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EPSON

EPSON TERMINAL PRINTER
LQ-870/1170

**SERVICE
MANUAL**

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PRECAUTIONS

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

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

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

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

DANGER

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

WARNING

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

PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of the LQ-870/1 170.

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

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

Chapter 2 - Describes the theory of printer operation.

Chapter 3 - Includes a step-by-step guide for product disassembly and assembly.

Chapter 4 - Includes a step-by-step guide for adjustment.

Chapter 5 - Provides Epson-approved techniques for troubleshooting.

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

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REVISION SHEET

REVISION	DATE ISSUED	CHANGE DOCUMENT
A	July 23, 1991	1st issue

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1.1 FEATURES

The LQ-870/1 170 is a small, light-weight, low-cost printer that provides advanced paper handling and is compatible with The LQ-5 10/550. The printer's main features are:

- **Use of ESC/P 2 control codes**
The printer can print fonts in various point sizes and receive and print raster graphic images.
- **Compatibility with LQ and SQ series printers**
- **Printing speeds:**
 - 300 characters per second (cps) in high-speed draft mode at 10 characters per inch (cpi)
 - 330 cps (draft, 12 cpi)
 - 275 cps (draft, 10 cpi)
 - 110 cps (LQ, 12 cpi)
 - 92 cps (LQ, 10 cpi)
- **Multiple fonts resident in the printer: nine letter quality (LQ) fonts (Roman, Saris Serif, Courier, Prestige, Script, OCR-B, Script-C, Orator, and Orator-S) and one draft font**
- **Clear, easy-to-read printing using standard EPSON fonts**
- **Selection of fonts, condensed printing, and the cut-sheet feeder (C SF) bin using control panel buttons**
- **Advanced paper handling**
 - Continuous paper:**
 - Three ways to insert continuous paper, using the front, bottom, or rear paper entrance
 - Auto backout and auto loading when using the front or rear paper entrance
 - Ability to use continuous paper without removing the cut-sheet feeder
 - Ability to use the standard tractor in three positions (two push tractor positions and one pull tractor position)
 - Single-sheet paper:**
 - Two ways to insert single-sheet paper, using the front or top paper entrance
 - Auto loading
- **Easy handling of single-sheet paper with the optional cut-sheet feeder**
- **Optional tractor that can be used to create a push-pull tractor feeding**
- **Optional interface cards**

The LQ-870/1 170 is equipped with the standard EPSON 8-bit parallel interface. The optional interface cards ensure compatibility with a wide variety of computers. Table 1-1 Lists the optional interface cards, Table 1-2 lists the optional units available for the LQ-870/1 170, and Figure 1-1 shows an exterior view of the LQ-870/1 170.

Table 1-1 Optional Interface Cards

Model No.	Description
C82305*	Serial interface card (inch screw) * 1
C82306"	Serial interface card (mini screw) * 1
C82307*	32KB serial interface card (inch screw)
C82308*	32KB serial interface card (mini screw)

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● The last digit in each part numbers above, represented by an asterisk (*), varies depending on the country.

* I. You cannot use the printer with the following baud rates: 1800, 200, 134.5, 110, or 75 bps.

NOTE: Refer to the "Optional Interface Technical Manual" for more information on the optional interface cards.

Table 1-2. Optional Units for LQ-870

Model No.	Description
C80637*	Single-bin cut-sheet feeder
C80638*	High-capacity cut-sheet feeder
C80020	Tractor
7753	Fabric ribbon cartridge
7768	Film ribbon cartridge

Table 1-2-1. Optional Units for LQ-1 170

Model No.	Description
C80639*	Single-bin cut-sheet feeder
C80640*	High-capacity cut-sheet feeder
C80021*	Tractor
7754	Fabric ribbon cartridge
7770	Film ribbon cartridge

● When the last digit in the part number above is represented by an asterisk (*), the number varies depending on the country.

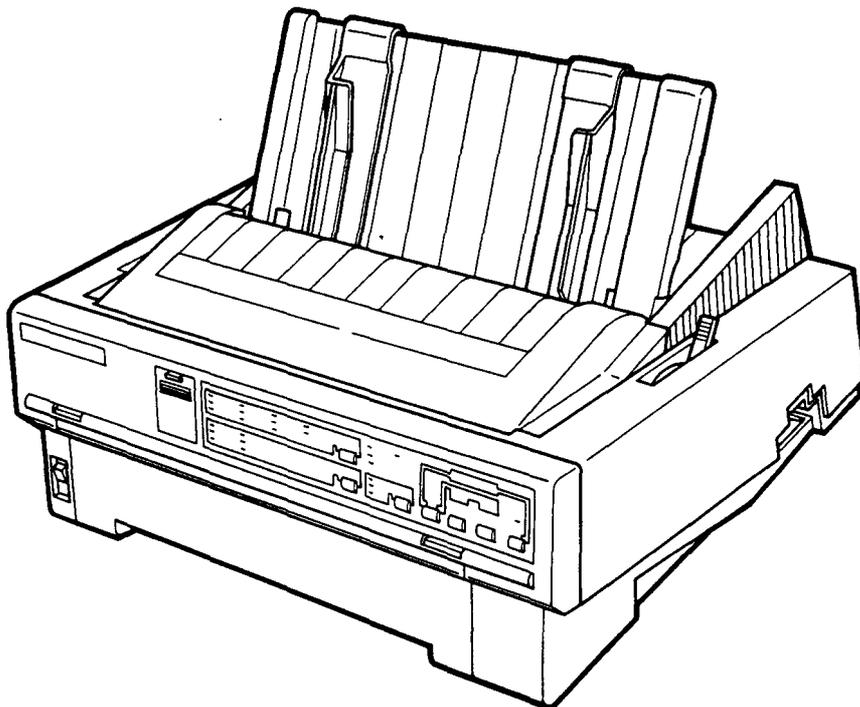


Figure 1-1. Exterior View of the LQ-870

1.2 SPECIFICATIONS

This section provides the specifications for the LQ-870/1 170.

