DOT MATRIX SERIAL IMPACT PRINTER

MODEL *C310P/R*

USERS MANUAL
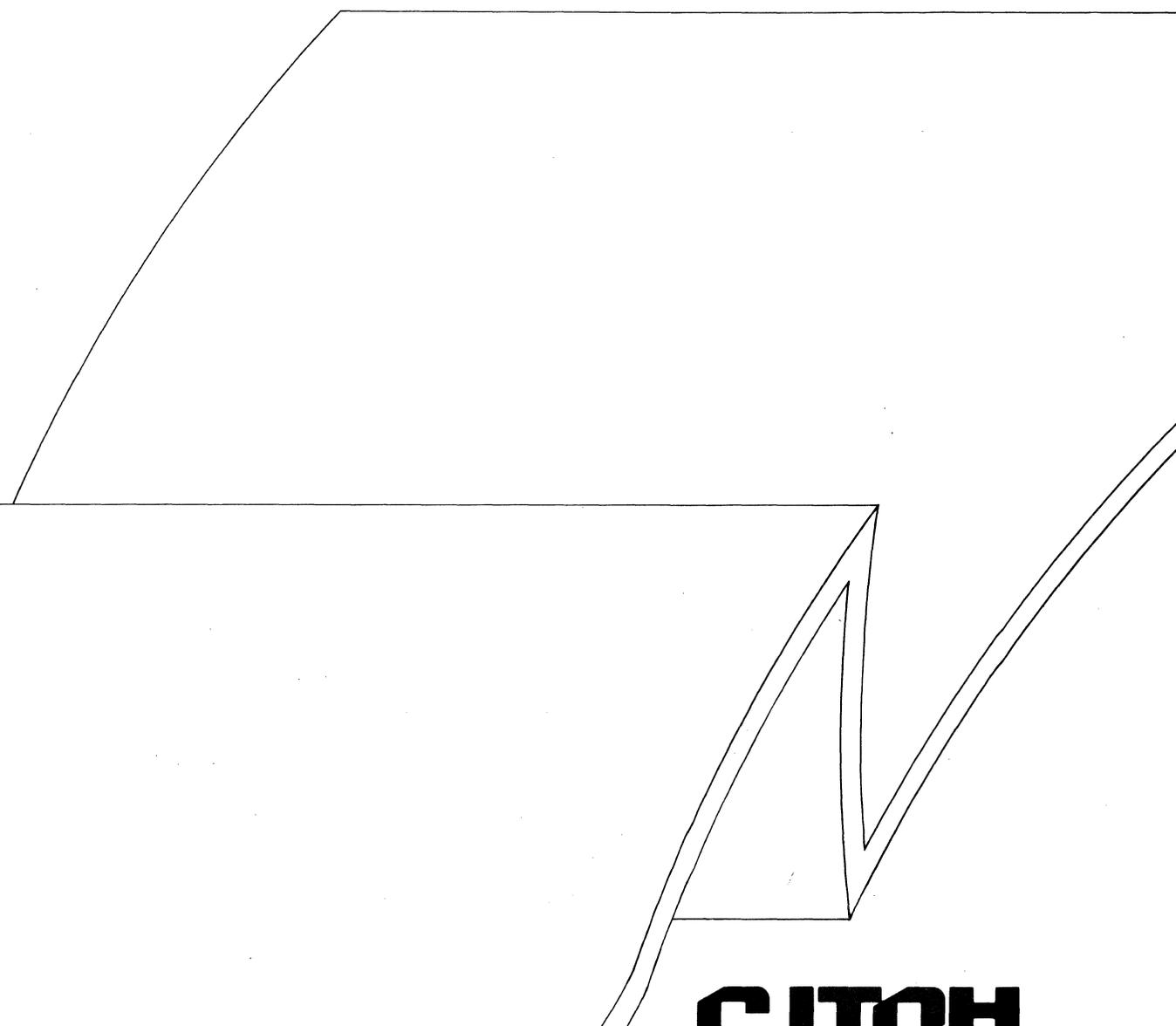
C.ITOH

Thank you for purchasing the model C310P/R.

"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 computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits

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 Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the US Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4."

Note:
Use of an unshielded interface cable will void FCC certification and may cause interference to radio and television reception in a residential environment. (US. VERSION ONLY)

Hersteller-Erklärung

zur

Einhaltung der Funk-Entstörung von Hochfrequenzgeräten
für nicht alleine sinnvoll betreibbare Anlagenkomponenten

Dieses Gerät entspricht als Einzelgerät den Funk-Entstöranforderungen der Postverfügung Nr. 1046/1984 bzw. der Grenzwertklasse B nach VDE 0871/6. 78.

Wird das Gerät innerhalb einer Anlage zusammen mit anderen Geräten betrieben, so muß bei Inanspruchnahme der "Allgemeinen (Betriebs-) genehmigung" nach der DBP-Verfügung Nr. 1046/1984 die gesamte Anlage der Grenzwertklasse B nach VDE 0871/6. 78 und den Auflagen nach § 2 der DBP-Verfügung Nr. 1046/1984 entsprechen.

Dies ist bei diesem einzeln geprüften Gerät meistens erfüllt, wenn es in einer Anlage (z.B. Computersystem) betrieben wird, die typgeprüft und für die ein VDE-Funkschutzzeichen mit dem Zusatz 0871-B erteilt worden ist.

Anmerkung:

Das VDE-Funkschutzzeichen bzw. die Hersteller-Erklärung soll dem in Funk-Entstörfragen sachunkundigen Betreiber gewährleisten, daß die technischen Voraussetzungen der Allgemeinen Genehmigung der Deutschen Bundespost erfüllt sind.

Nicht alleine sinnvoll betreibbare Anlagenkomponenten, z.B. periphere Geräte wie Drucker, Monitore, Datenspeicher — auch wenn sie in einer bestimmungsgemäßen Anlage geprüft wurden und mit einem Funkschutzzeichen mit dem Zusatz 0871-B/P gekennzeichnet sind — gewährleisten nicht immer, daß bei beliebiger, eventuell unsachgemäßer Zusammenschaltung einzelner geprüfter und gekennzeichneter Komponenten auch die gesamte Anlage in Ordnung ist.

C. Itoh Electronics, Japan
Februar 1986

**"All of the features and specifications are
subject to change without prior notice"**

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CHAPTER 1
OVERVIEW

The Model C310 is a compact, table-top dot matrix serial impact printer equipped with a 9-wire print head. It is used as a data communication terminal for producing hard copy for CRT displays, and as a peripheral terminal for minicomputers and small business computers. Each character is composed of a 9 (H) $\times$ 9 (V), 17 (H) $\times$ 17 (V) or 27 (H) $\times$ 17 (V) dot matrix. The printing speed is Max. 300 characters per second in data processing mode.

1.1 Features of Model C310

The printer provides a very large selection of features.

a. **High-speed Printing**
   A high print speed of Max. 300 CPS is available in DP (Data Processing) mode.

b. **High-quality Print**
   High-quality print is produced in LQ (Letter Quality) mode.

c. **Non-volatile setup Mode**
   Most Modes of operation are selectable by using the user friendly setup menu.

d. **Paper Feed Features**
   Push or pull paper feed can be provided by using the built-in tractors. Paper can be fed by means of a bottom feed also.

e. **Auto Loading Feature**
   Auto loading allows easy paper insertion and automatic placement of the paper at the initial printing position for cut sheet paper in friction feed, and for fan-fold paper in push tractor position.

f. **Proportional Printing**
   Proportional Printing mode allows fine printing.

g. **Auto Sheet Feeder (Optional)**
   Installation of an optional auto sheet feeder permits automatic feed of cut sheet paper.

h. **CG Cassettes (Optional)**
   Installation of optional CG (Character Generator) cassettes provides user selection of additional character fonts.

i. **Color Print Capability (Color Printer only)**
   When the optional four-color ribbon is installed, printing can be performed in seven different colors.

1.2 Preparation Prior to Operation

1.2.1 Names of Printer Parts

Paper cover

Print cover (B)

Friction release lever

Print cover

Power switch

Bottom cover

Platen knob

Operation panel

Fig. 1-1

Fuse

Power connector

Auto loading lever

Back cover

CG cassette socket

Interface connector
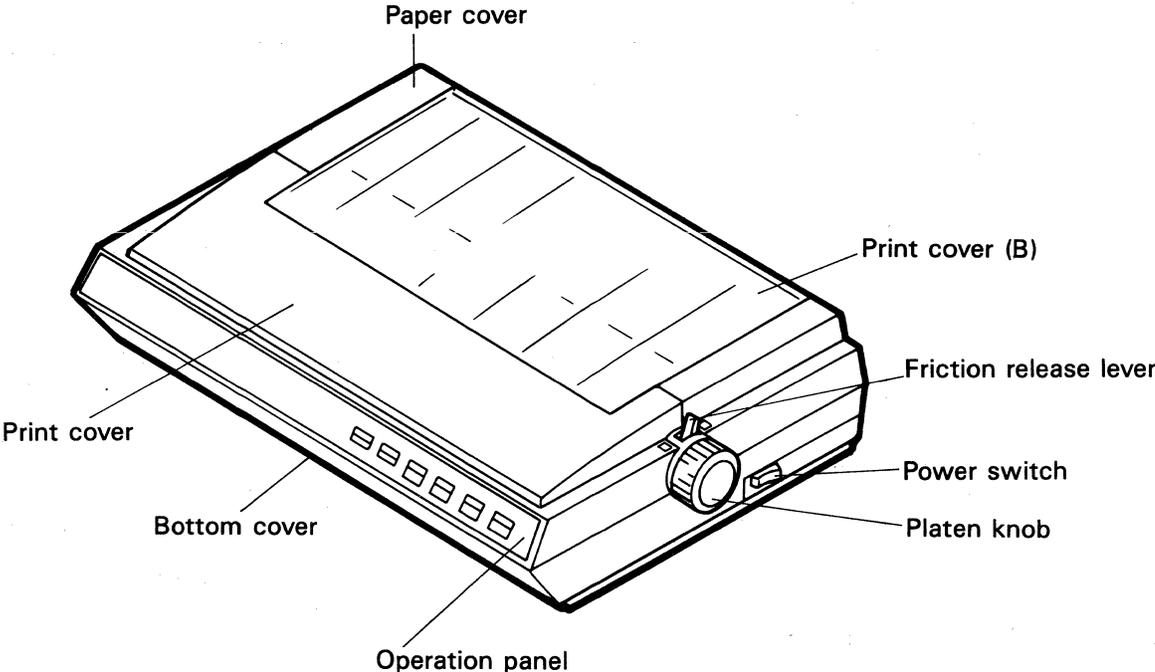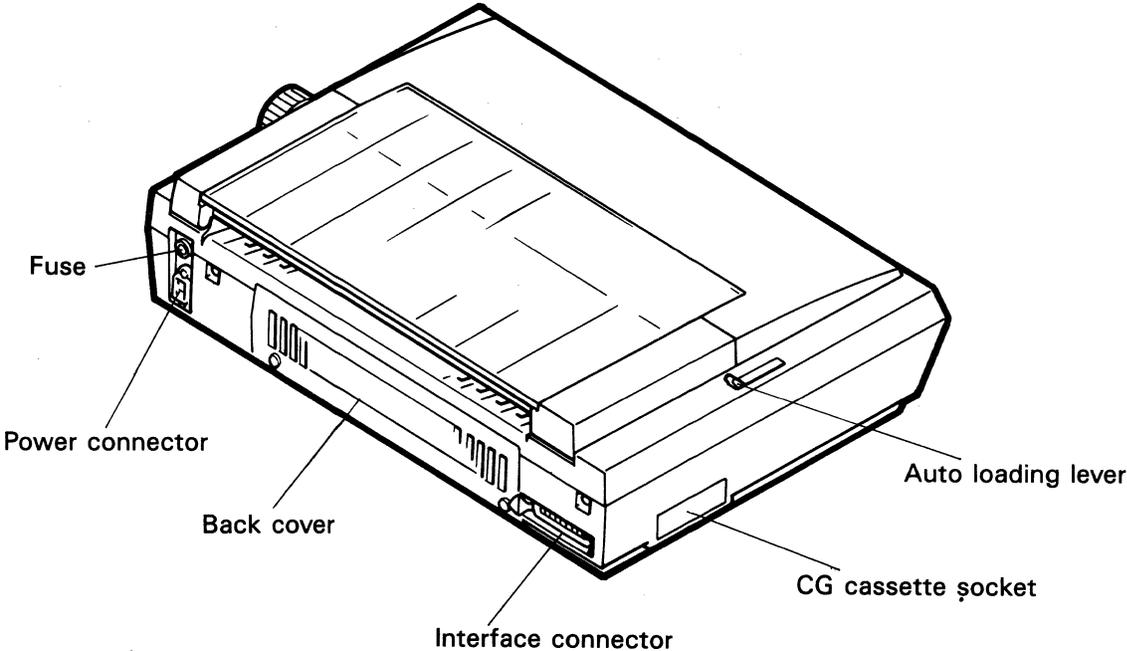
Fig. 1-2

1.2.2 Printer location

a. The Dot Matrix Printer is designed to be placed on an ordinary table. However, it should be level to avoid an excessive load on the carriage movement.

b. The printer should not be used in a location with excessively high or low temperatures or high humidity. (Refer to the environmental requirements in Section 1.3 "Basic Specifications.")

c. Do not place the printer in a location where it will be subject to strong shock or vibration.

d. Avoid using the printer in a dusty or oily location.

e. Avoid using the unit in a location with direct sunlight.

f. Avoid getting the printer wet.

1.2.3 Accessories

Ribbon Cassette
Power Cord
User's Manual

1.3 Basic Specifications

1.3.1	Product Name	Dot Matrix Serial Impact Printer
1.3.2	Print Method	Logic Seek Printing
1.3.3	Print Speed	Max. 300 CPS (DP : Data Processing Mode)
		50 CPS (NLQ : Near Letter Quality Mode)
		33 CPS (LQ : Letter Quality Mode)
1.3.4	Line Feed Speed	3.2 IPS
1.3.5	Character Format	

MODE	HORIZONTAL	VERTICAL
Data Processing	9	9
NLQ	17	17
Letter Quality	27	17

1.3.6   Character Pitch

Char./In.	Char./Line	Character Pitch
9	72	Elongated
10	80	Pica
12	96	Elite
13.4	107	Condensed 3
15	120	Condensed 2
17	136	Condensed 1
18	144	Condensed 0
*	*	Proportional

* : Varies according to the characters.

1.3.7   Graphics

Horizontal (DPI)	Vertical (DPI)	Dot Matrix (Horizontal)
60	72	Full
72	72	Full
80	72	Full
96	72	Full
107	72	Full
120	72	Full
136	72	Full
144	72	Full
160	72	Full
240	72	Full

1.3.8	Type of Character	Double Width
		Emphasized
		Underline
		Super/Subscript
		Italic

1.3.9   Paper Feed Direction   Forward
                                      Reverse (When Friction or Push Pin Feed is used)

1.3.10 Line Spacing   1/6″, 1/8″, or N/144″

1.3.11 Paper Feed Method   Friction Feed
                                      Pin Feed (Push or Pull)
                                      Automatic Sheet Feeder (Option)

1.3.12 Form
        a. Form Width   107.9 to 279.4 mm (4.25″ to 11″)
        b. Form Thickness   0.05 to 0.28 mm (0.002″ to 0.011″)
        c. Copy Capability   Original + 3
                                      (The total paper thickness should be within the range in
                                      item 1.3.12.b, above.)
        d. Type of Form   Fan-folded Sprocket Paper
                                      Single Sheet Paper (Cut Form)

1.3.13 Inked Ribbon

Type	Cassette (CLABK-12802)	Cassette (CQABK-12901)
Color	Black	4 Color
Dimensions	13 (W) × 13,000 mm (L) 0.51″ (W) × 511.81″ (L)	21.6 (W) × 13,000 mm (L) 0.85″ (W) × 511.81″ (L)
Life	2 Million Characters	1 Million Characters

1.3.14 Life of Head   100 Million Characters

1.3.15 Life of Printer   5 Million Lines

1.3.16 Interface   8 Bit Parallel (Centronics Compatible), Serial (RS-232C)

1.3.17 Power Requirements   100 V ± 10%, 115 V ± 10%, 220 V ± 10%, 240 V ± 10%

1.3.18 Environmental Requirements
        Operating Temperature &
        Humidity   10°C ~ 40°C (50°F ~ 104°F) (10% ~ 85% RH)
        Storing Temperature & Humidity   −25°C ~ +60°C (−13°F ~ +140°F) (10% ~ 90% RH)

1.3.19 Power Consumption
        Operating   120 W
        Standby   15 W

1.3.20 Weight   9.5 kg (25.3 lb)

1.3.21 Dimensions   442 (W) × 346 (D) × 128 (H) mm (17.4″ × 13.6″ × 5.0″)

CHAPTER 2
OPERATION

2.1 Power Switch and Power Cord

2.1.1 Power Switch

The power switch is located on the right side of the printer, near the rear, as shown in Fig. 2-1. Pushing the front "|" side of the switch will turn on the printer, and pushing the rear "○" side of the switch will turn off the printer. The printer on-off state is indicated by the power indicator on the operation panel (see Fig. 2-3).

Platen knob
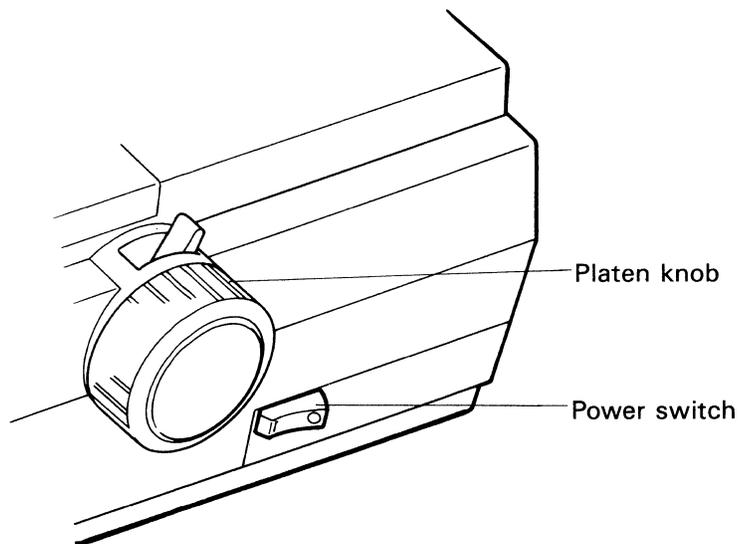
Power switch

Fig. 2-1

2.1.2 Power Cord

Attach the power cord to the inlet at the back of the printer as shown in Fig. 2-2. Before connecting the power cord to the outlet, be sure that the power switch is off.

NOTE: Remove all shipping restraints before appling power. Permanent damage can occur!

Power inlet

Power cord
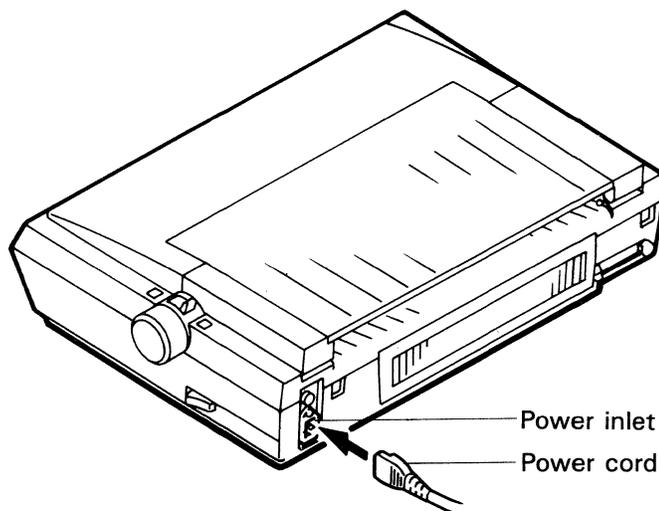
Fig. 2-2

2.2 Operation Panel

This printer has an operation panel, at the front right-hand side of the top cover, as shown in the figure below. There are four push switches, three green LED indicator lamps, and one red LED indicator lamp.
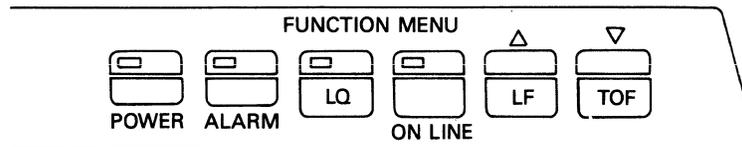
Fig. 2-3

2.2.1 Operation Switches (In Normal Printer Mode)

a. **LQ Switch**
   Pressing this switch will toggle the DP (Data Processing) mode and the NLQ (Near Letter Quality) or LQ (Letter Quality) mode. But be sure to perform the LQ switching while no printing is taking place.

b. **ON LINE Switch**
   By pressing this switch, the printer can be placed on-line or off-line.

c. **LF Switch**
   When this switch is pressed in an off-line state, one-line feed takes place. When the switch is kept pressed, four line feeds take place and then the paper is fed continuously.

d. **TOF Switch**
   When this switch is pressed in an off-line state, the paper is automatically fed to the TOF position set in the VFU (Vertical Format Unit).

2.2.2 Indicator Lamps

a. POWER Lamp
When the printer power is turned on, this lamp lights. The lamp remains lit until the power is turned off.

b. ALARM Lamp
When an abnormal condition such as Cover Open and PE (Paper Empty) occurs in the printer, this lamp lights or blinks. The lamp goes out when the abnormal condition is cleared.

c. LQ Lamp
This lamp lights when the LQ (Letter Quality) or NLQ (Near Letter Quality) mode is selected. The lamp is off while the DP mode is selected.

d. ON LINE Lamp
This lamp lights when the printer is ready to receive data (on-line). The lamp is off when the printer is not ready to receive data (off-line).

2.3 Alarm Switch

Cover Open Switch

- This is an interlock switch which indicates that the print cover is open (Cover Open).

- When the cover is opened during printing, the printer automatically stops after printing one line and then is deselected. When no printing is taking place, the printer is immediately deselected.

- To resume the printer operation, close the cover and press the ON LINE switch to place the printer on-line.

Paper Empty Switch

- This switch indicates that the paper end is near or no paper is inserted.

- The switch is installed behind the platen. When it detects the absence of paper (PE: Paper Empty), the ALARM lamp comes on. The printer continues printing to a position of about one inch from the paper end and then is placed off-line to stop printing. To continue printing, press the ON LINE switch so that the printer prints one line and stops again.

- If a PE state is detected when the power is turned on or an INPUT PRIME signal is received, the printer will immediately be placed off-line.

2.4 How to Mount and Remove the Ribbon Cassette

The ribbon cassette should be mounted on the printer in the following manner.

① Check that the printer power is off.

② Remove the print cover. Move the carrier to the left.

③ Turn the cassette drive knob of the ribbon cassette clockwise to take up the slack.

④ Place the rear of the ribbon cassette below the cover, and insert the ribbon cassette between the ribbon guide plate and the ribbon guide. Align the left and right notches of the cassette with the cassette supporters and push the cassette against the ribbon deck until a click is heard.
   • If the cassette is lifted, push down the cassette while turning the cassette drive knob clockwise.

⑤ After the ribbon cassette is mounted, turn the cassette drive knob clockwise and check that the cassette is properly engaged with the ribbon drive gear.
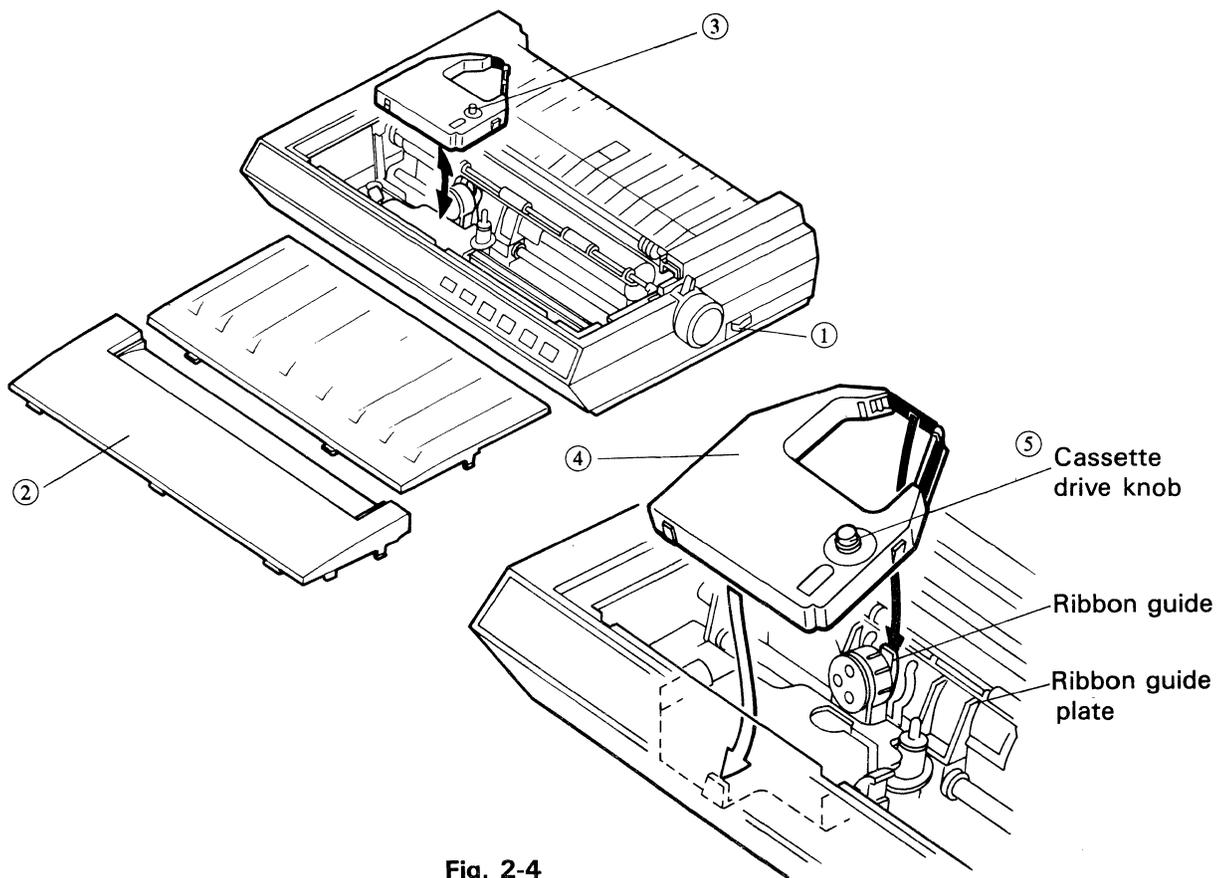
Fig. 2-4

To remove the ribbon cassette, pull upon the cassette while pushing the cassette holding clasps away from the cassette.
In order to perform color printing, the color-ribbon must be installed (color printer only).

2.5 Adjustment of Gap Between Print Head and Platen

The gap between the print head and the platen can be adjusted for four positions by means of the gap adjust lever.

1) Moving the gap adjust lever towards the rear of the printer will decrease the gap between the print head and the platen. The lever should usually be set at the rear most position when single sheet paper is used.

2) For multiple copies, move the gap adjust lever and adjust it for the desired paper thickness.

Head   Platen

Platen knob

Gap adjusting lever
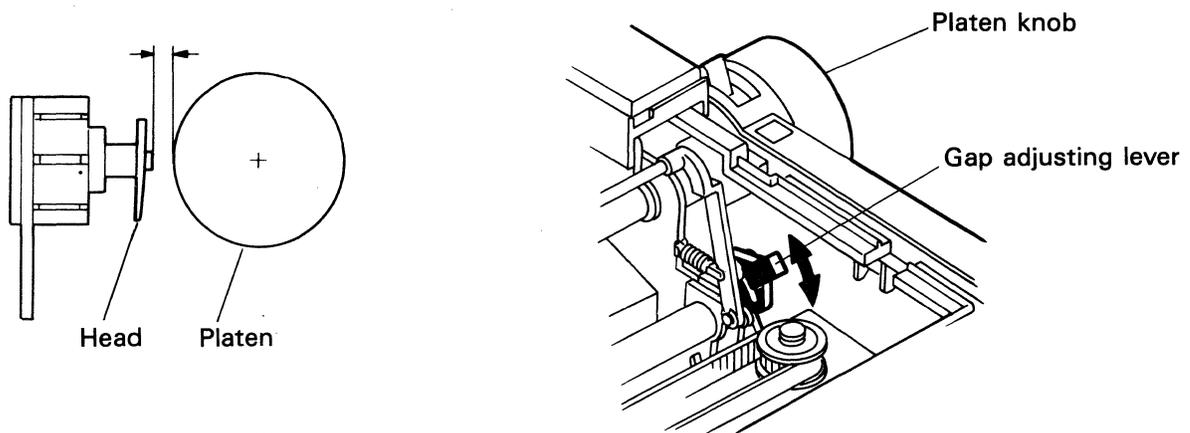
Fig. 2-5

2.6 How to Insert Paper

This printer can provide four kinds of paper handling. You can select the most convenient one among them. For details, see the sections that are referred to in each example.

Paper settings are:

① Friction Feed. (Section 2.6.1)
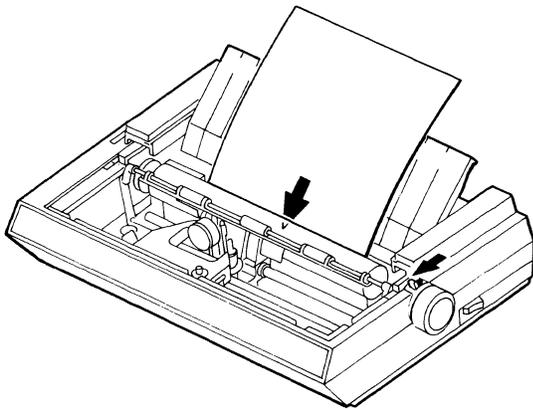
② Push tractor,　(Section 2.6.2)
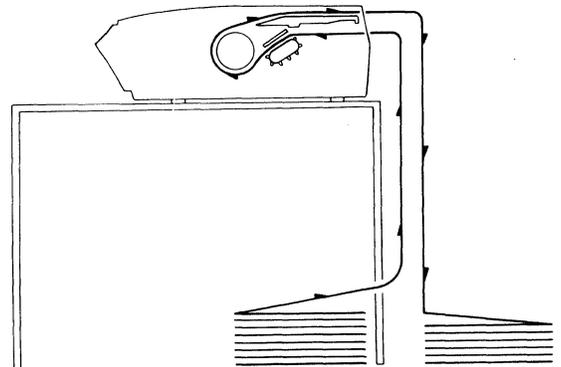
③ Pull tractor,　(Section 2.6.3)
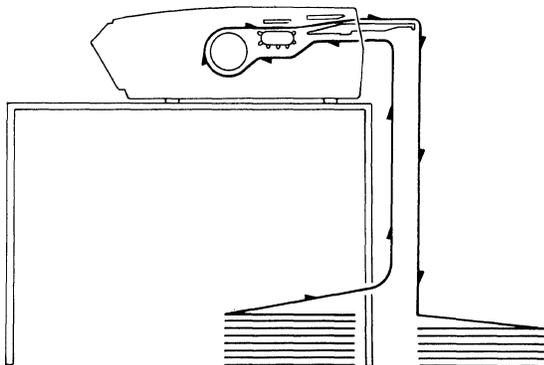
④ Bottom feed, (Section 2.6.4)
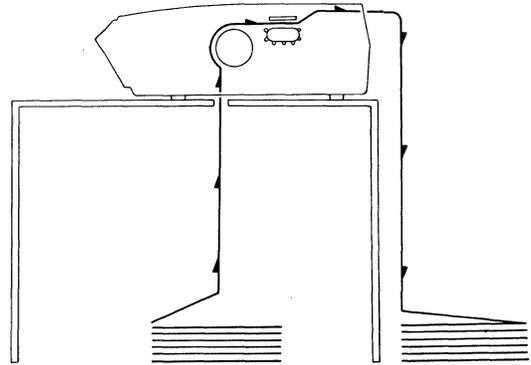
Fig. 2-6

2.6.1 Friction Feed (Using Single Sheet Paper)

2.6.1.1 Remove the print cover and the print cover (B), and open the paper cover rearward by rotating it. (Fig. 2-7)
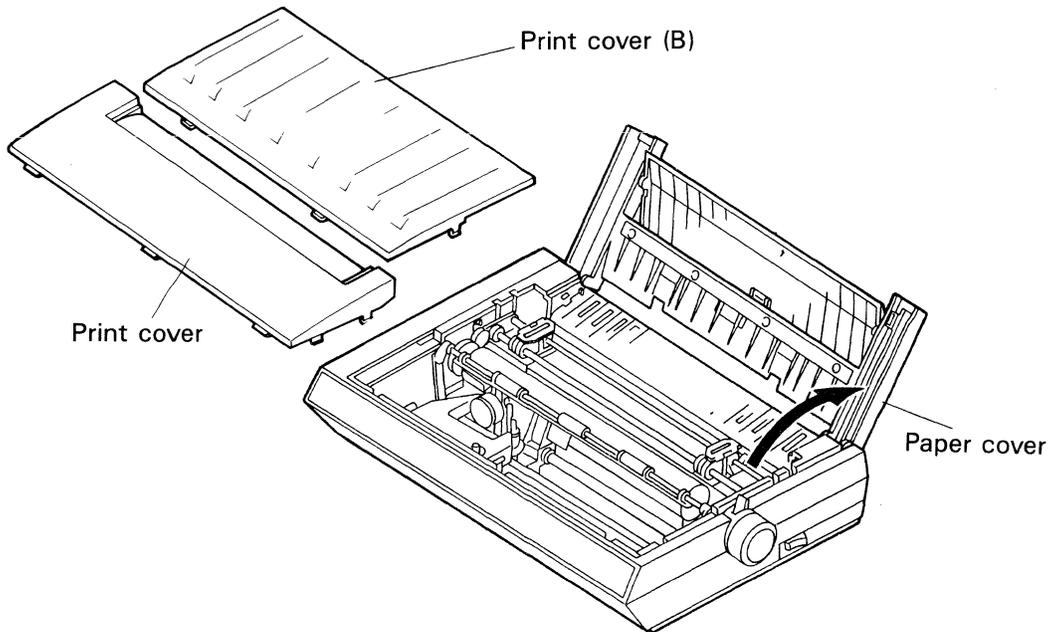
Fig. 2-7

Pull the left and right tractor unit lock levers toward you to release the tractor unit; then push down the tractor unit.

NOTE: If you have trouble pushing down the center of the tractor unit, please push down its left side.
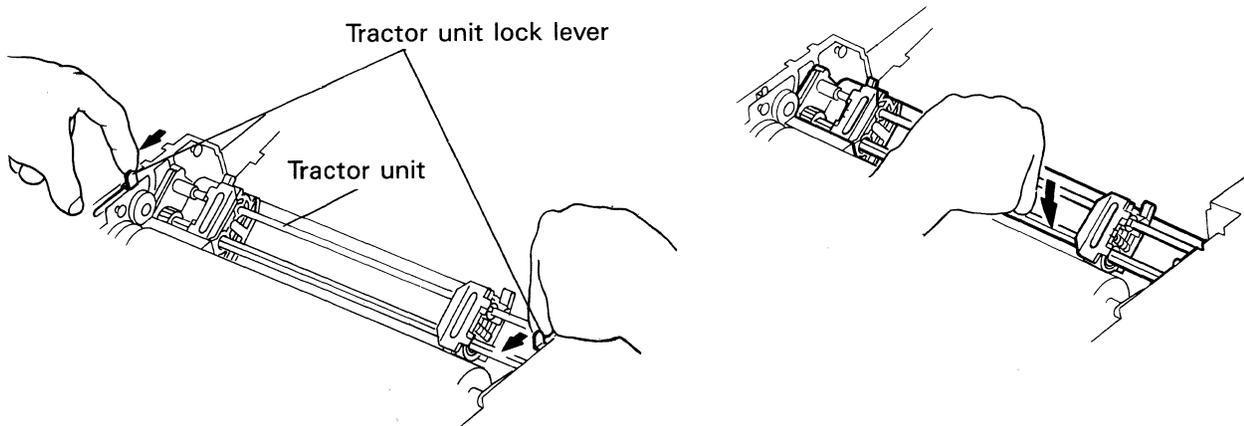
Fig. 2-8

2.6.1.2 Close the paper cover on the printer and raise the paper guide cover by rotating it 40 degrees forward ; then close the print cover.

