Compliance Information

For Customers in the U.S.A.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and
2) This device must accept any interference received, including interference that may cause undesired operation.

Warning

PERSONAL INJURY. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide responsible protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In such cases, the users will be required to correct the interference at their own expense.

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.

The user may find the following booklet prepared by the Federal Communications Commission helpful: How to Identify and Resolve Radio-TV Interference Problems. This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-00-00345-4.

This equipment has been tested and certified for compliance with U.S. regulations regarding safety by TUV Rheinland of North America, Inc.

For Customers in Canada

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.
This equipment has been tested and certified for compliance with Canadian regulations regarding safety by TUV Rheinland of North America, Inc.

Pour la Clientèle du Canada
Le présent appareil numerique n’emet pas de bruits radioelectriques depassant les limites applicales aux appareils numerique de las class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Cet équipement est certifié CSA.

For Customers in the European Union
This equipment displays the CE mark to indicate conformance to the following legislation:

• EN60950-1:2001, A11:2004 Safety Requirements for Information Technology Equipment
• EN61000-3-2: 2000, A2:2005 Harmonics
• EN61000-3-3: 1995, A1:2001 Voltage Fluctuations

ITE immunity using:
IEC 61000-4-2 Electrostatic Discharge
IEC 61000-4-3 Radiated Electromagnetic Field
IEC 61000-4-4 Electrical Fast Transient
IEC 61000-4-5 Surge
IEC 61000-4-6 Conducted RF
IEC 61000-4-8 50 Hz Radiated Susc.
IEC 61000-4-11 Voltage Dips, Interrupts
Support and Training

Contact Information
If you have any questions or need assistance, please contact Videojet Technologies Inc. at 1-800-843-3610 (for all customers within the United States). Outside the U.S., customers should contact their Videojet Technologies Inc. distributor or subsidiary for assistance.

Videojet Technologies Inc.
1500 Mittel Boulevard
Wood Dale, IL 60191-1073 U.S.A.
Phone: 1-800-843-3610
Fax: 1-800-582-1343
International Fax: 630-616-3629
Web: www.videojet.com

Service Program

About TotalSource Commitment
TotalSource® TOTAL SERVICE PLUS RELIABILITY, is the Videojet Technologies Inc. commitment to provide you - our customer - the complete service you deserve.

The TotalSource Commitment
The Videojet TotalSource® Service Program is an integral part of our business in providing marks, codes, and images where, when, and how often customers specify for packages, products, or printed materials. Our commitment includes:

• Applications support
• Installation services
• Maintenance training
• Customer response center
• Technical support
• Field service
• Extended hours phone assistance
• Parts and supplies
• Repair service
Customer Training

If you wish to perform your own service and maintenance on the printer, Videojet Technologies Inc. highly recommends you, to complete a Customer Training Course on the printer.

Note: The manuals are intended to be supplements to (and not replacements for) Videojet Technologies Inc. Customer Training.

For more information on Videojet Technologies Inc. Customer Training Courses, call 1-800-843-3610 (within the United States only). Outside the U.S., customer should contact a Videojet subsidiary office or their local Videojet distributor for more information.
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Introduction

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• Introduction
• Who must use this manual
• How to use this manual
• Content Presentation
• Videojet Customer Training
• To Begin With

**Warning**

PERSONAL INJURY. You must read Chapter 2, “Safety” before you operate the equipment.

Introduction

The Excel Dual Nozzle printer is a single head, two stream ink jet printer. The printer can code, overprint and do industrial marking.

References to the Videojet Excel Dual Nozzle Printer

The word "printer" refers to the Videojet Excel Dual Nozzle printer for easy reading in the manual.

The Printer Supplies

The printer can print on any type of surface, texture, curve, or shape, because of many types of Videojet® inks that are available.
Caution

EQUIPMENT DAMAGE. Use only Videojet fluids with a flashpoint greater than -22°C (-8°F) and boiling point greater than 56°C (133°F) to prevent the fire hazards.

Contact your Videojet sales representative or distributor for any questions about the supplies selection (inks, make-up fluids, and cleaning solutions) or product applications.

Who Must Use this Manual

This manual is for the service technician. This manual contains the information on installation, setup, maintenance, troubleshooting, and service of the printer.

Warning

PERSONAL INJURY. Only the qualified personnel must perform the service and maintenance procedures of the printer. The qualified technical personnel must complete a training course which must include this base. The personnel must know or understand the equipment, and know the hazards.

The Service Manual is a supplement and not a replacement to the training.

Note: You can select Videojet (or one of its distributors) to maintain and service your printer, but maintain a Service Manual for future reference.

Note: Keep this manual in a safe location for easy access and to refer the manual easily.

How to Use this Manual

If you are a first time user of the printer or have minimum knowledge of the printer, refer to the section “To Begin With” on page 1-4. The section gives an introduction of the different topics included in this manual.
If you are experienced with the printer, use the information in this manual for reference. This manual is arranged, so that you can find the information you need quickly and easily.

**Content Presentation**

This section describes the styles used to write the information in the manual. The writing styles separate the important information from the common text.

*Note:* Refer to Chapter 2, “Safety”, for examples of Warning and Caution information.

**Printer Keys and Status Lights**

All keys on the keyboard and the status lights are shown in upper case within the text.

*Example:* Press the HEAD key to start the ink system. The green LED status light is activated to indicate that the printer startup sequence has started.

**Notes**

The word *Note* used in the text supplies additional information to a step or piece of information.

*Note:* To reach the frame <01 Edit>, press the ENTER key until the frame appears in the display screen.

**Text in the Display Screen**

The words, characters, or symbols within the text that appear on the display screen are shown within the arrow symbols (<,>).

*Example:* When you press the F3 key to select <VIEW PRINT>, the last message that was loaded into the printer appears.

**Videojet Customer Training**

The customers who select to service and maintain the printer, Videojet recommends a Customer Training Course which covers the Videojet Excel
Dual Nozzle printer. The Service Manual will be a supplement and not a replacement to Videojet Customer Training.

To know more on Customer Training Courses, call 1-800-843-3610 (within the U.S.A. only). Outside the U.S.A., customers must contact a Videojet subsidiary office or local distributor for more information.

To Begin With

Read the sections shown below to understand the printer better and to learn to print a message on a product.

Note: Before you continue, get the printer installed by a qualified service technician and the system parameters set.

1 Review “Content Presentation” on page 1-3 in this chapter.

2 Read Chapter 2, “Safety”, to understand the safety rules for this product and the supplies used. Do the reading before you remove the supplies from the package or operate the printer.

3 Read Chapter 3, “Installation”, to know about printer setup and installation.

4 Read Chapter 4, “Equipment Description and Component Identification”, for description and location of different components of the printer.

5 Read Chapter 5, “Theory of Operation”, to understand the basic printer operation.

6 Read Chapter 6, “Software Summary Chart - Service Mode” shows different screens of the printer software.

7 Chapter 7, “Maintenance” describes the maintenance procedures for the printer at different time intervals.

8 Chapter 8, “Troubleshooting” describes different faults and warnings and the cause and solutions for them.

9 Chapter 9, “Illustrated Parts List”

10 Chapter 10, “Spare Parts and Accessories”

11 Chapter 11, “Serial Interface” describes the printer setup to communicate with an external computer and list of commands.
This chapter contains the following topics:

- Introduction
- Safety Conventions Used in the Manual
- Equipment Safety Guidelines
- Placement of the Printer
- Ink Safety Guidelines
- Medical Emergencies

**Caution**

EQUIPMENT DAMAGE. Read this chapter thoroughly before attempting to install, operate, service, or maintain this product.

**Introduction**

The policy of Videojet Technologies Inc. is to manufacture non-contact printing/coding systems and ink supplies that meet high standards of performance and reliability. Therefore, we employ strict quality control measures to eliminate the potential for defects and hazards in our products.

The intended use of this printer is to print information directly onto a product. Use of this equipment for any other purpose may lead to serious personal injury.

The safety guidelines provided in this chapter are intended to educate the operator on all safety issues so that the operator can operate the printer safely.
Safety Conventions Used in the Manual

Specific safety information are listed throughout this manual in the form of Warning and Caution statements. Pay close attention to these statements as they contain important information that help in avoiding potential hazards to yourself or to the equipment.

Warning Statements

- Warning statements are used to indicate hazards or unsafe practices that may result in personal injury or death.
- They have a triangular symbol with an exclamation mark to the immediate left of the text.
- They are always preceded by the word “Warning”.
- They are always found before the step or information referring to the hazard.

Example:

⚠️ Warning

PERSONAL INJURY. The next step, “Cleaning the Printhead,” must be performed by the service or maintenance personnel. Qualified personnel have successfully completed the training courses, have sufficient experience with this printer, and are aware of the potential hazards to which they may be exposed.

Caution Statements

- Caution statements are used to indicate hazards or unsafe practices that can result in product or property damage.
- They have a triangular symbol with an exclamation mark to the immediate left of the text.
- They are always preceded by the word “Caution”.
- They are always found before the step or information referring to the hazard.
Example:

**Caution**

EQUIPMENT DAMAGE. Never turn off the printer by switching the AC power switch to the Off (O) position. Before pressing the Off key, allow the printer to complete the three and a half minute shutdown sequence. Failure in following this procedure prevents the printer from drawing the ink in the ink return line, back into the reservoir. This may cause the ink to dry in the ink return line, resulting in problems when you turn the printer on again.

---

**Equipment Safety Guidelines**

This section contains important safety guidelines pertaining to the operation and handling of the printer and associated equipment.

**Warning**

PERSONAL INJURY. Always observe the following safety guidelines while operating and handling the printer and associated equipment.

---

**Comply with Electrical Codes**

All electrical wiring and connections must comply with the applicable local codes. Consult the appropriate regulatory agency for more information.

---

**Avoid Breathing Exhaust Vapors**

During its operation, the printer releases fumes from the printer exhaust tube. These fumes may be flammable and present a health hazard. For these reasons, do not allow the exhaust to be confined to an area that does not have proper ventilation, or is located near a source of ignition. Printer exhaust fumes are generally heavier than air, so keep all sources of ignition away from low areas where the fumes may travel or accumulate.
If, under any circumstances, the printer is to be kept in a place that lacks proper ventilation, it is necessary to expel the printer exhaust to the outside air. Consult the appropriate regulatory agency in concern with the emission permit and venting system requirements, before giving vent to the printer exhaust into the outside air.

*Note*: A Vapor Exhaust Ducting Kit is available at Videojet Technologies Inc.

**Do Not Remove Warning Labels**

The following printer stands have been approved:

- Mobile Floor Stand (P/N-391301-01 (Painted) and 391301-02 (Stainless))
• Table Top Stand (P/N-371156)
• Wall Mount Bracket (P/N-379275)

Ink Safety Guidelines

This section provides important safety guidelines pertaining to the usage and handling of printer supplies (inks, make-up fluids, and cleaning solutions).

⚠️ Warning

PERSONAL INJURY. Observe the following safety guidelines while using or handling inks, make-up fluids, and cleaning solutions. For continued protection against a possible fire hazard, use only Videojet supplies having a flash point not lower than -22°C (-8°F) and boiling point not lower than 56°C (133°F).

No Smoking

Do not smoke near the printer or printhead. If the printer exhaust fumes are subjected to an ignition source, it may result in an explosion or fire.

Wear Safety Glasses

Wear safety glasses with side shields (or equivalent eye protection) when handling any ink, make-up fluid, or cleaning solution. If it splashes onto your eyes, flush your eyes with water for 15 minutes and consult a physician immediately.

Avoid Skin Contact

Wear butyl rubber gloves while handling the ink, make-up fluid, or cleaning solution. Avoid contact with skin and mucous membranes (nasal passage, throat). On contact with the skin, remove any contaminated
clothing and wash the area with soap and water. Consult a physician if irritation persists.

**Avoid Breathing in Vapors**

Avoid prolonged exposure to the print exhaust vapors. If respiratory protection is needed, a cartridge organic respirator can be used.

**Dispose Ink Properly**

Do not pour any ink, make-up fluid, or cleaning solution into sinks, sewers, or drains. Waste disposal must comply with local regulations. Contact the appropriate regulatory agency for more information.

**Read the Material Safety Data Sheets**

Read and understand the Material Safety Data Sheet (MSDS) before using any ink, make-up fluid, or cleaning solution. An MSDS exists for each type of ink, make-up fluid, and cleaning solution. The appropriate sheet or sheets are supplied along with the shipped product.

Ensure that you retain all MSDS’ for future reference in case you need to consult a physician regarding an ink-related accident. Additional copies of MSDSs are available on request, and can be obtained by contacting the Videojet Customer Service Department at 800–843–3610. Outside the U.S, customers should contact a subsidiary Videojet office or their local Videojet distributor.

**Store the Inks Properly**

Certain inks, make-up fluids, and cleaning solutions are flammable and must be stored appropriately. Storage must comply with local regulations. Contact the appropriate regulatory agency for more information. The label on the bottle or the MSDS indicates if a particular fluid is flammable or not.
Caution

EQUIPMENT DAMAGE. The waste container or service tray grounded to the printhead must be made of metal. Use of a non-metallic waste container/service tray may result in possible electrostatic discharge.

Medical Emergencies

This section provides important medical information in case of an accident.

Warning

PERSONAL INJURY. In the event of a medical emergency, contact a physician immediately.

Emergencies Involving Printer Fluids

If the incident involves an ink, make-up fluid, or cleaning solution, carry the bottle and/or MSDS with you to the physician’s office. These items contain important information that the physician may require in order to provide the precise medical treatment.

Rocky Mountain Poison Control Center

All of Videojet inks, make-up fluids, and cleaning solutions are also registered with the Rocky Mountain Poison Control Center, located in the United States. If the bottle or MSDS cannot be located, the physician can contact the Rocky Mountain Poison Control Center to obtain the information required.

Rocky Mountain Poison Control Center
(303) 623-5716

Note: Persons outside the United States requiring medical attention can have a physician contact the Rocky Mountain Poison Control Center in the United States or a poison control center or hospital in their own area.
This chapter contains the following:

- Site preparation
- Electrical requirements
- Compressed air requirements
- Printer packaging and inspection
- Printer stand and printhead stand installation
- Muffler installation
- Printhead assembly
- The printer setup (To load the fluid)
- Control board connections
- Detector Setup
- Shaft Encoder Setup
- Encoder Selection
- I/O Features
- High Voltage Gap Adjustment
- Vacuum Adjustment
- Positive Air Adjustment

Site Preparation

Consider the following guidelines to set the printer near the conveyor:

- Select an area that is free of vibrations before you install the printhead and the umbilical.

- Make sure that the printhead reaches the location at the conveyor. Loosen and route the umbilical to the products on the conveyor. Do not bend or stretch the umbilical. Do not allow any portion of the umbilical near sharp objects or areas where there is heavy movement of persons and equipment.
• Make sure the umbilical does not make any sharp bends. The ink must have a easy path to return to the printer cabinet.

**Note:** The recommended setting for the printhead is 3 ft. (maximum) above or below the printer cabinet.

• Select the final location of the printer. Then you must attach the printer stand tightly on the floor (or the wall) to prevent the vibrations during the operation.

**Note:** If the printer is attached to the mobile floor stand, there is no need to attach the printer stand tightly to the floor.

**Note:** Make sure that the printhead easily reaches the conveyor, then you can tighten the printer stand to the floor.

• When you select the location, make sure that there is easy access to the AC power source and necessary printer exhaust connections. Also make sure that you can access the connections of the compressed air source (unless you use a portable air compressor).

• Allow enough space to open the cabinet, and access the printer for the routine service and maintenance procedures.

• Allow enough space to service the printhead. During the routine service procedures, the printhead is removed from the holder and put into a service tray.

• Make sure the printer has good ventilation or the customer must provide correct exhaust for fumes from the printer aspirator.

### Electrical Requirements

<table>
<thead>
<tr>
<th>Voltage and Frequency</th>
<th>85-264 VAC, 50-60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption</td>
<td>75 watts maximum, 60 watts standard</td>
</tr>
<tr>
<td>Current</td>
<td>1 amp maximum</td>
</tr>
</tbody>
</table>

*Table 3-1: Electrical Requirements*
Compressed Air Requirements

The air source must supply the air that is free of contamination, water and oil to meet the requirements shown in the Table 3-2.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Pressure</strong></td>
<td>Minimum of 4.8 bar (70 psi); maximum of 6.9 bar (100 psi); recommended 5.5 bar (80 psi)</td>
</tr>
<tr>
<td><strong>Air Intake</strong></td>
<td>4,248 litres/hour maximum (2.5 SCFM) 3,398 litres/hour (2.0 SCFM) normal at 5.5 bar (80 psi)</td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td>The air must be of instrument quality sent through a 0.03 micron filter and no more than 1 PPM oil content. The air must be 99% water free. You can purchase the twin-package filter that can provide the air quality required. The filter has a prefilter, followed by a submicron coalescing-type filter.</td>
</tr>
<tr>
<td><strong>Air Pressure Dew Point</strong></td>
<td>Less than 4 ºC (40 ºF) at 5.5 bar (80 psi)</td>
</tr>
</tbody>
</table>

*Table 3-2: Compressed Air Requirements*

*Note: If a compressed air source is not available, you can use a nitrogen source.*

Remove and Inspect the Printer

Remove the printer from its carton and inspect for damage. Examine the control unit, the umbilical, and printhead (refer to Figure 3-1 on page 3-4). The printer package is done carefully at the VIDEOJET manufacturing facility. If there is any damage, file the damage claims with the company that made the shipment.
The Printer Stand

The VIDEOJET® Excel Dual Nozzle printer requires the support to stand. Fit the printer to a printer stand to provide the necessary support. You can order the printer stand from Videojet Technologies. Contact VIDEOJET at 1-800-843-3610 within the USA. Outside the U.S.A., the customers must contact their VIDEOJET distributor or subsidiary for assistance. Refer to Chapter 10, “Spare Parts and Accessories” section in this manual for available printer stands and mounts.

Figure 3-1: Videojet Excel Dual Nozzle Printer

1. Umbilical
2. Control Unit
3. Printhead
**Caution**

EQUIPMENT DAMAGE. Install the printer on a floor printer stand or a wall-mount printer stand with four 1/4-inch x 1/2-inch bolts. For printers installed on the wall, (four 3/8 inch) x (1 inch) bolts are used. Make sure to engage a minimum of 50% of the threads on each bolt.

Attach the printer to any of the printer stands or wall brackets by following the instructions supplied with the mounting device.

**Install the Printer Stand**

1. Follow the instructions included with your printer stand or the wall mount kit.

2. Put the printer and stand at the required location. Allow enough space at the front side of the printer to access the cabinet for service purposes. Make sure that the location allows enough area for the printhead to reach its mounting location.

**The Printhead Stand**

Refer to Chapter 10, “Spare Parts and Accessories” for part number information of the printhead stand. Attach the stand to the floor after you select the final location of the printhead stand according to the installation instructions included with the printhead stand.

**Note:** Make sure that the printhead stand is away from the vibrations for best printer performance. Fasten the printhead to the floor with a bolt, and make sure that the printhead reaches over the production line to print on product.
The Muffler

The muffler is found in the pack of auxiliary parts included with the printer package. The parts are shown in Table 3-3.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>206041</td>
<td>Muffler</td>
<td>1</td>
</tr>
<tr>
<td>186975</td>
<td>The Hex key 8mm (5/16 inches)</td>
<td>1</td>
</tr>
<tr>
<td>186514</td>
<td>The Hex key short arm 1.3 mm (0.050 inches)</td>
<td>1</td>
</tr>
<tr>
<td>223722</td>
<td>The Hex Key long arm 1.3 mm (0.050 inches)</td>
<td>1</td>
</tr>
<tr>
<td>356539</td>
<td>Bleed tube</td>
<td>2</td>
</tr>
<tr>
<td>355269</td>
<td>Magnifier Loupe</td>
<td>1</td>
</tr>
<tr>
<td>379243</td>
<td>High Voltage Plate Gap Gauge</td>
<td>1</td>
</tr>
<tr>
<td>356230</td>
<td>Flow Meter</td>
<td>2</td>
</tr>
<tr>
<td>SP371675</td>
<td>Nozzle</td>
<td>2</td>
</tr>
<tr>
<td>390019</td>
<td>Charge Tunnel (Shipped with Nozzle, in box)</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3-3: Auxiliary Parts

Install the muffler as shown in Figure 3-2.

Figure 3-2: Installation of Muffler
Assemble the Printhead

Review this procedure to assemble the printhead. The steps are arranged in an order to prevent any stress on printhead components.

1. Unpack all parts from the nozzle packages and put all parts in a safe area.

2. Find the two green ground wires (Item 4, Figure 3-3 on page 3-8) from the nozzle package.

3. Find the screws (Item 3) on the deck.

4. Fasten the green ground wires (Item 4) space lug under the screws, and tighten the screws, so that the green ground wire are tight.

5. Connect the other ends of the green ground wires to the barbs on the ink control valves. Connect to the ink line barb on the lower right side of valve (as viewed from rear end of the valve). Refer to Figure 3-3 on page 3-8.

6. Use the screws to connect the charge tunnels to the sides of the nozzles. Attach the charge tunnel to the nozzle with only the font screw.

7. Use the syringe and tubing to flush nozzle with the make-up solution. Refer to the instructions sent with the nozzles for more information.

8. Attach the O-Ring provided to the barb on the back side of the nozzle.

9. First, you must install nozzle-2 (Item 1, Figure 3-3 on page 3-8). Lift the H.V. wire-2 from the inside deck assembly. This action allows easy installation of nozzle-2 and ink valve. Position Nozzle and ink valve into the printhead deck. Make sure that wires like H.V. Wire or nozzle drive wires are not under the ink valve-2.

10. Begin with the nozzle upside down, insert the nozzle barb into the ink control valve. Screw the nozzle into the ink valve with 2 to 3 turns. The nozzle must be in correct mounting position with bottom mounting plate locator pins of the nozzle are inserted to enable the nozzle to be flush to printhead deck assembly.

11. Fasten the charge tunnel wires to the charge tunnel. Make sure that charge tunnel wire-2 does not apply any stress on the following:
   - Ink control valve
   - The y-fittings in the ink supply
   - The y-fittings in the supply flow paths of the auto flush

Note: If necessary, loosen the nozzle (Item 2) undercarriage retaining plate to change the position of the sense wire, strobe light wires, and ink return line to access the screws for mounting nozzle.
12 Insert the two mounting screws from the bottom side of printhead to attach nozzle-2 to printhead.

13 Pass the charge tunnel wire-2 through a different route if necessary.

14 Make electrical connection to nozzle-2.

*Note: A number on the wire helps to identify the nozzle drive wire (2).*

15 Repeat steps 6 through 14 with nozzle-1 (Item 2).

16 Restore the undercarriage retaining plate if removed to access the screw.

17 When both the nozzles are installed and all connections made, make sure that H.V. wire-1 and 2 are routed along outside or above of ink valves. Make sure the H.V. wires will not put any stress to ink valve. Check charge tunnel wires to make sure that they do not interfere with the ink valves. Coil all the remaining tubing and in the back side of printhead. Make sure that you do not bend the tubing. Place chassis cover on printhead assembly cover. This action must not cause any stress to the components.

*Figure 3-3: Printhead*
High Voltage Gap Procedure

This procedure describes how to align the high voltage plate and arm assembly correctly. The operator must perform this adjustment on both nozzle-1 and nozzle-2 accurately.

Tools Required

The tools required to perform this procedure are shown in Figure 3-4.

![Figure 3-4: Tools](image-url)
Procedure

Do the following tasks to align the high voltage plate and arm assembly correctly:

**Nozzle-1**

1. Rotate (one full turn) and loosen the two screws that hold the high voltage plate to the arm assembly. Hold the plate and arm so that the arm does not bend when you loosen these screws.

2. Rotate (one full turn) and loosen the two screws that hold high voltage arm to the printhead chassis.

3. Insert H.V. gauge into the printhead as shown in Figure 3-6 on page 3-11.
4 Use the large side of the gap gauge to hook the rear edge of the gauge to the rear edge (close to the nozzle) of the ground plate. The front edge of the gauge must touch the front edge of the H.V. plate. Refer to Figure 3-7. Move the gauge in the direction indicated in Figure 3-7 and slide the gauge between the H.V. plate and ground plate.

5 While you push the gauge downwards and towards the front of the printhead at the center of the high voltage plate, tighten the high
6 Tighten the front high voltage plate mounting screw.

7 Rotate the two screws that hold the H.V. arm to the chassis to your right until the screws are tight. Make sure that the H.V. plate remains aligned with the gauge. Do not completely tighten these screws now.

8 Tighten the front screw that attaches the H.V. arm to the chassis while you hold the arm tightly to the chassis. Refer to Figure 3-9 on page 3-13. Then tighten the rear screw.
9 Slide the gauge in and out in between the plates. When the gauge is not in between the plates, make sure the H.V. plate does not tilt downwards.

**Note:** When there is a downward movement in the H.V. plate, perform the next step. Else, continue to step 11.

10 Loosen and adjust the arm again.

11 The H.V. arm assembly on nozzle-1 has a groove to protect the H.V. wire from damage. This wire is held into this groove. Check to make sure that the H.V. wire is routed correctly as shown in Figure 3-10 on page 3-14.

*Figure 3-9: Tighten the H.V Arm to the Chassis for Nozzle-1*
Do the following tasks to align the high voltage plate and arm assembly correctly:

**Nozzle-2**

1. Rotate (one full turn) and loosen the two screws that hold the high voltage plate to the arm assembly. Hold the plate and arm so that the arm does not bend when you loosen these screws.

2. Rotate (one full turn) and loosen the two screws that hold the high voltage arm to the printhead chassis.

3. Use the small side of the gap gauge and hook the rear edge of the gauge to the rear edge (close to the nozzle) of the ground plate. The front edge of the gauge must touch the front edge of the H.V. plate. (Figure 3-11 on page 3-15).

4. Move the gauge in the direction indicated in Figure 3-11 on page 3-15 and slide the gauge between the H.V. plate and ground plate.

5. While you push the gauge downwards and towards the front of the printhead at the center of the high voltage plate, tighten the high voltage plate screw. Select the closest screw to the nozzle.

6. Tighten the front high voltage plate mounting screw.

7. Rotate the two screws that hold the H.V. arm to the chassis to your right until the screws are tight. Make sure that the H.V. plate remains aligned with the gauge. Do not completely tighten these screws now.
8 Tighten the front screw that attaches the H.V. arm to the chassis while you hold the arm tightly to the chassis. Refer to Figure 3-11 on page 3-15. Then tighten the rear screw.

![Figure 3-11: Tighten H.V. Arm to Chassis - Nozzle-2](image)

9 Slide the gauge in and out in between the plates. When the gauge is not in between the plates, make sure the H.V. plate does not tilt downwards.

Note: When there is a downward movement in the H.V. plate, perform the next step.

10 Loosen and adjust the arm again.
Connect the Electrical Power

The printer is available in two power-configurations:

- The power cord is installed when the 120 VAC printers are shipped. Additional changes are not required for AC connection.
- 240 VAC printer shipment includes power cord without the plug. Install the correct plug on the power cord (plug not provided).

Connect 120 VAC Units

1. First you must measure and make sure that correct 120VAC is available. You can use AC circuit tester to validate correct wires. When an AC circuit tester is not available, use the volt meter to check the voltage between neutral and the ground. The volt meter must read a value of 0V or millivolts.

2. Connect the power cord plug to the correct electrical source.

3. The main power switch is on the lower right side of the printer cabinet. To turn on the printer, push the AC rocker switch to the position (refer to Figure 3-12).

*Note: The AC power switch is on lower right side of printer cabinet.*

![Figure 3-12: AC Power Switch](image-url)
Connect Compressed Air

Connect the printer to a source of clean, oil free and dry air at 80 to 100psi (5.5 to 6.9 bar). For description of the recommended air filter, you can refer to Chapter 10, “Spare Parts and Accessories”. Refer to the printer specifications table for more information. If the air quantity or quality is not good, refer to accessory section of the manual for information on inlet air accessories.

Follow the instructions included with your air filter assembly. Remember to follow the air quality and the operating pressure guidelines given below for maximum performance:

- The air must not contain the solid particles of size more than one micron.
- Do not increase the pressure more than 100psi (6.9 bar) pressure. A pressure relief valve automatically removes the air supply if the pressure is more than 100psi (6.9 bar).

Make sure that the volume of the air which flows in is 2.5 SCFM minimum (in the volume).

The Printer Setup

Loading the printer with fluids

- The selection of the correct ink return line
- Incoming Air, Positive Air and vacuum adjustments
- How to load the ink

Tools and Supplies Needed

Note: Parts shown by an asterisk (*) are included in the final printer assembly. Refer to Chapter 10, “Spare Parts and Accessories”, for information about printer accessories and the VIDEOJET Spare Parts Kits.

The following tools and supplies are required for correct setup of the printer:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VIDEOJET® ink</td>
<td></td>
</tr>
</tbody>
</table>

Table 3-4: Tools and Supplies Needed
Confirm the Correct Ink Return Line and Transfer Line

The printers are either water based or solvent based systems. A water based system has the larger ink line attached. A solvent based system has the smaller ink return line attached. The type of return line required for use with each type of ink is shown in Table 3-7 on page 3-46.

All solvent inks do not require small return lines. Some solvent inks require large return lines. Check the return line chart for correct return line if the printhead mount is turned upside down. A printhead that is turned upside down is one where:

- The slots at the front of the printhead are towards the floor.
- The high voltage arms and plates are toward the floor.

If the printhead is turned upside down, you must use the large return lines.

If you must change the ink return lines because of a change in the type of ink, remember the following:

- The Dual Nozzle printer does not have both return lines large and small in the umbilical assembly. The correct printer should be ordered for the application or ink type used. If a field change needs to be

---

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>VIDEOJET® make-up fluid</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>VIDEOJET® cleaning solution</td>
<td>-</td>
</tr>
<tr>
<td>356230</td>
<td>Flow Meter</td>
<td>2</td>
</tr>
<tr>
<td>356539</td>
<td>Bleed Tube</td>
<td>2</td>
</tr>
<tr>
<td>186514</td>
<td>The Hex Key (Short Arm)</td>
<td>1</td>
</tr>
<tr>
<td>223722</td>
<td>The Hex Key (Long Arm)</td>
<td>1</td>
</tr>
<tr>
<td>355495</td>
<td>Wash Pan (Service Tray)</td>
<td>1</td>
</tr>
<tr>
<td>379256</td>
<td>Printhead Holder and Thumb Screw</td>
<td>1</td>
</tr>
<tr>
<td>355269</td>
<td>Magnifier</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Selection of hand tools</td>
<td>-</td>
</tr>
<tr>
<td>379243</td>
<td>High Voltage Gap Gauge</td>
<td>1</td>
</tr>
<tr>
<td>91535804</td>
<td>Screw Starter</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3-4: Tools and Supplies Needed (Continued)
made, the proper return lines will have to be changed by pulling new return lines into the umbilical and printhead.

- Change the ink return line at both the printhead end and the ink return tube on the ink module.
- For water and poly-based inks, make sure to use only the large transfer line.

**Note:** VIDEOJET recommends printhead configuration in the standard position (high voltage plate faces up). When the upside down printhead position (high voltage plate faces down) is required, use the large ink return line and set the vacuum levels. Refer to Table 3-7 on page 3-46.
Initial Vacuum Adjustment

1. Loosen the lock ring on needle valve then adjust the vacuum at the needle valve on the air manifold. Tighten the lock ring when the vacuum is set (refer to Figure 3-14 on page 3-20).

2. Check the vacuum gauge on the fluid pan door while you adjust the vacuum (refer to Figure 3-15).

3. Adjust vacuum to 254 mm of Hg (10 in of Hg).

![Vacuum Flow Control Valve]

Figure 3-14: Adjust the Vacuum
Fluids Low Adjustment

The air moves through the fluids low needle valve on the solenoid bank to supply the fluids low switch and the replenishment bottles. This air monitors the fluid level within the bottles.

Use a screwdriver to adjust the needle valve (refer to Figure 3-16 on page 3-22)

1. If the printer has no fluids in it (printer is dry of all fluids), install two bottles of make-up solution in the left and right side of fluid pan. You will be placing a bottle of make in the ink position for this adjustment and following procedures.

2. Turn power switch as side of printer to (l) ON. Allow the printer to boot up.

3. Once <01 Edit> menu is in view. Press F5 key until <04 Edit> is in view. Press F1 key under <Service Printer>. Press HEAD Key to start air.

4. When you adjust the needle valve, look in the make-up replenishment bottle.

5. Hold the dip tubes approximately 25 mm (one inch) below the liquid surface (refer to Figure 3-17 on page 3-23).

6. Adjust the needle valve for approximately two bubbles per second.
**Caution**

EQUIPMENT DAMAGE. Do not open the needle valve by more than one quarter (1/4) turn. The air pressure more than the required limit damages the switch.

*Figure 3-16: Adjusting the Fluids Low Needle Valve*
Flush the System and Load the Ink

*Note:* Refer to Chapter 7, “Maintenance” for instructions to flush the system with the make-up fluid and to load the same with the ink. The chapter also contains the following calibration procedure.

**Warning**

PERSONAL INJURY. Make sure to connect the service tray with electrical ground wire, and install the printhead into the service tray. The incorrect installation of the service tray and the printhead when you use flammable ink can cause the fire because of static discharge.

**Caution**

EQUIPMENT DAMAGE. Make sure that the work area has good ventilation.
Caution

EQUIPMENT DAMAGE. During first use, you must flush the printer with the make-up fluid before you load the ink into the system. You must flush the system with the make-up fluid when you take the system back online from the storage.

1. Prepare the printer.
2. Refer to Chapter 7, Maintenance for the following procedures.
3. Load the make-up fluid
4. Drain the make-up fluid.
5. Load the ink.
6. Perform ink renewal procedure.
7. Ink stream calibration.
8. The ink stream breakoff adjustment.
10. Return to chapter 3 (Installation).
11. Perform positive air adjustment.
12. Continue with installation of accessories such as product detector, shaft encoders and all other accessories used in the application.
**Adjust the Positive Air Flow**

The positive air helps to prevent the entry of any contamination into the printhead.

1. Adjust the setting at the positive air needle valve, found on the solenoid bank (refer to Figure 3-18).

   ![Figure 3-18: Adjusting the Positive Air Needle Valve](image)

2. Use a screwdriver and two flow meters (VIDEOJET® PART NUMBER 356230) for this adjustment. The air flow is measured at the printhead with the ink on.

3. Hold the flow meters against the printhead faceplate (refer to Figure 3-19 on page 3-26).

4. Adjust the needle valve to 2.0 +/- 0.5 SCFH measured at the printhead. The flow meter must be vertical to get an accurate reading on both the flow meters.
Accessory Connections and Explanations

**Connect RS-232**

The Excel RS-232 standard-serial-interface design creates a communications link to many external communication devices and the host computers.

The correct configuration of the interface enables the printer to receive the message data from any source, which matches with the RS-232 specifications. Refer to Chapter 11, “Serial Interface” for more information about the RS-232 interface. Serial COMM Port-2 cable kit is required for remote communications. Videojet Part Number is 378817.

For additional information on the Enhanced Serial Interface (ESI) communication capabilities of the Excel DN printer. Refer to the Enhanced Serial Interface (ESI) Manual Videojet Part Number is 361565. The ESI manual is an additional manual that describes the following features found on the Excel DN printer through remote RS-232 communications:

- Printer Queries: Print Status, Product Count, Print Count, Ink Status, Message Printed.
• Printer Setup: Print Delay, Message orientation, Multi-stroke, Repeat Print.
• Message Creation and Format: The Matrix Selection, Download of messages to the printer, ability of remote insert of all automated insert into the message.
• Monitor of faults and Status
• Remote Configuration of printer with remote commands
• Other remote setup and control features

Connect the Product Detector

Caution
EQUIPMENT DAMAGE. The printer must be Off when you install the product detector.

Do the following tasks to connect the product detector:

1. The product detector cable (internal) is installed inside the printer cabinet and connected on the left side of the printer cabinet. The cable is a 3-pin Amphenol connector.
Select the best detector for the application. Refer to Chapter 10, “Spare Parts and Accessories” of this manual for information on the product detector kits.

If you cannot use the Videojet product detector kit, install a 3-pin Amphenol connector on the customers product detector. The Videojet Part number for the 3-pin Amphenol connector (male) is 500-0036-578. Refer to the section on troubleshooting for the information on wiring diagrams.

If you use a Videojet product detector with a conxall connector, there is an adaptor cable that connects the product detector to the Amphenol connector. The Videojet Part Number is 378981.

Select the product detector. Connect the Amphenol Male connector to Amphenol female connector on left side of printer cabinet, next to the detector icon. Refer to the item 7, Figure 3-20.

Turn ON (|) Printer.

Note: Optional Ports are reserved for the expanded I/O board assembly and its additional cables.

Figure 3-20: Optional Ports
Note: When the product detector is active, this LED turns on and turns off. The LED illuminates if you put an object before the product detector.

7 Make sure the product detector energizes with the printer. Follow all product detector installation and setup instructions given with the product detector.

8 After the installation, open the printer cabinet with the Hex key to see the control board.

Note: The operation depends on the type of the product detector. If you see the upper left side of the printer control board, you find a green LED (PD1) with a legend. This green LED illuminates when the detector provides a current sinking (NPN) signal to the printer.
Product Detector Specifications
The specifications of the product detector are as follows:

- The printer is configured to accept an NPN input.
- The printer can supply +12VDC power to the product detector.
- The printer comes with an internal 3-pin cable that connects the product detector to the printer control board.

Set the Product Detector Edge of Detection
The printer software controls the active level of detection. To change the active level of detection:

1. Navigate to the PRINTER SETUP menu <07 Print Menu>.
2. Press F4 to select the Active Level LOW/HIGH. The Videojet product detectors kits are an NPN output. Set Active Level to LOW.

The type of signal received from the product detector depends on the method used to detect - retro reflective compared to the proximity, or beam break compared to the beam make. (The installation instructions in the VIDEOJET® product detector package indicate the type of product detector).

The detector signal LED PD1 (Green LED) on the control board indicates the status of the detector signal. Refer to Figure 3-21 on page 3-29 for the location of the detector signal LED PD1. When the LED turns on, the printer starts printing a message.

Connect the Encoder
When the speed of the conveyor is not a constant, a shaft encoder is used. For the shaft encoder to operate correctly, the product must move at same time as the shaft encoder turns. The Shaft Encoders are set in different methods like direct coupled or reduced (divided-down).

- A direct encoder maintains a 1:1 ratio between encoder pulses and the printed strokes.
- A reduced encoder (divided-down) is used when the current shaft encoder supplies to many pulses per inch, more than the printer can use per inch. This encoder divides the pulses that are sent to the printer to provide the correct pulses per inch for the correct pitch to print.

Note: The Pulses Per Inch (PPI) is the number of pulses from the shaft encoder fed into the printer. The Pulses per Inch (PPI) should be set on the printer for the exact amount of pulses delivered to the printer from the shaft encoder (prior to any dividing of pulses).
INTERNAL (INT) is used if the product speed is constant. An internal clock sets the stroke-rate to a constant speed. To get more information about internal encoder, refer to “Internal Coding” on page 3-32.

EXTERNAL (REDUCE or DIRECT) is used if the product conveyor speed is not a constant. You must use a shaft encoder with this selection. The shaft encoder monitors the changes in the conveyor speed and changes the stroke rate (Print Pitch). The shaft encoder must move according to the movement of the product for better operation and good quality of print.

Select the REDUCE option to decrease the encoder rate input. Select the DIRECT option if the encoder input is not divided. Refer to “External Coding” on page 3-33, to get more information about external encoder.

AUTO is used when the product speed changes from that of the conveyor (product slippage). The signal from the product detector calculates the product speed. Refer to “Auto Encoder” on page 3-36 for more information on the auto encoder.

Procedure

Follow these steps to install the shaft encoder wires in the printer:

⚠️ Caution

EQUIPMENT DAMAGE. The printer must be Off when you install the encoder.

1 Add the shaft encoder to the printer.

2 Calculate the required pulses per revolution required for the application. Refer to Chapter 10, “Spare Parts and Accessories” of this manual for the correct encoder kit needed.

3 If you want to use a Videojet encoder kit with a conxall connector, you must purchase an adaptor cable kit. The Videojet Part Number is 378985.

4 When you select the correct encoder for the application, follow the encoder installation instructions on how to install the internal cable correctly.

5 If the customer needs another encoder not provided by Videojet, then the customer must purchase the Videojet encoder connector. This connector is a 4-pin male connector that you can install on another shaft encoder cable. Videojet Part Number is 500-0036-581.

6 If you do not use the shaft encoder kit provided by Videojet, you must install the 4-pin (female plug) internal cable into the printer.
cabinet. The internal cable is a part of the shaft encoder adapter kit. The Videojet Part Number is 378985.

**Note:** You must install the 4-pin (female plug) internal cable next to the encoder icon.

![Encoder Internal Connector](image)

**Figure 3-22: Encoder Internal Connector**

1. Shaft Encoder Port
2. Basic Input/Output Board

7 Connect the 25ft cable to the shaft encoder and the other end to the internal encoder cable on left side of printer cabinet.

**Internal Coding**

When the product speed is constant, the internal encoder is used. The internal clock of the printer is set to the speed of the product in

- feet per minute (ft./min.)
- meters per minute (m./min.).

You can use the following four methods to calculate the product speed:

**Method 1:**
Use a handheld-tachometer that is calibrated to measure:

- the linear-surface speed in ft./min.
- the revolutions per minute
of the pulley of the belt. Use the following formula to change RPM to surface speed:

\[
\text{Surface speed (ft./min.) = PI} \times \frac{d \times \text{RPM}}{12}
\]

where \( PI = 3.14 \)

where \( d = \) pulley diameter in inches

**Method 2:**
Create a mark for reference on the conveyor belt and measure how many inches (one inch equals 25.4 mm) this mark moves in 5 seconds. This number is equal to the conveyor speed in ft./min.

**Method 3:**
You must know:
- The number of products made per minute on the line
- The size of the product
- The distance between each product.

Use the above data to calculate the product speed.

For example:

There is a production of 1200 products per min. on the line.

Each product is 2.5 inches in width and there is a one-inch distance between each product, then

\[
\text{Conveyor speed} = \frac{(\text{products per min.}) \times (\text{size} + \text{clearance, in inches})}{12}
\]

**EXAMPLE:**

Conveyor Speed = (1200)(2.5 inch + 1 inch) / 12

Conveyor Speed = 350 ft./min.

**Method 4:**
You can use the product counter of the printer also to calculate the number of products per minute. Calculate the line speed as shown in the method 3.

**External Coding**

When the speed of the product and the conveyor is not a constant, an external encoder is required (a shaft encoder is required).

The shaft encoder is connected to the conveyor at a point where the conveyor shaft that is selected and the conveyor turn together. The shaft encoder provides a pulse for each vertical stroke of the message.
NOTE: For the shaft encoder to work properly with the printer, the shaft encoder must turn in a direct relation to the movement of the product. When the product moves, encoder moves and when product stops encoder stops.

Required shaft encoder:

Pulses per Revolution (PPR) = \(d \times \text{strokes per inch}\)

Where \(\text{strokes per inch} = (\text{strokes per character}) \times (\text{characters per inch})\)

**Example 1:**

Given information:

- \(d = 23\) inches.
- 5 x 7 matrix
- 10 characters per inch
- 6 strokes per character (five printed strokes from the 5 x 7 character, plus one "guard" stroke that leaves a space between the characters).

\((23 \text{ inches per revolution}) \times (60 \text{ strokes per inch}) = 1380\text{PPR}\)

**Example 2:**

To use the standard 1800PPR shaft encoder as shown in example 1, you require some type of gears to supply the 60 pulses per inch. Refer to Figure 3-24.
To make a decision about the gears required, the following method is used.

\[(1800 \text{ PPR}/1380 \text{ PPR}) = 1.3 \text{ or } 1:3:1 \text{ gear ratio}\]

If the diameter of "a" = 2.0 inches, then the diameter of "b" is 2.6 inches. (2.0 inches \(\times\) 1.3 = 2.6 inches). For one rotation of "a", 1380 pulses are created from the 1800PPR shaft encoder.

If that same 1800 PPR shaft encoder is connected to the shaft on the conveyor, the calculation can be as follows:

\[
\frac{1800 \text{ pulses per revolution}}{23 \text{ inches per revolution}} = 78 \text{ pulses per inch.}
\]

\[
\frac{78 \text{ pulses per inch}}{6 \text{ strokes per character}} = (13 \text{ characters per inch}).
\]

Because the standards require 10 characters per inch on the product the message is compressed. Refer to Example 1.

Note: The maximum value for the line speed of 5x7 print matrix decreases because the printer is printing more characters per inch than 10 characters.

Note: Refer to Chapter 7, System and Print Set-up, in the Videojet Excel Dual Nozzle Operator Manual (PART NUMBER 361843) for more information about how to use external encoder.
Auto Encoder

Set the encoder setting to auto encode during the following conditions:

- the line speed of the product is not a constant
- the movement of the encoder is not proportional to the conveyor movement

The examples for auto encode are cable feed product, air conveyor, gravity feed conveyor.

The Auto Encode Example

Total Distance = Y + Speed Compensation + Print Delay

3.5 inches = 2.0 + 0.75 inches + 0.75 inches

Print Delay = Speed Compensation + Print Delay

1.5 inches = 0.75 inches + 0.75 inches

Set the nozzle-1 on the product where the message must start the printing with a minimum of 1.50 inch delay.

Note: The smallest amount of print delay is recommended for best operation.
When the speed compensation is used, move the printhead position further from the product detector to increase the print delay to 1.50 inches minimum.

When the speed compensation is not used, set Print Delay to 0.75 inch. Move the printhead closer to detector.

\[
\text{Y = Detect area in 1/10 of an inch.}
\]

\[
\text{Width of product (Y) \times 10 to calculate the width in 1/10 of an inch.}
\]

**EXAMPLE:** Width of product 2.0 inch

\[
2 \times 10 = 20
\]

Detect Area = 20

Print Delay = 0.75 inch

Total Distance = \(Y + \text{Print Delay}\)

\[
2.75 \text{ inches} = 2.0 + 0.75 \text{ inches}
\]

Set the nozzle-1 on the product where the message must start the printing with a minimum of 0.75 inch delay.

**Note:** The smallest amount of print delay is recommended (0.75 inch).
The Installation Guide for Auto Encode Application

• An accurate detector is required to detect the product. A “Send and Receive” detector or retro-reflector detector is recommended. The changes in color or distance do not cause any change to these detectors. This feature gives the same quality in the product detection.

• The product detector must have a narrow beam for accurate measurement of the speed of every product.

• When the Videojet detector kits are used, make sure the product detector is set to the correct edge. Set the Light and Dark switch on the Tri-Tronics product detectors correctly. If the detector is used in the proximity mode, switch is set to the Light. If the detector is used in the beam break mode, switch is set to the Dark.

• The product size must be 2.5 mm (0.9 inch) minimum to 330 mm (13 inches) maximum.

• The minimum speed of the product is 1.5 m/min. (5 ft./min.).

• The speed compensation is an additional setting that keeps the code in the center of the product. This setting keeps the printed code from moving on the product and adds an additional 0.75 inch to the print delay value.

• The Auto Encode requires the printing to occur on the trailing edge of product detection. The trigger of the printer changes to the trailing edge automatically. You are not required to change any jumpers or printer settings.

• You must set the Print Delay value (01 PRINT) menu to the lowest value. When the product detect occurs, the Excel Dual Nozzle printer requires some print delay to build the image.

Do the following tasks to setup auto encode:

• Set the Active Level in the <PRINT 07> of the printer to LOW.

• Set the Select Encoder to Int, and select Set-Up Auto in the <Print 04>.

