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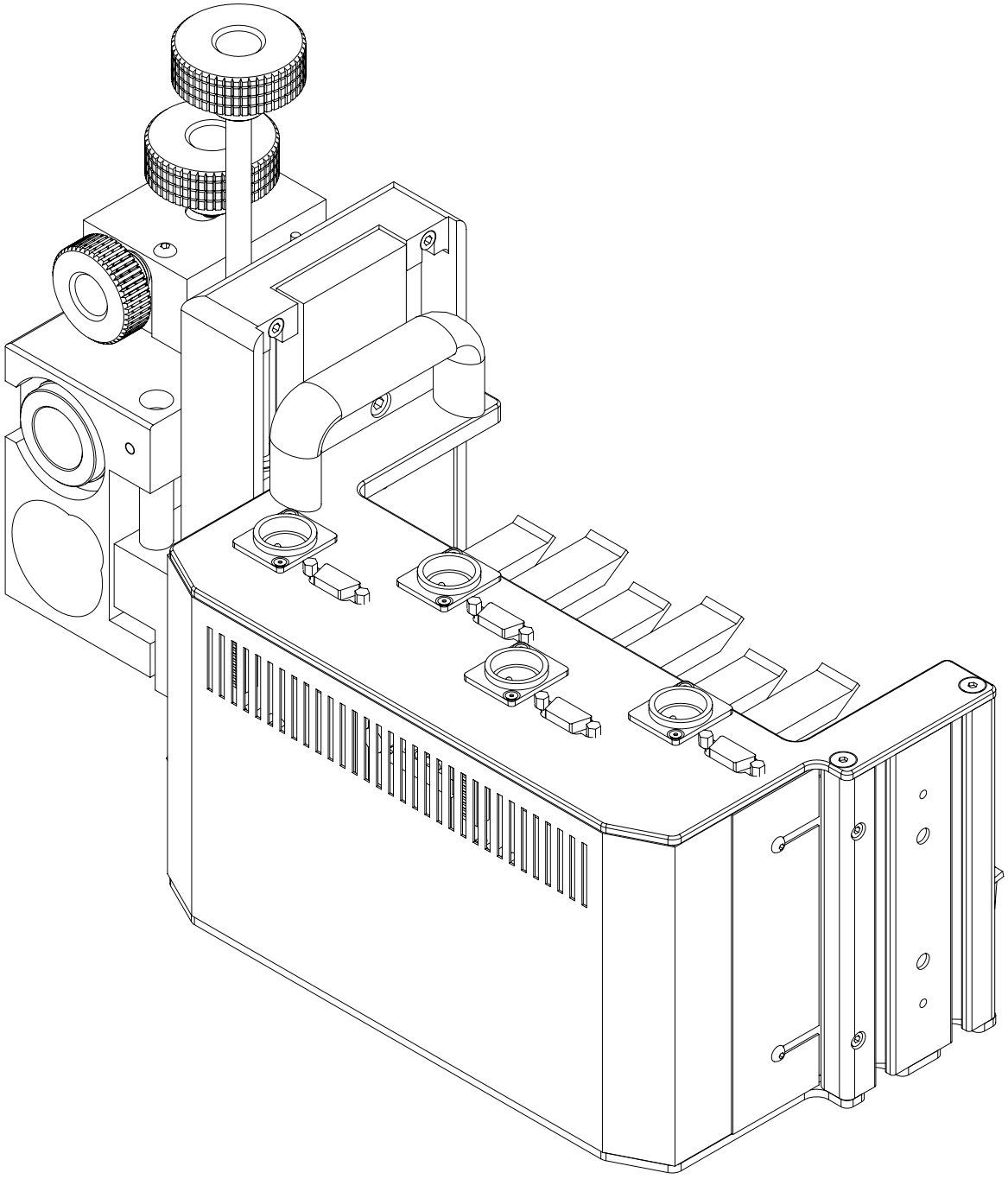
Apollo 4C Printheads



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User's Guide V1.0

Apollo 4C Printheads User's Guide

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Apollo 4C Printheads

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General Information

Chapter 1

1.1 Description

The BK791 Series Apollo printheads are based on HP Thermal Ink-Jet (TIJ) technology, which utilizes multiple color ink cartridges to provide a 1” print coverage.

These printheads are designed to mount on a BK80B Buskro bridge and can be independently adjusted in terms of height, lateral position, and relative angle to the transport tabletop. In addition, due to the symmetry of the design, each printhead can be mounted on either side of the bridge to simplify configuration changes.

The Apollo series printheads are also fully compatible with standard Buskro controllers equipped with Compose IQ or Compose SI software. This technology is also capable of running in conjunction with other available print technologies such as the Atlas, Atlas UVC, and Elite.

1.2 Specifications

1.2.1 Apollo 4C Specifications, 1”

Item	Specification	Note
Vertical Resolution	600 DPI	
Horizontal Resolution	110, 165, 220, 330, 440, 660 DPI	Software-selected
Ink Supply	Ink cartridge (*42 mL*)	Matisse Cyan, 1/2" vertical coverage
		Matisse Magenta, 1/2" vertical coverage
		Matisse Yellow, 1/2" vertical coverage
		Matisse Black, 1/2" vertical coverage
Ink Type	Dyed, water based	
Printhead Type	Thermal ink-jet (*TIJ*)	
Firing Frequency	13 KHz	
Power requirement	5V @ 0.4A, 28V	
Print swath – Vertical	1” (*25.4 mm*)	2 x Matisse Cyan ink cartridges
		2 x Matisse Magenta ink cartridges
		2 x Matisse Yellow ink cartridges
		2 x Matisse Black ink cartridges

1.2.2 Controller Specifications

Item	Specification
Environment	Windows 95/98/Me/XP
Imaging software	Compose SI, Compose IQ
Fonts	True type – 4 to 32 point size
Graphics	Bitmap, JPEG, PCX, WMF
Layout Controls	Lines, Boxes, Color Text, Variable graphics and text
Functions	Operator, Setup, Diagnostics, Layout, Job management, Reports
Production reports	Daily, job and machine production, audit Crystal reports
Record control	Re-print, re-cue, search, position
Address recovery	Infinite - Any record within the database
Operator display	Active display of records, single record
Auxiliary controls	Stacker/Diverter operation

1.2.3 Apollo Production and Speed Rating

Resolution[1] (DPI)	**Surface Speed** *(ft/min)*	*(m/s)*	**Production**[2] *(pieces/hour)*
110 *(100)*	545	2.8	35,650
220 *(200)*	270	1.4	17,650
330 *(300)*	180	0.9	11,750
440 *(400)*	135	0.7	8,800
660 *(600)*	90	0.5	5,850

Note:

1 The Apollo 4C Printhead can operate at either resolution. The resolution used depends on the accompanying print technology.

2 The Production Count is based on a No. 10 envelope (9.5” Long) and a 1.5” gap between pieces. Longer pieces would decrease the production rate. The production rating is based on operating frequencies and is the theoretical maximum based on software constraints. Actual production rates may differ based on acceptable print quality.

1.2.4 Software Specifications

The Apollo printheads can use either Compose IQ or SI. The features are compared in Table 1-1.

Table 1-1: *Feature Comparison (Compose IQ and SI)*

No.	Feature description	*Si*	*IQ*
1	**Job Handling**		
1.1	Multiple List Types: text, MS Access, Dbase, Foxpro, Excel	√	√
1.2	Multiple Code Pages; Foreign character sets	√	√
1.3	Multiple Copy Printing		√
1.4	Job Preparation and Recall	√	√
2	**Setup**		
2.1	Stacker/Diverter Control	√	√
2.2	Printhead Supported: Apollo, Atlas, Atlas UVC, Elite	√	√
2.3	Printhead Micro-Alignment	√	√
2.4	Master/Slave Communication		√
2.5	Product Tracking; up to 8 zones		√
2.6	(*Optional*) OCR for camera/database lookup applications		√
2.7	(*Optional*) Selective for control of feeder and other devices		√
2.8	Print Verification		√
2.9	English only Language Interface	√	
2.10	English, French, Spanish, German, Japanese, Korean, Chinese (simplified, traditional), Thai Language Interface		√
2.11	Password Protection	√	√
3	**Operator Display**		
3.1	Record Navigation Tools	√	√
3.2	Record Search, Re-printing, and Cueing	√	√
3.3	Record Status Color Coding	√	√
3.4	Single Record Display - Static	√	
3.5	Multiple Record Display – Real-time refresh		√
3.6	Operator View: Multiple record or product tracking		√
4	**Layout**		
4.1	Text: Fixed and Variable up to 99 components @ 255 characters/field	√	√
4.2	128 frames per printhead	√	√
4.3	Graphics: Fixed and Variable, Bitmap	√	√
4.4	Drawing Aids: Boxes, Lines	√	√
4.5	Barcode; Linear: Code 128, Codabar, EAN, UPC, 2 of 5, 3 of 9	√	√
4.6	Barcode, postal:	Postnet, Planet	ALL
4.7	Barcode, 2D: Datamatrix ECC200, PDF417, QR		√
4.8	Alignment Tools : 0, 90, 180, 270 orientation	√	√
4.9	Text Manipulation Tools: typeface, alignment, True Type	√	√
4.10	Serial Numbering	√	√
4.11	Time and Date Stamping	√	√
5	**Reports (Crystal)**		
5.1	Production: Job, Machine		√
5.2	Audit: completed, not completed, duplicate, lost/wasted records		√
6	**Diagnostics**		
6.1	Printhead test label and test firing	√	√
6.2	Input Sensors and Output Device testing	√	√
6.3	Encoder Scope	√	√
6.4	Printhead Parameter Viewing	√	√
7	**General**		
7.1	Windows-based, XP compatible (*Compose V6.0)*	√	√
7.2	Multiple Print Resolutions: 110, 150, 220, 330, 440, 660	√	√
7.3	Core Charge Rebate applicable		√

