

**SERVICE MANUAL  
AND  
PARTS CATALOG**

**meritronic 325**

**DIEHL**

## G e n e r a l

DIEHL meritronic is a four-species 10-digit printing electronic digital-calculator.

This manual covers the instructions for accurate service and the Spare Parts List.

All details regarding the electronical-mechanical section are explained in writing and by diagrams.

The logic is made up of integrated modules of latest technology in 2 LSI-chips HD 32115 P and 32116 P.

We wish you much success in your studies and practical use.

DIEHL datensysteme GmbH

Technical Service

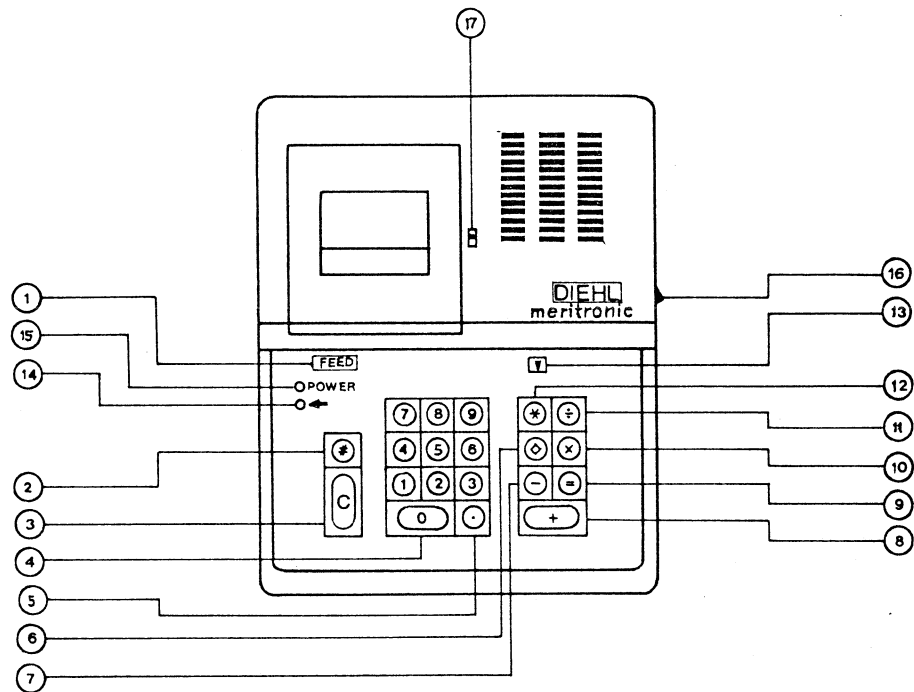
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# NAMES AND FUNCTIONS OF KEYS



- |                      |                            |
|----------------------|----------------------------|
| 1. PAPER FEED BUTTON | 9. EQUAL KEY               |
| 2. NON-ADD KEY       | 10. MULTIPLICATION KEY     |
| 3. CLEAR KEY         | 11. DIVISION KEY           |
| 4. NUMERAL KEY       | 12. TOTAL KEY              |
| 5. DECIMAL POINT KEY | 13. DECIMAL POINT SELECTOR |
| 6. SUB-TOTAL KEY     | 14. OVERFLOW LAMP          |
| 7. SUBTRACTION KEY   | 15. POWER LAMP             |
| 8. ADDITION KEY      | 16. POWER SWITCH           |
|                      | 17. PAPER RESET KNOB       |

## A U T O   C L E A R

Turning on the power switch "clears" all that have entered into, and currently retained by the calculator. At the same time, characters "O.C" get printed. This is called AUTO CLEAR print.

## P L U S   O R   M I N U S   K E Y

Depressing the key loads a copy of Y register contents into MEMORY. As you repeat this, as many copies as the number of repetitions go into MEMORY until an overflow occurs upon exceeding the capacity. When you notice the overflow, you would depress C key to clear: depressing C key does not clear MEMORY. In this case, as in the foregoing case, what have entered it prior to the overflow remain in there.

## S P E C I A L   C U L C U L A T I O N

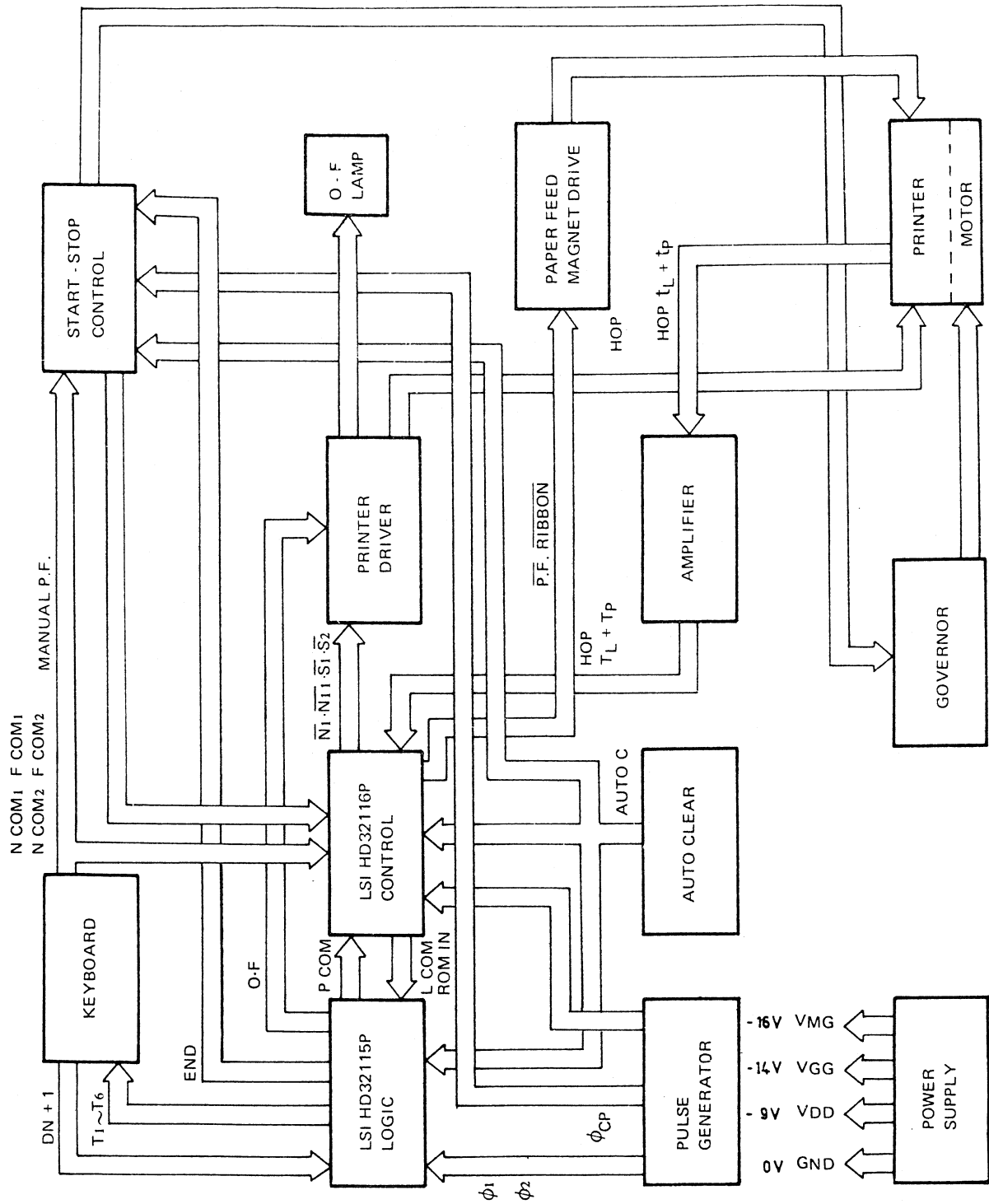
- 0 ÷ 0 = This results in an overflow print, making ERROR LAMP come on.
- 1 ÷ 0 = This results in an overflow and coming on of ERROR lamp.
- 0 ÷ 1 = Results in "O" print: the decimal point locates itself at the selected position.

|               |               |          |
|---------------|---------------|----------|
| 0 . ÷         | 1 . ÷         | 0 . ÷    |
| 0 . =         | 0 . =         | 1 . =    |
| ..OVER.FLOW.. | ..OVER.FLOW.. | 0.0000 ◊ |
| 0 . C         | 0 . C         |          |
|               |               | 0 . ÷    |
|               |               | 1 . =    |
|               |               | 0 . ◊    |

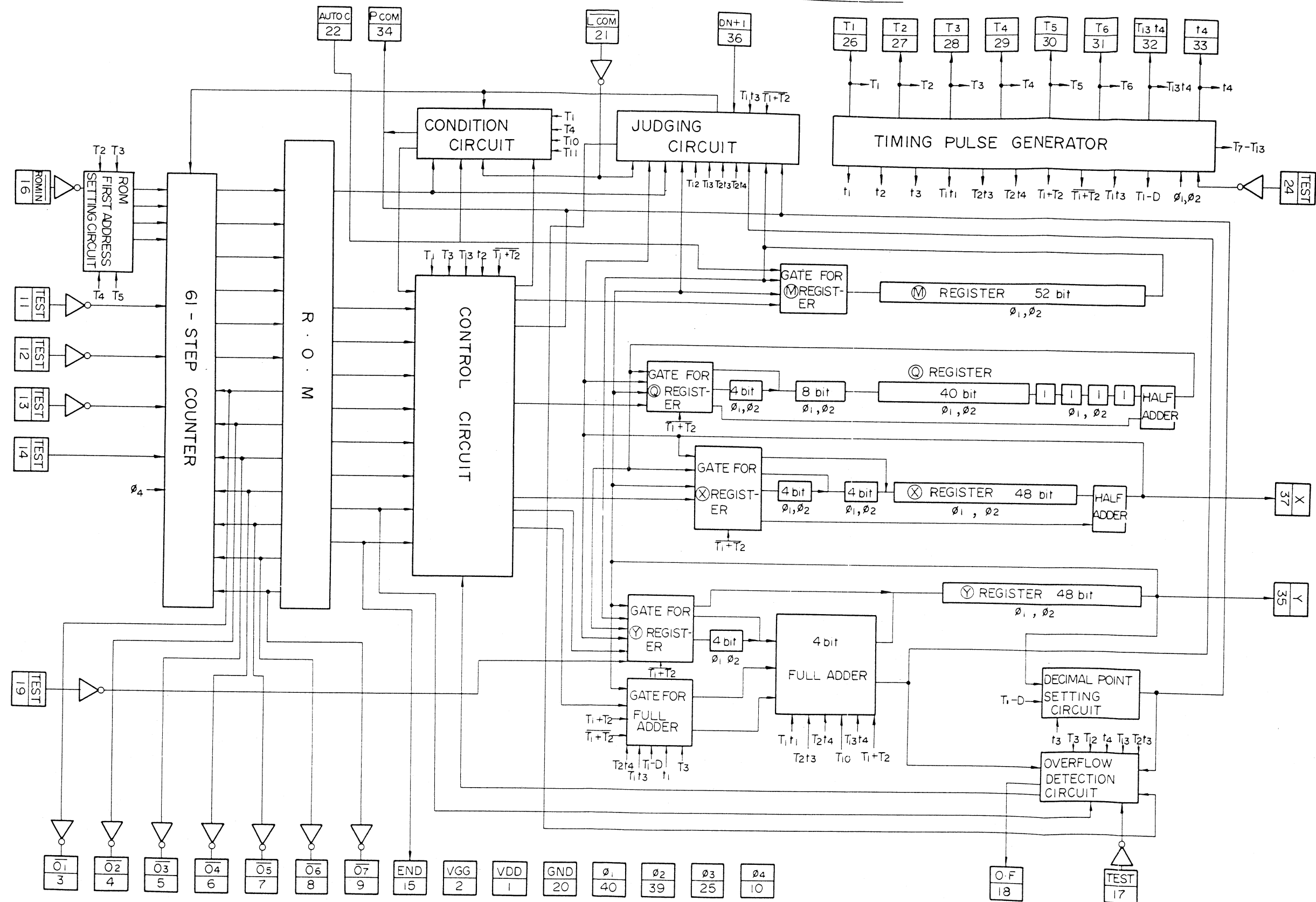
## GENERAL TECHNICAL DETAILS

|                                 |                                                               |
|---------------------------------|---------------------------------------------------------------|
| <u>Keys:</u>                    | Ten-Key system                                                |
| <u>Capacity:</u>                | Entry .... 10 digits max.<br>Result .... 10 digits max.       |
| <u>Decimal Point:</u>           | Entry .... Floating<br>Result .... Up to 4 decimal places     |
| <u>Print speed:</u>             | 2,7 lines/sec.                                                |
| <u>Control tape:</u>            | Width 58 mm<br>Diameter 70 mm                                 |
| <u>Ribbon:</u>                  | Nylon ribbon, double spool,<br>width 13 mm, length 6 m, black |
| <u>Main Components:</u>         | LSI, IC                                                       |
| <u>Mains connection values:</u> | 100, 115, 125 or 220, 240 Volt<br>50/60 Hz $\pm$ 15 %         |
| <u>Power Consumption:</u>       | 26 W max.                                                     |
| <u>Dimension:</u>               | 295 mm x 230 mm x 91 mm                                       |
| <u>Weight:</u>                  | 4,5 kg                                                        |

# FUNCTION BLOCK DIAGRAM

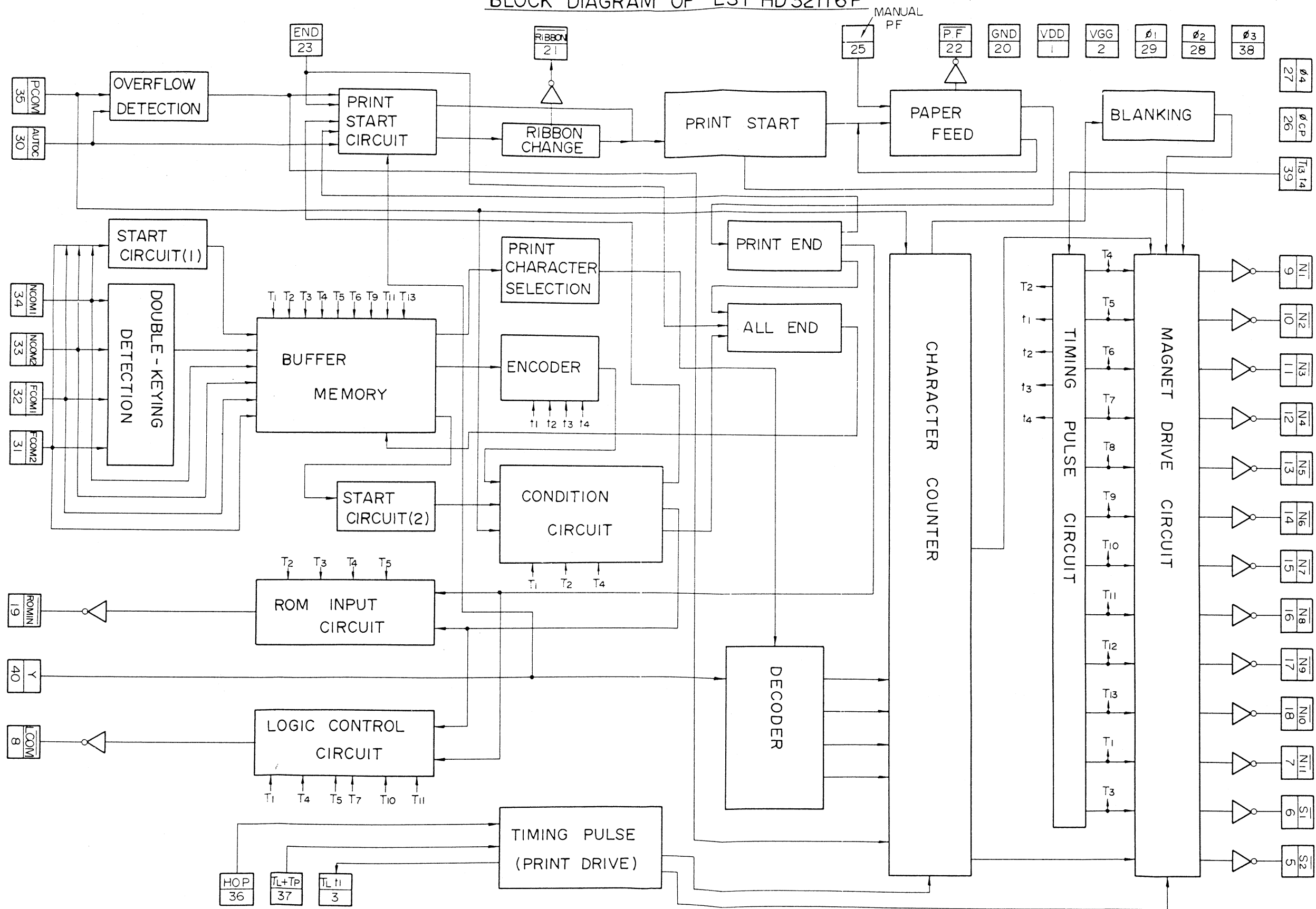


BLOCK DIAGRAM OF LSI HD 32115P





# BLOCK DIAGRAM OF LSI HD32116P



# EXPLANATION OF THE SIGNALS

- (A) ALL END ..... Signal for terminating all arithmetic operations as well as printing action
- AUTO C ..... Automatic clear signal
- (D) DN + 1 ..... Decimal point selector output signal
- (E) END ..... Logic operation end signal
- (F) F COM 1 ..... Output signal initiated by depressing one of these keys:  
+, -,  $\diamond$ , \*, x,  $\div$ .
- F COM 2 ..... Output signal initiated by depressing one of these keys:  
#, C, =.
- (G) GND ..... Zero volt potential (0 volt), and logic "1"
- (H) HOP ..... Home pulse, synchronized to type wheel rotation and occurring at the start of one rotation of the wheel
- (L) L COM ..... Signal varying in state with arithmetic operation by logic-circuit flip-flops
- (M) M ..... Memory register symbol, signifying also the data, decimal point position and sign stored in memory
- MANUAL P·F ..... Signal initiated by depressing the paper feed button
- (N)  $N_1 - N_{11}$  ..... Trigger signals for numeral and decimal-point magnets
- $N\text{ COM}_1$  ..... Key output signal initiated by keys 1-6
- $N\text{ COM}_2$  ..... Key output signal initiated by keys 7-9 and 0
- (O)  $O_1 - O_7$  ..... ROM output signal

|     |                        |                                                                                                                                                              |
|-----|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | OF .....               | FOFL output signal, initiating the lighting up of OVERFLOW lamp                                                                                              |
| (P) | P COM .....            | State signal for FKL, FOFL and $y + 1$                                                                                                                       |
|     | P•F .....              | Trigger signal for paper feed magnet                                                                                                                         |
|     | FEED .....             | Paper feed end signal                                                                                                                                        |
|     | Pr END .....           | Print drive end signal                                                                                                                                       |
| (Q) | Q .....                | Q register symbol, signifying also what are in the register: data (Q), decimal point position (q) and sign (SQ)                                              |
| (R) | ROM .....              | "Read only memory" signal, for storing steps involved in arithmetic operation                                                                                |
|     | ROM IN .....           | Signal for designating the first address of ROM                                                                                                              |
|     | RIBBON .....           | Trigger signal for ribbon change magnet                                                                                                                      |
| (S) | $S_1, S_2$ .....       | Trigger signals for symbol print magnets                                                                                                                     |
| (T) | $t_1 - t_4$ .....      | Bit timing pulses                                                                                                                                            |
|     | $T_1 - T_{13}$ .....   | Digit timing pulses                                                                                                                                          |
|     | TLt <sub>1</sub> ..... | Signal for developing $\phi_{cp}$                                                                                                                            |
|     | TL + Tp .....          | The output signal of the check-up magnet. It determines the character printing timing                                                                        |
| (V) | VGG .....              | - 14 V                                                                                                                                                       |
|     | VDD .....              | - 9 V                                                                                                                                                        |
|     | VMG .....              | - 16 V                                                                                                                                                       |
| (X) | X .....                | Signifying X register as well as its stored data (X), including decimal point position (x) and sign (SX)                                                     |
| (Y) | Y .....                | Signifying Y register as well as its stored data (Y), including decimal point position (y) and sign (SY). The contents of this register alone go into print. |

Figure 1 shows four registers (M, Q, X, Y) for a 52-bit multiplier. The registers are defined as follows:

- M REGISTER:** A 52-bit shift register.
- Q REGISTER:** A 48-bit shift register with a 4-bit multiplier input and a 4-bit feedback path.
- X REGISTER:** A 48-bit shift register with a 4-bit multiplier input and a 4-bit feedback path.
- Y REGISTER:** A 48-bit shift register with a 4-bit multiplier input and a 4-bit feedback path.

The legend indicates the following symbols:

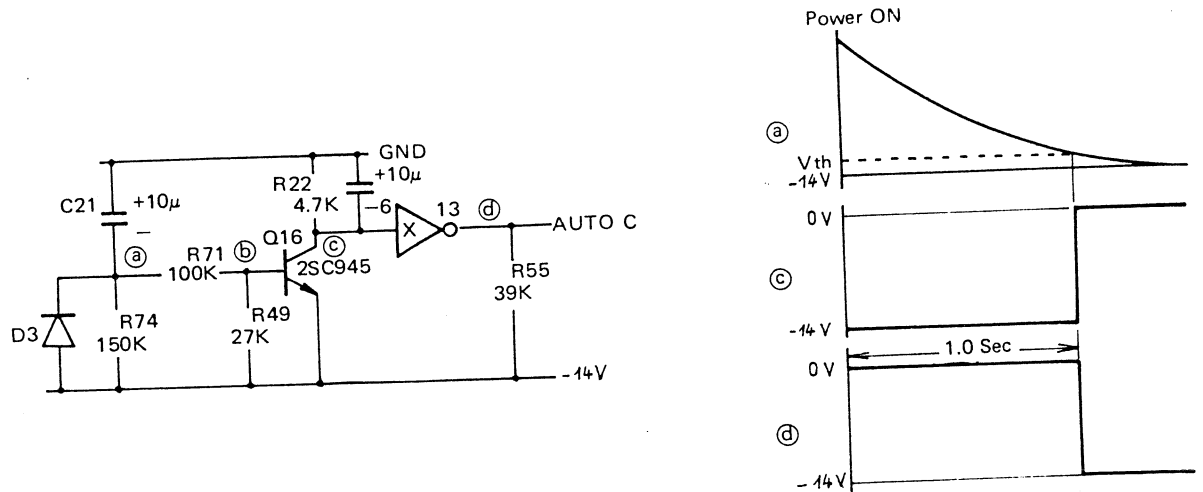
- ⊙ Self closed gate
- ⊗ Left shift
- Right shift

Diagram illustrating the IEEE 754 single-precision floating-point format. The 32-bit word is divided into three fields:

- Sign (S):** 1 bit.
- Exponent (E):** 8 bits.
- Mantissa (M):** 23 bits.

The mantissa is represented as a binary fraction. The bits are labeled  $t_1$  through  $t_{23}$ . A callout shows the decimal point alignment, with bits  $t_1$  through  $t_4$  to the left of the decimal point and bits  $t_4$  through  $t_{23}$  to the right.

## AUTO CLEAR CIRCUIT



Referring to the above circuit diagram, "AUTO C" is the output signal of this circuit and is taken from the inverter (X). "VGG" is the source of this signal.

If the on-off switch is turned on,  $C_{21}$  starts getting charged. As this charging proceeds, the potential at point ① goes downward to "VGG", thereby bringing down the potential at point ②. When the ② potential reaches the threshold level of transistor  $Q_{16}$ , this transistor starts conducting and drives the point ③ to zero-volt potential, so that the polarity of inverter output reverses.

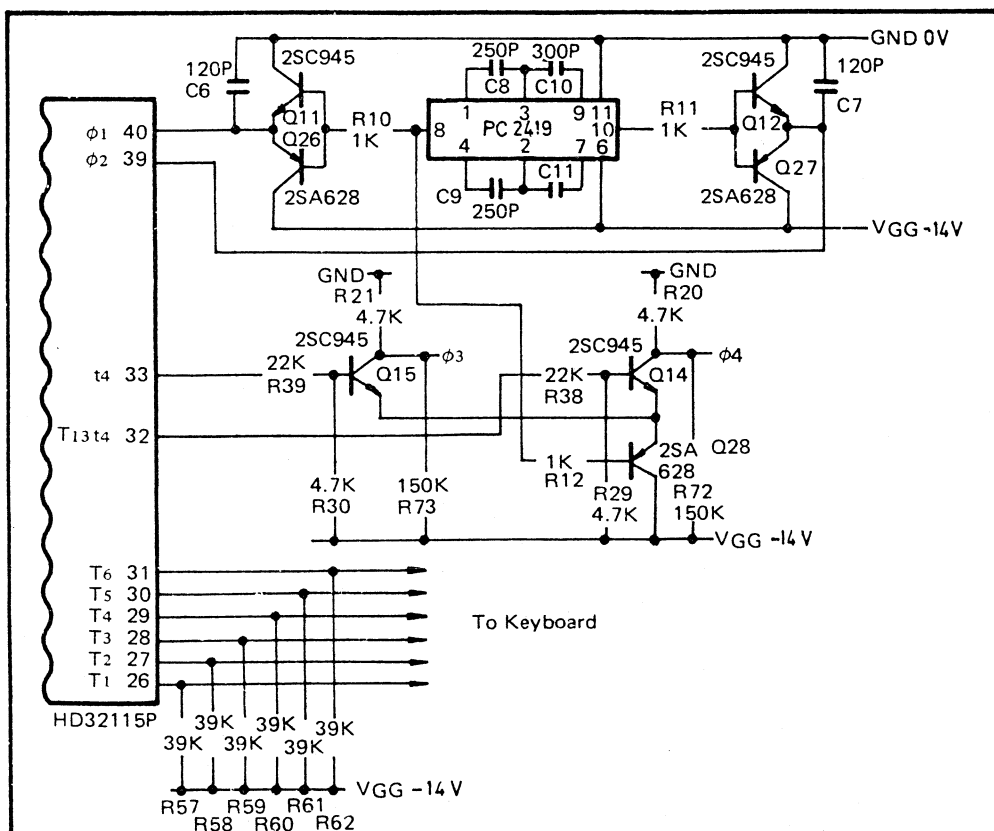
It will be seen that the "AUTO C" signal is that which persists from the moment the on-off switch is turned on to the moment the base (point ②) of  $Q_{16}$  transistor reaches the threshold potential. This signal applies to LSI HD 32115P and 32116P to "clear" all functions, to drive the motor and to cause print signals to emerge from  $N_1$ ,  $N_2$  and  $S_1$  for printing characters "O.C".

## TIMING CHAIN

In this circuit the shift pulses for registers and flip-flops as well as the timing pulses for arithmetic operations are generated.

