



Videojet 1610 Excel Service Manual

P/N 462134-21

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Compliance Information

For Customers in the European Union

This equipment displays the CE mark to indicate conformance to the following legislation:

- BS EN61000-6-4 2001 Generic Emissions Standard for Industrial Environments
- BS EN55022 Class A 2006 Emissions Standard for industrial environments
- BS EN61000-3-2 2006 Harmonic Current Fluctuations
- BS EN61000-3-3 1995 Voltage Fluctuation and Flicker
- BS EN61000-6-2 2005 Generic Immunity Standard for industrial environments
- BS EN61000-4-2 1995 ESD Requirements
- BS EN61000-4-3 2006 Radiated Susceptibility
- BS EN61000-4-4 2004 Electrical Fast Transient Burst Requirement
- BS EN61000-4-5 2006 Surges Requirements
- BS EN61000-4-6 1996 Conducted Susceptibility
- BS EN61000-4-11 2004 Voltage Dips and Interruptions

Following the provisions of EU EMC Directive 2004/108/EC.

EC Low Voltage Directive 2006/95/EEC

Essential health and safety requirements relating to electrical equipment designed for use within certain voltage limits.

IEC 60950-1:2001: Safety requirements for information technology equipment including electrical business equipment.

EN 60529:1992: Degrees of protection provided by enclosures (IP code).

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

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 reasonable 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 which case the user will be required to correct the interference at his 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 and electrical emissions by:

Electromagnetic Testing Services Limited

Pratts Fields

Lubberhedges Lane

Stebbing, Dunmow

Essex, CM6 3BT

England, UK

This equipment has been investigated by Underwriters Laboratories Inc. in accordance with the standard for safety: UL 60950-1: Safety of information technology equipment first edition. Subject 2178 marking and coding equipment, electronics.

Report reference E252185.

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 and electrical emissions by:

Electromagnetic Testing Services Limited

Pratts Fields

Lubberhedges Lane

Stebbing, Dunmow

Essex, CM6 3BT

England, UK

This equipment has been investigated by Underwriters Laboratories Incorporated in accordance with the standard for safety: CAN/CSA C22.2 No. 60950-1-03. Safety of information technology equipment. Subject 2178 marking and coding equipment, electronics.

Report reference E252185.

Pour la clientèle du Canada

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

Cet équipement est certifié CSA.

This equipment has been investigated by Underwriters Laboratories Incorporated in accordance with the standard for safety: CAN/CSA C22.2 No. 60950-1-03. Safety of information technology equipment. Subject 2178 marking and coding equipment, electronics.

Report reference E252185.

Support and Training

Contact Information

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

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Service Program

About *Total Source*® Commitment

Total Source® TOTAL SERVICE PLUS RELIABILITY, is the commitment to provide you - our customer - the complete service you deserve.

The *Total Source* Commitment

The *Total Source*® 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 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 the local Videojet distributor for further information.

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Introduction

1

Videojet 1610 Excel Printer

The Videojet 1610 Excel is a continuous ink jet printer that can print fixed and variable codes at high line speeds on consumer and industrial products. The printer delivers superior uptime, print quality, and ease of use to the operators.

About the Manual

The Videojet 1610 Excel Service Manual is written for the service technician of the printer. The Service Manual contains the installation, service, and troubleshooting procedures.

Related Publications

The Videojet 1610 Excel Operator Manual (Part Number: 462133 is available for reference).

Language Codes

When you order these manuals, make sure to add the 2-digit language code at the end of the part number. For example, the part number of the Spanish version of the Operator Manual is 462133-04. Use the list of language codes shown in Table 1-1 on page 1-4 to identify the translated versions of the manual.

Note: Availability of the Operator Manual is indicated by an asterisk (*). Availability of the Service Manual is indicated by a plus sign (+). Availability of the Illustrated Parts List is indicated by the number sign (#). Contact the Videojet distributor or subsidiary for more information.

Code	Language	Availability (see note)		
01	English (US)	*	+	#
02	French	*		
03	German	*		
04	Spanish	*		
05	Portuguese Brazilian	*		
08	Italian	*		
09	Dutch	*		
11	Arabic	*		
15	Norwegian	*		
16	Finnish	*		
17	Swedish	*		
18	Danish	*		
19	Greek	*		
20	Hebrew	*		
21	English (UK)	*	+	#
23	Polish	*		
24	Turkish	*		
25	Czech	*		
26	Hungarian	*		
33	Vietnamese	*		
34	Bulgarian	*		

Table 1-1: List of Language Codes

Content Presentation

This manual contains different types of information like safety guidelines, additional notes, User Interface (UI) terminology and so on. To help you identify the different types of information, different writing styles are used. This section describes these writing styles.

The Word 'Printer'

The word 'printer' indicates the Videojet 1610 Excel printer, from this point onwards, in this manual.

Positional References

Unless stated to the contrary, positions and directions such as left, right, front, rear, to the right and to the left are given with respect to the printer when viewed from the front.

Units of Measurement

This manual uses metric units of measurement. The equivalent English measures are included in parenthesis. For example, 240 mm (9.44 inches).

Note: The default date display format is US (month/day/year) for the Videojet 1610 Excel UI.

Safety Information

The safety information includes warning and caution statements.

Warning

The warning statements indicate hazards or unsafe practices that can result in personal injury or death.

For example:



Warning

The cleaning agent is poisonous if taken internally. Do not drink. Seek medical attention immediately if ingested.

Caution

The caution statements indicate hazards or unsafe practices that can result in damage to the equipment.

For example:



Caution

Do not fit or remove any connector on the printer when the power is on, otherwise the printer may get damaged.

Additional Notes

Notes provide additional information about a particular topic.

For example:

Note: You can set the password protection for some functions to prevent any unauthorized access.

User Interface Terminology

The frames and menus of the UI are shown between two angle brackets. For example, <01 Edit>.

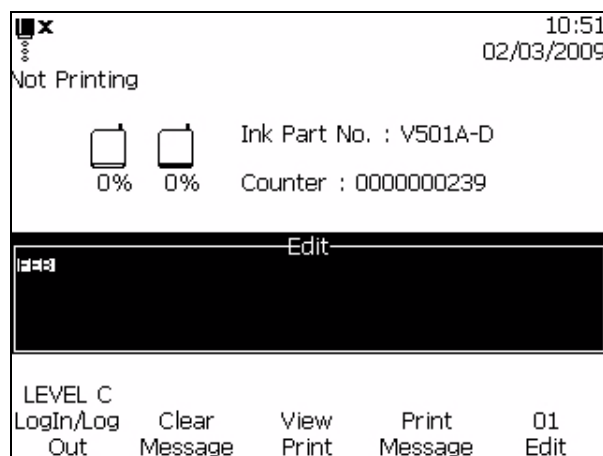


Figure 1-1. Menu Screen

Keys

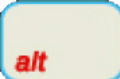
Key	Style Used
	<i>Left arrow key</i>
	<i>Right arrow key</i>
	<i>Up arrow key</i>
	<i>Down arrow key</i>
	<i>Enter key</i>
	<i>Esc key</i>
	<i>F1 key</i>
	<i>F2 key</i>
	<i>F3 key</i>
	<i>F4 key</i>
	<i>F5 key</i>
	<i>Alt key</i>
	<i>Ctrl key</i>

Table 1-2: Content Presentation Style for Keys

Key	Style Used
	Shift key
	HEAD key
	PRINT key
	CANCEL key
	DELETE key

Table 1-2: Content Presentation Style for Keys

Abbreviations and Acronyms

Abbreviation	Expansion
AC	Alternating Current
CSB	Control System Board
DC	Direct Current
DMM	Digital Multi Meter
DVM	Digital Volt Meter
EHT	Extra High Tension
FPGA	Field Programmable Gate Array
IEC	International Electrotechnical Commission
LED	Light Emitting Diode
LCD	Liquid Crystal Display
MOD	Modulation
MS	Microsoft
PC	Personal Computer
PCB	Printed Circuit Board

Table 1-3: Abbreviations and Acronyms

Abbreviation	Expansion
PIB	Printer Interface Board
PSU	Power Supply Unit
QVGA	Quarter Video Graphics Array
SoC	System on Chip
SRAM	Static Random Access Memory
USB	Universal Serial Bus
VDC	Volts of Direct Current
WYSIWYG	What You See Is What You Get
FIB	Front Panel Interface Board

Table 1-3: Abbreviations and Acronyms

Chapters in the Manual

Chapter No.	Chapter Name	Description
1.	Introduction	Contains the information about this manual, the related publications, and writing styles used in this manual
2.	Safety	Contains the safety and hazard information
3.	Main Parts	Describes the main parts of the printer
4.	Installation	Explains the installation procedures of different parts of the printer
5.	Printer Operation	Contains the information on how to use the UI to setup and operate the printer
6.	User Interface	Explains how to use the UI to create and store messages
7.	Replacement Instructions	Explains the procedures to remove and replace the parts of the printer
8.	Maintenance	Provides the maintenance and cleaning procedures of the printer.
9.	Troubleshooting	Contains diagnostic and troubleshooting procedures
10.	IPL	Contains the illustrated parts list of orderable parts
11.	Appendix A	Describes clean start, quick start, clean stop and quick stop procedures

Table 1-4: List of Chapters

Chapter No.	Chapter Name	Description
12.	Appendix B	Contains encoder setup information

Table 1-4: List of Chapters

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. We enforce strict quality control techniques to eliminate the potential for defects and hazards in our products.

The intended use of the Videojet 1610 Excel printer is to print information directly onto a product. Use of this equipment in any other fashion may lead to serious personal injury.

The safety guidelines provided in this chapter are intended to educate the technicians on all safety issues, so that the printer is serviced and operated in a safe manner.

General Safety Guidelines

- Always refer to the correct service manuals as per the specific Videojet printer model.
- Only Videojet-trained personnel must carry out installation and maintenance work. Any such work undertaken by unauthorized personnel may damage the printer and will invalidate the warranty.
- To avoid damage to the printer components, use only soft brushes and lint free cloths for cleaning. Do not use high pressure air, cotton waste, or abrasive materials.
- The printhead must be completely dry before attempting to start the printer, otherwise the printhead may get damaged.
- To prevent nozzle clogs, always wear rubber gloves whenever the nozzle tubing manifold is to be disconnected from the printhead valve module.

Electrical Safety Guidelines

This section explains the safety guidelines related to electrical power supply and electrical cables.

Electrical Power Supply



Warning

Lethal voltages are present within this equipment when it is connected to the mains electrical supply. Only trained and authorized personnel must carry out the maintenance work. Observe all statutory electrical safety codes and practices. Unless it is necessary to run the printer, disconnect the printer from the mains electrical supply before removing the covers or attempting any service or repair activity. Non-adherence to this warning can result in death or personal injury.



Warning

A high AC voltage is present at the inverter and backlight. Extreme caution is required when diagnosing failure in these areas.

Electrical Cables



Warning

Use only the mains power cable supplied with the printer. The end of this cable must have an approved, three-pole, mains plug that has a protective ground conductor.

The electrical power cables, sockets and plugs must be kept clean and dry.

For pluggable equipment, the socket-outlet must be installed near the equipment and must be easily accessible.

**Warning**

Always inspect the cables for damage, wear, corrosion, and deterioration. Make all grounding/bonding connections void of areas of paint, ink build-up, and corrosion.

Grounding

**Warning**

The printer must be connected only to an AC power supply that has a protective ground conductor and must be according to IEC requirements or applicable local regulations.

**Warning**

Do not use the printer if there is any interruption in the protective ground conductor or if the protective ground conductor is disconnected. The failure to follow this warning can cause an electrical shock.

**Warning**

Always ground conductive equipment to an earthing electrode or to the building grounding system with approved cables as per NEC standards in order to drain all potential static discharge. For example, a metal service tray to earth ground.

**Warning**

A resistance reading from the grounded service tray to the equipment chassis or mounting bracket should be 0 to less than 1 ohm. A resistance check should be made using a safe and reliable ohmmeter and should be done on a frequent basis



Warning

To ensure safe grounding, the resistance between the mains lead earth wire and the test points must be less than 1Ω .



Warning

The PCBs contain static sensitive devices. A suitably grounded, antistatic wrist strap must be worn when working on or handling PCBs.

Bonding



Warning

Always prevent static discharge from occurring. Use proper Grounding and Bonding methods. Only use Videojet approved metallic service trays and ground cables.



Warning

Always bond conductive equipment together with approved cables to maintain them at the same potential and minimize static discharge. For example, printhead to metal service tray.



Caution

Always empty the service trays frequently. Some inks and cleaning solutions are flammable. Make sure that the waste fluids are disposed according to HAZMAT.

Fuses



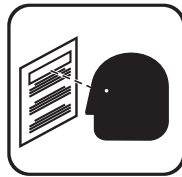
Warning

To ensure continued protection against fire hazards, replace fuses only with the specified type and rating.

Fluid Safety Guidelines

This section describes the hazards that may occur while handling ink, make-up fluid, and cleaning solutions, and the safety precautions that a user must take to prevent the hazards.

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. For more information, visit www.videojet.com and navigate to *Documentation > Material Safety Data Sheets*.

Ink and Make-up Fluid



Warning

The ink and make-up fluid are irritating to the eyes and respiratory system. To prevent personal injury when handling these substances:

Always wear protective clothing and rubber gloves.

Always wear goggles with side-shields or a face mask. It is also advisable to wear safety glasses when carrying out maintenance.

Apply barrier hand cream before handling ink.

If ink or make-up fluid contaminates the skin, wash immediately with soap water. DO NOT use washdown or solvent to clean ink stains from the skin.



Warning

The ink and make-up fluid are volatile and flammable. They must be stored and handled in accordance with local regulations.

Do not smoke or use a naked flame in the vicinity of these substances.

Immediately after use, remove any tissue or cloth that becomes saturated with these substances. Dispose all such items in accordance with the local regulations.

In the event that any ink or make-up fluid container is not completely empty after use, it should be resealed. Only full bottles are recommended for use when replenishing ink or make-up fluid; partially filled bottles must be disposed in accordance with the local regulations.



Warning

When setting up the nozzle, direct the ink stream into a beaker or suitable container. To avoid the contamination of the ink, do not reuse any ink collected in this way. Dispose all waste ink in accordance with the local regulations.



Warning

Prolonged breathing of make-up fluid or cleaning fluid vapor may cause drowsiness and/or effects similar to alcoholic intoxication. Use only in open, well-ventilated areas.

Cleaning Agent



Warning

The cleaning agent is poisonous if taken internally. Do not drink. Seek medical attention immediately if ingested.



Warning

The cleaning agent is irritating to the eyes and respiratory system. To prevent personal injury when handling this substance:

Always wear protective rubber gloves and clothing.

Always wear goggles with side-shields or a face mask. It is also advisable to wear safety glasses when carrying out maintenance.

Apply barrier hand cream before handling the cleaning agent.

If cleaning agent contaminates the skin, rinse off with running water for at least 15 minutes.



Warning

The cleaning agent is volatile and flammable. It must be stored and handled in accordance with local regulations.

Do not smoke or use a naked flame in the vicinity of the cleaning agent.

Immediately after use, remove any tissue or cloth that becomes saturated with cleaning agent. Dispose all such items in accordance with local regulations.



Caution

Make sure that the cleaning agent is compatible with the ink used before carrying out printhead cleaning otherwise the printhead may get damaged.

Compressed Air Safety Guidelines



Warning

Airborne particles and substances are a health hazard. Do not use high pressure compressed air for cleaning purposes.

UI Related Safety Guidelines



Caution

To prevent unauthorized access to the software, ensure that **Clear Password** is executed when exiting from a higher level password.



Caution

Ensure that the correct message name is selected for message deletion as no message selection confirmation prompt is given. All messages apart from the TEST MESSAGE will be deleted.



Caution

The Delete User Field option does not ask for confirmation to delete a user field.

Other Important Guidelines

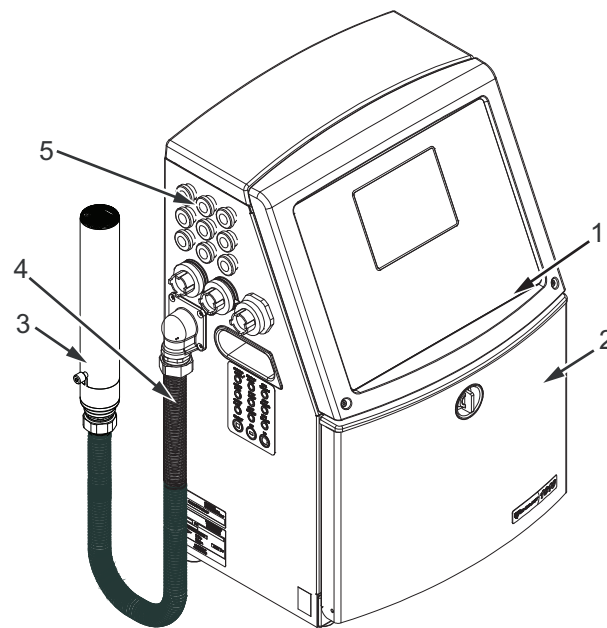
- 1 **DEGRADED PERFORMANCE.** Machine functions that only Videojet-trained personnel can access are set at password level 3 (MASTER password). To obtain the password, do one of the following:
 - Call Videojet Technologies Inc. Customer Service Department at 1-800-843-3610 (United States only), or contact the local Videojet Technologies Inc. representative.
 - Access *Service* tab at www.videojet.com.
- 2 **EXCESSIVE USE OF MAKE-UP FLUID.** As solvent is used during the stop cycle, repeatedly stopping and starting the printer can lead to excessive use of make-up fluid or solvent. This makes the viscosity go out of the range and can lead to a Ink Core Level High error.
- 3 **QUICK STOP.** After a quick stop, the machine must not be left in the same state for any length of time as drying ink may make restarting difficult.
- 4 **PRINTER OVERHEATING.** Report all overheating incidents to a maintenance engineer.

- 5** DAMAGE TO GUTTER. Never attempt to bend the gutter. Its position is fixed.
- 6** DAMAGE TO CHARGE ELECTRODE. The charge electrode is not adjustable so, do not attempt any mechanical adjustments.
- 7** EQUIPMENT DAMAGE. Adhere to prescribed circuit limitations when using any external input or output devices with the printer.
- 8** EQUIPMENT DAMAGE. The DIN connector for the lamp stack must not have any inductive load placed on it as it may cause damage to the PCB.
- 9** EQUIPMENT DAMAGE. Do not fit or remove any connector on the printer when the power is on, otherwise the printer may get damaged.
- 10** RISK OF EXPLOSION. If the battery is replaced by an incorrect type, it will lead to an explosion. Always dispose the used batteries according to the instructions and local regulations.
- 11** HEATER. In a fault condition, heater can reach 70 °C. Do not touch the plate on which the heater is mounted. The failure to follow this warning can cause personal injury.

Main Parts

3

Printer Overview



- | | |
|---------------------------------|-----------------------------|
| 1. Electronics Compartment Door | 5. Connector Panel |
| 2. Ink Compartment | 6. Electronics Compartment* |
| 3. Printhead | 7. Mains Power Switch* |
| 4. Umbilical | 8. Back Filter* |

** The components are not shown in the picture.*

Figure 3-1: Main Parts of the Printer

Figure 3-2 shows the schematic diagram of Videojet 1610 Excel printer.

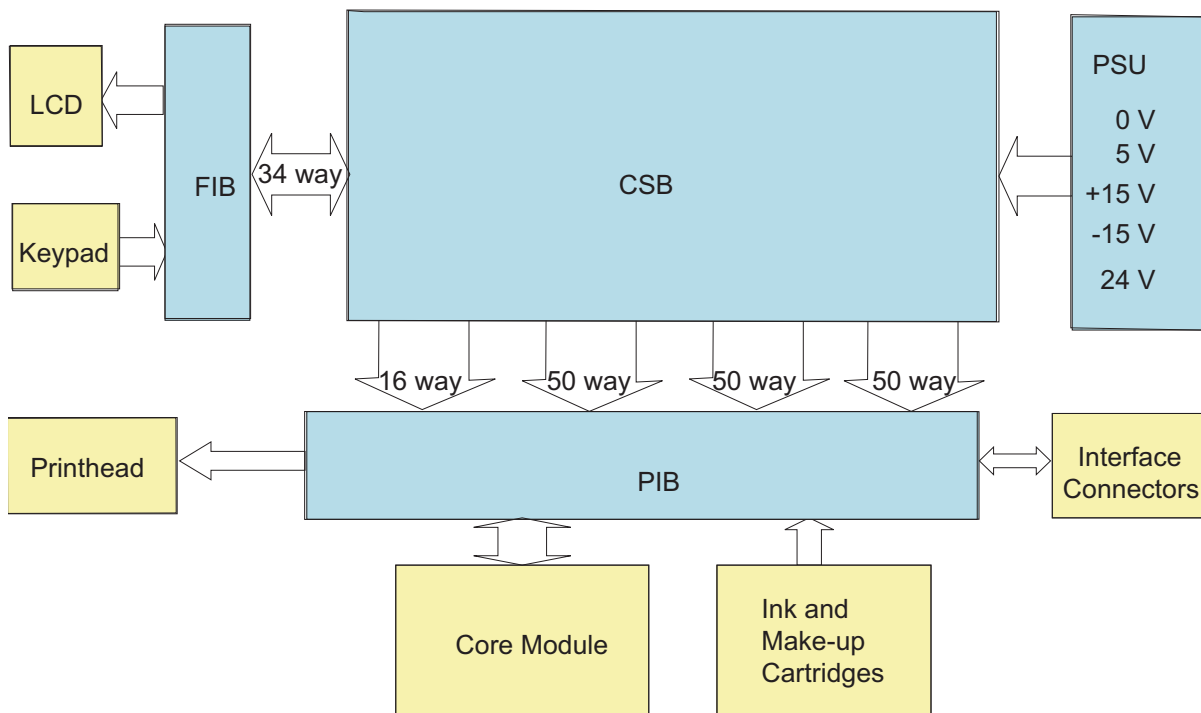


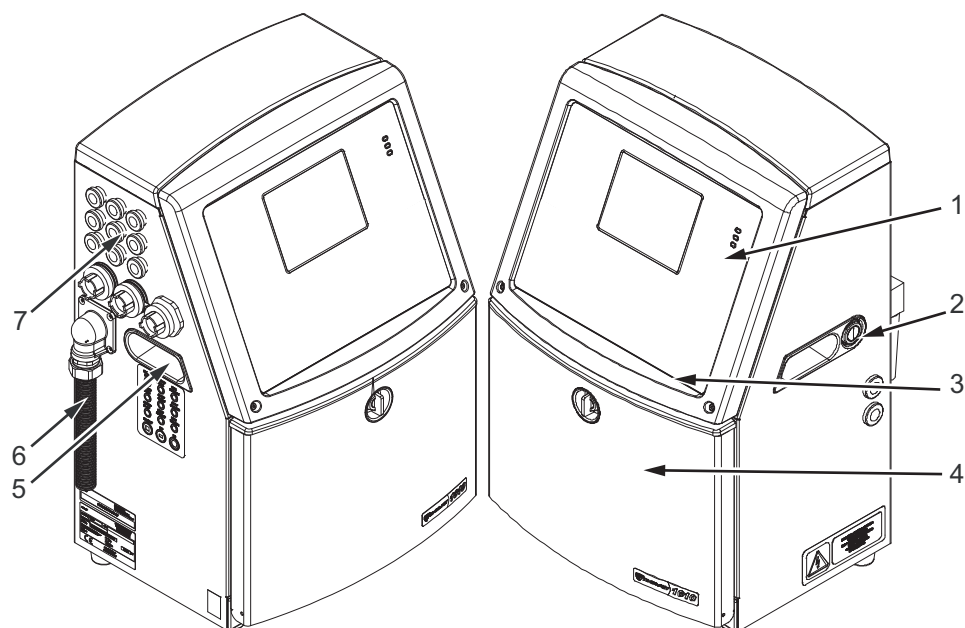
Figure 3-2: System Overview

Cabinet

The cabinet of Videojet 1610 Excel printer is made of stainless steel. The cabinet includes the following parts:

- Control panel
- Electronics compartment door
- Mains power switch
- Ink compartment door
- Connector panel
- Umbilical

Refer to Figure 3-3 on page 3-3 to see the parts of the cabinet.



- | | |
|---------------------------------|--------------------|
| 1. Control Panel | 5. Handle |
| 2. Mains Power Switch | 6. Umbilical |
| 3. Electronics Compartment Door | 7. Connector Panel |
| 4. Ink Compartment Door | 8. Back Filter* |

**The component is not shown in the figure.*

Note: Availability of the connectors depends on the printer model you choose.

Figure 3-3: Printer Cabinet

Control Panel

The control panel (Figure 3-4) provides the user interface to the printer. Refer to Chapter 3 in the Videojet 1610 Excel Operator Manual for more information.

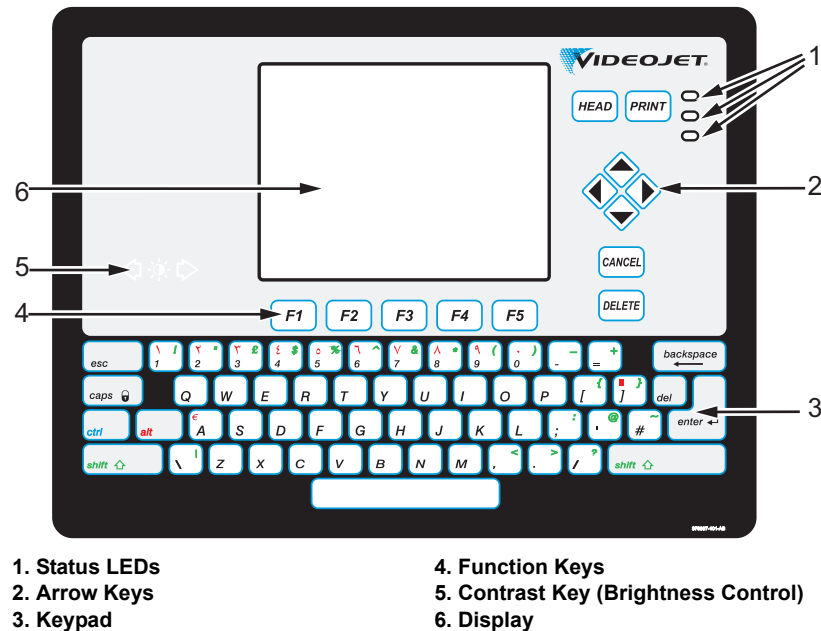


Figure 3-4: Control Panel

Mains Power Switch

The mains power switch (item 1, Figure 3-5) is a green push button to turn on or turn off the power supply to the printer. You can find the mains power switch on the right side of the printer.

Note: The handles (item 2) are provided for easy movement of the unit.

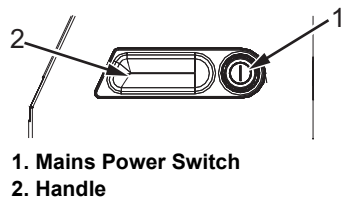


Figure 3-5: Mains Power Switch

Electronics Compartment Door

The electronics compartment door (item 3, Figure 3-3 on page 3-3) is mounted on two hinges. The door has a seal that is water resistant and prevents entry of any dust into the cabinet.

Note: The seal depends on the model of the printer. Videojet 1610 is fitted with IP65 sealing.

The door is closed using two M4 x 30 socket head screws. The door contains control panel (refer to “Control Panel” on page 3-4) and front panel interface board.

See “Electronics Compartment” on page 3-19 for more information on the electronics compartment.

LCD and Front Panel Interface Board

The front panel interface board (FIB), provides the interface between the CSB and the LCD and keyboard. This assembly is located inside the electronics compartment door.

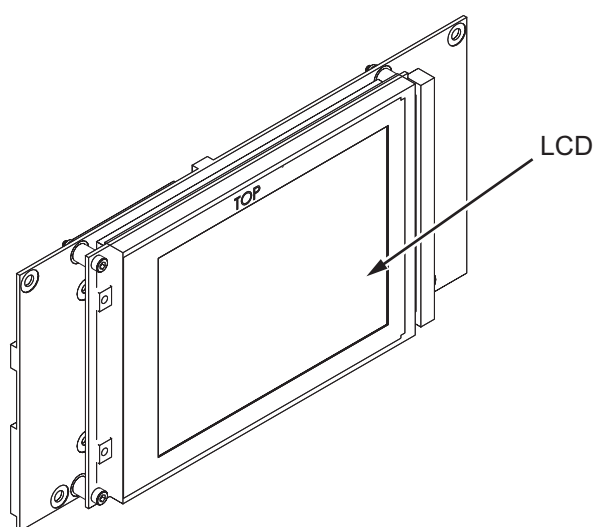


Figure 3-6: LCD

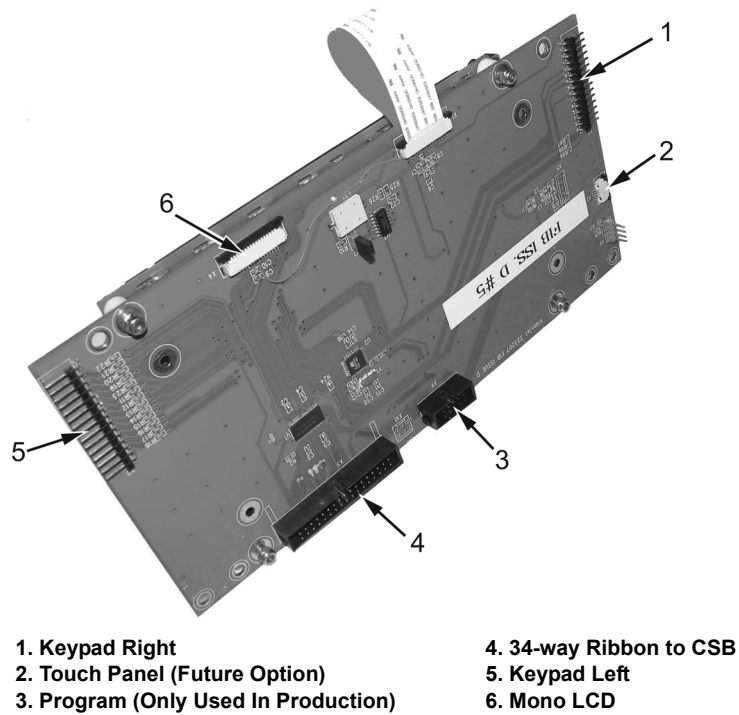


Figure 3-7: FIB

Ink Compartment Door

The ink compartment door (item 4, Figure 3-3 on page 3-3) is mounted on a hinge pin. The door has a seal that is water resistant and prevents entry of any dust into the cabinet.

Note: Videojet 1610 Excel is fitted with IP65 sealing.

Umbilical

The umbilical (item 6) connects the printhead to the printer cabinet. It sends the control signals and ink to the printhead.

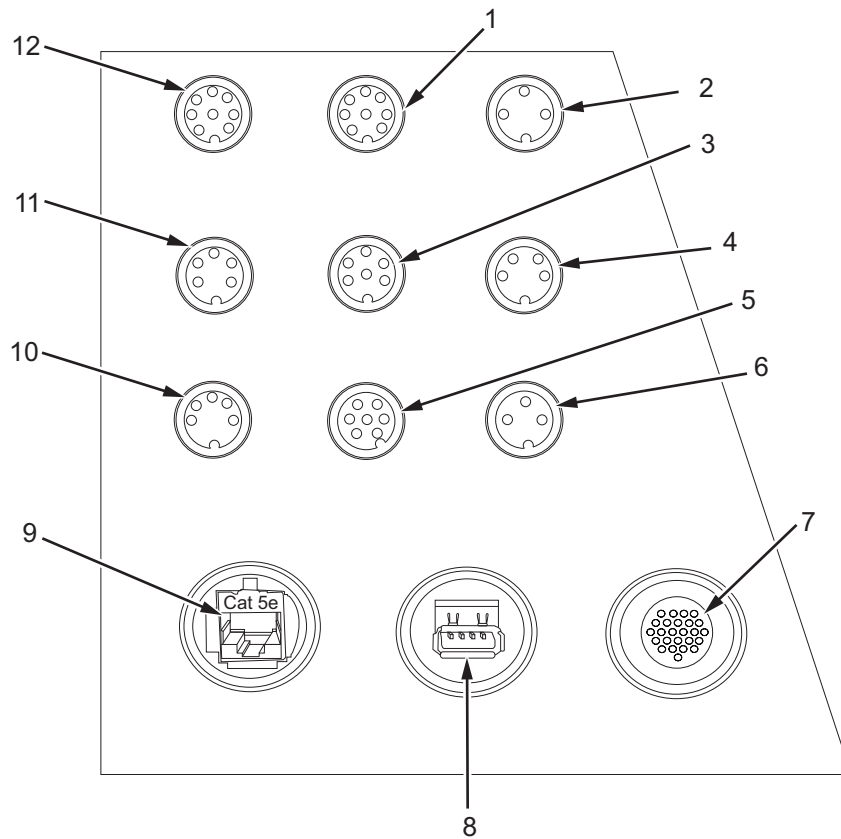
Connector Panel

The connector panel (item 7) provides inputs for several types of external devices.

Table 3-1 provides the connectors available for the printer.

Connector Type	PCB	Standard	Optional
Print Trigger1	PCB 1	Videojet 1610 Excel	-
COMMS RS232	PCB 2	Videojet 1610 Excel	-
COMMS RS485	PCB 1	Videojet 1610 Excel	-
Shaft Encoder	PCB 2	Videojet 1610 Excel	-
Relay Switches	PCB 1	Videojet 1610 Excel	-
Status Output (Lampstack)	PCB 2	Videojet 1610 Excel	-
USB	-	Videojet 1610 Excel	-
Message A Input	PCB 3	Videojet 1610 Excel	-
Print Trigger 2 Bi-directional input	PCB 3	Videojet 1610 Excel	-
Message B Input	PCB 3	Videojet 1610 Excel	-
Ethernet	-	Videojet 1610 Excel	-
I/O 25 Way	PCB 4	Videojet 1610 Excel	-

Table 3-1: Connector Panel Ports



- | | |
|------------------------------------|---------------------|
| 1. Message A Input | 7. I/O 25 Way |
| 2. Print Trigger 2 (Reverse Print) | 8. USB |
| 3. Status Output (Lampstack) | 9. Ethernet |
| 4. Shaft Encoder | 10. COMMS RS485 |
| 5. Relay Switches | 11. COMMS RS232 |
| 6. Print Trigger 1 | 12. Message B Input |

Figure 3-8: Connector Panel

Note: All the connectors are sealed to provide the required protection from water and dust according to the IP65 standard.

Status Output Connector

The printer provides an output for a set of status lights through the status output connector (item 3, Figure 3-8 on page 3-8). This is a 6-way DIN connector. The pin allocation is shown in Table 3-2 and Figure 3-9.

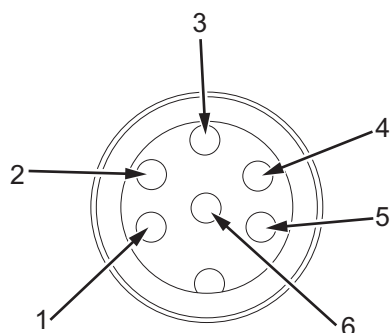


Figure 3-9: Status Output Connector Pin Diagram

Pin	Function
DIN Pin 1	Red lamp negative supply
DIN Pin 2	Amber lamp negative supply
DIN Pin 3	Green lamp negative supply
DIN Pin 4	+24 VDC supply to the strobe/siren ^a
DIN Pin 5	Strobe/siren negative supply
DIN Pin 6	+24 VDC common to the traffic lights ^a

Table 3-2: Status Output Connector Pinouts

a. Maximum current rating is 900 mA for pins 4 and 6 combined.

Shaft Encoder Connector

The printer provides a nominal +15 VDC (100 mA total) output for use by a shaft encoder with a maximum frequency of 100 kHz. The shaft encoder connector (item 4) is a 4 way DIN connector. The pin allocation is shown in Table 3-3.

Note: For 24 VDC, the maximum current is 60 mA.

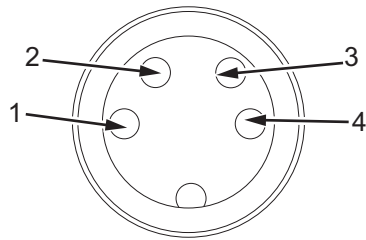


Figure 3-10: Shaft Encoder Connector Pin Diagram

Pin	Function
DIN Pin 1	+15 VDC supply to shaft encoder
DIN Pin 2	Shaft encoder input 'A'
DIN Pin 3	Shaft encoder input 'B'
Din Pin 4	0 VDC common

Table 3-3: Shaft Encoder Connector Pinouts

Note: The shaft encoder output must be of the PUSH/PULL type.

Relay Switches

The relay switches connector (item 5) is a 7 way DIN connector. This connector supports the following relays:

- Relay 'A' duplicates the functionality of the green LED on the keyboard, and you can use the relay to provide a 'Print Ready' output.
- Relay 'B' duplicates the functionality of the yellow LED on the keyboard, and you can use the relay to provide a 'warning' output.

Maximum Contact Loading

1A @ 30 VDC

0.3 A @ 125 VAC

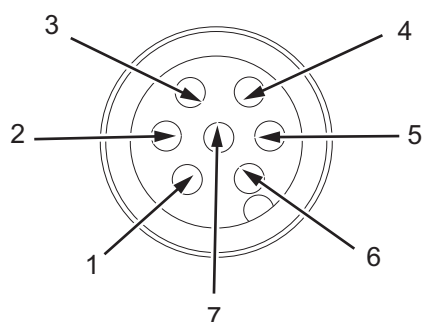


Figure 3-11: Relay Switches Connector Pin Diagram

Pin	Function
DIN Pin 1	Relay A - Normally open contact
DIN Pin 2	Relay A - Normally closed contact
DIN Pin 3	Relay A - Common contact
DIN Pin 4	Relay B - Normally open contact
DIN Pin 5	Relay B - Normally closed contact
DIN Pin 6	Relay B - Common contact
DIN Pin 7	Not used

Table 3-4: Relay Switches Connector Pinouts

Print Trigger 1 Connector

The printer provides a +15 VDC, 100mA output for use by a photoelectric cell (PEC), inductive proximity detector or micro switch. The print trigger 1 connector (item 6) is a 3 way DIN connector. The pin functions are shown in Table 3-5.

Note: For 24 VDC, the maximum current is 60 mA.

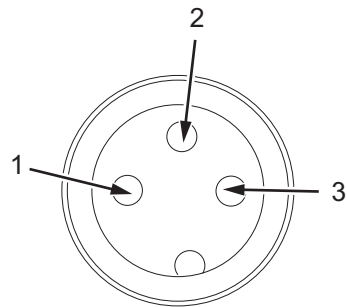


Figure 3-12: Print Trigger 1 Connector Pin Diagram

Pin	Function
DIN Pin 1	+15 VDC supply to sensor
DIN Pin 2	Sensor output
DIN Pin 3	0 VDC common

Table 3-5: Print Trigger 1 Connector Pinouts

I/O 25 Way Connector

The I/O 25 way connector (Bulgin Connector) is available for Videojet 1610 Excel printer (item 7). See Figure 3-13.

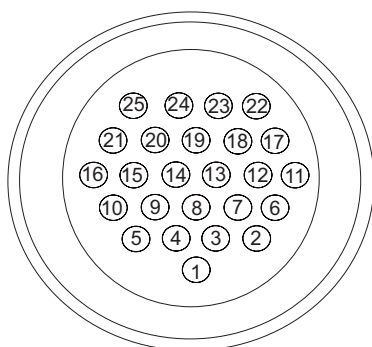


Figure 3-13: I/O 25 Way

Pin	Function
1.	+15VDC Supply Voltage
2.	Serializer Increment / Decrement (+)
3.	Serializer Increment / Decrement (-)
4.	Serializer Reset (+)
5.	Serializer Reset (-)
6.	Jet Stop (+)
7.	Jet Stop (-)
8.	Spare Input #1 (+)
9.	Spare Input #1 (-)
10.	Spare Input #2 (+)
11.	Spare Input #2 (-)
12.	Common
13.	Power +12 VDC to +24VDC (Customer Supply Voltage)
14.	Print Complete (Open Collector)
15.	Spare Output #1 (Open Collector)
16.	Spare Output #2 (Open Collector)
17.	Print Ready (Open Collector)

Table 3-6: I/O 25 Way Pinouts

Pin	Function
18.	Warnings (Open Collector)
19.	Faults (Open Collector)
20.	Common
21.	No Connection
22.	No Connection
23.	No Connection
24.	Chaise Ground
25.	Chaise Ground

Table 3-6: I/O 25 Way Pinouts (Continued)

Beacon Indicator Pins

Pin	Function
17	Print Ready Output
18	Warning Output
19	Fault Output

USB Connector

The USB Connector (item 8) allows for data to be transferred to and from a connected USB flash drive.

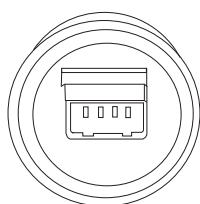


Figure 3-14: USB Connector

Ethernet Connector

The ethernet connector (item 9) is used to connect the printer to a remote computer or network to import data or control the printer remotely.

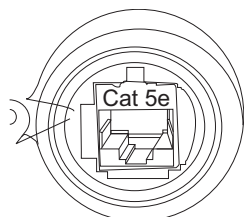


Figure 3-15: Ethernet Connector

RS-485 Connector

The RS-485 connector (item 10) is a 5 way DIN (180 degree or stereo type) connector. Use this to connect the printer to an RS-485 network to import data or control the printer remotely at up to 1Mbps (bi-directional, half-duplex). The pin allocation is shown in Table 3-7.

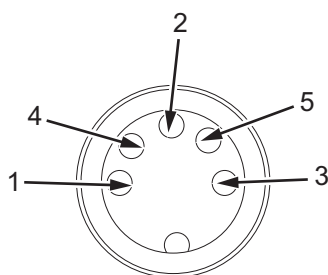


Figure 3-16: RS-485 Connector

Pin	Function
DIN Pin 1	Line A
DIN Pin 2	Line B
DIN Pin 3	0 VDC Common
DIN Pin 4	-
DIN Pin 5	-

Table 3-7: RS-485 Connector Pinouts

RS-232 Connector

The printer has an RS-232 communication port at up to 250 kbps, 1-8-1, no parity, bi-directional, full-duplex. The RS-232 connector (item 11) is a 5 way DIN connector. The pin allocation is shown in Table 3-8.

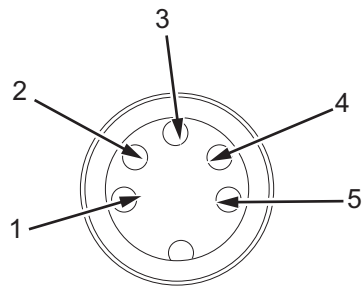


Figure 3-17: RS-232 Connector

Pin	Function
DIN Pin 1	0 VDC common
DIN Pin 2	Transmit data out from the printer.
DIN Pin 3	Receive data into the printer.
Din Pin 4	DTR output from the printer.
Din Pin 5	DCD input to the printer.

Table 3-8: RS-232 Connector Pinouts

Message A and B Input Connectors

There are eight external message inputs provided on PCB3 with four inputs on each of two Message connectors as shown in Table 3-9 on page 3-17 and Table 3-10 on page 3-17. The user has to link adjacent pins to indicate a logic '1' value on that bit. The link short-circuits a resistive 15V DC supply to an opto-isolated input.

The 1610 printers use the Message inputs to select message numbers coded in either BCD format (00-99) or binary format (0-255) with Message A as the least significant digit or nibble.

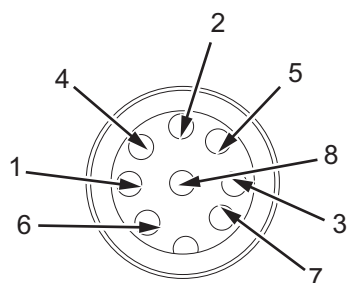


Figure 3-18: Message A Input Connector

Pin	Message Selection Bit
DIN Pin 1	0 (Least significant bit +15V DC supply)
DIN Pin 2	0 (Least significant bit input)
DIN Pin 3	1 (Second bit +15V DC supply)
Din Pin 4	1 (Second bit input)
Din Pin 5	2 (Third bit +15V DC supply)
Din Pin 6	2 (Third bit input)
Din Pin 7	3 (Most significant bit +15V DC supply)
Din Pin 8	3 (Most significant bit input)

Table 3-9: Message A Input Connector Pinouts

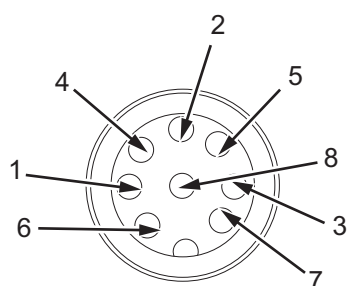


Figure 3-19: Message B Input Connector

Pin	Function
DIN Pin 1	4 (Least significant bit +15V DC supply)
DIN Pin 2	4 (Least significant bit input)
DIN Pin 3	5 (Second bit +15V DC supply)
Din Pin 4	5 (Second bit input)
Din Pin 5	6 (Third bit +15V DC supply)
Din Pin 6	6 (Third bit input)
Din Pin 7	7 (Most significant bit +15V DC supply)
Din Pin 8	7 (Most significant bit input)

Table 3-10: Message B Input Connector Pinouts

An Example:

Input	Message Selection Bits							
	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0
9	0	0	0	0	1	0	0	1
54	0	1	0	1	0	1	0	0
99	1	0	0	1	1	0	0	1

Table 3-11: Message Selection Bits - An Example

Print Trigger 2 Connector

The printer provides "+15VDC, 100mA output for use by a photoelectric cell (PEC), inductive proximity detector or micro switch. The print trigger 2 connector (item 2) is a 3 way DIN connector. The pin functions are shown in Table 3-12 on page 3-18. This connector is also used in cross print applications.

Note: The maximum input signal is 60 mA and 24VDC.

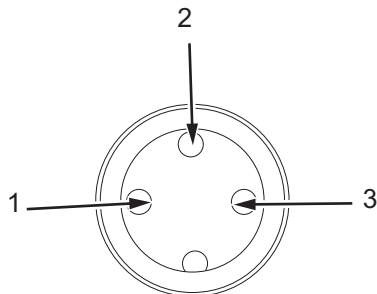


Figure 3-20: Print Trigger 2 Connector

Pin	Function
DIN Pin 1	15V DC
DIN Pin 2	Sensor Output
DIN Pin 3	Ground

Table 3-12: Print Trigger 2 Connector Pinouts

Back Filter

The ink compartment draws the air from the outside atmosphere to keep the compartment cool. The back filter removes the dust from the air that goes inside the ink compartment (see Figure 3-21). The IP65 back filter is standard for Videojet 1610 Excel.

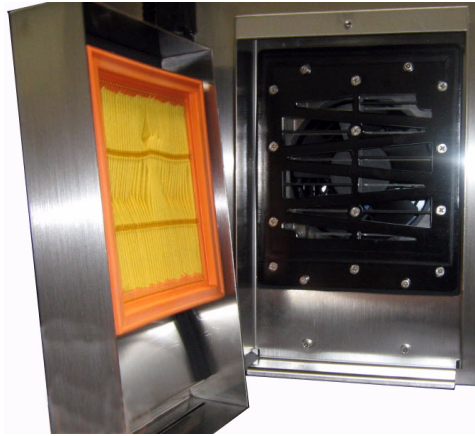


Figure 3-21: Back Filter

Electronics Compartment

Note: When a customer orders a Videojet 1610 Excel printer with an air dryer kit, the positive air pump is not fitted to the printer. The air dryer supplies positive air to the printhead from an external air source. Air dryers are required when the printer is operated in an environment where the humidity is more than 80%.

