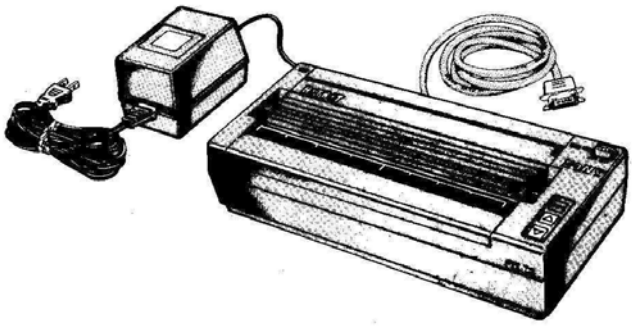
PRN-T24, AC-T11

SERVICE MANUAL



24 DOT THERMAL PRINTER

SONY

TABLE OF CONTENTS

1. OPERATION

1-1. NOTICE FOR THE CUSTOMERS IN THE UNITED KINGDOM IMPORTANT 1-1
1-2. PRECAUTIONS 1-1
1-3. LOCATION AND FUNCTION OF PARTS AND CONTROLS 1-1
1-4. PREPARATION 1-2
1-5. HOW TO PRINT 1-4
1-6. CONTROL CODE FUNCTIONS 1-7
1-7. SWITCHING THE DIP SWITCHES 1-13
1-8. CHARACTER CODE TABLE 1-14
1-9. SPECIFICATIONS 1-14
1-10. CONNECTOR PIN ARRANGEMENT 1-14

2. SERVICE INFORMATION

2-1. REMOVAL 2-1
2-1-1. Removal of Middle Lid 2-1
2-1-2. Removal of Front Lid 2-1
2-1-3. Removal of Rear Lid 2-1
2-1-4. Removal of Upper Case 2-1
2-1-5. Removal of Printer Mechanism and Battery Case Unit 2-2
2-1-6. Removal of Main Board 2-2
2-1-7. Disassembly Procedure of the Printer Mechanism . 2-3
2-1-8. Assembly Procedure of Printer Mechanism 2-5
2-1-9. Head Adjustment 2-6
2-2. REPAIR PARTS 2-6

3. MAINTENANCE AND REPAIR

3-1. MAINTENANCE 3-1
3-2. REPAIR 3-1
3-3. CAUTION FOR HANDLING 3-7
3-4. OILING STANDARD 3-7
3-5. ADHESION STANDARD 3-8

4. CIRCUIT DESCRIPTION AND MECHANISM BLOCK DESCRIPTION

4-1. POWER SUPPLY CIRCUIT 4-1
4-1-1. Voltage and Their Usages 4-1
4-2. RESETTING CIRCUIT 4-1
4-3. MPU, ROM/RAM, AND CONTROL CIRCUIT 4-2
4-3-1. MPU 4-2
4-3-2. ROM 4-2
4-3-3. RAM 4-2
4-3-4. Control Circuit 4-2
4-4. MOTOR AND SOLENOID DRIVE CIRCUIT 4-3
4-4-1. Motor (10Ω) 4-3
4-4-2. Electromagnetic Clutch (8Ω) 4-5
4-4-3. Trigger Solenoid (10Ω) 4-5
4-5. PRINTING HEAD DRIVE CIRCUIT 4-6
4-5-1. Printing Head Resistance Value 4-6
4-5-2. Power Application Time of Printing Head 4-6
4-6. INTERFACE CIRCUIT 4-6
4-7. SWITCH AND SENSOR CIRCUIT 4-7
4-8. POWER/LOW BATTERY LIGHTING CURCUIT . . . 4-7
4-9. MECHANISM BLOCK OUTLINE DESCRIPTION . . 4-7
4-10. FRAME BLOCK 4-7
4-11. DRIVE BLOCK 4-7
4-12. PRINTING, COLUMN RAISING, COLUMN RAISING RETURN AND TAPE WINDING MECHANISM BLOCK 4-7
4-12-1. Printing Mechanism Block 4-8
4-12-2. Column Raising Mechanism Block 4-8
4-12-3. Tape Winding Mechanism Block 4-8
4-13. PAPER FEEDING MECHANISM BLOCK 4-9
4-13-1. Paper Feeding Mechanism Block during Printing Operation 4-9
4-13-2. Manual Paper Feeding Mechanism Block 4-9
4-14. HEAD RELEASE MECHANISM BLOCK 4-10
4-14-1. Head Release Mechanism Block during Printing Operation 4-10
4-14-2. Manual Head Release Mechanism Block 4-10
4-15. CARRIAGE DETECTION SIGNAL GENERATING BLOCK 4-10

5. BLOCK DIAGRAM

5-1. OVERALL 5-1

6. SCHEMATIC DIAGRAM

6-1. SEMICONDUCTOR PIN ASSIGNMENTS 6-1
6-2. MAIN BOARD 6-9
6-3. LED, SW BOARD 6-14
6-4. PE, FCB BOARD 6-15
6-5. AC-T11 6-16

7. TROUBLESHOOTING

7-1. GENERAL PRECAUTION ITEMS 7-1
7-2. MAIN FLOW 7-2

8. REPAIR PARTS AND FIXTURE

8-1. MECHANICAL PARTS LIST 8-1
8-1-1. Cover Block 8-1
8-1-2. Printer Block 8-3
8-2. ELECTRICAL PARTS LIST 8-5
8-2-1. AC-T11 8-5
8-2-2. LED Board 8-5
8-2-3. MAIN Board 8-5
8-2-4. SW Board 8-8
8-2-5. Frame 8-8
8-3. PACKING AND ACCESSORY 8-8

CHAPTER 1
OPERATION

1-1. NOTICE FOR THE CUSTOMERS IN THE UNITED KINGDOM IMPORTANT

The wires in the mains lead of the supplied ac power adaptor are coloured in accordance with the following code.

Blue.....Neutral
Brown.....Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:
The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

1-2. PRECAUTIONS

On safety

- Operate on 120, 220, or 240 V ac by using the supplied ac power adaptor according to your local power supply.
- Use this adaptor only for this printer.
  Polarity of the ac power adaptor plug is as illustrated.

- Should any solid object or liquid fall into the cabinet, unplug the unit and have it checked by qualified personnel before operating it any further.
- Disconnect the ac power adaptor from the wall outlet if the set is not to be used for an extended period of time. The STANDBY switch on the printer does not turn the ac adaptor off.
- To disconnect the ac power cord of the ac power adaptor, pull it out by the plug. Never pull the cord itself.
- Do not place or drop heavy objects on the ac power cord. Use of a damaged cord is dangerous.

On installation

- The printer consists of high-precision mechanical parts. Do not drop it or bump it against other objects. Do not place it in a place subject to vibration or on an unstable base.
- Do not install the unit near heat sources such as a radiator or an air duct, or in a place subject to direct sunlight, dust, or moisture.

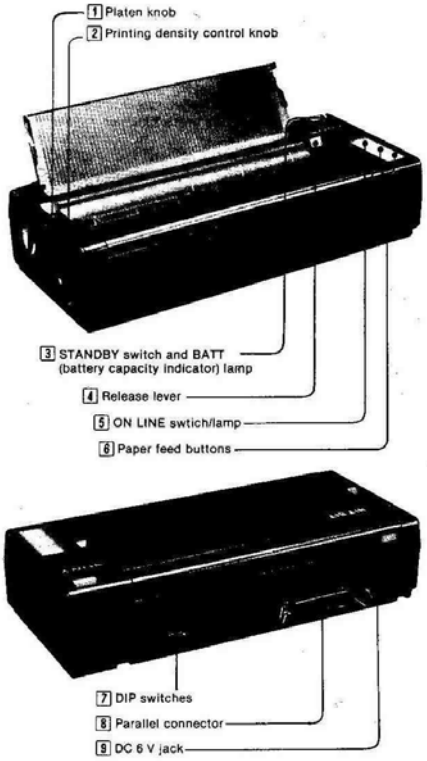
On operation

- Use the specified type of paper. Never attempt printing without paper loaded in the printer.
- Do not touch the mechanical parts inside the printer, or the graphics will not be drawn precisely or other problems may occur.

On cleaning

- Clean the enclosure or surface with a soft, dry cloth or a soft cloth lightly moistened with water or mild detergent solution. Do not use any solvent, such as alcohol or benzine, as it might damage the finish.

1-3. LOCATION AND FUNCTION OF PARTS AND CONTROLS



[1] Platen knob
Turn to rotate the paper feed roller. Set paper, position the release lever toward the front of the unit, then turn this knob and paper will be fed.

[2] Printing density control knob
Controls the printing density. If your printout is unclear, turn this knob to the back. If it is too dark and a blotches appear, turn this knob to the front.

[3] STANDBY switch and BATT (battery) lamp
Press to turn on the power. Press again to turn off.
The BATT lamp comes on when the power is turned on.
If the battery is nearly exhausted, the BATT lamp blinks.

Note: If the battery is nearly exhausted, a correct printout will not be obtained. If the BATT lamp blinks, press the STANDBY switch to turn off the power, then replace all of four batteries, or connect the ac power adaptor to the wall outlet, then press the STANDBY switch.

4 Release lever
Position the lever toward the front of the unit to fix the sheet against the platen. Position toward the back of the unit to free the sheet.

5 ON LINE switch/lamp
While the printer is in the online mode (able to print data from the computer), the ONLINE lamp is on. If the ON LINE switch is pressed, the lamp goes off and the unit enters the offline mode (unable to print data from the computer).

If the ON LINE switch is pressed during printing, the unit enters the offline mode after having printed the current line, then the ON LINE lamp goes off. If the ON LINE switch is pressed again, the unit enters the online mode and continues printing from where it left off.

6 Paper feed button
Press to feed paper. Set the printer into the offline mode, then press the ▲ button; paper is fed forward. If the ▼ button is pressed, paper is fed backward.

To print the test pattern , while pressing the ▲ or ▼ button, press the STANDBY switch.

7 DIP switches
Used to set various functions.
- You may have to set the DIP switches according to your software. Refer to the operating instructions of your software.

8 Parallel connecto
Connect to the computer using the supplied cable.

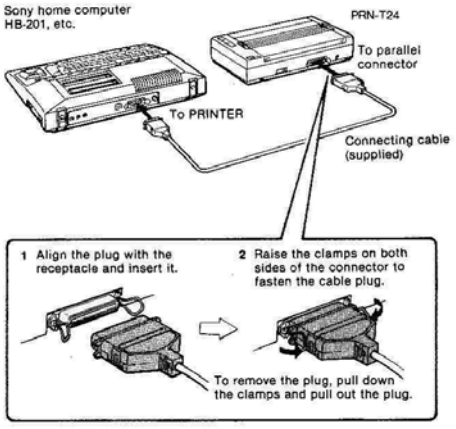
9 DC 6 V jack
Connect to the supplied ac power adaptor.

Note: Never connect to an adaptor other than the supplied ac power adaptor.

1-4. PREPARATION

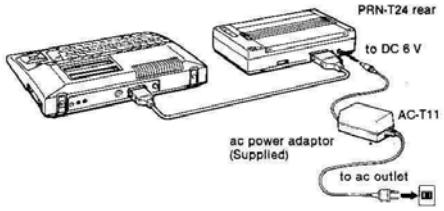
CONNECTION

- Before connecting, be sure to turn off the computer and the printer.



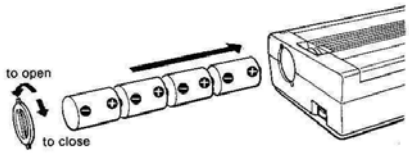
POWER PREPARATION

Power supply using the ac power adaptor



Note: Use the ac power adaptor supplied. Do not use any other ac power adaptor.

Power supply using batteries
Turn the battery cover counterclockwise to open, then insert four SUM-1 type (size D) dry cell batteries as shown below, then close the battery cover.



If the ac power adaptor is connected to the DC 6 V jack, the unit will not operate using batteries.

Note: Do not connect the AC power adaptor while the STANDBY switch of the printer which is being operated with batteries is on.

Notes on use of batteries
Incorrect use of batteries may cause a dangerous liquid leakage or explosion. Pay attention to the following:

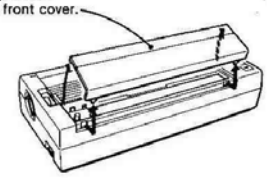
- To prevent useless consumption or liquid leakage of batteries, turn the power off after using the printer.
- Make sure the polarity (plus and minus) of each battery is set as indicated.
- Do not use new batteries with used batteries.
- Do not use different types of batteries because their performance is different, even if their form is the same.
- There are chargeable and unchargeable dry cell batteries. Before using batteries, read the notes explained on their surface.
- When batteries will not be used for a long period, remove them.

INSTALLING AND REPLACING A RIBBON CARTRIDGE

When using regular paper (sheets or roll of paper, or paper other than thermal paper), install a ribbon cartridge.

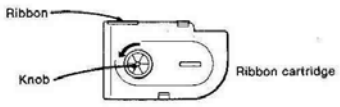
Installing a ribbon cartridge

1 Open the top cover.
2 Remove the front cover.

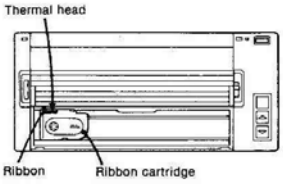


3 Push the release lever towards the back of the unit.

4 Turn the knob of the ribbon cartridge counterclockwise until the ribbon slack is completely taken up.



5 Install the ribbon cartridge so that the thermal head is placed between the ribbon and ribbon cartridge.



6 Install the front cover.

Removing a ribbon cartridge

Remove the front cover, push the release lever towards the back of the printer, then pull the ribbon cartridge out.

Notes: If the ribbon cartridge is removed when the release lever is positioned toward the front of the printer, the ribbon may be cut. When removing the ribbon cartridge, push the release lever towards the back of the printer. The printer will continue to operate ever if the ribbon runs out during printout.

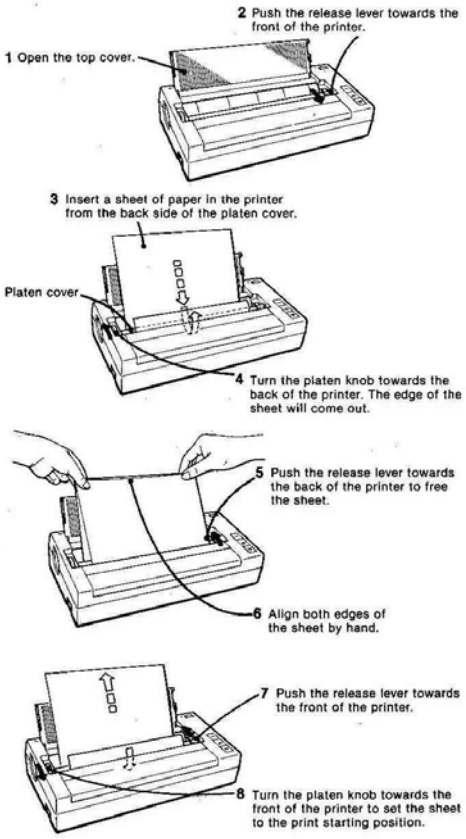
Service life of ribbon cartridge

One Sony PRK-T10 ribbon cartridge can print out about 22,000 characters. Use Sony PRK-T10 containing two ribbon cartridges.

LOADING PAPER

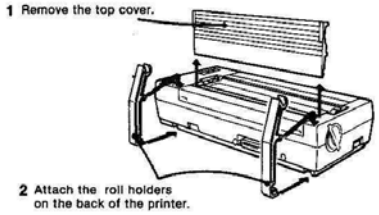
Loading a sheet of paper

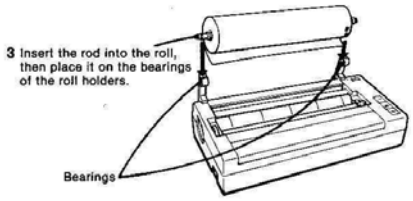
To load sheets of regular or thermal paper, follow the procedure shown below.



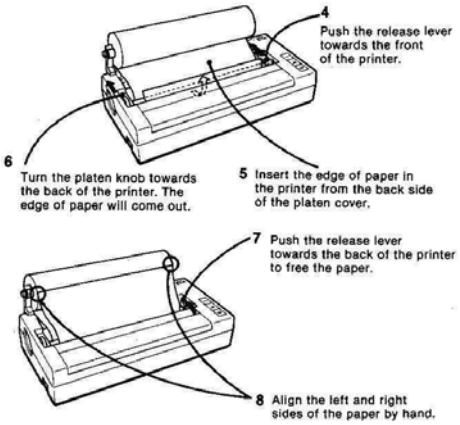
- Hold the release lever positioned towards the front of the printer.
- Before removing a sheet, push the release lever towards the back of the printer.

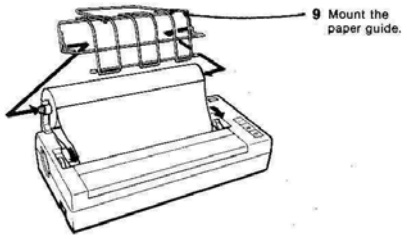
Loading a roll of paper
There are two types of paper rolls: regular and thermal. For loading, the optional roll holders and a rod are necessary. Follow the procedure shown below.





After the roll of paper is installed, load paper in the same way as for loading a sheet of paper. The procedure is as follows:





After making sure the paper is straight, position the release lever towards the front of the printer, then turn the platen knob towards the front of the printer to set the paper to the print starting position.

- If paper is not straight, malfunction may occur. When printing out an extremely long program list, correctly load paper so that it is straight.
- When cutting the paper, press the platen knob downward, so that the paper does not move and can easily be cut.

1-5. HOW TO PRINT

BEFORE STARTING

Turn on the power of the computer, then the printer.
When the printer is turned on, one line will be fed.

Available paper
Regular or thermal paper is available in the printer. When using regular paper, install a ribbon cartridge; when using thermal paper, if the ribbon cartridge is installed, remove it.

To get a clear printout, use paper whose surface is smooth.
We recommend the following paper:

Regular paper for thermal transfer ... HBJ-A047P (contains 100 A4-size sheets.)
Thermal paper ... HBJ-A048P (contains one roll of paper.)

Notes: For keeping printout a long time, use a regular paper with a ribbon cartridge. If a thermal paper is kept for a long period, (specially, if it is left in a place subject to direct sunlight), the printout will become discolored.

PRINTING THE BUILT-IN TEST PATTERN

The PRN-T24 contains a test pattern generator for a self print test. To print the test pattern, follow the procedure shown below:
- Be sure to load paper on the printer before the test pattern printing.

1 While pressing the paper feed button ▲, press the STANDBY switch to turn on the power. A test pattern will be printed out. Then, release the ▲ button.

- The print out fonts are automatically changed as follows:
  Pica ⟶ Elite ⟶ Condense ⟶ Proportional ⟶ Pica

Pica: 10 characters printed out per inch
Elite: 12 characters printed out per inch
Condense: 18 characters printed out per inch
Proportional printing: Changes the character width according to types of characters for easy reading.

2 Press the STANDBY switch again to turn the power off. Printing of the test pattern will end.

- Be sure to load a sheet of paper or a roll of paper before printing the built-in test pattern.

BASIC OPERATION

Printing out a program list
To print out an MSX-BASIC program list, enter the LLIST command. For example, execution of the following statement will print a program list between line numbers 10 and 100:

```
LLIST 10-100
```

Printing out characters in the MSX-BASIC program
Enter the LPRINT command.
For example, execution of the following statement will print characters A, B, C, D, and E:

```
LPRINT "ABCDE"
```

Or, run the following program:

```
10 INPUT A
20 INPUT B
30 LPRINT "A+B="; A+B
```

If 5 is entered for A and 7 for B from the keyboard, A+B = 12 will be printed out.

In other words, the LPRINT command is used to run a PRINT command on the printer instead of the display screen.

- When operating the printer with software other than the MSX-BASIC program, read the user's manual of the software.

Temporarily stopping print-out
To temporarily stop printing out a program list, press the ON LINE switch. After the current line is printed, the thermal head returns to the left end, the ON LINE lamp goes off, and printing stops. (offline mode)

If the ON LINE switch is pressed again, the ON LINE lamp comes on and printing restarts from where if left off. (online mode)

Stopping print-out due to paper-out
Set DIP switch 2 on the back side of the printer to OFF.
- DIP switch 2 is set to OFF at the factory.

While DIP switch 2 is set to OFF, if paper is nearly exhausted during printing, the last printable line is printed out, the thermal head returns to the left end, the unit enters the offline mode, and printing stops. (The ON LINE lamp also goes off.)

If the ON LINE switch is then pressed, one more line is printed out and the thermal head returns to the left end.

Replace paper, then press the ON LINE switch. Printing will restart from where it left off.

- If DIP switch 2 is ON, printing will continue, even if paper is nearly exhausted. When using sheets of paper, set DIP switch 2 to OFF.

ADVANCED OPERATION

The PRN-T24 can be changed to various modes by sending a specific code from the computer.

See the control code list. This list includes 43 control codes.
The following explains how to control the printer using some of these codes.

How to send a code
To send a code using MSX-BASIC, enter the CHR$ function and LPRINT command.

For example, to feed a line, see "New line" in "Operation Control of the control code list". The code name of "New line" is LF and its hexadecimal code is &H0A.

The heaxadecimal code &H0A is sent to the printer from the computer using the CHR$ function and LPRINT command.

Make sure the printer is in online mode, then enter the following statement in direct mode:

```
LPRINT CHR$ (&H0A);
```

One line will be fed. This is because "line feed" code, &H0A is sent to the printer from the computer with the above LPRINT command.

You can thus control the printer using 43 control codes.

Magnifying characters
See "Magnifying characters" and "Cancellation of magnification" in the item, Print Mode Control of the control code list. Their code names are SO and SI and the hexadecimal codes are &H0E and &H0F respectively. If "Magnifying characters" is specified, the horizontal width (the number of horizontal dots)of each character will become twice the regular width.

The following example shows a program containing these codes and the printout:

```
10 C$="ABCDE"
20 LPRINT CHR$(&HE) 'enlarged
30 LPRINT C$
40 LPRINT CHR$(&HF) 'normal
50 LPRINT C$
60 END
```

Result

```
ABCDE
ABCDE
```

Character modes

The following example shows a program to print out characters in various character modes as well as the above magnification mode:

```
10 C$="HOW IS THE PRINTER?"
20 '
30 LPRINT CHR$(&H1B);CHR$(&H48);C$ ---Printing with pica
40 LPRINT CHR$(&H1B);CHR$(&H45);C$ ---Printing with elite
50 LPRINT CHR$(&H1B);CHR$(&H51);C$ ---Printing with condense
60 LPRINT CHR$(&H1B);CHR$(&H50);C$ ---Proportional printing
70 LPRINT
80 LPRINT CHR$(&H1B);CHR$(&H45) ---Sets to the elite mode.
90 LPRINT CHR$(&H1B);CHR$(&H58) ---Starts underlining.
100 LPRINT C$:LPRINT
110 LPRINT CHR$(&H1B);CHR$(&H21) ---Emphasizes characters.
120 LPRINT C$:LPRINT
130 LPRINT CHR$(&HE) ---Magnifies characters.
140 LPRINT C$:LPRINT
150 LPRINT CHR$(&H1B);CHR$(&H59) ---Ends underlining.
160 LPRINT CHR$(&H1B);CHR$(&H48) ---Sets the pica mode.
170 LPRINT CHR$(&HF) ;CHR$(&H22) ---Cancels emphasis
180 LPRINT "TEST END"              and mangification.
190 END
```

Result

```
HOW IS THE PRINTER? ---Pica
HOW IS THE PRINTER? ---Elite
HOW IS THE PRINTER? ---Condense
HOW IS THE PRINTER? ---Proportional printing

HOW IS THE PRINTER? ---Elite, and underline

HOW IS THE PRINTER? ---Elite emphasis, and underline

HOW IS THE PRINTER? ---Elite, maginification, emphasis, and underline

TEST END ---Pica
```

- The above statement, LPRINT CHR$(&H1B);CHR$(&H48), can be changed to LPRINT CHR$(&H1B);"H". (Others are also the same.)

PRINTING OUT DATA IN HEXADECIMAL NOTATION

While pressing the two line feed buttons (▲ and ▼) simultaneously, press the STANDBY switch to turn the power on. Data from the computer will be printed out in hexadecimal notation.

With this function, control codes such as "line feed" and space can be printed out in hexadecimal notation as input data. It is convenient for operation check.

To release the hexadecimal notation mode, press the STANDBY switch again to turn the power off.