Print cover

Paper guide cover

Paper cover
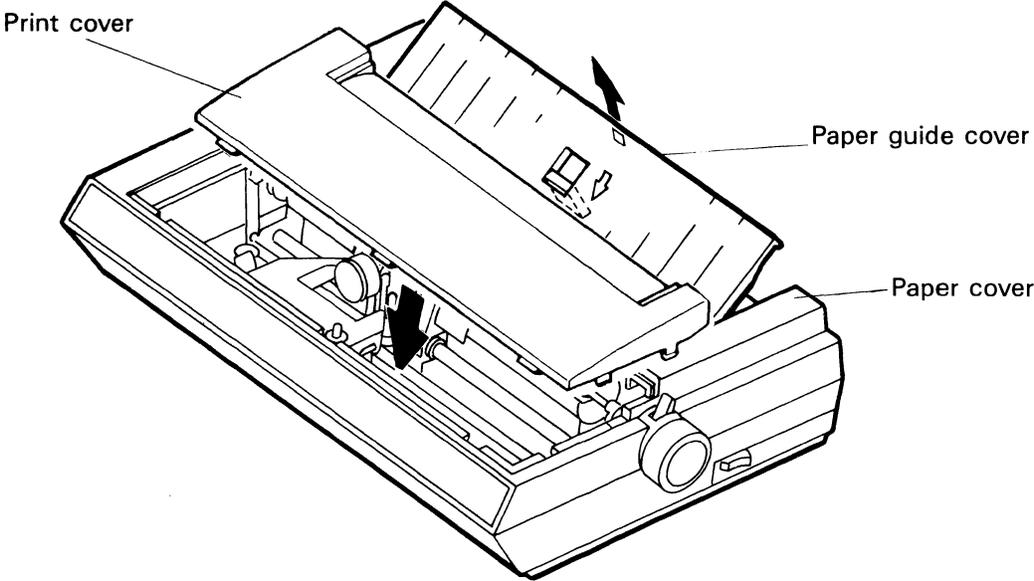
Fig. 2-9

2.6.1.3 Pull up the paper stand located at the rear of the paper guide cover. Insert the paper straight along the paper guide cover with the friction release lever set to the friction feed position.

Paper

Paper stand

Friction release lever
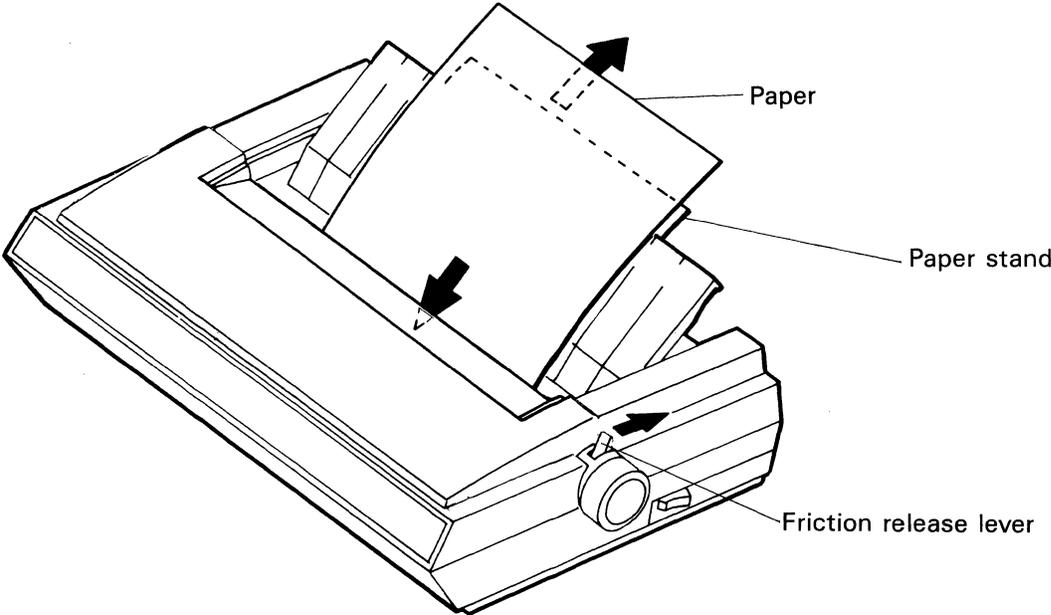
Fig. 2-10

2.6.1.4 Turn the power on. Then pull the auto loading lever all the way forward to engage the auto loading switch until the paper appears in front of the platen; then release the lever. (The paper will automatically be fed.)

Auto loading lever

Paper

Paper stand

Platen

Friction release lever

Power switch

ON
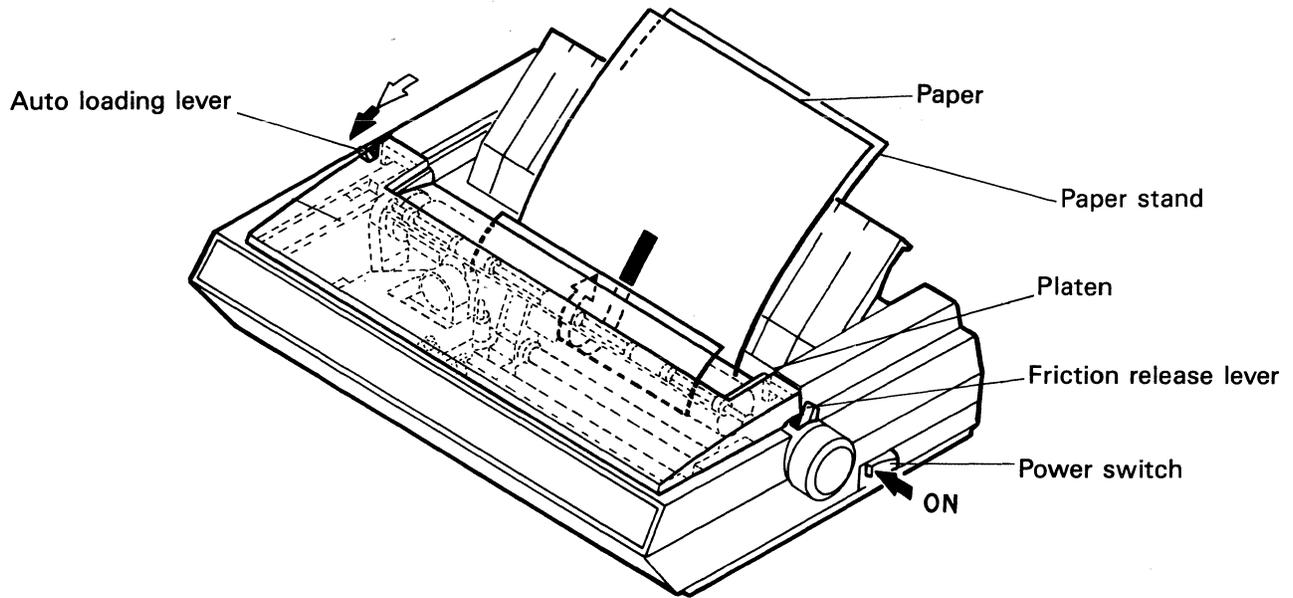
Fig. 2-11

2.6.2 Push Tractor Operation

2.6.2.1   Remove the print cover and print cover (B), and open the paper cover.
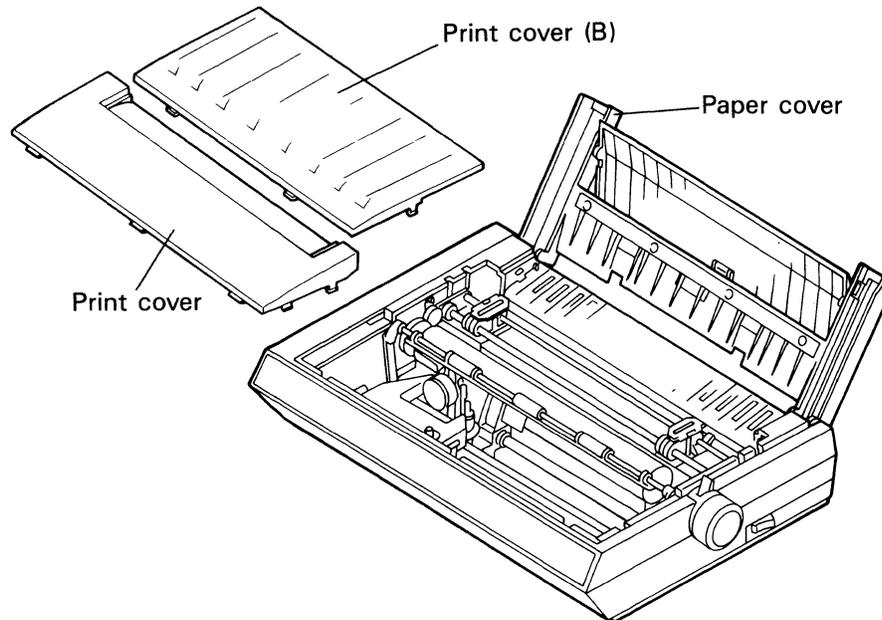
Fig. 2-12

Pull the left and right tractor unit lock levers toward you to release the tractor unit; then push down the tractor unit.

NOTE: If you have trouble pushing down the center of the tractor unit, please push down its left side.
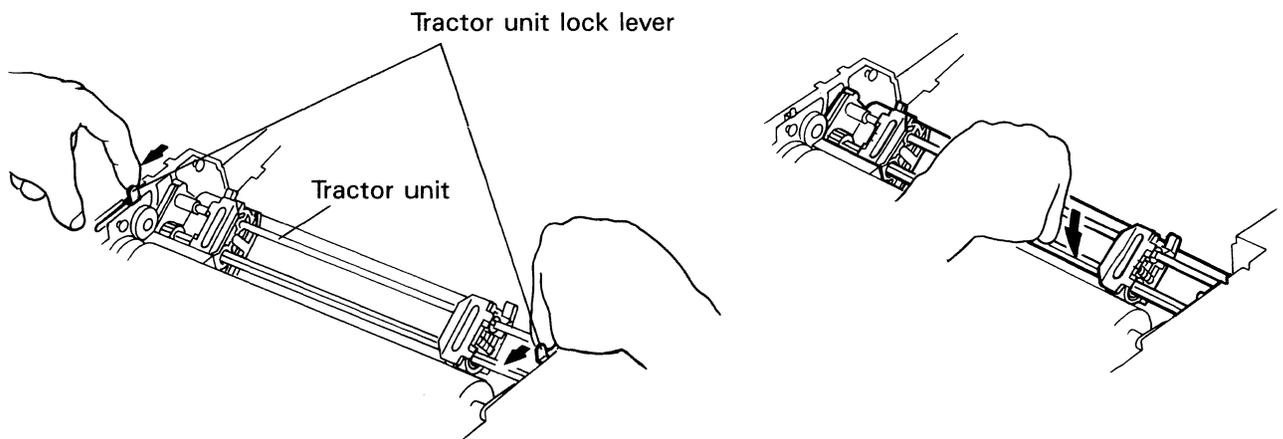
Fig. 2-13

2.6.2.2   Insert the paper below the paper cover of the printer and move the friction release lever to the pin feed position and adjust the right and left sprocket tractor positions for proper paper width.

Pull the tractor set lever of the left tractor toward you. Move the tractor to the left edge of the paper. Then push the tractor set lever back to lock the tractor.
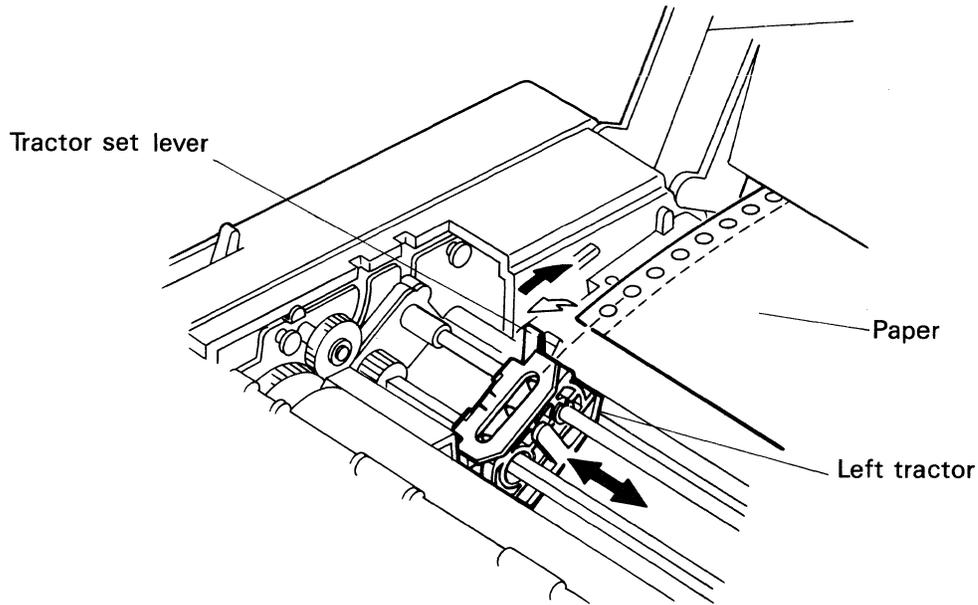
Fig. 2-14

Open the paper holder. Align the left-hand side holes of the paper with the tractor pins. Then close the paper holder.
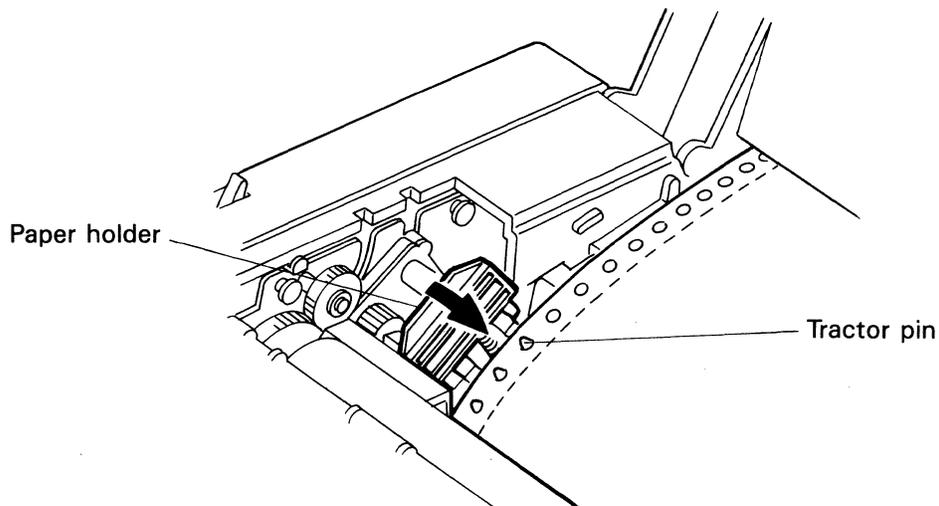
Fig. 2-15

Pull the tractor set lever of the right tractor toward you and open the paper holder.

Align the right-hand side holes of the paper with the tractor pins, and close the paper holder.
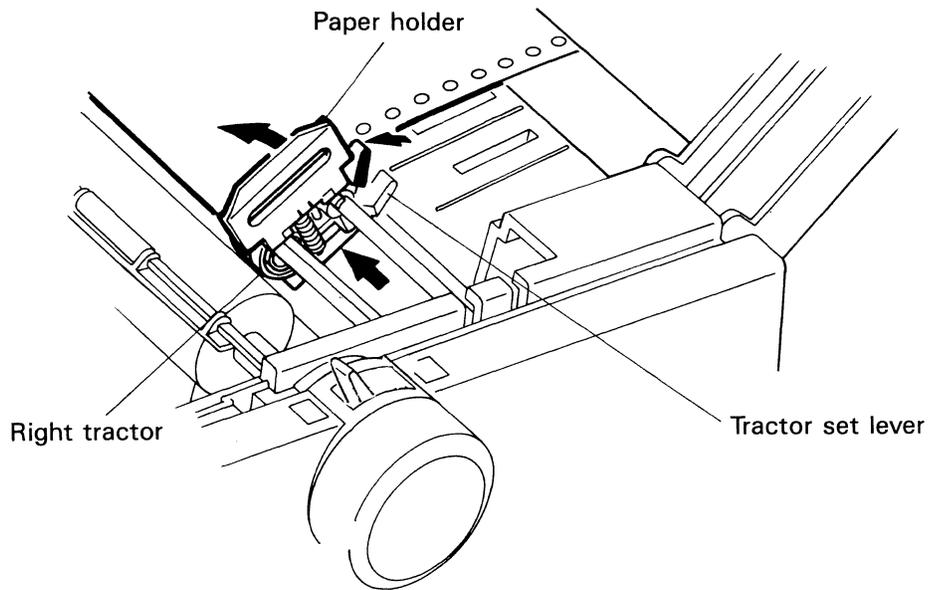
Fig. 2-16

Move the right tractor until the horizontal paper slack is eliminated. Push the tractor set lever to the back to lock the tractor.
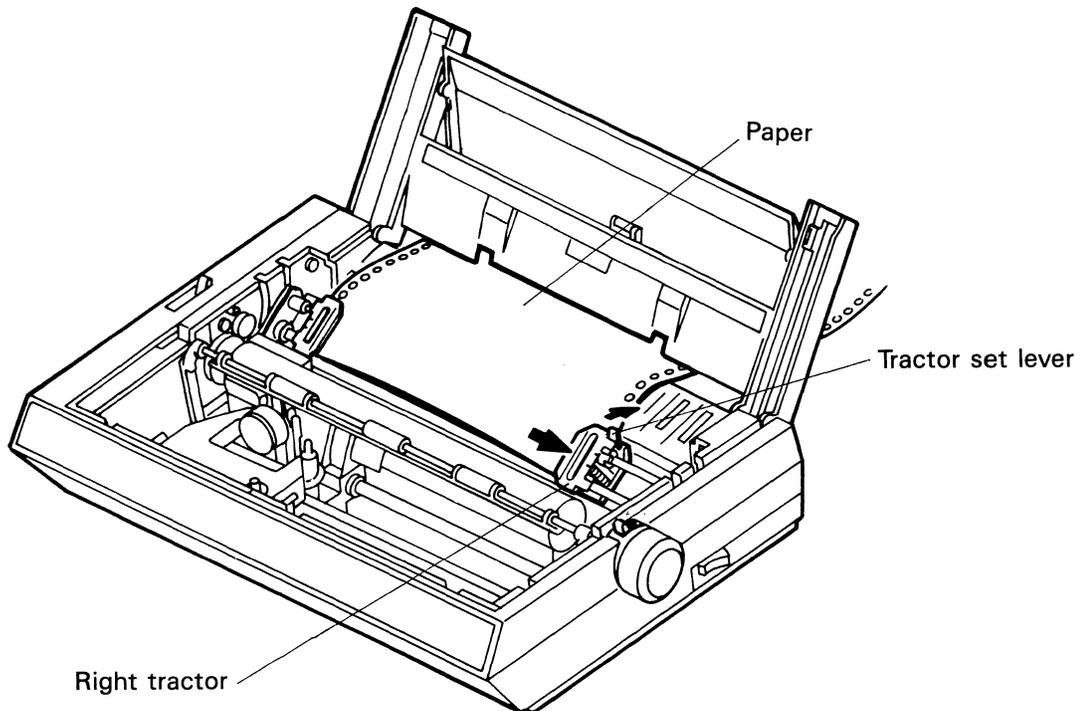
Fig. 2-17

2.6.2.3 Move the carrier to the center, and turn the platen clockwise as indicated by the arrow in Fig. 2-18 to feed the paper.
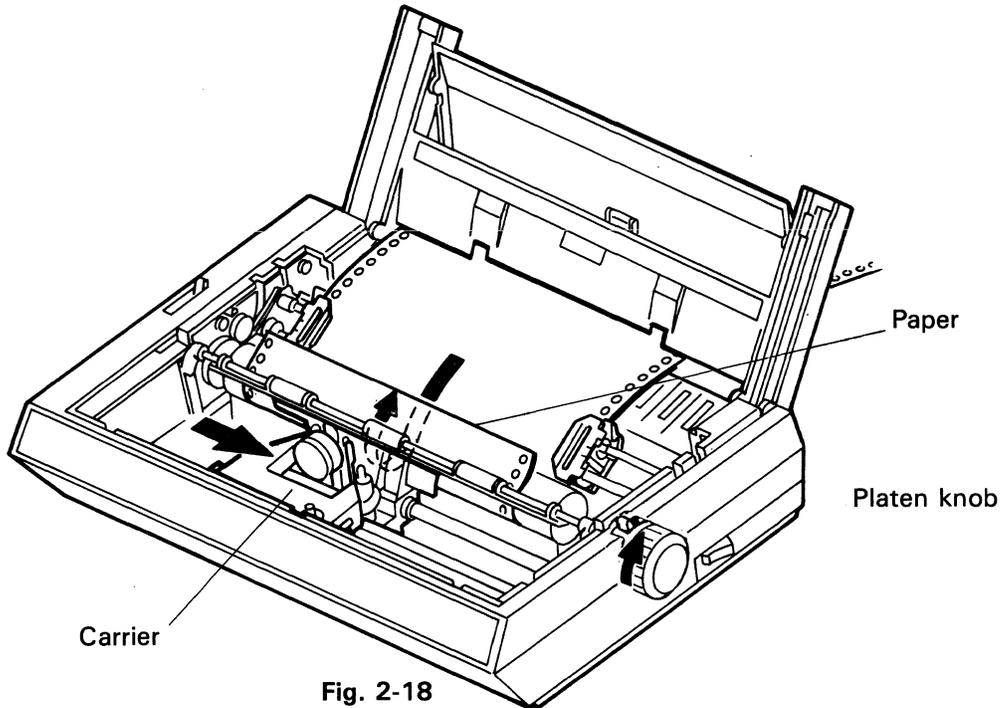
Fig. 2-18

2.6.2.4 Close the paper cover and reposition the print cover and the print cover (B).

NOTE: The paper should pass over the paper cover.
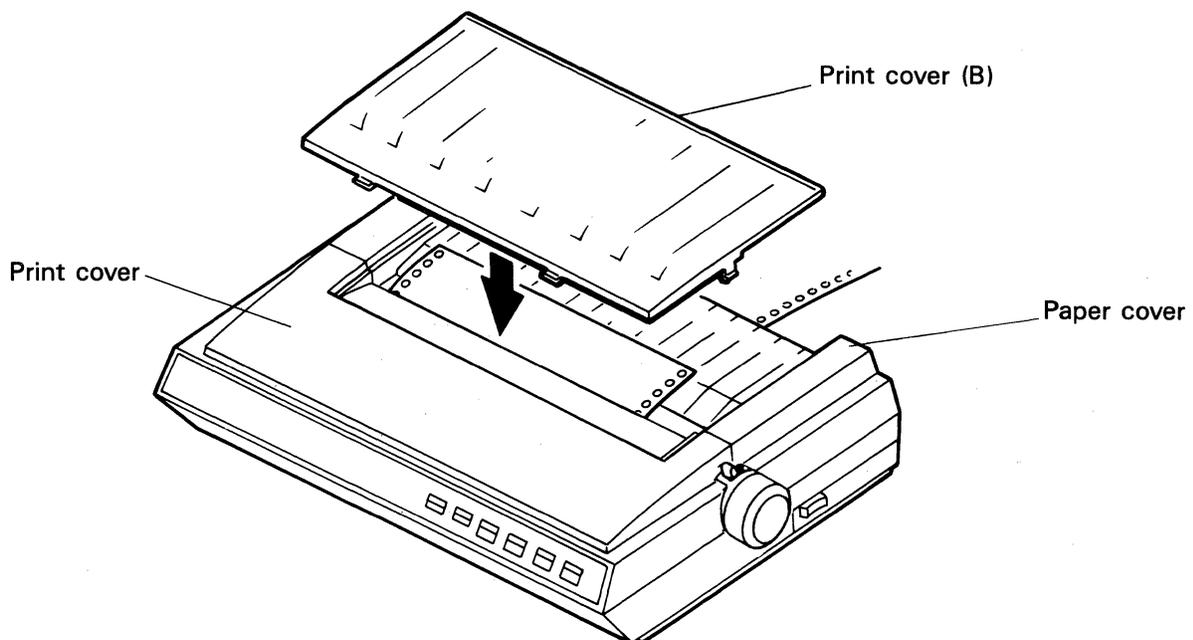
Fig. 2-19

2.6.2.5 Recommended paper path for use with push tractors

Max. 91 cm (3 ft.)
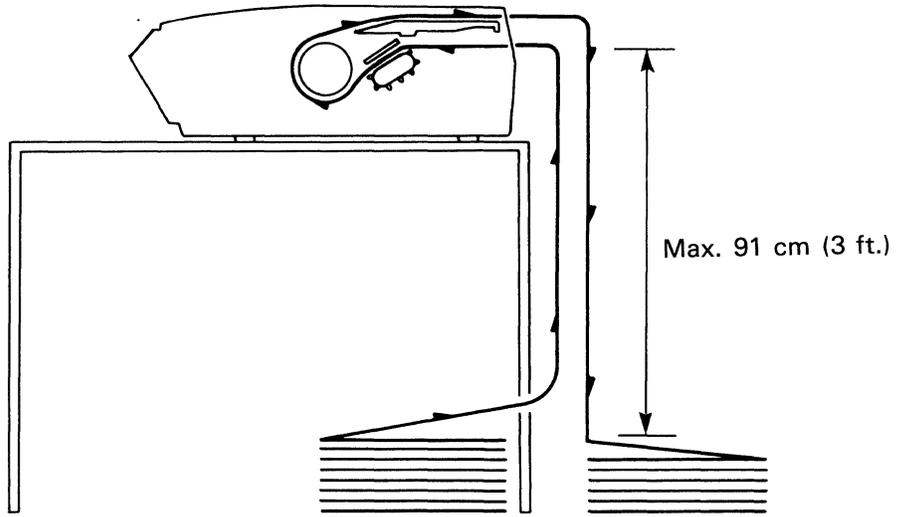
Fig. 2-20

2.6.3 Pull Tractor Operation

2.6.3.1   Remove the print cover and the print cover (B).

2.6.3.2   Remove the paper cover and detach the paper guide cover from the paper cover.

2.6.3.3   After detaching the paper guide cover, reposition only the paper cover on the printer.

Paper guide cover

Paper cover

Print cover
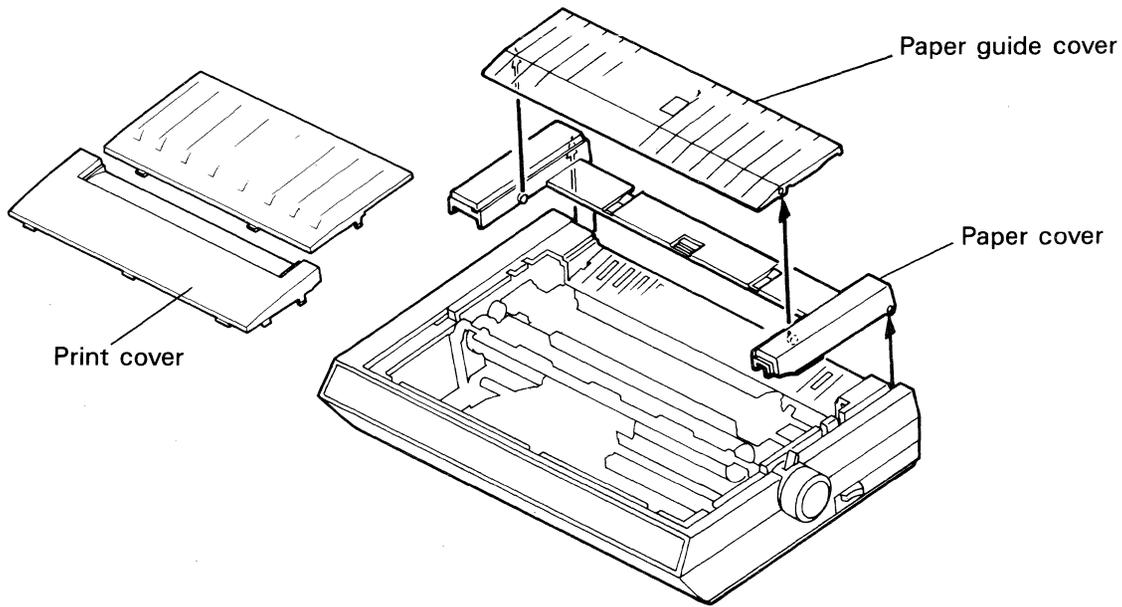
Fig. 2-21

Pull the left and right tractor unit lock levers toward you to release the tractor unit; then pull up the tractor unit.

Tractor unit lock lever

Tractor unit
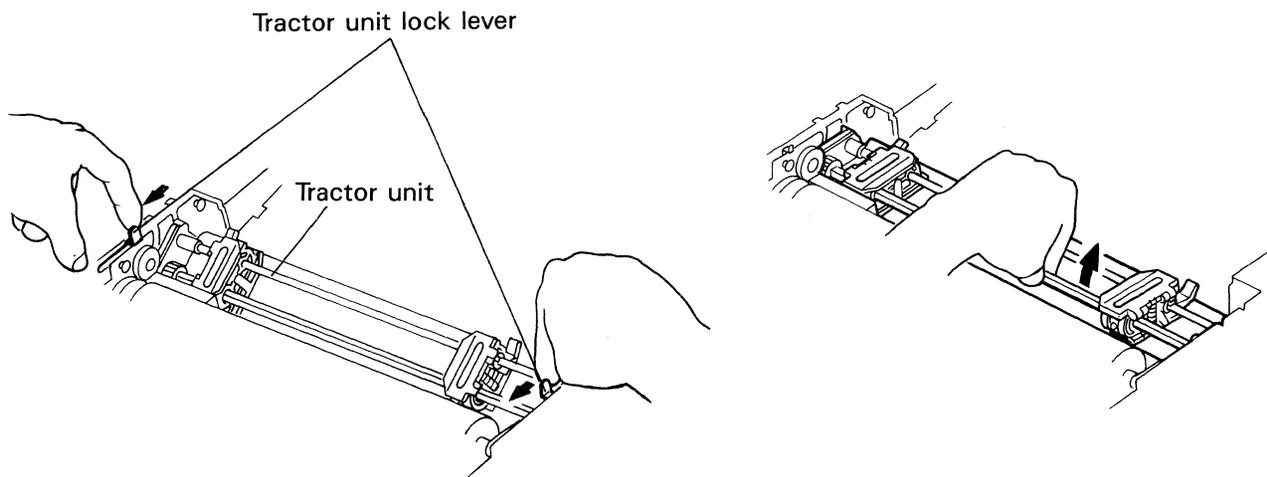
Fig. 2-22

2.6.3.4 Adjust the left and right tractor positions for proper paper width.

Pull the tractor set lever of the left tractor toward you. Move the tractor to the left edge of the paper. Then push the tractor set lever away from you to lock the tractor.

Open the paper holder. Align the left-hand side holes of the paper with tractor pins and close the paper holder (Fig. 2-23).

Paper holder

Left tractor

Tractor set lever
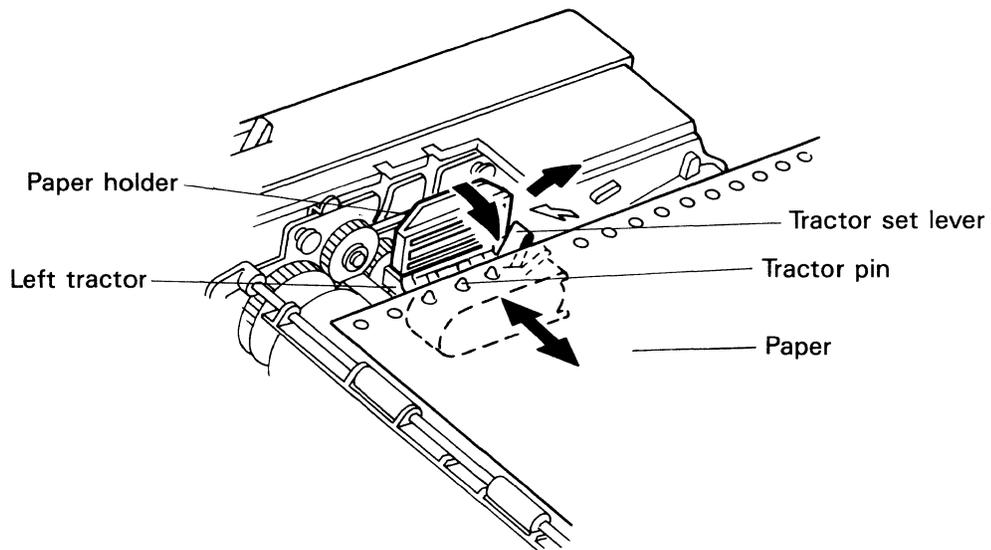
Tractor pin

Paper

Fig. 2-23

Pull the Tractor set lever of the right tractor toward you and open the paper holder.

Align the right-hand side holes of the paper with the tractor pins. Close the paper holder.

