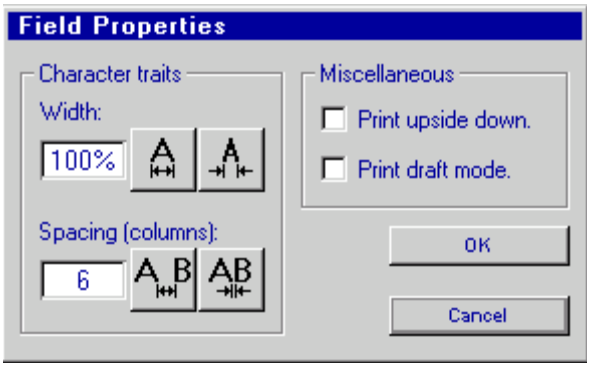
1. Select the field; its color changes from dark blue to red.
2. Touch the corresponding field type button (the button with the dark gray background); the field's Edit dialog box is displayed.
3. Make all desired changes.
4. Touch the **OK** button to close the dialog box and view the changes. Touch the **Cancel** button to discard all changes and close the dialog box.
5. Press **Enter** to release the field; its color changes from red to dark blue.

Deleting a Field:

1. Select the field; for a Text field, press **Enter** after it's selected. The field color will change from dark blue to red.
2. Press the **Backspace** or the **Delete** key.

Changing Field Properties:

Text Field:



1. Select the field; its color changes from dark blue to light blue.
2. Touch the **Text Field Properties** button; the Field Properties dialog box is displayed.
3. Change the field's properties as desired.
4. Touch the **OK** button to close the dialog box and view the changes. Touch the **Cancel** button to discard all changes and close the dialog box.
5. Press **Enter** twice to release the field; its color changes from light blue to red to dark blue.

All Other Field Types:

1. Select the field; its color changes from dark blue to red.
2. Touch the corresponding field type button (the button with the dark gray background); the field's Edit dialog box is displayed.
3. Touch the **Properties…** button; the Field Properties dialog box is displayed.
4. Change the field's properties as desired.
5. Touch the **OK** button to close the Field Properties dialog box. Touch the **Cancel** button to close the dialog box while discarding all changes.
6. Touch the **OK** button to close the Edit dialog box and view the changes. Touch the **Cancel** button to discard all changes and close the Edit dialog box.
7. Press **Enter** to release the field; its color changes from red to dark blue.

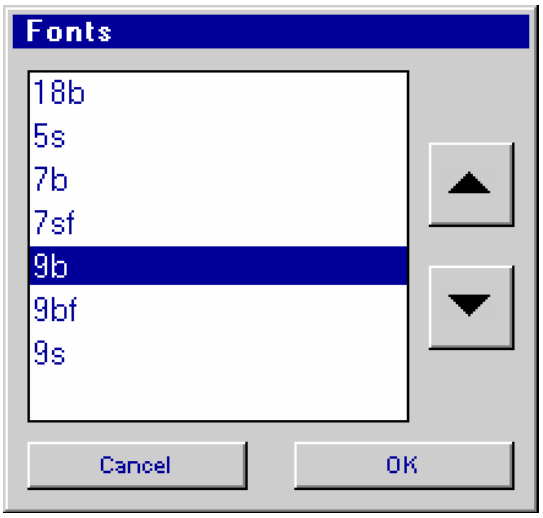
Character Width Trait will adjust the width of all characters in the selected text field. The factory default character width settings will produce characters and logos that are proportional to each print head type:

Default Character Width		
Print Head Type	Fonts	Logos (.bmp)
Vx	100%	100%

Print Draft Mode: If this box is checked, every other column of the field will print.

Changing a Field's Font:

1. Select the field.
2. Touch the **Fonts** button; the Fonts dialog box is displayed with the current font selection highlighted.
3. Select the new font.
4. Touch the **OK** button to close the Fonts dialog and view the change. Touch the **Cancel** button to discard the change and close the dialog box.
5. Press **Enter** to release the field.



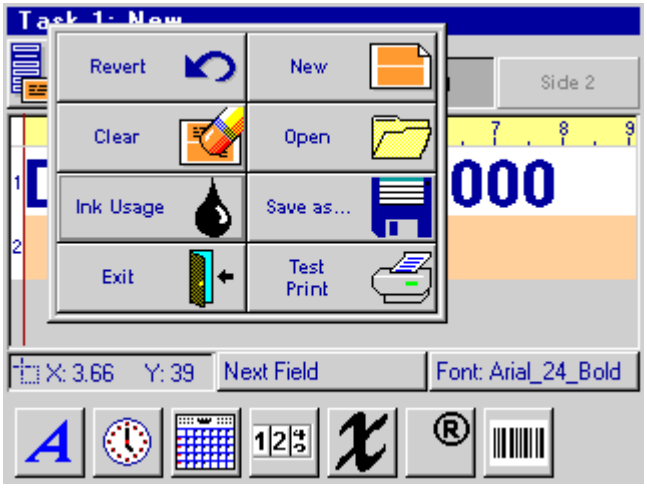
Edit Screen Keyboard Shortcuts

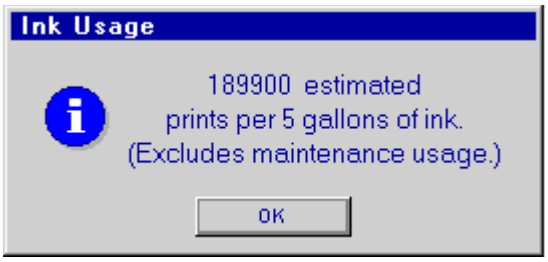
Ctrl X Cut the selected field from the print message.
Ctrl C Copy the selected field.
Ctrl V Paste (insert) the last field cut or copied at the current pointer position.
Ctrl S Save all changes made to the print message.
Ctrl O Open a message for editing or viewing.
Ctrl N Create a new print message.
Tab Move from field to field, or to the first field if no field is currently selected.
F1 Scroll the edit window left.
F2 Scroll the edit window right.
F5 Scroll the edit window up (only when zoomed in).
F6 Scroll the edit window down (only when zoomed in).
F4 Show the extended lowercase character dialog.
F8 Show the extended uppercase character dialog.

Estimating Ink Consumption

A utility available on the Edit Screen estimates a print message's ink consumption. To display the estimated ink consumption for the message being created or edited, select **Ink Usage** from the Messages Menu.

Ink consumption is reported as the estimated number of times the *entire* message will print per five gallons of ink for an Integrated Valve task. Ink consumption is calculated by multiplying the average drop volume by the total number of dots in the printed message.





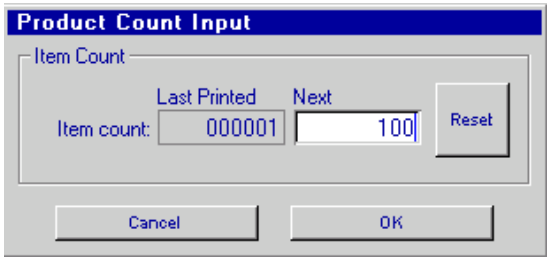
Side 2 = Side 1: When the **Side 2 = Side 1** option is selected, the total number of dots is determined by counting the number of dots on Side 1 of the message, then doubling it.

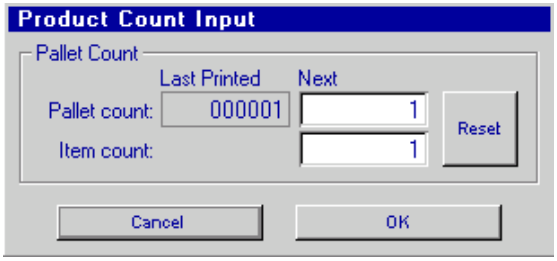
When estimating ink usage using the controller, the estimate is given in prints per 5 gallons of ink. To convert from prints per 5-gallons to prints per 13 fl-ozs, divide thegiven number of estimated prints by 49 (i.e.: 431300 prints per 5-gal converts to 8802 prints per 13 fl-oz).

Printing a Message

1. Touch the decorated **Print** button at the top of the **Home Screen** to access print options, then touch the **Print …** button. Or, touch the **Print …** button at the bottom of the screen.
2. Type in a message name, or touch a message name on the list, and touch the **Print It** button.

   When a message with one or more count codes is loaded for printing, a dialog box is displayed showing the current value of the count and allowing the operator to preset the count to any value within its defined limits. For messages with two or more counts, separate boxes are displayed, one after another, for each count.





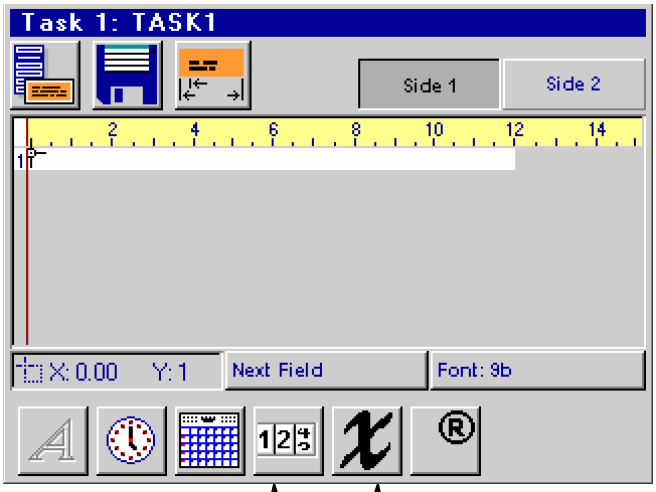
3. To stop printing at any time, open the print options list and touch **Cancel Print**. The system will prompt the user to confirm.

Deleting a Message

1. Touch the decorated **Messages** button on the **Home Screen**.
2. On the **Messages** screen, type in a message name or touch a message name on the list.
3. Touch the decorated **Delete** button. When prompted to confirm, touch **Yes**.

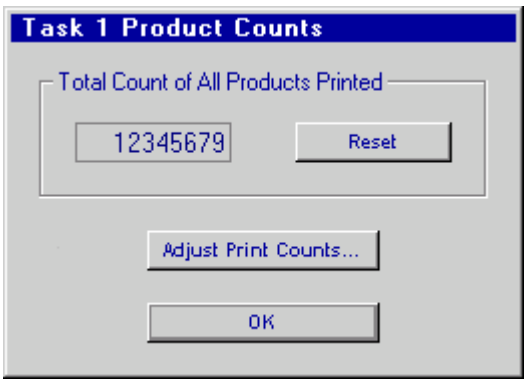
Making Adjustments During Printing

Product count and variable field data can be changed during printing, as long as the controller has not been set up for Message Look Up, Network Mode, Network Notification or Command and Control. Follow the instructions below for the type of information that needs to be changed.



Adjusting Product Counts

To adjust product counts for the current print message, touch the **Edit Counts** button on the Home Screen. The Product Counts dialog box is displayed:

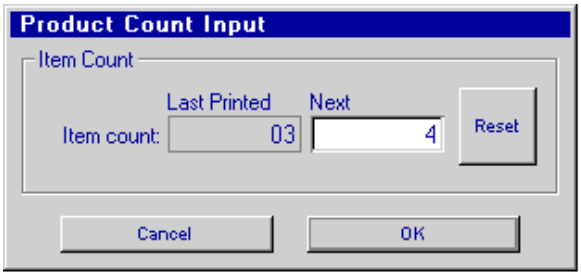


The "Total Count of All Products Printed" is a non-printing count that is incremented every print cycle. Touch the **Reset** button to reset this count to zero.

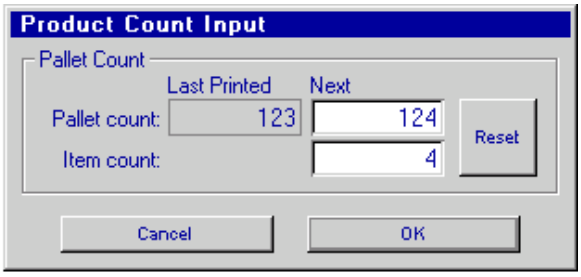
Touch the **Adjust Print Counts...** button to change the value of any printable count the current print message may have. If the current message has no counts, the **Adjust Print Counts...** button is grayed out.

Touch the **OK** button to close the dialog box and return to the Home Screen.

When the **Adjust Print Counts...** button is touched, and the current print message contains one or more counts, the Product Count Input dialog box is displayed:



Product Count Input dialog box for an item count.



Product Count Input dialog box for a pallet count.

To change the product count, touch the **Next** box, type in the new count, and press **Enter**. Enter a value lower than the count's defined minimum and it changes to the minimum. Enter a value greater than the defined maximum and it changes to the maximum.

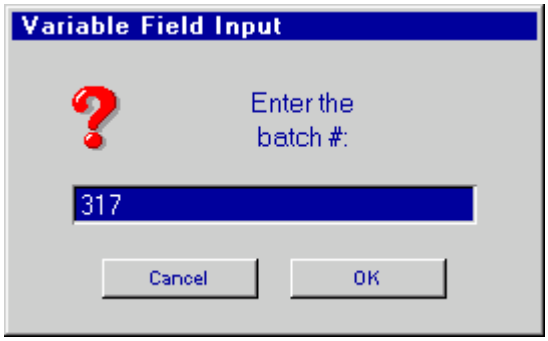
To reset a count to its starting value, touch the **Next** box, then touch the **Reset** button. Touch the **OK** button to confirm the change and return to the Home Screen, or if the message has more than one count, to go to the next count.

Touch the **Cancel** button to close the dialog box and return to the Home Screen without making any changes.

NOTE: The **Item Count** on the Pallet Count dialog is a count internal to the pallet count. It tracks the current number of items on the pallet. When this count reaches the defined items per pallet, the pallet count is incremented. This Item Count does not print. It is provided for those who want to print a pallet count only. If both a pallet count and an item count (for example, BOX 4 OF PALLET 124) are being printed, a separate Product Count Input dialog box will be shown for each count. To keep the item-pallet counts properly synchronized, the printable Item Count ('4' in the left illustration above) must match the Pallet Count item count ('4' in the right illustration above).

Changing Variable Field Data

To change the data printed in a User Variable Field or Data Variable Field using prompts, touch the **Edit Variable Fields** button. The Insert Variable Field dialog box is displayed:



Type in the new data. Touch the **OK** button to confirm the change and return to the Home Screen, or if the message has more than one variable field, to go to the next field.

Touch the **Cancel** button to close the dialog box and return to the Home Screen without making any changes.

Section 8: Frequently Asked Questions

Q: *Will changing the print resolution change the positioning of the print on the product?*

A: Yes. An increase in resolution moves the dots, and thus the characters, closer together, increasing the rate at which the message downloads to the print head, and thus starting the print cycle earlier. A decrease in resolution has the opposite effect.

In addition, the point at which the print head begins printing can be affected by the number and types of autocodes (which also affect download time) and conveyor speed.

Q: *Can I print an 18-dot font with VxJet 9X print heads?*

A: Yes. When entered as an 18-dot font, the data will span two message lines on the display, and will be printed by two VxJet 9X print heads.

NOTE: Printing an 18-dot font with two VxJet 9X print heads requires precise alignment of the heads. You will need to fine-tune both the vertical placement of the print heads on bracketry (see **Mounting the Print Heads**, *Section 4, Installation*) and the Product Sensor offset.

Q: *How do I use the Relay inputs and Isolated outputs listed in the software?*

A: The Duo does not support adding the Relay Board, which is required to use these features.

Section 9: Maintenance

The following are the recommended maintenance procedures to keep the ink 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 (cracked and/or chipped).
3. Be sure the nuts and bolts holding the bracketry in place remain tight.
4. Equipment may be cleaned utilizing the appropriate conditioner for the ink in use.

Caution: Do not spray conditioner on, or wipe off, exposed electrical connections.

