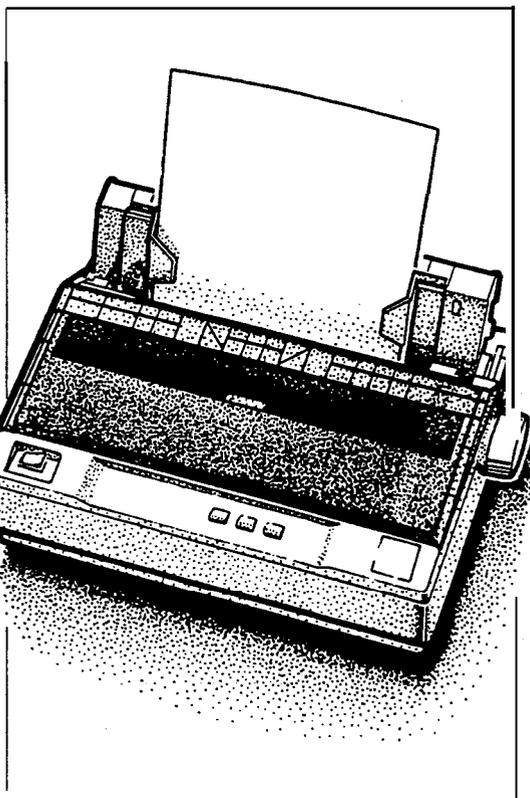


EPSON TERMINAL PRINTER

LQ-300

SERVICE MANUAL



EPSON

4003792

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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 BOTH THE POWER SOURCE AND PERIPHERAL DEVICES 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 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 functions, theory of electrical and mechanical operations, maintenance, and repair of LQ-300.

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

CHAPTER 1. PRODUCT DESCRIPTION

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

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of printer operation.

CHAPTER 3. DISASSEMBLY AND ASSEMBLY

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

CHAPTER 4. ADJUSTMENTS

Includes a step-by-step guide for adjustment.

CHAPTER 5. TROUBLESHOOTING

Provides Epson-approved techniques for adjustment.

CHAPTER 6. MAINTENANCE

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

APPENDIX

Describes connector pin assignments, circuit diagrams, circuit board component layout and exploded diagram.

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

REVISION SHEET

Revision	Issue Date	Revision Page
Rev. A	September 28, 1994	1st issue

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CHAPTER 1 Product Description

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1.1 FEATURES

The LQ-300 is a small, light-weight, 24-pin serial impact dot-matrix color printer suitable for personal use. The major features of this printer are:

- Fast printing of 10-cpi draft characters at 200 cps
- Compact design saves precious work space
- Easy-to-operate panel
- Quiet printing
 - Two built-in 8-bit parallel interfaces and an EIA-232D serial interface
 - Printing of up to 66 lines on A4-size or 62 lines on letter-size paper
 - Optional color printing using a color ribbon (black, magenta, cyan, yellow)
 - Detachable tractor (push, pull, and push-pull tractor feed)

Figure 1-1 shows an exterior view of the LQ-300, and Table 1-1 lists the optional units available for the LQ-300.

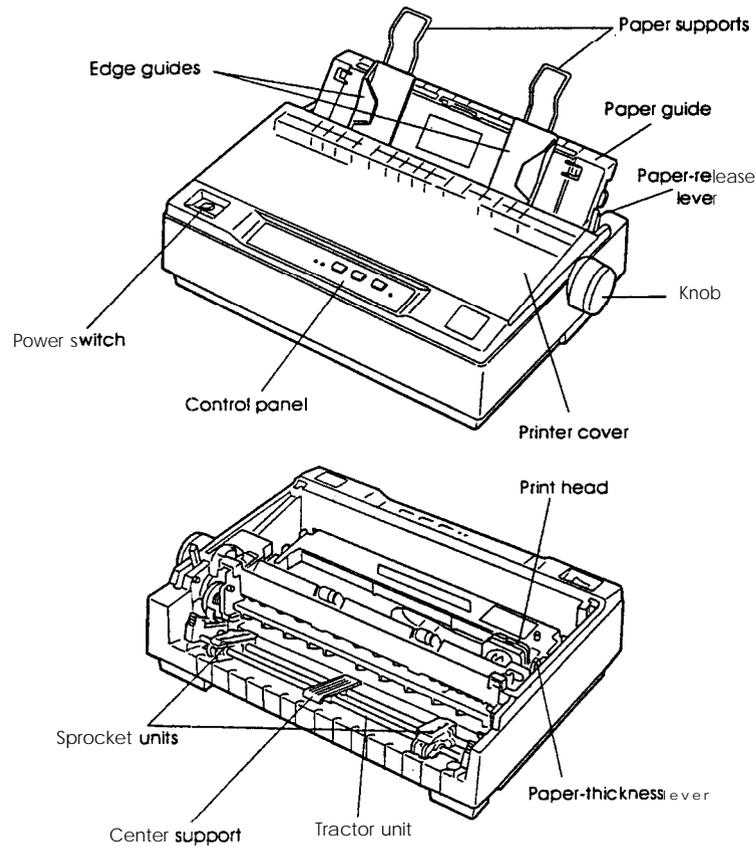


Figure 1-1. Exterior View of the LQ-300

Table 1-1. Optional Units

Model	Description
#7753	Ribbon cartridge (monochrome)
#7755	Ribbon cartridge (monochrome, sub-cartridge)
#7768	Ribbon cartridge (film)
S015077	Ribbon cartridge (color)
C80637*	Single-bin cut sheet feeder
C83211•	Color upgrade kit
C80030*	Pull tractor unit

* The number represented by an asterisk varies depending on the country.

1.2 SPECIFICATIONS

This section provides detailed information about the LQ-300.

1.2.1 Hardware Specifications

Printing method: Serial impact dot matrix
 Pin arrangement: 12 x 2, staggered
 Pin diameter: 0.20 mm (0.0079 inches)