• Set the detect area for the width of product (in one tenths of an inch). This is the distance the product detector sees.

• Set the Speed Compensation setting in <01 Auto-E> to ON/OFF.

• You must set the distance between the printhead and the product detector. When you set this distance, set the printhead so that the nozzle-1 is over the area where you must start printing code on the product.

You can calculate the distance as follows:

The width of the product + 0.75 (Print Delay) + 0.75 (Speed Compensation) = distance from the detector to nozzle-1.
Installation Guide for the Product Detector

1. Make sure that you select the correct detector for the best product detection.

   **Note:** Normally, beam break is recommended for best product detection.

2. Install the product detector on the leading edge of the product. A delay in the printing of the message on the surface of the product is because of the print delay.

   Excel Dual Nozzle printer requires a minimum print delay of 19.05 mm (0.75 inch). The delay of 0.75 inch is needed because the printer builds the message for every product detect received.

   **Note:** The distance from the edge of the printhead sleeve to the nozzle slot is 0.75 inch approximately. For reference, set the product detector at the side of the printhead sleeve.

---

**Figure 3-28: Product Detection Setup**

Nozzle-1 is put at the position on the product where the message starts printing with a minimum of 0.75 inch delay.

- Print delay distance is 1.0 inch distance between the nozzle-1 and the message start edge.
- Enter the print delay value in 100th of an inch.
• Print delay value = Distance in inches x 100. For example if the print delay is 1.0 inch, print delay value is 100.

Note: The manufacturer recommends that the smallest amount of print delay is used.

Note: The Excel Dual Nozzle has the ability to queue product detects. The printer can queue up to 10 product detects. This allows the Excel Dual Nozzle to use larger print delay or it accommodates for the larger size of the printhead with out skipping products. If you need to clear this product detect queue just remove the printer from the PRINT mode to clear the product detect queue.

Make the Final Detector and Encoder Settings
Make sure that the product detector and shaft encoder connectors are attached tightly.

Make the Software Settings
Set the SELECT ENCODER setting at the keyboard in the print setup mode. Use the following guidelines for your application.

Note: You must turn on the printer to complete the following procedure.

1. Begin in the Frame <04 PRINT>. Refer to Figure 3-29 on page 3-41.
2. See the current settings above <SELECT ENCODER>. Press F1 to change the settings (INT., AUTO., REDUCE, DIRECT).
Set the Encoder Selection for the Printer

There are four available encoding settings like Internal, Reduce, Direct and Auto.

Refer to Table 3-5 to select the correct setting for your application.

<table>
<thead>
<tr>
<th>If the Product Speed:</th>
<th>Then the Encoder Type Should Be Set to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>&lt;INT&gt; Internal</td>
</tr>
</tbody>
</table>

Table 3-5: Select Correct Type of Encoding
Note: DIRECT or REDUCED are the settings you must use with an external shaft encoder.

Procedure

Do the following tasks to set the selected encoder:

1. Begin in the frame <04 PRINT>.
2. Press F1 key under SELECT ENCODER to toggle through all available encoding selections. Refer to Table 3-6 to complete the next step.
   - Navigate to Frame <01 AUTO.-E> to set the Auto Encoder.
   - Navigate to Frame <01 INT.-E> to set the Internal Encoder.
   - Navigate to Frame <01 EXT.-E> to set the External Encoder.

Refer to Figure 3-30 on page 3-43 to find these Frames in the Software Summary Chart.

<table>
<thead>
<tr>
<th>If the Product Speed:</th>
<th>Then the Encoder Type Should Be Set to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes with the conveyor</td>
<td>&lt;REDUCED&gt; External</td>
</tr>
<tr>
<td>Changes, and we cannot use an external encoder</td>
<td>&lt;DIRECT&gt; External</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;AUTO&gt; Automatic</td>
</tr>
</tbody>
</table>

Table 3-5: Select Correct Type of Encoding (Continued)

<table>
<thead>
<tr>
<th>THEN SELECT:</th>
<th>USE THE NUMERIC KEYPAD TO ENTER THE FOLLOWING VALUES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;INT&gt;</td>
<td>&lt;SET-UP INTERNAL&gt; press (F3) ENTER LINE SPEED IN FEET/MINUTE (5-916)</td>
</tr>
<tr>
<td>&lt;AUTO&gt;</td>
<td>&lt;SET-UP AUTO&gt; press (F2) ENTER IN TENTHS OF AN INCH (1-130)</td>
</tr>
<tr>
<td>&lt;DIRECT&gt;</td>
<td>&lt;SET-UP EXTERNAL&gt; press (F4) ENTER ENCODER PPI (60-1200)</td>
</tr>
<tr>
<td>&lt;REDUCED&gt;</td>
<td>&lt;SET-UP EXTERNAL&gt; press (F4) ENTER ENCODER PPI (60-1200) ENTER REDUCTION FACTOR (2-9999)</td>
</tr>
</tbody>
</table>

Table 3-6: Correct Encoder Values Setting
PULSES per INCH (PPI) This is a value set when external shaft encoders are used. The PPI value must be the equal to the number of pulses delivered from the shaft.

Note: The next step is optional. If you do not need the speed compensation turned on, continue to step 5. Follow these instructions to turn the speed compensation on.

Note: Refer to the Speed Compensation <SPEED COMP> Summary below for more information.

3 See the current setting above <SPEED COMP>. If necessary, press F1 to change the setting (ON, OFF).

4 Press F3 and use the numeric keys to enter the <ENCODER PPI> value (the pulses per inch output of the encoder used). (Range: 60-1200)

5 Press the ENTER key twice. Frame <04 PRINT> appears in the display screen.

Speed Compensation (Adjustment)

The speed compensation (adjustment) enables the printer to print a message in the same position on a product with the changes in the product speed. This feature is useful if the conveyor speed changes from slow speed to fast speed. The printer calculates a variable stroke-delay for each product. When the product speed is decreased, the variable stroke-delay increases. The design of this feature is for a printhead distance of 4.76 mm (3/16 inch) or 4.76 mm (0.1875 inch) from the surface of the product.
Note: When the speed compensation (adjustment) is turned on, the print delay increases by 60 strokes (approximately 25.4 mm, or one inch). Subtract 1 inch from the existing delay for the printed code to remain in the same position on the product.

I/O Features

Connect Basic I/O
The Standard I/O features of this printer include one basic solid state input and one relay output. In order to access these features, the Basic I/O kit must be installed. See Figure 3-22 on page 3-32 for the location of the internal connector on the Controller board.

The Basic Input is an "active low" signal that is 24 volt tolerant. The active state is indicated by a signal which is pulled to ground. The inactive state may be pulled high externally or left to "float" to an open circuit.

This input is normally used to indicate print direction in bi-directional printing applications.

The Basic Output is a set of isolated relay contacts are accessible - normally open, common and normally closed. The relay activates when the printer is ready to print. The relay is de-activated under all other conditions. For wiring information to these I/O signals, refer to “Basic I/O Wiring Diagrams” on page 8-108.

Note: For all relay wiring, do not exceed 24 Volts DC/AC. PCB conductors and insulation are not rated for more than this. Damage to circuitry may result if exceeded.

Connect Expanded I/O
There are additional input and output possibilities by means of the installation of an Expanded I/O Board Kit.

Additional alarm relay signals are available using this Expanded I/O board along with the Alarm Relay Cable Kit.

With the above two kits installed, access to two alarm relay output signals is possible. These relay contact outputs are electrically isolated connections.

Relay 1 activates under any Fault Conditions which light the RED LED on the keyboard panel.

Relay 2 activates under any Warning Conditions which light the YELLOW LED on the keyboard panel.
For each relay, three contacts are accessible - normally open, common and normally closed. For wiring information for these Alarm relay signals, refer to “Expanded I/O Alarm Relay Wiring Diagrams” on page 8-116.

*Note:* For all relay wiring, do not exceed 24 Volts DC/AC. PCB conductors and insulation are not rated for more than this. Damage to circuitry may result if exceeded.

**Nozzle Alignment Setup**

The nozzle-1 and nozzle-2 is offset by 21.4 mm (0.844th of an inch) distance separation. You must set an additional setting to do the left alignment for the messages from each nozzle. This setting is the `<Head Alignment>` `<Stroke Adjust>` option in `<Print 06>` menu. The `<Stroke Adjust>` is the value that the technician or customer sets to align the left side of the code. This value is the number of stroke delay between nozzles.

For stroke adjustment, use the cursor keys of the printer to raise or lower the value. Right and left cursors raise and lower the setting by 10, up and down cursors raise and lower setting by 1.
**Note:** This value must never be greater than the length of the product.

![Diagram showing nozzle alignment](image)

**Figure 3-31: Nozzle Alignment Setup**

**Note:** As you raise the value of <Stroke Adjust>, the message in nozzle-1 moves closer to the message in nozzle-2.

<table>
<thead>
<tr>
<th>Ink Type</th>
<th>Vacuum Setting for Standard Printhead Configuration</th>
<th>Vacuum Setting for Inverted Printhead Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vacuum in-Hg (cm Hg)</td>
<td>Ink Return Line</td>
</tr>
<tr>
<td></td>
<td>Below 65 F (18 C) and above</td>
<td>Small</td>
</tr>
<tr>
<td>16-1200</td>
<td>13 (33)</td>
<td>13 (33)</td>
</tr>
<tr>
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**Table 3-7: The Vacuum Settings for Inks Used in the Printer**
<table>
<thead>
<tr>
<th>Ink Type</th>
<th>Vacuum Setting for Standard Printhead Configuration</th>
<th>Vacuum Setting for Inverted Printhead Configuration</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
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<td>65 F (18 C) and above</td>
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Table 3-7: The Vacuum Settings for Inks Used in the Printer (Continued)
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<th>Ink Type</th>
<th>Vacuum Setting for Standard Printhead Configuration</th>
<th>Ink Setting for Inverted Printhead Configuration</th>
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</thead>
<tbody>
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<td>Vacuum in-Hg (cm Hg)</td>
<td>Ink Return Line</td>
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*Table 3-7: The Vacuum Settings for Inks Used in the Printer (Continued)*
<table>
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<th>Ink Type</th>
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<th>Vacuum Setting for Inverted Printhead Configuration</th>
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<tbody>
<tr>
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<td>Vacuum (cm Hg)</td>
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Table 3-7: The Vacuum Settings for Inks Used in the Printer (Continued)
<table>
<thead>
<tr>
<th>Ink Type</th>
<th>Vacuum Setting for Standard Printhead Configuration</th>
<th>Vacuum Setting for Inverted Printhead Configuration</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Vacuum in-Hg (cm Hg)</td>
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Table 3-7: The Vacuum Settings for Inks Used in the Printer (Continued)
### Table 3-7: The Vacuum Settings for Inks Used in the Printer (Continued)

<table>
<thead>
<tr>
<th>Ink Type</th>
<th>Vacuum Setting for Standard Printhead Configuration</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Vacuum in-Hg (cm Hg)</td>
<td>Ink Return Line</td>
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<td></td>
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<td>65 F (18 C) and above</td>
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</tbody>
</table>

**Note:** The VIDEOJET inks normally used are shown in Table 3-7. The table does not include the data for all inks made by VIDEOJET.
This chapter contains the description of the following:

- Introduction
- The control unit
- The printhead
- Component identification

Introduction

The Videojet Excel Dual Nozzle printer has two basic assemblies by the name control unit and the printhead. The umbilical assembly (a flexible conduit that contains electrical and the fluid lines) connects these two assemblies. Refer to Figure 4-1.

1. Control Unit
2. Printhead
3. Umbilical

Figure 4-1: Videojet Excel Dual Nozzle Printer
The Control Unit

The control unit has the hydraulic, pneumatic, electronic compartments of the printer, and the keyboard. Refer to Figure 4-2.

Hydraulics Compartment (Fluid Pan)

The hydraulics compartment is found behind the front door of the control unit (refer to Figure 4-2). The ink and make-up fluid are stored, monitored, and maintained in this compartment to get the required viscosity of the fluid (thickness). The pressure is applied to the ink to make sure that the ink drops at the printhead reach correct velocity.

Note: The most common name for the hydraulics compartment is the “fluid pan”.

Refer to “Hydraulic Components” on page 4-9 for more information on the main components found in the hydraulics compartment.
Figure 4-2: The Control Unit
Pneumatic Compartment

The pneumatics compartment is on the back side of the cabinet door (refer to Figure 4-2). The pressure of the air that flows inside the printer is regulated, controlled, and distributed in this compartment.

Refer to “Pneumatic Components” on page 4-12 for information on the main components found in the pneumatics compartment.

Electronics Compartment

The electronics compartment is found against the back side of the control unit cabinet (refer to Figure 4-2 on page 4-3). The electrical signals and electronic signals are generated and controlled in the electronics compartment.

Refer to “Electronic Components” on page 4-17 for information on the main components found in the electronics compartment.

Keyboard

The keyboard is on the front of the control unit (refer to Figure 4-2 on page 4-3). The keyboard contains the control keys, and alpha keypad, and a display screen (refer to Figure 4-3 on page 4-5). Use the keyboard to operate the printer.

Refer to the Videojet Excel Dual Nozzle Operator Manual (PART NUMBER 361843) for information on how to use the keyboard:

• To create and print the messages
• To perform other functions.
The Printhead

The printhead receives pressurized ink through the umbilical, and turns the ink stream into very small ink drops that contain electrical charge. The charged ink drops are deflected to a substrate to form a printed code.

Refer to “Printhead Components” on page 4-18 for information on the main components found in the printhead.

Refer to Chapter 5, “Theory of Operation” for more information on how the printhead operates.
Component Identification

Introduction

This section identifies the location and describes the function of the main components in the:

- Hydraulics compartment
- Pneumatics compartment
- Electronics compartment
- Printhead

Note: Only main printer components are included in this section.

The section is divided into the following subsections:

<table>
<thead>
<tr>
<th>Components</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Components</td>
<td>4-9</td>
</tr>
<tr>
<td>Pneumatic Components</td>
<td>4-12</td>
</tr>
<tr>
<td>Electronic Components</td>
<td>4-17</td>
</tr>
<tr>
<td>Printhead Components</td>
<td>4-18</td>
</tr>
</tbody>
</table>

Table 4-1: Components and their Page numbers
The Location and Description of Main Components

Table 4-2 shows each of the main printer components included in this section. The following information is included for each component:

- The page number that shows the location of the component on the printer.
- The page number where you can find a description of the function of the component.

Note: The following components are recorded in an alphabetical order.

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Control Solenoid</td>
<td>4-13</td>
</tr>
<tr>
<td>Air Control Valve</td>
<td>4-13</td>
</tr>
<tr>
<td>Air Input</td>
<td>4-13</td>
</tr>
<tr>
<td>Cabinet Door Latch</td>
<td>4-10</td>
</tr>
<tr>
<td>Charge Tunnel</td>
<td>4-22</td>
</tr>
<tr>
<td>Control Board</td>
<td>4-17</td>
</tr>
<tr>
<td>Catcher</td>
<td>4-22</td>
</tr>
<tr>
<td>Final Ink Filter</td>
<td>4-11</td>
</tr>
<tr>
<td>Ground Plate</td>
<td>4-22</td>
</tr>
<tr>
<td>High Voltage Deflection Plate</td>
<td>4-21</td>
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<tr>
<td>Horizontal Adjustment Screw</td>
<td>4-20</td>
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<tr>
<td>Horizontal Locking Screw</td>
<td>4-20</td>
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<td>Ink Add Solenoid</td>
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<tr>
<td>Ink Bottle</td>
<td>4-10</td>
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<tr>
<td>Ink Control Valve</td>
<td>4-19</td>
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<td>Ink Low Needle Valve</td>
<td>4-16</td>
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<td>Ink Low Switch</td>
<td>4-14</td>
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<tr>
<td>Ink Module Assembly</td>
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</tr>
<tr>
<td>Ink Pressure Gauge</td>
<td>4-9</td>
</tr>
<tr>
<td>Ink Pressure Regulator</td>
<td>4-10</td>
</tr>
<tr>
<td>Ink Return Line</td>
<td>4-21</td>
</tr>
<tr>
<td>Ink Supply Cylinder</td>
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<tr>
<td>Input Air Filter</td>
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Table 4-2: Component Name, Location and Description
<table>
<thead>
<tr>
<th>Component Name</th>
<th>Page</th>
</tr>
</thead>
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<tr>
<td>Intermediate Pressure Regulator</td>
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</tr>
<tr>
<td>Make-up Fluid Bottle</td>
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</tr>
<tr>
<td>Make-up Add Solenoid</td>
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<tr>
<td>Nozzle</td>
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<td>Positive Air Needle Valve</td>
<td>4-16</td>
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<td>Solenoid Bank</td>
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<tr>
<td>Transfer Pressure Regulator</td>
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<tr>
<td>Transfer Solenoid</td>
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<td>Vacuum Check Valve</td>
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<td>Vacuum Filter</td>
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<td>Vacuum Gauge</td>
<td>4-9</td>
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<td>Vacuum Generator</td>
<td>4-16</td>
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<td>Vacuum Flow Control Valve</td>
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<tr>
<td>Vertical Adjustment Screw</td>
<td>4-21</td>
</tr>
</tbody>
</table>

*Table 4-2: Component Name, Location and Description (Continued)*
Hydraulic Components

Refer to Figure 4-5 on page 4-9 and Figure 4-6 on page 4-10 for the location of the hydraulic components, and refer to the following pages to find a description of the function of the components.

![Figure 4-5: Hydraulics Compartment (with Fluid Pan Door Closed)](image)

1. Cabinet Door Latch
2. Make-up Fluid Bottle
3. Ink Bottle
4. Vacuum Gauge
5. Ink Pressure Gauge

Ink Pressure Gauge

The ink pressure gauge indicates the amount of air pressure (in psi and bar) applied to the ink supply cylinder. The common name for this pressure is "ink pressure". Adjust the ink pressure regulator to control the ink pressure (refer to Figure 4-6 on page 4-10).

Vacuum Gauge

The vacuum gauge measures the current level of vacuum (in inches and cm of Hg) within the system. Adjust the vacuum flow control valve to control the vacuum level (refer to Figure 4-6 on page 4-10).

Make-up Fluid Bottle

The make-up fluid bottle contains the make-up fluid that is drawn into the ink module assembly as necessary. When the ink becomes too thick and
the flow time increases, you can use the make-up fluid to decrease the thickness the ink.

**Ink Bottle**

The ink bottle contains the clean ink, which is drawn into the ink module assembly as necessary.

**Cabinet Door Latch**

The cabinet door latch enables the operator to use the Hex key supplied with the printer. The operator can access the pneumatic and electronics compartments of the printer with the Hex key.

![Figure 4-6: Hydraulic Compartment (with Fluid Pan Door Opened)](image)

1. Ink Supply Cylinder  
2. Final Ink Filter  
3. Vacuum Filter  
4. Fluid Pan Door  
5. Ink Pressure Regulator  
6. Ink Module Assembly

**Ink Pressure Regulator**

The operator can use the ink pressure regulator to set (manually) the amount of air pressure supplied to the ink supply cylinder. This action now controls the speed of the ink drops through the printhead. The ink pressure that is set depends on the type of ink used. The normal setting is 2.8 to 4.1 bar (40 to 60 psi).
Caution

EQUIPMENT DAMAGE. Do not adjust the ink pressure regulator unless you must perform the ink stream calibration.

Vacuum Filter
The vacuum filter prevents the ink particles from entering the solenoid bank and other passages that are inside the vacuum system.

Final Ink Filter
The final ink filter prevents the ink particles from entering the ink supply cylinder and the printhead.

Ink Supply Cylinder
The ink supply cylinder provides a constant supply of pressurized ink to the printhead. The cylinder contains a magnetic float and two external reed switches. The float and switches, monitor the viscosity of the ink and maintain required fluid level in the cylinder.

Ink Module
The ink module assembly contains the following hydraulic components of the ink system (refer to Figure 4-8 on page 4-12).
• Ink transfer pump
• Ink add valve
• Make-up fluid add valve
• Reed switch
• Check valve
• Shut-off valve
• Ink return tube

Pneumatic Components

Refer to Figure 4-9 on page 4-13 for the location of the pneumatic components and following pages to find a description of the function of the components.

Open the cabinet door to access this compartment. Use the Hex key supplied with the printer.
Air Control Valve
Operated by pilot air from the air control solenoid, this valve allows the air to flow to the complete system.

Air Control Solenoid
Operated by +12 VDC, this solenoid allows pilot air pressure to energize the air control valve.

Air Input
The regulated plant air pressure is supplied to the manifold assembly of the input air. The manifold assembly contains the input air filter, air control valve, intermediate pressure regulator, transfer pressure regulator, and air control solenoid.
Input Air Filter
The input air filter removes the contamination present in the plant air before the air enters the air manifold assembly.

*Note:* The input air filter removes the contamination from the instrument grade air only. The additional filters can be necessary if the required quality of the plant air is not available.

Solenoid Bank
The solenoid bank allows the air and vacuum distribution to the correct ports and solenoids (refer to Figure 4-10 on page 4-15).

Transfer Pressure Regulator
The transfer pressure regulator controls the air pressure to the ink transfer pump and the shut-off valve during the cycle of ink transfer. The regulator and the valve are found in the ink module assembly.

Fluids Low Switch (Ink Low Switch)
The fluids low switch monitors the fluid levels in the ink bottle and make-up bottle. The operator can use the fluids low needle valve to adjust the air flow to the switch (refer to Figure 4-10 on page 4-15).

Intermediate Pressure Regulator
The intermediate pressure regulator regulates the air pressure to 4.1 bar (60 psi) and distributes the air to the positive air systems, vacuum systems and the ink low switch.

*Note:* The regulator is factory preset to 4.1 bar (60 psi). The operator can measure the intermediate air pressure at a test port on the solenoid bank (refer to Figure 4-10 on page 4-15).
Transfer Solenoid

The transfer solenoid controls the flow of air and vacuum to the ink transfer pump and shut-off valve. The transfer pump and the valve are found in the ink module assembly. When you energize the transfer solenoid, the solenoid supplies the transfer (air) pressure to the ink transfer pump and the shut-off valve to perform an ink transfer cycle. When the solenoid is de-energized, vacuum is applied to the ink transfer pump and shut-off valve to fill the pump again for the next transfer cycle.

Nozzle Solenoid

When you energize the nozzle solenoid, the solenoid supplies plant air pressure to the ink pressure regulator. The ink pressure regulator supplies the ink pressure to the ink supply cylinder. The nozzle solenoid is energized when the ink is turned on and HEAD key either flashes continuously or is on continuously.
Ink Add Solenoid
When you energize the ink add solenoid, the solenoid applies the vacuum to the ink add valve (found on the ink module assembly). Then the fresh ink is drawn from the ink bottle into the reservoir of the ink module assembly.

Make-up Add Solenoid
When you energize the make-up add solenoid, the solenoid applies the vacuum to the make-up add valve. Then the make-up fluid is drawn from the make-up fluid bottle into the reservoir of the ink module assembly.

*Note:* The make-up add valve is found in the ink module assembly.

Vacuum Check Valve
The design of vacuum check valve protects the fluid system if the exhaust line has a bend or blockage. If the vacuum output airflow of the vacuum generator is prevented, all components normally under the vacuum can become pressurized. Then, the vacuum check valve routes the output of the vacuum generator to the fluid pan to prevent any damage to the pneumatic and the hydraulic system.

Vacuum Generator
The vacuum generator operates on the venturi rule to create negative low pressure (vacuum). Use the vacuum flow control valve to adjust the vacuum.

Vacuum Flow Control Valve
The vacuum flow control valve enables the operator to adjust the vacuum level in the vacuum system. See the vacuum gauge (on the fluid pan door) to read the current setting of the vacuum. The setting of vacuum depends on the type of ink and printhead direction.

Fluids Low Needle Valve (Ink Low Needle Valve)
The fluids low needle valve enables the operator to adjust the air flow to the ink and make-up fluid bottles. The printer uses this air to monitor the fluid level inside the bottles. This valve and the ink low switch operate together.

Positive Air Needle Valve
The positive air needle valve enables the operator to adjust the positive air to the printhead. Positive air prevents the contamination from entering the printhead. This valve is preset in the factory, but is adjustable to 56.6 litres per hour (2 SCFH) at each slot, total of 113.28 litres per hour (4 SCFH) at
both slots. The ink is turned on. Use a flow meter to get an accurate setting.

**Note:** The exact setting depends on ambient conditions. But the high pressure puts the ink drops in wrong position and leads to printer faults.

### Electronic Components

Refer to Figure 4-11 for the location of the main electronic components, and the following pages to find a description of the function of the components.

Open the cabinet door to access the electronics compartment. Use the Hex key supplied with the printer.

**Figure 4-11: Electronic Components**

**Controller Board**

The Controller board has the computer which controls the printer operations and the interface I/O circuitry.
**PEAP Board**

The PEAP board contains all of the logic and analog circuitry which interfaces to the ink system and printhead.

**Printhead Components**

Refer to Figure 4-12 for the location of the printhead components, and the following pages to find a description of the function of the components.
**Ink Control Valve**
The ink control valve controls the flow of pressurized ink to the nozzle. This valve is attached to the rear of the nozzle. The ink control valve opens at 0.9 to 1.9 bar (13 to 28 psi) of ink pressure. There are two valves in the printhead, one for each nozzle.

**Auto Flush Line**
The auto flush line is the tube start from the auto flush "Y" fitting to ink control valves. There are two such lines in the printhead, one for each ink valve. These lines only exist in the auto flush version printhead.

**Positive Air Disperser**
The positive air disperser is connected to positive air tube and distributes the air flow inside printhead to keep printhead clean and dry.

*Note: The positive air disperser is not shown in the picture.*

**Ink Line**
The ink line is the tube start from the ink "Y" fitting, to the ink control valves. There are two such lines in the printhead, one for each ink valve.

**"Y" Fitting**
The "Y" fitting is a three way manifold that receives ink from ink line of umbilical and distributes to two ink control valves. For auto flush version printhead, there is another identical "Y" fitting that receives make-up fluid from auto flush line of umbilical and distributes to two ink control valves.

**Chassis**
The chassis is the stainless forming structure that provide mounting for printhead components. It includes round front plate with two slots for printing drop passage, double level deck body and hub that connected with umbilical.

**Cover Locking Screw**
The cover locking screw is located at the hub of chassis and provides locking for printhead cover.

**Chassis Grounding Screw**
The chassis ground screw secure the chassis body with grounding strip from umbilical.
Ink Grounding Screw
The ink grounding screw secure the ink grounding wire to chassis. There are two such screws in each printhead for two ink stream grounding respectively.

Printhead Seal O-ring
The O-ring provides a sealing between deck and cover.

Cable Bracket
The cable bracket is mounted to chassis to secure wire cable from umbilical.

Retainer Clip
The retainer clip is mounted at bottom of chassis to secure ink return line, catcher sensing line and LED wire. There are two identical clips in each printhead.

Retainer Clip Mounting Screw
The retainer clip mounting screws secure the retainer clip to chassis bottom. There are four identical screws for each printhead, two for each retainer clip.

Horizontal Locking Screw
The horizontal locking screw prevents horizontal movement of the ink stream after the horizontal position of the ink stream is adjusted. When you loosen (approximately one and a half-turn), you can adjust the horizontal direction of the ink stream by the horizontal adjustment screw. When you tighten, you cannot move the nozzle horizontally. There are two such identical screws in the printhead, one for each nozzle platform.

Horizontal Adjustment Screw
The horizontal adjustment screw adjusts the horizontal position of the ink stream in the catcher. Turn this screw to adjust the ink stream to your left and right in the catcher. There are two such identical screws in the printhead, one for each nozzle platform.
**Caution**

EQUIPMENT DAMAGE. Before you can adjust the horizontal adjustment screw, you must loosen the horizontal locking screw. If you do not loosen the horizontal locking screw, this can cause damage to the printhead.

---

**Vertical Adjustment Screw**

The vertical adjustment screw adjusts the vertical position of the ink stream in the catcher. Turn this screw to your left and adjust the ink stream upward. Turn this screw to your right and adjust the ink stream downwards in the catcher. There are two such identical screws in the printhead, one for each nozzle platform.

**LED**

The LED strobes at the same frequency like the nozzle drive signal and allows the ink stream to appear stationary. The action helps to inspect the ink stream and breakoff drop in the charge tunnel during the nozzle drive adjustment. There are two LEDs in the printhead.

**Ink Return Line**

The ink return line is a tube that starts from the catcher, through the umbilical assembly and to the ink module assembly in the fluid pan. The ink return line returns the small ink drops which were not required, to the ink module reservoir. There are two such lines in the printhead, one for each catcher.

**High Voltage Arm**

The high voltage arms provide adjustable structural support for high voltage plates. By adjusting the mounting screws, the space between high voltage plate and ground plate could be adjusted for optimal performance. There are two different arms in the printhead, one for each nozzle respectively.

**High Voltage Deflection Plate**

The high voltage deflection plate is set opposite the ground plate and provides a positive high voltage (upper electrode). The ink drops move through the electric field created between the high voltage plate and the ground plate. The high voltage deflection plate deflects the charged drops (negative) over the catcher to create a printed code. There are two different high voltage deflection plate, one for nozzle 1 and another for nozzle 2.
Catcher
The catcher collects the ink drops that were not required for printing. The vacuum draws these small ink drops back into the ink module reservoir for circulation again. The catcher also contains a sensing electrode used to detect charged ink drops to monitor the drop chargeability if there is no printing. There are two identical catchers in the printhead.

Ground Plate
When the ground plate is put opposite to the high voltage deflection plate, the ground plate becomes the lower electrode (where the high voltage deflection plate is the upper electrode). Refer to “High Voltage Deflection Plate” on page 4-21 for more information.

Charge Tunnel
When the ink drops leave the nozzle, the charge tunnel (is an electrode that) charges the ink drops. There are two identical charge tunnel in the printhead, one for each nozzle.

Nozzle
The nozzle is an assembly which contains a orifice and a piezo-electric crystal used to change the ink stream into small drops of ink. An oscillator found on the control board, drives the nozzle to create ultrasonic vibrations. The ultrasonic vibrations break the ink stream into small drops of ink. There are two identical nozzles in the printhead.

Nozzle Platform
The nozzle platform is attached to the printhead deck and provides the support for nozzles. The platform is adjustable in horizontal and vertical orientation for ink stream alignment. There are two such identical platforms in the printhead. Each is independently adjustable.

Nozzle Platform Pivot
The nozzle platform pivot provides rotating restrain for nozzle platform to chassis deck. It also prevent the vertical movement of nozzle platform. There are two such pivot pins in each printhead, one for each nozzle platform.

Note: The printhead includes the chassis cover, and printhead cover also.
Theory of Operation

This chapter contains the following topics:

- A description of the fluids system
- A description on how ink drops are created and controlled
- A description of the events in the five major printer cycles - power on, start-up, ink transfer, make-up add, and fresh ink add

Fluids System Description

**Fluids System**

The term "fluids system" refers to the components that perform the following functions:

- Supply the fluids to the printhead from the ink cabinet
- Help to use the fluids again
- Remove the fluids from the printer
Refer to Figure 5-1, then Table 5-1 for a description of the fluids system.

**Figure 5-1: Fluids System**

<table>
<thead>
<tr>
<th>Step</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ink or make-up fluid flows from the supply bottles into the reservoir in the ink module. Then, the ink flows from the reservoir to the transfer pump.</td>
</tr>
<tr>
<td>2</td>
<td>Ink flows from the transfer pump, through the final ink filter, into the ink supply cylinder.</td>
</tr>
<tr>
<td>3</td>
<td>Ink flows from the ink supply cylinder to the printhead.</td>
</tr>
<tr>
<td>4</td>
<td>Ink that is not used to print the characters, is returned to the reservoir through the catcher.</td>
</tr>
</tbody>
</table>

**Table 5-1: Fluids System Description**
The Ink Stream and Ink Drops

**Ink Pressure**

The ink pressure regulator applies the pressure to the ink supply cylinder. Ink pressure is set to 2.8–4.1 bar (40–60 psi). Refer to Figure 5-2.

The ink pressure performs the following:

a. Enables the ink to flow from the ink supply cylinder to the printhead.

b. Creates the ink stream and controls the speed of the ink drops.

The ink pressure is adjusted:

- During the first installation
- After you change the ink types.
- After you service some printer components.

Refer to Chapter 7, “Maintenance”, for information on how to adjust the ink pressure.

**Figure 5-2: Ink Pressure Regulator and Ink Supply Cylinder**
How to Create the Ink Drops

An oscillator crystal on the control board generates a fixed ultrasonic frequency signal of 66 kHz for the Videojet Excel Dual Nozzle printer.

The fixed frequency signal energizes the piezo-electric nozzle crystal, which is around the nozzle ink chamber. Refer to Figure 5-3. The nozzle crystal vibration breaks the ink stream into small ink drops.

![Diagram of crystal vibration creating ink drops]

1. Ink Drops Breaking Off
2. Nozzle Crystal

Figure 5-3: Crystal Vibration which Create Ink Drops

Nozzle Drive

The strength, or amplitude, of the fixed ultrasonic frequency signal sent to the crystal in the nozzle depends on the nozzle drive voltage (AC).

When the nozzle drive voltage increases, the ink stream breaks into the ink drops. The voltage level changes with the type of ink, environmental temperature and the crystal sensitivity.

The nozzle drive is adjusted:
- During the first installation
- After you change the ink types
- After you service some printer components.

Refer to Chapter 7, “Maintenance” for information on how to adjust the nozzle drive.
**Ink Drop Breakoff**

Figure 5-4 shows the correct ink drop breakoff. The charge tunnel must contain three to four complete drops.

![Figure 5-4: Typical Ink Drop Breakoff](image)

**Satellites**

When you use some ink types, the tail of the drop breaks and a separate smaller drop is created. This small drop is the satellite. Refer to Figure 5-5. The tail and satellite formation changes with the type of ink and environmental temperature.

![Figure 5-5: Satellite Merges with Parent Drop](image)

If the satellite remains behind and merges with the following drop, the incorrect distribution of charge occurs. This incorrect distribution of charge occurs because, the satellite carries away a part of the charge from the original drop. The incorrect distribution of charge on both the drops leads to distortions in the printing. Refer to “How to Charge the Ink Drops” on page 5-6 for more information.
How to Control the Ink Drops
The printer uses the electric charges to control or move the ink drops for printing.

How to Charge the Ink Drops
Refer to Figure 5-6, then Table 5-2 on page 5-6 for a description on how the printer charges the ink drops.

![Diagram of ink drop charging process]

1. Charge Tunnel
2. Nozzle

Figure 5-6: Charge the Ink Drops

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>The ink stream that is connected to an electrical ground exits the nozzle and enters the charge tunnel.</td>
</tr>
<tr>
<td>b</td>
<td>The printer sends positive electrical pulses to the charge tunnel. The pulses and the nozzle drive signals operate together, so that a pulse reaches and the ink drop formation also occurs at a time</td>
</tr>
<tr>
<td>c</td>
<td>When the ink drops break from the ink stream, the positive electrical pulses make the ink drops to pull additional electrons from the ink stream. The amount of negative charge on drops of ink depends on the pulse that comes before the break off.</td>
</tr>
</tbody>
</table>

Table 5-2: How to Charge the Ink Drops
Ink Drop Deflection

After the ink drops leave the charge tunnel, each ink drop passes under a deflection plate. The deflection plate (positive charge) gets the ink drop (negative charge), and deflects the drop away from its original path. Refer to Figure 5-7.

![Figure 5-7: Ink Drop Deflection](image)

1. Charge Tunnel
2. Deflection Plate
3. Deflected Ink Drops
4. Uncharged Ink Drops Entering catcher

The degree of deflection depends on the amount of the negative charge on the ink drop. Greater the charge, greater the deflection.

The drops that are not charged continue in a straight path to the catcher and are used again in the ink module.
Print Delay

When the print trigger is received, the printer applies the print delay. The print delay is applied to calculate the time to wait before the first code of the nozzle ejects on the product.

The movement of the product from the right side to the left side is shown in the Figure 5-8. Because of this movement, the nozzle-1 (the upper nozzle, printing the upper line) prints first. The print delay, entered in 100th of an inch calculates the time between print trigger and the first stroke that is printed from the nozzle-1.

The Excel Dual Nozzle printer uses a minimum delay of 75 (75/100ths of one inch, or ¾ inch). This delay allows the printer to create the image and to compensate the flight time (if "Speed Comp" is turned on). The radial distance between the printhead cover and either printhead slot is 0.69 inch approximately. The reasons given above indicate that the minimum print delay must not damage the printing operations if the photoeye is attached to the printhead cover.

Note: The printing operation is not damaged if the photoeye is installed upstream of the printhead.
**Stroke Adjust**

The operator can use the “Head Align” option to adjust the “Stroke Adjust” parameter.

*Figure 5-9: Head Align*
The Stroke Adjust option is as shown in Figure 5-10.

Figure 5-10: Stroke and Adjust Options

**Stroke Adjust**
The Stroke Adjust is the linear distance between the two slots on the printhead.

Figure 5-11: Stroke Adjust
The units for Stroke Adjust are "strokes". The default value for Stroke Adjust is 48. "48" equals a linear distance of 0.8 inches at 60 strokes per inch, (the linear distance between the two slots on the printhead is 0.844 inch). The feature of stroke adjust is for the vertical alignment of the lines of text between the two nozzles of the printer.

**Note:** If the encoder is setup correctly, the objects are printed correctly.

The stroke adjust aligns the upper lines of print with the lower lines. But the stroke adjust must be less than the product delay (in strokes), or an error is received.

**Left-to-Right Example**

When the direction of product movement is "left to right" as shown in Figure 5-12 on page 5-12, the printing process is the same with the following exceptions:

- Nozzle-2 prints first.
- Print delay is the distance from the nozzle-2 slot on the printhead to the end of the longest line of the message.
In the condition of left to right movement the printer uses the message length to make sure that the multiple lines of the message remains left justified. If the right justification is needed, use the spaces to put the elements within the message.
How to Queue

The Excel Dual Nozzle printer can queue the signals from the product detector.

When the printer queues, multiple signals from the product detector are received before nozzle-2 has finished printing its portion of the message. The Excel Dual Nozzle has the ability to queue 64 signals from the product detector (minimum). Then 64 products are present between the product detector and the downstream nozzle with the correct code on the correct product.

**Note:** To queue, the distance between the signals from the product detector is greater than the message length.

The receipt of the “next” signal from the product detector within the linear boundaries of the message length is not possible. Here the printer ignores the "false" product detector signals and a product is not coded.

**Note:** A signal from the product detector that is within 20.3 mm (0.8 inches) (the distance between the nozzles) of the previous signal is taken as a "false" product detect and ignored.

If the printer is "skipping" products, then

a. Check to make sure that <distance between print triggers> is greater than <message length>.

b. Check to make sure that the photoeye is setup correctly.
Gap Control

The different printing parameters like Print delay, Encoding and Stroke Adjust controls the horizontal alignment of the printed elements.

The vertical alignment of the printed lines is important, because the customers try to repeat multiple line messages generated before by a single nozzle at increased line speeds.

The following factors change the vertical alignment (the GAP between the lines printed by nozzle-1 and the lines printed by nozzle-2).

- High voltage (major factor)
- Throw distance (major factor)
- Head rotation (major factor)
- Ink stream alignments (minor factor)

Since you can control the high voltage settings for the two ink streams separately, you can get the gap control if you adjust the high voltage setting for nozzle-2 only. If this method is used, character heights for the two lines are different.

Conclusion

You can decrease the gap between the objects printed by nozzle-1 and nozzle-2 by the following methods:

- Increase high voltage
- Increase the throw distance

You can see the effect on character height. In the end, the quality of print decreases. You must inspect again the ink stream alignment after you make any changes to the high voltage. The inspection is done to make sure that there are no problems while you clean the printhead.
Positive Air

Positive air is important to the correct operation of the Excel Dual Nozzle printer. The standard method of positive air delivery is not enough, because of the different internal printhead framework in Excel Dual Nozzle printer. As the result of improvement, the positive air line ends in a new component with the name "disperser".

![Figure 5-14: Printhead Showing Disperser](image)

You must balance the flow of air, out of each printhead slot and must be 2 SCFH. If the air flow is not balanced, swap the flow meters to make sure that the imbalance is not because of the measuring device. If a valid imbalance exists, adjust the positive air needle valve so that the smaller flow rate equals 2 SCFH. Check the print quality to make sure that the print quality from the slot with the higher flow rate is not decreased.
Character Fonts

The character fonts are made of a matrix of vertical strokes of ink drops. For example, five vertical strokes, each of seven drops in height, make each character in a 5 x 7 matrix character font.

The location of the ink drop in the vertical stroke depends on the amount of charge on an ink drop. Refer to Figure 5-16 on page 5-17.

The printer makes sure horizontal alignment by automatically timing the strokes with the movement of the printing surface.
Printer Sequences

The printer sequences give complete descriptions of the events in the five major printer cycles:

- Power On
- Start-up
- Ink Transfer
- Make-up Add
- Fresh Ink Add
- The fluids low alert

Printer Power On

When you power on the printer, the printer loads the software and operating parameters from the flash card.
Head Startup Sequence

Table 5-3 through Table 5-4 and Figure 5-17 through Figure 5-18 describe the events in the 60 second printer startup sequence. This sequence gets activated as follows:

1. The printer startup sequence begins
2. The print ready status is reached

0-1 Second After Head key is pressed

Figure 5-17: Head Start-up 0-1 Second
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The control board checks to see if priming is required. If yes, the Head startup is cancelled and a &quot;Fluids System Empty - Prime Required&quot; fault is reported (This action is not shown in the figure).</td>
</tr>
<tr>
<td>2</td>
<td>The control board checks to see if shop air pressure is found. If not, an &quot;Air pressure fault&quot; is generated (This action is not shown in the figure).</td>
</tr>
<tr>
<td>3</td>
<td>The HEAD light flashes on the control panel (This action is not shown in the figure).</td>
</tr>
<tr>
<td>4</td>
<td>The control board energizes the air control solenoid and allows the shop air to reach the air control valve.</td>
</tr>
<tr>
<td>5</td>
<td>Pilot air (shop air that operates the air control valve) opens the air control valve that allows shop air into the system.</td>
</tr>
<tr>
<td>6</td>
<td>Shop air flows to the transfer pressure regulator. The top port (#3 in Printer Start-up 0-1 Second) of the transfer pressure regulator provides 1.03-1.24 bar (15-18 psi) over the ink pressure to the transfer solenoid.</td>
</tr>
<tr>
<td>7</td>
<td>Shop air flows to the intermediate pressure regulator, which is factory set to approximately 4.1 bar (60 psi) applies the air to the left side of the solenoid bank.</td>
</tr>
<tr>
<td>8</td>
<td>The shop air is applied to the nozzle solenoid. The flow of air stops at this solenoid until the ink turns on.</td>
</tr>
</tbody>
</table>
| 9     | The components on the left side of the solenoid bank do the following:  
(a) The fluids (like ink) low needle valve supplies the air to the fluids low switch and the replenishment bottles.  
(b) The positive air needle valve supplies the air to the printhead to keep the printhead free of contamination.  
(c) The vacuum flow control valve supplies the air to the vacuum generator to create the vacuum for the full system. |
| 10    | The vacuum (refer to above) is applied to the following:  
(a) The transfer solenoid  
(b) The ink-add solenoid  
(c) The make-up add solenoid  
(d) Ink module  
(e) Vacuum filter  
(f) Ink return lines |
| 11    | The control board checks for a reservoir low condition. If so, the control board starts to fill the reservoir with fresh ink. For more information on how to fill the reservoir with fresh ink refer to “Fresh Ink Add Sequence” on page 5-34. |

*Table 5-3: 0 - 1 Second After Power On*
10 Seconds After Head On

Figure 5-18: 10 Seconds After Head on (stages 12 through 21)

**Note:** The control board will not start the next section until the reservoir low condition is completed.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>The control board turns on the nozzle drive and charge tunnel power supplies (this action is not shown in the figure).</td>
</tr>
<tr>
<td>13</td>
<td>The control board energizes the nozzle solenoid.</td>
</tr>
<tr>
<td>14</td>
<td>Shop air moves through the nozzle solenoid to the bottom (input) of the ink pressure regulator. The regulator decreases the shop air to approximately 2.8-4.1 bar (40-60 psi). This pressure is ink pressure.</td>
</tr>
</tbody>
</table>

Table 5-4: 10 Seconds After Head On
The Flowcharts for the Head Startup

The flowcharts in Figure 5-19 on page 5-22 through Figure 5-20 on page 5-23 give a different view of the head startup sequence. The flowcharts show the connections between the events, electrical functions, and fault information.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>The ink pressure regulator supplies the ink pressure to the ink trap, the ink supply cylinder, and the transfer pressure regulator (through the solenoid bank).</td>
</tr>
<tr>
<td>16</td>
<td>The pressurized ink supply cylinder supplies the ink to the printhead.</td>
</tr>
<tr>
<td>17</td>
<td>When in the printhead, the pressurized ink moves through the ink control valve. This valve needs approximately 1 – 1.9 bar (14 – 28 psi) to open.</td>
</tr>
<tr>
<td>18</td>
<td>After the ink moves through the ink control valve, ink enters the nozzle. Inside the nozzle, the ink emits and breaks into the ink drops.</td>
</tr>
<tr>
<td>19</td>
<td>Ink drops are charged in the charge tunnel.</td>
</tr>
<tr>
<td>20</td>
<td>The ink passes under the high voltage plate, which is not energized now, in the startup sequence.</td>
</tr>
<tr>
<td>21</td>
<td>Ink then enters the catcher, where the charge on the ink drop is tested.</td>
</tr>
</tbody>
</table>

Table 5-4: 10 Seconds After Head On (Continued)
Procedure A

Power On

Air control solenoid energized

Pilot air to air control valve

Shop air into the printer

Nozzle solenoid

Shop air at 5.5 bar (80 psi)

Transfer pressure regulator

1.03-1.24 bar (15-18 psi) ink pressure out of regulator

Intermediate pressure regulator

4.1 bar (60 psi) intermediate air out of regulator

Transfer Solenoid

Procedure C on page 5-24

Procedure E on page 5-26

Procedure B on page 5-23

Figure 5-19: Printer Start-up Flowchart A
Procedure B

Intermediate air at 4.1 bar (60 psi)

Ink low needle valve

Positive air needle valve

Vacuum Flow Control valve

Vacuum at 0.33 m (13 in) Hg

Make-up add solenoid

Ink add solenoid

Transfer Solenoid

Vacuum Filter

Ink Module

catcher

Figure 5-20: Printer Start-up Flowchart B
Procedure C

6 seconds after Power On

Shop air pressure > 4.1 bar (60 psi)

Nozzle solenoid energized ten seconds after Power On

Yes

Shop air to ink pressure regulator

Ink pressure at 2.8-3.4 bar (40-49 psi)

Transfer pressure regulator

Transfer pressure at 15-18 psi (1.03-1.24 bar) + ink pressure

Figure 5-21: Printer Start-up Flowchart C
Procedure D

Procedure C on page 5-24

Ink supply line pressurized

> 30 psi (2.1 bar)?

Ink control valve opens and ink flows through the nozzle forming ink drops

Stream test passed?

40 second delay after Power On

Phasing fault (APC) detected?

51 seconds high voltage On

57 seconds head On

No signal warning

No signal fault

Printhead shutdown

Figure 5-22: Printer Start-up Flowchart D
Procedure E

5 second after Head On

CT supply turned On

Selected faults enabled

The Reservoir overfill switch

Reservoir shutdown

Panic shutdown

Watch dog time out exceeded

Processor fault

Figure 5-23: Printer Start-up Flowchart E
Procedure F

Real time clock

Real time clock fault

CT supply sense

CT supply fault

Printhead shutdown

3 seconds after head startup started, CT supply sense enabled

The Air pressure monitor switch

The Air pressure monitor switch open > 20 seconds

Ink low switch

Ink low switch open > 30 minutes

8 seconds after power On, air pressure fault enabled

60 seconds after power On, ink low fault enabled

Figure 5-24: Printer Start-up Flowchart F
Head Shutdown Sequence

When the OFF key is pressed, the printer starts the shutdown sequence. The normal time for shutdown is four minutes. The shutdown sequence is shown in the Table 5-5.