Paper

Paper holder

Right tractor
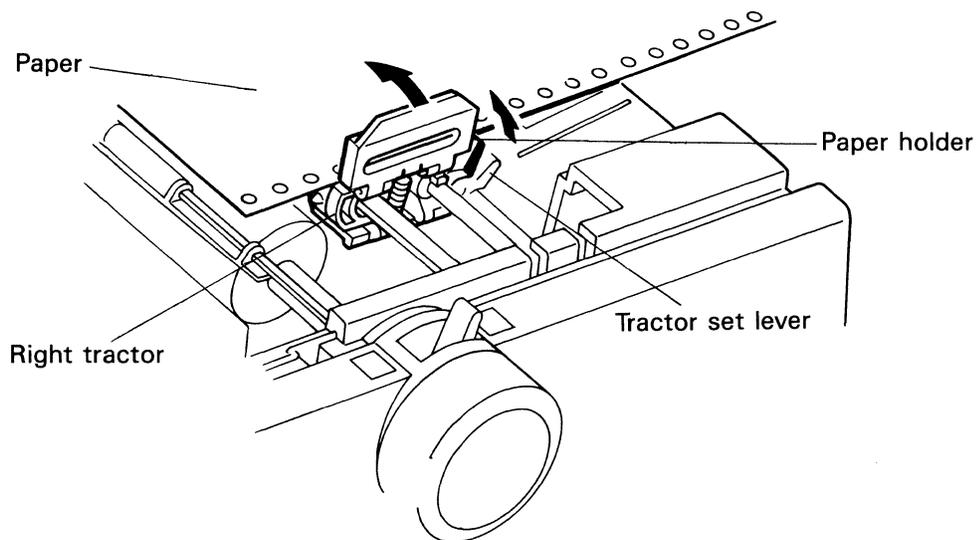
Tractor set lever

Fig. 2-24

Move the right tractor until the horizontal paper slack is eliminated. Push the tractor set lever away from you to lock the tractor in place.
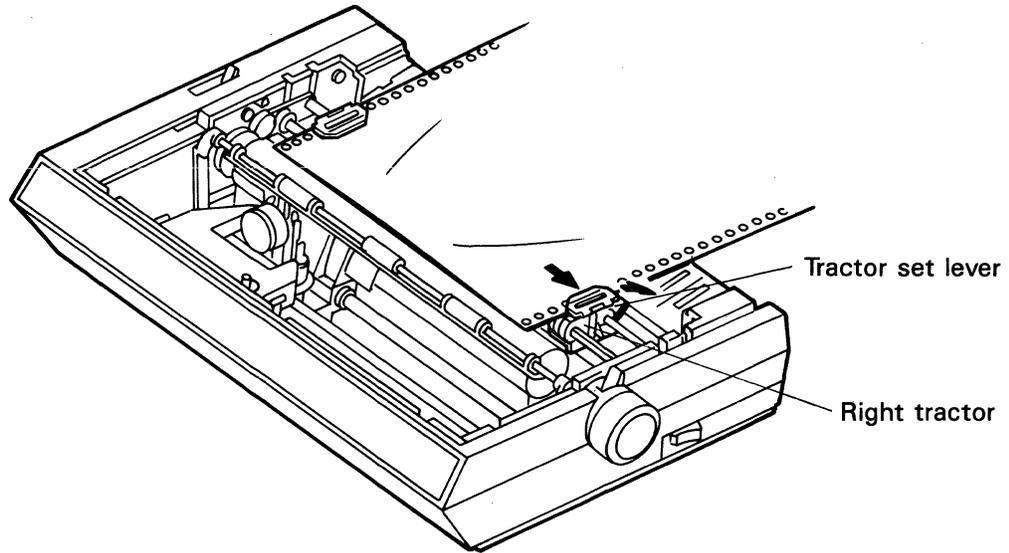
Fig. 2-25

2.6.3.5 After positioning the tractors, open the paper holders of the left and right tractors and remove the paper.

2.6.3.6 Set the friction release lever to the friction position and insert the paper as indicated by the arrow in Fig. 2-26.
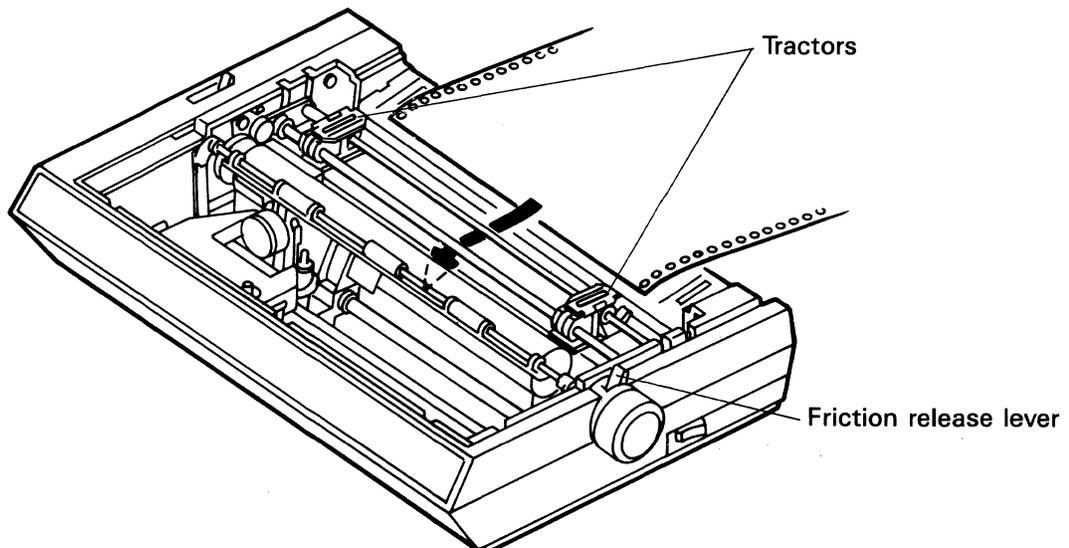
Fig. 2-26

2.6.3.7 Move the carrier to the center and turn the platen knob clockwise to feed the paper to the front of the platen.
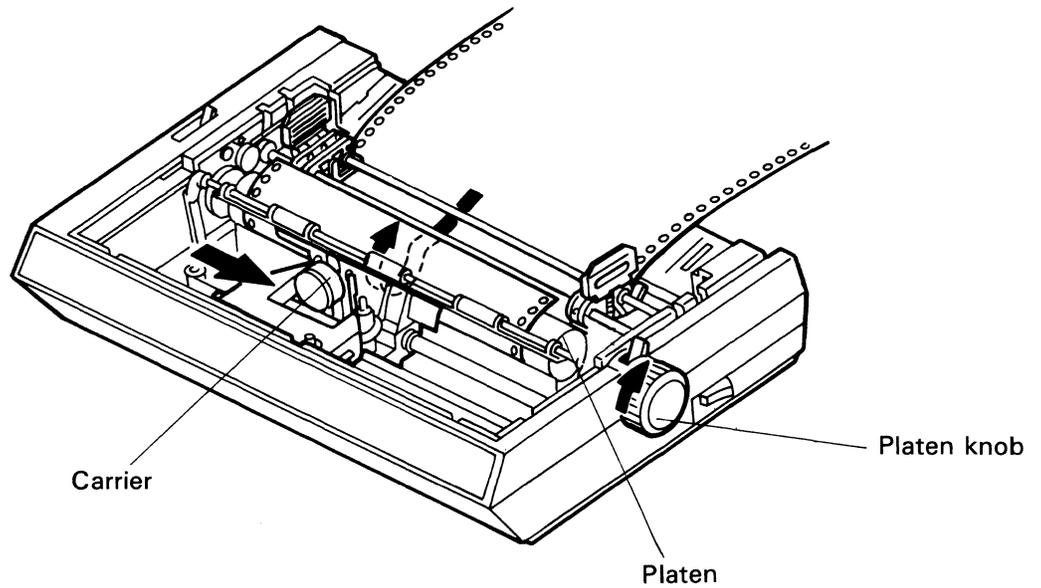
Fig. 2-27

2.6.3.8 When the paper exits in front of the platen, set the friction release lever to the pin feed position. Align the left-hand and right-hand side holes of the paper with the left and right tractors pins respectively. Close the paper holders.
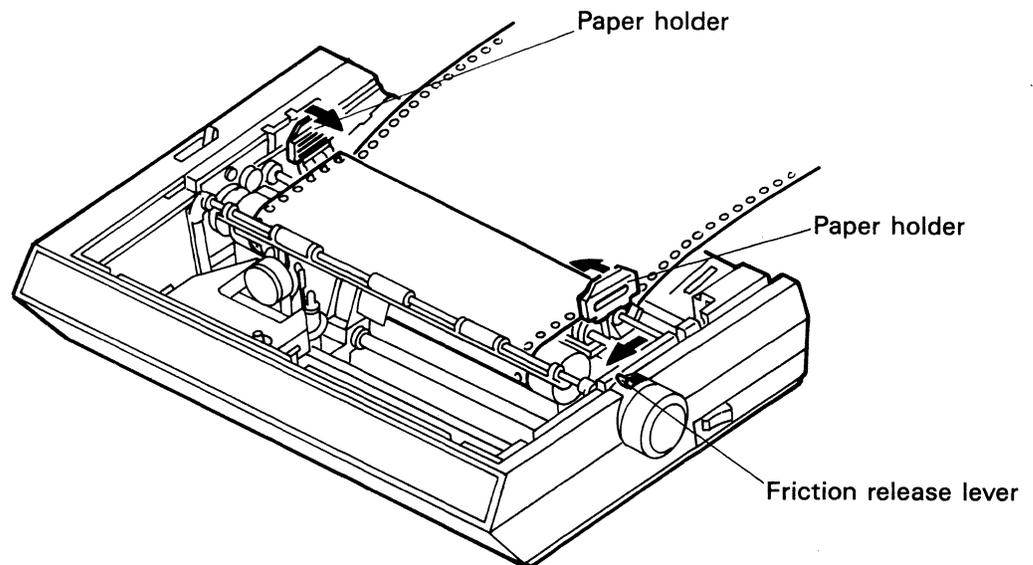
Fig. 2-28

2.6.3.9 After inserting the paper, reposition the paper guide cover on the paper cover as shown below. Next, attach the paper guide cover from the rear of the paper cover. In this case, set the paper so that the top of paper appears between the paper cover and the paper guide cover and the paper goes over the paper guide cover.

Paper guide cover

Paper cover
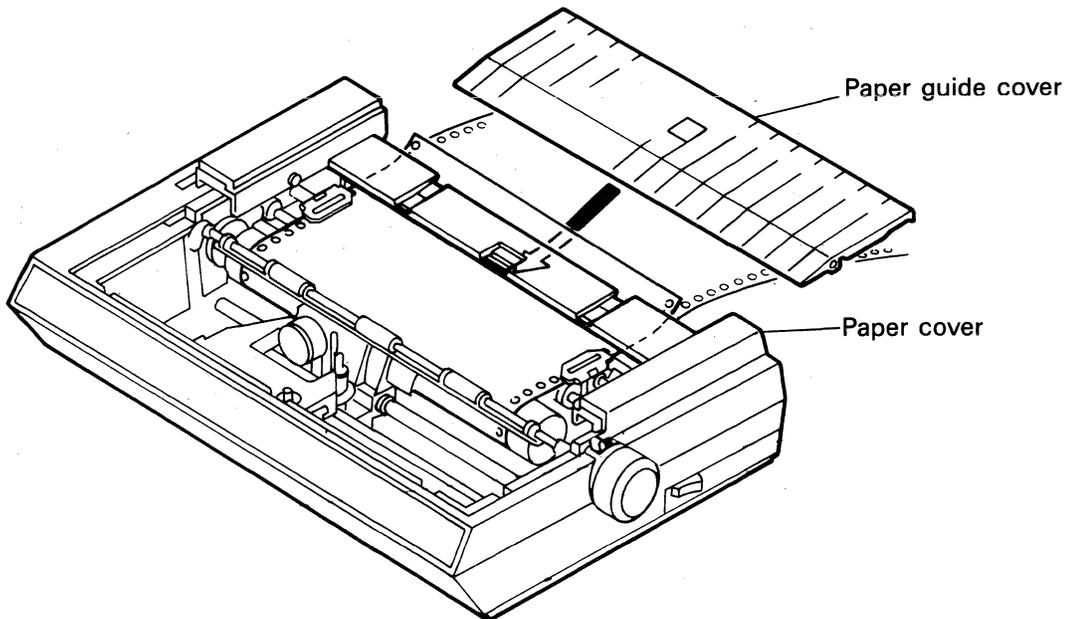
Fig. 2-29

Reposition the paper guide cover as shown in the figure below.

Paper cover

Paper guide cover
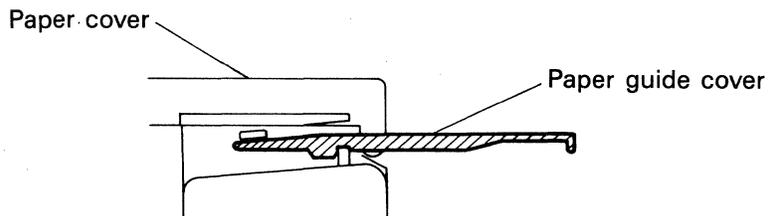
Fig. 2-30

2.6.3.10 Mount the print cover and the print cover (B) to finish paper loading.
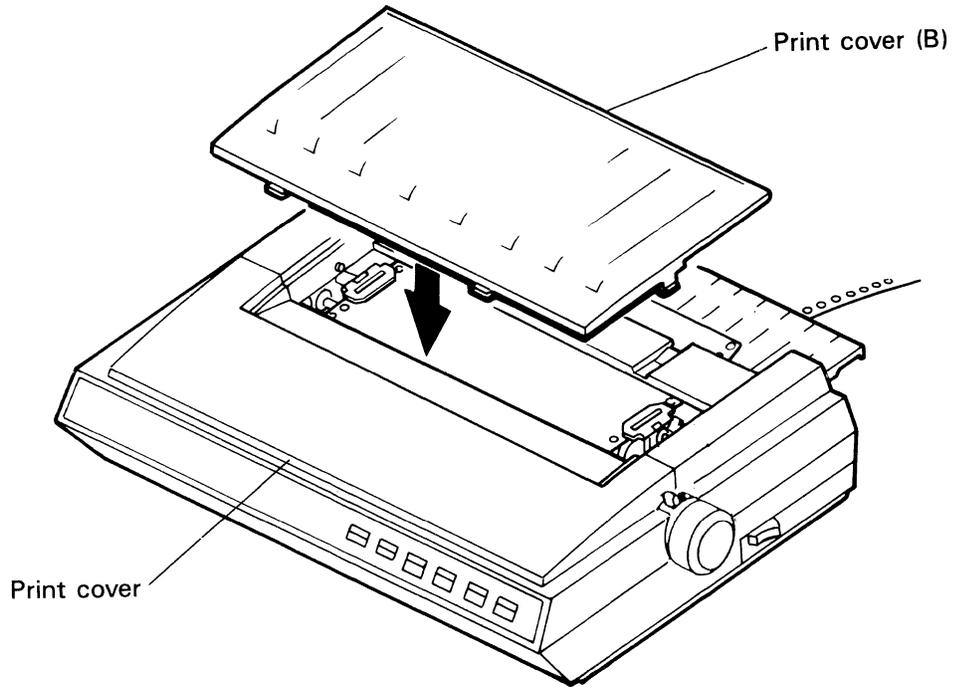
Fig. 2-31

2.6.3.11 Recommended paper path for pull tractor operation.
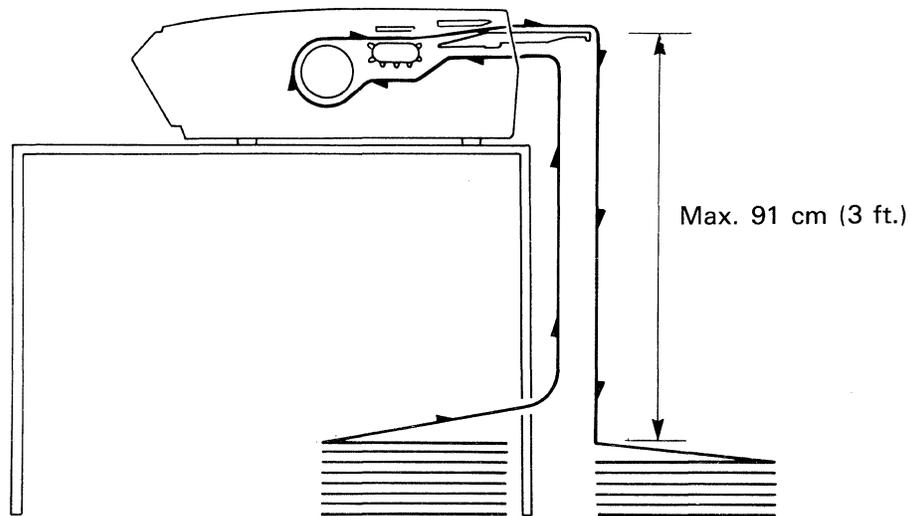
Fig. 2-32

In this state, reverse feed cause paper to be entangled.

2.6.4 Bottom Feed

2.6.4.1   Remove the print cover and the print cover (B).

2.6.4.2   Remove the paper cover.

2.6.4.3   After detaching the paper guide cover, reposition only the paper cover on the printer.
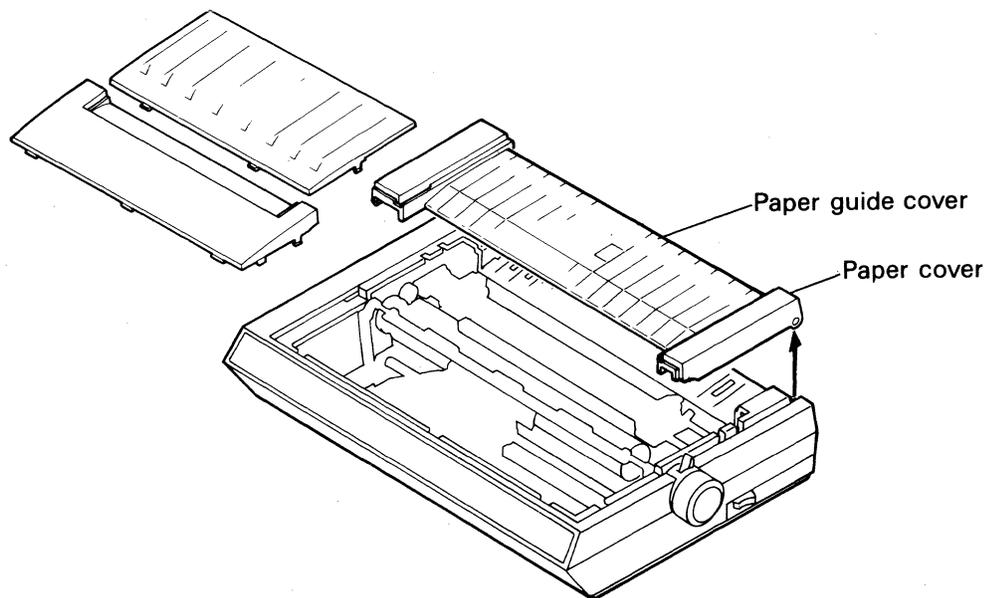
Fig. 2-33

Pull the left and right tractor unit lock levers toward you to release the tractor; then pull up the tractor unit.
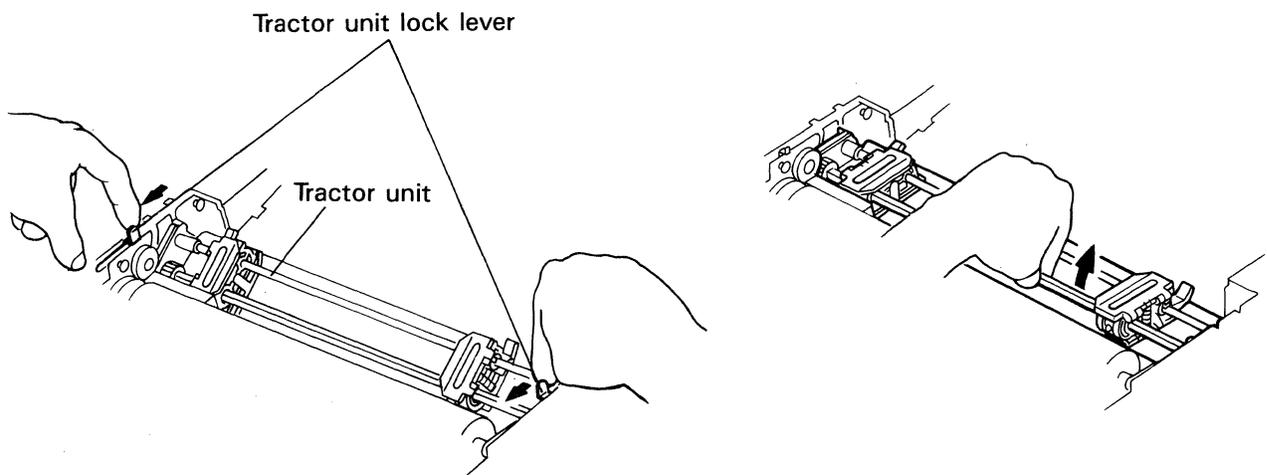
Fig. 2-34

2.6.4.4 Adjust the left and right tractor positions for proper paper width.

Pull the tractor set lever of the left tractor toward you. Move the tractor to the left edge of the paper. Then push the tractor set lever away from you to lock the tractor.

Open the paper holder. Align the left-hand side holes of the paper with the tractor pins and close the paper holder. (Fig. 2-35)
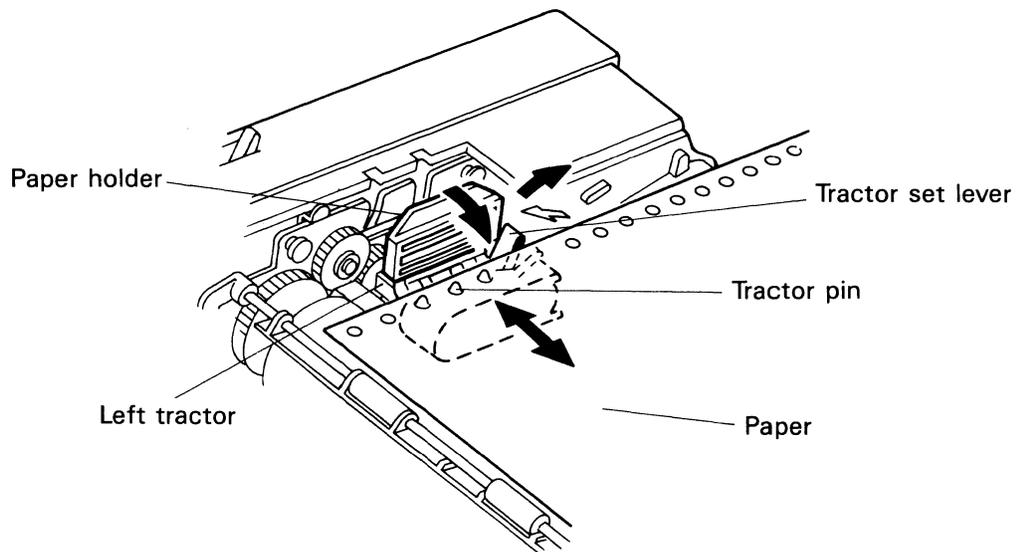
Paper holder

Tractor set lever

Tractor pin

Left tractor

Paper

Fig. 2-35

Pull the tractor set lever of the right tractor toward you and open the paper holder.

Align the right-hand side holes of the paper with the tractor pins and close the paper holder.

Paper

Paper holder

Right tractor

Tractor set lever

Fig. 2-36

Move the right tractor until the horizontal paper slack is eliminated. Push the tractor set lever away from you to lock the tractor in place.
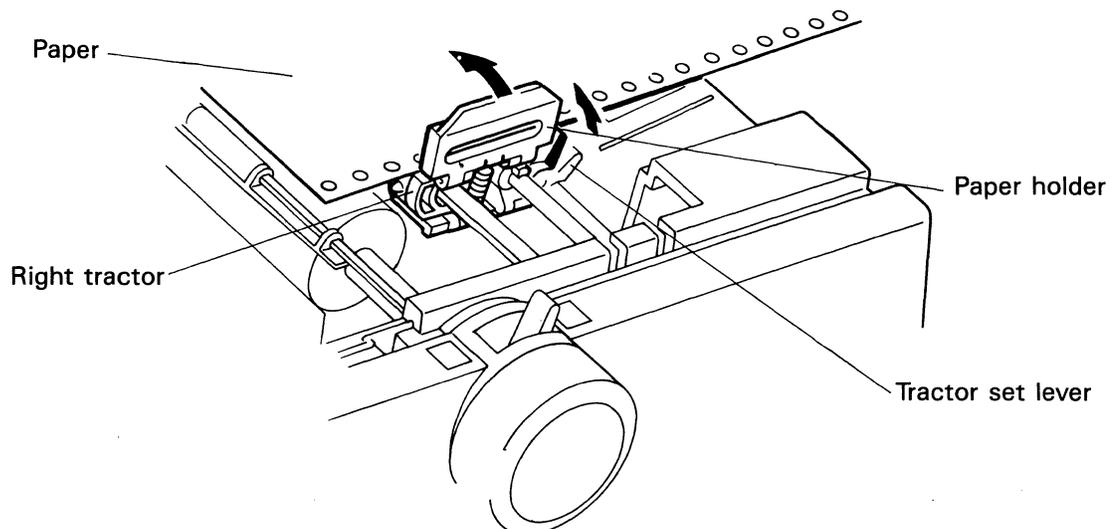
Tractor set lever
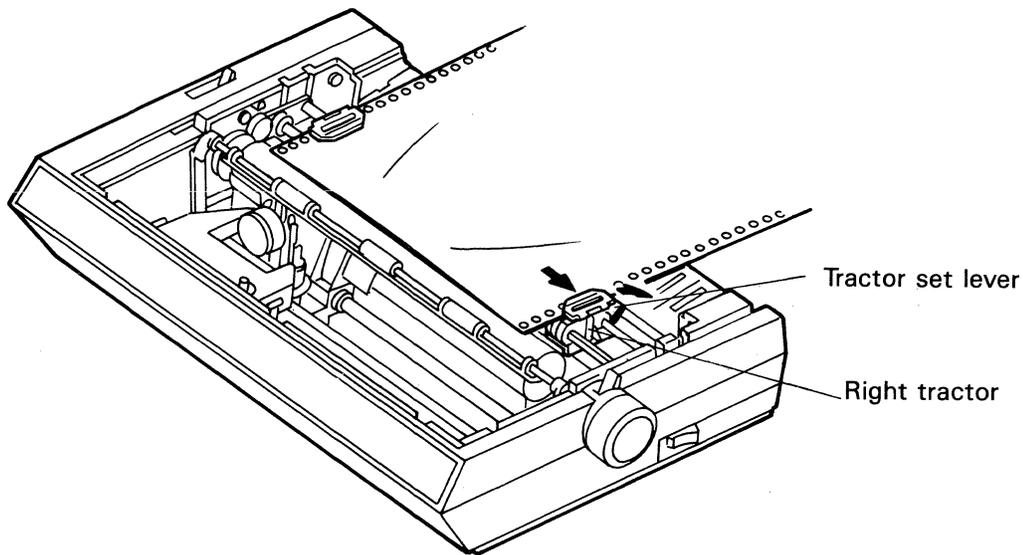
Right tractor

Fig. 2-37

2.6.4.5 After positioning the tractors, open the paper holders of the left and right tractors and remove the paper.

2.6.4.6 Remove the power cord and computer interface cable from the printer.
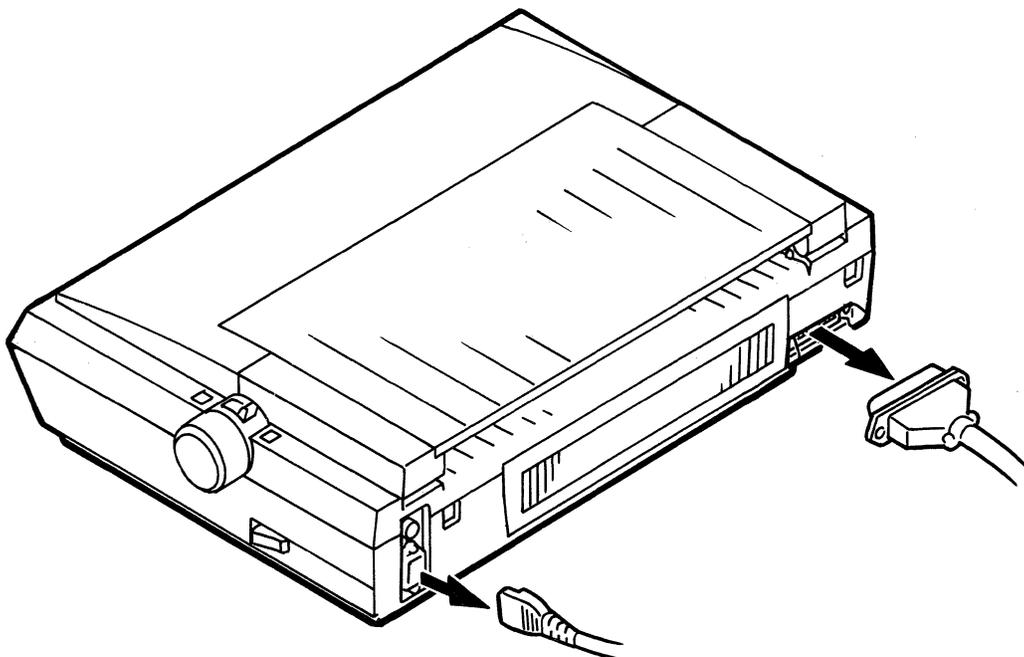
Fig. 2-38

2.6.4.7 After setting the tractors and removing the cables, place the printer on end. Insert the paper through the bottom paper inlet.
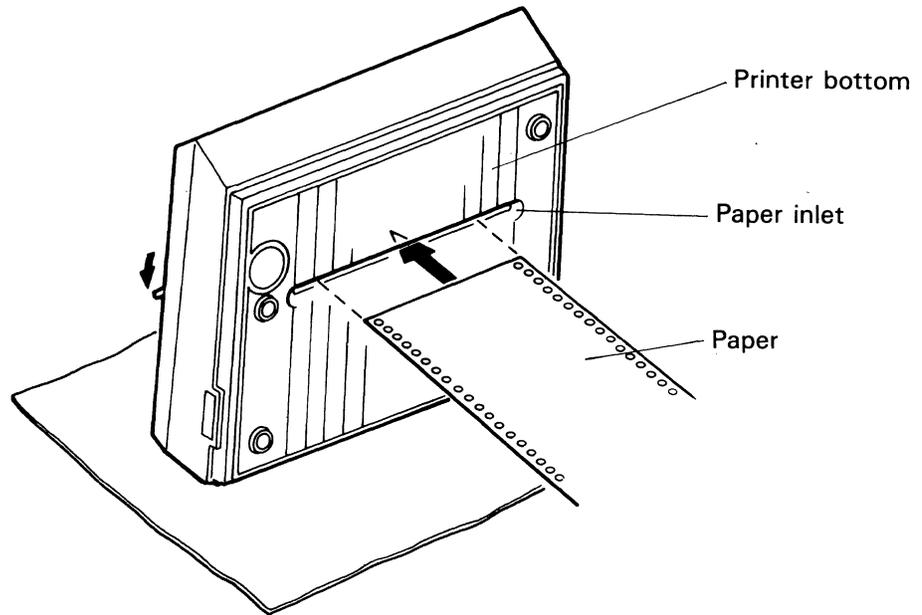
Fig. 2-39

2.6.4.8 Open the paper holders of the tractors and pass the paper in front of the platen. Then align the left-hand and right-hand side holes of the paper, with the tractor pins. Close the paper holders.
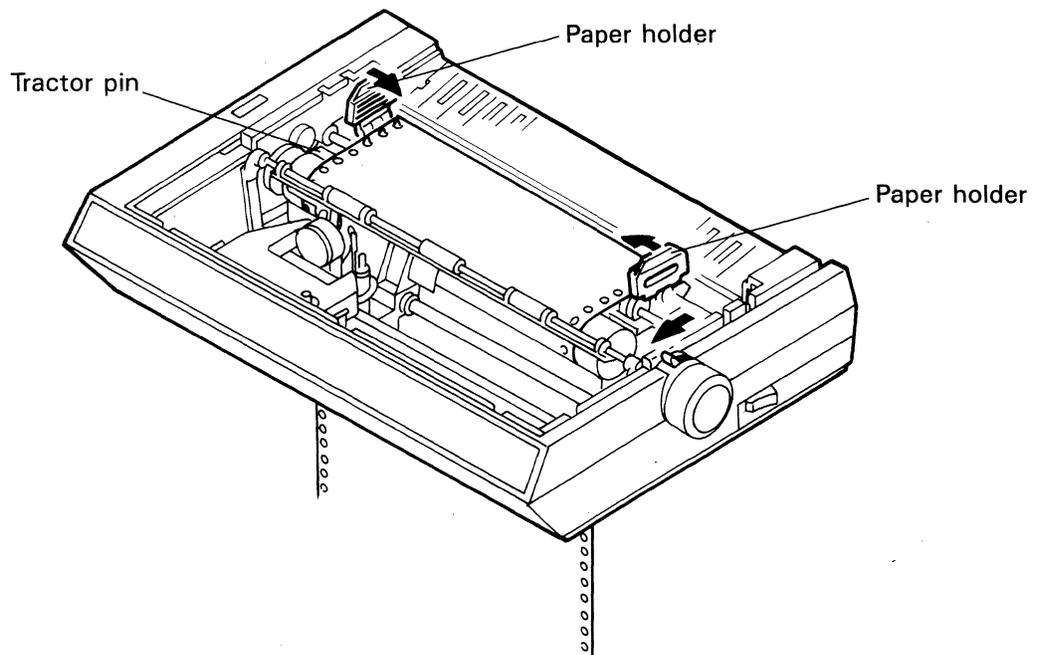
Fig. 2-40

2.6.4.9 After setting the paper, attach the paper cover and paper guide cover. Then attach the print cover and the print cover (B).

