DOT MATRIX PRINTER
SP349F-A SERIES

USERS MANUAL

star

Federal Communications Commission
Radio Frequency Interference
Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For compliance with Federal Noise Interference Standard, this equipment requires a shielded cable.

This statement will be applied only for the printers marketed in U.S.A.

Statement of
The Canadian Department of Communications
Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

The above statement applies only to printers marketed in Canada.

Self Declaration

Radio interferences regarding this equipment has been eliminated according to Vfg 1046/1984 announced by the DBP.
DBP has been informed about the introduction of this special equipment and has been conceded the right to examine the whole series.
It is upon the responsibility of the user to assume that his own assembled system is in accordance with the technical regulations under Vfg 1046/1984.
To observe FTZ-regulations it is necessary, to establish all connections to the printer with shielded cable.
The equipment may only be opened by qualified service representatives.

This statement will be applied only for the printers marketed in Germany.

NOTICE

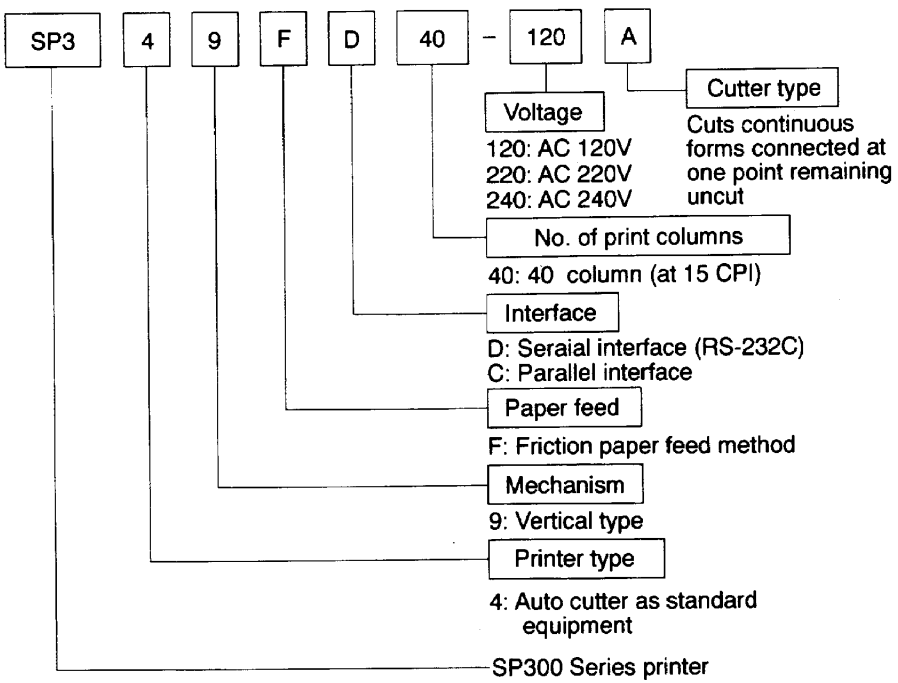
- *All rights reserved. Reproduction of any part of this manual in any form whatsoever, without STAR's express permission is forbidden.*
- *The contents of this manual are subject to change without notice.*
- *All efforts have been made to ensure the accuracy of the contents of this manual at the time of going to press. However, should any errors be detected, STAR would greatly appreciate being informed of them.*
- *The above notwithstanding, STAR can assume no responsibility for any errors in this manual.*

1. OUTLINE

The SP349F-A Series is a Vertical type Serial Impact Dot Matrix Printer which is equipped with an auto cutter as standard equipment. This series is designed for use with various receipt or ticket issuing terminals.

The major features of the SP349F-A Series are as follows:

1. Bi-directional printing at approx. 3.2 lines/sec.
2. Serial interface or Parallel interface.
3. Versatile print functions, including expanded character mode, inverted character printing and underlining, can be set by control cords.
4. The data buffer allows the unit to receive print data even during printing.
5. Peripheral unit drive circuit enables control of external devices such as cash drawers.
6. Realizes high speed paper feed by stepping motor drive.
7. Long-lived, improved auto cutter.
8. Backed up RAM
9. Variable paper width selectable at 2.25, 3.0 and 3.25 inches.
10. Paper rewinder and wall mounting bracket are optional.



2. UNPACKING AND INSTALLATION

2-1. Unpacking

After unpacking the unit, check that all the necessary accessories are included in the package.

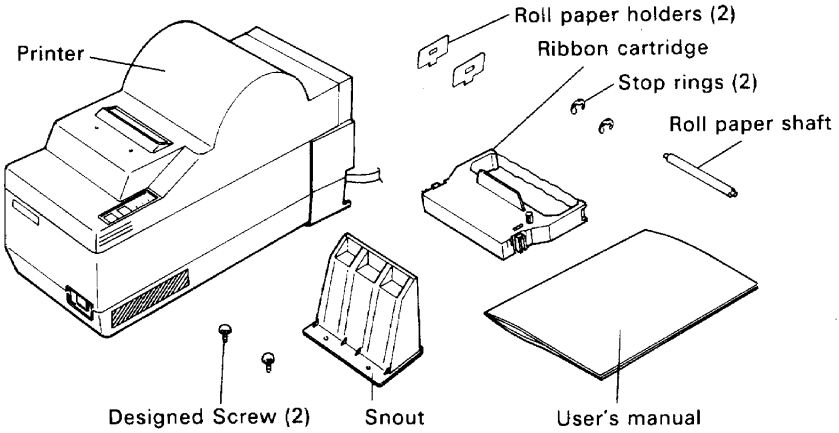


Fig. 2-1 Unpacking

2-2. Handling Notes

1. Install the unit on a stand or table having a flat, even surface.
   (Refer to Fig. 2-2 page 3)
   Bracket for wall mounting is optional.
   IMPORTANT!
   The printer may be attached to a wall with an optional wall bracket. Be sure the bracket is firmly attached, and the wall is strong enough to support both the weight of the printer and other stress that may be put on it.
2. Do not connect the AC power plug to the same outlet used for other electrical noise generating devices (such as an electrical motor, etc.)
   IMPORTANT!
   Install the socket-outlet near the printer and it shall be easily accessible.
3. Be careful not to drop paper clips, pins or other foreign matter into the unit as these could cause it to malfunction.
4. When cleaning the outer surface of the unit, wipe away dirt, foreign matter, etc., with a soft cloth soaked in a neutral detergent.
5. Do not attempt to print when the paper or ribbon cartridge are not loaded in the printer as this could damage the print head.
6. Use only roll paper that is not glued to the core.
7. Do not open the cover while printing (this is interpreted as a mechanical error and the printer will stop).

3. PARTS IDENTIFICATION AND NOMENCLATURE

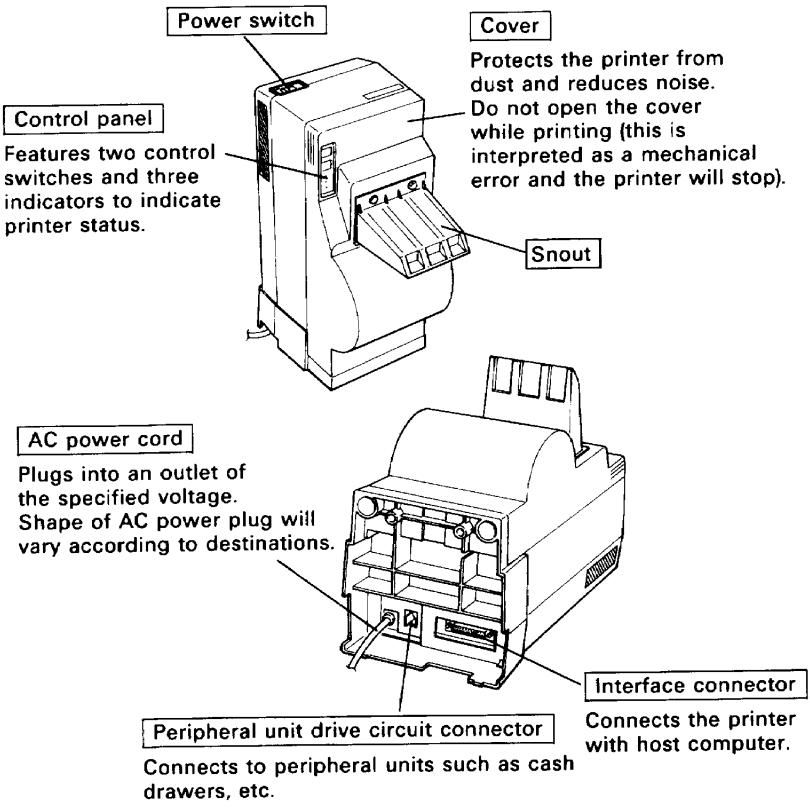
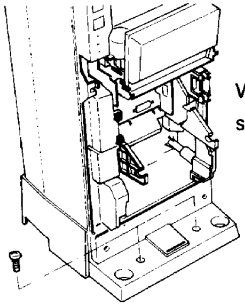


Fig. 3-1 External view of the printer

NOTE



When it is installed on the rough place, stabilize it with M8 screws.

Fig. 2-2 Installation Note

4. LOADING THE RIBBON CARTRIDGE AND PAPER

4-1. Loading the Ribbon Cartridge

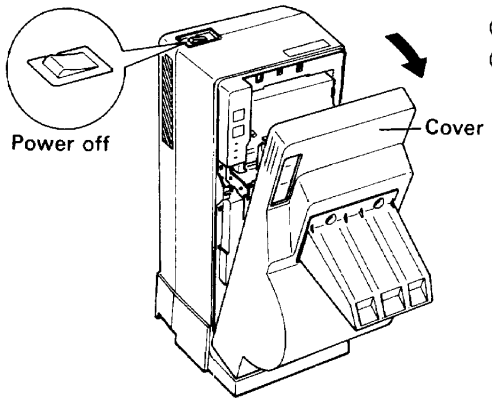


Fig. 4-1 Removing the cover

① Turn off power to the printer.
② Pull the upper part of the cover forwards to remove it.
Note: As the printing head will be hot just after having printed, make sure not to touch it.

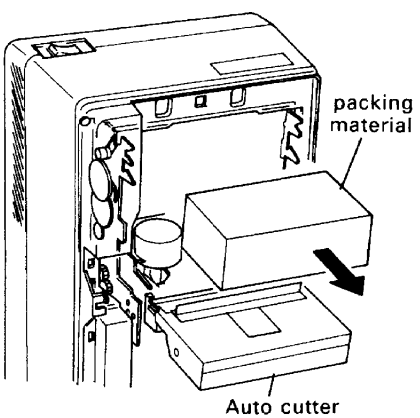
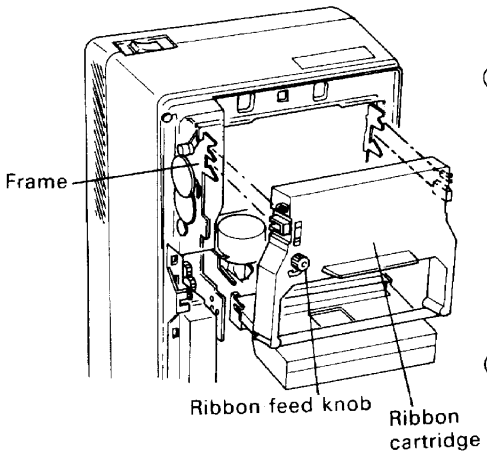


Fig. 4-2 Pull down the auto cutter and remove the packing material

③ Pull down the auto cutter and put it in horizontal position.
④ Remove the packing material.



④ Turn the ribbon feed knob of the ribbon cartridge in the direction of the arrow to remove slack in the ribbon.

⑤ Align the ribbon cartridge guide with the notched part of the frame. Insert the ribbon cartridge from that position till you hear a locking sound. Insert the ink ribbon between the print head and ribbon separator. At this time, make sure that the ink ribbon is not protruding beyond the ribbon separator.

⑥ Turn the ribbon feed knob of the ribbon cartridge in the direction of the arrow to remove slack in the ribbon.

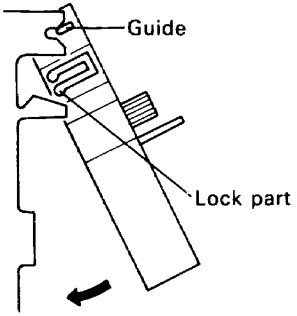


Fig. 4-3 Setting the ribbon cartridge

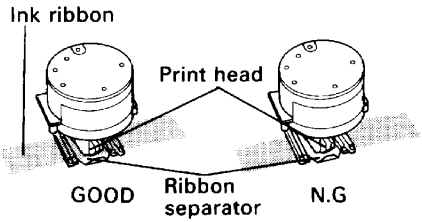
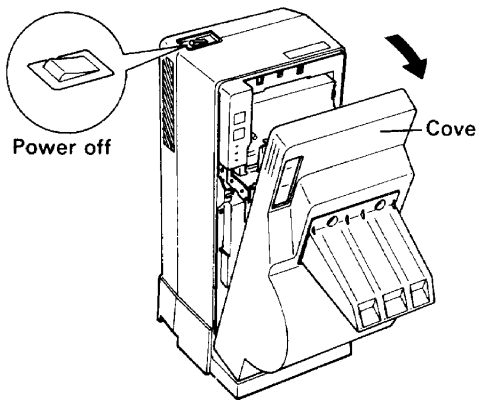


Fig. 4-4 Setting the ribbon cartridge

⑦ Push up the auto cutter and install the cover in reversed order of its removal.

4-2. Loading the Roll Paper



① Turn off power to the printer.
② Pull the upper part of the cover forwards to remove it.
Note: As the printing head will be hot just after having printed, make sure not to touch it.

Fig. 4-5 Removing the cover

③ Adjust the DIP switch 2-4, roll paper holder and adjust lever position according to the width and thickness of the roll paper that is used.
- Refer to Fig. 6-1 in regard to the position of the DIP switch.
- If you would not know the standard position of the adjust lever, lower the adjust lever as far as it will go (on the paper holder side) : position E, and then pull it 2 steps up. That position is standard position A for single paper. Pull it 1 step more from position A, that position is B for copy paper.

Paper		DIP switch 2-4 (Fig. 6-1)	Adjust lever position (Fig. 4-6)	Roll paper holder (Fig. 4-8)
Paper width	Thickness			
2.25-inch	single	OFF	A	Used (Inner groove)
	copies	OFF	B	Used (Inner groove)
3.0-inch	single	ON	A	Used (Outer groove)
	copies	ON	B	Used (Outer groove)
3.25-inch	single	ON	A	Not used
	copies	ON	B	Not used

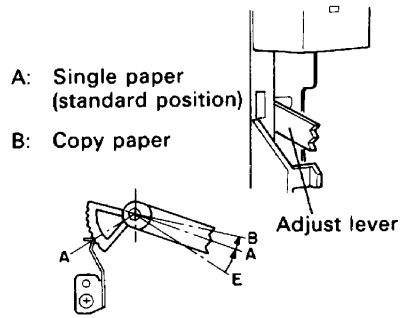


Fig. 4-6 Position of the adjust lever

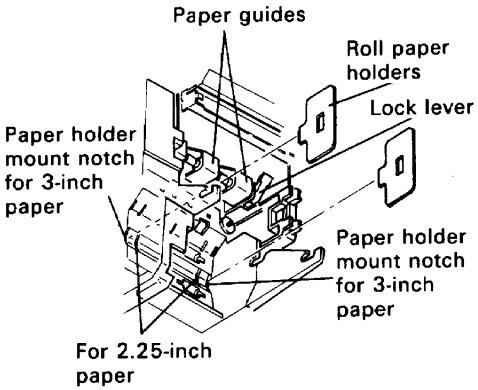


Fig. 4-7 Mounting the roll paper holders

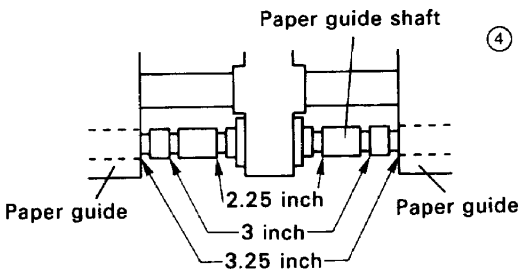


Fig. 4-8 Roll paper guide

④ Reset both sides of the paper guides when changing the paper width.

- Fix the paper guides with the lock lever at a position where there is a spare space of approximately 0.5 mm in relation to the used paper.
  It is convenient to set the paper guide by inserting a stop ring into the groove corresponding to the paper guide shaft shown in the Fig. 4-8.

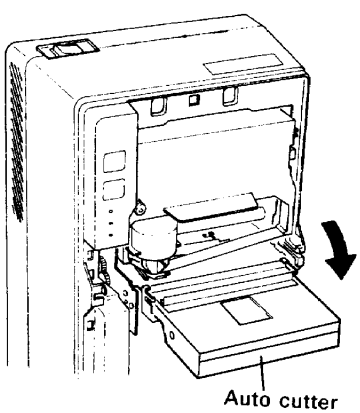


Fig. 4-9 Pull down the auto cutter

⑤ Pull down the auto cutter and put it in horizontal position.

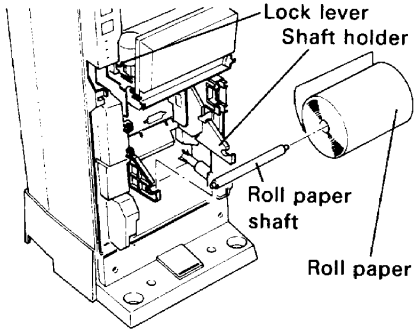


Fig. 4-10 Loading the paper

⑥ Turn on power to the printer.

