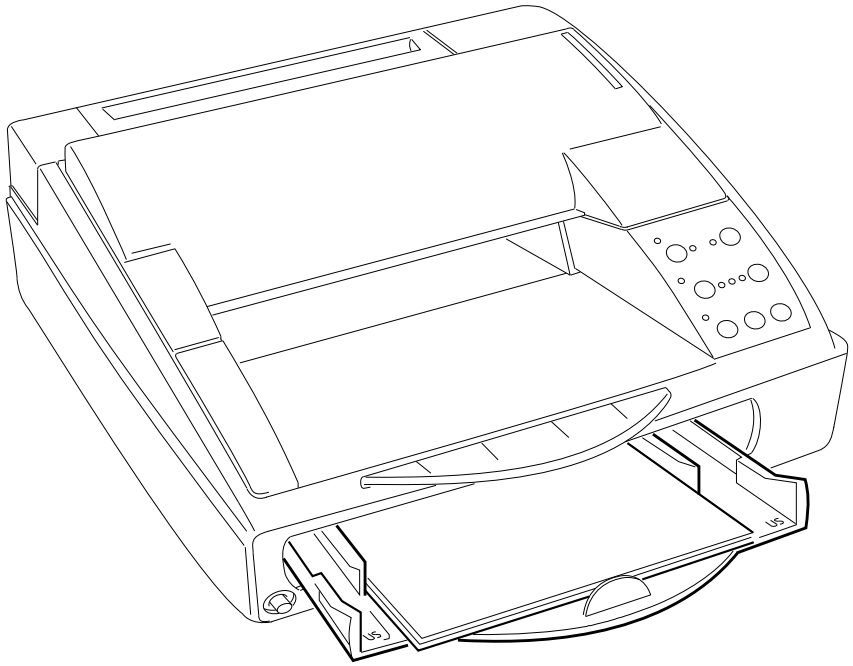
digital

DECwriter 500i

DECcolorwriter 520ic

(LJ500 and LJ520)

Service Manual



EK-LJ50E-SV.A01

First Edition - July 1994

PREFACE

This service manual provides technical, mechanical and electronic information for product support.

Refer to this manual when a fault has not been corrected using the recommendations described in the Installation and User Guide included with the printer.

Summary

This manual is divided into 9 chapters and 1 appendix which contains the list of recommended spares (FRU). The chapters are organized to develop an autonomous and gradual approach to printer problems.

Some paragraphs are marked on a dark background and advise the use of particularly important situations or procedures. If these observations are not heeded, the printer could malfunction.

Associated Documentation

EK-LJ50*-UG	DECwriter 500i & DECcolorwriter 520i - *Installation and User Guide*
EK-LJ50*-RF	Read-Me-First - DECwriter 500i
EK-LJ52E-RF	Read-Me-First - DECcolorwriter 520i (English only)

The * in the above two part numbers corresponds to the language identifier for the appropriate language, e.g. F- French, G- German and so on.

Languages supported are English (UK and USA), French, German, Italian and Spanish

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

INFORMATION TO THE USER

NOTE: This equipment has been tested and found to comply with the 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 receiver
- Connect the equipment to an outlet of a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for assistance.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Connecting of peripherals requires the use of grounded shielded cables.

EMI Requirements for Canadian Market

This digital apparatus does not exceed the class B limits for radio noise emissions from digital apparatuses as set forth in the radio interference regulations of the Canadian Department of Communications.

Spécifications EMI pour le Marché Canadien

Le présent appareil numérique n'emet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe B prescrites dans le reglement sur le brouillage radioélectrique edicté par le Ministere des Communications du Canada.

This equipment conforms to the specifications of EEC directive 87/308 on the prevention and elimination of radio-frequency disturbances.

NOTICE Digital Equipment Corp. reserves the right to modify the equipment described in this manual at any time and without notice.

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1. GENERAL

1.1 INTRODUCTION

The LJ500 and LJ520 are "bubble ink jet" printers that combine excellent quality printing with a fast writing speed, a low noise level and considerable versatility in the paper handling. With these qualities they can compete with many Laser Printers.

This service manual is intended for the DECwriter 500i monochrome inkjet printer with color option, and the DECcolorwriter 520ic color inkjet printer otherwise known as the LJ500 and LJ520. The only difference is that the color model is shipped with the color kit, and the monochrome model can be upgraded with the color kit, which has to be ordered separately. In all other respects the two printers are identical and therefore all instructions and operations described in this manual are applicable to both printer models, unless reference is made to a specific model.

This non-impact printer is designed and constructed to guarantee reliability and to give constant quality of both text and high resolution graphics. It uses “drop on demand” thermal ink jet technology with a monochrome (black) or colour disposable print head, associated with very low power consumption (25W - less than a standard light bulb). It produces a laser-like print density of up to 300 x 300 dots per inch (dpi) with minimal operating disturbance. The monochrome print head has a rechargeable system and its ink is water- resistant.

This printer can be connected to personal computers with a standard parallel or optional serial interface. Compatible with MS-Windows and many other software applications commonly used with this class of printer, it can be used in most working environments. The resident firmware emulates the HP DeskJet 500C printer (extended PCL-III commands).

1.2 TECHNICAL CHARACTERISTICS

Printing Technique	Non-impact, bubble ink jet
Print Head	Disposable Black or Color
Black	Vertical resolution: 300 dpi Repetition frequency: 5000 Hz Nozzles: 50 (in 4 groups of 12 or 13) Vertical construction: 2 cols of 25 nozzles Water-resistant ink Ink cartridge life: 90,000,000 dots (400,000 characters,, average or 400 pages) Replaceable ink cartridges No. cartridges per print head: up to 10 (depending on usage: work load and storage)
Color	Vertical resolution: 300 dpi Repetition frequency: 3000 Hz Nozzles: 51 (in 3 vertical groups: yellow, magenta, cyan) Vertical construction: 2 cols, one of 25 and one of 26 nozzles Print head life: 200 pages at 8% coverage
Print Matrix,	300 x 300 dpi
Print Definition	
(Vertical x Horizontal)	1/300 in x 1/100 in for Draft 1/300 in x 1/150 in for NLQ 1/300 in x 1/300 in for LQ (rows shifted by 1/600 in.)
Print Density	75, 100, 150, 300 dpi
Print Pitch	10, 12, 16.67 cpi; PS Each basic fixed pitch value can be condensed to half and expanded to double its value (e.g.: 10cpi: 5 cpi / 20cpi)
Print Orientation	Portrait and Landscape
Print Line Length (A4 paper size),	
Portrait orientation:	- 80 characters with 10 cpi pitch - 96 characters with 12 cpi - 132 characters with 16.67 cpi pitch

	Landscape orientation:	- 112 characters with 10 cpi pitch - 134 characters with 12 cpi - 186 characters with 16.67 cpi
Printing Speed	*DOS and similar environments:*	400 cps in Draft 280 cps in NLQ 160 cps in LQ
	Windows and similar environments:	DRAFT : up to 5 ppm (pages per minute) NLQ : up to 4 ppm Letter Quality : up to 3 ppm (these values may vary depending on the software application and/or the type of computer used)
Work Load		should not exceed 350 pages per day nor 1000 pages per month, including 160 color pages
Printer Life		5 years
Print Path		Bi-directional
Graphic Printing		Bit Image Mode - density: 300 x 300 dpi
Ink Save Mode		10% ink saving in graphics mode
Linespacing		Elementary value: 1/300 in Resident value: 1/6 in (4.23 mm)
Printer Emulation		Resident : PCL III + Optional : IBM -X24/EPSON LQ 850 (available on Emulation card)
Paper Handling		-Automatic: ASF1 (tray capacity:120x80g/m2 shts.)
		Manual: including thick documents, film, envelopes (weight up to 135 g/m2) (see Chap. 3 User Guide for paper characteristics) Optional: ASF2; tractor (for fan-fold stationery)
Interface		Resident: parallel (Centronics) Optional: serial (EIA RS 232C)
RAM		128K bytes
Operating Environment		Temperature: 15 to 35oC Relative Humidity: 15% - 85%

Noise Emittance	Less than 50 dBA in LQ mode
Electrical Characteristics	Voltage: -110 - 120 V; +/- 10% -120 - 240 V; + 6% / - 10% Frequency: 50 or 60 Hz Power absorbed: < 25 W

Certification

For mains voltage 115 V (USA and Canada):,

Electromagnetic Compatibility	FCC Class B “Certified”
Safety Regulations,	USA: UL 1950/478 Canada: CSA C22.2

For mains voltage 220 - 240 V,

Electromagnetic Compatibility	EN 55022 Class B CEE 87/308 VDE 0871 level B (DBP Verf.243/1991)
Safety Regulations	EN 60950 + Nordic Deviations Germany: GS (EN 60950/9.88 eZH/618)

Physical Characteristics, Basic printer ready for use

Height - 6.81 in (173 mm)
Width - 15.15 in (385 mm)
Depth - 18.34 in (466 mm)
Weight, - 11 lbs (5 kg)

1.3 FIRMWARE AND CHARACTER GENERATORS

Basic emulations

The basic firmware, contained on 1 Mbyte ROM assembled on the BA X100 board, emulates the HP Deskjet 500 and HP Deskjet 500C printers, with the corresponding character generators.

The machine automatically makes the selection between the two emulations according to the type of cartridge installed (black ink cartridge: HP Deskjet 500; color inks cartridge: HP Deskjet 500C).

Optional emulations:

The available optional emulations are EPSON LQ 850 and IBM Proprinter 4207. Each emulation includes the relevant set of characters and both are contained on a specific card.

The optional emulations cannot handle optional fonts on the memory card. To enlarge the LQ 850 and 4207 emulation graphic fonts, the memory extension memory card must be inserted to handle the DLL functions (Down Line Loading).

Character generator:

The task of the character generator is to assign a specific printable character to each code included in the graphic set.

The first 128 codes in the ISO table (0-127)are the standard USA ASCII character set. This group does not include national variations or semigraphic symbols.

The assignment of the codes included in the second ISO set table (128-255) varies from country to country and from product to product.

Note

For full and up-to-date details of the character sets and command codes, please refer to Appendix D of the User Guide

Character set:

The character sets in the machine and available for all resident or optional fonts are the following:

CP 437 International;
PC 8 Denmark/Norway;
ECMA 94 LATIN 1 ISO 8859/1;
ISO Nb 21 Germany EPSON 02;
ISO Nb 15 ITALY;
ISO Nb 61 Norway 2;
05; ISO Nb 10 Sweden;
ISO Nb 6 USA (ASCII) EPSON 00;
ISO Nb 16 Portugal;
LEGAL;
Denmark OPE 1 ;
Denmark OPE 2;
CP 863 French/Canadian.
ROMAN 8;
PC-850 Multilanguage/Latin 1;
ISO Nb 4 United Kingdom;
ISO Nb 69 France;
ISO Nb 60 Norway 1;
ISO Nb 11 Sweden: Names EPSON
ISO Nb 17 Spain;
ISO Nb 2 IRV;
ISO Nb 14 JIS ASCII;
CP 860 Portugal;
UNIX International;
Spain2;

Further character sets in the machine and available for the ROM resident fonts (Courier, Letter Gothic and Times Nordic) are:

PC WIN1 (ANSI WINDOWS 3.1);
ISO 8859/2 Latin 2;
CP 857 Turkish (Latin 5);
PC WIN3 Turkish Win 3.1 (Latin 5);
CP 855 Cyrillic;
PC WIN4 (Cyrillic Windows 3.1);
CP 851 Greek;
PC WIN5 (Greek Windows 3.1);
ISO 8859/8 Hebrew;
PC Kamenicky.
CP 852 Latin 2;
PC WIN2 (East Europe. Win 3.1);
ISO 8859/9 Latin 5;
CP 866 Cyrillic;
ISO 8859/5 Cyrillic;
CP 210 Greek;
ISO 8859 Greek;
CP 862 Hebrew;
PC Slovenia;

Resident fonts:

The character fonts in the machine firmware are divided according to the required page format: vertical or horizontal.

The list of the available fonts is shown in the tables that follow, that also indicate the possible character heights (in print dots) and spacing (in characters per inch).

Fonts for vertical page format

Style	Height	Pitch
Courier	6 / 12	5 / 10 / 20
Courier italic	6 / 12	5 / 10 / 20
Courier	6 / 12	8,33 / 16,67 / 33,34
Letter Gothic	6 / 12	5 / 10 / 20
Letter Gothic	6 / 12	6 / 12 / 24
Letter Gothic italic	6 / 12	6 / 12 / 24
Letter Gothic	4,75 / 9,5	8,33 / 16,67 / 33,34
TMS Nordic	6 / 12	Proportional
TMS Nordic italic	6 / 12	Proportional
BF Times	7 / 14	Proportional
BF Times italic	7 / 14	Proportional
BF Times	6 / 12	Proportional
BF Times italic	6 / 12	Proportional
BF Times	5 / 10	Proportional
BF Times italic	5 / 10	Proportional
BF Times	4 / 8	Proportional
BF Times italic	4 / 8	Proportional
Line	7 / 14	Proportional
Line italic	6 / 12	Proportional
Line	6 / 12	Proportional
Line	5 / 10	Proportional
Line italic	5 / 10	Proportional
Line	4 / 8	Proportional

Fonts for horizontal page format

Style	Height	Pitch
Courier	6 / 12 / 24	10 / 20
Courier italic	6 / 12 / 24	10 / 20
Courier	6 / 12 / 24	16,67 / 33,34
Letter Gothic	6 / 12 / 24	12 / 24
Letter Gothic	4,75 / 9,5 / 19	16,67 / 33,34

Basic emulation optional fonts:

An ISO code character set that is the same as the basic character generator but with a different style. These fonts are on optional cards, and the contents of the card are given below:

1- "Prestige Elite" card (256 Kbytes)

Style	Height	Pitch	Page format	Nº Setup
Prestige Elite	10	12	Vertical	101
Prestige Elite italic	10	12	Vertical	102
Prestige Elite	7	16.67	Vertical	103
Letter Gothic italic	12	12	Horizontal	104
Line Draw	10	12	Vertical	
Math Prestige	10	12	Vertical	
Math Prestige	12	16.67	Vertical	
Pi Font Prestige	10	12	Vertical	
Pi Font Prestige	7	17.67	Vertical	

2- "Times Nordic" card (256 Kbytes)

Style	Height	Pitch	Page format	Nº Setup
Times Nordic	30	Proportional	Vertical	111
Times Nordic	14	Proportional	Vertical	112
Times Nordic italic	14	Proportional	Vertical	112
Times Nordic	12	Proportional	Vertical	114
Times Nordic italic	12	Proportional	Vertical	115
Times Nordic	10	Proportional	Vertical	116
Times Nordic italic	10	Proportional	Vertical	117
Times Nordic	8	Proportional	Vertical	118
Times Nordic italic	8	Proportional	Vertical	119

3- "Nordic" card (256 Kbytes)

Style	Height	Pitch	Page format	Nº Setup
Nordic	30	Proportional	Vertical	121
Nordic	14	Proportional	Vertical	122
Nordic italic	14	Proportional	Vertical	122
Nordic	12	Proportional	Vertical	124
Nordic italic	12	Proportional	Vertical	125
Nordic	10	Proportional	Vertical	126
Nordic italic	10	Proportional	Vertical	127
Nordic	8	Proportional	Vertical	128
Nordic italic	8	Proportional	Vertical	129

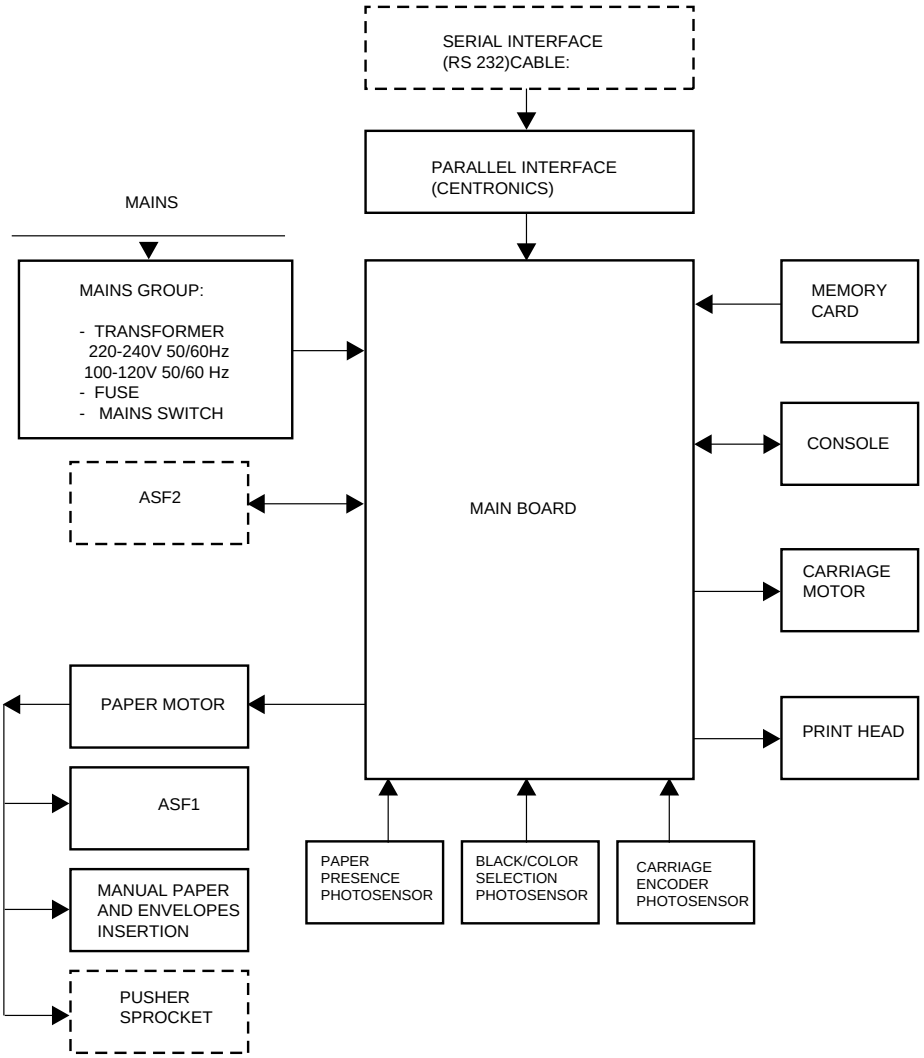
1.4 Product OPTIONS

All the options can be installed by the operator following the instructions enclosed with the package.

