

PF-5 Service Manual

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## NOTICE

The information in this manual is subject to change without notification. Additional pages may be inserted in future editions. The user is asked to excuse any technical inaccuracies or typographical errors in the present edition.

No responsibility is assumed if accidents occur while the user is following the instructions in this manual. No responsibility is assumed for defects in the printer's firmware.

The contents of this manual are protected by copyright. No part of this manual may be reproduced or copied by any means without the permission of the copyright holder. The printer's firmware (contents of its read-only memory) is similarly protected by copyright.

## INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

*Reorient or relocate the receiving antenna.*

*Increase the separation between the equipment and receiver.*

*Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*

*Consult the dealer or an experienced radio/TV technician for help.*

Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.

## IMPORTANT NOTICE TO SERVICE PERSON

Before attempting service on the printer, including disassembling, re-assembling, troubleshooting, and adjustment, read this manual carefully. During performing service, use extreme care to avoid possible electric shock hazard, burn, and human injuries. Make sure the printer is not provided with any safety facilities other than those primarily intended for the safety of users.

## PREFACE

This manual contains information pertaining to service and maintenance of the PF-5 paper feeder. The information in this manual contains the following chapters:

Chapter 1: General information

Chapter 2: Maintenance

Chapter 3: Paper specifications

Chapter 4: Parts catalog

Chapter 5: Hardware notes

Appendix: Schematic diagrams

## Legend

Throughout the chapters, *Warning* denotes the precaution which, if ignored, could result in personal injury, and/or irrevocable damage to the printer. *Note* denotes precautions which, if ignored, could result in damage to the printer.

# Chapter 1: General information

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## 1.1. General

This chapter explains basic considerations and precautions to be observed when repairing, maintaining and inspecting the paper feeder PF-5. The precautions are fairly extensive; however, to prevent accidents, it is very important that the service person read the precautions carefully, and observe them at all times.

At the end of the chapter, specifications for the product are provided.

## 1.2. Product description

The PF-5 option paper feeder provides the Kyocera printer models of FS-1500/A and FS-3500/A with a second source of paper supply in addition to that provided by the printer's standard cassette. The printer can automatically switch paper feeding back and forth between the standard paper cassette (capacity: 250 sheets) and the option paper feeder (capacity: 500 sheets), or the user can select the source of paper supply himself using the switches on the printer's control panel. In addition, two paper feeders can be stacked to get a third source of paper supply.

The paper feeder includes a motor and rollers to feed paper into the printer, and the built-in electronics for controlling the motor. Technical explanation for the electronics circuits is made in chapter 5, *Hardware notes*, in this manual.

Topics covering the installation and operations of the printer are fully detailed in the paper feeder's *User's Manual*.

### 1.2.1. Original packing list

The paper feeder package contains each of the following items in the indicated quantities.

- ❖ PF-5 option paper feeder, 1
- ❖ PC-8 paper cassette (A5/B5/A4/Letter/Legal size), 1
- ❖ Cable holder, 2
- ❖ Instruction manual (English/German/French/Italian/Spanish), 1

### 1.2.2. Names of parts

The paper feeder has the following parts. See figure on next page.

«Connector» When you install the optional paper feeder, this connector plugs into a connector located inside the bottom of the printer.

«Positioning pins» When installing the optional paper feeder, these pins fit into two holes in the bottom of the printer.

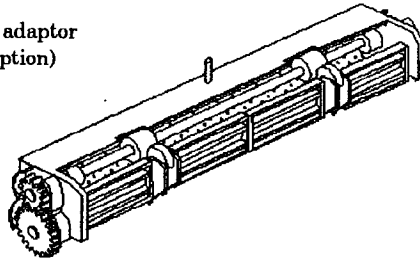
«Paper cassette» This cassette holds up to 500 sheets of standard A4 or Letter size paper (paper with a thickness 0.1 mm). It also accommodates A5, B5, and Legal size paper.

«Indicator panel» Shows the size of paper currently installed in the paper cassette, and indicates whether the paper feeder is ready for use.

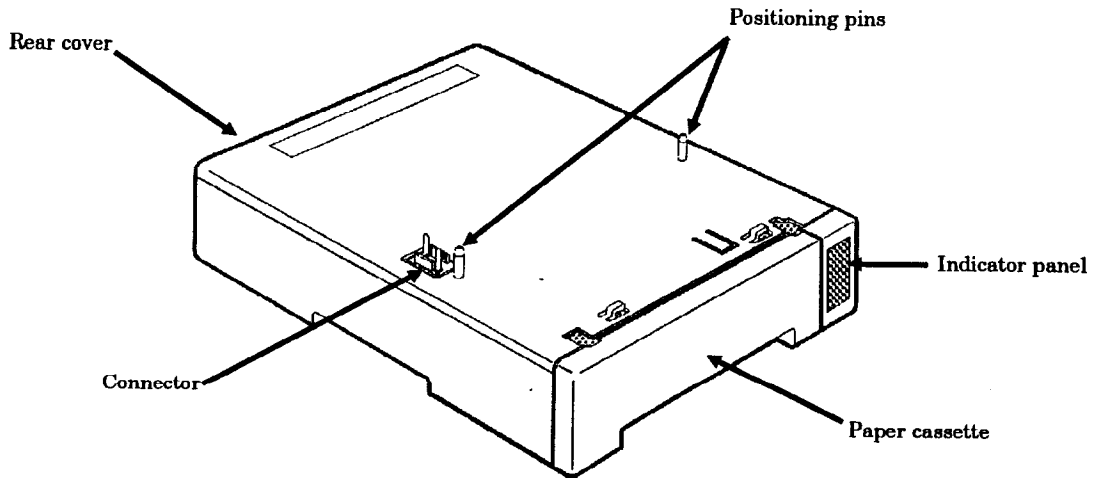
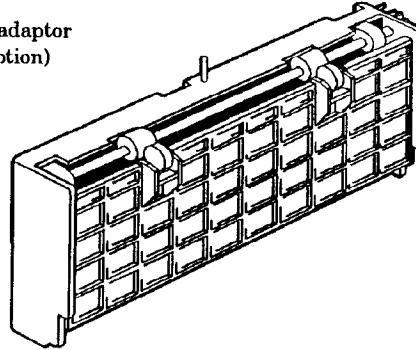
«Rear cover» When using the paper feeder together with the optional duplex unit or sorter/stacker, opens to allow clearing paper jams.

**FIG. 1.1. ENVELOPE FEEDER AND PAPER PATH ADAPTORS**

PA-1 paper path adaptor  
for FS-1500/A (Option)



PA-2 paper path adaptor  
for FS-3500/A (Option)



«Paper path adaptor» This optional unit increases the reliability of paper feed from the optional paper feeder into the printer. Type PA-1 is used for model FS-1500/A and type PA-2 is used for model FS-3500/A.

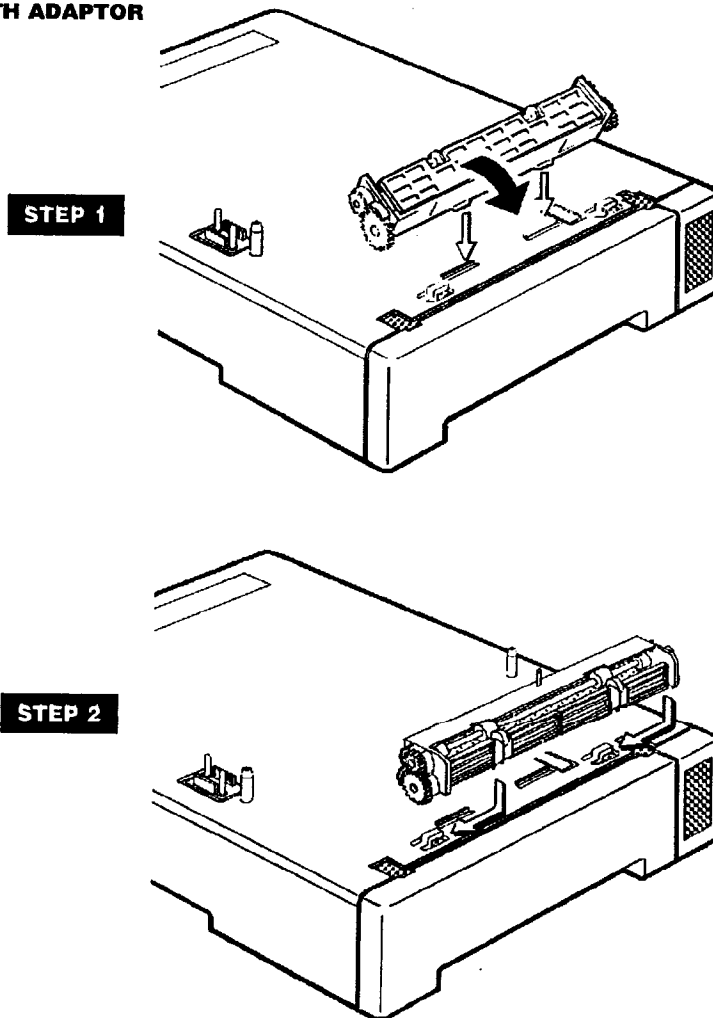
**NOTE:** The paper path adaptor is required in order to use the optional paper feeder. The paper path adaptor is an optional accessory, and is sold separately from the PF-5 optional paper feeder.

### 1.2.3. Installing the paper path adaptor

The optional paper path adaptor should be installed onto the paper feeder as shown in the following figures. The PA-1 paper path adaptor is shown as the example. Use the same manner for installing the PA-2 adaptor if the printer is an FS-3500/A.

**NOTE:** If the printer is installed with two paper feeders, the paper path adaptor is installed only on the top feeder.

**FIG. 1.2. INSTALLING THE PA-1 PAPER PATH ADAPTOR**

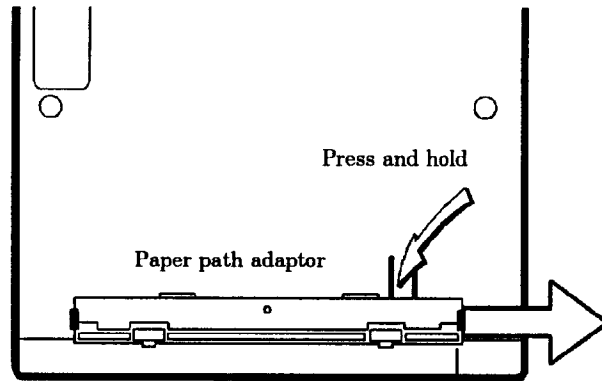




#### 1.2.4. Removing the paper path adaptor

To remove the paper path adaptor, press at the point indicated in the figure below while sliding the paper path adaptor to the right.

**FIG. 1.3. REMOVING THE PAPER PATH ADAPTOR**



## 1.3. Precautions concerning service and maintenance

Only a qualified technician should perform service on the equipment, who is familiar with fundamental safety countermeasures as dictated for all electronics technicians. Observe the following precautions during service and maintenance of the paper feeder. These are to prevent the possible personal injuries to the technician and the damage to the equipment.

### 1.3.1. Precautions

Always observe the following precautions when maintaining or inspecting the paper feeder.

- ❖ When performing any maintenance or inspection procedure, first unplug the power cord. Make sure that the printer power is turned off before replacing circuit boards or electrical components in the paper feeder.
- ❖ To prevent electrostatic discharge damage to electrical circuits, be sure to wear an antistatic band when handling the circuit boards.
- ❖ Be particularly careful when reconnecting the power after having repaired or replaced a component that has the potential for causing an electric shock.
- ❖ If the paper feeder is to be transported or stored for a lengthy period of time, the unit should be packed in its original packaging.
- ❖ If packed in their original packaging, these units can be stacked five high for up to six months. They should not be stacked sideways or upside down, however.
- ❖ Store the paper feeder in a cool, dark, dry area. Avoid storage in dusty areas.
- ❖ Ship units out on a first in, first out basis.

### 1.3.2. Replacement parts

Be sure to use only Kyocera-recommended supplies and components. Kyocera assume no liability in the event of damage resulting from the use of unauthorized components.

### 1.3.3. Notes concerning paper storage

Use of paper with a high moisture content in the paper feeder can adversely affect printing quality through the occurrence of paper jams, wrinkling, and other difficulties. Observe the following paper handling guidelines.

- ❖ Store paper in a dry place. Do not place paper directly on a damp floor.
- ❖ Do not stand paper on end for storage. Stack paper horizontally on a flat surface.
- ❖ After loading paper in the paper cassette, store any leftover paper in the original wrapping or a plastic bag.