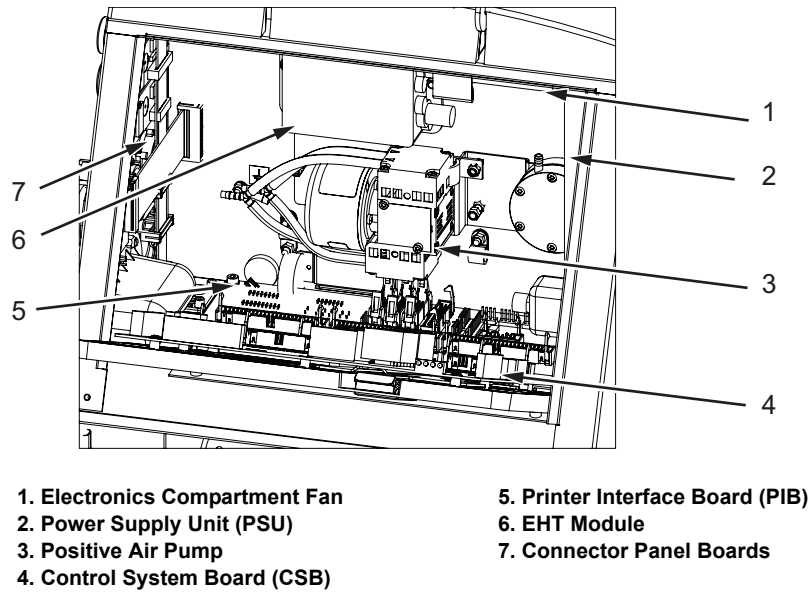


Figure 3-22: Electronics Compartment

Power Supply Unit

The Power Supply Unit (PSU) is the main source of power to the printer. The mains input circuit is shown in the Figure 3-23. The AC electrical power is supplied through three core cables. The line and neutral are fed to the On/Off switch. After the On/Off switch the line and neutral are fed to TB1 connector on the PSU.

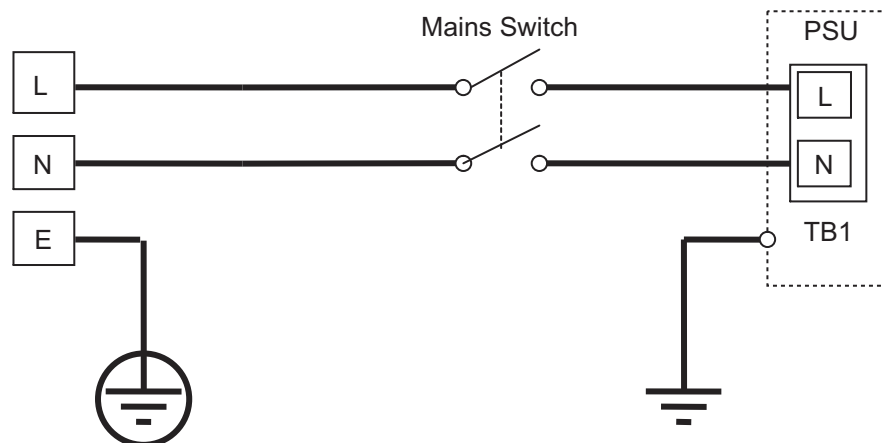


Figure 3-23: Mains Input Circuit

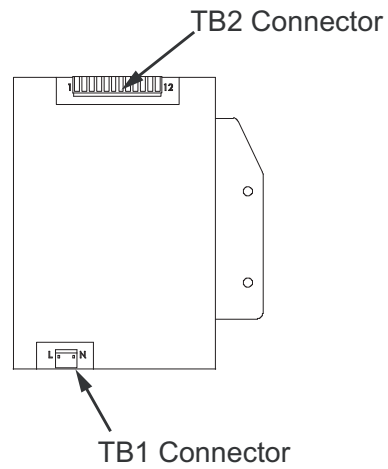


Figure 3-24: Power Supply Unit

The PSU features are as follows:

- The PSU provides four DC voltage levels (+24 VDC, +15 VDC, +5 VDC, and -15 VDC) to the CSB.
- The input power to the PSU ranges from 100 to 240 VAC, 50 – 60 Hz.

Control System Board

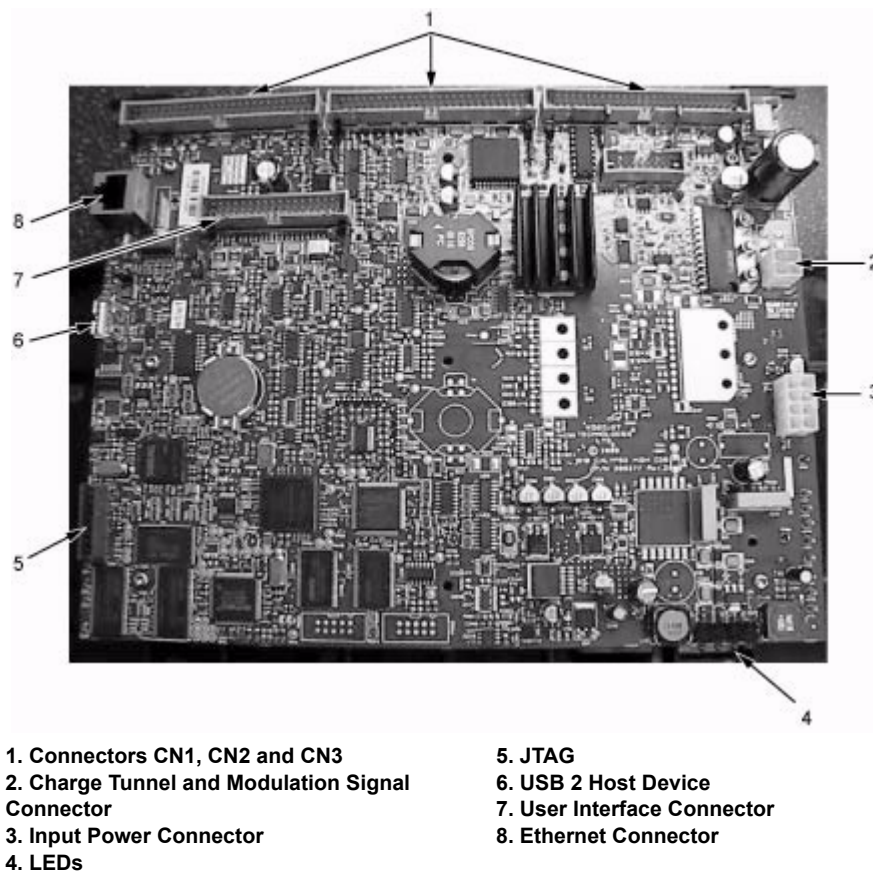


Figure 3-25: Control System Board

Connectors 1, 2, and 3

The ribbon cables from the PIB connect to the CSB through the connectors 1, 2 and 3 (item 1, Figure 3-25) and relay the data that reaches PIB from different parts of the printer to the CSB.

Charge Tunnel and Modulation Signal Connector

The charge tunnel and modulation signals are generated on the CSB. These signals are sent directly to the printhead through the umbilical. All other input or output signals are sent through the PIB.

Charge 1 MOD Connector

Pin	Function
DIN Pin 1	Charge

Table 3-13: Pin Functions for Charge 1 MOD Connector

Pin	Function
DIN Pin 2	GND
DIN Pin 3	GND
DIN Pin 4	MOD

Table 3-13: Pin Functions for Charge 1 MOD Connector (Continued)

Input Power Connector

You can check the voltages at input power connector (item 3, Figure 3-25 on page 3-22) to make sure that the power supply from the mains power supply is of the correct value.

Pin	1	2	3	4	5	6	7	8
Signal	+15 V	0 V	+5 V	-15 V	+5 V	+24 V	0 V	N/C

Table 3-14: Pin Connections - Input Power Connector

LEDs



- | | |
|-------------------------|--------------------|
| 1. Power LED | 3. SoC to FPGA LED |
| 2. Printhead Engine LED | 4. Ethernet LED |

Figure 3-26: Status LEDs

LED	Description
Power	Indicates the status of 3.3 VDC
Printhead Engine	Flashes when printing is in progress
SoC to FPGA	Indicates the status of communications between the processor and the FPGA
Ethernet	Indicates the status of Ethernet communications

Table 3-15: Status LEDs

Electronics Compartment Fan

A cooling fan circulates the air inside the electronics compartment. The top-cover casting of the printer dissipates the heat.

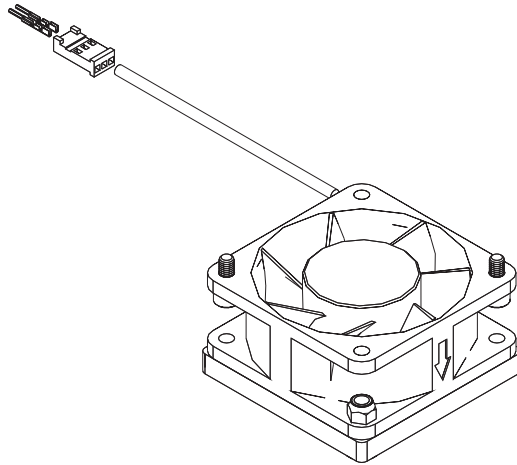
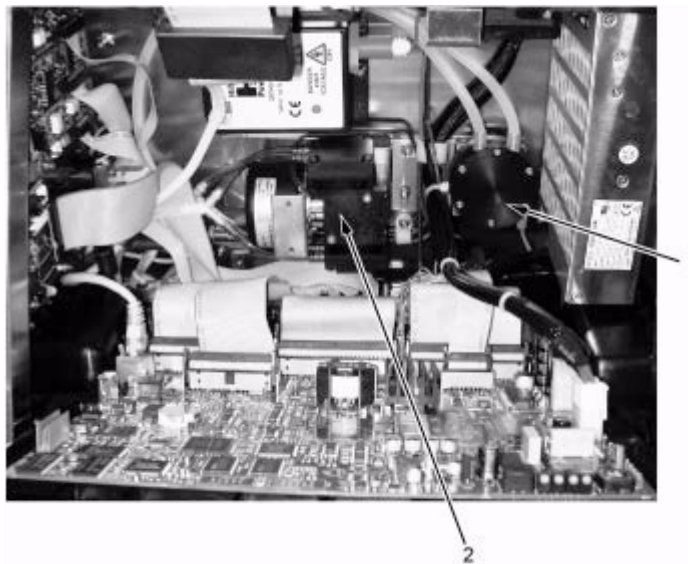


Figure 3-27: Cooling Fan

Positive Air Pump

The positive air pump (with dampener) assembly provides dust free air to the printhead and thus prevents the accumulation of dust in the printhead and contamination of the ink (Figure 3-28).



- 1. Dampener
- 2. Positive Air Pump

Figure 3-28: Positive Air Pump

Note: When a customer orders a Videojet 1610 Excel printer with an air dryer kit, the positive air pump is not fitted to the printer. The air dryer supplies positive air to the printhead from an external air source. Air dryers are required when the printer is operated in an environment where the humidity is more than 80%.

Printer Interface Board

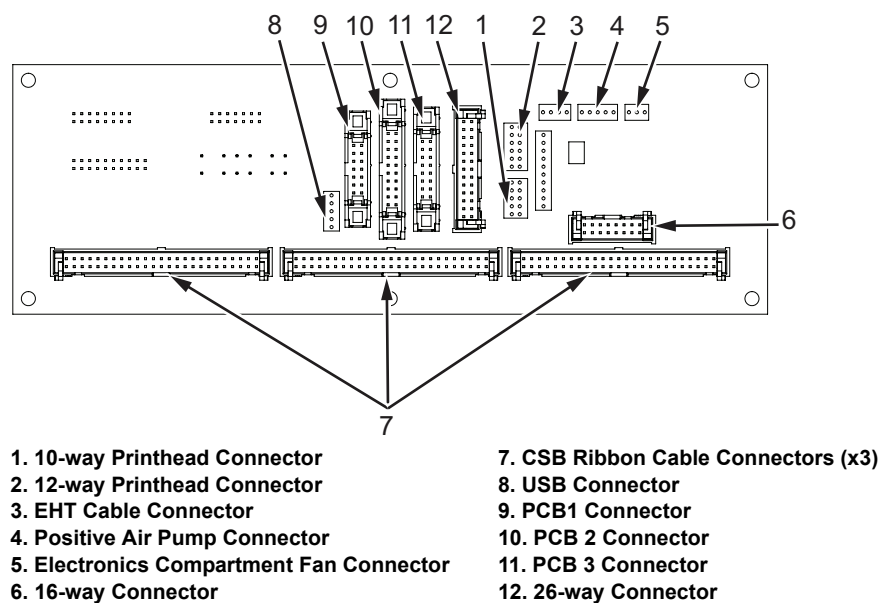


Figure 3-29: Printer Interface Board (PIB) - Electronics Compartment Side

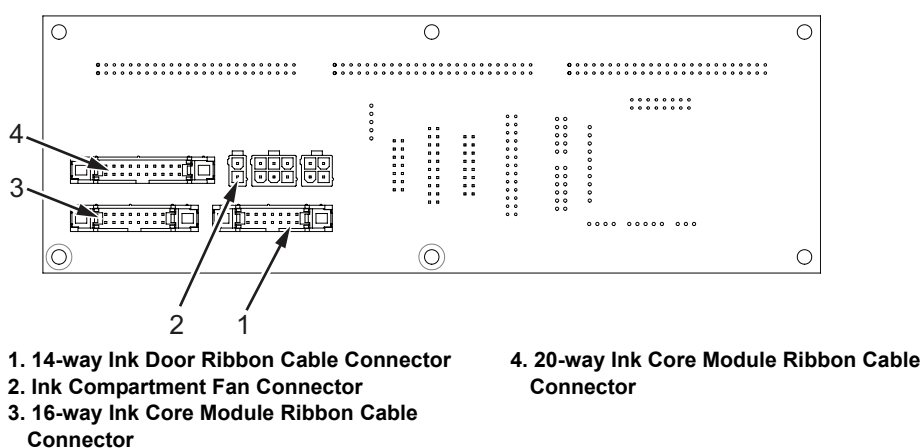


Figure 3-30: Printer Interface Board (PIB) - Ink Compartment Side

The description of different connectors on the PIB is provided in the Table 3-16.

Connector	Description
10-way Printhead Connector 12-way Printhead Connector	Connection to valves, phase detector, strobe LED, heater and thermistor, and gutter detect
EHT Cable Connector	Input to EHT module
Positive Air Pump Connector	Input to positive air pump
Fan Connector	Input to electronics compartment fan
CSB Connectors (x4)	Input to CSB
USB Connector	External USB (not the USB connection on CSB)
PCB1 Connector	Print Trigger 1, COMMS RS-485, and Relay Switches
PCB 2 Connector	COMMS RS-232, Shaft Encoder, Status Output
PCB 3 Connector	Message A and B Input, Print Trigger 2
PCB 4 Connector	I/O 25 Pin Connector
Ink System	Ink pump, valves, sensors, level detectors, smart chip supplies validation system

Table 3-16: PIB Connectors

EHT Module

The extra high tension (EHT) module (item 2, Figure 3-31 on page 3-26) generates the high tension voltage (0 to 8000 VDC) that is supplied to the deflector plate in the printhead.

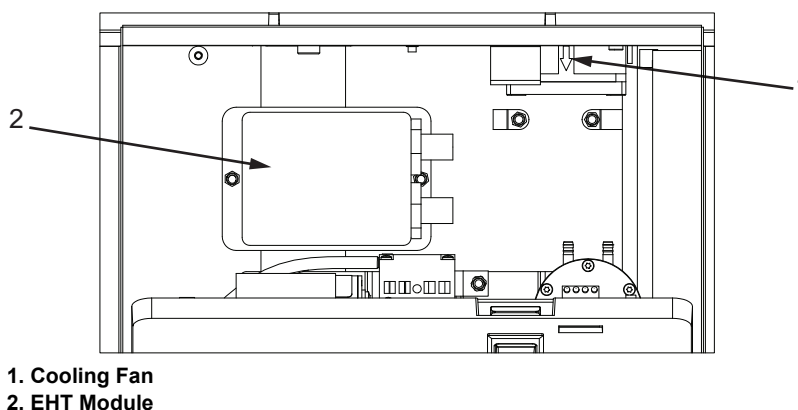
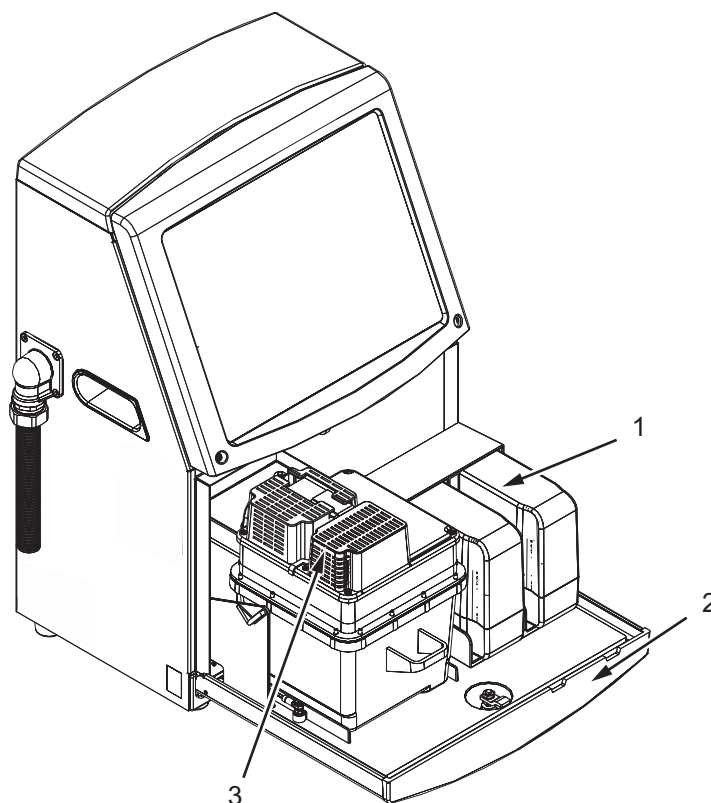


Figure 3-31: Cooling Fan and EHT Module

Ink Compartment

The ink system provides a continuous supply of ink to the printhead at the correct pressure, temperature and viscosity. The ink system is housed in the printer cabinet and the different components of the system are interconnected by PTFE tubing.



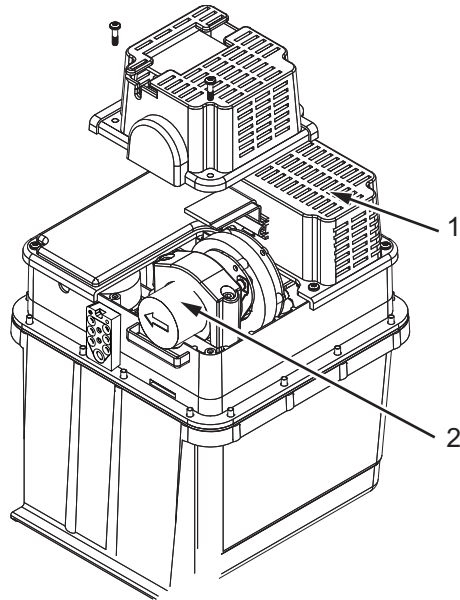
- | | |
|-------------------------|-------------------------|
| 1. Smart Cartridges | 3. Ink Core Module |
| 2. Ink Compartment Door | 4. Ink Compartment Fan* |

****The component is not shown in the picture***

Figure 3-32: Ink Compartment

Ink Core Module

The ink core module maintains the pressure and viscosity of the ink in the printer.



- 1. Ink Core
- 2. Ink Core Pump

Figure 3-33: Ink Core Module

The ink core module contains the following subsystems:

- Ink core pump
- Ink core

Ink Core Module Connections

There are three input, three output, and one vent hydraulic connections to the ink core module.

Connections	Type of Tube
Input Hydraulic Connections	• Ink addition tube (black-striped tube) • Gutter pump discharge (blue-striped tube) • Make-up addition tube (green-striped tube)
Output Hydraulic Connections	• Flush supply tube (red-striped tube) • Ink supply tube (clear tube) • Ink Commissioning Tube (clear tube)
Vent	Vent or breather tube (clear tube)

Table 3-17: Ink Core Module Connections

Two ribbon cables provide the electrical interface between the ink core module and the electronic system. The cables connect directly from the ink core module to the PIB and allow for the transfer ink core data.

Ink Core Pump

The ink core pump is a positive displacement gear pump driven by a 24 VDC brushless motor.

The pump provides stable ink pressure to the nozzle during printing and also provides a flow of ink to other components inside the ink core module.

Smart Cartridges

Two types of cartridges are used in the printer.

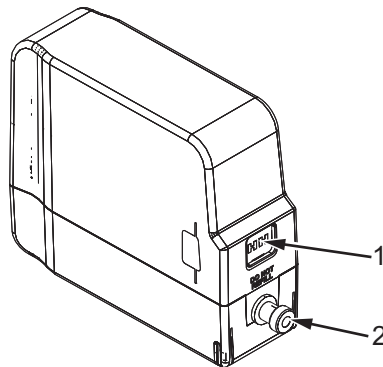
- Ink cartridge - This contains the ink.
- Make-up cartridge - This contains the make-up fluid.

Functions

The cartridge is based on smart chip technology that helps you to:

- Store the information about the ink levels and make-up fluid
- Use the correct type of ink or make-up fluid

- Know the expiry date of the ink



- 1. Smart Chip PCB
- 2. Septum

Figure 3-34: Smart Cartridges

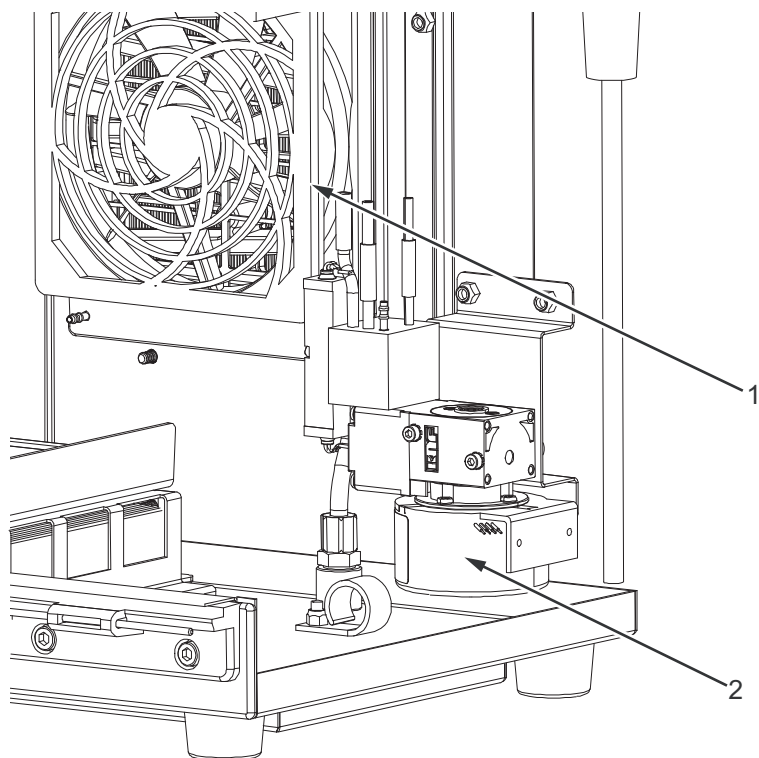
Ink Compartment Fan

The ink compartment fan (item 1, Figure 3-35 on page 3-31) cools the ink compartment.

Gutter Pump

The gutter pump (item 2, Figure 3-35 on page 3-31) is fitted to the rear of the cabinet inside the ink compartment. The functions of the gutter pump are as follows:

- Vacuum generation for gutter suction
- Vacuum generation to assist in nozzle back flushing
- Ink delivery to the ink core module during printer installation



- 1. Ink Compartment Fan**
- 2. Gutter Pump**

Figure 3-35: Fan and Gutter Pump

Condenser Assembly

The condenser assembly converts the solvent/air vapour created in the mixer tank into recoverable solvent.

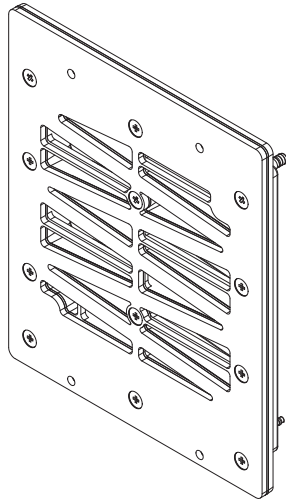


Figure 3-36: Condenser Assembly

Printhead

The printhead contains the following parts:

- Printhead cover
- Printhead engine
- Printhead valve module

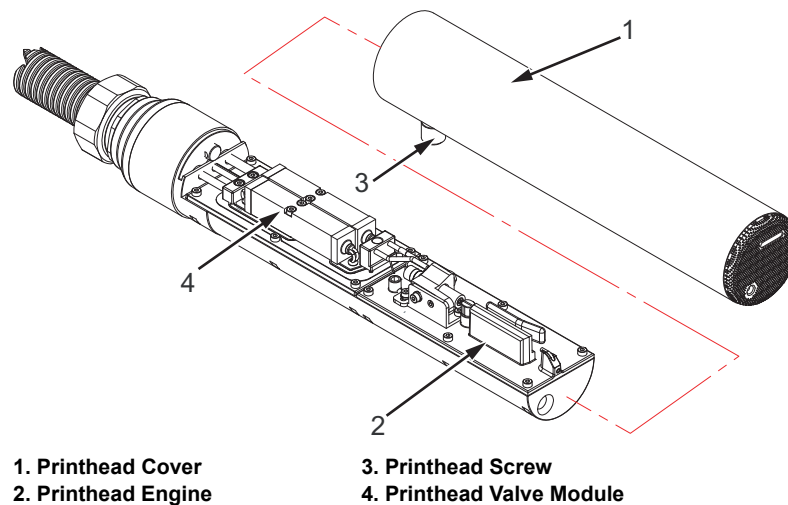


Figure 3-37: Printhead

Printhead Cover

The printhead cover (item 1, Figure 3-37) is attached to the printhead with a printhead screw (item 3). The cover protects the printhead components. Removal of the cover is sensed by the printer through the cover switch. When the cover is removed the voltage to the deflector electrodes is turned off.

Printhead Valve Module

The printhead valve module (item 4) consists of the bleed/gutter valve, ink feed valve, solvent feed valve, and the head heater.

Printhead Engine

The printhead engine (item 2) consists of the nozzle, charge electrodes, time of flight sensors, deflection plate, and gutter tube.

Nozzle

The nozzle (item 8, Figure 3-38 on page 3-35) creates the ink droplets.

Charge Electrode

The charge electrode (item 9) applies an electrical charge to each ink droplet. The charge applied to the droplet is variable and affects the position of the droplet on the substrate.

Phase Detectors

The phase detectors (item 12) measure the ink drop velocity and perform phasing.

Gutter Tube

The gutter tube (item 11) is the return path for the uncharged ink droplets that are not used for printing. The gutter delivers the ink back into the ink core.

The gutter detect senses when ink is present in the gutter. The ink feed tubes are metallic and a signal is fed to one of them. A signal return lead is connected to the other. When ink (which is conductive) is present, the signal passes through it to the return lead. The gutter detect signal is then fed, via the umbilical, to the CSB in the electronics system.

Deflection Plate

The deflection plate (item 10) is supplied with a fixed positive DC voltage (0 - 8000 VDC) from the EHT Module. This voltage deflects the charged drops over the top of the gutter, through the printhead slot, and onto the substrate.

Printhead Functions

The phasing and velocity fly-by sensors and supporting circuitry contribute directly or indirectly to the performance of six critical control functions during steady-state operation:

- Phasing
- Modulation control
- TOF measurement
- Pump speed control
- Target pressure control
- Viscosity control

The functions of the ink core module are shown in Table 3-18.

Name	Function	Frequency
Phasing	Between prints, charge transfer to test drops is measured by the LEAD fly-by sensor (phase detector) in order to synchronize drop charging to drop break-off, thereby optimizing print quality.	Performed approximately 25 times per second
Modulation Control	Between prints, modulation amplitude is validated by performing an abbreviated auto-modulation test using the LEAD fly-by sensor (phase detector). The amplitude is changed in small increments whilst measuring the rate of change of the phase angle in order to verify that the amplitude setting remains at or near the “appropriate setting”.	Performed continuously
TOF Measurement	Between prints, drop velocity is monitored by measuring the TIME OF FLIGHT of the test drops from the LEAD (phase) sensor to the TRAILING (velocity) sensor. The measured result is referred to as the “actual velocity”.	Performed every TENTH phasing test
Pump Speed Control	A pressure transducer inside of the Core measures “actual pressure”. This pressure is compared to the “target pressure”. The resultant error is used to increase or decrease the pump speed.	Performed once per second
Target Pressure Control	The “target pressure” represents the nominal pressure the printer determines that it must operate at in order for the actual velocity to be equal to the “velocity set point”. The printer makes modifications to the target pressure by reviewing the “history” of the velocity error parameter (“PID” control). “Velocity error” refers to the difference between the actual velocity and the set point.	Occur every 10 seconds

Table 3-18: Ink Core Module Functions

Name	Function	Frequency
Viscosity Control	Once the printer has determined its “target pressure”, it has the means to perform viscosity adjustments. Determination concerning viscosity is made by comparing the empirically-determined “target pressure” to a reference pressure known as the “temperature-compensated target pressure”. This value is acquired indirectly from data encoded on the ink cartridge Smart Chip. This reference pressure is mathematically determined and represents the pressure required to acquire the correct “actual velocity” under ideal viscosity conditions. If the target pressure deviates from the reference pressure, the printer attributes this to viscosity variation and responds accordingly.	Pressure is constantly measured. The printer adds make-up if the pressure goes outside the given range for a set time period.

Table 3-18: Ink Core Module Functions

Printhead Operation

The flush supply and ink supply lines merge at Pico valve V1. The ink is heated as it flows through the manifold assembly to the nozzle. The nozzle is outfitted with both the feed and the bleed ports. The nozzle bleed port provides a source of vacuum, used during manual irrigation/backflushing.

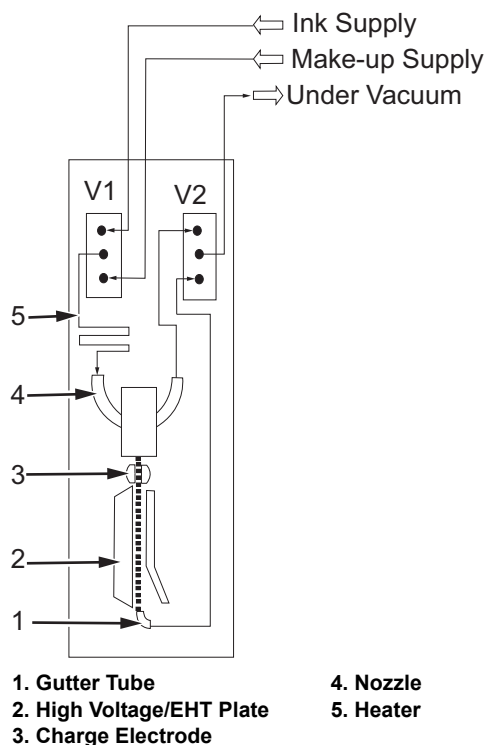


Figure 3-39: Printhead Operation

The flow of ink is as follows:

- 1 The ink and solvent mixture flows through the feed line (item 16, Figure 3-38 on page 3-35) into the printhead.
- 2 The ink enters the feed valve (item 4).
- 3 The valves open or close as per the print requirements.

***Note:** The bleed valve opens and closes as needed during flushing the nozzle and supplying ink to the nozzle.*

- 4 The ink flows into the nozzle.

To adjust the nozzle refer to “Nozzle Adjustment” on page 4-37.

- 5 The piezoelectric crystal vibrates the nozzle at a frequency of around 75 KHz nominal value in the longitudinal direction.

This vibration enables the nozzle to breakup the stream of ink into droplets.

- 6 The ink drops enter the charge electrode (item 9) where they are charged at different voltage levels based on the character to be generated.
- 7 The charged ink drops then pass through the EHT/ High Voltage Field (item 2, Figure 3-39) and over the phase detectors.
- 8 The High Voltage/EHT plate deflects the charged drops of ink at various angles depending on the charge placed on the drop at the moment of breakoff.
- 9 An electrically conductive ink is supplied under pressure by the ink core to the nozzle assembly (item 6, Figure 3-40) through the ink feed pipe (item 1).
- 10 An ink stream is formed as the ink is forced out of the nozzle jet orifice (item 5).

A modulation signal is applied to a ceramic transducer which is clamped to the nozzle assembly. The transducer crystals (item 3 and item 4) causes the nozzle assembly to vibrate longitudinally, breaking up the ink stream into droplets, a small distance away (the break up point) from the nozzle jet orifice. The frequency of modulation is 76.8 kHz (nominal value).

The ink droplets are produced at the same rate as the modulation frequency and are uniform in size and separated by equal distances. The nozzle orifice diameter is 60 microns.

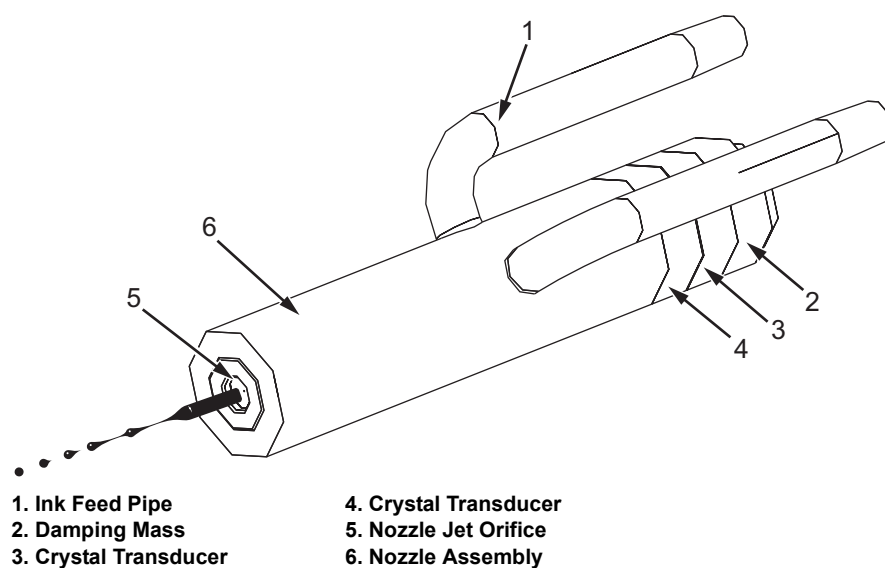
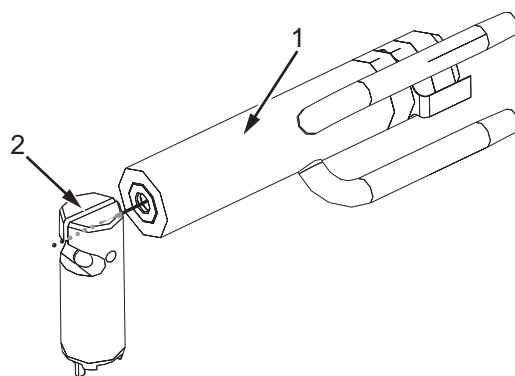


Figure 3-40: Ink Jet Formation

Droplet Charging

- 11** The charge electrode (item 2 in Figure 3-41) is positioned at the break up point of the ink stream and extends for several drops either side of it.

***Note:** This allows a tolerance for break up position and shields the ink stream from the influence of the other electrostatic fields. The distance between the nozzle assembly (item 1) and the charge electrode is 2 mm.*



1. Nozzle Assembly
2. Charge Electrode

Figure 3-41: Charge Electrode

The ink stream and the charge electrode can be considered as the two electrodes of a capacitor. By raising the charge electrode to a specific positive voltage (with a charge pulse) the section of the ink system within the charge electrode will have a negative charge induced on it. When a

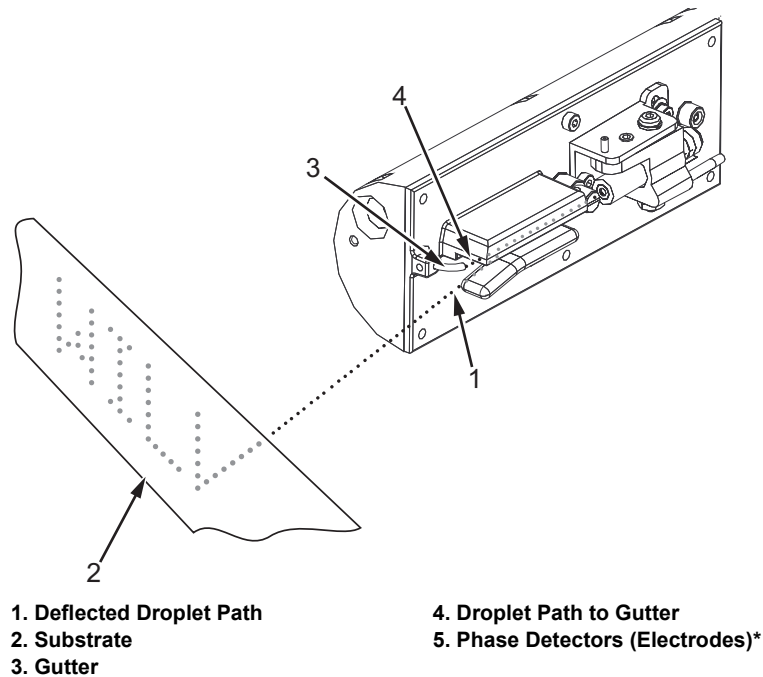
drop of ink then breaks from the jet it will have trapped on it a charge directly proportional to that on the charge electrode. If the positive voltage is then removed from the charge electrode, the negative charge on the jet will discharge through the ink jet and nozzle assembly to ground. However, the drop of ink which has become detached from the jet cannot discharge as it no longer has a conductive path to ground.

Droplet Deflection

- 12** The droplet stream passes through an electrostatic field maintained by the deflector electrodes that are connected to a high tension supply (typically 6 kV).
- 13** The negatively charged droplets are deflected by the field towards the high voltage deflector electrode.

The distance a drop is deflected is proportional to the charge carried. The charge carried is proportional to the voltage applied to the charge electrode when the drop became detached from the ink jet.

The charged droplets once deflected leave the printhead to form characters in a dot matrix format on the substrate. Droplets which are not required for printing are not charged and are therefore not deflected.



** The part is not shown in the figure*

Figure 3-42: Droplet Deflection

Umbilical

The umbilical has the electrical wiring and ink system tubing from the printer to the printhead.

The Hydraulic System

This section describes the combined operation of the ink system, printhead and umbilical to print on a substrate. The Figure 3-43 on page 3-42 shows the hydraulic system of the printer.

The hydraulic system of the printer consists of the following components:

- Ink cartridge
- Make-up cartridge
- Ink core module
- Umbilical
- Printhead

- Gutter pump
- Condenser

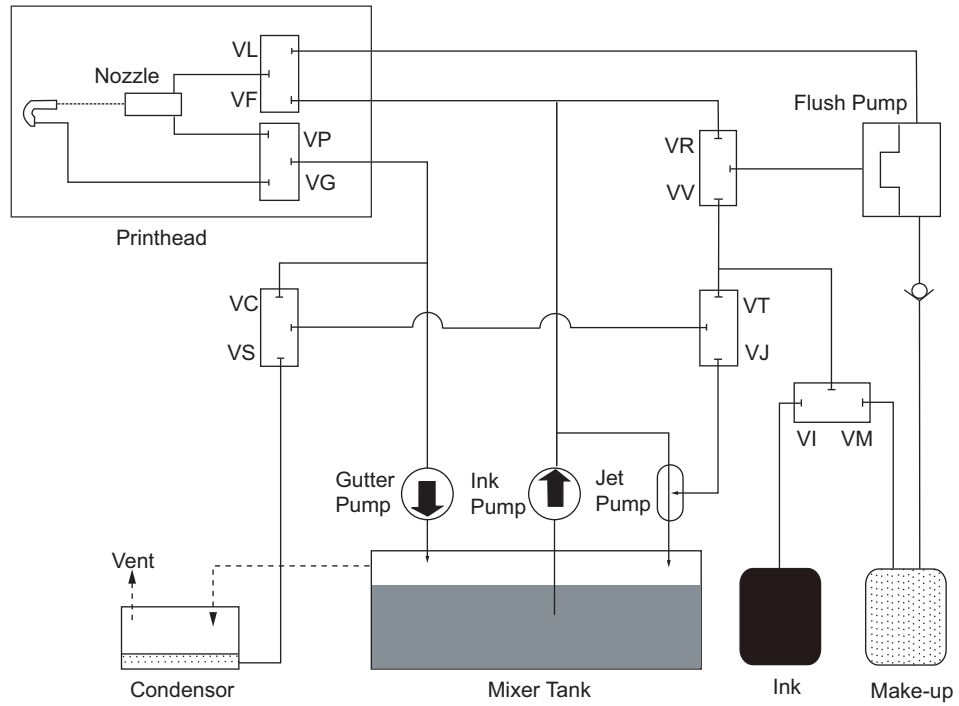


Figure 3-43: Hydraulic System Components

Introduction

This chapter describes the procedures to install Videojet 1610 Excel printer.



Caution

Only Videojet trained personnel must carry out the installation and maintenance work. Any such work undertaken by unauthorized personnel can damage the printer and invalidate the warranty.



Warning

Make sure that the mains electrical supply is within the range indicated by the label adjacent to the mains inlet of the printer. If the voltage ratings differ, do not use the printer until you consult your Videojet supplier.

Use only the mains power cable supplied with the printer. This cable must terminate in an approved, three-pole, mains plug which has a protective ground conductor.

Keep electrical power cables, sockets and plugs clean and dry at all times.



Warning

The printer must be connected to an AC power supply, which has a protective ground conductor in accordance with IEC requirements or applicable local regulations. Any interruption of the protective ground conductor or disconnection to the protective ground terminal may render the apparatus dangerous.



Warning

Lethal voltages are present within this equipment when it is connected to the mains electrical supply. Observe all statutory electrical safety codes and practices. Unless it is necessary to run the printer, disconnect the printer from the mains electrical supply before removing the covers, or attempting any service or repair activity. The failure to follow this warning can cause death or personal injury.

Tools and Supplies

Tools

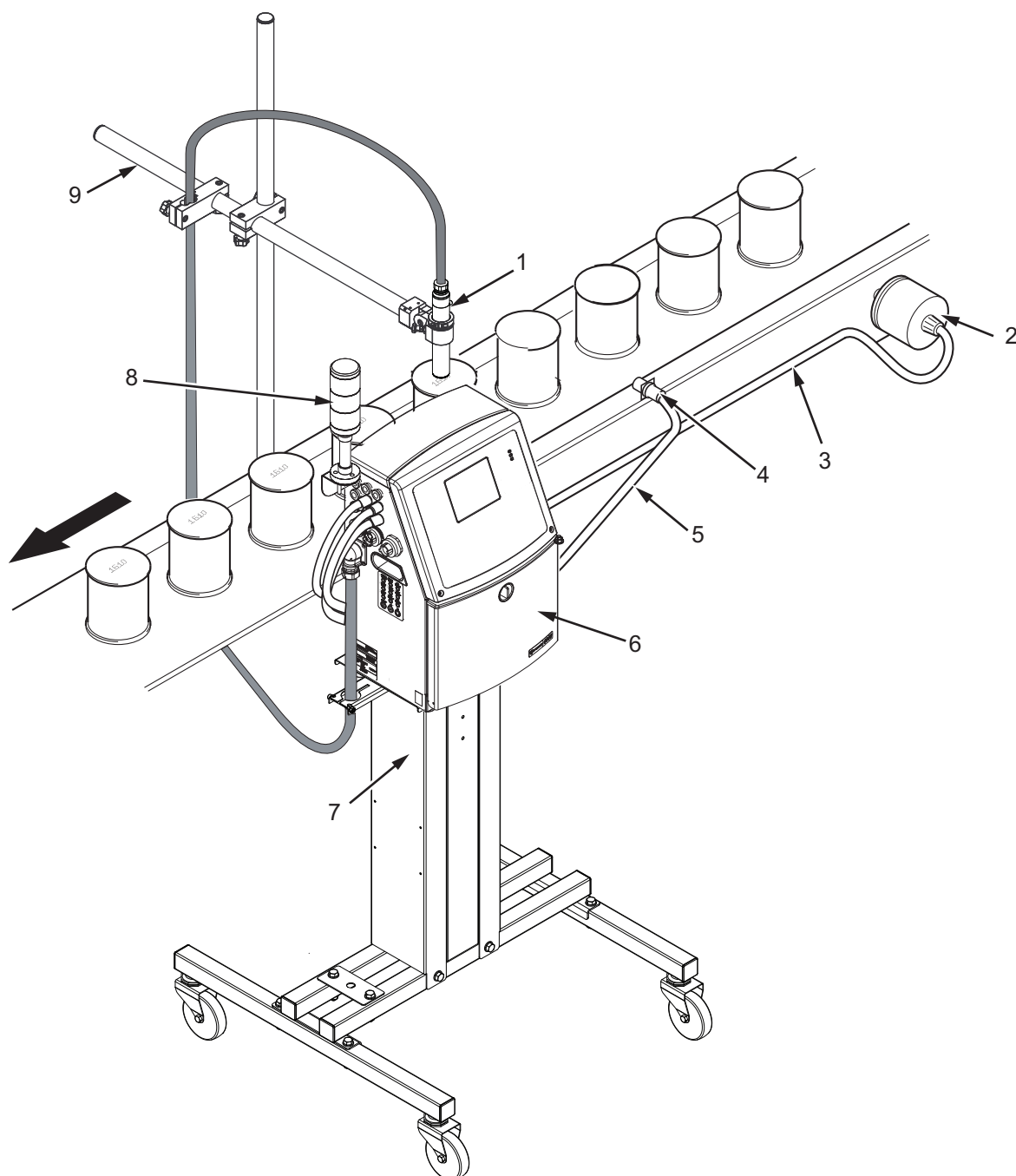
Refer to the service tool kit listed in “Tools Kit” on page 10-48 for information on tools and supplies required to install the printer.

Supplies

- Two cartridges of ink
- Two cartridges of make-up fluid
- Wash bottle
- Wash solution
- Gloves
- Tissue

Typical Production Line

A typical printer installation is shown in Figure 4-1 on page 4-3, where the printer (item 6) is mounted on a printer stand (item 7). The printhead (item 1) is configured to print vertically with the help of a clamp and bracket assembly. A stack light (item 8) is fitted to the printer.



1. Printhead
2. Shaft Encoder
3. Shaft Encoder Cable
4. Photo Cell
5. Photo Cell Cable
6. Printer
7. Printer Stand
8. Stack light
9. Printhead Stand

Figure 4-1: Typical Production Line Installation

Unpack and Inspect the Printer

- 1 Open the shipping box, and make sure that all the parts listed in the packing list are present in the box. If any part is missing, contact Videojet Technologies Inc.
 - Refer to Chapter , “Support and Training” for Videojet contact information.
 - Refer to Chapter 10, “Illustrated Parts List” for part numbers.
- 2 Make sure that there are no damaged parts. If you find any damaged part, contact Videojet Technologies Inc. to order a new part.

Commission the Printer

This section describes the tasks that a user must perform to commission the printer.

Inspect the Ink System

- 1 Put the printer on a stand or table.

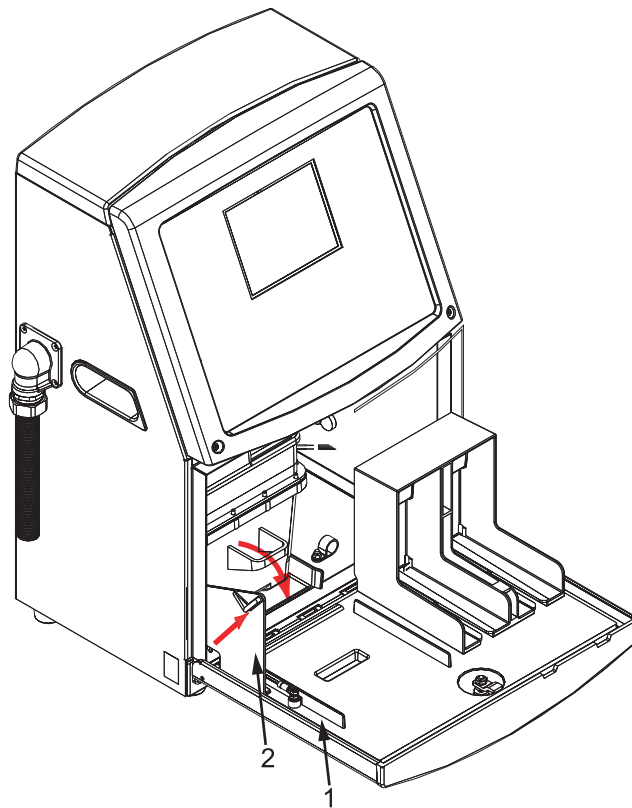
***Note:** The printer can be mounted on three types of stands: mobile printer stand, static printer stand, or the wall-mounting assembly. Refer to the respective installation instructions to install the printer on a stand.*

- 2 Turn the knob and open the ink compartment door (see Figure 4-2).



