

Cash Register

CMS 140 euro / CMS 240 euro

SERVICE MANUAL

Code 686711S-00

PREFACE

This manual is addressed to the field engineers who will install and service the CMS 140/240 cash register. It provides all the information needed for a correct product maintenance.

SUMMARY

This manual is divided into six chapters.

The first three chapters describe the operating, functional checks, and maintenance and repair procedures.

Chapter 4 describes the disassembly and adjustment procedures. Chapters 5 and 6 describe the electronic circuitry and provide the schematics.

The appendix holds the SPARE PARTS CATALOGUE.

PREREQUISITES

The topics described in this manual require knowledge of similar products.

REFERENCE DOCUMENTATION

Instruction Manual - (provided with the product)

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SPARE PARTS CATALOGUE A-1

1. OVERVIEW

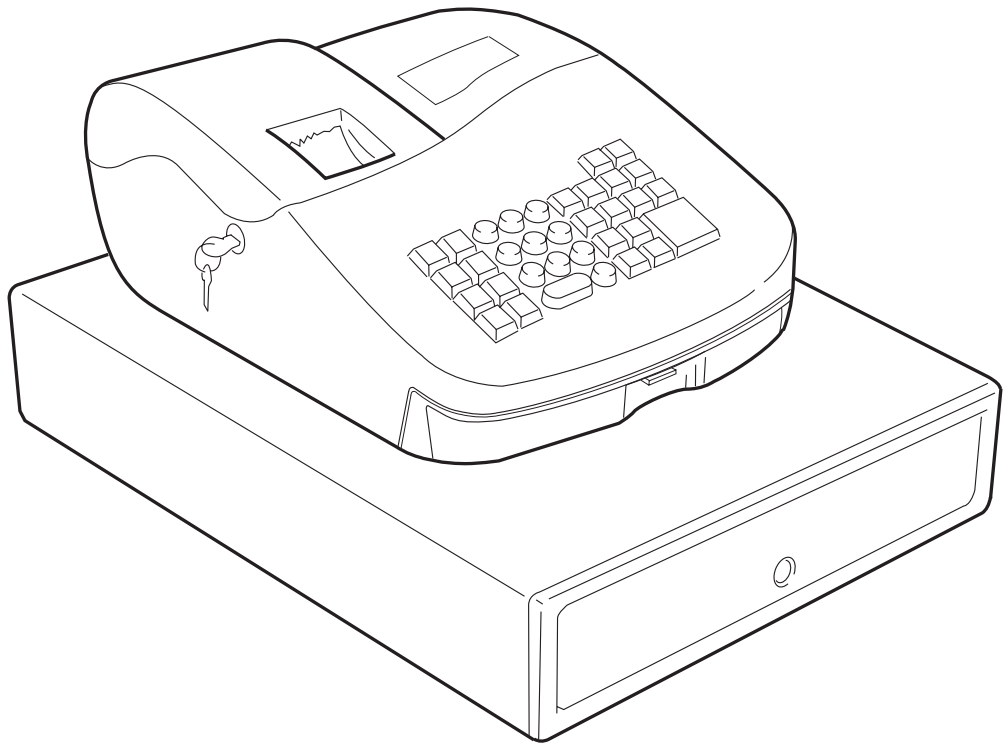


Fig. 1-1

1.1 TECHNICAL SPECIFICATIONS

Type:	Electronic cash register with printer and eight departments
Display:	Fluorescent display, symbols for error, change, minus, total and program mode
Capacity:	Input 7 digits and readout
Printer:	Serial printer with ink roller
Paper supply:	57-mm single ply register tape
Memory battery protection:	Approx. 3 months after power interruption via 4 AA batteries
Technology:	CMOS RAM
Voltage:	220-240V 50/60 Hz ~ 115V 50/60 Hz
Power consumption:	0.07A; operating 0.22A
Operating temperature:	0° to 40°C
Dimensions:	Depth 425 mm, width 324 mm, height 220 mm
Weight:	Approx. 6 kg

2. SPECIFICATIONS AND OPERATING PRINCIPLES

2.1 SPECIFICATIONS

2.1.1 Features

The Micro Printer was designed and developed as a printer for use with calculators. It offers the following features:

- Ultra-compact and lightweight design.
- Use of movable type for sharp printing quality.
- High printing speed due to a carriage return mechanism that can return the carriage from any column position.
- Silent operation and printing.
- Provided with quick feeding and paper free functions.
- Use of ordinary calculator paper.
- Requires no control of the motor speed.

2.1.2 Specifications

The main specifications are listed as follows.

Print method

Type-printing serial printing

Carriage width

Max. 19 printable columns (including one column of symbols)

Character position

On symbol column side: 13 positions +1 empty positions

On numeric column side: 14 positions

Character size

1.6 (W) x 2.5 (H) mm

Intercharacter intervals

Between numerics: 2.1 mm

Between a numeric and symbol: 2.6 mm

Line spacing: 4.6 mm

Print speed

Average printing speed at 6.0 VDC

19-column printing: TYP 0.9 l/s

7-column printing: TYP 2.2 l/s

Paper (Supplied by the user)

Type: Regular paper

Size: Width 57.5 mm +/- 0.5 mm

Roll diam.: 80 mm or less

Thickness: 0.06 - 0.085 mm

Average weight: 47 g/m² - 64 g/m²
(40 - 55 kg/1000 sheets/1091 x 788 mm)

Paper feed

TYP 8 lps. Fast paper feeding is also possible and a paper release mechanism is provided.

Inking

Ink roll method

Colors : Purple or black

Ink roll life: Purple 1,000,000 characters

Black 350,000 characters

Standard: IR-40

Motor

Terminal voltage: 6.0 +0.5 -2.0 VDC

Average current: Approx. 0.25 A (during 19 columns 7 character shift printing at 6.0 VDC, 25°C)

Detector

Mechanical point of contact

Reset signal "R", Timing signal "T", and a Sub-Timing signal "t"

D.C. resistance: Approx. 20 Ohm +/- 2 ohm (at 25°C)

Connection method

Jumper Wire on printer side

Guaranteed operating temperature

0°C - 50°

External dimensions

86 (W) x 58.4 (D) x 19 (H) mm

Weight

Approx. 90 g.

2.1.3 Mechanisms

This printer consists of two print wheels, a hammer, and a carriage equipped with an ink roll. It is a serial printer with movable type, and performs printing by sequentially moving across from the lowest-order column.

When the motor is activated, the gear trains rotate and cause the print wheels and detection wheel to rotate. When the trigger coil is charged according to a signal (which corresponds to a character) output from the detector, character selection is performed, the print wheel stops, the print gear is rotated by the action of the planet gear, a character is printed then the carriage shifts to the next column (column-shift operation).

When the charge to the trigger coil is lengthened during character selection performed at the end of line, printing is performed then the carriage is returned to the initial column and the paper is fed forward, thereby completing the printing of one line.

This printer consists of five mechanisms: the transmission and selective mechanism, detection mechanism, print mechanism, inking mechanism, and paper feeding mechanism.

Fig. 2-1 shows an external view of the Micro Serial Printer. For details on the operating principles and handling of each mechanism, see section 2.2, "OPERATING PRINCIPLES", and Chapter 3, "HANDLING, MAINTENANCE, AND REPAIR".

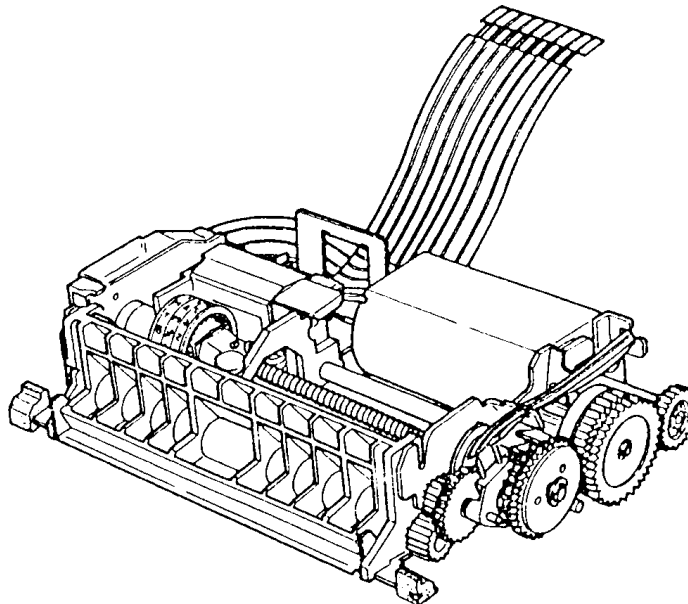


Fig. 2-1 Exterior View

2.2 OPERATING PRINCIPLES

2.2.1 Transmission/Select Mechanism

As shown in Fig. 2-2, this mechanism consists of the reduction gear train, selective mechanism, print gear train, and paper feed gear train.

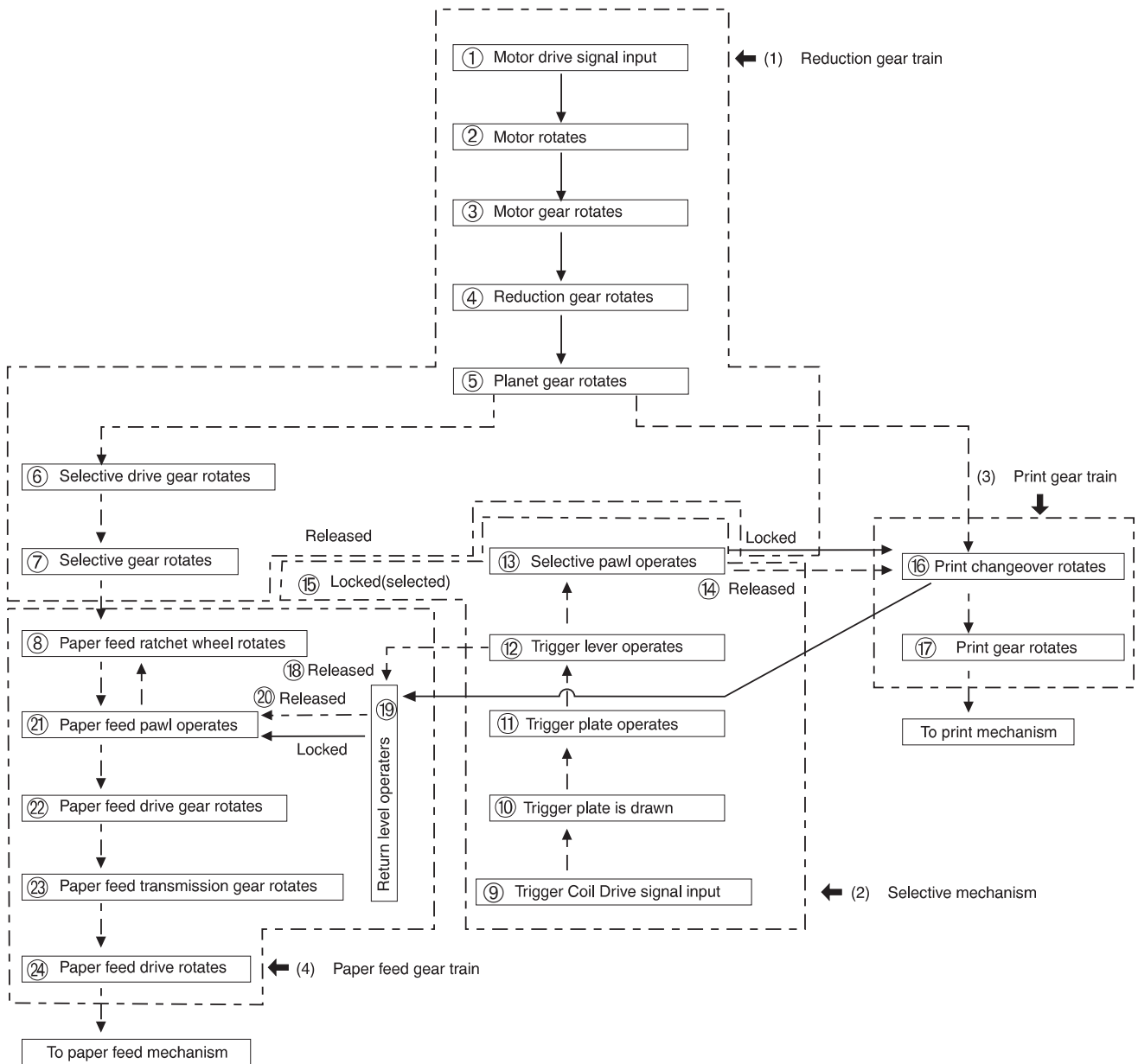


Fig. 2-2 Transmission/Select Mechanism

Reduction gear series (See Figs. 2-2 and 2-3.)

The reduction gear train consists of the motor gear, reduction gear, planet gear, selective drive gear, selective gear assembly, selective pawl, and print changeover cam. When the motor rotates **2**, the rotation force is sequentially reduced from the motor gear **3** on the same shaft through the gear train to the selective gear assembly **7**.

The rotation of the print changeover cam is locked by the action of the selective pawl, so the paper feed ratchet wheel **8** on the same shaft as the selective gear assembly, the print wheel, and detection wheel also rotate at the same time.

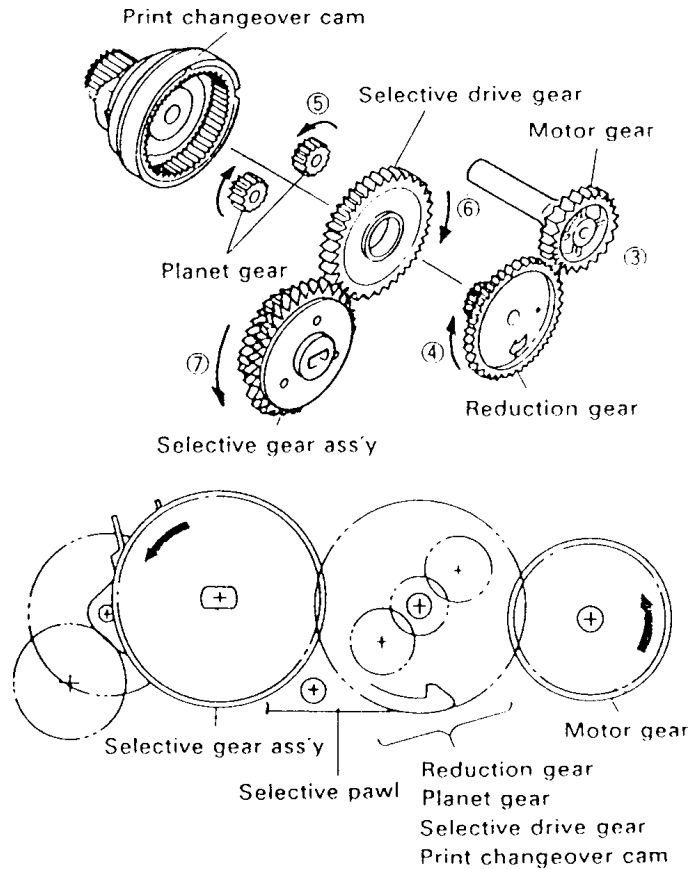


Fig. 2-3 Reduction Gear Series

Select mechanism (See Figs. 2-2 and 2-4.)

As shown in Fig. 1-4, the select mechanism consists of the selective gear assembly, trigger coil, trigger plate, and selective pawl. During rotation of the reduction gear series, when a Drive signal is input **9** to the trigger coil in conformance with the Timing signal output from the detector, the trigger plate is drawn **10** to the yoke fixed onto the selective gear assembly so that the trigger plate **11**, trigger lever **12**, and selective pawl **13** rotate together with the rotation of the selective gear assembly. At the same time as the print changeover cam is unlocked, the selective pawl locks **15** the tooth section corresponding to the character of the selective gear assembly. When the selective gear assembly is stopped, the print wheel mounted on the same shaft is stopped also, and character selection is performed.

Print gear series (See Figs. 2-2 and 2-4.)

The print gear series consists of the print changeover cam and print gear. When the selective gear assembly is stopped by the select mechanism, the interlocked selective drive gear is also stopped. At the same time, the unlocked **14** print changeover cam is coupled and is rotated **16** by the planet gear of the rotating reduction gear series. The print gear thus rotates **17** which is transmitted to the printing mechanism.

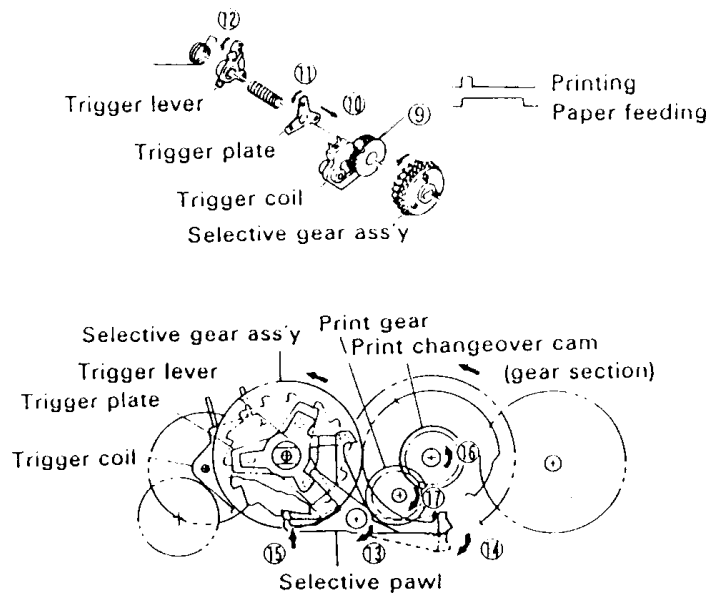


Fig. 2-4 Select Mechanism and Print Gear Series

Paper feeding gear series (See Figs. 2-2 and 2-5.)

As shown in Fig. 2-5, the paper feeding gear series consists of the paper feed ratchet wheel, paper feed drive gear assembly, paper feed transmission gear, and paper feed gear.

During column selection or consecutive paper feeding, although the select mechanism and printing gear series will operate through lengthening the Trigger Coil Drive signal at the first column during space selection, the return lever and trigger lever are in the unlocked status **18** in order to maintain a long operating status of trigger plate and trigger lever.

When the print changeover cam rotates, because the cam controlling the return lever reaches a notched section, the return lever is released and begins operating **19** due to spring force, and its interlocking with the paper feed ratchet in the paper feed drive gear assembly is cancelled **20**.

The paper feed ratchet operates **21** due to spring force, and meshes with the teeth of the paper feed ratchet wheel which is on the same shaft as the selective gear. When the printing operation is completed, the print changeover cam causes the selective pawl to return to its pre-selection status, and the print changeover cam is stopped. When the selection gear begins rotation, the paper feed driver gear assembly **22**, paper feed transmission gear **23** and paper feed gear **24** all rotate together with the paper feed ratchet wheel, which is transmitted to the paper feeding mechanism.

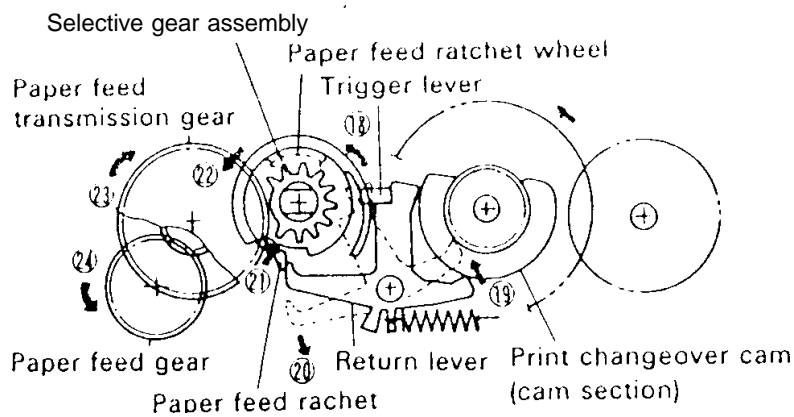


Fig. 2-5 Paper Feeding Gear Series

2.2.2 Detector Mechanism

(See Fig. 2-6.)