The timing chain consists of:

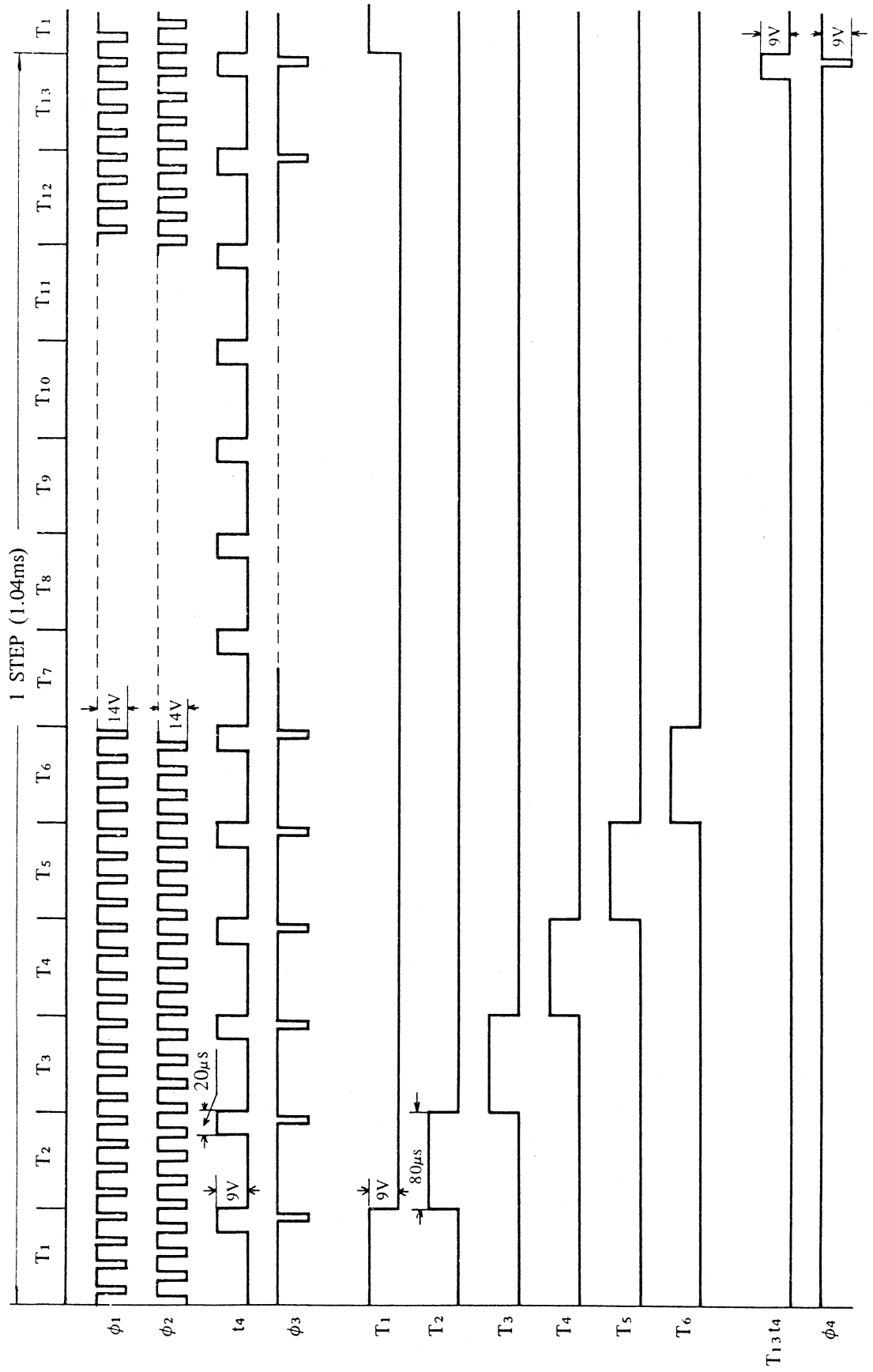
1. oscillator (PC 2419)
2. pulse former for the clock signals
3. pulse former for the bit signals



### Circuit operation

PULSE GENERATOR PC 2419 produces  $\phi 1$  and  $\phi 2$ . These pulse signals apply to LSI HD 32115P, wherein, with these signals, new timing signals are produced: namely,  $t_4$ ,  $T_1 - T_6$  and  $T_{13}t_4$ . The  $t_4$  applies to AND GATE composed of  $Q_{15}$  and  $Q_{28}$ , and opens this gate for the incoming  $\phi 1$  to introduce  $\phi 3$  ( $t_4\phi 1$ ). On the other hand, the  $T_{13}t_4$  applies to another AND GATE composed of  $Q_{14}$  and  $Q_{28}$ , and opens this gate for the incoming  $\phi 1$  to make  $\phi 4$  ( $T_{13}t_4\phi 1$ ) available from this gate. The signals  $T_1 - T_6$  are for keyboard input signals.

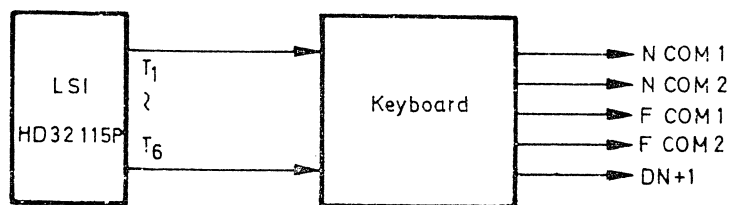
# TIME CHART





## KEYBOARD INPUTS

### BLOCK DIAGRAM

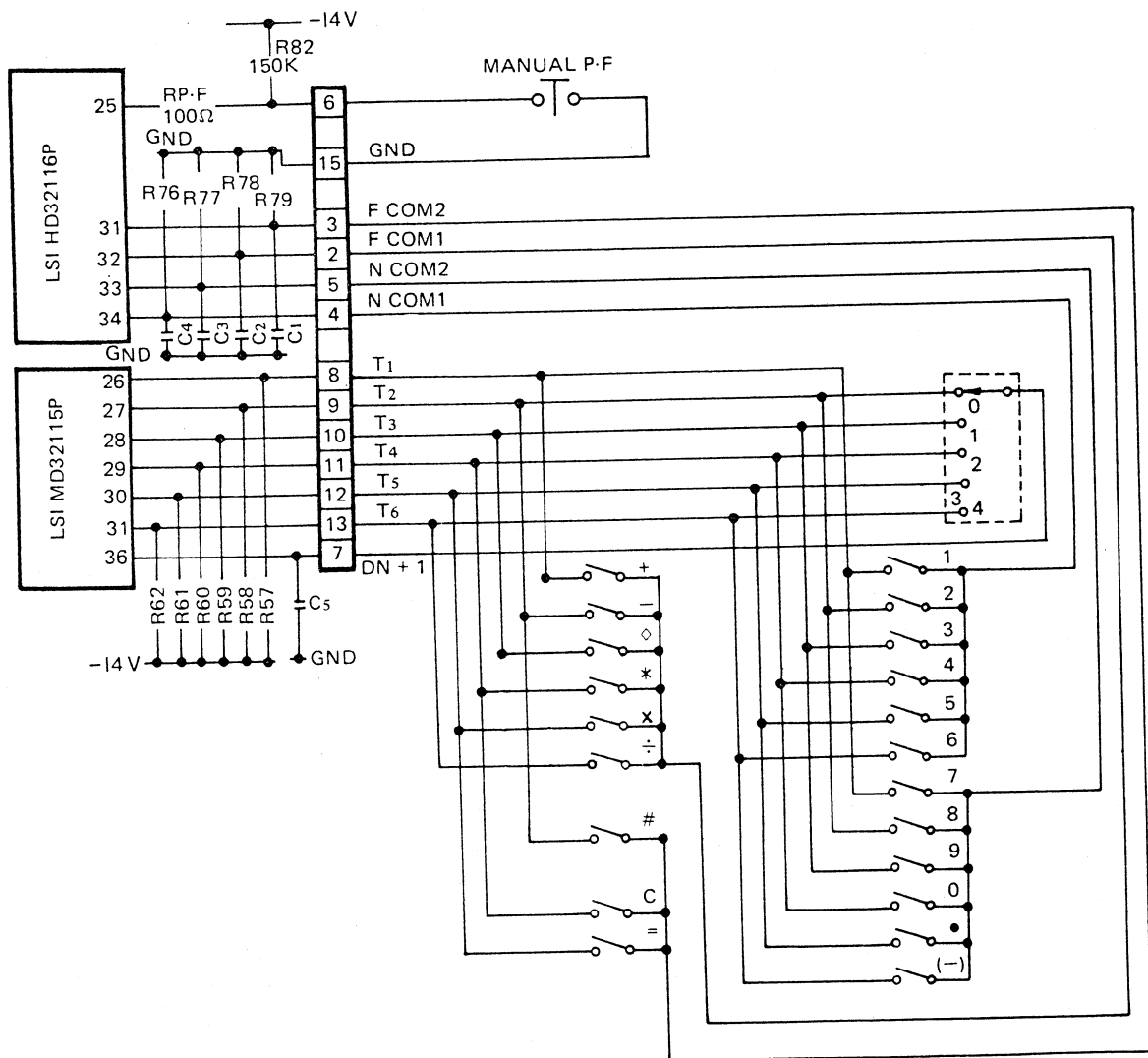


Signals  $T_1 - T_6$  coming from LSI HD 32115 P are the input for each key of the keyboard. As will be noted in the diagram below, the keyboard is divided into 4 blocks.

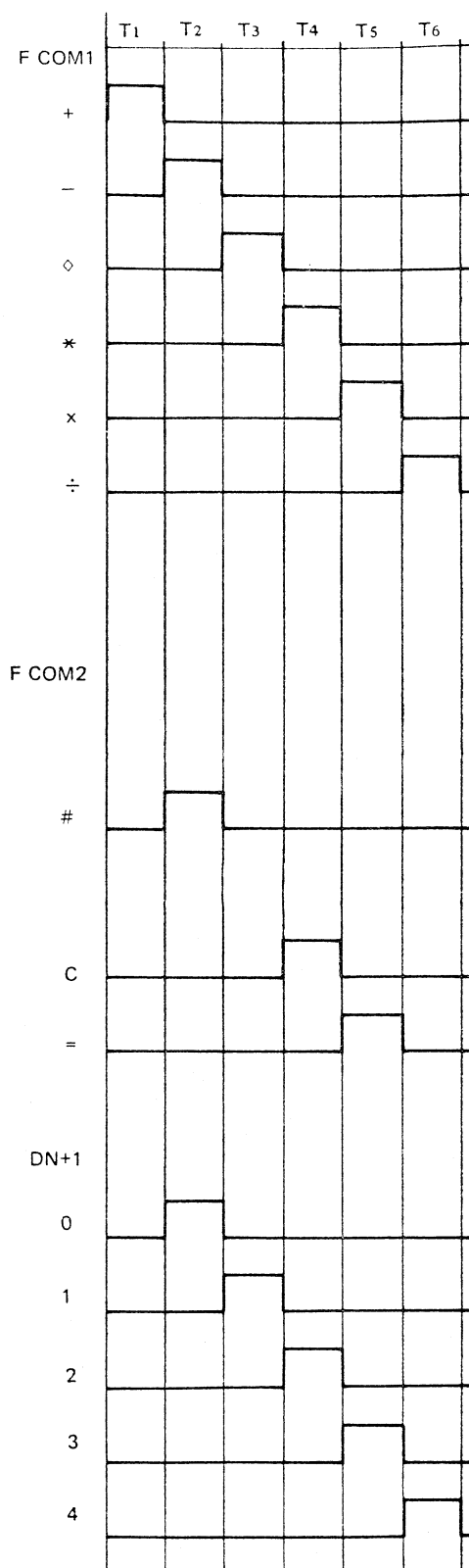
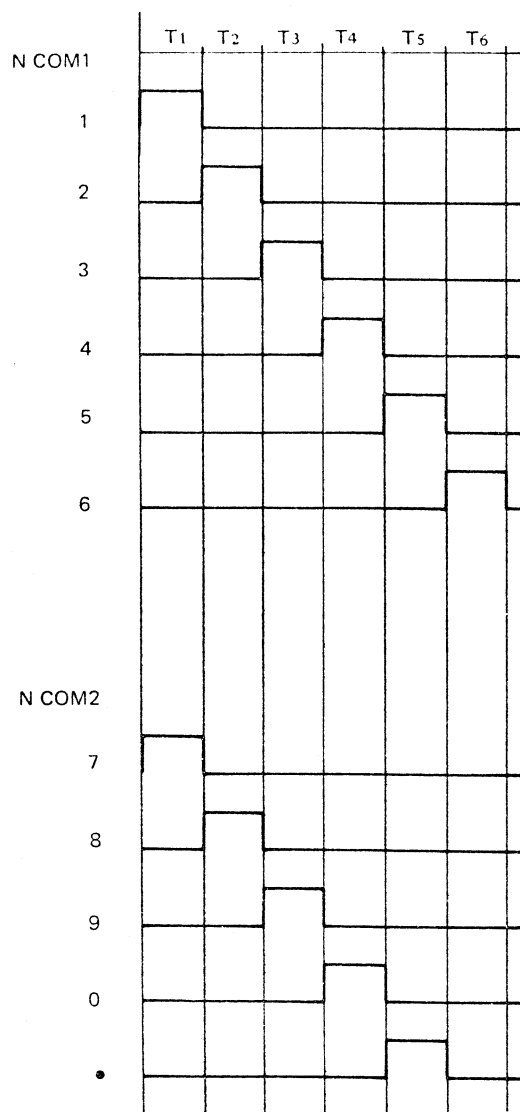
N COM 1 ..... 1, 2, 3, 4, 5, 6.  
 N COM 2 ..... 7, 8, 9, 0, .  
 F COM 1 ..... +, -,  $\diamond$ , \*, x,  $\div$ .  
 F COM 2 ..... , #, C, =.

The signal for individual key is contained in the assigned signal. The output of the decimal point selector is identified as DN + 1 and takes a different signal value as indicated in the table below.

| Output | T <sub>1</sub> | T <sub>2</sub> | T <sub>3</sub> | T <sub>4</sub> | T <sub>5</sub> | T <sub>6</sub> |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|
| N COM1 | 1              | 2              | 3              | 4              | 5              | 6              |
| N COM2 | 7              | 8              | 9              | 0              | •              |                |
| F COM1 | +              | -              | $\diamond$     | *              | x              | $\div$         |
| F COM2 |                | #              |                | C              | =              |                |
| DN + 1 |                | 0              | 1              | 2              | 3              | 4              |



# TIME CHART

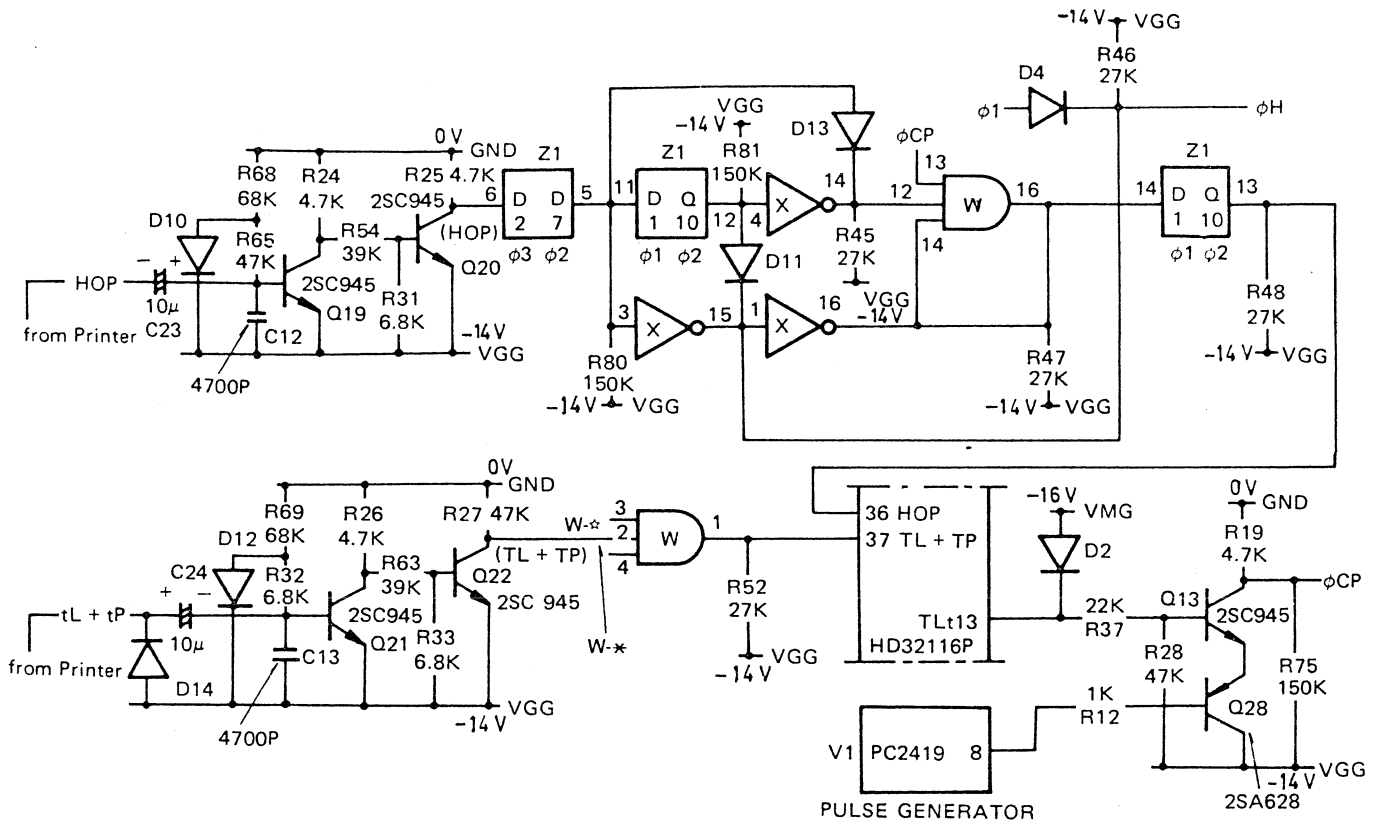


[illegible]

1. Assume that one of the above-named signals has just applied to MOTOR DRIVE CIRCUIT. By this input signal, F/F DISCHARGE (Which is AND GATE  $W_{(a)}$ ) switches to SET condition and its output turns on transistors  $Q_{17}$  and  $Q_{18}$ , so that positive charge in capacitor  $C_{19}$  flows out through  $R_1$  and  $Q_{18}$ . This discharging current drives down the input signal this flip-flop gets inverted by  $X_{(a)}$  and, upon passing through DIODE  $D_{10}$ , emerges as  $S_3$  from F/F  $Z_2$  (d). The  $S_3$  applies to GOVERNOR CIRCUIT to set MOTOR in operation.

2. As MOTOR starts running, CHECK MAGNET and MAGNET HEAD in PRINTER section produce signals  $t_L + t_p$  and HOP, respectively. These signals are subsequently amplified by AMPLIFYING CIRCUIT and come out as  $(T_L + T_p)'$  and  $(HOP)'$ . Signal  $(HOP)'$  produces  $\phi_H$  (which is synchronized to  $(HOP)'$  and applies to F/F  $Z_2 (c)$  to drive these flip-flops. The circuit involving F/F  $Z_2 (b)$  and F/F  $Z_2 (c)$  serves as a compensation circuit for PRINT CONTROL PULSE during the period of motor start-up. Compensation is necessary because, when the motor is picking up speed, motor speed changes rapidly and PRINT CONTROL PULSE  $T_L + T_p$  and also  $\phi_{cp}$  remain unstable unless a provision is made to avoid such instability.
  
3. Concurrent with the driving of F/F  $Z_2 (b)$  and F/F  $Z_2 (c)$ , AND GATE W (b) issues forth  $T_L + T_p$ . LSI HD 32116P receives this signal and produces  $T_L t_1$  from it. Signal  $T_L t_1$  meets  $\phi_1$  in an AND gate and comes out as  $\phi_{cp}$ .
  
4. The signal  $\phi_{cp}$  so produced applies to F/F DISCHARGE (AND GATE W (a)) to reset this flip-flop. Consequently, transistors  $Q_{17}$  and  $Q_{18}$  go off to charge capacitor  $C_{19}$  through  $R_{85}$ . The charging time is about 2.8 seconds. This charging current raises the input side of F/F  $Z_2 (a)$  to GND (0 V) level, so that signal  $S_3$  disappears to cause the motor to stop.

## PRINT CONTROL PULSE



### Amplifying circuit

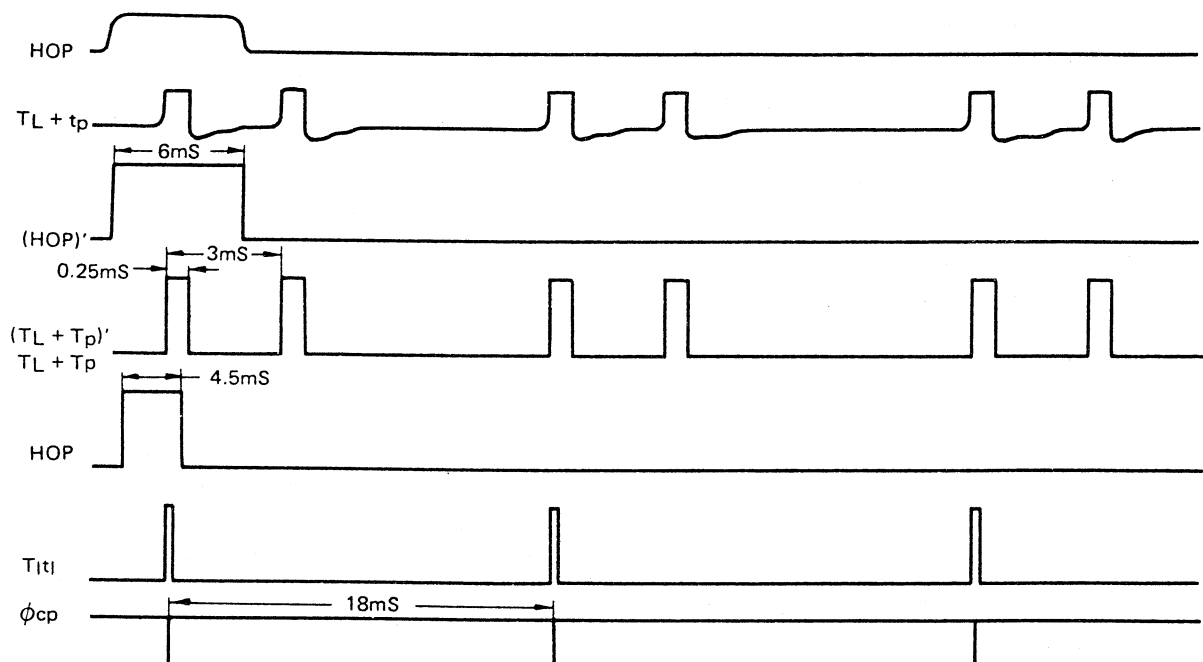
The signal  $t_L + t_p$  generated by CHECK MAGNET is normally at a level above VGG but could show up at a level below VGG. Because of this possibility, it is not proper to permit this signal to apply in its as-generated form to the base of a transistor. With such a lower-than VGG  $t_L + t_p$  a counter electromotive force would occur between base and emitter to result in a ruptured transistor.

DIODE D14 is provided to prevent this. If signal  $t_L + t_p$  is below VGG, current will flow through D14 from the VGG line. This arrangement guards the base of transistor  $Q_{21}$  against chances of falling in potential below  $V_{>G}$ . Capacitor  $C_{24}$  removes the DC component of  $t_L + t_p$  applying to the base of transistor  $Q_{21}$ . The signal gets amplified by  $Q_{21}$  and comes out of  $Q_{22}$  in inverted form.

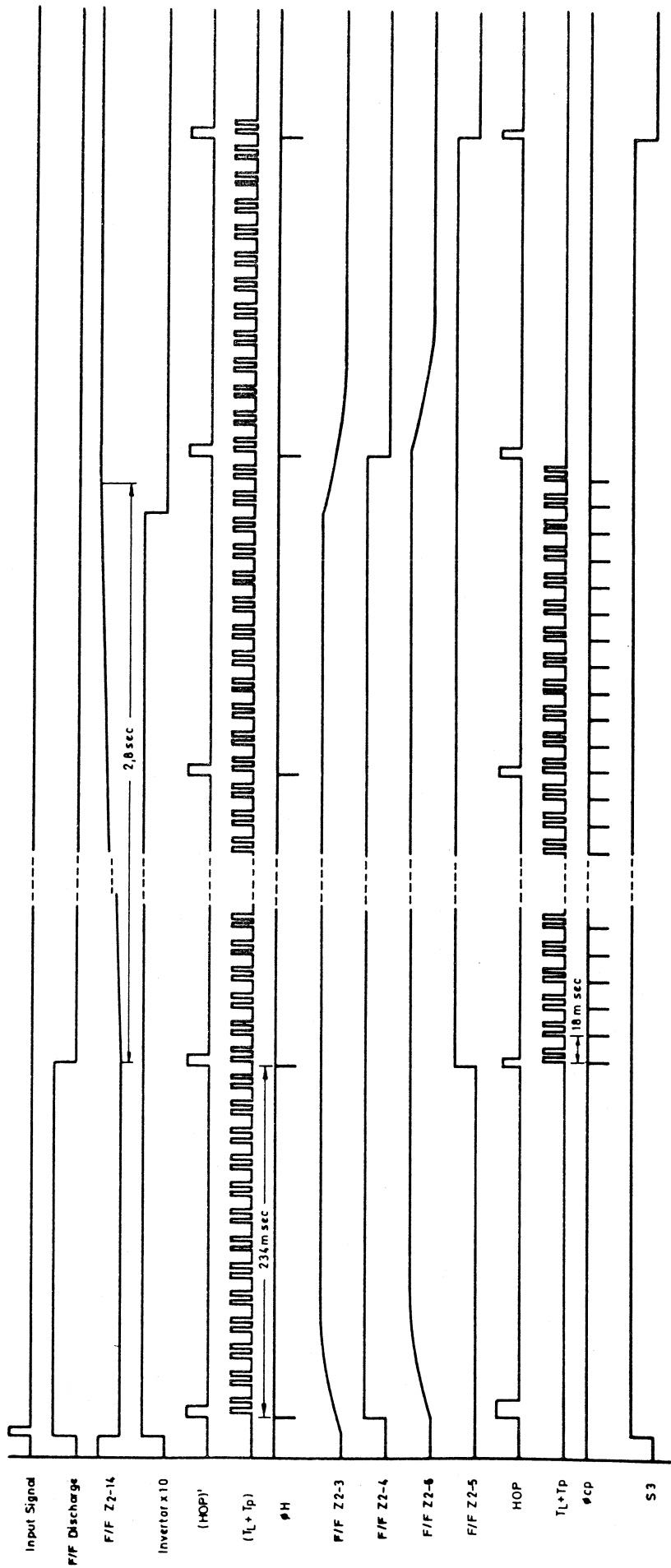
The amplifying circuit for signal hop operates in a manner similar to the foregoing amplification. In this circuit, there is no counterpart of DIODE D14 because this signal never becomes more negative than VGG.

Signals HOP and  $T_L + T_p$  are very important in synchronizing action relative to PRINT. For timing or positional adjustment of these signals, you are advised to refer to "Positional adjustment of HOP and  $T_L + T_p$ ", given in page 69.