Figure 4-2: Turn the Knob

- 3 Push the plate (item 2, Figure 4-3 on page 4-5) in the direction shown to open the ink compartment door (item 1) completely.



- 1. Ink Compartment Door
- 2. Plate

Figure 4-3: Ink Compartment Door

- 4 Remove and discard the foam pads (see Figure 4-4 on page 4-5).

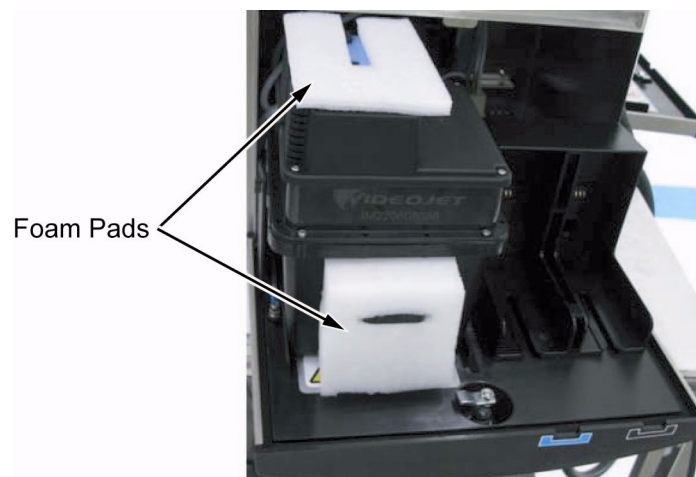
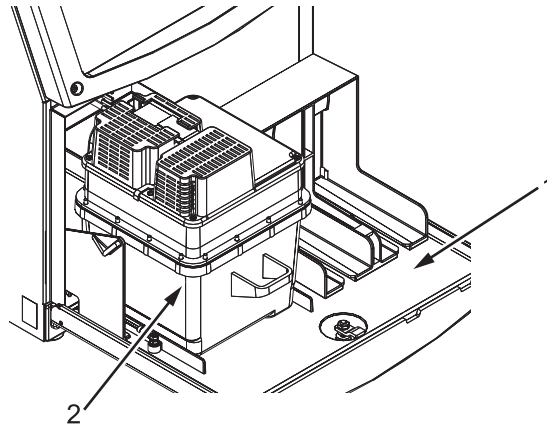


Figure 4-4: Foam Pads Removal

- 5 Remove and discard the foam pads that are attached to the CSB in the electronics compartment.

- 6 Pull the ink core module out of the ink compartment (see Figure 4-5 on page 4-6). Inspect the ink core for shipping damages such as cracks.



1. Ink Compartment Door
2. Ink Core Module

Figure 4-5: Pull Ink Core Module

- 7 Make sure that the ink core manifold is connected to the ink core module correctly (see Figure 4-6).

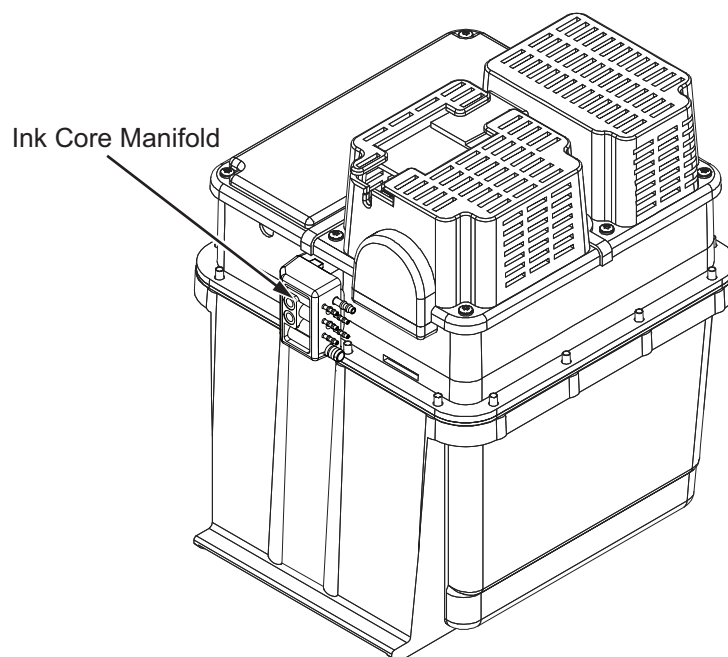
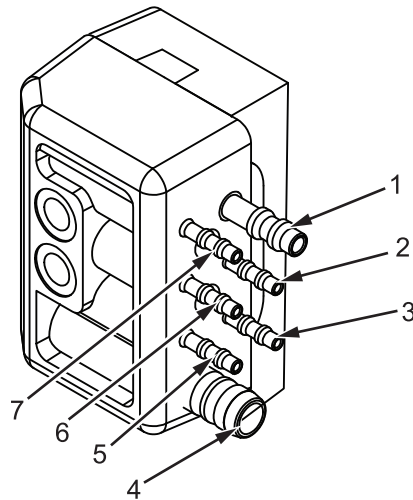


Figure 4-6: Ink Core Manifold

- 8 Make sure that all the tubes are connected to the ink core manifold (see Figure 4-7 on page 4-7). Refer to Table 4-1 on page 4-7 for the colour code of the sleeves.

- 9** Make sure that the air vent tube is connected to the condenser assembly inside the hydraulics compartment.



1. Clear Tube (5/32 inch)
 2. Red Stripe Tube (1/8 inch)
 3. Green Stripe Ink Tube (1/8 inch)
 4. Air Vent

5. Blue Stripe Tube (1/8 inch)
 6. Black Stripe Make-up Tube (1/8 inch)
 7. Clear Tube (1/8 inch)

Figure 4-7: Tubes to Ink Core Manifold

Tube Number	Colour code of the Sleeve
1	Brown
2	Red
3	Green
4	N/A
5	Blue
6	Black
7	Yellow

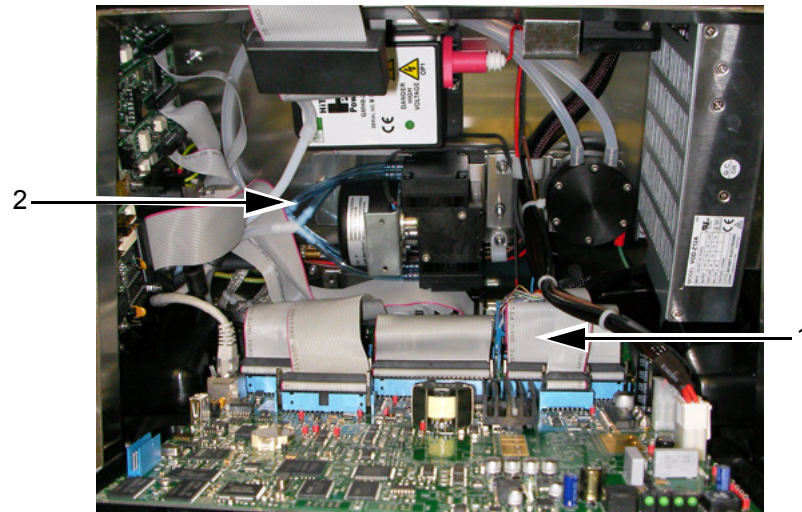
Table 4-1: Manifold Sleeves

- 10** Push the ink core module into the ink compartment.
11 Close the ink compartment door.

Inspect the Electronics System

- 12** Open the electronics compartment and make sure that all the electrical cables are fitted and routed correctly.

- 13** Make sure that the pneumatic tube that connects to positive air pump is connected correctly.



- 1. Cables**
2. Pneumatic Tube

Figure 4-8: Air Pump and Dampener

Inspect the Printhead

- 14** Remove the printhead cover (see Figure 4-9 on page 4-9) and inspect for damages like:
- Loose tubing, decks, screws and manifolds
 - Damage to printhead sleeve
 - Scratches to printhead assembly
 - Loose fitting of the umbilical on the back of the printhead
 - Cracks and abrasions on the black umbilical rubber jacket
- 15** Check the distance between the nozzle and the charge electrode (Table 4-2).

Microns	Charge Electrode Distance
60 Microns	1 mm

Table 4-2: Charge Electrode Distance

- 16** Visually check the charge electrode gap.
- $Gap = 0.575-0.675 \text{ mm}$
- 17** Replace the printhead cover.

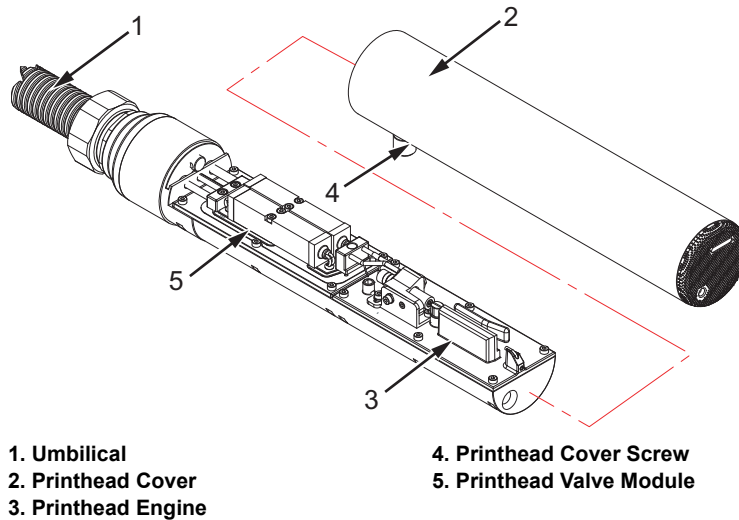


Figure 4-9: Printhead Cover Removed

Log into UI

- 18 Connect the printer to the AC power supply and turn on the printer. The <01 Edit> screen appears (see Figure 4-10 on page 4-9).

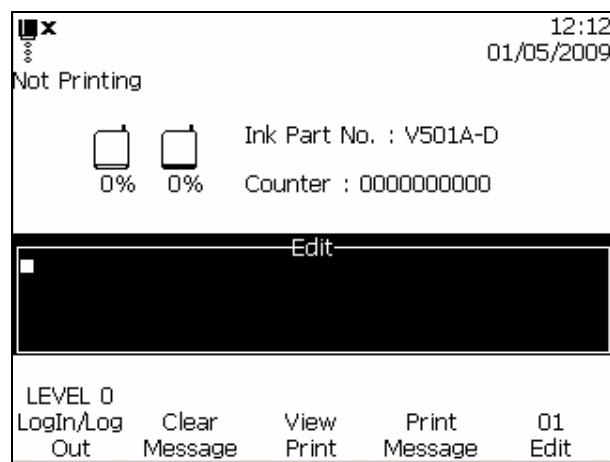


Figure 4-10: <01 Edit> Screen

- 19 If you cannot see the display, adjust the contrast using the contrast adjustment button .
- 20 Log into the user interface (UI) at level C password. Press the *F1* key. The following message appears:

Enter password -> ■

<To set Level 0, Press Enter without any entry>

Use the password generated by the *DailyPassword* application. To obtain the password, do one of the following:

- Call Videojet Technologies Inc. Customer Service Department at 1-800-843-3610 (United States only), or contact the local Videojet Technologies Inc. representative.
- Access *Service > Videojet Password Generator* tab on www.videojet.com.

Note: The printer may display a **No Ink Parameters** warning and an **Ink Core Change** alarm. These are normal indications that the ink core is new and not programmed.

Install Ink and Make-up Cartridges

- 21 Open the ink compartment door (refer to Step 2 and Step 3 on page 4-4).



Warning

The ink, solvent and make-up fluid are irritating to the eyes and respiratory system. To prevent personal injury when handling these substances follow the guidelines given below:

Always wear protective clothing and rubber gloves.

Always wear goggles with side-shields or a face mask. It is also advisable to wear safety glasses when carrying out maintenance.

Apply barrier hand cream before handling ink.

If ink or make-up fluid contaminates the skin, wash immediately with soapy water. DO NOT use washdown or solvent to clean ink stains from the skin.



Warning

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. For more information, visit www.videojet.com and navigate to *Documentation > Material Safety Data Sheets*

- 22** Access *04 System - System Info > 01 Info - Version Info* to view the version information. Record the following:

- SW Version
- PE Firmware Version
- CE Image Version

Confirm that the CSB / Ink Core "utilization" are set at *High/High* for 1610 Excel.

- 23** Perform a hardware test. Access *04 Edit > Service Printer - Service 1 > Service 2 > Service 3 > Service 4 > Service 5 > Service 6 > HARDWAR TEST*. Press the *F1* Key (Figure 4-11).

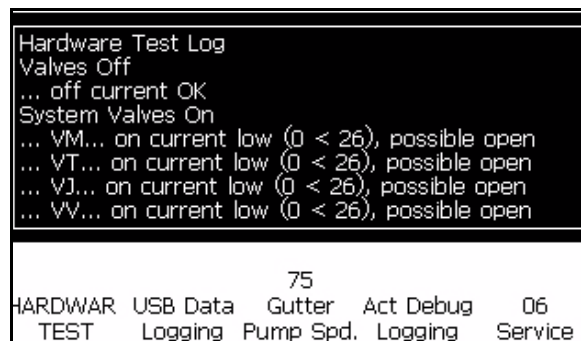
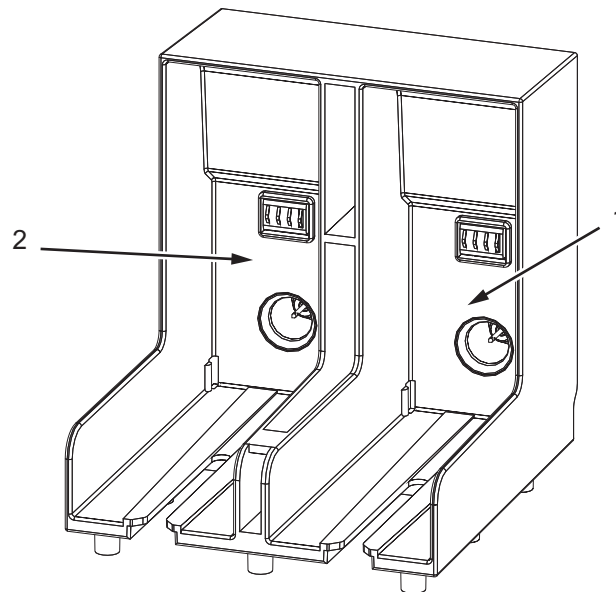


Figure 4-11: Hardware Self-test

- 24** Install one new cartridge of ink and one new cartridge of make-up fluid in the printer (Figure 4-12 on page 4-12).
- 25** Make sure that the ink out and make-up out icons disappear.



- 1. Ink Receptacle
- 2. Make-up Receptacle

Figure 4-12: Ink and Makeup Cartridge Holder

- 26** If unknown ink and unknown make-up icons are displayed, perform the 'Update Ink Core' Parameters.

Note: Make sure that the ink and make-up cartridges are inserted into the correct slots.

To update the parameters, do the following tasks:

- a. Select 01 Edit> 02 Edit >03 Edit> 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Auto Prime > 01 Prime > 02 Prime - Update Core. The ink data is displayed on the screen.
- b. Make sure that the part number on the ink cartridge matches with the part number displayed on the screen. Record the part number. See Figure 4-13 on page 4-13.
- c. Press the *Enter* key and wait for about 4 to 5 seconds. The ink data displayed on the screen disappears and the new ink type information appears.

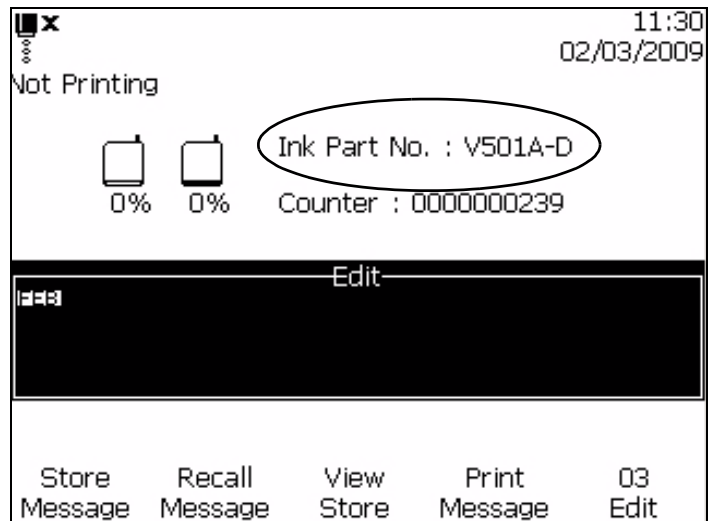


Figure 4-13: Ink Data

- 27** Verify and record the ink type and expiration date. Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service - Printer Log > 01 Log - Ink Data > 01 Ink - Ink Data (see Figure 4-14 on page 4-13).

V501A-D	393634463734	8	1152	72151
Ink		Visc	Visc	Visc
Ref.	Serial No.	Coef 1	Coef 2	Coef 3
V701A-D	0/0/0/AB	21/10/2008	128	255
Makeup	Prod.	FluidExp.	Fluid	Cartridge
Ref.	BatchCode	Date	Level	Refit Cnt
Ink	Makeup			01
Data	Data			Ink

Figure 4-14: Ink Smart Chip Data

- 28** Verify and record the make-up type and expiration date. Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service - Printer Log > 01 Log - Ink Data > 01 Ink - Makeup Data (see Figure 4-15 on page 4-14).

V701A-D		413936433734	
Makeup		Serial No.	
Ref.			
0/0/0/CD	128	255	21/10/2008
Prod.	Fluid	Cartridge	FluidExp.
BatchCode	Level	Refit Cnt	Date
Ink		01	
Data		Ink	
Makeup			
Data			

Figure 4-15: Makeup Smart Chip Data

- 29** Verify and record the 'Time Ink On'. Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service - Printer Log > 01 Log - Run Times > 01 Run Time (see Figure 4-16).

< 1	65512	0.40	
Drop	Time	Machine	01
Counter	Ink On	Run Time	Run Time

Figure 4-16: 01 Run Time

Configure the Printer

- 30** Please make sure printhead is clean and dry. Calibrate the HV. Refer to "Calibrate EHT" on page 4-40.
- 31** Set date and time. Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - System Set-Up > 01 System (see Figure 4-17).

12:37	03/12/08	85	11	
Set	Set	Set	Set	01
Time	Date	HR/WK	WK/YR	System

Figure 4-17: Set Time/Date

- 32** Set the nozzle type and the conduit length.
- Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Nozzle Setting > 01 Settings - Nozzle Type (see Figure 4-18 on page 4-15). Make sure that the nozzle type is set correctly for the current configuration (60 micron).

60 Micron Nozzle Type	MEK Fluid Type	651 Frequency Divider	76.805 Drop Frequency	01 Settings
-----------------------------	----------------------	-----------------------------	-----------------------------	----------------

Figure 4-18: Nozzle Type

- Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Ink Pressure > 01 Pressure - Conduit Length (see Figure 4-19 on page 4-15). Make sure that the conduit length is set correctly for the current configuration (see Table 4-3).

Note: During the installation procedure, keep the printhead at the same height as the point where the umbilical is attached to the cabinet.

Printer	Conduit Length
Videojet 1610 Excel	3 m (standard), 6m (optional)

Table 4-3: Conduit Length

3 Mtrs Conduit Length	0 Print Head Elevation	01 Pressure
-----------------------------	------------------------------	----------------

Figure 4-19: Conduit Length

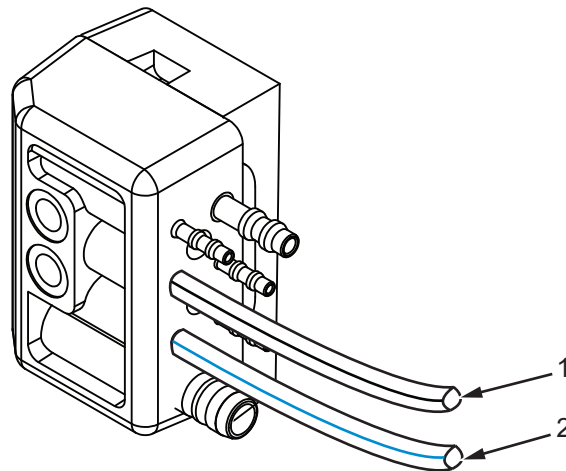
Prime the Ink Core Module

- 33** Start *Prime Core* (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service -Auto Prime > 01 Prime) (see Figure 4-20) and record the time to prime.

Prime Core	Empty Core	ON Flush Prime	Umbilical Prime	01 Prime
---------------	---------------	----------------------	--------------------	-------------

Figure 4-20: Prime Core

- 34** Make sure that the fluid flows through the black-striped tube (item 1, Figure 4-21) and blue-striped tube (item 2).



- 1. Black Striped Tube
- 2. Blue Striped Tube

Figure 4-21: Prime Core

- 35** Monitor the flow of fluid as it is pulled toward the ink core. As the ink core reaches a low level, the red LED is turned off and is replaced with a Ink Core low icon.

Note: When ink core is empty, the red LED is illuminated.

Note: Make sure to see that the ink is being pulled from the cartridge to the gutter pump and then sent to the ink core. If the ink is not flowing, the system shows the cartridge empty icon even though no fluid was pulled from it.

- 36** The *Prime Core* procedure stops automatically when the ink core level reaches middle level.

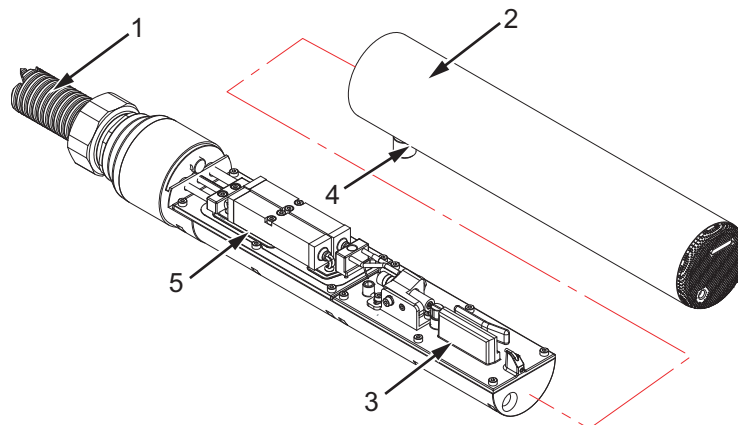
If the ink level stalls above 'low' but below 'middle', replace the cartridge when prompted to allow the completion of the '*Prime Core*' procedure.

Note: The printer indicates if another cartridge is required to complete the procedure.

Note: Monitor the Diagnostics Screen Two to track the Ink Core Level from Empty to Low to Middle.

Perform System Flush Purge and Umbilical Purge

- 37** Remove the printhead cover screw that fastens the printhead cover to the printhead chassis and remove the printhead cover (see Figure 4-22).



- 1. Umbilical
- 2. Printhead Cover
- 3. Printhead Engine

- 4. Printhead Cover Screw
- 5. Printhead Valve Module

Figure 4-22: Printhead Cover Removed



Caution

Always wear a set of rubber gloves before disconnecting the nozzle tubing manifold. This helps to prevent nozzle clogs.

- 38 Remove the M2 x 6 socket-head-cap screw (item 1, Figure 4-23) that attaches the front tubing manifold to the printhead valve module.
- 39 Remove the 2-way manifold gasket (item 5).
- 40 Put the 2-way manifold gasket provided in the bypass kit on the ports of the printhead valve module.
- 41 Fit the nozzle bypass manifold (that has the loop of tube) (part Number 399247) to the printhead valve module using the M2 x 6 socket-head screw.

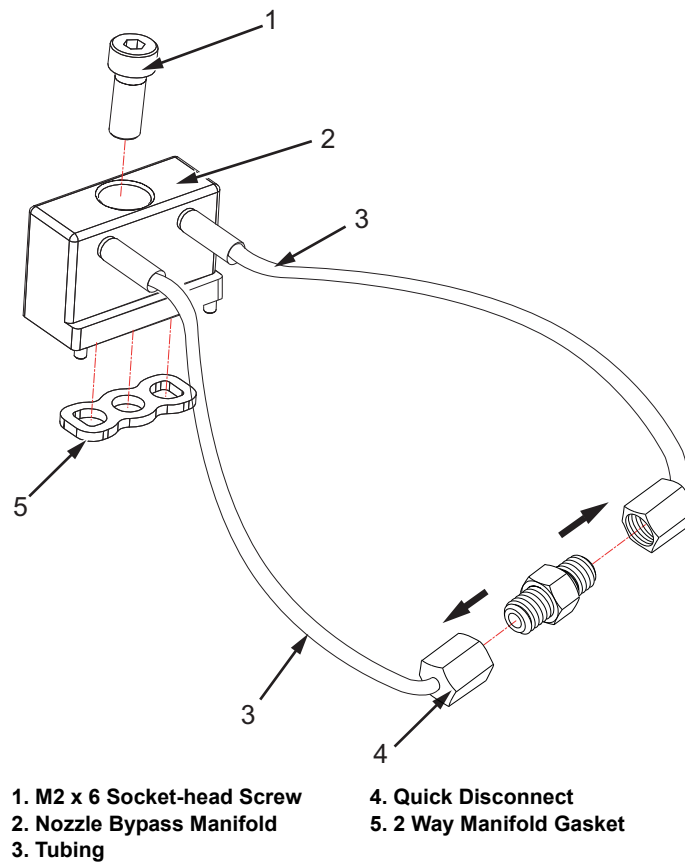


Figure 4-23: Bypass Manifold

- 42 Open the quick disconnect (item 4) in the middle of the loop and direct the supply side into a receptacle.
- 43 Start Flush Prime (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Auto Prime > 01 Prime).

Prime Core	Empty Core	ON Flush Prime	Umbilical Prime	01 Prime
---------------	---------------	----------------------	--------------------	-------------

Figure 4-24: System Flush Purge

- 44 Observe if the fluid flows through the flush supply line (red stripe) and flows out of the loop in the end.

Make sure that the fluid that is ejected is clear (make-up, not ink).

Note: Allow the system flush procedure to stop automatically after completion. The procedure takes 15 minutes.

- 45 Connect the quick disconnect in the middle of the loop connector and perform umbilical prime. This procedure will not finish automatically,

so turn off the mains power switch to stop the umbilical prime process after a few seconds.



Figure 4-25: Umbilical Prime

- 46** Remove the nozzle bypass manifold and the 2-way manifold gasket.
- 47** Fit the front tubing manifold to the printhead valve module using M2 x 6 socket-head-cap screw. Make sure to fit the gasket under the manifold.

Perform Ink Stream Alignment and Viscosity Calibration

- 48 Remove the make-up cartridge from the make-up stall.
- 49 Turn the ink ON in the service mode (access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service).

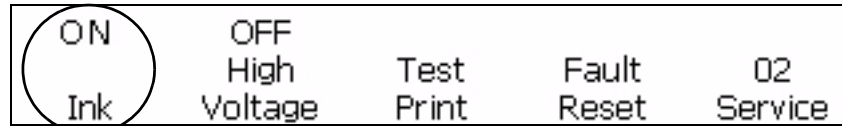


Figure 4-26: Ink On

You can see the ink stream toggling at the start, because of air bubbles that remain in the system. If the nozzle is clogged, refer to “How to Clear a Clogged Nozzle” on page 9-52.

- 50 Check the position of the ink stream into the gutter:
 - If the ink stream is aligned into the gutter, go to Step 51.
 - Else, do mechanical adjustments to the nozzle (refer to “Nozzle Adjustment” on page 4-37).

Note: Inspect the nozzle orifice and charge electrode to make sure that the stream travels through the center of the electrode and runs parallel to the walls of the electrode/charge tunnel.

If adjustments are at either end of the ranges, there can be a nozzle partial clog even though the ink stream is not severely misaligned.

While in some cases, an ink stream can be misaligned, you can adjust the ink stream to flow correctly into the gutter. But a misaligned ink stream leads to incorrect pressure setting as the printer needs more than normal pressure to get the correct velocity with a slightly clogged nozzle.

- 51 Make sure that the jet startup is complete. The jet running icon on the

main screen must be solid (must not flash)



- 52 Make sure that the printer has reached steady state. Steady state indicates: actual velocity = velocity set point, $\pm 0.1\text{m/second}$ (check these parameters on Diagnostics Screen One).

**Caution**

If the viscosity calibration is not done, the viscosity high/low warning will not disappear from the screen. This calibration step is the most critical step in installing the printer.

- 53** Perform viscosity calibration (refer to "Calibrate Viscosity" on page 4-41) and record *Target Pressure* (both the values). To record the pressure, access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > Diagnostic Screens > Diagnos Screen > Diagnos Screen.
- 54** Check the ink stream alignment and make the fine adjustments if necessary. The ink stream must be centered horizontally and vertically not more than 2 to 3 stream widths from the top of the gutter. The top of the gutter is the arc opposite the EHT plate (angled plate). Refer to Figure 4-44 on page 4-38 for more information.
- 55** Insert a fresh make-up fluid cartridge again.

Clean Stop and Clean Start the Printer

- 56** Put a piece of paper under the printhead (to capture splatter) and press the HEAD key to do a clean stop.

Note: Exit the service mode with the ink and high voltage "on", then use the HEAD key to stop the jet.

During shutdown if ink splatters inside the printhead, check the ink stream alignment again and make sure that the flush pump is fully primed.

Note: The flush pump is a controlled diaphragm inside the ink core module.

- 57** Put another piece of paper under the printhead and press the HEAD key to do a clean start.

During startup, perform clean start if the ink splatters inside the printhead, check the ink stream alignment again and make sure that the flush pump is fully primed.

Perform Final Checks

- 58** Make sure that auto modulation is enabled (04 Edit - System Set-up > 03 System - Status Screens > 03 Screen - Enables Screen).
- 59** Install the printhead cover and verify that the amber light is turned off:

If the amber light is turned on when with the printhead cover fitted, check the *Current Warnings* screen and perform the required troubleshooting. Access 04 Edit - Service Printer > 01 Service - Diagnostic Screens > 02 Diagnostic - Warnings Screen.

- 60 Take a sample print.
- 61 Close the ink compartment door.
- 62 Make sure that the electronics compartment and the ink compartment doors are closed and locked.



Caution

Do not perform Step 64 until the system is ready for production, as it affects the viscosity adjustments of the printer.

- 63 Backup printer settings using a USB flash drive. Select 05 Service - System Backup (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service > 04 Service > 05 Service).

Sequence	HV	Phase	Fault	04
Control	Adjust	Select	Reset	Service
↓				
System	System	System	System	05
Backup	Restore	Clone	Upgrade	Service

Figure 4-27: System Backup

- 64 If the production printing is necessary, measure the vertical distance between the umbilical exit point on the side of the cabinet and the bottom of the printhead when it is fitted to the conveyor. This is the *Printhead Elevation*. Enter the value (in centimeters) in the UI.

3 Mtrs	0	
Conduit	Print Head	01
Length	Elevation	Pressure

Figure 4-28: Printhead Elevation

- 65 Press the *Enter* key to backup the settings.
- 66 Validate machine parameters (refer to Table 4-4).

Machine Parameter	Typical Value (see Note above)
Head Temperature	35 °C
Drop Frequency	75 to 77 Hertz
Modulation Voltage	Variable (auto sets on jet start)
Printing Phase	Variable (auto controls)
Phasing Threshold	200 (auto controls after setup 170 - 250 nominally)
Phase Profile	Variable combinations of 1 and 0: For every 16 digits there should always be between 7 and 9 consecutive ones. The rest of the digits should be zeros. For example: • 1111111100000000 • 0001111111000000 • 0000011111111100 Note: The ones can also be wrapped around: 11111100000000111
Ink Temperature	Typically 10 °C - 35 °C, subject to the environmental temperature (Higher and lower temperatures may be seen when running at environmental extremes of -5 °C or 45 °C)
Electronics Temperature	Typically 15 °C to 50 °C This is subject to the environmental temperature.
Pump rpm	1200-1800
Makeup Vacuum	Variable Subject to the amount of make-up fluid available in the cartridge.
Heater Power	Variable Relative to the environmental temperature. Zero above 35 °C
Gutter Detect Status	In Gutter - When Ink Jet is running normally
Ink Core Level	Mid level
EHT Voltage	4 KV to 8 KV
% EHT Trip	85%

Table 4-4: Typical Diagnostics Screen Values

Machine Parameter	Typical Value (see Note above)
Traffic light	• Green - Printing (no warnings or errors) • Green and Yellow - Printing, but with errors • Yellow - Not printing, warnings or errors present • Red - Failure state

Table 4-4: Typical Diagnostics Screen Values (Continued)

Set the Password Levels

Consult the customer and find out which machine functions must be available for different personnel and which passwords they want to use. Set the passwords for levels A and B. You can also set the password levels for the menus. Use the *DailyPassword* application for the daily level C password.

Notes: The password levels of functions set at password Level 0, A or B can be changed at Password Level B. The password level of functions set at Password Level C cannot be changed at any password level. Contact the Videojet representative or access *Service > Videojet Password Generator* tab on www.videojet.com to obtain the password.



Figure 4-29: Password Menu



Caution

Machine functions that only trained personnel can access are set at password level C (master password). Contact the Videojet representative or access *Service > Videojet Password Generator* tab on www.videojet.com to obtain the password.

Set the Throw Distance

Set the throw distance from 5 mm to 15 mm. The optimum printhead distance for the 1610 Excel printer is 12 mm.

Install the Encoder

The printer has two options to adjust print pitch. The first is external encoding (shaft encoder). This is when the product is transported on a conveyor or transport. Make sure that the shaft encoder is directly related to the movement of the conveyor for the external encoder to work properly.

The second varying speed option is to use the auto encoder option. This option is used when a shaft encoder cannot be used since there is no way of tracking the production line movement. The auto encode option uses a very accurate detector to sense the leading and trail edge of each product and adjust the width of the code for every product.

When the product speed is constant, the printer uses internal encoding.

Internal Encoding

An internal clock sets the stroke rate to a constant pace. Refer to “Internal Encoding” on page B-1, for more information on internal encoding.

Do the following tasks to set encoding source to internal encoder:

- 1 Navigate to 01 Edit > 02 Edit > 03 Edit > 04 Edit - Print Set -Up > 01 Print > 02 Print > 03 Print > 04 Print - Select Encoder (see Figure 4-30 on page 4-25).
- 2 Set <Select Encoder> to <Int>.

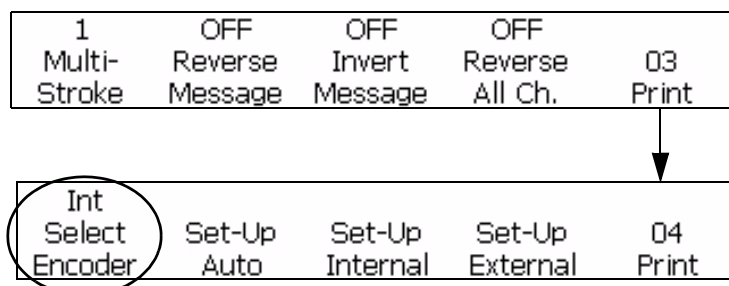


Figure 4-30: Internal Shaft Encoder

Note: A width of 1 will provide the fastest print that the printer can achieve in each font using the Internal Shaft Encoder option (refer to Figure 4-31). The message width is increased by approximately 3% for each increment.

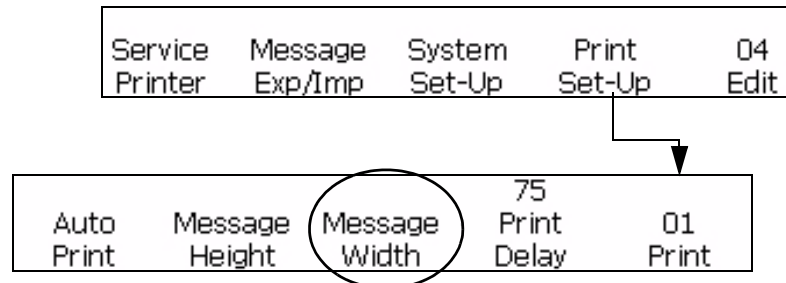


Figure 4-31: Messages Width

External Encoding

If the conveyor speed varies, an external shaft encoder must be fitted in order to maintain constant message width. If the product moves, the encoder turns and if the product stops, the encoder stops. (refer to “External Encoding” on page B-2 for more information).

Note: Make sure that the movement of the product is directly related to the movement of the conveyor.

Do the following tasks to install an external shaft encoder:

- 1 Turn off the printer.
- 2 Connect the shaft encoder cable to the shaft encoder connector. See the following pictures for connections:
 - Figure 4-32 on page 4-27 - shows the shaft encoder connector on the connector panel.
 - Figure 4-33 on page 4-27 - describes the shaft encoder connector socket pin layout.

Note: You can configure the printer to accept a two-phased encoder input (quadrature).

Note: Using quadrature shaft encoders to determine changes of direction disables the width function (that is, the width must be set to 1). If width control is required, an external divider box must be provided.

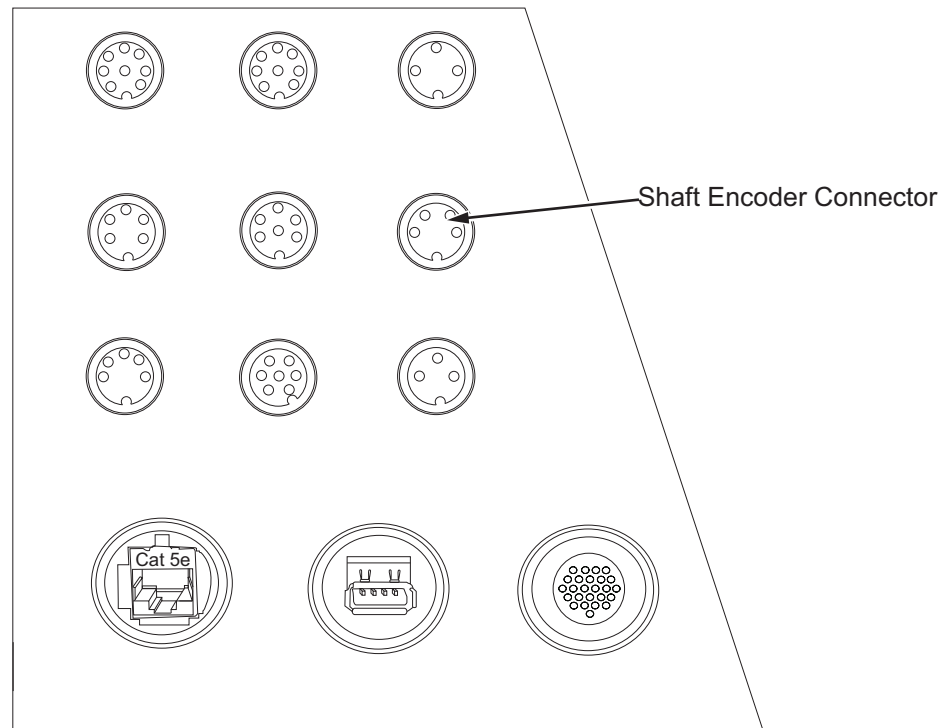
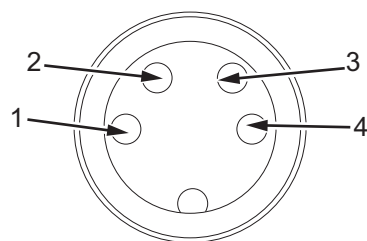


Figure 4-32: Connector Panel



- 1. Pin 1 = +15VDC Supply
- 2. Pin 2 = Signal A Input
- 3. Pin 3 = Signal B Input
- 4. Pin 4 = OV Common

Figure 4-33: Encoder - Socket Pin Layout

- 3 Two LEDs on the boards show the operating status of the shaft encoder inputs. Use the LEDs to confirm that a shaft encoder is connected correctly.
- 4 Set the shaft encoder source to External. Navigate to 01 Edit > 02 Edit > 03 Edit > 04 Edit - Print Set -Up > 01 Print > 02 Print > 03 Print > 04 Print - Select Encoder.

Reduced				
Select	Set-Up	Set-Up	Set-Up	04
Encoder	Auto	Internal	External	Print

Figure 4-34: Select Encoder

- 5 Make sure to set the physical parameters for external encoder.
- 6 Make sure the encoder movement is in direct relation to the movement of the product being printed on.
- 7 Calculate the distance (in inches/mm) the product moves per revolution of the shaft of the encoder.
- 8 Divide the PPR of the encoder by the calculated distance (inches/mm).

For example,

$1800 \text{ PPR} / 12 \text{ inches (calculated distance)} = 180 \text{ pulses per inch (PPI)}$

- 9 Since the printer is setup in the non-quad encoder mode, the printer uses both edges of the A and B channels to calculate the PPI.

Therefore, as per the example,

$\text{PPI of channel A and B} = 180 \times 4 = 720 \text{ PPI}$

- 10 To determine the correct width factor divide the PPI value by 60. This give you the width factor to divide the incoming pulses.

For example, $720 \text{ PPI} / 60 = 12$

- 11 Set the correct width setting. Navigate to *Print > Line Configuration > Message Configuration*. Press the right cursor key to change setting to *Divider/Strokes*. Scroll down to *Encoder Resolution* and enter the value 720 for the PPI option.
- 12 Go to *Message > Message Parameters > Width (Divider)*. Enter the value of 12 for the divider. This divides the $720 \text{ PPI} / 12 = 60$. This is the print pitch value the printer uses for printing.

Auto Encoding

When auto encoding is selected, the signal from the product detector is used to determine the product speed, and code the product at a set stroke rate. For more information, refer to “Auto Encoding” on page B-6 and the Operator Manual.

Do the following tasks to set encoding source to internal encoder:

- 13** Navigate to 01 Edit > 02 Edit > 03 Edit > 04 Edit - Print Set -Up > 01 Print > 02 Print > 03 Print > 04 Print - Select Encoder (see Figure 4-30 on page 4-25). Set <Select Encoder> to <Int>.

Set the Speed compensation

Speed compensation enables the printer to print a message in the same position on a product as the product speed changes. This feature can be useful if the conveyor speed is very high and the product is relatively small. The printer computes a variable stroke delay for each product. As the product speed is reduced, the variable stroke delay increases. The correct print distance must be entered. The nominal value is 11 mm and the range is 5 mm to 15 mm.

Note: When speed compensation is ON, the print delay is increased by 60 strokes (approximately one inch, or 25.4 mm). Therefore, one inch must be subtracted from the existing delay in order for the printed code to remain in the same position on the product.

Turn on *Speed Comp.* based on the method of encoding (for example, see Figure 4-35). Access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Print Set -Up > 01 Print > 02 Print > 03 Print > 04 Print - Set-Up External > 01 Ext-E.

OFF	Non-quadr	540	2	
Speed	Encoder	Encoder	Reduction	01
Comp.	Setup	Resolution	Factor	Ext-E

Figure 4-35: Speed Compensation Setting Example

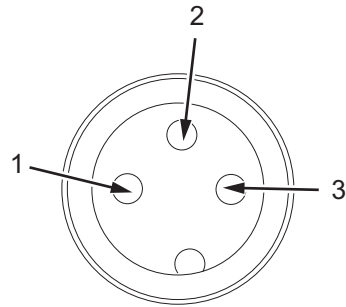
Enter the throw distance (access 01 Edit > 02 Edit > 03 Edit > 04 Edit - Print Set -Up > 01 Print > 02 Print > 03 Print > 04 Print > 05 Print > 06 Print - Throw Distance)

1	ON	OFF		
Throw	Reverse	5x7 SL	Special	06
Distance	Barcode	Tower	Print Mode	Print

Figure 4-36: Throw Distance

Install the Product Detector

Figure 4-1 on page 4-3 shows a photocell (item 4) connected through a cable (item 5) to print trigger 1 connector on the connector panel.



- 1. +15 VDC Supply to Sensor
- 2. Sensor Output
- 3. 0 VDC Common

Figure 4-37: Print Trigger 1 Connector Pin Diagram

Note: Print Trigger 2 is for reverse print and is not a product detector trigger, but a change in state reverses the direction of print. It has an NPN and PNP connection. The Print Trigger 2 option is available with the optional PCB3 connector.

Do the following tasks to install a product detector:

- 1 The photocells may be either NPN or PNP devices. The default signal input is NPN. Set Jumper JB1 on the CSB to match the device type (see Figure 4-38).

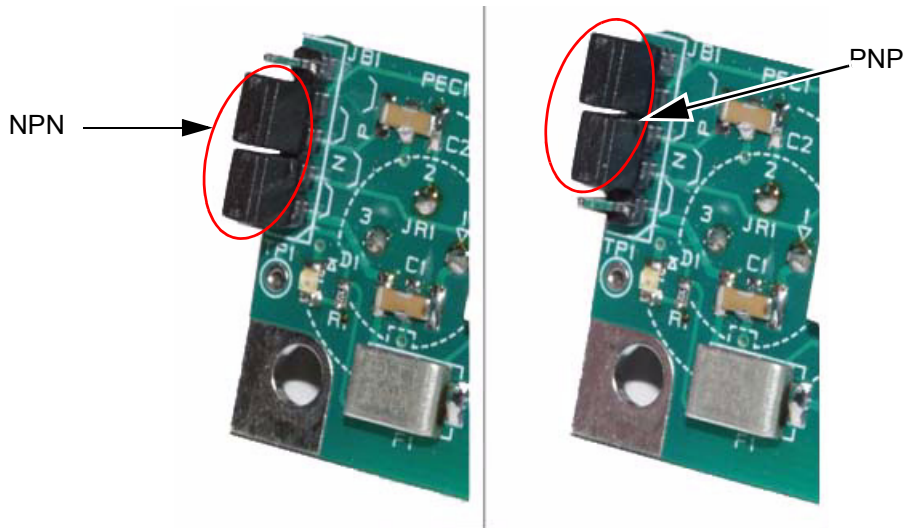


Figure 4-38: Product Detector Configuration

Table 4-5 lists the settings for the type of product detector.

Print trigger	Device type	Jumper 1	Pins	Jumper 2	Pins
1	NPN	A-B	1-2	C-D	3-4
1	PNP	B-C	2-3	D-E	4-5

Table 4-5: Jumper Settings

- 2 Turn on the printer.
- 3 Select the product detector. Access <07 Print - Product Detector> (01 Edit > 02 Edit > 03 Edit > 04 Edit - Printer Set -Up > 01 Print > 02 Print > 03 Print > 04 Print > 05 Print > 06 Print > 07 Print).

Set the relevant photocell level(s) to *Active high* or *Active low* based on the device type.

- 4 Access 07 Print - Active Level (01 Edit > 02 Edit > 03 Edit > 04 Edit - Printer Set -Up > 01 Print > 02 Print > 03 Print > 04 Print > 05 Print > 06 Print > 07 Print).

