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# SERVICE MANUAL

# EPSON

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## PRECAUTIONS

Precautionary notations throughout the text are categorized relative to 1 ) personal injury, and 2) damage to equipment:

**DANGER** Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by a DANGER headings.

**WARNING** Signals a precaution which, if ignored, could result in damage to equipment.

The precautionary measures itemized below should always be observed when performing repair/maintenance procedures.

### DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM BOTH THE POWER SOURCE AND THE HOST COMPUTER BEFORE PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURE.
2. NO WORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIAR WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

### WARNING

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGE IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY-AC RATING DIFFERENT FROM THE AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE  $\mu$ P CHIPS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS RECOMMENDED BY THE MANUFACTURER; INTRODUCTION OF SECOND-SOURCE ICS OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

# PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of the DFX-8000.

The instructions and procedures included herein are intended for the experienced repair technician, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

**Chapter 1 - Provides a general product overview, lists specifications, and illustrates the main components of the printer.**

**Chapter 2 - Describes the theory of printer operation.**

**Chapter 3 - Includes a step-by-step guide for product adjustment.**

**Chapter 4 - Includes a step-by-step guide for product disassembly and assembly.**

**Chapter 5 - Provides Epson-approved techniques for troubleshooting.**

**Chapter 6 - Describes preventive maintenance techniques and lists lubricants and adhesives required to service the equipment.**

**.The contents of this manual are subject to change without notice.**

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REVISION	DATE ISSUED	CHANGE DOCUMENT
A	July 2, 1990	1st issue

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## 1.1 FEATURES

The DFX-8000 is a 18 pin serial dot matrix printer with a maximum speed of 1060cPs. This system was designed for full-fledged business use, and places emphasis on high-speed printing, heavy duty specifications and continuous sheet handling. The main features of this system are as follows:

- **Maximum printing speed:**
  - 1060 cps (High-speed draft mode)
  - 960 cps (Draft elite mode)
  - 800 cps (Draft pica mode)
- **Bi-directional two way push tractor**
- **Most advanced paper handling**
  - Automatic tractor select function
  - Automatic paper back-out and loading function
  - Automatic paper thickness measurement
  - Automatic platen(-head) gap adjustment
  - Automatic paper width detection
  - Paper statement memory backup function
  - Copy mode can be selected by control panel
- **Optional paper cutter**
- **Standard 8 bit parallel interface and RS-232C standard serial interface**
- **EPSON ESC/P-83 printer driver (Compatible with FX-850/1050, DFX-5000)**
- **IBM Pro-printer emulation mode**
- **3k byte input data buffer**
- **Compatible with EPSON optional interface board series #81 XX**

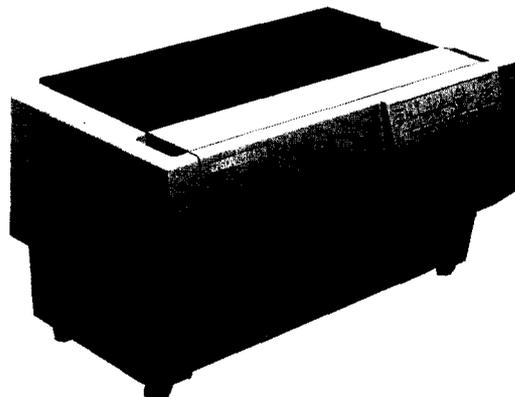


Figure 1-1. DFX-8000

Table 1-1. Options and Expendable

Group	No./Code	Name /Description
Option	#8309 #C8 15001 #C8 15002 #8 XXX	<b>Pull tractor unit</b> <b>Paper cutter unit (for EAI version)</b> <b>Paper cutter unit (for another version)</b> <b>Optional interface board series</b>
Expendable	#8766 #8767	<b>Ribbon cartridge</b> <b>Ribbon pack</b>

## 1.2 SPECIFICATIONS

This chapter describes the specifications of the DFX-8000.

### 1.2.1 General Specifications

This section describes general specifications with the exception of the interface specifications.

