USER'S MANUAL

CONTROL BOARD

MODEL BD2-2820

Rev. 1.00 Nov. 06,1996

Japan CBM Corporation
Information Systems Div.

<CAUTIONS>

1. Before using this equipment, be sure to read this User's manual thoroughly.
   Please keep this with care so as to referred to any time at need.
2. Portions of the contents of this User's manual may be changed without prior notice.
3. The reproduction of parts or all of the contents of this User's manual without permission is strictly forbidden.
4. Absolutely do not carry out maintenance, disassembly, or repair of parts that are not specified in this User's manual.
5. Note that losses which may be attributed to the user's wrong operation method or operating environment will be outside the responsibility of this company.
6. Do not carry out the operations other than those explained in this User's manual, since doing do so may become a cause of accidents or breakdowns.
7. Because data is basically transient, long-period and permanent storage of data will not be possible. Please note in advance that this company will not be responsible in any way for losses or lost profits caused through the clearing of the data due to breakdowns, repairs, investigations, etc.
8. If any questionable points, mistakes, omitted explanations, etc. are found in the contents of this manual, please contact this company.
9. Please note that notwithstanding the conditions in above 8, this company will not be responsible for the consequences of results obtained through operation of this equipment.

CONTENT

1. OUTLINE

This control boars is designed to be used to control our thermal printer, "LT-282" or "LT-283" series through the computer etc.

As being provided with many abundant functions, it can be used widely in various applications.

Before you start using it, read this manual thoroughly and understand the content.

1. FEATURES

(1) Ultra compact
(2) Both interface of Serial and Parallel can be selected by dip switch.
(3) Input buffer incorporated.
(4) Bar code printing is available.
(5) Auto paper cutter control incorporated.
(6) User-defined character registration function (94 characters)

1.1 PRECAUTION

(1) Make sure to turn OFF the power supply in case of connecting / disconnecting the connectors.
(2) Absolutely do not make a short circuit between the terminals of connectors.
(3) Use power supply, LED, interface etc. following their specifications.

2. BASIC SPECIFICATIONS

2.1 Model classification

BD 2- 282 0 U

Character Set
U：International model

Model name of applied printer mechanism
282 : For LT-282 and LT-283

Model name

2.2 BASIC SPECIFICATIONS

ITEM	CONTENTS
Print width	56 mm : LT-282 , 52 mm : LT-283
Print Speed	50 mm / s (MAX)
Number of columns	Font A : 37 columns LT-282, 34 columns LT-283 Font B : 49 columns LT-282, 46 columns LT-283
Character dimensions	Font A : 1.25 mm x 3.00 mm (10x24 dots + 2 dots space) Font B : 0.88 mm x 2.13 mm (7x17 dots + 2 dots space)
Character types	Alphanumeric, international characters
Bar code type	UPC-A/E, JAN (EAN) 13 / 8 columns , ITF CODE 39, CODE 128, CODABAR
Line pitch	4.23 mm (1/6 inch)
Interface	Parallel (conforms to Centronics) or Serial (conforms to RS-232C) (Selectable by dip switch)
Input buffer	4 K bytes or 72 bytes (Selectable by dip switch)
Supply voltage	5V ± 5 % 145 mA (Self printing) 24 V ± 5 % Average 1.8 A (Peak approx. 6 A)
Operating Environment	5 - 40 ℃
Storage Environment	-20 - 60 ℃
Outer Dimension	80 mm (W) x 80 mm(D) (For height of component parts, see outer drawing.)
Weight	Approx. 50 g

3. Connecting connectors

3.1 CN 1

Not used.

3.2 CN 2 Connector for Printer Mechanism (For Print Head)

PIN NO.	SIGNAL NAME	I/O	FUNCTION
1	VH	OUTPUT	POWER FOR PRINT HEAD
2	VH	OUTPUT	POWER FOR PRINT HEAD
3	VH	OUTPUT	POWER FOR PRINT HEAD
4	GND		GND
5	GND		GND
6	GND		GND
7	VCC	OUTPUT	POWER FOR PRINT HEAD CIRCUIT
8	STRB1	OUTPUT	STROBE 1
9	STRB2	OUTPUT	STROBE 2
10	STRB3	OUTPUT	STROBE 3
11	CP	OUTPUT	CLOCK PULSE
12	LATCH	OUTPUT	LATCH SIGNAL
13	DI	OUTPUT	HEAD DATA INPUT SIGNAL
14	TH	INPUT	THERMISTOR SIGNAL
15	GND		GND
16	DO	INPUT	HEAD DATA OUTPUT SIGNAL

USING CONNECTOR : B16B-PH-K-S (JST)

APPLICABLE CONNECTOR : PHR-16 (JST)

3.3 CN 3 Connector for Print Mechanism (For Motor)

PIN NO.	SIGNAL NAME	I/O	FUNCTION
1	A	OUTPUT	OPERATION SIGNAL FOR MOTOR A
2	B	OUTPUT	OPERATION SIGNAL FOR MOTOR B
3	A’	OUTPUT	OPERATION SIGNAL FOR MOTOR A’
4	B’	OUTPUT	OPERATION SIGNAL FOR MOTOR B’

USING CONNECTOR : 53047-0410 (MOLEX)

3.4 CN 4 Connector for Print Mechanism (For Sensor)

PIN NO.	SIGNAL NAME	I/O	FUNCTION
1	VCC	OUTPUT	PHOTO TRANSISTOR COLLECTOR(PAPER SENSOR)
2	P-E	INPUT	PHOTO TRANSISTOR EMITTER (PAPER SENSOR)
3	P-A	OUTPUT	DIODE ANODE (PAPER SENSOR)
4	GND		DIODE CATHODE (PAPER SENSOR)
5	GND		HEAD UP SENSOR GND
6	H-U	INPUT	HEAD UP SIGNAL

USING CONNECTOR : 53047-0610 (MOLEX)

3.5 CN 5 Connector for Interface

PIN NO.	SIGNAL NAME	I/O	FUNCTION
1	VCC	INPUT	POWER SUPPLY FOR CIRCUIT (5V)
2	VCC	INPUT	POWER SUPPLY FOR CIRCUIT (5V)
3	VCC	INPUT	POWER SUPPLY FOR CIRCUIT (5V)
4	GND		GND
5	GND		GND
6	GND		GND
7	VP	INPUT	POWER SUPPLY FOR OPERATION(24V)
8	VP	INPUT	POWER SUPPLY FOR OPERATION(24V)
9	VP	INPUT	POWER SUPPLY FOR OPERATION(24V)
10	VP	INPUT	POWER SUPPLY FOR OPERATION(24V)
11	VP	INPUT	POWER SUPPLY FOR OPERATION(24V)
12	VP	INPUT	POWER SUPPLY FOR OPERATION(24V)
13	P-GND		GND FOR OPERATION
14	P-GND		GND FOR OPERATION
15	P-GND		GND FOR OPERATION
16	P-GND		GND FOR OPERATION
17	P-GND		GND FOR OPERATION
18	P-GND		GND FOR OPERATION
19	LF-SW	INPUT	LF SWITCH INPUT
20	ERROR	OUTPUT	ERROR LED OUTPUT (CAN BE CONNECTED DIRECTLY)
21	PE OUT	OUTPUT	PE LED OUTPUT (CAN BE CONNECTED DIRECTLY)
22	DTR	OUTPUT	SERIAL INTERFACE DTR
23	TXD	OUTPUT	SERIAL INTERFACE TXD
24	RXD	INPUT	SERIAL INTERFACE RXD
25	DSR	INPUT	SERIAL INTERFACE DSR
26	STB	INPUT	PARALLEL INTERFACE STB
27	BUSY	OUTPUT	PARALLEL INTERFACE BUSY
28	ACK	OUTPUT	PARALLEL INTERFACE ACK
29	DATA 0	INPUT	PARALLEL INTERFACE DATA 0
30	DATA 1	INPUT	PARALLEL INTERFACE DATA 1
31	DATA 2	INPUT	PARALLEL INTERFACE DATA 2
32	DATA 3	INPUT	PARALLEL INTERFACE DATA 3
33	DATA 4	INPUT	PARALLEL INTERFACE DATA 4
34	DATA 5	INPUT	PARALLEL INTERFACE DATA 5
35	DATA 6	INPUT	PARALLEL INTERFACE DATA 6
36	DATA 7	INPUT	PARALLEL INTERFACE DATA 7
37	PE	OUTPUT	PARALLEL INTERFACE PE
38	FAULT	OUTPUT	PARALLEL INTERFACE FAULT
39	RESET	INPUT	PARALLEL INTERFACE RESET
40	FG	-	FG

USING CONNECTOR : LY20-40P-DT1-P5 (JAE)
APPLICABLE CONNECTOR : LY10-DC40 (JAE)
Caution

1. For LED of ERROR and PE, there is a resister of 330Ω on the circuit side to make current value 10 mA. Please use LED which its voltage is approx. 2V. LED over 10 mA may break a control board.
2. Control circuit requires power supply only for one pin of each VCC and GND. However, Operational voltage is to be supplied to all of pins for safety use.
3. Serial interface equips a driver and receiver of RS-232C, make sure to use it at RS-232C level.