For full details see the appropriate section in the User's Guide.

2. FUNCTIONAL DESCRIPTION

2.1 GENERAL BLOCK DIAGRAM



Note: The blocks with dashed lines are options

2.2 Printer Components and Internals

The following two figures show the main components and the internals the printer:

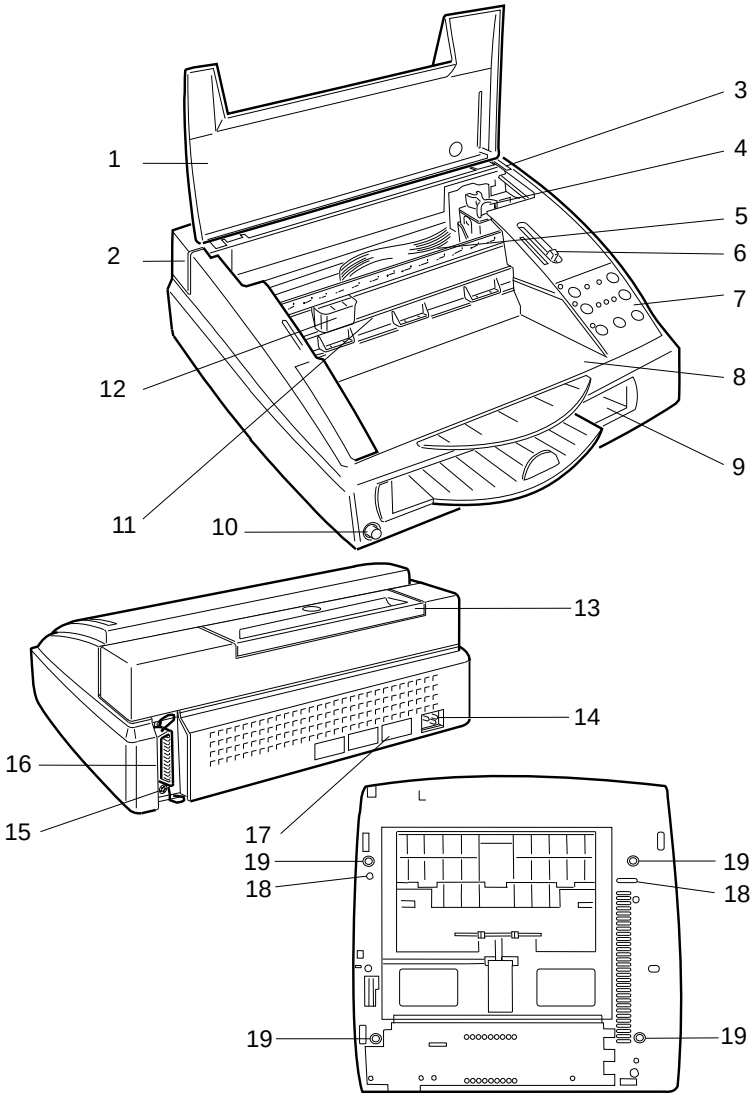


Fig. 2-1 Main Components

Front View

1 Top Cover
2 Paper insertion slot (for manual feed)
3 Slot for optional emulation/font card
4 Ink jet print head
5 Print head carriage
6 Print head selection lever
7 Operator Panel
8 Paper output tray
9 Paper input tray
10 ON/OFF switch
11 Ink tube
12 Ink slide

Rear view

13 Manual Feed paper insertion slot cover
14 Power cable socket
15 Socket for optional ASF 2
16 Parallel interface cable
17 Electrical data plate

Underside View

18 Mounting points for optional ASF-2
19 Printer feet

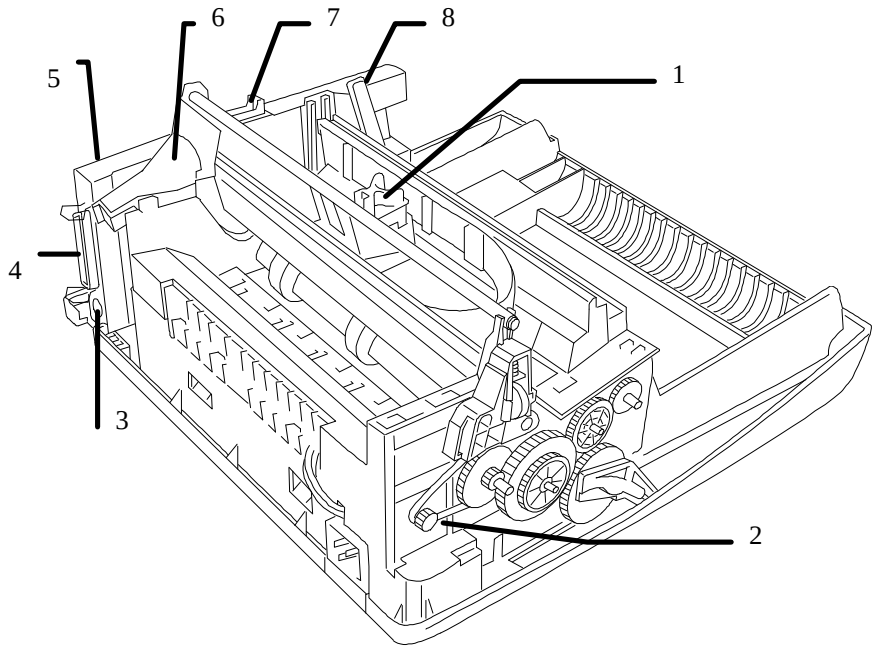


Fig. 2-2 Internal Functional Groups

1 Print Head
2 Paper movement step motor
3 ASF-2 connector
4 Parallel interface connector
5 Main Board
6 Carriage transport DC motor
7 PCMCIA card (optional) connector
8 Black/Color selection lever

2.3 BLACK INK-JET HEAD FUNCTIONING

Ink jet head Description:

This consists of an interchangeable sealed container containing 50 print nozzles and an electric circuit including 50 miniresistors (Fig. 2-3). The nozzles are assembled on a Nickel and Gold composition called "electroformed". These have a conical structure, as illustrated in figure 2-3.

The ink, contained in a sponge cartridge, is connected to the nozzles via channels in the resin layer of the head. This layer is electrically insulated from the miniresistors. The miniresistors are aligned to the nozzles and connected electrically to the external head contacts.

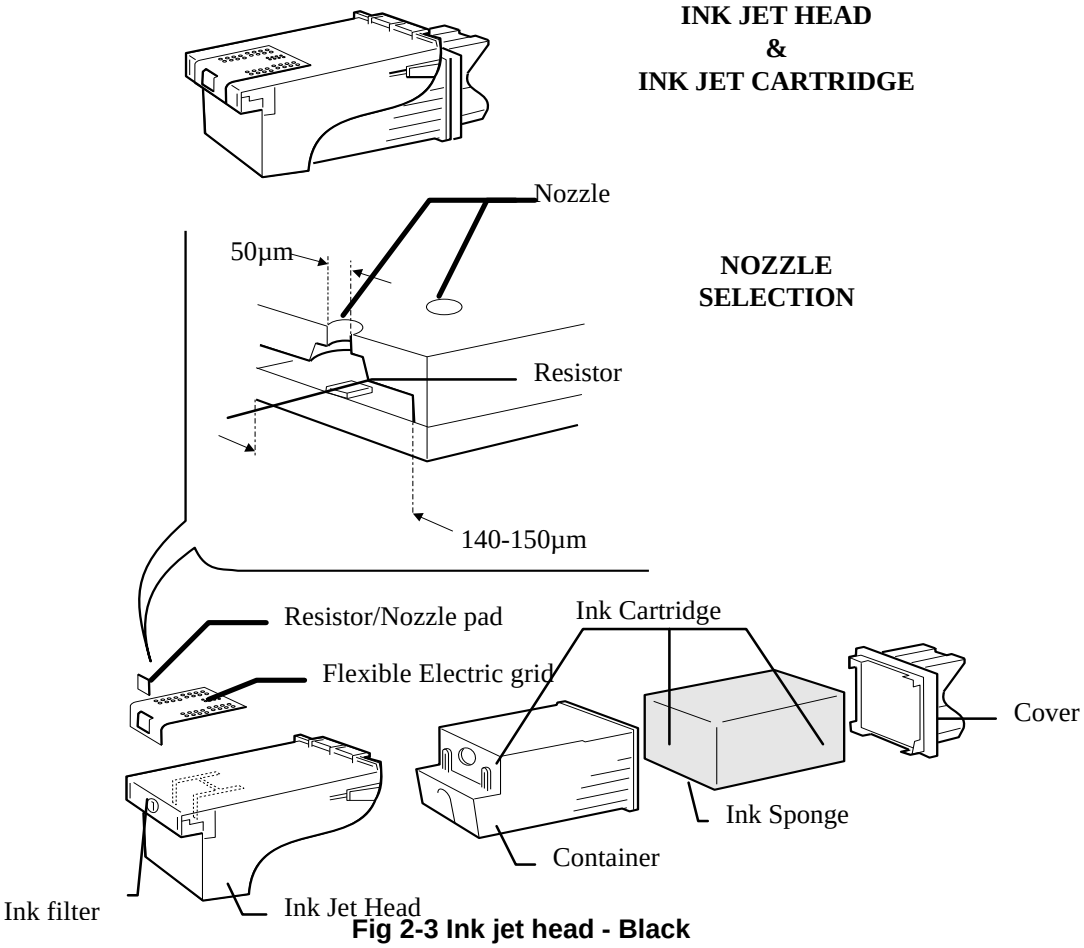


Fig 2-3 Ink jet head - Black

How an Ink-jet Works:

Every single nozzle generates an ink bubble each time the relative resistor is powered for a few nanoseconds.

When the resistor heats up, the ink touching it evaporates.

This phenomena determines the formation of a bubble which quickly expands and compresses the remaining liquid inside the nozzle. A part of the ink "bubble" is ejected out via the nozzle hole at a speed of approximately 15m/s.

Figure 2-4a/e illustrate the prominent bubble formation and ejection phases.

Once the resistor power supply command is terminated, the evaporated ink bubble is broken down and a quantity of ink equal to that ejected is reinstored for channeling in the nozzle vein.

At this point, the eject command for a new bubble can begin.

NOZZLE

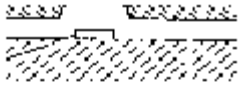


Fig. 2-4a

INITIAL STATUS

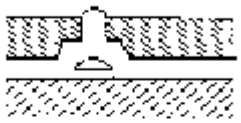


Fig. 2-4b

THE RESISTOR HEATS UP AND STARTS TO FORM VAPOR BUBBLE.

THE INK EXITS FROM THE NOZZLE.

Fig. 2-4c

THE BUBBLE REACHES ITS MAXIMUM DIMENSION.

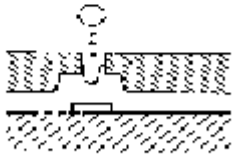


Fig. 2-4d

THE BUBBLE BREAKS DOWN AND AN INK BUBBLE IS EJECTED.

Fig. 2-4e

THE INK IS RESET, FOR CHANNELLING, IN THE NOZZLE.

Fig 2-4 Ink Bubble Formation

The nozzles:

The print nozzles (1-50) are placed on two columns, each containing 25 nozzles. They are placed in sequence on each column as illustrated in figure 2-5.

In addition, the matrix is made up of:

- A,C and B,D nozzles with 2.50 and 1.49 extreme print nozzle damper/equilibrator functions.
- E-L cartridge equilibrator nozzles.

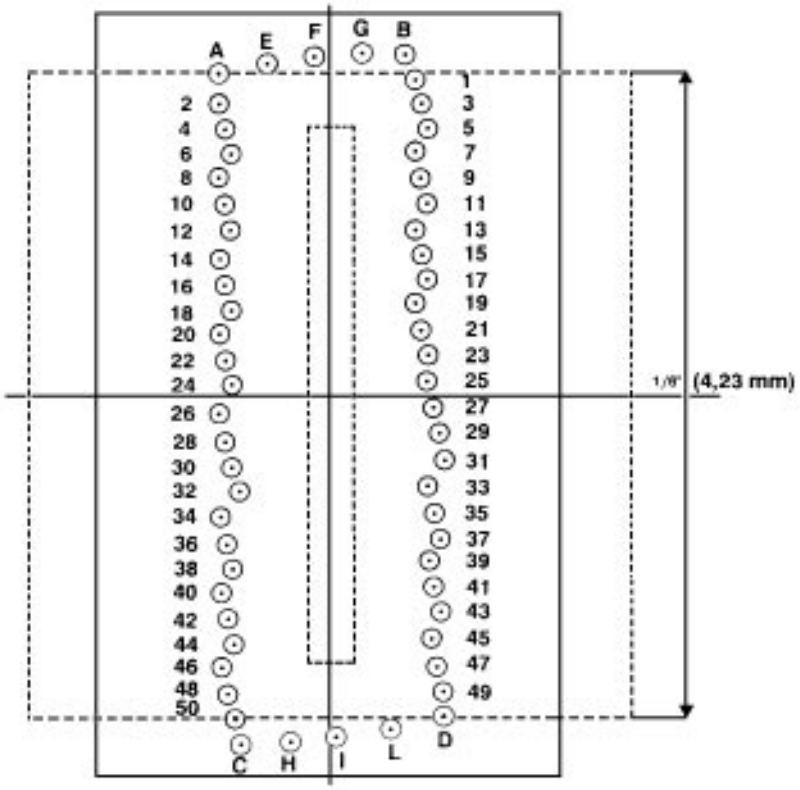


Fig 2-5 Nozzle Matrix

Resistors actuation circuit specifications:

The resistors are divided into four groups; two of which contain 12 resistors and two 13. Each group can be controlled by only one resistor at a time and therefore no more than 4 resistors can be controlled simultaneously.

In addition, to avoid induction phenomenon's between adjacent resistors/nozzles, the drive will be carried out in a particular sequence (Fig. 2-6).

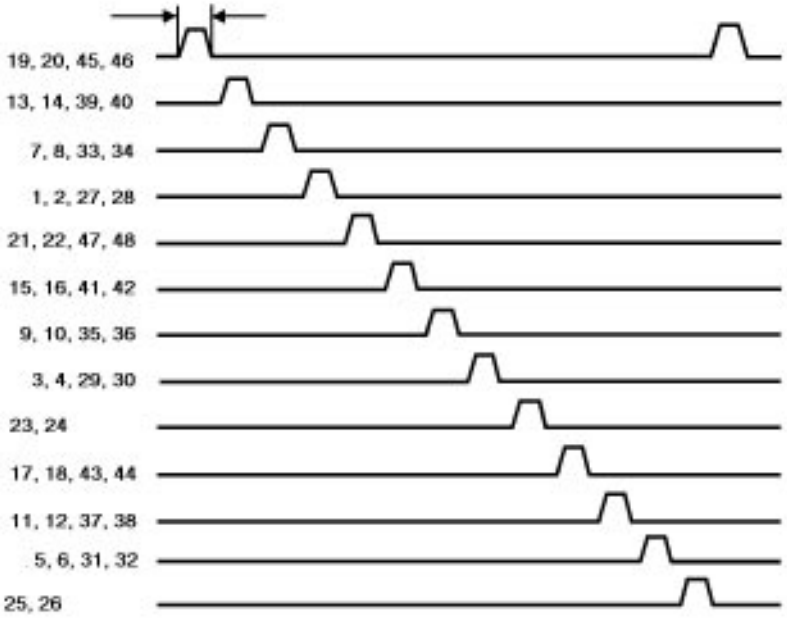


Fig 2-6 Resistor drive sequence

Each resistor group is controlled by a 18.8 V driver circuit. For correct head functions, the above voltage must be stabilized.

Characteristic disadvantages which could occur with lower voltages are: lack of bubble ejection if the head is not used for a short period, lack of bubble ejection with low temperature. Higher voltage may provoke excess bubble commands or the absence of command due a resistor deterioration.

2.4 COLOR INK-JET HEAD FUNCTIONING

Color Ink jet head Description:

The color ink jet head has a replaceable sealed container that contains 51 printing nozzles, three liquid ink containers, one for each basic color, and an electric circuit with 51 miniresistors (Fig. 2-7a).

The nozzles are divided as follows between the three basic colors:

- Yellow: 18 nozzles
- Magenta: 17 nozzles
- Cyan: 16 nozzles

The nozzle construction technology is the same as for the monochrome ink jet: they are obtained from a Nickel and Gold compound called "electroformed". They have a tapered structure as can be seen in figure 2-7b.

The ink is in three containers, one for each color.

Inside each of these containers there is a sponge to prevent the ink from shaking when the head is moving thus avoiding possible interference in the carriage translation, spillage from the vent holes and the formation of froth.

The ink arrives at the corresponding nozzles through channels in the resin layer of the head. This layer is electrically isolated from the miniressitors.

The miniresistors are positioned to correspond to the nozzles and are connected electrically with the head external contacts.