⑦ Cut the tip of the roll paper in a straight line.

- In case the tip of the paper is fastened with a label, etc., remove the adhesive part of the label. If adhesive remains on the paper, it will stick onto the roller of the printer, making it impossible to feed the paper.

⑧ Observe the winding direction of the roll paper and insert the paper till it stops under the guide.

⑨ Push the FEED button (paper feed) on the control panel.
Release the switch when the roll paper has been fed out 10 cm from the paper outlet.

⑩ Insert the roll paper shaft into the paper roll and set it in the shaft holder.

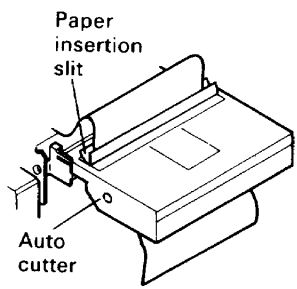


Fig. 4-11 Insertion of paper in the auto cutter

⑪ Insert the tip of the roll paper in the auto cutter paper slit.

- When using copying paper, insert only the original (the upper paper) in the slit of the auto cutter. Insert the paper which is to be copied (the lower paper) between the platen and the auto cutter. In this case, the Rewinder PW349 (option) will be necessary in order to wind the paper that is copied. In regard to the setting method for the rewinder, please refer to the user's manual of the rewinder.

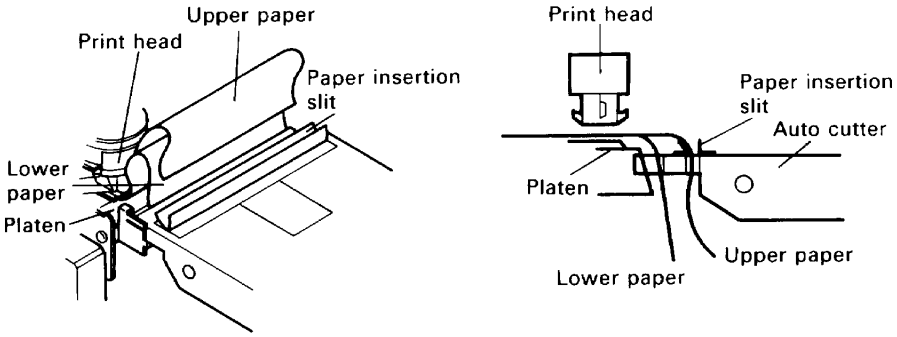


Fig. 4-12 Insertion of paper in the auto cutter (When using paper copying)

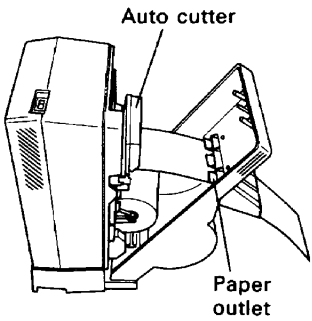


Fig. 4-13 Paper outlet of the front cover

⑫ Pull at the tip of the paper, and push up the auto cutter after taking up the slack in the paper.

⑬ Take out the paper through the snout of the cover, and then replace the cover in reverse order of its removal.

4-3. Removing the Roll Paper

Remove the cover then cut off the paper near the rear of the paper guide and press the FEED button to feed out the paper remaining in the unit.
When the paper runs out, a buzzer will sound 4 times per cycle for 2 cycles.

Note 1. Remove the paper remaining in the printer by pressing the FEED button (If you remove the paper by hand, the paper could be wrinkled or slip and cause a paper jam.)

2. When the paper end warning mark appears, replace the paper immediately. Continuing to use the roll can cause paper jams.

4-4. Connecting the Interface Cable

Use the interface cable of which dimension A is less than 46 mm shown in Fig.4-15 for both serial and parallel interface.

4-4-1. Serial Interface Cable

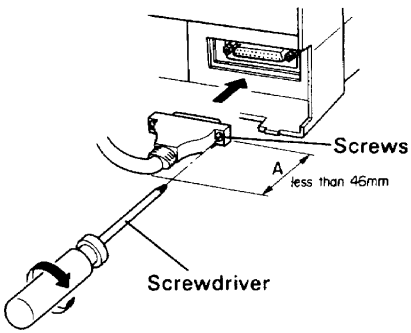


Fig. 4-14 Connecting the serial interface cable

① Turn off power to both the host computer and printer.
② Insert the terminal at one end of the interface cable into the connector on the printer and fasten the right and left screws.
③ Insert the other terminal of interface cable into the host computer's connector, and fasten the right and left screws.

4-4-2. Parallel Interface Cable

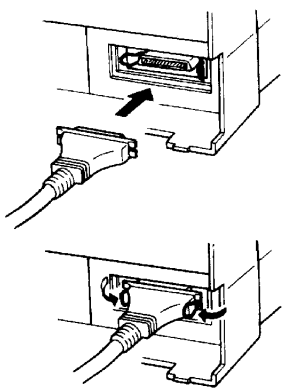


Fig. 4-15 Connecting the parallel interface cable

① Turn off power to both the host computer and printer.
② Insert one terminal of the interface cable into the printer's connector, and fasten it with the clasp.
③ Insert the other terminal of interface cable into the host computer's connector, and fasten it with the clasp.

5. CONTROL PANEL

5-1. Basic Operation

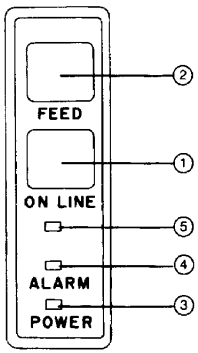


Fig. 5-1 Control panel

① ON LINE button
Switches the printer between ON LINE and OFF LINE. Whenever the printer switches between ON LINE and OFF LINE, the buzzer gives one short beep (ON LINE and OFF LINE switching is possible only when paper is loaded in the printer.)

② FEED button
- When this button is pressed and then released within 0.5 sec., the paper feeds one line.
- When this button is held depressed for more than 0.5 sec., the paper feeds continuously.
(The above paper feed operation is possible for both ON LINE and OFF LINE modes.)

③ POWER lamp (green LED)
- Lights when the power of the printer is on.

④ ALARM lamp (red LED)
- Lights when the paper is out.
If the paper is out, load a new roll paper and press the ON LINE button.
- Flashes when the cover is open or a mechanical error (motor lock etc.) occurs.
The buzzer will give one short beep followed by a long beep.
Mount the cover properly in place and press the ON LINE button. If the buzzer still sounds and the ALARM lamp flashes at this point, it signifies that a mechanical error has occurred. Remove the cause of the error and turn the power to the printer off and back on again to reset the printer.
(In case of a mechanical error, the data will not be cleared even if the power is turned off.)

⑤ ON LINE lamp (green LED)
- Lights when printer is ON LINE.
- Goes out when printer is OFF LINE.

When all the three lamps ③ to ⑤ light simultaneously and the buzzer sounds continuously, a CPU error has occurred. In case of CPU error, turn off the power once, and then turn it on again. When turning off the power, the data will be cleared.

5-2. Switch Operation (Combined Switch Operation)

① <SELF PRINT TEST>

FEED + POWER ON (Turn the power on while holding the FEED button depressed.)

After performing self-printting according to the VER. No., DIP switch setting and characters, cutting will be done. When the FEED button is pressed after completed self-printing, character printing and cutting will be repeatedly performed.

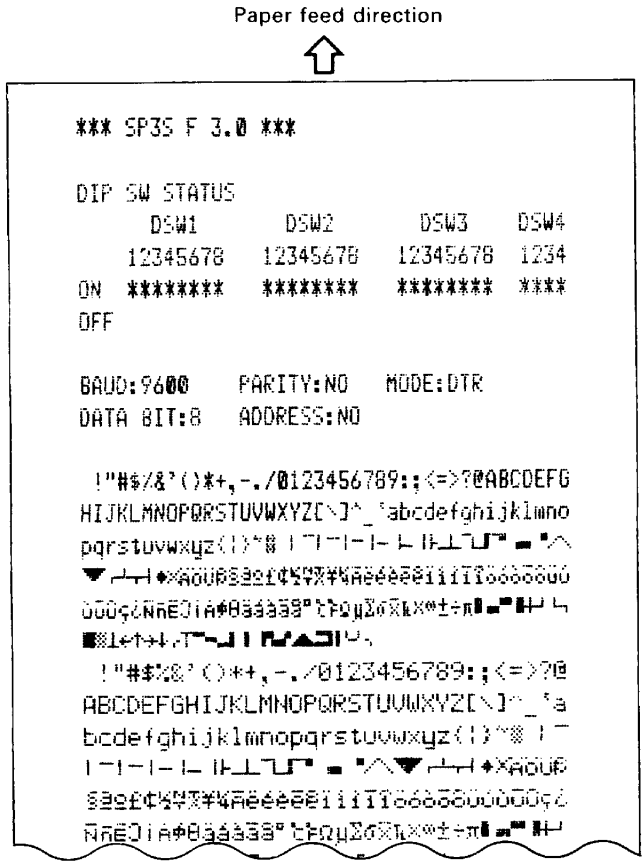


Fig. 5-2 Self printing sample (when using serial interface printer)

6. DIP SWITCH SETTING

Each of the switches in the DIP switch array is factory preset to ON. Make sure to turn the power of both the printer and host computer off before changing the setting of the DIP switches.

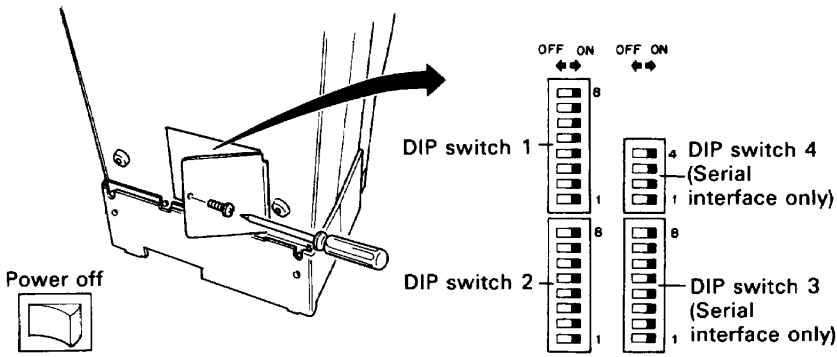


Fig. 6-1 DIP switch array

■ DIP-SW 1

Switch	Function		ON	OFF
1-1	(Not used)			
1-2				
1-3	Control code CR		Invalid	Valid
1-4 *1	When turning the power on.	DC1, DC 3 mode	Select	Deselect
		Addressable mode *2	Deselect	Select
1-5	Setting the paper feed length		1/6-inch	1/8-inch
1-6	Setting the buffer size		4 K-bytes	256 bytes *3
1-7	Backed up RAM		YES	NO
1-8	Paper out detection function		Valid	Invalid

*1 If you use a parallel interface printer, Switch 1-4 is used for switching the auto cutting control mode. For details, see Switch 3-4 described on the following page.

*2 The addressable mode is valid only when optional RS-422A serial interface is mounted.

*3 256 bytes at serial inter face printer 2 lines at parallel interface printer

■ DIP-SW 2

Switch	Function	ON	OFF
2-1	Character code table	See table below.	
2-2			
2-3	(Not used)		
2-4	Setting the paper width	3.25-inch, 3.0-inch	2.25-inch
2-5	(Not used)		
2-6	International character set	See table below.	
2-7			
2-8			

☐ Character code table

Switch	U.S.A. & Europe	IBM #1	IBM #2	Japan
2-1	ON	OFF	ON	OFF
2-2	ON	ON	OFF	OFF

☐ International character set

Switch	U.S.A.	France	Germany	England	Denmark	Sweden	Italy	Spain
2-6	ON	OFF	ON	OFF	ON	OFF	ON	OFF
2-7	ON	ON	OFF	OFF	ON	ON	OFF	OFF
2-8	ON	ON	ON	ON	OFF	OFF	OFF	OFF

■ DIP-SW 3 (For serial interface type only)

Switch	Function	ON	OFF
3-1	Data transmission rate	See next page	
3-2			
3-3			
3-4	Auto cutting control mode *4	Invalid	Valid
3-5	Data composition	DTR mode	X-ON/X-OFF mode
3-6	Data word length	8-data bit	7-data bit
3-7	Vertical parity check	No parity check	Parity check
3-8	Parity	Odd parity	Even parity

*4 When a command is given to continuously feed paper over 7/6 inches in the auto cutting control mode, the paper will be fully cut.

☐ Data transmission rate (baud rate)

bps	3-1	3-2	3-3
150	OFF	OFF	OFF
300	OFF	OFF	ON
600	OFF	ON	OFF
1200	OFF	ON	ON
2400	ON	OFF	OFF
4800	ON	OFF	ON
9600	ON	ON	ON/OFF

■ DIP-SW 5 (For serial interface type only)

Function / Switch	DC1, DC3 invalid mode	Addressable mode *5														DC1, DC3 valid mode
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	
4-1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
4-2	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
4-3	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
4-4	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

*5: The addressable mode is valid only when an optional RS-422A serial interface is mounted.

a) When DIP SW4-1 through 4-4 are all ON (DC1/DC3 invalid mode)
DC1 and DC3 codes are invalid.

b) When DIP SW4-1 through 4-4 are all OFF (DC1/DC3 mode)
DC1: select
DC3: deselect
When the printer receives the DC3 code, it throws away data until it receives the DC1 code (all the data between the DC3 and DC1 codes)
DTR is always ready.

c) Other settings (addressable mode)
DC1 n: select n (address)
DC3: deselect
When the printer receives the DC3 code, it throws away data until it receives the DC1 n code (with the n matching the printer's own address).
DTR is always ready.

Note: DIP SW1-4 selects the select/deselect state for when the power is first switched on.

7. SERIAL INTERFACE

7-1. Interface Specifications

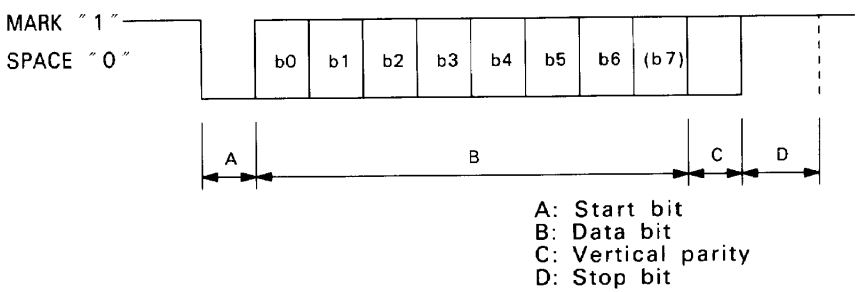
① Data transmission method: Asynchronous serial interface

② Baud rate: Selectable from 150, 300, 600, 1200, 2400, 4800, 9600 bps (Refer to "6. DIP Switch Setting".)

③ Word length: Start bit: 1 bit
Data bit: 7 or 8 bits (selectable. Refer to "6. DIP Switch Setting".)
Parity bit: Odd, even or none (selectable. Refer to "6. DIP switch setting".)
Stop bit: 1 or 2 bit length

④ Signal polarity: RS-232C (Standard feature)
MARK : Logic "1" (−3V to −15V)
SPACE: Logic "0" (+3V to +15V)
Current loop (optional)
MARK : Logic "1" (current ON)
SPACE: Logic "0" (current OFF)

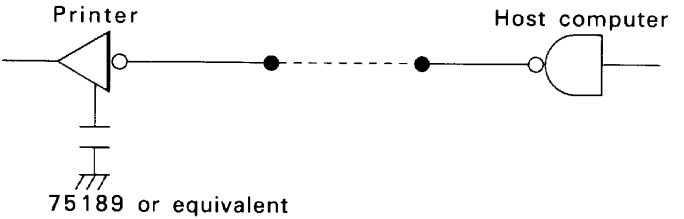
RS-422A (optional)
MARK: Logic "1"
A is 0.2V or more than B
SPACE: Logic "0"
A is −0.2V or less than B
(see Fig. 7-3)



7-2. Interface Circuit

7-2-1. RS-232C Serial Interface

Input (RXD, CTS)



Output (DTR, $\overline{\text{FAULT}}$, TXD, RCH, RTS)

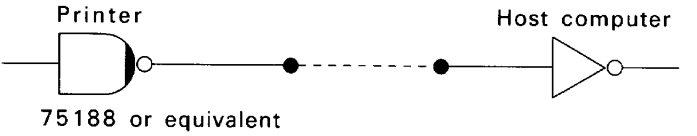
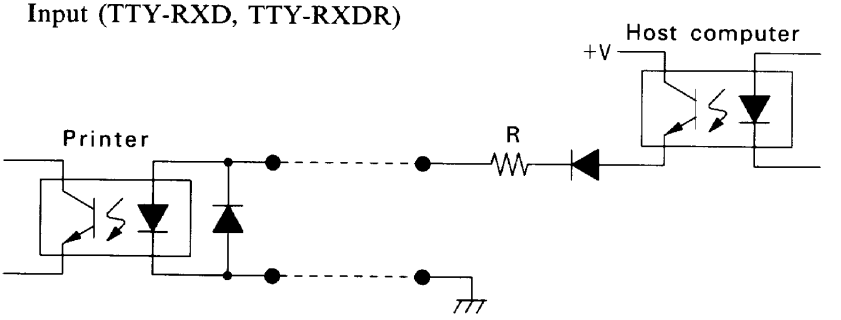


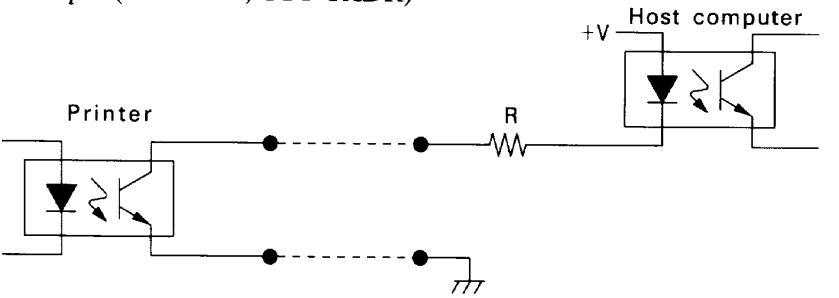
Fig. 7-1 RS-232C interface circuit

7-2-2. Current Loop (option)

Input (TTY-RXD, TTY-RXDR)



Output (TTY-TXD, TTY-TXDR)

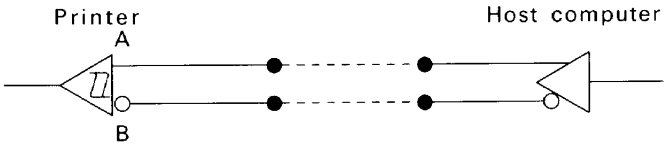


Note: Adjust "R" so that the loop current is set within 10 to 20 mA.

