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SERVICE REFERENCE MANUAL

SERIES 6 WAXJET™ HIGH RESOLUTION PRINTING SYSTEMS

Revision 4.15 (February 1999)

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Caution

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Warning: Fire, explosion and severe burn hazard. Do NOT recharge, disassemble, heat above 100º C, incinerate or expose contents to water.

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Introduction

The WaxJet™ Model 6100 Wax Jet Printer uses a non-toxic, non-hazardous solid Wax to produce cost effective small character codes (up to ½" in height) on to any substrate. The system is particularly effective on shrink-wrap material.

Nothing touches the product other than the wax itself. There are no rollers or rubber typefaces to change. Changing the printed message contents and format is accomplished by simple keyboard entry. The printer will usually display options available with each command and show prompts and status information to assist the user. SystemMaster, a Windows based program, can be used to program printers (up to 32) from a remote PC.

Small individual drops of wax, fired by the Printhead at precise times form alphanumeric characters and special graphic characters. The Printhead ejects wax by microprocessor controlled piezoelectric crystals that force the wax through tiny orifices, creating very precise drops of wax. The Printhead firing signals are synchronized to the movement of the conveyor belt or driven by an internal oscillator. In either case, a product detect circuit ensures that the desired message will be printed on the correct location on the package or carton.

Basic Operation

Single Phase 110VAC or 220 VAC, 50 or 60 Hz powers Series 6 products. When product detect occurs (usually via photocell sensor), system will print characters in a dot matrix format. A system clock or encoder pulses synchronize Printhead firing pulses with product motion, insuring that printed message is positioned properly on product. The frequency of the firing pulses combined with the speed of travel determines the horizontal print resolution of the messages printed.

Using This Manual

This manual is designed to provide the FoxJet Authorized Technical Representative with a service reference that will assist in providing a high level of support to end-users. This manual is not written for and should not be distributed to the end user. The manual is not a substitute for factory training nor is it a replacement for the Operator's Manual. It is assumed that the user is familiar with general mechanical and electrical safety procedures. A section is provided for the insertion of Technical Bulletins, which are distributed regularly. Technical Bulletins augment the Service Reference Manual as equipment or software evolves.

Safety Precautions

Operating and servicing the Series 6 WaxJet system requires that certain safety precautions be followed in order to prevent equipment damage and/or personal injury.

When operating or servicing the system, observe the following precautions:

- Touching the Printhead or the Wax system when at operating temperatures can cause injury. The Printhead is heated to temperatures as high as 135° C (275° F) and will cause severe burn if it comes in contact with bare skin. FoxJet strongly advises that heat insulating gloves be worn when carrying out any maintenance on the Printhead/Wax System.
- Keep the system clean and free from dust, particularly when performing any maintenance routines.
- Do not stand in front of or place hands in front of Printhead while priming. The hot Wax can spray up to 12" or more during the priming procedure.
- Ensure that Printhead is mounted so that products do not come into contact with it. High heat from the Printhead may damage product(s) and the Printhead may be damaged as well.
- Avoid handling the wax system and wax hose while in operation.
- Use extreme caution when adding wax cubes to wax system. Do not drop wax cubes in such manner that the wax is splashed out of reservoir.
- Do not overfill wax reservoir. Damage to internal connections in the wax system can occur.
- Use only FoxJet approved solvents and wipes on the Nozzle Array plate. Damage to its special coating will occur and wax may build up on it.
- Avoid directly wiping the Nozzle Array plate, damage to the special coating may occur.

During servicing, ensure that:

- You always wear a grounded static wrist strap to avoid static discharge when working inside the controller. The controller's electronics are susceptible to damage from static discharge.
- The system has been turned off for at least 1 hour prior to performing any service procedures on the Printhead and wax system or in preparation for shipping.
- Service procedures are followed precisely.

Application Design

Design Factors

The Series 6 WaxJet Printing System is a simple, yet sophisticated product coding system. The Series 6 WaxJet printing developed as a method of providing high resolution, small character printing without the hazards associated with solvent based inks. FoxJet has combined solid-state piezoelectric technology with non-toxic wax material for a superior alternative to mechanical systems and hazardous chemical use. WaxJet printing systems have the ability to print up to five lines of high resolution (up to 300 dpi) alphanumeric text or graphics within a ½" (12mm) image area. Each Printhead channel is tuned for optimum efficiency and the modular format allows end-use field repair, eliminating costly production delays. FoxJets advanced integrated Printhead/wax system is designed for maximum protection against shock and vibration ensuring consistent, high resolution print quality.

To ensure that system is installed in an application geared for success, the following factors must be considered.

Substrate Type

Series 6 wax adheres very well to chipboard cartons, coated cardboard, flexible packaging, plastic, paper, wood, and shrink-wrap. It is effective on a number of additional substrates, particularly those that will melt slightly when contacted by the hot wax.

Speed

Line speed (speed of conveyor belt travel) is the most critical factor in determining the capability of the Printhead to print reliably in a given application. When using the internal clock, line speed combined with firing frequency determines the print resolution. When using and encoder, the line speed combined with the encoder pulse train determines firing frequency that the Printhead will fire. Shaft encoder assemblies are actually rated in terms of DPI.

The following page shows some simple mathematical formulas that can be used to calculate the feasibility of any print application. The maximum rate at which a Series 6 Printhead can reliably print is 8 kHz.

Formulas

Firing frequency, as it applies to a given application, is determined with the following two formulas.

Using Shaft Encoder:

$$\left(\frac{EDPI}{W}\right) \times LS = FREQ.$$

where:

EDPI= Encoder assembly base DPI rating

W= WIDTH setting of FoxJet controller

LS= Line Speed (in inches/second; IPS)

Freq.= Firing pulses generated by belt movement (in cycles per second: Hz) to Printhead (8 kHz maximum)

The formula for converting foot per minutes to inches per seconds is.

FPM÷5 = IPS

Using Internal Oscillator:

35000 ÷ W = Freq.

Print DPI's are determined with the following formulas.

Using Internal Oscillator (35kHz):

$$(35000 \div W) \div LS = DPI$$

where:

DPI= Horizontal print resolution

W= WIDTH setting of FoxJet controller

LS= Line Speed (in inches/second; IPS)

Using Shaft Encoder Assembly:

$$EDPI \div W = DPI$$

where:

EDPI= Encoder assembly base DPI rating

W= WIDTH setting of FoxJet controller

DPI= Horizontal print resolution

Product Pitch

Product detection starts the print process for each product. It is important that the previous print cycle is complete before a new print cycle can start. Product spacing and photocell mounting must be such that print cycle is complete before next product is detected by photocell. This is usually accomplished by ensuring that the distance between photocell and Printhead is shorter than the distance between products.

Environmental Factors

Series 6 systems will operate in ambient air temperatures ranging from 50 º– 95º Fahrenheit. Humidity (non-condensing) can range between 20% and 80%. Standard equipment cabinets are not water resistant, however, NEMA – 4 controller cabinets are available as an option for locations using water wash-down procedures.

Equipment Mounting

Equipment can be mounted directly onto conveyor line or in stand-alone assemblies. Mounting to conveyors with high degree of vibration may cause de-priming conditions and, consequently, poor print quality. A typical installation is pictured below.

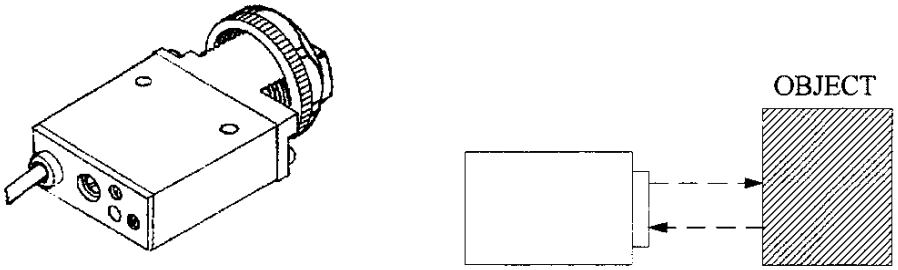
Caution : Mounting this way can be unstable unless stand is anchored to the floor.

Product Detection (Photocell)

Product detection devices are used to initiate print cycles and properly locate printing on package. Photocells are more suitable than mechanical devices (such as switches) because they are less likely to produce "double pulses" per product. Photocells are usually mounted directly onto the Printhead housing, however, they can be mounted directly to the conveyor with its own bracketry. Photocells must be mounted up line from the Printhead for accurate product detection. Most photocell assemblies have some adjustment capabilities for operation in various application designs.

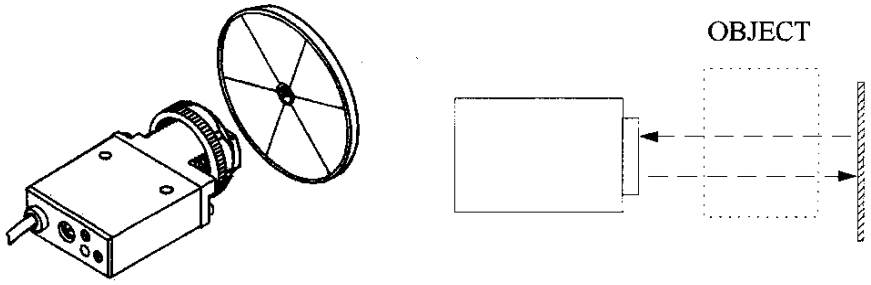
Proximity

The proximity photocell senses its own emitted light reflected back as an object passes by. The proximity photocell is supplied with all systems and is effective for most applications.



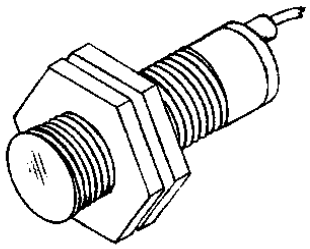
Reflective

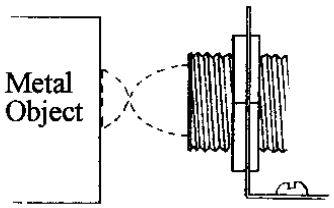
The Retro-Reflective Photocell consists of a sensor and a reflector with the reflector mounted directly in front of the sensor so that product passes between the two. When the beam is broken, the photocell sends the product detect signal.



Inductive

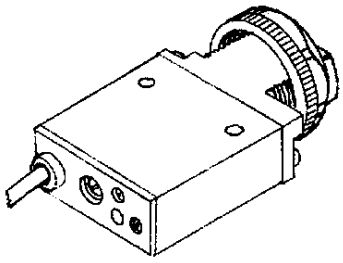
The Inductive Proximity Sensor uses a coil to radiate an electromagnetic field. When a metallic object approaches the sensor's surface, the magnetic field will distort. The distortion in the lines of flux induces a change in the current driving the coil and, consequently, send a product detect signal.

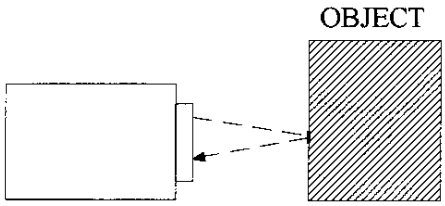




Print Registration Photocell

The Print Registration Photocell detects a print registration mark on an object by sensing its own emitted light reflected from the mark. The sensing area can be as small as 0.04" (1mm) in diameter at the focus point.





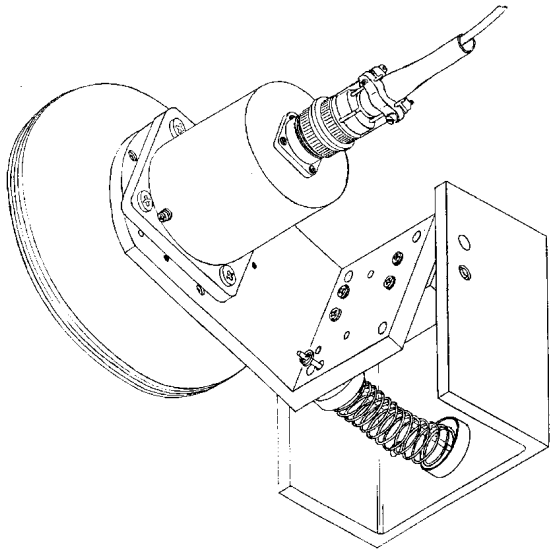
External Alarm

The External Alarm Beacon is used to indicate system ready and wax low situations. The beacon is comprised of a green light and a red light. When the CPU detects an wax low condition, it will cause the red light to flash. When the green light is lit, the system is ready for printing. The lenses on the lights are made of heat and shock resistant polycarbonate resin. The can be mounted onto of the floor stand or integrated into a conveyor system.

Line Speed Monitoring (Shaft Encoder)

Shaft encoders are timing instruments necessary for applications with varying conveyor line speed and/or for printing bar codes. The shaft encoder synchronizes Printhead firing to the speed of the production line. Shaft encoders generate a number of pulses during shaft rotation that relate to the conveyor line travel. Typically, shaft encoders are comprised of a wheel attached to the shaft of an encoder module. The size of the wheel and the number of pulse per revolution that the encoder outputs and the rate of rotation will determine the frequency at which the Printhead will fire.

FoxJet's Shaft Encoder Kit is comprised of 3 wheels and a 5000 PER shaft encoder mounted in a spring loaded pivot bracket that can be used to generate a pulse train that provides 245, 284 and 300 base DPI. Base DPI's can be further adjusted during programming. (See WIDTH command in the Command Definitions.)



AutoPrint Module

The AutoPrint Module (must be used with a shaft encoder) allows printing at specified intervals without photocell triggers. Popular applications for AutoPrint Module use are web printing applications such as tickets or wrapping materials. Any product where photocell triggers would be difficult to generate might be printed on using the AutoPrint Module.

The AutoPrint Module's dimensions are 3" x 2" x 3". It has three cables with DB-9 connectors mounted to the outside of the box. The system shaft encoder and photocell are connected to the AutoPrint Module instead of the controller. LED's indicating the presence of shaft encoder pulses and photocell signals ("product detection"). Product detection signals can be actual photocell triggers or AutoPrint Module generated photocell triggers. The AutoPrint Module has three modes of operation, selectable by a three-position toggle switch. They are:

- PT – Pass Through. PT mode passes the Photocell and Shaft Encoder signals directly to the FoxJet controller and system operates as normal.
- AP – AutoPrint. AP mode generates "product detection" signals to the controller by counting shaft encoder pulses and comparing the count to operator selection (thumb wheel switches). Photocell triggers are not necessary as in normal printing modes.
- PC – Photocell. PC mode operates the same as PA mode, except that the photocell must be blocked continuously. In this mode, the photocell would act as an "AutoPrint Enable" signal.

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Specifications

Series 6 Hardware

WaxJet™ Model 6100 Controller

Processor:	Motorola 68332
Speed:	16.67 MHZ
Baud Rate:	9.6k, 19.2k, 38.4k (Expandable to 115k)
Memory:	512KB RAM 512KB ROM
Communication:	2 Serial Ports, 2 RS232 or 1 RS232 and 1 RS485
Single Printhead	9.6k, 19.2k, 38.4k (Expendable to 115k)

Connections

Connector Type: Standard DB9,DB25

Printhead: 10' (3M) Signal Cable

Inputs (opto isolated, open collector or TTL type)

Photocell	Shaft Encoder

Outputs (opto isolated)

Alarm (open collector

External Power (+12 VDC)

Diagnostics

Light Emitting Diode (LED) Indicators

Photocell	Shaft Encoder
Wax Level	Heaters
High Voltage	Data Receive
Data Transmit	AC Voltage

Electrical Requirements

Switch Selectable	110-115VAC, 3 A Max 220-240VAC, 1.5 A Max
Frequency	50-60 Hz

Operating Environment

	Operating	Storage
Temperature	50°F to 95°F 10°C to 35°C	5°C to 110°C -15°C to 43°C
% Relative Humidity (non-condensing)	20-80%	5-95%

Certification

FCC	CE	UL
	TUV	Rheinland

Series 6 Firmware/Software

Firmware

100 Messages	Programmable Counters
100 Char/line	Automatic Time & Date
Del/Ins Functions	Edit/Save Functions

Programmable Shift Functions

Product/Batch Counters

Standard fonts: 1-5 Lines

WaxJet™ Model 6100 Stores 24 Graphic Images

SystemMaster 2000™ Software (Opt.)

Windows™ Based (95)

Message/Product/label Management

Password Protection (10 user levels)

Copy/Edit/Save Functions

Extensive Graphic/Message Storage (PC hard drive space limited)

Graphic Utilities

Backup/Restore Functions

WYSIWYG Capabilities

Network up to 32 wax jet controllers with bi-directional communication from controller to host PC

Series 6 Consumables

Wax Tank

Reservoir Capacity: 360 ml

Wax Fill Method: Manual Feed

Non-Pressurized Capillary Feed Technology

Low Wax Sensor

Wax Specifications

Wax Color Cubes

Immediate dry times on any substrate

Substrate: Porous & Non-Porous

Wax Volume: 40 ml per cube

Colors: Black, Blue, and Red

Non-Toxic/Non-Hazardous

Base: Wax, Dye Based Only

USDA Compliant

Wax Consumption

Font	Characters/ML
5x5	592,500
7x5	512,500
9x9	325,000
12x6	155,500
14x8	112,500
31x20	23,800

Series 6 Printhead

Imaging

Number of Channels: 31
Number of Orifices: 31
Droplet Size: 0.0033”
Image Area: up to .5” (12 mm)
Operating Temperature: 275°F (135°C)
Vertical Resolution: 62-124 DPI
Horizontal Resolution: 75-300 DPI

Print Capabilities

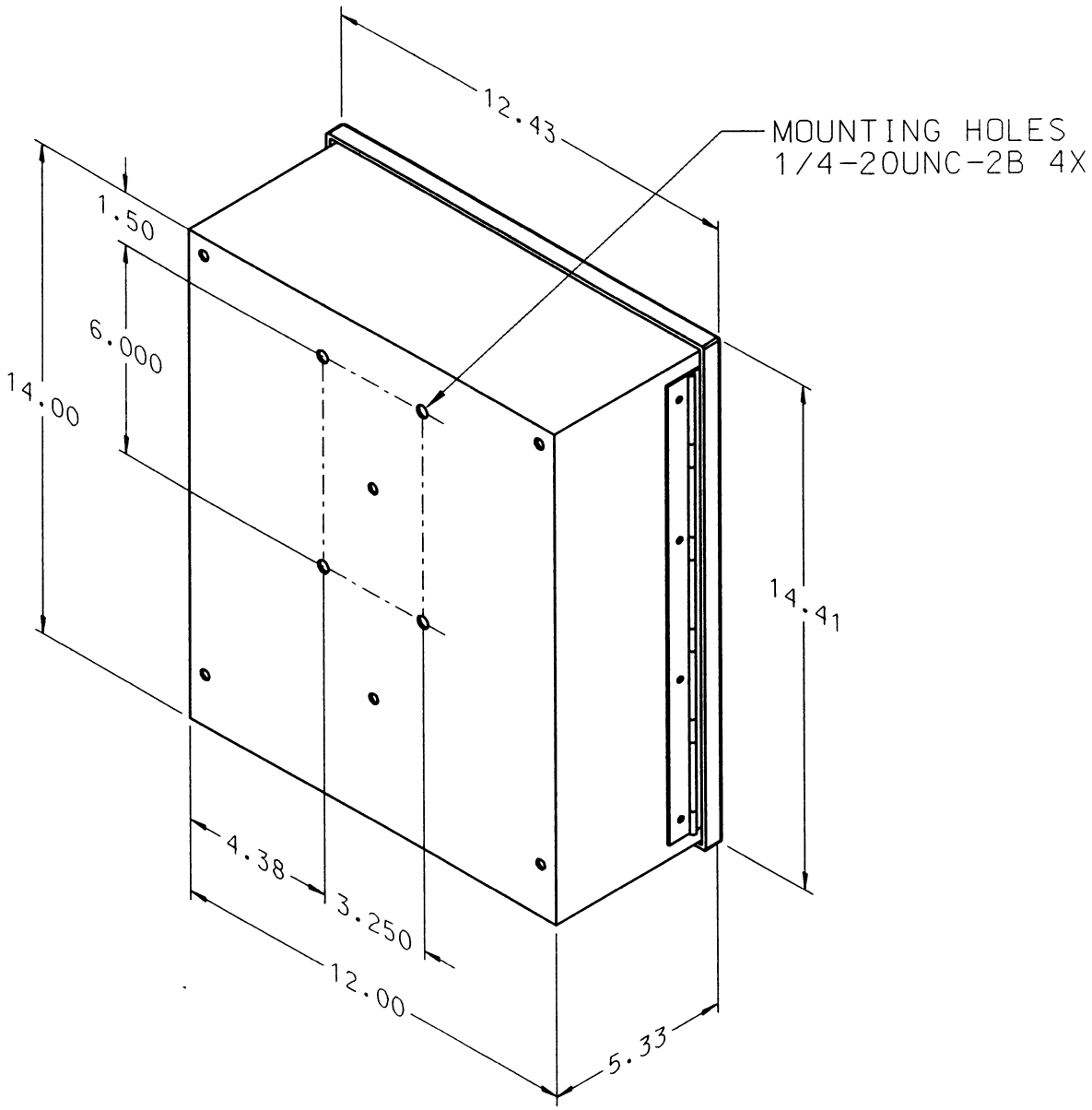
Maximum Firing Frequency: 8 kHz
Maximum Line Speed:
150 DPI 260 ft/min (80 M/min)
300 DPI 130 ft/min (80 M/min)
Throw Distance: 1/16”: (1.5 mm) to ¼” (6 mm)
Max Line Speed at ¼” is 80 ft/min (24M/min)
Max Line Speed at 1/8” 150 ft/min (46 M/min)
Max Line Speed at 1/16” 260 ft/min (80 M/min)
Printhead Orientation: Horizontal/Vertical,
Down - with 8° angle in either orientation
Shock & Vibration Limits:
Vibration 10 g’s all axes, .06” (2 mm) displacement, 10-350 Hz
Shock 30 g’s, .25” (6 mm) displacement, 11 ms duration

Dimensions

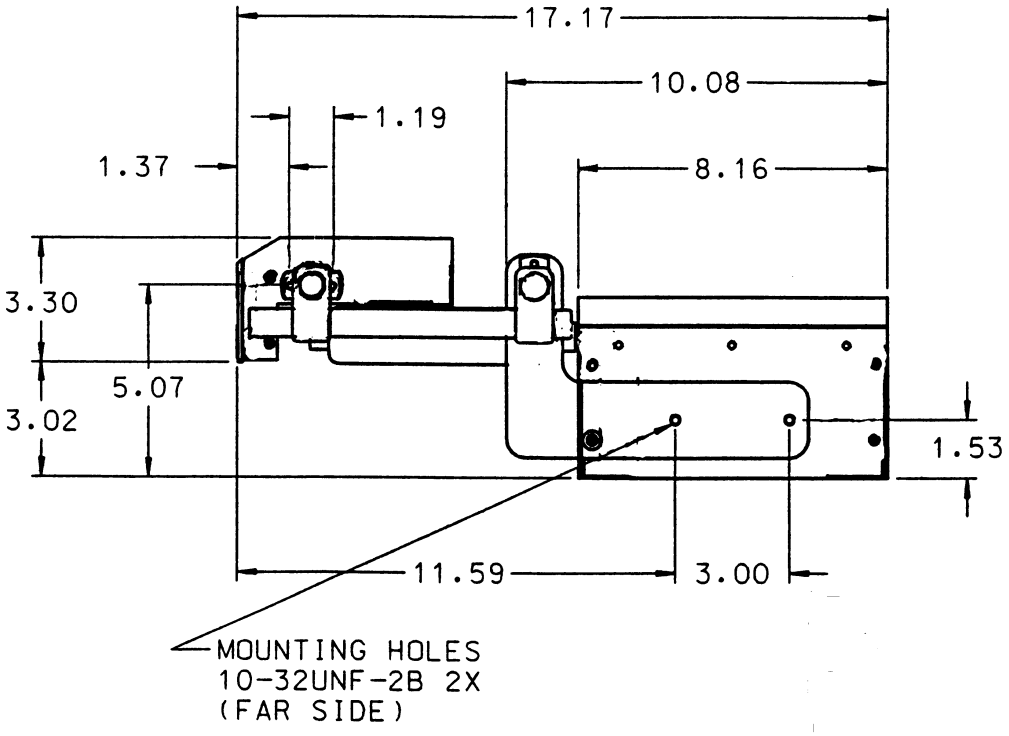
	Height	Length	Width	Weight
WaxJet™ Model 6100 Controller	5.5” 140 mm	14.0” 356 mm	12.5” 318 mm	25 lbs 11 kg
Integrated Printhead/Wax Assembly	6.32” 160 mm	17.17” 436 mm	6.4” 162 mm	11 lbs 5 kg

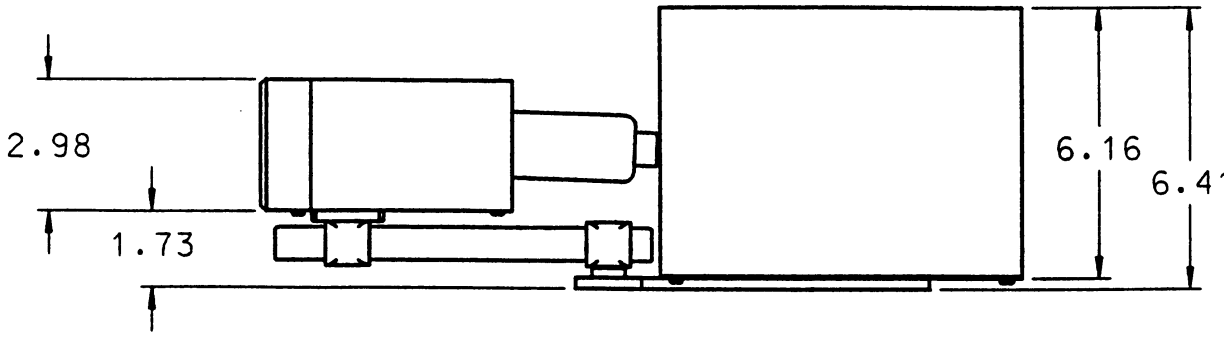
Dimensions

Controller



Integrated Printhead/Wax System





Theory of Operation

The FoxJet printing system is comprised of a few standard parts that are used for all models. The main difference between models will be the firmware, the Printhead used and the electronics that drive the Printhead

The WaxJet Driver board is a single Printhead driver. The WaxJet system will only have one driver circuit. At this time there is no Multi-head configuration for the Series 6 WaxJet Printing system and there is only one Printhead available.