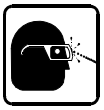
Annually:

Replace encoder O-rings.

Recalibrate Touch Screen.

Print Head Maintenance

Daily Startup



Wear safety goggles when working with industrial inks or solutions!

Clean print head faceplates with the appropriate conditioner for your ink supply. Spray conditioner on a lint-free wipe and wipe the faceplate in a circular motion to remove ink from the orifices.

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

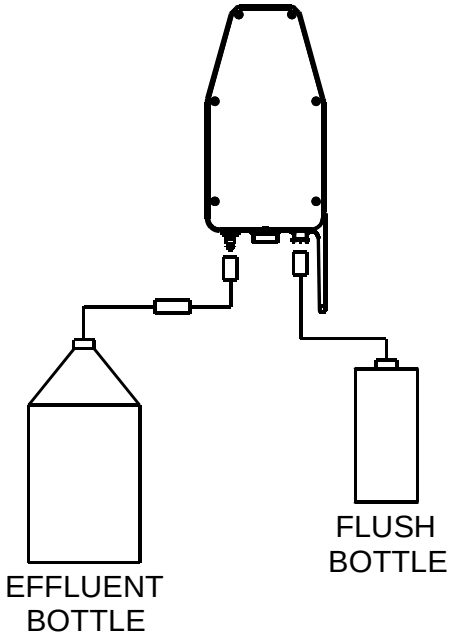
To check for proper purging, swipe a sheet of cardboard or other material across the front of the print head at about the normal printing distance as the print head purges. If all orifices are purging, the result should be a solid band of ink across the material. It is not uncommon for the first purge to show streaks where some of the orifices are not purging properly. Purge the head a few more times until all orifices are purging. Repeat the process with all the heads in the daisy chain.

Shutdowns of Seven Days or Longer

Flush and thoroughly purge the print head(s) and the ink supply.

After extended shutdown periods of a week or longer, it may be necessary to flush all print heads with conditioner, as follows:

1. Begin with the last print head in the system (the one just before the effluent bottle). To prevent ink drips, enclose the couplings in a clean cloth when changing connections. Have a cloth handy to wipe up any ink spills.



2. Disconnect the ink line from the female quick disconnect (upper fitting) on the back of the print head, and attach the Flush Bottle assembly (1902-964).
3. Close the shutoff valve and disconnect the effluent bottle assembly from the male quick disconnect that terminates the ink-feed line to the print heads.
4. Attach the effluent bottle to the effluent port's male quick disconnect (lower fitting) on the back of the print head, and open the shutoff valve.
5. Squeeze the flush bottle to force conditioner through the print head. Note the color of the liquid in the waste line, and continue flushing until it runs clear.
6. Close the shutoff valve and disconnect the effluent bottle and flush bottle assemblies.
7. Re-attach the ink line to the print head and purge the print head until ink is again flowing to the orifices.
8. Repeat steps 2 through 7 for each print head in the system.

Store the effluent bottle where it cannot be knocked over or damaged. When the effluent bottle is full, dispose of the waste in accordance with local, state and federal regulations.

Spare Print Heads

It is recommended that spare print heads be circulated into operation on a regular basis. Rotate the print heads every couple of months to keep them performing up to expectations. Rotating spare print heads prevents hardening of internal components, making startup much easier. Before returning a spare print head to the shelf, be sure to thoroughly flush with conditioner.

Ink Supply Maintenance

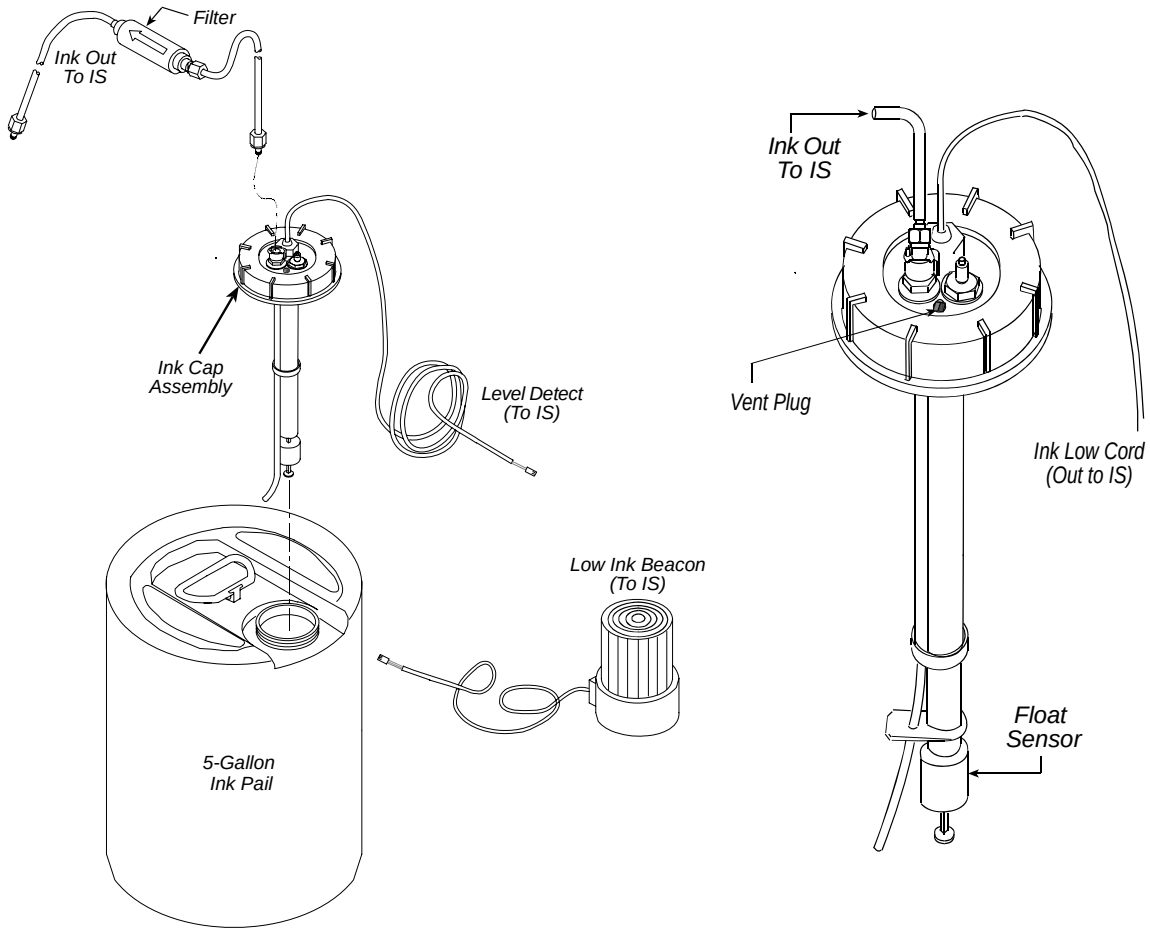
Changing Ink Containers

CAUTION: Porous ink must be used with a porous ink supply. Non-porous ink must be used with a non-porous ink supply. The ink supply can not be flushed to use a different ink type.

The Ink-Out Beacon lights when the ink pail is almost empty. This alerts the operator to ready a new pail of ink for changeover. However, it is not necessary to change ink until the beacon switches from a steady glow to a slow flash, signifying that the pail is empty.

When the beacon begins flashing, the system will continue to print, as the accumulator contains enough ink for a few more minutes of operation. The amount of print time remaining is dependent on the number of print heads and the message being printed, so the operator may have anywhere from five to thirty minutes to change the ink container. If timely action is not taken, printed dots will begin to diminish in size until they disappear altogether.

NOTE: Allowing the system to run longer with the beacon flashing will not pump more ink out of the pail. A flashing beacon means the accumulator is no longer receiving ink from the pail. Any ink remaining in the bottom of the pail should be carefully poured into the new pail or disposed of in accordance with state and local regulations.



The following procedure explains how to change ink while the system continues to print. Determine whether the system is using porous (TWP) or non-porous (TSO) ink, and replace with the same type of ink.

Changing ink colors is a two step process: First flush the system with the appropriate conditioner for your ink type, then change ink colors - making sure to use the same ink type. Changing ink colors without first flushing the system with conditioner may damage the system.

NEVER USE PIGMENTED INK IN THE INK SUPPLY. This system is not designed to operate with pigment particles. Use of pigmented ink will permanently clog the ink supply.

Wear eye protection and use appropriate safety equipment when changing pails of ink.

1. Disconnect the 1/8" supply line from the female quick-disconnect in the ink pail cap, and set the empty pail aside.
2. Set the new pail in place and remove the cap.
3. Remove the cap assembly from the empty pail and insert it into the new pail. Tighten snugly by hand.
4. Connect the 1/8" ink supply line from the ink supply to the female quick-disconnect on the ink cap. Make sure the couplings snap into place.
5. Press the Prime button on the ink supply momentarily to prime the system. The beacon should turn off.

Daily Startup

Be sure all ink lines are undamaged and free of entanglement before operation.

Intermittent (as required)

When disconnecting ink lines, spray the quick disconnects with the appropriate ink conditioner to prevent them from sticking open.

Annually

Replace the filter assembly as follows:

1. Disconnect the old filter assembly via the quick disconnects at the rear of the ink supply and at the ink supply container.
2. Connect the new filter assembly (5760-319) by snapping the ends into the quick disconnects. Be sure the arrow on the filter is facing toward the ink supply.
3. Discard the old filter in accordance with local regulations.

CAUTION: Ink is under pressure within the ink supply and ink lines. Be sure to bleed pressure from the system prior to removing any components.

Section 10: Troubleshooting

The VxJet 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 Notes

Ink Supply

Most ink supply problems involve an empty ink container, kinked or crushed ink lines, or leaks (internal or external). If there are no apparent leaks, the ink supply container is not empty, and the ink supply will not supply sufficient pressure at the output, the pump is the most likely suspect. The accumulator rarely fails, so all other suspect components should be checked first. Check the power fuse (F1) and the beacon fuse (F2). (See *Appendix B, Theory of Operation* for more information.) The normal output pressure should be 20-25 psi.

Print Heads

Electronic failures in the print head will normally open the print head fuse, which will open the 15VDC line to the driver board and the daisy chain output connector. Mechanical problems generally show up as leakage or print quality issues, but distance from the substrate and solenoid pulse width will also effect overall print quality.

Troubleshooting Tests

Purge Test

This test will determine if the print heads are functional.

1. Place cloth in front of print head front plate.
2. Press and hold the Purge button according to procedure in *Section 9, Maintenance*.
3. Listen for solenoid buzz.
4. Check for ink on cloth.

NOTE: An encoder signal is not required for the purge function.

If solenoids buzz and ink dots appear on cloth, the print head is functional.

If solenoids buzz but no ink dots appear on cloth, the print head is clogged or there is an ink supply problem.

If solenoids do not buzz, there may be a cable, print head, or controller electronics failure.

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 tripping photocell.
3. Check for ink on cloth.

Printed dots on cloth indicate that the system is printing; delay may be set incorrectly, or photocell is not sensing product correctly.

No ink on cloth indicates that the system is not printing.

Print Head Ink Pressure Test

This test will determine if the print head pressure is correct.

1. Connect the ink pressure gauge (5700-743) to the ink out port on the rear of the print head, or monitor the ink pressure via the LED at the rear of the print head.
2. While printing (not purging), check the pressure; refer to the print head pressure chart for the optimum pressure for your print head. The ink pressure gauge must be level with the print head. Note that pressure can vary by as much as 0.75 PSIG while printing.
3. Pressure should be such that the nominal print head pressure is centered within the deflection of the gauge

If pressure is not correct, see *Setting Ink Pressure* later in this Section.

Ink Regulator Input Pressure Test

This test will determine if the regulator input pressure is within operational range.

1. Connect ink pressure gauge to end of ink line where effluent line is normally attached.
2. Check that pressure does not fall below 10 PSIG at any time.

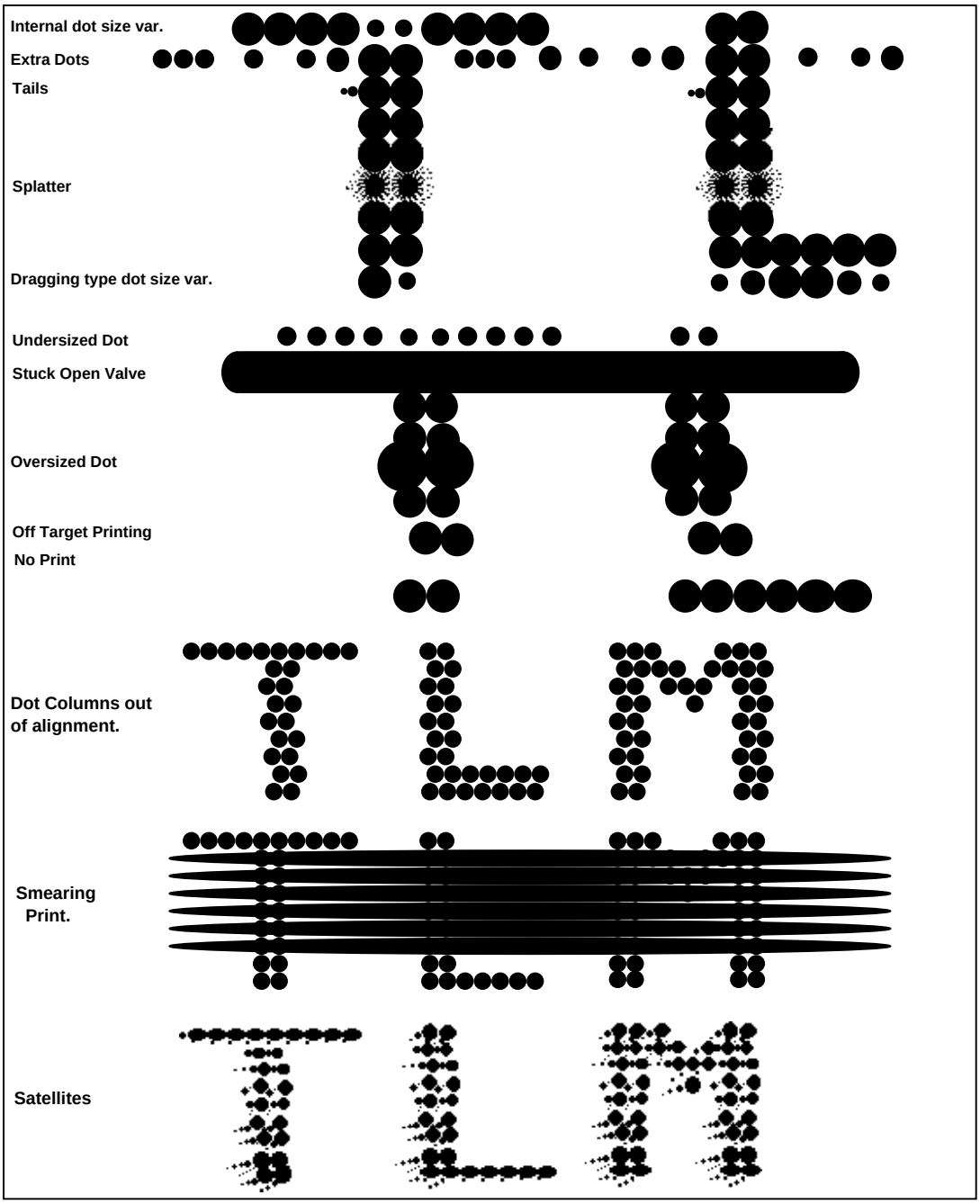
NOTE: The lowest pressure should be just prior to when the pump turns on.

