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Introduction

This Chapter contains a simplified description of the HP DesignJet 500/800 Printer circuits and mechanical functions. Mechanical and Printed Circuit Assembly (PCA) overviews present a functional description of how the Printer operates.

SKU Overview

In total there are 8 SKU's which are detailed as follows:

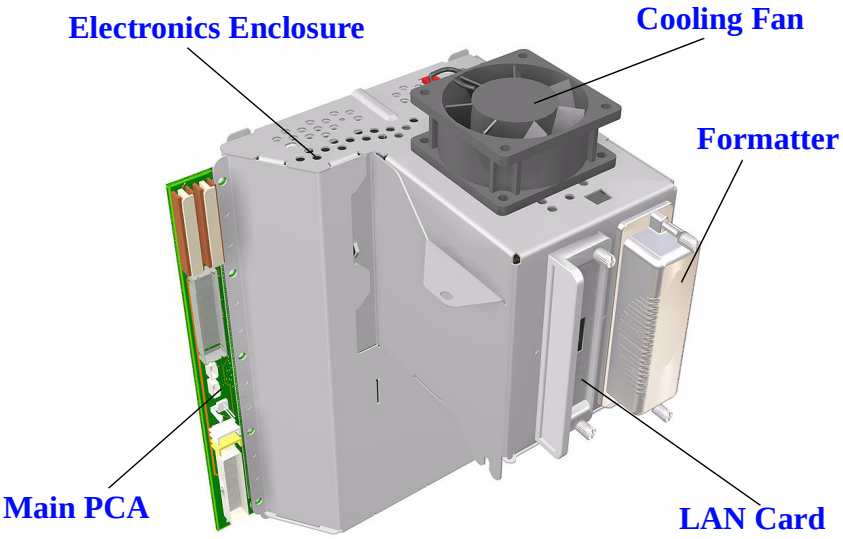
	Windows HP DesignJet 500	**Windows HP DesignJet 500PS**
Part Number	24" Model - C7769B 42" Model - C7770B	24" Model - C7769C 42" Model - C7770C
Resolution	1200 x 600 dpi	1200 x 600 dpi
Languages	■ Raster Data Only ■ HPGL/2 Upgrade (still 600 dpi)	■ MAC/WIN PostScript RIP
Memory	16 MB (no expansion needed)	16 MB (no expansion needed)
Hard Disk	Not available	Not available
Network Card	Option	Option
Formatter	Option	Option

	Power CAD HP DesignJet 800	**GA HP DesignJet 800PS**
Part Number	24" Model - C7779B 42" Model - C7780B	24" Model - C7779C 42" Model - C7780C
Resolution	2400 x 1200 dpi (Super Best)	2400 dpi (Super best)
Languages	■ HPGL/2	■ PostScript Level 3 ■ HPGL/2
Memory	96 MB (expandable to 160 MB)	160 MB
Hard Disk	6 GBytes (Queuing)	6 Gbytes (Asian Fonts included)
Network Card	Standard	Standard
Formatter	Standard	Standard

Electrical System

Introduction

The Printer's engine electronics (Main PCA) is controlled by a Kayak ASIC. Kayak is the application-specific integrated circuit (ASIC), designed in Hewlett-Packard's Vancouver Printer Division, forming the heart of the thermal-inkjet large format printer digital electronics.