Print cover (B)

Paper guide cover

Print cover
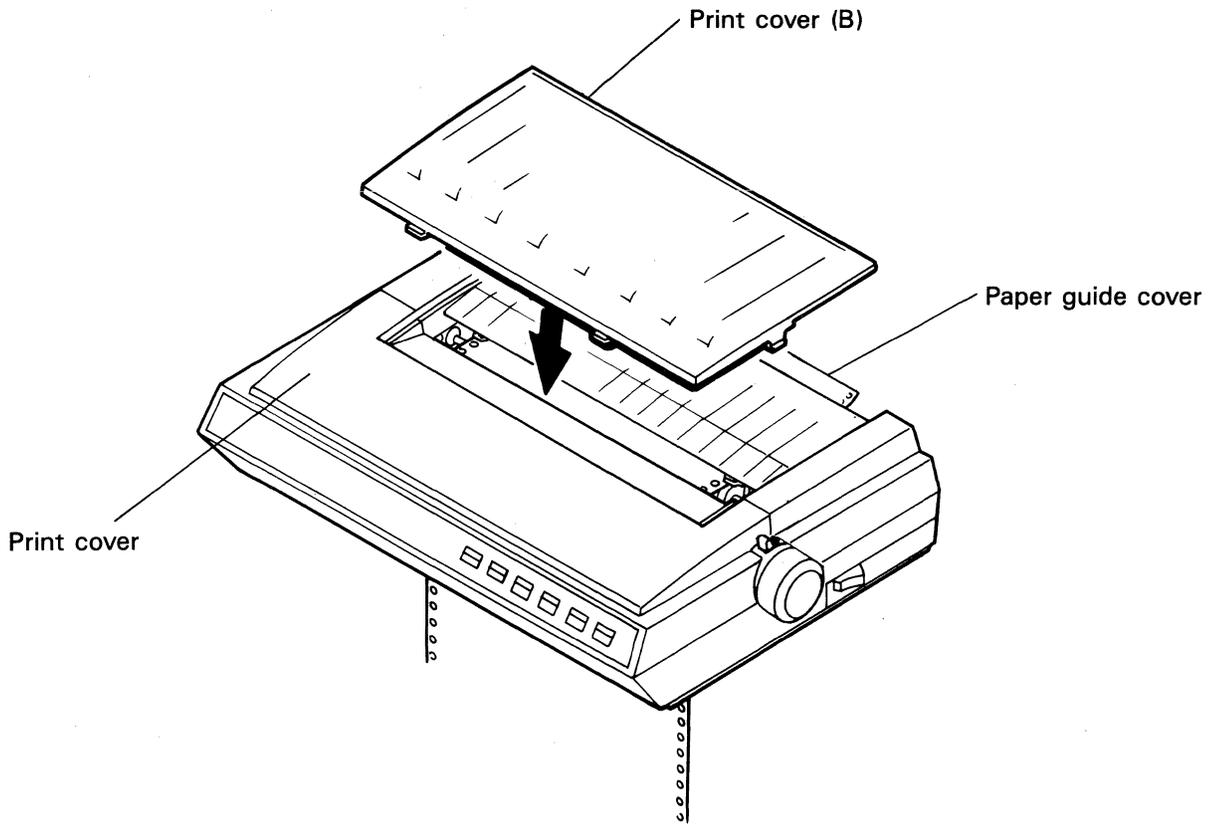
Fig. 2-41

2.6.4.10 It is now possible to use a bottom feed print stand.
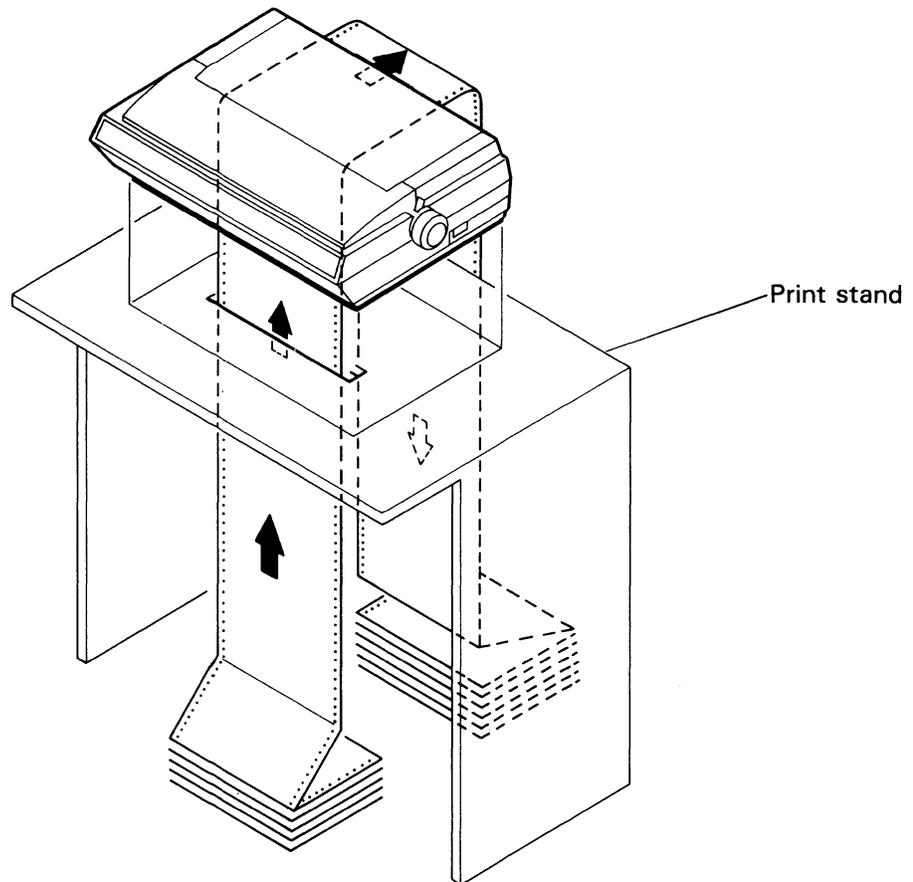
Fig. 2-42

2.6.4.11 Recommended paper path for bottom feed

Max. 91 cm (3 ft.)
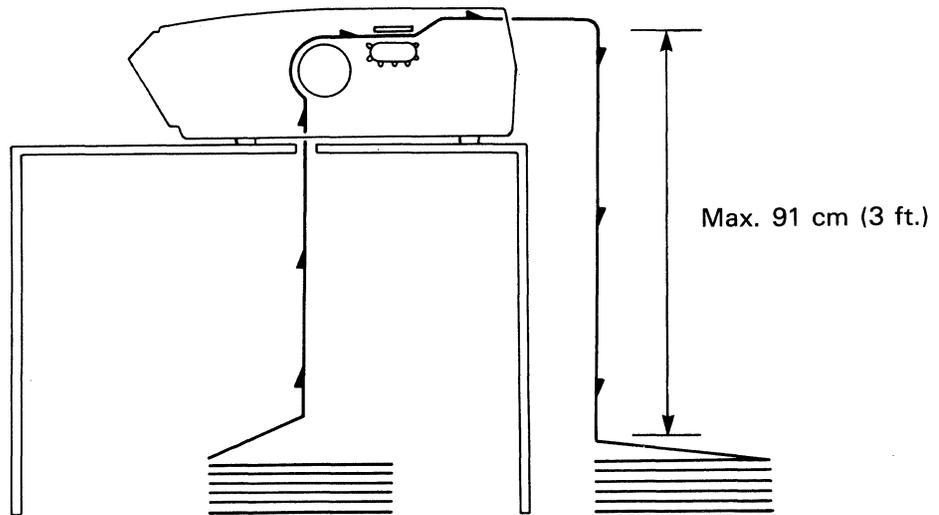
Fig. 2-43

2.7 How to Change the Fuse (Auswechseln der Sicherung)

① Disconnect the power cord from the printer.
(Das Netzkabel aus dem Printer abziehen.)

② Turn the fuse holder cap counterclockwise while pushing it, and remove the fuse holder cap.
(Den Sicherungshalter im Gegenuhrzeigersinn drehen und dabei eindrücken. Anschließend kann er abgezogen werden.)
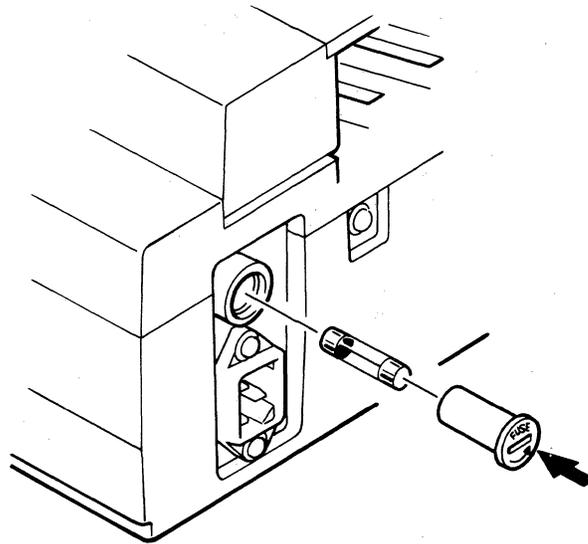
Fig. 2-44

③ Change the fuse after disconnecting the fuse holder cap.
Take care to use the recommended fuse.
(Nach dem Abnehmen der Sicherung auswechseln.
Immer Sicherungen mit der vorgeschriebenen Stärke verwenden.)

2.8 Removing and Installing the Print Head

2.8.1 Removal

2.8.1.1 Remove the print cover and the print cover (B). Move the carrier to a position where the bail rollers and operation panel are not in the way. (At this time, the ribbon cassette should also be removed.)
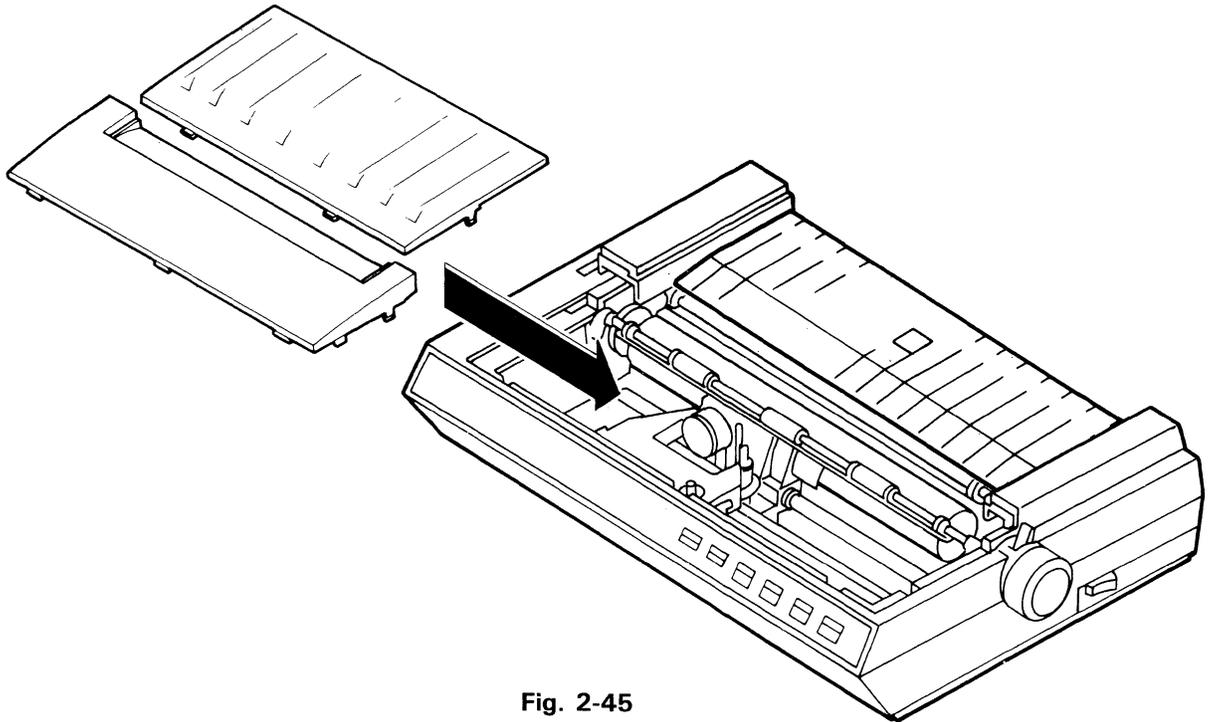
Fig. 2-45

2.8.1.2 While pulling the head clamp to the right, remove the print head by carefully pulling it up.
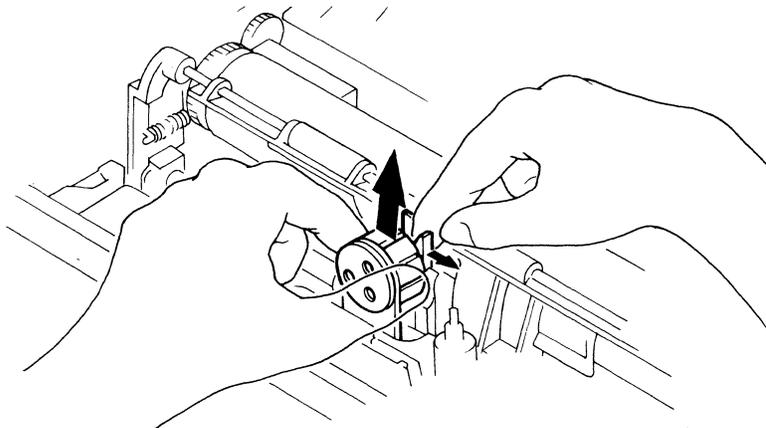
Fig. 2-46

2.8.2 Installation

2.8.2.1 While opening the head clamp, mate and insert the print head into the connector on the carrier block.

2.8.2.2 Load the ribbon cassette and repositioin the print cover and the print cover (B).

2.9 How to Connect the Interface Cable

The interface cable should be connected as shown in figure 2-47.

Cable

Lock

Fig. 2-47

2.10 Self Print Test Function

This printer has a self test function which allows the printer to check its operation without being connected to a data source. This test can be performed in the following manner.

- Turning the power on while pressing the | TOF | switch on the operation panel causes the printer to print the Type 1 self test pattern.

- Turning the power on while pressing the | LF | switch on the operation panel causes the printer to print the Type 2 self test pattern.

Type 1
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'
89:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'(
```

Type 2

NOTE: Some characters may be different depending on the setting of function.

```
*** DP MODE ***
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmno
pqrstuvwxyz{|}~_____
```

```
*** NLQ MODE ***
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmno
pqrstuvwxyz{|}~_____
```

```
*** LQ MODE ***
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmno
pqrstuvwxyz{|}~_____
```

Reduction percent (83%)

2.11 Hex Print Mode

In this mode, the data received from the computer is printed in hex representation. This mode is useful for decoding data sent from the computer. The mode can be activated in the following manner.

- Turn the printer power on while pressing the ON LINE switch on the operation panel.

Example

«Sample Program»

```
10 LPRINT CHR$(27);"m0";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
20 LPRINT CHR$(27);"m1";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
30 LPRINT CHR$(27);"m2";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
```

«Printing»

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

(Hex Print Sample)

```
1B 6D 30 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50 51
52 53 54 55 56 57 58 59 5A 0D 0A 1B 6D 31 41 42 43 44 45 46
47 48 49 4A 4B 4C 4D 4E 4F 50 51 52 53 54 55 56 57 58 59 5A
0D 0A 1B 6D 32 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
50 51 52 53 54 55 56 57 58 59 5A 0D 0A
```

Reduction percent (60%)

CHAPTER 3
SET-UP MODE

3.1 Operation Panel in Set-up Mode

The set-up mode is the method to set printer functions at power on time. The set-up mode is different from the normal print mode, and therefore in this mode the switches and lamps have the meanings which are completely different from those in the normal print mode.
The shaded area ▓▓▓▓ on the following panel shows the function of each switch in the set-up mode.
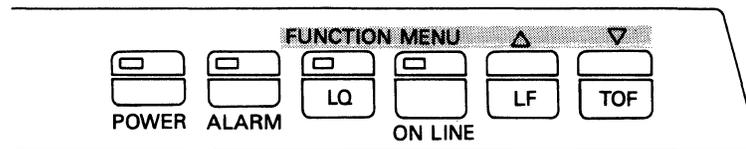
Fig. 3-1

For the printer to enter this mode, be sure to insert the paper and reliably close to cover. If no paper is inserted, the printer cannot enter the set-up mode. In such a case, the printer is placed in the normal mode.

When the set-up mode is activated, Paper Empty (no paper present) detection and Cover Open (cover open or not reliably closed) detection become invalid. Use paper that is long enough and reliably close the cover. The auto sheet feeder and the auto loading function cannot be used in this mode.

(1) $\boxed{\text{LQ}}$ **Switch**

The LQ switch is used to select the function select mode at the start or end of set-up mode.

1) Start of Set-up Mode

$\boxed{\text{L Q}}$ + $\boxed{\text{Power SW}}$
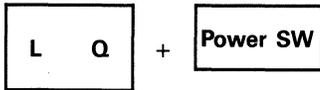
(LQ lamp blinks)
Turning on the printer power while pressing the $\boxed{\text{LQ}}$ switch activates the set-up mode, and the currently set menu statuses of the five most frequently used functions are automatically printed.

$\boxed{\text{L Q}}$ + $\boxed{\text{ON LINE}}$ + $\boxed{\text{Power SW}}$
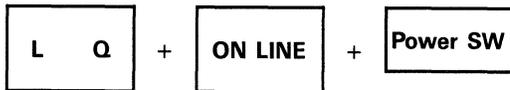
(LQ lamp blinks)
Turning on the printer power while simultaneously pressing the $\boxed{\text{LQ}}$ switch and $\boxed{\text{ON LINE}}$ switch activates the set-up mode. All of the currently set functions and menu statuses are printed.

NOTE: In either case, the function select mode is activated.

2) End of Set-up Mode

[Function Select Mode]
(LQ lamp blinks) + $\boxed{\text{L Q}}$
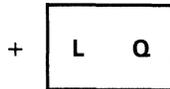
(All the lamps except the POWER lamp go out and light depending on the set-up.)

Set-up mode is deactivated by pressing the $\boxed{\text{LQ}}$ switch while the function select mode is active in the set-up mode. The normal printer mode then operates according to the newly set function and menu numbers.

NOTE: If the printer power is turned off without pressing the $\boxed{\text{LQ}}$ switch to end the set-up mode, the setting changes made so far are ignored and the printer returns to the settings that were in effect before entering set-up mode.

3) Selection of Function Select Mode

[Menu Select Mode]
(ON LINE lamp blinks) + $\boxed{\text{L Q}}$
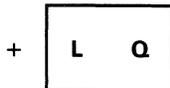
(ON LINE lamp goes out and LQ lamp blinks)

The change from the menu select mode to the function select mode is done by pressing the $\boxed{\text{LQ}}$ switch.

(2) ⌁ ON LINE ⌁ **Switch**
Selection of Menu Select Mode

[Function Select Mode]   + | ON LINE | (LQ lamp goes out and ON LINE lamp blinks)
(LQ lamp blinks)

Changing from the function select mode to the menu select mode
is done by pressing the | ON LINE | switch.

(3) | LF | **Switch**

[Function Select Mode]   + | L   F |
[Menu Select Mode]
**(LQ lamp or ON LINE
lamp blink)**

The function or menu number is incremented and printed by press-
ing the | LF | switch in the function and menu select modes. The num-
ber is incremented each time the switch is pressed; the last number
is followed by the first number. When the | LF | switch is pressed
for the first time after the set-up mode is started, the first preset
function number and its current menu value are printed.

(4) | TOF | **Switch**

[Function Select Mode]   + | TOF |
[Menu Select Mode]
**(LQ lamp or ON LINE
lamp blink)**

The function or menu number is decremented and printed by pressing
the | TOF | switch in the function and menu select modes. The num-
ber is decremented each time the switch is pressed. When the | TOF |
switch is pressed for the first time after the set-up mode is started,
the last preset function number and its current menu value are
printed.

3.2 Operational Procedures in Set-up Mode

Set-up Mode (Operation examples and their printouts)

Example 1

Condition: There are no setting changes in the five frequently used functions.

Operation: | L   Q | + | Power ON | Turn on the printer power while pressing the ⎡LQ⎤ switch.
(Function select mode)

Print:

```
FUNCTION          MENU
No.               No. STATUS

01  FORM LENGTH   09  11
02  LPI           01   6
03  CPI           01  10
04  LQ OR NLQ     01  LQ
05  BUZZER        01  ON


FUNCTION          MENU
No.               No. STATUS

01  FORM LENGTH   09  11
```

Print Sample 1

3-4

Example 2

Condition: There are setting changes in the five most frequently used functions.
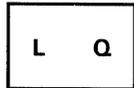
Operation: 1 | L   Q | + | **Power ON** | Turn on the printer power while pressing the LQ switch.
(Enter set-up mode)

Changes: Change Menu No. 09 of function No. 01 to 10
Change Menu No. 01 of function No. 02 to 02

• Change the form length from 11″ to 12″.
• Change the Line Spacing from 1/6″ to 1/8″.

Operation 2:

(Select function No. 01) → | ON LINE | → | L   F | → | L   Q | → | L   F | →

(Menu select mode)   (Increment menu No. 09 to 10)   (Function select mode)   (Increment function No. 01 to 02)

| ON LINE | → | L   F | → | L   Q | → | L   Q |

(Menu select mode)   (Increment menu No. 01 to 02)   (Function select mode)   (End setting change)
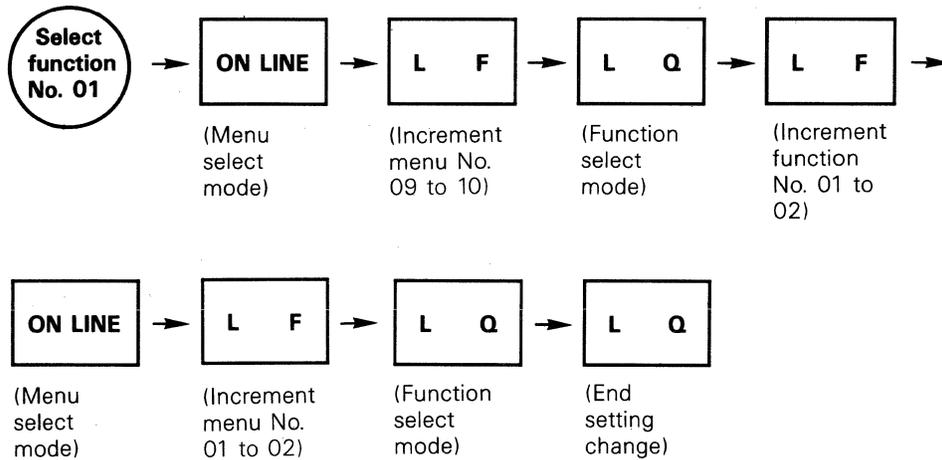
NOTE: Press the LF switch continuously in the function mode and function numbers change as follows; 01, 02, . . . 05, 01, 02, . . . 05. While pressing the TOF switch, the change of function numbers is reverse; 01, 05, 04 . . . 01, 05, 04 . . . 01.

Print:

```
FUNCTION              MENU
No.                   No.  STATUS

01  FORM LENGTH       09   11
02  LPI               01   6
03  CPI               01   10
04  LQ OR NLQ         01   LQ
05  BUZZER            01   ON


FUNCTION              MENU
No.                   No.  STATUS

01  FORM LENGTH       09   11
                      10   12
02  LPI               01   6
                      02   8
```

Check: Check if the setting changes have been made in the initial function status set mode.

Operation 3: | Power OFF | → | L   Q | + | Power ON |
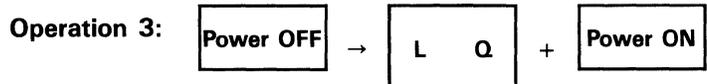
Turn off the printer power, and turn on the printer power again while pressing the [LQ] switch.

Print:

```
FUNCTION              MENU
No.                   No. STATUS

01  FORM LENGTH       10  12
02  LPI               02   8
03  CPI               01  10
04  LQ OR NLQ         01  LQ
05  BUZZER            01  ON


FUNCTION              MENU
No.                   No. STATUS

01  FORM LENGTH       10  12
```

Print Sample 1

Example 3

Condition: There are setting changes in the set-up mode. (Including functions other than the five most frequently functions.)

Operation 1:

```
┌─────────┐     ┌──────────┐     ┌──────────┐
│  L   Q  │  +  │ ON LINE  │  +  │ Power ON │
└─────────┘     └──────────┘     └──────────┘
```

Turn the power on while pressing the │LQ│ switch and │ON LINE│ switch.
(Function select mode)

Changes: Change Menu No. 10 of function No. 01 to 09
Change Menu No. 02 of function No. 02 to 01
Change Menu No. 01 of function No. 13 to 02
Change Menu No. 01 of function No. 15 to 02

- Change the form length from 12″ to 11″.
- Change the Line Spacing from 1/8″ to 1/6″.
- Change the Selection at Power on time from ON Line to OFF Line.
- Change the LF or non LF at Buffer full Print from LF to non LF.

Operation 2:
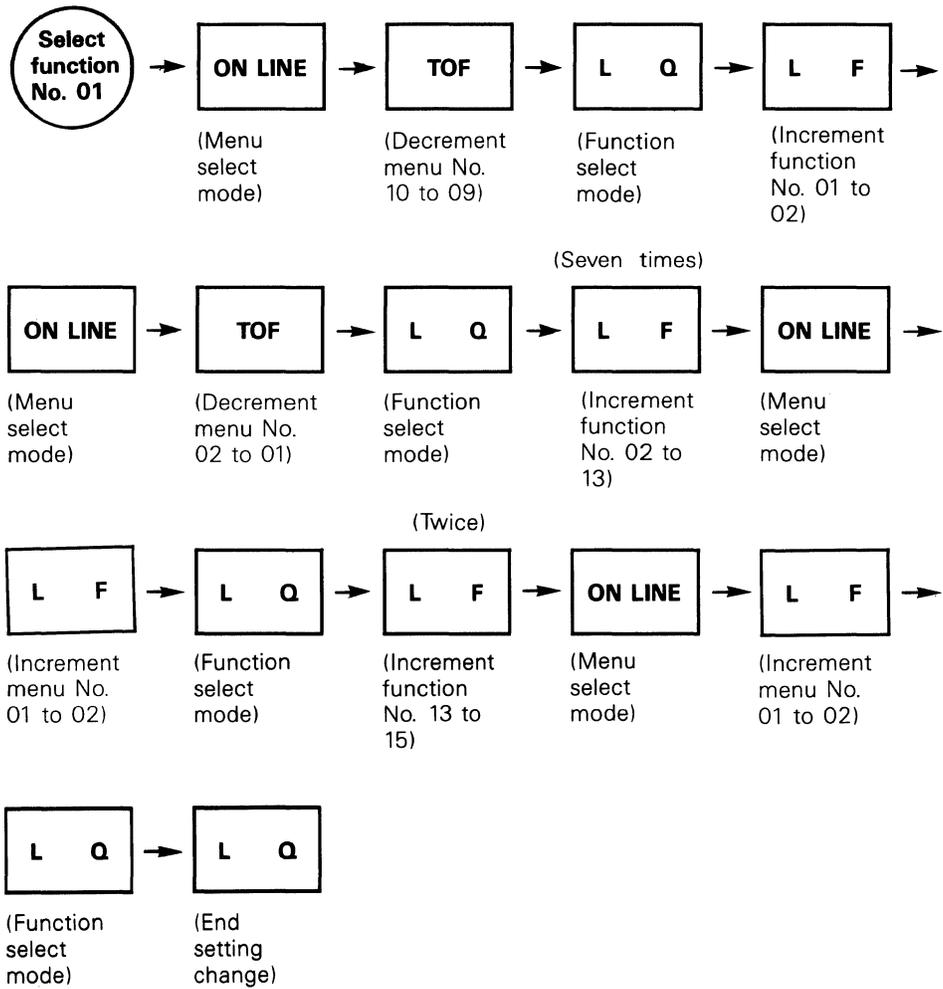
```
  ┌─────────┐
 ( Select  )      ┌──────────┐      ┌──────────┐      ┌──────────┐      ┌──────────┐
 ( function ) ──▶ │ ON LINE  │ ──▶  │   TOF    │ ──▶  │  L   Q   │ ──▶  │  L   F   │ ──▶
 ( No. 01  )      └──────────┘      └──────────┘      └──────────┘      └──────────┘
  └─────────┘
                   (Menu            (Decrement        (Function         (Increment
                   select           menu No.          select            function
                   mode)            10 to 09)         mode)             No. 01 to
                                                                        02)
```

(Seven times)

```
 ┌──────────┐      ┌──────────┐      ┌──────────┐      ┌──────────┐      ┌──────────┐
 │ ON LINE  │ ──▶  │   TOF    │ ──▶  │  L   Q   │ ──▶  │  L   F   │ ──▶  │ ON LINE  │ ──▶
 └──────────┘      └──────────┘      └──────────┘      └──────────┘      └──────────┘

 (Menu             (Decrement        (Function         (Increment        (Menu
 select            menu No.          select            function          select
 mode)             02 to 01)         mode)             No. 02 to         mode)
                                                       13)
```

(Twice)

```
 ┌──────────┐      ┌──────────┐      ┌──────────┐      ┌──────────┐      ┌──────────┐
 │  L   F   │ ──▶  │  L   Q   │ ──▶  │  L   F   │ ──▶  │ ON LINE  │ ──▶  │  L   F   │ ──▶
 └──────────┘      └──────────┘      └──────────┘      └──────────┘      └──────────┘

 (Increment        (Function         (Increment        (Menu             (Increment
 menu No.          select            function          select            menu No.
 01 to 02)         mode)             No. 13 to         mode)             01 to 02)
                                     15)
```

```
 ┌──────────┐      ┌──────────┐
 │  L   Q   │ ──▶  │  L   Q   │
 └──────────┘      └──────────┘

 (Function         (End
 select            setting
 mode)             change)
```

Print:

```
                 FUNCTION                    MENU
                 No.                          No.  STATUS

                 01   FORM LENGTH             10   12
                 02   LPI                     02    8
                 03   CPI                     01   10
                 04   LQ OR NLQ               01   LQ
                 05   BUZZER                  01   ON
                 06                           02
                 11                           02
                 12                           02
                 13                           01
                 14                           01
                 15                           01
                 16                           01
                 18                           01
                 19                           03
                 21                           02
                 22                           01
                 23                           01
                 24                           01
                 25                           01
                 26                           01
                 27                           01
                 41                           01
                 61                           02
                 81                           01
                 82                           02
                 83                           01
                 84                           02
  See NOTE below* 85                          02
                 86                           01
                 91                           01
                 92                           01
                 93                           01
                 94                           01
                 95                           03
                 96                           04
                 00                           01


                 FUNCTION                    MENU
                 No.                          No.  STATUS

                 01   FORM LENGTH             10   12
                                              09   11
                 02   LPI                     02    8
                                              01    6
                 03   CPI                     01   10
                 04   LQ OR NLQ               01   LQ
                 05   BUZZER                  01   ON
                 06                           02
                 11                           02
                 12                           02
                 13                           01
                                              02
                 14                           01
                 15                           01
                                              02
```

NOTE: *Function numbers 81 to 96 are printed only if your printer is equipped with a serial interface.

Check: Check if the setting changes have been made in the initial function status set mode.

Operation 3: `Power OFF` → `L Q` + `ON LINE` + `Power ON`
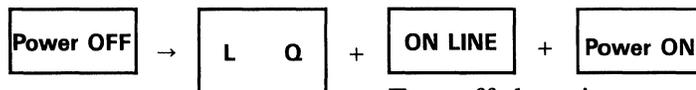
Turn off the printer power. Turn on the printer power again while pressing the LQ switch and ON LINE switch.

Print:

```
FUNCTION              MENU
No.                   No. STATUS

01  FORM LENGTH       09   11
02  LPI               01    6
03  CPI               01   10
04  LQ OR NLQ         01   LQ
05  BUZZER            01   ON
06                    02
11                    02
12                    02
13                    02
14                    01
15                    02
16                    01
18                    01
19                    03
21                    02
22                    01
23                    01
24                    01
25                    01
26                    01
27                    01
41                    01
61                    02
81                    01
82                    02
83                    01
84                    02
85                    02
86                    01
91                    01
92                    01
93                    01
94                    01
95                    03
96                    04
00                    01


