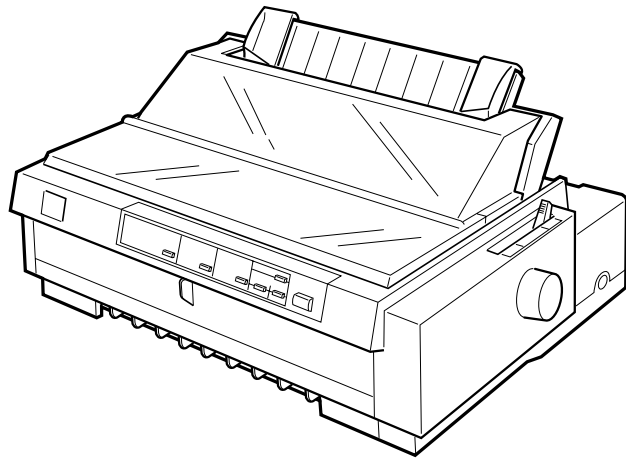


SERVICE MANUAL



Impact Serial Dot Matrix Printer
EPSON FX-980



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 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 THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURES.
2. NOWORK 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 VOLTAGES 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 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 MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; INTRODUCTION OF SECOND-SOURCE ICs OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes basic functions, theory of electrical and mechanical operations, maintenance and repair procedures of FX-980. The instructions and procedures included herein are intended for the experienced repair technicians, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. PRODUCT DESCRIPTIONS

Provides a general overview and specifications of the product.

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of electrical and mechanical operations of the product.

CHAPTER 3. DISASSEMBLY AND ASSEMBLY

Describes the step-by-step procedures for disassembling and assembling the product.

CHAPTER 4. ADJUSTMENTS

Provides Epson-approved methods for adjustment.

CHAPTER 5. TROUBLESHOOTING

Provides the step-by-step procedures for troubleshooting.

CHAPTER 6. MAINTENANCE

Provides preventive maintenance procedures and the lists of Epson-approved lubricants and adhesives required for servicing the product.

APPENDIX

Provides the following additional information for reference:

- *EEPROM Address Map*
- *Connector Pin Assignments*
- *C276 Main Board / C244 PSH Board Component Layout*
- *C276 Main Board / C244 PSH Board Circuit Diagram*

Revision Status

Revision	Issued Date	Description
A	March 17, 1999	First Release

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CHAPTER

1

PRODUCT DESCRIPTION

1.1 Overview

The EPSON FX-980 serial impact dot matrix printer is designed based on the existing FX-2170. Both products are common in most features, but vary in width; the FX-980 is narrower than the FX-2170. So this manual only provides information specific to the FX-980.

1.2 Specifications

These specifications provide statistical information for the FX-980. For information that is not included in this section, refer to the FX-2170 Service Manual.

1.2.1 Features

The main features of this printer are:

- Print speed: High speed draft: 506 cps at 10 cpi
Draft: 380 cps at 10 cpi
NLQ: 95 cps at 10 cpi
- Character tables: Standard version: 13 tables
NLSP version: 37 tables
- Reliability: Total print volume: 25 million lines
(except printhead)
MTBF: 10,000 power on hours (POH)
- Printhead life: 300 million characters
Ribbon life: 7.5 million characters
- Interface: Bi-directional parallel interface
Type-B interface
Serial interface
- Control codes: ESC/P2 and IBM 2380 plus emulation

- Copy capability: 1 original + 5 copies always
1 original + 6 copies at pull tractor feed
(front, bottom)
- Control panel functions: Font, Pause, Condensed Pause, Tear off,
Bin, LF/FF, Load/Eject, Micro Adjust,
Self-Test, Data Dump, and the Default
Setting
- Power supply: Universal Power Supply version
supported

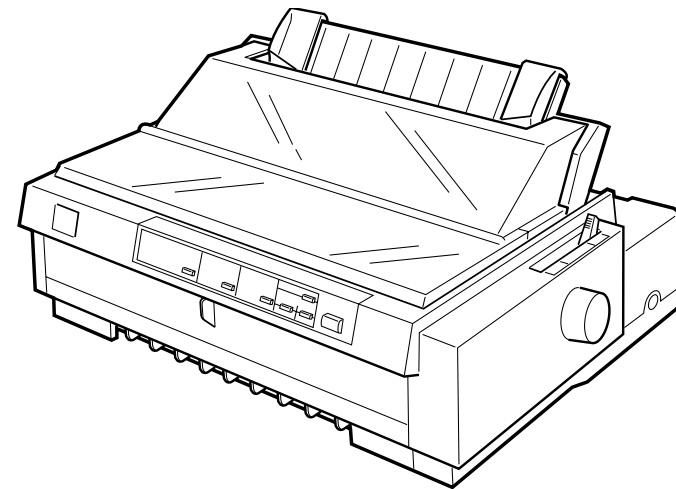


Figure 1-1. Exterior View of the FX-980

1.2.2 Accessories

Table 1-1. Items Included with the Printer

Enclosed Items	Quantity
User's manual	1
Driver diskette	1
Ribbon cartridge	1
Power supply cable (230 V Version)	1

Table 1-2. Consumable and Optional Items

Unit	Description
Ribbon cartridge	S015091-0036
Ribbon pack	S010036-0036
High-capacity cut sheet feeder (bin 1)	C806841 (EAI), C806842 (Non-EAI)
Second bin cut sheet feeder (bin 2)	C806851 (EAI), C806852 (Non-EAI)
Pull tractor unit	C800331 (EAI), C800332 (Non-EAI)
Roll paper holder	#8310
32 KB intelligent serial I/F card	C82307* / C82308*
Type-B Local Talk I/F card	C82312*
Coax I/F card	C82314*
Twinax I/F card	C82315*
IEEE-1284 parallel I/F card	C82345*
Type-B Ethernet I/F card for 10Base T/2	C82362*
Type-B Ethernet I/F card for 100Base T / 100Base TX	C82363* *1, C82364*

1: When you use Ethernet interface card (C82363), you need to attach the optional interface card adapter (C82525*) to the interface card.

1.3 Hardware Specifications

This section also contains information specific to the FX-980. For other information, refer to the FX-2170 Service Manual.

1.3.1 Printing Specifications

- Print method: Impact dot matrix
- Number of pins: 18 pins
- Print pin alignment: 9 × 2
- Print pin diameter: 0.0114 inch (0.29 mm)
- Color: Black
- Print direction: Bi-directional with logic seeking
- Resolution: See the table below:

Table 1-3. Resolution

Printing mode	Horizontal density	Vertical density	Adjacent dot print
High speed draft	90 dpi	72 dpi	No
Draft	120 dpi	72 dpi	No
Draft condensed	240 dpi	72 dpi	No
Draft emphasized	120 dpi	72 dpi	Yes
NLQ	240 dpi	144 dpi	No
Bit image	60, 72, 80, 90, or 120 dpi	72 dpi	Yes
	120 or 240 dpi	72 dpi	No

- Print speed and printable columns: See the table below.

Table 1-4. Print Speed and Printable Columns

Print Mode	Character Pitch	Printable Columns	Print Speed (cps)		
			Normal	Copy 1	Copy 2
High-speed draft	10 cpi	80	506	439	337
	12 cpi	96	569	455	404
	15 cpi	120	569	494	426
High-speed draft condensed	17 cpi	137	560	483	322
	20 cpi	160	506	379	329
Draft	10 cpi	80	380	330	284
	12 cpi	96	455	396	341
	15 cpi	120	380	285	285
Draft Condensed	17 cpi	137	325	282	244
	20 cpi	160	380	330	284
Draft emphasized	10 cpi	80	190	165	142
NLQ	10 cpi	80	95	82	71
	12 cpi	96	114	99	85
	15 cpi	120	94	71	31
	17 cpi	137	81	70	60
	20 cpi	160	95	82	71

NOTES:

1. When the power supply voltage drops to the lower limit, the printer stops printing and then starts printing on that line again more slowly than before.
2. When the head temperature rises to the upper limit, the printer stops printing. When the head temperature falls to the normal level, the printer start printing again more slowly than before.
3. Copy 1: When the paper thickness lever is set to 2 or 3.
4. Copy 2: When the paper thickness lever is set to 4 or more.

1.3.2 Paper Handling

- Feeding method
 - Friction feed (front, rear)
 - Push tractor feed (front lever)
 - Push & Pull tractor feed (front, rear)
 - Pull tractor feed (front, rear, bottom)
- Feed speed
 - Normal mode: 1/6 inch feed: 46 msec
 Continuous feed: 0.127 MPS (m/second)
 5.0 IPS (inches / second)
 - Copy mode: 1/6 inch feed: 68 msec
 Continuous feed: 0.078 MPS (m/second)
 3.1 IPS (inches/second)
- Input data buffer: 0 Kbyte or 64 Kbyte
 (depends on the default setting)

Release lever: See the following table.

Paper thickness lever: See the following table.

Table 1-5. Release Lever Settings

Lever Position	Paper path / Feeder	Paper / Media
Friction	Manual insertion (front)	Cut sheet (Single sheet & Multipart), Card
	Manual insertion (rear)	Cut sheet (Single sheet & Multipart), Card, Envelope
	CSF Bin 1	Cut sheet (Single sheet & Multipart), Card, Envelops
	CSF Bin 2	Cut sheet (Single sheet)
	Roll paper holder	Roll paper
Front tractor	Push tractor feed (front)	Continuous paper (Single sheet & Multipart), Continuous paper with labels
	Push & Pull tractor feed (front)	Continuous paper (Single sheet & Multipart), Continuous paper with labels
Rear tractor	Push tractor feed (rear)	Continuous paper (Single sheet & Multipart)
	Push & Pull tractor feed (rear)	Continuous paper (Single sheet & Multipart)
Full release	Pull tractor feed (front)	Continuous paper (Single sheet & Multipart), Continuous paper with labels
	Pull tractor feed (rear)	Continuous paper (Single sheet & Multipart)
	Pull tractor feed (bottom)	Continuous paper (Single sheet & Multipart), Continuous paper with labels

Table 1-6. Adjust Lever Setting Position

Setting Position	Paper Thickness (inch)		Paper Thickness (mm)
	Minimum	Maximum	
0	0.0024	0.0043	over 0.06 up to 0.11
1	0.0043	0.0071	over 0.11 up to 0.18
2	0.0071	0.0079	over 0.18 up to 0.20
3	0.0079	0.0098	over 0.20 up to 0.25
4	0.0098	0.0126	over 0.25 up to 0.32
5	0.0126	0.0154	over 0.32 up to 0.39
6	0.0154	0.0185	over 0.39 up to 0.47

1.3.3 Paper Specifications

This section provides paper specifications for the FX-980.

- Cut seet (single sheet, not multipart)

Table 1-7. Cut Sheet (Single Sheet, Not Multipart)

	Front Entry		Rear Entry	
	Minimum	Maximum	Minimum	Maximum
Width (inch) (mm)	3.9 100	10.1 257	3.9 (7.2 ^{*1}) 100 (182 ^{*1})	10.1 257
Length (inch) (mm)	5.8 148	14.3 364	3.9 (8.3 ^{*1}) 100 (210 ^{*1})	14.3 364
Thickness (inch) (mm)	0.0025 0.065	0.0055 0.14	0.0025 0.065	0.0055 0.14
Weight (g/m ²) (lb.)	52 14	90 24	52 14	90 24
Quality	Plain paper, Recycled paper ^{*2} , Not curled, folded, or crumpled			

*1: Value when CSF bin 2 is used.

*2: Printing on recycled paper is available only under normal temperature and humidity conditions.

- Cut sheet (multipart)

Table 1-8. Cut Sheet (Multipart)

	Front Entry		Rear Entry ^{*1}	
	Minimum	Maximum	Minimum	Maximum
Width (inch) (mm)	3.9 100	10.1 257	3.9 100	10.1 257
Length (inch) (mm)	5.8 148	14.3 364	3.9 100	14.3 364
Copies	1 original + 5 copies		1 original + 5 copies	
Total Thickness (inch) (mm)	0.0047 0.12	0.018 0.46	0.0047 0.12	0.018 0.46
Weight (one sheet of multipart) (g/m ²) (lb.)	40 12	58 15	40 12	58 15
Quality	Plain paper, Recycled paper, Paper that is not curled, folded, or crumpled.			
Jointing	Line glue at the top or one side of form.		Line glue at the top of form.	

*1: Not available for the 2nd CSF.

☐ Envelope

Table 1-9. Envelope

		Front Entry		Rear Entry	
		Minimum	Maximum	Minimum	Maximum
Envelop (No. 6)	Width (inch) (mm)	---		6.5 165	
	Length (inch) (mm)	---		3.6 92	
Envelop (No. 10)	Width (inch) (mm)	---		9.5 241	
	Length (inch) (mm)	---		4.1 105	
Total Thickness (inch) (mm)		---	---	0.0063 0.16	0.020 0.52
		---		The difference of thickness at the printable area is within 0.0098 inch (0.25mm).	
Weight	(g/m ²) (lb.)	---	---	45 12	90 24
Quality		---		BOND paper, plain paper or AIRMAIL No glue at a flap Not curled, not folded, not crumpled	

NOTES:

1. Printing on envelope is available only under normal temperature and humidity conditions.
2. Envelopes should be inserted from rear entrance only.
3. Set the longer side of envelope horizontally.

☐ Continuous paper (Single sheet and Multipart)

Table 1-10. Continuous Paper (Single sheet and Multipart)

		Front Entry		Rear Entry		Bottom Entry	
		Min.	Max.	Min.	Max.	Min.	Max.
Width	(inch) (mm)	4 101.6	10.0 254	4 101.6	10.0 254	4 101.6	10.0 254
Length (one page)	(inch) (mm)	4 101.6	22 558.8	4 101.6	22 558.8	4 101.6	22 558.8
Copies		1 original + 5 copies *1		1 original + 5 copies		1 original + 5 copies *1	
Total Thickness	(inch) (mm)	0.0025 0.065	0.018 0.46	0.0025 0.065	0.018 0.46	0.0025 0.065	0.018 0.46
Weight (not multipart)	(g/m ²) (lb.)	52 14	82 22	52 14	82 22	52 14	82 22
Weight (one sheet of multipart)	(g/m ²) (lb.)	40 12	58 15	40 12	58 15	40 12	58 15
Quality		Plain paper, Recycled paper, Carbonless multipart paper					
Joining		Point glue or paper staple (both sides)					

*1: When pull tractor is used, 1 original copy + 6 copies is available.

Continuous paper with labels

Table 1-11. Continuous Paper with Labels

	Front Entry		Bottom Entry		Rear Entry	
	Min.	Max.	Min.	Max.	Min.	Max.
Label size	See the figure below.		See the figure below.		---	
Base sheet width (inch) (mm)	4 101.6	10.0 254	4 101.6	10.0 254	---	---
Base sheet length (one page) (inch) (mm)	4 101.6	22 558.8	4 101.6	22 558.8	---	---
Base sheet thickness (inch) (mm)	0.0028 0.07	0.0035 0.09	0.0028 0.07	0.0035 0.09	---	---
Total thickness (inch) (mm)	0.0063 0.16	0.0075 0.19	0.0063 0.16	0.0075 0.19		
Label weight (g/m ²) (lb.)	64 17		64 17		---	
Quality	AVERY CONTINUOUS FORM LABELS, AVERY MINI-LINE LABELS or the same quality labels				---	

NOTES:

1. Printing on labels is available only under normal temperature and humidity condition.
2. The base sheet of labels must be continuous paper.
3. Continuous paper with labels should be inserted from the front or bottom entrance.