<table>
<thead>
<tr>
<th>Time (Sec.)</th>
<th>Printer Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Turns Off high voltage to the printhead</td>
</tr>
</tbody>
</table>
| 3^1         | • The nozzle solenoid de-energizes, and stops the flow of ink to the printhead  
|             | • The vacuum remains turned on to clear the return lines |
| 240         | • The air control solenoid de-energizes |

Table 5-5: Head Shutdown Sequence

1. If your printer has the Auto Flush option, the auto flush sequence begins if the operator presses "A" during the first 30 seconds of the head shutdown sequence.

Head Shutdown

If the HEAD key is turned Off during normal operation, the printer starts a head shutdown sequence. The head shutdown sequence takes four minutes.

This shutdown sequence:

• Removes the ink from the ink return line
• Prevents the solvent from becoming vapor (occurs if the vacuum remained on without the circulation of the ink)

The other name for this sequence is Air Control Solenoid Shutdown sequence because the air control solenoid is turned off because of this sequence.

The Head Shutdown Sequence-Summary

Table 5-6 gives a summary of the head shutdown sequence. This sequence is automatic and takes five minutes.

<table>
<thead>
<tr>
<th>Time (Sec.)</th>
<th>Printer Action</th>
</tr>
</thead>
</table>
| 0           | • Turns off high voltage.  
|             | • Turns off the HEAD and the PRINT light.  
|             | • Turns off the READY light on the front of the printer.  
|             | • Displays <HEAD SHUTDOWN> |
| 3           | • Turns off ink valve  
|             | • Displays <HEAD OFF> |

Table 5-6: Head Shutdown Sequence
The Ink Transfer Cycle

Table 5-7 and Figure 5-25 on page 5-30 describe the cycle of the ink flow in the printer.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When the pressurized ink flows to the printhead, the level in the ink supply cylinder drops. A magnetic float in the ink supply cylinder drops with the ink level.</td>
</tr>
</tbody>
</table>
| 2     | When the magnetic float drops to the bottom of the cylinder, the magnet closes the transfer request switch. This action gives the signal to the control board that the ink supply cylinder requires more fluid.  
**Note:** The transfer request switch is an external installation. |
| 3     | The control board energizes the transfer solenoid. When, the transfer pressure is applied, the transfer solenoid opens. |
| 4     | The transfer solenoid applies the transfer pressure to the transfer pump. The transfer pump transfers ink to the ink supply cylinder (through the check valve and final ink filter). |
| 5     | The magnetic float in the cylinder goes upward with the ink that flows into the cylinder until the float closes the start switch. |
| 6     | When the start switch closes, the control board de-energizes the transfer solenoid. The transfer solenoid closes and the transfer pressure supplied to the pump changes to vacuum to help the pump to get refilled. |
| 7     | The Vacuum is applied to the dry sides of the transfer pump and shut-off valve. The above action allows the ink from the reservoir to refill the transfer pump. |
| 8     | When the ink flows to the printhead, the magnetic float again moves downward. When the float drops below the start switch, a timer circuit starts that measures the time until the next transfer request.  
Flow time is the amount of time the float takes to move from the start switch to the transfer switch. |

**Table 5-7: Ink Transfer Cycle**

---

**Table 5-6: Head Shutdown Sequence**

<table>
<thead>
<tr>
<th>Time (Sec.)</th>
<th>Printer Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>240</td>
<td>• Turns off the air control solenoid</td>
</tr>
</tbody>
</table>
Figure 5-25: Ink Transfer Cycle
The Flow Cycle and the Ink Transfer Cycle

The ink transfer cycle takes approximately 30 seconds (to complete) during the printer run time (Ink On Time). The ink transfer cycle occurs during the flow cycle (ink recycling). Refer to Figure 5-26.

Figure 5-26: Flow Cycle and Ink Transfer Cycle
Ink cycles from ink cylinder to printhead to module reservoir; module to pump; pump to cylinder

Ink cylinder float drops because ink flows to nozzle

Transfer request switch closes

Transfer solenoid energized (removes the vacuum and applies the pressure to the pump)

The Pump fills ink cylinder until the start switch closes

Transfer solenoid de-energized (removes the pressure)

Transfer solenoid de-energized

The pump is refilled from the reservoir through the input check valve of the pump.

The Cycle repeats approximately every 60 seconds with the printhead On.

Transfer switch closed > 10 seconds?

Start switch closed 20 seconds after transfer switch?

The Start switch opens to start the ink flow timer

Is current ink time <= 84% set point time?

Is current ink time = 116%-124% set point time?

Is current ink time > 125% set point time?

Flow Time Too Short fault

Flow Time Too Long fault

Empty Time Too Long fault

Normal Fault

Transfer Request Too Long Fault

Fill Time Too Long Fault

Figure 5-27: Ink Recycling Flowchart
**Make-up Add Sequence**

The make-up add sequence adds make-up fluid to the system at the end of a transfer cycle to adjust for evaporated solvent.

**Solvent Evaporation**

During the printer operation, solvent/make-up evaporates from the system. The process leads to an increase in ink viscosity (thickness) and can cause an increase in the flow time (refer to step 8 of Table 5-7 on page 5-29).

**Make-up Add Time**

The control board defaults to a make-up add time of 0.75 seconds at first startup. Then adjusts as required to control the ink viscosity.

During the next startup, the software uses either the last recorded value or 0.2 seconds (the software selects the longer version).

**Make-up Add Prevention**

When in the flow time cycle or the make-up add sequence, activation of the inhibit switch prevents or stops the make-up add sequence. Refer to Figure 5-30 on page 5-38.

The air and vacuum conditions set at the printer startup are in effect.

Table 5-8 and Figure 5-28 on page 5-34 show the make-up add sequences.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When the control board adds the make-up at the end of the transfer cycle, the board calculates the make-up add time (not shown).</td>
</tr>
<tr>
<td>2</td>
<td>The control board energizes the make-up add solenoid during the make-up add time. This action applies the vacuum to and opens the make-up add valve on the ink module.</td>
</tr>
<tr>
<td>3</td>
<td>The vacuum pulls make-up fluid into the reservoir from the supply bottle.</td>
</tr>
<tr>
<td>4</td>
<td>The make-up add solenoid de-energizes at the end of the add time. This action removes the vacuum to the make-up add valve.</td>
</tr>
<tr>
<td>5</td>
<td>When the make-up add valve closes, the make-up flow to the reservoir stops.</td>
</tr>
</tbody>
</table>

*Table 5-8: Make-up Add Sequence*
Fresh Ink Add Sequence

The fresh ink add sequence adds new ink to the system. The following pages describe the fresh ink add sequence and the components that start the sequence.

Set Point Time and Current Ink Time

Set Point Time and Current Ink Time are two values that are important to the fresh ink add sequence:

- The Set Point Time is the first complete flow cycle that immediately follows system calibration.
- The Current Ink Time is the last flow-time.

Figure 5-28: Make-up Add Sequence
Add the Fresh Ink
The new ink is added during normal operation if the following two conditions occur at a time:

- the magnetic float in the reservoir closes the S1 fluids request switch
- the current ink time is within 0.5 seconds of set point time

Note: If the current ink time is more than 0.5 seconds than set point time, the control board adds make-up fluid instead of new ink.

Note: The Service Mode procedures of Auto Prime and Auto Refresh also add new ink instead of make-up. When the switch that requests the fluids, is activated, the high flow-time starts the make-up add during other Service procedures.
Ink Add

1. Is the fluids request switch closed?
   - No
     - Make-up add valve opens
     - Make-up add valve closes
     - The cycle repeats as required
   - Yes
     - Make-up solenoid de-energized
     - Ink add valve opens

2. Is current ink time <= set point time?
   - No
     - Make-up solenoid is energized (applies the vacuum to make-up add valve)
   - Yes
     - Ink add valve opens

3. The vacuum in ink module reservoir causes ink to flow until fresh ink request switch opens

4. Ink add solenoid de-energized

5. Ink add valve closes

6. The cycle repeats as required

Make-up Add

1. Is current ink time above the set point?
   - No
     - Make-up add valve opens
   - Yes
     - Make-up solenoid is energized (applies the vacuum to make-up add valve)

2. The vacuum in ink module reservoir causes make-up to flow for set make-up time

3. Make-up solenoid de-energized

4. Make-up add valve closes

5. The cycle repeats as required

Figure 5-29: Make-up Add/Ink Add Flowchart
## Fresh Ink Add Sequence

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When the ink is used in the printing, the magnetic float in the ink reservoir drops, and closes the S1 fluids request switch.</td>
</tr>
</tbody>
</table>
| 2     | (a) If the current ink time is within 0.5 seconds of the set point time, the control board energizes the ink add solenoid.  
(b) If the current ink time is more than 0.5 seconds than the set point time, the control board energizes the make-up add solenoid.  
(c) If the printhead is turned Off, the control board energizes the make-up add solenoid. |
| 3     | The vacuum opens either:  
(a) the make-up add valve or  
(b) the ink add valve |
| 4     | The vacuum pulls new ink (or make-up fluid) from the supply bottle into the reservoir. |
| 5     | The magnetic float goes upward, and opens the fluids request switch. When the switch opens, the ink add or make-up add solenoid de-energizes, and closes to vacuum. This action closes the valve to the vacuum and stops the flow of fluid (This process is not shown in the figure). |

*Table 5-9: Fresh Ink Add Sequence*
The Fluids Low Alert Sequence

The Fluids Low Alert sequence monitors the fluid level in both the ink and make-up supply bottles. When the fluid is finished, a Fluids Low warning tells the operator to replace the supply bottle.
The Fluids Low Switch
The Fluids low switch is a differential pressure switch used to monitor the set back pressure on the fluid in the supply bottle.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The fluids low needle valve applies pressure to the supply bottles and the fluids low switch. The air pressure is set to create two bubbles per second in the supply bottles.</td>
</tr>
<tr>
<td>2</td>
<td>When the fluid level drops in a bottle, the decrease in back pressure releases the fluids low switch, and the following occurs: 1. a 30-minute timer starts (This action is not shown in the figure). 2. the SERVICE light illuminates continuously and a prompt displays a Fluids Low Warning to tell the operator of the condition.</td>
</tr>
<tr>
<td>3</td>
<td>If the bottle is not replaced within 15 minutes, the Ink Out Fault shutdown starts and the SERVICE light illuminate. (This action is not shown in the figure).</td>
</tr>
<tr>
<td>4</td>
<td>If the bottle is replaced during the 15-minute warning, the SERVICE lamp turns off. The failure to replace the bottle within the 15-minute period causes an Ink Out fault. (This action is not shown in the figure).</td>
</tr>
</tbody>
</table>

*Table 5-10: The Fluids Low Alert Sequence*
Figure 5-31: Fluids Low Alert Sequence
This chapter contains a description of how to use the Software Summary Chart to perform the procedures in the Service mode. The chapter contains the following topics:

- Introduction
- How to Record Maintenance Information in the Memory (Printer Log)
- How to Reset the Faults
- How to Turn the Ink On
- How to Turn High Voltage On
- How to Test and Print a Sample Message
- Setting the Ink Pressure
- How to Adjust the Nozzle Drive
- How to Adjust High Voltage
- Setting a Password
- Other Service Mode Parameters
Introduction

This chapter describes how to perform the service procedures. Each of the procedures in this chapter uses the Service mode of the software. The Service mode is shown in Figure 6-2 on page 6-4.

Software Illustration Standards

The example illustration Figure 6-1 describes how to use the software illustrations for each procedure to move through the software.

Note: The SERVICE PRINTER area is a fault override area. This area displays normal faults but will not turn off the printer. This feature allows you in the troubleshooting of the printer without the interference with faults. If a fault occurs, press one of the Fault Reset buttons to clear the fault.
The printer in the service mode is shown in the Figure 6-2.
Figure 6-2: Service Mode
How to Record Maintenance Information in the Memory (Printer Log)

Introduction

The procedures in this section describes on how to use the Printer Log feature in the software. Refer to Figure 6-3 on page 6-6. This feature enables you to do the following:

- Record maintenance times in the memory.
- Store the information like the type of ink or make-up fluid used in the printer.
- Calculate the printer run times, drop counter and non resettable print counter.

*Note: Service log contain a log of all faults, warnings, Print Start, and Print Stops.*
How to Record Maintenance Times in the Memory

This procedure describes on how to record the dates of filter changes in the printer memory.
Procedure

Do the following tasks to record the dates of filter changes:

1. Begin with the Frame <01 SERVICE>. Refer to Figure 6-4.
2. Press F2 to select <PRINTER LOG>. Frame <01 LOG> appears in the display screen.
3. Press F3 to select <MAINT. TIMES>. Frame <01 MAINT.> appears in the display screen.
4. Refer to the chart below for the options available in this frame.

<table>
<thead>
<tr>
<th>When F Keys Pressed</th>
<th>Response on Display Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2 - &lt;INK FILTER&gt;</td>
<td>ENTER INK FILTER DATA - - - 4</td>
</tr>
<tr>
<td>F3 - &lt;VACUUM FILTER&gt;</td>
<td>ENTER VACUUM FILTER DATA - -4</td>
</tr>
</tbody>
</table>

Table 6-1: The display on how to Record Maintenance Times in the memory
Enter the date of the last filter change. You can enter a maximum of eight digits and characters.

Press the ENTER key. The date appears in the display screen.

How to Record Ink and Make-up Fluid in the Memory

This procedure describes on how to record the type of ink and make-up fluid used in the printer into the printer memory.

<table>
<thead>
<tr>
<th>When F Keys Pressed</th>
<th>Response on Display Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4 - &lt;INK ADD FILTERS&gt;</td>
<td>ENTER INK ADD FILTER DATA - - 4</td>
</tr>
</tbody>
</table>

Table 6-1: The display on how to Record Maintenance Times in the memory

5 Enter the date of the last filter change. You can enter a maximum of eight digits and characters.

6 Press the ENTER key. The date appears in the display screen.

Procedure

Do the following tasks to record the type of ink and make-up fluid:

1 Begin with the Frame <01 SERVICE>. Refer to Figure 6-5.

2 Press F2 to select <PRINTER LOG>. Frame <01 LOG> appears in the display screen.

3 Press F2 to select <INK DATA>. Frame <01 INK> appears in the display screen.

4 Refer to the chart below for the options available in this frame.

<table>
<thead>
<tr>
<th>When F Keys Pressed</th>
<th>Response on Display Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2 - &lt;INK TYPE&gt;</td>
<td>ENTER INK TYPE - - 4</td>
</tr>
</tbody>
</table>

Table 6-2: The display of the type of ink and Make-up Type Fluid in the memory
Enter the ink and make-up fluid type. You can enter a maximum of eight digits and characters.

5 Press the ENTER key. The fluid type entered appears in the display screen.

### How to Access the Service Log Data

This procedure describes how to enter the <SERVICE LOG> to access all the printer faults, warnings, start print, and stop print. The service log contains a log of all faults warning and stamps the time date to help in the troubleshooting the problems of the printer. Refer to Figure 6-6.

![Figure 6-6: Access the Service Log](image)

Table 6-2: The display of the type of ink and Make-up Type Fluid in the memory

<table>
<thead>
<tr>
<th>When F Keys Pressed</th>
<th>Response on Display Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3 - &lt;MAKE-UP TYPE&gt;</td>
<td>ENTER MAKE-UP TYPE - 4</td>
</tr>
</tbody>
</table>

When F Keys Pressed Response on Display Screen

F3 - <MAKE-UP TYPE> ENTER MAKE-UP TYPE - 4

Table 6-2: The display of the type of ink and Make-up Type Fluid in the memory
How to Access the Current Run Times

This procedure describes on how to enter the <PRINTER LOG> to access the printer run times.

![Diagram of printer run times]

Procedure

Do the following tasks to access the printer run times:

1. Begin with the Frame <01 SERVICE>. Refer to Figure 6-7.
2. Press F2 to select <PRINTER LOG>. Frame <01 LOG> appears in the display screen.
3. Press F1 to select <RUN TIMES>. Frame <01 RUN TIME> appears in the display screen.
4. Refer to the Table 6-3 for the options available in this frame.
5. Press the ENTER key to return to Frame <01 LOG>.

<table>
<thead>
<tr>
<th>When F Keys Pressed</th>
<th>Response on Display Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 - &lt;DROP COUNTER&gt;</td>
<td>The number of millions of drops printed.</td>
</tr>
<tr>
<td>F2 - &lt;TIME INK ON&gt;</td>
<td>The number of hours that the ink is turned On</td>
</tr>
<tr>
<td>F3 - &lt;TIME PRINTING&gt;</td>
<td>The number of hours for which the PRINT light is turned On</td>
</tr>
</tbody>
</table>

Table 6-3: The display of Current Run Times
How to Reset the Faults

Introduction

The Fault Reset is a function in the software that can clear the fault from the display screen. The printer must be in the Service mode to clear the fault with this function.

There is no need to enter the service mode to reset the warnings. You can use the "CANCEL" key to reset the printer warnings. When other printer faults appear, you must use the "RESET FAULT" with in the service mode. Many printer faults turn off the ink stream and high voltage. When in the SERVICE MODE, the printer turns on the ink and high voltage after the problem is cleared.

This procedure describes on how to reset some printer faults.

The Fault Reset is available in three locations in the Service mode for your use. The Fault Reset in all the three locations operate in the same method. Refer to Figure 6-8 on page 6-12.
Note: Refer to the Chapter 7, “Maintenance” for a complete list of printer faults.

Procedure

Do the following tasks to reset a fault:

1. Refer to Figure 6-8 and find the frame <01, 02, 03, SERVICE>.
2. Press F4 to select <FAULT RESET>. The fault is reset.
How to Turn the Ink On

Introduction

This procedure describes how to turn the ink to the printhead On.

Note: The Excel Dual Nozzle printer has two nozzles where one nozzle solenoid only controls the ink stream. Turn on the INK feature and the ink is supplied to both nozzles. There is not an single ink on / off nozzle control.

Procedure

Do the following tasks to turn the ink to the printhead On.

1. Begin with the frame <02 SERVICE>. Refer to Figure 6-9.

2. See the current setting above <INK>. (Settings: <OFF>, <ON>.) If necessary, press F1 to change the setting.
   - When <INK> is set to <ON>, ink to the printhead is turned On.

Note: Green LED on printer display flashes which indicates the ink stream is turned ON.

Figure 6-9: Access Frame <02 SERVICE>
• When <INK> is set to <OFF>, ink to the printhead is turned Off.

**Note:** Green LED on printer display is turned off which indicates the ink stream is turned OFF.

### How to Turn High Voltage On

**Introduction**

This procedure describes on how to turn high voltage to the printhead On. The ink must be On for the high voltage to turn On. (Refer to “How to Turn the Ink On” on page 6-13).

**Note:** You find a small delay when you press the HIGH VOLTAGE button to turn ON. The delay is because of the time it takes to turn on the two high voltage power supplies. Press the HIGH VOLTAGE button ON and wait for two seconds to see the change.

---

**Figure 6-10: Access Frame <02 SERVICE>**
Procedure
Do the following tasks to turn high voltage to the printhead On:

1. Begin with the Frame <02 SERVICE>. Refer to Figure 6-10 on page 6-14.

2. See the current setting above <HIGH VOLTAGE>. (Settings: <OFF>, <ON>). If necessary, press F2 to change the setting.
   - When <HIGH VOLTAGE> is set to <ON>, high voltage to the printhead is turned On.
   
   **Note:** Green LED on printer display flashes at a faster rate which indicates the ink stream and high voltage is turned On

   - When <HIGH VOLTAGE> is set to <OFF>, high voltage to the printhead is turned Off.

   **Note:** Green LED on printer display flashes at a lower rate which indicates the ink stream is ON and the High Voltage is turned OFF.

How to Print a Test Sample Message

Introduction
This procedure describes on how to print a test sample message. The test print function is available in the frame <01 SERVICE> only.

**Note:** The test print is done if all of the following conditions are met:

- Ink is turned On
- High Voltage-1 and 2 is turned On.
- The test print is turned On
- Print matrix is selected.
• The message created and loaded in the printer EDITOR screen.

<table>
<thead>
<tr>
<th>Clear</th>
<th>View</th>
<th>Print</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>Print</td>
<td>Message</td>
<td>Edit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SINGLE</th>
<th>10x16</th>
<th>Char</th>
<th>Print</th>
<th>Char.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Matrix</td>
<td>Set-Up</td>
<td>Inserts</td>
<td>Edit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Store</th>
<th>Recall</th>
<th>View</th>
<th>Print</th>
<th>03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>Message</td>
<td>Store</td>
<td>Message</td>
<td>Edit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service</th>
<th>System</th>
<th>Print</th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer</td>
<td>Set-Up</td>
<td>Set-Up</td>
<td>Edit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service</th>
<th>Log</th>
<th>Printer</th>
<th>OFF</th>
<th>Test</th>
<th>Fault</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log</td>
<td>Print</td>
<td>Test</td>
<td>Fault</td>
<td>Reset</td>
<td>Service</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 6-11: Access Frame <01 SERVICE>*

**Procedure**

Do the following tasks to print a test sample message.

1. Begin with the Frame <01 SERVICE>. Refer to Figure 6-11.

2. Prepare the substrate for test print. Set the printhead for a test print.

   **Note:** Make sure that the printhead is moved towards the substrate before you turn on the test print in step 3. Turn on the Ink with the high voltage-1 and-2 on. When you press F3 (described in step 3), the printer removes the ink from the printhead immediately.

   **Note:** The Select Encoder feature found under the PRINTER SETUP menus <PRINT 04> menu controls the print pitch. When you set the Select Encoder feature to Direct or Reduced, the shaft encoder turns and the pulses are sent for printing to occur.

3. Put the substrate before the selected printhead and press the SHIFT key and F3 to select <TEST PRINT>. The printer removes ink for approximately 30 seconds then stops automatically and turns off the test printer and high voltage.

   **Note:** Press F3 again to stop the test print before 30 seconds.
To Set the Ink Pressure

Introduction

The procedure shows you how to set the ink pressure. This function is used during the printer calibration only. Refer to Chapter 7, “Maintenance” for the complete procedure on printer calibration.

Procedure

You must perform steps 1 and 2 during the printer calibration after you do the following:

Note: Perform the procedure on ink refresh then only you must perform the ink calibration (INK PRESSURE).

a. Turn the ink On for the printhead (refer to page 6-13).
b. Preset the ink pressure between 40 psi (2.8 bar) and 50 psi (3.45 bar). Adjust the ink pressure regulator to preset while you monitor the reading on the gauge door.

c. Adjust the nozzle drive to center the ink stream breakoff point in the charge tunnel window (refer to page 6-21).

d. Set the printhead in the location where the printer prints. Make sure for the correct height of the printhead over the printer cabinet. The correct height allows the printer to set to the correct pressure to make sure best ink stream breakoff.

**Warning**

PERSONAL INJURY. Replace the printhead cover before setting the ink pressure. During this procedure, the ink under high pressure can eject from the nozzle and into your eyes.

Do the following tasks to set the ink pressure:

1. Begin with a Frame <03 SERVICE>. Refer to Figure 6-12 on page 6-17.

2. Press the SHIFT key and F2 to select <INK PRESSURE>. The following appears on the display screen.

```
Pressure is......0
LOW       SET       HIGH
Pressure may be High or Low in normal operation
DO NOT ADJUST
<Use CANCEL to exit with no change>
```

For the printhead, <LOW>, <SET>, or <HIGH> is highlighted for each nozzle. Use the following Table 6-4 to select the next step to complete the procedure.

<table>
<thead>
<tr>
<th>If Reading is</th>
<th>Do the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;LOW&gt;</td>
<td>Turn the ink pressure regulator to increase the ink pressure until &lt;SET&gt; appears for each nozzle.</td>
</tr>
<tr>
<td>&lt;SET&gt;</td>
<td>Press the Enter key when both nozzles indicate &lt;SET&gt;. Then the printer creates a new set point value.</td>
</tr>
<tr>
<td>&lt;HIGH&gt;</td>
<td>Turn the ink pressure regulator to decrease the ink pressure until &lt;SET&gt; appears for each nozzle.</td>
</tr>
</tbody>
</table>

*Table 6-4: Set the Ink Pressure*
Ink Pressure Value

There will be a numeric value of zero or positive number or negative number. The best ink pressure is a value of zero. The display must read either SET 0 or SET 1 or -1 for each nozzle to allow the printer to create a new set point value.

**Note:** Press the CANCEL key if the ink pressure regulator needs more than 45 degrees of adjustment. Next, adjust again the nozzle drive to center the breakoff point in the charge tunnel window, and set the ink pressure again.

**Note:** If you press the Enter key, and both the displays of the nozzles are at <SET>, the printer begins a two minute auto set point sequence. Then the operating set point for the printhead is selected. When the sequence is completed, the printer has a new set point value. Found under the <03 SERVICE> menu under <FLOW TIMES> screen.

Frame <FLOW TIMES>

The Frame <03 SERVICE> menu under the F1 <FLOW TIMES> screen displays the values for the following: (Refer to Figure 6-13 on page 6-20)

- Set point ink time
- Make-up add time
- Make-up inhibit
- Current ink time

These values are displayed to monitor the system.
Figure 6-13: Access <01 Flow>
How to Adjust the Nozzle Drive

Introduction
The nozzle drive function is used in two procedures which are printer calibration and the nozzle drive setup. Refer to Figure 6-14 on page 6-22.

Printer Calibration Procedure
The printer calibration procedure sets the ink pressure. To perform this procedure correctly, center the ink stream breakoff in the charge tunnel window. You can use the nozzle drive adjustment to do the adjustment.

Nozzle Setup Procedure
The procedure on the nozzle drive set-up defines the “print window”, or the range of nozzle drive values that provides the prints which are of good quality. Here the nozzle drive value is adjusted to move the breakoff point to the position in the charge tunnel which gives the best quality print. When you compare with the procedure on printer calibration, breakoff point is not necessary to be in the center of the charge tunnel window.

Note: To set the ink pressure the ink stream breakoff point is set at the center in the charge tunnel. For the procedure on nozzle setup, the breakoff point can move from the center of the charge tunnel. Each of these procedures are described completely in Chapter 7, “Maintenance”.
Figure 6-14: Access Frame <04 SERVICE>
How to Adjust High Voltage

Introduction

This procedure shows you how to adjust high voltage for nozzle-1 and nozzle-2. You can adjust the high voltages of each nozzle separately.

The Procedure on ADJUST HV-1

Do the following tasks to adjust high voltage-1:

1. Begin with the Frame <04 SERVICE>. Refer to Figure 6-15.
2 Press the F2 key to select <HV ADJUST 1>. The following appears in the display screen.

```
High Voltage 1 Adjustment -> 0
<Use Cursors to change value>
```

3 Use the arrow keys to increase or decrease the high voltage setting.

4 A setting of zero is for 3,000 VDC to the printhead, and 100 is for 6,000 VDC to the printhead.

**The Procedure on ADJUST HV-2**

Do the following tasks to adjust high voltage-2:

1 Begin with the Frame <04 SERVICE>. Refer to Figure 6-15 on page 6-23

2 Press the F4 key to select <HV ADJUST 2>. The following appear in the display screen.

```
High Voltage 2 Adjustment -> 0
<Use Cursors to change value>
```

3 Use the arrow keys to increase to decrease the high voltage setting.

4 A setting of zero is for 3,000 VDC to the printhead and 100 is for 6,000 VDC to the printhead.
Barcode Insert

The different barcodes available are: 3 of 9, 2 of 5 Interleaved (2 of 5I), EAN-8, EAN-13, UPC-A, UPC - E, Code 128, EAN 128, 2D Data Matrix

Instructions
1. Begin with Frame <03 Insert>. Refer to Figure 6-16.

2. Press F1 to select <Bar Code>. Then press F5. Frame <02 Barcode> appears in the display.

3. Use the arrow keys to move the cursor to the location in the message where you want the bar code insert to appear.

4. You can now choose to add a bar code into the message:
To insert an EAN-13 bar code, press F2 to select <Insert EAN-13>. Enter 12 numeric digits for this barcode (the 13th digit checksum will be automatically calculated). In the editor, the barcode image for that data will be displayed.

To insert an EAN-8 bar code, press F3 to select <Insert EAN-8>. Enter seven numeric digits for this barcode (the 8th digit checksum will be automatically calculated). In the editor, the barcode image for that data will be displayed.

5 Use the appropriate keys on the keyboard to enter the information which is to appear in the bar code.

### 2D Data Matrix Barcodes

#### Overview

The Excel Dual Nozzle printer now supports 2D Data Matrix barcodes in matrix size from 10x10 to 24x24. This provides for a highly condensed code for use in a wide range of applications where space is limited.

#### Operation Overview

When inserting 2D data matrix barcode into a message, use the same method as 1D barcode (like EAN128 or UPCA). You must follow some guidelines while you create the message to include the barcode. Select the Font of minimum height to contain the 2D Barcode. For the 10x10, 12x12, 14x14, and 16x16 2D Data Matrix barcodes, select the 10x16, 16x24 Print Matrix and DOUBLE Char Size. For 18x18, 20x20, 22x22, and 24x24 2D Data Matrix barcodes, select the 16x24 Print Matrix and TRIPLE Char Size. These selections provide the greatest readability of the barcodes.

#### Procedure

1. Begin with the frame <02 Edit>.
2. Press F2 <Print Matrix> until the necessary Print Matrix is displayed (10x16, 10x16 HS, 16x24 or 16x24 HS).
3. Press F1 <Char Size> until the necessary Char Size is displayed.
4. From the frame <05 Barcode>, Press F1 <Insert Datamatrix> to insert the Data matrix barcode. Refer to Figure 6-18 on page 6-27.
5 Press F2 <Datamatrix Density> to select the necessary Data matrix Density.

6 Enter the necessary data into the Data Matrix barcode.

7 To change to standard text entry, exit from the barcode inserts.
Setting a Password

Introduction
This procedure shows you how to define a password, and how to enable (turn On) the password, so that access to the Service mode is prevented.

Figure 6-19: Access Frame <05 SERVICE>
Procedure
1. Begin with the Frame <05 SERVICE>. Refer to Figure 6-19 on page 6-28.
2. Press F3 to select <ENTER PASSWORD>. The following appears in the display screen:

   Enter password:

3. Use the keyboard to enter a maximum of eight characters for the password.
4. Press the ENTER key.
5. See the current setting above <PASSWORD LOCK>. (Settings: <OFF>, <ON>) If necessary, press F1 to change the setting.
   • When <PASSWORD LOCK> is set to <ON>, a password is required to enter the Service mode.
   • When <PASSWORD LOCK> is set to <OFF>, password is not required to enter the Service mode.

Other Service Mode Parameters
For information on Frame <01 PRIME>, refer to the procedure on ink maintenance in Chapter 7, “Maintenance.”
This chapter includes the following topics:

- Introduction
- Scheduled maintenance
- Maintenance - each day
- Maintenance - each week
- Maintenance - 500 hour
- Maintenance - 2,500 Hour
- Maintenance - each year
- Ink maintenance features
- Quality of the print (setup procedure for nozzle drive)
- The description of auto flush option

**Caution**

EQUIPMENT DAMAGE Refer to the “Safety Cautions for Ink Maintenance” on page 7-25 to start the ink maintenance.

**Introduction**

**The Maintenance Schedule to Prevent the Potential Damage**

This chapter contains the maintenance schedule that is recommended to prevent the potential damage to the printer. If you follow the given schedules, you can keep the printer in the best condition and understand how the printer operates. When the problems occur, following the recommended schedules help the operator to identify the cause of those problems.

Refer to “Scheduled Maintenance” on page 7-2.
Ink Maintenance

Ink maintenance is the term given to the procedures that describe the following processes:

- To load the fluids
- To flush the fluids
- To drain the fluids
- To refill the ink
- To calibrate the printer (setting the ink pressure)
- Setting the nozzle drive
- To prepare the printer for storage
- To change the ink (new type of ink)

Refer to “Ink Maintenance Features” on page 7-24.

Quality of Print (Setup procedure for Nozzle Drive)

This section helps you find the print window, or the range of nozzle drive values that give better print quality. The quality of print is an expanded description of the setup procedure for the nozzle drive. Refer to Figure 7-26 on page 7-40 for more information.

Refer to “Quality of the Print (Setup Procedure for Nozzle Drive)” on page 7-42.

Scheduled Maintenance

Description

You must perform several normal maintenance functions in normal intervals to make sure efficient printer operation.

This section provides maintenance schedules and procedures to prevent the potential damage that can occur to the printer. The section also provides the information on how to clean and replace the components at known intervals.
Refer to Table 7-1 below for a list of all the recommended scheduled maintenance procedures, and where to turn in this chapter to find those procedures.

<table>
<thead>
<tr>
<th>How Often to Perform</th>
<th>Procedure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each day</td>
<td>Check the fluid level in the ink and make-up fluid bottles (Change bottles, if necessary)</td>
<td>7-4</td>
</tr>
<tr>
<td></td>
<td>Inspect the fluid lines for leaks</td>
<td>7-5</td>
</tr>
<tr>
<td></td>
<td>Drain the ink trap</td>
<td>7-6</td>
</tr>
<tr>
<td>Each week</td>
<td>Clean the printhead</td>
<td>7-8</td>
</tr>
<tr>
<td>Every 500 Hours*</td>
<td>Change the vacuum filter</td>
<td>7-15</td>
</tr>
<tr>
<td>Every 2,500 Hours*</td>
<td>Change final ink filter</td>
<td>7-17</td>
</tr>
<tr>
<td></td>
<td>Change the fluid bottle filters</td>
<td>7-19</td>
</tr>
<tr>
<td>Change every 5 years</td>
<td>Change the Battery on the Control Board</td>
<td>7-21</td>
</tr>
<tr>
<td>One time in every year</td>
<td>Change the muffler</td>
<td>7-22</td>
</tr>
<tr>
<td></td>
<td>Change the input air filter</td>
<td>7-23</td>
</tr>
</tbody>
</table>

Table 7-1: The Maintenance Schedule

* A feature in the printer software, <RUN TIMES> enables the operator to access the number of hours the printer is in use. Refer to “How to Record Maintenance Times in the Memory” on page 6-6 in Chapter 6, “Software Summary Chart - Service Mode” for more information on the Printer Log Program.

Maintenance - Each Day

This section describes the procedures that you must complete every day.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Summary</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the fluid levels in the ink and make-up bottles (Change bottles, if necessary)</td>
<td>You have approximately 15 minutes to change the ink and the make-up bottles. You must perform this procedure after a fluids low warning occurs before the printer uses all the fluids.</td>
<td>7-4</td>
</tr>
<tr>
<td>Inspect the fluid lines for leaks¹</td>
<td>Check the ink module and other fluid components for ink leaks. If you find a leak around a fitting, use an adjustable wrench to tighten the fitting no more than 1/4 of a turn at a time.</td>
<td>7-5</td>
</tr>
</tbody>
</table>

Table 7-2: Every Day Maintenance Schedule
Check the Fluid Level in the New Ink and Make-up Bottles

Check the amount of fluid in the new ink and make-up bottles of the ink and the make-up fluid.

A Fluid Low Warning occurs when the level of fluid in either bottle drops below the height of the fluid low sensor. The fluid low sensor is on the filter tube assemblies that are inside the fluid bottles. This warning appears on the printer display screen. You have 15 minutes approximately to change the ink bottle and the make-up bottle. You must perform this procedure after a fluid low warning occurs before the printer uses all the fluid. The fluid low warning changes to a fluids out fault.

How to Change a Fluid Bottle

**Note:** There is no need to switch off the printer to perform this procedure. The printer can continue to print while the new ink bottles or make-up bottles are changed.

**Note:** During this procedure, ink leaks into the printer. Put the paper towels inside the printer to absorb this ink.

**Procedure**

Do the following tasks to drain the ink trap.

1. Identify the fluid bottle that requires the replacement.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Summary</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain the ink trap</td>
<td>During the normal operation, the ink trap remains, clean and dry. Ink collects in the ink trap if the ink in the ink cylinder fills more than the limit.</td>
<td>7-6</td>
</tr>
</tbody>
</table>

Table 7-2: Every Day Maintenance Schedule

1. If the fitting has a barb, inspect the tube to make sure there is no break. Also make sure the correct position of the tube on the barb.
2. Make sure that there is no ink in the clear tube that leads to the ink trap from the top of the ink cylinder. The clear tube is a pneumatic air line and must not contain ink.
2 Loosen the cap from the new fluid bottle and discard the cap. Cut and slide the foil backward to remove as shown in Figure 7-1.

Figure 7-1: Opening a Fluid Bottle

3 Loosen the cap on the bottle you require to replace. Carefully remove the cap and attached filter tube assembly from the bottle when you carefully remove the bottle from the cabinet.

4 Follow the local regulations and discard the fluid bottle removed from the printer.

5 Carefully insert the cap and attached tubes of the filter tube assembly into the new fluid bottle.

6 Tighten the cap and put the bottle into position in the fluid pan.

Inspect the Fluid Lines for Leaks

Inspect the printer cabinet before you start the printer. Check the ink module and other fluid components for fluid leaks. If you find a leak around a fitting, use an adjustable wrench to tighten the fitting no more than 1/4 (one quarter) of a turn at a time.

Note: A line with a brass fitting is an air or vacuum line. A line with a stainless steel fittings is an ink or make-up fluid line.

Always remember that leaks can cause problems and this problem is different from the problem at the source of the leak. Refer to the diagrams in Chapter 5, “Theory of Operation” to monitor the paths of fluids and air in the full system. Make sure that potential problems are corrected immediately.
Caution

EQUIPMENT DAMAGE. Do not tighten a fitting more than the limit because you can break the fitting and the tube.

Drain the Ink Trap

This procedure describes how to drain the ink trap. During the normal operation, the ink trap remains clean and dry. You must drain the ink trap when an ink cylinder fills more than the required limit. If the air line at the top right side of ink cylinder is found to have ink or make-up fluid, then the ink cylinder is filled more than the required limit. When the color of the air line changes, you must drain the ink trap and clean the air line.
Procedure
1  Open the gauge door and find the ink trap on the rear of the gauge door assembly (refer to Figure 7-3).

2  Find the drain valve on the bottom of the ink trap.

   **Note:** If the ink collects in the ink trap, remove and clean the ink pressure line that runs from the ink trap to the cylinder.

3  Keep the paper towels below the drain valve, and press the drain valve.

---

*Figure 7-3: Ink Trap*
Maintenance - Each Week

This section describes the procedures you must complete every week. Follow the procedures in this section to prevent the decrease in the concentration of the ink. The ink is diluted if you use more cleaning fluids.

---

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Summary</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean the printhead</td>
<td>Clean the printhead each week. Never clean the printhead during the shutdown.</td>
<td>7-8</td>
</tr>
</tbody>
</table>

Table 7-3: Each week Maintenance Schedule

---

Clean the Printhead

The following section describes when and how to clean the printhead.

- Clean the printhead every week.
- You must clean the printhead more number of times for some applications.
- When you use some types of inks, you must clean the printhead more number of times.
- You must clean the printhead before the printer is started.
- If the printhead is installed in an area where vibrations occur, you must clean the printhead more number of times.

During the printer shutdown, you must not clean the printhead. If you do not clean the printhead during the shutdown, a cap of ink is allowed to dry over the end of the nozzle. This ink cap prevents the air from entering the nozzle so that the ink will not dry. The formation of blocks in the nozzle is prevented if the air does not enter the nozzle.

**Note:** If the printer has the Auto Flush option, the system cleans the nozzle and ink return line automatically with the make-up fluid. This process occurs when the HEAD key is pressed for hydraulic shutdown. During this process, there is no formation of an ink cap over the nozzle opening because the ink inside the nozzle is flushed away. If you turn off the HEAD key while the printer is in the service mode, the Auto Flush is not activated automatically.

**Note:** The EDN printer allows the operator to perform the auto flush manually. When you turn off the HEAD key, the printer performs the auto flush.
Procedure

⚠️ **Warning**

PERSONAL INJURY. Before you start this procedure, make sure to switch off the AC power to the printer.

Do the following tasks to clean the printhead:

1. If the printer is in the operation mode, press the HEAD key to turn off the ink stream. Allow the printer to complete its programmed shutdown sequence of four minutes.  

   **Note:** Wait until the vacuum gauge on gauge door displays 0 in/hg and “SHUTDOWN MESSAGE” appears on the display screen of the printer.

2. Set the AC power switch to the OFF position (O). Refer to Figure 7-4.

![AC Power Switch](Figure 7-4: AC Power Switch)
3 Find the screw that holds the printhead cover in position (refer to Figure 7-5).

4 Use a screwdriver to loosen the screw, then slide the printhead from the printhead cover.

![Figure 7-5: Remove the Cover from the Printhead]

5 See and inspect the printhead assembly. Look for particles and ink that normally collect in the orifice of the nozzles, charge tunnel, deflection plates and the catchers. The nozzle orifices are on the front of the nozzles. Refer to Figure 7-6 on page 7-11 for the location of each component.

*Note:* You can find the orifice of the nozzles on the front of the nozzles.
Connect the printhead to an electrical ground. Refer to Figure 7-7 on page 7-12 for two methods of how to connect the printhead to an electrical ground.

**Warning**

PERSONAL INJURY Make sure that the service tray and the printer are connected to the electrical ground, then install the printhead into the service tray. When you use flammable ink, you must connect the service tray and the printer to the electrical ground. When you use flammable ink if you fail to connect the above items to the electrical ground, a static discharge can cause a fire.
Caution

EQUIPMENT DAMAGE. When you clean the charge tunnel, do not use additional force. More force can cause wrong alignment, which is dangerous, and also can cause damage.
7 Make sure the printhead points downward into the service tray that is connected to an electrical ground. Use the cleaning solution or make-up fluid recommended by VIDEOJET (refer to Figure 7-8 on page 7-13) to flush away the contamination.

8 You must clean all dirty surfaces of the printhead and clean the nozzle point, in the end. When the nozzle point is cleaned, dry the printhead and start the ink stream immediately.

**Note:** The ink can begin to dry inside the nozzle if you do not start the ink stream quickly.

**Note:** Use the cleaning solution in less quantity. Do not flush the cleaning solution more than the required limit into the catcher.

9 Use compressed air at approximately 1.4 bar (20 pounds per square inch) to dry the printhead completely.

**Caution**

EQUIPMENT DAMAGE. Do not use any cloth or paper towels to dry the printhead or cover. Only use compressed air at approximately 1.4 bar (20 pounds per square inch). Do not send compressed air into the catcher.

10 Remove the printhead from the service tray.

11 Inspect the printhead cover. If the cover is dirty, clean and dry the cover before you insert the printhead.

12 Discard the cleaning solution in the service tray (or other waste container used) correctly.
Caution

EQUIPMENT DAMAGE. Do not put the cleaning solution into sinks, sewers, or drains. When you discard the printer fluids, follow all correct local regulations. Contact the correct regulatory agency for more information.

Note: You must clean and dry the nozzle point again in some conditions.

Maintenance - 500 Hour

Description

This section describes the procedures that you must complete after every 500 hours of printer operation. Refer to Table 7-4 below for a list of the procedures in this section. The table also shows the page numbers to turn to for the description of each procedure.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Summary</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the vacuum filter</td>
<td>Replace the vacuum filter every 500 hours of the printer operation.</td>
<td>7-15</td>
</tr>
</tbody>
</table>

Table 7-4: 500-Hour Maintenance Schedule

How to Calculate the Number of Hours the Printer has Operated

This procedure shows you how to access the Printer Log in the Service mode. The Printer Log helps to know the number of hours the printer has operated.

The printer automatically calculates the values of two cycles of operation: <TIME INK ON> and <TIME PRINTING>. Both values are accessed from <PRINTER LOG> in the Service mode.

- <TIME INK ON> refers to the number of hours that the ink is turned on.
- <TIME PRINTING> refers to the number of hours the PRINT light is turned on.
Refer to the procedure below to access this section in the Service mode.

**Procedure**

Do the following tasks to access the Printer Log:

1. Begin with the Frame <01 SERVICE>. Refer to Figure 7-9 on page 7-15.
2. Press F2 to select <PRINTER LOG>. Frame <01 LOG> appears in the display screen.
3. Press F1 to select <RUN TIMES>. Frame <01 RUN TIME> appears in the display.

   *Note: The F2 <TIME INK ON> indicates the number of hours that the ink is turned on. The F3 <TIME PRINTING> indicates the number of hours the PRINT light is turned on.*

4. Press the ENTER key to return to Frame <01 LOG>.

**Change the Vacuum Filter**

Change the vacuum filter after every 500 hours of printer operation (Time Ink On). (Refer to “How to Calculate the Number of Hours the Printer has Operated” on page 7-14). Refer to Figure 7-10 on page 7-16 for the location of the vacuum filter.

Also replace the filter for one the following reasons:

- The liquid is visible.
- The correct vacuum is not maintained
- The ink leaks from the catcher.
• When the phasing occurs at more than normal intervals, No signal faults are found or the quality of the print is bad.

Some change of color in the filter during the operation is normal. Enter the date on which the filter was changed, in the printer log under <MAINT. TIMES>.

**Note:** Water based inks can foam in ink module and decrease the life of the vacuum filter. Use an additional vacuum trap bottle with water based inks.

---

**Procedure**

Do the following tasks to change the vacuum filter:

---

**Warning**

PERSONAL INJURY. Before you start this procedure, make sure to turn off the AC power to the printer. Also make sure to disconnect the AC power and compressed air supply to the printer.

---

1. Open the fluid pan door and the gauge door.
2. Record the direction of the vacuum filter.
3. Remove the vacuum filter from its mounting bracket.
4. Disconnect the vacuum line on the right side of the filter and disconnect the luer fitting.
5 Disconnect the large hexagonal fitting on the left side.

6 Loosen the filter from the elbow fitting on the right side, and remove the filter.

7 Inspect the elbow fitting for ink build up. Clean if necessary.

8 Install new vacuum filter, and make sure that the new filter is set in the same direction.

9 Connect the elbow and luer fittings, then push the vacuum line on the vacuum filter barb.

10 Fasten the filter into its mounting bracket.

**Note:** When the filter is in the bracket, make sure that all tubes are not bent or pressed together. Make sure all connections are tight.

11 Reconnect compressed air and AC power to the printer.

---

**Maintenance - 5000 Hour**

**Description**

This section describes the procedure that you must complete every 5000 hours of printer operation (Time Ink On). Refer to Table 7-5 below for the procedure in this section, and the page number to turn to for the description of that procedure.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Summary</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change final ink filter</td>
<td>Change final ink filter found at the top of the ink cylinder, left side. Change the fluid bottle filters in the make-up fluid and ink bottles, every 5000 hours.</td>
<td>7-19</td>
</tr>
<tr>
<td>Change the fluid bottle filters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 7-5: Maintenance Schedule - 5000 Hours*

1. Refer to “How to Calculate the Number of Hours the Printer has Operated” on page 7-14.

**Change the Final Ink Filter**

This procedure describes how to change the final ink filter (refer to Figure 7-11 on page 7-19). You must prime the system after the installation.
Final Ink Filter Replacement

Do the following tasks to replace the final ink filter.

**Warning**

PERSONAL INJURY. Before you start this procedure, make sure to turn off the AC power of the printer. Also make sure to disconnect the AC power and compressed air supply to the printer.

1. Put the paper towels or absorbent rags on the bottom of the fluid pan to absorb any ink that leaks during the procedure.
2. Use a 7/16 inch open-end wrench to remove the ink input line from the bottom of the existing ink filter.
3. Turn the existing ink filter to the left side and remove the ink filter from the top cap of the ink cylinder.