4. RESET terminal is pulled up by 3.3KΩ. Make sue to make this terminal NC, when this terminal is not used.

3.6 CN6 Connector for Paper Cutter

PIN NO.	SIGNAL NAME	I/O	FUNCTION
1	M +	OUTPUT	CUTTER MOTOR OPERATIONAL SIGNAL M+
2	M -	OUTPUT	CUTTER MOTOR OPERATIONAL SIGNAL M-
3	SW	OUTPUT	CUTTER SWITCH INPUT SIGNAL
4	GND	-	GND

Using Connector : 5207-0410A (MOLEX)

Remarks : Use specified Paper Cutter. (Model name : AC-120/ACS-120)

4. DIP SWITCH SETTING

DIP SWITCH

		ON	OFF	FACTORY SETTING
DS1-1	AUTO CUTTER	ENABLE	DISABLE	OFF
2	CR SELECTION	LF ENABLE	LF DISABLE	ON
3	PRINT DENSITY	COMBINATION WITH J-6 (SEE BELOW)		OFF
4	DTR/XON-XOFF	XON-XOFF	DTR/DSR	OFF
5	INTERFACE	SEE BELOW		OFF
6	"			OFF
7	"			OFF
8	"			OFF

JUMPER

		SHORT	OPEN	FACTORY SETTING
J1	FONT SELECTION	SEE BELOW		SHORT CIRCUIT
J2	"			SHORT CIRCUIT
J3	"			SHORT CIRCUIT
J4	AUTO LOADING	ENABLE	DISABLE	SHORT CIRCUIT
J5	INPUT BUFFER	4K BYTES	72 BYTES	SHORT CIRCUIT
J6	PRINT DENSITY	COMBINATION WITH DS1-3		SHORT CIRCUIT
	(SUPPLEMENTARY)	SEE BELOW		SHORT CIRCUIT
J7	BIT LENGTH	8 BIT	7 BIT	SHORT CIRCUIT
J8	PRINTER MECHANISM	LT-282	LT-283	SHORT CIRCUIT

DS1-

8	7	6	5	INPUT METHOD	PARITY	BAUD RATE
OFF	OFF	OFF	OFF	PARALLEL INPUT	--	--
OFF	OFF	OFF	ON	SERIAL INPUT	NONE	1200 bps
OFF	OFF	ON	OFF	"	"	2400 bps
OFF	OFF	ON	ON	"	"	4800 bps
OFF	ON	OFF	OFF	"	"	9600 bps
OFF	ON	OFF	ON	"	"	19200 bps
OFF	ON	ON	OFF	"	ODD	1200 bps
OFF	ON	ON	ON	"	"	2400 bps
ON	OFF	OFF	OFF	"	"	4800 bps
ON	OFF	OFF	ON	"	"	9600 bps
ON	OFF	ON	OFF	"	"	19200 bps
ON	OFF	ON	ON	"	EVEN	1200 bps
ON	ON	OFF	OFF	"	"	2400 bps
ON	ON	OFF	ON	"	"	4800 bps
ON	ON	ON	OFF	"	"	9600 bps
ON	ON	ON	ON	"	"	19200 bps

J-

3	2	1	INTERNATIONAL/JAPAN		INTERNATIONAL CHARACTER
OPEN	OPEN	OPEN	JAPAN		JAPAN
OPEN	OPEN	SHORT	JAPAN		JAPAN
OPEN	SHORT	OPEN	INTERNATIONAL		SWEDEN
OPEN	SHORT	SHORT	INTERNATIONAL		DENMARK 1
SHORT	OPEN	OPEN	INTERNATIONAL		U.K.
SHORT	OPEN	SHORT	INTERNATIONAL		GERMANY
SHORT	SHORT	OPEN	INTERNATIONAL		FRANCE
SHORT	SHORT	SHORT	INTERNATIONAL		U.S.

DS1-3	J-6	PRINT DENSITY
OFF	OPEN	LIGHTER
OFF	SHORT	LIGHT
ON	OPEN	DARK
ON	SHORT	DARKER

5. POWER SUPPLY

5.1 SPECIFICATIONS

VCC : 5V ± 5% 145 mA

VP : 24V ± 5% 1.8A (Peak : approx.6A)

5.2 Precautions

(1) Design the product to supply power to VCC before VP When power is supplied to this control board.

(2) Design the product to turn off the power for VCC after VP when power is turned off.

(3) Make sure to turn off the power in case of connecting / disconnecting connectors.

(4) Make sure to use VCC and VP following their specifications.

(5) Make sure to use this control board connecting all of terminals between VP and P-GND.

6. Parallel interface

6.1 Specifications

Data input method : 8 bit parallel signal (DATA0 - 7)

Control signals : $\overline{\text{ACK}}$, BUSY, $\overline{\text{STB}}$, $\overline{\text{FAULT}}$, PE, $\overline{\text{RESET}}$

6.2 Explanation of input / output signals

DATA0-7 : 8 bit parallel signal (Positive logic)

$\overline{\text{STB}}$: Strobe signal to read 8 bit data (Positive signal)

$\overline{\text{RESET}}$: Signal to reset control board

$\overline{\text{ACK}}$: 8 bit data request signal. Pulse signal output at the end of the BUSY signal (Negative logic)

BUSY : Signal to indicate BUSY state of the printer.Input new data for "LOW" (Positive logic)

$\overline{\text{FAULT}}$: Signal which is made "LOW" when printer is in alarm state.(Negative logic)

PE : Signal which is output when paper runs out.(Positive logic)

6.3 Electrical characteristics

(1) Input Signal Level

All the input signals are at TTL level.

"HIGH" level : 2.0V MIN

"LOW" level : 0.8V MAX

(2) Output Signal Level

All the input signals are at TTL level.

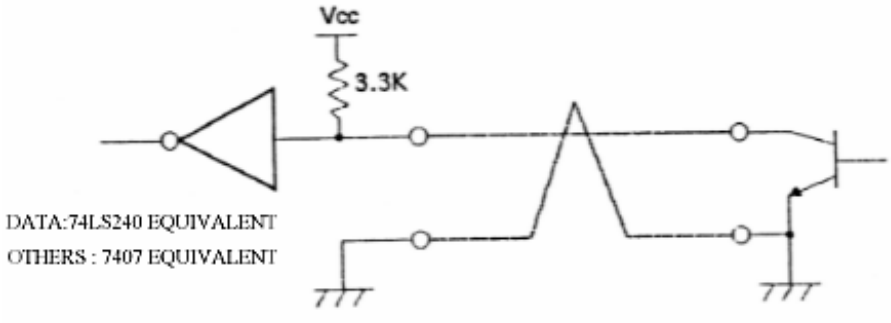
"HIGH" level : 2.4V MIN

"LOW" level : 0.4V MAX

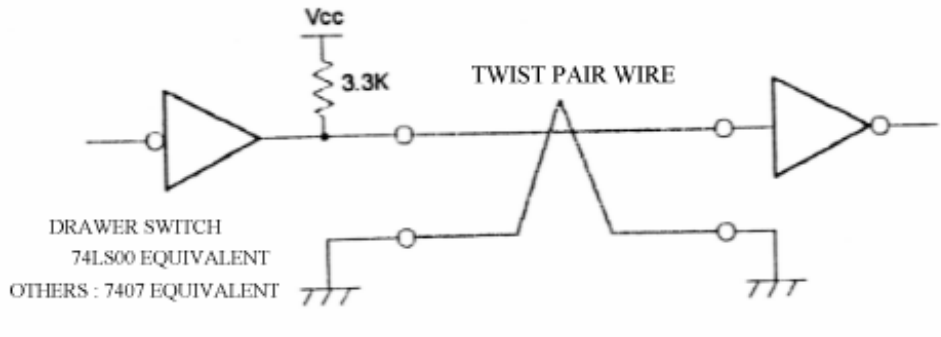
(3) I/O Conditions

All the input signals are pulled up by 3.3KΩ.