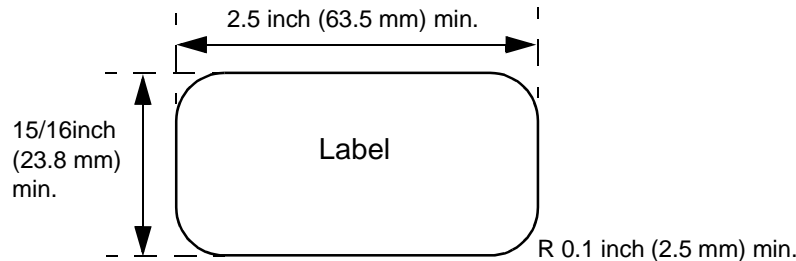


Figure 1-2. Printable Area - Label

Roll paper

Table 1-12. Roll Paper

	Front Entry		Rear Entry	
	Minimum	Maximum	Minimum	Maximum
Width (inch) (mm)	---		8.5 216	
Length (inch) (mm)	---		---	
Thickness (inch) (mm)	---	---	0.0028 0.07	0.0035 0.09
Weight (g/m ²) (lb.)	---	---	52 14	82 22
Quality	---		Plain paper, Recycled paper Not curled, folded, or crumpled	

1.3.4 Ribbon Specifications

- Type: Fabric
- Color: Black
- Ribbon Life: Approximately 7.5 million characters
(Draft 10 cpi, 14 dots / character)

1.3.5 Electrical Specifications

The electrical specifications for the FX-980 are the same as for the FX-2170 except for the items below. For information on other items, see the FX-2170 Service Manual.

- 120 V Version
 - Input voltage range: AC 99 to 132 V
 - Power consumption: Approximately 46 W
(ISO/IEC10561 Letter pattern)
Energy Star Compliant
- 230 V version
 - Power consumption: Approximately 46 W
(ISO/IEC10561 Letter pattern)
Energy Star Compliant
- UPS version
 - Rated voltage range: AC 100 to 120 V / AC 220 to 240 V
 - Input voltage range: AC 90 to 132 V / AC198 to 264 V
 - Rated frequency range: 50 to 60 Hz
 - Input frequency range: 49.5 to 60.5 Hz
 - Rated current: 1.1 A (max. 2.2 A / 0.6 A (max 1.1 A))

- Power consumption: Approximately 46 W
(ISO/IEC10561 Letter pattern)
Energy Star Compliant
- Insulation resistance: 10 M Ω min.
(between AC line and chassis, DC 500 V)
- Dielectric strength: AC 1500 Vrms. 1 min.
(between AC line and chassis)

1.3.6 Reliability

- Total print volume: 25 million lines (except printhead)
- MTBF: 10000 POH (24% duty)
- Printhead life: Approximately 300 million characters

1.3.7 Safety Approvals

- 120 V version
 - Safety standards: UL1950, CSA C22.2 No. 950
 - EMI: FCC part15 subpart B class B
CSA C108.8 class B
- 230 V version
 - Safety standards: EN60950 (VDE)
 - EMI: EN55022 (CISPR pub.22) class B
AS/NZS 3548 class B
- UPS version
 - Safety standards: UL1950, CSA C22.2 No. 950,
EN60950 (VDE)

- EMI: FCC part15 subpart B class B
CSA C108.8 class B
EN55022 (CISPR pub.22) class B
AS/NZS 3548 class B

1.3.8 CE Marking

- 230 V version & UPS version
 - Low voltage directive 73/23/EEC:EN60950
 - EMC Directive 89/336/EEC: EN55022 class B
EN61000-3-2
EN61000-3-3
EN50082-1
IEC801-2
IEC801-3
IEC801-4

1.3.9 Physical Specifications

- Without options
 - Dimensions: 528 mm(W) x 404 mm(D) x 236 mm(H)
 - Weight: Approximately 11 kg
- Including CSF bin 1
 - Dimensions: 528 mm(W) x 471 mm(D) x 380 mm(H)
 - Weight: Approximately 13 kg
- Including CSF bin 1 & bin 2
 - Dimensions: 528 mm(W) x 600 mm(D) x 411 mm(H)
 - Weight: Approximately 13.5 kg

1.4 Firmware Specifications

This section describes the firmware specifications for the FX-980.

1.4.1 Control Codes and Fonts

- Control codes: ESC/P2 and IBM 2391 Plus Emulation
- Character tables:

Standard version (13 character tables)

Italic table	PC 860 (Portuguese)
PC 850 (Multilingual)	PC 437 (US, Standard Europe)
PC 861 (Icelandic)	PC 863 (Canadian-French)
PC 865 (Nordic)	Abicomp
BRASCI	Roman 8
ISO Latin 1	PC 858
ISO 8859-15	

NLSP version (37 character tables)

Italic table	PC437 (US, Standard Europe)	
PC437 Greek	PC850 (Multilingual)	
PC852 (East Europe)	PC853 (Turkish)	PC855 (Cyrillic)
PC857 (Turkish)	PC866 (Russian)	PC869(Greek)
MAZOWIA (Poland)	Code MJK (CSFR)	
ISO 8859-7 (Latin/Greek)	ISO Latin 1T (Turkish)	
Bulgaria (Bulgarian)	PC774 (LST 1283:1993)	
Estonia (Estonia)	ISO 8859-2	PC866 LAT. (Latvian)
PC866 UKR (Ukraina)	PC860 (Portuguese)	
PC861 (Icelandic)	PC865 (Nordic)	PC APTEC(Arabic)
PC708 (Arabic)	PC720 (Arabic)	PCAR864 (Arabic)
PC863 (Canadian-French)	Abicomp	
BRASCI	Roman 8	ISO Latin 1
Hebrew7*	Hebrew8*	PC862 (Hebrew)*
PC 858	ISO 8859-15	

* Not displayed in the Default setting mode.

International character set (13 countries)

U.S.A.	France	Germany
U.K.	Denmark 1	Sweden
Italy	Spain 1	Japan
Norway	Denmark 2	Spain 2
Latin America		

* The international and legal characters are these 12 codes:
23H, 24H, 40H, 5BH, 5CH, 5DH,
5EH, 60H, 7BH, 7CH, 7DH, 7EH

- Typeface:
 - Bitmap fonts
 - EPSON Draft (10 cpi, 12 cpi, 15 cpi)
 - EPSON Roman (10 cpi, 12 cpi, 15 cpi, Proportional)
 - EPSON Sans Serif (10 cpi, 12 cpi, 15 cpi, Proportional)
 - Bar codes
 - EAN-13, EAN-8, Interleaved 2 of 5, UPC-A, UPC-E,
Code 39, Code 128, POSTNET
- Character tables and available typefaces:

The following bitmap fonts are supported by all character tables available for FX-980.

EPSON Draft, EPSON Roman, EPSON Sans Serif

NOTE: ESC R command is effective on all the chracter tables.

1.4.2 Printable Area

Printable area for the FX-980 is the same as for the FX-2170 except for the point below:

Cut Sheet:

Left Margine (Single/Multipart)	<FX-980>
	3 mm or more (Paper width is \leq 216 mm) 27 mm or more (Paper width is \leq 257 mm)
Right Margine (Single/Multipart)	<FX-980>
	3 mm or more (Paper width is \leq 216 mm) 27 mm or more (Paper width is \leq 257 mm)

1.4.3 Interface Specifications

This printer provides bi-directional 8-bit parallel interface, serial interface, and Type-B interface optional interface card slot as standard.

For information that is not covered in this section, refer to the FX-2170 Service Manual.

1.4.3.1 Parallel Interface (Forward Channel)

- Transmission mode: IEEE-1284 compatibility mode
- Signal level: TTL compatible
IEEE-1284 level 1 device)
- Pin assignment: The pin assignment (forward channel) is the same as for the FX-2170 except for the function of the pins below:

Pin No.	Function
18	<FX-980> This line is pulled up to +5 V through 3.9 k Ω resistor.
35	<FX-980> This line is pulled up to +5 V through 1.0 k Ω resistor.

- BUSY signal is active (HIGH level) under the conditions below:
In addition to the conditions given in the FX-2170 Service Manual,
 - If -ERROR or PE signal is active (low level, high level, respectively).
- ERROR signal is active (low level) under the conditions below:
 - If there is a paper-out error.
 - If there is a release lever error.
 - If there is a cover open error.
- PE signal is active (high level) under the condition below:
 - If therer is a paper-out error.

1.4.3.2 Parallel Interface (Reverse Channel)

- Transmission mode: 8 bit parallel, IEEE-1284 nibble mode
- Synchronization: Refer to the IEEE-1284 specification
- Handshaking: Refer to the IEEE-1284 specification
- Signal level: IEEE-1284 level 1 device
- Data transmission timing: Refer to the IEEE-1284 specification
- Device ID:

```
[00H][4DH]
MFG: EPSON;
CMD: ESCPL2,PRPXL24,BDC;
MDL: FX-980;
CLS: PRINTER;
DES: EPSON[SP]FX-980;
```

- Pin assignment: The pin assignment (reverse channel) is the same as for the FX-2170 except for the functions of the pins below:

Pin No.	Function
18	<FX-980> This line is pulled up to +5 V through 3.9 k Ω resistor.
35	<FX-980> This line is pulled up to +5 V through 1.0 k Ω resistor.

1.4.3.3 Serial Interface

- Synchronization: Asynchronous
- Signal level: EIA-233D
 MARK (logical 1): -3 V to -25V
 SPAC:E (logical 0): +3 V to +25V
- Word length: Start bit: 1 bit
 Data bit: 8 bit
 Parity bit: Odd, Even, Non, Ignore
 Stop bit: 1 bit or more
- Baud rate: 2400, 4800, 9600, or 19200 bps
- Handshaking: DTR signal and XON/SOFF
- Error handling: When a parity error is detected, the received byte is changed to a “*” character code. Overrun error and framing error are ignored.
- Connector: 25 pin subminiature D-shell connector (female)
- Connector pin assignment and signals: See Table 1-13 on the following page.

Table 1-13.
Connector Pin Assignment and Signals for Serial I/F

Pin No.	Signal Name	In/Out*1	Functional Description
2	TXD	Out	Transmits data.
20	DTR	Out	Indicates that the printer is ready to receive data or not.
11	REV	Out	Connected directly to the DTR signal.
4	RTS	Out	Request to send. Always SPACE level when the printer is powered on. Pulled up to +12 V via 4.7 K Ω resistor.
3	RXD	In	Receives data.
7	Signal GND	-	Signal GND.
1	Chassis GND	-	Chassis GND.
other	NC	-	Not used. Not connected.

*1: In/Out refers to the direction of signal flow from the printer's point of view/.

1.5 Operation Instruction

This section provides information on the FX-980 control panel buttons, LED, and operations. Since the layout and functions of the control panel are mostly common to those of FX-2170, this section only provides the information that is specific to FX-980. For other information, see FX-2170 Service Manual.

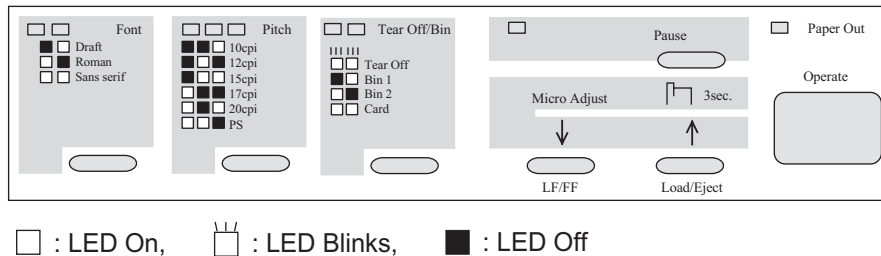


Figure 1-3. Control Panel

□ Operations at power on

Turning on the printer while pressing panel buttons executes the functions shown in the following table.

Table 1-14. Operations at Power On

No.	Buttons	Function
1	Load / Eject	NLQ self test
2	LF / FF	Draft self test
3	Pitch	Default setting (See the following table for the setting menu.)
4	Load / Eject & LF / FF	Data dump
5	Font & Tear Off / Bin	EEPROM clear
6	Tear Off / Bin & LF / FF	Clear EEPROM for Driving Line count for ribbon change timing
7	Pause	Bi-d adjustment
8	Font	Alternates copy mode on and off. When "off" is selected, beeps one time. When "on" is selected, beeps two times. The setting is saved to non-volatile memory.
9	The others	Not available.

Table 1-15. Default Setting Menu

Item	Setting / Value ¹
Character table	Standard version / NLSP version: See Section 1.3 for the character tables available. PC437
International character set for Italic table	Italic U.S.A. , Italic France, Italic Germany, Italic U.K., Italic Denmark 1, Italic Sweden, Italic Italy, Italic Spain 1
Page length for front tractor	3 inch, 3.5 inch, 4 inch, 5.5 inch, 6 inch, 7 inch, 8 inch, 8.5 inch, 11 inch , 70/6 inch, 12 inch, 14 inch, 17 inch
Page length for rear tractor	3 inch, 3.5 inch, 4 inch, 5.5 inch, 6 inch, 7 inch, 8 inch, 8.5 inch, 11 inch , 70/6 inch, 12 inch, 14 inch, 17 inch
Print direction	Bi-d. , Uni-d.
Software	ESC-P2 , IBM 2380 Plus
I/F mode	Auto , Parallel, Serial, Optional
Auto I/F wait time	10 sec. , 30 sec.
Input buffer	On , Off
Baud rate	19200BPS , 9600BPS, 4800BPS, 2400 BPS
Parity	None , Odd, Even, Ignore
Skip over perforation	On, Off
Auto tear off	On, Off
Auto line feed	On, Off
Auto CR (IBM 2380 Plus) ²	On, Off
0 slash	On, Off
Buzzer	On , Off
IBM character table	Table2 , Table 1

*1: Settings with bold weight means the standard factory settings.

*2: This setting is effective when IBM Plus 2380 emulation is selected.

Status code indicated by the LEDs

Table 1-16. Status code indicated by the LEDs

	Pause	Paper Out	Tear Off / Bin	Condensed	Font
Pause	On	---	---	---	---
Paper out	On	On	---	---	---
Paper jam	On	Blink	---	---	---
Head hot	Blink	---	---	---	---
Cover Open	On	---	---	---	---
Micro Adjust	Blink	---	---	---	---
Tear off	---	---	*	---	---
Bin selection	---	---	*	---	---
Pitch selection	---	---	---	*	---
Font selection	---	---	---	---	*
Fatal error	Blink	Blink	Blink	Blink	Blink

*: Varies depending on the selection. (See Figure 1-2.)

Buzzer

Paper out error: Beeper sounds (...) *

Cover Open error: Beeper sounds (...) *

Release lever operation error: Beeper sounds (- - - -) *

Illegal panel operation: Beeper sounds (.) *

* The description (.) and (-) shows how the beeper sounds.

(.): Beeper sounds approx.100 ms and interval is approx. 100 ms.

(-): Beeper sounds approx.500 ms and interval is approx. 100 ms.

1.5.1 Errors

- Paper out:
When the printer fails to feed a sheet, it goes a paper out error.
- Release lever error:
When release lever position is wrong, it goes a release lever error.
- Cover Open error:
When the printer's cover is opened, it goes a release lever error.
- Fatal error:
Carriage control error and Power supply voltage error

1.5.2 Bi-directional Adjustment Function

Bi-directional adjustment can be made for the following three modes.

