Functional Overview

10

Introduction

This Chapter contains a simplified description of the HP DesignJet 5000 and 5500 Series Printers.

Electrical System

The electrical system of the Printer consists of six major blocks and their associated cabling:

- Power Supply Unit: Connected to the mains supply of whichever country this block provides 24V, 5V, 3.3V and -15V to the rest of the electrical system. It has a soft power switching feature allowing the firmware to control when power is removed from the system, and eliminates the need for high tension cables to the front panel.
- Main Electronics: This block contains the I/O, central processing units and controls most of the motors and sensors in the printer. The motors and sensors themselves are located throughout the printer and are connected to the main electronics via cables.
- Carriage: Connected to the Printheads, this block supplies power to them, as well as monitoring and protecting them from damage. It also has the ability to control warming and to perform continuity checking, as well as controlling the Line Sensor. The Carriage Encoder is also located in this block.
- Ink Supply Station: The Ink Supply Station is connected to the Ink Cartridge supplies, and controls air pressure (pump, sensor and valve), as well as monitoring ink levels and the supply latch sensor.
- Service Station: Contains the electronics needed to perform drop detection, a DC motor/encoder for capping, wiping and spitting and a stepper motor for priming.
- Front Panel: is the user interface. It consists of an LCD display, a key panel and four LEDs.

Front Panel

The Front Panel is used to display messages, configure the Printer and send commands to the Printer via the keys.

The display is a 128 x 64 pixel graphic LCD and can display both text and graphics at the same time. The display has an LED backlight to improve its viewing characteristics. The contrast of the LCD can also be adjusted.

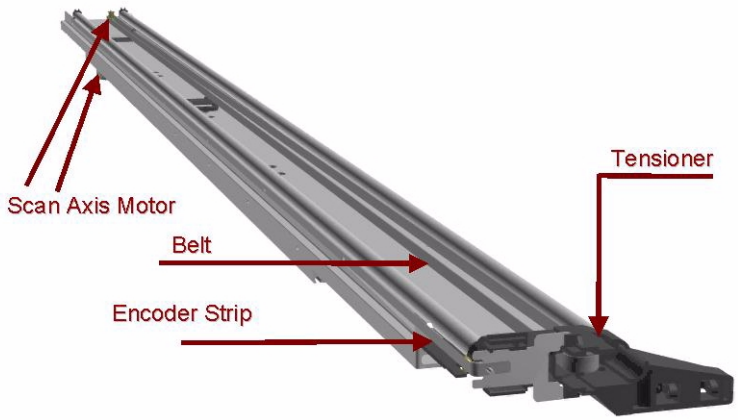
The navigation and command keys are distributed in three groups:

- 1 key at the bottom left corner is used to select the **Print Quality** (**Max. Quality**, **Productivity** or **Max. Speed**). The LEDs on top of the key show the selected option.
- 2 keys at the top left part are used to send commands directly to the printer: **Cancel** and **Load/Unload Media**.
- 5 keys to the right of the display are used to navigate through the menus: **Back**, **Enter**, **Up**, **Down** and **Menu**. (You can print a demo plot called Menu to get the complete menu tree).
- 1 key on the upper right corner is used to set the Printer to Standby mode.

Scan Axis

The Scan Axis determines the Carriage's motion and its position with respect to the media. Its main parts are:

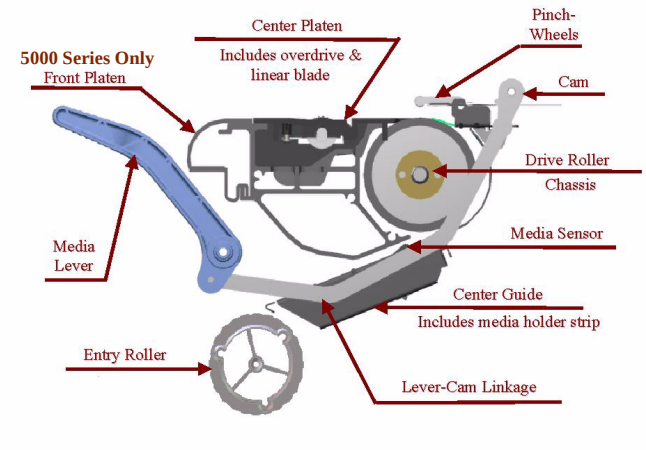
- Scan-Axis Motor - drives the Carriage using the Belt.
- Tensioner - maintains the tension of the Belt.
- Encoder Strip - determines the position of the Carriage using the LED Sensor on the Carriage PCA.



