**cardco, inc.**

# OPERATING MANUAL

## Cardco LQ/1
### Daisy wheel letter quality printer.

Dual interface built in. Fully interfaced for
Commodore VIC-20/C-64/264/364 computers,
and all computers using standard parallel printer output.

# FCC NOTICE (U.S.A. only)

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause 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 the receiving antenna
— Relocate the equipment with respect to the receiver
— Move the equipment away from the receiver.
— Plug the equipment into a different outlet so that the equipment and receiver are on different branch circuit

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communication helpful:

"How to Identify and Resolve Radio TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

# PREFACE

This equipment is a daisy wheel impact printer which delivers high quality printouts.

The printer provides both a serial print mode and a line print mode by means of DIP switch operation.

In the serial print mode, an ESC sequence offers a minimum of 1/120 inch carriage movement and a minimum of 1/48 inch paper feed, which allows the printer to perform bold print, superscripts and subscripts. Full use of various word processing programs such as WordStar*, etc. is possible. The code compatibility with Diablo** 1610 provides interfacing with leading word processing software.

In the line print mode, the printer automatically prints bidirectionally.

The printer is provided with a Centronics compatible parallel interface.

*WordStar is a registered trademark of MicroPro International Corporation.
**Diablo is a registered trademark of Xerox Corporation.

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    accomplished by opening the top cover.
    Opening the top cover interrupts the printing
    and, after closing the top cover, printing can
    be resumed with the ON LINE switch.
17. Platen Knob
    (Platen Variable)
18. Upper Cover

# 2. PREPARING THE MACHINE FOR OPERATION

The following accessories are packed together with this printer:
1. Daisy Wheel
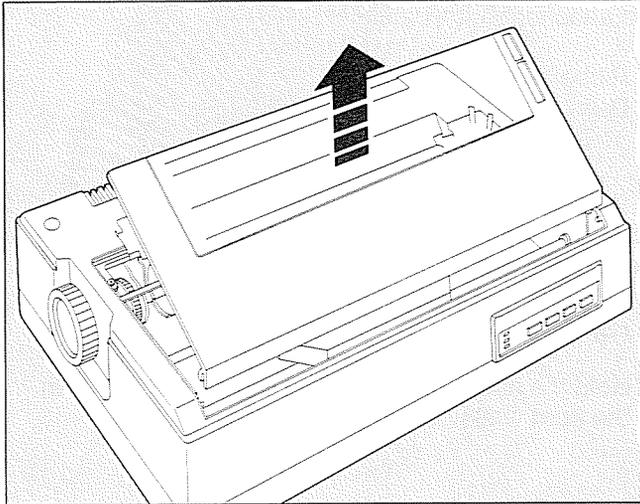
2. Multi-strike film ribbon (installed on the carriage)
3. Power Cord

**Top Cover**_____

The top cover can be removed from the printer when replacing the daisy wheel or ribbon.
To remove the top cover, raise it and pull it upwards.
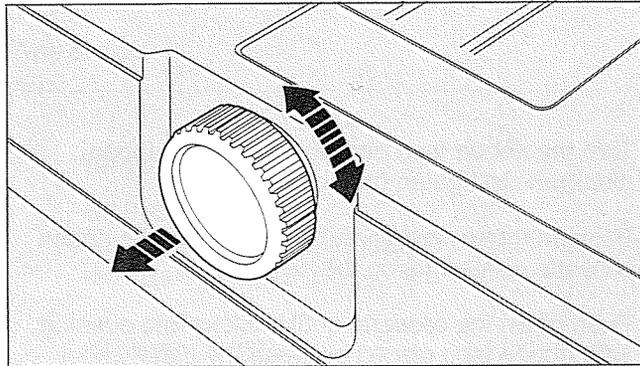
**Platen Variable**_____

The platen can rotate freely and be set at any line regardless of the line spacing by turning the platen knob while pulling it out.
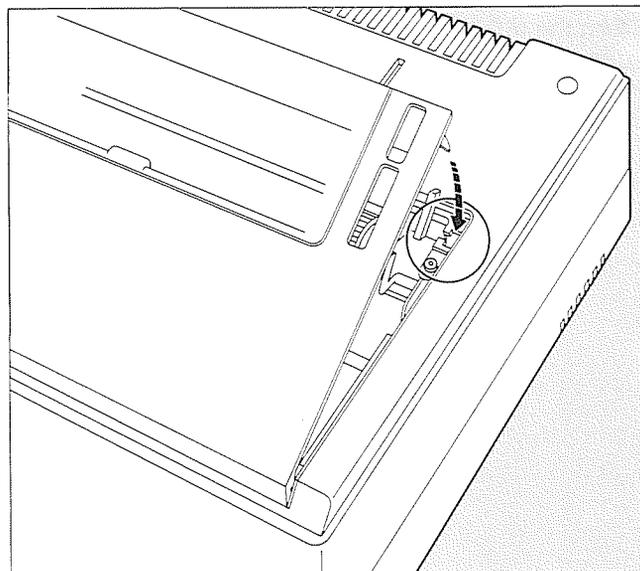
**Protector Switch**_____

The protector switch is provided inside the printer.
When the top cover is opened, the protector switch will go on and interrupt the printing.
To resume printing, close the top cover and depress the ON LINE switch.
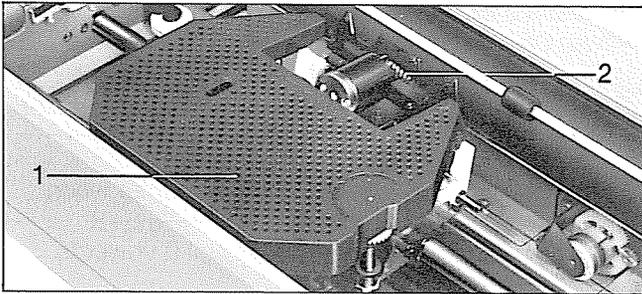
## Carriage

The carriage prints on the paper while moving in parallel with the platen. The following print elements are attached to the carriage.

1. Ribbon
2. Daisy wheel
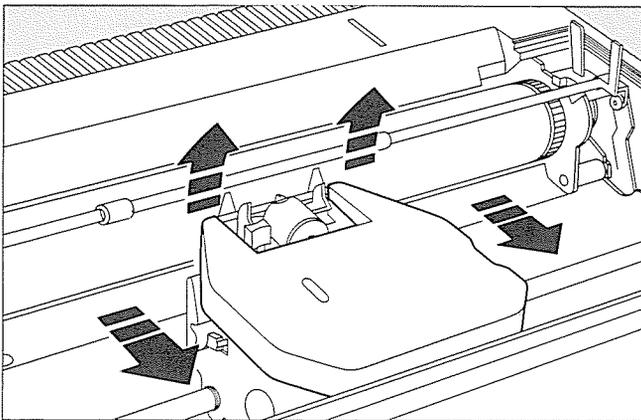
To replace the ribbon (Multi-strike film ribbon is provided with the printer.).

1. Remove the top cover.

2. Hold the ribbon with both hands and lift it up from the front while pulling it towards you.
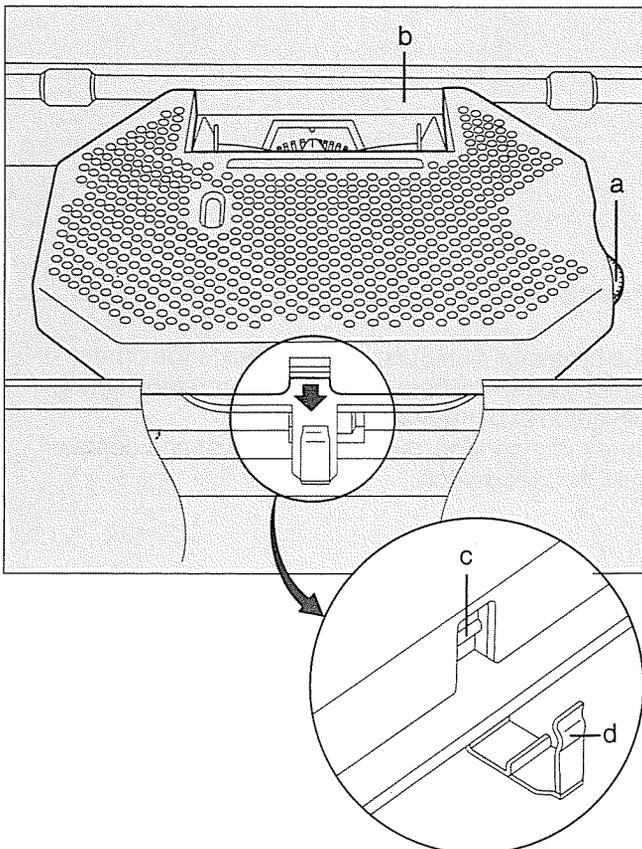
3. Turn the ribbon feed disk (a) on the new ribbon clockwise to tighten the ribbon (b).