<Printer side> <Host side>

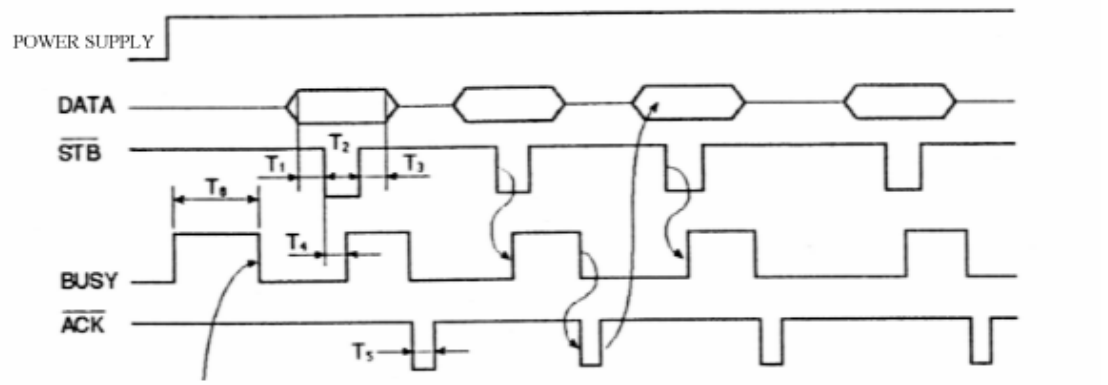


All the output signals are pulled up by 3.3KΩ.



6.4 Timing chart

(1) Data Input and Printing Timing



ACK is not outputted.

T1, T2, T3	: 0.5 micro sec. MIN
T4	: 270 ns MAX
T5	: 2.3 micro sec. TYP
T6	: 500 ms MIN (On supplying power)

6.5 Data receiving control

When BUSY signal is "LOW", data from the host can be received. When it being "HIGH", data can not be received.

6.6. Buffering

The size of buffer can be selected by setting of Jumper switch J5.

When 4K buffer is selected, as big data can be buffered in input buffer, host side can be released immediately.

7. Serial interface

7.1 Specifications

(1) Data transfer system: Asynchronous

(2) Baud rates

1200, 2400, 4800, 9600, 19200 bps (Selectable by user)

(3) Configuration of one word

Start bit : 1 bit
Data bit : 7 bits or 8 bits (Selectable by user))
Parity bit : Add/even or no parity (Selectable by user)
Stop bit : 1 bit or more

(4) Signal polarity

RS-232C

- Mark = logic " 1" (-3V ～ -12V)
- Space = logic " 0" (+3V～ +12V)

(5) Receiving data (RD signal)

RS-232C

- Mark = 1
- Space = 0

(6) Receiving control (DTR signal)

RS-232C

- Mark : Data transfer not available
- Space : Data transfer available

(7) Transmission control (TD signal)

DC1 code (11H) X-ON : Data reception available
DC3 code (13H) X-OFF : Data reception not available

7.2 Explanation of Input / Output signals

7.2.1 Input / Output signals

(1) RD

Serial receiving data signal. On occurrence of framing error, overrun error, or parity error, the data is printed as "?".

(2) DTR

When this signal is READY, write data or a command. When they are written in BUSY, overrun error is occurred and data is ignored. Even during printing, data can be loaded in the input buffer. Further, BUSY can take place on supply of power, during test printing, during on-line, or on resetting.

(3) TD

When, while in data reception, the rest of input buffer on the printer side goes less than 10 bytes (72K bytes mode) or 128 bytes (4K bytes mode), DC3 (13H) data reception impossible signals are output. When the rest of input buffer goes more than 20 bytes (72 bytes mode) or 256 bytes(4K bytes mode), DC1 (11H) data reception possible signals are output to the host. When DTR/DSR control having been selected in status information transmission, it is first confirmed that DSR is "space" and data is sent. When DTR/DSR control has not been selected, DSR is ignored and data is transmitted.

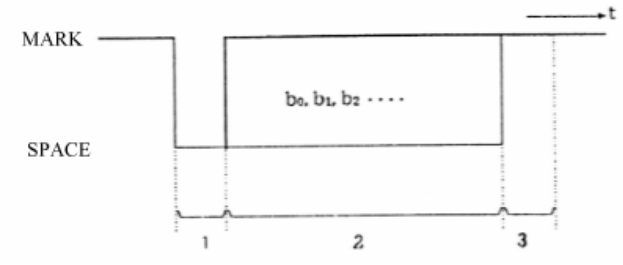
(4) FG

Case GND

(5) GND

Common GND on the circuit.

7.3 Date configuration



1 Start bit
2 Data bit (+ parity bit)
3 Stop bit (1 or more)

(1) Start Bit
In 1/2 bit from the mark-to-space starting edge, state is read once again. When "space" state is confirmed, it is recognized as the start bit. If it is "mark" state, it is not taken as the start bit. Without taking it as an error, detection of a start bit is carried out once again.

(2) Data Bit + Parity Bit
Data bit and parity bit are sampled at 1/2 start bit for time length equal to 1 bit. The state thus sampled is taken as the data for the bit concerned. Bits are named as
Bit 0, Bit 1, ... parity bit counted from the one close to the start bit.

(3) Stop Bit
The stop bit is a mark level of 1 bit or more. With "space" having been detected on detection of a stop bit, framing error takes place.

7.4 Error detection

Parity, framing, and overrun are detected. On detection of any error, the data are stored in the buffer as "?".

(1) Framing Error
With "space" state having been detected on detection of a stop bit, error takes place. The data are stored in the buffer as "?".

(2) Parity Error
With an error having been detected under specifying parity check, the data is stored in the buffer as "?".

(3) Overrun Error
On detection of an overrun error, the data are stored in the buffer as "?".

7.5 Data receiving control

When DTR/DSR control having been selected, with BUSY signal at "LOW", data from the host side are received. With the signal at "HIGH", they can not be received.
When DTR/DSR control not having been selected, after X-ON transmission, data is received from the host side. No transmission of data can take place after X-OFF is transmitted.

7.6 Buffering

Data transfer to the input buffer include DTR signals and TD signals as the control signals concerned.

(1) DTR signals (See 7.2. (2).)

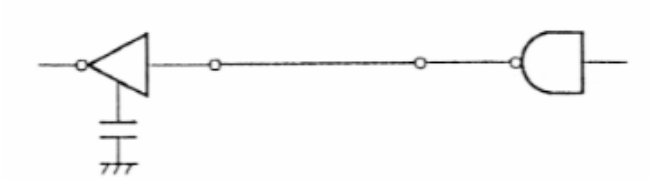
(2) TXD signals (See 7.2. (3).)