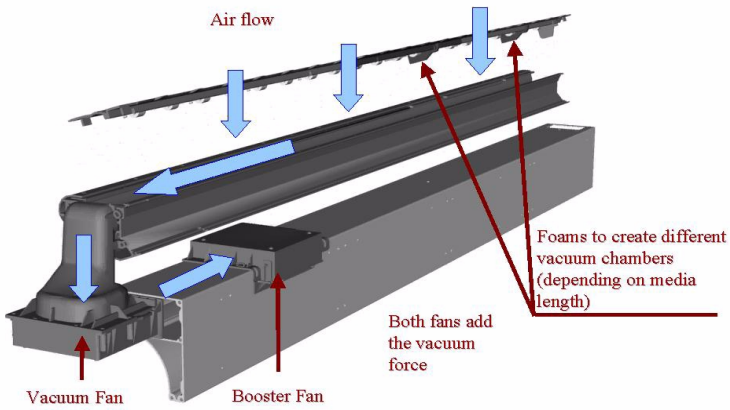
Paper Axis

The Paper Axis determines the motion of the media through the printer. Its main parts are:

- Paper-Axis Motor - provides traction to the Overdrive.
- Center Platen and Overdrive - controls the printing path and expansion of the media.
- Pinch-wheels and Lever - “captures” the media and provides added friction.
- Center Guide and Entry Roller - feeds media through the paper path.
- Vacuum Fans - provides the required vacuum to maintain the media flat over the Center Platen.



The diagram below illustrates the air flow created by the Vacuum Fans.



Ink Delivery System (IDS)

The Ink Delivery System (IDS) delivers ink under pressure from the large capacity off-axis Ink Cartridges via permanently connected tubes to the high throughput Printheads.

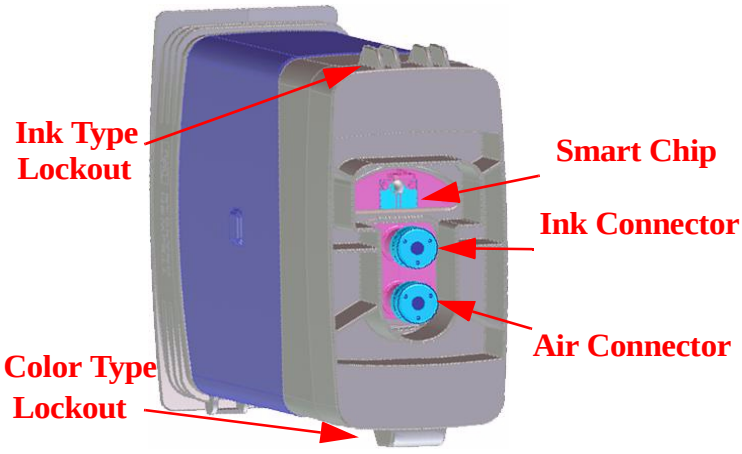
The IDS consists of six major subsystems:

- The Ink Cartridges.
- The Ink Supply Station (ISS).
- The Tubes System.
- The Printheads.
- The Air Pressurization System (APS).
- The Leak Detect System (LDS).

Ink Cartridge

The HP No.81 Ink Cartridges for the HP DesignJet 5000 Series deliver 680 cc of ink. Residual ink in the Ink Cartridge is required to avoid starvation in the Ink System, that could cause damage to components. Ink Cartridges are designed with:

- Smart chip storing Ink Cartridge information.
- Ink connector to deliver ink to the Ink Tubes.
- Air connector that forces ink out of the Ink Cartridge.
- Ink Type lockouts that avoid Ink Cartridges with the wrong type of ink being installed in the Ink Supply Station.
- Color lockouts allowing insertion of only one color in a given slot.



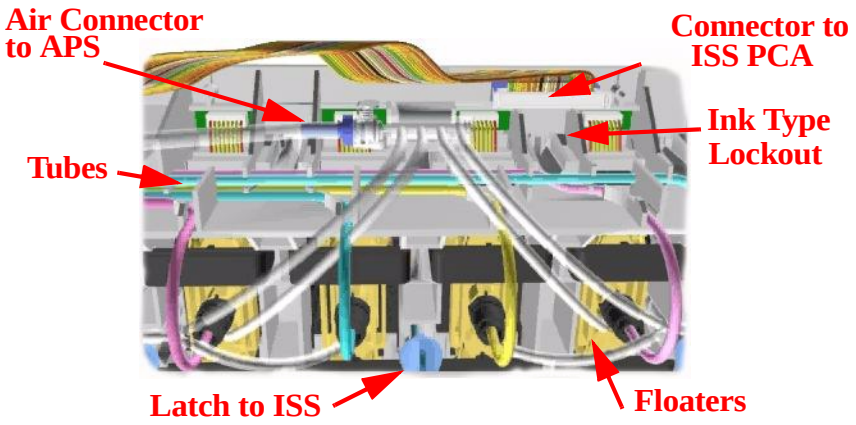
Ink Supply Station (ISS)

In the Printer, the Ink Cartridges reside inside the Ink Supply Station (ISS). This module is situated on the left side of the machine.

The ISS includes the plastic housing that surrounds the supplies, the latch mechanism, and the fluid and electrical connections to the Ink Cartridges. It also supports the Air Pressure System (APS) that forms a replaceable module clipped under the ISS.