- High-speed draft mode
- Draft mode
- NLQ mode

1.5.3 EEPROM Initialization

Areas reset by EEPROM clear operation (described in Section 1.3.1) are as shown in the following tables:

Table 1-17. Initialization Area for EEPROM (1/2)

No.	Item	Factory setting
1	Character table selection	PC437
2	Page length (rear tractor)	11 inch
3	Page length (front tractor)	11 inch
4	Page length (CSF Bin 1)	22 inch
5	Page length (CSF Bin 2)	22 inch
6	TOF adjustment value (rear tractor)	8.5 mm
7	TOF adjustment value (front tractor)	8.5 mm
8	TOF adjustment value (CSF Bin 1)	8.5 mm
9	TOF adjustment value (CSF Bin 2)	8.5 mm
10	TOF adjustment value (rear manual insertion)	8.5 mm
11	TOF adjustment value (front manual insertion)	8.5 mm
12	Bottom margin (rear tractor)	11 inch
13	Bottom margin (front tractor)	11 inch
14	Font selection	Roman
15	Pitch selection	10 cpi
16	Copy mode	Off
17	Print direction setting	Bi-D
18	I/F mode selection	Auto
19	Auto I/F wait time setting	10 sec

Table 1-18. Initialization Area for EERPOM (2/2)

No.	Item	Factory setting
20	Auto line feed	Off
21	Auto tear off	Off
21	Skip over perforation	Off
22	High speed draft	On
23	Input buffer	On
24	Software	ESC/P
25	0 slash	Off
26	Buzzer	On
27	Roll paper	Off
28	Auto CR (IBM)	Off
29	Tear-off adjustment value	0 clear
30	Manual insertion wait time	2 or 3 sec.
31	Tear-off wait time	3 sec.
32	Serial baud rate	19200
33	Serial parity	None
34	Paper width measure	On
35	TOF minimum value	4.2 mm
36	I/F timing data	BUSY
37	Paper edge length	0 clear
38	Page length (rear manual insertion)	22 inch
39	Page length (front manual insertion)	22 inch

1.6 Main Components

The main components for the FX-980 are as follows. They are designed for easy disassembly and repair work.

- C276 Main Board
- C166 PSB/PSE / C244 PSH
- C276 PNL Board
- Printer Mechanism
- Housing (upper and lower cases)

1.6.1 C276 Main Board

The C276 Main Board consists of the TMP96C141 CPU, an E05B50 gate array, a PS-RAM, a PROM, and so on.

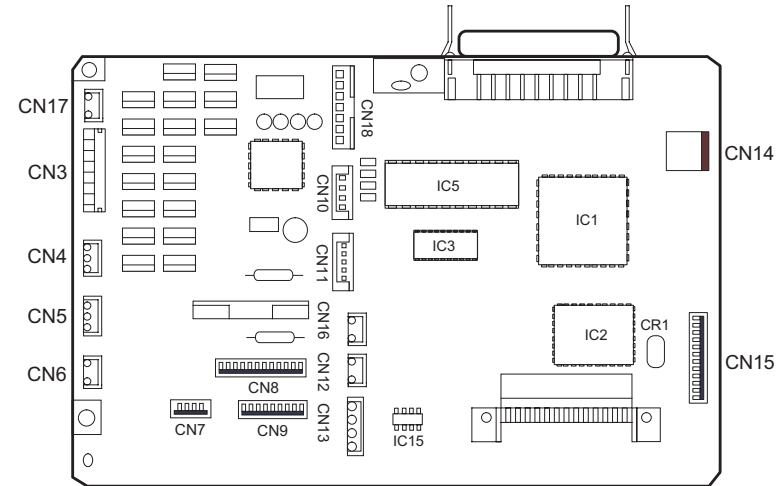


Figure 1-4. C276 Main Board Assembly

1.6.2 C276 PNL Board

This board function is the control panel for the FX-980. It consists of the power switch, six buttons, and the indicator LEDs.

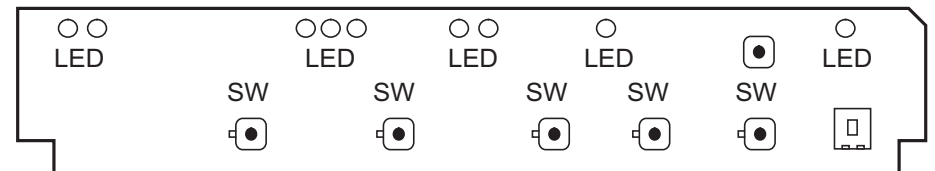


Figure 1-5. C276 PNL Board Assembly

CHAPTER

2

OPERATING PRINCIPLES

2.1 Printer Mechanism Operations

See the LQ-2070 Service Manual.

2.2 Power Supply Operation

See the LQ-2070 Service Manual.

2.3 Control Circuit

The control circuit consists of the C276 Main Board assembly and C276 PNL Board. This section describes the major components and explains how the boards work.

2.3.1 Overview of the Control Circuit Operation

The printer's control circuit includes a TMP96C141 CPU that runs at 19.66 MHz, an E05B50 gate array, a 1M bit PS-RAM (8-bit bus, less than 100ns), a 4M bit PROM (8-bit bus, less than 120ns), and other circuits. It oversees control of all the components in the printer. The following chart shows you a block diagram of the control circuit.

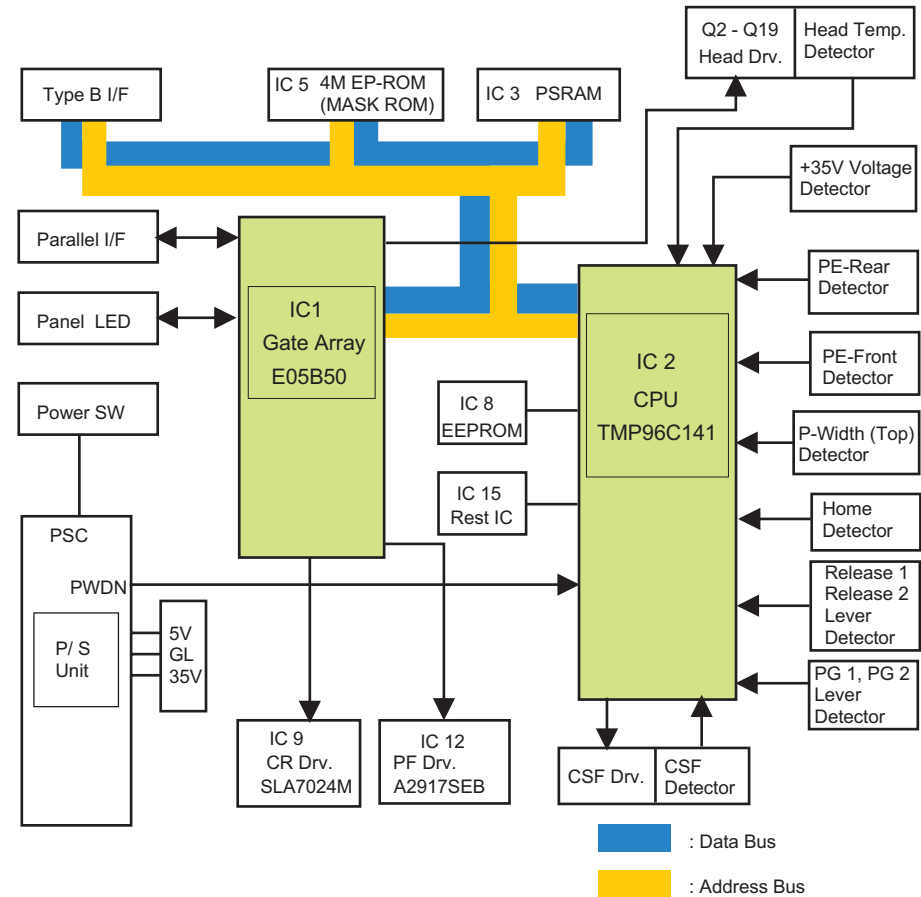


Figure 2-1. Control Circuit Block Diagram

The following figure shows the data flow from the host computer to the printhead. Data sent from the host computer is converted to image data and transmitted to the printhead through the gate array.

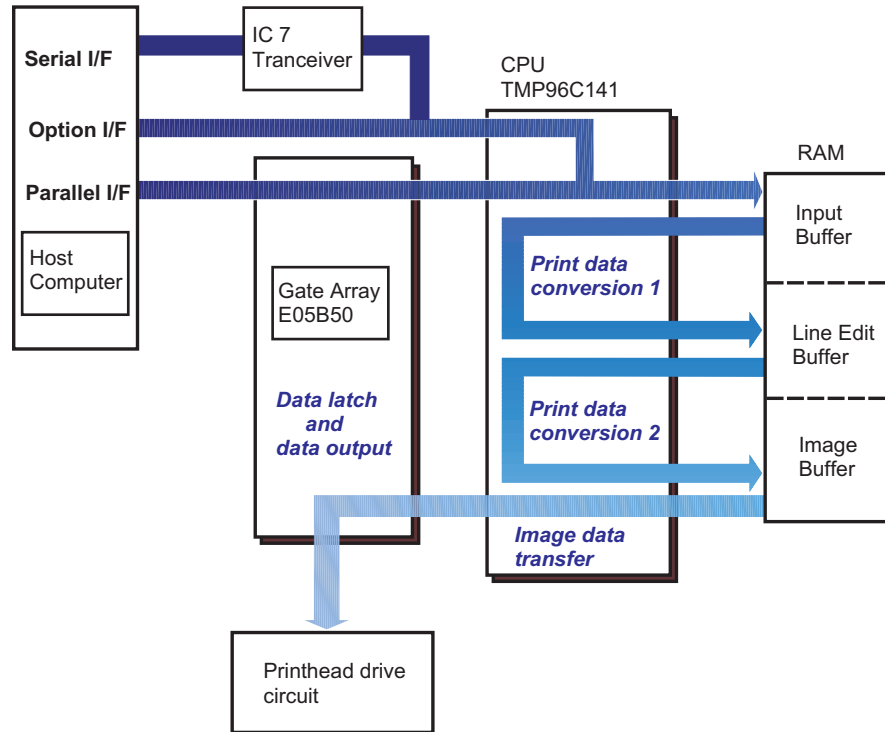


Figure 2-2. Data Flow

The table below lists the each function of the main components of the C276 Main Board.

Table 2-1. Functions of the Main Board

IC	Location	Function
CPU	IC 2	Receives data from the host computer and sends it to the input buffer in RAM (under interrupt processing control). Extends the input data held in the buffer to create image data. Loads this image data to the image buffer in RAM. Transfers the image data to the printhead driver circuit.
Gate Array	IC 1	Controls the functions below: <ul style="list-style-type: none"> • Controls output data from the internal block • Memory management • Address latch of the address/data bus from the CPU • Clock control unit • Bit manipulation • Interface control • Expanded parallel port • Printhead control • Motor control
EEPROM	IC 8	An electrically writable and erasable ROM used to hold such information as the TOF position and bidirectional adjustment value.
ROM	IC 5	The ROM contains the program that runs the CPU and holds the character design (also called the character generator).
RAM	IC 3	The RAM contains the CPU working area and the buffers.
SLA7024M	IC 9	Driver circuit for the CR motor.
A2917SEB	IC 12	Driver circuit for the PF motor.

2.3.2 System Reset Circuit

Control circuits IC1 and IC2 are initialized when a /RESET signal (LOW level) is output from port 5 (VOUT) of IC15. IC15 monitors the +5 V line on port 2, and resets under the following conditions:

1. When the power supply is turned on, a /RESET signal is output. /RESET is canceled when the +5 V line goes up to 4.2 V, and then 100 ms passes.
2. When the +5 V line goes below +4.2 V, a /RESET signal is output. /RESET is canceled when the +5 V line goes back up to 4.2 V and then 100 ms passes.

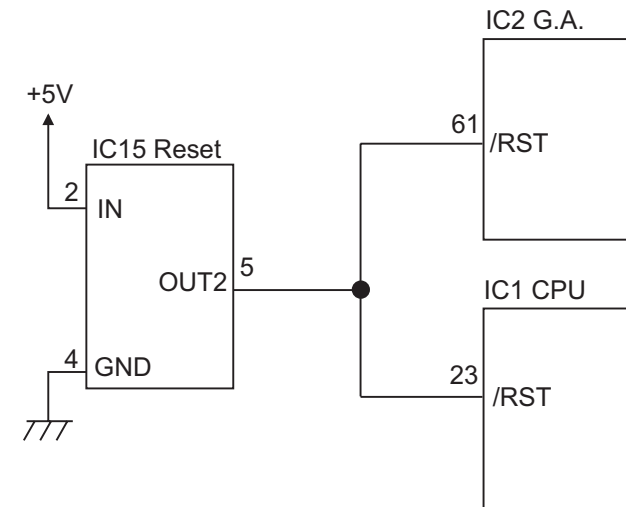


Figure 2-3. Reset Circuit

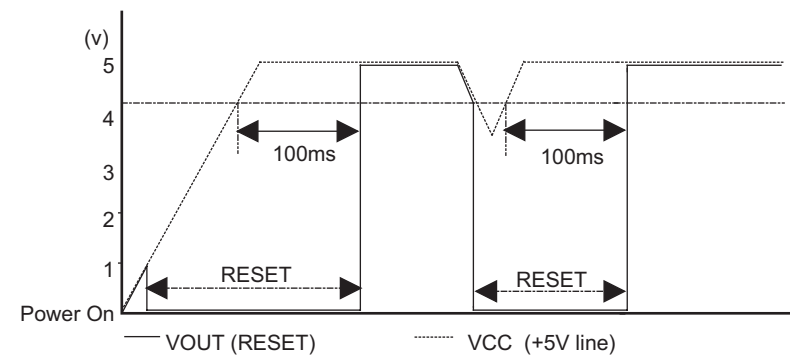


Figure 2-4. Reset Signal Output Timing

2.3.3 Printhead Driver Circuit

The standard voltage for the A/D converter is made in ZD1 and input to CPU port 78. Based on this standard voltage, the A/D converter in the CPU operates. Port 74 monitors the +35 V line between R70 and R71 to determine the printhead driver pulse width. Using the monitored voltage, the CPU converts the voltage to a digital value and decides the printhead driver pulse width, and then transports the data to the gate array via CPU ports 15 and 19. Based on the monitored voltage, the CPU decides the printing interval. Port 73 monitors the printhead temperature to protect the printhead. If the temperature exceeds 107° C (225° F), printing is stopped.

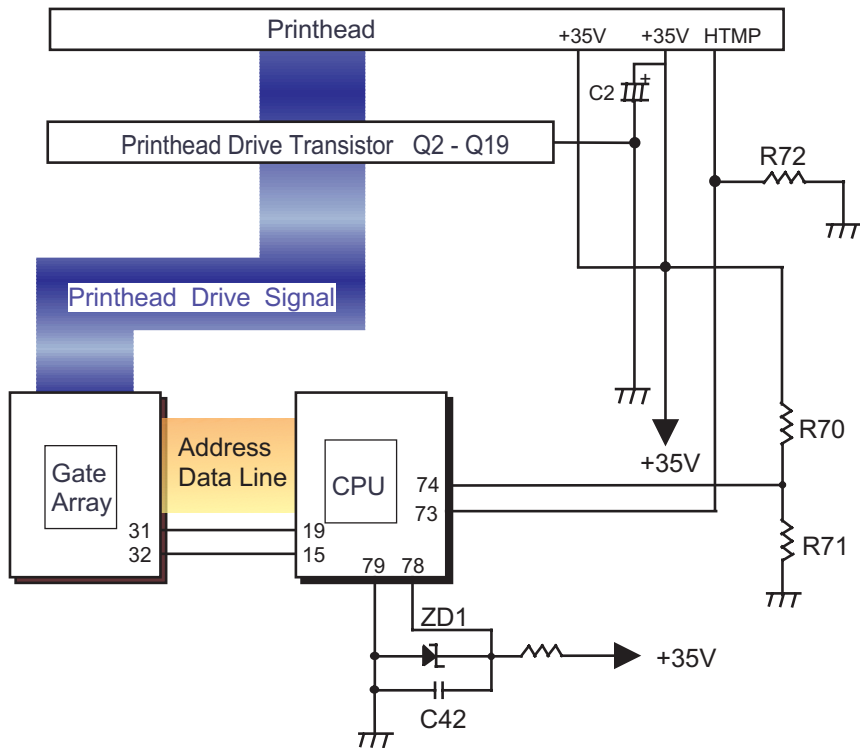


Figure 2-5. Printhead Drive Circuit

2.3.4 CR Motor Driver Circuit

The CR motor driver circuit is shown below.