#### 1.2.1.1 Printing

Printing method:

**Serial impact dot matrix**

Pin configuration:

**18 wires (a double column of 9 wires, see Figure 1-2)**

Pin diameter:

**0.29 mm**

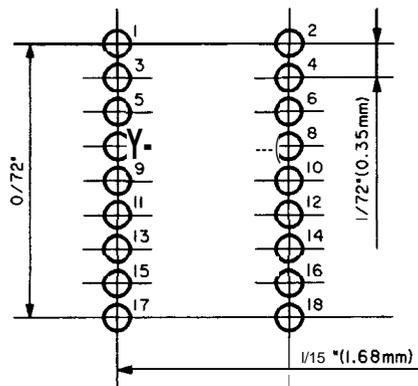


Figure 1-2. Printhead Pin Configuration

**Dot matrix:**

9 X 9 (Draft)  
18 X 20 (NLQ)  
9 X 7 (High speed Draft)

**Printing direction:**

**Text mode**

**Bi-directional with logic seeking**  
(Uni-directional print can be specified by program)

**Bit image mode**

**Uni-directional**

**Built in character sets:**

**ASCII characters**  
**International characters (13 countries)**

**Graphics**

**Built in fonts:**

**Draft**  
**NLQ Roman**  
**NLQ Saris-serif**

**Printing pitch:**

**2.54 mm (10 CPI)**  
**0.423 mm (60 DPI)**

**Paper feeding:** **Bi-directional variable width push tractor feed**

**NOTE:** Push or pull feed is also available, using the optional pull tractor unit.

(See Chapter 3 for details.)

**Line spacing:** **1/6" or 1/8" (DIP switch setting/programmable)**  
**n/2 16" (programmable)**

**Paper feed speed:**

**Line feed(1/6° feed) 26 ms (6"/sec)**

**Form feed(continuous) 17 ms (10"/sec)**

**Character size: See Table 1-2**

**Character pitch: See Table 1-2**

Table 1-2. Character Size, Pitch

Printing mode	Width [mm]	Height [mm]	Total character width [mm]	Pitch [CPI]
<b>Pica (Normal)</b>	<b>2.1</b>	<b>3.1</b>	<b>2.54</b>	<b>10</b>
<b>Emphasized pica</b>	<b>2.1</b>	<b>3.1</b>	<b>2.54</b>	<b>10</b>
<b>Condensed pica</b>	<b>1.05</b>	<b>3.1</b>	<b>1.48</b>	<b>17</b>
<b>Elite</b>	<b>1.7</b>	<b>3.1</b>	<b>2.11</b>	<b>12</b>
<b>Condensed elite</b>	<b>0.85</b>	<b>3.1</b>	<b>1.27</b>	<b>20</b>

NOTES: 1. The total character width is the total of character width and the character spacing (in dots).

2. In the proportional mode, total character width varies because of different character spacings.

**Printing column width:**

**See Table 1-3**

Table 1-3. Printing Column Width

Printing mode	Printable column width [CPL] (max.)
<b>Pica mode</b>	<b>136</b>
<b>Condensed pica mode</b>	<b>233</b>
<b>Elite mode</b>	<b>163</b>
<b>Condensed elite mode</b>	<b>272</b>

NOTE: CPL...Character Per Line

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Printing speed:

See Table 1-4  
Table 1-4. Printing Speed

Printing mode	Printing speed[CPS]
High speed draft (pica)	1066
Draft (pica)	800
Draft (elite)	960
Condensed draft (pica)	680
Emphasized draft (pica)	400
NLQ (pica)	160
NLQ (elite)	192

Input data buffer size:

3 K bytes

#### 1.2.1.2 General Paper Specifications

Feeding method:

Tractor feed

Type:

Continuous (Fan-fold) paper

- Single-part form
- Multi-part forms
- Label form
- Overlapping multi-part forms

Quality:

High quality paper

Width:

101 – 406.4 mm (4 – 16 inches)

Length:

Min. 88.9 mm (3.5 inches, label form)

Width:

4 – 16 inches (101 – 406 [mm])

Total thickness:

Front tractor

Within 0.46 mm

Within 0.018 inches

Rear tractor

Within 0.30 mm

Within 0.012 inches

NOTES: 1. Horizontal alignment may be irregular in the top 75 mm (3inches) of the first page.

2. When using the optional pull tractor unit, do not print on the top 120mm (4.8 inches) of the first page.

3. Clean paper (with no folds, creases, or tears, (especially for the copying paper)) should be used. Figure 1-3 shows paper that is unsuitable.

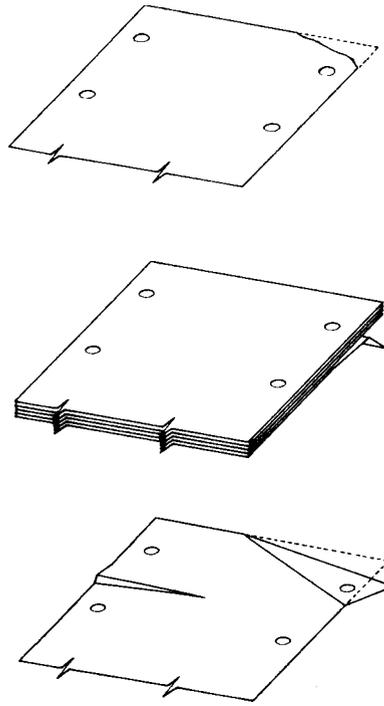


Figure 1-3. Unsuitable Paper

4. Forms-override printing is available 20 lines after paper end. The paper feeding pitch is not guaranteed. The end of printable area is 15mm from the bottom edge of paper.