4. Position the recess (c) of the cassette at the ribbon cassette retainer (d) on the carriage.

5. Push down the cassette until it clicks into position with ribbon tape placed between the daisy wheel and the platen.

6. Turn the ribbon feed disk 2 or 3 times in the arrow direction to remove any slack in the ribbon.

7. Replace the top cover.
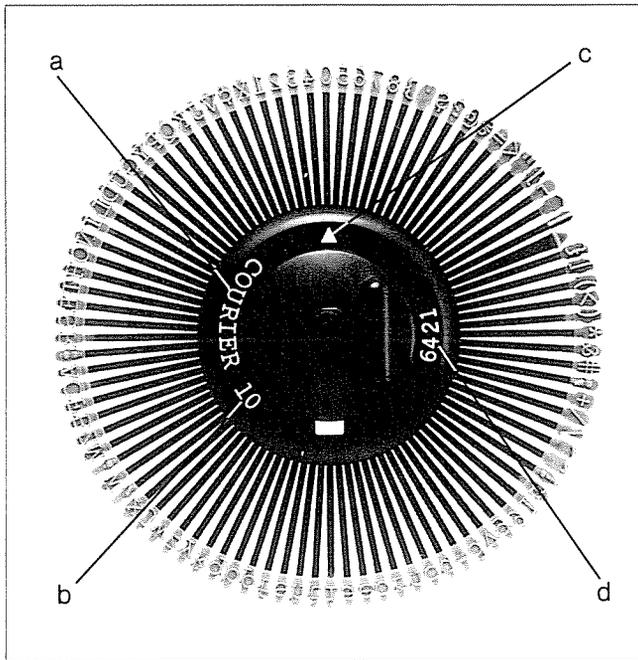
## Daisy Wheel

The following indications are given on the daisy wheel:

a. Type style (standard)
   COURIER

b. Typing pitch
   10 — 10-character per inch

c. Symbol of typing pitch
   ▲ — 10-pitch

d. Code number for character arrangement
   6421 (4 digits) — ASCII

## Type styles

10-pitch — 6421

COURIER 10
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

12-pitch — 6422

COURIER 12
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijlmnopqrstuvwxyz

15-pitch — 6423

GOTHIC MINI
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

Optional Daisy Wheels of 12-pitch and 15-pitch are available.
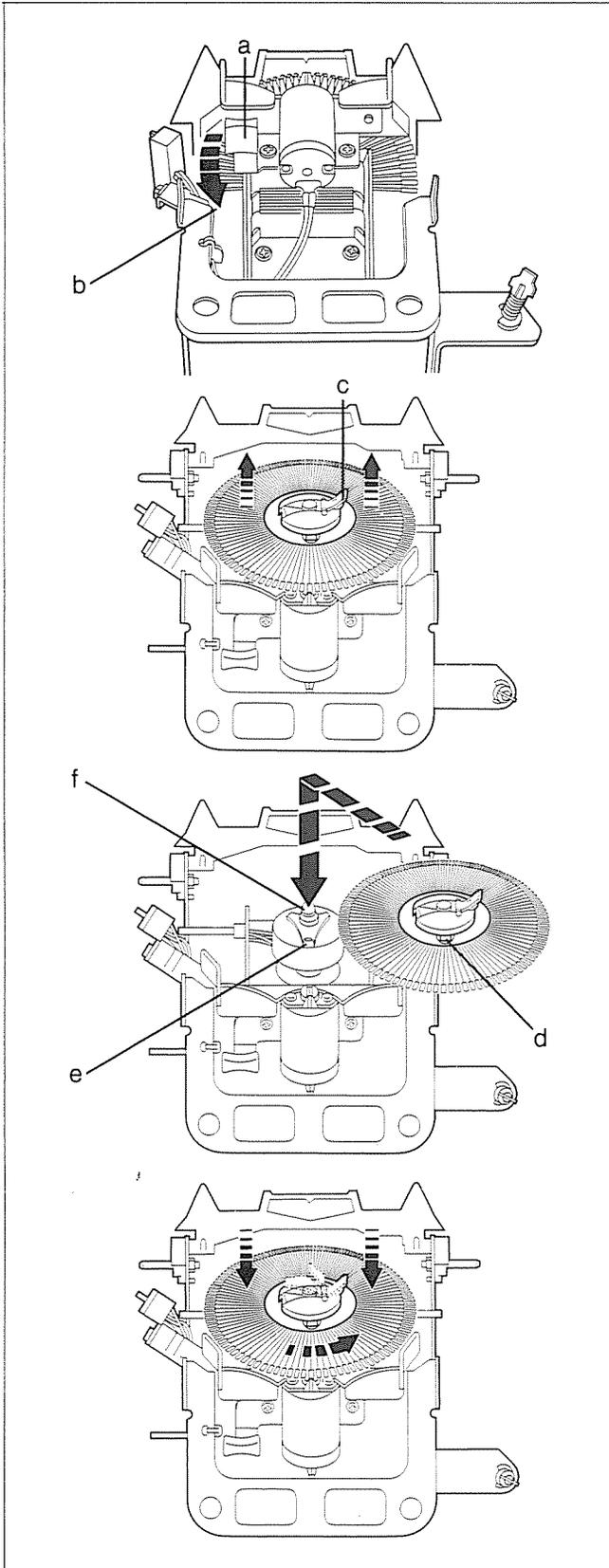
To replace the daisy wheel

1. Remove the ribbon (See page 4).

2. Hold the red lever (a) and pull it to tilt the daisy wheel holder unit (b) towards you.

3. Open the lever (c) in the center of the daisy wheel until it clicks, and then remove the daisy wheel.

4. Open the lever in the center of the daisy wheel of your choice and align the slot (d) of the daisy wheel with the daisy wheel holder (e) and mount the daisy wheel onto the guide pin (f).

5. Close the lever by pushing it with a forefinger until it CLICKS into position.
6. Make one turn of the daisy wheel with a finger to confirm it is set properly.
7. Restore the daisy wheel holder unit to the original position using the red lever.
8. Remount the ribbon in the position (See page 4).

**Notes:**
● *When replacing the daisy wheel, be sure to turn power switch off.*
● *Do not turn the power switch on before the daisy wheel is mounted.*
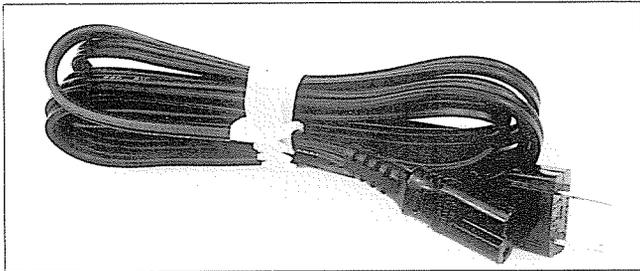
## Power Cord

The power cord is packed with the printer.
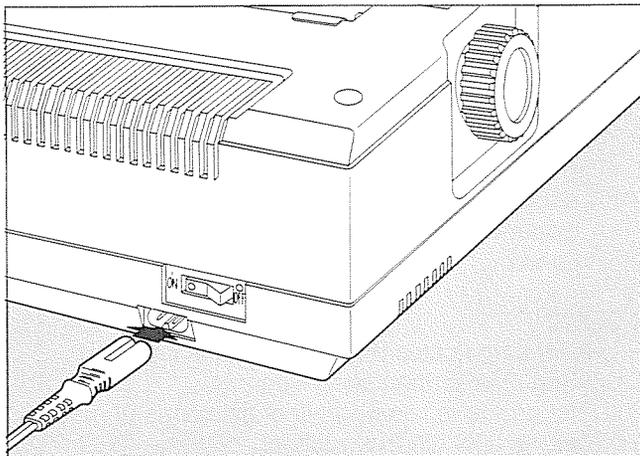
## Power Switch

This switch supplies power to all circuits of the printer and also initializes the printer.
As to re-initialization at power on, refer to "Power On and Remote Reset" on page 10.

*Notes:*
- *Be sure to power on the printer after turning on the host cofmputer, and power off the printer before turning off the host computer.*
- *Be sure to turn off both of the printer and host computer before connecting or disconnecting them.*
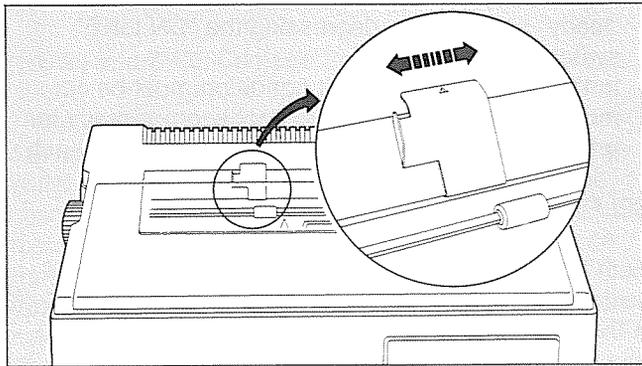
## Paper Guide

This guide is responsible for positioning the paper in the horizontal direction.
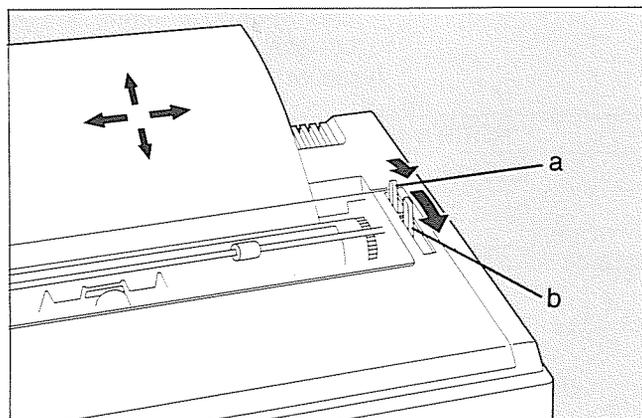
## Paper Release Lever

Pulling the lever (a) towards you permits you to adjust the paper position as desired. (Used in conjunction with the paper bail lever.)

