

# EPSON<sup>®</sup>

# LQ-200

# ActionPrinter<sup>™</sup> 3000

## Service Manual

### Revision Level

Revision	Date
1st printing	March 1991

## FCC Compliance Statement For American Users

This equipment has been tested and found to comply with limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**CAUTION: The connection of a nonshielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels that exceed the limits established by the FCC for this equipment. It is the responsibility of the user to obtain and use a shielded equipment interface cable with this device. If this equipment has more than one interface connector, do not leave cables connected to unused interfaces.**

Changes or modifications not expressly approved by Epson America, Inc., could void the user's authority to operate this equipment.

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## Chapter 1      General Description

---

Features .....	1-1
Specifications .....	1-3
Hardware Specifications .....	1-3
Firmware Specifications (ESCYP).....	1-9
Parallel Interface.....	1-14
DIP Switches and Jumpers.....	1-18
DIP Switches.....	1-18
Jumpers .....	1-20
Operating Instructions .....	1-21
SelectType .....	1-21
Self Test .....	1-21
Demonstration .....	1-22
Hexadecimal Dump Function.....	1-23
Bit Image Printing .....	1-24
Error Conditions .....	1-25
Buzzer Operation.....	1-25
Printer Initialization .....	1-26
Default Values.....	1-27
Head Adjust Lever.....	1-28
Printhead Protection During Heavy Duty Printing.....	1-29
Main Components.....	1-29
CO64 MAIN PCB .....	1-30
Control Panel PCB .....	1-30
PEBFIL-II PCB .....	1-31
Transformer .....	1-31
Model 5C10 Printer Mechanism.....	1-32
Housing.....	1-33

## Chapter 2      Principles of Operation

---

Overview .....	2-1
Connector Summary.....	2-1
Overview of Printer Mechanism Operation .....	2-3
Circuit Overview.....	2-7
Firmware Overview .....	2-8
Principles of Operation.....	2-9
Power Supply Circuit .....	2-9
Reset Circuit .....	2-25
Address Decoder and Bank Register .....	2-29
Carriage Operation .....	2-30
Paper Feeding .....	2-43
Printhead.....	2-47
A/D Converter Circuit .....	2-52
Host Interface .....	2-55
Ribbon Feed Mechanism.....	2-56

## Chapter 3 Disassembly and Assembly

---

General Repair Information .....	3-1
Tools .....	3-2
Small Parts .....	3-3
Service Checklist .....	3-5
Disassembly and Assembly .....	3-6
Removing the Printhead .....	3-7
Removing the Case .....	3-8
Removing the Circuit Boards .....	3-11
Removing the Printer Mechanism .....	3-14
Disassembling the Printer Mechanism .....	3-19

## Chapter 4 Adjustment

---

Adjustment Overview .....	4-1
Adjusting the Platen Gap .....	4-1
Adjusting the Bidirectional Printing Alignment .....	4-4
VRI and VR2 Specifications .....	4-5
Adjustment Procedures .....	4-6

## Chapter 5 Troubleshooting

---

Procedure for Troubleshooting the Printer .....	5-1
Unit Replacement .....	5-1
Repair of the Main Board .....	5-10
Repair of the Printer Mechanism .....	5-17

## Chapter 6 Maintenance

---

Preventive Maintenance .....	6-1
Lubrication and Adhesive Application .....	6-1

# Appendix

---

Connector Summary.....	A-1
Circuit Diagrams.....	A-3
Circuit Board Component Layout.....	A-7
Exploded Diagrams.....	A-8
Case Outline Drawings.....	A-12

Subsequent product modifications will be brought to your attention via Service Bulletins. Please revise the text as bulletins are received.

This document is subject to change without notice.

**Note:**

This manual uses minus signs (-) in front of signals to indicate that they are active LOW signals.

# Chapter 1

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## General Description

Features .....	1-1
Specifications .....	1-3
Hardware Specifications .....	1-3
Firmware Specifications (ESCYP).....	1-9
Parallel Interface .....	1-14
DIP Switches and Jumpers.....	1-18
DIP Switches.....	1-18
Jumpers .....	1-20
Operating Instructions .....	1-21
Selectype .....	1-21
Self Test .....	1-21
Demonstration .....	1-22
Hexadecimal Dump Function.....	1-23
Bit Image Printing .....	1-24
Error Conditions .....	1-25
Buzzer Operation.....	1-25
Printer Initialization .....	1-26
Hardware initialization .....	1-26
Software initialization .....	1-26
Default Values .....	1-27
Head Adjust Lever .....	1-28
Printhead Protection During Heavy Duty Printing.....	1-29
Main Components.....	1-29
C064 MAIN PCB .....	1-30
Control Panel PCB .....	1-30
PEBFIL-II PCB .....	1-31
Transformer .....	1-31
Model 5C10 Printer Mechanism.....	1-32
Housing.....	1-33