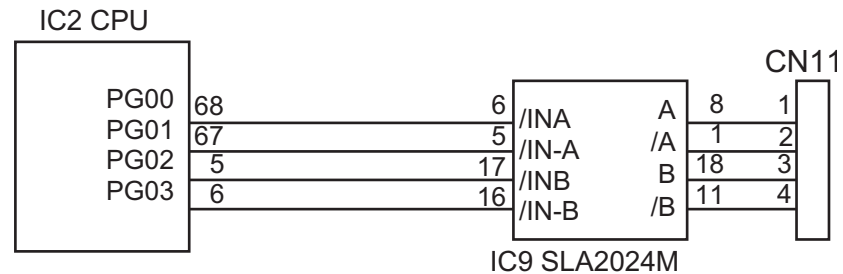


Figure 2-6. CR Motor Driver Circuit

The carriage motor driver circuit controls the CR motor, using an open-loop, constant drive arrangement. 2-2 and 1-2 phases excite the motor. One step of the 2-2 phase switching system corresponds to 2 steps of the 1-2 phase switching system. Ports 1, 8, 11, and 18 of the SLA7024M are used to change the excitation phase, depending on the selected print mode. Table 2-2 on the following page describes the motor driver modes.

The SLA7024M (IC9) CR motor driver circuit detects and regulates the amount of current flowing in the carriage motor coil. The current flowing through the coil varies, depending on the speed of the CR motor. The CPU sets the amount of current via the Address / Data line. Signals are sent via ports 3 (RFA) and 14 (RFB) to the SLA7024M. The SLA7024M sets the coil current, depending on the CR speed.

Table 2-2. CR Motor Driver Modes

Speed Mode	Print Speed (CPS)	Drive Frequency (PPS)	Excitation Phase	Application (See the Remarks.)	Remarks
8/3	507	6080	2-2	HN	H: High speed draft D: Draft L: LQ B: Bit image R: Raster graphics N: Normal C-1: Copy 1 C-2: Copy 2 P: Power down CP: Copy Power down
5/2	475	5700	2-2	HN (12 cpi)	
44/19	440	5280	2-2	HC-1	
2	380	4560	2-2	HC-1 (12cpi), DN, HN (15 cpi)	
16/9	338	4053	2-2	HC-2, H cold mode, HC-2 (12cpi)	
33/19	330	3960	2-2	DC-1, HC-1 (15 cpi), HN (17 cpi)	
3/2	285	3420	2-2	HP, H (12 cpi) cold mode, DC-2, HC-2, (15 cpi), HC-1 (17 cpi)	
4/3	253	6080	1-2	HP (12 cpi), D cold mode, H (15 cpi) cold mode, HN (20 cpi)	
1	190	4560	1-2	HC-1P, HC-2P, HC-1P (12 cpi), HC-2P (12 cpi), DP, LN, HP (15 cpi), HC-2 (17 cpi), H (17 cpi) cold mode, HC-1 (20 cpi), HC-2 (20 cpi)	
33/38	165	3960	1-2	LC-1, HC-1P (15 cpi), HP (17 cpi)	
3/4	143	3420	1-2	LC-2, LC-2P (15 cpi)	
2/3	127	3040	1-2	L cold mode, HC-1P (17 cpi), LN (15 cpi)	
1/2	95	2280	1-2	LP, HC-2 (17 cpi), LC-1 (15 cpi), LC-2 (15 cpi), LN (17 cpi), LN (20 cpi)	
33/76	82	1980	1-2	LC-1 (17 cpi), LC-1 (20 cpi)	
57/152	71	1710	1-2	LC-2 (17 cpi), LC-2 (20 cpi)	
33/152	41	990	1-2	LC1P, LC2P	
77/456		770	1-2	LC1PP (17 cpi), LC2PP (17 cpi)	

2.3.5 PF Motor Driver Circuit

The figure below shows the PF motor driver circuit.

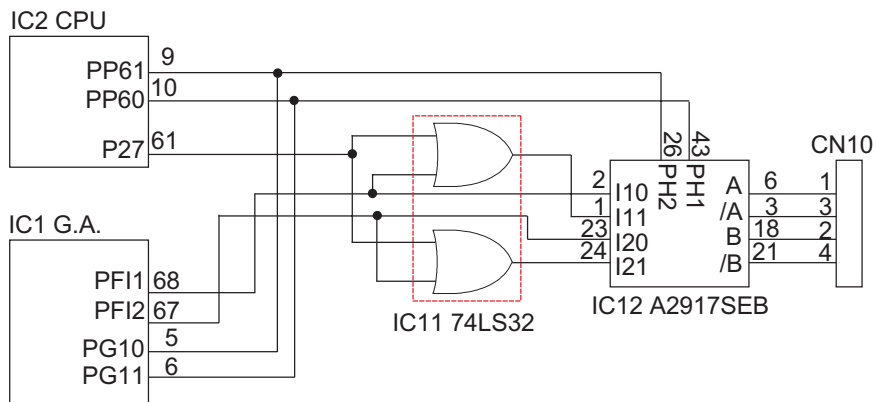


Figure 2-7. PF Motor Driver Circuit

IC 12 driver receives phase data from the CPU and gate array. The PF driver current is controlled by the 74LS32 using port 61 (P27) of IC2. These controlled drive currents are output to ports 2 (I10), 1 (I11), 23 (I20), and 24 (I21) of the A2917SEB.

2.3.6 EEPROM Control Circuit

The EEPROM is nonvolatile memory that stores information even if the printer power is off. The figure below shows the EEPROM control circuit.

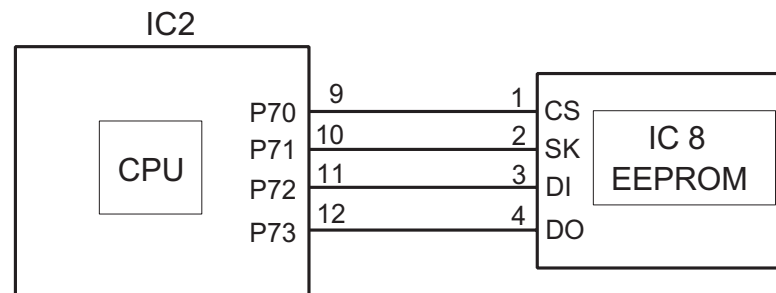


Figure 2-8. EEPROM Control Circuit

The EEPROM is controlled by CPU ports 9 (P70), 10 (P71), 11 (P72), and 12 (P73). Port 11 is the data output line used to save the information to the EEPROM, and port 12 is the data input line used to read the saved data from the EEPROM. Port 70 is the chip select line, and port 71 is the clock timing line. When the PWDN signal (power down) is detected on port 20 (INTO), the CPU writes the necessary data to the EEPROM before the +5 V line drops to 4.75 V.

2.3.7 Sensor Circuit

The CPU detects conditions of the following sensors: home position (HP) sensor, release sensors 1 and 2, platen gap (PG) sensors 1 and 2, rear and front paper end (PE) sensors, paper width (PW) sensor, and cover open sensor.

Two types of sensors are used in this printer. Release sensors 1 and 2, the PG sensors 1 and 2, the front PE sensor, and the cover open sensor are momentary switches.

The other type of sensor is used for the HP sensor, rear PE sensor, and PW sensor, which are photo diode switches. The HP sensor detects CR home position when the photo diode rays are cut off by the printhead.

The rear PE sensor detects that paper has been loaded when the photo diode rays are cut off by the sensor plate, which is included in the rear PE sensor. The PW sensor, used for paper width measurement and paper loading positioning, detects the paper edge by comparing the measured voltage with standard voltage, which was measured during the power on sequence.

Additionally, as mentioned on the page 2-24 (LQ-2070 Service Manual), the +35 V line and head temperatures are monitored to set the pulse length of the head driver signal.

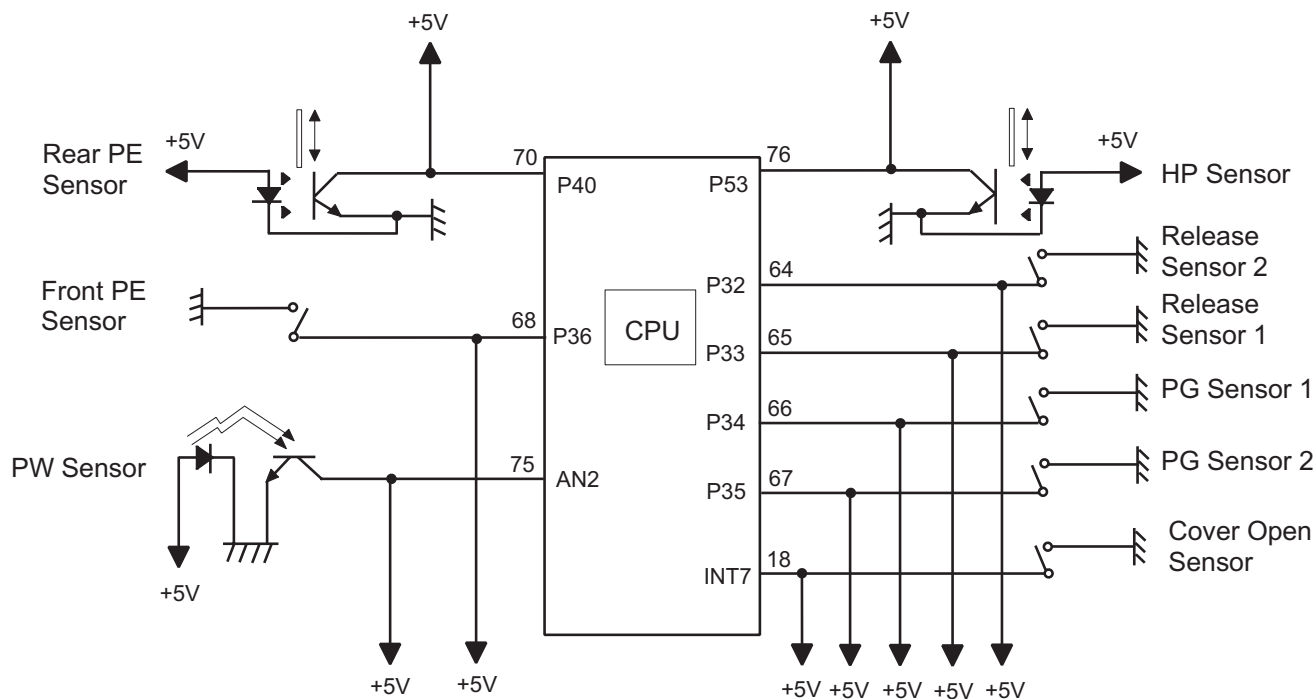


Figure 2-9. Sensor Circuit

CHAPTER

3

DISASSEMBLY AND ASSEMBLY

3.1 Overview

This chapter provides disassembling / assembling procedures for the FX-980. Since the most procedures are common to the FX-2170, this chapter only includes information that is specific to the FX-980.

3.2 Printer Disassembly and Assembly

The assembly procedures to be explained for the FX-980 are as listed below. (Note the heading numbers and figure numbers used in the FX-2170 Service Manual are applied to this chapter.)

- Section 3.2.10 Removing the Printer Mechanism
- Section 3.2.10.3 Removing the Right Frame Assembly
- Section 3.2.10.5 Removing the Left Frame Assembly
- Section 3.2.11 Removing the C276 Main Board Assembly

For other disassembly procedures, see the FX-2170 Service Manual.

3.2.10 Removing the Printer Mechanism

- Changed point:
The printer mechanism and the connector cover are connected with a screw, so the operation for removing the screw (step 3) is added.
1. Remove the rear / front edge guide assembly, front cover, paper eject assembly, rear / front tractor units, and printer cover (see Section 3.2.1).
 2. Remove the panel board assembly (see Section 3.2.2) and upper housing assembly (see Section 3.2.7).
 3. Remove the screw securing the upper connector cover located above the option I/F slot to the printer mechanism.
 4. Remove 4 printer mechanism mounting screws.
 5. Disconnect the following connectors on the C276 Main Board assembly:

CN4 (3-pin, white)	CN5 (3-pin, black)
CN6 (2-pin, white)	CN7 (4-pin white FFC)
CN8 (18-pin, white FFC)	CN9 (16-pin, white FFC)
CN10 (4-pin, blue)	CN11 (5-pin, blue)
CN12 (2-pin, blue)	CN13 (4-pin, black)
CN16 (2-pin, yellow)	

NOTE: Disconnect the cables for CN10 and CN11 after releasing the connector lock by pulling up.

6. Remove the printer mechanism.



Perform the Bi-directional adjustment and TPE reset.
Refer to Chapter 4.

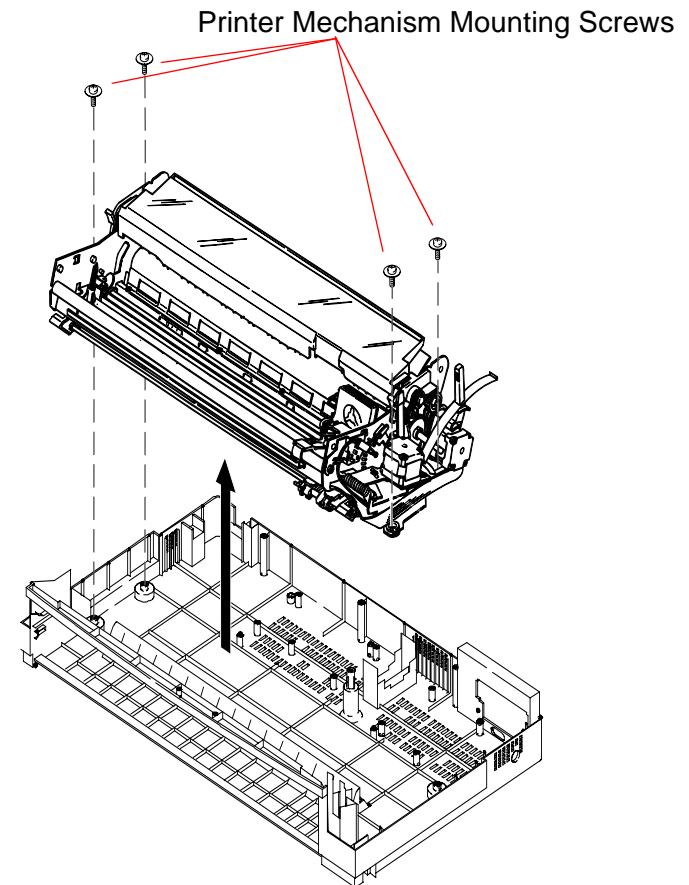


Figure 3-17. Removing the Printer Mechanism



- Notice the connection for cables CN10 and CN11 and align the red colored cable to the pin 1 of the connector.
- The tightening torque for the printer mechanism mounting screw = 0.98 Nm - 1.18 Nm (10 - 12 Kg - cm)

3.2.10.3 Removing the Right Frame Assembly

□ Changed points:

- Step 4 for removing the release sensor 1 is added. (See Figure 3-21 for its location.) In the FX-2170, the release sensor 1 is on the left frame.
- The Hexagon nut standard M7 (step 5) is used instead of the FX-2170's standard M4.