## Paper Bail Lever

Pulling the lever (b) towards you releases the paper bail rollers from the platen, allowing free motion of the paper.

# 3. CONTROL PANEL

| POWER | ON LINE | LINE FEED | FORM FEED | TOF SET |
|---|---|---|---|---|
| ☐ POWER | | | | |
| ☐ ALERT | ☐ | ☐ | ☐ | ☐ |
| ☐ ON LINE | | | | |
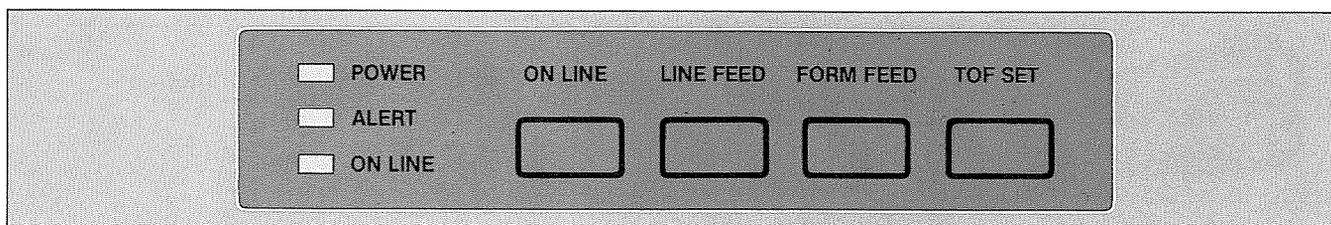
**Switches**

(1) ON LINE
Pressing the "ON LINE" switch toggles the printer between the two states of "on line" and "off line". The present condition is indicated by the "ON LINE" lamp.
While printing a line in the "line print" mode, the printer can not be taken "off line". It can be taken "off line" when the line feed (LF) signal is received after completing a line of printing.
Depressing this switch does not interrupt the printing of the self-test pattern.

(2) LINE FEED
Depressing this switch causes a one-line (1/6 inch) paper feed. Continuous pressure on this switch results in continuous paper feed.

(3) FORM FEED
Depressing this switch causes the paper to be advanced to the designated first line of the next page. This paper advancement is accurate with paper lengths of 11 or 12 inches only. Page length setting is carried out by means of the DIP switch setting. (See page 9, SW 3 )

(4) TOF SET
When the paper is set to the position desired by the user as the first line, depressing the TOF SET switch stores " top of form" information in memory. To change the TOF SET position, move the platen to the desired position and depress the switch. The old TOF SET position is automatically cleared.

Without using the TOF SET switch, the TOF SET position is set at the present printing position when the power is turned on or when the paper is loaded by means of the automatic paper insertion.

(5) Automatic Paper Insertion
Insert the paper in the back of the platen. Depress the FORM FEED switch while depressing the TOF SET switch, then the paper will automatically be fed to the printing line approximately 1.0 inch (25mm) from the upper edge of the paper.

**Lamps**

(1) POWER
This lamp is lit when the power switch is on.

(2) ALERT
This lamp lights on the following occasions:
•The ribbon is depleted.
•The top cover is opened.
•A "paper out" occurs with the optional form tractor installed.

(3) ON LINE
This lamp indicates that the printer is ready for printing. It is extinguished when:
1) The printer is taken "off-line" by means of pressing the "ON LINE" switch, or
2) ALERT condition exists.
In the former case, the printer is put back into a "ready" condition by depressing the "ON LINE" switch.
In the latter case, the fault condition must be corrected first, and then the printer becomes ready for printing by the depression of the "ON LINE" switch.

SELF-TEST

With the power switch off, depress the "LINE FEED" switch and place the power switch to "ON" position. A five-line printout will occur. The power switch must be toggled off and back on before normal operation can be resumed. (See page 24)

# 4. DIP SWITCH

DIP Switches SW1-SW5 are located under the top cover behind the control panel. This section explains the setting and functions of the 5 switches.

It is advisable to set the individual DIP switches before the printer is powered on. To set the switches, remove the top cover. (See page 3.)

*The Asterisk in the following tables indicates the factory setting.



**DIP switch SW 1 ∿ SW 5**
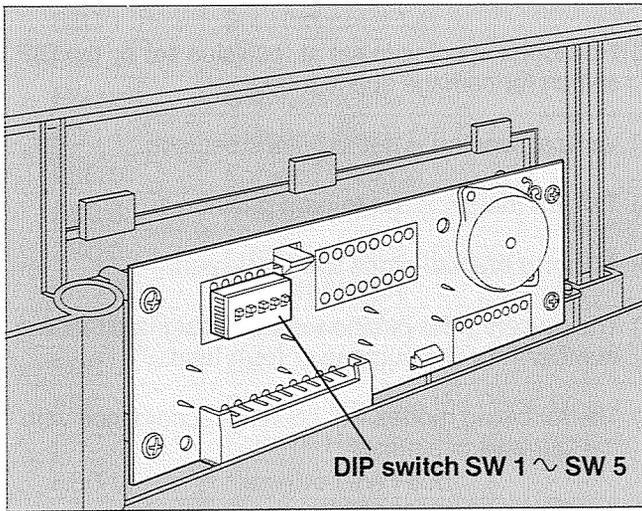
## (1) SW1 and SW2: Carriage Space Mode

These switches control the amount of the horizontal carriage movement when printing and spacing. In the serial print mode, once ESC US n code is input, the space amount is controlled by that code and, as a result, not changeable by these switches. But, since these switches also control the hammer pressure, they must be properly set to agree with the pitch of the selected daisy wheel.
This switch condition is read when:

A. The printer is powered on,
B. ESC CR P code is received, or
C. The PRIME signal is received.

| SW1 | SW2 | PITCH |
|------|------|----------|
| OFF* | OFF* | 10 pitch |
| OFF | ON | 12 pitch |
| ON | OFF | 15 pitch |

## (2) SW3: Form Length

The amount of form feed must be preset to either an 11 or 12 inch paper length. This switch condition is read when:

A. The power is turned on,
B. ESC CR P code is received,
C. TOF SET or FORM FEED is executed, or
D. The PRIME signal is received.

| SW3 | LENGTH |
|------|-----------|
| OFF* | 11 inches |
| ON | 12 inches |

## (3) SW4: Auto Line Feed

SW4 selects whether or not a line feed (LF) is automatically carried out with the execution of a carriage return (CR). In the serial print mode, the switch condition is read immediately before data input.
In the line print mode, the switch condition is read immediately before execution of a carriage return.

| SW4 | MODE |
|------|--------|
| OFF* | CR |
| ON | CR+LF |

## (4) SW5: Serial or Line Print Mode

SW5 selects one of the two print modes, serial print or line print. In the serial print mode, the printer executes printing character by character as it receives a character of data from the host computer. In the line print mode, the received data is put into a buffer and printed line by line only upon receipt of a CR, LF, or FF code. In this mode, the printer will automatically print bidirectionally.
This switch condition is read when:

A. Power is turned on,
B. An initial remote reset (ESC CR P) is performed, or
C. The PRIME signal is received.

| SW5 | MODE |
|------|--------|
| OFF* | SERIAL |
| ON | LINE |

# 5. BELL (BEL) FUNCTIONS

# 6. POWER-ON AND REMOTE RESET

(1) A bell sounds for a half second and the ALERT lamp lights up in case you open the top cover in the "on line" mode. While printing, this function interrupts printing and moves the carriage to the center. Depressing the "ON LINE" switch after closing the top cover resumes printing.

(2) A bell sounds and the ALERT lamp lights up when the ribbon is depleted in the "on line" mode. While printing, this function interrupts printing and moves the carriage to the center. To resume printing, change the ribbon and depress the "ON LINE" switch.

(3) A bell sounds when the carriage bypasses the right margin.

(4) A bell sounds and the ALERT lamp lights up when the optional Form Tractor is in use and the paper is depleted in the "on line" mode. If the paper is depleted while printing, this function interrupts printing and moves the carriage to the center. To resume printing, set the paper and depress the "ON LINE" switch.

(5) A bell sounds five times and printing is interrupted in case the type wheel gets entangled with the ribbon. In this case remove the fault and turn on the power before you resume printing.

Upon:
a — power-on
b — receipt of the $\overline{\text{PRIME}}$ signal (pin 31 of the connector).
or
c — receipt of the ESC CR P sequence (serial mode only), the printer will default to the following:

(1) Carriage moves to the far left (printing position 1).

(2) Printing will be in the forward printing direction.

(3) Horizontal spacing is set at the value set by the DIP switch for carriage space mode.

(4) Vertical spacing is set to 6 lines per inch.

(5) The left margin is set to print position 1.

(6) All horizontal tab stops will be cleared.

(7) The present print position will be designated as line number 1 for the purpose of form feed.

