1.0 DP6 & DP7 DOCUMENT PRINTERS - FUNCTIONAL SPECIFICATIONS

1.1 PRINT CHARACTERISTICS

Print Method	Impact with automatic thickness compensation				
	DP6: 9 wire dot matrix DP7: 24 wire dot matrix				
Print Line Width	8.0” (203 mm)				
Character Spacing	5, 6, 8.5, 10, 12, 17, 20 and 24 characters/inch				
Font	96 char. ASCII, international character support				
Print Speed		DP6	DP6	DP7	DP7
(chars/second)	Chars/inch	10	12	10	12
	Draft	165	200		
	Normal	125	150	150	180
	Correspondence	32	37	75	90
Dot Graphics	DP6: 60, 120, 240 horizontal; 72, 144 vertical				
(dots/inch)	DP7: 60,120,180, 360 horizontal; 72, 180 vertical				
Feed Speed	50 msec. single line feed at 5 or 6 lines/inch				
	12 inches/second (305 mm/sec) slew speed				
Feed Accuracy	+/- 0.6%				

1.2 FORMS CHARACTERISTICS

Media	Single sheets, passbooks, 6 part multipart forms and envelopes.		
Document Width	2.5” (64 mm) to 9.5” (241 mm)		
Document Length	2.5” (64 mm) minimum, no maximum		
Document Thickness	0.0035” (0.09 mm) to 0.062” (1.57 mm)		
Non-printable Areas		DP6	DP7
	Top of form	0.25”(6.4mm)	0.16”(4.1mm)
	Above horiz. fold	0.25”(6.4mm)	0.38”(9.7mm
	Below horiz. fold	0.31”(7.9mm)	0.27”(6.9mm)
	Bottom of form	0.40”(10.2mm)	0.45”(11.4mm)
	Vertical fold/edge	0.25”(6.4mm)	0.25”(6.4mm)

1.3 RIBBON

Cartridge	Endless loop ribbon with internal reinking
	DP6: NEC P2200 compatible
	DP7: Panasonic KX-P155 compatible

1.4 INTERFACE

Standard Serial	RS-232, DP6: 1200-9600 baud, 4KB buffer
	DP7: 2400-19200 baud, 11KB buffer
Optional	RS-232 dual ports or PC parallel port
Command Sets	IBM Proprinter/4722, Unisys and Craden
Protocols	DTR, Xon/Xoff and Block
Power Input	100-130 or 200-260 VAC, 50-60 Hz, 50 W max.

1.5 PHYSICAL CHARACTERISTICS

Dimensions	Width: 14.1” (357mm) Height: 6.3” (160 mm)
	Depth: 10.8” (275 mm) operating, 7.8” (197 mm) standby
Weight	18.3 pounds (8.3 kg) + 3.5 pounds (1.6 kg) packing

1.6 ENVIRONMENTAL & STANDARDS

Operating	10 to 40° C, 10 to 90% humidity
Storage	-30 to 70°C, 5 to 95% humidity
Standards	IEC 950, UL 1950, UL File E91899
	FCC 20780 Class A certified, Canadian UL Listed

2.0 INSTALLATION

2.1 NORMAL INSTALLATION PROCEDURE

1. Read this section and 3.1 to 3.6 on Operation and Configuration.
2. Remove the cabinet lid and cut the shipping strap that fastens the carriage to the rail on the metal box. Save the packing material.
3. Install the ribbon cartridge (See 3.3).
4. Check that the label on the printer rear correctly indicates the input supply voltage. (Either 115 VAC for 100-130 VAC input or 230 VAC for 200-260 VAC). If it is incorrect, see Changing Supply Voltage in 2.3.

   CAUTION: CONNECTION OF A PRINTER WIRED FOR 115 VAC TO A 230 VAC INPUT CAN PERMANENTLY DAMAGE THE PRINTER!
5. Check that the power switch on the printer rear is off ("0" side depressed). Connect the line cord to the printer and then to an electrical outlet. If a suitable line cord was not supplied with the printer, procure an IEC HAR (harmonized) line cord that has an IEC 320-C13 style connector and the appropriate HAR plug for your country.
6. Connect and fasten the interface cable to the rear panel connector. (See 3.13.3 for cabling information).
7. Documents longer than 8" will feed out the printer rear. Insure that space is available for the longest document to be fed.
8. Turn on the power switch located on the rear of the printer. READY should be displayed.
9. Configure the printer by the procedure in 3.6. Default settings are:

   LINES/INCH = 6
   CHARS/INCH = 10
   CHARS = SCRIPT
   PRINT = NORMAL
   QUIET MODE = N
   DOCUMENT INSERT TOP EDGE
   PAUSE
   BEGIN PRINTING IMMEDIATELY
   LINE#1 =. 250 IN
   PROTOCOL = DTR
   BAUD RATE = 9600
   WORD LENGTH = 8
   PARITY = NONE
   STOP BITS = 1
   INPUT BUFFER MULTIPLE LINE INSERT WITH 1 SEC
   EMULATION MODE C
   RETURN ON FEED Y

   In printers with the automatic alignment feature:
   SKEW DETECTION CORRECT SKEW
   SKEW DETECTION ALLOWED = .050
   IF FORM SKEWED ENTER/EJECT KEYS
   IF NARROW FORM PROCEED

   Common variations are EMULATION MODE I for IBM Proprinter emulation and PROTOCOL = XON/XOF for software that does not use DTR hardware handshaking. Function 94 settings are factory selected for a specific printer mechanism and should not usually be changed.
10. Perform a local print test using 95 FUNCT. (See 3.9)
11. If the host is unable to print correctly, check that the Communication Parameters selected under 93 FUNCT match the host parameters and review all Printer Parameters selected under 92 FUNCT.

2.2 RESHIPMENT

If possible, retain the original packing material for reshipment. In any event the following precautions must be observed:

1. Fasten the carriage with a cable tie, string or wire passing around the top of the carriage plate and through the hole in the front of the guide rail. Insure that the carriage can't move horizontally or vertically.
2. If the original packing material is not used, insure that the cabinet lid will not move during shipment and that the unit has sufficient protective padding on all sides.

2.3 CHANGING SUPPLY VOLTAGE

The printer can be set to operate with either 115 VAC or 230 VAC input. It will operate from 50 or 60 Hz at either setting. The label on the back indicates the current setting. To change the voltage setting:

CAUTION: THIS CHANGE MUST BE PERFORMED BY TRAINED SERVICE PERSONNEL

1. Disconnect the line cord from the printer.
2. Remove the screw on the right end of the line cord receptacle and the screw to the left of the power switch. Slide the power input assembly out of the printer rear.
3. Disconnect the internal power cable from the power input assembly.
4. Use a small blade to depress the locking tab on the side of the green/yellow wire contact and slide the contact out of the connector. Use the blade to pry the plastic key out of the cable connector.
5. Insert the green/yellow wire contact into the connector position where the key had been and insure that it locks in place. Insert the key into the connector position where the green/yellow wire had been.
6. Reconnect the internal connector to the power input assembly.
7. **CHECK THE CONNECTOR TO THIS CHART. THIS IS IMPORTANT!**

   Position 1 is the pin closest to the power switch.

Position:	1	2	3	4	5	6	7	8
115 VAC:	Brown	Blue	Grn/Yel	Wht/Brn		Key		Wht/Blue
230 VAC:	Wht/Blue		Grn/Yel		Wht/Brn	Key	Blue	Brown

8. Use a meter to insure there is less than 0.1 ohm resistance from the center blade of the line cord receptacle and the printer baseplate.
9. Slide the power input assembly back into the printer and fasten it.
10. Replace the fuse and fuse holder with the type indicated on the label on the back corresponding to the new input voltage.
11. Modify the label on the back to indicate the new supply voltage.

3.0 OPERATION

3.1 AUTOMATIC DOCUMENT INSERTION

Insertion procedures may be configured to satisfy varied applications. (See Printer Parameters in 3.6.1). This description first explains a basic insertion sequence and then describes variations.

1. Place the document under the clear plastic guide and gently push the left edge of the document against the edge of the document guide.

2. Slide the document forward until it contacts the feed rollers which will automatically move the document to the first printable line.

3. Printing can now commence. After printing is complete the document may be ejected.

Step 2 may be configured so that the rollers do not activate for a few seconds or until the ↑A key is pressed. This allows more time to insert cumbersome documents or to train new operators.

Printers with the auto alignment feature should be configured for no delay. Documents should be inserted toward the left edge guide and rollers, then quickly released to allow them to automatically align. Auto alignment may be disabled for an individual document by pressing the FUNCT key before insertion. See 3.6.5 to configure auto alignment.

Step 2 may be configured to move the document down to the last (bottommost) printable line.

Step 3 may be configured to delay printing until the ENTER key is pressed. This allows the operator to insure that the document has inserted correctly. If not, it may be EJECTed and reinserted.

3.2 SEMI-AUTOMATIC DOCUMENT INSERTION

If delay printing until the ENTER key is pressed has been configured, the document can be positioned to begin printing at a specific place:

1. Proceed with steps 1 and 2 of the automatic insertion procedure.

2. Use the ↑A and ↓B keys to align the center of the desired print line with the front edge of the metal guide above the document.

3. Press the ENTER key. The desired print line will be automatically positioned in front of the printhead and printing can now begin.

4. After printing is complete the document may be ejected.

When Configuration 12 is selected in 94 FUNCT, pressing ENTER before document insertion allows keypad entry of the number of lines to be fed before printing begins.

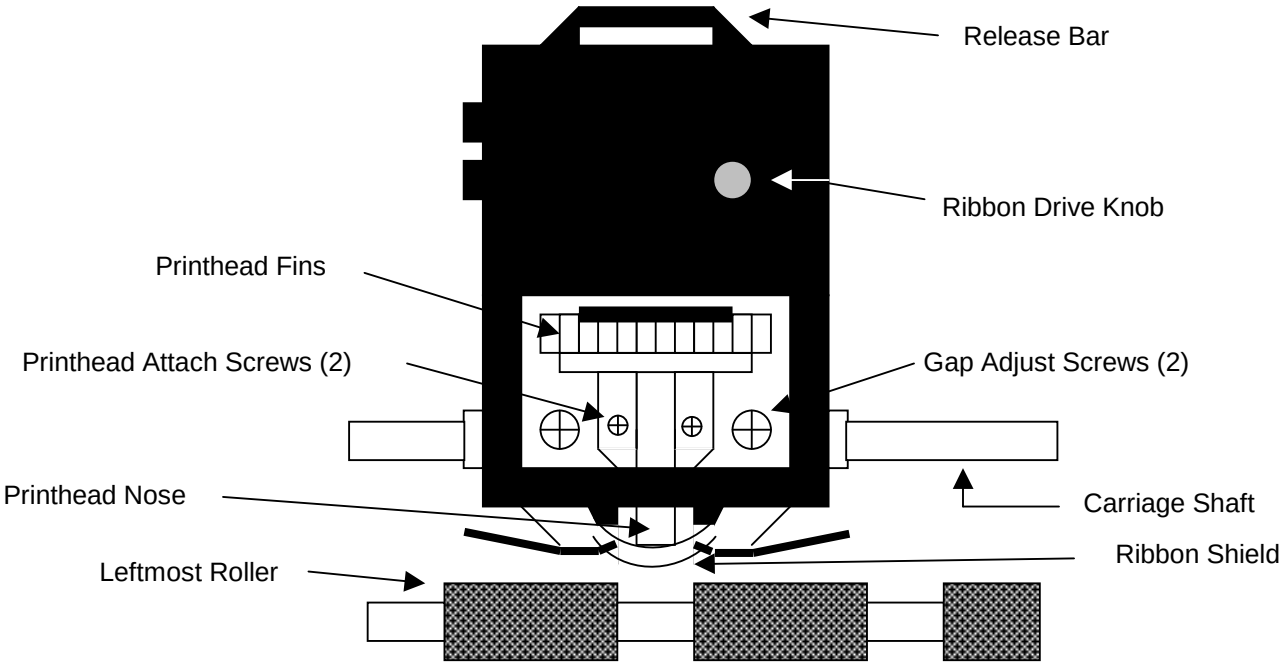
3.3 RIBBON CARTRIDGE LOADING/REPLACEMENT

The DP6 cartridge (Part# 99059) is compatible with the NEC P2200 cartridge. Its drive knob is on the right side of the cartridge. The DP7 cartridge (Part # 99073) is compatible with the Panasonic KX-P155. Its drive knob is in the center of the cartridge. The useful life of cartridges from various suppliers may vary greatly and some may be too heavily reinked for document printing applications. The reinker in some DP7 cartridges must be manually engaged by removing a clip or pressing a spring when printing becomes light. Do not engage the reinker until printing becomes light or else printing will become too dark.

3.3.1 DP6 Ribbon Cartridge Loading/Replacement

To replace a DP6 ribbon cartridge:

1. Remove the lid. If the printer has just finished more than 3 minutes of continuous printing, the printhead fins may be hot to the touch. Avoid contact with the fins.
2. Press the ↑A and ↓B keys simultaneously to position the printhead nose just to the right of the leftmost rubber roller segment.
3. Release the old cartridge from the carriage by pulling the release bar on top of the cartridge forward. Lift the carriage shaft and remove the old cartridge.
4. Rotate the ribbon drive knob until the slot on its bottom side lines up with the ribbon drive tab on the carriage. Pull a small loop of ribbon from the nose of the cartridge.
5. Lift the carriage shaft with a little finger. Insert the ribbon loop between the bottom of the printhead nose and slotted plastic ribbon shield and then push the cartridge against the carriage until it snaps into place.
6. Insure that the ribbon is located between the printhead nose and the ribbon shield and the shield is seated with the notched side toward the rear of the printer. If the ribbon is caught on the front of the printhead nose use a pen point to push it into place. Rotate the knob on the cartridge clockwise and check that the ribbon moves correctly.

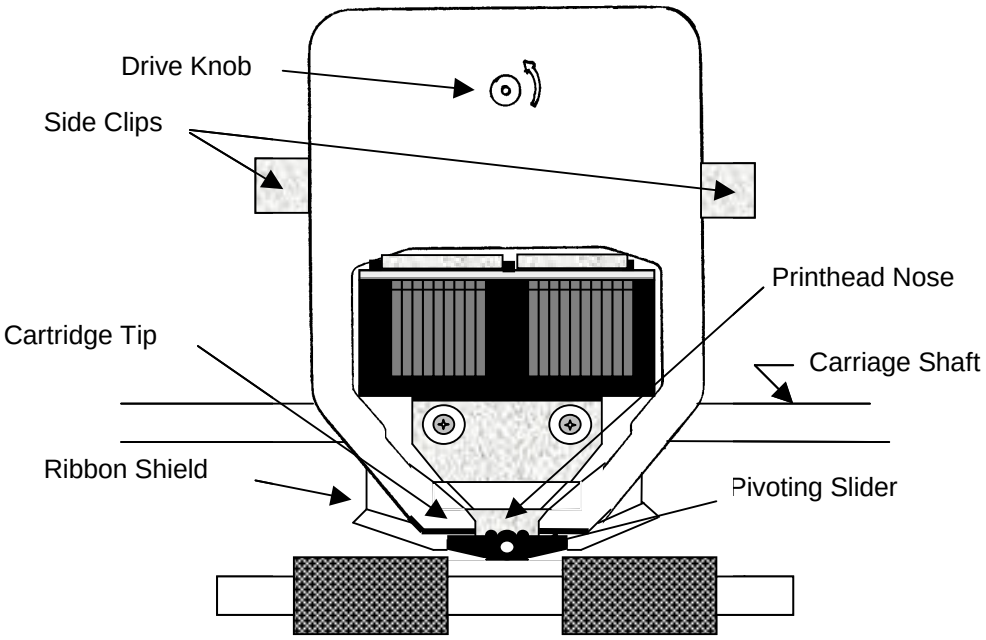


DP6 RIBBON CARTRIDGE LOADING

3.3.2 DP7 Ribbon Cartridge Loading/Replacement

To replace a DP7 ribbon cartridge:

1. If the new cartridge has a plastic ribbon shield attached, remove it.
2. Pull about a 1/2" loop of ribbon from the new cartridge.
3. Remove the lid. If several minutes of continuous printing have just been finished, the printhead and carriage may be hot to the touch. Avoid contact with those parts.
4. Press the ↑A and ↓B keys simultaneously to position the printhead nose between two drive roller segments.
5. Lift the carriage shaft with a little finger. Remove the old cartridge by pressing the side clips while pulling the old cartridge forward.
6. Push the metal ribbon shield downward. Guide the new cartridge's ribbon loop around the pivoting slider and under the printhead nose.
7. Locate the cartridge tips behind the pivoting slider.
8. Move the cartridge toward the carriage and rotate the cartridge knob counter-clockwise until the cartridge seats on the carriage plate.
9. Insure that the ribbon lies flat against the printhead nose and that both metal side clips lock onto the cartridge tabs.



DP7 RIBBON CARTRIDGE LOADING

3.4 KEYPAD OPERATION

EJECT: ejects an inserted document if the print buffer is empty.

↑A: moves a document up 1/60" with each depression. If held depressed, the document will slowly move into the printer. Also initiates document insertion if the printer is configured for key rather than automatic insertion. (See 3.6.1)

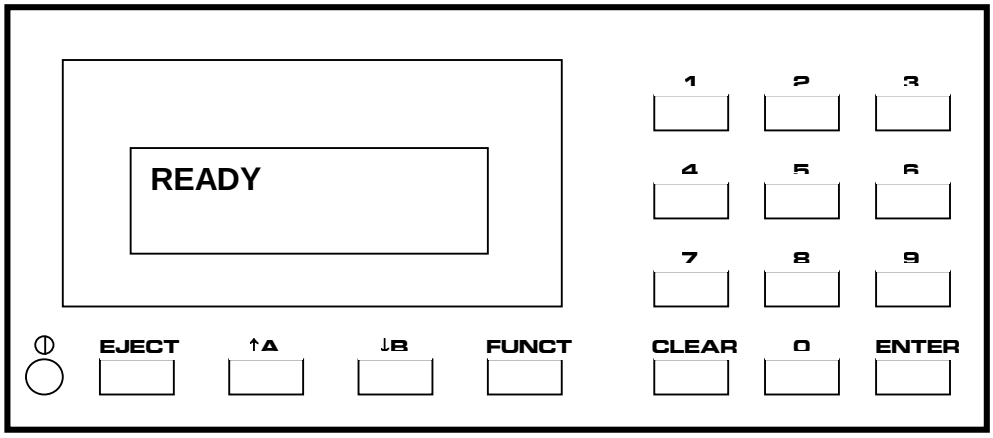
↓B: moves a document down 1/60" with each depression. If held depressed, the document will slowly move out of the printer .

FUNCT: enters previously keyed digits as a function code. All function codes beginning with 9 are reserved for internal printer operations. All other function codes are transmitted to the host system and their usage is defined by the host. On printers with the auto alignment feature, pressing FUNCT before document insertion will disable auto alignment for an individual document. See 3.6.5 to configure auto alignment.

CLEAR: erases any previously keyed digits before they are transmitted to the host by the FUNCT or ENTER keys.

ENTER: transmits previously keyed digits to the host system. All responses are defined by the host. This key also initiates document printing if the printer is configured to delay printing until the ENTER key is pressed (See 3.6.1).

0 to 9: enter digits to be transmitted to the host by the FUNCT or ENTER keys. Key depressions appear on the lower display line.



KEYPAD & DISPLAY PANEL

3.5 DISPLAY OPERATION

The display consists of 2 lines of 16 characters each and is used to display messages both from the printer and the host system. There is a contrast knob to the left of the EJECT key that should be adjusted for maximum legibility depending on the display viewing angle. When the printer is turned on, "READY" will be displayed.

3.6 CONFIGURATION

The printer may be completely configured from the keypad with all parameters saved in a non-volatile memory. There are 4 configuration function codes:

Configuration Category	Press
Printer Parameters	9 2 then FUNCT
Communication Parameters	9 3 then FUNCT
Service Parameters	9 4 then FUNCT
Override Parameters	9 9 then FUNCT

After accessing a category, each parameter will be displayed. Press ↑A to display the next choice for the parameter or press ENTER to display the next parameter. If the display does not change when ↑A is pressed, the keypad is locked. See 3.6.4 to unlock the keypad.

3.6.1 Printer Parameters

Press 9 2 then FUNCT to display the following parameters or press 9 0 0 then FUNCT to print them on a previously inserted document. Changes may be made as described above. Before proceeding, see 3.1-3.2 and select the insertion sequence which best fits your application.

DISPLAY	REMARKS
LINES/INCH = 5 or 6	Select 5 or 6 lines per inch vertical spacing
CHARS/INCH = 10, 12 or 17	Select 10, 12 or 17 characters per inch horizontal spacing.
CHARS = BLOCK or SCRIPT	Select BLOCK or SCRIPT lower case characters in NORMAL mode (DP6 only).
PRINT = NORMAL, CQ or DRAFT	Select NORMAL, correspondence quality CQ or high speed DRAFT (DP6 only) print. Do not use DRAFT on thick forms or passbooks.
QUIET MODE = Y or N	Select Y for reduced noise on thin documents. Select N for darker print on thick documents.
DOCUMENT INSERT = TOP or BOTTOM EDGE	Select insertion to the TOP EDGE or the BOTTOM EDGE of the document.
DOCUMENT INSERT WITH X SEC PAUSE or WITH ↑A KEY	Select automatic insertion 0, 1 or 2 seconds after a placing a document in the input tray or delay insertion until ↑A is pressed to allow more time for aligning documents.
BEGIN PRINTING IMMEDIATELY or AFTER ENTER KEY	Select to begin printing IMMEDIATELY after the document insertion or delay printing until ENTER is pressed to verify proper alignment.
LINE # 1 = .XXX	Select the distance, between -0.80” and 0.80”, from the document top edge to the center of the first print line. Select 0.25” unless needing software compatibility with another printer.