1. Remove the rear / front edge guide assembly, front cover, paper eject assembly, rear / front tractor unit, and the printer cover (see Section 3.2.1).
2. Remove the panel board (see Section 3.2.2) and upper housing assemblies (see Section 3.2.7).
3. Remove the printer mechanism (see Section 3.2.10 in this manual), CR motor assembly (see Section 3.2.9), PF motor (see Section 3.2.10.1), and PG sensor assembly (see Section 3.2.10.2).
4. Remove the release lever sensor 1 from the inner side of the right sub frame.
5. Remove the hexagon nut (standard M7) securing the gap adjustment lever. Then, remove the gap adjust lever from the right frame assembly.
6. Remove 2 CBS screws (3 × 6, F/Zn) securing the platen cover.
7. Remove 3 CBS screws (3 × 6, F/Zn) securing the right frame assembly at the positions illustrated.
8. Remove the right frame assembly.

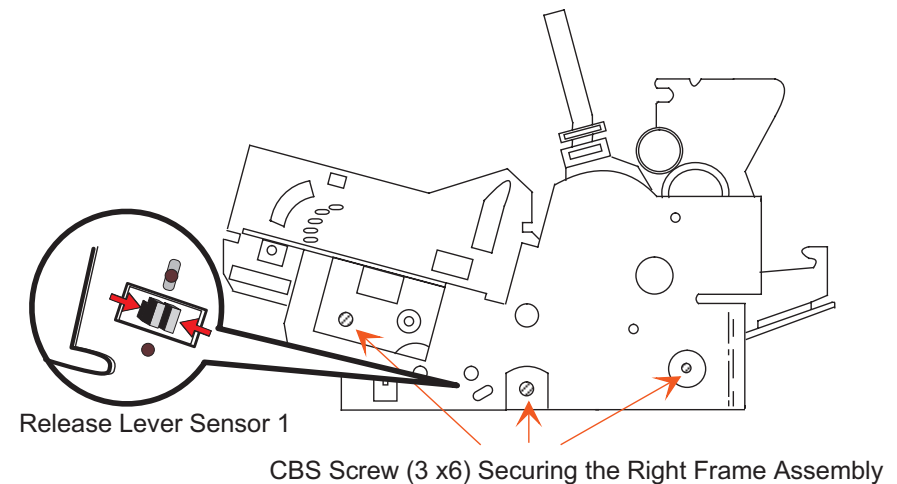


Figure 3-21. Removing the Right Frame Assembly



Perform the platen gap adjustment and the Bi-directional adjustment. (Refer to Chapter 4.)

3.2.10.5 Removing the Left Frame Assembly

□ Changed points:

■ Step 6

There are only two connectors to be disconnected instead of FX-2170's three, because the FX-980 has only one release lever sensor on the left frame.

■ The Hexagon nut standard M7 is used instead of the FX-2170's standard M4.

1. Remove the rear / front edge guide assembly, front cover, paper eject assembly, rear / front tractor unit, and the printer cover.
2. Remove the panel board assembly (see Section 3.2.2), upper housing assemblies (see Section 3.2.7), and then remove the printer mechanism (see Section 3.2.10 in this manual).
3. Remove 2 CBS screws (3 × 6, F/Zn) securing the platen cover.
4. Remove the hexagon nut (standard M7) securing the front CR guide and left frame.
5. Remove 4 CBS screws (3 × 6, F/Zn) securing the left frame assembly.
6. Disconnect the connector cable (blue) from the release lever sensor, and then disconnect the connector cable from the HP sensor.
7. Remove the left frame assembly.



Adjust the platen gap and Bi-D adjustment. (Refer to Chapter 5.)



- The tightening torque for the CBS screw (3 × 6, F/Zn) = 0.78 to 0.98 Nm (8 - 10 Kgf - cm)
- The tightening torque for the hexagon nut (standard M7) = 1.18 - 1.37Nm (12 - 14 Kgf - cm)

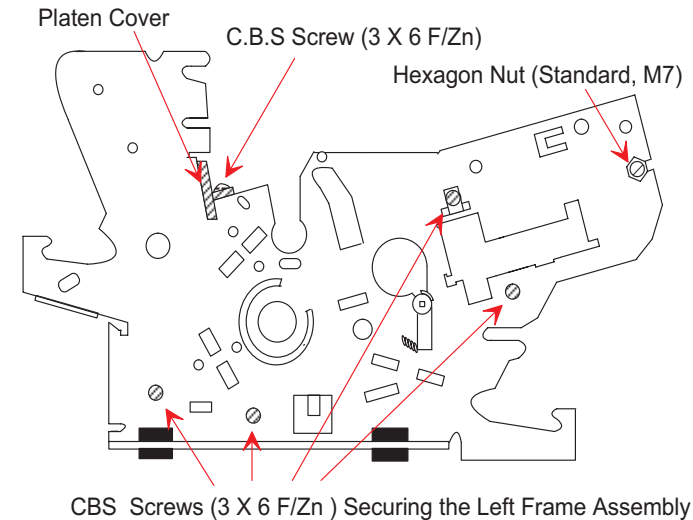


Figure 3-26. Removing the Left Frame Assembly

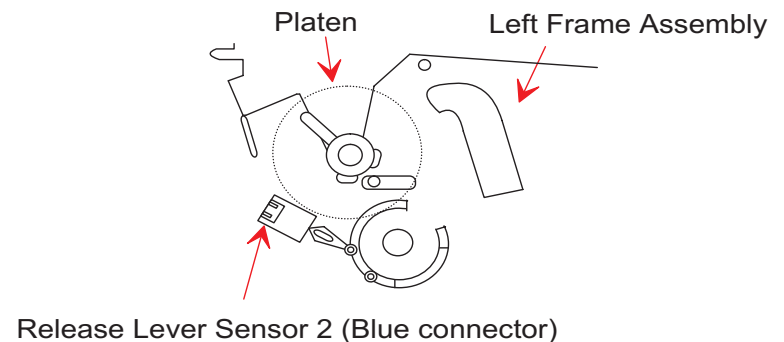


Figure 3-27. Release Lever Sensor

3.2.11 Removing the C276 Main Board Assembly

□ Changed points:

- The C276 Main Board in the FX-980 can be removed without removing the I/F cage, so the operation for removing the cage is eliminated.
- Step 5 (I/F cover removal) is added. (This operation is not new but omitted in the FX-2170 Service Manual.)

1. Remove the rear / front edge guide assembly, front cover, paper eject assembly, rear / front tractor unit, and printer cover (see Section 3.2.1).
2. Remove the panel board (see Section 3.2.2).
3. Disconnect the following connectors from the C276 Main Board assembly.

CN3 (10-pin, white)	CN4 (3-pin, white)
CN5 (3-pin, black)	CN6 (2-pin, white)
CN7 (4-pin white FFC)	CN8 (18-pin, white FFC)
CN9 (16-pin, white FFC)	CN10 (4-pin, blue)
CN11 (5-pin, blue)	CN12 (2-pin, blue)
CN13 (4-pin, black)	CN15 (22-pin, FFC)
CN16 (2-pin, yellow)	

NOTE: Disconnect the cables for CN10 and CN11 after releasing the connector lock.

NOTE: Disconnect the cable for CN3 by pushing down the connector lock.

4. Remove the 3 CBS screws (3 x 12, F/Zn) securing the upper connector cover.

5. Remove the 2 screws securing the I/F cover and remove the I/F cover.
6. Remove the 5 CBB screws (3 x 12, F/Zn) and 1 CBC lamitite screw (3 x 8, F/Zn) securing the C276 Main Board assembly to the lower housing assembly.
7. Remove the C276 Main Board.

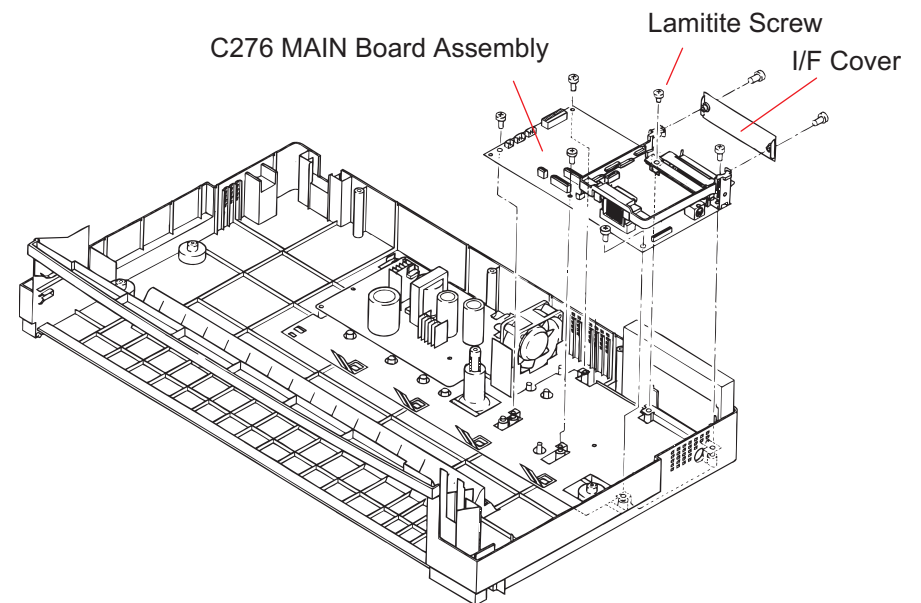


Figure 3-37. Removing the C276 Main Board Assembly



If you replace the main board, perform the Bi-directional adjustment and run the default setting program.



- Notice the location of the CBC lamitite screw (3 x 8, F/Zn). Refer to Figure 3-37 on the previous page.
- Lock CN10 and CN11 by pushing down each connector's lock after inserting the connector cable.
- The tightening torque for the CBB (3 x 12, F/Zn) screw and CBB (3 x 8, F/Zn) = 0.78 - 0.98 Nm (8 - 10 Kgf - cm)

CHAPTER

4

ADJUSTMENT

4.1 Overview

The adjustment items required for the FX-980 are the same as for the FX-2170. Therefore, see Table 4-1 in the FX-2170 Service Manual and perform any necessary adjustment after disassembling/assembling the printer.

CAUTION



Though the conditions for each adjustment are the same as for the FX-2170, the adjustment program used for the FX-980 is different. Therefore, observe the instructions given in the following sections.

4.1.1 Pre-operation for the Adjustment Program

1. Load continuous paper. (80-column paper should be used to avoid printing on the platen.)

CAUTION



- Do not use cut sheet for the Bi-D adjustment. Since the Bi-D adjustment has to be performed with the top and bottom edges of the sheet firmly set in the paper path, use of cut sheet will not provide accurate adjustment.
- Use single continuous paper.
- Adjustment program for serial dot matrix printer does not run without any paper loaded. So, be sure to turn the printer on first and then load paper.

2. Set the release lever to the continuous paper position.
3. Connect the printer and the PC and turn the printer on.
4. Press the Load/Eject button to send the paper to the stand-by position. Then press the LF/FF button more than 10 times until the leading edge of the paper is completely out of the printer.

NOTE: If you omit this operation, the printer will perform Uni-D print instead of Bi-D.

5. Double-click "LQSERIES.EXE". The program starts up and the screen below appears.

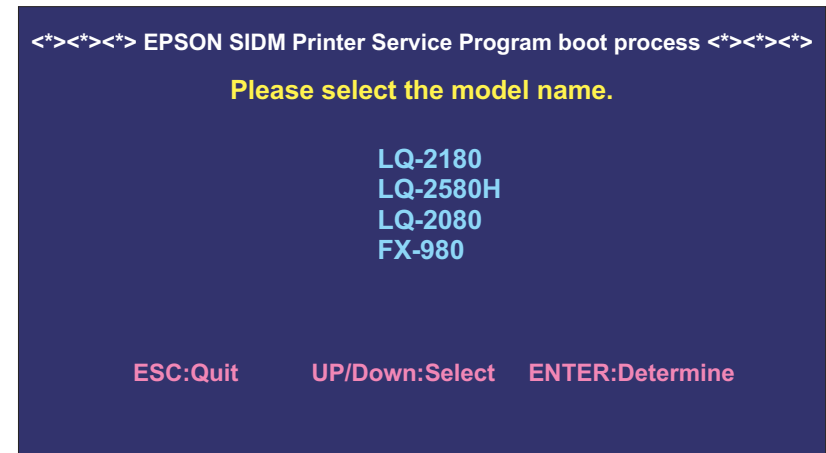


Figure 4-1. LQSERIES.EXE Initial Screen

6. Move the cursor to "FX-980" and press the Enter key.
7. The following screen appears.

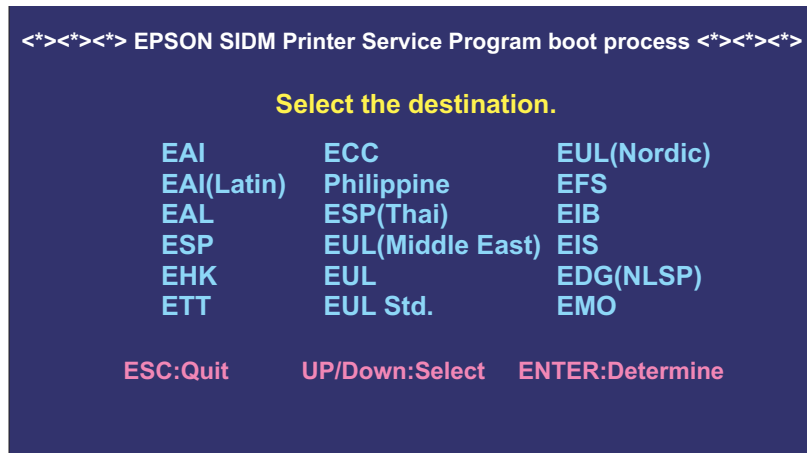


Figure 4-2. Destination Selection Screen

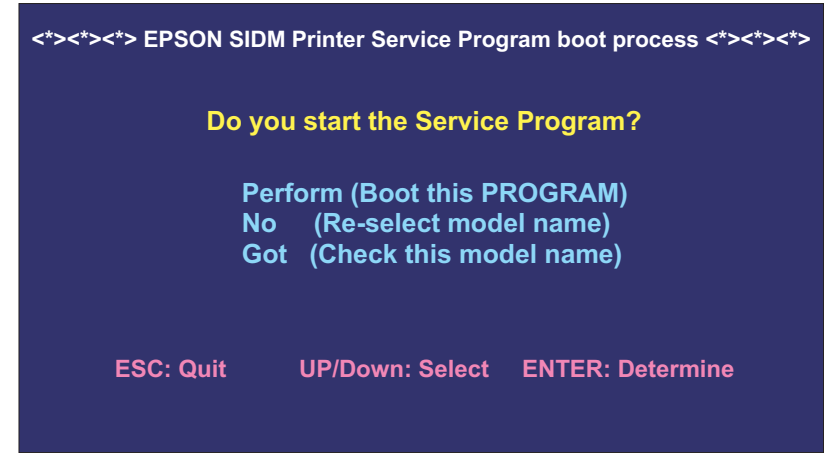


Figure 4-3. Main Menu Selection Screen

8. Check the printer to be adjusted for the destination and press the Enter key.

10. Select "Perform". The following screen appears.



Be sure to select a proper destination. If you select a wrong destination, the printer may not print desirable characters.



- Select "No" if you have input a wrong model name in the screen shown in Figure 4-1.
- If you select "Got", the printer flashes the model name stored in the RAM to the EEPROM once and reads it again.

