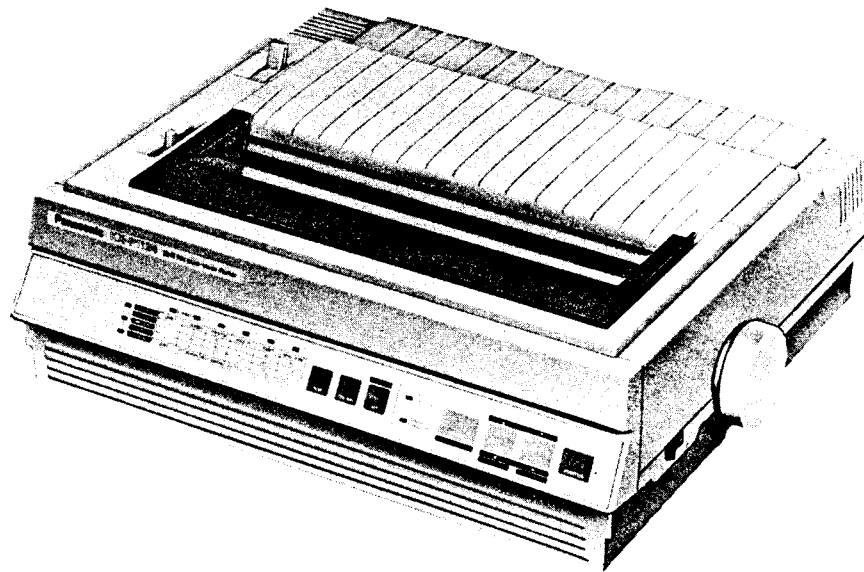


Service Manual

Printer

KX-P1124

Dot Matrix Printer



Panasonic

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


3.2 Function Mode

The function mode is selected by pressing the FUNCTION switch. The ON LINE indicator blinks when in the function mode.

The following functions are selected by using the ROW and COLUMN switches.

When the function is selected, the SET switch enters the function. The COLUMN indicator blinks to show the position of the function, and when SET is pressed, the column indicator lights continuously.

3.2.1 Function Chart

| FUNCTION | ROW | COLUMN | | | | | |
|------------------|---|--|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------------|
| | | <input type="checkbox"/> PGM <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Font | <input type="checkbox"/> ON <input type="checkbox"/>  <input type="checkbox"/>  | Draft | Courier | Prestige | Bold PS | Script | Sans Serif |
| Pitch | <input type="checkbox"/> ON <input type="checkbox"/> ON <input type="checkbox"/>  | 10 cpi | 12 cpi | 15 cpi | 17 cpi | 20 cpi | P.S |
| Page Length | <input type="checkbox"/>  <input type="checkbox"/> ON <input type="checkbox"/>  | 11 inch | 12 inch | 14 inch | 8 inch | 8.5 inch | 11 ² / ₃ inch |
| LPI | <input type="checkbox"/>  <input type="checkbox"/> ON <input type="checkbox"/> ON | 6 lpi | 8 lpi | 3 lpi | 4 lpi | 7.5 lpi | 12 lpi |
| Other | <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> ON | Quiet Mode | Left Margin | Right Margin | Macro#1 | Macro#2 | Macro#3 |
| Print Mode Check | <input type="checkbox"/> ON <input type="checkbox"/> ON <input type="checkbox"/> ON | Present mode can be printed on the paper by pressing the SET switch. | | | | | |

- Note:**
- The PGM (Program) overrides software commands sent to the printer.
 - PS (Proportional Spacing) and draft mode cannot be simultaneously selected. If selected together, the buzzer sounds indicating a mismatch.
 - The quiet mode can only be set and released by repeatedly pressing the SET switch.

3.2.2 Printing Margin

The left and right margin can be set to the desired positions by the following procedure in the function mode:

1. Select the left (right) margin mode.
2. Move the carriage to the desired position by using FF or LF switches.
3. Set the left (right) margin into the memory by pressing the SET switch.

- Note:**
- The COLUMN indicator continues to blink while setting the margin.
 - The margin can also be set through software commands.

3.3 Initial Set Up Mode

The initial set up mode is entered by holding the FUNCTION switch actuated while turning on the printer. The ON LINE indicator blinks signifying the initial set up mode is selected.

The following functions in a 12 row by 6 column grid are selected by using the ROW and COLUMN switches. The SET switch is used to enter the function. After selecting the first 6 rows, pressing the ROW switch causes the ROW indicator to blink, indicating setting of the bottom set of functions.

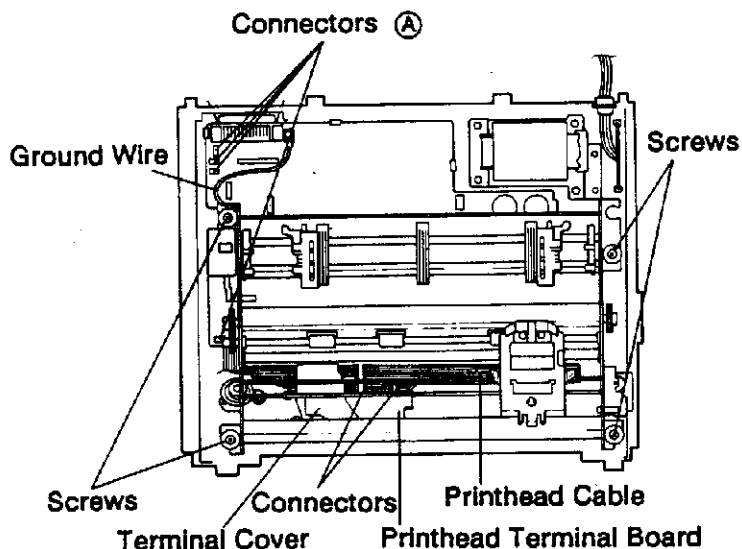
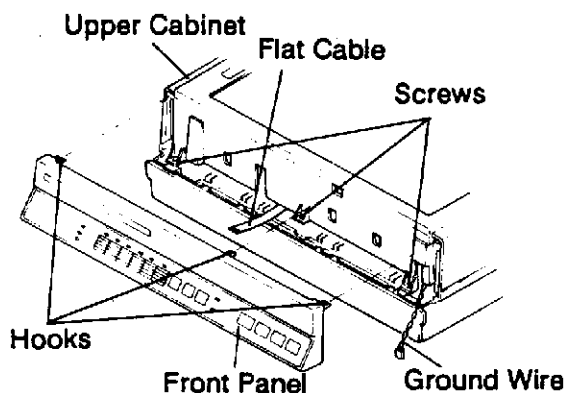
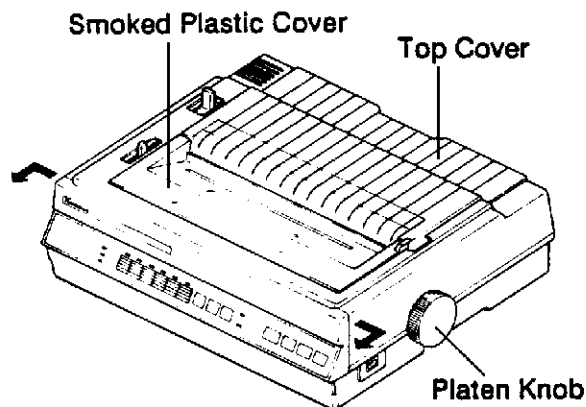
The blinking COLUMN indicator tells the position of the function selected. It stops blinking after pressing the SET switch.

| FUNCTION | ROW | COLUMN | | | | | |
|-----------------------------|---------------------------------------|--|---|------------------------------------|--------------------------|---------------------------|--------------------------------------|
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Emulation | <input type="checkbox"/> | LQ-2500 (EPSON) ITALIC | LQ-2500 (EPSON) GRAPHIC | IBM G1 | IBM G2 | --- | --- |
| | <input checked="" type="checkbox"/> | | | | | | |
| Default Font | <input type="checkbox"/> | Draft | Courier | Prestige | Bold PS | Script | Sans Serif |
| | <input checked="" type="checkbox"/> | | | | | | |
| International Charactor Set | <input type="checkbox"/> | U.S.A. | France | Germany | England | Denmark 1 | Sweden |
| | <input checked="" type="checkbox"/> | | | | | | |
| International Charactor Set | <input type="checkbox"/> | Italy | Spain 1 | Japan | Norway | Denmark 2 | Spain 2 |
| | <input checked="" type="checkbox"/> | | | | | | |
| Print Mode Check | <input type="checkbox"/> | Latin America | Print Direction | Skip Perforation | Auto LF | Auto CR | P.O Detect On |
| | <input checked="" type="checkbox"/> | | | | | | |
| Print Mode Check | <input type="checkbox"/> | Present mode can be printed on the paper by pressing the SET switch. | | | | | |
| Serial Interface Baud Rate | <input type="checkbox"/> | Download Buffer (with 32K ROM) | Cut Sheet Feeder Load | Buzzer On | Zero Slash Off | Alternate Graphic Mode On | Data Length ON=7 bit OFF=8 bit |
| | <input checked="" type="checkbox"/> | | | | | | |
| Serial Interface Baud Rate | * <input type="checkbox"/> | No Applications Area | | | | | |
| | * <input checked="" type="checkbox"/> | 150 | 300 | 600 | 1200 | 2400 | 4800 |
| Protocol | * <input type="checkbox"/> | 9600 | --- | No Parity | Ignore Parity | ODD Parity | EVEN Parity |
| | * <input checked="" type="checkbox"/> | | | | | | |
| Protocol | * <input type="checkbox"/> | Protocol ON=XON/OFF OFF=DTR | R.Buffer ON=288 byte OFF=152 byte | S.Polarity ON=Space OFF=Mark | --- | --- | --- |
| | * <input checked="" type="checkbox"/> | | | | | | |
| Print Mode Check | * <input type="checkbox"/> | Present mode can be printed on the paper by pressing the SET switch. | | | | | |
| Print Mode Check | * <input checked="" type="checkbox"/> | | | | | | |

Note: The bottom 5 functions (*) are functional only with the interface board KX-P23 option.

4. Removal and Replacement Procedures

For safety and to avoid possible damage to electronic components, the AC line cord must be unplugged before disassembly.

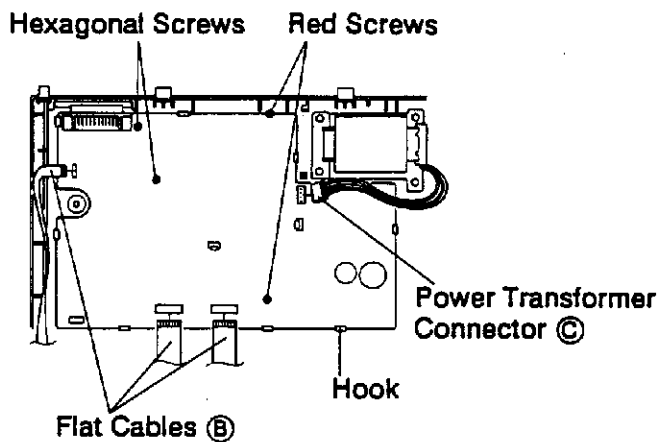


4.1 Covers

1. Remove the smoked plastic cover and the top cover.
2. Release 3 hooks by pulling the front panel upper side.
3. Unplug the flat cable and ground wire from the front panel and remove the front panel.
4. Remove the screws (3) from the upper cabinet.
5. Remove the platen knob.
6. Raise the front of the upper cabinet, and release the hooks (4) located at its rear side and remove the upper cabinet.

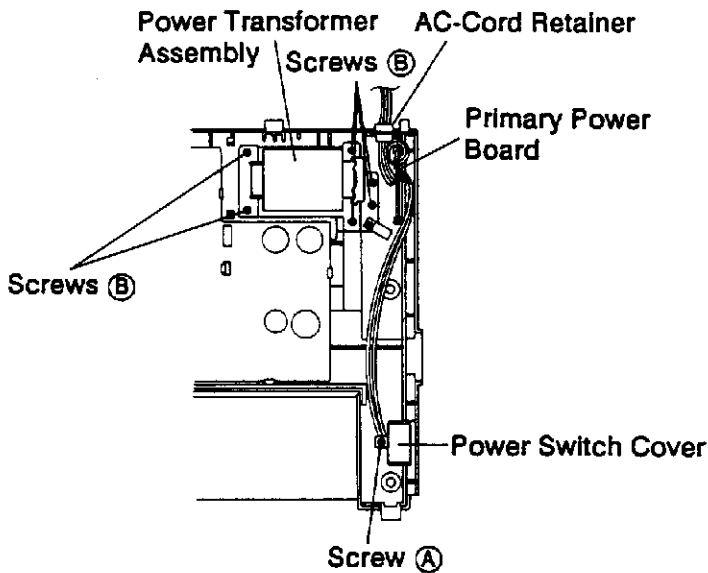
4.2 Printing Mechanism

1. Move the carriage to the right side of the chassis.
2. Remove the ground wire from the left side of the chassis.
3. Remove the screws (4).
4. Remove the terminal cover from the paper slot upper cover.
5. Unplug the 2 printhead cables from the connectors on the printhead terminal board.
6. Lift the left side of the chassis, and unplug the connectors (A) from the main board under the chassis.
7. Hold both sides of the chassis frame and carefully lift off the printing mechanism from the lower cabinet.



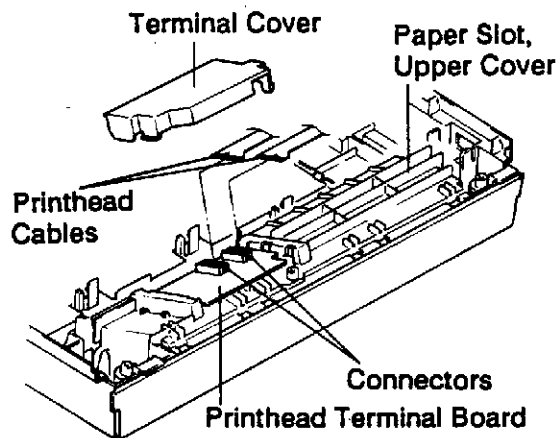
4.3 Main Board

1. Unplug the 3 flat cables (B) from the main board.
2. Unplug the power transformer connector (C) from the main board.
3. Remove the 2 red screws and 2 hexagonal screws.
4. Remove the main board by releasing the 10 hooks starting from right to left.



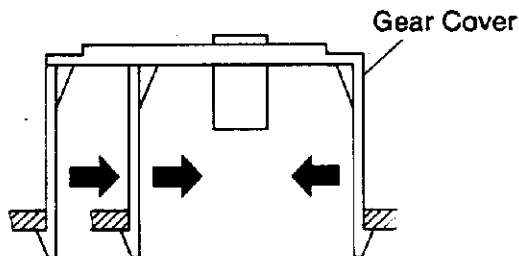
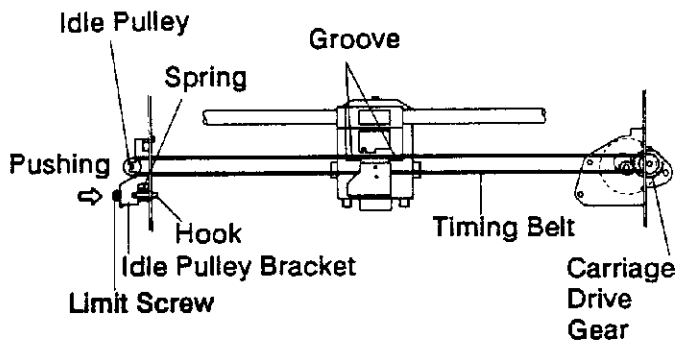
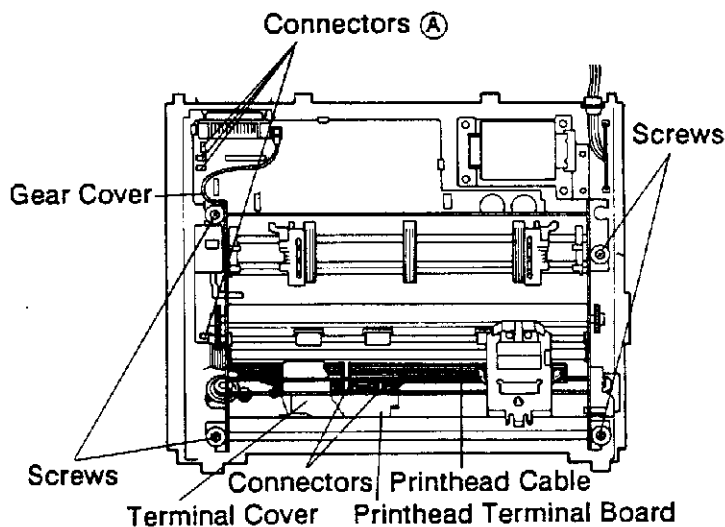
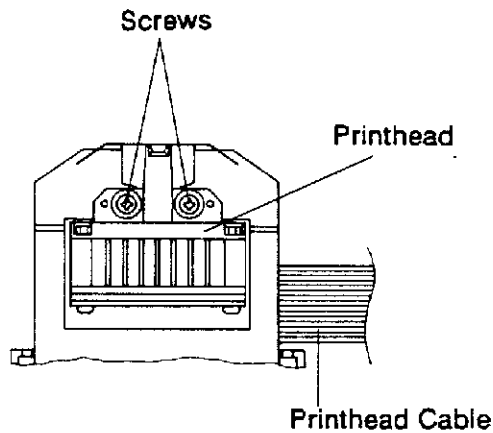
4.4 Power Transformer Assembly

1. Remove screw (A) and the power switch cover from the lower cabinet.
2. Remove the AC-cord retainer and the primary power board from the lower cabinet.
3. Remove the 6 screws (B).
4. Remove the power transformer assembly.



4.5 Printhead

1. Move the carriage to the right side of the chassis.
2. Remove the terminal cover from the paper slot upper cover.
3. Carefully unplug the 2 printhead cables from the connectors on the printhead terminal board.



4. Remove the 2 screws from the printhead.
5. Carefully remove the printhead with the 2 print head cables.

Note: The printhead cable cannot be separated from the printhead.

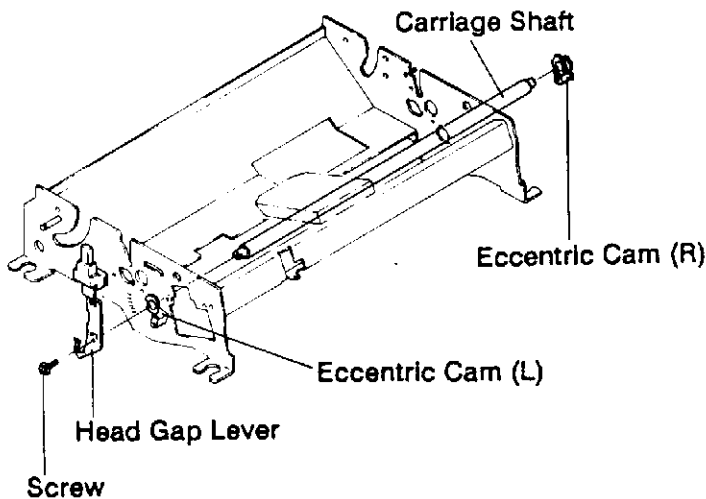
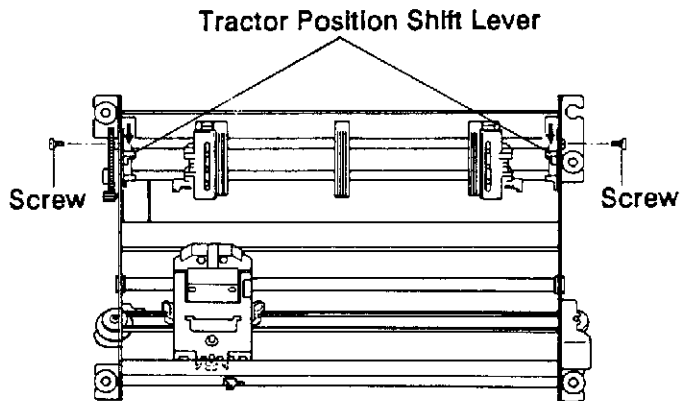
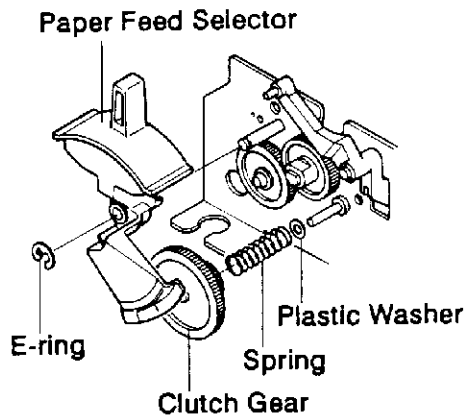
Note: When the printhead is installed, make sure that the head gap is correct.

4.6 Timing Belt

1. Move the carriage to the right side of the chassis.
2. Remove the ground wire from the left side of the chassis.
3. Remove the screws (4).
4. Remove the terminal cover from the paper slot upper cover.
5. Unplug the 2 printhead cables from the connectors on the printhead terminal board.
6. Lift the left side of the chassis, and unplug the connectors **A** from the main board under the chassis.
7. Remove the chassis from the lower cabinet, and turn over the chassis.
8. Fully loosen the screw on idle pulley bracket.
9. Remove the timing belt from the carriage drive gear while pushing the idle pulley bracket.
10. Release the bracket hook from the side frame then remove the bracket, idle pulley and the spring.
11. Remove the timing belt from the idle pulley.
12. Remove the gear cover by releasing the 4 cover hooks.
13. Pull out the timing belt from the groove and remove it.

Note: When the timing belt is replaced, move the carriage to the left and then to the right to make sure there is no binding in the belt and ribbon feed is normal.

Note: When installing the limit screw, the top of screw must be flush and then turned one time against the chassis frame.