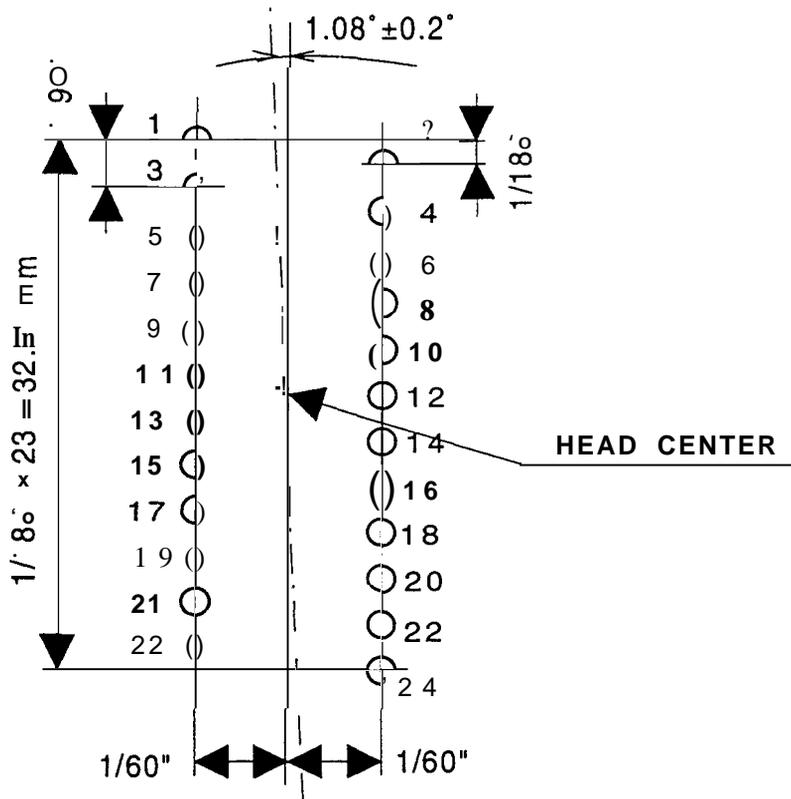


Figure 1-2. Pin Configuration

Printing direction: Bidirectional with logic seeking for text and unidirectional for graphics. (Bidirectional printing of graphics can be selected with a printer setting or software command.)

1.2.1.1 Paper Handling Specifications

Paper paths

- Cut sheet path: Rear entry (manual insertion or optional CSF)
Cannot handle multi-part paper using friction feed
- Continuous paper paths: Rear entry (push tractor feed using the push tractor unit or pull tractor feed using the pull tractor unit or push-pull tractor feed using both tractor units)
- Continuous paper parking: Possible, using push tractor unit
- CSF: Cannot handle envelopes or multi-part paper
- Feeding pitch: 1/6 inch, 1/8 inch, or Programmable feeding in increments of 1/360 inch, minimum
- Feeding system: Friction feed or tractor (push, pull, and push-pull) feed

Friction feed

- Set the release lever to the friction position.
- . Insert the left edge of the sheet at the marked position.
- Do **not perform** reverse feed in the area within 0.63 inch (16 mm) from the bottom edge of the sheet.

Push tractorfeed

- Set the release lever to the tractor position.
- Install the tractor unit in the rear in the push tractor position.**
- On the first page (that is, the page immediately after sheet loading) the accuracy of paper feeding is not guaranteed within the area 0.87 inch (22 mm) from the top edge of the sheet.
- On the last page, the accuracy of paper feeding is not guaranteed after the paper comes off the tractor pins.
- During printing of labels, never perform reverse feeding.**
- Do not eject the labels from the rear.**

Pull tractor feed

- Set the release lever to the tractor position.
- . Install the tractor unit in the top in the pull tractor position.
- Do not perform reverse feeding.
- Do not eject them from the rear.

Push pull tractor feed

- Set the release lever to the tractor position.**
- Install one tractor unit in the rear in the push tractor position and install the other tractor unit in the top in the pull tractor position.**
- . **Do not perform reverse feeding.**
- Do not eject the paper from the rear.**

Paper thickness lever: The adjust lever must be set to proper position for the paper thickness, as shown below.

Table 1-2. Paper Thickness Lever Settings

Lever Position	Paper Thickness	Corresponding Paper
0	0.065 mm -0.12 mm (0.0026 in. -0.0047 in.)	Ordinary paper
1	0.12 mm -0.19 mm (0.0047 in. -0.0075 in.)	Multi-part forms (2 sheets)
2	0.19 mm -0.26 mm (0.0075 in. -0.01 in.)	Multi-part forms (3 sheets)
3	0.26 mm -0.32 mm (0.01 in. -0.013 in.)	Multi-part forms (4 sheets)
4	0.32 mm -0.44 mm (0.013 in. -0.017 in.)	Envelopes (20 lb.)
5	0.44 mm -0.52 mm (0.017 in. -0.02 in.)	Envelopes (24 lb.)

Paper-feeding speed: See Table 1-3.

Table 1-3. Feeding Speed

Lever Position	Feeding	1/6 inch Line Feed	Continuous Feed
0, 1	Friction	Max. 94 ins/line Typ. 80 ins/line (*) Min. 75 ins/line	Max 3.6 inches/sec. Typ. 3.3 inches/sec (*) Min. 2.8 inch/sec.
	Tractor		
2-5	Friction	Max. 106 redline Typ. 104 ins/line (*) Min 94 ms/line	Max. 2.8 inches/sec. Typ. 2.5 inches/sec.* Min. 2.2 inches/sec.
	Tractor		

* Feed speed is varies depending on the motor driving voltage.

1.2.1.2 Paper Specifications

Table 1-4. Specifications for Cut Sheet Paper (CSF)

Width	182 mm -216 mm (7.2 in. -8.5 in.)
Length	210 mm -364 mm (8.3 in. -14.3 in.)
Thickness	10.07 mm -0.12 mm (0.0028 in. -0.0047 in.)
Weight	64-90 g/m ² (18 -24 lb.)
Quality	Plain paper, recvcled paper

Table 1-5. Specifications for Cut Sheet Paper (Manual Insertion)

Width	148 mm -257 mm (5.8 in. -10.1 in.)
Length	182 mm -364 mm (7.2 in. -14.3 in.)
Thickness	0.065 mm -0.14 mm (0.0025 in. -0.0055 in.)
Weight	52.3-90 g/m ² (14 -24 lb.)
Quality	Plain paper, recycled paper

Table 1-6. Specifications for Envelopes

Size	No. 6 Width x Length: 166 mm x 92 mm (6.5 in. x 3.6 in.) No. 10 Width x Length: 240 mm x 104 mm (9.5 in. x 4.1 in.)
Thickness	0.16 mm - 0.52 mm (0.0063 in. - 0.0197 in.)
Weight	45- 91 g/m ² (12 -24 lb.)
Quality	Bond paper (not curled, folded, or crumpled), plain paper, airmail paper

Notes: . Printing of envelopes is guaranteed only at room temperature and normal humidity (15 - 25° C (59 - 77° F) ,20- 60% RH).

- Variations in envelope thickness must be less than 0.25 mm (0.0098 in.).
- . When inserting envelopes, keep the longer side horizontal.