See 3.6.5 for automatic alignment parameters that appear on the Printer Parameter menu.

NOTE: Most Printer Parameters may be configured by the host system via the HT or other commands. This allows for dynamic reconfiguration on a document by document or line by line basis.

3.6.2 Communication Parameters

Press 9 3 then FUNCT to display the following Communication Parameters or press 9 0 0 then FUNCT to print them on a previously inserted document. Changes may be made as described in 3.6.

DISPLAY	REMARKS
INTERFACE PROTOCOL = BLOCK, DTR, XON/XOF or PARALLEL INTERFACE	Select the protocol which matches your system configuration (See 3.13). Select PARALLEL if the parallel interface option is installed & skip the next 4 items.
BAUD RATE = XXXX	Select 1200 (DP6 only), 2400, 4800, 9600 or 19200 (DP7 only) baud.
WORD LENGTH = 7 or 8	Select 7 or 8 bits/word.
PARITY = XXXX	Select parity bit as EVEN, ODD or NONE.
STOP BITS = 1 or 2	Select 1 or 2 stop bits.
INPUT BUFFER SINGLE LINE or MULTIPLE LINE	Select a SINGLE LINE or a MULTIPLE LINE buffer of 3K (DP6) or 11K (DP7).
EMULATION MODE = C, I, EF4565 or EF4600/EFP95	Select C to enable commands used with previous versions of this printer. Other selections enable commands compatible with popular PC based financial printers.
AUTO CARRIAGE RETURN ON FEED = Y or N or N	Select Y unless compatibility with software written for another printer is needed.
DUAL PORT = Y or N	Select Y if the dual port option is installed to allow printer sharing between two hosts. Either DTR or XON/XOF protocol must be selected.
PAPER OUT = NO DOC or NEVER	Select NO DOC if the parallel interface is to indicate paper empty whenever no document is in the printer or NEVER if it is never to indicate paper empty.
SELECT = DOC PRES or ALWAYS	Select DOC PRES if the parallel interface is to indicate off-line whenever no document is in the printer or ALWAYS to always indicate on-line.

3.6.3 Service Parameters

Press 9 4 then FUNCT to display the following Service Parameters. These parameters are factory selected specifically for each printer mechanism and recorded on the label next to the display inside the printer. They do not usually need to be modified by the user.

CAUTION: CHANGE OF THESE PARAMETERS BY UNTRAINED PERSONNEL MAY RESULT IN INCORRECT PRINTER OPERATION.

DISPLAY	REMARKS
TOP OFFSET = XX	Adjusts the uppermost print line location. Smaller values print closer to the top document edge.
INDEX OFFSET = XX	Adjusts the distance moved when semi-automatic positioning is used. Larger values move the print line up the document.
LEFT OFFSET = XX	Adjusts the carriage home location during document insertion. Larger values move the carriage to the left.
LEFT MARGIN = XX	Adjusts the first column print position. Larger values move printing to the right.
CAR. ALIGN = XX	Positions lines printed right to left so they align with lines printed left to right. Larger values move those lines to the left.
FORWARD COMPENSATION = XX	Adjusts distances moved down the document. Larger values increase the distance moved between the topmost and bottommost line.
REVERSE COMPENSATION = XX	Adjusts distances moved up the document. Larger values increase the distance moved between the bottommost and topmost line.
EJECT HOLD OFFSET = XX	Adjusts how much of the document is held in the feed rollers after it is ejected. Lower values hold less of the document.
CONFIGURATION = XX	Selects custom interface options. Select 00 unless indicated otherwise on the Parameter label or incorrect operation may occur.
GATE OFFSET = XX	Adjusts gate height. Larger values raise gate. (DP7 with Automatic Alignment feature only)
NORMAL DARKNESS = 0 to 10	Adjusts darkness at normal print speed. Lower values reduce darkness and increase ribbon life. Select the lowest value that provides suitable legibility on thick forms (DP7 only).
CQ DARKNESS = 0 to 10	Adjusts CQ print darkness (DP7 only).

3.6.4 Override Parameters

Press 9 9 then FUNCT to display the following Override Parameters. Changes should be made only by trained personnel.

DISPLAY	REMARKS
LOCKED or UNLOCKED	LOCKED allows parameters to be displayed but not changed. UNLOCKED allows parameters to be changed by the ↑A key.
COVER OVERRIDE OFF or ON	OFF requires the cabinet lid to be closed for printing to occur. ON allows trained personnel to print with the lid removed. Replacing the lid automatically sets the override OFF.

3.6.5 Automatic Alignment Parameters

The following printer parameters may be selected at the end of the Printer Parameter (9 2 FUNCT) menu on printers with the automatic alignment feature:

DISPLAY	REMARKS
SKEW DETECTION = CORRECT SKEW, DETECT SKEW, or IGNORE	select CORRECT SKEW to automatically align skewed documents, DETECT SKEW to detect but not align skewed documents, or IGNORE to disable both skew detection and correction.
SKEW DETECTION ALLOWED = .030, .050, .080, .110 or .130	Select the maximum skew per 4 inches of document width. Treatment of documents with excess skew is set by the next parameter.
IF FORM SKEWED = ENTER/EJECT KEYS or AUTOMATIC EJECT	If a document has excess skew, ENTER/ EJECT KEYS will continue printing if ENTER is pressed or eject the document if EJECT is pressed. AUTOMATIC EJECT will always eject a document with excess skew
IF NARROW FORM = PROCEED or ENTER/EJECT KEYS	Documents less than 4.5 inches wide will be detected as skewed. PROCEED will always accept the document, ENTER/EJECT KEYS will continue printing if ENTER is pressed or eject the document if EJECT is pressed.

3.7 DIAGNOSTICS

3.7.1 Power Up Diagnostics

Diagnostic routines are automatically executed during power-up. If a fault is detected, ROM TEST BAD or RAM TEST BAD may be displayed. If a fault occurs, press ↑A to advance to the next test. However, the printer should not then be operated. If the problem is not a POWER FAILURE (see 3.10.1), contact your Service Personnel or see 5.6 of the Technical Manual for troubleshooting.

3.7.2 Enhanced Diagnostics

Diagnostics may be executed by pressing 9 0 then FUNCT. If no faults exist, PROM REVISION XX, ROM TEST OK and RAM TEST OK will be displayed. If a fault exists, "BAD" will be displayed instead of "OK" until ↑A is pressed to advance to the next test.

After RAM TEST XXX is displayed, SENSORS LFBC will be displayed. L is the left home carriage sensor; F and B are the front and back document sensors and C is the cover open sensor. Any sensor that is covered will have its corresponding indicator erased. Each sensor may be activated to check for proper operation. Press ↑A to conclude this test.

3.8 SELF TEST

A document may be test printed by pressing 9 1 FUNCT. SELF TEST is displayed until a document is inserted. Then CHAR LENGTH = 30 is displayed. Press ↑A to select CHAR LENGTH = 80. (30 characters requires a document at least 3 1/2" wide, 80 characters requires 8 1/2".) Do not print across a vertical fold or document edge. Press ENTER to print the top and bottom lines of the document and then eject it.

3.9 LOCAL PRINTING

In addition to Self Test function 91, it is possible to print several variable length lines without host commands. Proceed as follows:

1. Insert a form manually or automatically and then press 9 5 FUNCT.
2. In response to CHAR LENGTH = 30, key in a two digit number of characters per line and then press ENTER. Insure that printing will not occur across a fold or document edge.
3. In response to LINE COUNT = 01, key in a 2 digit number of lines.
4. Each time ENTER is pressed, that number of lines will be printed.
5. Press EJECT to eject the document and CLEAR to clear the display.

3.10 ERROR CONDITIONS

3.10.1 Power Failure

All Configuration Parameters are stored in a non-volatile memory. Power up diagnostics display POWER FAILURE if an error is detected in that memory. It is now necessary to re-enter the parameters. Press FUNCT to begin the prompting sequence. The factory set values for the Service Parameters are listed on the label next to the display inside the printer.

3.10.2 Document Jam

In the unlikely event that a document becomes jammed in the printer, printing will stop and "DOCUMENT JAM" will be displayed. The operator must clear the jam condition by moving the printhead left as far as possible and removing the document from the printer.

3.10.3 Cover Open

If the printer lid is removed to replace a ribbon cartridge or clear a document jam, COVER OPEN is displayed and printing is disabled. Printing will resume 3 seconds after the lid is replaced.

3.10.4 Page Overflow

If the printer is commanded to move past the last printable line on a document it will eject the document and display PAGE OVERFLOW INSERT NEXT PAGE. Printing will resume when another document is inserted.

3.10.5 Carriage Fault

This message will be displayed if the carriage could not move to the left margin and is probably caused by a jammed carriage, bad motor driver fuse or a bad left home sensor.

3.11 DP6 & DP7 PROGRAMMING

CAUTION: DURING PROGRAM DEVELOPMENT ALL PRINTING SHOULD BE DONE ON SINGLE SHEET PAPER UNTIL PRINT FIELDS ARE CORRECTLY FORMATTED. PRINTING DIRECTLY ACROSS THICK FOLDS AND DOCUMENT EDGES CAN DAMAGE THE PRINTHEAD.

The printer accepts two separate command sets, C and I, that are selectable either from the keypad using 9 3 FUNCT (see 3.6.2) or the interface. Mode C is compatible with previous versions of this printer while Mode I is compatible with popular PC based printers. If Mode I is selected, the DP6 can use a IBM Proprinter driver and the DP7 can use a IBM Proprinter X24 driver. Unique Mode C commands to communicate with the keypad/display and request status can still be accessed in Mode I by preceding the Mode C command with a ESC character.

3.11.1 Mode C Command Summary

Mode C recognizes the following ASCII control sequences:

	ASCII	Hex	Command
	STX	02	Start envelope data
	ENQ	05	Status request
	BEL	07	Load upper display immediate
*	BS	08	Reverse line feed
	HT	09	Configuration download
*	LF	0A	Line feed
*	VT	0B	Vertical tab feed
*	FF	0C	Eject document
*	CR	0D	Print buffer
	SO	0E	Begin expanded characters
	SI	0F	End expanded characters
	DC1/DLE	11/10	Key buffer request
	DC2	12	Line count request
	DC3/ETB	13/17	Load upper display delayed
	DC4	14	Master reset
	EM	19	Document length request
	SUB	1A	Status request delayed
	ESC SO	1B 0E	Begin double height characters
	ESC SI	1B 0F	End double height characters
*	ESC n	1B 3#	Feed document up #/120 inches
	ESC A	1B 41	Begin 60 dot/inch graphics
	ESC B	1B 42	Begin 120 dot/inch graphics
	ESC E	1B 45	Begin bold print
	ESC F	1B 46	End bold print
*	ESC J n	1B 4A	Feed document up n/216 inches
	ESC]	1B 5D	Reverse line feed
	ESC ~ I	1B 7E 49	Select Mode I
	FS	1C	Load lower display immediate
	GS	1D	Load lower display delayed
	RS n	1E n	Skip n blank spaces in print line
	US	1F	Begin/End underscore

Commands prefixed with a * will not be executed until after an ENQ is received if the BLOCK protocol is used. ENQs are not required if DTR or XON/XOF protocols are used.

3.11.2 Mode C Document Movement Commands

BS or ESC] moves the document down one line, with line spacing keypad selected (see 3.6.1) or set by an HT command.

LF moves the document up one line, with line spacing keypad selected (see 3.6.1) or set by an HT command.

VT n moves the document a variable number of lines or steps with n being a single byte, bit coded as 01ULCCCC where:

U = 1 = Up feed U = 0 = Down feed
L = 1 = Line feed (1/6" or 1/5") L = 0 = Step feed (1/60")
CCCC = Line count or step count

ESC n moves the document up (CCCC)/120 inches where n is a single byte bit coded as 0011CCCC.

ESC J n moves the document up n/216 inches where n is a single binary coded byte.

FF ejects the document.

If any document movement command (BS, LF, VT, ESC n, ESC], ESC J n or FF) has been preceded by any printable ASCII characters, they will be printed before the movement command is executed.

3.11.3 Mode C Print Commands

CR prints all preceding printable ASCII characters. There is no document movement due to the CR.

SO starts double width printing. All characters received after an SO and before an SI, CR or feed command will be printed double width.

SI stops double width character printing.

ESC SO starts double height printing. All characters received after an ESC SO and before an ESC SI, CR or feed command will be printed double height. Single height characters will be printed in line with the top of double height characters if they are mixed in a print line.

ESC SI stops double height printing.

ESC E starts bold, double strike printing in 10 and 12 character/inch NORMAL print speed and reduces print speed by 33% (DP6) or 50% (DP7).

ESC F stops bold printing.

RS n inserts n blank spaces into the print line and can be used to reduce the number of characters transmitted when large blank spaces are to be printed. n is of the form 01NNNNNN where NNNNNN is the number of blanks to be inserted. RS A is 1 blank, RS z is 58.

US enables or disables underscoring of printable characters. All characters received after a US and before another US, CR or feed command will be printed with the character underscored.

STX prints envelopes. It must be immediately followed by two bytes, X and Y, each bit coded as 01NNNNNN. NNNNNN/10 inches is the distance from the top edge of the envelope to the first line of text for X and from the left edge of the envelope to the first column of text for Y. Following X and Y are normal lines of text separated by LF's and finally terminated by a FF which causes printing and ejection.

DC4 clears all previously received data out of the buffer.

3.11.4 Mode C Display Commands

BEL immediately displays the following 16 characters on the upper line of the alphanumeric display. The characters must not be control characters and there must be exactly 16 displayable characters.

FS loads the lower display line just like BEL loads the upper line.

DC3 or ETB operate identically to a BEL command but all previously received print and document movement commands are executed before the upper line of the display is loaded.

GS loads the lower display line just like DC3 loads the upper line.

3.11.5 Mode C Configuration Commands

HT changes the machine configuration and must be followed by 2 characters of the form 01PVHFCS and 01LEIBDQ where:

P = 1: Permanent configuration change.
0: Change just for one document
V = 1: 5 lines/inch vertical spacing
0: 6 lines/inch vertical spacing
H = 1: 12 characters/inch horizontal spacing if S=0
0: 10 characters/inch horizontal spacing if S=0
F = 1: Script lower case
0: Block lower case
C = 1: Correspondence quality print if S=0
0: Normal print if D = 0
S = 1: 17 characters/inch horizontal spacing
0: Horizontal spacing determined by H bit
L = 1: Lock keypad from modifying set up parameters
0: Unlock keypad for modifying set up parameters
E = 1: Document present set by ENTER key after insertion
0: Document present set automatically after insertion
I = 1: Insertion initiated by DOWN key
0: Start insert _ seconds after document sensed in chute
B = 1: Insertion to bottom edge
0: Insertion to top edge
D = 1: Draft print (do not use on thick documents) if C=0
0: Print mode determined by C bit
Q = 1: Quieter print on thin documents
0: Darker print on thick documents

All parameters configurable by an HT are also programmable from the keypad. See 3.6.1.

ESC ~ I clears all previously received data out of the buffer and switches the interface to Mode I.

3.11.6 Mode C Status and Keypad Commands

Status, key buffer contents, line count or document length data are transmitted when requested by the host.

ENQ requests printer status and is executed when it is received.

SUB also requests printer status but it is executed identically to an ENQ only after all previously received commands have been executed. SUB may be used to interrupt the host and notify it that the printer is now idle.

Printer status is a single byte that is bit significant as follows:

0 1 DP XE DJ KB BZ BA

DP = Document present. Set whenever a document is in the feed path.

XE = Transmission error. If BLOCK protocol is used, all characters received since the last ENQ will be ignored and should be retransmitted. If DTR or XON/XOF protocols are used the character associated with the error will be printed as a "@".

DJ = Document jam. The printhead has not returned to the document edge correctly and operator attention is required.

KB = Key buffer. The key buffer contains key stroke information that will be transmitted upon receipt of a DC1.

BZ = Busy. Either printing or document movement is now occurring.

BA = Input buffer available. At least 1000 characters of space are available in the input buffer or the buffer is empty. Buffer operation is detailed in 3.13.1.

DC1 or DLE request keypad data. Upon receipt of either, all keypad input that has been pressed since the previous DC1 or DLE will be transmitted. A maximum of 16 strokes can be buffered. Transmitted characters will be one of the following:

ASCII	Meaning
0-9	Numeric keys 0-9
:	FUNCTion key
;	ENTER key
<	Either ↑A or ↓B key
=	EJECT key
?	End of buffer

The last character transmitted is always a ?. If a DC1 or DLE is received and no keys have been pressed only a ? will be transmitted.

As numeric keys are pressed, their values are displayed on the lower display line. Pressing ENTER or FUNCT transfers the key strokes to the key buffer. Pressing CLEAR deletes numeric key strokes before they are transferred to the key buffer.

Function values beginning with 9 are reserved for internal printer operation and are not transferred to the key buffer. See 3.6 to 3.9 for details of the internal printer functions.

DC2 requests line count information. Upon receipt, 2 bytes are transmitted. The first byte indicates the number of lines and the second indicates the number of additional 1/60" steps moved since the document was initially registered at top edge or bottom edge.

EM requests document length information. Upon receipt, 2 bytes representing the document length (if the document was automatically inserted to the bottom edge) are transmitted. The first byte indicates the number of lines and the second byte indicates the number of additional 1/60 inch steps.

3.11.7 Mode C Graphics Commands

Dot addressable graphics may be printed at 60 or 120 dots/inch (dpi) horizontally by 72 or 144 dpi vertically. ESC A must precede each line of 60 dpi data with a maximum of 480 data bytes. ESC B must precede each line of 120 dpi data with a maximum of 960 bytes. Each line of data must be terminated by a feed command, usually a VT e, ESC 1 or ESC 9.

Each data byte is of the form 1ABCDEF where A is the lowest and F is the highest of 6 vertical dots printed in a single dot column. Each bit must be set to a 1 for the corresponding dot to be printed.

VT e moves a document up 5/60 inch and positions it for printing contiguous rows of graphics since 5/60 is the same height as 6/72. The RS command is useful for filling multiple blank dot columns. For example, the following sequence will print a diagonal line starting in the upper left corner of column 1 and slanting down to the right:

ASCII	Hex
ESC A A B D H P ` VT e	1B 41 41 42 44 48 50 60 0B 65
ESC A RS F A B D H P ` VT e	1B 41 1E 46 41 42 44 48 50 60 0B 65
ESC A RS L A B D H P ` VT e	1B 41 1E 4C 41 42 44 48 50 60 0B 65

ESC 1 feeds a document up 1/120 inch or about one half dot height. Graphics can be printed at a vertical density of 144 dpi by using ESC 1 but the host must interleave the data. Each line of data must contain dot data for every other row of dots to be printed. After an ESC 1 and the next line of dot data, an ESC 9 moves the document 9/120 inch and positions it for printing the next contiguous row of dots.

Assuming full width lines, graphics throughput is 18 seconds/inch for 60 by 72 dpi and 22 seconds/inch for 120 by 72 dpi. Speed is halved when printing 144 dpi vertically

3.12.1 Mode I Command Summary

Mode I recognizes the following ASCII control sequences:

	ASCII	Hex	Command
*	BS	08	Print the buffer and backspace one character
	HT	09	Move the print pointer to the next horizontal tab
*	LF	0A	Line feed
*	VT	0B	Move the document to the next vertical tab
*	FF	0C	Eject the document
*	CR	0D	Print the buffer
	SO	0E	Begin expanded characters
	SI	0F	Begin 17.1 character/inch printing
	DC2	12	Begin 10 character/inch printing
	DC4	14	End expanded characters
	CAN	18	Clear the print buffer
	ESC - n	1B 2D n	Begin (n=1) or end (n=0) underscore
	ESC 0	1B 30	Set 1/8 inch line spacing
	ESC 1	1B 31	Set 7/72 inch line spacing
	ESC 2	1B 32	Set line spacing stored by prior ESC A
	ESC 3 n	1B 33 n	Set n/216 inch line spacing
	ESC 4	1B 34	Eject the document
	ESC 5 n	1B 35 n	Begin (n=1) or end (n=0) automatic LF after CR
	ESC :	1B 3A	Begin 12 character/inch printing
	ESC A n	1B 41 n	Store n/72 inch line spacing
	ESC B	1B 42	Set vertical tab stops
	ESC D	1B 44	Set horizontal tab stops
	ESC E	1B 45	Begin bold print
	ESC F	1B 46	End bold print
	ESC G	1B 47	Begin correspondence quality (CQ) print
	ESC H	1B 48	End correspondence quality print
	ESC I n	1B 49 n	Begin CQ (n=2) or normal (n=0) print
*	ESC J n	1B 4A n	Feed document up n/216 inches
	ESC K	1B 4B	Begin 60 dot/inch graphics
	ESC L	1B 4C	Begin 120 dot/inch graphics
	ESC R	1B 52	Set all tabs to default values
	ESC W n	1B 57 n	Begin (n=1) or end (n=0) expanded chars
	ESC X mn	1B 58	Set left and right margins at columns m and n
	ESC Y	1B 59	Begin 120 dot/inch full speed graphics
	ESC Z	1B 5A	Begin 240 dot/inch graphics
	ESC [@	1B 5B 40	Begin or end double high or wide
	ESC [I	1B 5B 49	Set character pitch
	ESC [J	1B 5B 4A	Set 1/5 inch line spacing
	ESC [d	1B 5B 64	Set print quality
	ESC [g	1B 5B 67	Set graphics mode (DP7 only)
*	ESC]	1B 5D	Reverse line feed
	ESC d	1B 64	Move print position
	ESC ~ C	1B 7E 43	Select Mode C
	ESC XXX	1B XXX	Execute Mode C command XXX

Commands prefixed with a * will not be executed until after an ESC ENQ is received if the BLOCK protocol is used. ESC ENQ's are not required if DTR or XON/XOF protocols are used.