1.3 Inkjet System Drawings

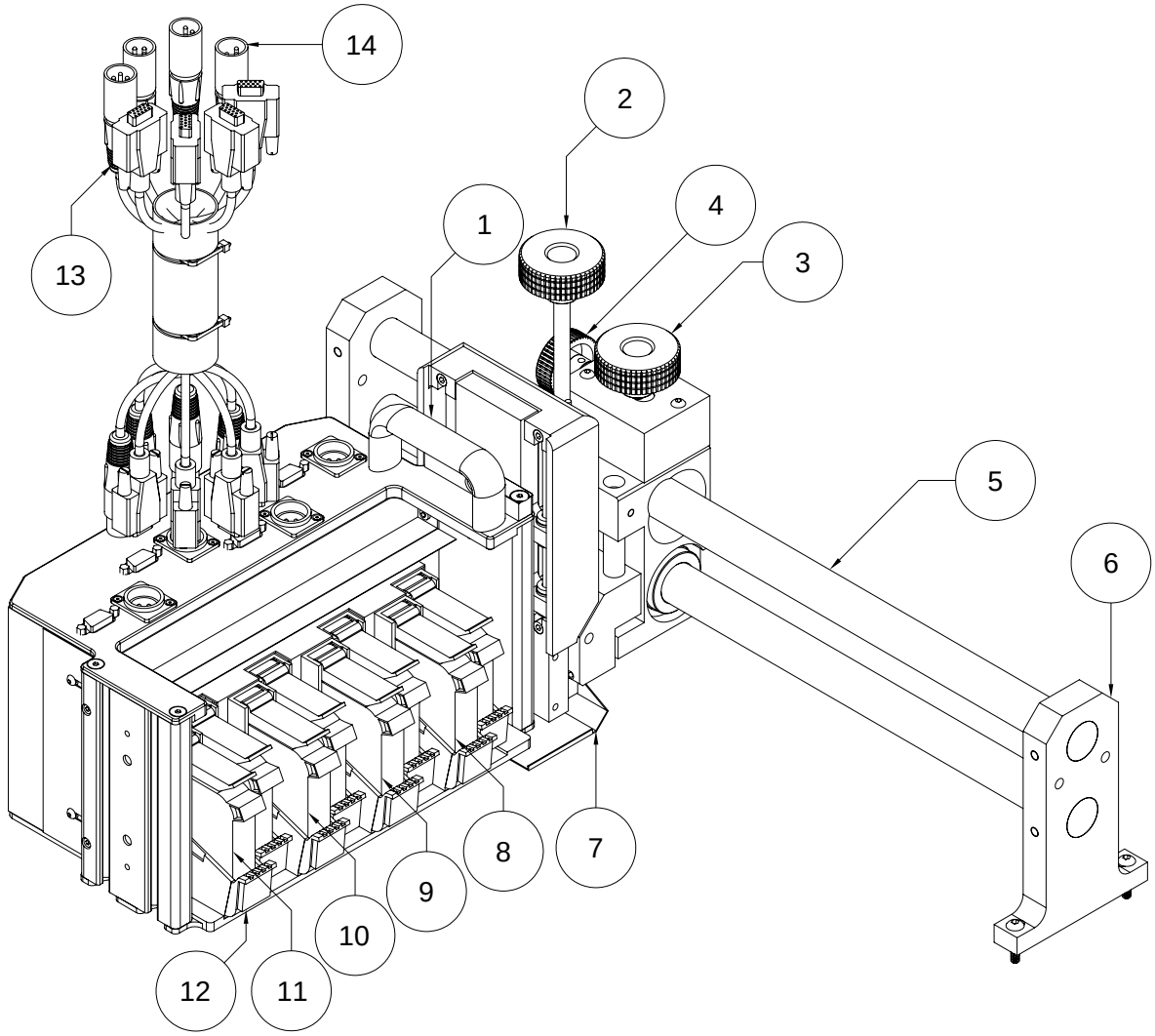


Table 1-2: *Apollo 4C Print Head Components (BK791-H-C80 Shown)*

Item	Description
1	Printhead Handle
2	Height adjustment knob
3	Lateral adjustment release knob
4	Fine lateral adjustment Knob
5	Bridge Rail (Available in different lengths)
6	Bridge Rail Mount (Two per bridge)
7	Printhead Shield
8	Ink Cartridge, Matisse Cyan (42 mL)
9	Ink Cartridge, Matisse Magenta (42 mL)
10	Ink Cartridge, Matisse Yellow (42 mL)
11	Ink Cartridge, Matisse Black (42 mL)
12	Cartridge Holder (Stall)
13	Printhead Data Cable
14	Printhead Power Cable

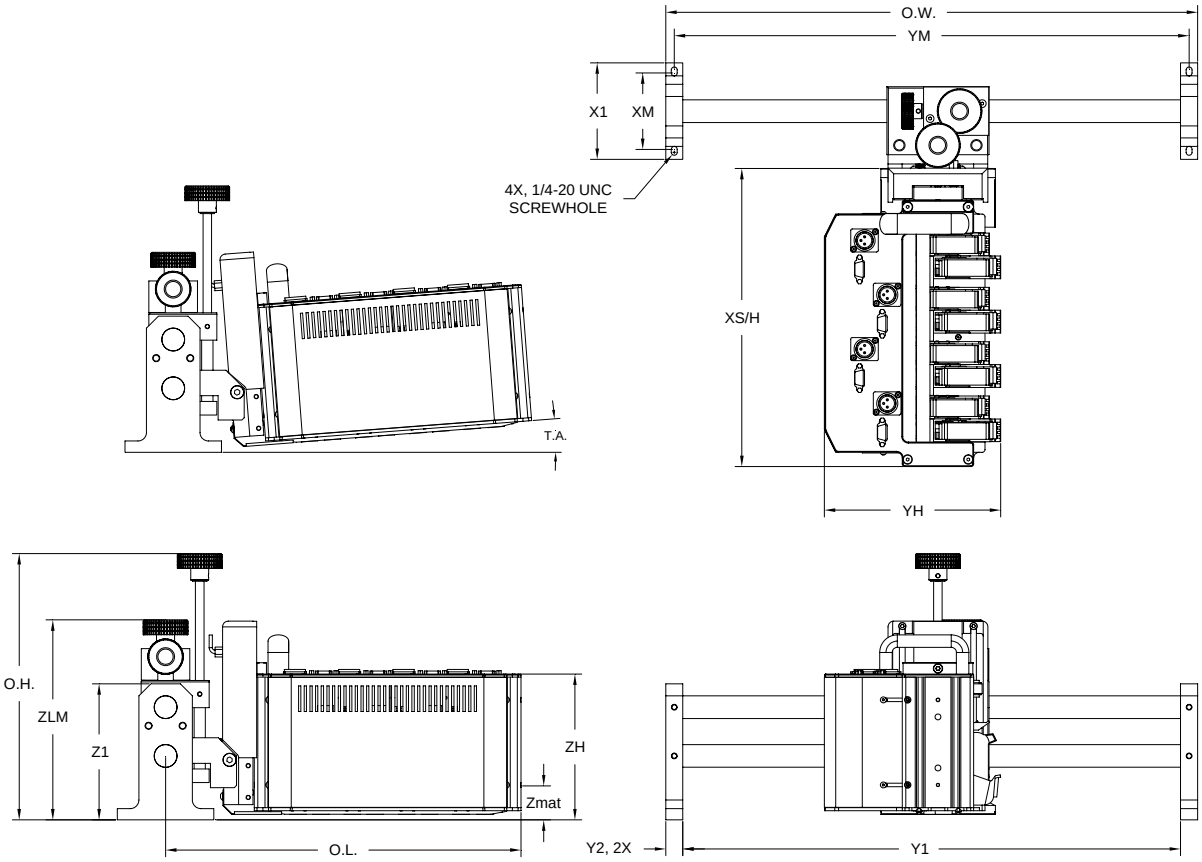


Table 1-3: *Apollo Printhead Dimensions (BK791-H-C80 Shown)*

Symbol	Description	Dimensions	
O.L.	1” Apollo 4C print head overall length from center of rail	15.67”	398 mm
O.W.	Overall width of bridge (22” Bridge)	23.45”	597 mm
O.H.	Overall height to height adjustment knob	11.74”	298 mm
X1	Bridge rail mount length	4.25”	108 mm
XM	Bridge rail mount mounting screw spacing	3.37”	86 mm
XS/H	1” Apollo 4C print head overall shield w/head length	13.14”	334 mm
Y1	Bridge exposed length	21.95”	558 mm
Y2	Bridge rail mount thickness	0.75”	19 mm
YH	1” Apollo 4C print head width	7.77”	197 mm
YM	Print head mount width	22.70”	577 mm
Z1	Bridge rail mount height	6.00”	152 mm
ZLM	Height of locking mechanism	8.82”	224 mm
Zmat	Height adjustment knob	1.50”	38 mm
ZH	1” Apollo 4C print head height	6.43”	163 mm

Printhead Overview

Chapter 2

2.1 Apollo 4C Printhead

The BK79 Series Apollo 4C Printheads are HP-based products that use two cartridges for each primary color (Cyan, Magenta, Yellow, and Black) to cover a 1" swath. Due to the symmetry of the design, each Apollo printhead is capable of mounting on either side of a standard bridge by simply exchanging which side the mounting assembly is used. Some general features of the Apollo printheads are:

1. Individual height control for each printhead (for material up to 1.44" thick).
2. Replaceable ink cartridges.
3. Universal front and back mounting for flexibility in multiple head configurations.
4. Spring-loaded head leveling design.
5. Convenient access for maintenance and service.

2.2 Electronic Components

The two main electronic components in the Apollo 4C printhead are the HP Interface Board and the Pen Driver Boards. There are four HP Interface Board and eight Pen Driver Boards for each inch of print. The HP Interface Board acts as a liaison between the two Pen Driver Boards and the Datapath card (installed in the computer controller). It essentially translates image data from the controller to the Pen Driver Boards, which regulates the ink cartridge voltage and temperature.

2.2.1 HP Interface Board Status LED

The HP Interface Board (Figure 2-1) is equipped with five LEDs designed to identify the current status of printhead. The meaning of each LED is described in Table 2-1.

Figure 2-1: *HP Interface Board*

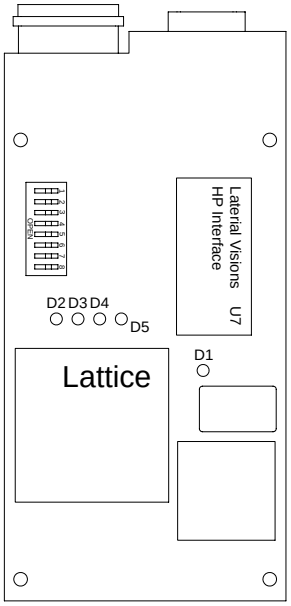


Table 2-1: *HP Interface Board LED Descriptions*

LED	Color	Function	Note
D1	Green	Processor Operation	ON when operating normally. Will BLINK if problem with processor
D2	Yellow	Pen #1 Comm error	ON if a communication error is detected to Cartridge #1
D3	Yellow	Pen #2 Comm error	ON if a communication error is detected to Cartridge #2
D4	Yellow	Pulse Warming	ON when pulse warming active
D5	Yellow	Reserved	No function

Note: If all four yellow LEDs light up and cannot be turned off even with a factory reset, the ispLSI Lattice chip may need to be replaced (P/N 9100677).

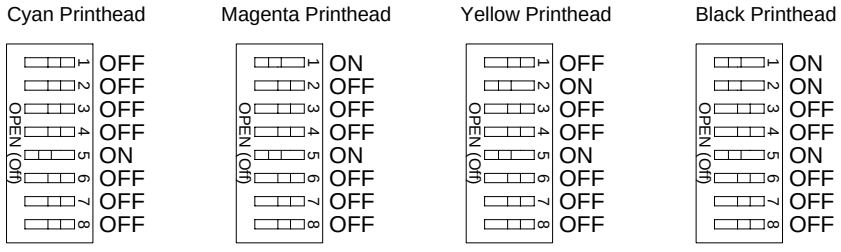
2.2.2 HP Interface Board DIP switch settings

In order for the printhead to properly function, the DIP switches on the HP Interface Board must be properly set. Of the eight total DIP switches, the first three are used to set the individual addresses for each HP Interface Board. As a result, each HP Interface Board will have a unique setting for the first three DIP switches while the remaining DIP switches are OFF under normal conditions. The possible DIP switch settings are shown in Table 2-2 and an example is shown in Figure 2-2.