4.7 Tractor Assembly

1. Remove the E-ring from the paper feed selector shaft.
2. Carefully remove the paper feed selector, clutch gear, spring and plastic washer.

Note: If the paper feed motor pinion has a flange, the clutch gear, spring, and plastic washer are not removable.

3. Remove the 2 screws from the both sides of the tractor assembly.
4. Pinch the tractor position shift levers, and remove tractor assembly upward.

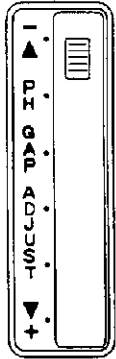
4.8 Carriage Shaft

1. Remove the head gap lever (1 screw).
2. Position the eccentric cam (R) to its opening by pulling the knob part and turning cam clockwise and remove it.
3. Carefully slide out the carriage shaft to right.
4. Set the eccentric cam to previous position when reinstalling the eccentric cam (R).

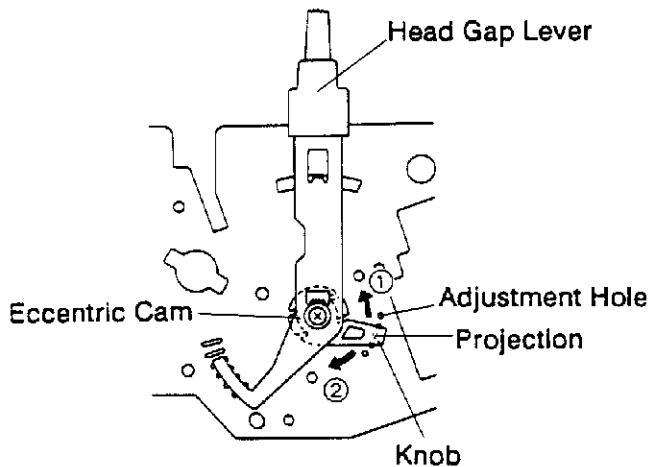
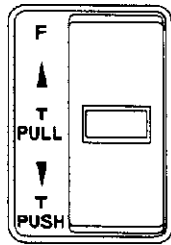
Note: When the carriage shaft is installed, ensure that the head gap is correct.

5. Adjustment

Head Gap Lever

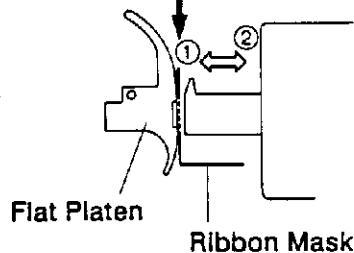


Paper Feed Selector



0.45mm Gauge
(does not pass)

0.4mm Gauge
(does pass)



5.1 Head Gap

1. Move the carriage to the center position of the flat platen, and loosen two head fastening screws.
2. Set the head gap lever to the single sheet position.
3. Set the paper feed selector to the "T PULL" position.
4. Set the both of eccentric cams to the center adjustment hole.
5. Insert a flat spacer approximately 0.25mm thick (about 2 sheets of paper) between ribbon mask and flat platen, gently push the printhead towards the platen, tighten two head screws, and remove spacer.

Note: When sliding the head to the platen, the rear side of the carriage must be flushed on surface of carriage guide plate.

6. Adjust the gap between the flat platen and the printhead for a clearance of 0.4mm-0.45mm by turning both side eccentric cams.

Upward movement decreases the head gap clearance, and downward movement increases the head gap clearance.

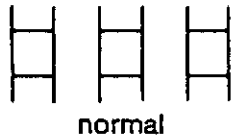
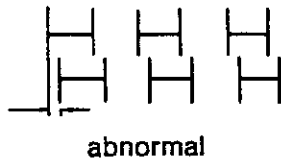
Note: The projection of the eccentric cam is released from the adjustment hole by pulling the knob part of the eccentric cam. Then, the eccentric cam is turned for the head gap adjustment—one step causes 0.035 mm movement. After adjustment, ensure that the projection is fitted in the hole.

Note: Use only a round wire feeler gauge of the specified dimension for this adjustment.

Note: The head gap adjustment is required when replacing the head, flat platen, carriage, carriage shaft and eccentric cams.

5.2 Print Timing

This adjustment is used for 6 different speeds. The print timing is adjusted using the following procedure:



1. Turn on the power switch while holding the FF switch actuated.
2. Select the print speed by pressing the COLUMN switch, and print the "H" pattern by pressing the SET switch.

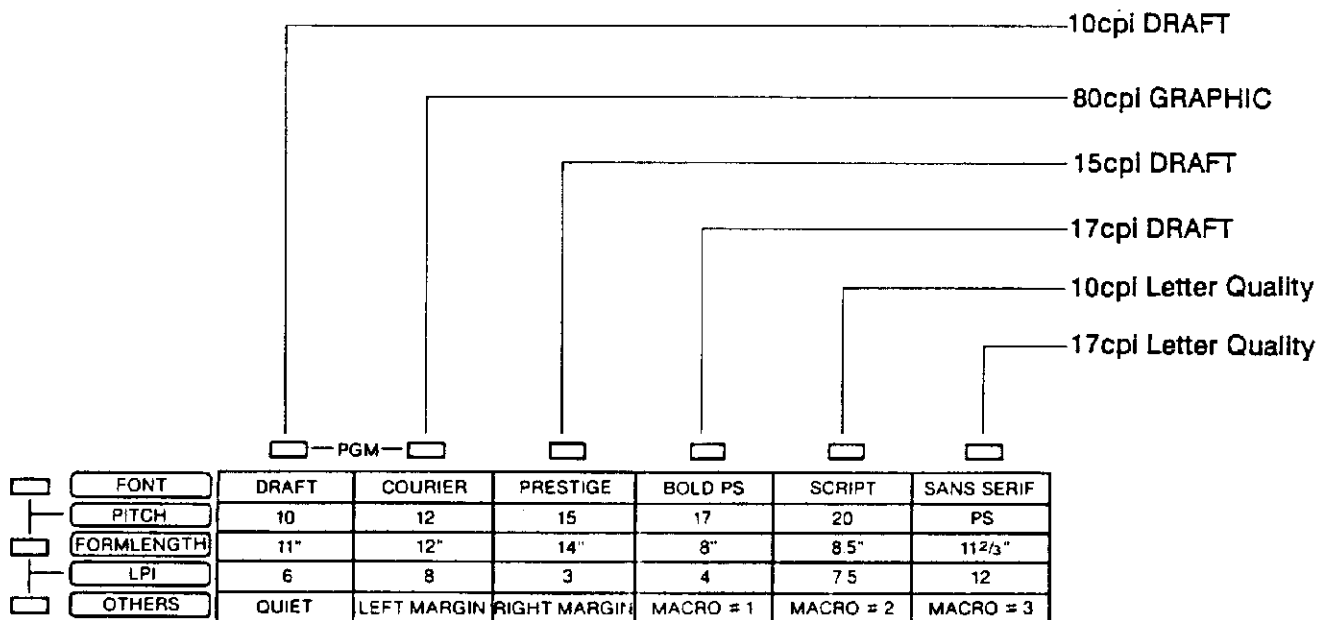
Note: The "H" pattern is printed for 4 full lines for each speed.

3. Check the print timings comparing the "H" pattern from line to line.
4. If the print timing is misaligned, adjust it by using the LF (Move to right) and FF (Move to left) switches and retry the printing for a final check.

Note: Pressing switch moves the line to move in 1/2160 inch increments.

5. Press the FUNCTION key to save the print timing into memory. The printer shifts to the normal print mode.

Note: If the second line of the "H" pattern is shifted by more than half of an "H" character, check the printing mechanism is normal before starting adjustment.



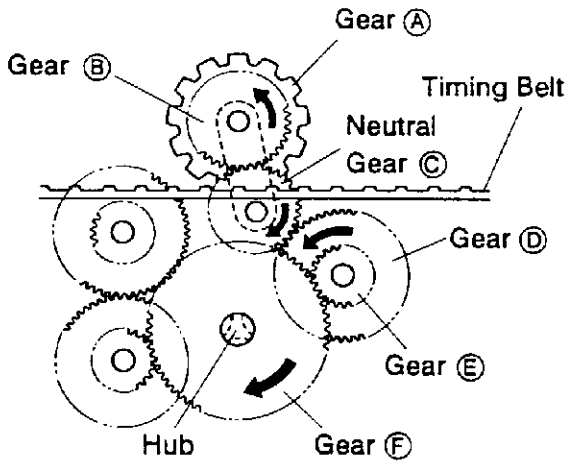


Fig. 1 (Bottom View)

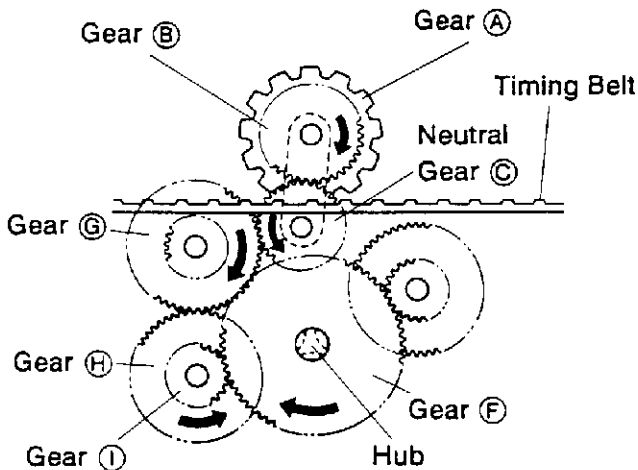
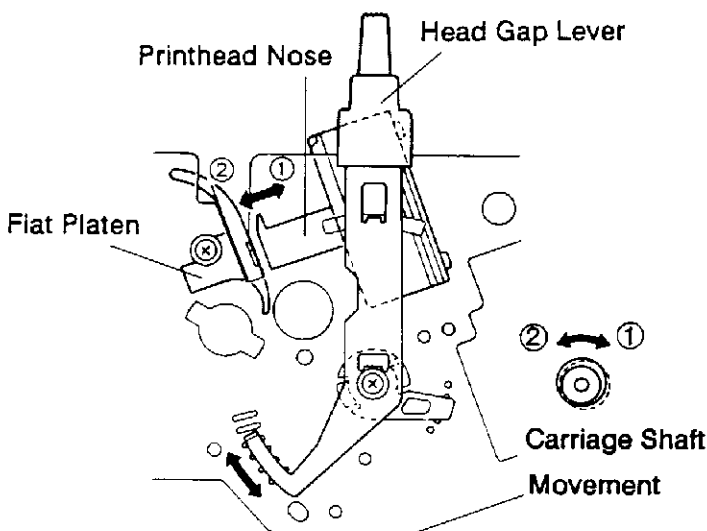


Fig. 2 (Bottom View)



6.1.4 Ink Ribbon Cassette Drive Mechanism

This function performs the ribbon feed operation in accordance with the movement of the carriage. The ink ribbon cassette drive mechanism is shown in Figures 1 and 2.

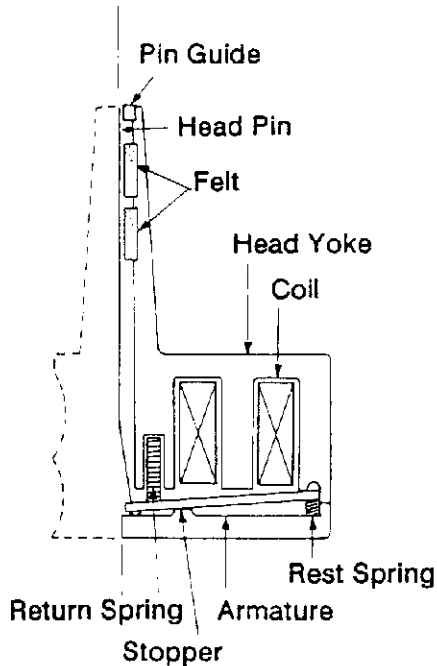
This mechanism gives uniform ribbon feed regardless of the direction of the carriage movement. It consists of the timing belt, gear A, gear F with the ribbon feed hub and 7 gears.

When the carriage moves to the right (Fig.1), the timing belt via gears A and B turns the neutral gear C clockwise round gear B, and then engages with neutral gear C to gear D which turns gear F with the hub clockwise via gear E.

When the carriage moves to the left (Fig.2), the timing belt via gears A and B turns neutral gear C counter-clockwise round gear B, and then engages with neutral gear C to gear G which turns gear F with the hub clockwise via gears H and I.

6.2 Copy Number Selection

Selection for the number of copies is made by changing the distance between the flat platen and the printhead nose tip. When the head gap lever is operated, the carriage shaft revolves, moving the carriage forward or backward.



6.3 Printhead

The printhead utilizes 24 electromagnets as a driving source, which causes the pins to strike through the ink ribbon against the flat platen onto the typing paper for matrix printing.

The construction of the printhead is shown below.

6.3.1 Power Transmission Mechanism

The 24 electromagnets set consists of a one piece yoke and a 24 coil assembly. The armature which secures the pins is supported by this yoke.

6.3.2 Printhead Pin Operation

When a coil assembly is excited by a print signal, the armature is drawn in, and the pin secured by the armature is guided by the various guides to move in the direction of the platen. The pin strikes through the ribbon to the paper. Next the return spring moves the armature and pin from the platen back to the rest position.

6.4 Paper Feed Mechanism

A DC pulse motor is used as a paper feed motor. Both continuous paper and single sheet can be fed by operating the paper feed selector. Continuous paper is loaded on both left and right sides of the pin belt on the tractor drive device. Continuous paper is fed from the bottom or rear of the printer. Single sheet is fed from the front of the printer.

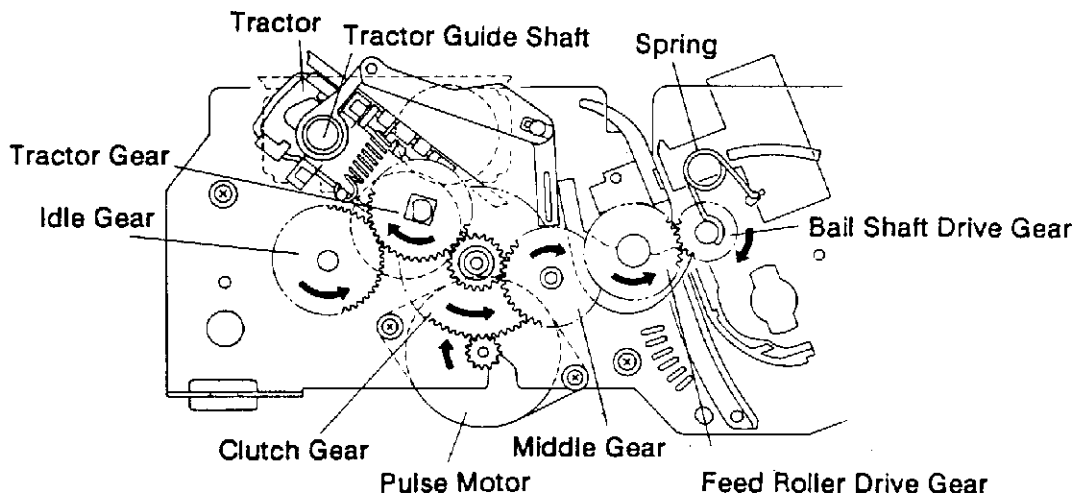
The paper feed mechanism is shown below.

6.4.1 Power Transmission Mechanism

Rotation is transmitted from the pulse motor to the clutch gear which turns the middle gear and tractor gear or idle gear clockwise. The clutch gear engages with the middle gear which turns the bail shaft drive gear via the feed roller drive gear, thus the friction roller and paper feed bail roller are turned.

By operating the paper feed selector, the clutch gear is released from the tractor gear or idle gear, thus preventing the tractor gear or idle gear from turning for the friction paper feed mode.

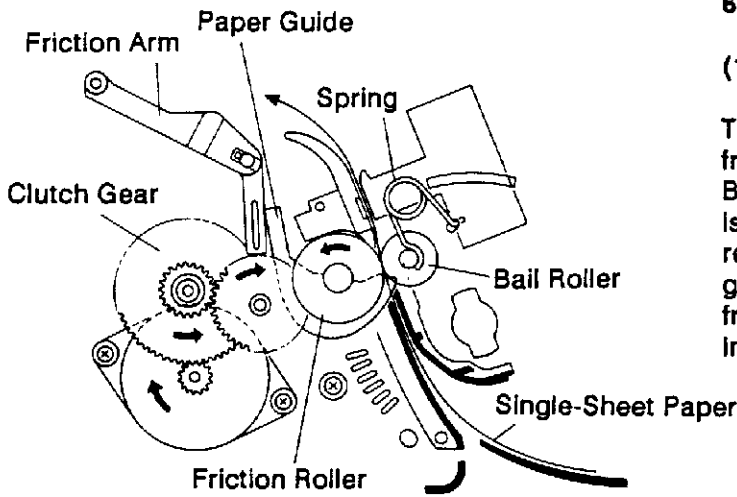
The tractor drive device with the tractor gear and idle gear can be turned around the tractor guide shaft and can be latched at the push- and pull-tractor paper feed positions.



6.4.2 Paper Feed Mode

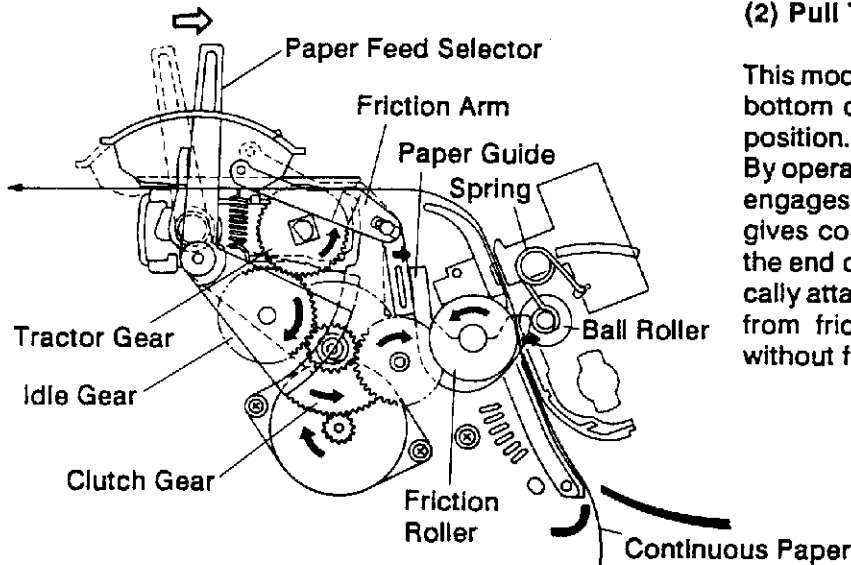
(1) Friction Paper Feed Mode

This mode is for feeding single-sheet paper from the front of the printer in the friction paper feed position. By operating the paper feed selector, the clutch gear is disengaged from the tractor gear and friction arm releases the spring loaded ball roller via the paper guide and ball roller shaft to apply pressure to the friction roller. This enables paper gripping and feeding with rotation.



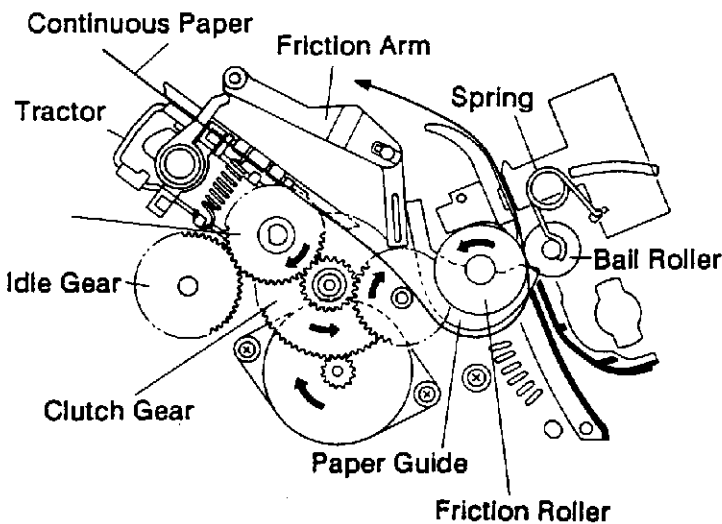
(2) Pull Tractor Paper Feed Mode

This mode is for feeding a continuous paper from the bottom of the printer in the pull tractor paper feed position. By operating the paper feed selector, the clutch gear engages with the tractor gear via the idle gear which gives counter-clockwise rotation to the tractor and the end of friction arm pushes paper guide mechanically attached to ball roller shaft to release ball roller from friction roller. This enables paper passing without friction.

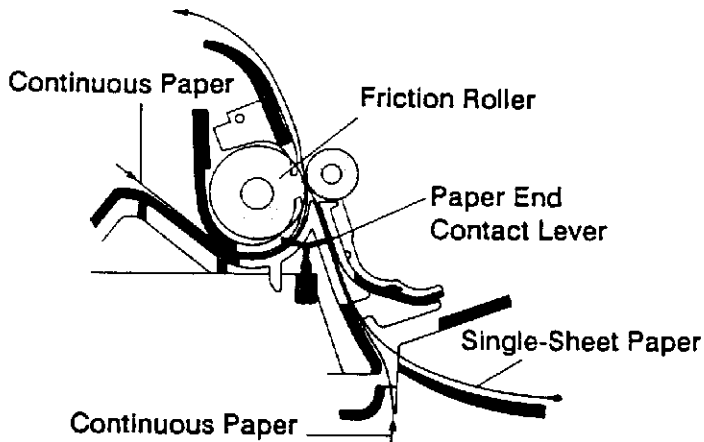


(3) Push Tractor Paper Feed Mode

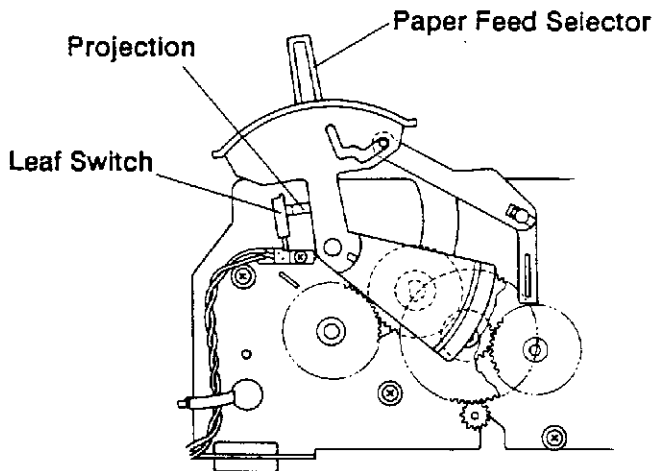
This mode is for feeding a continuous paper from the rear of the printer by combination of tractor device and friction paper feed mechanism in the push tractor paper feed position. By operating the paper feed selector, the clutch gear engages with the tractor gear to permit tractor rotation and friction arm releases the spring loaded ball roller via the paper guide and ball roller shaft to apply pressure to the friction roller.