The detector mechanism consists of the detector assembly and the detector gear. The detector employs a mechanical contact-point system and generates a Timing signal "T" and Sub-Timing signal "t" in correspondence to each character position on the print wheel.

The detector also generates a signal Reset signal at each rotation of the print wheel. Waveform rectification of these signals is to be performed by the user to use as Timing pulses or Reset pulses.

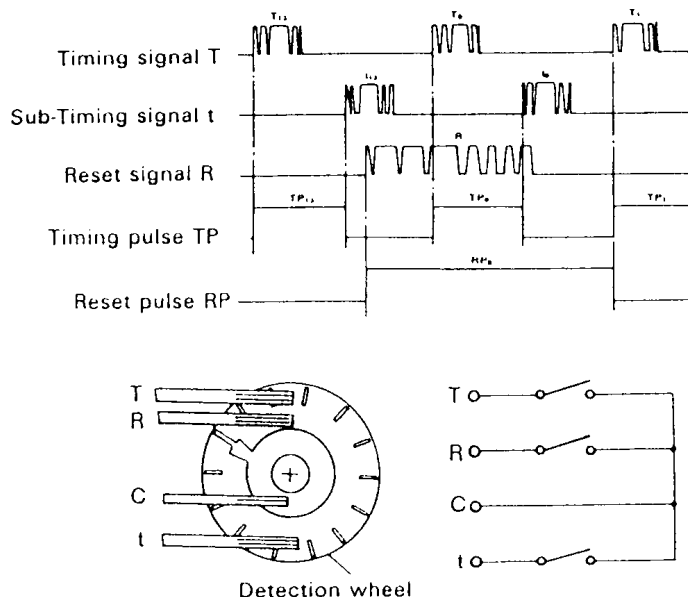


Fig. 2-6 Detector Mechanism

2.2.3 Printing Mechanism

The printing mechanism performs two functions: the printing operation and carrying operation.

Printing operation (See Fig. 2-7.)

When the print gear series (see subsection 2.2.1, Transmission/Select Mechanism) causes the print shaft and print cam to rotate in the → arrow 1 and 2 directions, the hammer transmission lever assembly and hammer rotates in the → arrow 3 and 4 directions; therefore, the print wheel is pressed in the → arrow 5 direction by the hammer, and printing is performed.

The hammer return spring moderates the pressure of printing and also functions to restore the hammer and hammer transmission lever assembly to standby status at the completion of printing. The print wheel, similar to the print changeover cam, makes one rotation with each printing operation, and the printing operation is performed during the first half of the rotation.

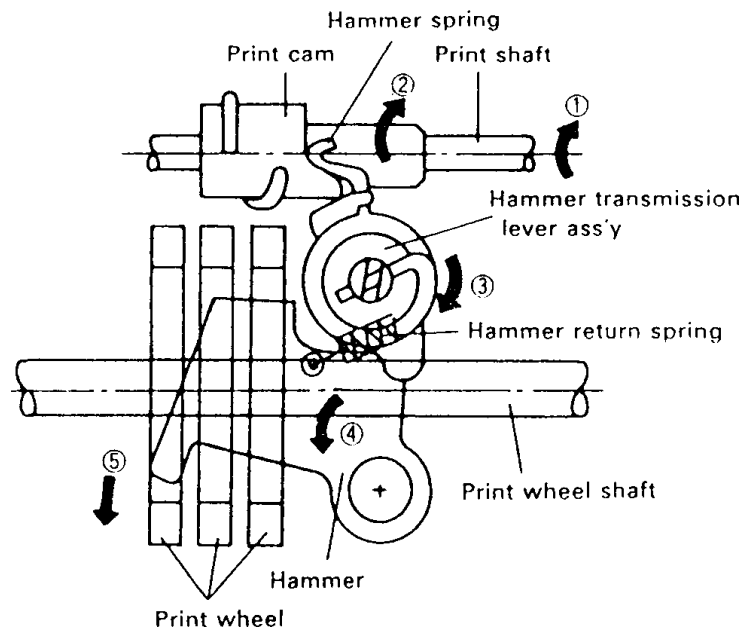


Fig. 2-7 Printing Operation

Carrying operation (See Fig. 2-8.)

The carrying operation is performed after the printing operation during the last half of the print shaft rotation. As soon as the positioning plate causes the print gear to begin rotating, the cam section of the print gear causes its meshing with the return lever to be unlocked, and the print gear meshes with the print cam.

When the print shaft rotates in the ➡ arrow 1 direction, the meshing between the teeth of the print cam and positioning plate causes the print shaft to slide to the ➡ arrow 2 direction while rotating in the ➡ direction while in the ➡ arrow 3 direction. Simultaneously with this sliding action, the carrying operation of the carriage unit is performed (➡ arrow 4).

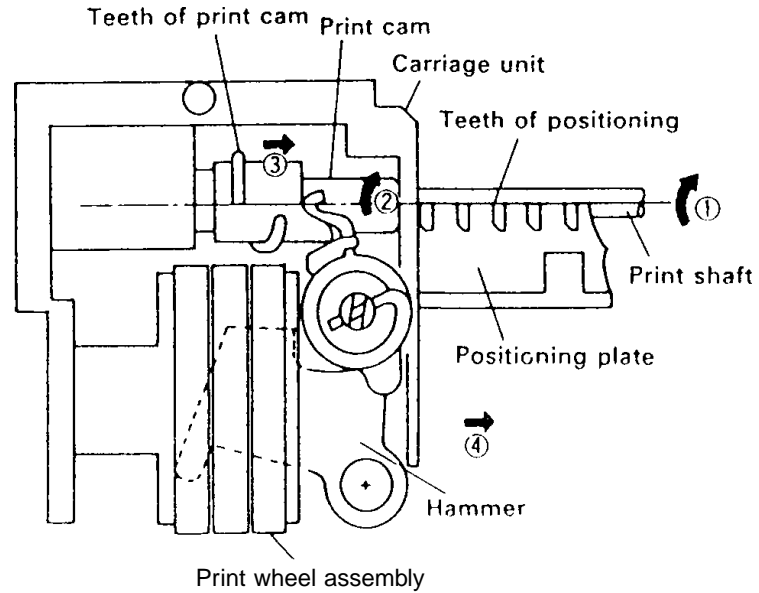


Fig. 2-8 Carrying Operation

2.2.4 Inking Mechanism

(See Fig. 2-9.)

The ink roll assembly is constantly pressed lightly against the outer periphery of the print wheel due to the operation of the ink roll spring.

When the print wheel rotates, the ink roll also rotates and the ink is supplied.

2.2.5 Paper Feeding Mechanism

The paper feeding mechanism performs two functions: the carriage return operation and the paper feeding operation.

Carriage return operation (See Fig. 2-10.)

The paper feeding gear series (see subsection 2.2.1, "Transmission/Select Mechanism") causes the return lever to drop into the cam section of the print change-over cam so that it meshes with the positioning plate (⇒ arrows 1 and 2). The rotation of the print changeover cam restores the return lever to its original position (⇒ arrow 3) and rotates the positioning plate with which it is meshed (⇒ arrow 4). As a result, the teeth of the positioning plate and print cam become disengaged (5), and the spring force of the print wheel spring and carriage spring causes the carriage to be returned (⇒ arrow 6).

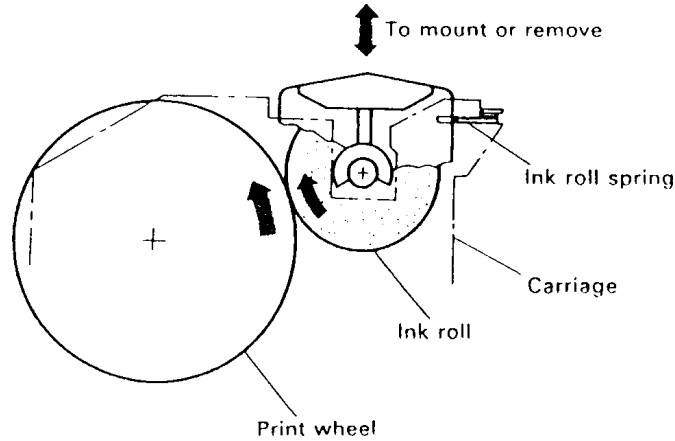


Fig. 2-9 Inking Mechanism

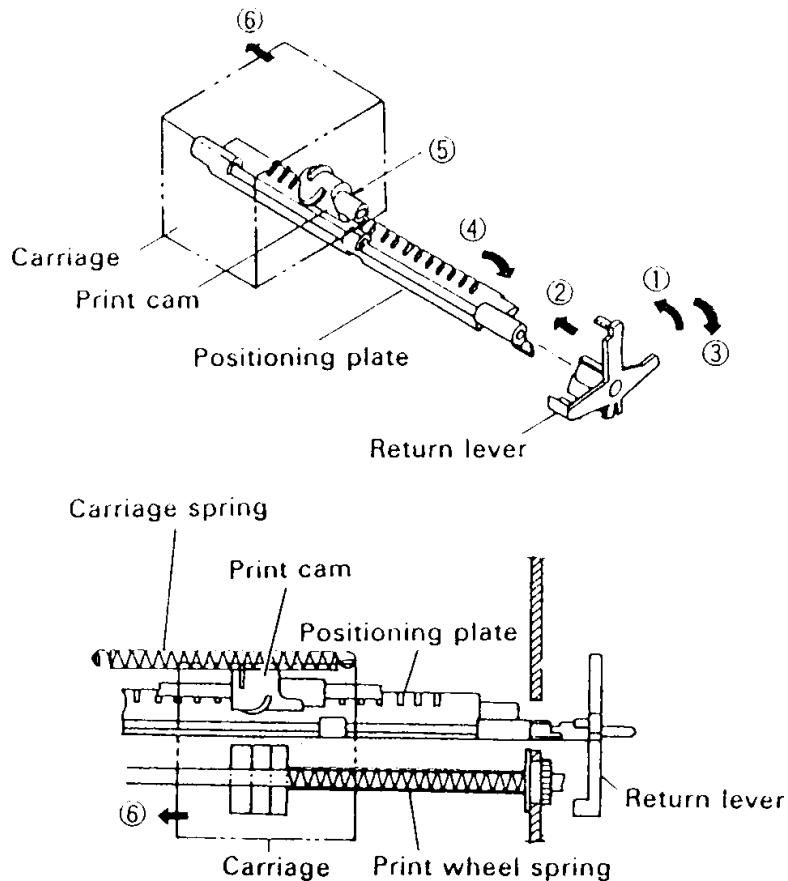


Fig. 2-10 Carriage Return Operation

Paper feeding operation (See Fig. 2-11.)

Paper feeding is executed while the paper feed drive gear assembly performs one rotation. When the paper feeding gear series (see subsection 2.2.1, "Transmission/Select Mechanism") causes the paper feed gear to rotate in the ➡ arrow 1 direction, the paper feed rubber within the platen also rotates in the ➡ arrow 2 direction, and the paper is fed by friction from

the paper hold roller, which is in contact with the paper feed rubber.

When the paper feed ratchet within the paper feed drive gear assembly strikes the return lever, it becomes disengaged with the paper feed ratchet wheel, the rotation of the paper feed drive gear assembly is stopped, and paper feeding is terminated.

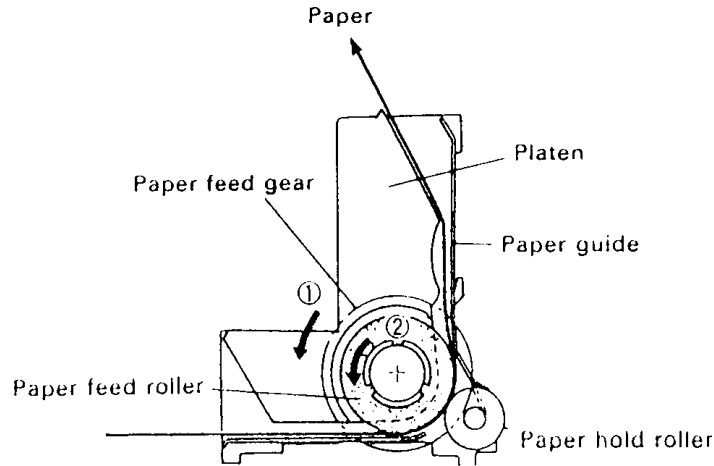


Fig. 2-11 Paper Feeding Operation

2.2.6 Printer Operation During One Print Cycle Initialization

To confirm that the carriage is in standby status (at the first column), initialization must be performed prior to printing and paper feeding. Initialization is completed performing line feed.

Printing of the first line

- 1 *The Timing pulses "TP" are counted after the Motor Drive signal is applied and the motor is activated. The Reset pulse "RP" appearing 8 Timing pulses shall be regarded as "RPo" and the first Timing pulse "TP" after the rising of "RPo" shall be regarded as "TPo".*
- 2 *Character selection (First column)*
The Trigger Coil drive pulse is applied to the trigger coil during the interval from Timing pulse "TPn" to "TPn+1" which correspond to the desired character. At such time, the Timing pulse interval ("TPn" to "TPn+1") is measured to obtain "TW1". Following character selection, the print wheel stops (the timing pulse retains the "TPn+1" status), then print and carrying are automatically executed.
- 3 *Character selection (second column)*
The print wheel starts rotating again and the first Timing pulse is TP12. Character selection can be performed from the next Timing pulse TP13. The rest of this character selection operation is identical to that described in Step (2) above.

4 Carriage return and paper feeding

During character selection for the highest-order column of a line of print, printing, carriage return, and paper feed are performed by adding: [the width of the drive pulse to the trigger coil] + [the timing pulse interval TW2 (TPn to TPn+1) at the time] + [(the TP interval TW1 measured during selection of the 1st column) x 6].

5 Motor OFF

After completing the printing of the highest-order printing is one line of printing, the print wheel begins rotation and the Timing pulse "TP" is generated. Counting from this initial rising pulse, the Motor Drive signal is cut off at the rising of the fourteenth Timing pulse "TP".

NOTES:

- During a one-line print cycle, confirm the Reset pulse "RP" between Timing pulses "TP13" and "TPo" or "TPo" and "TP1".
- The first Timing pulse that is generated after the print column-shift process (TPn'2) cannot be used for character selection.

Consecutive printing

- 1 The process for the initial line is similar to that for "Printing of the first line".
- 2 Printing of the second and later lines begins as follows: After completing the printing of the highest-order column for printing of the first line, with the motor remaining driven, count the following Timing pulses "TP". From the rising of the 29th Timing pulse, printing of the first column of the second line becomes possible. Next, follow Steps 2 to 4 of "Printing of the first line".
- 3 Consecutive printing is performed by repeating Step 2 above.
- 4 Motor OFF
Perform Step 5 of "Printing of the first line".

Paper feeding of the first line

- 1 The Timing pulses "TP" are counted after the Motor Drive signal is applied and the motor is activated. The Reset pulse "RP" appearing 8 Timing pulses shall be regarded as "RPo" and the first Timing pulse "TP" after the rising of "RPo" shall be regarded as "TPo".
- 2 Paper feeding
Select the empty character "TP10". At such time, measure the Timing pulse interval "TP10" to "TP11" to obtain TW1. When the width of the Trigger Coil Drive pulse equals the measured "TW1" plus six times "TW1", the empty character on the print wheel is selected and paper feeding is performed.
- 3 Motor OFF
After completing the paper feeding of one line, the print wheel begins rotation. Counting from the initial rising Timing pulse, the Motor Drive signal is cut off at the rising of the fourteenth Timing pulse "TP".

NOTE:

- During a one-line print cycle, confirm the Reset pulse "RP" between Timing pulse "TP13" and "TPo" or "TPo" and "TP1".

Fast paper feeding

- 1 The process for feeding the initial line is similar to that for "Paper feeding of the first line".
- 2 Paper feeding of the second and later lines begins as follows: After completing the paper feeding of the first line, with the motor remaining driven, count the following Timing pulses "TP". From the rising of the 21st Timing pulse, selection of the empty character "TP10" becomes possible. Next, follow Step 2 of "Paper feeding of the first line".
- 3 Fast paper feeding is performed by repeating Step 2 above.
- 4 Motor OFF
Perform step 3 of "Paper feeding of the first line".

3. HANDLING, MAINTENANCE, AND REPAIR

3.1 HANDLING THE PRINTER

3.1.1 Precautions on Printer Handling

Precautions on transport (See Fig. 3-1.)

- (1) When transporting this printer, never carry it by grasping only the jumper lead.
- (2) Never expose the printer to impact by dropping or striking it, placing two printers into contact or similar means.

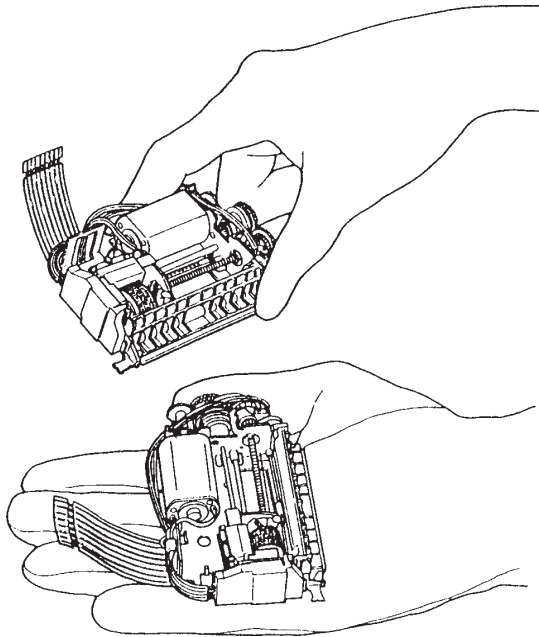


Fig. 3-1 Proper Handling of Printer

Precautions on storage

- Avoid storage in locations exposed to excessive dirt or dust, direct sunlight or excessive moisture.
- In the case of long-term storage (over 1 month), place the printer in a polyethylene bag after wrapping it in anti-rust (VPI) paper, then store it in a dry location.

Precautions on use

- Since this printer employs a permanent magnet (motor section), avoid using it in locations exposed to excessive iron filings, dirt, dust or other foreign particles.
- Never perform a printing operation without the paper and ink roller installed.
- Make sure you use only the paper and ink roll assembly that are stipulated in the specifications.
- The ink roll assembly is a disposable part; do not attempt to refill its ink supply.

3.1.2 Paper Setting

Loading the Paper

When loading the paper into the printer, note the following points.

Paper Setting Procedures (See Fig. 3-2.)

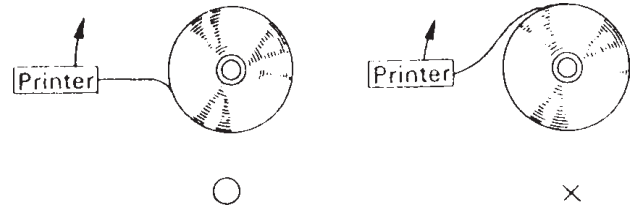


Fig. 3-2 Paper Setting Procedures

The Leading Edge of Rolled Paper (See Fig. 3-3.)