#### TIME CHART



# TIME CHART

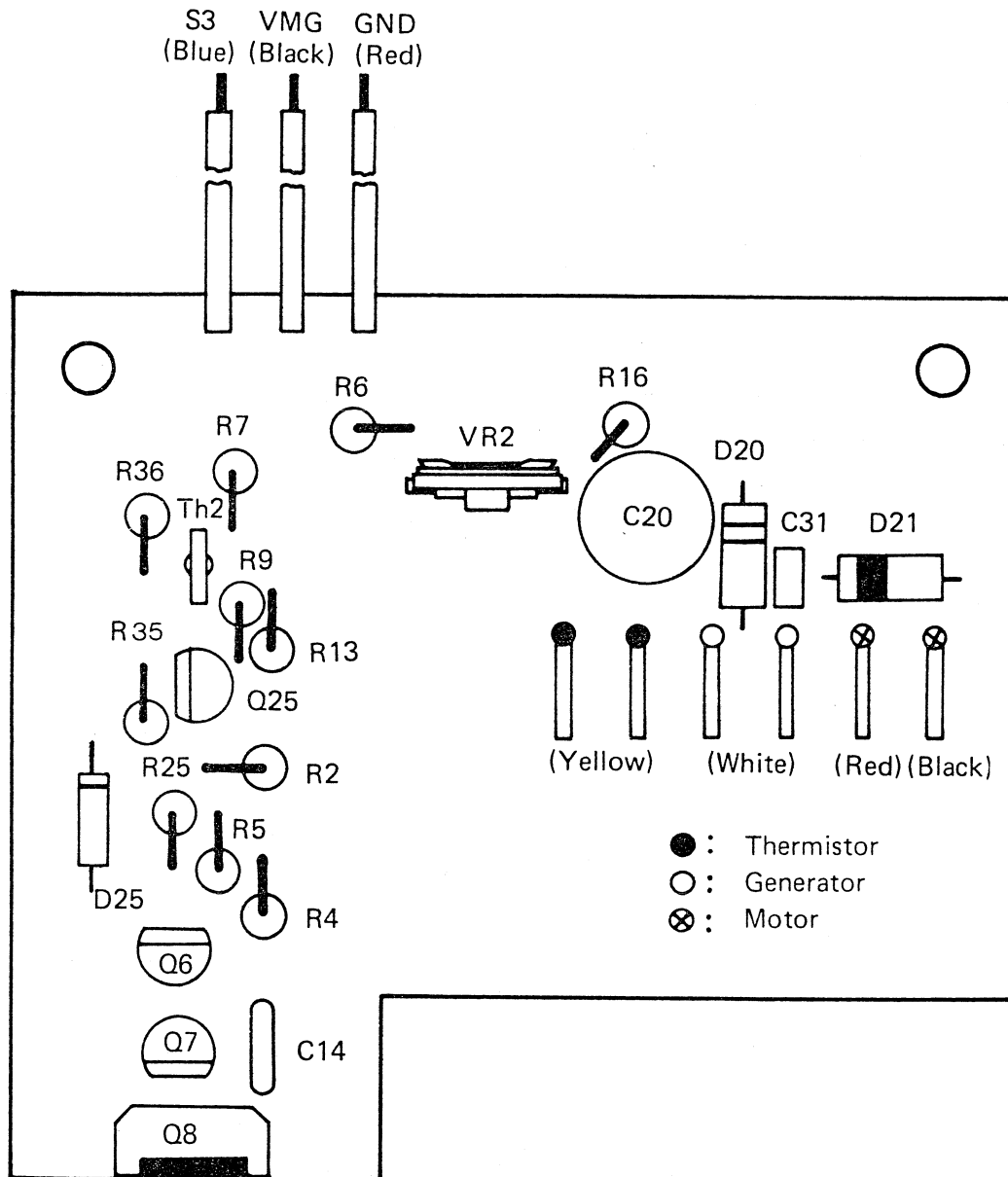




The motor thus started picks up speed and, during its acceleration, a large electromotive force occurs by induction in the field circuit FG of the motor. By this induced emf, the potential of point (a) shifts closer to GND level than to VMG level. Consequently, point (b) shifts closer to VMG than to GND and point (c) too shifts likewise closer to VMG in terms of potential.

-22-

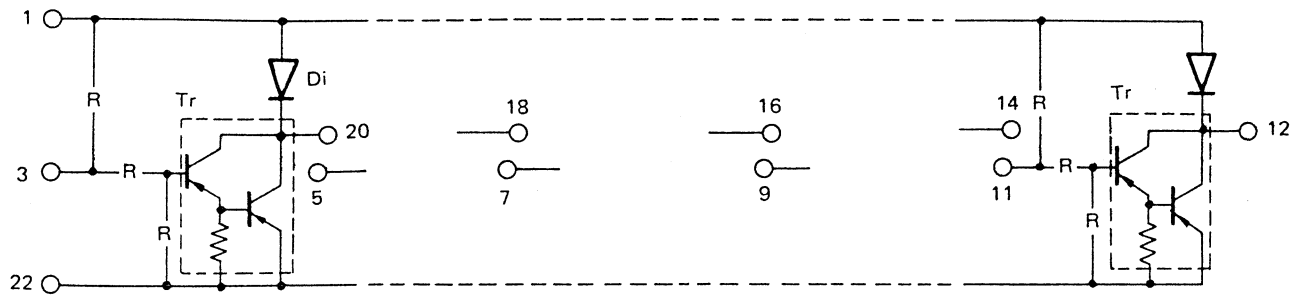
# COMPONENTS GOVERNOR



# PARTS LIST

| <u>Governor circuit</u> |           |                                                   |
|-------------------------|-----------|---------------------------------------------------|
| Index                   | Parts No. | Description                                       |
| Q25                     | 14000079  | Transistor 2 SA 628                               |
| Q7                      | 14000081  | " 2 SC 711                                        |
| Q6                      | 14000136  | " 2 SC 454                                        |
| Q8                      | 14010043  | " 2 SC 1096                                       |
| D20                     | 14010657  | Silicon Diode SD-46                               |
| D25                     | 14010675  | Zener Diode MZ-212                                |
| D21                     | 14010676  | Silicon Diode SR1FM-2                             |
| R4                      | 16010090  | Carbon Film Resistor 470 $\Omega$ 1/4 W $\pm$ 5 % |
| R5                      | 16010138  | " " " 510 $\Omega$ 1/4 W $\pm$ 5 %                |
| R9                      | 16010207  | " " " 1 K 1/4 W $\pm$ 5 %                         |
| R16                     | 16010217  | " " " 2,2 K 1/4 W $\pm$ 5 %                       |
| R13                     | 16010228  | " " " 1,5 K 1/4 W $\pm$ 5 %                       |
| R35                     | 16010288  | " " " 10 K 1/4 W $\pm$ 5 %                        |
| R36                     | 16010319  | " " " 22 K 1/4 W $\pm$ 5 %                        |
| R53                     | 16010361  | " " " 33 K 1/4 W $\pm$ 5 %                        |
|                         | 16011526  | " " " 430 $\Omega$ 1/4 W $\pm$ 5 %                |
| R6                      | 16011527  | " " " 680 $\Omega$ 1/4 W $\pm$ 5 %                |
| C20                     | 16040371  | Electrolytic Capacitor 4,7 $\mu$ F, 35 V          |
| C14                     | 16060224  | Ceramic Capacitor 0,02 $\mu$ F, 25 V              |
| C31                     | 16060225  | Mylar Capacitor 500 pF, 50 V                      |
|                         | 74765319  | Radiant Heat Plate: Governor                      |
|                         | 74765322  | Stopper Plate: Left                               |
|                         | 74765323  | Stopper Plate: Right                              |
|                         | 74799800  | Motor                                             |
|                         | 74799801  | P.C.B.: Governor                                  |

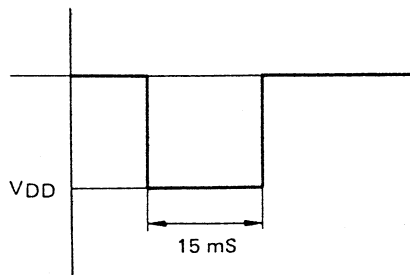
## PRINTER DRIVER



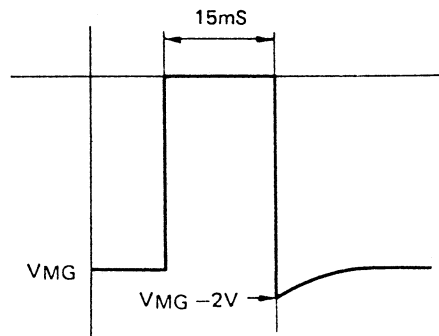
This system uses a circuit of PC 2902 (HIC) which drives hammer magnet and ribbon change magnet. The circuit performance is designated in the parts specifications which may be referred to.

### Standard Waveform

#### a) Hammer magnet drive

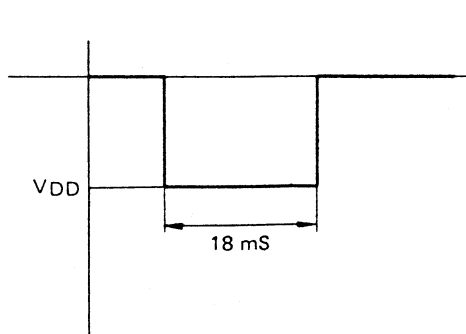


(1) LSI output

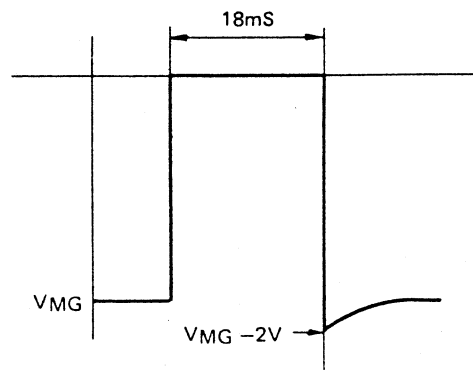


(2) Driver output

#### b) Ribbon change magnet drive

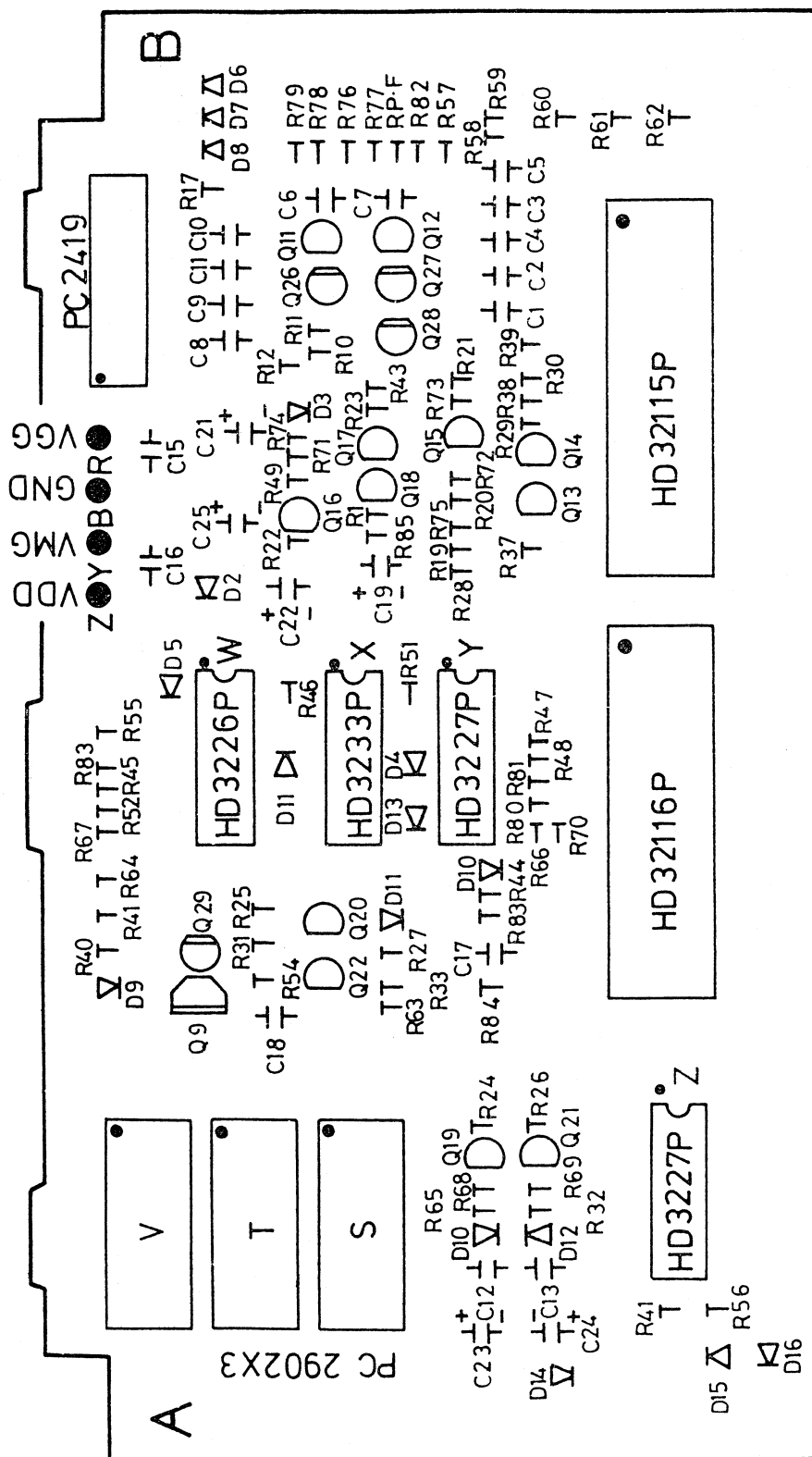


(3) LSI output

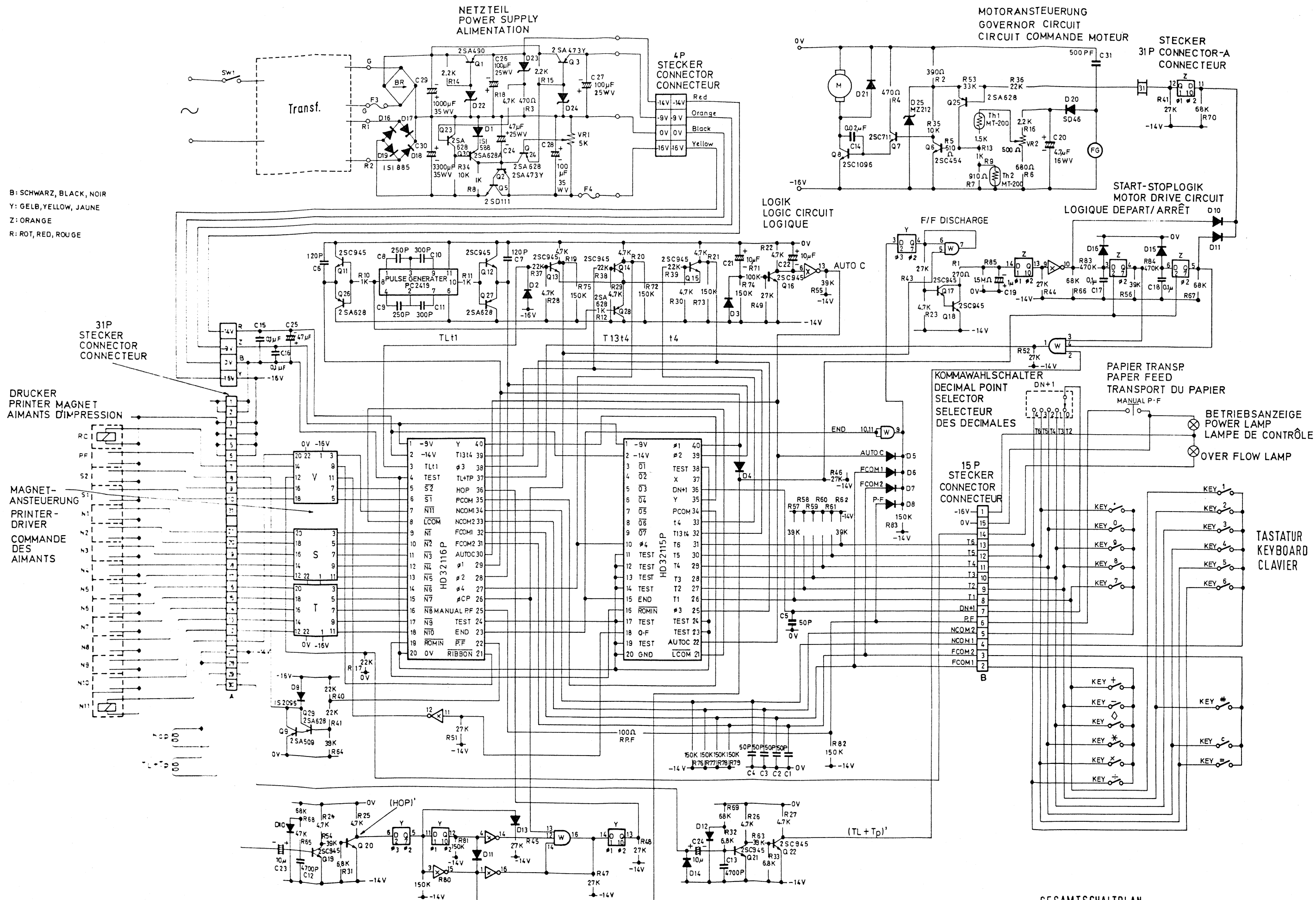


(4) Driver output

## COMPONENT LOCATION



B: SCHWARZ, BLACK, NOIR  
Y: GELB, YELLOW, JAUNE  
Z: ORANGE  
R: ROT, RED, ROUGE



GESAMTSCHALTPLAN  
CIRCUIT DIAGRAM Diehl meritronic 325  
SCHEMA D'ENSEMBLE 6.8.73

## POWER SUPPLY

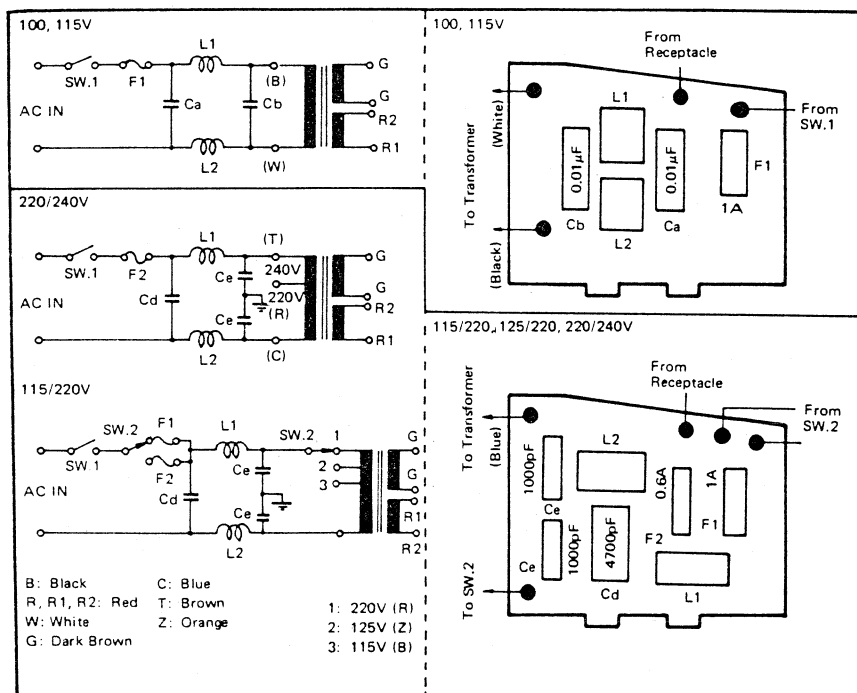
### Primary circuit

Input energy comes from the commercial power supply line and is admitted to the primary side of the transformer through the on-off switch, fuse and noise filter circuit.

The primary side of the transformer is so wired as to permit its connection selectively for a number of supply voltages. One type of transformer is intended to receive power at 100 volts or 115 volts: no rewiring is involved.

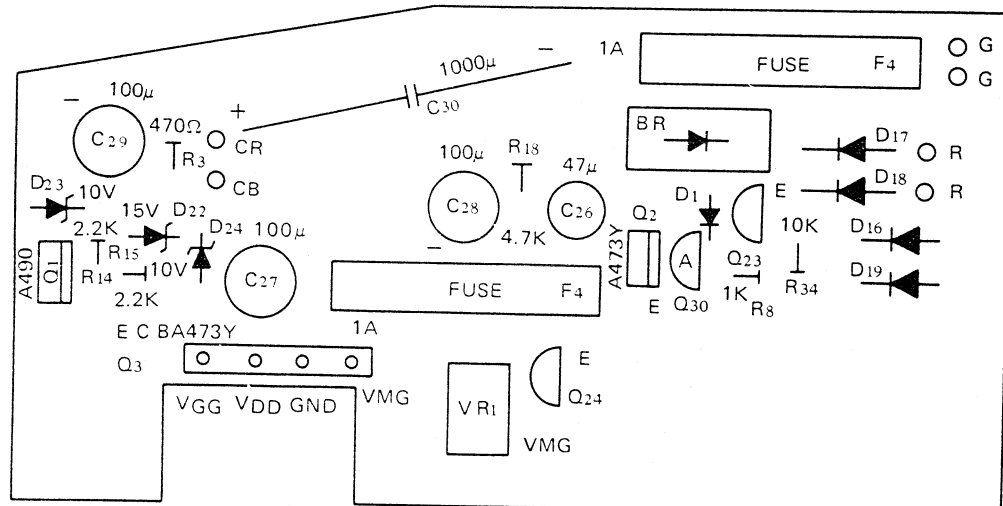
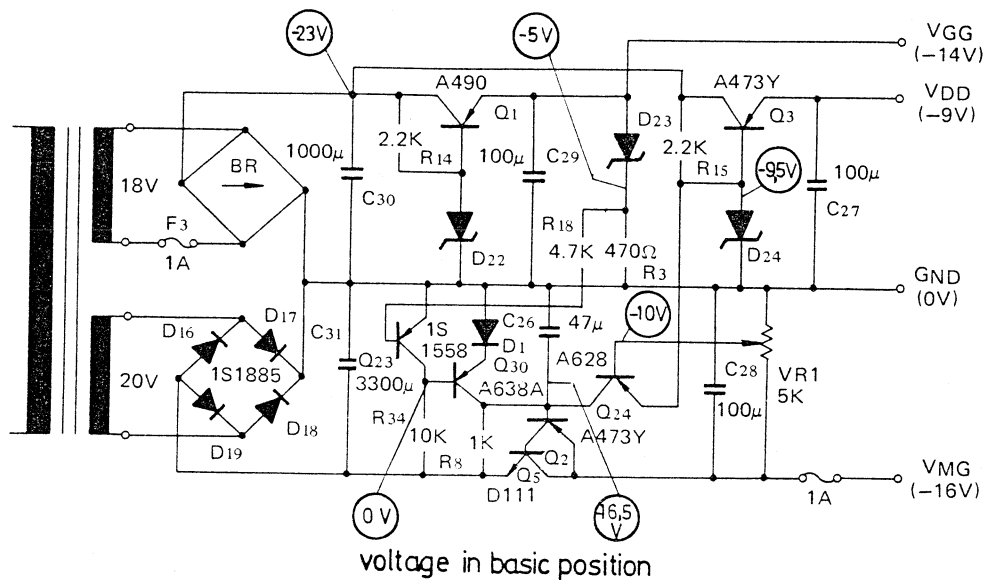
Another type (220/240 V) comes as wired for 220 volt supply. To adapt this transformer to 240 volt supply, replace the red wire (soldered) by the brown (free). This transformer may come as wired for 240 volt supply: to change from 240 volts to 220 volts in this case, replace the brown (soldered) by the red (free) wire.

In still another type (115/220 V or 125/220 V), rewiring is not needed. A selector switch is provided in the rear section of the power supply part, so that you can suit the transformer to whichever supply voltage is available.



## Secondary circuit

Transformed voltages available from the power supply transformer are two: 18 volts and 20 volts. These voltages apply to the DC current stabilizer circuit, which produces three DC voltages: - 9 volt, - 14 volt and - 16 volt. DC power needs of all circuits are met by these three.





