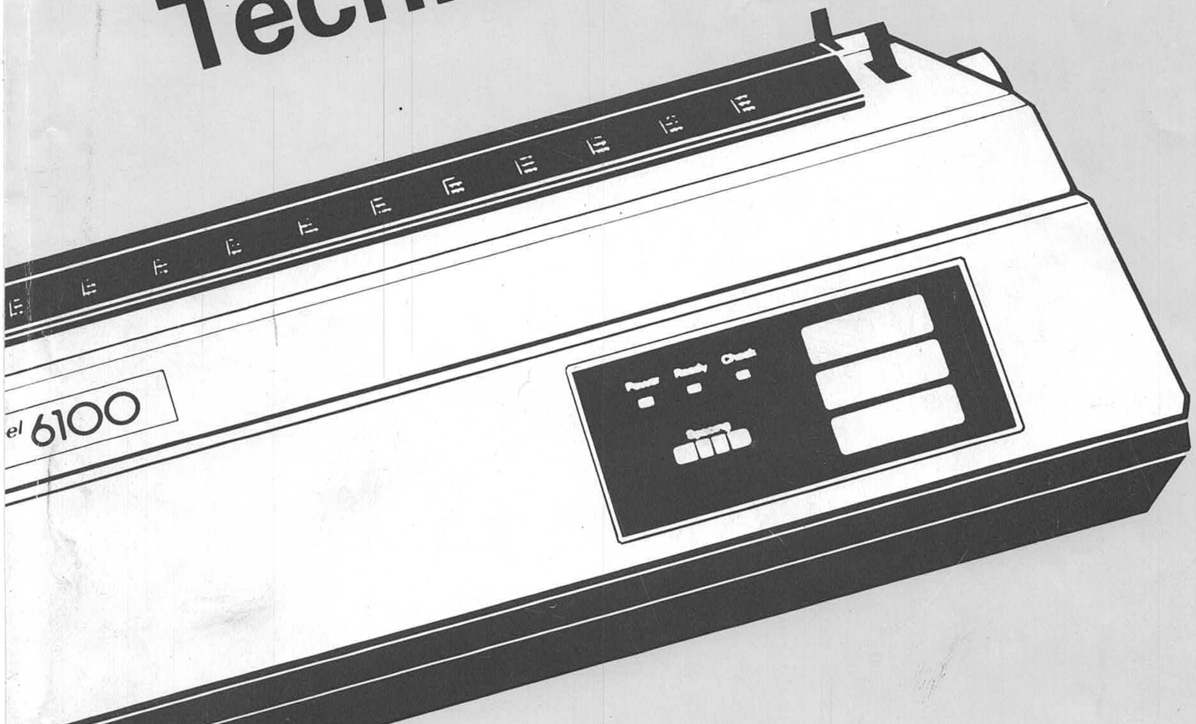
JUKI daisywheel printer 6100

Technical Manual



CONTENTS

GENERAL

This Technical Manual describes the maintenance, troubleshooting, and operating principle of the daisy wheel printer.

1. Basic Specifications

Print speed	:	18 characters/second (Max.)
Print system	:	Daisy wheel
Print wheel	:	100-characters/wheel
Character spacing	:	110 characters under 10 pitch. 132 characters under 12 pitch. 165 characters under 15 pitch. 82 to 220 characters under proportional spacing mode.
Line spacing	:	1/48 inch (1/96 inch possible by ESC sequence)
Form feed	:	Friction feed
Max. form width	:	13 inches (printing line 11 inches)
Copies	:	Original copy + 3 copies
Ribbon	:	IBM 82 compatible multi strike or single strike ribbon (selectric II ribbon)
Interface	:	Centronics parallel interface RS232C Serial Interface (Option)
Environmental requirements	:	Temperature 41°F ~95°F (5 ~35°C) Humidity 30% ~85% (no dew condensation)
Weight	:	About 27.5 lbs. (about 12.5 kg)

2. Main Component Units

This printer consists of the following three major units.

2.1 Print unit

The print unit is comprised of the frame assembly, carriage and linear motor unit and the form feed mechanism. Occupying the largest part of the print unit, the carriage performs lateral feed, character selection, printing and ribbon feed. Use of a liner motor makes the carriage simple in design for easy maintenance.

2.2 Control unit

This unit provides all the controls for the printer and consists of a power supply and two CPU boards. One of the CPU circuit boards serves as the slave CPU circuit board for controlling the print unit mechanisms, and the other is the master CPU circuit baord for controlling the slave CPU circuit board and for the communication with the host CPU.

2.3 Cover unit

The cover unit consists of a bottom cover, center cover, top cover, and acoustic cover. Except for two screws, snap-latches are used for connection between the covers.

3. Block Diagrams

3.1 Block diagram of all component units

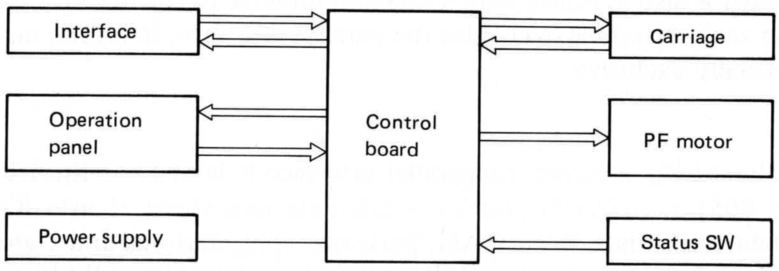


Fig. 3.1

3.2 Block diagram of control boards

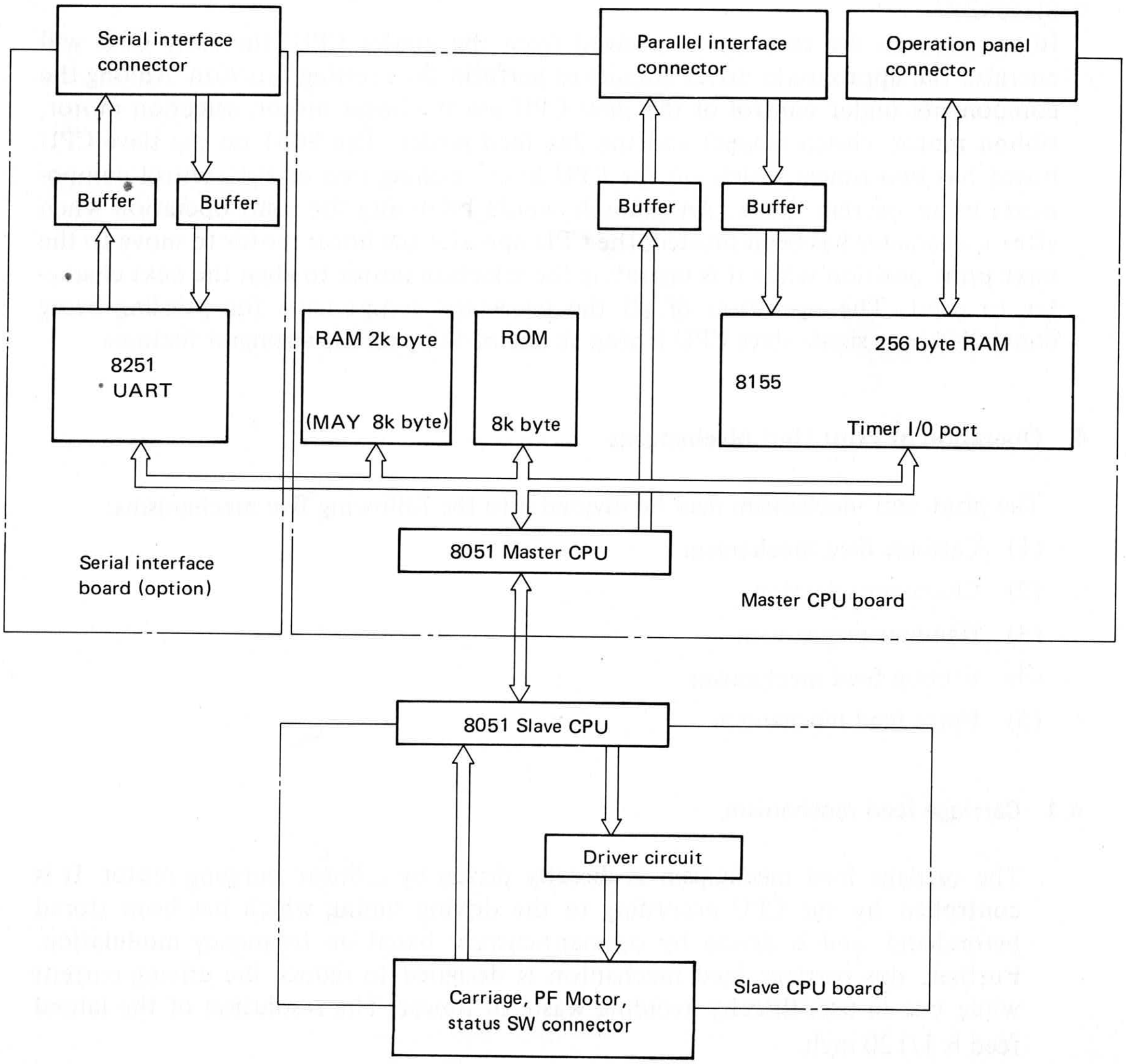


Fig. 3.2

As previously described in Section 2 "Main Component Units", all communications to the host CPU and all printing functions are performed by the control unit. Two separate circuit boards, the Master CPU and the Slave CPU, comprise the Control Unit. The standard printer comes with a Centronics compatible Parallel Interface. An optional serial interface board is also available which attaches directly to the master CPU board. Installation of the serial interface over-rides the parallel interface, in effect, making the two interfaces mutually exclusive.

- Master CPU
  Data from the host CPU received via parallel interface is latched at the I/0 port of the 8155. The 8051 master CPU retrieves this data and stores it into RAM. The master CPU then reads data from RAM, performs computations and transfers the data necessary for printing to the slave CPU. All data retrieved from RAM is checked for embeded escape sequences or special control codes.

- Slave CPU
  In response to the commands received from the master CPU, the slave CPU will energize the appropriate driver circuits to perform the printing function. Among the components under control of the slave CPU are the linear motor, selection motor, ribbon motor, clutch magnet and the line feed motor. The 8051 on the slave CPU board has two timers which aid the CPU in controlling two of the control components in an overlap mode. An example would be during the print operation when after a character has been printed, the CPU operates the linear motor to move to the next print position while it is operating the selection motor to align the next character to print. The operation of all the necessary components for printing being controlled by a signle slave CPU is seen as one of this printers strongest features.

4. Operation of Print Unit Mechanisms

The print unit mechanism may be divided into the following five mechanisms:

(1) Carriage feed mechanism

(2) Character selection

(3) Hammer mechanism

(4) Ribbon feed mechanism

(5) Form feed mechanism

4.1 Carriage feed mechanism

The carriage feed mechanism is directly driven by a linear stepping motor. It is controlled by the CPU according to the driving timing which has been stored beforehand, and is driven by constant-current based on frequency modulation. Further, this carriage feed mechanism is designed to reduce the driving current while not in use, thereby avoiding waste of power. The resolution of the lateral feed is 1/120 inch.

The positional detection is done at the leftmost point. This positional detection is done to detect the home position, and no positional detection will be done during printing. In other words, since open-loop control is used, no out-of-position prints caused by erroneous feed made by external force during printing will be corrected. In the following cases, however, the printer will move its carriage to the left end to detect the home position and then indicate the error or correct the position:

* The home position is detected using the form feed code. If, at this time, any feed error caused by an external force already exists, an error indication will be given.
* With the printer stopped by operating the pause switch, if you inadvertently move the carriage while doing ribbon replacement or the like, operate the check switch to restart the printer. Then the printer will detect the home position to correct the position for normal printing.

The carriage will perform high-speed skipping for higher effective printing speed. The skipping comes in long skipping and short skipping, each having different skipping speed. The linear motor uses a permanent magnet and is driven by the interaction with the driving current.

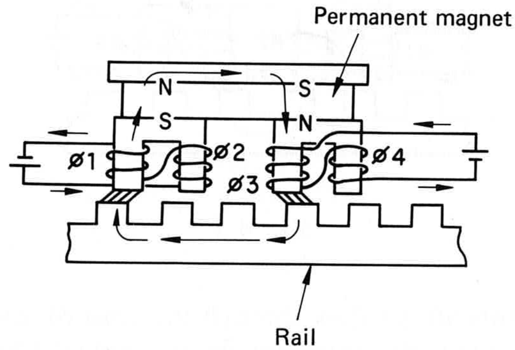


Fig. 4.1

When currents are allowed to flow through the coils as shown in Fig. 4.1, the magnetic fluxes produced by the coils and those produced by the permanent magnet will flow through the poles of the coil $\phi 1$ and coil $\phi 3$. In the coils $\phi 2$ and $\phi 4$, the direction of the fluxes produced by the coils is opposite from that of the fluxes produced by the permanent magnet and therefore the both fluxes will cancel each other. As a result, the magnetic poles of the coils $\phi 1$ and $\phi 3$ are attracted to the poles of the rail, causing the motor to stop as shown in Fig. 4.1.

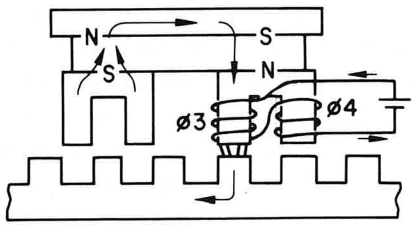


Fig. 4.2

When currents are allowed to flow through only the coil $\phi 3$ as shown in Fig. 4.2, the magnetic fluxes produced by the coil and the permanent magnet will flow through the poles of the coil $\phi 3$, causing the motor to move the right and then stop in the position indicated in Fig. 4.2.

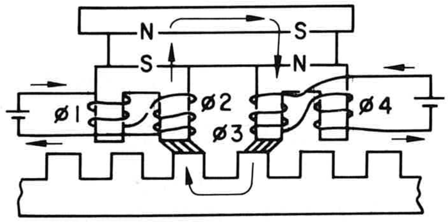


Fig. 4.3

Further, when currents are let flow through the coils $\phi 1$ and $\phi 2$ in the opposite direction from the above, the magnetic fluxes produced by the coils and those produced by the permanent magnet will cancel each other at the poles of the coil $\phi 1$ because of their opposite direction. The magnetic fluxes generated by the coils and the permanent magnet will go through the poles of the coil $\phi 2$. Consequently, the poles of the coils $\phi 2$ and $\phi 3$ will be attracted to the poles of the rail, and the motor will further move to the right before it stops at the point indicated in Fig. 4.3.

Thus, the motor is moved by successively changing the direction of the currents flowing through the coils.

4.2 Character selection mechanism

The character selection mechanism is directly driven by a stepping motor. It is controlled by the CPU according to the driving timing which has been stored beforehand, and is driven by constant-current. Large currents flow through the mechanism during acceleration but the currents grow smaller as the speed increases. Further, it is designed to reduce the driving current wile not in use in order to avoid waste of power. The rotational resolution is 3.6°, i.e., there are 100 stop positions per revolution, which correspond to the number of printable characters on the daisy wheel. The daisy wheel is to be dropped in for setting. To perform the initial setting, move the carriage to the left end and run the motor to position the daisy wheel.
The daisy wheel is positioned by the following mechanism.

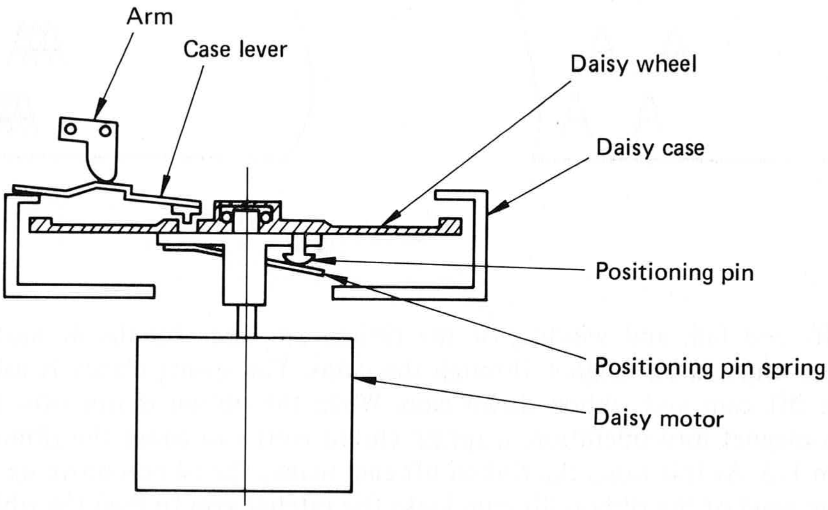


Fig. 4.4

When the carriage is moved to the left end, the arm on the frame depresses the case lever. When the daisy motor runs and the pin of the case lever enters the hole in the daisy wheel, the daisy wheel stops rotating. As the motor further runs until the positioning pin enters the positioning hole in the daisy wheel, the rotation of the daisy wheel will be synchronized with the motor running.

4.3 Hammer mechanism

The Hammer mechanism consists of a long-stroke plunger magnet. It is driven by a constant-current chopper circuit which is controlled by the slave CPU. Impact pressure is determined by the length of time that the driver circuit is energized and can be varied according to the size of the character to be printed.

4.4 Ribbon feed mechanism

A wide ribbon which can be vertically shifted in three stages is used. Either a single-strike ribbon or multi-strike ribbon is used. In the multi-strike ribbon, the same part is hammered a few times while in the single-strike ribbon the same part is struck only once.
The drive gear ratio, which determines the amount of ribbon movement, is automatically set according to the type of ribbon cartridge being installed.

1. Single-strike ribbon
2. Multi-strike ribbon

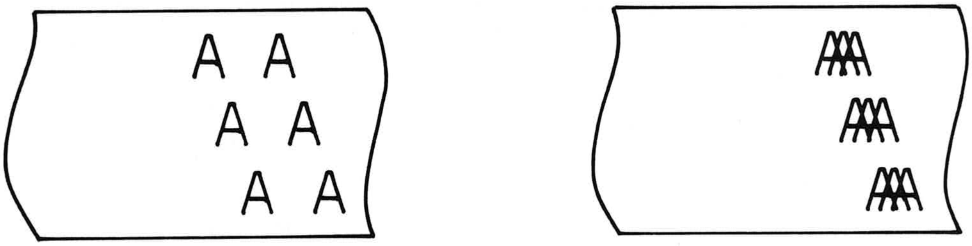


Fig. 4.5

The lift and fall, and winding of the ribbon are done by the dc motor, spring clutches and clutch magnet through the cams. The spring clutch is used for the ribbon lift cam and ribbon down cam. When the ribbon motor runs to put the clutch magnet into operation, a spring clutch works to cause the ribbon lift cam to turn 1/3. At this time, the ribbon lift cam makes the ribbon move up and down, and the pawl of the ribbon lift cam kicks the ratchet arm to feed the ribbon.
As the motor runs in the operate the ribbon down cam, making the ribbon go down to the lowest position. The ribbon down cam is activated at the end of a print operation to allow easy visual inspection of the last print line.

4.5 Form feed mechanism

The platen is driven by a stepping motor through an intermediate gear to accomplish form feed. When moving the platen in reverse, the stepper motor will move the platen past the point where printing is to be done, then the platen will be moved forward to the print line and stopped. This is down to help compensate for backlash between the gears of the form feed mechanism.

5. Removal and Replacement

This section details the procedures necessary for parts replacement, lubrication and adjustment.

5-1. Maintenance tools

Table 5.1 below shows the maintenance tools for the priner. The tools which belong to Level A are required for the maintenance, and those belonging to Level B are not indispensable but are recommended to carry out maintenance early and quickly.

Table 5.1 List of Maintenance Tools

No.	Name of tool	Specification	Level
1	+ Phillips Screwdriver No. 1	75 mm long	A
2	+ Phillips Screwdriver No. 2	100 mm long	A
3	– Round-blade Screwdriver No. 1	4 mm wide, 75 mm long	A
4	Hexagon Screwdriver	1.5 mm wide across flat	A
5	Hexagon Screwdriver	2.0 mm wide across flat	A
6	Hexagon Screwdriver	2.5 mm wide across flat	A
7	Open Ended Spanners	5.5 mm wide across flat	A
8	Open Ended Spanners	10 mm wide across flat	A
9	Spring Fixer	Tool No. E1144100000	B
10	Round Nose Pliers	150 mm long	A
11	Tweezers	AA	A
12	Stop Ring Pliers	S-O	A
13	Soldering Iron	30 W	A
14	E-shaped Snap Ring Pliers No. 2	ETH-2	B
15	E-shaped Snap Ring Pliers No. 25	ETH-2.5	B
16	E-shaped Snap Ring Pliers No. 3	ETH-3	B
17	E-shaped Snap Ring Pliers No. 4	ETH-4	B
18	Feeler Gauge	75A19	A
19	Ohm Meter	AC/DC volt, ohm and ampere meter	A
20	Oscilloscope		B

5.2 Disassembly and assembly

The following describes the disassembly procedures for the main parts of the printer. Unless otherwise described, assemble the parts in reverse order from disassembly procedures.

CAUTION: BEFORE PROCEEDING WITH ANY OF THE REMOVAL/REPLACEMENT PROCEDURES YOU SHOULD TURN THE PRINTER OFF DISCONNECT THE POWER CORD AND UNPLUG THE INTERFACE CONNECTOR.

NOTE: All procedures outlined in the removal/replacement section of this manual assume that the tractor assembly is not present on your printer. For tractor removal see your tractor installation manual.

5.2.1 Removing the covers (Refer to Fig. 5.1 on Page 10 and Page 13)

(1) Top cover and acoustic cover assembly ①

To remove the top cover and acoustic cover assembly simply pull up along the front edge until it disengages from the center cover assembly. Once the front edge is free, pull up along the front edge until it disengages from the center cover assembly. Once the front edge is free, pull the top cover toward you to completely remove it.

(2) Removing the center cover ②

Step 1. Move the carriage to the center of the platen.

Step 2. Move the paper guide to the far left and then turn the paper table toward the rear of the machine.

Step 3. Pull the paper release lever to the forward (released) position.

Step 4. To remove the platen assembly, locate the two black plastic platen bearings. On each bearing there are two protrusions. Pinch the two protrusions together while gently pulling the platen away from the frame. Repeat this procedure for both ends of the platen.

Step 5. Remove two screws ③ which are located just below the area where the platen knobs exit the cover.

Step 6. There are 5 points () along the front edge of the center cover which must be disengaged from the bottom cover. Reach points designated to detach the five clasps.

Step 7. Slowly lift the front of the center cover and push toward the rear to disengage the last 3 clasps. Lift the cover away from the printer assembly.

(3) Removing the bottom cover ④

Step 1. Move the carriage as far to the left as possible.

Step 2. Locate two ribbon cable assemblies, 1 center and 1 far right in the base of the printer. Remove and retain two pieces of tape from each of the ribbon cable assemblies.

Step 3. Remove two screws( ) which fasten the printer frame to the bottom cover.

Step 4. Carefully lift the front of the printer frame. Pull the frame forward to disengage it from the bottom cover then lift the printer assembly completely away.

(4) To replace cover assemblies, reverse the procedures outlined above.

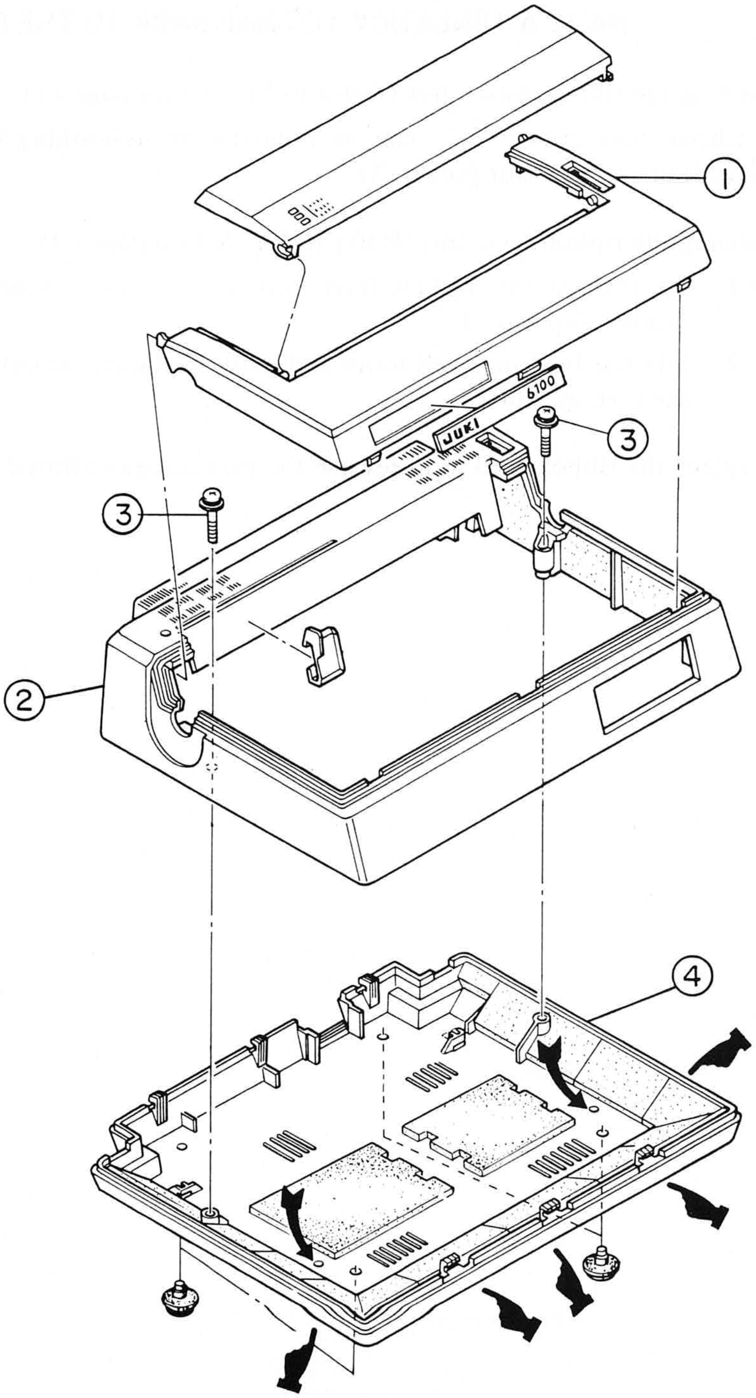


Fig. 5.1

5.2.2 Removing the ribbon feed unit

(1) Removing the ribbon cartridge (Refer to Fig. 5.2 on page 12)

Step 1 Move the ribbon release level (A) to the front of the ribbon mechanism (released position).

Step 2. Remove the ribbon cartridge (B) .

Step 3. Return the ribbon release lever to the side position.

CAUTION: THE RELEASE LEVER IS SPRING-LOADED AND WILL HAVE A TENDENCY TO SNAP BACK TO THE SIDE.....

(2) Removing the ribbon base cover (Refer to Fig. 5.3 on page 12)

The ribbon base cover (C) can be removed by unhooking it from the carriage frame at the four points (D) .

(3) Removing the ribbon feed unit (Refer to Fig. 5.3 on page 12)

Step 1. To remove the ribbon feed unit, remove one mounting screw located at point (E) .

Step 2. Lift the feed unit and move it slightly to the left to detach it from the carriage unit.

(4) To replace the ribbon feed unit, reverse the procedures outlined above.

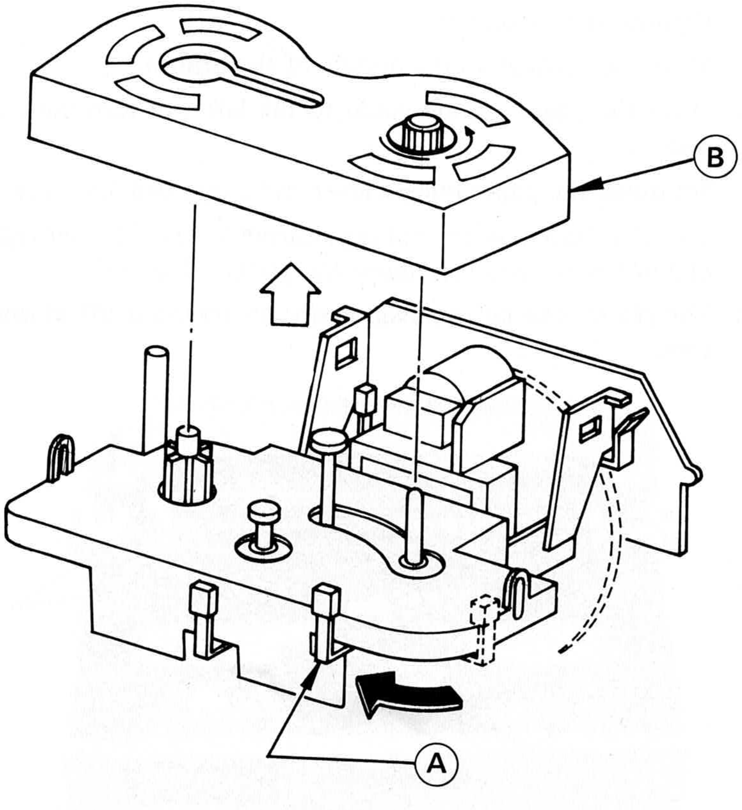


Fig. 5.2

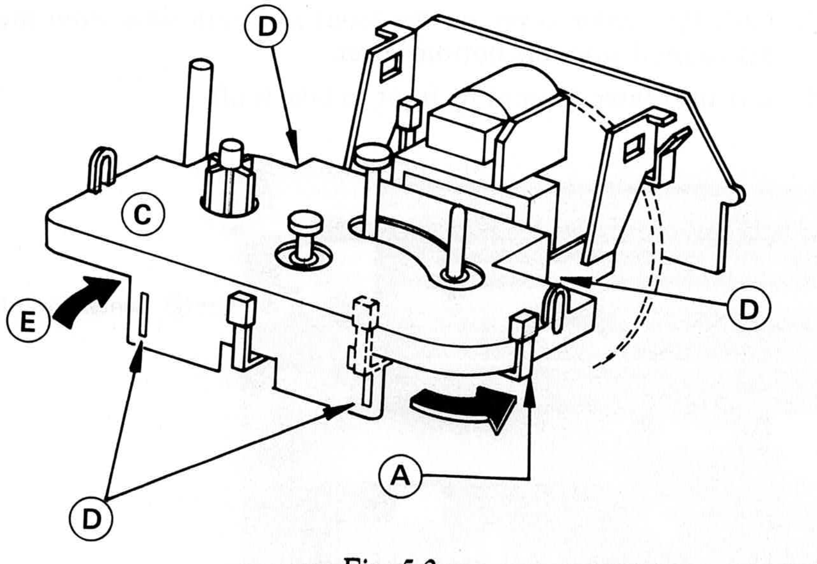


Fig. 5.3

5.2.3 Removing the center cover

Step 1. Remove the top cover.

Step 2. Move the carriage to the middle of the printer.

Step 3. Move the paper setting guide to the left and turn the paper table backward.

Step 4. Set down the paper release lever and paper bail lever toward you.

Step 5. Lift the platen while pulling bearing levers ① on eigher side of the platen toward you to remove the platen. (Fig. 5.4)

NOTE: The platen can be removed easily by taking it off at one side each at a time.