## 1.4. Specifications

### 1.4.1. Mechanical specifications

ITEM	SPECIFICATION
Applicable printer	FS-1500/A and FS-3500/A
Number of paper cassette	One
Paper size	A5, B5, A4, Letter, Legal.
Paper capacity	500 sheets maximum, 60 to 90 g/m <sup>2</sup>
Environmental requirements	Temp: 10-32.5°C (50-90.5°F), Humidity: 20-80% (no condensation), Ideal conditions are 20°C/65% RH, Altitude under 2000 m.
Dimensions	11 H x 34.5 W x 48 D cm
Weight	5.3 kg
Power supply	Supplied from printer

### 1.4.2. Paper specifications

ITEM	SPECIFICATION
Weight	60 to 90 g/m <sup>2</sup>
Thickness	0.086 to 0.110 mm (3.4 to 4.3 mils)
Dimensional accuracy	±0.7 mm
Squareness of corners	90°±0.2°
Moisture content	4% to 6%
Direction of grain	Long grain
Pulp content	80% or more

#### NOTE: TYPES OF PAPER

With the following types of paper, paper feed performance should be tested prior to purchase even if the above specifications are fulfilled. If possible, use of these paper types should be avoided.

- ❖ Glossy paper
- ❖ Translucent paper
- ❖ Paper with a texture surface finish
- ❖ Perforated paper
- ❖ Paper with punched holes

For more detailed explanation of paper handling, see chapter 3.

# Chapter 2: Maintenance

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## 2.1. Introduction

This chapter explains the following subjects:

Section 2.2 explains with illustrations the disassembly procedures required to replace parts.  
Section 2.3 explains procedures for cleaning those parts which require periodic cleaning.  
Note that the paper feeder requires no lubrication at any part.

## 2.2. Disassembly procedures

This section provides procedures for disassembling of the paper feeder. When replacing parts for which there is no specific procedure described, refer to the exploded view shown in chapter 4. Before beginning any disassembly procedure, be sure to read the notes below:

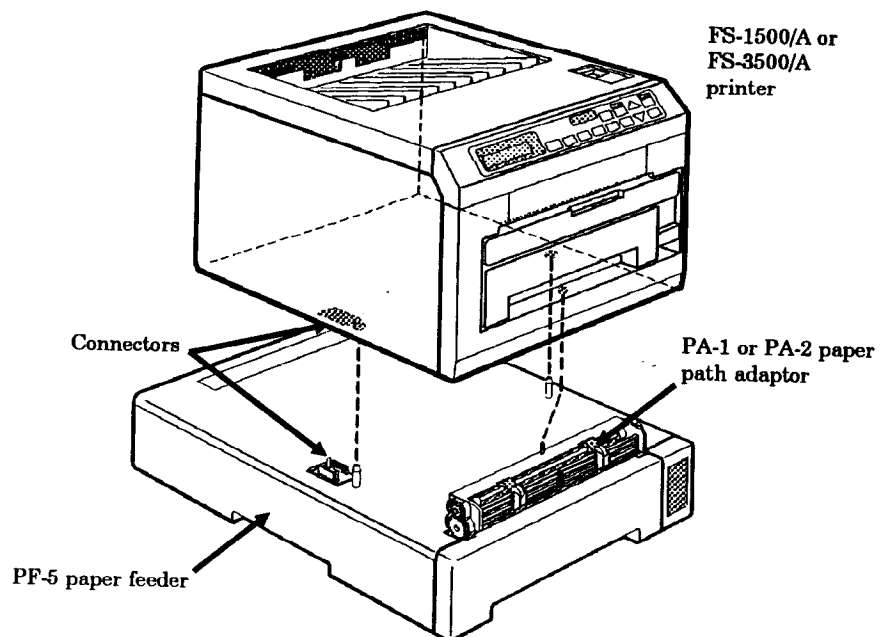
- ❖ Before removing the feeder from the printer, be sure to turn off printer power.
- ❖ Be sure to use the correct screws when installing a component. Using incorrect screws can result in the threads of the screws being stripped, which may lead in turn to other problems. Frequent insertion and removal of self-tapping screws can cause damage to screw holes. Do not tighten screws excessively.
- ❖ When removing or installing circuit boards, wear a grounded wrist strap to protect against damage due to discharge of static electricity.
- ❖ Before proceeding, make sure printer power is switched off.

### 2.2.1. Removing the paper feeder from the printer

**CAUTION:** Before removing the paper feeder, turn printer power off.

To remove the paper feeder from the printer, slowly and carefully raise the printer from the paper feeder. This also disconnects the connector on the feeder from the corresponding connector in the base of the printer.

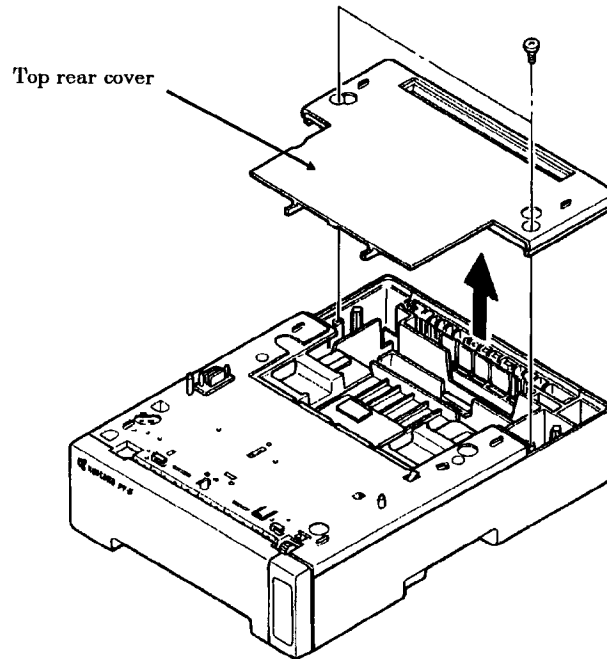
**FIG. 2.1. REMOVING THE PAPER FEEDER FROM PRINTER**



### 2.2.2. Removing the top rear cover

To disassemble the feeder, begin by removing the top rear cover. Remove two screws as shown in Figure 2.2. below.

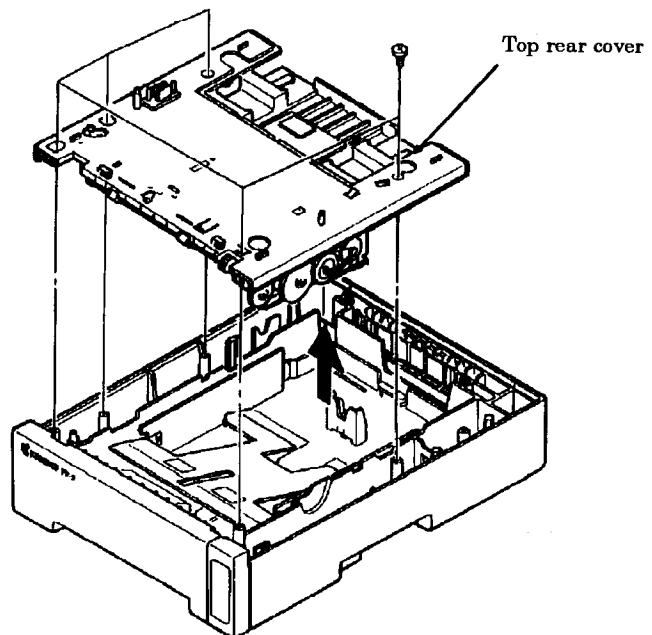
**FIG. 2.2. REMOVING THE TOP REAR COVER**



### 2.2.3. Removing the top cover assembly

To remove the top cover assembly, remove five self-tapping screws, as shown in Figure 2.3.

**FIG. 2.3. REMOVING THE TOP COVER ASSEMBLY**



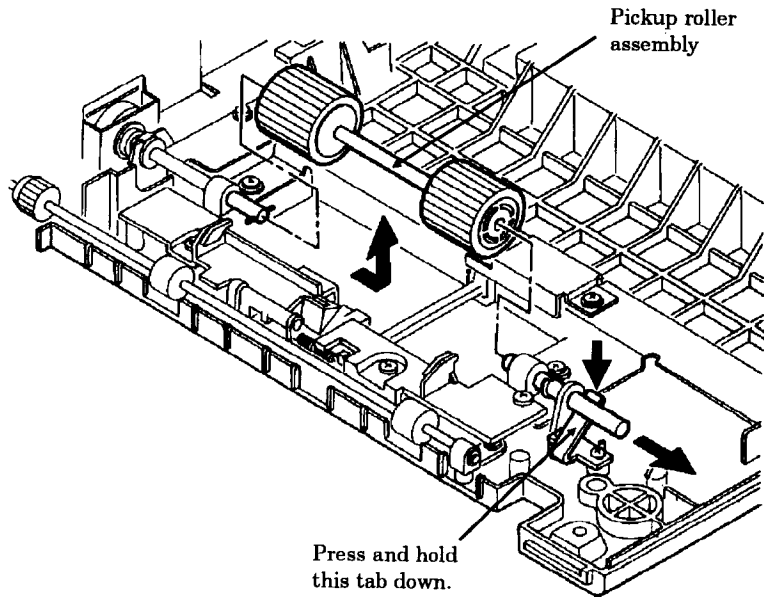


### 2.2.4. Removing the pickup roller assembly

The pickup roller assembly does not normally require periodic replacement. For cleaning purpose, however, the roller assembly can be removed in the following manner:

1. Press and hold the top of the stopper down.
2. Slide the roller shaft assembly towards the right. This frees the one end of the pickup roller assembly.
3. Remove the pickup roller assembly out as shown.

**FIG. 2.4. REMOVING PICKUP ROLLER**

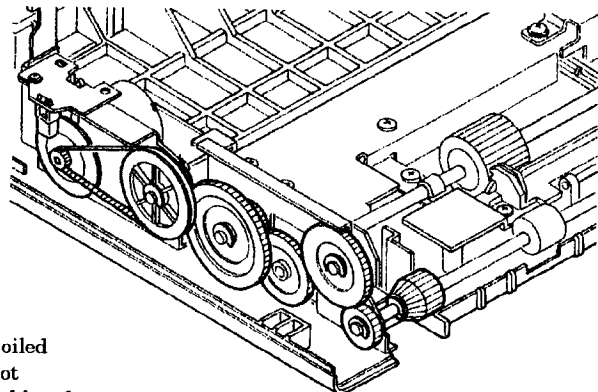


### 2.2.5. Drive gear arrangement

Figure 2.5. shows arrangement of the drive gears and belt.

**NOTE:** The gears need no periodic lubrication.

**FIG. 2.5. ARRANGEMENT OF GEARS**



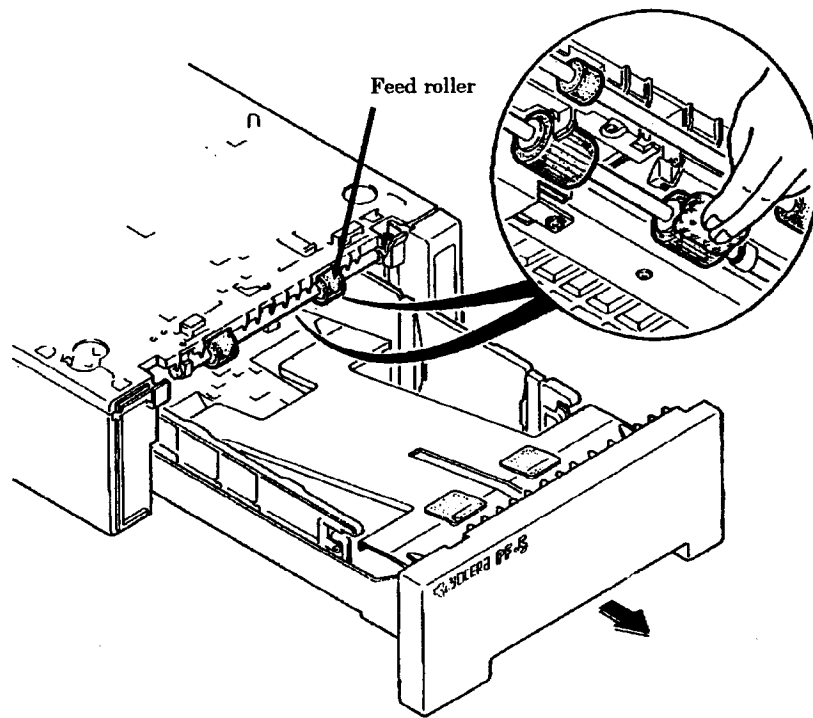
**NOTE:** Gears are oiled at the factory. Do not touch them by naked hand.

## 2.3. Cleaning procedures

After the paper feeder has been used for a certain period of time, tiny paper scraps and dust will begin to accumulate on the feed roller. Because these scraps and dust will hamper paper feeding, periodic cleaning is necessary using the procedure explained below.

Clean the feed roller with a cloth moistened with alcohol.