Print Quality Troubleshooting

Diagnosis

HOW TO USE THIS SECTION:

1. Look at the problem characters on your substrate and compare them with the figure below to diagnose the exact name for the problem.
2. Look at the next segment entitled "Print Quality Definitions" to verify that you classified the problem correctly.
3. Look at the table on the following page to identify possible causes for your printing problem.
4. See subsequent pages for solutions to various print quality problems.



Print Quality Definitions

[1] Internal Dot Size Variation	The system prints dots that are different in size.
[2] Extra Dots	The system continues to print dots outside the designated dot columns.
[3] Tails	The system prints dots with small trails of ink.
[4] Splatter	The system prints shapeless dots surrounded by tiny "aerosol" dots.
[5] Dragging type dot size variation	The system prints different size dots.
[6] Undersized Dot	The system prints dots that are smaller than normal.
[7] Stuck Open Valve	The system prints a solid row of ink ejecting from an orifice.
[8] Oversized Dot	The system prints dots that are larger than normal.
[9] Off Target Printing	The individual dots do not line up exactly.
[10] No Print	The system prints nothing.
[11] Dot Columns Out of Alignment	The dot columns do not exactly line up.
[12] Smearing Print	The system prints individual dot columns that run together giving a "dirty" look to the printed message.
[13] Satellites	Any extraneous ink particles found near the printed dots.
[14] Message Broken	Incomplete printing or gaps in printed message.
[15] Dynamic Seepage	Seepage from orifices during print.
[16] Static Seepage	Seepage from orifice when system is not printing.
[17] Missing Dots	Individual print head dots not printing.

NOTE: Seepage is defined as ink running down the front plate from one orifice far enough to connect to an adjacent orifice.

PRINT QUALITY PROBLEM	POSSIBLE CAUSE
Internal Dot Size Variation	• Low ink pressure
Extra Dots	• High ink pressure • Pulse width set too high • Incorrect pre-load
Tails	• Print head too far from the target • Pulse width set too high • Incorrect pre-load
Splatter	• Print head too far from the target • Pulse width set too high • Incorrect pre-load
Undersized Dot	• Low ink pressure • Pulse width set too low • Incorrect pre-load
Stuck Open Valve	• High ink pressure • Pulse width set too high • Incorrect pre-load
Oversized Dot	• High ink pressure
Off Target Printing	• Print head too far from target • Low ink pressure
No Print	• Low ink pressure • Pulse width set too low • Print head failure • Controller or cabling failure
Dot Columns Out of Alignment	• Internal line speed turned on • Incorrect direction selected in software
Smearing Print	• Print head too close to target • Incorrect ink usage for your application
Satellites	• Print head too far from target
Message is Broken	• Photocell is triggering multiple times per box • Loose cable connections
Garbled Printing	• System improperly grounded • Excessive line noise
Dynamic Seepage	• Pulse width set too low • Low ink pressure • Incorrect pre-load
Static Seepage	• High ink pressure • Incorrect pre-load
Missing Dots	• Pulse width set too low • Clogged orifice

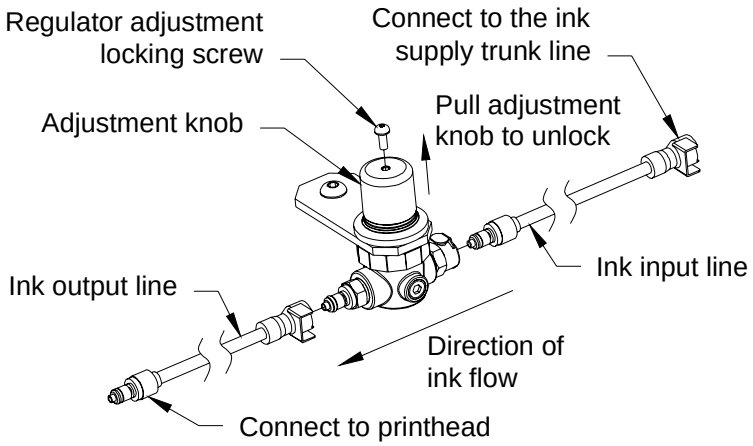
NOTE: Pre-load adjustment should be performed after all other causes are eliminated.

Setting Ink Pressure

Ink pressure must be set within specifications. Lowering the ink pressure to alleviate print head seepage may result in performance and reliability problems. The design relies on the equilibrium of ink pressure, pre-load, and pulse width.

The orifice size and membrane excursion areas have been specifically tuned to work with the ink pressure specified for the print head. When operating correctly, all ink will jet from the orifices and leave only a moist seal of the membrane against the orifice. Lowering the pressure reduces the dot velocity and does not allow all of the ink to evacuate through the orifices. The ink left behind will seep out and run down the front plate.

1. Either connect a pressure gauge to the back of the print head ink or monitor the ink pressure via the LED at the rear of the print head (depending on print head type).
2. Monitor ink pressure while printing. Note that the pressure drops by as much as 0.75 PSIG (usually less) during the print cycle. Nominal pressure should be centered within the deflection range while printing.
3. If pressure is low, remove the regulator adjustment locking screw and pull the adjustment knob up into the unlocked position (see illustration).
4. Open the regulator by slowly turning the knob clockwise until the nominal print head pressure while printing is centered within the deflection of the gauge.



5. Check pressure 15 minutes after setting it. The pressure should be within the same range +/- 0.5 PSIG. If not, perform the regulator maintenance procedure.

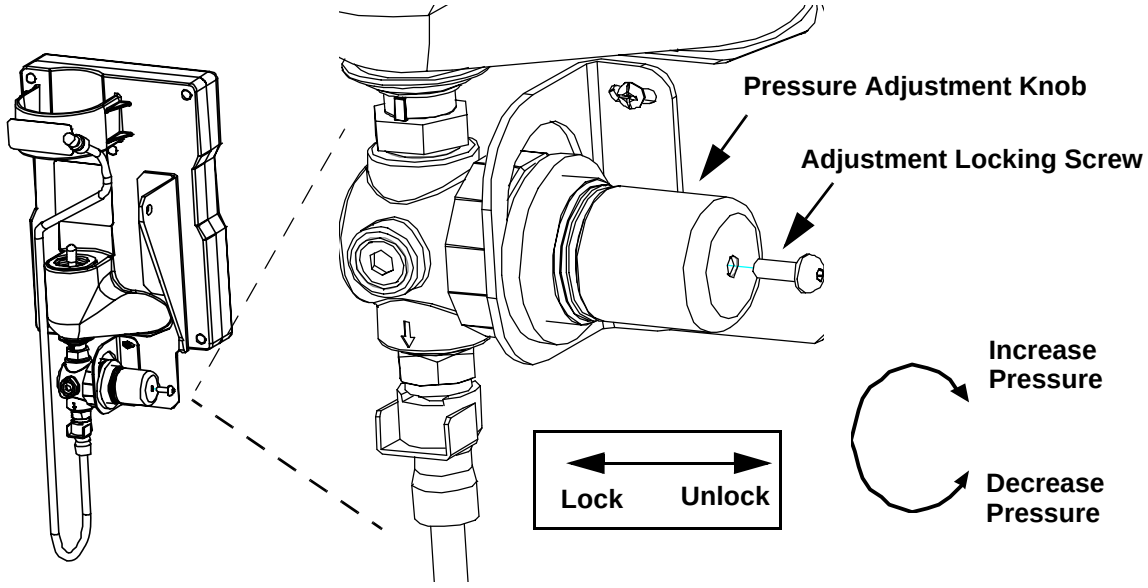
NOTE: Lowering the ink pressure also reduces the amount of ink that reaches the substrate. To compensate for the lighter mark, the technician may increase the pulse width to obtain an acceptable size dot. By doing so, the pulse width can exceed the maximum recommended by specification and significantly lower the life expectancy of the solenoid. In high line speed applications, the mortality of the solenoid will shorten exponentially.

Ink Regulator Maintenance Procedure

Pressure swings (decreasing and increasing pressure from nominal setting) can be caused by obstructions in the valve seat of the ink regulator. Obstructions in the valve seat area may also cause the pressure to creep up over a period of time (for example, the pressure is set at 7 PSIG, and fifteen minutes later it has increased to 9 PSIG).

The following maintenance procedure can remove obstructions from the valve seat area of the ink regulator, restoring normal operation.

1. Ensure that the system is idle and not in print mode.
2. Install a NEW can of conditioner into the receiver (ink may be used, but conditioner is preferred).
3. Unplug the ink line from the printhead.
4. Plug the ink line into an effluent bottle (5750-503).
5. Remove the regulator adjustment locking screw, and pull the pressure adjustment knob into the unlocked position.
6. Rotate the pressure adjustment knob clockwise until it stops, then counterclockwise until it stops. Repeat six to twelve times.
7. Disconnect the ink line from the effluent bottle and re-connect it to the printhead.
8. Turn the ink regulator off (completely counter-clockwise).

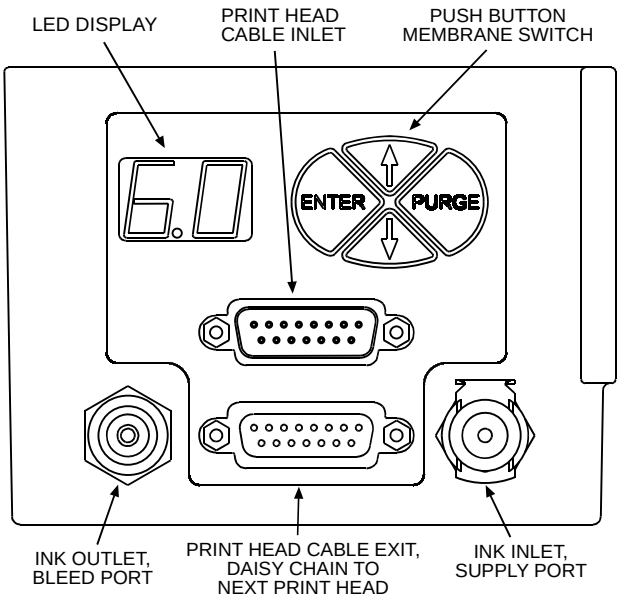


9. Attach a pressure gauge to the ink outlet (male quick-disconnect). The gauge must be level with the printhead for accurate measurements.
10. Increase the regulator to 7psi (nominal operating pressure).

NOTE: The ink regulator pressure setting should always be adjusted by turning the pressure adjustment knob clockwise (increasing pressure). Never set the regulator pressure by turning the knob counterclockwise (decreasing pressure). If the regulator was adjusted above desired setting, turn the regulator knob fully counterclockwise until it stops and purge the printhead to relieve internal pressure. Then, slowly open the regulator by turning it clockwise until the desired pressure has been achieved.

Print Head Pulse Width Adjustment

When a print head solenoid is on, the piston pulls away from the membrane, ink pressure moves the membrane away from the orifice, and ink is expelled through the orifice to form a dot. When the solenoid turns off, the piston moves forward which pushes the membrane forward to seal the orifice. Solenoid pulse width controls the amount of time that the solenoid is on. If printed **dots are over- or undersized**, pulse width adjustment may be required.



To adjust the pulse width, hold down the up and down arrows simultaneously. The last channel to be accessed will be displayed. Press the ENTER button. The pulse width setting will be displayed. This value is relative and can range between 15 and 65. The higher the value, the larger the dot size, and vice versa. **Generally, pulse width adjustment on a new print head is not recommended. These values are factory set.** However, it may be necessary to increase pulse widths if there are long print head cable lengths in the daisy chain. Decreasing the pulse widths will likely result in missed dots at first start-up. If a pulse width is changed, the ENTER button must be pressed to save the new value(s). Again, press the down arrow until "Pr" is displayed. Press ENTER to exit to the Home Screen.

NOTE: If the ENTER button is not pressed, the display will revert to the home screen after 30 seconds and the pulse width value will not be saved.

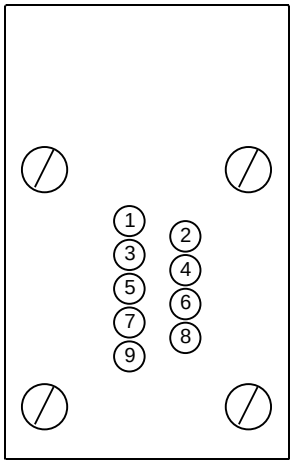
Cleaning the Front Plate of a Clogged Print Head

If dots are missing from the print, the print head front plate may have dried ink or debris covering the orifices. To clean the front plate:

1. Wipe the front plate with a conditioner-wetted towel (towel should be very wet).

NOTE: A squeeze bottle of conditioner can be used to flush the front plate.

2. Purge the print head; check if missing dots are purging.
3. Wipe the front plate with a conditioner-wetted towel and inspect front plate. (There should be no dried ink or debris on front plate).
4. Repeat steps 1 through 3 until front plate is clean. If cleaning the front plate and purging do not clear the clogged orifice, follow the orifice broaching procedure.



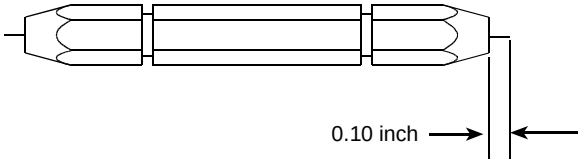
Printhead front plate orifices (NOT TO SCALE)

Broaching the Orifice

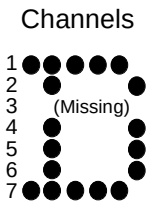
If a print head orifice is clogged or obstructed and wiping the front plate and purging will not clear it, the appropriate orifice should be broached.

CAUTION: Failure to follow the broaching instructions can result in damage to the print head.

1. Wipe the front plate with a conditioner-wetted towel.
2. Make sure the broach pin does not extend out of the handle more than 0.10 inch. This will ensure that the broach pin will not poke a hole in the membrane and cause internal leaking. (Internal leaking will show up as a no print failure several weeks later.)



3. Identify the clogged orifice by identifying the missing dot(s) from a print sample.

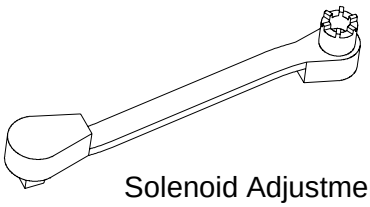


4. Count the orifices on the front plate up or down to locate the clogged orifice. A flashlight may be necessary as the orifices are very small.
5. Carefully insert the broach pin into the orifice until the handle touches the front plate. Remove the pin and create a print sample.
6. If the print sample shows that the orifice is still clogged, purge the print head and make a second print sample.
7. If still clogged, count the orifices again to make sure you are broaching the correct orifice, and repeat steps 5 and 6.

CAUTION: Avoid broaching repeatedly. The broach pin is like a microscopic file that will enlarge the orifice with repeated insertions. The enlarged orifice will seep ink, print off target or produce other print anomalies.

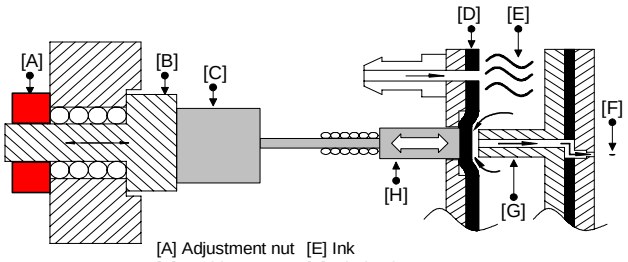
Print Head Pre-Load Adjustment

WARNING: Wear safety goggles when servicing the print system.