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## Figures

Figure 1-1.	LQ-200/AP3000 .....	1-2
Figure 1-2.	Pin Configuration.....	1-3
Figure 1-3.	Printable Area for Single Sheet Paper .....	1-5
Figure 1-4.	Printable Area for Continuous Paper .....	1-6
Figure 1-5.	Character Matrix.....	1-13
Figure 1-6.	Data Transmission Timing .....	1-14
Figure 1-7.	Self Test .....	1-21
Figure 1-8.	Demonstration .....	1-22
Figure 1-9.	Hexadecimal Dump .....	1-23
Figure 1-10.	Head Adjust Lever.....	1-28
Figure 1-11.	LQ-200/AP3000 Component Layout. ....	1-29
Figure 1-12.	C064 MAIN PCB .....	1-30
Figure 1-13.	Control Panel PCB .....	1-30
Figure 1-14.	PEBFIL-II PCB.....	1-31

Figure 1-15.	Transformer .....	1-31
Figure 1-16.	Model 5CIO Printer Mechanism .....	1-32
Figure 1-17.	Housing.....	1-33

---

## Tables

Table 1-1.	Optional Units.....	1-2
Table 1-2.	Specifications for Single Sheet Paper .....	1-4
Table 1-3.	Specifications for Continuous Paper.....	1-4
Table 1-4.	Specifications for Labels.....	1-4
Table 1-5.	Built-In Fonts .....	1-9
Table 1-6.	Printing Modes .....	1-11
Table 1-7.	Character Matrix and Character Size.....	1-12
Table 1-8.	Connector Pin Assignments and Signal Functions .....	1-15
Table 1-9.	Handshaking (DCI/DC3) Protocol.....	1-17
Table 1-10.	DIP Switch Set 1 .....	1-18
Table 1-11.	DIP Switch Set 2 .....	1-18
Table 1-12.	International Character Set and Character Table Selection.. ..	1-19
Table 1-13.	Font Selection.....	1-19
Table 1-14.	Page Length Selection .....	1-20
Table 1-15.	Character Pitch Selection .....	1-20
Table 1-16.	Print Density .....	1-24
Table 1-17.	Bit Image Printing.....	1-24
Table 1-18.	Head Adjust Lever.....	1-28

# General Description 1

## Features

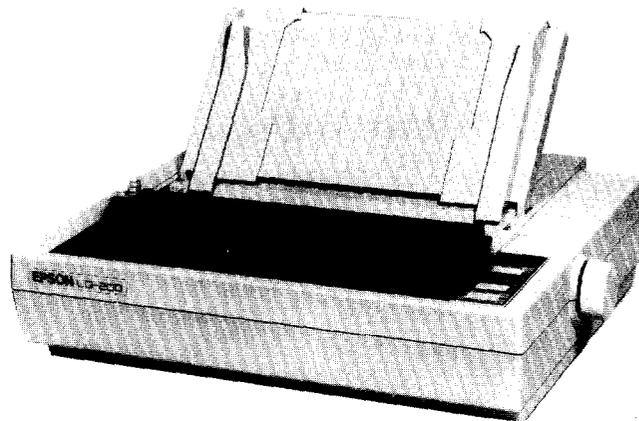
The Epson® LQ-200/ActionPrinter™ 3000 (AP3000) is a small, light-weight, low-cost printer similar to the LQ-500. The printer's main features are:

- Epson ESC/P® code printing, implemented as a standard feature
- These printing speeds: 192 cps (draft, 12 cpi)  
160 cps (draft, 10 cpi)  
64 cps (letter quality, 12 cpi)  
53 cps (letter quality, 10 cpi)
- Clear, easy-to-read printing with standard Epson fonts
- Seven built-in letter quality (LQ) fonts (Roman, Sans Serif, Courier, Prestige, Script, OCR-B, and Orator)
- Direct built-in font selection using control panel buttons
- Automatic loading for single sheet paper
- Two paper slots (rear and bottom)
- Easy handling of single sheet paper with the optional cut sheet feeder (CSF)
- Standard Epson 8-bit parallel interface.

Table 1-1 lists the optional units available for the printer and Figure 1-1 shows the printer.

**Table 1-1. Optional Units**

Model	Description
7341	Cut sheet feeder <b>(CSF)</b>



**Figure 1-1. LQ-200/AP300**

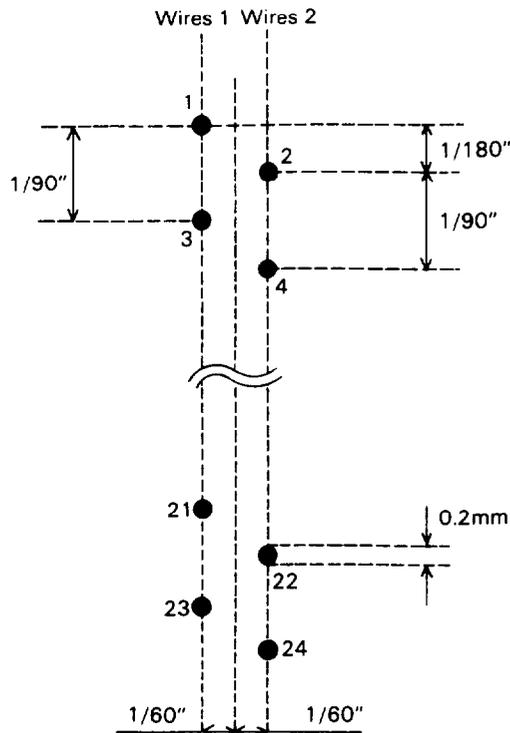
## Specifications

This section provides the specifications for the LQ-200/AP3000.