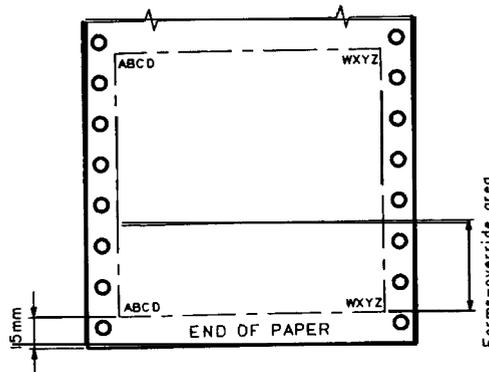


Figure 1-4. Forms Over Ride Area

3. Clean paper (with no folds, creases, or tears, (especially for the copying paper)) should be used. Figure 1-3 shows paper that is unsuitable.

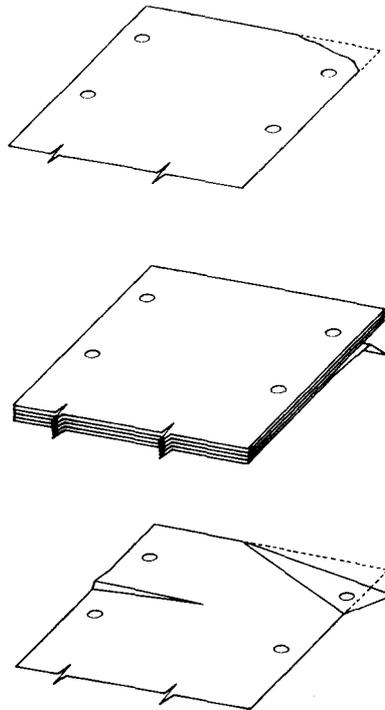


Figure 1-3. Unsuitable Paper

4. Forms-override printing is available 20 lines after paper end. The paper feeding pitch is not guaranteed. The end of printable area is 15mm from the bottom edge of paper.

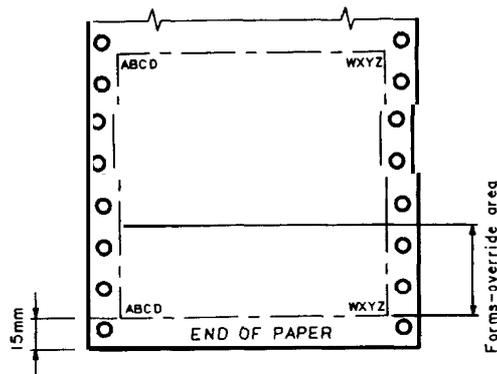


Figure 1-4. Forms Over Ride Area

- 5. Weak horizontal and vertical perforations cause paper jams.
- 6. The pitch of perforations (pitch of the cut part and uncut part) must be less than 3: 1 (ratio).

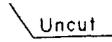


Figure 1-5. Pitch of Perforation

- 7. Perforations must have an uncut part on each side edge of the paper.

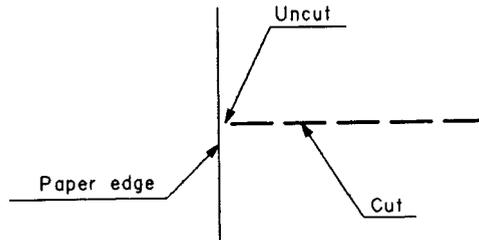


Figure 1-6. Side Edge of Perforation

- 8. At the intersection of horizontal and vertical perforations, the cut part of the Perforations must not cross each other. Figure 1-7 shows examples of good perforation intersections.

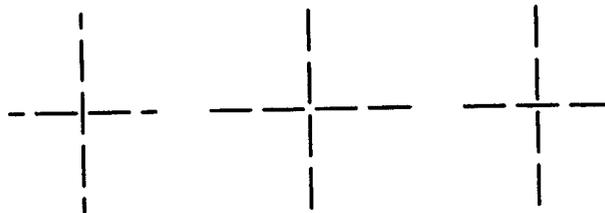


Figure 1-7. Perforation Intersection

- 9 The raised portion at a perforation (fold) must be less than 1 mm from the flat part, with the bottom layer kept flat by force.