Solenoid Adjustment Tool

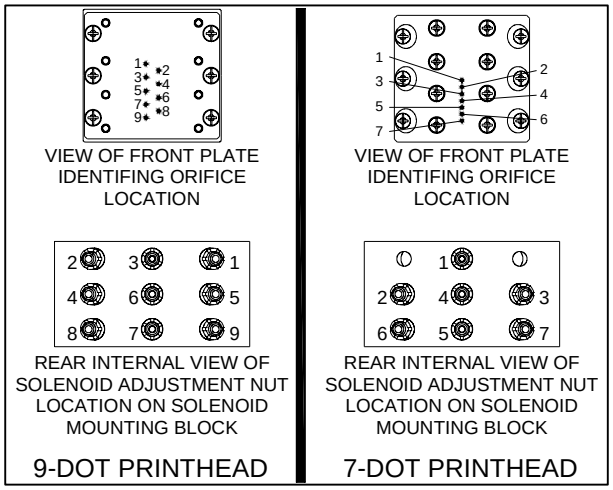
If a print head is leaking when not printing (static leakage), it requires solenoid preload adjustment. Pre-load is the amount of force a piston **[H]** applies to the membrane in the print head **[D]** to prevent ink **[E]** from leaking when the print head is idle or not printing. The Preload Pressure is 9 psig, and the Operating Pressure is 7 psig.



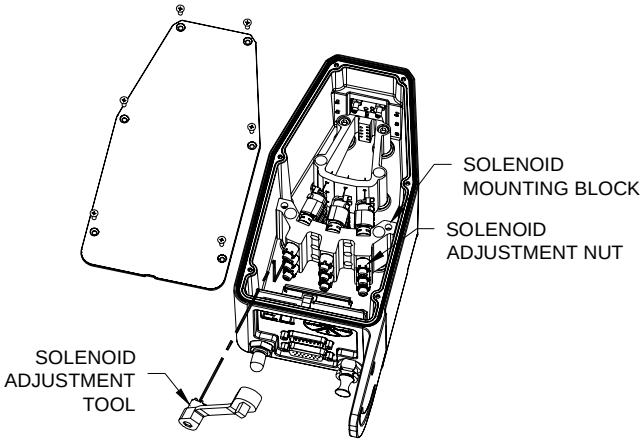
[A] Adjustment nut
[B] Bushing
[C] Solenoid
[D] Membrane
[E] Ink
[F] Ink droplet
[G] Chamber plate post
[H] Piston

Preload Adjustment Procedure:

1. Adjust the regulator to the preload pressure.
2. Clean the front plate with a clean cloth and maintenance spray.
3. Remove the print head enclosure cover.
4. Channel Purge the print head.
5. Clean the front plate with a clean cloth and maintenance spray.
6. Identify the orifice that is leaking from the diagram at right.
7. Use the diagram at right to locate the adjustment nut that controls the leaking orifice.
8. Using the solenoid adjustment tool, SLOWLY AND CAREFULLY turn the adjustment nut counter-clockwise approximately 1/8 turn to add additional pressure to the piston.



CAUTION: Excessive preload will damage the print head.



9. Channel Purge the print head again.
10. Clean the front plate again with a clean wipe and maintenance spray.
11. If no static leakage is observed after 1 minute, then replace the print head enclosure cover. If static leakage continues, then repeat the pre-load adjustment procedure until static leakage stops.
12. Adjust regulator pressure to operating pressure.

Appendix A: Specifications

Controller Specifications

Size

Height: 10.5" [266.7mm]

Width: 9.64" [244.9mm]

Depth: 2.89" [73.4mm]

Weight: 6.6 lbs (3.0kg)

User Interface

Type: Graphical User Interface

Keyboard: 70-key, QWERTY style, elastomeric keyboard

5.7" Display: 320 x 240 color LCD with touch screen, 5.7" diagonal

Fonts

5-dot, 7-dot, 9-dot and 18-dot

Storage

1 meg flash memory is available for message files and logo files. With automatic on-the-fly file compression, effective storage is 2+ meg.

Print Speed

Up to 650 fpm

Maximum Field Length

Up to 256 characters long (81 inches for variable field)

Maximum Product Length

200 inches

Maximum Repeat Print Distance

200 inches

Print Heads, using VxJet IS Duo

2 - IV9Dot Heads

2 - IV18Dot Heads

Print Heads, using VxJet IS

8 - IV9Dot Heads

4 - IV18Dot Heads

Encoder

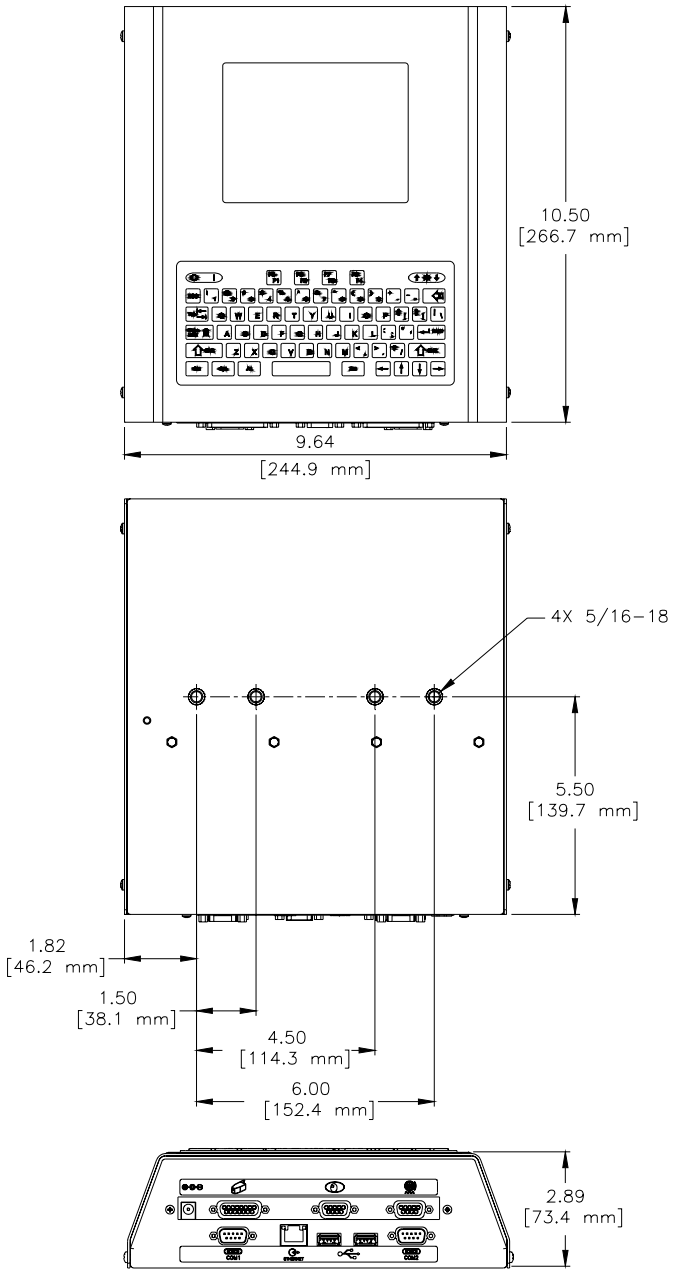
2400 ppr/300 ppi, TTL Level, 5-26 VDC

Product Sensor

15 VDC, current sinking, active low

Ports

(2) RS-232 ports, (1) 100Base-T Ethernet port



Enclosure

Powder-coat painted industrial enclosure

Print Performance

Integrated Valve - Up to 28 lines of print at 650 fpm (See *"Appendix D: Maximum dpi Calculation for a Given Line Speed" on page 101*.)

Electrical

90-260 VAC, 50/60 Hz, 3.0A max. (power supply input)

15VDC, 4.6A (controller input)

Environment

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

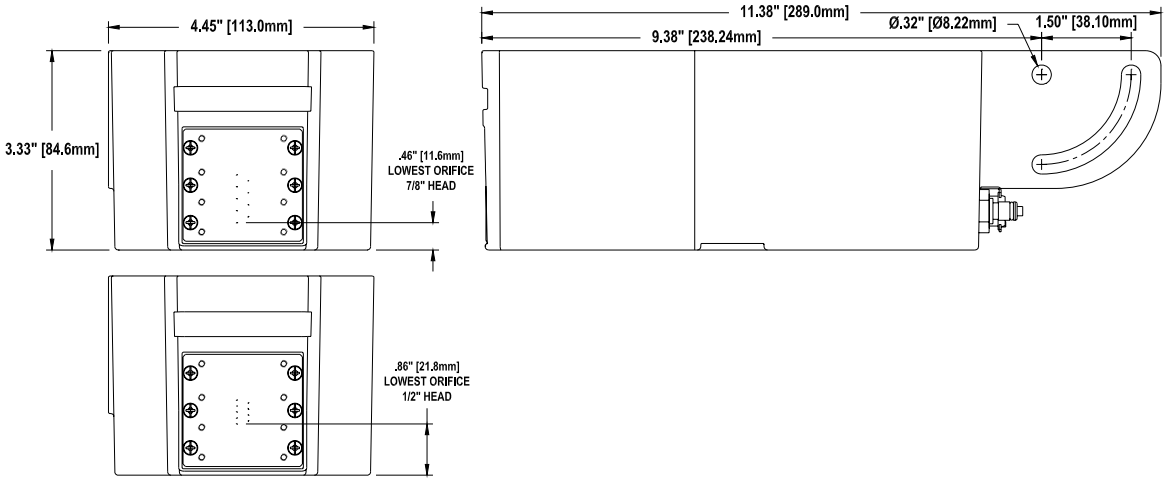
Operating humidity: 10 - 90%, non-condensing

Maximum Distance Between Print Head and Controller

35 feet for a system using a pressurized ink can ink supply

100 feet for a system using a standard IS

Print Head Specifications



Weight	5.4 lbs (2.4 kg)
Enclosure	Paint over anodized aluminum
Electrical	15 VDC input from controller
Ink Filtration	25 micron in-line
Print Speed	Up to 650 ft/min (print resolution dependent)
Ink Type	Porous (water based) or Non-Porous (alcohol or MEK based) as indicated on label.
Operating Pressure	7 psi ink input
Environment	Ambient operation temperature: 40°F to 104°F (10°C to 40°C) Operating humidity: 10 - 90% non-condensing

IS (Ink Supply) Specifications

Size

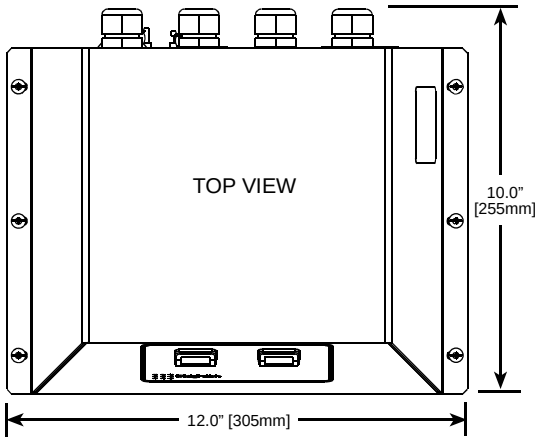
Height: 5.7" (144mm)

Width: 12.0" (304.8mm)

Depth: 10.0" (255mm)

Weight: 14 lb. (6.4kg)

Cable Clearance: 3" from the rear of the ink supply



Enclosure

Cold rolled steel (painted black) or stainless steel

Ink Filtration

100 micron absolute (5760-319 Ink Filter Assembly)

Electrical

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

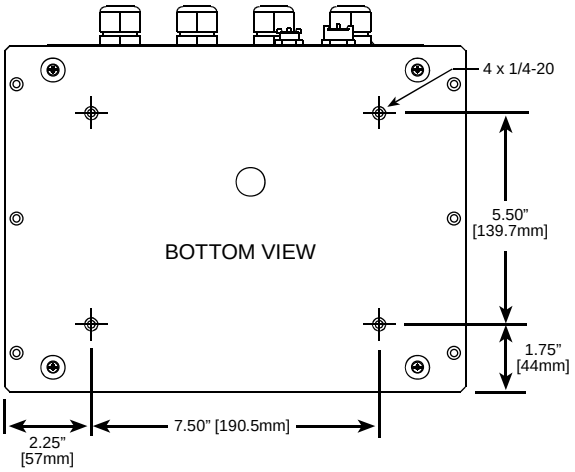
European: 207VAC-253VAC, 50Hz, 0.5 Amp max.

Normal Operating Pressure Range

20 psi to 25 psi (approximately)

Cable Ports

- Ink low level
- Ethernet
- Power cord
- Ink status beacon



Environment

Ambient operating temperature: 40°F to 104°F

Operating humidity: 10-90%, non-condensing

Tubing Limitations

Maximum horizontal tube length = 100 ft.

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

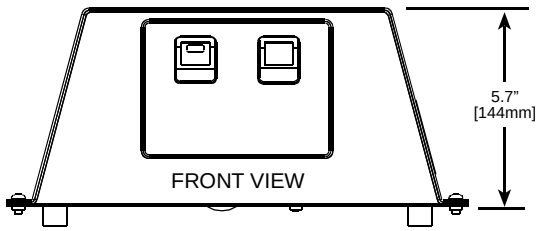
Ink Supply Limitations

Maximum height above ink supply (top of ink supply to bottom of ink supply) = 8 ft.

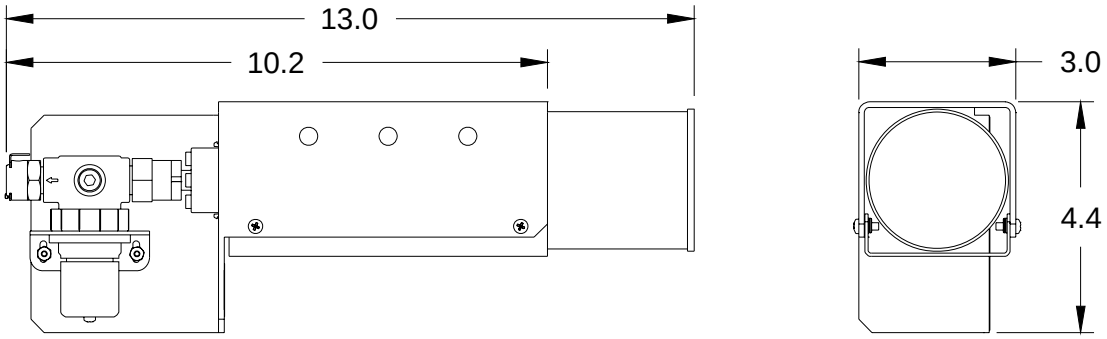
Maximum distance below ink supply (bottom of ink supply to bottom of ink supply) = 8 ft.

Maximum horizontal distance between ink supply and supply = 8 ft.

Maximum number of valves = 144



VxJet IS Duo Specifications



Enclosure

Stainless Steel

Normal Operating Pressure Range

15 psi (approximately)

Tubing Limitations

Maximum Horizontal tube length = 25 ft.

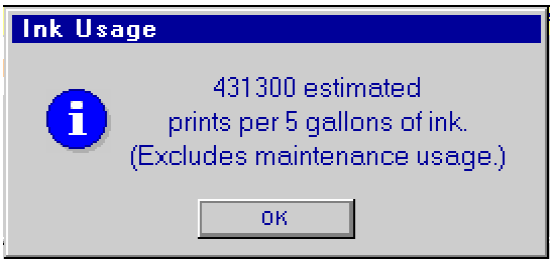
Maximum vertical tube length (bottom of IDS to bottom of highest print head) = 10 ft.

System Limitations

Maximum number of print heads: 2

Ink Usage

When estimating ink usage using the controller, the estimate is given in prints per 5 gallons of ink. To convert from prints per 5-gallons to prints per 13 fl-ozs, divide the-given number of estimated prints by 49 (i.e.: 431300 prints per 5-gal converts to 8802 prints per 13 fl-oz).



Appendix B: Theory of Operation

Functional Description

The VxJet ink jet system prints text, autocodes (such as product counts or time and date stamps) 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, top, or bottom. 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.