Table 1-7. Specifications for Continuous Paper (Single Sheet and Multi-Part)

Width	101.6 mm - 254 mm (4.0 in. - 10.0 in.)
Total thickness	0.065 mm - 0.32 mm (0.0025 in. - 0.012 in.)
Weights	52.3- 82 g/m ² (14 - 22 lb.) — not multi-part 40- 58.2 g/m ² (12 - 15 lb.) — multi-part
Copies	4 sheets (1 original + 3 copies)
Quality	Plain paper, recycled paper, carbonless multi-part paper

Table 1-8. Specifications for Continuous Paper with a Label

Label size (W x L)	63.5 mm (min.) x 23.8 mm (min.) [2.5 in. (min.) x 15/16 in. (min.)]
Width of base paper	101.6 mm -254 mm (4.0 in. x 10.0 in.)
Thickness of base paper	0.07 mm - 0.09 mm (0.0028 in. - 0.0031 in.)
Total thickness	0.16 mm -0.19 mm (0.0063 in. - 0.0075 in.)
Weight	68 g/m ² (17 lb.)
Quality	Plain paper

- Notes:**
- Use only continuous-type labels and use them only with the tractor.
 - . Examples of labels
 - Avery Continuous Form Labels
 - Avery Mini-Line Labels
 - Printing of envelopes is guaranteed only at room temperature and normal humidity (15 - 25° C (59 - 77° F) ,20- 6(Mo RH).