Hardware Description

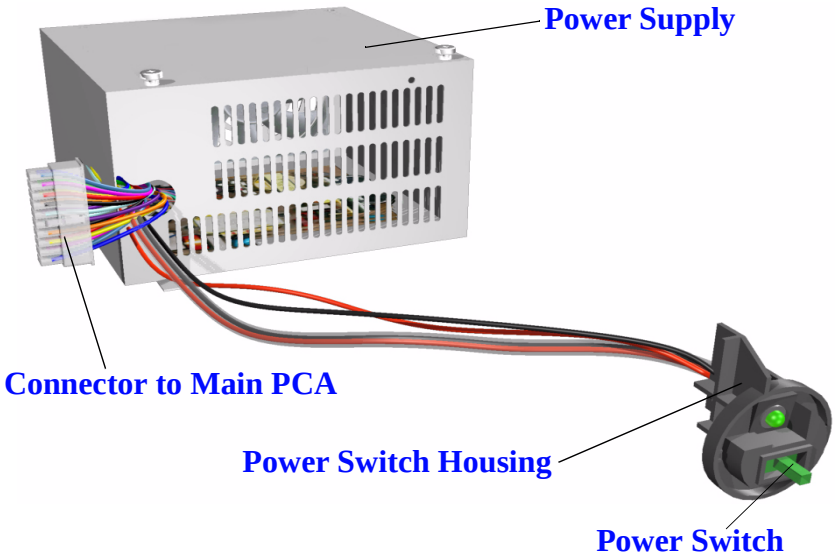
- The Kayak ASIC is fed with a 15.975MHz crystal-quartz which through a phase lock loop (PLL) is raised to 192MHz and after that divided to the ColdFire frequency of 96MHz and further divided to the external memory bus of 48MHz.
- The Kayak ASIC incorporates the CF3_g Motorola CF3MRSX processor mega cell. As implemented in Kayak, the processor, with 8KB of unified cache, has a maximum operating frequency of 98MHz and at this frequency it is capable of approx. 70 MIPS.
- Two physical EIO slots are supported from which the optional formatters and EIO cards will be plugged. Three expansion options are currently supported.
- The Main PCA will come with an on-board 2MB(x16) flash memory that will allow both the end user and service engineers to upgrade with the latest firmware code available.
- A total of 16MB SDRAM (x32) or 32MB SDRAM (depending on the Printer Model) will be loaded in the engine PCA, not allowing further user self-memory upgrades.

- The memory bus is also used to control Navata gate array. Navata is a customized ASIC to control most of the Printer's sensors (ISS optical sensors, pinch wheels, digital encoder, etc.), Power Supply, Scan-Axis Motor driver, Vacuum Fan, Front Panel, Carriage, etc.
- A 16k serial EEPROM is used to store different line calibration parameters and the Printer's life history (number of plots, etc.). The ISS PCA also contains an EEROM that contains a backup of all critical parameters from the Main EEROM.
- The Main PCA has an analogue IC which controls two DC motors (IDS and paper) and one stepper motor (Service Station). This IC, as well as the IC in the Carriage PCA, is controlled through the VPR serial interface from the Kayak ASIC at a bus clock frequency of 1.6MHz.
- From the Main PCA the Interconnect Cable connects to the Interconnect PCA (located on the right hand side of the Printer) which then splits into different subsystems: Front Panel, IDS PCA, Aerosol Fan, Service Station and media loading sensors (pinch, media sensor and media button).
- Two discrete drivers are implemented for the Carriage Motor driver and the Vacuum Fan.
- The Main PCA comes with fully protected motor drivers for Carriage, Paper-Axis, Service Station and IDS motors. Any short-circuit will be detected and protected.
- Trailing Cables come with an interlock loop that will prevent from turning on voltages in the Carriage while the Trailing Cable is not properly connected. A similar approach of using an interlock pair is used in the Interconnect Cable to ensure it is properly connected.
- The EIO slots do not allow for hot insertions while the machine is powered. **That is why it is very important to always power-off the Printer before inserting the EIO Card or the Formatter or else the Main PCA could be burned**.
- Serial channel, to be used for line production and service purposes only, will be isolated from Kayak pins with a GPIO in the Navata ASIC.

Power Supply Unit (PSU)

The PSU is used to supply the power required by the printer in any condition and has the following features:

- 130W maximum continuous average power (171 W at peak) with power factor correction.
- 4 outputs with voltages of +5.0V, +3.3V, +12V and +32V.
- Operates with convection cooling when +32V output is at minimum load but the Power Supply is cooled by forced air provided by a fan in the Power Supply enclosure when the +32V output is loaded.
- The Power Supply is connected directly to the Power Switch and a green LED located at the front of the Printer on the bottom left hand side.