### Hardware Specifications

Printing Method Serial, impact, dot matrix

Pin Configuration 24 wires; 12 x 2 staggered, diameter 0.008 inches (0.2 mm)



**Figure 1-2. Pin Configuration**

Feeding Methods Friction feed, tractor feed

Line Spacing 1/6 inch or programmable in units of 1/180 inch

Paper Insertion From rear or bottom

Paper Feed Speed 100 ms/line at 1/6-inch line feed  
2.2 inches per second, continuous feed

Paper Specifications See Tables 1-2, 1-3, and 1-4.

**Table 1-2. Specifications for Single Sheet Paper**

<b>Width</b>	7.15 to 10.1 inches (182 to 257 mm)
<b>Length</b>	7.15 to 14.3 inches (182 to 364 mm)
<b>Thickness</b>	0.0025 to 0.004 inches (0.065 to 0.1 mm)
<b>Weight</b>	14 to 22 lb (52 to 82 g/m <sup>2</sup> )
<b>Quality</b>	Standard paper
<b>Copies</b>	Not available

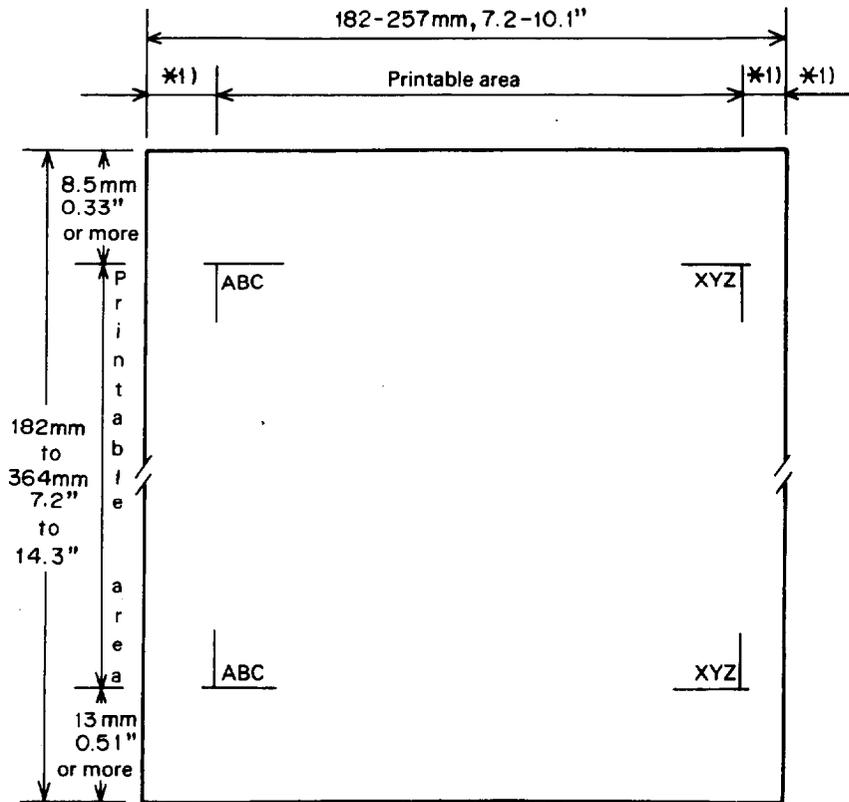
**Table 1-3. Specifications for Continuous Paper**

<b>Width</b>	4.0 to 10.0 inches (101 to 254 mm)
<b>Copies</b>	Three sheets maximum (one original and two copies)
<b>Quality</b>	Standard paper
<b>Total Thickness</b>	0.0025 to 0.01 inches (0.065 to 0.25 mm)
<b>Weight</b>	One sheet: 14 to 22 lb (52 to 82 g/m <sup>2</sup> ) Two sheets: 11 to 15 lb (40 to 58 g/m <sup>2</sup> ) × 2 Three sheets: 11 to 15 lb (40 to 58 g/m <sup>2</sup> ) × 3

**Table 1-4. Specifications for Labels**

<b>Label Size</b>	2.5 to 0.93 inches minimum (63.5 to 254 mm)
<b>Width of Continuous Backing Paper</b>	4.00 to 10.0 inches (101 to 254 mm)
<b>Thickness</b>	Backing paper: 0.0028 to 0.0035 inches (0.07 to 0.09 mm) Total thickness: 0.0063 to 0.0075 inches (0.16 to 0.19 mm)
<b>Weight</b>	18 lb (68 g/m <sup>2</sup> ) maximum
<b>Quality</b>	Standard paper