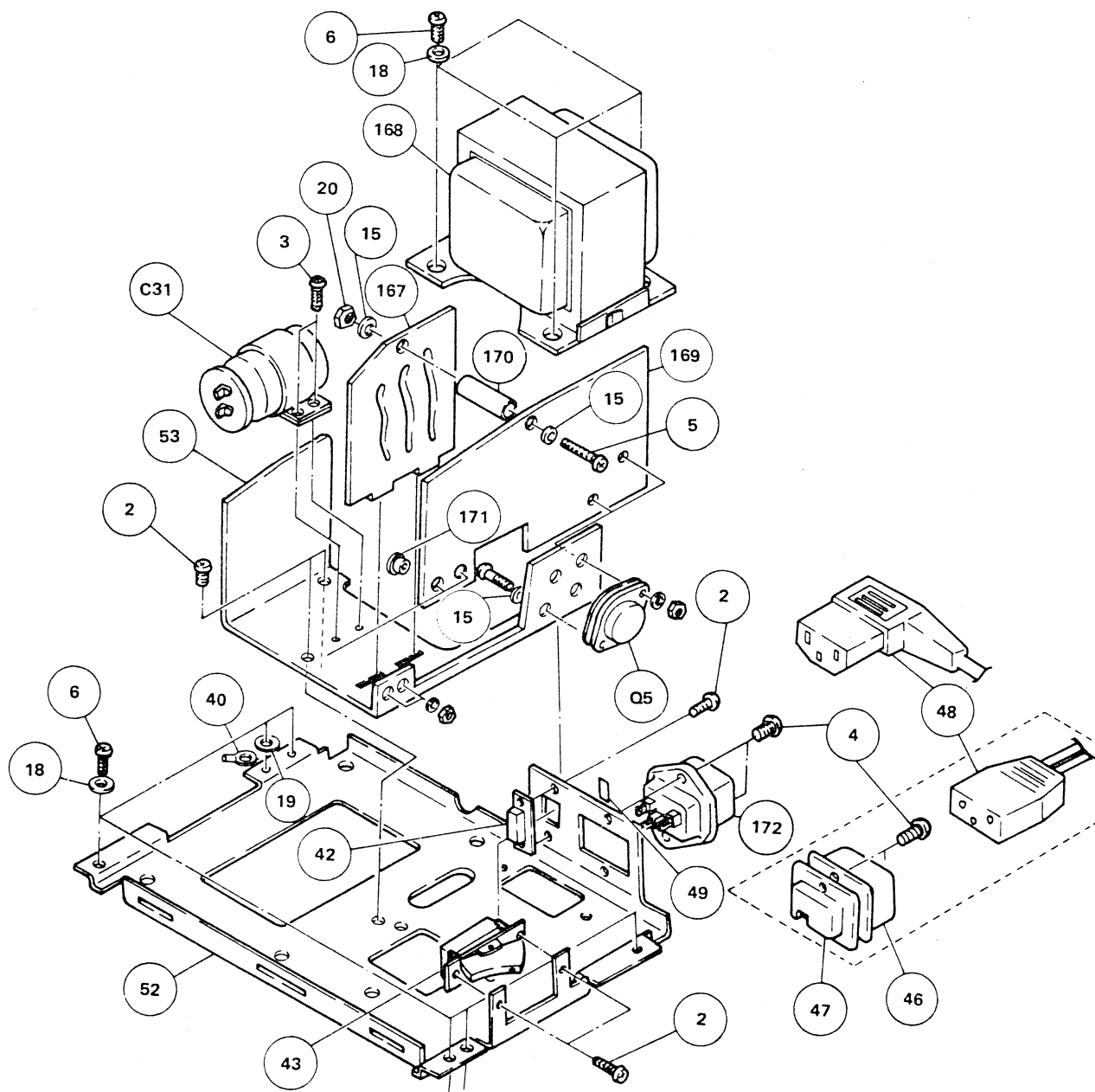
# PARTS LIST - PRIMARY CIRCUIT

| Index No. | Part No. | Description                        | 115 V<br>UL | 115 V | 220/<br>240 V | 115/<br>220 V | 125/<br>220 V |
|-----------|----------|------------------------------------|-------------|-------|---------------|---------------|---------------|
| F1        | 11070067 | Fuse Holder: 125 V, 3 A            |             | x     | x             | x             | x             |
| F2        | 11070073 | Fuse: 250 V, 1 A                   |             | x     |               | x             | x             |
| F1        | 11070079 | Fuse: 250 V AC, 0,6 A              |             |       | x             | x             | x             |
| Ce        | 11070081 | UL Fuse: 125 V, 1 A                | x           |       |               |               |               |
| Cd        | 16050067 | MP Capacitor 1000 pF, 250 V AC     |             |       | x             | x             | x             |
| Ca, Cb    | 16050068 | MP Capacitor 4700 pF, 250 V AC     |             |       | x             | x             | x             |
| L1, L2    | 16060151 | Polyester Capacitor 0,01 µF, 250 V | x           | x     |               |               |               |
| 167       | 16070008 | SN Coil: FL 15 R 101               | x           | x     | x             | x             | x             |
| 167       | 74767101 | P.C.B.: Power Supply Primary 1     | x           | x     |               |               |               |
| 167       | 74767103 | P.C.B.: Power Supply Primary 2     | x           | x     | x             | x             | x             |

# PARTS LIST - SECONDARY CIRCUIT

| Index Nr. | Part No. | Description                        |
|-----------|----------|------------------------------------|
|           | 11020175 | Connector 4P: Plug                 |
|           | 11040132 | Fuse Holder                        |
| F3        | 11070021 | Fuse 1 A                           |
| F4        | 11070082 | Time-lag Fuse 1 A                  |
| Q23, Q24  | 14000079 | Transistor 2 SA 628                |
| Q30       | 14000080 | " 2 SA 628 A                       |
| Q3        | 14000097 | " 2 SA 473 Y                       |
| Q5        | 14010042 | " 2 SD 111                         |
| Q1        | 14010053 | " 2 SA 490                         |
| Q2        | 14010057 | " 2 SA 473 (With Accessory)        |
| D1        | 14010611 | Silicon Diode 1 SI 588             |
| D23       | 14010665 | Zener Diode EQA 01-10              |
| D16 - D19 | 14010668 | Silicon Diode 1 SI 885             |
| BR        | 14020129 | Silicon Diode Bridge 0,6 A SIRB-10 |
| D24       | 14020177 | Zener Diode EQA 01-10 RA           |
| D22       | 14020178 | Zener Diode EQA 01-15              |
|           |          | <u>Carbon Film Resistor</u>        |
| R3        | 16010096 | 470 1/4 W 10 %                     |
| R18       | 16010193 | 4,7 K 1/4 W 10 %                   |
| R8        | 16010218 | 1 K 1/4 W 10 %                     |
| R14, R15  | 16010219 | 2,2 K 1/4 W 10 %                   |
| R34       | 16010300 | 10 K 1/4 W 10 %                    |
| VR1       | 16010793 | Variable Resistor 5 K 0,1 W        |
| C26       | 16040288 | Electrolytic Capacitor 47 µF, 25 V |
| C27 - C29 | 16040289 | " " " 100 µF, 25 V                 |
| C30       | 16040290 | " " " 1000 µF, 35 V                |
| C31       | 16040299 | " " " 3300 µF, 35 V                |
| 169       | 74767202 | P.C.B.: Power Supply Secondary     |

# POWER SUPPLY



# PARTS LIST - POWER SUPPLY

| Index No. | Part No.   | Description                                                      |
|-----------|------------|------------------------------------------------------------------|
| 2         | 03130050 B | Pan Head Screw: M 3 x 5                                          |
| 3         | 03130060 B | " " " : M 3 x 6                                                  |
| 4         | 03130080 B | " " " : M 3 x 8                                                  |
| 5         | 03130200 B | " " " : M 3 x 20                                                 |
| 6         | 03140060 B | " " " : M 4 x 6                                                  |
| 15        | 07010030 B | Flat Washer: M 3                                                 |
| 18        | 07030040 B | Spring Washer: M 4                                               |
| 20        | 07040040 B | Crown Washer: M 4                                                |
| 40        | 11000840   | Terminal: Rosin Type                                             |
| 42        | 12040323   | Voltage Change Switch (115/220 V,<br>125/220 V)                  |
| 43        | 12040374   | Power Switch (for USA)                                           |
| 43        | 12040381   | Power Switch                                                     |
| 46        | 60620177   | Receptacle: (for Latin America, Asia 115 V)                      |
| 47        | 60620182   | Cover: Receptacle: (for Latin America,<br>Asia 115 V)            |
| 48        | 60620184   | Power Cord: Latin America, Asia 115 V)                           |
| 48        | 74767601   | Power Cord: 115 V UL                                             |
| 48        | 74767602   | Power Cord: Germany                                              |
| 48        | 74767603   | Power Cord: Australia                                            |
| 48        | 74767612   | Power Cord: England, Hong Kong, Singapore                        |
| 48        | 74767613   | Power Cord: France, Spain                                        |
| 49        | 74677503   | Name Plate: Voltage Change: 115/220 V                            |
| 49        | 74697506   | Name Plate: Voltage Change: 125/220 V                            |
| 52        | 74761530   | Chassis                                                          |
| 53        | 74761531   | Radiation Plate: Power Supply                                    |
| 167       | 74767101   | P.C.B.: Power Supply: Primary 115 V                              |
| 167       | 74767103   | P.C.B.: Power Supply: Primary 115/220 V,<br>125/220 V, 220/240 V |
| 168       | 74767121   | Power Transformer: 115 V                                         |
| 168       | 74767122   | Power Transformer: 220/240 V                                     |
| 168       | 74767123   | Power Transformer: 115/125/220 V                                 |

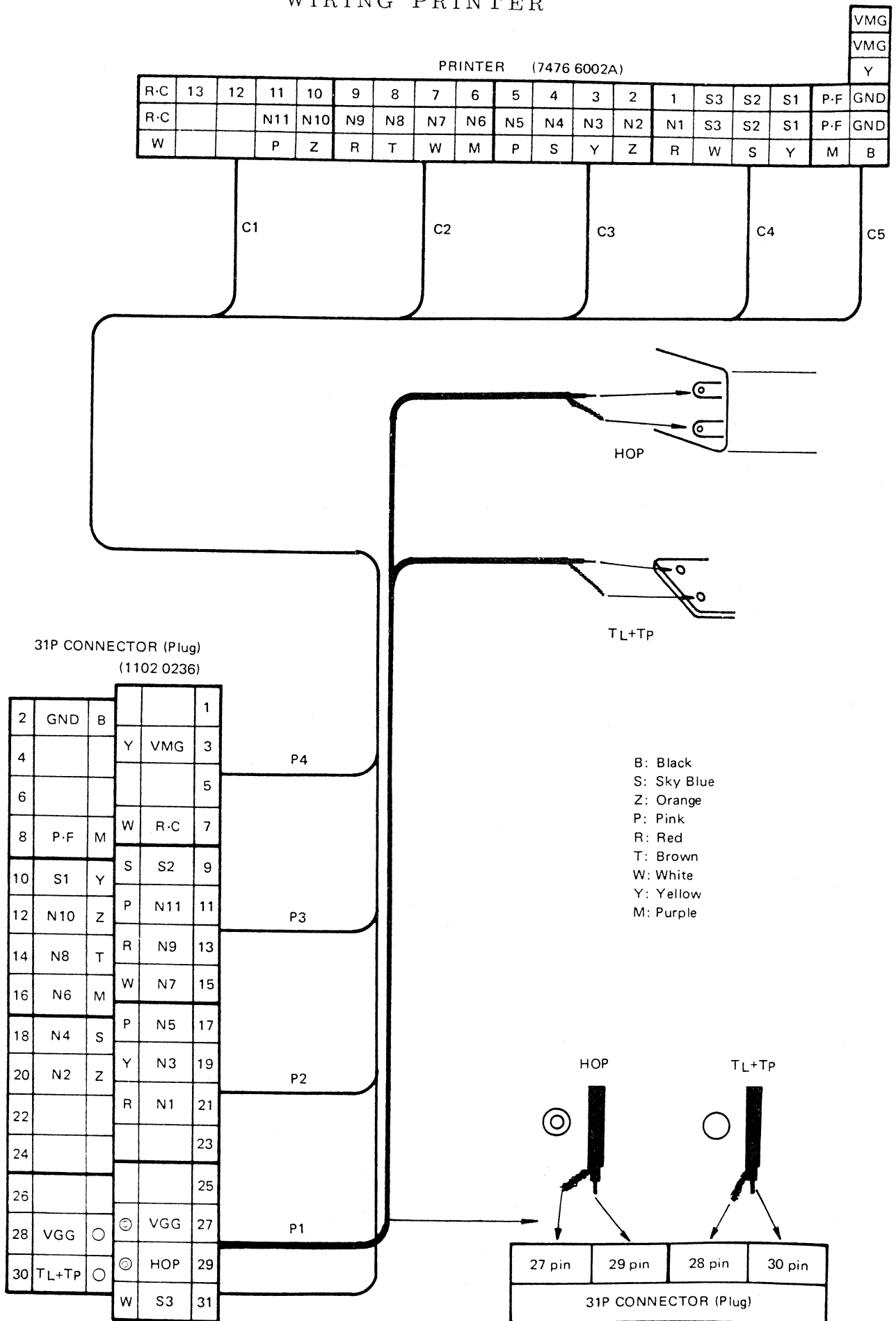
| Index No. | Part No. | Description                          |
|-----------|----------|--------------------------------------|
| 169       | 74767202 | P.C.B.: Power Supply: Secondary      |
| 170       | 74767501 | Insulation Washer                    |
| 171       | 74767504 | Spacer: Power Supply P.B.C.          |
| 172       | 74767604 | Receptacle                           |
| Q5        | 14010042 | Transistor 2 SD 111                  |
| C31       | 16040299 | Electrolytic Capacitor 3300 uF, 35 V |

NOTE: Parts 74767101, 74767103 and 74767202 are not assemblies; they are individual parts of P.C.B.

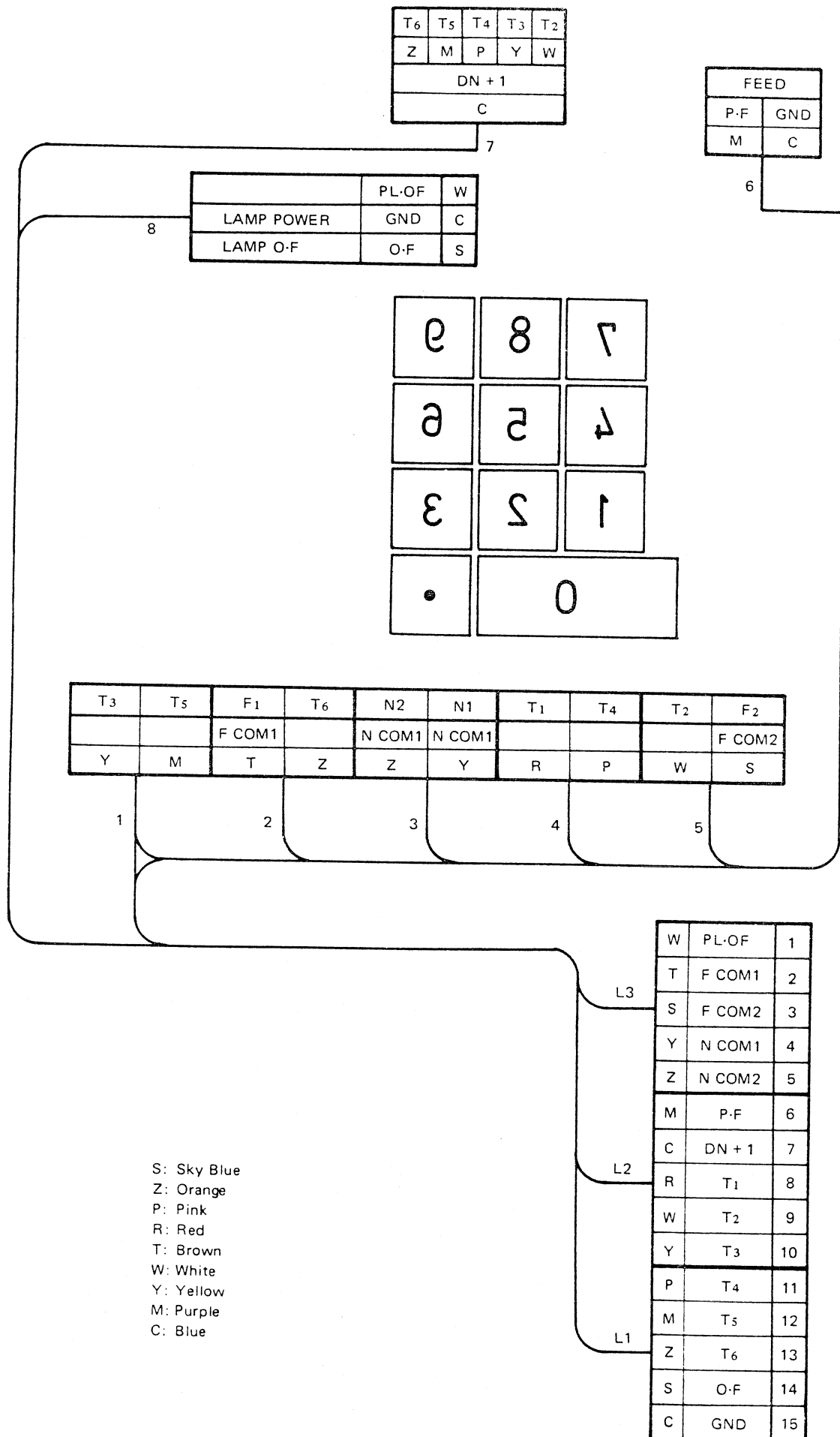
Power Supply Assembly

|     |          |           |                       |
|-----|----------|-----------|-----------------------|
| 173 | 74767910 | 100 V     |                       |
| 173 | 74767911 | 115 V UL  |                       |
| 173 | 74767912 | 115 V     | (Latin America, Asia) |
| 173 | 74767913 | 220 V     | (Germany)             |
| 173 | 74767914 | 240 V     | (England, Australia)  |
| 173 | 74767915 | 115/220 V | (Latin America)       |
| 173 | 74767916 | 115/220 V | (France, Asia)        |
| 173 | 74767917 | 125/220 V | (Spain)               |

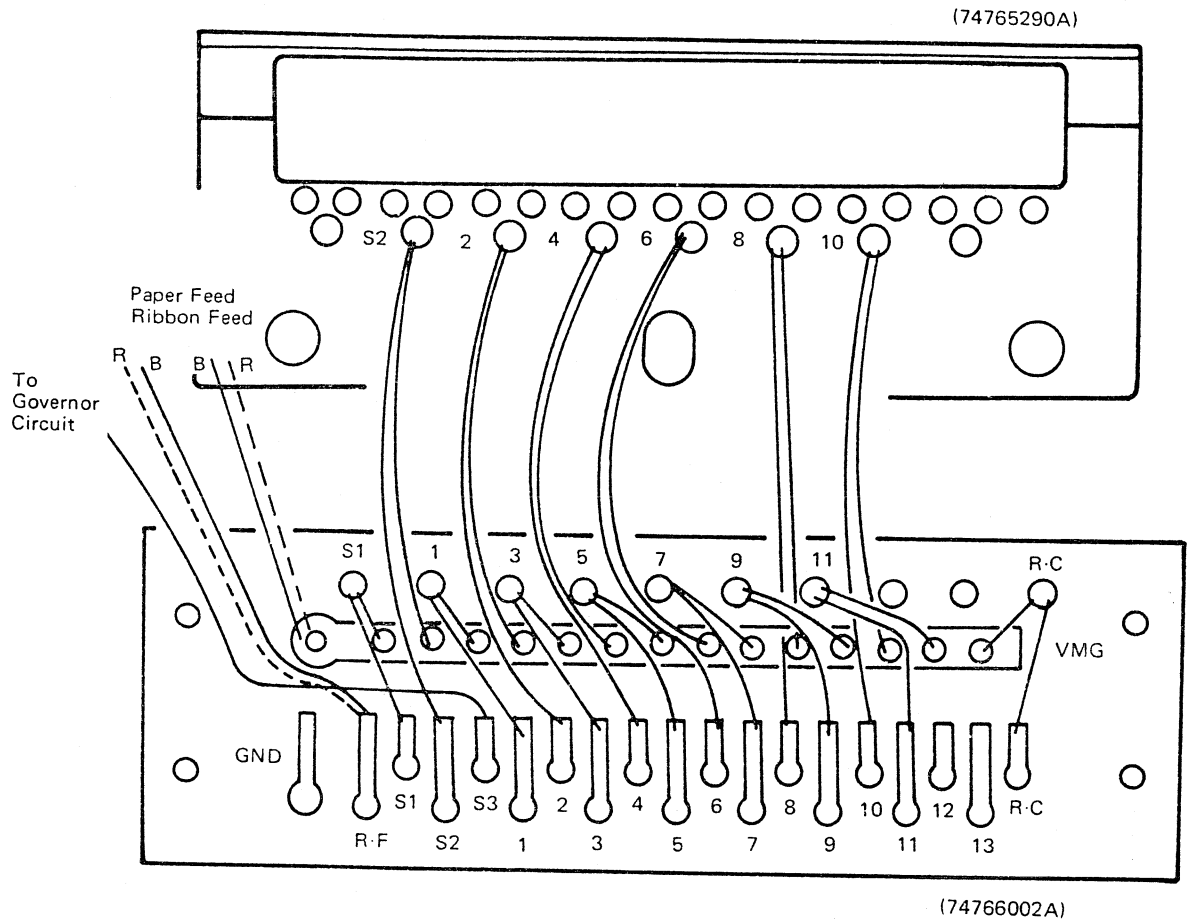
# WIRING PRINTER



# WIRING KEYBOARD



## WIRING MAGNETS

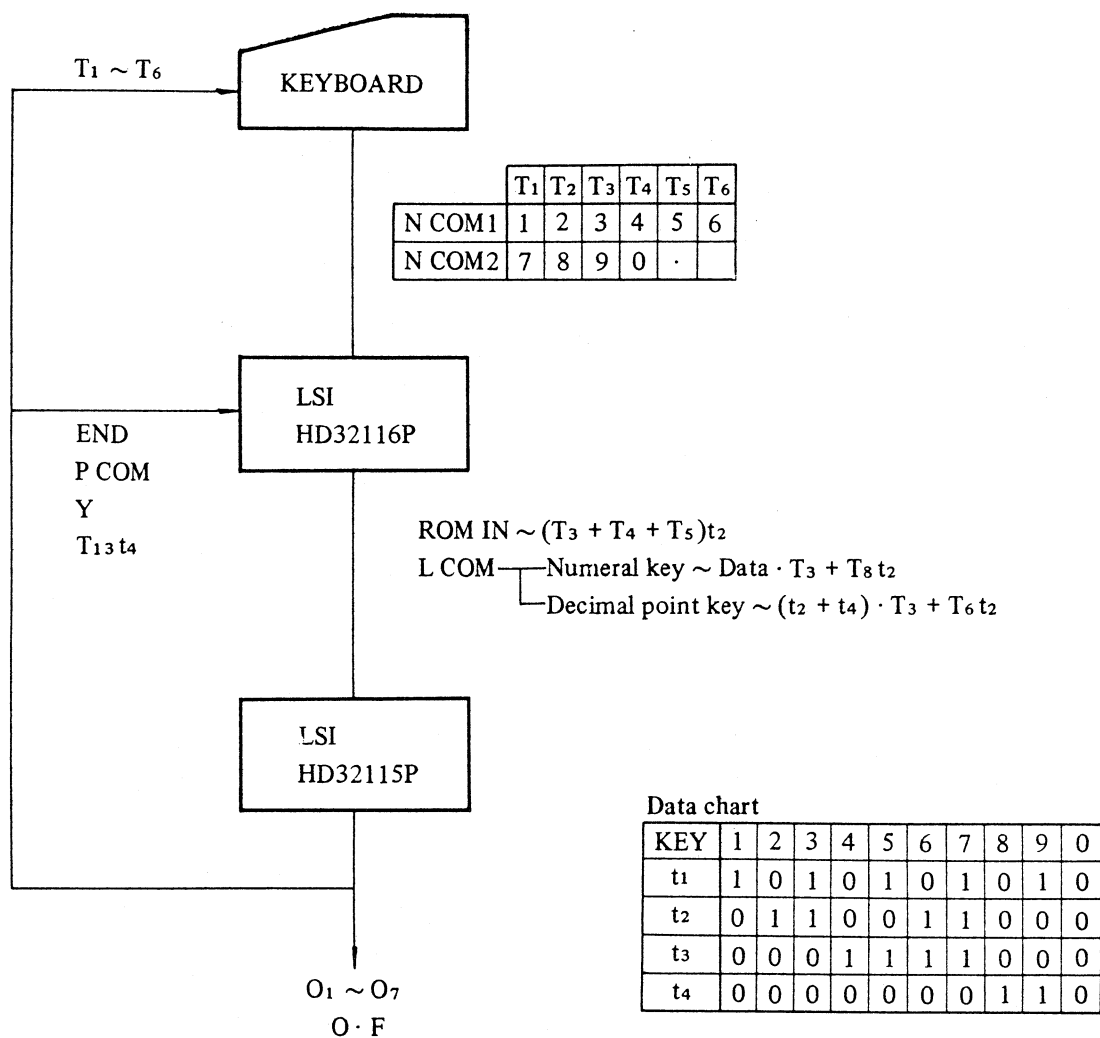


The above diagram shows how the magnets in the printer section are wired. In the diagram, sign magnets are represented by  $S_1$  and  $S_2$ ; numeral and magnets by 1 through 10; ribbon change magnet by RC; and paper/ribbon feed magnet by PF. Two magnets are used in feed drive, represented by PF. Black and red wires are used in such a way as to alternate black and red.



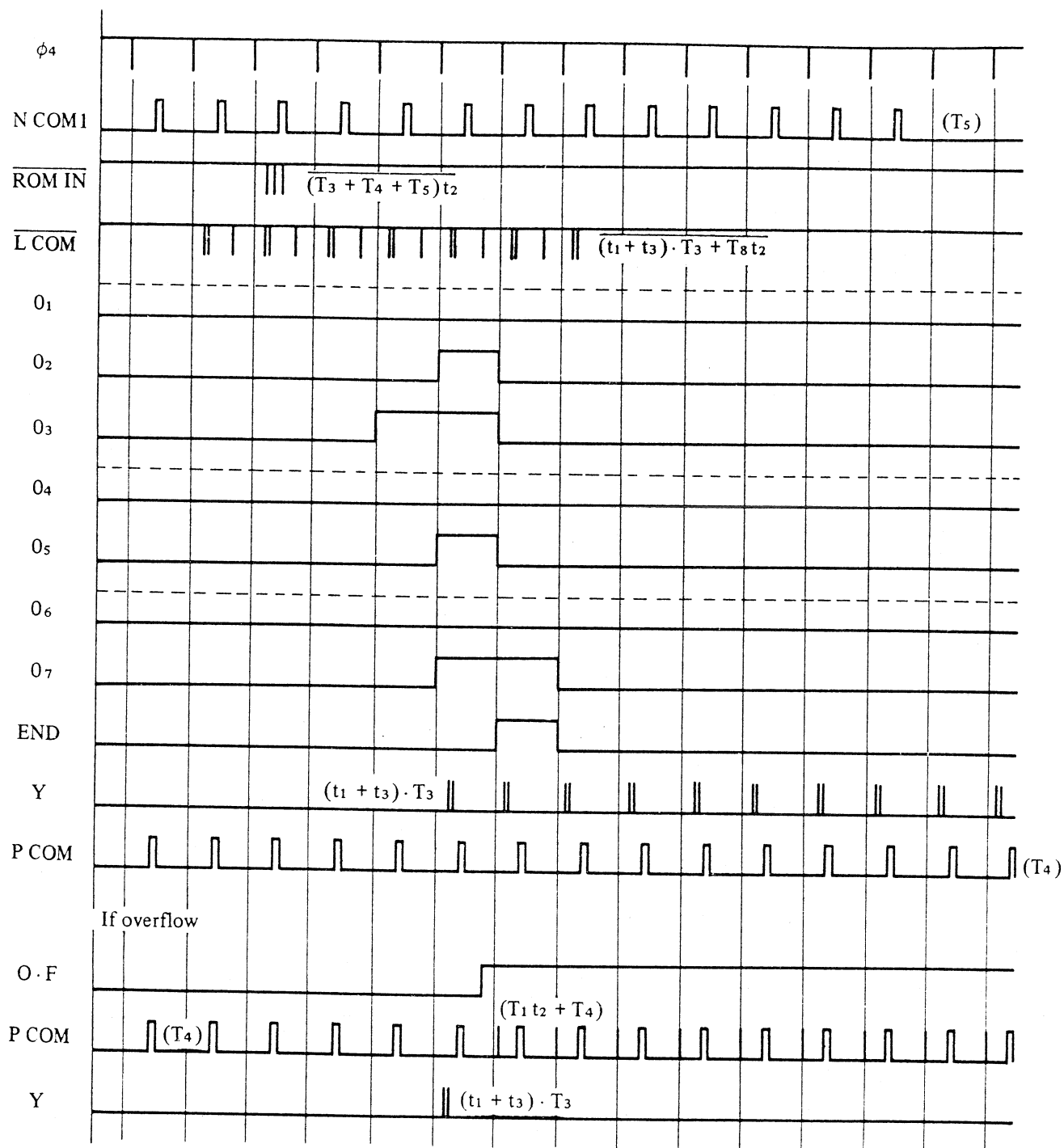
# NUMBER ENTRY

## BLOCK DIAGRAM



# ENTRY TIME CHART

Example: When 5 key is depressed.