CONTROL CODE LIST

	Function	Code name	Hex. code
Operation control	Start of printing	CR	&H0D
	Line feed	LF	&H0A
	Moving the thermal head to the horizontal tabulation position	HT	&H09
	Moving the thermal head to the vertical tabulation position	VT	&H0B
	Paper feed	US	&H1F
		FF	&H0C
Function control	Horizontal tabulation		
	Horizontal tabulation setting	ESC (	&H1B &H28
	Cancellation of a horizontal tabulation	ESC)	&H1B &H29
	Cancellation of all horizontal tabulations	ESC 2	&H1B &H32
	Vertical tabulation		
	Start of a vertical tabulation setting	GS	&H1D
	End of vertical tabulation setting	RS	&H1E
	Left margin setting	ESC L N_2 N_1 N_0	&H1B &H4C n_2 n_1 n_0
	Right margin setting	ESC/N_2 N_1 N_0	&H1B &H2F n_2 n_1 n_0
	Line feeding width setting		
	Setting the line feeding width to 1/6"	ESC A	&H1B &H41
	Setting to the line feeding width 1/8"	ESC B	&H1B &H42
	Setting the line feeding width to N/120"	ESC T N_1 N_0	&H1B &H54 n_1 n_0
	Line feeding direction setting		
	Line feeding forward	ESC f	&H1B &H66
	Line feeding backward	ESC r	&H1B &H72
	Magnifying characters setting	SO	&H0E

Print mode control	Character modes		
	Setting 10 cpi (pica)	ESC H	&H1B &H48
	Setting 12 cpi (elite)	ESC E	&H1B &H45
	Setting 18 cpi (condense)	ESC Q	&H1B &H51
	Setting the proportional printing	ESC P	&H1B &H50
	Emphasis character setting	ESC !	&H1B &H21
	Cancellation of emphasis	ESC "	&H1B &H22
	Magnifying characters setting	SO	&H0E
	Cancellation of magnification	SI	&H0F
	Underline		
	Underline start	ESC X	&H1B &H58
	Underline end	ESC Y	&H1B &H59
	Specific print modes		
	Space insertion in dot unit	ESC {1, i, 8}	&H1B {1, i, 8}
	Tabulation movement in dot unit	ESC F N_3 N_2 N_1 N_0	&H1B &H46 n_3 n_2 n_1 n_0
	Repeat printing	ESC R N_2 N_1 N_0	&H1B &H52 n_2 n_1 n_0
	8-bit dot pattern repeat	ESC V N_2 N_1 N_0	&H1B &H56 n_2 n_1 n_0
	16-bit dot pattern repeat	ESC W N_3 N_2 N_1 N_0	&H1B &H57 n_3 n_2 n_1 n_0
	24-bit dot pattern repeat	ESC U N_3 N_2 N_1 N_0	&H1B &H55 n_3 n_2 n_1 n_0
	8-bit dot pattern printing	ESC S N_3 N_2 N_1 N_0	&H1B &H53 n_3 n_2 n_1 n_0
	16-bit dot pattern printing	ESC I N_3 N_2 N_1 N_0	&H1B &H49 n_3 n_2 n_1 n_0
	24-bit dot pattern printing	ESC J N_3 N_2 N_1 N_0	&H1B &H4A n_3 n_2 n_1 n_0
	Copy modes		
	Copy mode setting	ESC D	&H1B &H44
	Cancellation of copy mode	ESC M	&H1B &H4D
Printer mode control	Online/offline mode switching		
	Online mode setting	DC1	&H11
	Offline mode setting	DC3	&H13
Print-out character control	Printing of characters having codes &H00 to &H1F	SOH	&H01
Data cancellation	Erasing the data of the buffer in the printer	CAN	&H18

1-6. CONTROL CODE FUNCTIONS

INITIAL STATE OF PRINTER

When the power is turned on, the following modes (initial state), of the modes that can be switched by a control code, are set:

Mode	Initial state
Font	Pica (10 cpi)
Character emphasis	None
Character magnification	None
Underline	None
Horizontal tabulation	None
Vertical tabulation	Every 6 lines
Left and right margins	None
Line feeding width	1/6"
Line feeding direction	Forward
Signal line	Online

CONTROLLING PRINTER OPERATION

Code name: CR (CARRIAGE RETURN) Hexadecimal code: &H0D

- This code is used to print out the data in the buffer of the printer and return the thermal head to the left end (carriage return).
- Only carriage return or carriage return and line feeding are automatically performed by switching DIP switch 8.

Code name: LF (LINE FEED) Hexadecimal code: &H0A

- This code is used to feed one line by the current line feeding width in the current line feeding direction.
- If the bottom line is set as a vertical tab position, the paper is fed until the next TOF position, when the thermal head goes over the bottom line.

Code name: HT (HORIZONTAL TAB) Hexadecimal code: &H09

- This code is used to move the thermal head to the nearest horizontal tabulation position. If no horizontal tabulation position is specified, this code is ignored.

Notes: Execute the following statement in your program before sending the HT code:

```
POKE &HF418,255
```

The HT code is not correctly sent to the printer unless this statement is executed.

To return the mode set with POKE &HF418,255 to the original state, enter

```
POKE &HF418,0
```

Code name: VT (VERTICAL TAB) Hexadecimal code: &H0B

- This code is used to feed paper up to the next vertical tabulation position in the current line feeding direction. If no vertical tabulation position is specified, paper will be fed until the next TOF.

Code name: US Hexadecimal code: &H1F

- The function of this code varies according to the value of the 1-byte data following this code.
  Assume that the value of the 1-byte data is CHR$(n). (n indicates a decimal number.) If $1 \leq n \leq 6$, paper will be fed until the vertical tabulation position of channel n. If $17 \leq n \leq 31$, paper will be fed by (n−16) lines.
- If other than the above data is entered, it is ignored and tabulation is not done.

Code name: FF (FORM FEED) Hexadecimal code: &H0C

- This code is used to feed paper until the next TOF in the current line feeding direction.

CONTROLLING THE PRINTER FUNCTIONS

Horizontal tabulation

Code name: ESC (Hexadecimal code: &H1B &H28

- This code is used to set the horizontal tabulation.

Specify the ESC (code as follows:
ESC (α, β, ...

α, β, ... indicates a 3-digit decimal number. For example, to position the horizontal tab in the 6th, 18th, 36th columns from the left end, enter

```
ESC (006, 018, 036.
```

(A period is needed at the end.)

- Up to 16 horizontal tabulation positions can be specified.
- If an incorrect entry is made, all the specified horizontal tabulations are cleared.
- All the horizontal tabulations that were set before this code was received are cleared.

Example: LPRINT CHR$ (&H1B); "(010, 020, 030."

Executing this statement causes the unit to position the horizontal tabulation in the 10th, 20th, and 30th columns from the left end.

Code name: ESC) Hexadecimal code: &H1B &H29

- This code is used to release the horizontal tabulation.

Specify the ESC) code as follows:
ESC) α, β, ...

The specification method is the same as for the ESC (code.

- If an incorrect entry is made, all the specified horizontal tabulations are cleared.

Example: LPRINT CHR$ (&H1B);") 030."

Executing this statement causes the unit to clear the horizontal tabulation in the 30th column from the left end.

Code name: ESC 2 Hexadecimal code: &H1B, &H32

- This code is used to clear all the specified horizontal tabulations.

Vertical tabulation

Code name: GS	Hexadecimal code: &H1D

- This code is a start command code used to set the vertical tabulation.
- The vertical tabulation is set with a combination of this code and the RS code.

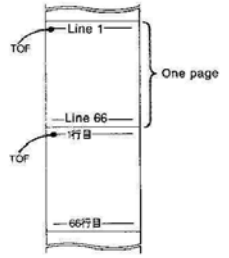
Code name: RS	Hexadecimal code: &H1E

- This code is used to indicate the end of data between the specified tabulation positions.

Vertical tabulation

The PRN-T24 can set the vertical tabulation. With this function, paper can be fed the specified number of lines required. It is convenient for tabulation.

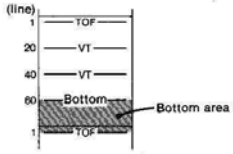
For vertical tabulation, paper loaded in the printer is divided every 66 lines and each 66-line segment of paper is regarded to be one page. Line 1 of each page is called top of form (TOF)*.



* The number of lines between TOFs can be changed to 72 by using the DIP switch.

With this vertical tabulation function, you can set any line on a page as a vertical tabulation position, and the line on which paper is to be automatically fed to TOF on the next page, as the bottom line.

For example, if the vertical tabulation (VT) is specified on lines 20 and 40 and the bottom line on line 60, the format of one page is as follows:



A space between the bottom and TOF of the next page is called bottom area.

—HOW TO SET A VERTICAL TABULATION—

To set a vertical tabulation, the following codes and data are sent to the printer. They are stored in the memory of the printer.

GS code

Data of TOF
↑
Data of untabulated lines
↓
Data of tabulated lines
↓
Data of untabulated lines
↑
Data of tabulated lines
|
(data of bottom)

Data of TOF of the next page

RS code

The GS and RS codes are used to declare the start and end of each vertical tabulation. The required data must be inserted between these codes.

Data other than the GS and RS codes defines whether each line is the tabulation position, TOF, or bottom line. It requires two bytes for each line. The contents of the 2-byte data are as follows:

	MSB 7	6	5	4	3	2	1	LSB 0	
Byte 1	*	1	CH_6	CH_5	CH_4	CH_3	CH_2	CH_1	One-line data
Byte 2	*	*	*	*	*	*	*	*	

* indicates 0 or 1.

Whether a line is the tablulation position, TOF, or bottom line is determined by setting the bit value of CH_1 to CH_6 to 0 or 1. The contents of CH_1 to CH_6 are as follows:

CH_6	CH_5	CH_4	CH_3	CH_2	CH_1		
0	0	0	0	0	1	The line is assumed to be TOF.	
0	0	0	0	1	1	The line is assumed to be the bottom.	
0	0	0	0	1	0	The line is assumed to be a tabulation position.	Called tabulation of channel 2.
0	0	0	1	0	0		Called tabulation of channel 3.
0	0	1	0	0	0		Called tabulation of channel 4.
0	1	0	0	0	0		Called tabulation of channel 5.
1	0	0	0	0	0		Called tabulation of channel 6.
0	0	0	0	0	0	The line is not assumed to be TOF, bottom, or tabulation. (regular line)	

As shown in this table, if only CH_1 is set to 1, the line is assumed to be TOF and if CH_1 and CH_2 are set to 1, the line is assumed to be the bottom line.

To specify a tabulation line, you may set any of five bits (CH_2 to CH_6) to 1. You may also set tabulation lines for each channel separately. For example, you can set a tabulation position on all lines in one page and use them as a tabulation line by specifying as follows:

TOF ... Line 1
Tabulation of channel 2 ... Lines 2, 7, 12, 17, 22, 27, 32, 37, 42, 47, 52, 57,
Tabulation of channel 3 ... Lines 3, 8, 13, 18, 23, 28, 33, 38, 43, 48, 53, 58,
Tabulation of channel 4 ... Lines 4, 9, 14, 19, 24, 29, 34, 39, 44, 49, 54, 59,
Tabulation of channel 5 ... Lines 6, 11, 16, 21, 26, 31, 36, 41, 46, 51, 56,
61Bottom ... Line 62

In other words, specifying only the tabulation of channel 5 enables the unit to stop paper feeding only on lines 6, 11, 16, ... 61.

A line in the bottom area can be set as tabulation of channed 3 to channel 6.

Example: To set lines 20 and 40 as a vertical tabulation lines and line 60 as the bottom line, the following data is sent to the printer with hexadecimal and binary codes. (All of bits that can be set to either 0 and 1 are set to 0.)

Hex. code	Binary code								Remarks
1D	0	0	0	1	1	0	1		GS (GROUP SEPARATOR) code (start of data sending)*
41	0	1	0	0	0	0	0	1	Specify line 1 as TOF*
00	0	0	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	Repeat "40 00" 18 times. Specify lines 2 - 19 as regular lines.
00	0	0	0	0	0	0	0	0	
40	0	0	0	0	0	0	0	0	
00	0	0	0	0	0	0	0	0	
42	0	1	0	0	0	0	1	0	Specify line 20 as tabulation of channel 2.
00	0	0	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	Repeat "40 00" 19 times. Specify lines 21 - 39 as regular lines.
00	0	0	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	
00	0	0	0	0	0	0	0	0	
44	0	1	0	0	0	1	0	0	Specify lines 40 as tabulation of channel 3.
00	0	0	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	Repeat line "40 00" 19 times. Specify lines 41 - 59 as regular lines.
00	0	1	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	
00	0	0	0	0	0	0	0	0	
43	0	1	0	0	0	0	1	1	Specify lines 60 as the bottom.
00	0	0	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	Repeat "40 00" 6 times. Specify lines 61 - 66 lines as regular lines (bottom area).
00	0	0	0	0	0	0	0	0	
40	0	1	0	0	0	0	0	0	
00	0	0	0	0	0	0	0	0	
41	0	1	0	0	0	0	0	1	Specify line 1 of the following page as TOF*.
00	0	0	0	0	0	0	0	0	
1E	0	0	0	1	1	1	1	0	RS (RECORD SEPARATOR) code (end of data sending)*

* The specification marked with an asterisk (*) is necessary and the others are optional.

Notes: The GS code must be followed by data of TOF (41H, 40H). If other data is received, the vertical tabulation command is canceled and the vertical tabulation mode returns to the initial state.
The RS code must follow data of TOF. If other data is received before the RS code, the vertical tabulation command is canceled an the vertical tabulation mode returns to the initial state.

- If the vertical tabulation position exceeds the number of lines between TOFs, an error occurs and the vertical tabulation mode returns to the initial state.

Margin setting

Code name: ESC L	Hexadecimal code: &H1B &H4C

- This code is used to position the left margin.
- Specify the left margin position with a 3-digit decimal number following ESC L.
  For example, to position the 12th column from the left end as the left margin, send ESC L 012.
- To cancel the left margin, send ESC L 000.

Example: LPRINT CHR$(&H1B);"L008"

Executing this statement causes the unit to position the eighth column from the left end as the left margin.

Code name: ESC /	Hexadecimal code: &H1B &H2F

- This code is used to position the right margin.
- Specify the right margin position with a 3-digit decimal number following ESC /.
  For example, to position the 15th column from the right end as the right margin, send ESC /065. (For pica)
- To cancel the right margin, send the following:
  Pica: ESC /080
  Elite: ESC /096
  Condense: ESC /144

Example: LPRINT CHR$(&H1B);"/053"

Executing this statement causes the unit to position the 27th column from the right end as the right margin.

Setting the line feeding width

Code name: ESC A	Hexadecimal code: &H1B &H41

- This code is used to set the line feeding width to $\frac{1}{6}$".

Code name: ESC B	Hexadecimal code: &H1B &H42

- This code is used to set the line feeding width to $\frac{1}{8}$".

Code name: ESC T	Hexadecimal code: &H1B &H54

- This code is used to set the line feeding width to $\frac{N}{120}$".
- Specify the value of N with a 2-digit decimal number following ESC T. For example, to set the line feeding width to $\frac{1}{3}$", in another word, $\frac{40}{120}$", send ESC T40.

Example: LPRINT CHR$(&H1B);"T10"

Executing this statement causes the unit to set the line feeding width to $\frac{10}{120}$ ($\frac{1}{12}$).

Note: When DIP switch 3 is off, if $\frac{13}{120}$", $\frac{14}{120}$", or $\frac{15}{120}$" is specified, the line feeding width is automatically set to $\frac{16}{120}$".

Setting the line feeding direction

Code name: ESC f	Hexadecimal code: &H1B &H66

- This code is used to feed a line forward.

Code name: ESC r	Hexadecimal code: &H1B &H72

- This code is used to feed a line backward.

CONTROLLING THE PRINT MODE

Character modes

Code name: ESC H	Hexadecimal code: &H1B &H48

- This code is used to select the 10 cpi (pica) mode.
- The 10 cpi mode remains unchanged until the 12 cpi (elite), 18 cpi (condense) or proportional mode is selected.
- If, in the 10 cpi mode, it is impossible to print in the current left and right margins, they are cleared. (This is also the same as for ESC E, ESC Q, and ESC P.)

Code name: ESC E	Hexadecimal code: &H1B &H45

- This code is used to select the 12 cpi (elite) mode.
- The 12 cpi mode remains unchanged until the 10 cpi (pica), 18 cpi (condense), or proportional mode is selected.

Code name: ESC Q	Hexadecimal code: &H1B &H51

- This code is used to select the 18 cpi (condense) mode.
- The 18 cpi mode remains unchanged until the 10 cpi (pica), 12 cpi (elite), or proportional mode is selected.

Code name: ESC P	Hexadecimal code: &H1B &H50

- This code is used to select the proportional mode. Proportional printing produces a proportional and easy-to-read printout by changing the width according to alphabetical characters, digits, and symbols.
- The proportional mode remains unchanged until the 10 cpi (pica), 12 cpi (elite) or 18 cpi (condense) mode is selected.

Code name: ESC !	Hexadecimal code: &H1B &H21

- This code is used to print out a bold emphasis character.

Code name: ESC "	Hexadecimal code: &H1B &H22

- This code is used to cancel character emphasis.
  With this code, a character emphasized with ESC ! will return to a regular print-out character.

Code name: SO	Hexadecimal code: &H0E

- This code is used to magnify a character.
  With this code, the horizontal width (number of dots) of a character to be printed out will become double.

Code name: SI	Hexadecimal code: &H0F

- This code is used to cancel magnification.
- With this code, a character magnified with SO will return to a regular size character.

Underline

Code name: ESC X	Hexadecimal code: &H1B &H58

- This code is used to start underlining.
- With this code, all print-out characters, digits, and symbols (including space and horizontal tabulation) can be underlined.

Code name: ESC Y	Hexadecimal code: &H1B &H59

- This code is used to end underlining.
- With this code, underlining specified with ESC X will be canceled.

Special print modes

Code name: ESC n	Hexadecimal code: &H1B n ($1 \leq n \leq 8$)

- This code is used to leave a space in dot unit.
- The ESC n code is effective only in the proportional mode.
- ESC 1 leaves a 1-dot space and ESC 8 leaves an 8-dot space.
- — If SO (magnification) is specified, the space also becomes double.

Example: 10 LPRINT CHR$(&H1B);CHR$(&H50);

20 LPRINT "A";CHR$(&H1B);CHR$(7);"B"

Executing these statements causes a 7-dot space between A and B.

Code name: ESC F	Hexadecimal code: &H1B &H46

- This code is used to move a tabulation position in dot unit.
- Specify the number of dots (on which a tabulation position moves) with a 4-digit decimal number following ESC F. The maximum number of dots is 1,440.

  For example, if ESC F 0512 is entered (codes &H1B, &H46, &H30, &H35, &H31, and &H32 are actually sent to the printer), the thermal head moves to the 512nd dot position from the left end.

Code name: ESC R	Hexadecimal code: &H1B &H52

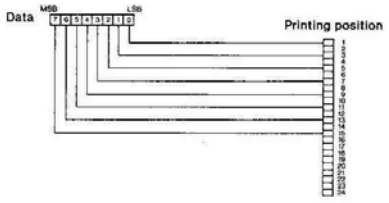
- This code is used to repeatedly print out the specified character by the specified number of times.
- Specify the number of repetitions with a 3-digit decimal number following ESC R, and specify the character to be printed out repeatedly with one byte following the number.

Example: LPRINT CHR$(&H1B);"R035*"

Executing this statement causes the printer to repeatedly print out an asterisk (*) 35 times.

Code name: ESC V Hexadecimal code: &H1B &H56

- This code is used to repeatedly print out a 8-bit dot pattern by the specified number of times.
- Specify the number of times with a 4-digit decimal number following ESC V, and specify the dot pattern with one byte following the number.
- The correspondence between the dot pattern data and printing positions is as follows:



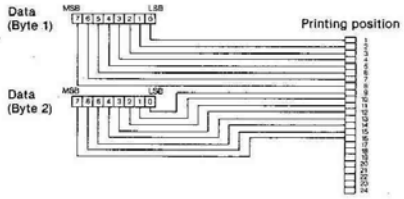
- If SO (magnification) is specified, the dot width also becomes double.
- Emphasis and underlining are ineffective if specified, but they are not cleared.
- After printing is ended, the unit will return to the original mode.

Example: LPRINT CHR$(&H1B);"V0270A"

Executing this statement causes the unit to repeatedly print out the 8-bit dot pattern corresponding to A 270 times.

Code name: ESC W Hexadecimal code: &H1B &H57

- This code is used to repeatedly print out a 16-bit dot pattern by the specified number of times.
- Specify the number of times with a 4-digit decimal number following ESC W, and specify the dot pattern with two bytes following the number.
- The correspondence between the dot pattern data and printing positions is as follows:



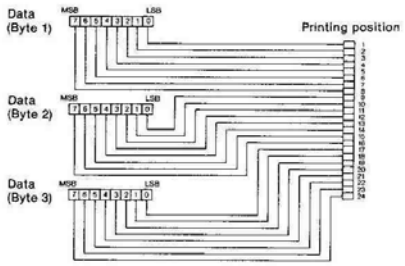
- If SO (magnification) is specified, the dot width also becomes double.
- Emphasis and underlining are ineffective if specified, but they are not cleared.
- After printing is ended, the unit will return to the original mode.

Example: LPRINT CHR$(&H1B);"W1234";CHR$(&H0F);CHR$(&HF0)

Executing this statement causes the unit to repeatedly print out the 16-bit dot pattern corresponding to CHR$(&H0F) and CHR$(&HF0) 1234 times.

Code name: ESC U Hexadecimal code: &H1B &H55

- This code is used to repeatedly print out a 24-bit dot pattern by the specified number of times.
- Specify the number of times with a 4-digit decimal number following ESC U, and specify the dot pattern with three bytes following the number.
- The correspondence between the dot pattern data and printing positions is as follows:



- If SO (magnification) is specified, the dot width also becomes double.
- Emphasis and underlining are ineffective if specified, but they are not cleared.
- After printing is ended, the unit will return to the original mode.

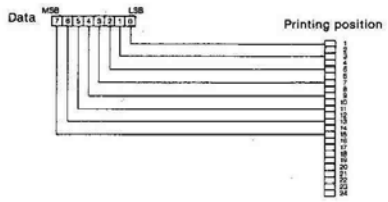
Example: LPRINT CHR$(&H1B);"U0782";CHR$(&HCD);CHR$(&HF1);CHR$(&HF0)

Executing this statement causes the unit to repeatedly print out the 24-bit dot pattern corresponding to CHR$(&HCD), CHR$(&HF1), and CHR$(&HF0) 782 times.

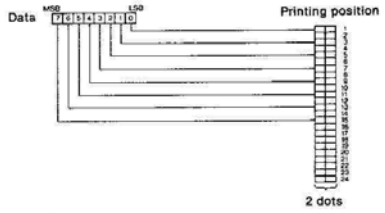
Code name: ESC S Hexadecimal code: &H1B &H53

- This code is used to convert data to an 8-bit dot pattern by the specified number of bytes.
- Specify the number of horizontal dot strings with 4-digit decimal number following ESC S. Data of the specified number of dot strings will be printed out as a dot pattern.
- The correspondence between the dot pattern data and printing positions is as follows:

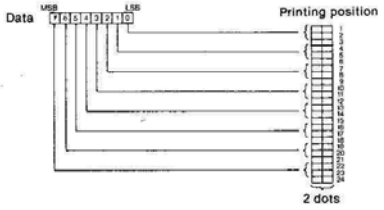
When DIP switch 3 is on and the copy mode is canceled with ESC M



When DIP switch 3 is on and the copy mode is specified with ESC D



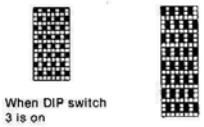
When DIP switch 3 is off



- If SO (magnification) is specified, the dot width also becomes double.
- Emphasis and underlining are ineffective if specified, but they are not cleared.
- After printing is ended, the unit will return to the original mode.

Example: LPRINT CHR$(&H1B);"S0008";CHR$(&H55);CHR$(&HAA); CHR$(&H55);CHR$(&HAA);CHR$(&H55);CHR$(&HAA);CHR$(&H55); CHR$(&HAA)

The following pattern is printed out:



Notes on 8-bit dot graphic mode
The correspondence between the dot pattern data and printing positions can be changed by switching DIP switch 3.
When DIP switch 3 is on, a printout gets smaller; when DIP switch 3 is off, a printout gets large and the number of dots on one line is 720. 720 or more dots may be required on one line depending on the types of the software. For example, the Sony Japanese language video word processor requires 960 dots on one line to print out 60 characters. In this case, the number of characters on one line of the screen must be 45 or less.

Notes on dot pattern printing
&H09 included in dot pattern data is converted to another code if an attempt is made to send it to the printer with an LPRINT command. Before sending the code, therefore, execute POKE &HF418,255. Then data of &H09 will be correctly sent to the printer.

To return the state set with POKE &HF418,255 to the original mode, execute POKE &HF418,0.

Code name: ESC I Hexadecimal code: &H1B, &H49

- This code is used to convert data of the specified number of horizontal dot strings to a 16-bit dot pattern.
- Specify the number of horizontal dot strings with a 4-digit decimal number following ESC I. Data of the double number of bytes as many as the specified number of dot strings will be printed out in units of two bytes (16 bits) as a dot pattern.
- The correspondence between the dot pattern data and printing positions is the same as for ESC W.
- If SO (magnification) is specified, the dot width also becomes double.
- Emphasis and underlining are ineffective if specified, but they are not cleared.
- After printing is ended, the unit will return to the original mode.

Example:

```
LPRINT CHR$(&H1B);"I0004";CHR$(&H92);CHR$(&H24);
CHR$(&HFF);CHR$(&H7F);CHR$(&HFF);CHR$(&F7F);
CHR$(&H92);CHR$(&H24)
```

Executing this statement causes the unit to print out the following dot pattern:

Code name: ESC J Hexadecimal code: &H1B &H4A

- This code is used to convert data of the specified number of horizontal dot strings to a 24-bit dot pattern.
- Specify the number of horizontal dot strings with a 4-digit decimal number following ESC J. Data of the triple number of bytes as many as the specified number of dot strings will be printed out in units of three bytes (24 bits) as a dot pattern.
- The correspondence between the dot pattern data and printing positions is the same as for ESC U.
- If SO (magnification) is specified, the dot width also becomes double.
- Emphasis and underlining are ineffective if specified, but they are not cleared.
- After printing is ended, the unit will return to the original mode.