6.5 End of Paper Detector



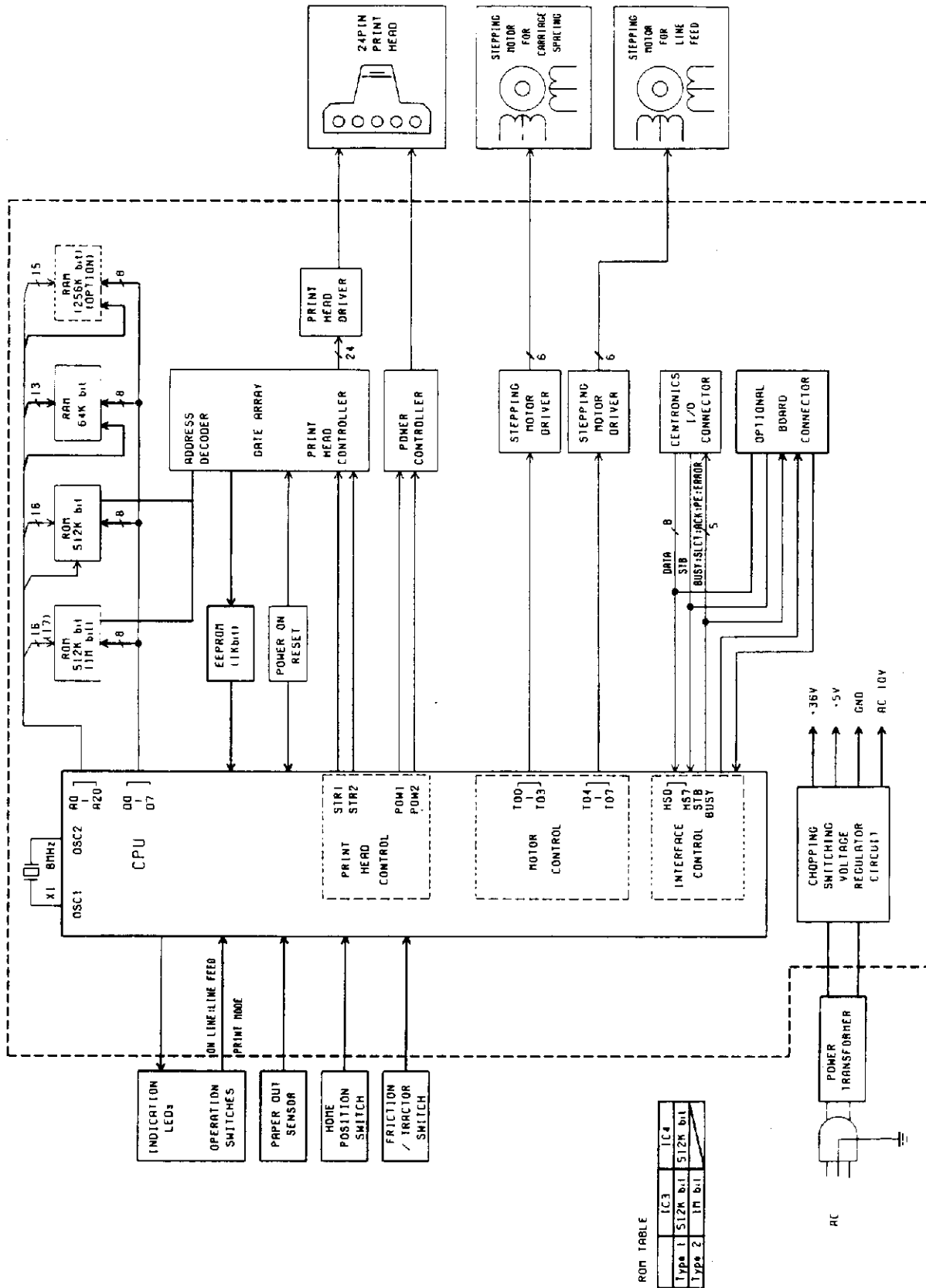
A photo interrupter is used for detecting the paper out of continuous paper and single sheet feed. It is located under the friction roller. While feeding the paper, the contact lever touches on surface of paper and when paper is out, the contact lever shuts off the photo-interrupter by breaking light beam.



The leaf switch located on rear side of the paper feed selector is used to notify the function of tractor feed and friction feed. When the paper feed selector is shifted to friction mode, the projection of paper feed selector pushes leaf switch to position as friction mode.

This leaf switch does not function at pull tractor position.

7. Electronic Circuit Block Diagram



ROM TABLE

| Type | IC3 | IC4 |
|--------|----------|----------|
| Type 1 | 512K bit | 512K bit |
| Type 2 | 1M bit | |

8. Electronic Circuit Descriptions

8.1 Principle of Operation

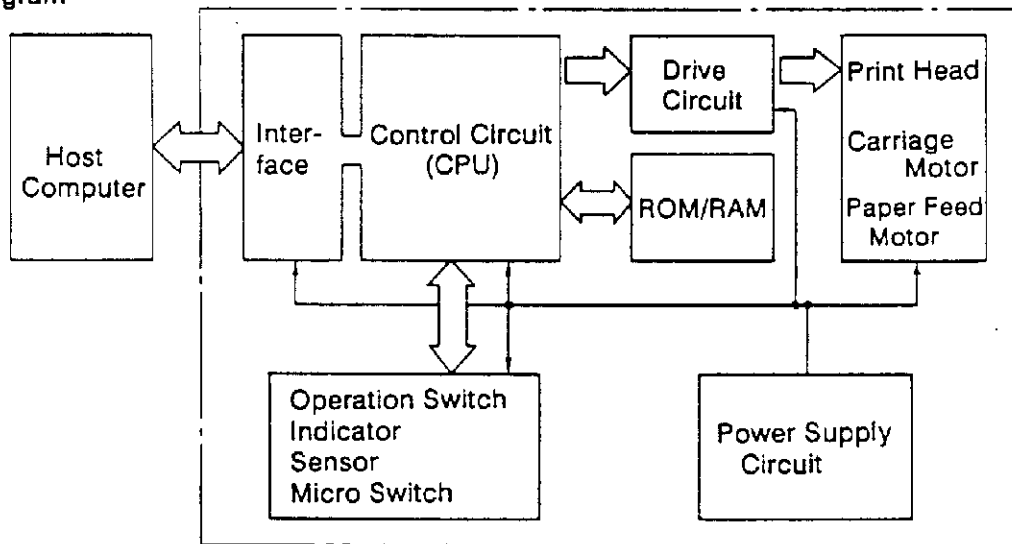
In this chapter, the basic operation of the electronic circuitry of the KX-P1124 multi mode printer is explained.

The KX-P1124 has two switches and one sensor. The home position switch sets a reference for the carriage and is necessary for aligning the first print position. The Friction/Tractor switch detects the way of paper-feed by Friction or Tractor. The paper out sensor is for detection of paper end, and prevents printing operation when the printer is out of paper.

The printer has three drive circuits; carriage spacing motor, paper feed motor and printhead.

The control panel is composed of switches and LEDs which indicate the various states of the printer.

Logic Diagram

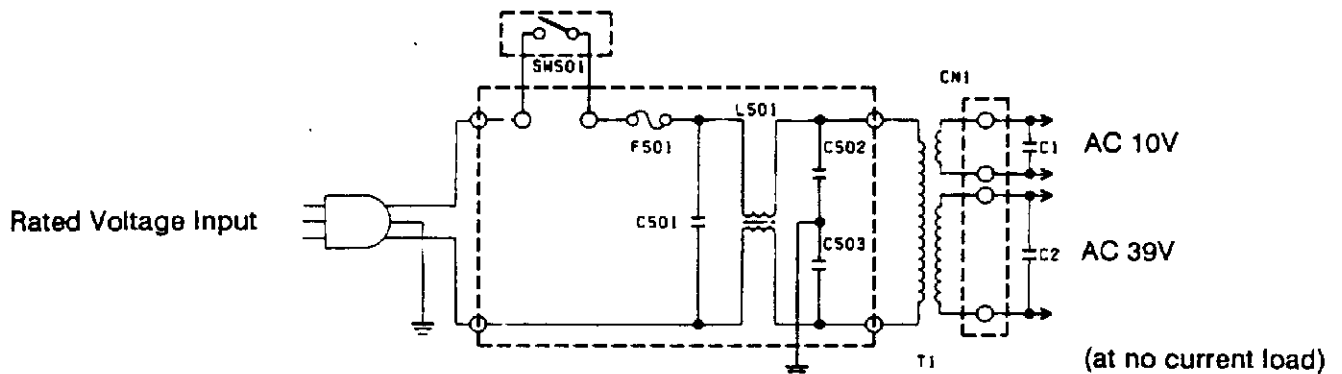


8.2 Circuitry

8.2.1 Power Supply Block

(1) Power and Filter Block

The fuse and filters are attached to a single printed circuit board. Primary power enters the power switch and passes through fuse F501. Absorption capacitors (C501, C502 and C503) together with choke(L501), located near the primary transformer, prevent noise from entering the circuit from the power source and prevent noise from leaving the printer to the power source. As a result, the printer's digital circuitry operates very stably, unaffected by line noise and prevents printer noise from affecting the outside power source.

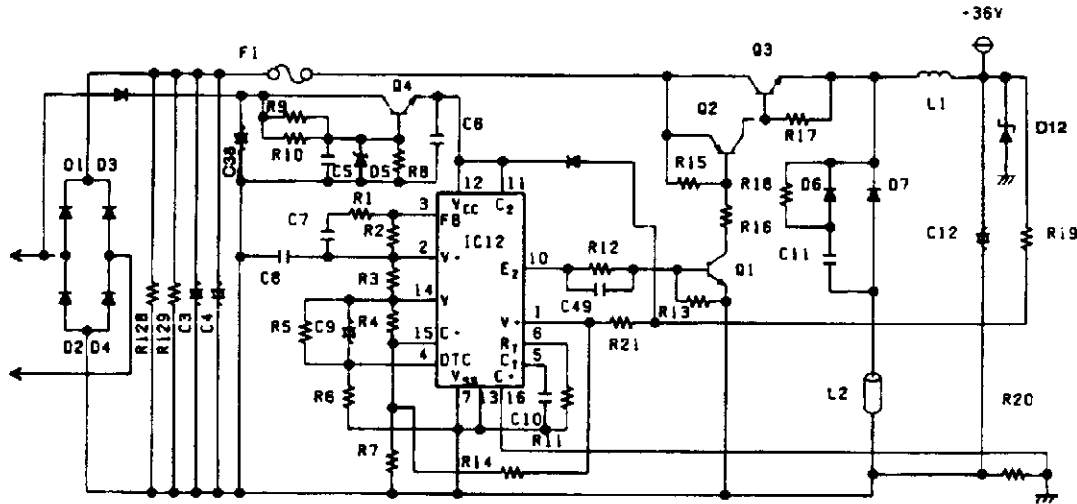


(2) Power Circuitry

(a) 36V Switching Regulator Circuit

The AC 39V, provided from secondary transformer, is rectified by a bridge circuit (consisting of D1, D2, D3, D4) and a stabilized DC voltage (36V) is provided. IC12(494) is a fixed frequency, pulse width modulation control circuit designed for switching mode power supply control.

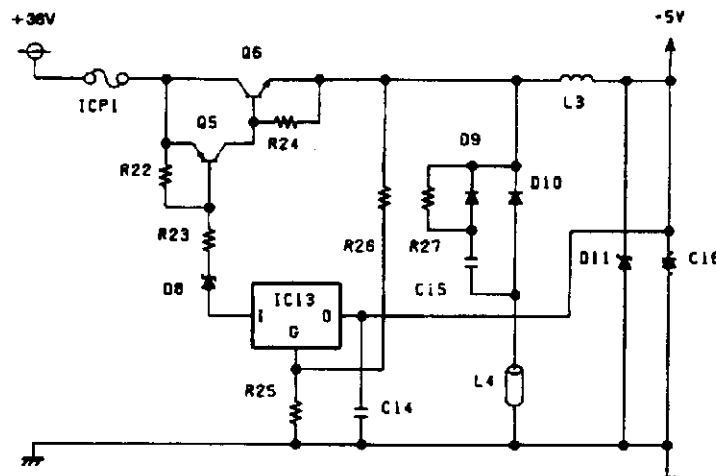
Pin ⑫ is the "Vcc" input terminal and the circuit consisting of R9, R10, D5 and Q4 provides about DC +20V. Pin ⑭ is the "reference voltage" output terminal which provides DC+5V. The switching frequency is determined by resistor R11 (connected with pin ⑥) and capacitor C10 (connected with pin ⑤). Usually, pin ④ is used for "DEAD TIME CONTROL", but in this circuit it is used for "SOFT START" when it is power on.



(b) 5V Switching Regulator Circuit

5V is provided by switching 36V. Usually IC13 is used as a "Series Regulator". But in this circuit, IC13 is used as a switching control circuit with reference voltage, 5V. The principle of switching is same with that of circuits which use IC12. When the output voltage of IC13 is less than the reference voltage, Q6 turns on, and when it reaches limit voltage, Q6 turns off.

The fixed voltage, about 5V is retained by repeating this operation. The switching frequency is determined by resistors R25 and R26. It is about 30KHz at 0.5A load.



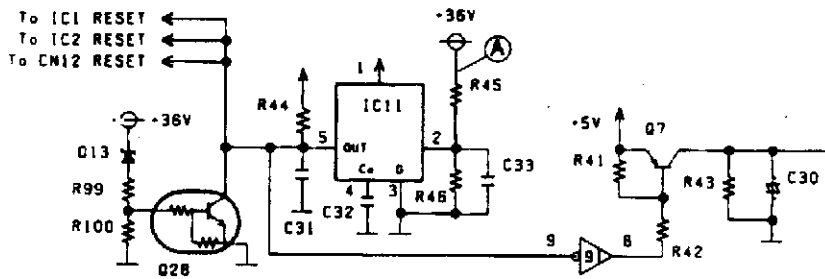
8.2.2 Reset Circuit

The reset circuit is provided to initialize the single chip CPU [MN18801A(IC1)] and the gate array(IC2). About 30 msec after the voltage (A) reached at approximately 25V, the reset terminal changes from L to H. In the initial power-on state, capacitor C32 is not charged, and IC11 pin (5) (out) is at the L level. About 30 msec after stabilization of the +5V, IC11 pin (5) changes from L to H. The output of this kind of delay circuit is impressed on IC1 and IC2 and the reset operation is performed.

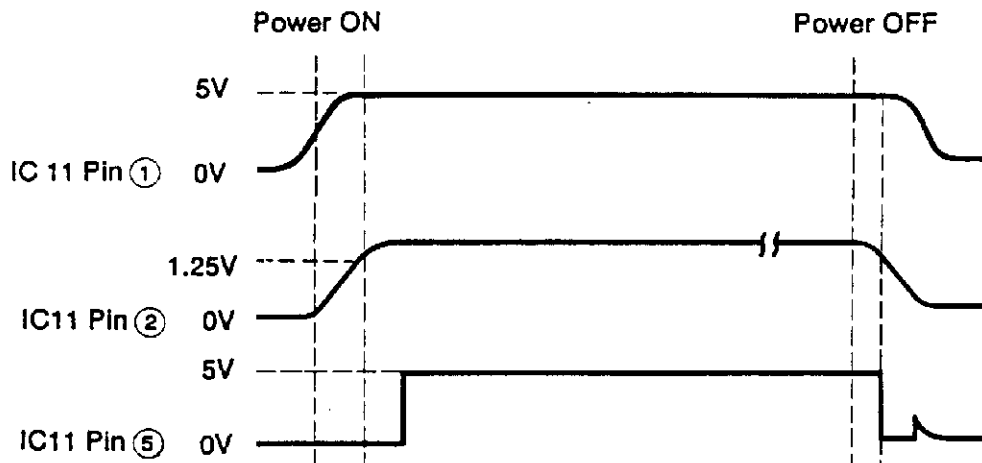
The output of IC11 is at the L level when the voltage drops, such as at current OFF times, causing the charge accumulated on C32 to be quickly discharged.

Since the CPU cannot control the printhead, carriage motor or paper feed motor during the reset pulse, each drive transistor array's base is fixed at the L level, by Q7 through RA8, RA10 and RA11 in order to prevent these components from moving.

When Q3 is shorted by an accident, D13, R99 and R100 detect over-voltage and Q28 turns on and the reset terminal changes H to L.



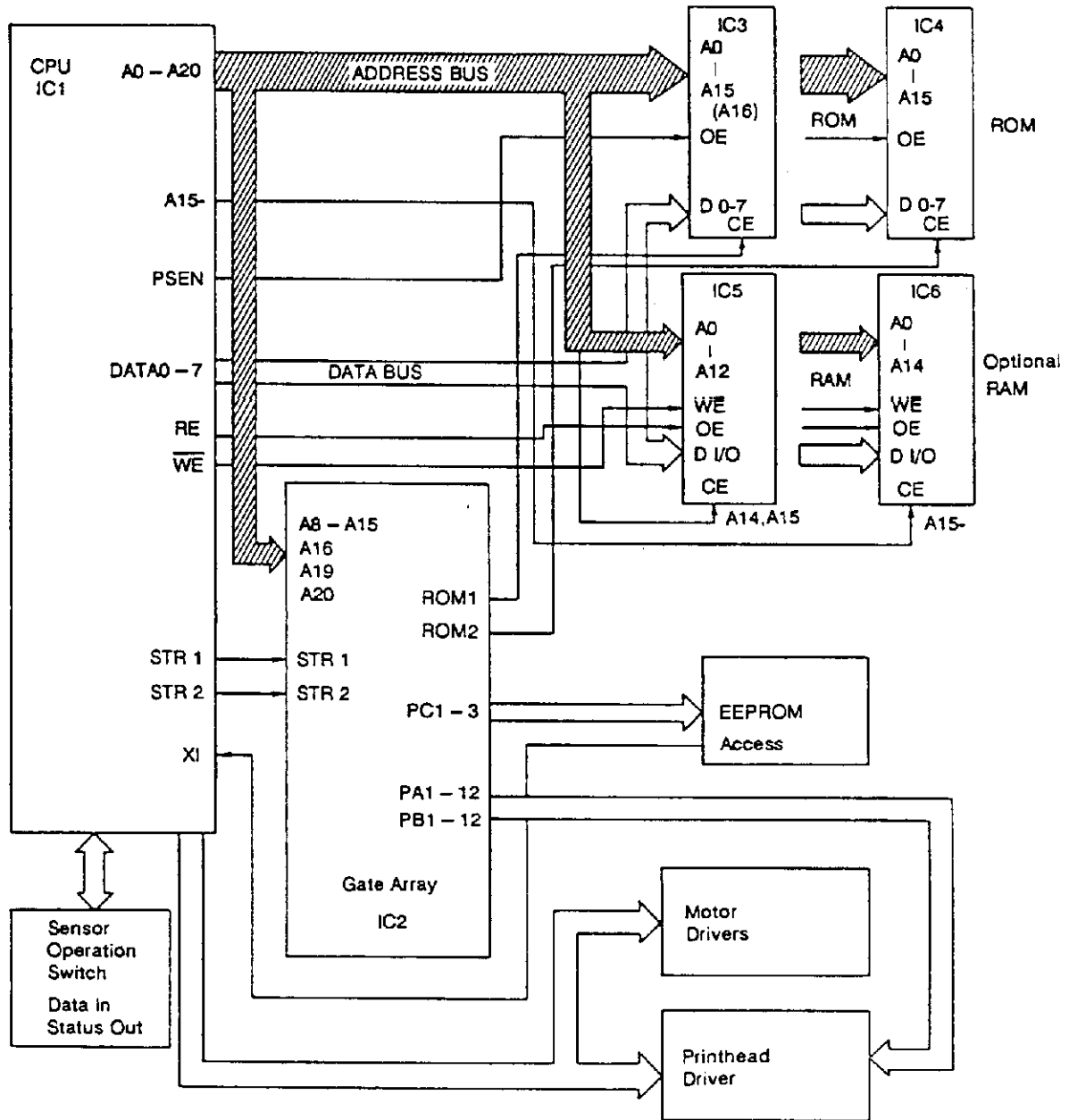
Timing Chart



8.2.3 CPU, Gate Array and Peripheral Circuit Block

(1) This block diagram consists of the CPU(IC1), Gate Array(IC2), ROM(IC3,4), RAM(IC5) and optional RAM(IC6). It receives the data from the host computer, processes the input from the printhead over-heat sensor and operation switch and controls the carriage, paper feed motors and the printhead.