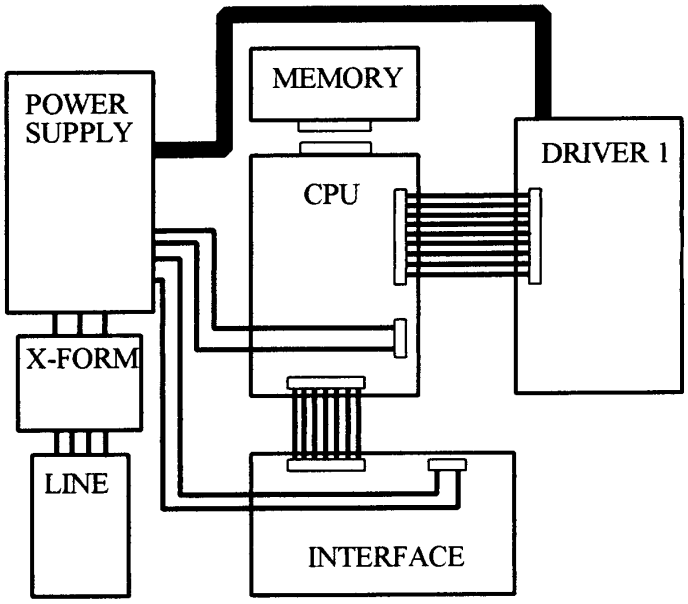


Figure 3-1

Power Supply

The power supply (or PSU) is a linear supply that provides all of the voltages used in the system. The input line voltage is selected by the orientation of the fuse module, allowing the user to match the environment line voltage for proper operation.

Input Voltages

110V-120VAC 3A-50/60 Hz
220V-240VAC 1.5A 50/60 Hz

Output Voltages

5 VDC	3A	Used for logic circuits
12 VDC	2A	Used for powering external peripherals
150 VDC	0.25A	Used for Printhead drive voltages
36 VAC	9 A	Used to heat Printhead

Power supply voltage checks should be made with the supply loaded and unloaded. Sometimes failures of other circuits can give the impression that the power supply voltage is incorrect. Moreover, sometimes supplies can give good voltages in unloaded condition, yet not function when circuits are connected to it.

All potentiometers on power supply are set at the factory and should **NOT** be adjusted in the field. If voltages are incorrect, a fault cannot be remedied by adjusting a potentiometer.

CPU PCB

The CPU PCB contains a 32-bit CMOS microprocessor for high performance data manipulation. 1 megabyte of RAM that is backed up by battery is used to store printing parameters and messages. The RAM will also receive the operating instructions from the firmware module at power up.

Messages and print parameters are programmed into the RAM with a hand held keypad that uses RS-232 communication through the Front Port connection. The FoxJet controller can also be programmed with a PC via the Rear Port connection. The user can download ASCII command strings or use SystemMaster to remotely control the FoxJet Printing systems.

The CPU will convert messages into bitmap images that it will pass to the driver board to be held in a FIFO (first in, first out buffer). The CPU will calculate the firing sequence based on user programmed parameters and, when the photocell trigger occurs, send timing pulse train to fire Printhead nozzles to driver board.

Timing pulses can be a function of shaft encoder input or an internal oscillator. Photocell inputs as well as shaft encoder inputs are received from the Interface PCB via opto-isolators.

Firmware Module

The Firmware Module connects directly to the CPU PCB. The Module will contain the system operating software. The current production standard is 6100415200, but there are many custom versions and older versions in use. Always check the firmware version when working on systems and especially when replacing the firmware module.

Driver PCB

The Driver PCB communicates to the CPU via a 60-pin ribbon cable. This bi-directional cable provides Printhead and wax system status to the CPU for fault detection and display. The LED's on the board show visual indication of the status that is being sent to the CPU. The CPU sends image data and timing pulses train to the Driver PCB on this cable as well.

The Printhead, wax tank and wax hose heating circuits are controlled on the Driver PCB. Two "pico" fuses are used to provide overload protection for the 36 VAC heating circuit voltage on the Driver PCB. If either of these fuses are open, none of the HEATING LED's will light.

Image bitmaps containing message structure are brought into the FIFO when SE command values are selected. When the photocell trigger occurs and DELAY value is counted out, the CPU will send pulse train to Printhead. The pulse train will fire the piezocrystals, ejecting small drops of wax in dot matrix patterns to the product as it passes in front of the Printhead.

Interface PCB

Connected to the CPU by a 34-pin ribbon cable, the Interface PCB mounts to the Connector Panel and connects the system to all peripherals and supplies 12 VDC for those peripherals. The Front Port connection will supply the hand held terminal with 5 volts from CPU circuits as well. The 12 VDC is fused with poly switches and green LED's indicate when voltage is present.

Printhead Wax / System

The Printhead/Wax System is an integrated assembly designed to simplify installation and minimize the effects of vibration on the print capabilities. Wax cubes are melted in the heated reservoir and the melted wax flows to the heated Printhead through the heated hose assembly. A 14-pin cable connects the heater control circuit in the controller to the hose and tank heater circuits. The Printhead Data Cable supplies heater voltage from the Driver PCB to the Printhead heater circuit.

The heated wax flows smoothly to the Printhead. The Printhead is positioned so that gravity feed from the wax reservoir replenishes the Printhead with wax as Printhead prints on the product. The Printhead can be oriented to fire at a horizontal or vertical plane.

The Printhead has a 31 channel nozzle array that can print an image area up to ½" high. Five lines of print can be programmed with high resolution (300 dpi). Printhead wax systems are available in blue, red, and black wax.

Programming

Programming the FoxJet Printing system can be accomplished in three different manners; through the Printer's keyboard, SystemMaster or through user-defined ASCII command strings. The Command Definitions found later in this manual will help to explain the function of each command. Some commands interact with others and affect the operation of the FoxJet printer.

For instance, changing the WIDTH command will require changing the DELAY command. As the value of the WIDTH command increases, the print resolution will Decrease. Refer to Formulas in Design Application for more information concerning print resolution. The DELAY value determines how long after product detect that a print cycle will occur. The DELAY value is in rasters, and the print resolution determines how many rasters there are in a given length of conveyor travel. If print resolution was 300 DPI, a DELAY value of 300 would represent an inch of belt travel.

Another important relationship is the WIDTH and SLANT values. SLANT is used with all Printhead, except Series 9, 8, and 7 256/32, 352,32. Chapter Five has more detail concerning the relationship between the SLANT and WIDTH commands.

Fonts or Font Codes as they are used in the FoxJet Printer refer to codes that select a particular dot matrix size, and or a low–resolution logo or graphic.

Character sets other than English are available through optional firmware (see price lists in the Distributor Products and Services Manual). Their use is detailed in the Operator's Manuals.

Keyboard Programming

Programming the FoxJet printer with the Hand-held keyboard or the integrated keyboard is accomplished by entering the two letter code for the command, entering the desired data or condition and pressing the enter key. The command will be saved until the next change. Refer to Chapter Five for definitions of the commands and directions in how to use. Most commands are only valid for current head selected by the **HE**ad command (multi-head systems), particularly editing commands. Those commands will require programming for each Printhead connected to the system. Some commands relate to two Printhead (Quantum systems and the WaxJet system only have one Printhead). Most configuration commands will affect all heads connected to the controller.

The FoxJet display will also display system status, such as the Main Menu shown below.

```
FoxJet Model 6100
INK LOW  *  *
HEATING A  *
COMMAND (A):_
```

The fourth line in any of the command screens will indicate which Printhead the command will affect. In the example below, the SLANT command would only apply to Printhead A.

```
 SLANT      [0-31]



*A*:_              7
```

There a few status screens that pop up on the display to indicated a condition that requires immediate attention (one shown below will be in xxxx415xxx firmware).

```
**LOW BATTERY **
SERVICE
REQUIRED
PRESS ANY KEY
```

Keyboard Specialty Keys

The following table shows methods for navigating through the edit screens on the hand held terminal or the integrated keyboard.

Alt ←	Moves cursor left one space
Alt →	Moves cursor right one space
Alt ↑	Moves the cursor one line up
Alt ↓	Moves the cursor one line down
Enter ↵	Saves all changes
Alt Esc	Aborts all changes
Standard Controllers	(6100, 7400, 9400)
Alt CLR	Overwriting backspace
⇧ Shift	Toggles between upper and lower case characters
Alt ⇧ Shift **C**	Clears entire message

SystemMaster Programming

FoxJet has developed a Windows-base program that will control up to 32 FoxJet Printing Systems through the external serial port (Rear Port). SystemMaster gives the user the ability to create messages, labels, and logos, then be able to view the print orientation on a what you see is what you get "WYSIWYG" preview screen. From the preview screen you can correct delay, or any other Printhead parameter issues. SystemMaster also gives the user the ability to log and track each printer and creates a database of information. SystemMaster use and programming is fully discussed in the SystemMaster User's Guide.

External Programming

The Rear Port provides for external communications via RS-232 or RS-485 protocol, using 8 data bits, no parity bit, and 1 stop bit. External programming requires a thorough understanding of the command structure and definitions of the FoxJet printer. This information can be found in Chapter Five.

External Programming (or Rear Port Programming) is accomplished with ASCII command strings.

Some ASCII characters have special functions such as Carriage Return (designated as CR , hex value 0D), Line Feed (0A) , Form Feed (0C), and Control F (06).

Many of the two letter commands detailed in Command Definitions pertain to individual heads. When the commands are received, the printer applies those changes to the Current Head only. The Current Head defaults to Head A and may be changed with the **HE**ad command (see Command Definitions). Please refer to the Command Definitions for a more complete description of which commands apply to single heads, dual heads, and all heads.

Note: The WaxJet system will not be configured with multi-head capabilities.

Download times are 1 millisecond per bit when using 9600 baud. The FoxJet printer will take an average of 30 to 45 milliseconds to decode and compile print jobs. If more specific information concerning decode and compile times are needed, contact your FoxJet Authorized Technical Support Representative.

Special Techniques

Some time saving techniques are explained in the following sections.

Embedded Codes

When creating messages, embedded codes can be inserted into the printed message that automatically update as time passes or products print. These codes are detailed below.

Inserting {DT} into a message will print the date as determined by system date set with DATE command every time that message is printed.

Embedded Codes for Date & Time			
{DT}	Inserts MM/DD/YR	{EC}	Inserts Exp. MM/DD/YY
{YE}	Inserts Year	{EY}	Inserts Exp. Year
{MO}	Inserts Month	{EM}	Inserts Exp. Month
{DA}	Inserts Day	{ED}	Inserts Exp. Day
{JD}	Julian Date	{EJ}	Inserts Exp. Julian date
{YL}	Inserts last digit year	{EL}	Inserts last digit of Exp. Yr
{AD}	Inserts DDD (alpha)	{EW}	Inserts Exp. DDD (alpha)
{AM}	Inserts MMM (alph)	{EA}	Inserts Exp. MMM (alpha)
{RM}	Inserts Rollover Month	{RY}	Inserts Rollover Year
{RD}	Inserts Rollover Day	{JR}	Inserts Rollover Julian day
{RC}	Inserts Rollover Date	{RL}	Inserts last digit of Rollover Yr
{TI}	Inserts HH:MM:SS	{HO}	Inserts Hour
{MI}	Inserts Minute	{SE}	Inserts Second

Other Embedded Codes			
{SH}	Inserts Shift Code	{BB}	Prints logos reversed (wh on bl)

Embedded Numbers Codes

Embedded codes for Numbers will print desired numbers value for batch counting or product counting per shift. When the NUMBERS command was set up, an upper and lower value was set, was well as an incrementation value. Embedded codes are used to print the result of the counting operation as part of a message, updating as photocell triggers occur. Embedded codes for numbers format is detailed below.

d = variable, for the digit of the counter that is to be printed.

Example of entering an embedded message for Numbers:

{V3V2U1}

This embedded code will print digit 1 each time, digits 2 & 3 when they are not leading zeros, counting up from the LOWER value set with the NUMBERS command. The LOWER value and incrementation value is set with the NUMBERS command.

Embedded Codes for Date & Time	
{NL}	To print the counter as a down counter, all 8 digits
{Ld}	To print a specified digit of the counter as a down counter
{Wd}	To print a specified digit of the counter as a down counter, unless it is a leading zero
{NU}	To print the counter as an up counter, all 8 digits
{Ud}	To print a specified digit of the counter as an up counter
{Vd}	To print a specified digit of the counter as an up counter, unless it is a leading zero

Mixed Fonts

Font Code 91 will allow the user to create a message that contains characters of different heights. Mixed font messages can have up to four lines of printed text. Each line can have its own font designation. Font combinations can be chosen from fonts 5, 7, 9, 14, 15, and 16.

The Fonts chosen must not exceed 31 dots high. Ideally, the sum of the dots used by the fonts selected should be less than 31 dots minus the number of lines. Some font combinations will NOT produce line separation.

After selecting the font, input the desired messages on each line. On line 5, enter the font information.

Example:

MSG 1 L1 F91
Line 1 contents
Line 2 contents*
Line 3 contents
Line 4 contents
4^9^7^207^105

The first parameter "4" is the number of lines to print. The second parameter "9" is the font for line #1. The third parameter "7" is the font for line #2. The fourth parameter "207" is the font with BOLD of 2 for line #3. The fifth parameter "105" is the font for line #4 with a BOLD of 1.

- Embedded codes are allowed.
- Each parameter entered on line #5 must be separated by a space.
- Individual line bold settings is allowed.

One-for-One Printing vs. Batch Mode

When using external programming and a printed message needs to be changed on every print cycle (one-for-one printing), the editing session for that message should be terminated with FF. This causes the controller to clear the FIFO after it prints that message. Consequently, in one-for-one printing, there will be an edit session for each print cycle. Image build times will limit the effectiveness of One-for-One printing. Typical image build times range form 30-50 milliseconds for 50 characters. Barcode image build times are in the 10-20 millisecond range for 15 characters.

However, in cases where a message doesn't change from print cycle to print cycle, it isn't necessary to edit that message more than once. Any embedded commands such as counters or system date will automatically be updated on each print cycle.

One-for-one printing and batch mode printing may be mixed. For instance, if message #1prints a counter using the embedded code. {U2U1}, and message #2 prints a product code that may change on every print cycle, and both messages are in the SELECT string, the following procedure should be followed:

Edit message #1 one time and terminate the session with CR.

Before every print cycle edit message # 2 with the correct product code and terminate the session with FF.

Alternative Input Devices

Input devices other than the handheld terminal can be connected to the Front Port connection on the FoxJet controllers (Rear Port or Aux. Port on Quantum systems). Any device that can output ASCII in RS-232 format can be used. One such device is a barcode reader. A barcode reader can be programmed to generate commands to the controller (such as Call Group or Label Request) based on the information read from the barcode. Another device is a programmable scale. Products can be weighed and the EDIT function can be used to input the data into a message. The device connections must match those of hand held terminal supplied with standard FoxJet controllers.

Command Definitions

Each Command Definition details function, data entry options and ASCII string for use in external programming. The following commands apply to 415 firmware released in fall 1997. Not all commands will apply to every system. Custom firmware may have additional command sets and some of the commands may operate differently than the standard configuration.

System Configuration Commands

Configuration commands are used during the initial setup of the system. Use extreme caution when changing these command as they can have a direct influence on print quality. Before changing these commands making notes of the default values and tracking what has been changed is recommended.

BAUD RATE

- *Models – Quantum systems only*

Accessed through keyboard, sets baud rate for Rear Port communication for Quantum systems. Must be set to match control device. The arrow keys select the desired baud rate. Keystrokes to enter command are **B A**. Use arrow keys to make desired selection and press Enter↵ to save.

CURVE

- *Models – All except Series 8*
- *Affects selected head only (of multiple head systems)*

To change the fire pulse settings, send 6 digits, which represent the three 2-digit fields. The LEVEL command must be set to Y in order to access the CURVE. Be sure to set the LE command back to N when done. The fire pulse settings vary with the wax type and Printhead type. This command is designed mainly for the Series 7 Products for precise control of the piezoelectric crystal's pulse width. CURVE command sets the fire pulse settings that control the piezoelectric drive pulses.

Contact your support representative before changing the CURVE on a Series 6 Printer. The LEVEL command must be set to Y in order to access CURVE. Keystrokes for CURVE command are **C u**

ASCII String

To change the CURVE to 43:10:06, enter:

```
LEY<CR>CU431006<CR>LEN<CR>
```

DATE

- *Models - All*

Sending 6 digits in MMDDYY format sets the system date. Set at installation and kept current by backup battery. The keystrokes are **D A**

The keys Alt and ← → can be used to move cursor for changing only part of the date.

ASCII String

To change the date to January 2, 1998, enter:

```
DA010298<CR>
```

DISPLAY [1-4]

- *Models – All except Quantum Systems*

The command sets the type of display terminal used for the hand held input device used on standard controllers (Front Port connection). The keystrokes are **D i**

1 - VT-100 Emulation Terminal
2 – Wyse Terminal
3 – FoxJet Terminal
4 – Reserved for future use

ASCII String

To change the display to utilize the Wyse terminal, enter:

```
DI2<CR>
```

ENCODER [Y/N]

- *Models – All (selected head on 8200)*

If there is an external shaft encoder installed, this should be set to Y. When set to N, the controller generates an internal shaft encoder. Switch 4 of SW2 on standard CPU PCB's must match (see Installation – System Configuration). Models 7400 and 8200 can have two encoder inputs. ENCODER 1 controls the top Driver PCB (A & B); ENCODER 2 controls the bottom Driver PCB C & D). The keystrokes are **E N**

ASCII String

To set the encoder to internal, enter:

```
ENN<CR>
```

ID [1-99]

Identification for SystemMaster network operation. Defaults to 99 at power up and accessed only through the keyboard. To change use keystrokes **I d**

LEVEL [Y/N]

The CURVE command is disabled when LEVEL command is set to N. Setting LEVEL to Y allows the CURVE command to be executed. Adjusting CURVE would not normally be done using external programming. Keystrokes are **l e**

ASCII String

To enable access to the CURVE command, enter:

```
LEY<CR>
```

NETWORK [Y/N]

- *All models*

Sets FoxJet printer system(s) to operate under SystemMaster network and accept SystemMaster commands via the Rear Port connection. Avoid input conflicts by returning display screen to main menu. This command is set at installation via the controller's input terminal. Keystrokes are **n e**

SLANT [0-31]

- *Models – All models except Series 9 & 8*

This command adjusts the angle of the print to obtain a vertical image when using nozzle arrays that are slanted (WaxJet, Series 7 printheads 192/32 and 96/32). Divide the print DPI (see WIDTH command) by 18 to calculate the proper slant value for WaxJet printheads. At the command prompt, the keystrokes are **S L**

ASCII String

To change the SLANT to 7, enter:

```
SL7<CR>
```

TIME

- *All Models*

This command displays the current time in HH: MM: SS format. The system clock is set with this command at installation and shouldn't need readjusting during normal operation. At the command prompt, the keystrokes are **T I**

Enter the new time with the numeric values for Hour, Minute, and Second. Use HH:MM:SS format.

The arrow keys, Alt and ← →, can be used for changing only part of the time.

ASCII String

To set the time to 11:20:21 PM

```
TI232021<CR>
```

TRIGGER EDGE [R/F]

- *All models*

A product detect event can be set to occur on either the Rising or Falling edge of the photocell input to the printer. The keystrokes are **t r**

ASCII String

To set the TRIGGER EDGE to rising, enter:

```
TRR<CR>
```

Editing Commands

Editing commands are specifically for preparing a message for printing. Most editing commands will only affect the selected head on multi-head systems.

BOLD [0-9]

- *All models*
- *Selected head (multi-head systems)*

Entering a nonzero number causes each raster to be repeated that many times, resulting in wider characters & graphics. The higher the bold level, the wider the characters appear, and the wider the message will appear. At the command prompt, the keystrokes are **B O**

A value between zero and 9 is entered. This multiplies the number of rasters for each character.