Print Head Daisy Chain(s)

Print heads attach to the VxJet 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 plugs into the second, etc. A daisy chain can be up to 72 dots long (eight 9-dot heads, four 18-dot heads, or a combination of 9- and 18-dot heads totaling no more than 72 dots).

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 72 times and you've output a column of print data. A latch (print) signal sent after the 72 dots have been shifted prints the column.

The VxJet always sends 72 dots of print data per column regardless of the number of print heads on a daisy chain. On a daisy chain with less than 72 dots the first dots shifted out are lost, not printed. For example, a daisy chain with two 18-dot heads prints the last 36 dots sent; the first 36 dots are lost.

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.

Photosensor

The photosensor detects when a product is about to pass by the print heads and signals the VxJet 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.

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 VxJet has two encoder options, external and internal. Use the external encoder where the conveyor speed fluctuates. You can use the internal encoder when the conveyor speed is constant.

IS (Ink Supply) Features

The IS provides ink to the print heads. In addition to pumping ink from the supply container, the ink supply is programmed with the following features:

1. *Continuous monitoring and maintenance of ink line pressure.* Whenever the pressure drops to a level of 20 psi, the ink supply pump turns on for five seconds and the pressure returns to a level between 23 and 27 psi.
2. *Ink supply "low" detection.* A float sensor mounted to the end of the ink cap assembly in the ink container informs the ink supply when the container is almost empty. The ink supply then alerts the operator by turning on the beacon light, and by sending a signal via ethernet to the VxJet controller.
3. *Ink supply "out" detection.* After the ink container float has dropped low and the ink supply pump has turned on for 60 cycles, it automatically shuts down the pump and alerts the operator via a slow flashing of the beacon, as well as an ethernet signal to the controller. Sufficient ink remains in the accumulator to continue printing while the operator replaces the ink supply container. Depressing the Prime Switch will allow for an additional 10 pump cycles.
4. *Broken line detection.* Any break in the ink line downstream from the ink supply causes the accumulator to quickly empty its supply through the break. When the ink supply senses this precipitous drop in pressure, it shuts down the pump and alerts the operator via a rapid flashing of the beacon and an ethernet signal to the controller.

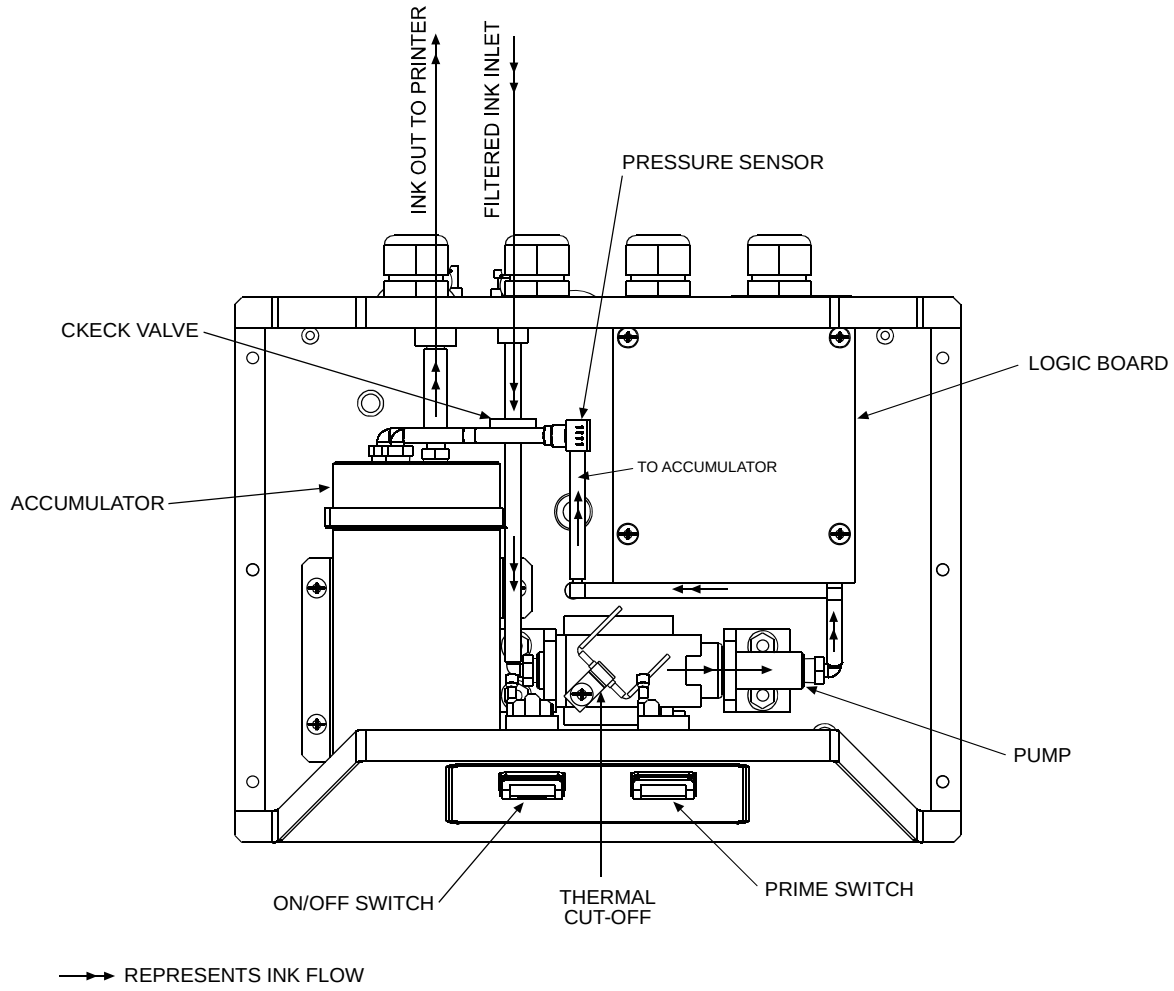
Startup Operation

After the appropriate fluid lines are plumbed to the inlet and outlet ports and all electrical connections are made, the ink supply can be turned ON. Depressing the ON/OFF (I/O) switch starts the process of automatically flushing the ink supply with the supply fluid. Ink is sucked from the supply tube in the tank, through the filter, and into the ink supply. After entering the system, the fluid passes through a check valve and a pump. Upon startup, the ink supply checks accumulator pressure status.

Normal Operation

During normal operation, fluid is pumped into the accumulator in 5-second-on / ½-second-off cycles until the system reaches a pressure of 20 psi. The pump cycles off in this manner in order to accurately measure pressure. Continuous monitoring of the line pressure occurs after reaching the goal pressure.

The print head(s) drains the accumulator until a line pressure of 20 psi or lower is detected by the pressure sensor circuitry. At this point, the pump cycles until the system reaches the target pressure. This operation continues until the ink supply is depleted.



Ink Low Detection

At a point prior to supply depletion, the low level detect sensor sends a closed signal back to the ink supply. The sensor is mounted on the end of a rod connected to the supply cap assembly and immersed in the ink supply. The float sensor acts as a reed switch that closes a contact and completes the signal detection circuit to the ink supply. This conditional information is then passed on to the user via a fixed "on" beacon light to the VxJet controller via ethernet. Note that the low ink condition has no operational effect on the system. It is merely a notification to the user that a new ink supply should be at the ready.

Ink Supply Replenishment

After the ink supply container is replaced, the operator depresses the prime button on the ink supply front panel. This re-primes the system via a 10-second flush of ink through the diverting solenoid valve (see *Startup Operation* in this Appendix) and the ink supply returns to normal operation. Depending on the length of time of the changeover and the ink consumption by the print heads, the accumulator may have dropped below 20 psi, in which case the pressure sensor circuitry initiates the 5-second pump cycle and pressure is restored to 23-27 psi.

Print Head Broken Line Detection

Because accidents are possible in any factory environment, the ink supply provides protection against continuous dumping of fluid from the ink supply after an "open" has been created in the print head supply line. When any downstream ink line is broken, the accumulator immediately dumps all of its supply through the broken line. As expected, the pressure drop measured by the pressure sensor immediately initiates the pump to replenish. However, the sensor is continuously measuring the change in pressure over time. When no increase in system pressure is detected after a pump cycle, the ink supply immediately shuts down the pump and alerts the operator via a rapid flashing of the beacon light and an ethernet signal to the VxJet controller. After the broken line has been repaired, depressing the prime button automatically restarts the pump.

Temporary Broken Line Override Feature

During first-time priming after installation, or other instances when it is necessary to purge air out of downstream ink lines, the broken line detection feature can be temporarily overridden by holding the prime button and simultaneously depressing the power button. This will allow the pump to cycle up to 20 times without shutting down. (The beacon will flash with each cycle.)

The ink supply will automatically end this process after 20 pump cycles. If more override cycles are desired, simply repeat the process. If immediate use of the broken line feature is desired, then simply depress the prime button only; the ink supply will automatically continue normal pumping and monitoring.

The following two conditions can emulate a broken line and necessitate an override:

1. Excessive opening of the effluent bottle line.

2. Very long lengths of downstream printer ink lines.

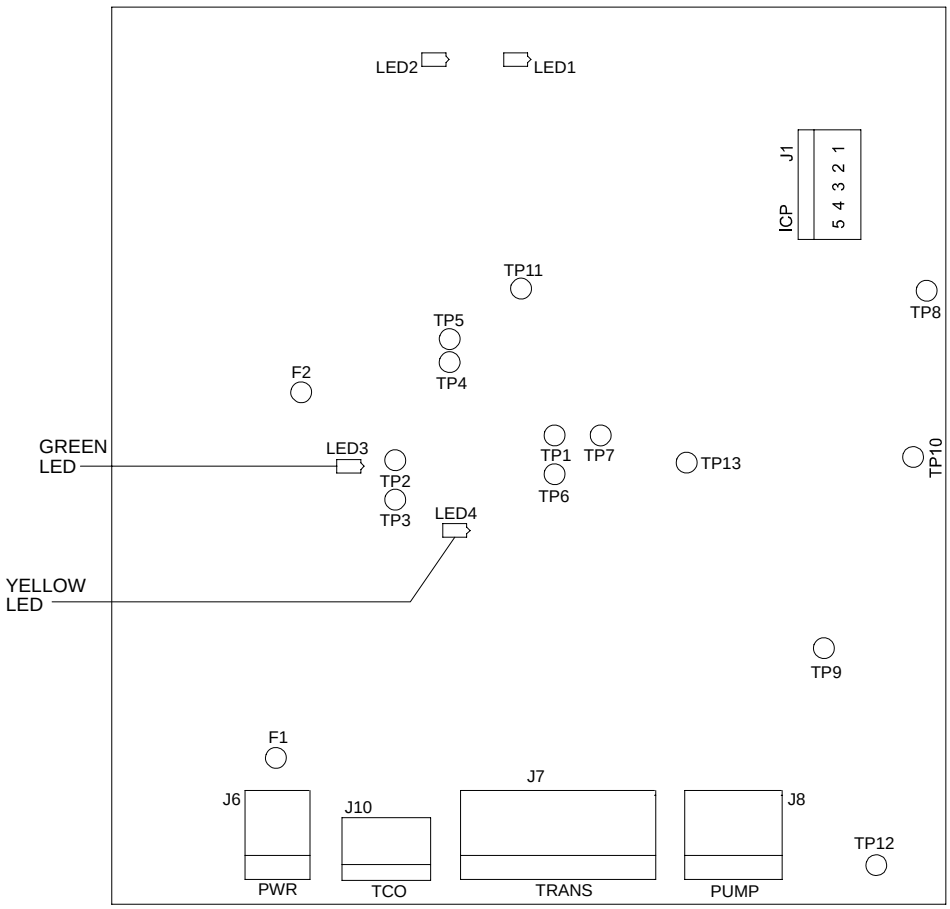
Permanent Broken Line Override Feature

When using an automatic flushing system, or other instances when it is necessary to permanently override the broken line feature, a jumper may be placed between pins 4 and 5 of J1 on the ink supply board. This will allow the pump to cycle continuously without shutting down. (The beacon will flash with each cycle.)

Overheating Protection

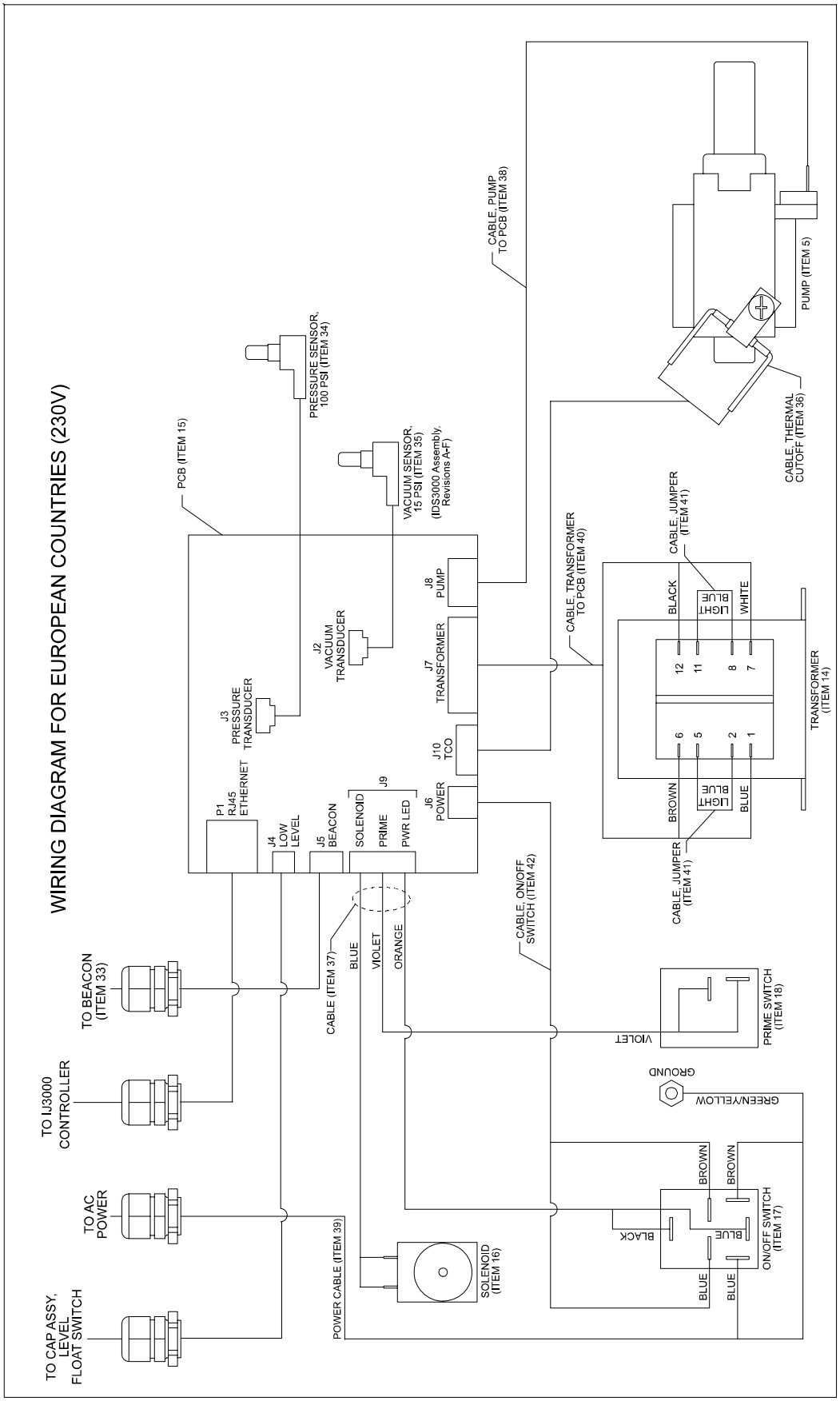
If the pump becomes clogged for any reason and the circuitry does not shut it down, the pump will become very hot. A thermal cut-off (TCO) device rigidly attached to the top of the pump acts as a thermal fuse by creating an "open" in the pump power circuit when excess temperature is encountered, shutting down the ink supply.