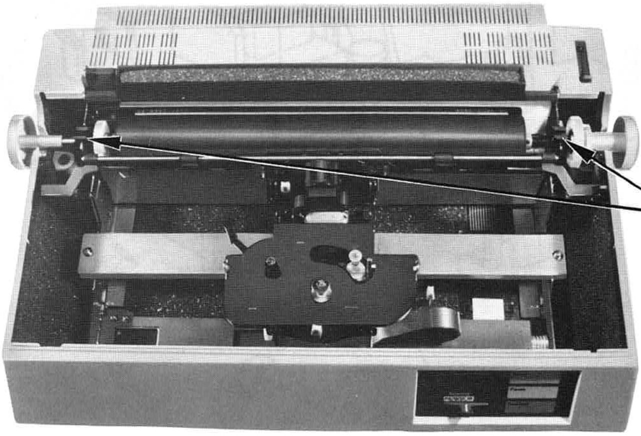


Fig. 5.4

Step 6. Remove two fixing screws ② from the center cover.

Step 7. Push the center cover on the front and both sides from the inside to disengage it from the bottom cover.

Step 8. Lift the center cover at its front to take it off.

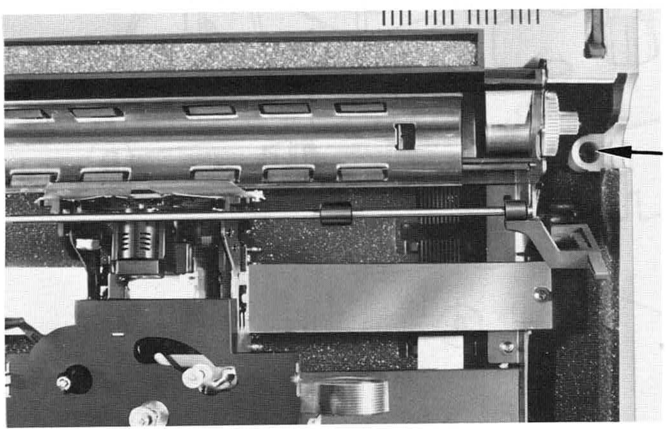


Fig. 5.5

CAUTION: WHEN INSTALLING THE PLATEN, FIT THE BEARING GROOVES ON EITHER SIDE ONTO THE SIDE FRAME AND THEN PUSH THE BEARING DOWN. (Fig.5.6)
AT THIS TIME, MAKE SURE TO SET DOWN THE PAPER RELEASE LEVER BACKWARD.

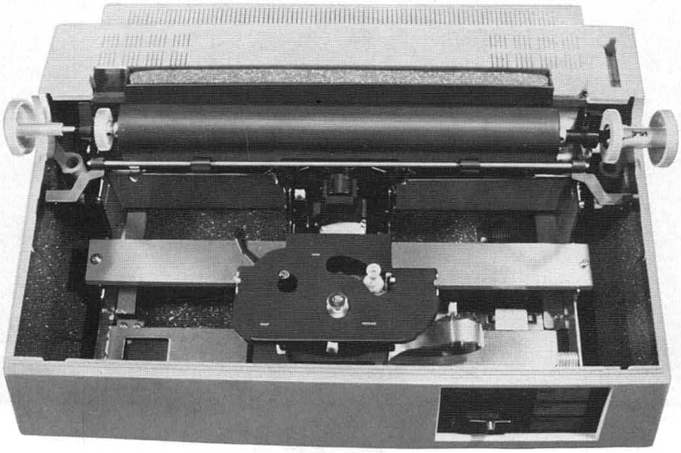


Fig. 5.6

5.2.4 Removing the carriage unit

Step 1. Remove two screws ① fixing the linear rail. (Fig. 5.7)

CAUTION: THE SHIMS USED FOR FIXING THE LINEAR RAIL ARE TO BE REINSTALLED EXACTLY IN THE SAME WAY AS BEFORE DISASSEMBLY.
TAKE CARE NOT TO LOSE THE SHIMS OR MISPLACE THE RIGHT SHIMS WITH THE LEFT ONE. NOTE THAT, HOWEVER, THE SHIMS SERVE AS ADJUSTMENT AIDS AND MAY NOT BE USED FROM TIME TO TIME.

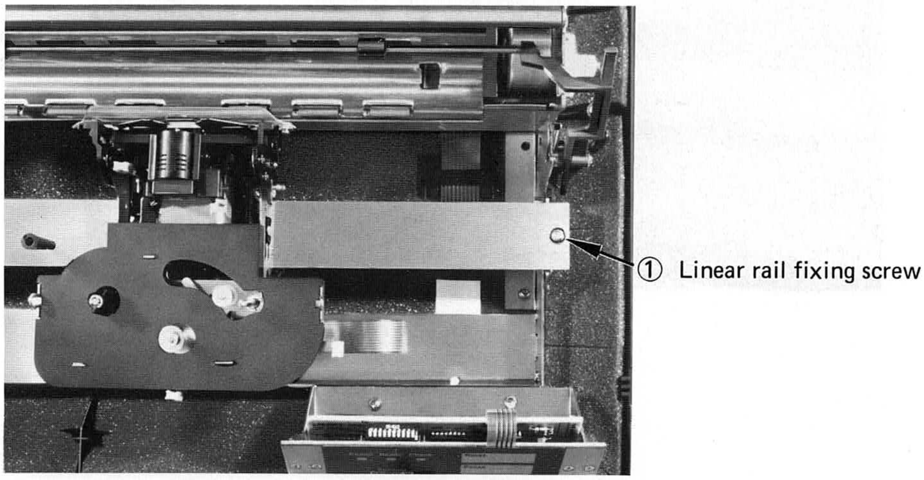


Fig. 5.7

Step 2. Lift the carriage unit and remove the flat cable holder. (Fig. 5.8)

Step 3. Disconnect the two flat cables from the connector the carriage circuit board.

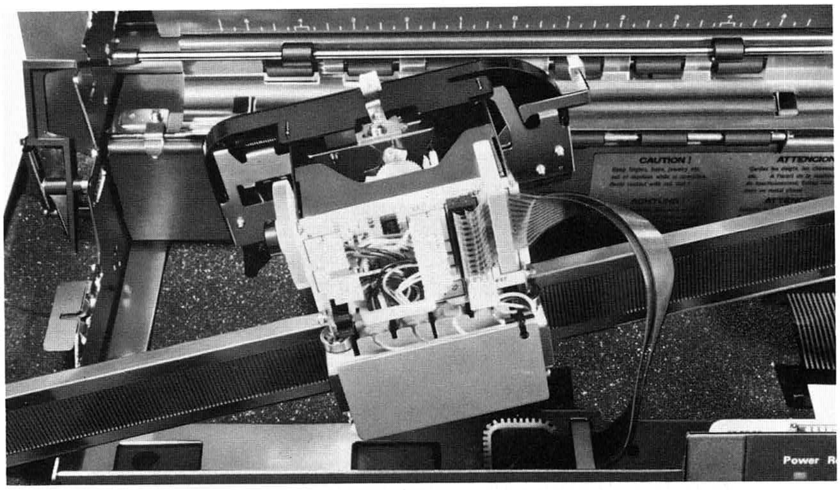


Fig. 5.8

5.2.5 Removing the ribbon feed unit

Step 1. Removing the ribbon, turn the ribbon release lever to the front to place it in the set state. (Fig. 5.9)

Step 2. Release the ribbon base cover at four hooks ① to remove the ribbon base cover. (Fig. 5.9)

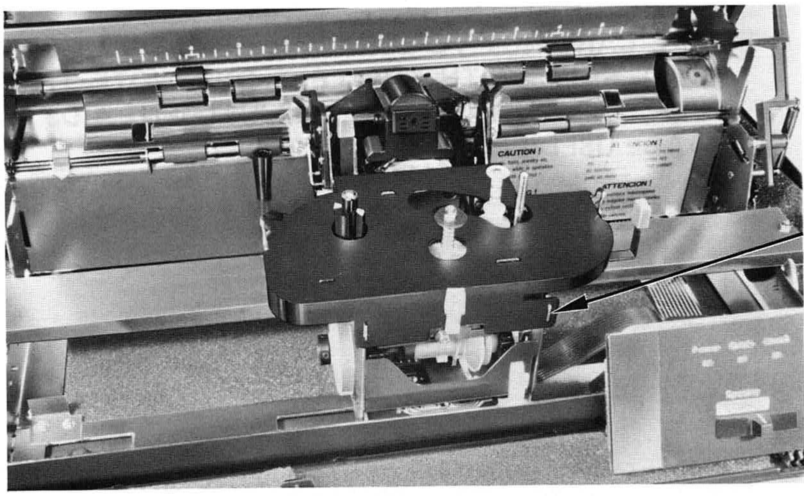


Fig. 5.9

Step 3. Remove fixing screws ② of the ribbon feed unit at the left of the carriage frame. (Fig. 5.10)

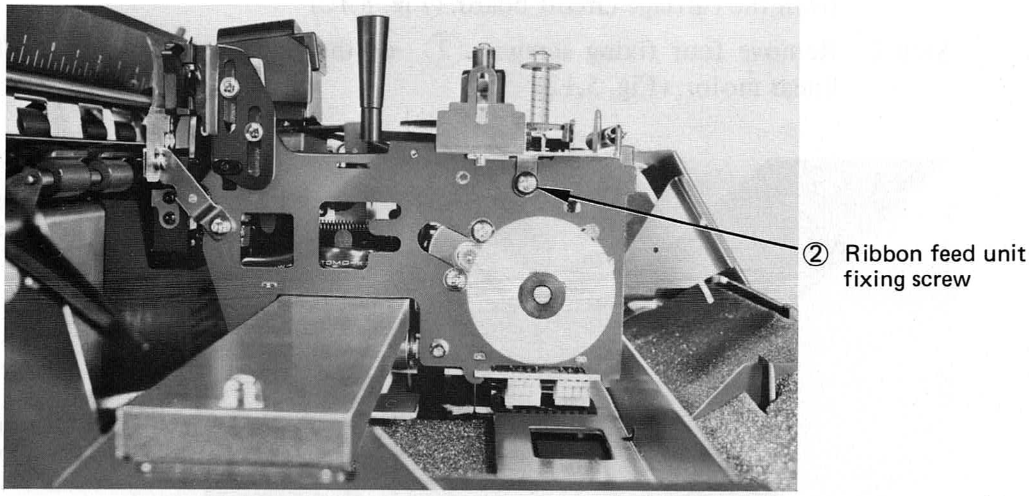


Fig. 5.10

Step 4. Pull the ribbon feed unit to the left, and disengage it from the carriage at the right side to remove it.

5.2.6 Removing the carriage circuit board

Step 1. Remove the carriage unit and disconnect all the connectors.

Step 2. Using pliers, straighten the form lug ① of the carriage frame, then remove the carriage circuit board. (Fig. 5.11)

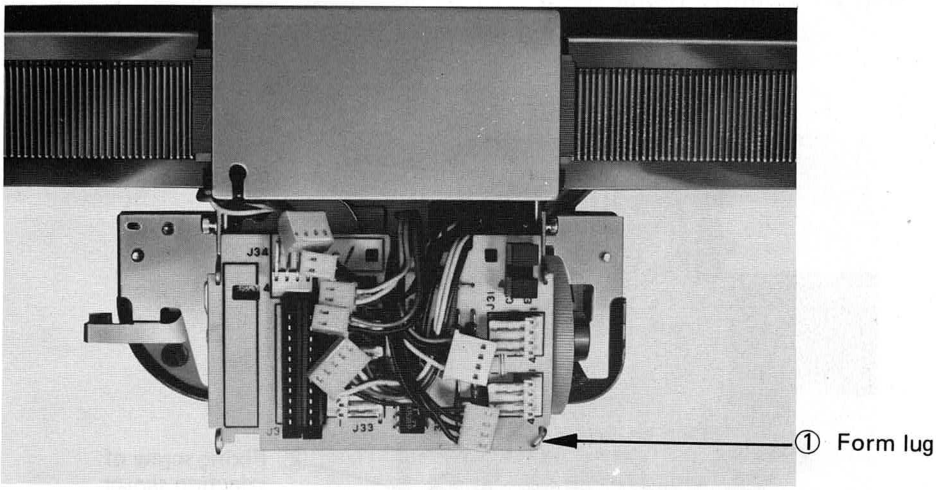


Fig. 5.11

5.2.7 Removing the linear motor

Step 1. Remove the carriage unit, and disconnect linear motor connector ① from the carriage circuit board. (Fig. 5.12)

Step 2. Remove four fixing screws ② of the linear motor to take off the linear motor. (Fig. 5.12)

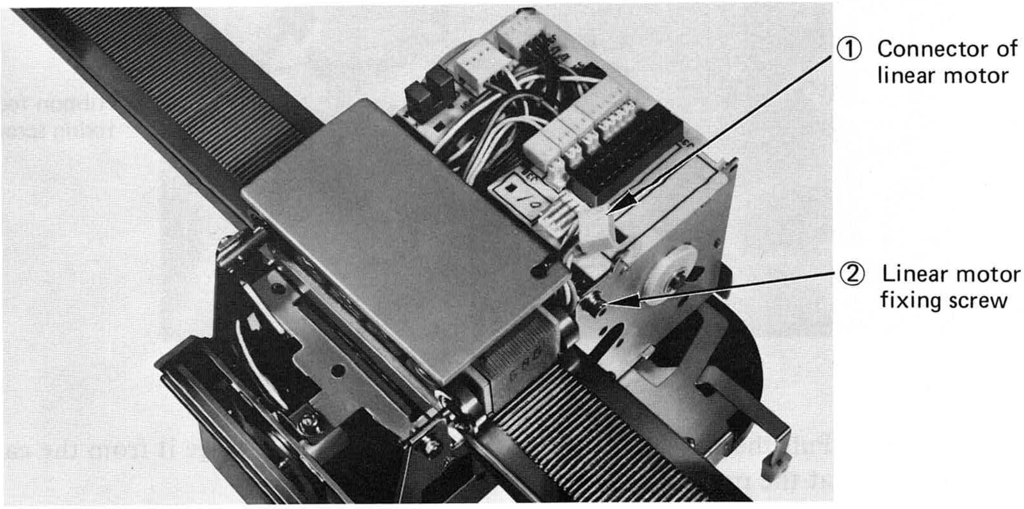


Fig. 5.12

5.2.8 Removing the selection sensor

Step 1. Remove the carriage unit and disconnect connector ① from the selection sensor. (Fig. 5.13)

Step 2. Remove fixing screw ② of the selection sensor and take off the selection sensor. (Fig. 5.13)

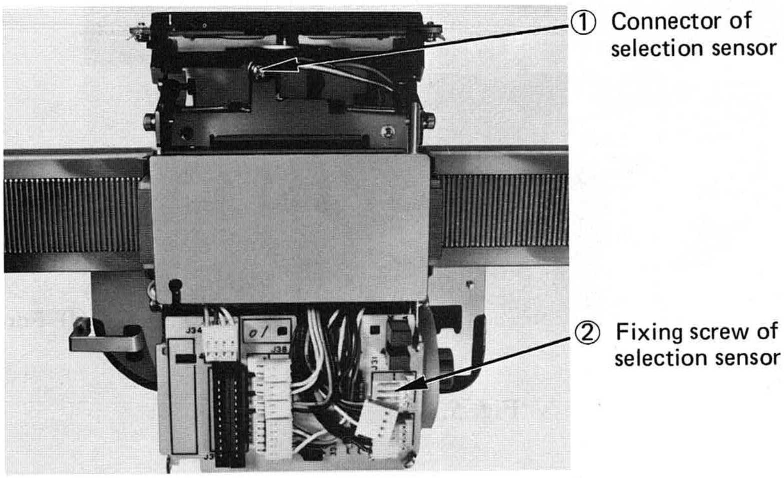


Fig. 5.13

5.2.9 Removing the ribbon detector

Step 1. Remove the carriage unit and disconnect connector ① from the ribbon detector. (Fig. 5.14)

Step 2. Remove fixing screw ② of the ribbon detector and take off the ribbon detector. (Fig. 5.14)

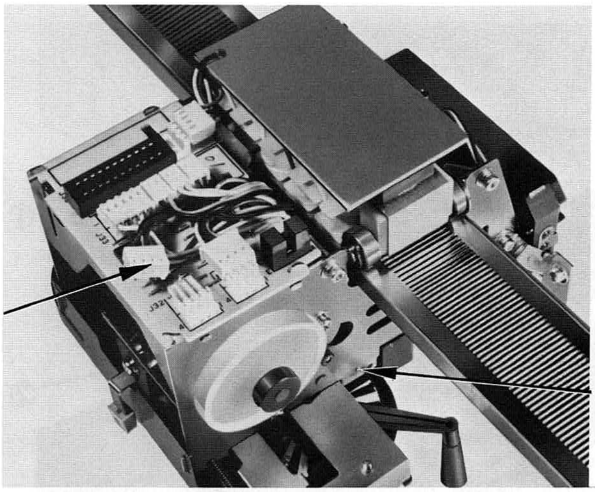


Fig. 5.14

5.2.10 Removing the cam follower

Step 1. Remove the carriage unit and take off the ribbon feed unit.

Step 2. Remove lift arm spring ① and cam follower spring ②. (Fig. 5.15)

Step 3. Remove E-shaped snap ring ③ and then remove the cam follower (Fig. 5.15)

NOTE: Remove the cam follower with the daisy motor in the set state (with the daisy motor pushed in forward).

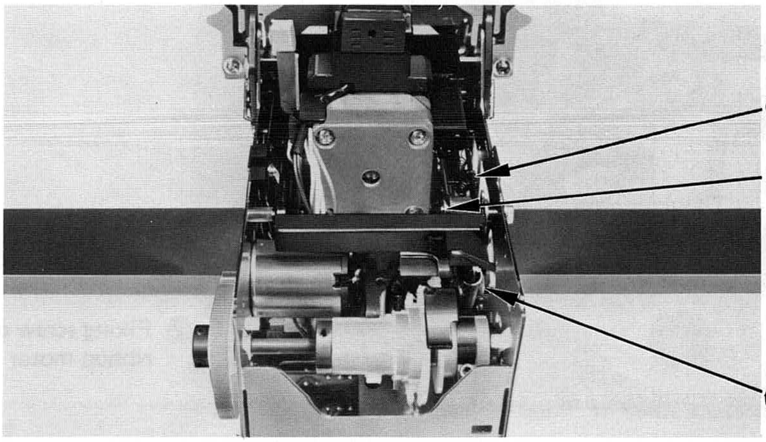


Fig. 5.15

5.2.11 Removing the ribbon lift arm

Step 1. Remove the carriage unit and then also remove the ribbon feed unit and cam follower.

Step 2. Remove E-shaped snap ring ① and hexagon nut ②. (Fig. 5.16)

Step 3. Draw out the lift arm shaft and remove the ribbon lift arm. (Fig. 5.16)

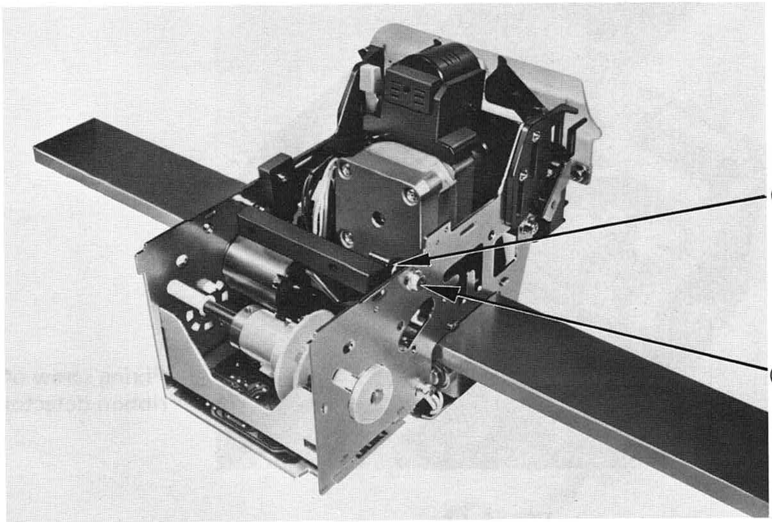


Fig. 5.16

5.2.12 Removing the ribbon motor

Step 1. Remove the carriage unit and then remove the ribbon feed unit.

Step 2. Remove the cable holder from the carriage circuit board, and disconnect connector ① from the ribbon motor. (Fig. 5.17)

Step 3. Remove the two fixing screw ② and take off the ribbon motor. (Fig. 5.17)

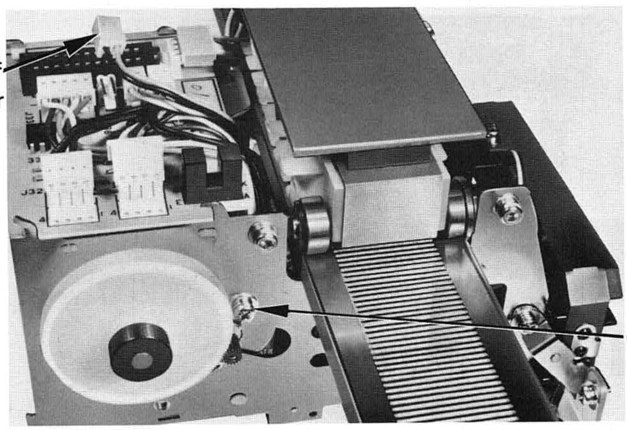


Fig. 5.17

5.2.13 Removing the clutch shaft

Step 1. Remove the ribbon feed unit and cam follower from the carriage.

Step 2. Loosen two setscrews ① of the clutch gear to release the clutch gear and bearing. (Fig. 5.18)

Step 3. Remove E-shaped snap ring ② and then remove the right bearing. (Fig. 5.18)

Step 4. Tilt the clutch shaft unit aslant to remove it.

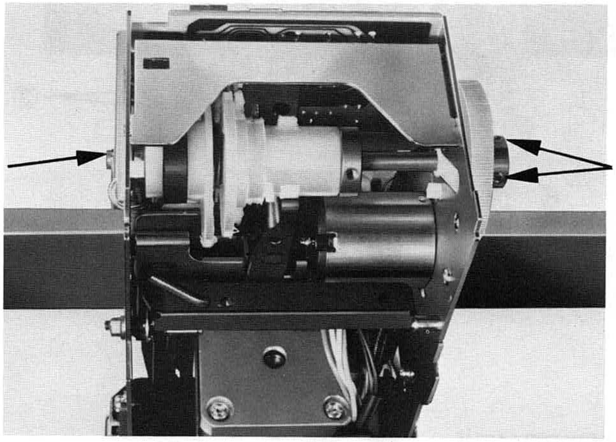


Fig. 5.18

5.2.14 Removing the clutch magnet unit

Step 1. Remove the carriage unit and take off the ribbon feed unit.

Step 2. Remove the cable holder from the carriage circuit board and disconnect connector ① at the clutch magnet unit. (Fig. 5.19)

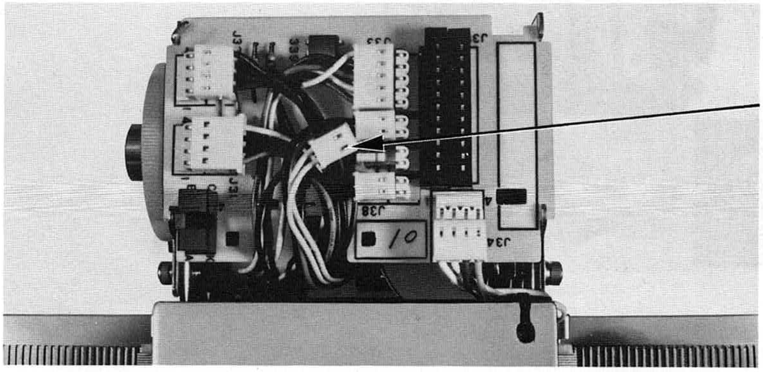


Fig. 5.19

Step 3. Remove two fixing screws ② of the clutch magnet unit, and take off the clutch magnet unit. (Fig. 5.20)

NOTE: The clutch magnet unit has a back stopper on its bottom, so that it cannot be removed unless it is tilted aslant.

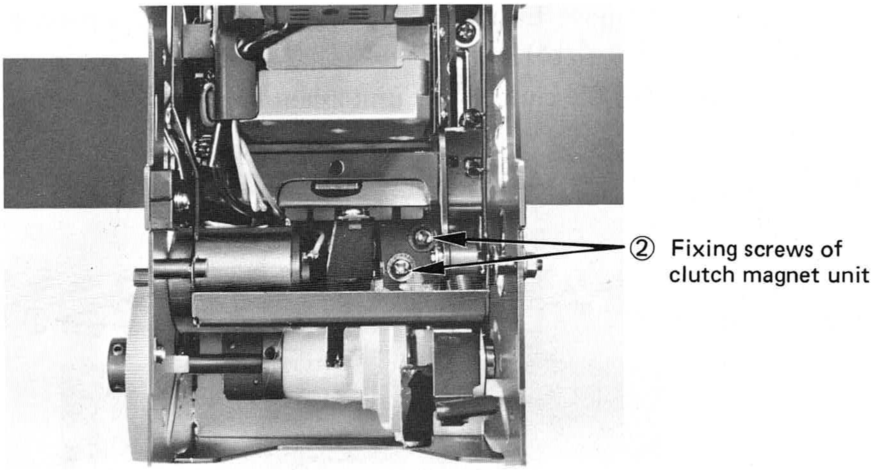


Fig. 5.20

5.2.15 Removing the hammer unit

Step 1. Remove the carriage unit and take off the ribbon feed unit.

Step 2. Remove the cable holder from the carriage circuit board, and disconnect connector ① at the hammer unit. (Fig. 5.21)

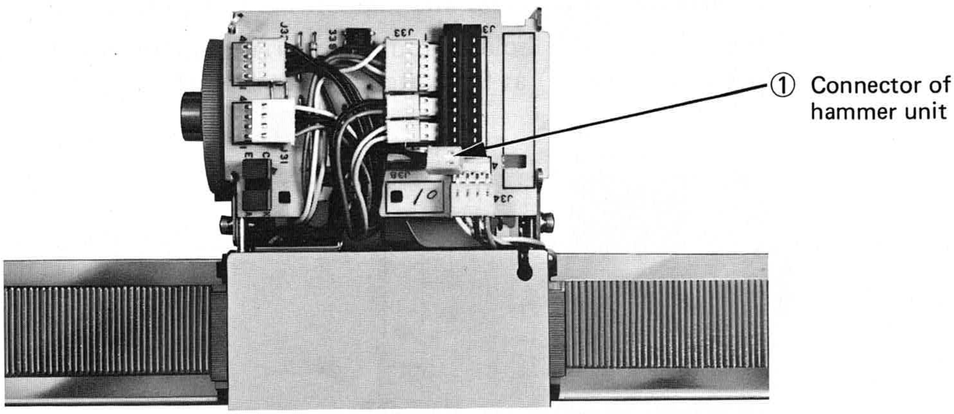


Fig. 5.21

Step 3. Draw the out lever toward you.

Step 4. Loosen two fixing screws ② of the hammer cover to remove the hammer cover. (Fig. 5.22)

Step 5. Remove two fixing screws ③ of the hammer bracket to take off the hammer bracket and hammer unit. (Fig. 5.23)

Step 6. Remove two fixing screws ④ of the hammer unit to take off the hammer unit. (Fig. 5.23)

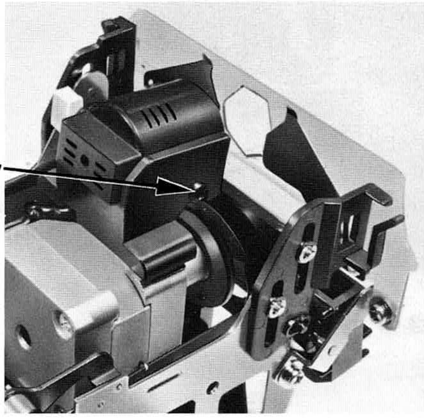


Fig. 5.22

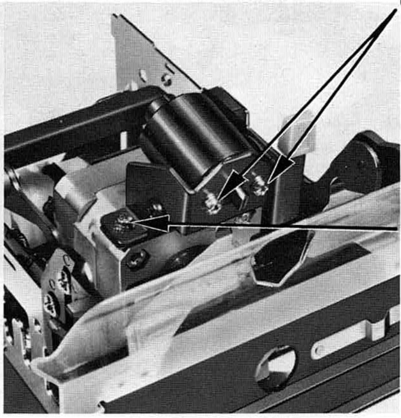


Fig. 5.23

5.2.16 Removing the selection & hammer unit

Step 1. Remove the carriage unit and take off the ribbon feed unit.

Step 2. Removing the cable holder from the carriage circuit board, disconnect connector ① at the selection motor and connector ② at the hammer unit. (Fig. 5.24)

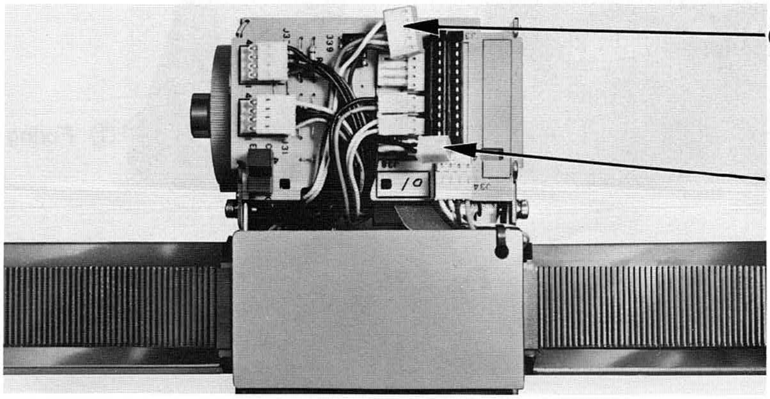


Fig. 5.24

Step 3. Loosen two fixing screws ③ of the right ball guide to remove the selection & hammer unit. (Fig. 5.25)

CAUTION: BE CAREFUL NOT TO LOSE THE FOUR BALLS WHICH ARE RELEASED WHEN THE UNIT IS REMOVED.

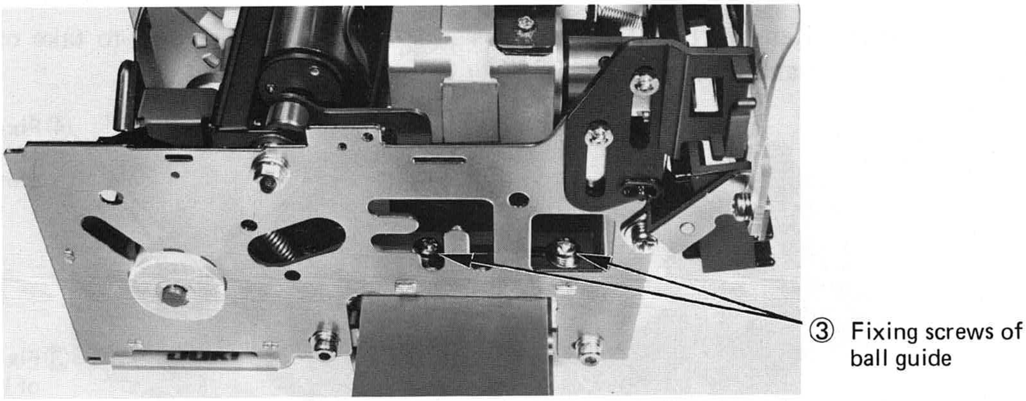


Fig. 5.25

5.2.17 Removing the operation panel circuit board

Step 1. Remove two fixing screws ① from the operation panel unit. (Fig. 5.26)

Step 2. Disconnect the flat cable from the operation panel unit.