3.12.2 Mode I Document Movement Commands

LF moves the document up one line, with line spacing keypad selected (see 3.6.1) or set by an ESC 0,1,2 or 3 command.

ESC 0 sets line spacing to 1/8 inch.

ESC 1 sets line spacing to 7/72 inch.

ESC 2 sets line spacing stored by a prior ESC A n.

ESC 3 n sets line spacing to n/216 inch with n being a single binary coded byte.

ESC 5 n sets auto LF if n=1 and resets it if n=0. A line feed is automatically performed when a CR is received if auto LF is set.

ESC A n stores lines spacing of n/72 inch with n being a single binary coded byte but the stored line spacing will not begin until it is set by an ESC 2.

ESC [J followed by the 4 byte hexadecimal sequence 02 00 20 01 sets line spacing to 1/5 inch.

VT moves the document up to the next vertical tab stop or does a LF if no tab stops are set.

ESC B nnnnn0 sets up to 64 vertical tab stops at each line n with each n being a single binary coded byte and terminating with a 0 byte. ESC B 0 clears all vertical tab stops.

ESC R clears all vertical tabs and sets horizontal tabs to default values of column 9 and every eighth column to the right.

ESC J n moves the document up n/216 inches with n being a single binary coded byte.

ESC] moves the document down one line, with line spacing keypad selected (see 3.6.1) or set by an ESC 0,1,2 or 3 command.

FF or ESC 4 ejects the document.

If any document movement command (LF, VT, FF, ESC 4, ESC J # or ESC]) has been preceded by any printable ASCII characters, they will be printed before the movement command is executed.

3.12.3 Mode I Print Commands

CR prints all preceding printable ASCII characters. There is no document movement due to the CR unless auto LF has been set by a ESC 5 01 command and then a LF will be performed.

BS prints all preceding printable ASCII characters and positions the print pointer so the next character will be printed over the last character.

HT moves the print pointer to the next horizontal tab to the right if one is set.

ESC D nnnnn0 sets up to 28 horizontal tab stops at each column n with each n being a single binary coded byte and terminating with a 0 byte. ESC D 0 clears all horizontal tab stops.

ESC R sets all horizontal tabs to default values of column 9 and every eighth column to the right and clears all vertical tabs.

ESC d mn moves the next print position right by (256 X n + m)/120".

ESC X mn sets the left and right margins at columns m and n. Printing will then begin at column m and can not extend past column n.

SO starts double width printing. All characters received after an SO and before a CR, DC4, CAN, ESC W or feed command will be printed double width.

DC4 stops double width character printing.

ESC W n starts double width printing if n=1 and stops it if n=0.

ESC [@ followed by 04 00 00 00 m n hex selects double high and wide print. Double high print is set if the low order nibble of m is 2 and single high is set if it is 1. Double line feeding is set if the upper nibble of m is 2 and single line feeding is set if it is 1. Double wide print is set if n is 2 and single wide is set if it is 1.

ESC : starts 12 character/inch printing.

SI starts 17.1 character/inch printing.

DC2 stops 12 or 17.1 character/inch printing and returns to 10 cpi.

ESC E starts bold, double strike printing in 10 or 12 character/inch.

ESC F stops bold printing.

ESC G starts correspondence quality printing.

ESC H stops correspondence quality printing.

ESC I n starts correspondence quality printing if n=2 and stops it if n=0.

ESC [F followed by 00 02 n_1 n_2 selects skew control as follows

n_1 n_2 =	
03 00	no skew detection
01 00	0.05 in. allowable skew
01 01	0.08 in. allowable skew
01 02	0.11 in. allowable skew
01 03	0.13 in. allowable skew

ESC [I followed by 02 00 m n hex selects print pitches as follows:
10 cpi if m n = 00 0B, 00 0C, 00 24, 00 19, 00 05 or 01 D4
12 cpi if m = 01 and n = EB, EF, 8F, D0, CB or D5
17 cpi if m = 01 and n = ED, C9, 8D, D2, CD or D7
20 cpi if m = 01 and n = EE, CA, 8C, D3, CE or D8
24 cpi if m = 01 and n = 1E, 1F, 20, 23, 21 or 24

ESC - n starts continuous underscoring if n=1 and stops it if n=0.

ESC [d followed by 01 00 n hex sets print quality to normal if n is between 1 and 127, to CQ if n is between 128 and 254, or to default if n is 255. No change occurs if n is 0.

CAN clears all previously received data out of the buffer.

ESC~C clears all previously received data out of the buffer and switches the interface to Mode C.

ESC XXX will execute Mode C command XXX. This allows access to Mode C commands that have no equivalent in Mode I for loading the alphanumeric display, requesting keypad input, printing double height characters and checking status. ESC XXX should not be used for Mode C commands other than ENQ, BEL, DC1/DLE, DC3/ETB, SUB, ESC SO, ESC SI, FS and GS.

3.12.4 Mode I Graphics Commands

DP6 dot addressable graphics may be printed at 60, 120 or 240 dots/inch (dpi) horizontally by 72 dpi vertically. ESC K sets 60 dpi, ESC L or ESC Y set 120 dpi and ESC Z sets 240 dpi. ESC Y prints at full speed but consecutive horizontal dots are prohibited. ESC L prints slower without this restriction. Each command is immediately followed by m and n, a 2 byte data count indicating that the number of following graphic data bytes is m + 256 X n. The maximum data count is 480 for ESC K, 960 for ESC L or ESC Y and 1920 for ESC Z.

Each data byte is of the bit form ABCDEFGH where A is the highest and H is the lowest of 8 vertical dots printed in a single dot column. Each bit must be set to a 1 for the corresponding dot to be printed.

ESC 3 followed by a 24 byte sets line spacing for printing contiguous rows of graphics since 24/216 is the same height as 8/72. The following hex sequence will then print a diagonal line starting in the upper left corner of column 1 and slanting down to the right:

1B 4B 08 00 80 40 20 10 08 04 02 01 0A

1B 4B 10 00 00 00 00 00 00 00 00 00 80 40 20 10 08 04 02 01 0A

The DP7 accepts ESC K, L and Y commands. These and other graphics modes are also selected by an ESC [g m n p where m + 256 X n is the following graphics data byte count plus one and p selects graphics densities as follows:

p value:	0	1	2	8	9	11	12
Density:	60x72	120x72	120x72	60x180	120x180	180x180	360x180

In the 180 dpi vertical modes, each group of 3 following graphics data bytes will be printed as one 24 dot vertical stroke.

3.13 COMMUNICATIONS INTERFACE

The standard interface provides for RS-232 asynchronous serial communications at 1200 (DP6 only), 2400, 4800, 9600 or 19200 (DP7 only) baud and has a multiple line input buffer. Characters may contain either 7 or 8 data bits, even, odd or no parity and 1 or 2 stop bits. These parameters are all keypad programmable. See 3.13.4 and 3.13.5 for Dual Port and Parallel interfaces.

3.13.1 Input Buffer Operation

All commands and characters received except immediate status requests, display and reset commands are placed in a first-in, first-out input buffer of 3K (DP6) or 11K (DP7) bytes. The BA status bit indicates at least 1000 characters of unused buffer are available. Transmission to the printer should be block structured (less than 1000 characters per block) with ENQs issued at the end of each block to check for transmission errors in the preceding block (requiring retransmission) and buffer availability for the next block. ENQs are not required for blocking data if DTR or XON/XOF protocols are selected from the keypad but these protocols do not allow for detection of transmission errors. Characters with transmission errors will be replaced by a "@" under those protocols.

The input buffer can receive the next line of data while the previous one is being printed. This eliminates transmission induced delays in printing. For this mode of operation SINGLE LINE INPUT BUFFER should be selected from the keypad and BA indicates an empty buffer.

The buffer may also be used to receive all commands for printing an entire document. In this mode of operation the full 3K or 11K byte buffer is utilized and BA indicates at least 1000 characters of unused buffer space. This technique can reduce host attention to the printer but caution must be used to determine correct recovery from document jams and operator intervention during printing.

In the unlikely event that a document should become jammed in the printer, printing will stop and "DOCUMENT JAM" will be displayed. The next status word requested by the host will have the document jam bit set. Once notified, the host may prompt the operator by writing recovery instructions to the display.

As part of the recovery procedure, the host may require all previously transmitted data to be destroyed. This might be the case if the transaction must be restarted. Previously transmitted data can be destroyed if the host transmits a DC4 in mode C or a CAN in mode I. After the operator has cleared the jam condition by moving the printhead to the left wall and removing the document, all data in the FIFO will be destroyed. The host should request status and check the document jam bit in the status word before retransmitting data.

The operator may also destroy the contents of the FIFO buffer if, after removing the document and moving the printhead to the left wall, the CLEAR key is depressed. The host must then be notified by the operator that the transaction data must be re-transmitted.

3.13.2 Interface Protocols

If the BLOCK protocol is used, ENQs must be issued to block data and the returned printer status byte should be examined by the host to check for transmission errors that require retransmission of the last block.

If host software cannot support the BLOCK protocol, either DTR or XON/XOF protocols may be selected from the keypad. In these modes the DTR signal will go false (negative voltage) or a DC3 (Xmit off) will be transmitted if less than 1000 characters of space are available in the buffer when a CR or document

movement command is received. Transmission from the host must then pause. DTR will later go true (positive voltage) or a DC1 (Xmit on) will be transmitted when space becomes available and host transmission may resume. DTR is equivalent to most operating systems' hardware protocol.

Under the DTR and XON/XOF protocols ENQ will still generate the normal status response but it is not necessary to transmit ENQs in order to cause command execution. However, if ENQ and DC1 are never issued and status responses are never examined by the host, it is difficult to use the keypad for system input.

3.13.3 Interface Signals

The interface provides for RS-232 communication. All signals are available on a 25 pin male connector equivalent to Cinch DB-25P. If the Dual Port option is installed there will be two identical 25 pin male connectors. All connectors have 4-40 threaded inserts for positive mating. Pin assignments are as follows:

Pin	Signal	Description
1	Protective ground	Attached to printer frame.
2	Transmit Data (TD)	From printer, transmits printer status.
3	Receive Data (RD)	To printer, receives data & commands.
4	Request To Send (RTS)	From printer, indicates printer is ready to transmit
5	Clear To send (CTS)	To printer, enables status transmission.
6	Data Set Ready (DSR)	To printer, enables printer to receive data and commands.
7	Signal ground	Attached to printer logic ground.
20	Data Terminal Ready (DTR)	From printer, indicates printer is ready to communicate. Also indicates input buffer available if DTR protocol is selected.

Note that regardless which interface is used DSR must be active for the printer to receive commands and CTS must also be active for the printer to transmit status. If no connection is made to these signals, they are biased active in the printer.

The following cable connection will work correctly in most applications using PC type 25 or 9 pin serial ports. A shielded cable with only one end of the shield connected to a metal connector cover or pin 1 of a 25 pin connector is recommended to increase immunity to static discharges and other electrical noise. Manufacturer's part number is 72118-1 for a 9 pin PC cable.

Printer Pin	PC-25 Pin	PC-9 Pin	Signal
3	2	3	Data to Printer
2	3	2	Data from Printer
20	5	8	DTR to PC CTS
-	6,20	4,6	PC DTR to PC DSR
7	7	5	Signal Ground

Some applications (Online, Microbilt, Bisys, Intrieve) check DSR rather than CTS for printer status. Use the following cable with such software. Manufacturer's part numbers are 72100-1 for a 9 pin PC cable and 72098-1 for a 25 pin PC cable.

Printer Pin	PC-25 Pin	PC-9 Pin	Signal
3	2	3	Data to Printer
2	3	2	Data from Printer
20	5,6	6,8	DTR to PC CTS & DSR
7	7	5	Signal Ground

3.13.4 Dual Port Option

The Dual Port option allows for simultaneous connection to two hosts with each one alternately enabled using either the DTR or XON/XOF protocols. A port is enabled for 0.25 seconds or, if data is received, until no document is present and the buffer is empty. If configuration 05 is selected under 94 FUNCT, the display will show which port received data.

3.13.5 Parallel Interface Option

A PC type parallel interface is optionally available. This interface accepts all commands defined in 3.11 or 3.12 but does not accept status, key buffer, line count or document length requests since data cannot be transmitted back to the host through this unidirectional interface. All signals are available on a 36 pin female connector. A shielded cable with only the PC end of the shield connected to a metal connector cover is recommended to increase immunity to static discharges and other electrical noise. Pin assignments are as follows:

Pin	Signal	Pin	Signal
1	Strobe(-)	13	Select
2 to 9	Data Bits 0 to 7	32	Error(-)
10	Acknowledge(-)	35	+5 Volts
11	Busy	18 to 25	Logic ground
12	Paper Empty		

4.0 THEORY OF OPERATION

4.1 OVERVIEW

The DP6 & DP7 Document Printers handle and print a large variety of documents. The mechanism consists of a printhead, a printhead drive assembly and a document drive assembly. The electronics consist of an AC PCB (printed circuit board), a power transformer, a Main PCB, two sensor assemblies and a keypad/display assembly.

4.1.1 Printhead Drive Assembly

The printhead drive assembly positions the printhead as it prints each line of characters. The printhead and ribbon drive mechanism are mounted on a moveable carriage which is supported by a carriage shaft. The carriage shaft is mounted to two pivot arms that allow the carriage to lift away from the platen and accommodate different thickness documents. The carriage is lifted by a slider that rides across the document surface and maintains a constant printhead to document gap, thereby maintaining print quality across a wide document thickness range. A guide wheel mounted on the carriage rides across the front of the metal box and stops the carriage from rotating around the carriage shaft.

A toothed belt clamped to the carriage is driven by a toothed pulley mounted on the carriage stepper motor located on the right side of the metal box. The stepper motor moves the printhead in 1/120th of an inch increments along the print line. Position information is maintained by the electronics and updated when a flag on the carriage interrupts the optical slot sensor mounted to the left pivot arm.

The ribbon cartridge is driven by a shaft on which two pulleys with internal one-way clutches are mounted. A spring tensioned steel cable mounted between the pivot arms rotates both pulleys as the carriage traverses and the clutches are oriented so the shaft is rotated clockwise by the rear pulley when the carriage is moving to the right and by the front pulley when the carriage is moving to the left.

4.1.2 Document Drive Assembly

The document drive assembly positions inserted documents. The document drive stepper motor mounted on the left side of the metal box is connected to the two drive rollers through toothed belts. A pinch roller is spring loaded against each drive roller providing friction feed for documents of varying thickness. Documents are fed between the drive and pinch rollers, with the spring loaded pinch roller automatically adjusting to the document thickness. The stepper motor positions in 1/120th of an inch increments.

The presence of a document in the input tray is sensed by the first of two optical slot sensors located along the left edge of the document path. The second sensor is used during document insertion for positioning to the top or bottom edge of the document.

Printers with the auto alignment feature have a gate that is raised across the document path during document insertion. At that time the printhead moves past its normal right home position, activating an arm that raises the gate. The rising gate reduces the spring loading force on the front document drive rollers, allowing documents to rotate and align against the gate. A third optical sensor, in line with the second sensor, checks the leading document edge to insure that both sense the leading document edge within a programmable alignment tolerance. After alignment is verified, the printhead moves to the left, lowering the gate out of the document path and restoring normal loading force to the document drive rollers.

4.1.3 AC Printed Circuit Board and Power Transformer

The AC PCB is located under the rear of the document drive and contains a line filter, line fuse and line switch. It provides AC to the power transformer located inside the metal box. The transformer converts 115 or 230 VAC to center tapped 48 VAC with the center tap connected to both chassis and signal ground.

4.1.4 Main Printed Circuit Board

The Main PCB is located in the rear of the printer and contains power supply, control and driver electronics. The center-tapped 48VAC from the power transformer is converted to unregulated +30 to 40VDC,

semiregulated +/-12VDC and switching regulated +5VDC on the main PCB. The unregulated +30 to 40VDC drives the printhead and stepper motors. The DP6 also develops unregulated -30 to -40VDC to drive the printhead.

The control electronics are based on a 6809 microprocessor, a 64 Kbyte EPROM, an 8K (DP6) or 32K (DP7) byte RAM, a 6522 I/O & timer device and an 8251 serial I/O communication device. The main PCB also contains circuitry for interfacing to the keyboard/display assembly, driving the printhead and stepper motors and providing signal level conversion for the serial interface signals. The driver electronics include switching transistors that drive the printhead and 4 H-Bridge switching regulators that drive the carriage and document drive stepper motors.

4.1.5 Keypad/Display Assembly

The keyboard/display assembly consists of a 16 key keypad arranged in a 4 x 4 scanning matrix and a 2 line by 16 character dot matrix LCD display module. The display buffers 32 characters of data and generates the dot patterns and timing to drive the LCD. The keypad assembly also contains an optical slot sensor that detects removal of the cabinet lid.

4.2 ELECTRONICS IN DETAIL - Refer to #72080 (#72115 for DP7) Schematic

The following sections describe the DP6 with DP7 differences described in parentheses.

4.2.1 Power Supply

The center-tapped 48VAC supplied from the power transformer is converted to unregulated +/-30VDC (+30 only in DP7) by diode bridge D3 to 6 (half bridge D3 & D4) and filter capacitors C18 and C19 (C22). The printhead is driven from +/-30VDC (+30 VDC only) and the stepper motors are driven from +30 VDC protected by a 0.75A fuse F1. Semiregulated +12VDC is generated from +30VDC by bleeder resistor divider R44 & 45 (R36 & 37) and linear regulator Q14 (Q31). In the DP6 semiregulated -12VDC is generated from -30VDC by bleeder resistor divider R38 & 39 and linear regulator Q13. (In the DP7 semiregulated -12VDC is generated from +12VDC by a 7662 switching inverter U10.) +5VDC to power the logic is generated from +30 VDC by switching regulator Q15 (Q35) using Schottky diode D20 (D37) and output filter L1,C31 (C36). The 100KHz switching frequency is set by C29 & R51 (C25 & R41).

The 48VAC input charges up C6 (C35) through D1,D2 and R1 (R40). The C6 (C35) voltage is monitored by precision reference Q1 (Q33) to insure correct operating voltages during power-up and power-down. Q1 (Q33) provides a PWROK signal through Q2 (Q34) to the microprocessor and an enable signal to the device decoding logic.

4.2.2 Microprocessor System

The 6809 microprocessor U23 (U26 in DP7) has a 1.0 (0.5) microsecond cycle time which it generates from 4MHz (8mhz) crystal Y1. Once each cycle the 6809 provides a timing pulse on U23 (U26) pin 34 for synchronizing the devices on the data bus and updates the address information on pins A0-A15. The high order address lines are decoded by a 74HC139 U11 (PAL U13). The decoded outputs are utilized as chip selects to the RAM, EPROM and other LSI devices so that the corresponding device can be read or written to by the 6809.

In the DP6 the 8 KByte RAM U21 is selected by U11 pin 6 when A15, 14 & 13 are all low. (In the DP7 the 32 Kbyte U25 is selected by U13 pin 16 when A15 is low unless A14 & 13 are both high and any bank select line BNK1 to 3 is low which selects EPROM or unless A14,12 & 11 are low and A13 is high which selects I/O devices.) The RAM provides work space and buffer memory for the 6809. All printer, communication and service configuration parameters are also stored in the RAM which is powered by a 3 Volt lithium battery when AC power is turned off. (Later versions of the DP6 and the DP7 uses serial EEPROM (U15A DP6; U11 DP7) to store parameters and have no battery.)

In the DP6 the 64 KByte EPROM U22 is selected by U25 pin 10 whenever either A14 or A15 is high, allowing 48 Kbytes of addressable EPROM. (In the DP7 the 64 or 128 KByte EPROM U24 is selected by U13 pin 19 whenever either A15 is high or any bank select BNK1 to 3 is low, allowing 64 or 88 Kbytes of addressable EPROM.) The EPROM contains the dot patterns for all printable characters and all programs that the 6809 executes to control the printer.

The 8251 serial communication controller U24 (U27) is selected by U11 pin 9 (U13 pin 14) and receives and transmits asynchronous serial data. Baud rate, word length, parity and number of stop bits are programmed into the 8251 from the keypad. The baud rate clock for the 8251 is generated by a 74LS161 binary counter U16 (U19) that provides one clock pulse for every thirteen E pulses provided by the 6809. RS-232 interface signals are level-shifted by receiver U13 (U15) and driver U8 (U9). Two OR gates U12 (U14) control dual port mode transmission.