**FIG. 2.6. CLEANING THE FEED ROLLER**



# Chapter 3: Paper specifications

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## 3.1. General guidelines

The paper feeder may not be used to print on paper not satisfying the requirements below. Also, special types of print media such as overhead projection (OHP) film, envelopes, adhesive-backed labels, and paper containing watermarks must not be used with the feeder. These types can result in jams, misfeeds, and paper waste, and in extreme cases can damage the paper feeder.

**NOTE:** The manufacturer assumes no liability for problems that occur when paper not satisfying these requirements is used with the paper feeder.

Selection of the right paper is important. The wrong paper can result in jams, misfeeds, curl, poor print quality, and paper waste, and in extreme cases can damage the paper feeder and the printer. The guidelines given below will increase the productivity of your office by ensuring efficient, trouble-free printing and reducing wear and tear on the printer and paper feeder.

### 3.1.1. Paper availability

Most types of paper are compatible with a variety of machines. Paper intended for xerographic copiers can also be used with the paper feeder and the printer.

There are three general grades of paper: economy, standard, and premium. The most significant difference between grades is the ease with which they pass through the printer. This is affected by the smoothness, size, and moisture content of the paper, and the way in which the paper is cut. The higher the grade of paper you use, the less risk there will be of paper jam and other problems, and the higher the level of quality your printed output will reflect.

Differences between paper from different suppliers can also affect the feeder's performance. A high-quality printer cannot produce high-quality results when the wrong paper is used. Low-priced paper is not economical in the long run if it causes printing problems.

Paper in each grade is available in a range of basis weights (defined later). The traditional standard weights are 16, 20, and 24 pounds (60 g/m<sup>2</sup> to 90 g/m<sup>2</sup>).

## 3.2. Paper Specifications

The following table summarizes the basic paper specifications. Details are given on the following table.

**TABLE 3.1. SPECIFICATIONS FOR WHITE BOND PAPER**

ITEM	SPECIFICATION
Weight	60 to 90 g/m <sup>2</sup> (16 to 24 lbs/ream)
Thickness	0.086 to 0.110 mm (3.4 to 4.3 mils)
Dimensional accuracy	±0.7 mm (±0.0276 inches)
Squareness of corners	90° ± 0.2°
Moisture content	4% to 6%
Direction of grain	Long grain
Pulp content	80% or more

### 3.2.1. Selecting the right paper

Printer printing is a process involving LED light, electrostatic discharge, toner, and heat. In addition, as the paper passes through the printer it undergoes considerable sliding, bending, and twisting motions. A high-quality printing paper matching the requirements withstands all these stresses, enabling the paper feeder and the printer to turn out clean, crisp printed copy consistently.

Remember that all paper is *not* the same. Some of the factors to consider when selecting paper for using with the feeder are as follows:

### 3.2.2. Condition of the paper

Avoid using paper that is bent at the edges, curled, dirty, torn, or contaminated with lint, clay, or paper shreds.

Use of paper in these conditions can lead to illegible printing, misfeeding, and paper jams, and can shorten the life of the paper feeder and the printer. In particular, avoid using paper with a surface coating or other surface treatment. The paper should have as smooth and even a surface as possible.

### 3.2.3. Composition

Do not use paper that has been coated or surface-treated and contains plastic or carbon. The heat of fusing can cause such paper to give off harmful fumes.

Bond paper should contain at least 80% pulp. Not more than 20% of the total paper content should consist of cotton or other fibers.

### 3.2.4. Paper size

Printer's cassettes are available for the paper sizes listed in Table 3.2. The dimensional tolerances are  $\pm 0.7$  mm ( $\pm 0.0276$  inches) for the length and width. The angle at the corners must be  $90^\circ \pm 0.2^\circ$ .

**TABLE 3.2. PRINTER'S CASSETTE SIZES**

PRINTER'S CASSETTE	SIZE
Legal	8.5 × 14 in
Letter	8.5 × 11 in
ISO A4	210 × 297 mm
JIS B5	182 × 257 mm
JIS A5	148 × 210 mm

### 3.2.5. Smoothness

The paper should have a smooth, uncoated surface. Paper with a rough or sandy surface can cause voids in the printed output. Paper that is too smooth, however, can cause multiple feeding and fogging problems. (Fogging is a gray background effect.)

### 3.2.6. Basis weight

Basis weight is the weight of a standard quantity of paper. In the traditional system the standard quantity is a ream consisting of 500 sheets measuring 17 × 22 inches each. In the metric system the standard quantity is 1 square meter.

Paper that is too light or too heavy can cause misfeeding, jams, and premature wear of the paper feeder and the printer. Uneven paper weight can cause multiple feeds, print defects, poor toner fusing, blurring, and other print quality problems. The proper weight is 60 to 90  $\text{g/m}^2$  (16 to 24 lbs/ream).

### 3.2.7. Thickness (Caliper)

Thick paper is referred to as high-caliper paper and thin paper as low-caliper paper. The paper used with the printer feeding from the paper feeder mode should be neither extremely thick nor extremely thin. If you are having problems with paper jams, multiple feeds, and faint printing, the paper may be too thin. If you are having problems with paper jams, and blurred printing the paper may be too thick. The proper thickness is 0.086 to 0.110 mm (3.4 to 4.3 mils).

### 3.2.8. Moisture content

Moisture content is defined as the percent ratio of moisture to the dry mass of the paper. Moisture can affect the paper's appearance, feedability, curl, electrostatic properties, and toner fusing characteristics.

The moisture content of the paper varies with the relative humidity in the room. When the relative humidity is high and the paper absorbs moisture, the paper edges expand, becoming wavy in appearance. When the relative humidity is low and paper loses moisture, the edges shrink and tighten, and print contrast may suffer.

Wavy or tight edges can cause misfeeding and alignment anomalies. The moisture content of the paper should be 4% to 6%.

To ensure the proper moisture content it is important to store the paper in a controlled environment. Some tips on moisture control are:

- ❖ Store paper in a cool, dry location.
- ❖ Keep the paper in its wrapping as long as possible. Rewrap paper that is not in use.
- ❖ Store paper in its original carton. Place a pallet etc. under the carton to separate it from the floor.
- ❖ After removing paper from storage, let it stand in the same room as the printer for 48 hours before use.
- ❖ Avoid leaving paper where it is exposed to heat, sunlight, or damp.

### 3.2.9. Paper grain

When paper is manufactured, it is cut into sheets with the grain running parallel to the length (long grain) or parallel to the width (short grain). Short grain paper can cause feeding problems in the paper feeder and the printer. All paper used in the paper feeder and the printer should be long grain.



### 3.2.10. Other paper properties

**Porosity:** Refers to the density of the paper structure; that is, to how openly or compactly the fibers are bonded.

**Stiffness:** Limp paper can buckle inside the paper feeder and the printer, while paper that is too stiff may bind. Either way the result is a paper jam.

**Curly:** Most paper has a natural tendency to curl in one direction. The paper should be loaded so that the natural curl is downward, to counteract the upward curl imparted by the printer. Printed sheets will then come out flat. Most paper also has a top and bottom surface. Loading instructions are usually given on the paper package.

**Electrostatic properties:** During the printing process the paper is electrostatically charged to attract the toner. The paper must be able to release this charge so that printed sheets do not cling together in the output tray.

**Whiteness:** The contrast of the printed page depends on the whiteness of the paper. Whiter paper provides a sharper, brighter appearance.

**Quality control:** Uneven sheet size, corners that are not square, ragged edges, welded (uncut) sheets, and crushed edges and corners can cause the paper feeder and the printer to malfunction in various ways. A quality paper supplier should take considerable care to ensure that these problems do not occur.

**Packaging:** Paper should be packed in a sturdy carton to protect it from damage during transport. Quality paper obtained from a reputable supplier is usually properly packaged.

### 3.2.11. Special paper

The type of special paper that can be used with the paper feeder is colored paper only. Use colored paper that is sold specifically for use with copiers (heat-fusing type).

Since the composition and quality of special paper vary considerably, special paper is more likely than white bond paper to give trouble during printing. No liability will be assumed if moisture etc. given off in printing on special paper causes harm to the machine or operator.

**NOTE:** Before purchasing special paper, test a sample on the paper feeder and the printer and check that printing quality is satisfactory.

Colored paper should satisfy the same conditions as white bond paper, listed in Table 1. In addition, the pigments used in the paper must be able to withstand the heat of fusing during the printing process (up to 200°C or 392°F).

Do not use paper with any kind of surface treatment, such as the type of paper commonly used for calendars.

# Chapter 5: Hardware notes

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## 5.1. Introduction

This chapter describes the operation of the electrical circuits in the paper feeder. Overall printing timing charts including all the relevant printer commands are provided at the end of this chapter. Schametic diagram is provided in Appendix A.

The electrical system of the paper feeder serves the following three functions:

- ❖ Communication with the printer, using the clock-synchronous serial interface
- ❖ Motor drive
- ❖ Display control

Details on each of these functions are explained in the following pages.

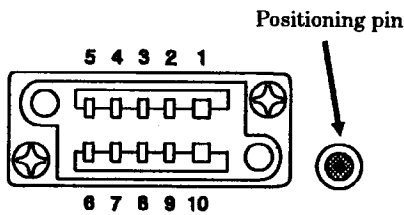
## 5.2. Feeder interface

Section 5.2. explains the operating theory of the feeder interface, using diagrams.

### 5.2.1. Connector configuration

The feeder and the printer exchange signals between them through connector CN100 which is provided on top of the feeder. The other end of the connector appears on the bottom of the feeder as CN101 and exchanges the same signals with other option units that are also installed with the printer, such as another paper feeder, sorter, etc. The names and functions of these signals are tabled below.

**FIG. 5.1. FEEDER CONNECTOR AND PIN ASSIGNMENT**



Feeder's left side

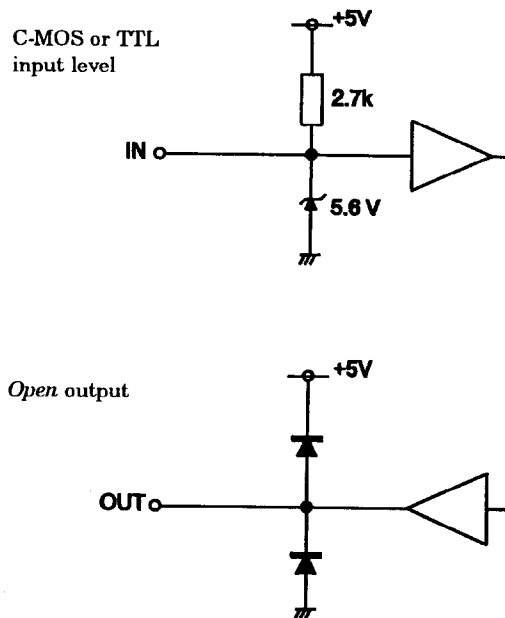
PIN	SIGNAL	DESCRIPTION
1	+24V	+24V power
2	SCKD	Serial clock
3	+5V	+5V power
4	READY	Hand shake signal
5	SEL0	Select bit 0
6	SEL1	Select bit 1
7	SEL2	Select bit 2
8	SID	Feeder output data
9	SOD	Feeder input data
10	GND	Ground

Signals SEL0, SEL1, and SEL2 are used to select and deselect the first (upper) or second (lower) paper feeder as the paper source, if the second feeder is installed. Following combinations are used for paper source selection.

FEEDER	LEVEL		
	SEL0	SEL1	SEL2
First (Upper)	0	1	0
Second (Lower)	0	1	1

Signal levels are of C-MOS level. Pulled-up for inputs and open-circuit configuration for outputs. See Figure 5.2., next page.