Example:

```
LPRINT CHR$(&H1B);"J0002";CHR$(&HCD);CHR$(&H71);
CHR$(&H4C);CHR$(&HCD);CHR$(&H71);CHR$(&H4C)
```

Excecuting this statement causes the unit to print out the following dot pattern:

Copy mode

Code name: ESC D	Hexadecimal code: &H1B &H44

- This code is used to double the number of horizontal dots on an 8-bit dot graphic printout specified with ESC S. (Copy mode)
- The ESC D code is effective only when DIP switch 3 is on.
- When ESC D is specified, if an attempt is made to set the paper feeding width to 4/120", 8/120", or 16/120" with ESC T, it is automatically changed to 3/120", 5/120" or 11/120". Even if 4/120", 8/120", or 16/120" is set before ESC D is specified, they are ignored and automatically changed to 3/120",5/120", or 11/120" if ESC D is specified.

Code name: ESC M	Hexadecimal code: &H1B &H4D

- This code is used to cancel the copy mode specified with ESC D.
- The ESC M code is effective only when DIP switch 3 is on.

CONTROLLING THE PRINTER MODES

Switching the online/offline mode

Code name: DC1 (DEVICE CONTROL)	Hexadecimal code: &H11

- This code is used to place the signal line of the printer into the online mode.
- The DC1 code is set to on or off by switching DIP swtich 5.

Code name: DC3	Hexadecimal code: &H13

- This code is used to place the signal line of the printer into the off-line mode.
  If the DC3 code is sent, data is not printed out until the DC1 code is sent.
- The DC3 code is set to on or off by switching DIP switch 5.

Canceling data

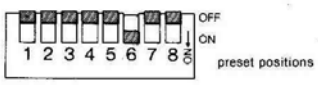
Code name: CAN (CANCEL)	Hexadecimal code: &H18

- This code is used to cancel all the unprinted data before CAN.

1-7. SWITCHING THE DIP SWITCHES

The PRN-T24 provides the DIP switches on the back side. Various functions can be selected by switching the DIP switches.

The respective DIP switches are preset at the factory as follows:



Notes on switching the DIP swithces

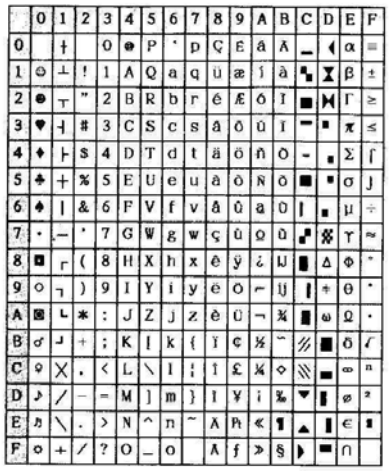
- Remember to turn the power of the printer off before switching the DIP switches.
- Each DIP switch can be set using the end of a small screwdriver.

Functions of DIP switches

Switch number	Function	OFF	ON	Value preset at factory
1	Switches digit Ø and character O.	O	Ø	OFF
2	Detects paperout.	Detected	Undetected	OFF
3	Handles the copy mode and sets a 8-bit dot pattern for ESC S.	Copy mode-ineffective Use of 24-dot area	Copy mode-effective Use of 16-dot area	OFF
4	Changes the page length.	66 lines	72 lines	OFF
5	Handles the DC1, DC3 codes.	Effective	Ineffective	ON
6	Automatically feeds a line after printing.	A line is not fed automat-cally.	A line is fed automatically.	ON
7	Print command code	Only CR	CR, LF, VT, FF, US	OFF
8	CR code function	Only carriage return	Carriage return and line feeding	OFF

1-8. CHARACTER CODE TABLE

The following table lists the character codes of the built-in ROM:



1-9. SPECIFICATIONS

Print functions

Print system: Serial thermal transfer system
Serial thermal system

Print head: 24 dots

Printing direction: One way (left to right)

Printing speed: 30 cps (character/second)
(not including CR and LF)

Character types: 252 types

Character size

	Pica	Elite	Condense	Proportional	Kanji
Dot area	24 × 18	24 × 15	24 × 10	Undefined	24 × 24
Dot configuration	18 × 15	18 × 12	18 × 8	Undefined	24 × 24
Character size (mm)	2.54 × 2.12	2.54 × 1.59	2.54 × 1.13	2.54 × Undefined	3.38 × 3.38

Character pitch and number of characters

	Pica	Elite	Condense	Proportional	Kanji
Pitch (character/inch)	10	12	18	Undefined	6.6*
Number of characters	80	96	144	Undefined	53*

* For a 3-dot space

Line feeding width 1/6", 1/8", N/120" (N = 0–99)

Paper feeding speed
250 ms (at 1/6" line feeding)

Paper feeding direction
Forward and backward

Paper feeding system
Friction feeding system

Ribbon
Ribbon cartridge supplied or optional PRK-T10
Service life: 22,000 characters

Paper

Paper types
Paper width: Max. 220 mm
Paper thickness: 0.05–0.12 mm
Outer diameter of a roll of paper: 50 mm or less
Recommended regular paper:HBJ-A047P
(100 A4 sheet)
Recommended thermal paper: HBJ-A048P
(Roll of paper)

Ambience

Operating temperature
5 °C to 40 °C (41 °F to 104 °F)

Operating humidity
30 % to 80 %

Power requirement
DC 6 V using the ac power adaptor supplied or SUM-1 (size D) batteries

Power consumption
7 W

Operating noise: 50 dB or less

Weight: 1.4 kg (3 lb 1 oz) (only main unit excluding batteries)

Dimensions: 295 × 67 × 132 mm (W/H/D)
(11⅝ × 2¾ × 5¼ inches)

Accessories supplied

Ac power adaptor 1
Connecting cable 1
Ribbon cartridge 1

While the informatin given is true at the time of printing, small production changes in the course of our company's policy of improvement through research and design might not necessarily be indicated in the specifications. We would ask you to check with your appointed Sony dealer if clarification on any point is required.

1-10. CONNECTOR PIN ARRANGEMENT

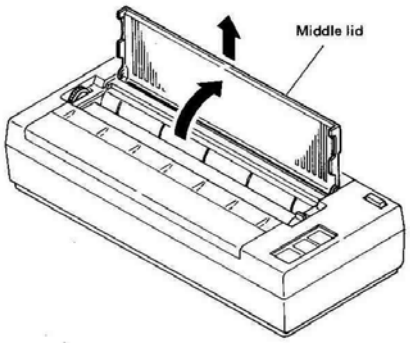
Pin no.	Signal name	Pin no.	Signal name
1	$\overline{STB}$	11	Busy
2	DATA 1	12	NC
3	DATA 2	13	SELECT
4	DATA 3	14	Signal GND
5	DATA 4	15	NC
6	DATA 5	16	Signal GND
7	DATA 6	17	FG
8	DATA 7	18	NC
9	DATA 8	19–29	Signal GND
10	$\overline{ACK}$	30–36	NC

CHAPTER 2
SERVICE INFORMATION

2-1. REMOVAL

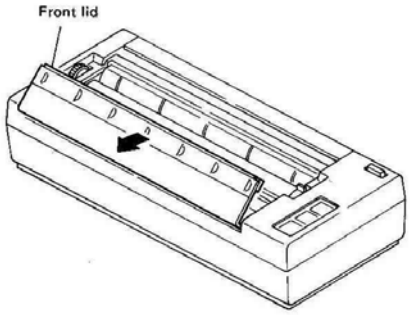
2-1-1. Removal of Middle Lid

Open the middle lid in the direction of arrow and pull it up.



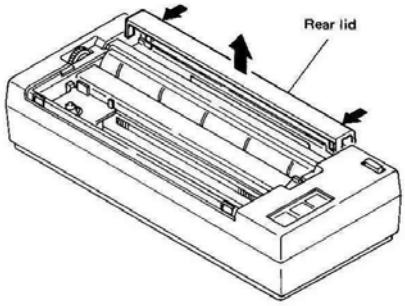
2-1-2. Removal of Front Lid

Open the front lid from its transparent section.



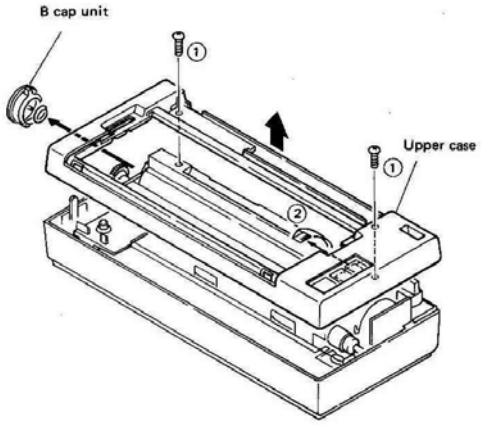
2-1-3. Removal of Rear Lid

Pull up the rear lid while pushing 2 points on the rear lid.



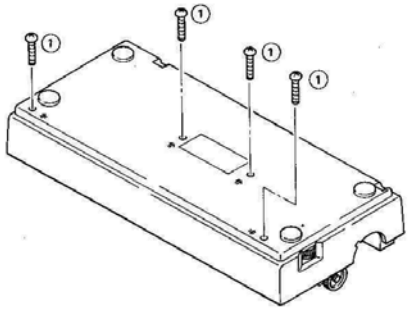
2-1-4. Removal of Upper Case

① Remove 2 screws and remove the upper case.
② Pull out the flat cable.
③ Remove the B cap unit.

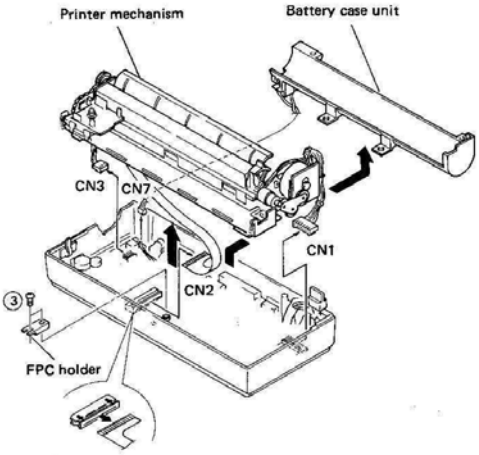


2-1-5. Removal of Printer Mechanism and Battery Case Unit

① Remove 4 ⇐ marked screws.

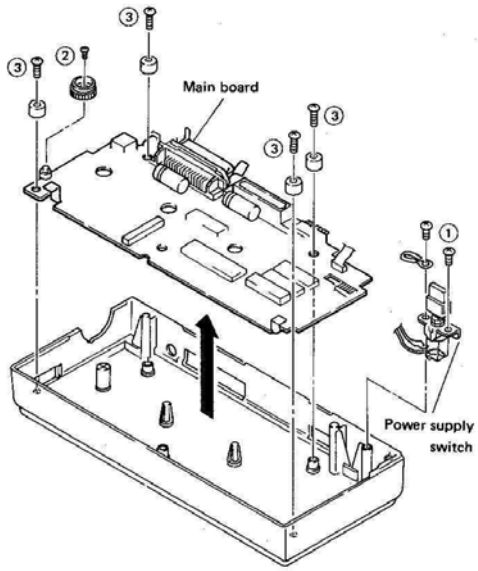


② Lift up the printer mechanism.
③ Remove 2 screws and remove the FPC holder.
④ Pull out 3 connectors (CN1, 2, and 3) and remove the printer mechanism.
⑤ Pull out 1 connector (CN7) and remove the battery case unit.



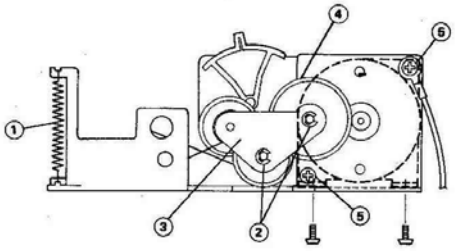
2-1-6. Removal of Main Board

① Remove 2 screws and remove the power supply switch.
② Remove 1 screw and remove VR knob.
③ Remove 4 screws and remove the main board.

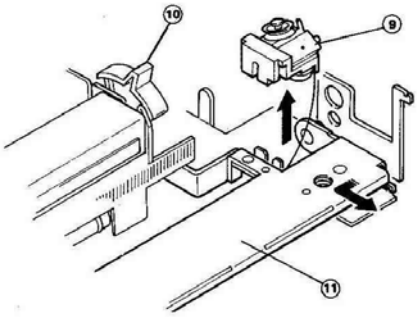


2-1-7. Disassembly Procedure of the Printer Mechanism

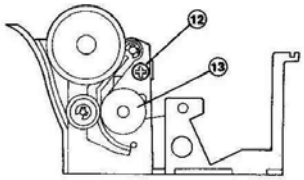
① Remove head pressure contact springs (2-6) on both sides.
② Remove 2 E washers (EW1.5).
③ Remove reinforcement plate (4-5).
④ Remove idle gear (4-4).



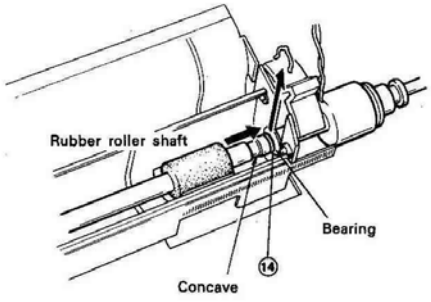
⑤ Remove screw (M2x5) which holds the motor.
⑥ Remove motor side plate unit (I) (4-2), and remove stepping motor (4-1).
⑦ Set wire holding jig to pulley gear unit (2-1-17).
⑧ Remove pulley gear unit (2-1-17).
⑨ Detach the pulley mounting stand unit (2-3) upward.
⑩ Pull down the release lever (5-10) toward you.
⑪ Draw the right side of the carriage guide plate (2-1-13) toward the left and pull forward.



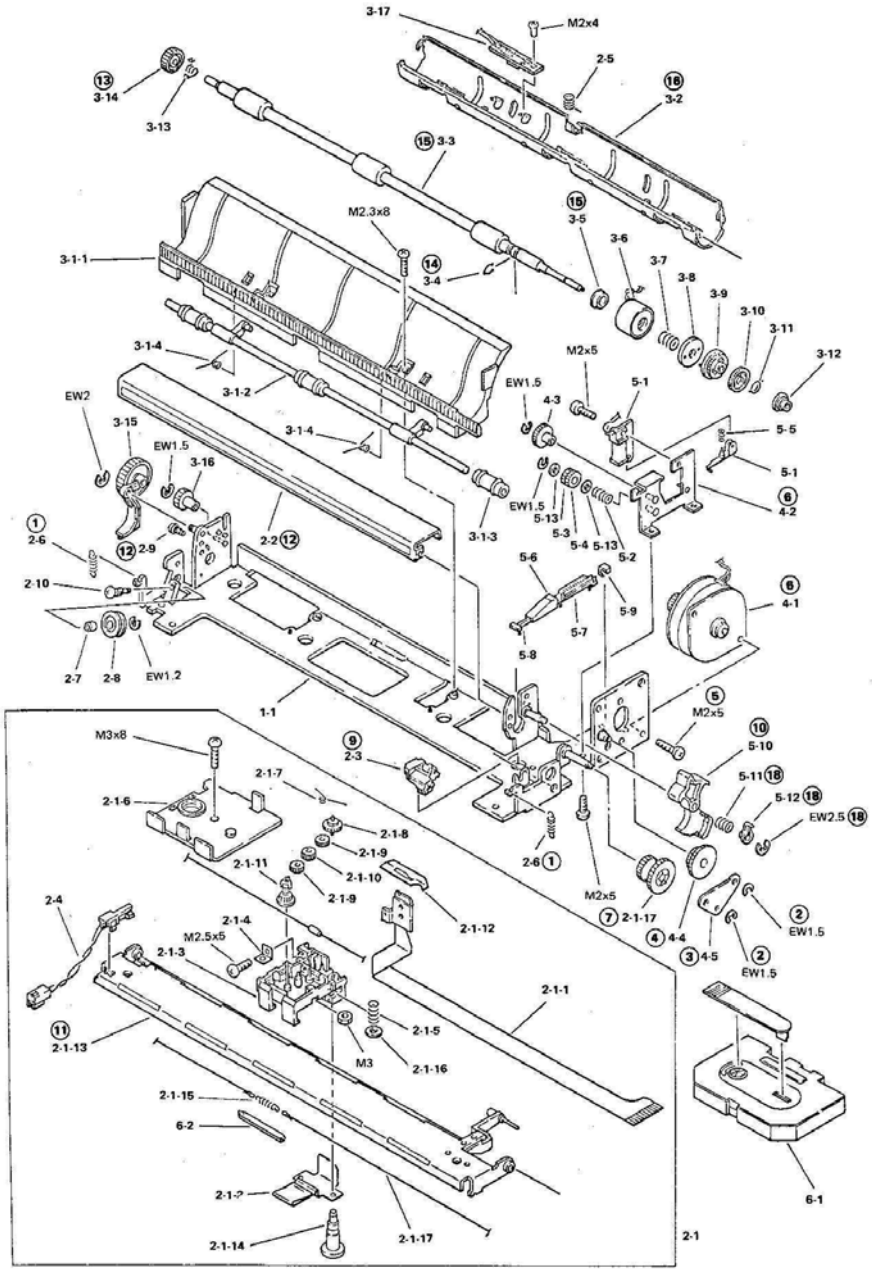
⑫ Remove screw (2-9) and remove platen (2-2).



⑬ Remove rubber roller gear (3-14).
⑭ Remove fastening spring (3-4).



⑮ Draw bearing (3-5) to the left to the rubber shaft (3-3).
⑯ Remove screws on both sides of the paper guide (B) (3-2).
⑰ While pressing the paper guide (B) (3-2) downward, pull the rubber roller shaft (3-3) to the right.
⑱ Remove E washer (EW2.5) of the release lever (5-10) section, clutch stopper (5-12), release lever spring (5-11) and the release lever in that order.
⑲ The rubber roller shaft, by the use of the concave located at the arrow mark in the Fig., is removed by pulling up from the right side plate of the frame unit.
⑳ Remove paper guide (B) (3-2).


3-17
M2x4
2-5
18
3-2
13
3-14
3-13
15 3-3
15
3-5
3-6
3-7
3-8
3-9
3-10
3-11
3-12
M2.3x8
14
3-4
3-1-1
3-1-4
3-1-2
M2x5
EW1.5
4-3
5-1
5-5
5-1
6
4-2
EW2
3-15
EW1.5
3-16
3-1-4
3-1-3
EW1.5
5-13
5-3
5-4
5-13
5-2
1
2-6
12
2-9
2-2
12
2-10
5-6
5-9
5-7
5-8
6
4-1
2-7
2-8
EW1.2
1-1
5
M2x5
10
5-10
5-11
18
5-12
18
EW2.5
18
M3x8
9
2-3
2-1-7
2-1-6
2-1-8
2-1-9
2-1-11
2-1-10
2-1-9
2-6
1
M2x5
7
2-1-17
4
4-4
2
EW1.5
3
4-5
2
EW1.5
2-4
2-1-4
M2.5x5
2-1-3
2-1-12
2-1-1
11
2-1-13
2-1-5
M3
2-1-16
2-1-15
6-2
2-1-?
2-1-14
2-1-17
2-1
6-1

2-1-8. Assembly Procedure of Printer Mechanism

① Set paper guide (B) (3-2).
② Install rubber roller shaft (3-3) into the right side plate of the frame unit by using the concave of the arrow section.

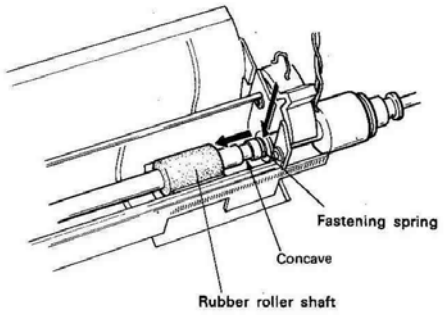
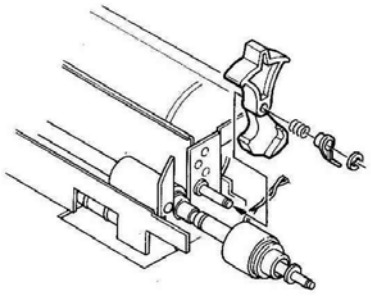


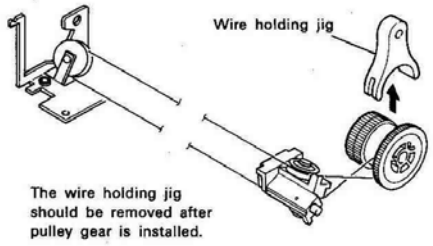
Fig. A

③ Install release lever (5-10), release lever spring, clutch stopper and E washer (EW2.5) in that order.

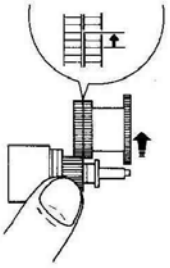


④ Slide the rubber shaft (3-3) to the left.
⑤ At this point, the protruding section of the clutch stopper is inserted into the slot of the clutch.
⑥ Slide the bearing (3-5) to the right and suppress it into the right side plate of the frame unit.
⑦ Install fastening spring (3-4) in the position as shown in Fig. A.
⑧ Install screws on both sides of the paper guide (B) (3-2).
⑨ Insert rubber roller gear (3-14).
⑩ Attach installing screw (2-9) to the platen.

⑪ Set the wire, as shown in Fig. below, into the pulley mounting stand unit and the pulley installed on the left edge of the frame unit.



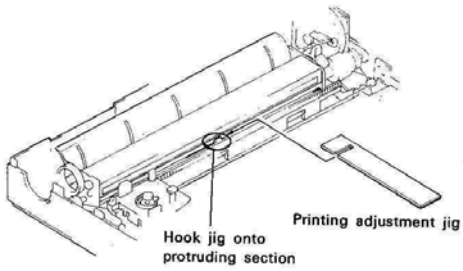
⑫ Bring down the release lever (5-10) to the rear.
⑬ Set the carriage guide plate (2-1-13) from the left side of the frame unit (1-1) and perform setting by drawing the right side section to the left.
⑭ Insert pulley mounting stand unit (2-3) from above.
⑮ Install pulley gear unit (2-1-17).
⑯ Remove wire holding jig from the pulley gear unit (2-1-17).
⑰ Engage the teeth of the pulley gear (non-backlash gear) after shifting 2 teeth.



⑱ Install stepping motor (4-1), set the motor side plate unit (I) (4-2) and secure with 2 screws each.
⑲ Install idle gear (4-4).
⑳ Install reinforcement plate (4-5).
㉑ Install 2 E washers (EW1.5).
㉒ Install head pressure contact spring (2-6) on the left and right.

2-1-9. Head Adjustment

At the time platen is head pressure contacted, if the platen is not contacted in parallel with the head, bend the center protruding section of the paper guide (B) (3-2), and adjust so that it is contacted in parallel by means of a printing adjustment jig.



① When the under section of the character printed becomes blurred → Lower the printing adjustment jig.
② When the upper section of the character printed becomes blurred → Raise the printing adjustment jig.

2-2. REPAIR PARTS

1. Safety Related Components Warning.
   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose part numbers appear in this manual or in service bulletins and service manual supplements published by Sony.
2. Replacement Parts supplied from Sony Parts Center will sometimes have a different shape from the original parts. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
   This manual's exploded views and electrical spare parts list indicate the parts numbers of "the standardized genuine parts at present".
   Regarding engineering parts changes in our engineering department, refer to Sony service bulletins and service manual supplements.
3. Printed Components in Bold-Face type on the exploded views and electrical spare parts list are normally stocked for replacement purposes. The remaining parts are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
4. Abbreviations

Ref. No.	Description
C□□, CV□□	CAPACITOR
CN□□	CONNECTOR
CP□□	COMBINATION PARTS
D□□	DIODE
DB□□	DIODE BLOCK
DL□□	DELAY LINE
F□□	FUSE
FB□□	FERRITE BEAD
FL□□	FILTER
IC□□	IC
L□□, LV□□	INDUCTOR
M□□	MOTOR
Q□□	TRANSISTOR
R□□, RV□□	RESISTOR
RB□□	RESISTOR BLOCK
RY□□	RELAY
S□□	SWITCH
SB□□	SOLAR BATTERY
T□□	TRANSFORMER
TH□□	THERMISTOR
X□□	CRYSTAL

5. Units for Capacitors, Inductors and Resistors
   The following units are assumed in schematic diagrams, electrical parts list and exploded views unless otherwise specified:
   Capacitors: μF
   Inductors: μH
   Resistors: ohm

CHAPTER 3
MAINTENANCE AND REPAIR

3-1. MAINTENANCE

1) Cleaning

Perform periodic cleaning about once every three months and remove small pieces of the recording papers, dust, etc.

[The points on cleaning]

① When cleaning, it is desirable to absorb small pieces of paper dust, etc. (use electric vacuum cleaner)

② Be sure to use soft brush (don't use metallic brushes) for the printing head cleaning. However, be careful not to damage the printing head surface.

③ Use acetone, alcohol or benzine for removing dirt. Don't use thinner, trychroloethylene, kent type solvents since there are possibilities of damaging the plastic parts.