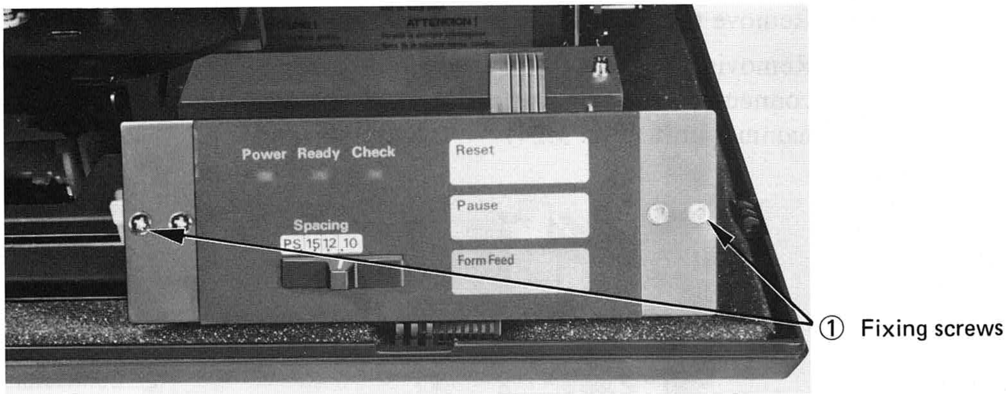


Fig. 5.26

Step 3. Disconnect connecting cables ② of the operation panel switch from the operation panel circuit board. (Fig. 5.27)

Step 4. Remove two fixing screws ③ of the operation panel circuit board to detach the circuit board from the operation panel switch. (Fig. 5.27)

CAUTION: MAKE SURE TO DRAW OUT THE SLIDE SWITCH KNOB STRAIGHT.

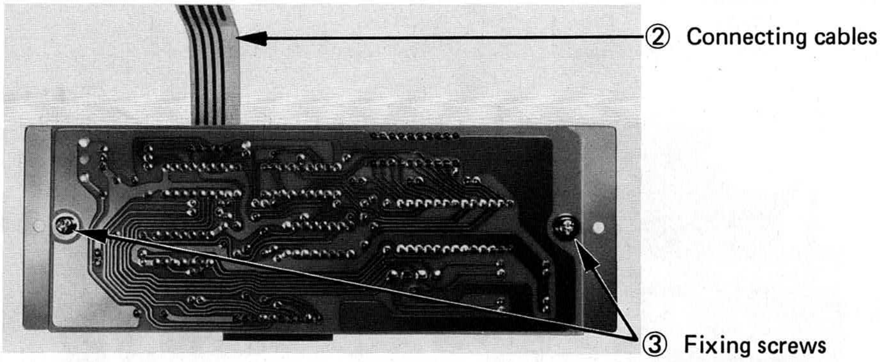


Fig. 5.27

5.2.18 Removing the circuit board cover

Step 1. Loosen three fixing screws ① of the circuit board cover. (Fig. 5.28)

Step 2. After removing the fixing screws from the circuit board cover, pull the cover up right above to take it off.

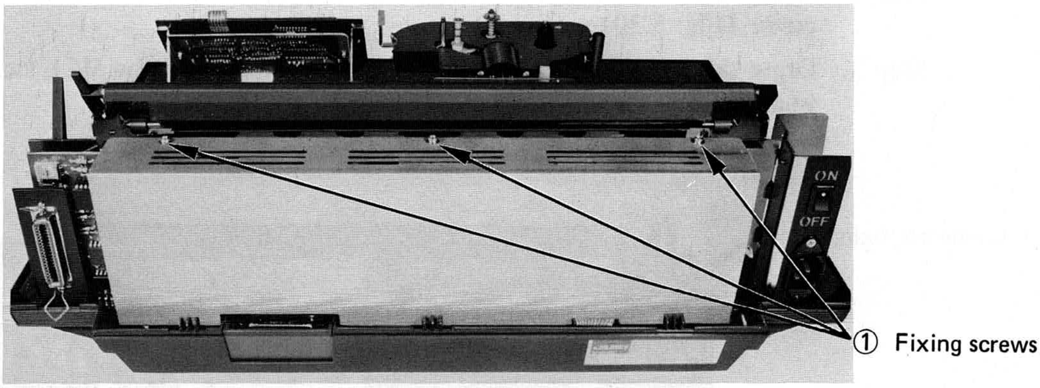


Fig. 5.28

5.2.19 Removing the SCU circuit board

Step 1. Removing the circuit board cover. (Refer to 5.2.18 on Page 24)

Step 2. Disconnect flat cables ① and ②. (Fig. 5.29)

Step 3. Remove connectors ③ and ④. If the printer has the paper end switch, also disconnect connector ⑤. (Fig. 5.29)

Step 4. Release the circuit board from the hooks of plastic holder ⑥. (Fig. 5.29)

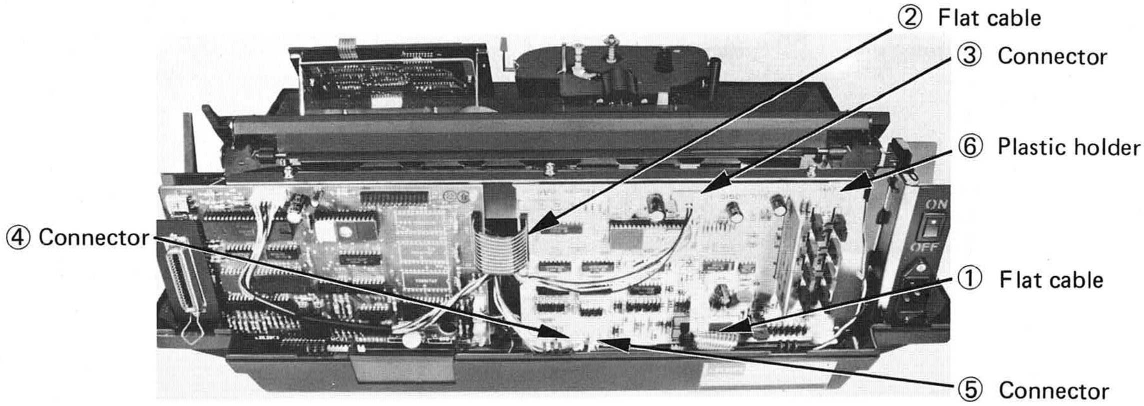


Fig. 5.29

5.2.20 Removing the MCU2 circuit board (option)

Step 1. Remove the circuit board cover. (Refer to 5.2.18 on Page 24)

Step 2. Remove two connector fixing screws ① to release the connector cover. (Fig. 5.30)

Step 3. Draw the MCU2 circuit board off the connector of the MCU1 circuit board.

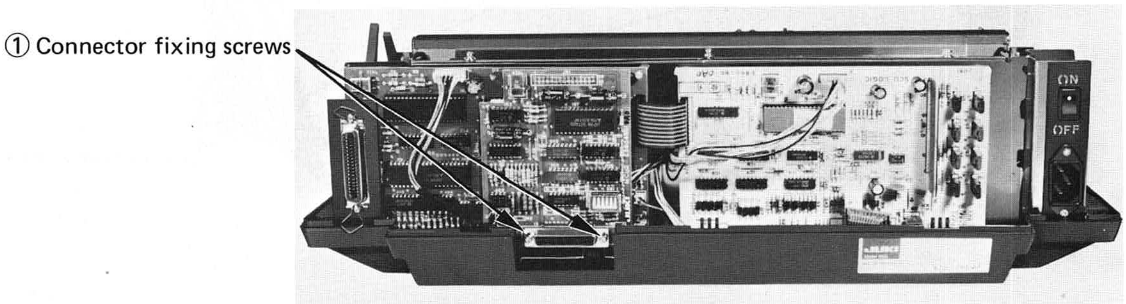


Fig. 5.30

5.2.21 Removing the MCU1 circuit board

Step 1. Remove the circuit board cover. (Refer to 5.2.18 on Page 24)

Step 2. Remove flat cable ① and ②, connectors ③ and ④, and ground wire ⑤. (Fig. 5.31)

Step 3. Remove two connector fixing screws ⑥. If the priner has an optional circuit board, also remove two studs ⑦. (Fig. 5.31)

Step 4. Release the circuit board from the hooks of plastic holder ⑧. (Fig. 5.31)

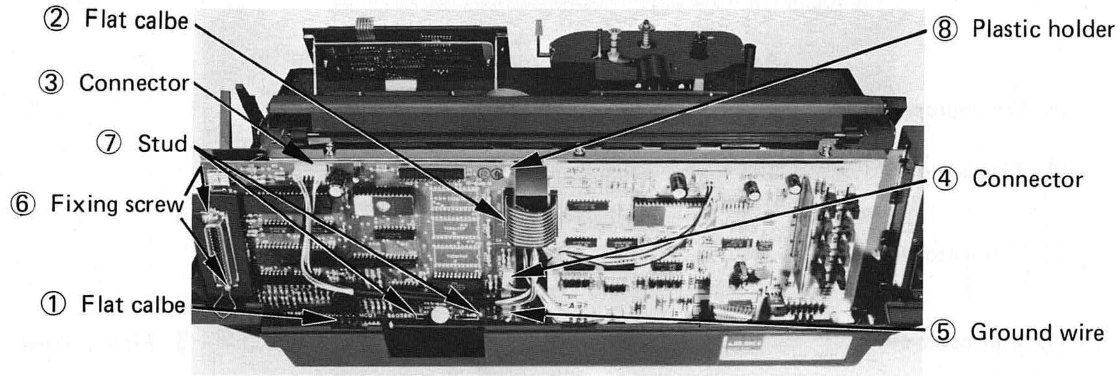


Fig 5.31

5.2.22 Removing the bottom cover

Step 1. Detach the four tapes fixing the flat cables of the carriage and operation panel from the bottom cover. (Fig. 5.32)

Step 2. Remove two fixing screws ① . (Fig. 5.32)

Step 3. Draw the printer main unit nearer to you before lifting it off the bottom cover.

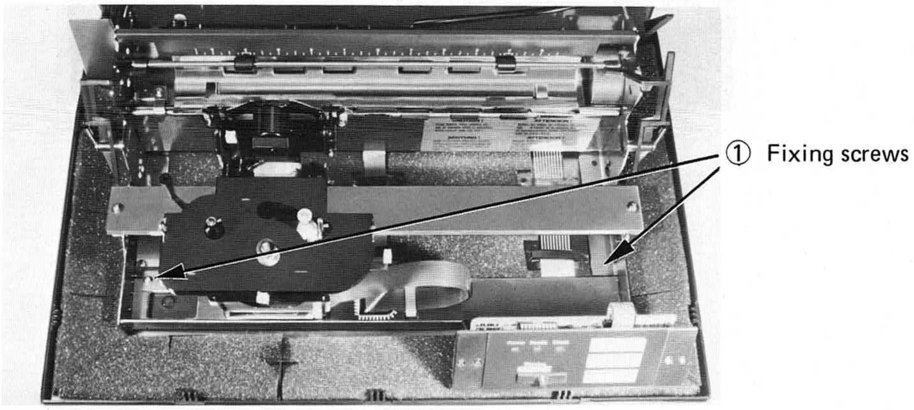


Fig. 5.32

5.2.23 Removing the controller unit

Step 1. Remove the bottom cover and the circuit board cover, and then disconnect flat cables ① and ②, and connectors ③ and ④. (Fig. 5.33)

Step 2. Remove two fixing screws ⑤ from either side of the frame. (Fig. 5.33)

Step 3. Move up aslant the controller unit to take off.

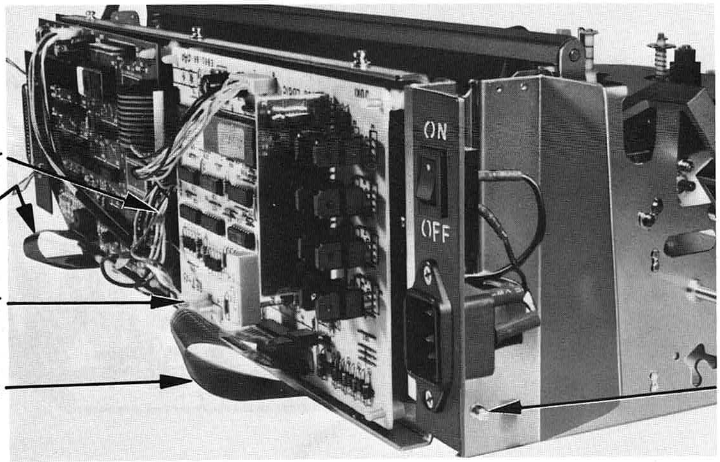


Fig. 5.33

5.2.24 Removing the power unit

Step 1. Remove the controller unit and then disconnect connectors ① and ②. (Fig. 5.34)

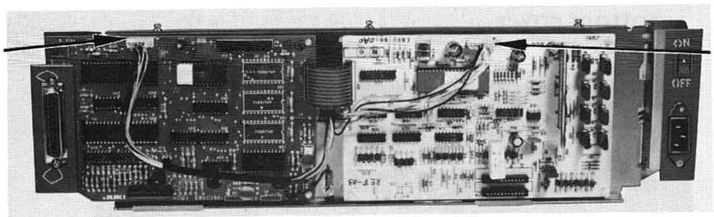


Fig. 5.34

Step 2. Remove two fixing screws ③ of the transformer and three fixing screws ④ of the circuit board. (Fig. 5.35)

Step 3. Release the hooks of the transformer to set the power unit free, and remove the solder on the circuit board of the primary cord. (Fig. 5.36)

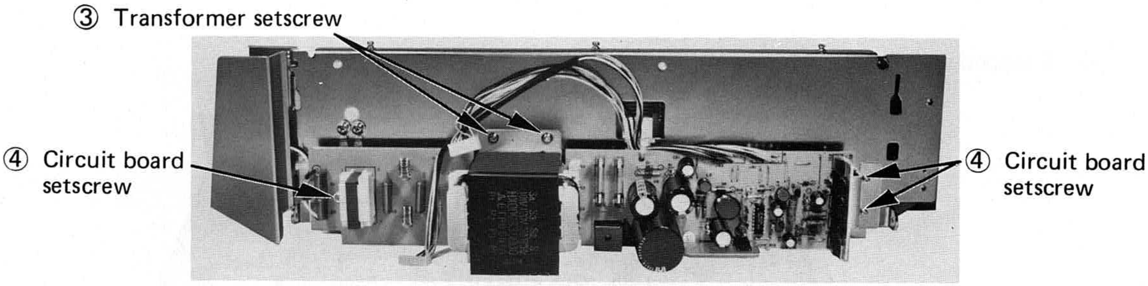


Fig. 5.35

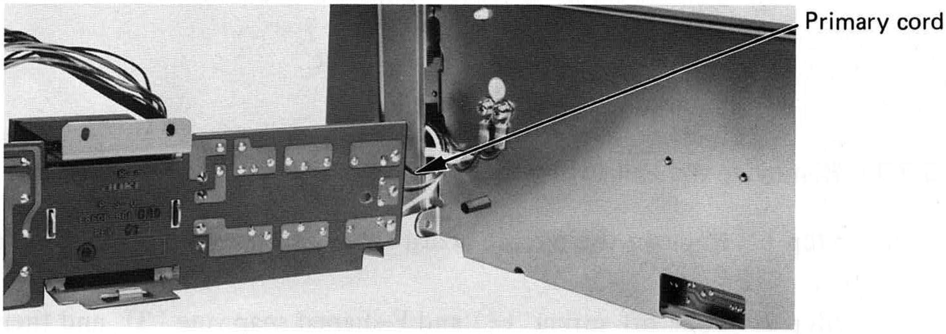


Fig. 5.36

5.2.25 Removing the line feed motor unit

Step 1. Remove the controller unit.

Step 2. Remove two motor fixing screws ① to release the line feed motor unit. (Fig. 5.37)

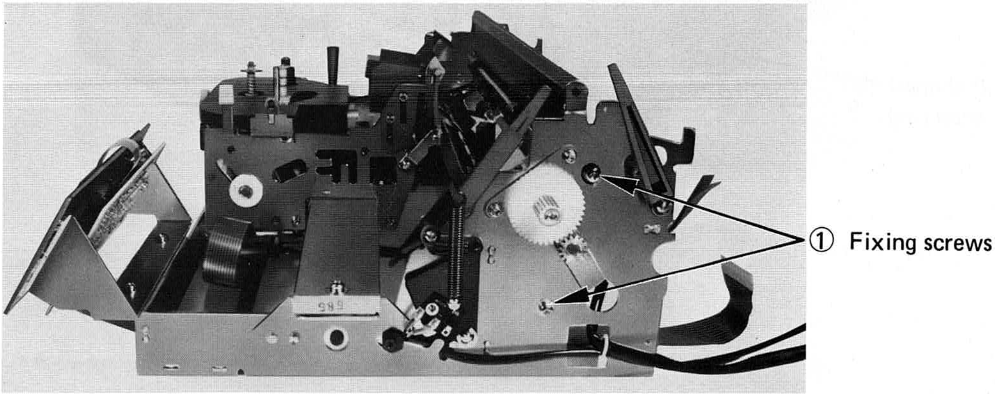


Fig. 5.37

5.2.26 Removing the feed roller unit

Step 1. Remove the paper pan.

Step 2. Removing E-shaped snap ring ①, draw out shaft ② and remove the feed roller unit. (Fig. 5.38)

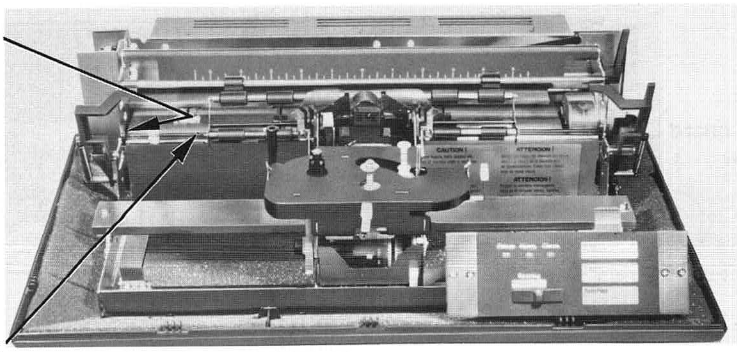


Fig. 5.38

5.2.27 Removing the bail switch unit

Step 1. Remove the circuit board cover and then remove connector ①. (Fig. 5.39)

Step 2. Take off spring ② and E-shaped snap ring ③, and then remove the bail switch unit. (Fig. 5.39)

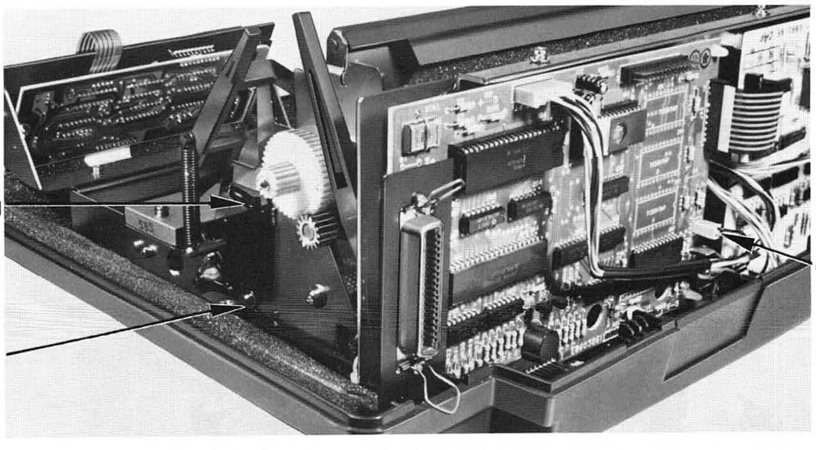


Fig. 5.39

5.2.28 Removing the paper end switch (for optional tractor)

Step 1. Take off the circuit board cover, and remove connector ①. (Fig. 5.40)

Step 2. Remove two switch fixing screws ② to release the paper end switch. (Fig. 5.40)

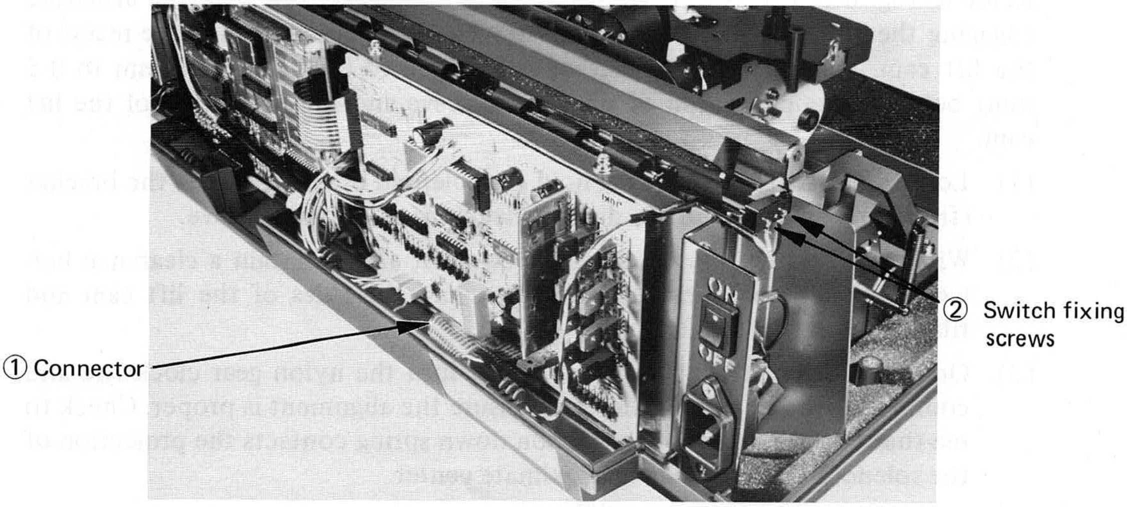


Fig. 5.40

6. Adjustment

6.1 Carriage unit and linear motor unit adjustment

6.1.1 Clutch shaft asm. and Clutch magnet asm.

Refer to Fig. 6.1, Fig. 6.2 (Page 32) and Fig. 6.3 (Page 32), with the armature engaging the clutch sleeve stop lug and the back stopper located in the recess of the lift cam, check for a clearance of 0.007 inch to 0.02 inch (0.2 mm to 0.5 mm) between the projection of the clutch sleeve and the projection of the lift cam.

(1) Loosen the two screws which hold the solenoid bracket. Adjust the bracket (front to rear) to attain the desired clearance as outlined above.

(2) While performing this adjustment you must also maintain a clearance between the solenoid bracket projection and the sides of the lift cam and ribbon down cam (Refer to Fig. 6.3).

(3) Once the adjustments have been made, turn the nylon gear clockwise and counter-clockwise several times to ensure the alignment is proper. Check to see that the projection of the ribbon down spring contacts the projection of the solenoid bracket at its approximate center.

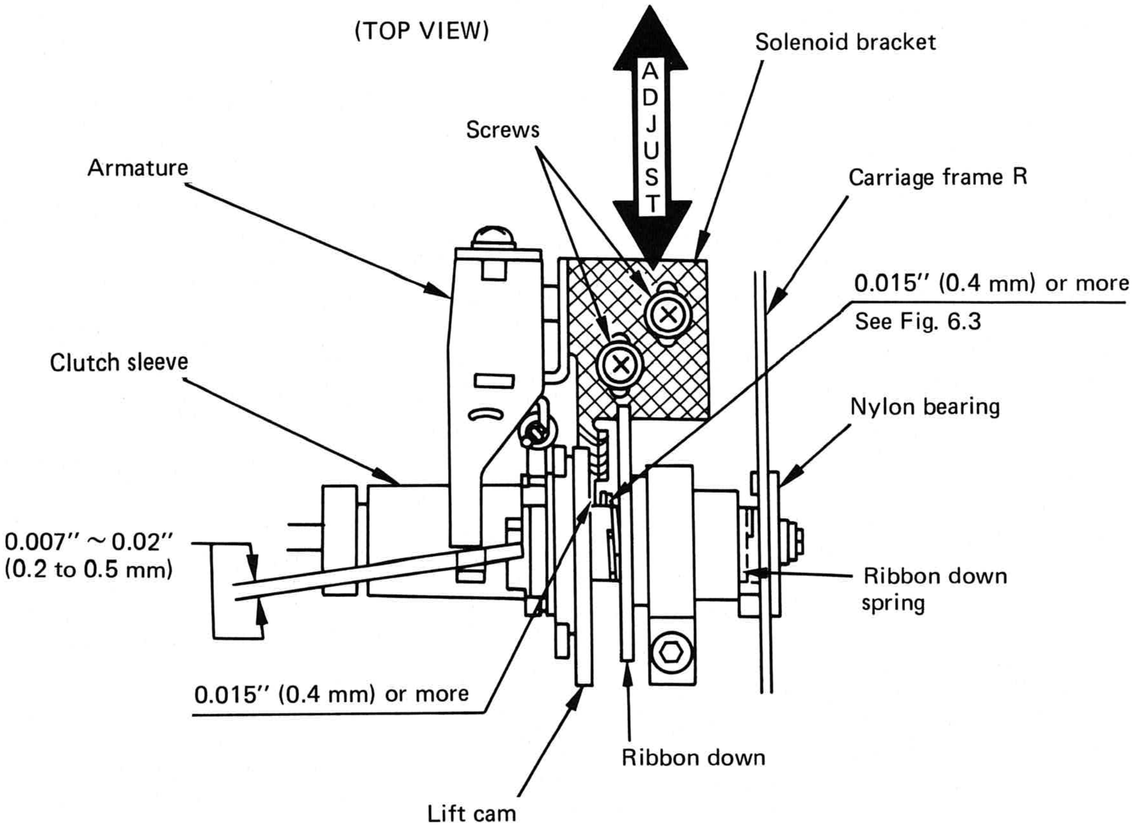
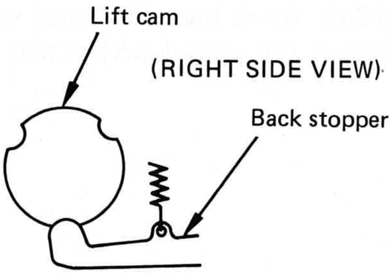


Fig. 6.1



* Back stopper engaged with the recess of the lift cam.

Fig. 6.2

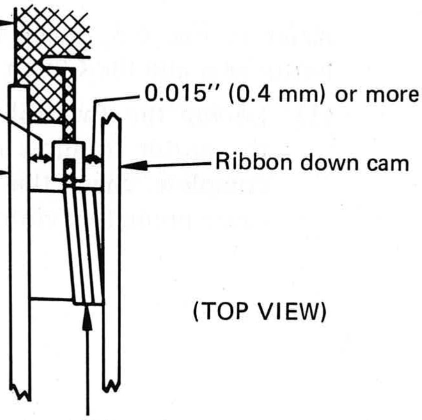


Fig. 6.3

6.1.2 Ribbon down cam

Refer to Fig. 6.4, when the nylon gear on the left side of the carriage is rotated clockwise the ribbon down cam should not make contact with the front of the carriage frame.

(1) Remove the E-shaped snap ring from the right end of the clutch shaft. The nylon bearing has two projections on its inner surface. The larger of the two engages a second projection of the ribbon down spring when the nylon gear is driven clockwise. The nylon bearing can be removed and re-inserted into special adjustment slots in the side frame.

(2) Once the proper adjustment has been made, replace the E-shaped snap ring and check the adjustment several times by turning the nylon gear clockwise then counter-clockwise.

NOTE: References to the ribbon drive gear, (clockwise/counter-clockwise) are as viewed from the left of the carriage.

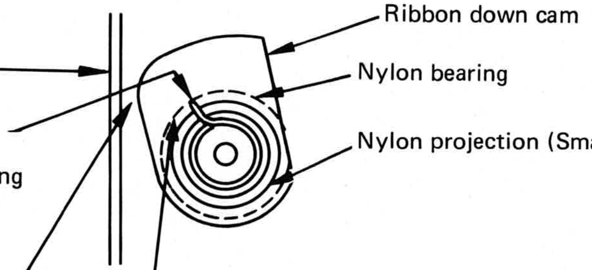


Fig. 6.4

6.1.3 Clutch gear and Ribbon motor gear

Refer to Fig. 6.5, check for a slight amount of backlash between the Ribbon motor gear and the Clutch gear.

(1) Loosen the two Ribbon motor fixing screws and adjust the position of the motor to allow a slight amount of backlash. When the adjustment is complete, check that the backlash is not excessive, too much backlash may cause premature clutch gear failure.

(LEFT SIDE VIEW)

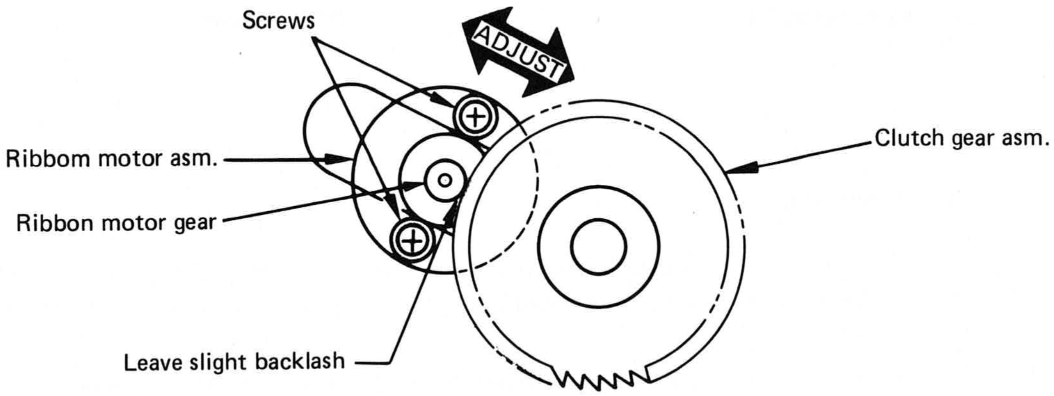


Fig. 6.5

6.1.4 Linear motor rail and Carriage frame assembly

Refer to Fig. 6.6, check for a clearance of 0.07 inch to 0.08 inch (1.9 to 2.1 mm) between the linear motor rail and the right and left carriage frames.

(1) Loosen the two setscrews which hold the carriage side frame to the linear motor slider. The setscrews are in elongated slots which allow the carriage side frames to move forward or back with respect to the linear motor rail. Once the adjustment has been made, re-tighten the setscrews and proceed with step 2.

(2) This procedure must be followed for both the left and right carriage side frames. It may be necessary to re-check your adjustments from the right side to the left to ensure that they are still within tolerance.

After performing this adjustment run a self-test and obtain a print sample. If print quality has been affected it may be necessary to perform the Carriage positioning adjustment on Page 37 and 38.