9. The following screen appears.



Figure 4-4. Main Menu Screen

4.1.2 Bi-D Adjustment

This adjustment is made after the main board or the CR motor has been replaced. The purpose of this adjustment is to electrically correct the head wire's point of impact during Bi-D printing. The adjusted value is stored in the specific address in the EEPROM. Once the value is stored, it will not be erased if the printer is turned off or the EEPROM is reset.

CAUTION If the printer is in the emulation mode, characters output for the Bi-D adjustment will be garbled. If so, turn ESC/P2 on using the EEPROM Initialization mode.

1. Perform the pre-operation. (See Section 4.1.1.)
2. Select "1. Bi-D Adjustment". The following screen appears.

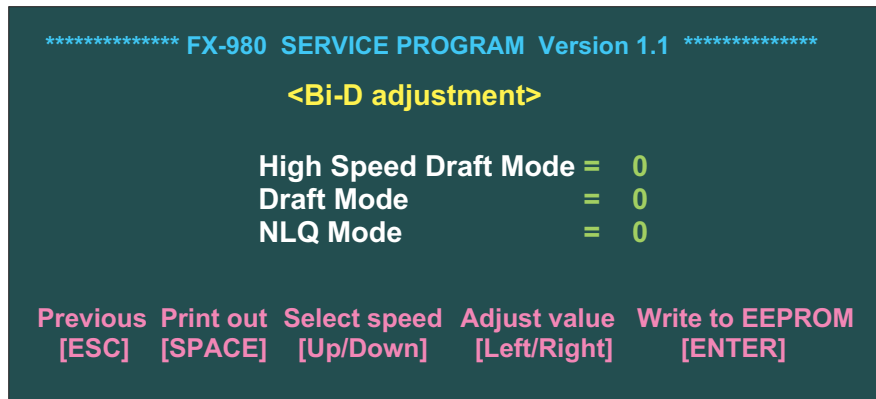


Figure 4-5. Initial Menu of the Bi-D Adjustment

3. Press the Space key to check the current Bi-D setting condition for the High speed draft mode. The printer prints the following pattern.



- The value "0" shown in the screen shown in Figure 4-5 is the initial value used in the program, which varies from the one stored in the EEPROM. However, if the main board has been replaced, the value in the EEPROM is replaced with "0" as the initial value.
- The printing pattern below is a sample for the high speed mode. Be sure to perform the adjustment in draft copy mode and LQ mode as well.

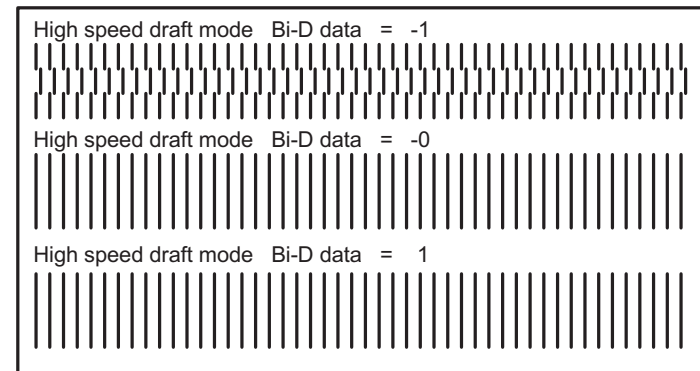


Figure 4-6. Bi-D Pattern Sample

4. Output the patterns for the Draft Mode and the NLQ Mode, the rest of the three modes in the screen (Figure 4-5). Then check that the vertical lines in the middle row for each mode are aligned. (If no adjustment is needed, you can turn the printer off, not continuing to the next step.)
5. Examine the patterns for the three modes output in the previous steps, and correct the value in the screen shown in Figure 4-5 until the vertical lines for the center value (Data = 0 in Figure 4-6) are aligned.

- When this adjustment is completed, if you need to perform another adjustment using this program, you can continue without turning off the printer.

4.1.3 TPE Level Reset

Make this adjustment when the main board or Top PE Sensor has been replaced. Generally, light level emitted from the photo diode in a photo sensor lowers with age. For this reason, the printer renews the current paper remaining level by detecting the black level of the platen each time the printer is turned on or paper is fed. When the TPE level is reset, FF is written and it approaches 00 as the time goes by. If this operation is not performed, paper out condition may be detected despite paper is set.

- Perform the pre-operation. (See Section 4.1.1.)
- Select “TPE Reset” in the main menu screen (Figure 4-4) and press the Enter key. The screen below appears.

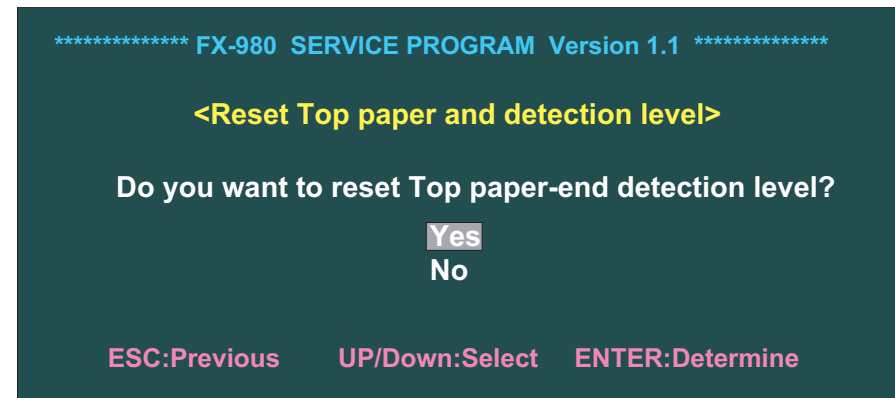


Figure 4-7. Screen - TPE Reset

- Select “Yes” and press the Enter key. FF is written in EEPROM when the printer power is turned off.

4.1.4 Writing the User-characteristic Data

Use this function to check the specific records of the printer used by your customer. Also, you can renew the starting date using this program. Since there is no standardized service operation using this function, you can use it whenever necessary.

1. Perform the pre-operation. (See Section 4.1.1.)
2. Select “Set or Reply Starting Date” and press the Enter key. The screen below appears.



When using this function, the printer must be in the normally operative condition. Make sure the printer is free from any error conditions such as paper out, fatal error, and so on. Otherwise, the function is not effective.

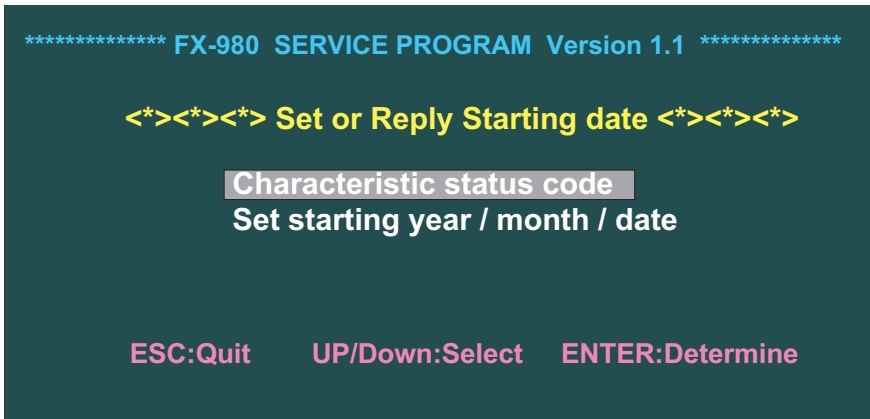


Figure 4-8. Screen - Set or Reply Starting Date

[To check the current status]

3. Select “Characteristic Status Code” and press the Enter key. The following screen appears.

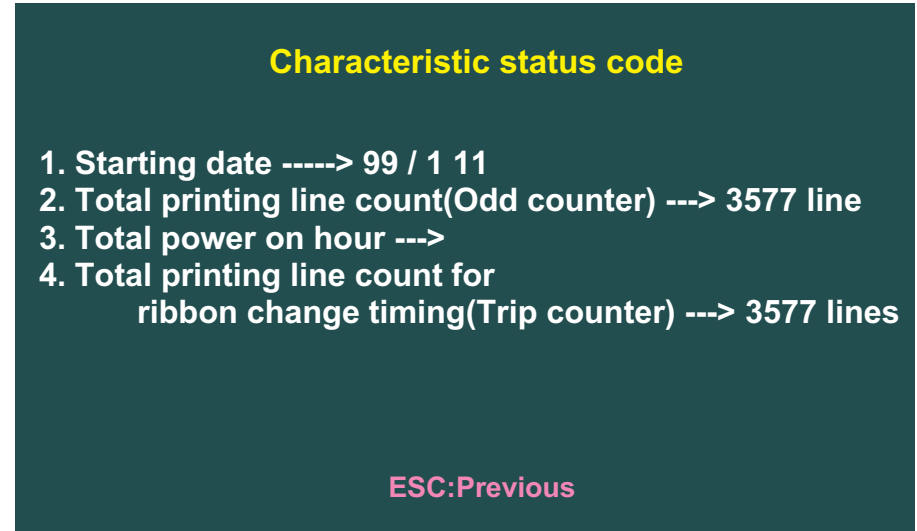


Figure 4-9. Screen - Characteristic Status Code

[To renew the Starting Year / Month / Date]

4. Select “Set Starting year / month / date” and press the Enter key. The following screen appears.

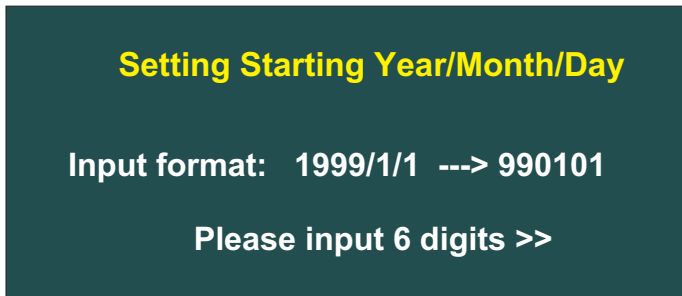


Figure 4-10. Screen - Setting Starting Year / Month / Date

5. Input a 6-digit data. Be sure to input it correctly since this program does not perform comparison check with the system timer. If you input a wrong data, start from the beginning.

CHAPTER

5

TROUBLESHOOTING

5.1 Overview

This chapter contains information necessary for troubleshooting. Like other chapters, this chapter does not include the information common to the FX-2170.

5.2 Troubleshooting Information

This section gives you troubleshooting information to let you test points for replaceable units.

5.2.1 Printhead

See the FX-2170 Service Manual.

5.2.2 Sensors

The information for this section is the same as for the FX-2170 except for the points below:

Table 5-1. Sensor Tests Points

Sensor CN Number	Test Pin Number	Test Method (Set the Meter to the DC Voltage.)	Meter Reading
CN12 (Release sensor 1)	1: Release1 2: GND	Place one lead on pin 1 and the other lead on pin 2, and check the voltage while toggling the sensor lever.	Open: +5 Short: 0V
CN16 (Release sensor 2)	1: Release 2 2: GND	Place one lead on pin 1 and the other lead on pin 2, and check the voltage while toggling the sensor lever.	Open: +5 Short: 0V
CN15 (Case open sensor)	1: COPEN 15: GND	Place one lead on pin 1 and the other lead on pin 15, and check the voltage while toggling the sensor lever.	Open: +5 (Case Open) Short: 0V (Case closed)
Others	See the FX-2170 Service Manual.		

5.2.3 Motors

See the FX-2170 Service Manual.

5.2.4 The Error codes with Indicators and Buzzer

- Error codes indicated by the LEDs

Table 5-2. Error Indication by LEDs

	Pause	Paper Out	Tear Off / Bin	Condensed	Font
Paper out	On	On	---	---	---
Paper jam	On	Blink	---	---	---
Head hot	Blink	---	---	---	---
Cover Open	On	---	---	---	---
Fatal error	Blink	Blink	Blink	Blink	Blink

- Buzzer

Paper out error: Beeper sounds (...) *

Cover Open error: Beeper sounds (...) *

Release lever operation error: Beeper sounds (- - - -) *

Illegal panel operation: Beeper sounds (.) *

* The description (.) and (-) shows how the beeper sounds.
 (.): Beeper sounds approx. 100 ms and interval is approx. 100 ms.
 (-): Beeper sounds approx. 500 ms and interval is approx. 100 ms.

5.3 Unit Level Troubleshooting

The information for this section is the same as for the FX-2170 except for the point below:

- Point: Main board number

<FX-2170>	<FX-980>
C166 Main Board	→ C276 Main Board

5.4 Repairing the C166 PSB/PSE Board

See LQ-2070 Service Manual.

5.5 Repairing the C276 Main Board

This section provides instructions to repair the C276 Main Board assembly. It describes various problems, symptoms, likely causes, and solutions. The checkpoint column provides proper waveforms, resistance values, and other information for each component of C276 Main Board.

NOTE: This information is necessary only for servicers who repair to the component level. Servicers who repair to the unit level (including all servicers in the U.S.) can ignore this section.

Table 5-3. Repairing the C276 Main Board (1/3)

Problem	Cause	Checkpoint	Solution
The printer does not operate at all.	Reset IC15 is defective.	Check the voltage waveforms of the VCC signal (CH1: IC15 pin 2) and VOUT signal (CH2: IC15 pin 5) when power is turned on. 	Replace IC15.
	The PROM (IC5) is not selected.	Check for a change in the signal from HIGH/LOW at pin 24 of IC5. 	Replace IC5 (or replace the main board).
	The PSRAM (IC3)	Check for a change in the signal from HIGH/LOW at pin 22 of the IC3.	Replace IC2 (or replace the main board).

Table 5-4. Repairing the C276 Main Board (2/3)

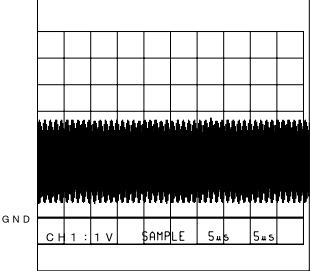
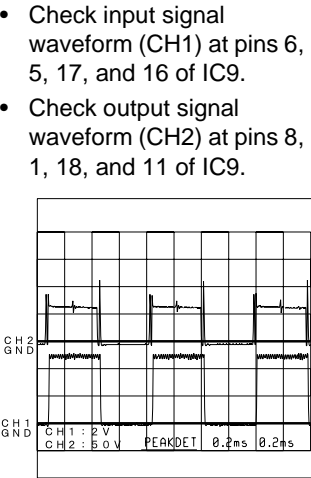
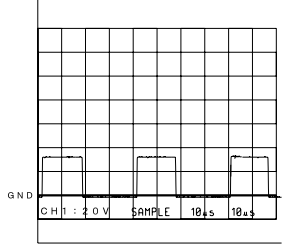
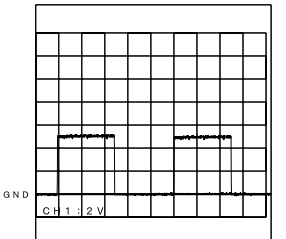
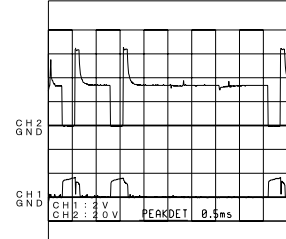
Problem	Cause	Checkpoint	Solution
The printer does not operate at all.	CR1 is defective.	Check the oscillator signal at pins 1 or 3 of the CR1. 	If the signal is not correct, replace the CR1 (or replace the main board). Otherwise, replace IC2.
Carriage operation is abnormal.	IC9 or IC2 is defective.	<ul style="list-style-type: none"> Check input signal waveform (CH1) at pins 6, 5, 17, and 16 of IC9. Check output signal waveform (CH2) at pins 8, 1, 18, and 11 of IC9. 	If the input signal is not correct, replace IC2 (or replace the main board). If the output signal is not correct, replace IC9.