**FIG. 5.2. INPUT/OUTPUT CONFIGURATIONS OF INTERFACE**



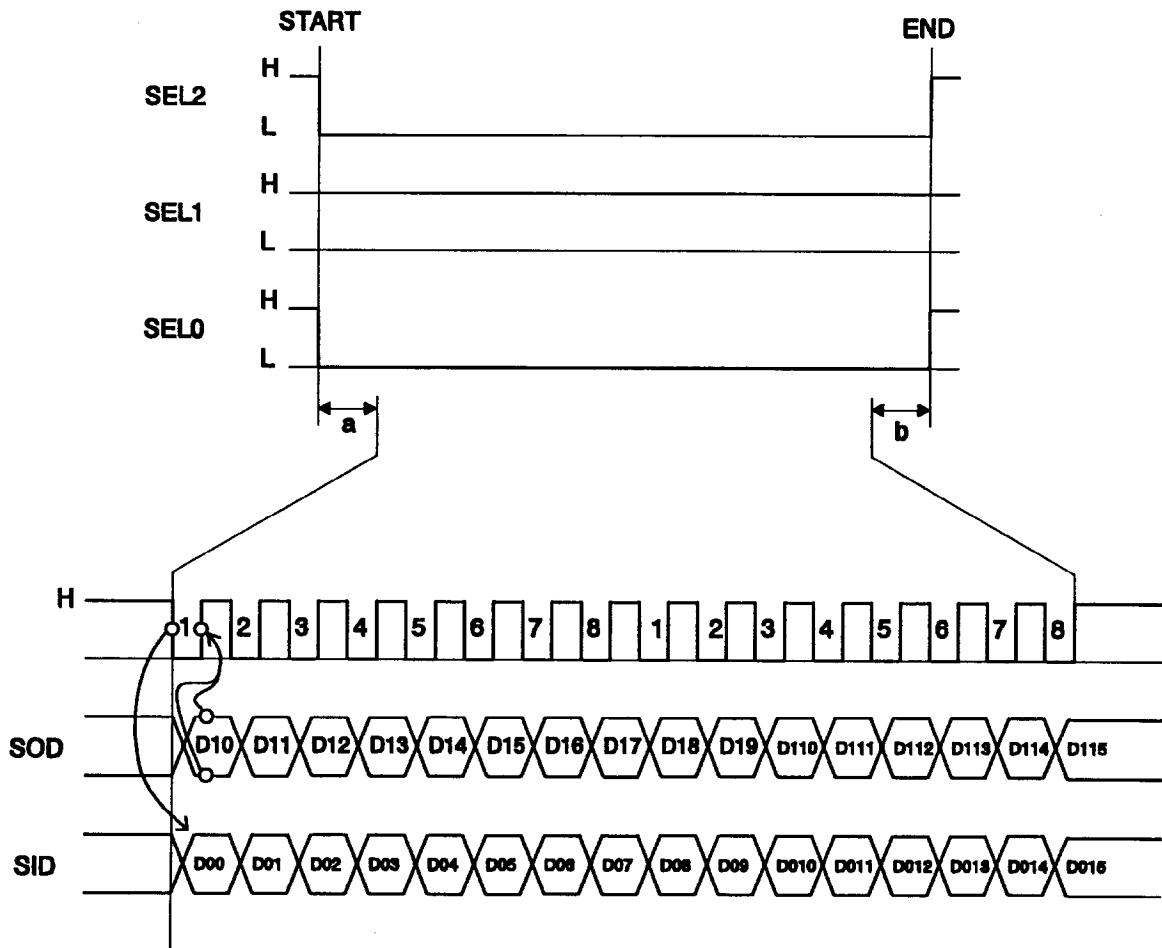
The I/O expander IC3, M66008FP, entertains these signals for converting them into parallel formatted signals. The converted signals then arrive at the input of the I/O expander, M6608FP. Details on interface theory are explained in the following section.

### 5.2.2. Interface theory of operation

The feeder's interface operates on the clock-synchronous serial interface method. The maximum synchronizing clock frequency is 200 kHz. The computer sends the feeder 8 bits at a time. Since the I/O expander is compatible with data transfer of 16 bits, it renders an 8-bit transfer twice for 16-bit data. The input port data signal  $\overline{SID}$  is given in synchronization with a fall of the  $\overline{SCKD}$  signal; while the I/O expansion output  $\overline{SOD}$  is sampled at a rise of  $\overline{SCKD}$ .

Figure 5.3. on the next page diagrams the behavior of these signals. In this diagram, DI0 through DI15 represent the data that arrive at the paper feeder; DO0 through DO15 represent the data the printer sends to the paper feeder. Interval *a* in the diagram is provided for the clock output delay which is within 1 microsecond through 1 millisecond. Interval *b* is the select release delay of 1 millisecond long (maximum).

**FIG. 5.3. SERIAL INTERFACE SIGNAL TIMINGS (TOP FEEDER)**



### 5.2.3. Interface controller pin assignment

Table 5.1. below shows the pin assignment of the interface controller IC, M66008FP (IC3). Data inputs and outputs are made on the parallel interface principle.

BIT	SIGNAL	DESCRIPTION	LOGICAL L MEANS ...	IC3	
				PIN	PORT ID
0	$\overline{\text{CONN}}$	Detection of feeder installation	Feeder detected	24	D1
1	PSIZ0	Bit 0 for paper sizing (See Note below.)		23	D2
2	PSIZ1	Bit 1 for paper sizing (See Note below.)		22	D3
3	PSIZ2	Bit 2 for paper sizing (See Note below.)		21	D4
4	$\overline{\text{PEMP}}$	Detection of paper presence	No paper detected	20	D5

BIT	SIGNAL	DESCRIPTION	LOGICAL L MEANS ...	IC3	
				PIN	PORT ID
5	—	Not used	—	19	D6
6	$\overline{\text{RCOPN}}$	Detection of the rear cover status	Cover is open.	18	D7
7	$\overline{\text{FAIL}}$	All outputs off	SOD line is shortcircuited.	17	D8
8	$\overline{\text{RDYLED}}$	READY indicator activation	Lit	16	D9
9	$\overline{\text{LOCON}}$	Printer's (or upper feeder's) cassette locking	Locked	15	D10
10	$\overline{\text{LOCOFF}}$	Printer's (or upper feeder's) cassette release	Released	14	D11
11	$\overline{\text{MON}}$	Feed motor activation	Activated (run)	13	D12
12	$\overline{\text{MSL}}$	Speed switching of feed motor	Slow	11	D13
13	$\overline{\text{CLON}}$	Feed roller clutch activation	Activated (feeding)	10	D14
14	$\overline{\text{LOCLED}}$	LOCK indicator activation	Lit	9	D15
15	$\overline{\text{HVER}}$	Host printer accommodation	FS-3500/A	8	D16

Bit combinations for selecting different paper sizes are shown in section 5.4.1.



## 5.3. Motor driver system

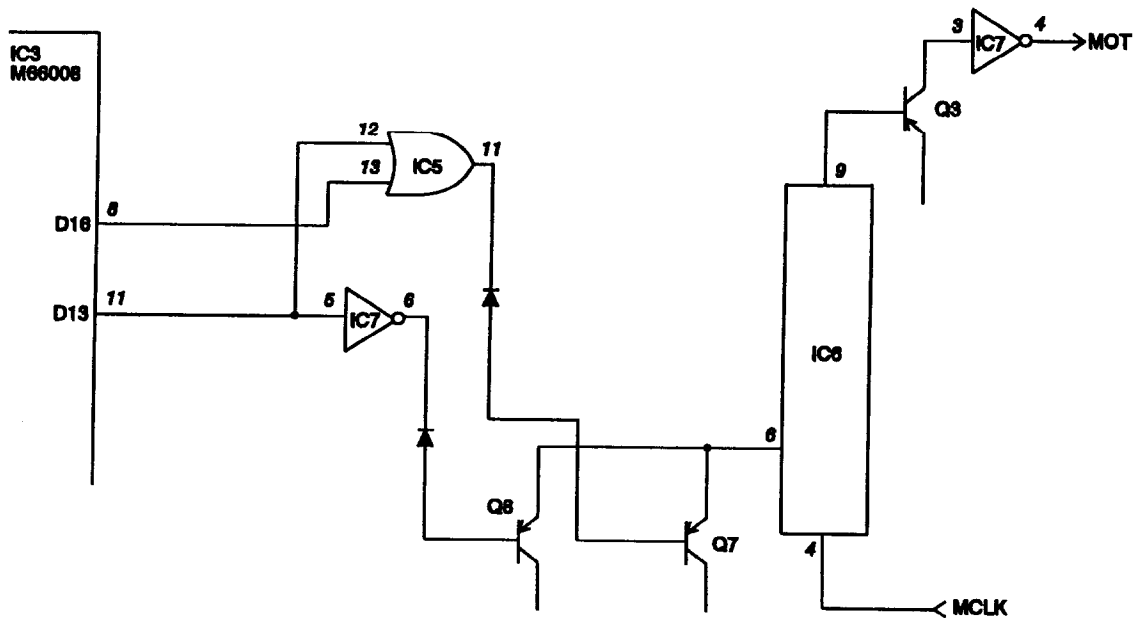
This section explains the operation of the feed motor controller and other clutches, solenoids, etc.

### 5.3.1. Feed motor controller

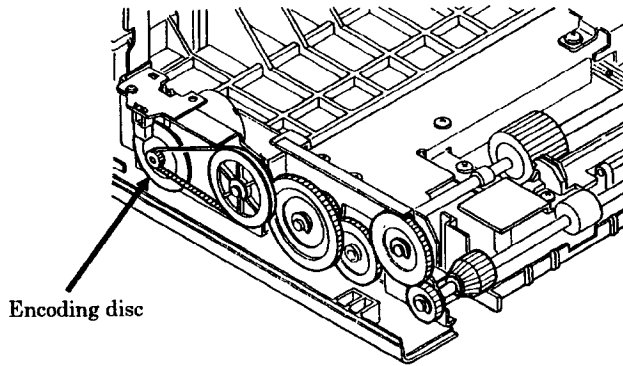
The feeder's motor is switched in three speeds to accommodate different printer models with different printing speeds—10 ppm or 18 ppm. See the simplified schematic diagram in Figure 5.4. below. Signals for driving the feed motor generated within the I/O expander IC3 appear at its ports D13 and D16 and arrive at the motor controller IC6, M5197IFP. The encoding disc which is mounted at the axis of the feed motor revolves and generates the reference MCLK signal. (The encoding disc is shown in Figure 5.5. on next page.) The motor controller IC6 utilizes this encoder output and the CPU output and maintains stability in the motor revolution. The CPU output has the following logic for controlling IC6.

CPU (IC3) PORT	H LEVEL	L LEVEL
D13	Normal printing speed	Quick feeding speed
D16	10-ppm printer	18-ppm printer

FIG. 5.4. MOTOR CONTROLLER CIRCUIT



**FIG. 5.6. ENCODING DISC FOR FEED MOTOR CONTROL**

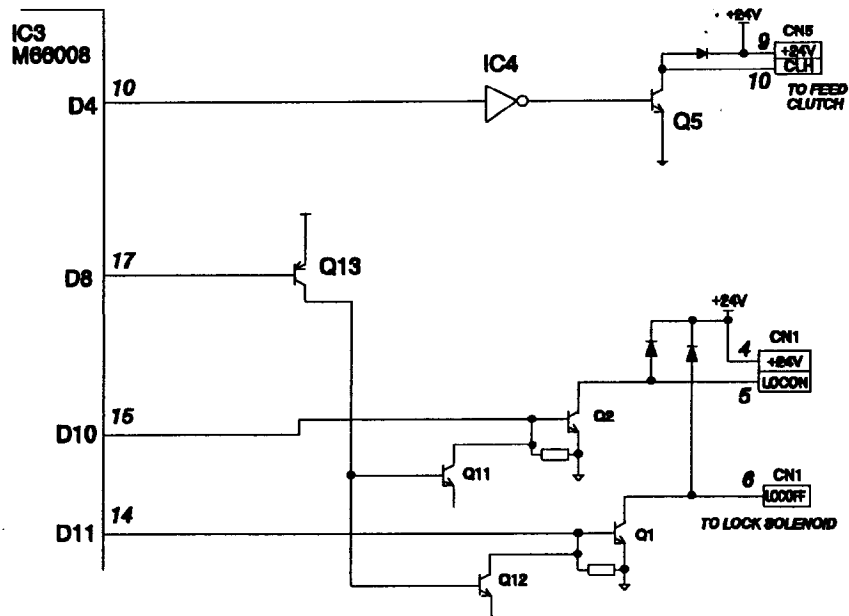


### 5.3.2. Clutch/solenoid controller

The paper feeder has provided with a clutch for paper feeding and a solenoid for locking the printer's paper cassette. (Locking of the printer's cassette is necessary as paper is fed from the paper feeder passing through the slot in the paper cassette.) These mechanisms are driven by Q5 (for the feed clutch), Q2, and Q1 (both for the cassette locking solenoid). The I/O expander IC 3 sends a low level signal from ports D14 (for the feed clutch), D11 and D10 (both for the locking solenoid) to activates the mechanisms, respectively.

Figure 5.4. below is a simplified schematic diagram for the clutch/solenoid driver.

**FIG. 5.5. CLUTCH/SOLENOID DRIVER CIRCUIT**



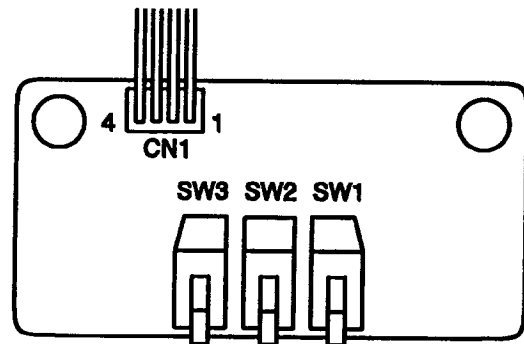
## 5.4. Indicator controller

The paper feeder has indicators for paper size, READY, and LOCK indication.