1.2.1 Hardware Specifications

Printing method Serial, impact, dot matrix
Pin configuration 24 wires; 12 x 2 staggered, diameter 0.2 mm (.008 in.)

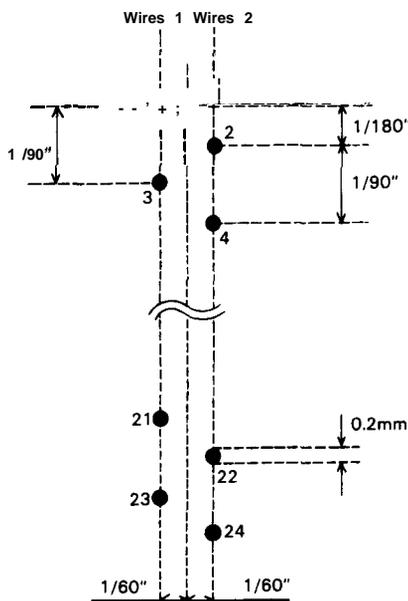


Figure 1-2. Pin Configuration

Feeding methods	Friction feeding (front and top paper entrances) Push tractor feeding (front and rear paper entrances) Pull tractor feeding (front and bottom paper entrances) Push-pull tractor feeding (front and rear paper entrances)
Line spacing	1/6 inch, 1/8 inch, or programmable in units of 1/360 inch
Paper insertion	Friction feeding: front or top paper entrance Tractor feeding: front, bottom, or rear paper entrance
Paper feed speed	Friction feeding without cut-sheet feeder: 59.0 msec for a 1/6-inch line feed 3.6 inches per second (ips) during continuous feeding Friction feeding with cut-sheet feeder: 62.7 msec for a 1/6-inch line feed 3.3 ips during continuous feeding Tractor feeding: 64.1 msec for a 1/6-inch line feed 3.0 ips during continuous feeding

NOTE: Paper handling precautions are listed below.

Friction feeding precautions

- Move the release lever to the **FRICION** position.
- Load paper into the front or top paper entrance.
- Do not use continuous paper.
- Do not perform any reverse feeds within the top 8.5 mm (.34 in.) or bottom 22 mm (.87 in.) of the paper.
- . Do not perform reverse feeds greater than 1/6 inch after a paper end is detected.
- Use the paper tension unit.
- . Load single-sheet multi-part forms only into the front paper entrance.
- . Use only carbonless multi-part forms.

Push tractor feeding precautions

- Move the release lever to the **REAR PUSH/FRONT PUSH** position.
- Load paper into the rear paper entrance.
- . Release the friction-feed mechanism.
- Multi-part forms must be spot pasted beyond the perforation between the sprocket holes.
- Use only carbonless multi-part forms.
- Use the paper tension unit.
- Do not perform reverse feeds greater than 1/6 inch.
- . Because paper feeding accuracy cannot be assured after a paper end is detected, do not perform reverse feeds after a paper, end is detected.

Push-pull tractor feeding precautions

- Move the release lever to the **REAR PUSH/FRONT PUSH** position.
- Load paper into the front, rear, or bottom paper entrance.
- Release the friction-feed mechanism.
- Remove the paper tension unit and attach the pull tractor.
- Make sure there is no slack in the paper between the platen and the pull tractor.
- Carefully align the pull tractor and push tractor sprockets.
- . Paper for multiple copies must be spot pasted beyond the perforation between the sprocket holes.
- Use only carbonless multi-part forms.
- Do not perform reverse feeds greater than 1/6 inch.
- Do not perform reverse feeds after a paper end is detected.

Pull tractor feeding precautions

- Move the release lever to the **PULL** position.
- Load paper into the front or bottom paper entrance.
- . Release the friction feed mechanism.
- . Remove the paper tension unit and attach the pull tractor.
- Paper for multiple copies must be spot pasted beyond the perforation between the sprocket holes.
- Use only carbonless multi-part forms.
- . Do not perform reverse feeds.

Paper specifications See Tables 1-3, 1-4, 1-5, 1-6, and 1-7.

Table 1-3. Specifications for Single-Sheet Paper (80/1 36 column)

Width	148 to 257/420 mm (5.8 to 10. 1/1 6.5 in.) (top insertion) 182 to 257/364 mm (7.2 to 10. 1/1 4.3 in.) (front insertion)
Length	364 mm (1 4.3 in.), maximum
Thickness	0.065 to 0.14 mm (0.0025 to 0.0055 in.)
Weight	14 to 24 lb (52.3 to 90 g/m ²)
Quality	Standard paper (such as photocopier paper)

Table 1-4. Specifications for Single-Sheet Multi-Part Forms (Carbonless) (80/1 36 column)

Width	182 to 2 16/364 mm (7.2 to 8.5/1 4.3 in.)
Length	257 to 297 mm (10.7 to 11.7 in.)
Thickness	0.065 to 0.14 mm (0.0025 to 0.0055 in.) — per sheet 0.12 to 0.64 mm (0.0047 to 0.0256 in.) total
Weight	17 to 24 lb (52.3 to 90 g/m ²) single sheets 12 to 15 lb (40 to 58 g/m ²) each
Quality	Carbonless duplicating paper
Copies	Four sheets (one original and three copies)