**Caution**

EQUIPMENT DAMAGE. Do not use teflon tape on either end of the ink filter. Make sure to fit the filter correctly into the top cap of ink cylinder and connect the input ink line to the bottom of ink filter. This task prevents the filter to cross-thread.

4. Clean any ink residue from the bottom of the ink cylinder cap. Install the new filter to the top cap of the ink cylinder. When you install the new filter, make sure that the O-ring is in position on the filter. Turn the filter to the right side into the top cap and carefully tighten the filter.
5. Connect the ink cylinder input line to the input end of the new filter. You can find the input end on the bottom side of the filter.
6. Hold the filter in your hand and carefully tighten the nut with your fingers. Use a 7/16 inches wrench to tighten the nut by (1/4) one quarter turn. Do not tighten more than the required limit. If the filter leaks during the operation, you can tighten the filter more until the top surface touches the top cap.
7 Prime the system with new ink. Refer to Figure 7-16 on page 7-29 for the correct procedure.

Change the Fluid Bottle Filters

If necessary, inspect and change the fluid bottle filters every 5000 hours. Refer to “How to Calculate the Number of Hours the Printer has Operated” on page 7-14.

Make sure that the replacement filters are put exactly like the old filters (refer to Figure 7-12 on page 7-20). Enter the <Ink Add Filter> under <MAINT. TIMES>.
Maintenance - Each year

Description

This section describes the procedure that you must complete one time in a year.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the battery on the control board</td>
<td>7-21</td>
</tr>
<tr>
<td>Change the muffler</td>
<td>7-22</td>
</tr>
<tr>
<td>Change the input air filter</td>
<td>7-23</td>
</tr>
</tbody>
</table>

Table 7-6: Maintenance Schedule - Each Year
Change the battery on the Control Board

Lithium Battery
When the printer is turned off, the lithium battery (PN 218926, Battery 3.1VDC) energizes the real-time clock (to maintain the current time).

Do the following tasks to change the lithium battery on the control board:

1. Keep the printer turned on, lift the lower side of the battery and slide outside.
2. Insert new battery and slide under the three flingers found on the top.
3. Push downwards to lock the battery into the socket.

Change the Muffler

Change the muffler each year. The muffler is found below the cabinet on the left side (refer to Figure 7-14 on page 7-23).
Procedure
Do the following tasks to change the muffler:

Warning
PERSONAL INJURY. Before you start this procedure, make sure to turn off the AC power of the printer. Also make sure to disconnect the AC power and compressed air supply from the printer.

1. Use a 9/16 inch open end wrench to remove the old muffler.
2. Screw a new muffler in position. Make sure to fasten the muffler tightly.
3. Reconnect compressed air and AC power to the cabinet.

Change the Input Air Filter
Change the input air filter one time in every year. Refer to Figure 7-14 on page 7-23 for the location of the input air filter.

Procedure
Do the following tasks to change the input air filter:
**Warning**

PERSONAL INJURY. Before you start this procedure, make sure to turn off the AC power of the printer. Also make sure to disconnect the AC power and compressed air supply from the printer.

1. Open the fluid pan door and the cabinet door to get access to the pneumatic compartment.
2. Disconnect the tube from to the bottom of the filter.
3. Loosen the filter bowl.
4. Loosen and discard the filter element.
   
   *Note: Keep the O-ring found on the top of the filter.*
5. Make sure the O-ring is set correctly, and fit a new filter element.
6. Replace the filter bowl.
7. Replace the tube on the fitting under the filter bowl. You must cut approximately 1/8 inches off the end of the tube.
8. Reconnect compressed air and AC power to the cabinet.

**Ink Maintenance Features**

**Introduction**

This section describes all the procedures necessary to load the fluids into the printer. The section also includes the procedures to maintain the fluids in the printer and drain the fluids from the printer.

All the procedures required to manage the printer fluids are broken down to their easiest forms. The flow charts provided in the section describe each of the procedures. The flow charts are easier to follow if the operator knows the equipment. The operator must know how to use the software, and follow the Software Summary Chart to perform these procedures.
Safety Cautions for Ink Maintenance

The following safety cautions are recommended for all procedures in this section.

**Caution**

PERSONAL INJURY. You must attach the printhead to the service tray or must attach a ground wire to provide the correct discharge path to the printer cabinet. Refer to Chapter 2, “Safety” in this manual for the recommended printhead methods to connect the printhead electrical ground.

**Caution**

PERSONAL INJURY. When you use the fluids, wear the safety eyeglasses with the side shields.

**Caution**

EQUIPMENT DAMAGE. Make sure that the work area has good ventilation.

**Caution**

PERSONAL INJURY. Put all fluids that you do not use into a metal container connected to an electrical ground.

**Caution**

PERSONAL INJURY. Correctly discard all fluids (that are not used) in approved containers in an approved method.

**General Excel Printer Fluid Maintenance**

Perform the following procedures in the order shown in Figure 7-15 on page 7-27.

- Flush the system
• Install a new printer
• Remove the ink contamination
• Store the printer

When you perform the maintenance procedures, the conditions that exist are shown in Figure 7-15 on page 7-27.

Ink Maintenance Flow Charts

Note: Some procedures are repeated for different fluid types. For example, use the procedure 1 to load ink and load make-up fluid.

Refer to Figure 7-15 on page 7-27 for the procedure to complete in each condition, and the page number to turn to for that known procedure. Refer to Table 7-7 for a list of each of the procedures found in Figure 7-15 on page 7-27, and where to turn in this chapter to find that procedure.

<table>
<thead>
<tr>
<th>Procedure Name</th>
<th>No. and Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load the fluids</td>
<td>“Procedure 1” on page 7-29</td>
</tr>
<tr>
<td>Flush the fluids</td>
<td>“Procedure 2” on page 7-31</td>
</tr>
<tr>
<td>Drain the fluids</td>
<td>“Procedure 3” on page 7-33</td>
</tr>
<tr>
<td>How to refill the ink</td>
<td>“Procedure 4” on page 7-35</td>
</tr>
<tr>
<td>Calibrate the printer</td>
<td>“Procedure 5” on page 7-37</td>
</tr>
<tr>
<td>Store the printer</td>
<td>“Procedure 6” on page 7-39</td>
</tr>
<tr>
<td>Setting the nozzle drive</td>
<td>“Procedure 7” on page 7-40</td>
</tr>
<tr>
<td>Change the ink type</td>
<td>“Procedure 8” on page 7-41</td>
</tr>
</tbody>
</table>

Table 7-7: Ink Maintenance Flow Charts

Note: While in the service mode the printer displays the faults, and will not put the printer into a shutdown. The printer allows the operator to reset the fault with the fault reset button. You are recommended to reset the fault that allows in the troubleshooting of the problem.
Note: When the printer is loaded only with the make-up fluid, do not store the printer. Some make-up fluid can damage the components in the printer if the fluid is kept in the printer for an extended time.
Caution

PERSONAL INJURY. You must refer to the “Safety Cautions for Ink Maintenance” on page 7-25 before you perform the all the procedures for ink maintenance.
Load the Fluid
The following procedure describes on how to load the fluids like ink, make-up fluid, or the cleaning solution.

Procedure 1

Start

Put the fluid in the right side replenishment cabinet and make sure that you load the make-up fluid on the left side.

Attach the bleed tubes to the ink valves in the printhead. Refer to Note 2 below.

Turn the regulator knob to the left side (ink pressure to 0 psi [0 bar]). Decrease the vacuum to 10 Hg/in. (23 Hg/cm).

Turn the Power On.

Enter the SERVICE Mode

Select <AUTO PRIME> in <03 SERVICE>.

Start <AUTO PRIME in <01 PRIME>. Refer to Note 1 below.

Is the TXSW LED Off.

Yes

Is the HEAD light flashing?

No

Yes

The display reads: <PRINTER IS PRIMED - CLOSE BLEED VALVE>

Refer to Note 3

Is the system loaded with the fluid?

No

Yes

Adjust the bleed screw on the printhead ink valve #2 to get a drip rate of 2-3 drops per second.

The display reads: <PRINTER PRIMING IS STARTING - OPEN BLEED VALVE>

Turn off Auto Prime. Remove the bleed tube.

Wait

Set the ink pressure to 5psi (0.34 bar).

Return to Figure 7-15

See Note 1

Figure 7-16: Load Fluid into the Printer

Note 1: The time required for the ink pressure to turn on now, is 3-4 minutes. Make sure to set the vacuum to 10 in/hg if the procedure takes longer than 3 to 4
minutes. If the problem continues, turn off the printer and start the procedure again.

**Note 2:** Refer to Figure 7-18 on page 7-32 for an illustration of the components used in this procedure.

**Note 3:** Close bleed valve #2. Open ink valve #1 use longer Allen key to reach the ink valve #1 (PART NUMBER 223722). Open ink valve so that the ink drips. When the ink begins to drip from the tube, close the bleed port
Flush the Printer

The following procedure describes how to flush the printer with the make-up fluid or the cleaning solution.

Procedure 2

Start

Select <AUTO PRIME> in <03 SERVICE>.

Turn On <AUTO PRIME> in <01 PRIME>. Refer to Note 1 below.

Set the ink pressure to 5psi (0.34 bar). Decrease the vacuum to 10 Hg/in. (23 Hg/in.).

Open the ink valves (valve #1 and 2) bleed port for 2 drops per second. Refer to Note 2 below.

Spray the make-up fluid or the cleaning solution into the catchers for 15 seconds.

Is the fluid from the bleed tubes clear?

Yes

Turn <AUTO REFRESH> Off in The Frame <01 PRIME>

Set the ink pressure to 40psi (2.8 bar) for alcohol/ketone and 50 psi (3.4 bar) water/poly. Set vacuum to setting on Table 3-7 on page 3-46.

Turn the vertical adjustment screws two turns to your left and raise the nozzles.

Allow the ink stream to run for 5 minutes (clean the nozzle).

Turn <INK> Off in <02 SERVICE>.

Turn the vertical adjustment screws two turns to your right and lower the nozzles.

Turn off the AC power.

No

Restart AUTO PRIME> if necessary.

Return to Figure 7-15

Figure 7-17: Flush the Printer with Make-up Fluid or Cleaning Solution

Note 1: The AUTO PRIME continues even after <PRINTER IS PRIMED. CLOSE BLEED VALVE> appears on the display.
**Note 2:** Refer to Figure 7-18 for illustrations of the components used in this procedure.

**Figure 7-18: Component Identification for Loading and Flushing Procedures**

1. Ink Valve
2. Locking Screw (for horizontal adjustment)
3. Horizontal Adjustment Screw
4. Vertical Adjustment Screw
5. Bleed Port
6. Bleed Port Screw

**Note:** Use Long Allen Wrench (PART NUMBER: 223722) and Short Allen Wrench (PART NUMBER: 186514).
Drain the Fluid

The following procedure describes on how to drain the fluids from the Printer

Procedure 3

Start

Attach the bleed tube to the ink valves. Refer to Note below.

Turn the regulator knob to your left (set the ink pressure to 0psi, or 0 bar).

Turn the power On.

Press the HEAD key to turn Off the printhead.

Select <AUTO PRIME> in 03 SERVICE.

Turn <AUTO DRAIN> On in <01 PRIME>.

Set the ink pressure to 5psi (0.34 bar).

Open the ink valves bleed port for two drops per second.

Is Auto Drain complete?

No

Yes

Close the bleed port, turn AC power switch Off.

Return to Figure 7-15

Figure 7-19: Drain the Fluid from the Printer

Note: Refer to Figure 7-20 on page 7-34 for illustrations of the components used in this procedure.
Note: Use Long Allen Wrench (PART NUMBER: 223722) and Short Allen Wrench (PART NUMBER: 186514)
Refill the Ink

Use the following procedure to refill the ink supply of the printer under the operating pressure. This procedure replaces all the ink within the printer. The procedure removes 1 inch (2.54 cm) of ink from the new ink bottle to complete the procedure.

Procedure 4

Figure 7-21: Ink Renewal Procedure

Note: Refer to Figure 7-22 on page 7-36 for illustrations of the components used in this procedure.
**Note:** You must raise the ink stream so that the ink streams clear the top of the catchers. The ink must fall into the service tray that is connected to an electrical ground.

**Figure 7-22: Component Identification for Ink Renewal**

1. Ink Pressure Knob
2. Ink Pressure Regulator
3. Locking Screw (for horizontal adjustment)
4. Horizontal Adjustment Screw
5. Vertical Adjustment Screw

**Note:** Use Long Allen Wrench (PART NUMBER: 223722) and Short Allen Wrench (PART NUMBER: 186514).
**Printer Calibration**

The following procedure calibrates the printer for the correct ink pressure and calculate the setup values for the printer. Route the umbilical and position printhead at the printing location for the best calibration of printer.

**Procedure 5**

Start

Turn <INK> On in the Frame <02 SERVICE>.

Align the ink streams into the catcher. Refer to **Note 1** below.

Preset the ink pressure to 40psi (2.8 bar) for ketone/alcohol or 50psi (3.4 bar) for water/poly. Set vacuum to setting on Table 3-7 on page 3-46.

Select <NOZZLE DRIVE> in the Frame <04 SERVICE>. Adjust the nozzle drive to move the breakoff drop to the center. Refer to **Note 2** below.

Select <INK PRESSURE> in the Frame <03 SERVICE>. Adjust the ink pressure regulator until <SET> highlights with an ink pressure of 0, +1, -1 0 value. Then press the ENTER key.

**Figure 7-23: Printer Calibration**

**Note 1:** Refer to Figure 7-24 on page 7-38 for illustrations of components used in the procedure 5.

**Note 2:** Do this for nozzle -1 and 2. Try to match the breakoff on each nozzle with the other nozzle.
Figure 7-24: Component Identification for Printer Calibration

1. Ink Valve
2. Bleed port screw
3. Bleed Port
4. Knob
5. Ink Regulator
6. Locking Screw (horizontal adjustment)
7. Horizontal Adjustment Screw
8. Vertical Adjustment Screw
**Note:** Use Long Allen Wrench (PART NUMBER: 223722) and Short Allen Wrench (PART NUMBER: 186514).

**Printer Storage**

**Procedure 6**

1. **Excel Fluid Maintenance**
   - on page 7-27

2. **Extended Storage?**
   - No
   - Yes

   **Yes**
   - Drain the make-up fluid. ("Procedure 3" on page 7-33).
   - Remove both replenishment bottles (make-up fluid bottle and ink bottle).
   - Turn <INK> On in the Frame<02 SERVICE>.
   - Set the ink pressure to 30psi (2 bar).
   - Run the printer for 15-30 minutes (approximately 15 for ketone/30 for water).

   **No**
   - Turn off the power.
   - Turn the AC power switch Off.
   - Put a cover on the printer and printhead.

***Figure 7-25: Printer Storage***

**Note:** When the printer is filled only with the make-up fluid and stored for too long, the plastic components of the printer can get damaged.
Nozzle Drive
This procedure enables the operator to prepare the ink stream breakoff correctly. This procedure helps the nozzles of the printer are set for the breakoff correctly and give the printer the best print quality.

Procedure 7

Start

Enter a text message to print in the required font.

Set <NOZZLE DRIVE> in the Frame <04 SERVICE>. Set at 1% and increase until the breakoff comes into the view in the charge tunnel window.

Slowly increase the nozzle drive level until the breakoff point reverses its direction and moves towards the front end of the printhead. (the point at which it reverses its direction is foldback)

Lower the nozzle drive below foldback. Make a decision about the print window (nozzle drive range that gives good quality of print). Use the following information:
- If satellites are present, they merge in the forward direction
- The number of satellites is less than equal to 3.
- The breakoff point is within the charge tunnel
- The quality of the print is acceptable (refer to Note below)

Set the nozzle drive between the maximum and minimum points of a good quality of print (calculated before), and with least number of satellites.

Adjust the positive air flow to 2 SCFH on each nozzle. Use two flow meters to set the air flow (positive) of both the nozzles at a time. Each nozzle printhead orifice must measure 2 SCFH with the ink On. See the procedure on positive air adjustment.

Return the printer to production.

Figure 7-26: Nozzle Drive Setup

Note: Refer to “Quality of the Print (Setup Procedure for Nozzle Drive)” on page 7-42 for a complete description.
Ink Conversion

Procedure 8

Start

Drain old-type ink

“Procedure 3” on page 7-33

Load old-type make-up fluid

“Procedure 1” on page 7-29

Flush system with old-type make-up fluid

“Procedure 2” on page 7-31

Drain old-type make-up fluid

“Procedure 3” on page 7-33

Load old-type cleaning solution

“Procedure 1” on page 7-29

Disassemble the ink module and ink cylinder. Use the old solution to clean the ink module and ink cylinder. Then clean with the new solution

Assemble the ink module and ink supply cylinder

Replace final ink filter and replenishment filters

If necessary, replace the ink return lines and the transfer tube (water/poly requires larger diameter) Refer to Note below.

Flush with new-type make-up fluid

“Procedure 2” on page 7-31

Drain make-up fluid

“Procedure 3” on page 7-33

Load new-type make-up fluid

“Procedure 2” on page 7-31

Drain cleaning solution

“Procedure 3” on page 7-33

Load new-type ink

“Procedure 1” on page 7-29

Renew the ink

“Procedure 4” on page 7-35

Calibrate the printer

“Procedure 5” on page 7-37

Figure 7-27: Ink Conversion Procedure

Note: If your printer has the auto flush option, flush the auto flush line and auto flush system. This action is necessary because the auto flush supply line is one of the idle ink return lines.
Quality of the Print (Setup Procedure for Nozzle Drive)

Introduction
The setup procedure of the nozzle drive helps to find the "print window" or nozzle drive range that gives good quality of print. The procedure also sets the nozzle drive inside the print window. Complete the setup procedure after the ink stream calibration and set the ink pressure.

The print window for one printhead is different from another printhead because of the differences in inks and also in the nozzles. This procedure holds good for all ink types and all Excel nozzles.

Definition: Foldback
The setup procedure of the nozzle drive requires that you find the "foldback" nozzle drive level. As you increase the nozzle drive level, the breakoff point moves towards the front end of the printhead. This point defines the “Foldback”. The print window is below the foldback. The procedure below gives an complete description.

Note: Repeat the following procedure if the ambient temperature changes to a large range.

Procedure
Do the following tasks for the nozzle drive setup.

1. Perform the printer calibration to set the ink pressure (refer to “Procedure 5” on page 7-37).
2. Enter a text message. Use the required font to print the message.
3. Follow the following procedure to find the foldback nozzle drive level.
   a. Set the nozzle drive level at one percent and increase the nozzle drive level until the breakoff point is inside the charge tunnel window. Monitor the position of the breakoff point in the charge tunnel window with a loupe or a magnifier. Refer to Figure 7-29 on page 7-43 for an example of what the ink stream looks inside the charge tunnel.
b. Increase the nozzle drive level slowly. The breakoff point moves towards the nozzle orifice (away from the front end of the printhead) as you increase the nozzle drive level. Refer to Figure 7-29.

Figure 7-29: Breakoff Point Initially Moves Toward Nozzle

Nozzle Orifice

Breakoff Point

Nozzle Orifice

Breakoff point moves toward nozzle orifice as you increase nozzle drive

Foldback occurs when the breakoff point reverses direction and moves toward the front end of the printhead as you continue to increase nozzle drive level

Figure 7-30: Foldback Occurs When Breakoff Point Reverses Direction

Note: The breakoff point disappears in the charge tunnel window while you increase the nozzle drive level. If the breakoff point disappears, decrease the nozzle drive level until the breakoff point appears. The final nozzle drive setting must be below the foldback level.

4 Do the following tasks to find the print window, or the nozzle drive range that gives good quality of print.
a. Decrease the nozzle drive level below the foldback level (step 3). Calculate the continuous nozzle drive range of values (or the print window) that meets all the following conditions:

- The print quality must be acceptable. Perform several test prints with the required font to print after the conditions referred to above are met. Make a decision about the print window, or the range of nozzle drive values that give good quality of print.
- The breakoff point must remain inside the charge tunnel. But the breakoff point is not required to be in the center.
- If there are satellite drops, they must move forward and merge in the drop stream and must join the rear of the previous drop. Refer to Figure 7-31 for an illustration of satellites that merge forward.
- The number of satellites that merge forward must be small (normally less than or equal to 3).

**Note:** The print window, useful for reliable printing, is found below the foldback level.

5 Set the nozzle drive in between the upper and lower bounds of good quality of print got in step 4. (Refer to Figure 7-32 on page 7-45). If satellites are present near the breakoff point, make sure that the number of satellites that merge forward are less than or equal to 3.

![Figure 7-31: Satellite Identification](image-url)
Setting the Guidelines for Nozzle Drive

Never set the nozzle drive more than the foldback level.

Repeat the procedure if a new nozzle or ink is added to the system. Also repeat the procedure if the ambient temperature changes to a large range.

*Note:* Do this procedure for each nozzle -1 and 2.

Positive Air Adjustment

Do the following tasks for the positive air adjustment.

1. Use the flow meters (two) together to measure the output of each slot at printhead front face at the same time.

2. Make sure the printhead is horizontal with the flow meters held in the vertical direction. If the flow meters are not vertical, the reading of the meters is changed.
3 Adjust positive air needle valve until positive air is at 2 SCFH on each flow meter.

Figure 7-33: Positive Air Adjustment

The Description of Auto Flush Option

Introduction

The auto flush option decreases the required printer maintenance. The auto flush allows the operator to start the printer and operate correctly without performing the procedure to clean the printhead.

Note: You must clean the printhead before you start the printer in normal conditions.

When the printer is shutdown, some ink remains in the printhead and ink supply line. When you start the printer again, this ink dries at the nozzle point which causes problems. The procedure removes the remaining ink from the nozzle and leaves a clean nozzle and ink line.

The Operation of Auto Flush

When the auto flush option is activated, the printer pumps to approximately 4.5 ml of pressurized make-up fluid through the printhead. This action completely cleans the nozzle and the ink return line in the printhead. The action helps to prevent problems that can occur when you restart the printer. Refer to Figure 7-34 on page 7-47 for the components of the auto flush system.
To Activate Auto Flush

When the HEAD key is turned off, the printer displays a message to the operator to run the autoflush option. When HEAD key is pressed and the operator activates the auto flush option, the auto flush solenoid is activated. The message <AUTO FLUSH RUNNING> appears on the display screen to indicate that the printer performs the procedure on auto flush correctly. The procedure on auto flush occurs at the start of the shutdown sequence that takes four minutes. When you start the printer for the next time, there is no need to clean the printhead.

Note: The procedure on auto flush does not activate by itself if the printer is shutdown in the Service mode.

Note: The manufacturer recommends that before the printer is started, you must inspect all the surfaces of the printhead to make sure they are clean. Clean the surfaces if necessary. The Auto flush will not clean any ink build up on top of catcher, High Voltage plate, charge tunnel.

Figure 7-34: Auto Flush System Components
Note: Only one nozzle is indicated in Figure 7-34 on page 7-47.

Manual Operation of Auto Flush

Introduction
You can activate auto flush manually to prime the printer. The priming procedure is like the procedure of auto flush except that the auto flush procedure pumps additional make-up fluid (4 to 5 times) through the system. You must prime to fill the auto flush line in the umbilical and printhead (refer to Figure 7-34).

Note: Prime the auto flush line in the umbilical and the printhead (filled). You must clean the nozzle with approximately 4.5ml of the make-up fluid at the shutdown. This procedure is automatic auto flush.

The Requirement of Auto Flush
The procedure on auto flush is done in these conditions:

During the printer installation:
When the printer is installed, prime the auto flush pump to add make-up fluid into a dry auto flush system (pump, umbilical and printhead).

To replace the fluids in the printer:
When the fluids expire, or have contamination, or the type of make-up fluid or ink is changed, drain the auto flush system to add new fluids.

Note: You cannot drain the auto flush pump. To remove all fluids from the auto flush system add, you must prime the auto flush pump two times (more than two times). Before you prime, put a new make-up fluid bottle or ink bottle in the fluid pan cabinet. The above process pushes all the fluids from the auto flush system, and adds new fluids.

For troubleshooting purposes:
If you find that the auto flush pump, ink valve or nozzle do not operate correctly, prime to identify problems with the system.

Tool Supplies Required
- Service tray
- Small, flat blade screwdriver
Procedure

Complete the procedure on auto flush (prime) during the printer installation to replace the fluids in the printer, or for troubleshooting purposes.

Note: If you perform this procedure during the printer installation, make sure that the printer is primed and calibrated with ink. Else, you cannot set the ink pressure and auto flush pressure. Refer to Chapter 3, “Installation” of the Service Manual for additional information.

Warning

PERSONAL INJURY. Only a trained service or the maintenance personnel must perform these procedures. The qualified personnel who complete the training courses, have knowledge about this printer, and know the potential hazards.

Prepare the Printhead for Auto Flush

Do the following tasks to prepare the printhead for auto flush.

1. Remove the printhead cover from the printhead.

2. Put the printhead into a service tray that is connected to an electrical ground.

Warning

PERSONAL INJURY. Make sure to that the printhead is ground to a service tray. If the printhead and the service tray is not connected to the electrical ground correctly, the flammable ink can cause the fire because of static discharge.

3. Use a flat blade screwdriver to turn the vertical adjustment screw to your left two full turns on the printhead (refer to Figure 7-35 on page 7-50). The nozzle raises and moves the ink stream above the catcher.

   Note: To turn the nozzle vertical adjustment screw two full turns is a reference. When priming is complete, turn the screw towards your right (two full turns) to set the ink stream to its original location before priming.

4. Turn the printhead towards the service tray.
Turn the Printer On and Start the Procedure on Auto Flush

Complete the following steps to turn on the printer and start the prime procedure.

1. Make sure that the main AC power switch (found on the side of the printer) is in the ON (I) position.
   - If YES, continue to step 2.
   - Else, turn the main AC power switch into the ON (I) position. Continue to step 2.

2. Make sure the display is illuminated. Press the HEAD key to start hydraulic and pneumatic systems.
   - If YES, continue to step 3.
   - Else, press the ON key to turn the printer on. Allow the printer to complete its startup sequence of 97 seconds. Continue to step 3.
3. Open the cabinet door to access the pneumatics cabinet (found on the rear of the fluid pan).

4. Adjust the auto flush pressure regulator (refer to Figure 7-34 on page 7-47). Monitor the auto flush pressure gauge (refer to Figure 7-36) until the pressure of auto flush is set equal to ink pressure (refer to Figure 7-36 on page 7-51). Continue to the next section.

Note: If the ink pressure is not known at this time, set the pressure of auto flush to 40psi (2.76 bar).

Begin Auto Flush
Complete the following steps to start the procedure on auto flush:

Caution
BAD PRINT. Do not start auto flush unless the ink stream raises above the catcher. Else the printer draws the make-up fluid into the module and decreases the concentration of the ink.
1. Press the correct function keys to access the Frame <01 PRIME> (refer to Figure 7-37).

2. Press the SHIFT+F3 button to select <FLUSH PRIME>.

The prompt <ADJUST FLUSH PRESSURE TO INK PRESSURE. ALIGN INK STREAM ABOVE CATCHER. INK STREAM SHOULD CLEAR PRINTHEAD.> must appear in the display screen.

Note: When the procedure on auto flush is completed, <AUTOFLUSH HAS BEEN PRIMED> appears in the display screen. If the auto flush is activated, the procedure takes approximately seven minutes. To validate if the auto flush is complete (all air removed from the lines), turn On <FLUSH
PRIME> and monitor for fluid in the nozzle. A continuous stream of fluid must move from the nozzle for 20 seconds.

*Note:* Press F3 to interrupt the prime procedure.

**How to Prepare the Printer for Operation**
Complete the following steps to prepare the printer for operation.

1. Remove the printhead from the service tray.

2. Turn the nozzle vertical adjustment screw, two full turns to your right on the printhead and the ink stream moves back into the catcher.

3. Turn On the ink and make sure that the ink stream alignment is correct.

   *Note:* You must align the ink stream further to get good quality of print while you maintain a clean printhead.

4. Put the printhead cover on the printhead.
Troubleshooting

This chapter includes:

- Troubleshooting startup problems of the printer
- Warnings
- Faults
- LED status indicators
- Electronic test points
- No signal fault
- Wiring diagrams

Introduction

This chapter describes different warnings and faults that can occur during the operation of the printer, and the action required to correct those problems.

Each printer fault and warning is described separately in this chapter. The fault and warning information is shown in the following format:

- The time at which the fault or warning is enabled
- The condition (the problem)
- The possible causes, and the related solutions

The troubleshooting chapter also gives the information on how to use the LEDs, the electronic test points and the wiring diagrams. This information helps the operator to identify the printer problems.

*Note: The symbol ** in the header cell of the tables indicates that the causes for the fault or warning can occur in the sequence shown.*
Troubleshooting Startup Problems of the Printer

When the software on the flash memory card of the printer is missing or damaged, the following two events occur:

- The progress bar that appears during the startup of the printer stops.
- An error message appears below the progress bar (for example, “No CF card inserted”).

Do the following tasks if the printer cannot load the operating software:

1. Replace the damaged card with a new flash memory card. The control circuit board is damaged if the problem continues.

2. Open the electronics compartment and make sure that there is power supply to the circuit boards (several LEDs must be illuminated). If there is no supply of power, check the PSU and the power connections.

3. Check the LEDs with labels T0 to T3 to know about the status of the printer startup.

   The labels T0 to T3 are found near the top edge of the open portion of the control board. See “Boot Progress Indicators of the Operating Software” on page 8-56.

Warnings

A warning tells you about a possible problem before the problem occurs. The warning signal allows some time to correct the problem before the warning condition becomes a fault condition.

When there is a warning condition, the following events occur:

- The Yellow LED on the keyboard illuminates continuously.

Note: If a stack light is connected to the printer, the yellow light (second light from the top) also illuminates.

- An icon that indicates the type of the warning, and the name of the warning appear on the display screen. For example Figure 8-1 on page 8-3 shows the icon that appears on the display screen during the “Fluids Low” warning condition.
Note: When a warning condition occurs, the printer continues the printing process. If the problem is not corrected, the warning condition becomes a fault condition. When the fault condition occurs, the printer stops the printing and automatically starts the shutdown sequence. The shutdown sequence requires four minutes.

The possible causes for different warnings, and the action required to correct the condition are recorded in a table in this chapter. When the warning condition is corrected, the printer automatically cancels the warning condition.

Fault and Warning Indications

When any fault occurs, the red LED in the upper right corner of the keypad illuminates. When any warning condition occurs, the amber LED illuminates.

If the alert light option is available, the alert light shows the status of the red and amber LEDs on the keypad.

If you use the optional expanded I/O board with the alarm-kit option, the printer contains one cold contact relay for warning and one cold contact relay for the faults. Refer to Appendix 10, “Spare Parts and Accessories” of the manual for the additional I/O board option.

Predominant Fault

If more than one fault or warning condition exist, the most serious condition is displayed. The icon and the name of this warning or fault condition appear in the status line, at the top of the screen. The most serious fault is the predominant fault.

Note: Several icons can appear if many faults or warnings occur. The display shows the text for only the most serious fault or warning condition.
The Fluids Low Warning

When the Fluids Low Warning occurs, refill the fluid in the ink or make-up fluid bottle within 15 minutes. If the bottle is not refilled in 15 minutes, the Fluid Out Fault occurs. Refer to “Fluid Out Fault” on page 8-17 for more information.

Figure 8-3: Icon for Fluid Low Warning

The Time Enabled

The warning is enabled when the air control solenoid is turned on.

Condition

There is no signal from the ink low sensor for 15 minutes.

Note: If the signal remains turned off for more than 15 minutes, a Fluids Out Fault occurs.
<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The fluid level in the ink or make-up fluid bottle is low.</td>
<td>Replace the empty bottle with a full bottle.</td>
</tr>
</tbody>
</table>
| 2. Wrong setting of sense air pressure in the bottles (wrong bubbler setting). | 1. Put the cap on the bottle. Put the end of the filter tube assembly below the fluid level by 25mm (1 inch) in the make-up fluid bottle.  
2. Adjust the needle valve for low fluids until a rate of two bubbles per second is reached. |
| 3. The supply line that goes into the filter tube assembly is compressed or disconnected from the bottle cap. | Check the condition of the line that goes to both filter tube assemblies. Make sure that the filter tube assembly is below the fluid level in both the bottles. |
| 4. The ink tube or make-up fluid tube connected to the ink or make-up fluid bottles is disconnected from the bottles or is not put inside the bottle correctly. | • Check the condition of the tubes that go into both the bottles. Make sure that the line goes into the bottle and the end of the tube is below the fluid level.  
• Check 1.5875mm (0.0625”) tee fitting on the bubbler line. The fitting is either broken or compressed.  
• Check the lure lock fitting at the top of the filler assembly.  
• Check the rubber tubes at the top of filter assembly for tight connections. |
| 5. The air lines that connect to the switch, or the electrical connections to the switch have problems. | • Check all pneumatic connections to the switch and the bottles.  
• Check all electrical connections from the switch to J25 connector, then to J29 connector on PEAP board.  
• Check for leaks. |
| 6. The ink low switch has defects                                     | Replace the ink low switch found on the rear of the fluid pan assembly                                                                           |

*Table 8-1: The Fluids Low Warning*
Over Speed Warning

This warning occurs when the speed of the encoder is more than the print speed of the printer.

![Warning Icon]

Figure 8-4: Icon for the Over Speed Warning

The Time Enabled

This warning occurs when the print key on the printer is turned on during the print cycle.

Condition

The printer is in the print mode and receives additional product detect signals.

Note: During this warning condition, the warning appears on the display screen, but the yellow LED or the yellow alert light are not illuminated.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The printer receives additional product detect signals because the product stops in front of the detector.</td>
<td>Do not allow the product to stop in front of the detector</td>
</tr>
<tr>
<td>2. Wrong type of product detector</td>
<td>Check the detector or detection method</td>
</tr>
</tbody>
</table>

Table 8-2: The Encoder Over Speed Warning

Not Phasing Warning

When the Not Phasing Warning occurs, correct the condition within five minutes. If the condition is not corrected within five minutes, a No Phase Time Fault occurs. Refer to “No Phase Time Fault” on page 8-13 for more information.
The Time Enabled

This warning is enabled during the process of printing.

Condition

The time interval between two jobs (printing of the messages) must be a minimum of 8.5 milliseconds.

The time interval from the end of one message printed to the start of the printing of the other message must be a minimum of 8.5 milliseconds. When this minimum time interval is not enough, this condition occurs.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The distance between the products on the conveyor is less</td>
<td>Review the application for correct detection of the product.</td>
</tr>
</tbody>
</table>
| 2. The product detector sends two signals at a time (double triggering). | Try these solutions (in the sequence shown) until the condition is corrected:  
  - Clean the detector eye  
  - Adjust the sensitivity of the product detector  
  - Check or change the position of the product detector  
  - If a fiber-optic light guide is used, replace the guide. There can be a possible damage in the guide.  
  - Replace the product detector |
| 3. The length of the message is long or the shaft encoder is not delivering enough pulses per inch | - If the maximum line-speed of the matrix is more than required, decrease the production line speed or select a faster matrix.  
  - If a shaft encoder is in use, make sure that there are enough pulses to print the whole message in the space and time required. |

Table 8-3: Not Phasing Warning
The No Signal Warning is different from the other warnings. The No Signal Warning is used as a reference during the startup of the printer. The printer does not give you a time interval (calculated before) to correct the condition.

**Note:** A temporary No Signal Warning during the startup sequence of the printer is normal. You can ignore this warning.

### The Time Enabled

When the ink stream test is done during the printhead startup or printer restart, this warning is enabled.

**Figure 8-6: Icon for No Signal Warning**

### Condition

One of the following conditions has occurred:

- There is no ink stream
- There are no ink drops
- The ink stream test signal is not applied to the ink stream by the charge tunnel
- The sensor in the ink stream cannot detect the charge on the drops.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. The time interval</td>
<td>• The printer must have a minimum of 8.5 milliseconds between the end of one</td>
</tr>
<tr>
<td>between the two product</td>
<td>product and the delivery of the next product detect signal.</td>
</tr>
<tr>
<td>detects is less</td>
<td>• Check the message that is loaded at this time for leading and trailing spaces.</td>
</tr>
<tr>
<td></td>
<td>Remove the spaces if the spaces are found.</td>
</tr>
</tbody>
</table>

*Table 8-3: Not Phasing Warning (Continued)*
<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. There is no ink stream | • Check the nozzle for blockage  
• Make sure that the ink pressure is applied to the ink supply cylinder  
• Check the ink valve  
• Make sure that the output of the ink supply cylinder is free of any blockages |
| 2. There are no ink drops | • Check and adjust the nozzle drive  
• Check the nozzle for particle obstruction  
• Replace the nozzle.  
• Check the electrical connection from the PEAP board to the nozzle  
• Check the nozzle drive output from the PEAP board at the test point (TP22 for nozzle-1, TP27 for nozzle-2). Check for waveform.  
• Make sure that the output of the ink supply cylinder is free of any blockage  
• Make sure that the ink pressure is correct  
• Replace the PEAP board. |
| 3. A signal is not applied to the charge tunnel (3.1 - 4.5VDC). | Try these solutions (in the sequence shown) until the condition is corrected:  
• Make sure that the printhead is clean and dry  
• Check for open 10K resistor connected to the charge tunnel  
• Check for output at TP22 for nozzle-1, TP27 for nozzle-2  
• Check for broken wires from the charge tunnel to the PEAP board.  
• Replace the PEAP board. |
| 4. The sensor in the ink stream does not detect the charge on the drops | • Make sure that the printhead is clean and dry  
• Make sure that the vacuum is set to 10-13 in/ hg  
• Make sure that the ink stream is aligned into the catcher.  
• Make sure that there is no ink build-up on the bottom of the catcher.  
• Make sure that the electrical connection to the catcher does not touch the printhead chassis (Dirty Contact)  
• Replace the catcher  
• Check the continuity from the catcher to the PEAP board  
• Replace the PEAP board, if necessary. |

*Table 8-4: No Signal Warning*
Faults

What is a Fault

A fault is defined as a condition of the printer that interrupts normal printer operation. The faults have many causes (for example, the ink is out of tolerance, or failure of one of the main printer components).

The printer continuously monitors all the systems for faults. There are two types of faults:

- Normal faults
- Panic faults

Normal Faults

Normal faults are faults that do not cause any permanent damage to the printer if the faults are allowed to continue. When a normal fault occurs, the printer starts the shutdown sequence.

Note: The shutdown sequence requires four minutes to complete.

Panic Faults

Panic faults are problems that can cause permanent damage to the printer if the faults are allowed to continue. When a panic fault occurs, the printer stops the operations immediately, but the display remains active to indicate the fault.

Result of a Fault

When there is a fault condition, the following events occur:

- If the printer was printing, the printing stops.
- The red LED on the keyboard illuminates.
- An icon that indicates the fault appears in the display. For example, refer to Figure 8-7 on page 8-11 for the Fluid Out fault icon.
- If the basic I/O option is in use, the contact output changes. Print ready output is turned off.
- If the three-colour stack light is used, the red light illuminates.
- If an external- yellow-strobe light is installed, the yellow strobe light flashes.
• If the optional expanded I/O board is installed within the printer with the alarm cable kit, the cold-contact relay for the fault is activated.

Figure 8-7: Fluid Out Fault

• If a normal fault occurs, the shutdown begins. The shutdown sequence requires four minutes.
• If a panic fault occurs, the printer stops the operations immediately.

Course of Action

The different faults and the actions required to correct them are shown in the format of a table in this section.

When you try one of the solutions to correct the problem, you must reset the fault condition. This action enables the printer to return to the normal operation.

Reset a Fault

There are two methods to reset a fault after you try to correct the problem:

• Press the Cancel key to reset normal faults or warnings.
• If the printer is in the Service mode, press the F4 key. You must be in one of the following frames: <01 SERVICE>, <02 SERVICE>, <03 SERVICE>, or <05 SERVICE>. 
The fault disappears from the display and allows normal operation of the printer if the tried solution corrects the problem. If the tried solution does not correct the problem, the original fault (or a different fault) appears again.

If the fault appears again, try another solution to clear the fault condition, then repeat the procedure to reset the fault. When you perform the correct action, the fault disappears from the display and printer returns to the normal operation.
No Phase Time Fault

The Time Enabled
When the printer is printing, this fault is enabled.

Condition
The time interval between the end of printing one message and the request to print another message is less.

Note: There must be a minimum of 8.5 milliseconds time interval between the printing of two messages.

Note: The print request is a software control signal. This signal is different from a product detect signal.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The distance between the products on the conveyor belt is less.</td>
<td>Review the application to find a better method of product detection.</td>
</tr>
<tr>
<td>2. The product detector sends two or (or more than two) signals at a time (double triggering).</td>
<td>Try these solutions (in the sequence shown) until the condition is corrected: 1. Clean the detector eye 2. Adjust the product detector sensitivity 3. Adjust the product detector position 4. Check all electrical connections 5. Replace the product detector</td>
</tr>
</tbody>
</table>

Table 8-5: No Phase Time Fault

Note: The fault condition indicates that the Not Phasing Warning is active for the more than five minutes.
Air Pressure Fault

The Time Enabled
This fault is enabled after the main air solenoid is turned on.

Condition
The factory-supplied air pressure has decreased to approximately 4.1 bar (60 psi) for more than 20 seconds.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. The air supply to the printer is stopped. | Try these solutions (in the sequence shown) until the condition is corrected.  
   • Make sure that the air pressure supply is connected to the printer, and the air pressure is turned on.  
   • Check the input air filter for blockage. |
| 2. The air supply to the printer has decreased to approximately 60 psi (4.1 bar). | Increase the pressure of the input air to the minimum required for the type of ink that is installed into the printer. |
| 3. The air pressure monitor switch has defects. | Try these solutions (in the sequence shown) until the condition is corrected:  
   • Use an ohm meter to check the operation of the air pressure monitor switch.  
   **Note:** The switch is normally open (NO), and held closed by the air pressure.  
   • Replace the air pressure monitor switch. |
| 4. The wires between the air pressure monitor switch and the PEAP board are cut or loose. | Try these solutions (in the sequence shown) until the condition is corrected:  
   • Check the continuity of the wires.  
   • Replace the PEAP board that has defects. |

Table 8-6: Air Pressure Fault
Ink Out Fault

**The Time Enabled**

When any of the following conditions occur, the fault is enabled:

- The printer starts with an empty make-up fluid bottle or ink bottle. The fault is sensed 60 seconds after the main air solenoid is turned on.
- The fluids low warning is active for more than 30 minutes.

**Condition**

The ink low switch is turned off for more than 30 minutes, or you tried to start the printer with an empty bottle.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low fluid level in the ink or make-up fluid bottle.</td>
<td>Check the fluid levels in both bottles. If the fluid level is low, replace the bottle that has low fluid level with a full bottle.</td>
</tr>
<tr>
<td>2. The sense air pressure in the bottles is not set correctly.</td>
<td>Put the end of the dip tube below the fluid level by 25mm (1 inch) in the bottle. Adjust the fluids low needle valve until a rate of two bubbles per second is reached.</td>
</tr>
</tbody>
</table>
| 3. The line that goes to the ink or make-up fluid bottle is disconnected from the bottle cap. Also the bottle filter assembly is not put inside the bottle correctly. | - Check the condition of the line that is connected to both the bottles.  
  - Make sure the “T” barb is not disconnected from the tubes that lead from the rear of the fluid pan.  
  - Check the "T" fitting and its connection to make sure that the tube or "T" barb is not kinked or broken. |
| 4. The ink low switch has defects | Replace the ink low switch |

*Table 8-7: Ink Out Fault*
No Air Fault

The Time Enabled
When the operator activates the ink, the fault is enabled.

Condition
The air pressure is not detected.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. The air supply to the printer is stopped. | Try these solutions (in the sequence shown) until the condition is corrected.  
• Make sure that the air supply is connected to the printer, and the air pressure is active.  
• Check the input air filter for blockage. |
| 2. The air supply to the printer has decreased to approximately 60 psi (4.1 bar). | • Increase the pressure of the input air, to the minimum required for the type of ink that is installed into the printer.  
• Check to make sure that the flow rate is available in SCFM (2.5 SCFM) |
| 3. The air pressure monitor switch has defects. | Try these solutions (in the sequence shown) until the condition is corrected:  
• Use an ohm-meter to check the operation of the air pressure monitor switch. The switch is normally open, and held closed by the air pressure.  
• Replace the air pressure monitor switch. |
| 4. The wires between the air pressure monitor switch and PEAP board are broken or loose. | Try these solutions (in the sequence shown) until the condition is corrected:  
• Check the continuity of the wires between switch and J25 connector  
• Check the continuity of wires between J25 connector and J29 connector on PEAP board.  
• Replace the PEAP board that has defects. |

Table 8-8: No Air Fault
**RAM Reinitialized Fault**

When a RAM reinitialized fault occurs, the red light on the keypad illuminates. A message "RAM Reinitialized Fault" appears at the top of the main screen (if the fault is the predominant fault).

**The Time Enabled**

When the power supply to the printer is turned on, the fault is enabled.

**Condition**

The battery backed up RAM failed. When this condition is detected, the printer sets the nozzle drive, high voltage, auto clean, ink pressure, and ink temperature to factory default values.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The lithium battery on the control circuit board is not active.</td>
<td>Replace the battery.</td>
</tr>
<tr>
<td>2. Battery backed up for RAM is corrupted.</td>
<td>Set the ink pressure, and adjust the Auto Nozzle Drive to calibrate the ink system again. (Refer to “To Set the Ink Pressure” on page 6-17 and “How to Adjust the Nozzle Drive” on page 6-21)</td>
</tr>
</tbody>
</table>

*Table 8-9: RAM Reinitialized Fault*

**Fluid Out Fault**

*Figure 8-11: Icon for Fluid Out Fault*

**The Time Enabled**

When any of the following conditions occur, the fault is enabled.

- The printer starts with an empty make-up fluid or ink bottle. When the main air solenoid is active, the fault is sensed.
- The fluids low warning is active for more than 15 minutes.
Condition

The ink low switch is turned off for more than 15 minutes, or you tried to start the printer with an empty bottle.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The fluid level in the ink or make-up fluid bottle is low.</td>
<td>Check the fluid levels in both bottles. If the fluid level is low, replace the bottle that has low fluid level with a full bottle.</td>
</tr>
<tr>
<td>2. Wrong setting of sense air pressure in the bottles.</td>
<td></td>
</tr>
<tr>
<td>3. The ink or make-up fluid tube is disconnected from the bottle cap. Also the bottle filter assembly is not put inside the bottle correctly.</td>
<td>Check the condition of the tube that goes inside both bottles. Make sure the line goes into the bottle and the end of the bottle filter assembly is below the fluid level.</td>
</tr>
<tr>
<td>4. The ink low switch has defects.</td>
<td>Replace the ink low switch.</td>
</tr>
</tbody>
</table>

Table 8-10: Fluid Out Fault

Charge Tunnel Supply Fault (Nozzle-1 and Nozzle-2)

Figure 8-12: Icon for Charge Tunnel Supply Fault

The Time Enabled

When you turn on the charge tunnel supply for nozzle-1 or nozzle-2, charge tunnel supply fault is enabled.
Condition

The PEAP board does not sense the outputs of the charge tunnel supply to nozzle-1 or nozzle-2.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Charge tunnel supply to nozzle-1 does not operate correctly</td>
<td>Replace the PEAP board.</td>
</tr>
<tr>
<td>2. Charge tunnel supply to nozzle-2 does not operate correctly</td>
<td>Replace the PEAP board.</td>
</tr>
</tbody>
</table>

Table 8-11: Charge Tunnel Supply Fault

High Voltage Supply Fault (Nozzle-1 and Nozzle-2)

The Time Enabled

When the high voltage supply for nozzle-1 and nozzle-2 is turned on, this fault is enabled.