④ Supply grease where it has been exhausted or where it is short in supply. (Don't apply grease or lubricants to the point unless specified.)

2) Recording paper

Use the recommended paper.

3-2. REPAIR

1) Repairing procedures

① "Phenomena" : Find out the phenomena of the failures from this column.

② "Condition" : Compare the faulty state with this column and confirm whether it is identical with it or not.

③ "Cause" : As the causes depending on the faulty states have been described, confirm where the cause of the fault is attributed to.

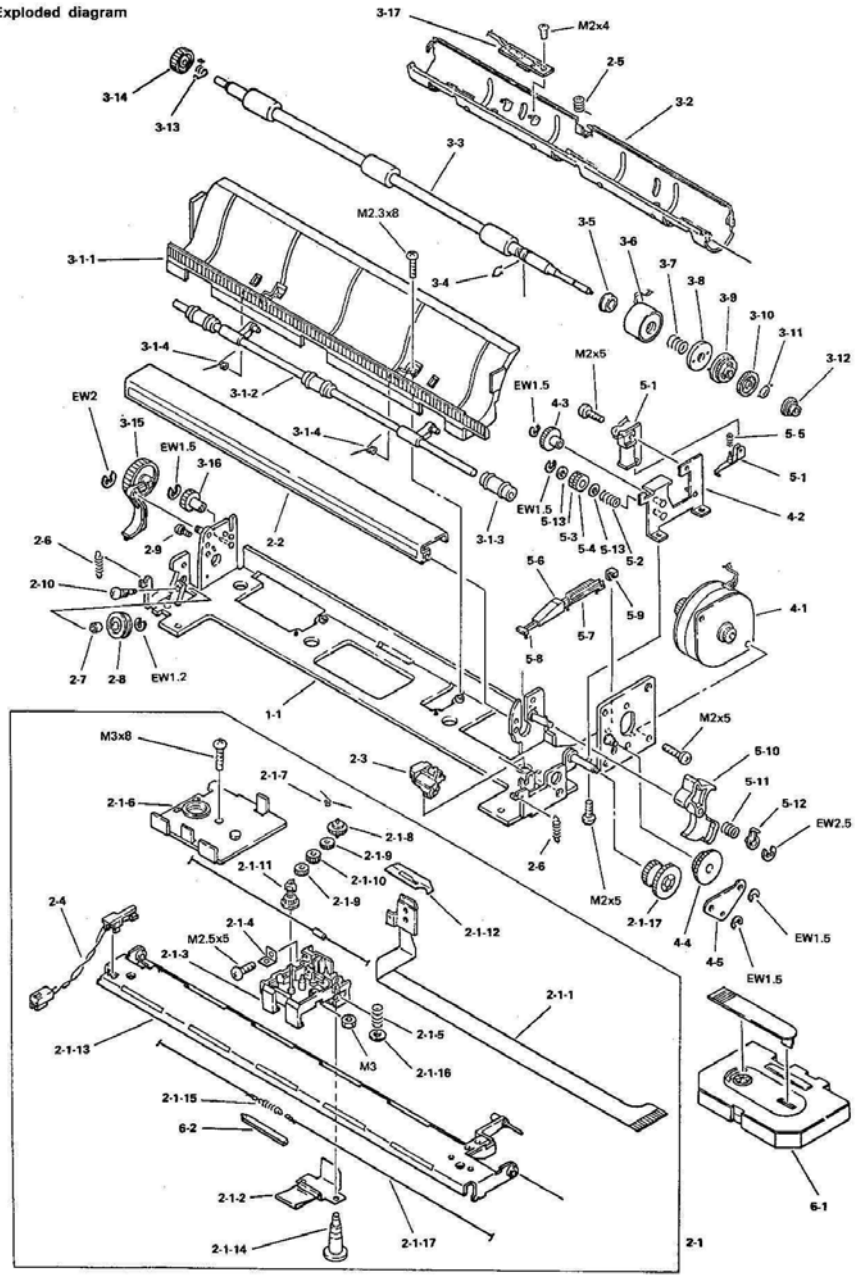
④ "Checking point and checking method"
: Since the point and how to check the structure which causes the fault have been enumerated, perform checking in accordance with the instructions in this column to find the faults.

⑤ "Repairing method"
: Perform repair of the point at fault in accordance with the instructions in this column.
When the same phenomena or conditions are still found even after the repair, repair should be carried out by checking the other items of the cause column.

2) Repair tools

- Drivers (Precision screwdriver, Philips head driver)
- Radio pliers or lead pliers and nipper
- Tweezers (Use ones with straight and sharp points.)
- ET holder (Nominal diameter 1.5, 2, and 2.5)
- Cotton applicator

3) Exploded diagram



Phenomena	Condition	Cause	Checking point and method	Repair method
1. Do not print all columns	Motor (4-1) and trigger magnet (5-1) are operated normally but the printer does not print.	(1) Ribbon cassette (6-1) is not mounted.	Check whether ribbon cassette (6-1) is mounted or not.	Mount ribbon cassette (6-1).
		(2) Ink ribbon (6-1) is exhausted.	Check whether the end marker of ink ribbon (6-1) is provided or not.	Replace ribbon cassette (6-1).
		(3) Head (2-1-1) is in pressure contact release (release lever (5-6) on) state.	Check the position of release lever (5-6).	Set release lever (5-6) to off.
		(4) Ink ribbon (6-1) is not wound.	Hold the ribbon cassette (6-1) winding bobbin with the thumb and forefinger, and rotate ribbon cassette (6-1) to check its rotation load.	Replace ribbon cassette (6-1).
2. Carriage (2-1) does not move to the left and right.	Motor (4-1) does not rotate even when the printing instruction is input.	(1) Disconnection of the lead wire	Check conduction of the lead wire.	Replace the lead wire or perform proper soldering.
		(2) Motor (4-1) is defective.	Check the coil resistance value of motor (4-1).	Replace motor (4-1).
		(3) Voltage drop of the battery	Check the voltage of the battery.	Replace the battery.
	Motor (4-1) rotates but carriage (2-1) does not move smoothly.	(4) Sliding of carriage (2-1) and carriage guide plate unit (2-1-13) is unsatisfactory.	Remove carriage guide plate unit (2-1-13) from frame unit (1-1) and check sliding of the carriage.	Replace carriage guide plate unit (2-1-13).
		(5) Wire dislocation	Check whether the wire is dislocated from the wire pulley.	Apply the wire again correctly.
		(6) Severance of wire	Check whether the wire is severed or not.	Replace the wire.
		(7) Gear deformation or foreign materials entering into the gear teeth.	Check the periphery of the gear.	Remove the foreign materials or replace the deformed gear.
		(8) Carriage (2-1) is in contact with FPC (2-1-2).	Check whether carriage (2-1) is in contact with FPC (2-1-12) or not.	Correct the installation of FPC (2-1-2).

Phenomena	Condition	Cause	Checking point and method	Repair method
3. Printing quality is not good.	Disarrangement of characters printed.	(1) Foreign materials are stuck on the platen unit (2-2).	Check whether foreign materials are on platen (2-2) or not.	Remove the foreign materials.
		(2) Carriage (2-1) does not move smoothly.	Equivalent to 2-(4).	Equivalent to 2-(4).
		(3) FPC (2-1-2) is not connected normally to the connector.	Check if FPC (2-1-2) is drawn toward connector and inserted.	Insert FPC (2-1-2) correctly into the connector.
	Dot lacks.	(4) The dot resistance of head (2-1-1) becomes high.	Check the individual dot resistances of head (2-1-1).	Replace head unit (2-1-1).
		(5) Disconnection of FPC (2-1-2)	Check the conduction of FPC (2-1-2).	Replace head unit (2-1-1).
	Printing is thin.	(6) The impression of head (2-1-1) is small.	Check the impression of head (2-1-1).	Replace impression spring (2-6).
		(7) Head (2-1-1) installation adjustment is insufficient.	Check whether head (2-1-1) is in contact with platen unit (2-2) with a certain inclination against it.	Correct the inclination of head (2-1-1).
	Characters printed is broken.	(8) Head (2-1-1) installation adjustment is insufficient.	Equivalent to 3-(7).	Equivalent to 3-(7).
		(9) Ink ribbon (6-1) is not being sent normally. (Wrinkled on the ribbon due to skew sending)	Remove ink ribbon (6-1) and check to see that there are wrinkles on the ribbon or not.	Replace ribbon cassette (6-1).
		(10) Ribbon cassette (6-1) is not mounted normally.	Check whether ribbon cassette (6-1) is installed normally or not.	Mount ribbon cassette (6-1) correctly.
		(11) Platen unit (2-2) does not sway sufficiently.	Check whether platen unit (2-2) sways normally or not.	Replace platen spring (2-5) or platen unit (2-2).
		(12) There are dents or foreign materials stuck onto the platen unit (2-2).	Equivalent to 3-(1).	Equivalent to 3-(1). However, if there are dents, replace platen unit (2-2).
	Printed surface is not clear.	(13) The pulling out load of ink ribbon (6-1) from ribbon cassette (6-1) is large.	Equivalent to 1-(4).	Equivalent to 1-(4).
		(14) The engaging margin between the rack on paper guide (A) (3-1-1) and winding gear (A) on carriage (2-1) is not large enough so that the winding gear (A) (2-1-8) sometimes comes off.	While keeping the winding bobbin unit (2-1-11) on the carriage (2-1) in fixed state, turn idle gear (4-4) manually to move carriage (2-1) and check to hear whether strange sound (gear dislocation sound) emits or not.	Move paper guide (A) (3-1-1) to carriage (2-1) side.

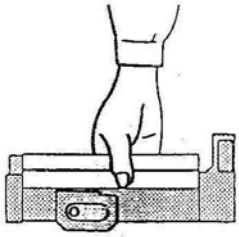
Phenomena	Condition	Cause	Checking point and method	Repair method
4. Ink ribbon does not wind normally. (Ink ribbon (6-1) is left as is and does not wind up.)	Printing surface is solid, and therefore normal printing cannot be carried out.	(1) Ink ribbon (6-1) is stuck on the head surface (2-1-1). (Sticking phenomenon)	Check whether ink ribbon (6-1) is stuck on head surface (2-1-1) or not.	Remove ink ribbon (6-1) from head surface (2-1-1) and wind the excessive ink ribbon (6-1) manually.
	Normal printing is carried out.	(2) The winding torque of bobbin unit (2-1-1) on carriage (2-1) is small.	Check the rotation torque (rotation load) of winding bobbin unit (2-1-11) on carriage (2-1). (At this point, be sure that head (2-1-1) should be in the pressure contacted state.)	Replace winding bobbin spring.
		(3) Winding gear spring (2-1-7) on the carriage (2-1) which is engaged with the rack on paper guide (A) (3-1-1) is out of position.	Check whether gear (2-1-6) on carriage (2-1) is correctly pressure contacted by winding gear spring (2-1-7) or not.	Install winding gear spring (2-1-7) correctly.
5. Strange sound	Scratching sound emits when the carriage is returning.	(1) The gear on carriage (2-1) is not separated completely from the rack on paper guide (A) (3-1-1).	Move cam (5-4) manually to put head (2-1-1) into pressure contact release state, and check that the gap between the gear on carriage (2-1) and the rack on paper guide (A) (3-1-1) is 0.3.	Adjust the shaft position of pressure contact release arm.
	Scratching sound emits when the carriage is returning.	(2) The engaging margin with the gear on paper guide (A) (3-1-1) is not sufficient so that the gear comes off.	Equivalent to 3-(14).	Equivalent to 3-(14).
6. Paper does not feed.	Paper does not feed. As a result, printing is repeatedly carried out on the same line.	(1) Disconnection of electromagnetic clutch (3-6).	Check conduction of lead wire.	Replace lead wise or perform proper soldering.
	Small roller (3-1-3) does not pressure contact with rubber roller (3-3).		Equivalent to 1-(3).	Equivalent to 1-(3).
7. Zigzag paper feeding	Paper skews to one side or both sides.	(1) The lever rotation direction deviation of small roller (3-1-3).	Check whether there is a lever rotation direction deviation or not.	Replace small roller unit (3-1-3).
		(2) Deformation of small roller holding spring (3-1-4).	Check whether small roller holding spring (3-1-4) is deformed or not.	Replace small roller holding spring (3-1-4).
		(3) Trigger magnet (5-1) malfunction.	Move cam (5-4) (to head pressure contact release direction) manually, and check that the actuator of trigger magnet (5-1) drops smoothly.	Equivalent to 3-(1) to (6).
		(4) Paper passing becomes worse.	Check paper dust and check the gap between paper guides (A) and (B) (3-1-1 and 3-2).	Remove paper dust and provide a proper gap between paper guides (A) and (B) (3-1-1 and 3-2).

Phenomena	Condition	Cause	Checking point and method	Repair method
8. Does not initialize.	When initializing, carriage detector (2-4) is not made contact.	(1) Contact failure due to carriage detector (2-4) deformation or sticking of foreign materials.	Perform conduction check at the make contact position of carriage detector (2-4).	Perform cleaning of carriage detector (2-4) contact point or replace carriage detector (2-4).
		(2) Disconnection of carriage detector (2-4)	Check conduction of the lead wire.	Replace lead wire or perform proper soldering.
	When initializing, carriage detector (2-4) is kept being made continuously.	(1) The contact point is always making contact due to deformation, etc., of carriage detector (2-4).	Perform conduction check.	Rectify the contact point or replace carriage detector (2-4).

3-3. CAUTION FOR HANDLING

1) How to carry

Fundamentally, it suffices to hold the ☐ section of the printer as shown below. If you hold the oblique lined section, it may cause various troubles.



2) Portion to which applying of force is prohibited

① It is strictly prohibited to apply force to the motor installed portion.
② It is strictly prohibited to pull, bend or fold the FPC.
③ Avoid to directly move the carriage to the left and right manually. Especially, it is strictly prohibited to move the head in pressure contact state as it may damage the mechanism. However, in the event it has to be moved manually for inspection, etc., the head should be released in advance and then the idle gear is turned manually to move the carriage.
④ Don't make flaws, striking scars, etc., on the wire.
⑤ Don't push the carriage guide plate strongly up and down or pull.
⑥ Don't pull the lead wire strongly.

3) Portion not to be touched

① Do not touch the head printing surface.

4) Caution for storage

Avoid storing printer in places where it is dusty, or under direct sun light or places of high humidity.
For storage for a long period of time, put the printer in a special package using drying agent, and store it in a dry place.

3-4. OILING STANDARD

Use G-488 (grease) to oil this printer. When oiling during disassembling or assembling, clean the parts thoroughly prior to oiling, and perform oiling in accordance with the following table.

No.	Oiling point	Kind of oil
1	Frame unit and rubber roller shaft coinciding portion	Grease
2	Release lever, small roller shaft and pressure contact release plate shaft coinciding portion.	Grease
3	Carriage and carriage guide plate sliding portion	Grease
4	Individual winding gears and carriage sliding portion	Grease
5	Pressure contact release shaft and cam sliding portion	Grease
6	Driving pulley shaft surface	Grease
7	Platen fulcrum hole	Grease
8	Carriage guide plate and frame unit coinciding portion	Grease
9	Sliding portion of rack, cam, and frame unit.	Grease
10	Rack and driving gear coinciding portion	Grease
11	Paper feeding gear and pulley gear coinciding portion	Grease

Grease name: FLOIL G-488
Manufacturer's name: Kanto Kasei Industrial Co., Ltd.

Note) Be sure not to stick grease in between the electromagnetic clutch main body and gear plate.
If grease sticks to it by chance, wipe it off thoroughly.

3-5. ADHESION STANDARD

The adhesive points of the adhesive screw lock and visca at the screw tightening portion are as shown in the table below. At this point, caution should be exercised that screw locking should be made to adhere over 1/4 of the screw head. Do not adhere the cross nicks of the screw head.

No.	Adhesion point	Adhesive used
1	Motor securing screw 2 points	Screw lock
2	Platen securing screw 1 point	Screw lock
3	Paper guide B securing screw 2 points (SP2×4)	Screw lock
4	Paper guide A securing screw 2 points (SP2.3×8)	Screw lock
5	Head unit securing screw 1 point (SP2.5×5)	Screw lock
6	Carriage securing screw and nut 1 point (SP3.8×3 NH3)	Screw lock
7	Head pressure contact spring terminal	Screw lock
8	Small roller spring terminal	Screw lock
9	FPC and FPC holding plate	Visca
10	Motor side plate unit securing screw 2 points	Screw lock
11	Trigger magnet securing screw	Screw lock
12	Carriage detecting unit and carriage guide plate	Tack pack
13	Carriage detecting switch and lead wire	Tack pack

CHAPTER 4
CIRCUIT DESCRIPTION AND MECHANISM BLOCK DESCRIPTION

4-1. POWER SUPPLY CIRCUIT

4-1-1. Voltages and Their Usages

Voltage	Usage
+6V (V_B)	1) Motor drive 2) Electromagnetic clutch drive 3) Solenoid drive
+5V (V_{CC})	1) Logic circuit drive 2) Display lamp drive 3) Chinese character ROM board (optional) drive 4) Sensor drive
+6V (V_P)	1) Printing head drive

(1) V_B denotes AC adapter voltage or battery voltage (When rating load 1.2A consumption)

AC input voltage	AC Adapter output voltage
Rating voltage +10%	Less than +0.9V
Rating voltage	Over +5.5V
Rating voltage −10%	Over +4.7V

The battery voltage differs depending upon the scattering of batteries to be used and hours used.
Possible usable voltage of the battery is over +4.5V. (When ASCII printin)

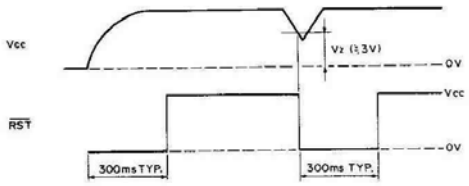
(2) V_P differs depending upon the rank of printing head resistance value.
Set VR1 to maximum density by the density adjusting knob and adjust the voltage as follows:

Printing head rank	V_P setting voltage
A	7.2 ± 0.1V
B	6.9 ± 0.1V
C	6.6 ± 0.1V

Note: The printing head rank is shown in FPC.

4-2. RESETTING CIRCUIT

When the power switch is turned on, it generates reset signal. It operates equivalent to the above, even if VCC becomes less than 3V. The reset signal resets MPU.



The resetting circuit is controlled by Zener voltage of D6. R35 and C26 are time constant circuits which determine the reset time.

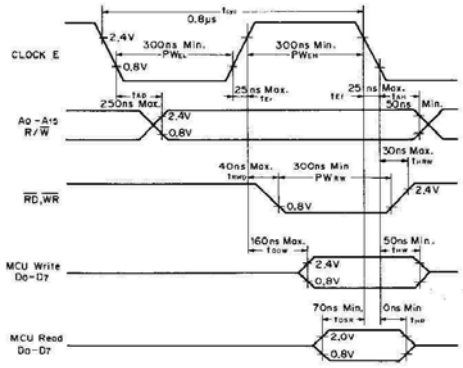
4-3. MPU, ROM/RAM, AND CONTROL CIRCUIT

4-3-1. MPU

The MPU is a CMOS version HD63A03X (HITACHI) of 64-pin shrink package.
It incorporates 192-byte RAM; however, ROM is attached externally. Ceramic oscillator of 4.91 MHz is clock input and it generates system clock of 1.23 MHz (1/4 division). The MPU is initialized by the reset input.

Port	I/O	Function	Active level
P10—P17	O	Address bus (A0 through A7)	—
P21	O	On-line output	L
P22	O	Clock output (Head driver)	H
P23	O	$\overline{ACK}$ output (Interface control)	L
P24	O	Serial data output (Head driver)	H
P25	O	Latch output (Head driver)	H
P26	O	Enable output (Head driver)	L
P30—P37	I/O	Data bus (D0 through D7)	—
P40—P47	O	Address bus (A8 through A15)	—
P51	I	$\overline{IRQ}$ (interface control)	L
P54	I	$\overline{PE}$ input (PE sensor)	L
P55	I	On-line switch	L
P56	I	Home position detection switch	L
P60—P63	O	Motor drive signal	L
P64	O	PF clutch drive signal	L
P65	O	Solenoid drive signal	L
P66	O	PE sensor drive signal	H
P67	O	$\overline{SELECT}$ (Interface control)	L

Bus timing



4-3-2. ROM

There are 2 ROMs of which one is program ROM of 128k-bits (PG : IC4) and the other is character ROM of 256k-bits (CG : IC3). They are both CMOS mask ROMs.
Chip select ($\overline{CS}$) and output enable ($\overline{OE}$) are active low.

4-3-3. RAM

The RAM is CMOS S-RAM (IC2) of 64 k-bits.
Chip select ($\overline{CS}$), write enable ($\overline{WE}$), and output enable ($\overline{OE}$) are active low.

4-3-4. Control Circuit

This circuit controls the selections of ROM/RAM, interface, and switches. The Chinese character ROM selection is also carried out when using Chinese character ROM board of Japanese specification.

Control address

Address	Contents
1000	Chinese character ROM output control I (Japanese specification) CE0—CE2, A0—A3.
1001	Chinese character ROM output control II (Japanese specification) A5—A11.
1002	Chinese character ROM output control III (Japanese specification) A12—A16.
1003	Chinese character ROM chip enable latch control (Japanese specification)
1004	DIP switch data input control
1005	LF and BF switch data input control
1006	Interface selection
2000—3FFF	SRAM selection
4000—BFFF	Character ROM selection
C000—FFFF	Program ROM selection

4-4. MOTOR AND SOLENOID DRIVE CIRCUIT

The drive of the motor, electromagnetic and trigger solenoid is carried out by the on-off transistor for driving which is controlled by the MPU port. Each output stage has a diode (Zener diode) for surge voltage absorption.

4-4-1. Motor (10Ω)

The drives of the stepping motor are initialize, paper feeding, head up and head down operations during 2-2 phase excitation, and the printing and carriage return operations are during 1-2 phase excitation.

Operation	Step	Phase	Frequency
Printing	*1480 max.	1-2	450 (PPS)
Carriage return	*1480 max.	1-2	720
Paper feeding	25 max.	2-2	200
Head up	40	2-2	200
Head down	40	2-2	200
Carriage shift within leeway	40	2-2	360

Note: * mark includes acceleration of 22 steps and deceleration of 18 steps.

(1) Initialize operation (2-2 phase)
Perform head up and shift in the direction of only X axis until carriage detection switch turns on. (1600 steps max.) Shift to home position and paper feed 1/6".

	Operating direction	No. of steps	Frequency	Remarks
1	X axis positive direction	50	100 (PPS)	
2	X axis negative direction	40	200	Head up
3	X axis negative direction	1600 max.	360	Carrige detection
4	X axis positive direction	45	360	Home position shift
5	X axis negatige direction	40	360	
6	X axis positive direction	5	360	
7	X axis positive direction	*20	200	Paper feeding
8	X axis negative direction	25	360	

Note: * : Turn on electromagnetic clutch.

(2) Paper feeding (2-2 phase)

		Operating direction	No. of steps	Frequency	Remarks
Normal direction	1	X axis positive direction	5	360 (PPS)	Electromagnetic clutch on
	2	X axis positive direction	*1 20 max.	200	
	3	X axis negative direction	*2 25 max.	360	
Inverse direction	1	X axis positive direction	25	360	Electromagnetic clutch on
	2	X axis negative direction	5	360	
	3	X axis negative direction	*1 20 max.	200	
	4	X axis positive direction	*2 19 max.	360	

Note: *1 1/120" per step. Make 20 steps as 1 unit and when the steps exceed 20, return to paper feeding starting position once by turning off electromagnetic clutch, and carry out paper feeding operation again.
*2 Return to paper feeding starting position.

(3) Printing (1-2 phase)
The carriage shifting amount is 1/180" per step.

	Operating direction	No. of steps	Frequency (PPS)	Remarks
1	X axis positive direction	40	200 (2-2 phase)	Head down (Solenoid on)
2	X axis positive direction	22	120→540	Slow up
3	X axis positive direction	1440 max.	540	Printing
4	X axis positive direction	18	540→120	Slow down
5	X axis negative direction	40	200 (2-2 phase)	Head up

When the printing starting section is a continuation of space, the head may be shifted in the head up state without consuming ink ribbon.
— Ribbon save: In the case of space of over 120 steps.

	Operating direction	No. of steps	Frequency (PPS)	Remarks
1	X axis positive direction	40	360 (2-2 phase)	
2	X axis positive direction	22	120→720	Slow up
3	X axis positive direction	Note	720	Space
4	X axis positive direction	18	720→120	Slow down
5	X axis negative direction	40	360 (2-2 phase)	

Note: Shift until 40 steps prior to next printing starting position.

(4) Carriage return (1-2 phase)
The amount carriage shift is 1/180" per step.

	Operating direction	No. of steps	Frequency	Remarks
1	X axis negative direction	22	120→720	Slow up
2	X axis negative direction	Note	720	Carriage return
3	X axist negative direction	18	720→120	Slow down

Note: Shift until 18 steps prior to home position.