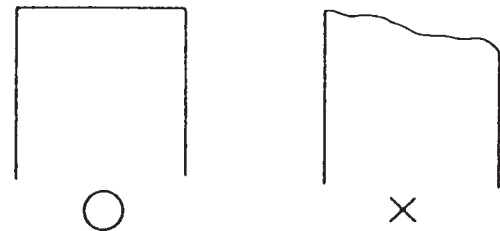


Fig. 3-3 The Leading Edge of Rolled Paper

Precautions on paper insertion

- Insert the paper straight into the paper entrance section. Never insert paper having an uneven leading edge at a slant.
- If the paper is pushed in the direction of feeding, paper insertion will be simplified.

Removing the Paper

Remove the paper by following on the two methods below.

- Perform paper feed using an electrical operation (switch the printer power to ON, then press the Paper Feed button), then remove the paper.
- Although the paper release mechanism in standby status allows the paper to be freely removed by pulling it out towards the front or back, make sure to pull it straight out of the printer. **Pulling the leading edge out at a slant causes paper jamming.**

3.1.3 Installing the Ink Roll Assembly

Fiting the Ink Roll Assembly (See Fig. 3-4.)

- Set the ink roll assembly in the cutout sections of the carriage, then press it down gently until it clicks into place.

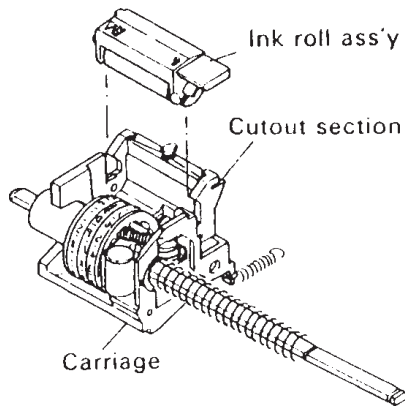


Fig. 3-4 Installation of Ink Roll Assembly

Replacement of ink roller assembly

(See Fig. 3-5.)

- Press the knob of the ink roll assembly in the → arrow direction, then lift the ink roll assembly up and out of the carriage.

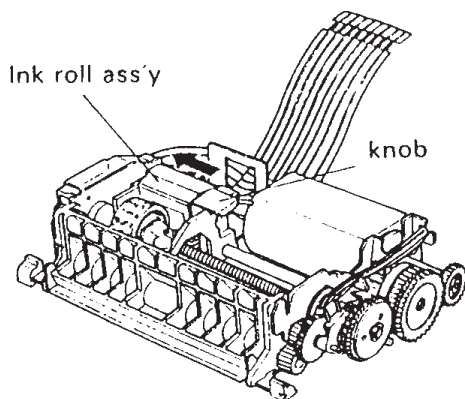


Fig. 3-5 Replacement of Ink Roller Assembly

3.2 MAINTENANCE

To ensure this printer retains its initial performance level throughout a long product life, and to prevent potential troubles, be sure to perform maintenance and management according to the points described in the following subsections.

3.2.1 Cleaning

Eliminating dirt or stains

Wipe off the soiled sections using alcohol or benzene.

Eliminating dust, scraps, and other foreign particles

Use a vacuum cleaner to carefully draw out all foreign particles from every part of the printer.

NOTES:

Never use thinner, tricholyene nor ketone solvents as they may deteriorate or damage the plastic parts. Check the remaining lubricant of each cleaned section and perform lubrication as required. (See subsection 3.3.3, "Lubrication Points".)

3.2.2 Inspection

The maintenance and check-up procedures for this printer are grouped into two types:

- 1) Daily checks that can be easily performed by the operator of the printer during the course of daily work, and
- 2) Periodic checks that can be performed only by persons having a thorough understanding of the printer mechanisms. These maintenance and check procedures should be implemented according to the technical level of the person conducting them.

Periodic Check

Every six months, periodic maintenance and inspection of the points below should be conducted:

Check Item	Standard	Repair Method
Adhesion/penetration of dirt, paper scraps, or dust to the printer interior.	<ul style="list-style-type: none">No excessive adhesion of dirt, paper scraps or dust.	<ul style="list-style-type: none">Use a vacuum cleaner to carefully remove all foreign matter from the printer.
Shape of the springs.	<ul style="list-style-type: none">No deformed springs.	<ul style="list-style-type: none">Replace any deformed springs.
Lubrication status.	<ul style="list-style-type: none">See subsection 3.3.1, "Lubrication Requirements".	<ul style="list-style-type: none">See subsection 3.3.3, "Lubrication Points".
Printing and paper feeding.	<ul style="list-style-type: none">No defects in the printed results.No defects in the paper feeding.Observe each function and confirm the absence of worn or deformed parts, paper jams, and other defects.	<ul style="list-style-type: none">See subsection 3.5.3, "Repair Guidelines".

Daily check

The printer and printer operation are checked to see if the printer is being operated in the proper manner and if it is being maintained in optimum condition.

If any unsatisfactory points are discovered, they should be remedied.

- Check that the ink roller ass'y is securely installed in the carriage.
- Check the ink roller in use conforms to the specifications (IR-40). Check the ink roller for damage, replacing the ink roller if the ink roller status is affecting printing quality.

3.3 APPLICATION OF LUBRICANTS

Lubrication plays an important role in maintaining this printer at its initial performance level throughout a long product life as well as preventing potential troubles. Make sure to apply the specified lubricants in the appropriate amounts at the specified intervals.

3.3.1 Lubricant Types

The type of oil used greatly influences performance and durability, and special attention is required to its low temperature characteristics. Consequently, the oils to be used with this printer are specified by us on the basis of the results of the thorough analyses of data for many types of oils and various experiments.

Note that our specified oils are available in 40cc (gm) containers (minimum supply unit).
The three types of oils to be use with this printer are: G-20, G-34 and 0-3.

3.3.2 Lubricating Requirements

Prior to lubricating a part during assembly or disassembly, that part must be thoroughly cleaned. The points requiring lubrication and the corresponding lubricant types are listed in subsection 3.3.3, "Lubrication Points", and shown in Fig.4-2, "Lubrication Points" (Note that corresponding numbers are used in the table and figure).

Lubrication should be periodically performed after every six months, every overhaul, or every 700,000 printed lines. If lubrication becomes deficient due to cleaning, disassembly or parts replacement, be sure to perform lubrication regardless of the actual lubrication interval.

3.3.3 Lubrication Points

(See also Fig. 4-2)

* (1), (2), (3), (11), (12) and (13) require lubrication during assembly.

No.	Lubrication Point	Oil Type
(1)	Flanged section of paper feeding ratchet wheel (contact point between frame and teeth).	G-34
(2)	Contact point of detection wheel with frame.	G-34
(3)	Contact point between selective gear ass'y and trigger plate.	0-3
(4)	Contact point between print shaft and frame (2 points).	0-3
(5)	Outer surface of print shaft.	0-3
(6)	Outer surface of print wheel shaft.	0-3
(7)	Contact point between print cam and hammer spring.	G-34
(8)	Teeth of positioning plate (3 points from the T side).	0-3
(9)	Contact point of positioning shaft with frame and return lever (3 points).	0-3
(10)	Print gear cam.	0-3
(11)	Planet gear (teeth and shaft entrance section) (2 points).	0-3
(12)	Contact point of the selective drive gear with the reduction gear.	0-3
(13)	Entire outer surface of detection wheel.	G-20
(14)	Contact point of selective pawl with print changeover cam.	0-3
(15)	Contact point between print wheel ass'y and carriage.	0-3
(16)	Contact point between guide shaft with frame and carriage.	0-3

3.4 TOOLS AND LUBRICANTS

3.4.1 List of Tools

Tool Designation	Availability
Electric soldering iron	<input type="radio"/>
Round-nosed pliers	<input type="radio"/>
Diagonal-blade nippers	<input type="radio"/>
Tweezers	<input type="radio"/>
Brush-Medium # 1	<input type="radio"/>
Brush-Thin # 2	<input type="radio"/>
Phillips screwdriver No. 1	<input type="radio"/>
ET holder # 1.5	<input type="radio"/>

Commercially available

3.4.2 List of Lubricants

Item	Designation	Volume
Oil	0-3	40 gm
Grease	G-20	40 gm
	G-34	40 gm

3.5 REPAIR

In consideration of the level of expertise required for implementation of after-service and repair procedures for this printer, such procedures have been grouped into two rankings: Level A and Level B. The person in charge of repair, therefore, should perform the repair procedures appropriate to the repair level and to his/her own level of expertise.

3.5.1 Repair Levels

LEVEL A:

Requires general knowledge and technical skills regarding the operating principles and structure of the printer, but does not require previous repair experience.

LEVEL B:

Requires full knowledge and technical skills regarding the structure and operating principles of the printer as well as previous repair experience.

3.5.2 Repair Procedures

If of problem occurs, check its symptoms and status and clarify the source of the problem with reference to subsection 3.5.3, "Repair Guidelines" then repair the damaged area. Note that the tables of subsection 3.5.K3, "Repair Guidelines", consist of the five items listed below, enabling troubleshooting and repair to be performed with speed and efficiency with minimum error.

Phenomenon

Check the symptoms of the trouble.

Condition

Compare the trouble status of the problem with the description in this column and locate the matching status.

Cause

This columns lists the potential causes on the basis of the trouble status, allowing the location of the trouble to be checked.

Check-Point & Method

In correspondence to the cause, this column lists what parts to check as well as the checking procedure to be used. Be sure to inspect the check-points according to the method describe here.

Repair Method

Repair the trouble area according to the description in this column. If the identical phenomenon and condition remain unchanged after performing the repair, check another item of the "Cause" column, then perform the relative repair.

NOTE:

If you wish to carefully check the operation of such parts as the gears, manually rotate the motor gear in the counter-clockwise direction to perform such check.

3.5.3 Repair Guidelines

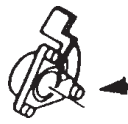

PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
1. Motor doesn't rotate.	Motor doesn't rotate despite issuing of print instruction or its rotation becomes locked.	(1) Defect of power input to motor.	-	- Check the input power. Use a tester or oscilloscope to check the input voltage between the motor terminals.	- Inspect and repair the power supply circuit.
		(2) Defective conductivity of jumper wire.	A	- Check the conductivity between the motor terminals.	- Perform resoldering or replace the jumper wire.
		(3) Locking of hammer and print wheel ass'y.	B	- Manually rotate the motor gear and check whether the operation of the print wheel ass'y and other mechanisms is normal.	- Replace the hammer.
		(4) Adhesion of foreign matter to the rotating mechanism	(B)	- Manually rotate the motor gear in the counter-clock-wise direction and check for the adhesion of foreign matter. Remove any foreign matter.	- Remove any foreign matter.
		(5) Improper mounting position of the print changeover cam.		- See Main Assembly B in the chapter 4 and check.	- Properly re-position the print changeover cam.
		(6) Defective motor.	B	- Check the above Cause (1) to (5) to see if they are applicable.	- Replace the motor.
2. No column printing is performed.	Motor rotates normally, but no printing is performed.	(1) Defective conductivity of jumper wire.	A	- Check the conductivity between across the terminals of detector ass'y and trigger coil.	- Perform resoldering or replace the jumper wire.
		(2) Broken coil lead of trigger coil.	B	- Measure the resistance value of the trigger coil. Rating: 20 +/- 2 Ohm (at 25°C).	- Replace the triggles coil.

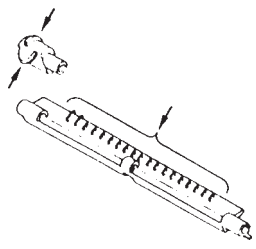
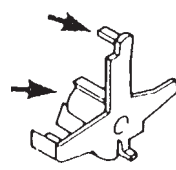
PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
2. No column printing is performed.	Motor rotates normally, but no printing is performed	(3) Improper position of print changeover cam.	B	- See CAUSE (5) of PHENOMENON !	
		(4) Broken hammer spring (hammer transmission lever ass'y).	B	- Remove the ink roll ass'y and check if the spring is broken.	- Replace the hammer transmission lever ass'y.
		(5) Faulty engagement between the print cam and hammer spring (hammer transmission lever ass'y).	B	- See Main Assembly A in chapter 4 and check.	- Properly engage the print cam and hammer spring. - If they easily become disengaged, bend the hammer spring to ensure engagement.
		(6) Abnormal charge pulses to the trigger coil.	B	- Check if the charge pulsewidth are within rated values.	- Perform repair on the circuit side.
3. Incomplete printing.	Top, bottom or sides of printed characters are missing.	(1) Faulty mounting of the platen ass'y.	A	- Check if the platen ass'y is firmly mounted in the frame.	- Properly re-mount it.
		(2) Wear to the print cam, hammer transmission lever ass'y or hammer.	B	- Manually set the trigger lever into drawn status, then perform a printing operation to check the hammer stroke.	- Replace any worn parts.
		(3) Wear or adhesion of foreign particles to positioning plate.	B	- Check the column-shift teeth of the positioning plate for wear and for the adhesion of foreign matter.	- Replace the positioning plate. - Remove any foreign matter.
		(4) Foreign particles adhered to print wheel ass'y or hammer.	A	- Check if foreign matter is adhered to front or back of the hammer tip and print wheel.	- Remove particles.

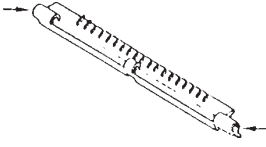
PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
3. Incomplete printing.	Top, bottom or sides of printed character are missing.	(5) Stretched print wheel ass'y or worn characters.	B	- Check for stretching at the frame of the print wheel and worn typefaces.	- Replace the print wheel ass'y.
4. Missing characters or missing printing.	Missing characters occur in all columns.	(1) Defective mounting of trigger lever spring.	A	- See Main Assembly B in chapter 4 and check.	- Properly re-mount it.
	Printing of characters other than those that should be printed.	(2) Disengage or stretch of selective pawl spring.	A	- Check the selecting ratchet spring for disengaged or stretch.	- Replace the selective pawl spring.
		(3) Stretching of hammer spring of the hammer transmission lever ass'y.	B	- Check the hammer spring for stretching.	- Replace the hammer transmission lever ass'y.
		(4) Malfunction of print wheel ass'y	B	- Return the print wheel ass'y and carriage to standby status and release the positioning plate. Next, manually slide the carriage to check if the print wheel ass'y slides smoothly.	- Replace the print wheel ass'y.
		(5) Bent flange of the detector ass'y.	B	- Check if the flange is bent.	- Replace the detector ass'y.
		(6) Foreign particles adhered to the trigger plate and the trigger yoke of the selective gear ass'y.	A	- Check for the adhesion of foreign matter. - Check for the adhesion of paper dust.	- If foreign particles are adhered, remove them.

PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
4. Missing characters or missing printing.	Missing characters occur in all columns.	(7) Scratches or burrs on the trigger plate or trigger yoke section (selective gear ass'y).	B	- Check the trigger plate and trigger yoke section for scratches and burrs.	- Replace the trigger plate and/or selective gear ass'y.
		Printing of characters other than those that should be printed.	(8) Improper mounting position of the print gear.	B	- See Main Assembly A in the chapter 4 and check.
	Printing of characters other than those that should be printed.	(9) Defective carryng.	B	- See PHENOMENON 8.	
		(10) Defective carriage return.	B	- See PHENOMENON 8.	
5. Smudged or faint printing.	Generation of smudged or faint printing	(1) Improper position of ink roll ass'y.	A	- See Installation of Ink Roller Ass'y in chapter 2 and check.	- Properly re-mount it.
		(2) Use of improper ink roll ass'y.	A	- Check if the specified ink roll ass'y is being used. Rated pulse width: IR 40.	- Properly re-mount it. Use only the specified part.
		(3) Stretching of the ink roll spring.	A	- Remove the ink roll ass'y to check if the springs stretched.	- Replace the ink roll spring.
		(4) No ink supply.	A	- Check the ink supply status.	- Replace the ink roller ass'y
		(5) Wear to the print cam, hammer transmission lever ass'y and hammer.	B	- See CAUSE (2) of PHENOMENON 3	
		(6) Dirt adhered to the print wheel ass'y or platen ass'y.	A	- Check for the adherence of ink clumps, paper dust, etc.	- Remove any dirt.

PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
5. Smudged or faint printing.	Generation of smudged or faint printing	(7) Bent platen ass'y (the metal section at the paper outlet).	A	- From the top of the printer, check if the platen ass'y is bent.	- Repair the metal section or replace the platen ass'y.
6. Paper is not fed.	The motor rotates normally, but paper not fed.	(1) Defective conductivity of jumper wires.	A	- See CAUSE (2) of PHENOMENON 1.	
		(2) Broken coil lead or trigger coil.	B	- See CAUSE (2) of PHENOMENON 2.	
		(3) Abnormal charge pulses to the trigger coil.	-	- See CAUSE (6) of PHENOMENON 2.	
		(4) Foreign matter has entered the paper guide of the platen ass'y.	A	- Check the paper guide path.	- Remove any foreign matter.
		(5) Worn or scratched paper feed gear train.	B	- Manually set the trigger lever to drawn status then feed the paper to check if any of the below gears are scratched or worn. - Paper feed ratchet wheel, paper feed drive gear ass'y, paper feed transmission gear, or paper feed gear.	- Replace any faulty parts.
		(6) Loose or damaged paper hold roller in the platen ass'y.	A	- Check if the platen ass'y is improperly mounted and if the paper hold roller is damaged.	- Properly re-mount the platen ass'y or replace it.
7. Uneven paper feeding pitch.	The line spacing of printed character is uneven	(1) Use of improper paper.	A	- Check that the specified paper is being used. Standard: See subsection 2.2 Specification.	- Use the specified paper.

PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
7. Uneven paper feeding pitch.	The line spacing of printed character is uneven.	(2) Processing installation of the platen ass'y.	A	- See CAUSE (1) of PHENOMENON 3.	
		(3) Defective platen ass'y.	B	- Check the paper feeding rubber for wear.	- Replace the platen ass'y.
		(4) Defective paper feed drive gear ass'y.	B	- Check if any of the internal springs are bent.	- Replace the paper feed drive gear ass'y.
		(5) Wear or damage to the gears.	B	- See CAUSE (5) of PHENOMENON 6.	
		(6) Defective supplying of paper.	A	- Check the paper supply path for obstructions.	- Repair each paper supply mechanism.
8. Defective carrying.	The carriage does not perform carrying.	(1) Wear of the trigger lever.	B	- Check the trigger lever for wear (interlocking section with selecting ratchet). 	- Replace the trigger lever.
		(2) Wear of the selective pawl.	B	- Check the selective pawl for wear. 	- Replace the selective pawl.

PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
8. Defective carrying.	The carriage does not perform carrying.	(3) Wear or broken teeth of the print cam and positioning plate.	B	- Check each part for wear and missing teeth. 	- Replace the print cam and positioning plate.
		(4) Abnormal input pulse to the trigger coil.	-	- Check the circuit to see if the pulsewidth of the carrying charge pulses is correct.	- Perform repair on the circuit side.
		(5) Malfunction of the positioning plate.	B	- With the positioning plate in its unlocked status, check for stretching of the return lever spring and for foreign matter adhered between the positioning shaft and positioning plate.	- Replace the return spring. - Remove any foreign matter.
9. Defective carriage return.	The carriage doesn't return.	(1) Wear of the return lever.	B	- Check the return lever for wear. 	- Replace the return lever.
		(2) Stretching of the return lever spring.	A	- Check the return lever spring for stretching.	- Replace the return lever spring.
		(3) Stretching of the carriage spring and print wheel spring.	B	- Check the carriage spring and print wheel spring for stretching.	- Replace the faulty part.