Table 1-5. Specifications for Continuous Paper (80/1 36 column)

Width	101 to 254/406 mm (4.0 to 10.0/16 in.)
Thickness	0.065 to 0.10 mm (0.0025 to 0.0039 in.) single sheet 0.065 to 0.32 mm (0.0025 to 0.012 in.) total
Weight	14 to 22 lb (52.3 to 82 g/m ²) single sheet 12 to 15 lb (40 to 58 g/m ²) each
Quality	Standard paper or carbonless duplicating paper
Copies	4 sheets (1 original and 3 copies)

Table 1-6. Specifications for Envelopes

Size	No. 6 = 166 mm x 92 mm (6.53 in. x 3.62 in.) No. 10 = 240 mm x 104 mm (9.45 in. x 4.09 in.)
Thickness	0.16 to 0.52 mm (0.0063 to 0.0197 in.) Differences in thickness within the printing area must be less than 0.25 mm (0.0098 in.).
Weight	12 to 24 lb (45 to 91 g/m ²)
Quality	Bond paper, standard paper, air mail
Copies	Not available

- NOTES:
- Printing on envelopes is available only at normal temperatures.
 - Load envelopes only into the top paper entrance.
 - Keep the longer side of the envelope horizontal when you insert it.
 - Place the left edge of a no. 6 envelope at the sheet guide mark.

Table 1-7. Specifications for Labels

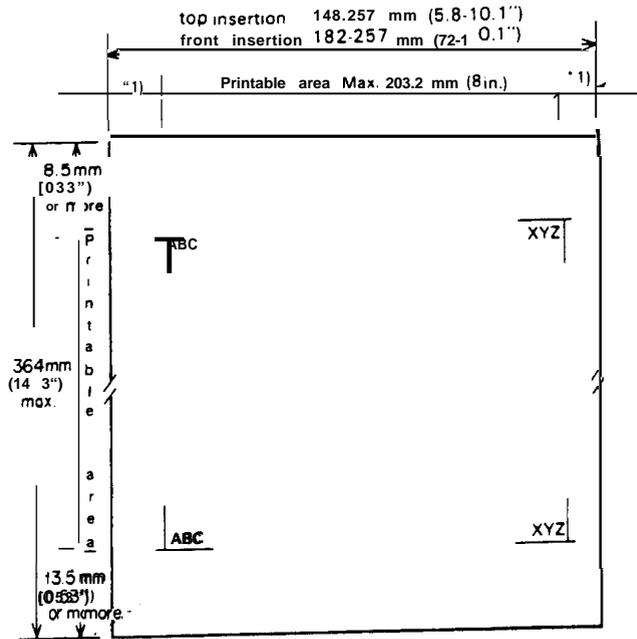
Label size	2 1/2 in x 15/16 in. 4 in. x 15/16 in. 4 in. x 7/16 in.
Thickness	0.07 to 0.09 mm (0.0028 to 0.0031 in.) —for the backing paper 0.16 to 0.19 mm (0.0063 to 0.0075 in.) — total
Copies	Not available

- NOTES:
- Printing on labels is available only at normal temperatures.
 - Only use labels on continuous backing paper with sprocket holes for tractor feeding.
 - Labels with pressure-sensitive paper must be spot pasted beyond the perforation between the sprocketholes and the total thickness must be less than or equal to 0.3 mm (0.01 18 in.). You can print labels only when the temperature is between 5 and 35 degrees C (4 1 and 95 degrees F) and humidity is between 10% and 80% RH.
 - Examples of labels: Avery continuous form labels and Avery mini-line labels

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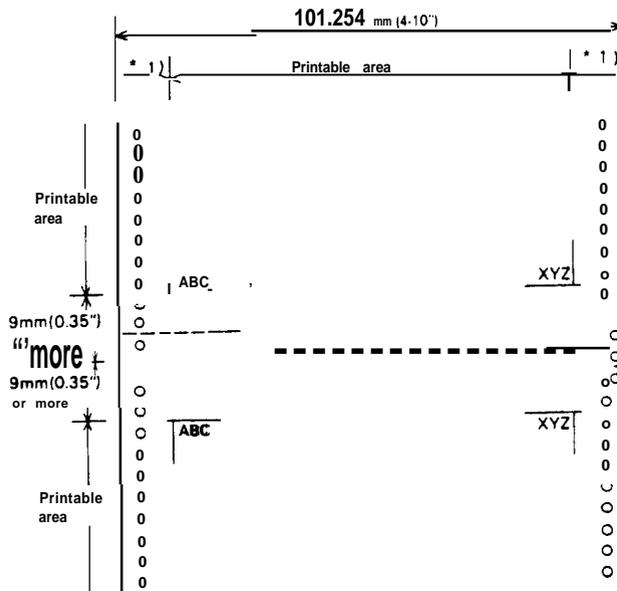
Printable area

See Figures 1-3, 1-4, and 1-5.



- *1) 3.0 mm (0.12 in.) or more when paper width is less than 229 mm (9 in.).
25 mm (0.9 in.) or more for top insertion or 26 mm (1.0 in.) or more for front insertion when paper width is 257 mm (10.1 in.).
- For top insertion, paper feeding accuracy cannot be assured within 26 mm (1.02 in.) from the bottom edge of the paper.
For front insertion, paper feeding accuracy cannot be assured within 47.0 mm (1.85 in.) from the bottom edge of the paper.