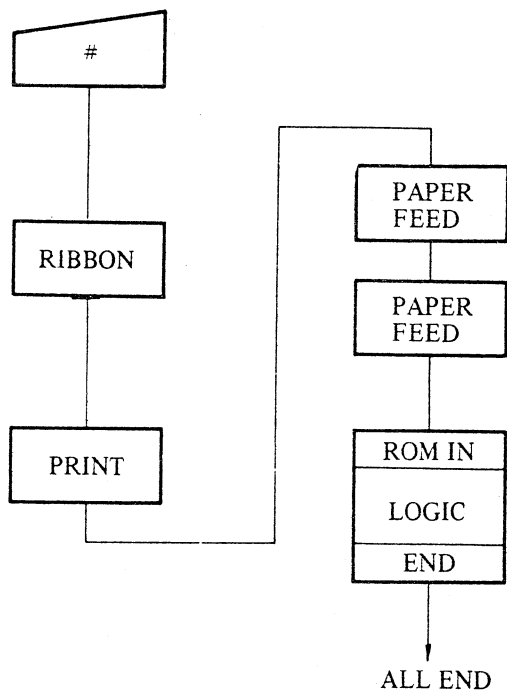
Note: P COM varies with the decimal point contents in the register.

| The decimal point contents | 0              | 1              | 2              | 3              | 4              | 5              | 6               | 7               | 8               | 9               |
|----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|
| P COM                      | T <sub>4</sub> | T <sub>5</sub> | T <sub>6</sub> | T <sub>7</sub> | T <sub>8</sub> | T <sub>9</sub> | T <sub>10</sub> | T <sub>11</sub> | T <sub>12</sub> | T <sub>13</sub> |

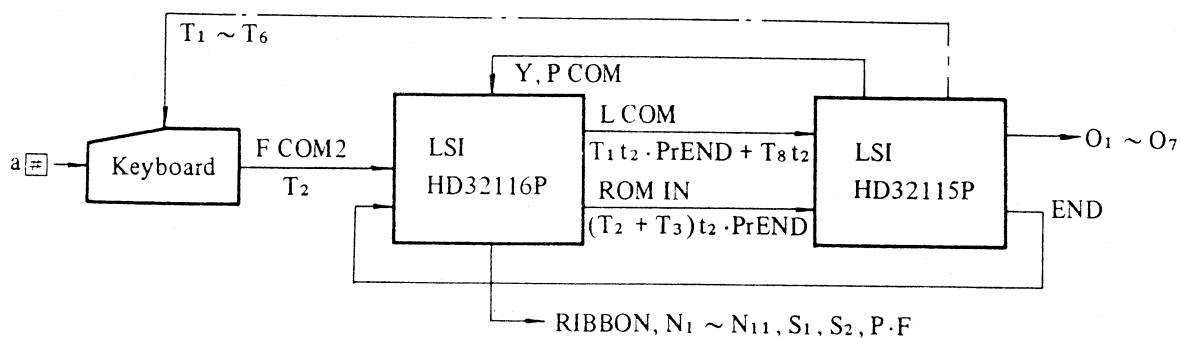
## NON - ADD

The non-add decision is reached through a series of logic steps initiated from the # key where number entry has not been made. By this decision, the normal action is defeated. Normally, depressing the # key after number entry results in data printing and then in the clearing of register. Without number entry, depressing the # key has no effect: the machine does not respond to it and temporarity remains inactive.

### FLOW CHART



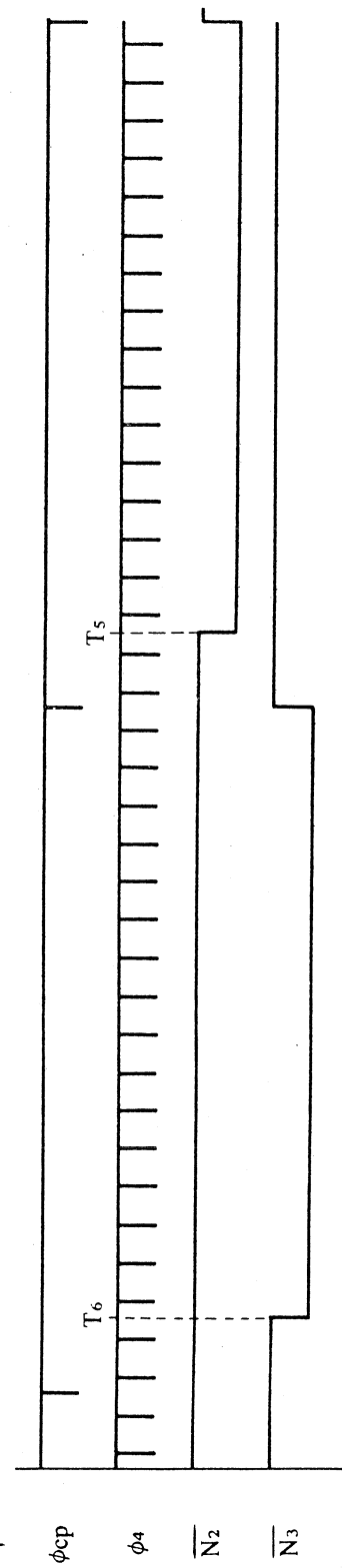
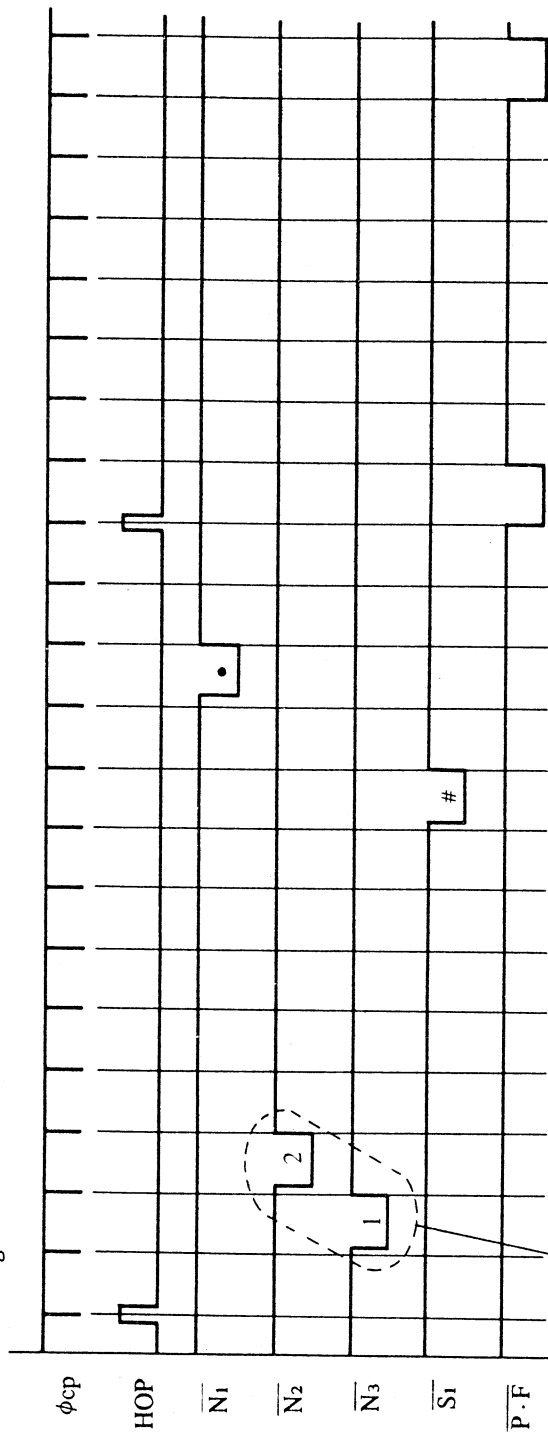
### BLOCK DIAGRAM



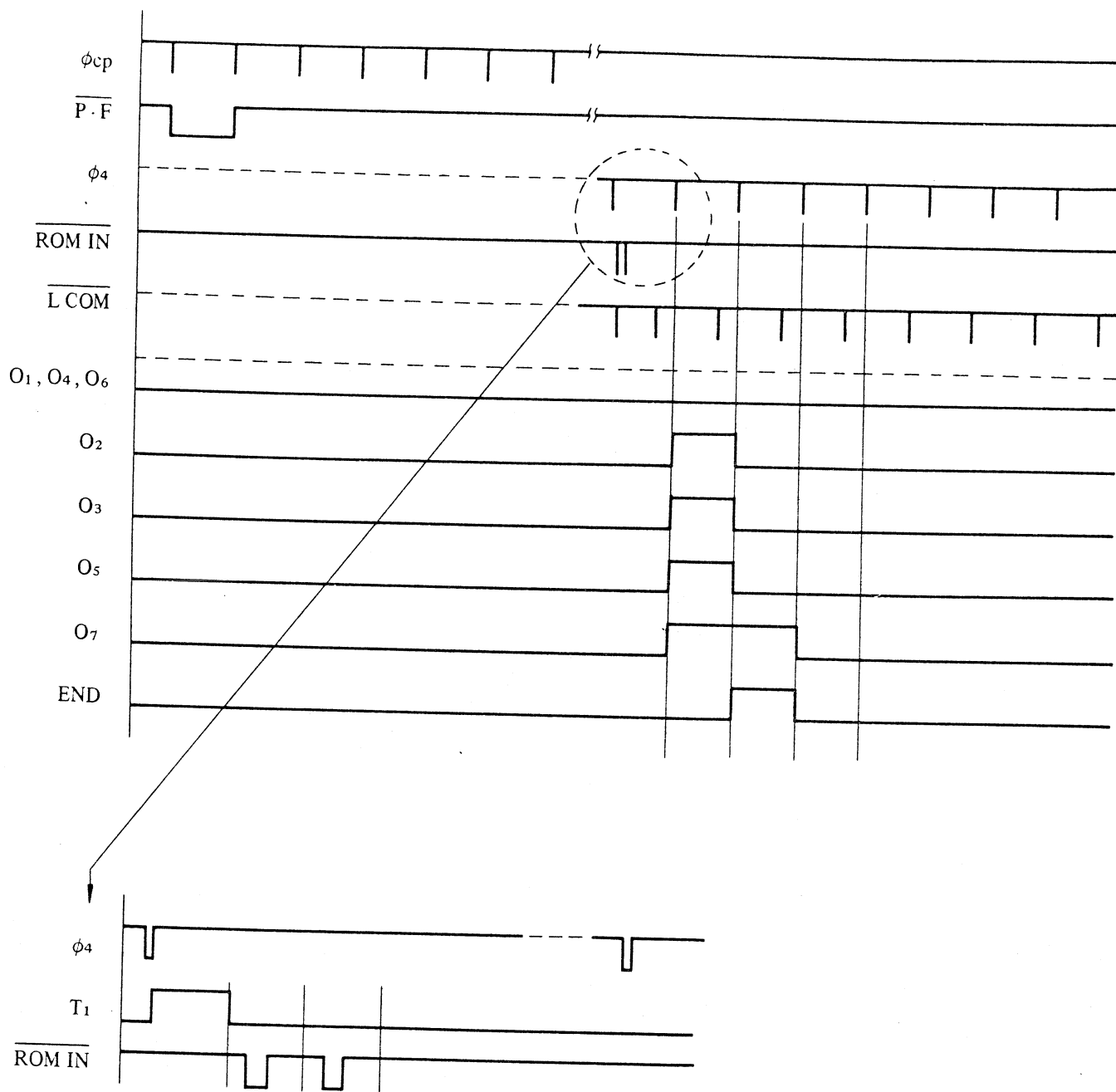
# TIME CHART

Example: 12 (#)

1. Print drive signal

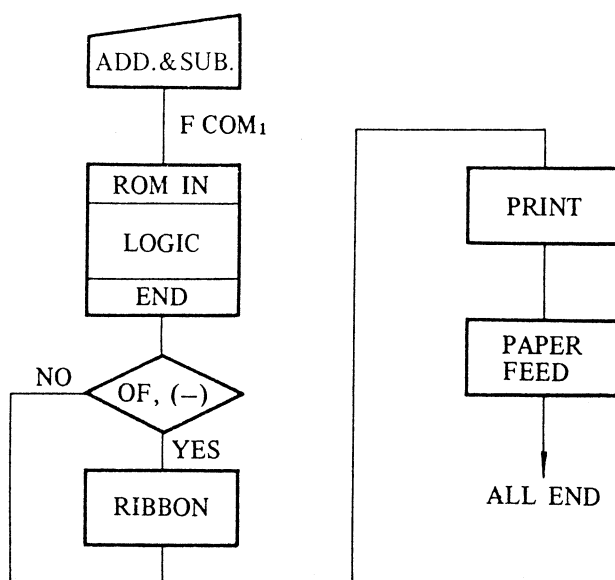


## 2. Logic signal

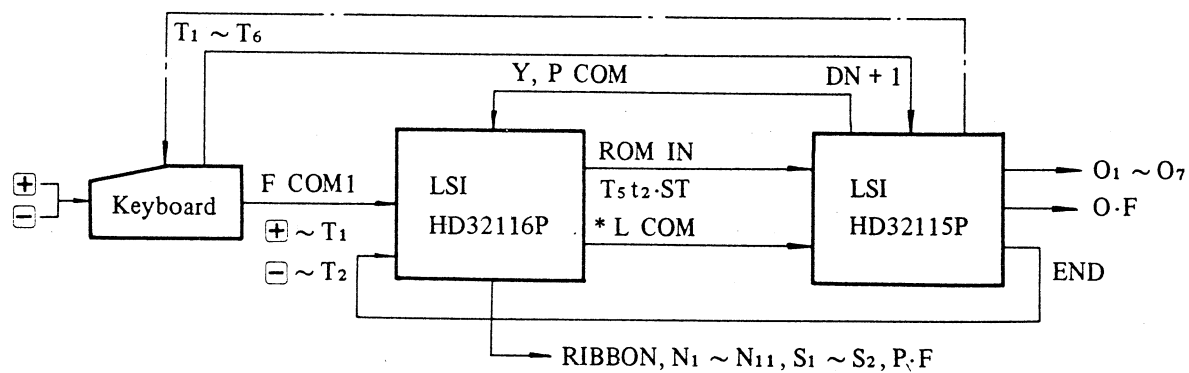


# ADDITION AND SUBTRACTION

## FLOW CHART



## BLOCK DIAGRAM



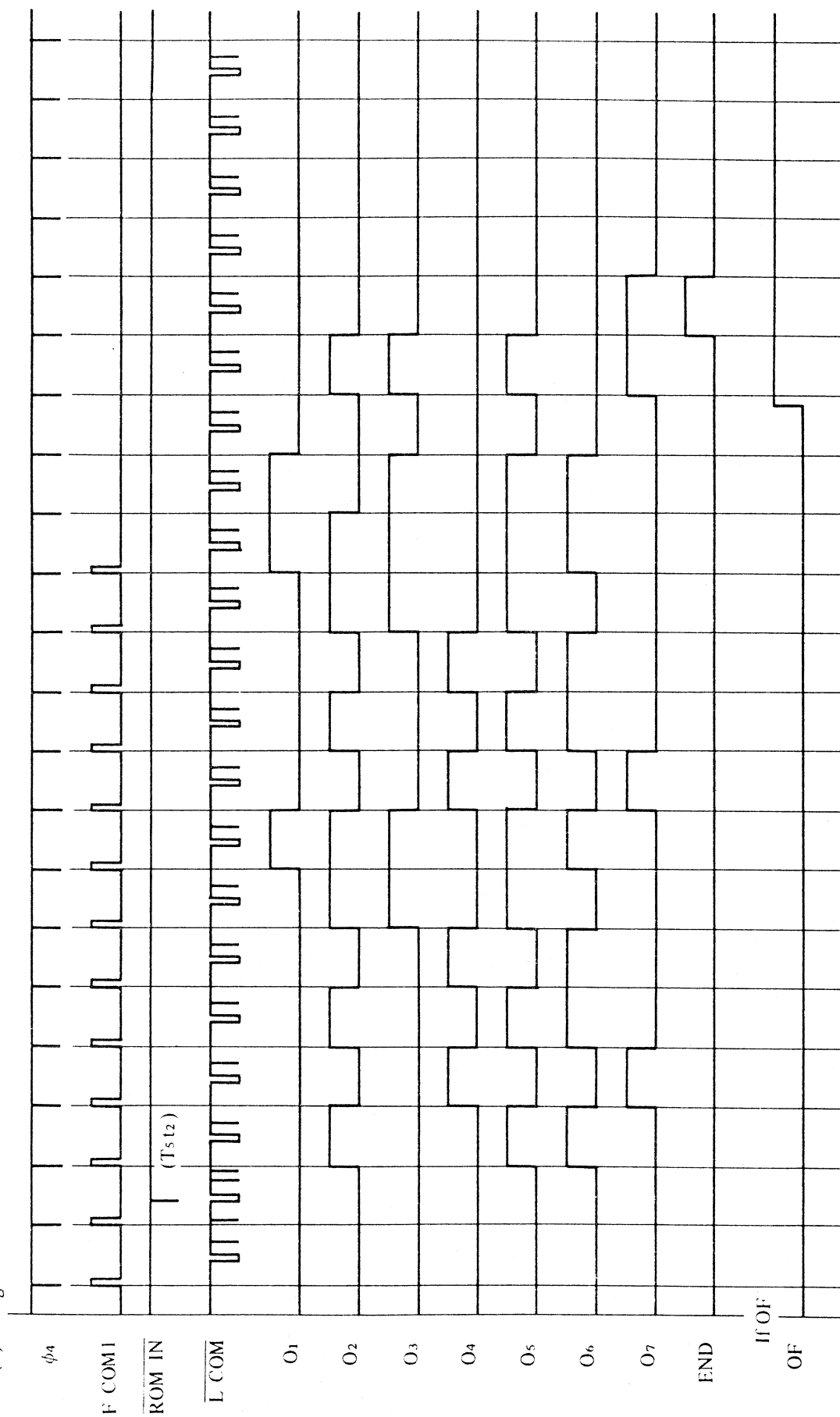
\* L COM

$$\begin{aligned} \oplus &\sim T_5 + (T_1 + T_{11})t_2 \cdot ST + T_8 t_2 \\ \ominus &\sim T_2 + T_5 + (T_1 + T_{11})t_2 \cdot ST + T_8 t_2 \end{aligned}$$

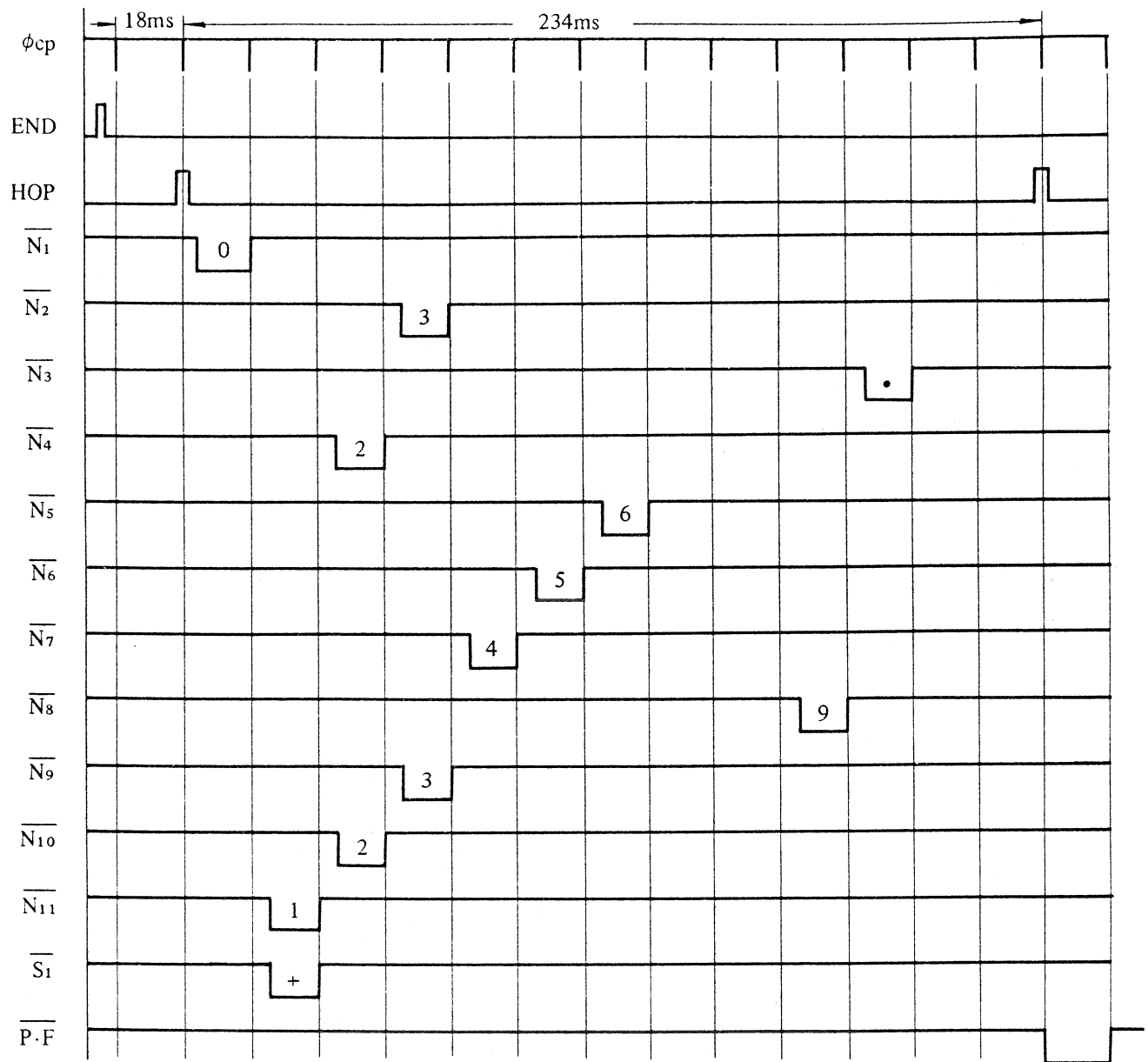
# TIME CHART

Example: 1 2 3 9 4 5 6 2. 3 (+) DN = 2

(1) Logic



(2) Print drive

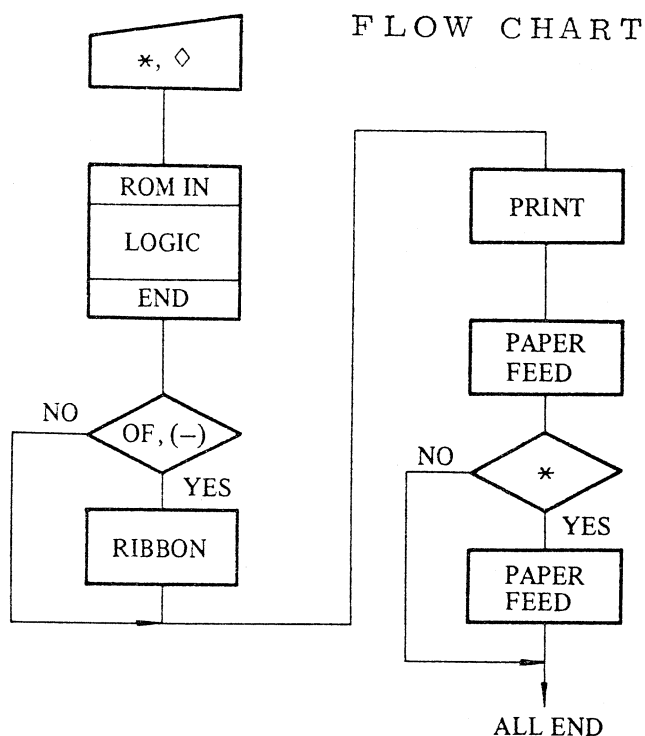




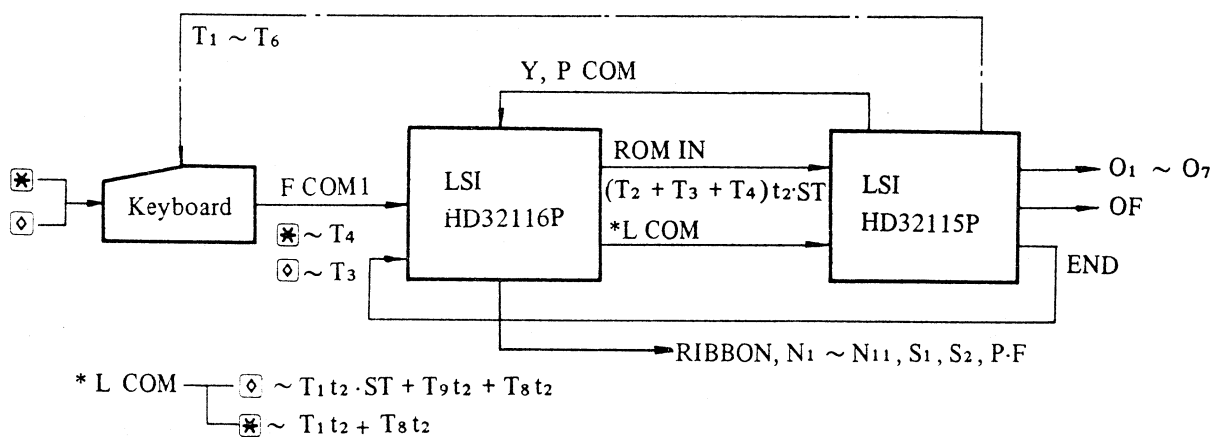
## TOTAL AND SUBTOTAL

Depress the TOTAL key, and contents of memory register go into print. Memory register then gets cleared.

A similar action occurs when the SUBTOTAL key is depressed. The only difference is that memory register does not get cleared.