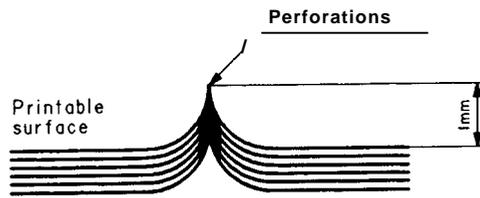


Figure 1-8. Raised Portion at a Perforation

10. The sprocket hole must be circular. The hole may have teeth.

11. The

12. The

that is not folded properly, as shown below.



Figure 1-10. Bad Folded Paper

13. No holes are acceptable in the printable area.
14. The paper must be torn off accurately along a perforation.

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1.2.1.3 Single Part Form

weight:

Weight of paper is indicated in [Kg], [lb.], and [g/m<sup>2</sup>].

45 – 70 Kg

14 – 22 lb.

52.6 – 82.7 g/m<sup>2</sup>

printable area:

See Figure 1-1 I

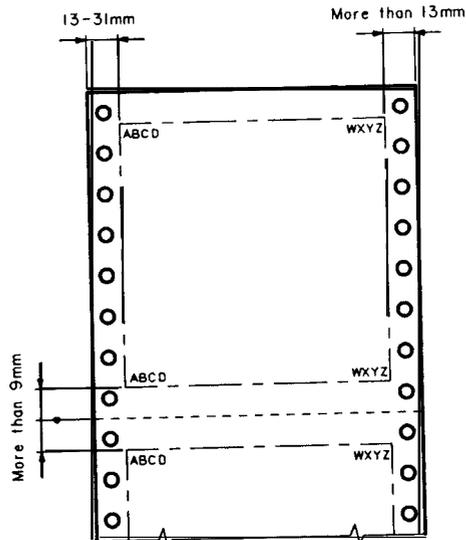


Figure 1-11. Printable Area of Single Part Form

1.2.1.4 Multi-part Forms

Printable area: Same with "Single part form" (See Figure 1-3)

Copying paper: Max. 6 sheets (1 original + 5 copies)

    Front tractor Max. 4 sheets (1 original + 3 copies)

    Rear tractor

Weight: Weight of paper is indicated in [Kg], [lb.], and [g/m2].

            35 - 48 Kg

            11 - 15 lb.

            41.4 - 56.4 g/m2

Table 1-5. Each Part Weight of a Multi-part Form

Total number of copies	Each part weight [Kg] (except the bottom)	Bottom sheet weight [Kg]
1	45, 55 or 70	45, 55 or 70
2	34 or 45	55 or 70
3	34 or 45	55 or 70
4	34	45, 55 or 70
5	34	45, 55 or 70
6	34	45, 55 or 70

- NOTES: 1. N = 6 (front) or 4 (rear). The total paper thickness of multi-part forms should be less than the maximum allowable paper thickness.
2. Carbon-less duplicating paper should be used for copying.
3. The copying paper should be joined using dotted paste (Spot-gluing) or 2 points paper staples (Tape-stitching).  
Dotted paste is recommended for better printing quality.
4. If the dotted paste is used, the paper can be joined either on a single side or on both sides.  
Figure 1-12 shows the specified paste positions.

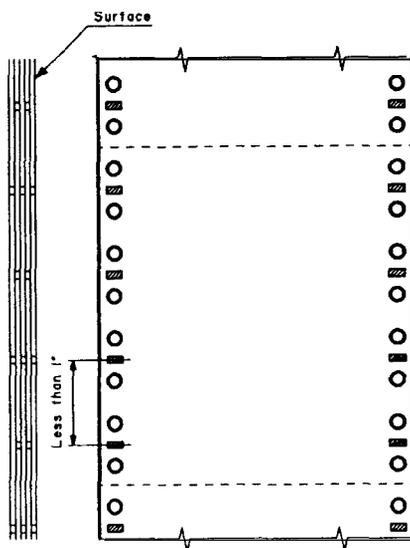


Figure 1-12. Dotted Paste Positions

- 5. The pasted parts must be pressed flat. There must be no creases in the paper.
- 6. Paper-stapling must be applied from the front. Paper must be flat. Figure 1-13 shows the stapling part cross section.

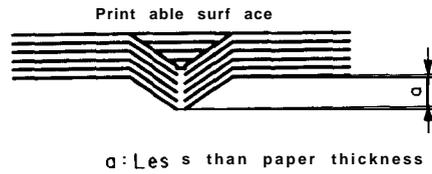


Figure 1-13. Stapling Part -1

- 7. Multi-part forms are fixed firmly to each other. Figure 1-14 shows the stapling part cross section.