Example: A 5hx5w raster character is printed at a bold value of 2. The 5x5 raster character would now be a 5x10 raster character.

ASCII String

To set the BOLD to 5, enter:

BO5<CR>

DELAY [0-9999]

- *All Models*
- *Selected head (multi-head systems)*

This setting varies the number of raster pulses that must occur after the photocell signal before printing cycle starts. Value is in rasters and the number of rasters per inch of travel is determined by print resolution. Formulas for calculating DELAY value can be found in the Setup/Installation chapter. Keystrokes are **d e**

ASCII String

To set the DELAY to 800, enter:

DE800<CR>

EDIT MESSAGE [0-99]

- *All models*

The EDIT command is used to create and change messages that are stored in the FoxJet Printer RAM. This command will allow the user to create and edit messages, as well as pick the matrix size with which the message will be printed.

After entering **E D** into the terminal, choose the desired message location to edit. Select the font by pressing the Alt key followed by the **FNT** key, entering desired code and press enter to return to message body.

ASCII String

When editing through the rear port, keep in mind that there is only 1 cursor control command (<LF>) to advance to the next line. The edit session is terminated with <CR> or <FF> .

Terminating message with <CR> will print the message in batch mode; terminating with <FF> will print only once (one-for-one) mode. Changing fonts is accomplished with a CTRL-F and selecting the font code.

For example, setting message #09 to print "ABC" on line 3 using font code 09 with bold of 4 (batch mode) would use the following ASCII string.

```
ED09409ABC<CR>
```

EXPIRATION DATE[1-9999]

- *All Models*

This command allows the setup of an expiration date. At the command prompt, the keystrokes are **E X** This value will add the specified number of days to system date. A number of embedded code formats can be used print the Expiration Date. An alteration of this clock has to be within 0 - 9999 range.

ASCII String

To change the expiration date to 30 days from current system date, enter:

```
EX0030<CR>
```

GAP [0-99]

- *All models*
- *Selected head*

This command controls the spacing in rasters between characters. At the command prompt, the keystrokes are **G A**.

ASCII String

To set the GAP to 6, enter:

```
GA6<CR>
```

INVERT [Y/N]

- *All models*
- *Selected head*

This command will allow the user to turn a message upside down. At the command prompt, the keystrokes are **I N**

ASCII String

To set the image to inverted, enter:

```
INY<CR>
```

MIRROR [Y/N]

- *Series 6 only*

Mirror command reverses the print so that it appears as a mirror image. Useful for printing on clear material.
Keystrokes are **m i**

ASCII String

To enable MIRROR function, enter:

```
MIY<CR>
```

NUMBERS

- *All models*
- *Selected head*

Numbers sets up a counter that counts photocell triggers. Four fields are used to set up the counter parameters. The counter can be used as a down or up counter. The NUMBERS counter resets at the start of a new shift. Printing the output of the counter is accomplished with embedded commands. At the command prompt, the keystrokes are **N U**

The arrow keys, Alt , ← , → , ↑ , ↓, are used for moving around this screen. Move the cursor over the area that is to be changed and enter the new value.

The UPPER value is the upper limit of the count.

The LOWER value is the lower limit of the count.

The REP (which starts with 0 being an increment of one) is a value that determines how many times a count is repeated.

The INC is the value at which the counts sequence increments by.

```
NUMBERS  *A   *
UPPER:  00000100
LOWER: 00000000
REP: 002   INC: 005
```

Example: A count routine that will count from 1-100 or from 100 to 1 by increments of 5 and repeats each count 3 times.

Use the Embedded Codes to display the results of the Numbers count setup.

ASCII String

The sequence for rear port access is:

NUuuuuuuuulllllllrrriii<CR>

Skipping over fields is possible by entering without a preceding string of digits. For example, to change the LOWER field without change the UPPER field, enter:

NU<LF>llllllll<CR>

where "llllllll" consists of the desired 8 digits for the lower field.

POSITION [0-32]

- *All models*
- *Selected head*

To adjust the vertical position of a printed message within the distance of the Printhead image area. The values represent nozzles. Entering 16 will allow the printed message to start at nozzle 16.

This is useful when printing small fonts with very few lines for fine tuning position. At the command prompt, the keystrokes are **P O**

ASCII String

To position the image up 5 nozzles or channels from the bottom, enter:

```
PO5<CR>
```

SELECT [0-99]

- *All models*
- *Selected head*

This command will select the messages to be printed. At the command prompt, the keystrokes are **S E**

The message string to be printed is selected here. A message string can contain as many as 8 different messages

ASCII String:

To select messages 3, 45, & 99, enter:

```
SE034599<CR>
```

WIDTH [1-255]

- *All models*
- *Selected head*

This command will adjust the horizontal print resolution. The WIDTH value will be divided into the encoder pulse train frequency or the internal clock frequency to create Printhead firing pulses.

For example, using a WIDTH value of 2 with a 300 DPI encoder assembly would generate pulse train for 150 DPI printing.

Any change in WIDTH value will require a change in DELAY value and the SLANT or OFFSET (1.9" Series 7 printheads) value.

At the command prompt, the keystrokes are **W I**

ASCII String

To set the WIDTH to 5, enter:

```
WI5<CR>
```

Utility Commands

Utility commands are used for special functions, diagnostics and some other printing features.

BACKUP [Y/N]

- *All models (415 firmware and above)*

When BACKUP is enabled, an ASCII string is output to the Rear Port that contains all Message and Parameter information. A host PC utilizing a text capture function can save the string on a PC for future Message/Parameter reloads. Keystrokes to initiate a BACKUP are **B U**, then select **Y** to initiate. To restore, just send text file from PC to controller. NETWORK (NE) command must be set N.

ASCII String

To initiate BACKUP, enter:

```
BUY<CR>
```

CALL GROUP [0-31]

- *All models*

This command will allow one of 32 different parameter groups (groups must be saved with SAVE command prior to using CALL command) to be called from storage for printing. Each group consists of the following command settings:

BOLD, DELAY, EXP. DATE, GAP, INVERT, NUMBERS, POSITION, SELECT, REVERSE, and WIDTH

At the command prompt, the keystrokes are **C A**

ASCII String

To call parameter group #1, enter:

```
CA01<CR>
```

CHANGE PASSWORD

- *All models except 7400*

This allows a level one user to add or delete the two passwords that determine the level 1 and level 2 access. At the command prompt, the keystrokes are **C P**

When change password is enabled, the keyboard will allow two passwords to be entered. The top line is for level 1 access and the second line is for level 2 access. Only two passwords can be entered. The system default passwords are "inkjet" for level 1 password and "111111111111111" (fifteen ones) for level 2 password. No password can exceed fifteen characters in length.

CLEAR MAP [Y/N]

- *All models*
- *Selected head*

CLEAR MAP clears the print buffers. The print buffer will hold the last message printed unless cleared. Keystrokes are **c l**

ASCII String

To clear the print buffer, enter:

```
CLY<CR>
```

COUNTERS

- *All models*
- *Selected head*

This command will allow the user to view the status of the incrementing Numbers command on the Display Screen. At the command prompt, the keystrokes are: **C O** (Used for monitoring only.)

PASSWORD [Y/N]

- *All models except 7400*

The Password enable function allows three levels of users with two specific passwords.

Level 1 Highest level, allows access to all commands currently supported by the controller.

Level 2 Mid level, only allows the following commands to be accessed.

Baud Rate	Delay	Label Request	Reverse	Status
Bold	Encoder	Label Save	Select	Test Print
Call/Save	Gap	Network	Sign In	Trigger Edge
Clear Map	ID	Numbers	Slant	Verify
Counters	Invert	Position	Sign Out	Width

Level 3 Lowest level, only allows the following commands to be accessed.

Clear Map	Status
Counters	Test Print
Delay	Verify
Sign In	

At the command prompt, the keystrokes are **P W**. Press **y** to enable. Press **n** to disable. Once enabled the user is automatically signed in as a level three user. In order to access other features the operator must Sign In.

When PassWord is disabled, Sign In, Sign Out, and Change Password are not available.

PRODUCT COUNTER

- *All models*
- *Selected head*

The Product Counter will count all products printed until the user resets it. The values are not used to print on product; this is strictly a status report. Keystrokes are **p c**

There are two programmable product counter. Each counter is associated with photocell input. Each counter sets up a counter that counts photocell triggers. Four fields are used to set up the counter parameters. The counter can be used as a down or up counter. Counter will increment any time that a product detect occurs, including test pattern prints or photocell triggers during setup or warmup. Product counters can only be reset by accessing the PC command.

A) UPPER: 99999999
B) LOWER: 00000000
C) REP: 000
D) INC: 001

ASCII String

The sequence for rear port programming is:

```
PCuuuuuuuulllllllrrriii<CR>
```

Skipping over fields is possible by entering without a preceding string of digits. For example, to change the LOWER field without changing the UPPER field, enter:

```
PC<LF>llllllll<CR>
```

where "llllllll" consists of the desired 8 digits for the lower field.

PRODUCT LOG

- *All models*

This command will cause the upper and lower counter values of each Product Counter to be displayed on the display screen. Keystrokes are **p l**

ASCII String

To view the contents of the Product Log, enter:

```
PL<CR>
```

Results: P1xxxxxxxxP2xxxxxxxx

ROLLOVER TIME

- *All models*

This sets the time of day when the system date is advanced. If set to before 1200, the date change will lag the real date. If set to after 1200, the date change will lead the real date. There are three 2-digit fields concatenated as Hours, Minutes, Secs.

At the command prompt, the keystrokes are **R O**

Enter the altered time with the numeric values for hour, minute, and seconds. Use the following format: HH: MM: SS

Acceptable entries are between 00:00:00 (midnight) to 23:59:59 (1 second before midnight).

The arrow keys, Alt ← → , can be used for changing only part of the time.

ASCII String

To cause the date to advance at 11:05:20 PM, enter:

```
RO230520<CR>
```

SAVE GROUP [0-31]

- *All models*

Certain settings may be saved into 1 of 32 parameter group storage locations. This is useful for later recalling a known correct set of parameters using CALL command.

At the command prompt, the keystrokes are **S A**

A parameter group can be saved to thirty-two different file locations. When a file is saved and then edited afterwards, it must be saved again before exiting or the changes will be lost.

The parameters saved in the parameter group position are:

BOLD, DELAY, EXP. DATE, GAP, INVERT, NUMBERS, POSITION, SELECT, REVERSE, and WIDTH.

ASCII String

To save the current settings to group #04, enter:

```
SA4<CR>
```

SHIFT SET [1-3]

- *All models*

This command uses four fields to set work shift parameters for coding with an embedded command. When using the embedded code {SH} in a message, the code associated within the work shift time range will be printed. At the command prompt, the keystrokes are **S H** (Series 8 - **S S**)

The display will allow editing of the four fields (shown below)

SHIFT #:	1	(up to 3 shifts allowed)
BEGIN:	00:00:00	(shift start time)
END:	08:00:00	(shift end time)
CODE:	A	(shift code that will be printed)

Example:

Shift 1	: Begin 00:00:00	End 07:59:59	Code A
Shift 2	: Begin 08:00:00	End 15:59:59	Code B
Shift 3	: Begin 16:00:00	End 23:59:59	Code C

With the above settings, the "**A**" will be printed between midnight and 7:59 AM when using the embedded code {SH} ({SS} for Series 8 systems).

ASCII String

The sequence for external programming of the SHIFT SET is as follows:

```
SHnbbbbbbeeeeeec<CR>
```

Where:

n	=SHIFT number
bbbbbb	=BEGIN time in HHMMSS format
eeeeee	=END time in HHMMSS format
c	=SHIFT CODE to be printed

It is necessary for the first field (shift #) to be entered. The printer then automatically advanced to the second field. To skip over a field, enter without any preceding digits.

- When a new shift begins, NUMBERS counters are reset. Setting all shift begin and end times to 00:00:00 prevents automatic reset of counters.
- Do not overlap shifts.
- CODE can only be an alpha character, not numeric.

SIGN IN [Y/N]

- *All models except 7400*

Allows the operator to log in to the controller when the PassWord command has been enabled. The default level 1 password is "**inkjet**" and the level 2 password is "**111111111111111**" (fifteen ones). At the command prompt, the keystrokes are **S I**

SIGN OUT [Y/N]

- *All models except 7400*

Allows the operator to log out when programming of the controller is complete. Command only functions when the command Password has been enabled. Cycling power on the FoxJet controller will not sign out the user. At the command prompt, the keystrokes are **S O**

TEST PATTERN

- *All models*
- *Selected head*

This command generates a test pattern print that fires all nozzles upon product detect and programmed DELAY.

At the command prompt, the keystrokes are **T E**

Figure 5-1

After typing **TE,** it is not necessary to confirm with the Enter↵ key. **(This screen needs to be showing in the display for the test pattern to work).**

To exit the test mode, press the Enter↵ key.

ASCII String

To initiate the test pattern, enter:

```
TE<CR>
```

A second carriage return will exit the test pattern.

VERIFY [Y/N]

- *All models except Series 8*

This command will allow the user to verify that the controller did receive the down loaded graphics. Used for verification only. At the command prompt, the keystrokes are **V E**

The display will show the font codes that have received logos. If no logos had been received, the printer would display "00" indicating that no downloaded logos were received by the printer.

ASCII String

To verify if a logo has been downloaded, enter:

```
VE<CR>
```

ZAP

- *All models*

This command will reset all parameters and messages to factory default settings. At the command prompt, the keystrokes are **Z A**

Enter **Y** for Yes.
Press Enter↵
Now turn the controller **OFF** then back **ON**, this will complete the ZAp command.

- *Do not press any other keys or the ZAp will not take place.*

ASCII String

To perform a ZAP using external programming, use the following steps

```
Enter ZAY<CR>
```

Cease all communications to the FoxJet controller.

Cycle power off to the FoxJet controller, then back on.

Rear Port Commands

As noted in Programming, Rear Port communications are simply the standard commands using ASCII character strings (see page 4-4). The following commands relate directly to Host PC to FoxJet Printer communications.

ACKNOWLEDGE [Y/N]

When this function is enabled, the printer will send an "A","B","C", or "D" out the rear port when the print image for a given head has been sent to the print buffer. This feature is useful in one-for-one printing because it signals the host computer that it is safe to download the next message.

`ACY<CR>` **to enable;**

`ACN<CR>` **to disable via Host PC.**

LABEL REQUEST

Label Request is programmed through the Front Port and when SystemMaster receives a Label Request, a search and download process is initiated in SystemMaster to find a stored label and download it the Printer. The hand held terminal can be used, but typically Label Request is programmed with a serial output device such as a barcode reader or a scale for automatic loading. The following string would be used.

`LR(filename)<CR>`

LABEL SAVE

Label Save is accessed from the FoxJet controller input device (hand held terminal or integrated keyboard). It allows the user to edit an active SystemMaster Label at the controller and save those changes to SystemMaster.

`LS(filename)<CR>`

Download Logo

A range of font selection codes is reserved for downloading logos to the FoxJet controller. Logos can be downloaded into the memory locations identified by the font selection codes by either ASCII command strings through the Rear Port or the Logo option on SystemMaster.

The Download command (via the rear port) allows downloading logos with ASCII command strings. Essentially, you would be loading individual dot values (print or no print) in the memory locations identified by the font selection code. First, you must draw the logo onto a dot matrix background that is 32 dots high and no more than 256 rasters wide. (See drawing on next page). Then you encode the logo information into hexadecimal code so that the FoxJet printer can decode it properly. Now you're ready to write an ASCII command string. The command string has many components (listed below).

<CR>	Resets the serial input data stream.
DO	Download following command string.
FF04	Identifies string as logo.
003C	Tags string to font selection code number in hexadecimal ($3C_{hex}$ is 60_{dec}).
0011	Number of vertical rasters to download in hexadecimal. (11_{hex} is 17_{dec})
XXXXXXXX	1 raster of encoded logo information (HEX), each digit representing 4 dots.
<CR>	Ends the download string.

The download string for the logo on following page would be as follows:

```
<CR>DOFF04003C0011F0000000103F000010FFC00001FF
F000F3FFF80093FFFC00F7FFFF0007FFFFCCF7FFFFCEB7
FFFFCC27FFFF0003FFFC00F3FFF80091FFF000F0FFE000
03F8000<CR>
```

Query

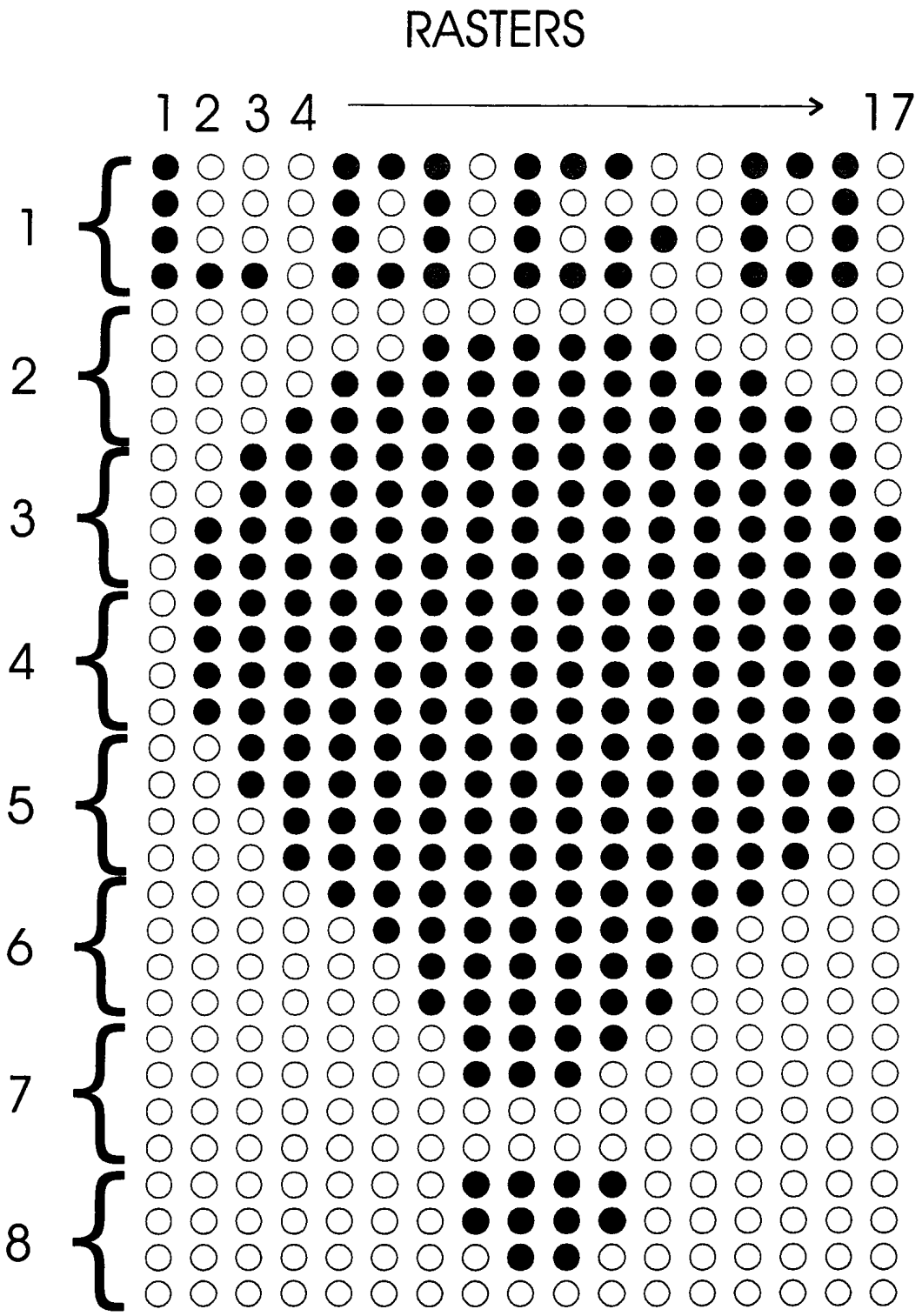
The **QU<CR>** sequence causes a status byte to be sent out the Rear Port bus. The 1st three bits are fixed at "010". The remaining bits have the following meanings:

BIT #4	BIT #3	BIT #2	BIT #1	BIT #0
Printhead status	High voltage status	Wax level	Printhead temperature status	Printhead heater status
0 = AVAIL 1 = NOT AVAIL	0= HV OK 1= HV NOT OK	0= WAX LOW 1= WAX OK	0= AT TEMP. 1= BELOW TEMP	0= NOT HEATING 1= HEATING

For example, a Printhead with everything OK and HEATING would have a status byte of 01000101 (Hex 45 = character 'E').

To obtain status from the controller, the following string should be used (single head systems):

```
HEA<CR>QU<CR>
```


RASTERS
1 2 3 4
17
1
2
3
4
5
6
7
8

This page intentionally left blank.

WaxJet™ Installation & Setup

System Configuration

Prior to powering up the system, it is a good idea to perform a visual inspection on the printed circuit boards in the controller.

- Check for damaged components and loose connections.
- Make sure that all socketed IC's are seated securely.
- Measure the Backup Battery voltage on the CPU PCB. Reconnect the battery if disconnected. If battery is a rechargeable Ni-Cad battery, a low voltage reading is not abnormal. A Low battery condition though can cause the CPU not to boot. After system is powered up, the battery will recharge.
- Configuring the system to operate consists of setting a few switches on the boards in the controller.

Interface PCB

The Interface PCB is located at the bottom of the 6100 controller. Switch SW1, located on the right side of the board, determines the communication protocol for use with a computer. If connecting a computer to the FoxJet controller, this switch should be set to match the communication protocol of the serial port of the host PC. The controller is shipped with the switch in the RS232 position.

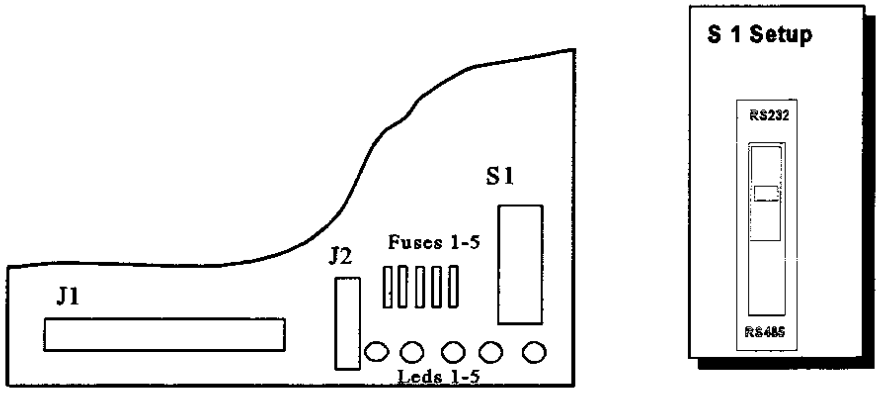


Figure 6-1

CPU

The CPU PCB contains two switches that are used for configuration. SW1, located on the left side of the CPU PCB, sets the baud rate for both the Front Port and Rear Port. The Front Port is typically used for the hand held terminal supplied with the system, which is configured for 9600 baud. SW1 is normally set for 9600 baud on both the Front and Rear Ports. See Table 6-1 for configuration.