### 5.4.1. Paper size indicators

Three switches are provided at the rear inner side in the paper feeder (Figure 5.7. below). Depending on the arrangement of the paper size adjuster in the paper cassette (PC-8), these switches are pressed in one of the combinations as tabled below. The switching information is then sent to the I/O expander IC3 (M66008) which in turn instructs the printer to accordingly set up the paper size.

**FIG. 5.7. PAPER SIZE SWITCHES IN THE FEEDER**



Combinations of bit values and levels at CN1 terminals (in brackets) are tabled below.

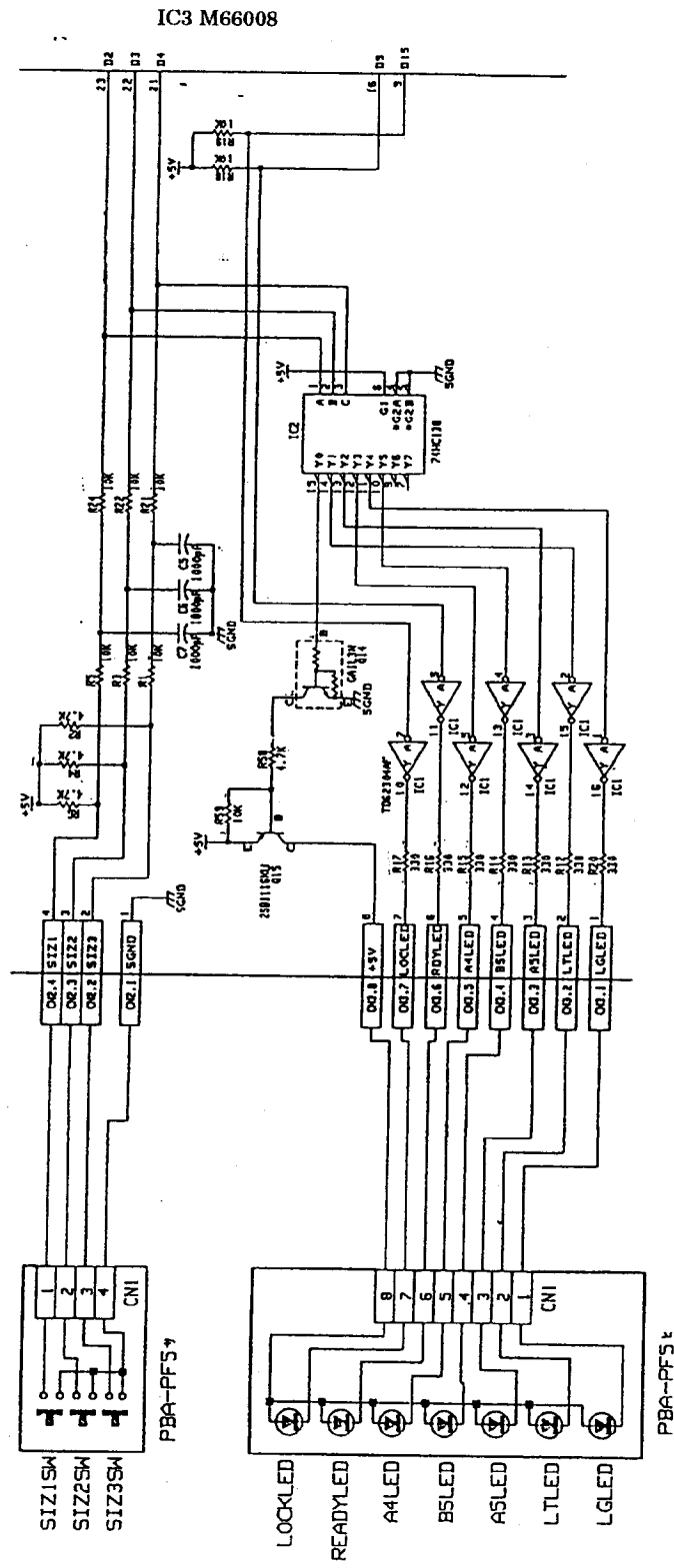
BIT (CN1 PIN)			PAPER SIZE
3 (4)	2 (3)	1 (2)	
0 (L)	0 (L)	0 (L)	—
0 (L)	0 (L)	1 (H)	Letter
0 (L)	1 (H)	0 (L)	A5
0 (L)	1 (H)	1 (H)	A4
1 (H)	0 (L)	0 (L)	Legal
1 (H)	0 (L)	1 (H)	B5
1 (H)	1 (H)	0 (L)	—
1 (H)	1 (H)	1 (H)	No cassette

### 5.4.2. Indicators encoder/driver

Paper size information is decoded by IC2, 74HC138, driven by transistor array IC1, and lights the corresponding LED indicators on the feeder's front panel. IC2 and IC1 also drives the READY and LOCK indicators.

Figure 5.8. on next page is a simplified diagram for paper sizing and indicators.

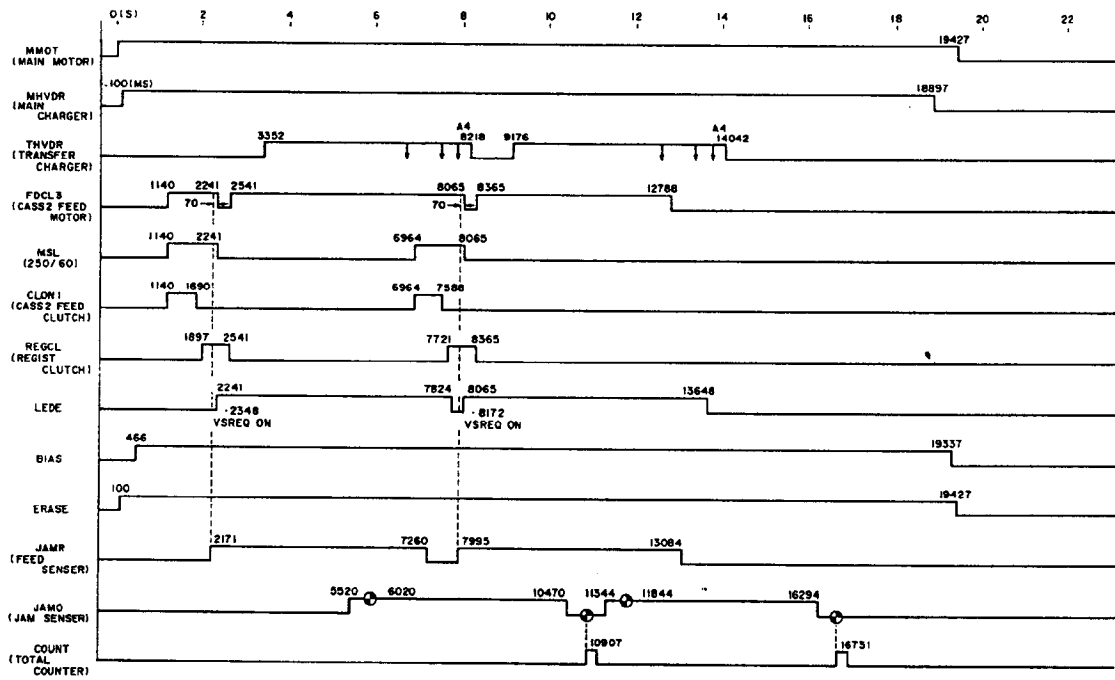
FIG. 5.8. PAPER SIZE SENSORS AND INDICATORS



# 5.5. Printing timing charts

**FS-1500/A: FIRST PF-5 FEEDER, A5/B5/A4/LETTER**

Drum speed=60.0005 mm/sec  
 Paper feeding (FDCL3)=250 mm/sec  
 Interrupt=2.4666 msec/pulse  
 Printing speed=10.3 ppm

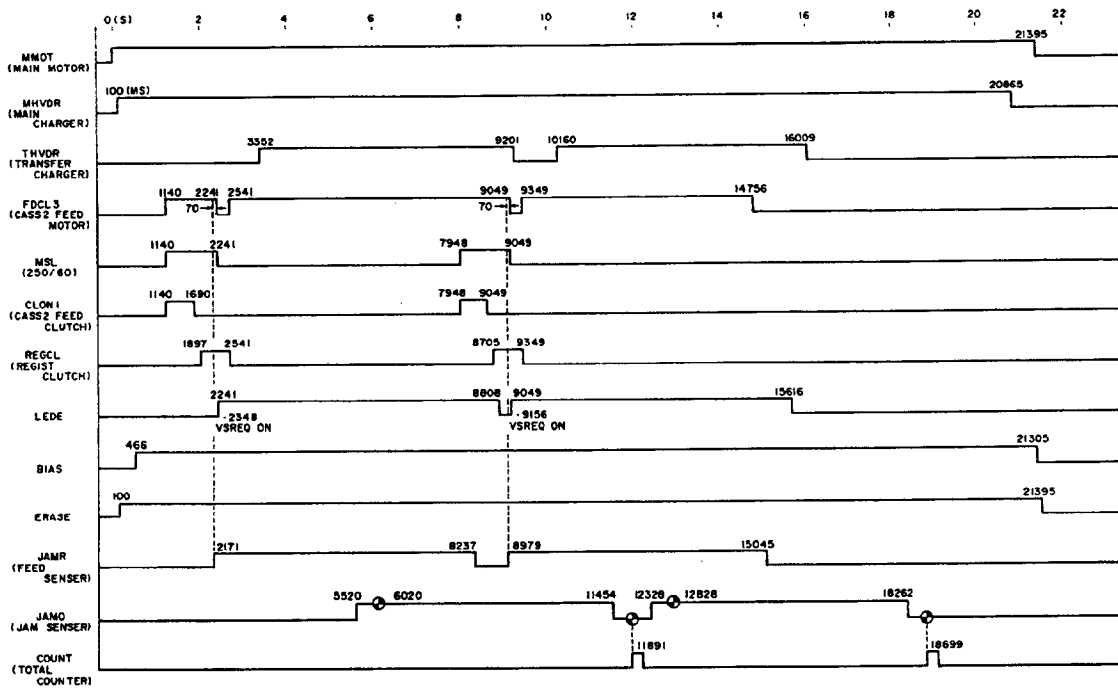


**THVDR OFF TIMING**

A5 ----- 6768 (12592)  
 B5 ----- 7551 (13375)  
 LETTER ---- 7918 (13742)

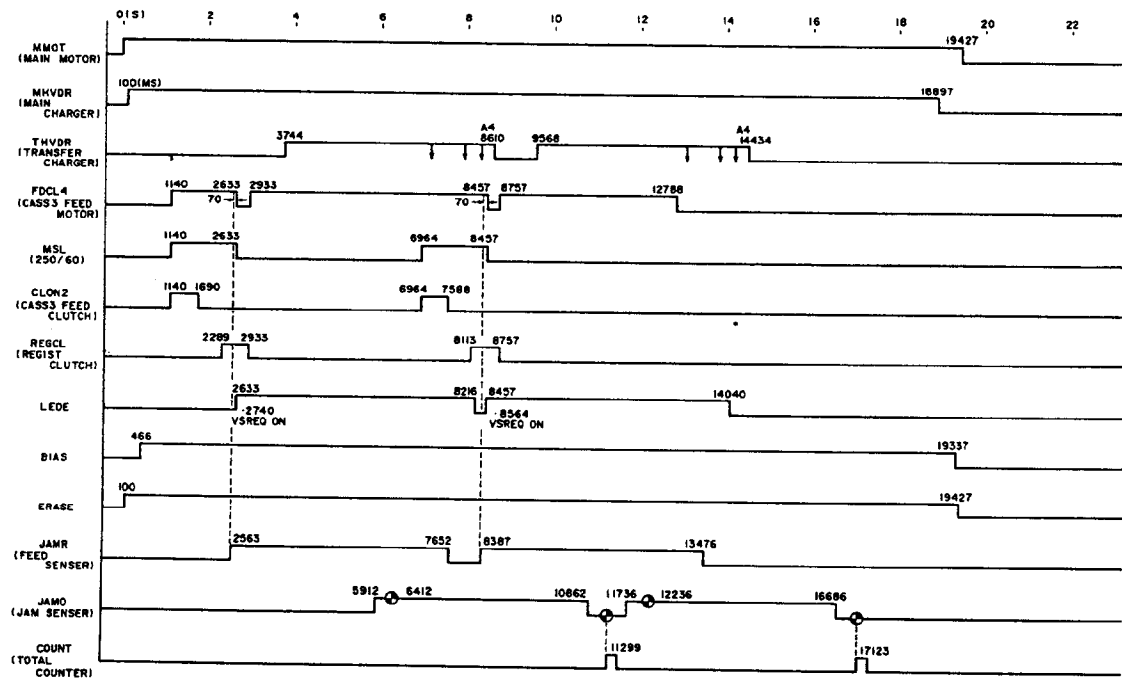
**FS-1500/A: FIRST PF-5 FEEDER, LEGAL**

Drum speed=60.0005 mm/sec  
 Paper feeding (FDCL3)=250 mm/sec  
 Interrupt=2.4666 msec/pulse  
 Printing speed=8.8 ppm