PHENOMENON	CONDITION	CAUSE	LEVEL	CHECK POINT AND METHOD	REPAIR METHOD
9. Defective carriage return.	The carriage doesn't return.	(4) Wear of the point where the cam section of the positioning plate contacts the frame.	B	- Check the point where the cam section of the positioning plate contacts the frame. 	- Replace positioning plate.
		(5) Abnormal input pulse to the trigger coil.	-	- Check the circuit to see if the pulse width of the return charge pulses is normal.	- Perform repair on the circuit side.
		(6) Carriage malfunction.	A	- Check if dirt has adhered to section where the carriage rubs against the print wheel ass'y	- Remove any dirt.

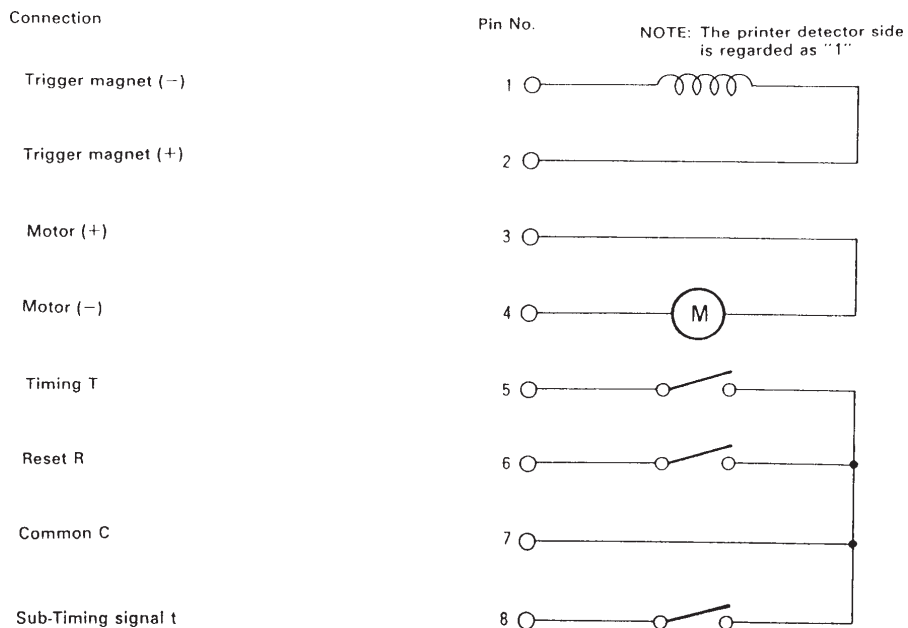
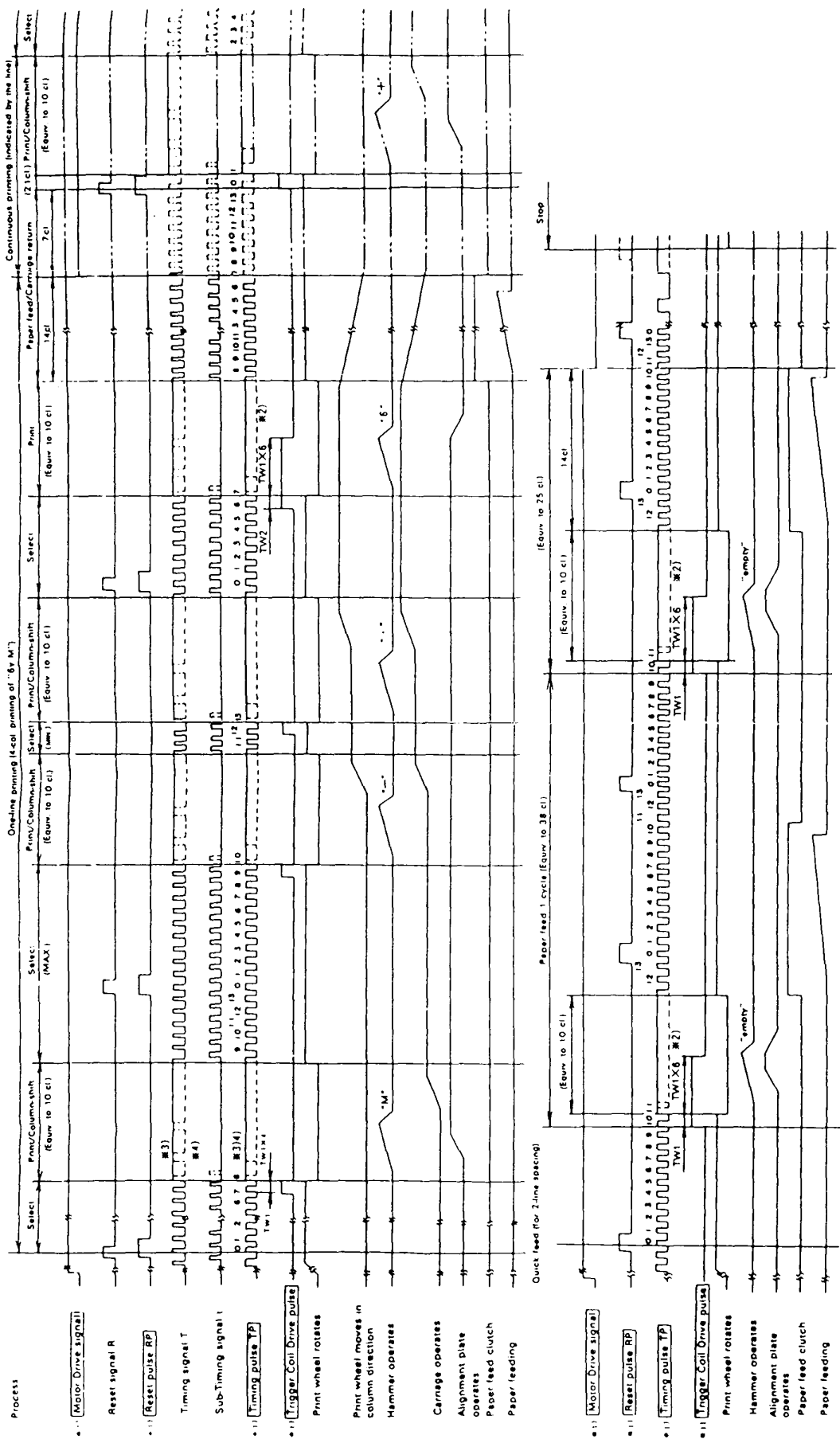


Fig. 3-6 Pin Assignment Diagram



- NOTES: The signals and pulses enclosed by a box are to be supplied by the user.
- The highest-order pulsewidth of the Trigger Coil Drive pulse for a line equals the Timing pulse interval TW2 during selection plus six times the Timing pulse interval for selection of the first column. For paper leading, the pulsewidth is the Timing pulse interval TW1 of the empty position during selection plus six times TW1.
 - During printing and carrying, the Timing signal T may show the signal level indicated in this chart by a dotted line.
 - During printing and carrying, the Timing Reserve signal t may enter the MAKE status within a time interval four times the Timing pulse interval TW1 during selection of the first column. In other print/carry areas, it is in the BREAK status. In such case, if the MAKE status of the Timing Reserve signal t is present, the Timing signal T is either MADE by the end of four TW1 intervals or is not MADE by the end of printing/carrying.
 - cl represents the cycle of a timing pulse.

Fig. 3-7 Timing Chart

4. ASSEMBLY AND DISASSEMBLY

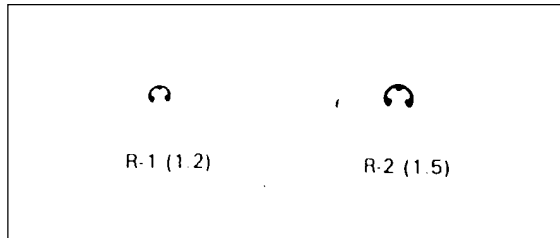
4.1 GENERAL

- Assembly and Disassembly are performed using procedures described in figure 4-1.
- The presence in the assembly procedure column of a “★” mark signifies that a <CHECK> is necessary; the presence an “◆” in the assembly procedures means there is a <DISASSEMBLY POINT> in the Assembly Points. It will be useful to refer to Assembly Points to confirm reassembling methods of reassembling as the components are disassembled.
- Underlined words in the Reassembly Step indicate that lubrication is required before fitting that component and that such lubrication would be very difficult if attempted after fitting is completed.
- A detailed description of lubrication, including points requiring lubrication upon completion of assembly, is given in section 3.3.3, “Lubrication Points”. Perform lubrication also with reference to Fig. 4-2, “Lubrication Points” at the back of this Chapter.
- Small parts are all represented by abbreviations.

List of Abbreviations for Small Parts

Symbol	Designation	Standard
S-1	Cup screw	M2 x 2.9
S-2	Cup screw	M2 x 3.5
R-1	Retaining ring TYPE-E	1.2
R-2	Retaining ring TYPE-E	1.5

Actual Size of Small Parts



4.2 MACHINE DISASSEMBLY - REASSEMBLY

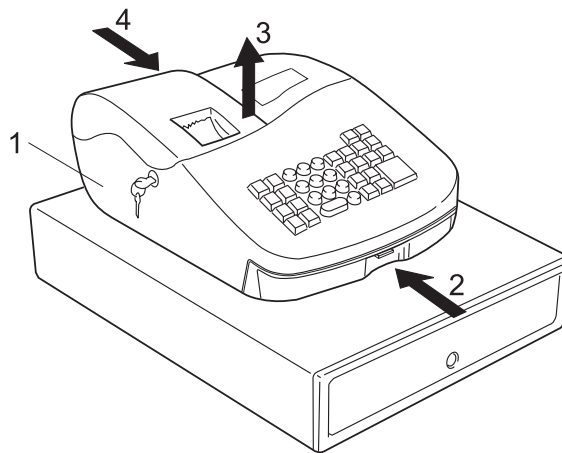
4.2.1 Machine Case

Disassembly

- Unplug the machine power cord from the electrical wall outlet.
- Push the case of the machine (1) in the direction of the arrow (2).
- Remove the case (1) by lifting it the direction of arrow (3).

Reassembly

- Correctly position the case on the machine (1).
- Push the case (1) in the direction of arrow (4).
- Plug the machine power cord into the electrical wall outlet.



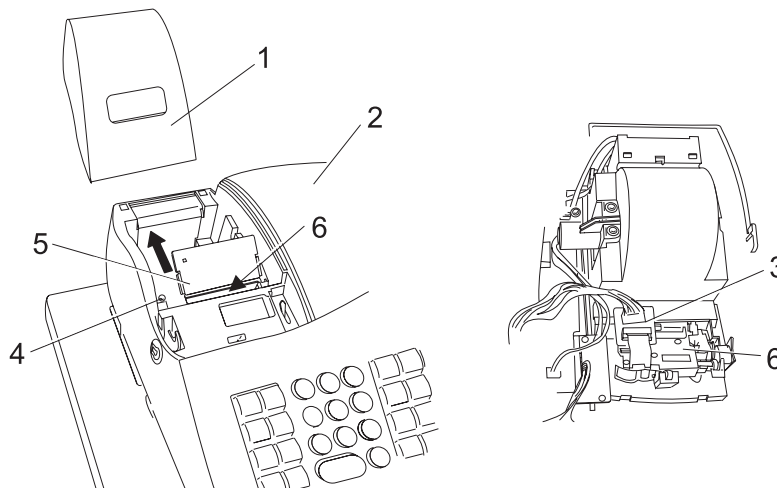
4.2.2 Printer Unit

Disassembly

- Remove the printer compartment cover (1).
- Remove the machine case (2).
- Disconnect connector (3).
- Using a screwdriver, remove screw (4) that secures the paper support (5) and remove this support.
- Remove the printer (6) in the direction of the arrow shown being careful to avoid damaging the connection cables.

Reassembly

- Correctly position the printer (6) as shown in the figure.
- Correctly position the paper support (5) and tighten its related securing screw (4).
- Reattach the connector (3).
- Refit the case of the machine (2) and the printer compartment cover (1).



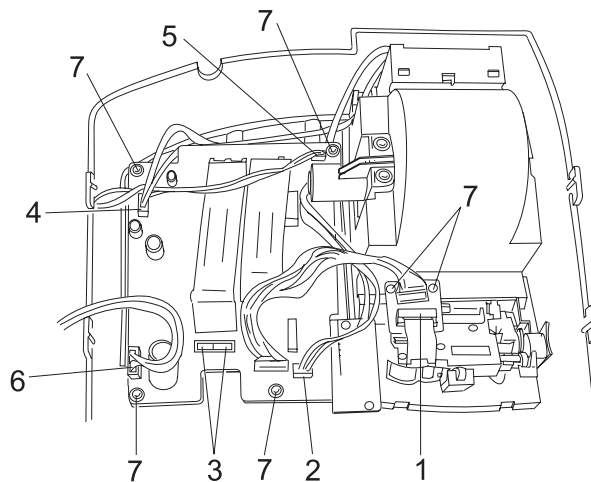
4.2.3 Main Board and Display

Disassembly

- Remove the machine case.
- Disconnect the printer connector (1).
- Disconnect the paper feed motor connector (2).
- Disconnect the keypad connectors (3).
- Disconnect the battery supply connectors (4).
- Disconnect the drawer open control mechanism connector (5).
- Disconnect the power supply connector (6).
- Using a screwdriver, remove the securing screws (7).
- Remove the main board (8).

Reassembly

Perform the disassembly procedure in reverse order.



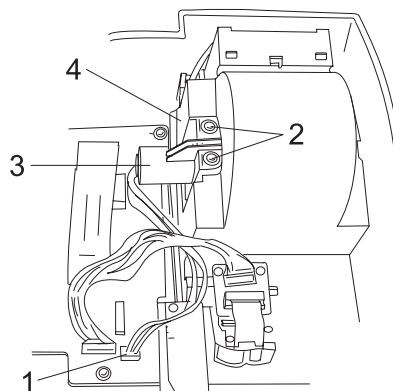
4.2.4 Paper Feed Motor

Disassembly

- Remove the machine case.
- Disconnect the motor power supply connector (1).
- With a screwdriver, remove securing screws (2).
- Remove motor (3) with its related support (4).

Reassembly

- Correctly position motor (3).
- Tighten securing screws (2).
- Reconnect the motor power supply connector (1).
- Refit the machine case.



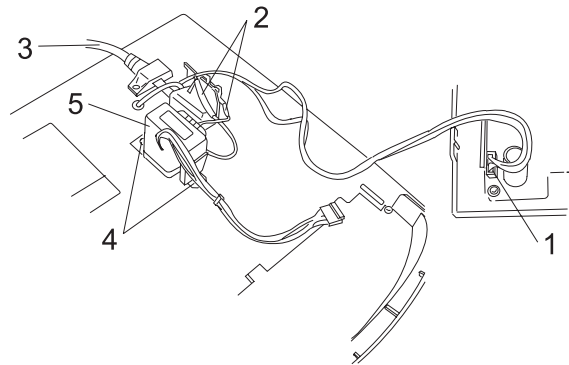
4.2.5 Power Supply

Disassembly

- Remove the machine case.
- Disconnect the power supply - main board connector (1a) and the drawer open mechanism - main board connector (1b).
- Slightly pull back the protection sheath (2).
- Using the appropriate tool, cut the junctions between the power cord (3) and the power supply cables.
- Remove the power supply securing screws (4).
- Remove the power supply (5).

Reassembly

- Correctly position the power supply (5) into its seat.
- Tighten the securing screws (4).
- Using the appropriate tool, restore the connections that were previously cut.
- Replace the protection sheaths (2).
- Reconnect the power supply - main board connector (1) and the drawer open mechanism - main board connector.
- Refit the machine case.



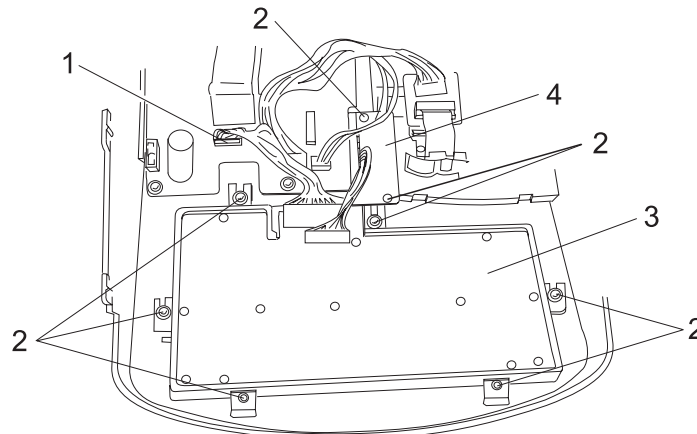
4.2.6 Keypad

Disassembly

- Remove the machine case.
- Disconnect the keypad - main board connectors (1).
- Using a screwdriver, remove securing screws (2).
- Remove the keypad (3) together with the machine's ON/OFF switch (4).

Reassembly

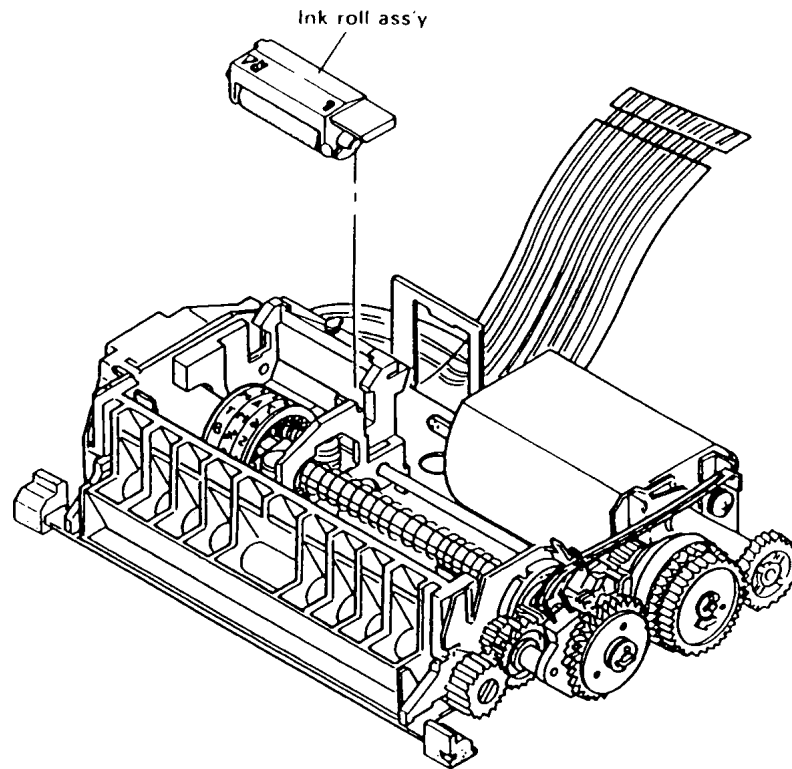
- Correctly position the keypad (3) and the ON/OFF switch (4).
- Tighten the securing screws (2).
- Restore connection (1).
- Refit the machine case.



4.3 PRINTER DISASSEMBLY - REASSEMBLY

4.3.1 Ink Roller

- Grasp the tab of the ink roller and lift it out of its slot.