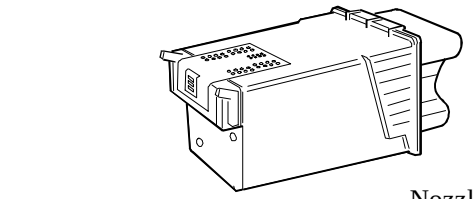


Fig 2.7a - Ink jet Head for Color Inks

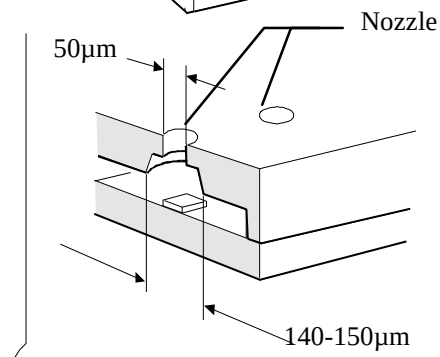


Fig 2.7b Nozzle Section

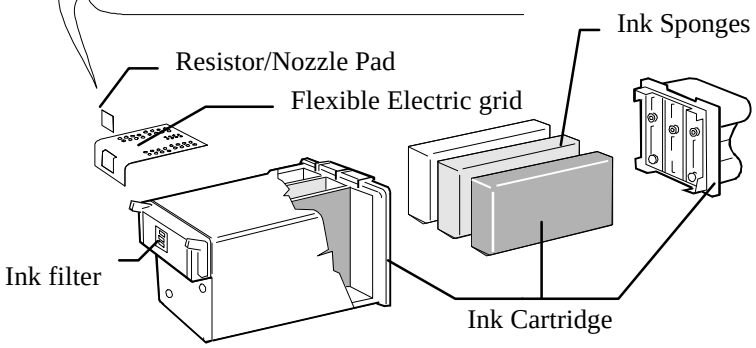


Fig 2-7 Color head

Ink jet printing functioning principle:

See section 2.8 where this has already been dealt with.

The nozzles:

The print nozzles (1-51) are placed vertically on two columns, containing respectively 25 and 26 nozzles , and horizontally in three groups, one for each color.

They are placed in sequence on each row of nozzles as illustrated in figure 2.8.

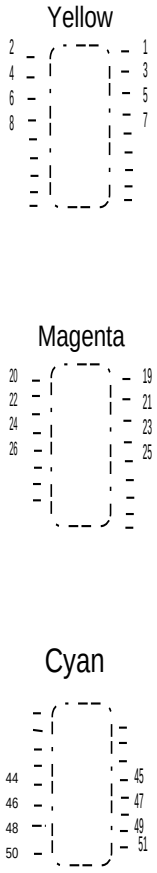


Fig 2-8 Nozzle Matrixes

Resistor enabling circuit specifications:

The resistors are divided into four groups; one contain 12 resistors and the other three 13. Each group can be controlled by only one resistor at a time and therefore no more than 4 resistors can be controlled simultaneously.

To avoid induction phenomenon's between adjacent resistors, the drives are carried out in the sequence illustrated in figure 2-9.

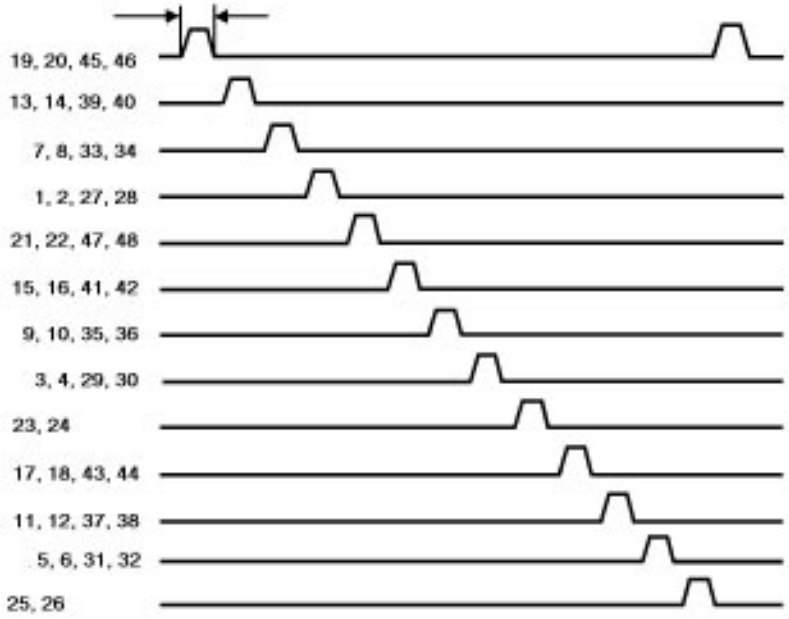


Fig. 2-9 Resistor drive sequence

Each resistor group is controlled by an 18.8 V driver circuit. For correct head functioning, the above voltage must be stabilized.

Characteristic disadvantages which could occur with lower voltages are: lack of bubble ejection if the head is not used for a short period, lack of bubble ejection with low temperature.

Higher voltage may provoke excess bubble commands or the absence of command due to resistor deterioration.

2.5 OPERATING CONTROLS

Operator Panel

The machine console has seven buttons and eight light emitting diodes (LED).

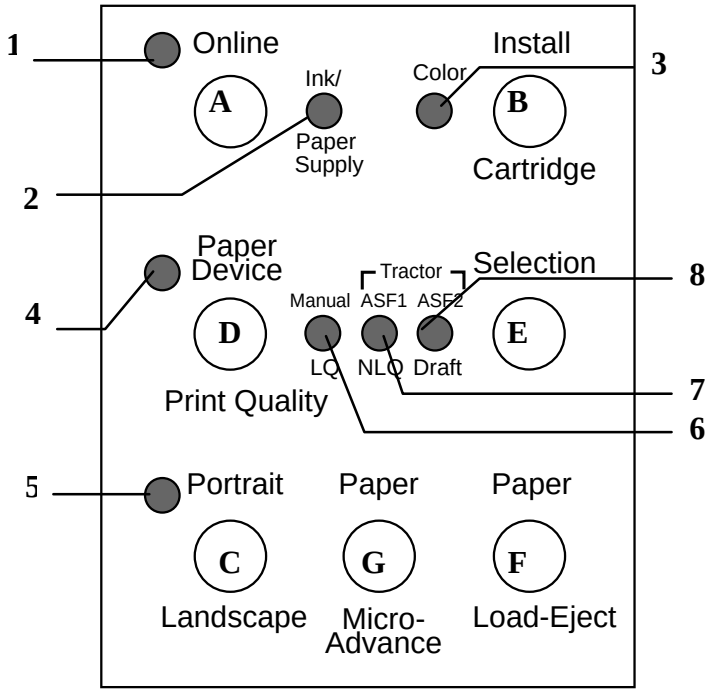


Fig 2-10 Operator panel

The keys (A/G) are used for the paper handling (load, feed, horizontal and vertical format), to set the print quality and to replace the ink cartridge.

The LEDs (1/8) indicate the machine status, end of paper/ink or an error message.

For full details as to the operation and meaning of the keys and LEDs on this panel, see the Fault Sympton and Solution section number 6.

Key functions

The key functions in the different machine operating modes are given below.

Some functions require that more than one key must be pressed simultaneously or in sequence, either while the machine is functioning or when it is powered up.

A ON LINE Toggles the printer between ON LINE and LOCAL operating modes

LED 1 indicates the machine status.
Keeping the key pressed at machine power-on (with paper present) it activates the print test.

B INSTALL CARTRIDGE Moves the print carriage to the position for changing the head or the ink cartridge.

LED 2 indicates the replacement request. LED 3 warns when there are head change errors.

Keeping the key pressed at the machine power-on activates hexadecimal printing.

C PORTRAIT/LANDSCAPE

With the printer in ON LINE and without data for printing (empty buffer) it alternates the vertical horizontal print modes that are indicated by LED 4.

Keeping the key pressed at machine power-on (with paper present) the bi-directional print alignment function is activated.

D PAPER DEVICE/ PRINT QUALITY

With the machine in ON LINE and without data to print it toggles PAPER DEVICE and PRINT QUALITY selection modes indicated by LED 5.

E SELECTION Selects the paper feeding device/print quality.

The parameter selected is indicated by LED 6, 7, 8

F PAPER LOAD-EJECT

Controls the paper feed on the selected device.
If the printer is in ON LINE and paper is present:

-with manual or ASF feed and data to be printed in the buffer, but waiting for a Form Feed command, it forces the print of an unconcluded page and its ejection;

-with Sprocket paper feed and data to be printed in the buffer but waiting for a Form Feed command, it forces the print of an unconcluded page and feeds the continuous module to the next first print position (TOF).

If the printer is in LOCAL and paper is present:

-with manual paper feed or ASF the sheet is ejected.

-with Sprocket it feeds the continuous module as far as the next first print position (TOF).

If there is no paper in the printer, regardless of the operating status:

-in manual paper feed or ASF it tries to insert a sheet in the printer

-with Sprocket it tries to feed the continuous module as far as the first print position (TOF).

G PAPERMICRO-ADVANCE

With the machine in ON LINE mode and without data to be printed (empty buffer) or in LOCAL mode, it advances the paper by one elementary unit (1/150").
Keeping the key pressed the paper continues to advance until the key is released.

B INSTALLCARTRIDGE + C PORTRAIT/ LANDSCAPE

Keeping these two keys pressed at machine power on the first file that is transmitted to the printer will be interpreted as a configuration file (see section 8.3).

B INSTALL CARTRIDGE + D PAPER DEVICE/ PRINT QUALITY

Keeping these two keys pressed at machine power on, the printer configuration parameters set in the factory will be restored (default parameters).

B INSTALL CARTRIDGE + G PAPER MICRO-ADVANCE

Pressing these two keys simultaneously regardless of the printer status, a machine reset is carried out (any printing operation in progress is canceled and the data in the buffer is lost).

2.6 COLOR SELECTION LEVER

The color selection lever is on the right-hand side of the machine, under the upper cover compartment.

The lever is usually directed towards the operator (BLACK setting), and in this position the printed is equipped with a black ink head.

This lever is only used to indicate the variation to the machine when a color head is installed.

When the lever is changed to COLOR setting, the monochrome print matrix protection is exchanged with another of a suitable size for the color head a photosensor is obscured and the electronic board receives the communication to change the machine setting (change in emulation, head drive and print speed).

The lever is only to be moved when the print head is in cartridge change position. If this is not respected there is danger that serious damage is caused to the print carriage and the protection rubber caps exchange kinematics.

To return to monochrome, change the heads and move the lever with the print carriage always in the cartridge change position.

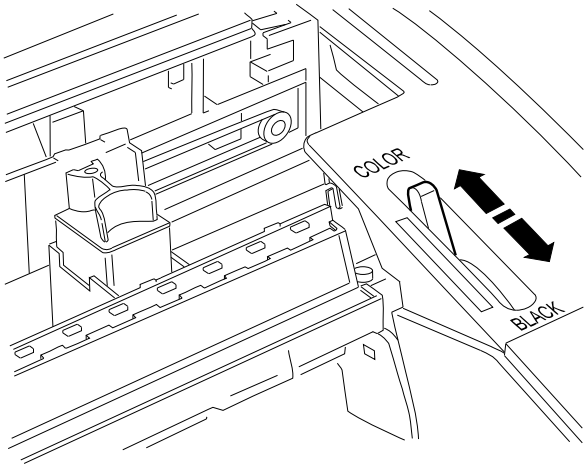


Fig. 2-11 Color selection lever

3. INSTALLATION

3.1 GENERAL INSTRUCTIONS

The following rules must be observed to guarantee optimum printer functioning and to avoid service for reasons not attributed to the product:

Mains power supply:

The LJ 500 and LJ 520 printers conform to the safety standard, ergonomics and the electromagnetic interference (EMI) imposed by the following organizations:

Safety:	**USA/ UL/ UL 1950/ 478 standard** **Italy IMQ/ CEI 74.1 and IEC 380 standards** **Canada/ CSA/ C22- 2 n 220 standard** **Scandinavia/ NEMKO/ EN 60950 standard**
Ergonomics	**T.U.V./E.R.G. G.S.Gi.d.f vom 1979**
EMI	**Germany/ VDE/ DBP verf. 243/1991 standard** **CEE/ CEE 87/308/ EN 55022 Class B** **USA/ FCC/ FCC part 15 Class. B standard.:**

Do not connect the printer to common power supply lines or industrial apparatus, as the electrical variations are higher and the static greater, than that tolerated by the printer.

Environmental conditions:

The printer can remain indefinitely in environmental conditions as indicated by the AB quality objectives (normal office environment). When operating, avoid any temperature variations that could cause condensation.

Product positioning:

The printer must be installed on a flat, steady surface. Do not expose the printer to ventilators, heat sources or direct sunlight. The latter instruction is especially important when using ink jet printers.

3.2 UNPACKING

Packing check:

Unpack the contents of the carton and check them against those illustrated in the following. Retain the carton and packing materials for future use should you need to relocate the printer at any time.

If anything is missing or damaged, call your supplier immediately.

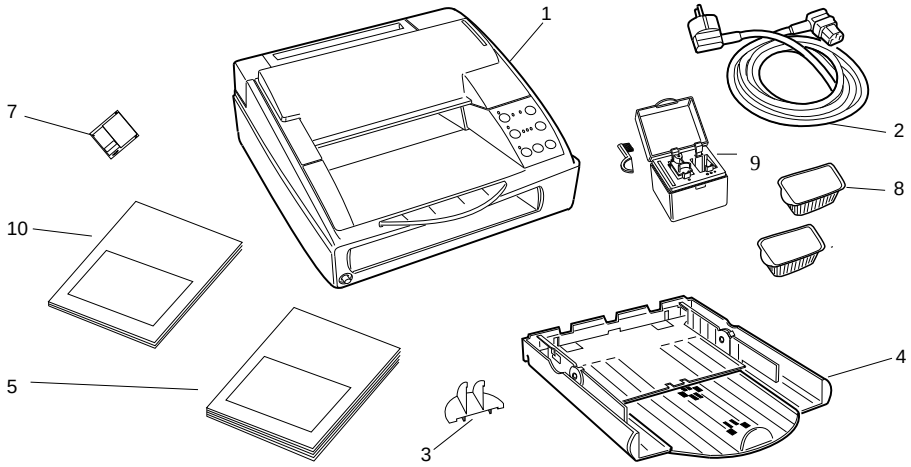


Fig 3-1 Package Contents

1.	Printer	6.	Driver diskette
2.	Power cable	7.	Black print head
3.	Paper stop	8.	Color print head*
4.	Paper input tray	9.	Storage box*
5.	User manual	10.	Read me first

* only for LJ 520

3.3 CONNECTION TO THE MAINS

Connect the mains power supply cable supplied with the printer first making sure that the voltage indicated on the label plate corresponds to that of the local network.

To ensure optimal machine operation, check with the instructions given in section 3.1.

3.4 INSTALLING THE PRINT HEAD

The print head is composed of two parts: an external wrapping and a throw-away ink cartridge. The head has an "ink presence" sensor that guarantees the constant print quality, giving timely indication when the cartridge is finished.

To install the print head:

1. Power up the printer. The INK-PAPER SUPPLY LED will blink to indicate that there is no print head.
2. Press the INSTALL CARTRIDGE push-button to position the carriage for head change.
3. Lift up the machine upper cover.
4. Open the container and remove the head, taking care not to touch the electric contacts.
5. There is an "Operating guide" printed inside the container that describes the installation procedure.

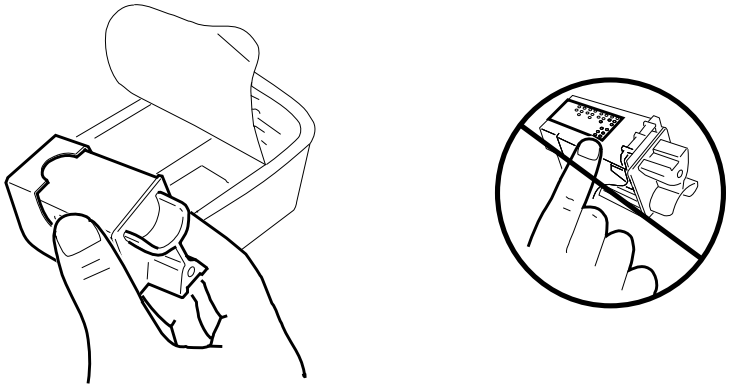


Fig. 3-2 Opening the head container

6. Holding the cartridge by the grip, remove the protective label from the nozzles.

7. Insert the cartridge in place, pushing it first down and then forward.

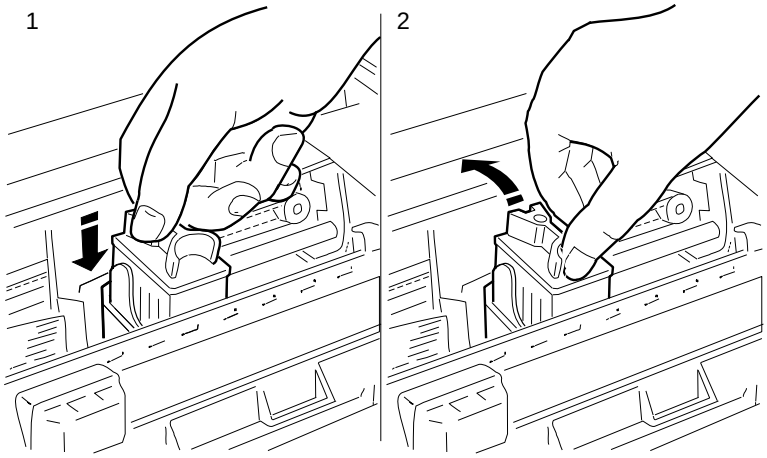


Fig. 3-3 Inserting the head into the machine

8. Close the machine upper cover.

9. Press the INSTALL CARTRIDGE key again: the print head will go to its parking position (right-hand end of stroke) and the machine checks the coherence between the installed head and the black/color lever setting. If the setting is correct, the COLOR LED will indicate the type of head installed (on = color, off = black) if there is an error, this will be indicated by the blinking of the INSTALL CARTRIDGE LED.

3.5 INSERTING AN OPTIONAL MEMORY/FONT CARD

The memory/font cards handled by this printer conform to PCMCIA standard (Personal Computer Memory Card International Association).