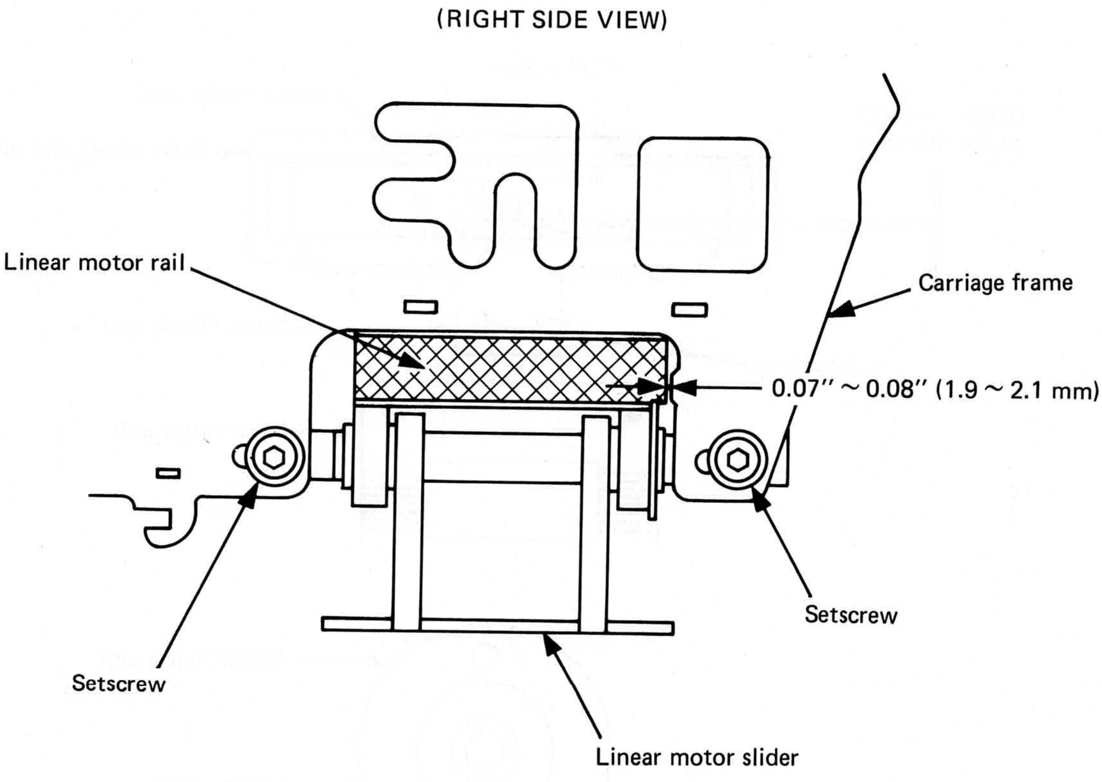


Fig. 6.6

6.1.5 Positioning the Motor flange assembly

Refer to Fig. 6.7 (Top View), with no daisy wheel present and the daisy motor latched in the forward position, check for a clearance of 0.007 inch to 0.02 inch (0.2 to 0.6 mm) between the surface of the motor flange and the innermost surface of the daisy wheel case.
Refer to Fig. 6.7 (Front View), with a daisy wheel installed, turn the printer on and allow it to complete its initialization sequence. Check to see that the "period" on the daisy wheel is positioned directly in front of the hammer unit.

(1) For check 1: Turn printer power on and allow it to complete its initialization sequence. Loosen the two motor flange setscrews and adjust as necessary.

(2) For Check 2: Loosen the setscrew which holds the selection sensor unit and adjust it from left to right as necessary.

These two adjustments are interrelated, it may be necessary to re-check each several time.

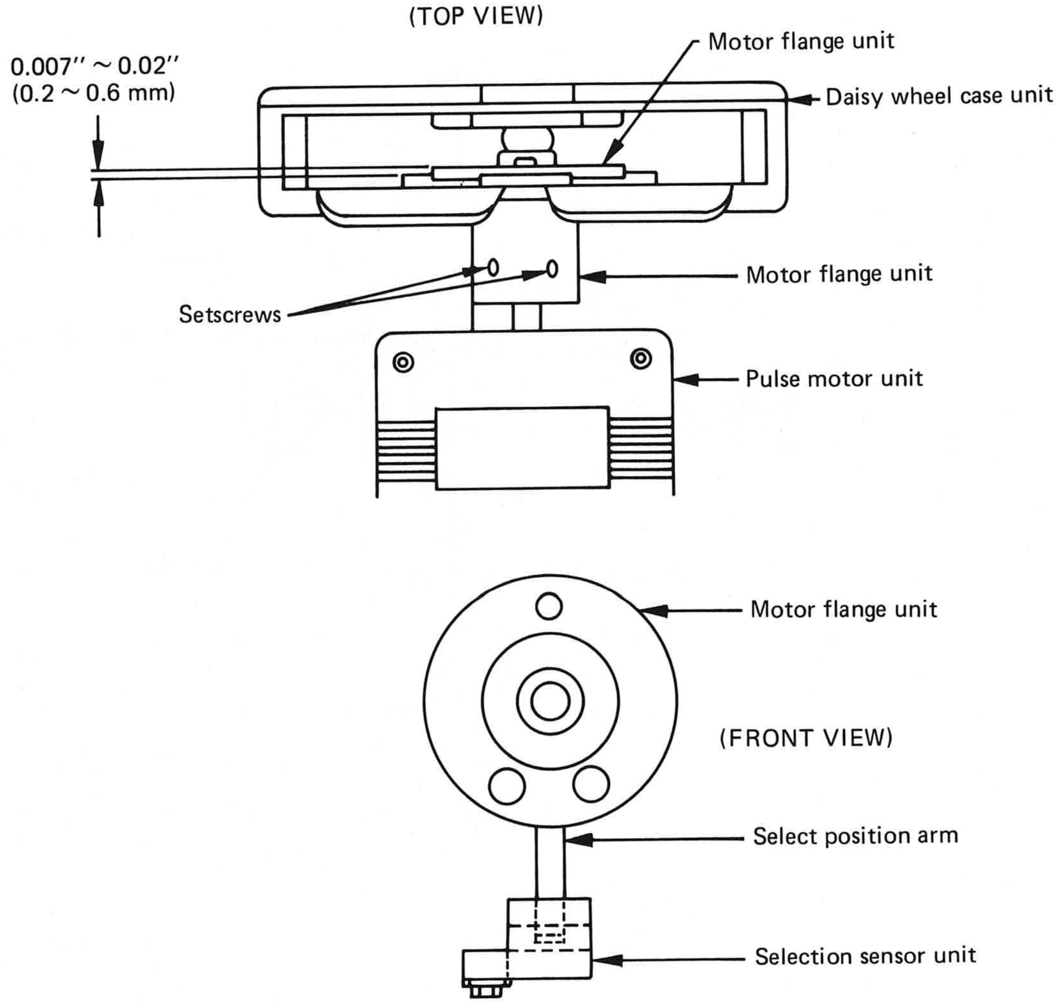


Fig. 6.7

6.1.6 Daisy wheel asm. and Hammer unit

Refer to Fig. 6.8, with machine power off, manually position one of the larger daisy characters (| [ ] { } ( )) in front of the hammer. Check for a clearance of 0.03 inch to 0.04 inch (0.9 to 1.1 mm) between the daisy character and the hammer tip.

(1) Loosen the two setscrews holding the hammer unit and adjust for the proper clearance.

Turn printer power on. After the initialization sequence is complete, check to see that the "period" is aligned directly in front of the hammer unit. If it is not properly aligned it will be necessary to readjust the hammer unit.

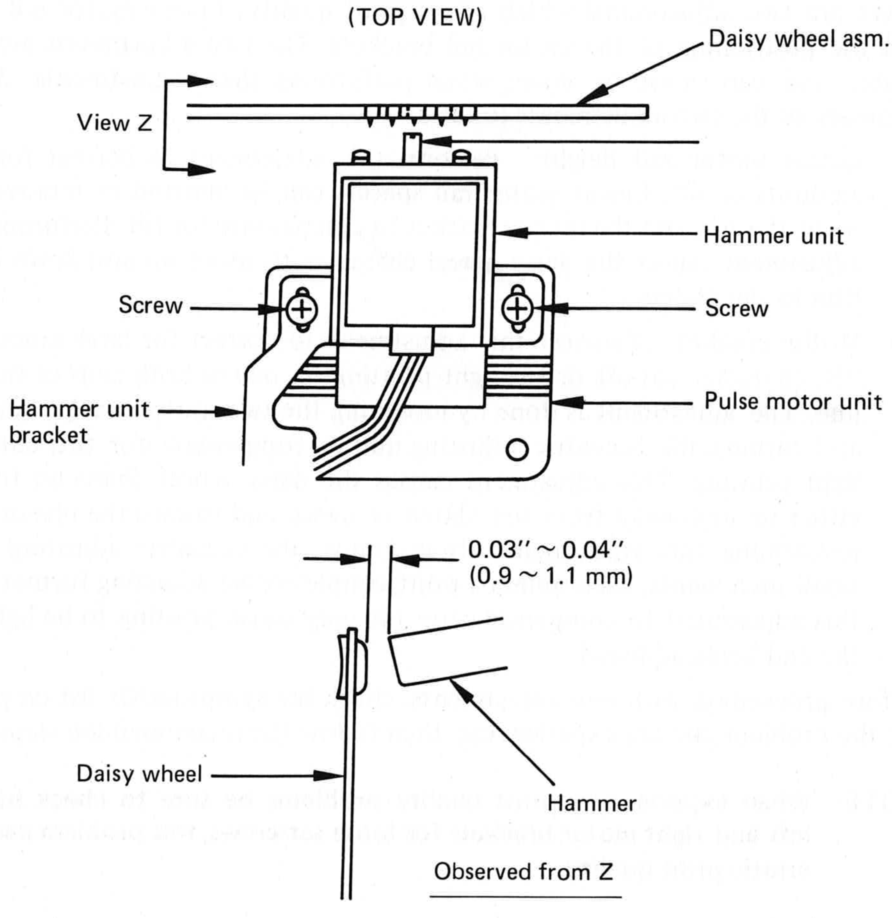


Fig. 6.8

6.1.7 Carriage unit positioning

Obtain a print sample either by running self-test or by running an appropriate program from a system. The sample should print as many of the available daisy wheel characters as possible. Check the print sample for character cut-off, light printing and for any noticeable tilt in the print line. Character cut-off should be more evident on the taller characters such as the "1" and some special characters (| { } [ ]). Print line tilt may only be evident on preprinted forms. If you are satisfied with the quality of the print sample then you need not proceed with the adjustments. If you are not satisfied with the quality of the print sample there are two items you should check before beginning the adjustment procedure. 1. Be sure your daisy wheel is not worn or does not have chipped characters. 2. Check the linear motor rail and carriage frame adjustment (Page 34).

There are two adjustments which affect print quality, Linear motor rail height and the positioning of the motor rail brackets. The two adjustments are interrelated and care must be taken when performing these adjustments. A brief summary of the two adjustments follows:

(1) Linear motor rail height: Perform this adjustment to correct for small amounts of tilt. Linear motor rail spacers can be inserted or removed between the rail and the motor bracket to compensate for tilt. Performing this adjustment causes the daisy wheel character to move up and down in relation to the platen.

(2) Motor bracket: Perform this adjustment to correct for large amounts of tilt, character cut-off or for light printing on one or both ends of the print line. The adjustment is done by loosening the two motor bracket setscrews and turning the eccentric adjusting nut to compensate for tilt, cut-off or light printing. This adjustment causes the daisy wheel character to move either up and away from the platen or down and toward the platen. When performing this adjustment, always move the eccentric adjusting nut in small increments, then obtain a print sample before adjusting further. Using this adjustment to compensate for tilt may cause printing to be lighter on the end being adjusted.

Before proceeding with any adjustments, check the symptom/fix list on page 38 for the problem you are experiencing, then follow the recommended steps.

NOTE: When experiencing print quality problems be sure to check both the left and right motor brackets for loose setscrews, this problem can cause erratic print quality.

(3) Light printing with or without cut-off over entire print line.
   a. Check linear motor rail to carriage frame adjustment. (Maintenance Section Page 34)
   b. Check hammer unit positioning. (Maintenance Section Page 36)
   c. Perform motor bracket adjustment (Left and right sides)
   d. Replace hammer unit. (Refer to Removal/Replacement Section)
   e. Replace SCU board. (Refer to Removal/Replacement Section)

(4) Light printing on one end with or without cut-off.
   a. Check that platen is fully seated on both ends.
   b. Perform motor bracket adjustment.
   c. Remove or insert motor rail spacers as needed.

(5) Tilted print line with or without cut-off on one end.
   a. Check that platen is fully seated on both ends.
   b. Remove or insert motor rail spacers as needed.
   c. Perform motor bracket adjustment.

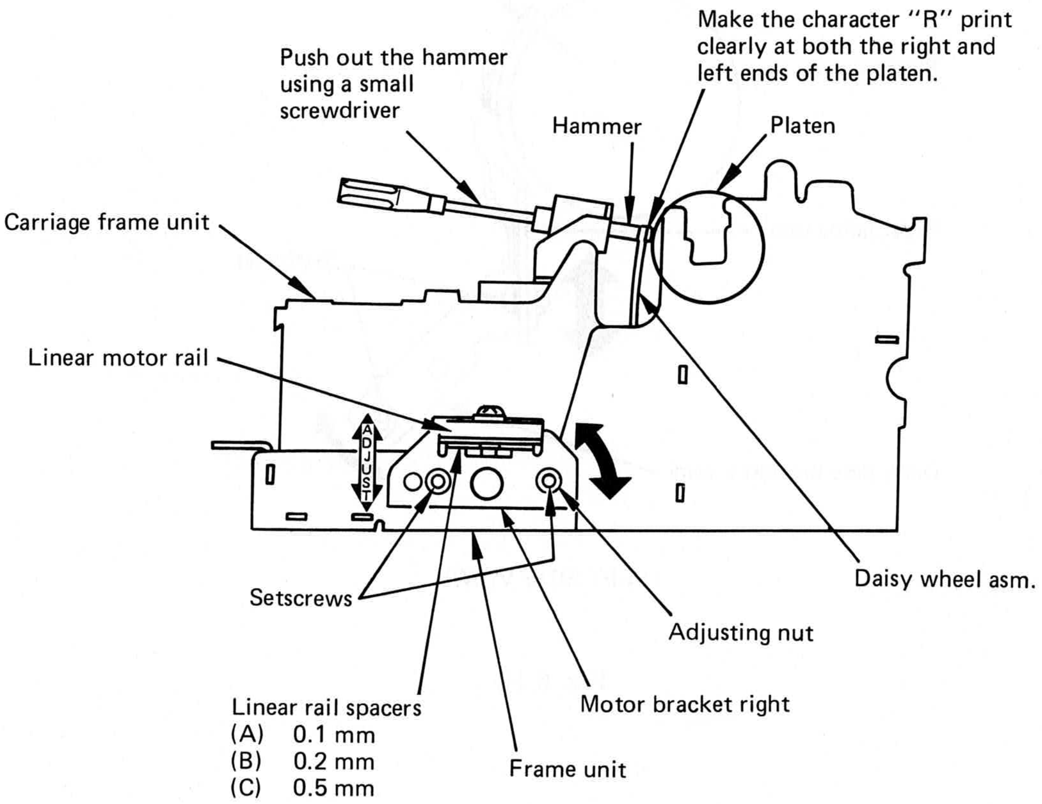


Fig. 6.9

6-1-8 Paper Guide positioning — Assembly

Refer to Fig. 6.10, check for a uniform clearance of 0.01 inch to 0.02 inch (0.3 mm to 0.5 mm) between the clear plastic paper guide and platen.

(1) There are four setscrews, two which hold the right and left ends of the plastic paper guide and two which hold the right and left daisy case brackets. The two screws holding the paper guide can be loosened to adjust the guide up and down. The screws which hold the daisy case brackets can be loosened to adjust the paper guide closer to or further from the platen. By alternately adjusting the right and left sides and checking the clearances, position the paper guide to the above specifications.

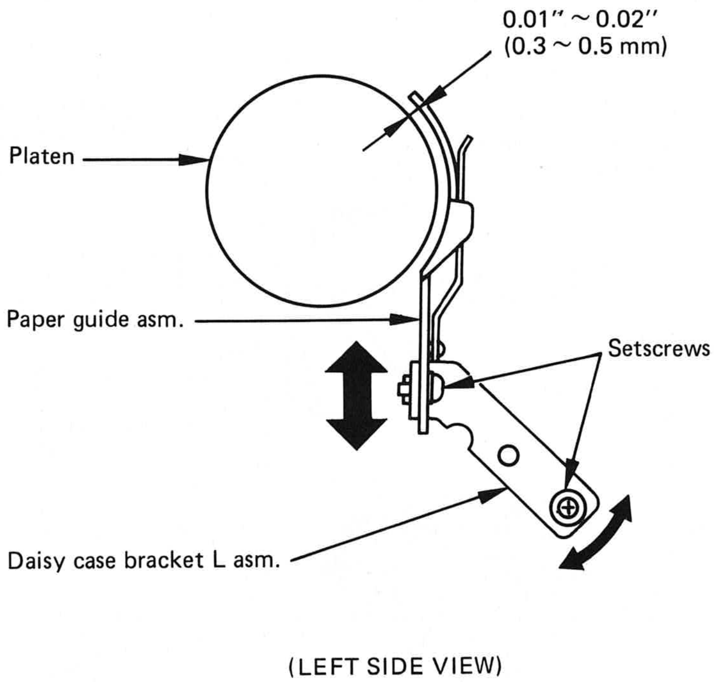


Fig. 6.10

6.1.9 Home position (HP) interrupter

Refer to Fig. 6.11, turn printer power on, after initialization cycle is complete check for a clearance of 0.8 inch to 0.9 inch (20.5 to 22.5 mm) between the left frame of the base and the left carriage side frame.

(1) Turn printer power off. Move the carriage to the right and loosen the two setscrews which hold the HP interrupter. If the clearance measured in the check procedure was too small, move the HP interrupter slightly to the right, re-tighten the screws and recheck the clearance. If the clearance measured was too large, move the HP interrupter slightly to the left and recheck.

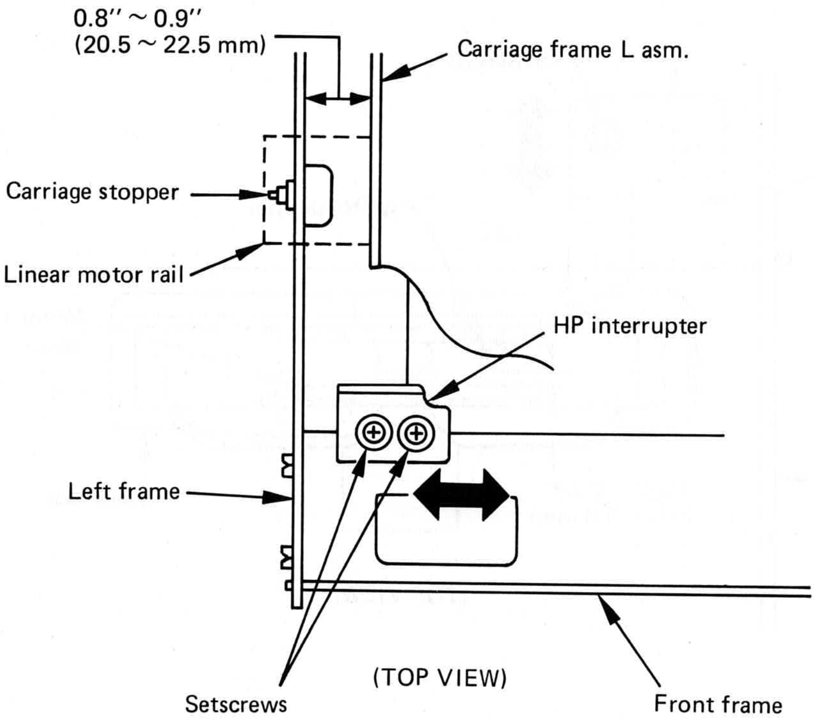


Fig. 6.11

6.1.10 Daisy stopper pin to Motor flange

Refer to Fig. 6.12, with printer power off, remove the daisy wheel and relatch the daisy motor and hammer unit in its forward position. Move the carriage assembly to the left and check the clearance between the Daisy stopper pin and the face of the motor flange. At its closest point, the stopper pin should be between 0.02 inch to 0.03 inch (0.5 to 0.8 mm).

(1) Loosen the setscrew on the Daisy setting lever and adjust for the required stopper pin to motor flange clearance.

(2) Re-install the Daisy wheel, turn printer power on and ensure that the daisy wheel sets itself properly.

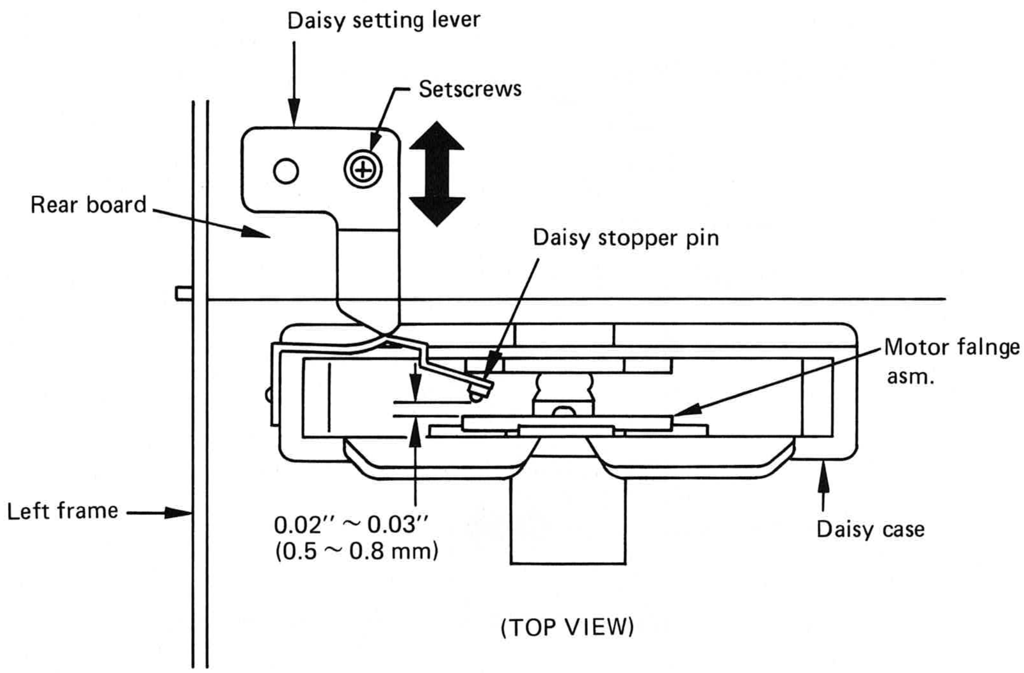


Fig. 6.12

6.2 Ribbon mechanism adjustment

6.2.1 Ribbon idler latch

Refer to Fig. 6.13, check that a slight rearward movement of the ribbon tensioner assembly causes the ribbon idler latch to disengage from the ribbon idler boss assembly.

(1) Loosen the ribbon idler latch setscrew and adjust the position of the idler latch to obtain the proper setting.

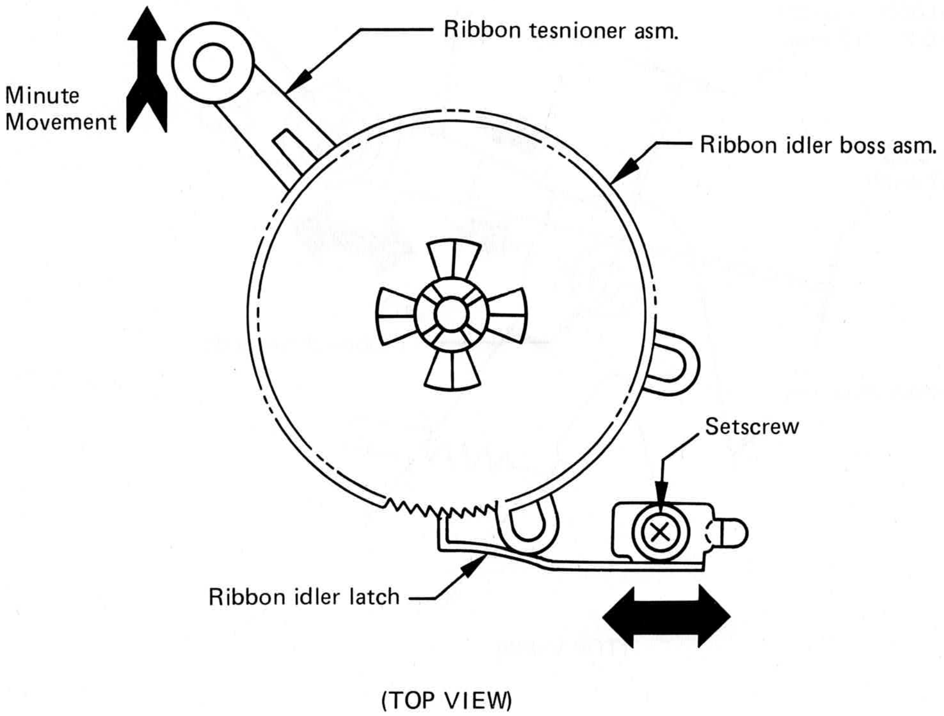


Fig. 6.13

6.2.2 Drive spool stopper

Refer to Fig. 6.14, inspect the drive spool stopper for the proper clearance as outlined below.

(1) The drive spool stopper may be adjusted by loosening the setscrew and positioning the stopper to meet the clearances as illustrated in the figure below.

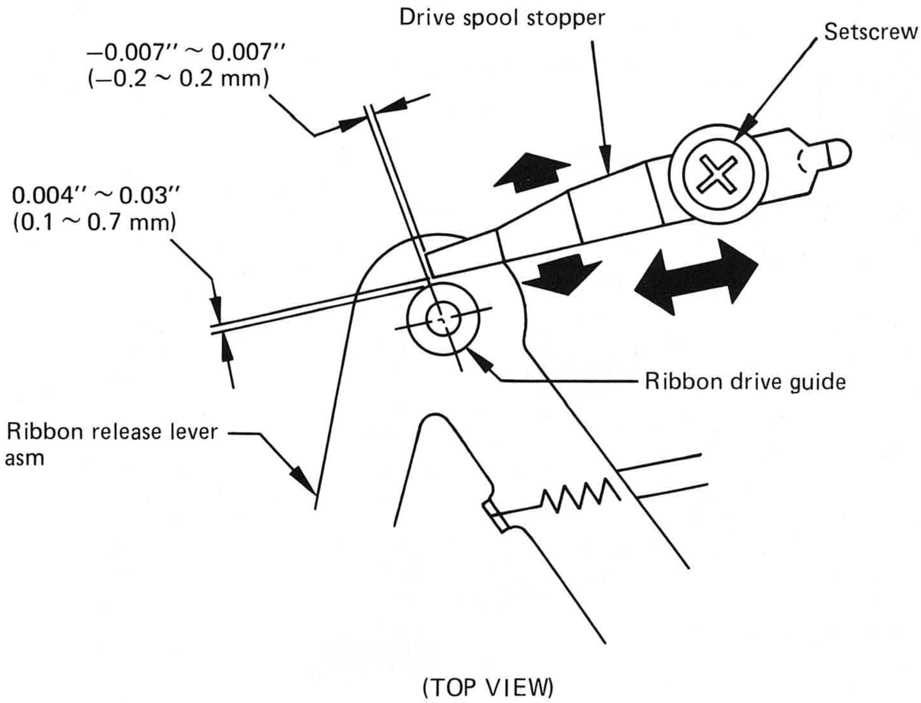


Fig. 6.14

6.2.3 Stroke adjustor

Refer to Fig. 6.15, with the Ribbon feed adjustor in position "A" manually disengage the armature from the clutch sleeve (Refer to Fig. 6.1, Page 31), slowly turn the clutch gear counter-clockwise and listen for 3 distinct clicks of the ribbon drive ratchet. Follow the above procedure with the Ribbon feed adjustor in the "B" position and listen for 4 clicks.

(1) Loosen the setscrew which holds the stroke adjustor and position the stroke adjustor to meet the requirements outlined above.

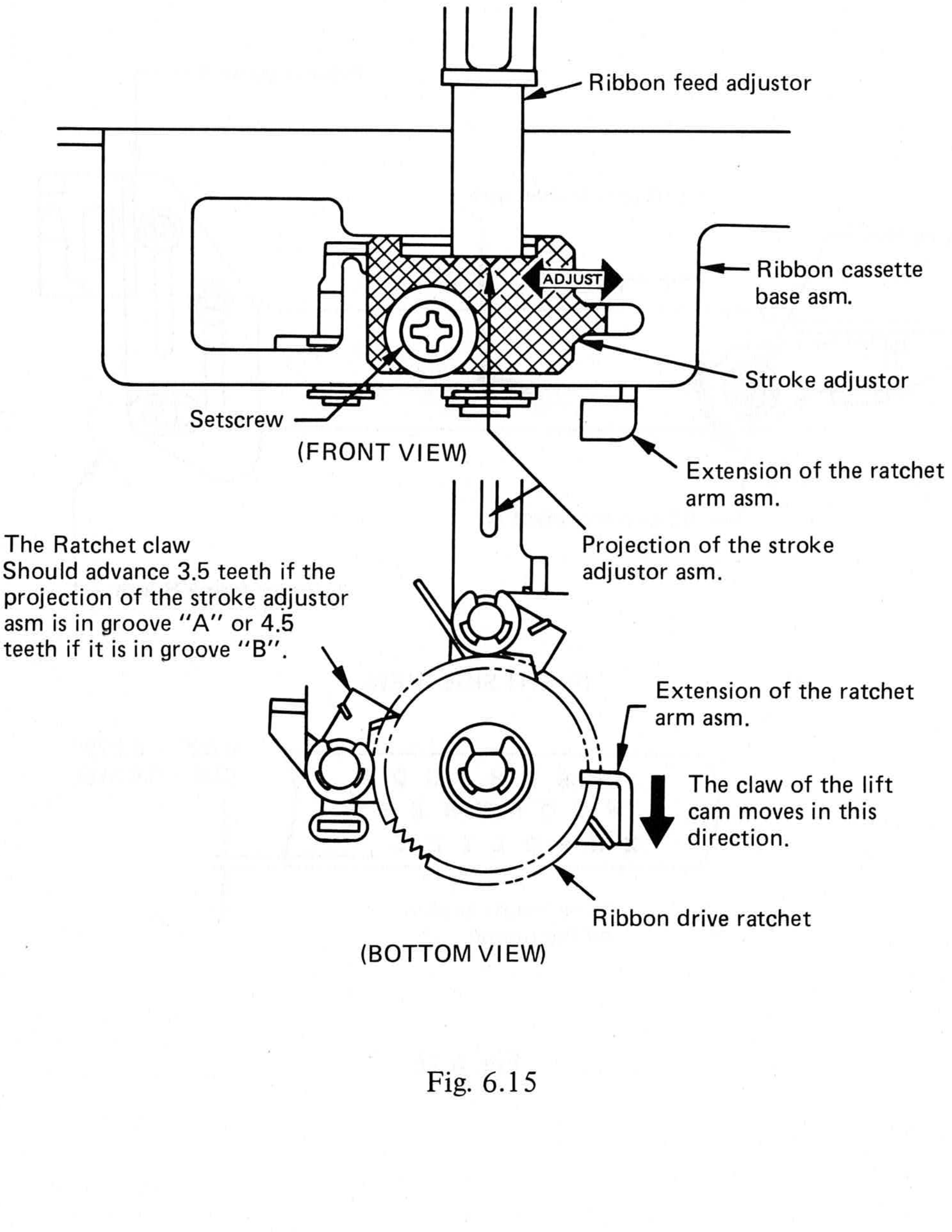


Fig. 6.15

6.2.4 Ribbon arm pivot

Refer to Fig. 6.16, run several lines of the self test print pattern, remove the ribbon cassette and inspect the printed images on the ribbon. Check to see that none of the character images are lower than 0.02 inch to 0.025 inch (0.5 to 0.6 mm) from the bottom edge of the ribbon.