FUNCTION              MENU
No.                   No. STATUS

01  FORM LENGTH       09   11
```

3-11

The general explanation for the set-up mode is finished. If you want your printer to return to the initial status, perform the following operations.

Operation 4:

(8 times)   (Twice)

| L   F | → | ON LINE | → | TOF | → | L   Q | → | L   F | →

(Increment function No. 01 to 13)　　(Menu select mode)　　(Decrement menu No. 02 to 01)　　(Function select mode)　　(Increment function No. 13 to 15)

| ON LINE | → | TOF | → | L   Q | → | L   Q |

(Menu select mode)　　(Decrement menu No. 02 to 01)　　(Function select mode)　　(End setting change)
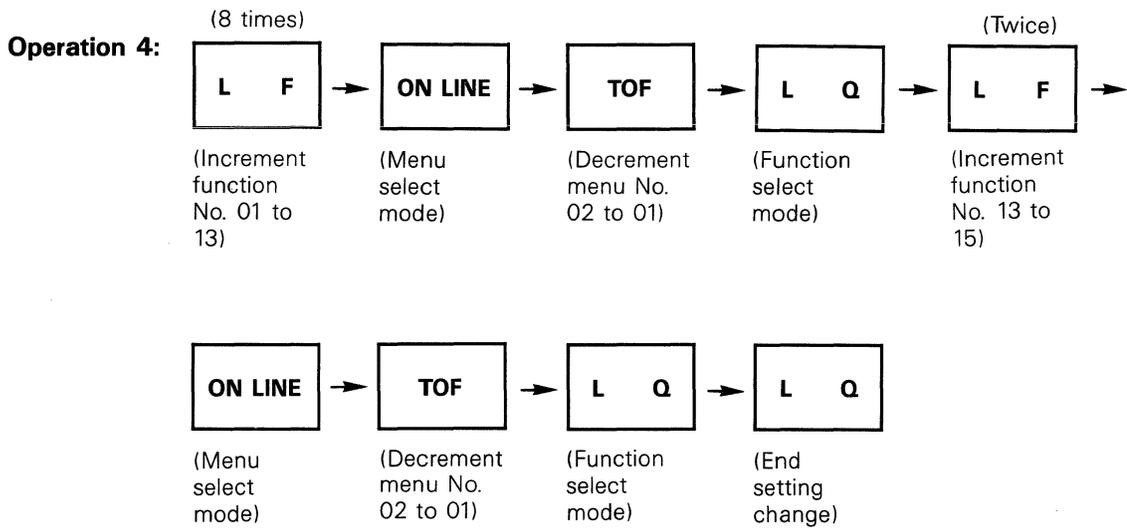
Check:　　Perform Operation 3 again to confirm the above changes. After you have confirmed the changes, push the ⎡LQ⎤ switch or turn the printer off and then on to leave the set-up mode.

3.3 Set-up Mode Table

The menu numbers, functions and contents in the set-up mode are listed in the table below.

☆: Shows the defoult setting

Function No.	Function	Menu No.	Content
00	Reset command selection	☆ 01 02	ESC c 1 ESC c
01	Form length	01 02 03 04 05 06 07 08 ☆ 09 10 11 12	3 inches 3.5 inches 4 inches 5.5 inches 6 inches 7 inches 8 inches 8.5 inches 11 inches 12 inches 14 inches 15 inches
02	Line spacing	☆ 01 02	1/6" Line spacing 1/8" Line spacing
03	Character pitch	☆ 01 02 03 04	10 CPI (80 DPI) 12 CPI (96 DPI) 17 CPI (136 DPI) Proportional
04	Change Function of LQ switch	☆ 01 02	Selection of LQ Selection of NLQ
05	Sound buzzer	☆ 01 02	Yes No
06[*1]	LQ CG selection	01 ☆ 02	Built-in CG Cassette CG
11	Receive buffer	01 ☆ 02	1 line buffer method N line buffer method
12	Data bits	01 ☆ 02	7 bit code 8 bit code
13	Selection at power on time	☆ 01 02	On line Off line
14	Print direction	☆ 01 02 03	Bidirectional[*2] Bidirectional[*3] Unidirectional
15	LF or NON-LF at buffer full	☆ 01 02	LF NON-LF
16	PE Detection	☆ 01 02	Valid Invalid
18	Type of Numeral ZERO	☆ 01 02	0 ∅

Function No.	Function	Menu No.	Content	
19	Selection of character set	01	JA	(Japanese)
		02	FR	(French)
		☆ 03	US	(American)
		04	UK	(British)
		05	GE	(German)
		06	SW	(Swedish)
		07	IT	(Italian)
		08	SP	(Spanish)
		09	DN	(Danish)
		10	NOR	(Norwegian)
		11	NET	(Netherlandish)
		12	AF	(African)
		13	US	(American)
		14	FRC	(French Canada)
		15	FRII	(French II)
		16	UKII	(British II)
21	Print command code	01	CR only	
		☆ 02	CR, LF, VT, FF, US	
22	CR Function	☆ 01	CR	
		02	CR + LF	
23	CAN code	☆ 01	Valid	
		02	Invalid	
24	Processing of DC1/DC3	☆ 01	Valid	
		02	Invalid	
25	Processing of SO/SI	☆ 01	Valid	
		02	Invalid	
26	Processing of FF code	☆ 01	FF Operation	
		02	LF Operation	
		03	Ignored	
27	Selection of VT setting	☆ 01	Set every 1"	
		02	Set every line	
41	Selection of expanded CG RAM	☆ 01		
		02	Refer to page 3-15	
		03		
		04		
61	Selection of auto sheet feeder	01		
		☆ 02	ASF310	

*1 : Valid only when a cassette is installed.

*2 : Excluding the bit image and CG graphic modes.

*3 : Excluding the CG graphic modes.

41 Selection of expanded CG RAM

Menu No.		STD	* OPTION
01	Data Buffer	2K Byte	10K Byte
	Down Load Buffer	—	—
02	Data Buffer	1K Byte	2K Byte
	Down Load Buffer	DP 95 characters	DP 95 characters LQ 95 characters
03	Data Buffer	1K Byte	2K Byte
	Down Load Buffer	DP 95 characters	DP 190 characters
04	Data Buffer	1K Byte	1K Byte
	Down Load Buffer	DP 95 characters	LQ 128 characters

Note: Character code is below.
  95 characters: 32 ~ 126 (20)H ~ (7E)H
128 characters: 32 ~ 126 (20)H ~ (7E)H
                160 ~ 192 (A0)H ~ (C0)H
190 characters: 32 ~ 126 (20)H ~ (7E)H
                160 ~ 255 (A0)H ~ (FE)H

* OPTION RAM (8K Bytes) is required.

Function numbers 81 to 96 are for serial printers only.

Function No.	Function	Menu No.	Content
81	Data processing after deselection by the ON-LINE switch.	☆ 01 02	Receive all input data even in DESELCT state Receive data for 350ms after DESELCT and ignore following data
82	Selection of Valid/Invalid DSR	01 ☆ 02	Valid Invalid
83	Selection Timing of RTS	☆ 01 02	Will be fixed at a high level while in SELECT mode. (Can be used for distinguishing SELECT/DESELECT) Syncronize it with DTR. (Can be used as RDY/BSY signal)
84	Validity of CD.	01 ☆ 02	Valid Invalid
85	Selection of CTS	01 ☆ 02	Valid Invalid
86[*1]	Selection of SD or CER	☆ 01 02	SD CER

91	OVER RUN
	  BUFFER TYPE
	  (READY/BUSY)
	  (XON/XOFF)
		☆ 01
		02
		03
		04
			20 bytes—busy 100 bytes—ready
			256 bytes—busy 336 bytes—ready
			512 bytes—busy 592 bytes—ready
			1024 bytes—busy 1104 bytes—ready[*2]

92	Selection of 7 bit or 8 bit data	01 ☆ 02	7 bit 8 bit
93	Protocol	☆ 01 02 03	RDY/BSY (LOW)[*3] RDY/BSY (HIGH)[*4] XON/XOFF
94	Stop Bit	☆ 01 02	1 bit 2 bit
95	Parity Bit	01 02 ☆ 03 04	No parity Odd parity Even parity Ignore parity
96	Baud Rate	01 02 03 ☆ 04 05 06 07 08	9600 BPS 4800 BPS 2400 BPS 1200 BPS 600 BPS 300 BPS 200 BPS 110 BPS

*1 Although menu No. 02 (CER) of Function No. 86 may be set, menu No. 01 (SD) will actually be set internally if Function No. 93 is set to menu No. 03 (X ON/X OFF Protocol).

Note: Selection of the porality of CER

*3 ⎍ Low (CER)

*4 ⎍ High (CER)
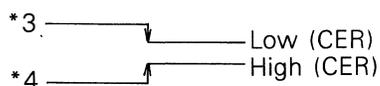
*2 When the capacity of the receive buffer is set to 1K byte by Function No. 41, the over run buffer operates as stated in Function 91, Menu No. 03.

3.4 Explanation of Function & Menu

The items set in the Set-up mode become active when the power is turned ON or when the printer is reset. Some sequences among those can be changed. While the power is ON, send the ESC codes to change the printer status.

— Five most frequently used Functions —

Function No.	Menu No.	Explanation	Override command
00	01,02	Select printer command. The reception of ESC c 1 resets the printer when Menu No. is 01. The reception of ESC c resets the printer when Menu No. is 02.	
01	01~12	Sets page length. The length from 3″ to 15″ is specified according to Menu No.	ESC v
02	01,02	Sets line spacing. The line spacing of 1/6″ or 1/8″ by LF command or buffer full is specified according to the Menu No.	ESC A ESC B ESC T (n)
03	01~04	Selects character pitch. The character pitch (10, 12, 17 and proportional) is specified according to the Menu No.	ESC n, ESC q ESC e, ESC p ESC N, ESC Q ESC E, ESC P
04	01,02	Sets the printing quality selected by the LQ switch on the front panel. The LQ mode is selected by depressing the LQ switch when Menu No. is 01. Pressing the LQ switch selects the LQ or NLQ characters when the LQ lamp is lit.	ESC m 0 ESC m 1 ESC m 2
05	01,02	Determines whether the internal buzzer sounds or not. The buzzer sounds (active) when Menu No. is 01, no sound (inactive) when Menu No. 02.	

— Others —

Function No.	Menu No.	Explanation	Override command
06	01,02	Selects LQ CG. These specifications are effective only when the optional CG cassette is installed. The built-in LQ CG is active when Menu No. is 01. The CG cassette is active when Menu No. is 02.	ESC ~0 ESC ~2
11	01,02	Selects the type of data buffer. The buffer capacity is 1 line when Menu No. is 01. The buffer receives data line by line. The buffer capacity is N lines when Menu No. is 02. The buffer can receive a large amount of data from the host computer at once.	
12	01,02	Selects 7-bit or 8-bit system. 7-bit system is selected when Menu No. is 01. 8-bit system is selected when Menu No. is 02.	
13	01,02	Selects the printer status when the power is turned ON or the printer is reset. ON LINE status is selected when Menu No. is 01, OFF LINE when Menu No. is 02.	
14	01~03	Selects print direction. Bidirectional print is selected (except bit image print) when Menu No. is 01. Bidirectional print is selected without exception when Menu No. is 02 CG Graphics are always printed unidirectionally. Unidirectional print is selected when Menu No. is 03. Even if ESC < code is received, bit image is printed out unidirectional as long as Menu No. 01 is selected.	ESC < ESC >

Function No.	Menu No.	Explanation	Override command
15	01,02	When Menu No. is 01, a LF is performed upon a buffer full condition. This prevents lines from being printed on top of each other. When Menu No. is 02, no LF is performed upon a buffer full condition therefore causing one line to be printed over the preceding line.	
16	01,02	Determines whether PE detection is effective or not. PE detection is effective when Menu No. is 01. Printing stops at 1 inch from the paper end. PE detection is ineffective when Menu No. is 02. Caution: Printing continues even if the paper becomes empty.	ESC O ESC o
18	01,02	Selects printing of the number 0 with or without a slash. 0 is selected when Menu No. is 01. ∅ is selected when Menu No. is 02.	
19	01~16	Selects the specified character set. The international character can be selected according to Menu No.	ESC D ESC Z
21	01,02	Determines which codes are assigned as printing command. The CR code is only used for printing function when Menu No. is 01. The CR, LF, VT, FF or US command is used for printing function when Menu No. is 02.	
22	01,02	Specifies the functions of CR. When Menu No. is 01, the CR code performs the following functions: printing command, carriage return. When Menu No. is 02, the CR code performs the following functions; printing command, carriage return, line feed.	
23	01,02	Selects whether the CAN code is effective or not. The CAN code is effective when Menu No. is 01. The CAN code is ineffective when Menu No. is 02.	
24	01,02	Determines whether the DC1/DC3 codes are valid or invalid. The DC1/DC3 codes becomes valid when Menu No. is 01. The DC1/DC3 codes becomes invalid when Menu No. is 02.	
25	01,02	Determines whether the SO/SI codes are valid or invalid. The SO/SI codes becomes valid when Menu No. is 01. The SO/SI codes becomes invalid when Menu No. is 02.	
26	01~03	Specifies the functions of the FF(0C)H code. The reception of FF performs the normal TOF when Menu No. is 01. The reception of FF performs the same operation as LF when Menu No. is 02. The reception of FF is ignored when Menu No. is 03.	
27	01,02	Determines the initial status of VT. VT is set every inch when Menu No. is 01. VT is set every line when Menu No. is 02. (VT performs the same operation as LF.)	

Function No.	Menu No.	Explanation	Override command
41	01~04	Starts or ends download setting. Refer to the below table.	
61	01,02	Selects the kind of ASF.	

Explanation detail table for Function No. 41:

Menu No.		STD	OPTION
01	Data Buffer	2K Byte	10K Byte
	Down Load Buffer	—	—
02	Data Buffer	1K Byte	2K Byte
	Down Load Buffer	DP 95 characters	DP 95 characters LQ 95 characters
03	Data Buffer	1K Byte	2K Byte
	Down Load Buffer	DP 95 characters	DP 190 characters
04	Data Buffer	1K Byte	1K Byte
	Down Load Buffer	DP 95 characters	LQ 128 characters

CHAPTER 4
CONTROL CODES

This printer performs many actions apart from printing characters. These actions include paper movement, forms setting, and sounding the buzzer. The control codes are not printable characters, but provide a means of controlling the printer.

4.1 Function Codes

Code Name	Hex. Code	Dec. Code	Function	Ref. Page
EOT	04	4	END DOWNLOAD CHARACTER	4-2
BEL	07	7	BELL	4-3
BS	08	8	BACKSPACE	4-4
HT	09	9	HORIZONTAL TABULATION	4-5
LF	0A	10	LINE FEED	4-6
VT	0B	11	VERTICAL TABULATION	4-7
FF	0C	12	FORM FEED	4-8
CR	0D	13	CARRIAGE RETURN	4-9
SO	0E	14	SELECT DOUBLE WIDTH CHARACTER	4-10
SI	0F	15	RELEASE DOUBLE WIDTH CHARACTER	4-10
DC1	11	17	SELECT PRINTER	4-11
DC2	12	18		*
DC3	13	19	DESELECT PRINTER	4-11
DC4	14	20		*
CAN	18	24	CANCEL	4-12
ESC	1B	27	ESCAPE	4-13
GS	1D	29	GROUP SEPARATOR	4-14
RS	1E	30	RECORD SEPARATOR	4-14
US	1F	31	UNIT SEPARATOR	4-14

NOTE:*When Japanese 7-bit mode is active (Function No. 19 = Menu No. 01 and Function No. 12 = Menu No. 01); DC2, DC4, SO and SI have the following functions:

DC2 — Set Double Width mode
DC4 — Clear Double Width mode
SO — Choose Katakana characters
SI — Choose ASCII characters

EOT

Hex. code   (04)

Dec. code   (4)

EOT (End of Transmission) code terminates a download character. Downloading a character is described on page 5-26.

«Format»

Hex. data   **LPRINT CHR$ (&H4)**

Dec. data   **LPRINT CHR$ (4)**

BEL

Hex. code	(07)
Dec. code	(7)

The BEL code sounds the built-in buzzer.
When the printer receives a BEL code, the buzzer sounds for 0.1 sec.
This code will be ignored if Function No. 05 is set to 02.

«Format»

Hex. data	**LPRINT CHR$ (&H7)**
Dec. data	**LPRINT CHR$ (7)**

BS

Hex. code   **(08)**

Dec. code   **(8)**

The BS (Backspace) code moves the carriage one character space to the left. When the printer receives a BS code continuously, the backspacing will be performed all at one time.

«Format»

Hex. data   **LPRINT CHR$ (&H8)**

Dec. data   **LPRINT CHR$ (8)**

Example

Print "^" over "a" using BS code.
1. Print "a".
2. Send the BS code.
3. Print "^".

«Sample Program»

```
10 LPRINT "a";CHR$(8);"^"
```

«Printing»

HT

Hex. code   **(09)**

Dec. code   **(9)**

The HT (Horizontal Tabulation) code moves the carriage to the next horizontal tab position to the right of the current carriage position. If none are set, this code is ignored. To set tabs, refer to page 5-19.

«Format»

Hex. data   **LPRINT CHR$ (&H9)**

Dec. data   **LPRINT CHR$ (9)**

Example

Print "AAA", "BBB", "CCC", and "DDD" at horizontal tab locations.
1. Print "AAA".
2. Send one HT code and print "BBB".
3. Send one HT code and print "CCC".
4. Send two HT codes and print "DDD".
(When the printer is powered up, Tabs are automatically set every 8 columns.)

«Sample Program»

```
10 LPRINT "12345678901234567890123456789O
            1234567890"
20 LPRINT "AAA";CHR$(9);"BBB";CHR$(9);"CCC"
            ;CHR$(9);CHR$(9);"DDD"
```

«Printing»

```
12345678901234567890123456789O1234567890
AAA       BBB     CCC                 DDD
```

LF

Hex. code   (0A)

Dec. code   (10)

The LF (Line Feed) code moves the paper to the next printing line.
This code can also be a printing command depending on the setting of Function No. 21.
This code can move the paper either forward or reverse.

«Format»

Hex. data   **LPRINT CHR$ (&HA)**

Dec. data   **LPRINT CHR$ (10)**

Example   Print "AAA", "BBB", "CCC", and "DDD" with line feeding.

«Sample Program»

```
10 LPRINT "AAA";CHR$(10);"BBB";CHR$(10);"CCC"
;CHR$(10);"DDD"
```

«Printing»

```
AAA
BBB
CCC
DDD
```

VT

Hex. code	**(0B)**
Dec. code	**(11)**

The VT (Vertical Tabulation) code moves the paper to the next vertical tab positions set at Power ON or to predetermined vertical tab positions set in the VFU (refer to Appendix C).
When no vertical tabs are set below the current line the paper is fed to the next TOF position (next page's top of form).

«Format»

Hex. data   **LPRINT CHR\$ (&HB)**

Dec. data   **LPRINT CHR\$ (11)**

Example

Print "AAA", "BBB", "CCC", and "DDD" using the VT code.
1. Print "AAA".
2. Send one VT code and print "BBB".
3. Send one VT code and print "CCC".
4. Send two VT codes and print "DDD".

«Sample Program»

```
10 LPRINT "AAA";CHR$(11);"BBB";CHR$(11);"CCC"
           ;CHR$(11);CHR$(11);"DDD"
```

«Printing»

AAA

BBB

CCC

DDD

Reduction Percent (70%)

FF

Hex. code	(0C)
Dec. code	(12)

The FF (Form Feed) code feeds paper to the next top of form position (the first line of the next page).
This code can also be a printing command depending on the setting of function No. 21.

«Format»

Hex. data	**LPRINT CHR$ (&HC)**
Dec. data	**LPRINT CHR$ (12)**

Example

Print "TOF" and send FF code. Then print "TOF".
Function No. 01, Menu No. 01 Form Length 3 ".

«Sample Program»

```
10 LPRINT "              TOF             ";CHR$(12)
20 LPRINT "              TOF             "
```

«Printing»

_____ TOF _____

_____ TOF _____

Reduction Percent (85%)

CR

Hex. code	(0D)
Dec. code	(13)

The CR (Carriage Return) code prints any data received since the last print command and moves the next printing position to the left margin position.

«Format»

Hex. data	**LPRINT CHR$ (&HD)**
Dec. data	**LPRINT CHR$ (13)**

Example

Print "AAAAAAAAA" by sending CR code.
Print "BBBBBBBBBB" and "CCCCCCCCC" by sending CR code.
Print "DDDDDDDDD" by sending CR code.

«Sample Program»

```
10 LPRINT "AAAAAAAAA";CHR$(13);CHR$(10);
20 LPRINT "BBBBBBBBBB";
30 LPRINT "CCCCCCCCC";CHR$(13);CHR$(10);
40 LPRINT "DDDDDDDDD"
```

«Printing»

```
AAAAAAAAA
BBBBBBBBBBCCCCCCCCC
DDDDDDDDD
```

	SO	SI
Hex. code	(0E)	(0F)
Dec. code	(14),	(15)

The SO code causes all subsequent characters to be Double width.
The SI code ends the Double width print mode.

«Format»

(SO) Hex. data	**LPRINT CHR$ (&HE)**
Dec. data	**LPRINT CHR$ (14)**
(SI) Hex. data	**LPRINT CHR$ (&HF)**
Dec. data	**LPRINT CHR$ (15)**

Example

Print "ABC" and send SO code. Then print "DEF". Send SI code and print "GHI".

«Sample Program»

```
10 LPRINT "ABC";CHR$(14);"DEF";CHR$(15);"GHI"
```

«Printing»

ABC**DEF** GHI

DC1/DC3 Code Device Control 1 and 3

	DC1	DC3
Hex. code	(11)	(13)
Dec. code	(17),	(19)

The DC1/DC3 codes control ON LINE/OFF LINE status from the host computer.

When the printer is OFF LINE, receipt of the DC1 code will place the printer ON LINE. When the printer is ON LINE, receipt of the DC3 code will place the printer OFF LINE.

However, if the printer is OFF LINE because of error, you must clear the error before sending the DC1 code.

These codes are ignored when Function 24 is set to menu 02.

«Format»

(DC1) Hex. data	LPRINT CHR$ (&H11)
Dec. data	LPRINT CHR$ (17)
(DC3) Hex. data	LPRINT CHR$ (&H13)
Dec. data	LPRINT CHR$ (19)

CAN

Hex. code	**(18)**
Dec. code	**(24)**

The CAN (Cancel) code clears all printable data received since last print command. It does not cancel any function code which has been received.

«Format»

Hex. data   **LPRINT CHR$ (&H18)**

Dec. data   **LPRINT CHR$ (24)**

Example

Send "ABCDEF" and CAN code. Then send "GHIJKL".

«Sample Program»

```
10 LPRINT "ABCDEF";
20 LPRINT CHR$(24);
30 LPRINT "GHIJKL"
```

«Printing»

```
GHIJKL
```

ESC

Hex. code   **(1B)**

Dec. code   **(27)**

ESC (Escape) code starts multiple character function codes. This code is always followed by one or more additional codes.

«Format»

Hex. data   **LPRINT CHR$ (&H1B)**

Dec. data   **LPRINT CHR$ (27)**

	GS	RS	US
Hex. code	(1D)	(1E)	(1F)
Dec. code	(29)	(30)	(31)

GS (Group Separator) code starts the VFU setting.

RS (Record Separator) code ends the VFU setting.

US (Unit Separator) code sets the vertical tab according to the VFU setting.

The US code can also be used for setting codes for multiple line feeds (N line feed, N=1~15).

A US code is used to tab to a specific setting on an assigned channel.(i.e, US code must be followed by the VFU channel number.)

A VT code will tab to the next established vertical tab. No further modification of the VT code is required. The detailed explanations of each code are included in the VFU explanation (see Appendix C).

CHAPTER 5
ESCAPE CODES:
FUNCTION CODES

Escape codes are used to select functions or
parameters of the printer. They are identified by
starting with the Escape Control Code (1BHex).
The data following consist of 1 or more ASCII
characters.

5.1 Expanded Function Codes

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Printing Direction	ESC >	1B 3E	27 62	Unidirectional Print	5-3
	ESC <	1B 3C	27 60	Bidirectional Print	5-3
Printing Quality	ESC m0	1B 6D 30	27 109 48	DP Mode	5-4
	ESC m1	1B 6D 31	27 109 49	NLQ Mode	5-4
	ESC m2	1B 6D 32	27 109 50	LQ Mode	5-4
Character Pitch	ESC n	1B 6E	27 110	9 CPI (Elongated)	5-5
	ESC N	1B 4E	27 78	10 CPI (Pica)	5-5
	ESC E	1B 45	27 69	12 CPI (Elite)	5-5
	ESC e	1B 65	27 101	13.4 CPI (Condensed 3)	5-5
	ESC q	1B 71	27 113	15 CPI (Condensed 2)	5-5
	ESC Q	1B 51	27 81	17 CPI (Condensed 1)	5-5
	ESC p	1B 70	27 112	18 CPI (Condensed 0)	5-5
	ESC P	1B 50	27 80	Proportional	5-5
Character Set (7 bit mode) Down Loaded Character Set	ESC $	1B 24	27 36	Alphanumeric/Symbol Mode	5-7
	ESC &	1B 26	27 38	Greek Mode	5-7*
	ESC #	1B 23	27 35	CG Graphics Mode	5-7
	ESC '	1B 27	27 39	Expanded CG RAM Designation Mode	5-7
	ESC *	1B 2A	27 42	Expanded CG RAM Designation Mode (7-bit mode only)	5-7

Note * When Japanese 7-bit mode is active (Function No. 19 = Menu No. 01 and Function No. 12 = Menu No. 01); ESC & selects Hiragana Character mode.

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Line Feed Direction	ESC f	1B 66	27 102	Forward Line Feed Mode	5-9
	ESC r	1B 72	27 114	Reverse Line Feed Mode	5-9
Line Feed Spacing	ESC A	1B 41	27 65	1/6″ Line Feed	5-10
	ESC B	1B 42	27 66	1/8″ Line Feed	5-10
	ESC T	1B 54	27 84	n/144″ Line Feed	5-10
Left/Right Margin Setting	ESC L	1B 4C	27 76	Set Left Margin	5-11
	ESC /	1B 2F	27 47	Set Right Margin	5-12
Dot Corresponding Graphics Mode	ESC G (n)	1B 47 (n)	27 71 (n)	Graphics Mode	5-13
	ESC S (n)	1B 53 (n)	27 83 (n)	Graphics Mode	5-13
	ESC g (n)	1B 67 (n)	27 103 (n)	Graphics Mode (Byte)	5-14
Dot Spacing	ESC (n) n = 1-6	1B (n) n = 31-36	27 (n) n = 49-54	1-6 Dot Spacing (For use with proportional spacing only)	5-15
Repeat Control	ESC R (n)	1B 52 (n)	27 82 (n)	Repeat Characters	5-16
	ESC V (n)	1B 56 (n)	27 86 (n)	Repeat 8 Bit Dot Column	5-17
	ESC F (n)	1B 46 (n)	27 70 (n)	Dot Space Tabulation	5-18
Horizontal Tabulation	ESC (	1B 28	27 40	Set Horizontal Tab Position	5-19
	ESC)	1B 29	27 41	Clear Some Positions	5-19
	ESC 0	1B 30	27 48	Initialization	5-19
VFU	ESC v	1B 76	27 118	Set VFU Positions	5-21
Horizontal Dot Spacing	ESC %0	1B 25 30	27 37 48	60 DPI	5-24
	ESC %1	1B 25 31	27 37 49	72 DPI	5-24
	ESC %2	1B 25 32	27 37 50	80 DPI	5-24
	ESC %3	1B 25 33	27 37 51	96 DPI	5-24
	ESC %4	1B 25 34	27 37 52	107 DPI	5-24
	ESC %5	1B 25 35	27 37 53	120 DPI	5-24
	ESC %6	1B 25 36	27 37 54	136 DPI	5-24
	ESC %7	1B 25 37	27 37 55	144 DPI	5-24
	ESC %8	1B 25 38	27 37 56	160 DPI	5-24
	ESC %9	1B 25 39	27 37 57	240 DPI	5-24
Download	ESC @	1B 40	27 64	CG Load	5-26
	ESC u	1B 75	27 117	CG Copy	5-26

ESC >, ESC < Code Set Printing Direction

	ESC >	**ESC <**
Hex. code	(1B), (3E)	(1B), (3C)
Dec. code	(27), (62)	(27), (60)

These codes select whether the printer prints unidirectional or bidirectional. ESC > selects unidirectional printing and ESC < selects bidirectional printing. The printing mode at Power ON is set by Function No. 14.
Bidirectional printing in Bit Image mode can be prevented by setting Function No. 14 to menu No. 01 or 03.
Bidirectional printing is set at power ON; unidirectional printing is for more accurate positioning during text printing for one line only.

«Format»

ESC >

Hex. data   LPRINT CHR$ (&H1B); ">"

Dec. data   LPRINT CHR$ (27); ">"

ESC <

Hex. data   LPRINT CHR$ (&H1B); "<"

Dec. data   LPRINT CHR$ (27); "<"

	ESC m0	**ESC m1**	**ESC m2**
Hex. code	(1B),(6D),(30)	(1B),(6D),(31)	(1B),(6D),(32)
Dec. code	(27), (109), (48)	(27), (109), (49)	(27), (109), (50)

These codes select DP, NLQ or LQ mode.
ESC m0 selects DP (Data Processing) mode.
DP mode prints at a high-speed of Max. 300 cps.
ESC m1 selects NLQ mode.
NLQ mode performs prints at 50 cps.
ESC m2 selects LQ (Letter Quality) mode.
LQ mode prints with improved character quality at 33 cps.

«Format»

ESC m0

Hex. data	LPRINT CHR$ (&H1B); "m0"
Dec. data	LPRINT CHR$ (27); "m0"

ESC m1

Hex. data	LPRINT CHR$ (&H1B); "m1"
Dec. data	LPRINT CHR$ (27); "m1"

ESC m2

Hex. data	LPRINT CHR$ (&H1B); "m2"
Dec. data	LPRINT CHR$ (27); "m2"

Example

Print the alphabet in DP mode, NLQ mode, and LQ mode.

«Sample Program»

```
10 LPRINT CHR$(27);"m0";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
20 LPRINT CHR$(27);"m1";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
30 LPRINT CHR$(27);"m2";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
```

«Printing»

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

	ESC n	**ESC N**
Hex. code	(1B), (6E)	(1B), (4E)
Dec. code	(27), (110)	(27), (78)

	ESC E	**ESC e**
Hex. code	(1B), (45)	(1B), (65)
Dec. code	(27), (69)	(27), (101)

	ESC q	**ESC Q**
Hex. code	(1B), (71)	(1B), (51)
Dec. code	(27), (113)	(27), (81)

	ESC p	**ESC P**
Hex. code	(1B), (70)	(1B), (50)
Dec. code	(27), (112)	(27), (80)

These codes select the character pitch.
Character pitch selections are as follows:

ESC n	9	CPI	(Elongated)
ESC N	10	CPI	(Pica)
ESC E	12	CPI	(Elite)
ESC e	13.4	CPI	(Condensed 3)
ESC q	15	CPI	(Condensed 2)
ESC Q	17	CPI	(Condensed 1)
ESC p	18	CPI	(Condensed 0)
ESC P	Variable		(Proportional)

The character pitch at Power ON and Printer Reset is determined by Function
No. 03.

«Format»

ESC n

Hex. data	LPRINT CHR$ (&H1B); "n"
Dec. data	LPRINT CHR$ (27); "n"

ESC N

Hex. data	LPRINT CHR$ (&H1B); "N"
Dec. data	LPRINT CHR$ (27); "N"

ESC E

Hex. data	LPRINT CHR$ (&H1B); "E"
Dec. data	LPRINT CHR$ (27); "E"

ESC e

Hex. data	LPRINT CHR$ (&H1B); "e"
Dec. data	LPRINT CHR$ (27); "e"

ESC q

Hex. data	LPRINT CHR$ (&H1B); "q"
Dec. data	LPRINT CHR$ (27); "q"

ESC Q

Hex. data	LPRINT CHR$ (&H1B); "Q"
Dec. data	LPRINT CHR$ (27); "Q"

ESC p

Hex. data	LPRINT CHR$ (&H1B); "p"
Dec. data	LPRINT CHR$ (27); "p"

ESC P

Hex. data	LPRINT CHR$ (&H1B); "P"
Dec. data	LPRINT CHR$ (27); "P"

Example   Print the alphabet in all character pitches.

«Sample Program»

```
10 LPRINT CHR$(27);"n";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
20 LPRINT CHR$(27);"N";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
30 LPRINT CHR$(27);"E";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
40 LPRINT CHR$(27);"e";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
50 LPRINT CHR$(27);"q";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
60 LPRINT CHR$(27);"Q";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
70 LPRINT CHR$(27);"p";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
80 LPRINT CHR$(27);"P";"ABCDEFGHIJKLMNOPQRSTUVWXYZ"
```

«Printing»

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

Reduction Percent (70%)

	ESC $	ESC &	ESC #
Hex. code	(1B), (24)	(1B), (26)	(1B), (23)
Dec. code	(27), (36)	(27), (38)	(27), (35)

	ESC '	ESC *
Hex. code	(1B), (27)	(1B), (2A)
Dec. code	(27), (39)	(27), (42)

These codes select the character set to be printed.
After receipt of ESC $ code in 7-bit mode, 20H-5FH of ASCII codes will print the alphanumeric/symbols (Standard ASCII).
After receipt of the ESC & code, 20H-5FH of ASCII codes will print the Greek characters.
After receipt of the ESC # code, 20H-5FH of ASCII codes will print the CG graphics characters.
When ESC ' code is received in the 7-bit and 8-bit modes, the expanded CG RAM area is selected. When the ESC * code is received in the 7-bit mode, the expanded CG RAM high area (codes A0~FE) is selected. (The ESC * code is ignored in the 8-bit mode).
For ESC ' and ESC *, see the download description on page 5-26.

«Format»

ESC $

Hex. data   **LPRINT CHR$ (&H1B); "$"**

Dec. data   **LPRINT CHR$ (27); "$"**

ESC &

Hex. data   **LPRINT CHR$ (&H1B); "&"**

Dec. data   **LPRINT CHR$ (27); "&"**

ESC #

Hex. data   **LPRINT CHR$ (&H1B); "#"**

Dec. data   **LPRINT CHR$ (27); "#"**

Example   Print 20(HEX)-5F(HEX) of ASCII code in each mode.

«Sample Program»

```
10 LPRINT CHR$(27);"$";
20 GOSUB 100
30 LPRINT CHR$(27);"&";
40 GOSUB 100
50 LPRINT CHR$(27);"#";
60 GOSUB 100
70 END
80 '
100 FOR I=&H20 TO &H5F
110 LPRINT CHR$(I);
120 NEXT I
130 LPRINT
140 RETURN
```

«Printing»

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
αβγδεςηθικλμνξοπρστυσχψωΓΣΛΩΦ
```

	ESC f	ESC r
Hex. code	(1B), (66)	(1B), (72)
Dec. code	(27), (102)	(27), (114)

ESC f selects forward line feed and ESC r selects reverse line feed.
If the printer has reverse line feed selected, the front panel line feed switch will cause paper to move forward.
When reverse feed is to be used, either friction feed or push pin feed must be used to prevent paper jamming.

«Format»

ESC f

Hex. data	LPRINT CHR$ (&H1B); "f"
Dec. data	LPRINT CHR$ (27); "f"

ESC r

Hex. data	LPRINT CHR$ (&H1B); "r"
Dec. data	LPRINT CHR$ (27); "r"

Example

Print Nos. from 1 to 5.
Print EEE-AAA with reverse line feed.
Print END next to No. 5 with forward line feed.

«Sample Program»

```
10 FOR I=&H31 TO &H35
20 LPRINT CHR$(I)
30 NEXT I
40 LPRINT CHR$(27);"r"
50 LPRINT "   EEE"
60 LPRINT "   CCC"
70 LPRINT "   BBB"
80 LPRINT "   BBB"
90 LPRINT "   AAA"
100 LPRINT CHR$(27);"f"
110 LPRINT
120 LPRINT
130 LPRINT
140 LPRINT
150 END
```

«Printing»

```
1   AAA
2   BBB
3   BBB
4   CCC
5   EEE
```

ESC A | ESC B

	ESC A	**ESC B**
Hex. code	(1B), (41)	(1B), (42)
Dec. code	(27), (65)	(27), (66)

ESC T (n)

Hex. code	(1B), (54) (n1 n2)	n1 n2 = 00-99
Dec. code	(27), (84), (n1 n2)	n1 n2 = 00-99

These codes set the line feed spacing.
ESC A selects 1/6″ line feed, or 6LPI and ESC B selects 1/8″ line feed or 8 LPI.
ESC T (n) selects n/144″ line feed.
n is a two-digit decimal number. To set 10/144″ line feed, n1 = 1 and n2 = 0 (31H 30H or 49 48).

«Format»

ESC A

Hex. data	LPRINT CHR$ (&H1B); "A"
Dec. data	LPRINT CHR$ (27); "A"

ESC B

Hex. data	LPRINT CHR$ (&H1B); "B"
Dec. data	LPRINT CHR$ (27); "B"

ESC T (n)

Hex. data	LPRINT CHR$ (&H1B); "Tn1n2"
Dec. data	LPRINT CHR$ (27); "Tn1n2"

Example

Select 1/6″ line feed and print "ABCDEFG".
After a line feed is performed, select 1/8″ line feed and print "ABCDEFG".
After line feed, select 14/144″ line feed and print "ABCDEFG".
After line feed, select 48/144″ and print "ABCDEFG" three times.

«Sample Program»

```
10 LPRINT CHR$(27);"AABCDEFG"
20 LPRINT CHR$(27);"BABCDEFG"
30 LPRINT CHR$(27);"T14ABCDEFG"
40 LPRINT CHR$(27);"T48ABCDEFG"
50 LPRINT "ABCDEFG"
60 LPRINT "ABCDEFG"
```

«Printing»

```
ABCDEFG
ABCDEFG
ABCDEFG
ABCDEFG

ABCDEFG

ABCDEFG
```

Reduction Percent (70%)

ESC L (n)

Hex. code	(1B), (4C), (n1 n2 n3) n1 n2 n3 = 000-XXX
Dec. code	(27), (76), (n1 n2 n3) n1 n2 n3 = 000-XXX

The ESC L (n) code sets the left margin position.

When the left margin position is set by this code, the preset left margin position is cleared.

Left margin is cleared when the power switch is tuned OFF.

n1n2n3 is a three-digit decimal number that corresponds to a character column position in the current pitch.

To set the left margin position at 20, n1n2n3 will be 0 2 0 (30Hex 32Hex 30Hex or 48 50 48).

This code sets the left margin position in the current character pitch. So, if the character pitch is changed after margin setting, the left margin will not be changed.

«Format»

ESC L (n)

Hex. data	LPRINT CHR$ (&H1B); "Ln1n2n3"
Dec. data	LPRINT CHR$ (27); "Ln1n2n3"

Example

Print "12345678901234567890".
Set the left margin position at 10th column.
Print "ABCDEFGHI".
Set the left margin position at 0 column.
Print "ABCDEFGHI".

«Sample Program»

```
10 LPRINT "12345678901234567890"
20 LPRINT CHR$(27);"L010ABCDEFGHI"
30 LPRINT CHR$(27);"L000ABCDEFGHI"
```

«Printing»

```
12345678901234567890
          ABCDEFGHI
ABCDEFGHI
```

ESC / (n)

Hex. code	(1B), (2F), (n1 n2 n3) n1 n2 n3 = 000-XXX
Dec. code	(27), (47), (n1 n2 n3) n1 n2 n3 = 000-XXX

The ESC / (n) code sets the right margin position.

When the right margin position is set by this code, the preset right margin position is cleared.

Right margin is cleared when the power switch is turned OFF.

n1n2n3 is a three-digit decimal number.

To set the left margin position at 20, n1 = 0, n2 = 2, and n3 = 0 (30Hex 32Hex 30Hex or 48 50 48).

This code sets the right margin position in the current character pitch. If the character pitch is changed after margin setting, the right margin will not be changed. In the proportional character pitch, the right margin is set as though pica pitch were in effect.

«Format»

ESC /(n)

Hex. data	**LPRINT CHR$ (&H1B); "/n1n2n3"**
Dec. data	**LPRINT CHR$ (27); "/n1n2n3"**

Example

Print "1234567890" seven times.
Set the right margin position at the 20th column.
Print "A" for 25 columns.
Set the right margin position at 80st column.
Print "H" for 25 columns.

«Sample Program»

```
10 FOR I=1 TO 7
20 LPRINT "1234567890";
30 NEXT I
40 LPRINT CHR$(27);"/020"
50 FOR K=1 TO 25
60 LPRINT "A";
70 NEXT K
80 LPRINT CHR$(27);"/080"
90 FOR J=1 TO 25
100 LPRINT "H";
110 NEXT J
```

«Printing»

```
1234567890123456789012345678901234567890123456789012345678901234567890
AAAAAAAAAAAAAAAAAAAA
AAAAA
HHHHHHHHHHHHHHHHHHHHHHHHH
```

Reduction Percent (70%)

ESC G (n)

Hex. code	(1B), (47), (n0 n1 n2 n3)	n0-n3 = 0000-XXXX
Dec. code	(27), (71), (n0 n1 n2 n3)	n0-n3 = 0000-XXXX

ESC S n0 n1 n2 n3

Hex. code	(1B), (53), (n0 n1 n2 n3)	n0-n3 = 0000-XXXX
Dec. code	(27), (83), (n0 n1 n2 n3)	n0-n3 = 0000-XXXX

The ESC G and ESC S codes select the dot graphics mode.
n0-n3 designates the number of dot columns you want to send. n0n1n2n3 is a four-digit decimal number. For example, to set 10, n0=0, n1=0, n2=1 and n3=0 (30Hex 30Hex 31Hex 30Hex or 48 48 49 48).
* ESC G and ESC S codes have the same function.

«Format»

ESC Gn0n1n2n3

Hex. data	LPRINT CHR$ (&H1B); "Gn0n1n2n3"
Dec. data	LPRINT CHR$ (27); "Gn0n1n2n3"

ESC Sn0n1n2n3

Hex. data	LPRINT CHR$ (&H1B); "Sn0n1n2n3"
Dec. data	LPRINT CHR$ (27); "Sn0n1n2n3"

Example

Designate 20 dot columns.
Print the following:

«Sample Program»

```
10 LPRINT CHR$(27);"G0020";
20 LPRINT CHR$(1);CHR$(3);CHR$(7);
   CHR$(&HF);CHR$(&H1F);CHR$(&H3F);CHR$(&H7F);
30 LPRINT STRING$(6,&HFF);
40 LPRINT CHR$(&HFE);CHR$(&HFC);CHR$(&HF8);
   CHR$(&HF0);CHR$(&HE0);CHR$(&HC0);CHR$(&H80)
```

«Printing»

ESC g (n)

Hex. code	(1B), (67),(n0 n1 n2) n0-n2 = 000-XXX
Dec. code	(27), (103), (n0 n1 n2) n0-n2 = 000-XXX

The ESC g code selects the dot corresponding graphics mode.
n0-n2 designate the number of dot columns you want to send. n0n1n2 is a three digit decimal number. For example, to set 10, n0=0, n1=1 and n2=0 (30Hex 31Hex 30Hex or 48 49 48). This code designates eight dot columns as a unit. Thus 010 means 80 dot columns.