Fig. 7-2 Current loop interface circuit

7-2-3. RS-422A Serial Interface (option)

Input (RD, CS)



Output (SD, RS)

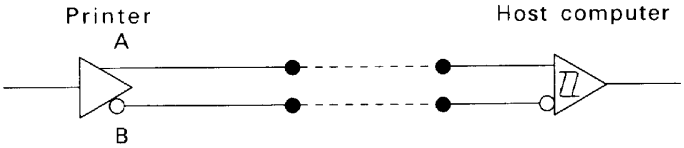


Fig. 7-3 RS-422A interface circuit

Note: Do not select two or more printers simultaneously in the addressable mode.

7-3. Connectors and Signals

RS-232C

Pin no.	Signal name	I/O direction	Function
1	F-GND	—	Frame ground
2	TXD	OUT	Transmitted data
3	RXD	IN	Received data
4	RTS	OUT	Data transmission request signal. This is always "SPACE" when the printer is turned on.
5	CTS	IN	This signal changes to "SPACE" when host computer is ready to transmit data. (In this instance, the printer does not check this signal.)
6	N.C.		Not connected
7	S-GND	—	Signal ground
8	N.C.		Not connected
9-10	N.C.		This pin is used when using the optional interface board.
11	RCH	OUT	This signal changes to "SPACE" when the printer is ready to receive data. (The signal line is same as pin 20.)
12	N.C.		Not connected.
13	S-GND	—	Signal ground
14	$\overline{\text{FAULT}}$	OUT	When printer error occurs (such as paper out, mechanical error, etc.), this signal is set to "MARK".
15	Multi-printer TXD	OUT	Diode coupled TXD
16	Multi-printer DTR	OUT	Diode coupled DTR
17 to 19	N.C.		This pin is used when using the optional interface board.
20	DTR	OUT	Data terminal ready signal. When the printer is ready to receive data, this signal changes to "SPACE".
21-22	N.C.		Not connected
23 to 25	N.C.		This pin is used when using the optional interface board.

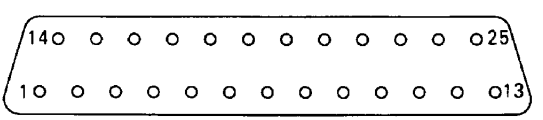


Fig. 7-4 Serial interface connector

20 mA current loop (option)

Pin no.	Signal name	I/O direction	Function
9	TTY TXDR	—	Indicates the ground side of the data signal of 20 mA loop current.
10	TTY TXD	OUT	Transmitted data of 20 mA current loop.
17	TTY TXDR	—	Indicates the ground side of the data signal of 20 mA loop current.
18	TTY RXDR	—	Indicates the ground side of the data signal of 20 mA loop current.
19	TTY RXD	IN	Received data of 20 mA current loop.
23	TTY RXDR	—	Indicates the ground side of the data signal at 20mA loop current.
24	TTY TXD	OUT	Transmission data of 20 mA current loop.
25	TTY RXD	IN	Reception data of 20 mA current loop.

RS-422A (option)

Pin no.	Signal name	I/O direction	Function
9	SD (+)	OUT	Transmitted data
10	SD (−)	OUT	Transmitted data
17	RD (+)	IN	Received data
18	RD (−)	IN	Received data
19	CS (+)	IN	When the host computer is set to standby for data transmission, this signal changes to "SPACE". (In this instance, the printer does not check the signal.)
23	CS (−)	IN	When the host computer is set to standby for data transmission, this signal changes to "SPACE". (In this instance, the printer does not check the signal.)
24	RS (+)	OUT	Data transmission request signal. When the printer is ready to receive data, this signal changes to "SPACE".
25	RS (−)	OUT	Data transmission request signal. When the printer is ready to receive data, this signal changes to "SPACE".

7-4. Interface Connections

The following is a basic example of interface connections. (For interface connections, refer to the specifications for the respective interface.) IBM PC type serial port is shown as example.

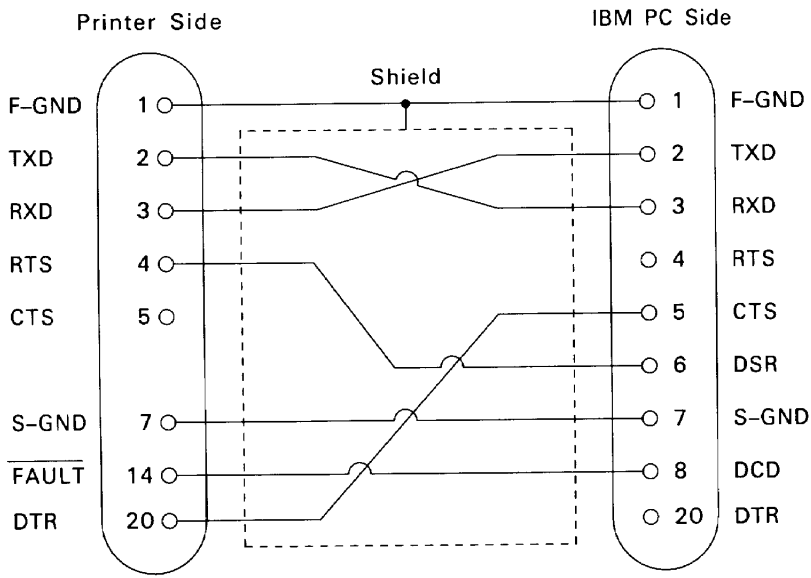


Fig. 7-5 Example of interface connections for IBM PC

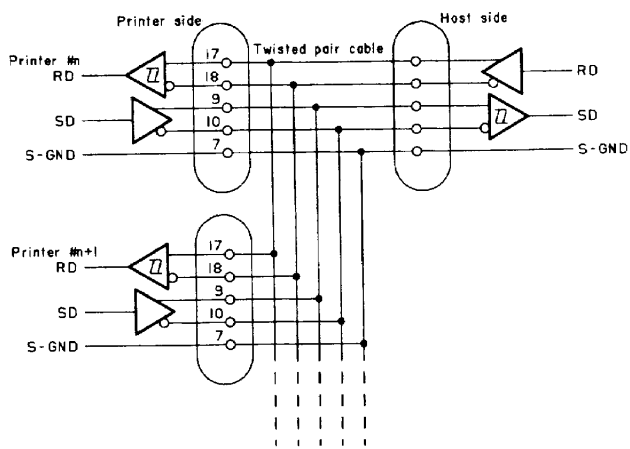


Fig. 7-6 Example of interface connections (RS-422A adressable mode)

7-5. Installing the Optional Interface Board

When using the optional 20 mA current loop interface or the RS-422A interface, the optional interface board must be mounted to the printer's main logic board. The following is the method of mounting the interface board to the printer's main logic board.

① Remove 6 screws on the bottom cover of the printer, then remove the bottom cover.

② When using optional 20 mA current loop interface board, swich SW1 on the optional board as follows.

X-ON/X-OFF mode: A-C
DTR mode : B-C

③ Connect the optional interface board connector to connector CN9 on the printer's main logic board.

④ At the same time, insert the plastic board support of the main logic board into the hole on the interface board.

⑤ Switch SW5 and SW6 on the main logic board from A-C to B-C.

⑥ Mount the bottom cover to the printer and fasten 6 screws to fix it in place on the printer.

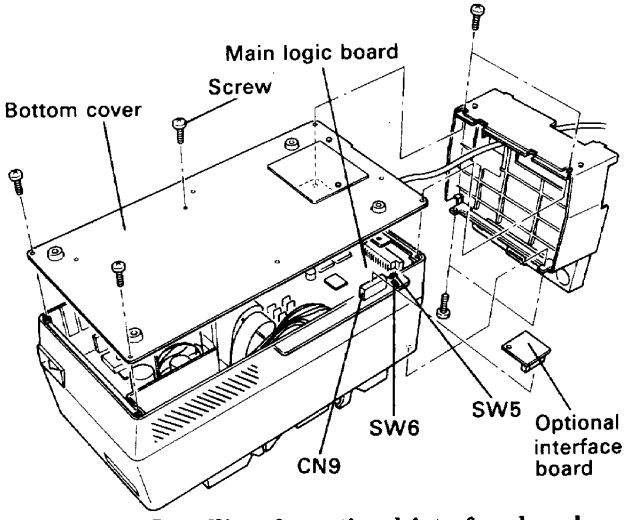


Fig. 7-7 Installing the optional interface board

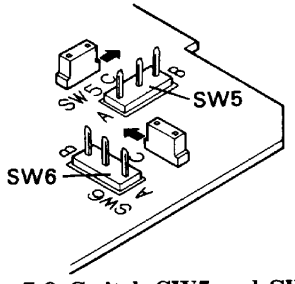


Fig. 7-8 Switch SW5 and SW6

7-6 Emergency Suspension

If any of the following errors is detected while the printer is operating, the printer halts and $\overline{\text{FAULT}}$ signal turns to "MARK".

SERIAL

① Mechanical errors
- Motor lock
- Defective timing detector (signal not issued)
- Abnormal home position check
- Timing error of the auto cutter
- Open or short of thermistor

To reset the emergency suspension, rectify the cause of trouble and adopt one of the following 2 methods.
- Turn the printer power off and on again. (returns to ON LINE)
- Push ON LINE button.

Even while in the status of no backed up RAM with DIP SW1-7, the RAM is not cleared when power is turned OFF. Printing resumes from the line being printed when the mechanism stopped.

② If the cover is opened while printing
If the cover is opened while printing, the same operation as given in above item "① Mechanical errors" takes place. To restart printing, close the cover and push ON LINE button.

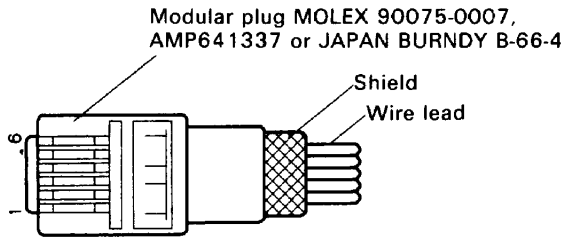
③ CPU error
If CPU goes erratic due to external noise, etc, the printer halts, treating it as CPU error. The buzzer sounds about 2 seconds.
Normal operation can be resumed by turning ON the power supply again, but the data contained in RAM gets cleared.

④ RAM Check Function
Before self-printing and when clearing the buffer, a RAM check is performed. Writes/reads the data (AA)H (55)H to/from all the external RAM addresses (except the CPU RAM).

⑤ Procedures at Time of Power Interruption
When using the backed up RAM function in valid status, the data in the buffer will be preserved even when there is a power interruption. When the power is turned ON again, the power interruption message "P.D" will be printed, and printing will be resumed from the line where it was stopped.
DIP SW1-4 selects the select/deselect state for DC1/DC3 mode and addressable mode for when the power is first switched on.
Sometimes the printing after the power is switched back on does not smoothly resume where it left off before the power was interrupted.

7-7. Peripheral Unit Drive Circuit

A drive circuit for driving peripheral units (such as cash drawers) is featured on the main logic board of this printer. A modular connector for driving peripheral unit is featured on the output side on the drive circuit. When using this circuit, connect the cable for the peripheral unit. (Cables must be prepared by the user.)
Use cables which meet the following specifications.



Note: Pin 1 must be shield drain wire connected to peripheral device frame ground.

Fig. 7-9 Cable specifications

① Connecting the cable

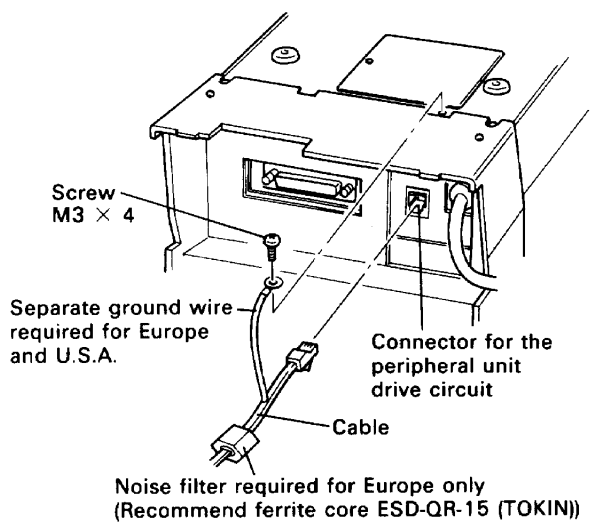
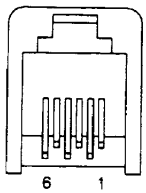


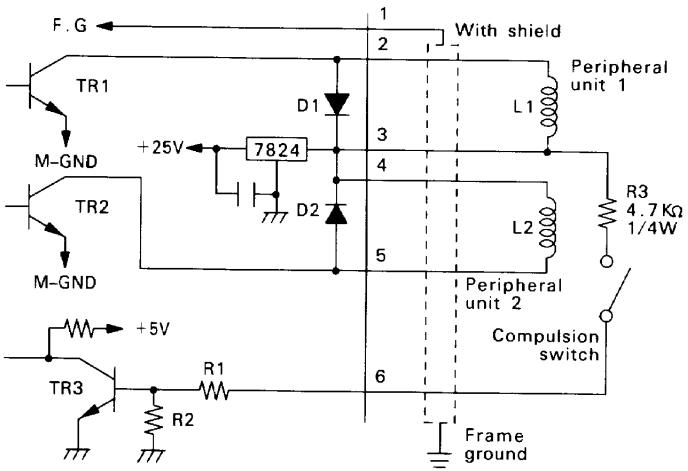
Fig. 7-10 Connecting the cable

② Drive circuit



6-P modular jack connector

[Drive output 24V, max. 1.0 A]



Notes:

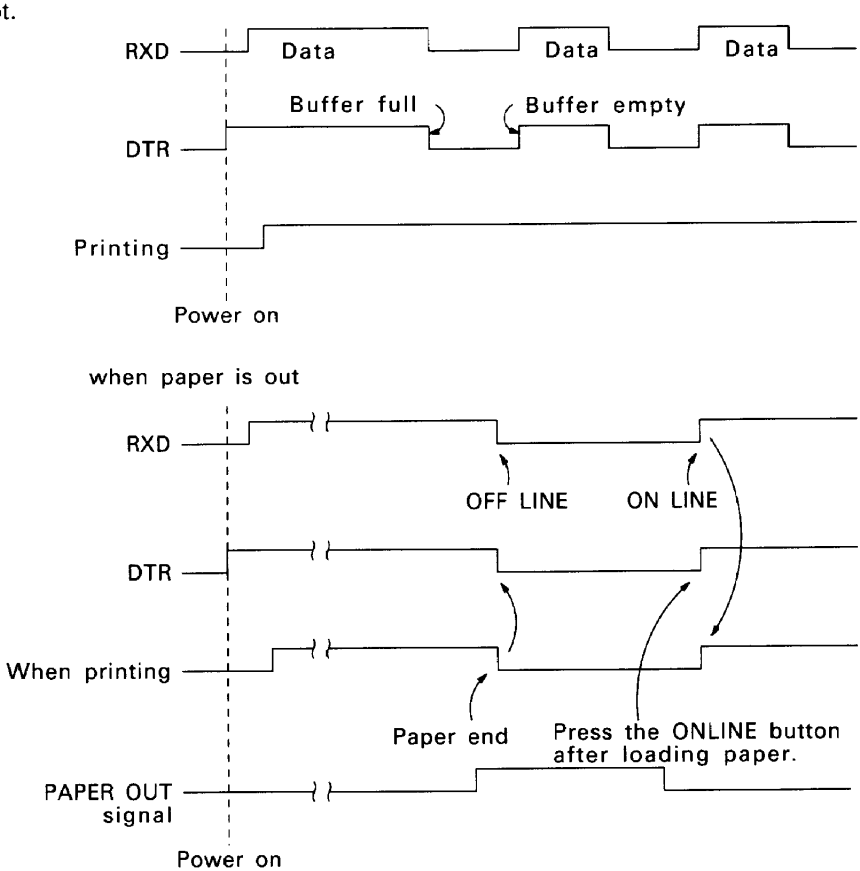
1. Peripheral units 1 and 2 cannot be driven simultaneously.
   When the peripheral unit has been driven continuously, set the drive duty to maximum 20 %.
2. The status of the compulsion switch is available in printer as status data. (Refer to "7-7. Data structure".)
3. Resistance values of coils L1 and L2 are minimum 24 Ω.
4. Absolute maximum rating of diodes D1 and D2 (Ta = 25°C)
   Average rectified current I_o = 1A
   Maximum forward surge current (60 Hz, sine wave 1 cycle) I_{FSM} = 40 A
5. Absolute maximum rating of transistors TR1 and TR2 (Ta = 25°C)
   Collector current Ic = 2A
   Collector loss Pc = 1.2W
6. Shield of cable must be connected to frame of peripheral device to provide static (ESD) drain.