SW2 is a bank of six individual switches that are used to configure peripherals connected to the Connector Panel. See Table 6-2 for configuration.

Reconnect battery if it has been disconnected. Batteries may be disconnected to lengthen life on CPU boards not immediately installed into operational systems (lithium only).

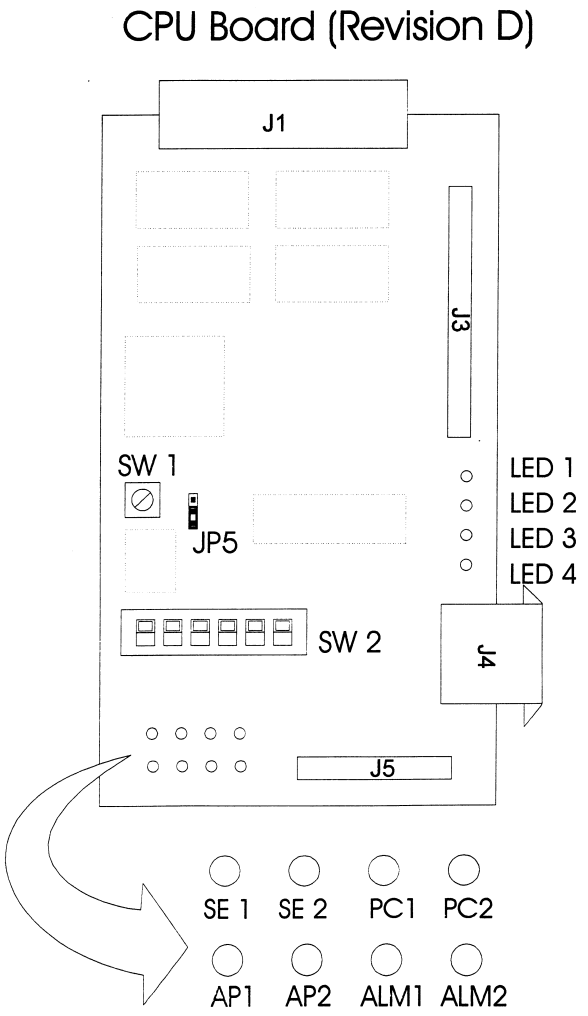


Figure 6-2

Table 6 - 1 - Switch SW1 (CPU)

Switch Position	Front Port Baud Rate	Rear Port Baud Rate
0	38.4K	9600
1	38.4K	9600
2	38.4K	9600
3	38.4K	9600
4	38.4K	38.4K
5	38.4K	38.4K
6	38.4K	38.4K
7	38.4K	38.4K
8	9600	38.4K
9	9600	38.4K
A	9600	9600
B	9600	19.2K
C	19.2K	9600
D	19.2K	19.2K
E	19.2K	19.2K
F	19.2K	19.2K

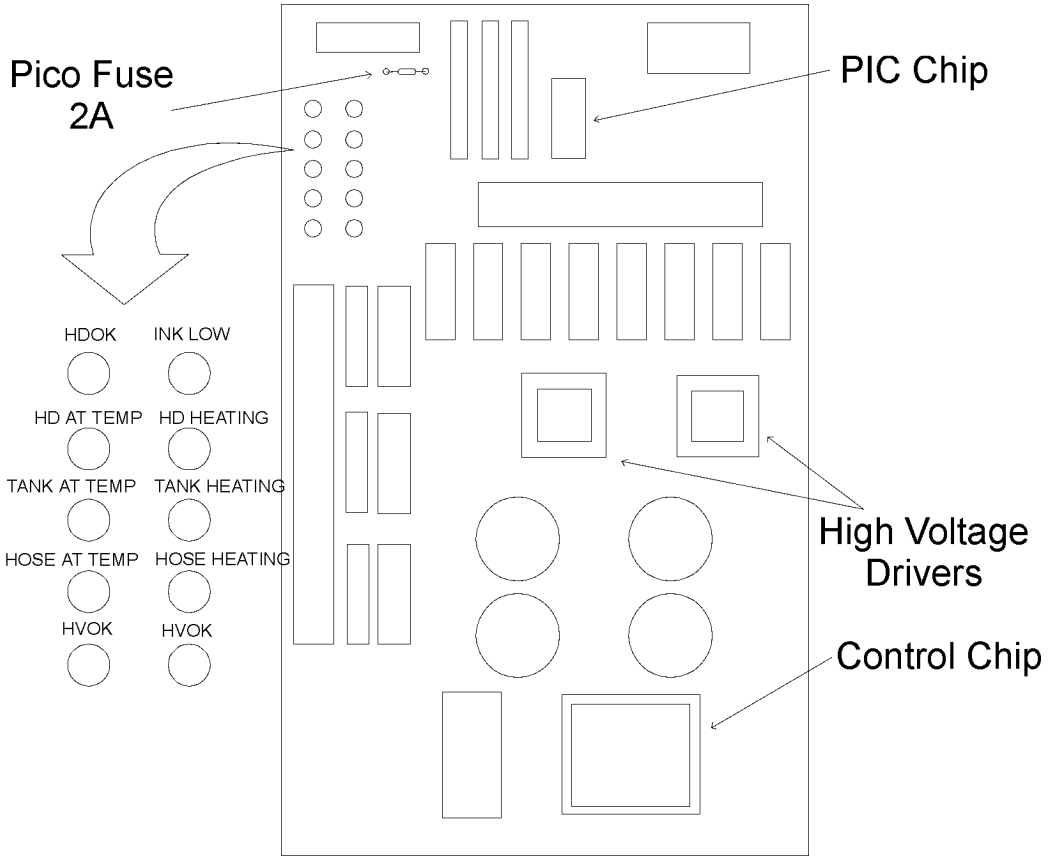
Table 6-2 - Switch SW2 (CPU)

SWITCH NUMBER	DOWN	UP
1 ENCODER TYPE	OPEN COLLECTOR	TTL
2 NOT USED		
3 NOT USED		
4 FIRING PULSE TIMING SOURCE	INTERNAL OSCILLATOR	EXTERNAL SHAFT ENCODER
5 NOT USED		
6 REAR PORT COMMUNICATIONS	SERIAL RS485	SERIAL RX232

- Note: Switch 4 must match ENCODER command setting for print operation. See Command Definitions.

Driver PCB

The Driver PCB doesn't require any particular settings, however, a visual inspection should be performed to ensure that all components are properly seated and that no damaged has occurred during shipping.



Power Entry Module

The Power Entry Module can be set to operate on 220 VAC or 110 VAC. The fuse module's orientation will determine voltage configuration. When inserting fuse module, ensure that voltage being used can be read when latch is closed.

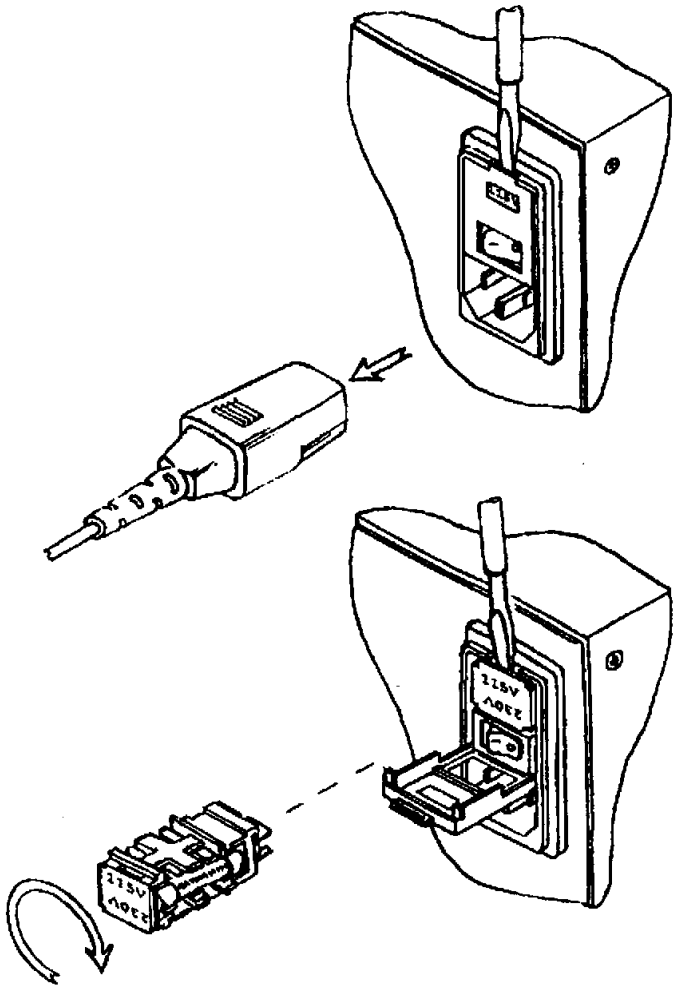


Figure 6-3

Equipment Installation

Mounting the system directly on the conveyor line is usually the most convenient and aesthetically pleasing installation. However, the operational characteristics of the conveyor will dictate the feasibility of mounting the printing system to it. Systems can be mounted to a sturdy portable frame (Floor Stand). A floor-mounted system is available to completely isolate printing equipment form the vibration of a conveyor line. There are several bracketry kits available, as well as individual pieces. Special bracketry has been designed for more complicated application situations. For more detailed information concerning the different bracketry kits, see Parts.

Production Line

The following procedure is the recommended method for installation of the Model 6100 System. Read each step carefully to avoid later problems.

6100 Controller

1. Assemble 2" bracketry as designed during site survey.
2. Mount controller to 2" post bracket assembly with (4) ½" x ¼" screws.
3. Position controller to desired height on 2"' post and tighten clamp.

Ensure that controller door has room to open. A minimum of 16" (inches) is required for door swing path.

Caution: Check stand stability with controller mounted

WaxJet Printhead / Wax System

There are a few factors to consider when mounting the WaxJet Printhead/Wax System. They are:

- Wax throw distance is a maximum of ¼". Faster production lines will require that the nozzle array be mounted closer to the product.
- Some products may be affected by the high heat levels emanating from the Printhead. Consider this factor when setting the throw distance.
- The Printhead/Wax System must be mounted so that nothing strikes it in order to avoid depriming and possible damage.

1. Place the Printhead/Wax System on a stable platform near the controller.
2. Support the Printhead assembly and remove the integration hardware from the Printhead.

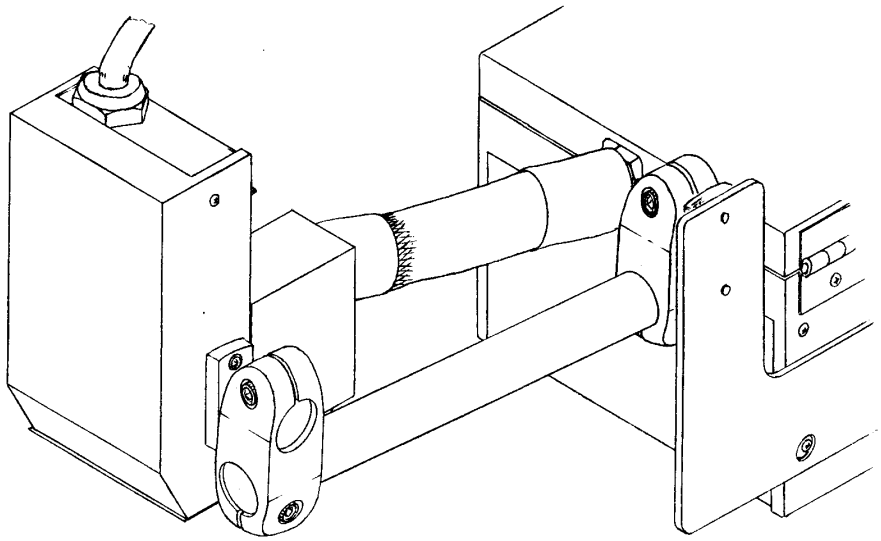


Figure 6-4

3. Remove the cover from the Printhead housing assembly and remove the screws securing the Printhead PCB.
4. Install the Printhead Data Cable to the Printhead PCB. The connector is keyed to avoid improper connection.

5. Orient the Printhead as determined during site survey. See Printhead Orientation on the next page.
6. Carefully slip Printhead Data Cable into the opening in the housing. Then secure sheath retaining nut to sheath.
7. Secure Printhead PCB to housing and re-install the Housing Cover.
8. Reassemble integration hardware.
   - The ¾" hardware can be mounted on either side of the Printhead/Wax System.
9. Assemble mounting bracketry as designed during site survey.
10. Mount Printhead/Wax system to bracketry.

Printhead Orientation

The integrated Printhead assembly can be mounted for horizontal printing or "top-down" printing. The Printhead assembly has a "tee" connection for the Wax supply, which allows for the different orientations. It's a relatively simple process to change the orientation.

1. Ensure that system has been turned off for at least one (1) hour prior to changing the orientation of the Printhead.
2. Remove integration hardware.
3. Remove the cap on the unconnected fitting.
4. Loosen hose connection and relocate Printhead to the new orientation.

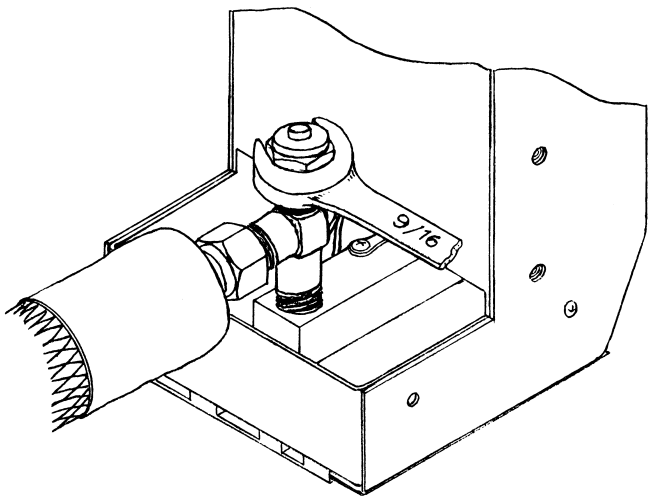


Figure 6-5

5. Tighten wax hose nut finger tight, then tighten 1 ¼ turn more with a wrench.
6. Install cap on the now unconnected fitting.
7. Re-install integration hardware to reassemble Printhead/Wax System.

Product Detection

1. Mount Photocell as designed during site survey. Distance between photocell and Printhead must be shorter than product pitch.

Line Speed Monitoring (encoder; optional equipment)

1. Open Shaft Encoder Kit and inventory contents. Detailed instructions are included in kit.
2. Determine the proper wheel using the formula below. Series 6 Printheads have a maximum firing frequency of 8kHz. FoxJet encoder wheels are rated at 300, 284 and 245 DPI when used with FoxJet Shaft Encoder.

$$\left(\frac{EDPI}{W}\right) \times LS = FREQ.$$

where:

EDPI=	Encoder assembly base DPI rating
W=	WIDTH setting of FoxJet controller
LS=	Line Speed (in inches/second; IPS)
Freq.=	Firing pulses generated by belt movement (in cycles per second: Hz) to Printhead (8 kHz maximum)

3. Mount the appropriate wheel to the shaft of the encoder. Tighten setscrews.
4. Mount the encoder pivot mount assembly to the conveyor line. To make sure that the rotation of the wheel will accurately reflect the speed of the conveyor belt, mount the wheel so that direct contact to the belt roller is made.
5. Route the encoder cable back to the controller, ensuring that the cable will not be damaged by conveyor line motion.

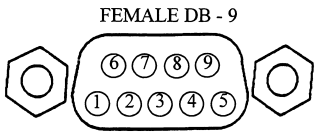
Auto-Print Module (optional equipment)

1. Mount the Auto-Print Module in an accessible location. (cover must be removed for adjusting)

Connections

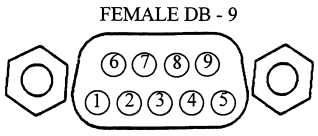
1. Route photocell cable to Controller and connect to Photocell 1 jack on Connector Panel.

PIN	SIGNAL NAME	TYPE
3	Photocell Signal	Input
5	DC Ground	Ground
6	+12 VDC	Supply



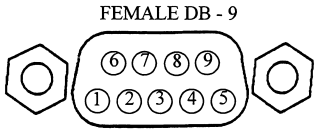
2. Route encoder cable to Controller and connect to Encoder 1 jack on Connector Panel.

PIN	SIGNAL NAME	TYPE
7	Shaft Encoder Signal	Input
5	DC Ground	Ground
6	+12 VDC	Supply



3. Connect Alarm Beacon to External Alarms jack on Connector Panel.

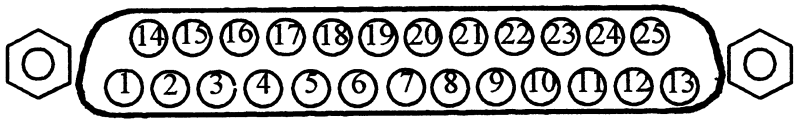
PIN	SIGNAL NAME	TYPE
4	Alarm 2	Output
5	DC Ground	Ground
6	+12 VDC	Supply
8	+ 12 VDC	Supply
9	Alarm1	Output



4. Connect hand held terminal to Front Port jack on Connector Panel.

PIN	SIGNAL NAME	TYPE
2	RS232 RX	Input
3	RS232 TX	Output
7	Ground	Ground
9	+ 5 VDC	Supply
12	RS485 TX+	Output
13	RS485 TX-	Output
14	+12 VDC	Supply
24	RS485 RX+	Input
25	RS485 RX-	Input

FEMALE DB -25



5. Ensure that power switch is off and plug power cord into electrical supply.

Initial Startup

Prior to powering up the controller, the Printhead/Wax System must be mounted. The Printhead nozzle array will heat up to 135° C (275° F).

1. After the power switch is engaged, the system will boot up and the heater circuits will begin to heat the Printhead, wax tank and wax hose. The display screen will exhibit the following.

```
FoxJet Model 6100
INK LOW  * *
HEATING A  *
COMMAND (A):_
```

The INK LOW status line will show an “A” until the wax in the Wax Reservoir becomes liquid, providing a path for the INK LOW circuit. The “HEATING” status line will indicate “A” until all heating circuits reach operating temperature. This usually takes about an hour.

2. Check LED's on the Driver PCB to make sure that heater circuits are operating properly.

Table 6-3

LED	FUNCTION	TYPICAL STATE
HEAD OK	Indicates that Printhead is connected	Lit if Printhead is connected.
WAX OUT	Indicate WAX LOW condition	Off until WAX LOW condition is sensed.
HEAD AT	Indicates when Printhead is at temp	Lite after Printhead reaches temp. Should remain steady.
HEAD HTR	Indicates that Printhead heating element is active	Lit while Printhead is heating. Cycles on & off to maintain temp.
TANK AT	Indicates that wax tank is connected and heating circuit is active	Lit after wax in tank reaches temp. Should remain steady.
TANK HTR	Indicates when wax hose reaches temp	Lit while tank is heating. Cycles on & off to maintain temp.
HOSE AT	Indicates when wax hose reaches temp	Lit after in hose reaches temp. Should remain steady.
HOSE HTR	Indicates when wax hose heating circuit is active	Lit while wax hose is heating. Will go off when wax in hose reaches temp. Cycles on & off to maintain temp.
HV OK	Indicates High Voltage on Driver PCB	Lit if high voltage is OK.

- If any of the AT TEMP LED's on the Driver PCB starts to flash, go to the Fault Diagnosis of Service section.

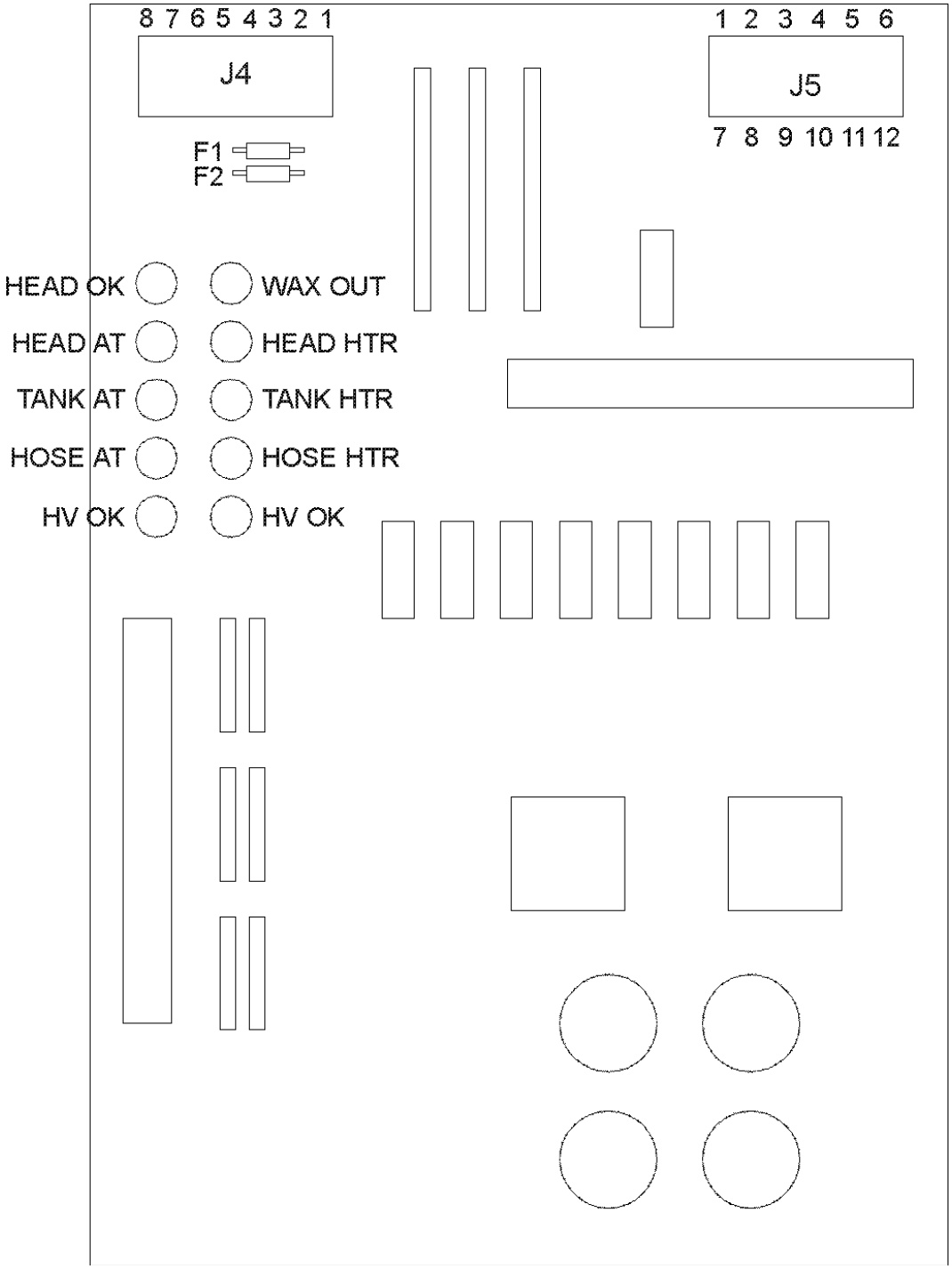

8 7 6 5 4 3 2 1
J4
1 2 3 4 5 6
J5
7 8 9 10 11 12
F1
F2
HEAD OK
WAX OUT
HEAD AT
HEAD HTR
TANK AT
TANK HTR
HOSE AT
HOSE HTR
HV OK
HV OK

Figure 6-6

3. Check LED's on the CPU PCB using table 6-4.

Table 6-4

LED	FUNCTION	TYPICAL STATE
LED1 LED2	Flash during XMIT & REC when downloading info from host computer	Will only flash during communication process; indicates Rear Port communication
LED3	On some systems, lights to indicate that encoder is selected in firmware; doesn't affect operation	Off on most systems
LED4	Indicates that system has passed power up tests	Will be lit when system is running: older systems will not use this indicator
PC1 PC2	Photocell Trigger indicator	Flashes when photocell triggers; with no photocell plugged in, light will not be lit
SE1 SE2	Shaft Encoder rotation indicator	Flashes to indicate a pulse from shaft encoder. Appears to be steady, but is actually flashing at encoder speed
ALM1	Indicates Printhead is at operating temperature	On when Printhead and wax system reaches operating temperature
ALM2	Red LED that indicates an WAX LOW condition	Off until WAX LOW exists
AP1 AP2	Not used in Series 6	Will not be lit for Series 6 operation

4. While the Printhead/Wax System is heating, perform the Operation Tests and Setup.

Operation Tests

1. Block Nozzle Array of Printhead with lint free wipe.
2. Configure photocell as designed during site survey.
3. Block photocell with product sample and adjust gain adjustment until LED on back of photocell flashes at a high frequency.
4. Remove product sample and adjust photocell gain adjustment 2 (two) turns counter-clockwise. LED should go out. (Light colored products may require angling photocell beam 15 degrees form perpendicular to product.)
5. Block photocell with product sample again and verify that P/C LED on CPU board flashes.
6. Pull encoder wheel (if installed) away from conveyor line and rotate wheel. Ensure that EN LED on CPU PCB flashes or lights.