(8) The following modes will be set in accordance with the DIP switch setting:

a — Carriage space mode
b — Form length
c — Auto line feed
d — Serial or line print mode

# 7. CODES AND FUNCTIONS

## 7-1 Code/Function Table

In the serial print mode or line print mode, the following codes (X) are usable.

| CODE | FUNCTION | SERIAL PRINT MODE | LINE PRINT MODE |
|------|----------|-------------------|-----------------|
| BEL | Audible Alarm | X | X |
| BS | Backspace | X | |
| CR | Carriage Return | X | X |
| ESC ∅ | Set Right Margin | X | |
| ESC 1 | Set Horizontal Tab | X | |
| ESC 2 | Clear All Tab Stops | X | |
| ESC 3 | Graphics Mode On | X | |
| ESC 4 | Graphics Mode Off | X | |
| ESC 5 | Forward Print On | X | |
| ESC 6 | Backward Print On | X | |
| ESC 8 | Clear Individual Tab Stop | X | |
| ESC 9 | Set Left Margin | X | |
| ESC D | Negative Half-Line Feed | X | |
| ESC U | Half-Line Feed | X | |
| ESC Y | Print 20 Hex (See the Code Table in Appendix C) | X | X |
| ESC Z | Print 7F Hex (See the Code Table in Appendix C) | X | X |
| ESC LF | Negative Line Feed | X | |
| ESC HT n | Absolute Horizontal Tab | X | |
| ESC VT n | Absolute Vertical Tab | X | |
| ESC RS n | Vertical Motion Index (VMI) | X | |
| ESC US n | Horizontal Motion Index (HMI) | X | |
| ESC CR P | Initial Remote Reset | X | |
| FF | Form Feed | X | X |
| HT | Horizontal Tab (normal) | X | |
| LF | Line Feed | X | X |
| SP | Space | X | X |

## 7-2 Explanation of Functions

In this section, the codes to control the functions of the printer are explained according to the above table. As to their usage and application, see the sample BASIC programs in the Appendix A.

| BEL (07H) | Sounds the bell for a half second. |
|-----------|-------------------------------------|
| BS (08H) | Moves the carriage in the direction opposite to the printing direction by one character. |
| CR (0DH) | A. Serial print mode<br>　　1. Moves the carriage to the left margin and prints the following data.<br>　　2. Cancels the backward direction printing mode and the graphics mode.<br>B. Line print mode<br>　　Causes the data stored in the buffer to be printed. |

| | |
|---|---|
| ESC ∅ (1BH, 30H) | Sets the right margin at the current carriage position. |
| ESC 1 (1BH, 31H) | Sets the horizontal tab at the current carriage position. |
| ESC 2 (1BH, 32H) | Clears all the tab stops simultaneously irrespective of the carriage position. |
| ESC 3 (1BH, 33H) | Puts the printer in the graphics mode. In the graphics mode, the carriage will not move even if a character is printed. Moving the carriage requires the operation of tab, space, back space or line feed. In the graphics mode, the space (SP) and back space (BS) are fixed to 1/60 inch while line feed (LF) and negative line feed (ESC LF) performs a 1/48 inch paper feed. The graphics mode is cancelled by the input of ESC 4 or CR. |
| ESC 4 (1BH, 34H) | Cancels the graphics mode. |
| ESC 5 (1BH, 35H) | Forward direction printing mode. |
| ESC 6 (1BH, 36H) | Backward direction printing mode. CR or ESC 5 restores the printer to the forward direction printing mode. |
| ESC 8 (1BH, 38H) | Clears the individual tab stop by inputting this code after the carriage has been moved to the tab stop by normal tab performance (HT). If there are no further pre-set tabs to the right of the printing position, the HT code will move the carriage to the right margin. |
| ESC 9 (1BH, 39H) | Sets the left margin at the current carriage position. |
| ESC D (1BH, 44H) | Feeds the paper downward by half of the amount specified by ESC RS n. In case the line feed spacing pitch is an odd number of 1/48-inch increments, the remainder is ignored. |
| ESC U (1BH, 55H) | Feeds the paper upward by half of the amount specified by ESC RS n. In case the line feed spacing pitch is an odd number of 1/48-inch increments, the remainder is ignored. |
| ESC Y (1BH, 59H) ESC Z (1BH, 5AH) | Used for printing any two characters not included in the 94-character ASCII code. As for the characters to be printed, see the Code Table of your typing wheel number. |
| ESC LF (1BH, 0AH) | Feeds the paper downward. The amount of paper feed is 1/6 inch when the printer is powered up, or as specified by ESC RS n. In the graphics mode it is set at 1/48 inch. |
| ESC HT n (1BH, 09H, n) | Makes it possible to move the carriage to any desired horizontal position without presetting the tab. The "n" is the number of characters counted from the left final position and cannot exceed 126. (Example) When you move the carriage to the 10th character position, "n" should be 10. Input of ESC HT 10 should be in the order of 1B, 09, 0A in hexadecimal according to the ASCII Code Table in page 23. This command is also effective in the graphics mode. |
| ESC VT n (1BH, 0BH, n) | Feeds the paper to any of the first 126 lines. Unlike the horizontal tab, there is only one method of vertical tabbing, that is an absolute vertical tab. (Example) When you feed the paper to the 20th line counted from the TOF SET position, "n" should be 20. ESC VT 20 should be input in the order of 1B, 0B, 14 in hexadecimal according to the ASCII Code Table on page 23. It is possible to feed the paper to a line beyond the page boundary. The paper feed thereafter is conducted from the TOF SET position of that page. |

| | |
|---|---|
| ESC RS n (1BH, 1EH, n) | Sets the line feed spacing pitch.<br>Line feed spacing pitch $=(n-1)\times 1/48$ inch.<br>The value of "n" cannot exceed 126.<br><br>(Example)<br>Desired line feed spacing pitch:1/4 inch (4 lines/inch)<br>$1/4=(n-1)\times 1/48$ inch    $n=13$<br>ESC RS 13 should be input in the order of 1B, 1E, 0D in hexadecimal according to the ASCII Code Table on page 23.<br><br>When ESC RS n code is not input, the amount of paper feed is automatically set to 1/6 inch at power on.<br>*Note:*<br>*The value of (n − 1) is called "VMI" (Vertical Motion Index). Refer to Appendix B.* |
| ESC US n (1BH, 1FH, n) | Sets the horizontal spacing pitch of the carriage.<br>Spacing pitch $=(n-1)\times 1/120$ inch<br>The value of "n" cannot exceed 126.<br><br>(Example)<br>Desired spacing pitch: 1/12 inch (12ch./inch)<br>$1/12=(n-1)\times 1/120$    $n=11$<br>ESC US 11 should be input in the order of 1B, 1F, 0B in hexadecimal according to the ASCII Code Table on page 23.<br><br>When ESC US n code is not input, the horizontal spacing pitch is set by DIP Switches SW1 and SW2.<br>*Note:*<br>*The value of (n − 1) is called "HMI" (Horizontal Motion Index). Refer to Appendix B.* |
| ESC CR P (1BH, 0DH, 50H) | This code resets the printer in the same manner as the power-on. (Refer to Item 7 "Power On and Remote Reset" on page 10.) |
| FF (0CH) | A. Serial print mode<br>  Feeds the paper to the TOF SET position on the next page.<br>B. Line print mode<br>  Feeds the paper to the TOF SET position on the next page after printing the current line. |
| HT (09H) | Moves the carriage to a preset tab position on the right. |
| LF (0AH) | A. Serial print mode<br>  Feeds the paper by one line upward.<br>B. Line print mode<br>  Feeds the paper by one line upward after printing the current line.<br>  Data following LF code are printed bidirectionally. |
| SP (20H) | Spaces the carriage by one selected pitch in the present printing direction. |

**Notes:**
● *Serial print mode*
  1. *SP, BS, HT, and CR move the carriage only when they are followed by print data.*
  2. *Carriage does not space after printing a character unless it is followed by print data.*
● *Line print mode*
  *The received data is placed into a buffer and printed upon receipt of a CR, LF, or FF code.*

# 8. PARALLEL INTERFACE

## 8-1 Explanation of Signals and Specifications

| PIN NO. | SIGNAL | IN/OUT | DESCRIPTION |
|---|---|---|---|
| 1 | STROBE | IN | Used to strobe (clock) the read data into the printer. The pulse width must be greater than 0.5μs when received at the printer. This signal is normally "HIGH" and data is read into the printer when the signal goes "LOW". |
| 2 | Data Bit 1 | IN | Data bits 1 through 7 represent the 1st (MSB) to 7th (LSB) bits of the ASCII "word" (character or command) to be executed by the printer (positive logic). |
| 3 | Data Bit 2 | IN | |
| 4 | Data Bit 3 | IN | |
| 5 | Data Bit 4 | IN | |
| 6 | Data Bit 5 | IN | |
| 7 | Data Bit 6 | IN | |
| 8 | Data Bit 7 | IN | |
| 9 | Data Bit 8 | IN | This bit is ignored. |
| 10 | ACK | OUT | A pulse of approx. 10μs which, when "LOW", indicates that data has been received and that the printer is ready to accept more data. |
| 11 | BUSY | OUT | When this signal is "HIGH" it indicates that the printer cannot receive data. This signal will go into the "HIGH" state upon the following conditions:<br>a) While data is being accepted.<br>b) During a printing operation.<br>c) When the printer is taken "off line" mode.<br>d) When a fault condition, ribbon out, top cover open or paper out (when using optional form tractor) |
| 12 | ALERT | OUT | This line will go "HIGH" when:<br>a) ribbon is depleted.<br>b) the top cover is opened.<br>c) paper is depleted (when using optional form tractor). |
| 13 | SELECT | OUT | A "HIGH" signal indicates that the host computer has "selected" the printer to receive data. |
| 14 | | | Not used. |
| 15 | | | Not used. |
| 16 | ØV | | Logic ground |

| PIN NO. | SIGNAL | IN/OUT | DESCRIPTION |
|---|---|---|---|
| 17 | CHASSIS GROUND | | Ground |
| 18 | | | +5V (see note) |
| 19 thru. 30 | | | Twisted Pair Ground |
| 31 | PRIME | IN | This signal, also known as INIT, when "LOW" resets the printer to its initial "Power-on" state. This signal must be kept "HIGH" when the printer is in normal operation. The pulse width of this signal must always exceed 50$\mu$s at the printer input. |
| 32 | FAULT | OUT | This signal will go "LOW" if the ribbon is entangled with the daisy wheel or operation is attempted without a daisy wheel in place. |
| 33 | | | Not used. |
| 34 | | | Not used. |
| 35 | | | Not used. |
| 36 | | | Not used. |

**Note:**

● No more than 5 ml A may be drawn from pin 18.