1.2.1.3 Printable Area

Cut sheets

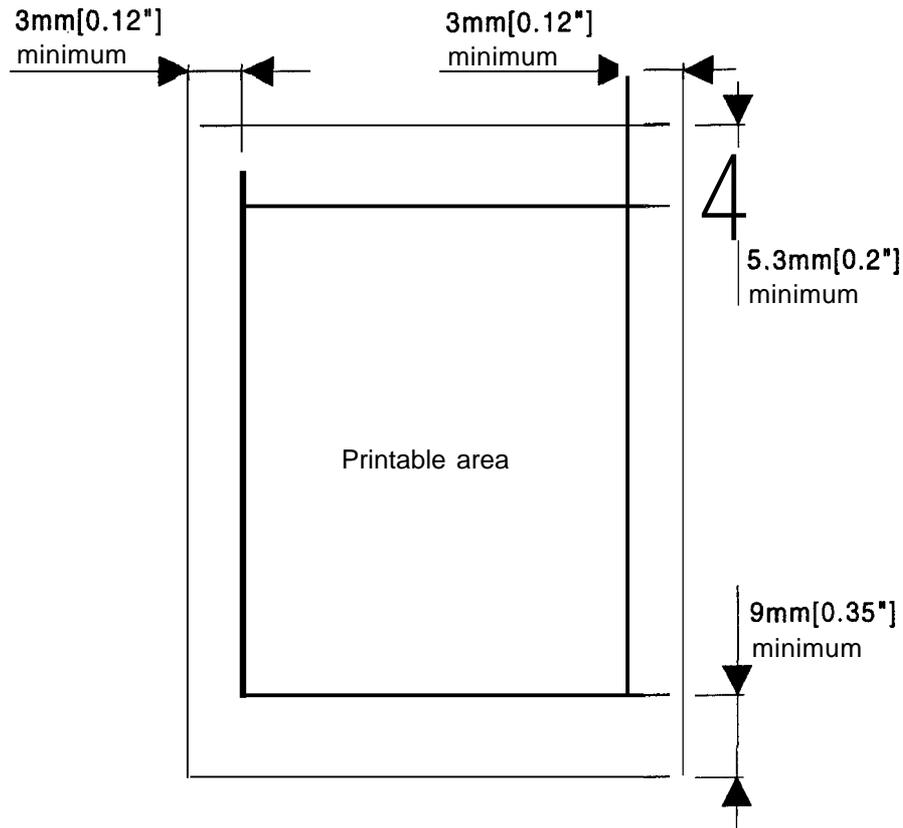


Figure 1-3. Printable Area for Cut Sheets

Envelopes

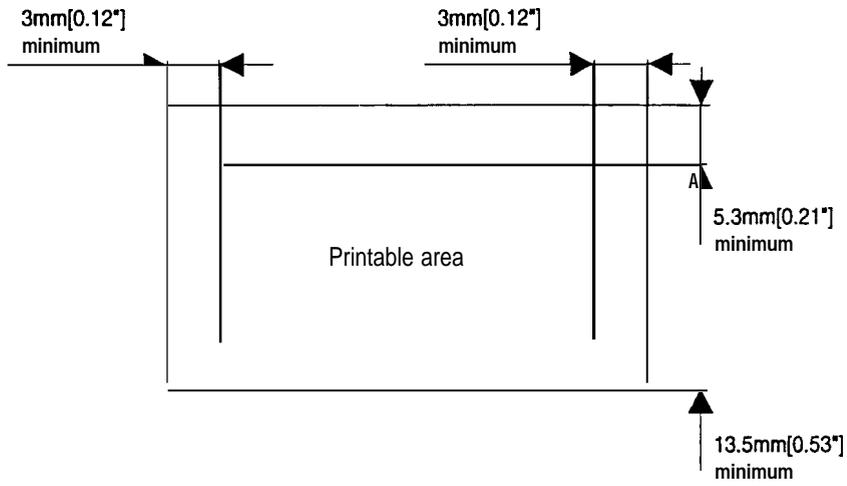


Figure 1-4. Printable Area for Envelopes

Continuous paper

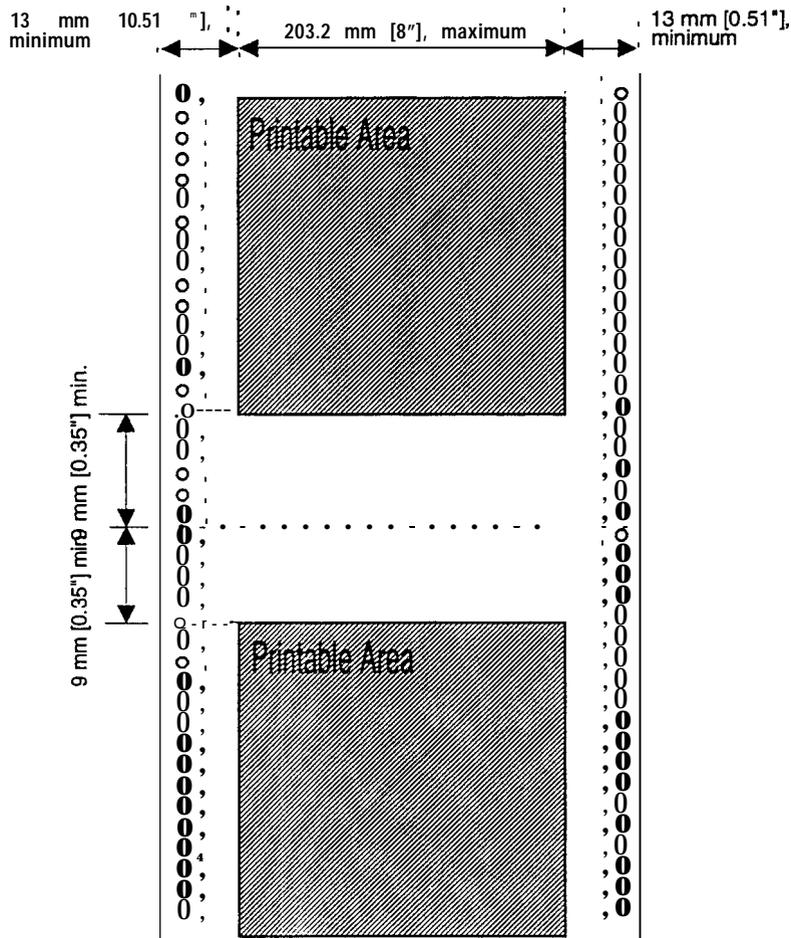


Figure 1-5. Printable Area for Continuous Paper

1.2.1.4 Ribbon Specifications

Ribbon cartridge (mono):	#7753 #7755 (sub-cartridge)
Ribbon cartridge (film):	#7768
Ribbon cartridge (color):	S015077
Ribbon color:	Black, magenta, cyan, yellow
Black ribbon life:	2 million characters (48 dots/character)
Film ribbon life:	0.2 million characters (48 dots/character)
Color ribbon life	
Black:	1 million characters (48 dots/character)
Magenta:	0.7 million characters (48 dots/character)
cyan:	0.7 million characters (48 dots/character)
Yellow:	0.5 million characters (48 dots/character)

1.2.1.5 Electrical Specifications**Table 1-9. Electrical Ranges**

Description	120 V Version	230 V Version
Rated voltage	120 VAC	220-240 VAC
Input voltage range	103.5-132 VAC	198-264 VAC
Rated frequency range	50- 60 Hz	
Input frequency range	49.5- 60.5 Hz	
Rated current	1.1 A	0.6 A
Power consumption	30 W (self-test in 10 cpi draft)	
Insulation resistance	10 MΩ, minimum (applying 500 VDC between AC line and chassis)	10 MΩ, minimum (applying 500 VDC between AC line and chassis)
Dielectric strength	1000 VAC ms for 1 minute or 1200 VAC rms for 1 second (between AC line and chassis)	1500 VAC rms for 1 minute (between AC line and chassis)

1.2.1.6 Environmental Conditions

Temperature range:

Operation:	5to35°C (41 to 95 °F)
Operation (film ribbon):	15to35°C (59 to 95 °F)
Operation (envelopes, labels, or recycled paper):	15to25°C (59 to 77 °F)
Storage:	-20 to55°C (-4 to 131 °F)

Humidity (without condensation):

Operation:	5 to 80%RH
Operation (film ribbon):	10 to 80% RH
Operation (envelopes, labels, or recycled paper):	20 to 60%RH
Storage:	5 to 85%RH

1.2.1.7 Reliability

MTBF:	4000 power on hours (POH)
Printhead life:	200 million strokes/wire (with monochrome ribbon) 100 million strokes/wire (with color and film ribbon)

1.2.1.8 Safety Approvals

Safety standards:	U.S. version:	UL1950 with D3, CSA22.2 #950 with D3
	European version:	EN 60950 (TÜV) IEC950 (SEMKO, DEMKO, NEMKO, SETI)
Radio frequency interference: (RFI)	U.S. version:	FCC part 15 subpart B class B
	European version:	Vfg.243 (VDE0878 part 3, part 30) EN55022 (CISPR PUB. 22) class B

1.2.1.9 Physical Specifications

Dimensions (W x D x H):	366 x 275x 141 mm (14.4 x 10.8x 5.6 inches) without tractor
Weight without tractor:	4.3 kg (9.5 lb.)

1.2.2 Firmware Specifications

Control codes:	ESC/P2 IBM X24E emulation EPSON remote
Input data buffer:	8KB
Download memory:	10KB
Character sets:	14 international character sets and one legal character set
Character tables:	

Table 1-10. Character Tables

Character Table	Standard Model	NLSP* Model
ITALIC	o	o
PC437 (US, Standard Europe)	o	o
PC850 (Multilingual)	o	o
PC860 (Portuguese)	o	x
PC861 (Icelandic)	o	x
PC863 (Canadian-French)	o	x
PC865 (Norwegian)	o	x
BRASCII	○	x
Abicomp	o	x
PC852 (East Europe)	x	o
PC853 (Turkish)	x	o
PC855 (Cyrillic)	x	o
PC857 (Turkish)	x	○
PC864 (Arabic)	x	○
PC866 (Russian)	x	o
PC869 (Greek)	x	o
PC437 Greek	x	o
ISO Latin IT (Turkish)	x	o
ISO 8859-7 (Greek)	x	o
Code MJK (Czecho, Slovakia)	x	o
MAZOWIA (Polland)	x	o
Bulgaria (Bulgaria)	x	o

o Supported x Not supported
 *NLSP = **National Language Support**

Bitmap fonts:	EPSON Draft (10 cpi/ 12 cpi/ 15 cpi)
	EPSON Roman (10 cpi/ 12 cpi/ 15 cpi/ Proportional)
	EPSON Saris Serif (10 cpi/ 12 cpi/ 15 cpi/ Proportional)
	EPSON Courier (10 cpi/ 12 cpi/ 15 cpi)
	EPSON Prestige (10 cpi/ 12 cpi)
	EPSON Script (10 cpi/ 12 cpi)
Scalable fonts:	EPSON Roman 8-32 points (units= 2 points)
	EPSON Sans Serif 8-32 points (units= 2 points)
	EPSON Roman T 8-32 points (units= 2 points)
	EPSON Saris Serif H 8- 32points (units = 2 points)
Character matrix:	Draft 10 cpi; 12 horizontal dots, 24 vertical dots
	NLQ 10 cpi; 36 horizontal dots, 24 vertical dots
Print mode:	Double-width
	Double-height
	Condensed
	Bold
	Double-strike
	Italics
	Super/subscript
	Outline
	Shadow
	Underline (single, double, single-broken, double-broken)
	Strike-through (single, double, single-broken, double-broken)
	OverScore (single, double, single-broken, double-broken)
Resolution:	See Table 1-11.
Printing speed and printable columns:	See Table 1-12.