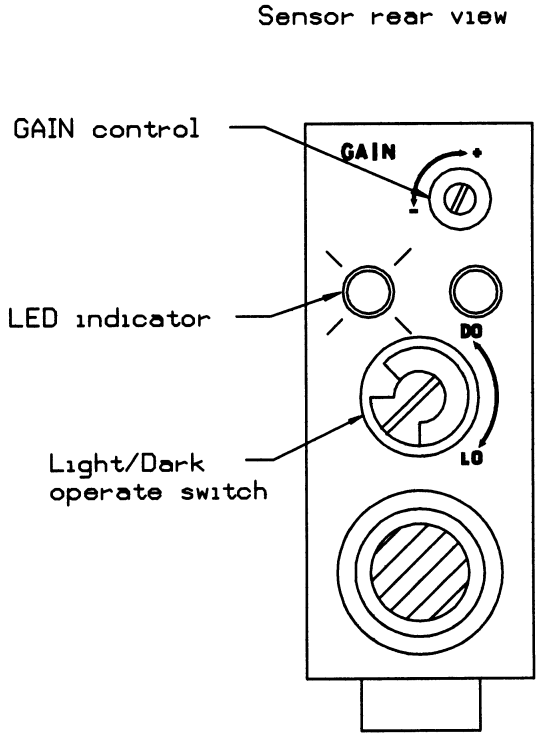


Figure 6-7

Operational Setup

Prior to purchase of FoxJet Printing System, a site survey would have been accomplished. Use the data obtained in the survey to set parameters and edit messages. Refer to Programming and Command Definitions sections.

Delay Value Calculation

The DELAY value is in raster units. Determine the DELAY value by adding the distance between photocell and the Printhead nozzle array to the distance from product edge to print location, then multiply the sum by the print DPI (Dots Per Inch).

$$(d1 + d2) \times DPI = DelayValue$$

where:

d1 = distance between photocell and nozzle array (in inches)

d2 = distance of product edge to print location (in inches)

DPI Calculations

If encoder installed, DPI is determined by dividing encoder DPI rating by the value set in the WIDTH command.

If encoder is not installed, DPI is determined by dividing 35000 (internal clock frequency) by value set in the WIDTH command, then divide the result by the line speed in IPS (Inches Per Second).

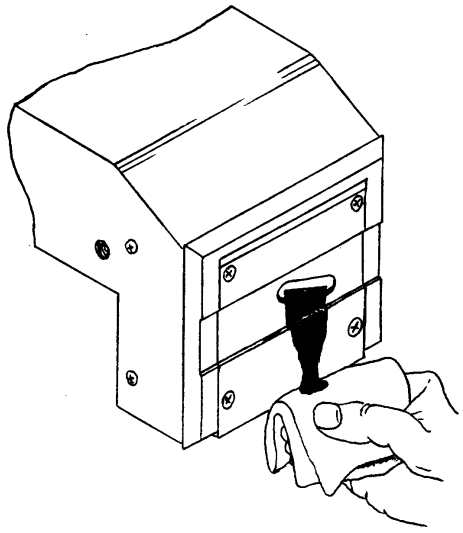
Printhead/Wax System Purge/Prime

Normally, the system should be fairly easy to prime. Prior to shipment, the system will have been print tested, then allowed to cool thoroughly before it is prepared for shipment. When the wax solidifies, there is little chance that air bubbles will develop. The wax reservoir will typically contain 150 – 250 ml of wax, which will be enough to prime the Printhead at installation. It is very important that the following Safety Precautions be followed when working around the WaxJet Printhead/Wax System.

Safety Precautions

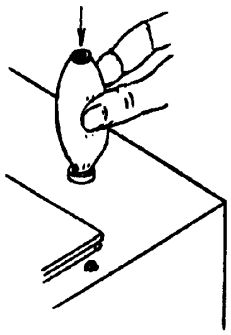
- Ensure that existing Printhead/Wax System is thoroughly cool before attempting any service on it. The Printhead assembly reaches temperatures as high as 135º C (275º F) during operation. Typically, a one (1) hour cool down period is necessary after shut down.
- Safety glasses and protective gloves are highly recommended when performing Purge and/or Prime Procedure.
- The Printhead and Wax System must be at operating temperature prior to performing the Purge or Prime Procedure. Cold spots in the wax system will restrict normal flow and cause the wax to flow back out the vent, possibly causing severe burn.
- Touching the Printhead or the wax system when at operating temperatures can cause injury. The Printhead is heated to temperatures as high as 135º C (275º F) and will cause severe burn if touched by bare skin.
- Do not stand in front of or place hands in front of Printhead while priming. The hot wax can spray up to 12" or more during the priming procedure.

1. Place lint-free absorbent material under the nozzle opening.



Caution: Wax is extremely hot

2. Insert the priming bulb into the reservoir (do not plug the hole in the bulb) and squeeze 2 or 3 times. Wax should flow out of the nozzles. Wipe faceplate gently while avoiding wiping the Array Plate.



3. Repeat until wax flow is smooth and all channels are passing air free wax.

- Priming too frequently or too hard will force air into the priming chamber, which will result in poor print quality.

Test Prints

Once the Printhead/Wax system is primed, it is recommended that some test printing be preformed. A test pattern is embedded in the firmware that will fire all 31 nozzles. Product detect and Printhead timing pulses are still required to perform a test print.

1. To perform a test print without using an encoder, set following parameters to the values indicated.

   - WIDTH 20
   - BOLD 2
   - ENCODER N
   - DELAY 500

2. Set Switch #4 of SW2 of the CPU PCB to the DOWN position.
3. Select TE command on hand held terminal. Do not press ENTER after inputting TE.
4. Pass a sample card past the Printhead after triggering the photocell. Repeat process until you have a feel for the proper speed to pass the sample card.
5. Test pattern print will look similar to figure 6-8.

Figure 6-8

6. Once you have determined that all nozzles are firing properly, reset parameters and switches to proper application configuration.
7. Monitor print operations until WAX LOW is detected, then follow Wax Refill procedures outlined in Service section.

Network Setup

Series 6 systems can be configured together into a printer network, controlled by a stand-alone PC with SystemMaster installed. SystemMaster can control up to 32 printer systems using RS485 serial communication. RS-485 is a communication protocol utilizing two balanced signals referenced to each other, rather than referenced to signal ground as in 4 wire RS-232 communication.

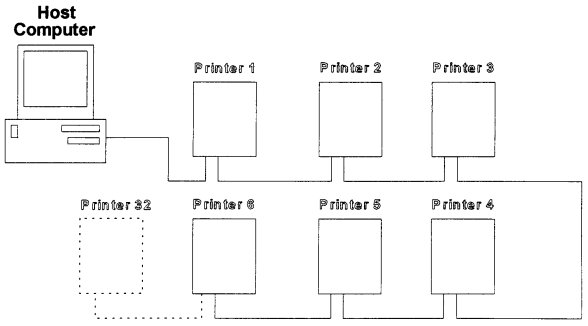


Figure 6-9

PC Configuration

When setting up an RS-485 communication port or card on PC, the interface card should must be configured for the correct communications port and interrupt request line. Alternatively, a converter that converts RS232 to RS485 can be installed.

COM1 is typically used for the mouse. COM2 or COM3 should be used for the FoxJet printer network. Be sure that no IRQ conflicts exist. For further information, consult your MIS department.

COM PORT	PORT ADDRESS	IRQ#
COM1	03F8	4
COM2	02F8	3
COM3	03E8	11
COM4	02E8	12

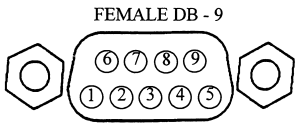
Your PC setup may vary

The port must also be programmed for parity bits, data bits, stop bit, and the baud rate of the interface card.

RS-485 Wiring

In a four-wire network it is necessary that one node be a master node (PC) and all others be slave nodes (FoxJet controllers). The network is connected so that the master node (SystemMaster PC) communicates to all slave nodes (all FoxJet printers connected). The slave nodes only communicate with the master node (they do not communicate with each other). The polarity of the transmit and receive data lines must be maintained. The table below shows the connections for FoxJet controller networks.

PC PORT	REAR PORT	FRONT PORT
TX (-)	PIN 3-RX(-)	PIN 25-RX(-)
TX (+)	PIN2-RX(+)	PIN 24-RX(-)
RX (-)	PIN 1-TX(-)	PIN 13-TX(-)
RX (+)	PIN9-TX(+)	PIN 12-TX(+)



Connections are made by "daisy chaining" shielded cable to the Rear Port jack on the 6100 controller. It will be necessary to construct a connector with dual cables since the 6100 controller has only one serial port available for RS-485 communication.

Controller Configuration

The FoxJet controller must have its CPU and Interface PCB switches and jumpers set appropriately. The following pages show the CPU board setting for a typical installation. Besides the switches and jumpers, each controller must have an ID# selected and NETWORK mode of operation enabled. The ID# is selected from the Front Port by entering "ID" and then selecting an identification number between 1-99 (first printer must be set to #01). The network mode of operation is enabled by entering "NE" and selecting Y from the hand held terminal. When the NETWORK mode is enabled, the Front Port is capable of receiving commands, but caution should be used. The unit can not distinguish between commands entered through the Rear Port (PC connection) and the hand held terminal. Conflicting commands or commands entered while the network is communicating should be avoided. It is best that the hand held terminal is set to the main screen when using SystemMaster if it's to remain connected to the controller.

- Note: When LED 4 on the CPU board is illuminated, it indicates that network communications is taking place.

Switch Settings & Jumper Configurations

Set SW1 of the Interface PCB to DOWN position for RS-485 communication. Set SW2 (#6) of CPU PCB to the DOWN position for RS-485 communications. Ensure that jumpers are installed at JP3 & JP4 if controller is last in network sequence to terminate the communication lines. If controller is not the last one, then remove jumpers form JP3 & JP4. (Figure below shows JP3 & JP4 as un-terminated)

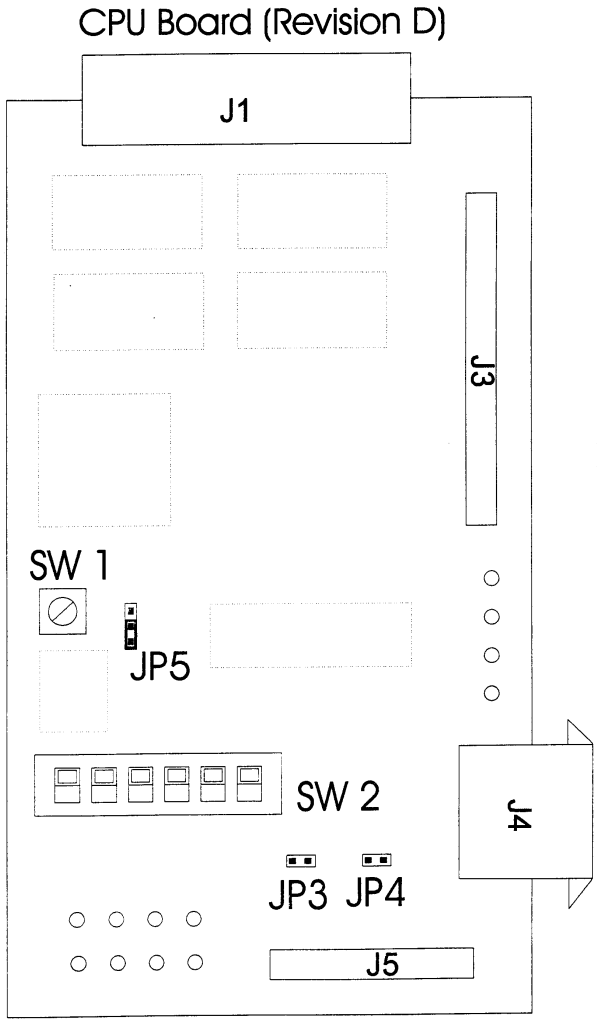


Figure 6-10

Service

Routine Maintenance

The Series 6 WaxJet system doesn't require much in the way of maintenance. Most of the maintenance involved is simple cleaning. The schedule that follows will assist in setting up an effective routine maintenance program.

Since the WaxJet Printhead/Wax System generates high heat levels during operation, please review all safety precautions prior to performing any service procedures.

Maintenance Schedule

The following table will assist in setting up an effective maintenance program.

PROCEDURE	DAILY	WEEKLY	QUARTERLY
Clean and prime Printhead	●		
Clean outside of Wax System (prevents contaminants from entering the wax supply)		●	
Clean outside of Printhead thoroughly		●	
Clean photocell lens			●
Ensure that mounting hardware is secure			●

- Only use WaxJet Maintenance Spray (#S31091) on the Array Plate and only when Printhead is cooled.
- A heat gun can be used to help remove solidified wax from surfaces.
- NEVER use any abrasive material or a scraper on the Printhead Array Plate. Damage to the Printhead is likely and any warranties will be voided.

Daily Cleanup

Wax buildup can deface product surfaces. Cleaning the faceplate and Array Plate with the WaxJet Solvent can be effective at prolonging the life of the Array Plate.

1. Spray a small amount of WaxJet Maintenance Spray on areas with wax buildup.
2. Wipe off residue with soft, lint-free cloth. **Avoid wiping the Nozzle Array Plate**.
3. Cover Printhead when not in use to prevent dust buildup.

- **Use only the WaxJet Maintenance Spray on the Series 6 Printhead.**
- **NEVER use any abrasive material or a scraper on the Printhead Assembly or the Array Plate. Damage to the Printhead is likely and any warranties will be voided.**

Cleaning Photocell Lens

Photocell lenses can get dirty and cause system to not print on some products or print in the wrong location.

1. Gently wipe the lens of the photocell with a lint free cloth.
2. Clean area surrounding photocell of dust.

- **Do not use any solvents on photocell lens. Damage to photocell is likely to occur.**

Cleaning Interior of Controller

1. Turn system off.
2. Open controller door and ground self to chassis. Components on boards are static sensitive.
3. Dust interior with low pressure air only.

Refilling Wax Supply

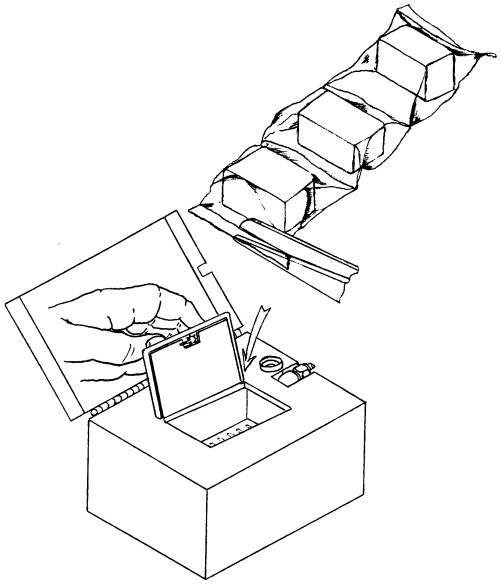
Adding wax to the WaxJet system can be accomplished without interrupting the printing process. When adding wax to the WaxJet Wax Reservoir, it is important that overflow conditions are avoided. When hot wax spills into the housing assembly, damage to internal wiring and/or the heater assembly is likely to occur. The following guidelines should aid in maximizing operating parameters.

- New system received from FoxJet will typically contain approximately 220-240 ml of wax. The grate in the reservoir will become visible when the wax level falls below 200 ml.
- Only add wax cubes when reminded by an "WAX LOW" indicator.
- When adding wax cubes after an "WAX LOW" indicator light, add no more than 6 cubes.
- WAX LOW will occur when the wax level falls to approximately 80-90 ml. Low wax conditions will be displayed on the keyboard display or by the External Low Wax Alarm Beacon. It is important that wax is added to he supply when an wax low occurs. Adding six 40 ml cubes will fill the tank to 320 ml.
- Maintaining a constant wax level will enhance the wax flow capabilities of the wax system.

WARNING

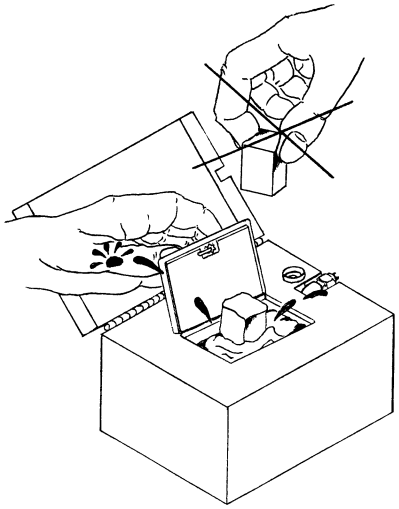
NEVER allow wax level to rise to less than 3/8" from top of metal wax reservoir.

1. Clean dust from around the reservoir to help prevent dust from clogging the nozzle array plate.
2. Open lid to the Wax Supply and open Wax package.

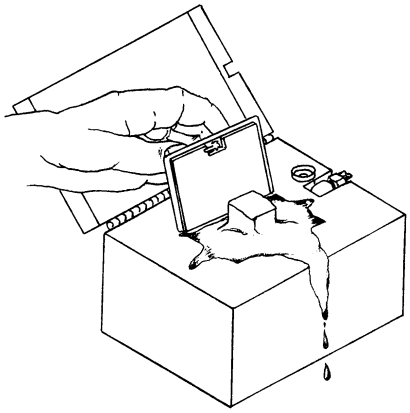


3. Gently place the Wax Cube in the wax supply.
4. Close lid.

Do Not splash or drop wax cubes.



Do Not overfill.



Priming Printhead

The Printhead used with the Series 6 WaxJet Printer may require priming during the Daily Start-Up Routine. Priming is the term for the process of evacuating air out of the wax system and Printhead. If the wax system or Printhead contain air bubbles, the wax flow will be inconsistent and, consequently, the print quality will be inconsistent.

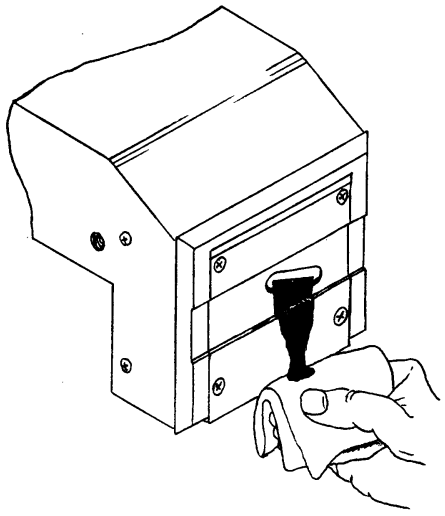
WARNING

The Printhead is very hot and can cause severe burn. Take extreme care not to touch the Printhead Array plate with bare skin while system is turned on.

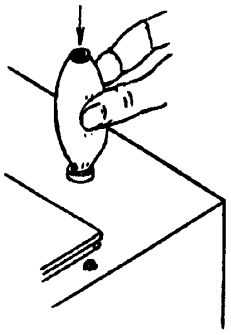
When priming the system, observe the following precautions:

- The Printhead and Wax System must be at operating temperature before performing the Priming Procedure.
- Touching the Printhead or the Wax System when at operating temperatures can cause injury. The Printhead is heated to temperatures as high as 135° C (275° F) and will cause severe burn if touched by bare skin. It is strongly advised that heat-insulating gloves be worn when carrying out any maintenance.
- Do not stand in front of or place hands in front of Printhead while priming. The hot wax can spray up to 12: or more during the priming procedure.

1. Place lint-free absorbent material under the nozzle opening.



2. Insert the priming bulb into the reservoir (do not plug the hole in the bulb) and squeeze 2 or 3 times. Wax should flow out of the nozzles. Wipe faceplate gently while avoiding wiping the Array Plate.



3. Repeat until wax flow is smooth and all channels are passing air free wax.

- Priming too frequently or too hard will force air into the priming chamber, which will result in poor print quality.

Fault Diagnosis

Fault conditions are typically diagnosed by analyzing the LED indicators on the various boards. Fault situations that can not be resolved using the indicators would require analyzation of the print process. Indicator tables follow and a section containing some common symptoms and some typical reasons for them. FoxJet system are designed to be repaired to the assembly level repair in field. Soldering on printed circuits is not recommended and FoxJet is unable to provide warranties on equipment serviced to component level.