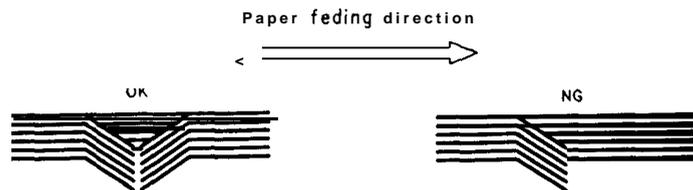


Figure 1-14. Stapling Part -2

- 8. The binding area should be flat. Figure 1-15 shows the stapling part cross section.

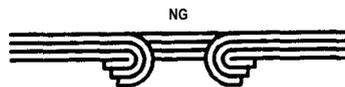


Figure 1-15. Stapling Part -3

- 9. Never use metal staples.
- 10. The position of staple or paste part must be outside of the printable area.
- 11. The sprocket hole of each layer must not be shifted.

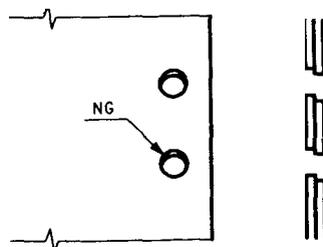


Figure 1-16. Sprocket Hole -2

1.2.1.5 Label Form

Printable area:

See Figure 1-17 and 18

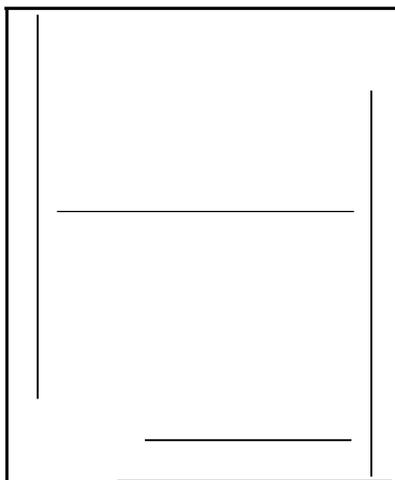


Figure 1-17. Label Form Printable Area -1

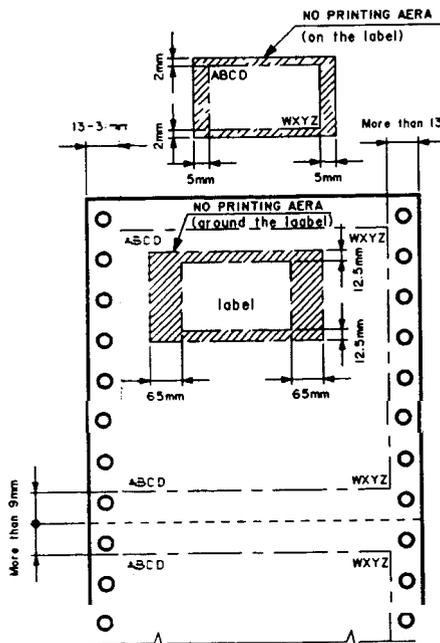
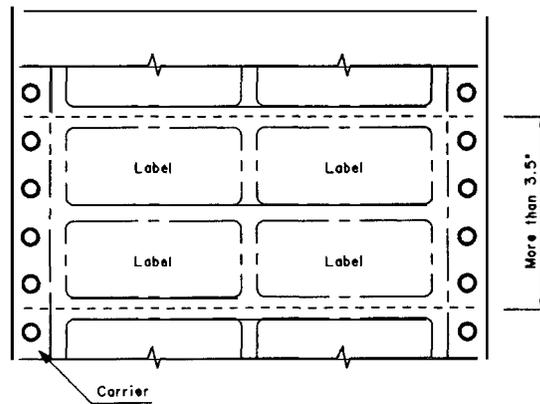


Figure 1-18. Label Form Printable Area -2

**WARNING**

- Do not perform the back feed.
- Do not perform the paper select.

- NOTES:**
1. If label forms are used, the paper should be loaded from the front tractor. The paper select function must not be used.
  2. If label forms are used, the paper should be fed only in the normal direction, using the MICRO FEED switch.
  3. If label forms are used, the paper must not be fed in the reverse direction. (Reverse paper feeding could cause the paper to jam, or the labels to stick to the unit.)
  4. When label forms are used, they must not be torn off.
  5. When label forms are used, the TOF (TOP OF FORM) function should not be executed.
  6. Easy come-off labels should not be used.
  7. Every label must be put on the carrier.