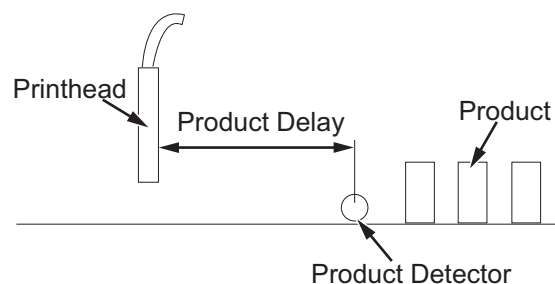


Figure 4-39: Product Delay

Install the Stack light

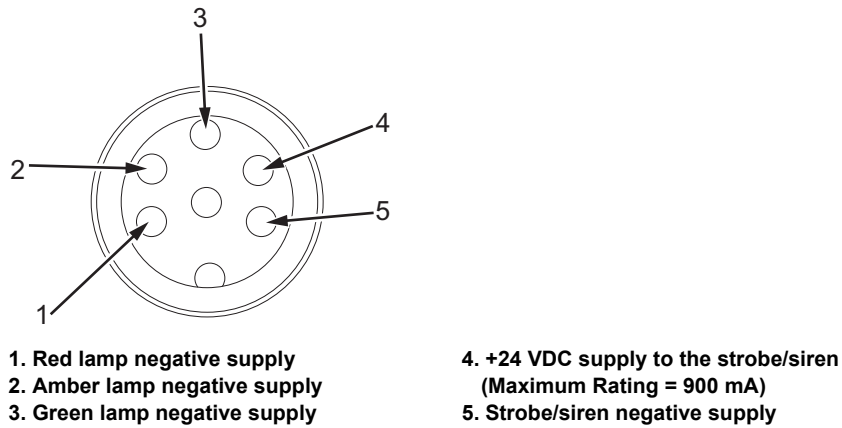
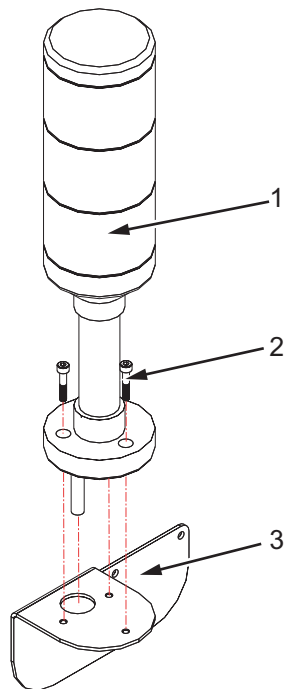


Figure 4-40: Status Output Connector Pin Diagram

Do the following tasks to install a stack light:

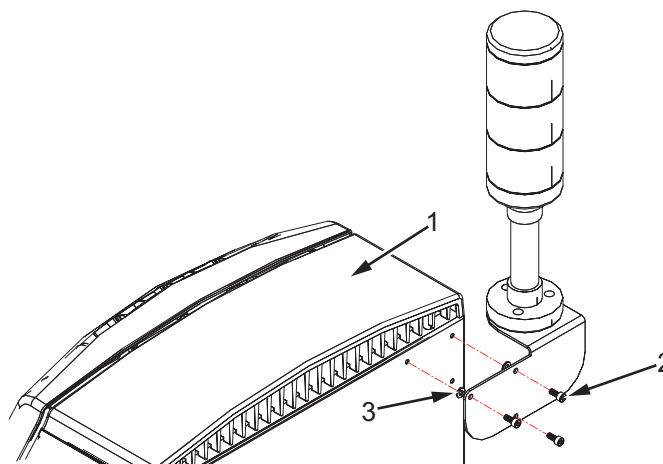
- 1 Fit the stack light (item 1, Figure 4-41 on page 4-35) to the stack light mounting bracket (item 3) using three M4x10 socket-head cap screws (item 2).
- 2 Fit the stack light mounting bracket to the printer cabinet (item 1, Figure 4-42 on page 4-35), using three M4x10 socket-head cap screws (item 2) and three M4 plain nylon washers (item 3).

Note: The position of the M4 plain nylon washers is important to maintain the IP rating.



- 1. Stack light
- 2. M4x10 Socket-head cap Screws (x3)
- 3. Stack light Mounting Bracket

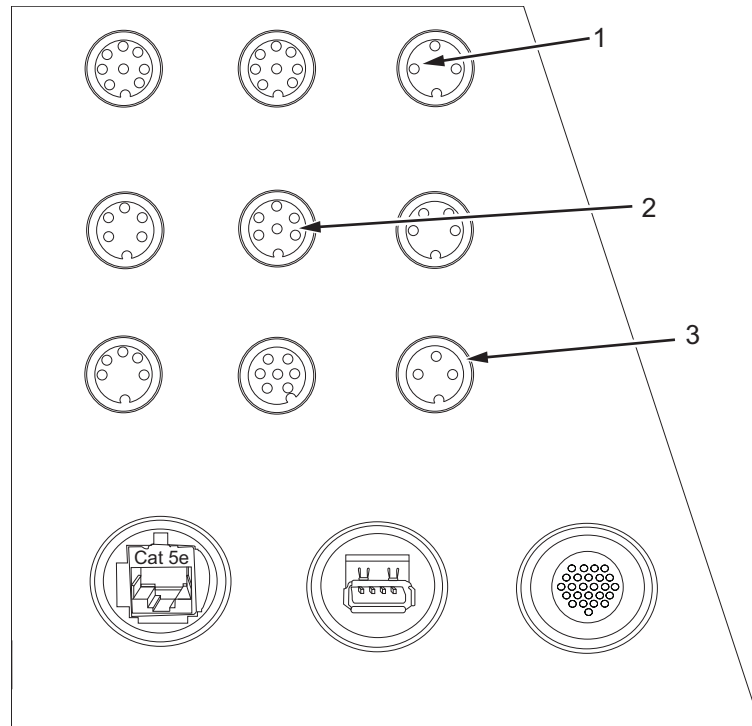
Figure 4-41: Stack light



- 1. Printer Cabinet
- 2. M4 x 10 Socket-head cap Screws (x3)
- 3. M4 Plain Nylon Washers (x3)

Figure 4-42: Stack light Installation

- 3 Insert the stack light connector into the status output connector on the connector panel (see Figure 4-43 on page 4-36).



- 1. Reverse Print Input
- 2. Status Output Connector
- 3. Product Detect Input (PEC1)

Figure 4-43: Connector Panel

The installation of the stack light is complete.

Nozzle Adjustment

Two adjustments are required; nozzle vertical adjustment and nozzle horizontal adjustment.

Note: Make sure that the adjustments are not at either end of the adjustment ranges. If adjustments are at either end of the ranges, there can be a partial clog in the nozzle even though the ink stream is not severely misaligned (to remove the blockage in the nozzle, refer to "How to Clear a Clogged Nozzle" on page 9-52).



Warning

The ink and make-up fluid are irritating to the eyes and respiratory system. Remember the following guidelines to prevent personal injury when handling these substances:

Always wear protective clothing and rubber gloves.

Always wear goggles with side-shields or a face mask. It is also advisable to wear safety glasses when carrying out maintenance.

Apply barrier hand cream before handling ink.

If ink or make-up fluid contaminates the skin, wash immediately with soap water. DO NOT use washdown or solvent to clean ink stains from the skin.

Do the following tasks to align the ink stream:

- 1 Loosen the printhead screw and remove the cover from the printhead.
- 2 Secure the printhead vertically in a suitable stand with the nozzle pointing downwards (see Figure 4-44 on page 4-38).
- 3 Put a suitable container beneath the printhead to collect the ink.
- 4 The *Gutter Fault Shutdown* is automatically disabled upon entering the *Service* mode (Frame <Service 01>) and automatically enabled upon leaving the *Service* mode.

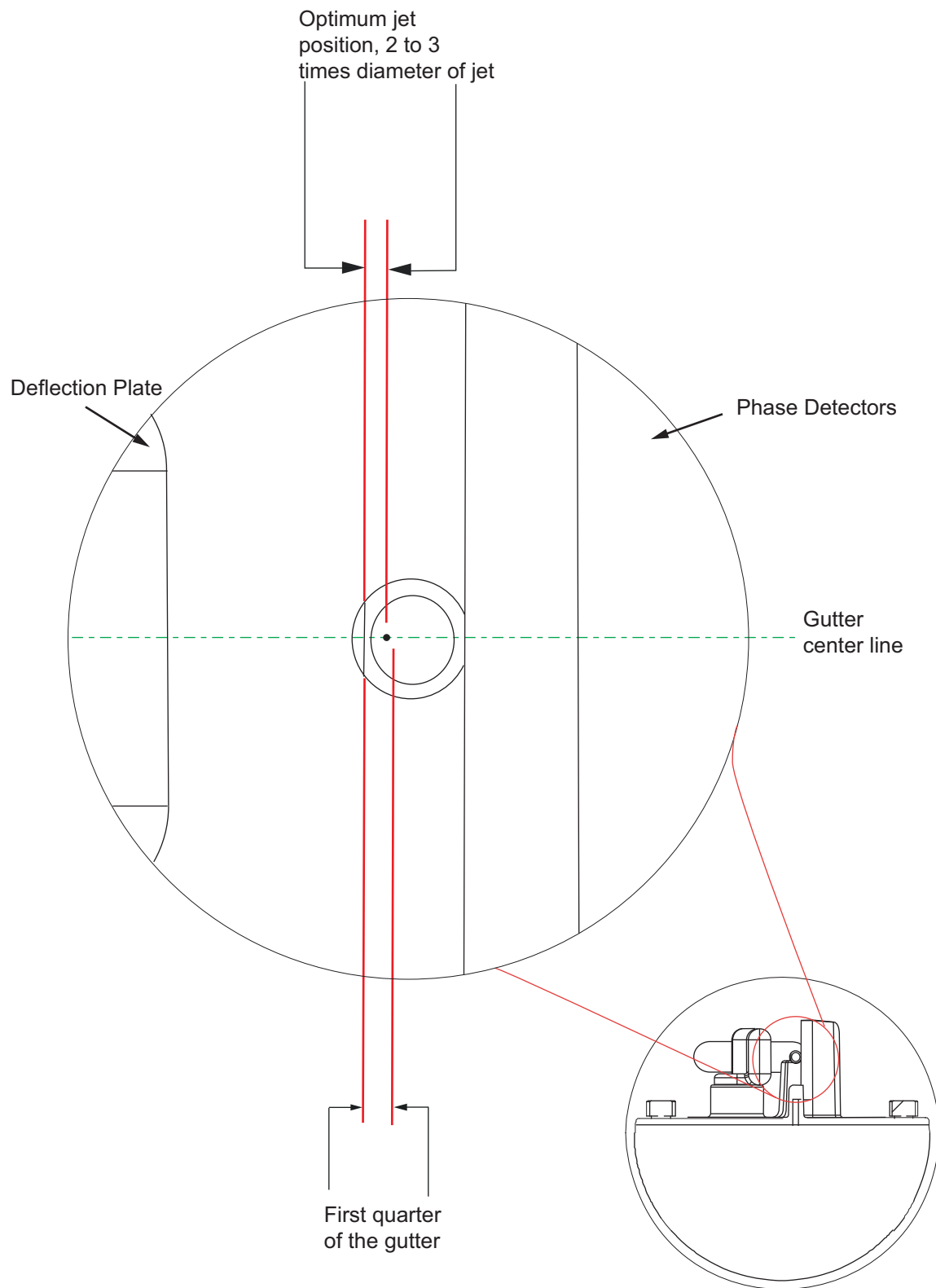


Figure 4-44: Ink Stream Alignment

- 5 Perform a Quick Start. When the ink jet has started, check that the ink jet is in the correct position in the gutter (see Figure 4-44 on page 4-38).

Note: You must perform a quick start rather than a clean start when you are aligning the printhead during the commissioning process. However, if you are aligning the printhead of a printer that has already been in operation for some time, you may perform either a quick start or a clean start at this point.



Caution

EQUIPMENT DAMAGE. Never attempt to bend the gutter. Its position is fixed.

- 6 Adjust the ink jet position, if necessary using the horizontal adjustment screws (item 2, Figure 4-45) and vertical adjustment screw (item 1).

When the adjustment has been made, make sure that the horizontal adjustment screws are tight and the ink jet position is correct.

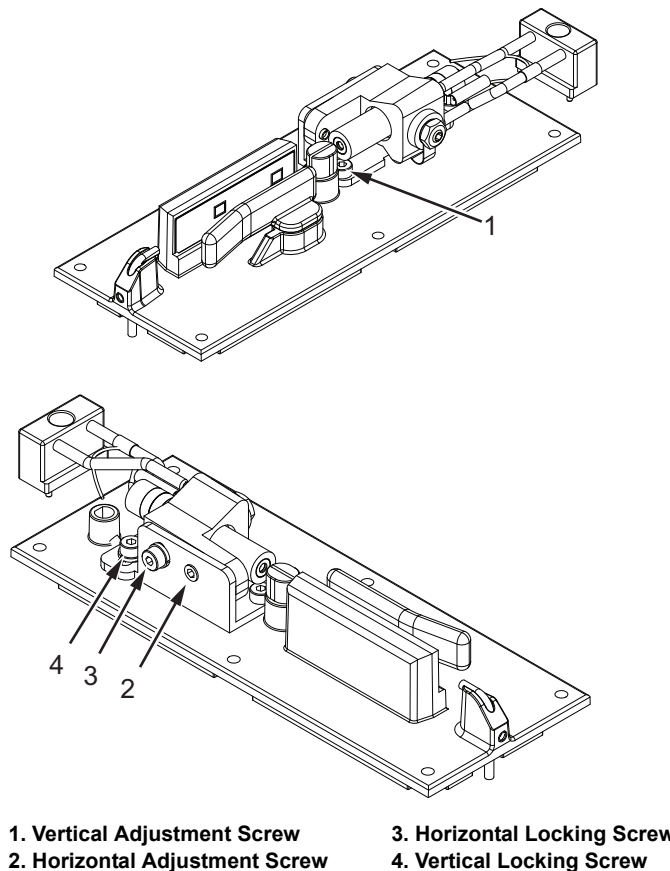


Figure 4-45: Printhead Adjustment Screw Location

Perform Calibration and Testing

The system calibration and test procedures must be performed when printhead engine module, EHT supply, CSB, or umbilical is changed.

Calibrate EHT

Do the following tasks to calibrate the EHT:

Note: Please make sure printhead is clean and dry.

- 1 Access *Calibrate HV* (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Auto Prime > 01 Prime > 02 Prime)

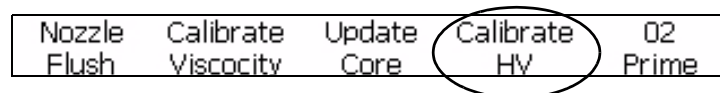


Figure 4-46: 02 Prime

- 2 Press the *F4* key to select Calibrate HV.
- 3 Calibration sweep occurs. Refer to Figure 4-47.

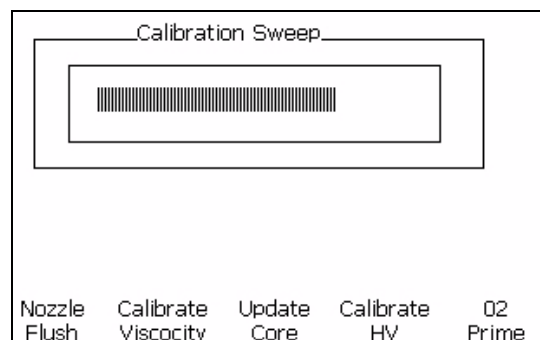


Figure 4-47: Calibration Sweep

Calibrate Viscosity

Do the following tasks to perform viscosity calibration:

Note: Perform this procedure every time the following are replaced

- Ink core module
- Printhead engine
- CSB

Note: Perform the viscosity calibration if the viscosity is correct. The viscosity is correct if target pressure and the temperature-compensated target pressure were equal before the components were replaced.

- 1 Keep the printhead at the same height as the umbilical during installation, this height is later adjusted when moved to the production line.

Set the printhead elevation value to zero (see Figure 4-48 (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Ink Pressure > 01 Pressure)).

3 Mtrs Conduit Length	0 Print Head Elevation	01 Pressure
-----------------------------	------------------------------	----------------

Figure 4-48: Printhead Elevation

- 2 Turn the knob and open the ink compartment door (see Figure 4-49).



Figure 4-49: Unlock Ink Compartment Door

- 3 Remove the make-up fluid cartridge (see Figure 4-50).

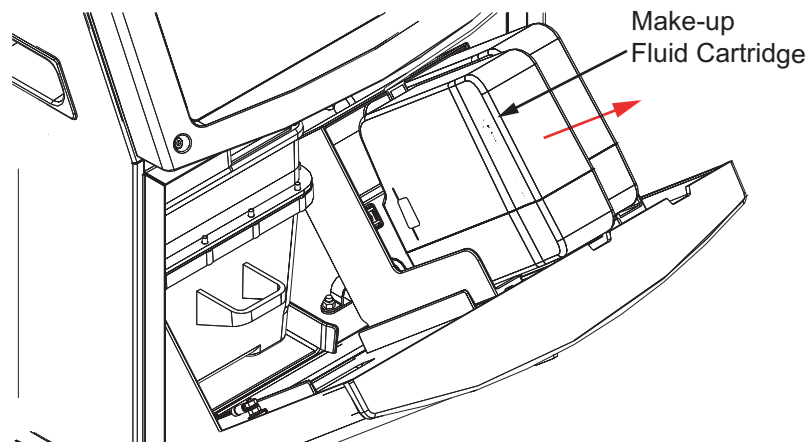


Figure 4-50: Cartridge Removal

- 4 Perform a Quick Start. See Figure 4-51 (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service).

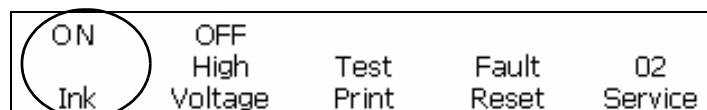


Figure 4-51: On Ink

- 5 Make sure that the jet startup is complete. The jet running icon on the home screen should be solid (not blinking) .

- 6 Make sure that the printer has reached steady state. Steady state means: Actual Velocity = Velocity Set Point + or -0.1 m/s
- 7 Perform viscosity calibration. Follow the prompts provided by the printer, assuming that the ink is known perfect ink (see Figure 4-52 (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Auto Prime > 01 Prime > 02 Prime)).

Note: Perfect ink is the ink that is pulled directly from an ink cartridge known to be within a specific viscosity range.

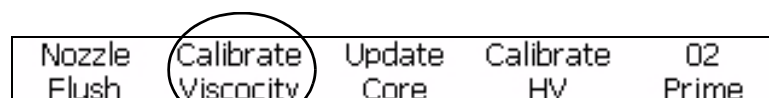


Figure 4-52: Viscosity Calibration

- 8 Put the make-up cartridge into make-up cartridge slot.

- 9** Enter the correct printhead elevation in the UI. Refer to Figure 4-48 on page 4-41.
- 10** Put the printhead into the printhead bracket on the conveyor.

Printer Operation

5

Introduction

This chapter describes the procedures you can perform at level C. For information on other tasks, refer to the Operator Manual.

Reset Run Hours

If the *Service* icon appears, the time until the next service is due must be entered to remove it.



Navigate to Frame <01 Run Time> (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service - Printer Log> 01 Log - Run Times> 01 Run Time).

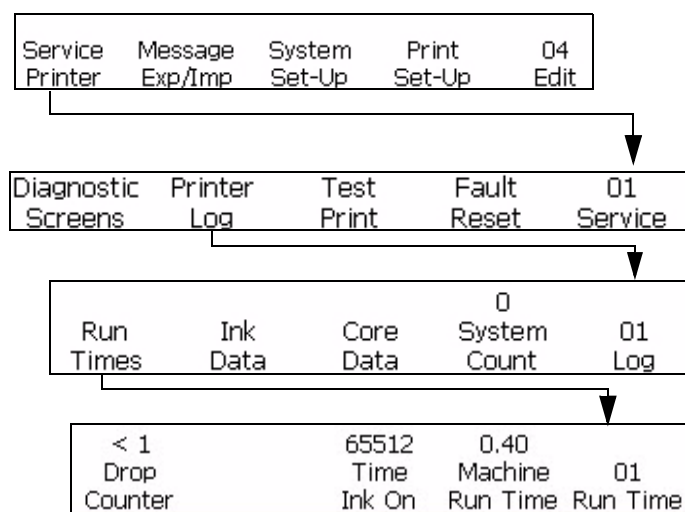


Figure 5-1: Data Logging Menu

Perform System Backup

Do the following tasks to perform a complete backup of all programmable printer files, including job and printer configuration information:

- 1 Press the HEAD key to stop the ink jet.
- 2 Insert a USB flash drive into the external USB port of the printer.
- 3 Select System Backup at <05 Service> (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service > 04 Service > 05 Service).

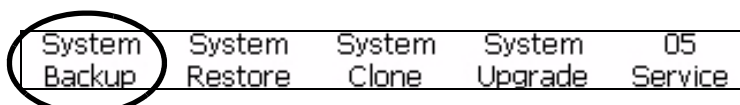


Figure 5-2: System Backup

- 4 Follow the printer prompts and complete the backup.

Perform Full System Restore

Do the following tasks to recover previously backed-up information from the USB flash drive:

- 1 Press the HEAD key to stop the ink jet.
- 2 Insert a USB flash drive into the external USB port of the printer.
- 3 Select System Restore at<05 Service> (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service > 04 Service > 05 Service). The *Overwrite all* option appears.

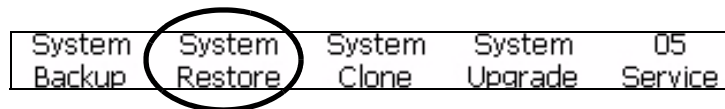


Figure 5-3: System Restore

- 4 Press Y (Figure 5-4), and system restore is completed.

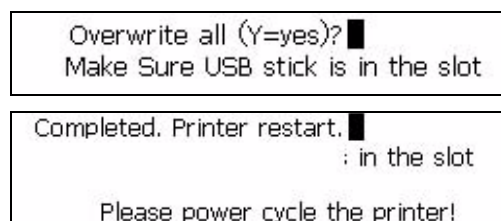


Figure 5-4: System Message

Perform Umbilical Prime

You should perform umbilical prime in the following conditions:

- To prevent debris from blocking the nozzle if the printer has not been used for a long time
- If contamination of the umbilical is suspected
- If a new umbilical has been fitted
- If the ink color or type is to be changed

Note: If you change the type of ink then, you must change the ink core module.

Refer to “Perform System Flush Purge and Umbilical Purge” on page 4-16 for information on how to perform umbilical prime.

Introduction

Refer to Videojet 1610 Excel Operator Manual for information on how to navigate in the UI, create the messages, edit the messages, save the messages, and create the user fields.

Frames and Menu Description

For more information, refer to the User Interface chapter in the operator manual.

01 Edit

01 Edit Menus	Description
LEVEL C LogIn/Log Out Clear Message View Print Print Message 01 Edit	
LogIn/LogOut	Allows the user to enter password to login and logout of the UI
Clear Message	Clears the message from the display
View Print	Displays the last message printed
Print Message	Prints the message loaded

Table 6-1: 01 Edit Menu Description

02 Edit

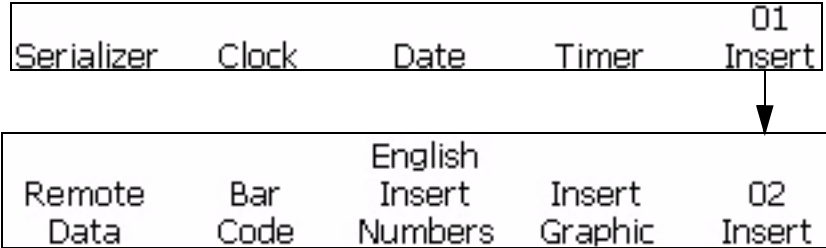
02 Edit Menus	Description
	
Char Size	Can set the character size to single or double
Font Setup	Can set the print matrices and font type (normal, narrow, or custom). Raster substitution ON/OFF: This allows the printer to select the best raster for the set print speed. Select raster: This allows the operator to select a specific raster for printing. The selected raster does not change if the printer speed changes.
Char Set-Up	Can create characters that are reversed, inverted, make the character bolder within a message and character spacing of an individual character within a message
Inserts	Contains variable information that can be placed into a message
	
Serializer	It is an alphanumeric value which is set in a message and the printer automatically starts from this value and repeats from the set count value.
Clock	Can insert the clock information like the hour, Minute, HR/WK and WK/YR, and alpha hour.
Date	Can insert date information like the current dates and the expiry dates.
Timer	Can insert and set the timer type, format in which it must appear, update interval.
Remote Data	It is used to download fixed or variable information from a host personal computer (PC) into the message
Bar Code	Inserts bar code into a message
Insert Numbers	Can change numeral inserts from English to Arabic numbers.

Table 6-2: 02 Edit Menu Description

02 Edit Menus	Description
Insert Graphic	Inserts graphic which is stored in the system

Table 6-2: 02 Edit Menu Description

03 Edit

03 Edit Menus	Description					
<table><tr><td>Store Message</td><td>Recall Message</td><td>View Store</td><td>Print Message</td><td>03 Edit</td></tr></table>		Store Message	Recall Message	View Store	Print Message	03 Edit
Store Message	Recall Message	View Store	Print Message	03 Edit		
Store Message	Stores the message entered					
Recall Message	Recalls the message stored					
View Store	Displays the stored message					
Print Message	Prints the message					

Table 6-3: 03 Edit Menu Description

04 Edit

04 Edit Menus	Description					
<table><tr><td>Service Printer</td><td>Message Exp/Imp</td><td>System Set-Up</td><td>Print Set-Up</td><td>04 Edit</td></tr></table>		Service Printer	Message Exp/Imp	System Set-Up	Print Set-Up	04 Edit
Service Printer	Message Exp/Imp	System Set-Up	Print Set-Up	04 Edit		
Service Printer	Provides information on the status of the printer and enables the service technician to perform maintenance and troubleshooting operations.					
Message Exp/Imp	Enables the transfer of message files to and from the USB Stick.					
System Set-Up	Enables the service technician to set up time variables, create graphics, display language and so on					
Print Set-Up	Enables the service technician to set the printing parameters like message height, width, type of encoding, throw distance and so on.					

Table 6-4: 04 Edit Menu Description

04 Edit Menus	Description
Service Printer	
Diagnostic Screens	Printer Log
Test Print	Fault Reset
01 Service	
ON Ink	OFF High Voltage
Test Print	Fault Reset
02 Service	
Auto Prime	Ink Pressure
Nozzle Setting	Fault Reset
03 Service	
Sequence Control	HV Adjust
Phase Select	Fault Reset
04 Service	
System Backup	System Restore
System Clone	System Upgrade
05 Service	
75	
HARDWARE TEST	USB Data Logging
Gutter Pump Spd.	Act Debug Logging
06 Service	
Line Polarity	Valve Test
07 Service	
Diagnostic Screens	Access the various diagnostic screens
Printer Log	Provides ink data, core data and run time data
Test Print	Prints a test message
Fault Reset	Resets a fault message
Ink	Enables Quick start and quick stop
High Voltage	Can turn off or on the high voltage option
Auto Prime	Enables to prime the core, empty core, flush prime and umbilical prime
Nozzle Setting	Provides the nozzle setting data like nozzle type, fluid type. frequency divider and drop frequency

Table 6-4: 04 Edit Menu Description

04 Edit Menus	Description
Sequence Control	Enables to set, run and edit sequence of operation for valve test, nozzle flush and so on.
HV Adjust	Enables to adjust the high voltage value.
Phase Select	Enables to set the manual phase, enable or disable phase test and phase charge voltage
System Backup	Saves the parameters set during the calibration process to the system memory, overwriting any previously saved parameters.
System Restore	Reads the previously saved parameters and settings are from memory, undoing any recent changes.
System Clone	Makes a copy of the entire system onto the USB stick.
System Upgrade	Updates the software with the latest additions
System Set-Up <pre> graph TD S1["12:37 Set Time 03/12/08 Set Date 85 Set HR/WK 11 Set WK/YR 01 System"] --> S2["Serial Comm Remote Protocols Network Settings Build Graphic 02 System"] S2 --> S3["Shift Set-Up 00:00 Set DayRoll Daylight Settings Status Screens 03 System"] S3 --> S4["Locale Setup Password Set-up English Display Language System Info 04 System"] </pre>	
Set Time	Sets system time in HHMM.
Set Date	Sets system date in MM/DD/YY.
Set HR/WK	Sets hour of the week.
Set WK/YR	Sets week of the year.
Serial Comm	Sets up the RS-232 and RS-485 baud rates that are configured for the required baud rate.

Table 6-4: 04 Edit Menu Description

04 Edit Menus	Description
Network Settings	Provides network settings like Use DHCP, IP Address, Subnet Mask, Default Gateway
Build Graphic	Enables to build and edit graphic of different sizes
Shift Set-Up	Enables to set the shift information
Set DayRoll	Allows you to define the time the day rolls over to the new day, other than the standard time (midnight).
Daylight Settings	Enables to set the daylight settings
Status Screens	Provides the status of various screens like diagnostic screens, alarm screen etc.
Locale Setup	Provides data about Editor Font Group, keyboard languages, display units and alternate zero
Password Set-up	Enables setting up of passwords for levels A and B. You can turn ON/OFF the password option.
Display Language	Enables you to select the display language
System Info	Provides system information

Table 6-4: 04 Edit Menu Description

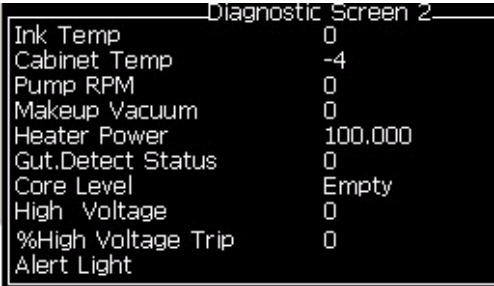
Diagnostic Screens

Diagnostics Screen One Menu	Commands	Function																				
Diagnostic Screen 1 <table><tr><td>Target Pressure</td><td>0.000 (0.000)</td></tr><tr><td>Actual Pressure</td><td>0.000</td></tr><tr><td>Velocity Set Pt.</td><td>20.000</td></tr><tr><td>Actual Velocity</td><td>0.000</td></tr><tr><td>Head Temp</td><td>0.000 (22.900)</td></tr><tr><td>Drop Frequency</td><td>76.805</td></tr><tr><td>Nozzle Drive Voltage</td><td>0.000 (0)</td></tr><tr><td>Printing Phase</td><td>0</td></tr><tr><td>Phase Threshold</td><td>200 (200)</td></tr><tr><td>Phase Profile</td><td>0000000000000000</td></tr></table>	Target Pressure	0.000 (0.000)	Actual Pressure	0.000	Velocity Set Pt.	20.000	Actual Velocity	0.000	Head Temp	0.000 (22.900)	Drop Frequency	76.805	Nozzle Drive Voltage	0.000 (0)	Printing Phase	0	Phase Threshold	200 (200)	Phase Profile	0000000000000000	Target Pressure	Empirically and theoretically determined pressures required to match the actual velocity to the set point.
Target Pressure	0.000 (0.000)																					
Actual Pressure	0.000																					
Velocity Set Pt.	20.000																					
Actual Velocity	0.000																					
Head Temp	0.000 (22.900)																					
Drop Frequency	76.805																					
Nozzle Drive Voltage	0.000 (0)																					
Printing Phase	0																					
Phase Threshold	200 (200)																					
Phase Profile	0000000000000000																					

Table 6-5: Diagnostics Screen One Menu and Commands

Diagnostics Screen One Menu	Commands	Function
	Actual Pressure	Pressure measured at the pressure transducer in the Core.
	Velocity Set Point	Required drop velocity.
	Actual Velocity	Drop speed measured in the printhead.
	Head Temperature	Temperature measured by the temperature sensor in the printhead.
	Drop Frequency	Current nozzle frequency
	Nozzle Drive Voltage	
	Printing Phase	Current phase selected for printing.
	Phase Threshold	Threshold value required to optimize the current phase profile (obtain eight 1's and eight 0's)
	Phase Profile	Digital representation of the results of the current phasing test

Table 6-5: Diagnostics Screen One Menu and Commands

Diagnostics Screen Two Menu	Commands	Function
 <pre> Diagnostic Screen 2 Ink Temp 0 Cabinet Temp -4 Pump RPM 0 Makeup Vacuum 0 Heater Power 100.000 Gut.Detect Status 0 Core Level Empty High Voltage 0 %High Voltage Trip 0 Alert Light </pre>	Ink Temperature	Temperature measured by the temperature sensor in the Core.
	Cabinet Temperature	
	Pump RPM	Measured pump RPM
	Makeup Vacuum	
	Heater Power	Percentage of current heater power with respect to the maximum allowable.
	Gutter Detect Status	Current state of gutter detect circuitry in the printhead and on the CSB.
	Ink Core level	Shows the current level of fluid in the ink core module
	High Voltage	Current EHT voltage
	% High Trip	Percentage of measured EHT leakage current with respect to the maximum allowable value.
	Alert Light	

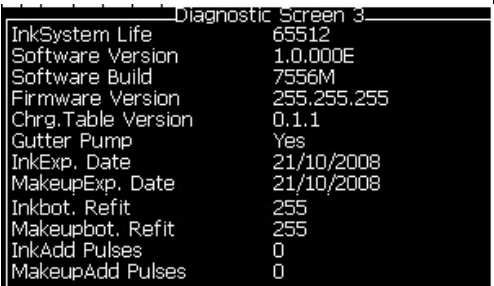
Diagnostics Screen Three Menu	Menu Option	Function
 <pre> Diagnostic Screen 3 InkSystem Life 65512 Software Version 1.0.000E Software Build 7556M Firmware Version 255.255.255 Chrg.Table Version 0.1.1 Gutter Pump Yes InkExp. Date 21/10/2008 MakeupExp. Date 21/10/2008 Inkbot. Refit 255 Makeupbot. Refit 255 InkAdd Pulses 0 MakeupAdd Pulses 0 </pre>	InkSystem Life	
	Software Version	
	Software Build	
	Firmware Version	
	Chrg. Table Version	
	Gutter Pump	
	InkExp. Date	
	MakeupExp. Date	
	Inkbot. Refit	
	Ink Add Pulses	
	MakeupAdd Pulses	

Table 6-6: Diagnostics Screen Three Menu and Commands

Replacement Instructions

When you order a spare part kit, the replacement instructions of the respective spare part are provided along with the kit. For more information, contact Videojet Technologies Inc. Refer to Chapter , “Support and Training” for the contact information.

The replacement instructions are available for the parts included in the following table.

Spare Part
Control System Board
Power Supply Unit
Liquid Crystal Display (LCD) or the Front Panel Interface Board (FIB)
Keyboard/Electronics Compartment Door
Ink Core Module
Ink Pump
Printhead Engine Assembly
Printhead Valve Module Assembly
Umbilical Assembly
Printer Interface Board (PIB)
Electronics Compartment Fan
Septum Assembly
Gutter Pump
Power Switch
Ethernet Connector
Positive Air Kit
Ink Door Assembly
Ink System Fan

Table 7-1: Available Instructions

Spare Part
EHT Module
USB Connector
Plug and Power Cable
CSB Lithium Battery
PCB 1, 2 and 3
Pressure Vacuum Test Tool
Printhead Bonding
Encoder and Adaptor Cable
Print Ready and Warning Output Cable

Table 7-1: Available Instructions

Printhead Bonding during Printing

Do the following tasks to establish bonding for the printhead and receptacle:

- 1 Make sure that the printhead cover (item 6, Figure 7-1 on page 7-3) is attached.

Note: The printhead is ground through the printhead screw (item 3) and umbilical (item 1). If there is no screw, you must provide the printhead with the path to the electrical ground.

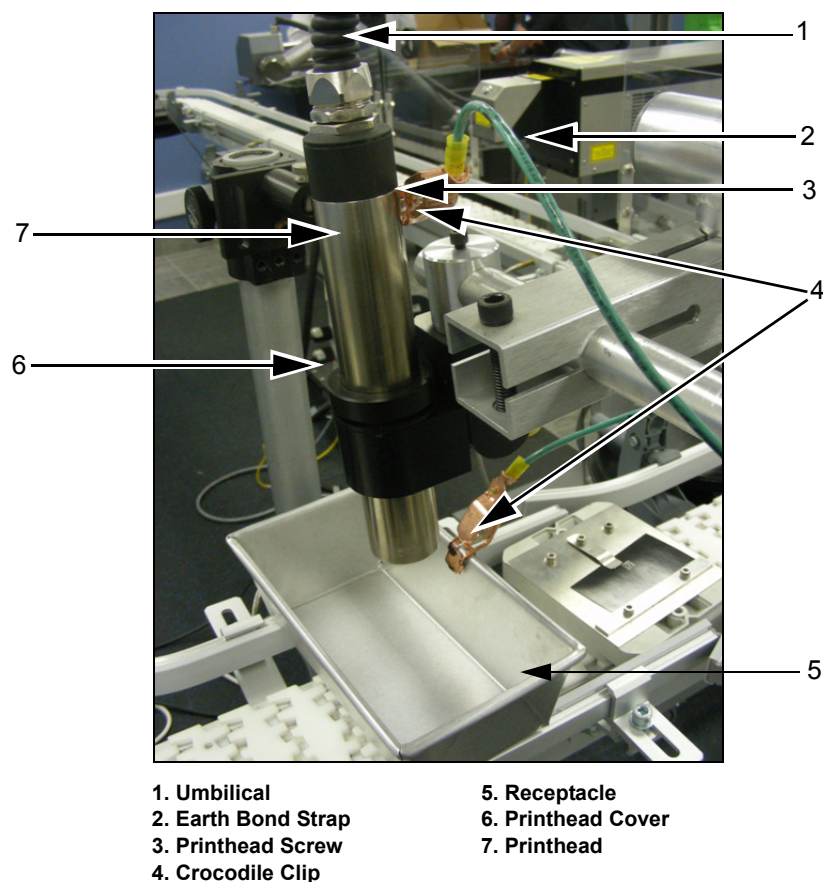


Figure 7-1. Printhead and Receptacle

- 2 Use a metal or other conducting receptacle (item 5, Figure 7-1) to collect the printhead fluid.
- 3 Connect one end of the earth bond strap (item 2) using crocodile clip (item 4) to the receptacle. Make sure that the connection is rigid.
- 4 Connect the other end of the earth bond strap to the printhead cover screw. Make sure that the connection is rigid.
- 5 Check the path from the electrical ground to the main printer cabinet using a multi-meter or a similar device to make sure that the earth loop is closed.
- 6 After the checks are completed, continue the printing operation.

Bonding during Servicing



Warning

PERSONAL INJURY. This operation must be carried out by a trained service technician only.

- 1 Remove the printhead cover (Figure 7-1 on page 7-3).
- 2 Locate the printhead screw into the printhead (Figure 7-2) and make sure that the screw is in contact with the earth wire in the umbilical.

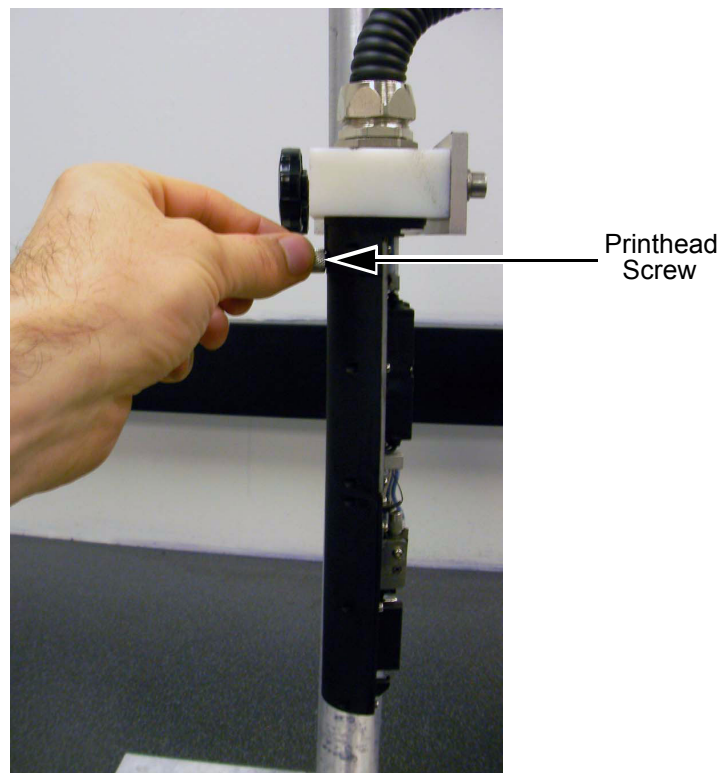


Figure 7-2. Printhead Screw

- 3 Follow Step 2 to Step 5 under “Printhead Bonding during Printing” on page 7-2.
- 4 Perform the required maintenance operation. Refer to the Chapter 8, “Maintenance” for more information on maintenance procedures.
- 5 Remove the printhead screw.
- 6 Refit the printhead cover.

The printhead bonding instructions is complete.

The preventative maintenance schedules mentioned in this chapter must be carried out by a trained and authorized personnel.

Actual intervals depend on machine running hours. The figures below are based on eight hours usage per day. If the actual usage is higher, the intervals should be reduced.

Task	Frequency
Clean the Printhead	As required.
Replace the Core Module	12000 hours (for 1610 Excel)
Replace the Ink pump	24000 hours
Replace the Fan Filter	2,000 hours
Replace the Floor Filter	Must be replaced with the ink core module
Replace the Air Dryer Filter (if fitted)	2,000 hours

Table 8-1: Preventative Maintenance Schedule



Warning

It is possible that in a fault condition the heater can reach 70 °C. Do not touch the plate on which heater is mounted. The failure to follow this warning can cause personal injury.

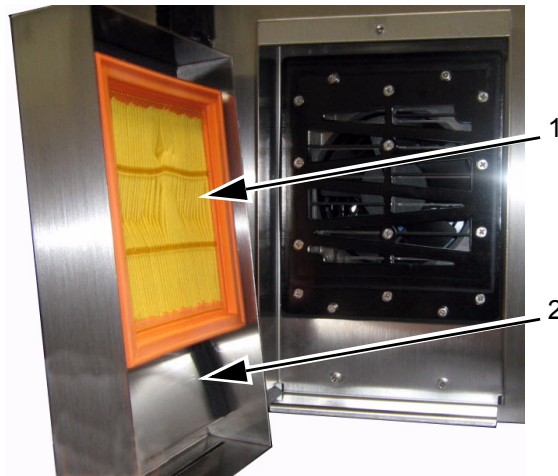
Replacement of Ink System Fan Filter for IP65

How to Remove the Old Ink System Fan Filter for IP65

Do the following tasks to remove the old ink system fan filter:

- 1 Turn the knob and open the ink system fan filter cover (item 2, Figure 8-1).

-
- 2 Remove the fan filter element (item 1) from the fan filter cover.



1. Fan Filter Element
2. Fan Filter Cover

Figure 8-1. Ink System Fan Filter - IP65

-
-
- 3 Discard the fan filter element according to the local regulations.

The removal of ink system fan filter for IP65 is complete.

How to Install the New Ink System Fan Filter

Do the following tasks to install the new ink system fan filter:

- 1 Insert the new ink system fan filter element inside the fan filter cover.
- 2 Close the ink system fan filter cover carefully.

The installation of ink system fan filter for IP65 is complete.

Replacement of Floor Filter for IP65

How to Remove the Old Floor Filter IP65

Do the following tasks to remove the old floor filter:

- 1 Loosen the four M4 x 16 cap-head screws (item 1, Figure 8-2 on page 8-3) and remove the screws.
- 2 Detach the ink core support channel (item 2).
- 3 Remove the filter element (item 3) from the drip tray (item 4).

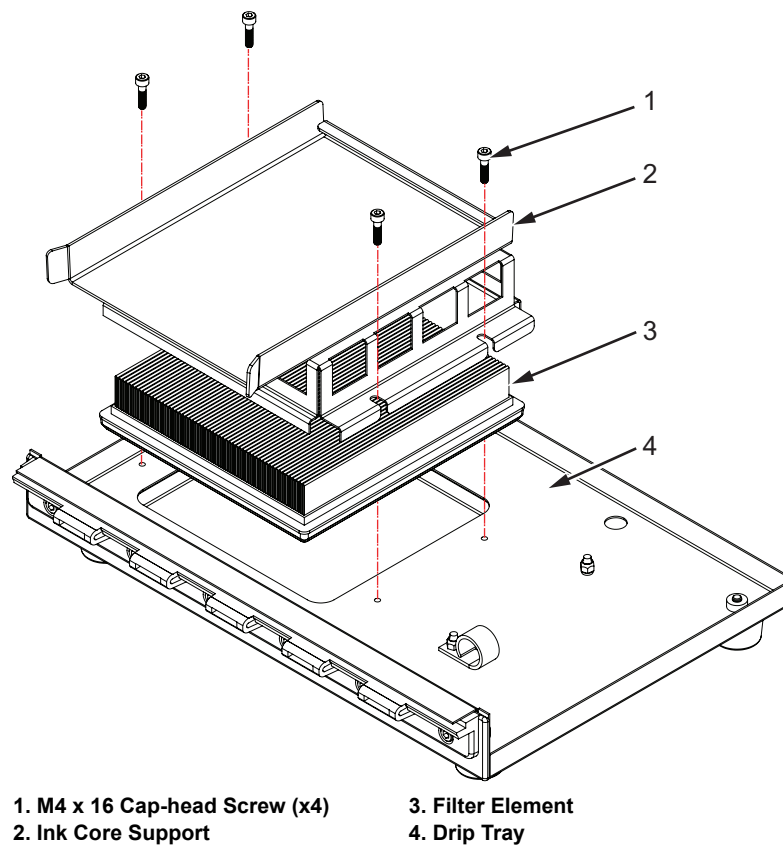


Figure 8-2. Floor Filter - IP65

- 4 Discard the old floor filter element according to the local regulation.
The removal of old floor filter for IP65 is complete.

How to Install the New Floor Filter IP65

Do the following tasks to install the new floor filter:

- 1** Insert the new floor filter element on the drip tray.
- 2** Attach the ink core support.
- 3** Tighten the M4 x 16 cap-head screws.

The installation of new floor filter for IP65 is complete.

Read the Operator Manual

The Videojet 1610 Excel Operator Manual (Part Number: 462133) contains the troubleshooting procedures that an operator is allowed to perform. Refer to the operator manual for these procedures.

This chapter contains the troubleshooting procedures that only trained personnel or a service technician is allowed to perform.



Warning

It is possible that in a fault condition the heater can reach 70° C (158° F) temperature. Do not touch the plate on which heater is installed. The failure to follow this warning can cause personal injury.

Important Guidelines

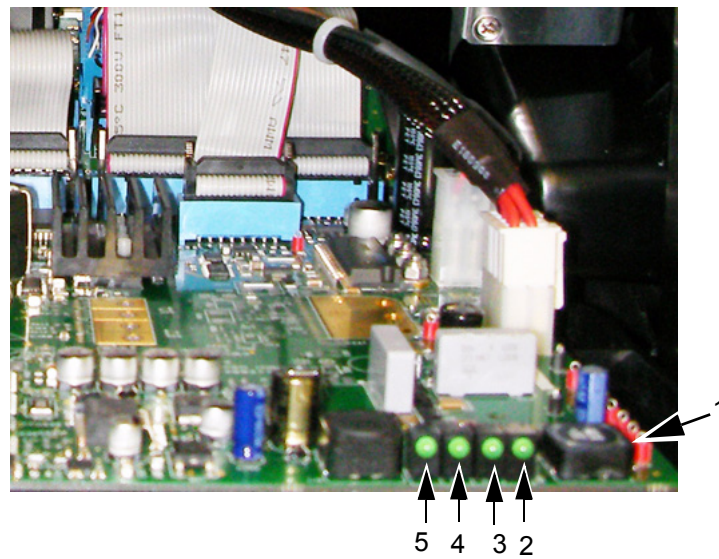
- Before you perform fault diagnosis or do any repairs described in this section, Videojet recommends to shift the printer from the production line to a clean environment.
- When a fault condition occurs, the first step to locate the cause must be to check the following:
 - The fault and status icons displayed on the display (refer to “Printer Status Icons” on page 9-7).
 - The status LEDs on the CSB.
- Table 9-6 on page 9-7 through Table 9-8 on page 9-14 list the possible printer status icons. These tables contain either remedial action or a reference to more detailed fault finding information.
- When you need to replace a part (for example, CSB, LCD and so on), refer to the related replacement instructions. For more information on how to obtain the related instructions, refer to Chapter 7, “Replacement Instructions”.

Startup Problems

Printer Fails to Start

Possible Cause	Remedial Action
Printer does not start	Check the power cord and plug for damage.
No mains power supply	Make sure that the mains power supply is turned on. To turn on the printer, press the green push button.
Mains power supply input cable disconnected or defective	1. Make sure that the mains power supply cable is connected. 2. Check the continuity of the cable. If the cable is defective, repair or replace the cable.
Printer mains power circuit breaker has tripped	Reset the circuit breaker - Turn off and turn on the circuit breaker.
Mains switch is faulty	Check mains switch. Replace the switch if faulty.
Cable between mains switch and PSU is disconnected or faulty	1. Check the cable connections. Reconnect if necessary. 2. Check the cable for continuity. Replace if faulty.
PSU output not reaching the CSB	Check LEDs 2 and 4 on CSB (see Figure 9-1 on page 9-3). LED 2 (power) must be ON and LED 4 (board processor) must be flashing.
Cable between PSU and CSB is faulty or disconnected	1. Check if the cable between PSU and CSB is connected. Reconnect if necessary. 2. Check the cable for continuity, replace if faulty.
PSU faulty	Replace the PSU
CSB failed	1. Make sure that LEDs 2, 3, 4 and 5 on CSB are illuminated (see Figure 9-1 on page 9-3). 2. Change the CSB

Table 9-1: Printer Startup Problem and Remedies



- 1. CSB
- 2. Power LED
- 3. Printhead Engine LED

- 4. SoC to FPGA LED
- 5. Ethernet LED

Figure 9-1: Status LEDs

Display Faults

Backlight



Warning

LETHAL VOLTAGES. A high AC voltage is present at the inverter and backlight. Extreme caution is required when diagnosing failure in these areas.