CPU Board Indicators

Table 7-1

LED	FUNCTION	TYPICAL STATE
LED1 LED2	Flash during XMIT & REC when downloading info from host computer	Will only flash during communication process; indicates Rear Port communication
LED3	On some systems, lights to indicate that encoder is selected in firmware; doesn't affect operation	Off on most systems
LED4	Indicates that system has passed power up tests	Will be lit when system is running: older systems will not use this indicator
PC1 PC2	Photocell Trigger indicator	Flashes when photocell triggers; with no photocell plugged in, light will not be lit
SE1 SE2	Shaft Encoder rotation indicator	Flashes to indicate a pulse from shaft encoder. Appears to be steady, but is actually flashing at encoder speed
ALM1	Indicates Printhead is at operating temperature	On when Printhead and wax system reaches operating temperature
ALM2	Red LED that indicates an WAX LOW condition	Off until WAX LOW exists
AP1 AP2	Not used in Series 6	Will not be lit for Series 6 operation

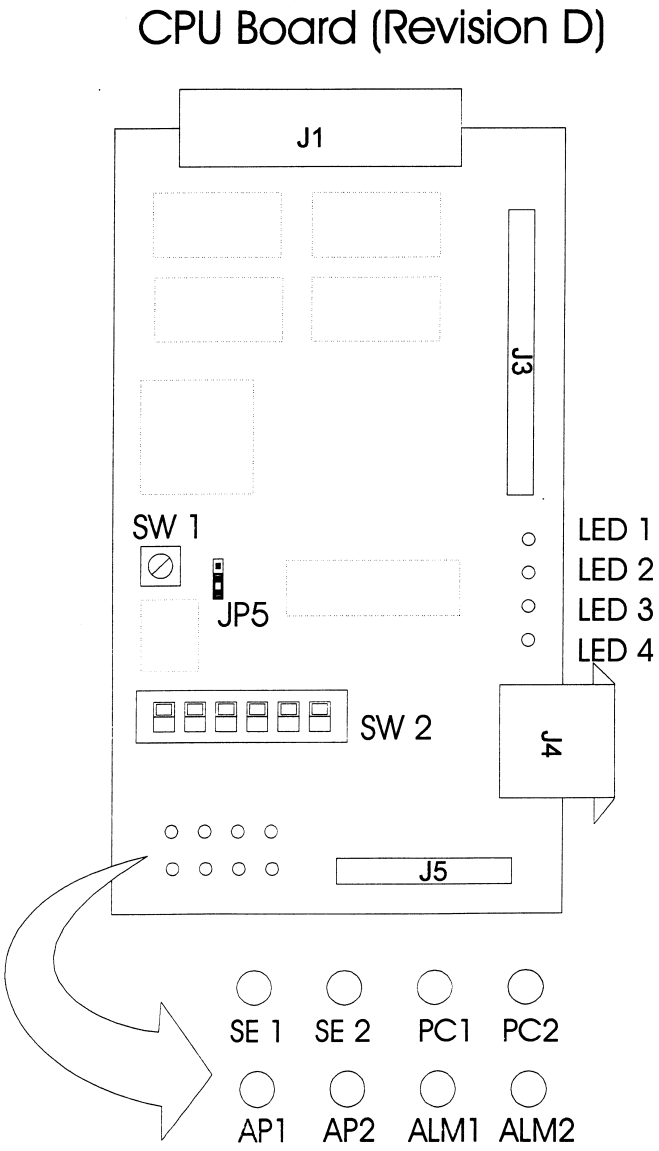

CPU Board (Revision D)
J1
J3
SW 1
JP5
LED 1
LED 2
LED 3
LED 4
SW 2
J4
J5
SE 1
SE 2
PC1
PC2
AP1
AP2
ALM1
ALM2

Figure 7-1

Driver Board Indicators

Table 7-2

LED	FUNCTION	TYPICAL STATE
HEAD OK	Indicates that Printhead is connected	Lit if Printhead is connected.
WAX OUT	Indicate WAX LOW condition	Off until WAX LOW condition is sensed.
HEAD AT	Indicates when Printhead is at temp	Lite after Printhead reaches temp. Should remain steady.
HEAD HTR	Indicates that Printhead heating element is active	Lit while Printhead is heating. Cycles on & off to maintain temp.
TANK AT	Indicates that wax tank is connected and heating circuit is active	Lit after wax in tank reaches temp. Should remain steady.
TANK HTR	Indicates when wax hose reaches temp	Lit while tank is heating. Cycles on & off to maintain temp.
HOSE AT	Indicates when wax hose reaches temp	Lit after in hose reaches temp. Should remain steady.
HOSE HTR	Indicates when wax hose heating circuit is active	Lit while wax hose is heating. Will go off when wax in hose reaches temp. Cycles on & off to maintain temp.
HV OK	Indicates High Voltage on Driver PCB	Lit if high voltage is OK.

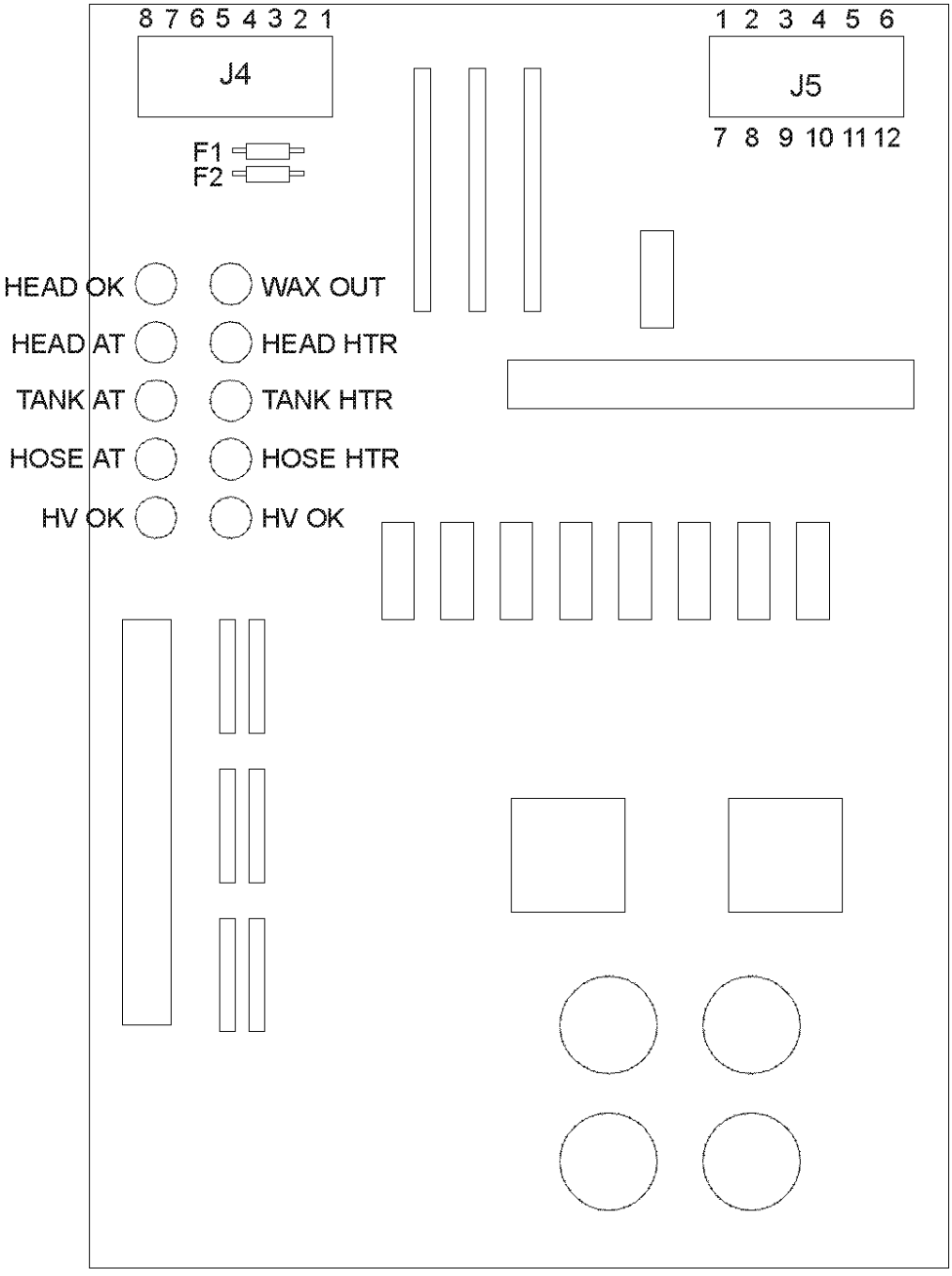

8 7 6 5 4 3 2 1
J4
1 2 3 4 5 6
J5
7 8 9 10 11 12
F1
F2
HEAD OK
WAX OUT
HEAD AT
HEAD HTR
TANK AT
TANK HTR
HOSE AT
HOSE HTR
HV OK
HV OK

Figure 7-2

Symptoms and Causes

The following pages list some known symptoms and typical causes. These lists are in no way complete and can not replace systematic troubleshooting. The service representative must have a solid foundation of system knowledge and wax jet printing principles, as well as basic electronic troubleshooting abilities to progress beyond these lists.

WARNING

Check heater circuits first whenever priming problems occur. If wax flow is restricted due to lack of heating, you can burn your hand when attempting to prime.

No Print

- Heater circuit failure
- Printhead Data Cable failure
- Encoder command and CPU SW2 mismatch
- No photocell trigger
- No encoder pulses being received
- No message selected or empty message selected
- Delay set too long or too short
- Printhead/Wax system de-primed

No Wax Flow

- Clogged Printhead nozzle array
- Air leak in wax system
- Poor Print Quality
- Wax system depriming
- Heater circuit failure
- Clogged or damaged Printhead array
- Programming error
- Gap between product and Printhead more than ¼”

Heater Circuit Failure

- Thermal fuse blown
- AC fuse on Driver board blown
- Bad connection on data cable or heater cable
- Power supply failure
- Driver board failure
- Bad thermistor

Display Malfunction

- Hand held terminal failure or needs reconnecting
- Bad CPU board
- Power supply failure or blown fuse
- Bad Firmware Module

Boot Failures

- Bad CPU board
- Power supply failure
- Low battery voltage
- Bad Driver board
- Bad Firmware Module

Troubleshooting Tips

- Boot failures can be due to the Driver card loading down the common bus between the CPU board and the Driver board. The system will boot up normally with the 60-pin ribbon cable disconnected, but of course the heater circuits will not be active.
- The low wax comparison is done on the Driver board. Sometimes low wax indications are due to false signals from the CPU, so it is a good idea to check all indicators when a problem arises.
- The pico fuses can be checked in circuit by measuring the voltage between them at both ends (as shown in the drawing below). If voltage is incorrect at one end, one of the pico fuses is bad.
- The heater indicators (amber LED's) will not light if one of the pico fuses is blown and heaters will not be active.
- **On all other FoxJet systems, erratic print usually calls for priming the Printhead. Priming problems on the WaxJet are usually due to heating circuit failures. Priming the WaxJet when a heater has failed will likely cause hot melted wax to come out the priming vent and can burn your hand.**
- Failure to print may be due to loss of timing signals, either from the encoder or the internal clock. Print with one configuration, then the other to verify which area fails.

Service Procedures

The following procedures are typically the first procedure to try in case of lockups, boot problems, or problems that produce erratic or garbled printed messages.

Memory Reset

Memory reset is used to completely reset system memory to default values. Sometimes power fluctuations or other interference can lock up data busses in the system. A memory reset can remedy a myriad of problems ranging from boot failures to garbled prints. Completely resetting will load all default values and clear all memory data busses. All data currently being saved in RAM will be lost, however.

1. Turn system off.
2. Disconnect battery from CPU board for 5-10 seconds and reconnect.
3. Re-apply power to system.

Manual ZAP

The manual ZAP will completely clear any capacitance built up on the CPU bus lines that might result from a power fluctuation or a static hit. It will also completely clear the RAM.

1. Turn system off.
2. Connect a jumper wire to TP2 at the upper left corner of the CPU board.
3. Touch the other end of the jumper to all the pins on the IC's located on the CPU board.
4. Disconnect jumper and re-apply power.

System Checks

System checks are more in depth procedures and should be performed only by qualified service personnel.

Wax System Heater Circuit Checks

The heater circuits can be checked for continuity and proper voltage levels from J5 (see Figure 7-2) on the Driver board. Use the following table and block wiring diagram.

Table 7-3: Wax System Voltage and Resistance Checks

Voltages (J5 on Driver PCB)			
Measure across	Function	Condition	Values
Pin 3 & 9	Tank Thermal Sense	Tank at Temp Tank cold	1.0 VDC 4.6 VDC
Pins 6 & 12	Tank Heating Voltage	Voltage while heating	36 VAC
Pins 1 & 7	Wax Low Detect	"WAX OUT" on "WAX OUT"off	4.6 VDC 1.0 VDC
Pins 2 & 8	Hose Thermistor	Hose at Temp Hose cold	1.2 VDC 4.6VDC
Pins 5 & 11	Hose Heating Voltage	Voltage while heating	36 VDC
Resistance Values (J5 on Driver PCB)			
Measure across	Function	Condition	Values
Pin 3 & 9	Tank Thermal Sense	Tank at Temp Tank cold	3 kΩ 105 - 120 kΩ
Pins 6 & 12	Tank Heating Coil	Resistance	10-11Ω
Pins 2 & 8	Hose Thermistor	Hose at Temp Hose cold	3 kΩ 105 - 120 kΩ
Pins 5 & 11	Hose Heating Element	Resistance	13.5 Ω

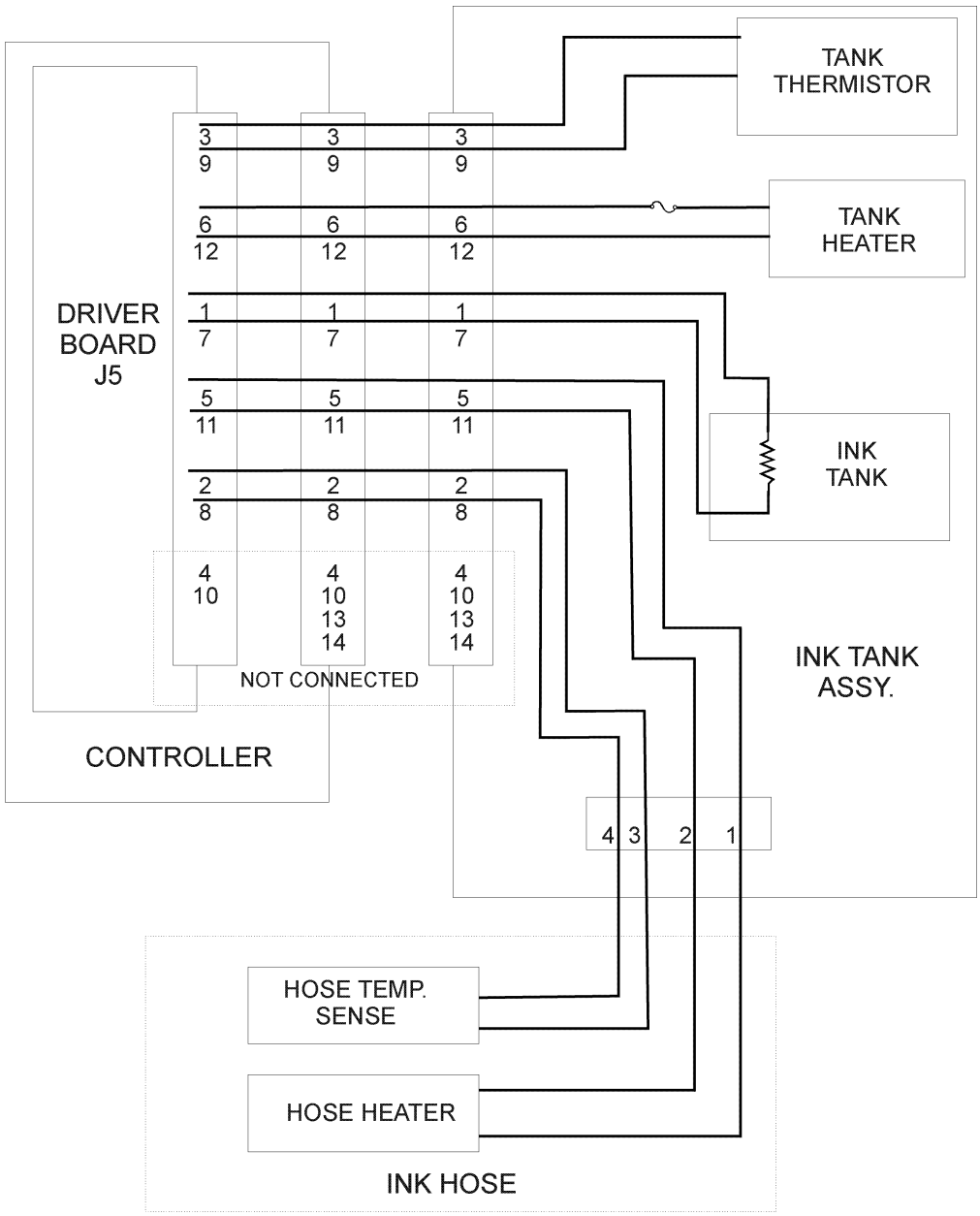

TANK
THERMISTOR
TANK
HEATER
DRIVER
BOARD
J5
INK
TANK
INK TANK
ASSY.
NOT CONNECTED
CONTROLLER
4 3 2 1
HOSE TEMP.
SENSE
HOSE HEATER
INK HOSE

Figure 7-3

Printhead Heater Circuit Checks

The Printhead heater circuit can best be checked at the Printhead PCB, but that involves removing the cover. An alternative is to conduct continuity tests at the Printhead Data Cable.

1. Turn system off.
2. Remove connector at J1 of the Driver board and measure across:

Pins 44 & 43	Printhead Heater	40 ♦
Pins 35 & 36	Printhead Thermistor	3k♦ hot 100k♦ cold

Power Supply Check

Power supply voltages can be checked on the Power Supply board or on the cable that goes to the Driver Board (Figure 7-2). Always turn system off before disconnecting any internal cables.

Measure +5 VDC & +12 VDC referenced to COM.

Measure across both legs when measuring AC voltage.

Measure between +150 and –150 for the high voltage DC.

J4 of DRIVER PCB	
PIN 1	+150 VDC
PIN 2	-150 VDC
PIN 3	NOT CONNECTED
PIN 4	+12 VDC
PIN 5	+5 VDC
PIN 6	COMMON
PIN 7	36VAC
PIN 8	36VAC RET

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Removal/Replacement Procedures

Field Replaceable Units (FRU) on FoxJet equipment are typically restricted to sub-assemblies and PCB assemblies. This chapter will detail the steps necessary to replace approved FRU's in operational and repair shop environments. Figures 8-1 through 8-3 will assist in removing and replacing the major components of the 6100 controller.

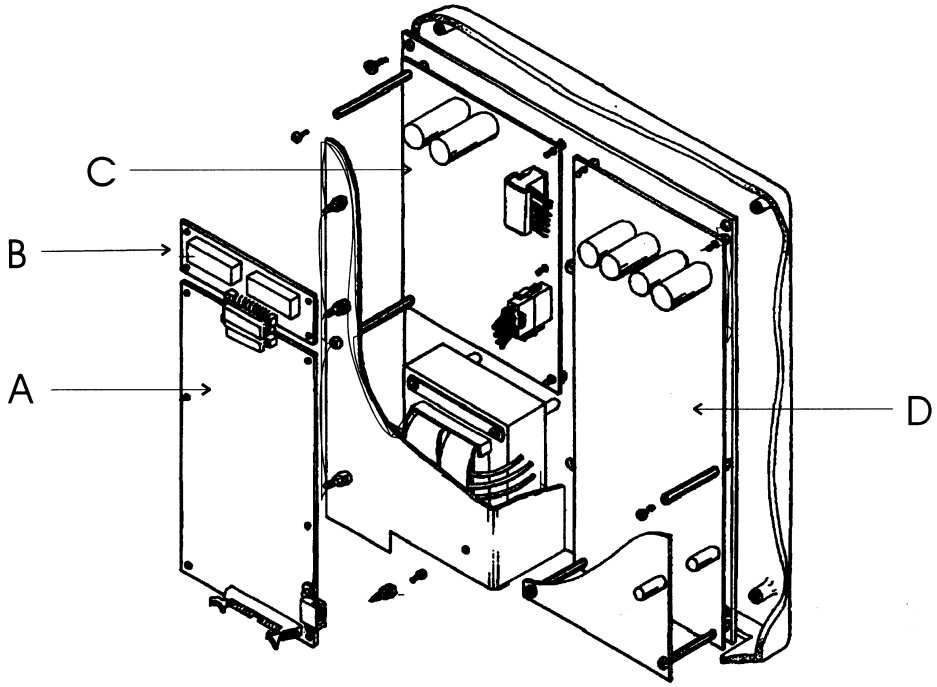


Figure 8-1

A	CPU PCB	X15019-002
B	Firmware Module	X15008
C	Power Supply Unit	X13006-001
D	Driver PCB	X15062

CPU PCB

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Removal

1. Turn system off.
2. Disconnect all connectors.
3. Remove Firmware Assembly.
4. Remove CPU PCB.

Installation

1. Inspect CPU PCB and ensure that all IC's are seated securely.
2. With system power turned off, position PCB in place and secure.
3. Install Firmware Assembly onto connector and secure on standoff posts.
4. Connect power cable J4.
5. Connect Driver data cable to J3.
6. Connect battery to RAM circuits. Use JP5 on boards with NI-Cad battery, or connect battery cable on boards with lithium battery (CPU PCB's manufactured or repaired after November 1997)
7. Measure battery voltage. Battery voltage should be at least 3.0 VDC. System will not boot properly if battery voltage is too low.

Ni-Cad batteries will recharge when system power is applied, although system is not booted. Typical recharge enough to boot in as little as 2 hours. After recharge period, recycle power to boot system. Full charge from complete discharge will take 48 hours of continuous power.

8. Set system time & date.
9. Re-program system operational parameters.
10. Return to normal operation.

Firmware Assembly

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Removal

1. Turn system power off.
2. Remove Firmware Assembly from connector and remove from form standoff posts.
3. Perform a Memory Reset. (refer to Service Procedures)

Installation

1. Inspect Firmware Assembly for damage that may have occurred during shipment.
2. Install Firmware Assembly onto connector and secure to standoff posts.
3. Apply system power.
4. Verify normal operation.

Driver PCB

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Removal

1. Turn off system power.
2. Disconnect all cables from Driver PCB.
3. Remove board from standoff posts.

Installation

1. Place board on standoff posts and secure with screws.
2. With system power off, connect Printhead Data Cable to J1.
3. Discharge high voltage capacitance from power cable (pins 1 & 2) and connect to J4.
4. Connect CPU Interface Data Cable to J3.
5. Apply system power. Monitor indicators for proper operation.
6. Print a test pattern after system has reached operating temperature to ensure that all channels are printing properly.
7. Return to normal operation.

Power Supply Unit

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Removal

1. Turn system power off.
2. Remove power cord from Power Entry Module.
3. Remove Firmware Assembly.
4. Remove CPU PCB.
5. Remove power supply cover plate.
6. Disconnect all cables from Power Supply Units.
7. Remove Power Supply Unit.