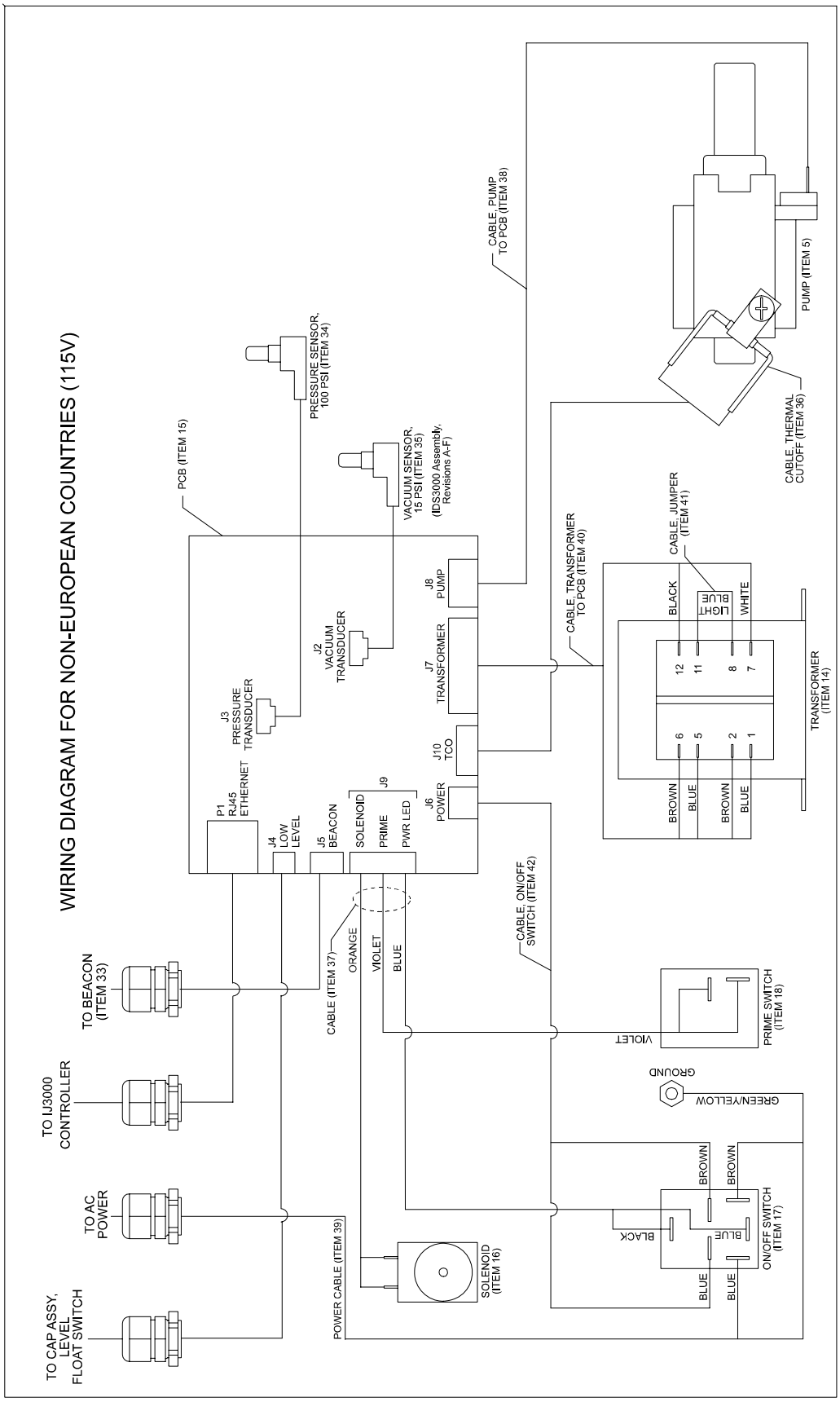
Ink Supply Board Test Points



Test Points:	TP1, TP2:	(TP1 - TP2) = 8mV/PSI at the vacuum sensor (applies only to Ink Delivery System Assembly, Revisions A - F)
	TP3:	0.2V/PSI of vacuum (applies only to Ink Supply Assembly, Revisions A - F)
	TP4, TP5:	(TP4 - TP5) = 1.2mV/PSI at the pressure sensor
	TP6:	0.1V/PSI of pressure
	TP7:	Toggles at the end of a pressure sampling period
	TP8:	GND
	TP9:	50VDC (approx.) unregulated from ink delivery power supply
	TP10:	24VDC
	TP11:	12VDC
	TP12:	5VDC
	TP13:	Toggles at the end of a vacuum sampling period
LEDs:	LED1:	(Not defined)
	LED2:	Green; indicates traffic on the network
	LED3:	Green; indicates the solenoid is energized, diverting ink back to the ink container
	LED4:	Yellow; indicates the pump is running
Fuses:	F1:	Power fuse, 250V, 315mA
	F2:	Beacon fuse, 125V, 1A
Connectors:	J1:	A jumper between pins 4 and 5 will permanently override the broken line feature.

Ink Supply Wiring Diagram




WIRING DIAGRAM FOR NON-EUROPEAN COUNTRIES (115V)
TO CAP ASSY, LEVEL FLOAT SWITCH
TO AC POWER
TO IJ3000 CONTROLLER
TO BEACON (ITEM 33)
POWER CABLE (ITEM 39)
SOLENOID (ITEM 16)
ON/OFF SWITCH (ITEM 17)
BROWN
BLUE
BLACK
GREEN/YELLOW
GROUND
PRIME SWITCH (ITEM 18)
VIOLET
CABLE (ITEM 37)
ORANGE
VIOLET
BLUE
CABLE, ON/OFF SWITCH (ITEM 42)
P1 RJ45 ETHERNET
J4 LOW LEVEL
J5 BEACON
J9 SOLENOID PRIME PWR LED
J6 POWER
J10 TCO
J7 TRANSFORMER
J8 PUMP
J3 PRESSURE TRANSDUCER
J2 VACUUM TRANSDUCER
PCB (ITEM 15)
PRESSURE SENSOR, 100 PSI (ITEM 34)
VACUUM SENSOR, 15 PSI (ITEM 35)
(IDS3000 Assembly, Revisions A-F)
CABLE, PUMP TO PCB (ITEM 38)
CABLE, TRANSFORMER TO PCB (ITEM 40)
CABLE, JUMPER (ITEM 41)
CABLE, THERMAL CUTOFF (ITEM 36)
PUMP (ITEM 5)
TRANSFORMER (ITEM 14)
BLACK
BLUE LIGHT
WHITE
12
11
8
7
6
5
2
1
BROWN
BLUE
BROWN
BLUE

Appendix C: Parts and Supplies

Consumables

Ink

The following is a partial list of inks and conditioners. Your sales representative can advise you on the proper ink for your application.

Porous Inks for IS (Water-Based)

Part Number	Description
2600928F	Conditioner, TWP, 5 Gallon
2601016F	Ink, TWP-1 Black, Porous, 5 Gallon
2601021F	Ink, TWP-101 Black, Porous, 5 Gallon
2600947SCF	Ink, TWP-GB Black, Porous, 5 Gallon

Non-Porous Inks (for IS)

Part Number	Description
2600199F	Conditioner, TSO Non-Porous (Alcohol-Based), 5 Gallon
2600201F	Ink, TSO-1 Black, Non-Porous (Alcohol-Based), 5 Gallon
2600227F	Ink, TSO-101 Black, Non-Porous (Alcohol-Based), 5 Gallon
2600970F	Ink, TSO-3100 Black, Non-Porous Fast Dry (Alcohol-Based), 5 Gallon
2600981F	Conditioner, TSO-4000, Non-Porous (MEK), 5 Gallon
2600986F	Ink, TSO-4400 Black, Non-Porous (MEK), 5 Gallon

Porous Inks for Pressurized Ink Can (Water-Based)

Part Number	Description	Package
5750242	Conditioner, TWP	2/case
5750243	Ink, TWP-1 Black	6/case
5750245	Ink, TWP-4 Blue	6/case
5750246	Ink, TWP-3 Green	6/case
5750244	Ink, TWP-2 Red	6/case
5750249	Maintenance Spray, TWP	2/case

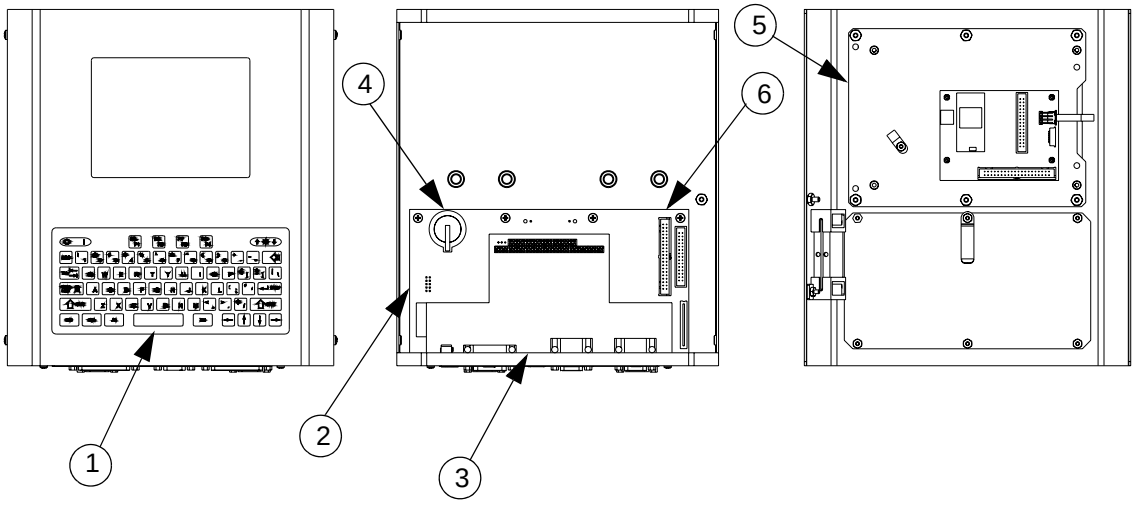
Non-Porous Inks for Pressurized Ink Can (Alcohol-Based)

Part Number	Description	Package
5750650	Conditioner, TSO-SC	2/case
5750651	Ink, TSO-3100 Black	6/case
5750652	Ink, TSO-2 Red	6/case
5750657	Maintenance Spray, TSO	2/case

Parts in Modular Kits

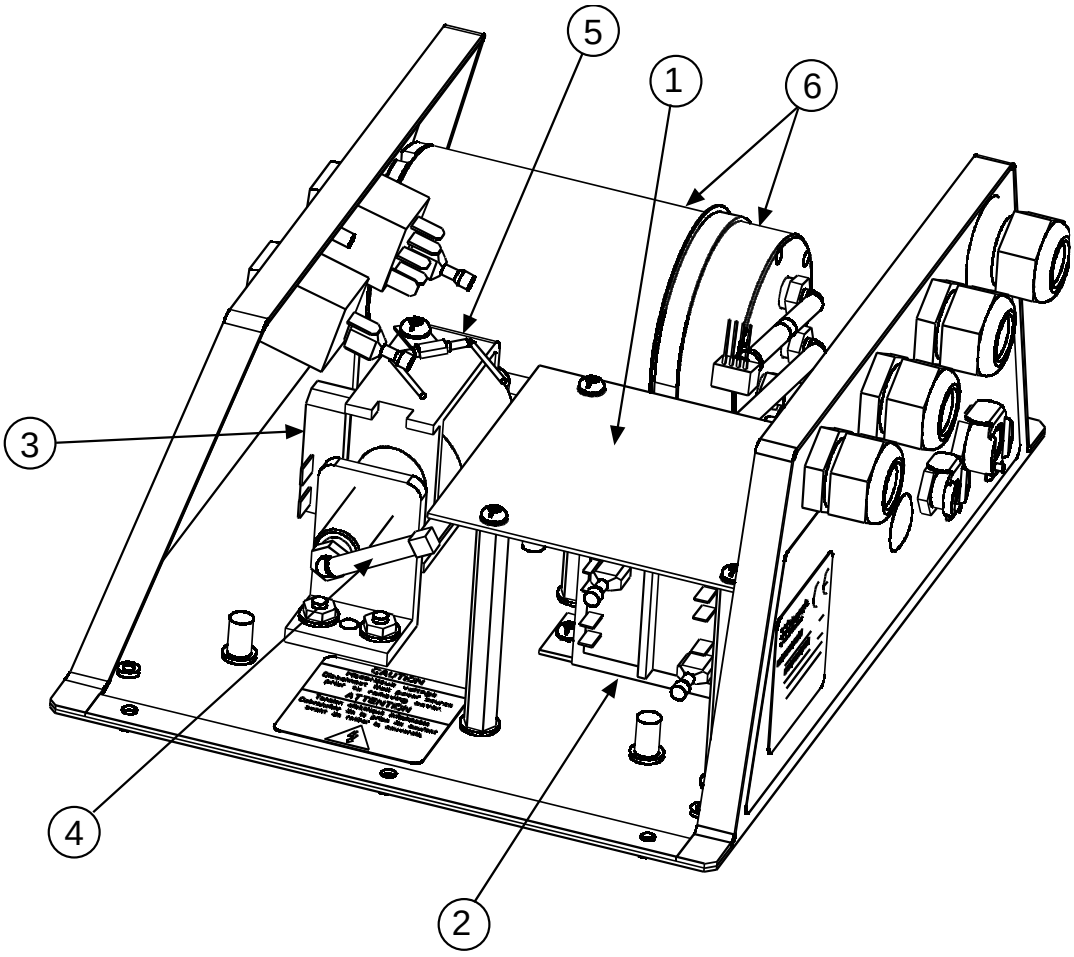
Part #	Description	Contents
1902-964	Flush Bottle Kit	
1902-857	Print Head Broach Kit	
5700-743	Pressure Gauge	
5701-501	Ink Regulator Kit (Non-Porous)	1 regulator, 1 bracket assembly
5701-502	Ink Regulator Kit (Porous)	1 regulator, 1 bracket assembly
5750-503	Effluent Bottle Kit	
5760-300	Ink Supply Spare Parts Kit	2 fuses, 1 beacon bulb
5760-310	Ink Supply Inlet-Outlet Tubing and Filter Kit	
5760-311	Ink Supply PCB Replacement Kit	
5760-314	Ink Supply Transformer Replacement Kit	
5760-315	Ink Supply 115VAC Pump Replacement Kit	
5760-316	Ink Supply Beacon Replacement Kit	
5760-317	Ink Supply Internal Tubing and Fittings Kit	All internal tubing, fittings, check valve and sensors
5760-318	Ink Supply 230 VAC Pump Replacement Kit	
5760-319	Ink Filter Kit	
5760-389	Thermal Cutoff Kit	
5760-394NP	Accumulator Replacement Kit, Non-Porous	Accumulator Assembly with outlet fittings (without mounting bar)
5760-394P	Accumulator Replacement Kit, Porous	Accumulator Assembly with outlet fittings (without mounting bar)

Controller Assembly Kits



ITEM	PART NO.	DESCRIPTION
1	5765201	Keypad Replacement Kit
2	5765202	CPU PCB Replacement Kit
3	5765203	VxJet Interface Board Replacement Kit
4	5765205	Display Replacement Kit, 5.7"
5	5760122	CPU Battery (Type: CR2032)
6	5760746	Cable, Display to CPU PCB, 40 Conductor
(not shown)	5760302	15 VDC Power Supply Kit, Integrated Valve

Ink Supply Assembly Kits



ITEM	PART NO.	DESCRIPTION
(not shown)	5760-310	TUBING/FILTER KIT
1	5760-311	PCB REPLACEMENT KIT
2	5760-314	TRANSFORMER REPLACEMENT KIT
3	5760-315 5760-318	PUMP REPLACEMENT KIT, 115VAC PUMP REPLACEMENT KIT, 230VAC
4	5760-317	INTERNAL TUBING AND FITTINGS KIT
5	5760-389	THERMAL CUTOFF KIT
6	5760-394	ACCUMULATOR REPLACEMENT KIT

Appendix D: Maximum dpi Calculation for a Given Line Speed

The maximum line speed of a valve print head is limited by the maximum frequency of the solenoid, which is 1000 Hz. The following steps will determine the operating frequency of the solenoids in the application. The graph on the following page can also be used to determine the maximum print resolution for a given line speed.