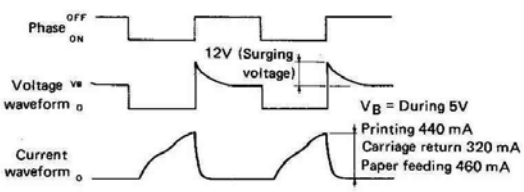
(5) Shake back control (1-2 phase)
During head up or head down, make the first 5 steps (2-2 phase) 1-2 phase excitation magnet 10 steps, and carry out shake back on each step.
1 step shift by shake back control

	Operating direction	No. of steps	Frequency	Remarks
1	Advance	2	250	
2				4 ms hold
3	Retreat	1	250	
4				4 ms hold

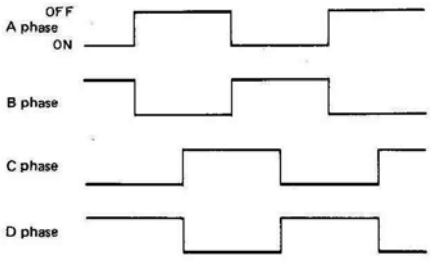
(6) Others
1) The next operation after the carriage has been stopped once by initialize, printing and contrtol command, should be carried out by applying power of the phase which has been stopped at the beginning of operation.
2) When the rotation of moter is inversed, it obtains a hold time of 8.2 ms.

(7) Motor drive signal

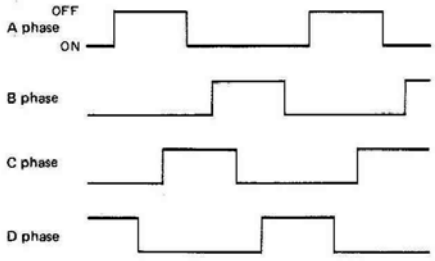
1) Voltage current waveform of motor coil 1 phase



2) 2-2 phase excitation magnetic drive timing



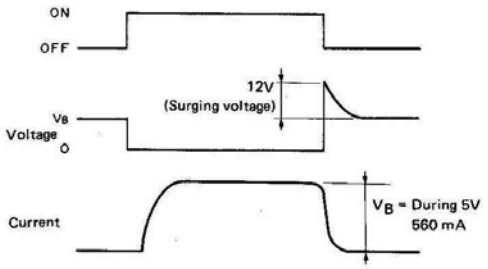
3) 1-2 phase excitation magnetic drive timing



4-4-2. Electromagnetic Clutch (8Ω)

By applying power to electromagnetic clutch, make the rotation of the stepping motor to paper feeding.
When the motor rotates in the printing direction (X axis positive direction), the paper is fed in the normal direction, and when it rotates in the X axis negative direction, the paper is fed in the inverse direction. When the electromagnetic clutch is on, carry out paper feeding operation after a hold time of 10 ms. Turn off the electromagnetic clutch when the operation is completed, and make the motor to 10 ms hold.

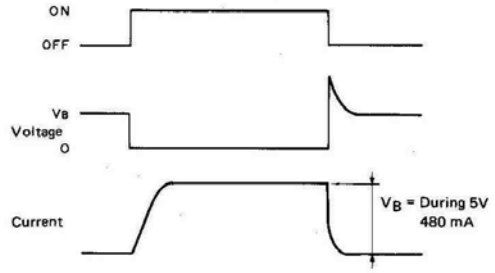
Voltage current waveform



4-4-3. Trigger Solenoid (10Ω)

Perform lock release of head down mechanism.
Turn trigger solenoid on during head down.
After trigger solenoid is turned on, maintain hold time of 10 ms.

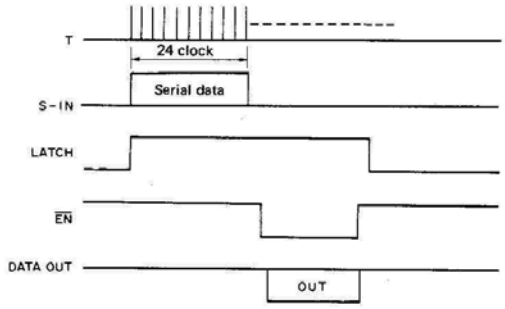
Voltage current waveform



4-5. PRINTING HEAD DRIVE CIRCUIT

Convert to parallel with IC16 and IC17 the serial data which has been output from P24 of MPU, and drive the head.
S-IN of IC16 is the serial data, the T of IC16 and IC17 are the reference clock of serial data, LATCH is the latch of output signal, and $\overline{EN}$ is the output ENABLE.
Although $\overline{EN}$ is controlled by MPU P26, time control is carried out by IC1 (non-triggerable one shat timer).
R12 and C4 are CR circuit and the $\overline{EN}$ maximum width is 1.8 ms.
— Head fire damage prevention function by reckless speeding of MPU.

IC16 and IC17 timing chart

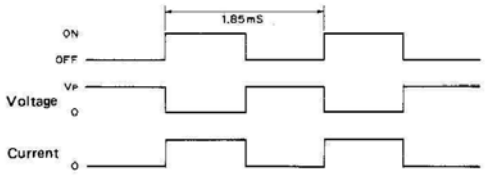


4-5-1. Printing Head Resistance Value

Head resistance rank is written in to FPC.

Resistance rank	Resistance value (per 1 dot)
A	87.6 Ω to 79.2Ω
B	80.8 Ω to 71.6Ω
C	73.2 Ω to 64.8Ω

Printing head drive waveform



4-5-2. Power Application Time of Printing Head

Regarding application of power to the head, the correction of power application is carried out with its power application record.

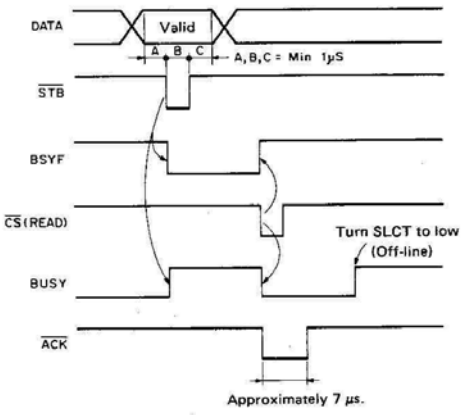
1	2	3	4	Power application time
OFF	OFF	OFF	ON	1.02 ms
ON	OFF	OFF	ON	0.99 ms
—	ON	OFF	ON	0.79 ms
—	—	ON	ON	0.59 ms

The above table shows the power application time of the pulse of 4.

4-6. INTERFACE CIRCUIT

It is a parallel interface of centronix specifications. When $\overline{STB}$ is input from the host computer, $\overline{BSYF}$ of IC13 becomes active, and BUSY is turned to high as also applying interrupt to MPU. The input data is latched by $\overline{STB}$. When MPU accepts interrupt and the data is read by activating $\overline{CS}$, BUSY becomes low and turns into $\overline{STB}$ standby mode.
When $\overline{ACKI}$ is activated at this time, $\overline{ACK}$ is output to the host computer.
When BSSL and SLCT of IC13 are made high (On-line state), SLCT becomes high.
When BSSL and SLCT of IC13 are made low (Off-line state), SLCT becomes low and BUSY forcibly becomes high.

Timing chart



4-7. SWITCH AND SENSOR CIRCUIT

The LF and BF switches and Chinese character ROM board input/non-input is read by selecting IC14.
The DIP switch input is read by selecting IC5.
The On-line switch is input to MPU P55.
The carriage detection switch is input to MPU P56. The PE sensor is driven by making MPU P66 to low and is detected at P54.
The On-line LED is lit by making MPU P21 to low.

Note: The PE sensor is a reflection type photo sensor and by inserting the recording paper, the reflection of light is generated and makes P54 to high.
As sensing is not possible against recording paper which has a high transparency degree such as OHP film, etc., it is required to invalidate the PE sensor by turning on DIP switch 2 when using this type of recording paper.

4-8. POWER/LOW BATTERY LIGHTING CIRCUIT

The power LED is lit by turning on the power switch. Moreover, when Vs becomes lower than 4.55V ±0.25V, power LED blinks as a battery replacement request sign.
When the Vs becomes lower than the above mentioned voltage, the output (Pin 14) of IC15(4/4) becomes high and the output (Pin 13) of IC15(3/4) becomes low, and the gate of IC14 is turned on.
IC1 is a non-stable multivibrator which outputs rectangular wave, and blinks the power LED (Cycle 2 Hz).

4-9. MECHANISM BLOCK OUTLINE DESCRIPTION

This printer is comprised roughly of 6 function blocks; namely, frame block, drive block, printing, column raising, column raising return and tape winding structure block, paper feeding mechanism block, head pressure contact release mechanism block and carriage detection signal generating block, and the drive of the main mechanism is comprised of 1 stepping motor, 1 electromagnetic clutch and 1 solenoid.

4-10. FRAME BLOCK

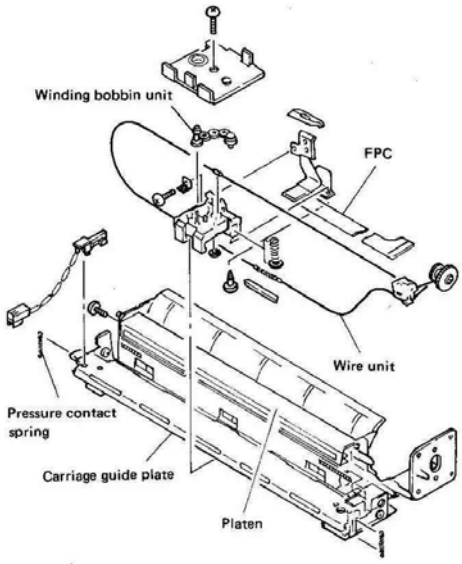
The frame block is comprised of the frame, shafts and pulley, and the respective interior and exterior structures are arranged on the frame.

4-11. DRIVE BLOCK

Distributes power of the stepping motor to pulley gear and paper feeding mechanism block through the idle gear.

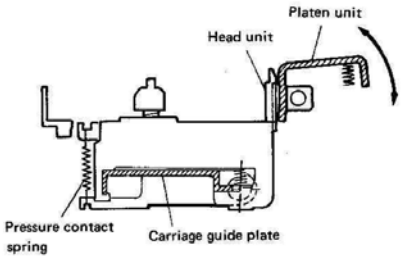
4-12. PRINTING, COLUMN RAISING, COLUMN RAISING RETURN AND TAPE WINDING MECHANISM BLOCK

The printing, column raising, column raising return and tape winding structure is comprised of the thermal head unit, winding bobbin unit for tape winding and gears for transmitting rotation to them, wire unit for transmitting power for column raising and column raising return, and carriage guide plate and carriage shaft, etc. to guide the movements of column raising and column raising return. The platen unit which receives the pressure of the carriage unit and thermal head and the pressure contact spring which generates that pressure constitute the main element.



4-12-1. Printing Mechanism Block

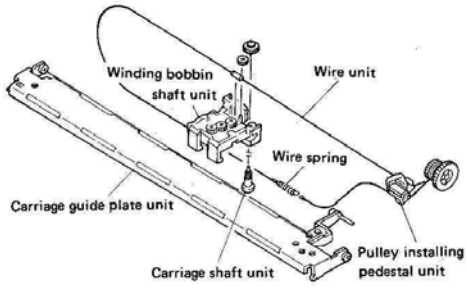
The printing mechanism block consists of the thermal head unit, platen unit, pressure contact spring and carriage guide plate units.



The head unit is pressure-contacted to the platen unit side by the pressure contact spring. At this time, with the fulcrum which supports the platen unit as the core, the platen unit freely rotates within a certain range to forcibly be pressured against the head surface during head pressure contact, and enables the platen surfaces to uniformly face each other without any space in between. Then the power is applied to the thermal head through FPC and printing is performed by the generation of heat.

4-12-2. Column Raising Mechanism Block

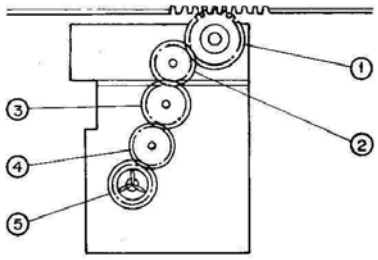
The column raising mechanism block consists of a wire unit, carriage guide plate unit, carriage shaft and a winding bobbin shaft unit to which the head unit is installed, wire spring, and pulley installing pedestal unit.



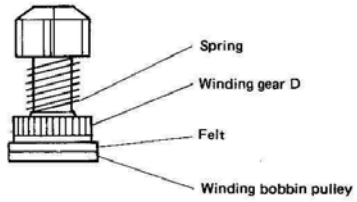
— Minimum shifting pitch —
The deceleration ratio between the stepping motor and wire unit is set at 1 : 2.64, and at 1 pulse (3.75°) of stepping motor, the shift of the bobbin shaft unit or head unit is 0.141 mm. In this case, power transmission from the wire unit to winding bobbin shaft unit is conducted by wire and the wire station is served by the wire spring. In addition, the guide when the winding bobbin unit shifts is carried out by 2 carriage shafts which contact and slide to the carriage guide plate unit.

4-12-3. Tape Winding Mechanism Block

The tape winding mechanism block consists of winding bobbin unit, winding gear A, winding gear B, winding gear C, winding gear spring and a rack section positioned in the front of paper guide A. In the printing state (head is pressure-contacted with platen), the winding gear A ① is engaged to the rack positioned in front of paper guide A, and when the carriage shifts to the right, that is, the column is raised, the winding gear A ① rotates. The rotation is transmitted to winding gear B ② → winding gear C ③ → winding gear B ④ and to winding bobbin unit ⑤. When winding bobbin unit ⑤ rotates, the winding bobbin of the cassette which coincides with it rotates and the tape within the cassette unit is wound. Moreover, winding gear A ① is so structured as to enable shifting within a certain range with gear B ② as the core, and is pressed against the rack side with the winding gear spring. This is due to the prevention of gear teeth from being damaged when winding gear A ① is engaged to the rack, and even when the tip of the teeth collide, the winding gear A ① runs off.



Also, in order to maintain a constant amount of tape winding, a slip mechanism is installed within the winding bobbin unit.



As can be seen in the above diagram, winding gear D and winding gear B are engaged and winding gear D teeth are pressed down with a spring to the winding bobbin pulley with felt. Due to this friction resistance, the rotation of winding gear D is transmitted to winding bobbin pulley and thereby rotates the winding bobbin unit. When the load applied to the winding bobbin unit becomes over a fixed value, the winding bobbin pulley and winding gear D are caused to slip.

4-13. PAPER FEEDING MECHANISM BLOCK

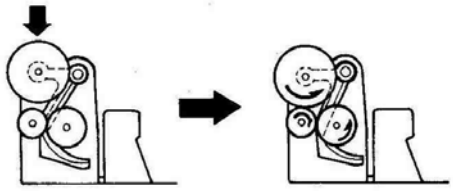
The paper feeding mechanism block consists of paper guide A unit, paper guide (B), rubber roller, electromagnetic clutch, gears for power transmission and manual knob.
Here, it is separated into the 2 blocks of paper feeding mechanism block during printing operation, and manual paper feeding block using a manual knob.

4-13-1. Paper Feeding Mechanism Block during Printing Operation

The paper feeding mechanism block during printing operation consists of paper guide A unit, paper guide B, rubber roller, electromagnetic clutch, electromagnetic clutch spring, gear plate, paper feeding gear and paper feeding gear stopper.
This printer carries out carriage column raising, column return and paper feeding with a single stepping motor. Accordingly, it is so structured that motor rotation is transmitted to paper feeding block only when power is applied to the electromagnetic clutch. To explain in further detail, the paper feeding gear is engaged with the pulley gear, and the paper feeding gear is further pressured into the gear plate. During normal printing column raising and column lowering states, the electromagnetic main body and gear plate are separated by the electromagnetic clutch spring.
Accordingly, the gear plate runs idle during printing column raising and column lowering.
When carrying out paper feeding operation, draw the wire stopper within the carriage to the left edge, and apply power to electromagnetic clutch and rotate maximum 40 steps (2-2 phase) in the direction of column raise, and cut off power. (1/12" paper feeding can be made at 2-2 phase 40 steps)
By performing the above, the rubber roller which coincides with the electromagnetic clutch rotates and thereby carries out paper feeding.
Also, when paper feeding is conducted continuously, repeat the normal and inverse rotation of the motor and also repeat the on and off operation of power application of the electromagnetic clutch, and thereby feed the paper. Moreover, when the normal and inverse rotation of the motor and the timing of on/off of electromagnetic clutch power application are inversed, the paper can be fed inversely.

4-13-2. Manual Paper Feeding Mechanism Block

The manual paper feeding mechanism block consists of manual knob unit, manual idle gear, rubber roller gear, manual knob spring and paper guide A unit, paper guide B, and rubber roller which are the structural element of the paper feeding mechanism during printing operation.
By depressing the manual knob, it engages manual idle gear. The manual idle gear is always in engagement with the rubber roller gear so that the rotation of the manual knob is transmitted to the rubber roller and thus the paper is fed.
In this case, the paper can be sent out normally or inversely by altering the direction of the manual knob. By eliminating the pressure applied to the manual knob, the manual knob is thrust up with the manual spring and the engagement with the manual idle gear is released.

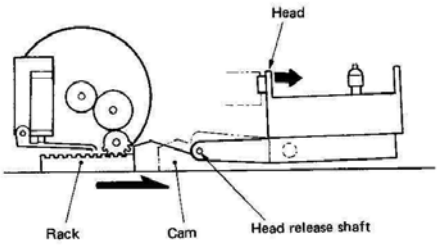


4-14. HEAD RELEASE MECHANISM BLOCK

The head release mechanism block consists of the frame unit, cam, rack, motor side plate unit, stepping motor, release lever and carriage guide plate unit.
Here, the head release mechanism during printing operation and the head release mechanism manually operated by using the release lever will be separated into 2 and explained below.

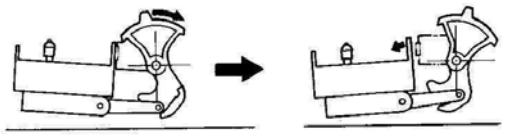
4-14-1. Head Release Mechanism Block during Printing Operation

The head release mechanism block during printing operation consists of a cam, rack, motor side plate unit and a part of the frame unit.
When the motor rotates in the printing column lowering direction, the cam drive gear rotates and the rack which coincides with it and also the cam which cam guide is bound to the frame slide and shift in the direction of arrow as shown in the diagram. Then the head release shaft which is caulked to the carriage guide plate unit by the cam is thrust upward, and the head is disengaged from the platen.
In case when performing pressure contact again, release the lock of the rack by applying power to the cam control solenoid by inversing the motor rotation, and the rack and cam are shifted in the opposite direction, and the head is pressure contacted to the platen by the pressure from the head pressure contacting spring.



4-14-2. Manual Head Release Mechanism Block

The manual head release mechanism block consists of a release lever and carriage guide plate unit. When the knob located on the upper section of the release lever is operated, the head release shaft which is caulked to the carriage guide plate unit by the cam section located on the underside of the release lever is depressed, the head is disengaged from the platen. Moreover, when the release lever is operated further, the small roller unit is depressed by another cam located on the opposite side of the release lever, and the rubber roller and the small roller unit are disengaged. Then the release lever is locked in this state. The release of the lock is performed by returning the release lever to its original position.

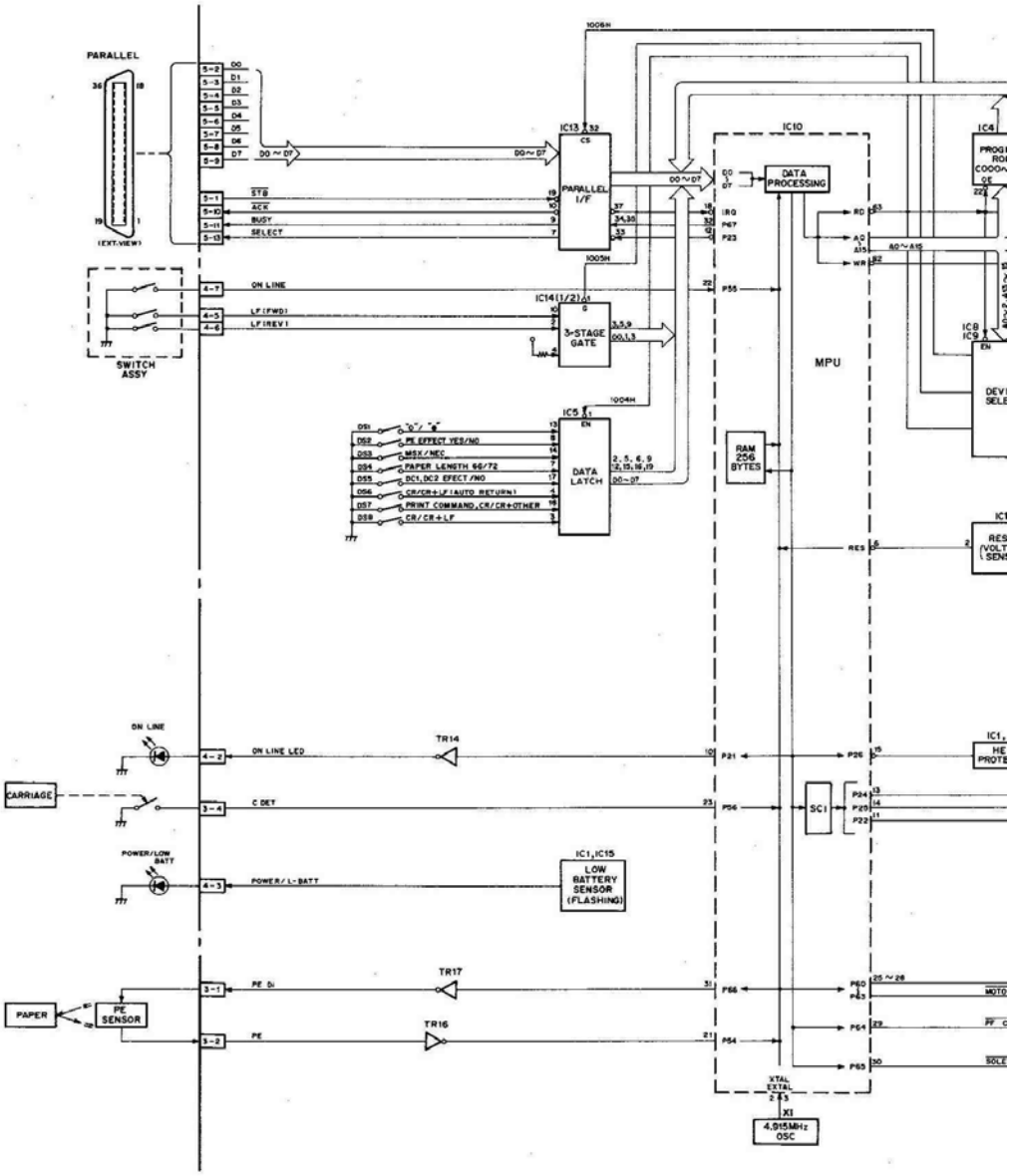


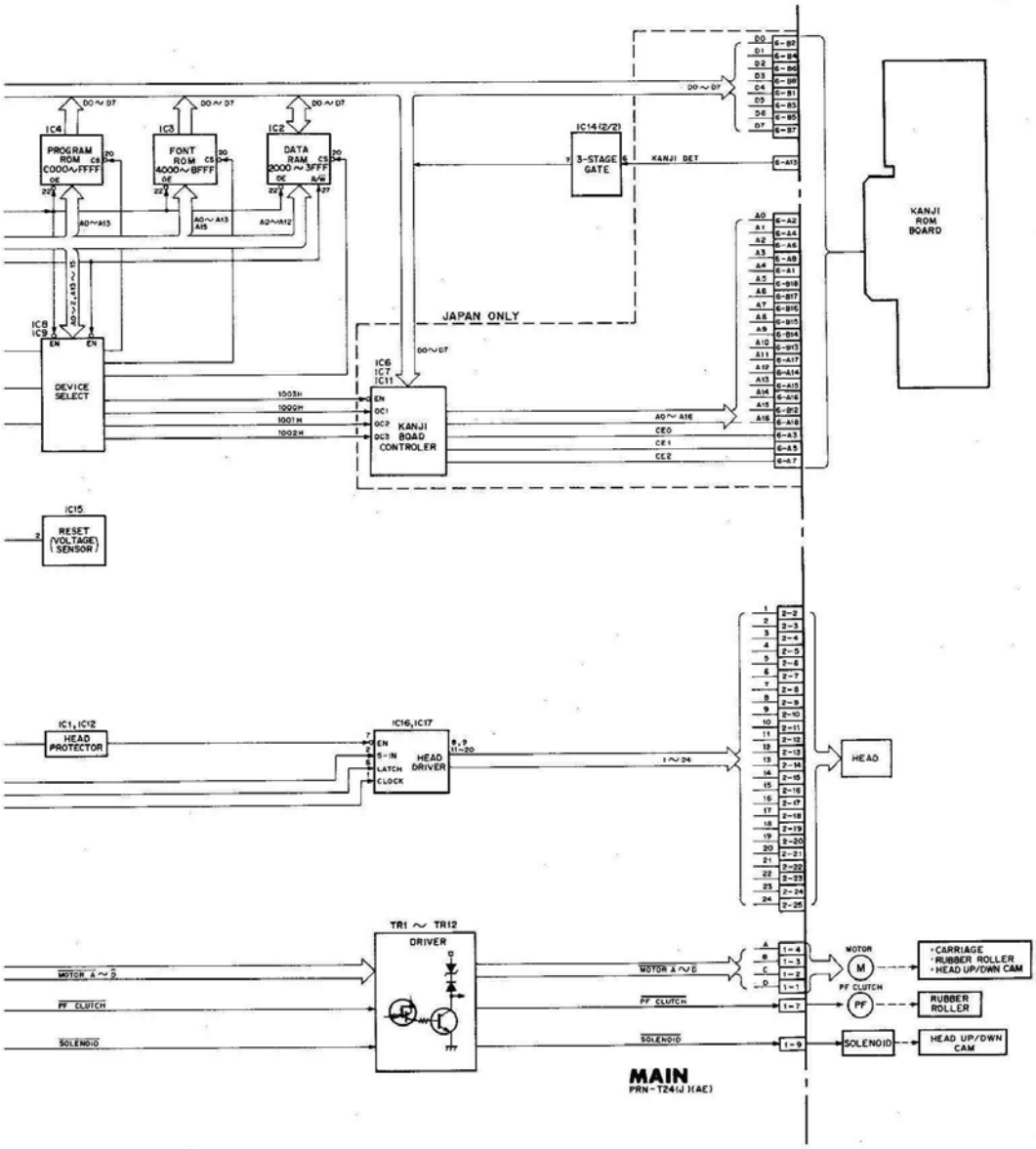
4-15. CARRIAGE DETECTION SIGNAL GENERATING BLOCK

The carriage detection signal generating block consists of a mechanical switch.