7.7 Electrical characteristics

(1) RS-232C Circuit

Input (RXD, DSR)

<Printer side> <Host side>



RXD Mark = (-8V) : stop bit

MAX 232 Equivalent Space = (+8V) : start bit

Output (DTR, TXD)

MAX 232 equivalent

DTR (-8V) : When busy TXD Mark = (-8V) : 1

(+8V) : when ready Space =(+8V) : 0

8. PRINT CONTROL FUNCTION

8.1 Command List

	CONTROL CODE	FUNCTION	CODE	PAGE
1	HT	Horizontal tab command	09H	19
2	CR	Print command	0DH	19
3	LF	Printing and paper feed	0DH	19
4	ESC SP	Setting the right space amount of the character	1BH 20H n	19
5	!	Collective specifying printing mode	1BH21H n	19
6	%	Specifying/canceling download character set	1BH25Hn	20
7	&	Defining download characters	1BH26H5nm [ap1p2...p5xa]m-n+1	20
8	*	Specifying the bit image mode	1BH2Amn1n2[d]k	21
9	-	Specifying/canceling underline	1BH2DH n	21
10	2	Specifying 1/6-inch line feed rate	1BH32H	21
11	3	Setting line feed rate of minimum pitch	1BH33Hn	21
12	@	Initializing the Printer	1BH40H	21
13	D	Setting horizontal tab position	1BH44H[n]k00H	22
14	E	Specifying/canceling highlighting	1BH45Hn	22
15	G	Specifying/canceling double printing	1BH47Hn	22
16	J	Printing and feeding paper n/203 inch	1BH4An	22
17	R	Selecting the international characters	1BH52Hn	23
18	c3	NOP	1BH63H33Hn	23
19	c4	NOP	1BH63H34Hn	23
20	c5	Enabling/disabling the panel switches	1BH63H35Hn	23
21	d	Printing and feeding the paper by n lines	1BH64Hn	23
22	p	NOP	1BH70Hmn1n2	24
23	t	Selecting the character code table	1BH74Hn	24
24	v	Transmitting the printer status (Serial type)	1BH75Hn	24
25	u	NOP	1BH76H	25
26	{	Specifying/canceling the inverted characters	1BH7BHn	25
27	V	Specifying/canceling the 90 ° - right-turned	1BH56Hn	26
28	$	Specifying the absolute positions	1BH24Hn1n2	26
29	¥	Specifying the relative positions	1BH5Cn1n2	26
30	GS k	Printing the bar code	1DH6BHn[“d”]k00H	27
31	w	Selecting the horizontal size (scale factor) of bar	1DH77n	27
32	h	Selecting the height of the bar code	1DH68Hn	27
33	H	Selecting of print position of HRI code	1DH48Hn	27
34	f	Selecting the font of HRI code	1DH66Hn	28
35	*	Defining the download bit image	1DH2An1n2[d]n1xn2x8	28
36	/	Printing the download bit image	1DH2FHm	29
37	:	Starting/ending macro definition	1DH3AH	29
38	^	Executing the macro	1DH5En1n2n3	29
39	ESC =	Data input control	1BH3DHn	30
40	a	Aligning the characters	1BH61Hn	30
41	i	Activating auto cutter (Full cut)	1BH69H	30

42	m	Activating auto cutter (Partial cut)	1BH6DH	31

9.2 Command Details

(1) Horizontal Tab Command (HT)

Code : (09)h

Shifts the printing position to the next horizontal tab position. The horizontal tab position is set by ESC D. Initial setting of the horizontal tab position is each 8 characters in 9th, 17th, 25th, 33rd' columns.

(2) Print Command (CR)

Code : (0D)h

1) When DS 1 -2 is OFF:

This command is ignored.

2) When DS 1- 2 is ON:

With data held inside the internal print buffer, printing and line feed are performed. Without data inside the internal print buffer, however, no printing is performed.

(3) Printing and Paper Feed Command (LF)

Code : (0A)h

Prints data inside the input buffer and feeds lines based on the line feed amount having been set.

(4) Setting the right space amount of the characters (ESC SP n)

Code : (1B)h + (20)h + n

☆ {0 ≦ n ≦ 20} Data is described in Hex code.

The rightward space amount is set in dot unit (1/203 inch unit). In the initial value, it is n=0. The rightward space amount in double wide mode is made double of the set volume.

(5) Collective Specifying Printing Mode (ESC ! n)

Code: (1B)h + (21)h + n

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Printing mode is assigned. Each n bit indicates the following:

		VALUE	
BIT	FUNCTION	0	1
0	Character Font	Font A	Font B
1	Undefined		
2	Undefined		
3	High-lighting	Canceled	Specified
4	Double height	Canceled	Specified
5	Double width	Canceled	Specified
6	Undefined		
7	Underline	Canceled	Specified

- With double height and double width being specified simultaneously, double wide and double high characters are consisted.
- An underline is attached to the full character width, which, however, is not attached to the part having been skipped by the horizontal tab. Neither is it attached to 90 ° -right-turned characters.
- The underline width is as having been specified by <ESC - >. (The default setting is 1 dot width.)
  In case that double wide character and normal character exist in same one line, the layout of underline is consistent one.

(6) Specifying/Canceling Download Character Set (ESC % n)

Code: [1B]h + [25]h + [n]

☆ {0 ≦ n ≦ FF} data is described in Hex code.

Specifying/canceling download characters. Download characters and download bit images cannot be defined simultaneously. Further, only the lowest bit (n0) is valid for n.
The lowest bit (n0) indicates the following.

n0	Function
0	Canceling download character
1	Specifying download character

(7) Defining Download Character (ESC & s n m a (D1D2 〜Dn))

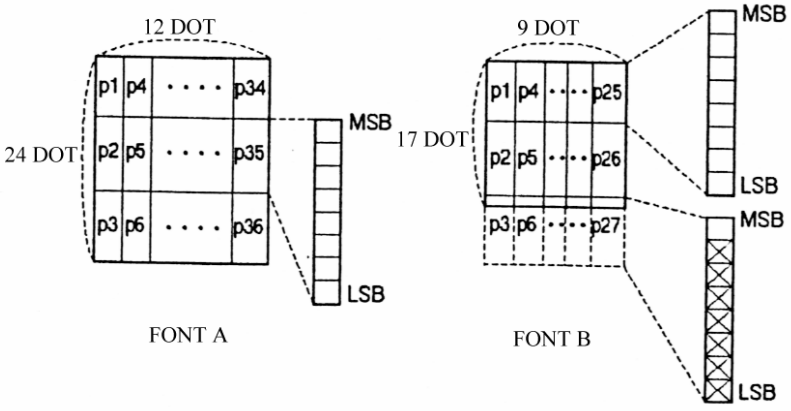
Code: [1B]h + [26]h + s +n +m +a +Dn

☆ {s = 03}
{20 (Hex) ≦ n ≦ 7E (Hex)}
{20 (Hex) ≦ m ≦ 7E (Hex)}
{0 ≦ a ≦ 0A (Hex)}

Defines the font of download characters of alphanumeric characters.

- "s" indicates the number of bytes in vertical direction.
- "n" indicates the start character code and m the end character code. To define only one character, set n=m.
- Character codes definable includes 95 ASCII codes in total between <20>H〜<7E>H.
- "a" indicates the number of dots in horizontal direction for definition.
- Dn is the data to be defined, which indicate a pattern equal to "a" dot in horizontal direction from the left end. The rest of the pattern on the right side is filled with space. The rest of data to be defined is s x a.
- Download characters thus defined remain valid until redefinition, ESC @ execution, GS * execution, or power OFF is practiced.

[EXAMPLE]



(8) Specifying the Bit Image Mode (ESC * m n1 n2 D1 ～Dn)

Code : [1B]h + [2A]h + m + n1 + n2 + Dn

☆ {m= bit image mode (See the table below.)}

{0 ≦ n1 ≦ FF}

{0 ≦ n2 ≦ 02} Data is described in Hex code.

According to the number of dots specified in n1, n2, specify the bit image of mode n.

- The no. of dots printed is divided by 256, whose quotient is taken as n2 and residualas n1.
- The total no. of dots printed in the bit image is equal to n1 + (256 x n2).
- When bit image data have been input in excess of dot position of one line (448 dots) , the excess data are discarded.
- d is bit image data, the bits subject to printing are taken as "1" and those not as "0".
- The bit image modes specified by m are shown as follows:

		VERTICAL DIRECTION		HORIZONTAL DIRECTION	
m(Hex)	MODE	NO. OF DOTS	DOT DENSITY	DOT DENSITY	MAX. NO OF DOTS
0	8-dot signle density	8	67 DPI	101 DPI	224 (208)
1	8-dot double density	8	67 DPI	203 DPI	448 (416)
32	16-dot single density	24	203 DPI	101 DPI	224 (208)
33	16-dot double density	24	203 DPI	203 DPI	448 (416)

- When the values set in m (bit image mode) are out of the above range, the data following after n1 is processed as normal printing data.
- After completion of bit image printing, printer returns to normal data processing mode.