Table 2-2: *HP Interface Board DIP Switch Settings*

DIP Switch		Data Channel Address							
Function	No.	1	2	3	4	5	6	7	8
Address	1	OFF	**ON**	OFF	**ON**	OFF	**ON**	OFF	**ON**
Address	2	OFF	OFF	**ON**	**ON**	OFF	OFF	**ON**	**ON**
Address	3	OFF	OFF	OFF	OFF	**ON**	**ON**	**ON**	**ON**
Not Used	4	OFF during normal operation.							
New System Support	5	OFF using old system support. ON using new system support.							
Not Used	6	OFF during normal operation.							
Test Fire	7	OFF during normal operation. ON for Test Fire.							
Factory Reset	8	OFF during normal operation. ON for factory reset.							

Figure 2-2: *Example Settings for Four BK791-H-C80 Apollo Heads*



Note: Always turn off power to the printheads before changing the DIP switch settings otherwise the electronics can be damaged.

2.3 Mechanical Components

The Apollo 4C printhead assembly consists of three basic elements: The printhead body (main housing for the electronics and the cartridges), the mounting assembly (connects the printhead body to the bridge), and the shield (protects the cartridge from contact with the transported material).

2.3.1 Adjustments

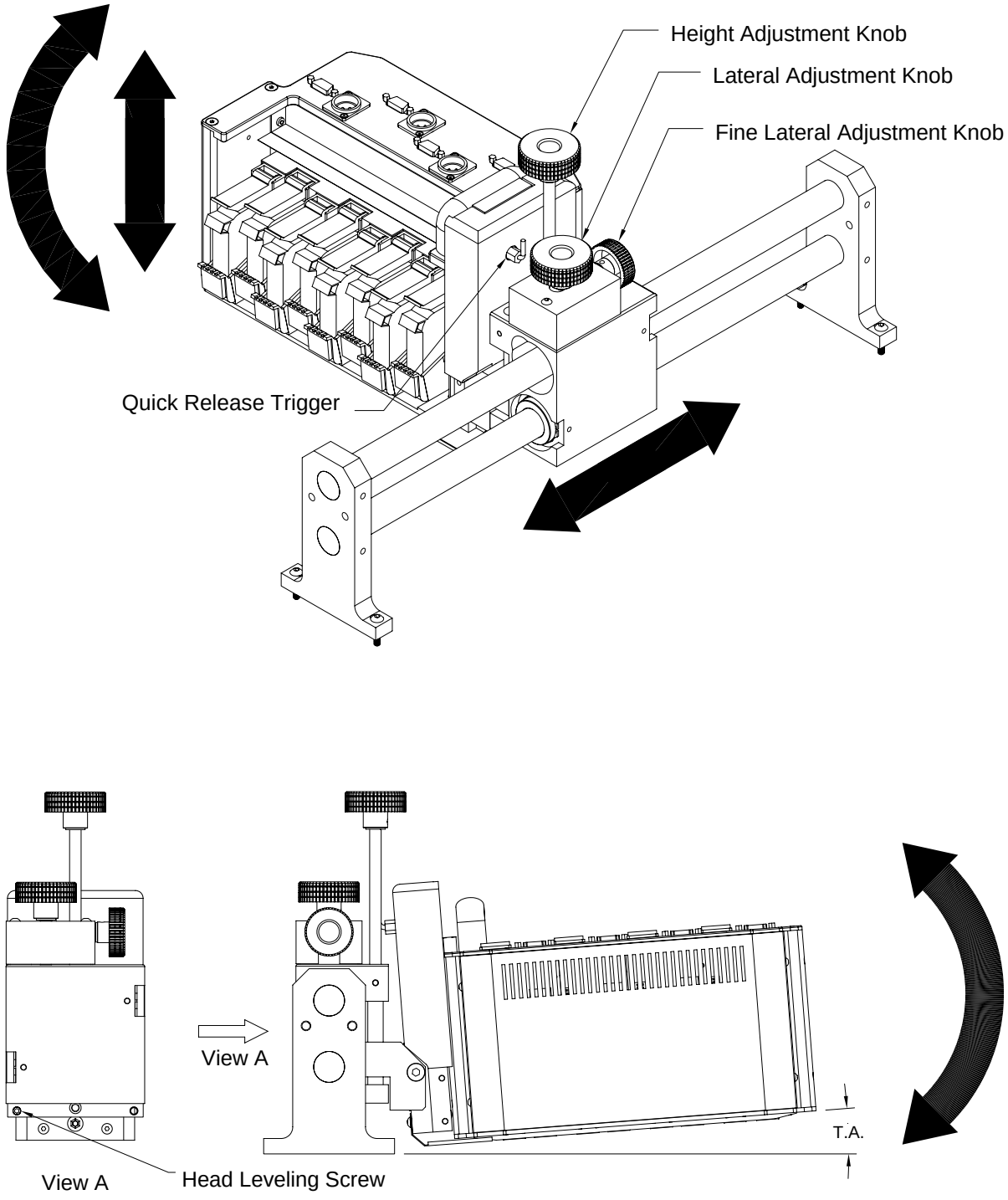
The Apollo printhead can be adjusted laterally, vertically, and angularly (Figure 2-3). Lateral adjustment along the length of the bridge is done by turning the Lateral Adjustment Knob and sliding the printhead to the desired location. Once in position, the knob is tightened to lock the printhead in place.

Height adjustment is achieved by turning the Height Adjustment Knob. A clockwise rotation raises the printhead while a counter-clockwise rotation lowers it. The adjustment provides the ability to accommodate material as thick as 1.25 inches and allows for fine adjustment to maximize the quality of print. This is done by lowering the printhead as close to the material as possible without interfering with product flow.

Angular adjustment is also known as printhead leveling. This is done by turning the Head Leveling Screw. A clockwise rotation increases the tilt angle (T.A.) while a counter-clockwise rotation decreases it. The optimum results will be achieved when the printhead is parallel to the transport tabletop. To wipe the cartridges, a quick release trigger has been built into the mounting mechanism. Pull on this to cause the printhead to rise. To place the printhead back into position, simply push down on the printhead until it clicks back into place.

It is also possible to remove the printhead body from the mounting assembly. This is done by loosening the Head Release Screw and sliding the printhead body up until it detaches from the mounting assembly.

Figure 2-3: *Apollo Printhead Adjustments (BK792-H-1 Shown)*



Printhead Setup

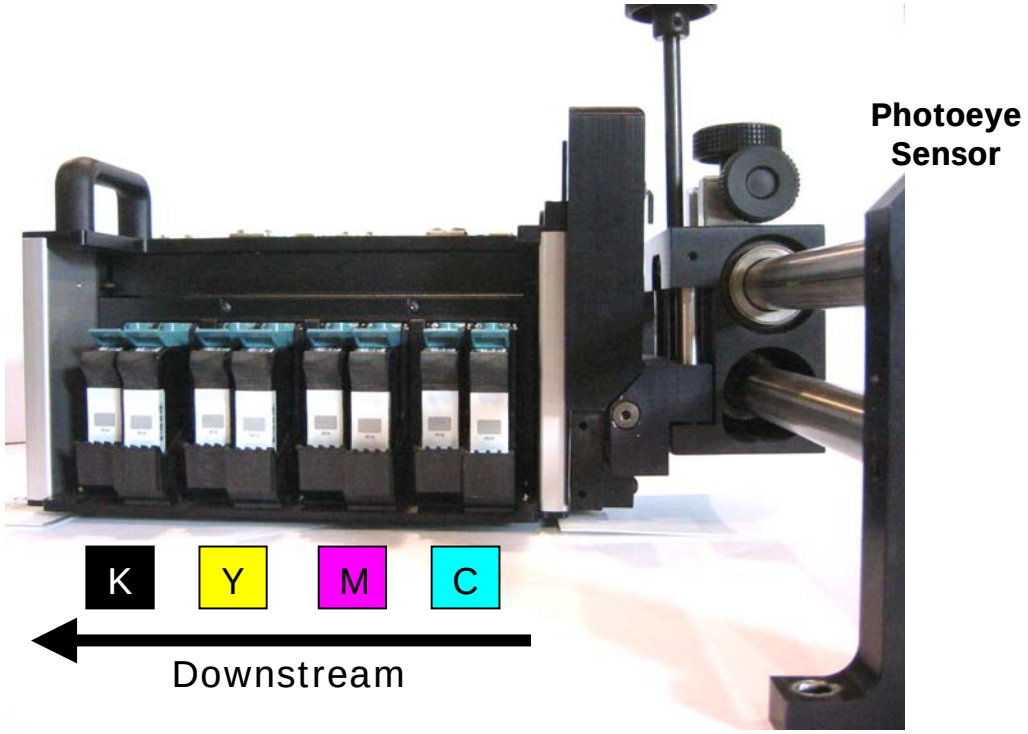
Chapter 3

3.1 Installation Instructions

The installation of a new printhead is relatively quick and simple. In order to properly install a printhead, reference the following:

1. Ensure that the controller (unit with the computer) power is off.
2. If this is an upgrade for an existing system in the field, remove the Datapath card and install the Printhead Support Chips (PSC) and confirm that the proper Lock chip is installed for the print technology. For full system orders (controller with printheads) this is done at the factory. If an expansion card (BK-EXP-1) is required (for two Apollo 4C printheads or for systems used in combination with other technology), install this onto the datapath card as well. Re-install the Datapath card into the computer.
3. Mount the printhead to the base in the appropriate orientation. Ensure the printhead is oriented such that the Cyan cartridges are closest to the photoeye sensor (as shown in *Figure 3-1*).

Figure 3-1: *Orientation of Apollo 4C Printhead*



In the case of reverse travel, ensure the printhead is oriented such that the Black cartridges are closest to the photoeye sensor.

4. Set the DIP switch settings of each HP Interface Board to match the printhead configuration (Section 2.2.2).
5. Connect the power and data cables from the head to the controller. The data cables must be installed in the Cyan-Magenta-Yellow-Black order on the datapath card. (e.g. 1-Cyan, 2-Magenta, 3-Yellow, 4-Black). There is one power and data cable for each HP Interface Board. For reverse travel, the data cables must be installed in the Black-Yellow-Magenta-Cyan order on the datapath card (e.g. 1-Black, 2-Yellow, 3-Magenta, 4-Cyan)
6. Install the appropriate Matisse ink pens in each stall following the color-coded labels.
7. Turn on the controller (i.e. BK1700) and load Compose. If the software version is earlier than V7.00, install the latest version of Compose IQ or SI.
8. In the Setup Window of Compose, define the head type as **"Apollo 4C"**. Set the distance from the photocue for only the 1st print bar as shown in Section 3.2.
9. For reverse travel, ensure the reverse travel feature has been enabled in the advanced options.

Note: There must be one Printhead Support Chip for each inch of print.