Fig. 7-11 Drive circuit

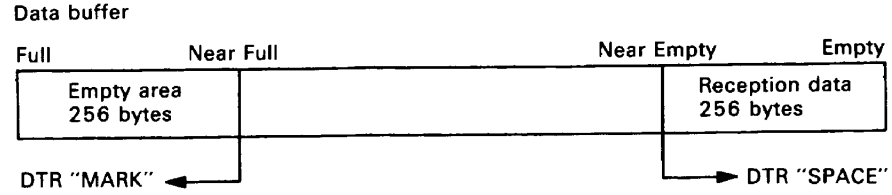
7-8. Data Structure

7-8-1. DTR mode

This mode is accessed when the DIP switch 3-5 is ON.
Signals are controlled using the DTR line as BUSY flag.
"SPACE" shows that the printer can receive data and "MARK" shows that it can not.



① DIP SW1-6 ON (buffer: approx. 4K bytes)
After the power is switched on, if there is no error in the printer, it sets the DTR signal line to "SPACE". After the host computer verifies that the DTR signal line is "SPACE", it sends the data text on the RXD signal line. When the empty area of the data buffer falls below 256 bytes, the printer sets the DTR signal line to "MARK". After the host computer verifies that the DTR signal line is "MARK", it stops sending the data text, but the printer can still receive the amount of data for which there is empty area in the buffer. If the host computer ignores the DTR signal and sends data, the printer throws away any data it receives that exceeds the empty area of the buffer. When the printer has emptied enough of the data buffer by printing the data that there is less than 256 bytes of data left in the buffer, it sets the DTR signal line to "SPACE".

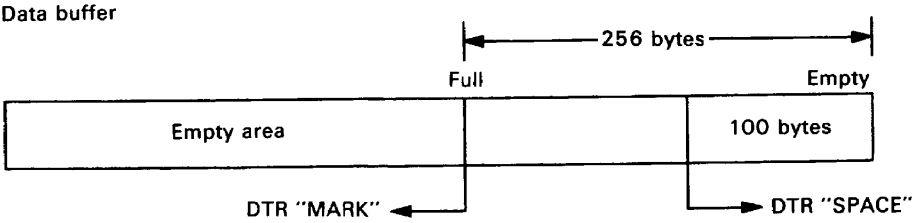


② DIP SW1-6 ON (buffer: 256 bytes)

After the power is switched on, if there is no error in the printer, it sets the DTR signal line to "SPACE". After the host computer verifies that the DTR signal line is "SPACE", it sends the data text on the RXD signal line. When 256 bytes or more of the data buffer is occupied, the printer sets the DTR signal line to "MARK". After the host computer verifies that the DTR signal line is "MARK", it stops sending the data text, but the printer can still receive data until the occupied area of the data buffer reaches about 4K bytes. If the host computer ignores the DTR signal and sends data, the printer throws away any data it receives that exceeds this approximately 4K bytes. When the printer has emptied enough of the data buffer by printing the data that there is less than 100 bytes of data left in the buffer, it sets the DTR signal line to "SPACE".

Data buffer Empty area 256 bytes 100 bytes

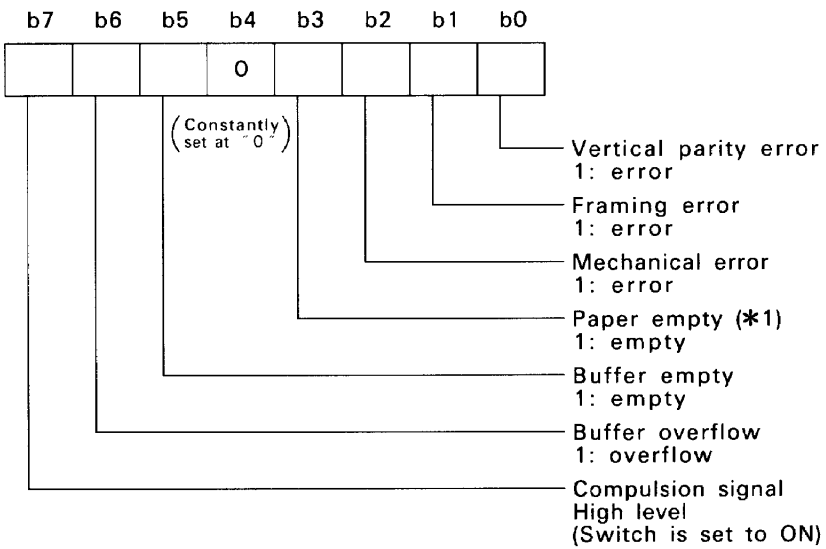
DTR mark DTR space



Under any of the following states, in which it can not print, the printer sets the DTR signal to "MARK" to tell the host computer that it can not receive data.

- Offline because the paper ran out
- Offline due to mechanical error
- Offline by the control switch
- Offline because the cover is open

[Paper out] (When DIP SW 1-8 is ON: Paper out detector is valid)
When the "paper out" detector senses the end of the paper, the printer stops printing after printing a maximum of two more lines or on feeding the paper. Immediately after a "paper out" condition is detected, the printer sets to OFF LINE and the DTR changes to "MARK". (To reset printer after a "paper out", load paper into the printer and press the ON LINE button to set the printer to ON LINE.)
[Paper Out] (When DIP SW1-8 is OFF, the paper out detection is invalid.)
Even if the paper runs out, the printing continues.
[Mechanical error]
Mechanical errors are detected when the cover is opened during printing, or when the motor locks and the unit will not print. Immediately after a mechanical error occurs, the printer sets the DTR to "MARK" and then sets the printer to OFF LINE. To cancel the mechanical error, close the cover properly and press the ON LINE button. If the buzzer sounds and the ALARM lamp flashes at this time, then locate the cause of the error and turn the power for the printer off and back on again to reset the printer.
When the printer returns online, the DTR signal is set to "SPACE". However, if the empty area of the buffer falls below 256 bytes, priority is given to the "MARK" condition until the amount of data in the buffer falls below 256 bytes.
[Status]

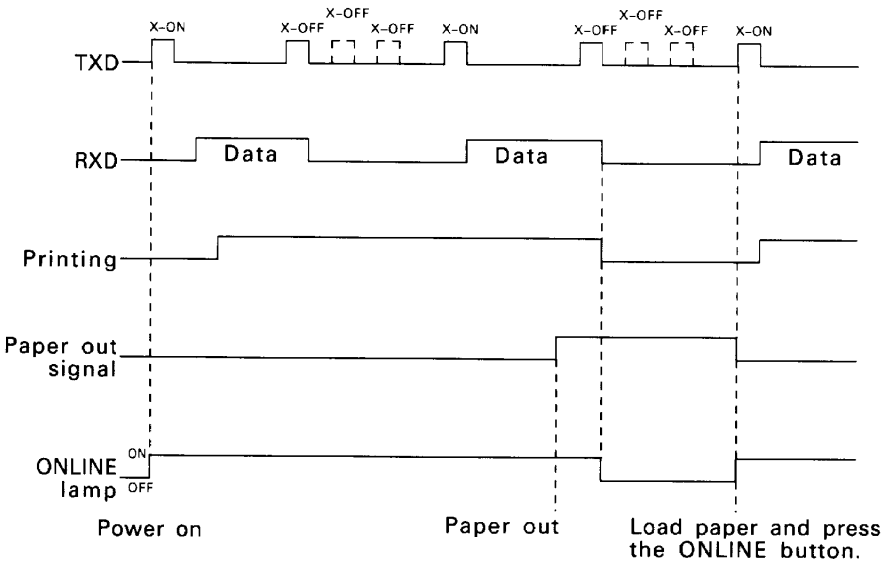


(*1): When DIP SW 1-8 is OFF (paper out detection invalid), Status b3 is always "0".
[Framing error]
A framing error occurs when SPACE is detected at the stop bit. When a framing error or a vertical parity error occurs for the data which is received, the printer prints out a "?" mark to indicate that the error occurred.
[Compulsion signal]
When pin 6 of the peripheral unit drive circuit connector is set "HIGH", status bit 7 becomes "1."

7-8-2. X-ON/X-OFF mode

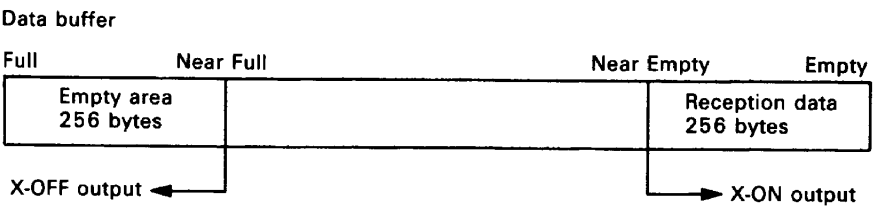
This mode is accessed when the DIP switch 3-5 is OFF.

This mode transmits X-ON (DC1) data when reception is possible, and X-OFF (DC3) data when reception is impossible, from the TXD signal to the host at regular intervals.



① DIP SW1-6 ON (buffer: about 4K bytes)

After the power is switched on, if there is no error in the printer, it outputs X-ON (control code: DC1 = hexadecimal (11)H). When the host computer receives the X-ON, it sends the data text on the RXD signal line. If the host computer does not send any data even though the printer has sent the X-ON, the printer outputs the X-ON every 3 seconds until data comes from the host computer. When the empty area of the data buffer falls below 256 bytes, the printer outputs the X-OFF (DC3 = (13)H) after it receives each byte. When the host computer receives the X-OFF, it stops sending the data text, but the printer can still receive the amount of data for which there is empty area in the buffer. If the host computer sends more data than can fit in the buffer, the printer throws away any data it receives that exceeds the empty area of the buffer. When the printer has emptied enough of the data buffer by printing the data that there is less than 256 bytes of data left in the buffer, it outputs X-ON.



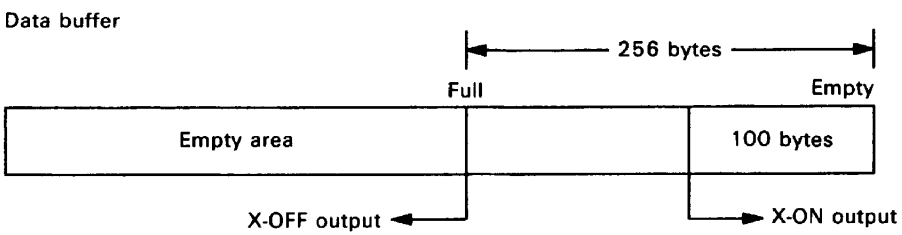
② DIP SW1-6 ON (buffer: 256 bytes)

After the power is switched on, if there is no error in the printer, it outputs X-ON (control code: DC1 = hexadecimal (11)H). When the host computer receives the X-ON, it sends the data text on the RXD signal line. If the host computer does not send any data even though the printer has sent the X-ON, the printer outputs the X-ON every 3 seconds until data comes from the host computer.

When 256 bytes or more of the data buffer is occupied, the printer outputs the X-OFF CD (3, (13)H) after it receives each byte. When the host computer receives the X-OFF, it stops sending the data text, but the printer can still receive data until the occupied area of the data buffer reaches about 4K bytes. If the host computer ignores the DTR signal and sends data, the printer throws away any data it receives that exceeds this approximately 4K bytes. When the printer has emptied enough of the data buffer by printing the data that there is less than 100 bytes of data left in the buffer, it outputs X-ON.

Data buffer Empty area 256 bytes 100 bytes

X-OFF output X-ON output



Under any of the following states, in which it can not print, the printer outputs the X-OFF. When it can not print, the printer outputs X-OFF after each data reception.

- Offline because the paper ran out
- Offline due to mechanical error
- Offline by the control switch
- Offline because a cover is open

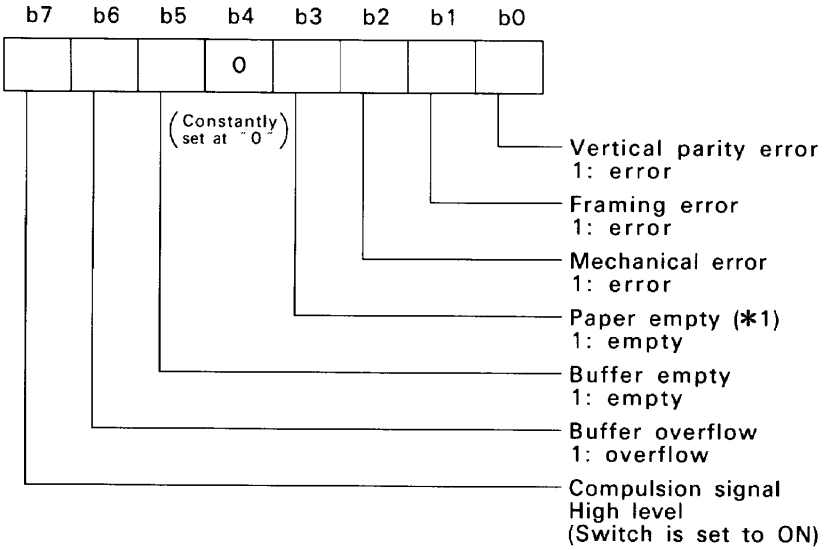
[Paper out] (When DIP SW 1-8 is ON: Paper out defector is valid)

When the "paper out" detector senses the end of the paper, the printer stops printing after printing a maximum of two more lines or on feeding the paper. The printer will set the DTR to "MARK" and set the printer to OFF LINE 5 seconds after a "paper out" condition is detected. To reset the printer after the "paper out", load a new roll of paper into the printer and press the OFF LINE button to set the printer ON LINE.

[Paper Out] (When DIP SW1-8 is OFF, the paper out detection is invalid.)
Even if the paper runs out, the printing continues.

[Mechanical error]
Mechanical errors occur when the cover is opened during printing and printing stops or when the motor locks and printing stops. After the error occurs, the printer outputs an X-OFF signal and stops printing. The printer sets the DTR signal to "MARK" and sets to OFF LINE five seconds after a mechanical error occurs.
To reset the printer after a mechanical error occurs, close the cover properly and press the ON LINE button. If a buzzer sounds and the ALARM lamp flashes at this point, locate the cause of the error and turn the power off and then back on to reset the printer.
When the printer returns online, it outputs the X-ON. However, if the empty area of the buffer falls below 256 bytes, priority is given to the X-OFF until the amount of data in the buffer falls below 256 bytes, so X-ON is not output.

[Status]



(*1): When DIP SW 1-8 is OFF (paper out detection invalid), Status b3 is always "0".

[Framing error]
A framing error occurs when SPACE is detected at the stop bit. When a framing error or a vertical parity error occurs for the data which is received, the printer prints out a "?" mark to indicate that the error occurred.

[Compulsion signal]
When pin 6 of the peripheral unit drive circuit connector is set at "HIGH", status bit 7 becomes "1."

7-8-3. STX-ETX mode

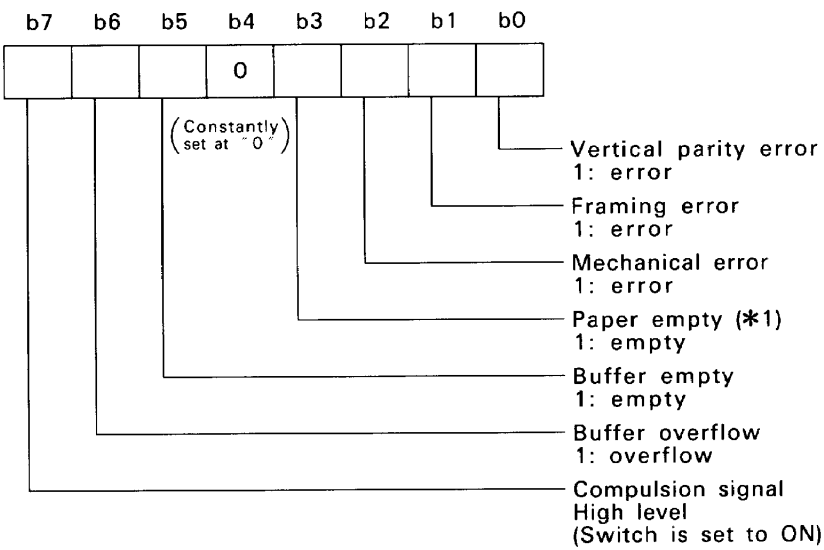
This mode is accessed from whichever DTR mode or X-ON/X-OFF mode.
A flowchart of this operation is illustrated on the Fig. 7-12.
To set this mode, the data buffer must be empty.
The host computer sends an ENQ code to the printer and acknowledges the printer status. Then, the host computer checks if the printer buffer is empty. After the host computer detects that the buffer is empty, a STX code and data are transmitted. After 1 block of data is transmitted, the host computer sends an ENQ code to the printer and then receives the printer status and check byte (horizontal parity for the printer).
At this point, the host computer performs a status and horizontal parity check. When the host computer determines that there was no error, it transmits an ETX code which serves as text end code. After the printer receives the ETX code, data in the data buffer is printed out. If an error occurs, a CAN code is transmitted by the host computer. (In this instance, the data which was previously sent to the buffer is cleared, thus, the host computer must retransmit the same data to the printer.)

Note 1: During STX-ETX mode (from STX code reception until ETX or CAN code reception), the online button does not work.