* For maximum dots, the figure in ( ) is for LT- 283.

(9) Specifying/ Canceling Underline (ESC - n)

Code: [1B]h + [2D]h + n

☆ {0 ≦ n ≦ 02} data is described in Hex code.

Specifying/canceling an underline.

- An underline is attached to the full character width. It is, however, not attached to the part having been skipped by horizontal tab command.
- An underline is not attached to a 90 ° - right-turned characters.
- Types of underlines by n value are shown below:

n (Hex)	Type
0	Canceling an underline.
1	Specifying an underline for 1-dot width.
2	Specifying an underline for 2-dot width.

(10) Specifying 1/6 inch line feed rate (ESC 2)

Code : [1B]h + [32]h

The line feed rate per line is specified by 1/6 inch.

(11) Setting line feed rate of minimum pitch (ESC 3 n)

Code : [1B]h + [33]h + n

☆ {0 ≦ n ≦ FF} data is described in Hex code.

The line feed rate per line is specified by n/360 inch.

- The initial value is n = 60(1/6 inch)(18H), being 4.23 mm line feed rate.

(12) Initializing Printer (ESC @)

Code : [1B]h + [40]h

Clears data stored in the print buffer and brings various settings to the initial state (Default state).

- Data inside the internal input buffer are not cleared.
- Dip switches setting are read once again.

(13) Setting Horizontal Tab Position (ESC D n NUL)

Code : [1B]h + [44]h + n [00]h

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Specifying a horizontal tab position.

- "n" indicates the no. of columns from the beginning to the horizontal tab position. At this time, n= set position − 1 is to be specified. For example, to set the position at 9th column, n=8 is to be specified.
- The tab position is set at position where it is "character width x n" from the line beginning. The character width, at this time, includes the rightward space amount. In double wide characters, it is made double of the ordinary case.
- Tab positions can be specified are maximum 32. Specifying exceeding this is ignored.
- ESC D NUL clears all the set tab positions. Following clearing, horizontal tab command is ignored.
- Initial value is specified for each eight characters(9.17.25.33.) of ANK characters.

(14) Specifying/canceling highlighting (ESC E n)

Code : [1B]h + [45]h + n

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Specifying/canceling the highlighting characters.

- "n" is valid only for the lowest bit (n0).
- Control by the lowest bit (n0) is shown as follows:

n0	Type
0	Canceling highlighting.
1	Specifying highlighting.

- This is effective to all characters.
- Dot configuration of a highlighted character includes one extra dot added at its side.
- The print result of Double printing and highlight character printing is completely same.

(15) Specifying/canceling Double Printing (ESC G n)

Code : [1B]h + [47]h + n

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Specifying/canceling the double printing.

- "n" is valid only for the lowest bit (n0).
- Control by n is shown as follows.

n0	Type
0	Canceling double printing.
1	Specifying double printing.

- The print result of Double printing and highlight character printing is completely same

.

(16) Printing and feeding paper at minimum pitch (ESC J n)

Code : [1B]h + [4A]h + n

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Prints data inside the print buffer and feeds paper by n/360 inch.

- Specified volume does not remain.
- The beginning of the line is to be considered as the next printing start position.
- Initial value is not defined.

(17) Selecting International Characters (ESC R n)

Code : [1B]h + [52]h + n

☆ {0 ≦ n ≦ 0A) Data is described in Hex code.

Selecting international characters.

- Depending on the value of n, following character sets are specified.

n(Hex)	CHARACTER SET
0	U.S.A.
1	France
2	Germany
3	U.K.
4	Denmark Ⅰ
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
A	Denmark Ⅱ

- The initial value of n indicates the character set specified by Jumper setting (J1 - J3).

(18) NOP (ESC c3)

(19) NOP (ESC c5)

(20) Enabling/Disabling Panel Switch (ESC c 5 n)

Code : [1B]h + [63]h + [35]h + n

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Selecting the LF switch valid/invalid.

- "n" is valid only in the lowest bit (n0).
- "n" bit means the followings.

N0	Condition
0	LF SW valid.
1	LF SW invalid.

- The initial value of n is "0".

(21) Printing and Feeding the paper by n lines (ESC d n)

Code : [1B]h + [64]h + n

☆* {0 ≦ n ≦ FF} Data is described in Hex code.

Prints data inside the buffer and feeds paper by n lines.

- Specified line does not remain.
- The beginning of the line is to be considered as the next printing start position.
- The initial value is not defined.

(22) Generating specified Pulse (ESC p m n1 n2)

Code : [1B]h + [70]h + m + n + n2

☆ {m = connector pin No. (See table below.)}

{0 ≦ n1 ≦ FF}

{0 ≦ n2 ≦ FF} Data is described in Hex code.

Signals specified by n1, n2 are output to Connector Pin m.

- Bit m (m0) means the followings.

m0	Condition
0	Drawer kick No. 2 pin
1	Drawer kick No. 5 pin

- ON time is considered as n1 x 2ms and OFF time as n2 x 2ms.
- When m is out of the defined range, n1, n2 are discarded, where no signals are output.
- Drive duty of Drawer is shown below:

$$\frac{\text{ON time}}{\text{ON time + OFF time}} \leqq 0.2$$

(Take OFF time as being 4 times or more longer than ON time.)

(23) Selecting Character Code Table (ESC t n)

Code : [1B]h + [74]h + n

☆ {0 ≦ n ≦ 1} Data is described in Hex code.

Selecting Page n on the character code table:

- "n" means the followings.

n (Hex)	Condition
0	IBM Character #2
1	Japanese Character

- The initial value of n is specified by Jumper setting (J1 - J3).

(24) Transmitting the printer status (ESC v)

Code : [1B]h + [76]h

Current printer status is transmitted..

- Status sent out consists of 1 byte whose content is as in the table below.
- In DTR/DSR control, after receptible state of the host (DSR signal being in SPACE state) is confirmed, only 1 byte is transmitted. In XON/XOFF control, DSR signal state not being confirmed, only 1 byte is transmitted.
- In DTR/DSR control, when the host is in unreceptible state(DSR signal being in MARK state), it waits until receptible state is created.
- In paper end (paper near end) status, this command may be unreceptible state due to BUSY state.

Remarks. This command is valid only for serial interface model.

BIT	FUNCTION	VALUE	
		0	1
0	Not defined		
1	Not defined		
2	Paper end	With paper	Without paper
3	Not defined		
4	Not used	Fixed to 0	-
5	Not defined		
6	Not defined		
7	Not defined		

(25) Transmitting the status of Peripheral Equipment (ESC u n)

Code : [1B]h + [75]h + n

☆ {n = 0}

Current status of connector pin No.3 is transmitted.

- "n" means the followings.

n (Hex)	Condition
0	Drawer Kick Connector No. 3

- Status transmitted consists of 1 byte whose content is as in the table below.
- Any equipment has not been connected to this connector, Bit 0 of n is always "1".
- In DTR/DSR control, after receptible state of the host (DSR signal being in SPACE state) is confirmed, only 1 byte is transmitted. Further, in XON/ XOFF control, DSR signal state not being confirmed, only 1 byte is transmitted.
- In DTR/DSR control, when the host is unreceptible state (DSR signal being in MARK state), it keeps waiting until receptible state is created.

BIT	FUNCTION	VALUE	
		0	1
0	Not defined		
1	Not defined		
2	Paper end	Paper remains	Paper out
3	Not defined		
4	Not used	Fixed to 0	-
5	Not defined		
6	Not defined		
7	Not defined		

(Remarks) This command is valid only for serial interface mode.

(26) specifying/Canceling Inverted Characters (ESC {)

Code : [1B]h + [7B]h + n

☆ {0 ≦ n ≦ FF} Data is described in Hex code.

Specifying/canceling inverted characters.

- "n" is valid only for the lowest bit (n0).
- Bit n (n0) means the followings.

n0	Condition
0	Canceling inverted characters.
1	Specifying inverted characters.

- Inverted printing means printing the line at 180 ° turned.
- This is valid only when this is specified at the beginning of a line.
- The initial value of n is "0".