In order to support multiple ink technologies (i.e. Atlas, Apollo, Elite, UVC) or two inches of print, an expansion board is required (Buskro P/N BK-EXP-1)

The data cable number (used to determine which connector on the datapath card to plug into) corresponds to the Data channel address setting on each individual HP Interface Board (Table 2-2).

Warning: In order to take advantage of the colour management feature and get optimized and expected results, the Matisse inks must be used. The use of any other ink may cause undesired results.

3.2 Printhead Configuration

Before printing is possible, the DIP switch settings on each HP Interface Board must be set and the matching configuration must be entered into Compose. The configuration depends on the quantity and type of printhead(s) used. The general setup formula for Compose can be seen in Table 3-1. The example in Figure 3-2 represents a two-inch colour system.

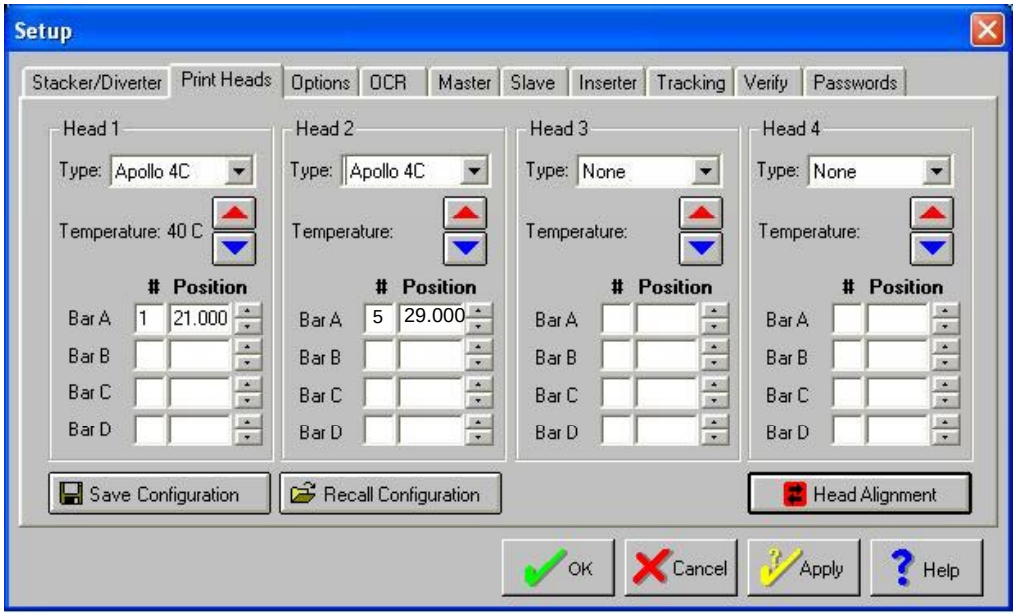
Table 3-1: *Horizontal Print Position and Print Bar Number Configuration*

			Print Bar A		Print Bar B		Print Bar C		Print Bar D	
Head	Printhead	Coverage	#	Position	#	Position	#	Position	#	Position
1	Apollo 4C	1”	N_1	X_1	N/A	N/A	N/A	N/A	N/A	N/A
2	Apollo 4C	2”	N_5	X_5	N/A	N/A	N/A	N/A	N/A	N/A

Note: N_n = Bar # (Equals coverage when only it is the first printhead in the system).
X_n represents the distance from the photocue to the first jet on the first cartridge.

The positions are theoretical values and may need slight adjustment.

Figure 3-2: *Example Setup for a 2" System*



3.2.1 Standard Printhead Configurations

Although a single controller is capable of supporting up to two inches of colour print with an expansion board (BK-EXP-1) when sufficiently powered, only systems with up to one inch

of colour print are considered standard configurations. In addition, in standard configurations the BK791-H-15AC80 (1 inch) is always considered the first printhead in order to minimize smearing of ink in multiple printhead systems. The standard configurations are described in Table 3-2.

Table 3-2: *HP Interface Board DIP switch and print bar configuration*

	BK791-H-15-C80				**BK791-H-15-C80**			
HP Interface Board DIP 1	OFF	**ON**	OFF	**ON**	OFF	**ON**	OFF	**ON**
HP Interface Board DIP 2	OFF	OFF	**ON**	**ON**	OFF	OFF	**ON**	**ON**
HP Interface Board DIP 3	OFF	OFF	OFF	OFF	**ON**	**ON**	**ON**	**ON**
HP Interface Board DIP 4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
HP Interface Board DIP 5	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
HP Interface Board DIP 6	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Head	**1**				**2**			
Horizontal Position	7.00				18.00			
Print Bar #	1				5			

3.3 Software Adjustments

The main software adjustments for the printhead can be found in the **Setup** dialog box (Figure 3-2) in Compose. In this window the type of printhead, temperature, print bar locations, and head alignment can be adjusted.

> **Note:** More detailed software information can be found in the Compose manual.

3.3.1 Printhead Type Selection

In order for the Apollo head to function properly, the **"Apollo 4C"** must be selected. Versions of Compose before V7.0 are not compatible with the Apollo 4C printheads.

3.3.2 Printhead Temperature Control

The nominal temperature for the Apollo 4C printhead is 40^{o}C. This can be adjusted by pressing the arrow icons beside the temperature reading in the **Setup** dialog box. The actual temperature can be viewed in the **Diagnostics** window. Note that one bar thermometer in the **Diagnostics** window indicates two ink cartridges. It is not possible to determine the temperature of each individual cartridge.

> **Note:** The temperature can be adjusted $\pm$10^{o}C. However, this can affect the performance of the printhead. As a result, only a qualified technician should change these values.

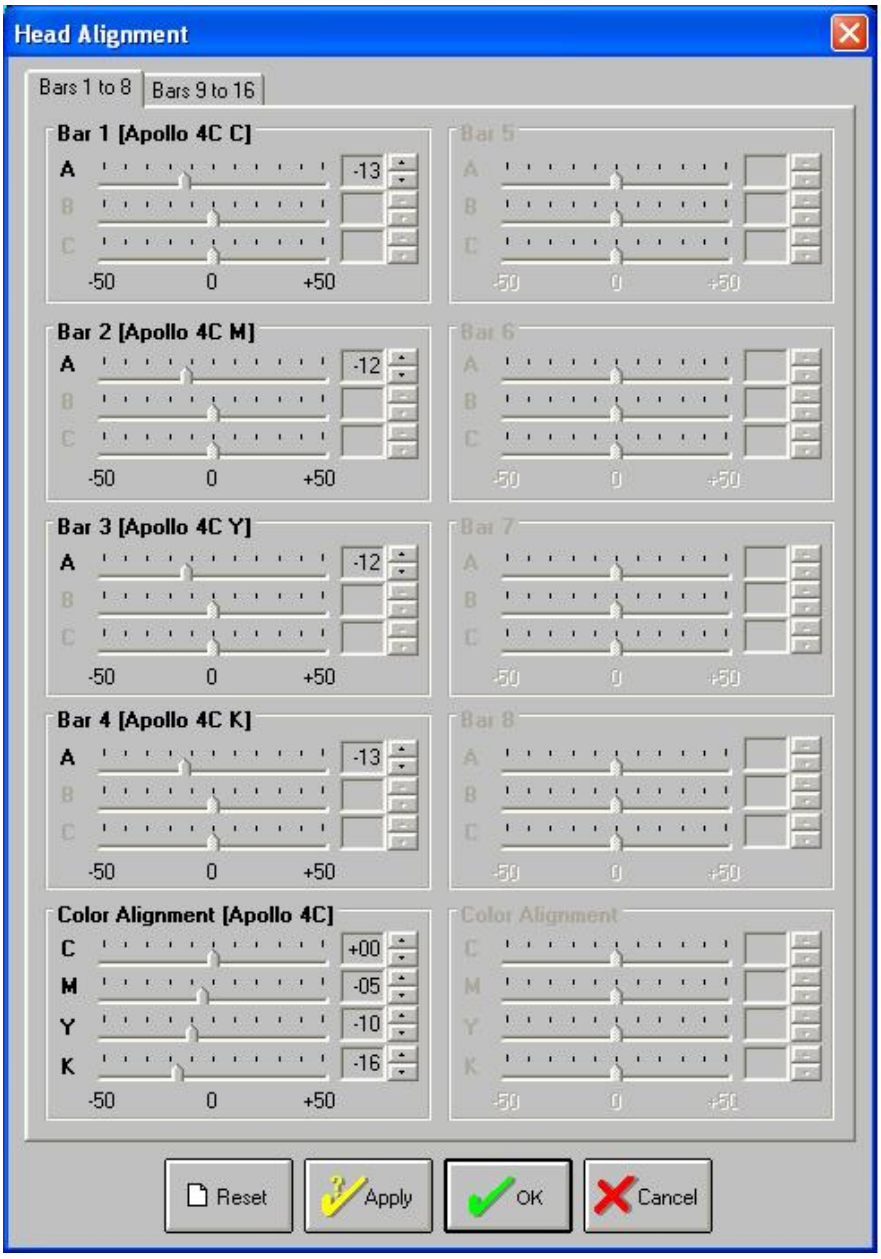
3.3.3 Print Bar Horizontal Position

In order to accurately position the print on the product, the print bar positions must be set properly. By definition, the position of the print bar is the distance in inches from the centre of the photocue sensor to the leading edge of the first print cartridge in the print bar. Coarse adjustment is achieved by entering in the print bar locations in the **Setup** window while fine adjustment is achieved in the **Head Alignment** dialog box (In the **Setup** window). The print bar positions for coarse adjustment are described in Section 0.

> **Note:** A Print Bar is defined as a pair of ink cartridges in the Apollo printhead.

In order to eliminate horizontal misalignment between cartridges, the **Head Alignment** tool can be used for fine adjustment (*Figure 3-3*) to shift each colour print bar left or right.

Figure 3-3: Print Bar Fine Adjustment



Note: It is recommended that a test pattern be used in conjunction with the coarse and fine adjustments. This makes it easier to visualize misalignment.

To align the color printhead:

1. Print a test label by selecting “Print Test Labels” in the main window.

   Figure 3-4: Misaligned text label

2. Using bar 1-4 sliders, align each of the thick color lines.

   Figure 3-5: Aligning colour cartridges.