The 6522 I/O & Timer device U20 (U23) is selected by U11 pin 10 (U13 pin 18) and contains two 8 bit output ports, 4 control lines and 2 programmable timers. Port A controls the document stepper motor and Port B controls the carriage stepper motor. Stepper motor timing and printhead print pulse length are controlled by the 2 timers.

4.2.3 Stepper Motor Drivers

Each stepper motor has 2 stator coils, each driven by a 3717 driver U1 to U4. Each 3717 contains 4 transistors arranged in a H-Bridge that can apply +30 VDC to either end of the coil, a 25KHz switching oscillator and comparators that limit the coil current by sensing the voltage on an external resistor R4,7,13 or 18 (R2,6,15 or 18). Each 3717 is controlled by 3 signals that are latched in the 6522: a phase signal which indicates which direction current is to flow through the coil and two signals which limit the current to 0,20,60 or 100% of a maximum value determined by the external resistor. 0% is used to turn off a winding, 20% is used when the motor is holding a fixed position and 100% is used when the motor is rotating. See Figure 4-1 for typical voltage waveforms on both ends of a motor coil and the external resistor. The ground plane under the 4 3717's is connected to a finned heat sink to reduce the temperature rise. Both stepper motor drivers are protected by a single 0.75A fuse F1.

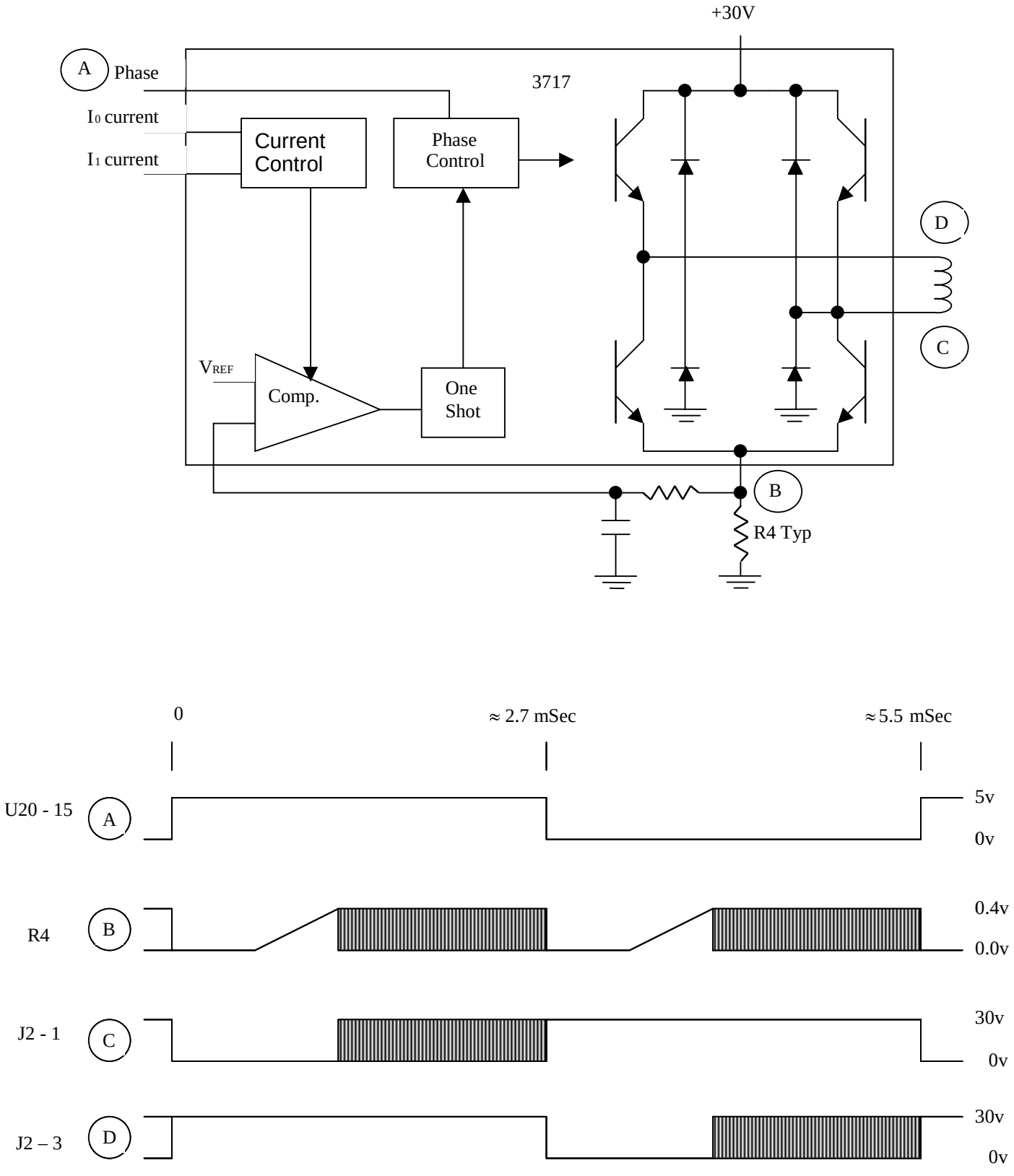


FIG 4.1 STEPPER MOTOR DRIVE CIRCUIT

Motor rotation occurs by sequentially changing the phase and current signals to the two motor coils. Motor speed is controlled by how rapidly the signals are changed. Following is a state table where each state change rotates the document motor rotor 1/400 of a revolution (1/120" of document motion) and there are 8 distinct states before the pattern repeats. Direction of motor rotation can be reversed by moving up rather than down through the state table. The 2 motor windings are labeled Phase A and Phase B and the phase and 2 current level signals for each winding are shown. The state table for the carriage motor is similar but the states with 0% current are skipped so each state change rotates the carriage motor rotor 1/200 of a revolution (1/120" of carriage motion).

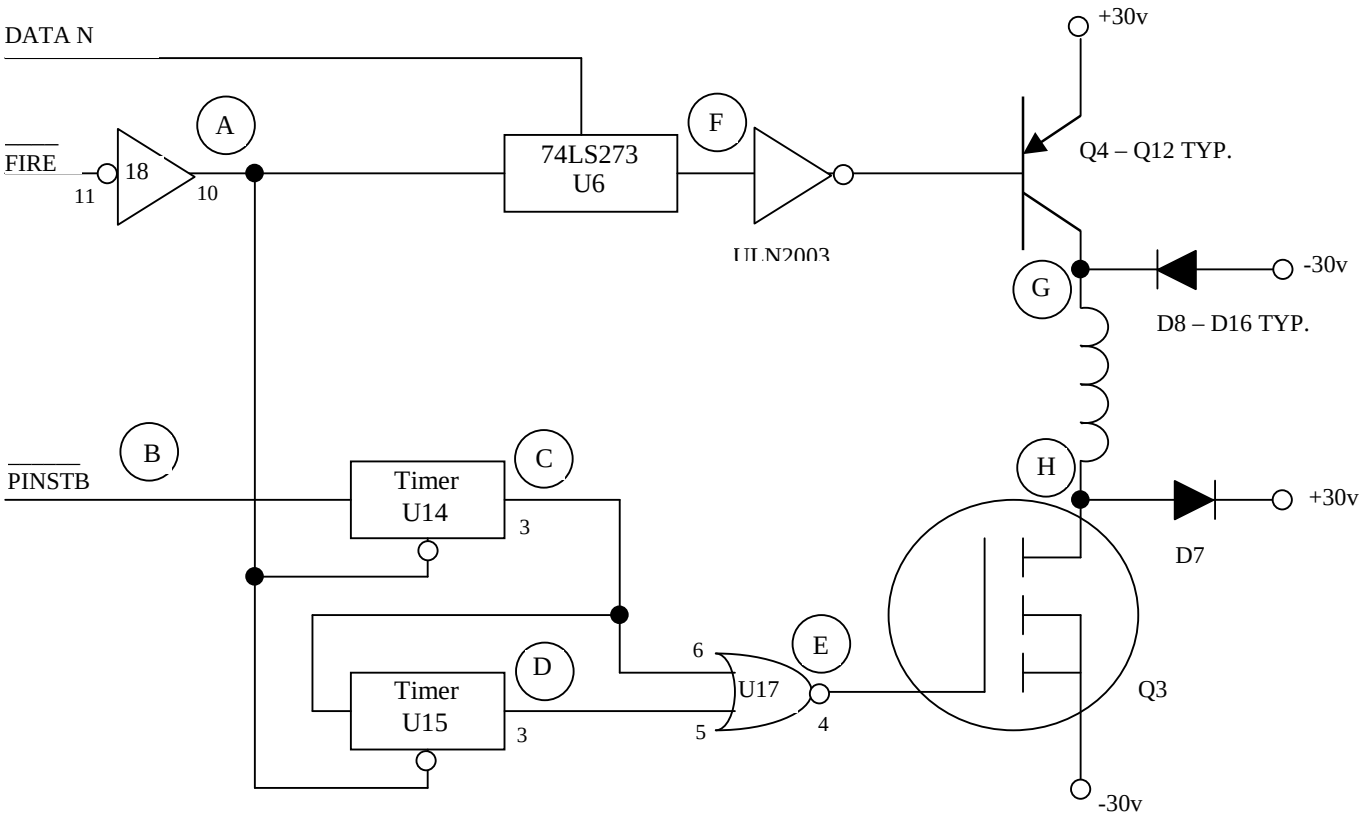
Phase A	I0A	I1A	Phase B	I0B	I1B	A Current	B Current	
1	0	0	1	0	0	100% Forward	100% Forward	<--
1	0	0	0	1	1	100% Forward	0% Reverse	|
1	0	0	0	0	0	100% Forward	100% Reverse	|
0	1	1	0	0	0	0% Reverse	100% Reverse	|
0	0	0	0	0	0	100% Reverse	100% Reverse	|
0	0	0	1	1	1	100% Reverse	0% Forward	|
0	0	0	1	0	0	100% Reverse	100% Forward	|
1	1	1	1	0	0	0% Forward	100% Forward	---

4.2.4 Printhead Drivers

During DP6 printing, a pulse at NAND gate U27 pin 3 simultaneously loads 74LS273 latch U6 with 8 bits indicating which printwires are to be driven and triggers print pulse timer U14. Each high bit in U6 applies +30 VDC to one side of the corresponding printwire coil via NPN predrivers U5 and TIP126 or TIP127 PNP drivers Q4 to Q12. Timer U14 applies -30 VDC to the other side of all printwire coils via Q17 and power MOSFET Q3.

(During DP7 printing, 24 bits of print dot data are serially shifted into U5 to U7. A pulse at OR gate U14 pin 6 then transfers the 24 bits to the U5 to U7 outputs. Each high bit turns on a printwire by activating power MOSFETS Q5 to 28. Timer U17 applies +30VDC to the other side of all printwire coils via Q1 and power MOSFET Q3.)

The pulse length of timer U14 (U17) is inversely proportional to the actual +30 VDC voltage level. As +30 VDC rises the current level in the coils increases more rapidly so the timer pulse shortens to keep the peak coil current relatively constant. When the timer pulse ends, it turns off Q3 and current in the coils circulates back to the +30 VDC supply through D7 (D32). The timer turn off also enables print pulse oscillator U15 (U18) which toggles Q3 on and off as an open-loop switching regulator to keep the current circulating in the coils relatively constant. Finally, 6522 timer output U20 (U23) pin 17 goes high which clears the printwire bits from U6 (U5 to U7) and resets both U14 & 15 (U17 &18). This turns off all transistors and the current in the coils rapidly discharges through diodes D8 to 16 (D6 to 29). (In the DP7 timer U16 enables this discharge path through Q4 for about 40 usec. after the 6522 timer output goes high. Then U16 turns off Q4 and the remaining coil current is dissipated in Q5 to 28.) See Figure 4-2 for typical waveforms.



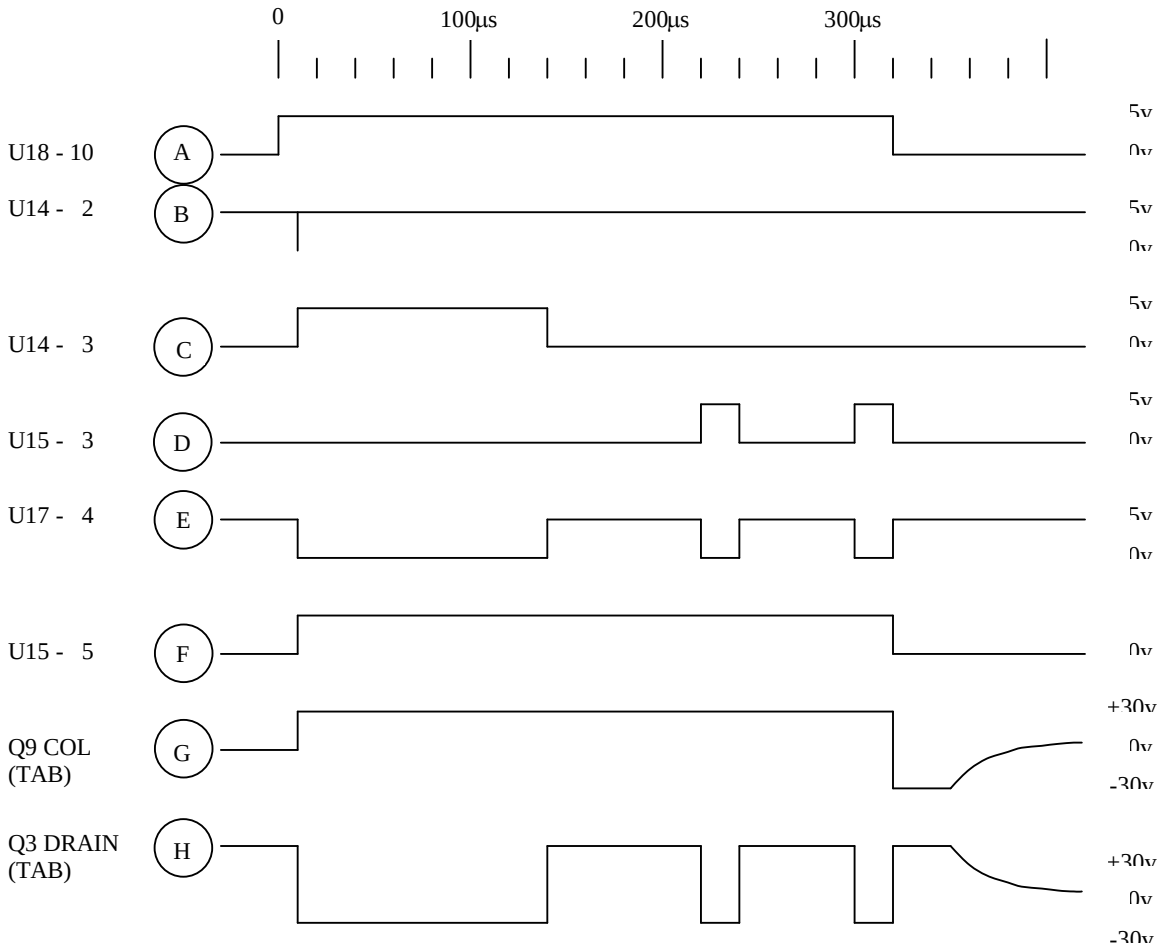


FIG 4.2 PRINTHEAD DRIVE CIRCUIT

4.2.5 Keypad and Display (Refer to Schematics #72082 and #72080 or #72115)

The keypad switches are arranged in a 4 by 4 X-Y grid. Address lines A0 to A3 drive the grid rows through 74LS367 buffer U10 (U12 in the DP7) and the grid columns are read onto the 6809 data bus through 74LS245 transceiver U19 (U22).

The display is a 2 line by 16 character liquid crystal display (LCD) with integral electronics. All data transfers between the 6809 and the display are buffered through transceiver U19 (U22). When the 6809 is ready to display data, it reads status from the LCD and if the LCD is ready to accept data, the 6809 writes ASCII characters to the LCD. The LCD then generates and displays the corresponding character patterns.

4.2.6 Sensors

Four optical sensors are used: the left home sensor for carriage position, the front and rear document sensors for document presence and position and the sensor on the keypad PCB for cover open condition. All sensors operate in the same way: a constant current is provided to the integral light emitting diode (LED) of the sensor through a resistor to +5 volts. The LED light turns on the corresponding phototransistor, raising its emitter voltage to about 3.5 VDC. When an object is placed in the slot between the LED and the phototransistor, the transistor turns off and its emitter is pulled down to ground by a resistor. Sensor status is read by the 6809 via 74LS365 buffer U7 (U8 in the DP7). Printers with the auto alignment feature add a fifth sensor for detecting skew of the inserted document. Both this sensor and the rear document sensor are reflective sensors which turn on their phototransistors when a document is present.

4.2.7 Character Printing

The carriage motor steps the carriage in 1/120" increments but dots can be printed twice per increment (3 times per increment in the DP7). Printing at 10 characters per inch (cpi) uses a 9 wide by 8 high (13 X 22) character matrix. Nine (13) increments are used for printing a character and 3 (5) increments for the intercharacter space. Printing at 12 cpi uses a 7 X 8 (11 X 22) matrix with 7 (11) increments used for printing and 3 (4) for spacing. Printing at 17.1 cpi uses a 9 X 8 (7 X 22) matrix with 9 half (7) increments used for printing and 5 (3.5) for spacing. At correspondence quality (CQ) speed half increment printing is used to double the horizontal resolution and the matrix doubles to 17 X 17 (25 X 22) for 10 cpi and 13 X 17 (19 X 22) for 12 cpi. DP6 CQ is printed in two passes with the document moved by 1/2 dot between passes to double the vertical resolution. DP7 CQ is printed in a single pass.

At all print speeds only every other dot position can be printed so the maximum number of horizontal dots printed is 4 for a 7 wide matrix, 5 for a 9 wide, 6 for an 11 wide, 7 for a 13 wide, 9 for a 17 wide, 10 for a 19 wide and 13 for a 25 wide matrix. In all print modes the upper 7 (17) printwires are used for printing normal characters, the eighth (18th through 22nd) wire for lower case descenders and the ninth (23rd & 24th) wire for underlining.

Printwire impact force and print density decrease as the printwire cycling frequency increases. Draft and CQ print at a maximum frequency of 1,000Hz (1,350Hz) and normal print occurs at a maximum frequency of 750Hz (1,350Hz).

5.0 MAINTENANCE

5.1 LUBRICATION AND CLEANING

5.1.1 Lubrication

There are no lubrication points in the printer. All parts are either permanently lubricated or are designed to operate dry. No lubricants should be used. They may adversely affect operation.

5.1.2 Document Feed Roller Cleaning

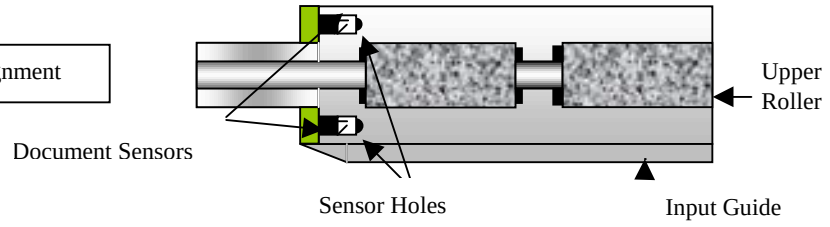
1. Remove the cabinet lid.
2. Moisten a lint-free cloth with isopropyl alcohol and wipe the front rollers while rotating the gear on the end of the roller shaft. **Do not use any strong solvents in place of alcohol.**
3. In similar fashion, clean the rear rollers. Make sure all rollers are dry and free of residue.

5.1.3 Document Sensor Cleaning

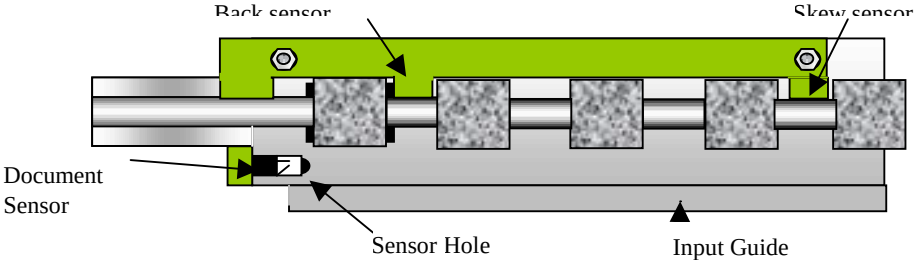
Clear document sensor light paths of paper dust and other obstructions if rollers continue to run when no document is present.

1. Insert the flexible nozzle tube of a compressed air can under the input guide and near each of the document sensors (2 sensors on printers without auto alignment, 3 sensors on auto alignment printers). Clear each sensor area with a 5 second burst of air.