Figure 1-3 Printable Area for Single-Sheet Paper



- 1) 13 mm (0.51 in.) or more with paper 101 to 241 mm (4 to 9.5 in.) wide. 25 mm (0.9 in.) or more for rear insertion or 26 mm (1.0 in.) or more for front insertion with paper 254 mm (10 in.) or more wide.

Figure 1-4 Printable Area for Continuous Paper

Ink ribbon	80-column: Black ribbon cartridge #7753 Film ribbon cartridge #7768 136-column: Black ribbon cartridge #7754 Film ribbon cartridge #7770 Color Black Life 2 million characters at 48 dots/character (black ribbon) 0.2 million characters at 48 dots/character (film ribbon), 80-column 0.3 million characters at 48 dots/character (film ribbon), 136-column Dimensions of ribbon cartridge: 80-column: 293 mm (width) x 34 mm (height) x 72 mm (depth) 11.7 in. (width) x 1.4 in. (height) x 2.9 in. (depth) 136-column: 468.5 mm (width) x 34 mm (height) x 72 mm (depth) 18.4 in. (width) x 1.4 in. (height) x 2.9 in. (depth)
Reliability	Mean cycles between failures (MCBF): 5 million lines (excluding printhead) Mean time between failures (MTBF): 4000 power-on hours (POH) at 25% duty, 80-column Mean time between failures (M CBF): 6000 power-on hours (POH) at 25% duty, 136-column
Printhead life	200 million strokes (black ribbon) 100 million strokes (film ribbon)
Safety approvals	Safety standards UL1 950 with D3 (U.S. version) CSA22.2#220 EN 60950 (TUV) (European version) Radio frequency interference (RFI) FCC class B (U.S. version) VDE0871 (self-certification) (European version)
Electrical specifications	120 V version Rated voltage 120 VAC Input voltage range 103.5 to 132 VAC Rated frequency range 50 to 60 Hz Input frequency range 49.5 to 60.5 Hz Rated current 2.0 A Power consumption Approx.58 W (during self-test in draft) Insulation resistance 10 Megohms minimum (at 500 VDC between AC line and chassis)

	Dielectric strength	1000 VACrms for one minute or 1200 VACrms for one second (between AC line and chassis)
220 to 240 V version	Rated voltage	220 to 240 VAC
	Input voltage range	198 to 264 VAC
	Rated frequency range	50 to 60 Hz
	Input frequency range	49.5 to 60.5 Hz
	Rated current	1.0 A
	Power consumption	Approx. 58 W (during self-test in draft mode at 10 cpi)
	Insulation resistance	10 Megohms minimum (at 500 VDC between AC line and chassis)
	Dielectric strength	1250 VACrms for one minute or 1500 VACrms for one second (between AC line and chassis)
Environmental conditions	Temperature	5 to 35 degrees C (41 to 95 degrees F), operating -30 to 65 degrees C (-22 to 149 degrees F), 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	80-column: Approx. 8.8 kg (4.0 lb) 136-column: Approx. 11.5 kg (5.2 lb)
	Dimensions	80-column: 449 mm (width) x 365 mm (depth) x 171 mm (height) 17.7 in. (width) x 14.7 in. (depth) x 6 in. (height) 136- column: 624 mm (width) x 365 mm (depth) x 171 mm (height) 24.6 in. (width) x 14.7 in. (depth) x 6 in. (height)

1.2.2 Firmware Specifications

Control codes	ESC/PTM level ESC/P 2 (EPSON standard code for printers)	
Printing direction	Bidirectional with logic seeking	
Input data buffer	8KB, 32KB, 64KB; to change RAM (4A 5A) This printer is able to input buffer capacity 8, 32, or 64KB	
Character code	8 bits	
Character tables	italic character table, PC 437, PC 850, PC 860, PC 863, PC 865 (PC indicates character tables for personal computers.)	
Fonts and pitches		
Bit map fonts	EPSON Roman	10, 12, 15, proportional
	EPSON Saris Serif	10, 12, 15, proportional
	EPSON Courier	10, 12, 15
	EPSON Prestige	10, 12
	EPSON Script	10, 12
	EPSON Script C	proportional
	OCR-B	10
	EPSON Orator	10
	EPSON Orator-S	10
	EPSON Draft	10, 12, 15
Scalable fonts	EPSON Roman	8 to 32 pt
	EPSON Saris Serif	8 to 32 pt
Printing modes	It is possible to select and mix the following printing modes, except 15 cpi condensed, which is not available.	
	. Print quality (draft or LQ)	
	● Character pitch (10, 12, 15, or proportional)	
	● Condensed	
	. Double-width	
	. Double-height	
	● Emphasized	
	. Double-strike	
	. Italic	
	. Underlined	
	● Double-underlined	
	● Overscore	
	● Strike-through	
	. Outline	
	● Shadow	

NOTES: High-speed draft is valid when the printer's status is as follows:

- High-speed draft mode is selected by DIP switch(SW1-6).
- Emphasized mode is not selected.
- Condensed mode is not selected.
- Draft mode is selected.
- No D/L (download) characters are sent to the printer.
- The horizontal dot space of characters is not set.
- No bit image is sent to the printer.
- Super/subscriPt is not selected.

(The printer switches back to normal mode to print emphasized; condensed, or download characters and bit images.)

printing speed See Tables 1-8 and 1-9.
 printing columns See Table 1-8.
 Character matrix See Table 1-10.
 Character size See Table 1-10.