Condition

Failure of high voltage supply for nozzle-1 or high voltage supply for nozzle-2 to operate. The PEAP board does not sense the outputs of the high voltage supply to nozzle-1 or high voltage supply to nozzle-2.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A low impedance path has occurred in the printhead, because of increase of fluid deposits on the components in the printhead.</td>
<td>Clean and dry the printhead.</td>
</tr>
</tbody>
</table>

Table 8-12: High Voltage Supply Fault
<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. There is a damaged high voltage nozzle-1 or nozzle-2 cable in the printhead or umbilical duct that causes a short circuit to ground.</td>
<td>Find and isolate the cause, and replace the umbilical duct.</td>
</tr>
</tbody>
</table>
| 3. The high voltage supply cables to nozzle-1 or nozzle-2 in the printhead have current limiting resistors, wired in series to the deflection plates. These resistors are open or have a leakage path to the ground. | Use the ohm-meter to measure the resistance from the High Voltage plate to High Voltage wire that connects to PEAP board. You must read 10M ohms. If you do not read 10M ohms, inspect the in-line resistor on the rear of the printhead. Inspect the resistor assemblies and make sure the following:  
  • The outer heat shrink is not changed by the fluids  
  • There is no damage to the heat shrink jacket material. |
| 4. The Ink deposits on the high voltage arm have made a path to the chaise of the printhead. | • Clean and dry the printhead  
  • Check the ink stream breakoff to make sure that there is no more than one satellite in the ink stream.  
  • Check the ink stream alignment (vertical and horizontal) to make sure that the ink stream enters the center of the catcher.  
  • Check the high voltage gap with H.V. gap tool (PART NUMBER 379243)  
  • Check the positive-air setting. If the positive air is set to low, ink splashes off the product and can enter the printhead. This ink can build the deposits on H.V. plate and arm. |
| 5. Intermittent high voltage faults. | • Inspect the umbilical. If the problem is because of bends or twists in the umbilical, replace the umbilical.  
  • The high voltage wire installation has broken. Replace the umbilical. |
| 6. There is a short circuit in the connection between H.V. deflection plate to the high voltage power supply on PEAP board. | • Check the solder connections at the resistor for the short circuit between shield wire and the conductor.  
  • Make sure that the installation on H.V. wire is not damaged. If the installation is damaged, repair with heat shrink.  
  • Replace the umbilical. |

Table 8-12: High Voltage Supply Fault (Continued)
High Voltage Arc Fault (Nozzle-1 or Nozzle-2)

The Time Enabled
The high voltage arc fault is enabled two seconds after the high voltage is turned on.

Condition
A high voltage arc is detected at the printhead.

Causes and Solutions

<table>
<thead>
<tr>
<th>Causes</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| The deposits of ink on the high voltage arm have made a path to the chaise of the printhead. | • Clean and dry the printhead  
• Check the ink stream breakoff to make sure that there is no more than one satellite in the ink stream.  
• Set vertical and horizontal alignment of the ink stream to make sure that the ink stream enters at the center of the catcher.  
• Check the positive-air setting. If the positive air is set to low, ink splashes off the product and can enter the printhead. This ink can build the deposits on H.V. plate and the arm |

Table 8-13: High Voltage Arc Fault
Status Fault (Nozzle-1 or Nozzle-2)

The Time Enabled
When the power supply to the printer is turned on, the status fault is enabled.

Causes and Solutions

<table>
<thead>
<tr>
<th>Causes</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The printer cannot set the nozzle drive because of hardware failure.</td>
<td>Replace the PEAP board.</td>
</tr>
</tbody>
</table>

Table 8-14: Status Fault

Phasing Fault (Nozzle-1 and Nozzle-2)

The Time Enabled
The fault is enabled 35 seconds after the printhead becomes active. When the head key or ink become active, the printhead becomes active.

Condition
The printer has passed the test to check the ink stream, but has failed to find one good phase (out of four phases).
<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. Ink deposits on the catcher.                                          | • Clean the printhead, and dry the printhead completely.  
• Check the ink stream vertical alignment.  
• Check the ink stream horizontal alignment.  
• Check for excessive vibration on printhead or umbilical. |
| 2. Contamination of the ink                                              | Perform the Ink Renewal procedure, followed by the Printer Calibration. (Refer to Appendix 7, “Maintenance”).                                      |
| 3. The printer is out of adjustment.                                     | Perform the Ink Renewal procedure, followed by the Printer Calibration. (Refer to Appendix 7, “Maintenance”).                                      |
| 4. The sensing circuit, the catcher, the wires, or the PEAP board have defects. | Try these solutions (in the sequence shown) until the condition is corrected:  
• Inspect the connections of the catcher sense (ring terminal screw) in the print head.  
• Inspect the barb that connects to the ground. The barb is on the ink return line that has defects.  
• Check the continuity of the catcher connections to either J21 or J22 connectors at the PEAP board.  
• Remove the pins of either J21 or J22 carefully and inspect the full condition of the pins and the crimps. Replace pins and make sure that they are locked into the plastic housing.  
• Make sure that the connectors are connected correctly.  
• Check the ground connections on the sensing circuits.  
• Check for continuity in sense wires, between printhead and PEAP board.  
• Replace the catcher assembly.  
• Replace the PEAP board |
| 5. The Ink stream break off is not correct.                              | • Check the ink stream breakoff within the charge tunnel to make sure that the ink stream breakoff is correct (refer to Maintenance Section).  
• Adjust the nozzle drive value to adjust the ink stream breakoff. Make sure that the breakoff is correct. |

Table 8-15: Phasing Fault
6. The ink stream alignment is not correct
   • Check the ink stream alignment to make sure that the ink stream enters the catcher correctly in horizontal direction, at the center.
   • Check to make sure that the vertical alignment of the ink stream is correct for the print matrix selected.

7. The charge tunnel can be out of alignment.
   • Make sure that the charge tunnel is not bent out of alignment. Adjust if necessary.
   • Make sure that the ink stream is in the center of the charge tunnel plates. Adjust if necessary.

8. Ink is not returning correctly, ink drips from the mouth of the catcher.
   • Make sure that the system vacuum must be in the range of 10 and 13 inch/hg.
   • Flush and dry the return line manually.
   • Make sure that the vacuum filter does not contain the contamination or blockage.
   • Check the umbilical, and make sure that there are no large dips and sharp bends.
   • Check vertical and horizontal ink stream alignments.
   • There can be a block in the return line. Back flush the return line with the make-up fluid or cleaning solution.

9. The ink stream ground connection is broken.
   Check the green ground wire from the printhead chassis and ink valve barb. Make sure that there is a good, clean, and dry connection on each nozzle.

Table 8-15: Phasing Fault (Continued)
<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 10. The air pressure does not remain the constant | • Make sure that the pressure of the input air to the printer is a minimum of 80 psi.  
• Check the external filter assembly for contamination. Clean and replace filters if the contamination is found.  
• Check for loose or bad connections in the input air pipes/hoses.  
• Make sure that any air blow offs are connected before incoming air regulator. (air guns)  
• Make sure that the ink trap of the printer does not contain ink contamination. Clean the ink trap, if necessary.  
• Check the air line between ink trap bottle and the top of the ink cylinder. Clean this line of all ink. This line is only for the air.  
• Check all pneumatic lines for air leaks |
| 11. The high voltage plate can be out of alignment. | Check the gap of the high voltage plate with the high voltage gap gauge.  
(Use gap gauge with part number: 379243).                                                                                                           |

*Table 8-15: Phasing Fault (Continued)*
Transfer Request Too Long Fault

The Time Enabled
The fault is enabled while the nozzle solenoid is active, and the ink flows.

Condition
The transfer request switch on the ink supply cylinder is closed for more than 10 seconds.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. The loss of the transfer pressure in the system. | Measure the transfer pressure and vacuum at the solenoid bank. The transfer pressure must be 15-18 psi (1.03-1.24 bar) approximately more than current ink pressure. Refer to Appendix 3, “Installation” for vacuum settings. If the transfer pressure and the vacuum are correct, try these solutions (in the sequence shown) until the condition is corrected:  
• Do an ink refresh and calibration if the ink is thick.  
• Inspect the check valve at the output of the ink module.  
• Check the shut-off valve in the ink module.  
• Inspect the input check valve on ink module between reservoir and transfer pump. Clean or replace the check valve.  
• Check the transfer pump in the ink module.  
• Check the operation of the transfer solenoid.  
• Regulate the input air if the pressure of the input air does not remain the constant.  
• Check the output of transfer pressure regulator. Replace the regulator if the fluctuations is detected. |

Table 8-16: Transfer Request Too Long Fault
2. The final ink filter has an obstruction.
   • Replace the final ink filter.
   • Make sure that there is no air in the final ink filter.
   • Perform an ink refresh and calibration.

3. The input or output pump transfer valves have defects.
   Replace the check valve.

4. The transfer request switch on the ink cylinder has defects or the wire is loose or broken.
   • Test the switch with a magnet and ohm meter to see if the connection is closed.
   • Replace the switch. The resistance across the switch must measure zero ohms. A high resistance closure of the transfer switch creates problems.

5. There is an air leak in the output line that connects from the transfer solenoid to the transfer pump or shut-off valve.
   • Make sure that there is no loose connection at the output line.
   • Replace the output line.
   • Replace the fittings.
   • Replace the ink module.

6. The magnetic float in the ink supply cylinder has gone to the bottom of the cylinder or cannot move.
   • Disassemble the ink supply cylinder and release the magnetic float.
   • Replace the float. If the float is broken, the float goes to the bottom of the cylinder.

7. There is a leak in the system.
   Check the system for leaks. Start from the output side of the ink cylinder, and continue through the umbilical to the nozzle.

8. The transfer pressure is set too low.
   • Make sure that the transfer pressure is 10 to 15 psi more than the ink pressure.
   • The transfer time interval from the turn off of the transfer switch (TXSW) to the turn on of the start switch (STSW) should be 4 - 6 seconds.

9. The time from the turn off of the (TXSW) LED (found on PEAP board) to the turn on of the (STSW) LED is greater than 10 seconds.
   Increase or decrease the transfer pressure until the time from turn off of the (TXSW) to the turn on of the (STSW) is between 4 - 6 seconds.
   **Note:** When you change the transfer pressure, make the adjustment and loosen the output fitting at the manifold. This action allows the regulator to vent to the correct pressure. ONLY adjust in small increments.

Table 8-16: Transfer Request Too Long Fault (Continued)
No Signal Fault (Nozzle-1 or Nozzle-2)

The Time Enabled

The fault is enabled seven seconds after the printhead is turned on, and both the phasing check fail after the printhead startup.

Condition

The PEAP board cannot sense the presence of any charged drops in the printhead.

Table 8-16: Transfer Request Too Long Fault (Continued)

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 10. The transfer line between check valve and final ink filter has air bubbles | • Replace the check valve.  
• Replace the final ink filter. The filter has a bad connection at the threads of the cylinder cap assembly. The air enters and the ink leaks because of the bad connection. |
| 11. The check valve has defects. | Replace the check valve. |

Figure 8-16: No Signal Fault
Note: The fault condition indicates that the No Signal Warning has occurred.

<table>
<thead>
<tr>
<th>Cause **</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. There is no ink stream. | Try these solutions (in the sequence shown) until the condition is corrected:  
  - Check the output of the ink pressure regulator with the help of the ink pressure gauge.  
  - Check the input of the ink pressure regulator.  
  - Check the nozzle for blockage.  
  - Check the ink control valve for blockage.  
  - Make sure that the output of the ink supply cylinder has ink.  
  - Make sure that the ink stream enters the catcher at the printhead.  
  - Check the printhead for any leaks at the printhead.  
  - Make sure that the output of the ink cylinder is free of any obstructions.  
  - Check the pneumatic line from the ink trap to ink cylinder for contamination. Clean or replace the line. |
| 2. There are no ink drops. | Try these solutions (in the sequence shown) until the condition is corrected:  
  - Check and adjust the nozzle drive voltage.  
  - Check the ink ground wire.  
  - Check for broken wires that lead from the PEAP board to the nozzle.  
  - Replace the nozzle.  
  - Check for the correct ink pressure.  
  - Check for broken wires from the PEAP board to the nozzle.  
  - Check the nozzle drive output from the PEAP board at the test points: TP22 NZ # 1, TP27 NZ # 2.  
  - Replace the PEAP board. |
| 3. A signal is not applied to the charge tunnel of nozzle-1 or charge tunnel of nozzle-2 (that is +3.5 to +4.5VDC RMS is not applied). | Try these solutions (in the sequence shown) until the condition is corrected:  
  - Check for open 10K ohm resistor found between the charge tunnel and the connector on the PEAP board.  
  - Check for output at TP22 on charge tunnel-1 and TP27 on charge tunnel-2.  
  - Check for broken wires from the charge tunnel to the PEAP board.  
  - Make sure that there are no dirty and loose connections at the charge tunnel.  
  - Check the charge tunnel coaxial cables for wears, damages, or bad connections at the PEAP board.  
  - Replace the PEAP board if other checks fail. |

Table 8-17: No Signal Fault
The Time Enabled

When the nozzle solenoid is on and the ink flows, the fill time too long fault is enabled.

---

### Fill Time Too Long Fault

**Table 8-17: No Signal Fault (Continued)**

<table>
<thead>
<tr>
<th>Cause **</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. There is an ink build-up between the catcher and the printhead chassis.</td>
<td>Clean and dry printhead completely.</td>
</tr>
</tbody>
</table>
| 5. Ink is not returning correctly because there is a leak at the printhead. | • Make sure that the vacuum setting is 10-13in/ hg.  
• Make sure that the return line is not damaged. If the return line is found damaged, replace the return line.  
• Make sure that the vacuum filter does not contain the contamination or blockage.  
• Flush the return line manually.  
• Replace the ink catcher. |
| 6. There is no sense signal at the catcher. **Note:** This signal is the integrated electrical charge collected in the ink block assembly across a small section of the ink return line. | Try these solutions (in the sequence shown) until the condition is corrected:  
• Clean and dry the printhead.  
• Check for signal at TP72 and TP73 for Nozzle-1, TP77 and TP78 for Nozzle-2.  
• Check for output at TP22 and TP27.  
• Make sure that the sense wires are not open or connected to the ground.  
• Check the electrical connections at the catcher.  
• Check the connections at J21 or J22.  
• Check the connection of ground wire at the barb on the ink return line.  
• Replace the PEAP board.  
• Check the green ground wire between printhead chassis and ink valve barb. |
Condition

The transfer request switch has opened, but more than 20 seconds have passed, and the start switch is not closed.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The input air pressure is lower than normal for the type of ink used.</td>
<td>Make sure that the pressure of the input air is minimum 1.03 bar (15 psi) above the current ink pressure.</td>
</tr>
<tr>
<td>2. The transfer pressure is lower than normal.</td>
<td>• Make sure that the transfer pressure is 1.03-1.24 bar (15-18 psi) above the current ink pressure. • Make sure that there is no air leak between the transfer pump and the transfer solenoid. • Ink is thick, perform an ink refresh and calibration procedure. • Transfer time must be between 5 - 6 seconds from turn off of transfer switch to turn on of start switch.</td>
</tr>
<tr>
<td>3. The transfer line is compressed, or is of the wrong size.</td>
<td>Make sure the transfer line is not compressed. Also make sure that the transfer line is of the correct size for the type of ink used. (Refer to Appendix 3, “Installation”).</td>
</tr>
<tr>
<td>4. The vacuum is low for the type of ink used.</td>
<td>Make sure that the vacuum setting is correct for the type of ink used. (Refer to Appendix 3, “Installation”).</td>
</tr>
<tr>
<td>5. The transfer pump has defects.</td>
<td>Check the shut-off valve diaphragm and the transfer pump diaphragm for separation and damage. Replace the pump diaphragm or the transfer solenoid, if necessary.</td>
</tr>
<tr>
<td>6. There is a blockage in the final ink filter.</td>
<td>Check the flow through the filter. Replace the final ink filter, if necessary.</td>
</tr>
<tr>
<td>7. The filter contains an air bubble or is not filling completely</td>
<td>Perform an auto prime procedure.</td>
</tr>
<tr>
<td>8. Ink is clogging the top cap of the ink cylinder.</td>
<td>Disassemble the ink cylinder and clean the top cap assembly.</td>
</tr>
<tr>
<td>9. The check valve has defects.</td>
<td>Replace the input and output check valves found on the ink module.</td>
</tr>
</tbody>
</table>

Table 8-18: Fill Time Too Long Fault
Empty Time Too Long Fault

The Time Enabled
When the nozzle solenoid is on and the ink flows, the empty time too long fault is enabled.

Condition
The current ink time is greater than 125 percent of the set point time during normal operation.

Note: Some service functions can allow the current ink time to be 150 percent of set point time.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is a blockage in the printhead nozzle.</td>
<td>Perform a back flush of the nozzle. Replace the nozzle, if necessary.</td>
</tr>
<tr>
<td>2. The lines and fittings, between the ink supply cylinder and the printhead have blockages or are bent or compressed.</td>
<td>Make sure that there are no blockages, bends or compression in the lines and fittings.</td>
</tr>
<tr>
<td>3. The ink pressure is lower than normal.</td>
<td>Perform the Ink Renewal procedure, followed by the Printer Calibration. (Refer to Appendix 7, “Maintenance”).</td>
</tr>
<tr>
<td>4. The bottom cap of the cylinder is clogged.</td>
<td>Disassemble the ink cylinder and clean the bottom cap assembly.</td>
</tr>
</tbody>
</table>

Table 8-19: Empty Time Too Long Fault
Flow Time Too Long Fault

The Time Enabled
The fault is checked while the ink flows (the nozzle solenoid is turned on).

Condition
The current ink time is from 116 to 124 percent of the set point time.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The make-up fluid is not added to the ink module. The in-line filter is clogged, or the make-up add valve is clogged, or there are problems with the settings of make-up add or make-up add solenoid.</td>
<td>Flush the nozzle with the make-up fluid to check the nozzle for blockage.</td>
</tr>
<tr>
<td>2. There is a minor blockage in the nozzle-1 or nozzle-2.</td>
<td>Perform the Ink renewal procedure, followed by the printer calibration. (Refer to Appendix 7, “Maintenance”).</td>
</tr>
<tr>
<td>3. The system is out of calibration.</td>
<td>Check the flow of the fluid through the ink control valve. Replace the damaged valve.</td>
</tr>
<tr>
<td>4. The ink control valve for nozzle-1 or nozzle-2 does not open.</td>
<td></td>
</tr>
<tr>
<td>5. The float in the ink supply cylinder is sticking (not stuck).</td>
<td>• Make sure that the printer is vertical to the floor (it must not tilt). • Ink Cylinder or float are damaged. Contact the Videojet Service Technician.</td>
</tr>
</tbody>
</table>

Table 8-20: Flow Time Too Long Fault
6. The ink control valve is connection is tight at the nozzle.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Check the setting of the ink control valve to the nozzle, and adjust as necessary. When you connect the valve correctly, the ink control valve moves up and down on the back of nozzle.</td>
<td></td>
</tr>
<tr>
<td>• There can be many O-rings inside the ink valve. One O-ring is enough. Remove the O-rings that are additional.</td>
<td></td>
</tr>
</tbody>
</table>

*Table 8-20: Flow Time Too Long Fault*
Flow Time Too Short Fault

The Time Enabled
The fault is checked while the ink flows (the nozzle solenoid is turned on).

Condition
The current ink time is less than 84% of the set point time.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is a leak between the output of the ink supply cylinder and the nozzles.</td>
<td>• Check for hydraulic leaks (ink dripping) between the output of the ink supply cylinder and the nozzles.</td>
</tr>
<tr>
<td>2. The ink has become very thin.</td>
<td>Try these solutions (in the sequence shown) until the condition is corrected: • Check the make-up add valve in the ink module for any leaks. • Make sure that there are no leaks in the make-up add solenoid. • Perform the Ink Renewal procedure, followed by the procedure of printer calibration. (Refer to Appendix 7, “Maintenance”).</td>
</tr>
<tr>
<td>3. Float sticking in cylinder.</td>
<td>• Make sure that the inner tubes of the cylinder are not damaged or bent. • Make sure that there are no ink deposits on walls of the ink cylinder. • If float is sticking to bottom cap of ink cylinder, remove and clean the float.</td>
</tr>
<tr>
<td>4. Leak in the ink system.</td>
<td>Inspect the ink system for leaks around the fittings.</td>
</tr>
<tr>
<td>5. Incorrect ink pressure calibration.</td>
<td>Perform another ink pressure test or calibration. Perform an ink refresh and calibration.</td>
</tr>
</tbody>
</table>

Table 8-21: Flow Time Too Short Fault
Reservoir Low Too Long Fault

The Time Enabled
When the fluids request signal stops, the reservoir low too long fault occurs.

Condition
The fluids request continued for more than 20 seconds.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. The system vacuum is low or not present. | • The system vacuum must measure 10 - 13in/hg.  
• Make sure that there is no blockage in the vacuum filter. Replace if necessary. |
| 2. The fresh ink or the make-up fluid line and refill bottle filter have blockages or are compressed | • Inspect the fluid lines for blockages or bends. Replace if necessary.  
• Inspect the bottle filters for blockages. Replace if necessary. |
| 3. The float in the ink module has gone to the bottom of the module, or there is no free movement | Remove the cap and the stem assembly, and inspect the float. |
| 4. The reed switches found on the cap and stem assembly have defects. | Replace the cap and the stem assembly. |
| 5. The vacuum filter has blockage. | Replace the vacuum filter. |
| 6. The ink or the make-up add valve have defects or leaks. | Repair or replace the ink or the make-up add valve, and make sure that there is no vacuum leak. |

Table 8-22: Reservoir Low Too Long Fault
The Reservoir Overfill Fault

The Time Enabled
When the printer is turned on, the reservoir overfill fault is enabled.

Condition
The magnetic float moves upward in the ink module and closes the overfill switch.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. The ink add or make-up add solenoid has defects.</td>
<td>Replace the ink add solenoid or the make-up add solenoid, and make sure that there is no vacuum leak.</td>
</tr>
<tr>
<td><strong>Table 8-23: Reservoir Overfill Fault</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table 8-23: Reservoir Overfill Fault (Continued)**
Reservoir Switches Fault

The Time Enabled
The reservoir switches fault is enabled one second after the printer is turned on.

Condition
Two out of three reservoir switches are on at the same time: reservoir low, reservoir full, and reservoir overfill

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| When the printer is turned on, the printhead is cleaned. | • Clean or replace the lines or parts that contain the contamination.  
• Turn off the printer and drain 2-3 ml of fluid from the drain port of the module. |

Table 8-24: Reservoir Switches Fault

Note: You cannot reset the above fault. After the troubleshooting, turn the AC power supply off, and turn on again.
Pressure Tank Switches Fault

The Time Enabled
The fault is enabled one second after the AC switch is turned on.

Condition
The two pressure tank switches are on at the same time—pressure tank low and pressure tank full switches.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>One or both of the switches failed</td>
<td>Replace the switch that has defects.</td>
</tr>
</tbody>
</table>
| Wiring or connector problem. | • Check the wires from the switches to make sure that there are no breaks in the insulation. The switches end in the connector on the back side of the fluid pan. Check the connection and pin seating within the connector.  
  • Check the harness that connects the fluid pan to the PEAP board. |

Table 8-25: Pressure Tank Switches Fault

Note: You cannot reset this fault. After the problem is corrected using the solutions shown in the above table, turn off the AC power and turn on again. Use the AC power switch. If the problem was corrected, the fault disappears. If not, try another solution and repeat this procedure.

Fluid System Empty Prime Required
When a prime required warning occurs, the amber light on the keypad illuminates. The “Fluid System Empty Prime Required” message appears at the top of the main screen if the condition is predominant.

Time Enabled
When the print head is turned on, the fault is enabled.
Condition

When you try to turn on the ink in the printer, the pressure tank low and the reservoir low switches are both turned on.

Table 8-26 shows the possible cause and solution for the Fluid System Empty Prime Required.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The printer has lost prime.</td>
<td>Perform the procedures to auto prime and load the ink.</td>
</tr>
</tbody>
</table>

*Table 8-26: Fluid System Empty Prime Required*

Print Engine Undefined Fault

When a print engine undefined fault occurs, the red light on the keypad illuminates. The printhead begins its normal sequence of shutdown. If the fault is predominant, the “Print Engine Undefined Fault” message appears also at the top of the main screen.

The Time Enabled

On power up

Condition

A print engine fault that is not defined has occurred.

Table 8-27 records the possible cause and solution for the print engine undefined fault.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A print engine fault that is not defined has occurred</td>
<td>Restart the printer. If this fault continues, load the current version of the printer software to the flash memory card of the printer.</td>
</tr>
</tbody>
</table>

*Table 8-27: Print Engine Undefined Fault*
PEAP Watchdog Timeout

When a PEAP watchdog timeout fault occurs, the red light on the keypad illuminates. Also the “PEAP Watchdog Timeout” message appears at the top of the main screen if the fault is predominant.

The Time Enabled

When the power supply to the printer is turned on, the PEAP watchdog timeout fault is enabled.

Condition

The printer software that controls the ink system cannot run for more than or equal to one second. Restart the printer. If the problem continues, update or replace the operating software of the printer.

This fault is a panic fault. The normal methods cannot reset the panic faults. After the problem is corrected, use the AC power switch to turn off the AC power, then turn on the power.

PEAP 24V Disabled

When a PEAP 24V disabled fault occurs, the red light on the keypad illuminates. The ink, the high voltage, all the valves switch off immediately. Also the “PEAP 24V Disabled” message appears at the top of the main screen if the fault is predominant.

The Time Enabled

When the power supply to the printer is turned on, the PEAP 24V disabled fault is enabled.

Condition

The controller board does not turn on the +24V SW on the PEAP board.
The normal methods cannot reset the panic faults. After the problem is corrected, turn off and turn on the AC power switch.

## Fan Failure Fault

When a fan failure fault occurs, the red light on the keypad illuminates. Then the printhead begins its normal sequence of shutdown of four minutes. Also the “Fan Failure Fault” message appears at the top of the main screen if the fault is predominant. Then the Fan Failure icon appears.

### The Time Enabled

When the AC power is turned on, the fan failure fault is enabled.

### Condition

The sensor in the cooling fan reports that the fan does not operate.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The power cable to the cooling fan has defects or the cable is disconnected.</td>
<td>Check the cable at the connector J25 on the PEAP board.</td>
</tr>
<tr>
<td>The cooling fan has defects</td>
<td>Replace the cooling fan</td>
</tr>
</tbody>
</table>

Table 8-29: Fan Failure Fault
Cabinet Over Temperature Fault

When a cabinet over temperature fault occurs, the red light on the keypad illuminates. Then the printhead begins its normal sequence of shutdown of four minutes. Also the “Cabinet Over Temperature Fault” message appears at the top of the main screen if the fault is predominant. Then the Cabinet Over Temperature icon appears.

The Time Enabled

The cabinet over temperature fault is enabled during the printhead startup.

Condition

The temperature of the internal cabinet is more than 63 °C (145 °F). The temperatures above this level can damage the circuitry.

Note: This temperature is monitored at TP87 on the PEAP board.

<table>
<thead>
<tr>
<th>Cause**</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The environment where the printer operates is hot</td>
<td>Move the cabinet to the correct environment or use external systems to increase or decrease the temperature according to the requirement.</td>
</tr>
<tr>
<td>The temperature sensor detects high fault temperatures near the sensor.</td>
<td>Check the fan assembly for correct operation. If the fan operates correctly, replace the PEAP board.</td>
</tr>
</tbody>
</table>

Table 8-30: Cabinet Over Temperature Fault
Bad Quality of the Print

The possible causes and required action for bad quality of the print are shown in the Table 8-31.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 1. The bottom of the code is being clipped. | • Clean the printhead.  
• Adjust vertical height of ink stream.  
• High voltage gap is not correct. Gap the high voltage plate with recommended high voltage gap tool (part number: 379243).  
• Adjust high voltage setting (recommended at 50%).  
• Refresh and calibrate again. |
| 2. The ink stream breakoff is not correct. | • Adjust the nozzle drive setting.  
• Perform the ink stream breakoff procedure. Refer to Maintenance Section for more information. |
| 3. The vertical alignment of the ink stream is incorrect. | • Adjust vertical height of ink stream.  
• Nozzle installed incorrectly. Remove and reinstall correctly. |
| 4. Ink build-up found on top of ink catcher. | Try these solutions (in the sequence shown) until the condition is corrected:  
• Clean the printhead.  
• Adjust vertical height of ink stream.  
• Make sure that the nozzle drive setting is correct.  
• High voltage gap is not correct. Gap the high voltage plate with recommended high voltage gap tool (PART NUMBER: 379243).  
• Adjust high voltage setting (recommended at 50%).  
• Check for excessive vibration. |

Table 8-31: Bad Quality of the Print
<table>
<thead>
<tr>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. The code is broken. The ink drops do not fall on the product</td>
<td>• Make sure that the printhead does not touch the production line or any source of vibration.</td>
</tr>
<tr>
<td>continuously to make a complete message.</td>
<td>• Make sure that the positive airflow is not set very high. Set between 2 +/- 0.5 SCFH.</td>
</tr>
<tr>
<td>• The shaft encoder is not receiving required number pulses per inch.</td>
<td>• The distance between the printhead and the product is large. The distance must not be more than 4.4625 mm (3/16”).</td>
</tr>
<tr>
<td>• The shaft encoder can be slipping.</td>
<td>• Check the output of all power supplies and input AC power for noise problem.</td>
</tr>
<tr>
<td>• The printhead has excessive vibration.</td>
<td>• Perform a check for a slipping shaft encoder.</td>
</tr>
<tr>
<td></td>
<td>• Check for the correct alignment of the shaft encoder.</td>
</tr>
<tr>
<td></td>
<td>• Replace the shaft encoder.</td>
</tr>
<tr>
<td></td>
<td>• Check for excessive vibration.</td>
</tr>
<tr>
<td>6. Mist of ink (halo affect) appears around the code.</td>
<td>Make sure positive airflow is not set very high. Set between 1 - 2 +/- 0.5 SCFH.</td>
</tr>
<tr>
<td>7. The characters are separated vertically because:</td>
<td></td>
</tr>
<tr>
<td>• The distance between the printhead and the product is large.</td>
<td></td>
</tr>
<tr>
<td>• High voltage set to a very high value.</td>
<td></td>
</tr>
<tr>
<td>• High voltage gap is set very tight.</td>
<td></td>
</tr>
<tr>
<td>• Excessive vibration on printhead or product.</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-31: Bad Quality of the Print (Continued)
<table>
<thead>
<tr>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| 8. The width of the code does not remain same. | • If the shaft encoder is used, check for slipping encoder.  
• Check the encoder jumpers of the printer for correct settings.  
• Check the software of the printer for correct Encoder setting (internal, reduced, direct, ext, auto).  
• If a shaft encoder is used, make sure that the reduction factor is set correctly.  
• Check the PPR of the encoder to make sure that the correct shaft encoder is used.  
• Make sure that the pulses per inch (PPI) delivered from the encoder are correct for the application. If many pulses are generated, the width of the code does not remain same because of decrease in the maximum line speed.  
• Check the printer settings for multi-stroke. Make sure that the multi-stroke is set to the correct setting. (Example multi-stroke = 1). |
| 9. The characters are separated horizontally. | • The shaft encoder coupling is broken or loose.  
• The encoder is not related to product movement, encoder slippage.  
• The product is struck on the production line.  
• The maximum line speed/characters per inch of the current print matrix is being exceeded. Reduce line speed or pick a different matrix. |
| 10. The ink drips from the catcher.         | • Make sure that the vacuum setting is between 11 and 13 in/hg.  
• Make sure that the vacuum filter does not contain any contamination or blockage.  
• Circulate the ink for some time within the service tray. The dried ink in the return line can create a small blockage. The circulation of ink makes the dried ink wet, and removes the blockage.  
• Make sure that the return line is not bent or stretched. |

Table 8-31: Bad Quality of the Print  (Continued)
Printer Setup Guide

Nozzle Drive Specifications

- Set the ink pressure first, and allow the pressure to set for more than 30 seconds
- Higher drive is needed for opaque inks
- The ink stream must be symmetrical
- The point of break-off and satellite recombination must occur inside the charge tunnel

![Figure 8-25: Sample of Proper Ink Stream Break Off](image)

The Ink Stream Alignment

Use horizontal and vertical adjustments, and send the ink stream (Item 2, Figure 8-26 on page 8-47) into the catcher (Item 1).

![Figure 8-26: Proper Ink Stream Alignment](image)
Visual Print Quality Troubleshooting Guide

Nozzle Drive Too High

Nozzle Drive Too Low

Ink Stream Aligned Too Low

Ink Stream Aligned Too High
Auto Flush - Troubleshooting

Description

This section helps you find, examine, and correct auto flush problems. The possible causes for these conditions are recorded in the order they can occur. Refer to Table 8-32

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
</table>
| The Pressure of Auto Flush is Low | The pressure of the Auto flush is set very low or there is a problem with the pressure setting. | 1. Check for blockage in the tube.  
2. Check the pressure of auto flush.  
3. Replace the pressure regulator of auto flush.  
4. Check the solenoid valve. |
| The Auto Flush does not prime | 1. A check valve in the auto flush pump is closed. | 1. Remove the input tube (bottom tube) from the auto flush pump.  
2. Use a syringe (part number 207499) and tube (part number 251413) to flush the pump with the make-up fluid. The check valve opens. Repeat if necessary.  
3. Reconnect the input tube to the auto flush pump, and prime the machine. |
|                               | 2. The auto flush solenoid has defects. | 1. When you run the auto flush, check for +12VDC at the solenoid.  
2. Replace the solenoid auto flush. |
|                               | 3. There is a leak in the auto flush fluid line. | 1. Inspect all tubes that start from the make-up fluid bottle, through the pump to the nozzle.  
2. Press the tube between the restrictor and the "Y" connector.  
3. Change the restrictor. |
|                               | 4. A check valve in the auto flush pump has defects. | Replace the auto flush pump. |

Table 8-32: The Conditions and Solutions for Auto Flush
<table>
<thead>
<tr>
<th>Condition</th>
<th>Cause</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Auto flush does not run. (no fluid stream</td>
<td>1. The pressure of the auto flush is low.</td>
<td>Increase the air pressure to a minimum.</td>
</tr>
<tr>
<td>through the nozzle)</td>
<td>2. The auto flush solenoid has defects.</td>
<td>1. Run the auto flush and check for +12V DC at the solenoid.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Replace the auto flush solenoid of 2.41 bar (35 psi).</td>
</tr>
<tr>
<td></td>
<td>3. The ink/auto flush valve does not open.</td>
<td>Replace the ink/auto flush valve or the nozzle.</td>
</tr>
<tr>
<td></td>
<td>4. The auto flush pump is defective.</td>
<td>Replace the auto flush pump.</td>
</tr>
<tr>
<td>One nozzle operates at a time</td>
<td>The fluid flows only through one nozzle.</td>
<td>1. Increase the air pressure to a minimum of 2.41 bar (35 psi).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Replace the ink/auto flush valve or the nozzle.</td>
</tr>
<tr>
<td>The fluid stream is not stable.</td>
<td>The air input pressure is high for the make-up fluid.</td>
<td>Adjust the auto flush pump pressure, so that the pump pressure becomes equal to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ink pressure.</td>
</tr>
<tr>
<td>Ink flows backwards into auto flush line.</td>
<td>There is blockage in the restrictor of auto flush.</td>
<td>Replace the restrictor.</td>
</tr>
</tbody>
</table>

Table 8-32: The Conditions and Solutions for Auto Flush (Continued)
LED Printer Status Indicators

Introduction

Many light emitting diodes (LED) that indicate the faults are present on the PEAP board. Refer to Figure 8-27. The PEAP board is found in the electronics cabinet of the printer. The LED display is useful to show the accurate cause of a printer fault.

Figure 8-27: LED Panel on the PEAP Board
Use the LEDs for Troubleshooting

The LEDs are useful during the troubleshooting. You must know the sequence of operation of the printer to use the LEDs and detect the faults. The sequence of operation of the printer includes:

- Power-up of the printer
- The Startup of the printer
- Printer shutdown
- The printhead restart
- Printhead shutdown
- Ink transfer or recycling
- Make-up add and the fresh ink add.

Refer to Appendix 5, “Theory of Operation” for more information on the sequence of operations.

When a problem occurs, the LEDs indicate the status of the printer. The LEDs show which valves, switches, power supplies, etc., were active or not active.

Table 8-33 records the LED status and their descriptions.

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>When LED illuminates</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>+24VDC Power Supply Status</td>
<td>+24V Power Supply is turned on</td>
</tr>
<tr>
<td>+12V</td>
<td>+12VDC Power Supply Status</td>
<td>+12V Power Supply is turned on</td>
</tr>
<tr>
<td>+LV</td>
<td>Low Voltage (+5V, 3.3V, 1.22V) DC Status</td>
<td>The low-voltage-power supplies on the PEAP board is turned on</td>
</tr>
<tr>
<td>AEN</td>
<td>Analog Circuit Enable Status</td>
<td>Analog circuit enable is turned on, Power is supplied Nozzle Drive Circuit, Charge Amps, and High Voltage Power Supplies are on.</td>
</tr>
<tr>
<td>APWR</td>
<td>Analog Power Status</td>
<td>+24V power supply to above analog circuits is on</td>
</tr>
<tr>
<td>MUIS</td>
<td>Make-up Inhibit Switch cycle status</td>
<td>Make-up Ink Inhibit Switch closed on Last cycle</td>
</tr>
<tr>
<td>TXSW</td>
<td>Transfer Switch</td>
<td>The transfer Switch is turned on</td>
</tr>
<tr>
<td>STSW</td>
<td>Start Switch</td>
<td>The start switch is turned on</td>
</tr>
<tr>
<td>OFIL</td>
<td>Reservoir Overfill Switch</td>
<td>The reservoir overfill switch is turned on</td>
</tr>
</tbody>
</table>

Table 8-33: LED Status Indicators
<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>When LED illuminates</th>
</tr>
</thead>
<tbody>
<tr>
<td>IREQ</td>
<td>Ink Request Switch</td>
<td>Ink Request switch within the ink module is turned on</td>
</tr>
<tr>
<td>ILOW</td>
<td>Ink Low Switch</td>
<td>Ink Low Switch is turned on</td>
</tr>
<tr>
<td>MUSW</td>
<td>Make-up Ink Inhibit Switch</td>
<td>Make-up Ink Inhibit Switch within the ink module is turned on</td>
</tr>
<tr>
<td>AIR</td>
<td>Main Air Switch</td>
<td>Main air is on (Air exists)</td>
</tr>
<tr>
<td>AVAL</td>
<td>Air Valve</td>
<td>The air valve is turned on</td>
</tr>
<tr>
<td>TVAL</td>
<td>Transfer Valve</td>
<td>Transfer valve is turned on</td>
</tr>
<tr>
<td>NVAL</td>
<td>Nozzle Valve</td>
<td>The nozzle valve is turned on (Ink flows to printhead)</td>
</tr>
<tr>
<td>MVAL</td>
<td>Make-up Valve</td>
<td>Make-up Valve is turned on</td>
</tr>
<tr>
<td>IVAL</td>
<td>Fresh Ink Adder Valve</td>
<td>Fresh Ink Adder Valve is turned on</td>
</tr>
<tr>
<td>FPMP</td>
<td>Auto Flush Pump</td>
<td>Auto Flush Pump is turned on</td>
</tr>
<tr>
<td>CV-1</td>
<td>Charge Voltage Power Supply Nozzle # 1</td>
<td>Charge Voltage Power Supply Nozzle # 1 is turned on</td>
</tr>
<tr>
<td>HV-1</td>
<td>High Voltage Power Supply Nozzle # 1</td>
<td>High Voltage Power Supply Nozzle # 1 is turned on</td>
</tr>
<tr>
<td>PHA1</td>
<td>Phase Stability Status Nozzle # 1</td>
<td>Indicates a Phasing Fault or No Signal Fault at the Nozzle # 1</td>
</tr>
<tr>
<td>CV-2</td>
<td>Charge Voltage Power Supply Nozzle # 2</td>
<td>Charge Voltage Power Supply Nozzle # 2 is turned on</td>
</tr>
<tr>
<td>HV-2</td>
<td>High Voltage Power Supply Nozzle # 2</td>
<td>High Voltage Power Supply Nozzle # 2 is turned on</td>
</tr>
<tr>
<td>PHA 2</td>
<td>Phase Stability Status Nozzle # 2</td>
<td>Indicates a phasing fault or No signal fault Present Nozzle # 2</td>
</tr>
</tbody>
</table>

*Table 8-33: LED Status Indicators (Continued)*
Control Board

On the portion of the control board that extends from behind the print engine board, a number of LEDs are seen.

Figure 8-28: Control Board LED Location
The colors and functions of these LEDs are shown in Table 8-34.

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Mnemonic</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>D23</td>
<td>Green</td>
<td>PD1</td>
<td>Input from the product detector 1. In some product detectors, this light is turned off and lighting only to indicate a successful detection of the product. For other product detectors, this light is turned off, and not illuminated to indicate a detected product.</td>
</tr>
<tr>
<td>D24</td>
<td>Red</td>
<td>ENC A</td>
<td>Indicates a pulse from the shaft encoder A.</td>
</tr>
<tr>
<td>D25</td>
<td>Red</td>
<td>ENC B</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D27</td>
<td>Yellow</td>
<td>OUT 6</td>
<td>The output relay related to Basic I/O port is active.</td>
</tr>
<tr>
<td>D28</td>
<td>Red</td>
<td>SIREN</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D29</td>
<td>Red</td>
<td>RED</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D30</td>
<td>Yellow</td>
<td>YEL</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D31</td>
<td>Green</td>
<td>GRN</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D33</td>
<td>Yellow</td>
<td>INT ENC</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D34</td>
<td>Red</td>
<td>BKLSH</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D35</td>
<td>Green</td>
<td>DIR</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D36</td>
<td>Yellow</td>
<td>T0, T1, T2 and T3</td>
<td>Indicate the status while you load the operating software from the flash memory card. See “Boot Progress Indicators of the Operating Software” on page 8-56 for more information.</td>
</tr>
<tr>
<td>D40</td>
<td>Green</td>
<td>JET1</td>
<td>Indicates the communication with the print engine board.</td>
</tr>
<tr>
<td>D41</td>
<td>Green</td>
<td>JET2</td>
<td>currently not used.</td>
</tr>
<tr>
<td>D42</td>
<td>Red</td>
<td>RESET</td>
<td>The control board is in the process of resetting itself.</td>
</tr>
<tr>
<td>D43</td>
<td>Green</td>
<td>BOOT</td>
<td>The control board is booting up.</td>
</tr>
<tr>
<td>D49</td>
<td>Green</td>
<td>5V</td>
<td>The 5V supply is turned on.</td>
</tr>
<tr>
<td>D50</td>
<td>Green</td>
<td>1.8V</td>
<td>The 1.8V supply is turned on.</td>
</tr>
<tr>
<td>D51</td>
<td>Green</td>
<td>3.3V</td>
<td>The 3.3V supply is turned on.</td>
</tr>
<tr>
<td>D52</td>
<td>Green</td>
<td>2.5V</td>
<td>The 2.5V supply is turned on.</td>
</tr>
</tbody>
</table>

*Table 8-34: Control Board LED Functions*
Boot Progress Indicators of the Operating Software

During the boot process, the LEDs T0, T1, T2, and T3 indicate the status of loading the operating software from the flash memory card. The LED status are useful to debug faults in the boot process (particularly if no video is displayed on the screen).

If T3 is not illuminated, these LEDs indicate the progress of the boot procedure, as shown in Table 8-35.

<table>
<thead>
<tr>
<th>T3</th>
<th>T2</th>
<th>T1</th>
<th>T0</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Main has been entered.</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Normal mode has been chosen.</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>On</td>
<td>Found file system on flash memory card.</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Programmed main programmable gate array.</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>About to start main application from flash card.</td>
</tr>
</tbody>
</table>

Table 8-35: Indications of Operating Software Boot Progress

---

**Table 8-34: Control Board LED Functions (Continued)**

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Mnemonic</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>D56</td>
<td>Green</td>
<td>PWR GD</td>
<td>All four of the control board component supplies (5V, 1.8V, 3.3V and 2.5V) are turned on. All four of them operate within 10% of the required voltage.</td>
</tr>
<tr>
<td>D57</td>
<td>Green</td>
<td>CF2</td>
<td>Flash memory card 2 is accessed.</td>
</tr>
<tr>
<td>D58</td>
<td>Green</td>
<td>CF1</td>
<td>Flash memory card 1 is accessed.</td>
</tr>
<tr>
<td>D60</td>
<td>Green</td>
<td>CF2 on</td>
<td>Flash memory card 2 is on.</td>
</tr>
<tr>
<td>D61</td>
<td>Green</td>
<td>CF1 on</td>
<td>Flash memory card 1 is on.</td>
</tr>
<tr>
<td>D62</td>
<td>Green</td>
<td>USB LINK</td>
<td>Not currently used.</td>
</tr>
<tr>
<td>D63</td>
<td>Green</td>
<td>PD2</td>
<td>Not currently used.</td>
</tr>
<tr>
<td>D65</td>
<td>Yellow</td>
<td>IN 9</td>
<td>Indicates activity on the Basic I/O port’s input line.</td>
</tr>
<tr>
<td>D69</td>
<td>Yellow</td>
<td>PRINT 1</td>
<td>Print Image in process.</td>
</tr>
<tr>
<td>D71</td>
<td>Yellow</td>
<td>PRINT 2</td>
<td>Not currently used.</td>
</tr>
</tbody>
</table>

---

LED Printer Status Indicators
If T3 is lit, however, these LEDs indicate a fault condition, as shown in Table 8-36.

<table>
<thead>
<tr>
<th>T3</th>
<th>T2</th>
<th>T1</th>
<th>T0</th>
<th>Fault Indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>No flash memory card inserted.</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>No valid file system found on flash memory card.</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>No valid main gate array code found.</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>No valid print engine gate array code found.</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>No valid nucleus code found.</td>
</tr>
</tbody>
</table>

*Table 8-36: Fault Indications*
Electronic Test Points

Introduction
To find the cause of printer faults and other conditions, you must check the control board and the PEAP board during some conditions. The test points on the control board and the PEAP board help to find and separate a problem.

When a wire breaks or printhead failure occurs, electrical circuit checks are necessary. Use a digital voltmeter (DVM) or an oscilloscope (as necessary) to check:

- The voltage signal levels at the printhead, control board and the PEAP board.
- The continuity and resistance of a wire, or the functions of a circuit or component.

Refer to Figure 8-29 on page 8-70 for the location of the test points on the print engine circuit board. Refer to Table 8-37 on page 8-60 to find the signal definition for each test point.
Table 8-37 records the test points and the signal definition for the print engine board.