DP6 & DP7 without Automatic Alignment



DP7 with Automatic Alignment

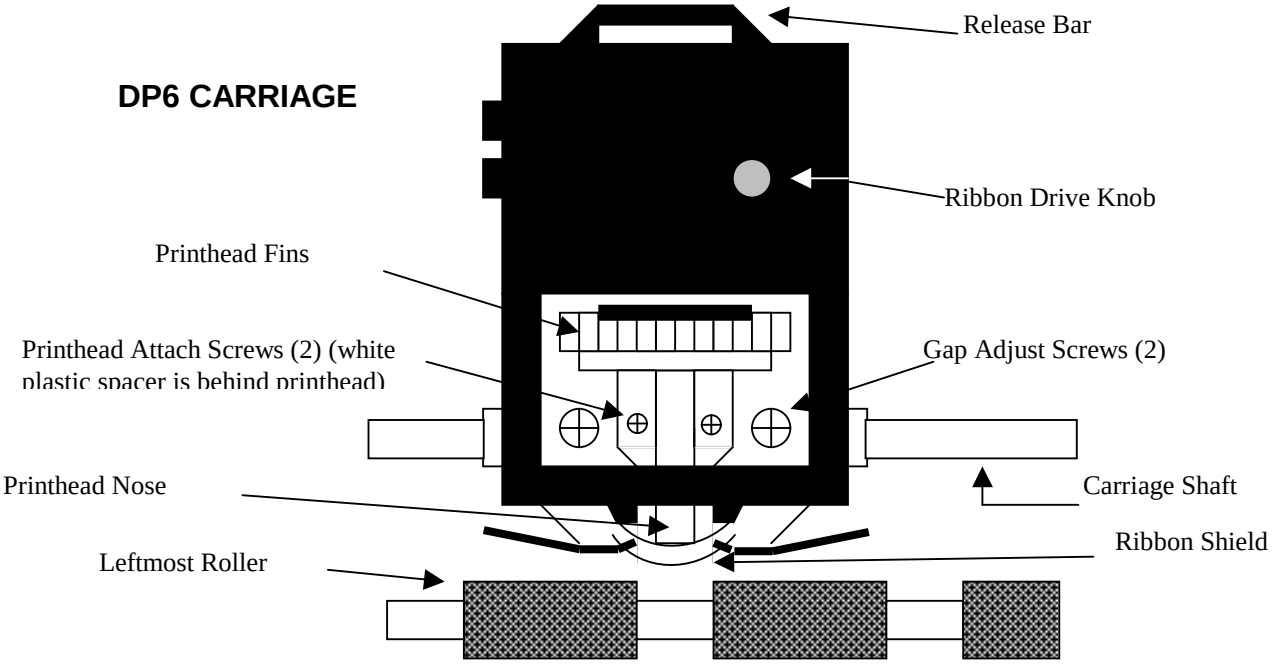


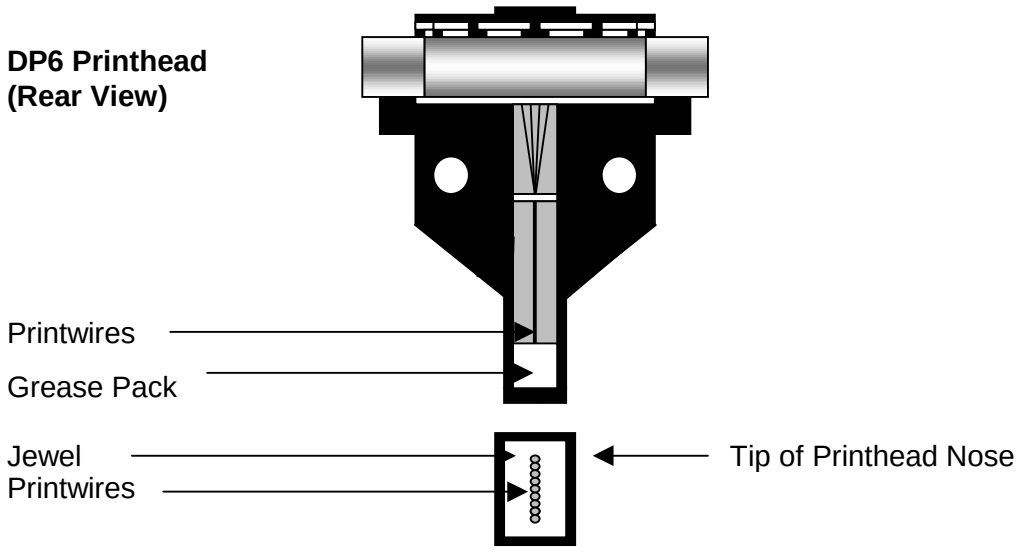
5.1.4 Printhead Cleaning

Perform when printwires stick or print quality becomes intermittent. Be sure to check the ribbon first! All necessary tools are included in the 73297-1 Printer Cleaning Kit.

5.1.4.1 DP6 Printhead Cleaning

1. Remove the cabinet lid and ribbon cartridge.
2. Remove the 2 screws fastening the printhead to the carriage.
3. Disconnect the printhead from the printhead flex cable.
4. Clean the tip of the printhead nose where the printwires extend from the printhead with an alcohol wetted napkin. Remove all ink and bits of ribbon fabric lint.
5. Use the blunt end of a printhead cleaning brush to remove the bulk of the grease packed around the printwires. Then wet the brush end with alcohol to do remove the rest of the grease from the printwires. Wipe the grease, ink and ribbon fabric "lint" from the brush onto the napkin provided.
6. Use the syringe filled with printhead lubricant to replace the "grease pack".
7. Replace the printhead and reconnect it to the flex cable. (The white spacer between the printhead and the carriage is critical to correct operation.)
8. Tighten the mounting screws while pushing the printhead down so the plastic nose flange sits flush against the edge of the carriage slot. Check the printhead gap.
9. Reinstall the ribbon shield and ribbon cartridge. Perform a test print.

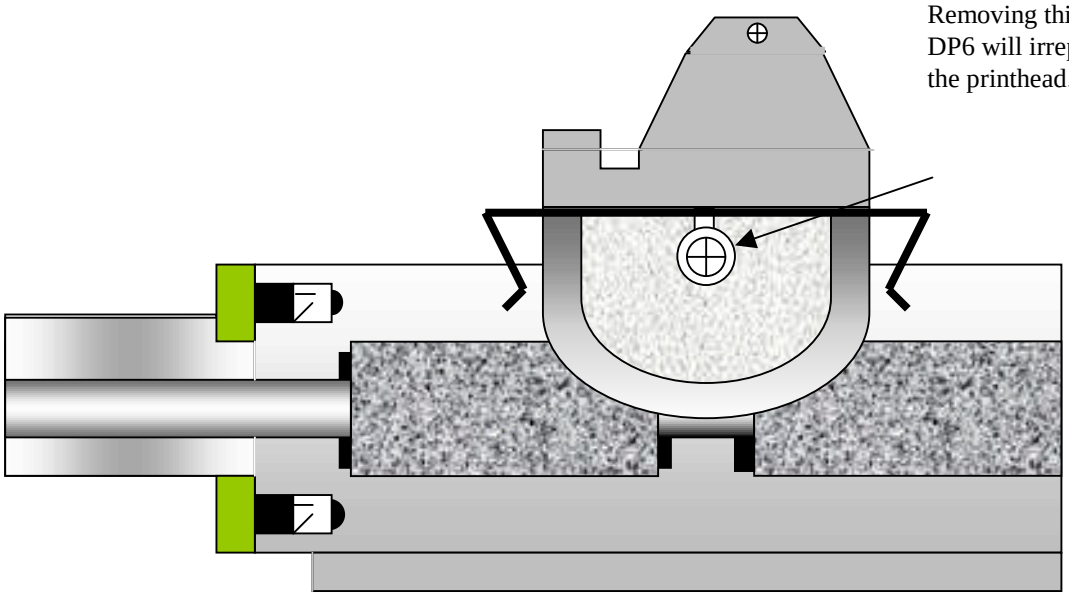




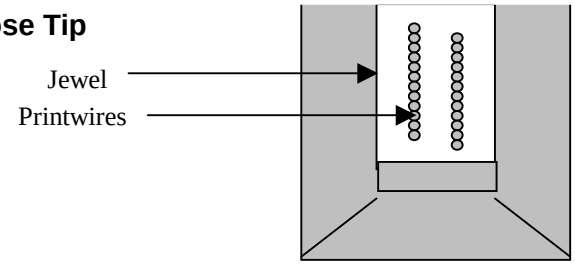
5.1.4.2 DP7 Printhead Cleaning

1. Remove the cabinet lid and ribbon cartridge.
2. Remove the ribbon shield by raising the carriage, pushing down on the shield until it snaps free from the carriage and sliding it out to the right.
3. Remove the screw fastening the printhead to the carriage.
4. Disconnect the printhead from the 2 printhead flex cables.
5. Remove the printhead by tilting it forward while lifting the carriage.
6. Clean the tip of the printhead nose where the printwires extend from the printhead with an alcohol wetted napkin. Remove all ink and bits of ribbon fabric lint.
7. Replace the printhead and reconnect it to the flex cables.
8. Tighten the mounting screw.
9. Replace the ribbon shield and cartridge and do a test print.

On the DP7 printer, remove this screw to remove printhead. Removing this screw on the DP6 will irreparably damage the printhead.



DP7 Printhead Nose Tip



5.1.5 Document Print Area Cleaning

Accumulated paper dust should be brushed or vacuumed occasionally from the platen, printhead, carriage shaft, feed rollers, document sensor and other the document path areas.

5.1.6 Cabinet Exterior Cleaning

The cabinet can be cleaned with a damp cloth and a mild, liquid soap or detergent. **Do not use harsh, abrasive cleaners.**

5.2 SERVICE PARAMETER SET-UP PROCEDURE

It may be necessary to reset service parameters that compensate for certain mechanical tolerances. These parameters are listed on a label inside the printer and may be reentered if necessary by the 94 FUNCT(see 3.6.3). If mechanical parts are replaced some parameters may have to be reset. New parameter values should be marked on the configuration label.

The service parameters are described in 3.6.3 and are determined by using 95 FUNCT local printing and 944 FUNCT forward/reverse printing as described below. Parameter values are changed with the ↑A and ↓B keys. After changing a parameter, use 95 and 944 FUNCT to obtain new print samples. Measure all distances again and re-adjust if necessary.

TOP OFFSET is set so the distance from the top document edge to the center of the first line printed by 95 FUNCT is located as specified by LINE #1 = .XXX under 92 FUNCT.

INDEX OFFSET sets the distance that a document moves after it is semi-automatically inserted. To adjust this parameter, configure 92 FUNCT for BEGIN PRINTING AFTER ENTER KEY. Insert a document and then move it slightly into the printer with the ↑A key. Draw a line across the document directly beneath the front edge of the metal input guide above the document. Press ENTER and the document will be repositioned. Set the INDEX OFFSET so that the first line printed by 95 FUNCT is centered on the line drawn across the document.

LEFT OFFSET is set so the carriage can still move leftward from its position after document insertion 0.01" to 0.02" (0.3 to 0.5mm) before it is stopped by mechanical interference.

LEFT MARGIN is set so the distance from the left document edge to the left edge of the first character printed by 95 FUNCT is 0.20" (5.1mm)

CAR ALIGN is set so that the center of 80 character lines printed from right to left align with those printed left to right by 95 FUNCT.

944 FUNCT prints a line of X's advances the document 10", prints another line of X's, reverses the document 10", prints a line of O's, advances the document 10", prints another line of O's and then ejects the document. It is used to set the following three parameters.

FORWARD COMPENSATION is set so that the distance between lines of X's printed by 944 FUNCT is 10.00" (254mm) +/- 0.02” (0.5mm)

REVERSE COMPENSATION is set so that the line of O's printed at the top of the page overlaps the line of X's within 0.02” (0.5mm).

EJECT HOLD OFFSET is set so that when a document printed by 944 FUNCT is ejected it is still held in the front drive rollers but can be removed by pulling gently on the document.

CONFIGURATION selects certain custom operating features and should not be set to a value other than shown on the configuration label without contacting the factory.

NORMAL DARKNESS (DP7 only) Lower values reduce darkness and increase ribbon life at normal print speed. Select the lowest value that provides suitable legibility on thick forms. CQ DARKNESS similarly controls darkness at correspondence quality print speed.

5.3 ELECTRICAL ADJUSTMENTS

There are no electrical adjustments required. Do not adjust the preset potentiometer on the main PCB without consulting the factory.

5.4 MECHANICAL ADJUSTMENTS

5.4.1 DP6 Printhead Gap

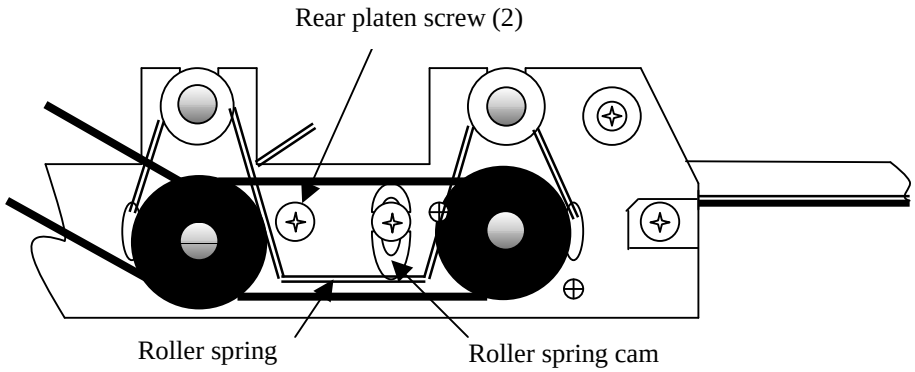
Too large a gap causes light print and missing dots. Too small a gap causes ribbon smear.

1. Remove the cabinet lid and ribbon cartridge (See 5.5.1).
2. Turn off power.
3. Flex the plastic ribbon shield and remove it from its holder.
4. Insert a .017" (.42 mm) feeler gauge between the platen (printing surface) and printhead nose from the side of the printhead. Insure that the feeler is flat against the platen and not beneath the plastic carriage slider. The .017" feeler should just fit without raising the printhead but a slight resistance should be felt as the feeler slides below the printwires.
5. If the gap is incorrect, slightly loosen the two larger head screws on either side of the printhead (Not the screws fastening the printhead to the carriage!) that fasten the gap plate to the carriage bracket. The gap changes as these screws are loosened so only loosen them enough to be able to move the plate. (See drawing in 5.1.4.1 above.)
6. Push the gap plate down so the gap is more than .017" and then push the printhead down so that the printwires just contact the .017" feeler. Insure that the gap plate is centered around the printhead nose and tighten the screws. Recheck the gap per step 4.
7. Replace the ribbon shield. Insure the shield tabs are set firmly and securely in the holder and the shield slot is toward the printer rear.
8. Mount the ribbon and use 95 FUNCT to print locally (See 3.9) to check print quality.

5.4.2 DP7 Printhead Gap

Too large a gap causes light print and missing dots. Too small a gap causes ribbon smear.

1. Remove the cabinet lid and ribbon cartridge (See 5.5.1).
2. Turn off power.
3. Remove the ribbon shield by raising the carriage, pushing down on the shield until it snaps free from the carriage and sliding it out to the right.
4. Insert a .013" (.32 mm) feeler gauge between the platen (printing surface) and printhead nose from the side of the printhead and behind the slider (plastic pivoting piece in front of the printhead nose). Insure that the feeler is flat against the platen. The .013" feeler should just fit without raising the printhead but a slight resistance should be felt as the feeler slides below the printwires.
5. If the gap is too small, it may be due to slider wear. Replace the slider with a new one if available. Remove the old slider by pushing it down while holding up the carriage. See drawing in paragraph 5.6.8 below. Orient the new slider below the slider pivot pin so that the notched corners face toward the printer rear. Push the carriage down against the slider until it snaps onto the slider pivot pin. Check that the slider pivots freely. Check the gap with the .013" feeler. If the gap is incorrect, proceed as follows:
6. On units with serial numbers below 70091 the gap must be adjusted by repositioning the gap plate as described for the DP6 in 5.4.1 steps 5 & 6 but with a .013" gap. Then skip to step 12 below.
   On all later units, proceed as follows:
8. Loosen the rear screws fastening the platen to the document drive side plates. Do not loosen the front platen screws that also locate the document drive roller spring cams. See drawing below.
9. Increase the gap by pushing the rear platen screwheads downwards. Decrease the gap by raising the rear platen screwheads.
10. Check the gap with the .013'" feeler. When it is correct, tighten the platen screws.



Left side of document drive (with cabinet removed)

11. Replace the ribbon shield by raising the carriage, sliding the shield between the carriage and the printhead until the shield slot is centered and then gently push the carriage down until the shield snaps into place
12. Mount the ribbon and print locally (see 3.9) to check print quality. Adjust the NORMAL and CQ DARKNESS parameters (see 5.2).

5.4.3 Carriage Drive Belt Tension

The carriage belt connects the carriage drive motor mounted in the right end of the box with the carriage. Low carriage belt tension can cause uneven character size and spacing or carriage stalling.

1. With the carriage in its leftmost position, use a spring gauge to deflect the center of the carriage belt. Proceed to step 2 only if the force to deflect one side of the belt so that it just touches the other side of the belt is not between 15 and 17 ounces (425-475 gms).
2. Remove the cabinet (see 5.5.1).
3. Locate the screw fastening the carriage idler pulley arm at the left end of the carriage drive belt to the left pivot arm. Turn it to clockwise to increase or counter clockwise to decrease the belt tension. Repeat step 1.

5.4.4 Document Drive Belt Tension

The document drive belt connects the document drive motor mounted to the left side of the box with the rear document drive roller. Low document belt tension causes uneven line spacing and document drive stalling.

1. Remove the cabinet (see 5.5.1).
2. Use a spring gauge to deflect the center of the document drive belt. Proceed to step 3 only if the force measured to deflect the belt 1/16" (1.5mm) is not between 1.5 and 2.5 ounces (40 and 70 gms).
3. Loosen the 3 screws that fasten the document drive motor to the metal box. Do not loosen too much or the jam nuts inside the box will fall off the screws.
4. Move the motor toward or away from the rear document drive roller to adjust the tension and tighten the screws. Repeat step 2.

5.4.5 Carriage Left Home Position

1. Only use the following procedure if the LEFT OFFSET parameter is not displayed by 94 FUNCT. If it is, use it to set left home (see 5.2).
2. Turn on power and insert a document to activate the carriage motor.
3. Loosen the set screw that fastens the drive pulley to the motor.
4. Push the carriage as far to the left as possible, then move it to the right about .020" (0.5 mm) and tighten the set screw.
5. Check that the carriage tab slides into the left home sensor without binding. Bend the tab if necessary.

5.4.6 Wheel Guide

The wheel guide holds the carriage guide wheel against the box. A loose wheel guide can cause wavy printing. A tight wheel guide can cause carriage stalling.

1. Remove the cabinet (see 5.5.1).
2. Loosen the screws on each end of the metal box fastening the wheel guide arms to the box.
3. With the carriage in its leftmost position, insert a .010" (.25 mm) feeler gauge between the guide wheel and the box. Push the wheel guide against the guide wheel and insure that the wheel guide arms are horizontal. Tighten the 2 wheel guide screws.
4. Move the carriage to its rightmost position and repeat step 3.
5. Adjust the envelope ramp on DP6's below S/N 00588 (see 5.4.6).

5.4.7 Envelope Ramp (DP6 below S/N 00588)

1. Move the carriage toward the right so that the printhead nose is still above the black platen but the flat top surface of the white plastic ramp is beneath the carriage flange.
2. Loosen the ramp screw on the wheel guide and adjust the ramp height so that the ramp raises the carriage 0 to .010" (.25 mm) off the platen. Insure that the upper surface of the ramp is parallel to the carriage flange and that it doesn't move when the screw is tightened.

5.4.8 Document Input Tray Height

1. Remove the cabinet (see 5.5.1).
2. Raise the input tray to its non-operating position.
3. Slightly loosen the 2 screws that fasten the tray support to the side plates and raise the tray support as far as possible.
4. Lower the input tray until it is horizontal (the height of the input tray near the tray support is within .03" (0.8mm) of the height of the tray at its front edge) and tighten the screws so that the tray support holds the input tray horizontal.

5.4.9 Document Drive Roller Spring Force

The document drive roller springs are formed wires that pull both front and rear upper document drive rollers against the lower rollers. The springs are mounted to both document drive side plates and adjusted by raising or lowering the cams mounted on the front screws fastening the side plates to the platen. Incorrect spring force can cause document skewing, slipping or stalling

1. Remove the cabinet (see 5.5.1).
2. Use a spring gauge to measure the force required to raise the right end of the front pinch roller very slightly. It should measure 3 to 4 ounces (85 to 115 gms).
3. If necessary, adjust this force by loosening the roller spring cam screw on the right side plate and raising or lowering the cam.
4. Repeat steps 2 & 3 on the left end of the front pinch roller but adjust to 12 to 13 ounces (340 to 370 gms).

5.4.10 Document Edge Guide Squareness

1. Insert a known good square against the front drive rollers so that it contacts the rollers evenly. Slide the square leftward until it contacts the edge guide. The guide and the perpendicular edge of the square must be parallel.
2. If adjustment is necessary, remove the guide cover from the edge guide by prying it upward.
3. Loosen the 3 nuts fastening the edge guide to the input tray.
4. Insure that the square is evenly contacting the rollers and that its left edge is flush against the document sensor PCB.
5. Position the edge guide with its right edge flush to the square and its rear edge flush to the sensor PCB. At the same time position the clear top guide so that its right rear corner fits flush into the mating edges of the stainless steel guide above the rollers. Tighten the 3 nuts.
6. Reattach the decorative cover using new pieces of 1/8" thick foam adhesive tape.