Applicable connectors

Plug: (on cable side) Amphenol 57-30360 or equal

Receptacle: (on printer side)
Amphenol 57-40360 or equal

View on receptacle from connector cable side.
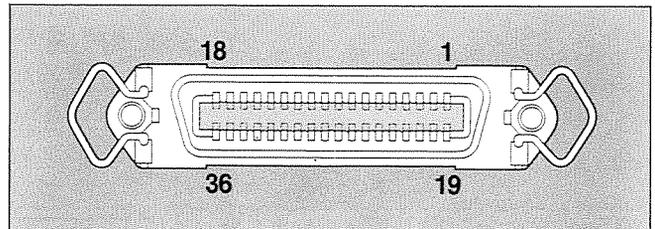
## 8-2 Input Output Circuits

DATA 1-8 ○——▷○—— 74LS04
+5V, 2.2kΩ, 30PF

STROBE ○——▷○—— 74LS32
+5V, 2.2kΩ, 1000PF

PRIME ○——▷○—— 7407
+5V, 2.2kΩ, 300PF

ACK ○——▷○—— 74LS32
+5V, 2.2kΩ

BUSY ○——▷— 74LS32
+5V, 2.2kΩ

ALERT FAULT SELECT ○——▷○—— 74LS04
+5V, 2.2kΩ

## 8-3 Timing Chart

DATA 1-8

500ns min. ←→ ←→ 500ns min.

STROBE

←→ 0.5μs min 500μ sec. max.
←→ 500ns max.

BUSY

ACK

←→ 10μs
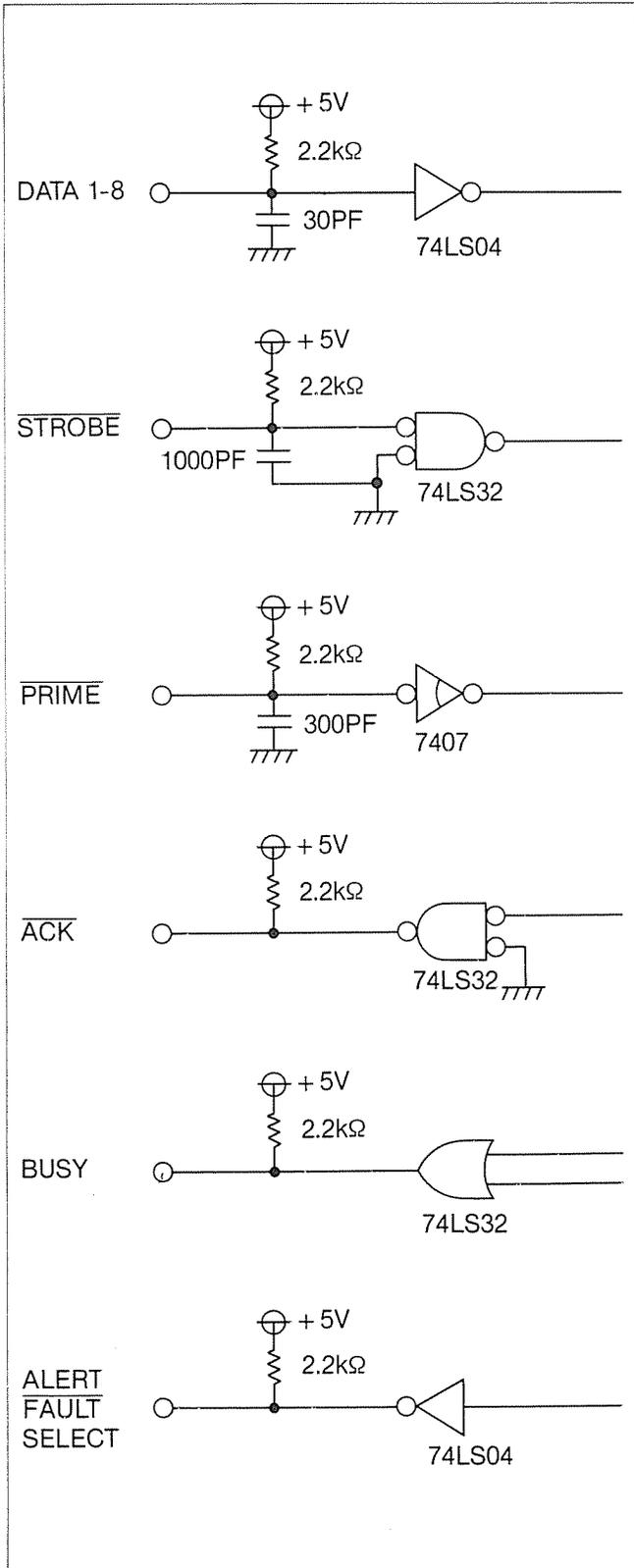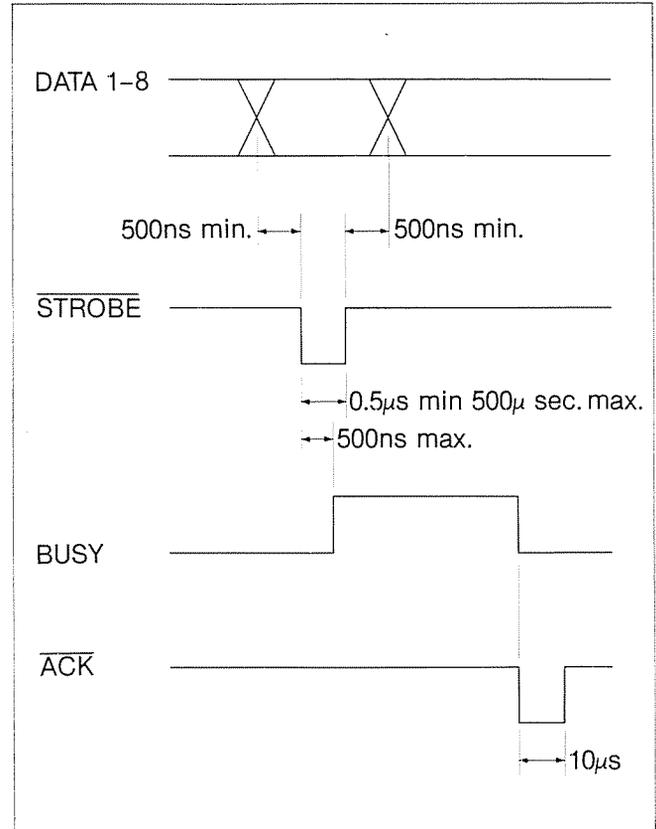
# 9. SPECIFICATIONS

| | |
|---|---|
| **Type:** | Daisy wheel impact printer |
| **Main body:** | Power supply, control board, printing mechanism, paper feed mechanism, carriage feed mechanism, control panel, operating levers and cover. |
| **Interface:** | Centronics compatible parallel interface |
| **Printing speed:** | 14 CPS (Shannon text with 12 pitch), 16 CPS in maximum |
| **Daisy wheel** | 96 characters |
| **Printing pitch:** | 10 ch./inch, 12 ch./inch, 15 ch./inch |
| **Carriage movement:** | 1/120 inch minimum |
| **Printing directions:** | Bidirectional the shortest distance |
| **Carriage return:** | 1200 ms/10 inches |
| **Printing width:** | 101 ch./10 pitch, 121 ch./12 pitch, 151 ch./15 pitch |
| **Copy capacity:** | 1 original + 3 copies |
| **Paper feed:** | Friction feed system |
| **Paper feed speed:** | 3.5 inch/second |
| **Line feed:** | Controllable to 1/48 inch minimum by means of host computer |
| **Ribbon:** | Multi-strike film ribbon (standard), One-time film ribbon, Fabric ribbon |
| **Control panel:** | Switches — ON LINE, LINE FEED, FORM FEED, TOF SET |
| | Lamps — POWER, ALERT, ON LINE |
| **Operating levers:** | Paper release lever, Paper bail lever |
| **Power rating** | 100, 115, 220, 240 VAC (50-60Hz) |
| **Power consumption:** | 100V system    70W max. |
| | 200V system    70W max. |
| **External dimensions:** | 445 (W) x 122 (H) x 315 (D) mm.   17.5 (W) x 4.8 (H) x 12.4 (D) inches |
| **Weight:** | 8.5kg.  (18.7 lbs.) |
| **Environment conditions:** | Operation | Temperature 10 to 40°C |
| | | Humidity 20 to 80% (No condensation) |
| | Stored | Temperature − 20 to 60°C |
| | | Humidity 5 to 90% (No condensation) |
| **Noise level:** | 65 dB or less (Scale A, 1 meter off) |
| **Reliability:** | MTBF 2,500 hours (25% duty) |
| **Option:** | Form Tractor |

# APPENDIX A  Sample BASIC Programs

The following sample BASIC programs provide examples of how the ESC codes are used.