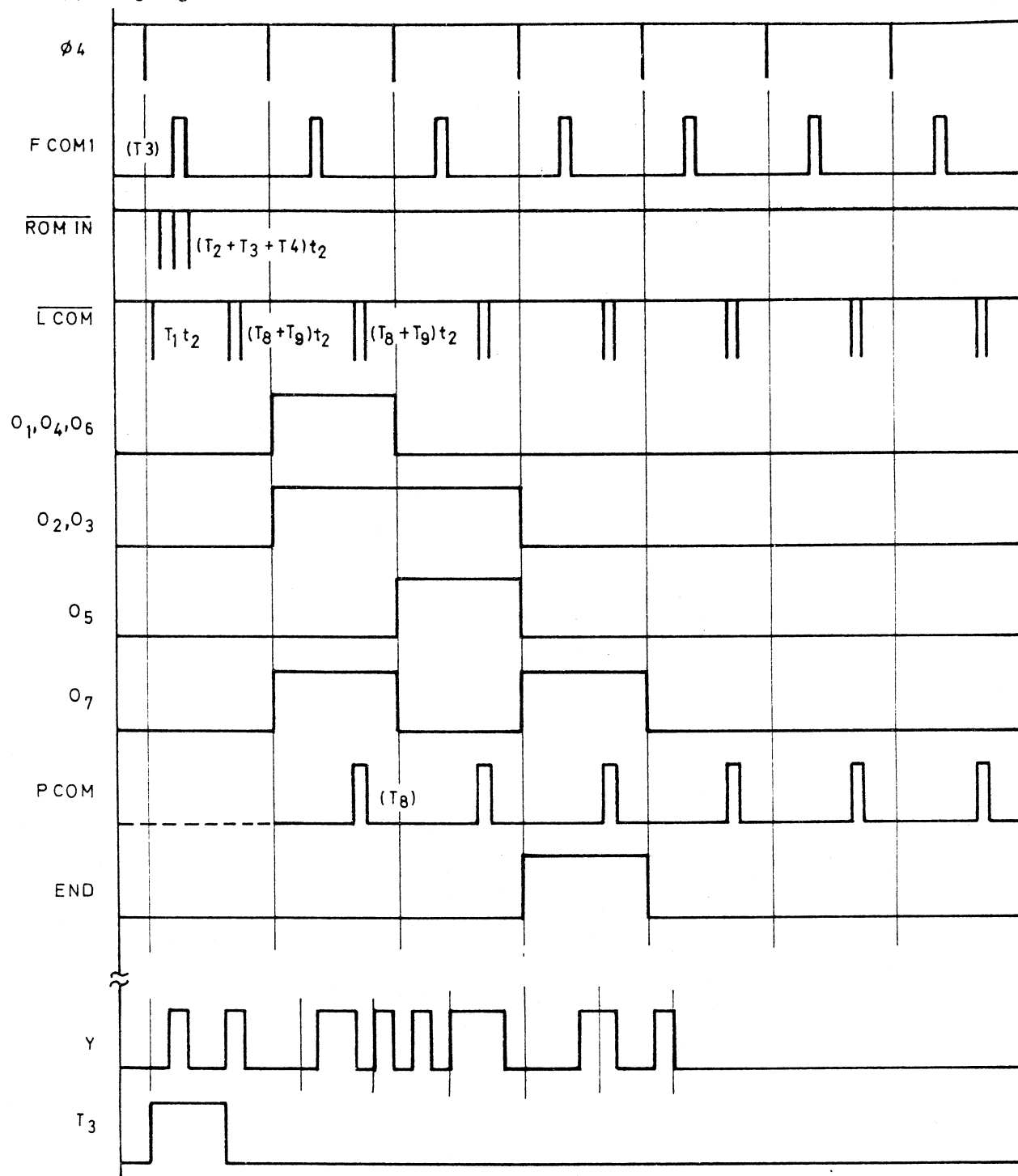
## BLOCK DIAGRAM



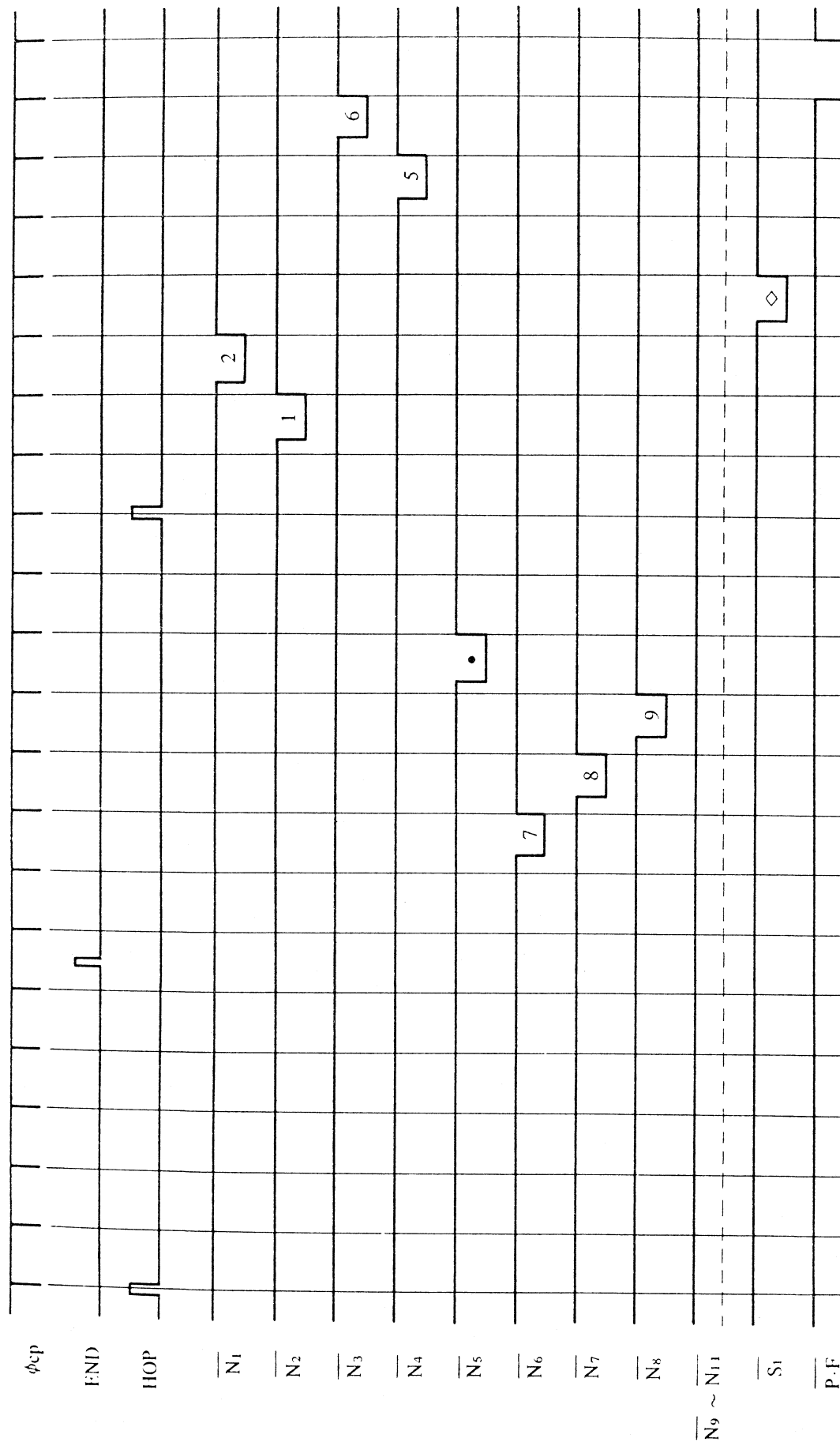
# TIME CHART

Example: Prints 987-5612 ◇

(1) Logic signal



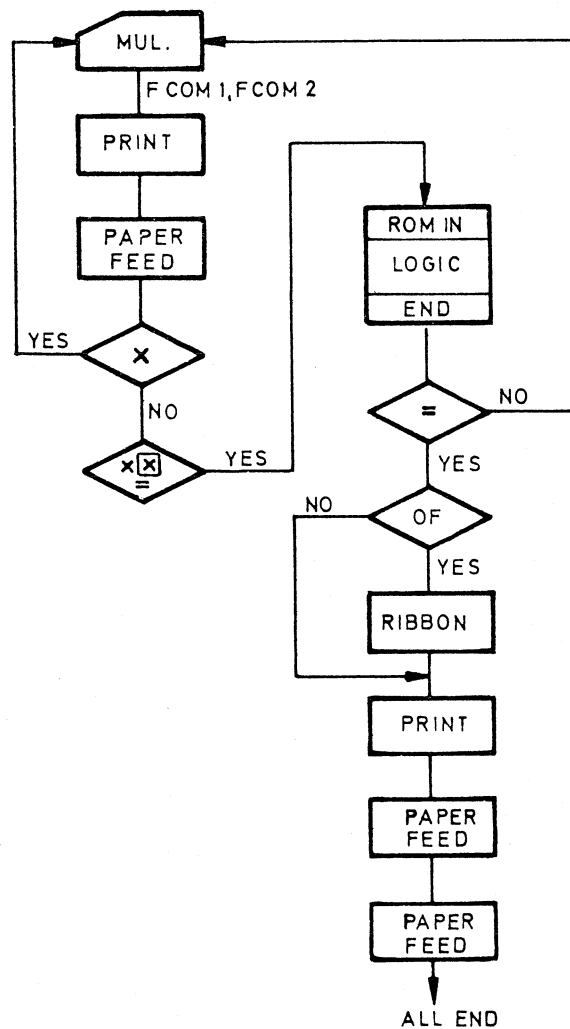
(2) Print drive signal



## MULTIPLICATION

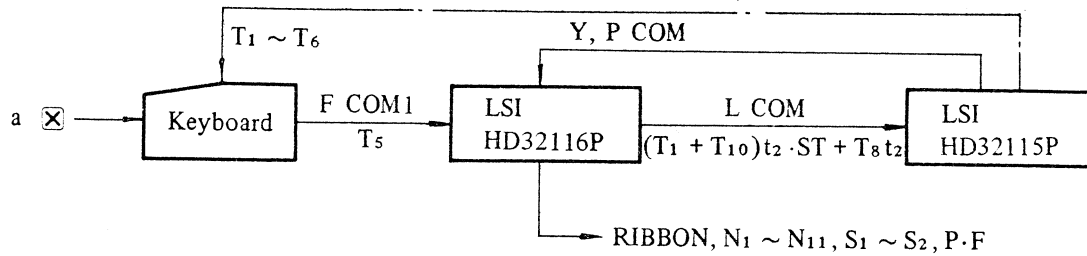
$a \times$  For printing out data (a) and symbol (x).  
 $a \times b \times$  or  $\div$  For performing  $a \times b$  after printing data (b) and symbol (x) or ( $\div$ ).  
 $a \times b =$  Upon completing the  $a \times b$  after printing out data (b) and symbol (=), the result of the computation and  $\diamond$  symbol are printed.  
 $a \times =$  Upon completing the  $a \times =$  after printing out data (a) and symbol (=), the result of the computation and  $\diamond$  symbol are printed.

## FLOW CHART

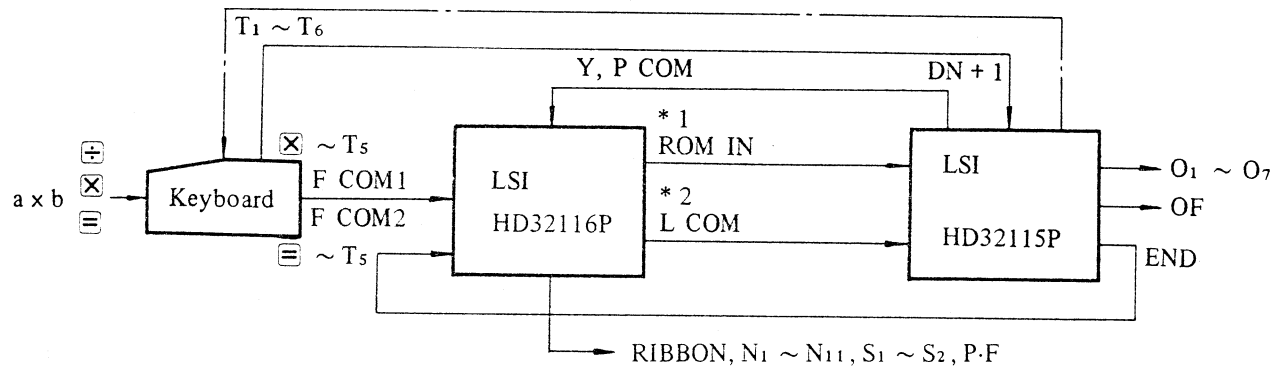


## BLOCK DIAGRAM

1)



2)

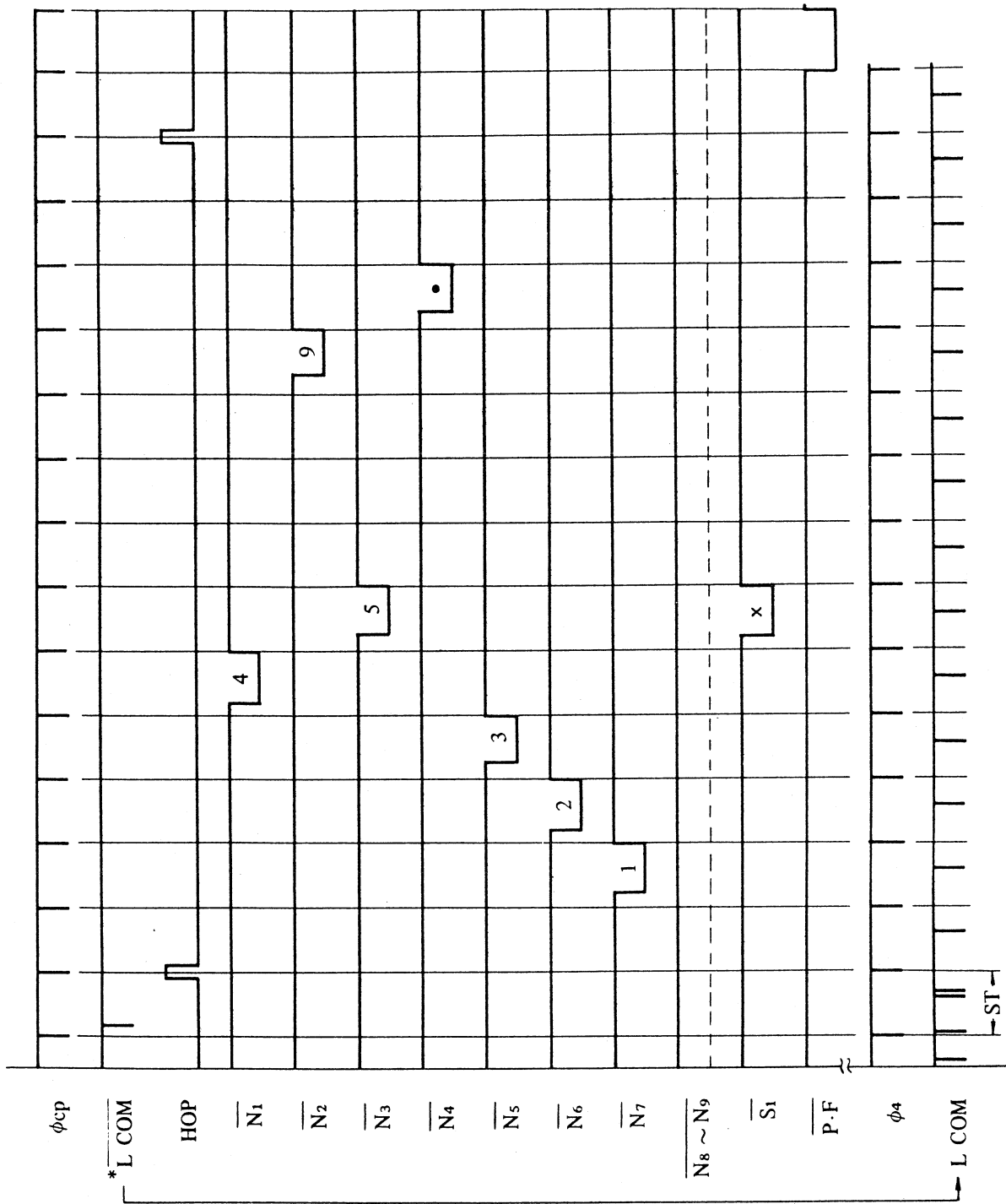


\* 1 ROM IN —  $a \times b \text{ (symbol)}, \equiv \sim T_3t_2 \cdot \text{PrEND}$   
 —  $a \times b =, c \equiv \sim (T_3 + T_5)t_2 \cdot \text{PrEND}$   
 —  $a \times \equiv \sim (T_2 + T_4)t_2 \cdot \text{PrEND}$

\* 2 L COM —  $\text{symbol} \sim (T_1 + T_{10})t_2 \cdot ST + T_8t_2$   
 —  $\equiv \sim T_7t_2 + T_1t_2 \cdot \text{PrEND} + T_8t_2$

# TIME CHART

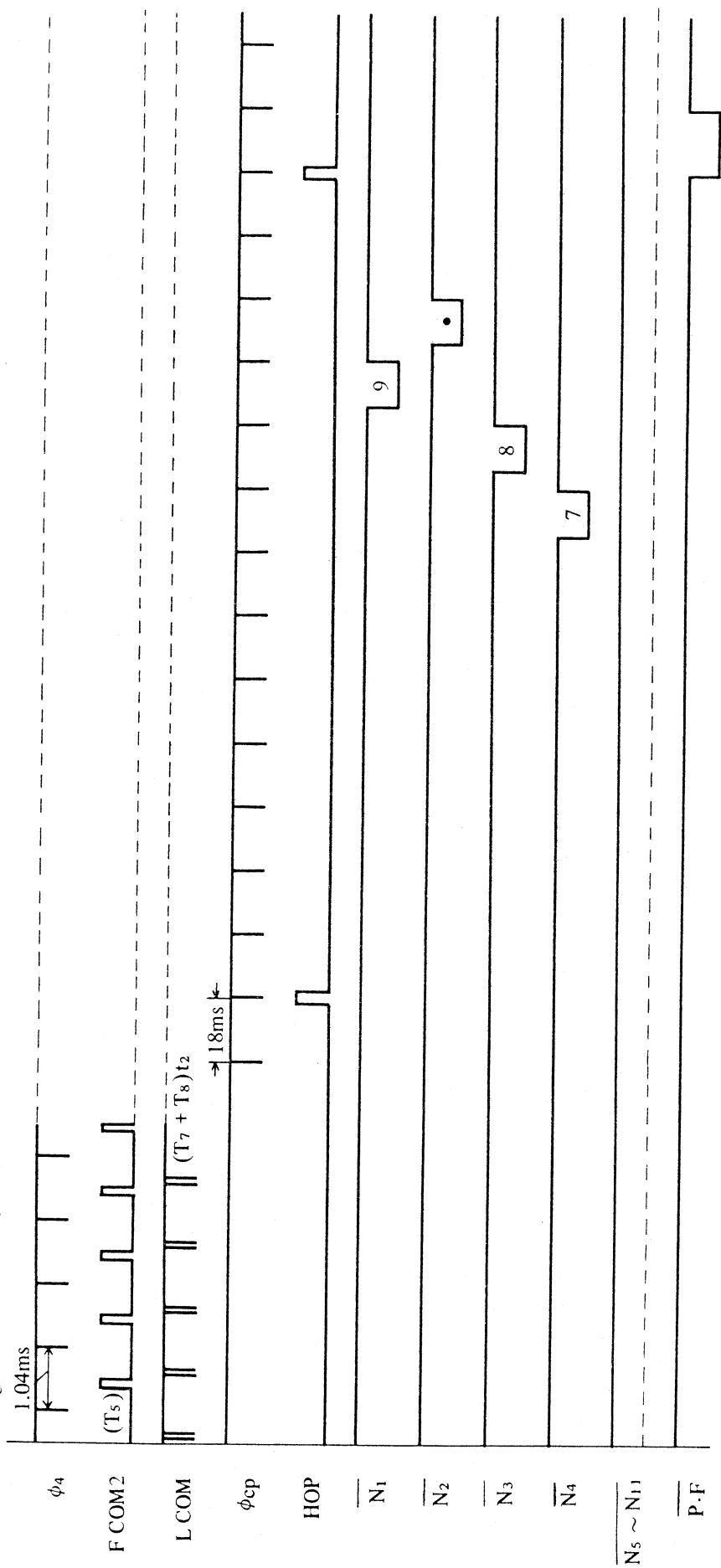
Example: 1 2 3 · 5 9 4 ☒



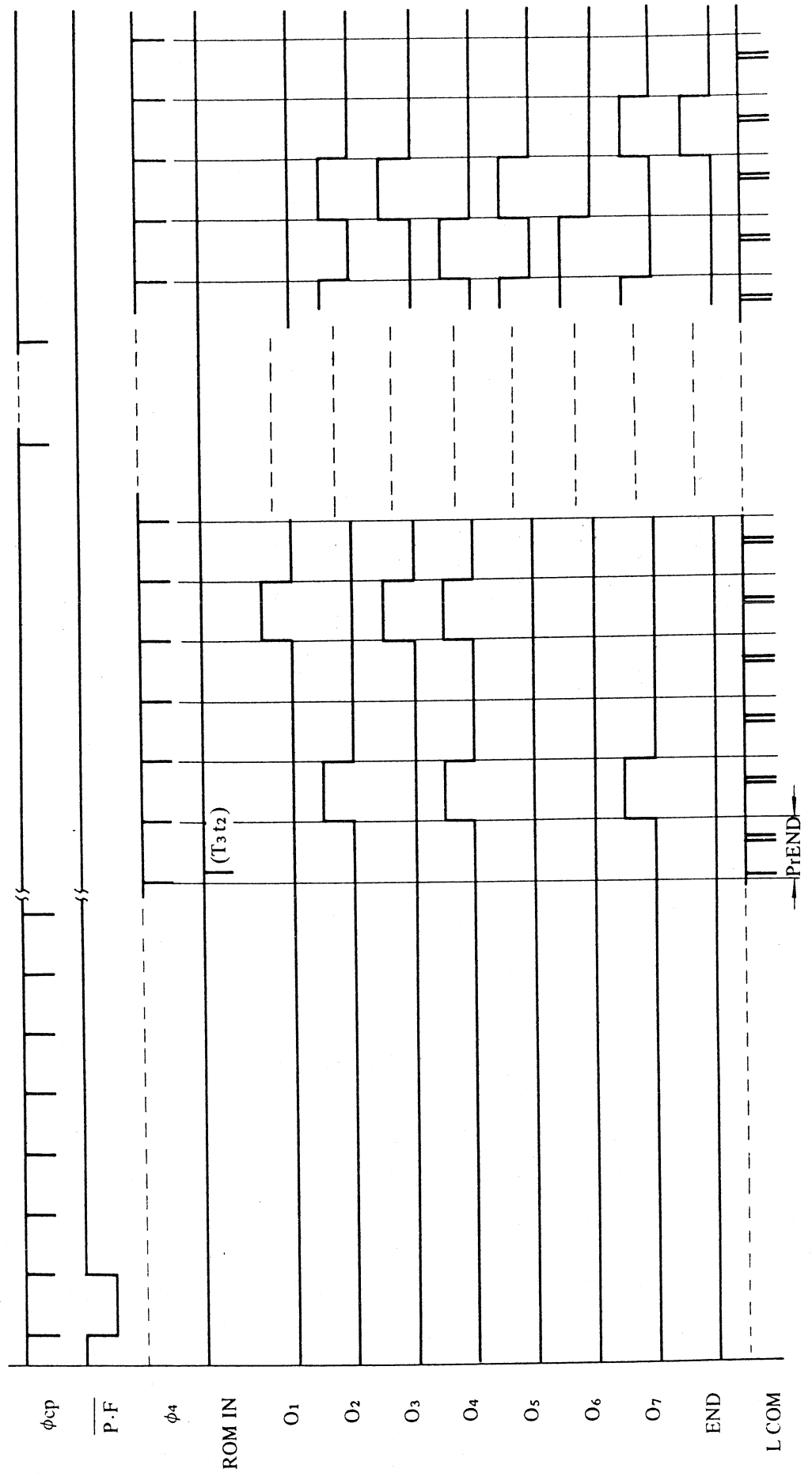
# TIME CHART

Example: 1 2 3 . 4 5 x 7 8 . 9  $\Rightarrow$  DN 4

1. Print drive signal: Prints 7 8 . 9 =

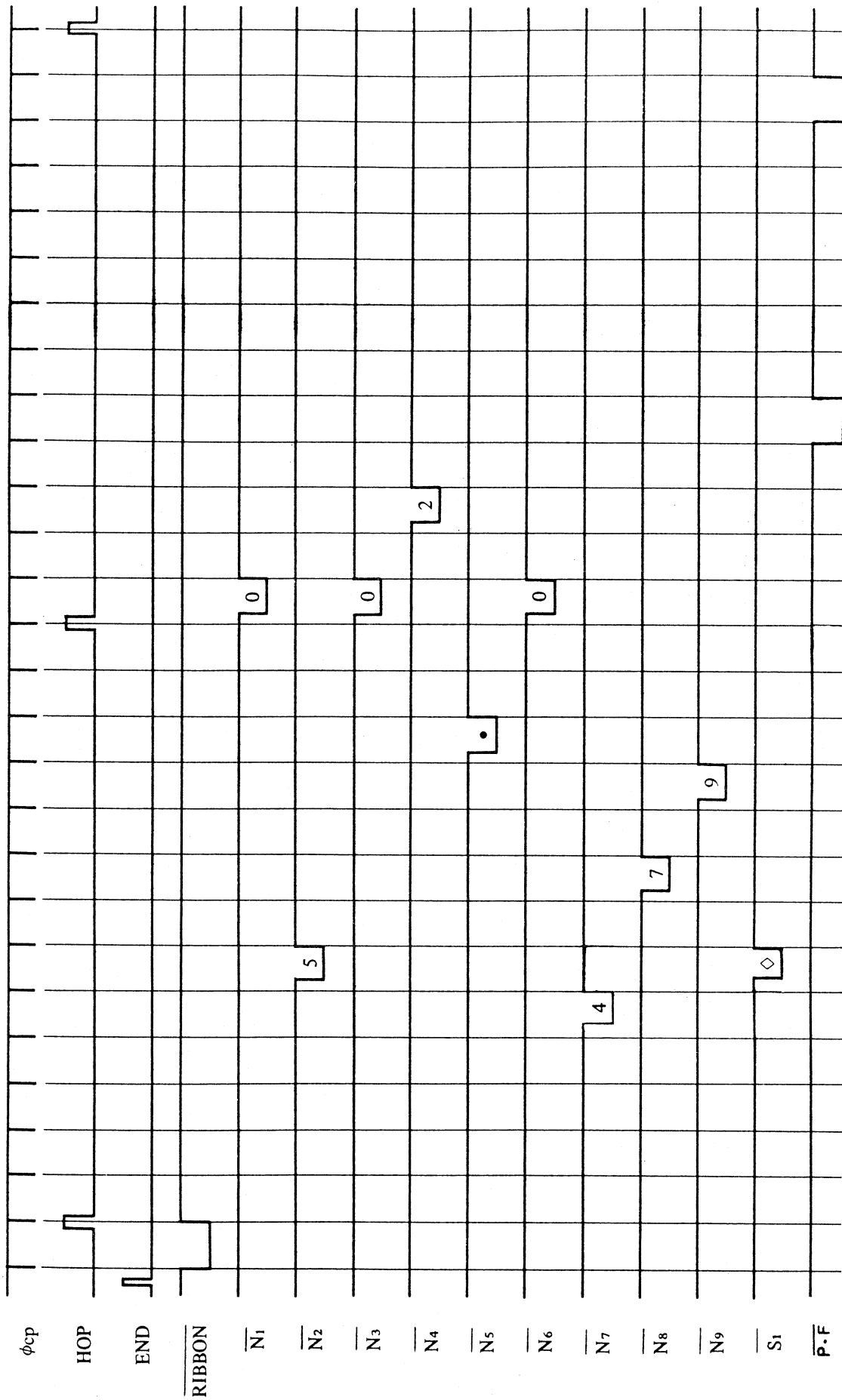


2. Logic signal





3. Print drive signal: Prints answer (9740.2050 - ◇)



## DIVISION

a  $\div$

For printing out data (a) and symbol ( $\div$ ).