**FS-1500/A: SECOND PF-5 FEEDER, A5/B5/A4/LETTER**

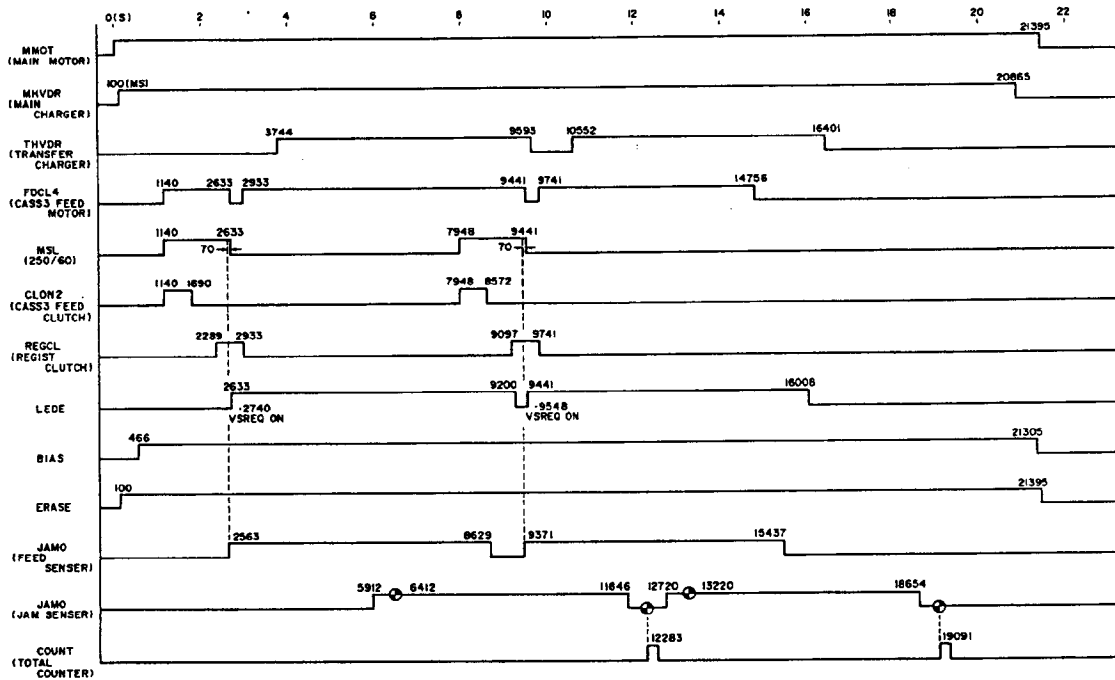
Drum speed=60.0005 mm/sec  
 Paper feeding (FDCL4)=250 mm/sec  
 Interrupt=2.4666 msec/pulse  
 Printing speed=10.3 ppm



THVDR OFF TIMING  
 A5 ----- 7160 (12984)  
 B5 ----- 7943 (13767)  
 LETTER ---- 8310 (14134)

**FS-1500/A: SECOND PF-5 FEEDER, LEGAL**

Drum speed=60.0005 mm/sec  
 Paper feeding (FDCLA)=250 mm/sec  
 Interrupt=2.4666 msec/pulse  
 Printing speed=8.8 ppm

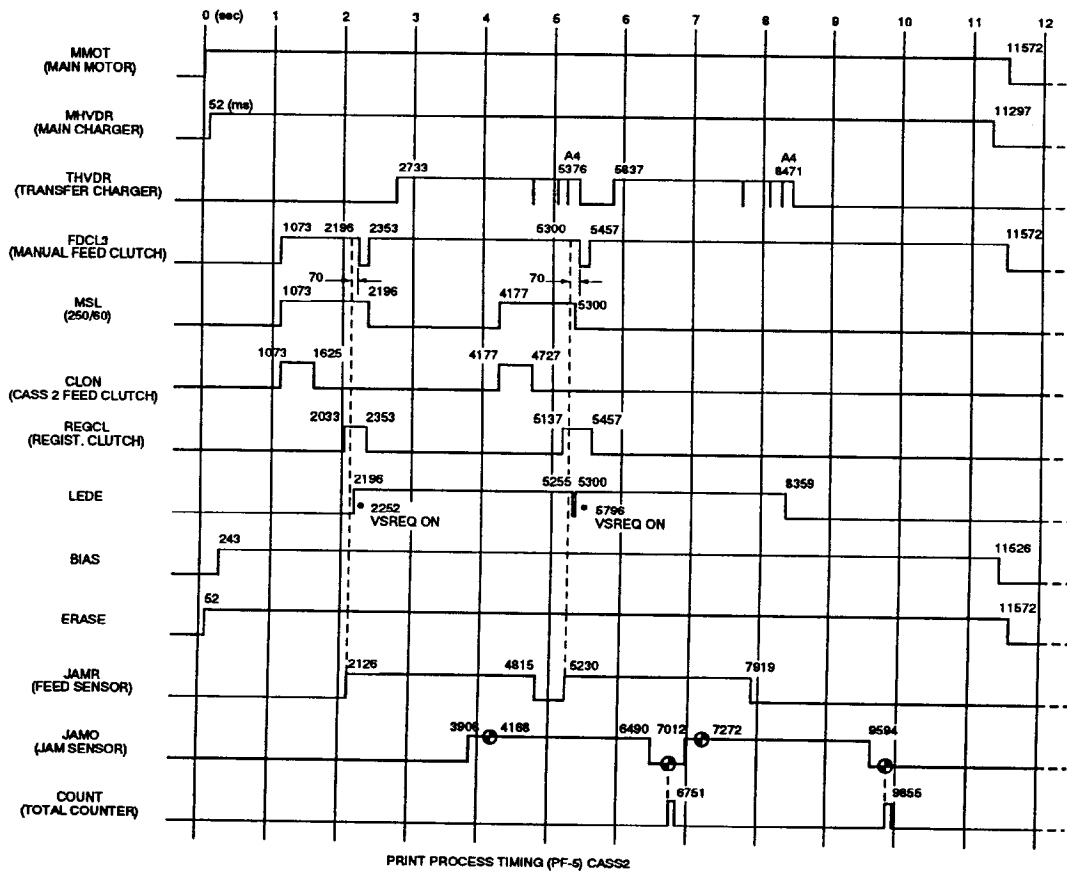


W93



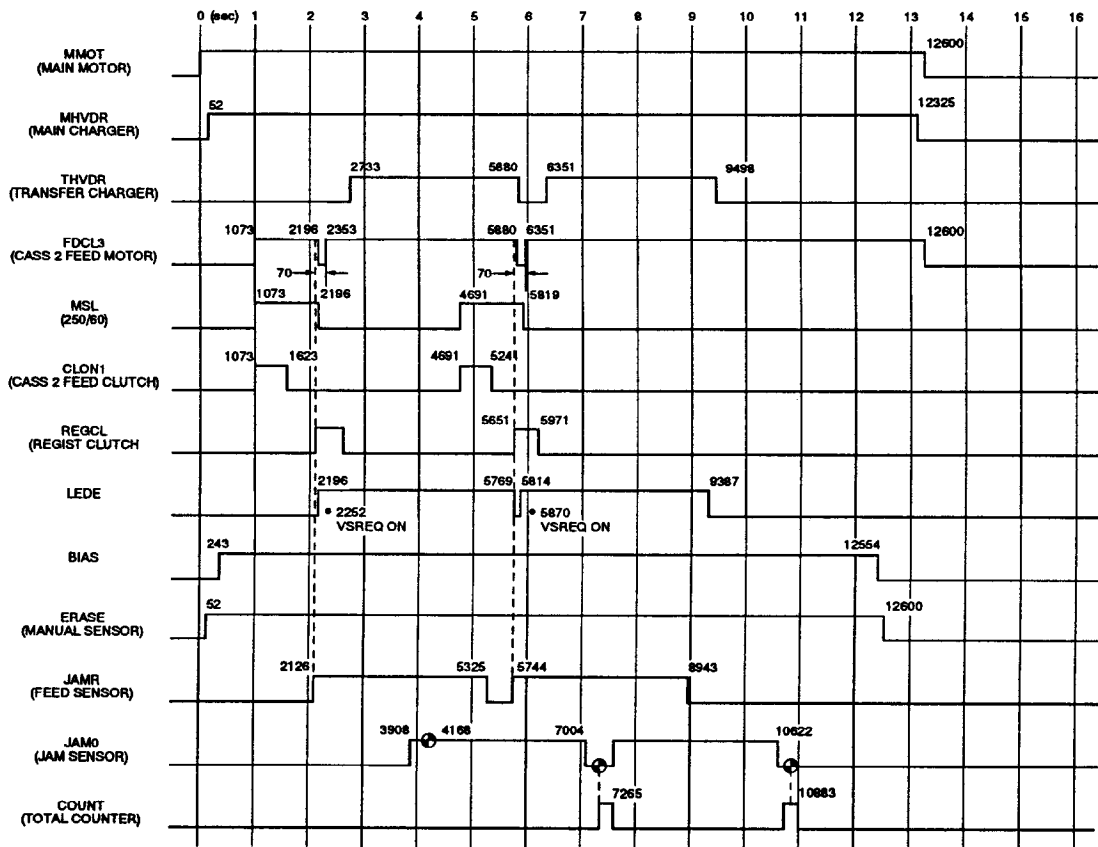
**FS-3500/A: FIRST PF-5 FEEDER, A5/B5/A4/LETTER**

Drum speed=115 mm/sec  
 Paper feeding (FDCL3)=250 mm/sec  
 Interrupt=1.5686 msec/pulse  
 Printing speed=19.3 ppm



**FS-3500/A: FIRST PF-5 FEEDER, LEGAL**

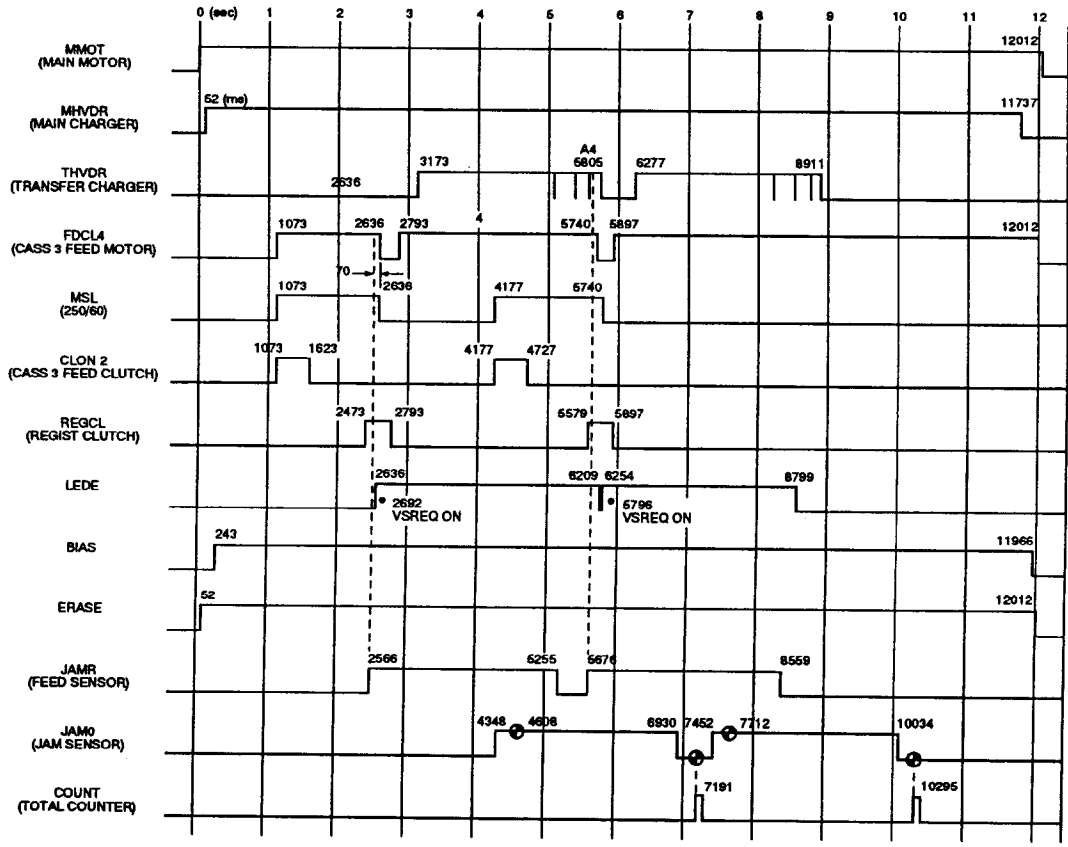
Drum speed=115 mm/sec  
 Paper feeding (FDCL3)=250 mm/sec  
 Interrupt=1.5686 msec/pulse  
 Printing speed=16.5 ppm