3. Using the colour alignment sliders, align the thin cyan lines with the other colours.

   Figure 3-6: Aligned Test Label

3.4 Monochrome Printhead Configuration

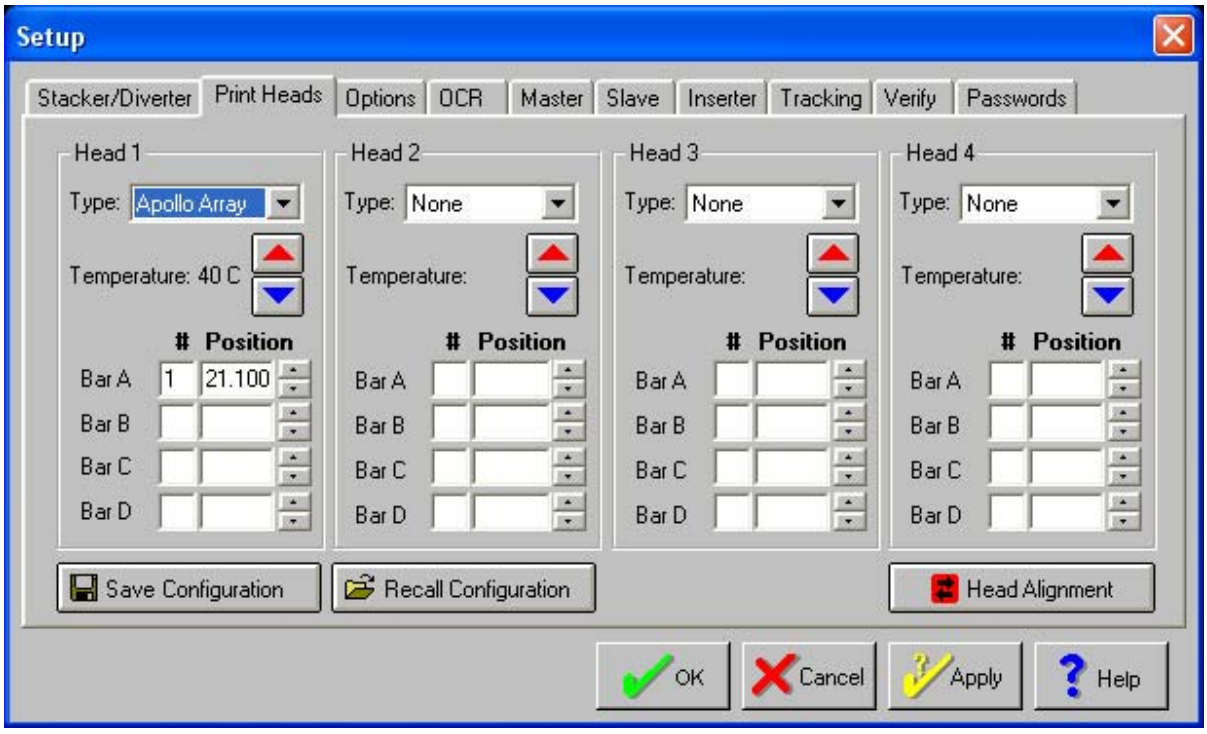
It is possible to set up the Apollo 4C printheads to act as a 1” Apollo Array and print in monochrome. To do this:

1. Specify the type as “Apollo Array” in the setup window.

2. Only the first two ink stalls closest to the photoeye will fire. Change out these cartridges to the desired colour.

Note that if this were already setup for an Apollo 4C, bar A’s number and position would not have to be changed.

Figure 3-7: *Monochrome printhead configuration.*



Printhead Maintenance

Chapter 4

4.1 General Maintenance

In order to obtain good print quality, the printheads must be properly maintained. During printing, ink and paper dust can build up on the printhead resulting in poor print quality. As a result, each ink cartridge must be properly cleaned.

The general procedure for cleaning an ink cartridge is to wipe the printhead with a moist cotton TexWipe® cloth. Only distilled or de-ionized water should be used to avoid mineral deposits from building up on the cartridge. Although TexWipe® cloths are recommended, any cloth with the following qualities are acceptable:

- Soft (to avoid printhead scratching)
- Fibreless (to avoid small fibres from blocking the nozzles)
- No chemical additives

Note: Never use industrial paper towels, toilet paper, or sponges to wipe the printhead.

4.1.1 Printhead Cleaning

There are two main methods of cleaning the ink cartridges. Either each individual ink cartridge can be removed from the stall and wiped, or the entire printhead can be raised using the quick release trigger to wipe multiple cartridges simultaneously. The method used depends on the preference of the operator. When cleaning the printhead, the following must be considered:

1. Use a soft, fibreless cloth.
2. The cloth must be moist with de-ionized or distilled water before wiping.
3. Wipe the cartridges in the direction of the nozzle rows (Figure 4-1).
4. Wipe the cartridges with the cartridge pointing down (printhead down).
5. Do not apply heavy pressure while wiping. A gentle wipe is sufficient.

Note: Never shake, drop, or hit the ink cartridge. This can result in the formation of bubbles near the ink firing chambers, which will result in poor print.

Figure 4-1: *Direction of wiping*

4.1.2 Interconnect Pad Cleaning

If needed, the interconnect pads on the cartridge can be cleaned with a moist cotton TexWipe® cloth or Q-Tip. However, it is important to ensure that the interconnect pad is dry before reinserting the cartridge back into the printhead (otherwise an electrical short may occur resulting in permanent damage).

4.1.3 Printhead Purging

If the printhead is inactive for an extended period of time, ink may dry in the nozzles forming "ink plugs". This would result in missing lines of print. When this occurs, the cartridges should first be wiped (Section 4.1.1). Once this is done, the ink plugs can be forced out or purged by printing test patterns at high resolutions (i.e. 660 DPI). This process should be repeated until the missing lines are eliminated.

4.1.4 Cartridge Disposal and Clean-up

The ink cartridges can be disposed of in normal garbage. In the case of ink spills, soap and water is sufficient for cleaning. Lava brand soap is also known to be effective to remove ink from hands.

4.1.5 Cartridge Storage

For short-term storage (less than 2 days, 1 day if the environment is hot and dry), the cartridges can remain in the printhead. For long-term storage, remove the cartridges from the printhead and keep them in an area that is relatively free of dust and paper particles. In addition, the storage area should not be dry.

Note: One option for long-term ink cartridge storage is to place the cartridges in a Tupperware container with a damp sponge or towel to maintain humidity. This will help to prevent the printhead from drying out.

Troubleshooting Guide

Chapter 5

5.1 Troubleshooting

The following chapter is a brief description of problems that may be encountered over the life of the printhead. The recommended solutions are also provided in Table 5-1.

Table 5-1: *General Troubleshooting*

Problem	Example	Action
Cartridge will not print.	Sheet is blank even after it has gone underneath the printhead.	• Confirm Compose is set to enable printing. • Wipe and purge printhead. • Re-insert the cartridge into the printhead. • Install a new ink cartridge. • Ensure the tape is off the ink cartridge printhead.
Missing lines/streaks in text or graphics.		• Wipe and purge printhead. • Re-insert the cartridge into the printhead. • Clean the interconnect pads. • Install a new ink cartridge.
Ink streaks around text or image.		• There is an ink buildup. Wipe the cartridges.

Image shows a color shadow or text is misaligned.		• Use test labels to match up printing positions of cartridges and use the printbar fine adjustment to align the colours
Colours are missing from the image		• Wipe and purge each print cartridge. • Re-insert the cartridge into the printhead, • The ink cartridge may be empty. Install a new ink cartridge. • Ensure the tape is off the ink cartridge printhead
Colours drop out and do not print		• The speed may be set too high. Lower the speed or change the graphic.
Colours appear off or inaccurate		• Ensure you have **Matisse** cartridges installed on the printhead placed in the proper order. • Ensure you have the correct media selected in the layout window.

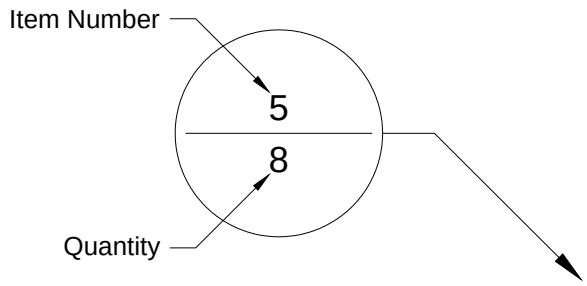
Assembly Drawings

Appendix **A**

List of Tables

List of Figures

Balloon Annotation and Parts Listing



Item	Part Number	Quantity	Description	Reference
1				
2				

The following is a description of how to interpret the information in this section:

Item:

This column indicates the item number used for each unique part in an assembly drawing. It is matched with the top number in the balloon pointing at the associated part.

Part Number:

This column represents the Buskro part number.

Quantity:

This represents the total number of a given part in an assembly. It is matched with the bottom number in the balloon pointing at the associated part.

Description:

This column contains a brief description of the part.

Reference:

This column indicates the page location for sub-assemblies.

Table A-1: *Printhead, Apollo, 1" x 600 DPI Color, 15' Umbilical (BK791-H-15-C80)*

Item	Part Number	Quantity	Description	Reference
1	9102711A	1	Cable, Apollo Printhead Umbilical, 15'	
2	9103660	1	Shield, Short, Apollo	
3	9103661A	1	Printhead Assembly, 1" Apollo Color	
4	BK80M-2	1	Printhead mount, 80 Series, Apollo	

Figure A-1: *Printhead, Apollo, 1" x 600 DPI Color, 15' Umbilical (BK791-H-15-C80)*

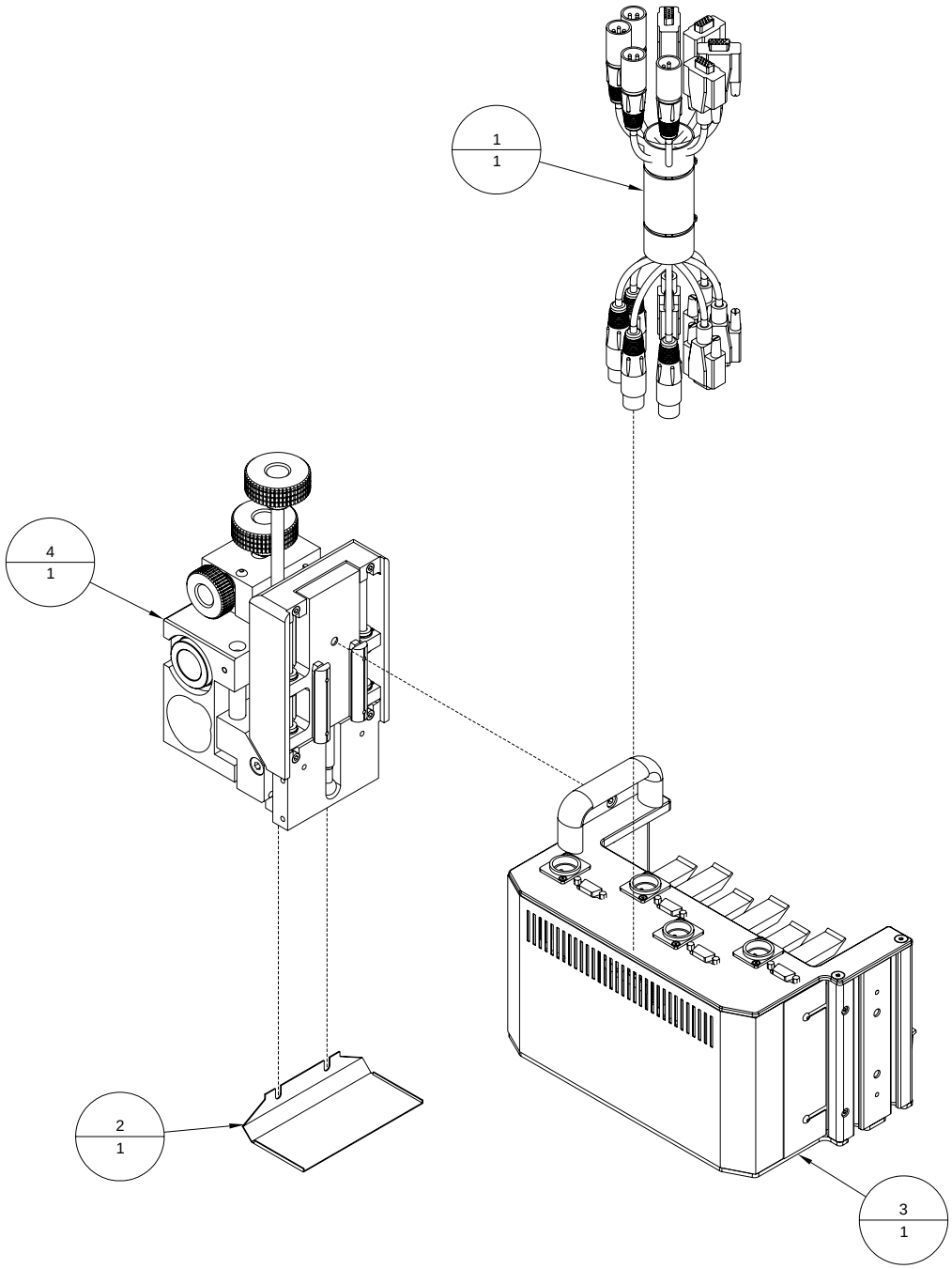


Table A-2: *Printhead Mount, 80 Series, Apollo (BK80M-2)*

Item	Part Number	Quantity	Description	Reference
1	9102819A	1	Bridge Mount Assembly	
2	9103645A	1	Printhead Support Assembly	