1. Determine the values for:

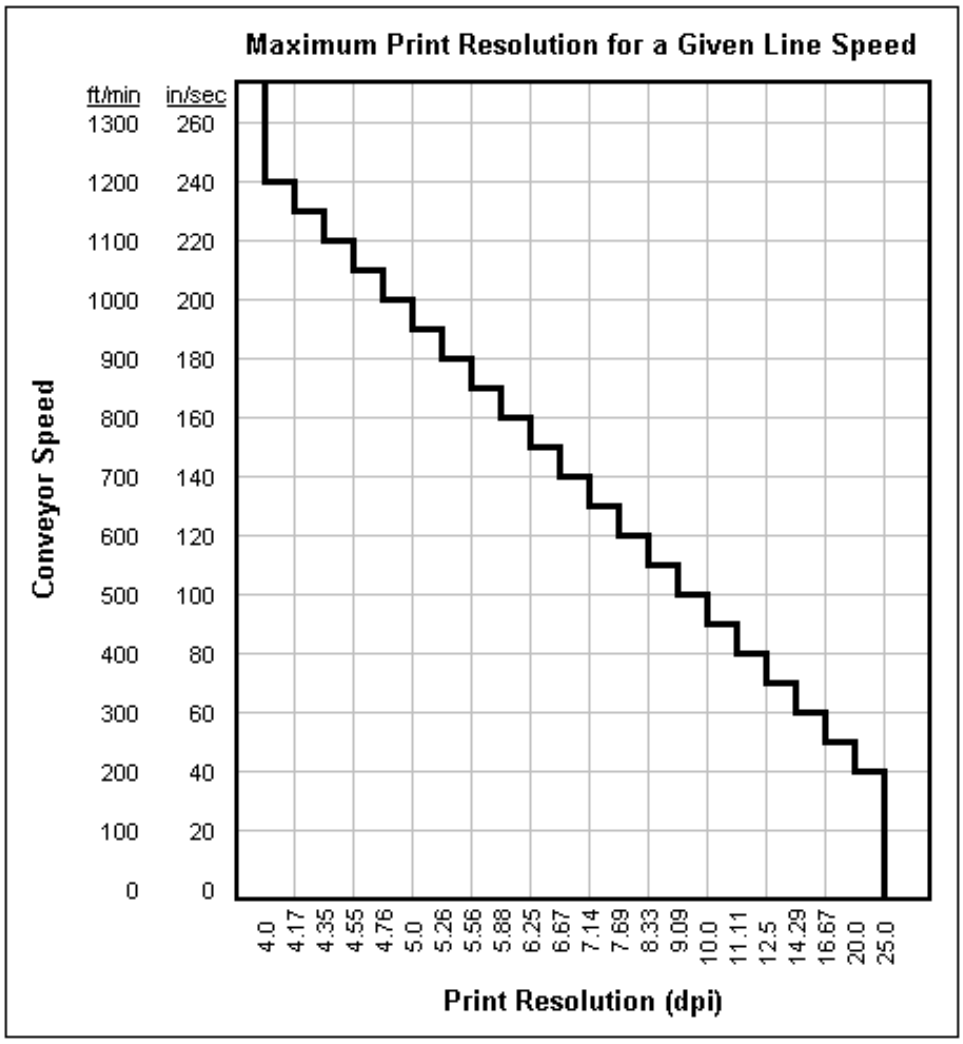
- Line speed in feet per minute: If a tachometer is not available, the line speed can be estimated by measuring the conveyor belt and using a stop watch to time one complete revolution of the belt. For example, a 20-foot, 7-inch conveyor belt takes 34 seconds to make a complete revolution. Divide 60 seconds by the number of seconds per revolution (34 in this case). Multiply the resulting number by the length of the belt (21 feet in this example; always round up to the next foot for this calculation). The answer is 37 feet per minute (60/34 x 21 = 37).
- Print resolution in dots per inch (dpi): Print resolution is selected through the software. This setting is measured in dots per inch; a setting of 4 denotes 4 dots, or print columns, per inch. Resolution can be set from 4 to 25 dpi.

2. The operating frequency of the solenoids can be determined with these two parameters by following the next two steps:

- Determine the line speed in inches per second. Divide the line speed in feet per minute by 5 to get inches per second. A line speed of 200 feet per minute is equal to 40 inches per second (200/5 = 40).
- Multiply the number of inches per second by the dpi setting to determine the solenoid operating frequency in Hz (cycles per second). Printing at 25 dpi, at a line speed of 40 inches per second, would result in a frequency of 1000 Hz (40 x 25 = 1000).

The operating frequency of a valve print head must be less than or equal to 1000 Hz. If it exceeds 1000 Hz, the print head will have reliability and print quality problems. In such a case, the best solution is to decrease the print resolution, which will decrease the operating frequency.

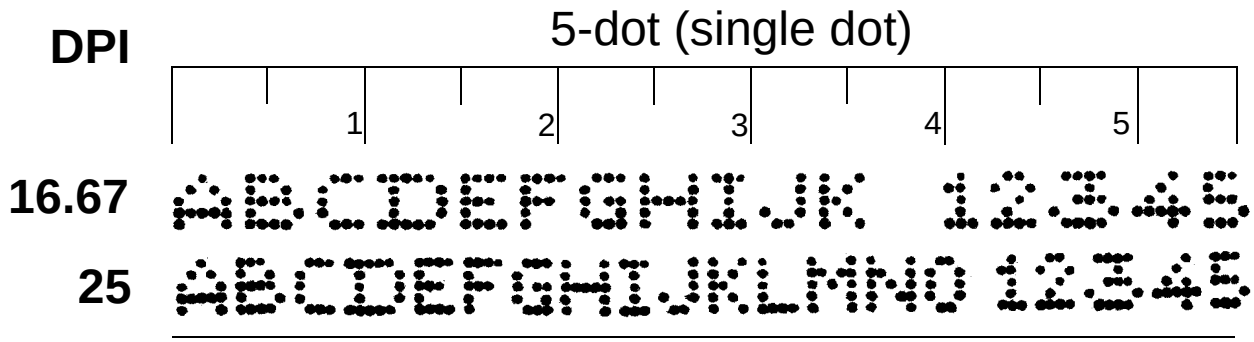
To determine the maximum print resolution for a given conveyor, divide 1000 by the conveyor speed in inches per second. Using the previous example, 1000 divided by 40 inches per second equals 25 dpi maximum print resolution. Even if a higher resolution is desired, the valve print head is not capable of it without encountering performance and reliability problems.

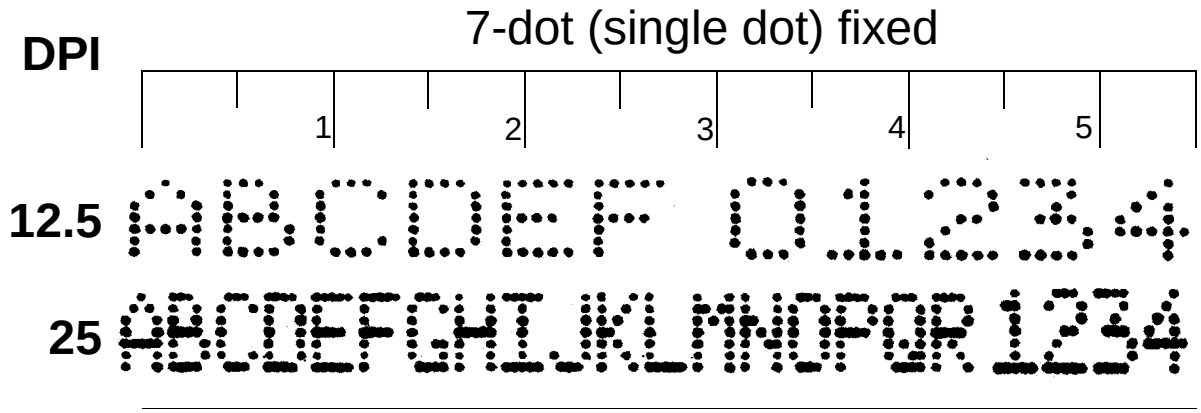

Maximum Print Resolution for a Given Line Speed
ft/min
in/sec
1300
260
1200
240
1100
220
1000
200
900
180
800
160
700
140
600
120
500
100
400
80
300
60
200
40
100
20
0
0
Conveyor Speed
4.0
4.17
4.35
4.55
4.76
5.0
5.26
5.56
5.88
6.25
6.67
7.14
7.69
8.33
9.09
10.0
11.11
12.5
14.29
16.67
20.0
25.0
Print Resolution (dpi)

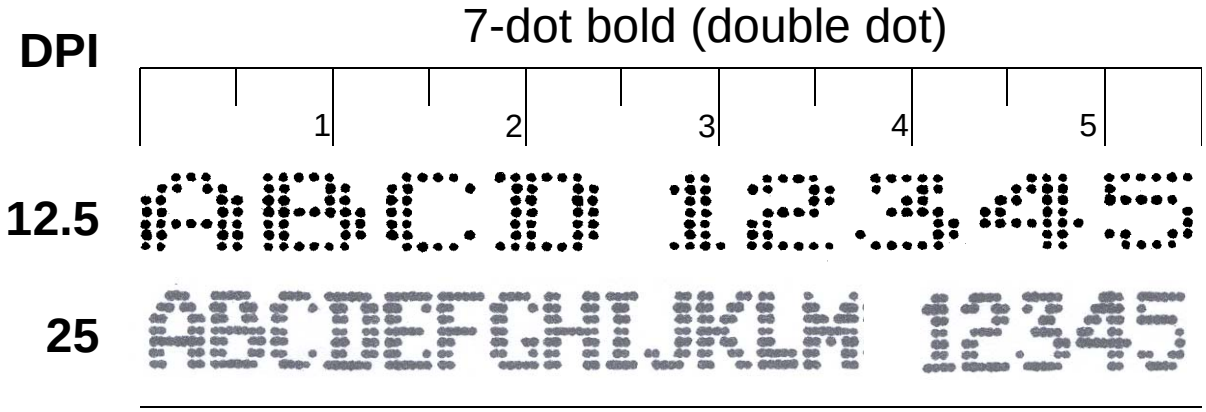
Appendix E: Font Samples

Character appearance is affected by weight and dots per inch (dpi). Character weights available are single dot and bold (double dot). The term "fixed" means the space allotted per character is the same regardless of the character. (An "I" occupies the same space as a "W".)

PRINT SAMPLES FOR A ½" 9-DOT PRINT HEAD

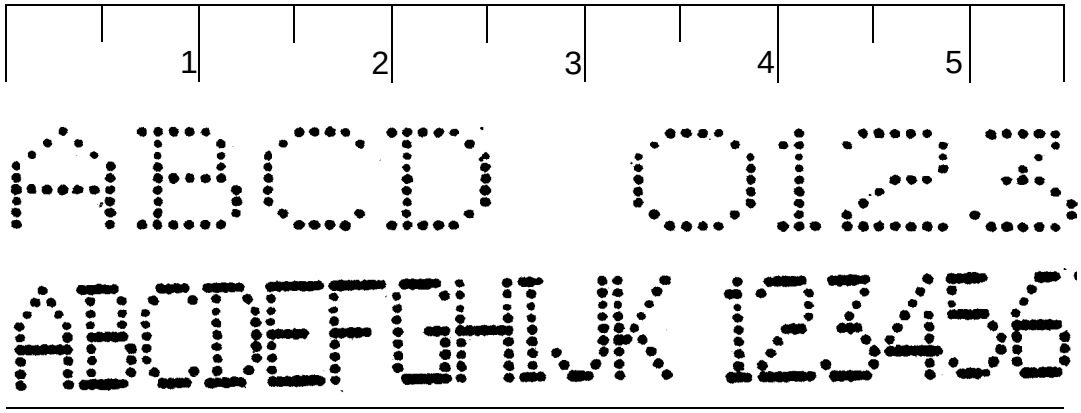






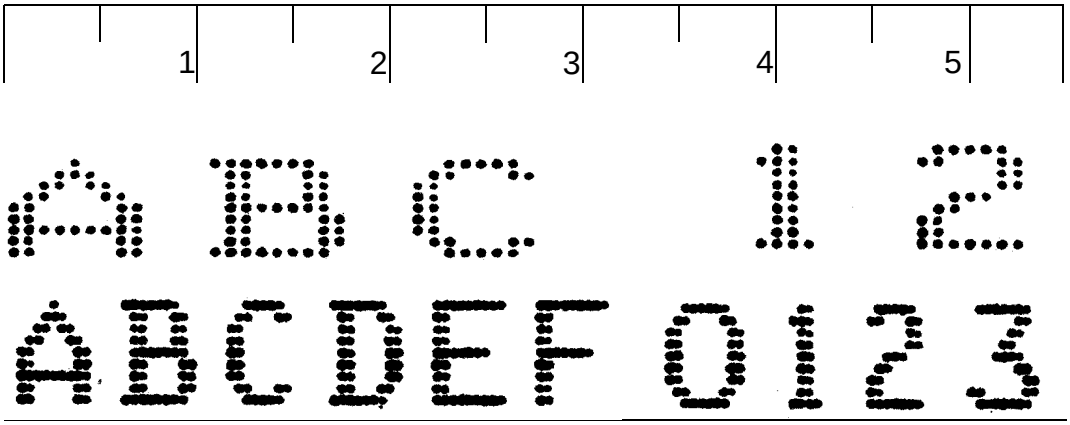
DPI

9-dot (single dot)