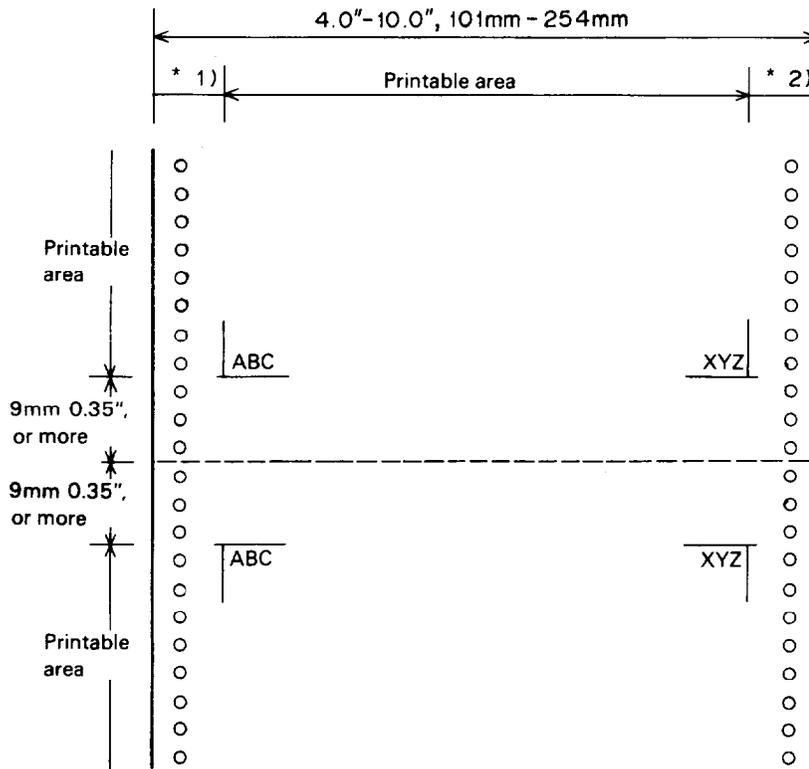
## Printable Area



**Figure 1-3. Printable Area for Single Sheet Paper**

## Notes:

- 1)** 0.12 inches (3 mm) or more using 7.2 to 9.0 inch (182 to 229 mm) wide paper. 1.08 inches (27 mm) or more using 10.1 inch (257 mm) wide paper.
- The lowest print position (0.54 inches or 13.5 mm) is only for reference.
  - Printing is possible approximately 1.48 inches (37 mm) from the bottom edge of the paper when you press the AUTO LOAD button to load a single sheet.
  - Paper feeding accuracy is not assured within 0.88 inches (22 mm) from the top edge of the paper and 1.20 inches (30 mm) from the bottom edge of the paper.



**Figure 1-4. Printable Area for Continuous Paper**

Notes:

- \*1) 0.52 inches (13 mm) or more using 4.0 to 9.5 inch (101 to 242 mm) wide paper.  
1.04 inches (26 mm) or more using 10.0 inch (254 mm) wide paper.
- \*2) 0.52 inches (13 mm) or more using 4.0 to 9.5 inch (101 to 242 mm) wide paper.  
1.04 inches (26 mm) or more using 10.0 inch (254 mm) wide paper.

## Ink Ribbon

Type Black ribbon cartridge #7753  
Film ribbon cartridge #7768

Color Black

Life 2 million characters at 48 dots/character  
(black ribbon)  
0.2 million characters using LQ characters  
(film ribbon)

Dimensions of Ribbon Cartridge 11.72 inches (width) x 1.36 inches (height)  
x 2.88 inches (depth)  
(293 mm x 34 mm x 72 mm)

## Reliability

Mean Cycles  
Between  
Failure  
(**MCBF**) 3 million lines (excluding printhead)

Mean Time  
Between  
Failure  
(**MTBF**) 40000 power-on hours (POH) at 25% duty

Printhead Life 200 million strokes (black ribbon)  
100 million strokes (film ribbon)

## Safety Approvals

Safety standards UL478

Radio  
Frequency  
Interference  
(RFI) FCC class B

## Electrical Specifications

Power Conditions	120 VAC $\pm$ 10%
Frequency Range	49.5 to 50.5 Hz (50 Hz model) 59.5 to 60.5 Hz (60 Hz model)
Current Rating	1.8 A
Power Consumption	Approximately 38 W (during self test in draft mode at 10 cpi)
Insulation Resistance	10 megohms minimum between AC line and chassis
Dielectric Strength	1250 VAC (rms), 1 minute between AC line and chassis

## Environmental Conditions

Temperature	41° to <b>95°F</b> (50 to <b>35°C</b> ), operating -22° to 140°F (-30° to 60°C), in shipping container
Humidity	10 to 80 % RH, operating 5 to 85 % RH, storage
Resistance to Shock	1 G, within 1 ms, operating 2 G, within 1 ms, storage
Resistance to Vibration	0.25 G, 55 Hz maximum, operating 0.50 G, 55 Hz maximum, storage

## Physical Specifications

Weight	Approximately 14.1 lb (6.4 kg)
Dimensions	15.6 inches (width) x 12.8 inches (depth) x 5.6 inches (height) (390 mm x 320 mm x 139 mm) excluding knob and paper guide

## Firmware Specifications (ESC/P)

Control Codes	ESC/P level ESC/P 84 (Epson Standard Code for Printers)
Printing Direction	Bidirectional (text) Bidirectional (bit image) when DIP switch 2-5 is on Unidirectional (bit image) when DIP switch 2-5 is off
Input Data Buffer	8KB when DIP switch 2-4 is on 1KB when DIP switch 2-4 is off (When DIP switch 2-4 is on, you cannot define user-defined characters.)
Character Code	8 bits
Character Sets	96-character ASCII character set 14 international character sets Legal character set PC (character tables for the Personal Computer) 437, 850, 860,863,865
Built-In Fonts	See Table 1-5.