<table>
<thead>
<tr>
<th>Test Point</th>
<th>Signal Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP80, TP91, TP92, TP65, TP93, TP94, TP5, TP60, TP15, TP24, TP29, TP56, TP69</td>
<td>Ground</td>
</tr>
<tr>
<td>TP81</td>
<td>+24VDC input from the power supply</td>
</tr>
<tr>
<td>TP83</td>
<td>+24VDC input to +12V valve regulator</td>
</tr>
<tr>
<td>TP82</td>
<td>+12VDC valve voltage</td>
</tr>
<tr>
<td>TP85</td>
<td>+5VDC logic regulator</td>
</tr>
<tr>
<td>TP87</td>
<td>Temperature sensor output</td>
</tr>
<tr>
<td>TP88</td>
<td>Over temperature flag</td>
</tr>
<tr>
<td>TP84</td>
<td>Analog enable from the controller board</td>
</tr>
<tr>
<td>TP35</td>
<td>High voltage nozzle-1 control signal</td>
</tr>
<tr>
<td>TP31</td>
<td>High voltage nozzle-1 monitor signal</td>
</tr>
<tr>
<td>TP37</td>
<td>High voltage nozzle-1 arc detect signal</td>
</tr>
<tr>
<td>TP41</td>
<td>High voltage nozzle-1 status signal</td>
</tr>
<tr>
<td>TP40</td>
<td>High voltage nozzle-1 program voltage</td>
</tr>
<tr>
<td>TP46</td>
<td>High voltage nozzle-2 control signal</td>
</tr>
<tr>
<td>TP42</td>
<td>High voltage nozzle-2 monitor signal</td>
</tr>
<tr>
<td>TP48</td>
<td>High voltage nozzle-2 arc detect signal</td>
</tr>
<tr>
<td>TP52</td>
<td>High voltage nozzle-2 status signal</td>
</tr>
<tr>
<td>TP51</td>
<td>High voltage nozzle-2 program voltage</td>
</tr>
<tr>
<td>TP10</td>
<td>+320V converter nozzle-1 control signal</td>
</tr>
<tr>
<td>TP3</td>
<td>+320V converter nozzle-1 output</td>
</tr>
<tr>
<td>TP2</td>
<td>+320V converter nozzle-1 status signal</td>
</tr>
<tr>
<td>TP20</td>
<td>+320V converter nozzle-2 control signal</td>
</tr>
<tr>
<td>TP13</td>
<td>+320V converter nozzle-2 output</td>
</tr>
<tr>
<td>TP12</td>
<td>+320V converter nozzle-2 status signal</td>
</tr>
<tr>
<td>TP21</td>
<td>+320V converter nozzle-1 output</td>
</tr>
<tr>
<td>TP22</td>
<td>Charge amplifier nozzle-1 output</td>
</tr>
<tr>
<td>TP26</td>
<td>+320V converter nozzle-2 output</td>
</tr>
</tbody>
</table>

Table 8-37: Test Points for Print Engine Board
### Test Points for Print Engine Board (Continued)

<table>
<thead>
<tr>
<th>Test Point</th>
<th>Signal Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP27</td>
<td>Charge amplifier nozzle-1 output</td>
</tr>
<tr>
<td>TP63</td>
<td>Nozzle drive clock</td>
</tr>
<tr>
<td>TP59</td>
<td>Printhead strobe pulse</td>
</tr>
<tr>
<td>TP53</td>
<td>Nozzle drive-1 output</td>
</tr>
<tr>
<td>TP66</td>
<td>Nozzle drive-2 output</td>
</tr>
<tr>
<td>TP72</td>
<td>Analog phase amp nozzle-1 signal</td>
</tr>
<tr>
<td>TP73</td>
<td>Phase amplifier nozzle-1 digital comparator output</td>
</tr>
<tr>
<td>TP77</td>
<td>Analog phase amp nozzle-2 signal</td>
</tr>
<tr>
<td>TP78</td>
<td>Phase amplifier nozzle-2 digital comparator output</td>
</tr>
</tbody>
</table>

#### TP81  +24VDC input from the power supply

**Description**
This voltage supplies the PEAP board (part number 379202) from the +24V power supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP81. You must measure a voltage of +24VDC ± 1.20 volts.

#### TP83  +24VDC input to the valve +12 volt regulator

**Description**
This voltage supplies the +12 volt valve regulator from the +24V power supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP83. You must measure a voltage of +24VDC ± 1.20 volts.
**TP82** +12VDC valve regulator output

**Description**
This voltage supplies all the +12V valve drivers and auxiliary circuits.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP82. You must measure a voltage of +12VDC ± 1.0V.

**TP85** +5VDC logic regulator output

**Description**
This voltage supplies all the +5V logic circuits.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP85. You must measure a voltage of +5VDC ± 0.25V.

**TP87** Temperature sensor output

**Description**
This voltage indicates the temperature in °C in the cabinet at the point near the sensor U51.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP87. To calculate the temperature indicated by the temperature sensor U51, follow this equation:

\[
\frac{(TP87 - 0.424V)}{(6.25 \times 10^{-3})} = \text{Temperature in } ^\circ\text{C.}
\]

Example: TP87 measures 0.585 volts.

\[
\frac{(0.585 - 0.424)}{(6.25 \times 10^{-3})} = 25.76 ^\circ\text{C.}
\]
TP88  Over temperature flag

**Description**
This comparator output sends a signal to the logic of an over temperature condition.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP88. You must measure a voltage of +0.33VDC ± 0.25V for a normal condition. A reading of more than 0.7V indicates a cabinet over temperature condition.

TP84  Analog enable signal from the controller board

**Description**
This comparator output from the controller board controls the +24VSW power on the PEAP board.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP84. You must measure a voltage of 0.7 VDC ± 0.25 volts for a normal condition. The PEAP is not enabled if the reading indicates 3.3 volts.

TP35  High voltage head 1 control signal

**Description**
This signal on the PEAP controls the nozzle-1 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP35. You must measure a voltage of 3.3VDC ± 0.25V for a normal ON condition for head-1 high voltage supply. A reading of 0.7 volts ± 0.25 indicates that nozzle-1 high voltage is not enabled.
TP31 High voltage head-1 monitor signal

**Description**
This signal on the PEAP indicates the high voltage level of the nozzle-1 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP31. You must measure a voltage of 3 VDC to 6 VDC for a normal high voltage range for nozzle-1 high voltage supply.

1 V = 1kV of deflection voltage.

TP37 High voltage nozzle-1 arc signal

**Description**
This signal indicates an arcing condition of the nozzle-1 high voltage deflection supply.

**Test**
Use an oscilloscope and connect the ground probe to any of the "GND" test points recorded in the table. Connect the end of the probe to TP37. You must monitor a change in the voltage, in digital format between 3.3 VDC and ground for an arcing condition. The comparator output that goes low indicates the arc condition.

TP41 High voltage nozzle-1 status signal

**Description**
This signal on the PEAP indicates the ON/OFF status of the nozzle-1 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP41. A measurement of 0.7 V ± 0.25 voltage indicates that nozzle-1 high voltage is enabled and the voltage is in the operation.

A reading of 3.3 VDC ± 0.25 V indicates that the nozzle-1 high voltage supply is in OFF status.
**TP40**  High voltage nozzle-1 program voltage

**Description**
This voltage on the PEAP indicates the program level required of the nozzle-1 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP41. You must measure a voltage of 3.0 VDC to 6.0 volts.

**TP46**  High voltage nozzle-2 control signal

**Description**
This signal on the PEAP controls the nozzle-2 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP46. You must measure a voltage of 3.3VDC ± 0.25 for a ON status (normal) for nozzle-2 high voltage supply. A reading of 0.7V ± 0.25 indicates that nozzle-2 high voltage is not enabled.

**TP42**  High voltage nozzle-2 monitor signal

**Description**
This signal on the PEAP indicates the high voltage level of the nozzle-2 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP42. You must measure a voltage of 3.0 VDC to 6.0 volts for a normal high voltage range for nozzle-2 high voltage supply. 1.0 volt = 1.0kV of deflection voltage.
**TP48** High voltage nozzle-2 arc signal

**Description**
This signal on the PEAP shows an arcing condition of the nozzle-2 high voltage deflection supply.

**Test**
Use an oscilloscope and connect the ground of the probe to any of the "GND" test points recorded in the table. Connect the end of the probe to the TP48. You must monitor a change in the voltage in a digital format between 3.3VDC and ground for an arcing condition. The comparator output goes low to indicate an arc condition.

**TP52** High voltage status nozzle-2 signal

**Description**
This signal on the PEAP indicates the ON/OFF status of the nozzle-2 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP52. You must measure a voltage of 0.7 V ± 0.25 that indicates that nozzle-2 high voltage is enabled, and operates correctly.

A reading of 3.3 VDC ± 0.25 V indicates that the nozzle-2 high voltage supply is in OFF status.

**TP51** High voltage program voltage nozzle-2.

**Description**
This voltage on the PEAP indicates the required level of program for the nozzle-2 high voltage deflection supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP51. You must measure a voltage of 3.0 VDC to 6.0 volts.
**TP10** +320V converter nozzle-1 control signal

**Description**
This signal on the PEAP controls the nozzle-1 +320 volt converter supply.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP10. You must measure a voltage of 3.3VDC ± 0.25 for a ON status (normal) for nozzle-1 +320V supply. A reading of 0.7V ± 0.25 indicates that nozzle-1 +320V converter is not enabled.

**TP3** +320V converter head-1 output

**Description**
This voltage on the PEAP supplies the power to the nozzle-1 charge amplifier.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP3. You must measure a voltage of 320VDC ± 1.0V for a ON status (normal) for nozzle-1 +320V supply.

**Caution**
PERSONAL INJURY. When you measure this voltage, connect or disconnect the test leads, be careful.

**TP2** +320V converter nozzle-1 status signal.

**Description**
This signal on the PEAP indicates the ON/OFF status of the nozzle-1 +320V converter supply.

**Test**
Use a DVM to connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP2. You must measure a
A voltage of 0.7V ± 0.25 indicates that nozzle-1 +320V converter is enabled and the converter is in the operation.

A reading of 3.3VDC ± 0.25V indicates that the nozzle-2 high voltage supply is in OFF status.

**TP20**
+320V converter control signal nozzle-2.

**Description**
This signal on the PEAP controls the nozzle-2 +320 volt converter supply.

**Test**
Use a DVM to connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP20. You must measure a voltage of 3.3 VDC ± 0.25V for a normal ON condition for nozzle-2 +320V supply. A reading of 0.7 volts ± 0.25 indicates that nozzle-2 +320V converter is not enabled.

**TP13**
+320V converter output nozzle-2

**Description**
This voltage on the PEAP powers the nozzle-2 charge amplifier.

**Test**
Use a DVM to connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP13. You must measure a voltage of 320VDC ± 1.0V for a normal ON condition for nozzle-2 +320V supply.

⚠️ **Caution**
PERSONAL INJURY. When you measure this voltage, connect or disconnect the test leads, be careful.
**TP12** +320V converter status nozzle-2 signal

**Description**
This signal on the PEAP indicates the ON/OFF status of the +320V converter of nozzle-2 supply.

**Test**
Use a DVM to connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP2. You must measure a voltage of 0.7 volts (± 0.25) that shows that +320V converter for nozzle-2 is enabled and the converter operates.

A 3.3VDC ± 0.25V reading indicates an OFF status for nozzle-2 +320V converter.

---

**TP21** +320V converter nozzle-1 output

**Description**
This voltage on the PEAP supplies power to the nozzle-1 charge amplifier. The voltage is fed from the jumper J1.

**Test**
Use a DVM to connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP21. You must measure a voltage of 320VDC ± 1.0V for a normal ON condition for nozzle-1 +320V supply.

**Caution**
PERSONAL INJURY. When you measure this voltage, connect or disconnect the test leads, be careful.

---

**TP22** Charge amplifier nozzle-1 output

**Description**
This signal on the board is got from the coax connector J5. This signal goes to the charge tunnel on nozzle-1.
Test
Connect an oscilloscope to TP22 and make sure that the PEAP board is in the print mode. As shown in Figure 8-29 on page 8-70, levels from 0 to 300 volts are monitored when you print. The shape of the waveform changes when you print.

![Figure 8-29: Test Point 51 Signal](image)

TP26  +320V converter output nozzle-2

**Description**
This voltage on the PEAP supplies power to the nozzle-2 charge amplifier. The voltage is fed from the jumper J3.

**Test**
Use a DVM and connect the ground probe to any of the "GND" test points recorded in the table. Connect the other probe to TP26. You must measure a voltage of 320 VDC ± 1.0V for a normal ON condition for nozzle-2 +320V supply.

**Caution**
ELECTRICAL SAFETY. When you measure this voltage, connect or disconnect the test leads, be careful.
TP27  Charge amplifier output nozzle-2

**Description**
This signal on the board is got from the coax connector J7. This signal goes to the charge tunnel on nozzle-2.

**Test**
Connect an oscilloscope to TP27 and make sure that the PEAP board is in the print mode. As shown in Figure 8-30, levels from 0 to 300 volts are monitored when you print. The shape of the waveform changes when you print.

![Figure 8-30: Test Point 51 Signal](image)

TP63  Nozzle drive clock

**Description**
This signal on the board is got from the nozzle clock buffer. This signal is a TTL level.

The frequency is 1.056mHz, and not a duty cycle waveform of 50%.

**Test**
Connect an oscilloscope to TP63 and make sure that the clock signal is found. You need a frequency counter to measure the clock frequency correctly.
TP59  Printhead strobe pulse

Description
A buffer strobe from the FPGA circuit runs the signal on the PEAP board. This signal divides and drives the LEDs of both the nozzles (nozzle-1 and nozzle-2) in the printhead. The strobe pulse is at a frequency of 66kHz.

Test
Connect an oscilloscope to TP59 and make sure that the strobe pulse is found. This pulse is divided at J18 pins 1 and 2.

TP53  Nozzle drive head-1 output

Description
This signal on the PEAP board is got from the coax connector J16. This signal goes to the nozzle-1. The amplitude is a 120V PPK (42.24V RMS) sine waveform.

Test
Connect an oscilloscope to TP53 and make sure that the PEAP board runs the nozzle-1. Couple (AC) the signal and set the sweep to approximately 10 micro seconds per division. As shown in Figure 8-31, you must monitor a sine wave. The amplitude changes and this change depends on the drive settings.

![Figure 8-31: TP64 Signal](image)
TP66  Nozzle drive nozzle-2 output

**Description**
This signal on the PEAP board is got from the coax connector J19. This signal goes to the nozzle-2. The amplitude is a 120V PPK (42.24V RMS) sine waveform.

**Test**
Connect an oscilloscope to TP66 and make sure that the PEAP board runs the nozzle-2. Couple (AC) the signal and set the sweep to approximately 10 micro seconds per division. As shown in Figure 8-32 on page 8-73, you must monitor a sine wave. The change in the amplitude depends on the drive settings.

![Figure 8-32: TP64 Signal](Image)

TP72  Analog phase amp nozzle-1 signal

**Description**
This signal on the PEAP board is got from the head-1 catcher. This signal is an accurate rectified signal and appears with a flat base-line for reference. There are only positive peaks shown.

**Test**
Connect an oscilloscope to TP72 and make sure that the phase amplifier head-1 operates correctly. Connect the probe ground lead to any of the ground test points. Connect the point of the probe to TP72. The normal amplitude of the highest peak is 1.5 volts. Refer to Figure 8-33 on page 8-74.
**TP73**  Phase amplifier nozzle-1 digital comparator output

**Description**
This signal on the PEAP board indicates which phases are good to the logic. This signal is in normal high and goes low to indicate a "good phase".

**Test**
Connect an oscilloscope to TP73 and make sure that the phase comparator nozzle-1 operates correctly. Connect the leads of the ground probe to any of the ground test points. Connect the point of the probe to TP73. The signal changes from 3.3 volts to ground. The signal, which goes low indicates a good phase. Refer to Figure 8-34 on page 8-75.
**TP77** Analog phase amp nozzle-2 signal

**Description**
This signal on the PEAP board is got from the head-2 catcher. This signal is a precision rectified signal and appears with a flat base-line for reference. There are only positive peaks shown.

**Test**
Connect an oscilloscope to TP77. This connection is made to make sure that the phase amplifier nozzle-2 operates correctly. Connect the leads of the ground probe to any of the ground test points. Connect the point of probe to TP77. The normal amplitude of the highest peak is 1.5V. Refer to Figure 8-35 on page 8-76.
**TP78** Phase amplifier nozzle-2 digital comparator output

**Description**
This signal on the PEAP board indicates which phases are good to the logic. This signal is high normally and goes low to indicate a "good phase".

**Test**
Connect an oscilloscope to TP78 and make sure that the phase comparator head-2 operates correctly. Connect the leads of the ground probe to any of the ground test points. Connect the point of probe to TP78. The signal changes from 3.3V to ground. The signal, which goes low shows a good phase. Refer to Figure 8-36 on page 8-77.

![Figure 8-35: Test Point 77 Signal](image-url)
Figure 8-36: Test Point 79 Signal
No Signal Faults

Introduction
A No Signal Fault occurs when a charge signal is not sensed in the catcher during an ink stream test. The printer does not sense the entry of the charged ink stream into the catcher. The printer performs an ink stream test during the startup, or if the printer senses a Phasing Fault, or if the ink pressure is set.

Many causes of the No Signal fault are recorded earlier in this chapter. Some conditions require electronic tests to check a broken wire, a printer component or PEAP board that have defects.

Troubleshooting Guidelines
Follow these guidelines if you are troubleshooting a No Signal Fault:

- Make sure the printhead is dry and free of dirt.
- Turn on the ink and turn off the high voltage when you perform most tests. Some tests require the operator to turn off the ink.
- Make sure that the phase indicator LEDs flash when you adjust the nozzle drive with the ink turned On and high voltage turned Off.
- Test in this order:
  a. nozzle system
  b. charge system
  c. return system
- Check for an ink stream at the nozzle.
- Check the vacuum at the catcher.
- Check the power supply LEDs.

There is No Ink Stream or Vacuum
If there is no ink stream or vacuum, the problem cannot be at the printhead. Else, look for a pneumatic or hydraulic problem.

Check for the Causes
Before you perform any complete electrical checks, look for the causes of a No Signal Fault.
• Check the alignment of the ink stream, and make sure the ink stream enters the catcher correctly.

• Check the vacuum setting, and make the necessary adjustments.

• If a No Signal Fault is seen continuously, run all electrical circuitry checks. The checks require the printer to be on if in the service mode. Make sure the high voltage is turned off.

**Caution**

**ELECTRICAL HAZARD.** Do not measure high voltage at the high voltage plate with a normal voltage meter. Use a special high voltage probe to measure +3,000 to +6,000VDC.

---

**The Nozzle Drive Circuitry Checks**

A No Signal Fault indicates a possible problem with the connections of the nozzle or the nozzle drive. If there is a problem with the connections, use these guidelines to correct the problem:

**Check the Printhead Components**

If there is a nozzle problem, use the magnifier to check for ink drops within the charge tunnel. If an ink stream is found, but you cannot see the ink drops, adjust the nozzle drive setting. If the ink stream does not break into small drops when the nozzle drive is adjusted, check the connections of nozzle wire terminal at the printhead. Clean, or tighten if necessary.

**Perform AC Voltage Test**

If the connections appear to be good, use an oscilloscope or a multimeter to check the peak-to-peak AC drive voltage at the printhead. Normal readings are from 5 to 120V peak-to-peak RMS.

**Check the Wires**

If the AC voltage test fails, move the nozzle drive wires at the printhead. If the oscilloscope responds with a voltage reading, the problem is an intermittent contact to the nozzle. Clean, or repair if necessary.

If you get a voltage reading at the printhead, but do not see the drops within the charge tunnel, the nozzle has defects. When you find that the nozzle has defects, you must replace the nozzle.

If the voltage test fails, check the continuity of the nozzle drive wire with a multimeter. The meter must read approximately zero ohms. A reading...
that is different from zero indicates that the nozzle drive wire is broken. If the nozzle drive circuit fails the continuity check, repair or replace the umbilical.

**Check the PEAP board**

If the wire is not broken, the problem can be the PEAP board. Check for failure of the nozzle drive output on the PEAP board at TP53 or TP66.

![Figure 8-37: TP53/TP66 - Nozzle Drive](image)

Figure 8-37 shows the nozzle drive taken at TP53 or TP66. Use this test point to check for possible nozzle or PEAP board failure. High distortions in the waveform can indicate a problem. The cycle period is 15 microseconds at 5 microseconds per division. Use any of the ground test points for a reference.

The voltage changes from approximately 0 to +120 VAC, peak-to-peak. You can control the voltage with the nozzle drive adjustment in the software. The control is got by setting a percentage (0-100%) of the available voltage. Each percentage indicates an increase or decrease of approximately 100mV peak-to-peak.

**Charge Tunnel Circuitry Checks**

A No Signal Fault can indicate a charge tunnel problem. Use a multimeter and oscilloscope to check the charge tunnel circuit.

**Check the Printhead Components**

If there is a problem with the charge circuit, use the magnifier to check for the presence of ink drops within the tunnel. If you see an ink stream, but
do not see the drops, follow the previous procedure to test the nozzle circuit. If the drop break off is correct and the system shows a No Signal Fault, then check the charge tunnel.

**Examine the Charge Wire Connection**

To start with, examine the connection of the charge wire in the printhead. Clean, or tighten the charge wire if necessary. If the connection is good, use a meter to check the charge voltage at the charge tunnel. There must be a reading of approximately 10 VDC peak-to-peak with an oscilloscope, or 3.5 VRMS with a multimeter. If the test fails, first move the charge tunnel wire at the printhead. If the meter responds with a voltage reading, the problem is a dirty or incorrect connection. Clean, or repair according to the requirement. If the reading of the voltage remains incorrect, use a multimeter to check for a broken wire or resistor.

**Check the Continuity**

Check the continuity of the charge tunnel wire from the PEAP board to the printhead. The charge tunnel wire must read approximately 10,000 ohms. Remember that a 10K resistor is found in the wire at the printhead. If the charge circuit fails the continuity check, repair or replace the umbilical.

**Test Point 22**

If there is continuity and no voltage at the charge tunnel, check the charge voltage at TP22 or TP27 on the PEAP board.

![Figure 8-38: Test Point 22 - Stream Test](image)
Ink Stream Test
The Excel Dual Nozzle printer performs an ink stream test during the Automatic-Phase Control (APC) Sequence. Refer to Figure 8-38 on page 8-81 for the ink stream test. The ink stream test is performed at the startup before a fault. The ink stream test is performed if the ink pressure is set. The PEAP board uses the ink stream test to lock on the charge window (correct one) within the charge tunnel. When the ink stream goes from the charge tunnel into the catcher, the test also checks for the presence and speed of the ink stream. This control is automatic.

Signal
The signal in the figure is test point 22 for the charge amplifier of nozzle-1 signal from the PEAP board to the charge tunnel. The signal shows 28-drop times of charge voltage to the charge tunnel for nozzle-1. A single continuous 10VDC charge is applied for 420 microseconds. The picture shows 0.5 microseconds per division.

Phasing Test
The Phasing Test that is part of the APC sequence, is shown in Figure 8-39. The phase test checks for the presence of charge on selected ink drops. The phasing test looks for the drops (best charged) that are in one of the four-test periods (phases). When the nozzle solenoid is turned on, the test is run. The test is not performed when the printer runs an ink stream test or prints.
The Figure 8-39 on page 8-82 displays 28 drops charged at the charge tunnel. Each drop in the group of 28 receives a 10VDC charge. The illustration indicates 0.52 microseconds per division.

**To Use the Test Points 22 or 27**
Monitor TP22 or TP27 to find a PEAP board with defects. Also check for loose connections or broken wires before you change a PEAP board. Take a reading at the TP22 or TP27. Move the probe to the related charge tunnels and repeat the measurement. Use the printhead chassis for a ground. A correct reading at the PEAP board and an incorrect reading at the charge tunnel indicates the wires that are with faults or a bad connection. If there is no voltage at either TP22 or TP27, change the PEAP board.

**Sense Signal Circuitry Checks**
A no signal fault can occur because of defects in sense signal circuit. The sense signal is the voltage that the PEAP board amplifies by the nozzle-1 or nozzle-2 phase amplifiers. If the printer indicates a no signal fault, first follow the previous procedures to test the nozzle drive and the charge circuits. If the nozzle drive and the charge circuits are good, check the phase amplifier circuits.

**Check the Ink Stream**
Make sure that the ink stream enters the catcher correctly. Also make sure that the vacuum is correct. Make the adjustments. If the fault continues, examine the catcher. Make sure that connectors are clean and tight. If the connections are good, perform the following test to separate the problem to the catcher, wire, or PEAP board.

**Check the Continuity**
Check the continuity of the white and black wires at the catcher. Replace the umbilical if you do not get a reading of near zero ohms.

**Check for Short Circuits**
You can check for a short circuit or low impedance at the catcher. Remove the connection of the white wire that go into the catcher. Any reading less than infinity indicates a bad catcher. Replace the block if necessary. The resistance to the PEAP board cannot make a decision about a bad board because of the input circuitry.
Test Point 73 and 78

The phase comparator signal from nozzle-1 or nozzle-2 phase comparators is shown in Figure 8-40. The PEAP board uses this signal to examine the drop charge.

![Figure 8-40: Test Point 73 and 78](image)

The PEAP board processes the signals from both the nozzles and calculates the best "phase" to use. This procedure is automatic. Use TP72, TP73 or TP77, TP78 to make sure that the phase circuits work correctly.
The Wiring Diagrams

Use the wiring diagrams in this section to find the complete path of a required wire. The information given helps:

- To identify the signal input and outputs in the printer
- To replace each wire
- General inspections

The wiring diagrams described in this chapter are shown in Table 8-38.

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Table 8-38: The Wiring Diagrams
Excel Dual Nozzle Wiring Diagram

The Excel Dual Nozzle wiring diagram is shown in the Figure 8-41. Refer to Appendix A, “Wiring Diagrams” for more information.

Figure 8-41: Excel Dual Nozzle Wiring Diagram
Excel Dual Nozzle PEAP Board Assembly

The Excel Dual Nozzle PEAP board assembly is shown in the Figure 8-42.

---

**Figure 8-42: Excel Dual Nozzle PEAP Board Assembly**
Controller Circuit Board

Figure 8-43: Controller Circuit Board Wiring Diagram
Figure 8-44: Ink System Harness
The part numbers of the ink system harness are recorded in Table 8-39.

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<th>Item Number</th>
<th>Part Number</th>
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<td>5-104505-6</td>
<td>Terminal, Pin</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>103653-1</td>
<td>Conn, 2 Pos</td>
<td>1</td>
</tr>
<tr>
<td>Not Shown</td>
<td>9921-10</td>
<td>Wire, Black, 22AWG</td>
<td>3.50</td>
</tr>
</tbody>
</table>

*Table 8-39: Ink System Harness - Part Numbers*
Ink System and Hydraulic Harness Circuit Board

Black Jumper Installed between Pins 11 and 12. Jumper is removed for IP54 configuration.

J15 must be connected to P15 when Auto-flush is not present.

J35 must be connected to P15 when Auto-flush is not present.

Figure 8-45: Ink System and Hydraulic Harness Circuit Board Wiring Diagram
Ink Harness Wiring Diagram - Jumpers P25 and J25

Figure 8-46: Ink Harness Wiring Diagram - Jumper P25 and J25

Ink Harness Wiring Diagram - Jumper J25

Note: This jumper only - use black wire.
This jumper is intended to be cut away for certain models so the end of the jumper loop should extend approximately 1.5" from the back of P29.

Figure 8-47: Ink Harness Wiring Diagram - Jumper J25
# Ink Harness Wiring Diagram - Jumper P25

<table>
<thead>
<tr>
<th>Trans (Pres Tank Low) SW</th>
<th>P25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start (Pres Tank Full) SW</td>
<td></td>
</tr>
<tr>
<td>To Bottle Switch</td>
<td></td>
</tr>
<tr>
<td>To Transvalve</td>
<td></td>
</tr>
<tr>
<td>To Ink Valve</td>
<td>S3-1</td>
</tr>
<tr>
<td></td>
<td>S3-2</td>
</tr>
<tr>
<td></td>
<td>L1-1</td>
</tr>
<tr>
<td></td>
<td>L1-2</td>
</tr>
<tr>
<td></td>
<td>L2-1</td>
</tr>
<tr>
<td></td>
<td>L2-2</td>
</tr>
<tr>
<td></td>
<td>L3-1</td>
</tr>
<tr>
<td></td>
<td>L3-2</td>
</tr>
<tr>
<td></td>
<td>L4-1</td>
</tr>
<tr>
<td></td>
<td>L4-2</td>
</tr>
<tr>
<td></td>
<td>L5-1</td>
</tr>
<tr>
<td></td>
<td>L5-2</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fresh Ink Req (Resv Low) SW</th>
<th>P35</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/U Ink Inhibit (Resv Full) SW</td>
<td></td>
</tr>
<tr>
<td>Overflow (Resv Overfill) SW</td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 8-48: Ink Harness Wiring Diagram - Jumper P25**
PEAP Board and Circuit Breaker

Refer to “PEAP Board and Circuit Breaker” on page A-3 for more information.
Keyboard Cable Wiring Diagram

Keyboard Cable 378635

Table 8-40 and Table 8-41 describes the wiring information of the keyboard cable 378635 wiring diagram shown in Figure 8-50.

<table>
<thead>
<tr>
<th>Wire End P1</th>
<th>Signal</th>
<th>Wire End P25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RED ANODE</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>RED CATHODE-GND</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>YEL ANODE</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>YEL CATHODE-GND</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>GREEN ANODE</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>GRN CATH + Contrast</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>ROW 1</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>ROW 2</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>ROW 3</td>
<td>17</td>
</tr>
<tr>
<td>10</td>
<td>ROW 4</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>ROW 5</td>
<td>21</td>
</tr>
<tr>
<td>12</td>
<td>ROW 6</td>
<td>23</td>
</tr>
<tr>
<td>13</td>
<td>ROW 7</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>ROW 8</td>
<td>27</td>
</tr>
<tr>
<td>15</td>
<td>FRAME GND from the Controller</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 8-40: Keyboard Cable 378635-Wiring Chart
<table>
<thead>
<tr>
<th>Wire End P2</th>
<th>Signal</th>
<th>Wire End P25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND from the controller</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>SHIFT KEY</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>CONTROL KEY</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>ALT KEY</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>CONTRAST DOWN KEY</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>CONTRAST UP KEY</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>COLUMN 1</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>COLUMN 2</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>COLUMN 3</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>COLUMN 4</td>
<td>20</td>
</tr>
<tr>
<td>11</td>
<td>COLUMN 5</td>
<td>22</td>
</tr>
<tr>
<td>12</td>
<td>COLUMN 6</td>
<td>24</td>
</tr>
<tr>
<td>13</td>
<td>COLUMN 7</td>
<td>26</td>
</tr>
<tr>
<td>14</td>
<td>COLUMN 8</td>
<td>28</td>
</tr>
<tr>
<td>15</td>
<td>FRAME GND from the controller</td>
<td>30</td>
</tr>
</tbody>
</table>

*Table 8-41: Keyboard Cable 378635-Wiring Chart*
LCD Data and Backlight Wiring Diagrams

LCD Data Cable 378745

Figure 8-51: LCD Data Cable 378745 Wiring Diagram

Table 8-42 describes the wiring information of the LCD data cable 378745 wiring diagram shown in Figure 8-51.

<table>
<thead>
<tr>
<th>Wire End P23</th>
<th>Signal</th>
<th>Wire End P1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DATA 0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>DATA 1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>DATA 2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>DATA 3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>LCD_ON+</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>FLM</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>LP</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>CP</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>+5V</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>GND</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>V (LCD)</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>V (ADJ)</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>FRAME GND</td>
<td>14</td>
</tr>
</tbody>
</table>

Table 8-42: LCD Data Cable 378745-Wiring Chart
LCD Backlight Cable 378746

Figure 8-52: LCD Backlight Cable 378746 Wiring Diagram

Table 8-43 describes the wiring information of the LCD data cable 378746 wiring diagram shown in Figure 8-52.

<table>
<thead>
<tr>
<th>Wire End “P” LED</th>
<th>Signal</th>
<th>Wire End “P28’ CNTL BRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LED CATHODE</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>LED ANODE</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 8-43: LCD Backlight Cable 378746-Wiring Chart
PD and Encoder Wiring Diagrams

Internal PD Cable 378688

Table 8-44 describes the wiring information of the internal PD cable 378688-wiring diagram shown in Figure 8-53.

<table>
<thead>
<tr>
<th>Wire End P33 &amp; 35</th>
<th>Signal</th>
<th>Color</th>
<th>J1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+12V Supply</td>
<td>RED</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>PD Signal</td>
<td>YELLOW</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>BLACK</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>FRAME GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-44: Internal PD Cable 378688-Wiring Chart
Internal Encoder Cable 378689

Table 8-45 describes the wiring information of the internal encoder cable 378689-wiring diagram shown in Figure 8-54.

<table>
<thead>
<tr>
<th>Wire End P31</th>
<th>Signal</th>
<th>Color</th>
<th>J3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+ 12V Supply</td>
<td>RED</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>ENC A Signal</td>
<td>YELLOW</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>ENC B Signal</td>
<td>BLUE</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>BLACK</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>FRAME GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-45: Internal Encoder Cable 378689-Wiring Chart

Figure 8-54: Internal Encoder Cable 378689-Wiring Diagram
External Encoder Cable 378774

Table 8-46 describes the wiring information of the external encoder cable 378774-wiring diagram shown in Figure 8-55.

<table>
<thead>
<tr>
<th>Wire End P1</th>
<th>Signal</th>
<th>Color</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+12V</td>
<td>RED</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>ENC A</td>
<td>WHITE</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>ENC B</td>
<td>GREEN</td>
<td>B</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>BLACK</td>
<td>F</td>
</tr>
<tr>
<td>A-</td>
<td>NA</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>B-</td>
<td>NA</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD</td>
<td>NA</td>
<td>G</td>
</tr>
</tbody>
</table>

Table 8-46: External Encoder Cable 378774-Wiring Chart
RS232 Port 1 Wiring Diagrams

External RS232, Port 1 Cable 378757

<table>
<thead>
<tr>
<th>Wire End P2</th>
<th>Printer Signal</th>
<th>Color</th>
<th>PC Signal</th>
<th>P1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RTS</td>
<td>BRN</td>
<td>CTS</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>RED</td>
<td>TX</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
<td>GRN</td>
<td>RX</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>BLK</td>
<td>GND</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>WHT</td>
<td>RTS</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>DTR / +5V</td>
<td>BLU</td>
<td>DSR</td>
<td>6*</td>
</tr>
<tr>
<td>NA</td>
<td>BLU</td>
<td>CD</td>
<td>1*</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>DTR</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>BLU</td>
<td>RI</td>
<td>9*</td>
<td></td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD/DRAIN</td>
<td>NA</td>
<td>NA</td>
<td>SHELL</td>
</tr>
</tbody>
</table>

Table 8-47: External RS232, Port 1 Cable 378757-Wiring Chart

The * symbol indicates that the wires are connected together.
Internal RS232 Port 1 Cable 378691

Note: Standard RS232 levels

Table 8-48 describes the wiring information of the internal RS232, Port 1 cable 378691-wiring diagram shown in Figure 8-57.

<table>
<thead>
<tr>
<th>Wire End P14</th>
<th>Signal</th>
<th>Printer</th>
<th>J2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CTS</td>
<td>GRAY</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>YEL</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>RTS</td>
<td>PURPLE</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>TX</td>
<td>ORANGE</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>BLACK</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>NONE</td>
<td>NC</td>
</tr>
<tr>
<td>7</td>
<td>SCN PWR (DTR)</td>
<td>RED</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>FRM GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-48: Internal RS232 Port 1 Cable 378691-Wiring Chart
Table 8-49 describes the wiring information of the external RS232, Port 1, hardware key, short cable 378803-wiring diagram shown in Figure 8-58.

<table>
<thead>
<tr>
<th>Wire End P2</th>
<th>Printer Signal</th>
<th>Color</th>
<th>PC Signal</th>
<th>P1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RTS</td>
<td>BLU</td>
<td>CD</td>
<td>1 **</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>GRN</td>
<td>RX</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
<td>RED</td>
<td>TX</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>BLK</td>
<td>GND</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>WHT</td>
<td>RTS</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>DTR / + 5V</td>
<td>BRN</td>
<td>RI</td>
<td>9 **</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>DSR</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>CTS</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>BRN</td>
<td>DTR</td>
<td>4 **</td>
<td></td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD / DRAIN</td>
<td>BARE</td>
<td>FRM/GND</td>
<td>SHELL</td>
</tr>
</tbody>
</table>

The **symbol indicates that the wires are connected together.
RS232 Port 2 Wiring Diagrams

Internal RS232, Port 2 Cable 378693

Table 8-50 describes the wiring information of the internal RS232, Port 2 cable 378693-wiring diagram shown in Figure 8-59.

<table>
<thead>
<tr>
<th>Wire End P29</th>
<th>Signal</th>
<th>Color</th>
<th>J6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX</td>
<td>ORANGE</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>YEL</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>CTS</td>
<td>BROWN</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>232 GND</td>
<td>BLACK</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>RTS</td>
<td>BLUE</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>FRM GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-50: Internal RS232, Port 2 Cable 378693-Wiring Chart

Note: This cable and Port2 external cable are for RS-232 remote communications. Insert Remote and ESI functions are done through this cable.
**External RS232, Port 2 Cable 378758**

**Figure 8-60: External RS232, Port 2 Cable 378758-Wiring Diagram**

**Note:** Standard RS232 levels

Table 8-51 describes the wiring details of the external RS232, Port 2 cable 378758-wiring diagram shown in Figure 8-60.

<table>
<thead>
<tr>
<th>Wire End P3</th>
<th>Printer Signal</th>
<th>Color</th>
<th>PC Signal</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RTS</td>
<td>BRN</td>
<td>CTS</td>
<td>8  *</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>RED</td>
<td>TX</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
<td>GRN</td>
<td>RX</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>BLK</td>
<td>GND</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>WHT</td>
<td>RTS</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>NA</td>
<td>BRN</td>
<td>CD</td>
<td>1  *</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>BRN</td>
<td>DSR</td>
<td>6  *</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
<td>DTR</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
<td>RI</td>
<td>9</td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD/DRAIN</td>
<td>NA</td>
<td>NA</td>
<td>SHELL</td>
</tr>
</tbody>
</table>

**Table 8-51: External RS232, Port 2 Cable 378758-Wiring Chart**

The * symbol indicates that the wires are connected together.

**Note:** The cable length is 3m (10feet.).
Basic I/O Wiring Diagrams

Internal Basic I/O Cable 378690

Table 8-52 describes the wiring information of the internal basic I/O cable 378690-wiring diagram shown in Figure 8-61.

<table>
<thead>
<tr>
<th>Wire End P26</th>
<th>Signal</th>
<th>Color</th>
<th>J3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relay Common</td>
<td>BROWN</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Relay NC</td>
<td>RED</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Relay NO</td>
<td>GREEN</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>User IN8-</td>
<td>WHITE</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>User +12V Ref</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>BLACK</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>FRM GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-52: Internal Basic I/O Cable 378690-Wiring Chart

Note: This cable is for no code no run applications. This application is the print ready output. These cables allow the operator to access the cold contact relay within the printer. The expanded I/O board is not required for this feature. This cable connects to the main control board.
External Basic I/O Cable 378760

Table 8-53 describes the wiring information of the external basic I/O cable 378760-wiring diagram shown in Figure 8-62.

<table>
<thead>
<tr>
<th>P3</th>
<th>Signal</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relay Common</td>
<td>BRN</td>
</tr>
<tr>
<td>2</td>
<td>Relay NC</td>
<td>RED</td>
</tr>
<tr>
<td>3</td>
<td>Relay NO</td>
<td>GRN</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>BLK</td>
</tr>
<tr>
<td>5</td>
<td>User IN8-</td>
<td>WHT</td>
</tr>
<tr>
<td>SHELL</td>
<td>Shield/Drain</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 8-53: External Basic I/O Cable 378760-Wiring Chart

Note: This cable is for no code no run applications. This application is the print ready output. These cables allow the operator to access the cold contact relay NO and NC contacts within the printer. The application does not require an expanded I/O board.
RS485 Port 2 Wiring Diagrams

Internal RS485, Port 2 Cable 378690

Table 8-54 describes the wiring information of the internal RS485, port 2 cable 378690-wiring diagram shown in Figure 8-63.

<table>
<thead>
<tr>
<th>Wire End P29</th>
<th>Signal</th>
<th>Color</th>
<th>J6</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>NONE</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>485 GND</td>
<td>BLACK</td>
<td>2</td>
</tr>
<tr>
<td>NONE</td>
<td>NONE</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>485+</td>
<td>ORANGE</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>485-</td>
<td>YEL</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>FRM GND</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>5 *</td>
<td>SEL 485-</td>
<td>BLU</td>
<td></td>
</tr>
<tr>
<td>7 *</td>
<td>GND</td>
<td>BLU</td>
<td></td>
</tr>
</tbody>
</table>

* Table 8-54: Internal RS485, Port 2 Cable 378690-Wiring Chart

The * symbol indicates that the wires are connected together.
External RS485, Port 2 Cable 378759

Table 8-55 describes the wiring information of the external RS485, port 2 cable 378759-wiring diagram shown in Figure 8-64.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Signal</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>485 GND (UNUSED)</td>
<td>NONE</td>
</tr>
<tr>
<td>2</td>
<td>485+</td>
<td>WHT/BLU STRIPE</td>
</tr>
<tr>
<td>3</td>
<td>485-</td>
<td>BLU/WHT STRIPE</td>
</tr>
<tr>
<td>4</td>
<td>SHIELD/DRAIN</td>
<td>BARE</td>
</tr>
</tbody>
</table>

Table 8-55: External RS485, Port 2 Cable 378759-Wiring Chart

Note: Standard RS485 levels

Figure 8-64: External RS485, Port 2 Cable 378759-Wiring Diagram
Expanded I/O Power Input Wiring Diagrams

Internal Expanded I/O Power Input Cable 378847

Table 8-56 describes the wiring information of the internal expanded I/O power input cable 378847-wiring diagram shown in Figure 8-65.

<table>
<thead>
<tr>
<th>Wire End P1</th>
<th>Signal</th>
<th>Color</th>
<th>J3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NONE</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>EXTERNAL SUPPLY +</td>
<td>RED</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>EXTERNAL SUPPLY -</td>
<td>BLACK</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 8-56: Internal Expanded I/O Power Input Cable 378847- Wiring Chart

Note: The internal expanded I/O power input cable and the optional expanded I/O card are used together.
External Expanded I/O Power Input Cable 378848

**Figure 8-66: External Expanded I/O Power Input Cable 378848-Wiring Diagram**

**Note:** Input supply voltage, +5 to +12V, maximum

Table 8-57 describes the wiring information of the external expanded I/O power input cable 378848-wiring diagram shown in Figure 8-66.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Signal</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DO NOT WIRE</td>
<td>WHT</td>
</tr>
<tr>
<td>2</td>
<td>EXTERNAL SUPPLY +</td>
<td>RED</td>
</tr>
<tr>
<td>3</td>
<td>EXTERNAL SUPPLY -</td>
<td>BLACK</td>
</tr>
</tbody>
</table>

**Table 8-57: External Expanded I/O Power Input Cable 378848-Wiring Chart**

**Note:** The external expanded I/O power input cable and the optional expanded I/O card are used together.
Expanded I/O Logic Wiring Diagrams

Internal Expanded Logic Cable 378812

Table 8-58 describes the wiring information of the internal expanded logic cable 378812-wiring diagram shown in Figure 8-67.

<table>
<thead>
<tr>
<th>Wire End P7</th>
<th>Signal</th>
<th>Color</th>
<th>J6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOGIC_0-</td>
<td>BRN</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>LOGIC_7-</td>
<td>WHT</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>LOGIC_1-</td>
<td>RED</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>LOGIC_3-</td>
<td>GRN</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>LOGIC_2-</td>
<td>BLU</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>BLK</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>FRM GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

Table 8-58: Internal Expanded Logic Cable 378812-Wiring Chart

Note: The internal expanded logic cable and the optional expanded I/O board are used together.
External Expanded Logic Cable 378813

**Figure 8-68: External Expanded Logic Cable 378813-Wiring Diagram**

**Note:** The Solid-state output circuit, open collector, 24VDC Maximum at 100 MA maximum

Table 8-59 describes the wiring information of the external expanded logic cable 378813-wiring diagram shown in Figure 8-68.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Signal</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOGIC_0-</td>
<td>BRN</td>
</tr>
<tr>
<td>2</td>
<td>LOGIC_7-</td>
<td>WHT</td>
</tr>
<tr>
<td>3</td>
<td>LOGIC_1-</td>
<td>RED</td>
</tr>
<tr>
<td>4</td>
<td>LOGIC_3-</td>
<td>BLU</td>
</tr>
<tr>
<td>5</td>
<td>LOGIC_2-</td>
<td>GRN</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>BLK</td>
</tr>
<tr>
<td>7</td>
<td>NO CONNECT</td>
<td>NONE</td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD/DRAIN</td>
<td>BARE</td>
</tr>
</tbody>
</table>

**Table 8-59: External Expanded Logic Cable 378813-Wiring Chart**

**Note:** The external expanded logic cable and the optional expanded I/O board are used together.
Expanded I/O Alarm Relay Wiring Diagrams

Internal Alarm Relay Cable 378770

Table 8-60 describes the wiring information of the internal alarm relay cable 378770-wiring diagram shown in Figure 8-69.

<table>
<thead>
<tr>
<th>Wire End P6</th>
<th>Color</th>
<th>Signal Name</th>
<th>J4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RED</td>
<td>REL1_NC</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>YEL</td>
<td>REL1_NO</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>WHITE</td>
<td>REL1_COM</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>BLACK</td>
<td>REL2_NC</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>BLUE</td>
<td>REL2_NO</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>GREEN</td>
<td>REL2_COM</td>
<td>6</td>
</tr>
<tr>
<td>NA</td>
<td>NONE</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

Table 8-60: Internal Alarm Relay Cable 378770-Wiring Chart

Note: Relay1 is the fault output relay. Relay2 is the warning output relay.

Note: The internal alarm relay cable connects to the printer control board.
External Alarm Relay Cable 378810

Table 8-61 describes the wiring information of the external alarm relay cable 378810-wiring diagram shown in Figure 8-70.

<table>
<thead>
<tr>
<th>P3</th>
<th>Signal</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>REL_1_NC</td>
<td>WHT</td>
</tr>
<tr>
<td>2</td>
<td>REL_1_NO</td>
<td>RED</td>
</tr>
<tr>
<td>3</td>
<td>REL_1_COM</td>
<td>BLK</td>
</tr>
<tr>
<td>4</td>
<td>REL_2_NC</td>
<td>GRN</td>
</tr>
<tr>
<td>5</td>
<td>REL_2_NO</td>
<td>BLU</td>
</tr>
<tr>
<td>6</td>
<td>REL_2_COM</td>
<td>BRN</td>
</tr>
<tr>
<td>7</td>
<td>NO_CONNECT</td>
<td>NONE</td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD/DRAIN</td>
<td>BARE</td>
</tr>
</tbody>
</table>

Table 8-61: External Alarm Relay Cable 378810-Wiring Chart

Note: The external alarm relay cable and the optional expanded I/O card are used together.
Expanded Opto I/O Wiring Diagrams

Internal Expanded Opto I/O Cable 378769

Table 8-62 describes the wiring information of the internal expanded opto I/O cable 378769-wiring diagram shown in Figure 8-71.