Figure A-2: *Printhead Mount, 80 Series, Apollo (BK80M-2)*

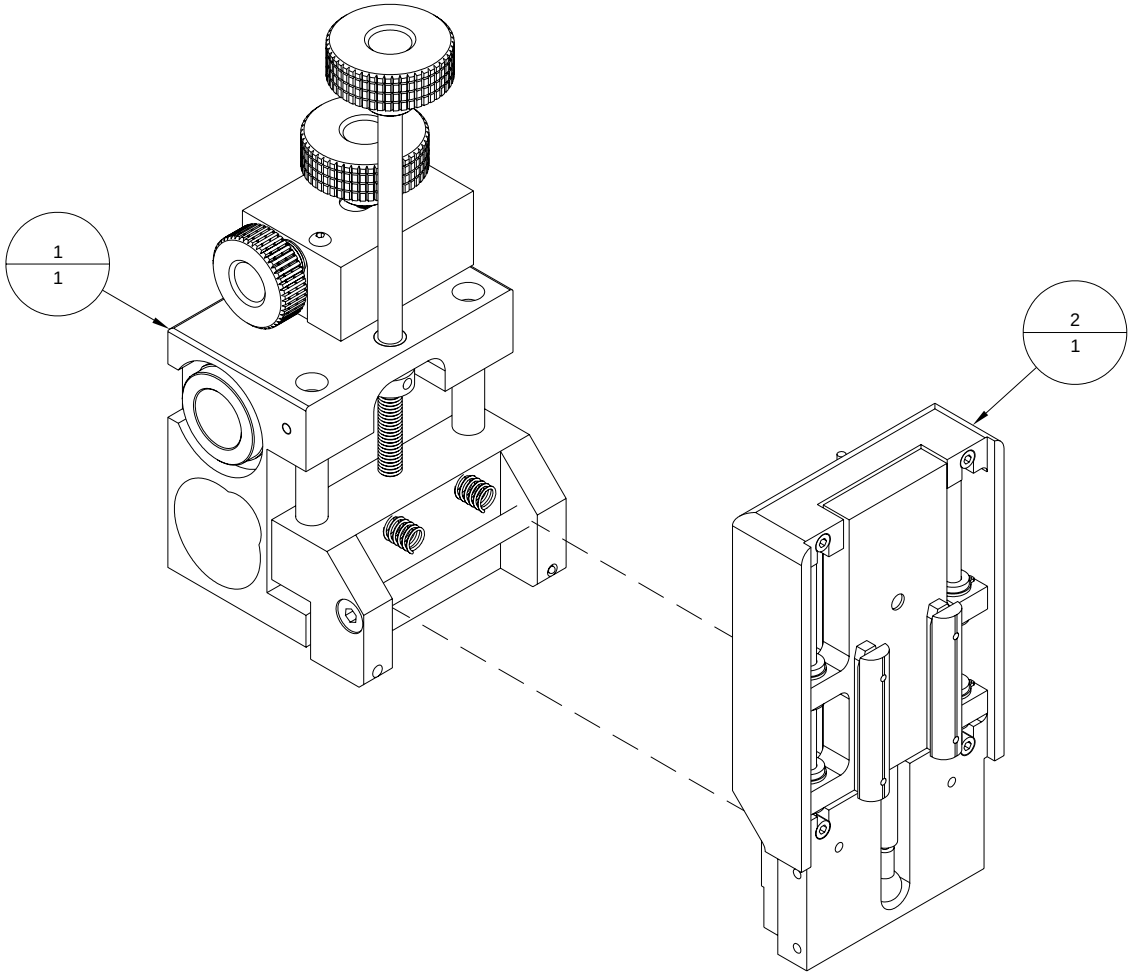


Table A-3: *Apollo Stall Assembly (9102277A)*

Item	Part Number	Quantity	Description	Reference
1	401310	3	Screw, PHMS, 4-40 UNC x 1/4"	
2	9100228	1	Board, HP Pen Driver	
3	9102277	1	HP Pen Stall	

Figure A-3: *Apollo Stall Assembly (9102277A)*

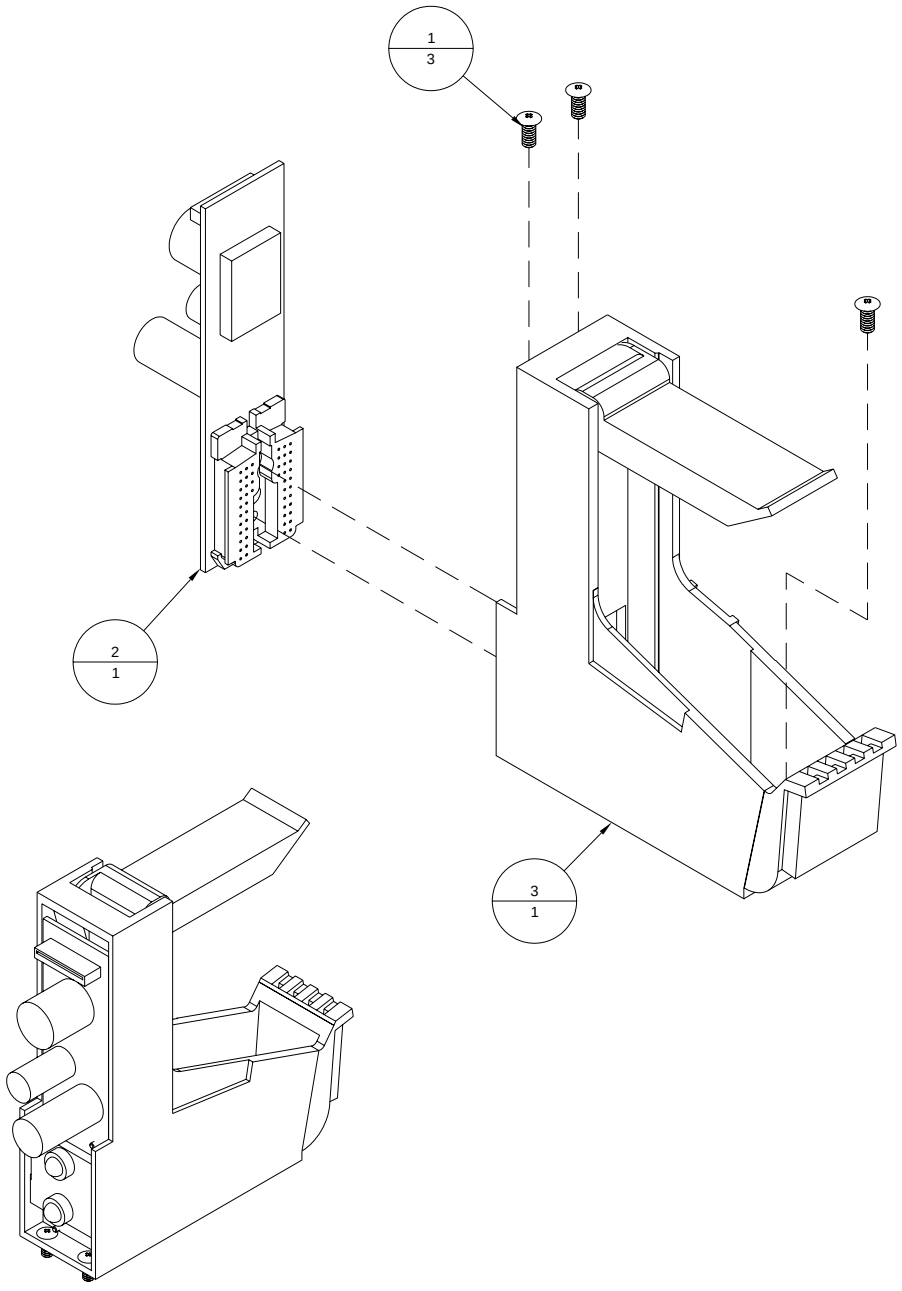


Table A-4: *Cable, Apollo Printhead Umbilical, 15' (9102711A)*

Item	Part Number	Quantity	Description	Reference
1	615140	2	Lashing Tie	
2	9100261A	4	Cable, HP Printhead Power, 15'	
3	9101776	1	Sleeving, Braided Expandable (148" Long)	
4	9102603	2	Shrink Wrap, 1 ½" OD, ½" I.D. (2" Long)	
5	9102687	4	Cable, Monitor Extension, HDF15F/M, 15'	