PRINT PROCESS TIMING (PF-5) CASS2

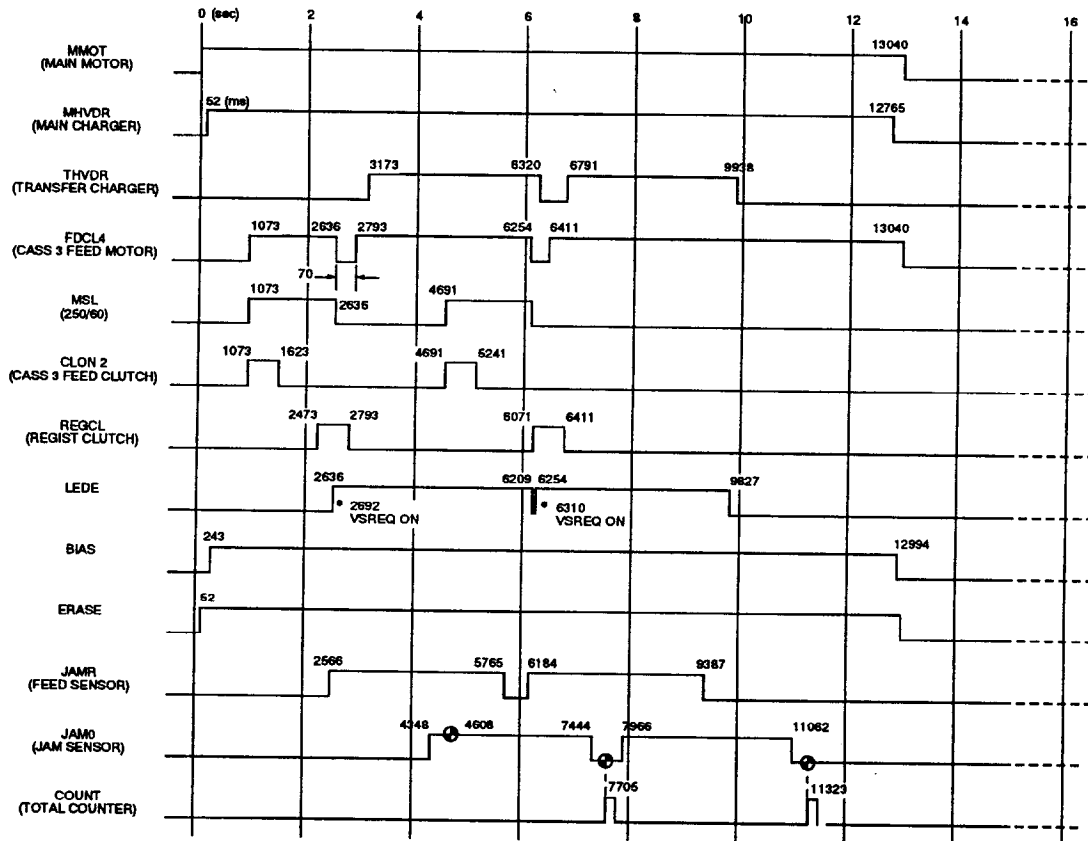
**FS-3500/A: SECOND PF-5 FEEDER, A5/B5/A4/LETTER**

Drum speed=115 mm/sec  
 Paper feeding (FDCL4)=250 mm/sec  
 Interrupt=1.5686 msec/pulse  
 Printing speed=19.3 ppm



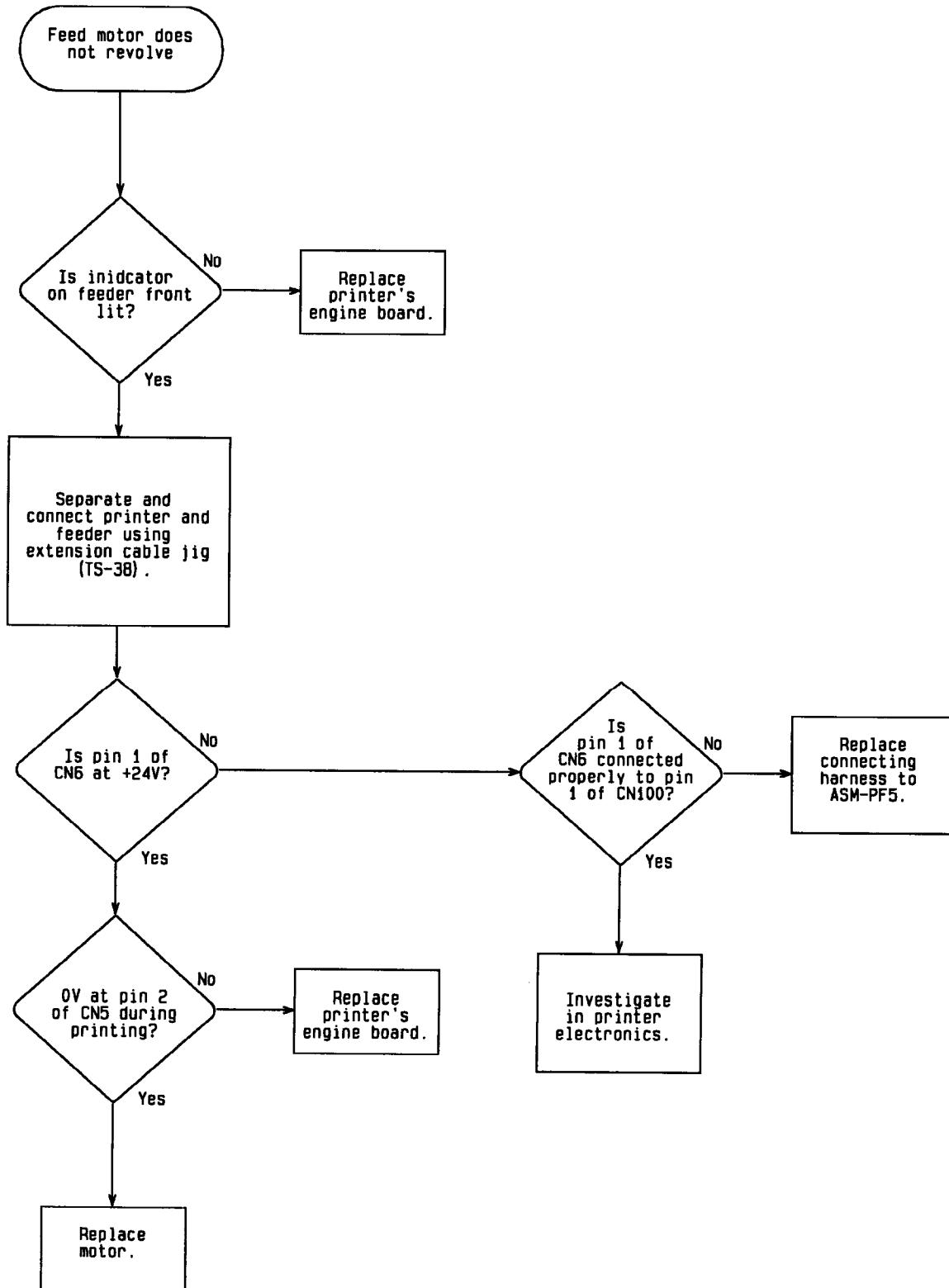
**FS-3500/A: SECOND PF-5 FEEDER, LEGAL**

Drum speed=115 mm/sec  
 Paper feeding (FDCL4)=250 mm/sec  
 Interrupt=1.5686 msec/pulse  
 Printing speed=16.5 ppm