Table 1-8. Printing (Text Mode) 80/1 36-Column

print Pitch	Peinting	Printable Columns	Character Pitch (cpi)	Printing Speed (cps)		
				Draft	LQ	HSD
10	0	80/1 36	10	275	92	300
	1	137/233	17.1	236	157	—
12	0	96/1 64	12	330	110	—
	1	160/274	20	275	183	—
15	0	120/204	15	413	138	—
	1	Invalid.				

cpi: characters per inch
 Cps: characters per second
 LQ: letter quality
 HSD: high-speed draft

Table 1-9. Printing (Bit Image Mode) 80/1 36-Column

Pins	Bit Image Printing Mode	Density (dpi)	Printable Dots	Printing Speed (ips)
8	Single-density	60	480/8 16	27.5
8	Dual-density	120	960/1 632	13.8
8	Double-speed, dual-density	120	960/1 632	27.5
8	Quadruple-density	240	1920/3264	13.8
8	CRT graphics	80	640/1 088	13.8
8	CRT graphics II	90	720/1 224	18.3
24	Single-density	60	480/8 16	27.5
24	Dual-density	120	960/1 632	13.8
24	CRT graphics II	90	720/1 224	18.3
24	Triple-density	180	1440/2448	9.2
24	Hex-density	360	2880/4896	9.2

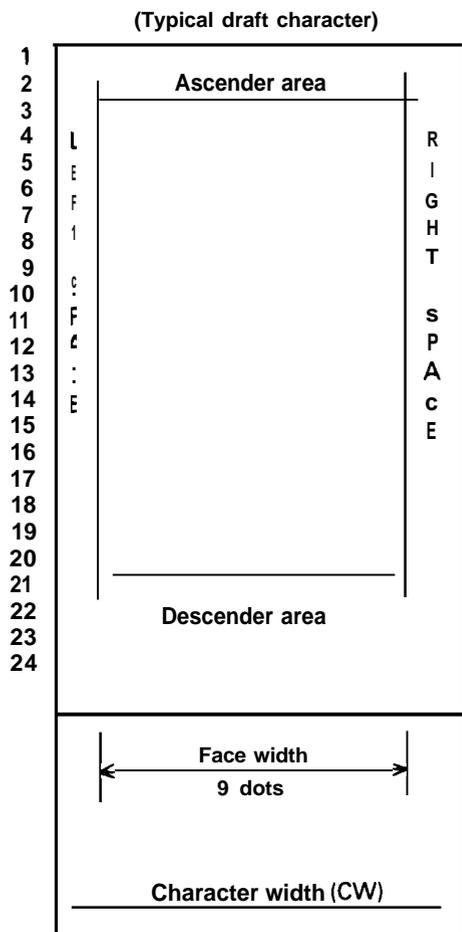
dpi: dots per inch

ips: inches per second

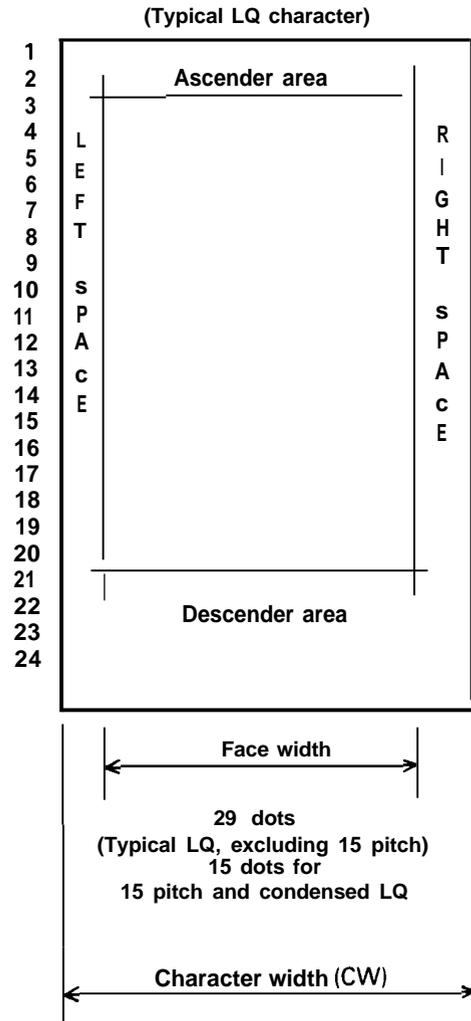
Table 1-10. Character Matrix and Character Size

printing Mode	Face Matrix	HDD	Character Size	Unit ESC SP
High-speed draft, 10 pitch	7 x 22	90	2.0 x 3.1	—
Draft, 10 pitch	9 x 22	120	1.9 x 3.1	120
Draft, 12 pitch	9 x 22	120	1.9 x 3.1	120
Draft, 15 pitch	7 X 16	120	1.0 X 2.3	120
Draft, 10 pitch, condensed	—	240	—	120
Draft, 12 pitch, condensed	—	240	—120	
LQ, 10 pitch	31 x 22	360	2.2 x 3.1	180
LQ, 12 pitch	27 X 22	360	1.9 x 3.1	180
LQ, 15 pitch	22 X 16	360	1.6 X 2.3	180
LQ, 10 pitch, condensed	—	360	—	180
LQ, 12 pitch, condensed	—	360	—	180
LQ, proportional	Max. 37 X 22 Min. 18 X 22	360 360	2.6 X 3.1 1.0 x 3.1	180
LQ, proportional, condensed	— —	360 360	— —	180
LQ, proportional, super/subscript	Max. 28 X 16 Min. 12 X 16	360 360	1.8 X 2.3 0.7 X 2.3	180
LQ, proportional, super/subscript, condensed	—	360 360	— —	180

- NOTES:
- HDD is the horizontal dot density in dots per inch.
 - 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 (which also can be sent as unit followed by the character string CHR\$(&h20)) indicates the minimum length to be added to the right of the character specified with the ESC SP control code.
 - “—” indicates that printer firmware reshapes the character matrix. Character width becomes half of the noncondensed character width.