Note: Some DVMs may not show the 1000 VAC correctly. Use an oscilloscope fitted with a high voltage probe to measure the voltage.

Possible Cause	Remedial Action
Backlight inverter faulty	1. Check for 24 VDC at 3 way input connector on backlight converter (Pins 1 and 2 on CSB B/LIGHT connector). 2. Check for 1000 VAC at output leads from backlight inverter (Pins 3 and 5). 3. If 24 VDC is present but 1000 VAC is missing, replace the LCD/backlight assembly.
Cable between CSB and backlight is disconnected or faulty	1. If 24 VDC is not present at backlight inverter but is present at Pins 1 and 3 of B/LIGHT connector on CSB, make sure that the cable is connected between the CSB and the backlight. 2. Check the cable for continuity, replace if faulty.
Backlight faulty	If 1000 VAC is present at output of backlight inverter but backlight is not illuminated, replace the LCD/Backlight assembly.
CSB faulty	Check for 24 VDC on pins 1 and 3 of B/LIGHT connector on CSB. If 24 VDC is not present, replace the CSB.

Table 9-2: Display Backlight Failure

LCD Faults

Possible Cause	Remedial Action
LCD contrast not set correctly	Press  to set the contrast.
Ribbon cable between CSB and LCD is faulty	Check the cable for continuity. Replace if faulty.
CSB faulty	Replace the CSB.
LCD faulty	Replace the LCD assembly.

Table 9-3: LCD Failure

Keypad Faults

Possible Cause	Remedial Action
Ribbon cable between CSB and keypad is disconnected or faulty	1. Make sure that the ribbon cable between CSB and the keypad is connected. 2. Replace the cable for continuity, replace if faulty.
CSB faulty	Replace the CSB.
Keyboard faulty	Replace the keyboard.

Table 9-4: Keypad Failure

Beacon Indication

Beacon Color	Description and Multi I/O Information
Red	• Alarm present • Jet off • All relays are off
	Multi I/O Connector Information Fault output on PCB 4 Multi I/O connector is ON Pin 19
Amber	• Jet on/off • Warning present • Print not enabled • Relay 2 is set
	Multi I/O Connector Information Warning output on PCB 4 Multi I/O connector is ON Pin 18
Green	• Print enabled • No warnings • Relay 1 is set
	Multi I/O Connector Information Print Ready output on PCB 4 Multi I/O connector is ON Pin 17
Green and Amber	• Print enabled • Warning present • Relay 1 and 2 is set
	Multi I/O Connector Information • Warning output on PCB 4 Multi I/O connector is ON Pin 18 • Print Ready output on PCB 4 Multi I/O connector is ON Pin 17

Table 9-5: Alarm Light Conditions

Beacon Color	Description and Multi I/O Information
Red and Amber	• Alarm present • Warning present • Jet off • Relay 2 is set
	Multi I/O Connector Information • Warning output on PCB 4 Multi I/O connector is ON Pin 18 • Fault output on PCB 4 Multi I/O connector is ON Pin 19
No Lights	• Jet on or off • No alarms • No warnings • Print disabled • All relays are off

Table 9-5: Alarm Light Conditions

Printer Status Icons

The printer status icons are divided into three groups:

- The indicator icons - These icons show the status of the ink jet.
- The fault icons - These icons indicate a fault condition. During a fault condition, the printer stops printing.
- The warning icons - These icons indicate a warning condition. The printer continues to print until the warning condition becomes a fault condition.

Indicator Icons

Icon	Name	Description
	Jet Running	The ink jet is running and the machine is ready to print. When the machine starts, this icon flashes.
	Jet Stopped	Indicates that the ink jet has stopped. When the machine stops, this icon flashes.

Table 9-6: Indicator Icons

Fault Icons

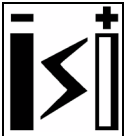
Fault	Reason	Causes	Action
EHT Trip 	Excessive current in the EHT circuit as measured by the CSB.	The printhead is dirty or wet	1. Clean and dry the printhead. 2. Restart the inkjet; monitor for ink buildup on the printhead during the printing operations, if possible.
		The EHT circuit is not calibrated	1. Stop the ink jet. 2. Calibrate EHT (refer to “Calibrate EHT” on page 4-40). 3. Restart the inkjet and monitor the system performance.
		Short in umbilical or EHT resistor	1. Stop the inkjet and turn off the printer. 2. Unplug the EHT wire from the EHT power supply. 3. Measure the resistance between the EHT wire and the EHT plate (44 mega-ohms). Note: <i>Not all meters can measure high resistance, use parallel resistor to calculate resistance.</i> 4. If open or short circuit exists, remove the printhead engine and inspect the EHT resistor. If you need any support, please contact Videojet Technologies Inc. 5. Replace the umbilical.
		Defective EHT power supply	Replace the EHT power supply.
		Defective CSB	Replace the CSB.
Charge Error 	Hardware Fault	• A short-circuited charge electrode • Faults in the CSB	• Make sure the charge tunnel/charge electrode is clean and dry. • Clear the fault and restart the inkjet. If the problem continues, call Videojet Technologies Inc. Customer Service Department at 1-800-843-3610 (United States only), or contact the local Videojet Technologies Inc. representative • If the problem continues, replace the CSB

Table 9-7: Fault Icons

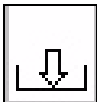
Fault	Reason	Causes	Action
Gutter Fault  Note: Gutter Fault is disabled while in Service Mode.	Ink jet is on, but ink stream is not detected in the gutter for more than 5 seconds	Nozzle is clogged	1. Perform a nozzle back flush. 2. Restart the inkjet and make sure that the ink stream is entering the gutter.
		Inadequate ink pressure	1. Check for the presence of pump fault (refer to "Pump Fault" on page 9-10) 2. Check the actual pressure using diagnostics screens.
		Ink stream is misaligned	1. Perform a nozzle flush. 2. Restart the inkjet and make sure that the ink stream is entering the gutter. 3. Perform an ink stream alignment (refer to "Nozzle Adjustment" on page 4-37).
		No vacuum	1. Clean the printhead. 2. Perform a nozzle flush and check for flow in the return line to make sure the proper operation of the vacuum system. 3. Remove the printhead engine and inspect the length of tubing between the gutter and the printhead valve module for clogs. 4. Loosen and clean valve V2 (VP and VG).
		The gutter sense chamber is defective	1. Remove the printhead engine and inspect the gutter sense chamber. 2. Check CSB test point 45 for the gutter sense signal. 3. Check umbilical wires related to the gutter sense signal. 4. Replace the umbilical if required.
Ink Core Empty 	The low level sensor in the ink core module is not covered.	New installation	Perform "Fill Ink Core" procedure to maintain correct level in ink core module.
		Ink Core Level Low warning has occurred, and the printer is unable to add ink.	1. Make sure the ink core is seated on a level surface. 2. Make sure the ink core and make-up cartridge are installed. 3. Check the ink core life. For more information, refer to "Ink Core Level Low" on page 9-26.
		Grounding is not correct	Check the green ground wire and lug under the motor cover

Table 9-7: Fault Icons (Continued)

Fault	Reason	Causes	Action
Pump Fault 	The pump speed is greater than 98% of the maximum value and the actual pressure is greater than 0.2 bar below the target pressure.	Presence of leaks in the ink compartment, electronics compartment or umbilical	1. Inspect the ink compartment, electronics compartment, and umbilical for leaks. 2. Repair if possible. 3. Monitor the speed of the pump: 1. Tip the core forward, check if the speed increases. 2. Bring the core back to the normal position. 3. Tip the core backward. Check if the speed decreases. This is a good test to check if the filter in the ink core is cracked or if there is a leak in the ink core. If the speed of the pump changes on tipping the core, replace the core.
		Erroneous pressure indication	1. Inspect the electrical connections between the ink core module and the PIB, and between the PIB and the CSB. 2. Check and compare the voltage readings at the test points related to pump and pressure: TP20, TP21, TP22, and TP47 (refer to "CSB Test Points" on page 9-40). Also, remove the top cover of the ink core module and measure the voltage between points + Press and - Press.
		Defective pump	1. Inspect the electrical connections between the ink core module and the PIB, and between the PIB and the CSB. 2. Open the pump compartment, and inspect the pump. 3. Replace the pump, if required.
		Ink too thin	1. Check the <i>Diagnostics Screen One</i>. 2. Compare the target pressure with the temperature-compensated target pressure. 3. If the target pressure is significantly less than (1 bar) the temperature-compensated target pressure, the ink is too thin. 4. Recover the viscosity by allowing the jet to run continuously, or by draining and re-priming the system.

Table 9-7: Fault Icons (Continued)

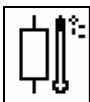
Fault	Reason	Causes	Action
		Erroneous velocity indication	1. Clean the printhead. 2. Check the <i>Diagnostics Screen One</i>. 3. Compare the <i>Actual Velocity</i> with the <i>Velocity Set Point</i>. 4. Remove the printhead engine and measure the resistances between the copper pads on the underside of the printhead engine; compare to the expected values. 5. With an oscilloscope, check the waveforms at the CSB test points related to velocity: "PHA", TP87, TP90, TP91, TP95, and TP96 (refer to "CSB Test Points" on page 9-40).
Cabinet Too Hot 	The cabinet temperature measured by the CSB is above 80° C (178° F)	The electronics compartment is overheated.	1. Open the electronics compartment. 2. Inspect the electronics compartment components for any damage or overheating. 3. If possible, operate the printer with the electronics compartment door open and monitor the <i>Cabinet Temperature</i> through the <i>Diagnostics Screen Two</i>. 4. Make sure that the fan inside the electronics compartment is working. 5. Check the filters at the bottom and behind the cabinet. Make sure that they are not clogged, else replace the filters.
		The ambient temperature is too high.	1. Move the printer to a location where the ambient temperature is lower, or attempt to lower the temperature at the current location. 2. Monitor the <i>Cabinet Temperature</i> through the <i>Diagnostics Screen Two</i>.
		The heat sink is insulated or obstructed.	Remove the insulation/obstruction from the surroundings of the heat sink.
		The mains power supply is defective.	1. Check the voltage levels of the mains power supply being supplied to the CSB. 2. Replace the mains power supply.
		The CSB is defective.	Replace the CSB.
Ink System Service Overdue 	Ink core module is in use for more than 12000 hours for 1610 Excel		Replace the ink core.

Table 9-7: Fault Icons (Continued)

Fault	Reason	Causes	Action
Unable to Control Viscosity	The printer has been unable to perform automatic viscosity control for 60 minutes or more.	Presence of <i>Ink Core Level High</i> warning, and target pressure has been greater than 0.1 bar above temperature-compensated target pressure for 1 hour.	Refer to “Ink Core Level High” on page 9-25.
		No make-up cartridge, empty make-up cartridge or invalid make-up cartridge, and target pressure has been greater than 0.1 bar above temperature-compensated target pressure for 1 hour.	Refer to “No Make-up Cartridge” on page 9-23.
		Faulty make-up valve	Check valve functionality
		Printer is unable to obtain a phase profile for 60 minutes.	Refer to “Phase Threshold Error” on page 9-17.
		Printer is unable to measure velocity for 60 minutes.	Refer to “No Time for TOF” on page 9-31.
Mod Driver Chip Over Temperature	Mod amplifier hardware has shutdown.	Mod amplifier temperature is more than the specified limit.	1. Check the fan at the top of the electronics compartment. 2. Make sure the heat sink does not have any debris.

Table 9-7: Fault Icons (Continued)

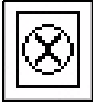
Fault	Reason	Causes	Action
Rasters Memory Overflow Detected 	Not enough memory to store all requested raster tables.		Remove the rasters that are not used. Follow the procedure to delete rasters.
Valve Error - Contact the Service Department 	Hardware error in valve hit / hold drive circuit.	Faulty power supply or control system board	Contact the Videojet Technologies Inc. Customer Service Department at 1-800-843-3610 (United States only), or contact the local Videojet Technologies Inc. representative.
Bad Phasing	Unable to obtain phase data during startup.	Loose Connection	Check for any loose connections between the cabinet and printhead.
Modulation Readback Failed	Hardware error, ADC not working or readback invalid.	CSB Failure	Replace CSB.

Table 9-7: Fault Icons (Continued)

Warning Icons

Warning	Reason	Causes	Action
Printhead Temperature Too High 	The printhead temperature is 3° C (37.4° F) more than the setpoint, with head heater enabled.	The printhead is (temporarily) overheated.	Allow the inkjet to run. The printhead temperature should correct itself.
		The ambient temperature is too high.	If print quality or performance issues are noted, consider operating the printer in a cooler environment.
		Defective power supply	1. Check the voltages from the mains power supply that is being supplied to the CSB. 2. Replace the mains power supply.
		Defective temperature control circuit (short)	1. Inspect the electrical connections between the CSB and the PIB, and between the PIB and the umbilical. 2. Remove the printhead valve module. 3. Inspect the electrical connections between the printhead valve module and the deck. 4. Measure the resistance between the copper pads on the underside of the printhead valve module and compare these values to the expected values. 5. Check the umbilical wires for continuity.
Incorrect Raster or Raster Family Name 	Requested raster table not loaded into the system. Warning appears immediately.	1. Corruption of data 2. Invalid use of file names	1. Delete custom files. 2. Check file names and reload raster.

Table 9-8: Warning Icons

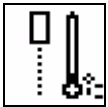
Warning	Reason	Causes	Action
Printhead Temperature Too Low 	The printhead temperature is more than 3° C (37° F) below the target temperature. Error duration before warning is 30 seconds	The printhead has not yet reached operational temperature.	Allow the inkjet to continue to run. The printhead temperature should correct itself.
		The ambient temperature is too low.	If print quality or performance issues are noted, consider operating the printer in a warmer environment.
		Defective power supply	1. Check the voltages from the mains power supply being supplied to the CSB. 2. Replace the mains power supply.
		Defective temperature control circuit (open)	1. Inspect the electrical connections between the CSB and the PIB, and between the PIB and the umbilical. 2. Remove the printhead valve module. 3. Inspect the electrical connections between the printhead valve module and the deck. 4. Reset the printhead valve module, start the printer and monitor printhead temperature. 5. If problem persists, measure the resistance between the copper pads on the underside of the printhead valve module and compare these values to the expected values. 6. Check the umbilical wires for continuity
TOF Too High	Measured jet velocity is more than 10% above target velocity.	1. Viscosity too low. 2. Pressure too high. 3. Restrictions in the nozzle.	1. Check the viscosity and pressure values. 2. Perform ink purge and reload.
TOF Too Low	Measured jet velocity is more than 10% below target velocity.	1. Viscosity too High. 2. Pressure too Low. 3. Restrictions in the nozzle.	1. Check the viscosity and the pressure values. 2. Perform backflush and reload.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Gutter Fault Shutdown Disabled	Operator has disabled machine shutdown on gutter fault. Warning appears immediately	Printer is in service mode	Exit from service mode
Printhead Cover Removed 	Lid switch circuit is open	The printhead cover is removed or not seated correctly	1. Install the printhead cover. 2. Make sure the printhead cover is completely seated on the printhead - slide the printhead completely into the sleeve.
		Missing Magnet	Make sure the magnet is there in front of the printhead sleeve.
		Defective lid switch	1. Stop the inkjet and turn off the printer. 2. Remove the printhead engine and inspect the lid switch. 3. Measure the resistance between the copper pads on the underside of the printhead engine and compare readings to the expected values. 4. Check umbilical wires for continuity.
		Open circuit	Inspect the cabling from the umbilical to the PIB and from the PIB to the CSB.
		Defective CSB	Check measurement at TP56 on the CSB.

Table 9-8: Warning Icons

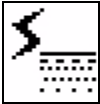
Warning	Reason	Causes	Action
Phase Threshold Error 	The printer is unable to acquire a phase profile with the phase threshold set to the minimum value.	The printhead is dirty	Clean and dry the printhead.
		The ink stream is misaligned	1. Perform a nozzle backflush. 2. Restart the inkjet. 3. If the ink stream is still misaligned, perform ink stream alignment (refer to "Nozzle Adjustment" on page 4-37).
		No break-off	1. Perform a visual inspection to verify break-off. 2. If break-off does not exist, check electrical connections on the printhead engine and in the electronics compartment. 3. Attempt to set the modulation manually to obtain break-off. 4. If break-off cannot be obtained, check the modulation signal on the CSB. If the modulation signal does not exist, refer to "CSB failed" on page 9-18. 5. If the modulation signal is present on the CSB, check for the modulation signal in the printhead. 6. Remove the printhead engine and check its electrical connections. 7. Replace the printhead engine.
		Phase Charge incorrectly set	1. Check the <i>Phase Charge</i> setting. 2. Adjust the <i>Phase Charge</i> setting to recover the phase profile.
		Electrical malfunction in TOF circuit	1. Check the electrical connections between the CSB and the PIB, and between the PIB and the umbilical. 2. Remove the printhead engine and check the electrical connections. 3. Check the resistance between the copper pads on the underside of the printhead engine, and compare the readings with the expected values. 4. Check for continuity in the umbilical wires.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
		No charge pulses	1. With the ink jet running but the printer not printing, check for the presence of charge pulses at the charge tunnel. 2. If pulses are not present, check for the presence of charge pulses at TP "CHG" on the CSB 3. Check for continuity in the umbilical wires.
		CSB failed	With test equipment, check for presence of all related signals on CSB: TP38, CHG, and PHA.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Ink Viscosity Too High 	The target pressure is greater than 0.1 bar above the temperature-compensated target pressure	The ink is too thick.	1. The printer should add make-up fluid to correct the ink viscosity. 2. Monitor the progress of make-up additions using <i>Diagnostics Screen Two</i>. If the printer does not appear to be attempting to add make-up (allow at least five minutes for a make-up addition to be attempted), see causes below. 3. If make-up addition capability is confirmed but printer operations are impaired by thick ink, consider flushing the system.
		The make-up cartridge is removed or seated improperly.	1. Install or reset the make-up cartridge. 2. Make sure that the <i>No Make-up</i> icon disappears.
		The make-up cartridge is of the wrong type.	1. Install a cartridge of the correct make-up type. 2. Make sure that the <i>Wrong Make-up</i> icon disappears.
		The make-up add line is disconnected or leaks.	1. Open the ink compartment door and gently pull the ink core module out. 2. Locate the green-striped tube behind the ink core module. 3. Make sure that the quick disconnect in this line is secure and that the line is not leaking.
		The ink core module level is high.	1. Confirm the condition by checking icons on display screen. 2. To clear the condition, perform the following steps: • Direct the printhead into a service tray. • Disable the gutter fault. • Raise the ink stream above the catcher. • Allow the ink stream to flow into the service tray until the ink core module level is restored to normal.
		The ink core module level is defective	Replace the ink core module.

Table 9-8: Warning Icons

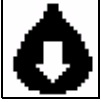
Warning	Reason	Causes	Action
Ink Viscosity Too low 	The target pressure is lesser than 0.1 bar below the temperature-compensated target pressure.	The ink is too thin.	1. Allow the inkjet to run so that the excess make-up fluid evaporates. The following actions will help to recover the viscosity: • Avoid nozzle backflushing and improper printhead cleaning (with the vacuum applied). • Use the Quick Start and Quick Stop options whenever possible. • Run Gutter Pump at maximum speed. • Check for flow in the green-striped tube to make sure that make-up is not being unnecessarily added. 2. If printer operations are affected by thin ink, flush the system. Perform the following steps: • Direct the printhead into a service tray. • Disable the gutter fault. • Raise the ink stream above the catcher. • Allow the ink stream to flow into the service tray until the viscosity is restored (the printer will add fresh ink to compensate for system losses).
Pressure too High 	The actual pressure is more than 0.2 bar above the target pressure.	Printer transient Erroneous pressure indication	Printer will correct itself 1. Inspect electrical connections between the ink core module and the PIB, and between the PIB and the CSB. 2. Replace the ink core module. Check and compare the voltage readings at the test points related to pump and pressure: TP20, TP21, TP22, and TP47 (refer to "CSB Test Points" on page 9-40). Also, remove the top cover of the ink core module and measure the voltage between points + Press and - Press.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Pressure Too Low 	The actual pressure is > 0.2 bar below the target pressure.	Printer transient.	Printer will correct itself.
		Leak in the ink compartment, electronics compartment, or umbilical.	1. Inspect the ink compartment, electronics compartment, and umbilical for leaks. 2. Repair if possible.
		Erroneous pressure indication.	1. Inspect the electrical connections between the ink core module and the PIB, and between the PIB and the CSB. 2. Check and compare the voltage readings at the test points related to pump and pressure: TP20, TP21, TP22, and TP47 (refer to "CSB Test Points" on page 9-40). Also, remove the top cover of the ink core module and measure the voltage between points + Press and - Press.
		Defective pump	1. Inspect electrical connections between the ink core module and the PIB, and between the PIB and the CSB. 2. Open the pump compartment, and inspect the pump. 3. Replace the pump.
No Ink Cartridge 	No ink available for addition to the ink core module	No ink cartridge is present	Insert an ink cartridge into the proper cartridge holder.
		The ink cartridge is empty	Remove the empty cartridge and insert a new ink cartridge.
		The printer is unable to read the ink cartridge smart chip	1. Make sure that the ink cartridge is installed correctly and locked into the holder. 2. Remove the ink cartridge. Check if the smart chip is present and is clean. 3. If another ink cartridge is available, insert it into the printer and see if the printer can read its smart chip. 4. Check if the smart chip reader (inside the receptacle) is positioned correctly and is clean. 5. Check the electrical connections between the smart chip reader and the PIB board, and between the PIB board and the CSB.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Wrong Ink Cartridge 	Ink type in cartridge incompatible with ink core module. fluid reference and fluid type must match ink core module.	A cartridge containing the wrong ink type has been inserted into the printer	1. Remove the ink cartridge. 2. Check the label on the ink cartridge to confirm the ink type. 3. Insert a cartridge of the correct ink type into the printer.
		A make-up cartridge has been accidentally inserted into the ink cartridge holder	1. Remove the cartridge. 2. Check the label on the cartridge to confirm fluid type. 3. Insert a cartridge of the correct ink type into the printer.
		The smart chip on the ink cartridge is programmed incorrectly or does not match the label.	1. Remove the cartridge. 2. Check the label on the cartridge to confirm fluid type. 3. Insert a cartridge of the correct ink type into the printer.
Ink Cartridge Expired	Ink past expiry date		Check the label on cartridge for expiration date. Replace the old cartridge with new ink cartridge.
Ink Cartridge Low 	Less than 5% of the required ink remains in the ink cartridge.	Ink used for printing	Insert a new ink cartridge into the proper cartridge holder after ink cartridge becomes empty.
Ink Cartridge Empty 	Ink cartridge smart chip data shows 0%.		1. Check if the current cartridge has fluid and is locked into position. 2. Replace the empty cartridge with a new ink cartridge.
Ink Insertions Exceeded	This ink cartridge is inserted more than 10 times.		Replace ink Cartridge.

Table 9-8: Warning Icons

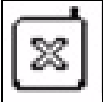
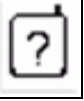
Warning	Reason	Causes	Action
No Make-up Cartridge 	No make-up fluid available for addition to the ink core module	Make-up cartridge is not present	Insert a make-up cartridge into the proper cartridge holder.
		The make-up cartridge is empty	Remove the empty cartridge and insert a new make-up cartridge.
		The printer is unable to read the make-up cartridge smart chip.	1. Ensure that the make-up cartridge is seated correctly in its receptacle. 2. Remove the make-up cartridge. Make sure that the smart chip is present and is clean. 3. If another make-up cartridge is available, insert it into the printer and see if the printer can read its smart chip. 4. Check that the smart chip reader (inside the receptacle) is positioned correctly and is clean. 5. Check the electrical connections between the smart chip reader and the PIB, and between the PIB and the CSB.
Wrong Make-up Cartridge 	The cartridge inserted into the make-up cartridge holder contains the wrong make-up type.	A cartridge containing the wrong make-up type has been inserted into the printer	1. Remove the make-up cartridge. 2. Check the label on the make-up cartridge to confirm the make-up type. 3. Insert a cartridge of the correct make-up type into the printer.
		An ink cartridge was accidentally inserted into the make-up cartridge holder.	1. Remove the cartridge. 2. Check the label on the cartridge to confirm fluid type. 3. Insert a cartridge of the correct make-up type into the printer.
		The smart chip on the make-up cartridge is programmed incorrectly or does not match the label.	1. Remove the make-up cartridge. 2. Check the label on the make-up cartridge to confirm the make-up type. 3. Insert a cartridge of the correct make-up type into the printer.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Makeup Cartridge Low 	Less than 5% of the make-up in the make-up cartridge remains.	Make-up used during jet on operations.	Make preparations to insert a fresh make-up cartridge into the proper cartridge holder. Replace the cartridge following Make-up Out indication.
Clean Start / Stop Inhibited	Viscosity is too low, so clean start / stop inhibited to prevent solvent addition		1. Start printer with the quick start procedure and allow the printer to print at a high duty cycle to lower the fluid level in the core. 2. Let the printer idle to burn off excess make-up fluid.
Makeup Insertions Exceeded	This make-up cartridge is inserted more than 10 times		Replace make-up cartridge. Note: Repeated insertions can lead to a 'viscosity too high' condition as excessive punctures reduce the seal on the cartridge.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Ink Core Level High 	The high level sensor in the ink core module is covered.	Excessive clean start and stops.	1. Use Quick Start and Quick Stop options until ink core module level is restored. 2. Keep jet running to use excess make-up. 3. If printer operation is impaired by high ink core module level (presence of <i>Unable to Control Viscosity</i> warning), raise the ink stream above the catcher to restore the ink core module level to normal.
		Excessive nozzle backflushing	1. Use Quick Start and Quick Stop options until ink core module level is restored. 2. Keep jet running to use excess make-up. 3. If printer operation is impaired by high ink core module level (presence of <i>Unable to Control Viscosity</i> warning), raise the ink stream above the catcher to restore the ink core module level to normal.
		Improper printhead cleaning	1. Use Quick Start and Quick Stop options until ink core module level is restored. 2. Keep the jet running to use excess make-up. 3. If printer operation is impaired by high ink core module level (presence of <i>Unable to Control Viscosity</i> warning), raise the ink stream above the catcher to restore the ink core module level to normal.
		Leak	1. Make sure the ink core is seated on a level surface in the cabinet. 2. Check for flow in the black or green striped tubing (ink and make-up add line). 3. If flow is present continuously, disconnect the line and check for presence of vacuum. 4. Replace the ink core module, if required.
		Grounding is not correct	Check the green ground wire and lug under the motor cover

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Ink Core Level Low 	The middle level sensor in the ink core module is uncovered.	Ink usage during printing	The printer should add ink to restore ink core module level to middle. However, if the printer is attempting to add ink, but the level is not restored, perform the following: 1. Confirm that the printer is attempting to add ink by monitoring the ink add valve on the <i>Valves Screen</i>. The screen should indicate that the valve is opening. 2. If the printer is not attempting to add ink, check if a valid cartridge of the correct ink type is inserted into the ink cartridge receptacle. 3. If the printer is attempting to add ink, but the level is not restoring, troubleshoot the ink addition system as follows: 1. Make sure the ink cartridge is not empty. 2. Make sure the ink core is seated on a level surface in the cabinet. 3. Stop the jet and perform a valve test. Make sure that the ink add valve is operational. If it is not operational, remove and clean the valve. 4. Inspect the black-striped tubing and the ink receptacle septum needle for obstruction. 5. Troubleshoot the venturi system - use the temporary gauge manifold to check the venturi vacuum. 6. Replace the ink core, if required.
		Grounding is not correct	Check the green ground wire and lug under the motor cover

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Cabinet Hot 	The cabinet temperature measured by the CSB is greater than 70° C (158° F)	The electronics compartment is overheating.	1. Open the electronics compartment. 2. Inspect the electronics compartment components for damage or overheating. 3. If possible, operate the printer with the electronics compartment door open and monitor the <i>Cabinet Temperature</i> using the <i>Diagnostics Screen Two</i>.
		The ambient temperature is too high.	1. Move the printer to a location where the ambient temperature is lower, or attempt to lower the temperature at the current location. 2. Monitor the <i>Cabinet Temperature</i> using the <i>Diagnostics Screen Two</i>.
		The heat sink is insulated or obstructed.	Remove the insulation / obstruction from the vicinity of the heat sink.
		The mains power supply is defective.	1. Check the voltages from the mains power supply being supplied to the CSB. 2. Replace the mains power supply if found faulty.
		The CSB is defective.	Replace the CSB.
		Electronics compartment fan is defective	Make sure the fan operates properly.
		Filters are defective	Make sure the filters are not clogged or dirty. Replace the filters, if required.
Ink Core Insertions Exceeded	The ink core module has been disconnected / reconnected more than 10 times		

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Pump RPM Near Max 	The pump speed is greater than 98% of the maximum value	Ink too thin	1. Check the <i>Diagnostics Screen One</i>. 2. Compare the <i>Target Pressure</i> with the temperature-compensated target pressure. 3. If the <i>Target Pressure</i> is significantly less than (1 bar) than the temperature-compensated target pressure, the ink is too thin. 4. Recover the viscosity by allowing the jet to run continuously, or by flushing and priming the system.
		Leak	1. Inspect the ink compartment, electronics compartment, and umbilical for leaks. 2. Repair if possible. 3. While monitoring the pump speed (rpm) from diagnostic screen 2, tip ink core backwards. If the speed decreases, there is a damaged filter in the core. Replace the core.
		Erroneous velocity indication	1. Clean the printhead. 2. Check the <i>Diagnostics Screen One</i>. 3. Compare the <i>Actual Velocity</i> with the <i>Velocity Set Point</i>. 4. Replace the printhead engine.
		Defective pump	1. Inspect electrical connections between the ink core module and the PIB, and between the PIB and the CSB. 2. Open the pump cover, and inspect the pump. 3. Replace the pump.
Ink Core Empty 	Ink core module low probe is uncovered - tank close to empty or empty.	Motor grounding	1. Check ink core connections 2. Check the replenishment cartridges, ink- add circuit and valves. 3. Check Grounding. 4. Check ink cartridge data (expiration date, type, and so on). 5. Check make-up cartridge data. 6. Check if printer must draw any vacuum. 7. Replace the ink core.
Pump Fault	The pump speed is greater than 98% of the maximum value	Refer to <i>Pump RPM Near Max</i> .	Refer to <i>Pump RPM Near Max</i> .

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
No Ink Core 	No data from ink core smart chip - ink core not plugged in.	Ink core not inserted or not plugged properly. Distorted data is transmitted	1. Insert ink core. 2. Make sure that the connections between the ink core and the printer are correct. 3. Check the ink core data. If necessary, replace the ink core.
Ink Core Service Soon (0.5% Left). 	Ink core module is very near the end of service life.	60 hours remaining on the ink core smart chip.	Make preparations to replace the ink core module.
Ink Core Service Soon (2% Left) 	Ink core module nearing the end of service life.	240 hours remaining on the ink core smart chip.	Make preparations to replace the ink core module.
Ink Core Service Soon (5% Left) 	Ink core module nearing the end of service life.	600 hours remaining on the ink core smart chip.	Make preparations to replace the ink core module.
Ink Core Service Soon (10% Left) 	Ink core module nearing the end of service life.	1200 hours remaining on the ink core smart chip.	Make preparations to replace the ink core module.
Product Delay Too Short 	Compile time greater than product delay.	Not enough time to build a message.	1. Enable the double buffering option. 2. Increase the print delay. 3. Check the product detector for double triggering problems.
Inter-print Gap Too Short* 	Insufficient time to compile between prints.	Not enough time to build a message.	1. Enable the double buffering option. 2. Increase the print delay. 3. Check the product detector for double triggering problems. 4. If continuous print is active, increase the distance between the prints. 5. Make sure the message does not have leading or trailing spaces.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
Print Queue Too Deep* 	Too many products between PEC and printhead.	Continuous Print delay set incorrectly	Increase the distance between repeat prints.
		Check Product Detector	Check the setup and sensing of the detector for double triggering problems.
		Message stretched	Check the line speed setting to make sure that the printer is printing at the problem speed.
		Encoder Problem	Check the shaft encoder and settings to make sure that the messages are printed completely and that the code is not stretched over several products.
Print Overlap* 	Print starts before end of current print.	Check Product Detector	Check the setup and sensing of the detector for double triggering problems.
		Message stretched	Check the line speed setting to make sure that the printer is printing at the problem speed.
		Encoder Problem	Check the shaft encoder and settings to make sure that the messages are printed completely and that the code is not stretched over several products.
No Time to Phase* 	Less than 6 milliseconds from the end of one print to the beginning of the next.	The line speed is too slow	Increase the line speed, if possible.
		The distance between adjacent products is too short.	Increase the distance between adjacent products, if possible.
		The message is too long.	Reduce the message length, if possible.
		The selected font is too big.	Enter the message again using a smaller font, if possible.

Table 9-8: Warning Icons

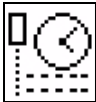
Warning	Reason	Causes	Action
No Time for TOF 	The printer is unable to acquire an actual velocity and thus cannot perform TOF velocity control.	No phase profile.	1. Observe <i>Diagnostics Screen One</i>. Note the <i>Phase Profile</i>. 2. If phase profile is not present (all zeroes), allow the printer to adjust the phase threshold to attempt and acquire a phase profile. 3. If the phase threshold is reduced to the minimum value and a phase profile still has not been acquired, see causes and perform actions under "Phase Threshold Error" on page 9-17".
		The printer is unable to set the modulation automatically.	1. Observe <i>Diagnostics Screen One</i>. Note the <i>Phase Profile</i>. 2. If the phase profile is erratic (1's and 0's present, but randomly), the modulation value acquired automatically by the printer may be erroneous. 3. Perform a visual inspection of the printhead to confirm incorrect modulation value. 4. Attempt to manually set the modulation to restore break-off; monitor diagnostics screen to assess status of automated controls. 5. If modulation cannot be restored manually, see causes and actions under "Phase Threshold Error" on page 9-17.

Table 9-8: Warning Icons

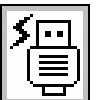
Warning	Reason	Causes	Action
Overspeed* 	The message cannot be printed at the required width	The current line speed is too fast.	1. Reduce the line speed. 2. If the encoder source is Internal, adjust the width to obtain the desired characters per inch.
		The current width setting is too low.	1. Increase the width setting. 2. Test the print to see if the warning condition gets cleared.
		The max printed dots parameter is too high	1. Edit the current message; examine the max printed dots parameter. 2. Reduce the max printed dots to the minimum allowable value.
		The selected font is too large.	Create a new message - use a smaller font if this is feasible. Ensure that the max printed dots is set to the minimum allowable value.
		Continuous Print problems	1. Increase the continuous print delay. 2. Increase the print delay. 3. Check the product detector for any noise or multiple detects.
Maximum Print Rate Exceeded	Current print go received less than one millisecond from last print go	Print Matrix problems	Make sure that the print matrix is correct.
		Product detector problems	Check product detector for any noise or multiple detects.
		Shaft Encoder problems	Correct the parameters for character pitch.
No Valid Ink Parameters	Ink core module not programmed or invalid values in smart chip	Ink core not inserted or not plugged properly. Distorted data is transmitted	1. Insert ink core. 2. Make sure that the connections between the ink core and printer are correct. 3. Check the ink core data. If necessary, replace the ink core.
Possible Ink Coefficient Update	Ink cartridge coefficients do not match ink core module coefficients	Ink Core problems	1. Update the ink core data. 2. Check the make-up and ink cartridge parameters. 3. Check the ink core parameters.
USB Connection Is Over Current 	External USB device drawing excessive current	Defective, or improper USB flash drive.	Use a different USB flash drive.

Table 9-8: Warning Icons

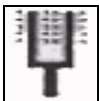
Warning	Reason	Causes	Action
Suspected Head Heater Failure	Heater set to 100% for more than one minute to achieve set temperature.	Printhead valve deck problems	Check whether the valve deck assembly is mounted correctly (loose screws).
		Wiring problems	Check the wiring between the Umbilical and PIB.
Creating Raster Catalog	Software busy. Raster being replaced. Cannot print.		
Bad Nozzle!!! Please Replace Or Repair	Nozzle taking excessive current - possible short circuit.		1. Replace the printhead engine. 2. Check the connection of the printhead engine to the copper pads below the printhead engine. 3. Check the nozzle drive signal on the CSB.
Tank Not Filling	Ink core module still LOW after 5 attempts to add ink to increase the level.		
DAC Overflow 	Charge DAC not operating correctly - CSB hardware fault.		
DAC Comms Error 	Charge DAC not operating correctly - CSB hardware fault.		
Tuning Required 	Nozzle tuning is required and the Auto Tuning function is disabled.	Modulation voltage about to adjust itself outside the control range (0 - 200 VAC)	Enable Auto tuning.

Table 9-8: Warning Icons

Warning	Reason	Causes	Action
TOF Warning	The <i>Actual Velocity</i> deviates from the <i>Velocity Set Point</i> by +/- 1%.	Erroneous TOF measurement.	Clean and dry the printhead.
		Nozzle partially obstructed.	Perform a nozzle backflush.
		Improper modulation setting.	See actions above for "The printer is unable to set the modulation automatically." on page 9-31.
		Pump or pressure problem.	See causes and actions described in "Pressure Too Low" on page 9-21.
Service Due 	Printer requires servicing.	The life of ink core module is over.	Replace the ink core module.
		Valve error	1. Run a <i>Valve Test</i> and a <i>Hardware Self Test</i> to determine which valve is defective. 2. If a valve (or valves) is not functioning, check electrical connections. Attempt to clear any clogged valves. 3. If all the valves are functioning, check CSB test points related to valves to identify potential electrical issues. They are: TP 1 through TP16, TP30, and TP68 (refer to "CSB Test Points" on page 9-40).

Table 9-8: Warning Icons

*Disable this warning if not required (under *System Set-Up* menu)

Voltage Checks

Table 9-9 is a representation of the power connector with the voltages shown for each pin. Use Pin 2 as the 0 V reference.

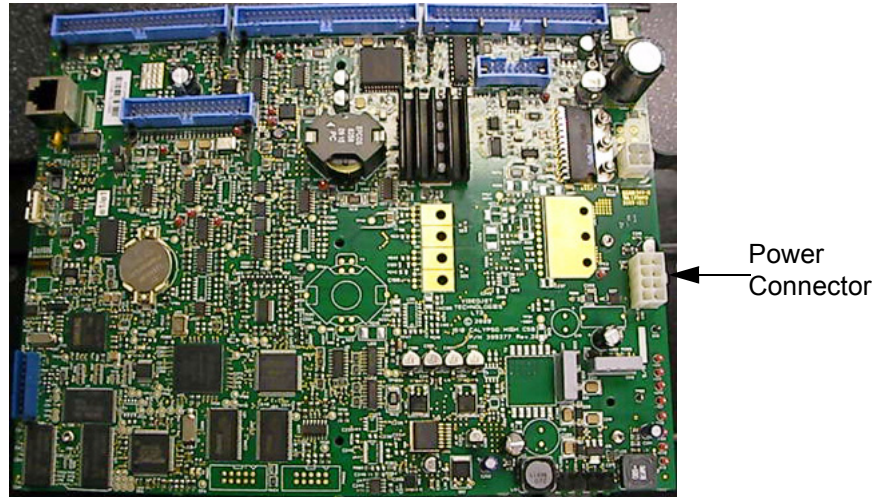


Figure 9-2: CSB Power Connectors

Note: Allow $\pm 5\%$ tolerance on all voltages except -24V which is allowed at $\pm 10\%$ tolerance. The power connector must be connected to the CSB to carry out this check.

PIN 4 -15V	PIN 8 No-connect
PIN 3 +5 V	PIN 7 0 V
PIN 2 0 V	PIN 6 +24 V
PIN 1 +15 V	PIN 5 +5 V

Table 9-9: CSB Power Connector Voltage Check

Jet Start and Stop Diagnostics

Use the following flow charts to diagnose problems that occur because of dirty inkjet starts and stops.

Quick Start Diagnostics

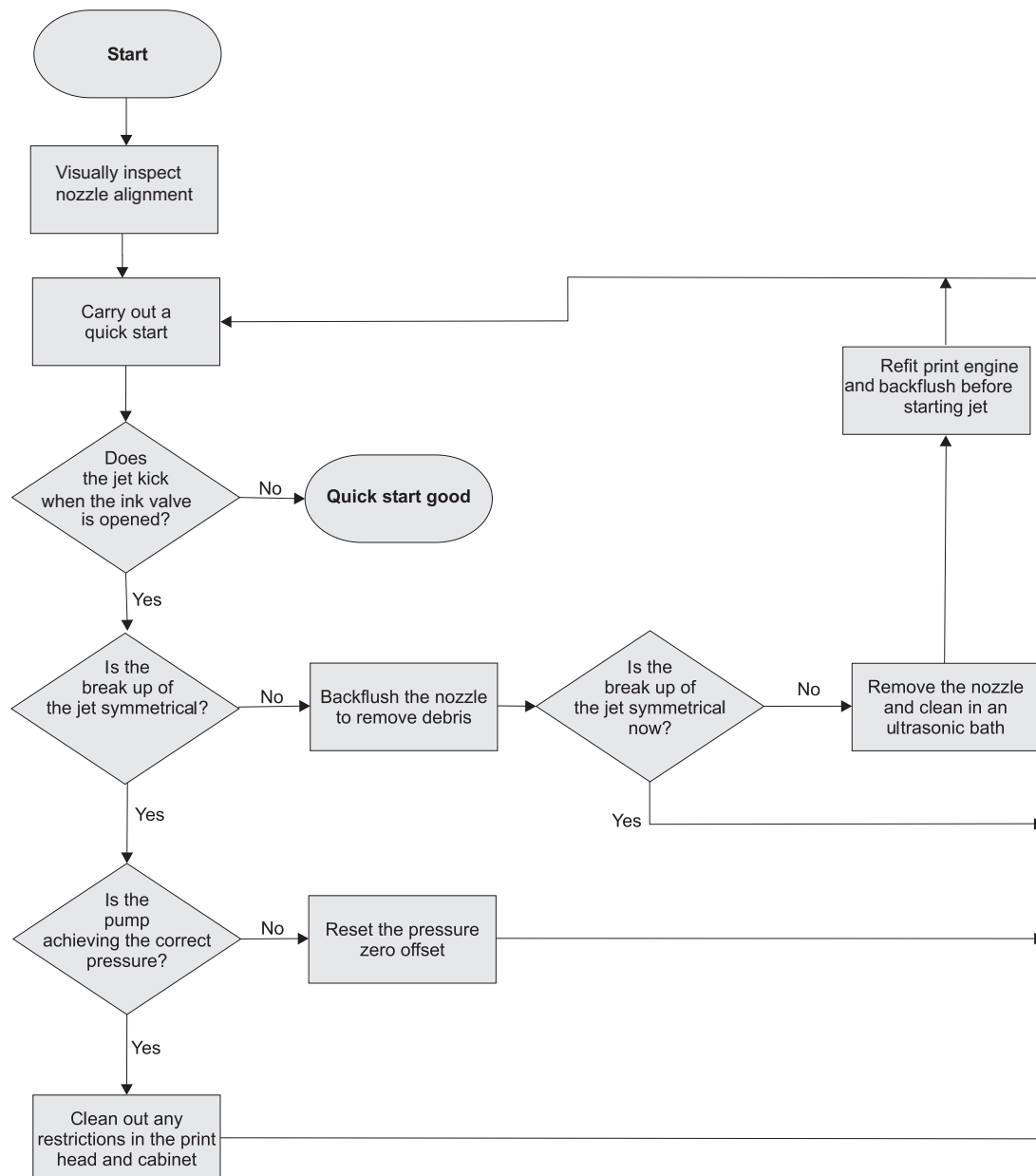
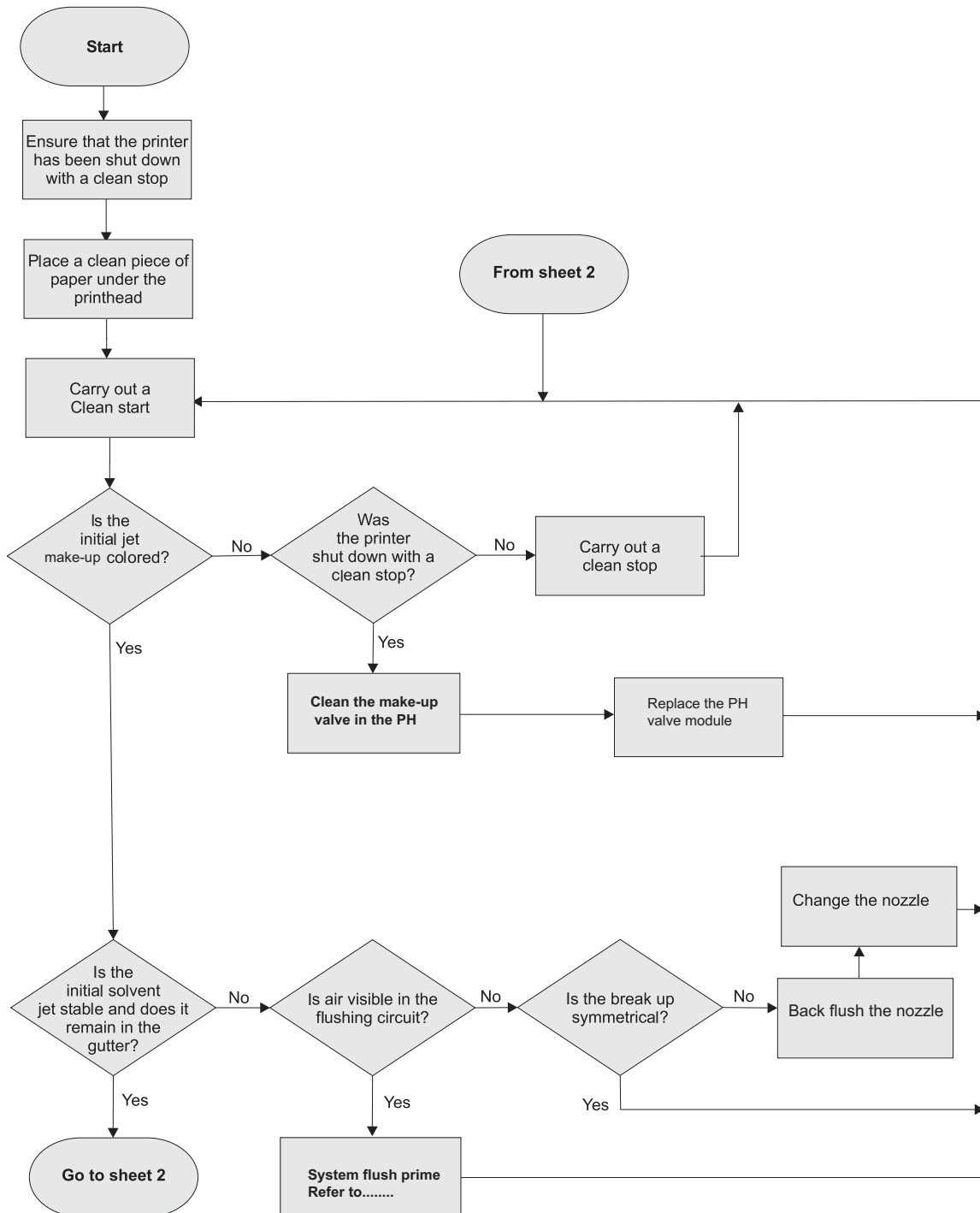
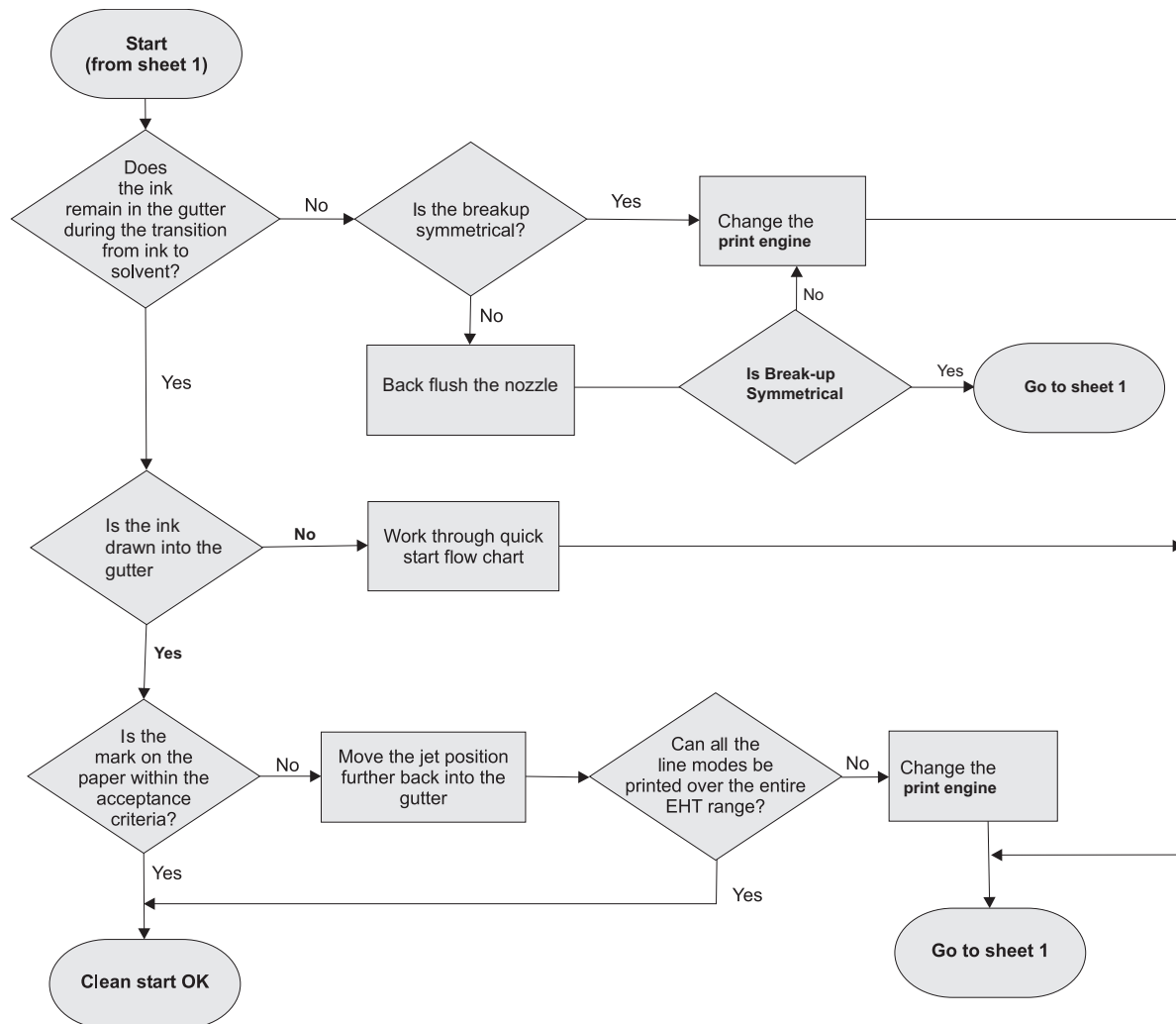


Figure 9-3: Quick Start Diagnostics Flowchart

Clean Start Diagnostics



Sheet 1



Sheet 2

Figure 9-4: Clean Start Diagnostic Flowchart

Clean Stop Diagnostic

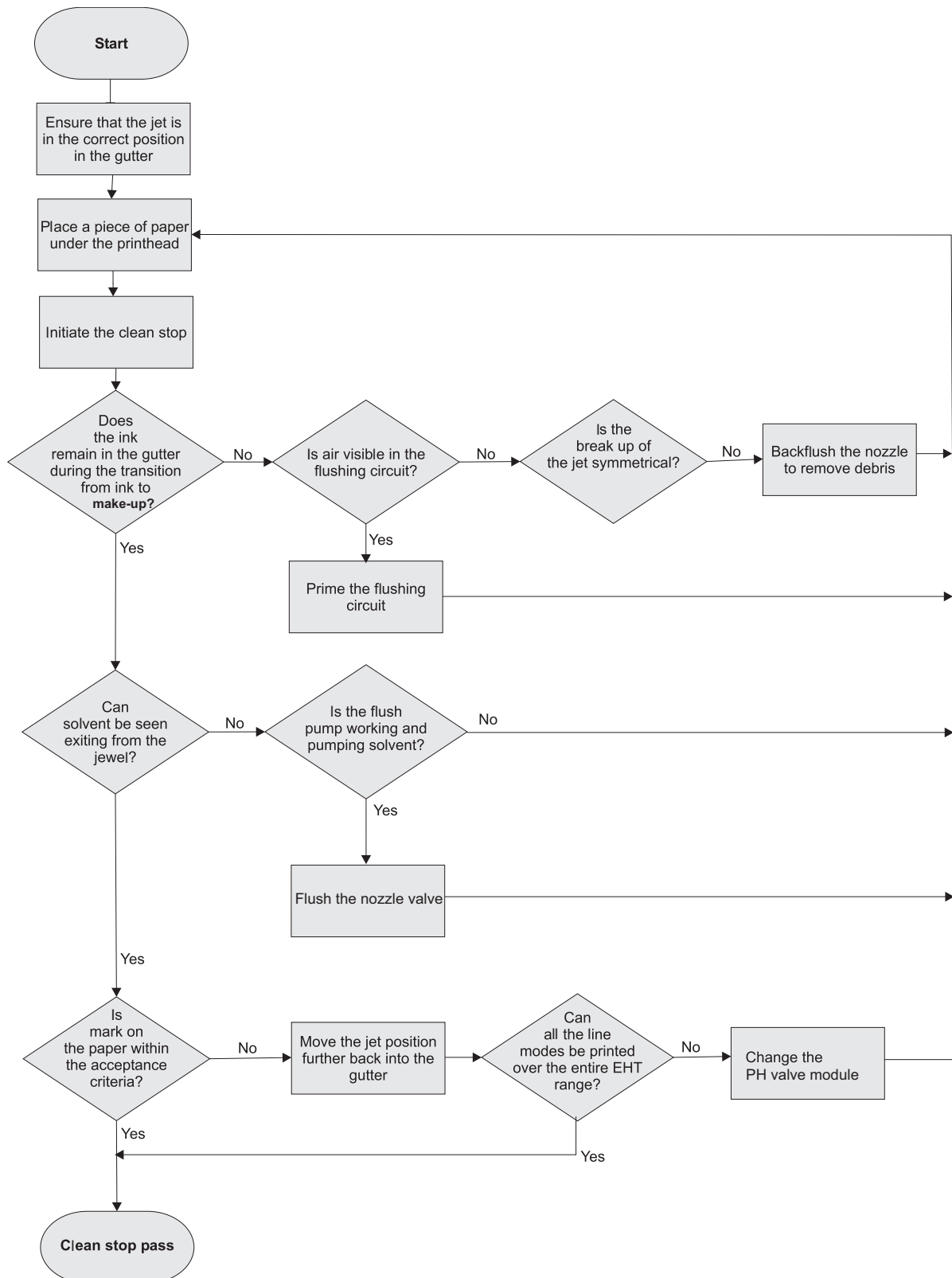


Figure 9-5: Clean Stop Diagnostics

CSB Test Points



Figure 9-6: Test Point 105

The CSB test points are described in Table 9-10.