(1) Loosen the pivot locking nut and turn the pivot slightly clockwise or counter-clockwise. Re-tighten the locking nut and perform the check procedure to ensure that the adjustment is proper. Readjust if necessary.

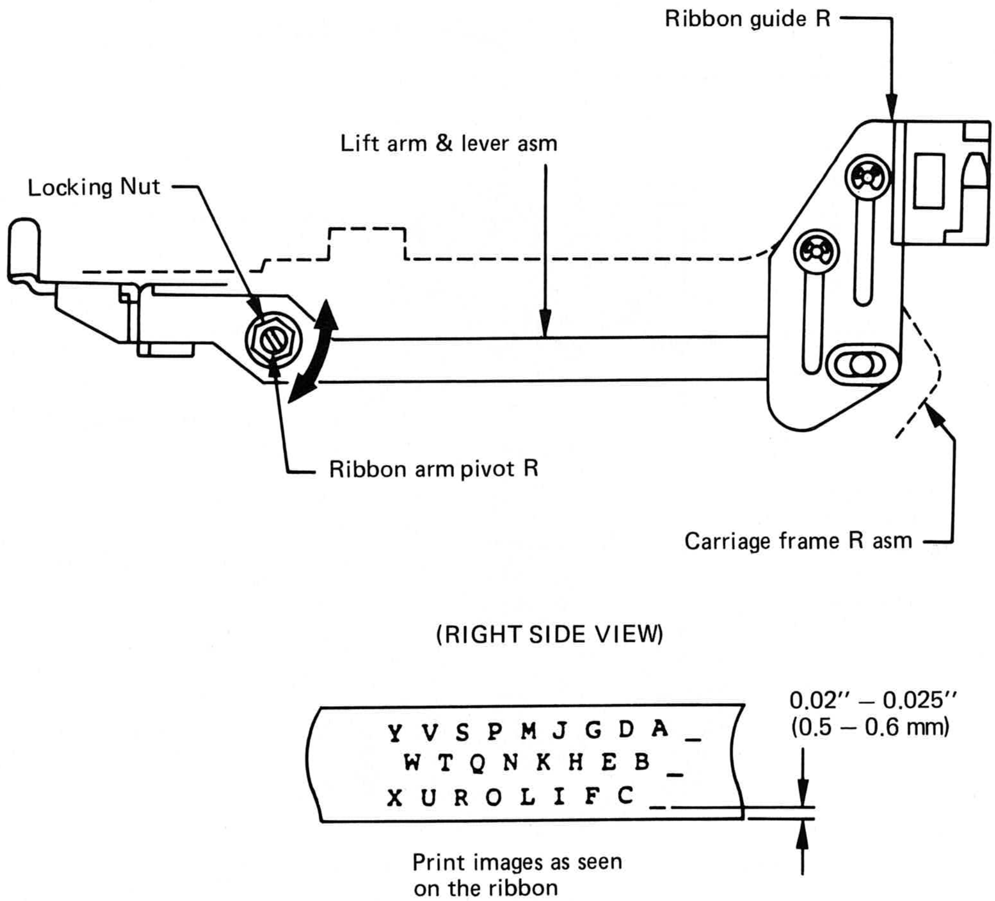


Fig. 6.16

6.3 Platen drive mechanism adjustment

6.3.1 Platen gear, Idler gear and Line feed motor gear

Refer to Fig. 6.17, remove the platen and check for a slight amount of backlash between the idler gear and the line feed motor gear. Replace the platen the check for a slight amount of backlash between the platen gear and the idler gear. Insufficient or excessive backlash may cause line feed problems.

(1) Perform this step only if the backlash between the platen gear and the idler gear needs adjusting.
Loosen the line feed motor setscrews and the idler gear setscrews. Adjust the idler gear to platen gear for the proper amount of backlash and tighten the idler gear setscrews. Proceed to step 3.

(2) Loosen only the line feed motor setscrews then proceed with the next step.

(3) Adjust the line feed motor gear to the idler gear for the proper amount of backlash, then tighten the line feed motor setscrews. Recheck the backlash of all gears.

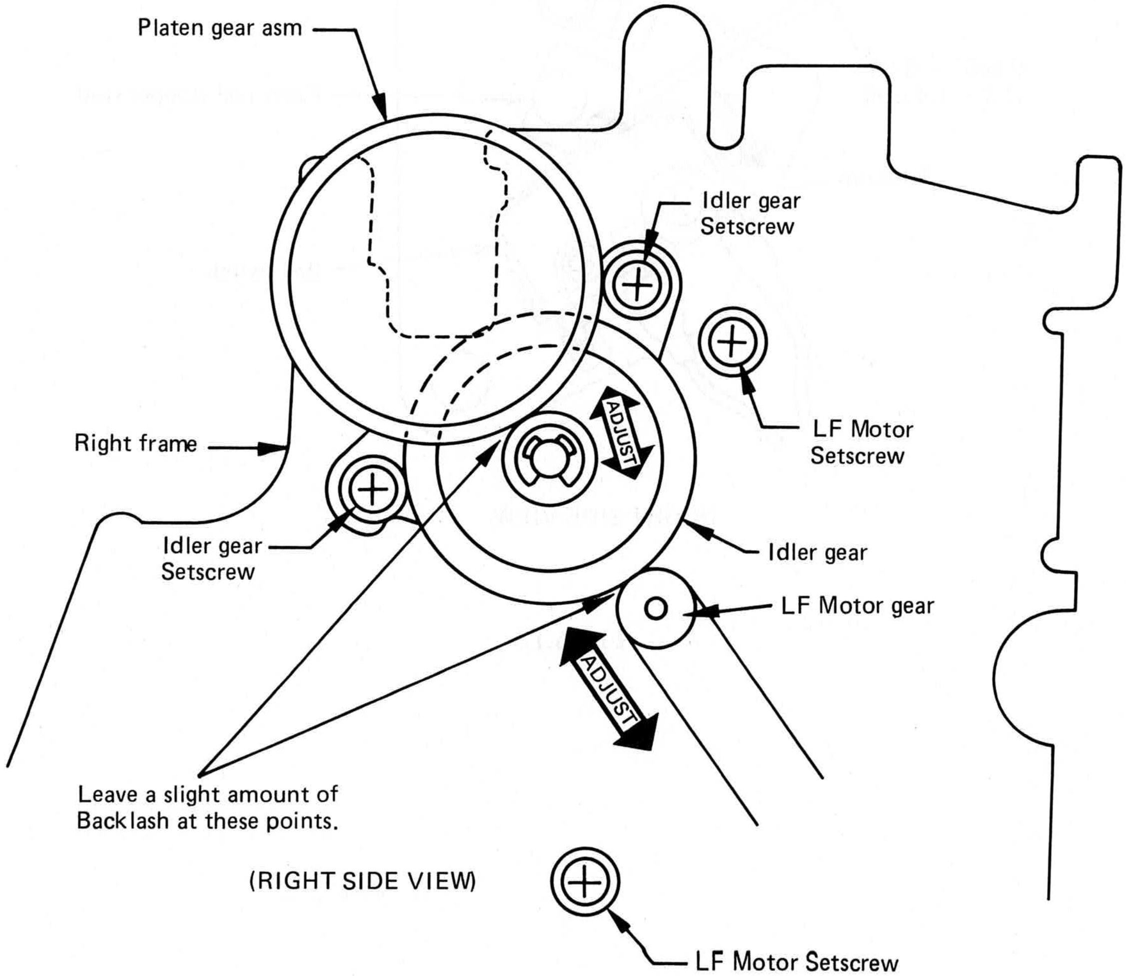


Fig. 6.17

6.4 Paper bail adjustment

6.4.1 Bail switch

Refer to Fig. 6.18, check that a 0.045 inch to 0.05 inch (1.2 to 1.4 mm) feeler gauge inserted between the paper bail stopper stud and the bail switch will cause the bail switch plunger to be activated.

(1) Loosen the setscrew which holds the bail switch and adjust as necessary to obtain the desired clearance.

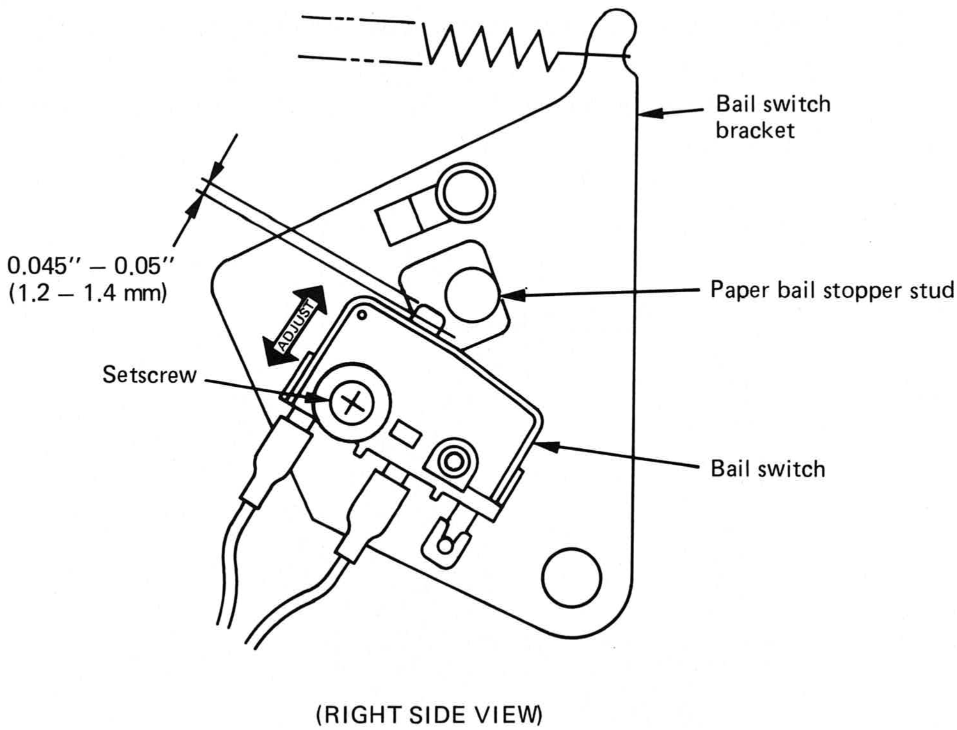


Fig. 6.18

7. THEORY OF OPERATION

7.1 Power supply

The power supply in the 6100 consists of a line input filtering circuit, voltage jumpers, power transformer and voltage regulation circuitry all contained in a single integrated unit. Two versiones of the power supply are available, the first is designed for use in the United States and Canada and accepts input voltages in the range of from 100 to 120 volts A.C., the second is designed for use in European countries and accepts input voltages in the ranges of from 220 to 240 volts A.C.. Both power supplies are designed to be used with either 50 or 60 Hertz line input frequency. The two types of power supplies are designated by a group letter, "A group" power supplies are the 100/120 volt range and "B group" power supplies are those for use with 220/240 volts. The chart below illustrates the differences in these two power supplies.

Table 7.1

Power supply	Input voltage	Fuses		For use in
		F1	F2	
"A" Group	100 to 120 VAC	1A	3A	United States Canada (50 or 60 Hertz)
"B" Group	220 to 240 VAC	1A	3.15A	European countries

The line input filter circuitry suppresses noises which might by present on the incoming AC line. The filter also acts to suppress any noises generated by the printer from being induced back to the AC input line. Fig. 7.1 is an illustration of the physical layout of the filter componetns. The filter consists of four capacitors and three inductors. The schematic diagram of the filter is shown in Fig. 7.2.

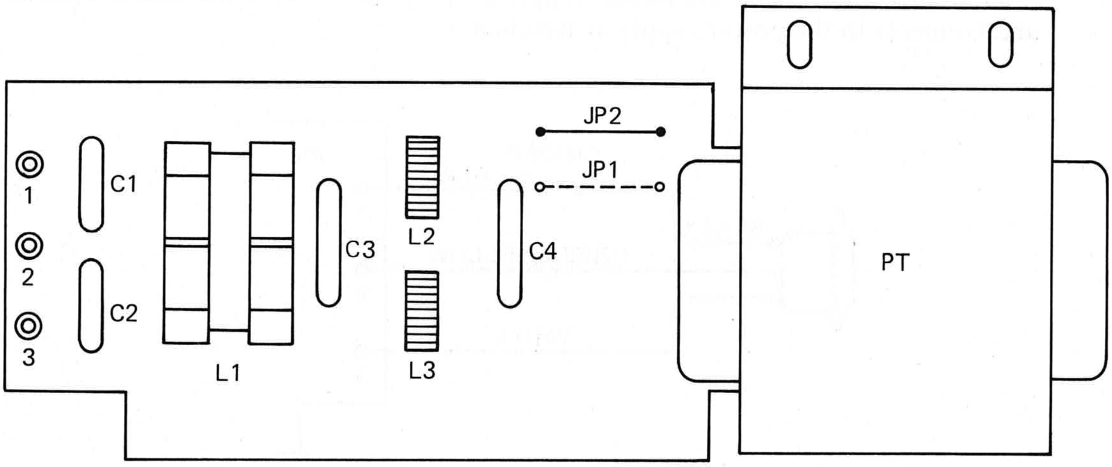


Fig. 7.1

Voltage jumpers JP1 and JP2 are used to compensate for the amount of input voltage. At the time the printer is manufactured, JP2 is installed since most areas of the United States and Canada use a line voltage between 110 and 117 VAC. If power supply output voltages are lower than normal, it may be necessary to remove JP2 and install it at JP1.

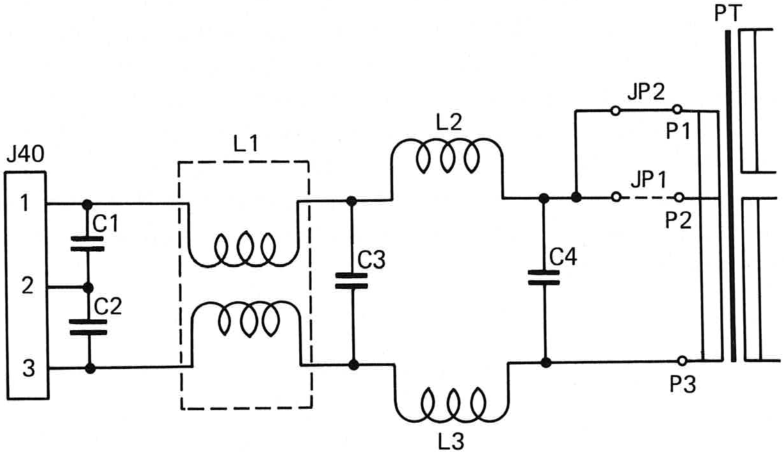


Fig. 7.2

Fig. 7.3 illustrates the proper line input wiring between the power cord socket, the ON/OFF switch and the power supply input terminals. Proper installation of these wires is essential to prevent the possibility of electric shock. The input wires are color coded to aid in identifying where they are to be connected. The black wire is the energized or "HOT" lead and should be connected between the ON/OFF switch and power supply terminal 1. The green/yellow lead is earth ground and connects to the power supply at terminal 2. The white lead is neutral and connects to the power supply at terminal 3.

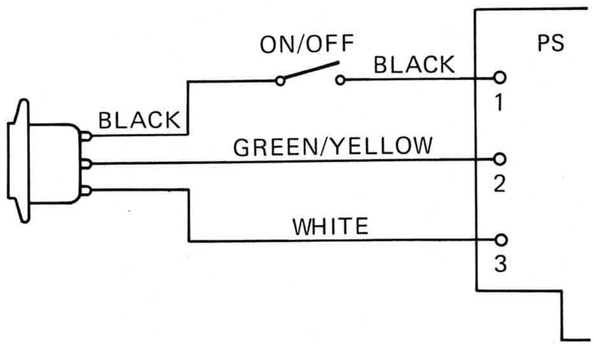


Fig. 7.3

Fig. 7.4 is a diagram of the power transformer. As shown below, the transformer accepts line input voltages in one of two ranges depending on the country where it is to be used. The input voltage is applied to the primary windings of the transformer and is converted to two output voltages of approximately 15 VAC and 27 VAC. The 15 VAC is filtered and regulated to develop +12 and −12 volts DC for the serial interface option. The 27 VAC is filtered and regulated to develop +5 volts DC, +24 volts DC and +30 volts DC. The +30 volts DC is developed by means of a voltage doubler, filter and regulator. Table 7.2 below shows the distribution of the DC voltages within the printer.

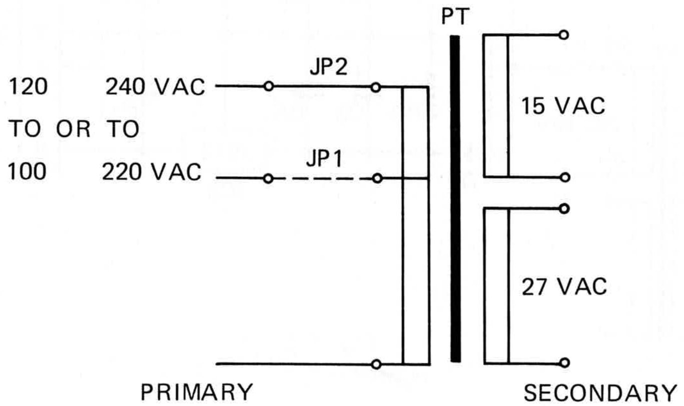


Fig. 7.4

Table 7.2

+12 ~12 VDC	Serial interface (RS-232) option
+5 VDC	All logic circuitry
+24 VDC	Daisy wheel motor, Line feed motor, Ribbon magnet and Ribbon drive motor
+30 VDC	Hammer magnet and Linear motor

Fuse F1 provides protection of the +12 and −12 volt lines to the serial interface. Fuse F2 provides protection for all other voltages in the printer. Ratings for fuses F1 and F2 are given in Table 7.1 on Page 48.

Fig. 7.5 is a diagram of the +12 and −12 VDC voltage regulator circuit. Diode D1 allows current flow through R1 only on the positive half of the AC signal. This signal is then filtered by C5 and C8 before being regulated to +12 volts by IC2. The same circuit action takes place for the −12 volts except that diode D2 allows current flow through R2 only on negative half cycles. Capacitors C10 and C11 are used to further filter the output voltages.

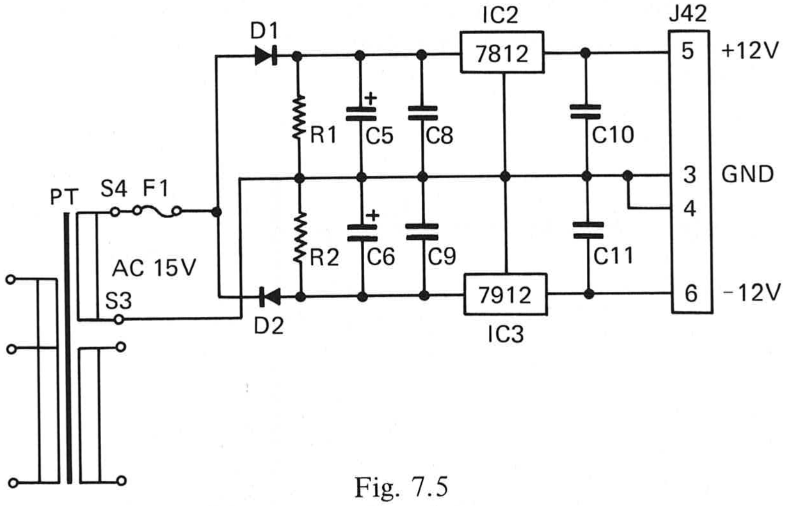


Fig. 7.5

Fig. 7.6 is a schematic diagram of the +30 VDC power supply. Diode D3 is a full-wave bridge rectifier which supplies an unfiltered DC signal to the +30, +24 and +5 VDC rectifier circuits. When power is first applied transistors Q1 and Q2 are turned off and there is no output at J41 pins 7 and 8. The output of the +5 volt regulator is applied to the integrator circuti consisting of R4 and C13. After a delay of approximately 200 milliseconds diode D4 becomes forward biased, this causes current flow through R5 which turns on Q2 and Q1. When machine power is turned off, the voltage supplied by diode D3 begins to drop. As the voltage drops below the sensor voltage of ZD, Q1 is turned off causing the +30 volts to drop before the +5 volt line turns off.

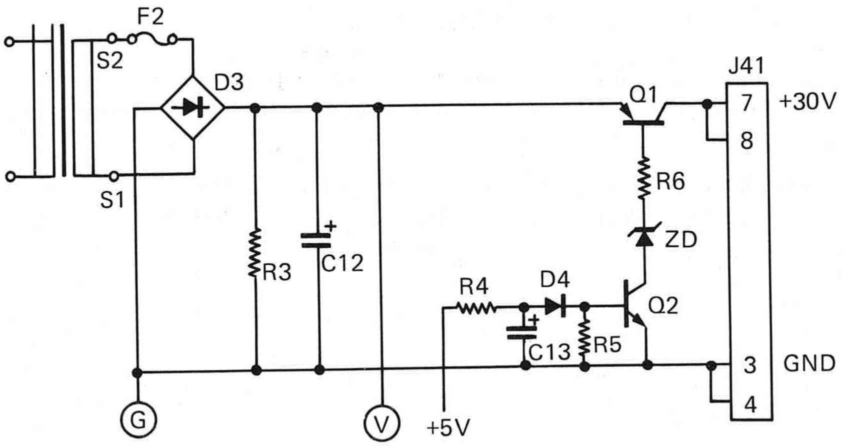


Fig. 7.6

Fig. 7.7 illustrates the power-on and power-off timing relationship between the +5 and +30 volt lines. The reason for the delay in turning the +30 on and off is to prevent the hammer from firing during power on and power off cycles.

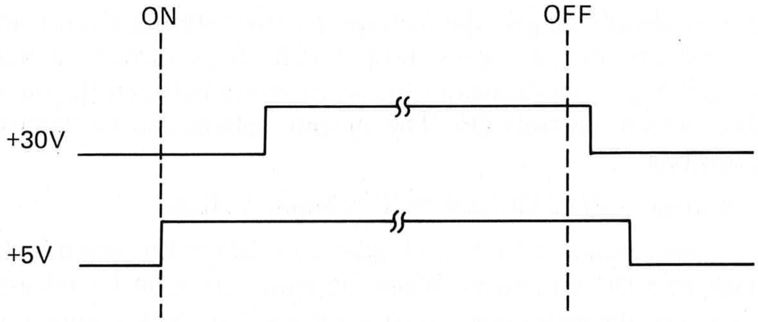


Fig. 7.7

Fig. 7.8 is the schematic diagram of the +24 volt regulator circuit. Transistor Q3 and Resistors R7 and R8 from an emitter-follower circuit which supplies Q4, Q5 and IC1 with the necessary biasing signal to keep the +24 volts at a constant level. Capacitor C16 acts to further filter the output and R11 acts as a combination load and bleeder resistor. The output of the +24 volt regulator is nto sequence sensitive.

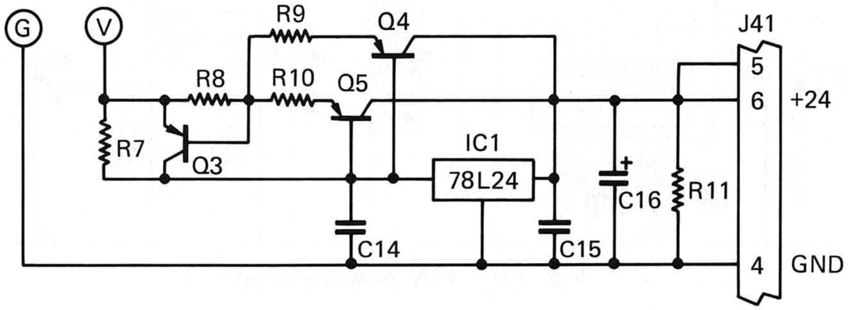


Fig. 7.8

Fig. 7.9 is the schematic diagram of the +5 VDC regulation circuitry. Unlike the regulators for the other voltages in the 6100, the +5 volt circuit utilizes a high frequency switching type regulator. A complete description of the operation of this regulator would be very difficult because of its complexity, however, a few general points will be discussed. The voltage applied to point Ⓐ of the circuit is a full wave rectified signal of approximately 30 volts. Transistor Q6 acts as a switch to periodically apply the voltage to the filtering circuit and feed-back networks. The amount of time during which Q6 is turned on determines the output voltage. Fig. 7.10 illustrates the relationship between the on and off times of the signal which controls Q6. The output voltage can be determined by the following formula:

Output Voltage = (t_{ON} Divided by T) x Input Voltage

When Q6 is conducting, Coil L5 and Capacitor C20 tend to smooth the controlled pulse voltage to a DC waveform. When Q6 turns off, Coil L5 releases its electromagnetic energy through commutating diode D6. Fluctuations in the input voltage or the resulting output voltage are detected by R24 and R25. A feedback signal which is supplied at the center of these two resistors is applied to the IC at pin 1 and the t_{ON} time is varied to maintain a constant output voltage. Overcurrent protection is achieved by monitoring the voltage between R20 and R21 and comparing it with the voltage between R24 and L6. If the resultant voltage exceeds a certain preset value, the t_{ON} time is again changed to reduce the output voltage. Fig. 7.10 also shows a representation of the output voltage, the amount of ripple on the +5 volts would be only a few millivolts.

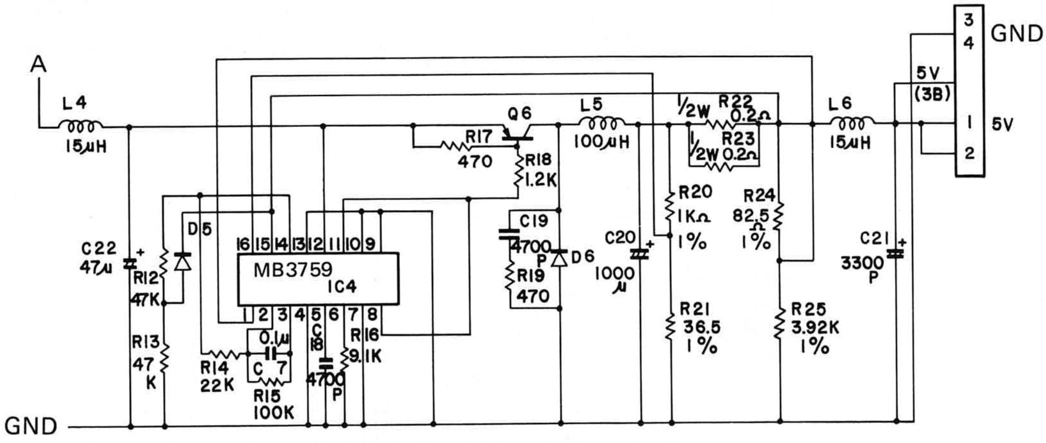


Fig. 7.9 +5V power circuit

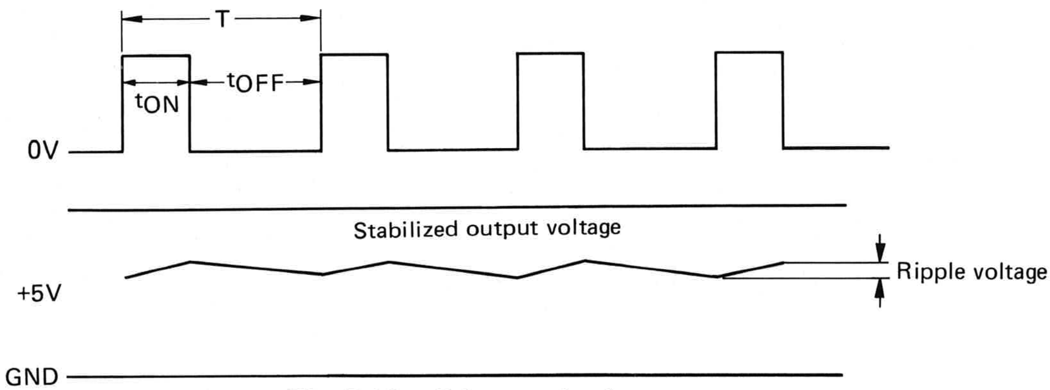


Fig. 7.10 Q6 control voltage

7.2 MCU and SCU Operations

Within the 6100 there are two printed circuit boards which monitor and control all of the printers functions. The two boards are the Master Control Unit (MCU-1) and the Slave Control Unit (SCU-1). The Master Control Unit, running a ROM resident control program, receives data via the parallel interface from the Host CPU, returns handshake signals to the interface, stores data and escape sequences in memory and passes data and control signals to the SCU. The MCU also monitors the Operator Panel functions. The SCU board receives the data and control signals from the MCU and performs the actual tasks of head positioning, daisywheel positioning, etc. The SCU operates under control of its own Masked ROM program which is an internal portion of the SCUs microprocessor. A third circuit board (MCU-2), which is a Serial Interface Option, can be installed onto the MCU-1 board to provide RS-232 communications capability. Installation of this option over-rides the standard parallel interface.

The MCU-1 board is comprised of a microprocessor (either an 8031 or and 8051), a control ROM, an 8155 PIA, 2 to 8K of RAM and associated support circuitry. Fig. 7.11 is an illustraction of the 8155 and the various I/O and control lines which connect to it. The 8155 consists of an internal 256 byte RAM, which the microprocessor uses for a scratchpad memory, a programmable 14 bit timer with mode control, two 8 bit bidirectional ports (port A and port B) and a bidirectional 6 bit port (port C) which can be used for control functions. Port C is set to what is known as "ALT 3" mode during initialization of the printer. Bits 0,1 and 2 of port C become control lines which are used in conjuntion with port A. Port A is used as an input buffer from the parallel interface. Port C bit 2 is used for the incoming strobe line, bit 1 is used to indicate a busy condition and bit 0 is used to initiate an interrupt to the 8031/8051 MPU. The remaining three bits of port C are used for the following : bit 3 – drives the READY lamp on the Operation Panel, bit 4 – drives the CHECK lamp and bit 5 is used to drive the audible alarm. Port B bits 0, 1 and 2 are used for reading the condition of the front panel switches during the initialization sequence. Port B bits 3, 4, and 5 are used for reading the condition of the serial interface board switches if this option is installed. Port B bit 6 is used to indicate to the microprocessor whether or not the serial interface board is present. The Timer In and Timer Out lines are used solely for the serial interface. The transfer of data between the 8155 and the 8031/8051 takes place over the multiplexed Address/Data lines (AD0 ~ AD7). The Address Latch Enable (ALE) line indicates when there is a valied address on the address/data lines and the Memory/IO line selects whether the bidirectional data will be sent to/received from the internal RAM, the timer or one of the ports.