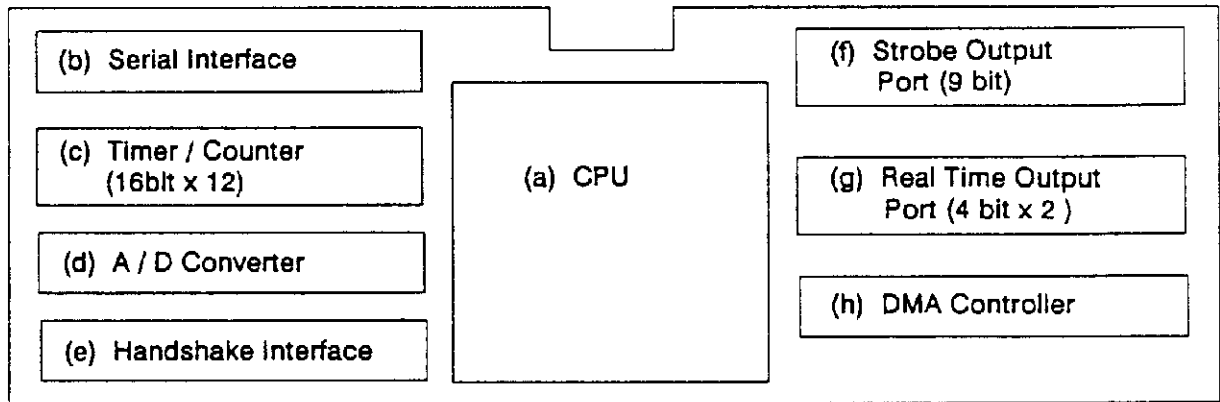
ROM contains the operation program, which controls data processing and mechanical function and the character generator, which determines the appearance of the characters.



Note: IC4 is vacancy when IC3 (1M bit ROM) is mounted.

(2) CPU Functions

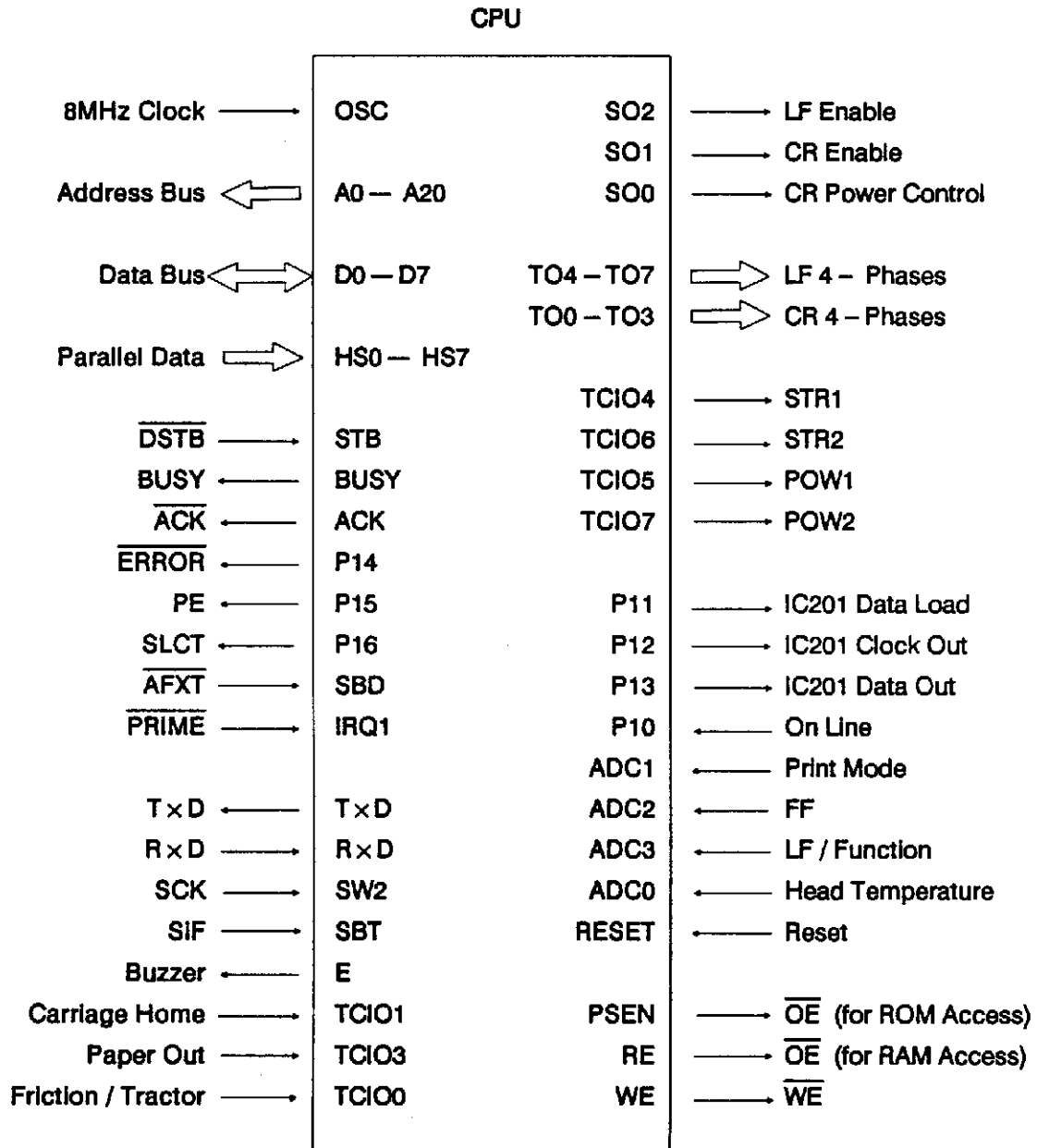
MN18801A Block Diagram



- (a) CPU
This block mainly consists of the Program Counter, Arithmetic Logical Unit, and Instruction Decoder. This block fetches the program from the ROM, decodes the instructions, and processes it accordingly.
- (b) Serial Interface
This block supports a serial communication interface (synchronous and asynchronous). This block also has a baud rate generator of up to 9600 baud.
- (c) Timer/Counter
This block consists of twelve 16-bit timers. They are used for generating the timing for the printhead and carriage motor.
- (d) A/D Converter
In this CPU, 8 bits/4 channel A/D Converters are prepared. In this model, one channel is used for sensing the overheat of the printhead and other channels are used for input of switches.
- (e) Handshake Interface
In this CPU, the Centronics Parallel interface (usually called Handshake Interface) is prepared. The busy signal to the host computer is generated automatically when receiving the DSTB (data strobe) signal. And the acknowledge signal is also generated automatically when the busy signal turns to L level (Ready state).
- (f) Strobe Output Port
Originally this port is used for driving the 9 pins of the print head. But in this model, this port is used as the output port for the motor enable signal.
- (g) Real Time Output Port
In this block, 8 channel real time ports are included. These are used for rotating the motor. Especially 4 channel (TO0—TO3) can drive the motor without software intervention using the DMA function. Software only controls the start and stop of DMA block.
- (h) DMA (Direct Memory Access) Controller
In this CPU, the DMA function is provided. This DMA function is used for driving the carriage motor. During printing operation, the CPU processes a lot of data. To decrease the CPU load, the DMA function controls the carriage motor, receiving the start and stop signal from the DMA block. synchronizing the output of the timer, which determines motor pulse rate, the DMA block fetches the motor driving pattern automatically.

(3) CPU Pin Functions

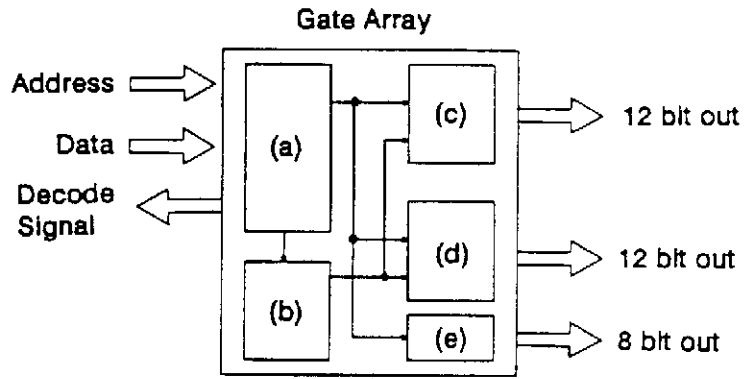
The CPU has total of 100 pins and an 8MHz Input clock. It controls a 128KB ROM, gate array, 8KB RAM, 32KB optional RAM, and an optional interface board. This RAM is used as an input buffer, line buffer, bit image buffer, and download area. The CPU pin functions are as follows. (Refer to page 8-24 for details.)



(4) Gate Array

The gate array(IC2) is a 64 Pin Shrink Dip Package and it consists of five blocks:

- (a) Address Decoder
- (b) Power Controller
- (c) Port A (12Bit)
- (d) Port B (12Bit)
- (e) Port C (8Bit)



Block (a) is the Address Decoder. It is used for access for ROMs.

Block (b) is the Head Drive Power Control.

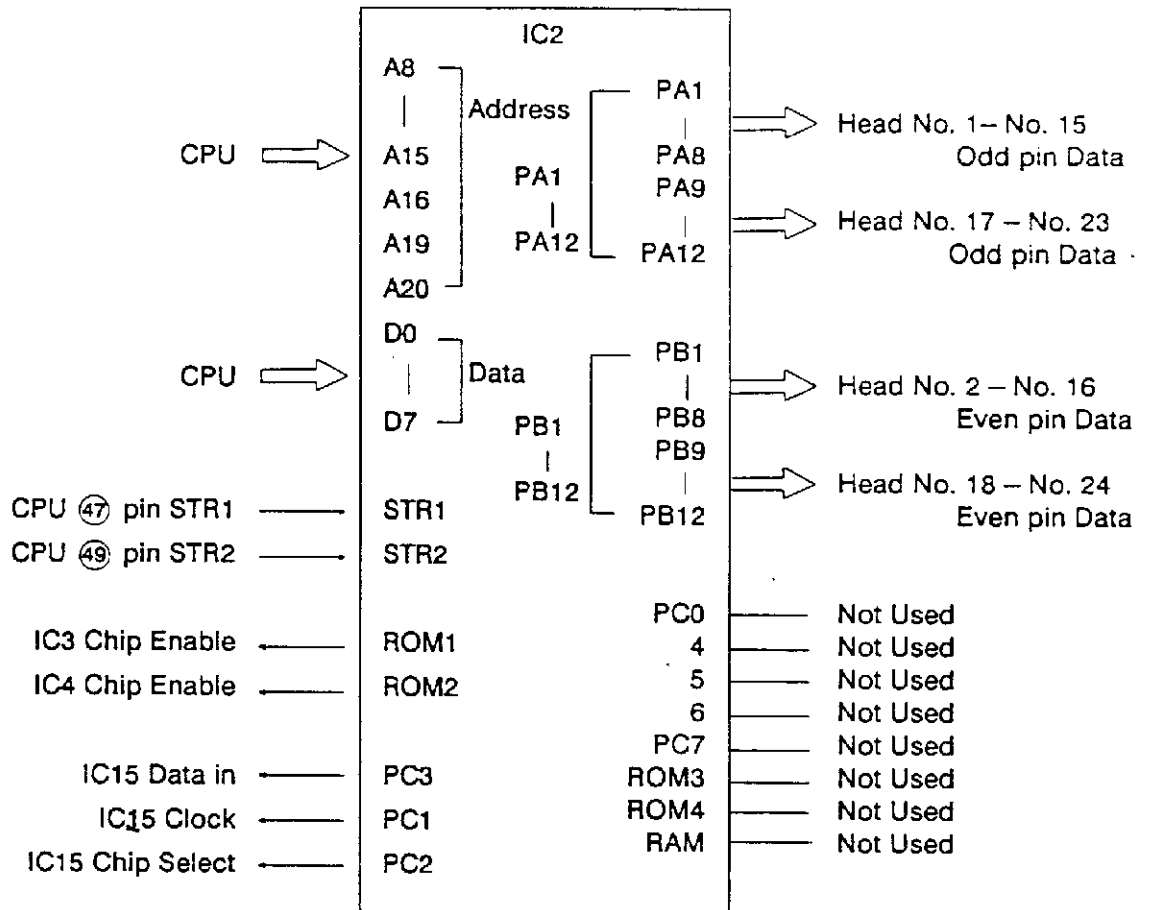
Block (c) is the 12 Bit Output Ports, and Head Data of odd-number pins are output.

Block (d) is the 12 Bit Output Ports, and Head Data of even-number pins are output.

Block (e) is the 8 Bit Output Ports, and 3 of the 8 bits control IC15 and the other bit is not used.

(5) Gate Array Pin Function

The pin functions are as follows.



(6) Chip Select Block

The CPU can access to 128K Byte ROM area and 64K Byte RAM area. The CPU generates PSEN signal for accessing to the ROM and generates RE and WE signals for accessing to RAM and Gate Array. The tables below shows the levels of address signals used to select the corresponding memory area.

ROM Memory Map

Type 1

| Address (DECIMAL) | Address (HEX) | A16 | PSEN | Chip | Description |
|-------------------|--------------------|-----|------|-----------|-------------|
| 0 - 64K | 000000H 00FFFFH | L | L | ROM (IC3) | 64K Byte |
| - 128K | 010000H 01FFFFH | H | L | ROM (IC4) | 64K Byte |

Type 2

| | | | | | |
|----------|--------------------|---|---|-----------|-----------|
| 0 - 128K | 000000H 01FFFFH | X | L | ROM (IC3) | 128K Byte |
|----------|--------------------|---|---|-----------|-----------|

Note: Refer to the Type 1 and Type 2 on the Block Diagram (page 7-1).

RAM Memory Map

| Address(DEC) | Address(HEX) | A15 | A15 | A14 | A13 | A12 | A11 | A10 | A9 | A8 | A7 - A0 | Chip | Description |
|--------------|--------------|-----|-----|-----|-----|-----|-----|----------------|----|----|----------|----------------|-------------|
| 0 | 000000H | H | L | L | L | L | H | L | L | L | X | Not used | 256 Byte |
| 256 | 000100H | | | | | | | Not used | | | | | |
| 512 | 0007FFH | | | | | | | Head Odd 1-8 | | | | | |
| 768 | | | | | | | | Head Even 1-8 | | | | | |
| 1024 | | | | | | | | Head Odd 9-12 | | | | | |
| 1280 | | | | | | | | Head Even 9-12 | | | | | |
| 1536 | | | | | | | | EEPROM | | | | | |
| 1792 | | | | | | | | Not used | | | | | |
| 2048 | 000800H | H | L | L | L | L | H | X | | | Not used | 6K Byte | |
| | 001FFFH | H | L | L | L | L | H | X | | | Not used | | |
| | | H | L | L | L | L | H | X | | | Not used | | |
| 8K | 002000H | H | L | L | H | X | | | | | | Not used | 8K Byte |
| | 003FFFH | H | L | L | H | X | | | | | | Not used | |
| 16K | 004000H | H | L | H | L | X | | | | | | Not used | 8K Byte |
| | 005FFFH | H | L | H | L | X | | | | | | Not used | |
| 24K | 006000H | H | L | H | H | X | | | | | | IC5 | 8K Byte |
| | 005FFFH | H | L | H | H | X | | | | | | IC5 | |
| 32K | 008000H | L | H | X | | | | | | | | IC6 (Optional) | 32K Byte |
| 64K | 00FFFFH | L | H | X | | | | | | | | IC6 (Optional) | |

X: Irrelevant

8.2.4 Parallel Interface Circuit

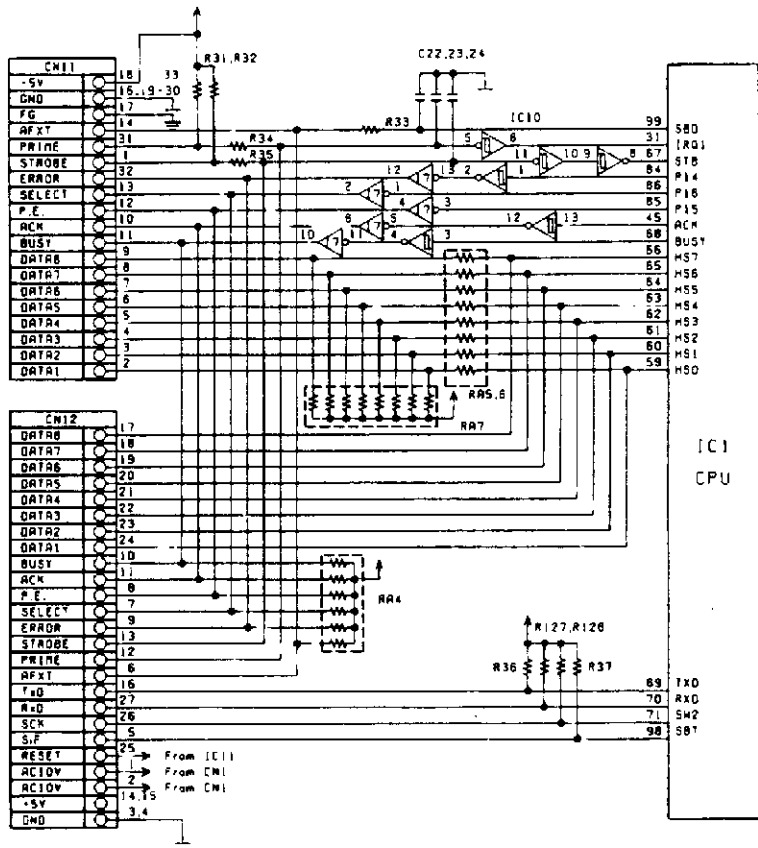
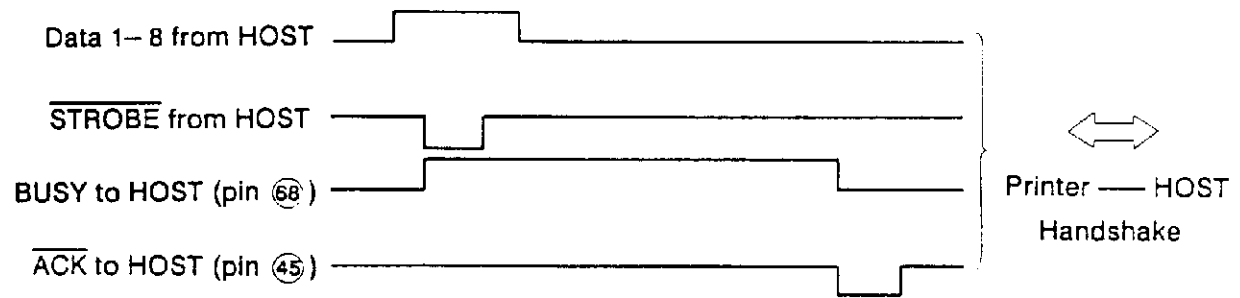
The Interface Block receives data from the host computer and generates the appropriate status signals. The handshake method is described in the following steps.

Process

- (1) A $\overline{\text{STROBE}}$ signal is sent from the host computer and is used to set the internal latch of the CPU. At the same time CPU pin 68 sends a BUSY signal to the host computer through IC7 pin 10.
- (2) The CPU checks the internal latch periodically and checks whether a STROBE is sent or not.
- (3) If a STROBE signal has been sent, the CPU reads the data from HS ports (HS0 – HS7). Then the internal latch is cleared automatically.
- (4) When the BUSY signal disappears, an ACK (Acknowledge) signal is sent to the host computer automatically during the time determined by software.
- (5) The CPU then judges the received data as to whether it is a character code, control code or bit image data and processes the data accordingly.
- (6) The CPU processes another command (for instance; operation switch state check, motor drive during print).

Thus the data received by handshake is accomplished.

Timing Chart



8.2.5 Carriage Motor Drive Block

The Carriage motor is driven by the four signals from T00, T01, T02 and T03, which are shifted 90 degrees from each other.

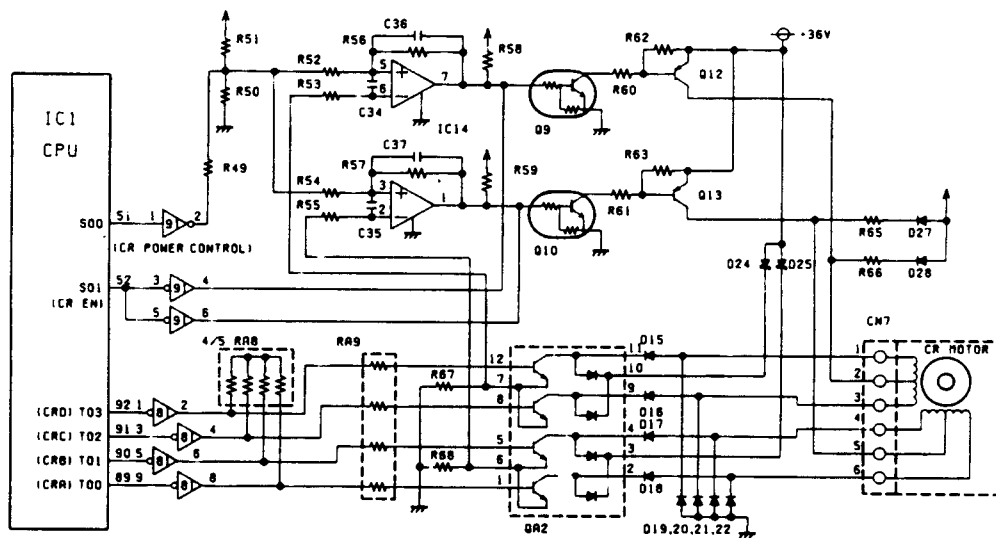
IC8 pins ⑥ and ⑧ are used to excite one winding (two phases) of the stepping motor, while pins ② and ④ excite the other two phases, creating a 2-2 driving system.

The time interval is determined by the CPU's interval counter clock as generated from the CPU's clock.