Test Point	Name	Test Equipment Required	Measurement
TP105	Valve Control Common	Voltmeter	Measure the voltage at TP105. The voltmeter must read approximately 4.5 VDC.

Table 9-10: CSB Test Points



Figure 9-7: Test Point 59, 60, and 61

Test Point	Name	Test Equipment Required	Measurement
TP60	Photocell one	Voltmeter	Used to determine the active state of photocell. Block the photocell with a product and measure the voltage at TP60. • A reading > 3 VDC indicates that the photocell is ACTIVE HIGH. • A reading < 0.5VDC indicates that the photocell is ACTIVE LOW.

Table 9-11: CSB Test Points

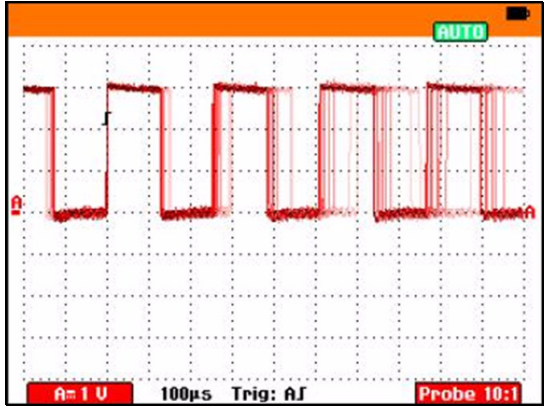
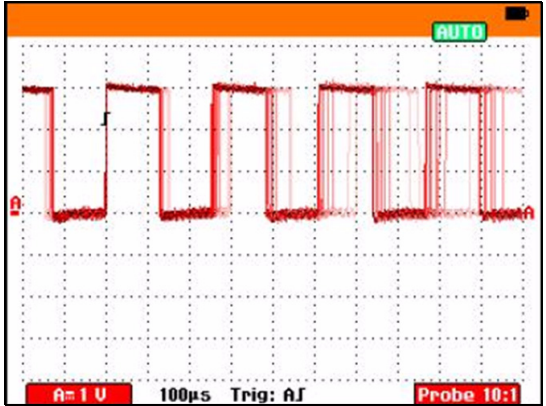
Test Point	Name	Test Equipment Required	Measurement
TP61	Shaft encoder one	Oscilloscope	Used to verify if the shaft encoder is supplying pulses to the printer. 1. Make sure that the encoder is connected to the printer and start the conveyor. 2. Measure the signal at TP61. The following output is considered to be good. 
TP59	Shaft encoder two	Oscilloscope	Used to verify if the shaft encoder is supplying pulses to the printer. 1. Make sure that the encoder is connected to the printer and start the conveyor. 2. Measure the signal at TP59. Note: A signal will be present only if a quadrature (two-phase) encoder is in use. 

Table 9-11: CSB Test Points (Continued)

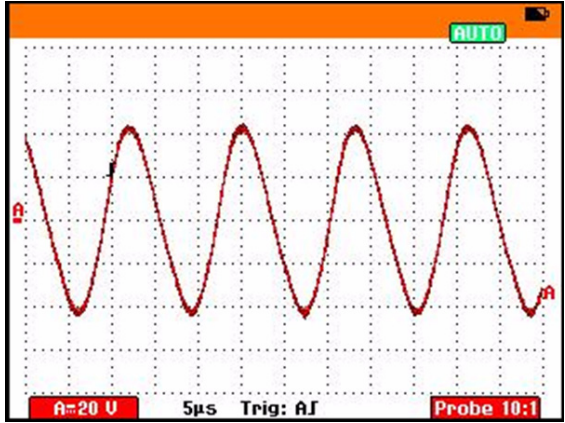
Test Point	Name	Test Equipment Required	Measurement
TP74	Pump set point	Voltmeter	Used to verify the analog signal provided by the FPGA to the pump driver circuit, to set the target pressure. 1 bar = 0.28 VDC.
+5 V (TP78)	5 VDC	Voltmeter	Used to verify if the filtered 5 VDC level on the CSB. Measure the voltage at TP23. Measured voltage should be +5 VDC.
VCORE (TP80)	FPGA core voltage	Voltmeter	Used to verify the FPGA core voltage on the CSB. Measure the voltage at TP25. Measured voltage should be +1.5 VDC.
+12 V ANAL (TP72)	+12 VDC	Voltmeter	Used to verify the regulated +12 VDC produced on the CSB. Measure the voltage at TP26. Measured voltage should be +12 VDC.
-12 V (TP75)	-12 VDC	Voltmeter	Used to verify regulated -12 VDC produced on the CSB. Measure the voltage at TP27. Measured voltage should be -12 VDC.
+24 V (TP77)	+24 VDC	Voltmeter	Used to verify unfiltered +24 VDC provided to the CSB from the mains power supply. Measure the voltage at TP28. Measured voltage should be +24VDC.
TP46 MOD	Modulation	Oscilloscope	Used to verify output modulation signal supplied by the CSB to the nozzle. With inkjet running, measure the signal at TP38. The following picture shows a good signal. 

Table 9-12: CSB Test Points

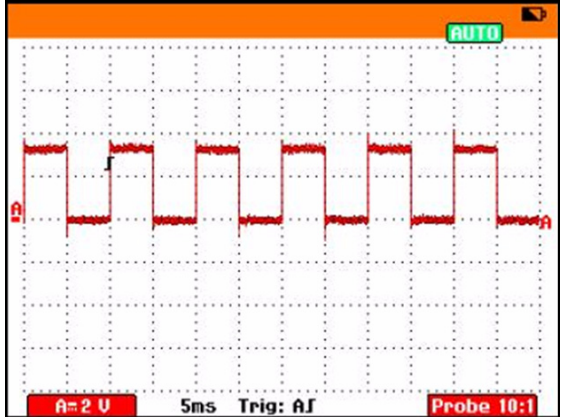
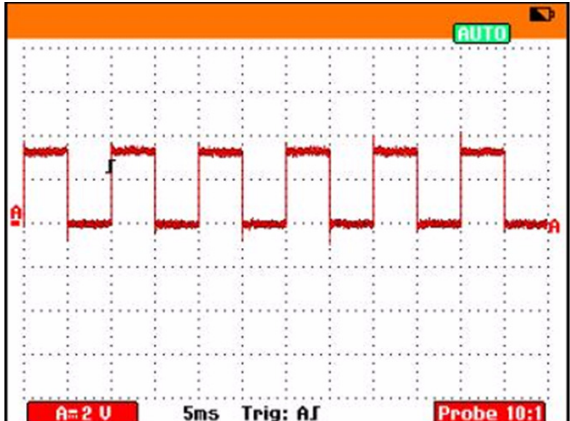
Test Point	Name	Test Equipment Required	Measurement
TP92	Level probe common	Voltmeter or Oscilloscope	Used to verify the common electrical drive signal in the CORE (mixer tank) level detection circuit. - If a voltmeter is used, the voltage should read 1.6 VDC. - If an oscilloscope is used, a good signal will look like the signal shown in the following figure. 
TP88	Level probe 0 (mixer tank high)	Voltmeter or Oscilloscope	Used to confirm whether the high sensor in the mixer tank module is covered or uncovered. - If a voltmeter is used and the sensor is covered, a voltage of 1.6 VDC indicates that the sensor is uncovered. - A voltage < 0.7 VDC indicates that the sensor is covered. - If an oscilloscope is used, the following signal indicates that the sensor is uncovered. 

Table 9-13: CSB Test Points

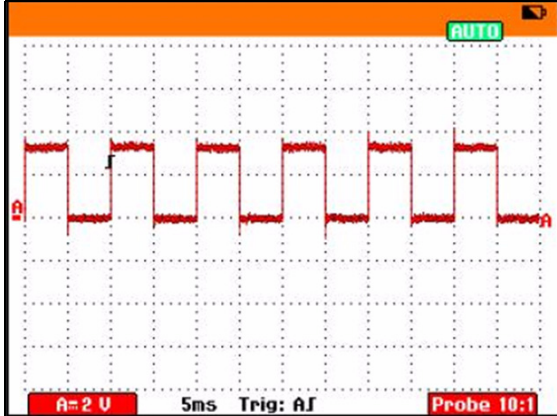
Test Point	Name	Test Equipment Required	Measurement
TP93	Level probe 1 (mixer tank middle)	Voltmeter or Oscilloscope	Used to confirm whether the middle sensor in the mixer tank module is covered or uncovered. - If a voltmeter is used and the sensor is covered, a voltage of 1.6 VDC indicates that the sensor is uncovered. - A voltage < 0.7 VDC indicates that the sensor is covered. - If an oscilloscope is used, the following signal indicates that the sensor is uncovered. 
TP94	Level probe 2 (mixer tank low)	Voltmeter or Oscilloscope	Used to confirm whether the low sensor in the mixer tank is covered or uncovered. - If a voltmeter is used and the sensor is covered, a voltage of 1.6 VDC indicates that the sensor is uncovered. - A voltage < 0.7 VDC indicates that the sensor is covered. - If an oscilloscope is used, the following signal indicates that the sensor is uncovered. 

Table 9-13: CSB Test Points (Continued)

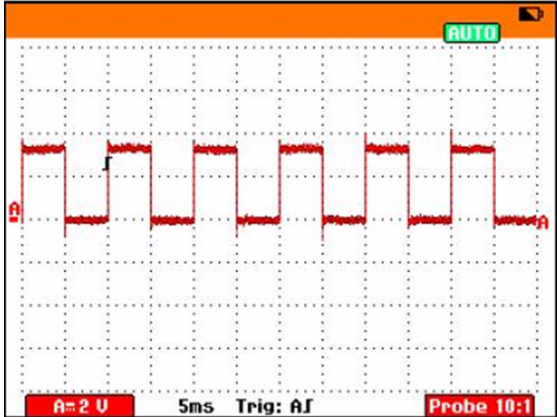
Test Point	Name	Test Equipment Required	Measurement
TP97	Gutter sense	Voltmeter or Oscilloscope	Used to confirm the status of the gutter detect circuit. • If a voltmeter is used and ink is present in the gutter, voltage should read < 0.7 VDC. • A voltage of 1.6 VDC indicates that the gutter detect chamber is empty. • If an oscilloscope is used, the following signal indicates that the gutter detect chamber is empty. 
TP101	Ink pressure	Voltmeter	Used to verify the electrical output of the pressure transducer that monitors the ink pump output in the core. 1 bar = 0.8 VDC.
TP103 VPWR	Vacuum	Voltmeter	Used to verify the electrical output of the pressure transducer that monitors the vacuum in the make-up addition system in the core.

Table 9-13: CSB Test Points (Continued)

Test Point	Name	Test Equipment Required	Measurement
CHG (TP55)	Charge Amplifier	Oscilloscope	Use the oscilloscope to measure the signal at TP51. When the ink stream is ON, and the printer is not printing, the following signal indicates that the charge amplifier circuit is functioning properly.

Table 9-14: CSB Test Points

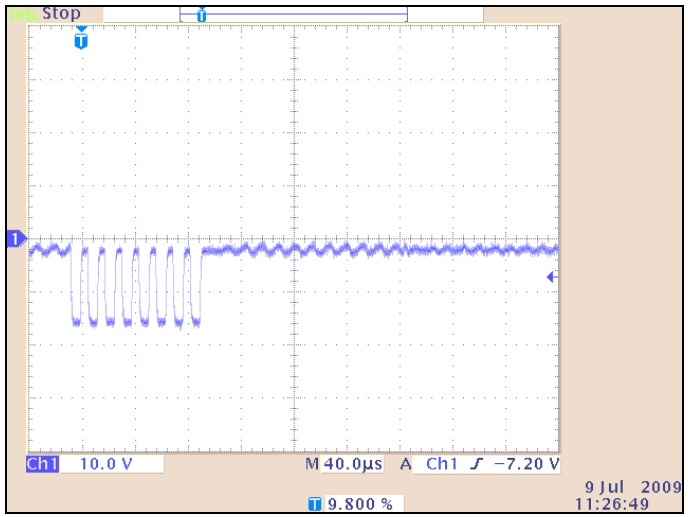
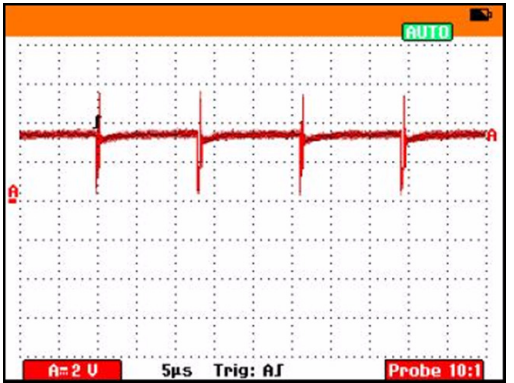
Test Point	Name	Test Equipment Required	Measurement
 The oscilloscope screen shows a blue waveform on a grid. The top left corner has a green 'Stop' button. The bottom status bar displays 'Ch1 10.0 V', 'M 40.0µs', 'A Ch1', and 'f -7.20 V'. A blue cursor is positioned at the top of the waveform. The date and time '9 Jul 2009 11:26:49' are in the bottom right corner.			
HEADT (TP39)	Printhead Temperature	Voltmeter	Use the voltmeter to measure the signal at TP53. This represents the analog output of the printhead temperature sensor. 0.055 VDC = 1° Celsius.
INKT (TP42)	Ink temperature	Voltmeter	Use the voltmeter to measure the signal at TP54. This represents the analog output of the core temperature sensor. 0.055 VDC = 1° Celsius.
TP41	41Strobe	Oscilloscope	Use the oscilloscope to measure the signal at TP55. This represents the digital signal used to drive the printhead strobe LED. A good signal will look as follows.  The oscilloscope screen shows a red waveform on a grid. The top right corner has a green 'AUTO' button. The bottom status bar displays 'A=2 U', '5µs', 'Trig: Af', and 'Probe 10:1'.

Table 9-14: CSB Test Points (Continued)

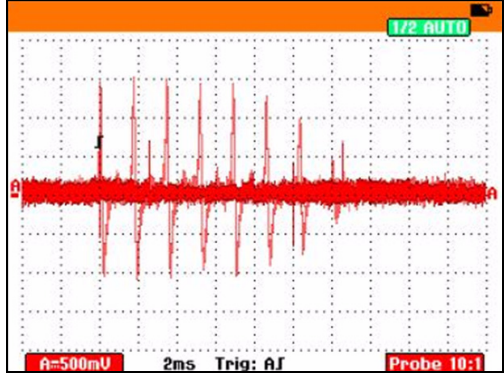
Test Point	Name	Test Equipment Required	Measurement
TP40	Printhead cover	Voltmeter	Use the voltmeter to measure the signal at TP56. • If the printhead cover is removed, the measured voltage should be 3.3 VDC. • If the printhead cover is fitted, the measured voltage should be < 0.5 VDC.
PHA (TP89)	Phasing	Oscilloscope	Use the oscilloscope to measure the signal at TP57. This represents the analog signal being detected by the first TOF sensor in the printhead. A good signal will look as follows. 

Table 9-14: CSB Test Points (Continued)

Test Point	Name	Test Equipment Required	Measurement
3V3 (TP71)	3.3 VDC	Voltmeter	Used to verify the output of the 3.3 VDC voltage regulator (chip U54) on the CSB. Measure the voltage at TP62. Measured voltage should be 3.3 VDC.
TP62	Photocell two	Voltmeter	Used to determine Active state of photocell #2 (Reverse Print Input). Block the photocell with a product and measure the voltage at TP17. • A reading > 3 VDC indicates that the photocell is ACTIVE HIGH. • A reading < 0.5VDC indicates that the photocell is ACTIVE LOW.
TP106	Valve common monitor	Voltmeter	Monitor during start-up sequence or valve test procedure to verify application of hit voltage by valve driver circuit.

Table 9-15: CSB Test Points

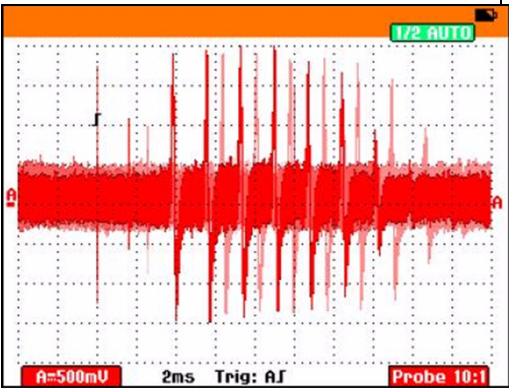
Test Point	Name	Test Equipment Required	Measurement
TP87 VEL	Velocity	Oscilloscope	Use the oscilloscope to measure the signal at TP69. This represents the analog signal is being detected by the second TOF sensor in the printhead. A good signal will look as follows. 

Table 9-15: CSB Test Points (Continued)

Test Point	Name	Test Equipment Required	Measurement
+15 V	+15 VDC	Voltmeter	Used to verify if unfiltered +15 VDC is being provided to the CSB from the Mains power supply. Measure the voltage at +15 V. Measured voltage should be +15 VDC.
-15 V	-15 VDC	Voltmeter	Used to verify if unfiltered -15 VDC is provided to the CSB from the Mains power supply. Measure the voltage at -15V. Measured voltage should be -15 VDC.
TP104	Hit drive	Voltmeter	Used to verify that the valve drive circuit is being supplied with the correct electronic signal to enable the application of hit voltage when solenoid valves are actuated. Measure the voltage at TP2. • If the measured voltage is +3.3 VDC, the hit circuit is turned off (this is the steady-state condition). • If measured voltage is 0 VDC, the hit circuit is turned on (indicating that valves are being opened).

Table 9-16: CSB Test Points

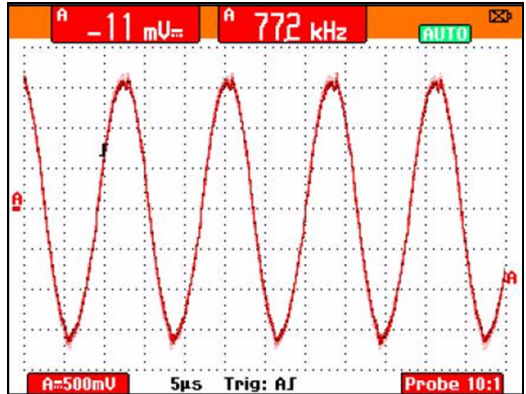
Test Point	Name	Test Equipment Required	Measurement
TP36 VREFP	Voltage Reference Positive	Voltmeter	Used to measure the positive reference voltage provided to the DAC on the CSB. Measure the voltage at TP76. Measured voltage should be +4.08 VDC.
VREFNT P57	Voltage reference negative	Voltmeter	Used to measure the negative reference voltage provided to the DAC on the CSB. Measure the voltage at VREFN. Measured voltage should be -4.08 VDC.
MODVT P44	Modulation voltage monitor	Voltmeter	The modulation voltage monitor is an output of the modulation circuit used by the CSB to track modulation voltage. Measure the voltage at MODV. Measured voltage should be less than 4 VDC, and should change as the automodulation routine is performed.
TP45	Modulation Power Amplifier Transformer Primary	Oscilloscope	TP45 allows the measuring of the modulation sine wave and is located on the opposite side of the transformer. Measure the signal at TP45 with an oscilloscope. A good signal will look as follows: 
TP38	EHT Setpoint	Voltmeter	Allows the measurement of the signal being provided to the EHT circuit to establish the EHT voltage. Measure the voltage at TP24. 1. A voltage between 0 and +24 VDC will be measured, depending upon the current character height. 2. Vary the character height and check to make sure that the voltage at TP24 varies accordingly.

Table 9-16: CSB Test Points (Continued)

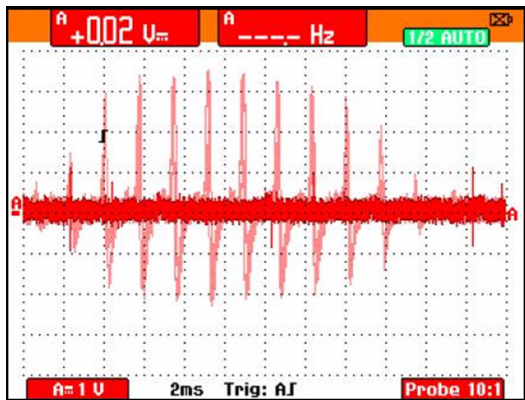
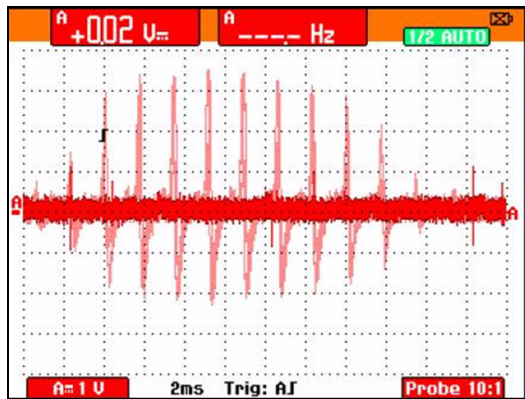
Test Point	Name	Test Equipment Required	Measurement
TP 52 MODI	Modulation Current Monitor	Voltmeter	The modulation current monitor is an output of the modulation circuit used by the CSB to track modulation current. Measure the voltage at TP40. Measured voltage should be less than 4 VDC, and will change as the automodulation routine is performed.
TP90	Phasing Signal Amplified	Oscilloscope	This test point allows the monitoring of the processed phasing signal downstream of chip U63 on the CSB. Measure the signal at TP58 with an oscilloscope. A good signal will look like the following figure. 
TP91	Velocity Signal Amplified	Oscilloscope	This test point allows the monitoring of the processed velocity signal downstream of chip U63 on the CSB. Measure the signal at TP59 with an oscilloscope. A good signal will look like the signal shown in the following figure. 

Table 9-16: CSB Test Points (Continued)

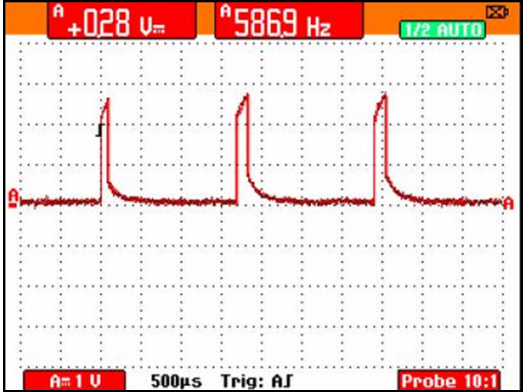
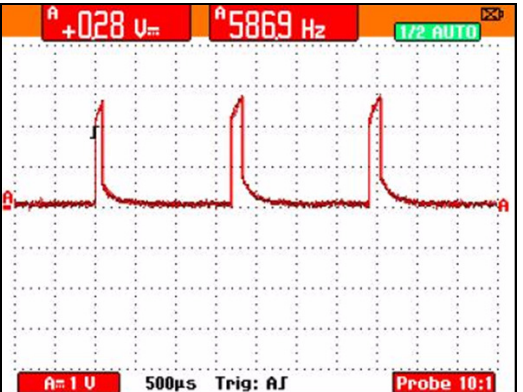
Test Point	Name	Test Equipment Required	Measurement
TP95	Phasing trigger 'A'	Oscilloscope	This test point allows the monitoring of the trigger signal supplied by chip U61 to the FPGA. Measure the signal at TP60 with an oscilloscope. A good signal will look like the following figure. 
TP96	Phasing trigger 'B'	Oscilloscope	This test point allows the monitoring of the trigger signal supplied by chip U61 to the FPGA. Measure the signal at TP96 with an oscilloscope. A good signal looks like the following figure. 
TP53 HV	Charge Supply Positive	Voltmeter	Used to verify the positive output voltage supplied by the charge amplifier supply to the charge amplifier. Measure the voltage at TP50. Measured voltage should be +300 VDC.
TP37	Power Supply for EHT Driver	Voltmeter	+28VDC

Table 9-16: CSB Test Points (Continued)

Test Point	Name	Test Equipment Required	Measurement
TP32	3.3V to LCD	Voltmeter	Used to verify the voltage supplied to the LCD. Measured voltage should be +3.3VDC.
TP33	VEE +28V to LCD	Voltmeter	Used to verify the voltage supplied to the LCD. Measured voltage should be +28VDC.

Table 9-17: CPU Test Points

How to Clear a Clogged Nozzle

To clear the blockage in the nozzle, you require to do the procedures described in this section. A blockage in the nozzle may be present if the printhead engine module is showing signs of a misaligned ink stream/ loss of ink stream.

Perform a Nozzle Flush

Do the following tasks to perform a nozzle flush:

- 1 Remove the printhead cover screw that fastens the printhead cover to the printhead chassis and remove the printhead cover (see Figure 4-22 on page 4-17).
- 2 Support the printhead in a suitable stand and place a container underneath to collect any extra solvent.
- 3 Make sure the container is connected to the electrical ground.
- 4 Initiate *Nozzle Flush* (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Auto Prime > 01 Prime > 02 Prime).

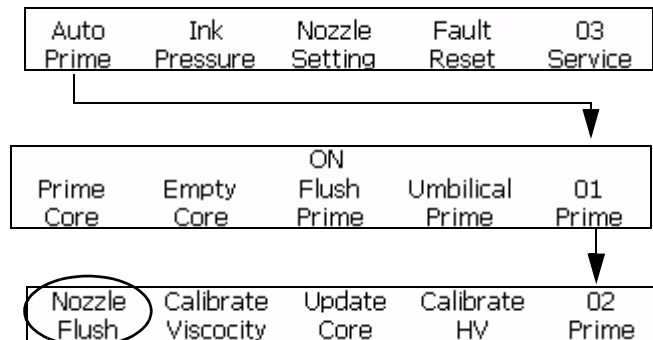


Figure 9-8: Nozzle Flush

- 5 Press the *Enter* key. The nozzle orifice must be washed with washdown to clear any blockages while nozzle flush is running.
- 6 If the problem is not resolved even after five nozzle flushes, perform a clean start (refer to “Perform a Clean Start” on page 9-53).

Perform a Clean Start

For information on how to perform a clean start, refer to “Clean Stop and Clean Start the Printer” on page 4-21.

A clean start will clean the nozzle with a higher operating pressure.

You can perform the Clean Start procedure for three times. If the ink jet remains misaligned, perform system flush purge (refer to “Perform System Flush Purge (with Nozzle Attached)” on page 9-53).

Perform System Flush Purge (with Nozzle Attached)

Do the following tasks to perform a system flush purge with the nozzle attached:

- 1 Start Flush Prime (01 Edit > 02 Edit > 03 Edit > 04 Edit - Service Printer > 01 Service > 02 Service > 03 Service - Auto Prime > 01 Prime).



Figure 9-9: System Flush Purge

- 2 Allow the system flush purge to run completely. Do not stop the purge prematurely.
- 3 After system flush purge is completed, perform a clean start (refer to “Clean Stop and Clean Start the Printer” on page 4-21).

- 4 If the ink stream is still misaligned, clean the nozzle with a syringe and cleaning liquid (refer to the next procedure).

Clean the Nozzle with a Syringe and Cleaning Liquid

Do the following tasks to clean the nozzle with a syringe and cleaning liquid:

- 1 Turn off the mains power switch of the printer.
- 2 Turn off the AC power supply to the printer.
- 3 Disconnect the mains power cord from the electrical outlet.
- 4 Remove the printhead cover screw that fastens the printhead cover to the printhead chassis and remove the printhead cover (see Figure 4-22 on page 4-17).



Caution

Always wear a set of rubber gloves before disconnecting the nozzle tubing manifold. This helps to prevent nozzle clogs.

- 5 Remove the M2 x 6 socket-head-cap screw that attaches the front tubing manifold to the printhead valve module (see Figure 4-23 on page 4-18).
- 6 Use a syringe to flush the nozzle with 50 ml of cleaning liquid:
 - a. Inject the solvent through the feed side of the manifold. You must see a stream of cleaning liquid that flows out of the nozzle.
 - b. Use an empty syringe to push air through the nozzle. You can repeat the process any number of times as it does not add any fluid to the system.
- 7 If the ink stream is still misaligned, contact Videojet Technologies Inc. Refer to Chapter , “Support and Training” for Videojet contact information.

Note: When the nozzle misalignment clears after a clean start, the ink stream goes out of alignment in the gutter and the system identifies a drop in target pressure that can result in the system erroneously detecting low viscosity fluid. So, it is critical that the nozzle orifice and charge electrode are inspected to verify that a slight misalignment is not present.

How to Correct Loss of Modulation

Do the following tasks if a printhead engine module indicates loss of modulation:

- 1 Perform the following procedures as a slightly misaligned ink stream or partially clogged orifice can cause bad drop formation that causes bad modulation:
 - a. "Perform a Nozzle Flush" on page 9-52
 - b. "Perform a Clean Start" on page 9-53.
- 2 Use a magnifying loupe to inspect the ink stream for drop formation. You must perform this task to make sure that the nozzle creates the droplets.
- 3 If the ink stream remains solid, check the modulation wire (small black wire) on the printhead engine module to make sure that it is not damaged and is correctly connected.
- 4 If you see a broken modulation wire, contact Videojet Technologies Inc. to change the printhead engine module.
- 5 If the modulation wire is not broken, use an oscilloscope to measure the MOD test point on the CSB to make sure that the on-board power supplies the modulation voltage.
- 6 Another possible cause of a loss of modulation is a bad connection under the printhead engine module itself.
 - a. Turn off the printer.
 - b. Remove the printhead engine module and test for continuity between the CSB and the printhead circuit.
 - c. If the continuity is good, install again the printhead engine module.
 - d. Restart the printer.

Illustrated Parts List

10

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 sub assemblies and other separate parts.

Illustrations

Table 10-1 on page 10-2 shows the symbols used to indicate the different levels of main assemblies in a printer, and the sub assemblies under the main assembly.

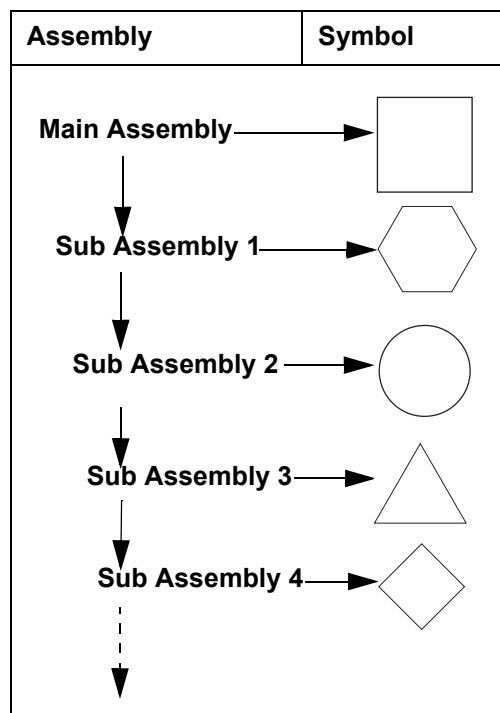


Table 10-1: Symbols Representation - Assemblies

..... ➤ Indicates further explosion.

Alphabets

- An alphabet is assigned to the main assemblies of a printer and each sub assembly under the main assembly. See Figure 10-1 on page 10-3.

For example: If A, B, C and D identify the main assemblies of a printer, then the alphabets E, F, and so on identify sub assemblies 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 they look like the numbers 1 and 0.

Numbers

A natural number (1,2,3....) is assigned to the stand alone parts (in ascending order) through out the breakdown of main assemblies. See Figure 10-1.

Note: The numbers assigned to main assemblies can be used only for one time.

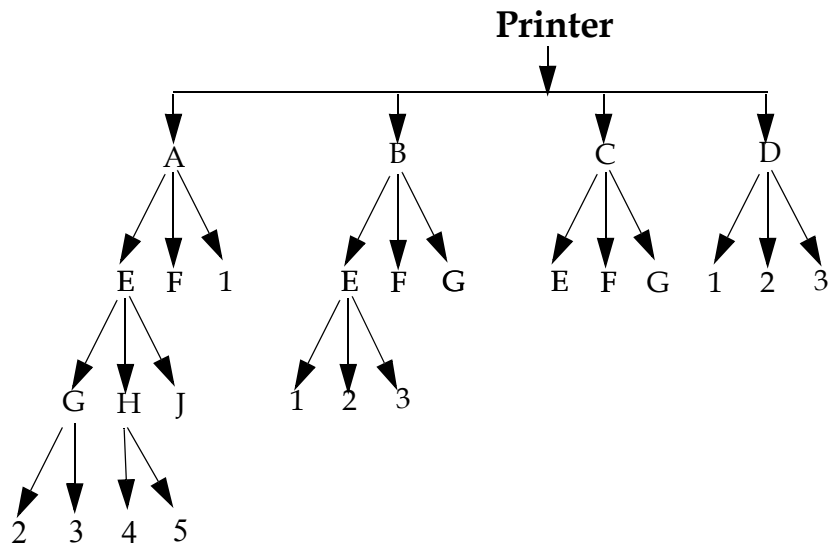


Figure 10-1: Graphical Representation of the Different Subassemblies and Parts

Tables

Figure 10-2 describes the styles used to show the explosion of the main assemblies in parts lists.

	Item Number	P/N	Description	Qty
Main Assembly →	A			
	3			
Subassembly 1 →	E			
	4			
Subassembly 2 →	H			
	5			
Parts under the Subassembly OR Stand-alone Part →	6			
	J			
	7			
	8			

Figure 10-2: 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 part number of item 9 in this table.

Note: This screw is a part of Core Module.

Note: This item can be ordered separately.

Videojet 1610 Excel Printer

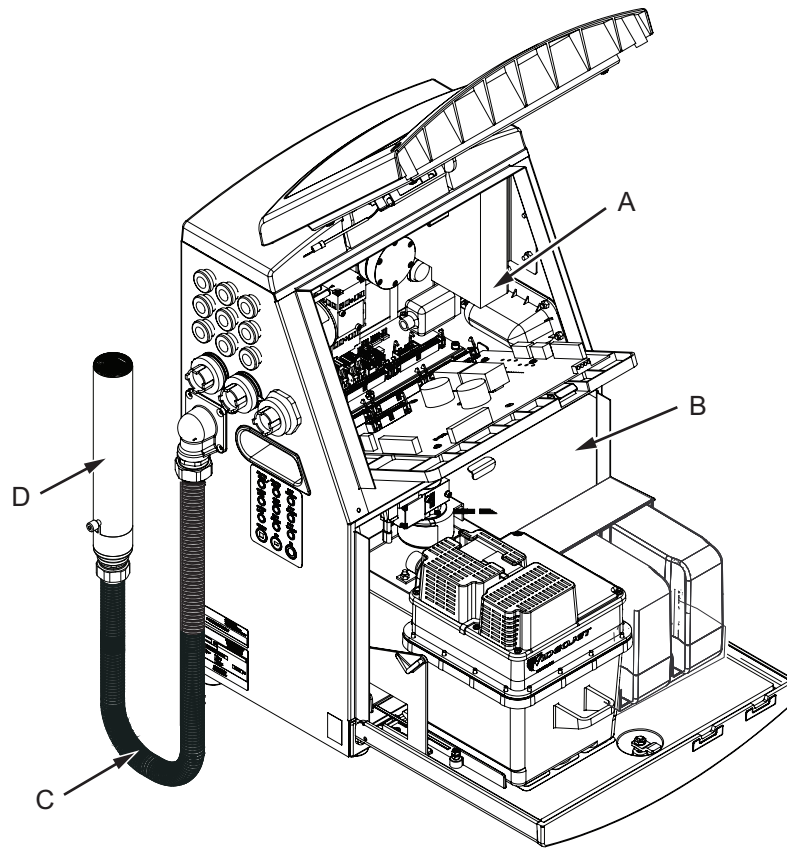


Figure 10-3: Main Parts of the Printer

Table 10-2 shows the sub assemblies of the printer.