«Format»

ESC g

Hex. data	LPRINT CHR$ (&H1B); "gn0n1n2"
Dec. data	LPRINT CHR$ (27); "gn0n1n2"

Example

Designate 16 dot columns.
Print the following:

«Sample Program»

```
10  LPRINT CHR$(27);"g002";
20  LPRINT CHR$(1);CHR$(3);CHR$(7);CHR$(&HF);
    CHR$(&H1F);CHR$(&H3F);CHR$(&H7F);CHR $(&HFF);
30  LPRINT CHR$(&HFF);CHR$(&H7F);CHR$(&H3F);
    CHR$(&H1F);CHR$(&HF);CHR$(7);CHR$(3);CHR$(1)
```

«Printing»   ▼

ESC n

Hex. code   (1B) n   n=1-6

Dec. code   (27) n   n=1-6

The ESC n code is valid only when the proportional mode is selected. This code sets dot spacing between characters. (n=1 to 6)
If more than a 6-dot space is required, repeat this code. This code is used to microspace a sentence to justify both left and right margins when printing text.
1-dot space is 1/120".

«Format»

ESC n

Hex. data   LPRINT CHR$ (&H1B); "n"

Dec. data   LPRINT CHR$ (27); "n"

Example   Print numbers from 1 through 6 with widening a dot space one by one.

«Sample Program»
```
10 LPRINT CHR$(27);"P";
20 FOR I=1 TO 6
30 LPRINT I;CHR$(27);CHR$(&H30+I);I
40 NEXT I
```

«Printing»
```
1  1
2  2
3  3
4  4
5  5
6  6
```

ESC R (n)

Hex. code   (1B), (52), (n0n1n2) (X)

Dec. code   (27), (82), (n0n1n2) (X)

The ESC R (n) code repeats the printing of the following character for the designated number of times. n0-n2 is the number of times you want to repeat. n1n2n3 is a three-digit decimal number. For example, to repeat a char. 20 times, n0=0, n1=2 and n2=0. The number will be 0 2 0 (30Hex 32Hex 30Hex or 48 50 48). X=The character to repeat.

«Format»

ESC Rn0n1n2

Hex. data   LPRINT CHR$ (&H1B); "Rn0n1n2"

Dec. data   LPRINT CHR$ (27); "Rn0n1n2"

Example   Print "A" 20 times by repeating.

«Sample Program»

```
10 LPRINT CHR$(27);"R020";"A"
```

«Printing»   AAAAAAAAAAAAAAAAAAAA

ESC V (n) (X)

Hex. code	(1B), (56), (n0n1n2n3)
Dec. code	(27), (86), (n0n1n2n3)

The ESC V (n) code repeats the printing of following 8 bit dot column data for the designated number of times.

n0-n3 is the number of times you want to repeat. n0n1n2n3 is a four-digit decimal number. For example, to repeat a byte of Col. data 100 times, n0=0, n1=1, n2=0 and n3=0. The number will be 0 1 0 0 (30Hex 31Hex 30Hex 30Hex or 48 49 48 48).

X=The dot column to repeat.

«Format»

ESC Vn0n1n2n3

Hex. data	LPRINT CHR$ (&H1B); "Vn0n1n2n3"
Dec. data	LPRINT CHR$ (27); "Vn0n1n2n3"

Example

```
LSB  • — 0
     • — 1
     • — 1    6
     • — 0
     ─────────
     • — 0        Repeat the printing of (E6) H 100 times
     • — 1    E
     • — 1
MSB  • — 1
```

«Sample Program»

```
10 LPRINT CHR$(27);"V0100";CHR$(&HE6)
```

«Printing»

ESC F (n)

Hex. code

(1B), (46), (n0 n1 n2 n3)

Dec. code

(27), (70), (n0 n1 n2 n3)

This code provides a space in units of dots. n0 to n3 following ESC F specify a space of dots. A 4-digit decimal number is put in n0 to n3. For example, to specify a space of 200 dots, code it as 0200 (30H, 32H, 30H, 30H or 48, 50, 48, 48). A space of dots is indicated by the number of dots starting at the current left margin position. Any designation to the left of the current carrier position will be ingored.

Listed below are horizontal pitches (character pitches) and the corresponding specifiable maximum dot spaces.

Horizontal Pitch (Character Pitch)	Specifiable Maximum Dot Space
60 DPI	479 Dots
72 DPI (9 CPI)	575 Dots
80 DPI (10 CPI)	639 Dots
96 DPI (12 CPI)	767 Dots
107 DPI (13.5 CPI)	855 Dots
120 DPI (15 CPI)	959 Dots
136 DPI (17 CPI)	1087 Dots
144 DPI (18 CPI)	1151 Dots
160 DPI (PROPORTIONAL)	1279 Dots
240 DPI	1919 Dots

«Format»

ESC F n0n1n2n3

Hex. data

LPRINT CHR$ (&H1B); "F n0n1n2n3"

Dec. data

LPRINT CHR$ (27); "F n0n1n2n3"

Example

The hyphen " - " is printed on the first line 30 times. A space of 200 dots is provided, followed by the print of "H", on the second line.

«Sample Program»

```
10 FOR I=1 TO 30
20 LPRINT "_";
30 NEXT I
40 LPRINT
50 LPRINT CHR$(27);"F0200";"HHHHH"
```

«Printing»

```
-----------------------------------------------------------------
                                              HHHHH
```

	ESC (	ESC)	ESC 0
Hex. code	(1B), (28)	(1B), (29)	(1B), (30)
Dec. code	(27), (40)	(27), (41)	(27), (48)

The ESC (, ESC) and ESC 0 codes set or clear the horizontal tab positions.
When ESC (code is received, the corresponding tab position is set.
The ESC) code clears each individual tab position.
ESC 0 clears all the tab positions.
A maximum of 32 tabs may be set in a single line.
The tab character pitch is set in the current character pitch. In the proportional pitch mode, the horizontal tab is set in the pica pitch.
If an incorrect setting is received, the horizontal tab positions are all cleared and return to the default setting. In the default setting, the horizontal tabs are set every 8 columns.

«Format»

ESC (

Hex. data	LPRINT CHR$ (&H1B); "("
Dec. data	LPRINT CHR$ (27); "("

ESC)

Hex. data	LPRINT CHR$ (&H1B); ")"
Dec. data	LPRINT CHR$ (27); ")"

ESC 0

Hex. data	LPRINT CHR$ (&H1B); "0"
Dec. data	LPRINT CHR$ (27); "0"

Example (1):

Set the horizontal tab positions at 1, 10, 15, and 20 columns. When setting, a comma (",") must be placed between the tab positions. And a period (".") must be placed after the last tab position.

«Sample Program»

```
10 FOR I=1 TO 3
20 LPRINT "1234567890";
30 NEXT I
40 LPRINT CHR$(27);"(005,010,015,020."
50 LPRINT "A";CHR$(9);"B";CHR$(9);"C";
          CHR$(9);"D";CHR$(9);"E"
```

«Printing»

```
12345678901234567890123456 7890
A    B    C    D    E
```

Example (2):

Clear the tab positions at 5 and 15 columns which set in Example 1.

«Sample Program»

```
10 FOR I=1 TO 3
20 LPRINT "1234567890";
30 NEXT I
40 LPRINT CHR$(27);")005,015."
50 LPRINT "A";CHR$(9);"B";CHR$(9);"C";
          CHR$(9);"D";CHR$(9);"E"
```

«Printing»

```
12345678901234567890123456 7890
A         B         CDE
```

Example (3):

Clear the remaining tab positions at 10 and 20 columns in Example 2.

«Sample Program»

```
10 FOR I=1 TO 3
20 LPRINT "1234567890";
30 NEXT I
40 LPRINT CHR$(27);"0"
50 LPRINT "A";CHR$(9);"B"
```

«Printing»

```
12345678901234567890123456 7890
A         B
```

ESC v

Hex. code	**(1B), (76)**
Dec. code	**(27), (118)**

This code programs the VFU. The four different settings can be executed by the characters following this code.
1. Set TOF position
2. Set page length
3. Set page length and bottom margin
4. Set page length, bottom margin and vertical tabulation

«Format»

ESC v

Hex. data	**LPRINT CHR$ (&H1B); "v"**
Dec. data	**LPRINT CHR$ (27); "v"**

Example (1):   Set the TOF positions at the current carriage position by ESC V code.

«Sample Program»
```
ABCDEF
ABCDEF
ABCDEF
ABCDEF
ABCDEF
```


```
ABCDEF
```


```
10 FOR I=1 TO 5
20 LPRINT "ABCDEF"
30 NEXT I
40 LPRINT CHR$(27);"v."
50 LPRINT CHR$(12)
60 LPRINT "ABCDEF"
```


Example (2):   Set the page length to 15 lines.

«Sample Program»
```
ABCDE
```


```
ABCDEF
```


```
10 LPRINT CHR$(27);"v15.";"ABCDE"
20 LPRINT CHR$(12)
30 LPRINT "ABCDEF"
```
                                    Reduction Percent (70%)

5-22

Example (3):

Set the page length to 15 lines and the bottom margin to 5 lines.

«Sample Program»

```
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
```

```
10 LPRINT CHR$(27);"v15,05";
20 FOR I=1 TO 15
30 LPRINT I
40 NEXT I
```

Example (4):

Set the page length to 15 lines, the bottom margin to 5 lines and set vertical tabs at line 5 and line 8.

«Sample Program»

```
ABC


DEF

GHI

JKL
```

```
10 LPRINT CHR$(27);"v15,05,05,08.";
20 LPRINT "ABC";CHR$(11);"DEF";CHR$(11);"GHI";CHR$(11);"JKL"
```

Reduction Percent (70%)

ESC % (n)

Hex. code   **(1B), (25) (n)**

Dec. code   **(27), (37) (n)**

The ESC % (n) code sets the horizontal dot density for the dot graphics mode. The value of n must be 0 to 9 and its corresponding function is listed in the following table.

Command	Hex. Code	Dec. Code	Function
ESC %0	1B 25 30	27 37 48	60 DPI
ESC %1	1B 25 31	27 37 49	72 DPI
ESC %2	1B 25 32	27 37 50	80 DPI
ESC %3	1B 25 33	27 37 51	96 DPI
ESC %4	1B 25 34	27 37 52	107 DPI
ESC %5	1B 25 35	27 37 53	120 DPI
ESC %6	1B 25 36	27 37 54	136 DPI
ESC %7	1B 25 37	27 37 55	144 DPI
ESC %8	1B 25 38	27 37 56	160 DPI
ESC %9	1B 25 39	27 37 57	240 DPI

* DPI in the above table means the horizontal dot density. The vertical dot density will be 72 DPI.

«Format»

ESC %n

Hex. data   LPRINT CHR$ (&H1B); "%n"

Dec. data   LPRINT CHR$ (27); "%n"

*n is a integral number in the range of 0 to 9.

Unless this code is used, the horizontal DPI in the dot corresponding graphics mode is set in the current character pitch as the table below.

Horizontal Pitch	Horizontal DPI	Vertical DPI	Dot Configuration
9 CPI	72	72	Full
10 CPI	80	72	Full
12 CPI	96	72	Full
13.4 CPI	107	72	Full
15 CPI	120	72	Full
17 CPI	136	72	Full
18 CPI	144	72	Full
Proportional	160	72	Full

5.2 Down Loading

   In this printer, down loading can be performed. It is convenient for the user to use the font which the user has prepared independently or to move the internal CG patterns to the expanded CG area and change a part of the font.

Entering the font which the user has independently prepared is generally called down loading. For down loading in this printer, two fonts; DP and LQ can be programmed.

Before performing this operation, a receive buffer is assigned to the expanded CG RAM area (for down loading). This assignment is carried out by means of Function No. 41 "RAM Area Selection."

5.2.1 ESC Code explanation Related to the Down Loading
   1) Load Expanded CG Character (Down Load)   ESC @
   2) Copy Built-in CG Area   ESC u
   3) Select Expanded CG RAM Area (Low)   ESC '
   4) Select Expanded CG RAM Area (High)   ESC *

5.2.1.1   ESC @ (n)
          When this code is received, DP or LQ characters are down loaded.

          ① (n)=1 [ESC @ 1]
             Down loading is carried out in DP mode.
             To load two or more characters at a time, code, length, space, and data are repeated and are finally followed by EOT.
             Up to 95 characters can be loaded and up to 190 characters with an 8K RAM installed (optional RAM).

          ② (n)=2 [ESC @ 2]
             Down loading is carried out in LQ mode.
             To load two or more characters at a time, code, length, space, and data are repeated, and are finally followed by EOT.
             If, however, there are characters with shorter lengths to be loaded, more than 95 characters can be entered (up to 190 characters).

5.2.1.2   ESC u
          When this code is received, the currently selected font is copied to the expanded CG RAM area. When any of the pica, elite and condensed (0, 1, 2, 3) pitches are selected, the pica (DP) font is copied and when the proportional mode is selected, the proportional font is copied.

5.2.1.3   ESC '
          When this code is received, the expanded CG RAM area is selected. In the case of 8-bit code, characters 20H to 7EH and A0H to FEH can be designated. In the case 7-bit code, characters 20H to 7EH can be designated.

5.2.1.4   ESC *
When this code is received in the case of 7-bit code, the expanded CG RAM (High) area is selected.
Characters A0H to FEH can be used as characters 20H to 7EH in a virtual manner.
If this code is used while 8-bit code is in effect, only normal ROM characters (not down loaded
characters) with codes 20H ~ FEH can be designated.

5.2.2 Expanded CG Character Load (Down Load)

This control code is ESC @, and is used to code and load the character patterns, which the user
prepared, into the expanded CG RAM area.
The parameters used in this control code are shown below.

- ESC @   : Down Load control code
- (n)   : Selection of DP (Data Processing Mode) or LQ (Letter Quality Mode)
                     For the detail of n values, see the page 5-26
- xx   : Selects the character code number to load
- nn   : Selects the character code length to load
- mm   : Selects the amount of space both preceding and following the character
                     to be downloaded
- dd1, dd2 ~ ddn   : Character data to load
- EOT   : Load Terminator code (end of text)

	E S C @ (n) xx nn mm dd1 dd2 ddnn E O T		
(n) :	Selection of DP or LQ	1	Byte
xx :	Code	1	Byte
nn :	Length	1	Byte
mm :	Space	1	Byte
dd1 dd2 dd3 :	Data	nn	Bytes

5.2.2.1   Length
Length is the length of data, combining the number of dot columns with descender control.
Firstly, the descender control flag is explained.

Some letters such as j and g have a part which descends below the main body of the letter, and
are called descending characters.

With this printer, the DP character is printed by a CG pattern with 7 vertical dots, and the LQ
character by a CG pattern with 13 vertical dots. On the other hand, the aforementioned charac-
ters are actually printed with 9 vertical dots in the case of DP, and with 17 vertical dots in the
case of LQ. Thus, before printing, the flags assigned to the 7th and 6th bits of length, determine
whether descending is carried out. Such flags are called descender control flags.
The following figure shows length; the number of horizontal dots of the actual pattern is as-
signed to bits 5 to 0, and descender control flags to bits 7 and 6.

```
  7   6   5   4   3   2   1   0
┌───┬───┬───┬───┬───┬───┬───┬───┐
│ 1 │ 1 │ 1 │ 0 │ 1 │ 0 │ 1 │ 0 │
└───┴───┴───┴───┴───┴───┴───┴───┘
```

No. of dot columns (000001 ~111111)
Hex &H01 ~&H3F
Decimal 1 ~63

Descender control flags
00   Normal
01   The entire word (character) descends by one dot in case of DP, and by two dots
      in case of LQ.
10   Not used.
11   When the 8th bit of the DP character pattern dot column is set or 16th bit of the
      LQ character pattern dot column is set, the dot column descends by two dots in
      case of DP, and by four dots in case of LQ.

5.2.2.2 Space

This defines the spaces preceding and following the character to be downloaded. A character
has 9 horizontal dots in the case of DP, and 27 horizontal dots in the case of LQ.
Such dots are followed by a space of 3 dots in the case of DP, and a space of n dots in the
case of LQ, to provide a space before the next character. Consequently, to down load a font
unique to the user, this space must also be considered except if a character is connected to the
next character such as in CG graphics.
Item 4) shows such an example.

It is not necessary to code the space as data in down loading.
Space is defined by one byte; the higher 4 bits define the preceding space, and the lower 4 bits
the following space.

Space Designation

```
┌───┬───┬───┬───┬───┬───┬───┬───┐
│ 7 │ 6 │ 5 │ 4 │ 3 │ 2 │ 1 │ 0 │
└───┴───┴───┴───┴───┴───┴───┴───┘
```

     Preceding   Following
       space   space
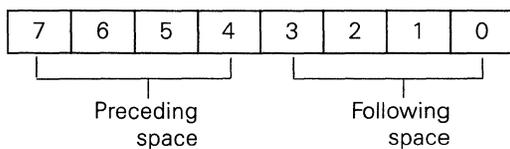
5.2.2.3 Data

This means data corresponding to each dot column of the character pattern to be loaded, and
is coded in hexadecimal or decimal notation.
The following figures show the relationship between dots and data representations.

5.2.2.4 Example of Down Loading
① Loading in the DP mode (No descender)
Character and data to load.

	0	0	0	1	1	1	0	0	

	1	2	3	4	5	6	7	8	9	10	11	12	
1			*		*								1
2		*				*							2
3	*						*						3
4	*												4
5	*				*		*		*				5
6		*					*						6
7			*		*		*						7
8													8
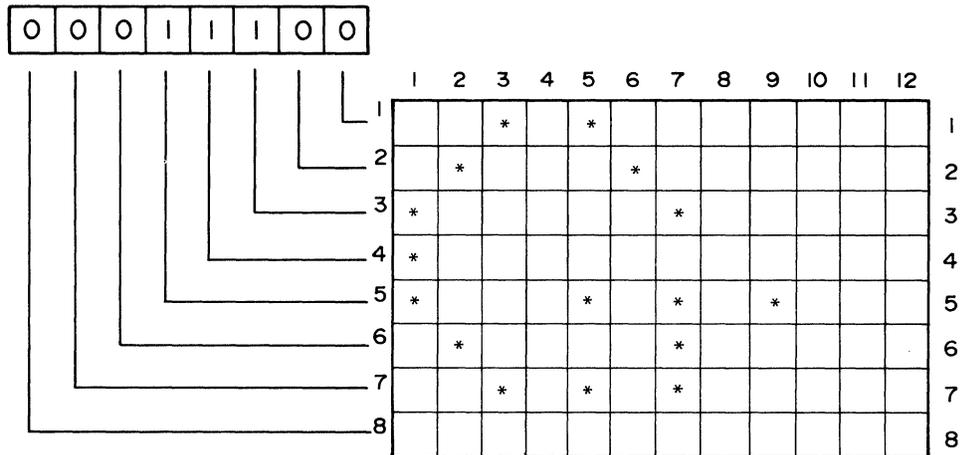
In loading the letter G as shown above, the data of each dot column (No. 1 ~ 12) corresponds to the vertical dots No. (1 ~ 8).
For example, the 1st dot column of data is &H1C in hexadecimal. The entire data of the dot column is shown below.

Dot column No.	—	1	2	3	4	5	6	7	8	9
DATA	—	IC	22	41	00	51	02	74	00	10

Character Length to load
The data length is 9 dot columns for the character to be loaded (which is not descending).
Then, the 1 data byte to indicate length is shown below (see next page).

```
Length        0   0   0   0   1   0   0   1      =&H09
              7   6   5   4   3   2   1   0
              └───┘   └───────┬───────────┘
                             └─────────────────────Data number 09
                  └──────────────────────────────Descender control flag
```

- **Character Space to load**

  In DP mode, a character is usually composed of 9 vertical dots, 9 horizontal dots, and a 3-dot space. The acount of space both preceding and following the character is specified by one byte as shown below. Usually the preceding space is set to 0 dots and the following space is set to 3 dots to provide space between characters. (In instances where two or more characters are to be connected, the following space should be set to 0 dots.)

```
0    0    0    0    0    0    1    1        =&H03
└─────────┬─────────┘ └─────────┬─────────┘
        space            following space
          0                     3
```

- **Loading Method**

  Loading in code No. 41H are shown as below.

```
ESC      @      1    (41)   (09)   (03)    (IC 22 41 00 51 02 74 00 10)    EOT
 ↓       ↓      ↓     ↓      ↓      ↓                                        ↓
(1B      40)    31    41     09     03     (IC 22 41 00 51 02 74 00 10)    04
└────┬────┘     │      │     │      │      └──────────────┬──────────────┘  │
  control      DP    code  length space          character data        End code
  code       selection number
```

The data in parentheses is hex.

② Loading in LQ mode (with descenders)
  • Character and data to load.
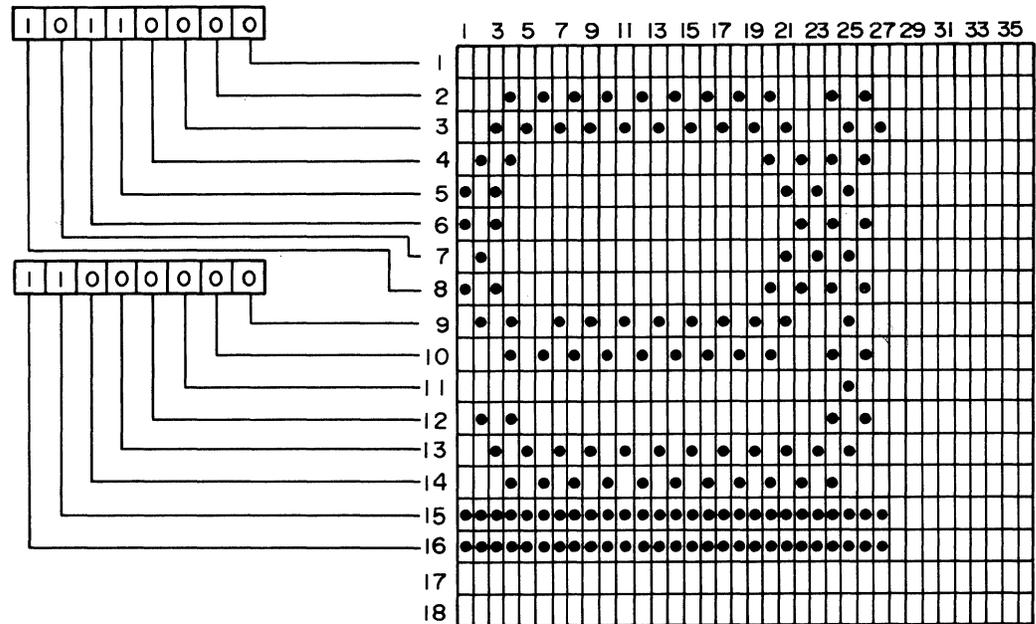
In loading an LQ character as shown in the figure above, each vertical dot column is made up of two bytes. For example, the data for the first dot column is:

FIRST Byte = B0 (HEX.)
SECOND Byte = C0 (HEX.)

Since the LQ character will descend below the base line of normal characters, vertical dots 15 and 16 of the dot columns are set to 1. This causes the dot columns (all the dot columns in this character) to be printed 4 dots lower than a normal character giving the appearance of a descending character.

- Character length to load.
  Since the character to be loaded is a descender and data length is 27 dots column, the data byte to indicate this information is shown below.

```
1   1   0   1   1   0   1   1      =&HDB
|___|   |_____|
  |                |
  |                |_____ Data byte number 27
  |_____ Descender control flag
```

- Character Space to load
  In LQ mode, a character is usually composed of 17 vertical dots, 27 horizontal dots, and a 9 dot (space). The amount of space both preceding and following the character is specified by one byte as shown below. Usually the preceding space is set to 0 dots and the following space is set to 9 dots to provide space between characters. (In instances where two or more characters are to be connected, the following space should be set to 0 dots.)

```
0   0   0   0   1   0   0   1      =&H09
|_____|   |_____|
        |                   |
 preceding space     following space
        0                   9
```

- Loading Method
  Loading in code No. 41H are as shown below.

```
ESC     @     2    (41)  (DB)  (09)   (DATA)                                    EOT
 ↓      ↓     ↓     ↓     ↓     ↓
1B      40    32    41    DB    09    B0C0   48C9   B4D0   0AEB   04D0           04
|___,___|     |     |     |     |     02E2   04D1   02E2   04D1   02E2
  Control     LQ    Code Length Space 04D1   02E2   04D1   02E2   04D1
  code     selection number                02E2   04D1   02E2   04D1   8AE2
                                           54D1   A8E0   50D0   AAEA   54D5
                                           AACA   04C0
                                           |_____,_____|
                                                          |
                                                   character data
```

The data in parentheses is hex.

CHAPTER 6
ESCAPE CODES:
CHARACTER
CONTROL CODES

Character control codes are Escape Codes that consists of two or more bytes and give variations to printed characters.

6.1 Character Control Codes

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Empha-sized Characters	ESC !	1B 21	27 33	Start Emphasized Character Printing	6-2
	ESC "	1B 22	27 34	End Emphasized Character Printing	6-2
Italic Characters	ESC i 1	1B 69 31	27 105 49	Start Italic Character Printing	6-3
	ESC i 0	1B 69 30	27 105 48	End Italic Character Printing	6-3
Underline	ESC X	1B 58	27 88	Start Underlining	6-4
	ESC Y	1B 59	27 89	End Underlining	6-4
Super/Subscript	ESC s 0	1B 73 30	27 115 48	End Super/Subscript Printing	6-5
	ESC s 1	1B 73 31	27 115 49	Start Superscript Printing	6-5
	ESC s 2	1B 73 32	27 115 50	Start Subscript Printing	6-5

	ESC !	ESC "
Hex. code	(1B), (21)	(1B), (22)
Dec. code	(27), (33)	(27), (34)

The ESC ! code causes subsequent characters to be printed in exphasized type. The ESC " code ends the emphasized character printing.

«Format»

ESC !

Hex. data	LPRINT CHR$ (&H1B); "!"
Dec. data	LPRINT CHR$ (27); "!"

ESC "

Hex. data	LPRINT CHR$ (&H1B); CHR$ (&H22)
Dec. data	LPRINT CHR$ (27); CHR$ (34)

Example

Print "ABCDEFG".
Start emphasized character printing and print "ABCDEFG".
End emphasized character printing and print "ABCDEFG" again.

Note: Due to limitations in BASIC, ESC " cannot be sent as ESC " " "; CHR$ (34) must be used in place of the quotation mark.

«Sample Program»

```
10 LPRINT "ABCDEFG";
20 LPRINT CHR$(27);"!ABCDEFG";
30 LPRINT CHR$(27);CHR$(34);"ABCDEFG"
```

«Printing»

ABCDEFGABCDEFGABCDEFG

	ESC i 1	**ESC i 0**
Hex. code	(1B), (69), (31)	(1B), (69), (30)
Dec. code	(27), (105), (49)	(27), (105), (48)

The ESC i 1 code causes subsequent characters to be printed in Italics.
The ESC i 0 code ends the Italic character printing.

«Format»

ESC i 1

Hex. data	LPRINT CHR$ (&H1B); "i 1"
Dec. data	LPRINT CHR$ (27); "i 1"

ESC i 0

Hex. data	LPRINT CHR$ (&H1B); "i 0"
Dec. data	LPRINT CHR$ (27); "i 0"

Example

Print 20H-4FH of ASCII code table.
Start the Italic character printing and print 20H-4FH.

«Sample Program»

```
10 FOR I=&H20 TO &H4F
20 LPRINT CHR$(I);
30 NEXT I
40 LPRINT CHR$(27);"i1"
50 FOR J=&H20 TO &H4F
60 LPRINT CHR$(J);
70 NEXT J
```

«Printing»

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
```

	ESC X	**ESC Y**
Hex. code	(1B), (58)	(1B), (59)
Dec. code	(27), (88)	(27), (89)

The ESC X code causes subsequent characters to be underlined.
The ESC Y code ends the underline mode.

«Format»

ESC X

Hex. data	LPRINT CHR$ (&H1B); "X"
Dec. data	LPRINT CHR$ (27); "X"

ESC Y

Hex. data	LPRINT CHR$ (&H1B); "Y"
Dec. data	LPRINT CHR$ (27); "Y"

Example

Print "ABCDEFGHIJKLMN", underlining the characters "DEFGHIJK".

«Sample Program»

```
10 LPRINT "ABC";
20 LPRINT CHR$(27);"XDEFGHIJK";
30 LPRINT CHR$(27);"YLMN"
```

«Printing»

```
ABCDEFGHIJKLMN
```

	ESC s 0	ESC s 1	ESC s 2
Hex. code	(1B),(73),(30)	(1B),(73),(31)	(1B),(73),(32)
Dec. code	(27), (115), (48)	(27), (115), (49)	(27), (115), (50)

The ESC s 0 ends both super and subscript printing.
The ESC s 1 code starts superscript (character printed on the top-half of line) printing.
The ESC s 2 code starts subscript (character printed on the bottom-half of line) printing.

«Format»

ESC s 0

Hex. data	LPRINT CHR$ (&H1B); "s 0"
Dec. data	LPRINT CHR$ (27); "s 0"

ESC s 1

Hex. data	LPRINT CHR$ (&H1B); "s 1"
Dec. data	LPRINT CHR$ (27); "s 1"

ESC s 2

Hex. data	LPRINT CHR$ (&H1B); "s 2"
Dec. data	LPRINT CHR$ (27); "s 2"

Example

Print "ABCDEFGHIJKLMN" in normal, superscript and subscript printing. Characters will also be underlined to clarify the difference.

«Sample Program»

```
10 LPRINT CHR$(27);"X";
20 LPRINT "ABCDEFGHIJKLMN";
30 LPRINT CHR$(27);"s1";"ABCDEFGHIJKLMN";
40 LPRINT CHR$(27);"s2";"ABCDEFGHIJKLMN"
```

«Printing»

ABCDEFGHIJKLMN^ABCDEFGHIJKLMN~ABCDEFGHIJKLMN

CHAPTER 7
ESCAPE CODES:
SYSTEM CONTROL CODES

System control codes are Escape Codes which consist of two or more bytes and select system functions.

7.1 System Control Codes

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Change LF Function	ESC l 0	1B 6C 30	27 108 48	Printing + Line Feed + Return (LF performs CR)	7-2
	ESC l 1	1B 6C 31	27 108 49	Printing + Line Feed (LF does not perform CR)	7-2
Detect PE	ESC O	1B 4F	27 79	Set PE Inactive	7-3
	ESC o	1B 6F	27 111	Set PE Active	7-3
Initialize Printer	ESC c 1	1B 63 31	27 99 49	Initialize Printer	7-4
	ESC c	1B 63	27 99	Initialize Printer	7-4

	ESC l 0	**ESC l 1**
Hex. code	(1B), (6C), (30)	(1B), (6C), (31)
Dec. code	(27), (108), (48)	(27), (108), (49)

These codes are valid when Function No. 21 = 2. (refer to Chapter 3)
These two codes change the function of the LF character as follows:
ESC l 0 causes the LF character to print the line, move the print head to left most position, and then advance the paper one line.
ESC l 1 causes LF character to print the line and advance the paper one line without changing the horizontal position.

«Format»

ESC l 0

Hex. data   **LPRINT CHR\$ (&H1B); "l 0"**

Dec. data   **LPRINT CHR\$ (27); "l 0"**

ESC l 1

Hex. data   **LPRINT CHR\$ (&H1B); "l 1"**

Dec. data   **LPRINT CHR\$ (27); "l 1"**

Example

Print "AAAAA" five times after sending ESC l 0 code.
Print "AAAAA" five times after sending ESC l 1 code.

«Sample Program»

```
10 LPRINT CHR$(27);"l0"
20 LPRINT "AAAAA";CHR$(10);"AAAAA";CHR$(10);
   "AAAAA";CHR$(10);"AAAAA";CHR$(10);"AAAAA"
30 LPRINT CHR$(27);"l1"
40 LPRINT "AAAAA";CHR$(10);"AAAAA";CHR$(10);
   "AAAAA";CHR$(10);"AAAAA";CHR$(10);"AAAAA"
```

«Printing»