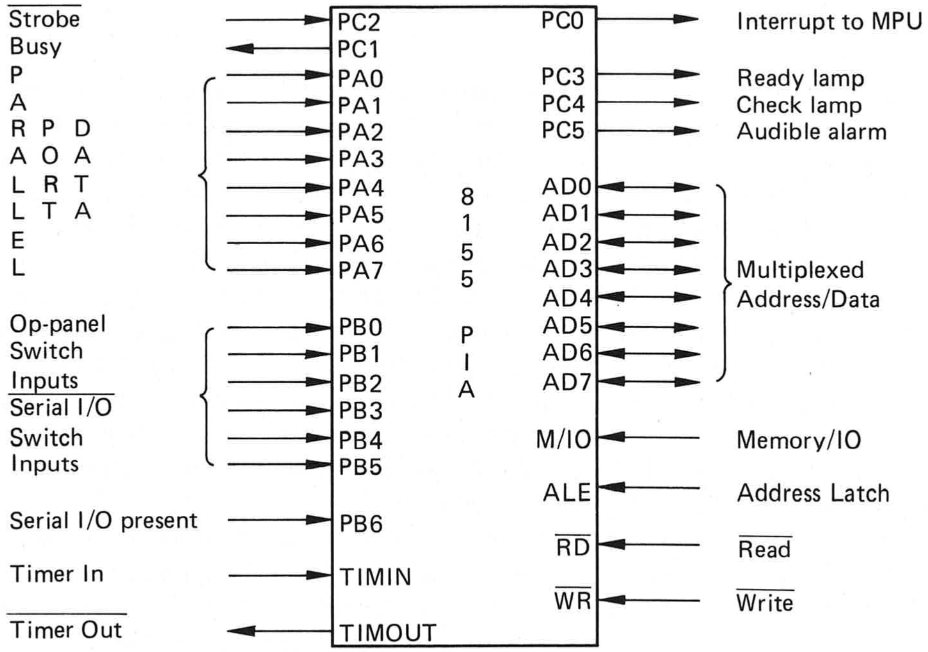


Fig. 7.11

The microprocessor of the MCU-1 board runs under control of a program which is contained in Read Only Memory (ROM). Depending on the type of microprocessor (8031 or 8051) this control program may be divided between two devices (8051 and separate ROM) or it may be resident in only one ROM. Further, the program may be contained in either a Masked (M-ROM) or Eraseable/Programmable ROM (EP-ROM). The following is a list of the possible combinations of microprocessors and associated ROMs.

8051 MPU (4K M-ROM)	+ 2332 (4K M-ROM)	= TOTAL 8K
8051 MPU (4K M-ROM)	+ 2732 (4K EP-ROM)	= TOTAL 8K
8031 MPU	+ 2764 (8K EP-ROM)	= TOTAL 8K

The 8031/8051 microprocessor serves as the main control element of the 6100, it operates at a fundamental clock frequency of 7.37 MHZ. Fig. 7.12 shows the base timing relationships for a ROM fetch cycle. The low byte of the ROM address is presented on the multiplexed address/data lines. The negative transition of the ALE line causes the low address byte to be latched into a 74LS373. The high address bits (A8 ~ A12) are present on port B bits 0 through 4 respectively and stay active for the entire read cycle. Once the low address byte has been latched the address/data lines are placed in a high impedance state and data presented from the ROM is read into the MPU during the positive transition of the PSEN signal line. The PSEN line is used strictly for the purpose of reading from a control ROM.

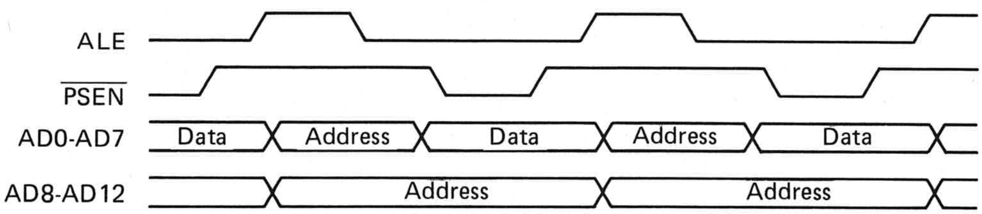


Fig. 7.12 ROM read timing diagram

The instructions which are fetched from the control ROM are decoded and processed by the 8031/8051. Instructions which require reading from or writing to RAM make use of separate Read and Write control lines. Fig. 7.13 illustrates the timing of a write operation to RAM. Once again the low order byte of the address is presented on the multiplexed address/data lines and is latched by the negative transition of the ALE line. At the same time that the low order address byte is being latched address lines All through A13 of the high address byte are decoded to provide chip enable (CE) lines to the RAM chips. The chip enable lines are active for each of the 2K increments of available RAM up to a maximum of 8K. With the address latched and decoded the MPU will now place the write data on the address/data lines. The data will be placed in RAM during the positive transition of the Write control line. During the write cycle the PSEN line will remain inactive which disables the control ROM from decoding the address and attempting to present any output data to the address/data bus.

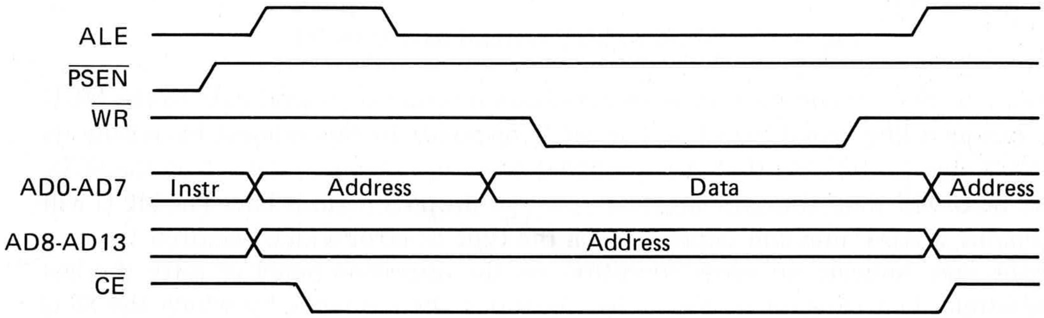


Fig. 7.13 RAM write timing diagram

Fig. 7.14 is the timing diagram for a RAM read cycle. As with the write operation the ALE, PSEN, Address/data lines and CE line timings are identical. The main difference in the read timing sequence is the amount of time that the actual read data is at a valid level. The time during which data is valid is a function of the RAM access time and should not exceed 400 nanoseconds. Data from RAM is latched in the MPU at the positive transition of the Read Data (RD) line.

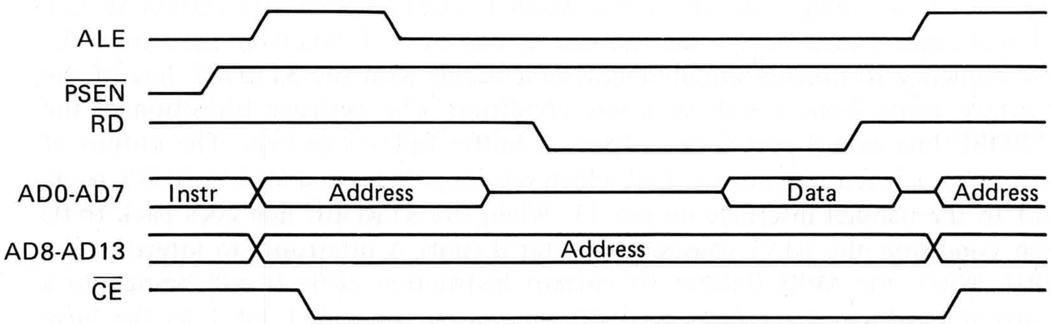


Fig. 7.14 RAM read timing diagram

During the power on initialization cycle port 3 of the 8031/8051 is programmed to act as an asynchronous serial I/O port for communications with the SCU board. The sequence by which the MCU-1 board transfers data to the SCU-1 board is shown in the timing diagram of Fig. 7.15. When the SCU is prepared to receive data it raises the SRDY line to the MCU. The SRDY line causes an interrupt to the processor and at the end of the current instruction cycle the processor will branch to a subroutine to transmit a byte of data to the SCU via the MTXD line. The transmitted data begins with a start bit followed by eight data bits, a ninth bit which is programmable and a stop bit. The ninth bit can be used to indicate that the byte is for control or address purposes.

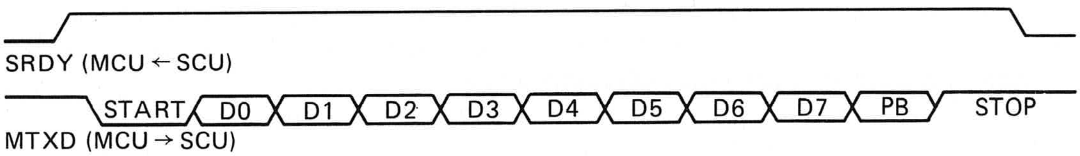


Fig. 7.15 MCU to SCU normal data transfer

When the SCU encounters an error condition it requests to send data to the MCU by raising a line called SDATA. The MCU responds to this request by raising its MRDY line to indicate that it is prepared to accept the error data from the SCU. The SCU will then transmit the data byte and drop its request line. The MCU will drop the MRDY line and depending on the type of error which occurred the processor may indicate an error condition on the operation panel or retry the last operation. The diagram in Fig. 7.16 illustrates the sequence by which the SCU transfers the error information to the MCU.

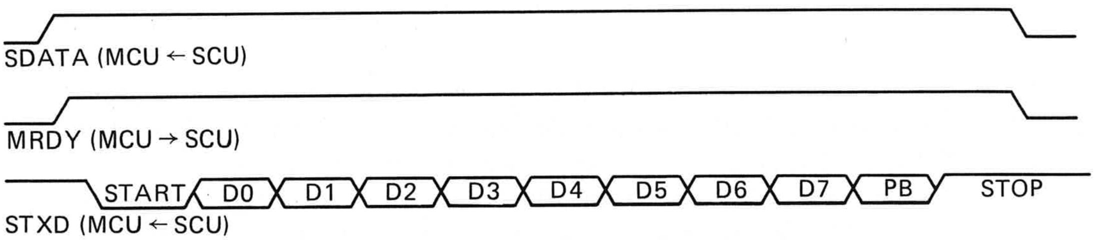


Fig. 7.16 SCU to MCU error data transfer

Fig. 7.17 is a timing diagram of the parallel interface lines and certain MCU-1 internal control lines during the transfer of one byte of data from the Host CPU. The sequence to process the incoming data begins with the STROBE line of the interface going from a high to a low condition. The negative transition of the STROBE line causes port C bit 1 (port A buffer full) to go high. The output of port C bit 1 is fed to a busy circuit which results in the signal MCU-1 BUSY being sent to the parallel interface on pin 11. When the STROBE line goes back to its high condition the 8155 causes port C bit 0 (port A interrupt) to interrupt the MPU. When the MPU finishes its current instruction cycle it will branch to a subroutine which first places a BUSY condition on port 1 bit 1 to the busy circuits. Next the MPU will read the data from port A of the 8155 and determine if it is printable data or a control code. The negative transition of the RD line to the 8155 resets port C bit 0 and during the positive transition of the RD line the data is latched in the MPU and the 8155 port C bit 1 is reset.

Once the data byte has been processed by the MPU the BUSY line to the parallel interface is dropped and the ACK signal will be sent to the Host CPU. The Host CPU may now initiate another transfer sequence by placing a new byte of data on the interface and sending the STROBE to the printer. The entire operation, from the reception of the strobe pulse to the transmission of the acknowledge pulse, takes approximately two milliseconds. Maximum data transfer rate is approximately 500 characters per second.

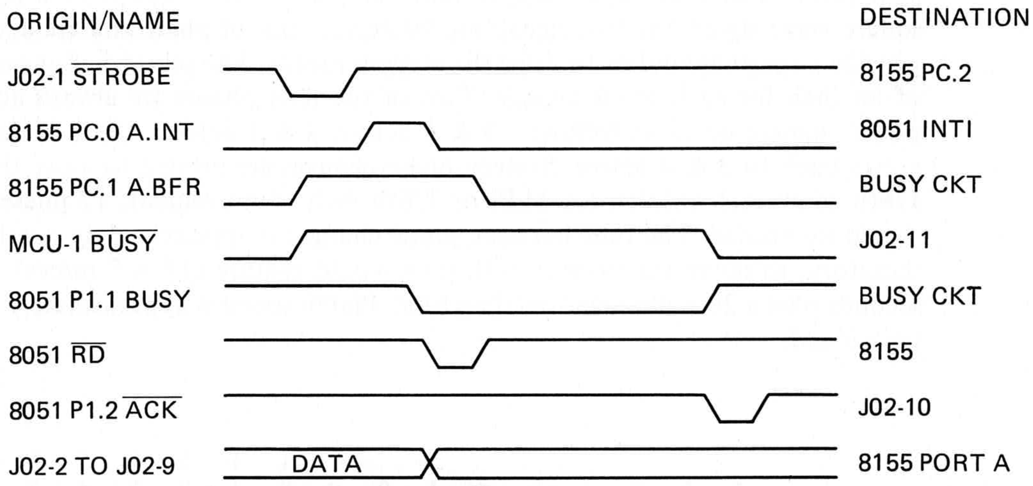


Fig. 7.17 Data transfer sequence between MCU-1 and Host CPU

The Slave Control Unit (SCU-1 board) accepts commands from the MCU-1 board and translates them into control signals which perform the mechanical functions necessary to print a character, space the carriage, move the forms, etc. The main component of the SCU is a microprocessor with an internal 4K ROM which contains the program for controlling the functions. The MPU may be one of two types, an 8051 whose control program is in a Masked ROM and may not be altered, or an 8751 which uses an EP-ROM. The 8051 and 8751 are operationally identical with the exception of the internal ROM. The ports of the MPU are configured as follows:

Port 0 : All bits set as inputs for receiving control signals such as the carriage home pulse, daisywheel sprocket home, paper end (with tractor feature), etc.

Port 1 : All bits set as outputs. Provides the actual clock pulses to the various stepper motor driver circuitry.

Port 2 : All bits set as outputs. This port provides gating signals which allow vertical forms motion, daisywheel character selection, linear stepper motion, etc. This port also provides the control lines to energize the ribbon clutch and fire the hammer solenoid.

Port 3 : Configured as an asynchronous special I/O port for communications with the MCU-1 board.

The 6100 provides vertical forms motion in increments of 1/96 of an inch either forward or backward. The timing diagram shown in Fig. 7.18 represents the control and clock signals necessary to move the forms forward one line at 6LPI. The VFG line (P2.2) is a gating signal which allows selection of either the forms stepper motor or the daisywheel stepper motor. The PMEN line (P2.1) is also used as a gating signal to allow stepper motion. Port 1 bits 7 and 8 each generate a square wave signal, the two signals are 90 degrees out of phase and are decoded to provide four phase pulses to drive the stepper motor. The platen will move 1/96th of an inch for each phase change. Two of the four phases are always active and phase changes occur as follows: 3 & 4 active, 4 & 1 active, 1 & 2 active, 2 & 3 active back to 3 & 4 active. Sixteen phase changes are needed to move the platen 1/6th of an inch (6LPI), for 8LPI or 1/8th inch of movement, 12 phase changes would be needed. The time between phase changes is approximately 5 millisecond, therefore, to move the platen 1/6th inch would require (16 x 5 msecs) 80 milliseconds plus a 20 millisecond settling time. Platen speed is approximately 2 inches per second.

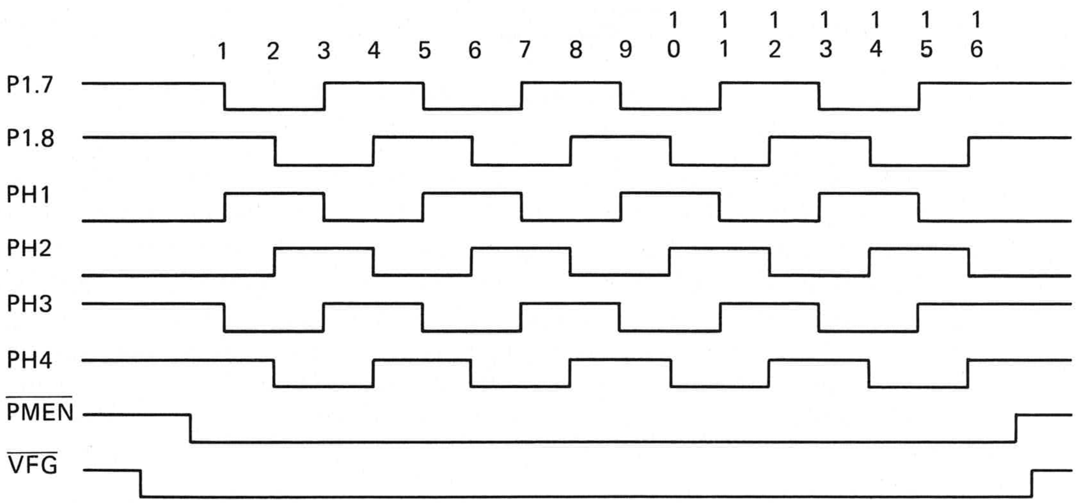


Fig. 7.18

The operation of the daisywheel selection motor is similar to that of the forms motor with only a few exceptions. Fig. 7.19 illustrates the control and timing signals for the daisywheel selection motor. The VFG line must be high to enable the decoding circuitry to produce the four phase pulses which drive the motor. The two square wave inputs to the decoding circuits now come from port 1 bits 5 and 6. The phase of these two lines are different from that of Fig. 7.18.

Changing the phase to the decoding circuits also changes the order in which PH1 to PH4 occur, this results in the stepper motor moving in the opposite (Clockwise) direction. As before there are always two phases active but the order is now as follows: 3 & 4 active, 2 & 3 active, 1 & 2 active, 1 & 4 active back to 3 & 4 active. The effect of the 16 phase changes illustrated here would be to move the daisywheel motion is always clockwise, during the power up intialization sequence and whenever the daisywheel is changed the stepper motor turns counterclockwise to synchronize the wheel to the stepper motor home position.

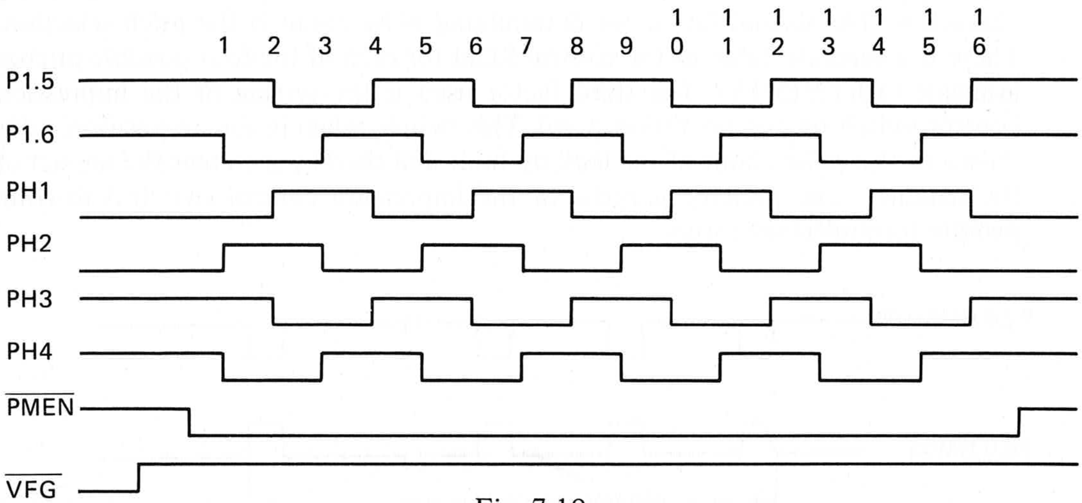


Fig. 7.19

The ribbon mechanism is controlled by a single DC motor within the carriage. When the motor is running clockwise it drives a three stage clutch which controls the ribbon lift guides and also advances the ribbon. At the end of printing the motor is reversed which results in the ribbon being lowered by means of the ribbon down cam. Both the three stage clutch and the ribbon down cam are on the same drive shaft. Fig. 7.20 shows the relationship between the two signals which control the ribbon drive motor. Port 2 bit 3 (DMEN) of the 8051/8751 controls turning the motor on and off. Port 2 bit 4 (DMCW) controls the motor direction. In step 1 of Fig. 7.20 the control lines are shown as they would appear when driving the ribbon motor clockwise (normal printing mode). In step 2 the control lines are sent up to drive the ribbon motor in the counter-clockwise direction (lower ribbon to expose print line). In step 3 the ribbon motor is again being driven clockwise for normal printing.

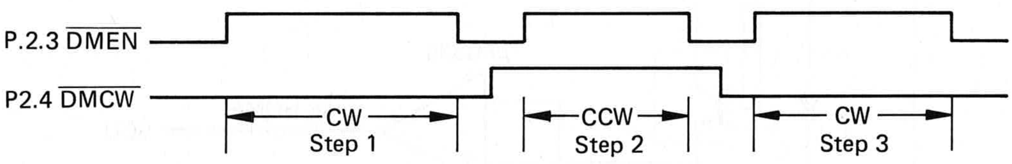


Fig. 7.20

Fig. 7.21 is an illustration of the hammer unit select pulses which drive the hammer and the check pulses which are used as a feedback signal to the MPU. The HMSL line drives the hammer circuitry with a series of pulses which correspond to the density of the character to be printed. As the density of the printed character to be printed. As the density of the printed character increases the number of pulses applied to the hammer coil also increases. Three factors determine the number of pulses sent and therefore the amount of impact of the hammer. First is the density of the character to be printed. The control ROM on the MCU-1 board has look-up tables which contain the number of pulses for the corresponding characters. The second factor for determining pulse count is the pitch selection. There is a separate table in the control ROM for each of the four possible pitches available (10/12/15/PS). The third factor used is the setting of the impression control switch on the operation panel. This switch, when in the on position. adds pulses to the pulse count of the look-up table and thereby increases the impact of the hammer. The primary purpose of the impression control switch is to compensate for multi-part forms.

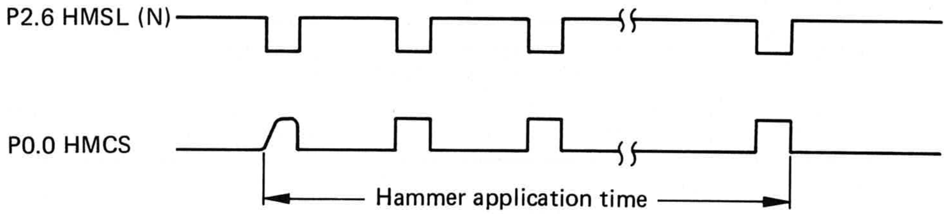


Fig. 7.21 Hammer drive signal

7.3 Daisy motor and linear motor home position sensor circuits

When the power switch is turned on or the printer is initialized, the detector circircuits operate as follows:

7.3.1 The SP home position sensor circuit detects the home position of the printing head at the left.

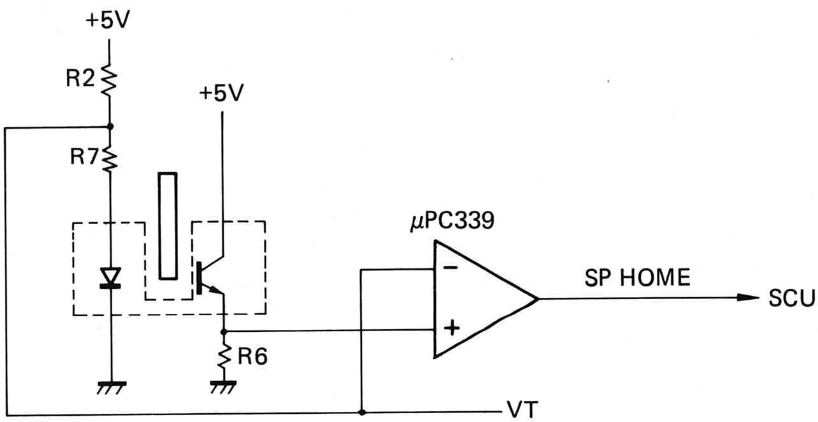


Fig. 7.22 SP home position sensor circuit

7.3.2 **Subesquently, the daisy wheel is given two and a half turns to be automatically set. The printing head is carried to the SP initial point, and the daisy wheel is turned again. The SL home position sensor circuit then detects the home position.**

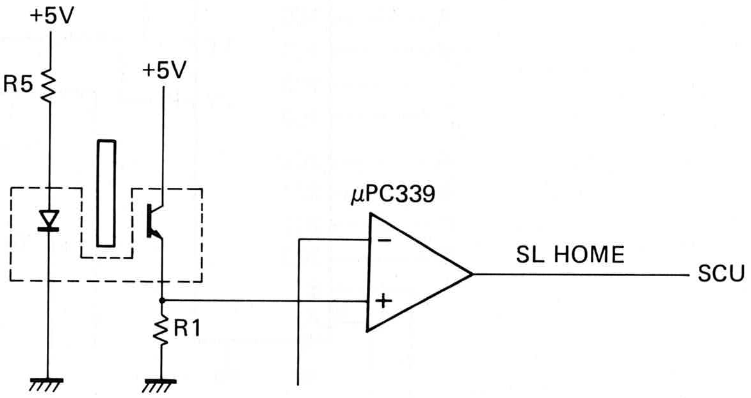


Fig. 7.23 SL home position sensor circuit

7.4 Control panel

The control panel has three membrane switches, one slide switch, and three indicators. The three indicators consist of two green LEDs and one red LED.
The three membrane switches are of non-lock type. Refer to Operation Manual for the detailed description of the switches and indicators. The switches and indicators on the control panel are connected to LSI "8155", and operated by the soft control circuit board of LSI "8751".

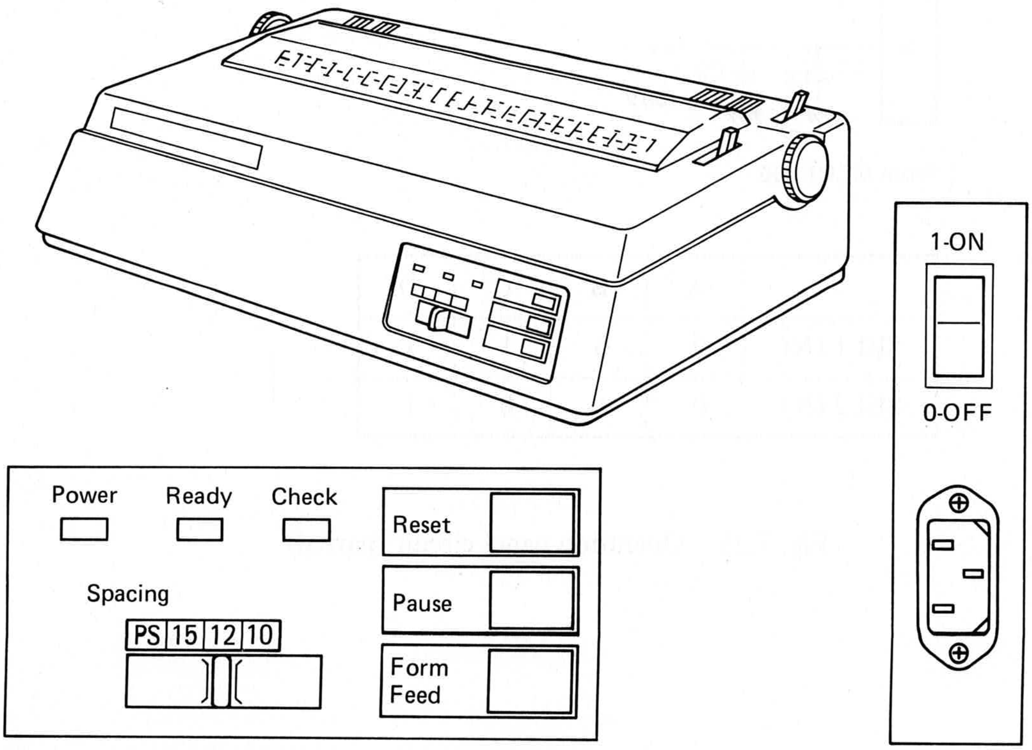
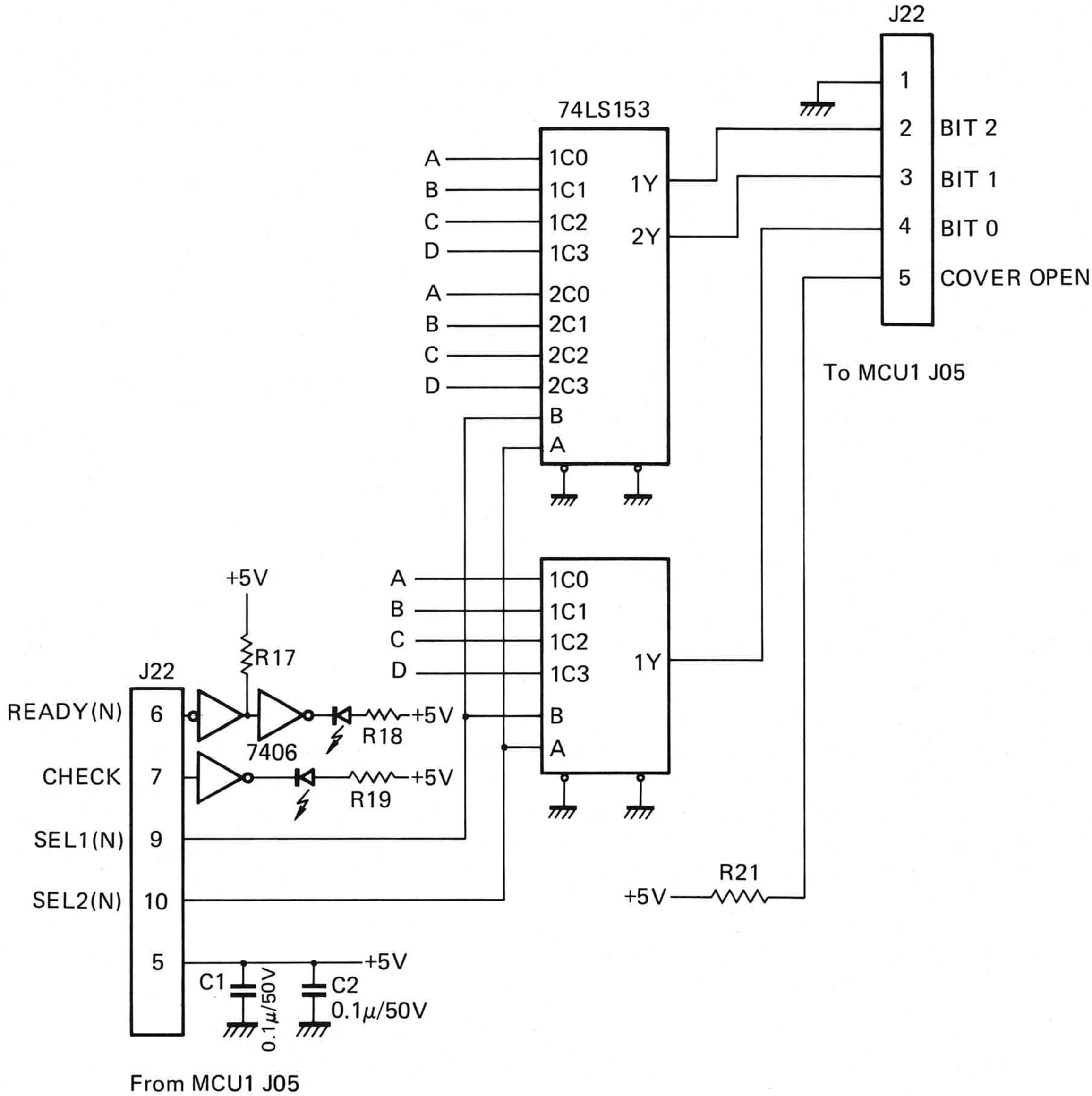


Fig. 7.24 Control Panel



	A	B	C	D
SEL1 (N)	0	0	1	1
SEL2 (N)	0	1	0	1

Fig. 7.25 Operation panel circuit (partial)

MCU1/Control panel signal table

Pin No.	Signal code	Description
1	GND	
2	BIT2	Decoding output of the membrane switches and slide switch
3	BIT1	
4	BIT0	
5	CV OPEN (N)	Unused
6	READY (N)	For lighting the data transfer ready LED
7	CHECK	For lighting the print inhibit LED
8	5V	
9	SEL1	Signal lines for selecting BIT2 to BIT0
10	SEL2	

Power : When the power switch is turned on, the green LED lights.