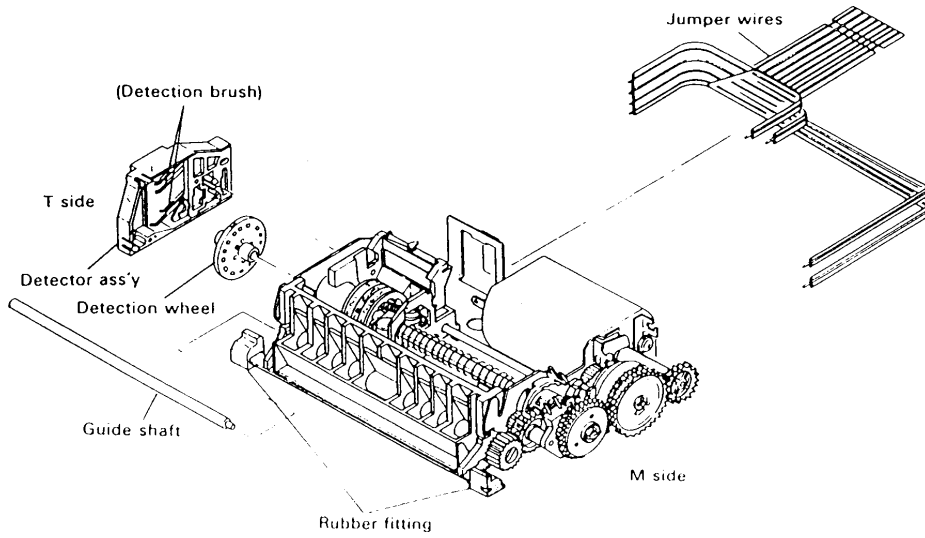
Refitting the Ink Roller

- Position the ink roller in its slot and then press it until it snaps into place.

4.3.2 Electrical Connections

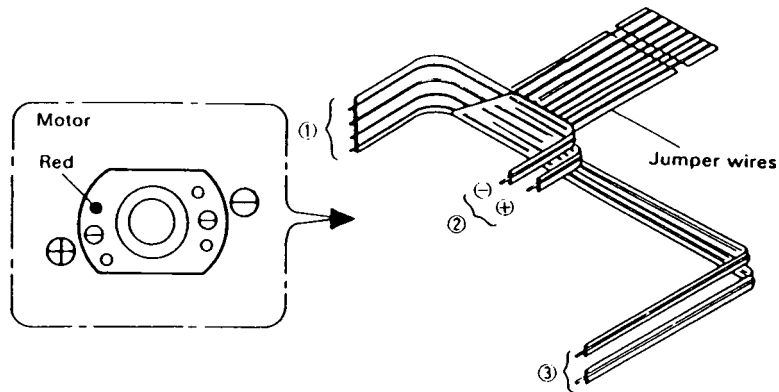
Disconnecting

- With the appropriate tool, cut the electrical connections and remove the connection cables.



Reconnecting

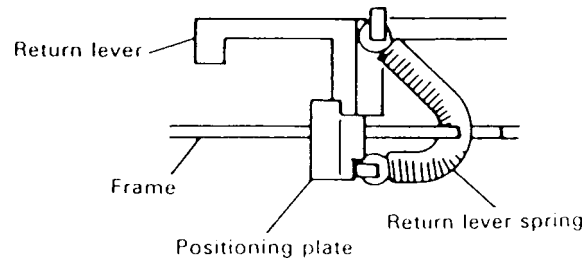
- With the appropriate tool, restore the electrical connections that were previously cut.



4.3.3 Return Spring

Disassembly

- Using the appropriate tool, release the spring at its ends and remove it.



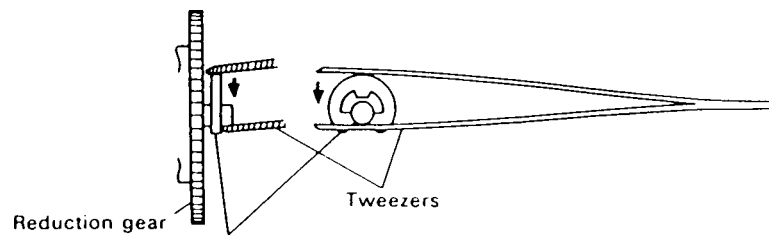
Reassembly

- Position the spring and hook it in place by placing its ends into the corresponding slots.

4.3.4 Snap Ring

Disassembly

- Using tweezers, remove the snap rings from the gears.



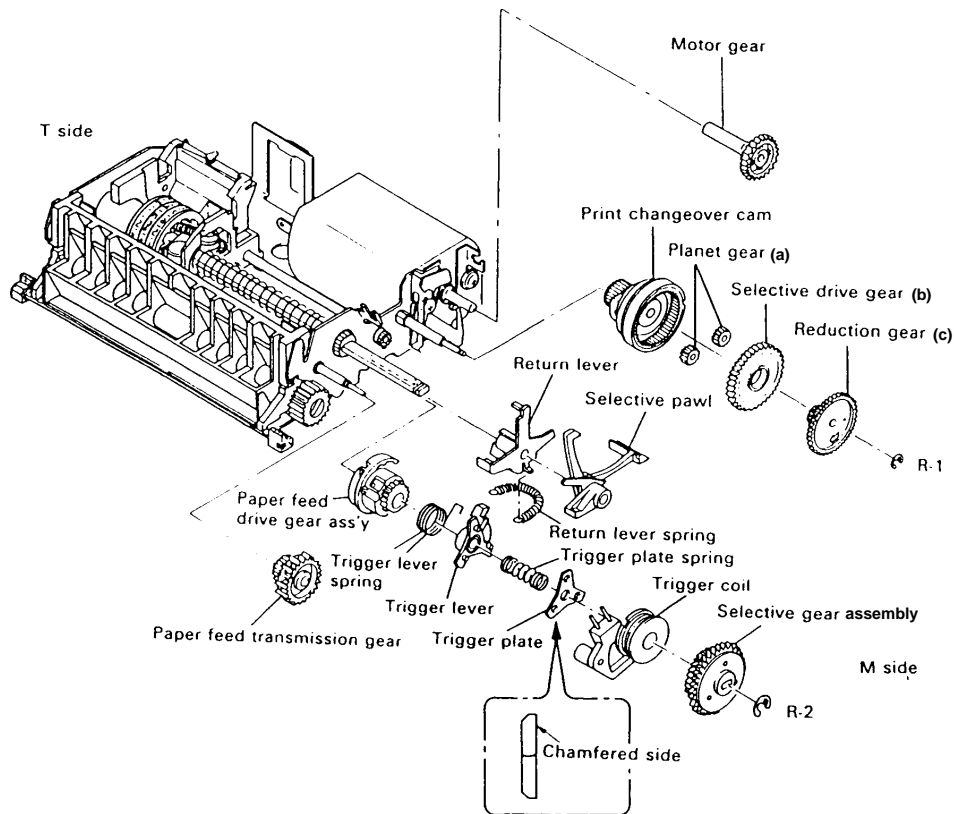
Reassembly

- Position the snap ring in place and secure it using tweezers.

4.3.5 Gear

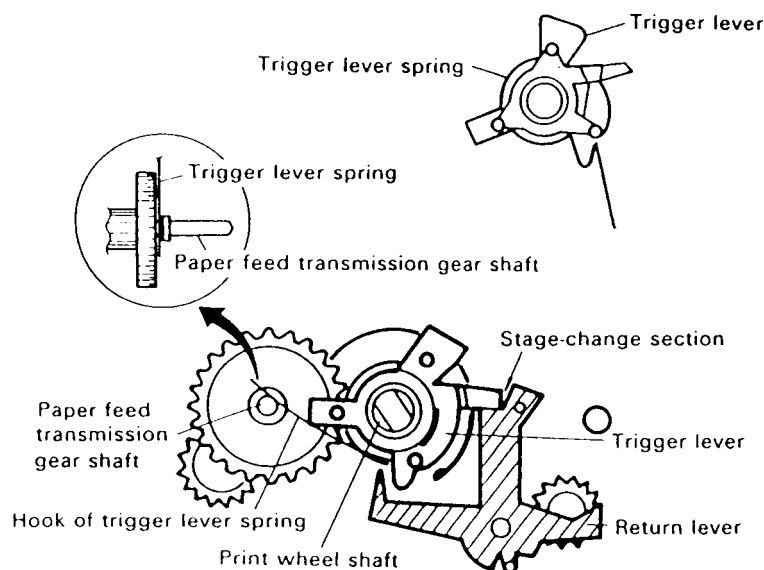
Disassembly

- Being careful to avoid loosening and/or damaging any part, remove the printer reduction gear - movement assembly as shown in the figure.



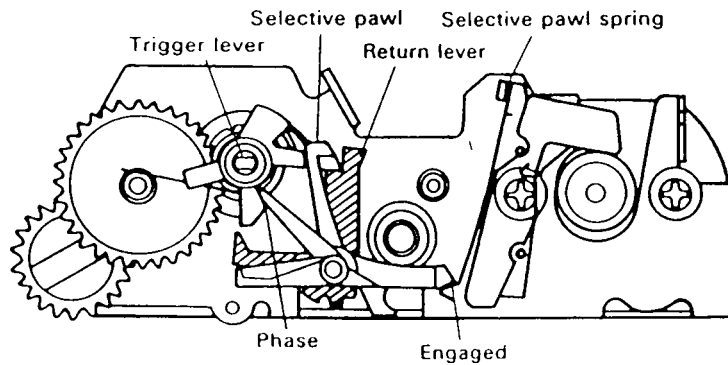
Reassembly

- Fit onto the print wheel shaft.
- Fit onto the paper feeding transmission gear shaft.
- Fit onto the positioning shaft.
- Assemble the trigger lever and trigger lever spring, then fit the assembled piece onto the print wheel shaft.
- After aligning the trigger lever with the stage-change section of the return lever, attach the hook of the trigger lever spring to the groove in the paper feed transmission gear shaft.
- Fit the positioning shaft then engage it with the selective pawl spring.

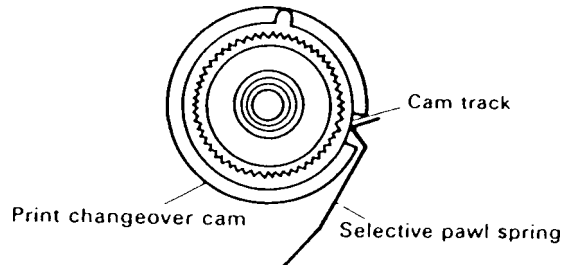


★ CHECK

- Check that its phase matches the trigger lever phase.



- Make sure that the phase of the print gear is properly aligned.
- Fit the print changeover cam so that the stopper of the selective pawl spring engages with the cam track on the outer periphery of the print shift cam.



- Make sure that the chamfered side faces outward.
- Fit onto the print wheel shaft and paper feeding transmission gear shaft.
- While matching the three dowels of the trigger lever to the openings of the trigger plate, press the opposite end of the print wheel shaft and press on the selecting gear assembly, then secure it with R-2.
- Push the tip of the print wheel shaft from the T side toward the T side so that the selective gear assembly contacts R-2.

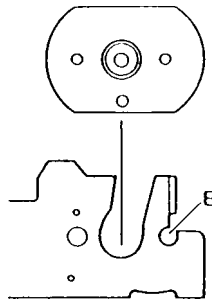
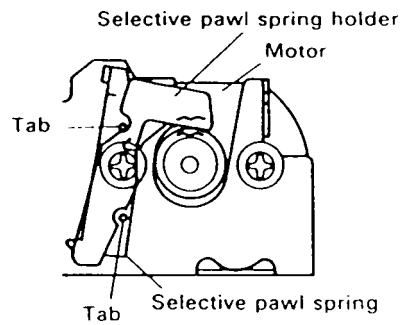
★ CHECK

- Before re-fitting the selective gear assembly during parts replacement or other occasions, make sure that the detection wheel and detector assembly have been removed (otherwise, the detection wheel and detector assembly may be damaged).
- Assemble parts a through c, fit the assembled piece onto the reduction shaft, then secure by R-1.

4.3.6 Motor

Disassembly

- Using a screwdriver, remove the securing screws.
- Remove the selection lever, related spring and then remove the motor.



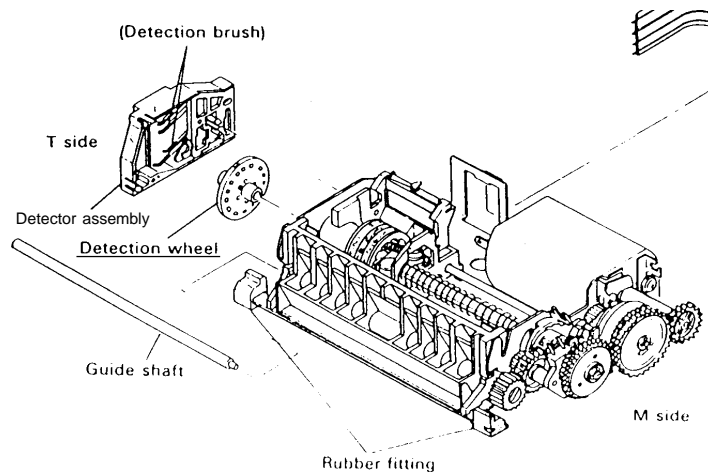
Reassembly

- Fit the motor with the round hole on its screw-hole side closest to the bottom, then secure section E by screw.
- Fit the spring onto the tab on the M side of the frame assembly.
- Fit the selective pawl spring holder, then secure by screw in the position where the selective pawl spring holder contacts the outer periphery of the motor shaft holder (~).

4.3.7 Detection Wheel

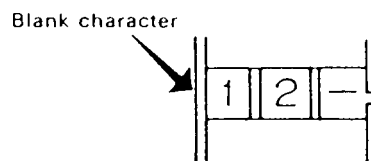
Disassembly

- Remove the detector assembly with related brushes.
- Slide the wheel off the guide shaft.



Reassembly

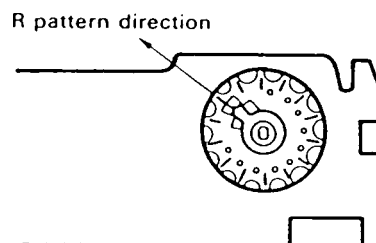
- Align the blank character of the print wheel with the print position of the platen.
- The rotation of the print wheel causes the motor gear to rotate in the counter-clockwise direction.



- Press the detection wheel onto the print wheel shaft.

★ CHECK

- Position the R pattern of the detection wheel towards the upper left diagonal direction.



- Pass the shaft along the track in the carriage from the frame T side to the frame M side.
- Match the tabs of the detector assembly to the related positions of the frame assembly, then fit the detector assembly.

★ CHECK

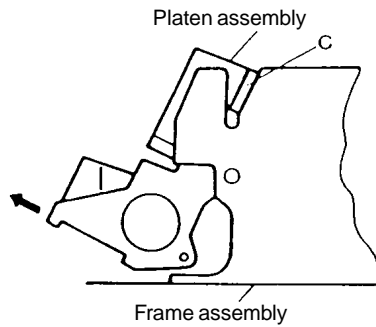
- Make sure you do not deform the detection brush of the detector assembly.

◆ DISASSEMBLY POINT

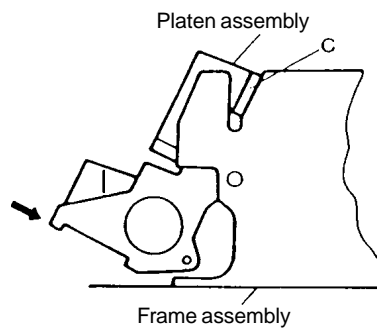
- To remove the detector assembly, release the hooks.

4.3.8 Platen Assembly Removal

- Remove the assembly in the direction of the arrow and lift it off.

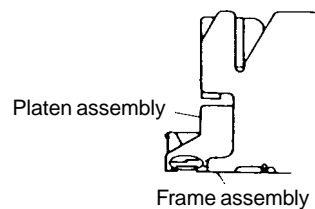


- Fit section C of the platen assembly into the frame assembly, then press the platen assembly in the → arrow direction.



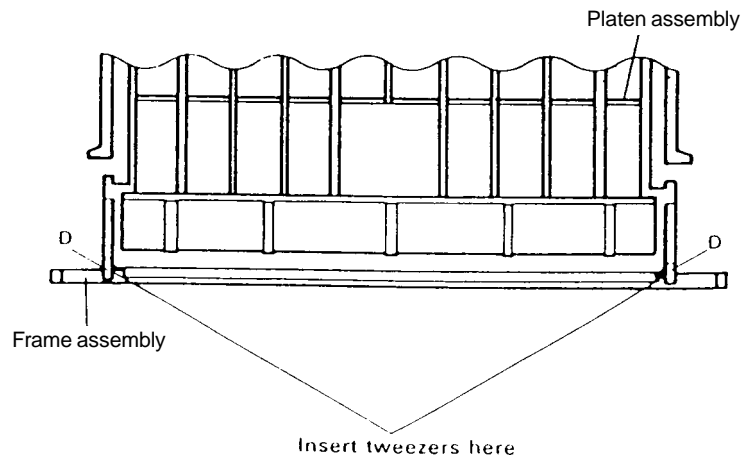
★ CHECK

- Make sure there is no gap between the platen assembly and frame assembly (at the section indicated by).



◆ DISASSEMBLY POINT

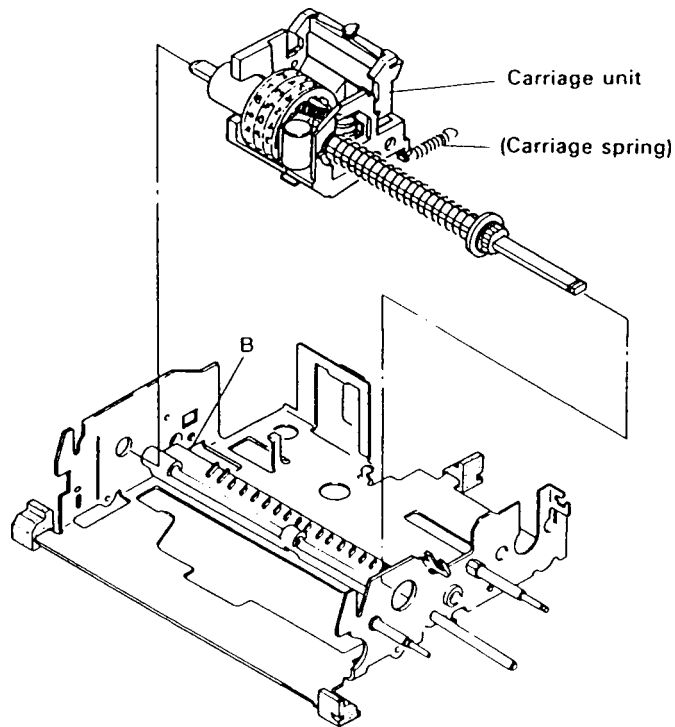
- To remove the platen assembly, insert tweezers into the gap between the bottom of the platen assembly and the frame assembly and then release section D.



4.3.9 Printer Carriage

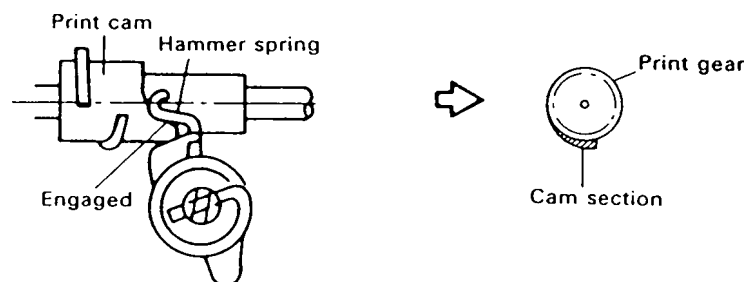
Removal

- Release the printer carriage spring from the structure and then slide the carriage off.