1. Apple* II users: Replace LPRINT with PRINT.
   Add a PR#n (n = slot number of interface card)
   before the PRINT command, and PR # 0 at the end
   of the program.

   *Apple is a registered trademark of Apple
   Computer, Inc.

2. In some BASIC dialects HT is not output as the
   command for tabbing but as spacing. So if you in-
   put the sample programs (2) and (5) in those
   dialects, the printing will not be the same as shown.

## (1) Margin Setting

Codes: ESC CR P (Initial Remote Reset)
       ESC 9 (Set Left Margin)
       ESC ∅ (Set Right Margin)

```
10 LPRINT CHR$(27);CHR$(13);"P";
20 LPRINT "LEFT MARGIN:10 RIGHT MARGIN:40"
30 LPRINT "0";:LPRINT SPC(9);
40 LPRINT "10";:LPRINT SPC(8);
50 LPRINT "20";:LPRINT SPC(8);
60 LPRINT "30";:LPRINT SPC(8);
70 LPRINT "40";:LPRINT SPC(8);
80 LPRINT "50"
90 LPRINT SPC(10);
100 LPRINT CHR$(27);CHR$(57);
110 LPRINT SPC(30);
120 LPRINT CHR$(27);CHR$(48)
130 LPRINT "12345678901234567890123456789012345 67890"
140 LPRINT "12345678901234567890123456789012345 67890"
150 END
160 END
```

```
    LEFT  MARGIN:10  RIGHT  MARGIN:40
    0,            10            20            30            40            50

                  12345678901234567890123456789012345 67890
                  12345678901234567890123456789012345 67890
```

## (2) Tab Setting and Tab Clear

Codes: ESC CR P (Initial Remote Reset)
      ESC 1 (Set Horizontal Tab)
      ESC 8 (Clear Individual Tab Stop)

```
10  LPRINT CHR$(27);CHR$(13);"P";          110 LPRINT CHR$(9);"X";
20  FOR N=1 TO 6                           120 NEXT
30  LPRINT "0123456789";                   130 LPRINT
40  NEXT                                    140 LPRINT CHR$(9);CHR$(9);CHR$(27);"8";
50  LPRINT                                  150 LPRINT CHR$(9);CHR$(9);CHR$(27);"8";
60  FOR N=1 TO 5                            160 LPRINT
70  LPRINT SPC(10);:LPRINT CHR$(27);"1";    170 LPRINT CHR$(9);"X";
80  NEXT                                    180 LPRINT CHR$(9);"X";
90  LPRINT                                  190 LPRINT CHR$(9);"X";
100 FOR N=1 TO 5                            200 END
```

```
        01234567890123456789012345678901234567890123456789012345678901234567890123456789

            X              X             X             X              X

            X                            X                            X
```

## (3) Setting the Horizontal Spacing Pitch

Codes: ESC CR P (Initial Remote Reset)
      ESC US n (Horizontal Motion Index)

```
10  LPRINT CHR$(27);CHR$(13);"P"
20  FOR N=8 TO 15
30  LPRINT CHR$(27);CHR$(31);CHR$(N)
40  LPRINT "PRINT SAMPLE OF n=";N
50  NEXT
60  END
```

```
PRINT SAMPLE OF n= 8

PRINT SAMPLE OF n= 9

PRINT SAMPLE OF n= 10

PRINT SAMPLE OF n= 11

PRINT SAMPLE OF n= 12

PRINT SAMPLE OF n= 13

PRINT  SAMPLE  OF  n=  14

PRINT   SAMPLE   OF   n=   15
```

## (4) Setting the Line Feed Spacing Pitch

Codes: ESC CR P (Initial Remote Reset)
       ESC RS n (Vertical Motion Index)

```
10 LPRINT CHR$(27);CHR$(13);"P";
20 FOR N=2 TO 8
30 LPRINT CHR$(27);CHR$(30);CHR$(8)
40 LPRINT CHR$(27);CHR$(30);CHR$(N);
50 FOR K=1 TO 3
60 LPRINT "- PRINT SAMPLE OF n=";N
70 NEXT K
80 NEXT
90 END
```

```
≡ PRINT SAMPLE OF n≡ 2
≡ PRINT SAMPLE OF n≡ 3
≡ PRINT SAMPLE OF n≡ 4
≡ PRINT SAMPLE OF n≡ 4
≡ PRINT SAMPLE OF n= 5
≡ PRINT SAMPLE OF n= 5
- PRINT SAMPLE OF n= 6
- PRINT SAMPLE OF n= 6
- PRINT SAMPLE OF n= 6
- PRINT SAMPLE OF n= 7
- PRINT SAMPLE OF n= 7
- PRINT SAMPLE OF n= 7
- PRINT SAMPLE OF n= 8
- PRINT SAMPLE OF n= 8
- PRINT SAMPLE OF n= 8
```
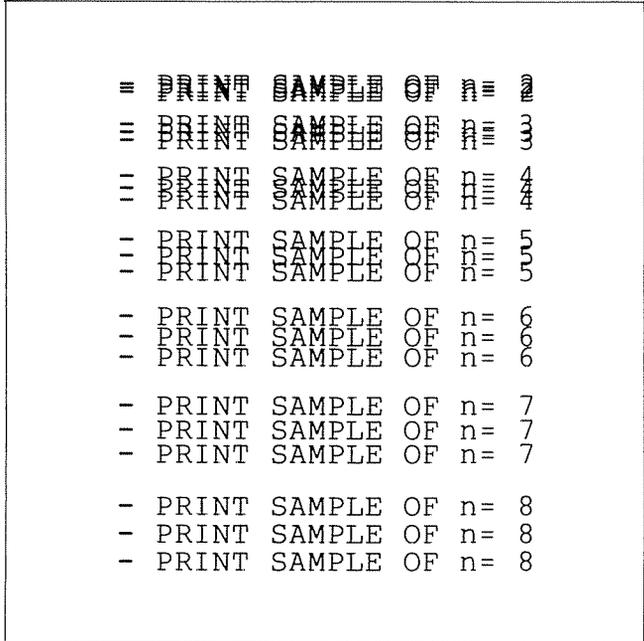
## (5) Absolute Tab

Codes: ESC CR P (Initial Remote Reset)
       ESC HT n (Absolute Horizontal Tab)
       ESC VT n (Absolute Vertical Tab)

```
10 LPRINT CHR$(27);CHR$(13);"P";
20 FOR N=1 TO 4
30 LPRINT "0123456789";
40 NEXT
50 LPRINT
60 FOR N=1 TO 8
70 LPRINT USING "#";N
80 NEXT
90 LPRINT CHR$(27);CHR$(9);CHR$(10);
100 LPRINT CHR$(27);CHR$(11);CHR$(5);"A";
110 LPRINT CHR$(27);CHR$(9);CHR$(20);
120 LPRINT CHR$(27);CHR$(11);CHR$(8);"B";
130 LPRINT CHR$(27);CHR$(9);CHR$(30);
140 LPRINT CHR$(27);CHR$(11);CHR$(5);"C";
150 LPRINT CHR$(27);CHR$(9);CHR$(30);
160 LPRINT CHR$(27);CHR$(11);CHR$(8);"D";
170 LPRINT CHR$(27);CHR$(9);CHR$(20);
180 LPRINT CHR$(27);CHR$(11);CHR$(5);"E";
190 LPRINT CHR$(27);CHR$(9);CHR$(10);
200 LPRINT CHR$(27);CHR$(11);CHR$(8);"F";
210 END
```

```
                  0123456789012345678901234567890123456789
                  1
                  2
                  3
                  4        A             E             C
                  5
                  6
                  7        F             B             D
                  8
```
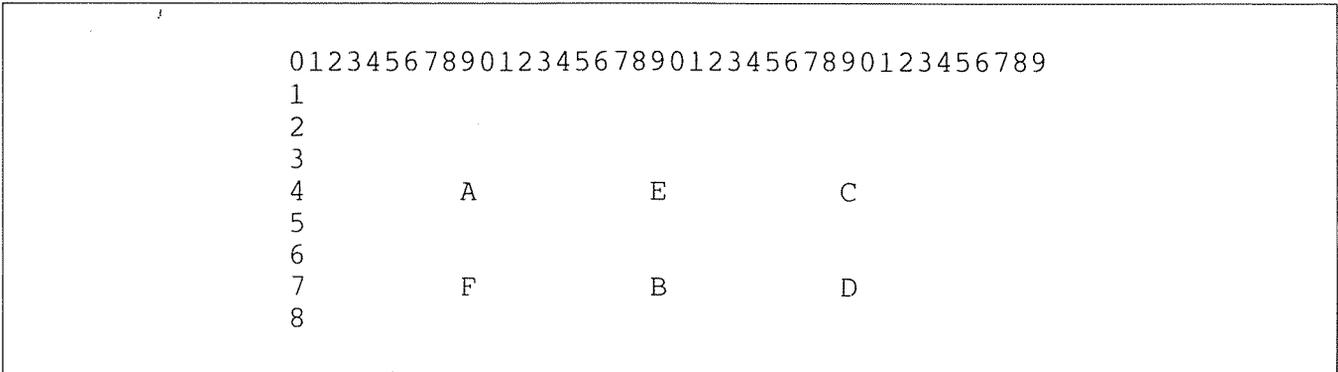
## (6) Underline