Note 2: When backup RAM is enabled, if the power is switched backon during STX-ETX mode, the printer leaves STX-ETX mode and throws away data until it receives the ENQ code.

Note 3: When using the printer in this mode, have DIP SW1-6 ON (for a buffer size of approx. 4K bytes).

[Status]

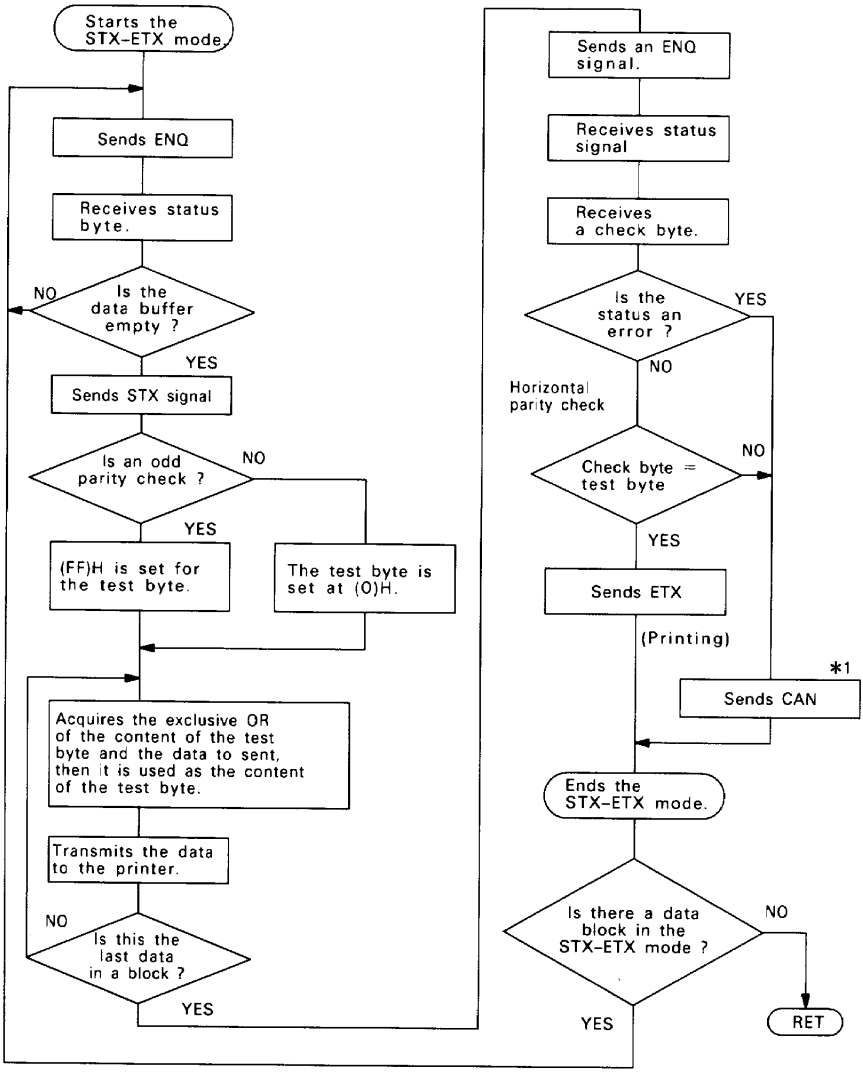


(*1): When DIP SW 1-8 is OFF (paper out detection invalid), Status b3 is always "0".

[Framing error]

A framing error occurs when SPACE is detected at the stop bit. When a framing error or a vertical parity error occurs for the data which is received, the printer prints out a "?" mark to indicate that the error occurred.

[Compulsion signal]
When pin 6 of the peripheral unit drive circuit connector is set at "HIGH", status bit 7 becomes "1."



*1 The data cleared by this CAN code is the data between the STX and ETX.
The command is not initialized.

Check byte:
Horizontal parity of the printer.
Test byte:
Horizontal parity of the host computer.

Fig. 7-12 STX-ETX mode flow diagram for host computer

8. PARALLEL INTERFACE

8-1. Interface Specifications

The operating specifications of the parallel interface are as follows.

(1) Data transfer rate : 1000 to 6000 characters per second
(2) Synchronization : Via externally supplied $\overline{\text{STROBE}}$ pulses
(3) Handshaking : $\overline{\text{ACK}}$ and BUSY signals
(4) Logic level : Compatible with TTL level

8-2. Interface Timing

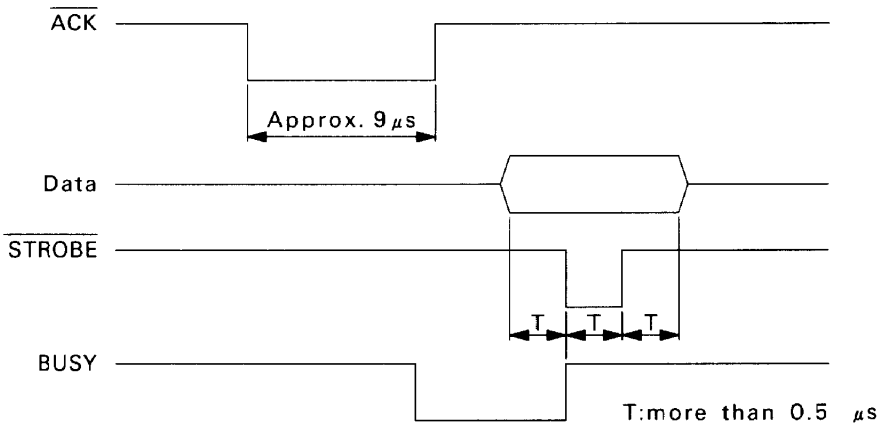


Fig. 8-1 Interface timing diagram

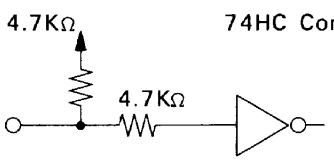
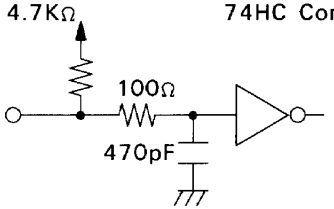
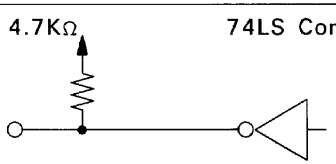
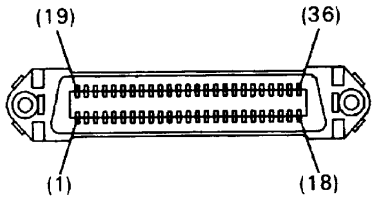
	Signal Name	Circuit Example
INPUT	DATA 1 – DATA 8 (To Printer)	
INPUT	$\overline{\text{STROBE}}$ (To Printer)	
OUTPUT	BUSY, $\overline{\text{ACK}}$ (From Printer)	

Fig. 8-2 Typical interface circuit

8-3. Connectors and Signals

Pin No.	Signal Name	IN/OUT	Function
1	$\overline{\text{STROBE}}$	IN	Signals when data is ready to be read. Signal goes from HIGH to LOW (for at least 0.5 microsec.) when data is available.
2-9	DATA1-8	IN	These signals provide the information of the first to eighth bits of parallel data. Each signal is at HIGH level for a logical 1 and at a LOW level for a logical 0.
10	$\overline{\text{ACK}}$	OUT	A 9 microsecond LOW pulse acknowledges receipt of data.
11	BUSY	OUT	When this signal goes LOW, the printer is ready to accept data. When the printer is in one of the conditions below. "HIGH" is set. 1. Data being entered. 2. Off line. 3. Error condition.
12	PAPER OUT	OUT	This signal is normally LOW. It will go HIGH if the printer runs out of paper.
13	SELECTED	OUT	This signal is HIGH when the printer is online.
14-15	N.C.		Unused
16	SIGNAL GND		Signal ground.
17	CHASSIS GND		Chassis ground, isolated from logic ground.
18	+5VDC		+5VDC (Max 50 mA)
19-30	GND		Twisted pair return signal ground level.
31	$\overline{\text{RESET}}$	IN	When this signal goes LOW, the printer is reset to its power-on condition.
32	$\overline{\text{ERROR}}$	OUT	This signal is normally HIGH. This signal goes LOW to signal that the printer cannot print due to an error condition. Refer to Item 8-4 Emergency Suspension.
33	EXT GND		External ground.
34	COMPULSION	OUT	Compulsion signal (See Fig. 8-6)
35-36	N.C.		Unused.



This connector mates with an Amphenol 57-30360 connector

Fig. 8-3 Parallel interface connector (printer side)

8-4 Emergency Suspension

If any of the following errors is detected while the printer is operating, the printer halts and $\overline{\text{ERROR}}$ signal turns to "LOW".

① Mechanical errors
- Motor lock
- Defective of timing detector (signal not issued)
- Abnormal home position check
- Timing error of the auto cutter
- Open or short of thermistor

To reset the emergency suspension, rectify the cause of trouble & adopt one of the following 2 methods.
- Turn the printer power off and on again. (returns to ON LINE.)
- Push ON LINE button.

Even while in the status of no backed up RAM with DIP SW1-7, the RAM is not cleared when power is turned OFF. Printing resumes from the line being printed when the mechanism stopped.

② If the cover is opened while printing
If the cover is opened while printing, the same operation as given in above item "① Mechanical errors" takes place. To restart printing, close the cover and push ON LINE button.

③ CPU error
If CPU goes erratic due to external noise, etc, the printer halts, treating it as CPU error. The buzzer sounds about 2 seconds.
Normal operation can be resumed by turning ON the power supply again, but the data contained in RAM gets cleared.

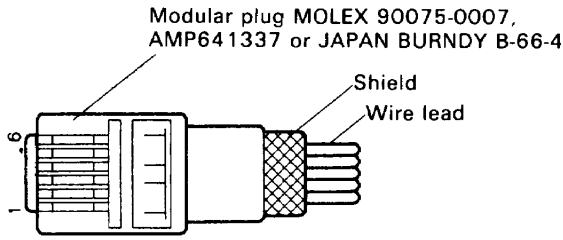
④ RAM Check Function
Before self-printing and when clearing the buffer, a RAM check is performed. Writes/reads the data $(AA)_H$ $(55)_H$ to/from all the external RAM addresses (except the CPU RAM).

⑤ Procedures at Time of Power Interruption
When using the backed up RAM function in valid status, the data in the buffer will be preserved even when there is a power interruption. When the power is turned ON again, the power interruption message " P.O.D " will be printed, and printing will be resumed from the line where it was stopped.
Sometimes the printing after the power is switched back on does not smoothly resume where it left off before the power was interrupted.

PARALLEL

8-5. Peripheral Unit Drive Circuit

A drive circuit for driving peripheral units (such as cash drawers) is featured on the main logic board of this printer. A modular connector for driving peripheral unit is featured on the output side on the drive circuit. When using this circuit, connect the cable for the peripheral unit. (Cables must be prepared by the user.)
Use cables which meet the following specifications.



Note: Pin 1 must be shield drain wire connected to peripheral device frame ground.

Fig. 8-4 Cable specifications

① Connecting the cable

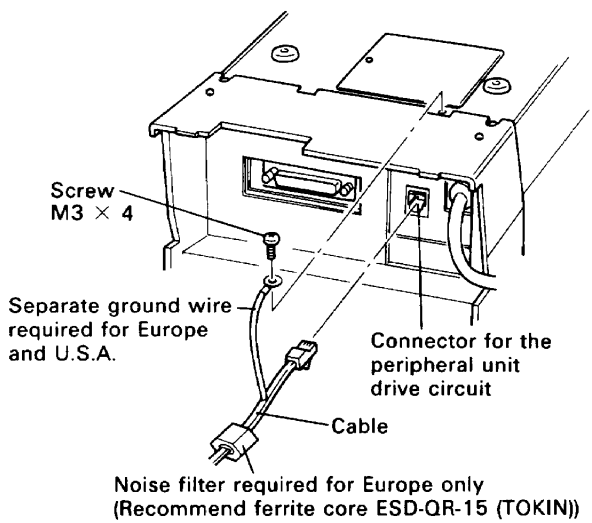
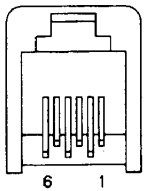


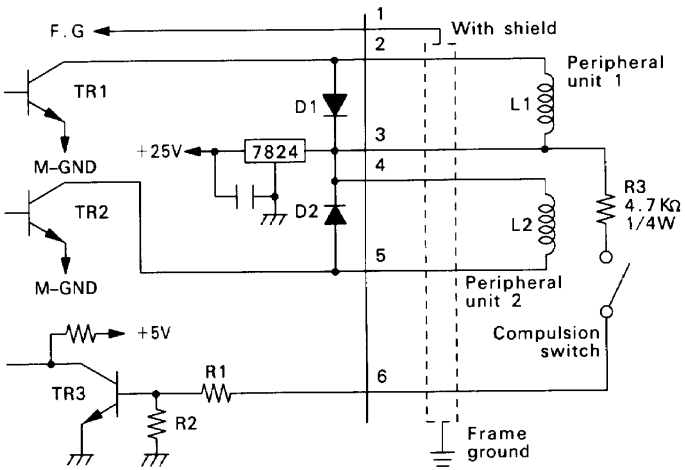
Fig. 8-5 Connecting the cable

② Drive circuit



6-P modular jack connector

[Drive output 24V, max. 1.0 A]



Notes:

1. Peripheral units 1 and 2 cannot be driven simultaneously.
   When the peripheral unit has been driven continuously, set the drive duty to maximum 20 %.
2. The status of compulsion switch can be known from Pin No. 34 of the parallel interface connector. When the switch in ON, Pin No. 34 turns to LOW level.
3. Resistance values of coils L1 and L2 are minimum 24 Ω.
4. Absolute maximum rating of diodes D1 and D2 (Ta = 25°C)
   Average rectified current I_0 = 1A
   Maximum forward surge current (60 Hz, sine wave 1 cycle) I_{FSM} = 40 A
5. Absolute maximum rating of transistors TR1 and TR2 (Ta = 25°C)
   Collector current Ic = 2A
   Collector loss Pc = 1.2W

Fig. 8-6 Drive circuit

9. AUTO CUTTER

9-1. Cutting Method

Cuts recording paper into continuous forms connected at only one point remaining uncut between adjacent forms.

Only one sheet of paper can be cut each time.

9-2. Cutting Position

The paper is cut approximately 21.7 mm above the printing head.

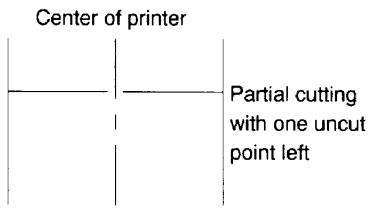


Fig. 9-1 Cutting method

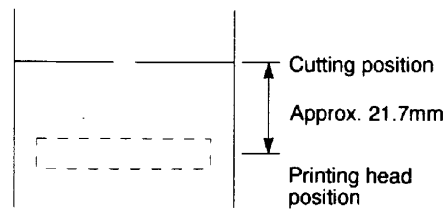


Fig. 9-2 Cutting position

9-3. Auto Cutting Control Codes

<ESC> "d" "0" or <ESC> "d" <0>
<ESC> "d" "1" or <ESC> "d" <1>
Refer to the control codes of chapter 10.

9-4. Other positions to be observed

① When continuously cutting for more than 12 minutes, make a maximum of 10 cuttings per minute.

② When using for a long time, paper dust will gather around the cutter. Therefore, make sure to clean periodically. If paper dust is not removed, normal paper feeding may become impossible.