CHAPTER 5
BLOCK DIAGRAM

5-1. OVERALL



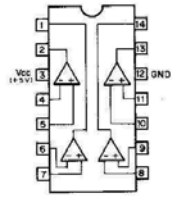

IC4
PROGRAM ROM C000H~FFFFH
IC3
FONT ROM 4000H~BFFFH
IC2
DATA RAM 2000H~3FFFH
IC14(2/2)
3-STATE GATE
KANJI SET
KANJI ROM BOARD
JAPAN ONLY
IC8
IC9
DEVICE SELECT
IC6
IC7
IC11
KANJI BOAD CONTROLER
1003H
1002H
1001H
1000H
CE0
CE1
CE2
IC15
RESET (VOLTAGE) SENSOR
IC1, IC12
HEAD PROTECTOR
IC16, IC17
HEAD DRIVER
HEAD
TR1 ~ TR12
DRIVER
MOTOR A ~ D
PF CLUTCH
SOLENOID
MOTOR
PF CLUTCH
SOLENOID
·CARRIAGE
·RUBBER ROLLER
·HEAD UP/DWN CAM
RUBBER ROLLER
HEAD UP/DWN CAM
MAIN
PRN-T241J (AE)

CHAPTER 6
SCHEMATIC DIAGRAM

6-1. SEMICONDUCTOR PIN ASSIGNMENTS

TYPE	PAGE
1S2075	6-8
2SA844	1-1
2SC1815	6-8
2SC3420	6-8
2SD1513	6-8
DAN601	6-8
DTA143XF	6-8
DTC143XF	6-8
GL-9PG2	6-8
HA17339	6-2
HD63A03XP	6-2
HD74HC08P	6-3
HD74HC138P	6-3
HD74HC139P	6-3
HD74HC273P	6-3
HD74HC367P	6-3
HD74HC373P	6-3
HD74HC374P	6-4
HM6264P-15	6-4
HN613128P	6-5
HN613256P	6-5
HZ12A1	6-8
HZ22-3	6-8
HZ3B2	6-8
HZ4B2	6-8
HZ5B2	6-8
LN351GCPP	6-8
M54610P	6-6
M54977P	6-7
MC3456P	6-4
S1S3M	6-8
TC5565PL-15	6-4
TC74HC08P	6-3
TC74HC138P	6-3
TC74HC139P	6-3
TC74HC273P	6-3
TC74HC367P	6-3
TC74HC373P	6-3
TC74HC374P	6-4
U15B	6-8

HA17339 (HITACHI)
COMPARATOR
— TOP VIEW —




```
A??     ;SEE BELOW PORT TABLE
BA      ;BUS AVAILABLE OUT
D0-7    ;DATA BUS I/O
DDR     ;DATA DIRECTION REGISTER
E       ;ENABLE OUT
EXTAL   ;EXTERNAL CRYSTAL IN
LIR     ;LOAD INSTRUCTION REG. OUT
MP0,1   ;MODE PROGRAM IN
MR      ;MEMORY READY
NMI     ;NON MASKABLE INTERRUPT IN
OCR     ;OUTPUT COMPARE REGISTER
P??     ;SEE BELOW PORT TABLE
RES     ;RESET IN
RD      ;READ
R/W     ;READ/WRITE OUT
SCI     ;SERIAL COMMUNICATION INTERFACE
STBY    ;STANDBY IN
WR      ;WRITE OUT
XTAL    ;CRYSTAL
```

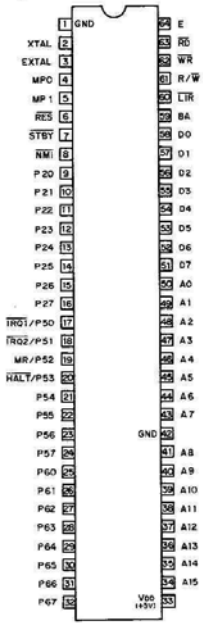
PORT TABLE

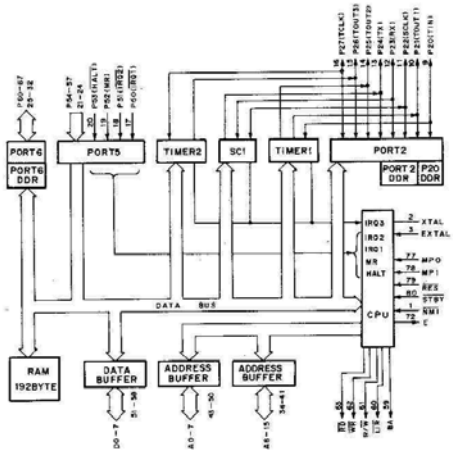
PORT	MODE2	MODE1,2
A0-7	8-BIT OUT	LOWER ADDRESS OUT
A8-15	8-BIT OUT	UPPER ADDRESS OUT
D0-7	8-BIT I/O	DATA BUS I/O

PORT	DUAL FUNCTION	
P20/TIN	8-BIT I/O	TIMER1 IN/CAPTURE IN
P21/TOUT1		TIMER1 OCR1 OUT
P22/SCLK		SCI CLOCK I/O
P23/RX		SCI RECEIVE
P24/TX		SCI TRANSMIT
P25/TOUT2		TIMER1 OCR2 OUT
P26/TOUT3		TIMER2 OUT
P27/TCLK		TIMER2 EXTERNAL CLOCK IN
P50/IRQ1	8-BIT IN	INTERRUPT REQUEST IN
P51/IRQ2		
P52/MR		MEMORY READY IN
P53/HALT		HALT IN
P54-57		----------

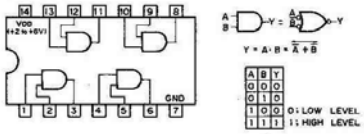
PORT60-67 ;8-BIT I/O PORT

HD63A03XP (HITACHI)
C-MOS 8-BIT MICROPROCESSOR
— TOP VIEW —

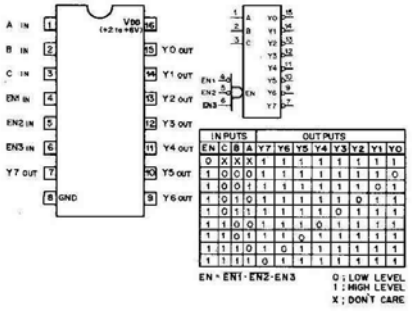




HD74HC08P (HITACHI)
TC74HC08P (TOSHIBA)
C-MOS 2-INPUT AND GATE
— TOP VIEW —



HD74HC138P (HITACHI)
TC74HC138P (TOSHIBA)
C-MOS 3-TO-8 LINE DECODER/DEMULTIPLEXER
— TOP VIEW —

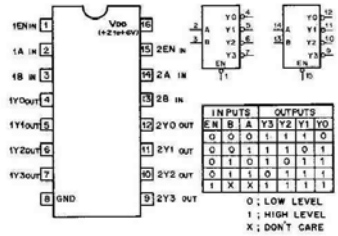


INPUTS				OUTPUTS						
EN	C	B	A	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
0	X	X	X	1	1	1	1	1	1	1	1
1	0	0	0	1	1	1	1	1	1	1	0
1	0	0	1	1	1	1	1	1	1	0	1
1	0	1	0	1	1	1	1	1	0	1	1
1	0	1	1	1	1	1	1	0	1	1	1
1	1	0	0	1	1	1	1	1	1	1	1
1	1	0	1	1	1	1	0	1	1	1	1
1	1	1	0	1	0	1	1	1	1	1	1
1	1	1	1	0	1	1	1	1	1	1	1

EN = EN1 · EN2 · EN3

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

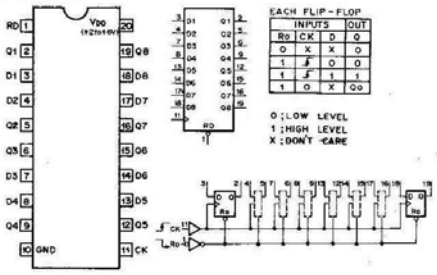
HD74HC139P (HITACHI)
TC74HC139P (TOSHIBA)
C-MOS 1-OF-4 DECODER/DEMULTIPLEXER
— TOP VIEW —



INPUTS			OUTPUTS			
EN	B	A	Y3	Y2	Y1	Y0
0	0	0	1	1	1	0
0	0	1	1	1	0	1
0	1	0	1	0	1	1
0	1	1	0	1	1	1
1	X	X	1	1	1	1

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

HD74HC273P (HITACHI)
TC74HC273P (TOSHIBA)
C-MOS D-TYPE FLIP-FLOP WITH RESET
— TOP VIEW —

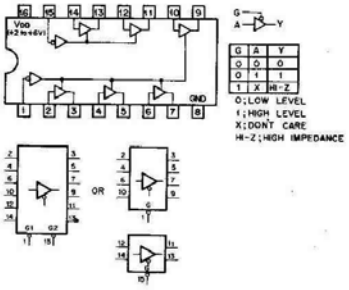


EACH FLIP-FLOP

INPUTS			OUT
$\overline{R_D}$	CK	D	Q
0	X	X	0
1	↑	0	0
1	↑	1	1
1	0	X	Q_0

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

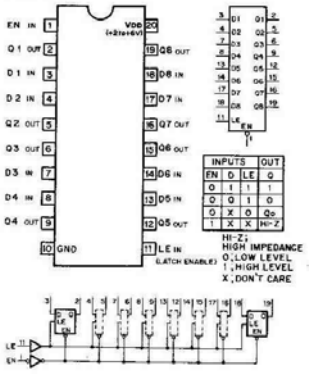
HD74HC367P (HITACHI)
TC74HC367P (TOSHIBA)
C-MOS BUS DRIVER WITH 3-STATE OUTPUTS
— TOP VIEW —



G	A	Y
0	0	0
0	1	1
1	X	HI-Z

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
HI-Z ; HIGH IMPEDANCE

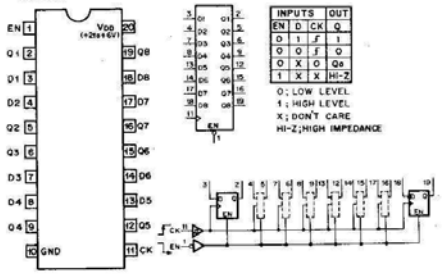
HD74HC373P (HITACHI)
TC74HC373P (TOSHIBA)
C-MOS 3-STATE OUTPUTS OCTAL LATCHES
— TOP VIEW —



INPUTS			OUT
EN	D	LE	Q
0	1	1	1
0	0	1	0
0	X	0	Q_0
1	X	X	HI-Z

HI-Z ; HIGH IMPEDANCE
0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

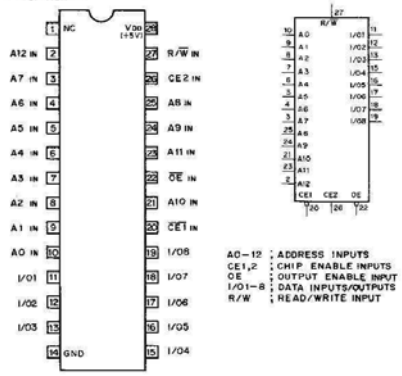
HD74HC374P (HITACHI)
TC74HC374P (TOSHIBA)
C-MOS 3-STATE OCTAL D-TYPE FLIP-FLOP
— TOP VIEW —



INPUTS			OUT
EN	D	CK	Q
0	1	↑	1
0	0	↑	0
0	X	0	Q0
1	X	X	HI-Z

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
HI-Z ; HIGH IMPEDANCE

HM6264P-15 (HITACHI) (ACCESS TIME = 150 nS)
TC5565PL-15 (TOSHIBA) (ACCESS TIME = 150 nS)
C-MOS 8192 WORDx8-BIT RAM
— TOP VIEW —

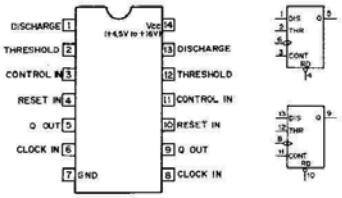


A0–12 ; ADDRESS INPUTS
CE1,2 ; CHIP ENABLE INPUTS
OE ; OUTPUT ENABLE INPUT
I/O1–8 ; DATA INPUTS/OUTPUTS
R/W ; READ/WRITE INPUT

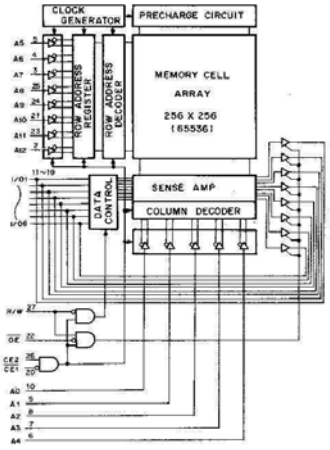
MODE	CE1	CE2	OE	R/W	I/O1~8
READ	0	1	0	1	DATA OUTPUTS
WRITE	0	1	X	0	DATA INPUTS
OUTPUT DESELECT	X	X	1	X	HI-Z
STANDBY	1	X	X	X	HI-Z
	X	0	X	X	HI-Z

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
HI-Z ; HIGH IMPEDANCE

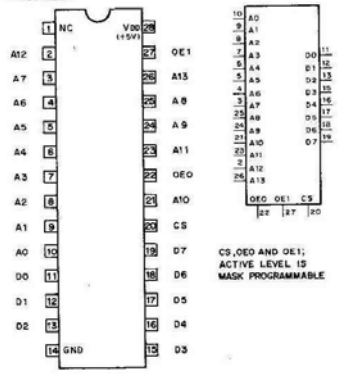
MC3456P (MOTOROLA)
DUAL TIMER
— TOP VIEW —



INPUT		OUT
RD	CK	Q
L	X	L
H	↓	L
H	↑	H

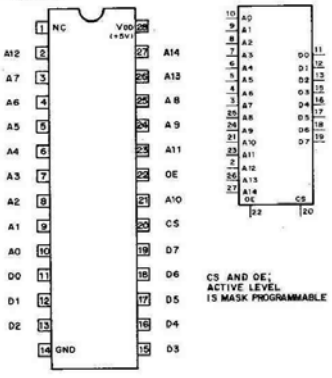


HN613128P (HITACHI)
C-MOS MASK PROGRAMMABLE ROM 128K-BIT (16384x8)
— TOP VIEW —

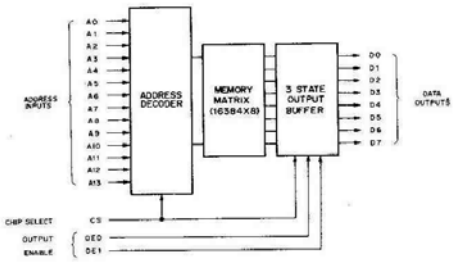


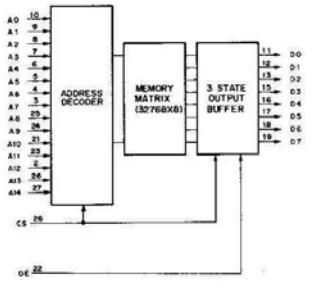
CS ,OEO AND OE1;
ACTIVE LEVEL IS
MASK PROGRAMMABLE

HN613256P (HITACHI)
C-MOS MASK PROGRAMMABLE ROM 256K-BIT (32768x8)
— TOP VIEW —



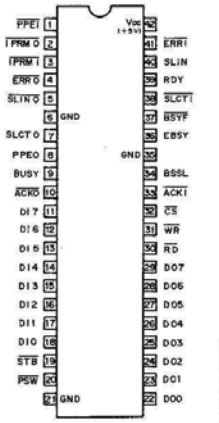
CS AND OE;
ACTIVE LEVEL
IS MASK PROGRAMMABLE

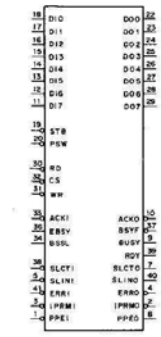




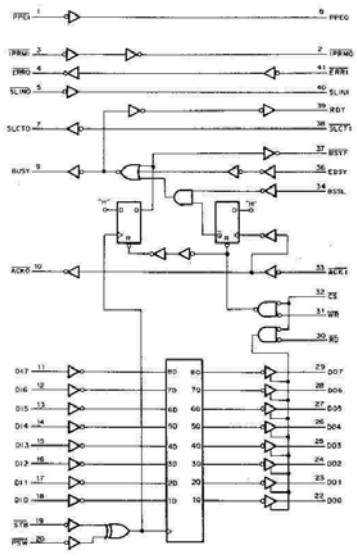
A0~A14 ; ADDRESS INPUT
CS ; CHIP SELECT
D0~D7 ; DATA
OE ; OUTPUT ENABLE

M54610P (MITSUBISHI)
PARALLEL DATA INTERFACE
— TOP VIEW —

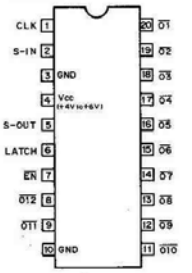


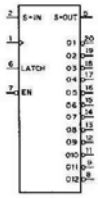


ACKI	ACKNOWLEDGE INPUT
ACKO	ACKNOWLEDGE OUTPUT
BSSL	BUSY SELECT
BSYF	BUSY FLAG
BUSY	I/F BUSY
CS	CHIP SELECT
DI0~7	DATA INPUT
DO0~7	DATA OUTPUT
EBSY	EXTERNAL BUSY
ERRI	ERROR INPUT
ERRO	ERROR OUTPUT
IPRMI	INPUT PRIME INPUT
IPRMO	INPUT PRIME OUTPUT
PPEI	PAPER END INPUT
PPEO	PAPER END OUTPUT
PSW	POLARITY SWITCH FOR STB
RDY	READY
SLCTI	SELECTED SLCTO INPUT
SLINI	SELECT INPUT
SLINO	SELECT OUTPUT
STB	STROBE
RD	READ
WR	WRITE

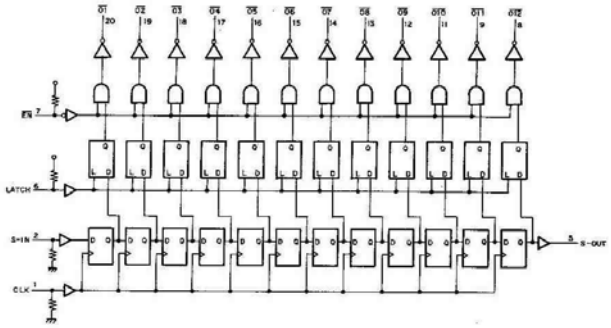


M54977P (MITSUBISHI)
BI-CMOS 12-BIT SHIFT REGISTER
— TOP VIEW —





CLK ; CLOCK
EN ; ENABLE
O1～12 ; OUTPUT
S-IN ; SERIAL DATA INPUT
S-OUT ; SERIAL DATA OUTPUT



Tr, Di, LED

<2SA>

2SA844

<2SC, 2SD>

2SC1815
2SD1513

2SC3420

<OTHER>

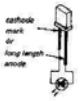
(SCALE2/1)

DTA143XF (R1=4.7K, R2=10K)

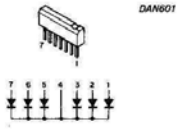
(SCALE 2/1)

DTC143XF (R1=4.7K, R2=10K)