Figure A-4: *Cable, Apollo Printhead Umbilical, 15' (9102711A)*

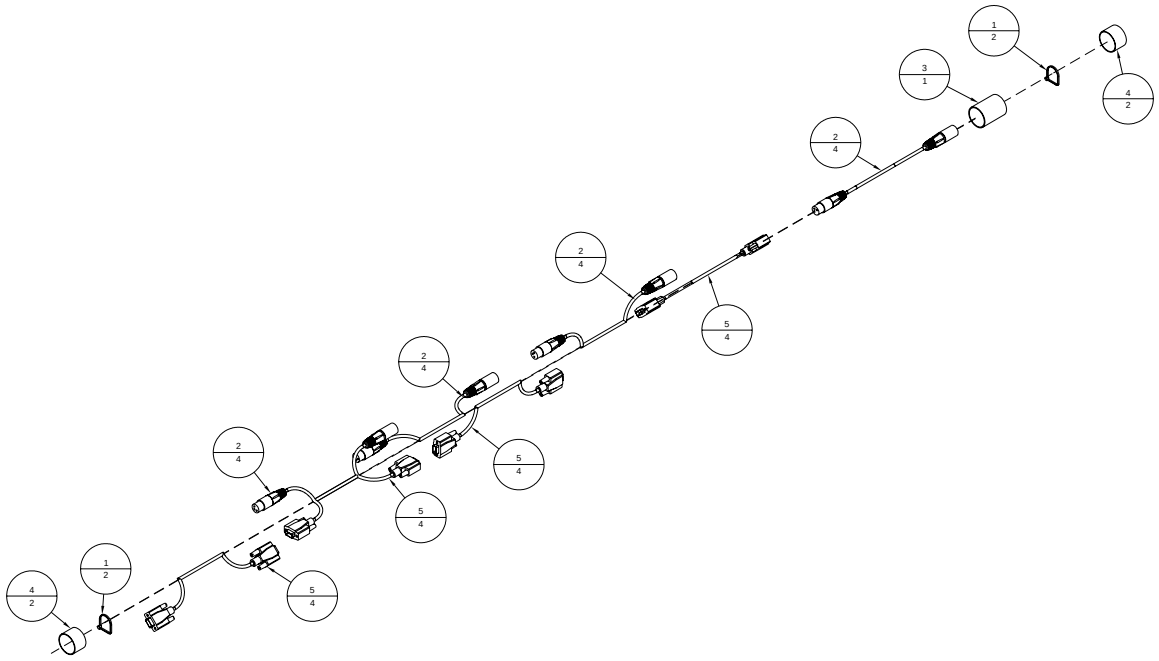


Table A-5: *Bridge Mount Assembly (9102819A)*

Item	Part Number	Quantity	Description	Reference
1	131020	1	Collar, 3/8" I.D.	
2	212533	2	Linear Bearing, 1" ID	
3	404520	3	Screw, BHCS, 10-32 UNF x 3/8"	
4	404807	2	Screw, SHSS, 10-32 UNF x 3/16"	
5	404810	2	Screw, SHSS, 10-32 UNF x ¼"	
6	437156	4	Retaining Ring, 1 9/16" ID, External	
7	439009	3	Lockwasher, No. 10	
8	505384	1	Flange Bushing, 3/8 ID x ½ OD x ½ LG	
9	9101128	2	Dowel Pin, ½" DIA x 4"	
10	9101874	2	Sprint, Compression	
11	9102592	1	Shoulder Bolt, 3/8" x 3 ½. 5/16-18 UNC	
12	9102819	1	Mount, Linear Bearing, Automatic	
13	9102877	1	Bearing, Thrust, ¼" I.D.	
14	9102879	1	Rod, Threaded, Thickness	
15	9102883	1	Mounting Block, Slider	
16	9102884	1	Plunger, Spring Loaded, Threaded, 1/4-20UNC	
17	9102885	1	Knob, Diamond Cut, Knurled, 2" Dia.	
18	9103460A	1	Locking Mechanism	

Figure A-5: *Bridge Mount Assembly (9102819A)*

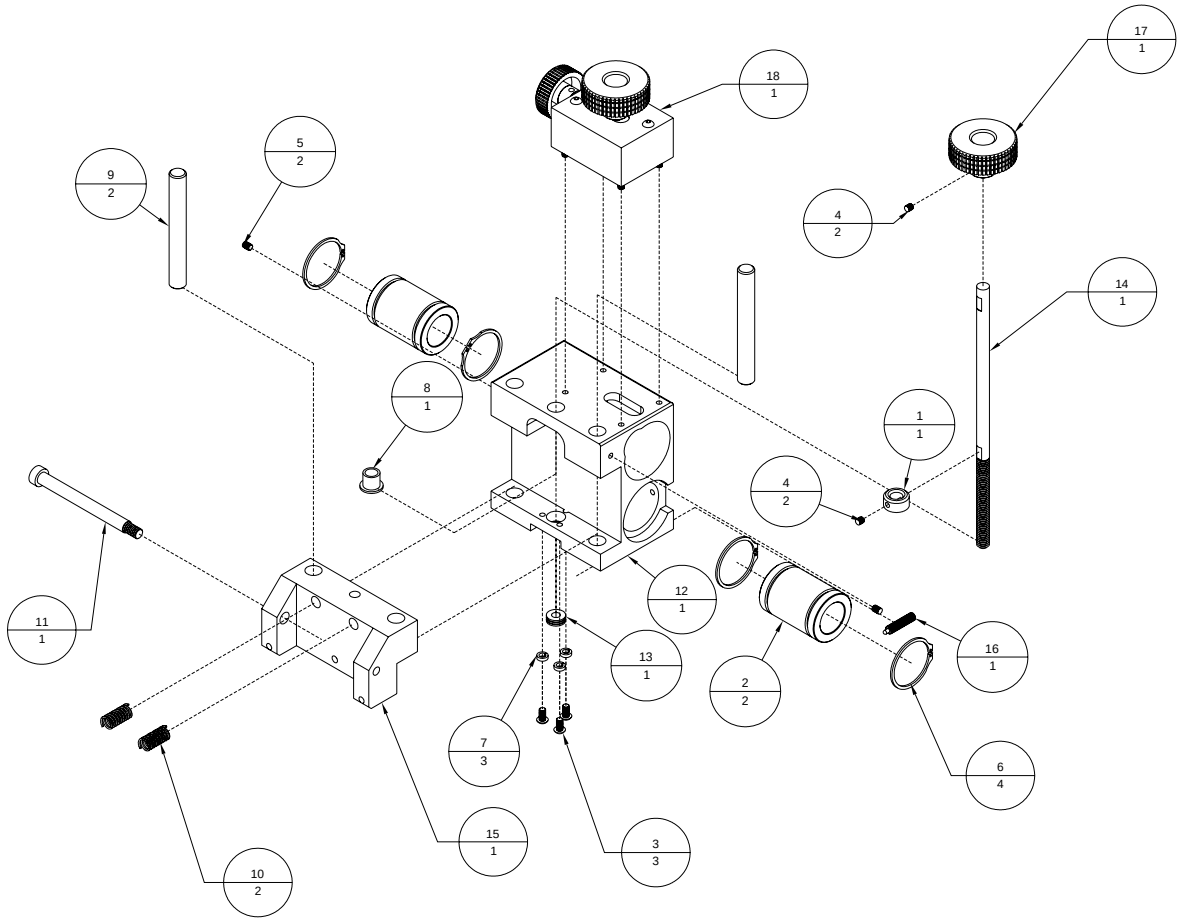


Table A-6: *Locking Mechanism (9103460A)*

Item	Part Number	Quantity	Description	Reference
1	404275	4	Screw, SHCS, 10-32 UNF x 1 1/4"	
2	404510	2	Screw, BHCS, 10-32 UNF x 1/4"	
3	404805	4	Screw, SHSS, 10-32 UNF x 1/8”	
4	404807	2	Screw, SHSS, 10-32 UNF x 3/16”	
5	436348	2	Dowel Pin, 1/4” Dia. X 2”	
6	505056	6	Flange Bushing, 1/4 ID x 3/8 OD x 1/4 LG	
7	9102885	1	Knob, Diamond Cut, Knurled, 2” Dia.	
8	9103457	1	Knob, Diamond Cut, Knurled, 1.57” Dia.	
9	9103458	1	Threaded Rod, 3/8-16 UNC	
10	9103459	1	Slider Nut, 3/8-16 UNC	
11	9103460	2	Bracket, Slider Block	
12	9103461	1	Threaded Rod, 3/8-24 UNF, Lateral Adjustment	
13	9103462	1	Cover, Lateral Adjustment Mechanism	
14	9103463	1	Pin, Brass, 3/16” Dia x 0.6” Long	

Figure A-6: *Locking Mechanism (9103460A)*

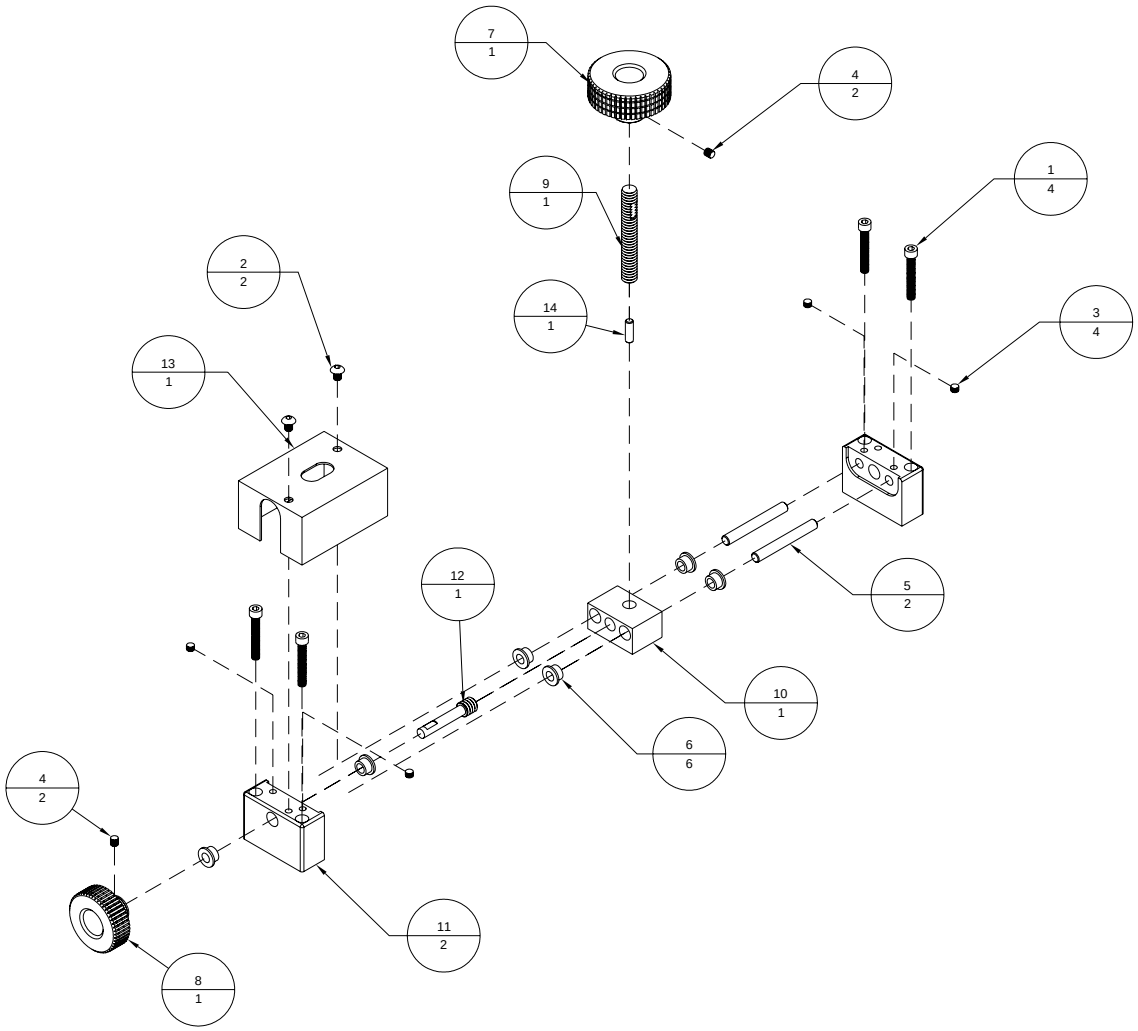


Table A-7: *Printhead Support Assembly, Apollo (9103645A)*

Item	Part Number	Quantity	Description	Reference
1	402250	4	Screw, SHCS, 6-32 UNC x 3/4"	
2	404230	4	Screw, SHCS, 10-32 UNF x 1/2"	
3	404510	2	Screw, BHCS, 10-32 UNF x 1/4"	
4	437050	8	Retaining Ring, 1/2" I.D., External	
5	9101996	1	Gas Spring	
6	9102126	1	Locknut, M4 x 0.7, Nylon Insert	
7	9102341	4	Bushing, Linear Ball Bearing	
8	9102411	2	Rod, 0.25” O.D. x 5.19 Lg.	
9	9102594	1	Mount, Printhead Solid	
10	9102792	1	Plunger, 3/8-16 UNC, Lever Type, Non-Locking	
11	9103645	1	Shuttle Block, Solid Mount, Apollo	
12	9103672	2	Profile Bar, Apollo Bar	