**Table 1-5. Built-in Fonts**

Epson Built-In Font	Family Number	10 cpi	12 cpi	15 cpi	Proportional
Draft	—	0	0	0	*1
Roman	0	0	0	*2	0
Sans Serif	1	0	0	0	0
Courier	2	0	0	0	0
Prestige	3	0	0	*2	0
Script	4	0	0	*2	0
OCR-B	5	0	0	*2	0
Orator	7	0	0	*2	0

### Notes:

- 0 = resident, '1 = proportional LQ font specified using ESC k, \*2 = 15 cpi Courier
- OCR-B and Orator are basically 10 cpi fonts. However, you can select the typestyle and pitch for these fonts.
- You cannot select 15 cpi and condensed printing at the same time.

**Printing Modes**      You can select and mix any of the following printing modes, except you cannot select 15 cpi and condensed printing at the same time.

- Draft or letter quality printing
- Character pitch (10 cpi, 12 cpi, 15 cpi, or proportional printing)
- Condensed
- Double-width
- Double-height
- Emphasized
- Double-strike
- Italic
- Underlined
- Double-underlined
- Overscore
- Strike-through
- Outline
- Shadow

**Printing Speed**      See Table 1-6.

**Printing Columns**    See Table 1-6.

**Character Matrix**     See Table 1-7.

**Character Size**        See Table 1-7.

**Table 1-6. Printing Modes**

Pitch	Con- densed	Empha- sized	Double- Width		Printable Columns	Character Pitch (cpl)	Printing Speed (cps)	
							Draft	LQ
10 cpi	0	0	0		80	10	160	53.3
	0	0	1		40	5	80	26.65
	0	1	0		80	10	80	53.3
	0	1	1		40	5	40	26.65
	1	x	0		137	17.1	137	91.3
	1	x	1		58	8.5	68.5	45.65
12 cpi	0	0	0		96	12	192	64
	0	0	1		48	6	96	32
	0	1	0		96	12	96	64
	0	1	1		48	6	48	32
	1	x	0		160	20	160	106.7
	1	x	1		80	10	80	53.35
15 cpi	0	0	0		120	15	240	80
	0	0	1		120	15	120	40
	0	1	0		60	7.5	120	80
	0	1	1		60	7.5	60	40
	1	x	x			Cannot be condensed.		
Proportional	0	x	0	max	68	8.6	—	46
				min	160	20	—	106.7
	0	x	1	max	34	4.3	—	23
				min	80	10	—	53.35
	1	x	0	max	137	17.1	—	91.3
				min	320	40	—	213.3
Proportional super/ subscript	1	x	1	max	68	8.6	—	45.65
				min	160	20	—	106.65
	0	x	0	max	102	12.8	—	68.7
				min	240	30	—	160
	0	x	1	max	51	6.4	—	34.35
				min	120	15	—	80
1	x	0	0	max	204	25.7	—	137.3
				min	480	60	—	320
				max	102	12.8	—	68.65
				min	240	30	—	160

## Notes:

- Max is the value appropriate for the maximum width character.
- Min is the value appropriate for the minimum width character.
- — means that the printer automatically selects LQ mode when you select proportional pitch.

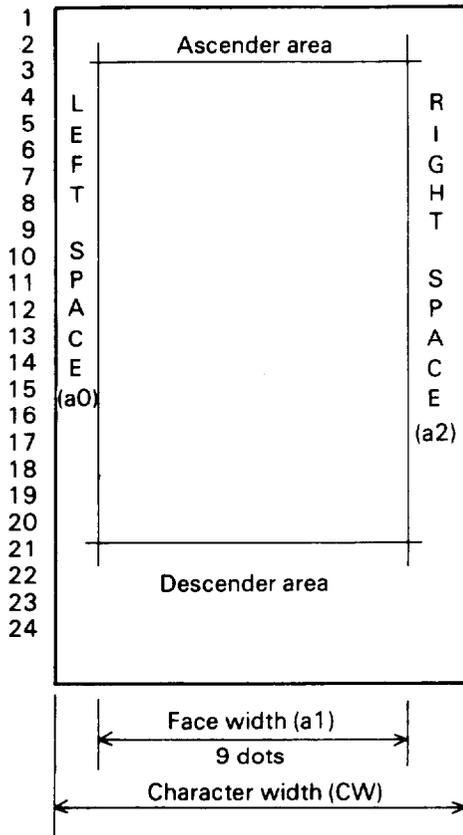
**Table 1-7. Character Matrix and Character Size**