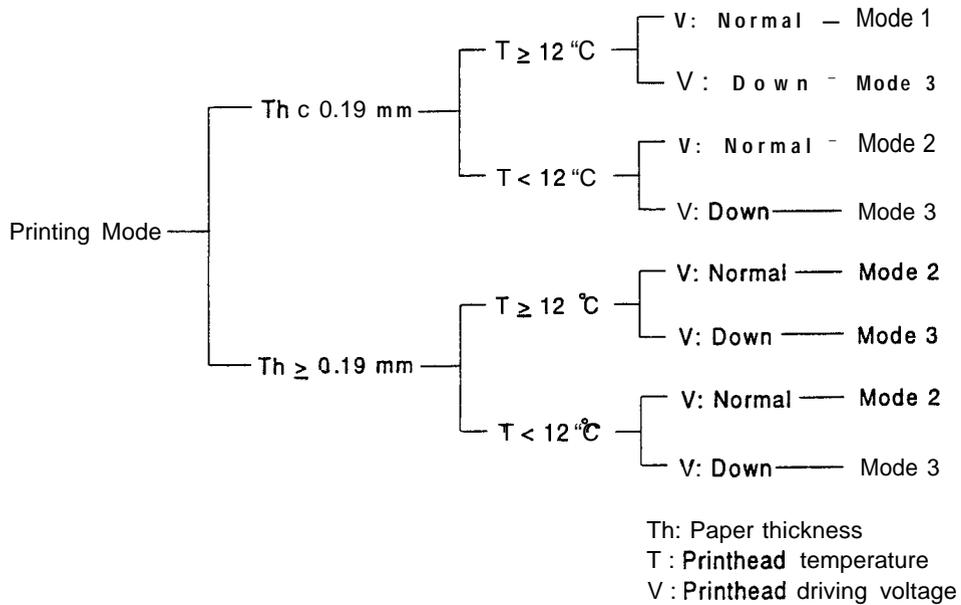
Table 1-11. Resolution

Printing Mode	Horizontal Density	Vertical Density	Adjacent Dot Printed?
Draft	120 dpi	180 dpi	No
Draft condensed	240 dpi	180 dpi	No
LQ	360 dpi	180 dpi	No
8-pin bit image	60 dpi	60 dpi	Yes
	120 dpi	60 dpi	Yes
	120 dpi	60 dpi	No
	240 dpi	60 dpi	No
	80 dpi	60 dpi	Yes
	90 dpi	60 dpi	Yes
24-pin bit image	60 dpi	180 dpi	Yes
	120 dpi	180 dpi	Yes
	90 dpi	180 dpi	Yes
	180 dpi	180 dpi	Yes
	360 dpi	180 dpi	No

Table 1-12. Printing Speed

Printing Mode	Character Size	Printable Columns	Maximum Print Speed [cps]		
			Mode 1	Mode 2	Mode 3
Draft	10 cpi	80	200	133	100
	12 cpi	96	240	160	120
	15 cpi	120	300	200	150
Draft condensed	17 cpi	137	171	114	86
	20 cpi	160	200	133	100
	10 cpi	80	67	50	33
	12 cpi	96	80	60	40
	15 cpi	120	100	75	50
LQ condensed	17 cpi	137	114	86	57
	20	160	133	100	67

Note: Each maximum print speed is changeable depending on attributes of characters within the line.



1.3 INTERFACE SPECIFICATIONS

LQ-300 has a Centronics-compatible parallel interface and an EIA-232D serial interface, one of which can be selected in default setting mode. Auto selection is also available.

1.3.1 Parallel Interface

The parallel interface has two modes:

- . Compatible mode
- Reverse mode

1.3.1.1 Compatible Mode

Data format:	8-bit parallel
Synchronization:	By $\overline{\text{STROBE}}$ pulse synchronization
Handshaking:	By BUSY and $\overline{\text{ACKNLG}}$ signals
Signal level:	TTL-compatible level (IEEE-P1284 level 1 device)
Adaptable connector:	36-pin 57-30360 (Amphenol) or equivalent
Data transmission timing:	See Figure 1-6.

Note: Transition time (rise time and fall time) of every input signal must be less than 0.2 μs .

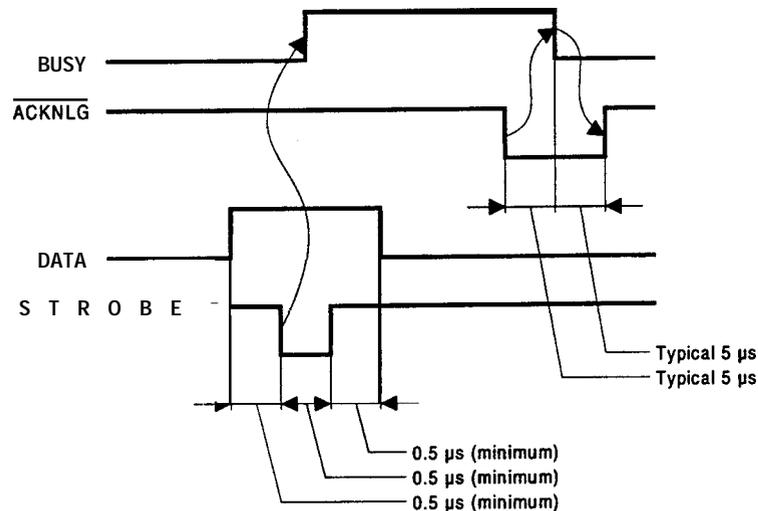


Figure 1-6. Data Transmission Timing

The BUSY signal is active (HIGH) under the following conditions:

- . During data reception (See Figure 1-6.)
- When the input buffer is full
- . When the INIT input signal is active
- . During a printer error
- . During the self-test mode
- . During the default setting mode
- . When the parallel interface is not selected

The $\overline{\text{ERROR}}$ signal is active (LOW) under the following conditions:

- . When a paper-out error occurs
- . When a release lever operation error occurs
- When a fatal error occurs

The PE signal is active (HIGH) under the following conditions:

- When a paper-out error occurs

Table 1-13 shows the connector pin assignments and signal functions for the 8-bit parallel interface.

Table 1-13. Signal and Connector Pin Assignments for Parallel Interface

Pin No.	Signal Name	Return GND Pin	I/O*	Description
1	$\overline{\text{STROBE}}$	19	In	The $\overline{\text{STROBE}}$ pulse is used to read the input data. The pulse width must be more than 0.5 μs . Input data is latched after the falling edge of this signal.
2-9	DATA0-DATA7	20-27	In	Parallel input data to the printer. A HIGH level means data 1. A LOW level means data 0.
10	$\overline{\text{ACKNLG}}$	28	out	This pulse indicates data has been received and the printer is ready to accept more data. The pulse width is approximately 12 μs .
11	BUSY	29	Out	HIGH indicates the printer cannot accept more data.
12	$\overline{\text{P}}^{\text{E}}$	28	Out	HIGH indicates <u>paper-out</u> . This signal is effective only when the ERROR signal is LOW.
13	SLCT	28	Out	Always HIGH output. (Pulled up to +5 V through 3.3K Ω resistor.)
14	$\overline{\text{AFXT}}$	30	In	Not used.
15,34	NC	.	—	Not connected.
16	GND	—	—	Signal ground.
17	Chassis GND	—	—	Chassis ground.
18	LOGIC-H	—	out	Pulled up to +5 V through 3.9K Ω resistor.
19-30	GND	.	—	Signal ground.
31	INIT	30	In	Input for printer initialization. Pulse width 50 μs minimum, active LOW.
32	$\overline{\text{ERROR}}$	29	Out	LOW indicates that some error has occurred in the printer.
33	GND	—	—	Signal ground.
35	+5V	—	out	Pulled up to +5 V through 3.3K Ω resistor.
36	SLIN	30	In	Not used.