10. CONTROL CODES

Control Codes Used for Character Setting

Control codes	Hexadecimal codes	Function	Page
<ESC> "R" *n*	1B 52 *n*	Select international character set	44
<ESC> "6"	1B 36	Select IBM character set #2	44
<ESC> "7"	1B 37	Select IBM character set #1	44
<ESC> "M"	1B 4D	Select 15-CPI character size	45
<ESC> "P"	1B 50	Select 12-CPI character size	45
<ESC> ":"	1B 3A	Select 8-CPI character size	45
<SO>	0E	Select expanded character mode	46
<DC4>	14	Cancel expanded character mode	46
<ESC> "W" "1" <ESC> "W" <1>	1B 57 31 1B 57 01	Select expanded character mode	46
<ESC> "W" "0" <ESC> "W" <0>	1B 57 30 1B 57 00	Cancel expanded character mode	46
<ESC> "E"	1B 45	Select emphasized print mode	46
<ESC> "F"	1B 46	Cancel emphasized print mode	46
<ESC> "-" "1" <ESC> "-" <1>	1B 2D 31 1B 2D 01	Select underline mode	47
<ESC> "-" "0" <ESC> "-" <0>	1B 2D 30 1B 2D 00	Cancel underline mode	47
<ESC> "_" "1" <ESC> "_" <1>	1B 5F 31 1B 5F 01	Select overline mode	47
<ESC> "_" "0" <ESC> "_" <0>	1B 5F 30 1B 5F 00	Cancel overline mode	47
<ESC> "4"	1B 34	Select highlighted print mode	47
<ESC> "5"	1B 35	Cancel highlighted print mode	48
<SI>	0F	Select inverted print mode	48
<DC2>	12	Cancel inverted print mode	48

Control Codes Used for Line Spacing

Control codes	Hexadecimal codes	Function	Page
<LF>	0A	Line feed	48
<CR>	0D	Line feed (same as LF)	48
<ESC> "z" "1" <ESC> "z" <1>	1B 7A 31 1B 7A 01	Set 1/6 inch line feed	49
<ESC> "0"	1B 30	Set 1/8 inch line feed	49
<ESC> "a" *n*	1B 61 *n*	Feed paper *n* lines	49

Control Codes Used for Page Layout

Control codes	Hexadecimal codes	Function	Page
<FF>	0C	Page feed (form feed)	49
<ESC> "C" *n*	1B 43 *n*	Set page length at *n*lines	49
<ESC> "C" <0> *n*	1B 43 00 *n*	Set page length at *n*inches	49
<ESC> "B" *n*1 *n*2	1B 42 *n*1 *n*2	Set vertical tab positions	50
<VT>	0B	Execute vertical tab	50
<ESC> "N" *n*	1B 4E *n*	Set bottom margin	50
<ESC> "O"	1B 4F	Cancel bottom margin	51
<ESC> "l" *n*	1B 6C *n*	Set left margin	51
<ESC> "Q" *n*	1B 51 *n*	Set right margin	51
<ESC> "D" *n*1 *n*2	1B 44 *n*1 *n*2	Set horizontal tab position	52
<HT>	09	Execute the horizontal tab	52

Control Code Used for Graphics Printing

Control codes	Hexadecimal codes	Function	Page
<ESC> "1"	1B 31	Set 7/72-inch line feed	53
<ESC> "A" *n*	1B 41 *n*	Define *n*/72-inch line feed	53
<ESC> "2"	1B 32	Set *n*/72-inch line feed	53
<ESC> "J" *n*	1B 4A *n*	One time line feed of *n*/72-inch	53
<ESC> "j" *n*	1B 6A *n*	One time reverse line feed of *n*/72-inch	54
<ESC> "z" "0" <ESC> "z" <0>	1B 7A 30 1B 7A 00	Set 1/12 inch line feed	54
<ESC> "y" *n*	1B 79 *n*	Set *n*/144-inch line feed	55
<ESC> "3" *n*	1B 33 *n*	Set *n*/216-inch line feed simulation	55
<ESC> "K" *n1* <0>	1B 4B *n1* 00	8 dot single density bit image	55
<ESC> "L" *n1 n2*	1B 4C *n1 n2*	8 dot double density bit image	57
<ESC> "h" "1" <ESC> "h" <1>	1B 68 31 1B 68 01	Select vertical expanded character mode	58
<ESC> "h" "0" <ESC> "h" <0>	1B 68 30 1B 68 00	Cancel vertical expanded character mode	58

Control Codes Used for Download Characters

Control codes	Hexadecimal codes	Function	Page
<ESC> "&" <0> *n*1 *n*2	1B 26 00 *n*1 *n*2	Definition of down load characters	59
<ESC> "%" "1" <ESC> "%" <1>	1B 25 31 1B 25 01	Enable download character set	60
<ESC> "%" "0" <ESC> "%" <0>	1B 25 30 1B 25 00	Disable download character set	60

Control Codes Used for Peripheral Units

Control codes	Hexadecimal codes	Function	Page
<ESC><BEL>n1 *n2*	1B 07 *n1* *n2*	Adjust drive pulse width for peripheral unit 1	62
<BEL>	07	Deferred drive command for peripheral unit 1	62
<FS>	1C	Immediate drive command for peripheral unit 1	62
<SUB>	1A	Immediate drive command for peripheral unit 2	63
<EM>	19	Immediate drive command for peripheral unit 2	63

Other Control Codes

Control codes	Hexadecimal codes	Function	Page
<RS>	1E	Sound buzzer	63
<CAN>	18	Cancel print data in buffer & Initialize printer	63
<DC3>	13	Set deselect mode	64
<DC1>	11	Set select mode	64
<ESC> "U" "1" <ESC> "U" <1>	1B 55 31 1B 55 01	Select uni-directional print mode	65
<ESC> "U" "0" <ESC> "U" <0>	1B 55 30 1B 55 00	Select bi-directional print mode	65
<ESC>"@"	1B 40	Initialize printer	65
<ENQ>	05	Enquiry	66
<STX>	02	Enter STX-ETX mode	66
<ETX>	03	Terminate STX-ETX mode	66
<ESC> "d" "0" <ESC> "d" <0>	1B 64 30 1B 64 00	Trigger auto-cutter drive	67
<ESC> "d" "1" <ESC> "d" <1>	1B 64 31 1B 64 01	Trigger auto-cutter drive	67

10-1. Control Codes Used for Character Setting

FUNCTION Select international character set

CODE <ESC> "R" *n*
(1B)H (52)H *n*

DEFINITION RANGE (00)H≦n≦(08)H

OUTLINE Selects the international character set corresponding to the value set for *n*.

n=(00)H: U.S.A.	(03)H: England	(06)H: Italy
(01)H: France	(04)H: Denmark	(07)H: Spain
(02)H: Germany	(05)H: Sweden	(08)H: Japan

The default international characters can also be set with DIP switches, however, setting by control code takes priority over setting by DIP switches.
Refer to chapter 12-5 "Code Table".

FUNCTION Select IBM character set #2

CODE <ESC> "6"
(1B)H (36)H

OUTLINE Selects IBM character set #2.

NOTE This code is only valid when the character code table set by DIP switches 2-1 and 2-2 is IBM character set #1 or #2.

FUNCTION Select IBM character set #1

CODE <ESC> "7"
(1B)H (37)H

OUTLINE Selects IBM character set #1.

NOTE This code is only valid when the character code table set by DIP switches 2-1 and 2-2 is IBM character set #1 or #2.

FUNCTION Select 15-CPI character size.

CODE <ESC> "M"
(1B)H (4D)H

OUTLINE 15-CPI is selected.
The maximum number of print columns is set by DIP switch (paper width setting) 2-4 as follows:

DIP SW 2-4	ON	OFF
Paper-width setting (inch)	3.25/3.0	2.25
Maximum no. of print columns.	40	28

When the power of the printer is turned on, 15 CPI printing is automatically selected.
This code valid only when received at the beginning of a line.

FUNCTION Select 12-CPI character size

CODE <ESC> "P"
(1B)H (50)H

OUTLINE 12-CPI is selected.
The maximum number of print columns is set by DIP Switch 2-4 (paper width setting) as follows. This code is valid only when received at the beginning of a line.

DIP SW 2-4	ON	OFF
Paper width setting (inch)	3.25/3.0	2.25
Maximum no. of print columns	33	23

FUNCTION Select 8-CPI character size

CODE <ESC> ":"
(1B)H (3A)H

OUTLINE 8-CPI character size is selected.
The maximum number of print columns is set by DIP Switch 2-4 (paper width setting) as follows. This code is valid only when received at the beginning of a line.

DIP SW 2-4	ON	OFF
Paper width setting (inch)	3.25/3.0	2.25
Maximum no. of print columns	22	15

FUNCTION Select expanded character mode

CODE <SO>
(0E)H

OUTLINE Data following this code is printed in double-width characters. Same as <ESC> "W" "1" or <ESC> "W" <1>.

FUNCTION Cancel expanded character mode

CODE <DC4>
(14)H

OUTLINE Cancels expanded character mode set by <SO> or <ESC> "W" "1" or <ESC> "W" <1> code. Data following this code is printed out in normal size characters.
Same as <ESC> "W" "0" or <ESC> "W" <0>.

FUNCTION Select expanded character mode

CODE <ESC> "W" "1" or <ESC> "W" <1>.
(1B)H (57)H (31)H or (1B)H (57)H (01)H

OUTLINE Data following this code is printed in double-width characters. Same as <SO>.

FUNCTION Cancel expanded character mode

CODE <ESC> "W" "0" or <ESC> "W" <0>
(1B)H (57)H (30)H or (1B)H (57)H (00)H

OUTLINE Cancels expanded character mode set by <ESC> "W" "1" or <ESC> "W" <1> or <SO> code. Data following this code is printed out in normal size characters. Same as <DC4>.

FUNCTION Select emphasized print mode

CODE <ESC> "E"
(1B)H (45)H

OUTLINE Data following this code is printed in the emphasized print mode In this mode, only uni-directional printing is performed.

FUNCTION Cancel emphasized print mode

CODE <ESC> "F"
(1B)H (46)H

OUTLINE Cancels emphasized print mode.

FUNCTION Select underline mode

CODE <ESC> "-" "1" or <ESC> "-" <1>
(1B)H (2D)H (31)H or (1B)H (2D)H (01)H

OUTLINE Data following this code is printed out underlined. (However, the spaces generated by horizontal tab are not underlined.)

FUNCTION Cancel underline mode

CODE <ESC> "-" "0" or <ESC> "-" <0>
(1B)H (2D)H (30)H or (1B)H (2D)H (00)H

OUTLINE Cancels underline mode.

FUNCTION Select overline mode

CODE <ESC>"_" "1" or <ESC>"_"<1>
(1B)H (5F)H (31)H or (1B)H (5F)H (01)H

OUTLINE Data following this code is printed out with an overline. (However the spaces generated by horizontal tab are not overlined.)

FUNCTION Cancel overline mode

CODE <ESC> "_" "0" or <ESC> "_" <0>
(1B)H (5F)H (30)H or (1B)H (5F)H (00)H

OUTLINE Cancels overline mode.

FUNCTION Select highlighted print mode

CODE <ESC> "4"
(1B)H (34)H

OUTLINE Prints with highlighted characters.
If an underline, overline or inverted print command is input while the highlighted print mode is in effect, the highlighted mode will be canceled and the newly input command will be executed. If a highlighted print command is received while the underline, overline or inverted print mode is in effect, the previously set mode is canceled and the highlighted print mode will be set.

FUNCTION Cancel highlighted print mode

CODE <ESC> "5"
(1B)H (35)H

OUTLINE Cancels highlighted print mode.

FUNCTION Select inverted print mode

CODE <SI>
(0F)H

OUTLINE Data following this code is printed out in inverted characters. This code is valid only when input at the beginning of a line, thus, normal and inverted characters cannot be mixed in on the same line.

FUNCTION Cancel inverted print mode

CODE <DC2>
(12)H

OUTLINE Cancels the inverted character mode. This code is valid only when input at the beginning of a line.

10-2. Control Codes Used for Line Spacing

FUNCTION Line feed

CODE <LF>
(0A)H

OUTLINE Data in the line buffer is printed out and one line is fed. If data does not exist before this code is received, the printer only feeds one line.

FUNCTION Line feed (Same as LF)

CODE <CR>
(0D)H

OUTLINE Functions the same as an LF code.
When DIP SW 1-3 is set to ON, this code becomes invalid.

FUNCTION Set 1/6-inch line feed

CODE <ESC>"z" "1" or <ESC>"z"<1>
(1B)H (7A)H (31)H or (1B)H (7A)H (01)H

OUTLINE Line feed is set at 1/6-inch after this code is received.

FUNCTION Set 1/8-inch line feed

CODE <ESC> "0"
(1B)H (30)H

OUTLINE Line feed is set at 1/8-inch after this code is received.

FUNCTION Feed paper *n* lines

CODE <ESC> "a" *n*
(1B)H (61)H *n*

DEFINITION RANGE $1 \leqq n \leqq 127$

OUTLINE After data in the line buffer is printed out, feeds the paper *n* lines.

10-3. Control Codes Used for Page Layout

FUNCTION Page feed (form feed)

CODE <FF>
(0C)H

OUTLINE After data in the line buffer is printed out, feeds the paper to the top of the next page.

FUNCTION Set page length at *n* lines

CODE <ESC>"C" *n*
(1B)H (43)H *n*

DEFINITION RANGE $1 \leqq n \leqq 255$ (default value $n = 42$)

OUTLINE Sets page length at *n* lines.

FUNCTION Set page length at *n* inches

CODE <ESC> "C" <0> *n*
(1B)H (43)H (00)H *n*

DEFINITION RANGE $1 \leqq n \leqq 127$

OUTLINE Sets page length at *n* inches.

FUNCTION Set vertical tab positions

CODE
<ESC> "B" *n1 n2...nk*<0>
(1B)H (42)H *n1 n2...nk* (00)H

DEFINITION RANGE $1 \leqq n1 < n2 < n3 < .... < nk \leqq 255$, $1 \leqq k \leqq 16$

OUTLINE Cancels all current vertical tab positions and sets new vertical tab positions at lines *n1, n2, etc., where n1, n2,* etc. are numbers between 1 and 255. A maximum of 16 vertical tab positions can be set. Tab positions must be specified in ascending order; any violation of ascending order terminates the tab position list. Standard termination is by the <0> control code. Vertical tab positions are set in terms of the current line spacing and do not move if the line spacing is changed later.

Note If a tab set position <*nk*> is equivalent or smaller than <*nk*−*1*> just preceding the tab set position, setting of vertical tab is assumed as complete.

FUNCTION Execute vertical tab

CODE
<VT>
(0B)H

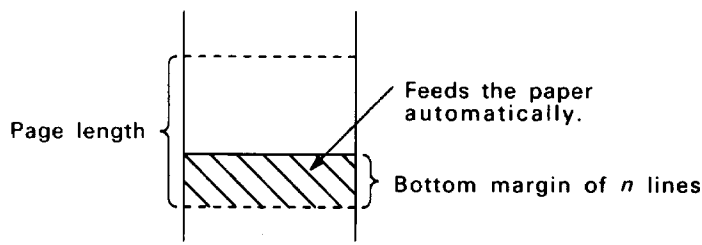
OUTLINE Feeds the paper to the next vertical tab set position.
When a vertical tab is not set, line feed is not performed. If the current line is at or below the last vertical tab set position, the paper feeds to the top of the next page.

FUNCTION Set bottom margin

CODE
<ESC> "N" *n*
(1B)H (4E)H *n*

DEFINITION RANGE $0 \leqq n \leqq 255$ (Default $n = 0$)

OUTLINE Sets bottom margin to *n* lines.



FUNCTION Cancel bottom margin

CODE <ESC> "O"
(1B)H (4F)H

OUTLINE Cancels bottom margin.

FUNCTION Set left margin

CODE <ESC> "1" *n*
(1B)H (6C)H *n*

DEFINITION RANGE $0 \leqq n \leqq$ (right margin -2)

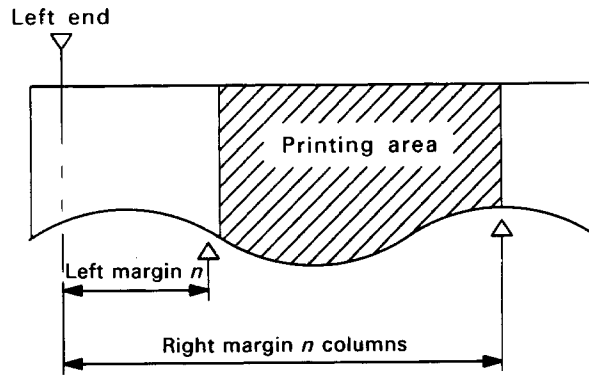
OUTLINE Sets the left margin at column *n* in the current character pitch. The left margin does not move if the character pitch is changed later. The left margin must be at least two columns to the left of the right margin and within the limits above.

FUNCTION Set right margin

CODE <ESC> "Q" *n*
(1B)H (51)H *n*

DEFINITION RANGE $2 \leqq n \leqq$ (maximum no. of print columns)

OUTLINE Sets the right margin at column *n* in the current character pitch. Column *n* becomes the last character position the line. The right margin does not move if the character pitch is changed later. the right margin must be within the limits above.



FUNCTION Set horizontal tab position

CODE <ESC> "D" *n1 n2....nk*<0>
(1B)H (44)H *n1 n2....nk* (00)H

DEFINITION RANGE $1 \leqq n1 < n2 < n3... < nk \leqq$(maximum print columns -1),
$1 \leqq k \leqq 16$

OUTLINE Cancels all current horizontal tab positions and sets new tab positions at columns *n1, n2,* etc. in the current character pitch, where *n1, n2,* etc. are numbers between 1 and (maximum print columns -1). The maximum number of horizontal tab positions allowed is 16. The tab positions must be specified in ascending order; any violation of ascending order terminates the tab position list. Standard termination is by the <0> control code. To clear all tab positions, specify <ESC> "D" <0>.

NOTE When the horizontal tab set position <*nk*> is equivalent or smaller than <*nk-1*> which is the column just preceding the set tab position, horizontal tab setting is assumed as complete.

FUNCTION Execute horizontal tab

CODE <HT>
(09)H

OUTLINE The print position skips to the next horizontal tab position in line. When the current position is after the final horizontal tab position that can be executed, this code is ignored. (Underlining and overline do not take place in the spaces between characters set with the horizontal tab function.)

10-4. Control Codes Used for Graphics Printing

FUNCTION Set 7/72-inch line feed

CODE <ESC> "1"
(1B)H (31)H

OUTLINE Line feed is set at 7/72-inch after this code is received.

FUNCTION Define *n*/72-inch line feed

CODE <ESC> "A" *n*
(1B)H (41)H *n*

DEFINITION RANGE $0 \leqq n \leqq 85$ (Default $n = 12$)

OUTLINE Line feed is defined at *n*/72-inch after this code is received. This code sets the feed at *n*/72-inch with the <ESC> "2" code.

FUNCTION Set *n*/72-inch line feed

CODE <ESC> "2"
(1B)H (32)H

OUTLINE This code sets the line feed at a defined value with the <ESC> "A" previously described.