(27) Specifying/Canceling 90 ° -right- turned Characters (ESC V n)

Code : [1B]h + [56]h + n

☆{0 ≦ n ≦ 1} Data is described in Hex code.

Specifying/canceling characters 90 ° -right- turned character.

- No underlines are attached to 90 ° -right- turned characters .
- "n" means the followings.

n (Hex)	Condition
0	Canceling 90 ° -right- turned Characters
1	Specifying 90 ° -right- turned Characters

- The initial value of n is "0".

(28) Specifying Absolute Positions (ESC $ n1 n2)

Code : [1B]h + [24]h + n1 + n2

☆ {0 ≦ n1 ≦ FF}

{0 ≦ n2 ≦ 1} Data is described in Hex code.

The printing start position is specified in the number of dots from the beginning of line. (1/20 inch unit)

- The number of dots is divided by 256, whose quotient is taken as n2 and the residual as n1. Therefore, the printing start position is equal to n1 + n2 x 256 from the beginning of line..
- Specifying beyond the line end is ignored.
- In case underline is specified, no underline is provided to the skipped portion.

(29) Specifying Relative Positions (ESC ¥ n1 n2)

Code : [1B]h + [5C]h + n1 + n2

☆ {0 ≦ n1 ≦ FF}

{0 ≦ n2 ≦ FF} Data is described in Hex code.

The printing start position is specified in the number of dots from the current position.

- Rightward direction is taken as plus and leftward direction as minus.
- To specify N dot in minus (left) direction, use a complement of N for assignment.

  − N dots = 65536 − N
- The number of dots is divided by 256, whose quotient is taken as n2 and the residual as n1.
- Specifying exceeding the end of line is ignored.
- In case underline is specified, no underline is provided to the skipped portion.

(30) Bar Code Printing (GS k n Dn NUL)

Code : [1D]h + [6B]h + n + Dn + [00]h

☆ {0 ≦ n ≦ 7} Data are described in Hex code.

Specifying a type of bar code and printing bar codes.

- The beginning of line is considered as the next printing start position.
- Depending on the value of n, the following bar code can be selected.
- Dn indicates a character code to be printed.

n (Hex)	Bar Code System	Maximum Columns
0	UPC-A	---
1	UPC-E	---
2	JAN13 (EAN)	---
3	JAN 8 (EAN)	---
4	CODE 39	15 (14) *
5	ITF	26 (24) *
6	CODABAR (NW-7)	19 (18) *
7	CODE 128	17 (15) *

* The figure in ( ) is for LT-283.

- When data being held in the print buffer, this command is ignored.
- Regardless of the specified feed pitch, this command feeds the paper to be required to print a bar code.
- When the character code Dn cannot be printed, the data following after this is printed as ordinary print data.
- When a bar code whose number of characters to be printed is fixed has been selected, the number of characters have to be always made equal to the number of characters to be printed.
- When the horizontal direction exceeds one line length, the excess part is not printed.

(31) Selecting Bar Code width (GS w n)

Code : [1d]H + [77]H + N

☆ {2 ≦ n ≦ 4} Data is described in Hex code.

Selecting bar code width.

- The initial value of this width is "3".

(32) Selecting Bar Code Height (GS h n)

Code : [1d]H + [68]H + N

☆ {1 ≦ n ≦ FF} Data is described in Hex code.

Selecting bar code height.

- "n" indicates the number of dots in vertical direction.
- The initial value of n is "162".

(33) Selecting Printing Position of HRI Characters (GS H n)

Code : [1d]H + [48]H + N

☆ {0 ≦ n ≦ 3} Data is described in Hex code.

Selecting printing position of HRI characters in printing bar codes.

- "n" means the followings.

n (Hex)	Printing Position
0	No printing
1	Above the bar code
2	Below the bar code
3	Both above and below the bar code

- The initial value of n is "0".

(34) Selecting the font of HRI code (GS f n)

Code : [1D]h + [66]h + N

☆ n = 0, 1

Selecting the font of HRI code in printing bar code.

The type of font can be printed by selecting n is as follows.

n	Font
0	Font A
1	Font B

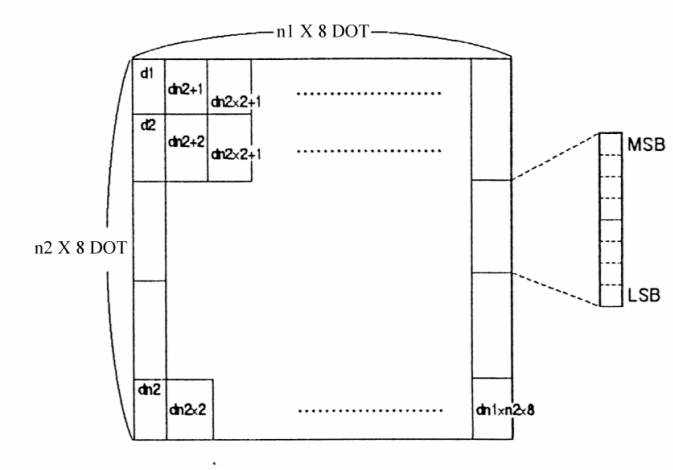
(35) Defining Download Bit Image (GS * n1 n2 Dn)

Code : [1D]h + [2A]h + n1 + n2 Dn

☆ {1 ≦ n1 ≦ FF}
{1 ≦ n2 ≦ 48}
{n1 × n2 ≦ 1311} Data is described in Hex code.

Defines downloading bit images of the number of dots specified by n1/n2.

- The numbers of dots are n1 x 8 in horizontal direction and n2 x 8 in vertical direction.
- Dn indicates bit image data.
- The download bit image thus defined remains effective until redefinition, ESC @ execution, ESC &, or power OFF takes place.
- A download character and a download bit image cannot be defined simultaneously. With this command executed, defined content of a download character is cleared.
- Relations between the bit image data and the dot defined are shown below:



(36) Printing Download Bit Image (GS / m)

Code : [1D]h + [2F]h + m

☆ {0 ≦ m ≦ 3} Data is described in Hex code.

Prints download bit iamges in a mode specified by m.

- Modes can be selected by m are shown ilable for selection with m are shown below.

m	MODE NAME	DOT DENSITY IN VERTICAL DIRECTION	DOT DENSITY IN HORIZONTAL DIRECTION
0	Normal mode	203 DPI	203 DPI
1	Double wide mode	203 DPI	101 DPI
2	double high mode	101 DPI	203 DPI
3	Double wide/double high mode	101 DPI	101 DPI

- When data exist inside the print buffer, this command is ignored.
- When a download bit image has not been defined, this command is ignored.
- A portion of a download bit image exceeding one line length is not printed.
- A download character and a download bit image cannot be defined simultaneously.

(37) Starting / Ending Macro Definition (GS :)

Code : [1D]h + [3A]h

Specifying starting / ending macro definition. Maximum content available for macro definition is 2048 bytes. A portion exceeding 2048 bytes is not defined.

- Even with ESC @ (initialization of the printer) having been executed, defined content is not cleared. Therefore, it is possible to include ESC @ into the content of macro definition.
- Normal printing operation is carried out even while in macro definition

(38) Macro Execution (GS ^ n1 n2 n3)

Code : [1D]h + [5E]h + n1 + n2 + n3

☆ {0 ≦ n1 ≦ FF}
{0 ≦ n2 ≦ FF}
{0 ≦ 3 ≦ 1} Data is described in Hex code.

Executing contents defined in macro.

- "n1～n3" indicate as follows:

n1 : The number of times of macro execution

n2 : Waiting time on macro execution
Waiting time of n2 x 100 msec is given for every execution.

n3 : Macro execution mode

n3	Mode
0	Continuous execution
1	Execution by LF SW

Continuous execution : The Macro is executed n1 times continuously at the time intervals specified by n2.

Execution by FEED SW : After waiting for lapse of time specified by n2, the ERROR LED flickers and the LF switch is waited to be pressed. When it is pressed, the macro is executed once. This action is repeated n1 times.

- When this command is received while in macro definition, suspension of macro definition is indicated. At this time, the defined content is cleared.
- No execution takes place when macro is held undefined or n1=0.
- While in macro execution with n3=1, paper feed with the LF SW is not available.