The cards contain a firmware emulation or an EPROM relevant to a character font group or an additional memory (RAM or Flash EPROM).

The card can be added after the printer has been installed. The card features and corresponding installation procedures are described in the appropriate manual, included in the same package as the memory card.

Switch the printer off before inserting a card.

After inserting a memory card with optional emulation, only its codes are recognized. To reselect the basic emulation, PCL3, remove the memory card.

The cards containing character fonts are specific for the basic emulation, PCL3, and are not, therefore, handled by IBM Proprinter 4207 and Epson LQ 850 optional emulations.

To install the memory card, proceed as follows:

Switch off the printer

Insert the memory card into the specific slot

Switch on the printer

If the memory card contains an emulation, program the new set up parameters; if the memory card contains an optional font, select the external font.

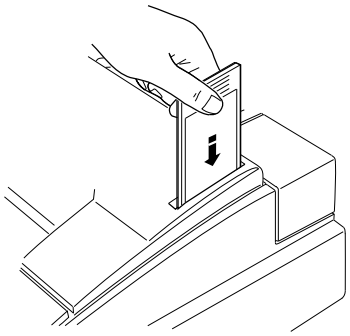


Fig. 3-4 Inserting the memory card

3.6 PAPER FEED

ASF sheet feed:

The sheets are fed into the machine using the ASF drawer on the machine.

The drawer can hold 120 sheets of 80 g/m² paper.

Sheets from 60 g/m² to 90 g/m² can be handled.

The printable area for the most common formats A4 and Letter/Legal can be obtained from the table below.

	A4		**Letter/Legal**	
	mm	inches	mm	inches
M	210	8.26	215.9	8.5
L	203.2	8	203.2	8
S	3.4	0.134	6.4	0.25
D	3.4	0.134	6.4	0.25
T	1	0.04	1	0.04
B	12.7	0.5	12.7	0.5

For ASF sheet feed, follow this procedure:

- Take the ASF drawer from the machine
- Insert the sheets (maximum 120) into the drawer
- Adjust the drawer side guides (1) according to the width of the sheets

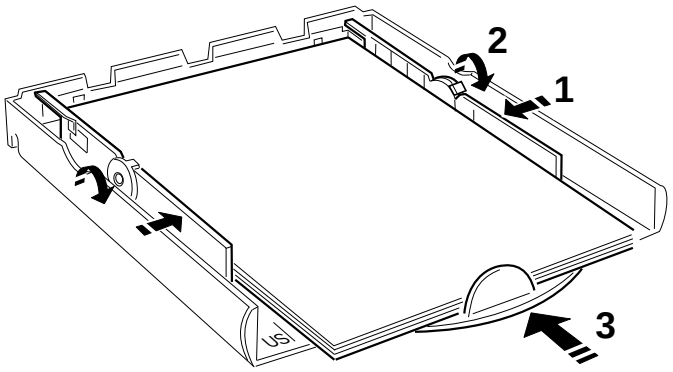


Fig. 3-5 Drawer guides adjustment

- Insert the drawer into the machine
- If A5 or Letter size format is used, insert the paper stop in the appropriate holes in the drawer

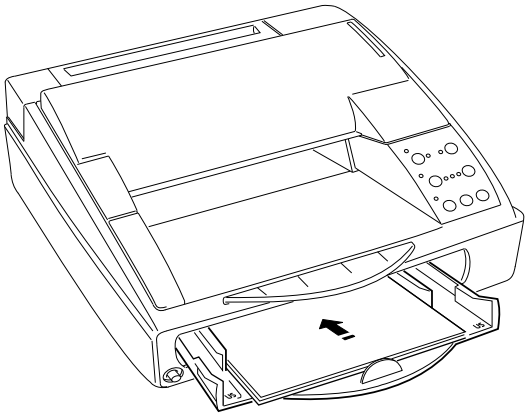


Fig. 3-6 Inserting the drawer into the machine

- Switch on the printer
- Press the PAPER LOAD/EJECT key to feed a sheet into the machine.

Manual insertion:

Manual paper feeding is through the rear slot on the machine which is accessed by lifting the rear cover. The machine will accept sheets and envelopes up to 135 g/m^2.

The printable area for the most commonly used envelope sizes: C5, DL, C#10 and C6 can be obtained from the table below.

C5	DL		C#10		C6			
	mm	inches	mm	inches	mm	inches	mm	inches
M	228.6	9	22	8.66	241.3	9.5	162	6.38
L	203.2	8	203.2	8	203.2	8	162	6.38
S	12.7	0.5	6.4	0.25	25.4	1	-	-
D	12.7	0.5	6.4	0.25	25.4	1	-	-
T	1	0.04	1	0.04	1	0.04	1	0.04
B	12.7	0.5	12.7	0.5	12.7	0.5	12.7	0.5

To insert the document manually, follow this procedure:

Lift the printer rear cover to have access to the manual feed slot

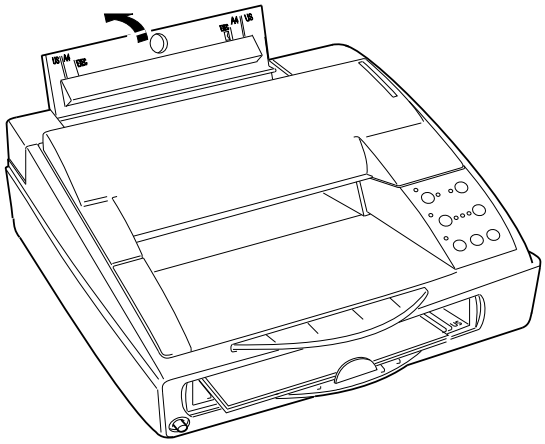


Fig. 3-6 Opening the rear cover

-With the printer switched on, insert the document into the manual feed slot so that it touches the feed rollers.

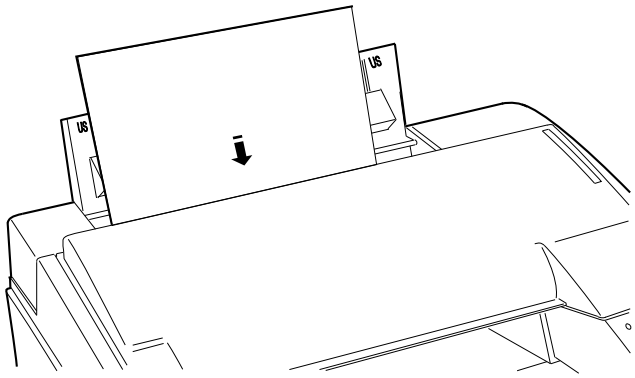


Fig. 3-8 Manual sheet feed

Press the PAPER LOAD-EJECT key to insert the document into the machine

Send the text for printing from the system.

3.7 SPROCKET INSTALLATION

The sprocket is an option that can be installed by the operator.

It is fitted into the machine near to the manual feed slot, removing the rear part of the casing and taking out the prepared marked part so as to have access to the movement socket. Install the option inserting it in the relevant guides.

Detailed instructions are contained in the packing together with the device.

"Tractor" must specified using the parameter set-up procedure, or selected using the PAPER DEVICE and SELECTION keys on the console(LEDs ASF1+ASF2 lit).

Paper loading by sprocket:

The sprocket can be used for continuous paper feed or for single sheets.

The printable area for continuous modules can be obtained from the table below, together with the figure that illustrates the meaning of the values in the table.

	mm	inches
M=P	241.3	9.5
L	203.2	8
S	19	0.75
D	-	-
T	1	0.04
B	1	0.04

To insert the continuous paper by Sprocket use the following procedure::

Lift the paper feed roller covers and insert the paper so that the feed holes are held by the feed roller pins, then close the covers.

Space the two feed rollers so they tension the paper roll correctly.

Use the PAPER DEVICE and SELECTION keys to enter the paper feed by sprocket (TRACTOR) through the console or select "TRACTOR" in the set-up parameters.

3.8 2nd PAPER TRAY (ASF2) INSTALLATION

ASF2 is an optional 2nd paper tray that can be installed by the operator. It is positioned under the machine base and is connected to the motherboard by a cable which has to be connected.

Detailed instructions for the installation are provided in the package together with the device.

Remember that the machine must be switched off when installing this device.

To feed the paper from ASF2 it is necessary to select feeding from this option in the set-up parameters.

Paper insertion from second ASF drawer:

The ASF2 has a paper feed drawer, like the integrated ASF. This drawer also has a capacity of 120 sheets of 80 g/m^2 paper.

It can handle sheets from 60 g/m^2 to 90 g/m^2.

The printable area is the same as for the integrated ASF (see page 3-6).

To insert the sheet from the second ASF the procedure is as follows:

Remove the ASF drawer from the machine

Insert the sheets (max. 120) into the drawer

Adjust the drawer side guides according to the width of the paper

Insert the drawer into the machine

Switch on the printer

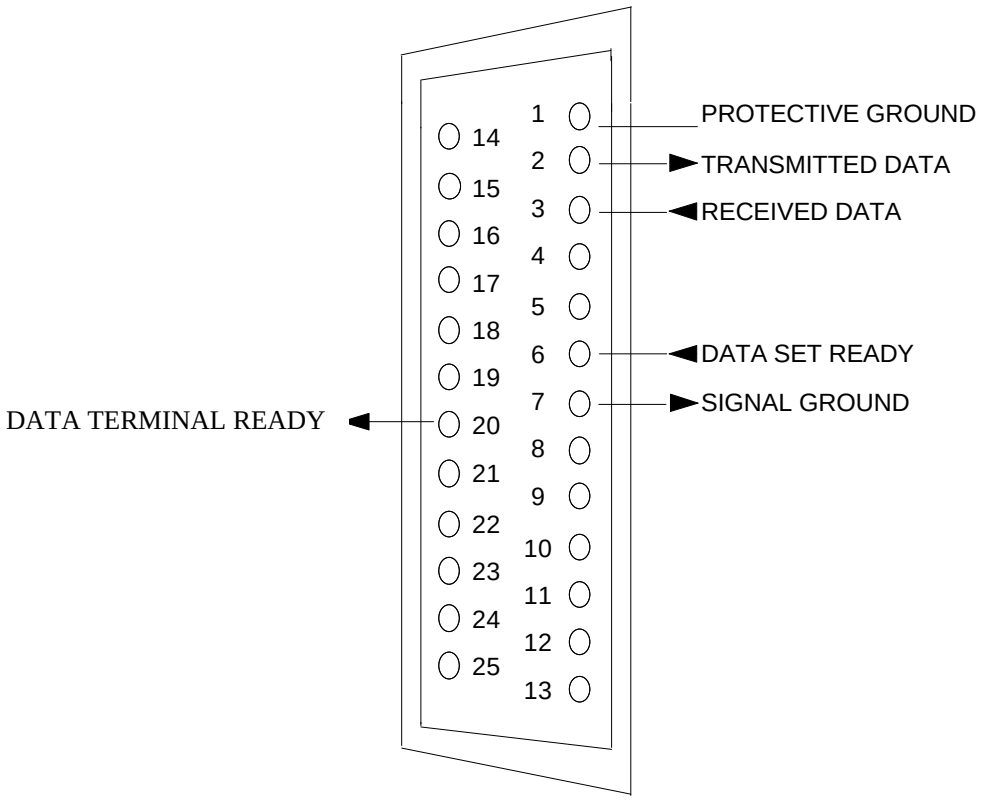
Use the PAPER DEVICE and SELECTION keys to set the paper feed for the second ASF (ASF2) through the keyboard.

3.10 SERIAL INTERFACE INSTALLATION

The serial interface is an option that can be installed by the operator.

Detailed instructions for the installation are supplied in the package with the device.

With the serial interface option connection to the system can be either serial or parallel. To make the choice it is only necessary to select the type of interface in the machine set-up. The figure below shows the 25-pin Cannon connector used to connect the serial interface, indicating the transmission signals.



3.11 PRINT TEST

To verify the correct printer installation the print test should be made, as described below:

Feed the ASF drawer with paper, preferably size A4

Switch off the machine then switch on keeping the ON LINE key pressed during power up.

The printer will start to feed the paper and print the test on four sheets.

The test finishes after the four pages have been printed and the machine is then ready for connection to the system.

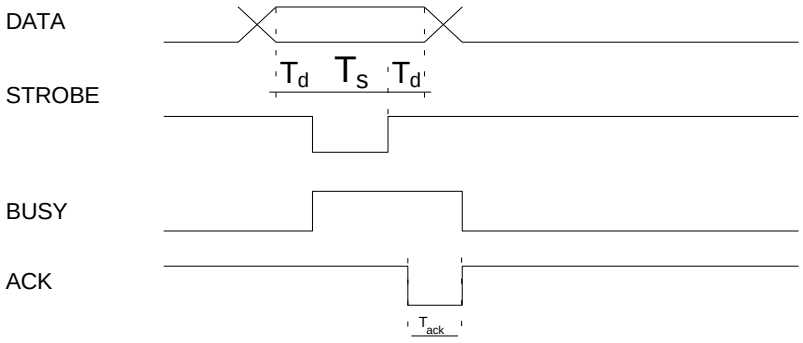
With this test it is possible to verify the machine functioning and to know the printer default set-up parameters.

3.12 SYSTEM CONNECTION

Centronics parallel interface

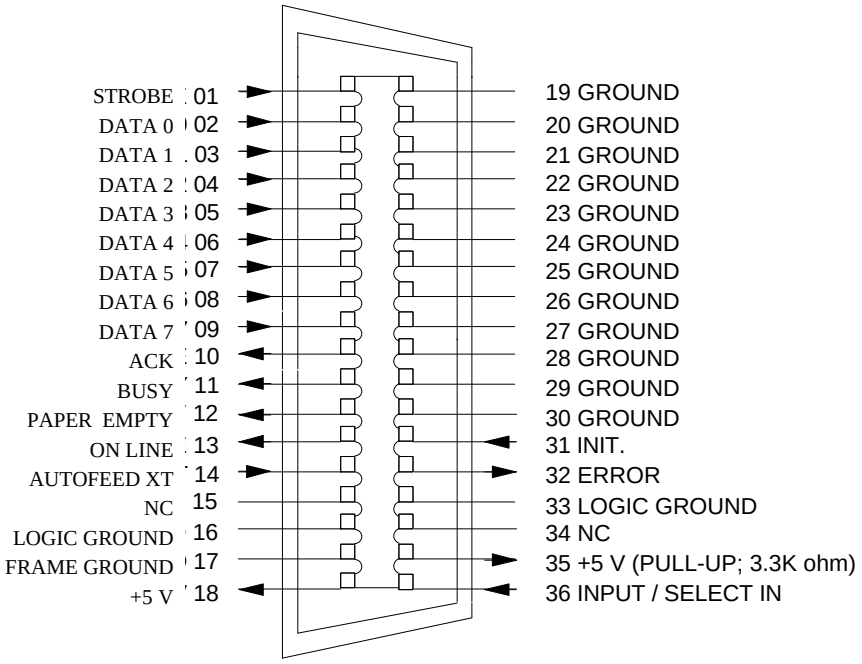
This interface is provided in standard mode on the printer and therefore does not require any further optional devices.

The data exchange synchronization (handshaking) is implemented via the character strobe signal issued from the system, and the busy signal emitted from the printer.



A 36 pin connection cable is supplied with the system, and this must not exceed 2.5 metres.

The figure below shows the 36 pin Amphenol connector for the parallel interface connection, indicating the transmission signals.



3.13 SWITCHING OFF THE PRINTER

Before switching off the printer, ensure that the head is positioned to the far right of the guide rail. This status is automatically obtained every time the printer is inactive for a few seconds, hermetically sealing the print nozzles and thus preventing the ink inside the nozzles from drying up.

3.14. INSTALLATION SET UP

The printer can be configured using a print driver that corresponds to the basic HP DJ 500C. emulation

For utility programs working in DOS environment the printer set-up can be carried out (if there is no suitable print driver) using a very simple mini-program contained in the DOS diskette that is included in the machine packing.

For the Windows 3.1 environment a diskette is supplied with the printer that contains the specific driver that uses the machine potential to the full. For the color option, the pack also includes a driver for color printing.

If the printer is not configured by the system, it will use the parameters set in the factory (Default).

DEFAULT parameters

To verify the parameters set up in the factory the print test can be run, printing the four pages that show the default setting and the print fonts available.