Ready : Lights up when the printer is ready to transfer data, and blinks when data are left in the buffer memory in the pause mode.

Check : The red LED lights or blinks when an error occurs.
Lights when the ribbon or form has run out. Blinks when an SP or SL home position detection error occurs.

8. Lubrication

Lubrication is very important in the maintenance of this printer. When carrying out ordinary maintenance on units of the priner, only grease is used, but when further disassembling each unit for overhauling, oil is necessary for some parts. Lubricate the points specified by Ⓖ and Ⓞ. The mark Ⓖ denotes grease and Ⓞ oil. The types of the lubricants to be used are:

- Ⓖ : Albania grease
- Ⓞ : White spindle oil

CAUTIONS :

1) **DO NOT USE ANY OTHER LUBRICANTS THAN THOSE SPECIFIED.**
2) **MAKE SURE TO LUBRICATE ONLY THE SPECIFIED PARTS.**
3) **WIPE OFF OLD LUBRICANT BEFORE LUBRICATING ANY PARTS.**

Carry out lubrication when overhauling the printer or replacing a unit for maintenance. Lubricate the specified parts of the new unit.

8.1 Lubricating the carriage unit

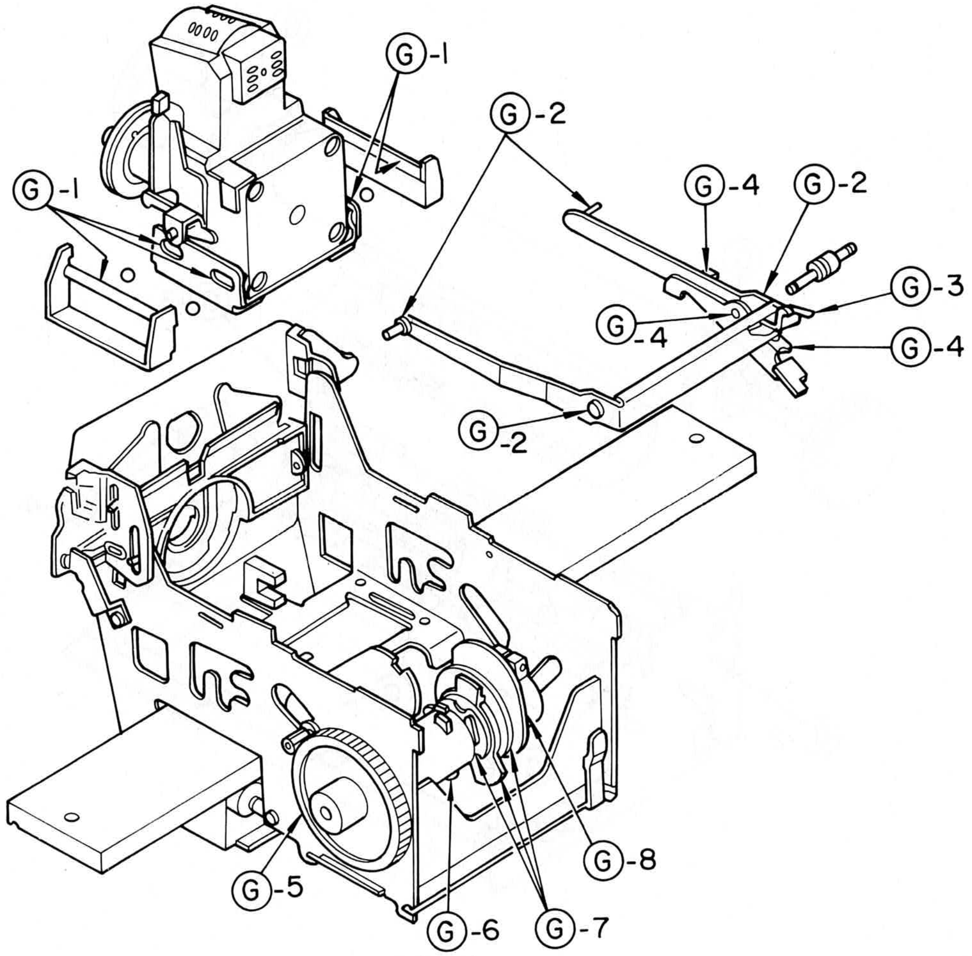


Fig. 8.1

Symbol	Parts to be lubricated
G -1	Grooves on either side of motor bracket and slots in right and left ball guides
G -2	Bearings and pins on either side of lift arm
G -3	Top face of ribbon lift lever
G -4	Cam follower bearing, spring hook, and ribbon lift lever receiving face
G -5	Clutch gear teeth surface
G -6	Three pawls or clutch sleeve
G -7	Surface of back stop cam of lift cam, three ribbon feed cams, and the surface of lift cam
G -8	Surface of ribbon down cam

8.2 Lubricating the frame unit

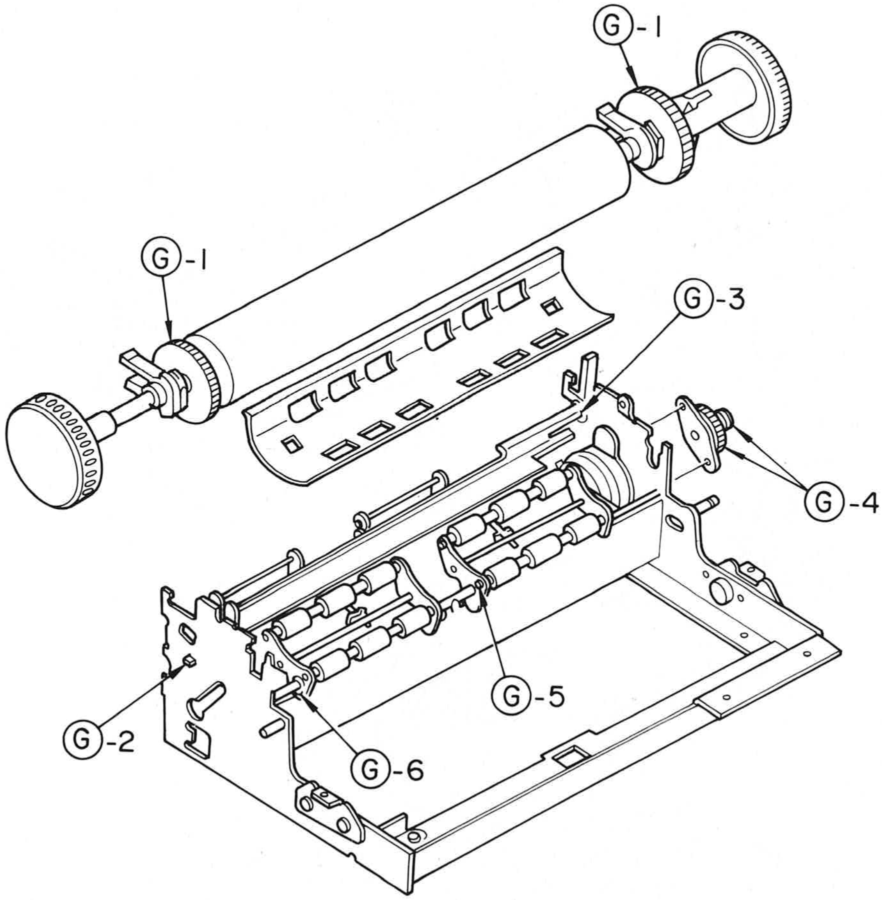


Fig. 8.2

Symbol	Parts to be lubricated
G -1	Teeth surface of platen knob gear of platen unit and optional gear teeth surface
G -2	Right and left bearings of paper release arm
G -3	Contact part between paper release lever and paper release arm
G -4	Idler gear teeth surfaces
G -5	Eight points on feed roller bearings
G -6	Contact part between feed roller unit and feed roller holding shaft

8.3 Lubricating the parts

When a component unit has been disassembled for repair, the following parts must be lubricated. Remember to wipe off the old lubricant before lubricating any parts.

Symbol	Where to lubricate
G - 1	Circumference of clutch liner A
G - 2	Circumference of clutch spring
G - 3	Inner surface of lift cam
G - 4	Side and circumference of clutch liner B
G - 5	Inner surface and circumference of ribbon down cam shaft
G - 6	Circumference of ribbon down spring
G - 7	Side and circumference of cam lock
G - 8	Back stopper bearing of clutch coil unit Both side of Back stopper spring, Armature spring
G - 9	Contact part between ribbon tension guide and ribbon idler latch
G -10	Release pin or ribbon release lever
G -11	Both ends of ribbon ratchet arm bearing
G -12	Surface of ribbon drive ratchet teeth
O - 1	Ribbon drive shaft bearing

G : Albania grease

O : White spindle oil

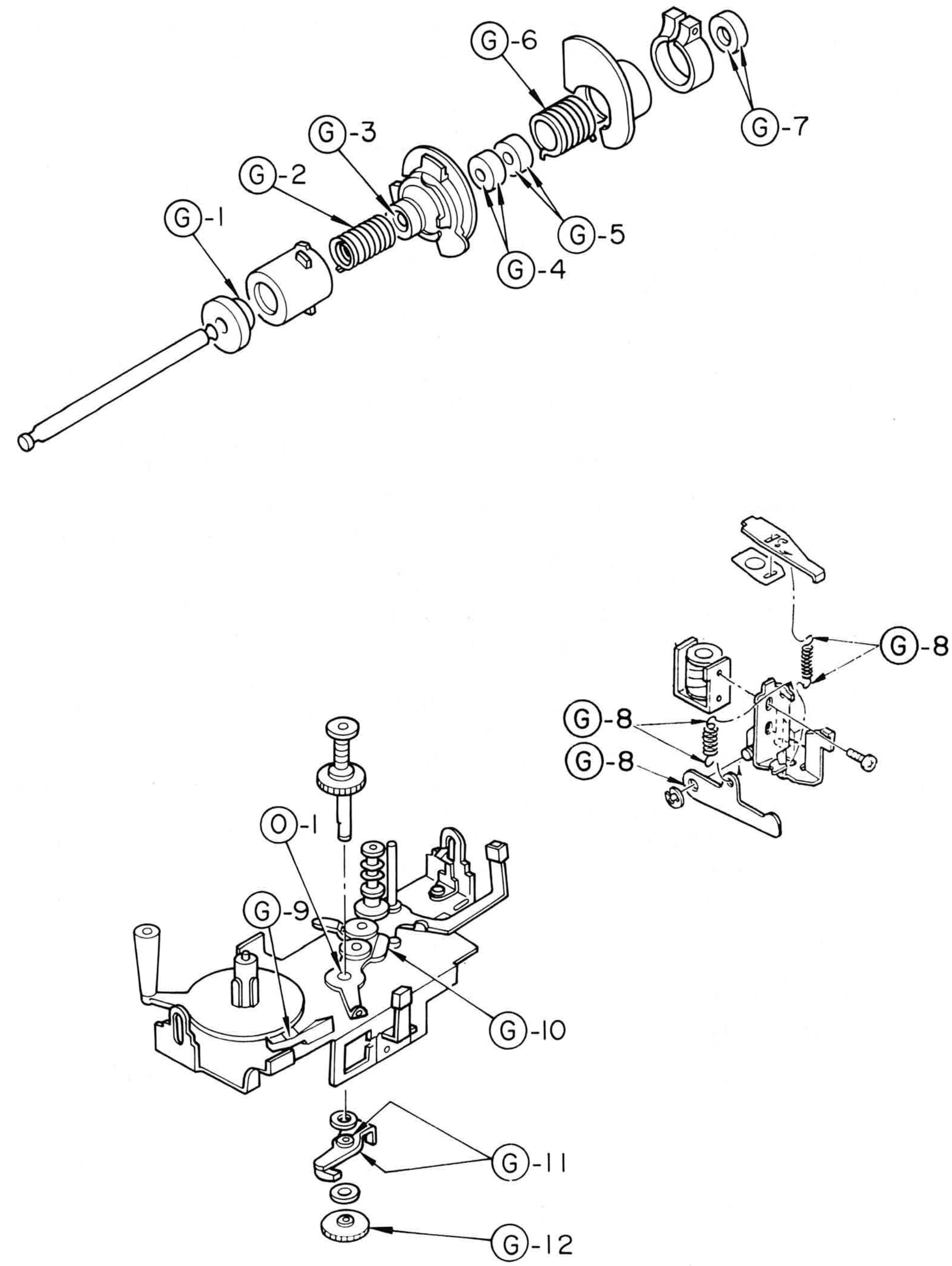
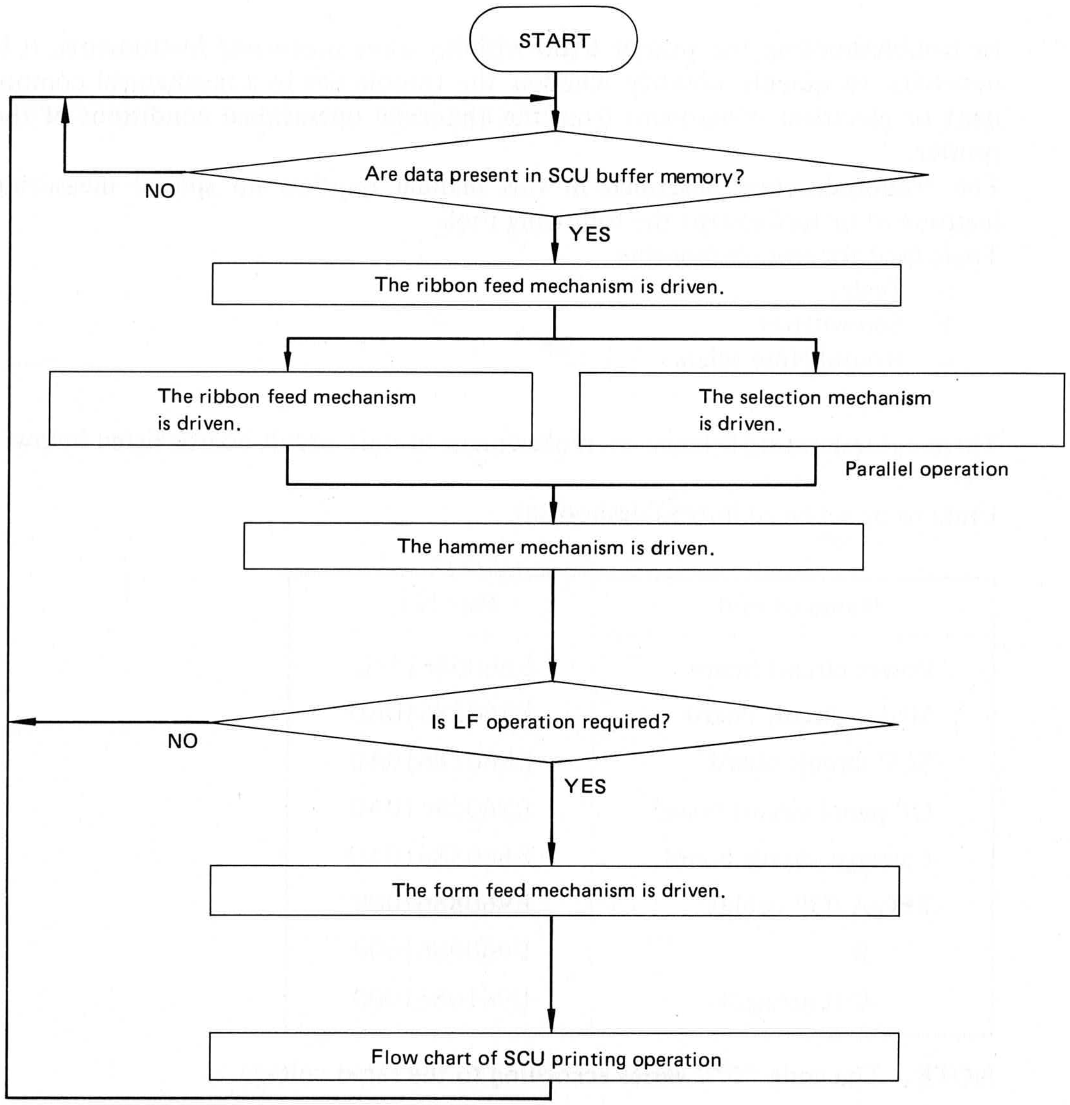


Fig. 8.3

9. Configuration

The 6100 Daisy Printer may be roughly divided into the following five mechanisms.

Hammer mechanism
Selection (daisy selection) mechanism
Form feed mechanism
Ribbon feed mechanism
Carriage mechanism



10. Troubleshooting

10.1 General Description

The troubleshooting procedures contained in this manual is shown by flow charts to allow troubleshooting to be made simply by measuring instruments (tester, etc.) without using special tools. In other words, the knowledge about the operation and assembly of the printer is enough to perform troubleshooting. The printer 6100 permits easy detachment of the electrical and mechanical components.

10.2 Troubleshooting

In troubleshooting the printer 6100 without using measuring instruments, it is necessary to quickly identify whether the trouble lies in a mechanical component or electrical component from the abnormal operational conditions of the printer.
The troubleshooting described in this manual requires no special measuring instrument or tool except the following tools:
Tools used for troubleshooting

a. Tester
b. Screwdriver
c. Round Nose pliers

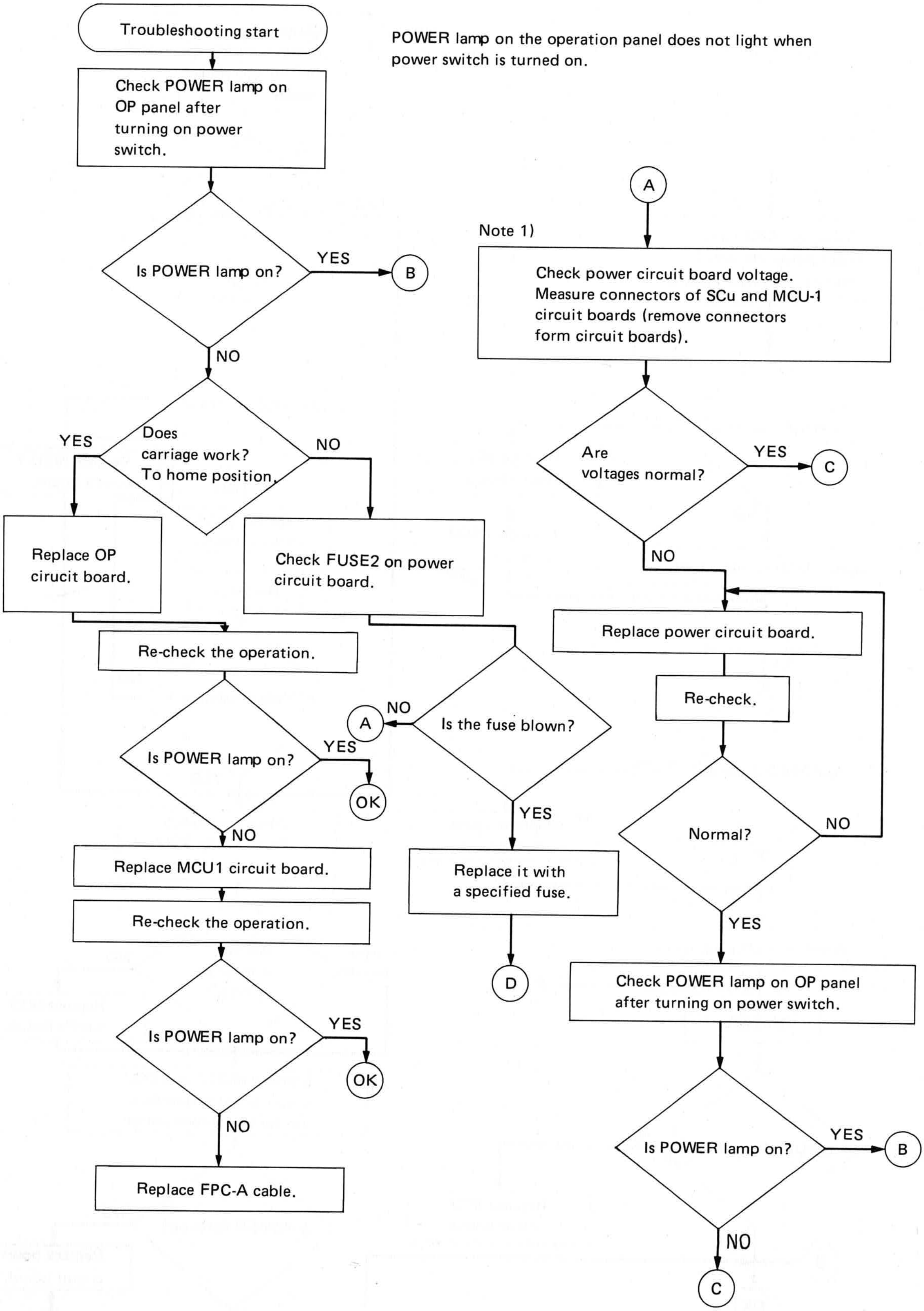
The troubleshooting is based on replacement of unit circuit boards listed below:

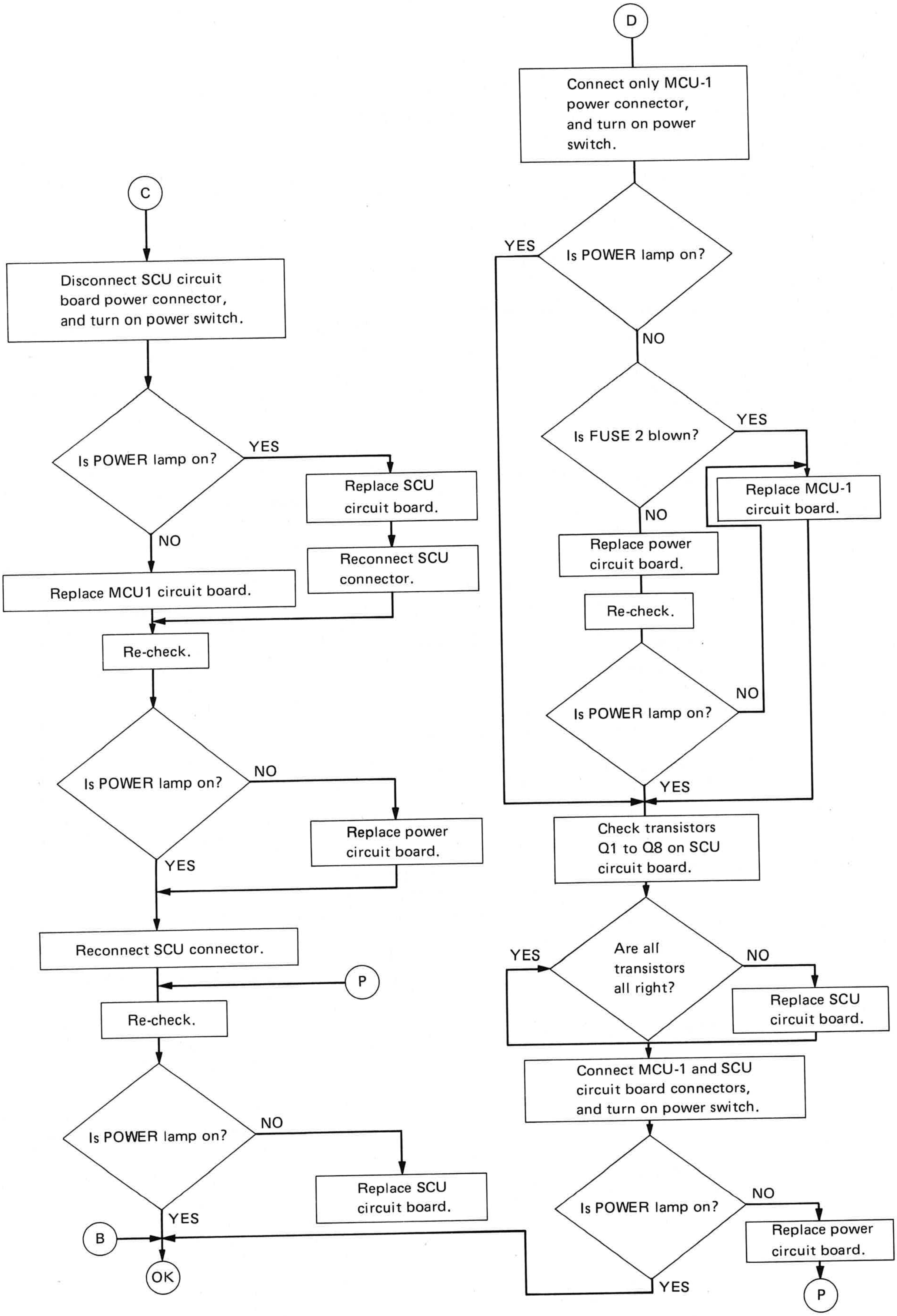
Units to be replaced in troubleshooting

Name of unit	Part No.
Power circuit board	E8606861**0
MCU1 circuit board	E86038610A0
SCU circuit board	E86018610A0
OP panel circuit board	E86028610A0
Carriage circuit board	E86058610A0
EPC-A (OP cable)	E9608861000
-B	E9609861000
-C (Carriage)	E9610861000

NOTE: The code "" varies according to the rated voltage.**

POWER lamp on the operation panel does not light when power switch is turned on.



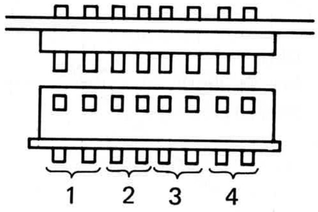

C
Disconnect SCU circuit board power connector, and turn on power switch.
Is POWER lamp on?
YES
NO
Replace SCU circuit board.
Reconnect SCU connector.
Replace MCU1 circuit board.
Re-check.
Is POWER lamp on?
NO
YES
Replace power circuit board.
Reconnect SCU connector.
P
Re-check.
Is POWER lamp on?
NO
YES
Replace SCU circuit board.
B
OK
D
Connect only MCU-1 power connector, and turn on power switch.
Is POWER lamp on?
YES
NO
Is FUSE 2 blown?
YES
NO
Replace MCU-1 circuit board.
Replace power circuit board.
Re-check.
Is POWER lamp on?
NO
YES
Check transistors Q1 to Q8 on SCU circuit board.
Are all transistors all right?
YES
NO
Replace SCU circuit board.
Connect MCU-1 and SCU circuit board connectors, and turn on power switch.
Is POWER lamp on?
NO
YES
Replace power circuit board.
P