Reassembly

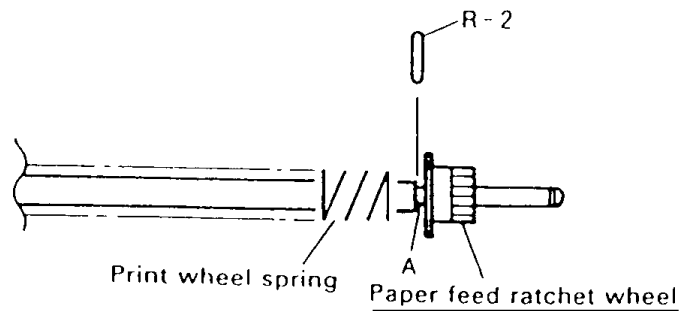
- Fit the carriage unit onto the frame assembly, making sure not to squash the carriage spring.
- Hook the carriage spring to section B of the frame assembly.
- Fit the print gear onto the print shaft.
- Pass the print shaft through the carriage unit from the M side of the frame assembly, engage the print cam and the hammer spring, then align the phase of the print gear so that its cam section is at the bottom.



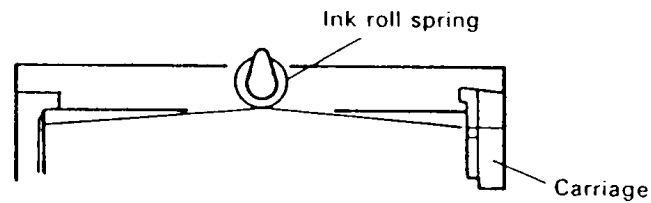
4.3.10 Printer Carriage

Disassembly

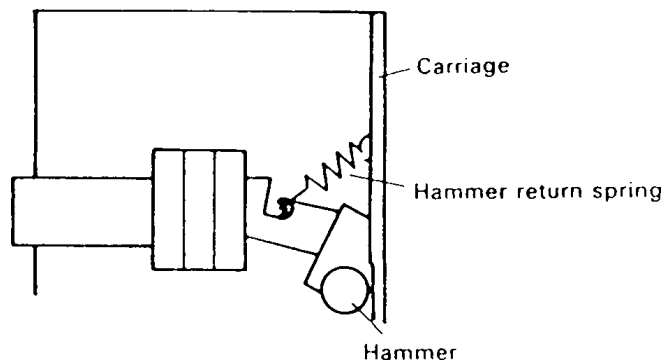
- Remove the paper feed wheel and then remove the R-2 ring from its position A.
- Remove the spring.
- Remove the printer shaft.



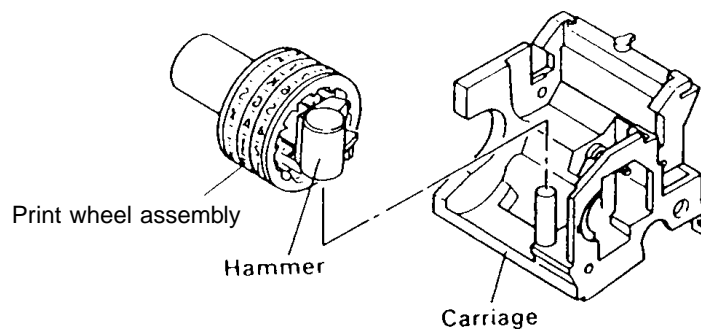
- Remove the ink roller securing spring from the carriage.



- Remove the hammer return spring.

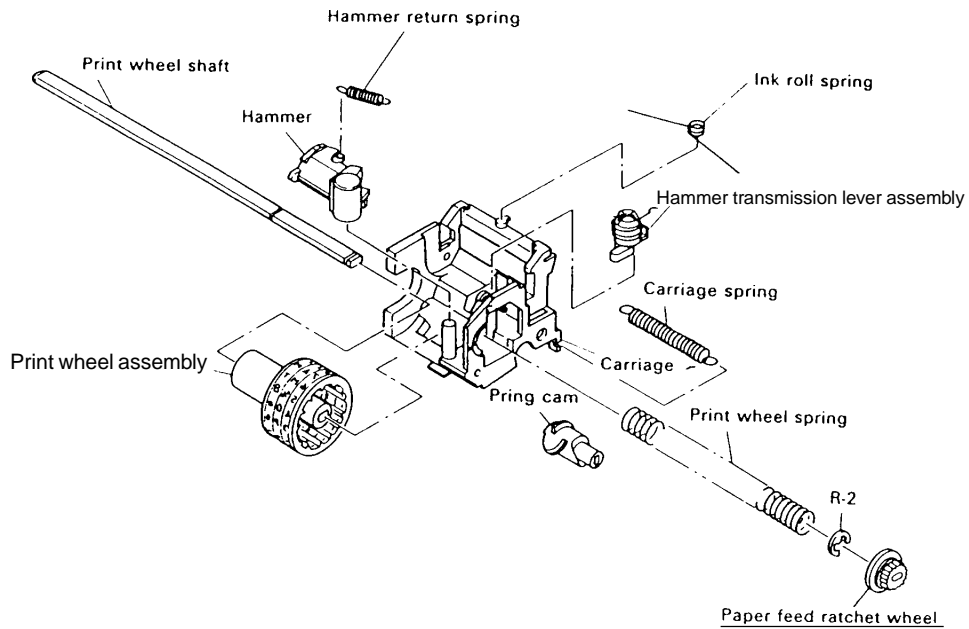


- Remove the print wheel assembly - hammer from the carriage.



Reassembly

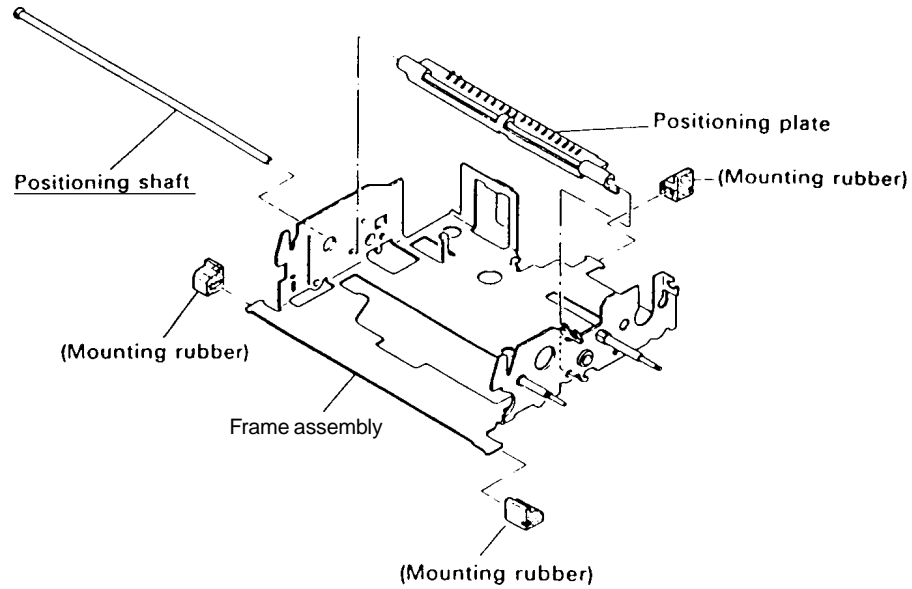
- Fit the hammer onto the print wheel assembly, then fit the assembled piece in the carriage.
- Fit from the bottom of the carriage.
- Attach the spring to the hammer and the carriage.
- Make sure you fit the ink roll spring so that it is properly oriented.
- Secure R-2 to section A of the print wheel shaft, then fit the print wheel spring and paper feed ratchet wheel.
- Pass the shaft through the hammer and print wheel assembly which the print wheel are fitted onto the carriage.



4.3.11 Machine Case

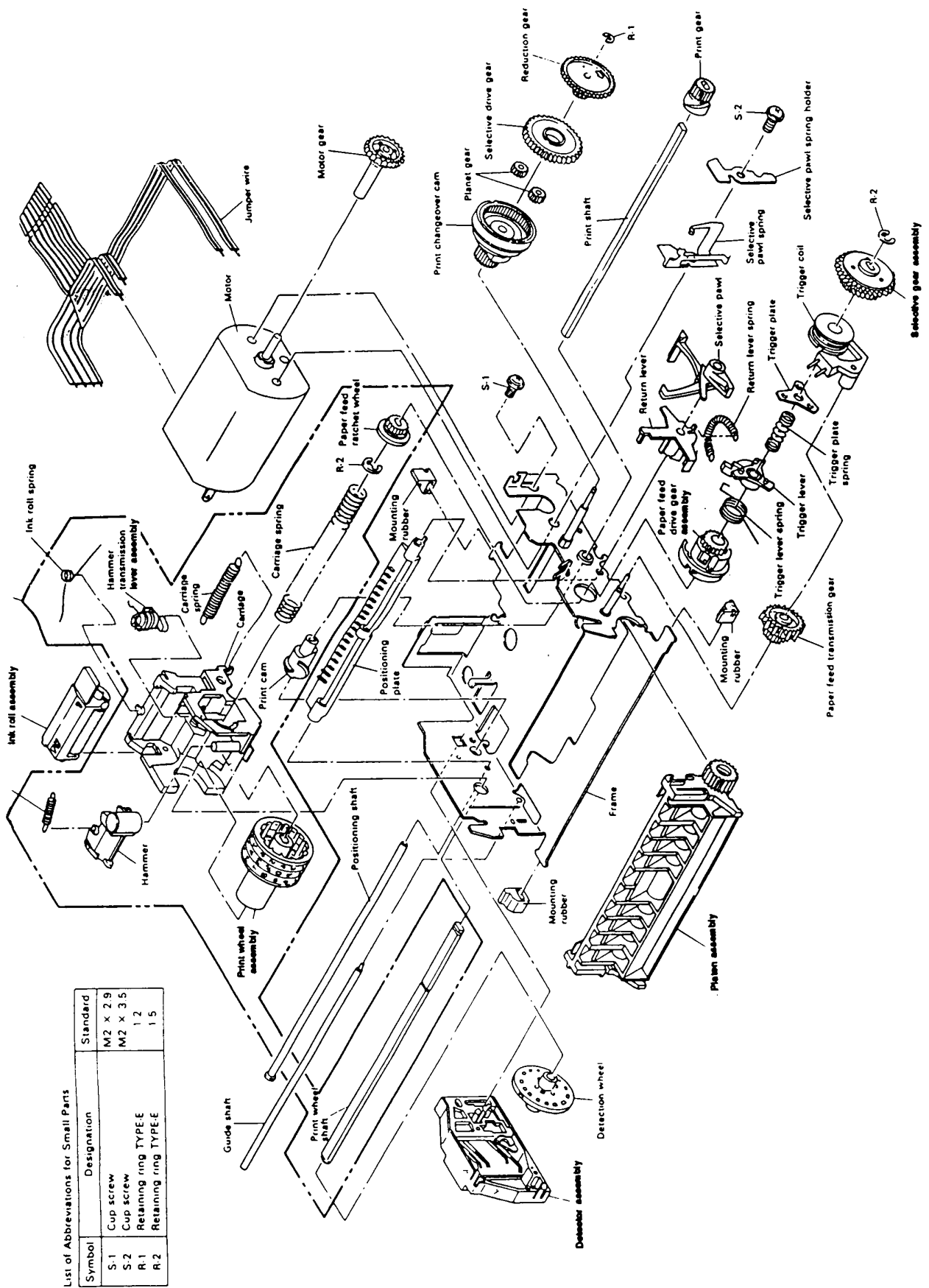
Disassembly

- Remove the positioning shaft with related positioning plate.
- Remove the mounting rubber.



Reassembly

- To reassemble follow the disassembly procedure in reverse order.



List of Abbreviations for Small Parts

Symbol	Designation	Standard
S-1	Cup screw	M2 x 2.9
S-2	Cup screw	M2 x 3.5
R-1	Retaining ring TYPE-E	1.2
R-2	Retaining ring TYPE-E	1.5

Fig. 4-1 Exploded View

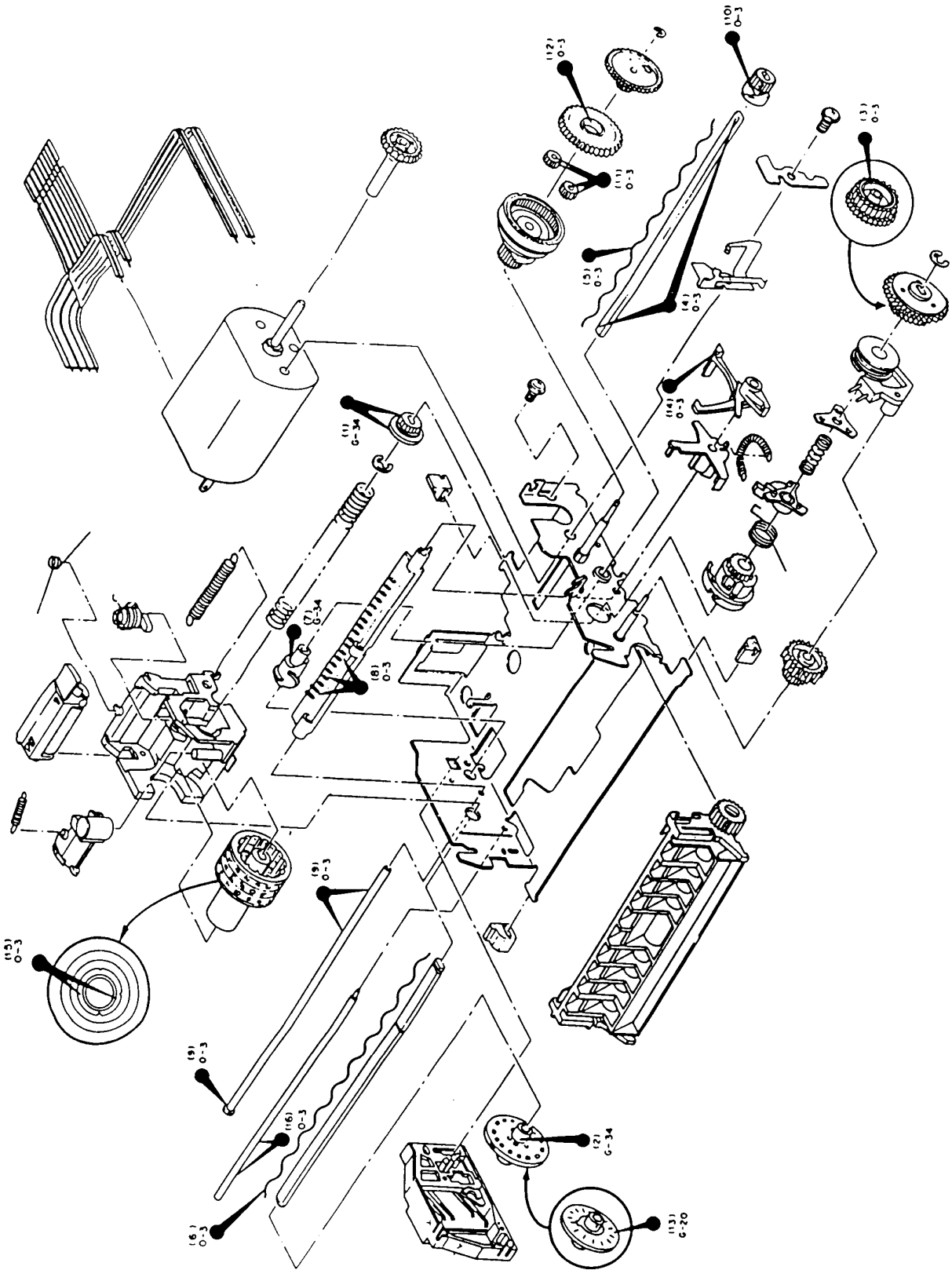


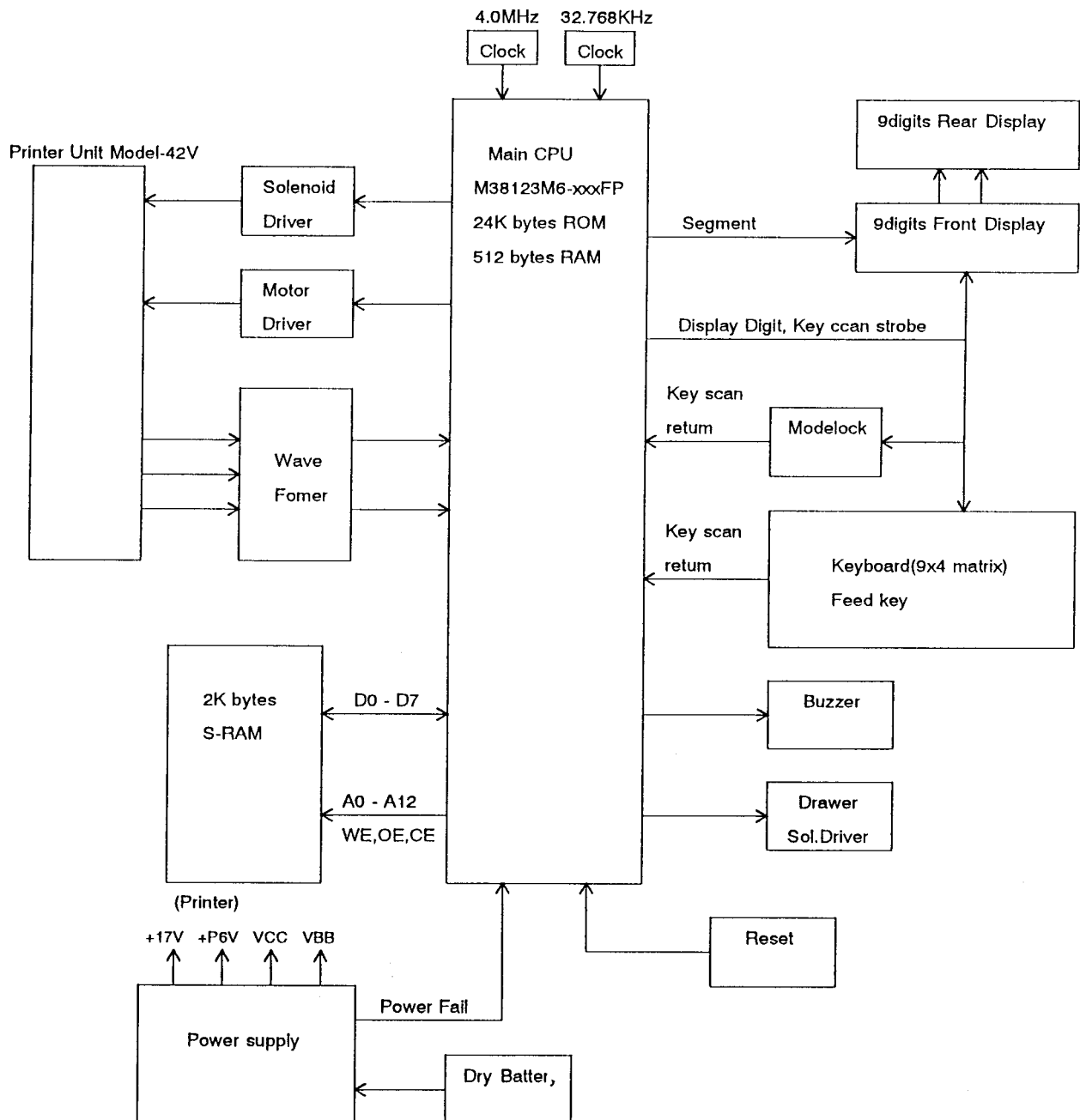
Fig. 4-2 Lubrification Points

5. CIRCUITRY

5.1 GENERAL

The terminal uses a 8-bits single chip microcomputer The CPU has 24K bytes of internal ROM and 512 bytes of internal RAM , and used 2K bytes S-RAM of external memory. The terminal also has a battery-backed up clock that keeps track of the month, day of the week, date, hour and minute.