(39) Data Input Control (ESC = n)

Code : [1B]h + [3D]h + n

☆ {0 ≦ n ≦FF} Data is described in Hex code.

Selecting equipments in which data input from the host is effective.

- Each bit of n indicates as follows:

		VALUE	
BIT	EQUIPMENT	0	1
0	Printer	Invalid	Valid
1	Not defined		
2	Not defined		
3	Not defined		
4	Not defined		
5	Not defined		
6	Not defined		
7	Not defined		

- When the printer has not been selected, this printer abandons all the received data until it is selected by this command.
- Even when the printer has not been selected, it can become BUSY state through printer operation.
- The initial value of n is "1".

(40) Aligning the characters (ESC a n)

Code : [1b}h + [61]h + n

☆ {0 ≦ n ≦ 2} Data is described in Hex code.

All the printed data within one line are aligned in the specified position.

- Depending on n value, positional alignment is carried out as in the table below:

n (Hex)	POSITION
0	Left end alignment
1	Centering
2	Right end alignment

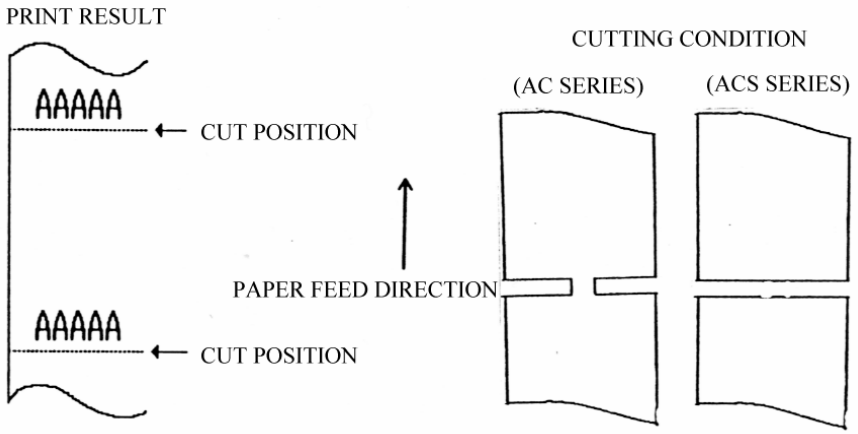
- This is valid only when n is inputted at the beginning of line.
- The initial value of n is "0".

(41) Full Cut (ESC i) (In selection of cutter option)

Code : [1B]h + [69]h

Activating auto cutter unit (Full cut)

- This is valid only when n is inputted at the beginning of line.
- Make sure to feed the paper by 18 mm or more before cutting paper, unless characters remain before the cutting point.

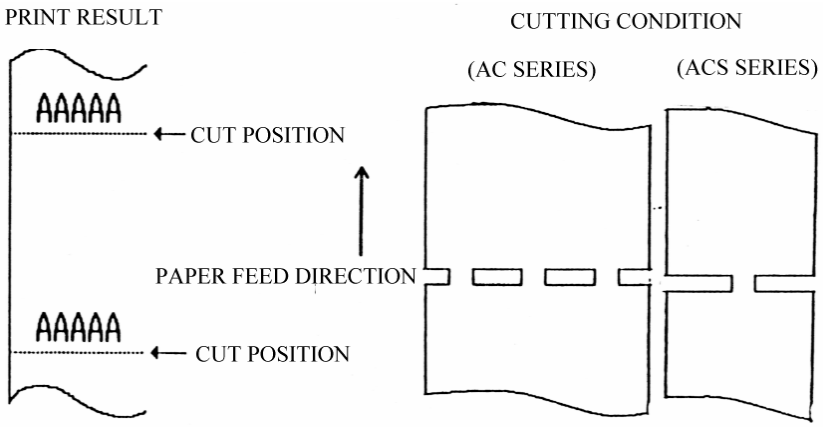


(42) Partial Cut (ESC m) (In selection of cutter option)

Code : [1B]h + [6D]h

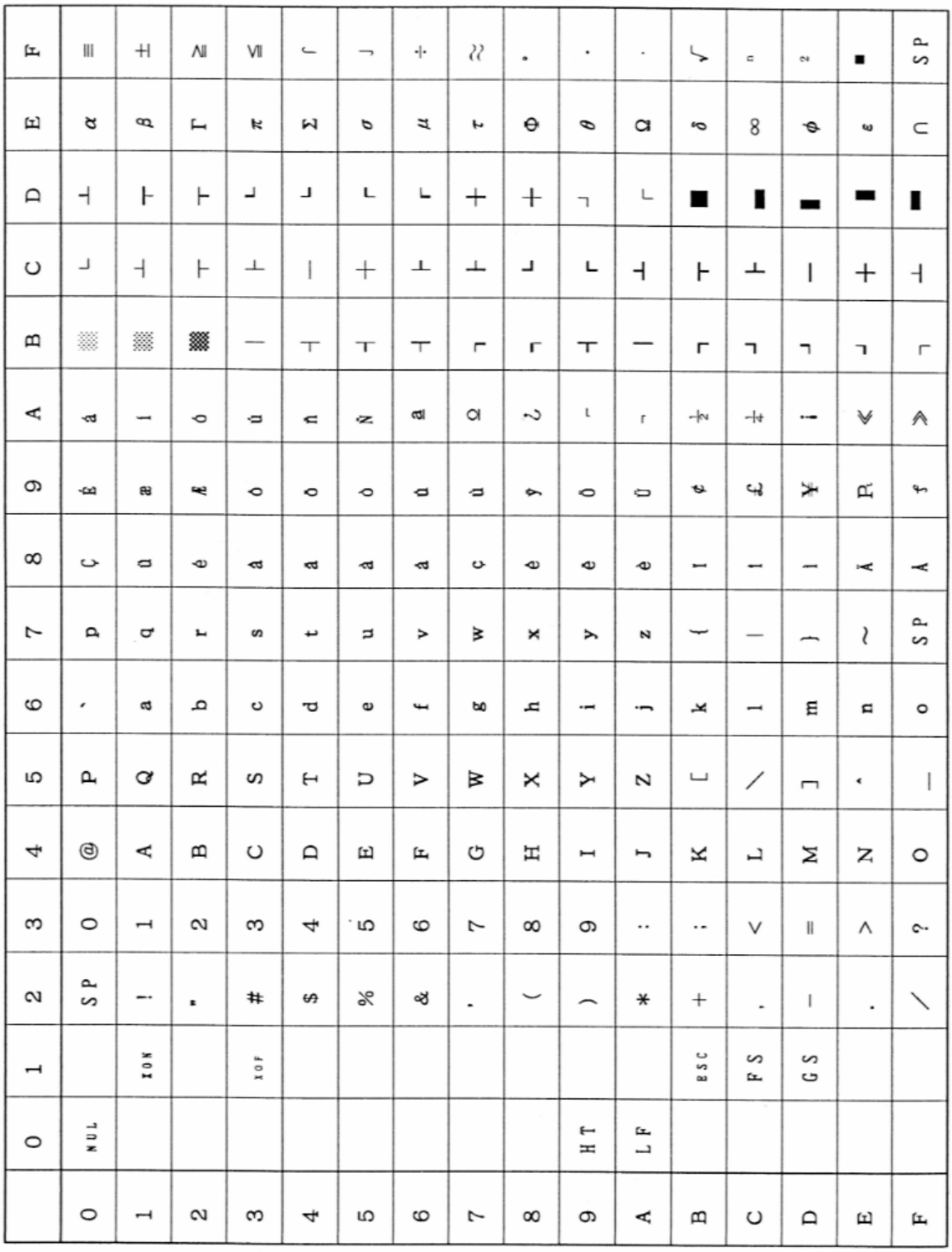
Activating auto cutter unit (Partial cut)

- This is valid only when n is inputted at the beginning of line.
- Make sure to feed the paper by 18 mm or more before cutting paper, unless characters remain before the cutting point.