NOTE: 1) How to check the voltage

SCU circuit board connector

1. Red +5V
2. Black GND
3. Yellow +24V
4. Orange +32V

SCU circuit board

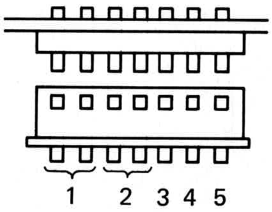


J11

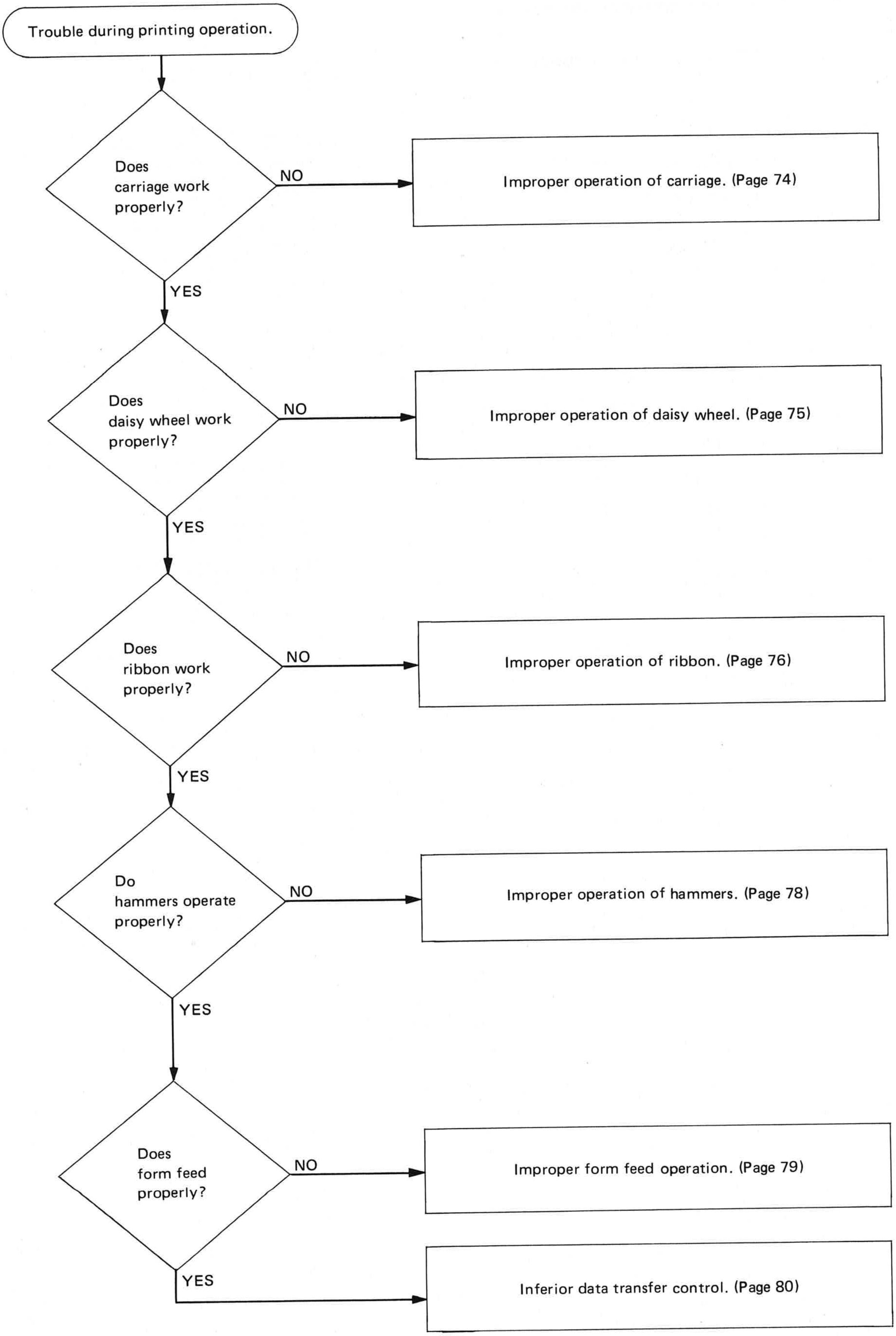
MCU1 circuit board connector

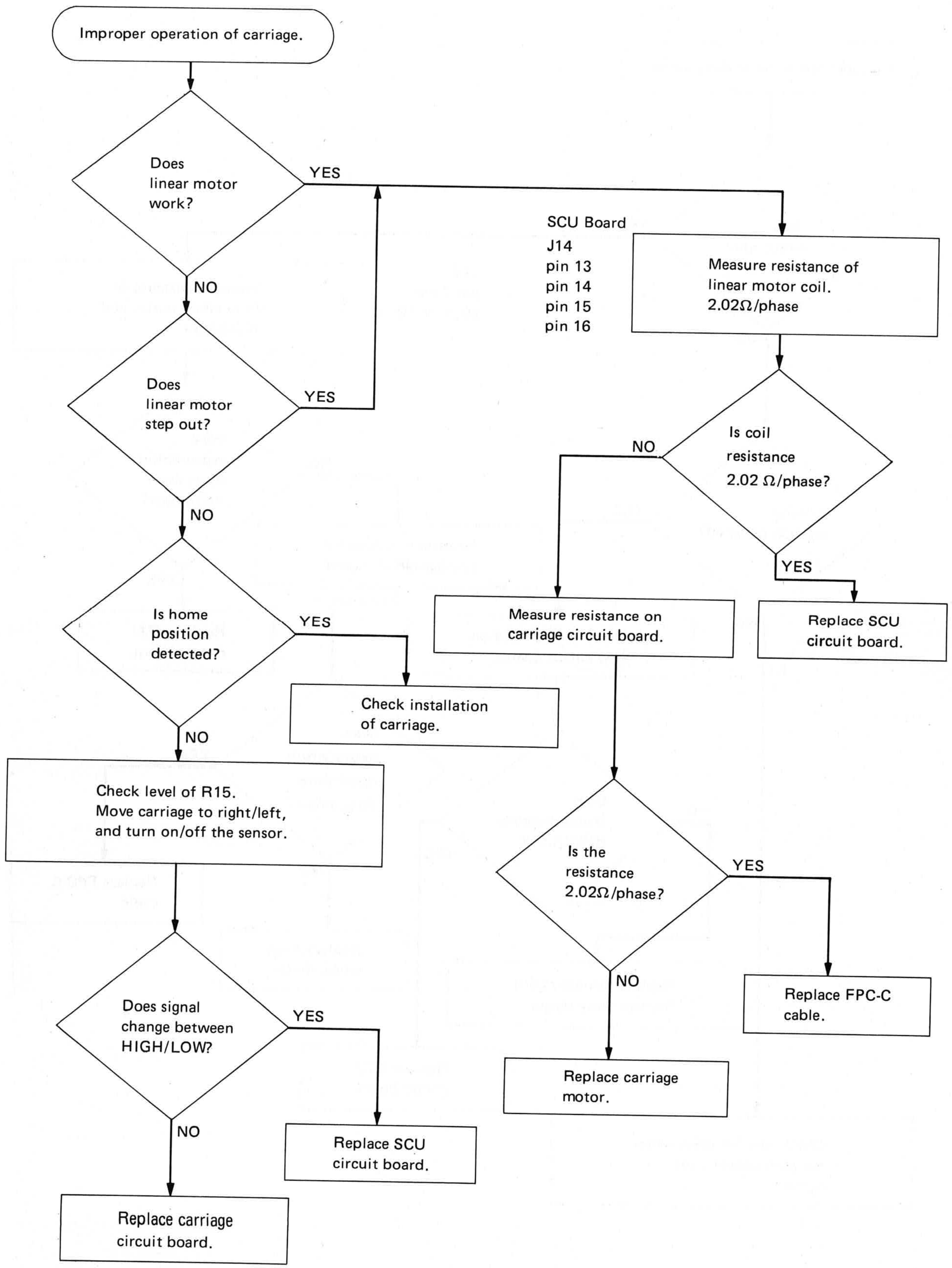
1. Red +5V
2. Black GND
3. Blue +12V
4. White −12V
5. Orange +32V

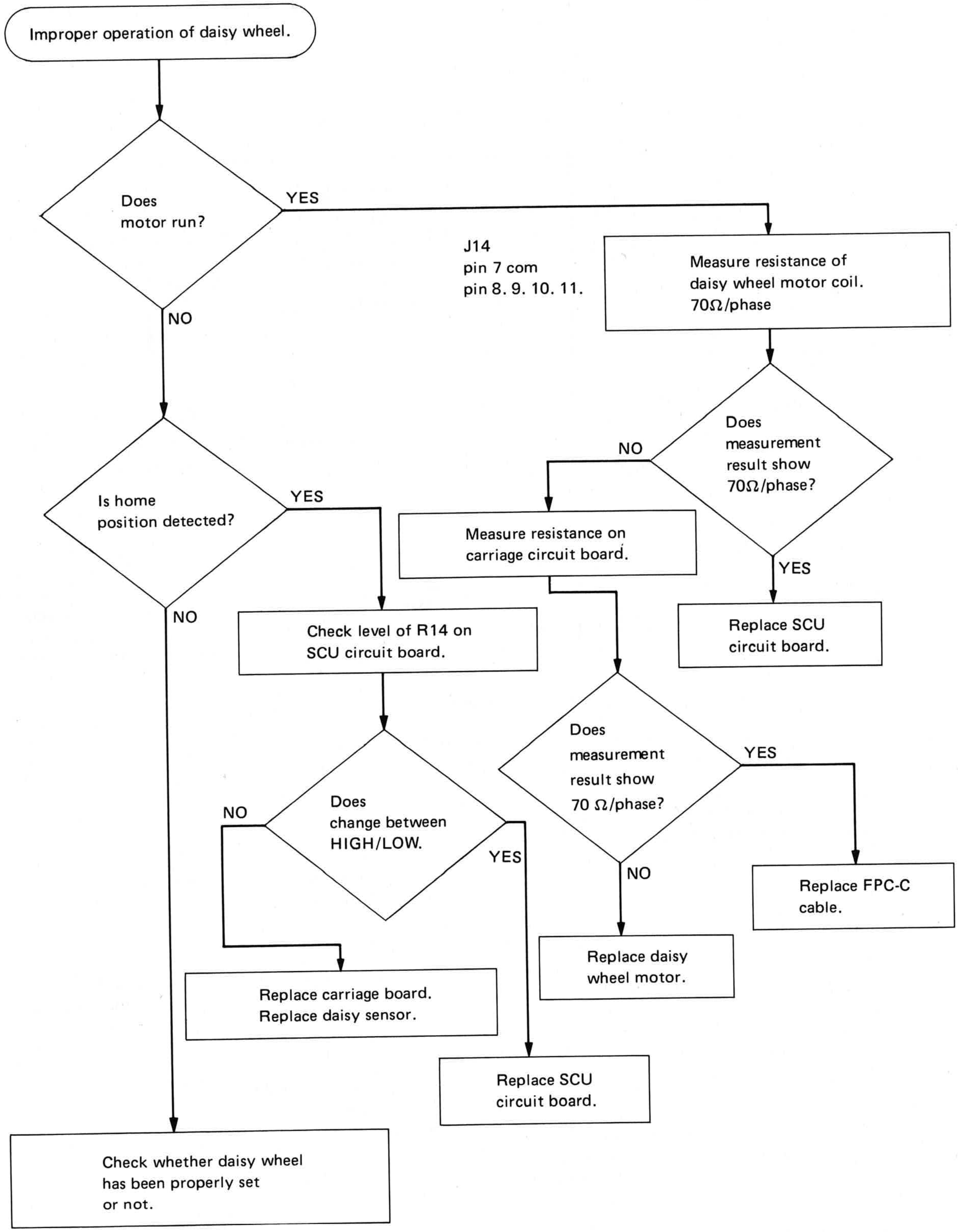
MCU1 circuit board

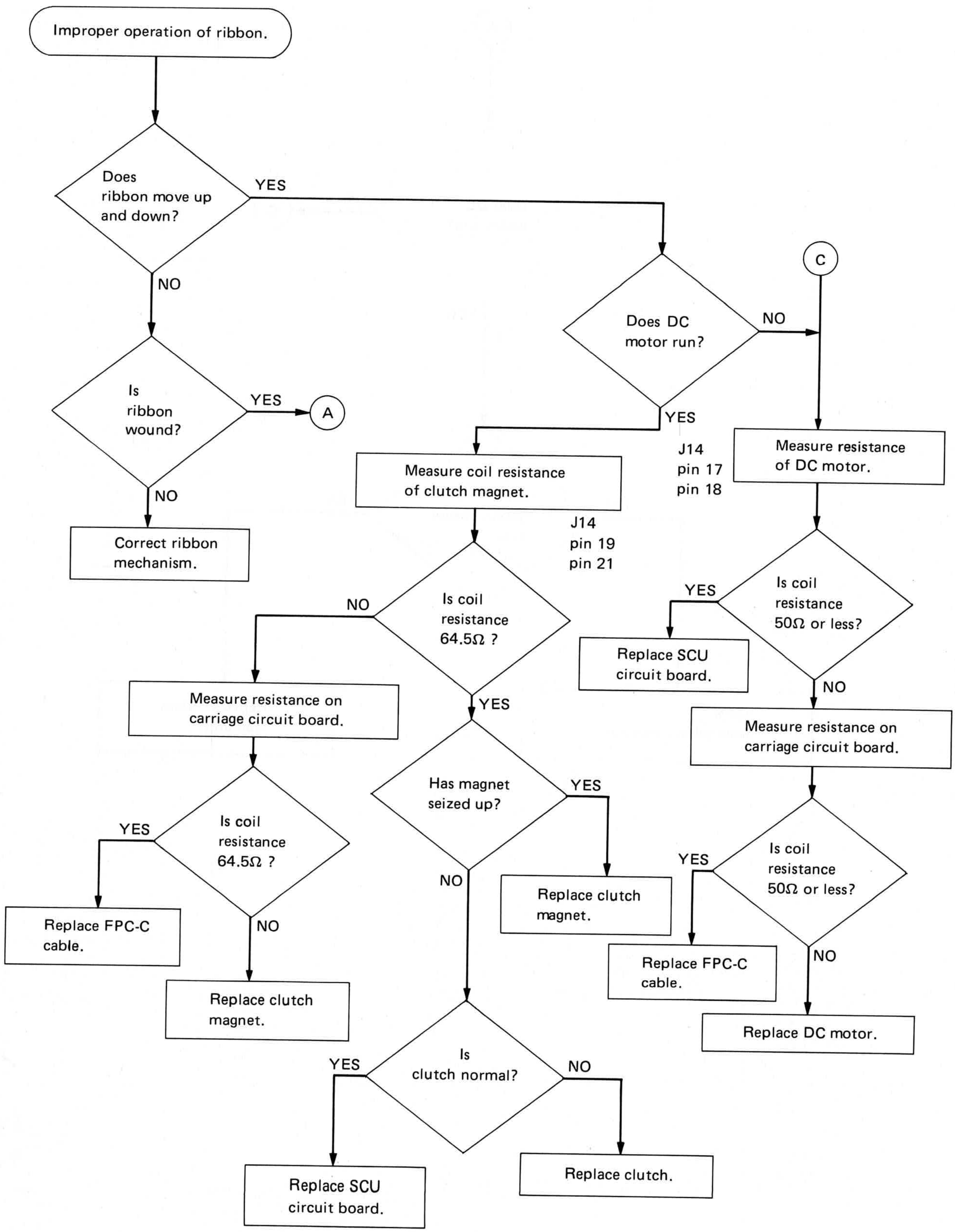


J01

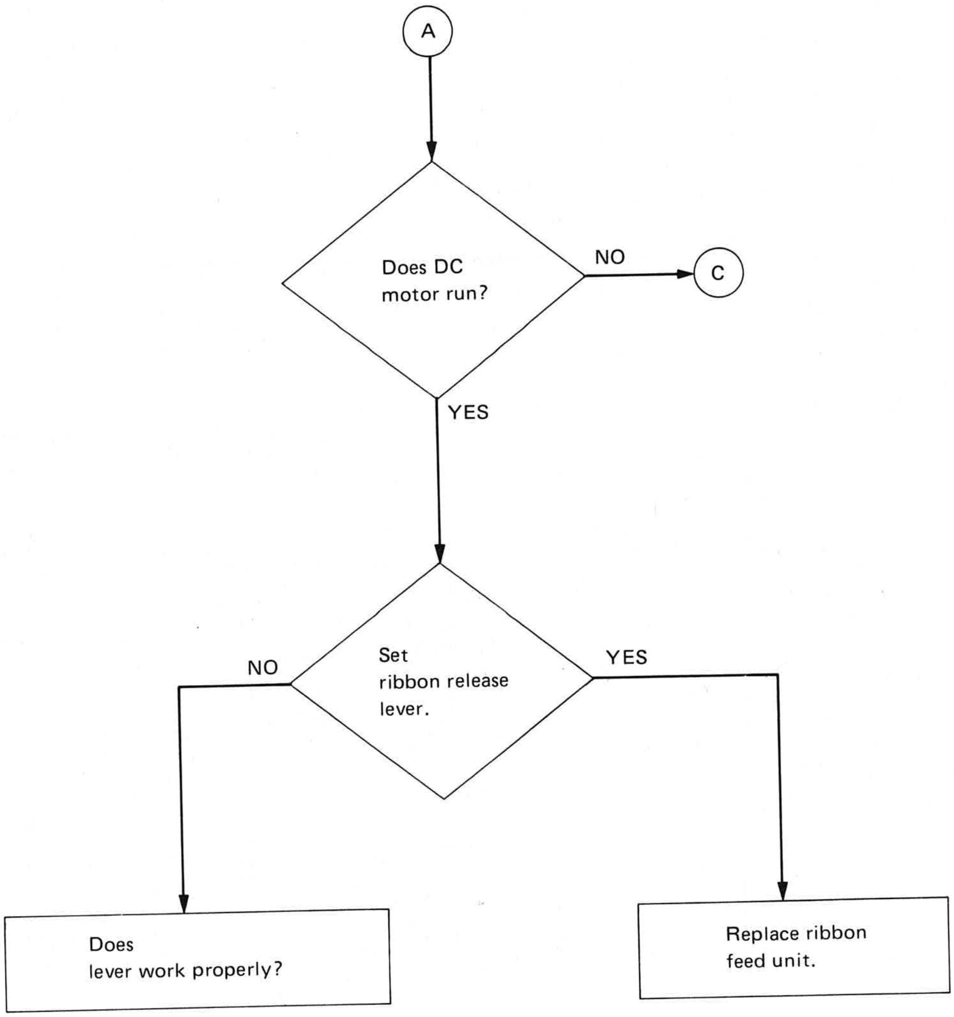

Trouble during printing operation.
Does carriage work properly?
NO
Improper operation of carriage. (Page 74)
YES
Does daisy wheel work properly?
NO
Improper operation of daisy wheel. (Page 75)
YES
Does ribbon work properly?
NO
Improper operation of ribbon. (Page 76)
YES
Do hammers operate properly?
NO
Improper operation of hammers. (Page 78)
YES
Does form feed properly?
NO
Improper form feed operation. (Page 79)
YES
Inferior data transfer control. (Page 80)

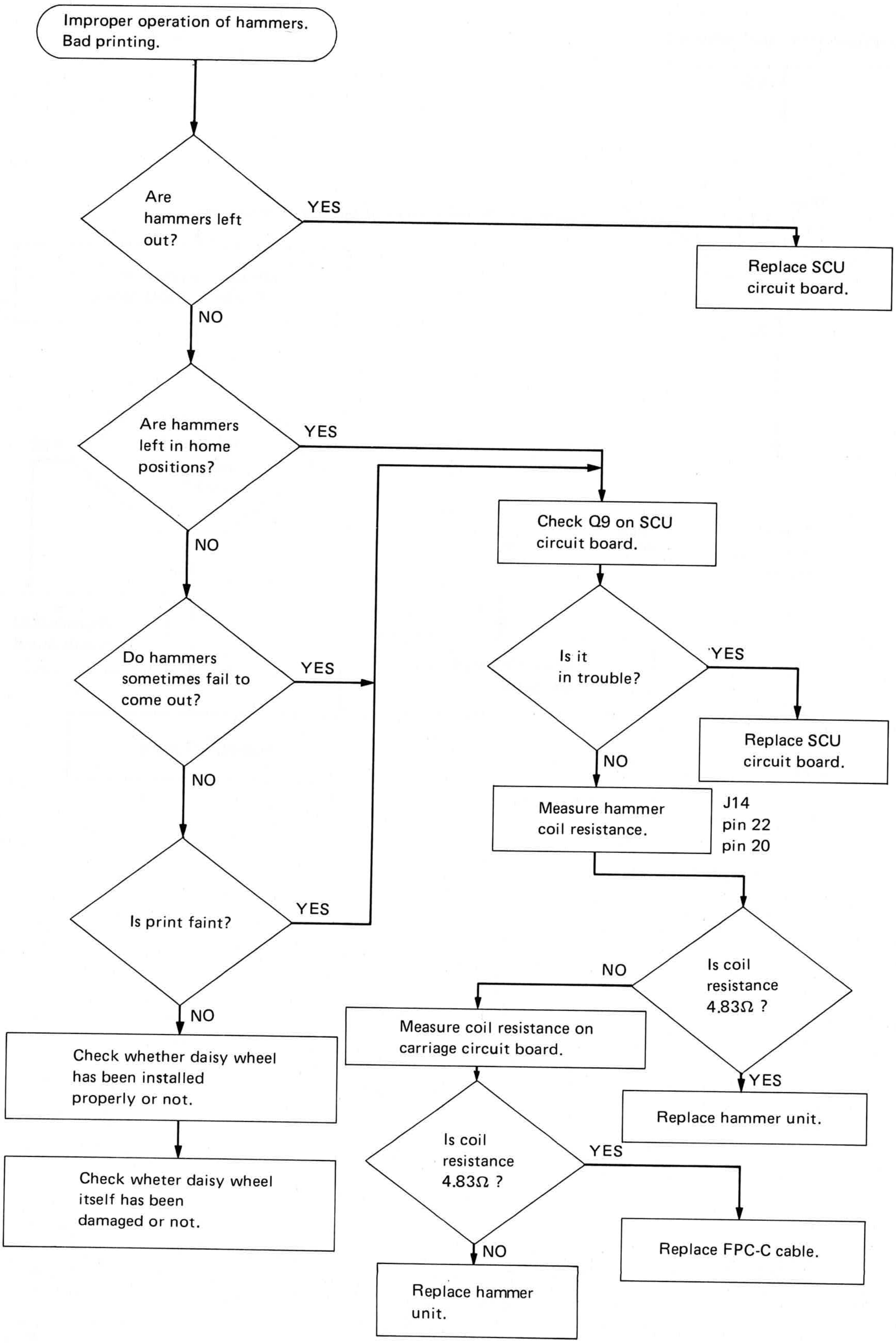

Improper operation of carriage.
Does linear motor work?
YES
NO
Does linear motor step out?
YES
NO
Is home position detected?
YES
NO
Check installation of carriage.
Check level of R15.
Move carriage to right/left,
and turn on/off the sensor.
Does signal change between HIGH/LOW?
YES
NO
Replace SCU circuit board.
Replace carriage circuit board.
SCU Board
J14
pin 13
pin 14
pin 15
pin 16
Measure resistance of linear motor coil.
2.02Ω/phase
Is coil resistance 2.02 Ω/phase?
NO
YES
Replace SCU circuit board.
Measure resistance on carriage circuit board.
Is the resistance 2.02Ω/phase?
YES
NO
Replace FPC-C cable.
Replace carriage motor.

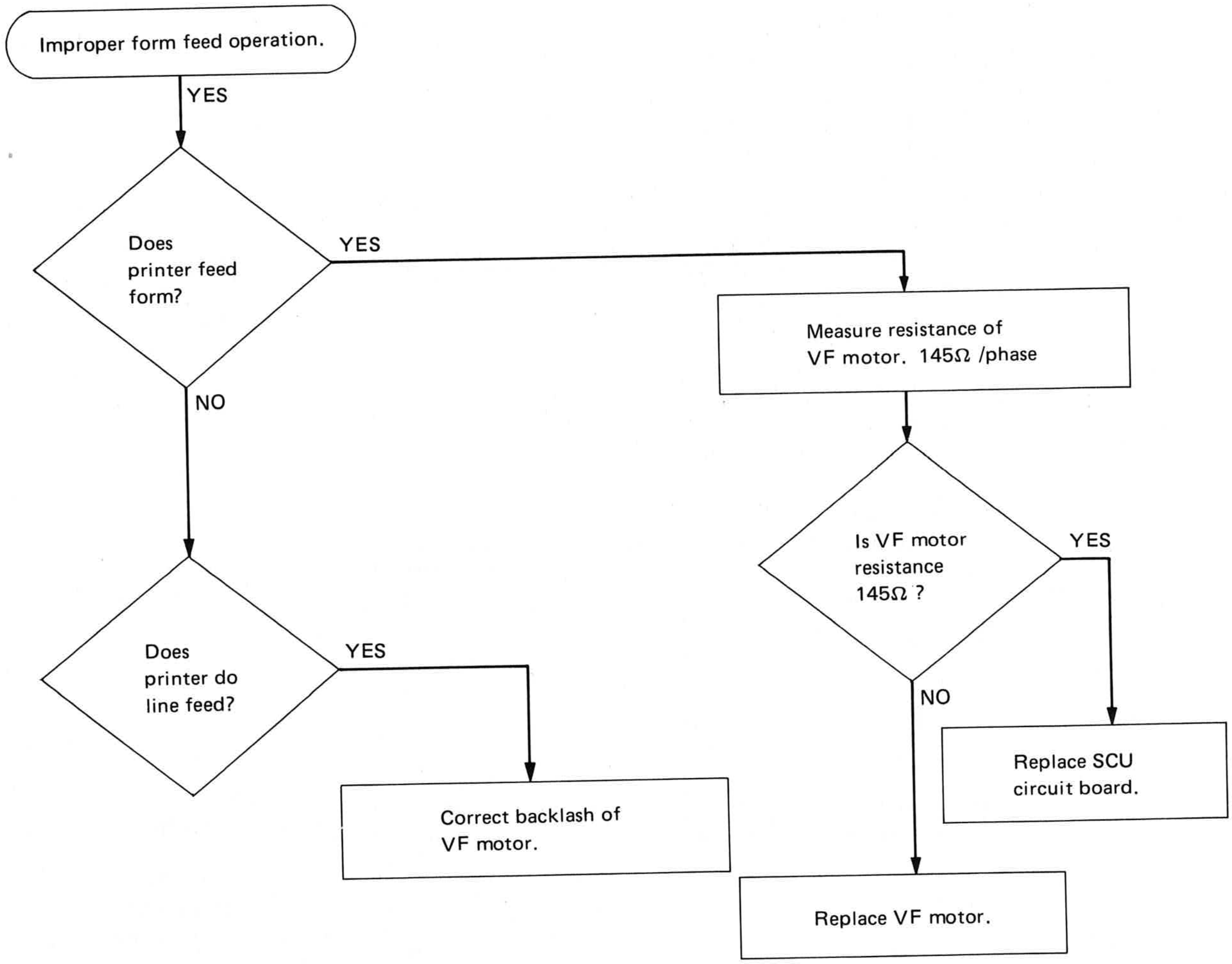

Improper operation of daisy wheel.
Does motor run?
YES
NO
J14
pin 7 com
pin 8. 9. 10. 11.
Measure resistance of daisy wheel motor coil. 70Ω/phase
Does measurement result show 70Ω/phase?
NO
YES
Is home position detected?
YES
NO
Measure resistance on carriage circuit board.
Replace SCU circuit board.
Check level of R14 on SCU circuit board.
Does measurement result show 70 Ω/phase?
YES
NO
Does change between HIGH/LOW.
NO
YES
Replace FPC-C cable.
Replace daisy wheel motor.
Replace carriage board. Replace daisy sensor.
Replace SCU circuit board.
Check whether daisy wheel has been properly set or not.

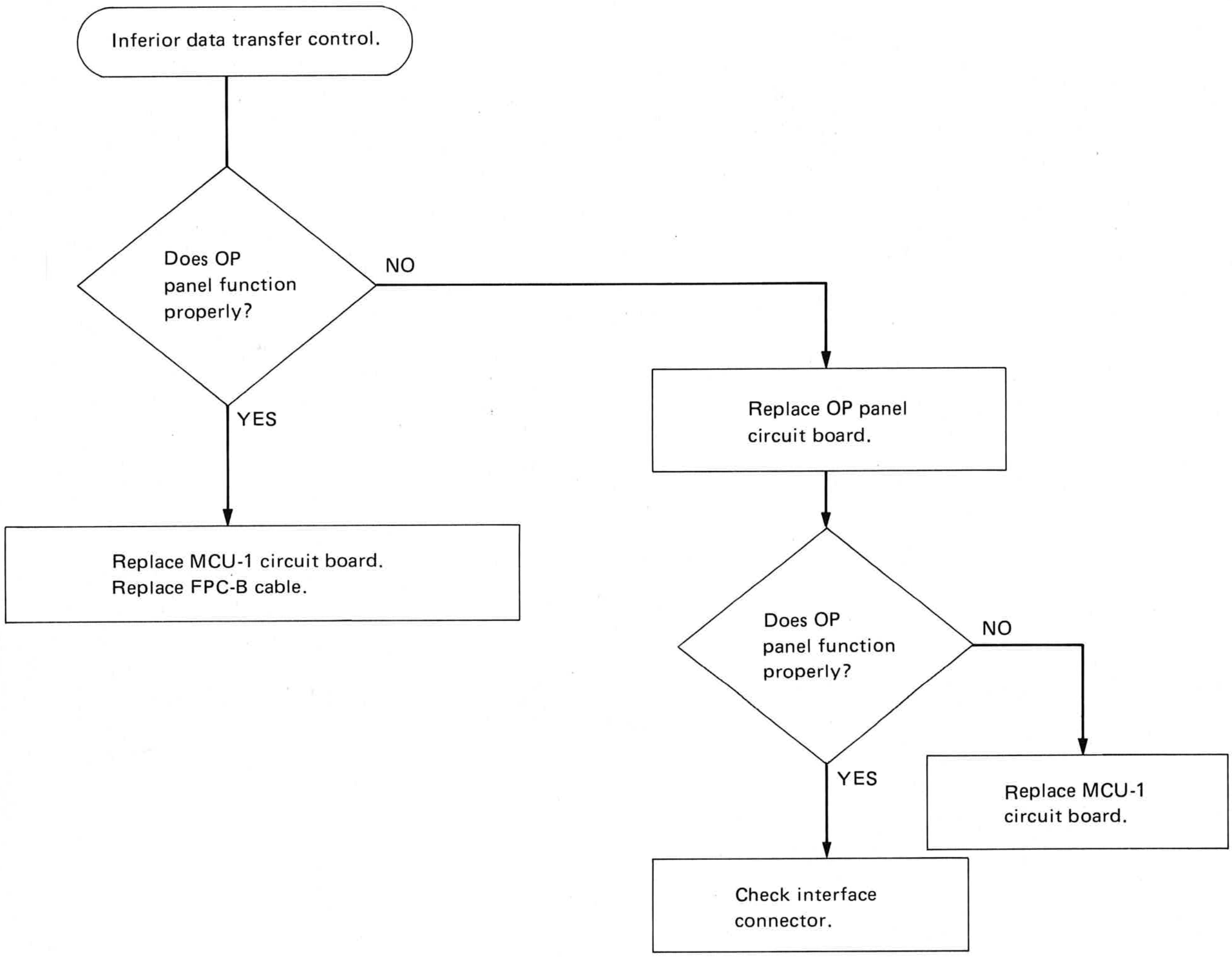


Improper operation of ribbon.
Does ribbon move up and down?
YES
NO
Is ribbon wound?
YES
A
NO
Correct ribbon mechanism.
Does DC motor run?
NO
C
YES
J14 pin 17 pin 18
Measure coil resistance of clutch magnet.
J14 pin 19 pin 21
Measure resistance of DC motor.
Is coil resistance 64.5Ω ?
NO
YES
Measure resistance on carriage circuit board.
Is coil resistance 64.5Ω ?
YES
NO
Replace FPC-C cable.
Replace clutch magnet.
Has magnet seized up?
YES
NO
Replace clutch magnet.
Is clutch normal?
YES
NO
Replace SCU circuit board.
Replace clutch.
Is coil resistance 50Ω or less?
YES
NO
Replace SCU circuit board.
Measure resistance on carriage circuit board.
Is coil resistance 50Ω or less?
YES
NO
Replace FPC-C cable.
Replace DC motor.

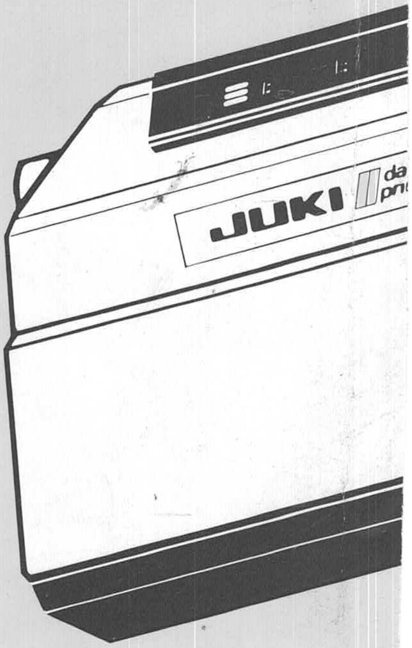

A
Does DC motor run?
NO
C
YES
Set ribbon release lever.
NO
YES
Does lever work properly?
Replace ribbon feed unit.


Improper operation of hammers. Bad printing.
Are hammers left out?
YES
Replace SCU circuit board.
NO
Are hammers left in home positions?
YES
Check Q9 on SCU circuit board.
NO
Do hammers sometimes fail to come out?
YES
Is it in trouble?
YES
Replace SCU circuit board.
NO
Measure hammer coil resistance.
J14
pin 22
pin 20
NO
Is print faint?
YES
Is coil resistance 4.83Ω ?
NO
Measure coil resistance on carriage circuit board.
YES
Replace hammer unit.
NO
Check whether daisy wheel has been installed properly or not.
Check wheter daisy wheel itself has been damaged or not.
Is coil resistance 4.83Ω ?
YES
Replace FPC-C cable.
NO
Replace hammer unit.


Improper form feed operation.
YES
Does printer feed form?
YES
Measure resistance of VF motor. 145Ω /phase
Is VF motor resistance 145Ω ?
YES
Replace SCU circuit board.
NO
Replace VF motor.
NO
Does printer do line feed?
YES
Correct backlash of VF motor.


Inferior data transfer control.
Does OP panel function properly?
NO
YES
Replace MCU-1 circuit board.
Replace FPC-B cable.
Replace OP panel circuit board.
Does OP panel function properly?
NO
YES
Replace MCU-1 circuit board.
Check interface connector.

Parts No. E01308610AA Printed in Japan



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