DPI

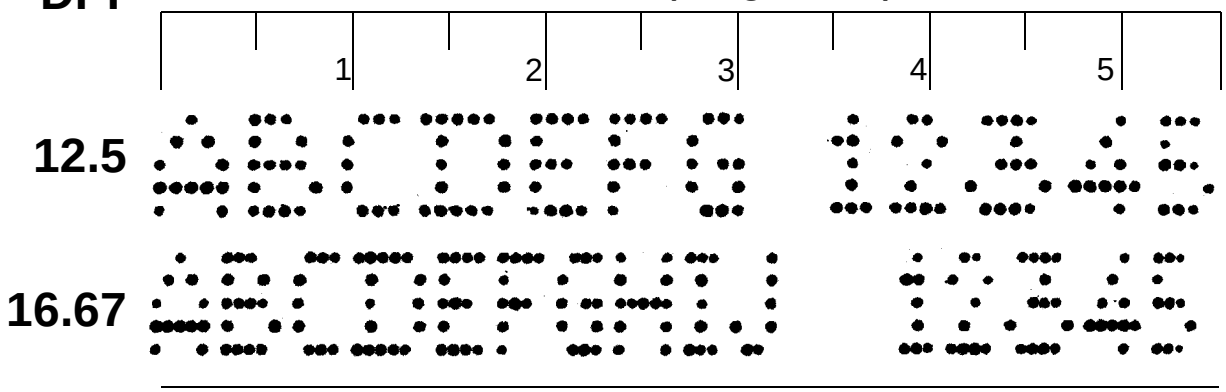
9-dot bold (double dot) fixed



PRINT SAMPLES FOR A 7/8" 9-DOT PRINT HEAD

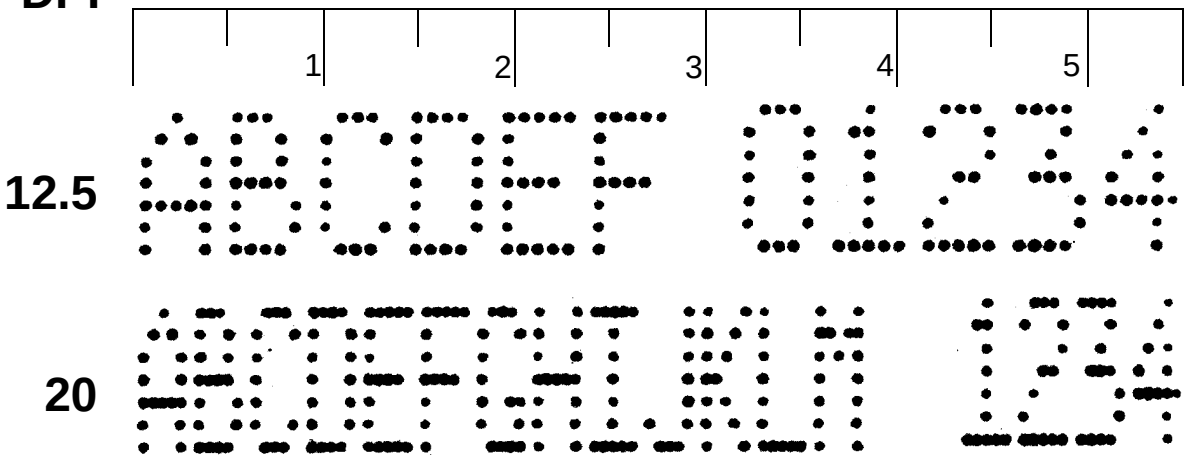
DPI

5-dot (single dot)



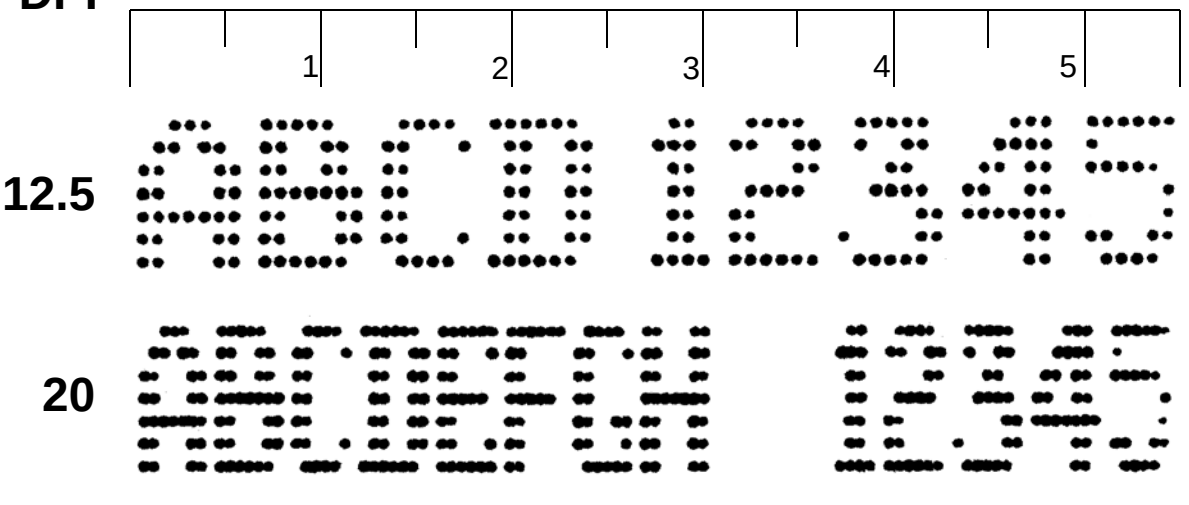
DPI

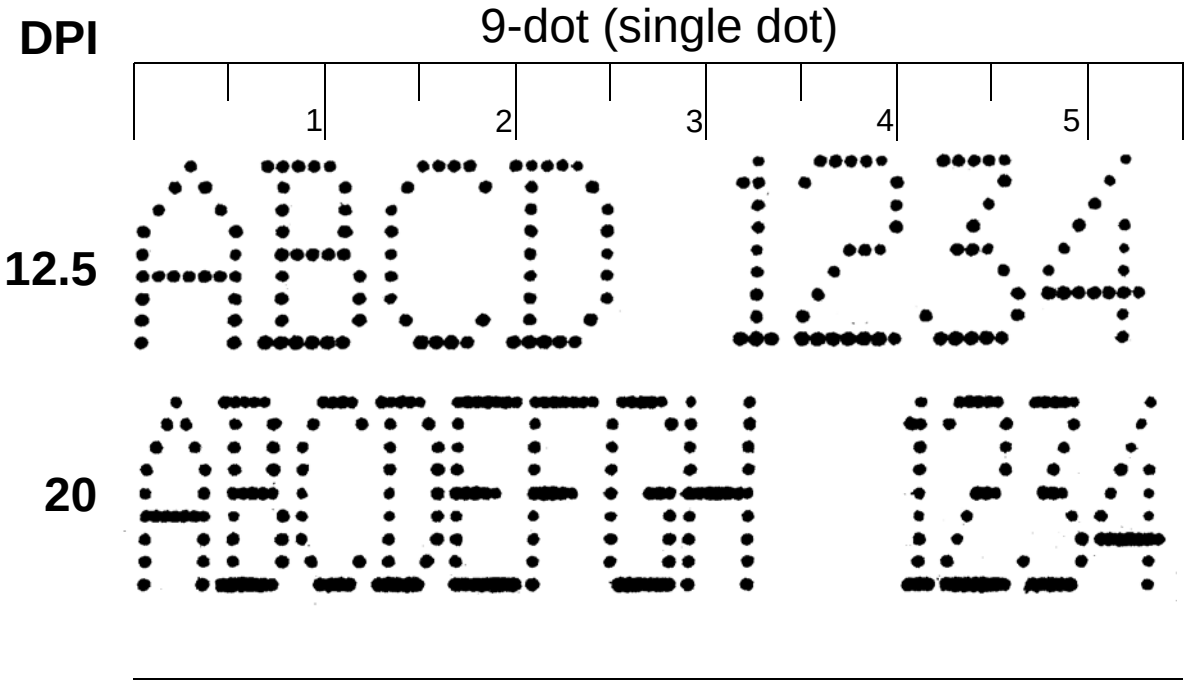
7-dot (single dot) fixed

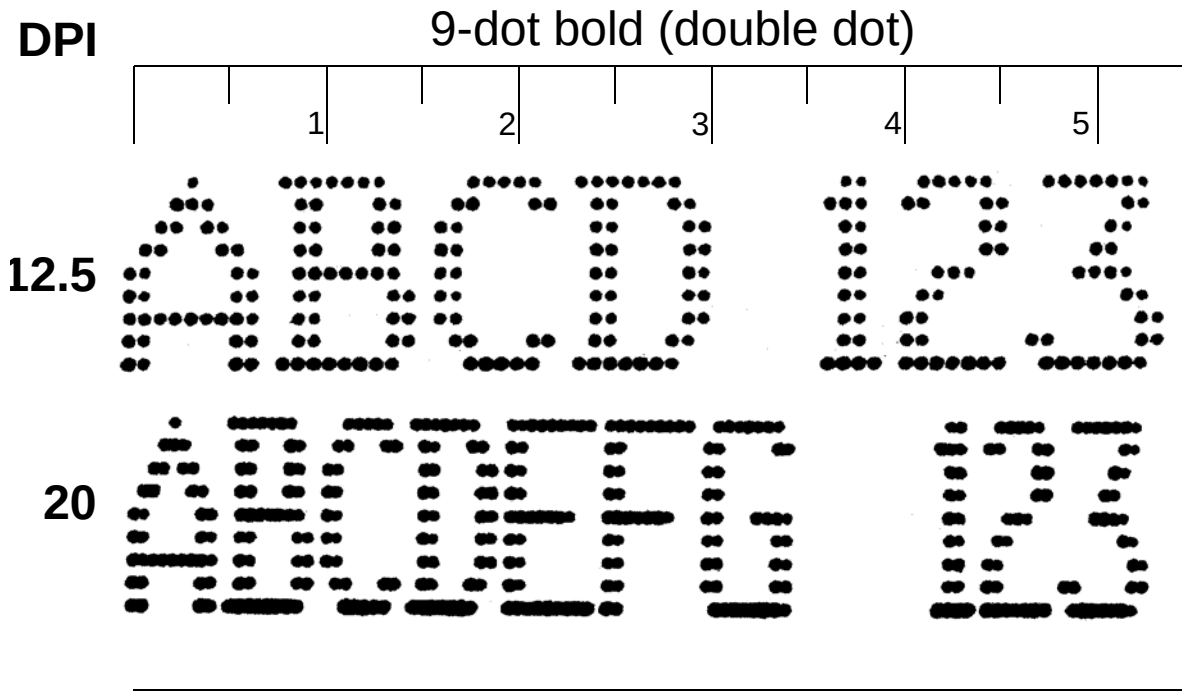


DPI

7-dot bold (double dot)




DPI
9-dot (single dot)
1
2
3
4
5
12.5
20


DPI
9-dot bold (double dot)
1
2
3
4
5
12.5
20

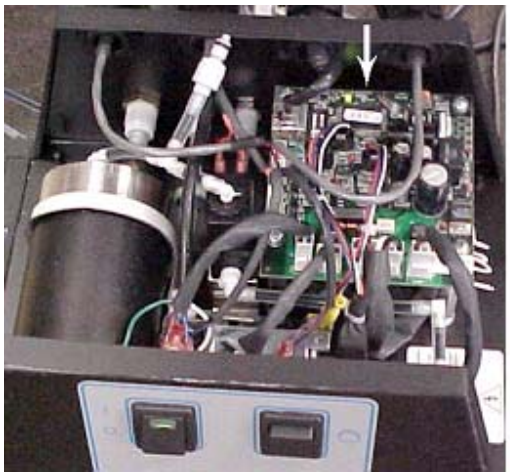
Appendix F: Setting the IP Address

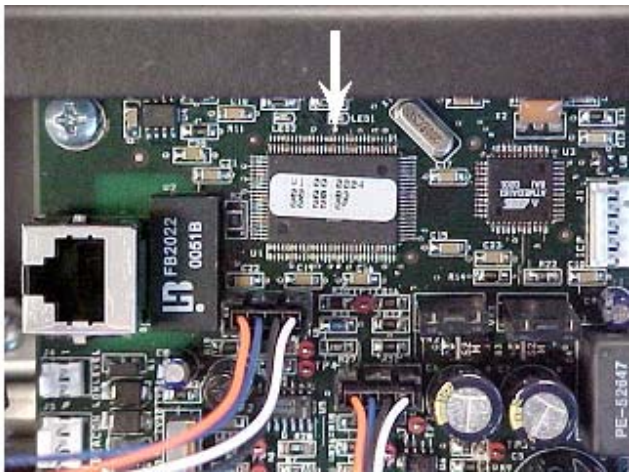
Equipment Needed

- VxJet IS.
- PC with an Ethernet port.
- Ethernet crossover cable.
- The **setip.exe** program. (Available from FoxJet Customer Service.)
- Phillips head screwdriver.

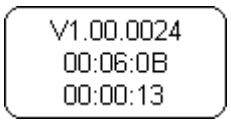
Procedure

1. Install the **setip.exe** program on your PC.
2. Unplug the VxJet IS.
3. Remove the VxJet IS cover.
4. Locate the integrated circuit with the label at the center back of the circuit board. (See photos below.)





The label will look similar to this:



Record the bottom two lines of numbers. This is the MAC address.

5. Plug one end of the Ethernet crossover cable into P1 on the circuit board. Plug the other end into the Ethernet connector on your PC.
6. Plug in the VxJet IS and turn it on.
7. Open a Command Prompt (DOS window) on your PC; go to the folder where you installed **setip.exe**.
8. Type **setip**, followed by a space, followed by the VxJet IS MAC address recorded in step 4, followed by a space, followed by the IP address for the VxJet IS, then press Enter. For example, type **setip 00:06:0B:00:00:13 10.1.2.2**.
9. To verify that the VxJet IS was set to the desired address, type **ping**, followed by a space, followed by the address. For example, **ping 10.1.2.2**. If successful, the response will look something like this:

```
C:\>ping 10.1.2.2

Pinging 10.1.2.2 with 32 bytes of data:

Reply from 10.1.2.2: bytes=32 time=15ms TTL=30
Reply from 10.1.2.2: bytes=32 time<10ms TTL=30
Reply from 10.1.2.2: bytes=32 time<10ms TTL=30
Reply from 10.1.2.2: bytes=32 time<10ms TTL=30

Ping statistics for 10.1.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  15ms, Average =  3ms

C:\>_
```

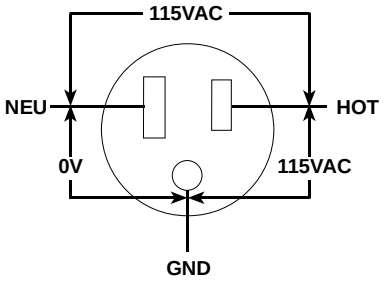
An unsuccessful attempt will look like this:

```
C:\>ping 10.1.2.2

Pinging 10.1.2.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 10.1.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum =  0ms, Average =  0ms

C:\>_
```

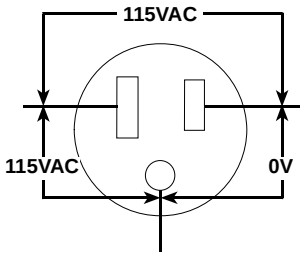
Turn off the VxJet IS and unplug it. Remove the Ethernet cable and put the cover back on.

Appendix G: Testing an Electrical Outlet

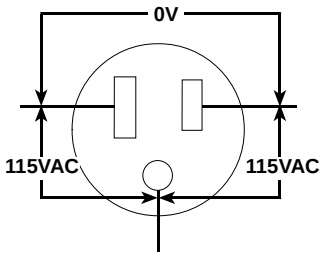
An outlet tester is the preferred method of checking an electrical outlet, although a voltmeter can also be used.



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 H: 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. Anytime you handle electronic components or printed circuit boards, ESD wrist straps should be used.

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 I: Glossary of Terms

Accumulator - Housed within the ink supply, the accumulator stores ink for delivery to the print heads.

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.

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

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, totaling up to 72 dots, connected to one interface board. The VxJet can control one or two daisy chains.

Dragging Type Dot Size Variation - Dots smaller than average, at the beginning of print only.

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.

IS - The Ink Supply consists of a number of components working together to transfer ink from the ink pail to the printed product.

Ink Filter - A 100-micron filter located in the ink line to remove any impurities from the ink before it reaches the print head.

Ink Regulator - This component is located in the ink line close to the print head and, in conjunction with the ink pressure gauge, can be adjusted to regulate ink pressure to the print head.

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

Internal Dot Size Variation - Dots are different in size at the intersection of a dot column and a dot row.

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 VxJet 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.

Off Target Printing - One or more dots not printed in the expected location in the character.

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.

Potentiometer - A variable voltage resistor that can be adjusted with a small screwdriver to effect voltage changes in print head solenoids.

Pressure Gauge - This can be attached to the ink line and used to measure ink pressure, aiding the operator in making adjustments to improve print quality.

Print Indentation -The sum of two measurements: The distance from the photosensor to the center of the print head, plus the distance from the leading edge of the product to the start of printing.

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

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

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

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