```
AAAAA
AAAAA
AAAAA
AAAAA
AAAAA

AAAAA
     AAAAA
          AAAAA
               AAAAA
                    AAAAA
```

	ESC O	**ESC o**
Hex. code	(1B), (4F)	(1B), (6F)
Dec. code	(27), (79)	(27), (111)

These codes change the printer condition for PE detection.
ESC O code deactivates PE detection.
PE detection is made active by ESC o code.
Initial PE detection status is selected by Function No. 16 when the printer is powered on.

«Format»

ESC O

Hex. data	LPRINT CHR$ (&H1B); "O"
Dec. data	LPRINT CHR$ (27); "O"

ESC o

Hex. data	LPRINT CHR$ (&H1B); "o"
Dec. data	LPRINT CHR$ (27); "o"

	ESC c 1	**ESC c**
Hex. code	(1B), (63), (31)	(1B), (63)
Dec. code	(27), (99), (49)	(27), (99)

The ESC c 1 code initializes the printer.
Initializing returns the printer's various functions to the power on defaults.
This code does not affect the current settings for VFU, HT and Download.
This code can be changed to ESC c by setting Function No. 00.

«Format»

ESC c 1

Hex. data	LPRINT CHR$ (&H1B); "c1"
Dec. data	LPRINT CHR$ (27); "c1"

CHAPTER 8
ESCAPE CODES:
ANNEX CONTROL CODES

Annex control codes are Escape Codes which consist of two or more bytes and select the printer functions and characteristics.

8.1 Annex Control Codes

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Select In-ternational Character Sets	ESC Z nn	1B 5A	27 90	International character sets will be selected by combi-nations of these commands.	8-2
	ESC D nn	1B 44	27 68		8-2

ESC Z, ESC D Code

Select International Character Sets

	ESC Z (n)		ESC D (n)	
Hex. code	(1B), (5A)	(n0, n1)	(1B), (44)	(n0, n1)
Dec. code	(27), (90)	(n0, n1)	(27), (68)	(n0, n1)

«Format»

The following commands select the corresponding international character sets.

JA LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)

FR LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H01); CHR$ (&H00)

US LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H02); CHR$ (&H00)

UK LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H03); CHR$ (&H00)

GE LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H04); CHR$ (&H00)

SW LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H05); CHR$ (&H00)

IT LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H06); CHR$ (&H00)

SP LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H07); CHR$ (&H00)

DN LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H08); CHR$ (&H00)

NOR LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H09); CHR$ (&H00)

NET LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H0A); CHR$ (&H00)

AF LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
    LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H0B); CHR$ (&H00)

FRII LPRINT CHR$ (&H1B); CHR$ (&H5A); CHR$ (&H0F); CHR$ (&H00)
     LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H0E); CHR$ (&H00)

UKII LPRINT CHR$ (&H1B); CHR$ (&H44); CHR$ (&H0F); CHR$ (&H00)

CHAPTER 9
ESCAPE CODES:
OPTION CODES

Option codes are Escape codes to select option-
al functions such as Color Printing, ASF, CG Cas-
sette etc.

9.1 Option Codes

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Select ROM	ESC ~ 0	1B 7E 30	27 126 48	Built In ROM	9-2
	ESC ~ 2	1B 7E 32	27 126 50	Cassette ROM	9-2
Color Control	ESC C (n)	1B 43 (n)	27 67 (n)	Color Selection	9-3
Select ASF BIN*	ESC EM 1 //1//	1B 19 31 2F 2F 31 2F 2F	27 25 49 47 47 49 47 47	Hopper 1	9-4
	ESC EM 2 //2//	1B 19 32 2F 2F 32 2F 2F	27 25 50 47 47 50 47 47	Hopper 2	9-4
	ESC EM R //R//	1B 19 52 2F 2F 52 2F 2F	27 25 82 47 47 82 47 47	Eject	9-4

Note * : These commands are valid only when Function No. 61 = menu No. 02.

	ESC ~0	ESC ~2
Hex. code	(1B), (7E), (30)	(1B), (7E), (32)
Dec. code	(27), (126), (48)	(27), (126), (50)

These codes are valid when CG (Character Generator) Cassette ROM is installed.
ESC ~0 code selects the built in ROM in the printer.
ESC ~2 code selects the CG cassette ROM.

«Format»

ESC ~0

Hex. data	LPRINT CHR$ (&H1B); "~0"
Dec. data	LPRINT CHR$ (27); "~0"

ESC ~2

Hex. data	LPRINT CHR$ (&H1B); "~2"
Dec. data	LPRINT CHR$ (27); "~2"

ESC C (n)

Hex. code

(1B), (43), (n)   n = 0-7

Dec. code

(27), (67), (n)   n = 0-7

This code is valid only for the color printer. (n) following ESC C selects the color of printing. (refer to the table below)

Value of n	Color	
0	(Black)	BAND 4
1	(Yellow)	BAND 1
2	(Magenta)	BAND 2
3	(Orange)	BAND 1 + BAND 2
4	(Cyan)	BAND 3
5	(Green)	BAND 1 + BAND 3
6	(Purple)	BAND 2 + BAND 3
7	(Black)	BAND 4

«Format»

ESC C (n)

Hex. data

LPRINT CHR$ (&H1B); "Cn"   n = 0-7

Dec. data

LPRINT CHR$ (27); "Cn"   n = 0-7

ESC EM 1/ESC EM 2
ESC EM R Code

	ESC EM 1	ESC EM 2	ESC EM R
Hex. code	(1B) H, (19) H, (31) H	(1B)H, (19)H,(32)H	(1B)H,(19)H,(52)H
Dec. code	(27), (25), (49)	(27), (25), (50)	(27), (25), (82)

ESC EM 1 = // 1 //
    If ASF (ASF C-310) is installed, paper feed from the Hopper 1 can be selected by this command.
ESC EM 2 = // 2 //
    If ASF (ASF C-310) is installed, paper feed from the Hopper 2 can be selected by this command.
ESC EM R = // R //
    This command is for ejecting the paper from the printer.
NOTE: // 1 //, // 2 // and // R // can be used in place of ESC EM 1, ESC EM 2 and ESC EM R. // 1 //, // 2 // and // R // should be put at the head of each line.

«Format»

ESC EM 1

Hex. data	**LPRINT CHR$ (&H1B); CHR$ (&H19); CHR$ (&H31)**
Dec. data	**LPRINT CHR$ (27); CHR$ (25); CHR$ (49)**

ESC EM 2

Hex. data	**LPRINT CHR$ (&H1B); CHR$ (&H19); CHR$ (&H32)**
Dec. data	**LPRINT CHR$ (27); CHR$ (25); CHR$ (50)**

ESC EM R

Hex. data	**LPRINT CHR$ (&H1B); CHR$ (&H19); CHR$ (&H52)**
Dec. data	**LPRINT CHR$ (27); CHR$ (25); CHR$ (82)**

CHAPTER 10
MAINTENANCE

The following simple periodic maintenance proce-
dures are recommended to keep the printer in top
operating condition.

10.1 Cleaning

10.1.1 Wipe off dirt with a soft cloth.
Remove obstacles such as a small paper with tweezers.

NOTE:
Be very careful not to damage the machine nor bend
a part when cleaning.

10.1.2 Carriage Shaft
The carrier shaft accumulates dust easily as it is lubricated with launa oil. Wipe off dirt with a soft cloth.

Caution: Do not overlubricate. Excessive dust could build up and may cause damage.
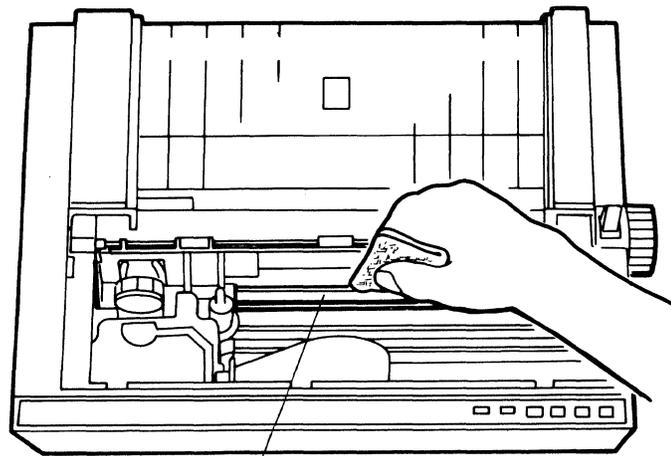
Fig. 10-1

Carrier shaft

10.1.3 Platen

Remove the print cover and the print cover (B). Then clean the rubber surface with a soft cloth.
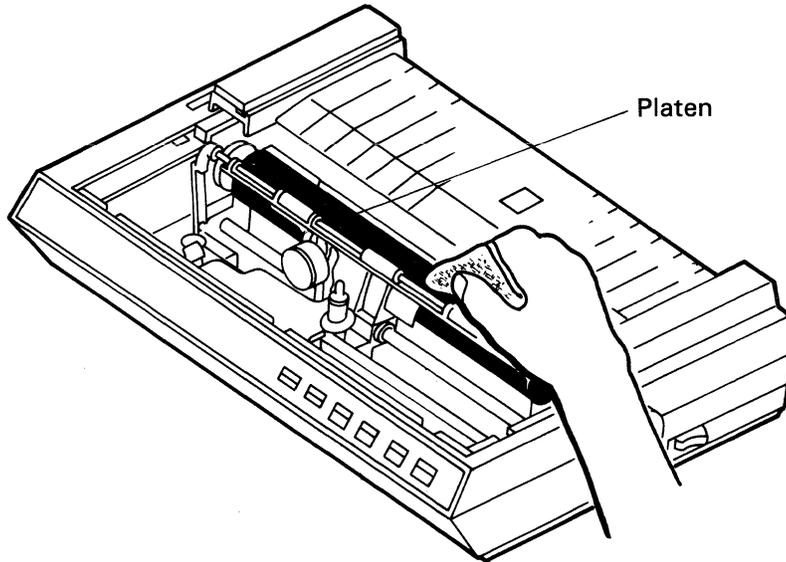
Fig. 10-2

CHAPTER 11
CODE DEFINITION

11.1 8 Bit Code Table

b8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
b7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

b4	b3	b2	b1	hex	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p	▬	⊥	α	ϱ	↑	1	=	×
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q	▬	⊤	β	σ	↓	2	⊨	····
0	0	1	0	2	STX	DC2	''	2	B	R	b	r	▬	⊣	γ	τ	←	3	±	⋮
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s	▬	⊢	δ	υ	→	4	⊣	⋮
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t	▬	─	ϵ	ϕ	±	5	◣	$\ddot{\top}$
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u	▬	─	ζ	χ	≠	6	◤	···|
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v	■			η	ψ	≥	7	◥	|···
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w	■			θ	ω	≤	8	▶	÷
1	0	0	0	8	BS	CAN	(	8	H	X	h	x	■	⌐	ι	Δ	≈	9	♠	÷
1	0	0	1	9	HT	EM	)	9	I	Y	i	y	■	⌐	$\varkappa$	Γ	·	(	♥	··|·
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z	■	└	λ	Σ	⊕	)	♦	÷
1	0	1	1	B	VT	ESC	+	;	K	[	k	{	■	┘	μ	Λ	∞	+	♣	±
1	1	0	0	C	FF	FS	,	<	L	\	l	¦	■	$\frown$	ν	Ω	∴	-	●	$\bar{\top}$
1	1	0	1	D	CR	GS	-	=	M	]	m	}	■	$\frown$	ξ	¢	½	·	○	±
1	1	1	0	E	SO	RS	.	>	N	^	n	~	■	$\smile$	o	$\surd$	¼	*	/	=
1	1	1	1	F	SI	US	/	?	O	_	o	DEL	┼	$\smile$	π	□	°	/	\	

11-1

JAPANESE

b8	b7	b6	b5	b4	b3	b2	b1		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
									0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
									0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
									0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
									0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
0	0	0	0	0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p	▬	⊥	SP	―	タ	ミ	＝	×
0	0	0	1	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q	▬	⊤	°	ア	チ	ム	⊢	円
0	0	1	0	0	0	1	0	2	STX	DC2	"	2	B	R	b	r	▬	⊣	┌	イ	ツ	メ	‡	年
0	0	1	1	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s	▬	├	┘	ウ	テ	モ	⊣	月
0	1	0	0	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t	▬	─	、	エ	ト	ヤ	◢	日
0	1	0	1	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u	▬	─	・	オ	ナ	ユ	◣	時
0	1	1	0	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v	■	│	ヲ	カ	ニ	ヨ	◥	分
0	1	1	1	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w	■	│	ァ	キ	ヌ	ラ	◤	秒
1	0	0	0	1	0	0	0	8	BS	CAN	(	8	H	X	h	x	▮	┌	ィ	ク	ネ	リ	♠	〒
1	0	0	1	1	0	0	1	9	HT	EM	)	9	I	Y	i	y	▮	┐	ゥ	ケ	ノ	ル	♥	市
1	0	1	0	1	0	1	0	A	LF	SUB	*	:	J	Z	j	z	▮	└	ェ	コ	ハ	レ	♦	区
1	0	1	1	1	0	1	1	B	VT	ESC	+	;	K	[	k	{	▮	┘	ォ	サ	ヒ	ロ	♣	町
1	1	0	0	1	1	0	0	C	FF	FS	,	<	L	¥	l	¦	■	⌐	ャ	シ	フ	ワ	●	村
1	1	0	1	1	1	0	1	D	CR	GS	−	=	M	]	m	}	■	＼	ュ	ス	ヘ	ン	○	人
1	1	1	0	1	1	1	0	E	SO	RS	.	>	N	^	n	~	■	＼	ョ	セ	ホ	゛	/	▨
1	1	1	1	1	1	1	1	F	SI	US	/	?	O	_	o	DEL	┼	⌐	ッ	ソ	マ	゜	＼	

11.2 7 Bit Code Table

b7	b6	b5						0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1

b7	b6	b5	b4	b3	b2	b1		0	1	2	2a	3	3a	4	4a	5	5a	6	7
			0	0	0	0	0	NUL	DLE	SP		0		@		P			p
			0	0	0	1	1	SOH	DC1	!		1		A		Q		a	q
			0	0	1	0	2	STX	DC2	"		2		B		R		b	r
			0	0	1	1	3	ETX	DC3	#	Refer to other table	3	Refer to other table	C	Refer to other table	S	Refer to other table	c	s
			0	1	0	0	4	EOT	DC4	$		4		D		T		d	t
			0	1	0	1	5	ENQ	NAK	%		5		E		U		e	u
			0	1	1	0	6	ACK	SYN	&		6		F		V		f	v
			0	1	1	1	7	BEL	ETB	'		7		G		W		g	w
			1	0	0	0	8	BS	CAN	(		8		H		X		h	x
			1	0	0	1	9	HT	EM	)		9		I		Y		i	y
			1	0	1	0	A	LF	SUB	*		:		J		Z		j	z
			1	0	1	1	B	VT	ESC	+		;		K		[		k	{
			1	1	0	0	C	FF	FS	,		<		L		\		l	|
			1	1	0	1	D	CR	GS	−		=		M		]		m	}
			1	1	1	0	E	SO	RS	.		>		N		⌒		n	~
			1	1	1	1	F	SI	US	/		?		O		_		o	DEL

11.3 7 Bit Code Table, Depending on 2a~5a Strings

	2nd Row					3rd Row					4th Row					5th Row				
	2	2a1	2a2	2a3	2a4	3	3a1	3a2	3a3	3a4	4	4a1	4a2	4a3	4a4	5	5a1	5a2	5a3	5a4
0	SP	▬	α			0	⊥	ρ	—	—	@	=	↑	た	タ	P	×	1	み	ミ
1	!	▬	β	｡	｡	1	⊤	σ	あ	ア	A	⊩	↓	ち	チ	Q	(円)	2	む	ム
2	"	▬	γ	「	「	2	⊣	τ	い	イ	B	‡	←	つ	ツ	R	(年)	3	め	メ
3	#	▬	δ	」	」	3	⊢	υ	う	ウ	C	∃	→	て	テ	S	(月)	4	も	モ
4	$	▬	ε	、	、	4	—	φ	え	エ	D	◢	±	と	ト	T	(日)	5	や	ヤ
5	%	▬	ζ	｡	｡	5	—	χ	お	オ	E	◣	∓	な	ナ	U	(時)	6	ゆ	ユ
6	&	■	η	を	ヲ	6	|	ψ	か	カ	F	◥	≥	に	ニ	V	(分)	7	よ	ヨ
7	'	■	θ	ぁ	ァ	7	|	ω	き	キ	G	◤	≤	ぬ	ヌ	W	(秒)	8	ら	ラ
8	(	█	ι	ぃ	ィ	8	「	Δ	く	ク	H	♠	≈	ね	ネ	X	(〒)	9	り	リ
9	)	█	κ	ぅ	ゥ	9	」	Γ	け	ケ	I	♥	·	の	ノ	Y	(市)	(	る	ル
A	*	█	λ	ぇ	ェ	:	∟	Σ	こ	コ	J	♦	⊕	は	ハ	Z	(区)	)	れ	レ
B	+	█	μ	ぉ	ォ	;	⌐	Λ	さ	サ	K	♣	∞	ひ	ヒ	[	(町)	+	ろ	ロ
C	,	█	ν	ゃ	ャ	<	⌢	Ω	し	シ	L	●	∴	ふ	フ	\	(村)	-	わ	ワ
D	-	█	ξ	ゅ	ュ	=	⌍	¢	す	ス	M	○	½	へ	ヘ	]	(人)	·	ん	ン
E	.	█	ο	ょ	ョ	>	⌎	√	せ	セ	N	/	¼	ほ	ホ	^	(▨)	*	"	"
F	/	+	π	っ	ッ	?	⌏	□	そ	ソ	O	\	∘	ま	マ	_		/	｡	｡

2a1~5a1 Graphic Symbols/Kanji (Japan Mode)   ESC #

2a2~5a2 Greek   ESC &

2a3~5a3 Hiragana   ESC & (Japan Mode Only)

2a4~5a4 Katakana   SO (Japan Mode Only)

11.4 Substitution List for International Character Set

NO		1	2	3	4	5	6	7	8	9	10	11	12
	HEX	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	Japanese					¥							
1	French			à	°	ç	§			é	ù	é	¨
2	US	#	$	@	[	\	]	^	`	{	|	}	~
3	UK		£										
4	German			§	Ä	Ö	Ü			ä	ö	ü	ß
5	Swedish		¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	Italian			§	°	ç	é		ù	à	ò	è	ì
7	Spanish			á	¡	Ñ	¿	é	í	ó	ñ	ú	ü
8	Danish				Æ	Ø	Å			æ	ø	å	
9	Norwegian				Æ	Ø	Å		°	æ	ø	å	
10	Dutch					IJ					ij		
11	African		ê	É	Ê	Ö	è	Ü	é	ë	ö	ô	ü
12	Undefine												
13	CAF			à	â	ç	ê	î	ô	é	ù	è	û
14	French II		â	à	î	ç	ê	û	ô	é	ú	è	ï
15	UK II	£											

NOTE:
The characters for the blank boxes are the same as the corresponding US characters.

11.5 Proportional Font Tables

11.5.1 Data Processing/NLQ Font
    (1) Standard Characters

ASCII CODE		Character	Width	ASCII CODE		Character	Width
DEC	HEX			DEC	HEX		
32	20	Space	8	69	45	E	12
33	21	!	6	70	46	F	12
34	22	"	8	71	47	G	12
35	23	# *	12	72	48	H	12
36	24	$ *	12	73	49	I	8
37	25	%	12	74	4A	J	10
38	26	&	12	75	4B	K	12
39	27	'	6	76	4C	L	12
40	28	(	8	77	4D	M	12
41	29	)	8	78	4E	N	12
42	2A	*	10	79	4F	O	12
43	2B	+	12	80	50	P	12
44	2C	,	6	81	51	Q	12
45	2D	—	12	82	52	R	12
46	2E	.	6	83	53	S	12
47	2F	/	10	84	54	T	12
48	30	0	12	85	55	U	12
49	31	1	8	86	56	V	12
50	32	2	12	87	57	W	12
51	33	3	12	88	58	X	12
52	34	4	12	89	59	Y	12
53	35	5	12	90	5A	Z	12
54	36	6	12	91	5B	[*	8
55	37	7	12	92	5C	\ *	10
56	38	8	12	93	5D	] *	8
57	39	9	12	94	5E	^ *	8
58	3A	:	6	95	5F	_	12
59	3B	;	6	96	60	` *	6
60	3C	<	8	97	61	a	12
61	3D	=	12	98	62	b	10
62	3E	>	8	99	63	c	10
63	3F	?	12	100	64	d	10
64	40	@ *	12	101	65	e	12
65	41	A	12	102	66	f	10
66	42	B	12	103	67	g	10
67	43	C	12	104	68	h	10
68	44	D	12	105	69	i	8

NOTE: *) Characters vary with each country

ASCII CODE		Character	Width
DEC	HEX		
106	6A	j	8
107	6B	k	10
108	6C	l	8
109	6D	m	12
110	6E	n	10
111	6F	o	12
112	70	p	10
113	71	q	10
114	72	r	10
115	73	s	12
116	74	t	8
117	75	u	12
118	76	v	12
119	77	w	12
120	78	x	12
121	79	y	12
122	7A	z	10
123	7B	{ *	8
124	7C		*	6
125	7D	} *	8
126	7E	~ *	10
127	7F		

(2) International Characters

ASCII CODE		JAPAN		FRANCE		USA	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	12	#	12	#	12
36	24	$	12	$	12	$	12
64	40	@	12	à	12	@	12
91	5B	[	8	°	6	[	8
92	5C	¥	12	ç	12	\	10
93	5D	]	8	§	10	]	8
94	5E	^	8	^	8	^	8
96	60	`	6	`	6	`	6
123	7B	{	8	é	12	{	8
124	7C	¦	6	ù	12	¦	6
125	7D	}	8	è	12	}	8
126	7E	~	10	¨	10	~	10

ASCII CODE		UK		GERMANY		SWEDEN	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	12	#	12	#	12
36	24	£	10	$	10	¤	12
64	40	@	12	§	10	É	12
91	5B	[	8	Ä	12	Ä	12
92	5C	\	10	Ö	12	Ö	12
93	5D	]	8	Ü	12	Å	12
94	5E	^	8	^	8	Ü	12
96	60	`	6	`	6	é	12
123	7B	{	8	ä	12	ä	12
124	7C	¦	6	ö	12	ö	12
125	7D	}	8	ü	12	å	12
126	7E	~	10	ß	10	ü	12

ASCII CODE		ITALY		SPAIN		DENMARK	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	12	#	12	#	12
36	24	$	12	$	12	$	12
64	40	§	10	à	12	@	12
91	5B	°	6	¡	6	Æ	12
92	5C	ç	12	Ñ	12	Ø	12
93	5D	é	12	¿	12	Å	12
94	5E	^	8	é	12	^	8
96	60	ù	12	í	8	`	6
123	7B	à	12	ó	12	æ	12
124	7C	ò	12	ñ	10	ø	10
125	7D	è	12	ú	12	å	12
126	7E	ì	8	ü	12	~	10

ASCII CODE		NORWAY		NETHERLAND		AFRICA	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	12	#	12	#	12
36	24	$	12	$	12	ê	14
64	40	@	12	@	12	É	12
91	5B	Æ	12	[	8	Ê	12
92	5C	Ø	12	IJ	12	Ö	12
93	5D	Å	12	]	8	è	12
94	5E	^	8	^	8	Ü	12
96	60	°	6	`	6	é	12
123	7B	æ	12	{	8	ë	12
124	7C	ø	10	ij	12	ö	12
125	7D	å	12	}	8	ô	12
126	7E	~	10	~	10	ü	12

ASCII CODE		FRENCH CANADA		FRANCE 2		UK 2	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	12	#	12	£	10
36	24	$	12	â	14	$	12
64	40	à	12	à	12	@	12
91	5B	â	14	î	10	[	8
92	5C	ç	12	ç	12	\	10
93	5D	ê	14	ê	14	]	8
94	5E	î	10	û	12	^	8
96	60	ô	12	ô	12	`	6
123	7B	é	12	é	12	{	8
124	7C	ù	12	ú	12	¦	6
125	7D	è	12	è	12	}	8
126	7E	û	12	ï	8	~	10

11.5.2 Letter Quality Font
(1) Standard Characters

ASCII CODE		Character	Width	ASCII CODE		Character	Width
DEC	HEX			DEC	HEX		
32	20	Space	24	69	45	E	36
33	21	!	18	70	46	F	36
34	22	"	24	71	47	G	36
35	23	# *	36	72	48	H	36
36	24	$ *	36	73	49	I	24
37	25	%	36	74	4A	J	30
38	26	&	36	75	4B	K	36
39	27	'	18	76	4C	L	36
40	28	(	24	77	4D	M	36
41	29	)	24	78	4E	N	36
42	2A	*	30	79	4F	O	36
43	2B	+	36	80	50	P	36
44	2C	,	18	81	51	Q	36
45	2D	—	36	82	52	R	36
46	2E	.	18	83	53	S	36
47	2F	/	30	84	54	T	36
48	30	0	36	85	55	U	36
49	31	1	24	86	56	V	36
50	32	2	36	87	57	W	36
51	33	3	36	88	58	X	36
52	34	4	36	89	59	Y	36
53	35	5	36	90	5A	Z	36
54	36	6	36	91	5B	[*	24
55	37	7	36	92	5C	\ *	30
56	38	8	36	93	5D	] *	24
57	39	9	36	94	5E	^ *	24
58	3A	:	18	95	5F	_	36
59	3B	;	18	96	60	` *	18
60	3C	<	24	97	61	a	36
61	3D	=	36	98	62	b	30
62	3E	>	24	99	63	c	30
63	3F	?	36	100	64	d	30
64	40	@ *	36	101	65	e	36
65	41	A	36	102	66	f	30
66	42	B	36	103	67	g	30
67	43	C	36	104	68	h	30
68	44	D	36	105	69	i	24

NOTE: *) Characters vary with each country

| ASCII CODE | | Character | Width |
DEC	HEX		
106	6A	j	24
107	6B	k	30
108	6C	l	24
109	6D	m	36
110	6E	n	30
111	6F	o	36
112	70	p	30
113	71	q	30
114	72	r	30
115	73	s	36
116	74	t	24
117	75	u	36
118	76	v	36
119	77	w	36
120	78	x	36
121	79	y	36
122	7A	z	30
123	7B	{ *	24
124	7C	¦ *	18
125	7D	} *	24
126	7E	~ *	30
127	7F		

(2) International Characters

ASCII CODE		JAPAN		FRANCE		USA	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	36	#	36	#	36
36	24	$	36	$	36	$	36
64	40	@	36	à	36	@	36
91	5B	[	24	°	18	[	24
92	5C	¥	36	ç	36	\	30
93	5D	]	24	§	30	]	24
94	5E	^	24	^	24	^	24
96	60	`	18	`	18	`	18
123	7B	{	24	é	36	{	24
124	7C	¦	18	ù	36	¦	18
125	7D	}	24	è	36	}	24
126	7E	~	30	¨	30	~	30

ASCII CODE		UK		GERMANY		SWEDEN	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	36	#	36	#	36
36	24	£	30	$	30	¤	36
64	40	@	36	§	30	É	36
91	5B	[	24	Ä	36	Ä	36
92	5C	\	30	Ö	36	Ö	36
93	5D	]	24	Ü	36	Å	36
94	5E	^	24	^	24	Ü	36
96	60	`	18	`	18	é	36
123	7B	{	24	ä	36	ä	36
124	7C	¦	18	ö	36	ö	36
125	7D	}	24	ü	36	å	36
126	7E	~	30	ß	30	ü	36

11-13

ASCII CODE		ITALY		SPAIN		DENMARK	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	36	#	36	#	36
36	24	$	36	$	36	$	36
64	40	§	30	à	36	@	36
91	5B	°	18	¡	18	Æ	36
92	5C	ç	36	Ñ	36	Ø	36
93	5D	é	36	¿	36	Å	36
94	5E	^	24	é	36	^	24
96	60	ù	36	í	24	`	18
123	7B	à	36	ó	36	æ	36
124	7C	ò	36	ñ	30	ø	30
125	7D	è	36	ú	36	å	36
126	7E	ì	24	ü	36	~	30

ASCII CODE		NORWAY		NETHERLAND		AFRICA	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	36	#	36	#	36
36	24	$	36	$	36	ê	42
64	40	@	36	@	36	É	36
91	5B	Æ	36	[	24	Ê	36
92	5C	Ø	36	IJ	36	Ö	36
93	5D	Å	36	]	24	è	36
94	5E	^	24	^	24	Ü	36
96	60	°	18	`	18	é	36
123	7B	æ	36	{	24	ë	36
124	7C	ø	30	ij	36	ö	36
125	7D	å	36	}	24	ô	36
126	7E	~	30	~	30	ü	36

ASCII CODE		FRENCH CANADA		FRANCE 2		UK 2	
DEC	HEX	Character	Width	Character	Width	Character	Width
35	23	#	36	#	36	£	30
36	24	$	36	â	42	$	36
64	40	à	36	à	36	@	36
91	5B	â	42	î	30	[	24
92	5C	ç	36	ç	36	\	30
93	5D	ê	42	ê	42	]	24
94	5E	î	30	û	36	^	24
96	60	ô	36	ô	36	`	18
123	7B	é	36	é	36	{	24
124	7C	ù	36	ú	36	¦	18
125	7D	è	36	è	36	}	24
126	7E	û	36	ï	24	~	30

QUICK
REFERENCE

Code Name	Hex. Code	Dec. Code	Function	Ref. Page
EOT	04	4	END OF TRANSMISSION	4-2
BEL	07	7	BELL	4-3
BS	08	8	BACKSPACE	4-4
HT	09	9	HORIZONTAL TABULATION	4-5
LF	0A	10	LINE FEED	4-6
VT	0B	11	VERTICAL TABULATION	4-7
FF	0C	12	FORM FEED	4-8
CR	0D	13	CARRIAGE RETURN	4-9
SO	0E	14	SELECT DOUBLE WIDTH CHARACTER	4-10
SI	0F	15	RELEASE DOUBLE WIDTH CHARACTER	4-10
DC1	11	17	SELECT PRINTER	4-11
DC2	12	18		*
DC3	13	19	DESELECT PRINTER	4-11
DC4	14	20		*
CAN	18	24	CANCEL	4-12
ESC	1B	27	ESCAPE	4-13
GS	1D	29	GROUP SEPARATOR	4-14
RS	1E	30	RECORD SEPARATOR	4-14
US	1F	31	UNIT SEPARATOR	4-14

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Printing Direction	ESC >	1B 3E	27 62	Unidirectional Print	5-3
	ESC <	1B 3C	27 60	Bidirectional Print	5-3
Printing Quality	ESC m0	1B 6D 30	27 109 48	DP Mode	5-4
	ESC m1	1B 6D 31	27 109 49	NLQ Mode	5-4
	ESC m2	1B 6D 32	27 109 50	LQ Mode	5-4
Character Pitch	ESC n	1B 6E	27 110	9 CPI (Elongated)	5-5
	ESC N	1B 4E	27 78	10 CPI (Pica)	5-5
	ESC E	1B 45	27 69	12 CPI (Elite)	5-5
	ESC e	1B 65	27 101	13.4 CPI (Condensed 3)	5-5
	ESC q	1B 71	27 113	15 CPI (Condensed 2)	5-5
	ESC Q	1B 51	27 81	17 CPI (Condensed 1)	5-5
	ESC p	1B 70	27 112	18 CPI (Condensed 0)	5-5
	ESC P	1B 50	27 80	Proportional	5-5
Character Set (7 bit mode) Down Loaded Character Set	ESC $	1B 24	27 36	Alphanumeric/Symbol Mode	5-7
	ESC &	1B 26	27 38	Greek Mode	5-7*
	ESC #	1B 23	27 35	CG Graphics Mode	5-7
	ESC '	1B 27	27 39	Expanded CG RAM Designation Mode	5-7
	ESC *	1B 2A	27 42	Expanded CG RAM Designation Mode (7-bit mode only)	5-7

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Line Feed Direction	ESC f	1B 66	27 102	Forward Line Feed Mode	5-9
	ESC r	1B 72	27 114	Reverse Line Feed Mode	5-9
Line Feed Spacing	ESC A	1B 41	27 65	1/6" Line Feed	5-10
	ESC B	1B 42	27 66	1/8" Line Feed	5-10
	ESC T	1B 54	27 84	n/144" Line Feed	5-10
Left/Right Margin Setting	ESC L	1B 4C	27 76	Set Left Margin	5-11
	ESC /	1B 2F	27 47	Set Right Margin	5-12
Dot Corresponding Graphics Mode	ESC G (n)	1B 47 (n)	27 71 (n)	Graphics Mode	5-13
	ESC S (n)	1B 53 (n)	27 83 (n)	Graphics Mode	5-13
	ESC g (n)	1B 67 (n)	27 103 (n)	Graphics Mode (Byte)	5-14
Dot Spacing	ESC (n) n = 1-6	1B (n) n = 31-36	27 (n) n = 49-54	1-6 Dot Spacing (For use with proportional spacing only)	5-15
Repeat Control	ESC R (n)	1B 52 (n)	27 82 (n)	Repeat Characters	5-16
	ESC V (n)	1B 56 (n)	27 86 (n)	Repeat 8 Bit Dot Column	5-17
	ESC F (n)	1B 46 (n)	27 70 (n)	Dot Space Tabulation	5-18
Horizontal Tabulation	ESC (	1B 28	27 40	Set Horizontal Tab Position	5-19
	ESC)	1B 29	27 41	Clear Some Positions	5-19
	ESC 0	1B 30	27 48	Initialization	5-19
VFU	ESC v	1B 76	27 118	Set VFU Positions	5-21
Horizontal Dot Spacing	ESC %0	1B 25 30	27 37 48	60 DPI	5-24
	ESC %1	1B 25 31	27 37 49	72 DPI	5-24
	ESC %2	1B 25 32	27 37 50	80 DPI	5-24
	ESC %3	1B 25 33	27 37 51	96 DPI	5-24
	ESC %4	1B 25 34	27 37 52	107 DPI	5-24
	ESC %5	1B 25 35	27 37 53	120 DPI	5-24
	ESC %6	1B 25 36	27 37 54	136 DPI	5-24
	ESC %7	1B 25 37	27 37 55	144 DPI	5-24
	ESC %8	1B 25 38	27 37 56	160 DPI	5-24
	ESC %9	1B 25 39	27 37 57	240 DPI	5-24
Download	ESC @	1B 40	27 64	CG Load	5-26
	ESC u	1B 75	27 117	CG Copy	5-26

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Empha-sized Characters	ESC !	1B 21	27 33	Start Emphasized Character Printing	6-2
	ESC "	1B 22	27 34	End Emphasized Character Printing	6-2
Italic Characters	ESC i 1	1B 69 31	27 105 49	Start Italic Character Printing	6-3
	ESC i 0	1B 69 30	27 105 48	End Italic Character Printing	6-3
Underline	ESC X	1B 58	27 88	Start Underlining	6-4
	ESC Y	1B 59	27 89	End Underlining	6-4
Super/ Subscript	ESC s 0	1B 73 30	27 115 48	End Super/Subscript Printing	6-5
	ESC s 1	1B 73 31	27 115 49	Start Superscript Printing	6-5
	ESC s 2	1B 73 32	27 115 50	Start Subscript Printing	6-5

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Change LF Function	ESC l 0	1B 6C 30	27 108 48	Printing + Line Feed + Return (LF performs CR)	7-2
	ESC l 1	1B 6C 31	27 108 49	Printing + Line Feed (LF does not perform CR)	7-2
Detect PE	ESC O	1B 4F	27 79	Set PE Inactive	7-3
	ESC o	1B 6F	27 111	Set PE Active	7-3
Initialize Printer	ESC c 1	1B 63 31	27 99 49	Initialize Printer	7-4
	ESC c	1B 63	27 99	Initialize Printer	7-4

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Select International	ESC Z nn	1B 5A	27 90	International character sets will be selected by combi-	8-2
Character Sets	ESC D nn	1B 44	27 68	nations of these commands.	8-2

	Code Name	Hex. Code	Dec. Code	Function	Ref. Page
Select ROM	ESC ~0	1B 7E 30	27 126 48	Built In ROM	9-2
	ESC ~2	1B 7E 32	27 126 50	Cassette ROM	9-2
Color Control	ESC C (n)	1B 43 (n)	27 67 (n)	Color Selection	9-3
Select ASF BIN	ESC EM 1 //1//	1B 19 31 2F 2F 31 2F 2F	27 25 49 47 47 49 47 47	Hopper 1	9-4
	ESC EM 2 //2//	1B 19 32 2F 2F 32 2F 2F	27 25 50 47 47 50 47 47	Hopper 2	9-4
	ESC EM R //R//	1B 19 52 2F 2F 52 2F 2F	27 25 82 47 47 82 47 47	Eject	9-4

APPENDIX A
PARALLEL INTERFACE

1 Parallel Interface Description

1.1 Data Input Method
8-bit Parallel Interface

1.2 Control Signals
$\overline{\text{ACK}}$, BUSY, SELECT, PE, $\overline{\text{DATA.STB}}$, $\overline{\text{INPUT.PRIME}}$, $\overline{\text{FAULT}}$, INPUT BUSY

1.3 Data Buffer
2K Bytes (Option 8K Bytes)
Data can be received while printing is taking place until the data buffer becomes full.

2 Input/Output Signals

2.1 DATA 1-8

2.1.1   Receive data, bits 1 through 8.

2.1.2   Logic 1 is a high level. The minimum pulse width is 3 μsec. DATA 1 is the LSB (Least Significant Bit), and DATA 8 is the MSB (Most Significant Bit).

2.2 $\overline{\text{DATA.STB}}$ (DATA.STROBE)

2.2.1   Input timing signal for receiving the above DATA 1-8.

2.2.2   Normally high level; low level indicates valid incoming data.

·2.2.3   The minimum pulse width is 1 μsec.

2.3 $\overline{\text{ACK}}$ (ACKNOWLEDGE)

2.3.1   Output pulse which requests the host to send data.

2.3.2   This signal is output after processing the data code received from the host.

2.3.3   Normally high level; low level to generate $\overline{\text{ACK}}$.

2.3.4   The nominal pulse width is Approx. 5 μsec.

2.3.5   The $\overline{\text{ACK}}$ signal is also output when the printer status changes from DESELECT to SELECT or the BUSY signal changes from the high to low level.

2.4 INPUT BUSY

2.4.1   Signal which indicates that the printer is busy.

2.4.2   If the host sends data after this signal becomes active, the sent data may be lost.

2.4.3   Conditions causing this signal to be a high level (BUSY) are:

a. The data buffer became full.

b. Printer deselected.

c. Printer fault status.

d. Input of $\overline{\text{INPUT.PRIME}}$. The BUSY signal is reset after the previously set time, if INPUT.PRIME is high.

e. While in operation, if the printer cannot catch up with received data.

2.5 SELECT

2.5.1   Output signal which indicates the on-line or off-line status of the printer. A high level signal is sent to the host when the printer is on-line (ready to receive data).

2.5.2   Conditions causing this signal to be a high level (SELECT, on-line) are:

a. ON LINE switch activated while the printer is deselected (OFF LINE). If the ON LINE switch is pressed in a PE state with no data in the buffer, the printer is temporarily selected (ON LINE) and the PE state is cleared. This allows one line of data to be input and printed, and then the printer returns to DESELECT status (OFF LINE) due to PE condition.

     b. Reception of DC1 code. However, if a DC1 code is received in a PE state, the printer will not be selected (not ON LINE).

     c. Printer power turned on when function No. 13 "POWER ON ON LINE" is selected.

2.5.3   Conditions causing this signal to be a low level (DESELECT, OFF LINE) are:

     a. ON LINE switch activated while the printer is selected (ON LINE).

     b. Reception of DC3 code.

     c. Printer power turned on when function No. 13 "POWER ON OFF LINE" is selected.

     d. Occurrence of printer error (head carrier overrun or failure in initialization at power on).

     e. PE or Cover Open detected.

2.6 $\overline{\text{INPUT PRIME}}$

2.6.1   This input signal resets the printer to the initial state; however, this signal does not affect SELECT/DESELECT or the pre-set VFU conditions.

2.6.2   Upon receipt of this signal, all data stored in the DATA BUFFER will be printed; the printer will then return to the initial state.

2.6.3   This signal is normally HIGH. $\overline{\text{INPUT PRIME}}$ is active when the signal is LOW.

2.6.4   Minimum pulse width is 1 microsecond.

2.6.5   After receiving an $\overline{\text{INPUT PRIME}}$, allow a delay time (5 ms.) until next data is received.

2.7 $\overline{\text{FAULT}}$

2.7.1   This is an output signal from the printer indicating printer FAULT state.

2.7.2   The signal is LOW during a FAULT state.

2.7.3   FAULT state occurs under any of the following conditions:

     a. Under a PE state. (However, if the $\boxed{\text{ON LINE}}$ switch is depressed during a FAULT state, the $\overline{\text{FAULT}}$ signal will temporarily become HIGH, enabling the printing of one line before returning to LOW.)

     b. Under a DESELECT state.

     c. An error or malfunction has occurred in the printer. (when the Head Carrier overruns or initialization can not be made at Power on.)

     d. Cover Open is detected.

2.8 PAPER EMPTY (PE)

2.8.1   This is an output signal from the printer indicating that the paper end is near. PE status is also created when no paper is present.

2.8.2   This signal is activated by a micro switch located below the platen.

2.8.3   This signal is HIGH when active.

2.9 +5V DC

2.9.1   This is not a signal. This is a +5V DC power source to an outside device.

2.9.2   The maximum output current available is 50 mA.

3 Timing Chart

3.1 Data is being received

SELECT

DATA

$\overline{\text{DATA STB}}$

INPUT BUSY

BUSY

$\overline{\text{ACK}}$

T1 ~ T3 Min. 1 μs
T4 Approx. 5μs
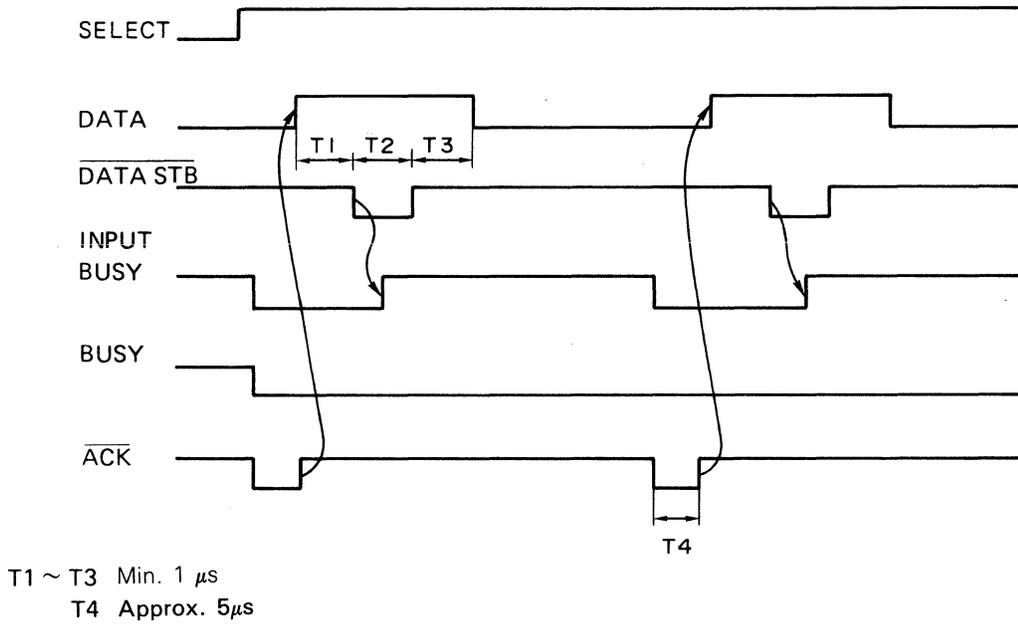
Fig. AppendixA 3-1 Timing Chart A

3.2 Data buffer goes full

DATA

$\overline{\text{DATA STB}}$

BUSY

INPUT BUSY

$\overline{\text{ACK}}$

(Buffer full sensed)
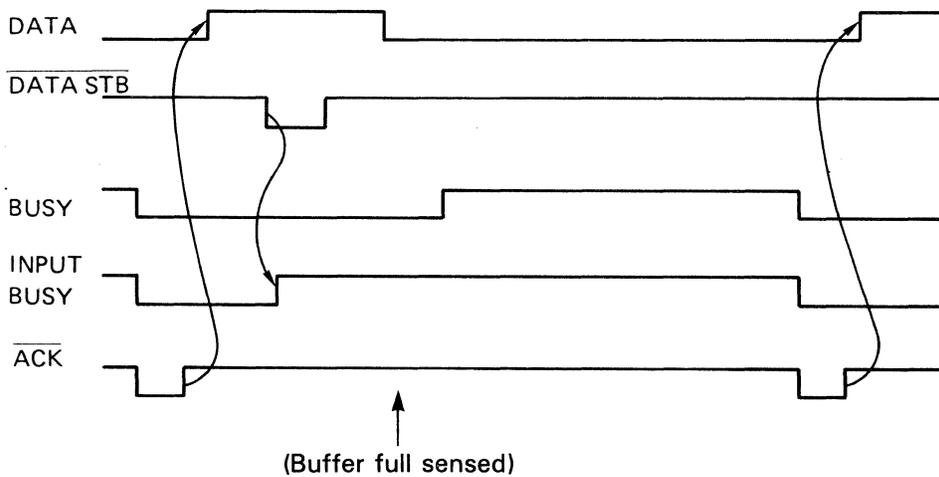
Fig. AppendixA 3-2 Timing Chart B

3.3 PE is detected
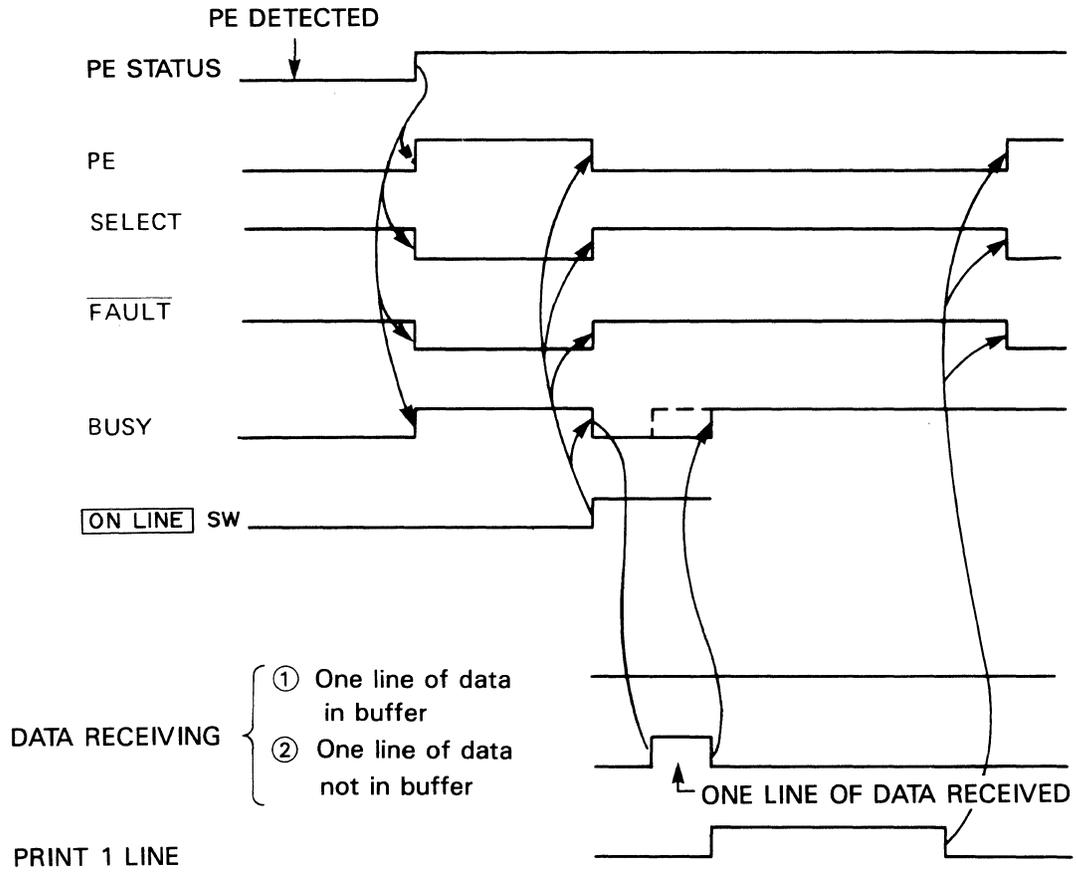
NOTE: In case that one or more lines of data are stored in the buffer.

Fig. AppendixA 3-3 Timing Chart C

4 Interface Connector Pin Assignments

PIN No.	SIGNAL NAME	PIN No.	SIGNAL NAME
1	DATA STROBE	19	TWISTED PAIR GND
2	DATA 1	20	TWISTED PAIR GND
3	DATA 2	21	TWISTED PAIR GND
4	DATA 3	22	TWISTED PAIR GND
5	DATA 4	23	TWISTED PAIR GND
6	DATA 5	24	TWISTED PAIR GND
7	DATA 6	25	TWISTED PAIR GND
8	DATA 7	26	TWISTED PAIR GND
9	DATA 8	27	TWISTED PAIR GND
10	ACK	28	TWISTED PAIR GND
11	INPUT-BUSY (BUSY)	29	TWISTED PAIR GND
12	PE	30	TWISTED PAIR GND
13	SELECT	31	INPUT PRIME
14	0V	32	FAULT
15	NC	33	0V
16	0V	34	NC
17	CHASSIS GND	35	NC
18	+5V	36	INPUT BUSY

NOTE: Pin 11 can select the INPUT BUSY signal or BUSY signal by means of jumper J3.