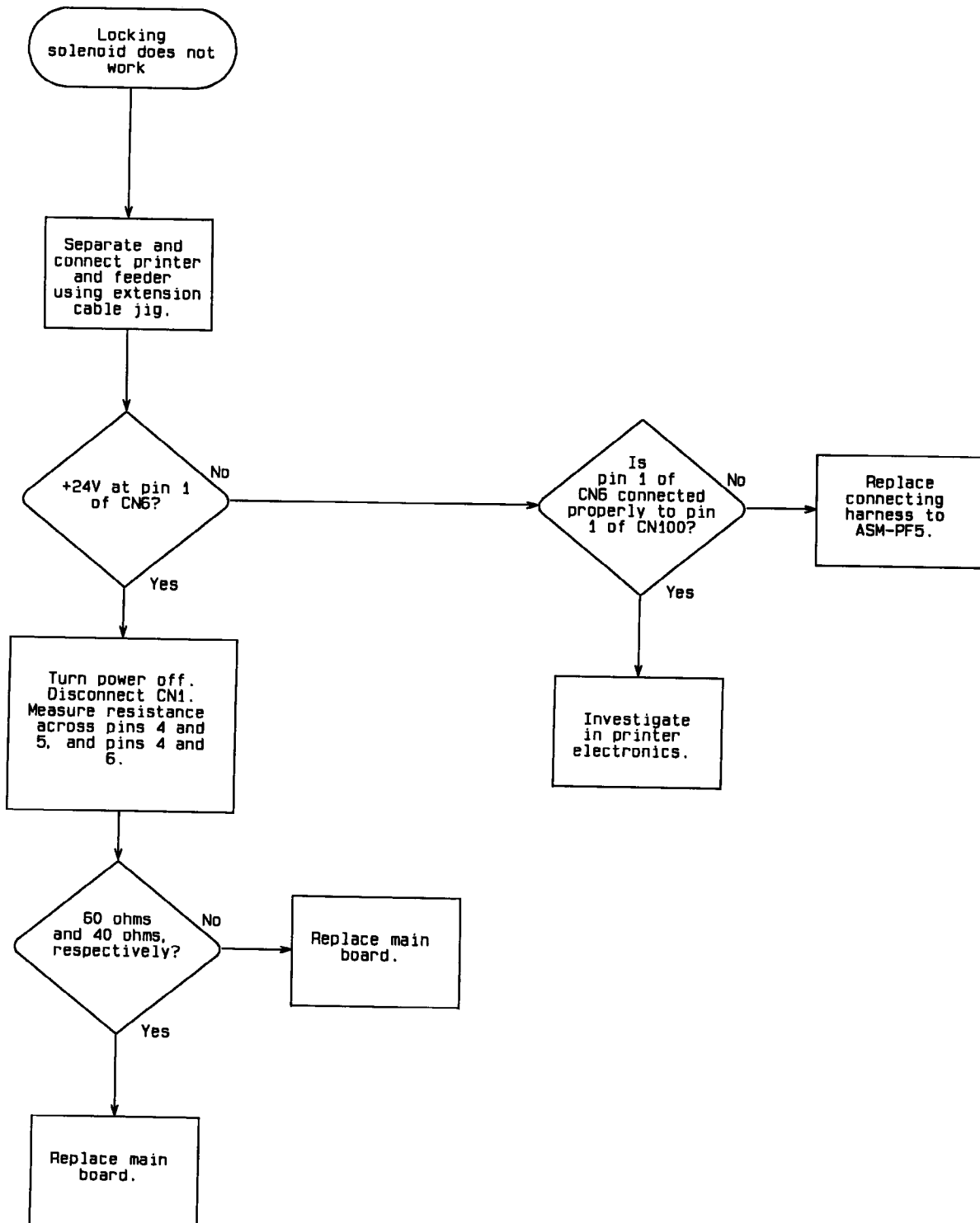
## 6.2. Troubleshooting flowcharts

### 6.2.1. Feed motor does not revolve



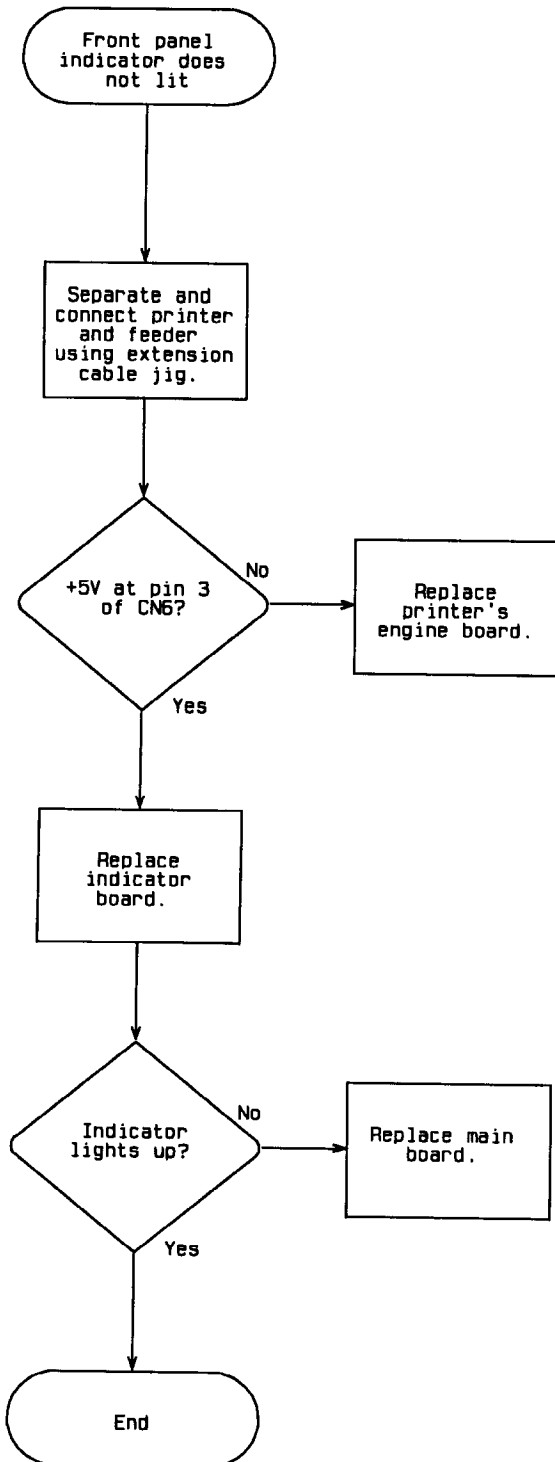
## 6.2.2. Locking solenoid problem

Locking solenoid problem



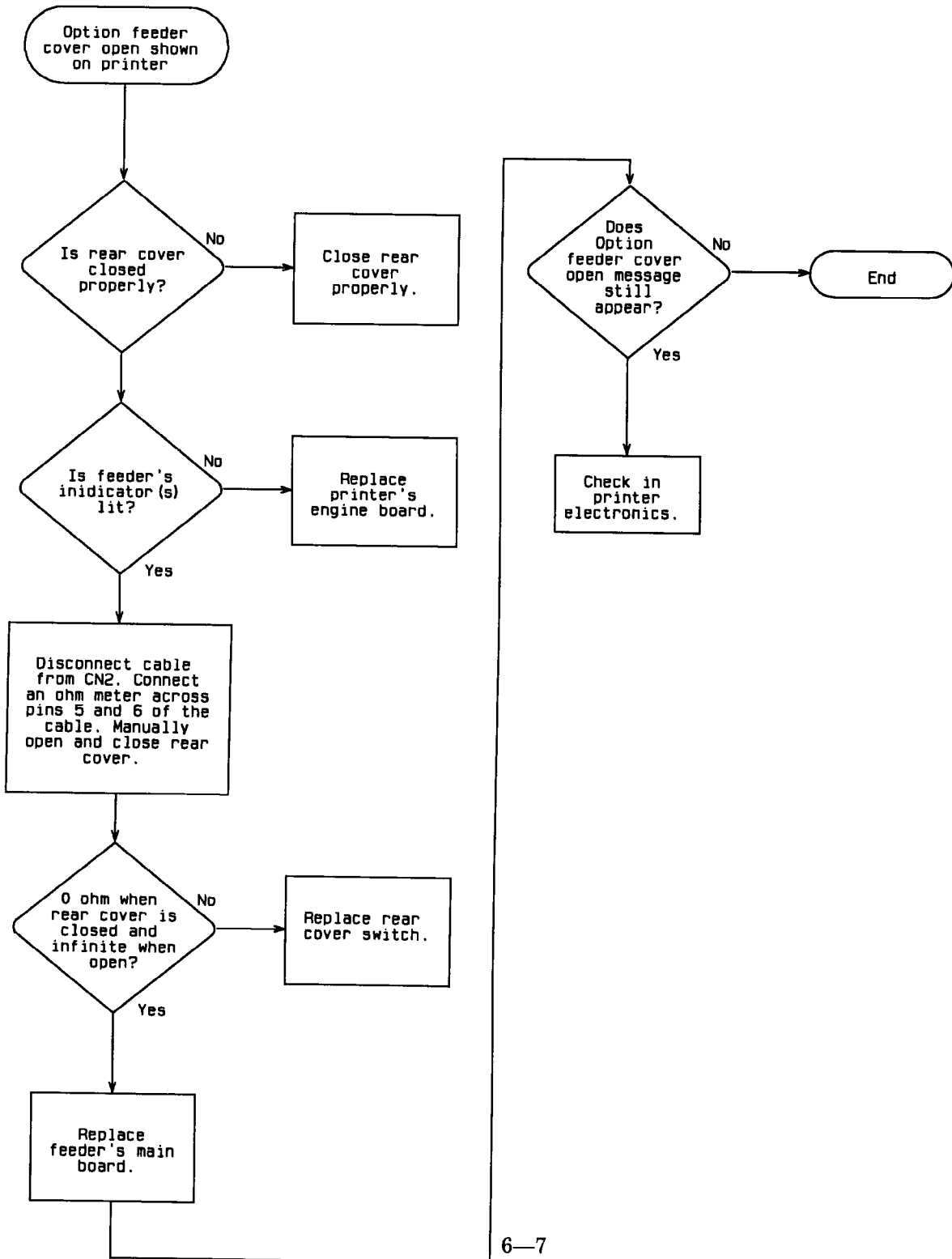
### 6.2.3. Front panel indicator does not light

Front panel indicator does not light



## 6.2.4. «Option feeder cover open» message does not go off

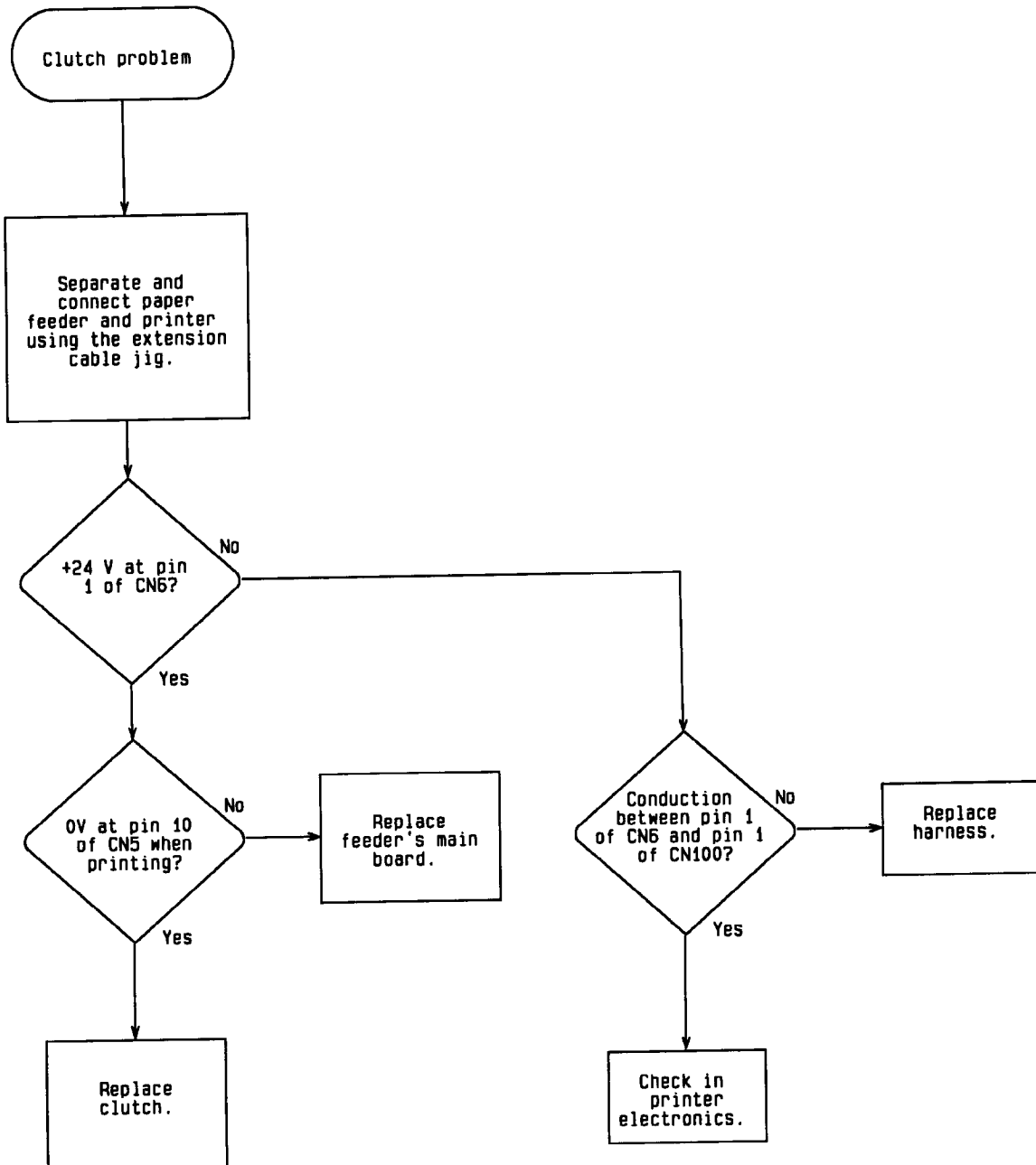
«Option feeder cover open» message does not go off





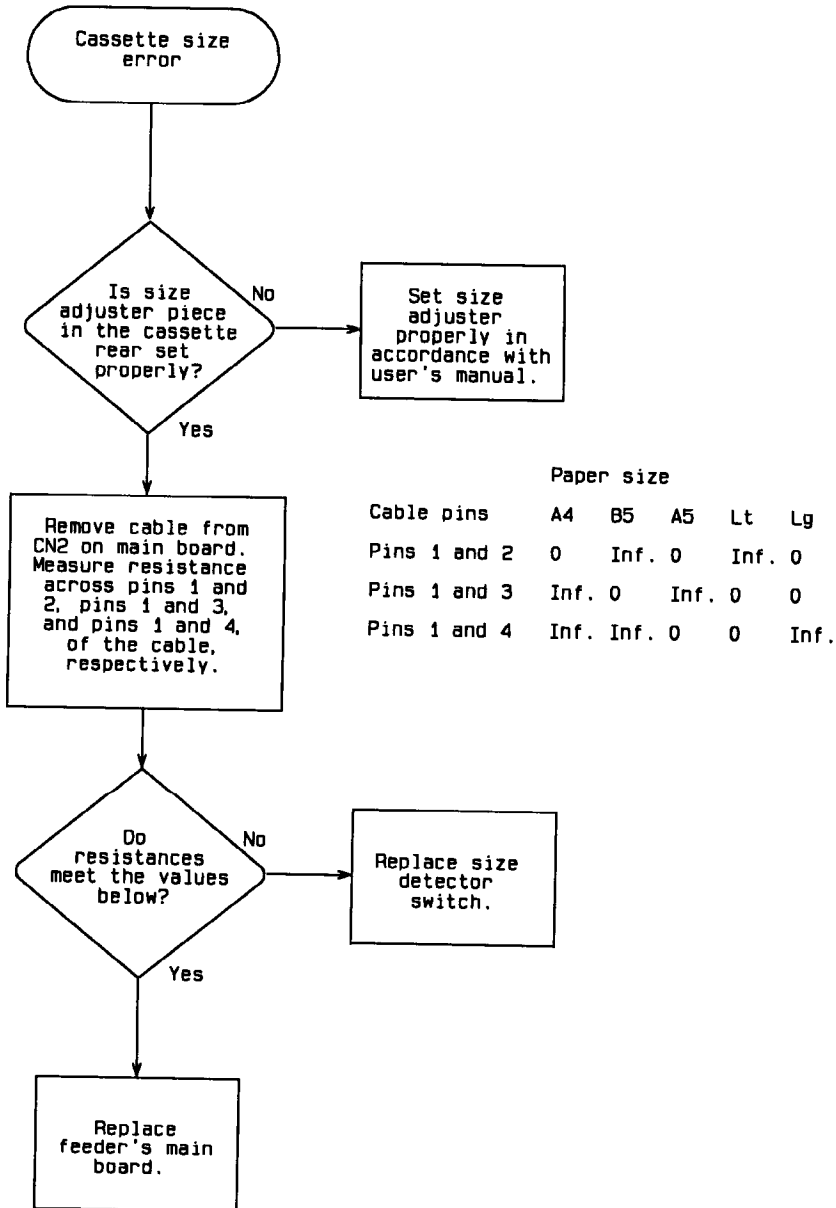
## 6.2.5. Clutch problem

Clutch problem



## 6.2.6. Cassette size detection error

Cassette size detection error



## 6.2.7. «Add paper» does not go off

«Add paper» does not go off