Item	Descriptions
A	Electronics Compartment
B	Ink Compartment
C	Umbilical
D	Printhead

Table 10-2: Videojet 1610 Excel Printer Assemblies

Electronics Compartment

A

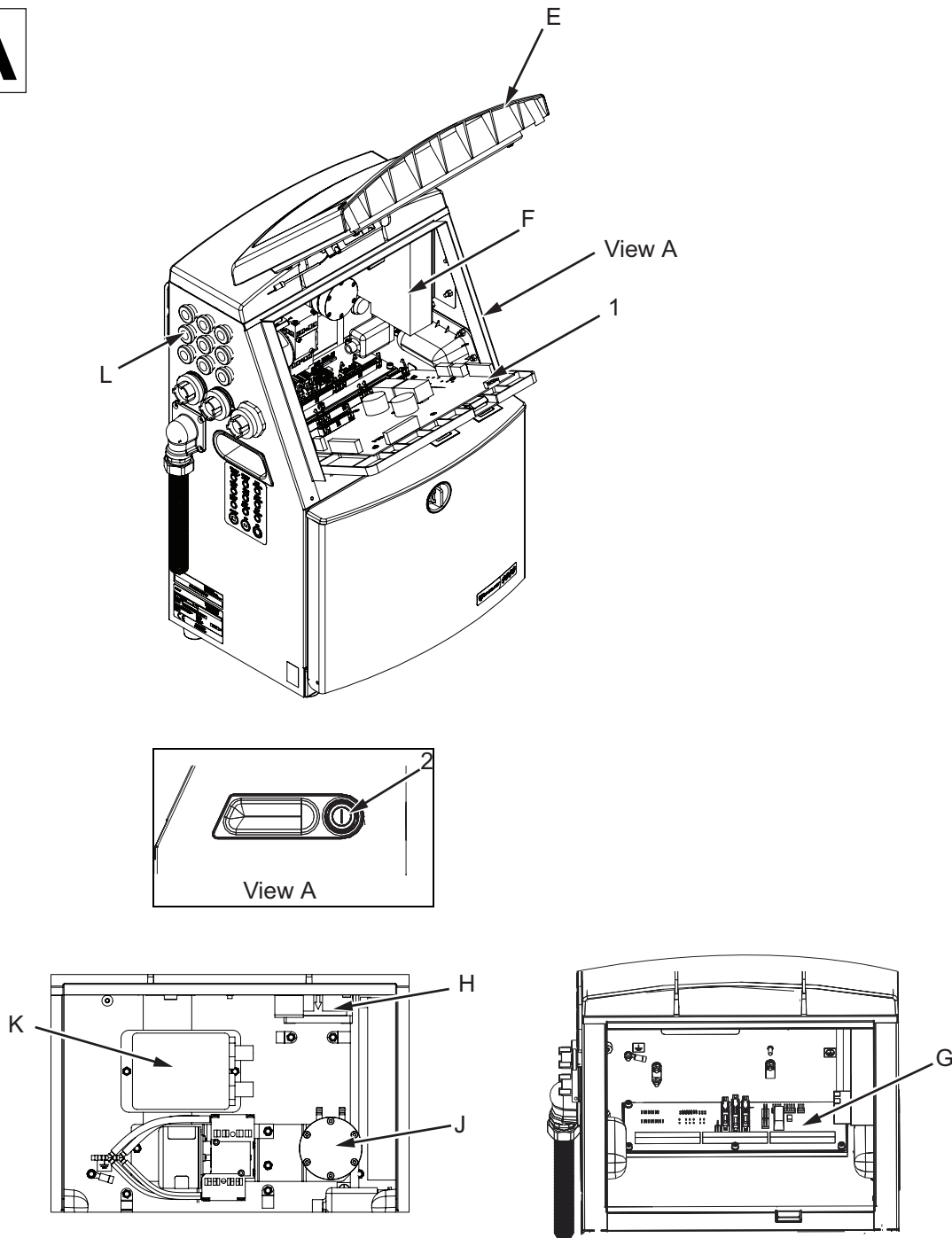


Figure 10-4: Electronics Compartment

Control System Board (CSB) with Back Plate

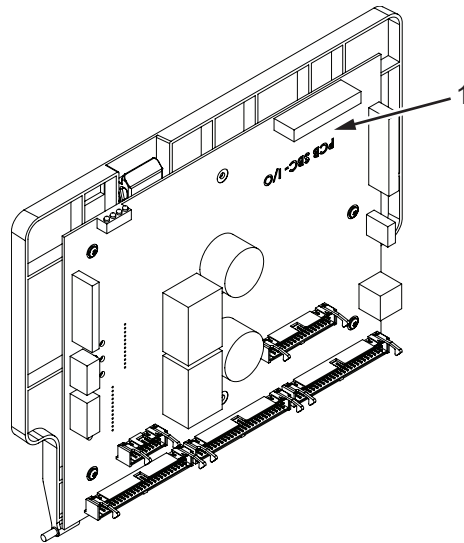


Figure 10-5: Control System Board Assembly with Back Plate

Power Switch

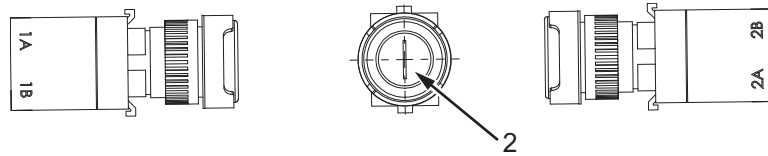


Figure 10-6: Power Switch

Electronics Door Assembly

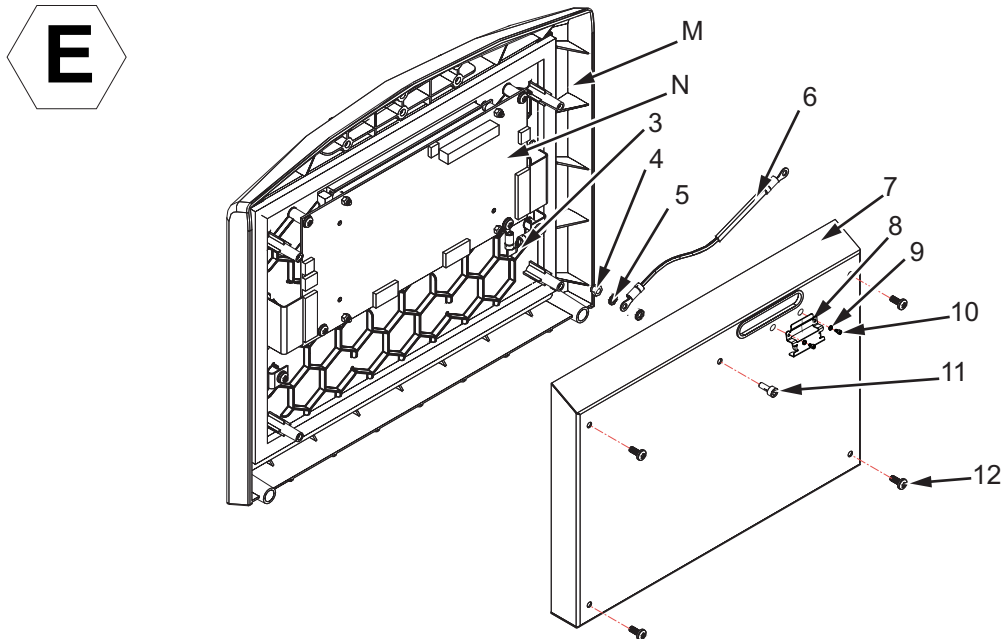


Figure 10-7: Electronics Door Assembly

Display Door

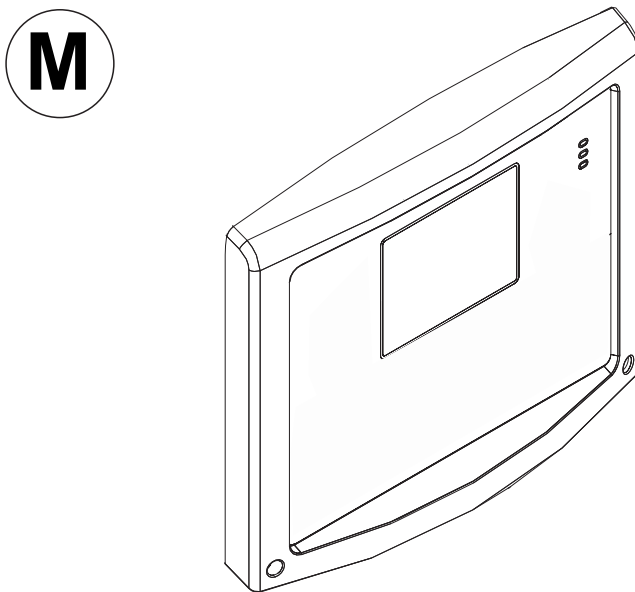


Figure 10-8: Display Door

LCD and FIB Assembly

N

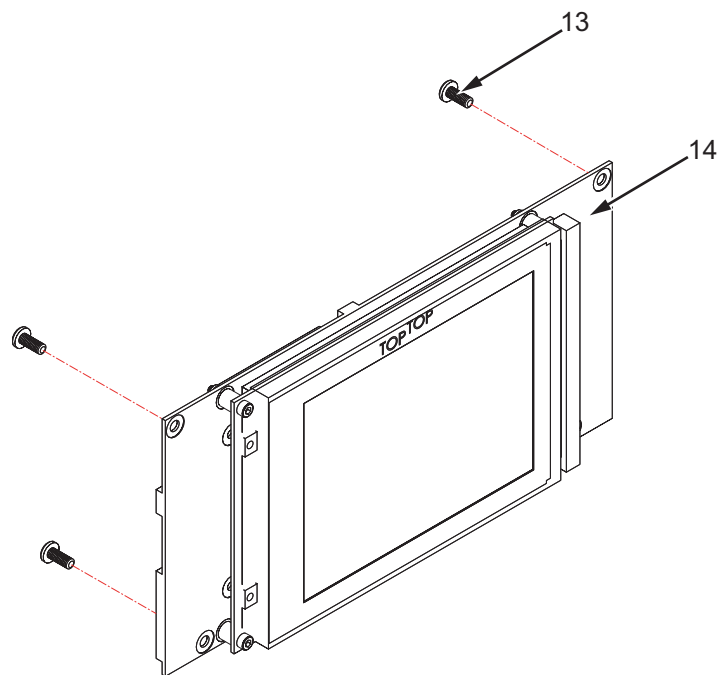


Figure 10-9: LCD and FIB

Power Supply Unit Assembly

F

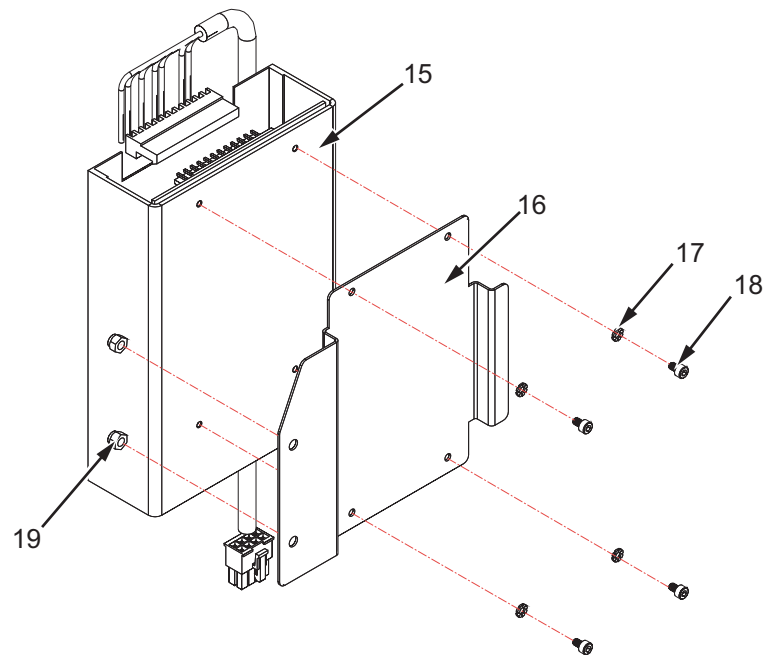


Figure 10-10: Power Supply Unit Assembly

Printer Interface Board Assembly (PIB)

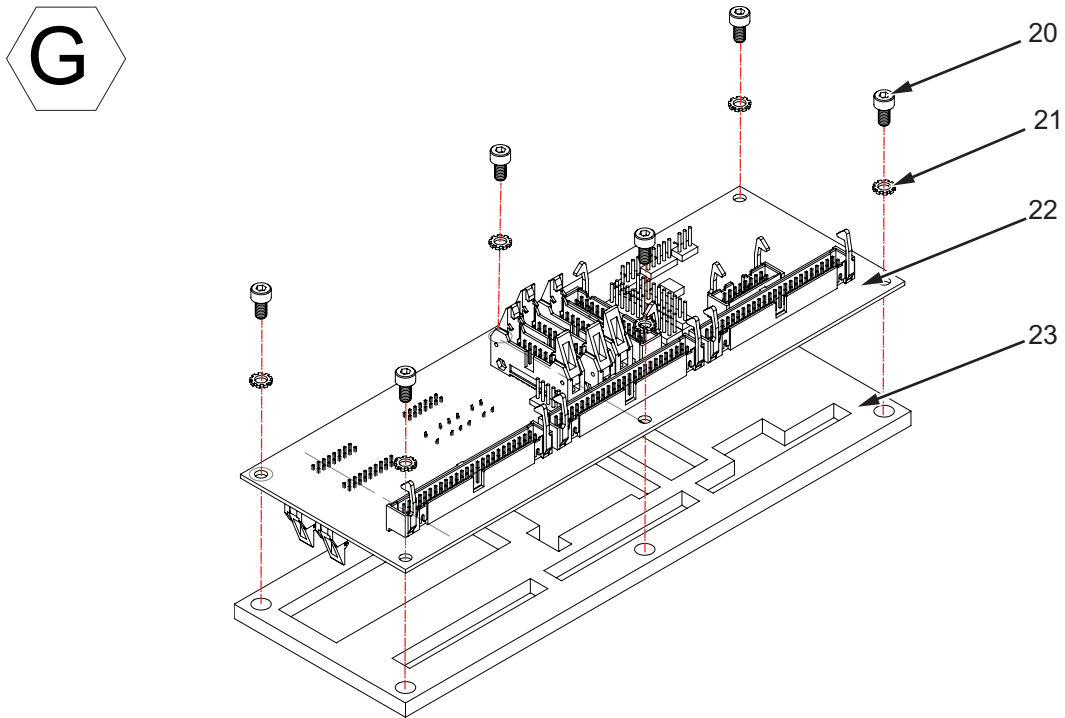


Figure 10-11: Printer Interface Board Assembly

Electronics Fan Assembly

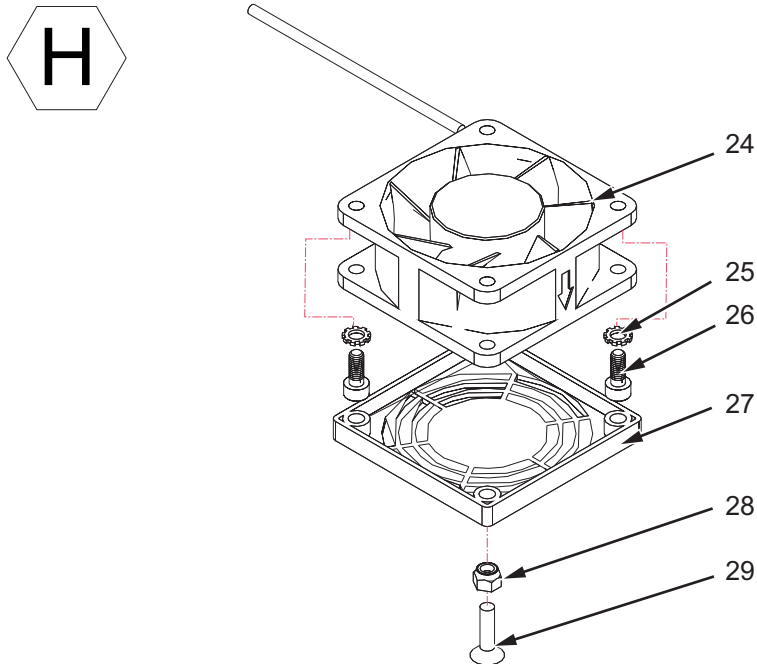


Figure 10-12: Electronics Fan Assembly

Positive Air Pump Assembly

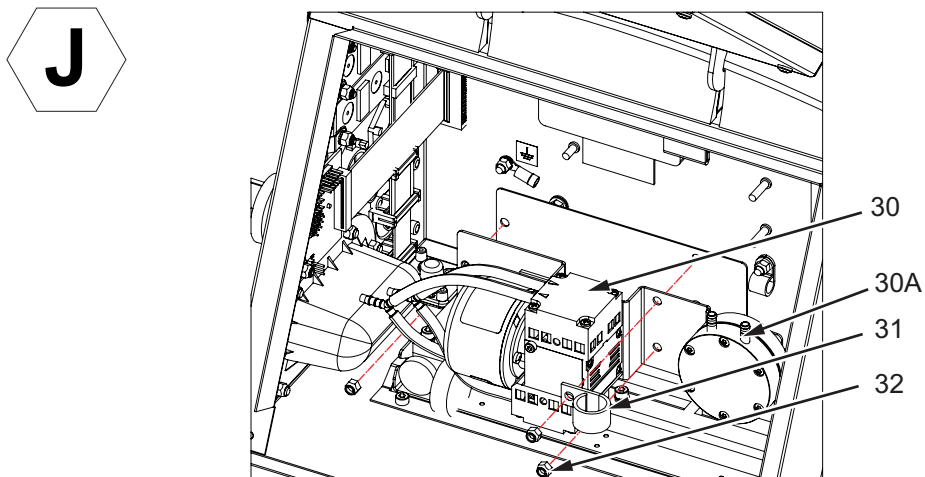


Figure 10-13: Positive Air Pump Assembly

EHT Module

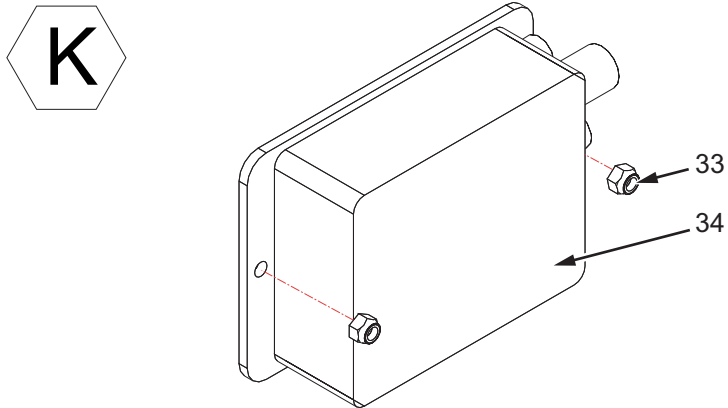


Figure 10-14: EHT Module

Connector Panel

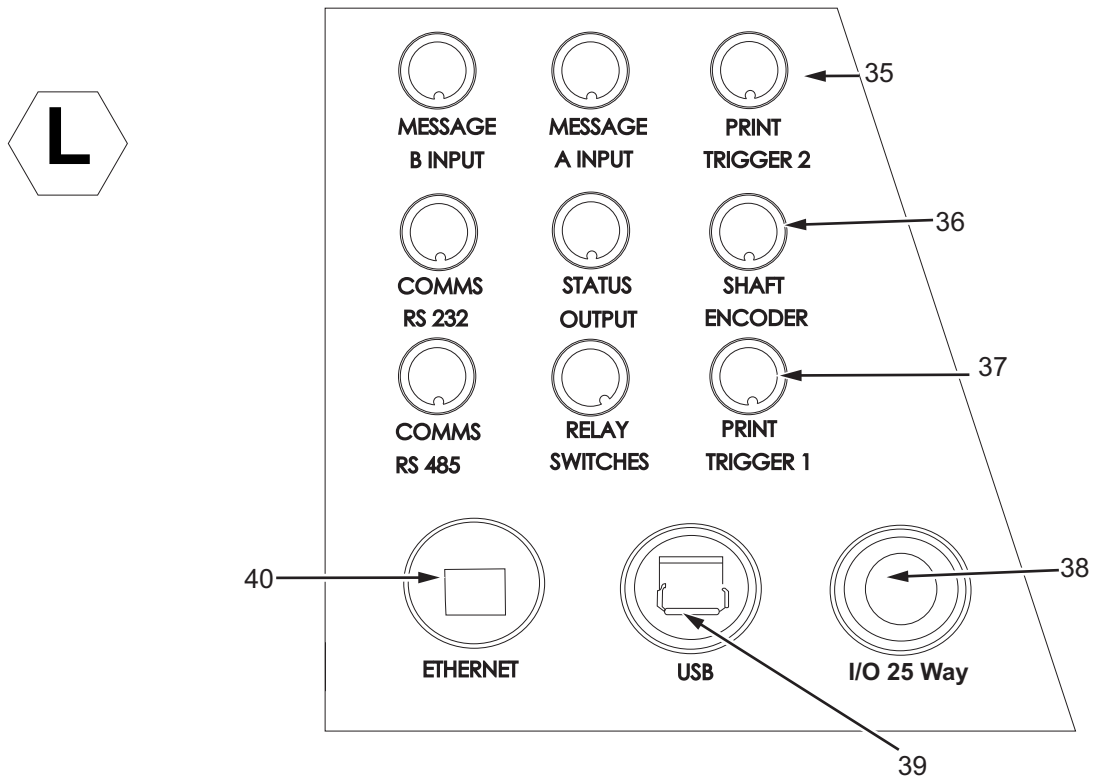


Figure 10-15: Connector Panel

PCB Assemblies

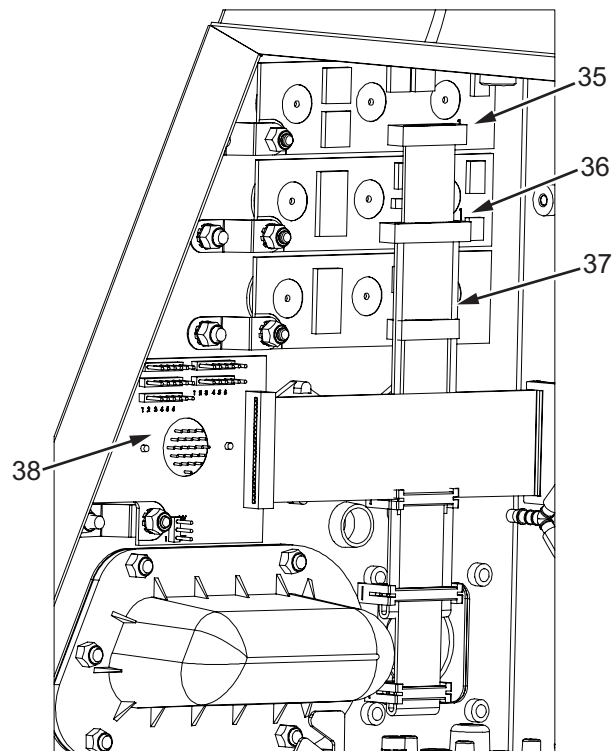


Figure 10-16: PCB 1,2,3 and 4 Assembly

Item Number	P/N	Description	Qty
A		Electronics Compartment	
1	SP399394E	Control System Board (CSB) with Back Plate	1
2	219041	Power Switch	1
E		Electronics Door Assembly	
3		Membrane Ground Wire	1
4		M4 Nyloc Nut	1
5		M4 ET Washer	2
6		Display Ground Wire	1
7		Display Rear Cover	1
8		Display Ribbon Connector Clamp	1

Table 10-3: Electronics Compartment

Item Number	P/N	Description	Qty
9		M4 ET Washer	2
10		M4 x 8 Cap-head Screw	2
11		M4 x 10 Cap-head Screw	1
12		K40 x 10 Pan-head Torx Screw	4
M		Display Door with Keypad (See Table 10-4 on page 10-15 for part numbers of different languages)	
N	399091	Liquid Crystal Display and Front Panel Interface Board Assembly	
13		K40 x 10 Pan-head Torx Screw	4
14		LCD and FIB Assembly	1
F	399077	Power Supply Unit (PSU) with Mount	
15		PSU	1
16		PSU Mounting Plate	1
17		M3 ET Washer	4
18		M3 x 5 Cap-head Screw	4
19		M4 Nyloc Nut	2
G	399473	Printer Interface Board (PIB) Assembly	
20		M4 x 8 Cap-head Screw	6
21		M4 ET Washer	6
22		PIB	1
23		PIB Gasket	1
H	399079	Electronics Fan Assembly	
24		Fan, 60 mm	1
25		M4 ET Washer	2
26		M4 x 10 Cap-head Screw	2
27		Finger guard, 60 mm	1
28		M4 Nyloc Nut	2
29		M4 x 16 Counter Sunk Screw	2

Table 10-3: Electronics Compartment (Continued)

Item Number	P/N	Description	Qty
J	SP399399	Double Headed Air Pump Kit	
30		Positive Air Pump	1
30A		Dampener	1
31		P-Clip	1
32		M4 Nyloc Nut	3
K	399081	EHT Module Assembly	
33		M4 Nyloc Nut	2
34		EHT Module	1
L		Connector Panel	
35	SP500096	PCB 3 Assembly	1
36	SP500097	PCB 2 Assembly	1
37	SP500095	PCB 1 Assembly	1
38	399475	PCB 4 Assembly	1
39	399084	USB Connector	1
40	399083	Ethernet Connector	1

Table 10-3: Electronics Compartment (Continued)

Display Door with Keypad in Different Languages

Part Number	Display Door with Keypad (EXCEL)	Country
399101	Display door with keypad European Excel	French, German, Spanish, Portuguese (Brazilian), Italian, Dutch, Norwegian, Finnish, Swedish, Danish, Portuguese (Portugal), Swiss (German), Swiss (French), Swiss (Italian), Spanish (CALA)
399102	Display door with keypad Turkish Excel	Turkish
399103	Display door with keypad Korean Excel	Korean
399105	Display door with keypad Polish Excel	Polish

Table 10-4: Display Door with Keypad - Excel

Part Number	Display Door with Keypad (EXCEL)	Country
399106	Display door with keypad Katakana Excel	Japanese
399107	Display door with keypad US Excel	English (US), Chinese (Simplified), English (UK and Ireland), Indian (English), Philippines (English)
399108	Display door with keypad Chinese Excel	Chinese (Traditional)
399109	Display door with keypad Russian Excel	Russian
399110	Display door with keypad Greek Excel	Greek
399111	Display door with keypad Bulgarian Excel	Bulgarian
399112	Display door with keypad Czech Excel	Czech, Hungarian
399113	Display door with keypad Arabic Excel	Arabic
399114	Display door with keypad Hebrew Excel	Hebrew
399541	Display door with keypad Thai Excel	Thai
399543	Display door w/ keypad Vietnamese	Vietnamese

Table 10-4: Display Door with Keypad - Excel

Ink Compartment

B

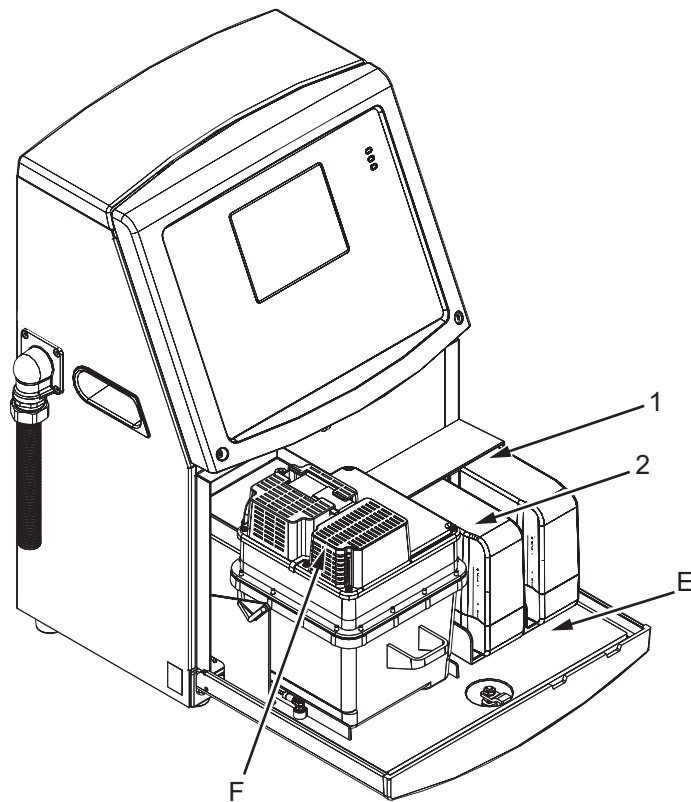


Figure 10-17: Ink System

Ink Cartridge

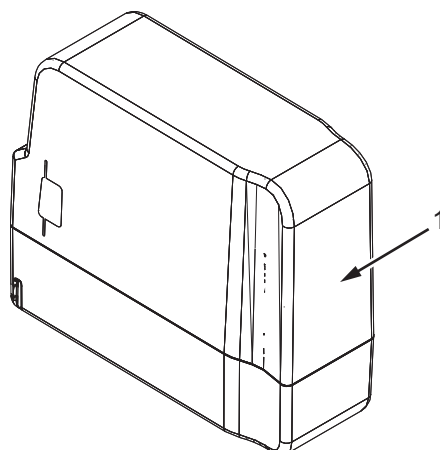


Figure 10-18: Ink Cartridge

Make-up Cartridge

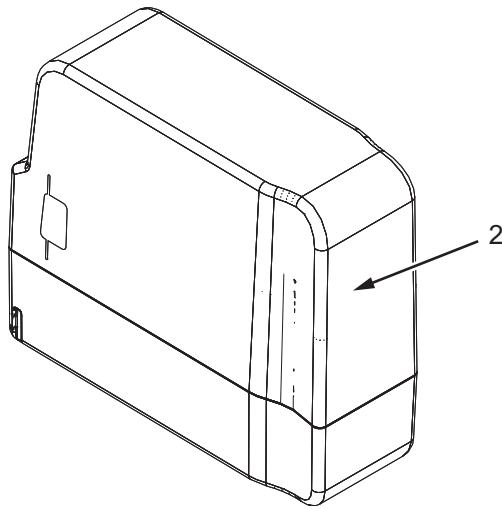


Figure 10-19: Make-up Cartridge

Ink Door Assembly

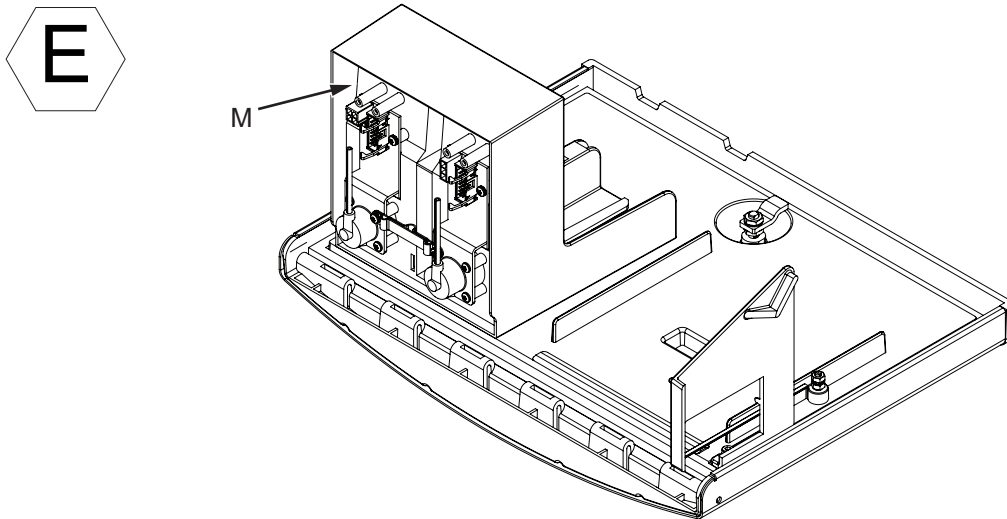


Figure 10-20: Ink Door Assembly

Septum Assembly

M

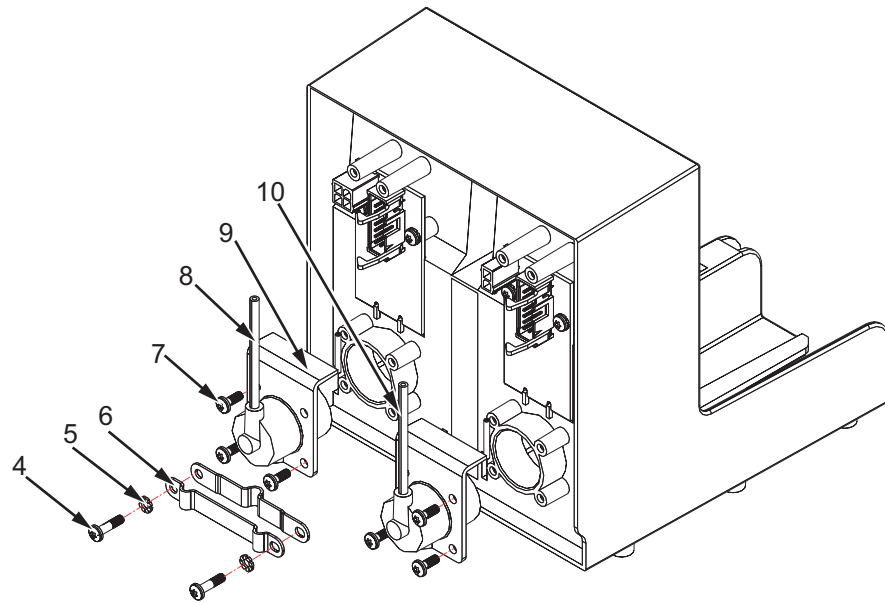


Figure 10-21: Septum Assembly

Ink Core Module Assembly

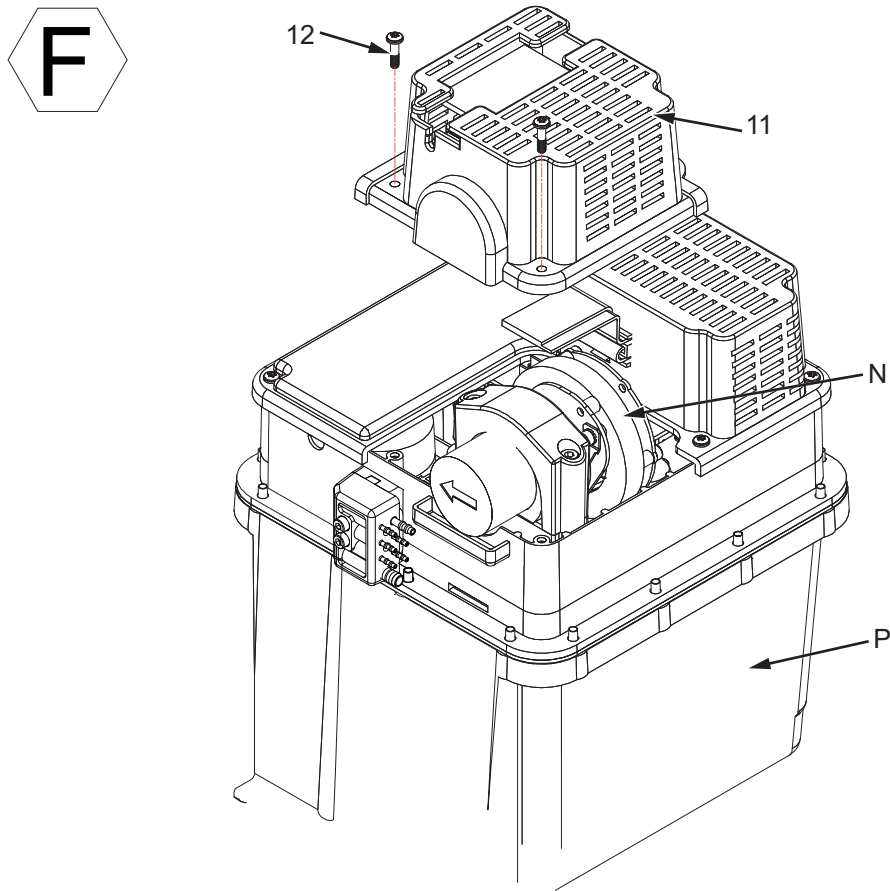


Figure 10-22: Core Module

Ink Core Pump

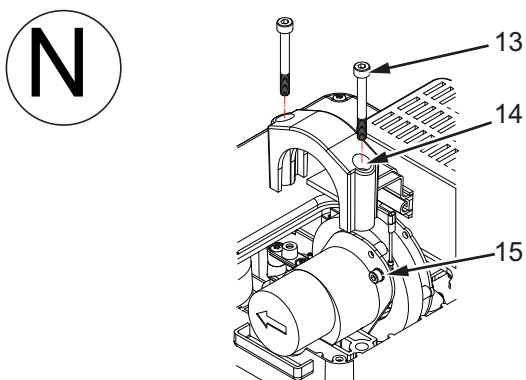


Figure 10-23: Ink Core Pump Assembly

P

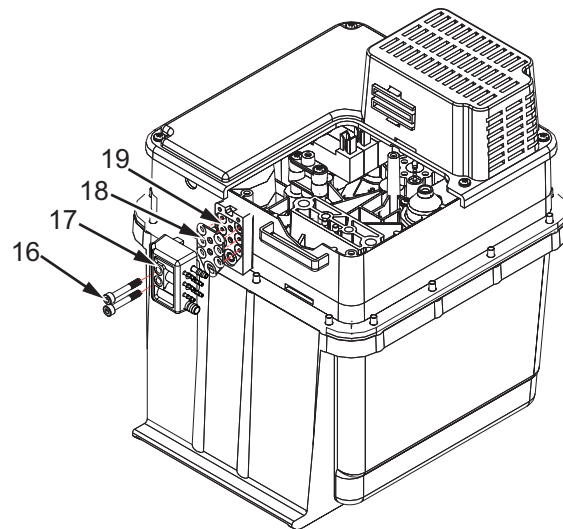


Figure 10-24: Ink Core Module Without Pump

Gutter Pump Assembly

G

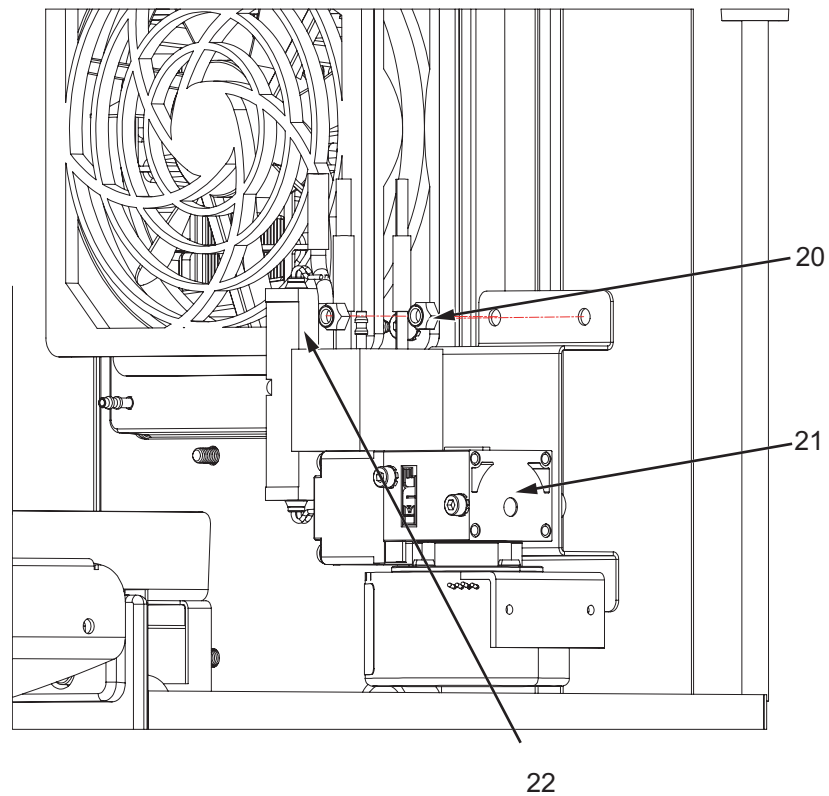


Figure 10-25: Gutter Pump Assembly

Ink System Fan

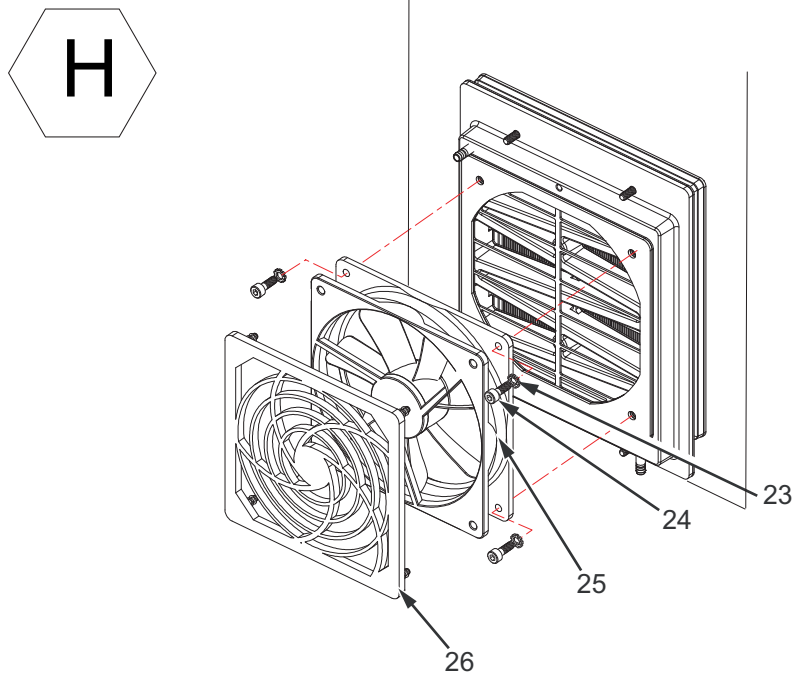


Figure 10-26: Ink System Fan Assembly

Condenser Assembly

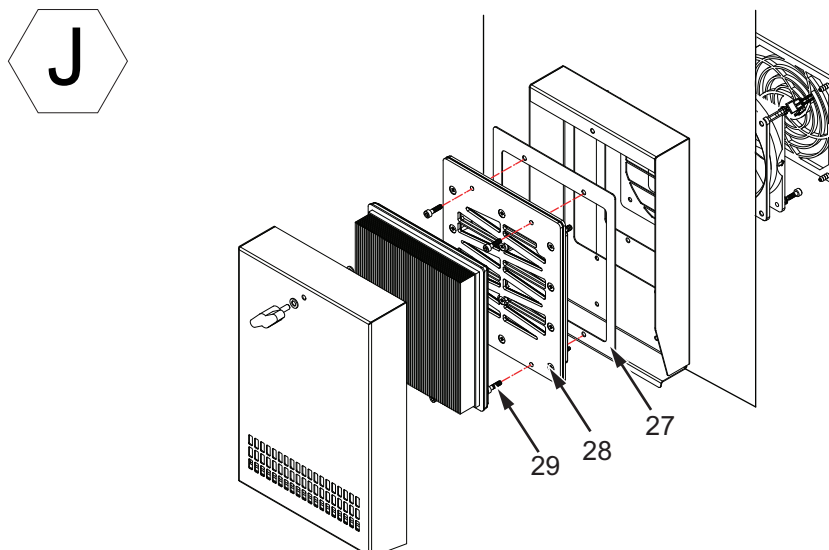


Figure 10-27: Condenser Assembly

Ink System Filter Assembly

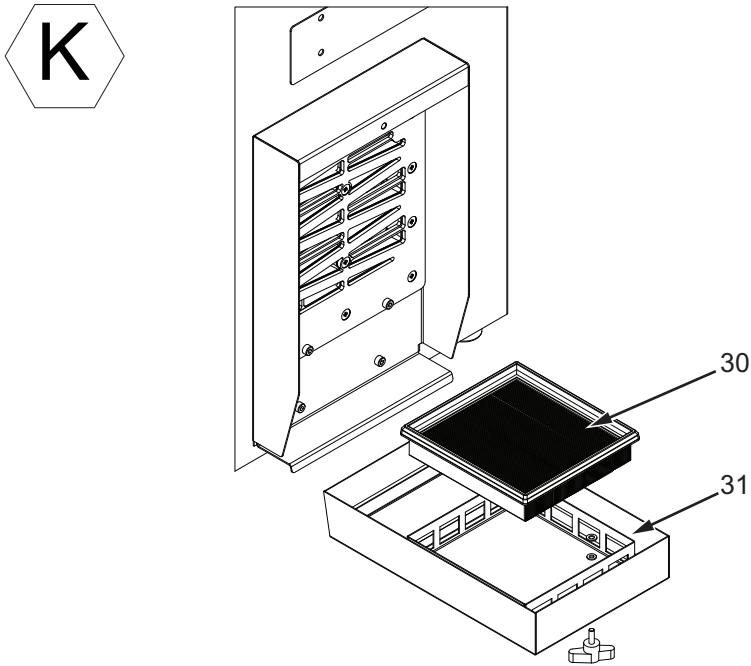


Figure 10-28: Ink System Filter Assembly - IP65

Floor Filter

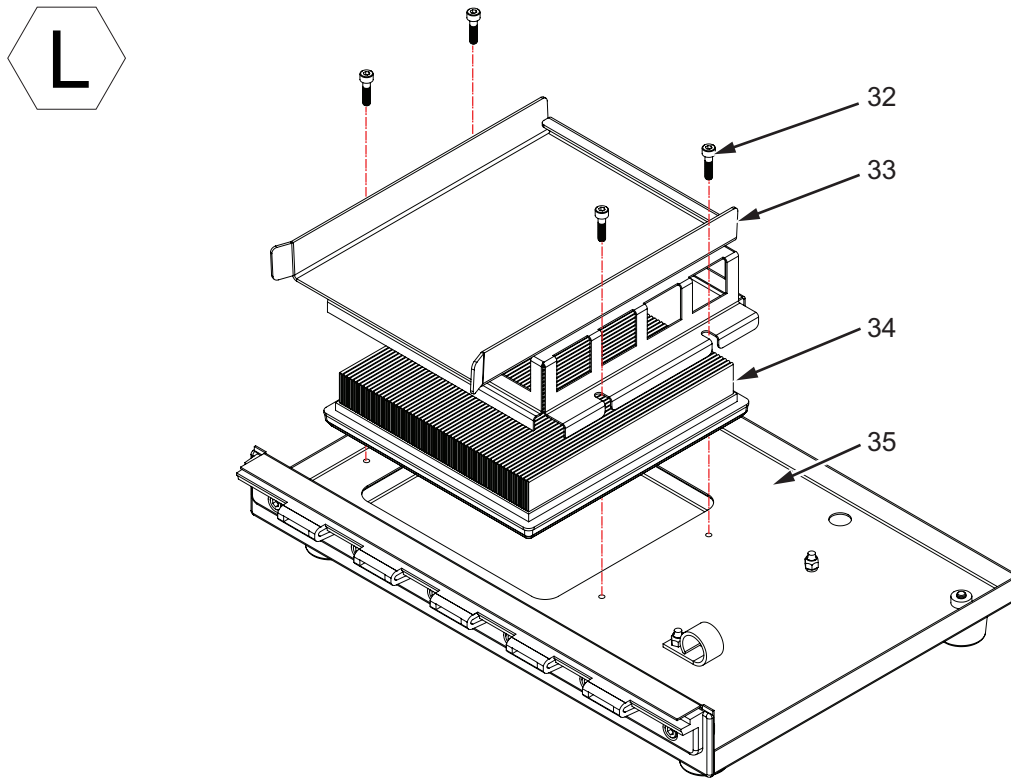


Figure 10-29: Floor Filter IP65

Item Number	P/N	Description	Qty
1		Ink Cartridge	1
2		Make-up Cartridge	1
E	399472	Ink Door Assembly	
3*		Hinge Pin	1
M	399073	Septum Assembly	
4		K30 x 12 Pan-head Torx Screw	2
5		M3 ET Washer	2
6		Tube and Ribbon Cable Clamp	1
7		K30 x 8 Pan-head Torx Screw	6
8		Black Stripe Tube (Ink System)	1

Table 10-5: Ink Compartment

Item Number	P/N	Description	Qty
9		Septum	2
10		Green Stripe Tube (Make-up System)	1
F	399340	Ink Core with Pump	
11		Ink Core Pump Cover	1
12		K30 x 12 Pan-head Torx Screw	2
N	399076	Ink Core Pump	
13		M4 x 35 Cap-head Screw	2
14		Saddle Clamp	1
15		Ink Core Pump	1
P	399341	Ink Core without Pump	
16		M3 x 7 Manifold Screw	2
17		Ink Core Manifold (Male)	1
18		Ink Core Manifold Gasket	1
19		Ink Core Manifold (Female)	1
G	399171	Gutter Pump Assembly	
20		M4 Nyloc Nut	2
21		Gutter Pump	1
22		3 Way Valve	1
H	399080	Ink System Fan Assembly	
23		M4 ET Washer	4
24		M4 x 12 Cap-head Screw	4
25		Fan	1
26		Fan Guard	1
J	399350	Condenser Assembly	
27		Condenser Body Gasket	1
28		Condenser 1610 Assembly	1
29		M4 x 16 Cap-head Screw	4

Table 10-5: Ink Compartment

Item Number	P/N	Description	Qty
K		Ink System Filter Assembly	
	399521	1610E Filter Kit Spares <i>Note: This kit has 8 filters (P/N 234502)</i>	
30	234502	Filter Element	1
31	399529	Filter Cover	1
L		Floor Filter Assembly	
32		M4 x 16 Cap-head Screw	4
33		Ink Core Support	1
34	234502	Filter Element	1
35		Drip Tray	1

Table 10-5: Ink Compartment

*- Items are not shown in the figure

Printhead

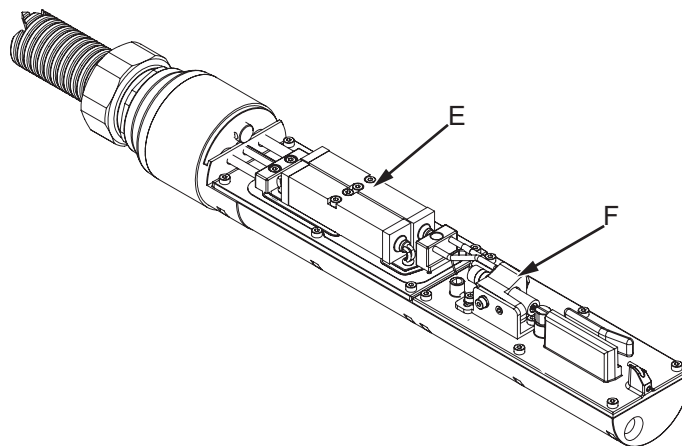
D


Figure 10-30: Printhead

Printhead Valve Module

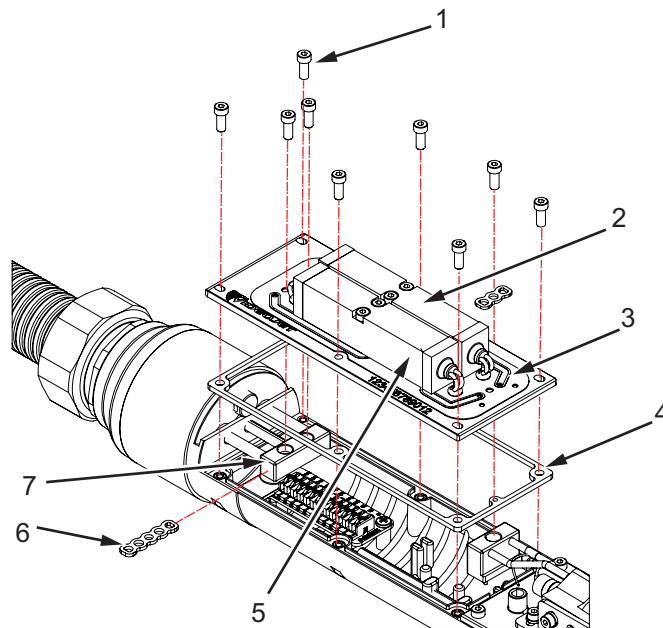


Figure 10-31: Printhead Valve Module

Printhead Engine

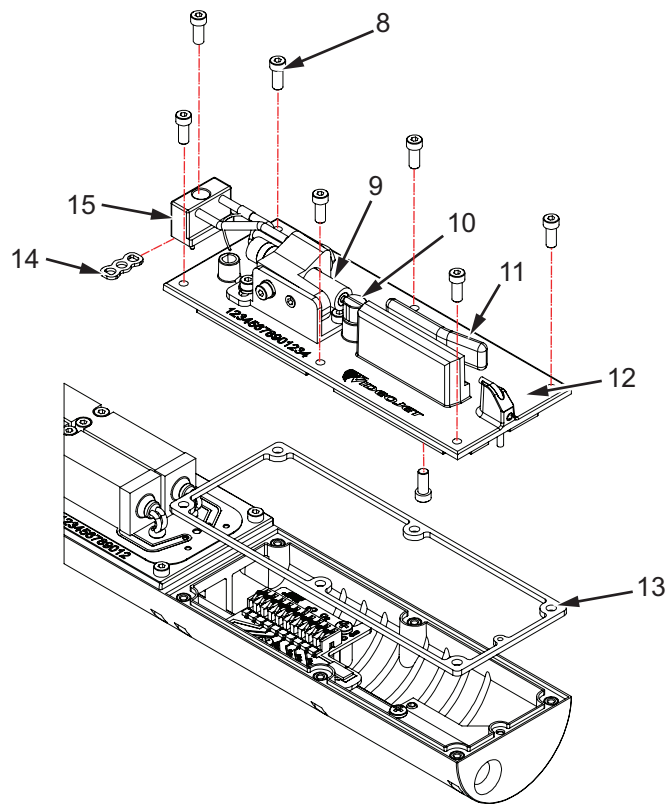


Figure 10-32: Printhead Engine

Item Number	P/N	Description	Qty
D		Printhead	
E	399181	Printhead Valve Module	
1		M2 x 6 Cap-head Screw	9
2		Gutter Valve	1
3		Printhead Valve Module Deck	1
4	Refer to Item 16	Printhead Valve Module Gasket	1
5		Feed Valve	1
6	Refer to Item 16	Rear Manifold Gasket	1
7		3 Way Manifold Assembly (Rear Tubing Manifold)	1