The Power Supply operates over a voltage range as described in the following table:

Rated Voltage	100-240 VAC
Normal Operating Range	88 - 264 VAC
Functional Operating Range	80 264 VAC
Rated Frequency	50/60 Hz
Frequency Test Limits	47 -63 Hz

As explained earlier, the Power Supply provides +5.0V, +3.3V, +12V and +32V to the Main PCA with the following maximum output currents:

Voltage	Maximum Output Current (A)	Systems
+3.3V	8.0	Digital Logic & EIO cards
+5.0V	1.7	Sensors, Front Panel, Bitronics and some analog logic in Main PCA
+12.0V	0.45	Aerosol & Cooling fans and to generate the 5.0V going to the carriage
+32.0V	3.7	Motors, Vacuum Fan and carriage

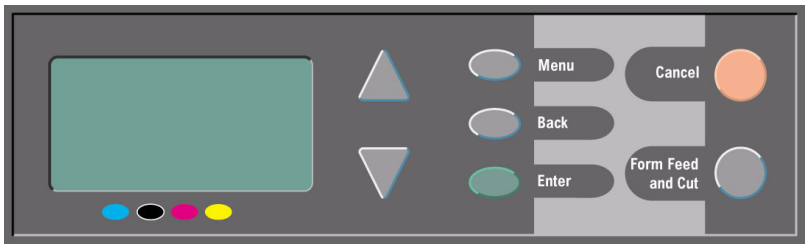
Front Panel

The user can interact with the printer in two ways: from the host via the I/O channels or directly via the front panel. The Front Panel is used to display messages (like the status of the machine or warnings), to configure the printer and to send commands to it (cancel the job or print a demo for example).

The Front Panel has an LCD display, 7 keys (no LEDs) and a buzzer (to provide audible feedback to the user).

The front panel display is a 128 x 64 pixel graphic LCD. Every pixel can be activated individually and the controller present on the Front Panel board allows it to display both text and graphics at the same time. The Front Panel has a positive reflective type display to improve its viewing characteristics and does NOT have an LED backlight.

The Front Panel is connected to the Interconnect PCA and NOT directly to the Main PCA.



Ink Delivery System (IDS)

The Ink Delivery System (IDS) delivers ink from the off-axis Ink Cartridges via permanently connected tubes to the high throughput Printheads for the HP DesignJet 500/800 Series Printers

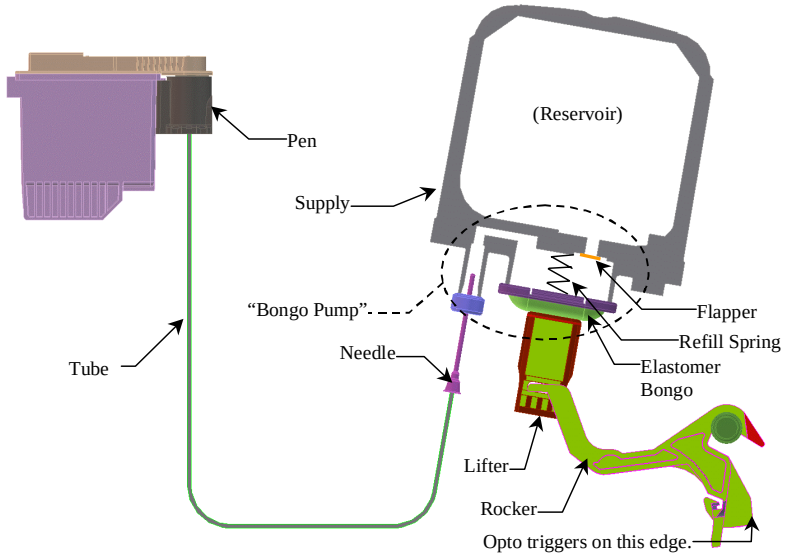
The IDS consists of two major subsystems:

- The Ink Supply Station (ISS).
- The Tubes Assembly.