5.1.1 Block Diagram



5.2 POWER SUPPLY CIRCUIT

+17 V

+6 V, the printer motor voltage, is generated using the 15.6 VAC input across Pins 1 and 2 of CN5. This AC voltage is rectified by the bridge rectifier and filtered by EC3, a 4700 uF capacitor. The resulting DC voltage is about +17 V.

+6 V

The circuit generating the +6 V uses the 17 V. It applies to the collector of T10, a D837B transistor. It is also dropped across R26, a 2.2 KOhm resistor, and D24, rated at 6.8 V. This provides a bias voltage of about 6.8 VDC on the base of T5. This output voltage is filtered by capacitor EC4 and supplied to the emitter of transistor T5. This voltage is used by the printer.

+5 V

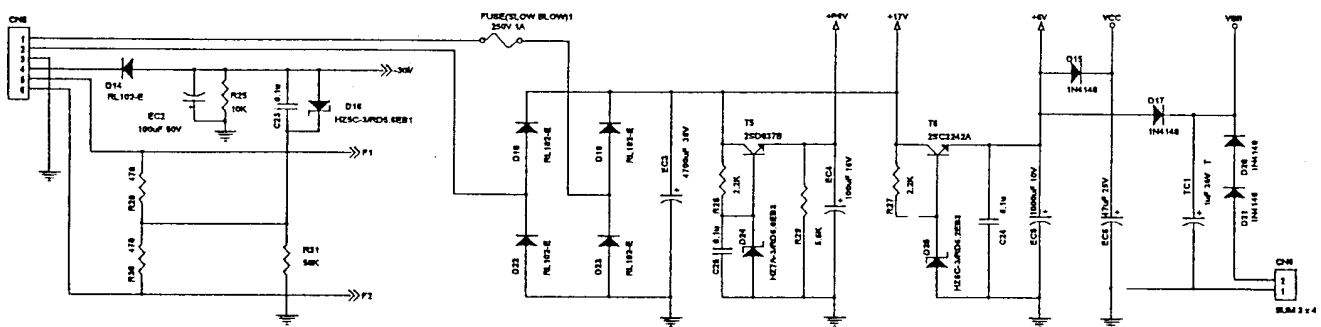
The circuit generating the +5 V uses the 17 V. It applies to the collector of T6, a C3242A transistor. It is also dropped across R27, a 2.2 KOhm resistor, and D25, rated at 6.2 V. This provides a bias voltage of about 6.2 VDC on the base of T6. This output voltage is filtered by capacitor EC5 and supplied to the emitter of transistor T6. This voltage is through the D15 diode, output voltage is 5.3 V.

-30 V

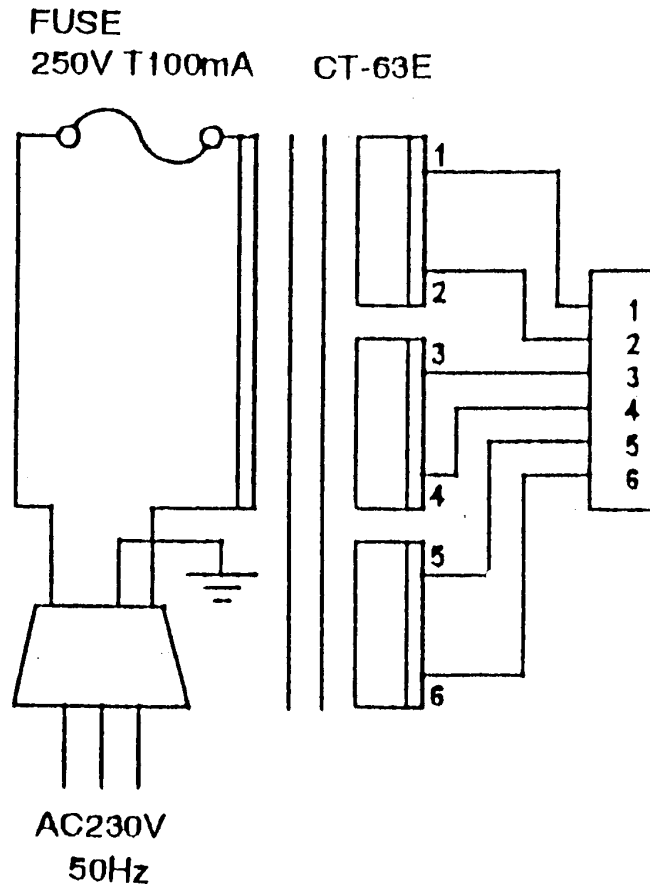
The -30 V circuit uses 27.5 VAC across Pins 3 and 4 of CN5. This AC voltage is rectified by D5, a diode, and filtered by EC2; output voltage is approximately -30V DC. This voltage is used by the display.

Filament Voltage

The filament voltage F1.F2 is used by the display tube. Its AC input is 4.0 V, and uses a ground reference -25 V from the -30 V circuit dropped across R28, R30, an 470 Ohm resistor.



5.3 TRANSFORMER WIRING DIAGRAM



5.4 POWER SUPPLY SPECIFICATIONS

Input - Power Consumption

Standing by: Maximum 9 Watts
 Printing: Maximum 16 Watts

Output - Rated Voltage

+5V to GND

Voltage: 5 V +/- 0.25 V
 Ripple: Less than 0.4 V p-p
 Stability: Line regulation - less than 0.3 V
 Temp. regulation - less than 0.3 V

Standing by
 Printing
 Viac -10% to +10%
 Temp. 0°C to 40°C

+6V to GDN

Voltage: 6.0 V +/- 0.5 V
 Ripple: Less than 1.0 V p-p
 Stability: Line regulation - less than 1.0 V
 Temp. regulation - less than 1.2 V

Standing by
 Printing
 Viac -10% to +10%
 Temp. 0°C to 40°C

-30 to GDN

Voltage: -30 V +/- 2.0 V
 Ripple: Less than 5.5 V p-p
 Stability: Line regulation - less than 8.5 V
 Temp. regulation - less than 2 V

Standing by
 Standing by
 Viac -10% to +10%
 Temp. 0°C to 40°C

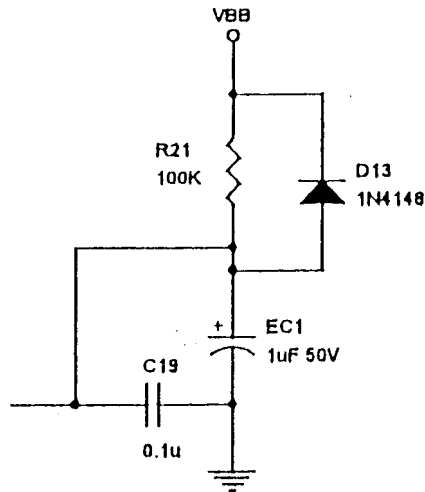
F1 to F2

Voltage: 4.0 +/- 0.2 Vac
 Stability: Line regulation - less than 1.0 V

Viac -10% to +10%.

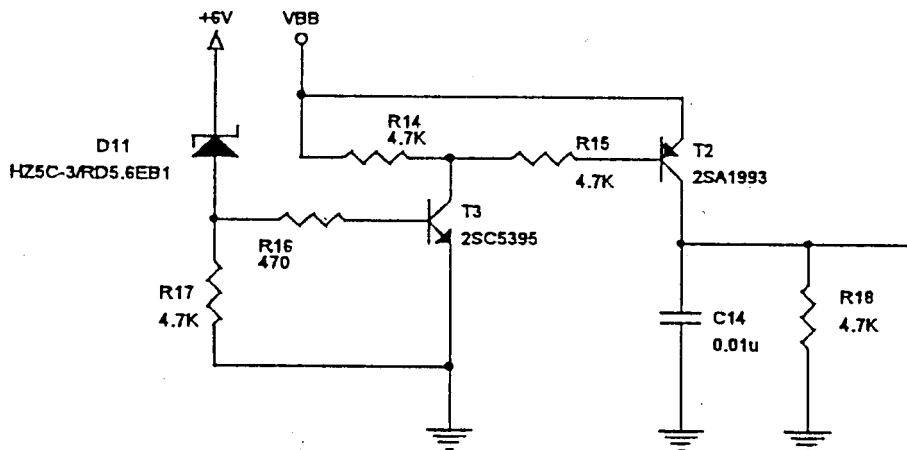
5.5 RESET CIRCUIT

The reset circuit prevents the CPU from starting to operate before the system is fully powered-up and initialized. Then 2uS after power is applied, reset goes high and the CPU can begin functioning. When power is first applied to the circuit, the VBB begins charging EC1, a capacitor. While EC1 is charging. Once EC1 is fully charged, the voltage drops across the capacitor.



5.6 POWER FAIL CIRCUIT

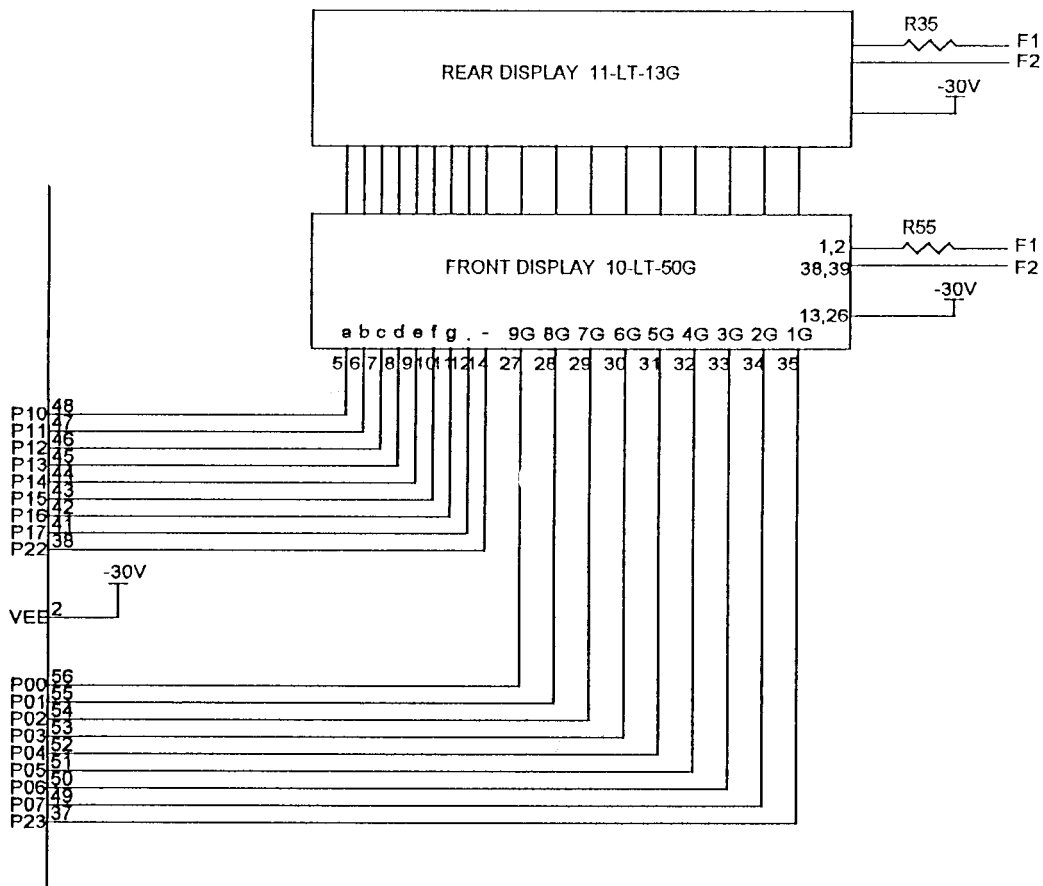
Power fail is generated by a circuit using the +6 V voltage. When power is on and the system is operating normally, the power fail signal stays at a high level.



5.7 DISPLAY CIRCUIT

Display control is done by timer interrupt routine of CPU. Cycle of the timer is about 680 usec. P00 through P07,P23 indicates scan signal of displayed digit and displayed digit of scan is done from G1 to G10 and each digit is turned on sequentially.

P10 through P17,P22 indicates segment signal and these are connected to each segment of the digit. Along with Segment signal and Grid signal, High level segment is turned on. I/O port of the CPU, which controls Segment and Grid, is high-voltage port and directly drives fluorescent display. High-voltage port is special I/O port designed for fluorescent display and VEE level (-30 V) will be output as a low level. Front display and Rear display are connected in parallel.



5.8 DISPLAY TUBE INFORMATION

8 . 8 . 8 . 8 . 8 . 8 . 8 . 8 . 8 . 8

G10 G9 G8 G7 G6 G5 G4 G3 G2 G1

G1-G7 **AMOUNT**
G8 **REPEAT/DEPT#**
G9 **SIGN/DEPT#**
G10 **NOT USED**

←
Clerk1 (G9)
-Clerk6 (G4)

Display Symbols

Discount

Minus amount Error Change Total Subtotal Prg. mode

- E C = S P

Display specification

- Display tube front 10LT-50G
 rear 11LT-13G
- Character size front 4 mm (H) x 4.9 (W)
 rear 12 mm (H) x 3.4 (W)

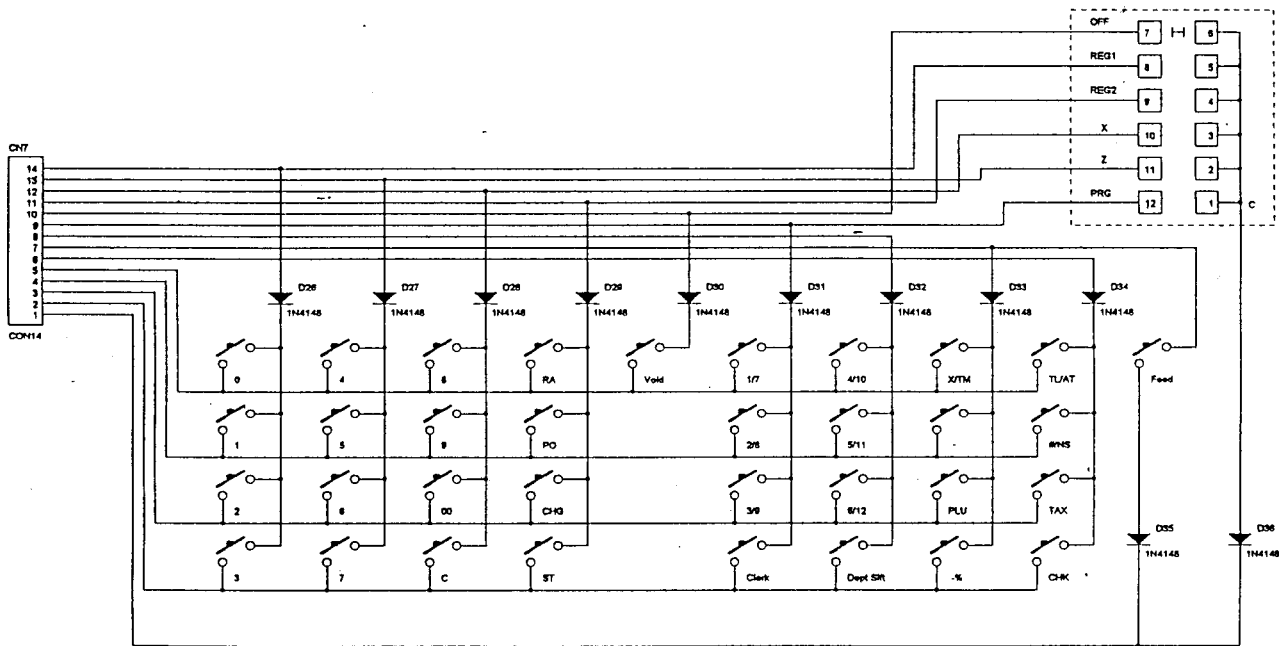
5.9 KEYBOARD CIRCUIT

Keyboard scan is done by CPU interrupt routine as same as one for display. P00 through P07, P23 are commonly used with scan signal displayed by Strobe line. P54 through P57 are return line of Keyboard matrix.

It consists of matrix of strobe line (8) x Return line (4) and total of 32 keys are assigned.

In order to remove chattering, key entry is confirmed when two sequential entry of a key.

P25 is used for Mode lock switch, Feed key. Mode lock switch is connected to strobe line (P00 through P04), Feed key is connected to P07.



5.10 PRINTER CIRCUIT

Motor

The printer motor is activated using the signal P51 from the CPU. This signal is normally low, and goes high to cause the motor to run.

Printer Magnets

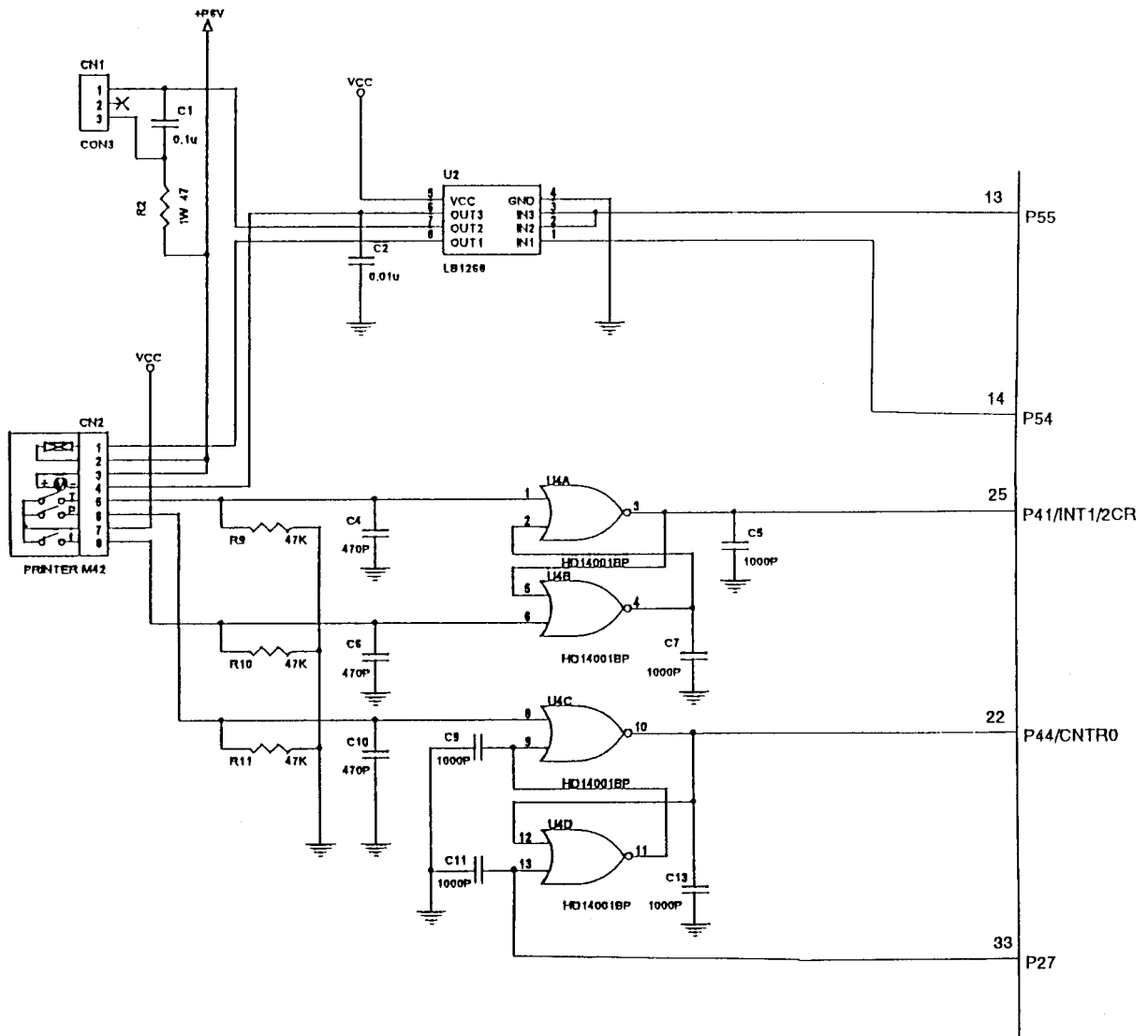
The signals P50 from the CPU are the input for the printer magnets. These normally low signals drop high with a print signal.