- 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

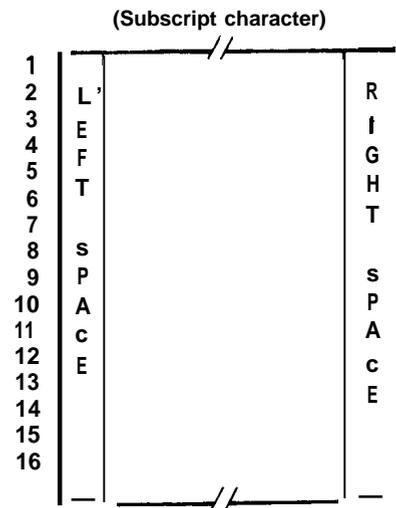
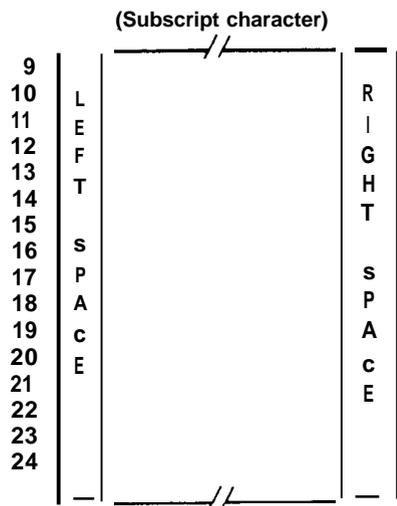


Figure 1-5. Character Matrix

1.3 PARALLEL INTERFACE

The specifications for the printer's 8-bit parallel interface are as follows:

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.

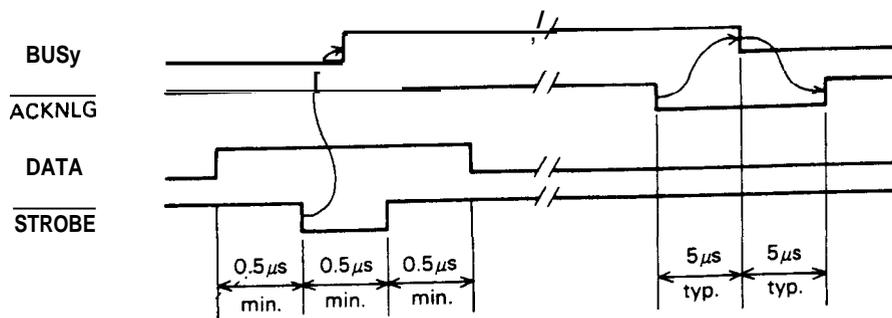


Figure 1-6. Data Transmission Timing

Table 1-11 provides the connector pin assignments and describes the signal functions of the 8-bit parallel interface.

Table 1-11. Connector Pin Assignments and Signal Functions

Pin No.	Signal Name	Return Pin No.	Dir.	Function
1	STROBE	19	IN	STROBE pulse to read the input data. Pulse width must be more than 0.5 μs. Input data is latched at the falling edge of this signal.
2	DATA 1	20	IN	Parallel input data to the printer. HIGH level means data 1. LOW level means data 0.
3	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 μs.
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	Always HIGH output. (Pulled up to +5V through a 5K-ohm resistor.)

Table 1-11. Connector Pin Assignments and Signal Functions (Cont.)

Pin No.	Signal Name	Return Pin No.	Dir.	Functional Description
14	$\overline{\text{AUTO FEED-XT}}$	—	IN	If LOW when the printer is initialized, the printer automatically performs a line feed upon input of the CR code (auto LF).
15				Not used.
16	GND		—	Ground for twisted pair grounding.
17	Chassis GND	—	—	Chassis ground level of printer.
18				Not used.
19 to 30	GND			Ground for twisted pair grounding.
31	INIT	16	IN	Pulse input for printer initialization (width: 50 μs , minimum, active LOW).
32	$\overline{\text{ERROR}}$		OUT	LOW indicates an error has occurred in the printer.
33	GND	—	—	Ground for twisted pair grounding.
34				Not used.
35			OUT	Always HIGH. (Pulled up to + 5 V through 3.3 K-ohm resistor.)
36	$\overline{\text{SLCT-IN}}$	—	IN	If LOW when the printer is initialized, DC 1/DC3 control is disabled.

- NOTES:**
1. "Dir." indicates the direction of the signal flow as viewed from the printer.
 2. "Return Pin No." denotes a twisted pair return line.
 3. The cable used must be shielded to prevent noise.
 4. All interface conditions are based on TTL levels. Both the rise and fall times of all signals must be less than 0.2 μs .
 5. The /AUTOFEED-XT signal can be set to LOW using DIP switch 2-4.
 6. The /SELECT-IN signal can be set to LOW using jumper 3.
 7. You can perform printing tests, including interface circuit tests, without using external equipment by setting the DATA 1 through DATA 8 pins to the /STROBE signal.