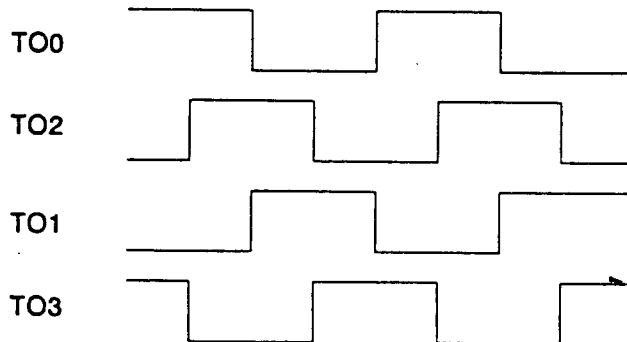
This circuit is a chopper drive circuit for fixing the amount of the current through the motor during stepping and has two threshold voltages (V_{SH} , V_{SL}). IC14 compares the voltage drop across R68(R67) which is in proportion to the current through the motor. For example, when the voltage drop across R68(R67) is larger than V_{SH} , IC14 is turned off and Q10(Q9) is turned off, then Q13(or Q12) is turned off. At the same time, the current through the motor decreases, because the voltage drop across R68(R67) decreases. When this voltage drop is smaller than V_{SL} , IC14 is turned on, and the current through the motor increases.

The amount of current through the motor is fixed during stepping by repeating this process.

These threshold voltages (V_{SH} , V_{SL}) are able to be changed by SO0s H or L signal according to the print mode. When the motor is in the standby state, Q13 and Q12 are turned off, and a holding voltage is supplied to the motor through R65 and R66.



Timing Chart



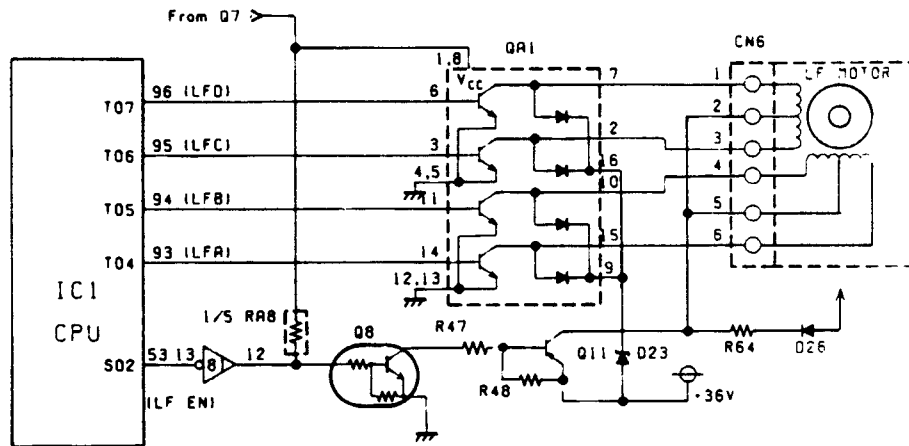
Pulse Rate Chart

Relation between the printing mode and the pulse rate is shown in the chart.

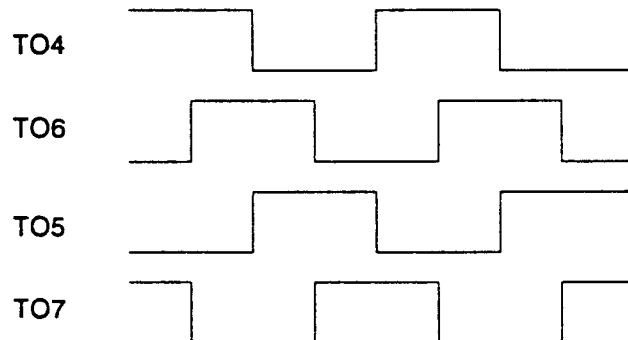
| Printing Mode | | Pulse Rate (PPS) |
|---------------|-------|------------------|
| DRAFT | 10CPI | 960 |
| | 12CPI | 960 |
| | 15CPI | 630 |
| | 17CPI | 480 |
| | 20CPI | 480 |
| LQ | 10CPI | 320 |
| | 12CPI | 320 |
| | 15CPI | 320 |
| | 17CPI | 320 |
| | 20CPI | 320 |

8.2.6 Paper Feed Motor Drive Block

During paper feed, the CPU sets SO2 at the L level and turns on Q8 and Q11. +36V is fed to the motor as a result. The exciting method by TO4, TO5, TO6 and TO7 is 2-2 driving system and the pulse rate is 380 pulse per second. When paper feed is not done, Q11 is turned off because of SO2's H level signal and a holding voltage (about 2V) is supplied to the motor through R64.



Timing Chart



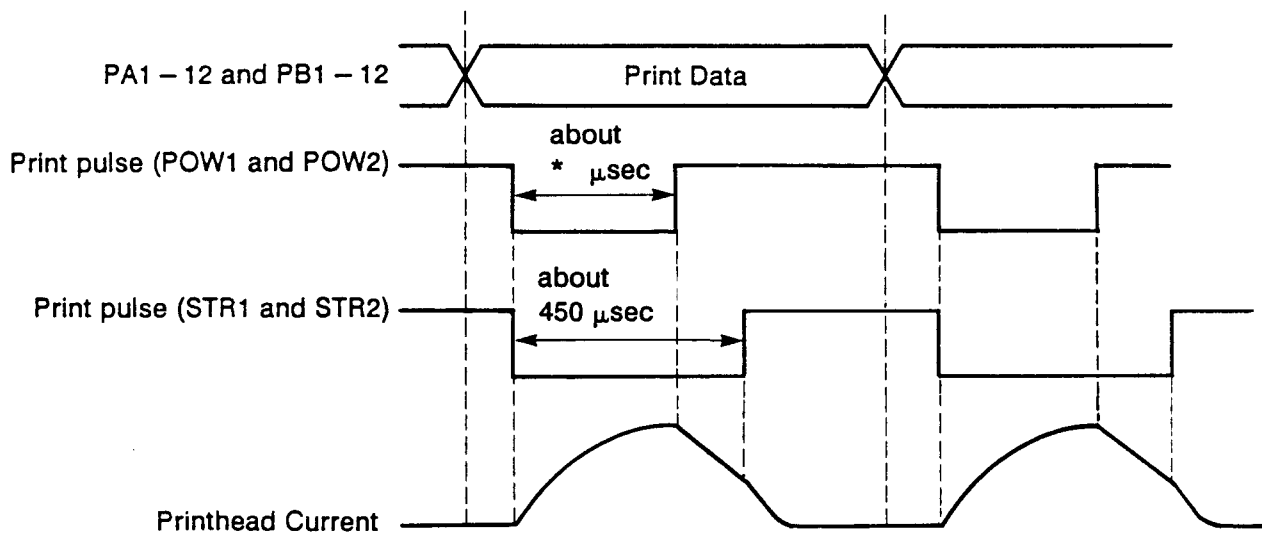
8.2.7 Head Drive Block

This block consists of QA3 – 8 and Q14 – 27. QA3 – 8 control each pin and Q14 – 27 control the power supplied to the printhead.

The CPU sets the data to be printed into PA1 – 12 and PB1 – 12 of IC2(Gate Array). Then the CPU sets the printing pulse and triggers STR1 and STR2 terminal of IC2. During this time, the head pin solenoids are driven by QA3 – 8 accordingly. The power supplied to the printhead is controlled by POW1 and POW2 through Q14 and Q15. And the power supplied to the printhead is restricted by the output of POW1 and POW2 in the CPU.

PTH is attached in the printhead and is used for detecting overheat of printhead in directly

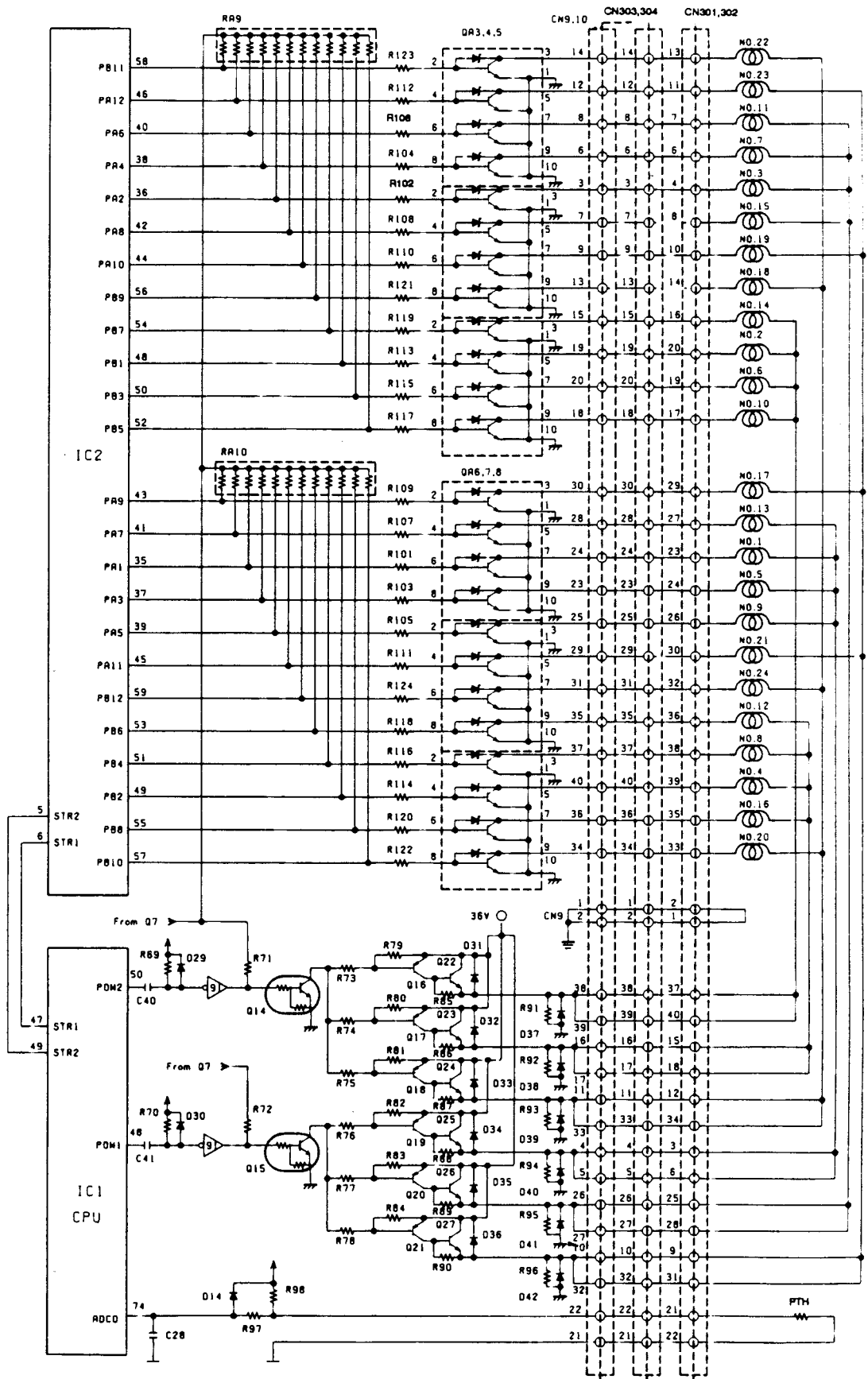
Timing Chart



*

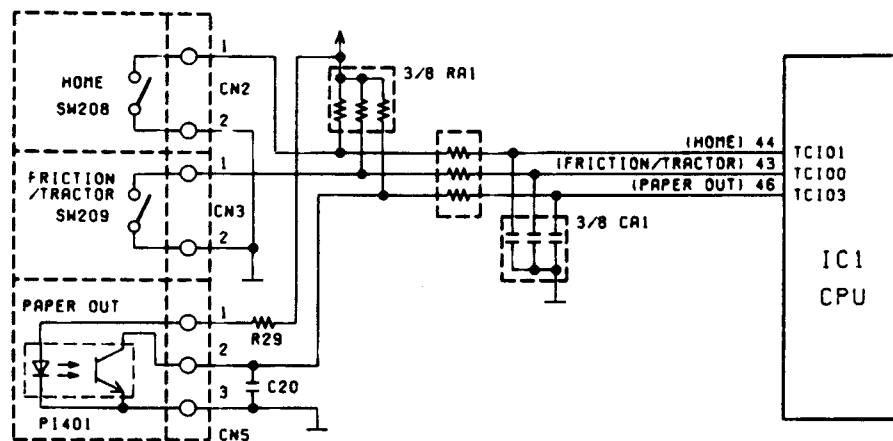
| | |
|-------|---------------------|
| Draft | about 235 μ sec |
| LQ | about 225 μ sec |
| Image | about 245 μ sec |

Circuit Diagram



8.2.8 Sensor and Switch Circuits

- (1) The purpose of the home position switch is to move the carriage to a reference position (home position) at the left end of the carriage when the power switch is turned on or when a Reset signal is generated. When the carriage comes to the home position, TCIO1 (pin 44) changes from H to L level.
- (2) One paper out sensor is provided. When this sensor detects paper out, TCIO3 (pin 46) changes from L to H and the LED flashes to indicate paper out status.
- (3) If paper feed switch is set to the friction position, TCIO0 (pin 43) is L and the CPU does not check paper out sensor.

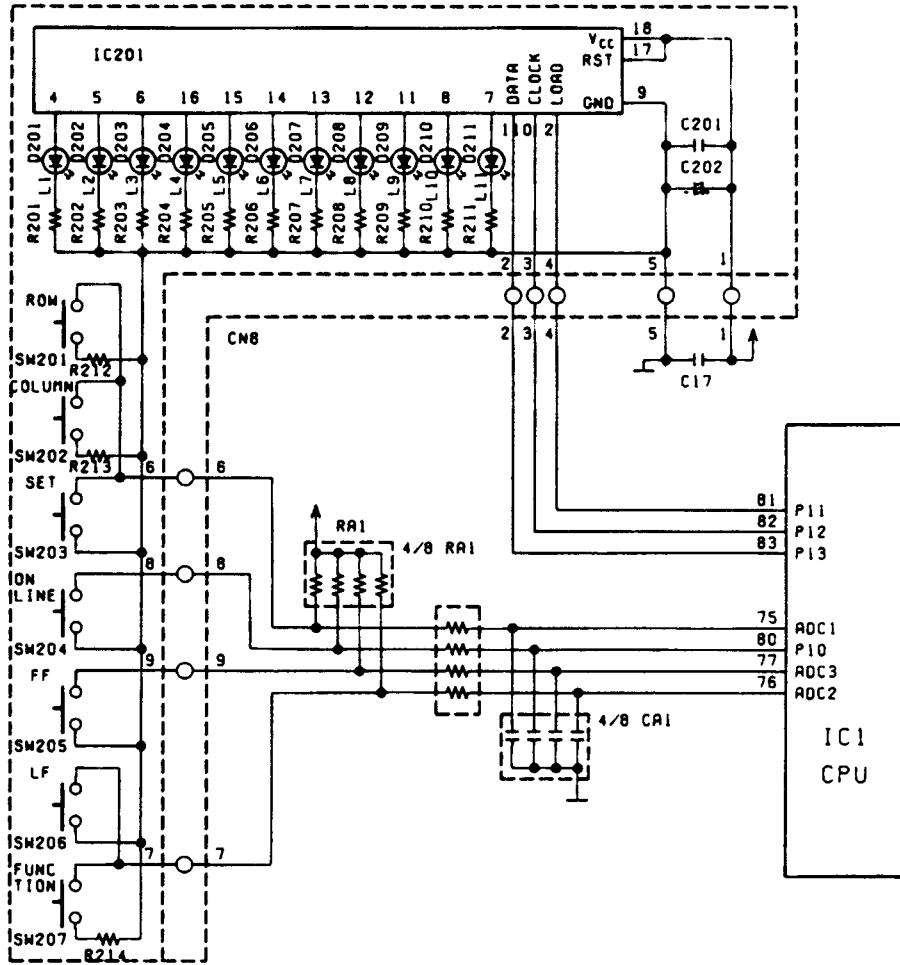


8.2.9 Control Panel

The control panel is composed of 7 switches and 11 LEDs.

- (1) The ON LINE switch switches between on-line and off-line, and is input to the CPU (pin 80). This switch is also used for continuous paper back in the function mode.
- (2) The paper feed switch is for one-line paper feed and is input to the CPU (pin 76). This switch is also used for driving the carriage to the right in the function mode.
- (3) The form feed switch is for one page-feed and is input to the CPU (pin 77). This switch is also used for driving the carriage to the left in the function mode.
- (4) The function switch switches between the function mode and the normal operation mode. In the function mode, continuous paper back function and margin sets are available.
- (5) The power/paper out LED lights when power is turned on and blinks when paper out is detected.
- (6) The ON LINE LED displays the on-line status.
- (7) Three ROW LEDs and six COL LEDs display print mode by matrix.

Circuit Diagram

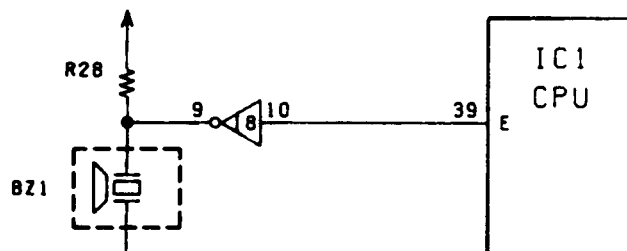


8.2.10 Buzzer, EEPROM

(1) Buzzer

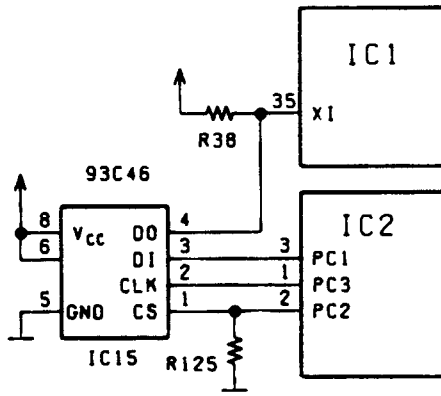
The buzzer is housed inside a case on the logic board, it sounds under the following circumstances:

- Out of paper state ... sounds for 0.5 second.
- Receiving BELL Code ... sounds for 0.5 second.
- Off line state with data remaining in receiving buffer ... sounds repeatedly.
- Before the unit starts self test printing ... sounds once.
- Overheat ... sounds for 1.0 second repeatedly until the temperature decreases.

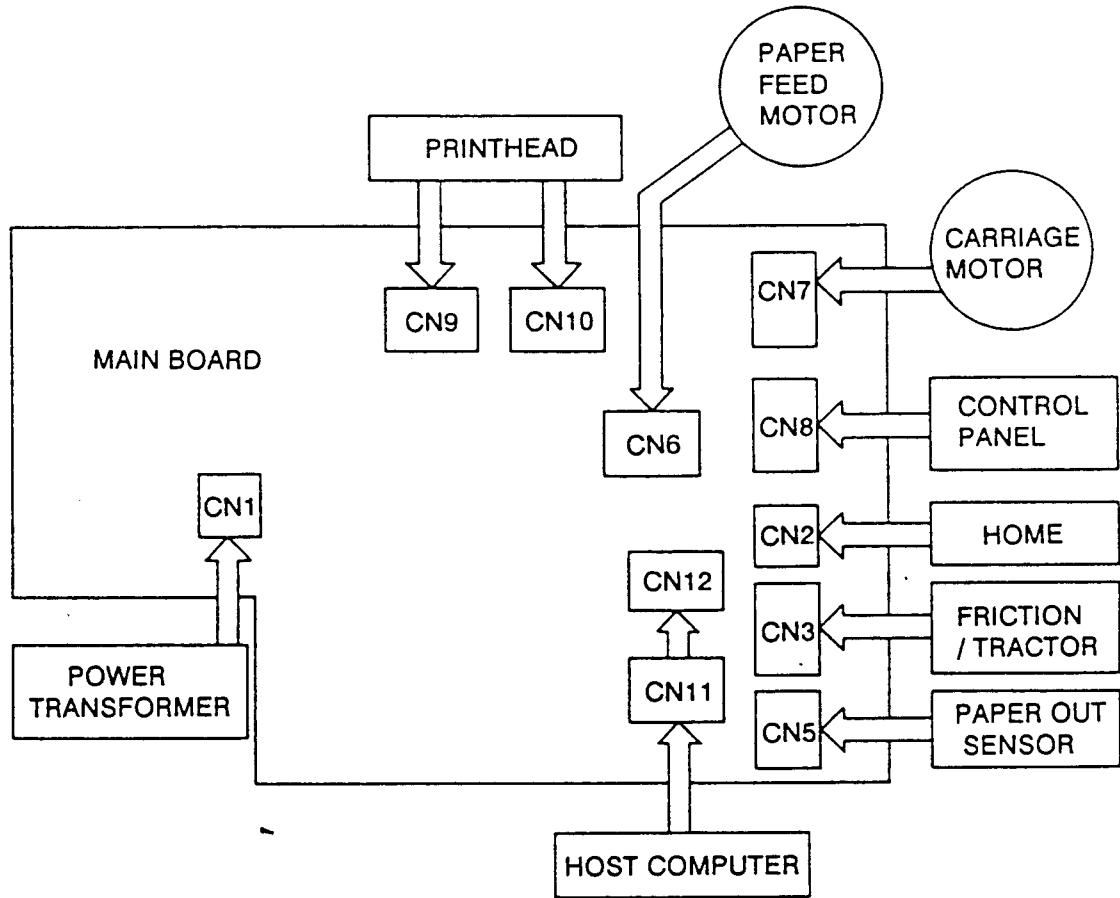


(2) EEPROM

This IC memorizes the setting such as printer-mode, character set etc.