* The //O column indicates the direction of the signal as viewed from the printer.

1.3.1.2 Reverse Mode

LQ-300 reverse mode supports IEEE-P1284 nibble mode, described in this section.

Transmission mode: IEEE-P1284 nibble mode

Signal level: IEEE-P1284 level 1 device

Adaptable connector: 36-pin 57-30360 (Amphenol) or equivalent

Table 1-14. Signal and Connector Pin Assignments for Parallel Interface

Pin No.	Signal Name	Return GND Pin	I/O*	Description
1	HostClk	19	In	Host clock signal.
2-9	DATA0-7	20-27	In	Signals DATA0 through DATA7 represent data bits 0 to 7.
10	Ptrclk	28	out	Printer clock signal.
11	PtrBusy / DataBit-3,7	29	Out	Printer busy signal and reverse channel transfer data bit 3 or 7.
12	AckDataReq / DataBit-2,6	28	Out	Acknowledge data request signal and reverse channel transfer data bit 2 or 6.
13	Xflag I DataBit-1,5	28	Out	X-flag signal and reverse channel transfer data bit 1 or 5.
14	HostBusy	30	In	Host busy signal.
15	NC	—	—	Not connected.
16	GND	·	—	Signal ground.
17	Chassis GND	—	—	Chassis ground.
18	Logic-H	—	out	Pulled up to +5 V via 3.9K Ω resistor.
19-30	GND	—	—	Signal ground.
31	$\overline{\text{INIT}}$	30	In	Not used.
32	DataAvail / DataBit-0,4	29	Out	Data available signal and reverse channel transfer bit 0 or 4.
33	GND	—	—	Signal ground.
34	NC	—	—	Not connected.
35	+5 V	—	out	Pulled up to +5 V via 3.3K S2 resistor.
36	1284-Active	30	In	1284 active signal.

* The I/O column indicates the direction of the signal as viewed from the printer.

1.3.2 Serial Interface

The LQ-300 is equipped with an 8-bit serial interface, standard.

Data format:	EIA-232D serial
Synchronization:	Asynchronous
Handshaking:	By DTR protocol, X-ON/X-OFF protocol, ETX/ACK protocol
Word length	
Start bits:	1 bit
Data bits:	7 or 8 bits (selectable)
Parity bit:	Odd, even, or none (selectable)
Stop bits:	1 bit
Bit rate:	300,600,1200,2400,4800, 9600,19200 bps (selectable)
Logic level	
MARK (logical 1):	
SPACE (logical 0):	-3 V to -25 V +3 v to +25 v
Parity check:	Odd, even, or no parity bit (selectable)
Connector:	EIA standard 25-pin D-SUB female connector

Table 1-15. Signal and Connector Pin Assignments for Serial Interface

Pin No.	Signal Name	I/O'	Description
1	Chassis GND	—	Chassis ground.
2	TXD	out	Transmit serial data.
3	RXD	In	Receive serial data.
4	RTS	out	Request to send. Always SPACE level when the printer is powered on. Pulled up to +12V via 4.7K Ω resistor.
7	Signal GND	—	Return path for data and control signals.
11	REV	out	Connected directly to the DTR signal.
20	DTR	out	Indicates that the printer is ready to receive data or not.
5,6,8-10, 12-19, 21-25	NC	—	No connection (not used).

* The I/O column indicates the direction of the signal as viewed from the printer.

1.3.3 Interface Selection

The printer has 2 interfaces: parallel and serial. These interfaces can be selected manually in default-setting mode or selected automatically.

- Manual selection

One of the two interfaces can be selected in default-setting mode.

- . Automatic selection

When automatic interface selection is enabled in default-setting mode, the printer is initialized to idle state scanning, in which an interface receives data when it is powered on, and the interface that receives data first is selected. When the host stops data transfer, and the printer is in the standby state for 10 or 30 seconds (time selectable in the default-setting mode), the printer returns to the idle state. As long as the host sends data to the printer interface in the BUSY state, the currently selected interface remains the same.

- . Interface state and interface selection

When the parallel interface is not selected, the interface is in the BUSY state. When the serial interface is not selected, the interface sends X-OFF and sets the DTR signal MARK. When the printer is initialized or returned to the idle state, the parallel interface is in a READY state, the serial interface sends X-ON and sets the DTR signal SPACE. Notice that the interrupt signal such as a INIT signal on the parallel interface is not effective while that interface is not selected.

1.3.4 Preventing the Host from Data Transfer Timeout

Hosts abandon attempts at data transfers to peripherals when a peripheral is in BUSY state for dozens of seconds continuously. To prevent hosts from this kind of timeout, the printer receives data very slowly, several bytes per minute, even if the printer is in BUSY state. This slowdown is started when the rest of the input buffer becomes several hundreds of bytes. Finally, when the input buffer is full, the printer goes into the BUSY state continuously.

1.4 OPERATING INSTRUCTIONS

This section describes control panel operation functions, self-test, hexadecimal dump, paper feed, micro adjustment, and printer initialization methods.

1.4.1 Control Panel Operation

The printer control panel contains three non-lock-type push buttons and three LED indicators for easy operation of the various printer functions.