These are the key functions of the ISS:

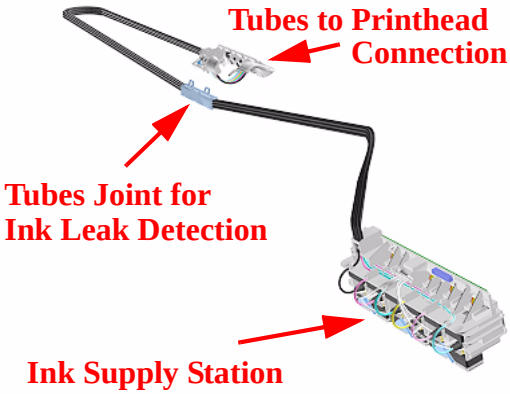
- Ink Cartridges support and location.
- Limit creep of cartridge side walls.
- Avoid incorrect insertion of colors and inks.
- Contain ink from leaks.
- Support the Air Pressurization System (APS).



Tubes System

The Tubes System is the assembly that performs these functions:

- Conduct the ink pumped from the Ink Cartridge to the Printhead.
- Conduct the air from the pump into the Ink Cartridge.
- Keep the ink in good condition until it is delivered to the Printhead.
- Avoid leaks and minimize ink on customer.



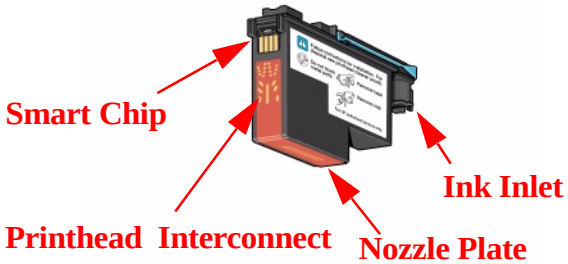
The Tubes move back and forth inside the volume defined by the Tube Guides. The Tube Guides are a pair of sheet metal parts with opposing U-shaped profiles.

The Tubes are threaded inside a protective extrusion called the Tube Carrier which consists of a base material that provides the structure of the part, and a resistant outer part protecting the structure.

Printheads

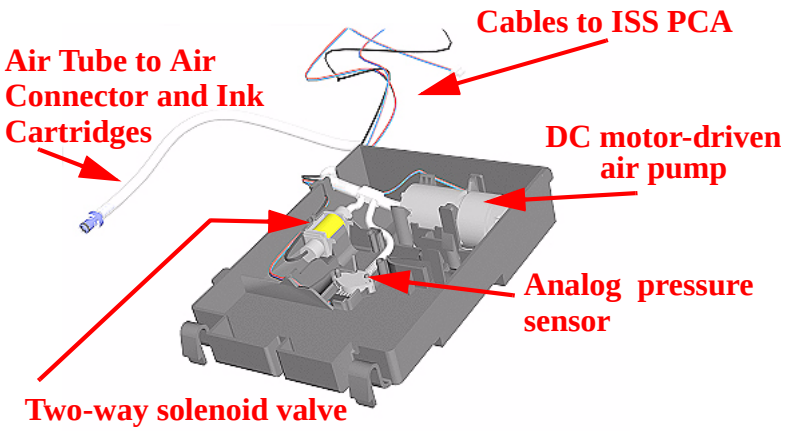
The Printheads are high precision devices that place the ink on the media. The Printheads are designed with:

- Smart chip storing Printhead information.
- Ink inlet to receive ink from the Tubes.
- Nozzle plate with 512 Nozzles to deliver ink on to the media.
- Ink Type lockouts that avoid Printheads of the wrong type (Setup Printheads or Ink type) being installed in the Carriage.
- Color lockouts that will allow only one color to be inserted into a given slot.



Air Pressurization System (APS)

The APS is the system that provides and controls the pressurization of the ink in the Ink Cartridges and is located under the ISS. The key purpose of this system is to ensure the minimum required ink pressure at the inlet to each Printhead respectively at the required print rates. The APS is also used to provide pressure for tube purge and as part of the blow prime system operation.



The APS pressurizes the ink in the Ink Cartridge bags by pressurizing the air around them. The Printer controls the air pressure using the pump with feedback from the sensor; when required the valve is opened to depressurize the air circuit. This allows control of the ink pressure at the inlet to the Printheads.

Service Station

The Service Station consists of a linear motion mechanism with a chassis containing one PrintHead Cleaner (PHC) for each printhead. Attached to the Service Station chassis, one optical drop detector provides nozzle check functionality.

Print Head Cleaner (PHC)

The PHC case is the main structural part of the replacement module. It is the part that the customer handles and contains the other sub-components:

- Wiper to remove ink residue and external debris from the Printhead.
- Spittoon to receive ink from the firing Printheads when the nozzles are cleared of viscous plugs and any loose debris.
- Cap to prevent the Printhead nozzles from drying out while the Printer is idle.
- Handle and Printable Label to remove and install the PHC. Also, the printer uses the handle top surface to recognize if the PHC is present or not.

In addition, there is a built-in mark on the handle (a vertical hole) to calibrate the Service Station (Scan-axis) if there is a problem and the EEROM is erased.