Ink Supply Station (ISS)

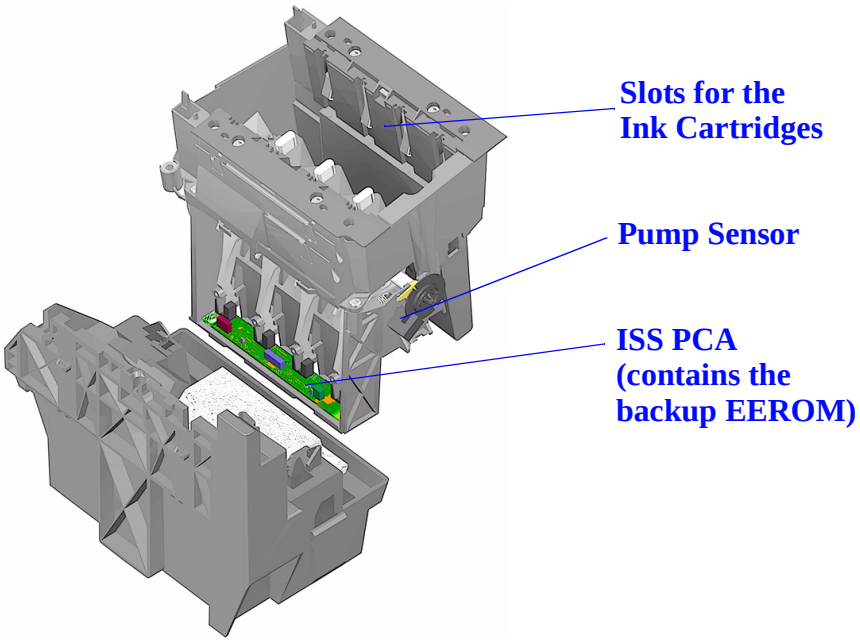
In the Printer, the Ink Cartridges reside inside the Ink Supply Station (ISS). The ISS is situated on the right hand side of the Printer and will be able to handle 69cc capacity Ink Cartridges (for all colors). The ISS is the part of the Printer that provides the pressure to pump the ink from the Ink Cartridges to the Printheads. It has a mechanism for each one of the four Ink Cartridges. Each mechanism consists of a spring that pulls from a rocker that pushes the lifter that pressurizes the bongo. There is a camshaft, which is driven by an electric motor, that moves the four lifters down pressing on the rocker. The ISS also has sensors which can detect when the pump chamber is empty and needs to be refilled (by pushing down the lifters).

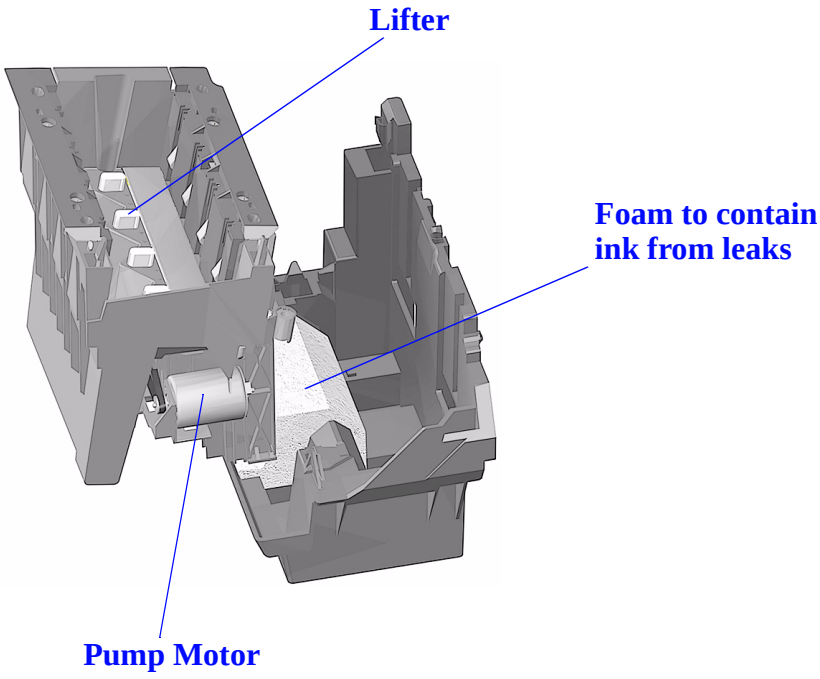
The following diagram explains the operation of the ISS:



These are the key functions of the ISS:

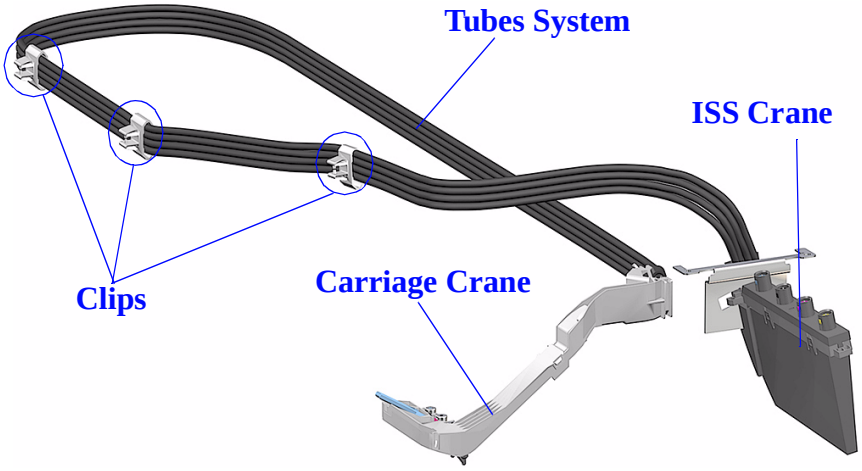
- Ink Cartridges support and location.
- Prevents incorrect insertion of colors and inks.
- Provides electrical connection to the Ink Cartridges.
- Locates the supply end of the Tubes Assembly.
- Contains ink from leaks.
- Includes the ISS PCA which contains the backup EEROM.





Tubes Assembly

The Tubes Assembly is the part of the Ink Delivery System which physically drives the ink from the Ink Cartridges in the ISS to the Printheads in the Carriage Assembly. The ink flows through a flexible tube from the ISS to the Carriage by means of the pressure applied by the pumping device in the ISS.



In both ends of the tubes there are fluidic interconnections which are designed to prevent any kind of ink leakage, and minimize the ink on customers as they interact with the system (i.e. when they must replace Ink Cartridges or Printheads).

While the Ink Cartridges remain static in the ISS, the Carriage goes back and forth along the scan-axis of the Printer. That is why the **tubes** have to be flexible in order to follow this movement.

Since the condition of the ink determines its performance on the printing media (and therefore the print quality output), the Tubes Assembly must guarantee the properties of the ink coming from the Ink Cartridges until it is delivered to the Printheads. This 'healthy' condition is defined by means of maximum water vapor losses and air ingestion that the ink can get along time.

Service Station

The purpose of the Service Station is to service the Printheads in order to guarantee their performance along their specified functional life in the following ways:

- Wiping of Printheads nozzle plate surface.
- Applying dissolvent on the Printheads nozzle plate surface.
- Capping the Printheads when they are not printing.

The Printhead also performs a spitting action in order to recover or refresh the nozzle performance, therefore the Service Station contains a Spittoon to retain the ink thus reducing the risk of ink leakage. A secondary Spittoon, which performs the same routine, is located on the left hand side of the Printer.

The function of wiping is to remove ink residue and external debris from the Printhead so that good drop ejection and nozzle performance is maintained throughout the life of the Printhead.

To help dissolve the ink spread on the nozzle plate and also to lubricate the wiper as it scrubs the nozzle plate, some dissolvent and lubricant (PolyEthileneGlycol 400) is applied to the Printheads nozzle plate (also by means of wiping).

Also, the Aerosol Fan is located at the bottom of the Service Station, so if the Aerosol Fan fails for any reason, the complete Assembly (Service Station and Aerosol Fan) needs to be replaced.