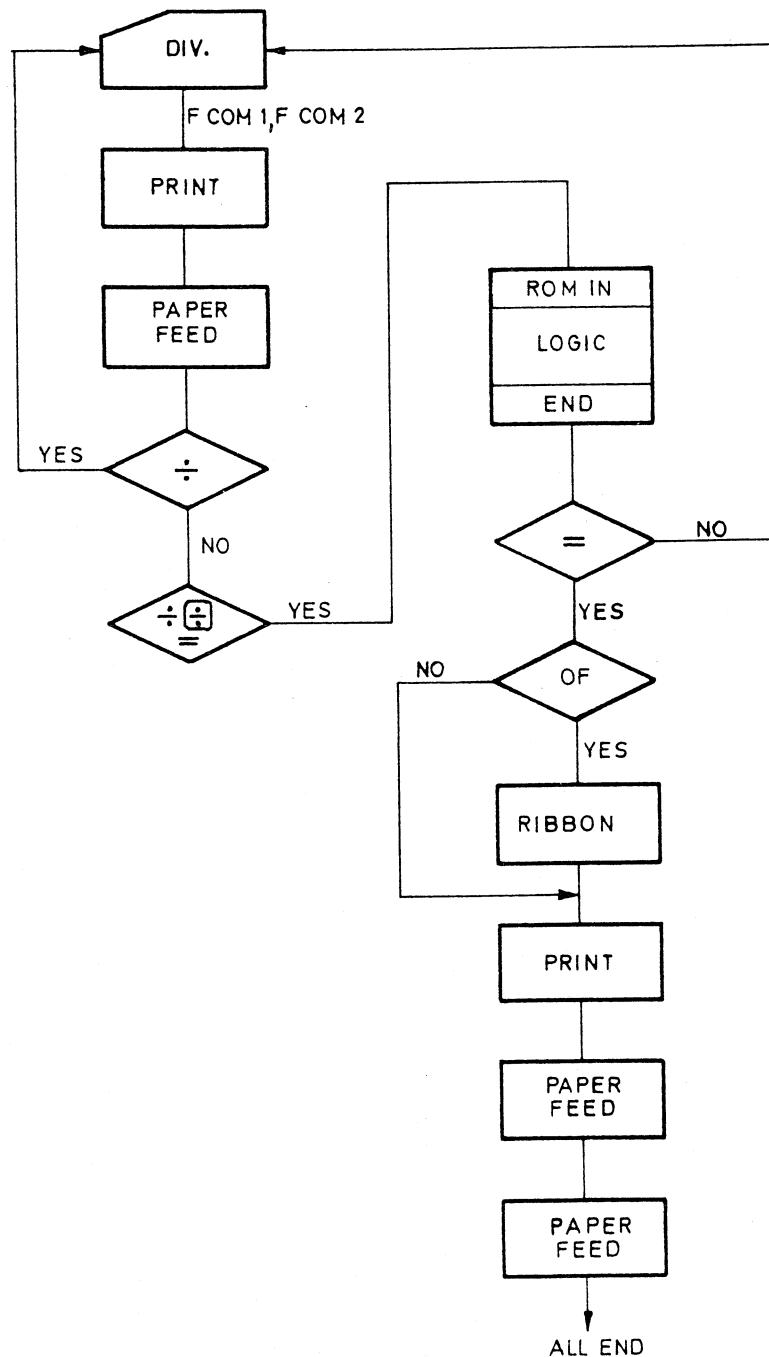
a  $\div$  b  $\div$  or  $\times$

For performing  $a \div b$  after printing data (b) and symbol ( $\div$  or  $\times$ ).

a  $\div$  b  $=$

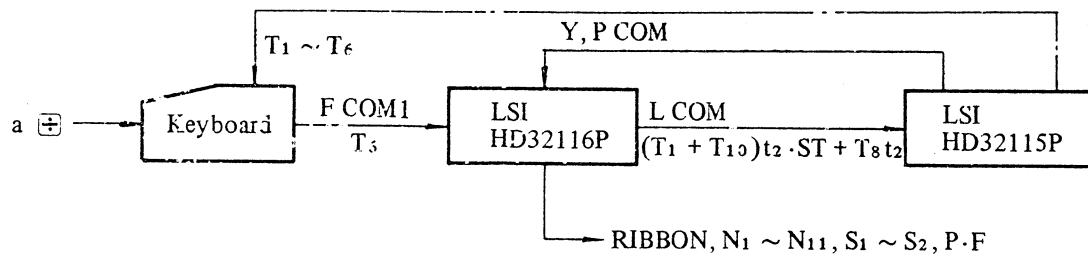
Upon completing the  $a \div b$  after printing out data (b) and symbol, the result of the computation and  $\diamond$  symbol are printed.

## FLOW CHART

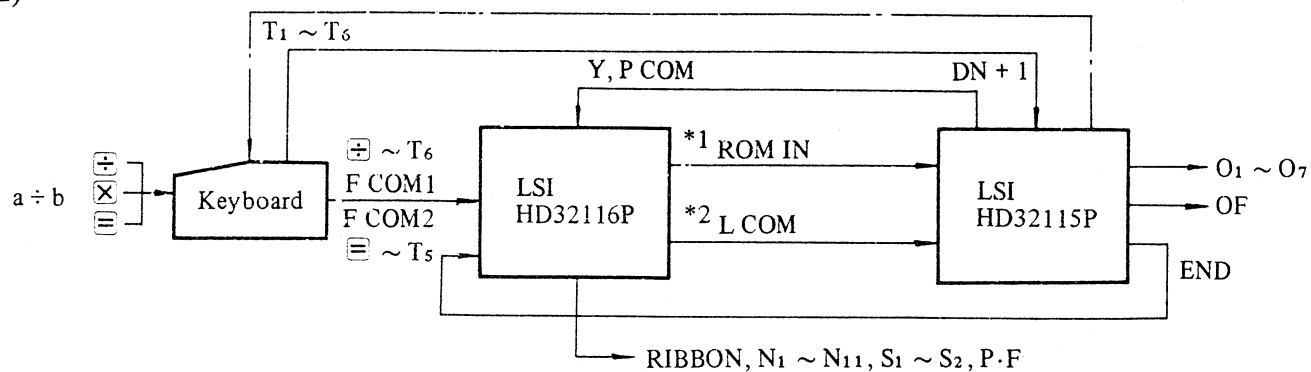


# BLOCK DIAGRAM

1)



2)

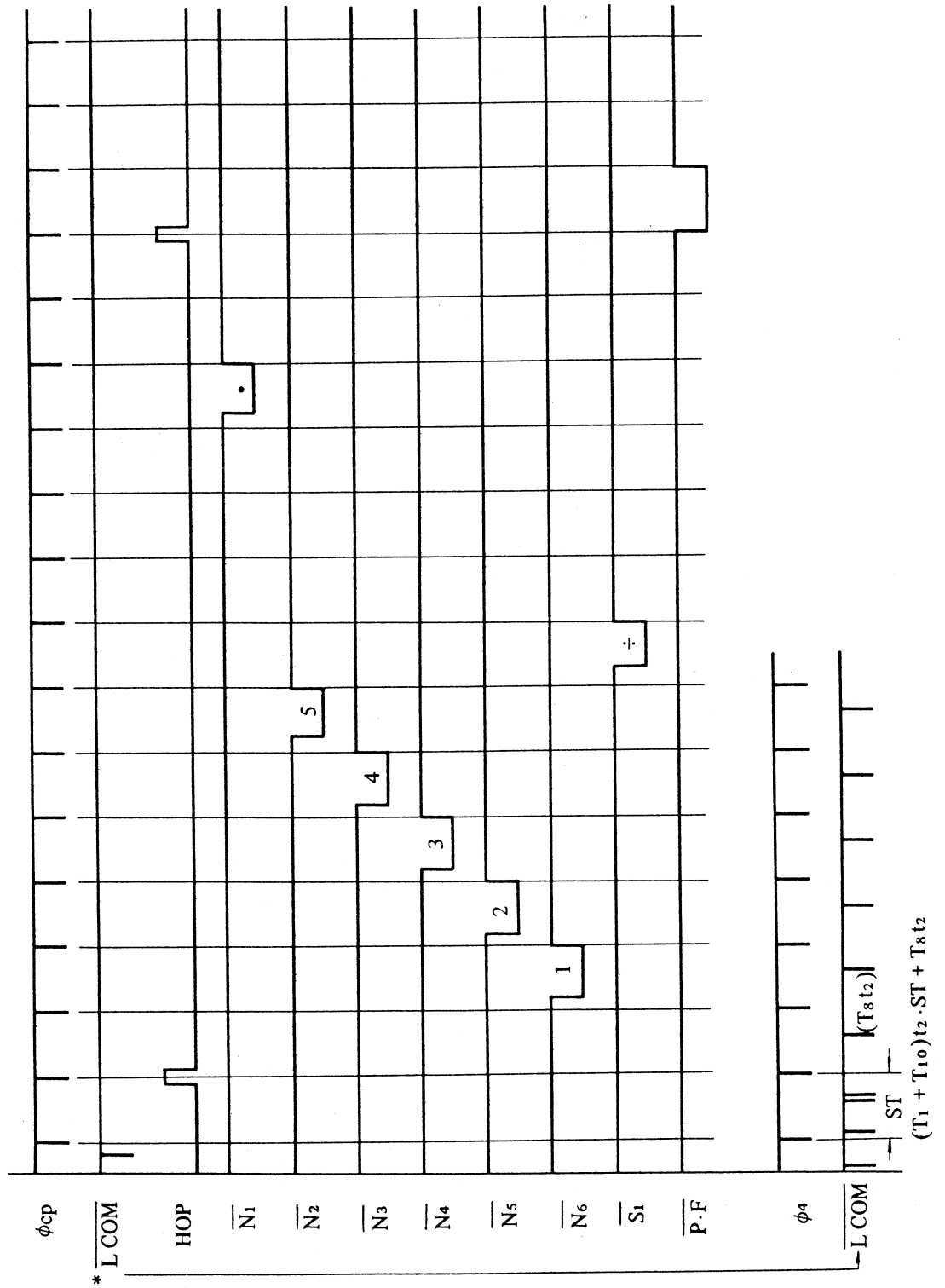


\*1 ROM IN —  $a \div b \div, \times, \equiv \sim (T_3 + T_4)t_2 \cdot \text{PrEND}$   
 —  $a \div b =, c \equiv \sim (T_4 + T_5)t_2 \cdot \text{PrEND}$

\*2 L COM —  $\div \sim (T_1 + T_{10})t_2 \cdot ST + T_8 t_2$   
 —  $\equiv \sim T_7 t_2 + T_1 t_2 \cdot \text{PrEND} + T_8 t_2$