To run this test, see section 5.2. The following values are set up in the factory:

Paper Format	A4
Paper Device	ASF1
Perforation Skip	Enabled
Text Scale Mode	Disabled
Always Bidir.	Disabled
Ink Save Mode	Enabled
BIM Density	75 dpi
Line Terminator	Normal
Print Quality	LQ
Width Type	OFF
Type Style	Courier Upright 10 12 Portrait
Character Set	CP 437 International

The following parameters are only included if the serial interface option is installed, to which these parameters refer:

Baud Rate	9600
Parity	None
Handshaking	Hardware

PROGRAMMABLE PARAMETERS

This chapter contains the printer parameters that can be programmed and the values that each of them can assume with the description for the creation of a parameters configuration file:

Parameter	Description	Note
PaperFormat	A4	
	A5	
	Letter	
	Legal	
	US Exec	
	DL	
	COM 10	
	C5	
	C6	
	Tractor	
PapDev	Manual	Manual paper feed
	ASF1	Integrated automatic paper feeder
	ASF2	Optional automatic paper feeder
	MPD	Optional multi-purpose device
	Sprocket	Optional continuous module feeder

Parameter	Description	Note
PerSkip	Off	Paper skip disabled (TOF= 0, BOF= printing continues to the last line of the page)
	On	Paper skip enabled (TOF= 12.7 mm - 0.5"; BOF= 12.7 mm - 0.5")
TextScale	Off	Nominal line feed value
	On	Reduced line feed value to increase the number of lines per printed page
AlwaysBidir	Off	Bi-directional print, if possible
	On	Always bi-directional print
InkSaveMode	Off	Feature disabled
	On	Reduces the ink consumption
Bimdensity	75	75 dpi (dots per inch)
	100	100 dpi
	150	150 dpi
	300	300 dpi
Terminator	Normal	CR = CR, LF = LF, FF = FF
	AutoLF	CR = CR+LF LF = LF, FF = FF
	AutoCR	CR = CR, LF = LF+CR, FF = FF+CR
	AutoCRLF	CR = CR+LF, LF = LF+CR, FF = FF+CR
Quality	LQ	Letter Quality
	NLQ	Near Letter Quality
	Draft	Draft
Parameter	Description	Note
WidthType	Normal	Normal size
	HalfWidth	Compressed characters
	HalfHeight	Half height
	HalfWidthHeight	Compressed -half height

Parameter	Description	Note
TypeStyle	1	Courier Upright Portrait 10 cpi 12 pts
	2	Courier Italic Portrait 10 cpi 12 pts
	3	Courier Upright Portrait 16,67 cpi 12 pts
	4	Letter Gothic Upright Portrait 10 cpi 12 pts
	5	Letter Gothic Upright Portrait 12 cpi 12 pts
	6	Letter Gothic Italic Portrait 12 cpi 12 pts
	7	Letter Gothic Upright Portrait 16,67 cpi 9,5pts
	8	TMS Nordic Upright Portrait PS 12pts
	9	TMS Nordic Italic Portrait PS 12pts
	10	BF Times Upright Portrait PS 14 pts
	11	BF Times Italic Portrait PS 14 pts
	12	BF Times Upright Portrait PS 12 pts
	13	BF Times Italic Portrait PS 12 pts
	14	BF Times Upright Portrait PS 10 pts
	15	BF Times Italic Portrait PS 10 pts
	16	BF Times Upright Portrait PS 8 pts
	17	BF Times Italic Portrait PS 8 pts
	18	Linea Upright Portrait PS 14 pts
	19	Linea Upright Portrait PS 12 pts
	20	Linea Italic Portrait PS 12 pts
	21	Linea Upright Portrait PS 10 pts
	22	Linea Italic Portrait PS 10 pts
	23	Linea Upright Portrait PS 8 pts
	24	Courier Upright Landsc 10 cpi 12pts
	25	Courier Italic Landsc 10 cpi 12pts
	26	Courier Upright Landsc 16,67 cpi 12pts
	27	Letter Gothic Upright Landsc 12 cpi 12 pts
	28	Letter Gothic Upright Landsc 16,67 cpi 12 pts
	100/199	External fonts (see options list)

Parameter	Description	Note
Charset	0	The selected character set remains unchanged
	1	CP 437 International
	2	HP Roman 8
	3	PC-8 Denmark/Norway
	4	CP 850 (Multilingual)
	5	ECMA 94 Latin
	6	ISO 4 United Kingdom
	7	ISO 21 Germany
	8	ISO 69 France
	9	ISO 15 Italy
	10	ISO 60 Norway 1
	11	ISO 61 Norway 2
	12	ISO 11 Sweden Names
	13	ISO 10 Sweden
	14	ISO 17 Spain
	15	ISO 6US ASCII
	16	ISO 2 IRV
	17	ISO 16 Portugal
	18	ISO 14 JIS ASCII
	19	Legal
	20	CP 860 Portugal
	21	Danish OPE 1
	22	UNIX International
	23	Danish OPE 2
	24	Spain II
	25	CP 863 French Canadian
	26	PC Win ANSI Windows 3.1
	27	CP 852 Latin 2
	28	ISO 8859/2 Latin 2
	29	PC Win East European Windows 3.1

Parameter	Description	Note
	30	CP 857 Turkey
	31	ISO 8859/9 Turkey
	32	PC Win Turkish Windows 3.1
	33	CP 866 Cyrillic
	34	CP 855 Cyrillic
	35	ISO 8859/5 Cyrillic
	36	PC Win Cyrillic Windows 3.1
	37	CP 210 Greece
	38	CP 851 Greece
	39	ISO 8859/7 Greece
	40	PC Win Greek Windows 3.1
	41	CP 862 Hebrew
	42	ISO 8859/8 Hebrew
	43	Slovenia
	44	Kamenicky
	99	Optional card default set

The following symbols are only recognized if the optional serial interface is installed.

Baudrate	1200	1200 Baud
	2400	2400 Baud
	9600	9600 Baud
	19200	19200 Baud
	38400	38400 Baud
Parity	None	
	Even	
	Odd	
HandShaking	Hard	DTR
	Soft	X-on/X-off + DTR

SYSTEM PARAMETER SET-UP

If it is necessary to change a configuration parameter, the procedure is as follows:

- With the PC and the aid of an ASCII based word processor or a file editor, create a file "XXXX" to write the parameters and descriptions that you want to enter.

-When creating the configuration file pay attention to:

- use a new line for each parameter with its relevant description separate each parameter from its description by a blank, a tabulation or an equal sign (=)

- the last line of the file must be "END" followed by a return with a line feed.

- To transmit the parameters to the printer:

- Switch on the machine keeping the INSTALL CARTRIDGE and PORTRAIT-LANDSCAPE keys pressed until the initialization is completed.

- Send the parameters configuration file from the PC to the printer with the command: copy "XXXX" prn

- The printer will configure according to the parameters received from the PC.

Run the print test to verify the machine configuration.

4. USER MAINTENANCE

No special preventive maintenance is required. However after any servicing it is advisable

- to ensure there is no trace of ink on the print head nozzle surface. If there is, clean and if necessary, replace the rubber cap and the cleaning wiper.
- check the orthogonality and the total adherence between the pump rubber cap and the external surface of the nozzle.
- remove any paper or ink residue from inside the machine

DO NOT TOUCH OR CLEAN THE NOZZLE OR ELECTRIC HEAD CONTACTS MANUALLY. IF NECESSARY, CLEAN USING A RAG DAMPENED WITH ALCOHOL OR A CLEAN BRUSH.

4.1 NOZZLE CLEANING AND INK RESET ("PRIME")

The external surface of the nozzles is cleaned automatically by the printer during the paper movement. The user is responsible for the ink reset operation when one or more nozzles are clogged.

The gradual nozzle check made during the print test (section 5.2) is very helpful to detect faulty nozzles.

Nozzle cleaning:

Nozzles are cleaned by the rubber wiper located at the right-hand end of the head stroke. During the printout intervals for paper movement, when the head is controlled by the parking area, before sealing, the nozzles graze the rubber cap and are cleaned of any ink particles or paper dust.

Ink reset (”PRIME”) Black Head Only:

This must be carried out when one or more nozzles no longer print. This operation is not required when the initial characters of the printout are incomplete, as this is probably caused by the printer having been left inactive for a certain period.

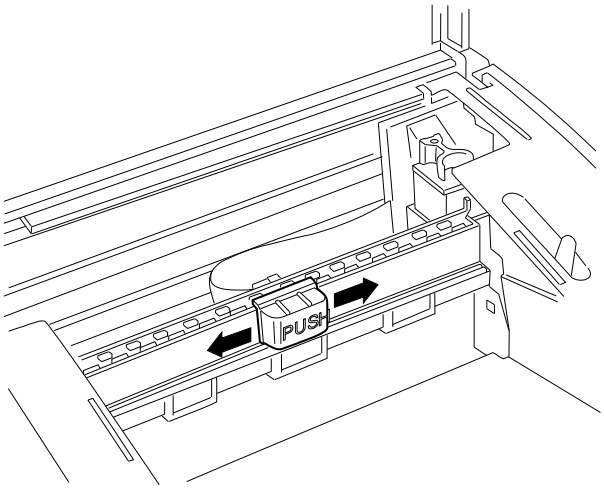
Ink reset is not required for the color heads, as there is an automatic nozzle cleaning cycle that takes place at each head change and machine power on.

The "PRIME" operation ejects a small quantity of ink. It is important that the “PRIME" operation is performed only when strictly necessary, to avoid ink being wasted and therefore reducing the cartridge life.

Do not carry out the ”PRIME” operation if the mechanical groups are disconnected from the base. If the ”PRIME” slide receives the command with the ink discharge tube disconnected from the blotting pad, any object or clothes near it may be splashed with ink.

To enable the ink reset, set the printer to local mode (in this status the nozzles are aligned to the rubber cap connected to the ink discharge tube)**.**

Push the slide back and forth as shown in the figure, until some ink is seen (one or two centimeters) in the tube below the slide.



The motion of the slide compresses and releases the tube, forcing the ink discharge and extraction. Press INSTALL CARTRIDGE to move the print head carriage to the head loading position, and move the slide backwards and forwards to empty the tube.

Press INSTALL CARTRIDGE to return the print head carriage to its rest position.

Run the print test to check the quality of printing.

Black Ink jet head cleaning and maintenance:

The ink jet head requires particular care as far as cleaning the nozzles are concerned.

Given their particular structure, the nozzles are likely to get clogged with dust or, if exposed, dried ink.

Some useful tips to guarantee the best use of the head are listed below:

- Only remove the head from its wrapper when about to insert it into the printer. The head is guaranteed for approximately 18 months if preserved in its sealed container and for approximately 6 months if unprotected (the two periods are cumulative).
- Do not place the head on the nozzle or on the electric contacts.
- Do not place the head on heat sources, air conditioners or dusty or dirty surfaces.
- If necessary (nozzles clogged), carry out the ”PRIME” command (section 4.1).
- The purpose of this command is to suck some ink through the nozzles to remove any dirt. This command should be carried out each time one or more nozzles become clogged.
- On termination of a print operation, hermetically seal the nozzle area to protect them from dust and to prevent the ink from drying. This operation is automatically carried out on the printer if it is inactive for a few seconds, therefore, wait a few seconds after the last printout before switching off the machine.
- In the case of a power failure, after switching off the printer, push the head by hand to the right, to the end of its stroke.

Note

If the computer is switched off while the printer is still switched on, the printer will reset. If the printer is switched off during this reset, the print head may not stop in its rest position.
Always switch off the printer before switching off the computer.

Color head cleaning and maintenance:

The color head also requires particular care as far as cleaning the nozzles are concerned.

Given their particular structure, the nozzles are likely to get clogged with dust or, if exposed, dried ink.

Some useful tips to guarantee the best use of the head are listed below:

- Only remove the head from its sealed wrapper when about to insert it into the printer. The head is guaranteed for approximately 18 months if preserved in its sealed container and approximately 6 months if unprotected (the two periods are cumulative).
- Do not place the head on the nozzle or on electric contacts.
- Do not place the head on heat sources, air conditioners or dusty or dirty surfaces.
- After a new color head has been installed the machine automatically runs a nozzle cleaning cycle, so the PRIME operation is not necessary for color heads.
- On termination of the print operation, hermetically seal the nozzle area to protect the nozzles from dust and to prevent the ink from drying. This operation is automatically carried out on the printer if it is inactive for a few seconds, therefore wait a few seconds after the last printout before switching off the machine.
- In the case of a power failure, after the printer has been switched off, push the head by hand to the right until it reaches its end of stroke.
- Whenever the color head is removed from the machine, take care to place it in the "Service station "supplied with the color kit: this will ensure that the head ink has the maximum protection against drying .

Note:

If the computer is switched off while the printer is still switched on, the printer will reset. If the printer is switched off during this reset, the print head may not stop in its rest position.

Always switch off the printer before switching off the computer.

5. DIAGNOSTICS AND TESTS

5.1 AUTODIAGNOSTICS AT POWER-ON

The machine firmware automatically tests the main functions of the machine at each power on.

If any faults are found they are indicated by all the LED s blinking on the console (see Section 6 for LED fault indications).

5.2 PRINT test with black print head

This test verifies the correct functioning of the head, it displays the machine operating parameters and visualizes the printer character fonts available .

The test supplies the following information:

- type of emulation selected and firmware release on the machine.
- type of print head installed (3600Hz for color head or 5000 Hz for Black head)
- correct hydraulic functioning of the nozzles (Print Head Test)

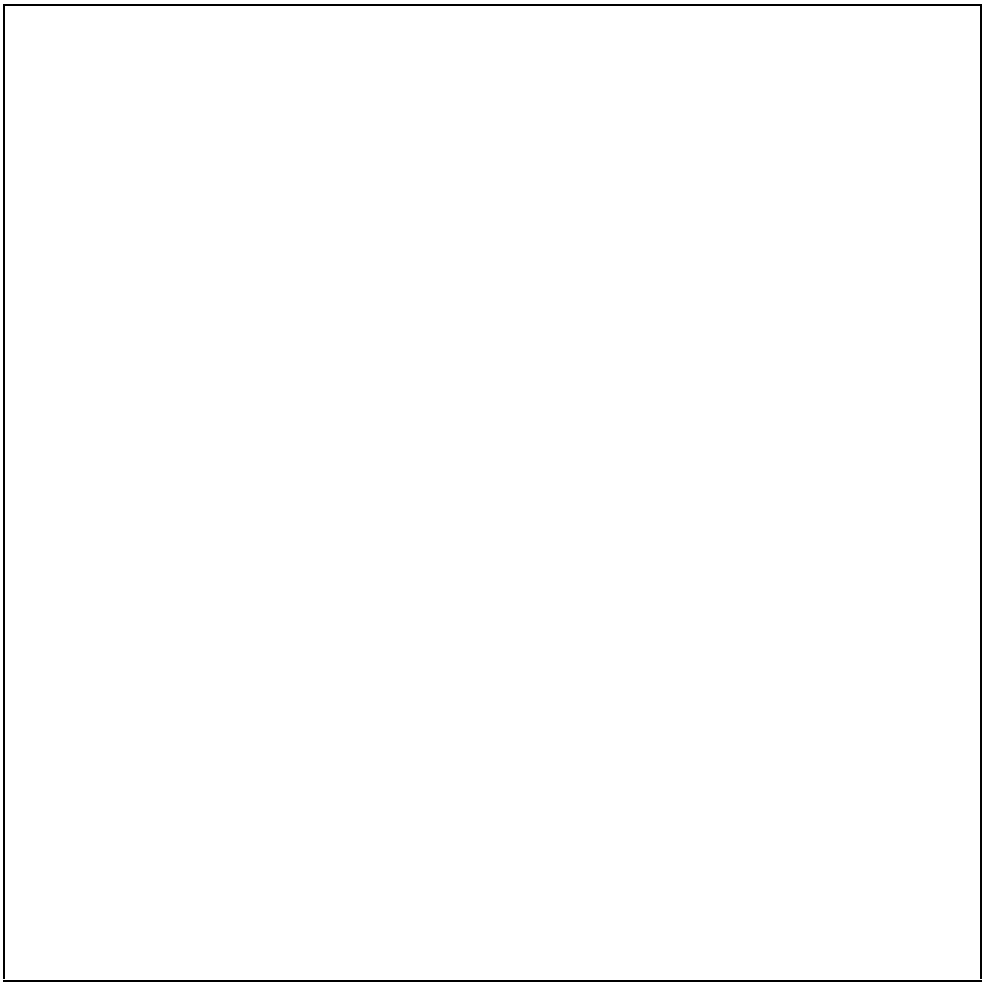
  If the test indicates that one or more nozzles has no ink bubble, but the Nozzles test is satisfactory, it may be necessary to run a PRIME operation.
- the electric continuity check on the nozzle activation circuit (Nozzles test)

  If the test indicates an error in the nozzle feed, see the guide to diagnostics section (5.5).
- the printer set-up parameters
- fonts available in Portrait and Landscape modes.

To run this test, proceed as follows:

- Load the ASF drawer with paper, preferably A4
- Switch off the machine then switch on keeping the ON LINE key pressed during the power on.

The printer will start to feed the sheets and print the test. The first page (as would be printed with a black print head) is shown below:



To interrupt the test, press ON-LINE, then press again to continue printing.

To stop the test before it is finished, switch off the machine or make a reset (press the INSTALL CARTRIDGE key followed by PAPER MICRO-ADVANCE).

The test ends automatically after the four pages have been printed and the machine remains in ON LINE.

5.3 PRINT test with COLOR print HEAD

There is a reduced print test for the color print head that only tests the functioning of the print nozzles .

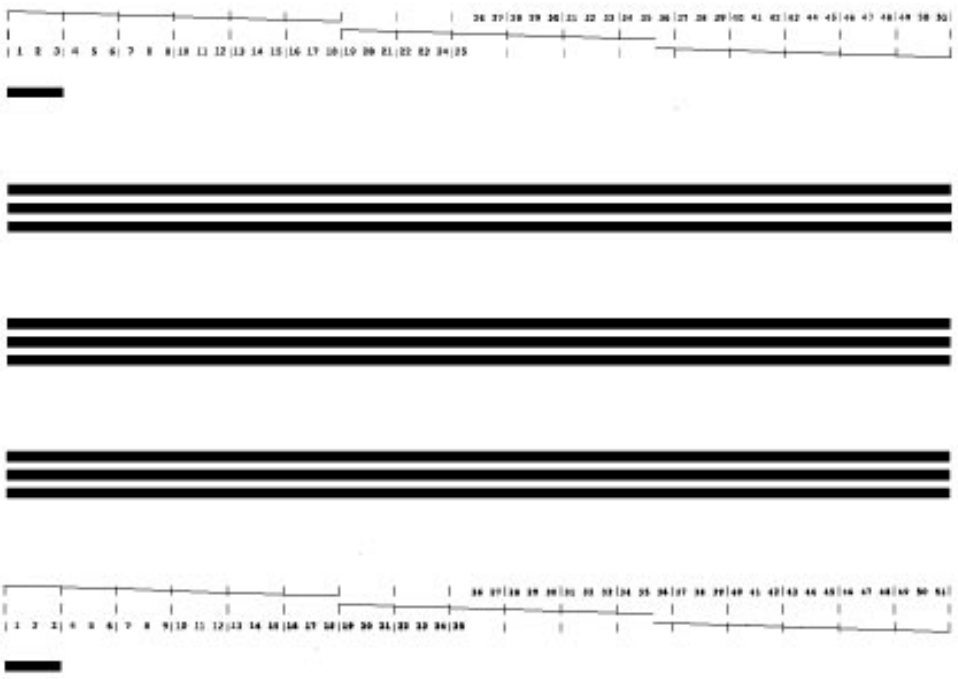
First the electrical functioning of the nozzles is tested and the result is given by a short line in blue if no faults are found, or in red to indicate the presence of faults.