FUNCTION One time line feed of *n*/72-inch

CODE <ESC> "J" *n*
(1B)H (4A) *n*

DEFINITION RANGE $1 \leqq n \leqq 255$

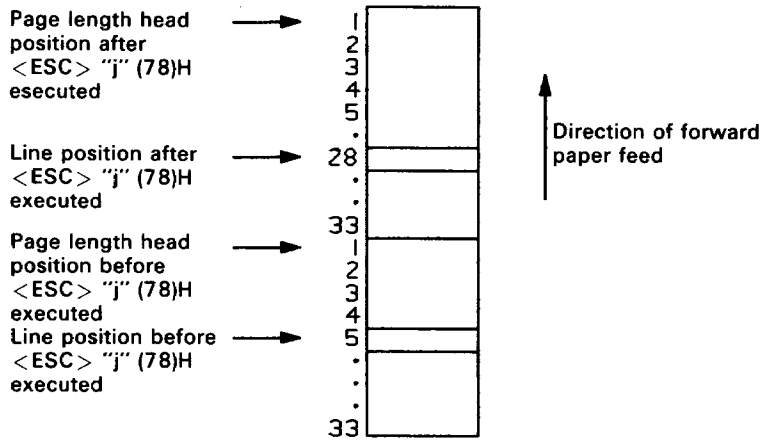
OUTLINE This code activates the *n*/72-inch paper feed once.

FUNCTION One time reverse line feed of $n/72$-inch

CODE <ESC> "j" n
(1B)H (6A)H

DEFINITION RANGE $1 \leqq n \leqq 255$

OUTLINE Feeds the paper $n/72$-inch one time in reverse.
Even when this command returns the printer to the previous page, the setting of page length management is not changed.
Example: <ESC> "j" (78)H executed when the page lengthe is 33 lines



Note: When reverse feeding the paper with this command, make sure to leave the paper extending at least 12/72 inch from the position of the cutter blade. If you reverse feed farther than this, the paper may jam.
Example: After the cutter operation, if the paper is fed A/72 inch (A > 6), the value of n that can be safety set for this command is $1 \leqq n \leqq A-12$.

FUNCTION Set 1/12-inch line feed

CODE <ESC> "z" "0" or <ESC> "z" <0>
(1B)H (7A)H (30)H or (1B)H (7A)H (00)H

OUTLINE Line feed is set at 1/12-inch after this code is received.

FUNCTION Set n/144-inch line feed

CODE <ESC> "y" n
(1B)H (79)H n

DEFINITION RANGE $1 \leqq n \leqq 255$

OUTLINE Line feed is set at n/144-inch after this code is received.

FUNCTION Set n/216-inch line feed simulation

CODE <ESC> "3" n
(1B)H (33)H n

DEFINITION RANGE $1 \leqq n \leqq 255$

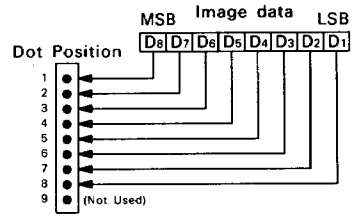
OUTLINE Line feed is set at n/216-inch after this code is received.
The actual line feed is set at INT $(n \times 2/3 + 0.5)/144$ inch.

FUNCTION 8 dot single density bit image

CODE <ESC> "K" $n1$<0> $m1$ $m2$ ....
(1B)H (4B)H $n1$ (00)H $m1$ $m2$ ....

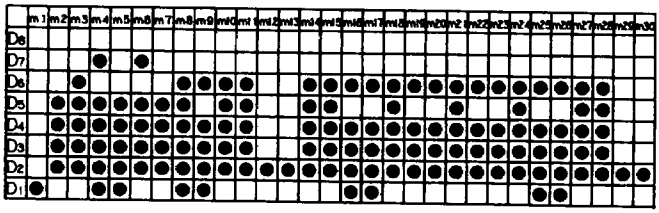
DEFINITION RANGE $1 \leqq n1 \leqq 200$

OUTLINE Excutes 8 dot bit image print determined by "$n1$". The total number of bit image data bytes in one line is equal to $n1$.
The printer ignores any data bytes over the specified amount allowed in one line. When the bit image print is finished the printer automatically returns to the character mode.



EXAMPLE

Actually, let us consider printing as a means of bit image. We will create the design below using bit image.



First, since the volume of data is 30, $n1$ = (1E)H. If the data $m1 \sim m30$ is converted to hexadecimal, it appears as shown below.

Data	Binary	Hexa-decimal
m1	00000001	01
m2	00011110	1E
m3	00111110	3E
m4	01011111	5F
m5	00011111	1F
m6	01011110	5E
m7	00011110	1E
m8	00111111	3F
m9	00101111	2F
m10	00111110	3E

Data	Binary	Hexa-decimal
m11	00111110	3E
m12	00000010	02
m13	00000010	02
m14	00111110	3E
m15	00111110	3E
m16	00101111	2F
m17	00101111	2F
m18	00111110	3E
m19	00101110	2E
m20	00101110	2E

Data	Binary	Hexa-decimal
m21	00111110	3E
m22	00101110	2E
m23	00101110	2E
m24	00111110	3E
m25	00101111	2F
m26	00101111	2F
m27	00111110	3E
m28	00111110	3E
m29	00000010	02
m30	00000010	02

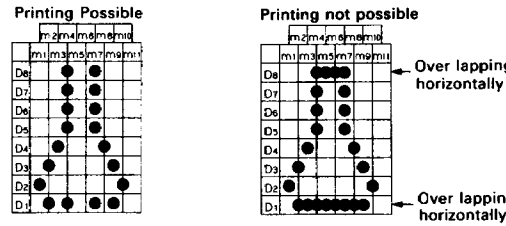
FUNCTION 8 dot double density bit image

CODE <ESC> "L" *n1 n2 m1 m2* ....
(1B)H (4C)H *n1 n2 m1 m2* ....

DEFINITION RANGE $1 \leqq n1 + 256 \times n2 \leqq 400$

OUTLINE This code executes double density bit image printing (half-dot printing) determined by "*n1*" and "*n2*". The total number of bit image data bytes in one line is equal to $n1 + n2 \times 256$. Refer to <ESC>K as to the relation between the dot position and the bit number. The printer ignores any data bytes over the specified amount allowed in one line.
The printer does not print adjacent dots. When the bit image printing is finished, the printer automatically returns to the character mode.

NOTE For double density bit image printing, dots cannot be printed overlapping each other in the horizontal direction.
The following is an example of this.



When printing one graphic image of a minimum of two lines with <ESC> K or <ESC> L, feed the paper a minimum of one line before printing so that the line spacing becomes identical between the lines.

FUNCTION Select vertical expaned character mode

CODE <ESC> "h" "1" or <ESC> "h" <1>
(1B)H (68)H (31)H or (1B)H (68)H (01)H

OUTLINE Prints characters two times the normal vertical size after the code is received.
However, the bit image mode <ESC> "K" and <ESC> "L" are excluded.

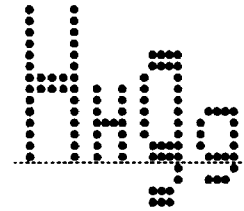
NOTE

(1) When combined with the <SO> code, this code enables printing of the characters in two times the normal vertical and horizontal size.

(2) This code is not combined with the inverted print mode <SI> code.

(3) For the 6 × 12 dots IBM block graphic (the characters code table (B0)H-(DF)H and (F4)H-(F5)H of IBM character set #1 and #2) of the font construction, enlargement is only vertical in the upper 8 dots.

(4) The relationship of the vertically enlarged character and the normal character is matched at the lower level.



(5) Feed the paper a minimum of one line before printing with this code.

FUNCTION Cancel vertical expanded character mode

CODE <ESC> "h" "0" or <ESC> "h" <0>
(1B)H (68)H (30)H or (1B)H (68)H (00)H

OUTLINE Cancels vertical expanded character mode

10-5. Control Codes Used for Download Characters

FUNCTION Definition of download characters

CODE When the 15-CPI character size is set (default setting):

<ESC> "&" <0> *n1 n2* [*m0 m1 m2 m3 m4 m5 m6 m7*]
n2 − n1 + 1

(1B)H (26)H (00)H *n1 n2* [*m0 m1 m2 m3 m4 m5 m6 m7*]
n2 − n1 + 1

When the 8-CPI or 12-CPI character size is set:

<ESC> "&" <0> *n1 n2* [*m0 m1 m2 m3 m4 m5*] *n2 − n1 + 1*

(1B)H (26)H (00)H *n1 n2* [*m0 m1 m2 m3 m4 m5*] *n2 − n1 + 1*

DEFINITION RANGE (21)H≦*n1*≦*n2*≦(7F)H, *m0* = (00)H or *m0* = (80)H

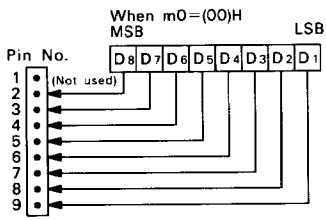
OUTLINE Defines download characters

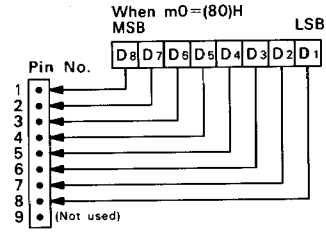
Up to 10 download characters can be defined and the defined character patterns can be stored in the printer's RAM.

Defining of download characters begins with character code *n1* and completes with *n2*. When only one character is defined, *n1*=*n2*.

m0 indicates the relationship between the character pattern and print head.

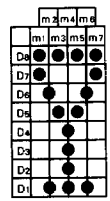
m1 m2.... Indicate the character pattern



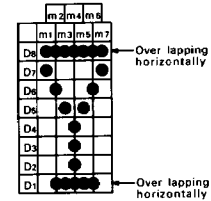


Note When the 15-CPI character size is set (the default setting), printing of adjacent horizontal dots is not allowed.

Printing possible



Printing not possible



FUNCTION Enable download character set

CODE <ESC> "%" "1" or <ESC> "%" <1>
(1B)H (25)H (31)H or (1B)H (25)H (01)H

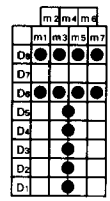
OUTLINE Enables the download character set
Download characters defined by the ESC & 0 code cannot be printed until enabled by this command.

FUNCTION Disable download character set

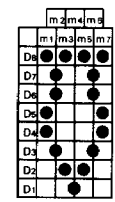
CODE <ESC> "%" "0" or <ESC> "%" <0>
(1B)H (25)H (30)H or (1B)H (25)H (00)H

OUTLINE Disables the selected download character set and selects the built-in character set. When the power of the printer is initially turned on, the built-in character set is selected.

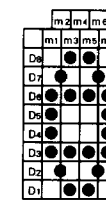
EXAMPLE To print a download character when the 15-CPI character size is set.
(1) Design the download character to be used at code positions (21)H, (22)H, and (23)H.



Char. Code=(21)H



Char. Code=(22)H



Char. Code=(23)H

(2) Define the download characters.
When character codes where the download character is written are specified as (21)H, (22)H, (23)H, *n1* = (21)H, *n2* = (23)H are obtained.
If the relationship between the character pattern data and printing head is specified to "not use pin 9", *m0* = (80)H is obtained. When data *m1* to *m7* are converted into hexadecimal data, they are indicated as follows.

Data	Binary	Hexa-decimal
m1	10100000	A0
m2	00000000	00
m3	10100000	A0
m4	00011111	1F
m5	10100000	A0
m6	00000000	00
m7	10100000	A0

Data	Binary	Hexa-decimal
m1	10011000	98
m2	01100100	64
m3	10000010	82
m4	00000001	01
m5	10000010	82
m6	01100100	64
m7	10011000	98

Data	Binary	Hexa-decimal
m1	00111000	3C
m2	01000010	42
m3	10100101	A5
m4	00000000	00
m5	10100101	A5
m6	01000010	42
m7	00111000	3C

Example of transmitting data

(1) Definition of down-load characters	(1B)H (26)H (00)H (21)H (23)H (80)H (A0)H (00)H (A0)H (1F)H (A0)H (00)H (A0)H (80)H (98)H (64)H (82)H (01)H (82)H (64)H (98)H (80)H (3C)H (42)H (A5)H (00)H (A5)H (42)H (3C)H
(2) Selecting the down-load character set	(1B)H (25)H (31)H
(3) Character codes	(21)H (22)H (23)H (0A)H
(4) Canceling the down-load character set	(1B)H (25)H (30)H
(5) Character codes	(21)H (22)H (23)H (0A)H

Printing Samples

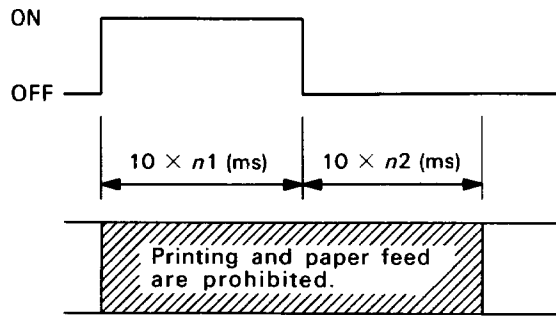
10-6. Control Codes Used for Peripheral Units

FUNCTION Adjust drive pulse width for peripheral unit 1

CODE <ESC> <BEL> *n1 n2*
(1B)H (07)H *n1 n2*

DEFINITION RANGE $1 \leqq n1 \leqq 127$, $1 \leqq n2 \leqq 127$ (default setting $n1 = n2 = 20$)

OUTLINE Adjusts drive pulse width for peripheral devices requiring other than standard 200 ms pulse time and delay time
Energizing time = 10 × *n1* (ms)
Delay time = 10 × *n2* (ms)
Executed by <BEL>, <FS> codes.



NOTE Adjustment is not necessary for standard cash drawers in the U.S.A. market.

FUNCTION Deferred drive command for peripheral unit 1

CODE <BEL>
(07)H

OUTLINE Executes drive pulse for peripheral unit 1 (deferred).

FUNCTION Immediate drive command for peripheral unit 1

CODE <FS>
(1C)H

OUTLINE Executes drive pulse for peripheral unit 1 (immediate).
This code differs from the <BEL> code as follows:
When the printer receives an <FS> code, the command is executed immediately. The <BEL> code is stored in the data buffer in the same manner as other codes, and executed in the order in which they are received.

FUNCTION Immediate drive command for peripheral unit 2

CODE <SUB>
(1A)H

OUTLINE Drives peripheral unit 2. Pulse width is fixed at 200ms with a fixed delay time of 200 ms.
When the printer receives a <SUB> code, the command is executed immediately. Same as <EM>.

NOTE Peripheral units 1 and 2 cannot be driven simultaneously.

FUNCTION Immediate drive command for peripheral unit 2

CODE <EM>
(19)H

OUTLINE Drives peripheral unit 2. Pulse width is fixed at 200ms with a fixed delay time of 200 ms.
When the printer receives a <EM> code, the command is executed immediately. Same as <SUB>.

NOTE Peripheral units 1 and 2 cannot be driven simultaneously.

10-7. Other Control Codes

FUNCTION Sound buzzer

CODE <RS>
(1E)H

OUTLINE A short alarm is generated by the printer.

FUNCTION Cancel print data in buffer & Initialize printer

CODE <CAN>
(18)H

OUTLINE Clears the data buffer and line buffer and initializes (<ESC> "@") all commands already set. However, the external device drive pulse width setting is not initialized.
For a serial interface printer, the select/deselect state for addressable mode and DC1/DC3 mode is not affected.
In STX-ETX mode, this CAN code clears the data between STX and ETX and the line buffer, but does not initialize the commands.

FUNCTION Set deselect mode

CODE <DC3>
(13)H

OUTLINE (1) When using serial interface printer:
This function differs depending on the setting of DIP switch 4.
a) When the DC1, DC3 invalid mode is set (DIP switches 4-1 to 4-4 are all set to ON), the printer ignores this code.
b) In the DC1, DC3 valid mode (with DIP switches 4-1 to 4-4 set to OFF), data following this code is ignored when the printer receives a <DC3> code.
The deselect mode is canceled by <DC1> code.
c) If the printer receives a <DC3> code during an addressable mode (with DIP switches 4-1 to 4-4 set to settings other than a) and b) above,), the data following this code is ignored.
Deselect mode can be canceled by a <DC1>*n* code.
Note that addressable mode is valid only when the RS-422A interface option is installed.
(2) When using parallel interface printer;
Data following this code is ignored when the printer receives a <DC3> code.
The deselect mode is canceled by <DC1> code.

FUNCTION Set select mode

CODE When using serial interface printer;
<DC1> or <DC1>*n*
(11)H or (11)H *n*
When using parallel interface printer;
<DC1>
(11)H

OUTLINE (1) When using serial interface printer;
This function differs depending on the setting of DIP switch 4.
a) When the DC1, DC3 invalid mode is set (DIP switches 4-1 to 4-4 are all set to ON), the printer ignores this code.
b) In the DC1, DC3 valid mode (with DIP switches 4-1 to 4-4 set to OFF), when the printer receives a <DC1> code, the deselect mode is canceled and data following this code is input to the buffer.

c) If the printer receives a <DC1>*n* code (*n* is the DIP switch controlled address) during the addressable mode (with DIP switches 4-1 to 4-4 set other than settings a) and b) above,), the deselect mode is canceled and data following this code is input to the buffer.
Note that addressable mode is valid only when optional RS-422A interface is installed.

(2) When using parallel interface printer;
When the printer receives a <DC1> code, the deselect mode is canceled and data following this code is input to the buffer.

NOTE Since signals sent from the printers collide when two or more printers are selected in the addressable mode, deselect all printes using the D3 code and select one from among the printers available.

FUNCTION Select uni-directional print mode

CODE <ESC>"U" "1" or <ESC> "U" <1>
(1B)H (55)H (31)H or (1B)H (55)H (01)H

OUTLINE Prints only when the print head moves from left to right.