<table>
<thead>
<tr>
<th>Wire End P2</th>
<th>Color</th>
<th>Signal</th>
<th>J2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RED</td>
<td>BIT 0-1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>YEL</td>
<td>GND 0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>WHITE</td>
<td>BIT 1-3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>BLACK</td>
<td>GND 1</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>BLUE</td>
<td>BIT 2-5</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>GREEN</td>
<td>GND 2</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>BROWN</td>
<td>BIT 3-7</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>ORANGE</td>
<td>GND 3</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 8-62: Internal Expanded Opto I/O Cable 378769-Wiring Chart

Note: The external expanded opto I/O cable and the optional expanded I/O card are used together.
External Expanded Opto I/O Cable 378804

Figure 8-72: External Expanded Opto I/O Cable 378804-Wiring Diagram

**Note:** Input voltage +12V, maximum

Table 8-63 describes the wiring information of the external expanded opto I/O cable 378804-wiring diagram shown in Figure 8-72.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Signal</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIT 0-</td>
<td>RED</td>
</tr>
<tr>
<td>2</td>
<td>GND 0</td>
<td>YEL</td>
</tr>
<tr>
<td>3</td>
<td>BIT 1-</td>
<td>WHT</td>
</tr>
<tr>
<td>4</td>
<td>GND 1</td>
<td>BLK</td>
</tr>
<tr>
<td>5</td>
<td>BIT 2-</td>
<td>BLU</td>
</tr>
<tr>
<td>6</td>
<td>GND 2</td>
<td>GRN</td>
</tr>
<tr>
<td>7</td>
<td>BIT 3-</td>
<td>ORG</td>
</tr>
<tr>
<td>8</td>
<td>GND 3</td>
<td>BRN</td>
</tr>
<tr>
<td>SHELL</td>
<td>SHIELD/DRAIN</td>
<td>BARE</td>
</tr>
</tbody>
</table>

Table 8-63: External Expanded Opto I/O Cable 378804-Wiring Chart

**Note:** The external expanded opto I/O cable and the optional expanded I/O card are used together.
The Illustrated Part List (IPL) contains the illustrations and the parts lists for the different assemblies in the printer. The parts lists give the part numbers, description and quantity of all the items and the modules in the printer. You can order the items and the modules for which the part numbers are given.

How to Read the IPL

This section describes how the higher assemblies are broken down to their related subassemblies and other separate parts.

Illustrations

Table 9-1 on page 9-2 shows the symbols used to indicate the different levels of main assemblies in a printer, and the subassemblies under the main assembly.
Alphabets

- An alphabet is assigned to the main assemblies of a printer and each subassembly under the main assembly. See Figure 9-1 on page 9-3.

  For example: If A, B, C and D identify the main assemblies of a printer, then the alphabets E,F, and so on identify the subassemblies below each main assembly in a sequence.

- The alphabets assigned to main assemblies are used only for one time.

- The alphabets “I” and “O” are not used because you can read the alphabets incorrectly as the numbers 1 and 0.
Numbers
A natural number (1,2,3,...) is assigned to the standalone parts (in the increasing order) in the chapter. See Figure 9-1.

Note: The numbers assigned to main assemblies are used only for one time.

![Graphical Representation of the different Subassemblies and parts](image)

Figure 9-1: Graphical Representation of the different Subassemblies and parts
Tables

Figure 9-2 describes the styles used to show the explosion of the main assemblies in the parts lists.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 9-2: Representation of the different Subassemblies and parts in the Table

Notes

Notes provide useful information. Some examples for note are as follows:

Note: To order this item, use the part number of Item 9 in this table.

Note: This screw is a part of solenoid bank assembly.

Note: You can order this item separately.
Quantity

Read the contents of Box 1 and Box 2 shown in the figure below. The quantity is shown in Box 1 only but to get the quantity for the contents in Box 2, there is a reference given to Box 1. This method is followed in the chapter.

<table>
<thead>
<tr>
<th>Box 1</th>
<th>Box 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>201143</td>
</tr>
<tr>
<td>15</td>
<td>212299</td>
</tr>
<tr>
<td>16</td>
<td>201027</td>
</tr>
<tr>
<td>17</td>
<td>350704</td>
</tr>
<tr>
<td>18</td>
<td>251413</td>
</tr>
<tr>
<td>19</td>
<td>205214</td>
</tr>
<tr>
<td>19</td>
<td>206217</td>
</tr>
<tr>
<td>J</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>250522</td>
</tr>
<tr>
<td>21</td>
<td>212299</td>
</tr>
</tbody>
</table>

Figure 9-3: Representation of Quantity
Videojet Excel Dual Nozzle Printer

Follow the steps to see the different systems in the printer:

1. Open the front door (Item 3, Figure 9-4) and fluid pan door (Item 2) to access the hydraulic compartment (Item C, Figure 9-5 on page 9-7).

*Note:* You can only order the printhead (Item A) and umbilical (Item B) assemblies together. Item A and B are separated in this chapter for readability.

Figure 9-4: Videojet Excel Dual Nozzle Printer (with fluid pan door closed)
2 Open the cabinet door (Item 1, Figure 9-6) to access the pneumatic compartment (Item E, Figure 9-6) and electronics compartment (Item D).
Table 9-2 shows the sub assemblies of the printer.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cabinet Door</td>
</tr>
<tr>
<td>2</td>
<td>Fluid Pan Door</td>
</tr>
<tr>
<td>3</td>
<td>Front Door</td>
</tr>
<tr>
<td>A</td>
<td><strong>Printhead</strong> (Refer to “Printhead” on page 9-9)</td>
</tr>
<tr>
<td>B</td>
<td><strong>Umbilical</strong> (Refer to “Umbilical” on page 9-13)</td>
</tr>
<tr>
<td>C</td>
<td><strong>Hydraulic Compartment</strong> (Refer to “Hydraulic Compartment” on page 9-23)</td>
</tr>
<tr>
<td>D</td>
<td><strong>Electronics Compartment</strong> (Refer to Figure on page 9-30)</td>
</tr>
<tr>
<td>E</td>
<td><strong>Pneumatics Compartment</strong> (Refer to “Pneumatic Compartment” on page 9-38)</td>
</tr>
</tbody>
</table>

*Table 9-2: Videojet Excel Dual Nozzle Printer Sub Assemblies*
Printhead

Note: You cannot order the printhead and the umbilical separately.

Figure 9-7: Printhead
Table 9-3 lists the part numbers of the printhead.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>379220</td>
<td>Printhead Assembly (Refer to Figure 9-7 on page 9-9)</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9-3: Printhead Parts List

*Figure 9-7: Printhead (Continued)*
### Table 9-3: Printhead Parts List (Continued)

<table>
<thead>
<tr>
<th>A and B</th>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SP379220-01</td>
<td>Kit, Printhead Assembly, Non-Auto Flush, Small Return Tube, Excel Dual Nozzle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SP379220-02</td>
<td>Kit, Printhead Assembly, Auto Flush, Small Return Tube, Excel Dual Nozzle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SP379220-03</td>
<td>Kit, Printhead Assembly, Non-Auto Flush, Large Return Tube, Excel Dual Nozzle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SP379220-04</td>
<td>Kit, Printhead Assembly, Auto Flush, Large Return Tube, Excel Dual Nozzle</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>355186</td>
<td>Nozzle, Platform Weldment Adjustment</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>371019</td>
<td>Ink Valve, Auto Flush, Assembly</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>SP355198</td>
<td>Ink Valve Non-Auto Flush</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>379234</td>
<td>O-Ring Seal Wash down Printhead,</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>370068</td>
<td>Screw, Special HD, M3 x 9.525mm, Sleeve Screw</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>223769</td>
<td>Ink Barb &quot;Y&quot;, Stainless Steel Tube</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>374514</td>
<td>Clip, Retainer 3.29&quot;</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>374530</td>
<td>Eccentric, Adjustment, Horizontal</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>206313</td>
<td>Washer, Lock, Split Ring, #4, 0.115 ID</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>193499</td>
<td>Washer, Flat, 0.025 x 0.125 ID</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>201169</td>
<td>Screw, 4-40 x 0.187, Panhead Slotted Machined, Stainless Steel Waxed</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>202505</td>
<td>Screw, 2-56 x 0.125, Panhead Slotted Machined, Stainless Steel</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>379235</td>
<td>Bracket, Cable Printhead</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>379221</td>
<td>Chassis, Weldment, Excel Dual Nozzle</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>204563</td>
<td>Screw, 2-56 x 0.250, Panhead Slotted Machined, Stainless Steel, PSVT</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>205827</td>
<td>Screw (on cable bracket)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>201397</td>
<td>Screw, 2-56 x 0.187, Panhead Slotted Machined, Stainless Steel Waxed</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>112700</td>
<td>Screw, Machined, Flat Head, Phil, 2-56 1/8 Long</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>355974</td>
<td>Clip, LED</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>355220</td>
<td>Pivot, Platform</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>206221</td>
<td>Ring, Retaining, Prong Lock, 0.125 ID</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>203755</td>
<td>Screw, 2-56 x 3/16&quot; (4.76mm)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>----------------------------------------------------------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td><strong>20</strong></td>
<td>355199</td>
<td>Arm, Plate, High Voltage, Assembly (Nozzle # 2)</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>21</strong></td>
<td>356725</td>
<td>Plate, High Voltage, Assembly (Nozzle # 2)</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td>356859</td>
<td>Strap, Grounding, Printhead, Catcher</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>23</strong></td>
<td>SP379230</td>
<td>Catcher Assembly, Gullet, Plastic, with ground strap 379233, Excel Dual Nozzle</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>24</strong></td>
<td>379228</td>
<td>Plate, High Voltage, Left, Printhead, (Nozzle # 1)</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>25</strong></td>
<td>379229</td>
<td>Arm, Plate, High Voltage, Left, Printhead</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>26</strong></td>
<td>390019</td>
<td>Charge Tunnel</td>
<td></td>
</tr>
<tr>
<td><strong>27</strong></td>
<td>203755</td>
<td>Screws, Mach, Rnd HD, 2-56x 3/16&quot; LG</td>
<td></td>
</tr>
<tr>
<td><strong>28</strong></td>
<td>SP371675</td>
<td>Nozzle, 66μ, Assembly</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>29</strong></td>
<td>363022</td>
<td>Ground Wire, 24 Gauge, Green Assy</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>30</strong></td>
<td>379266</td>
<td>Disperser Assembly, Air Excel Dual Nozzle</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>31</strong></td>
<td>379226</td>
<td>Rear Printhead Cover</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>32</strong></td>
<td>379225</td>
<td>Printhead Sleeve</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><em>33</em></td>
<td></td>
<td>Washdown IP65, printhead sleeve, cover <strong>Note: This is an optional accessory</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><em>34</em></td>
<td>206582</td>
<td>O-Ring, 0.042 ID Used with Nozzle to ink valve</td>
<td><strong>2</strong></td>
</tr>
</tbody>
</table>

Table 9-3: Printhead Parts List (Continued)

* Items not shown in the Figure.
Umbilical

Figure 9-8: Umbilical Assembly - Printhead Side (G) and Enclosure side (F)
Enclosure Side

Figure 9-9: Umbilical - Enclosure Side

High Voltage Connector

Figure 9-10: High Voltage Connector
**Sense Line 4 Position Connector**

![Sense Line 4 Position Connector Diagram](image)

*Figure 9-11: Sense Line 4 Position Connector*

**Charge Tunnel Nozzle Drive Connector**

![Charge Tunnel Nozzle Drive Connector Diagram](image)

*Figure 9-12: Charge Tunnel Nozzle Drive Connector*

**LED Connector**

![LED Connector Diagram](image)

*Figure 9-13: LED Connector*

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
</tr>
<tr>
<td>3</td>
<td>Gray</td>
</tr>
<tr>
<td>4</td>
<td>Gray</td>
</tr>
<tr>
<td>5</td>
<td>Shield</td>
</tr>
</tbody>
</table>

*Table 9-4: LED Connector Color Code*
Table 9-4: LED Connector Color Code  (Continued)

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Shield</td>
</tr>
</tbody>
</table>

Table 9-4: LED Connector Color Code

**Sense Line 3 Position Connector**

![Figure 9-14: Sense Line 3 Position Connector]

**Fitting and Braid Connector**

![Figure 9-15: Fitting and Braid Connector]

Table 9-5 below lists the parts of the umbilical from the enclosure side.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td><strong>Umbilical Assembly</strong> (Refer to Figure 9-8 on page 9-13)</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td><strong>Umbilical Assembly - Enclosure Side</strong> (Refer to Figure 9-9 on page 9-14)</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>203339</td>
<td><em>Note</em>: Refer to the same part on the printhead side.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>202549</td>
<td><em>Note</em>: Refer to the same part on the printhead side.</td>
<td></td>
</tr>
</tbody>
</table>

Table 9-5: Umbilical - Enclosure Side Parts list
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>212757</td>
<td><strong>Note:</strong> Refer to the same part on the printhead side.</td>
</tr>
<tr>
<td>4</td>
<td>206214</td>
<td><strong>Note:</strong> Refer to Item 1, Table 9-6 on page 9-21.</td>
</tr>
<tr>
<td></td>
<td>251413</td>
<td><strong>Note:</strong> Refer to Item 1, Table 9-6 on page 9-21.</td>
</tr>
<tr>
<td>5</td>
<td>206214</td>
<td><strong>Note:</strong> Refer to Item 10, Table 9-6 on page 9-21.</td>
</tr>
<tr>
<td></td>
<td>251413</td>
<td><strong>Note:</strong> Refer to Item 10, Table 9-6 on page 9-21.</td>
</tr>
<tr>
<td>6</td>
<td>209412</td>
<td>Tubing Nylon, 0.281 ID, 3/8” OD 46 feet</td>
</tr>
<tr>
<td>7</td>
<td>218937</td>
<td>Fitting, Liq-Tight, 3/4” Straight 1</td>
</tr>
<tr>
<td>8</td>
<td>212299</td>
<td>Cable, Custom, 7 Conductor 48.66 feet</td>
</tr>
<tr>
<td>9</td>
<td>219148</td>
<td>Tubing, Shrink, 0.500 ID, W ADV 0.5 feet</td>
</tr>
<tr>
<td>*10</td>
<td>219176</td>
<td>Nut, Lock, Conduit, 3/4 NPT 2</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>-</td>
<td><strong>High Voltage Connector</strong>  (Refer to Figure 9-10 on page 9-14) -</td>
</tr>
<tr>
<td>11</td>
<td>370216</td>
<td>Insulation Cup 2</td>
</tr>
<tr>
<td>12</td>
<td>208191</td>
<td>Connector Crimp, Spade 2</td>
</tr>
<tr>
<td>13</td>
<td>212299</td>
<td>Cable, Custom, 7 Conductor  Refer to Item 8 for Quantity -</td>
</tr>
<tr>
<td><strong>J</strong></td>
<td>-</td>
<td><strong>Sense Line 4 Position Connector</strong>  (Refer to Figure 9-11 on page 9-15) -</td>
</tr>
<tr>
<td>14</td>
<td>205509</td>
<td>Tubing Shrink, 0.063 ID Black 0.66 feet</td>
</tr>
<tr>
<td>15</td>
<td>210658</td>
<td>Housing, 4 Pos, AMP MTE Receptacle 1</td>
</tr>
<tr>
<td>16</td>
<td>210650</td>
<td>Contact, Receptacle, 26-22 AWG 12</td>
</tr>
<tr>
<td>17</td>
<td>206174</td>
<td>Tubing, Shrink, 0.125 ID Black 1.1 feet</td>
</tr>
<tr>
<td>18</td>
<td>212299</td>
<td>Cable, Custom, 7 Conductor  Refer to Item 8 for Quantity -</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>-</td>
<td><strong>Charge Tunnel and Nozzle Drive Connector</strong>  (Refer to Figure 9-12 on page 9-15) -</td>
</tr>
<tr>
<td>19</td>
<td>205966</td>
<td>Connector Coaxial, Plug, Quick Connect 4</td>
</tr>
<tr>
<td>20</td>
<td>212299</td>
<td>Cable, Custom, 7 Conductor  Refer to Item 8 for Quantity -</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>-</td>
<td><strong>LED Connector</strong>  (Refer to Figure 9-13 on page 9-15) -</td>
</tr>
<tr>
<td>21</td>
<td>205509</td>
<td>Tubing Shrink, 0.063 ID Black 0.66 feet</td>
</tr>
<tr>
<td>22</td>
<td>210660</td>
<td>Housing, 6 Position, AMP MTE Receptacle 1</td>
</tr>
</tbody>
</table>

Table 9-5: Umbilical - Enclosure Side Parts list (Continued)
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 23 | 210650 | Contact, Receptacle, 26-22 AWG  
Refer to Item 16 for Quantity |
| 24 | 212299 | Cable, Custom, 7 Conductor  
Refer to Item 8 for Quantity |
| **M** | - | Sense Line 3 Position Connector  
(Refer to Figure 9-14 on page 9-16) |
| 25 | 205509 | Tubing Shrink, 0.063 ID Black  
Refer to Item 21 for Quantity |
| 26 | 212369 | Housing, 3 Position, AMP MTE Receptacle  
1 |
| 27 | 210650 | Contact, Receptacle, 26-22 AWG  
Refer to Item 16 for Quantity |
| 28 | 206174 | Tubing, Shrink, 0.125 ID Black  
Refer to Item 17 for Quantity |
| 29 | 212299 | Cable, Custom, 7 Conductor  
Refer to Item 8 for Quantity |
| **N** | - | Fitting and Braid Connector  
(Refer to Figure 9-15 on page 9-16) |
| 30 | 206186 | Terminal, Ring, #8, 12-10AWG  
2 |
| 31 | 203684 | Wire, Braided, 3/8 WD x 0.03 Thick  
21.66 feet |
| 32 | 219150 | Tape, EMI, 1" Wide  
0.34 feet |
| 33 | 218937 | Fitting, Liquid-Tight, 3/4", Straight  
1 |
| 34 | 217097 | Conduit, Non-metallic Flexible, 3/4"  
20 feet |
| 35 | 212299 | Cable, Custom, 7 Conductor  
Refer to Item 8 for Quantity |
| 36 | 219149 | Tubing Shrink, 0.5 ID, Semi-rigid  
0.25 feet |

Table 9-5: Umbilical - Enclosure Side Parts list (Continued)
Printhead Side

Figure 9-16: Umbilical - Printhead Side
Ink Return Line Connector

Figure 9-17: Ink Return Line Connector

LED Connector

Figure 9-18: LED Connector

High Voltage Connector

Figure 9-19: High Voltage Connector

Charge Tunnel Connector

Figure 9-20: Charge Tunnel Connector
Table 9-6 below lists the parts of the umbilical on the printhead side.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td>Umbilical Assembly</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Refer to Figure 9-8 on page 9-13)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>Umbilical Assembly - Printhead Side</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Refer to Figure 9-16 on page 9-19)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>251413</td>
<td>Tubing Plastic, 1/8 OD, Return line, Large Tube, Water, (Nozzle-1)</td>
<td>46 feet</td>
</tr>
<tr>
<td>2</td>
<td>206214</td>
<td>Tubing Teflon, Small Tube Return Line (Solvent), 0.053 ID 0.085 OD, (Nozzle-1)</td>
<td>46 feet</td>
</tr>
<tr>
<td>2</td>
<td>219148</td>
<td>Tubing Shrink, 0.5 ID, W ADV</td>
<td>0.5 feet</td>
</tr>
<tr>
<td>3</td>
<td>218937</td>
<td>Fitting, Liquid-tight, 3/4&quot;, Straight</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>217097</td>
<td>Conduit, Nonmetallic Flexible, 3/4&quot;</td>
<td>20 feet</td>
</tr>
<tr>
<td>5</td>
<td>216176</td>
<td>Nut, Lock Conduit 3/4&quot; NPT</td>
<td>2 (one on each side of umbilical)</td>
</tr>
<tr>
<td>6</td>
<td>202549</td>
<td>Tubing, Teflon, 0.062 ID x 0.03 W, Ink Line</td>
<td>23.08 feet</td>
</tr>
<tr>
<td>7</td>
<td>212757</td>
<td>Tubing, Teflon, 0.053 ID x 0.085 OD, Brown Stripe, Auto Flush Tubing</td>
<td>24.4 feet</td>
</tr>
<tr>
<td>8</td>
<td>203339</td>
<td>Tubing, Pollyallomer, 1/8 OD, Positive Air Tube</td>
<td>22.75 feet</td>
</tr>
<tr>
<td>9</td>
<td>206214</td>
<td>Tubing, Teflon, 0.053 ID x 0.016 W, Ink Line</td>
<td>0.16 feet</td>
</tr>
<tr>
<td>10</td>
<td>251413</td>
<td>Tubing Plastic, 1/8 OD, Return line, Large Tube, Water, (Nozzle-2)</td>
<td>46 feet</td>
</tr>
<tr>
<td>206214</td>
<td>Tubing Teflon, Small Tube Return Line (Solvent), 0.053 ID 0.085 OD, (Nozzle-2)</td>
<td>46 feet</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>203684</td>
<td>Wire, Braided, 3/8 WD x 0.03 Thick</td>
<td>21.66 feet</td>
</tr>
<tr>
<td>12</td>
<td>212204</td>
<td>Terminal, Ring, #4, 12-10 AWG</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9-6: Umbilical - Printhead Side Parts List
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Ink Return Line Connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Tubing, Shrink, 0.047 ID Black</td>
<td>1.38 feet</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Tubing, Shrink, 0.125 ID</td>
<td>0.08 feet</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Cable, Custom, 7 Conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Item 8, Table 9-5 on page 9-16.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Tubing, Shrink, 0.187 ID</td>
<td>0.06 feet</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Fitting, Barb, Return Line</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Terminal, Ring, #2, 26-22 AWG</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>LED Connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Figure 9-18 on page 9-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Tubing, Shrink, 0.093 ID</td>
<td>0.08 feet</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Cable, Custom, 7 Conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Item 8, Table 9-5 on page 9-16.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>LED, Red, Solid State, T1 Package</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Tubing, Shrink, 0.063 ID Black</td>
<td>0.66 feet</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>High Voltage Connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Figure 9-19 on page 9-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Resistor, High Voltage, 10M, 1%, 1500V</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Tubing, Heat Shrink, 0.187 ID, Black</td>
<td>4 inches</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Tubing Teflon, 0.144 ID x 0.02W</td>
<td>0.15 feet</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Cable, Custom, 7 Conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Item 8, Table 9-5 on page 9-16.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Tubing, Shrink, 0.125 ID Black</td>
<td>1.1 feet</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Terminal Lug</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Wire, High Voltage, 0.13kV DC, 22 AWG</td>
<td>0.55 feet</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Charge Tunnel Connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Figure 9-20 on page 9-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Tubing, Shrink, 0.125 ID Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Item 27 for Quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Cable, Custom, 7 Conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refer to Item 8, Table 9-5 on page 9-16.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Resistor FCF, 10K Ohm 1/4W, 5%</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Terminal Lug</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Wire, Insulated, White, 20 GA</td>
<td>0.25 feet</td>
<td></td>
</tr>
</tbody>
</table>

Table 9-6: Umbilical - Printhead Side Parts List (Continued)
| M  | - | **Nozzle Drive Connector,**  
(Refer to Figure 9-21 on page 9-21) | 1 |
|----|---|---------------------------------|---|
| 35 | 206174 | Tubing, Shrink, 0.125 ID Black  
Refer to Item 27 for Quantity | - |
| 36 | 363040 | Connector, (2) Pin Female with Latch  
Nonomnetics | 2 |
| 37 | 205509 | Tubing, Shrink, 0.063 ID, Black  
Refer to Item 23 for Quantity | - |

Table 9-6: Umbilical - Printhead Side Parts List (Continued)

**Hydraulic Compartment**

![Figure 9-22: Hydraulic Compartment with Autoflush Option](image-url)
Gauge Door Assembly

Figure 9-23: Gauge Door Assembly
Figure 9-24: Ink Module Assembly
Ink Cylinder and Switch Assembly

Table 9-7 below lists the parts of the hydraulic compartment.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
<th>Description</th>
<th>Qty</th>
</tr>
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<tbody>
<tr>
<td>C</td>
<td></td>
<td><strong>Hydraulic Compartment</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Refer to Figure 9-22 on page 9-23)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SP370551</td>
<td>Bottle Filter (Make-up)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>251413</td>
<td>Tubing, Plastic, 1/8 OD, (Fluids Low)</td>
<td>11.35 feet</td>
</tr>
<tr>
<td>3</td>
<td>205987</td>
<td>Fitting, Tube, Barbed, 1/16 ID, “T”</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>212645</td>
<td>Fitting, Tube, 1/16 Barbed Elbow</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>250077</td>
<td>Tie Cable</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 9-7: Hydraulic Compartment Parts List
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>204615</td>
<td>Tubing, Extruded, 1/8 ID X 1/4 OD</td>
<td>1.71 feet</td>
</tr>
<tr>
<td>7</td>
<td>374637</td>
<td>Barb, Filter Cap, Male Luer Lock to 1/8 Barb</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>090073</td>
<td>Bottle (1 Qt.)</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>SP370551</td>
<td>Excel Dual Nozzle Printer Only: 66 Bottle Filter (Ink)</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>390593</td>
<td>Tube, Transfer 0.032 ID, Large (Water)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>390592</td>
<td>Tube, Transfer 0.067 ID, Small (Solvent)</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>208759</td>
<td>Nut, Hex Machine Screw, 8-32, Waxed</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>204499</td>
<td>Tube, Teflon, 0.032 ID x 0.47 W x 0.125 OD</td>
<td>4.28 feet</td>
</tr>
<tr>
<td>13</td>
<td>202549</td>
<td>Tubing, Teflon, 1/16 ID</td>
<td>3.42 feet</td>
</tr>
<tr>
<td>14</td>
<td>205999</td>
<td>Tubing, Extruded, 3/16 ID x 0.313 OD, SLCN</td>
<td>0.08 long</td>
</tr>
<tr>
<td>15</td>
<td>204667</td>
<td>Filter, Disposable, 3 Micron</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>203303</td>
<td>Fitting, Tube, FML Elbow, 1/4 OD</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>212599</td>
<td>Gasket, 3/16&quot; ID</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>201867</td>
<td>Fitting, Tube, Barb, 1/8 ID</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>201871</td>
<td>Fitting, Tube, Bulkhead Union</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>206889</td>
<td>Tubing, Extruded, 0.170 ID x 0.250 OD</td>
<td>2.31 feet</td>
</tr>
<tr>
<td>19</td>
<td>206407</td>
<td>Plate, Striker, Door, Adhesive</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>206417</td>
<td>Nut, Acorn, 8-32, Stainless Steel</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>205981</td>
<td>Fitting, Pipe, Lock Nut, 1/8 NPT, Brass</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>356148</td>
<td>Tube, Coupling</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>SP375007-03</td>
<td>Filter, Ink, 5 Micron Absolute</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>206765</td>
<td>Fitting, Pipe, Lock Nut, 1/4 Npsl</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>212673</td>
<td>Plug Fitting, 1/8 x 27 NPT</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SP374535</td>
<td>Gauge Door Assembly</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>SP370682</td>
<td>Regulator, Pressure, Assembly</td>
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</tr>
<tr>
<td>27</td>
<td>208302</td>
<td>Barbed Swivel Elbow</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>251413</td>
<td>Refer to Item 2</td>
<td>-</td>
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<tr>
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<td>Refer to Item 2</td>
<td>-</td>
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<tr>
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<td>251413</td>
<td>Refer to Item 2</td>
<td>-</td>
</tr>
<tr>
<td>31</td>
<td>201844</td>
<td>Fitting, Tube, Barb, 1/16 X 10-32 M</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>SP356015</td>
<td>Trap, Assy</td>
<td>1</td>
</tr>
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</table>

Table 9-7: Hydraulic Compartment Parts List (Continued)
### Table 9-7: Hydraulic Compartment Parts List (Continued)

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<thead>
<tr>
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<th>Code</th>
<th>Description</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>33</td>
<td>206318</td>
<td>Fitting, Tube, Elbow 1/8 O.D.</td>
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<tr>
<td>34</td>
<td>193499</td>
<td>Washer, Flat, 0.025 x 0.125 ID</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>207112</td>
<td>Nut, Hex, 4-40 0.062 High</td>
<td>4</td>
</tr>
<tr>
<td>35</td>
<td>205981</td>
<td>Fitting, Pipe, Lock Nut 1/8 NPT, Brass</td>
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</tr>
<tr>
<td>36</td>
<td>209152</td>
<td>Gauge, Vacuum, 0-30 Hg, Bttm MNT</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>209151</td>
<td>Gauge, Pressure, 0-100 Psig, 1/8 NP</td>
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<tr>
<td>38</td>
<td>374541</td>
<td>Door, Gauge, SST, Weldment</td>
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<tr>
<td>G</td>
<td>SP390579</td>
<td><strong>Ink Module Assembly</strong></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>SP355611</td>
<td>Diaphragm, Valve, Adder</td>
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<tr>
<td>40</td>
<td>355609</td>
<td>Pusher, Adder</td>
<td>2</td>
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<tr>
<td>41</td>
<td>SP355342</td>
<td>Spring Compression</td>
<td>2</td>
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<tr>
<td>42</td>
<td>355606</td>
<td>Cap, Adder Valve</td>
<td>2</td>
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<tr>
<td>43</td>
<td>193499</td>
<td>Washer, Flat</td>
<td>8</td>
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<td>44</td>
<td>208760</td>
<td>Nut, Mach Screw</td>
<td>8</td>
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<tr>
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<td>Gasket 3/16&quot; ID Refer to Item 17 for Quantity</td>
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<tr>
<td>46</td>
<td>209160</td>
<td>Fitting, Tube</td>
<td>2</td>
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<td>47</td>
<td>208302</td>
<td>Swivel, Barbed, Elbow, Fitting</td>
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<td>48</td>
<td>205826</td>
<td>SCREW, 8-32 x 0.87</td>
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<td>49</td>
<td>206430</td>
<td>Washer, Lock</td>
<td>4</td>
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<td>355046</td>
<td>Cap, Domed</td>
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<td>SP207016</td>
<td>Diaphragm, Rolling, 2.00 inch square</td>
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<td>375003</td>
<td>PISTON, PUMP</td>
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<td>53</td>
<td>SP205978</td>
<td>Spring, Compression, 2-1/2 long</td>
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<tr>
<td>54</td>
<td>202549</td>
<td>Tubing, Teflon</td>
<td>3.25 inches</td>
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<tr>
<td>55</td>
<td>203322</td>
<td>Tube, Ferrule, Front</td>
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<td>203323</td>
<td>Tube, Ferrule, Back</td>
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<td>203324</td>
<td>Tube, Nut</td>
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<tr>
<td>56</td>
<td>374809</td>
<td>Fitting, Check Valve, Duck Bill Check Valve</td>
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<td>57</td>
<td>207407</td>
<td>Valve, Combination</td>
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<tr>
<td>58</td>
<td>207015</td>
<td>O Ring, 1.540 I</td>
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<tr>
<td>No.</td>
<td>Part Number</td>
<td>Description</td>
<td>Qty.</td>
</tr>
<tr>
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<td>--------------</td>
<td>--------------------------------------------------</td>
<td>------</td>
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<tr>
<td>59</td>
<td>206840</td>
<td>Cap, Non Threaded</td>
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<td>60</td>
<td>SP374563</td>
<td>Plug, Drain</td>
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<td>61</td>
<td>390590</td>
<td>Ink Module</td>
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<tr>
<td>62</td>
<td>206728</td>
<td>Tubing, Extruded (Quantity of 2)</td>
<td>0.25 inches</td>
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<td>63</td>
<td>SP390589</td>
<td>Ink Cylinder and Switch Assembly</td>
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</tr>
<tr>
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<td>356003</td>
<td>Bracket, Mounting, Tank, Press, Assembly</td>
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<tr>
<td>64</td>
<td>204476</td>
<td>Fitting Connector, Tubing, 10-32 1/8 TB</td>
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<td>Gasket, 3/16 ID</td>
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<tr>
<td>65</td>
<td>205886</td>
<td>Screw, Machined, Panhead, POZ, 6-32 1-1/8 lg</td>
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<td>Washer, Flat, 0.153 ID</td>
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<tr>
<td>66</td>
<td>205819</td>
<td>O Ring, 0.364 ID</td>
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<td>67</td>
<td>355290</td>
<td>Bracket, Magnet, Weldment</td>
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<tr>
<td>68</td>
<td>206062</td>
<td>Magnet, Permanent, Door Catch</td>
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<tr>
<td>69</td>
<td>356008</td>
<td>Shield, Pressure Tank</td>
<td>1</td>
</tr>
<tr>
<td>70</td>
<td>100319</td>
<td>Screw, Machined, Panhead, POZ, 8-32 1/4 long</td>
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</tr>
<tr>
<td></td>
<td>190341</td>
<td>Washer, Flat, 0.032 x 0.203 ID</td>
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</tr>
<tr>
<td>71</td>
<td>SP355034</td>
<td>Float, Pressure Tank, Assembly</td>
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</tr>
<tr>
<td>72</td>
<td>SP356007</td>
<td>Cap, Sub, Restrictor, Assembly</td>
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<tr>
<td>73</td>
<td>203473</td>
<td>Fitting, Tube, ML Connector, 1/8 OD</td>
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<tr>
<td>74</td>
<td>110213</td>
<td>Screw, Machined, Panhead, POZ, 4-40 5/16 long</td>
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<tr>
<td></td>
<td>193499</td>
<td>Washer, Flat, 0.025 x 0.125 ID</td>
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<td>356168-02</td>
<td>Switch, Pressure Tank, S5, Assembly (TXSW)</td>
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<td>205811</td>
<td>Tubing, Teflon, 0.500 ID</td>
<td>0.63 feet</td>
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<td>77</td>
<td>356168-01</td>
<td>Switch, Pressure Tank, S4, Assembly (STSW)</td>
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<td>78</td>
<td>355094</td>
<td>Bracket, Switch, Assembly</td>
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<tr>
<td>79</td>
<td>201160</td>
<td>Washer, Flat, 0.153 ID</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>100357</td>
<td>Screw, Machined, Panhead, POZ, 6-32 1/4 long</td>
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<tr>
<td>80</td>
<td>SP390586</td>
<td>Cap, O-ring, Pressure Tank</td>
<td>1</td>
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</tbody>
</table>

Table 9-7: Hydraulic Compartment Parts List (Continued)
Electronics Compartment

Figure 9-26: Electronics Compartment
Figure 9-26: Electronics Compartment (Continued)
Figure 9-26: Electronics Compartment (Continued)
Keyboard Assembly

Figure 9-27: Keyboard Assembly
Control Board

Table 9-8 below lists the parts of the electronics compartment.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
<th>Description</th>
<th>Qty</th>
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<tr>
<td>D</td>
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<td><strong>Electronics Compartment</strong>&lt;br&gt;(Refer to Figure 9-26 on page 9-30)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>206061</td>
<td>Fitting, Nut &amp; Sleeve, 1-11/32 Length</td>
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</tr>
<tr>
<td></td>
<td>355148</td>
<td>Fitting Plug Bulkhead</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9-8: Electronics Compartment Parts List

Figure 9-28: Control Board

Table 9-8 below lists the parts of the electronics compartment.
<table>
<thead>
<tr>
<th>No.</th>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>209058</td>
<td>Cover, Waterproof, Rocker Switch</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>208336</td>
<td>Screw, M4 x 8, Socket CAP, ST BLK</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>500-0076-133</td>
<td>Plug, Blanking 18 mm</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>208338</td>
<td>Nut, Keps, M4</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>SP379202</td>
<td>PCB, PEAP Assembly, Excel Dual Nozzle</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>223723</td>
<td>Nut, M4, Nylon</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>208309</td>
<td>Mount, Adhesive Backed, 4-way</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>379279</td>
<td>Shield, Power Supply</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>378751</td>
<td>Cord, Power,18AWG, SJT, 8 feet.</td>
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</tr>
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<td>11</td>
<td>-</td>
<td>Refer to Item 50</td>
<td></td>
</tr>
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<td>12</td>
<td>212391</td>
<td>Standoff, Hex, M4 x 12, M/F, SS</td>
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</tr>
<tr>
<td>13</td>
<td>206041</td>
<td>Muffler, Air, Pneumatic Exhaust</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>204477</td>
<td>Fitting, Bulkhead,1/4 NPT 1L</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>206252</td>
<td>Fitting, Tube, ML Connector, 3/8 OD</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>212351</td>
<td>Tubing, 3/8 inch O.D. Polyethylene W/flame Retardant</td>
<td>2</td>
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<tr>
<td>17</td>
<td>206804</td>
<td>Nut, Single Thread, SLF RTNG, U, 8-32</td>
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<td>18</td>
<td>202306</td>
<td>Clamp, Cable, 3/8 ID</td>
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<tr>
<td>19</td>
<td>219176</td>
<td>Nut, Lock, Conduit, 3/4 NPT</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>207667</td>
<td>Screw, M4 x 35, Panhead PHIL Machined, ST Zinc</td>
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<tr>
<td>21</td>
<td>218927</td>
<td>Guard, Fan, 120mm</td>
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<tr>
<td>22</td>
<td>SP378630</td>
<td>Fan Assembly, W/ Connector, (IP65 Printer Configuration)</td>
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<tr>
<td>23</td>
<td>379211</td>
<td>Cable, Excel Dual Nozzle Keypad</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
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<td>Cable, Excel Dual Nozzle LCD Backlight</td>
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<td>25</td>
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<td>Cable, Excel Dual Nozzle LCD Data</td>
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<td>26</td>
<td>207583</td>
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<td>27</td>
<td>378761</td>
<td>Display, LCD</td>
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<td>28</td>
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<td>Harness, Ink System, Excel Dual Nozzle</td>
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<td>29</td>
<td>14478</td>
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<td>193756</td>
<td>Washer, Flat, 0.031 x 0.125 ID</td>
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<td>390666</td>
<td>Harness, Power Supply</td>
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Table 9-8: Electronics Compartment Parts List (Continued)
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<tbody>
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<td>203667</td>
<td>Nut, Lock, Conduit, 1/2 NPT</td>
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<td>33</td>
<td>206275</td>
<td>Gasket, 1/2 NPT</td>
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<td>208917</td>
<td>Connector, Cord, Strain Relf, 1/2 inch NPT</td>
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<td>35</td>
<td>-</td>
<td>Refer to Item 50</td>
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<tr>
<td>36</td>
<td>210611</td>
<td>Switch Power 2PDT &amp; Circuit Breaker 1.3 AMP</td>
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<tr>
<td>37</td>
<td>217206</td>
<td>Filter, Line, 2 AMP, 1/4 inch Connectors</td>
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<tr>
<td>38</td>
<td>-</td>
<td>Refer to Item 50</td>
</tr>
<tr>
<td>39</td>
<td>216514</td>
<td>Power Supply, AC/DC, 100W, 24V</td>
</tr>
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<td></td>
<td></td>
<td><strong>Keyboard Assembly</strong></td>
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<td>(Refer to Figure 9-27 on page 9-33)</td>
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<td>40*</td>
<td>SP378997-101</td>
<td>Keyboard, Kit EDN, US</td>
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<tr>
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<td>SP378997-102</td>
<td>Keyboard, Kit EDN, European</td>
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<tr>
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<td>SP378997-103</td>
<td>Keyboard, Kit EDN, Turkish</td>
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<td>SP378997-105</td>
<td>Keyboard, Kit EDN, Japanese (Katakana)</td>
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<td>SP378997-109</td>
<td>Keyboard, Kit EDN, Polish</td>
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<td>SP378997-110</td>
<td>Keyboard, Kit EDN, Korean</td>
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<td>SP378997-111</td>
<td>Keyboard, Kit EDN, Arabic</td>
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<td>SP378997-114</td>
<td>Keyboard, Kit EDN, Thai</td>
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<td>223724</td>
<td>Standoff, M4 x 3mm, M/F, Nylon</td>
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<td>378614</td>
<td>Bezel, Keyboard</td>
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<tr>
<td>43</td>
<td>219482</td>
<td>Standoff, Hex M3 x 0.05 x12mm Female/female</td>
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<tr>
<td>44</td>
<td>84518</td>
<td>P Clip 4.8mm</td>
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<tr>
<td>45</td>
<td>218934</td>
<td>Spacer, Standoff 0.250 Long</td>
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<tr>
<td></td>
<td></td>
<td><strong>Control Board</strong></td>
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<tr>
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<td>(Refer to Figure 9-28 on page 9-34)</td>
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<tr>
<td>46</td>
<td>218926</td>
<td>Battery, Lithium, 3.1VDC</td>
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<td>*47</td>
<td>218920</td>
<td>Compact Flash Card (CF), Blank</td>
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<td>*48</td>
<td>379241</td>
<td>Programmed Compact Flash Card (CF)</td>
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<tr>
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<td>379241-01</td>
<td>Programmed Compact Flash Card (CF) English, French, German, Dutch, Italian, Spanish, Portuguese, Danish, Finnish, Swedish.</td>
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*Table 9-8: Electronics Compartment Parts List (Continued)*
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<thead>
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<th>Part Number</th>
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<tr>
<td>379241-03</td>
<td>Programmed Compact Flash Card (CF) English, Saudi Arabian, Turkish</td>
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<td>379241-04</td>
<td>Programmed Compact Flash Card (CF) English, Simplified Chinese</td>
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<td>379241-05</td>
<td>Programmed Compact Flash Card (CF) English, Thai</td>
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<tr>
<td>379241-06</td>
<td>Programmed Compact Flash Card (CF) English, Korean</td>
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<tr>
<td>379241-07</td>
<td>Programmed Compact Flash Card (CF) English, Japanese (Hiragana, Katakana, Kanji)</td>
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<td>379241-08</td>
<td>Programmed Compact Flash Card (CF) Italian, Language</td>
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<td>379241-09</td>
<td>Programmed Compact Flash Card (CF) Dutch, Language</td>
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<td>379241-10</td>
<td>Programmed Compact Flash Card (CF) Excel DN, Chinese (Simplified), Language</td>
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<td>379241-11</td>
<td>Programmed Compact Flash Card (CF) Excel DN, Arabic, Language</td>
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<tr>
<td>379241-12</td>
<td>Programmed Compact Flash Card (CF) Excel DN, Korean, Language</td>
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<td>379241-16</td>
<td>Programmed Compact Flash Card (CF) Finnish, Language</td>
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<td>379241-23</td>
<td>Programmed Compact Flash Card (CF) Polish, Language</td>
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<td>379241-24</td>
<td>Programmed Compact Flash Card (CF) Turkish, Language</td>
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<tr>
<td>378954</td>
<td>Harness Kit, Power Distribution</td>
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<tr>
<td></td>
<td>Harness, AC Filter to Breaker</td>
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<tr>
<td></td>
<td>Harness, AC Power Supply to Breaker</td>
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<tr>
<td></td>
<td>Harness DC Power Supply to PEAP</td>
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<tr>
<td></td>
<td>Ground Wire, Power Supply</td>
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<tr>
<td>379213</td>
<td>Cable Assembly, LCD Backlight</td>
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Table 9-8: Electronics Compartment Parts List (Continued)

* Items not shown in the Figure
Pneumatic Compartment

Figure 9-29: Pneumatic Compartment Without Autoflush Option
Figure 9-30: Pneumatic Compartment With Autoflush Option
Cap and Stem Assembly

Figure 9-31: Cap and Stem Assembly
Main Air Manifold Assembly

Figure 9-32: Main Air Manifold Assembly
Table 9-9 below lists the parts of the pneumatic compartment.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>P/N</th>
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<td>E</td>
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<td><strong>Pneumatic Compartment</strong> (Refer to Figure 9-29 on page 9-38)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>100319</td>
<td>Screw, Machined, Panhead, Phillips, 8-32 1/4 long</td>
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<tr>
<td>2</td>
<td>201576</td>
<td>Screw, 4-40 x 0.312, Panhead Slotted Machined, Stainless Steel Waxed</td>
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<td></td>
<td>193756</td>
<td>Washer, Flat, 0.031 x 0.125 ID</td>
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<tr>
<td>3</td>
<td>356037</td>
<td>Bracket, Support, Switch, Reed, PCB</td>
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<tr>
<td>4</td>
<td>371817</td>
<td>Plug, Hole 0.562</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>371816</td>
<td>Plug, Hole 0.437</td>
<td>1</td>
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<tr>
<td>6</td>
<td>101234</td>
<td>Clamp, Hose, 0.250</td>
<td>2</td>
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<tr>
<td>7</td>
<td>205986</td>
<td>Fitting, Tube, ML, 1/4 OD</td>
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<tr>
<td>8</td>
<td>251413</td>
<td>Tubing, EVA, 0.063 I.D./0.125 O.D.</td>
<td>11.935</td>
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<tr>
<td>9</td>
<td>204615</td>
<td>Tubing, Extruded, 1/8 ID x 1/4 OD</td>
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<tr>
<td>10</td>
<td>205987</td>
<td>Fitting, Tube, Barbed, 1/16 ID, 'T'</td>
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<tr>
<td>11</td>
<td>355316</td>
<td>Harness, Hydraulic, Assembly</td>
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*Table 9-9: Pneumatic Compartment Parts List*
<table>
<thead>
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<th>P/N</th>
<th>Description</th>
<th>Quantity</th>
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<td>12</td>
<td>206143</td>
<td>Clamp, Cable, 0.5 x 1 x 0.520 HI, Black</td>
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<td>13</td>
<td>206889</td>
<td>Tubing, Extruded, 0.170 ID x 0.250 OD</td>
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<td>14</td>
<td>SP204446</td>
<td>Switch, Pressure Differential-packed, (Ink Low)</td>
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<td>15</td>
<td>209200</td>
<td>Adapter, Switch, Press</td>
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<td>16</td>
<td>250496</td>
<td>Grommet, Rubber, 0.125 ID</td>
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<td>207259</td>
<td>Fitting, Tube, Straight, 5/16 Dia</td>
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<td>18</td>
<td>371780</td>
<td>Manifold, Air-in, 170IAF</td>
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<td>19</td>
<td>201199</td>
<td>Fitting, Tube, Male Elbow, 3/8 OD</td>
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<td>Nut, Keps, 8-32</td>
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<td>Tubing, Polyethylene, 3/8 OD</td>
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<td>250077</td>
<td>Tie, Cable, Nylon, 7/64 x 3-7/8</td>
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<td>23</td>
<td>205953</td>
<td>Jumper, Common Bar, 4 Circuit, 0.635 long</td>
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<td>24</td>
<td>370327</td>
<td>Plug, 0.129 Fluid Pan</td>
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<td>370326</td>
<td>Plug, 0.074 Fluid Pan</td>
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<td>26</td>
<td>208266</td>
<td>Auto Flush Pressure Regulator</td>
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<td>27</td>
<td>208345</td>
<td>Screw, M2 x 0.5 x 30 Phillips</td>
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<td>28</td>
<td>209151</td>
<td>Auto Flush Pressure Gauge</td>
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<tr>
<td>29</td>
<td>206420</td>
<td>Fitting, Pipe, FML Elbow, 1/8 NPT</td>
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<tr>
<td>30</td>
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<td>Tube (Ribbed)</td>
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<tr>
<td>31</td>
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<td>Gasket Seal EPDM, 0.312 O.D x 0.150 I.D.x 0.030 Thick</td>
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<tr>
<td>32</td>
<td>201844</td>
<td>Fitting, Tube, Barb, 1/16 x 10-32M</td>
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<td>33</td>
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<td>Fitting, Tube, Barb, 1/8 ID</td>
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<td>Swivel, Barb Fitting</td>
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<td>374719</td>
<td>Block, Mounting</td>
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<td>205991</td>
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<td>Cap and Stem Assembly</td>
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<td>355114</td>
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<td>Float, Buffer, Assembly</td>
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Table 9-9: Pneumatic Compartment Parts List (Continued)
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<th>Description</th>
<th>Quantity</th>
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<td>G</td>
<td>379274</td>
<td><strong>Main Air Manifold Assembly</strong></td>
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<td>204476</td>
<td>Fitting Connector, Tubing, 10-32 1/8 Tube</td>
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<td>45</td>
<td>208199</td>
<td>Fitting, Stud, Valve, N.C.</td>
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<td>356047</td>
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<tr>
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<td>201864</td>
<td>Fitting, Tube, Male Connector, 1/8 NPT</td>
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<td>202050</td>
<td>Transducer, Air/vac, 40 psi,14 inches Hg</td>
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<td>204605</td>
<td>Fitting, Pipe, Male Tee,1/8 NPT</td>
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<td>201872</td>
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<td>205983</td>
<td>Fitting, Tube, Adj T M/MFL 10-32</td>
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<td>H</td>
<td>355151</td>
<td><strong>Input Air Manifold Assembly</strong></td>
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<td>201865</td>
<td>Fitting, Pipe, Nipple, 1/8 NPT</td>
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<td>Fitting, Tube, Barb 1/16 x 10-32 M</td>
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<td>68</td>
<td>212599</td>
<td>Gasket, 3/16 ID</td>
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Table 9-9: Pneumatic Compartment Parts List (Continued)
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<th>Description</th>
<th>Quantity</th>
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<td>Fitting, Tube Elbow</td>
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<td>Manifold, One Position</td>
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<td>71</td>
<td>Fitting, Pipe, 0.250</td>
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<tr>
<td>72</td>
<td>Fitting, Tube, ML Elbow, 1/4 OD</td>
<td>1</td>
</tr>
<tr>
<td>73</td>
<td>Filter</td>
<td>1</td>
</tr>
<tr>
<td>74</td>
<td>Filter, Air, 0.03 Micron, W/housing</td>
<td>1</td>
</tr>
<tr>
<td>75</td>
<td>Bracket, Manifold</td>
<td>1</td>
</tr>
<tr>
<td>76</td>
<td>Valve, Solenoid, 3 Way, 12V DC, NC</td>
<td>1</td>
</tr>
<tr>
<td>77</td>
<td>Screw, Machined, Panhead, POZ, 8-32 5/16 long</td>
<td>2</td>
</tr>
<tr>
<td>78</td>
<td>Fitting, Tube, Male “T” Elbow, 1/8 OD</td>
<td>1</td>
</tr>
<tr>
<td>79</td>
<td>Regulator, Transfer 10-32 1/8-27 NPT</td>
<td>1</td>
</tr>
<tr>
<td>80</td>
<td>Fitting Connector, Tubing, 10-32 1/8 Tube</td>
<td>2</td>
</tr>
<tr>
<td>81</td>
<td>Fitting, Tube, Barb, 1/8 ID</td>
<td>1</td>
</tr>
<tr>
<td>82</td>
<td>Regulator, Air, Adjustable, 10-32 1/8-27 NPT</td>
<td>2</td>
</tr>
<tr>
<td>83</td>
<td>Fitting, Tube, Male Connector, 1/8 OD</td>
<td>1</td>
</tr>
<tr>
<td>84</td>
<td>Accessory, Valve, Air Pilot OP, 15-32</td>
<td>1</td>
</tr>
<tr>
<td>85</td>
<td>Fitting, Pipe, Cross, Female, 1/8 NPT</td>
<td>1</td>
</tr>
<tr>
<td>*86</td>
<td>Fitting, Pipe, 0.125</td>
<td>1</td>
</tr>
<tr>
<td>87</td>
<td>Valve, Poppet, Air/water/oil, 2 Way</td>
<td>1</td>
</tr>
<tr>
<td>88</td>
<td>Opaque Only: Plug</td>
<td>1</td>
</tr>
</tbody>
</table>

* Indicates parts not shown on figure.