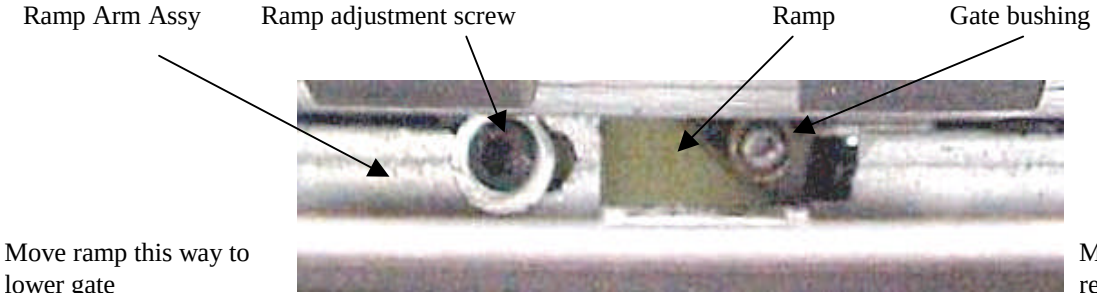
5.4.11 Print Skew

Perform this adjustment if the printing is not perpendicular to the left document edge.

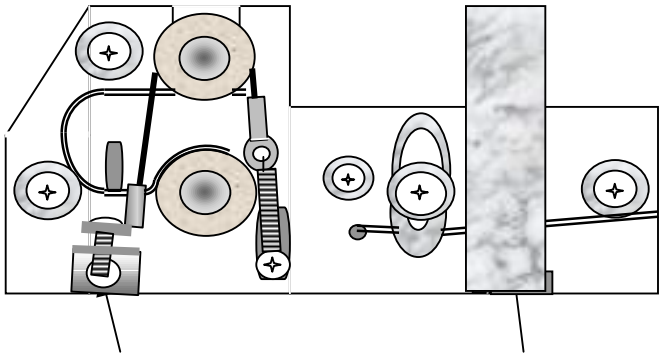
1. With power on, insert an 8 1/2" wide document with known good perpendicular edges into the rear document drive rollers and insure that its left edge is still flush to the edge guide.
2. Print an 80 character line of local printing (see 3.9) and eject.
3. The distance from the top document edge to the bottom of the print line should be the same within .01" (.25 mm) on both ends of the print line. Proceed only if adjustment is necessary.
4. Remove the cabinet (see 5.5.1)
5. Loosen the 2 screws that fasten the right document drive side plate to the right side of the metal box.
6. Move the right side of the document drive further into the box to rotate the print line clockwise. Move it out of the box to rotate the print line counterclockwise. Do not move it so far that the carriage binds against the upper exit guide or the ribbon shield support binds against the upper input guide.
7. Tighten the screws and return to step 2.
8. If skew cannot be eliminated by moving the right end of the document drive, move the left end but and then check the document drive belt tension and top offset (see 5.2 & 5.4.3)

5.4.12 Auto Alignment Gate Ramp

1. Insert an Allen wrench through the hole in the tray support and loosen the ramp adjustment screw.
2. Hold the ramp arm against the right side plate and move the ramp adjustment screw toward the right until the gate just begins to rise. Tighten the screw in this position



View: Gate arm from front of printer with tray support removed



R

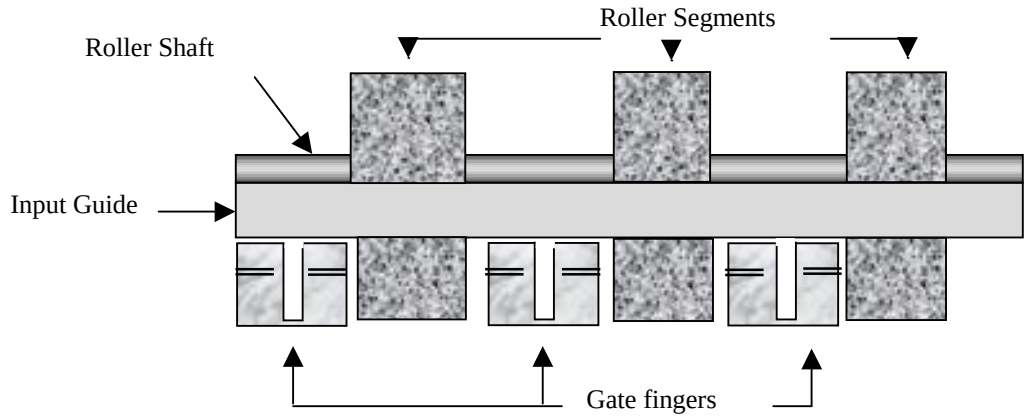
View: Right side of DP7 w/automatic alignment with cabinet removed.

5.4.13 Auto Alignment Roller Spring Tension

1. Raise the gate by pressing 9 4 7 FUNCT ↑A.
2. Manually feed an ½" wide strip of the thinnest paper used on the machine (usually a receipt copy under the rightmost front upper roller segment.
3. Pull the paper out from under the roller segment. Adjust the roller spring tensioning screw on the right side plate so ther is a very light drag from the roller on the paper. Clockwise adjustment increases drag.

4. Repeat steps 2 and 3 for the leftmost roller segment and the roller spring tensioning screw on the left side plate.

5.4.14 Auto Alignment Gate Travel



1. Raise the gate by pressing 9 4 7 FUNCT ↑A.
2. Press FUNCT to adjust the gate height. The gate fingers should be as close as possible (within 0.02" or 0.5mm) to the input guide without touching it. Each press of ↑A will slightly raise the gate and each press of ↓B will slightly lower the gate. When the gate is at the correct height, press ENTER.
3. Press ↓B to lower the gate to its deactivated position and then press↑A to check for correct activated gate height. Press CLEAR to exit the test. Recheck by repeating step 1.

5.4.15 Auto Alignment Skew Sensor Calibration

1. Press 9 4 6 FUNCT to display "Skew Calibration".
2. Insert a document with known square top and left edges. If the document inserts straight and its top edge is perfectly parallel to the input guide edge, press ENTER to calibrate the skew sensors and exit. If the document did not insert perfectly, press EJECT and insert again.

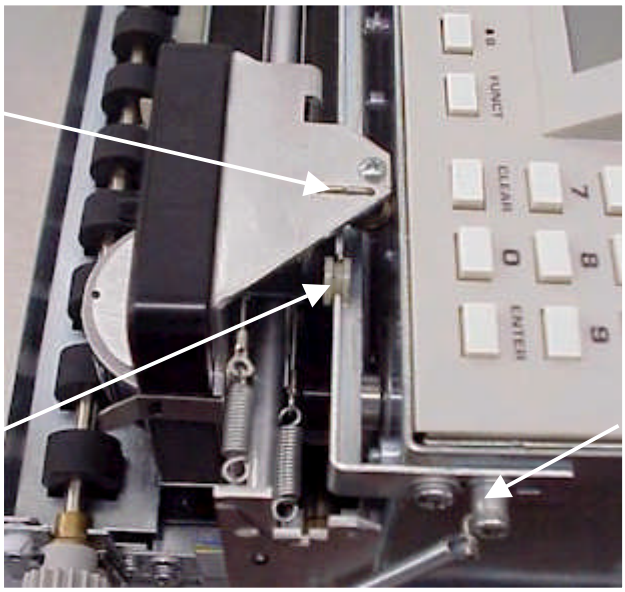
5.4.16 DP7 Carriage Spring

The spring between the box and the right pivot arm reduces the carriage force against the platen, minimizing picking of document edges and slider wear. To adjust spring tension rotate the spring hooks. Tension should be set as high as possible without causing lighter print near the edges of thick documents.

5.4.17 DP7 Carriage Lift Button

The carriage lift button raises the carriage at its right home position so that envelopes and other wide documents may be fed without the carriage weight pressing on them.

1. Remove the ribbon shield by raising the carriage, pushing down on the shield until it snaps free from the carriage and sliding it out to the right.
2. Move the carriage to the position on the right side of the printer where the carriage is lifted to its highest point by the lift button.
3. The gap between the printwires and the platen should now be between 0.026” and 0.030”.
4. To adjust, slightly loosen the right front wheel guide clamp screw and raise or lower the wheel guide to get the proper print gap. Tighten the screw while holding the wheel guide.
5. Reheck the gap and repeat step 4 if necessary.



5.5 REPLACEMENT PROCEDURES

5.5.1 Cabinet

1. Turn off power and remove the cabinet lid.
2. Loosen 4 screws located in each corner of the cabinet.
3. Raise the input tray and then lift off the cabinet.

5.5.2 Main PCB

1. Record all FUNCT 92 and 93 parameters so the new PCB can be configured correctly. If replacing a DP7 PCB, installing serial EEPROM U11 from the old PCB in the new PCB will transfer all parameters.
2. Remove the cabinet (see 5.5.1).
3. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
4. Disconnect the following cables (see Assy Dwg #72080 for DP6 or #72115 for DP7):

DP6	DP7	Description
J1	J1	input power
J2	J2	carriage stepper motor
J3	J3	document stepper motor
J4	J4&5	printhead
J5	J6	carriage home & document sensors
J6	J7	interface
J7	J8	keypad/display

5. Raise the PCB and remove the hinge screw in each lower corner.
6. To replace the PCB, reverse the procedure in steps 3 to 5.
7. Reconfigure the new PCB with the FUNCT 92 and 93 parameters recorded in step 1 and the FUNCT 94 parameters listed on the configuration label.

5.5.3 Battery

1. Record all 92 and 93 FUNCT parameters.
2. Turn off power and remove the cabinet (see 5.5.1).
3. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
4. Remove the old battery from its holder and discard it in a way that won't expose it to flame or high temperature.
5. Install a new #68026 Lithium battery in the holder with the "+" terminal facing away from the PCB. Replace only with the same or equivalent type.
   CAUTION: Danger of Explosion if battery is incorrectly replaced !
6. Remount the PCB and cabinet.
7. When the printer is powered on, POWER FAILURE will be displayed. Press FUNCT and reenter the 92 and 93 FUNCT parameters recorded in step 1 and the FUNCT 94 parameters listed on the configuration label.

5.5.4 Keypad/Display Assembly

1. Remove the cabinet (see 5.5.1).
2. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
3. Disconnect the Keypad/Display cable from J7 of the Main PCB.
4. Remove the 5 screws fastening the metal box top to the box.
5. Remove the 4 screws fastening the keypad/display to the box top and remove the keypad/display.
6. To install a new keypad/display reverse the procedure in steps 1 to 5

5.5.5 AC board

1. Turn off power and unplug the AC Cord.
2. Facing the rear of the printer remove the screw on the right end of the AC cord receptacle and the screw to the left of the power switch.
3. Slide out the AC PCB and disconnect the transformer connector.
4. To install a new AC PCB reverse the procedure in steps 1 to 3.

5.5.6 Carriage Home Sensor

1. Remove the cabinet (see 5.5.1).
2. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
3. Disconnect the Carriage Home Sensor cable from J5 of the Main PCB.
4. Remove the 2 screws fastening the sensor to the left pivot arm and remove the cable tie fastening the sensor cable to the pivot arm.
5. To install the new sensor reverse the procedure in steps 1 to 4.

5.5.7 Document Sensor

This does not apply to document sensors in printers with the automatic alignment feature. See 5.5.14 and 5.5.15 for replacement of those sensors.

1. Remove the cabinet (see 5.5.1).
2. Remove the 4 screws mounting the mechanism to the baseplate.
3. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
4. Disconnect the Document Sensor cable from J5 of the Main PCB.
5. Slide the left roller spring off the roller spring cam and lift the spring off the front roller.
6. Remove the screws fastening the input guide and the document sensor to the left side plate. Keep the sensor mounting spacer that is freed when the sensor mounting screw is removed.
7. Raise the input tray and slide the sensor to the left to free it from the input guide. Lift the left ends of the front roller and the input guide just enough to remove the sensor.
8. Mount the new sensor and route its cable back under the document drive to the Main PCB.
9. Push the mechanism toward the front right corner of the baseplate before fastening them.
10. Insure that the sensor PCB sits flush against the baseplate and left edge of the input guide and that the sensor cable passes under the sensor mounting spacer.
11. Reverse the procedure in steps 1 to 6. Insure that the left roller spring is inside the roller bushing flanges and that the spring ends hook inside the side plate slots.
12. Adjust the input guide so there is no more than .020” clearance between it and the carriage.
13. Adjust the TOP, INDEX and EJECT HOLD offsets under so that inserted documents are correctly positioned (See 5.2). Record any new values on the parameter label.

5.5.8 Transformer

1. Turn off power and unplug the AC Cord.
2. Remove the cabinet (see 5.5.1) and the AC PCB (see 5.5.5).
3. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
4. Disconnect the input power connector from J1 of the main PCB.
5. Remove the screw to the left of the transformer that fastens the chassis grounding wires to the metal box.
6. Remove the 2 screws that fasten the transformer to the metal box.
7. See 2.3 to insure that the new transformer is wired for the correct input voltage. **CONNECTION OF A TRANSFORMER WIRED FOR 115 VAC TO A 230 VAC INPUT CAN CAUSE PERMANENT DAMAGE TO THE PRINTER!**
8. To install a new transformer reverse the procedure in steps 1 to 6. Route the transformer wires under the carriage motor so the main PCB input power connector does not pull off.

5.5.9.1 DP6 Printhead

1. Remove the cabinet lid and ribbon cartridge.
2. Remove the 2 screws fastening the printhead to the carriage. See drawing in 5.1.4.1.
3. Disconnect the printhead from the printhead flex cable.
4. Mount the printhead spacer and mounting screws on the new printhead.
5. Replace the printhead and reconnect it to the flex cable.
6. Tighten the mounting screws while pushing the printhead down so the plastic nose flange sits flush against the edge of the carriage slot.
7. If possible, check the printhead gap (see 5.4.1).
8. Check the top offset parameter (see 5.2)

5.5.9.2 DP7 Printhead

1. Remove the cabinet lid and ribbon cartridge.
2. Remove the ribbon shield by raising the carriage, pushing down on the shield until it snaps free from the carriage and sliding it out to the right.
3. Remove the screw fastening the printhead to the carriage. See drawing in 5.1.4.2
4. Disconnect the printhead from the 2 printhead flex cables.
5. Remove the old printhead by tilting it forward while lifting the carriage.
6. Replace the printhead and reconnect it to the flex cables.
7. Tighten the mounting screw.
8. If possible, check the printhead gap (see 5.4.2).
9. Replace the ribbon shield and cartridge. Adjust TOP OFFSET, NORMAL and CQ DARKNESS (see 5.2).

5.5.10 Carriage Drive Belt

1. Remove the cabinet (see 5.5.1).
2. Remove the screws fastening the belt clamp.
3. Remove the screw fastening the carriage idler pulley arm to the left pivot arm. The belt and pulley arm are replaced as an assembly.
4. To install the new belt reverse the procedure in steps 2 and 3.
5. Tension the carriage belt (see 5.4.2).
6. Set the LEFT HOME (see 5.4.4), LEFT MARGIN and CAR ALIGN parameters (see 5.2).

5.5.11 Carriage Motor

1. Remove the cabinet (see 5.5.1).
2. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
3. Disconnect the carriage motor cable from J2 of the Main PCB.
4. Remove the 4 screws fastening the carriage motor to the metal box.
5. Transfer the carriage motor pulley to the new motor. Leave a .01" (0.2mm) gap between the pulley hub and the motor flange.
6. Assemble the 4 screws to the new motor. The DP6 uses a second flat washer on the upper screw closest to the transformer. The DP7 uses shorter screws on the side closer to the transformer. Carefully install the motor in the box and fasten but do not tighten the screws.
7. Insure that the transformer cables are not pinched by the motor. With the carriage near the right side of the printer, locate the motor vertically so that the carriage drive belt is horizontal from the motor pulley to the carriage clamp surface and tighten the motor mounting screws.
8. Tension the carriage belt (see 5.4.2).
9. Set the LEFT HOME (see 5.4.4), LEFT MARGIN and CAR ALIGN parameters (see 5.2).
10. Reverse the procedure in steps 1 to 3.

5.5.12 Document Drive Belt

1. Remove the cabinet (see 5.5.1).
2. Slide the belt between the 2 drive rollers off the rear roller pulley
3. Slide the document drive belt off the document motor pulley.
4. Install the new document drive belt and the old connecting belt.
5. Tension the drive belt (see 5.4.3).

5.5.13 Document Motor

1. Remove the cabinet (see 5.5.1).
2. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
3. Disconnect the Keypad/Display cable from J7 of the Main PCB.
4. Remove the 5 screws fastening the metal box top to the box and remove the box top.
5. Disconnect the document motor cable from J3 of the Main PCB.
6. Remove the 3 screws fastening the document motor to the metal box.
7. Transfer the document motor pulley to the new motor. Leave a .02" (0.5mm) gap between the pulley hub and the motor flange.
8. Install the new motor by reversing the procedure in steps 2 to 6.
9. Slide the document drive belt onto the motor pulley and tension the belt (see 5.4.3).

5.5.14 Auto Alignment Skew Sensor

1. Remove the two nuts fastening the skew sensor to the input guide.
2. Disconnect the skew sensor from the input sensor by pulling it upward
3. Install the lower sensor insulator, the new skew sensor and the upper sensor insulator.
4. Adjust the TOP, INDEX and EJECT HOLD so that inserted documents are correctly positioned (See 5.2). Record any new values on the parameter label.
5. Calibrate the skew sensor (See 5.4.14).

5.5.15 Auto Alignment Input Sensor

1. Remove the cabinet (see 5.5.1).
2. Remove the 4 screws mounting the mechanism to the baseplate.
3. Remove the 2 screws in the PCB upper corners or, if the PCB has button fasteners, pry each upper corner free and fold the PCB down.
4. Disconnect the Input Sensor cable from J5 of the Main PCB.
5. Remove the Auto Alignment Skew Sensor (see 5.5.14)
6. Remove the input tray support.
7. Remove the screw fastening the input sensor to the left side plate. Keep the sensor mounting spacer that is freed when the sensor mounting screw is removed.
8. Mount the new sensor and route its cable back under the document drive to the Main PCB. Assure the cable does not run under the gate or gate assembly hardware.
9. Push the mechanism toward the front right corner of the baseplate before fastening them.
10. Insure that the sensor PCB sits flush against the baseplate and left edge of the input guide and that the sensor cable passes under the sensor mounting spacer.
11. Reverse the procedure in steps 1 to 6.
12. Adjust the input tray height (See 5.4.7).
13. Adjust the TOP, INDEX and EJECT HOLD offsets so that inserted documents are correctly positioned (See 5.2). Record any new values on the parameter label.
14. Calibrate the skew sensor (See 5.4.14).

5.5.16 Ribbon Drive Cable

1. Before proceeding, read the rest of this procedure to insure that the correct routing of the new cable is understood. Refer to assy. drawing 73255-1 for DP6 or 73255-4 for DP7.
2. Remove the cabinet (see 5.5.1). Move the carriage to the center. If working with a DP7, remove the home sensor from the left pivot arm. If working with a DP7 or if there are 2 ribbon cable springs on the DP6 left pivot arm, remove the old cable and upper spring and skip to Step 7.
3. Remove the screw from the middle of the right pivot arm slot. Slide the cable ball ends to the middle of the slot to release them from the arm and remove the cable. Discard the screw and cable.
4. Remove the cotter pin mounting the ribbon cable yoke and spring to the middle of the left pivot arm slot. Discard the pin, yoke and spring.
5. Insert the long cotter pin (supplied) through the lower hole in the left pivot arm slot until the pin loop contacts the arm hole and then bend the pin legs flush against the arm and around the edges of the arm. Similarly mount the short cotter pin to the pivot arm slot upper hole..
6. Attach one of the springs (supplied) to the lower cotter pin loop.
7. Kinking the new cable during installation can shorten its life. Keep a slight tension on the cable while routing so it will not unwind.
8. Attach one cable end to the lower spring mounted on the pivot arm.
9. Route the cable under the rear ribbon drive pulley and then over the top of the rear pulley.
10. Route the cable end back under the rear pulley so that it passes (DP6:behind, DP7:in front of) the previous wrap.
11. Route the cable through the bottom pivot arm hole, through the channel of the plastic ribbon cable retainer (supplied) and back through the top pivot arm hole.
12. Thread the cable end over the top of the front drive pulley.
13. Route the cable around the front pulley and again thread it over the top of the front pulley so it passes (DP6:behind, DP7: in front of) the previous wrap.
14. Attach the cable end to the other spring and stretch the spring just enough to attach it to the upper spring fastening loop.
15. Move the carriage back and forth. Check for smooth travel of the cable around the two pulleys and for equal tension on both springs.
16. Reinstall the DP7 left home sensor.

5.6 TROUBLESHOOTING

5.6.1 Basic Troubleshooting Procedure

This procedure exercises everything in the printer except the interface to the host system. If any step is not successfully executed, refer to the corresponding troubleshooting section.

1. Turn on printer power.
   A) If nothing appears on the display, see 5.6.2.
   B) If < > BAD is displayed, replace the indicated component on the main PCB or the complete main PCB.
   C) If CARRIAGE FAULT is displayed, see 5.6.6.

2. Press 12345678 and then CLEAR. Each number should appear in the display and then all should disappear. If this does not occur or if diagnostics don't begin to execute in the next step, see 5.6.3.