Table 5-5. Repairing the C276 Main Board (3/3)

Problem	Cause	Checkpoint	Solution
Paper feed is abnormal.	IC1 is defective. IC12 is defective.	<ul style="list-style-type: none"> Check input signal waveform at pins 1, 2, 23, and 24 of IC12. Check output signal waveform at pins 6, 3, 18, and 21 of IC12. 	If the input signal is not correct, replace IC1 or IC2. If the input signal is correct and the output signal is not correct, replace the IC12.
No data is printed.	IC2 is defective.	Check the output signal waveform at pins 31 and 32. 	If this signal is not output, replace IC2.
A particular dot fails to print.	IC1 is defective or one of the head drive transistors is defective (Q2 - Q19).	<ul style="list-style-type: none"> Check the voltage waveform (CH1) at port HD1 - HD18 of IC1. Check the voltage waveform (CH2) at the collector or emitter side of each transistor. 	If the head drive signal is not output, replace IC1 (or replace the main board). If the head drive signal is output, replace the head drive transistor.

5.6 Repairing the Printer Mechanism

See the FX-2170 Service Manual.

CHAPTER

6

MAINTENANCE

See the FX-2170 Service Manual.

CHAPTER

7

APPENDIX

7.1 EEPROM Address Map

This chapter provides EEPROM Address Map for FX-980 and component layouts and circuit diagram for the C276 Main Board.

NOTE: The data of two or more bytes are assigned in such as lower byte to lower address, higher byte to higher address.

Table 7-1. EEPROM Address Map (1/7)

Address	Data	Data Format	Q-pit data	Factory setting
00H, 01H	(reserved)		0000H	0000H
Area 1				
02H, 03H	Character table selection	0: PC437 19:ISO 8859-7 1: PC850 20:MAZOWIA 2: PC860 21:Code MJK 3: PC863 22:Bulgaria 4: PC865 23:Estonia 5: PC861 24:PC774 6: BRASCII 25:ISO 8859-2 7: Abicomp 26:PC866 LAT 8: ISO Latin 1 27:PC866 UKR 9: Roman 8 28:Hebrew 7 10:PC437 Greek 29:Hebrew 8 11:PC852 30:PC862 12:PC853 31:PCAPTEC 13:PC855 32:PC708 14:PC857 33:PC720 15:(reserved) 34:PCAR864 16:PC866 35:PC858 17:PC869 36:ISO 8859-15 18:ISO Latin 1T 37:Italic U.S.A. 41:Italic Denmark I 38:Italic France 42:Italic Sweden 39:Italic Germany 43:Italic Italy 40:Italic U.K. 44:Italic Spain I	0000H	0000H (PC437)

Table 7-2. EEPROM Address Map (2/7)

Address	Data	Data Format	Q-pit data	Factory setting
04H, 05H	Page length for rear tractor	1 to 22 x 432 (by 1/432 inch) 0000H: 11 inch (default)	0000H (11 inch)	0000H (11 inch)
06H, 07H	Page length for front tractor	1 to 22 x 432 (by 1/432 inch) 0000H: 11 inch (default)	0000H (11 inch)	0000H (11 inch)
08H, 09H	Page length for CSF bin 1	1 to 22 x 432 (by 1/432 inch) 0000H: 11 inch (default)	0000H (22 inch)	0000H (22 inch)
0AH, 0BH	Page length for CSF bin 2	1 to 22 x 432 (by 1/432 inch) 0000H: 11 inch (default)	0000H (22 inch)	0000H (22 inch)
0CH, 0DH	TOF adjustment value for rear tractor	-144 to 432 (4.2 mm to 8.5 mm + 1 inch, by 1/432 inch) *	0000H (8.5 mm)	0000H (8.5 mm)
0EH, 0FH	TOF adjustment value for front tractor	-144 to 432 (4.2 mm to 8.5 mm + 1 inch, by 1/432 inch) *	0000H (8.5 mm)	0000H (8.5 mm)
10H, 11H	TOF adjustment value for CSF bin 1	-144 to 432 (4.2 mm to 8.5 mm + 1 inch, by 1/432 inch) *	0000H (8.5 mm)	0000H (8.5 mm)
12H, 13H	TOF adjustment value for CSF bin 2	-144 to 432 (4.2 mm to 8.5 mm + 1 inch, by 1/432 inch) *	0000H (8.5 mm)	0000H (8.5 mm)
14H, 15H	TOF adjustment value for rear manual insertion	-144 to 432 (4.2 mm to 8.5 mm + 1 inch, by 1/432 inch) *	0000H (8.5 mm)	0000H (8.5 mm)
16H, 17H	TOF adjustment value for front manual insertion	-144 to 432 (4.2 mm to 8.5 mm + 1 inch, by 1/432 inch) *	0000H (8.5 mm)	0000H (8.5 mm)
18H, 19H	Bottom margin for rear tractor	1 to 22 x 432 (by 1/432 inch), 0000H: 11inch (default)	0000H (11 inch)	0000H (11 inch)

*: Minimum value depends on the value for 2DH - 2EH.

Table 7-3. EEPROM Address Map (3/7)

Address	Data	Data Format	Q-pit data	Factory setting
1AH, 1BH	Bottom margin for front tractor	1 to 22 x 432 (by 1/432 inch), 0000H: 11inch (default)	0000H (11 inch)	0000H (11 inch)
1CH	Font selection	0: Draft 2: Sans serif 1: Roman	00H (Draft)	00H (Draft)
1DH	Pitch selection	0: 10 cpi 3: 17 cpi 1: 12 cpi 4: 20 cpi 2: 15 cpi 5: Proportional	00H (10 cpi)	00H (10 cpi)
1EH	Copy mode	b0: copy mode 0: Off, 1: On b1: pull tractor check 0: Yes, 1: No b2 to b7: (reserved)	00H	00H
1FH	Print direction setting	0: Bi-d. 1: Uni-d.	00H (Bi-d.)	00H (Bi-d.)
20H	I/F mode selection	0: Auto I/F selection 1: Serial I/F 2: Parallel I/F 3: Type-B I/F	00H (Auto)	00H (Auto)
21H	Auto I/F wait time setting	10:10 sec. 30:30 sec. 00:10 sec. (default)	0AH (10 sec.)	0AH (10 sec.)
22H	Auto line feed Auto tear off Skip over perforation High speed draft Input buffer --- --- ---	b0: Auto line feed 0: Off, 1: On b1: Auto tear off 0: Off, 1: On b2: Skip over perforation 0: Off, 1: On b3: High speed draft 0: On, 1: Off b4: Input buffer 0: On, 1: Off b5 to b7: (reserved)	00H	00H

Table 7-4. EEPROM Address Map (4/7)

Address	Data	Data Format	Q-pit data	Factory setting
23H	Software 0 slash Buzzer --- Auto CR --- --- ---	b0: Software 0: ESC/P, 1: IBM 2380 Plus b1: 0 slash, 0: Off, 1: On b2: Buzzer 0: On, 1: Off b3: (reserved) b4: Auto CR (IBM) 0: Off, 1: On b5 to b7: (reserved)	00H	00H
24H, 25H	Tear-off adjustment value	-128 to +127 (by 1/432 inch)	0000H	0000H
26H	(reserved)		00H	00H
27H	Backup flags 1 Copy mode		00H	00H
28H	Backup flags 2 In tear-off state Bin select	0: Friction Bin 1 or Tractor not Tear off 1: Friction Bin 1 2: Friction Bin 2 3: (reserved) 4: Tractor & Tear off	00H	00H
29H	Panel mask pattern 1	b0: LOAD function b1: EJECT function b2: FONT selection b3: PITCH selection b4: TEAR OFF function b5: BIN selection b6: Draft self test b7: NLQ self test	00H	00H

Table 7-5. EEPROM Address Map (5/7)

Address	Data	Data Format	Q-pit data	Factory setting
2AH	Panel mask pattern 2	b0: LF function b1: FF function b2: Micro Adjust function b3: Pause function b4: Data dump b5: Default setting b6: Bi-d. adjustment b7: Copy mode	00H	00H
2BH	Manual insertion wait time	3 to 30 (by 0.1 sec.), 00H: 2 sec when Normal mode. (same as 3 sec when copy mode. default)	00H (2or3 sec.)	00H (2or3 sec.)
2CH	Tear-off wait time	3 to 30 (by 0.1 sec.), 00H: 3 sec. (default)	00H (3 sec.)	00H (3 sec.)
2DH	Serial baud rate	0: 19200 bps 4: 1200bps 1: 9600 bps 5: 600 bps 2: 4800 bps 6: 300 bps 3: 2400 bps	00H (19200)	00H (19200)
2EH	Serial parity	0: None 2: Odd 1: Even 3: Ignore	00H (None)	00H (None)
2FH	(reserved)		00H	00H
30H-33H	Driving line count for ribbon change timing	0 - 0FFFFFFFH (count)	000000 00H	000000 00H
34H-37H	Driving Hour	0 - 0FFFFFFFH (minutes)	000000 00H	000000 00H
38H-3BH	Driving Line Count	0 - 0FFFFFFFH (count)	000000 00H	000000 00H
3CH	Starting Year	0 - 99 (the last two figures of Anno Domini)	00H	00H
3DH	Starting Month	1 - 12	00H	00H
3EH	Starting Date	1 - 31	00H	00H

Table 7-6. EEPROM Address Map (6/7)

Address	Data	Data Format	Q-pit data	Factory setting
3FH	Black paper mode paper width measure	b0: black paper mode 0: Off, 1: On b1: paper width measure 0: On, 1: Off b2 to b7: (reserved)	00H	00H
40H to 41H	TOF Minimum value	-144 to -72, 0: -72 (4.2 mm) In case that it is bigger than -72, the value is considered -72.	00H	00H
42H	I/F timing data	bit0-3: BUSY timing data bit4-7: XAACK timing data	00H	00H
43H	(complement of 42H)		FFH	FFH
44H to 5DH	(reserved)		00H	00H
5EH, 5FH	Paper edge length		0000H	0000H
60H, 61H	Page length for rear manual insertion	1 to 22 x 432 (by 1/432 inch), 0000H: 22 inch (default)	0000H (22 inch)	0000H (22 inch)
62H, 63H	Page length for front manual insertion	1 to 22 x 432 (by 1/432 inch), 0000H: 22 inch (default)	0000H (22 inch)	0000H (22 inch)
64H to 66H	Sub-number for customization	00H to 09H	000000H (Standard)	000000H (Standard)
67H	(reserved)		00H	00H

Table 7-7. EEPROM Address Map (7/7)

Address	Data	Data Format	Q-pit data	Factory setting
Area 2				
68H	Market	0: Standard version 1: NLSP version	00H	00H
69H	IBM character table	0: Table2 1: Table1	00H	00H
6AH to 6FH	(reserved)		00H	00H
70H	Printable column	0: 136 columns 1: 80 columns	01H	01H
71H	Check sum of Area 2 (68H)		00H	00H
Area 3				
72H	Vp adjustment value		*a)	*a)
73H	Vp adjustment value (complement of 72H)		*a)	*a)
74H	Bi-d adjustment value for high speed draft mode	-12 to +12 (by 1/720 inch)	00H	*a)
75H	Bi-d adjustment value for draft mode	-12 to +12 (by 1/720 inch)	00H	*a)
76H	Bi-d adjustment value for NLQ mode	-12 to +12 (by 1/720 inch)	00H	*a)
77H	(reserved)		00H	00H
78H	TPE level		FFH	FFH
79H	TPE adjustment position	-10 to +10 (by 1/216 inch)	00H	00H
7AH to 7FH	(reserved)		00H	00H

*a) These data are fixed by each printer hardware in the factory. They should not be changed afterwards.

7.2 Connector Summary

The following figure shows how primary components are connected.

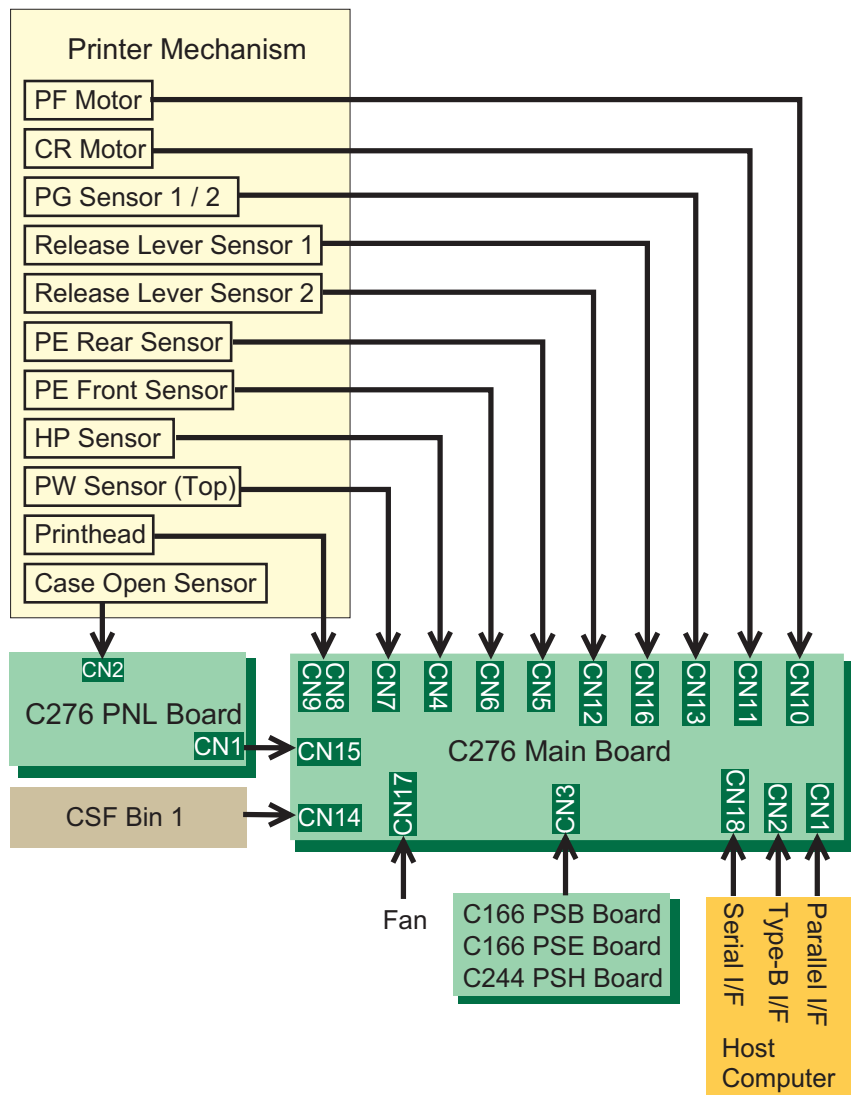


Figure 7-1. Cable Connection

The table below shows the cable alignment of the C276 Main Board.

Table 7-8. C276 Main Board Connection

Board	Connector	Function	Pins
C276 Main Board	CN1	Parallel interface	36
	CN2	Type B interface	36
	CN3	C166 PSB/PSE / C244 PSH assembly	10
	CN4	HP sensor	3
	CN5	Rear PE sensor	3
	CN6	Front PE sensor	2
	CN7	TOP sensor	4
	CN8	Printhead (F)	18
	CN9	Printhead (R)	16
	CN10	PF motor	4
	CN11	CR motor	5
	CN12	Release lever position sensor 1	2
	CN13	PG sensor 1/2	4
	CN14	CSF	10
	CN15	C276 PNL Board assembly	22
	CN16	Release lever position sensor 2	2
	CN17	Fan	2
	CN18	Serial interface	7

The table below provides information of the connector that vary from C166 Main Board used in FX-2170.