Codes: ESC CR P (Initial Remote Reset)

```
10 LPRINT CHR$(27);CHR$(13);"P"
20 LPRINT "SAMPLE OF ";
30 A$="UNDERLINE"
40 FOR N=1 TO LEN(A$)
50 LPRINT MID$(A$,N,1);
60 LPRINT CHR$(8);"_";
70 NEXT
80 END
```
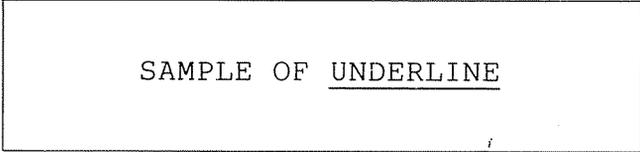
SAMPLE OF UNDERLINE

## (7) Boldface

Codes: ESC CR P (Initial Remote Reset)
       ESC US n (Horizontal Motion Index)

```
10 LPRINT CHR$(27);CHR$(13);"P"
20 LPRINT "SAMPLE OF ";
30 A$="BOLDFACE"
40 FOR N=1 TO LEN(A$)
50 LPRINT CHR$(27);CHR$(31);CHR$(2);
60 LPRINT MID$(A$,N,1);
70 LPRINT CHR$(27);CHR$(31);CHR$(12);
80 LPRINT MID$(A$,N,1);
90 NEXT
100 END
```
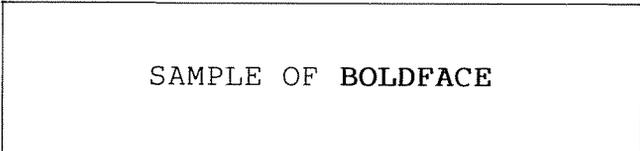
SAMPLE OF **BOLDFACE**

## (8) Graphics Mode

Codes: ESC CR P (Initial Remote Reset)
       ESC 3 (Graphics Mode On)

```
10 LPRINT CHR$(27);CHR$(13);"P";
20 WIDTH 255
30 LPRINT CHR$(27);"3";
40 FOR N=1 TO 50
50 LPRINT ".";" ";
60 NEXT
70 FOR N=1 TO 20
80 LPRINT ".";CHR$(10);
90 NEXT
100 FOR N=1 TO 40
110 LPRINT ".";CHR$(8);
120 NEXT
130 FOR N=1 TO 15
140 LPRINT ".";CHR$(27);CHR$(10);
150 NEXT
160 END
```
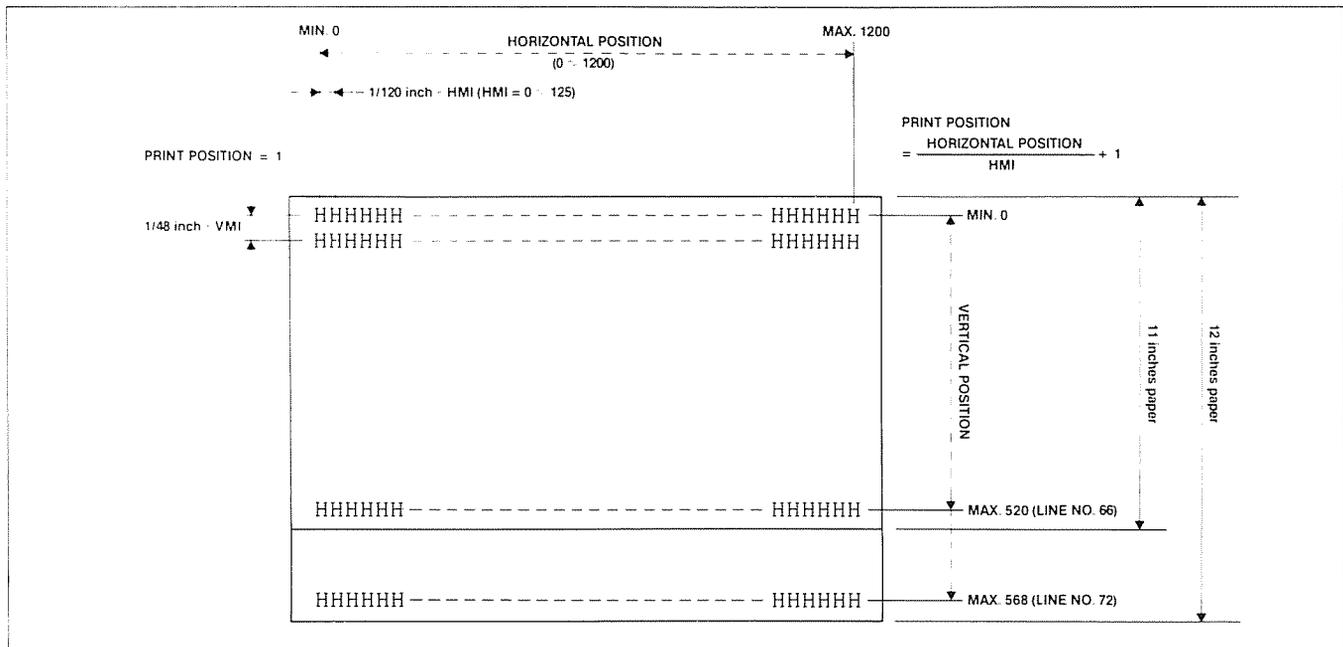
(1) Horizontal Motion Index (HMI)

Following the printing of a character or a space, the carriage moves by 1/120 inch $\times$ HMI. HMI represents Horizontal Motion Index and is variable from a minimum of 0 (no spacing) to a maximum of 125 (125/120=1.04 inch).

| PITCH SELECT SWITCH | HORIZONTAL SPACING | | |
|---|---|---|---|
| | Ch./inch | Max. ch. per line | HMI |
| 10 | 10 | 101 | 12 |
| 12 | 12 | 121 | 10 |
| 15 | 15 | 151 | 8 |

(2) Vertical Motion Index (VMI)

A line feed causes the paper to move by 1/48 inch $\times$ VMI. VMI represents Vertical Motion Index and is variable form a minimum of 0 to a maximum of 125.

(3) Horizontal Position

This is the value which represents the distance between the printhead and left final stop in 1/120 inch increments, ranging from a minimum of 0 to a maximum of 1200 (1/120 inch $\times$ 1200=10 inches).

(4) Vertical Position

This is the value which represents the distance between the current printing line and the designated first line in the corresponding page in 1/48 inch increments, ranging from a minimum of 0 to a maximum of 520 (11 inches paper).

(5) Print Position

The print position is indicated by the number calculated form the maximum left margin setting (the position the carriage goes upon power-on) to the present position of the carriage taking into consideration the pitch selected, according to the following formula:

$$\text{Print Position} = \frac{\text{Horizontal Position}}{\text{HMI}} + 1$$

The maximum left margin is always considered as position 1 and therefore the maximum print position in 10 pitch, (HMI=12) is:

$$(1200/12+1)=101$$

(6) Line Number

The line number is indicated by the number calculated from the first line of the page, to the present position of the carriage, taking into consideration the line feed spacing selected. The line number, there, can be calculated as follows:

$$\text{Line Number} = \frac{\text{Vertical Position}}{\text{VMI}} + 1$$

For example, when using the standard (the default value upon power-on) 6 lines per inch spacing (VMI=8) on 11 inches paper, the maximum number of lines would be:

$$(520/8+1)=66$$

# APPENDIX C Code Tables

**ASCII (642)**

| b8 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| b7 | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| b6 | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| b5 | | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| **b4 b3 b2 b1** | | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 0 0 0 0 | 0 | NUL 0/0 | DLE 10/16 | SP 20/32 | 0 30/48 | @ 40/64 | P 50/80 | ` 60/96 | p 70/112 |
| 0 0 0 1 | 1 | SOH 1/1 | DC1 11/17 | ! 21/33 | 1 31/49 | A 41/65 | Q 51/81 | a 61/97 | q 71/113 |
| 0 0 1 0 | 2 | STX 2/2 | DC2 12/18 | " 22/34 | 2 32/50 | B 42/66 | R 52/82 | b 62/98 | r 72/114 |
| 0 0 1 1 | 3 | ETX 3/3 | DC3 13/19 | # 23/35 | 3 33/51 | C 43/67 | S 53/83 | c 63/99 | s 73/115 |
| 0 1 0 0 | 4 | EOT 4/4 | DC4 14/20 | $ 24/36 | 4 34/52 | D 44/68 | T 54/84 | d 64/100 | t 74/116 |
| 0 1 0 1 | 5 | ENQ 5/5 | NAK 15/21 | % 25/37 | 5 35/53 | E 45/69 | U 55/85 | e 65/101 | u 75/117 |
| 0 1 1 0 | 6 | ACK 6/6 | SYN 16/22 | & 26/38 | 6 36/54 | F 46/70 | V 56/86 | f 66/102 | v 76/118 |
| 0 1 1 1 | 7 | BEL 7/7 | ETB 17/23 | ' 27/39 | 7 37/55 | G 47/71 | W 57/87 | g 67/103 | w 77/119 |
| 1 0 0 0 | 8 | BS 8/8 | CAN 18/24 | ( 28/40 | 8 38/56 | H 48/72 | X 58/88 | h 68/104 | x 78/120 |
| 1 0 0 1 | 9 | HT 9/9 | EM 19/25 | ) 29/41 | 9 39/57 | I 49/73 | Y 59/89 | i 69/105 | y 79/121 |
| 1 0 1 0 | A | LF A/10 | SUB 1A/26 | * 2A/42 | : 3A/58 | J 4A/74 | Z 5A/90 | j 6A/106 | z 7A/122 |
| 1 0 1 1 | B | VT B/11 | ESC 1B/27 | + 2B/43 | ; 3B/59 | K 4B/75 | [ 5B/91 | k 6B/107 | { 7B/123 |
| 1 1 0 0 | C | FF C/12 | FS 1C/28 | , 2C/44 | < 3C/60 | L 4C/76 | \ 5C/92 | l 6C/108 | \| 7C/124 |
| 1 1 0 1 | D | CR D/13 | GS 1D/29 | – 2D/45 | = 3D/61 | M 4D/77 | ] 5D/93 | m 6D/109 | } 7D/125 |
| 1 1 1 0 | E | SO E/14 | RS 1E/30 | . 2E/46 | > 3E/62 | N 4E/78 | ^ 5E/94 | n 6E/110 | ~ 7E/126 |
| 1 1 1 1 | F | SI F/15 | US 1F/31 | / 2F/47 | ? 3F/63 | O 4F/79 | _ 5F/95 | o 6F/111 | DEL 7F/127 |

ROM No. 642

ASCII Code → | ESC 1B/27 | ← Hex / ← Decimal

ESC Y = ¢
ESC Z = ⌐

23

# SELF-TEST PATTERN SAMPLE

```
¢!"#$%&'()*+,-./0  9:;<=>?@ABCD   RSTUVWXYZ[\]^_`abcd   rstuvwxyz{|}~¬
!"#$%&'()*+,-./01  :;<=>?@ABCDE    STUVWXYZ[\]^_~abcde   stuvwxyz{|}~¬¢
"#$%&'()*+,-./012  ;<=>?@ABCDEF    TUVWXYZ[\]^_~abcdef   tuvwxyz{|}~¬¢!
#$%&'()*+,-./0123  <=>?@ABCDEFG    UVWXYZ[\]^_~abcdefg   uvwxyz{|}~¬¢!"
$%&'()*+,-./01234  =>?@ABCDEFGH    VWXYZ[\]^_~abcdefgh   vwxyz{|}~¬¢!"#
```

# CARE AND MAINTENANCE

Please carefully follow the instructions below so that your printer will always perform with the optimum efficiency.

Daisy Wheel:
Be extremely careful not to bend the petal or scratch the typeface when handling.

Cleaning:
An operator should periodically wipe and dust the interior of the printer to remove paper dust or residue with a soft cloth using mild cleaning solvent. Absolutely do not use an organic solvent like thinner. Also clean the exterior of the printer periodically to keep its appearance.

Do not use the printer in an environment where electro-static or electro-magnetic fields exist.

Service:
It is recommended that the printer be periodically checked by an authorized service engineer only. A recommended period is once a year at least.

# IN CASE OF DIFFICULTY

Should difficulties be encountered, the following is a quick check list for possible causes;

The printer does not operate at all.

Make sure:
— the power cord is plugged in.
— the cable between host computer and the printer is properly connected.
— the ON LINE Switch is not in OFF LINE mode. (ON LINE Lamp is lit.)

Paper does not advance.

Make sure:
— the paper release lever is in closed position.
— the paper is not jammed in the back of the platen or at the paper bail rollers.

Ribbon does not feed.

Make sure:
— the ribbon is properly set.
— the ribbon is not entangled with the daisy wheel or not twisted.

# UNPACKING INSTRUCTIONS

①

Remove the top cover. Then remove the packing (A) on the cassette ribbon and pull out the paper (B) from the platen in the direction of the arrow.

Die Schutzhülle abnehmen. Dann die Verpackung (A) vom Kassettenband abnehmen und das Papier (B) in Pfeilrichtung von der Schreibrolle ziehen.

Déposer le couvercle supérieur. Puis enlever la garniture (A) sur le ruban à cassette et retirer le papier (B) du rouleau dans la direction de la flèche.

Desmonte la cubierta superior, quite la empaquetadura (A) de la caja de cinta y extraiga el papel (B) del rodillo, en dirección de la flecha.
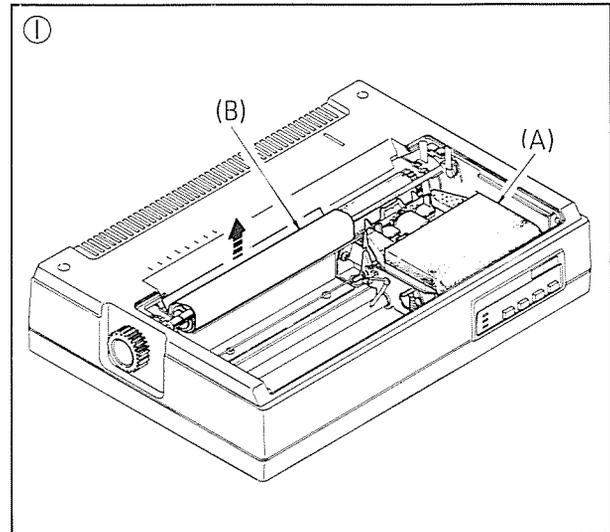
②

While drawing the cassette ribbon to the front, dismount the white packing (C) for transportation on the carriage upward.

Das Kassettenband nach vorne ziehen und dann die weiße Packung (C), die für den Transport auf dem Schlitten angebracht ist, abnehmen.

Tout en tirant tout d'abord le ruban de la cassette, demonter la garniture blanche (C) pour le transport sur le chariot.

Extraiga la cinta cassete y quite la empaquetadura blanca (C) provista sobre el carro para fines de transporte.
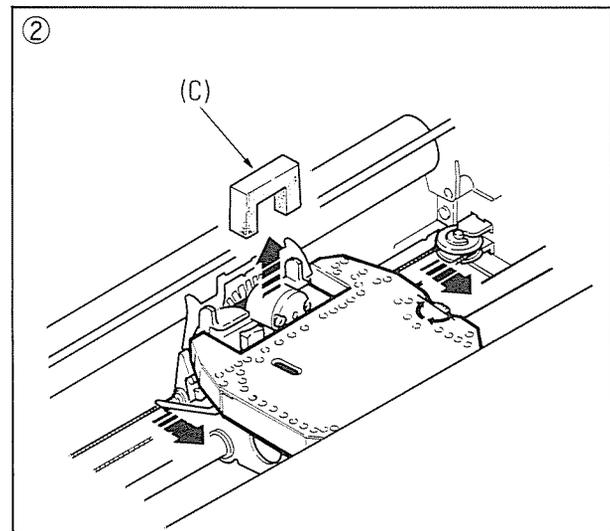
③

Remove the two screws (D) and collars (E) on the bottom cover fixing the carriage.

Die beiden Schrauben (D) am Boden herausschrauben und die Hülsen (E) abnehmen.

Déposer les deux vis (D) et les colliers (E) sur le couvercle inférieur fixant le chariot.

Quite los dos tornillos (D) y los collarines (E) de sujeción del carro alojados en la cubierta inferior.

H3752(A)
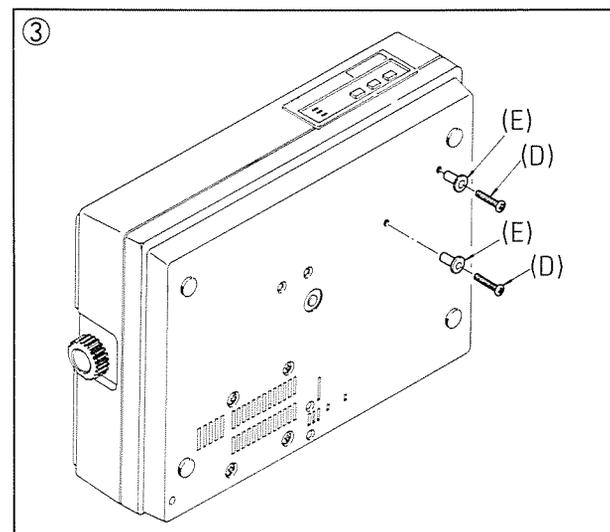
**cardco, inc.**

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