**Figure 1-19. Label and Carrier**

8. Corners of the labels must be rounded.
9. The surface of label must be flat.

1.2.1.6 Overlapping Multi-part Forms

Printable area:

See Figure 1-20

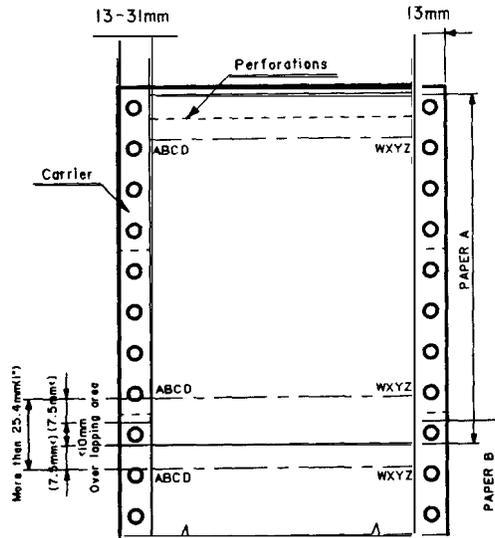


Figure 1-20. Printable Area of Multi-part Forms with Label

**WARNING**

- Do not perform the back feed.
- Do not perform the paper select.

NOTES: 1. The thickness of overlapping area is less than 0.7 mm (0.028 inches).

2. The multi-part paper must be bonded at the top side of multi-part paper. Figure 1-21 shows the multi-part paper binding method.

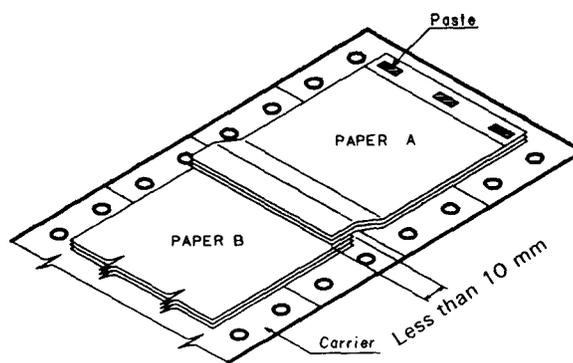


Figure 1-21. Multi-part Paper Binding Method

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### 1.2.1.7 Ribbon Specification

Ribbon cartridge: # 8 7 6 6  
Ribbon pack: # 8 7 6 7  
(The ribbon pack is a handy pack containing an exchangeable endless ribbon.)  
Ribbon pack exchanges: Maximum 4 times for one cartridge.  
Color: Black  
Dimension:  
    Cartridge 506(W) X 23(H) X 140(D) mm  
    Ribbon 13mm X 70m (Endless)  
Life: Approx. 15 million characters (14 dots/chr.)

### 1.2.1.8 Electrical Specifications

Supply voltage:  
    120VAC model 103.5 to 132 VAC  
    220-240VAC model 198 to 264 VAC  
Rated current:  
    120VAC model 7A  
    220-240VAC model 5A  
Frequency range: 49.5 to 60.5 Hz  
Power consumption: 200W (Self test printing in draft mode)  
Insulating resistance: 10 M ohms min. (between the AC line and chassis)  
Dielectric strength:  
    120VAC model 100OVAC(rms) 1 minute or 1200VAC(rms) 1 second  
    220-240VAC model 1250VAC(rms) 1 minute or 1500VAC(rms) 1 second

### 1.2.1.9 Environmental

Temperature:  
    Operating 5°C to 35°C  
    Storage -30°C to 60°C  
Humidity:  
    Operating 10% to 80% RH. (Non condensation)  
    Storage 5% to 85% RH (Non condensation)  
Impact proof:  
    Operating 1 G (1 msec. or less)  
    Storage 2G (1 msec. or less)  
Vibration proof:  
    Operating Max. 0.25G, 55 Hz  
    Storage Max. 0.5G, 55Hz

**1.2.1.10 Physical**

**Dimensions:** 700(W) X 369(H) X 382(D) mm  
(See Figure in APPENDIX)

**Weight:**

Without options 29Kg  
With the pull tractor 30Kg  
With the paper cutter 34Kg

**1.2.1.11 Reliability**

**MCBF:** 24 million lines (except the printhead life)

**MTBF:** 6000 POH (power on hour)

**Life of printhead:** 400 million characters (14 dots/chr.)

**1.2.1.12 Safety Approvals**

**Safety standard:** UL478 5th  
CSA 22.2 # 154  
BSI  
TUV VDE0806  
IEC950  
R.F.1: FCC class B  
VDE 0871

1.2.2 Interface Specifications

The DFX-8000 employs an 8-bit standard parallel interface, and an RS-232C serial interface.