For faults found, see the diagnostics guide (section 5.5).

The hydraulic functioning of the nozzles is checked printing three lines using all 51 nozzles. The last of these three lines must not have any white lines in the colored bands. If there are, switch off the printer then run a new print test.

The procedure to run this test is the same as for the monochrome head (section 5.2).

The next page shows an example (monochrome) of the print test for the color head.



5.4 ”DATA SCOPE” PRINTOUT (HEX DUMP)

This function prints any incoming character with the corresponding ASCII codes (hexadecimal), thus enabling a verification of the receiving of the control codes sent by the system.

Enabling the Data Scope printout:

Switch off the printer, press the INSTALL CARTRIDGE key and keeping the key pressed switch the printer on again.

Disabling the Data Scope printout:

To interrupt the hexadecimal printing, press the ON LINE key, to start up again from where the printer left off, press the key once more.

To exit from this type of printout, switch off the machine or make a reset (press the INSTALL CARTRIDGE key and then also the PAPER MICRO-ADVANCE key).

5.5 DIAGNOSIS GUIDELINES

The diagnosis guidelines list some of the more important error symptoms and provides a description of the probable causes.

These faults, the symptoms and probable causes have been divided into the following groups:

- **Faults at power-on:**

Includes all faults corresponding to Vac/Vdc power supply circuits and control circuits.

When the printer is switched on and nothing happens (no LED is lit and no mechanical movement occurs) check that the local network system is not disabled. Switch the printer off and then on again to check whether the fault persists.

Next check the power supply board checking the condition of the fuses and that there is power to the main board.

Finally, replace the main board.

If the printer does not initialize (enabled at each power-on and clears the printer) and all the LEDs are blinking, check that the paper is not jammed, disconnect the printer from the system and take out the memory card.

After each of these operations, try switching the printer off then on again.

If the printer does not initialize and MANUAL, ASF1, ASF2 LEDs are blinking, check that the print carriage is running freely.

If the ON LINE LED blinks very quickly at power on, replace the main board.

- **Print quality faults**

Includes all faults which do not block the printer but reduce the print quality considerably.

If characters are printed incomplete with one or two dots missing (the print test described in section 5.2 pin points these characters) first clean the nozzles as described in section 7.

If in the print test the Nozzle Test indicates nozzles that are not electrically connected, remove the head and clean the contacts on the carriage and on the head with a clean brush or a rag damped with alcohol .

If the fault persists replace the print carriage and flat cable, and finally the main board

If the printout is smeared or irregular, ensure that the carriage movement is smooth, the carriage belt tension device works correctly, the encoder strip is clean and check the setting of the driver voltage.

Clean the encoder strip carefully with a rag dampened with alcohol, and, if necessary (persistent strains, faded or damaged vertical bars or dog-earred corners), replace the part (see section 9.11).

If the driver voltage is higher than specified (18.8 V) the head resistors overheat thus shortening their life span.

Furthermore it should be remembered that an excessive increase in the environmental temperature could cause smeared printing or irregular bubble formation.

- **Paper feed faults**

Includes paper jamming, irregular paper feed and lack of paper movement.

The paper movements are controlled by a step motor. If the paper feed function does not work, check the paper present signal kinematic, the motor transfer kinematic from the motor to the paper feed roller, the motor cable and lastly replace the main board.

Jamming or irregular feed may be caused by paper residue or foreign bodies along the paper path or by an incorrect calibration of the tension of the paper motor belt.

If the paper feed from the drawer is irregular, re-shuffle and turn over the sheets in the drawer, clean the feed rollers, adjust the side clasps and the rear sheet clasp.

- **Data transmission faults:**

Check that the interface cable is the correct type and that it is not too long (2.5 meters for the parallel cable).

Check the connections to the PC and the printer.

Check that the printer configuration parameters are coherent with those required by the utility software installed on the PC.

6. FAULT CONDITIONS AND MEANING

Operational Status

The operational status of the printer can be initially determined by the condition of the LEDs on the operater panel which is shown below.

The LEDs, labelled 1 to 8, indicate the machine status, end of paper/ink or an error message. It is mainly these you can use to determine an initial problem

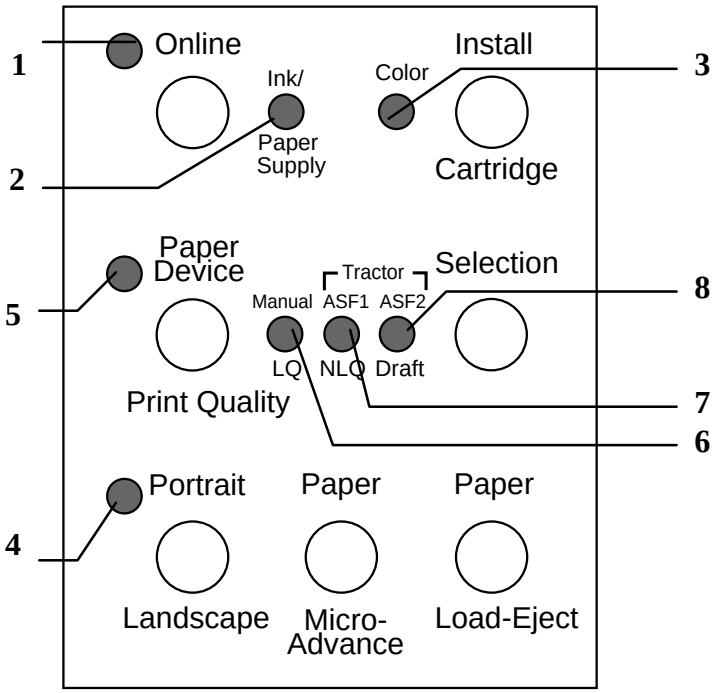


Fig 7-1 Operator panel LEDs and Keys

Fault Conditions and Indications

The table below show the machine fault status as indicated by the LEDs. The operational status of the machine is given in Section 2.

LED								MEANING
1	2	3	4	5	6	7	8	
B	B	B	B	B	B	B	B	Power on fault
					B	B	B	Carriage reset fault
DB								Electronic board fault
	B							Paper fault
	DB							End of ink/No head
		B						Wrong ink cartridge installed
		DB						Cartridge lever is in the wrong position

Key: B=Blinking, DB=Double Blink

Normal Conditions and Indications

LED								MEANING
1	2	3	4	5	6	7	8	
OFF								LOCAL
ON								ON LINE
B								ON LINE receiving data
		OFF						Black cartridge installed
		ON						Color cartridge installed
			OFF					Vertical page format
			ON					Horizontal page format
				OFF	ON	OFF	OFF	Print quality : LQ
				OFF	OFF	ON	OFF	Print quality : NLQ
				OFF	OFF	OFF	ON	Print quality : DRAFT
				ON	ON	OFF	OFF	Paper feed: Manual
				ON	OFF	ON	OFF	Paper feed: ASF1
				ON	OFF	OFF	ON	Paper feed :ASF2
				ON	OFF	ON	ON	Paper feed : Sprocket
				ON	ON	ON	OFF	Multipurpose device

Please refer to the functional description part in Section 2 for full details of the operation of the keys in conjunction with the LEDs.

7 MECHANICAL ADJUSTMENTS

7.1 PRINT HEAD AND THE WRITING SURFACE GAP

The distance between the head and the writing surface and the parallelism between the print matrix and the writing surface are obtained using a specific tool when assembling the printer.

If the print quality should deteriorate along the writing line, it is advisable to check the distance and if necessary, adjust the gap between the print head and printing surface.

Procedure:

To obtain the distance of 1.3 +0.2/0 mm between the head nozzles and the writing surface, proceed as follows:

- Loosen the screws that fasten the two plastic supports of the carriage slide bars. The left hand support is loosened through two screws, whereas for the motor support (right) it is necessary to loose three fastening screws.
- Move the print head carriage, with the print head (even if empty) loaded, to the extreme left. Using a feeler gage, measure 1.3 mm between the print head nozzles and the writing surface. Tighten the screws on the left support.
- Repeat the operation with the printer head carriage at the right hand side.
- Check the measurements both at either end and the middle and, if necessary, adjust.
- Run a print test.

7.2 ADJUSTING THE TENSION OF THE PAPER FEED MOTOR BELT

The tension of the paper feed motor belt is adjusted during printer assembly, using a specific tool.

If, during paper feeding irregular line feeds, deformed characters or white stripes along the printing line occur, check the belt tension and, if necessary, correct it.

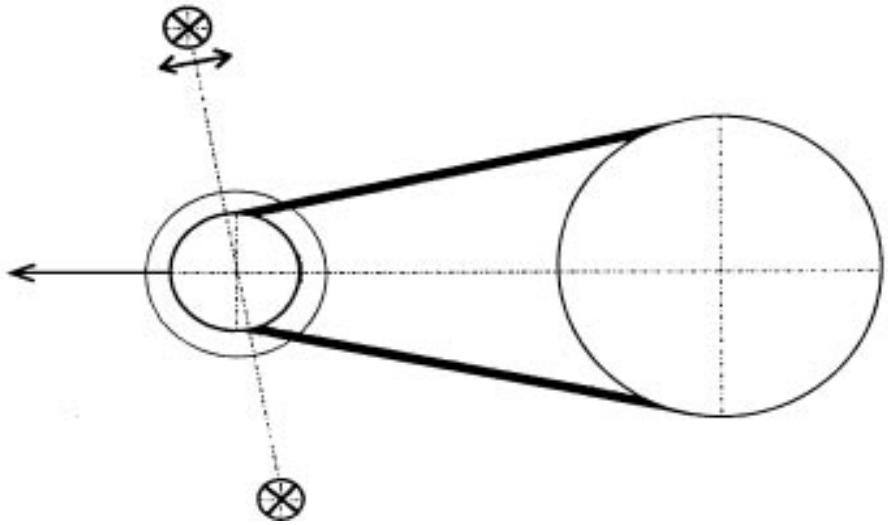
Procedure:

With all parts mounted, loosen the motor fixing screws so that the motor is slightly blocked.

Rotate the motor anticlockwise so that the rear screw is against the right edge of its hole.

Using a dynamometer, apply a force of 6 N +/- 0.5 in direction of the pulley interaxis (see figure below).

Maintaining the applied force, tighten the motor screws.



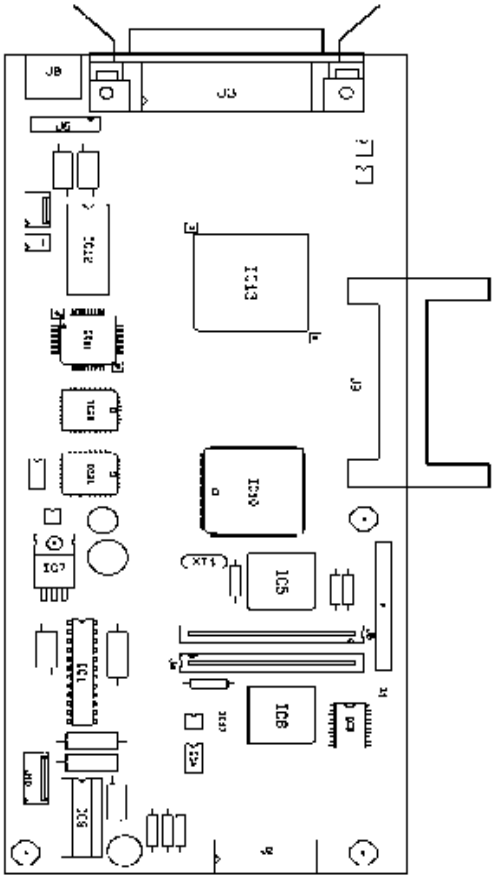
7.3 BI-DIRECTIONAL PRINT ALIGNMENT ADJUSTMENT

If the printout is badly aligned due to the bi-directional printing, the defect can be corrected by means of the following procedure:

- Make sure there is paper in the machine.
- Power up the printer keeping the PORTRAIT-LANDSCAPE key pressed.
- The machine will automatically print a series of vertical bars that permit the bi-directional alignment correction.
- To run this function, read the instructions on the sheet supplied in the machine.

8. ELECTRICAL INTERCONNECTIONS

8.1 MAIN BOARD MAIN COMPONENTS

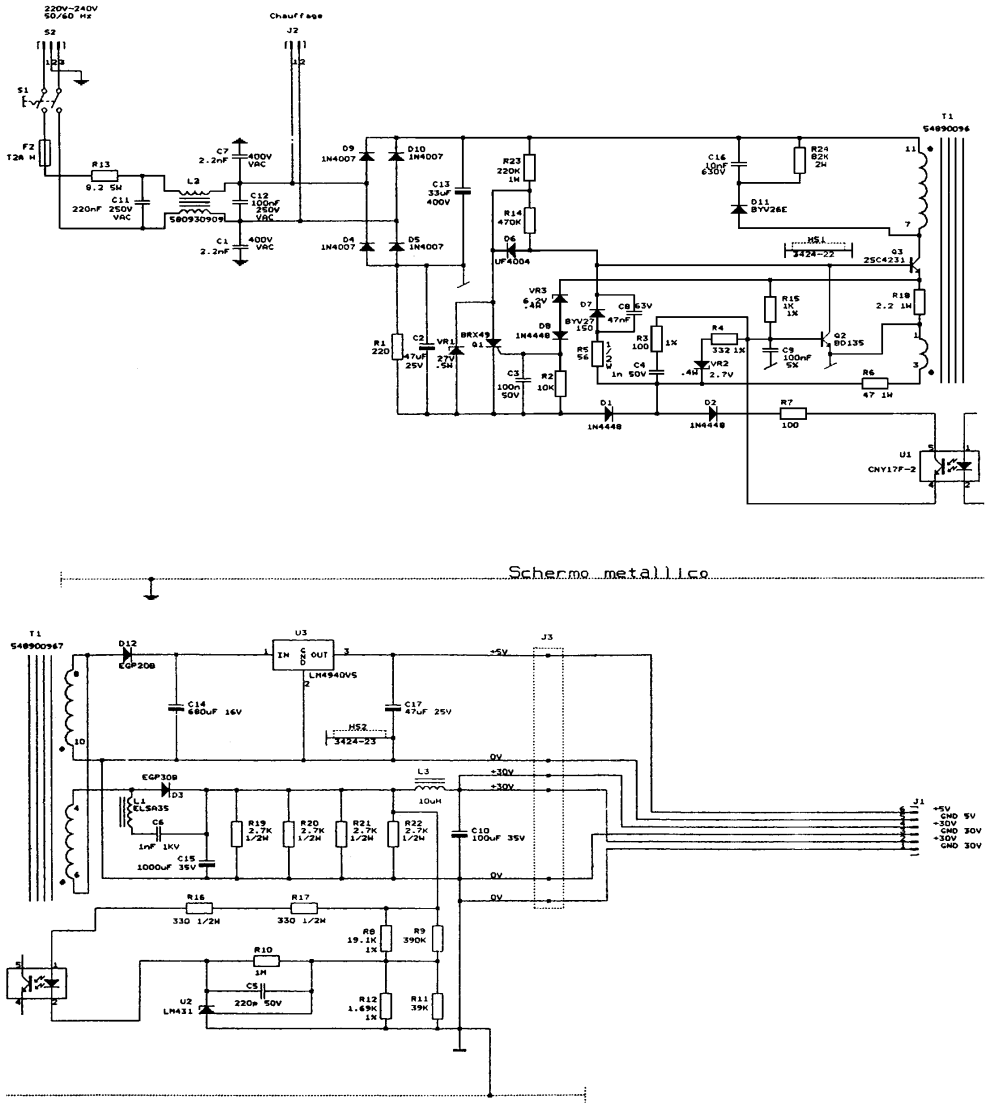


J1 Paper Motor
J2 Console
J3 Parallel Interface
J4 Print Head
J5 Print Head
J6 Power Supply
J7 Carriage Motor
J8 ASF2/MPD
J9 Memory Card
J10 Black / Color Head and Paper Presence Photosensors

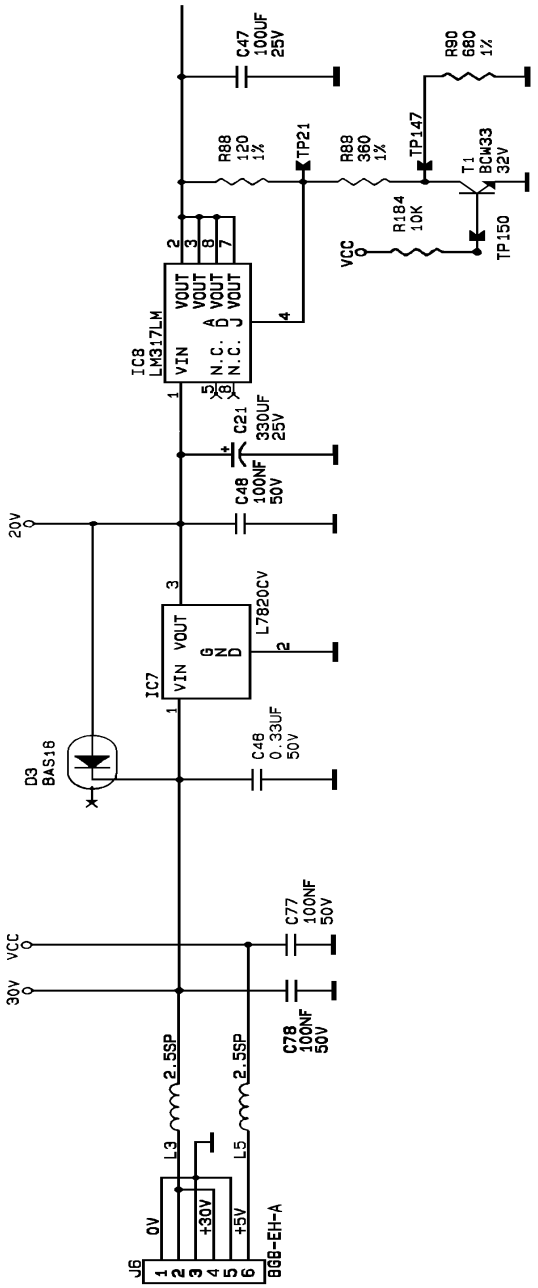
IC1 Paper Motor Driver
IC3 8 Bit Buffer
IC4 Operational Amplifier
IC5 Head Driver
IC6 Head Driver
IC7 20 V Regulator
IC8 Voltage Regulator
IC9 Head Motor Driver
IC10 CPU 80C186XL
IC11 ROM 1 Mbyte
IC12 Dynamic RAM
IC13 CATHY ASIC
IC16 256 Bit EEPROM
IC17 LM 393
IC20 FLASH EPROM
IC21 FLASH EPROM