LN351GCPP ; GREEN



GL-9PG2 ; GREEN



DAN601

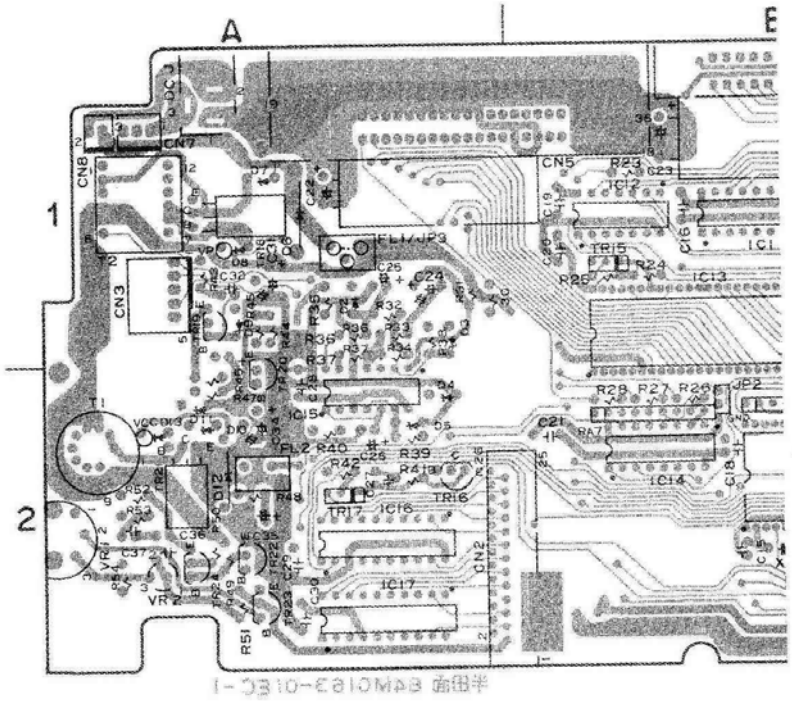
1S2075

HZ 7.1A 7
HZ 7.1B 7
HZ 7.1 7

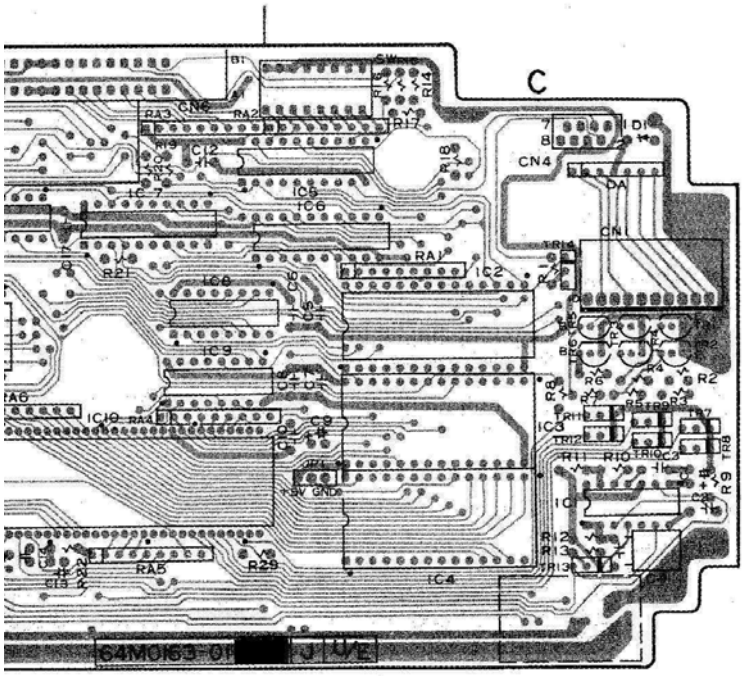
S153M

U15 7

6-2. MAIN BOARD

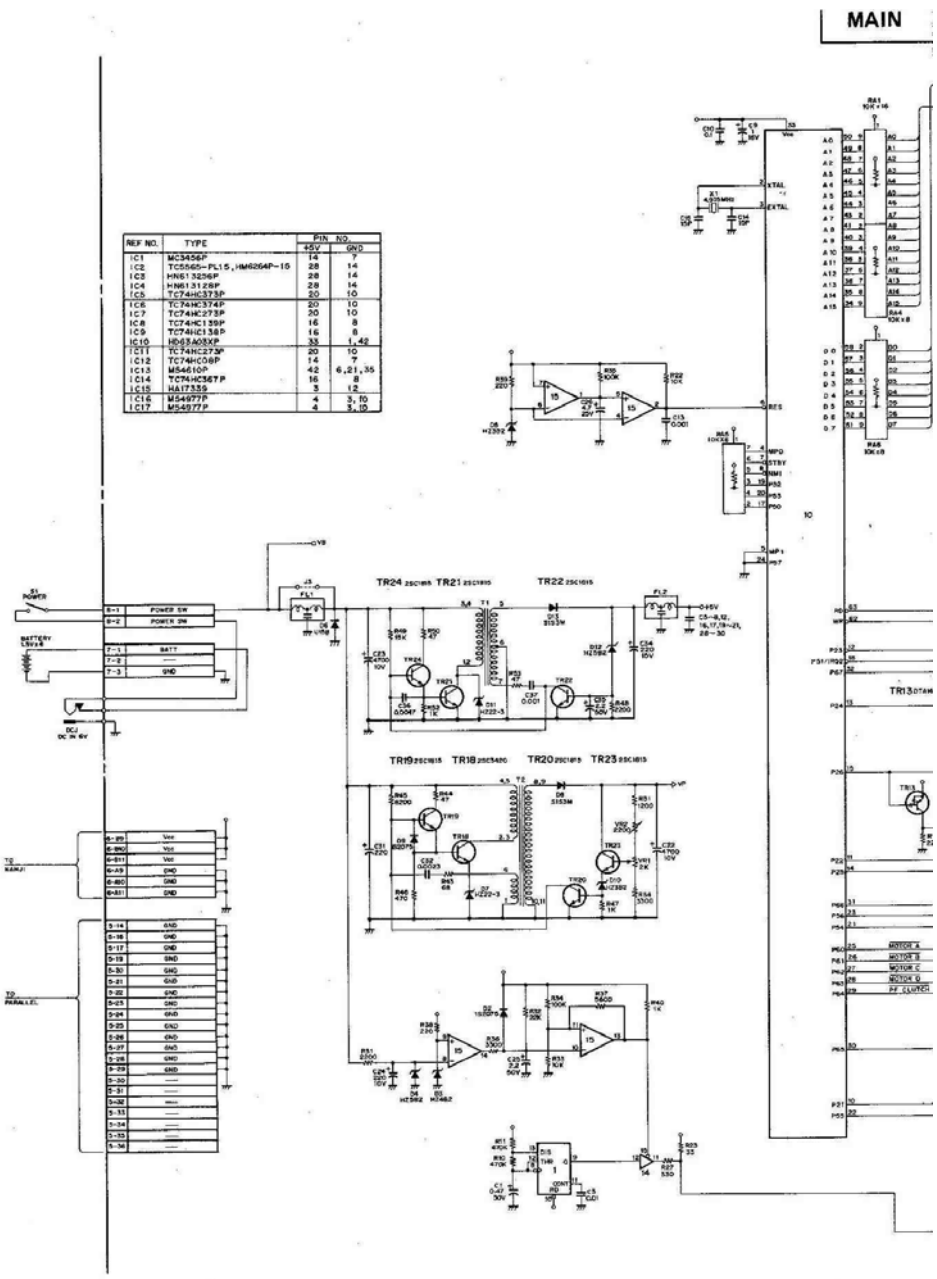


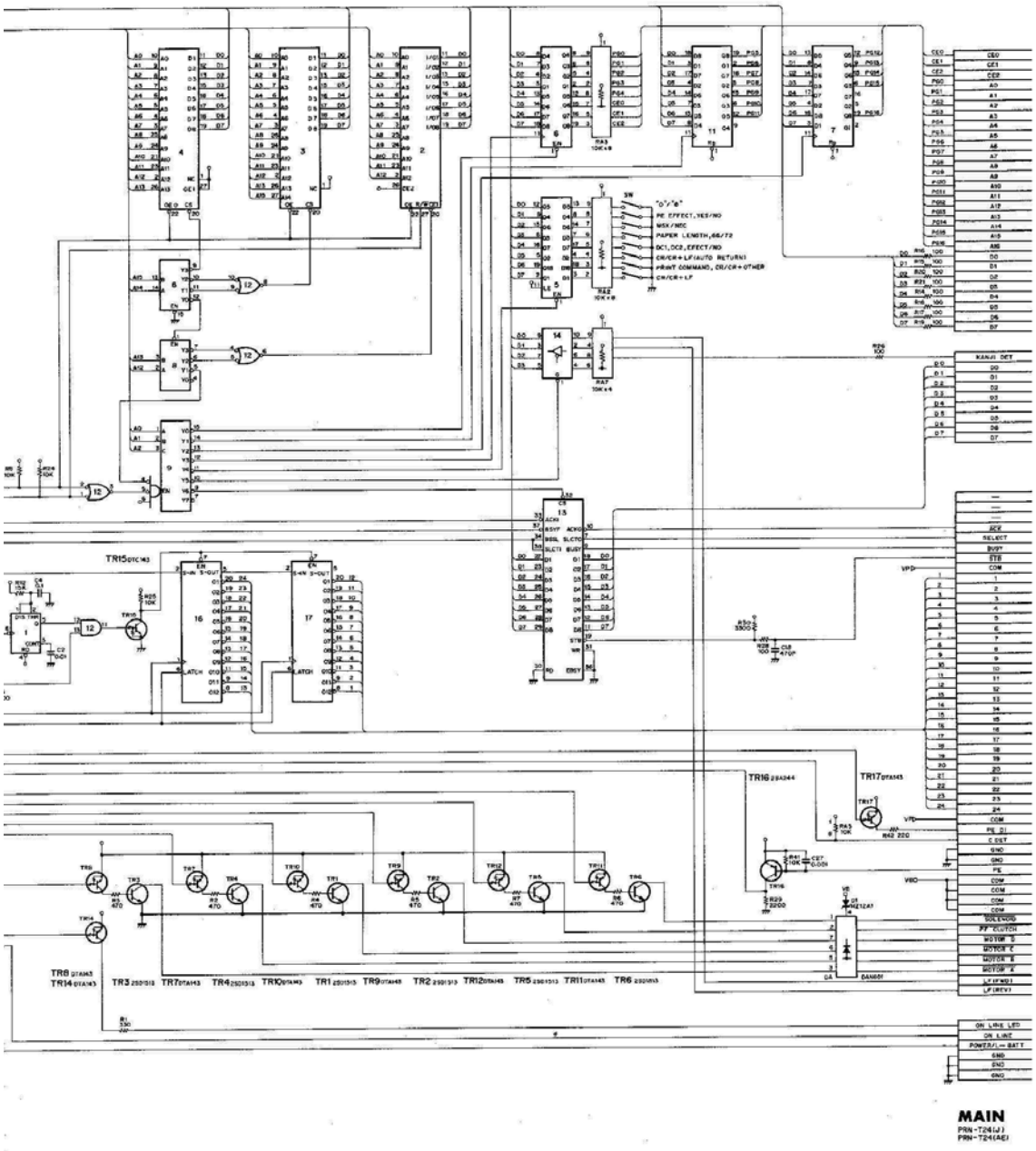
C1	C - 2	C24	A - 1	D1	C - 1	IC1	C - 2	R1	C - 1	R23	
C2	C - 2	C25	A - 1	D2	A - 1	IC2	C - 1	R2	C - 2	R24	
C3	C - 2	C26	A - 2	D3	A - 1	IC3	C - 2	R3	C - 2	R25	
C4	C - 2	C27	A - 2	D4	A - 2	IC4	C - 2	R4	C - 2	R26	
C5	C - 1	C28	A - 2	D5	A - 2	IC5	C - 1	R5	C - 2	R27	
C6	C - 1	C29	A - 2	D6	A - 1	IC6	C - 1	R6	C - 2	R28	
C7	C - 2	C30	A - 2	D7	A - 1	IC7	B - 1	R7	C - 2	R29	
C8	C - 2	C31	A - 1	D8	A - 1	IC8	B - 1	R8	C - 2	R30	
C9	C - 2	C32	A - 1	D9	A - 1	IC9	B - 2	R9	C - 2	R31	
C10	C - 2	C34	A - 2	D10	A - 2	IC10	B - 2	R10	C - 2	R32	
C12	B - 1	C35	A - 2	D11	A - 2	IC11	B - 1	R11	C - 2	R33	
C13	B - 2	C36	A - 2	D12	A - 2	IC12	B - 1	R12	C - 2	R34	
C14	B - 2	C37	A - 2	D13	A - 2	IC13	B - 1	R13	C - 2	R35	
C15	B - 2					IC14	B - 2	R14	C - 1	R36	
C16	B - 1	CN1	C - 1	DA	C - 1	IC15	A - 2	R15	C - 1	R37	
C17	B - 1	CN2	A - 2			IC16	A - 2	R16	C - 1	R38	
C18	B - 2	CN3	A - 1	DCJ	A - 1	IC17	A - 2	R17	C - 1	R39	
C19	B - 1	CN4	C - 1					R18	C - 1	R40	
C20	B - 1	CN5	A - 1	FL1	A - 1	JP1	C - 2	R19	B - 1	R41	
C21	B - 2	CN6	B - 1	FL2	A - 2	JP2	B - 2	R20	B - 1	R42	
C22	A - 1	CN7	A - 1			JP3	A - 1	R21	B - 1	R43	
C23	B - 1	CN8	A - 1	GND	B - 2			R22	B - 2	R44	



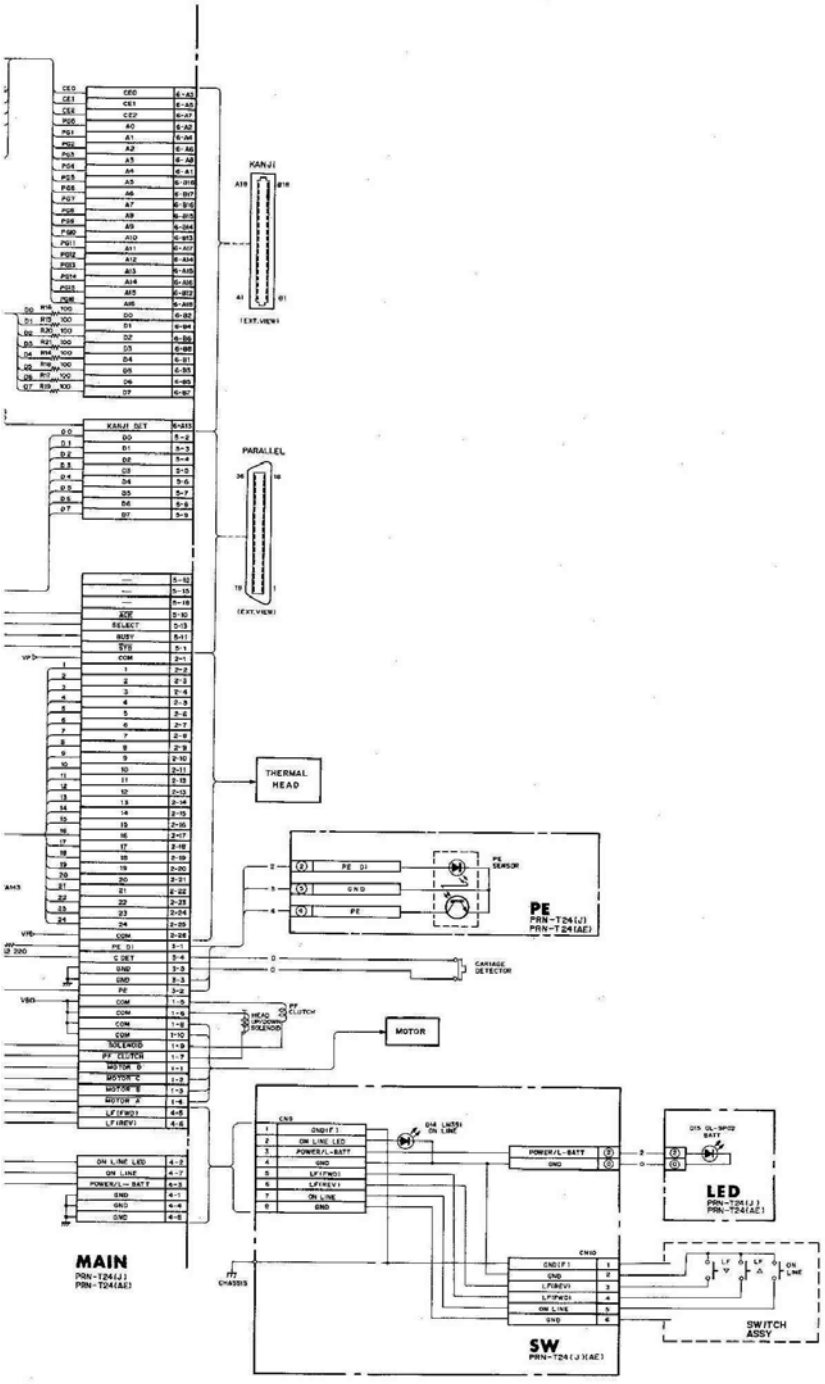
MAIN – COMPONENT SIDE –
PRN-T24(J)(AE)

B - 1	R45	A - 1	TR1	C - 1	VCC	A - 2
B - 1	R46	A - 2	TR2	C - 1		
B - 1	R47	A - 2	TR3	C - 1	VP	A - 1
B - 2	R48	A - 2	TR4	C - 1		
B - 2	R49	A - 2	TR5	C - 1	VR1	A - 2
B - 2	R50	A - 2	TR6	C - 1	VR2	A - 2
B - 2	R51	A - 2	TR7	C - 2		
A - 1	R52	A - 2	TR8	C - 2	X1	B - 2
A - 1	R53	A - 2	TR9	C - 2		
A - 1	R54	A - 2	TR10	C - 2		
A - 1			TR11	C - 2		
A - 1	RA1	C - 1	TR12	C - 2		
A - 1	RA2	C - 1	TR13	C - 2		
A - 1	RA3	B - 1	TR14	C - 1		
A - 1	RA4	B - 2	TR15	B - 1		
A - 1	RA5	B - 2	TR16	A - 2		
A - 2	RA6	B - 2	TR17	A - 2		
A - 2	RA7	B - 2	TR18	A - 1		
A - 2			TR19	A - 1		
A - 2	SW	C - 1	TR20	A - 2		
A - 1			TR21	A - 2		
A - 1	T1	A - 2	TR22	A - 2		
	T2	A - 1	TR23	A - 2		
			TR24	A - 2		

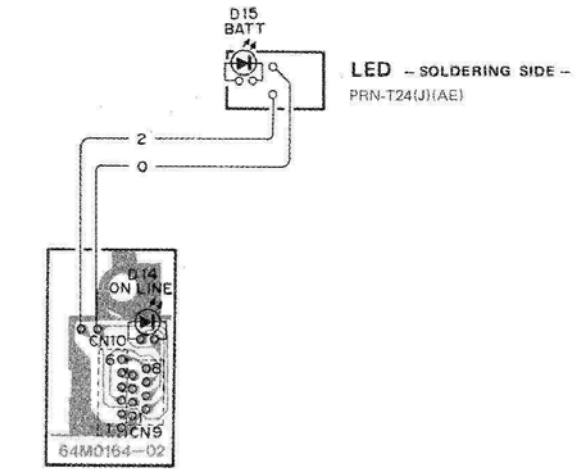

MAIN
REF NO. | TYPE | PIN NO. +5V | PIN NO. GND
IC1 | MC3456P | 14 | 7
IC2 | TC5565-PL15, HM6264P-15 | 28 | 14
IC3 | HN613256P | 28 | 14
IC4 | HN613128P | 28 | 14
IC5 | TC74HC373P | 20 | 10
IC6 | TC74HC374P | 20 | 10
IC7 | TC74HC273P | 20 | 10
IC8 | TC74HC139P | 16 | 8
IC9 | TC74HC138P | 16 | 8
IC10 | HD63A03XP | 33 | 1, 42
IC11 | TC74HC273P | 20 | 10
IC12 | TC74HC08P | 14 | 7
IC13 | M54610P | 42 | 6, 21, 35
IC14 | TC74HC367P | 16 | 8
IC15 | HA17358 | 8 | 12
IC16 | M54977P | 4 | 3, 10
IC17 | M54977P | 4 | 3, 10
TR24 2SC1815 TR21 2SC1815
TR22 2SC1815
TR19 2SC1815 TR18 2SC5400
TR20 2SC1815 TR23 2SC1815

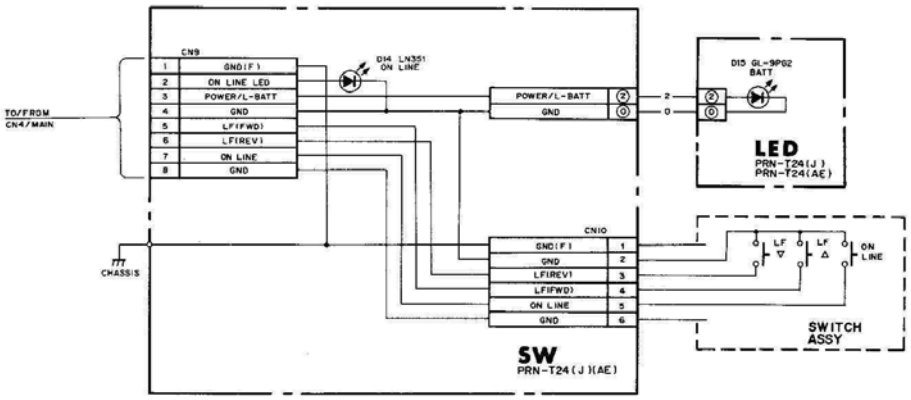


MAIN
PRN-T241(J)
PRN-T241(AE)

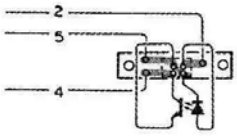

KANJI
PARALLEL
THERMAL HEAD
PE
PRN-T24(J)
PRN-T24(AE)
CARRIAGE DETECTOR
MOTOR
LED
PRN-T24(J)
PRN-T24(AE)
MAIN
PRN-T24(J)
PRN-T24(AE)
SW
PRN-T24(J)(AE)
SWITCH ASSY

6-3. LED, SW BOARD

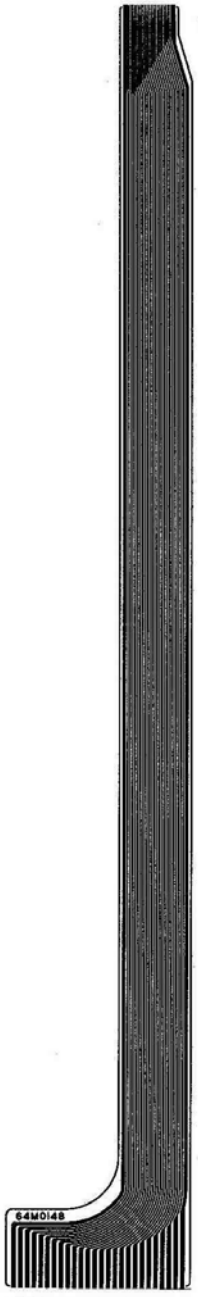




6-4. PE, FCB BOARD

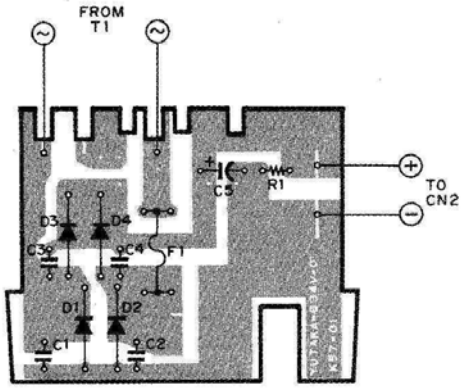


PE –SOLDERING SIDE–
PRN-T24(J)(AE)

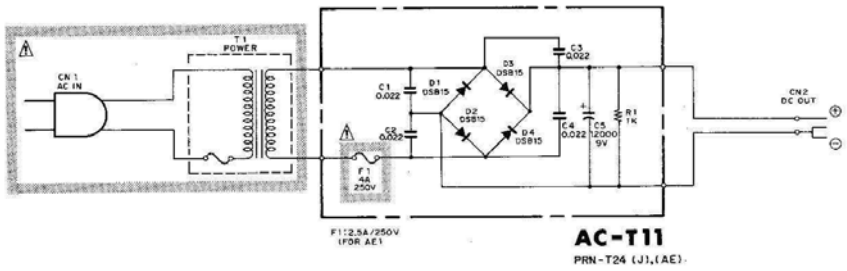


FCB
PRN-T24(J)(AE)
FROM CN2/MAIN BOARD

6-5. AC-T11



AC-T11 – SOLDERING SIDE –
PRN-T24(J)(AE)



AC-T11
PRN-T24 (J),(AE)

CHAPTER 7
TROUBLESHOOTING

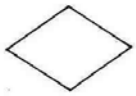
7-1. GENERAL PRECAUTION ITEMS

Note 1) When checking flow chart in between, caution should be exercised that there may be abnormal items above the said check.

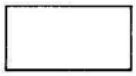
Note 2) When "connector is difective", check for broken piece of the connector pin, smear on the surface, rust, faulty cord connection, defective cord, etc.

The meaning of the the symbols which comprises a flow chart is as follows.

Start or completion



Judgment

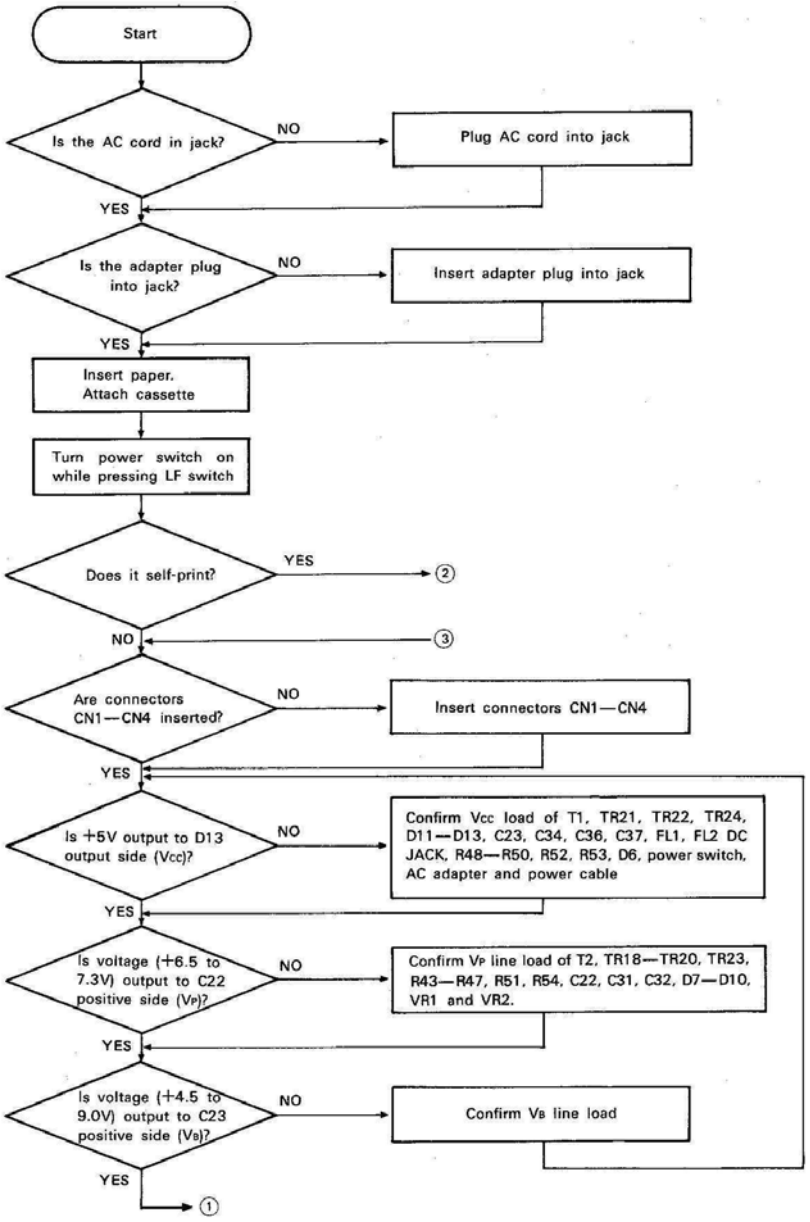


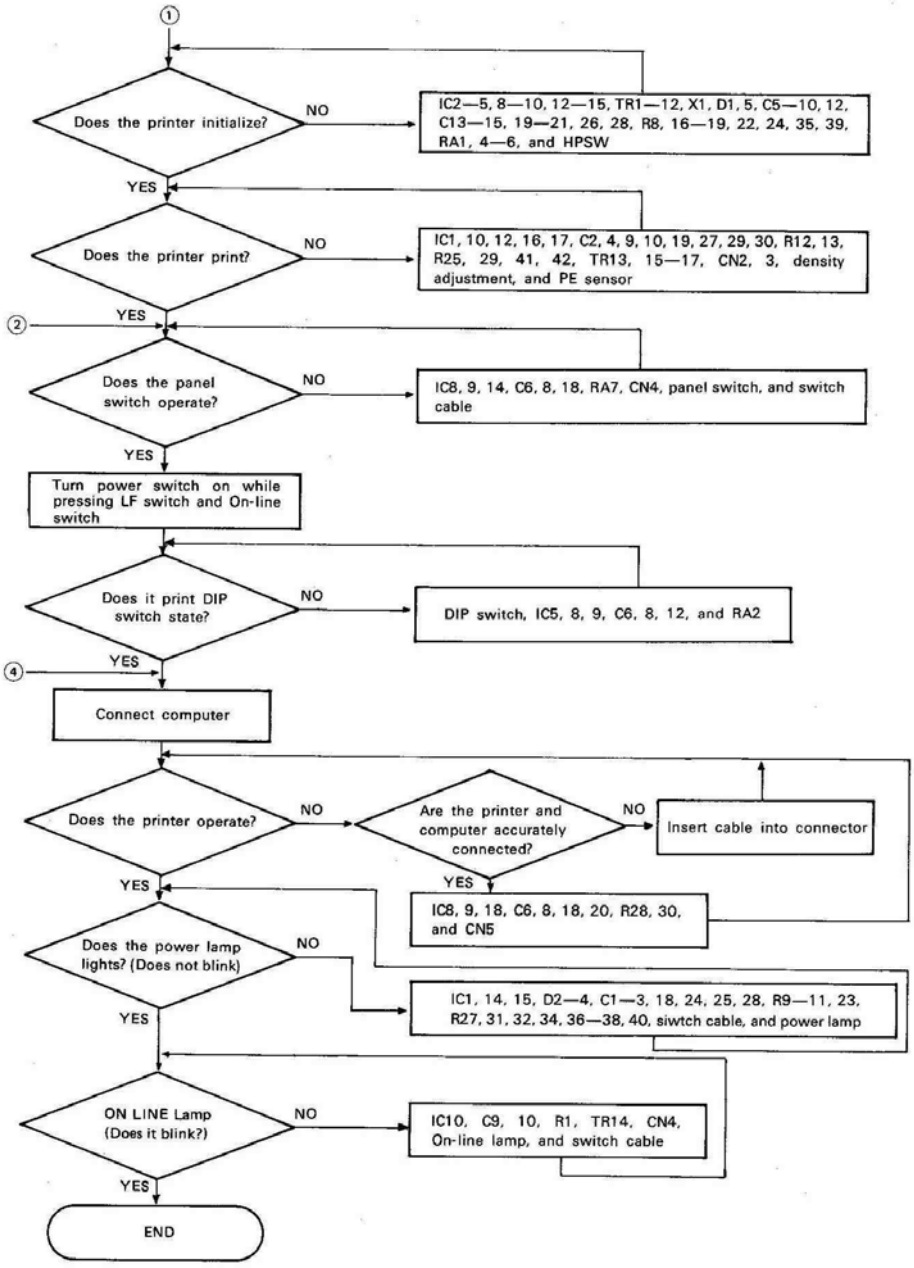
Defective phenomena, operation, check for defective cause, object of repair

Note 3) The C22 positive side (V_P) differs by the rank of printing head.
The printing head rank is displayed as shown in table below to FPC.
With the VR1 as the maximum density, it is adjusted to below voltage with VR2.
Caution should be exercised that the printing head will be damaged by heat and causes printing trouble when V_P exceeds the below mentioned voltage.