1.2.2.1 Parallel Interface

Type:	8-bit standard parallel interface
Data format:	8-bit parallel
Logic level:	TTL compatible
Synchronization:	By STROBE pulse
Hand shaking:	By both ACKNLG and BUSY, or either of them
Hand shake timing:	See Figure 1-22
Connector:	57-30360 (AM PHENOLL) or equivalent (See Figure 1-23)

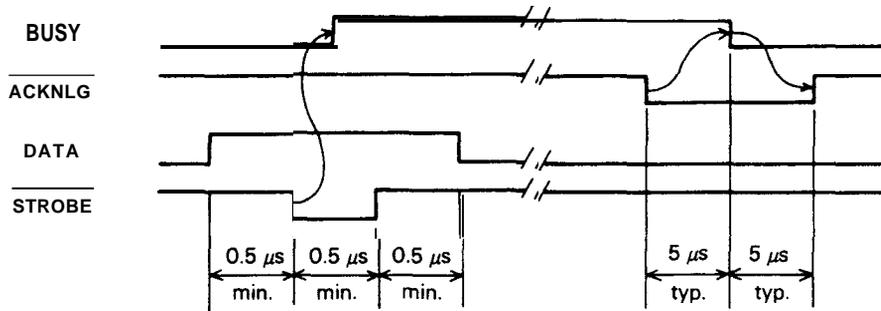


Figure 1-22. Hand Shake Timing

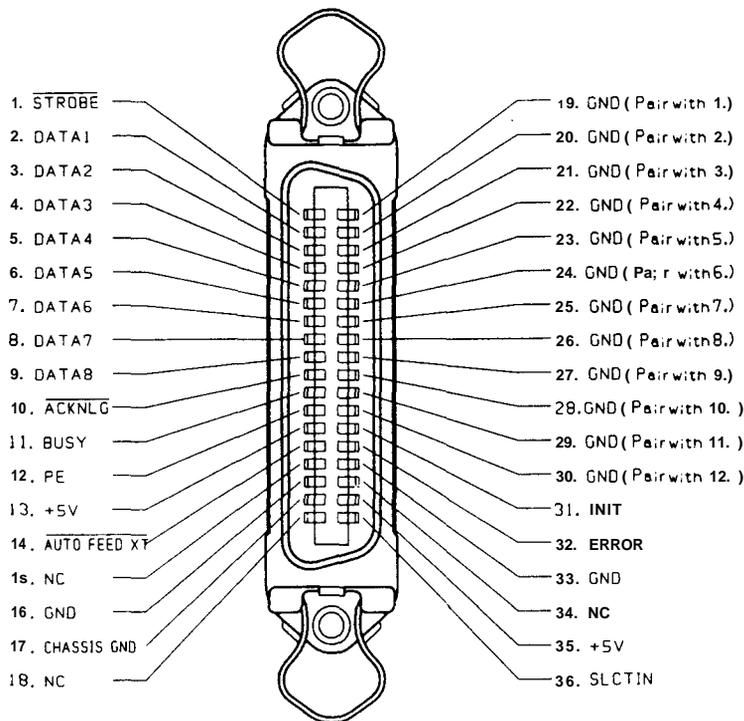


Figure 1-23. 36-pin 57-30360 Connector

Table 1-6. Parallel Interface Pin Assignment

Pin No.	Signal Name	Return Pin No.	DIR	Functional Description
1	$\overline{\text{STROBE}}$	19	In	Strobe pulse to read the input data. Pulse width must be more than 0.5 $\mu\text{s}$ . Input data is latched after falling edge of this signal.
2	DATA 1	20	In	Parallel input data to the printer. "HIGH" level means data "1". "LOW" level means data "0".
3	DATA2	21	In	
4	DATA3	22	In	
5	DATA4	23	In	
6	DATA5	24	In	
7	DATA6	25	In	
8	DATA7	26	In	
9	DATA8	27	In	
10	$\overline{\text{ACKNLG}}$	28	out	This pulse indicates data are received and the printer is ready to accept next data. pulse width is approx. 12 $\mu\text{s}$ .
11	BUSY	29	out	HIGH indicates printer can not accept next data.
12	PE	30	out	HIGH indicates papepr-out. This signal is effective only when $\overline{\text{ERROR}}$ signal is "LOW".
13	SLCT	—	out	Always "HIGH" output. (Pulled up to $\div 5\text{V}$ through 3.3K ohms register.)
14	$\overline{\text{AUTO FEED-XT}}$	—	In	If the signal is "LOW" when the printer is initialized line feed is automaitcally performed by input of "CR" code. (Auto LF)
15	—	—	—	Not used
16	GND	—	—	Ground for twisted-pair grounding.
17	Chassis GND	—	—	Chassis ground level of printer
18	—	—	—	Not used.
9 to 30	GND	—	—	Ground for twisted-pair grounding.
31	INIT	16	In	Pulse (width: 50 $\mu\text{s}$ min., active "LOW") input for printer initialization.
32	$\overline{\text{ERROR}}$	—	out	LOW indicates that some error has occurred in the printer.
33	GND	—	—	Ground for twisted-pair grounding
34	—	—	—	Not used.
35	—	—	out	Always "HIGH". (Pulled up to +5V through a 3.3 K-ohm register.)
36	$\overline{\text{SLCT-IN}}$	—	In	If the signal is "LOW" when printer is initialized, the DC 1 /DC3 control is disabled.