Timing Signal

The printer generates, through the use of a mechanical switch assembly, a timing signal that is returned to the CPU through the INT1 line.

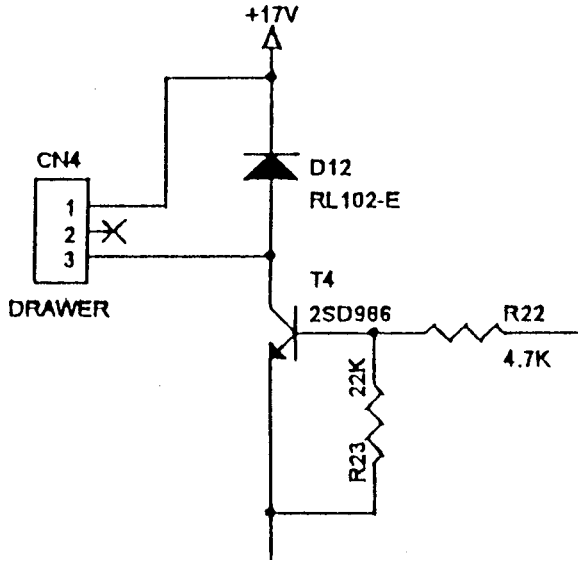
A sector wheel passes through the nor gate M2, creating a square wave.

The CPU uses this signal from the printer as the basis for timing the printer magnet signals, the motor drive and feed.



5.11 DRAWER CIRCUIT

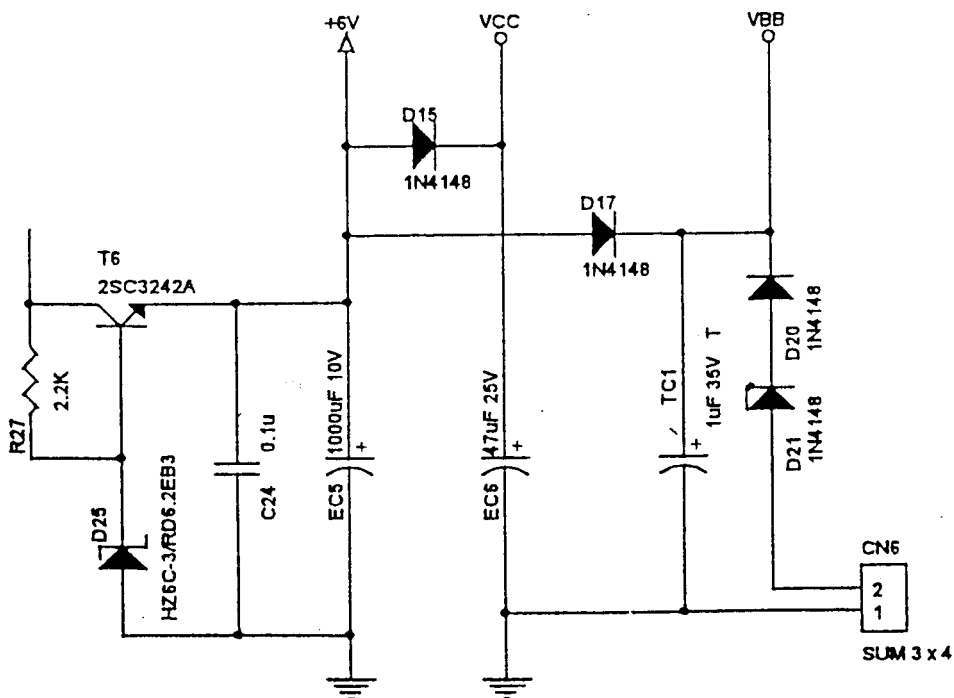
The drawer is activated using the signal P26 from the CPU. This signal is normally low, and goes high to cause the drawer to run. When P26 is high, T9 is on. Current flow through the transistor cause the collector to be held low, near high potential.



5.12 BATTERY CIRCUIT

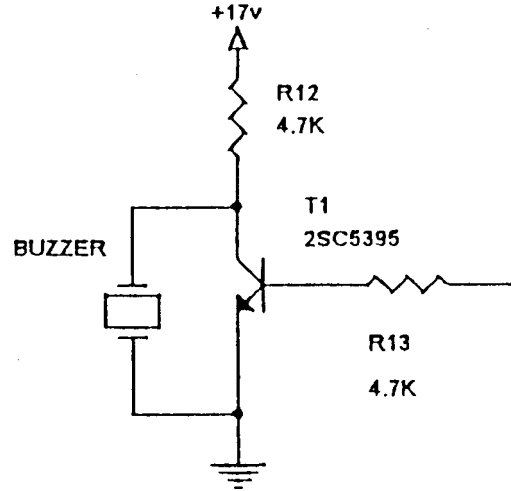
When the +5 V supply starts dropping, as in a power fail condition, the voltage through the divider network drops accordingly.

When +5 V no voltage, D17 is shut off current B+5 V is through the D20 and D21 from battery.



5.13 BUZZER CIRCUIT

The buzzer circuit uses signal P24 from the CPU. This normally low signal goes high on 2 conditions. First, on a error tone, P24 goes high until the error condition is cleared. For a key entry tone, P24 goes high and then returns to its low state. This pulse is of extremely short duration.

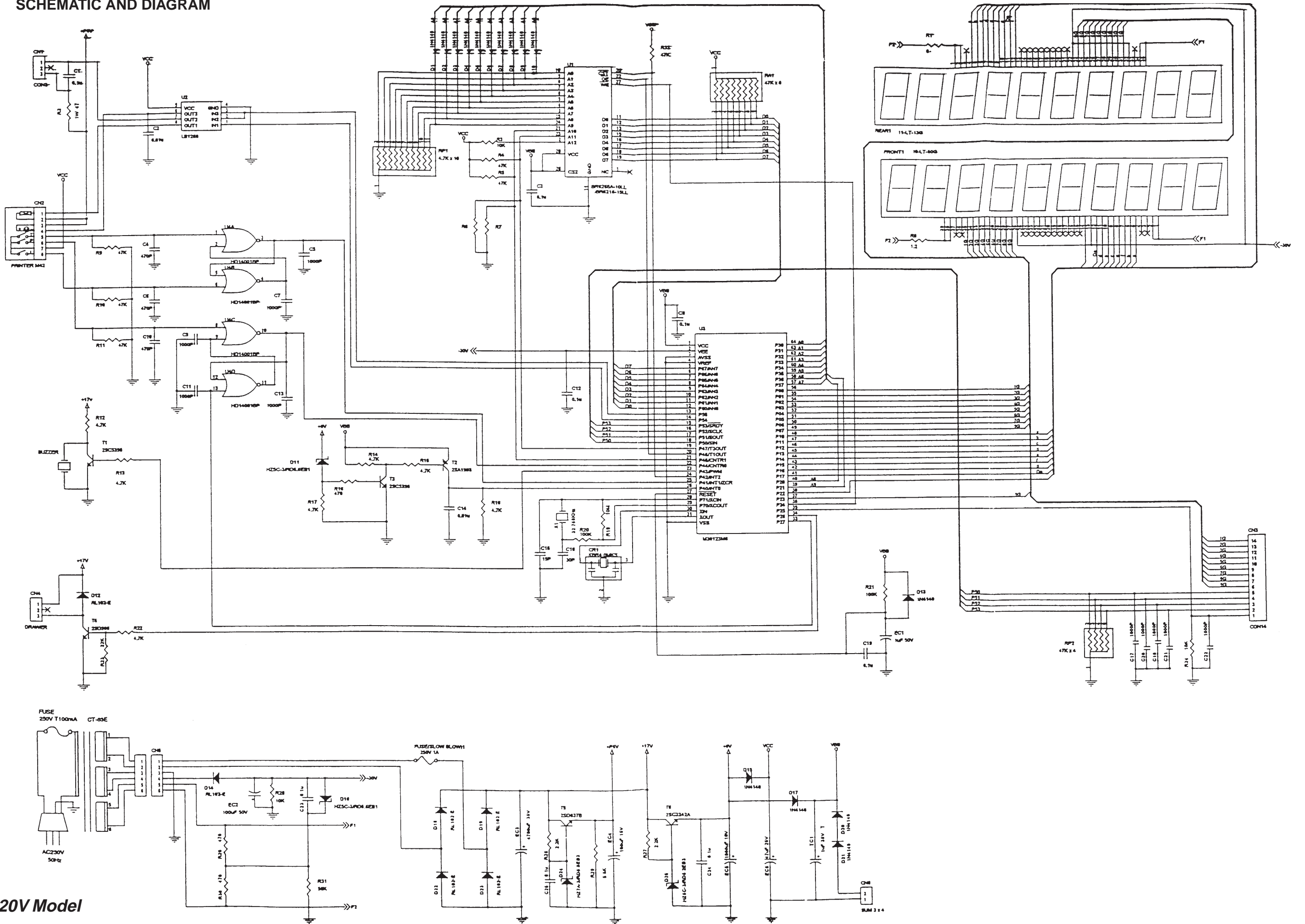


When the voltage at +5 V has dropped, voltage back-up is provided by the battery.

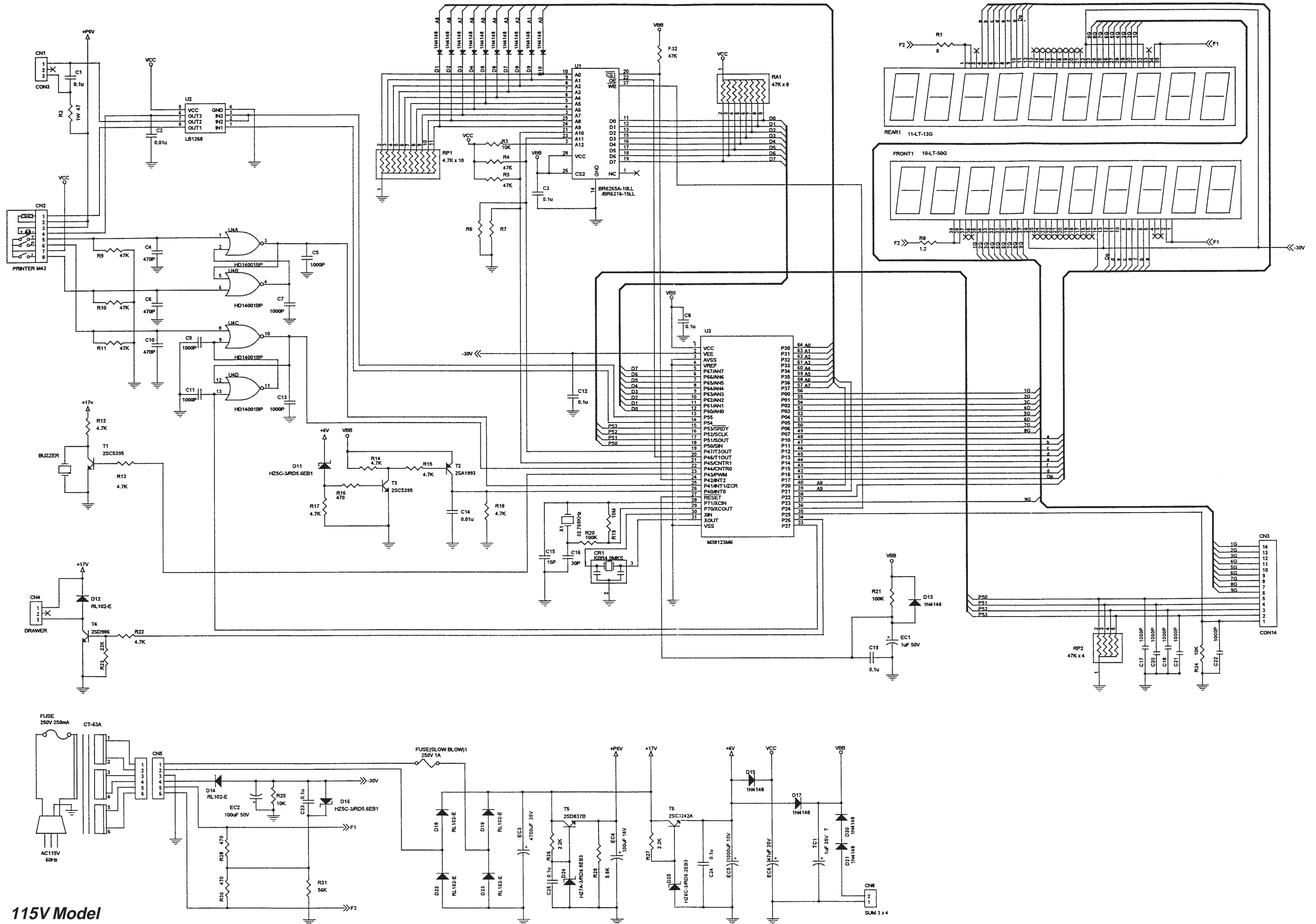
The battery voltage B+5V goes to the CPU and external RAM.

Battery specification:
 Type: SUM-3 x 4
 Voltage: 6.0 V
 Rating: 500 mAh

6. SCHEMATIC AND DIAGRAM



220V Model



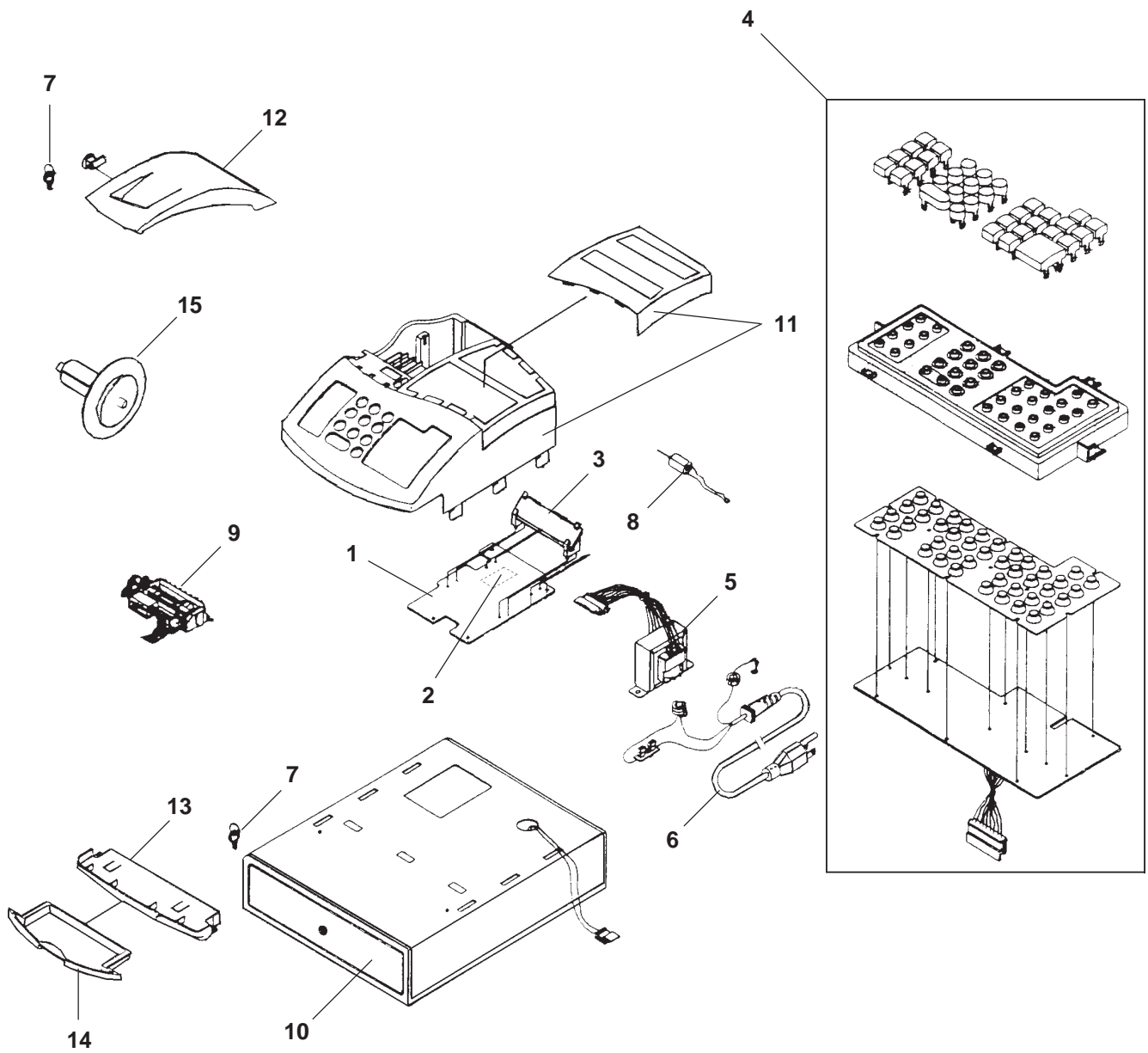
115V Model

SPARE PARTS CATALOGUE

IMPORTANT

THIS PUBLICATION IS WRITTEN BY OLIVETTI LEXIKON (SPARE PARTS DEPARTMENT).
THIS CATALOGUE IS THE ONLY DOCUMENT TO WHICH REFERENCE MAY BE MADE
FOR ORDERING SPARE PARTS.

REF.	CODE	DESCRIPTION
1	128703 B	MAIN BOARD
2	128704 C	LSI 225 CX - M38123 M4
3	128705 D	DISPLAY 10 LT - 50G
4	128839 T	COMPLETE KEYBOARD ASSY
5	128707 F	TRANSFORMER
6	128708 Q	AC CORD AOBA EP307
7	128709 R	PRINTER END CASSETTE KEY
8	128710 D	MOTOR
9	128711 S	PRINTER M42 - V
10	128834 N	CASSETTE
11	128835 P	COVER ASSEMBLY
12	128836 Q	PRINTER COVER
13	128837 R	FRONT COVER
14	128838 S	DEPOSIT DRAWER
15	128717 Y	WINDING REEL



REF.	CODE	DESCRIPTION
1	417168 U 128718 H	MAIN BOARD 115V MAIN BOARD 220V
2	128704 C	LSI 225 CX - M38123 M4
3	128705 D	DISPLAY 10 LT - 50G
4	128721 U	DISPLAY 11 LT - 13G
5	128722 V	FRONT SUPPORT
6	128723 W	REAR SUPPORT
7	128710 D	MOTOR
8	128707 F	TRANSFORMER
9	128708 Q	AC CORD AOBA EP307
10	128840 G	CASSETTE
11	128709 R	PRINTER END CASSETTE KEY
12	128842 W	PRINTER COVER
13	128717 Y	WINDING REEL
14	128711 S	PRINTER M42 - V
15	128843 X	FRONT COVER
16	128844 Y	DEPOSIT DRAWER
17	128841 V	COVER ASSEMBLY
18	128845 Z	COMPLETE KEYBOARD ASSY