3. Execute 90 FUNCT diagnostics (see 3.7) and exercise the three sensors. If any sensor does not operate, see 5.6.4.

4. Execute Local Printing (see 3.9) and use an 8 1/2" x 11" document.
   A) If a document will not load into the printer, see 5.6.5.
   B) If the carriage will not move across the document, see 5.6.6.
   C) If no printing occurs, see 5.6.7.
   D) If print quality is not acceptable, see 5.6.8.
   E) For other possible problems, see 5.6.9. through 5.6.12

5.6.2 No Display

If nothing appears on the display on power up, check that:

1. the power switch on rear of printer is ON.
2. the input power cord is plugged into both printer and supply outlet.
3. the contrast knob below the display is set for good display contrast.
4. the fuse in the rear panel fuse holder is good.
5. input power is present on the input power cord.
6. the keypad/display cable is attached to main PCB at DP6 J7 or DP7 J8.
7. 48 VAC is present between J1 pins 1 and 3. If not, check transformer wiring (see 2.2).
8. At least 4.3 and less than 4.7 Volts is present across R14(DP6) or R61(DP7). If not, problem is in switching power supply or power OK circuitry.
9. Replace either the main PCB or the display module.

5.6.3 Defective Keypad

If keypad depressions are not sensed proceed as follows:

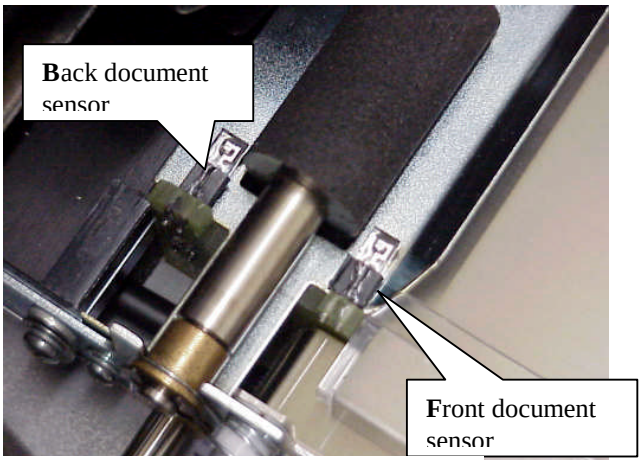
1. If a single key fails but all others are OK, just that key may be replaced after the keypad is removed (see 5.5.4).
2. If a row or column of keys all fail, a key may be permanently depressed or the problem is in the cable between the main PCB and the keypad or on the main PCB.

5.6.4 Defective Sensor

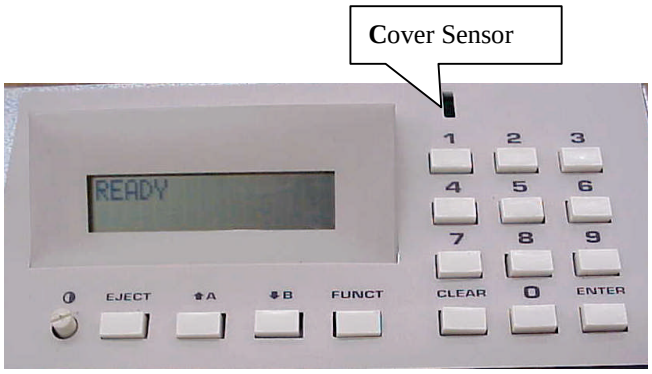
All sensors transmit and receive infrared light. The front (F) and back (B) document sensors are slot sensors that activate when the slot is blocked by a document. The back (B) and skew (S) sensors used in automatic alignment printers are reflective sensors that activate when an inserted document reflects light back on the sensor. The cover (C) and left home (L) sensors are toggled by metal flags that enters the sensor slots.

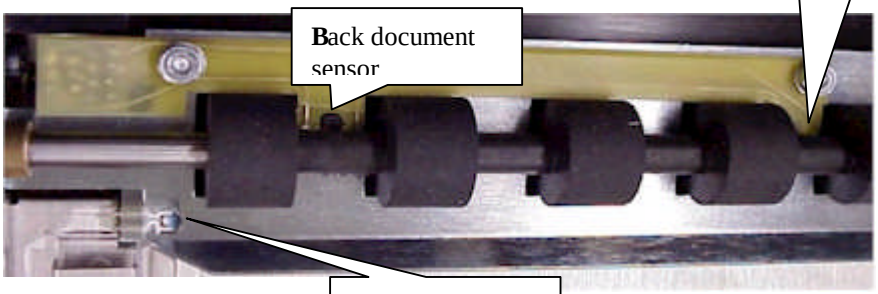
Press 9 0 FUNCT to run diagnostics and display “SENSORS” and the letters LFBC (& S if auto alignment is installed). Place an object in any sensor’s light path to remove the corresponding sensor letter from the display. Press ENTER to return to READY status.

Symptom	Condition	Remedy
Rollers run continuously before a document is inserted and no F displayed during 90 FUNCT diagnostics.	Front document sensor light path is blocked by paper, dust, a bent input tray or guide. Sensor may be bent .	Clear light path with compressed air to the sensor. Align input tray or input guide to its proper position.
Rollers run continuously after a document is ejected and no B displayed during 90 FUNCT diagnostics.	Back document sensor light path is blocked by paper, dust, a bent input tray or guide. Sensor may be bent .	Clear light path with compressed air to the sensor. Align input tray or input guide to its proper position.
Carriage drives into the left side of the printer.	94 FUNCT parameters are incorrect Defective “home” sensor.	Check 94 FUNCT parameters against label under the cabinet lid next to the display. Remove and replace the home sensor.
Carriage drives into the right side of the printer.	Home sensor is disconnected from the main PCB.	Reconnect home sensor to the main PCB

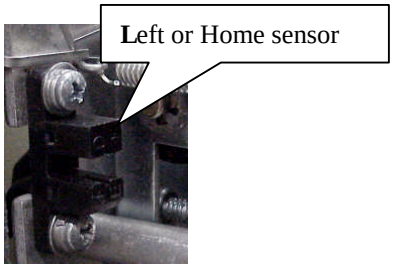


DP6 all & DP7 without automatic alignment





DP7 with automatic alignment



For any of the five (document, carriage left home and cover open) slotted optical sensors:

1. Check that the slot is free of debris and paper dust. In the case of the document sensors, check that it is aligned with the holes in the chutes.
2. Check that sensor connector is firmly seated on J5 of the main PCB.
3. Remove the sensor connector cover and check that the respective sensor wires are seated in their individual connector slots.
4. Replace the sensor (see 5.5.6 or 5.5.7) or U7 (DP6) or U8 (DP7) on the main PCB.

5.6.5 No Document Motion

If a document will not advance upon insertion:

1. Press EJECT if the previous document was manually removed without an eject command.
2. Press ↑A if configured for DOCUMENT INSERT WITH ↑A KEY (see 3.6.1).
3. Check that the drive belts are on their pulleys and the pulleys are tight on their shafts.
4. Check for a good 0.75A fuse in F1 on the main PCB.
5. Check that the motor cable is seated onto J3 of the main PCB.
6. Remove the connector cover and check that the four motor leads are seated in their individual connector slots.
7. Measure about 3 ohms resistance between pins 1 and 2 and between 3 and 5 of the motor connector. If not, replace the motor (see 5.5.13).
8. Repair or replace the main PCB with a bad U3 or U4 driver circuit.

5.6.6 No Carriage Motion

If the carriage will not move at power-up (CARRIAGE FAULT) or after a document is inserted:

1. Check that the orange shipping strap fastening the carriage has been removed so the carriage can move from left to right.
2. Press ENTER if configured for PRINTING AFTER ENTER KEY (see 3.6.1).
3. Check for a good 0.75A fuse in F1 on the main PCB.
4. Check that the motor cable is seated onto J2 of the main PCB.
5. Remove the connector cover and check that the four motor leads are seated in their individual connector slots.
6. Measure about 3 ohms resistance between pins 1 and 3 and between 4 and 5 of the motor connector. If not, replace the motor (see 5.5.11).
7. Repair or replace the main PCB with a bad U1 or U2 driver circuit.

5.6.7 No Print or Light Print

If there is no printhead noise when the carriage traverses a document:

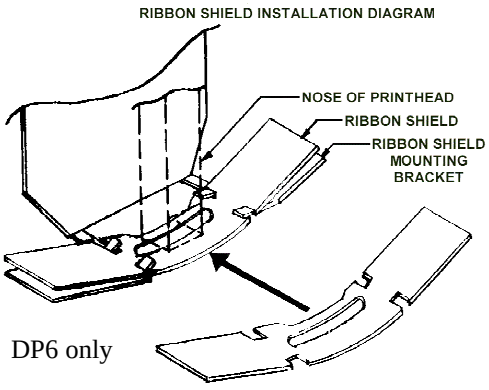
1. Check that the printhead is plugged into the carriage flex cable(s).
2. Check that the flex cable(s) are plugged into the main PCB.
3. Replace timers U14&15 (DP6) or U17&18 (DP7) or MOSFET Q3 on the main PCB.
4. Repair or replace the main PCB with a bad driver circuit.

If there is printhead noise but there is no print or light print:

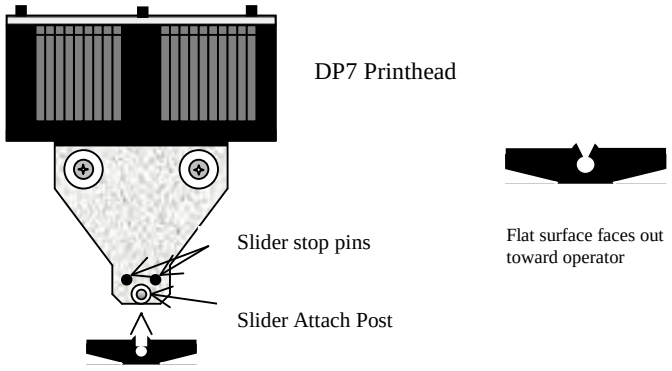
1. Correctly install the ribbon cartridge (see 3.3) or replace it if worn out.
2. Remove the cartridge and check for jammed ribbon.
3. Check that the cartridge knob rotates as the carriage traverses.
4. Check for a displaced or upside down ribbon shield
5. Check that QUIET MODE is turned off under 92 FUNCT.
6. If a DP7, check the NORMAL and CQ DARKNESS parameters (see 3.6.3)
7. Check the printhead gap (see 5.4.1).
8. Clean the printhead (see 5.1.4).

5.6.8 Print Quality

Symptom	Condition	Remedy
Printing ½ characters or a row of dots is missing, usually bottoms of lower case g, j, y, etc.	DP6 ribbon shield installed backward. Printhead or printing circuit is defective (unusual).	Remove ribbon cartridge, remove ribbon shield and install per the drawing below. Replace printhead or main PC board.
Printer is printing streaks over printed lines. Documents jamming under the printhead.	Ribbon shield is missing or worn. Ribbon is near end of life. Ribbon has too much ink. Printhead gap is too small.	Replace ribbon shield. Replace ribbon cartridge. Reset printhead gap.
First few characters printed are partially formed.	Printwires are clogged with ink, ribbon lint and paper dust.	Remove and clean printhead with Printer Cleaning Kit.
Large gaps in printing or sporadic light print occurs.	Ribbon fabric is folded or twisted inside cartridge. Ribbon drive clutches are slipping.	Replace ribbon cartridge. Replace ribbon drive clutches
Every other line of print is light or unreadable.	Ribbon drive clutches are slipping.	Replace ribbon drive clutches
Printing not dark enough on multiple part forms or receipts.	Quiet mode set to Y. Printhead gap too large.	Change quiet mode to N Reset printhead gap.



DP6 only



DP7 Slider

If print is light all across the print line, check with the same procedure as if printhead noise were present in 5.6.7. Be aware that printing on a thick document will always be a little lighter than on a thin one.

If there is ribbon smear on the document and it is not very wrinkled:

1. Check that document is not too thick or printing is too close to a fold or edge (see 1.2)
2. Check for a displaced or missing ribbon shield.
3. Check printhead gap (see 5.4.1).

5.6.9 Missing Dots

If a single row of dots is missing:

1. Refer to the printwire pinouts in the upper right corner of the main PCB schematics. Pin 1 prints the uppermost dots of uppercase characters, pin 8 (DP6) or pins 17 through 22 (prints lower case descenders (g,j,p,q and y) and pin 9 (DP6) or pin 24(DP7) prints underscores. Disconnect the flex cable from the main PCB and measure the resistance of the bad printwire through the cable. It should be approximately 16 ohms (DP6) or 8 ohms (DP7). If it is not, remove the printhead from the carriage and measure resistance at the printhead. If it is OK, replace the flex cable. If it is not, replace the printhead.
2. Repair or replace the main PCB with bad driver circuit (TIP 126 (DP6) or IRFU110 (DP7) is the most likely failure point).
3. The printhead may be mechanically faulty with a bent wire, broken return spring or jammed wire. Replace the printhead.

5.6.10 Erratic Document Feed or Mispositioning

If feeding is erratic or preprinted forms are not correctly positioned:

1. Check for correct LINES/INCH and LINE #1(see 3.6.1).
2. Check that all service parameters are correctly set (see 5.2).
3. Check that the roller springs are loaded on both sides of the document drive.
4. Clean the feed rollers (see 5.1.1).
5. Check that all belt drive pulleys are tight on their shafts.
6. Check the document drive belt tension (see 5.4.3).

5.6.11 Erratic Character Spacing or False Document Jams

If horizontal character spacing is erratic or preprinted forms are not correctly printed:

1. Check for correct CHARACTERS/INCH settings (see 3.6.1).
2. If the carriage shaft shows any residue build-up, wipe it clean with a soft, dry cloth.
3. Check the carriage belt tension (see 5.4.2).
4. Tighten the drive pulley set screw on the carriage motor shaft.
5. Check that the carriage home flag does not bind in the slot of the carriage home sensor.
6. Check that the carriage moves freely by hand and that the guide wheel does not bind between the wheel guide and the box.

5.6.12 Interface Inoperative

If the printer works in self test, but won't run from the interface:

1. Check that the I/O cable is correct for your application (see 3.13.3)
2. Check for firm mounting of the interface cable and the internal I/O cable on the main PCB.
3. Check for comm parameters set to match the host system (see 3.6.2).
4. Check for correct interface wiring (see 3.13.3).
5. Press 9 4 2 then FUNCT to print all previously received data immediately after the transaction. Control characters print as underlined lower case block with e message terminators added.
6. Check that the CTS and DSR signals on pins 5 and 6 are either not connected or are driven above +3V by the host system .
7. Check that ENQ characters are being sent (see 3.13.1 and 3.13.2) or that the DTR or XON/XOFF protocol is selected.
8. Replace the interface circuits in U8 and U13 (DP6) or U14 and U15 (DP7).
9. Replace the 8251A communications device in U18 (DP6) or U27(DP7).

5.7 RECOMMENDED SPARE PARTS

Machine Population:	1	10	25	50	100	250
Class A Spares Qty:	1	1	2	3	5	10
Class B Spares Qty:		1	1	2	3	5
Class C Spares Qty:			1	1	2	3

DESCRIPTION	DP6 PART#	DP7 PART#
Class A: Alphanumeric Display	53013	SAME
Fuses, 0.75 A, Box of 5	68038	SAME
Fuses, 1.5 A, Box of 5 (115V UNITS)	68036	SAME
Fuses, 0.7 A, Box of 5 (230V UNITS)	68040	SAME
Ribbon Shield	71492	71707
Slider		71721
Main PCB Assembly	72080-1	72115-1
Keypad Assembly	72082-1	SAME
Document Sensor Assembly	72083-1	SAME
Printhead Assembly	73280-1	73301-1
Cleaning Kit	73297-1	73297-7
Technical Manual	99063	SAME
Class B: Ribbon Drive Cable Kit	73287-1	SAME
AC PCB Assembly	72081-1	SAME
Home Sensor Assembly	72093-1	SAME
Class C: Document Driven Belt 87T080P	67251	SAME
Document Drive Belt 118T080P	67252	SAME
Carriage Drive Belt 290T080P	67284	SAME
Printhead Cable Assembly	72088-1	72117-1
Transformer Assembly	72094-7	SAME
Motor Assembly	73266-1	SAME

5.8 RECOMMENDED SERVICE TOOLS

#1 and #2 Phillips Screwdrivers
3/16", 5/16" and 11/32" Open End Wrenches
.050", 1/16" and 5/64" Allen Wrenches
.010" to .018" feeler gauges and a 1 lb. Or 500 gm. Spring Gauge
6" scale calibrates in 1/100"
¼" nut driver

6.0 MAJOR ASSEMBLY PARTS LISTS

72080-1 DP6 MAIN PCB ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
1	21000	IC 74LS00	1	U27
2	21002	IC 74LS02	2	U17,25
3	21004	IC 74LS04	2	U18,26
4	21032	IC 74LS32	1	U12
5	21161	IC 74LS161	1	U16
6	21245	IC 74LS245	1	U19
7	21273	IC 74LS273	1	U6
8	21365	IC 74LS365	1	U7
9	21367	IC 74LS367	1	U10
10	25005	IC EF6809P	1	U23
11	25012	IC MC1488/75188	1	U8
12	25013	IC MC1489/75189	1	U13
14	25027	IC 27C512 EPROM	1	U22
15	25028	IC 82C51A	1	U24
16	25029	IC 93C46	1	U15A (REV F & UP)
17	25031	R6522P	1	U20
18	25032	IC 62256	1	U21
19	26008	IC TL431CLP	1	Q1
20	26010	IC ULN2003AN	1	U5
21	26015	IC TLC/ICM7555	2	U14,15
22	26018	IC MC1472/75477	1	U9
23	26019	IC PBL3717/2	4	U1-4
24	28139	IC 74HC139	1	U11
25	30102	RES 1/4W 5% 1K OHM	10	R5,6,11,12,14,16,17,52,54,55
26	30103	RES 1/4W 5% 10K OHM	4	R48,49,64,58
27	30105	RES 1/4W 5% 1MEG OHM	1	R40
28	30121	RES 1/4W 5% 120 OHM	1	R57
29	30203	RES 1/4W 5% 20K OHM	1	R50
30	30221	RES 1/4W 5% 220 OHM	2	R32,33
31	30222	RES 1/4W 5% 2.2K OHM	1	R53
32	30274	RES 1/4W 5% 270K OHM	1	R1
33	30332	RES 1/4W 5% 3.3K OHM	13	R20-28,30,31,42,43
34	30470	RES 1/4W 5% 4.7 OHM	1	R59
35	30472	RES 1/4W 5% 4.7K OHM	6	R35-7,41,51,60
36	30563	RES 1/4W 5% 56K OHM	6	R3,8-10,15,19
37	31045	RES 2W 5% 150 OHM	2	R38,44
38	31048	RES 1.0W 5% .51 OHM	4	R4,7,13,18
39	31051	RES 1/4W 1% 36K OHM	1	R47
40	31053	RES 2.0W 5% 1K OHM	2	R39,45
41	31054	VARISTOR 101 VOLT	1	V1
42	34102	SIP 10P 9 RES 1K OHM	1	RP1
43	36009	POT 3/8 SQ 50K OHM	1	R46
44	40221	CAP 22pf 500V 10%	2	C22,23
45	41301	CAP 300pf 1KV 10%	2	C37, UART
46	42104	CAP 0.001uf 100V 20%	12	C2-5,7-10,12-15
47	42221	CAP 0.0022uF	3	C27-29
48	43103	CAP 0.01uf 16V 20%	8	C1,11,20,21,24,32,33,35
49	43108	CAP 0.01uF 50V 5%	2	C26,34
50	45332	CAP 3.3uf 35V 20%	3	C6,25,30
51	47222	CAP 220uF 16 V	2	C16,17

52	47473	CAP 470uf 10V LO ESR	1	C31

72080-1 DP6 MAIN PCB ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
53	48332	CAP 3300uF 50V	2	C18,19
54	50001	DIODE 1N914R	5	D1,2,18,19,24
55	50007	DIODE 1N4002	10	D8-16,25
56	50017	DIODE 1N5401	4	D3-6
57	50021	DIODE 1N5822	1	D20
58	50022	DIODE 1N966A/B	1	D22
59	50023	DIODE FR252	1	D7
60	51008	TRANS 2N5400/2N2907	3	Q2,16,17
61	51013	TRANS TIP126/127	9	Q4-12
62	51021	TRANS IRF540	1	Q3
63	52002	REGULATOR UA78M12CT	1	Q14
64	52003	REGULATOR UA79M12CT	1	Q13
65	52014	REGULATOR L4960	1	Q15
66	52015	REGULATOR UA78L06ACLP	1	Q18 (REV A – E)
67	54021	INDUCTOR 120 uH	1	L1
68	55003	CRYSTAL 4MHz HC18U	1	Y1
69	60008	DIP SOCKET 8P	1	U15A
70	60014	DIP SOCKET 14P	2	U8,13
71	60028	DIP SOCKET 28P	2	U21,24
72	60032	DIP SOCKET 32P	1	U22
73	60040	DIP SOCKET 40P	2	U20,23
74	60104	BATTERY HOLDER	1	B1 (REV A – E)
75	61013	HEADER 13P SGL 0.100	1	J5
76	61720	HEADER 20P DBL GOLD	2	J4,7
77	61802	HEADER 20P DBL RT TIN	1	J6
78	62081	HEADER 5P SGL 0.156	1	J1
79	62112	HEADER 5P SGL 0.100 LOCK	2	J2,3
80	64017	FUSE CLIP	2	F1
81	64034	HEAT SINK	1	Q15
82	65016	SPACER .25X.14X.25 AL	2	
83	67270	PEM NUT 4-40	2	
84	67354	EDGE LINER	1	
85	68026	BATTERY, LITHIUM	1	B1 (REV A – E)
86	68038	FUSE 3AG .75A	1	F1
87	70080	MAIN PC BOARD	1	
88	71469	HEAT SINK	1	