XT1 20 MHz Quartz
Z1 Board data plate

8.2 POWER SUPPLY BOARD



8.3 POWER SUPPLY CIRCUIT ON MAIN BOARD



8.4 CONNECTOR SIGNALS

	Main Board Connector											
PAPER MOTOR	**J1**	**J2**	**J3**				**J4**		**J5**	
1	OUT1A									
	OUT1B									
	OUT2A									
4	OUT2B									
CONSOLE										
LED 8		1 VCC								
LED 7		Q 0								
LED 6		Q 1								
LED 5		Q 2								
LED 4		Q 3								
LED 3		Q 4								
LED 2		Q 5								
KEY G		Q 6								
KEY F		CLV0								
KEY E		CLV1								
KEY D		CLV2								
KEY C		CLV3								
KEY B		CLV4								
KEY A		CLV5								
LED 1		CLV6								
		Q7								
		16								
PARALLEL INTERFACE			/STRB1	01	19	GND	INKREF2	1	CHA	1
			CD 0	02	20	GND	S50	2	CHB	2
			CD 1	03	21	GND	C4	3	VCC	3
			CD 2	04	22	GND	C3	4	GND	4
			CD 3	05	23	GND	S49	5	COD1	5
			CD 4	06	24	GND	RINKREF1	6	S51	6
			CD 5	07	25	GND	S47	7	COD2	7
			CD 6	08	26	GND	S33	8	S6	8
			CD 7	09	27	GND	S35	9	S10	9
			/ACK 0	10	28	GND	S45	10	S8	10
			BUSY0	11	29	GND	S43	11	C2	11
			PE 0	12	30	GND	S41	12	S2	12
			ONLINE0	13	31	/INIT 1	S37	13	S4	13
			AUTOFD0	14	32		S39	14	S12	14
				/ERROR0			S31	15	S14	15
				15	33	GND	S29	16	S16	16
			GND	16	34		S25	17	S22	17
				17	35	/UART	S27	18	S18	18
			VCC	18	36		S23	19	S20	19
				/SLCTIN			S19	20	S24	20
							S17	21	S28	21
							S21	22	S26	22
							S15	23	S30	23
							S13	24	S32	24
							S11	25	S38	25
							S3	26	S40	26
							S1	27	S42	27
							C1	28	S44	28
							S7	29	S46	29
							S9	30	S36	30
							S5	31	S34	31
							NTC	32	S48	32
							PRINT HEAD			

J9				J6	J7	J8	J10	
							1 PAPER GND IO1 GND VCC VCC 6	**PAPER /HEAD PHOTOS**
						1 VCC ASFCMD +30V IO2 GND 6		**ASF 2**
					1 OUT1 OUT2 2			**CARRIAGE MOTOR**
GND	01	35	GND	1				**POWER SUPPLY**
AD3	02	36	/CD1	GND				
AD4	03	37	AD11	+30V				
AD5	04	38	AD12	GND				
AD6	05	39	AD13	+30V				
AD7	06	40	AD14	GND				
/CE1	07	41	AD15	+5V				
AD10	08	42	/CE2	6				
/OE	09	43						
A11	10	44						
A9	11	45						
A8	12	46	A17					
A13	13	47	P0					
A14	14	48	P1					
/WE	15	49	P2					
	16	50	P3					
VCC	17	51	VCC					
VPP1	18	52	VPP2					
A16	19	53						
A15	20	54						
A12	21	55						
A7	22	56						
A6	23	57						
A5	24	58	RST					
A4	25	59						
A3	26	60						
A2	27	61	/REG					
A1	28	62	/BVD2					
A0	29	63	/BVD1					
AD0	30	64	AD8					
AD1	31	65	AD9					
AD2	32	66	AD10					
	33	67	/CD2					
GND	34	68	GND					
MEMORY CARD								

9. PARTS REPLACEMENT

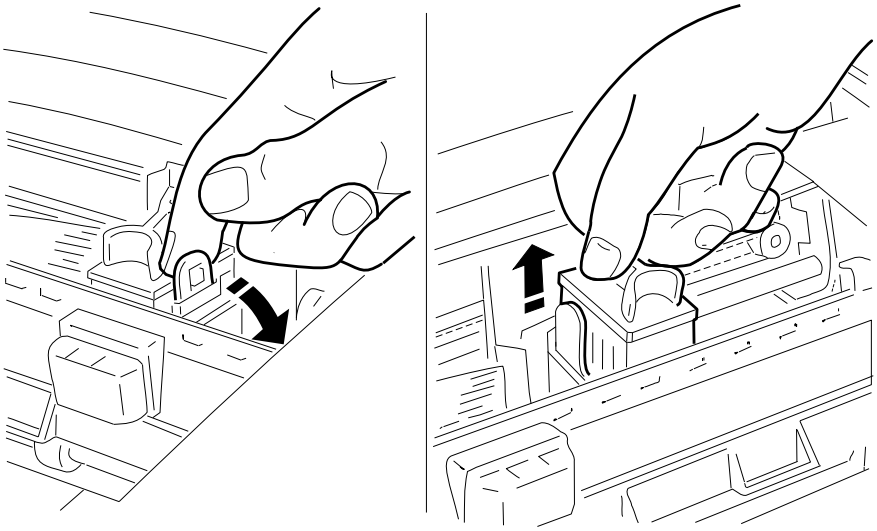
9.1 WARNING NOTES

AS A SAFETY PRECAUTION, BEFORE STARTING ANY DISASSEMBLING OPERATION SWITCH THE PRINTER OFF AND DISCONNECT IT FROM THE POWER SUPPLY MAINS.

- all operations should be carried out in clean, free areas.
- before switching the printer off, make sure that the head is in the parked position (Carriage on the right).
- when disassembling the head, do not rest it on the contacts or nozzles side; do not touch these parts with your hands.
- to reassemble, follow the disassembly instructions in reverse. make sure that all the connectors have been refitted correctly.
- adjustments after the disassembling/re- assembling of parts is not foreseen EXCEPT FOR THE PRINT HEAD CARRIAGE BARS (SECTION 8.1) AND THE PAPER FEED MOTOR BELT (SECTION 8.2)
- sfter servicing, test to ensure that there are no problems on the printer.

9.2 REPLACING THE INK CARTRIDGE:

- Open the cover to have access to the print head.
- Press the INSTALL CARTRIDGE key on the console to bring the print head to the change cartridge position.
- Do not remove the print head. Remove only the ink cartridge using the black lever on the print head.
- Remove the protective tape from the new ink cartridge.
- Insert the new ink refill immediately, pressing it down until it clicks into place.
- Close the cover and press the INSTALL CARTRIDGE key to delete the end of ink message and set the machine in ON LINE.

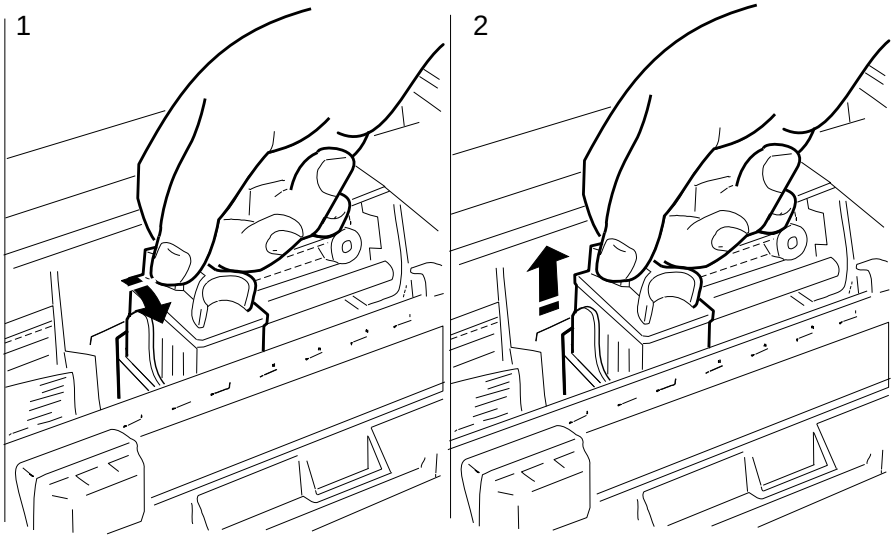


Note:

Before installing a new cartridge, check the validity date on the sealed wrapping.
If the print quality is not the best, run the Prime operation.

9.3 DISASSEMBLING/ RE-ASSEMBLING THE PRINT HEAD:

- Open the cover to have access to the print head.
- Press the INSTALL CARTRIDGE key on the console to bring the head to the change cartridge position.
- Release and remove the head, together with the ink cartridge. To do so, grasp the head pulling it towards the rear and remove it from its position.
- If the head is to be reused, handle it with care, following the instructions in section 9.1.

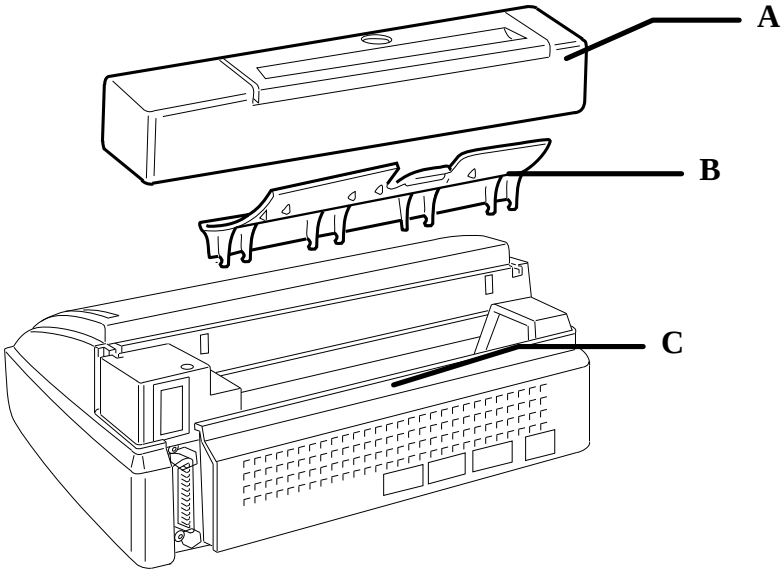


Note:

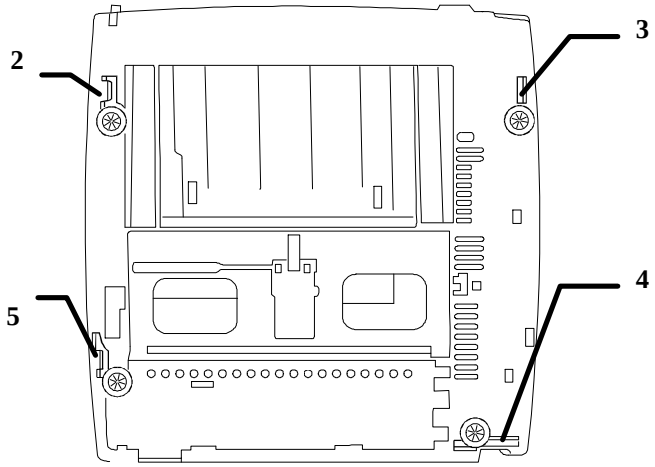
When installing a new head, check the validity date on the sealed wrapping.
If necessary carry out a "PRIME" nozzle cleaning operation after installing the new head.

9.4 DISASSEMBLING / RE-ASSEMBLING THE CASING

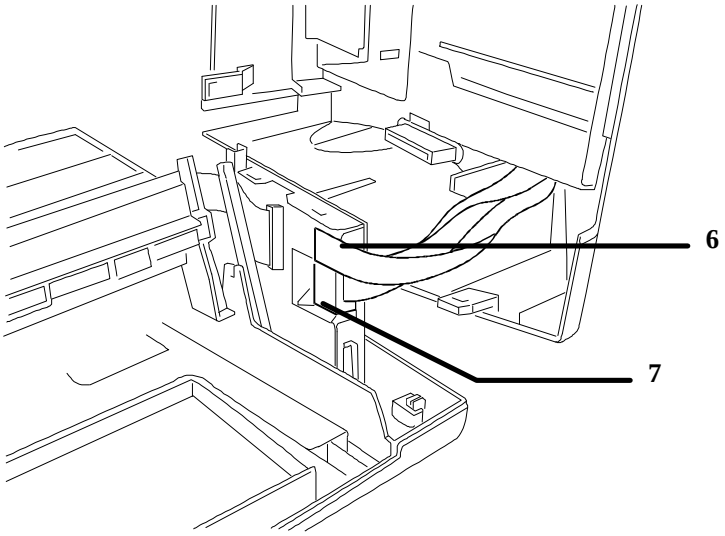
- Take out the paper drawer.
- Take off the rear cover (A), carefully remove the paper conveyor (B) by pushing the side levers gently inward.
- Release the catch (C) in the center on the inside of the casing.



- Turn the machine over and release the catches (2), (3), (4) and (5).

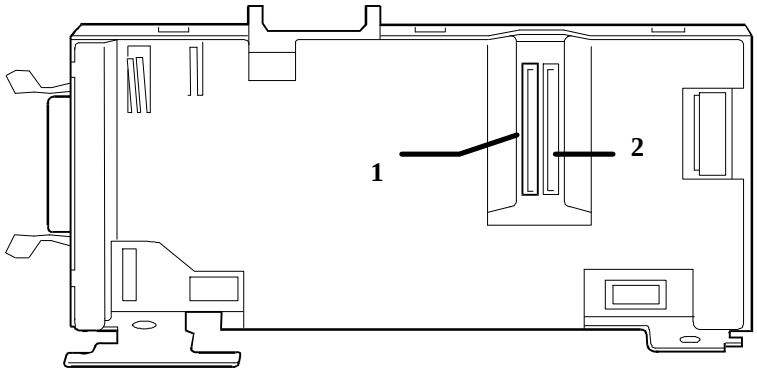


- Carefully lifting the casing, disconnect the console flat cable from its connector (6) on the motherboard and remove the protective strip (7) from the board shield.

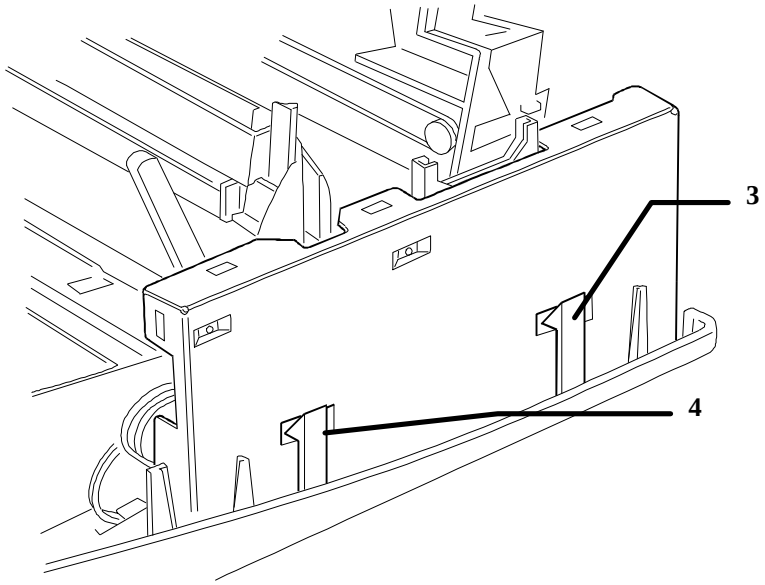


9.5 DISASSEMBLING / RE-ASSEMBLING THE MAIN BOARD:

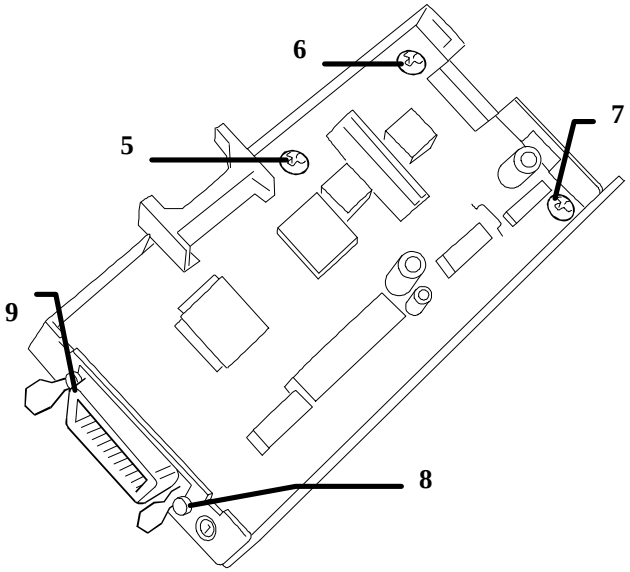
- Remove the casing (section 9.4).
- Disconnect the head flat cables from connectors (1) and (2).