FUNCTION Select bi-directional print mode

CODE <ESC>"U" "0" or <ESC>"U"<0>
(1B)H (55)H (30)H or (1B)H (55)H (00)H

OUTLINE Returns to the standard bi-directional print mode. (This mode is set automatically when the printer power is turned on.)

FUNCTION Initialize printer

CODE <ESC> "@"
(1B)H (40)H

OUTLINE Initializes all the commands already set. However, the external device drive pulse width setting is not initialized. Also, the line and data buffers are not cleared and the DIP switches are not read in again.
For a serial interface printer, the select/deselect state for addressable mode and DC1/DC3 mode is not affected.

FUNCTION Enquiry

CODE <ENQ>
(05)H

OUTLINE This code is valid when using serial interface printer.
Online in STX-ETX mode: The printer sends the status data and the check byte to the host computer.
Online in any other mode: The printer sends only the status data to the host computer.
Offline in any mode: The printer only sends the status data to the host computer if there is a mechanical error in status bit or if the paper out bit is set.

NOTE When IBM character set #2 is selected by character code, codes <ENQ> does not exist. (In this instance, select another code.)

	U.S.A. & Europe	IBM #1	IBM #2	Japan
(05)H	<ENQ>	<ENQ>	♣	<ENQ>

FUNCTION Enter STX-ETX mode

CODE <STX>
(02)H

OUTLINE This code is valid when using serial interface printer.
STX-ETX mode is set.

FUNCTION Terminate STX-ETX mode

CODE <ETX>
(03)H

OUTLINE This code is valid when using serial interface printer.
Terminates the STX-ETX mode and prints out the text data.

NOTE When IBM character set #2 is selected by character code, codes <ETX> does not exist. (In this instance, select another code.)

	U.S.A. & Europe	IBM #1	IBM #2	Japan
(03)H	<ETX>	<ETX>	♥	<ETX>

FUNCTION Trigger auto-cutter drive

CODE

<ESC> "d" "0" or <ESC> "d" <0>
(1B)H (64)H (30)H or (1B)H (64)H (00)H
<ESC>"d" "1" or <ESC> "d" <1>
(1B)H (64)H (31)H or (1B)H (64)H (01)H

OUTLINE This code causes the printer to trigger auto-cutter.

11. GENERAL SPECIFICATIONS

Printing method:	Serial impact dot matrix	
Print direction:	Bi-directional	
Number of head pins:	9 wires	
Number of print columns:	40 columns, 15 CPI (3.25 or 3.0-inch paper)	
	33 columns, 12 CPI (3.25 or 3.0-inch paper)	
	22 columns, 8 CPI (3.25 or 3.0-inch paper)	
Character set:	ASCII	96 (characters)
	Special characters	64
	Block graphics	64
	IBM special characters	64
	IBM block graphics	50
	KATAKANA	64
	International characters	12
	Download characters	10
Font configuration	7 × 9 or 5 × 9	

Paper width	3.25 inch (82.5 mm)			3.0 inch (76 mm)			2.25 inch (57.5 mm)		
CPI	15	12	8	15	12	8	15	12	8
Number of columns	40	33	22	40	33	22	28	23	15
Dot space (H×V mm)	0.330 × 0.353	0.330 × 0.353	0.495 × 0.353	0.330 × 0.353	0.330 × 0.353	0.495 × 0.353	0.330 × 0.353	0.330 × 0.353	0.495 × 0.353
Column spacing (mm)	1.65	1.98	2.97	1.65	1.98	2.97	1.65	1.98	2.97
Character size (mm)	1.29 × 2.42	1.62 × 2.42	2.28 × 2.42	1.29 × 2.42	1.62 × 2.42	2.28 × 2.42	1.29 × 2.42	1.62 × 2.42	2.28 × 2.42
Total no. of dots	200	198	132	200	198	132	140	138	90
Print area (mm)	65.7	65.0	64.8	65.7	65.0	64.8	45.9	45.2	44.1
Left/Right margins	8.4/8.4	8.4/9.1	8.4/9.3	5.2/5.2	5.2/5.8	5.2/6.0	5.8/5.8	5.8/6.5	5.8/7.6

Print speed:	Approx. 3.2 lines per sec.
Line spacing:	1/6-inch (initial setting), 1/8-inch, 1/12-inch, *n*/72-inch *n*/144-inch
Paper feed method:	Friction feed
Paper feed speed:	Approx. 3 inches/sec.
Paper specifications	
Paper type:	Ordinary bond and carbonless copy paper
Paper width:	82.5 ±0.5 mm (3.25 inches) 76 ±0.5 mm (3.0 inches) 57.5 ±0.5mm (2.25 inches)
Roll diameter:	(Single) 85mm (3.35 inches) max. (copies using paper rewinder) 76 mm (3.0 inches) max. Lower paper length 27.4 m (90 feet)
Thickness	(single) 0.07 mm to 0.10 mm (copies) Original + 1 copy (Total thickness within 0.14 mm, with each sheet 0.05 to 0.08 mm thick) However, paper that can be cut with the auto cutter is one sheet of 0.06 – 0.085 mm thickness.
Internal diameter of roll:	12 ±1 mm Note: The paper must not be glued to the core.
Ink ribbon specifications	
Ribbon type:	Cartridge cassette
Color:	Purple standard or black optional
Ribbon material:	Nylon (#40 denier)
Ribbon life:	Purple (standard) 6,000,000 characters Black (option) 1,600,000 characters
Interface:	
Serial interface	RS-232C serial interface (standard) 20mA current loop (option) RS-422A (option)
Parallel interface	Centronics compatible
Data buffer:	Selectable 4K or 256 bytes (Serial interface) Selectable 4K or 2 lines (Parallel interface)
Peripheral unit drive circuit:	2 circuits (24V, max. 1A with a 1 circuit compulsion switch
Overall dimensions:	182W × 265D × 383H (mm)
Weight:	Approx. 5.2 kg
Power Supply:	AC120V±10% 60Hz AC220V±10% 50Hz AC240V±10% 50Hz
AC power cable:	Approx. 155 cm long
Power consumption:	Max. 60 W Avg. 30W (During continuous printing of ASCII characters)

Ambient temperature/humidity	
Operating temperature:	0°C to +50°C
Operating humidity:	10% to 90% RH (without condensation)
Storage temperature:	−20°C to +70°C
Storage humidity:	5% to 95%RH (at 40°C) without condensation.
Mechanism reliability:	5,000,000 lines MCBF (except head life and auto cutter)
Print head life:	One hundred million characters
Paper cutter reliability:	600,000 cut (MCBF)
Optional unit:	Paper reweinder PW349-24 Bracket set SP349

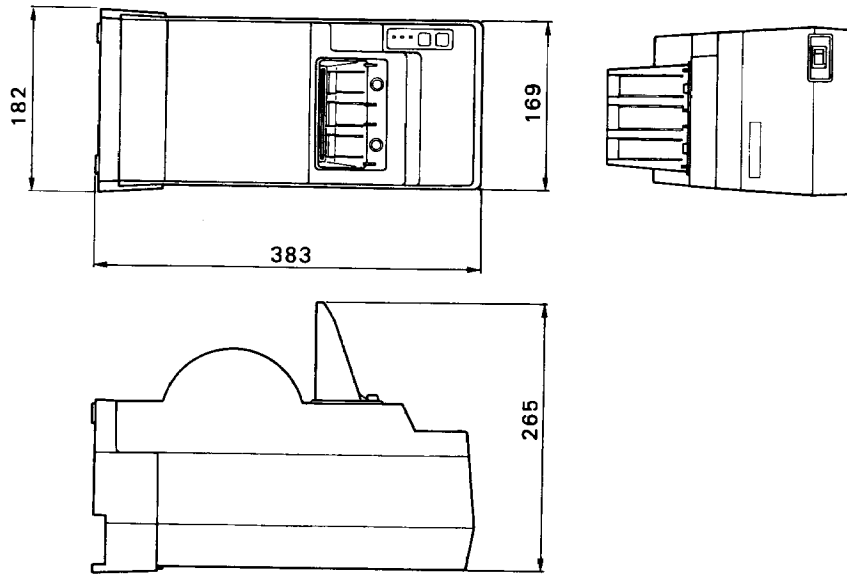


Fig. 11-1 Overall dimensions (mm)

12. CHARACTER CODE TABLE

12-1. U.S.A. & Europe (DIP SW2-1: ON, SW2-2: ON)

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

(SP: Space)

Hexa-decimal	8	9	A	B	C	D	E	F
0	SP 128	 144	Ä 160	é 176	ù 192	ā 208	224	240
1	129	 145	Ö 161	è 177	ū 193	â 209	225	 241
2	 130	 146	Ü 162	ē 178	û 194	° 210	226	 242
3	131	147	ß 163	ê 179	ç 195	°C 211	227	243
4	132	 148	§ 164	ï 180	¿ 196	°F 212	228	 244
5	 133	 149	a 165	í 181	Ñ 197	Ω 213	 229	 245
6	134	150	o 166	ì 182	ñ 198	μ 214	230	246
7	135	 151	f 167	ī 183	Ē 199	Σ 215	231	 247
8	 136	 152	¢ 168	î 184	ɔ 200	σ 216	 232	 248
9	137	 153	½ 169	ö 185	i 201	x̄ 217	233	249
A	138	154	N T 170	ó 186	Å 202	TL 218	 234	 250
B	 139	 155	T X 171	ò 187	ϕ 203	X 219	 235	 251
C	140	 156	¥ 172	ō 188	θ 204	∞ 220	 236	252
D	141	 157	¼ 173	ô 189	ä 205	± 221	 237	 253
E	 142	 158	Ā 174	ü 190	á 206	÷ 222	238	254
F	143	 159	ë 175	ú 191	à 207	π 223	239	 255

(SP: Space)

12-2. IBM Character Set #1 (DIP SW2-1: OFF, SW2-2: ON)

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

(SP: Space)

Hexa-decimal	8	9	A	B	C	D	E	F
0	128	144	á 160	176	192	208	α 224	≡ 240
1	129	⟨DC1⟩ 145	í 161	177	193	209	β 225	± 241
2	⟨STX⟩ 130	⟨DC2⟩ 146	ó 162	178	194	210	Γ 226	≥ 242
3	⟨ETX⟩ 131	⟨DC3⟩ 147	ú 163	179	195	211	π 227	≤ 243
4	132	⟨DC4⟩ 148	ñ 164	180	196	212	Σ 228	⌠ 244
5	⟨ENQ⟩ 133	149	Ñ 165	181	197	213	σ 229	⌡ 245
6	134	150	a 166	182	198	214	μ 230	÷ 246
7	⟨BEL⟩ 135	151	o 167	183	199	215	τ 231	≈ 247
8	136	⟨CAN⟩ 152	¿ 168	184	200	216	Φ 232	° 248
9	⟨HT⟩ 137	⟨EM⟩ 153	⌐ 169	185	201	217	Θ 233	∙ 249
A	⟨LF⟩ 138	⟨SUB⟩ 154	¬ 170	186	202	218	Ω 234	· 250
B	⟨VT⟩ 139	⟨ESC⟩ 155	½ 171	187	203	219	δ 235	√ 251
C	⟨FF⟩ 140	⟨FS⟩ 156	¼ 172	188	204	220	∞ 236	n 252
D	⟨CR⟩ 141	⟨GS⟩ 157	¡ 173	189	205	221	φ 237	² 253
E	⟨SO⟩ 142	⟨RS⟩ 158	« 174	190	206	222	∈ 238	■ 254
F	⟨SI⟩ 143	159	» 175	191	207	223	∩ 239	255

(SP: Space)

12-3. IBM Character Set #2 (DIP SW2-1: ON, SW2-2: OFF)

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

(SP: Space)

Hexa-decimal	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▓ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	μ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	– 250
B	ï 139	¢ 155	½ 171	╗ 187	╦ 203	▉ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	∞ 236	n 252
D	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	ϕ 237	² 253
E	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	╧ 207	■ 223	∩ 239	255

(SP: Space)

12-4. JAPAN (DIP SW2-1: OFF, SW2-2: OFF)

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

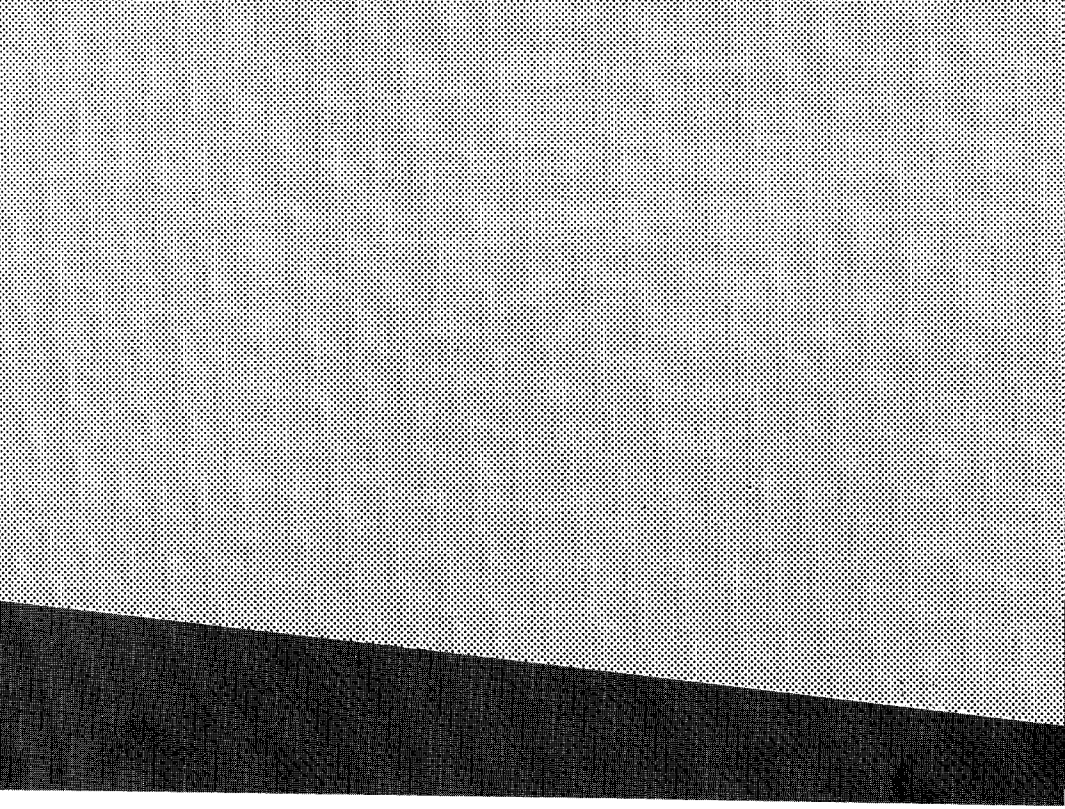
(SP: Space)

Hexa-decimal	8	9	A	B	C	D	E	F
0	SP 128	144	SP 160	ー 176	タ 192	ミ 208	224	240
1	129	145	° 161	ア 177	チ 193	ム 209	225	241
2	130	146	「 162	イ 178	ツ 194	メ 210	226	242
3	131	147	」 163	ウ 179	テ 195	モ 211	227	243
4	132	148	、 164	エ 180	ト 196	ヤ 212	228	244
5	133	149	・ 165	オ 181	ナ 197	ユ 213	229	245
6	134	150	ヲ 166	カ 182	ニ 198	ヨ 214	230	246
7	135	151	ァ 167	キ 183	ヌ 199	ラ 215	231	247
8	136	152	ィ 168	ク 184	ネ 200	リ 216	232	248
9	137	153	ゥ 169	ケ 185	ノ 201	ル 217	233	249
A	138	154	ェ 170	コ 186	ハ 202	レ 218	234	250
B	139	155	ォ 171	サ 187	ヒ 203	ロ 219	235	251
C	140	156	ャ 172	シ 188	フ 204	ワ 220	236	252
D	141	157	ュ 173	ス 189	ヘ 205	ン 221	237	253
E	142	158	ョ 174	セ 190	ホ 206	゛ 222	238	254
F	143	159	ッ 175	ソ 191	マ 207	° 223	239	255

(SP: Space)

12-5. International Character Sets

Hexadecimal	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
U.S.A.	#	$	@	[	\	]	^	`	{	|	}	~
France	#	$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
England	£	$	@	[	\	]	^	`	{	|	}	~
Denmark	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
Spain	₧	$	@	¡	Ñ	¿	^	'	¨	ñ	}	~
Japan	#	$	@	[	¥	]	^	`	{	|	}	—



HEAD OFFICE
STAR MICRONICS CO., LTD.
20-10 Nakayoshida, Shizuoka, 422, Japan
Tel: (054) 263-1115, Telefax: (054) 263-8714, Telex: 3962611 STAR J

OVERSEAS SUBSIDIARY COMPANIES

STAR MICRONICS AMERICA, INC.
70-D Ethel Road West, Piscataway, NJ 08854, U.S.A.
Tel: (908) 572-9512, Telefax: (908) 572-5095

STAR MICRONICS DEUTSCHLAND GMBH
Westerbachstraße 59 D-6000 Frankfurt/Main 94, Germany
Telefon: (069) 78 99 90, Telefax: (069) 78 10 06, Telex: 4 175825 star d

STAR MICRONICS U.K. LTD.
Star House, Peregrine Business Park, Gomm Road, High Wycombe, Bucks, HP13 7DL, U.K.
Tel: 0494 471111, Fax: 0494 473333, Telex: 83393 STAR UK

STAR MICRONICS ASIA LTD.
18/F., Tower II, Enterprise Square, 9 Sheung Yuet Road, Kowloon Bay, Hong Kong
Tel: 796 2727, Fax: 799 9344

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