Installation

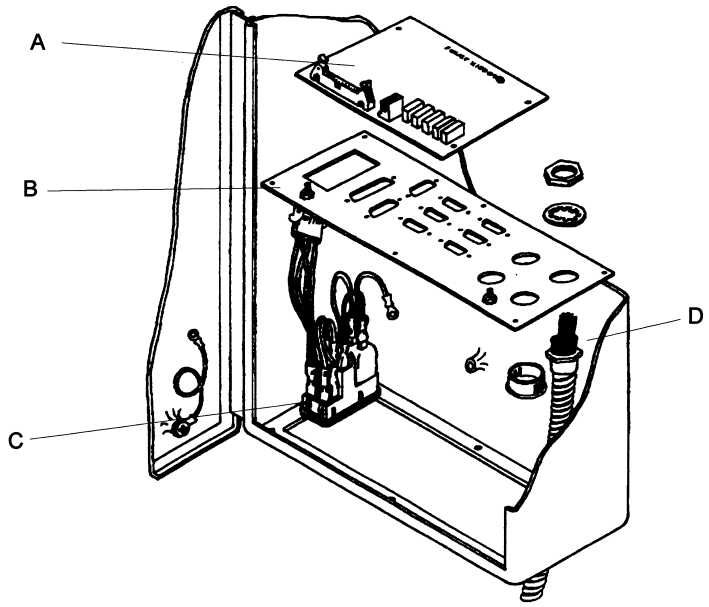
1. Inspect Power Supply Unit for damage that may have occurred during shipment.
2. Place PSU in controller and secure with screws.
3. Connect AC supply.
4. With system power switch in the off position, connect power cord to Power Entry Module.
5. Plug power cord into outlet and turn system power on.
6. With a DVM, measure power supply outputs.
7. Turn system power off and install cover plate.
8. Connect power cable to Interface PCB.
9. Connect power cable Driver PCB.
10. Install and secure the Firmware Assembly and the CPU PCB.
11. Connect power to the CPU PCB.
12. Turn system power on and check for proper boot up sequence.
13. Return system to normal operation.

Interface PCB

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Removal

1. Turn system power off.
2. Disconnect all cables from the Connector Panel of the controller.
3. Disconnect the cables at J1 & J2.of Interface PCB.
4. Remove the nuts on either side of each connector on the Connector Panel and slide the PCB out of the controller.



CONTROLLER END PLATE

Figure 8-2

A	Interface PCB	X15021-001
B	Controller End Plate	X21034
C	Power Entry Module	X011356

Installation

1. Inspect Interface PCB for damage that may have occurred during shipment.
2. Place board in position and secure with fasteners.
3. Connect ribbon cable from CPU to J1.
4. Connect power cable from PSU to J2.
5. Re-connect peripheral cables to proper plugs on Connector Panel.
6. Apply system power; ensure that the 5 green LED's on Interface PCB light.
7. Test all aspects of operation, particularly those involving the peripherals connected to the Connector Panel.
8. Return to normal operations.

Backup Battery (Ni-Cad)

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Rechargeable Ni-Cad batteries were installed on all CPU PCB's manufactured before November 1997. CPU PCB's manufactured after November 1997 will have lithium batteries.

Removal

1. Turn system power off.
2. Remove CPU PCB.
3. Unsolder three pins to BT1 on CPU PCB.

FoxJet cannot be held responsible for damage to boards occurring from poor soldering techniques or faulty soldering equipment. Any soldering on PCB's performed outside of FoxJet's Repair Facility will void any and all warranties.

4. Carefully clean solder from holes.

Installation

1. Inspect battery for corrosion.
2. Position battery on board and solder in place.
3. Re-install CPU PCB and apply system power.
4. Measure battery voltage. Voltage should be 3.4 – 4.0 VDC. Battery will recharge as long as power is applied to system.

Backup Battery (Lithium)

Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

New battery must be installed before old battery is disconnected or all saved data in RAM will be lost.

1. Measure new battery voltage. Should be at least 4.0 VDC.
2. Connect battery to unused connector on battery interface board on CPU.
3. Remove old battery.
4. Secure new battery.

Printhead Data Cable

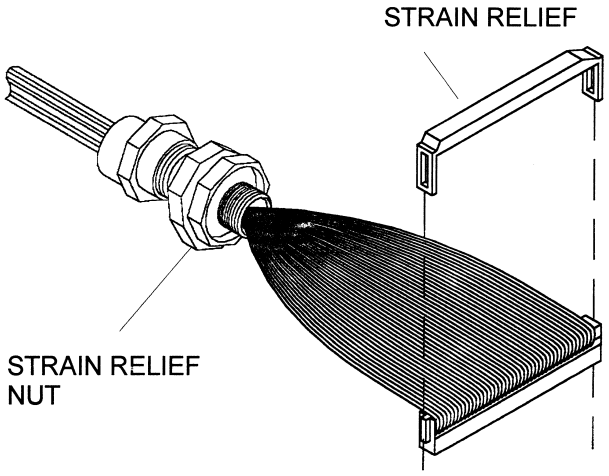
Some components on PCB's are static sensitive. It is recommended that static discharge precautions be observed when working in and around the FoxJet controller and when handling FoxJet printed circuit boards.

Removal

1. Turn system power off.
2. Open controller door and disconnect Printhead data cable from J1 on the Driver board.
3. Gently remove strain relief from connector (if installed).
4. Remove nut from cable shield and gently thread the connector the retaining nut.
5. Feed the cable out the opening in the connector panel.
6. Remove Printhead assembly from the mounting hardware and remove the Printhead Housing Cover.
7. Remove four screws securing Printhead PCB in place.
8. Disconnect the Printhead data cable from the connector on the Printhead PCB and unthread the nut on the cable sheath.

Installation

1. Connect the Printhead data cable to the connector on the Printhead PCB. The connector is keyed to maintain proper orientation.
2. Position sheath on Printhead housing and secure with retaining nut.
3. Re-install housing cover and remount the Printhead Assembly.
4. Remove the strain relief from the connector on the controller end of the Printhead data cable.



PRINTHEAD DATA CABLE
(CONTROLLER CONNECTION)

Figure 8-3

5. Gently feed the connector through the retaining nut and feed the connector through the opening in the Connector Panel.
6. Gently slide the retaining nut back over the connector and secure the cable sheath to the Connector Panel.
7. Connect the Printhead data cable to the Driver PCB.
8. Turn system on and verify proper operation of the heating circuits.
9. After system has reached operating temperature, perform Purge/Prime and verify print operations.

Printhead

The WaxJet Printhead Replacement Kit (part # X01160-002) comes with all of the parts needed for replacing the Printhead, as well as the following instructions. Removing and replacing components of the WaxJet Solid Wax System is a delicate task. During operation, the Printhead is heated to approximately 135° C (275° F). Make sure that the system is thoroughly cooled down to avoid injury. Handle the wax hose carefully to avoid damage. Read each step carefully and follow the prescribed sequence to avoid pitfalls. The drawings included with the instructions and shown in this section are for illustrative purposes and are not necessarily exact replicas of the assemblies.

Series 6 WaxJet Printhead (Integrated) Replacement Kit (X01160-002)	
Part #	**Description**
X41022-002	Print Head, S6 Integrated Left.
X40157-001	Filter Screen SS 25 Micron Large
X40097-001	Seal, Heat Isolation, S6 P/H
X22094-001	Screws, Printhead mounting (4)

Refer to Figures 1-3 when using the following procedure. Should further clarification be required, contact your Support Representative.

Removal

1. Turn system OFF and allow to cool down. (At least 1 hour)
2. Support Printhead housing assembly and remove mounting hardware. (Figure 8-4)

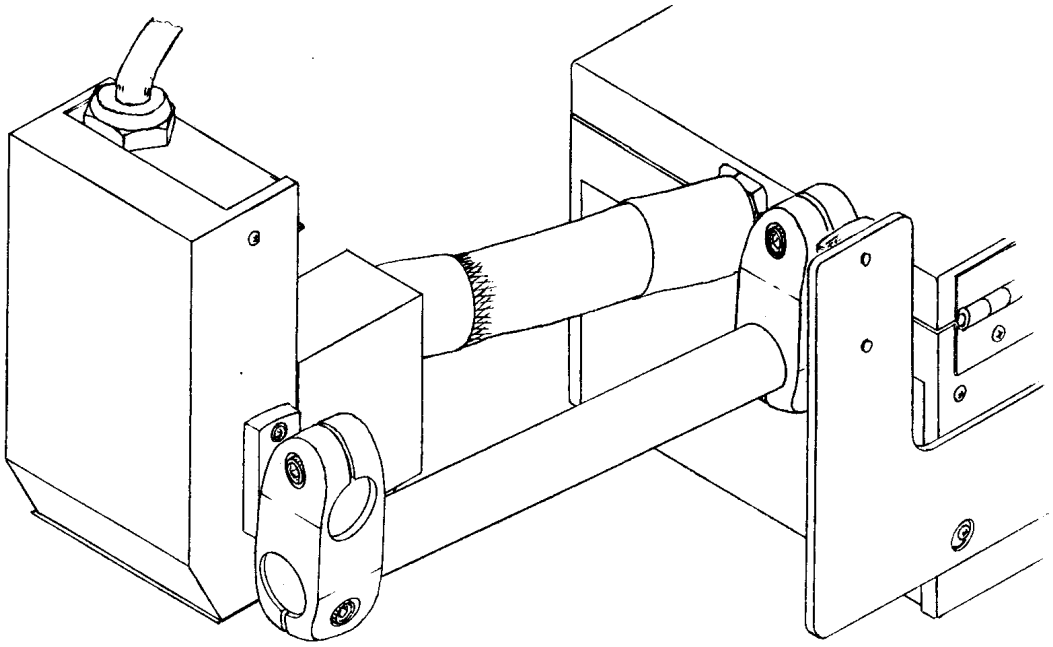


Figure 8-4

3. Remove ¾" mounting bracket from Printhead Assembly.
4. Remove photocell mounting bracket and 6 screws from Printhead housing cover and remove housing cover.
5. Disconnect the Printhead ribbon cable from the Printhead PCB.
6. Remove the 4 screws securing the faceplate to the Printhead Housing assembly and pull gently away from heater block. The Printhead is attached to the faceplate.

7. Gently slide the Printhead ribbon cable through the slot in the Printhead Housing Assembly. (Figure 8-5)

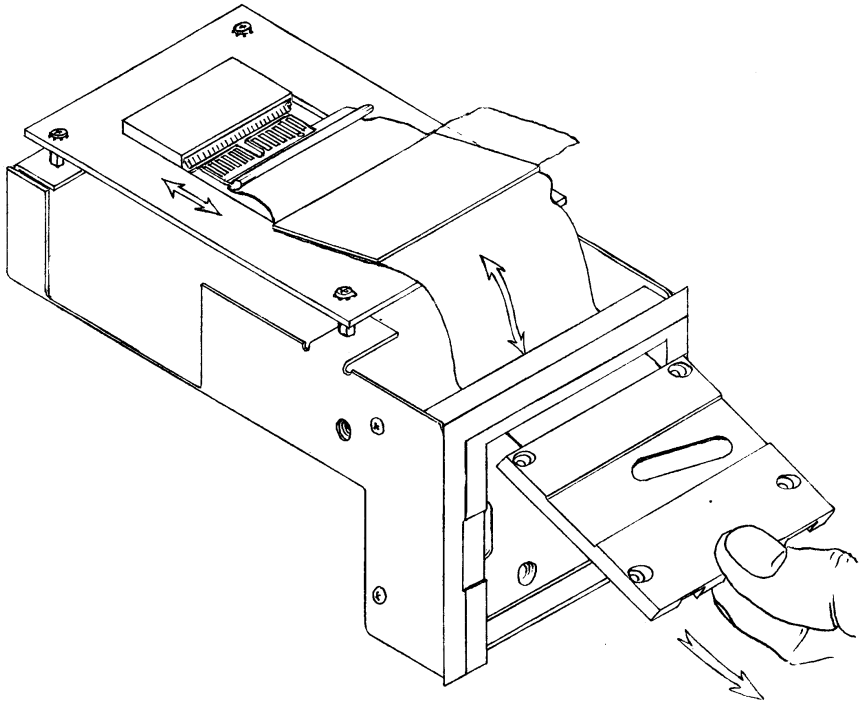


Figure 8-5

8. Remove the 4 screws securing the Printhead to the faceplate and pull the Printhead off and discard.
9. Remove any residual wax from the faceplate with a hot air gun. ***DO NOT use a scraper of any kind.***
10. Carefully remove the rubber seal in the heater block and also remove the disc filter.
11. Clean any residual wax from the heater block.

Installation

1. Insert new disc filter into heater block wax fitting.
2. Insert new rubber seal, ensuring that shoulder of seal is flush with the surface of the heater block.
3. Carefully remove the protective film from the new Printhead.
4. Position the Printhead with the shiny side to the faceplate and secure with 4 new screws. Tighten snugly but avoid over tightening.
5. Feed Printhead cable through opening in Printhead housing and carefully connect to the Printhead PCB.
6. Remove the yellow seal from the wax inlet opening on the back of the Printhead and secure the faceplate to the Printhead Housing Assembly. (Figure 8-6)

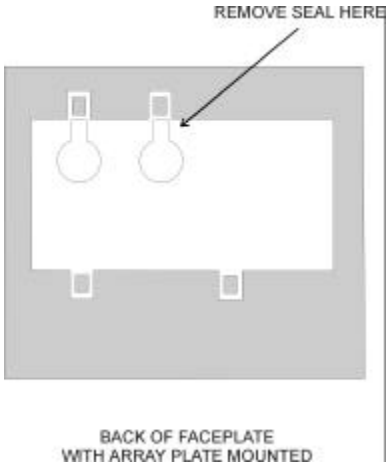


Figure 8-6

7. Turn system on and Check system LED's for proper operation of the heating circuits.
8. Allow Printhead to heat to operating temperature. Prime/Purge system. If leaks occur, tighten ¼ turn at a time until leaks stop.
9. Perform test print.
10. After ensuring Printhead is operating properly turn system off and re-install Printhead housing cover and mounting hardware.
11. Re-prime Printhead and perform print test until all nozzles are firing. Resume normal operation of printer.

Wax Reservoir Heater

The WaxJet Heater Replacement Kit (part #X01162-002) contains all of the parts needed for replacing the heater, as well as the following instructions. Removing and replacing components of the WaxJet Solid Wax System is a delicate task. During operation, the Printhead is heated to approximately 135º C (275º F). Make sure that the system is thoroughly cooled down to avoid injury. Handle the wax hose carefully to avoid damage. Read each step carefully and follow the prescribed sequence to avoid pitfalls. The drawings included with these instructions and shown in this section are for illustrative purposes and are not necessarily exact replicas of the assemblies.

Refer to Figures 8-7 and 8-8 when using the following procedure. Should further clarification be required, contact your Support Representative.

Removal

1. Turn system OFF and allow to cool down. (At least 1 hour)
2. Support Printhead and remove Printhead mounting hardware.
3. Disconnect 14-pin heater cable and open filler door of Wax System.
4. Remove 8 screws on side of Wax System and remove housing cover (1).
5. Remove 4 screws on top insulator plate (2).
6. Remove insulator plate and carefully remove top insulation blanket (3) from around tank assembly (4).
7. Disconnect wax line at tank fitting and disconnect hose heater wires. Place Printhead aside. Use a wrench to hold fitting at tank assembly while loosening hose fitting connecting nut with another wrench (counter clockwise to loosen).
8. Do not allow fitting at tank to turn.
9. Disconnect thermal fuse and heater cable assemblies (see Figure 8-8), if installed, and skip ahead to step 13. Otherwise, continue with the following steps.
10. Remove wax low detection wire(s) from side of reservoir.
11. Remove thermal fuse assembly (8) from side of tank.
12. Remove clamp from thermal fuse and set aside.
13.

Use a pin extractor to remove heater pad wires from wax system heater cable connector (pins 6 and 12).

14. Remove 4 screws securing tank mounting base plate (6) to housing base (7).
15. Carefully pull tank assembly away from wax line and turn tank assembly on to its side.
16. Remove 4 baseplate mounting screws and remove baseplate.
17. Remove heater pad (5) or (11, Figure 2).

Note: On systems manufactured before October 1997, the heater pad will be a soft rubber type material (Figure 8-7). Later versions will be the circular metallic heater assembly (Figure 8-8).

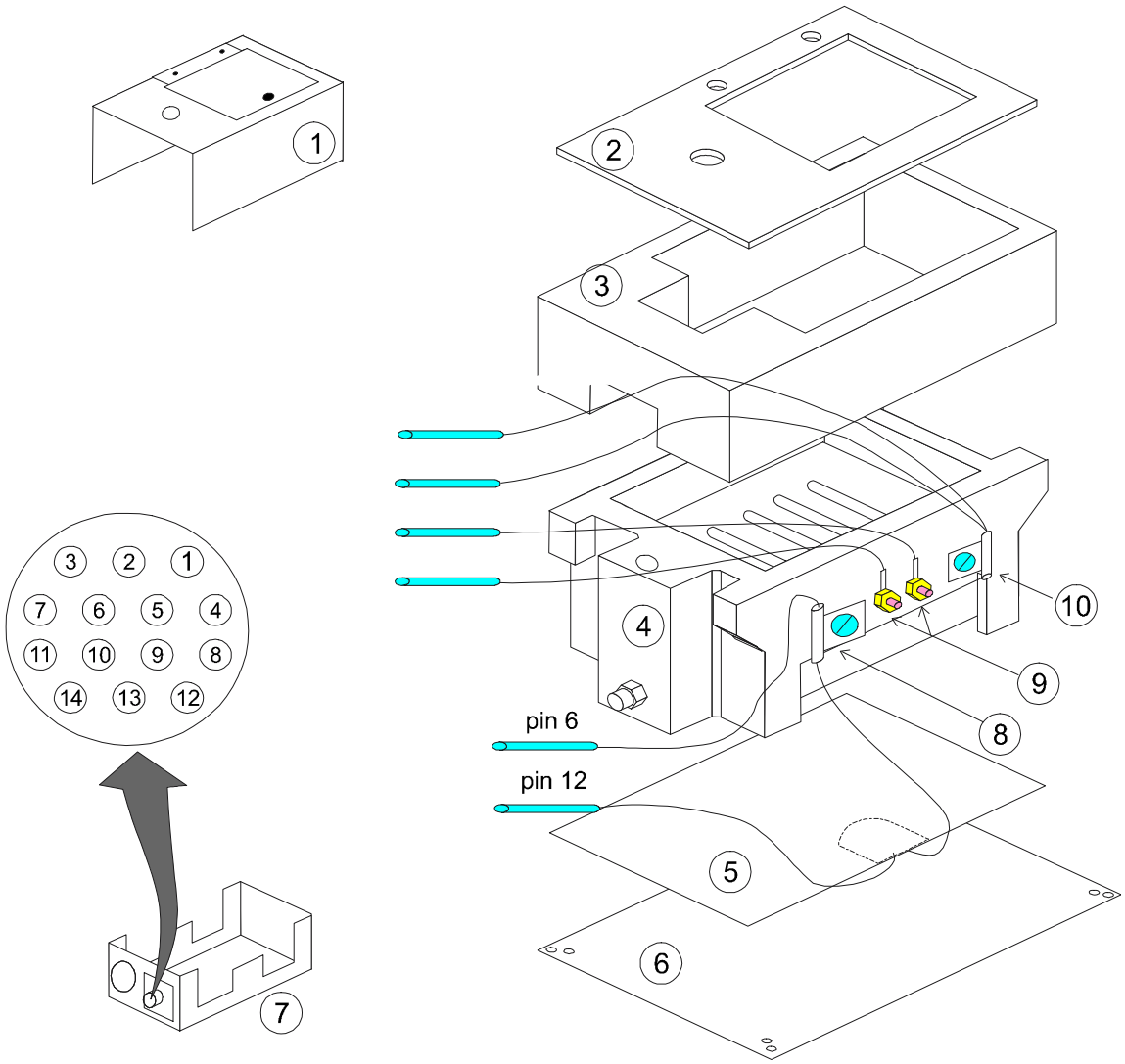


Figure 8-7

Installation

Refer to Figure 8-8 for the installation procedure.

1. Insert heater assembly (11) between tank assembly (4) and new mounting baseplate (13). Ensure that molded connector faces away from tank assembly.
2. Secure mounting baseplate (13) to tank assembly (4). Ensure that heater pad remains between tank assembly and mounting baseplate and that heater assembly wires are routed through cutout on mounting baseplate.
3. Secure heater mounting plate and tank assembly to housing base (7).
4. Install new thermal fuse assembly (14) onto tank assembly. Connect male connector to one of the connectors on cable assembly (12).
5. Connect male connector of heater assembly (11) to the other connector of the cable assembly.
6. Install cable assembly pin connectors into positions 6 and 12 on back of 14-pin connector of housing base (7).
7. Reconnect and secure wax low detection wires with 3/8" nuts.
8. Place clamp around thermal fuse (8) and reconnect to side of tank assembly (4).
9. Connect wax line to wax tank assembly (4) and tighten finger tight.
10. Tighten with a wrench 1 ¼ turn.

CAUTION: Over torquing wax line fitting will result in damage to wax line. Do not allow tank fitting to turn.

11. Reinstall top insulation blanket (3) around tank assembly (4).
12. Install and secure insulator plate (2) with screws.
13. Re-install wax system housing cover (1).
14. Re-install Printhead mounting hardware.
15. Connect 14-pin heater cable from controller to wax system.
16. Turn system **ON** and allow to heat.

Follow priming procedures as outlined in the Operators Manual and check for leaking at wax tank fitting connection. If leak occurs at fitting, tighten fitting nut ¼ turn at a time until leak stops.

17. Resume normal operating procedures.

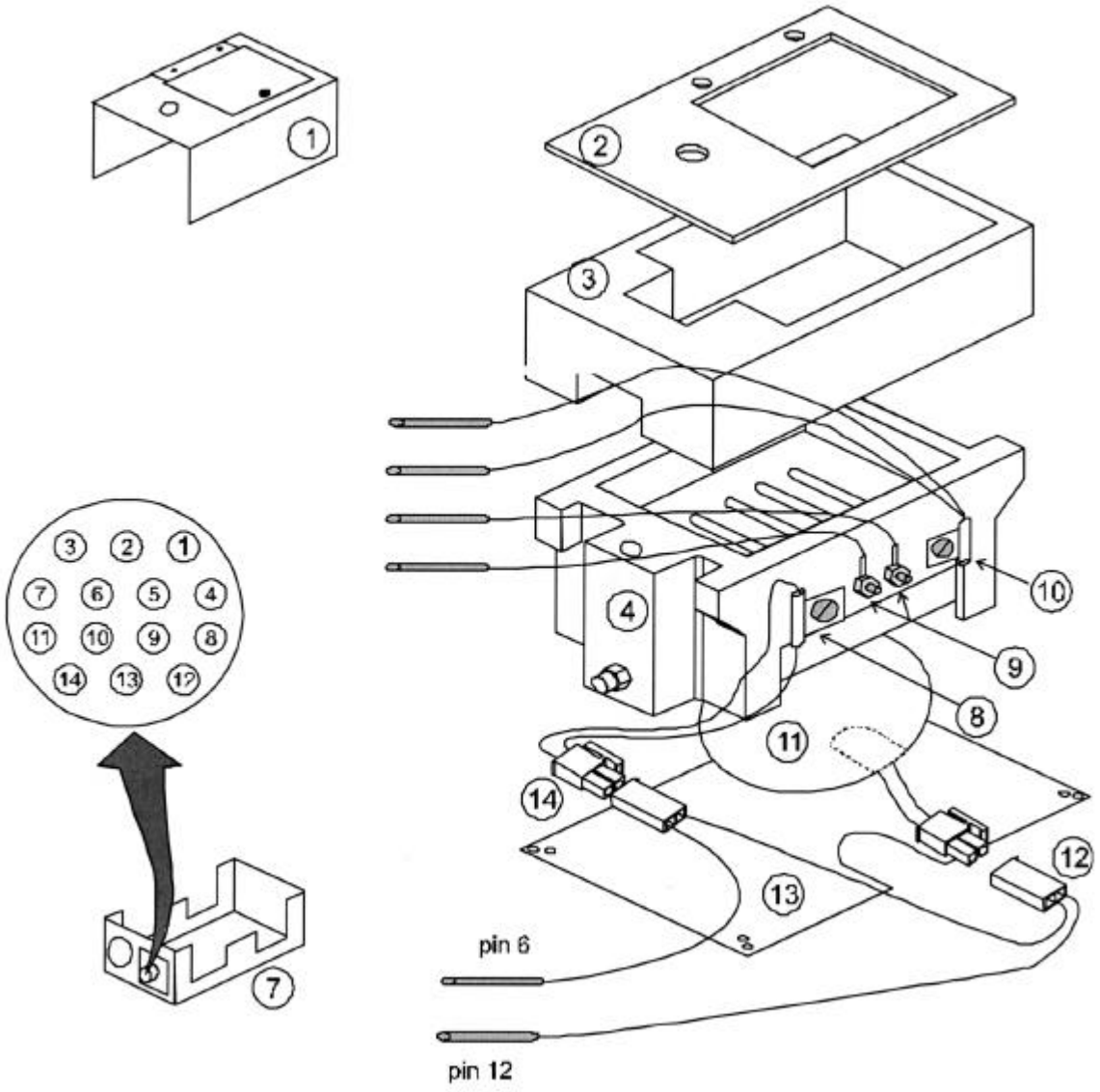


Figure 8-8

Wax Reservoir Thermal Fuse

Removing and replacing components of the WaxJet Solid Wax System is a delicate task. During operation, the Printhead is heated to approximately 135º C (275º F). Make sure that the system is thoroughly cooled down to avoid injury. Handle the wax hose carefully to avoid damage. Read each step carefully and follow the prescribed sequence to avoid pitfalls. The drawings shown in this section are for illustrative purposes and are not necessarily exact replicas of the assemblies.