8.2.11 Logic Board Connection Diagram



8.3 Explanation of Connectors

8.3.1 Name of Connectors

Connector applications are shown below. For details, refer to tables.

| | | | |
|-----|---------------------------|------------|------------------|
| CN1 | : Power Supply | CN8,CN201 | : Control Panel |
| CN2 | : Carriage Home Switch | CN9,CN303 | : Printhead |
| CN3 | : Friction/Tractor Switch | CN10,CN304 | : Printhead |
| CN5 | : Paper Out Sensor | CN11 | : Centronics I/O |
| CN6 | : Line Feed Motor | CN12 | : Option I/O |
| CN7 | : Carriage Motor | CN301 | : Printhead |
| | | CN302 | : Printhead |

8.3.2 Pin Assignment

CN1 (Power Supply)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|--------------------|--------|
| 1 | AC 39V | For Main Board | — |
| 2 | AC 39V | For Main Board | — |
| 3 | AC 10V | For Optional Board | — |
| 4 | AC 10V | For Optional Board | — |

CN6 (Line Feed Motor)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|------------------------------|--------|
| 1 | LFD | Phase D for Line Feed Motor | In |
| 2 | SLF | Line Feed Motor Power Supply | Out |
| 3 | LFC | Phase C for LineFeed Motor | In |
| 4 | LFB | Phase B for Line Feed Motor | In |
| 5 | SLF | Line Feed Motor Power Supply | Out |
| 6 | LFA | Phase A for Line Feed Motor | In |

CN2 (Carriage Home Switch)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|----------------------|--------|
| 1 | SW | Carriage Home Switch | In |
| 2 | SG | Signal Ground | — |

CN7 (Carriage Motor)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|-----------------------------|--------|
| 1 | CRD | Phase D for CarriageMotor | In |
| 2 | SCR | Carriage Motor Power Supply | Out |
| 3 | CRC | Phase C for Carriage Motor | In |
| 4 | CRB | Phase B for Carriage Motor | In |
| 5 | SCR | Carriage Motor Power Supply | Out |
| 6 | CRA | Phase A for Carriage Motor | In |

CN3 (Friction / Tractor Switch)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|---------------------------|--------|
| 1 | SW | Friction / Tractor Switch | In |
| 2 | SG | Signal Ground | — |

CN8, CN201 (Control Panel)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|-----------------------|--------|
| 1 | +5V | +5V Supply | Out |
| 2 | DATA | IC201 LED Data In | Out |
| 3 | CLK | IC201 Clock | Out |
| 4 | LOAD | IC201 LED Data Load | Out |
| 5 | SG | Signal Ground | — |
| 6 | MODE | ROW/COLUMN/SET Switch | In |
| 7 | LF | LF/FUNCTION Switch | In |
| 8 | ON LINE | ON LINE Switch | In |
| 9 | FF | FF Switch | In |

CN5 (Paper Out Sensor)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|------------------|--------|
| 1 | Anode | +5V Supply | Out |
| 2 | Collector | Paper Out Sensor | In |
| 3 | Cathode | Signal Ground | — |

CN9, CN303 (Printhead)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|---------------------|--------|
| 1 | FG | Frame Ground | In |
| 2 | FG | Frame Ground | In |
| 3 | H3 | Head Pin 3 Drive | In |
| 4 | +36V | +36V for Pin 1, 5 | Out |
| 5 | +36V | +36V for Pin 9, 13 | Out |
| 6 | H7 | Head Pin 7 Drive | In |
| 7 | H15 | Head Pin 15 Drive | In |
| 8 | H11 | Head Pin 11 Drive | In |
| 9 | H19 | Head Pin 19 Drive | In |
| 10 | +36V | +36V for Pin 17, 21 | Out |
| 11 | +36V | +36V for Pin 20, 24 | Out |
| 12 | H23 | Head Pin 23 Drive | In |
| 13 | H18 | Head Pin 18 Drive | In |
| 14 | H22 | Head Pin 22 Drive | In |
| 15 | H14 | Head Pin 14 Drive | In |
| 16 | +36V | +36V for Pin 12, 16 | Out |
| 17 | +36V | +36V for Pin 4, 8 | Out |
| 18 | H10 | Head Pin 10 Drive | In |
| 19 | H2 | Head Pin 2 Drive | In |
| 20 | H6 | Head Pin 6 Drive | In |

CN301 (Printhead)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|---------------------|--------|
| 1 | FG | Frame Ground | In |
| 2 | FG | Frame Ground | In |
| 3 | +36V | +36V for Pin 1, 5 | Out |
| 4 | H3 | Head Pin 3 Drive | In |
| 5 | H7 | Head Pin 7 Drive | In |
| 6 | +36V | +36V for Pin 9, 13 | Out |
| 7 | H11 | Head Pin 11 Drive | In |
| 8 | H15 | Head Pin 15 Drive | In |
| 9 | +36V | +36V for Pin 17, 21 | Out |
| 10 | H19 | Head Pin 19 Drive | In |
| 11 | H23 | Head Pin 23 Drive | In |
| 12 | +36V | +36V for Pin 20, 24 | Out |
| 13 | H22 | Head Pin 22 Drive | In |
| 14 | H18 | Head Pin 18 Drive | In |
| 15 | +36V | +36V for Pin 12, 16 | Out |
| 16 | H14 | Head Pin 14 Drive | In |
| 17 | H10 | Head Pin 10 Drive | In |
| 18 | +36V | +36V for Pin 4, 8 | Out |
| 19 | H6 | Head Pin 6 Drive | In |
| 20 | H2 | Head Pin 2 Drive | In |

CN10, 304 (Printhead)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|---------------------|--------|
| 21 | SG | Signal Ground | — |
| 22 | OHP | Overheat Protector | In |
| 23 | H5 | Head Pin 5 Drive | In |
| 24 | H1 | Head Pin 1 Drive | In |
| 25 | H9 | Head Pin 9 Drive | In |
| 26 | +36V | +36V for Pin 3, 7 | Out |
| 27 | +36V | +36V for Pin 11, 15 | Out |
| 28 | H13 | Head Pin 13 Drive | In |
| 29 | H21 | Head Pin 21 Drive | In |
| 30 | H17 | Head Pin 17 Drive | In |
| 31 | H24 | Head Pin 24 Drive | In |
| 32 | +36V | +36V for Pin 19, 23 | Out |
| 33 | +36V | +36V for Pin 18, 22 | Out |
| 34 | H20 | Head Pin 20 Drive | In |
| 35 | H12 | Head Pin 12 Drive | In |
| 36 | H16 | Head Pin 16 Drive | In |
| 37 | H8 | Head Pin 8 Drive | In |
| 38 | +36V | +36V for Pin 10, 14 | Out |
| 39 | +36V | +36V for Pin 2, 6 | Out |
| 40 | H4 | Head Pin 4 Drive | In |

CN302 (Printhead)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|---------------------|--------|
| 21 | OHP | Overheat Protector | In |
| 22 | SG | Signal Ground | — |
| 23 | H1 | Head Pin 1 Drive | In |
| 24 | H5 | Head Pin 5 Drive | In |
| 25 | +36V | +36V for Pin 3, 7 | Out |
| 26 | H9 | Head Pin 9 Drive | In |
| 27 | H13 | Head Pin 13 Drive | In |
| 28 | +36V | +36V for Pin 11, 15 | Out |
| 29 | H17 | Head Pin 17 Drive | In |
| 30 | H21 | Head Pin 21 Drive | In |
| 31 | +36V | +36V for Pin 19, 23 | Out |
| 32 | H24 | Head Pin 24 Drive | In |
| 33 | H20 | Head Pin 20 Drive | In |
| 34 | +36V | +36V for Pin 18, 22 | Out |
| 35 | H16 | Head Pin 16 Drive | In |
| 36 | H12 | Head Pin 12 Drive | In |
| 37 | +36V | +36V for Pin 10, 14 | Out |
| 38 | H8 | Head Pin 8 Drive | In |
| 39 | H4 | Head Pin 4 Drive | In |
| 40 | +36V | +36V for Pin 2, 6 | Out |

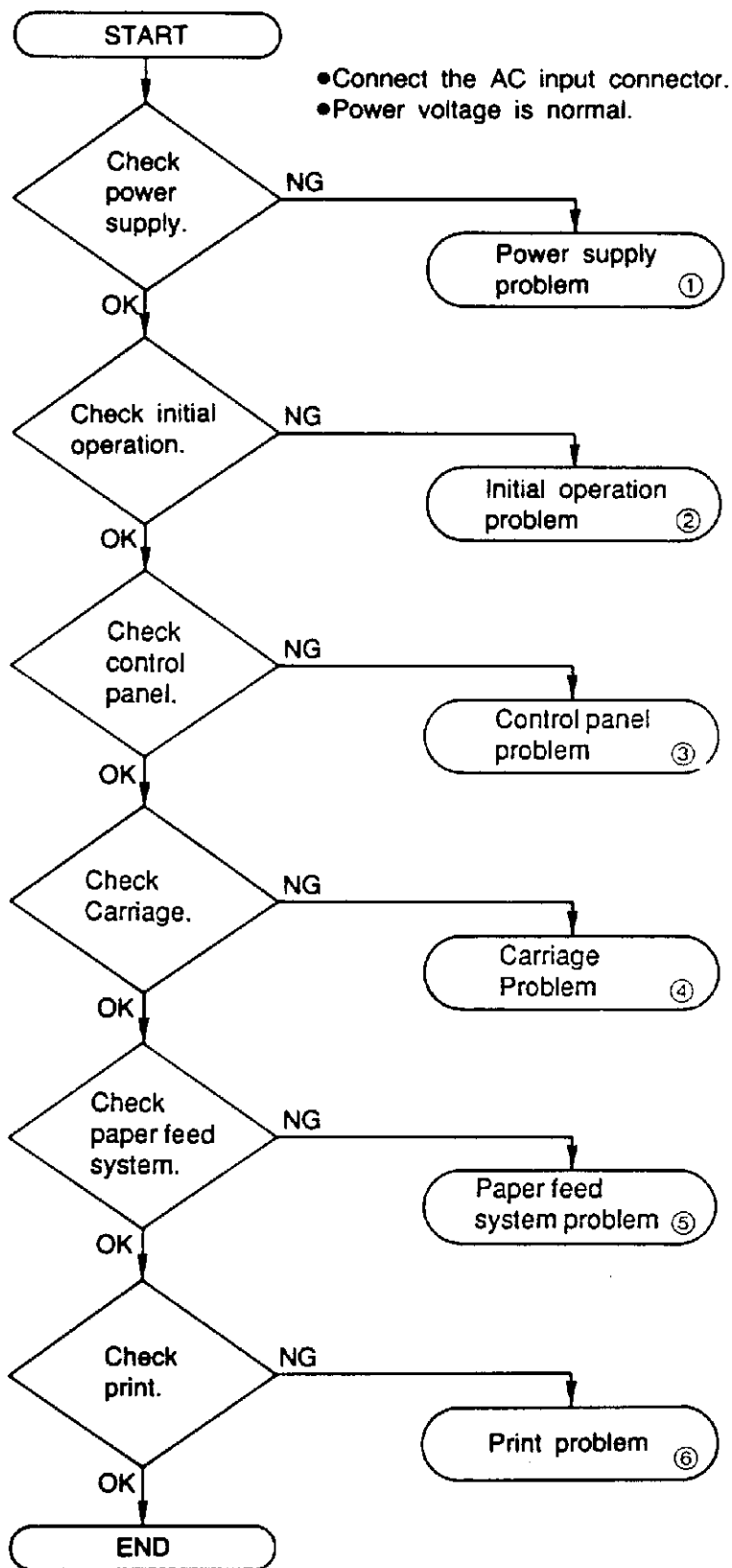
CN11 (Ceramics I/O)

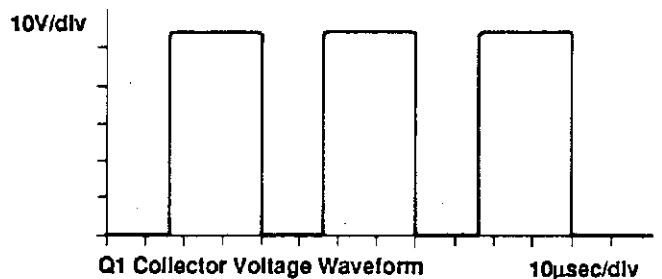
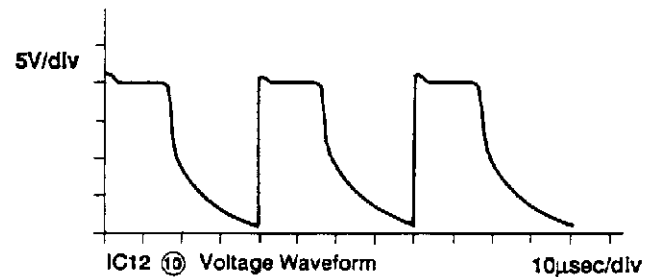
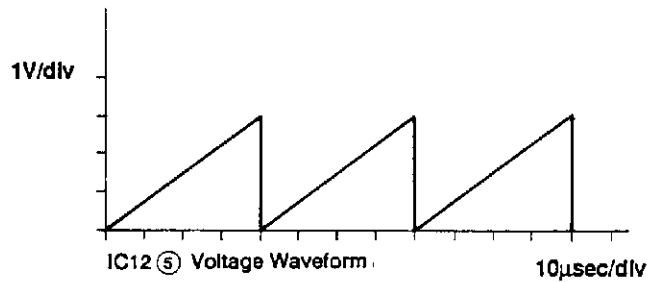
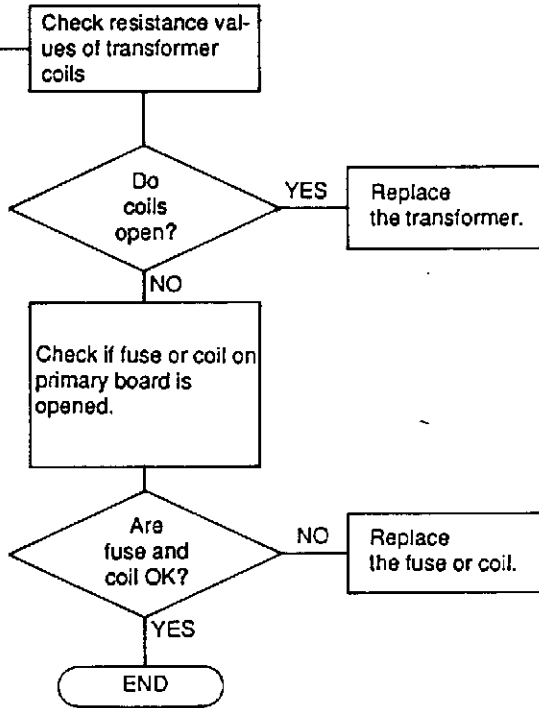
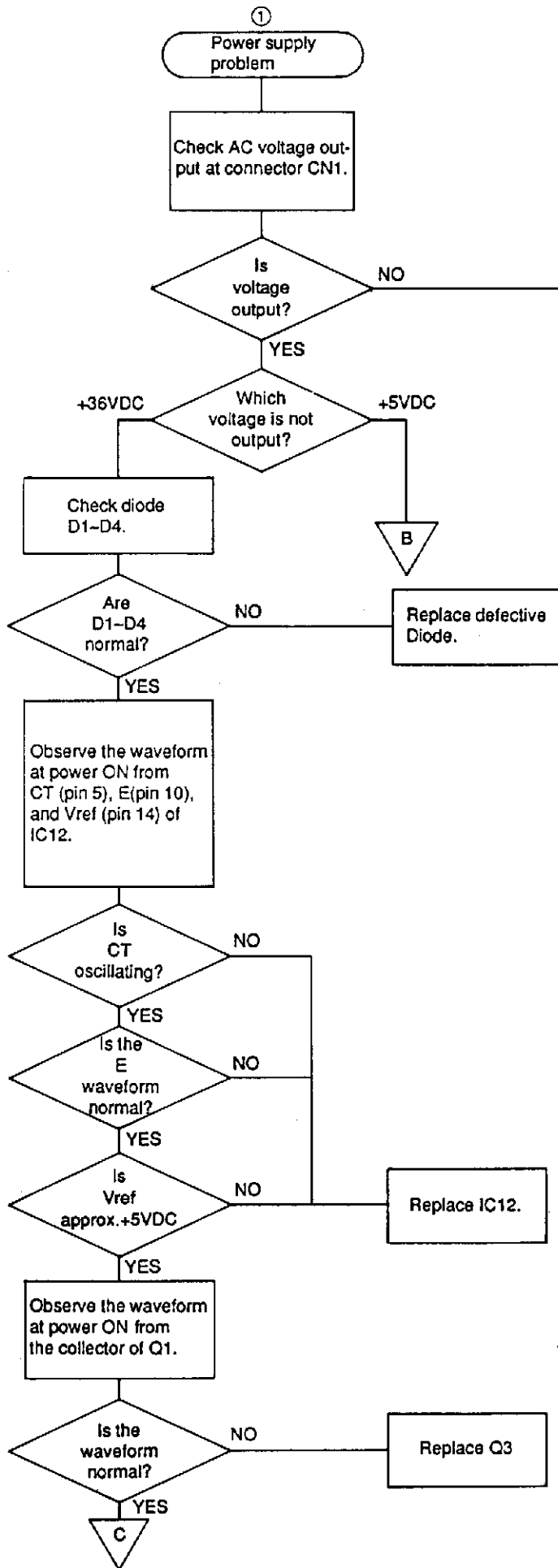
| Pin No. | Return Side Pin No. | Signal Name | Description | In/Out |
|---------|---------------------|-------------|-----------------|--------|
| 1 | 19 | STB | Strobe | In |
| 2 | 20 | DATA 1 | Parallel DATA 1 | In |
| 3 | 21 | DATA 2 | Parallel DATA 2 | In |
| 4 | 22 | DATA 3 | Parallel DATA 3 | In |
| 5 | 23 | DATA 4 | Parallel DATA 4 | In |
| 6 | 24 | DATA 5 | Parallel DATA 5 | In |
| 7 | 25 | DATA 6 | Parallel DATA 6 | In |
| 8 | 26 | DATA 7 | Parallel DATA 7 | In |
| 9 | 27 | DATA 8 | Parallel DATA 8 | In |
| 10 | 28 | ACK | Acknowledge | Out |
| 11 | 29 | BUSY | Busy | Out |
| 12 | | PE | Paper End | Out |
| 13 | | SLCT | Select | Out |
| 14 | | AFXT | Auto Feed XT | In |
| 15 | | --- | --- | --- |
| 16 | | SG | Signal Ground | --- |
| 17 | | FG | Frame Ground | --- |
| 18 | | +5V | +5V | Out |
| 31 | 30 | PRIME | Prime | In |
| 32 | | ERROR | Error | Out |
| 33 | | SG | Signal Ground | --- |
| 34 | | --- | --- | --- |
| 35 | | --- | --- | --- |
| 36 | | --- | --- | --- |

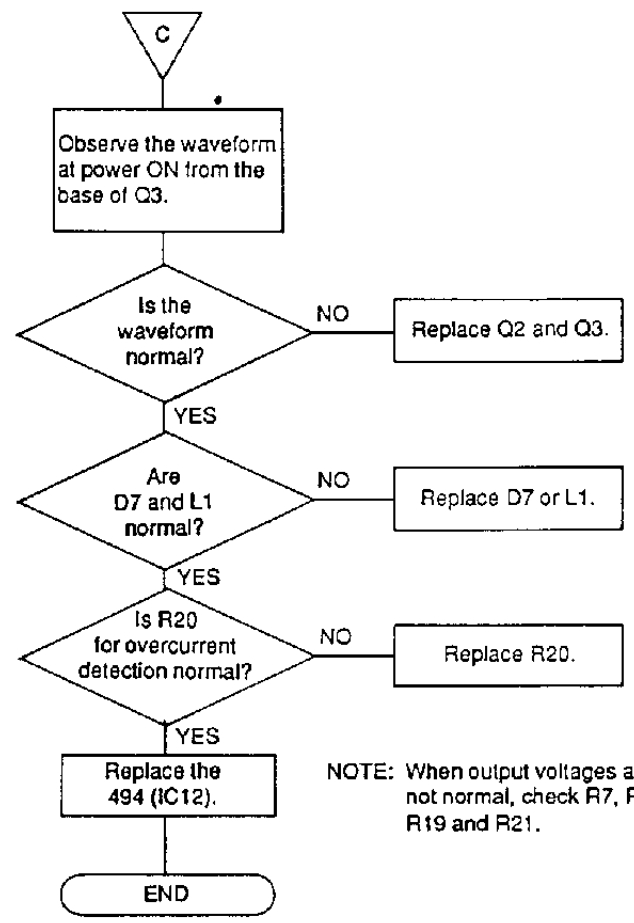
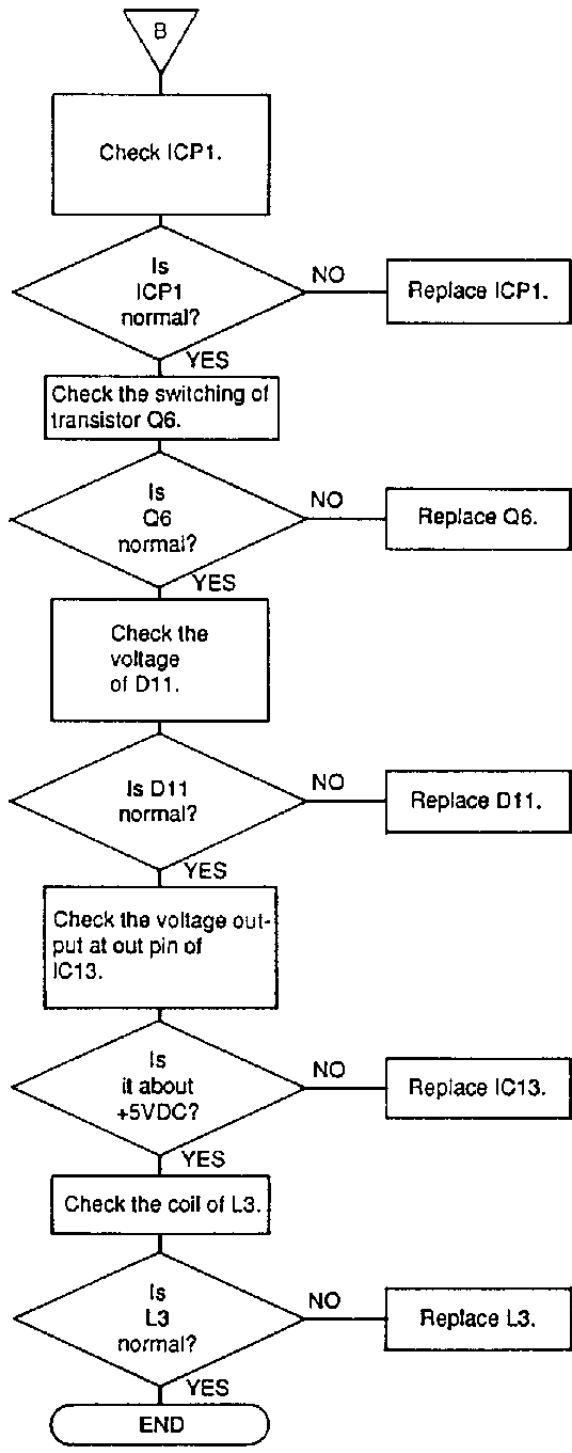
CN12 (Option I/O)

| Pin No. | Signal Name | Description | In/Out |
|---------|-------------|--------------------------|--------|
| 1 | AC 10V | AC 10V for Serial Option | |
| 2 | AC 10V | AC 10V for Serial Option | |
| 3 | SG | Signal Ground | |
| 4 | SG | Signal Ground | |
| 5 | SIF | Check of Option Board | In |
| 6 | AFXT | Auto Feed XT | In |
| 7 | SLCT | Select | Out |
| 8 | PE | Paper End | Out |
| 9 | ERROR | Error | Out |
| 10 | BUSY | Busy | Out |
| 11 | ACK | Acknowledge | Out |
| 12 | PRIME | Prime | In |
| 13 | STB | Strobe | In |
| 14 | +5V | +5V Supply | Out |
| 15 | +5V | +5V Supply | Out |
| 16 | TxD | Transmitted Data | Out |
| 17 | DATA 8 | Parallel DATA 8 | In |
| 18 | DATA 7 | Parallel DATA 7 | In |
| 19 | DATA 6 | Parallel DATA 6 | In |
| 20 | DATA 5 | Parallel DATA 5 | In |
| 21 | DATA 4 | Parallel DATA 4 | In |
| 22 | DATA 3 | Parallel DATA 3 | In |
| 23 | DATA 2 | Parallel DATA 2 | In |
| 24 | DATA 1 | Parallel DATA 1 | In |
| 25 | RESET | Reset to Option | Out |
| 26 | SCK | Serial Clock | In |
| 27 | RxD | Received Data | In |
| 28 | --- | Not Used | |