Table 9-9: Pneumatic Compartment Parts List (Continued)
Spare Parts and Accessories

This chapter includes:

- The accessories that are available for use with the Excel Dual Nozzle printer
- The items included in the spare parts kit of Excel Dual Nozzle printer
- The information on how to order accessories, parts and supplies

Introduction

Description
Videojet Technologies Inc. offers many accessories, parts and supplies (inks, make-up fluid and the cleaning solutions) for use with the VIDEOJET® Excel Dual Nozzle series printer. This chapter shows the accessories available for the Excel Dual Nozzle series printer and the contents of the spare parts kit of Excel Dual Nozzle series.

How to order Accessories, Parts and Supplies
This section contains the instructions for customers to follow to order from Videojet Technologies Inc.

For Customers in the U.S.A
To get VIDEOJET® accessories, parts and supplies (ink, make-up fluid and cleaning solution) contact the Videojet Technologies Inc. Customer Service Department at 1-800-843-3610.

You must keep the following information ready for the Videojet Technologies Inc. Customer Service Representative.

- Your customer number
- Your name and telephone number
• The purchase order (P.O.) number
• The method of delivery you select
• Part number and quantity of all accessories, parts or supplies required.

For Customers Outside the U.S.A
Contact the Videojet Technologies Inc. subsidiary or distributor in your area to get VIDEOJET® accessories, parts and supplies.

Accessories

Description
This section contains the part numbers of VIDEOJET® accessories and several illustrations.

Printhead Stand
The part numbers of the printhead stand are recorded in Table 10-1.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>379263</td>
<td>Printhead Stand</td>
</tr>
</tbody>
</table>

*Table 10-1: Printhead Stand*

Printer Stand and Accessories
The part numbers of the printer stand and accessories are recorded in Table 10-2.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>391301-01</td>
<td>Mobile Floor Stand, Painted</td>
</tr>
<tr>
<td>391301-02</td>
<td>Mobile Floor Stand, Stainless Steel</td>
</tr>
<tr>
<td>371156</td>
<td>Table Top Stand</td>
</tr>
<tr>
<td>371155</td>
<td>Stand, Stationary Floor</td>
</tr>
<tr>
<td>379275</td>
<td>Wall Mount Brackets, Printer Excel Dual Nozzle</td>
</tr>
</tbody>
</table>

*Table 10-2: Printer Stand and Accessories Parts List*
Voltage Regulators and Conditioners

The part numbers of the voltage regulators and conditioners are recorded in Table 10-3.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>356841-02</td>
<td>Power Conditioner, 120 VAC/2 AMP Unit</td>
</tr>
<tr>
<td>80000008</td>
<td>Power supply, Uninterruptible</td>
</tr>
</tbody>
</table>

Table 10-3: Voltage Regulators and Conditioners List

Product Detectors

The part numbers of the product detectors are recorded in Table 10-4.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>375085-08</td>
<td>Medium range proximity, beam make, detector</td>
</tr>
<tr>
<td>375085-09</td>
<td>Retro-reflective, beam break, detector</td>
</tr>
<tr>
<td>375085-10</td>
<td>Proximity fiber optic, beam make, adapter detector</td>
</tr>
<tr>
<td>375085-11</td>
<td>Small part proximity fiber optic, beam make, adapter detector, bifurcated, 0.046&quot; (1.17 mm) diameter tip</td>
</tr>
<tr>
<td>375085-12</td>
<td>Through beam fiber optic adapter detector, beam break, 0.125&quot; (3.17 mm) diameter tip, Green light</td>
</tr>
<tr>
<td>375085-13</td>
<td>Proximity fiber optic Registration Mark Detector, green, beam make, 0.125&quot; (3.17 mm) diameter tip</td>
</tr>
<tr>
<td>375085-14</td>
<td>Retro-reflective fiber optic Transparent Object Detector, beam break, 0.125&quot; (3.17 mm) diameter tip with reflector</td>
</tr>
<tr>
<td>40331830</td>
<td>Product Detector, Metal Proximity 1</td>
</tr>
<tr>
<td>378981</td>
<td>Product Detector Adapter Cable Kit</td>
</tr>
</tbody>
</table>

Table 10-4: Product Detectors Parts List
Shaft Encoder (with Cable)
The part numbers of the shaft encoder (with the cable) are recorded in Table 10-5.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>378815</td>
<td>Kit, Shaft Encoder, 3/8&quot; 1800 PPR shaft w/cables</td>
</tr>
<tr>
<td>378821</td>
<td>Kit, Shaft Encoder, 3/8&quot; 3600 PPR shaft w/cables</td>
</tr>
<tr>
<td>378985</td>
<td>Shaft Encoder Adapter Cable Kit</td>
</tr>
</tbody>
</table>

Table 10-5: Shaft Encoder (with Cable) Parts List

Encoder Accessories
The part numbers of the encoder accessories are recorded in Table 10-6.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>377529</td>
<td>Encoder Wheel 12 inch Circumference 3/8&quot; Bore</td>
</tr>
<tr>
<td>210066</td>
<td>Encoder Wheel 12 inch Circumference 3/8&quot; Bore White Rubber</td>
</tr>
<tr>
<td>377519</td>
<td>Universal Encoder Mount</td>
</tr>
</tbody>
</table>

Table 10-6: Encoder Accessories Parts List

Alert Light
The part numbers of the alert light are recorded in Table 10-7.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>378772</td>
<td>Alert Light Strobe</td>
</tr>
<tr>
<td>378771</td>
<td>Alert Light, Tri-Color¹, Strobe Light (Yellow Only)</td>
</tr>
</tbody>
</table>

Table 10-7: Alert Light List
1. Not approved for IP54 or IP65

Air Accessories
The part numbers of the air accessories are recorded in Table 10-8.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>370930</td>
<td>Compressed Air Filtration System</td>
</tr>
</tbody>
</table>

Table 10-8: Air Accessories Parts List
External Five-gallon Make-up Fluid Supply
The part numbers of the external five-gallon make-up fluid supply are recorded in Table 10-9.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>353975-02</td>
<td>External Five-gallon Make-up Fluid Supply</td>
</tr>
</tbody>
</table>

Table 10-9: External Five-gallon Make-up Fluid Supply List

Serial Interface Kit
The part numbers of the serial interface kit are recorded in Table 10-10.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>378817</td>
<td>Serial Interface Kit (Cable), Comm Port 2 (ESI)</td>
</tr>
<tr>
<td>378806</td>
<td>Kit, Cable RS232 port 1</td>
</tr>
<tr>
<td>378986</td>
<td>RS-232, Port 1 Adapter Cable Kit</td>
</tr>
<tr>
<td>378987</td>
<td>RS-232, Port 2 Adapter Cable Kit</td>
</tr>
</tbody>
</table>

Table 10-10: Serial Interface Kit Parts List

Additional Accessories
The part numbers of the additional accessories are recorded in Table 10-11.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>379246</td>
<td>Printhead Sleeve, Washdown Cover Excel Dual Nozzle&lt;sup&gt;1&lt;/sup&gt;, IP65 Wash down Cover</td>
</tr>
<tr>
<td>379245</td>
<td>Clamp, Printhead Holder Assembly, Dual Nozzle, 6&quot;</td>
</tr>
</tbody>
</table>

Table 10-11: Additional Accessories Parts List
1. Use to maintain the IP54 or IP65 rating during washdown.

**Printhead Cleaning Tools**

The part numbers of the printhead cleaning tools are recorded in Table 10-12.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>202047</td>
<td>Wash Bottle</td>
</tr>
<tr>
<td>355495</td>
<td>Service Tray (Wash pan Tray Only)</td>
</tr>
<tr>
<td>379256</td>
<td>Printhead Bracket for Service Tray**</td>
</tr>
<tr>
<td>370092</td>
<td>Wire, Gnd, Cleaning Tray</td>
</tr>
</tbody>
</table>

*Table 10-12: Printhead Cleaning Tools*

1. For a complete service tray assembly, you must order P/N 379256 and P/N 355495 together.

**Special Tools**

The part numbers of the special tools are recorded in Table 10-13.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>379243</td>
<td>High Voltage Gap Gauge</td>
</tr>
<tr>
<td>356230</td>
<td>Flow Meter</td>
</tr>
<tr>
<td>91535804</td>
<td>Screw Starter</td>
</tr>
<tr>
<td>526-0001-123</td>
<td>Wrench, din spanner</td>
</tr>
<tr>
<td>355269</td>
<td>Magnifier, 10x</td>
</tr>
<tr>
<td>186514</td>
<td>Hex key, 0.050&quot; (Short Arm)</td>
</tr>
<tr>
<td>223722</td>
<td>Hex key, 0.050&quot; (Long Arm)</td>
</tr>
<tr>
<td>186975</td>
<td>Hex Key 5/16&quot; Short Arm (Door)</td>
</tr>
<tr>
<td>217035</td>
<td>Service Tray Assembly</td>
</tr>
<tr>
<td>371114</td>
<td>Vacuum/Pressure Gauge Kit</td>
</tr>
<tr>
<td>SP212321</td>
<td>Reduran Hand Cleaner</td>
</tr>
<tr>
<td>202047</td>
<td>Tool, Bottle, Wash, 250ml</td>
</tr>
<tr>
<td>356539</td>
<td>Bleed Tube, Packed</td>
</tr>
<tr>
<td>28000035</td>
<td>Glasses, Safety</td>
</tr>
</tbody>
</table>

*Table 10-13: Special Tools List*
Spare Parts Kits

The Spare Parts Kit for Excel Dual Nozzle Printer

The part numbers of the spare parts and spare parts kits are recorded in Table 10-14.

<table>
<thead>
<tr>
<th>Part Numbers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>379278</td>
<td>Spare Part Kit With Autoflush</td>
</tr>
<tr>
<td>379264</td>
<td>Spare Part Kit Without Autoflush</td>
</tr>
</tbody>
</table>

Table 10-14: Spare Part Kit List

Supplies

Different types of VIDEOJET® ink, make-up fluid and the cleaning solution that is correct for your application are available through Videojet Technologies Inc.

Refer to “How to order Accessories, Parts and Supplies” on page 10-1 for information to get VIDEOJET® supplies from Videojet Technologies Inc.
Serial Interface

This chapter includes:

• Introduction
• Theory of operation
• The host setup
• Printer setup
• To view messages through the printer display
• The cable setup
• The printed message setup
• Message mode
• Communication description
• Sample communication program
• Communications troubleshooting

Introduction

The Videojet Excel Dual Nozzle printer contains an RS–232 Serial Interface to allow for control by an external computer. This chapter describes the following:

• The setup procedure for the printer to communicate with a computer.
• The list of commands you can send to the printer.

Theory of Operation

The Videojet Excel Dual Nozzle printer is configured as a "DTE" (Data Terminal Equipment) device as shown in the RS-232 Interface Standard. The CCITT V.24 Interface Standard is equivalent to the RS-232C. The descriptions of the EIA standards according to CCITT V.24 also apply. (Refer to Figure 11-1 on page 11-2.)
The Serial Interface allows the download of external messages into the printer. Use the external computer to do the following tasks:

- Insert the data into an existing message that is created through the keyboard of the printer
- Create the whole message itself.

The external computer is given the name "host".

The host computer does not control the printer application. The host computer functions as a remote memory for messages. The normal printer configuration allows the memory to store 225 messages. The RS232 Interface increases this storage area to the storage limits of the host computer. The serial interface also allows the operator to insert a new message for each signal from the product detector.

The Basic Operation of Serial Interface that Uses Remote Data Insert

The basic operation of the serial interface which uses the remote data insert is as follows:

1. A message is created in the Edit mode of the printer or at the host computer.
2. The Insert Remote mode uses the Remote Data Insert and allows the operator to create a message on the printer keyboard. This mode also takes variable information (64 characters maximum) and inserts the variable into the message that is printed. You can change the variable information for each product. You can insert the variable into the message one time only.
3. The Message Remote mode allows the operator to download the complete message through the host. If you use this procedure for printer setup, you cannot enter a message through the printer keyboard.
4. When the printer receives a new signal from the product detector, the printer operation changes according to that signal. For example if the host does not send any additional messages to the printer prints the last message received.
The Host Setup

This section describes the setup parameters of the host computer.

Communication Parameters

Refer to the operator manual of your host computer for the setup instructions of the following specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word length</td>
<td>8 bits</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Duplex</td>
<td>Full</td>
</tr>
<tr>
<td>Baud rate</td>
<td>1200-115200</td>
</tr>
<tr>
<td>Start bit</td>
<td>1</td>
</tr>
<tr>
<td>Stop bits</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

*Table 11-1: Specifications*

RS-232 Parameters

Make sure that the host is a DCE (Data Communication Equipment) or a DTE (Data Terminal Equipment). Examine the degree of compatibility of the host to the 25-pin RS-232 standard.

You can create and send the required message from the host by commercial software or if you program the host on site. The cable connections, communication parameters, hexadecimal codes, ASCII characters, and character information are described in the following sections.

Videojet Excel Dual Nozzle Printer Setup

This section describes the setup procedures to prepare the Videojet Excel Dual Nozzle printer for communication with the host computer.

You must program the printer to receive the messages from the host. The following parameters are set in the Videojet Excel Dual Nozzle system software:

- Baud Rate
- Remote Mode
- INSERT Buffer Size
• Print Matrix Selection

Baud Rate

The Baud Rate is the speed at which data is received and transmitted. The baud rate is set in the Frame <02 System>. Use the following procedure to set the Baud Rate.

Procedure

1. Begin in the Frame <02 SYSTEM>. Refer to Figure 11-2.

2. Check the current setting above <BAUD RATE>. Press F1 to change the setting. (Settings: 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200)

Note: The baud rate must be high enough, so that data is supplied to the printer faster than the printer prints the messages. If the baud rate is not high enough, the data sent by the host will not reach the printer at the right time. If the data sent by
the host does not reach the printer at the right time, the printer prints the last message in the print buffer.

Remote Mode

There are two settings for the Remote Mode: <MESSAGE> and <INSERT>.

Message

The MESSAGE setting is used when the whole printed message is downloaded from a host device. When this mode is selected, data from the host is put into the input or stack buffer. Then the data is moved to the print buffer. When the printer receives the signal from the product detector, the printer prints the data in the print buffer on the product.

Note: When the printer is in this mode, you cannot use the printer editor or the keyboard to create the messages.

Insert

This setting is applicable to the fixed messages that are created through the printer keyboard only. INSERT is used when the data sent to the printer is inserted into a fixed message.

If INSERT is selected, select the size of REMOTE DATA message at the keyboard. The maximum size of REMOTE DATA buffer is 63 printed characters, and a carriage return. Refer to “REMOTE DATA Buffer Size” on page 11-6. You can add REMOTE DATA message, in a fixed message, provided there is enough space to insert.

<REMOTE MODE> in the Frame <02 SYSTEM> changes between MESSAGE and INSERT. Refer to Table 11-2.

<table>
<thead>
<tr>
<th>If &lt;REMOTE MODE&gt; Is Set to:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;MESSAGE&gt;</td>
<td>The printer prints all the messages sent by the host</td>
</tr>
<tr>
<td>&lt;INSERT&gt;</td>
<td>External data transmissions are printed within the messages that are created through the keyboard.</td>
</tr>
</tbody>
</table>

Table 11-2: Remote Mode Settings
Procedure
This procedure shows you how to set the remote mode for external data transmission.

1  Begin with the Frame <02 SYSTEM>. Refer to Figure 11-2 on page 11-4.

2  Check the current setting above <REMOTE MODE>. Press the SHIFT+F2 button to change the setting (Settings are The MESSAGE and INSERT).

   Note: If INSERT is selected, set the size of the Remote Data buffer. Refer to “REMOTE DATA Buffer Size” on page 11-6.

3  Press the ENTER key to save the setting.

REMOTE DATA Buffer Size
The buffer which collects the 1-64 characters from the host is input into the fixed message in the printer. This feature is available only in the Insert Remote Mode.

Figure 11-3: Access Frame <01 REMOTE>
Procedure
1  Begin with the Frame <01 REMOTE>. Refer to Figure 11-3 on page 11-6.

2  Press F2 to select <BUFFER SIZE>. The following dialog box appears in the display screen.

   Enter Buffer Size (1-64)-->

3  Use the numeric keyboard to enter the size of the buffer. The entry must be within 1-64.

   The size of the remote data buffer equals the maximum number of characters that the host sends, plus one character for the carriage return. The carriage return indicates the end of the message.

Example:
The longest line is 25 characters. The entry for the size of the remote data buffer must equal 26 (25 characters plus one character for carriage return).

   Note: If the data sent from the host is formatted without a carriage return, set the size of REMOTE DATA buffer to exact number of characters required for insert.

   Note: The printer collects the set amount of characters and inserts them into the remote data field.

4  Press the ENTER key. Frame <01 REMOTE> appears again in the display screen.

5  Use the arrow keys to move the cursor to the location in the message where you need the insert to appear.

6  Press F3 to select <REMOTE DATA>. The insert appears in the message in the form of "insert remote symbols". Refer to Figure 11-4 on page 11-8.

An insert remote symbol appears for each character entered in <BUFFER SIZE>. If the <BUFFER SIZE> option is set to 8, eight insert remote symbols appear in the message where the remote information is printed. Refer to Figure 11-4 on page 11-8.
Print Matrix Selection

Select your print matrix in the frame <02 EDIT> after you select Remote Mode <INSERT>.

**Note:** You must begin with the selection of the Remote Mode <INSERT> for print matrix selection. This action is required in both conditions where, the messages are sent in Remote Mode <MESSAGE> or Remote Mode <INSERT>. Refer to “Remote Mode” on page 11-5 to select Remote Mode <INSERT>. You cannot select a print matrix unless Remote Mode <INSERT> is selected.
Set the following through the EDIT mode of the printer software:

- Print matrix selection
- INSERT mode
- The System Set-Up mode

2. Select the Frame <02 Edit>. Refer to Figure 11-5.
3. Press F2 again and again to see all of the print matrix selections.
   
   **Note:** The F2 key will not respond unless the display screen is cleared of all messages.
4. When the necessary print matrix appears in the display above the F2 key, release the F2 key.
5. Press F5 until Frame <01 Edit> appears.
6. Press F4 <Print Message>. This step loads the print matrix into the print buffer.
7. Use the print matrix to select Remote Mode <INSERT> or <MESSAGE> as required for the message. Refer to “Remote Mode” on page 11-5.

---

**To View Messages through the printer Display**

**Insert Remote Mode - Remote Data**

The printer prints the fixed message from the printer keyboard and displays on the Edit screens. When the Remote Data Insert is inserted into the message, the message appears in the display of the printer as an "IR" character. This character is for the data insert from the host. If you must see the print buffer (found in the <01 EDIT> screen), the time and date
inserts change with each message. The data insert will remain as an "IR" character. You must view the printed code on the product itself to see what is actually printing.

Message Remote Mode
When the printer is in the MESSAGE mode, the printer receives data from the host. You cannot see the messages that are sent from the host. To see the downloaded messages you must trigger the printer. You must provide a product detect signal to Product detect input. The message prints from the printhead on the product, where you can see the message. You can see the <VIEW PRINT> screen found in the <01 EDIT> screen. This screen allows the operator to see the previous message printed only.

Note: The <VIEW PRINT> screen displays the first 40 characters of the message only.

The Cable Setup
This section contains basic installation procedures, the RS-232 designation of required pins, and sample cable configurations. These topics are as follows:

• Installation
• Serial Communications Cable kit
• RS-232 Designations
• Cable Configurations

Installation
The Videojet Excel Dual Nozzle printer has a 5-pin Amphenol connector for remote RS-232 communications. The standard printer does not include this connector. The Videojet part number 378817 is the RS-232 kit or communication Port 2. This kit is required to have remote communications with the Videojet Excel Dual Nozzle printer.

Serial Communications Cable Kit
VIDEOJET provides a serial-interface cable kit (PART NUMBER 378817). The cable kit provides an internal cable that connects to the control board and a 10-foot external cable with DB9 female connector on host side.
This cable assembly allows a quick disconnect from the unit and helps to move the printer if necessary. The breakdown of the cables is shown below.

**RS-232, Port-2, Wiring Diagram**

**Internal RS232, Port-2 Cable (PART NUMBER 378693)**

<table>
<thead>
<tr>
<th>Wire End P29</th>
<th>Signal</th>
<th>Color</th>
<th>J6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX</td>
<td>Orange</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>Yellow</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>CTS</td>
<td>Brown</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>232 GND</td>
<td>Black</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>RTS</td>
<td>Blue</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>from GND (NC)</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

*Table 11-3: Internal RS232, Port-2 Cable, Wiring Chart*

Figure 11-6: Internal RS232, Port-2 Cable, Wiring Diagram

Table 11-3 shows the wiring information of the internal RS232, Port 2 cable 378693 wiring diagram shown in Figure 11-6.
External RS232, Port-2 Cable (PART NUMBER 378758)

Figure 11-7: External RS232, Port-2 Cable, Wiring Diagram

*Note: Standard RS232 levels.*

Table 11-4 shows the wiring information of the external RS232, Port-2 cable (PART NUMBER 378758), wiring diagram is shown in Figure 11-7

<table>
<thead>
<tr>
<th>Wire End P3</th>
<th>Printer Signal</th>
<th>Color</th>
<th>PC Signal</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RTS</td>
<td>Brown</td>
<td>CTS</td>
<td>8*</td>
</tr>
<tr>
<td>2</td>
<td>RX</td>
<td>Red</td>
<td>TX</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>TX</td>
<td>Green</td>
<td>RX</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Black</td>
<td>GND</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>White</td>
<td>RTS</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>NA</td>
<td>Brown</td>
<td>CD</td>
<td>1*</td>
</tr>
<tr>
<td>NA</td>
<td>Brown</td>
<td>DSR</td>
<td>6*</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>DTR</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>RI</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>SHELL</td>
<td>SHEILD/DRAIN</td>
<td>NA</td>
<td>NA</td>
<td>SHELL</td>
</tr>
</tbody>
</table>

*Table 11-4: External RS232, Port-2 Cable, Wiring Diagram*

The symbol * Indicates that ports are connected together.
Figure 11-8: RS-232 Data Port and Connector Locations
EQUIPMENT DAMAGE. The cable descriptions for the host are described in the RS-232 specifications. Remember that all RS-232 devices cannot be cabled with the printer in the same form they are provided. Some host devices do not provide or receive the control signals described.

Special cables are required for some applications. If the host does not provide the signals, then take further steps to insert or remove the jumpers for the required signals. To receive these signals, do either crossover cable or software handshaking to receive the signals.

If the printer does not identify the required signals, several problems can occur. For example, problems occur with the communication if the handshaking is not known from the host.

Serial Communication Adapter Cable (Part Number 378987)

If you have an existing Excel serial communication cable (part number 394502) you can use an adapter cable (part number 378987) to connect your existing serial cables to the Excel Dual Nozzle Printer. This cable adapts the existing 25 feet cable Conxall cable to the Excel Dual Nozzle.

Cable Lengths

The RS-232 standard requires a maximum cable length of 15.25 m (50 ft.) between the printer and the host. This length is required because of the effects of inductance and capacitance on transmitted signals over longer distances. The effect of inductance and capacitance is decreased at a lower baud rate. If, the distance must be greater than 15.25 m (50 ft.), a voltage amplifier (a short haul modem) is recommended.
The Printed Message Setup

Character Set
The printer has a built in the character set. The character sets are different and depend on the font selected. The character set includes:

- Blank space
- Alphabets
- Numerals 0-9
- Standard punctuation marks
- Standard graphics characters which appear on most keyboards (for example +, =, <, >, @, &)
- The extended graphics characters set. The set includes different characters for international applications like:
  - International currency symbols
  - letters with umlauts, accents, and angstroms
  - Arabic numbers
  - Other symbols which are normally used
- Custom characters that you can create and insert into your message.

Delimiting Messages
The carriage return (CR) (Hex code 0D) must delimit the messages sent to the printer. If a host sends a line feed (LF) character (Hex code 0A), then this character is ignored. The carriage return shows the end of the message.

Example:
If the size of Remote Buffer was set to 12 characters and 5 were sent with the carriage return, then 5 characters are printed and 7 spaces follow the data printed.

Enhanced Serial Interface (ESI)
The Videojet has a complete serial communication guide (PART NUMBER 361565) for remote communications. This manual tells of all the remote commands and responses for the host PC. This ESI programmers guide gives all automatic inserts that you can add to the printed messages. The ESI programmer guide includes “ESI Tester Program” which is test
software. This test program is a Visual Basic program which can test all commands on the Videojet Excel Dual Nozzle printer. You are recommended to try the program before you write any programs. The test program is a good method to examine what the Videojet Excel Dual Nozzle printer does remotely. You can send the commands and messages to see how the printer responds. This serial interface includes the basic operations of the serial interface of the Videojet Excel Dual Nozzle printer.

**RS-232 Command Set**

Refer to Table 11-5 for the commands of the Enhanced Serial Interface (ESI).

*Note:* Use the ESI programmers guide for all ESI commands and response. The number of commands are very vast for this section.

<table>
<thead>
<tr>
<th>Command Description</th>
<th>Command (Hex code)</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Query</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Status Inquiry</td>
<td>1B,00,00</td>
<td>11-21</td>
</tr>
<tr>
<td>System Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinitialize RS-232</td>
<td>1B,01,00</td>
<td>11-20</td>
</tr>
<tr>
<td>Clear Input/Stack and Print Buffer</td>
<td>1B,01,01</td>
<td>11-18</td>
</tr>
</tbody>
</table>

*Table 11-5: RS-232 Command Set for Videojet Excel Dual Nozzle Series Printers*

**Single line Mode**

Access single line mode by two methods given below:

- Select a single line matrix (7 x 9, 5 x 7, 5 x 5)
- Use Hex codes when in the 10 x 16 or 16 x 24 mode

<table>
<thead>
<tr>
<th>Hex Codes</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B,81,04</td>
<td>Select 5 x 5 single-line mode</td>
</tr>
<tr>
<td>1B,81,05</td>
<td>Select 5 x 7 single-line mode</td>
</tr>
<tr>
<td>1B,81,06</td>
<td>Select 7 x 9 single-line mode</td>
</tr>
<tr>
<td>1B,81,07</td>
<td>Select 10 x 16 single-line mode</td>
</tr>
<tr>
<td>1B,81,08</td>
<td>Select 16 x 24 single-line mode</td>
</tr>
</tbody>
</table>

*Table 11-6: Single-Line Mode*
**Twin-line Mode**

If you select “TWIN LINE” at the printer keyboard, the printer enters into the Twin-line Mode.

<table>
<thead>
<tr>
<th>Hex Codes</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B,81,08</td>
<td>Select 5 x 7 twin-line mode</td>
</tr>
<tr>
<td>1B,81,09</td>
<td>Select 5 x 7HQ twin-line mode</td>
</tr>
</tbody>
</table>

*Table 11-7: Twin-line Mode*

**Append Message**

Activate the Append Message function in the Frame <02 INSERT>. When the printer is in the MESSAGE mode, you cannot load an appended message. Refer to “The Keyboard Operation”, in Chapter 6, Videojet Excel Dual Nozzle Operator Manual (PART NUMBER 361843) for additional information on “Append Message” function.

**Communication Description**

Refer to the page numbers recorded to find the information on following topics on communication.

<table>
<thead>
<tr>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Hardware</td>
<td>11-17</td>
</tr>
<tr>
<td>Buffers</td>
<td>11-18</td>
</tr>
<tr>
<td>Data Flow Control</td>
<td>11-18</td>
</tr>
<tr>
<td>Reinitializing Interface and Buffers</td>
<td>11-20</td>
</tr>
<tr>
<td>Print Status Inquiry</td>
<td>11-21</td>
</tr>
<tr>
<td>Additional Information</td>
<td>11-21</td>
</tr>
</tbody>
</table>

*Table 11-8: Information and their Page No. for Communication Description*

**Communication Hardware**

The interface USART (Universal Serial Asynchronous Receiver and Transmitter) is a type 82510.

The EDN connector is a 6-pin Amphenol Female connector.

The printer is a Full Duplex communication device. The printer can transmit and receive data together.
Buffers

The communications (internal/stack) buffer is the storage location for data received from the host and which supplies data to the print buffer. Refer to Figure 11-9).

When a product is detected, print buffer requests data from the communications buffer. If the communications buffer cannot supply new data, the printer prints the message which exists in the print buffer.

![Diagram of Communication Buffer and Print Buffer](image)

Figure 11-9: Communication Buffer and Print Buffer

Communications Buffer Specifications

*Note: The buffer specifications can change with the printer software versions.*

<table>
<thead>
<tr>
<th>Size</th>
<th>Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer Size</td>
<td>70 Messages (Min. to Max. Message Length)</td>
</tr>
<tr>
<td>Buffer Full</td>
<td>70% of Buffer Size</td>
</tr>
<tr>
<td>Buffer Overfill</td>
<td>30% for Buffer Size</td>
</tr>
<tr>
<td>Buffer Full Cleared</td>
<td>40% for Buffer Size</td>
</tr>
</tbody>
</table>

Table 11-9: Communications Buffer Specifications

Data Flow Control

The printer sends both software handshaking and hardware handshaking signals to the host. The host makes a decision about the signals to use for data flow control.
The printer maintains a clear communication always. If the communication from the host is not clear, the printer sends a communication error message to the host but remain online always. Refer to “Communication Error Message (07,02)” on page 11-20. If the printer is in the print function mode the messages printed can reflect the data which is not clear and which comes in at the RS-232 port.

Software Handshaking

The Software handshaking is uni-directional. The printer sends X-OFF and X-ON signals to the host. The printer will not respond to software handshaking characters sent from the host.

- When a condition for Buffer Full or Buffer Overfill exists, X-OFF (Hex code 13) is sent to the host. This signal requests the host to stop the transmission.
- When a condition for Buffer Full Cleared exists, X-ON (Hex code 11) is sent to the host. This signal requests the host to continue the transmission.

The X-ON and X-OFF signals transmit on pin-2 as control data.

Note: There are different conditions where the printer sends an X-ON character to the host. The printer can send many X-ON characters to the host at a time.

When the printer sends X-OFF to the host, time can elapse before the host responds. Any data sent by the host at this time is held in the overflow buffer of the printer communication buffer. This process will not cause any data loss.

Hardware Handshaking

The Hardware handshaking is bi-directional. The signals are sent between both the printer and the host.

- When a condition for Buffer Full or Buffer Overfill exists, the printer makes pin 4 (RTS) NOT TRUE and tells the host to stop to transmit the data. If the host ignores this instruction, the printer receives data, but can cause the loss of data.
- When a Buffer Full Cleared or Buffer Overfill Cleared condition exists, the printer makes pin 4 (RTS) TRUE to tell the host to transmit data.

Overflow Buffer Full Message (07,03)

This message is the last warning the printer gives the host, that the host has ignored all software handshaking and hardware handshaking
instructions to stop data transmission. During this present condition, the data sent from the host to the printer is lost.

**Communication Error Message (07,02)**

When the data is sent from the host to the printer, the printer sends this message to tell the host that it has detected a transmission error.

If some major communication problems occur, the host does not identify the communication error message from the printer.

The printer must continue to receive data in both conditions where, a clean transmission is received or not received.

**Reinitializing Interface and Buffers**

The host sends the commands to the printer that reinitialize the following:

- The serial interface
- The communication buffers
- The print buffers.

Any reinitialization command from the host to the printer must be a single-command transmission. If an additional character (the carriage return or line feed character) follows the command, the first printed message can contain incorrect characters.

The host sends a single reinitialization command in the correct procedure. The buffer holds the additional characters to the printer until the printer gives a correct response to the host (that is 11, 07, 08, 07, 01).

**Reinitialize RS-232 Serial Interface Command**

The RS-232 Serial Interface command to reinitialize is Hex code - 1B,01,00. This command, reinitializes all buffers (except internal stack and the print buffer) and communication lines of the printer. The printer prints the last message until new messages are received.

The printer responds with the Hex code (11, 07, 08, 07, 01).

*Note: The printer initializes its data buffers and pointers at the Startup.*

**Clear External and Internal Buffers Command**

This command sequence clears the internal/stack buffer. The command also clears the print buffer of the printer. The printer will not print any messages. The command sequence is Hex code (1B,01,01).
The printer responds with the Hex code (07, 08, 07, 07).

Print Status Inquiry
The host can find the print status. The host sends Hex code (1B,00,00) to make sure that the PRINT key is enabled.

<table>
<thead>
<tr>
<th>Printer Response (Hex Code)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>07, 05</td>
<td>The print key is turned OFF</td>
</tr>
<tr>
<td>07, 06</td>
<td>The print key is turned ON</td>
</tr>
</tbody>
</table>

*Table 11-10: Printer Responses to the host Print Status Inquiry*

Additional Information
The following additional information on the serial interface can help if the troubleshooting is required.

Message Received Regardless of Print Status
The Printer RS-232 communications buffer is active always. The buffer remains active when the printer is in a non-printing mode, and continues to receive the characters until a Buffer Full condition occurs.

Message Repeat Desired
If a message is sent to the printer without additional messages, the printer prints the same message at each product detect. The printer stops the print until additional messages are received.

Message Repeat Not Desired
If the printer repeats the messages, and this action is not the required result, then the possible reason can be that the data is sent slowly. If the printer does not receive a new message by the time of the next product detect, the previous message transmitted gets printed again. Make sure the baud rate is high follow the frequency of your product detect signal.

Message Storage
If all messages from a current run are not used, the messages are maintained and printed if the next run begins. The messages are lost if the
printer is shutdown between runs or a command to clear the buffer is received.

Sample Communication Program

The following VISUAL BASIC program demonstrates the host program. The “Remark lines” are printed in for easy reading. The Hex codes are used. You can use decimal also. This program does not read or understand the responses from the printer.

Note: VIDEOJET does not help in programming. The sample program is given only for reference.

Note: Use VIDEOJET communication cable (PART NUMBER 378817) for better results.

Program Notes

• The program is set to communicate at a baud rate of 9600 baud.
• The Chr$(&H1B) is the hexadecimal equivalent of ESC.
• The “+” character is used to add the commands or text together.
• The character type “tells the program to print the characters between them as text characters.
• The OPEN statement sets the communication port to the protocol necessary to communicate.

COMM 1 = Communication port 1. You can set this port from 1-4 and the setting depends on your computer hardware.

n = no parity, 8=data bits or word length, 1=the number of stop bits needed.
Sample Program

Private Sub Btn_Date_Click()
    Dim Send_Out As String
    Send_Out = Chr$(&H1B) + Chr$(&H84) + Chr$(&H1) + Chr$(&H1B) + Chr$(&H84) + Chr$(&HE) + Chr$(&H2F) + Chr$(&H1B) + Chr$(&H84) + Chr$(&HE) + Chr$(&H2F) + Chr$(&H3) + Chr$(&H1B) + Chr$(&H84) + Chr$(&HE) + Chr$(&H2F) + Chr$(&H1B) + Chr$(&H84) + Chr$(&H8) + Chr$(&H1B) + Chr$(&H84) + Chr$(&HE) + Chr$(&HE) + Chr$(&HD)
    Form1.MSComm1.Output = Send_Out
    'Insert Month / Day / Year
    End Sub

Private Sub Btn_Send_Mess_Click()
    Dim Send_Out As String
    Send_Out = (Form1.Text1.Text) + Chr$(&HD)
    Form1.MSComm1.Output = Send_Out
    'Send Message
    Debug.Print Send_Out
    End Sub

Private Sub BtnClr_Int_Ext_Buffer_Click()
Dim Send_Out As String
Send_Out = Chr$(&H1B) + Chr$(&H1) + Chr$(&H1)
Form1.MSComm1.Output = Send_Out
'Clear Internal and External Buffers
End Sub

Private Sub Btn_Exit_Click()
If MSComm1.PortOpen = True Then MSComm1.PortOpen = False
Unload Form1
End Sub

Private Sub Btn_Prt_OFF_Click()
Dim Send_Out As String
Send_Out = Chr$(&H1B) + Chr$(&H1) + Chr$(&HA)
Form1.MSComm1.Output = Send_Out
'Place Print Mode ON
End Sub

Private Sub Btn_Prt_ON_Click()
Dim Send_Out As String
Send_Out = Chr$(&H1B) + Chr$(&H1) + Chr$(&H9)
Form1.MSComm1.Output = Send_Out
'Place Print Mode ON
End Sub

Private Sub Btn_Test_Click()
Dim Send_Out As String
Send_Out = Chr$(&H1B) + Chr$(&H1) + Chr$(&H1)
Form1.MSComm1.Output = Send_Out
'Clear Internal and External Buffers
End Sub
Private Sub Form_Load()
    Dim Send_Out As String
    MSComm1.CommPort = 1
    MSComm1.PortOpen = True
    'Open Port on Start
End Sub

Private Sub MSComm1_OnComm()
    Dim Send_Out As String
    'Send_Out = MSComm1.Output
    Form1.MSComm1.Output = Send_Out
    'On Error Resume Next    ' Defer error trapping.
End Sub

Communications Troubleshooting

Refer to the following list for communications troubleshooting.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The printer will not print your messages.</td>
<td>• Make sure the printer is in the MESSAGE MODE.</td>
</tr>
<tr>
<td></td>
<td>• Check the baud rate, and make sure that this baud rate matches the host.</td>
</tr>
<tr>
<td></td>
<td>• Make sure the protocol is set correctly-Word length of 8-bit, no parity, and 1 stop bit.</td>
</tr>
<tr>
<td></td>
<td>• Make sure the host transmits to pin 2 on the COMM-2 port.</td>
</tr>
<tr>
<td></td>
<td>• Make sure the messages end with a carriage return.</td>
</tr>
<tr>
<td></td>
<td>• If the printer cannot make the communication, check the cable configuration. Refer to &quot;Cable Lengths&quot; on page 11-14.</td>
</tr>
<tr>
<td>The messages are sent, but are not seen.</td>
<td>• You must print the message to see the message that was sent to the printer. Also you can look at the View Print screen, or check the output of the printhead to see the message.</td>
</tr>
</tbody>
</table>

Table 11-11: Communications Troubleshooting
Note: Do not run the printer without the fluids. Several fault conditions can occur, and the unit will not run.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The printer does not print on every product.</td>
<td>• Make sure that you do not send more than one carriage return. More than one carriage return causes the printer to print blank message.</td>
</tr>
<tr>
<td>• Make sure that the baud rate is at the required speed to get the message before the printer detects a product.</td>
<td></td>
</tr>
<tr>
<td>• If you store several messages in the buffer, timing problems are caused.</td>
<td></td>
</tr>
<tr>
<td>• If a command is given to clear the buffer, make sure the previous message is printed completely. The printer must print this previous message before the command is sent.</td>
<td></td>
</tr>
<tr>
<td>• If a command is used to reinitialize RS-232, make sure the previous message has printed completely. The printer must print this previous message before the command is sent.</td>
<td></td>
</tr>
<tr>
<td>The printer prints all messages but the printer will not respond to commands like clear buffer.</td>
<td>• Make sure you send the correct sequence of the commands.</td>
</tr>
<tr>
<td>• Try the Visual Basic program to check the correct operation of the printer.</td>
<td></td>
</tr>
<tr>
<td>• If the problem continues to exists, use the software or hardware cable configuration.</td>
<td></td>
</tr>
</tbody>
</table>

Table 11-11: Communications Troubleshooting (Continued)
Wiring Diagrams

This chapter contains the Wiring Diagrams of the Excel Dual Nozzle printer.

- Excel Dual Nozzle block diagram
- PEAP Board and Circuit Breaker
- Ink Harness Wiring Diagram - Jumpers P25 and J25
Figure A-2: PEAP Board and Circuit Breaker
Figure A-3: Ink Harness Wiring Diagram - Jumpers P25 and J25

Ink Harness Wiring Diagram - Jumpers P25 and J25

Note: For the P25 Pins 1, 2, 3 and 4 are connected together by a shorting bar, as are Pins 17, 18, 19 and 20.

Note: This Jumper only - use black wire. This jumper is intended to be cut away for certain models so the end of the jumper loop should extend approx 1.5" from the back of P29.
Table B-1 lists the printing specifications.

<table>
<thead>
<tr>
<th>Print Matrix</th>
<th>Max. Char/Sec (2)</th>
<th>Character Pitch(2)</th>
<th>Max Line Speed</th>
<th>Character Height (1)</th>
<th>High Voltage Range (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>char/ inch</td>
<td>char/ cm</td>
<td>feet/ minute</td>
<td>meters/ minute</td>
<td>Range inches</td>
</tr>
<tr>
<td>5x5 SL Accudrop™</td>
<td>1833</td>
<td>10</td>
<td>3.9</td>
<td>916</td>
<td>279.1</td>
</tr>
<tr>
<td>5x5 TL Accudrop™</td>
<td>1375</td>
<td>10</td>
<td>3.9</td>
<td>343</td>
<td>104.5</td>
</tr>
<tr>
<td>5x7 Single Line</td>
<td>1222</td>
<td>10</td>
<td>3.9</td>
<td>611</td>
<td>186.2</td>
</tr>
<tr>
<td>5x7 SL (High Speed)</td>
<td>1047</td>
<td>10</td>
<td>3.9</td>
<td>261</td>
<td>79.5</td>
</tr>
<tr>
<td>5x7 STL (High Quality)</td>
<td>392</td>
<td>10</td>
<td>3.9</td>
<td>98</td>
<td>29.8</td>
</tr>
<tr>
<td>5x7 TL 4</td>
<td>785</td>
<td>10</td>
<td>3.9</td>
<td>196</td>
<td>59.7</td>
</tr>
<tr>
<td>5x7 Tri Line</td>
<td>673</td>
<td>10</td>
<td>3.9</td>
<td>112</td>
<td>34.1</td>
</tr>
<tr>
<td>6x7 SL</td>
<td>1047</td>
<td>8.6</td>
<td>3.3</td>
<td>611</td>
<td>186.2</td>
</tr>
<tr>
<td>7x9 SL</td>
<td>407</td>
<td>10</td>
<td>3.9</td>
<td>203</td>
<td>61.8</td>
</tr>
<tr>
<td>5x5 Quad Line</td>
<td>440</td>
<td>10</td>
<td>3.9</td>
<td>55</td>
<td>16.7</td>
</tr>
<tr>
<td>10x16 5</td>
<td>171</td>
<td>5</td>
<td>1.9</td>
<td>171</td>
<td>52.1</td>
</tr>
<tr>
<td>10x16HS 5</td>
<td>323</td>
<td>5</td>
<td>1.9</td>
<td>323</td>
<td>98.4</td>
</tr>
<tr>
<td>16x24 6</td>
<td>36</td>
<td>3.3</td>
<td>1.2</td>
<td>55</td>
<td>16.7</td>
</tr>
<tr>
<td>16x24HS 6</td>
<td>130</td>
<td>3.3</td>
<td>1.2</td>
<td>196</td>
<td>59.7</td>
</tr>
</tbody>
</table>

Table B-1: Printing Specifications

1. The height values are based on a throw distance of 3/16” and ink type 16-8530. The values are
nominal for these setup conditions and can vary based on factors such as throw distance, ink type, and ink viscosity.

2. Includes a single space stroke between characters except for the 16 and 24 high matrices which contain two space strokes between characters.

3. These are recommended values. Optimum setting will be based on the application.

4. This font is embedded in the 10x16 matrix and can be accessed by selecting a single high character size in the menu screen. Its top speed at 10 cpi is 196 ft/min using an external encoder. When using the internal encoder, the maximum printing speed at 10 cpi is 171 ft/min.

5. This matrix can mix 10x16 characters with 5x7 single line and 5x7 twin line.

6. This matrix can mix 16x24 characters with the fonts described in note 6. The following font combinations can also be printed: 10x16 over 5x7, 5x7 over 10x16, three lines of 5x7.

## Datamatrix Speed Specifications

Table B-2 lists the datamatrix speed specifications.

<table>
<thead>
<tr>
<th>Datamatrix Size</th>
<th>16 High Matrix</th>
<th>24 High Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datamatrix 10X10</td>
<td>114 ft/min</td>
<td>NA</td>
</tr>
<tr>
<td>Datamatrix 12X12</td>
<td>114 ft/min</td>
<td>NA</td>
</tr>
<tr>
<td>Datamatrix 14X14</td>
<td>114 ft/min</td>
<td>NA</td>
</tr>
<tr>
<td>Datamatrix 16X16</td>
<td>114 ft/min</td>
<td>NA</td>
</tr>
<tr>
<td>Datamatrix 18X18</td>
<td>NA</td>
<td>55 ft/min</td>
</tr>
<tr>
<td>Datamatrix 20X20</td>
<td>NA</td>
<td>55 ft/min</td>
</tr>
<tr>
<td>Datamatrix 22X22</td>
<td>NA</td>
<td>55 ft/min</td>
</tr>
<tr>
<td>Datamatrix 24X24</td>
<td>NA</td>
<td>55 ft/min</td>
</tr>
</tbody>
</table>

Table B-2: Datamatrix Speed Specifications

1. Based on 60 strokes per inch.