Refer to Figures 8-7 and 8-8 when using the following procedure. Should further clarification be required, contact your Support Representative.

Removal

1. Turn system OFF and allow to cool down. (At least 1 hour)
2. Support Printhead and remove Printhead mounting hardware.
3. Disconnect 14-pin heater cable and open filler door of Wax System.
4. Remove 8 screws on side of Wax System and remove housing cover (1).
5. Remove 4 screws on top insulator plate (2).
6. Remove insulator plate and carefully remove top insulation blanket (3) from around tank assembly (4).
7. Disconnect thermal fuse and heater cable assemblies (see Figure 2), if installed, and skip ahead to step 13. Otherwise, continue with the following steps.
8. Remove thermal fuse assembly (8) from side of tank.
9. Remove clamp from thermal fuse and set aside.
10. Use a pin extractor to remove heater pad wires from wax system heater cable connector (pins 6 and 12).

Installation

Refer to Figure 8-8 for the installation procedure.

1. Install new thermal fuse assembly (14) onto tank assembly. Connect male connector to one of the connectors on cable assembly (12).
2. Connect male connector of heater assembly (11) to the other connector of the cable assembly.
3. Place clamp around thermal fuse (8) and reconnect to side of tank assembly (4).
4. Reinstall top insulation blanket (3) around tank assembly (4).
5. Install and secure insulator plate (2) with screws.
6. Re-install wax system housing cover (1).
7. Re-install Printhead mounting hardware.
8. Connect 14-pin heater cable from controller to wax system.
9. Turn system **ON** and allow to heat.
10. Check indicators for proper operation of the heating circuits.
11. Resume normal operating procedures.

Wax Tubing

The WaxJet Wax Tubing Replacement Kit (part # X01184-001) contains the following components. The instructions in this section are also contained in the kit. Removing and replacing components of the WaxJet Solid Wax System is a delicate task. During operation, the Printhead is heated to approximately 135º C (275º F). Make sure that the system is thoroughly cooled down to avoid injury. Handle the wax hose carefully to avoid damage. Read each step carefully and follow the prescribed sequence to avoid pitfalls. The drawings included with these instructions and shown in this section are for illustrative purposes and are not necessarily exact replicas of the assemblies.

Series 6 (Integrated) Aluminum Wax Tube Replacement Kit (X01184-001)	
40148-001	FITTING, COMPRESSION 1/8 TO 1/4
X40147-001	TUBING, ALUMINUM ¼" OD
X40148-001	FITTING, COMPRESSION 1/8 TO 1/4

Removal

1. Turn off power and allow wax system to cool for 1 hour.
2. Transfer Printhead/Wax System from production line to a clean workbench environment.
3. Support Printhead and remove Printhead mounting hardware.
4. Remove photocell mounting bracket and rotational side mount bracket on wax reservoir cover.
5. Remove screws securing housing cover, open wax fill cover and remove housing cover.
6. Do not remove the wax fill cover.
7. Remove top mounting plate and top insulating foam.
8. Disconnect heater hose wire at connector.
9. Loosen heater hose tube fitting nuts at both ends.
10. Remove print head housing assembly from mounting bracket.
11. Loosen wax line nut at print head, remove print head from heater hose and set aside.

12. Remove heater hose at wax reservoir.
13. Cut the aluminum tubing at one end of heater hose assembly and slide aluminum tube out and discard. Do not damage hose heater assembly as it will be reused.

Installation

1. Slide new aluminum tubing through end of the hose heater from which the heater wires extend.
2. Connect to the wax reservoir fitting and tighten finger tight. Then tighten with a wrench 1 ¼ more turns.
3. Slide nut onto tubing, then items 2 and 3 as shown in Figure 8-9.

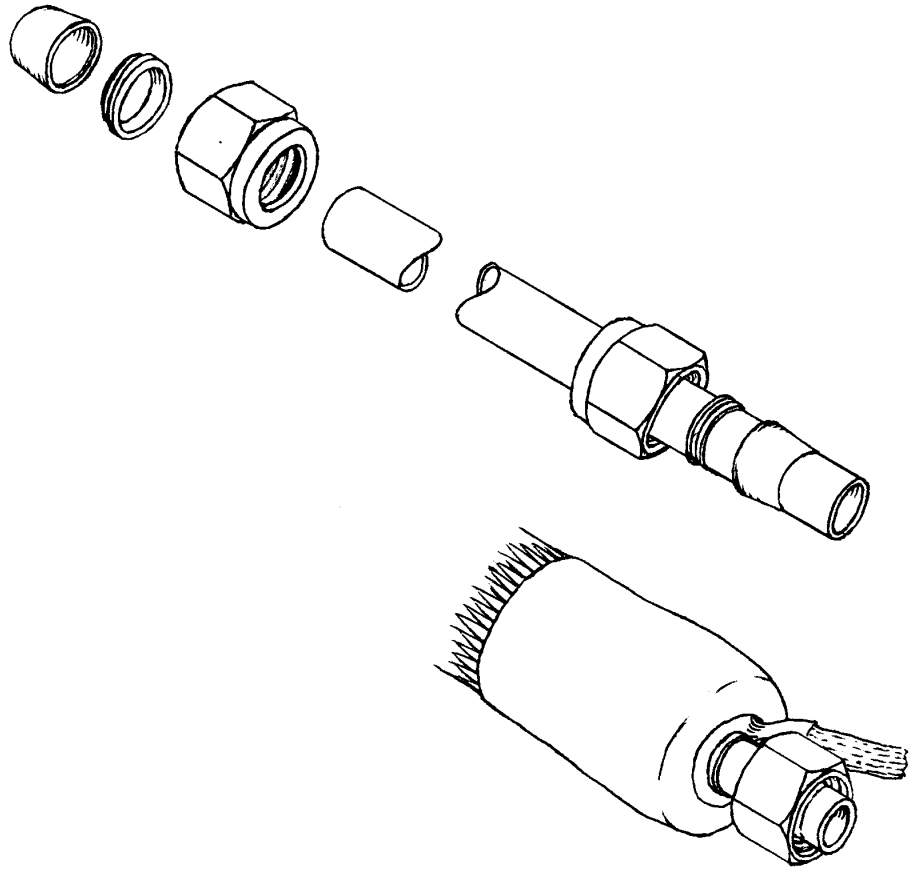


Figure 8-9

4. Push tubing into Printhead firmly and tight compression fitting finger tight.

5. Then tighten with a wrench 1 ¼ turns more.
6. Connect heater hose wires and re-install insulating foam and top plate. Re-install housing cover.
7. Secure housing cover with screws and install rotational mounting bracket.
8. Allow system to heat to operating temperature and check for leaks at fittings.
9. If leaking occurs, tighten fittings ¼ turn at a time until leaking stops.
10. Re-install Printhead housing assembly mounting hardware.
11. Prime air out of system until a steady stream of wax flows through the nozzle plate.
12. Perform test prints and return system to service.

Wax Hose

Removing and replacing components of the WaxJet Solid Wax System is a delicate task. During operation, the Printhead is heated to approximately 135° C (275° F). Make sure that the system is thoroughly cooled down to avoid injury. Handle the wax hose carefully to avoid damage. Read each step carefully and follow the prescribed sequence to avoid pitfalls. The drawings shown in this section are for illustrative purposes and are not necessarily exact replicas of the assemblies.

Removal

1. Turn off power and allow wax system to cool for 1 hour.
2. Transfer Printhead/Wax System from production line to a clean workbench environment.
3. Support Printhead and remove Printhead mounting hardware.
4. Remove photocell mounting bracket and rotational side mount bracket on wax reservoir cover.
5. Remove screws securing housing cover, open wax fill cover and remove housing cover.
6. Do not remove the wax fill cover.
7. Remove top mounting plate and top insulating foam.
8. Disconnect heater hose wire at connector.
9. Loosen heater hose tube fitting nuts at both ends.
10. Remove print head housing assembly from mounting bracket.
11. Loosen wax line nut at print head, remove Printhead from heater hose and set aside.
12. Remove heater hose at wax reservoir and discard heater hose.

Installation

1. Install heater hose at wax reservoir fitting. Tighten finger tight.
2. It may be necessary to melt wax residue in tank fitting with a hot air gun so that heater hose seats properly.
3. Support Printhead Assembly and install heater hose to print head fitting. Tighten finger tight.
4. Reinstall print head onto mounting bracket and secure.
5. Connect heater hose wires and re-install insulating foam and top plate. Re-install housing cover.
6. Secure housing cover with screws and install rotational mounting bracket.
7. Tighten heater hose line nuts 1 ¼ turn.
8. Allow system to heat to operating temperature and check for leaks at fittings.
9. If leaking occurs, tighten fittings ¼ turn at a time until leaking stops.
10. Prime air out of system until a steady stream of wax flows through the nozzle plate.
11. Perform test prints and return system to service.

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Parts & Bracketry

Parts Replacement Kits

There are kits available for replacing the more critical components of the Series 6 WaxJet Printhead/Wax System. Each kit includes all parts and instructions needed for effective replacement of those components. Other parts can be found in the WaxJet Parts List found in the Distributor Products and Services Manual or by contacting your support representative.

Printhead Replacement Kit

Printhead (Integrated) Replacement Kit (X01160-002)	
Part #	**Description**
X41022-002	Print Head, S6 Integrated Left.
X40157-001	Filter Screen SS 25 Micron Large
X40097-001	Seal, Heat Isolation, S6 P/H
X22094-001	Screws, Printhead mounting (4)

Heater Assembly Replacement Kit

Heater Assembly Replacement Kit (X01162-002)		
Heater Kit Items	Part Number	Quantity
Heater Assembly	X01163-001	1
Replacement Procedures	X01161-001	1
Pin Extractor	S30062-001	1
Thermal Fuse Assembly	X01164-001	1
Cable Assembly	X01165-001	1
Mounting Baseplate	X21144-004	1
Clamp, fuse	X22149-001	1

Wax Tubing Replacement Kit

Aluminum Wax Tube Replacement Kit (X01184-001)	
40148-001	FITTING, COMPRESSION 1/8 TO 1/4
X40147-001	TUBING, ALUMINUM ¼" OD
X40148-001	FITTING, COMPRESSION 1/8 TO 1/4

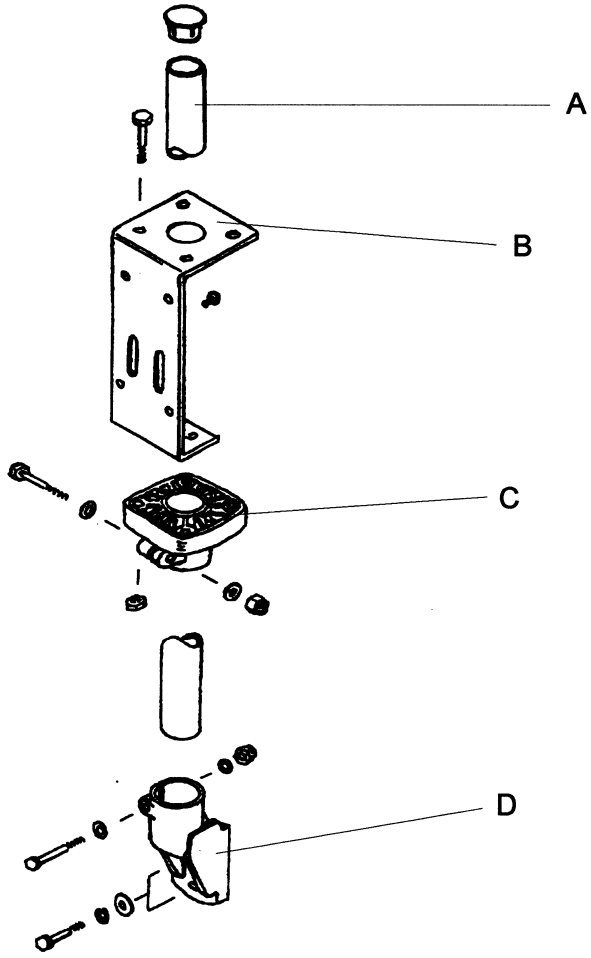
Fuse List

FoxJet Part #	Where used	Circuit Reference	Volt Rating	Current Rating	Thermal Rating
X12134-001	Wax Driver Bd	F1,F2	125	7	N/A
X12121-001	I/O-X15021-001	F1,F2,F3, F4,F5	30/50	Trip 2.2/ Trip 2.2	N/A
X12146-001	Pow. Ent. Mod.		250	3.15	N/A
X12145-001	Fuse Holder		250	3.15	N/A
N/A	Power Supply		125	10	N/A
X12144-001	Series 6 Tank		125/250	7/5	150°C
X12137-001	Series 6 Printhead		250	2	169°C

Bracketry

Controller Conveyor Mounting Kit

The Controller Conveyor Mounting Kit (part # S02200-001) is used to mount the standard controller to the sided of a conveyor or platform.



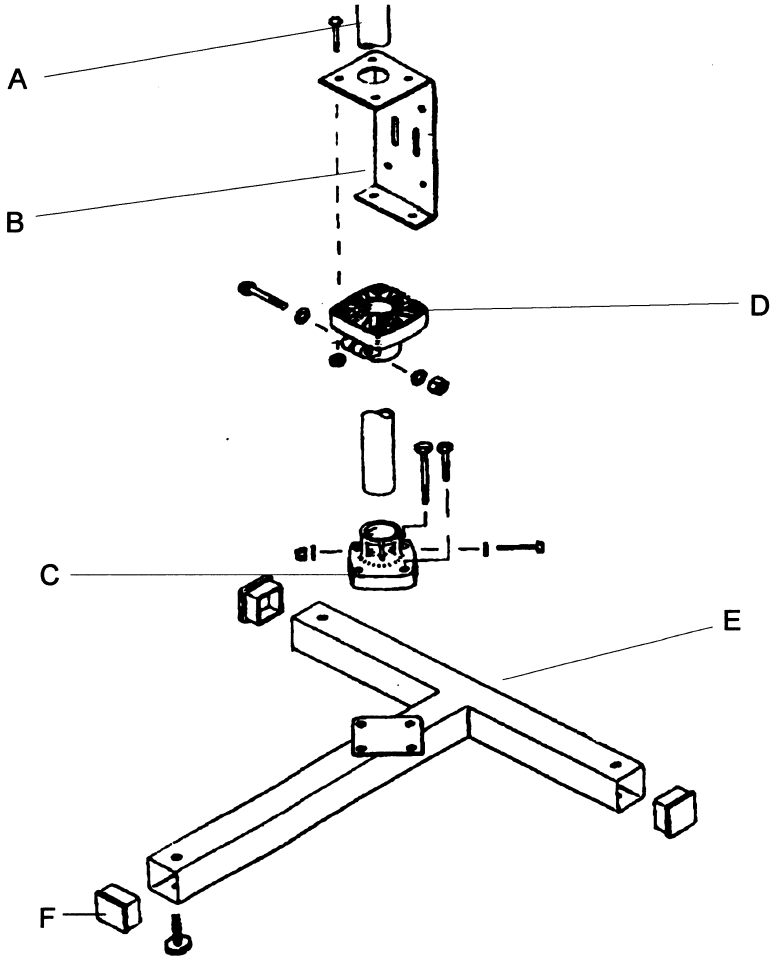
CONVEYOR BRACKETRY

Figure 9-1

A	Post, 2" x 3'	X20018-001
B,C	Controller Bracket Assy.	X22151-001
D	Conveyor Side Mount	X20105-001

Controller Floor Stand Kit

The Controller Floor Stand Kit (part 3 S02014-001) is used for mounting independent of the conveyor to minimize the effects of vibration from the conveyor.



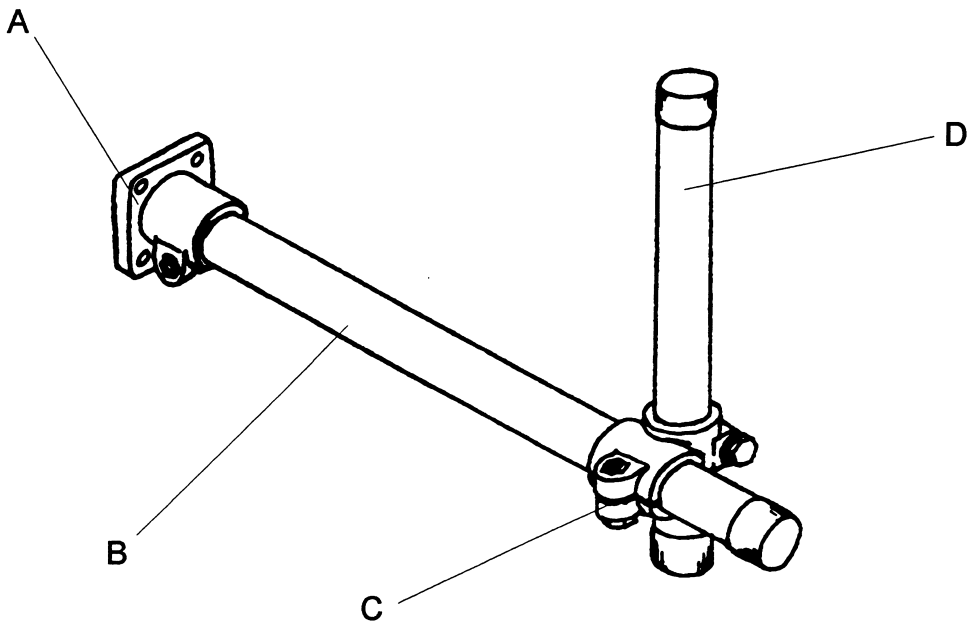
FLOOR STAND BRACKETRY

Figure 9-2

A	Post, 2" x 6'	X20042-001
B,D	Controller Bracket Assy.	X22151-001
C,E,F	T-Stand Assy.	X20105-001

Printhead Mounting Kit (1”)

The 1” kit (part # S02436-001) can be mounted to the conveyor or used with a Floor Stand with the addition of a 90° cross block (1” by 2”).



CONVEYOR MOUNTING KIT

Figure 9-3

A	Flange Base	X21094-001
B	1” x 18” Rod	X20081-001
C	90° Cross block (1” - 1”)	X21093-001
D	1” x 12” Rod	X20100-001

Linear Positioning Rod

The Linear Positioning Rod allows for easy adjustment of the Printhead/Wax System. This is especially helpful when printheads need repositioning for different print locations. A set screw in the cross block secures the position after components have been placed in the desired position. The drawing below shows the Linear Positioning Rod with a Series 7 Printhead, but it is quite effective with the WaxJet Printhead/Wax System as well.

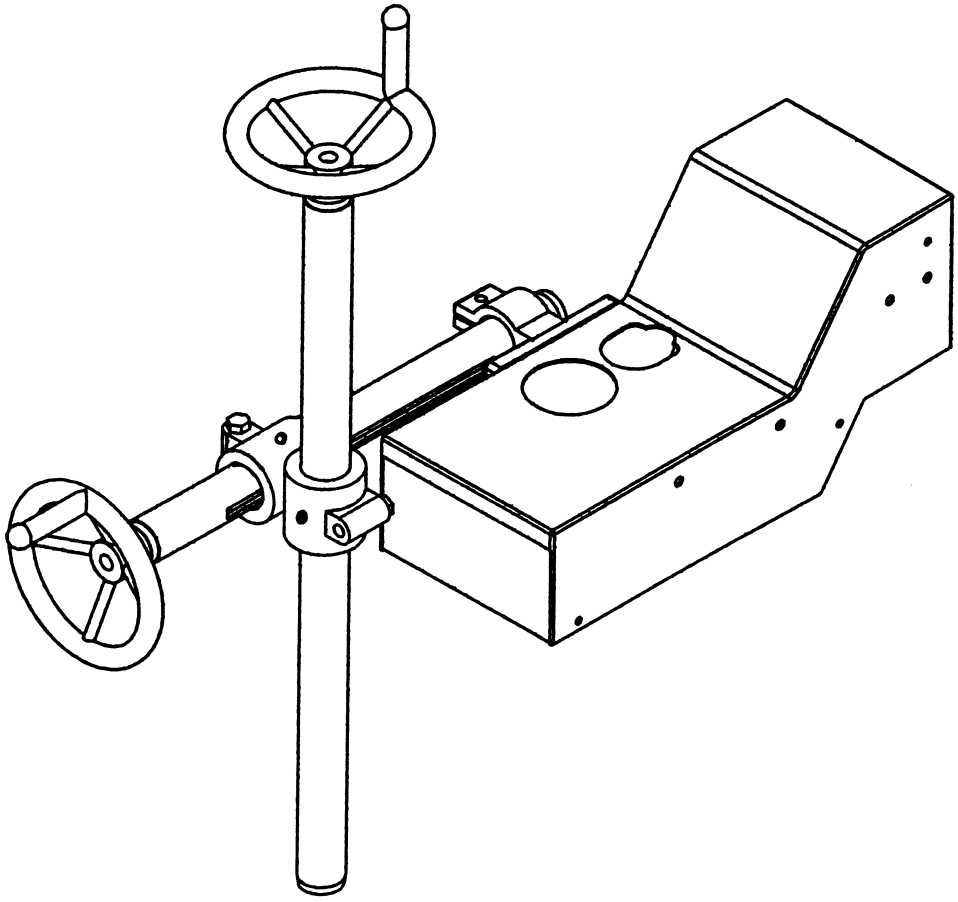


Figure 9-4

12” Linear Positioning Rod	X20153-001
18” Linear Positioning Rod	X20154-002