Printing head rank	V_P setting voltage
A	7.2 ± 0.1V
B	6.9 ± 0.1V
C	6.6 ± 0.1V

7-2. MAIN FLOW


Start
Is the AC cord in jack?
NO
Plug AC cord into jack
YES
Is the adapter plug into jack?
NO
Insert adapter plug into jack
YES
Insert paper. Attach cassette
Turn power switch on while pressing LF switch
Does it self-print?
YES
②
NO
③
Are connectors CN1—CN4 inserted?
NO
Insert connectors CN1—CN4
YES
Is +5V output to D13 output side (Vcc)?
NO
Confirm Vcc load of T1, TR21, TR22, TR24, D11—D13, C23, C34, C36, C37, FL1, FL2 DC JACK, R48—R50, R52, R53, D6, power switch, AC adapter and power cable
YES
Is voltage (+6.5 to 7.3V) output to C22 positive side (VP)?
NO
Confirm VP line load of T2, TR18—TR20, TR23, R43—R47, R51, R54, C22, C31, C32, D7—D10, VR1 and VR2.
YES
Is voltage (+4.5 to 9.0V) output to C23 positive side (VB)?
NO
Confirm VB line load
YES
①


①
Does the printer initialize?
NO
IC2—5, 8—10, 12—15, TR1—12, X1, D1, 5, C5—10, 12, C13—15, 19—21, 26, 28, R8, 16—19, 22, 24, 35, 39, RA1, 4—6, and HPSW
YES
Does the printer print?
NO
IC1, 10, 12, 16, 17, C2, 4, 9, 10, 19, 27, 29, 30, R12, 13, R25, 29, 41, 42, TR13, 15—17, CN2, 3, density adjustment, and PE sensor
YES
②
Does the panel switch operate?
NO
IC8, 9, 14, C6, 8, 18, RA7, CN4, panel switch, and switch cable
YES
Turn power switch on while pressing LF switch and On-line switch
Does it print DIP switch state?
NO
DIP switch, IC5, 8, 9, C6, 8, 12, and RA2
YES
④
Connect computer
Does the printer operate?
NO
Are the printer and computer accurately connected?
NO
Insert cable into connector
YES
YES
IC8, 9, 18, C6, 8, 18, 20, R28, 30, and CN5
Does the power lamp lights? (Does not blink)
NO
IC1, 14, 15, D2—4, C1—3, 18, 24, 25, 28, R9—11, 23, R27, 31, 32, 34, 36—38, 40, siwtch cable, and power lamp
YES
ON LINE Lamp (Does it blink?)
NO
IC10, C9, 10, R1, TR14, CN4, On-line lamp, and switch cable
YES
END

CHAPTER 8
PEPAIR PARTS AND FIXTURE

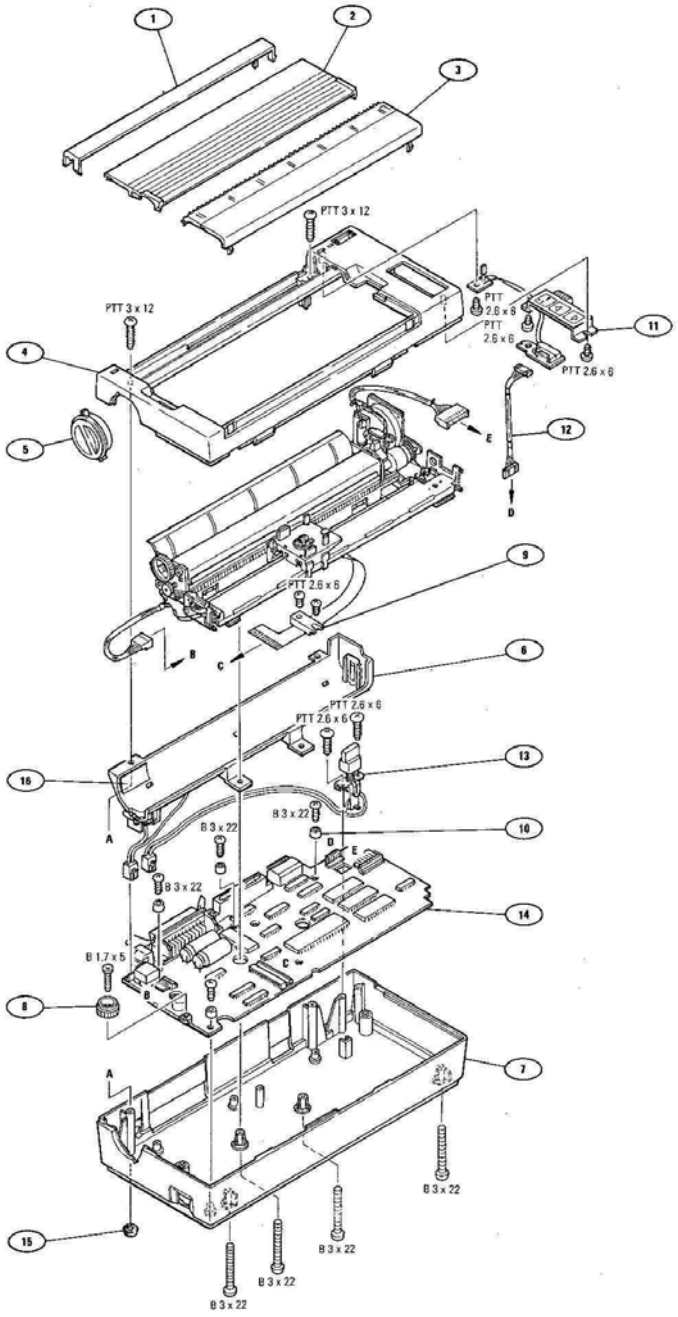
8-1. MECHANICAL PARTS LIST

No.	Parts No.	Description
8-1-1.	**Cover Block**	
1	**9-988-116-01**	**BACK LIST**
2	**9-988-117-01**	**CENTER LID**
3	**9-988-118-01**	**FRONT LID ASSY**
4	**9-988-119-01**	**UPPER CASE**
5	**9-988-120-01**	**B-CAP UNIT**
6	9-988-121-01	B-CASE UNIT
7	**9-988-122-01**	**LOWER CASE**
8	**9-988-123-01**	**VOLUME KNOB**
9	9-988-124-01	FPC SUPPORTER
10	9-988-125-01	COLLAR
11	**9-988-126-01**	**SWITCH ASSY**
12	9-988-127-01	CABLE
13	**9-988-128-01**	**POWER SW UNIT**
14	9-988-129-01	MOUNTED CB, MAIN
15	**9-988-130-01**	**FOOT, RUBBER**
16	9-988-131-01	LABEL, BATTERY

NOTE:

1. **The shaded and ⚠ -marked components are critical to safety. Replace only with same components as specified.**
2. Parts printed in Bold-Face type are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.
3. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

COVER BLOCK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No.	Parts No.	Description
8-1-2.	**Printer Block**	
21	**9-988-093-01**	**ROLLER SHAFT UNIT, RUBBER**
22	**9-988-094-01**	**MOTOR PLATE UNIT**
23	**9-988-095-01**	**PLATEN UNIT**
24	**9-988-096-01**	**CARRIAGE GUIDE PLATE UNIT**
25	**9-988-097-01**	**MOTOR UNIT**
26	**9-988-098-01**	**ROLLER INSTALLATION STAND UNIT**
27	**9-988-099-01**	**WIRE ROLLER(B) UNIT**
28	**9-988-100-01**	**MANUAL KNOB UNIT**
29	**9-988-101-01**	**PE SENSOR UNIT**
30	**9-988-102-01**	**RELEASE LEVER**
31	**9-988-103-01**	**IDLE GEAR**
32	**9-988-104-01**	**CLUTCH STOPPER**
33	**9-988-105-01**	**RUBBER ROLLER GEAR**
34	**9-988-106-01**	**MANUAL IDLE GEAR**
35	9-988-107-01	SPRING COVER
36	**9-988-108-01**	**PULLEY SHAFT**
37	**9-988-109-01**	**SPRING COMPRESSION**
38	**9-988-110-01**	**SPRING WIRE**
39	**9-988-111-01**	**PLATEN SPRING**
40	**9-988-112-01**	**ACTUATOR SPRING**
41	**9-988-113-01**	**RELAESE LEVER SPRING**
42	**9-988-114-01**	**MANUAL KNOB SPRING**
43	**9-988-115-01**	**CARRIAGE DETECT UNIT**

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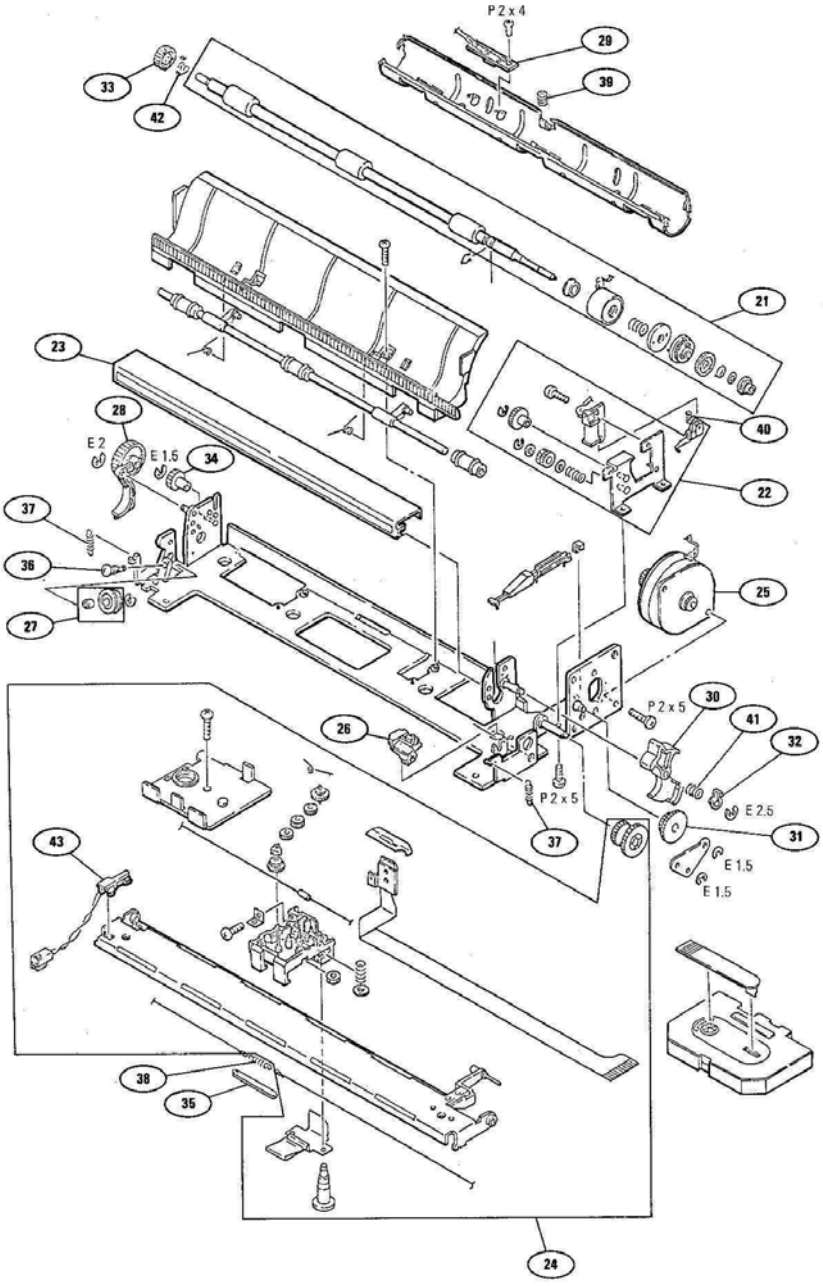
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E2.5
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E1.5
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8-2. ELECTRICAL PARTS LIST

8-2-1. AC-T11

Ref. No.	Parts No.	Description
	⚠ 1-463-662-11	AC ADAPTOR, AC-T11(AE)
	9-984-440-01	CASE, UPPER
	9-984-441-01	CASE, LOWER
	9-984-443-01	PRINTED CIRCUIT BOARD
	9-987-683-01	PLATE, NAME(AE)
C1	**1-101-005-00**	**CERAMIC 0.0022 50V**
C2	**1-101-005-00**	**CERAMIC 0.0022 50V**
C3	**1-101-005-00**	**CERAMIC 0.0022 50V**
C4	**1-101-005-00**	**CERAMIC 0.0022 50V**
C5	**9-987-706-01**	**ELECT 12000 9V**
⚠CN1	**9-987-685-01**	**AC IN(AE)**
CN2	**9-984-444-01**	**DC OUT**
D1	**9-984-447-01**	**DSB15**
D2	**9-984-447-01**	**DSB15**
D3	**9-984-447-01**	**DSB15**
D4	**9-984-447-01**	**DSB15**
⚠F1	**1-532-286-11**	**250V 2.5A**
R1	**1-247-713-11**	**CARBON 1K 5% 1/4W**
T1	**9-987-684-01**	**POWER(AE)**

8-2-2. LED Board

Ref. No.	Parts No.	Description
	9-988-167-01	PRINTED CB, LED
D14	**9-988-134-01**	**LN351**

8-2-3. MAIN Board

Ref. No.	Parts No.	Description
	9-988-129-01	MOUNTED CB, MAIN
C1	**1-123-379-00**	**ELECT 0.47 20% 50V**
C2	**1-161-013-00**	**CERAMIC 0.01 10% 25V**
C3	**1-161-013-00**	**CERAMIC 0.01 10% 25V**
C4	**1-136-001-11**	**FILM 0.1 5% 50V**
C5	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C6	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C7	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C8	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C9	**1-131-347-00**	**TANTALUM 1 20% 16V**
C10	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C12	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C13	**1-161-039-00**	**CERAMIC 0.001 10% 25V**
C14	**1-102-951-00**	**CERAMIC 15P 5% 50V**
C15	**1-102-951-00**	**CERAMIC 15P 5% 50V**
C18	**1-102-824-00**	**CERAMIC 470P 10% 50V**
C19	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C20	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C21	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C22	**1-123-314-00**	**ELECT 4700 20% 10V**
C23	**1-123-314-00**	**ELECT 4700 20% 10V**
C24	**1-123-308-00**	**ELECT 220 20% 10V**
C25	**1-123-381-00**	**ELECT 2.2 20% 50V**

NOTE:

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   Replace only with same components as specified.

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Ref. No.	Parts No.	Description
C26	**1-123-369-00**	**ELECT 4.7 20% 25V**
C27	**1-161-039-00**	**CERAMIC 0.001 10% 25V**
C28	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C29	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C30	**1-161-025-00**	**CERAMIC 0.1 10% 25V**
C31	**1-123-308-00**	**ELECT 220 20% 10V**
C32	**1-161-043-00**	**CERAMIC 0.0022 10% 25V**
C34	**1-123-308-00**	**ELECT 220 20% 10V**
C35	**1-123-381-00**	**ELECT 2.2 20% 50V**
C36	**1-161-047-00**	**CERAMIC 0.0047 10% 25V**
C37	**1-161-039-00**	**CERAMIC 0.001 10% 25V**
CN1	9-988-156-01	10P
CN2	9-988-157-01	26P
CN3	9-988-158-01	5P
CN4	9-988-159-01	8P
CN5	9-988-160-01	36P
CN6	9-988-161-01	39P
CN7	9-988-162-01	3P
CN8	9-988-163-01	2P
D1	**8-719-904-21**	**HZ12A1**
D2	**1-806-734-11**	**1S2075**
D3	**8-719-901-42**	**HZ4B2**
D4	**8-719-911-50**	**HZ5C1**
D5	**8-719-102-49**	**RD3.0E-N1**
D6	**9-988-132-01**	**U15B**
D7	**8-719-922-33**	**HZ22-3**
D8	**9-988-133-01**	**S1S3M**
D9	**1-806-734-11**	**1S2075**
D10	**8-719-102-49**	**RD3.0E-N1**
D11	**8-719-100-90**	**RD24E-B2**
D12	**8-719-102-65**	**RD4.7E-N2**
D13	**9-988-133-01**	**S1S3M**
DA	**9-988-135-01**	**DAN601**
DCJ	**9-988-166-01**	**DC IN 6V**

Ref. No.	Parts No.	Description
FL1	**9-988-150-01**	**LPF**
FL2	**9-988-151-01**	**LPF**
IC1	**9-988-140-01**	**MC3456**
IC2	**8-759-201-49**	**TC5565PL-15**
IC3	**9-988-142-01**	**HN613256-PRNT24AE**
IC4	**9-988-144-01**	**HN613128-PRNT24AE**
IC5	**8-759-203-35**	**TC74HC373P**
IC8	**8-759-202-89**	**MC74HC139P**
IC9	**8-759-202-26**	**TC74HC138P**
IC10	**9-988-145-01**	**HD63A03XP**
IC12	**8-759-202-14**	**TC74HC08P**
IC13	**9-988-146-01**	**M54610P**
IC14	**8-759-302-37**	**TC74HC367P**
IC15	**9-988-147-01**	**HA17339**
IC16	**9-988-148-01**	**M54977P**
IC17	**9-988-148-01**	**M54977P**
R1	**1-246-461-46**	**CARBON 330 5% 1/4W**
R2	**1-247-708-11**	**CARBON 470 5% 1/4W**
R3	**1-247-708-11**	**CARBON 470 5% 1/4W**
R4	**1-247-708-11**	**CARBON 470 5% 1/4W**
R5	**1-247-708-11**	**CARBON 470 5% 1/4W**
R6	**1-247-708-11**	**CARBON 470 5% 1/4W**
R7	**1-247-708-11**	**CARBON 470 5% 1/4W**
R8	**1-247-725-11**	**CARBON 10K 5% 1/4W**
R9	**1-247-725-11**	**CARBON 10K 5% 1/4W**
R10	**1-246-537-00**	**CARBON 470K 5% 1/4W**
R11	**1-246-537-00**	**CARBON 470K 5% 1/4W**
R12	**1-249-460-11**	**CARBON 15K 5% 1/4W**
R13	**1-247-717-11**	**CARBON 2.2K 5% 1/4W**

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R22	1-247-725-11	CARBON 10K 5% 1/4W
R23	1-246-461-46	CARBON 330 5% 1/4W
R24	1-247-725-11	CARBON 10K 5% 1/4W
R25	1-247-725-11	CARBON 10K 5% 1/4W
R27	1-246-461-46	CARBON 330 5% 1/4W
R28	1-247-700-11	CARBON 100 5% 1/4W
R29	1-247-717-11	CARBON 2.2K 5% 1/4W
R30	1-247-143-00	CARBON 3.3K 5% 1/4W
R31	1-246-481-00	CARBON 2.2K 5% 1/4W
R32	1-247-163-00	CARBON 22K 5% 1/4W
R33	1-246-497-00	CARBON 10K 5% 1/4W
R34	1-246-505-00	CARBON 22K 5% 1/4W
R35	1-249-469-11	CARBON 100K 5% 1/4W
R36	1-246-485-00	CARBON 3.3K 5% 1/4W
R37	1-247-149-00	CARBON 5.6K 5% 1/4W
R38	1-247-704-11	CARBON 220 5% 1/4W
R39	1-247-704-11	CARBON 220 5% 1/4W
R40	1-247-713-11	CARBON 1K 5% 1/4W
R41	1-246-497-00	CARBON 10K 5% 1/4W
R42	1-246-457-00	CARBON 220 5% 1/4W
R43	1-247-698-11	CARBON 68 5% 1/4W
R44	1-247-696-11	CARBON 47 5% 1/4W
R45	1-247-153-00	CARBON 8.2K 5% 1/4W
R46	1-246-465-00	CARBON 470 5% 1/4W
R47	1-246-473-00	CARBON 1K 5% 1/4W
R48	1-246-481-00	CARBON 2.2K 5% 1/4W
R49	1-246-501-00	CARBON 15K 5% 1/4W
R50	1-246-441-00	CARBON 47 5% 1/4W
R51	1-247-133-00	CARBON 1.2K 5% 1/4W
R52	1-246-473-00	CARBON 1K 5% 1/4W
R53	1-246-441-00	CARBON 47 5% 1/4W
R54	1-246-485-00	CARBON 3.3K 5% 1/4W
RA1	1-231-410-00	RESISTOR ARRAY 10Kx8
RA2	1-231-410-00	RESISTOR ARRAY 10Kx8
RA4	1-231-410-00	RESISTOR ARRAY 10Kx8
RA5	1-231-410-00	RESISTOR ARRAY 10Kx8
RA6	1-231-410-00	RESISTOR ARRAY 10Kx8
RA7	1-231-410-00	RESISTOR ARRAY 10Kx8
SW	9-988-155-01	DIP

Ref. No.	Parts No.	Description
T1	9-988-152-01	SWITCHING
T2	9-988-153-01	SWITCHING
TR1	9-988-136-01	2SD1513
TR2	9-988-136-01	2SD1513
TR3	9-988-136-01	2SD1513
TR4	9-988-136-01	2SD1513
TR5	9-988-136-01	2SD1513
TR6	9-988-136-01	2SD1513
TR7	9-988-137-01	DTA143XF
TR8	9-988-137-01	DTA143XF
TR9	9-988-137-01	DTA143XF
TR10	9-988-137-01	DTA143XF
TR11	9-988-137-01	DTA143XF
TR12	9-988-137-01	DTA143XF
TR13	9-988-137-01	DTA143XF
TR14	9-988-137-01	DTA143XF
TR15	9-988-138-01	DTC143XF
TR16	8-729-384-46	2SA844C
TR17	9-988-137-01	DTA143XF
TR18	9-988-139-01	2SC3420
TR19	8-729-281-52	2SC1815Y
TR20	8-729-281-52	2SC1815Y
TR21	9-988-139-01	2SC3420
TR22	8-729-281-52	2SC1815Y
TR23	8-729-281-52	2SC1815Y
TR24	8-729-281-53	2SC1815GR
VR1	1-230-075-00	VAR, 2K
VR2	1-230-521-11	VAR, 2.2K
X1	9-988-149-01	CERAMIC 4.91MHZ

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Ref. No.	Parts No.	Description
8-2-4. SW Board		
	9-988-168-01	PRINTED CB, SW
CN9	9-988-164-01	8P
CN10	9-988-164-01	6P
D15	**8-719-919-67**	**GL-9PG2**

8-2-5. Frame

S1	**9-988-154-01**	**POWER**

8-3. PACKING AND ACCESSORY

Ref. No.	Parts No.	Description
	1-463-662-11	AC ADAPTOR, AC-T11(AE)
	3-760-439-11	OPERATIN MANUAL(ENGLISH)
	3-760-439-41	OPERATIN MANUAL (FRENCH,GERMAN,SPANISH)
	3-760-439-51	OPERATIN MANUAL (DUTCH,SWEDISH,ITALIAN)
	9-988-087-01	CUSION UPPER
	9-988-088-01	CUSION LOWER
	9-988-090-01	CARTON INDIVIDUAL(AE)

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