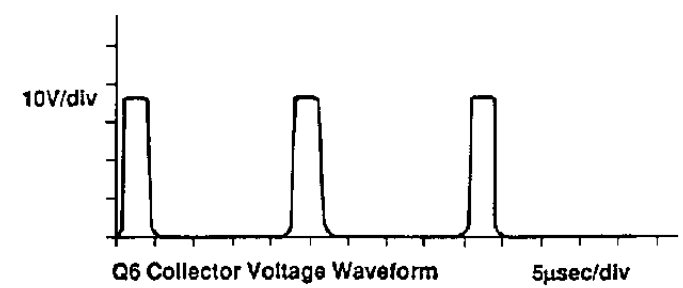
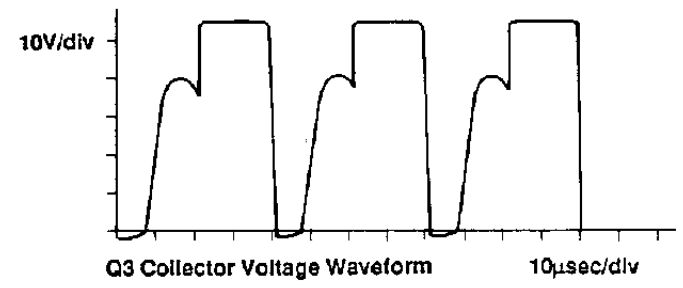
8.5 Trouble Shooting Flow Chart

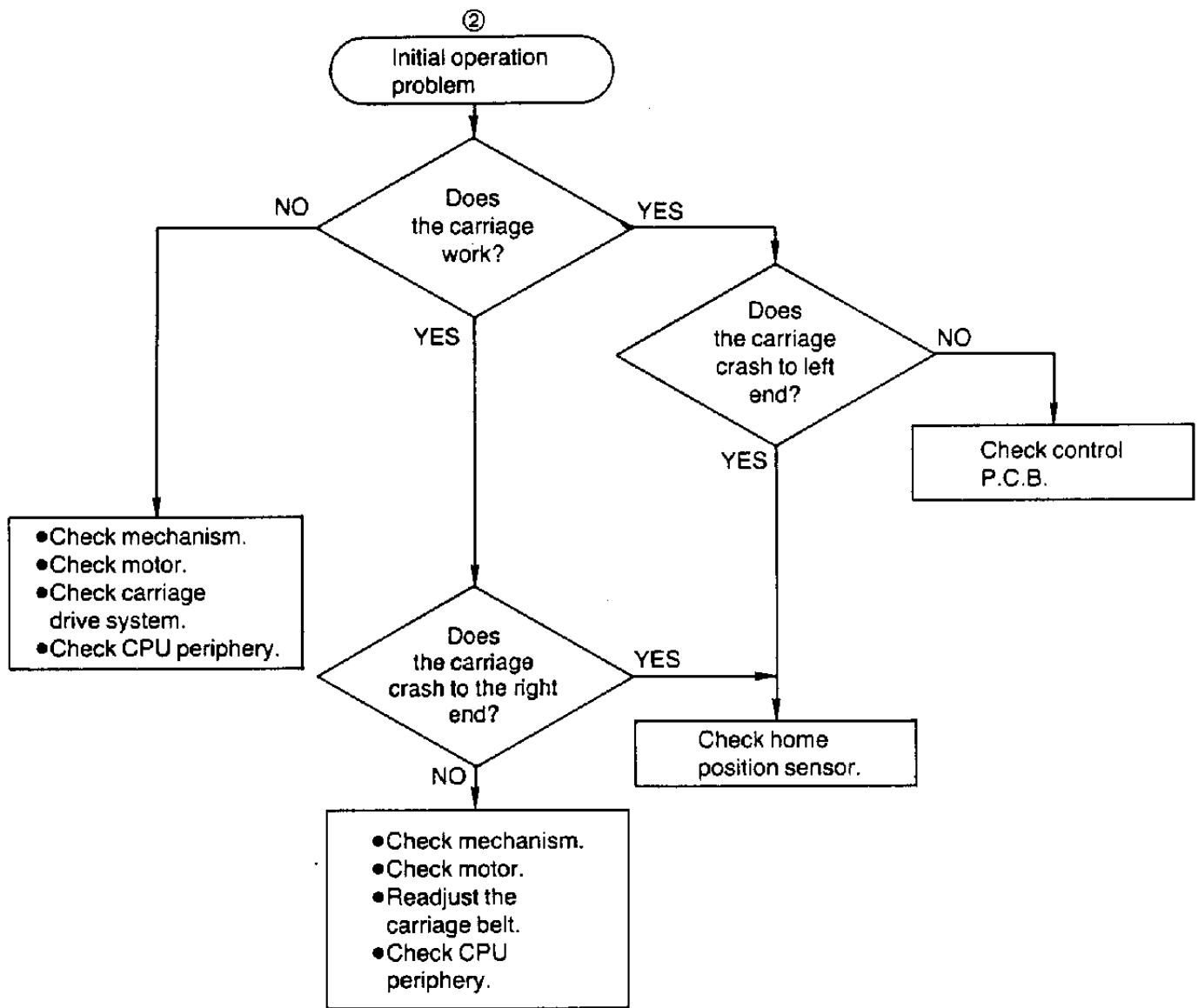


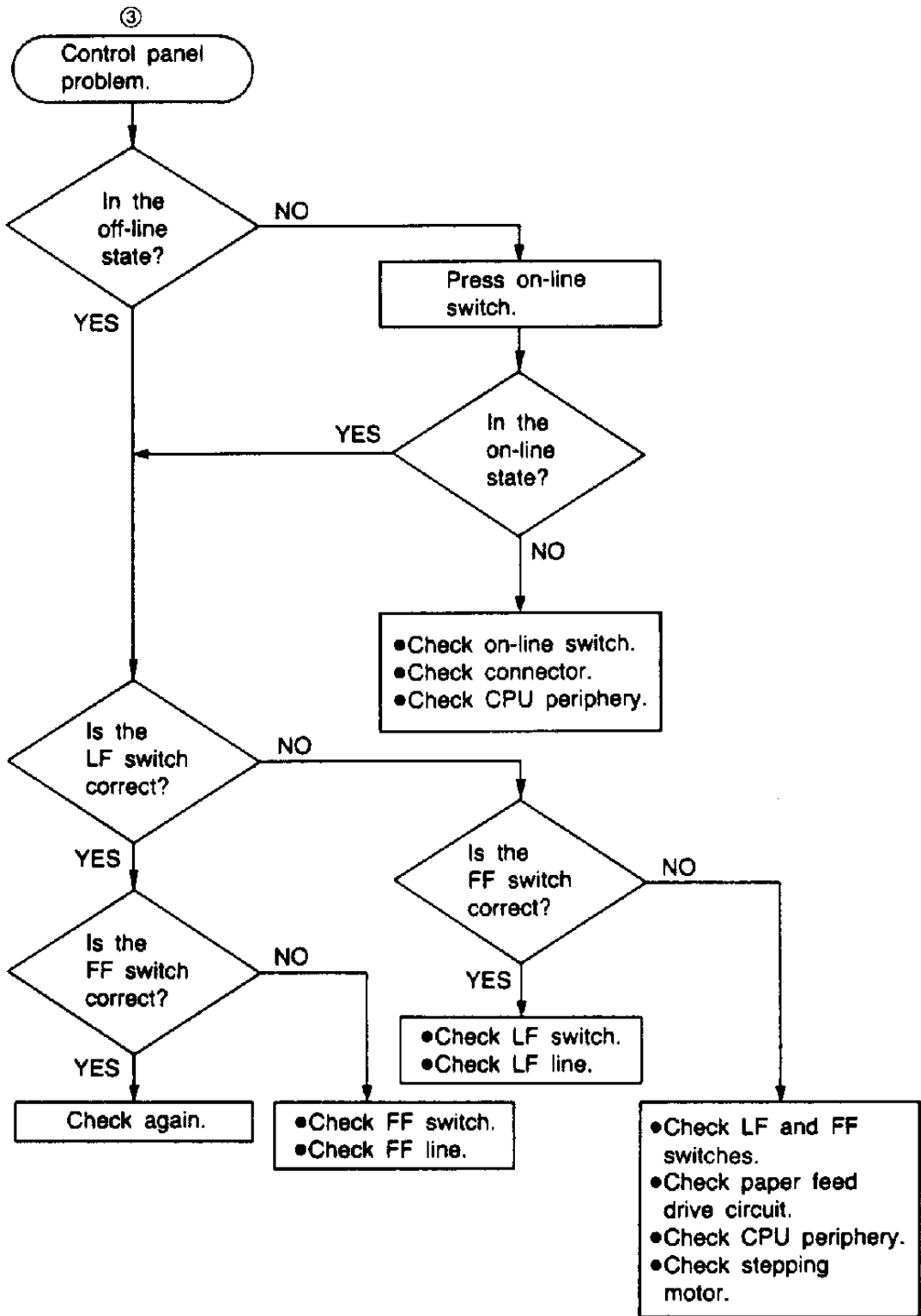


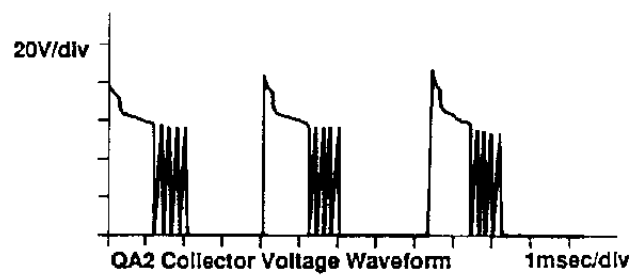
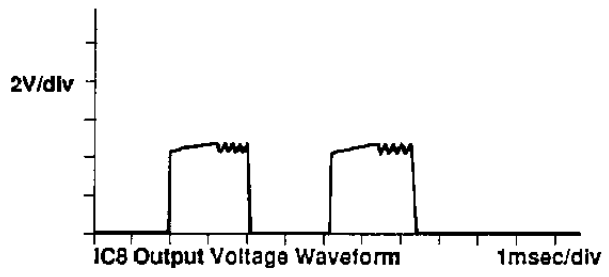
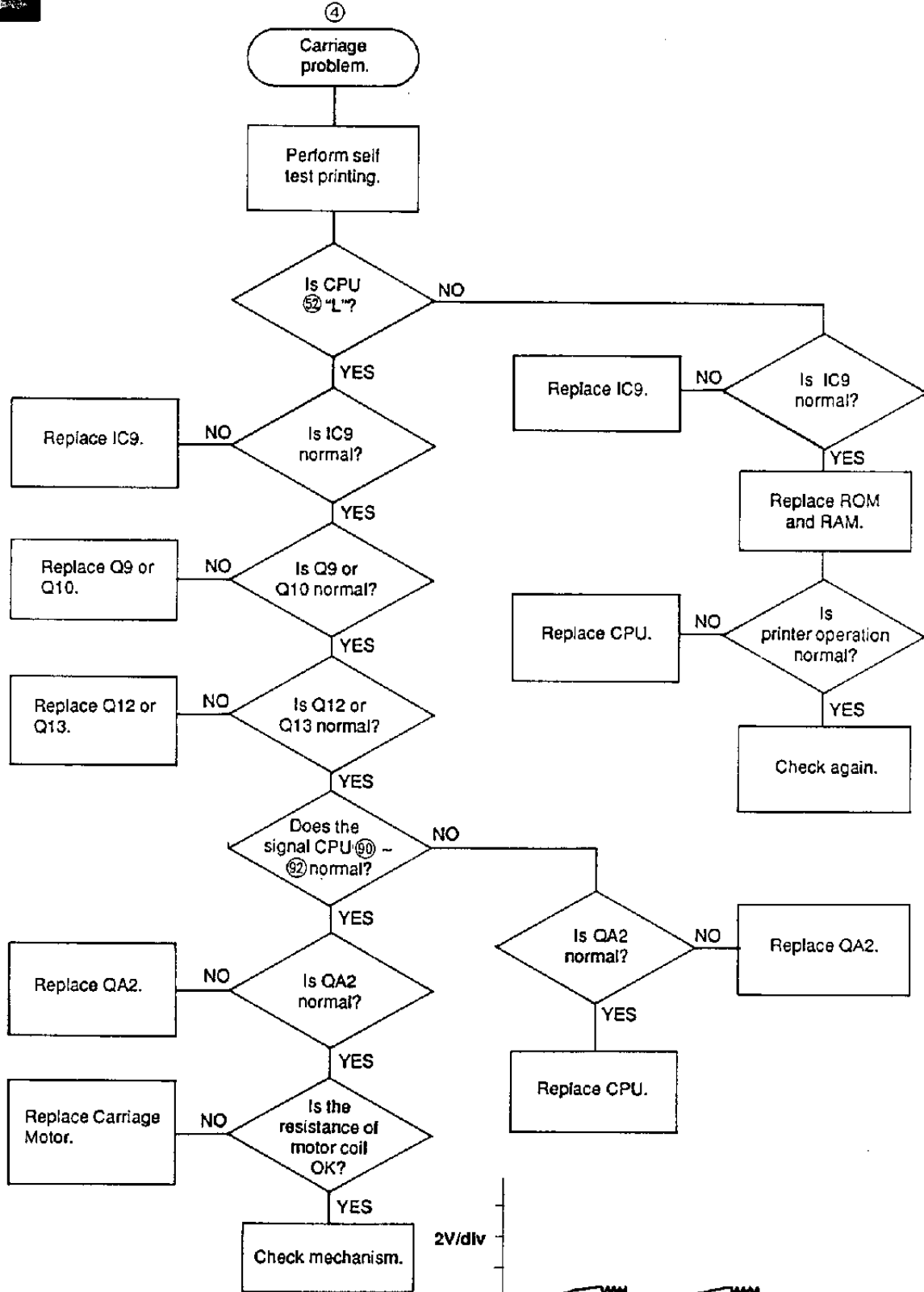


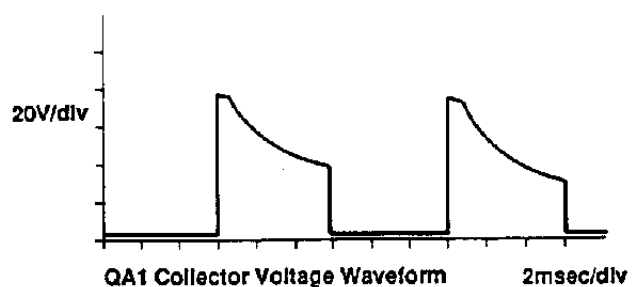
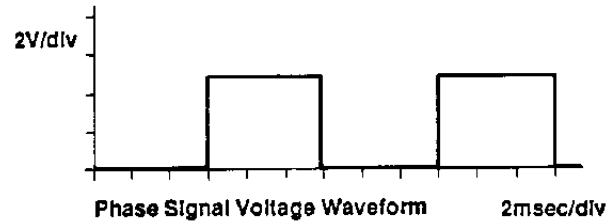
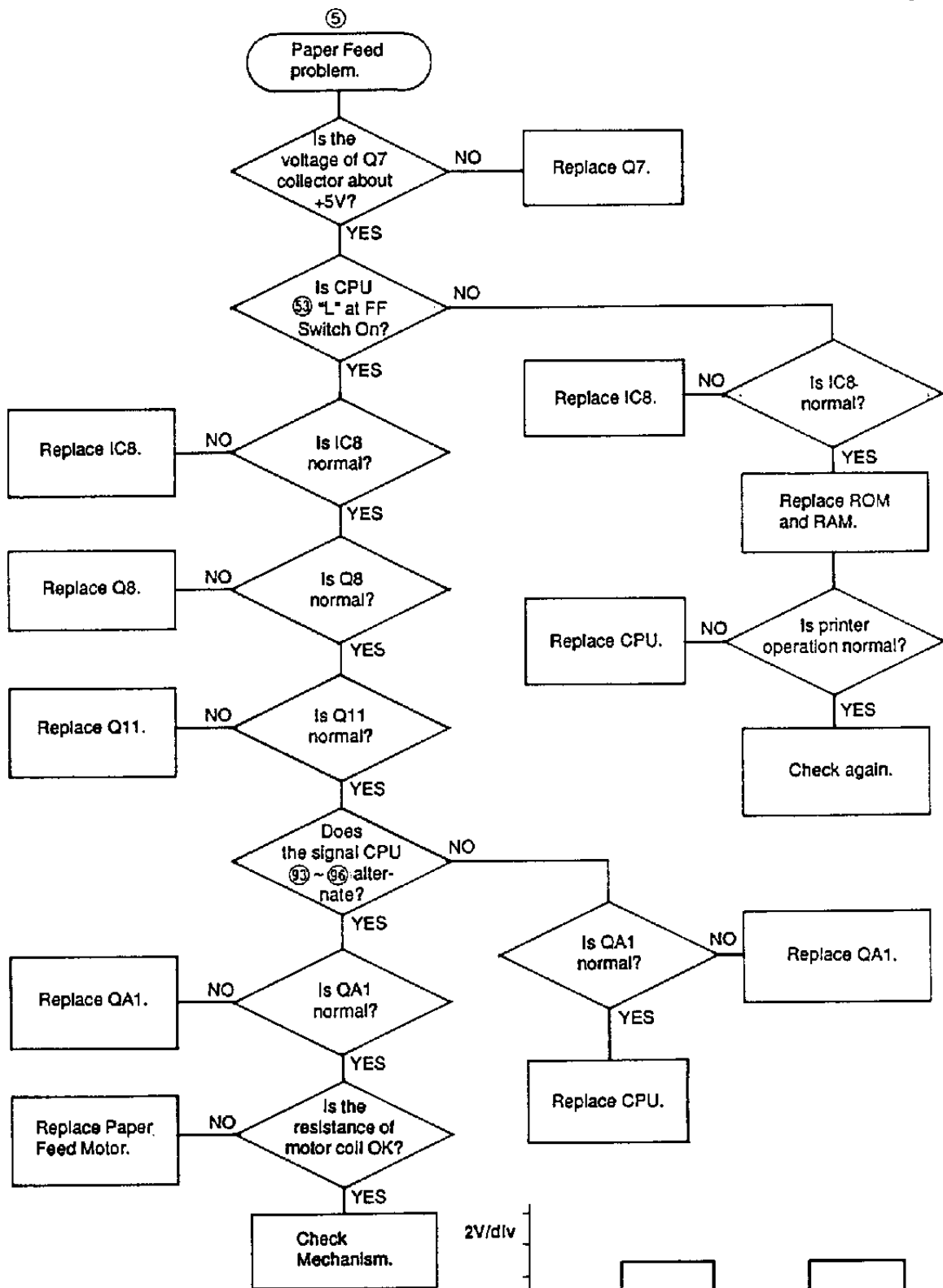
NOTE: When output voltages are not normal, check R7, R14, R19 and R21.