<b>Printing Mode</b>	<b>Face Matrix</b>	<b>HDD</b>	<b>Character Size H × V (mm)</b>	<b>Unit ESC sp.</b>
Draft, 10 cpi	9 × 22	120	1.9 × 3.1	120
Draft, 12 cpi	9 × 22	120	1.9 × 3.1	120
Draft, 15 cpi	7 × 16	120	1.0 × 2.3	120
Draft, 10 cpi, condensed	—	240	—	120
Draft, 12 cpi, condensed	—	240	—	120
LQ, 10 cpi	31 × 22	360	2.2 × 3.1	180
LQ, 12 cpi	27 × 22	360	1.9 × 3.1	180
LQ, 15 cpi	22 × 16	360	1.0 × 2.3	180
LQ, 10 cpi, condensed	—	360	—	180
LQ, 12 cpi, condensed	—	360	—	180
LQ, proportional	max 37 × 22 min 18 × 22	360 360	2.6 × 3.1 1.0 × 3.1	180 180
LQ, proportional, condensed	— —	360 360	— —	180 180
LQ, proportional, super/subscript	max 28 × 16 min 12 × 16	360 360	1.8 × 2.3 0.7 × 2.3	180 180
LQ, proportional, super/subscript, condensed	— —	360 360	— —	180 180

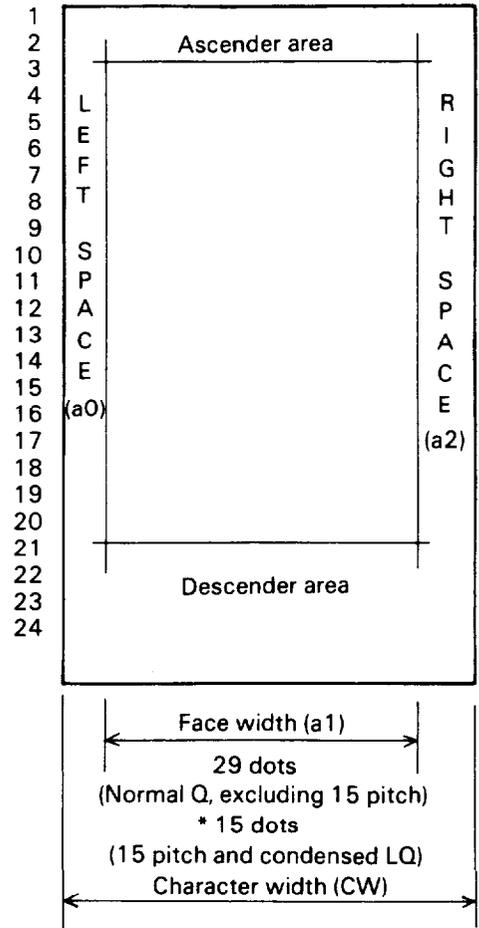
## Notes:

- HDD is the horizontal dot density in dots per inch.
- The face matrix and character size indicate the size of the maximum character. This value depends on the paper, the ribbon, and other variables.
- Unit ESC SP indicates the minimum length to be added to the right of the character specified using ESC SP. You can also send Unit Esc SP followed by the character string CHR\$ (&h20).
- — indicates that printer firmware reshapes the character matrix. Character width is half of the noncondensed character width.

(Normal character)



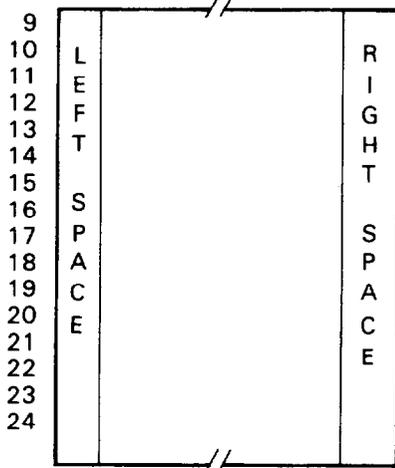
- 12 dots, 10 cpi, 120 dpi
- 15 dots, 12 cpi, 180 dpi
- 16 dots, 15 cpi, 240 dpi
- 14 dots, condensed, 10 cpi, 240 dpi
- 12 dots, condensed, 12 cpi, 240 dpi



- 36 dots, 10 cpi, 360 dpi
- 30 dots, 12 cpi, 360 dpi
- 24 dots, 15 cpi, 360 dpi
- 21 dots, condensed, 10 cpi, 360 dpi
- 18 dots, condensed, 12 cpi, 360 dpi

\* The printer firmware makes 15 dots from 29 dots.