1.4 CONTROL PANEL

There are seven non-lock buttons and 19 indicators on the control panel.

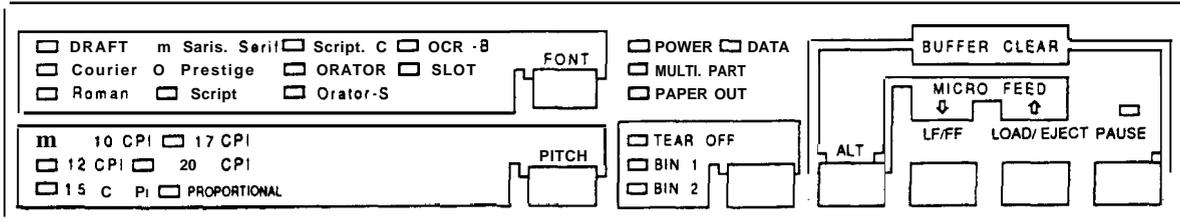


Figure 1-7. Control Panel

1.4.1 Buttons

(1) Operate switch

Use this switch to turn on the power supply to the printer.

(2) PAUSE button Press this button to toggle the printer between the PAUSE condition (in which there is no printing or paper feeding and the printer does not accept data) and the RUNNING condition. Press the PAUSE and ALT buttons at the same time to clear the input buffer and perform a software initialization. Pressing the PAUSE and ALT buttons has the same effect as the ESC @ command.

(3) LINE FEED/FORM FEED button Press this button to perform a line feed. Hold it down to perform a form feed, whether the printer is in the PAUSE or the RUNNING condition. Press this button and the ALT button at the same time to use the micro reverse feed function.

(4) LOAD/EJECT button Press this button to load or eject paper. See Section 1.6.8, Paper Loading and Ejection. Press this button and the ALT button at the same time to use the micro forward feed function.

(5) TEAR OFF/BIN 1/BIN 2 button When the printer is in tractor feed mode, press this button to advance continuous paper to the tear-off position. The TEAR OFF indicator light comes on. When the printer is in friction feed mode, press this button to select bin 1 or bin 2 of the cut-sheet feeder. The indicator light of the selected bin comes on.

(6) ALT button Use this button with other buttons to perform a variety of functions.

(7) FONT button Press this button to select a font. Press it again to select the next font. The FONT indicator light shows the currently selected font.

(8) CONDENSED button Press this button to select normal or condensed printing.

NOTE: FONT and CONDENSED button selections are stored as defaults and take effect when the printer is initialized.

1.4.2 Indicator Lights

(1) OPERATING (green)

Lit when the printer's operate switch is on and AC power is supplied.

(2) PAUSE (orange)

Lit when the printer is in PAUSE mode. In PAUSE mode, there is no printing or paper feeding and the printer does not accept data.

(3) TEAR OFF (orange)

Lit when the page is advanced to the tear-off position.

(4) DATA (orange)

Lit when the printer has received data from the host machine.

(5) PAPER OUT (red)

Lit when the paper-out detector detects that there is no paper. See Section 1.6.3, Paper-out Detection and Form Override Function.

(6) MULTI-PART (green)

Lit when the paper-thickness lever is positioned at the fourth step or higher.

(7) BIN 1 (green)

Lit when bin 1 is selected.

(8) BIN 2 (green)

Lit when bin 2 is selected.

(9) FONT (green) -Draft, Courier, Roman, Saris Serif, Prestige, Script, Script C, Orator, Orator-S, OCR-B

These indicator lights show the currently selected font.

(10) CONDENSED (green)

Lit when condensed mode is selected.

1.5 DIP SWITCHES AND JUMPERS

This section describes the DIP switches and jumpers of the LQ-870/1170.

1.5.1 DIP Switches

The printer has two banks of DIP switches located on the control panel. Tables 1-12 through 1-15 describe the functions of the DIP switches. The status of the DIP switches is read only at power-on or upon receipt of the //NIT signal.

Table 1-12. DIP Switch Set 1 (SW1)

No.	Description	ON	OFF	Factory Setting
1 2 3	International and PC character set selection	See Table 1-14.		ON ON ON
4	Character table selection	Graphic	Italic	OFF
5	Graphics direction"	Unidir.	Bidir.	OFF
6	High-speed draft mode	Invalid	Valid	OFF
7	Input buffer	Invalid	Valid	OFF
8	One-inch skip continuous paper	ON	OFF	OFF

Table 1-13. DIP Switch Set 2 (SW2)

No.	Description	ON	OFF	Factory Setting
1 2	Page length of continuous paper	See Table 1-15.		OFF OFF
3	Auto tear-off	ON	OFF	OFF
4	Auto line feed	ON	OFF	OFF

Table 1-14. International and PC Character Set Selection

1-1	1-2	1-3	Country	Pc
ON	ON	ON	Us.	437
ON	ON	OFF	France	850
ON	OFF	ON	Germany	860
ON	OFF	OFF	U.K.	863
OFF	ON	ON	Denmark 1	865
OFF	ON	OFF	Sweden	(437)
OFF	OFF	ON	Italy	(437)
OFF	OFF	OFF	Spain 1	(437)

When you turn on DIP switch 1-4 and use ESC + O to select the italic character table, the country setting becomes U.S.

When you turn off DIP switch 1-4 and use ESC t 1 to select the graphics character table, the PC setting becomes 437.