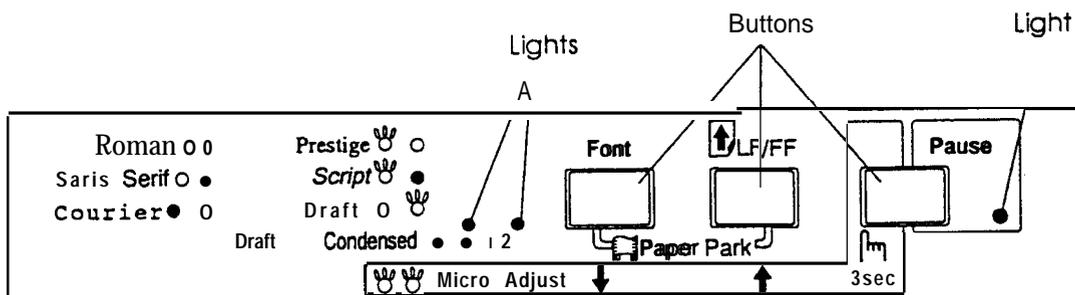


Figure 1-7. Control Panel

Buttons

- Pause:** Switches printer status between printing and no printing, if there is print data in the input buffer. When the printer is out of paper, the light flashes and the beeper sounds three times.
- Font:** Selects one of the available fonts. When you hold down this button while you turn on the printer, you enter the printer setting mode.
- LF/FF:** When you press this button, the printer feeds paper line by line. Hold it down to load a single sheet, or to advance continuous paper to next top-of-form position.

Indicators

- Pause (Orange):** Lights when the printer in pause mode.
- Font 1 and 2 (Green):** Indicates the currently selected font.

Special Mode

- Self-test mode:** Hold down the LF/FF button and turn on the printer.
- Hex dump mode:** Hold down the LF/FF and Font buttons and turn on the printer.
- Default-setting mode:** Hold down the Font buttons and turn on the printer.
- Micro adjustment mode:** Hold down the Pause button or Font button.
- Paper park mode:** Hold down the Font and LF/FF buttons together.

Table 1-16. Paper Feeding Functions

Operations	Tractor Feed		Friction Feed	
	Not Paper Out	Paper Out State	Not Paper Out	Paper Out State
Press LF/FF button briefly	Line feed (*1)	Load continuous paper	Line feed	Load a sheet (*2)
Press LF/FF button continuously	Form feed (*1)	Load continuous paper	Eject	Load a sheet (*2)
Press LF/FF and Font buttons at the same time	Paper park (*1)	—	—	—
Insert a sheet to the manual insertion slot	—	—	—	After 2 seconds load the sheet manually (*2)

(*1): When the printer is in tear-off state, these functions are performed after returning from the tear-off position.

(*2) Once a manually inserted sheet is loaded, the printer enters manual insertion mode. After that, even if data remains in the buffer, the printer goes into a paper out error state at the end of every a sheet and waits for insertion of the next sheet. The CSF is enabled again by sheet loading operation from the CSF or by initialization.

1.4.2 Self-test Function

This section explains how to run the self-test.

1. Hold down the LF/FF button and turn on the printer to start the self-test.
2. If paper is not loaded, the printer attempts to load it.
3. The printer prints alphanumeric characters continuously.
5. Quit self-test mode printing by pressing the Pause button and turning the printer off.

1.4.3 Hexadecimal Dump Function

The hexadecimal dump is a useful tool for troubleshooting data control problems. This section describes how to run a hex dump.

1. Turn on the printer while holding down the LF/FF and Font buttons.
2. If paper is not loaded, the printer attempts to load it (either single sheet or continuous paper).
3. If the printer cannot load the paper, it indicates a paper-out error. In this case, insert paper again, and press the Pause button.
4. The printer waits for data after printing the message "Hex dump(*)".
 - "Hex Dump": English or German is selected
 - "Codes Hexadecirnaux": French is selected
 - "Dump esadecimale": Italian is selected
 - "Volcado hex": Spanish is selected
5. Received data is printed as both hexadecimal codes and ASCII characters. If a corresponding printable character does not exist, the printer outputs a period (.).
6. Quit hexadecimal dump printing by pressing the PAUSE button and turning the printer off.

Note: In hex dump mode, the character table depends on the default setting, and 10 cpi draft is selected automatically.

1.4.4 Micro Adjustment Function

To enter adjustment mode, press the Pause button for three seconds, until the printer beeps once and the Pause lights blink to indicate that the adjustment operation is available. If the printer state is not one of the conditions shown below, this operation is ignored.

- TOF position adjustment:
The position can be adjusted just after the paper is loaded.
- Tear-off position adjustment:
The position can be adjusted when paper is actually located at the tear-off position.

In the adjustment mode, press the LF/FF button to feed paper forward and the Font button to feed paper backward. You can cancel adjustment mode by pressing the Pause button or inputting a print command. The adjusted position is stored in non-volatile memory.

1.4.5 Printer Status Indication

This section describes how the printer indicates status and error conditions using LEDs and the beeper.

The symbols below describe the frequency of beeper sounds.

- (•): The beeper sounds for 100 rns with an interval of 100 ms between beeps.
- (—): The beeper sounds for 500 rns.

While initialize signal is active:	Pause light is on.
During initialization:	Pause light blinks
Standby or printing state:	Pause light is off
Pause state:	Pause light is on
Micro adjustment mode:	Beeper sounds (•) and Pause light blinks. (light on:off ratio= 1:1)
Tear-off:	Pause light blinks (light on:off ratio= 1:6)
Paper-out error state(*1)	Beeper sounds (..) and Pause light blinks (light on:off ratio= 6:1)
Operating error (*2), fatal error (*3):	Beeper sounds (—) and Pause light is on.

Notes:

(*1): A paper-out error occurs with any of the following conditions:

- Paper is not loaded after loading is attempted.
- A full sheet finishes printing after single sheet loading by manual insertion.
- The end of continuous paper is reached.

When a paper-out error occurs, the printer stops printing and enters the pause state. After that, when a sheet is loaded, the PAUSE light stops blinking and the light stays on, but the printer remains in the pause state. Press the PAUSE button to start printing.

(*2): An operating error occurs for any of the following conditions:

- The release lever is set to the TRACTOR position without ejecting cut sheets.
- The release lever is set the FRICTION position without ejecting continuous paper.

(*3): A fatal error occurs with any of the following conditions:

- Power supply voltage is abnormal.
- Printhead temperature is abnormal.

1.4.6 Selected Font

The combination of two **Font** LEDs (1 and 2) is used to indicate the selected font. To choose one of the seven internal fonts listed on the control panel, press the **Font** button.

Table 1-17. Font Selection

Selected Font	Font 1 Light	Font2 Light
Roman	On	On
Saris Serif	On	off
Courier	off	On
Prestiae	Blinking	On
script	Blinking	off
Draft	On	Blinking
Draft condensed	off	off

1.4.7 Printer Initialization

There are three types of initialization: power-on initialization, hardware initialization, and software initialization.

1.4.7.1 Power-on Initialization

The power-on initialization is performed by turning the printer powered on. When the power-on initialization is performed:

- . The printer mechanism is initialized.
- The hardware initialization is performed.

1.4.7.2 Hardware Initialization

Hardware initialization is performed by:

- . Turning on the printer.
- . The falling edge of a negative pulse or a low signal on the parallel interface /INIT line.