(Subscript character)



(Subscript character)

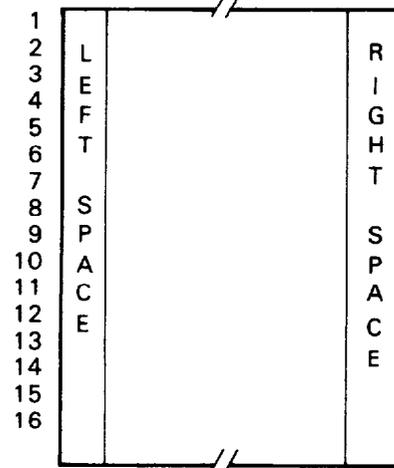
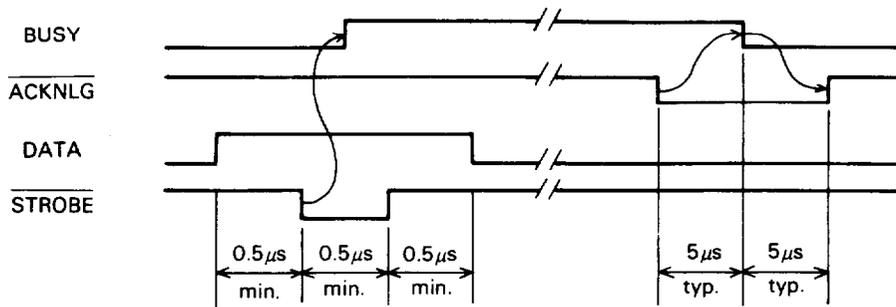


Figure 1-5. Character Matrix

## Parallel Interface

This section provides the specifications for the standard parallel interface.

Data Format	8-bit parallel
Synchronization	-STROBE signal
Handshaking	BUSY and -ACKNLG signal
Signal Level	TTL compatible
Adaptable Connector	57-30360 (Amphenol) or equivalent
Data Transmission Timing	See Figure 1-6.



**Figure 1-6. Data Transmission Timing**

Table 1-8 shows the connector pin assignments and signal functions of the 8-bit parallel interface.

**Table 1-8. Connector Pin Assignments and Signal Functions**

Pin No.	Signal Name	Return Pin No.	DIR	Description
1	-STROBE	19	In	Strobe pulse to read the input data. Pulse width must be more than 0.5 $\mu$ s. Input data is latched after the falling edge of this signal.
2	DATA 1	20	In	Parallel input data to the printer. HIGH level means 1. LOW level means 0.
3	DATA 2	21	In	
4	DATA 3	22	In	
5	DATA 4	23	In	
6	DATA 5	24	In	
7	DATA 6	25	In	
8	DATA 7	26	In	
9	DATA 8	27	In	
10	-ACKNLG	28	Out	This pulse indicates data has been received and the printer is ready to accept more data. Pulse width is approximately 11 $\mu$ s.
11	BUSY	29	Out	HIGH indicates the printer cannot accept more data.
12	PE	30	Out	HIGH indicates paper-out. This signal is effective only when the -ERROR signal is LOW.
13	SLCT	—	Out	Output is always HIGH. (Pulled up to +5 V through 3.3K-ohm register.)
14	-AUTOFEED XT	—	In	If this signal is LOW when the printer is initialized, the printer automatically performs a line feed when it receives a CR code (auto LF).
15	—	—	—	Not used.
16	GND	—	—	Ground for twisted pair.
17	Chassis GND	—	—	Ground for chassis.
18	—	—	—	Not used.
19 to 30	GND	—	—	Ground for twisted pair.

**Table 1-9. Connector Pin Assignments and Signal Functions (cont.)**

Pin No.	Signal Name	Return Pin No.	DIR	Description
31	-INIT	16	In	Pulse (width: 50 $\mu$ s minimum, active LOW) input for printer initialization.
32	-ERROR		Out	LOW indicates that an error has occurred.
33	GND	—	—	Ground for twisted pair.
34	—	—	—	Not used.
35	—	—	Out	Always HIGH. (Pulled up to +5 V through a 3.3K-ohm register.)
36	-SLCT-IN	—	In	If this signal is LOW when the printer is initialized, DC1/DC3 control is disabled.

## Notes:

- DIR refers to the direction of signal flow as viewed from the printer.
- Return Pin No. denotes a twisted pair return line.
- The cable must be shielded to prevent noise.
- All interface conditions are based on TTL levels. The rise and fall times of all signals must be less than 0.2  $\mu$ s.
- You can set the -AUTO FEED-XT signal to LOW using DIP switch 2-4.
- You can set the -SLCT-IN signal to LOW using jumper 6.
- By setting the DATA 1 through 8 pins to the -STROBE signal, you can perform printing tests, including interface circuit tests, without using external equipment.
- Minus signs are used in front of signal names indicate active LOW signals.

Table 1-9 shows the handshaking (DC1/DC3) protocol.

**Table 1-9. Handshaking (DC1/DC3) Protocol**

On Line/ Off Line	*SLCT-IN	DC1/DC3	*ERROR	BUSY	*ACKNLG	Data Entry
Off line	HIGH/ LOW	DC1/DC3	LOW	HIGH	No pulse	Disabled
On line	HIGH	DC1	HIGH	LOW/HIGH (during data entry)	Pulse output after entry	Enabled (normal process)
		DC3	HIGH	LOW/HIGH (during data entry)	Pulse output after entry	Enabled (Waits for DC1. See note 2.)
On line	LOW	DC1	HIGH	LOW/HIGH (during data entry)	Pulse output after entry	Enabled (normal process)
		DC3	HIGH	LOW/HIGH (during data entry)	Pulse output after entry	Enabled (normal process)

Notes:

1. Table 1-9 assumes that no \*ERROR status exists other than that due to off line mode.
2. When the printer receives a DC3 code, it ignores input data. When the printer receives a DC1 code, data transmission continues.
3. The DC1 and DC3 codes are enabled only when the SLCT-IN signal (pin number 36) is HIGH and the printer is initialized.
4. If the SLCT-IN signal is LOW when the printer is initialized, DC1/DC3 handshaking is invalidated and the printer ignores the DC1/DC3 control codes.
5. If the SLCT-IN signal is HIGH when the printer is initialized, the printer starts from the selected (DC1) state.
6. Minus signs are used in this table to indicate active LOW signals.