9. CHARACTER CODE TABLE

9.1 INTERNATIONAL

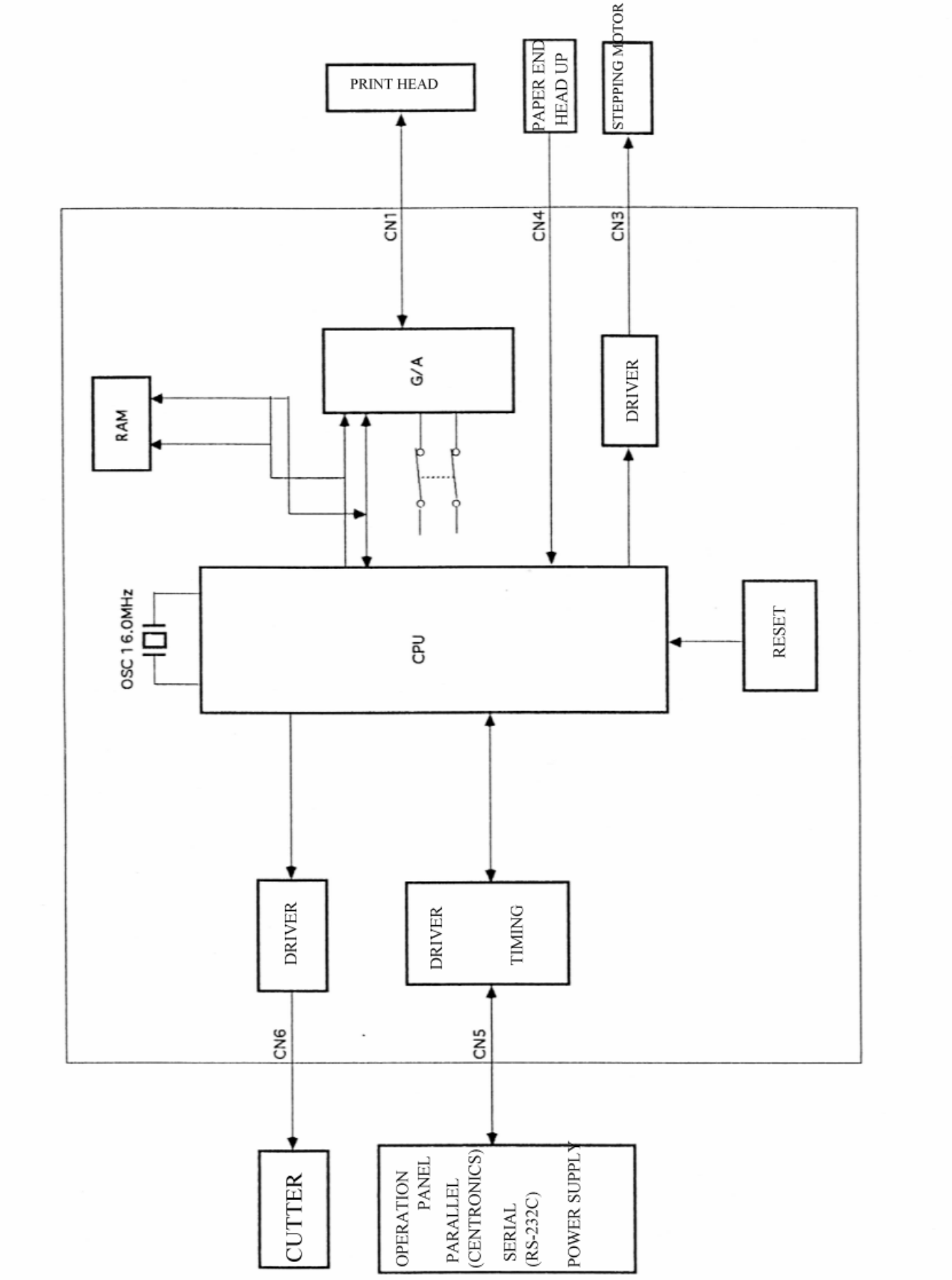


	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	Ç	É	á	▒	└	┴	α	≡
1		ION	!	1	A	Q	a	q	ü	æ	í	▒	┴	┬	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	├	Γ	≥
3		IOF	#	3	C	S	c	s	â	ô	ú	│	├	└	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	┬	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	┤	┼	┌	σ	⌡
6			&	6	F	V	f	v	å	û	ª	┤	├	┌	μ	÷
7			'	7	G	W	g	w	ç	ù	º	┐	┼	┼	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	┐	└	┼	Φ	°
9	HT		)	9	I	Y	i	y	è	Ö	⌐	┤	┌	┘	θ	·
A	LF		*	:	J	Z	j	z	è	Ü	¬	│	┴	┌	Ω	·
B		ESC	+	;	K	[	k	{	ï	¢	½	┐	┬	■	δ	√
C		FS	,	<	L	\	l	|	î	£	¼	┘	┼	■	∞	ⁿ
D		GS	-	=	M	]	m	}	ì	¥	¡	┘	─	■	φ	²
E			.	>	N	^	n	~	Ä	R	«	┘	┼	■	ε	■
F			/	?	O	_	o	SP	Å	ƒ	»	┐	┴	■	∩	SP

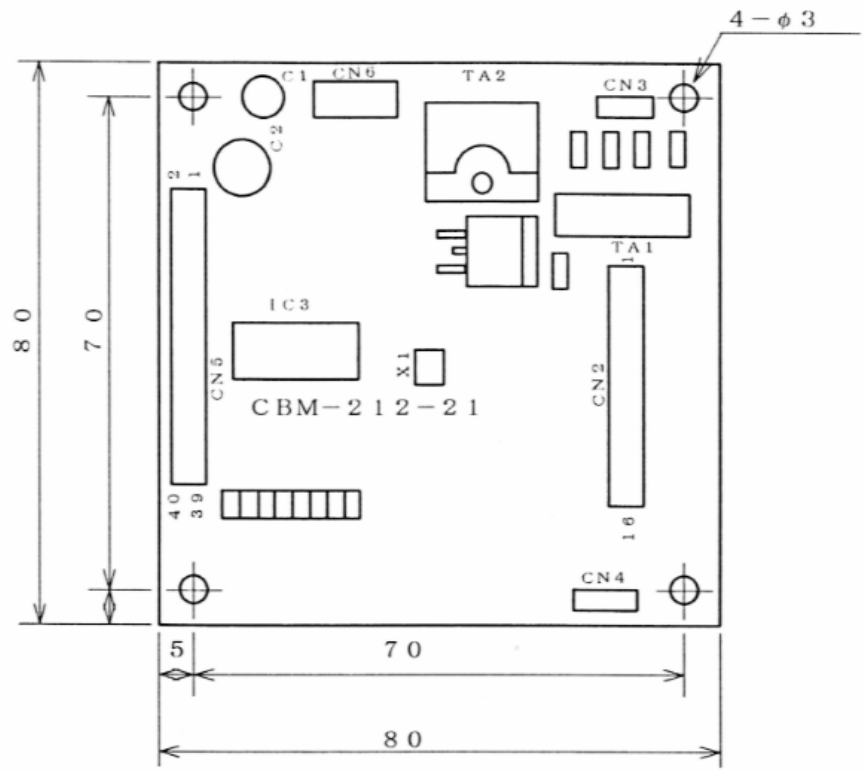
9.2 INTERNATIONAL CHARACTER CODE TABLE

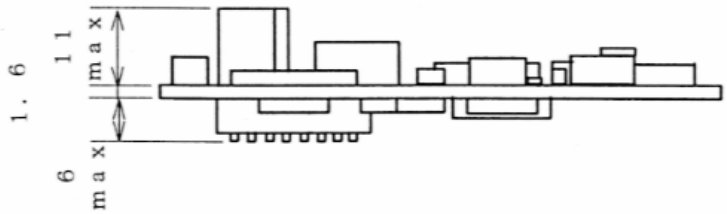
	国 名	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	U.S.A.	#	$	@	[	\	]	^	`	{	|	}	~
1	FRANCE	#	$	à	°	Ç	§	^	`	é	ù	è	¨
2	GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	U.K.	£	$	@	[	\	]	^	`	{	|	}	~
4	DENMARK I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
5	SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	ITALY	#	$	@	°	\	é	^	ù	à	ò	è	ì
7	SPAIN	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	JAPAN	#	$	@	[	¥	]	^	`	{	|	}	~
9	NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	DENMARK II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

APPENDIX 1. BLOCK DIAGRAM



APPENDIX 2. BASIC DRAWING





UNIT = mm