- By means of clasps (3) and (4) release the board rack and remove it upwards.



- Unplug any connectors that are still connected.
- Remove the protective shield to have access to the board and its components.
- To replace the board, remove screws (5), (6), (7) and (8), (9).



Note:

When replacing the mother board, update the firmware release as described in section 8.2.

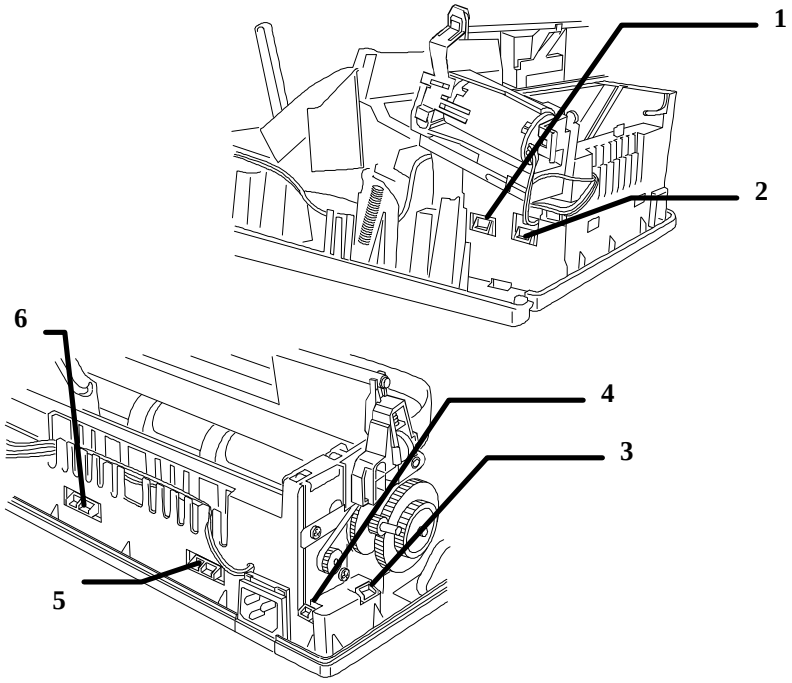
9.6 DISASSEMBLING/ RE-ASSEMBLING THE OPERATOR PANEL:

- Remove the casing (section 9.4).
- Lift the panel using your fingers or a small screwdriver and unclip it from the printer.
- The button and LED assembly will be loose on the rear of the panel.
- Gently pull off the interconnecting cable to complete the removal ensuring that you mark it to know the orientation for reconnection.

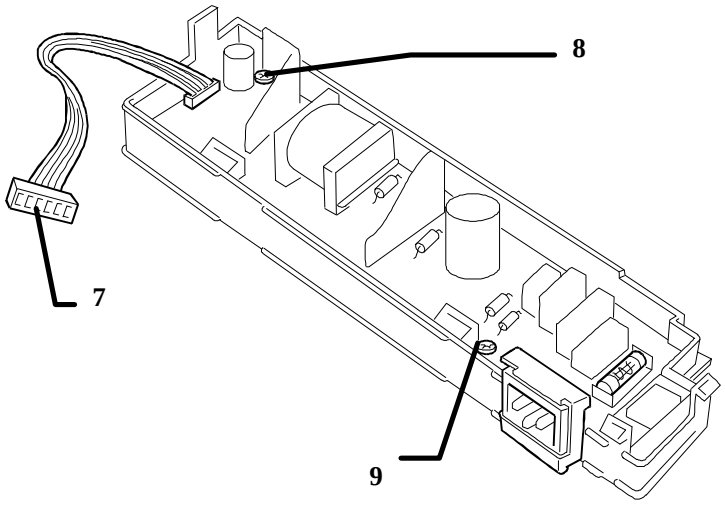
When reassembling, ensure that the button and LED assembly is properly aligned before clipping the panel down.

9.7 DISASSEMBLING / RE-ASSEMBLING THE POWER SUPPLY BOARD:

- Remove the casing (section 9.4).
- Release clasps (1), (2), (3), (4), (5), (6) and take out the board rack.



- Unplug the connector (7) from the mother board.
- To replace the board, remove screws (8) and (9).

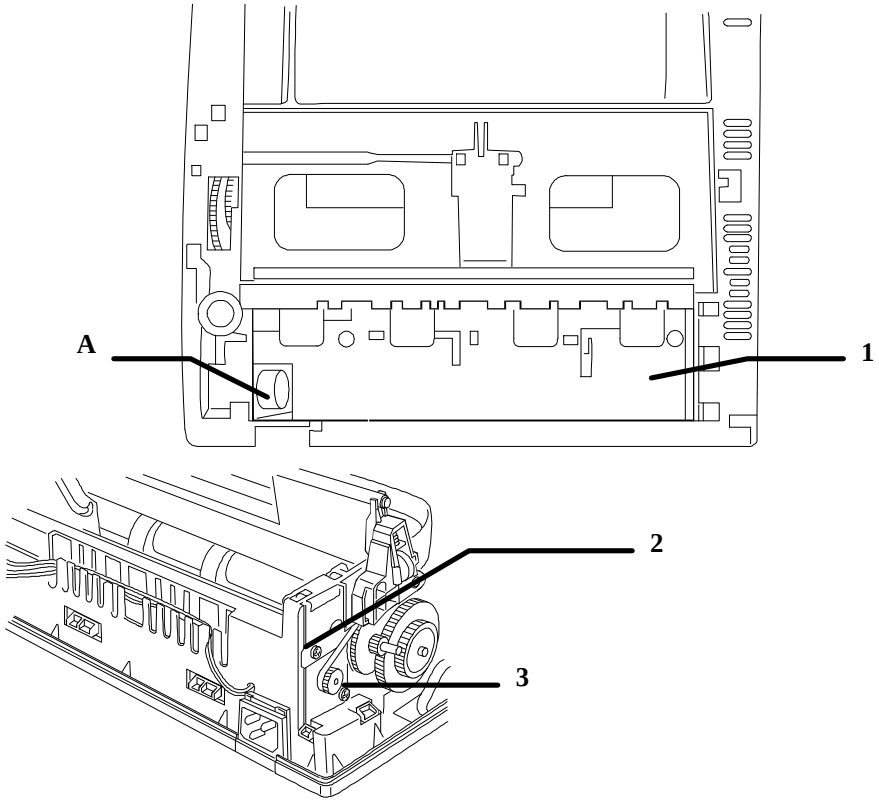


Note:

When replacing the fuse, make sure that the new one has the same characteristics.
When replacing the mother board, check that the mains voltage supported is the same as that of the old board.

9.8 DISASSEMBLING / RE-ASSEMBLING THE PAPER FEED MOTOR

- Remove the power supply board (section 9.7)
- Unhook and take out the separator (1)
- Remove screws (2) and (3) and withdraw the paper feed motor (A)
- Free the motor cables from the cable clamp slots and unplug the connector from the mother board.

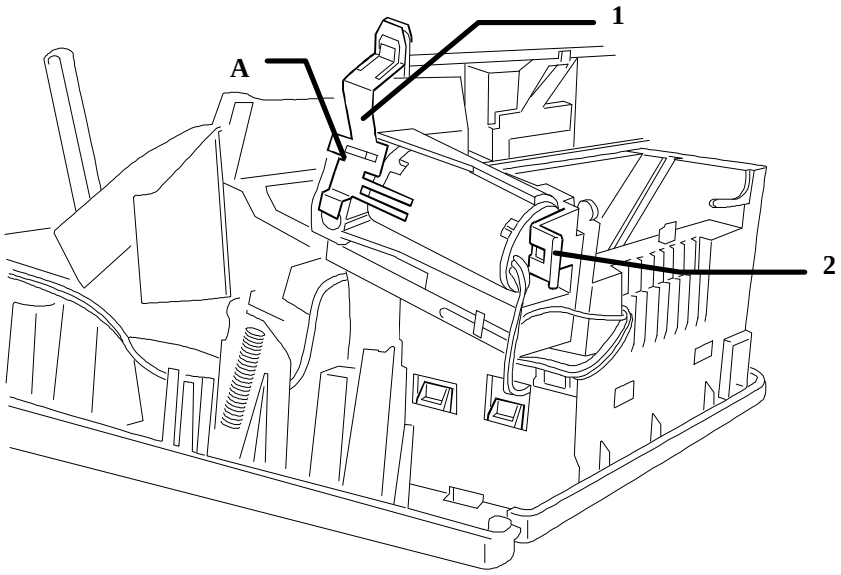


Note:

After reassembling the motor, calibrate the paper feed motor belt tension as described in section 8.2.

9.9 DISASSEMBLING / RE-ASSEMBLING THE CARRIAGE MOTOR

- Remove the mother board (section 9.5)
- Lift tab (A) and draw out the ground spring (1)
- Unclasp hook (2) that fastens the bottom, then remove the motor from its housing

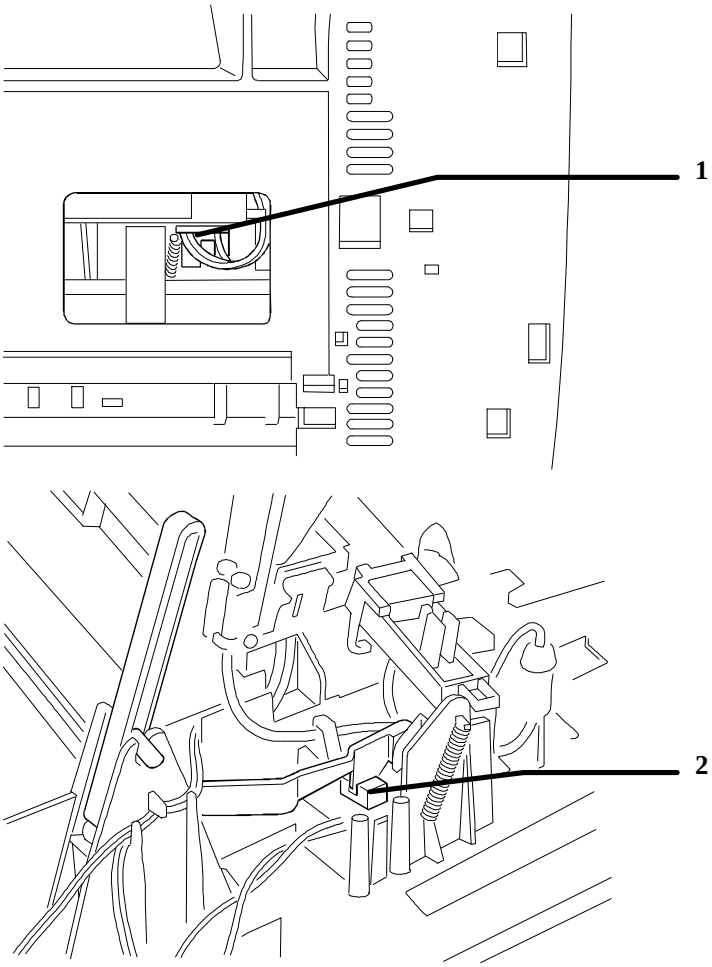


Note:

When re-assembling, make sure that the belt and belt tensioned are functioning correctly

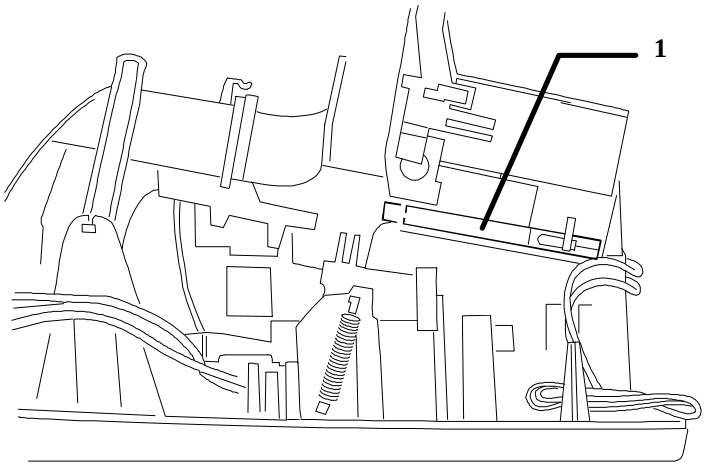
9.10 DISASSEMBLING / RE-ASSEMBLING THE BLACK/COLOR SELECTION AND SHEET PRESENCE PHOTOSENSORS

- Remove the mother board (section 9.5).
- Release the sheet presence photosensor (1) from its position and take it out of the machine
- Release the black/color selection photosensor (2) from its position
- Draw the cables out from the cable clamp slots.



9.11 DISASSEMBLING / RE-ASSEMBLING THE LINEAR ENCODER

- Remove the mother board (section 9.5)
- Take out the tensioning leaf spring (1) and turning it 90^0, free it from the linear encoder strip
- Free the encoder band from the fastening hook at the other end and carefully withdraw it from the reading slot on the print head.



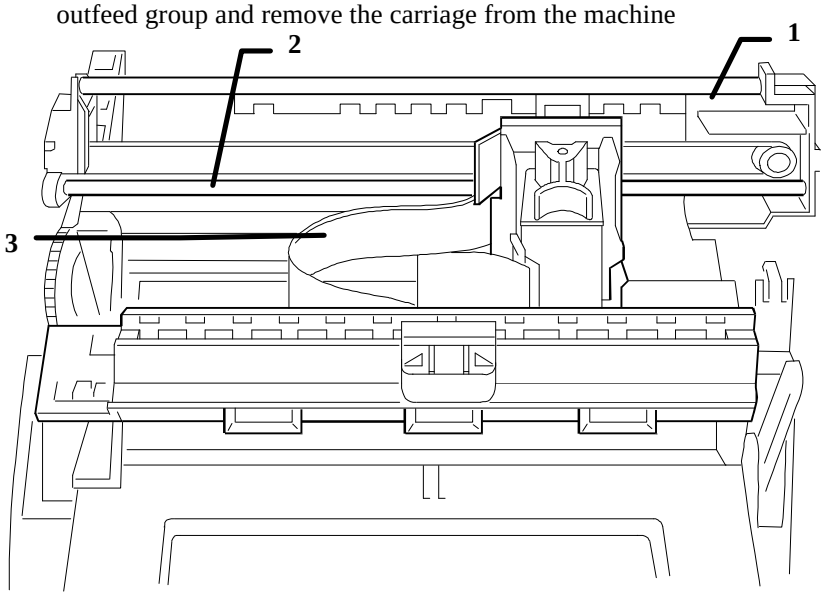
Note:

When re-assembling the strip, make sure that it is positioned so that the arrows are pointing upwards and that the written indications can be read correctly(see figure below), and take care to insert it correctly in the print head photosensor slot.

DO NOT TOUCH THE SHADED AREA ON THE STRIP, OTHERWISE THE PHOTOSENSOR MAY NOT READ THE SIGNALS CORRECTLY.

9.12 DISASSEMBLING / RE-ASSEMBLING THE PRINT CARRIAGE

- Remove the carriage motor (section 9.9)
- Remove the linear encoder (section 9.11)
- Withdraw the carriage upper guide shaft (1)
- Remove the flexible supporting brackets and withdraw the carriage lower guide shaft (2)
- Draw out the flat cables (3) from the guides on the paper outfeed group and remove the carriage from the machine

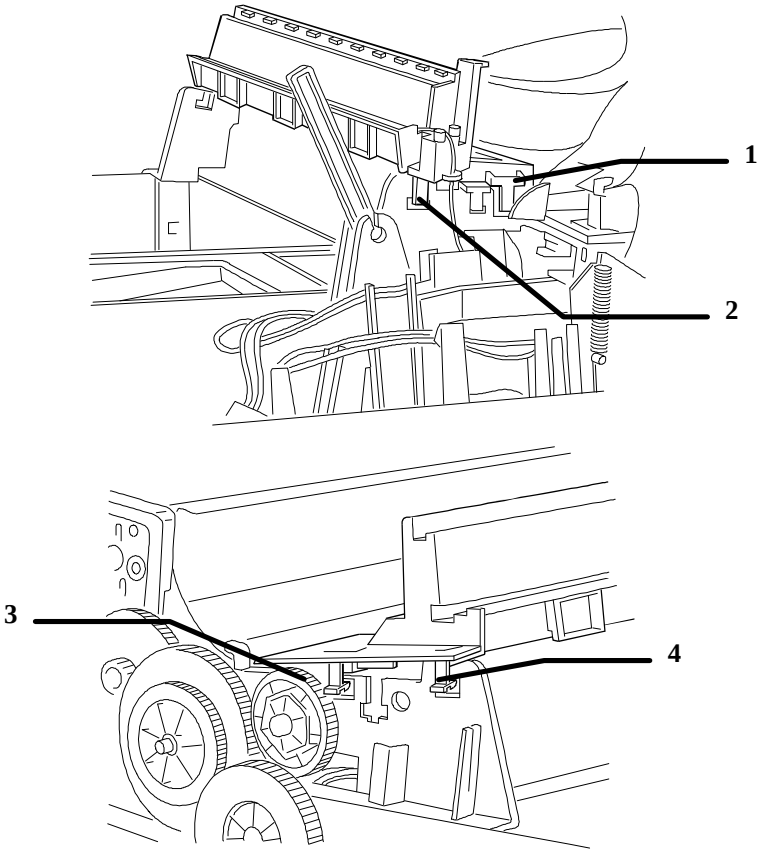


Note:

After re-assembling, run a print test and, if necessary, adjust the distance between print head nozzles and writing surface as described in section 8.1.

9.13 DISASSEMBLING / RE-ASSEMBLING THE PAPER OUTFEED GROUP

- Remove the casing (section 9.4)
- Withdraw the head flat cable from the guides on the paper outfeed group
- Free the ends of the ink tube
- Release the paper outfeed group from clasps (1), (2), (3), (4) and raise it.



Note:

When re-assembling, take care to insert the tractor group correctly.