## DIP Switches and Jumpers

This section describes the functions of the DIP switches and jumpers.

### DIP Switches

The LQ-200/AP3000 has two sets of DIP switches underneath the cartridge slot cover. Tables 1-10 through 1-15 describe the functions of these DIP switches. The printer reads the DIP switch settings only at power on or after receiving the -INIT signal.

*Table 1-10. Dip Switch Set 1*

Number	Description	On	Off
1 2 3	Italics: international set selection Graphics: character table selection	See Table 1-12	
4 5 6	Font selection	See Table 1-13	
7	Table Selection	Graphics	Italics
8	Cut sheet feeder (CSF) mode	On	Off

*Table 1-11. Dip Switch Set 2*

Number	Description	On	Off
1 2	Page length selection	See Table 1-14	
3 4 5 6	Auto line feed Input data buffer <sup>1</sup> Print direction for graphics <sup>2</sup> One-inch skip-over-perforation	On 8K Bidirectional On	Off 1KB Unidirectional Off
7 8	Character pitch selection	See Table 1-15	

Notes:

- 1. When DIP switch 2-4 is on, you cannot create user defined characters.
- 2. When DIP switch 2-5 is on, you can select bidirectional graphics printing using ESC U0.

**Table 1-12. International Character Set and Character Table Selection**

1-1	1-2	1-3	Country	Character Table
On	On	On	United States	PC 437 (United States)
On	On	Off	France	PC 850 (multilingual)
On	Off	On	Germany	PC 860 (Portugal)
On	Off	Off	United Kingdom	PC 863 (Canada-French)
Off	On	On	Denmark 1	PC 865 (Norway)
Off	On	Off	Sweden	PC 437 (United States)
Off	Off	On	Italy	PC 437 (United States)
Off	Off	Off	Spain 1	PC 437 (United States)
Default			United States	PC 437

**Table 1-13. Font Selection**

1-4	1-5	1-6	Font
Off	Off	Off	Courier
On	Off	Off	Roman
Off	On	Off	Sans Serif
On	On	Off	Prestige
Off	Off	On	Script
On	Off	On	OCR-B
Off	On	On	Orator
On	On	On	Draft

**Table 1-14. Page Length Selection**

2-1	2-2	Page Length	CSF Page Length
Off	Off	11 inches	61 lines (A4)
On	Off	12 inches	65 lines (letter)
Off	On	8.5 inches	61 lines (A4)
On	On	70/6 inches	65 lines (letter)
Default		11 inches	CSF page length 61 lines

**Table 1-15. Character Pitch Selection**

2-7	2-8	Character Pitch
Off	Off	10 cpi
On	Off	12 cpi
Off	On	17 cpi
On	On	20 cpi

## Jumpers

Jumper 6, located underneath the cartridge slot cover, is user selectable. If you connect jumper 6, the -SLCT-IN signal is LOW and the printer ignores the DC1/DC3 control codes.

## Operating Instructions

This section explains how to use SelecType, the self test, the demonstration, the hexadecimal dump, and other functions.

### SelecType

The SelecType function allows you to easily choose any of the seven built-in LQ fonts when the printer is on line and not printing. To select a font, you press the FORM FEED button until the two SelecType indicator lights match the desired font.

### Self Test

To run the self test in draft mode, turn on the printer while pressing the LINE FEED button. To run the self test in letter quality (LQ) mode, turn on the printer while pressing the FORM FEED button.

To stop or start the self test, press the ON LINE button. To end the self test, press the ON LINE button and then turn off the printer.

The first line of the self test shows the firmware revision number. Next the self test prints the current DIP switch settings.

```

XXXXX
Country      SW1-1 1-2 1-3      Page length      SW2-1 2-2
  USA         on  on  on         11"              off off
  France      on  on  off         12"              on  off
  Germany     on  off on         8.5"             off  on
  U.K.        on  off off         70/6"           on  on
  Denmark     off on  on         Auto LF          SW2-3
  Sweden      off on  off         Invalid          off
  Italy        off off on         Valid            on
  Spain       off off off         Receive buffer   SW2-4
Font          SW1-4 1-5 1-6      1kbytes          off
  Courier     off off off         8kbytes          on
  Roman       on  off off         Graphics print   SW2-5
  Sans Serif  off on  of         '                off
  tige        on  on                SW2-6

```

**Figure 1-7. Self Test**

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## Demonstration

To start the demonstration, turn on the printer while holding down the LINE FEED and ON LINE buttons.

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**Figure 1-8. Demonstration**

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