Figure A-7: *Printhead Support Assembly, Apollo (9103645A)*

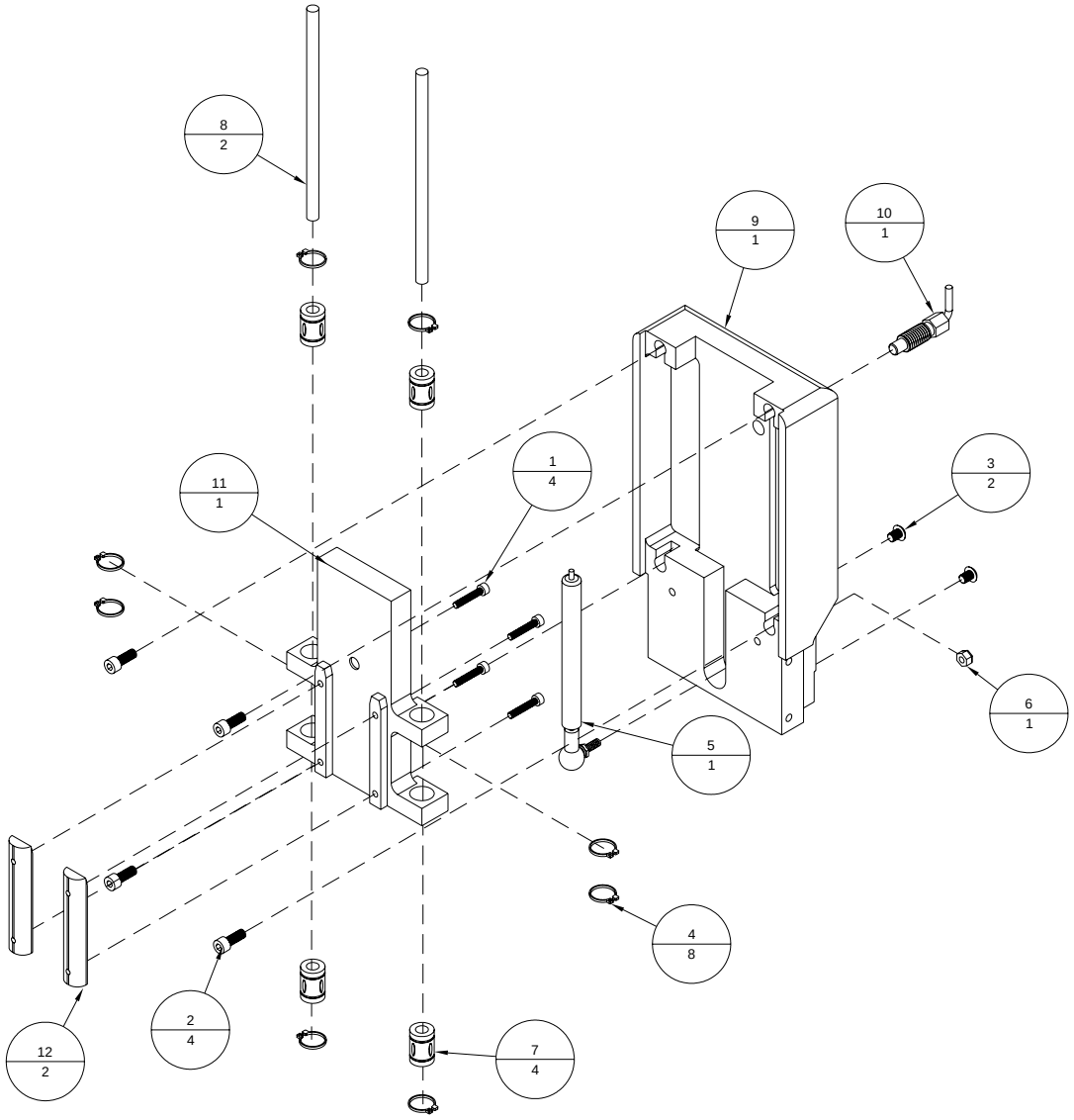


Table A-8: *Apollo Interface Board Assembly (9103649A)*

Item	Part Number	Quantity	Description	Reference
1	401010	2	Screw, FHCS, 4-40 UNC x 1/4"	
2	401310	2	Screw, PHMS, 4-40 UNC x 1/4"	
3	403510	1	Screw, BHCS, 8-32 UNC x 1/4"	
4	440530	2	Washer, #6, Nylon	
5	615322	2	Female Screwlock, 4-40 UNC	
6	9100220	1	Board, HP Interface	
7	9103649	1	Brace, Apollo Interface Board	

Figure A-8: *Apollo Interface Board Assembly (9103649A)*

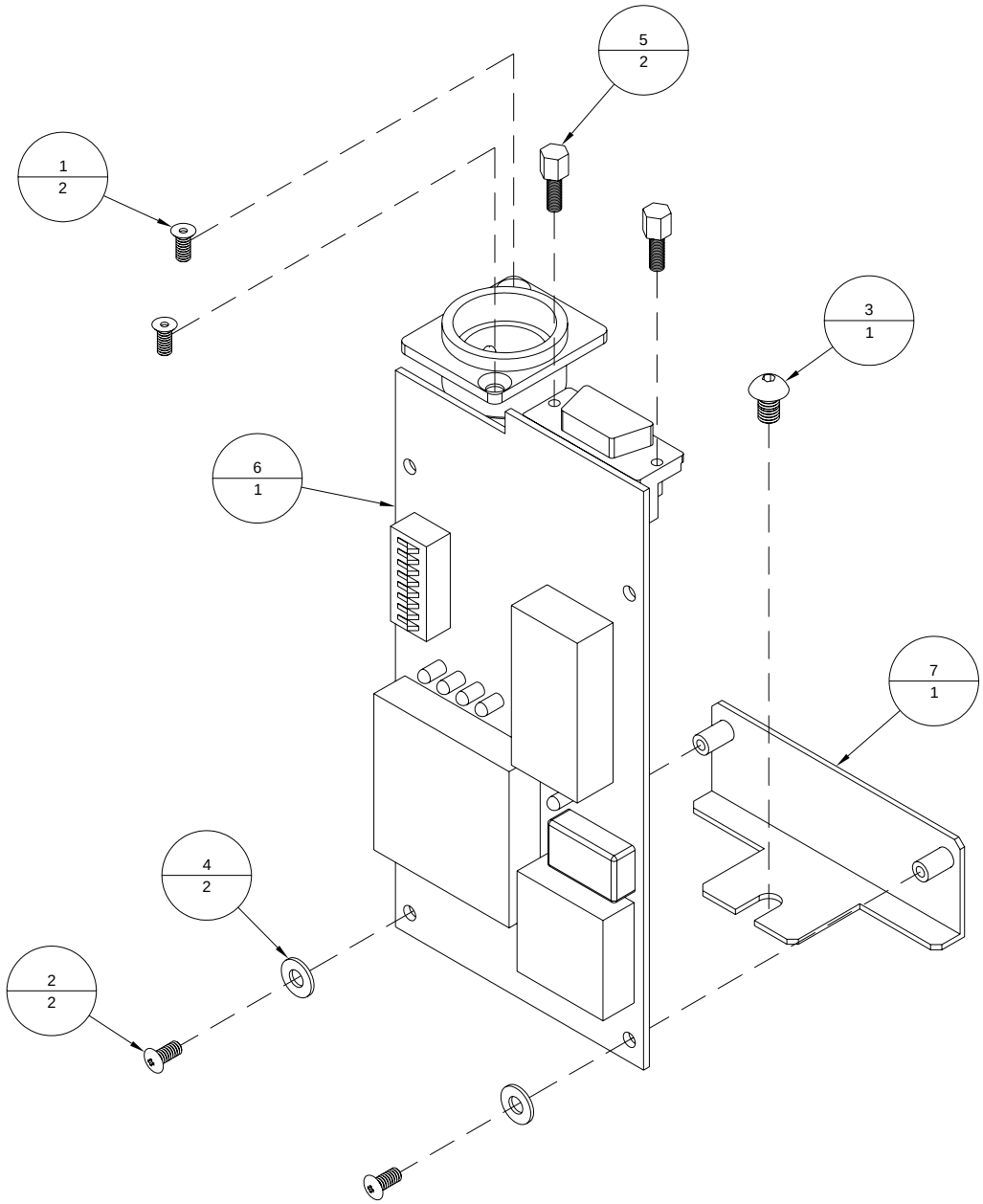


Table A-9: *Print Head Assembly, 1" Apollo Colour (9103661A)*

Item	Part Number	Quantity	Description	Reference
1	401310	2	Screw, PHMS, 4-40 UNC x ¼"	
2	401320	4	Screw, PHMS, 4-40 UNC x 3/8"	
3	402240	4	Screw, SHCS, 6-32 UNC x 5/8"	
4	402510SS	6	Screw, BHCS, 6-32 UNC x 1/4" SS	
5	404020	6	Screw, FHCS, 10-32 UNF x 3/8"	
6	404070	2	Screw, FHCS, 10-32 UNF x 1"	
7	405050	2	Screw, FHCS, ¼-20 UNC x ¾"	
8	405230	1	Screw, SHCS, ¼-20 UNC x ½"	
9	439004	6	Lockwasher, No. 4	
10	9102189	2	Mounting Extrusion, HP Printhead	
11	9102277A	8	Apollo Stall Assembly	
12	9102703	1	Label, Apollo Dipswitch Settings	
13	9102846	1	Handle, Pull, 1/4-20	
14	9103649A	4	Apollo Interface Board Assembly	
15	9103652	1	Cover, Side, 4" Apollo	
16	9103661	1	Plate, Bottom, 1" Apollo Color	
17	9103662	1	Plate, Top, 1" Apollo Color	
18	9103664	2	Sled 1, Apollo	
19	9103673	1	Bracket, Inside, 1" Apollo Color	
20	9103676	1	Block, Locking Apollo	
21	9103793	1	Bracket, Top, 1" Apollo Color	
22	9103885	1	Color Label, CMYK	

Figure A-9: *Print Head Assembly, 1" Apollo Colour (9103661A)*