Table 10-6: Printhead Assembly

Item Number	P/N	Description	Qty
F	399422	Printhead Engine (60 micron)	
8		M2 x 6 Cap-head Screw	8
9		Nozzle Assembly	1
10		Charge Electrode	1
11		Deflector Plate	1
12		Printhead Engine Deck	1
13	Refer to Item 16	Printhead Engine Gasket	1
14	Refer to Item 16	Front Tubing Manifold Gasket	1
15		2 Way Manifold Assembly (Front Tubing Manifold)	1
16	399336	Printhead Gasket Kit	
		Gasket, Printhead	10
		Gasket, 3 way Manifold	10
		Gasket, 2 way Manifold	10
*		Connection Manifold Gasket	10
*		4.47 x 1.78 o-ring	10

Table 10-6: Printhead Assembly

*- Items are not shown in the figure

Cables

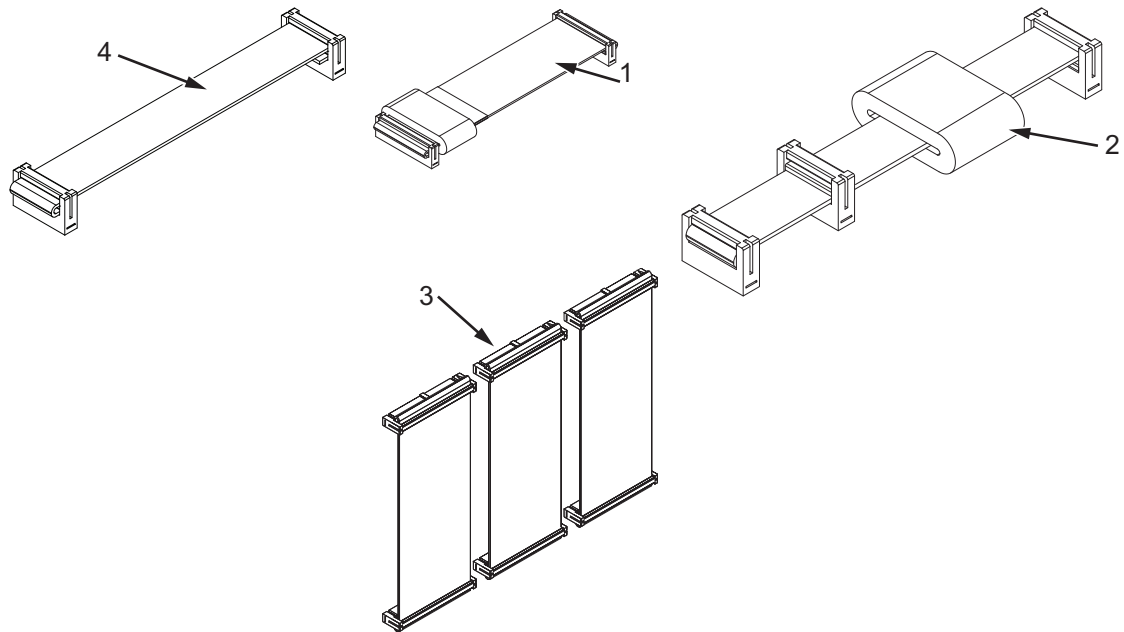


Figure 10-33: Cables

Item Number	P/N	Description	Qty
	399505	Cables Kit	
1		Ribbon Cable Assembly Display	1
2		Ribbon Cable Assembly Smart Chip and Pump 14 Way	1
3		50 Way Ribbon Cables	3
4		16 Way Ribbon Cable	1

Table 10-7: Cables

Optional Accessories

Beacon Kit

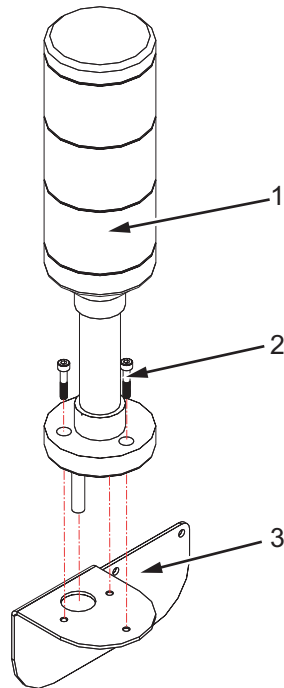


Figure 10-34: Beacon Kit

Dry Air Kit Assembly

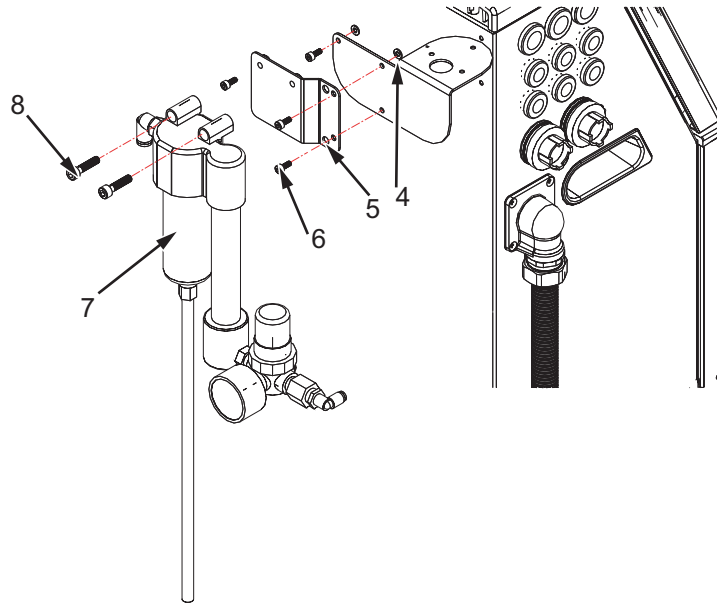


Figure 10-35: Dry Air Kit Assembly

Static Stand

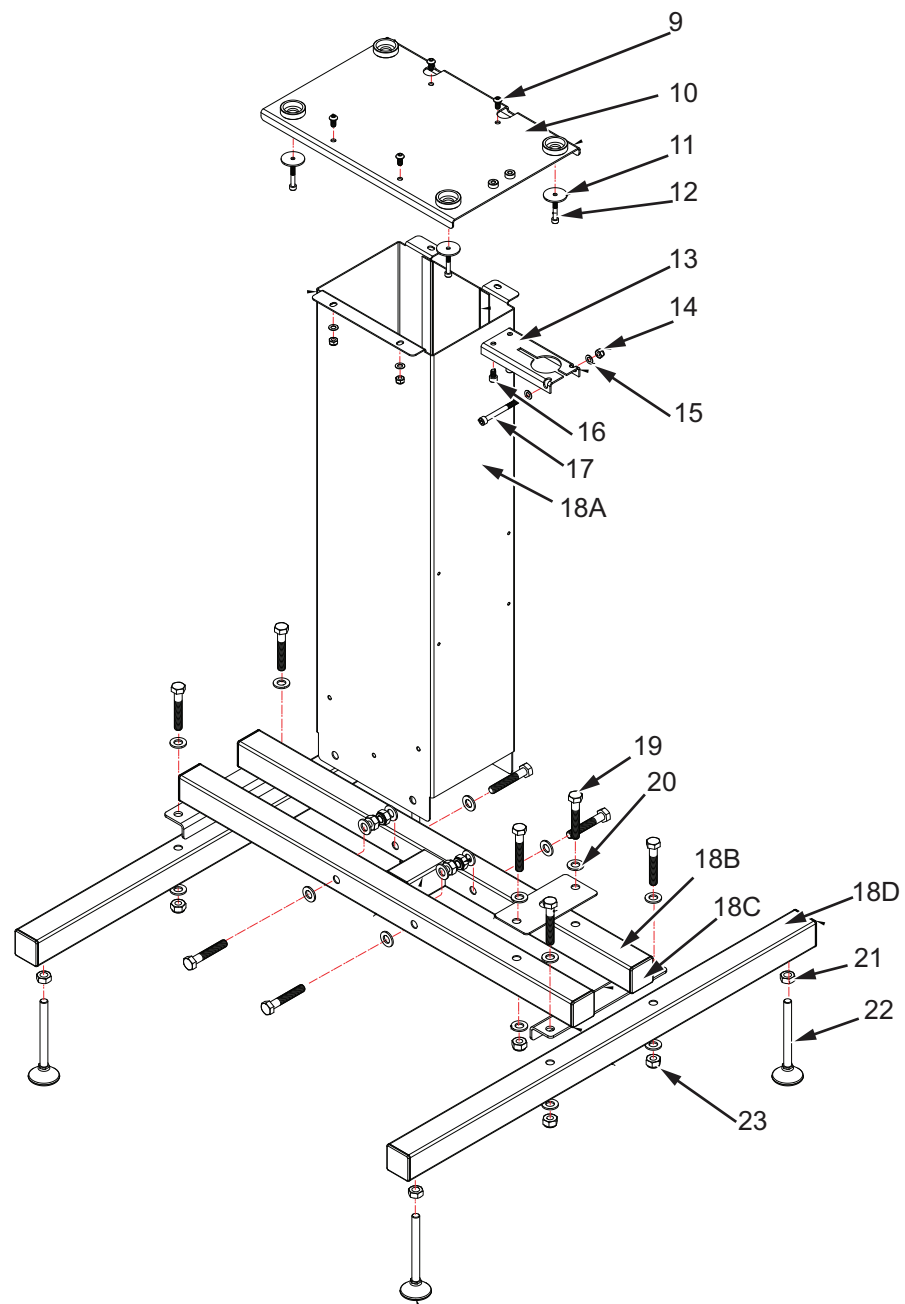


Figure 10-36: Static Stand

Note: You can use the adaptor plates with the existing printer stands.

Mobile Stand

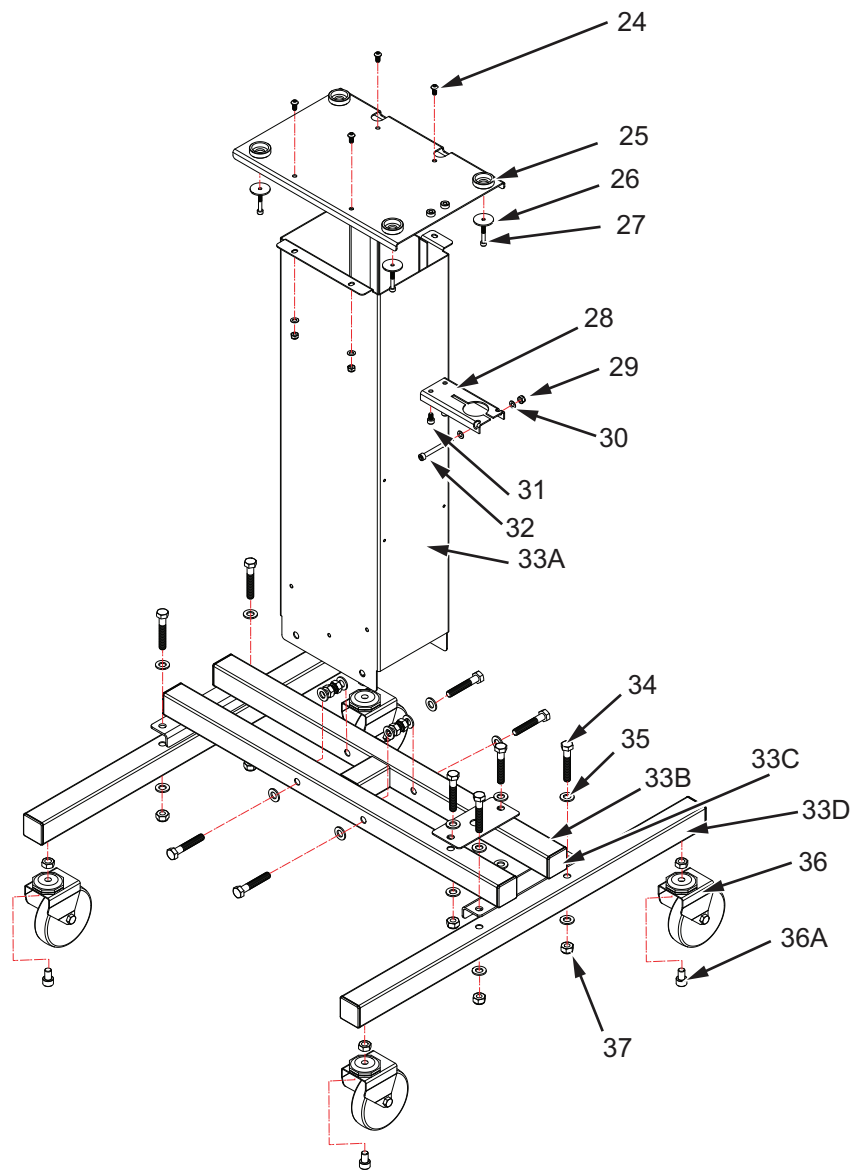


Figure 10-37: Mobile Stand

Note: You can use the adaptor plates with the existing printer stands.

Printhead Stand

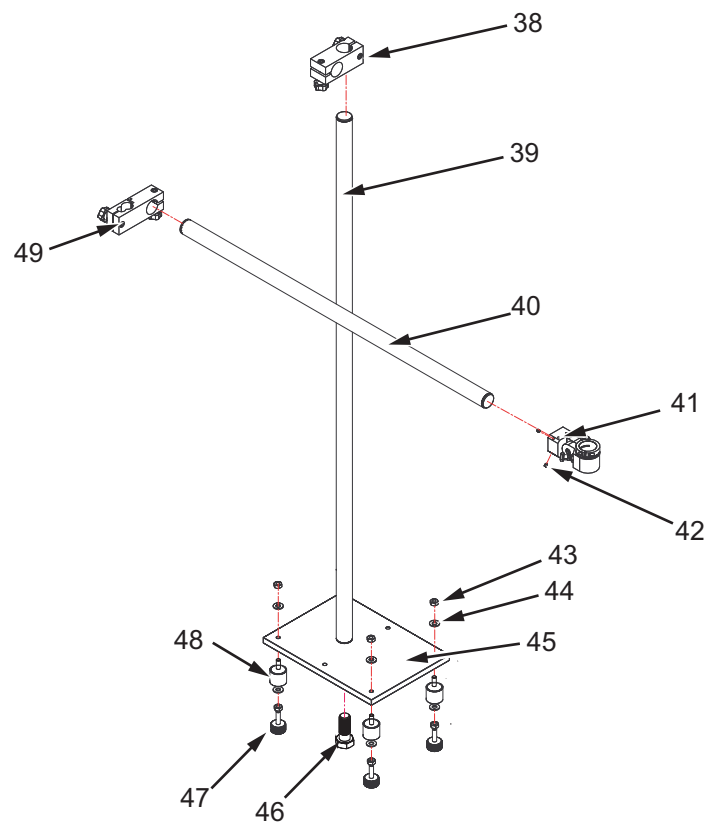


Figure 10-38: Printhead Stand

Printhead Holder

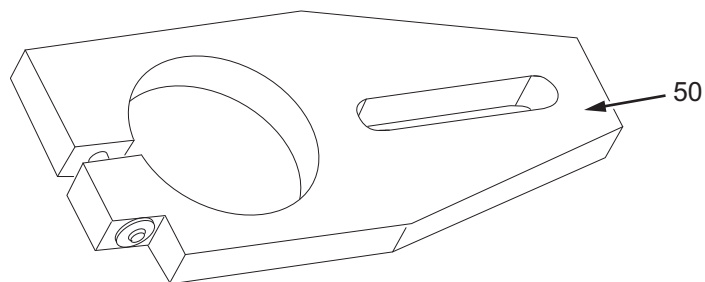


Figure 10-39: Printhead Photocell Holder - 8 mm

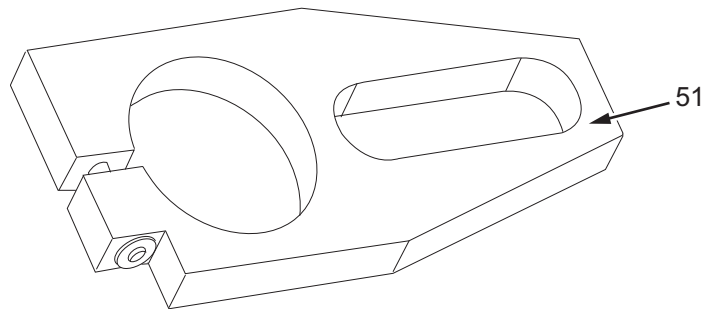


Figure 10-40: Printhead Photocell Holder - 18 mm

Mounts to Printhead Holder

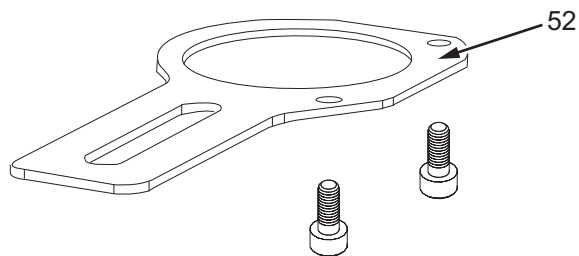


Figure 10-41: Mounts to Printhead Photocell Holder -8

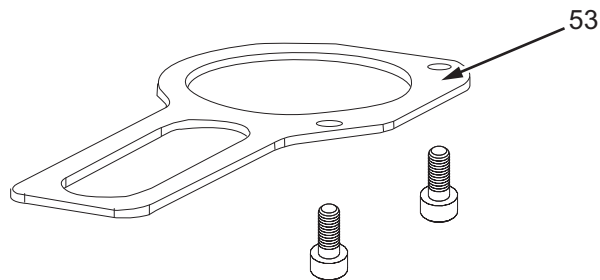


Figure 10-42: Mounts to Printhead Photocell Holder - 18mm

Wash Station Assembly

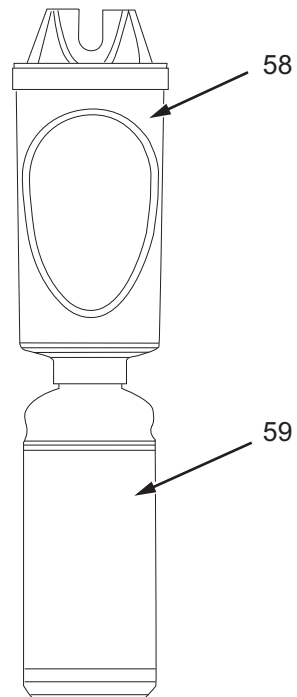


Figure 10-43: Wash Station Assembly

Shaft Encoder

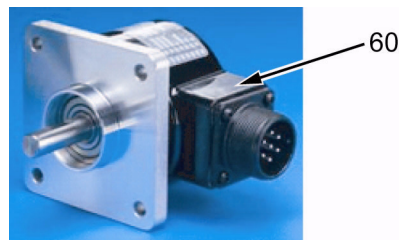


Figure 10-44: Shaft Encoder

Shaft Encoder Accessories

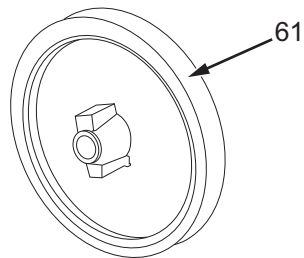


Figure 10-45: Circular Wheel

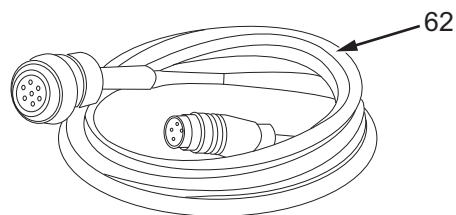


Figure 10-46: Shaft Cable

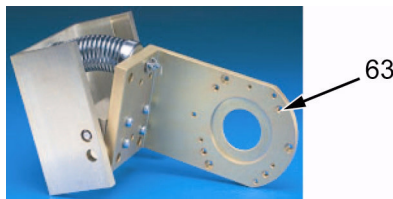


Figure 10-47: Spring Bracket

Product Detectors



Figure 10-48: Detector EZ

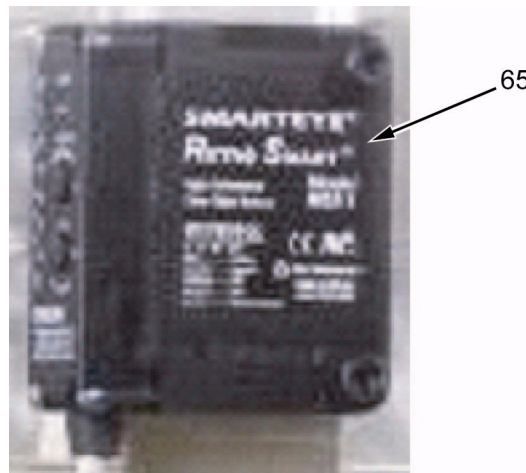


Figure 10-49: Detector Retro Smart

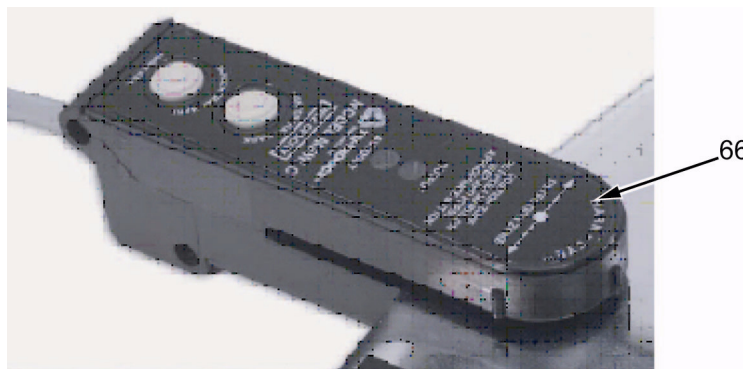


Figure 10-50: Detector Label Eye

Power Accessories



Figure 10-51: Power Conditioner



Figure 10-52: Uninterrupted Power Supply

Power Cord

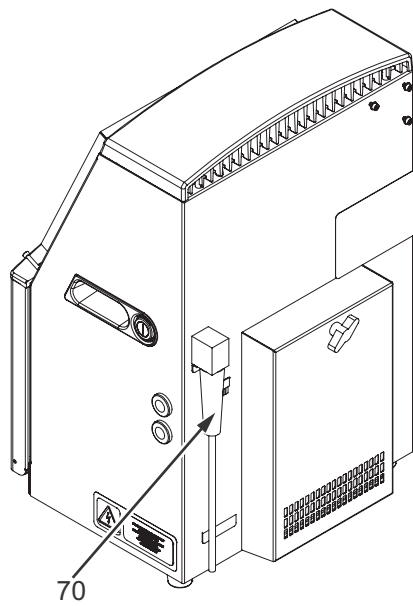


Figure 10-53: Power Cord

Din Plugs



Figure 10-54: 3 Way DIN Plug

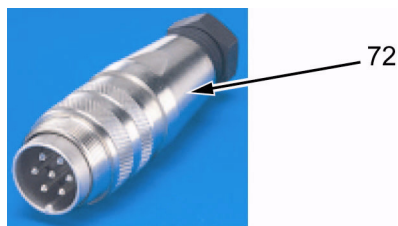


Figure 10-55: 7 Way DIN Plug

Item Number	P/N	Description	Qty
	399089	Beacon Assembly	
1		Beacon	1
2		M4x10 Socket-head Cap Screw	3
3		Beacon Mounting Bracket	1
	399474	Air Dryer Assembly	
4		Air Dryer Mounting Bracket	1
5		M4 Nylon Washers	2
6		M4 x 10 Socket-head Cap Screw	3
7		Air Dryer	1
8		1/4 inch-20 x 1 inch Socket-head Screw	2
	399363	Static Stand Standard	
	399502	Static Stand - Harsh Environment	
9		M6 x 12 Button Socket-head Screw	4
10	399337	Adapter Plate	1
11		Stand Foot Clamp Washer	4
12		M5 x 30 Cap Head Screw	4
13		Stand Tube Clamp	1
14		M6 Nyloc Nut	5
15		M6 Plain Washer	6
16		M6 x 10 Cap Head Screw	2
17		M6 x 60 Cap Head Screw	1
18A		Stand Column	1
18B		Stand Cross Brace Detail Assembly	1
18C		Tube Plug 40mm SQ	8
18D		Stand Leg Detail Assembly	2
19		M10 x 60 Hex Bolt	10

Table 10-8: Accessories

Item Number	P/N	Description	Qty
20		M10 Washer	20
21		M10 Nut	4
22		M10 x 100 Levelling Foot	4
23		M10 Nyloc Nut	10
	399362	Mobile Stand Standard	
	399501	Mobile Stand - Harsh Environment	
24		M6 x 12 Button Socket-head Screw	4
25	399337	Adapter Plate	1
26		Stand Foot Clamp Washer	4
27		M5 x 30 Cap Head Screw	4
28		Stand Tube Clamp	1
29		M6 Nyloc Nut	5
30		M6 Plain Washer	6
31		M6 x 10 Cap Head Screw	2
32		M6 x 60 Cap Head Screw	1
33A		Stand Column	1
33B		Stand Cross Brace Detail Assembly	1
33C		Tube Plug 40mm SQ	8
33D		Stand Leg Detail Assembly	2
34		M10 x 60 Hex Bolt	10
35		M10 Washer	20
36		100m Castor	4
36A		M10 x 16 Cap Head Screw	4
37		M10 Nyloc Nut	10
	399086	Printhead Stand	
38		Clamp Assembly	1
39		Vertical Tube	1
40		Printhead Cross Tube	1

Table 10-8: Accessories (Continued)

Item Number	P/N	Description	Qty
41		Printhead Mount Assembly	1
42		M6 x 8 Grub Screw	2
43		M10 Nut	8
44		M10 Washer	8
45		Stand Base Plate	1
46		M16 X 40 Hex Bolt	1
47		Adjustable Foot	4
48	399093	Anti-vibration Mounting	4
49		Umbilical Clamp Assembly	1
50	399248	Printhead Photocell Holder 8 mm	1
51	399278	Printhead Photocell Holder 18 mm	1
52	399293	Printhead Mount Photocell Holder 8mm	1
53	399294	Printhead Mount Photocell Holder 18mm	1
58	399085	Wash Station Assembly	1
	202047	250ml Wash Bottle	1
59	301-0007-005	Empty 1 Liter Bottle	1
60		Shaft Encoder	
		Encoders	
	41000255	2500 PPR	1
	377530	3600 PPR (use with 21000217)	1
	41000256	5000 PPR	1
		Encoder Kits	
	378815	1800 PPR kit (encoder, 25ft cable)	1
	40331750	2500 PPR kit (encoder, mounting bracket, wheel)	1
	378821	3600 PPR kit (encoder, 25ft cable)	1
	80200266	5000 PPR kit (encoder, mounting bracket, wheel)	1

Table 10-8: Accessories (Continued)

Item Number	P/N	Description	Qty
61	21000217	12 inch Circular Wheel	1
	377529	12 inch Circular Wheel (With replaceable ring)	1
	377523	Replaceable ring for part 377529	1
62	378192	3 m Shaft Cable	1
	378193	6 m Shaft Cable	1
	378985	Encoder Adapter Cable Kit (To convert from older style Conxall (excel) connectors to new DIN connectors)	1
63	377519	Spring Bracket	1
64	234211	Detector EZ-Pro Proximity Fiber	1
	234212	Detector EZ-Pro Through Beam fiber	1
65	234215	Detector Retro Smart (Clear Materials)	1
66	234213	Detector Label Eye (Web Printing)	1
	234214	Detector Mark Eye (Web Registration Mark)	1
67*	378981	Product Detector Adapter Cable (To convert from older style Conxall (excel) connectors to new DIN connectors)	1
68	356841-02	120 V Power Conditioner	1
	234597	240 V Power Conditioner	1
69	80000008	Uninterrupted Power Supply (120 V Version)	1
70		Power Cord (Refer to Table 10-9 on page 10-47)	1
71	500-0036-578	3 Way DIN Plug (Photo Cell) For product detector and reverse printing input	1
72	500-0036-583	7 Way DIN Plug (Relays) For Print Ready output and warnings	1
73*	500-0036-577	6 Way DIN Plug (Alert Beacon)	1
74*	500-0036-581	4 Way DIN Plug (Shaft Encoder)	1
75*	500-0036-584	8 Way DIN Plug (Message Select A/B)	1
76*	500-0076-141	DIN Plug Dust Cap	1
77*	399133	Exhaust Kit	1
78*	Refer item 48	Anti Vibration Kit Stand	1

Table 10-8: Accessories (Continued)

Item Number	P/N	Description	Qty
79*	399068	Printhead Mounting	1
80*	399098	Universal Printhead Mounting	1
81*	500-0036-582	5 Way DIN Plug (RS232)	1
82*	234433	5 Way DIN Plug (RS485)	1
83*	399504	25 way I/O (PCB 4) Cable	1
84*	SP378810	Alarm cable - 7 way DIN connector with 6ft cable	1
85*	SP378982	Encoder Adapter Cable	1
86*	399475	25 way I/O (PCB 4) Cable Kit	1

Table 10-8: Accessories (Continued)

*- Items are not shown in the figure

Power Cord

Part Number	Description
SP399205	Mains Power Cable EUROPEAN
SP399204	Mains Power Cable US CAN
399251	US 120V Molded Plug Power Cord (Type B)
399252	European Union Molded Plug Power Cord (Type F)
399253	Danish Molded Plug Power Cord (Type K)
399254	Italian Molded Plug Power Cord (Type C)
399255	Swiss Molded Plug Power Cord (Type J)
399256	UK Molded Plug Power Cord (Type G)
399257	China Molded Plug Power Cord (Type I)
399258	India Molded Plug Power Cord (Type D)
399261	Swedish Molded Plug Power Cord
399262	Finnish Molded Plug Power Cord
399263	Norwegian Molded Plug Power Cord

Table 10-9: Power Cord

Miscellaneous Accessories

Connectivity

Part Number	Description
399186	Extension Cables 3 m RS485
399062	Extension Cables 6 m RS232
399279	Lampstack Extension Cable Beacon 6m
223213	External Ethernet Connector Cable 5 m
SP399083	Ethernet Connector Kit Spares
SP399084	USB Connector Kit Spares

Table 10-10: Connectivity

Hydraulics

Part Number	Description
399472	Ink Door Spare
399171	Gutter Pump Spare
399072	Tubing kit Spare

Table 10-11: Hydraulics

Printhead and Umbilical

Part Number	Description
399506	Printhead and Umbilical Complete (3 m) 60 micron (Standard for Videojet 1610 Excel)
399507	Printhead and Umbilical Complete (6 m) 60 micron (Optional for Videojet 1610 Excel)
399508	Printhead Chassis and Umbilical (3 m) (Standard for Videojet 1610 Excel)
399509	Printhead Chassis and Umbilical (6 m) (Optional for Videojet 1610 Excel)
SP399355	Printhead Sleeve and Screw
223277	Printhead Screw Only

Table 10-12: Printhead and Umbilical

Tools Kit

There are several tools in the tool kit for normal maintenance of printer.

The Service Tool Kit (TL399250)

Table 10-13 lists the tool kit items and their part numbers.

Part Number	Description
234639	Allen/Hex Key, 0.035 inch, Set of 5
234638	M4 Nut Spinner (7mm)

Table 10-13: TL399250 Tool Kit Parts List

Part Number	Description
234642	Ball Driver 2mm
234643	Ball Driver 2.5mm
234644	Ball Driver 3mm
234645	Ball Driver 4mm
234650	Side Cutters
234640	Allen/Hex Key 1.27mm, Set of 5
234641	Allen/Hex Key 1.5mm, Set of 5
234651	Folding Knife
234652	Knife Blades
234653	Spanner/Wrench 7mm
234654	Spanner/Wrench 1/2 inch
234655	Screwdriver Flat Blade 2.5mm
234657	DIN Spanner/Wrench
234658	Tube Cutter
355269	Loupe Magnifying Glass
234494	USB A to USB A Cable
399280	System Manifold Pressure Test Tool
399247	Nozzle Bypass Manifold Kit
234646	Torx Driver T10
234647	Torx Driver T20
234632	USB Memory Stick 2GB
234638	M4 Nut Spinner (7mm)
234648	No.1 Pozidrive
234649	No.2 Pozidrive
399519	Bonding Strap
	Tool Bag

Table 10-13: TL399250 Tool Kit Parts List (Continued)

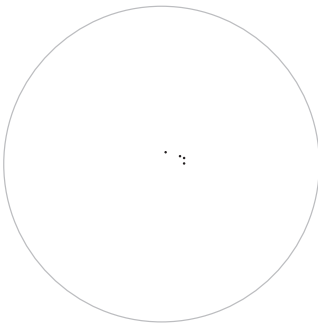
Clean/Quick Start and Stop Description

A

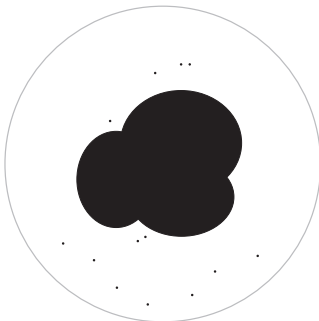
Clean Start/Stop Standards

The following illustrations show the minimum acceptable standards for clean start and clean stop. Compare these to samples obtained by placing a sheet of blank paper directly under the printhead.

(samples are shown actual size)



Typical clean start/stop



Typical dirty start/stop



Minimum standard required

Figure A-1: Clean Start/Stop Test Illustrations

Clean Start

The Clean Start sequence is as follows:

- 1** The solvent from the filter is forced through the umbilical connection into the printhead.
- 2** At the printhead, the solvent enters the heater manifold and passes into the main fluid path between the jet valve and the nozzle.
- 3** The jet starts when the nozzle becomes pressurized by the solvent flow.
- 4** If the previous stop was a clean stop, the jet will consist of almost pure solvent. The flow of solvent quickly removes any ink residues in the jet orifice.
- 5** Fluid in the jet is caught by the gutter and directed to the ink core.
- 6** Once the solvent flows through the jet, the jet valve opens, merging ink with the solvent.
- 7** The bleed valve then opens to increase the fluid flow through the nozzle, removing any trapped air bubbles from the nozzle body.
- 8** Once the bleed valve opens, the flush pump valve (V7) turns off, preventing further solvent from being pumped into the nozzle.
- 9** The flush pump returns to its priming stroke and the non-return valves in the pump prevent fluid from the printhead returning to the umbilical connection.
- 10** Approximately ten seconds after the flush pump turns off, the bleed valve closes and ink continues to flow through the jet at 4 bar.
- 11** Modulation is switched on and the ink pressure changes to give the correct jet velocity.
- 12** Heater manifold temperature is allowed to reach the correct value before enabling the phasing checks on the jet.

Quick Start

This method starts without a flushing sequence, and uses the ink supply to bleed the air from the nozzle.

Clean Stop

The Clean Stop sequence is as follows:

- 1 Deflector plate voltages are switched off before beginning this sequence.
- 2 The ink pressure is set to 4 bar and the modulation voltage switches off.
- 3 To increase the ink flow through the nozzle body, the bleed valve turns on.
- 4 The flush pump valve turns on applying solvent pressure to the printhead.
- 5 Pure solvent is forced through the filter to the printhead, mixing solvent into the ink stream in the heater manifold.
- 6 Approximately one second after the solvent starts to mix with the ink, the feed valve (V6) in the cabinet turns off, removing ink pressure from the printhead.
- 7 Ink ceases to flow into the heater manifold and the solvent flushes ink from the nozzle body.
- 8 Five seconds later the bleed valve turns off and then turns on again, introducing solvent into the jet valve, which inhibits the formation of ink residues when the printer is turned off.
- 9 The jet valve (on the heater manifold) turns off, ensuring that no ink diffuses into the solvent. At this point, no ink should be present in the nozzle body.
- 10 The gutter valve switches off, increasing the suction on the bleed system. After a short pause, the bleed valve turns off.
- 11 After another short pause, the gutter valve turns on to clear any fluid from the gutter.
- 12 Once the gutter valve turns off, the main ink pump also turns off.

Quick Stop

Note: This sequence is used to manually stop the jet for a short period, or to automatically stop the jet during instances like EHT trip and charge error.

This method switches off the ink without flushing the nozzle or manifold. Hence the manifold and the nozzle are full of ink when the jet stops. The machine must not be left in this state for long periods, as dry ink in the jet orifice may make restarting difficult. This procedure is primarily intended

for situations where the machine may be stopped and restarted several times in quick succession. Under these conditions, the use of solvent may become excessive and cause dilution of the ink.

Nozzle Flush

When nozzle flush is selected, the vacuum from the venturi is applied to the return side of the nozzle, creating suction at the nozzle orifice. Solvent is applied to the nozzle orifice to clear any blockage.

Nozzle flush automatically times out after 2 minutes but can be stopped at any time before that by pressing *F1* key *Abort Flush*.

A nozzle flush can be started with the jet running or stopped. If the jet is running, selecting nozzle flush will first turn off the feed valve V6 to stop the flow of ink to the nozzle.

Encoder Information

B

Internal Encoding

Internal encoding is used when product speed is constant. An internal clock sets the stroke-rate to a constant pace.

Internal encoding is used when the product speed is constant. The internal clock of the printer is set to the speed of the product in feet per minute (FPM) or meters per minute (MPM)

***Note:** Internal encoding is also used when test printing a sample message. For information on test printing a sample message, refer to Operator Manual.*

To use internal encoding, it is necessary to determine the product speed. This section describes four methods that can be used to determine the product speed.

Method 1

Use a handheld tachometer that is calibrated to measure linear surface speed in FPM or measure the revolutions per minute of the pulley. Convert RPM to surface speed by using the following formula:

$$\text{Surface speed (FPM)} = [\Pi d \times (\text{RPM})]/12$$

where $\Pi = 3.14$ and d = pulley diameter in inches.

Method 2

Establish a reference mark 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 FPM.

Method 3

If you know the number of products produced per minute on the line, the size of the product, and the gap between each product, you can calculate the product speed.

For example:

1200 products per minute are produced on the line, each product is 2.5 inches wide, and there is a one inch gap between each product.

Conveyor speed = [(products per minute) × (size + gap)]/12

where size and gap are in inches.

Method 4

It is also possible to use the printer's product counter to determine the number of products per minute, and then calculate the line speed as described in "Method 3" on page B-2.

External Encoding

External encoding is used when the speed of the conveyor varies. A shaft encoder measures the conveyor speed, and transmits the data to the printer. This data enables the printer to vary the stroke rate according to the variation in the speed of the conveyor. You can use the following types of shaft encoding methods:

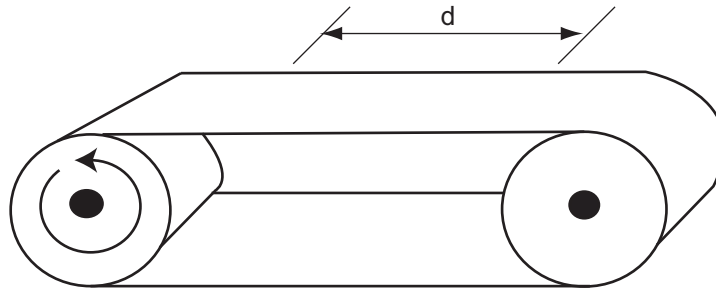
- A direct shaft encoder maintains a 1:1 ratio between the encoder pulses and print strokes.
- Non-quad - Uses both the channels from encoder A and B. The leading and trailing edges of the channels give four times the number of pulses delivered from the encoder

For example, if PPI from the encoder is 180, the pulses from the two edges (x 2) of the channels A and B are 360 PPI each, which totals to 720 PPI. If the required strokes per inch is 60, the reduction factor or width is $720/60 = 12$.

- Backlash protection printing - If the product is placed on a line that can move or settle (for example, conveyor belt) and it stops, backlash protection makes sure that the printer prints on that product one time only. In this feature either A leads B or B leads A. This provides the printer with backlash protection. The printer counts the number of encoder counter strokes as it prints. If the line stops and moves backwards, the printer will not restart printing until the counter stroke number has returned to the last known good position. This feature makes sure that the printer prints one time in the standard

direction of line travel and not in the reverse direction of line travel.
The maximum stroke count is 64K.

- A divided-down shaft encoder is used when the conveyor speed requires fewer pulses than the actual output of the shaft encoder.



d = distance of conveyor (product) travel per revolution of shaft

Figure B-1: Product Distance

Required shaft encoder:

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

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

Example 1

1800 PPR Encoder connected to production line.

$d = 10$ inches of product travel for one revolution

If you want to print using 5x7 SL matrix and the required print pitch is 10 Characters Per Inch (CPI),

then $1800 \text{ PPR} / 10 = 180 \text{ PPI}$,

as the printer can see both edges of incoming channel,

then $180 \times 2 = 360 \text{ PPI}$.

If both A and B channel are in use, then multiply the PPI value that you get by 2 for the second channel.

$360 \times 2 = 720$

Note: If you use both channels, A and B, from the encoder, use the following calculation:

$(\text{Encoder PPR/Inches travelled for one revolution}) \times 4$.

The printer PPI is 720 with a print pitch requirement of 10 CPI. The number of strokes required for a 5x7 SL matrix at 10 CPI is 60.

Therefore, $720 \text{ PPI} / 60 \text{ strokes} = 12$

12 is the printer reduction factor or width divider setting. This gives you a print output of 10 CPI of 5x7 SL matrix.

As the 5x7 SL matrix is based on 10 CPI, you can get the top line speed on printer speed chart.

Example 2

1800 PPR Encoder connected to a production line

$d = 23 \text{ inches per revolution}$

$\text{PPI} = 1800 / 23 = 78 \text{ PPI}$

But, as the setting is a non-quad configuration, the channel uses both the edges so the PPI value is

$78 \text{ PPI} \times 2 = 156$

Example 3

1800 PPR Encoder connected to a production line

$d = 23 \text{ inches per revolution}$

$\text{PPR} = 1800$

For two edges, $\text{PPR} = 3600$

Therefore, $3600 \text{ PPR} / 23 = 156 \text{ PPI}$

Reduction Factor = $156 \text{ PPI} / 60 = 2.6$

As you cannot get the value 2.6, you must use either 2 or 3.

If you use the value 2, then $156 \text{ PPI} / 2 = 78 \text{ PPI}$ or 13 CPI.

The value reduces the line speed for all matrices proportionally. To get the reduction follow the example below:

If you want to print using 5 x 7 matrix that has a 800 feet/minute line speed at 10 CPI, then

Line speed (feet/minute) = $800 \text{ feet/minute} (10 \text{ CPI} / 13 \text{ CPI}) = 615 \text{ feet/minute}$

With 2 as the reduction factor, the new line speed for a 5 x 7 single line has reduced to 615 feet/minute.

If this speed is slow for the application, set the reduction factor as 3.

$156 \text{ PPI} / 3 = 52 \text{ PPI}$ or 8.6 CPI.

Therefore,

Line speed (feet/minute) = 800 feet/minute (10 CPI/8.6 CPI) = 930 feet/minute.

Example 4

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 inches per revolution x 60 strokes per inch = 1380 PPR

Example 5

If the standard 1800 PPR shaft encoder is to be used as shown in Example 1, it will be necessary to provide some type of gearing to supply the required 60 pulses per inch as shown in Figure B-2.

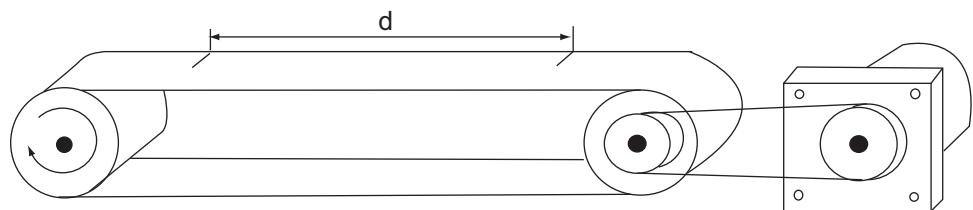
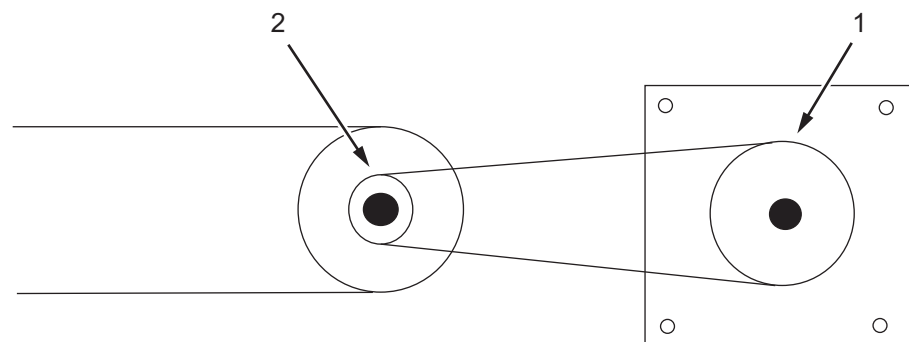


Figure B-2: External Shaft Encoder

To determine the required gearing, the following method is used.

$1800 \text{ PPR} / 1380 \text{ PPR} = 1.3$ or 1:3:1 gear ratio



- 1. Pulley b
- 2. Pulley a

Figure B-3: External Shaft Encoder - With Pulley

If the diameter of “a” = 2.0 inches, then the diameter of “b” is 2.6 inches (2.0 inches x 1.3 = 2.6 inches). For one rotation of “a”, 1380 pulses are produced from the 1800 PPR shaft encoder.

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

$(1800 \text{ pulses per revolution}) / (23 \text{ inches per revolution}) = 78 \text{ pulses per inch}$

$(78 \text{ pulses per inch}) / (6 \text{ strokes per character}) = 13 \text{ characters per inch}$

Since the standard calls for 10 characters per inch (refer to Example 1), the message would be compressed on the product.

Auto Encoding

Auto encoding is used when the product speed and the conveyor speed are different (product slippage) or when the product is allowed to fall through guides from one level to another. When auto encoding is selected, the signal from the product detector is used to determine the product speed, and code the product at a set stroke rate. The requirements for auto encoding are the following:

- A product detector
- The length of the detect area (the amount which the detector senses). This value must be entered into the printer.
- The distance between the printhead and the product detector must be set such that, both the leading and trailing edges of the product are sensed by the product detector before the printer starts printing the message.

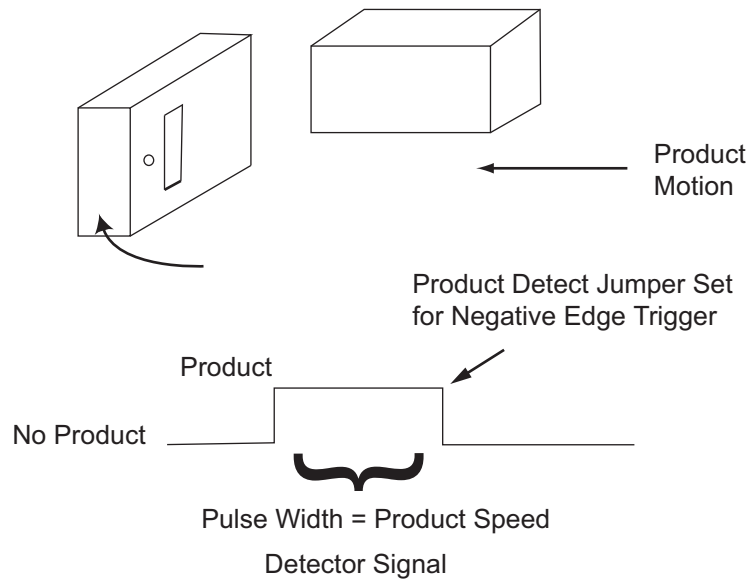


Figure B-4: Auto Encoding

Example

Given information:

Detect area = 5 inches (127 mm)

Pulse width of this product = 0.1 seconds

Then, Product speed = 5 inches/0.1 second = 50 inches per second (127.0 mm/0.1 s = 1270.0 mm/s)

$(50 \text{ inches per second} \times 60 \text{ seconds per minute}) / (12 \text{ inches per foot}) = 250 \text{ FPM}$

$(1270 \text{ mm/s} \times 60 \text{ s/minute}) / 1000 \text{ mm/m} = 76.2 \text{ MPM}$