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- NOTES:
1. "DIR" indicates the input/output direction from the printer side.
  2. The return side means the twisted pair return, which is connected to the signal ground. The interface signals must be sent through twisted pair lines, and the return lines must be connected. The cable should be shielded and the printer chassis ground should be connected to the chassis to reduce noise.
  3. TTL levels must be used for the interface. The rise or fall times of the signals should be 0.2 us or less.
  4. Refer to Figure 1-6. for the signal timing chart.
  5. Data should only be sent according to the ACKNLG and BUSY signals. (Data should be sent to this printer after confirming the ACKNLG signal or when the BUSY signal is low.)
  6. If the proper character codes are sent over the DATA 1 to 8 lines of the interface connector (open should be " 1", and short to GND "0") and the ACKNLG pin is connected to the STROBE pin, the test printing (including the interface circuit) can be performed without any external equipment.
  7. A short in terface cable is recommended to reduce noise.
  8. See Table 1-7. for DC1/DC3 control.

Table 1-7. DC1/DC3 Control

SLCT IN signal state (Initial state)	Code	Printer state	Printer data entry
High	DC 1	Selectable	Enable
	DC3	Not selectable	DC 1 code waiting state. All data before the DC 1 code will be ignored.
Low	DC 1	Usually selected	Usually enabled
	DC3		

Type: RS-232C compatible serial interface  
 Data format: RS-232C compatible serial  
 Word length:  
     Start bit 1  
     Data bit 7 or 8 (Selectable by DIP switch)  
     Parity bit Odd, Even or Non-parity (Selectable by DIP switch)  
     Stop bit 1 bit or more  
 Bit rate: 300, 1200, 9600, 19200 BPS (Selectable by DIP switch)  
 Logic level:  
     MARK (Logical "1") -3V to -27V  
     SPACE (Logical "0") +3V to +27V  
 Synchronization: Asynchronous  
 Hand shaking: By DTR(REV) signal or X-ON/X-OFF protocol

Table 1-8. DTR and XON/XOFF Control

DTR signals	Control code	Printer state and operation
MARK	XOFF (DC3/13H)	Data reception disabled. If the printer is in the(DC3/13H) following states, an XOFF code (DC3/ 13H) is sent to the host computer to set the DTR signal to the MARK level. ● When the available (empty) space in the input data buffer becomes 512 bytes (Buffer full): ● Error state (Off-line, ERROR, or Paper End)
SPACE	XON (DC1/11 H)	Data reception enabled. If the printer is in the (DC 1/1 1 H) following state, an XON code (DC 1 /1 1 H) is sent to the host computer to set the DTR signal to the SPACE level. ● When the empty space in the input data buffer becomes 784 bytes: ● Restored from ERROR state (ON-LINE)

Handshake timing: See Figure 1-24. and Figure 1-25.  
 Connector: EIA Standard 25 pin connector (See Figure 1-26.)

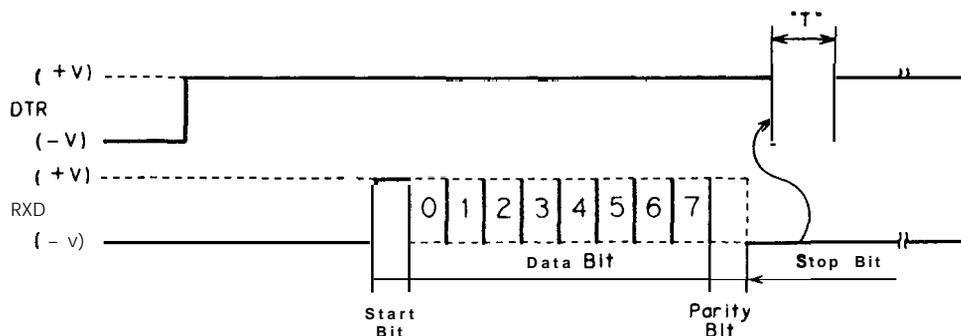


Figure 1-24. DTR Control Handshake Timing