Figure 7-2. Connector Pin Assignment (Changed/new items only)

	FX-2170 (C166 Main Board)			FX-980 (C276 Main Board)		
	Connector	Function	Pin assignment	Connector	Function	Pin assignment
1	CN14	CSF	1: A 2: B 3: -A 4: -B 5: HOLD 6: +5V 7: GND 8: GND 9: +35V 10:+35V	CN14	CSF	1: +35V 2: +5V 3: HOLD 4: +35V 5: -A 6: B 7: GND 8: GND 9: A 10:-B
2	CN12	Release lever position	1: RELEASE 1 2: GND 3: RELEASE 2 4: GND	CN12	Release lever sensor 1	1: RELEASE 1 2: GND
				CN16	Release lever sensor 2	1: RELEASE 2 2: GND
3	---	---	---	CN17	Fan	1: PE 2: GND

7.3 Component Layout

Currently unavailable.

Figure 7-3. C276 Main Board Component Layout - Component Side

Currently unavailable.

Figure 7-4. C276 Main Board Component Layout - Soldering Side

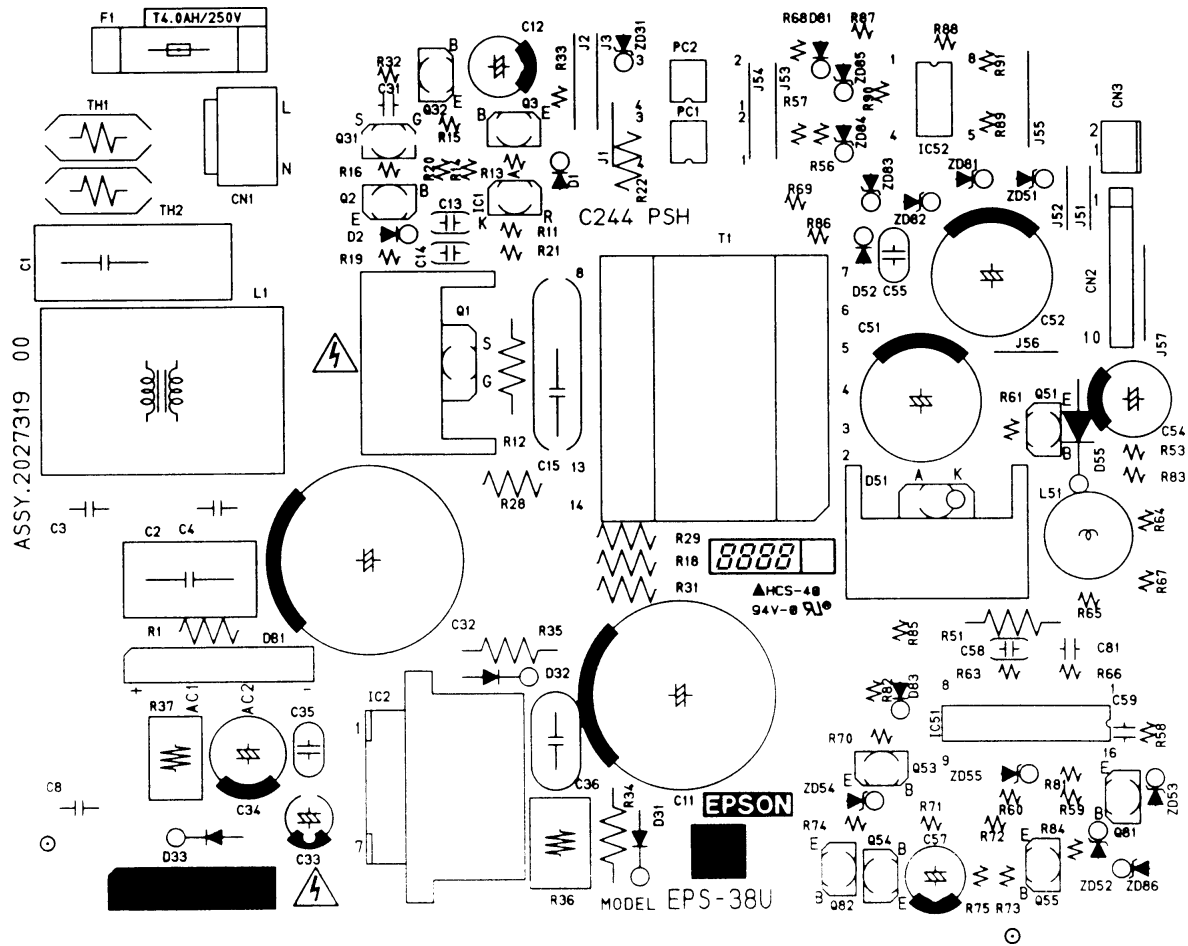
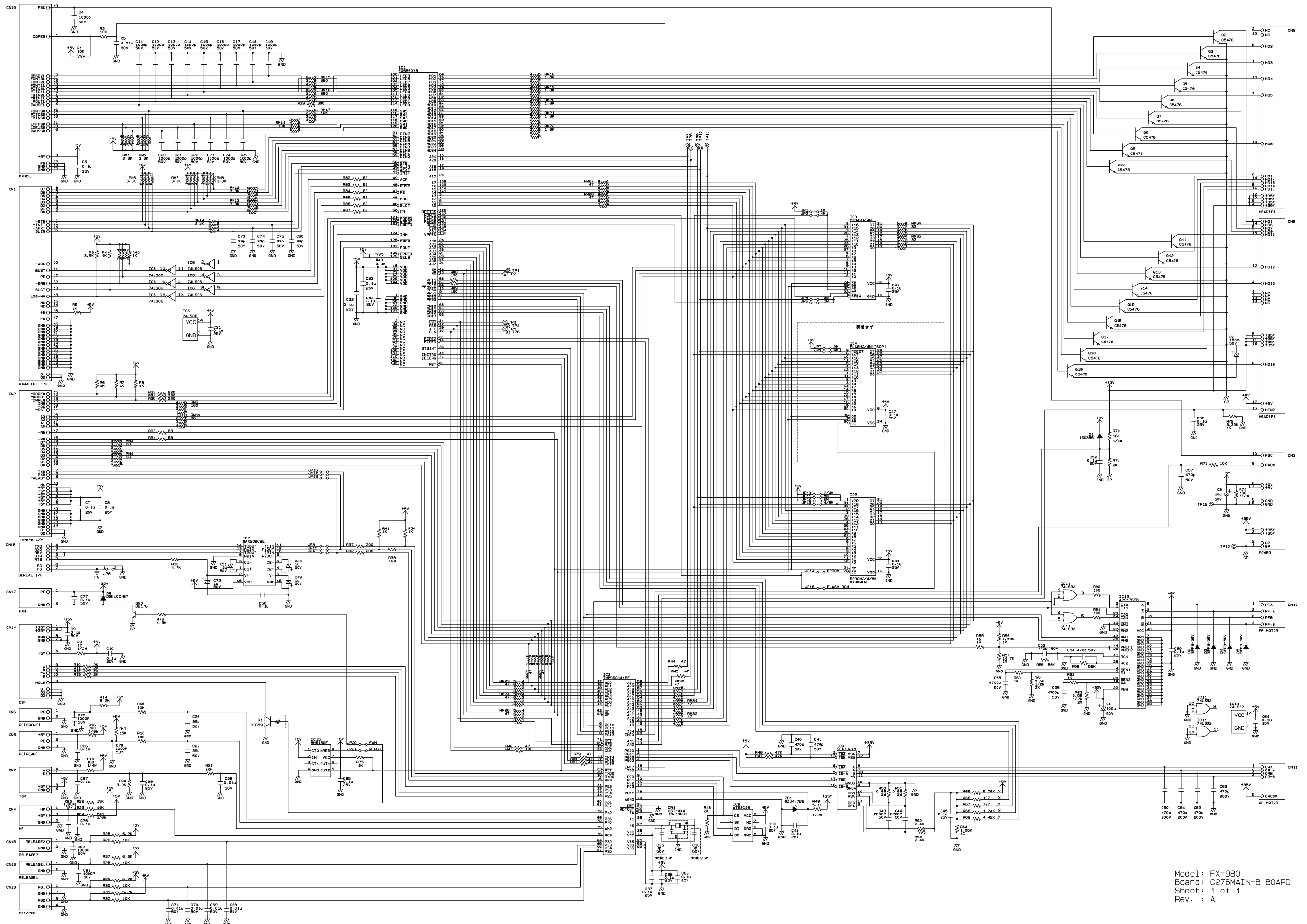


Figure 7-5. C244PSH Board Component Layout

7.4 Circuit Diagrams

See the following pages for the circuit diagrams below:

- C276 Main Board
- C276 PNL Board
- C244 PSH Board



Model: FX-980
 Board: C276MAIN-B BOARD
 Sheet: 1 of 1
 Rev.: A

1

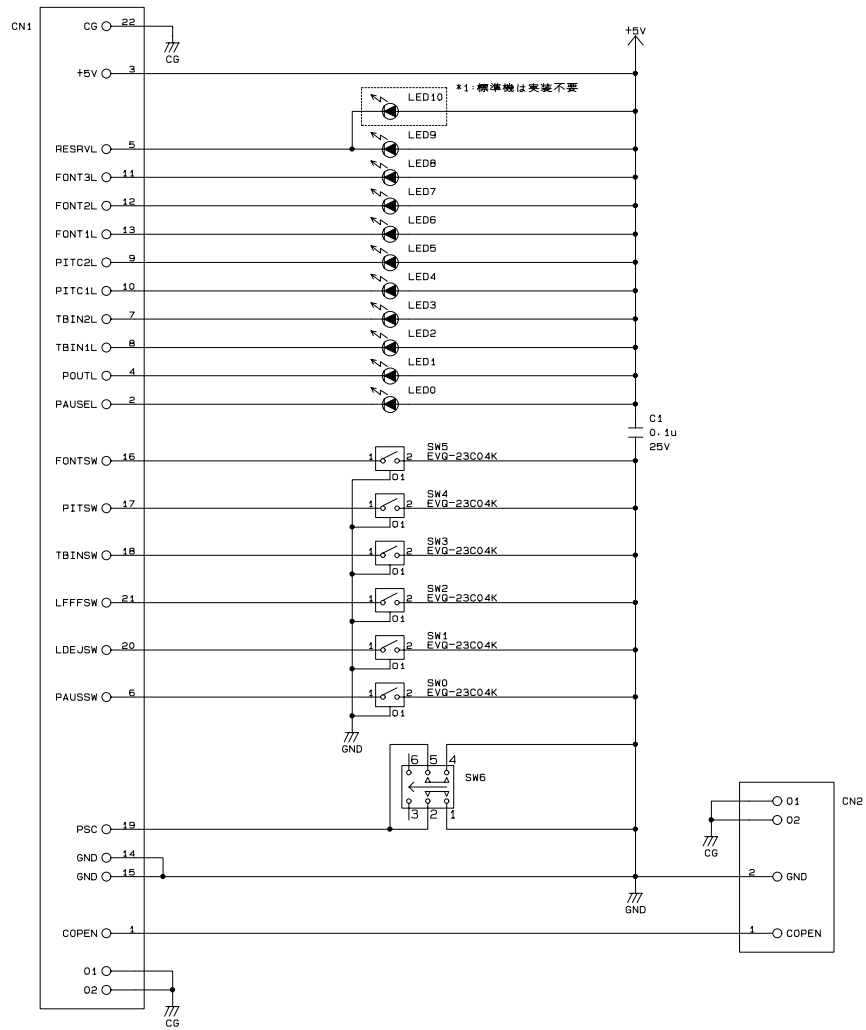
2

3

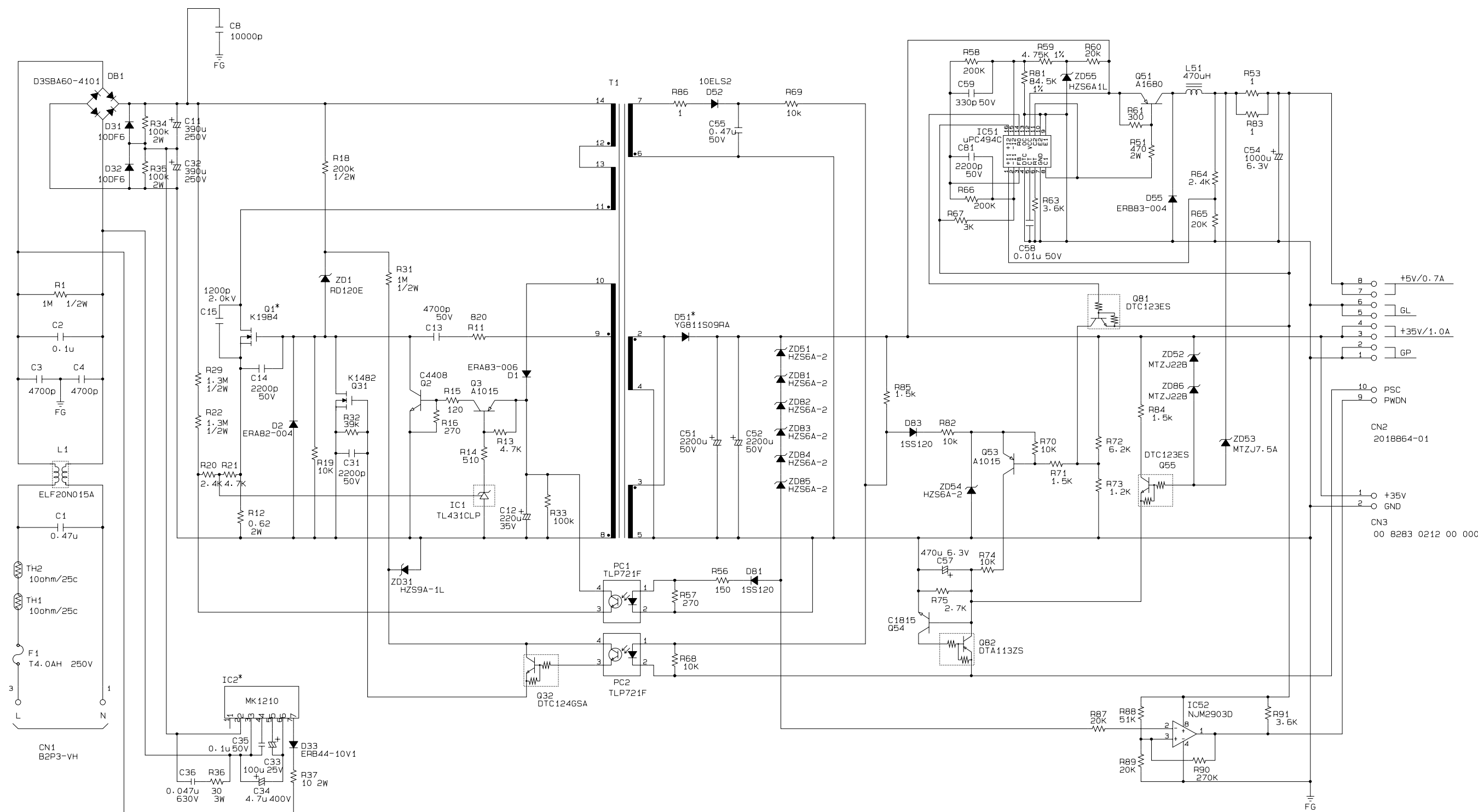
4

5

6



Model: FX-980
 Board: C276PNL BOARD
 Sheet: 1 of 1
 Rev. : A



* : Heat sink (Q1, D51, IC2)

Model : FX-2180
 Board : C244PSH BOARD
 Sheet : 1 of 1
 Rev. : 0