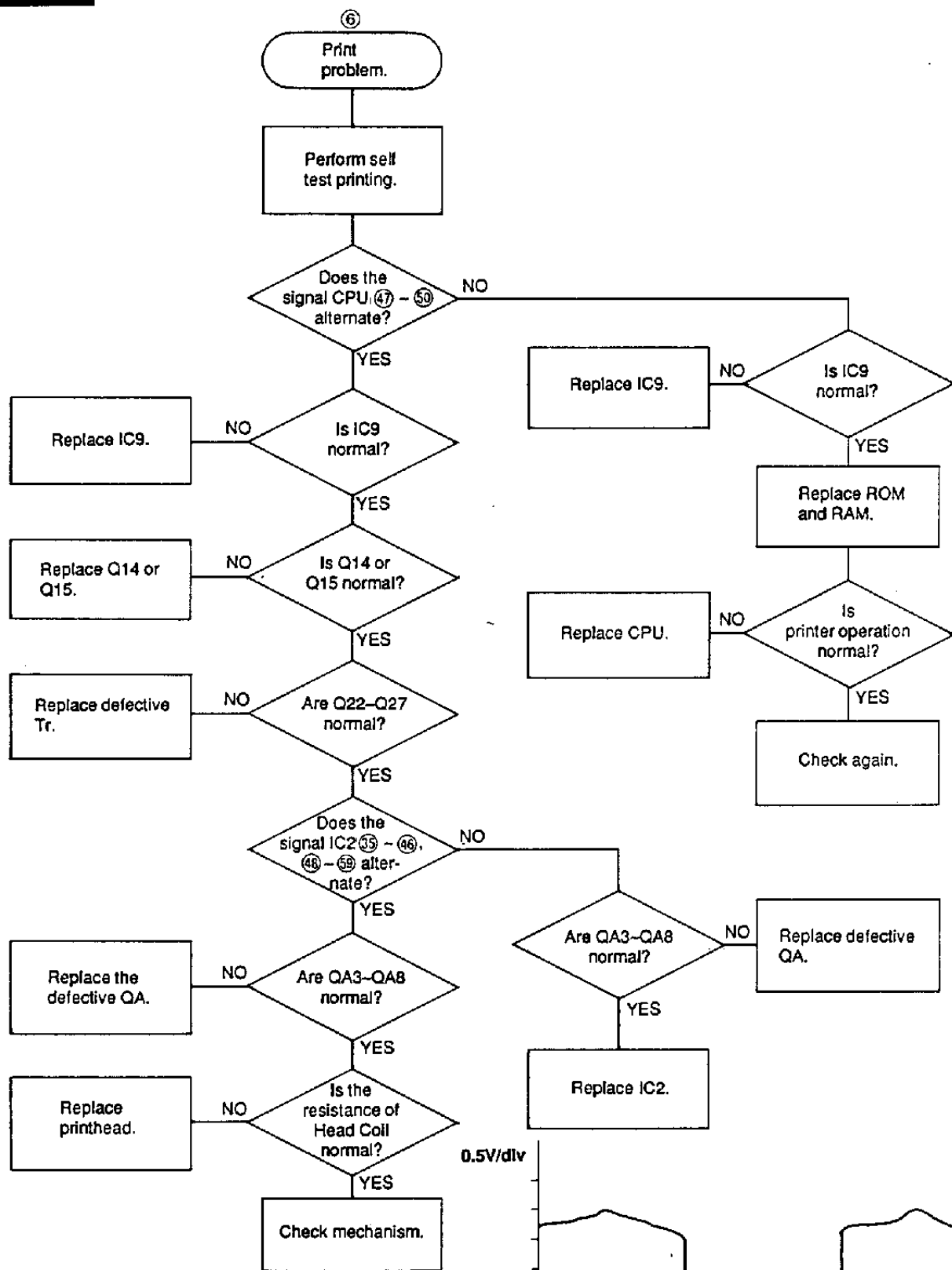




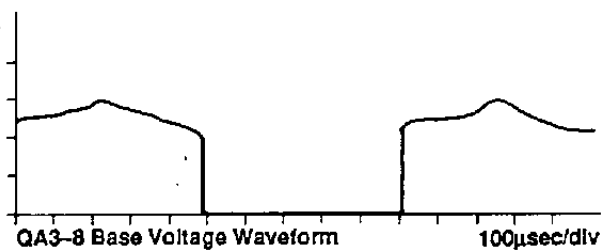




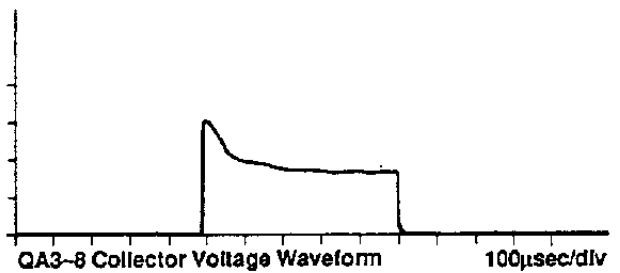




0.5V/div



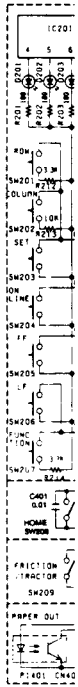
20V/div



8.6 9. Parts List and Lubrications

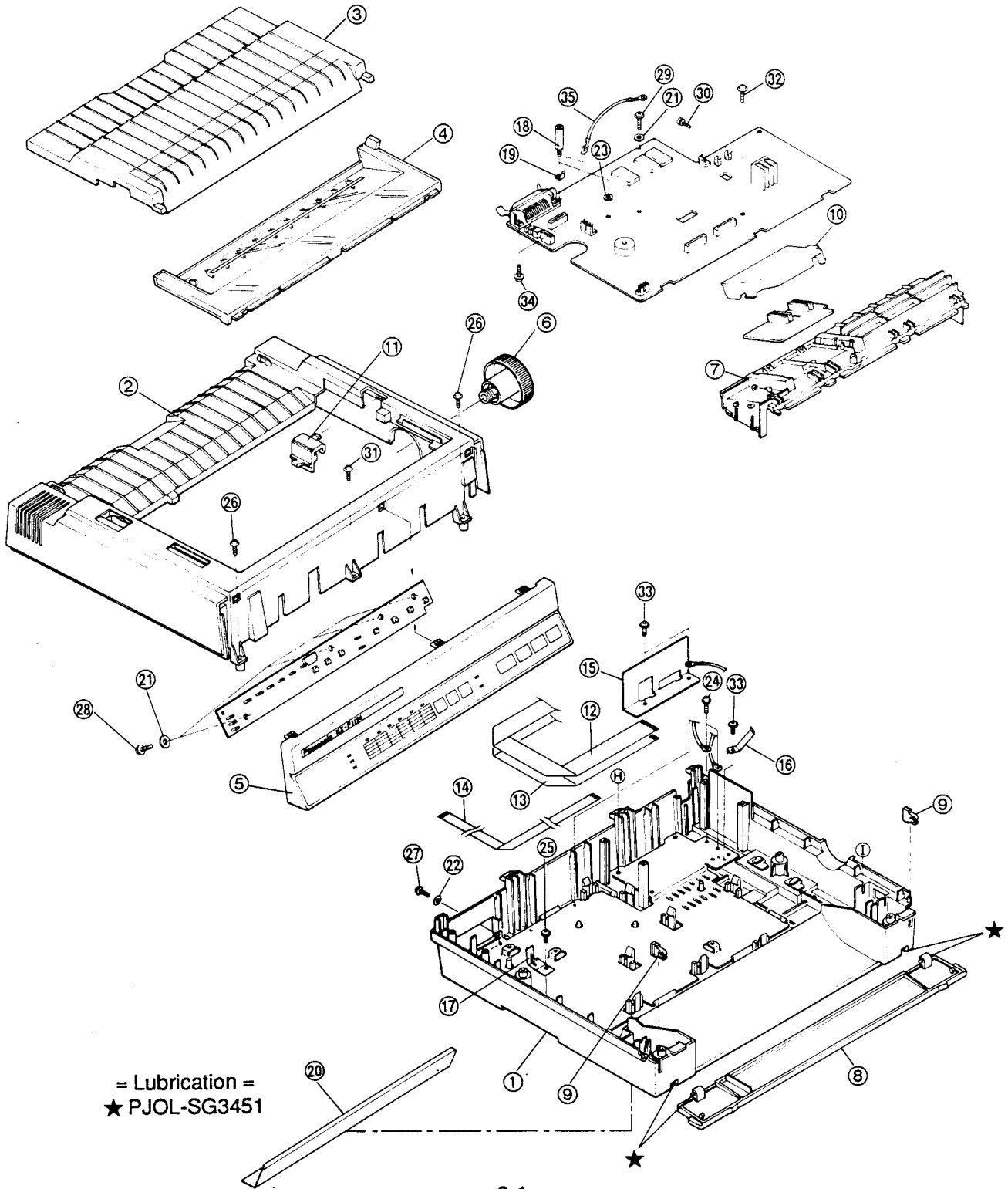
Notes: 1. Important safety notice.
 Components identified by \triangle mark have special characteristics important for safety.
 When replacing any of these components, use only manufacturer's specified parts.
 2. The S mark is for service standard parts and may differ from production parts.
 3. The * mark is available during the production period only.

9.1 Cabinet



| |
|------|
| SW1 |
| SW2 |
| SW3 |
| SW4 |
| SW5 |
| SW6 |
| SW7 |
| SW8 |
| SW9 |
| SW10 |
| SW11 |
| SW12 |
| SW13 |
| SW14 |
| SW15 |
| SW16 |
| SW17 |
| SW18 |
| SW19 |
| SW20 |
| SW21 |
| SW22 |
| SW23 |
| SW24 |
| SW25 |
| SW26 |
| SW27 |
| SW28 |
| SW29 |
| SW30 |
| SW31 |
| SW32 |
| SW33 |
| SW34 |
| SW35 |
| SW36 |
| SW37 |
| SW38 |
| SW39 |
| SW40 |
| SW41 |
| SW42 |
| SW43 |
| SW44 |
| SW45 |
| SW46 |
| SW47 |
| SW48 |
| SW49 |
| SW50 |

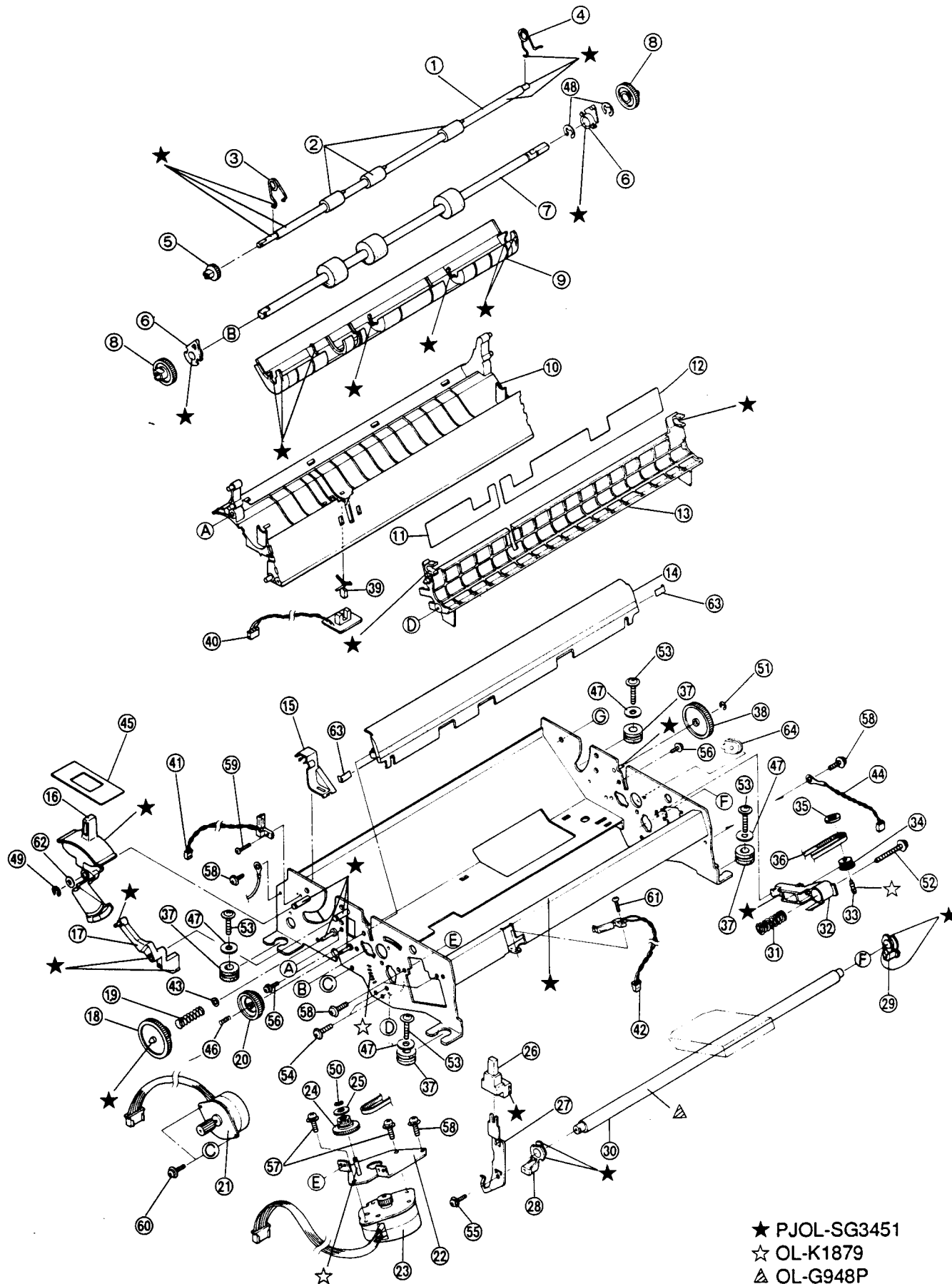
| |
|------|
| SW1 |
| SW2 |
| SW3 |
| SW4 |
| SW5 |
| SW6 |
| SW7 |
| SW8 |
| SW9 |
| SW10 |
| SW11 |
| SW12 |
| SW13 |
| SW14 |
| SW15 |
| SW16 |
| SW17 |
| SW18 |
| SW19 |
| SW20 |
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| SW38 |
| SW39 |
| SW40 |
| SW41 |
| SW42 |
| SW43 |
| SW44 |
| SW45 |
| SW46 |
| SW47 |
| SW48 |
| SW49 |
| SW50 |



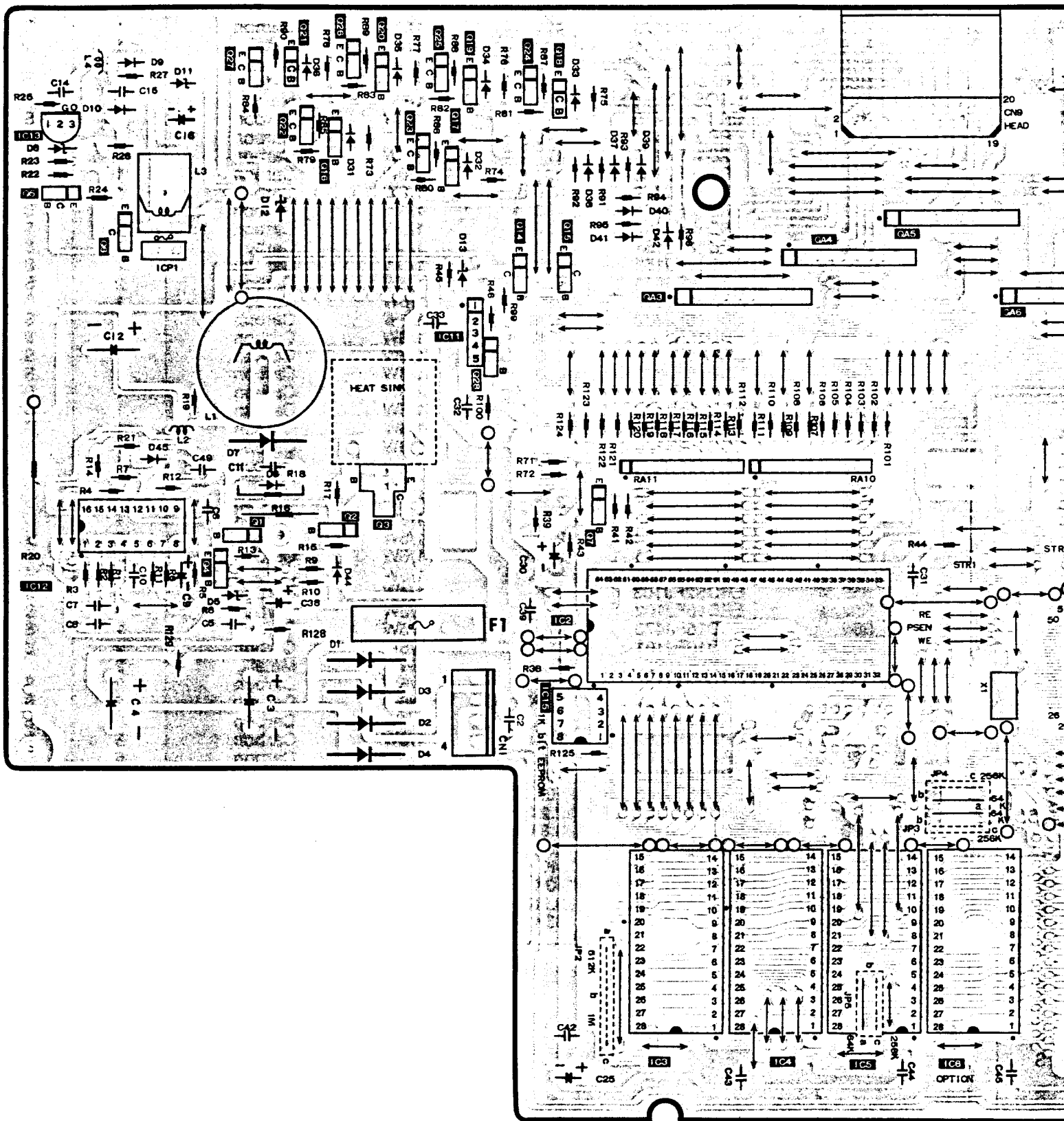
= Lubrication =
 ★ PJOL-SG3451

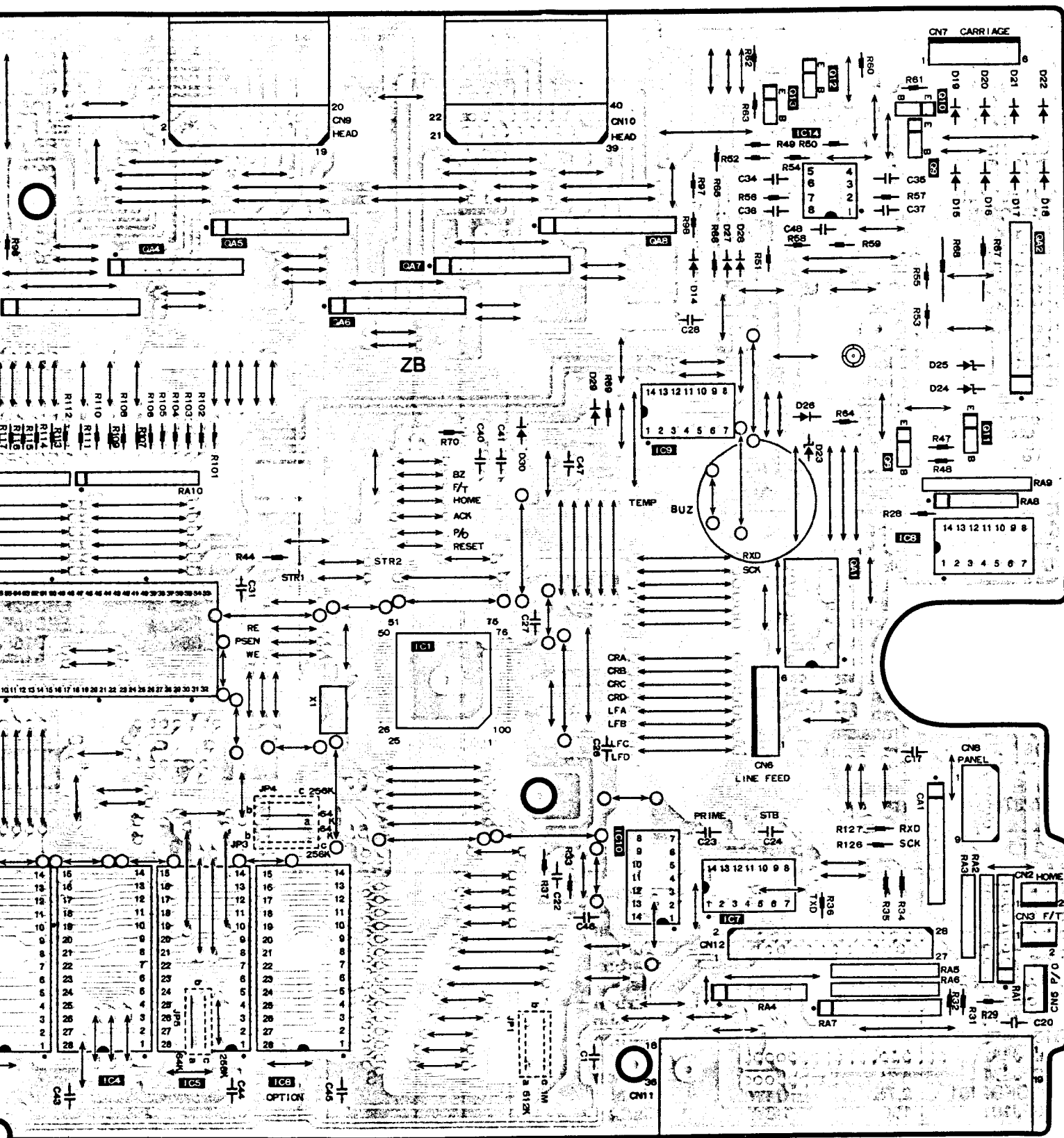
9.

9.4 Chassis



9.5 Main Board





(Parts Side View)