When hardware initialization is performed:

- Print data in the input buffer is cleared.
- . Download character definitions are cleared.
- . The printer's settings are returned to the defaults.
- The printer is set to the standby condition, if no fatal error occurs.

1.4.7.3 Software Initialization

Software initialization is performed upon receipt of the control code ESC @. When software initialization is performed:

- Print characters in the buffer are not cleared.
- . The printer setting is changed to the default, but download character definition is not cleared.

1.4.8 Printer Settings

1.4.8.1 Selectable Printer Settings

The following printer settings can be changed by users in default-setting mode:

Character table (Standard):	PC437/850/860/861 /863/865 /BRASCII/Abicomp
Character table (NLSP):	PC437/437 Greek/850 /852/853/855/857/864/866/869 /ISO Latin IT /ISO 8859-7/Code MJK/Mazowia/Bulgaria
Page length:	11 /12/ 8.5/ 70/6 inches (A4)
1-inch skip-over-perforation:	On / <u>Off</u>
Auto tear off:	On / <u>Off</u>
Graphic print direction:	Unidirectional / Bidirectional
Software	ESC/P2 / IBM X24E
AGM:	on/ <u>Off</u>
Auto line feed:	On / <u>Off</u>
Interface:	Auto selection (10 second wait) / Auto selection (30 second wait) / Parallel / Serial
Bit rate (serial I/F):	300 / 600/ 1200/ 2400/ 4800/ <u>9600</u> / 19200 bps
Parity bit (serial I/F):	None / Odd/ Even
Data length (serial):	7 bits / 8 bits
ETX/ACK (serial):	On / <u>Off</u>
State reply	On / <u>Off</u>

Note: Underlines show factory setting.

1.4.8.2 Changing the Default Settings

You can change some parameters that the printer refers to at printer initialization.

1. To enter the default setting mode, turn on the printer while holding down the Font button, The printer prints out the firmware version. If paper is not loaded, insert a sheet of paper.
2. The printer automatically loads paper and prints a table of languages to choose from: English, French, German, Italian, and Spanish. The Font lights indicate the currently selected language, as shown in the table below.

Table 1-18. Font Lights and Language Selection

Font 1 Light	Font 2 Light	Language
OFF	ON	English
OFF	Blinks	French
ON	OFF	German
ON	ON	Italian
ON	Blinks	Spanish

3. Press the Font button to change the language, and press the LF/FF button to select.
4. Press the Font button again after selecting a language. The printer prints help text to guide you in setting defaults. The printed instructions include submenu tables listing all the settings you can change and showing you how the control panel lights appear for each selection.
5. To change the settings, press the Font button to move down and press the LF/FF button to move up in the menu of options shown below. The printer beeps once each time you press the these buttons while you are in this menu.

Table 1-19. Default Options

Font 1 Light	Font 2 Light	Pause Light	Setting	Go to Submenu
Blinks	OFF	OFF	Character table	Table 1-20
Blinks	ON	OFF	Page length	Table 1-21
OFF	Blinks	OFF	Skip over perforation	Table 1-22
ON	Blinks	OFF	Auto tear-off	Table 1-22
Blinks	OFF	ON	Graphic print direction	Table 1-23
Blinks	ON	ON	Software	Table 1-24
OFF	Blinks	ON	AGM	Table 1-22
ON	Blinks	ON	Auto line feed	Table 1-22
Blinks	OFF	Blinks	interface	Table 1-25
Blinks	ON	Blinks	Bit rate	Table 1-26
OFF	Blinks	Blinks	Parity bit	Table 1-27
ON	Blinks	Blinks	Data length	Table 1-28
Blinks	Blinks	Blinks	ETX/ACK	Table 1-22
Blinks	Blinks	OFF	State reply	Table 1-22

- When you reach the setting you want to change, press the Pause button once. The printer automatically enters the submenu for that setting.
- Press the Font button to move through the settings in the submenu. The printer beeps twice each time you press the Font button while in a submenu.
- When the lights match your desired setting, press the Pause button to make your selection. The printer saves the new setting and returns to the menu shown above.
- Repeat steps 5 through 8 for each additional setting you want to change, or skip to step 10 to exit the printer's default setting mode.
- When you are finished, turn the printer off. Any settings you have made remain in effect until you change them again.

Table 1-20. Character Tables

Font 1 Light	Font 2 Light	Pause Light	Standard Model	NLSP Model
OFF	OFF	OFF	PC 437	PC 437
ON	OFF	OFF	PC 850	Pc 650
OFF	ON	OFF	Pc 860	PC 864
ON	ON	OFF	PC 863	PC 437 Greek
OFF	OFF	ON	PC 865	Pc 652
ON	OFF	ON	Pc 861	PC 853
OFF	ON	ON	BRASCII	PC 855
ON	ON	ON	Abicomp	PC 857
OFF	OFF	Blinks	—	Pc 866
ON	OFF	Blinks	—	PC 869
OFF	ON	Blinks	—	ISO Latin IT
ON	ON	Blinks	—	ISO 8859-7
OFF	Blinks	Blinks	—	Code MJK
ON	Blinks	Blinks	—	Mazowia
Blinks	Blinks	Blinks	—	Bulgaria

Table 1-21. Page Length

Font 1 Light	Font 2 Light	Pause Light	Setting
OFF	OFF	OFF	11 inches
ON	OFF	OFF	12 inches
OFF	ON	OFF	8.5 inches
ON	ON	OFF	7 ⁵ / ₆ inches

Table 1-22. Skip Over Perforation / Auto Tear Off/ AGM / Auto Line Feed/ ETX/ACK / State Reply

Font 1 Light	Font 2 Light	Pause Light	Setting
OFF	OFF	OFF	off
ON	ON	ON	On

Table 1-23. Graphic Print Direction

Font 1 Light	Font 2 Light	Pause Light	Setting
OFF	OFF	OFF	Uni-D
ON	ON	ON	Bi-D

Table 1-24. Software

Font 1 Light	Font 2 Light	Pause Light	Setting
OFF	OFF	OFF	ESC/P2
ON	ON	ON	IBM X24E

Table 1-25. Interface

Font 1 Light	Font 2 Light	Pause Light	Setting
OFF	OFF	OFF	Auto selection (10 ms wait)
ON	OFF	OFF	Auto selection (30 ms wait)
OFF	ON	OFF	Parallel
ON	ON	OFF	Serial

Table 1-26. Bit Rate

Font 1 Light	Font 2 Light	Pause Light	Setting
OFF	OFF	OFF	300 bps
ON	OFF	OFF	600 bps
OFF	ON	OFF	1200 bps
ON	ON	OFF	2400 bps
OFF	OFF	ON	4800 bps
ON	OFF	ON	9600 bps
OFF	ON	ON	19200 bps