Table 1-15. Page Length

2-1	2-2	Page Length
OFF	OFF	11 inches
ON	OFF	12 inches
OFF	ON	8.5 inches
ON	ON	70/6 inches

1.5.2 Jumpers

If jumper 3 is connected to GND, the /S LCT-IN signal is set to LOW and the printer ignores DC 1/DC3 control.

1.6 OPERATING INSTRUCTIONS

This section describes the self-test, hexadecimal dump function, error states, printer initialization, and buzzer operation.

1.6.1 Self-Test

To run the self-test in draft mode, turn on the printer while pressing the LOAD/EJECT button. To run the self-test in LQ mode, turn on the printer while pressing the LINE FEED/FORM FEED button. You can press the PAUSE button to stop or start the self test.

When you are satisfied with the self test, press the PAUSE button to stop it and then turn off the printer.

The firmware revision number is printed on the first line of the self-test, followed by the current DIP switch settings.

XXXXXX						
Country/PC	SW1-1	1-2	1-3	1-4	High speed draft	SW1-6
U.S.o.	on	on	on	off	Valid	off
France	on	on	off	off	Invalid	on
Germany	on	off	on	off	Receive buffer	SW1-7
U.h.	on	off	off	off	Valid	off
Denmark	off	on	on	off	Invalid	on
Sweden	off	on	off	off	1 inch skip	SW1-8
Italy	off	off	on	off	Invalid	off
Spain,	off	off	off	off	Valid	on
TC 437	on	on	on			SW2-1 2-2
						off off

Figure 1-8. Self-Test

1.6.2 Hexadecimal Dump Function

To enter hexadecimal dump mode, turn on the printer while pressing both the LOAD/EJECT and the LINE FEED/FORM FEED buttons. In hexadecimal dump mode, the printer prints the hexadecimal representation of the input data along with the corresponding ASCII characters. This function is useful for checking the data the printer receives from the host. If input data is a control code instead of a character code, a period (.) is printed in the ASCII column,

1B 40 1B 52 00 1B 74 01 1B 36 12 1B 50 1B 70 00	.@. R . t . . 6 . . P . P .
20 20 54 68 69 73 20 69 73 20 61 6E 20 65 78 b 1	This is an exa
6D 70 6C 65 20 6F 66 20 61 20 64 b 1 74 61 20 64	mple of a data d
75 60 70 20 70 72 69 6E 74 6F 75 74 2E 20 54 68	ump printout. Th
69 73 20 66 65 61 74 75 72 65 20 6D 61 6B 65 73	is featur e makes
0A 20 20 20 20 20 69 74 20 65 61 73 79 20 66 6F	. i t easy fo

Figure 1-9. Hexadecimal Dump

1.6.3 Paper-Out Detection and Form Override Function

The paper-out detector is attached to the printer mechanism. When the paper-out detector senses a paper end, the printer first performs a form override. If paper loading fails, the BUSY signal goes HIGH, the PAPER OUT indicator light comes on, the interface PE signal becomes HIGH, the \ERROR signal becomes LOW, and the printer enters the PAUSE condition.

The form override function ignores the paper out and allows the printer to print additional lines after a paper out is detected. After you load paper and press the PAUSE button, the printer returns to the RUNNING condition and printing begins again.

The printer enters the paper-out state only when a paper out is detected after the printer performs a paper loading operation,

1.6.4 Error Conditions

If any of the following error conditions are detected, the printer automatically enters the PAUSE condition.

- The home position is not detected at printer mechanism initialization.
- The home position is detected during printing.
- . The PAUSE button is pressed and the printer enters the PAUSE condition.
- A paper out is detected after the printer performs a paper loading operation.

If the parallel interface is selected, the following interface signals are output to indicate the error and to stop data transmission:

- The BUSY signal becomes HIGH.
- . The /ERROR signal becomes LOW.
- No /ACKNLG pulse is sent.

1.6.5 Buzzer Operation

The buzzer sounds under the following conditions:

- A paper-out error is detected. (The buzzer beeps three times for 0.1 seconds, with 0.1 second intervals.)
- Abnormal carriage movement is detected. (The buzzer beeps five times for 0.5 seconds, with 0.5 second intervals.)
- . A control panel setting is accepted. (The buzzer produces one 0.1-second beep.)

1.6.6 Printer Initialization

There are three types of initialization: hardware, software, and control panel.

(1) Hardware initialization

This type of initialization takes place when you turn on the printer (and the AC power cord is plugged in) or when the /INIT signal is received.

When the printer is initialized, it performs the following actions:

- (a) Initializes the printer mechanism.
- (b) Clears the input data buffer.
- (c) Clears the downloaded character set.
- (d) Clears the print buffer.
- (e) Returns the printer settings to their default values.

(2) Software initialization

The ESC @ command initializes the printer but does not perform functions (a), (b), and (c) above. The last SelecType settings still take effect.

(3) Control panel initialization

Pressing the PAUSE and ALT buttons at the same time initializes the printer but does not perform functions (a) and (c) above. The last SelecType settings still take effect.

1.6.7 Default Values

When the printer is initialized, the following default values take effect:

Page position	The current paper position becomes the top-of-form position.
Left and right margins	Released
Line spacing	1/6 inch
Vertical tabs	Cleared
Horizontal tabs	Every eight characters (relative)
Family number of typestyle	Last font selected from the control panel
Download characters	Kept during software initialization Cleared during hardware initialization
Character spacing	Last setting selected from the control panel
Printing effects	Cleared except condensed printing
Condensed printing	Last setting selected from the control panel
Printer condition	RUNNING (not PAUSE)