```
19                                              36
 O O O O O O O O O O O O O O O O O O
 O O O O O O O O O O O O O O O O O O
 1                                              18
```
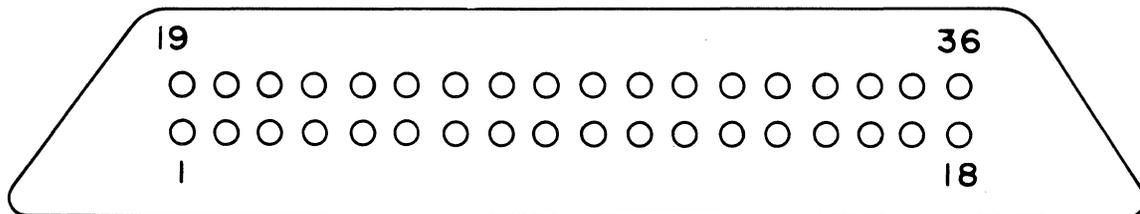
Printer Connector: AMPHENOL 57-40360

Cable Connector: AMPHENOL 5740360

5 Signal Electrical Characteristics

5.1 Signal Level

Input

"High" level   2.4 to 5V

"Low" level   0 to 0.4V

Output

"High" level   2.4 to 5V

"Low" level   0 to 0.4V

5.2 Input/Output Gate

① Input Gate
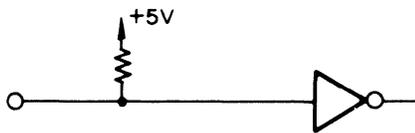
● DATA1 ~ 8
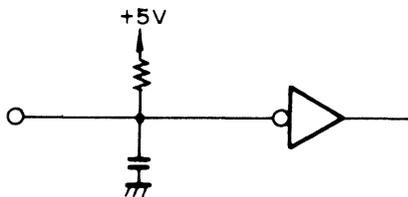
● $\overline{\text{DATA STB}}$

● $\overline{\text{INPUT PRIME}}$

② Output Gate
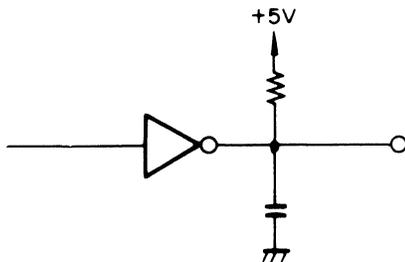
● BUSY

● SELECT

● $\overline{\text{FAULT}}$

● $\overline{\text{ACK}}$

● INPUT BUSY

● PE

APPENDIX B
SERIAL INTERFACE

1 Serial Interface (RS232C)

1.1 Data Input Method
7 or 8-bit Serial

1.2 Data Input Codes
ASCII, JIS 7 or 8-bit, National Character Codes, Character Generator Based Graphic Symbol Codes, Dot Corresponding Graphics (8-bit Codes)

1.3 Data Buffer
2K Byte. (Option 8K Byte)

1.4 Data Transmission Speed
110 200 300 600 1,200 2,400 4,800 and 9,600 BPS

1.5 Data Protocol
1) Data: READY/BUSY (DTR) System

2) X ON/X OFF System

1.6 Synchronization System
1) START-BIT: 1 bit

2) STOP-BIT: 1 bit or 2 bits
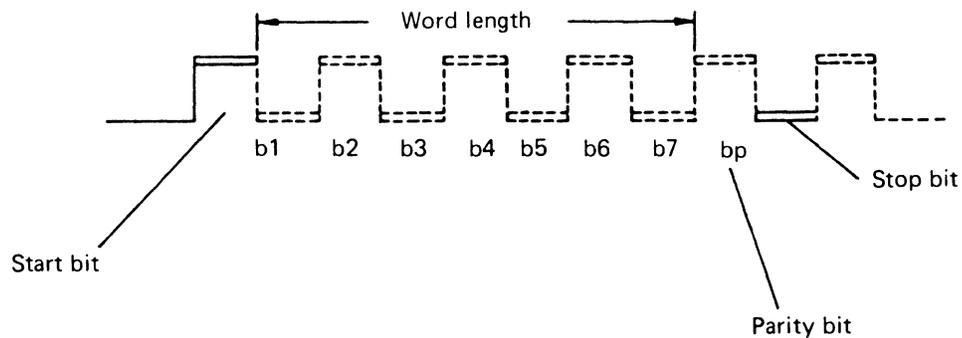
3) Word length: 7 or 8 bits

1.7   Error Detection

1) Parity Check: VRC (vertical redundancy check), EVEN ODD, NO-PARITY, and IGNORE.

2) Framing Error: Identifies when there is no STOP BIT within a frame specified by the START BIT.

3) Overrun Error: Identifies when the next data are input before the current data are read by the printer.

Note: If any of the above errors occur, the erroneous data are printed intact. An error in Dot Corresponding Graphics is also printed intact.

1.8   Connector Pin Assignment Table

Note: "C"=Connected;
RS232C   "NC"=Not Connected

PIN-NO.	Symbol	Descriptions	Direction	RDY/BSY	X ON/X OFF
1	FG	Frame Ground		C	C
*(2)	SD	Send Data	Output	NC	C
3	RD	Received Data	Input	C	C
4	RTS	Request to Send	Output	NC	C
5	CTS	Clear to Send	Input	NC	C
6	DSR	Data Set Ready	Input	NC	C
7	SG	Signal Ground		C	C
8	CD	Carrier Detect	Input	NC	C
20	DTR	Data Terminal Ready	Output	C	C
*(2)	CER	Carrier Error	Output	C	NC
14	FAULT	Fault	Output	C	C

Fig. Appendix B 1-1 Connector Pin Assignments

1.9   Applicable Connector (RS232C)
Plug (cable side:)   DB-25P (made by JAE) or the equivalent (male)
Receptacle (printer side):DB-25SA-N (made by JAE) or the equivalent (female)
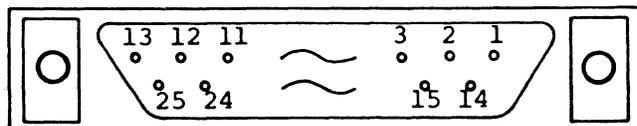
Fig. Appendix B 1-2 RS232C Connector

2 Signal Descriptions

The signal levels are defined at the connector pins.

Mark is a low level or logic 0.
Space is a high level or logic 1.

2.1 DATA RDY/BSY Protocol

When the printer is operated with the DATA READY/BSY Protocol, the following signal lines are necessary:

① FG (Frame Ground)
Grounding line for circuit protection.

② CER (Carrier Error)
(This signal is sent depending on the Function settings)
When any of the errors (Parity Error, Framing Error or Overrun Error) are detected, this signal goes low within 1 ms from the stop bit end of received data. If the host computer continues to send data to the printer without sending the CAN code, the printer will continue to receive data.
In case the CER line is low level when the printer receives the CAN code or the DC3 code, or when the printer is deselected by the | ON LINE | switch, this line goes high.

Note: In the Bit Image Graphic mode the CAN code and the DC3 code become Bit Image Graphic data.
When a transmission error occurs in the Bit Image Graphic mode and the CER line becomes low (high) level, the host CPU does not turn the CER line to high (low) level until the Bit Image Graphic mode is finished.

A low or high signal depends on the Function settings.

③ RD (Received Data)
This is a serial data transmission line to the printer from a host CPU. When no data is transmitted, this line must be in "MARK" (low) state.

⑦ SG (Signal Ground)
This is a signal ground line.

⑭ FAULT (Fault)
This signal is low when the printer has an abnormal condition or when deselected. It is high when the printer is normal and selected.

⑳ DTR (Data Terminal Ready)
This line becomes high while the printer can receive data.
This line becomes low while the printer can not receive data.

2.2 X ON/X OFF Protocol

When the printer is operated with the X ON/X OFF Protocol, the following signal lines are necessary:

① FG (Frame Ground)
Grounding line for circuit protection.

② SD (Send Data)
This is a serial data transmission line to the host CPU from the printer.
When no data is transmitted, this line must be in "MARK" (low) state.

③ RD (Received Data)
This is a serial data transmission line to the printer from a host CPU. When no data is transmitted, this line must be in "MARK" state.

④ RTS (Request to Send)
This is an output signal from the printer, and goes high (logic 1) when the printer is selected.

⑤ CTS (Clear to Send)
This is a control line for printer input signals.
This line must go high to allow the printer to send data to the host.

⑥ DSR (Data Set Ready)
This is an input signal line to the printer. It must go high in order to permit the printer to send and receive data.

⑦ SG (Signal Ground)
This is a grounding line for signals.

⑧ CD (Carrier Detected)
This line is used to indicate the presence of an input carrier signal entering the printer. It is normally ignored.

⑭ $\overline{\text{FAULT}}$ (Fault)
This signal is low when the printer has an abnormal condition or when deselected. It is high when the printer is normal and selected.

⑳ DTR (Data Terminal Ready)
This is a printer output status signal.
When power is supplied to the printer and the printer is ready to receive data, this line becomes high.

Note: DSR and CTS can be ignored depending on the Function settings.

3 Input/Output Circuit Configurations

3.1 Input/Output Circuit Configurations
RS232C

	Signals	Circuit
Output	FAULT SD (CER) RTS DTR	+5V −12V 0V +12V SN75188 or the equivalent
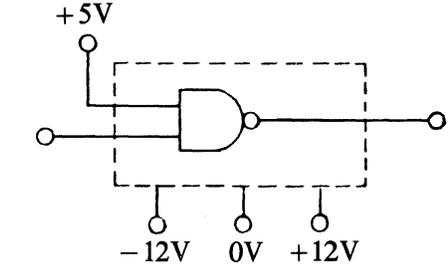
	Signals	Circuit
Input	RD CTS DSR CD	+5V 0V SN75189A or the equivalent
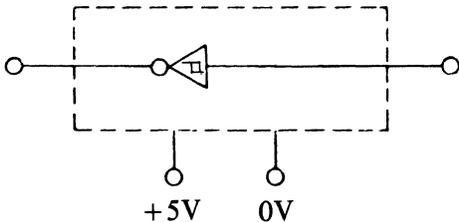
Fig. Appendix B 3-1 Circuit Configuration (RS232C)

1 Output level: Nominal ±8V
2 Input level: Max.   ±15V
               Min.   ± 5V

Note: The circuit is protected against input signals (fail-safe operation).

The threshold voltage level is shown below:

+1.8V   +0.9V

0

MARK   SPACE   MARK
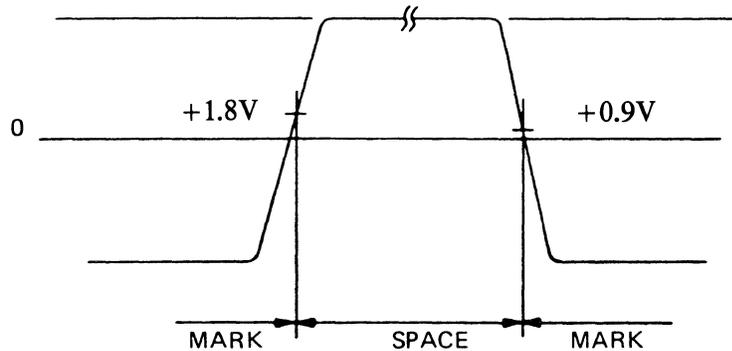
4 Printer Status and Control SW/Control Code

4.1 READY

- This signal indicates that the printer is able to receive data (READY)

Protocol	Signal
RDY/BSY	Sets DTR to High.
XON/XOFF	Transmits XON.

4.2 BUSY

- This signal indicates that the printer is not able to receive data (BUSY)

Protocol	Signal
RDY/BSY	Sets DTR to Low.
XON/XOFF	Transmits XOFF.

- Conditions that make the printer Busy
  a) When the data buffer is full.

    Reception buffer 2.0K byte (Option 8K Bytes)
    Overrun buffer (Depending on the Function settings)

  b) When the printer is set to DESELECT mode
  c) When the printer is set to FAULT status

4.3 SELECT

- This signal is an output signal which indicates that the printer is set to SELECT or DESELECT mode. In SELECT mode data can be received, while in DESELECT mode the received data except DC1 code is ignored (depending on the Function settings).
- When the printer is in the SELECT mode, the level will be high.
- Conditions that set the printer to SELECT mode.
  a) When the ON LINE switch is depressed in the DESELECT mode.
    However, by depressng the ON LINE switch in the PE status when there is no data in the buffer, the printer will be set to SELECT mode once so as to release the PE status, and after receiving and printing a line or so of data, it will return to the PE, DESELECT mode.
  b) When DC1 code is received when the printer is set to the DESELECT mode (when DC1 code is valid).
    However, when the printer is in the PE status, the reception of DC1 code does not set the printer to SELECT mode.
  c) Immediately after the power is turned on (depending on the Function settings).

- Conditions that set the printer to the DESELECT mode

  a) When the [ON LINE] switch is depressed in the SELECT mode.
  b) When DC3 is received. (Depending on the Function settings.)
  c) When the printer is in the PE status.
  d) When the power is turned ON. (Depending on the Function settings.)
  e) When there is an ERROR. (A PRINTER ERROR occurs when the head carrier overruns, or when the printer fails to initialize after the power is turned on.)
  f) When the COVER OPEN status is detected.

- The RTS signal is used to distinguish this signal.

4.4 FAULT

- This is an output signal which indicates that the printer is in the FAULT status.
- When the printer is in the FAULT status, the level is low.
- Conditions that set the printer to the FAULT status.

  a) When the printer is in the PE status. (However, when the printer is set to the SELECT mode at this time, the FAULT status will be released once. [the level will be high], the data will be received and printed out, and then the level will become low.)
  b) When the printer is set to DESELECT mode.
  c) When there is an ERROR (when the head carrier overruns, or the printer failes to initialize after the power is turned on).
  d) When the COVER OPEN status is detected.

4.5 Relationship between the [ON LINE] switch and DC1/DC3 code

- In case of RDY/BSY Protocol
  This unit makes the DTR and RTS signal levels low when it is set to the DESELECT mode with the [ON LINE] switch or receives the DC3 code.
  This unit makes the DTR and RTS signal levels high when it is set to the SELECT mode with the [ON LINE] switch or receives the DC1 code.
  The data between the DC3 code and DC1 code (or, when [ON LINE] switch is depressed) will be ignored.
- In case of XON/XOFF Protocol
  This unit transmits the XOFF code to the host CPU when it is set to the DESELECT mode with the [ON LINE] switch or receives the DC3 code.
  However, if the XOFF code has been already transmitted because the data buffer is full, another XOFF code will not be transmitted.
  This unit will transmit the XON code only when the XOFF code has been transmitted with the [ON LINE] switch or the DC3 code when it is set to the SEL status with the [ON LINE] switch or receives the DC1 code.

4.6 Data Buffer

This unit provides a data buffer with 2K Bytes. (Option 8K Bytes). This printer has an overrun buffer depending on the Function settings.

APPENDIX C
VFU

1 VFU (Vertical Form Unit)

1.1 VFU Function

The VFU function is to feed the paper automatically to a pre-programmed line.

The TOF position and vertical tab positions are set as follows according to the set-up mode.

If you wish to set them to another position, they must be set by the program.

1.2 VFU Initialization

TOF position . . . . .is set according to the forms length specification of Function No. 1. (3 ~ 15 inches)

Vertical tab position . . . Vertical tab (ch2) is set at every inch from the TOF.
The number of lines will differ with the No. 2 function specification. (Line spacing pitch specification)

Example
The VFU is initialized with the forms length 11 inches and a vertical pitch of 6 lines/inches as follows;

	ch6 ch5 ch4 ch3 ch2 ch1	NOTE
	8 7 6 5 4 3 2 1	
1	X 1 0 0 0 0 0 1	TOF (ch1)
	X X X X X X X X	
2	X 1 0 0 0 0 0 0	
	X X X X X X X X	
3	X 1 0 0 0 0 0 0	
	X X X X X X X X	
4	X 1 0 0 0 0 0 0	
	X X X X X X X X	
5	X 1 0 0 0 0 0 0	
	X X X X X X X X	
6	X 1 0 0 0 0 0 0	
	X X X X X X X X	
7	X 1 0 0 0 0 1 0	VT (ch2)
	X X X X X X X X	
8	X 1 0 0 0 0 0 0	
	X X X X X X X X	
9	X 1 0 0 0 0 0 0	
	X X X X X X X X	
10	X 1 0 0 0 0 0 0	
	X X X X X X X X	
11	X 1 0 0 0 0 0 0	
	X X X X X X X X	
12	X 1 0 0 0 0 0 0	
	X X X X X X X X	
13	X 1 0 0 0 0 1 0	VT (ch2)
	X X X X X X X X	
14	X 1 0 0 0 0 0 0	

	ch6 ch5 ch4 ch3 ch2 ch1	NOTE
53	X 1 0 0 0 0 0 0	
	X X X X X X X X	
54	X 1 0 0 0 0 0 0	
	X X X X X X X X	
55	X 1 0 0 0 0 1 0	VT (ch2)
	X X X X X X X X	
56	X 1 0 0 0 0 0 0	
	X X X X X X X X	
57	X 1 0 0 0 0 0 0	
	X X X X X X X X	
58	X 1 0 0 0 0 0 0	
	X X X X X X X X	
59	X 1 0 0 0 0 0 0	
	X X X X X X X X	
60	X 1 0 0 0 0 0 0	
	X X X X X X X X	
61	X 1 0 0 0 0 1 0	VT (ch2)
	X X X X X X X X	
62	X 1 0 0 0 0 0 0	
	X X X X X X X X	
63	X 1 0 0 0 0 0 0	
	X X X X X X X X	
64	X 1 0 0 0 0 0 0	
	X X X X X X X X	
65	X 1 0 0 0 0 0 0	
	X X X X X X X X	
66	X 1 0 0 0 0 0 0	
	X X X X X X X X	
67	X 1 0 0 0 0 0 1	TOF (ch1)
	X X X X X X X X	

- TOF is set in the first line of ch1.
- VT is set at every inch from the position of TOF.
- X can be either 0 or 1.
- Tab set of one line needs 2 bytes of data.

1.3   Setting Method of VFU

1.3.1   Form length is determined and then the TOF is set in ch1. (max. 15 inches)

1.3.2   Stop position is determined.

1.3.3   Setting of channel (ch2 ~ 6) is programmed.

1.3.4   VFU is set by using the VFU setting program.

Example

Form length is set at 11 inches (66 line) and Line spacing is set at 1/6 inch.
The tab is set by initialization at lines 15, 30 and 45. (ch2)
VT is set by using ch3. Bottom is set at line 60.

```
100 ' ***** VFU SET PROGRAM *****
110 '
120 '
130 '
140 '
200 '
201 DATA 1,0,0,0,0,0,1    :'TOF
202 DATA 1,0,0,0,0,0,0
203 DATA 1,0,0,0,0,0,0
204 DATA 1,0,0,0,0,0,0
205 DATA 1,0,0,0,0,0,0
206 DATA 1,0,0,0,0,0,0
207 DATA 1,0,0,0,0,1,0    :'VT2
208 DATA 1,0,0,0,0,0,0
209 DATA 1,0,0,0,0,0,0
210 DATA 1,0,0,0,0,0,0
211 DATA 1,0,0,0,0,0,0
212 DATA 1,0,0,0,0,0,0
213 DATA 1,0,0,0,0,1,0    :'VT2
214 DATA 1,0,0,0,0,0,0
215 DATA 1,0,0,0,1,0,0    :'VT3
216 DATA 1,0,0,0,0,0,0
217 DATA 1,0,0,0,0,0,0
218 DATA 1,0,0,0,0,0,0
219 DATA 1,0,0,0,0,1,0    :'VT2
220 DATA 1,0,0,0,0,0,0
221 DATA 1,0,0,0,0,0,0
222 DATA 1,0,0,0,0,0,0
223 DATA 1,0,0,0,0,0,0
224 DATA 1,0,0,0,0,0,0
225 DATA 1,0,0,0,0,1,0    :'VT2
226 DATA 1,0,0,0,0,0,0
227 DATA 1,0,0,0,0,0,0
228 DATA 1,0,0,0,0,0,0
229 DATA 1,0,0,0,0,0,0
230 DATA 1,0,0,0,1,0,0    :'VT3
231 DATA 1,0,0,0,0,1,0    :'VT2
232 DATA 1,0,0,0,0,0,0
233 DATA 1,0,0,0,0,0,0
234 DATA 1,0,0,0,0,0,0
235 DATA 1,0,0,0,0,0,0
236 DATA 1,0,0,0,0,0,0
237 DATA 1,0,0,0,0,1,0    :'VT2
238 DATA 1,0,0,0,0,0,0
239 DATA 1,0,0,0,0,0,0
240 DATA 1,0,0,0,0,0,0
241 DATA 1,0,0,0,0,0,0
242 DATA 1,0,0,0,0,0,0
243 DATA 1,0,0,0,0,1,0    :'VT2
244 DATA 1,0,0,0,0,0,0
245 DATA 1,0,0,0,1,0,0    :'VT3
246 DATA 1,0,0,0,0,0,0
247 DATA 1,0,0,0,0,0,0
248 DATA 1,0,0,0,0,0,0
249 DATA 1,0,0,0,0,1,0    :'VT2
250 DATA 1,0,0,0,0,0,0
251 DATA 1,0,0,0,0,0,0
252 DATA 1,0,0,0,0,0,0
253 DATA 1,0,0,0,0,0,0
254 DATA 1,0,0,0,0,0,0
255 DATA 1,0,0,0,0,1,0    :'VT2
256 DATA 1,0,0,0,0,0,0
```

```
257 DATA 1,0,0,0,0,0,0
258 DATA 1,0,0,0,0,0,0
259 DATA 1,0,0,0,0,0,0
260 DATA 1,0,0,0,0,1,1  :'BOTTOM
261 DATA 1,0,0,0,0,0,0
262 DATA 1,0,0,0,0,0,0
263 DATA 1,0,0,0,0,0,0
264 DATA 1,0,0,0,0,0,0
265 DATA 1,0,0,0,0,0,0
266 DATA 1,0,0,0,0,0,0
267 DATA 1,0,0,0,0,0,1  :'TOF
300 '
310 '
320 RESTORE 201
330 PRINT CHR$(12)
340 LPRINT CHR$(&H1D);
350 FOR I=1 TO 67
360   N=0 : V$=" "
370   FOR J=6 TO 0 STEP -1
380     READ M : N=N+M*2^J
390     V$=V$+STR$(M)+" "
400   NEXT J
410   LPRINT CHR$(N);CHR$(64);
420   PRINT USING "###";I;
430   PRINT "    ";V$
440 NEXT I
450 LPRINT CHR$(&H1E)
460 PRINT
470 END
```

Program setting

201-267	: Data for setting
340	: Setting start code (GS)
360-380	: Data Reading and decimalization of each byte of data
410	: 2 bytes of data are sent to the printer
450	: Setting end code (RS)

1.4 VFU Operation

US code (1F) and channel No. are sent to the printer to set VFU channels.

US code function

- Performs a line feed until receiving the tab position of pre-programmed channel.
- If there is no tab set in the selected channel, the printer will line-feed until the next TOF position.
- If reverse line spacing mode is set, it performs reverse line feed.
- Automatic feed from the bottom area is performed.
- The code will be a print command by setting the Menu No. of Function No. 21 to 02.

Input Format

LPRINT CHR$ (&H1F); CHR$ (n);
or
LPRINT CHR$ (31); CHR$ (n);
* n is channel No. 1 to 6

Explanation

Line feeds are performed until reaching a pre-programmed tab position in the VFU by using FF, VT or US code. The following explains the exceptions.

If tab setting is in the bottom area, the tab is ignored and line spacing is performed until the next TOF line.

If VT is operated by using ch2 ~ 6, line feeds continue until the TOF position is reached.

The bottom position should be a 1 for channel 1 and 2, and 0 for channel 3 ~ 6.

US (1F) has the same function as FF.

US (n) code is used to select a VFU operation. The channel is determined by (n). The line number of "n line" and "line feed" is also determined by (n).

To select a channel; (n)=0 ~ 6 (01) H ~ (06) H
To select a line or line feed; (n)=1 ~ 15 (11) H ~ (1F) H
All other lines: US (n) code is ignored.

1.5 VFU Specification

1.5.1   Maximum form feed length (TOF — TOF length) 15 inches.

1.5.2   Initial parameters set
Form length:	Set the Menu No. 01 to 12 (3″ ~ 15″) of Function No. 01.
Lines per inch:	Set the Menu No. 01, 02 (1/6″, 1/8″) of Function No. 02.
Vertical tabs:	Set every inch from TOF. (channel 2 is used)

1.5.3   TOF Positioning: Only channel 1 is used for setting.

1.5.4   VT Positioning: Channel 2 ~ 6 can be used for setting vertical tab positions.

1.5.5   Bottom Positioning: Both channel 1 and 2 are set.
Only one Bottom position can be set within the form length.

1.5.6   Data code   One line is sent to printer as 2 bytes.
Setting start code: GS
Setting end code: RS

1.5.7   Data is ignored, if data exceeding the form length is sent or if the setting method is not correct, the VFU will return to initial status. The data will be treated as print data.

1.5.8   Top of form will be set at the current paper position when programming is completed.