72082-1 DP6&7 KEYPAD ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
1	30000	RES 1/4W 5% 0 OHM	6	
2	30221	RES 1/4W 5% 220 OHM	1	R3
3	30222	RES 1/4W 5% 2.2K OHM	1	R4
4	30332	RES 1/4W 5% 3.3K OHM	1	R5
5	30472	RES 1/4W 5% 4.7K OHM	1	R1
6	34472	SIP 10P 9 RES 4.7K OHM	1	RP1
7	36011	POT 10K	1	R2
8	40221	CAP 22pf 500V 10%	1	C2
9	43103	CAP 0.01uf 16V 20%	1	C1
10	53011	SENSOR	1	

11	62090	CONN 14P 30 DEGREE	1	
12	63015	KEY SWITCH	16	
13	66414	4-40 X 7/8" PHMS	2	
14	67193	S CAP	2	

72082-1 DP6&7 KEYPAD ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
15	70082	KEYBOARD PCB	1	
16	72084-1	KEYPAD CABLE ASSY	1	

72081-1 DP6&7 AC PCB ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
1	42473	CAP 0.0047uF 250V 20%	2	C2,3
2	44222	CAP 0.22uF 250V 20%	1	C1
3	60105	AC SOCKET RECEPT.	1	
4	62053	RING TERMINAL #10	1	
5	62089	HEADER 8P SGL RT 0.200	1	
6	63023	AC SWITCH	1	SW1
7	65066	3/16 PCB SPACER	2	
8	68027	FUSE HOLDER 1 1/4"	1	F1, 115VAC
	68031	FUSE HOLDER 5X20MM	1	F1, 230VAC
9	68036	FUSE 3AG 1.5A	1	F1, 115VAC
	68040	FUSE 5X20MM .7A	1	F1, 230VAC
10	70081	AC PC BOARD	1	
11	71456	AC BRACKET	1	

72115-1 DP7 MAIN PCB ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
1	21000	IC 74LS00	1	U30
2	21002	IC 74LS02	2	U20,28
3	21004	IC 74LS04	2	U21,29
4	21032	IC 74LS32	1	U14
5	21161	IC 74LS161	1	U19
6	21245	IC 74LS245	1	U22
7	21365	IC 74LS365	1	U8
8	21367	IC 74LS367	1	U12
9	25012	IC MC1488/75188	1	U9
10	25013	IC MC1489/75189	1	U15
11	25025	IC PAL 16V8	1	U13
12	25027	IC 27C512 EPROM	1	U24
	25035	IC 28F010 FLASH MEM	1	U24
13	25028	IC UPD71051C	1	U27
14	25029	IC 93C46 EEPROM	1	U11
15	25030	IC EF68B09	1	U26
16	25031	IC G65SC22P-2	1	U23
17	25032	IC 32KB SRAM	1	U25
18	26008	IC TL431CLP	1	Q33
19	26015	IC TLC/ICM7555	3	U16,17,18
20	26019	IC PBL3717/2	4	U1-4
21	28595	IC 74HC595	3	U5,6,7
22	30102	RES 1/4W 5% 1K OHM	9	R4,5,12,13,16,17,57,59,61
23	30103	RES 1/4W 5% 10K OHM	5	R24,42,50,53,64
24	30105	RES 1/4W 5% 1MEG OHM	1	R58
25	30121	RES 1/4W 5% 120 OHM	1	R47
26	30203	RES 1/4W 5% 20K OHM	4	R7A,R42B,R62,R65

27	30221	RES 1/4W 5% 220 OHM	2	R27,30
28	30222	RES 1/4W 5% 2.2K OHM	3	R14,26,45
29	30274	RES 1/4W 5% 270K OHM	2	R40,63
30	30332	RES 1/4W 5% 3.3K OHM	4	R11,28,42A,52
31	30470	RES 1/4W 5% 4.7 OHM	1	R69

72115-1 DP7 MAIN PCB ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
32	30472	RES 1/4W 5% 4.7K OHM	11	R10,20,21,32-35,41,51,63,66
33	30563	RES 1/4W 5% 56K OHM	6	R3,7,8,19,55,56
34	31023	RES 1.0W 5% 0.2 OHM	1	R20A
35	31045	RES 2.0W 5% 150 OHM	1	R36
36	31048	RES 1.0W 5% .51 OHM	4	R2,6,15,18
37	31051	RES 1/4W 1% 36K OHM	1	R67
38	31053	RES 2.0W 5% 1K OHM	2	R37,38
39	31054	VARISTOR 101 VOLT	1	V1
40	36009	POT 3/8 SQ 50K OHM	1	R46
41	40181	CAP 18pf 500V 10%	2	C31,32
42	41103	CAP 100pf 50V 20%	1	C13A
43	41121	CAP 120pf 50V 10%	1	C46
44	41301	CAP 300pf 1KV 10%	4	C13,33,45,47
45	42104	CAP 0.001uf 100V 20%	12	C2-5,8-11,15-18
46	42221	CAP 0.0022uF	4	C25,26,41,43
47	43103	CAP 0.01uf 16V 20%	10	C1,7,14,19,28-30,34,39,44
48	43108	CAP 0.01uF 50V 5%	2	C6,40
49	43109	CAP 0.02uF 100V	1	C21
50	45332	CAP 3.3uf 35V 20%	3	C35,42,47
51	46103	CAP 10uf 16V 20%	2	C23,24
52	46221	CAP 22uf 100V 20%	1	C12
53	47222	CAP 220uF 16 V	1	C20
54	47473	CAP 470uf 10V LO ESR	1	C36
55	48332	CAP 3300uF 50V	1	C22
56	50001	DIODE 1N914R	8	D1,2,30,30A,33,38-40
57	50007	DIODE 1N4002	24	D6-29
58	50008	DIODE 1N5229B	2	D35,36
59	50013	DIODE 1N5242A	2	D31,34
60	50017	DIODE 1N5401	2	D3,4
61	50021	DIODE 1N5822	1	D37
62	50023	DIODE FR252	1	D32
63	51008	TRANS 2N5400/2N2907	1	Q34
64	51021	TRANS IRF540	2	Q3,4
65	51022	TRANS IRFU3055	24	Q5-28
66	51023	TRANS MPSA06	3	Q1,2,35
67	52002	REGULATOR UA78M12C	1	Q31
68	52014	REGULATOR L4960	1	Q35
69	52015	REGULATOR UA78L06ACLP	1	Q29
70	52017	IC 7662 VOLTAGE INVERTER	1	U10
71	54021	INDUCTOR 120 uH	1	L1
72	55005	CRYSTAL 8MHz HC18U	1	Y1
73	60008	DIP SOCKET 8P	1	U11
74	60014	DIP SOCKET 14P	2	U9,15
75	60020	DIP SOCKET 20P	1	U12
76	60028	DIP SOCKET 28P	2	U25,27

77	60032	DIP SOCKET 32P	1	U24
78	60040	DIP SOCKET 40P	2	U23,26
79	61013	HEADER 13P SGL 0.100	1	J6
80	61720	HEADER 20P DBL GOLD	1	J8
81	61802	HEADER 20P DBL RT TIN	1	J7
82	62081	HEADER 5P SGL 0.156	1	J1
83	62104	CONN LIF 15P	2	J4,5
84	62112	HEADER 5P SGL 0.100 LOCK	2	J2,3

72115-1 DP7 MAIN PCB ASSY

ITEM	PART#	DESCRIPTION	QTY	LOCATION
85	64017	FUSE CLIP	2	F1
86	64034	HEAT SINK	2	
87	65016	SPACER .25X.14X.25 AL	2	
88	67270	PEM NUT 4-40	2	
89	67354	EDGE LINER	1	
90	68038	FUSE 3AG .75A	1	F1
91	70115	MAIN PC BOARD	1	
92	71469	HEAT SINK	1	

73250-1,-7 DP6&7 PRINTER ASSYS

ITEM	PART#	DESCRIPTION	73250-1 DP6 QTY	73250-7 DP7 QTY
1	69006	LINE CORD	1	1
2	73251-1	LID ASSY	1	1
3	73252-1	DP6 CABINET ASSY	1	
	73252-2	DP7 CABINET ASSY		1
4	73253-1	DP6 ELECTROMECHANICAL ASSY	1	
	73253-7	DP7 ELECTROMECHANICAL ASSY		1
5	73281-1	DP6 SHIPPING KIT	1	
	73281-2	DP7 SHIPPING KIT		1
6	99059	DP6 RIBBON CARTRIDGE	1	
	99073	DP7 RIBBON CARTRIDGE		1

73253-1,-8 DP6&7 ELECTROMECH ASSYS

ITEM	PART#	DESCRIPTION	73253-1 DP6 QTY	73253-8 DP7 QTY
1	65061	SPACER .25 X .14 X .62	2	2
2	67197	ARROW BUTTON	2	2
3	67279	BUMPON FEET	4	4
4	71460	BASE PLATE	1	1
5	71480	CABLE RESTRAINT	1	
6	71492	DP6 RIBBON SHIELD	1	
7	71495	GUIDE COVER	1	1
8	71497	SPACER BLOCK (1ST 200 ONLY)	1	
9	71500	BELT ADJUSTOR (1ST 200 ONLY)	1	
10	71505	PRINTHEAD MOUNTING SPACER	1	
11	71707	DP7 RIBBON SHIELD		1
12	72080-1	DP6 MAIN PCB ASSY	1	
13	72081-1	AC PCB ASSY	1	1
14	72088-1	DP6 PRINTHEAD CABLE ASSY	1	
15	72115-1	DP7 MAIN PCB ASSY		1
16	72117-1	DP7 PRINTHEAD CABLE ASSY		1
17	73255-1	DP6 CARRIAGE DRIVE ASSY	1	
	73255-7	DP7 CARRIAGE DRIVE ASSY		1
18	73256-1	BOX TOP ASSY	1	1
19	73257-1	DOCUMENT DRIVE ASSY	1	1

	73257-7	DP7 DOCUMENT DRIVE ASSY		1
20	73258-1	SINGLE MALE I/O ASSY	X	X
	73258-2	DUAL MALE I/O ASSY	X	X
	73258-3	SINGLE FEMALE I/O ASSY	X	X
	73258-4	DUAL FEMALE I/O ASSY	X	X
	73258-5	DUAL 9 PIN MALE I/O ASSY	X	X
	72103-1	DP6 PARALLEL I/O ASSY	X	
	72120-1	DP7 PARALLEL I/O ASSY		X
21	73279-1	BELT CLAMP ASSY	1	
22	73280-1	DP6 PRINTHEAD ASSY	1	
	73301-1	DP7 PRINTHEAD ASSY		1
23	73303-1	RAMP ARM ASSY		1

73255-1,-7 DP6&7 CARRIAGE DRIVE ASSY 73255-1 73255-7

ITEM	PART#	DESCRIPTION	DP6 QTY	DP7 QTY
1	65068	SPACER 1/4OD X 3/16L		1
2	67071	SPRING CLIP		1
3	67156	#10 INTERNAL LOCK WASHER	2	2
4	67261	COTTER PIN 1/16D X 1/2L	1	
5	67274	PEM NUT S-440-2	2	2
6	67289	HEADED SPIROL PIN .12D X .25L	2	2
7	67335	RIBBON SPRING		2
8	67295	CABLE GUARD		1
9	67296	COTTER PIN 1/16D X 1 1/4L	1	
10	67316	CARRIAGE SPRING		1
11	67334	BUTTON		1
12	71407	DP6 PIVOT ARM	2	
13	71420	CARRIAGE SHAFT	1	1
14	71436	STIFFENING ROD	1	1
15	71441	SHORT PIVOT BUSHING	2	2
16	71443	PIVOT WASHER	2	2
17	71450	CABLE RETAINER		1
18	71753	RIBBON DRIVE CABLE		1
19	71535	CABLE GUARD	1	
20	71551	HEAD CABLE CLIP	1	1
21	71702	DP7 PIVOT ARM		2
22	71709	DRIVE BELT CLAMP		1
23	71713	SPRING RETAINER		1
24	71724	PIVOT SPACER	1	1
25	72093-1	HOME SENSOR ASSY	1	1
26	73259-1	CARRIAGE IDLER ASSY	1	1
27	73260-3	BOX ASSY	1	1
28	73265-1	DP6 CARRIAGE ASSY	1	
	73265-4	DP7 CARRIAGE ASSY		1

73256-1 DP6&7 BOX TOP ASSY

ITEM	PART#	DESCRIPTION	QTY
1	53013	ALPHANUMERIC DISPLAY	1
2	71423	TOP COVER	1
3	71457	DISPLAY CUSHION	2
4	71464	KEYPAD DECAL	1
5	71477	DISPLAY DECAL	1
6	72082-1	KEYPAD ASSY	1

73257-1,-7 DP6&7 DOCUMENT DRIVE ASSY 73257-1 73257-7

ITEM	PART#	DESCRIPTION	DP6 QTY	DP7 QTY	
1	65044	STANDOFF .25 X #6 X .56	1	1	
2	65060	STANDOFF .25 X #6 X .31	1	1	
3	65063	SPACER .25 X .12 X .75	1	1	NON AUTO ALN
4	67022	PUSHNUT	1	1	
5	67070	TRAY BUSHING	2	2	
6	65073	STANDOFF .25HEX X #4 X .75		1	AUTO ALIGN
7	67118	GEAR 18T24P	1	1	NON AUTO ALN
8	67244	ROLLER BUSHING	4	4	
9	67254	TRAY SPRING	1	1	
10	67266	E RING .25	2	1	
11	67330	GEAR, 18T24P .25 ID		1	AUTO ALIGN
12	67333	CRESCENT RING		1	AUTO ALIGN

73257-1,-7 DP6&7 DOCUMENT DRIVE ASSY 73257-1 73257-7

ITEM	PART#	DESCRIPTION	DP6 QTY	DP7 QTY	
13	67272	FLAT HEAD SCREW #4 X .38	1	1	
14	71404	INPUT GUIDE	1	1	NON AUTO ALN
15	71419	INPUT TRAY	1	1	NON AUTO ALN
16	71428	ROLLER SPRING	2	2	NON AUTO ALN
17	71448	UPPER ROLLER	2	2	NON AUTO ALN
18	71723	MOLDED EDGE GUIDE	1	1	
19	71479	TRAY DECAL	1	1	
20	71739	ANCHOR BRACKET		2	AUTO ALIGN
21	71742	UPPER ALIGN ROLLER		1	AUTO ALIGN
22	71744	ALIGN INPUT GUIDE		1	AUTO ALIGN
23	71746	RELIEF SPRING		2	AUTO ALIGN
24	71748	REAR ROLLER SPRING, LEFT		1	AUTO ALIGN
25	71749	REAR ROLLER SPRING, RIGHT		1	AUTO ALIGN
26	71750	ALIGN SENSOR GASKET, TOP		1	AUTO ALIGN
27	71751	ALIGN SENSOR GASKET, BOTTOM		1	AUTO ALIGN
28	71758	ALIGN INPUT TRAY		1	AUTO ALIGN
29	72083-1	DOCUMENT SENSOR ASSY	1	1	NON AUTO ALN
30	72123-1	ALIGN SENSOR ASSY		1	AUTO ALIGN
31	72124-1	INPUT SENSOR ASSY		1	AUTO ALIGN
32	73262-1	LOWER DRIVE ASSY	1	1	NON AUTO ALN
33	73276-1	TRAY SUPPORT ASSY	1	1	
34	73304-1	ROLLER CABLE ASSY		2	AUTO ALIGN

73259-1 DP6&7 CARRIAGE IDLER ASSY

ITEM	PART#	DESCRIPTION	QTY
1	67022	PUSHNUT	2
2	67245	CARRIAGE IDLER BUSHING	1
3	67284	CARRIAGE BELT 290T (201 & UP)	1
4	71417	TENSIONING ARM	1
5	71440	CARRIAGE IDLER SHAFT	1
6	71459	CARRIAGE IDLER PULLEY	1

73260-3 BOX ASSY

ITEM	PART#	DESCRIPTION	
1	65068	SPACER 1/4 X .14 X 3/16	1
2	67071	SPRING CLIP	1
3	67082	FLAT CBL CLIP	1

4	67249	PULLEY 36T080P	1
5	67285	PULLEY 21T080P	1
6	67354	VINYL STRIP	1
7	71413	WHEEL GUIDE	1
8	71714	BOX	1
9	71491	RAMP (1ST 740 DP6 ONLY)	1
10	72094-7	TRANSFORMER ASSY	1
11	73266-1	MOTOR ASSY	2

73261-1 DP6&7 EXIT CHUTE ASSY

ITEM	PART#	DESCRIPTION	QTY
1	67271	UHMW TAPE 1.25 X 10	1
2	71405	EXIT TRAY	1
3	71406	EXIT GUIDE	1
4	71471	FLEX HINGE	2

73262-1, -7 DP6&7 LOWER DRIVE ASSY

ITEM	PART#	DESCRIPTION	73262-1 DP6 QTY	73262-7 DP7 QTY
1	65074	STANDOFF .1875 X #4 X .5		1 AUTO ALIGN
2	67018	HEADED SPIROL PIN .06 X .19	1	1
3	67070	BUSHING		1 AUTO ALIGN
4	67118	GEAR 18T24P	1	1 NON AUTO ALN
5	67244	ROLLER BUSHING	4	4
6	67246	PULLEY 26T080P	1	1
7	67251	DOC DRIVEN BELT 87T080P	1	1
8	67252	DOCUMENT DRIVE BELT 118T080P	1	1
9	67255	PUSHNUT 3/8	4	4
10	67274	PEM NUT 4-40	2	2
11	67327	SPRING, COMPRESSION		2 AUTO ALIGN
12	67330	GEAR, 18T24P .25 ID		1 AUTO ALIGN
13	67333	CRESCENT RING		1 AUTO ALIGN
14	71401	SIDE PLATE	2	2 NON AUTO ALN
15	71449	LOWER ROLLER	2	2 NON AUTO ALN
				1 AUTO ALIGN
16	71481	CAM REV B	2	2
17	71743	LOWER ALIGN ROLLER		1 AUTO ALIGN
18	71745	ALIGN SIDE PLATE		2 AUTO ALIGN
19	73261-1	EXIT CHUTE ASSY	1	
20	73277-1	PLATEN ASSY	1	1 NON AUTO ALN
	73277-7	ALIGN PLATEN ASSY		1 AUTO ALIGN
21	73278-1	COMPOSITE PULLEY ASSY	1	1
22	73302-1	GATE ASSY		1 AUTO ALIGN

73265-1,-7 DP6&7 CARRIAGE ASSYS

ITEM	PART#	DESCRIPTION	73265-1 DP6 QTY	73265-7 DP7 QTY
1	65065	SPACER .50 X .19 X .06	1	1
2	67278	THRUST BEARING	1	1
3	67282	GRIP RING .09	1	
4	67296	COTTER PIN		1 AUTO ALIGN
5	67333	CRESCENT RING		1 AUTO ALIGN
6	71416	WHEEL POST	1	1 NON AUTO ALGN

7	71422	DP6 CABLE BRACKET	1		
8	71703	DP7 CABLE BRACKET		1	
9	71704	CARTRIDGE CLIP		1	
10	71735	WASHER, OILITE		1	
11	71755	ALIGN WHEEL POST		1	AUTO ALIGN
12	73268-1	SLIDER PLATE ASSY	1		
13	73269-1	DP6 RIBBON DRIVE ASSY	1		
	73269-7	DP7 RIBBON DRIVE ASSY		1	
14	73270-1	DP6 CARRIAGE PLATE ASSY	1		
	73270-3	DP7 CARRIAGE PLATE ASSY		1	
15	73274-1	RIBBON BRACKET ASSY	1	1	

73269-1,-7		**DP6&7 RIBBON DRIVE ASSYS**	**73269-1**	**73269-7**
ITEM	**PART#**	**DESCRIPTION**	**DP6 QTY**	**DP7 QTY**
1	67212	WASHER .31 X .13 X .01 NY	1	1
2	67322	WASHER STAINLESS .020T		
3	73273-1	RIBBON CLUTCH ASSY	2	2
4	73275-1	DP6 RIBBON DRIVE SHAFT ASSY	1	
	73275-7	DP7 RIBBON DRIVE SHAFT ASSY		1

73270-1,-3		**DP6&7 CARRIAGE PLATE ASSY**	**73270-1**	**73270-3**
ITEM	**PART#**	**DESCRIPTION**	**DP6 QTY**	**DP7 QTY**
1	67018	SPIROL PIN .06 X .19		2
2	67209	RIBBON SHAFT BUSHING	1	1
3	67258	PUSHNUT 1/2	2	
4	67276	CARRIAGE SHAFT BUSHING	1	1
5	67306	BAND CLAMP		2
6	71402	DP6 CARRIAGE BRACKET	1	
	71701	DP7 CARRIAGE BRACKET		1

73281-1,-2		**DP6&7 SHIPPING KIT**	
ITEM	**PART#**	**DESCRIPTION**	**QTY**
1	99056	OPERATORS MANUAL	1
2	99064	END CAPS, SET	1
3	99065	SHIPPING CARTON	1
4	99066	POLY BAG 14 X 16 X 8	1
5	99075	SHIPPING RETAINER	1