# TIME CHART

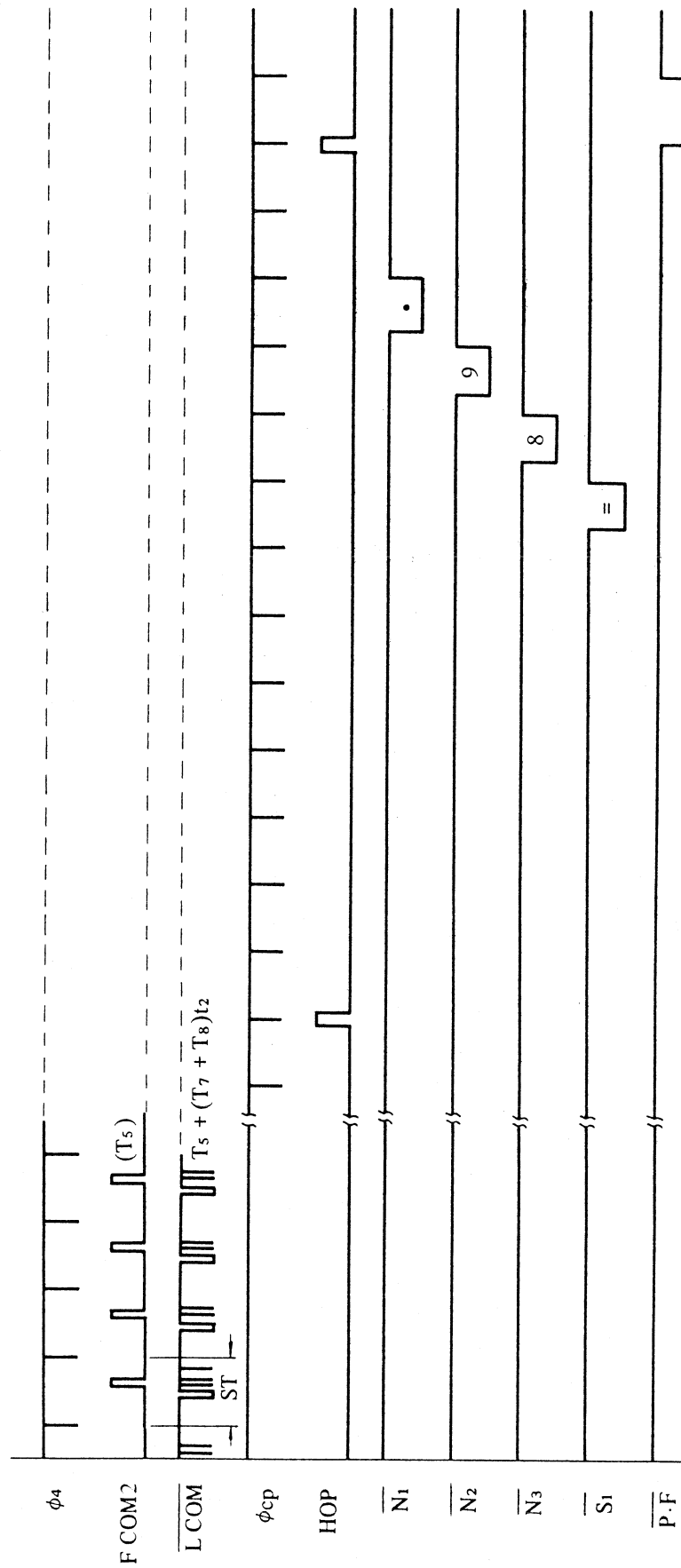
Example: 1 2 3 4 5 ⊕



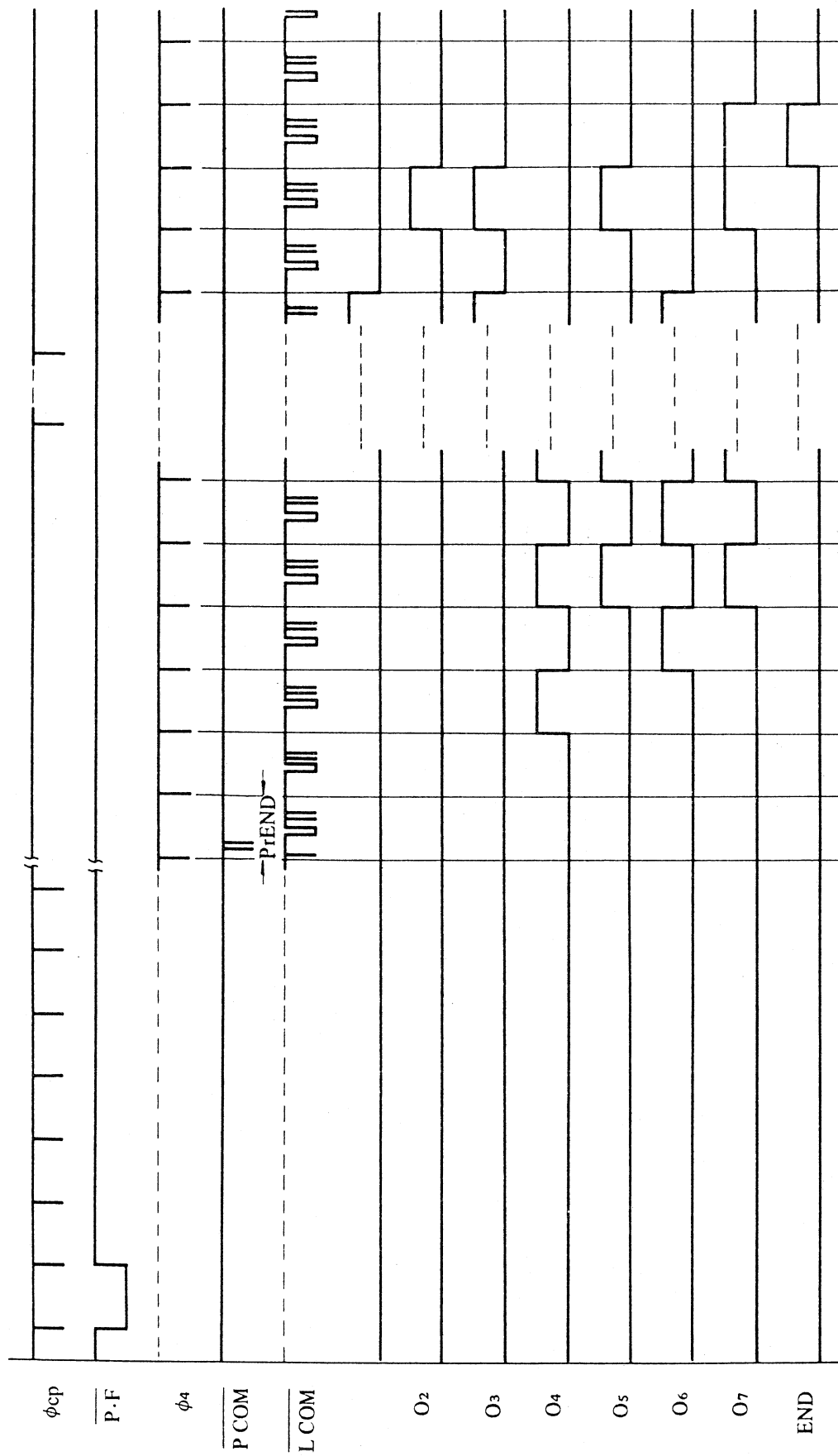
# TIME CHART

Example: 1 2 . 3 ÷ 9 8  $\equiv$  DN = 4

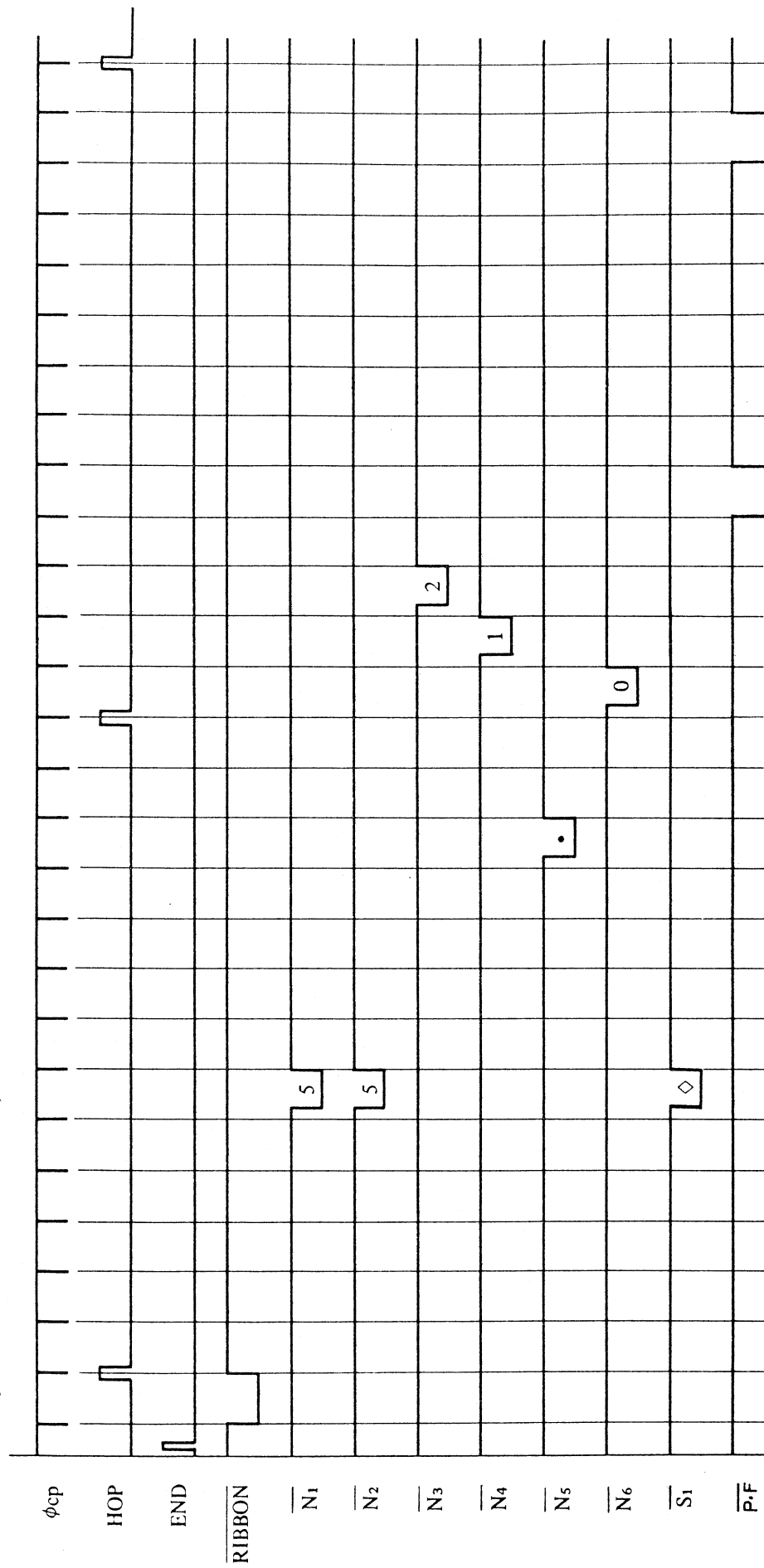
1. Print drive signal: Prints 9 8 . =



2. Logic signal

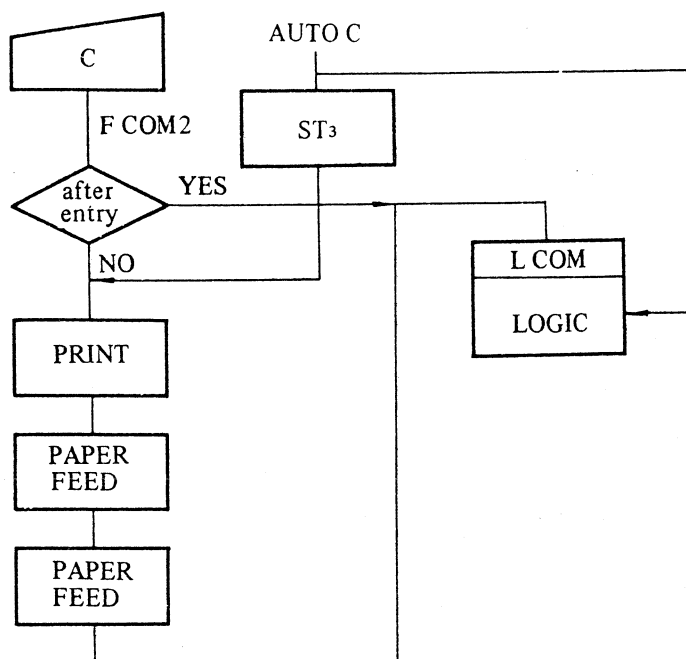


3. Print drive signal: Print answer (0·1 2 5 5 ◇)

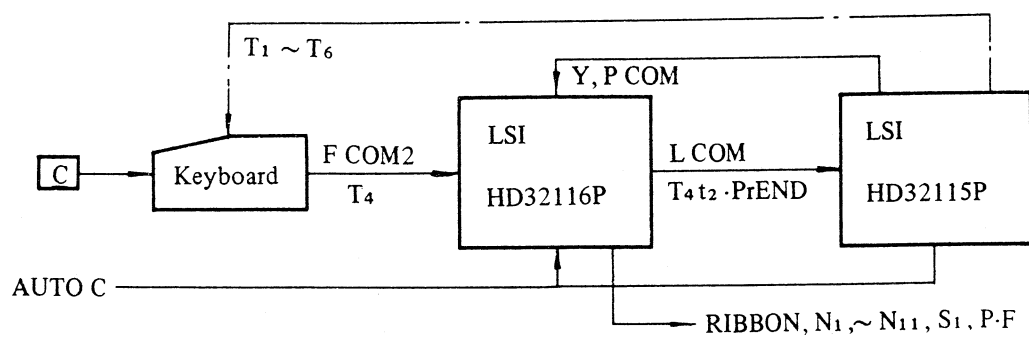


CLEAR

# FLOW CHART



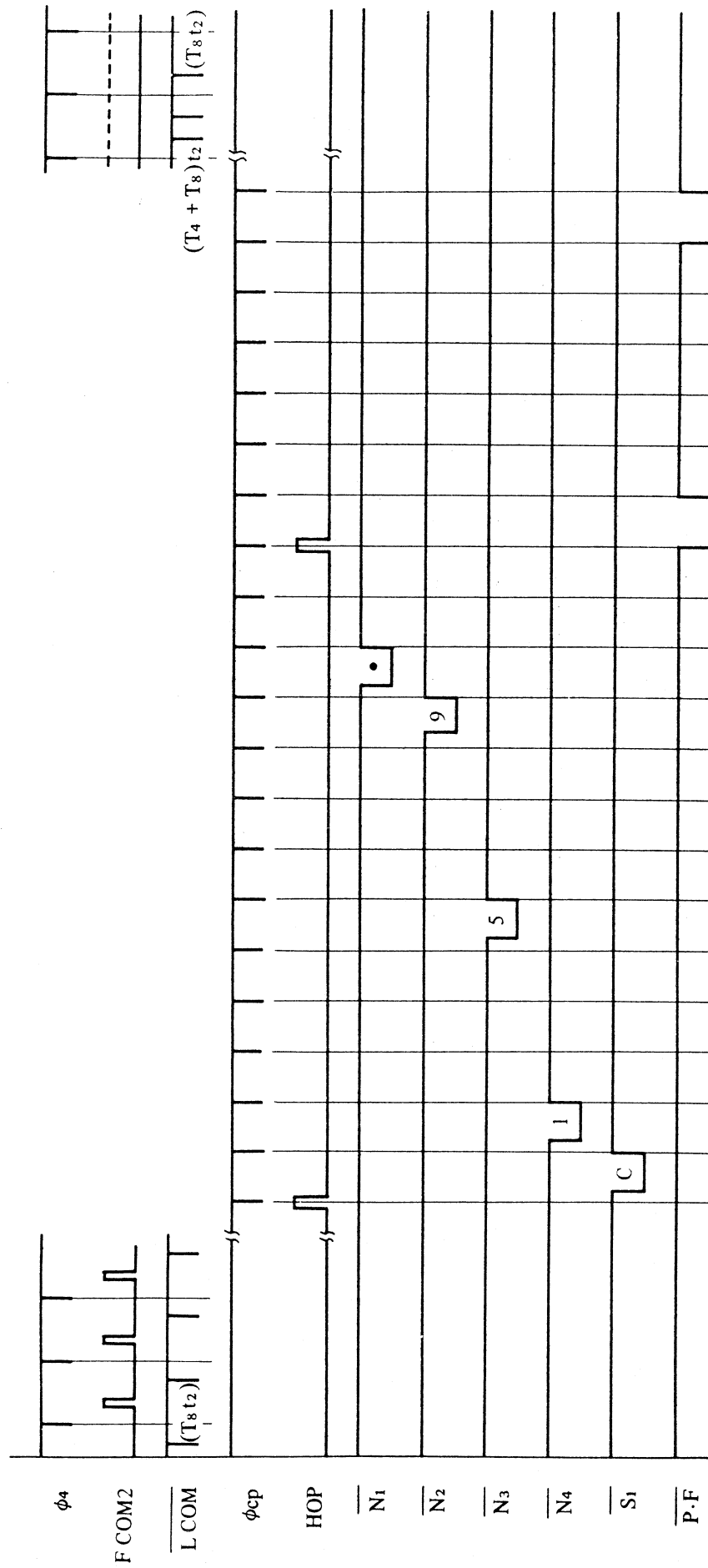
# BLOCK DIAGRAM





# TIME CHART

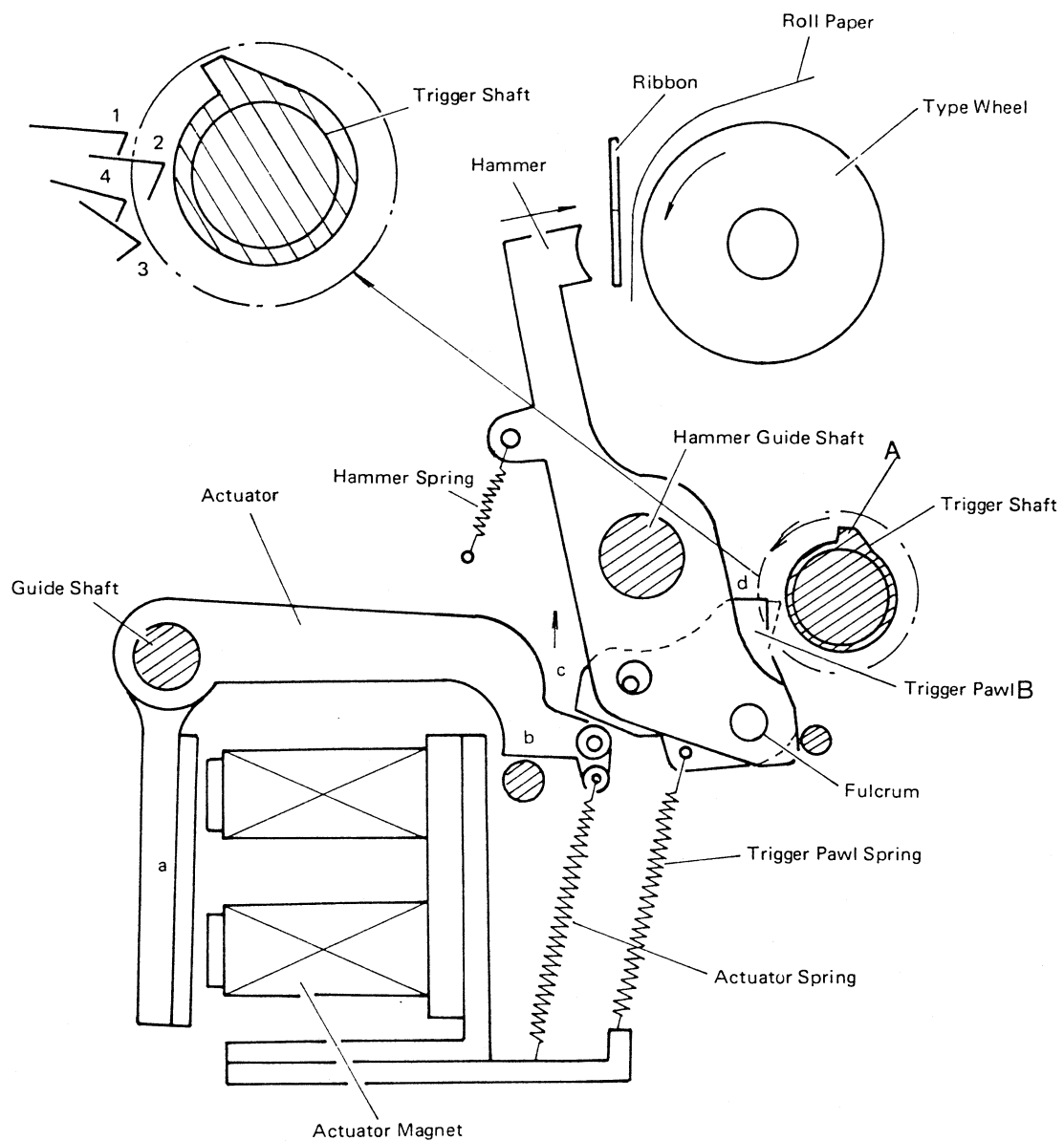
Example: When C key is depressed after function key. (1 5 9 x C)



## TECHNICAL DETAILS OF THE PRINTER

|                              |                                                                                                                                                                                            |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Number of characters:</u> | 13 (10 digits 1 decimal point and 2 symbols)                                                                                                                                               |
| <u>Character spacing:</u>    | 3 mm                                                                                                                                                                                       |
| <u>Line spacing:</u>         | 4,5 mm $\pm$ 0,3 (Note all printed)                                                                                                                                                        |
| <u>Control tape:</u>         | Quality, Printer use type<br>Width ..... 58 $\pm$ 0,1 mm                                                                                                                                   |
| <u>Ribbon:</u>               | Material ..... Nylon<br>Width ..... 12,7 mm<br>Length ..... 6 meters<br>Color ..... Black, Red<br>Spool ..... 35 $\phi$                                                                    |
| <u>Print speed:</u>          | Black character printing ..... 2,79 lines/second<br>Red character printing ..... 2,23 lines/second<br>Paper feed time .... 125,37 milliseconds<br>Ribbon feed time ... 125,37 milliseconds |
| <u>Hammer magnets:</u>       | Voltage ..... D.C. 16 $\pm$ 1 volts<br>Energizing time .... 14,92 milliseconds                                                                                                             |
| <u>Ribbon feed magnets:</u>  | Voltage ..... D.C. 16 $\pm$ 1 volts<br>Energizing time .... 17,91 milliseconds                                                                                                             |
| <u>Paper feed magnet:</u>    | Voltage ..... D.C. 16 $\pm$ 1 volts<br>Energizing time .... 17,91 milliseconds                                                                                                             |
| <u>Magnet head:</u>          | Detection voltage .. 700 mV Minimum                                                                                                                                                        |

## PRINT OPERATION



### Explanation

When a signal is given to the magnet, the magnet will be actuated to attract the actuator, which movement is taken up by point (B) of type hammer. Thus, part (B) is turned in the arrow direction. Since the trigger lever is turning, parts (A) and (B) happen to be hit against each other.

As a consequence, the type hammer is pressed down, turning around the center shaft to hit the typewheel. In time with this, the magnet signal is reset because magnet current is interrupted, and the hammer is returned by the function of spring.

Part (B is also returned by the tension of spring after being hit by the trigger lever.

1. There should be no dragging effect between the actuator and shaft. The actuator must run smooth.
2. The operations of type hammer and part (B) should be light.

## DEFINITION OF LOGIC TERMS

This diagram represents the character surface of the print wheel as cut off along the line between "1" and "13" lines and laid out flat.

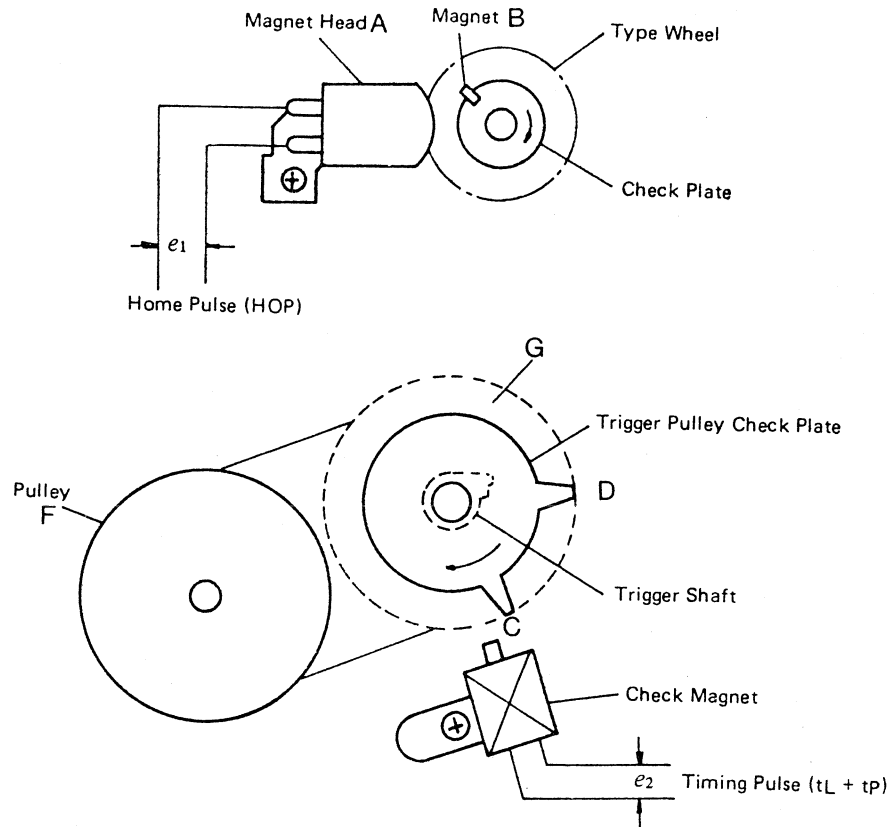
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| - | - | - | - | - | - | - | - | - | - | - | - | ⊖ | - | 13 |
| . | . | O | V | E | R | . | F | L | O | W | . | . | . | 12 |
| . | . | . | . | . | . | ⊙ | . | . | . | . | . | . | . | 11 |
| 9 | 9 | ⑨ | 9 | 9 | ⑨ | 9 | 9 | 9 | ⑨ | 9 | ↓ | ↓ | . | 10 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | # | # | . | 9  |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | = | = | . | 8  |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | ÷ | ÷ | . | 7  |
| 5 | ⑤ | 5 | 5 | ⑤ | 5 | 5 | 5 | ⑤ | 5 | 5 | x | x | . | 6  |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | * | ⊛ | . | 5  |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | ◇ | ◇ | . | 4  |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | - | - | . | 3  |
| ① | 1 | 1 | ① | 1 | 1 | 1 | ① | 1 | 1 | ① | + | + | . | 2  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C | C | . | 1  |

N<sub>11</sub> N<sub>10</sub> N<sub>9</sub> N<sub>8</sub> N<sub>7</sub> N<sub>6</sub> N<sub>5</sub> N<sub>4</sub> N<sub>3</sub> N<sub>2</sub> N<sub>1</sub> S<sub>2</sub> S<sub>1</sub>

.. O V E R F L O W ..

In this case, the 12th-line timing pulse causes all these magnets to be simultaneously energized S<sub>1</sub>, S<sub>2</sub>, N<sub>1</sub> through N<sub>11</sub> inclusive. With these magnets operating, "...OVERFLOW..." gets typed out on the paper.

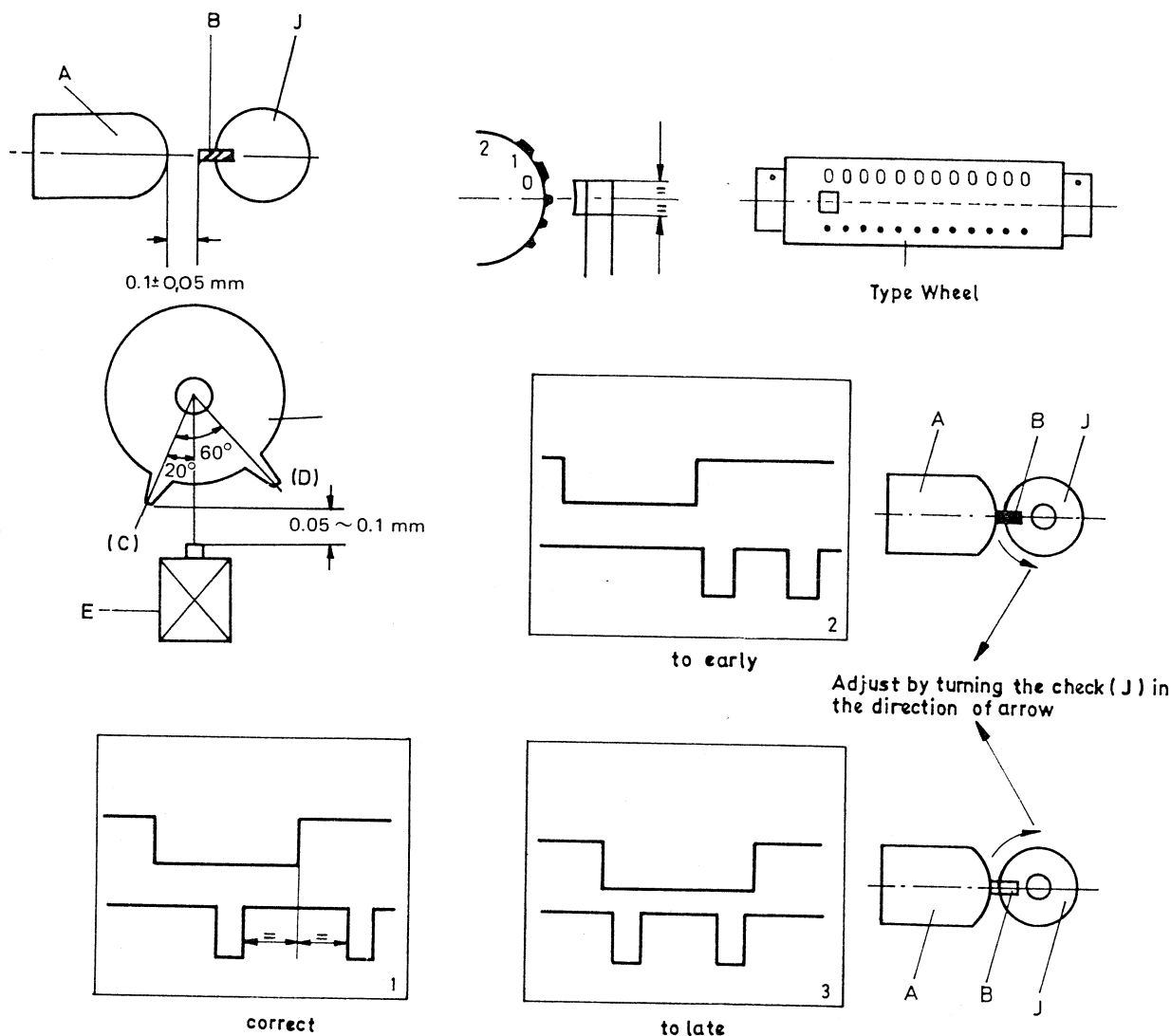
## TIMING FOR PRINTING



### Explanation

When a key is depressed, current will flow through the motor to start. Thus, the motor rotation is communicated to pulley (F) which drives part (G) by means of belt. The typewheel is also driven by pulley (G) through a gear interlocked with it. Part (B) running with the typewheel generates magnetic signal output (called home pulse) at a rate of one pulse per typewheel rotation and communicates it to part (A). Parts (C) and (D) generate set and reset pulses which cooperate to carry out printing by one line.

These pulse instructions are given to the magnets, to drive hammers.



### Adjustment of printing position

Bring the type-hammer center inline with the (-) print position of the typewheel, and bring the check plate (B) at the center of the magnet head. Then secure with screw.

The pick-up (E) and trigger lever assembly have been factory adjusted so that the angle included between the pick-up and (C) and (D) may be within the range from  $15^{\circ}$  to  $30^{\circ}$ , and no adjustment is required.

For the fine control of prints, refer to the mechanical pulse table.

For details, refer to the timing chart.

## PAPER FEEDING

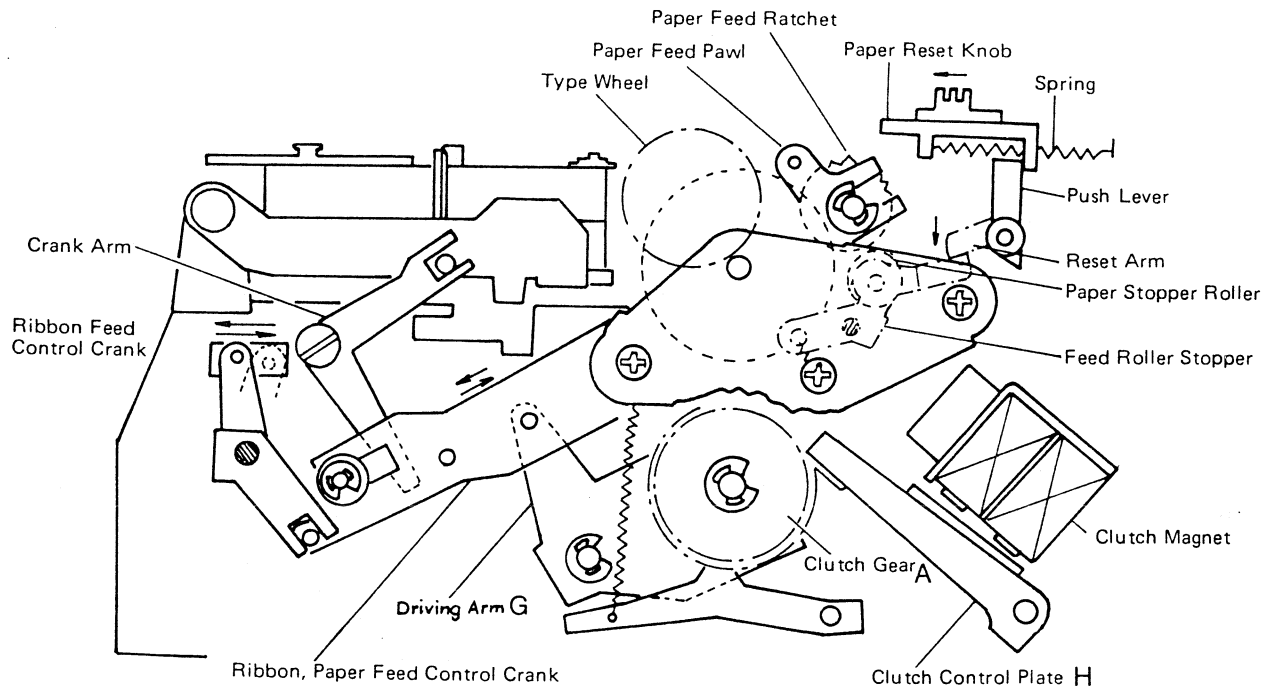


Fig. 1

### Paper feeding action

When a signal is given to the magnet, the lever (H) will be attracted to let the gear (A) in mesh with the gear (B) interlocked with the motor. With this, clutch cam will be driven, driving lever (G) in the arrow directions as shown above. Then, the motion of lever (G) is communicated to paper feed pawl to kick up the paper feed ratched to feed paper. Usually, the paper is fed one tooth in terms of gear feed; but in the case of "total", twice repetitive feed motions are carried out to advance the paper by two spacings (two teeth in terms of gear feed).



## RIBBON FEEDING

### Explanation

The ribbon is run on (C) and (D) through (A) and (A').

The action of lever (F) is transmitted to part (B) through the medium of an interlocking lever (G). The claw of swing plate (B) advances gear (D) by one pitch in the arrow direction. In this case, part (E) functions to prevent the reversal of ribbon.

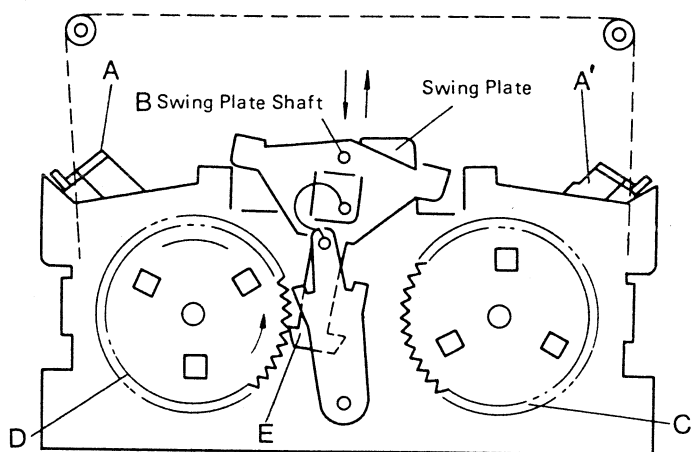


Fig. 1

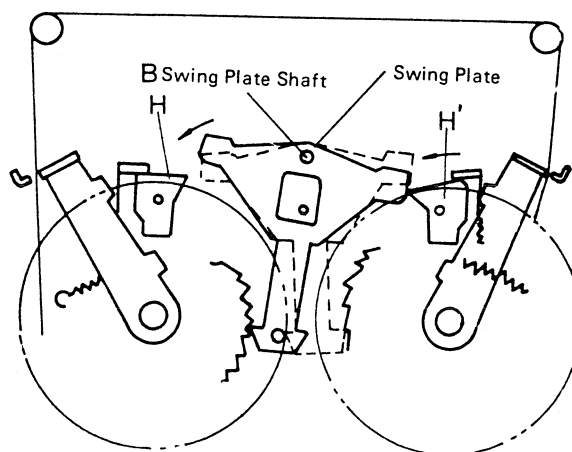
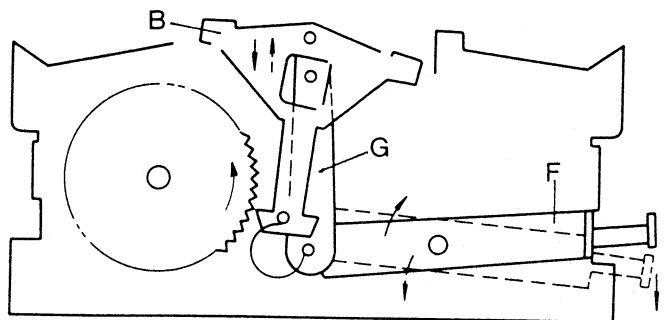
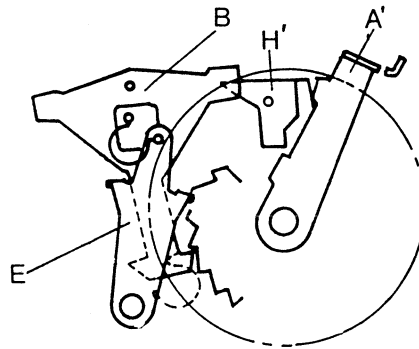


Fig. 2



Reversing of the ribbon is illustrated on the figures 1-2-3 in the right sequence. With reference to Fig. 2, the ribbon spool (D) and the ribbon are checked by part (A'). Part (H') is controlled by (A') and will be shifted to part (B) thus bringing part (B) and the claw of part (E) in contact with each other to accomplish what is shown in Fig. 3. This action is repeated alternately.

Fig. 3

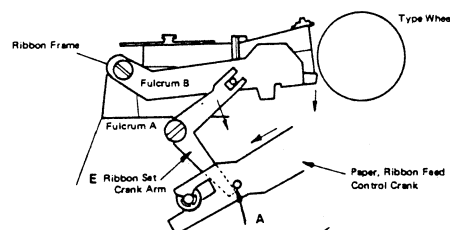
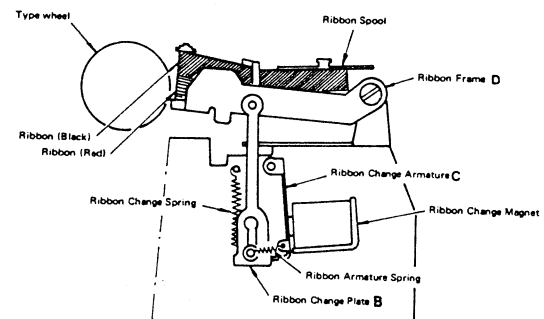
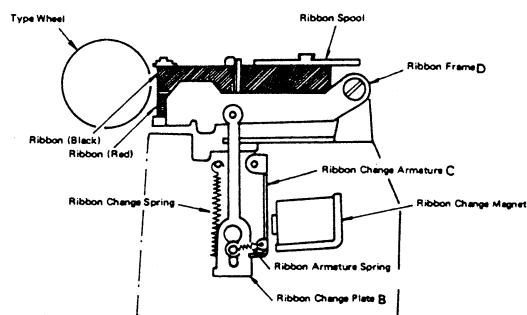


## BLACK-RED CHANGING ACTION

### Explanation

The black and red changing action is accomplished in the following way: when a signal is given to the magnet, the magnet will be attracted to disengage part (C) from the offset part (B). Thus, part (D) is driven upwards by the function of spring, establishing the red tape position to effect red printing.

The changeover from red to black printing is carried out by returning the tape to its original position by means of part (A). In this way, the black/red changeover is carried out.



## SEQUENCE OF DISASSEMBLING

- 1 Remove the ribbon mechanism.
- 1 - 1 Remove 1 clip at the ribbon feed control (Fig. 3) and move lever to the right.
- 1 - 2 Take off 1 clip at the changeover plate (Fig. 4).
- 1 - 3 Remove crank arm (Fig. 3).
- 1 - 4 Remove 1 screw at the left side and take off ribbon mechanism completely.
- 2 Motor
- 2 - 1 Remove governor circuit (3 screws).
- 2 - 2 Unsolder the lead wires.
- 2 - 3 Remove guide ring (Fig. 4).
- 2 - 4 Take off driving belt.
- 2 - 5 Remove pulley (Fig. 4).
- 2 - 6 Remove 3 screws and take off motor from below.
- 3 Magnet A
- 3 - 1 Remove holder plate (4 screws) (Fig. 2).
- 3 - 2 Remove cable clamp.
- 3 - 3 Remove 3 screws from the support plate (Fig. 2).
- 4 Magnet B
- 4 - 1 Disassemble according to points  
1 - 1 to 1 - 4  
2 - 1  
3 - 1 to 3 - 3
- 4 - 2 Remove 3 screws of the spring hanger.
- 4 - 3 Disconnect the springs.
- 4 - 4 Remove 2 spring pins right, left respectively, of the side plates.
- 4 - 5 Press both side plates slightly apart until the magnet block becomes free (Fig. 1).

- 5           Printing hammers.
- 5 - 1       Disassemble according to points 1-1 to 1-4.
- 5 - 2       Remove holder (Fig. 3).
- 5 - 3       Remove sleeve (Fig. 3).
- 5 - 4       Remove guide plate front (Fig. 2).
- 5 - 5       Remove control plate (Fig. 3).
- 5 - 6       Loosen 2 spacer on the printing hammers shaft.
- 5 - 7       Remove 1 screw at the left side plate.
- 5 - 8       Disconnect all springs.
- 5 - 9       Remove printing hammers.

- 6           Typewheel
- 6 - 1       Remove holder (Fig. 3).
- 6 - 2       Remove spur gear (Fig. 3).
- 6 - 3       Loosen 2 screws on the typewheel (Fig. 2).
- 6 - 4       Take off both screws from the bearing at the left side (Fig. 4).
- 6 - 5       Pull out shaft to the left (Fig. 4).

Adjustment page 69

- 7           Actuator.
- 7 - 1       Disassemble according to points 1-1 to 1-4.
- 7 - 2       Remove ribbon changeover plate (Fig. 4).
- 7 - 3       Remove 1 nut and washer at the actuator shaft (Fig. 1).
- 7 - 4       Disconnect the springs of the actuator.
- 7 - 5       Loosen 2 screws from the sleeve at the actuator shaft.
- 7 - 6       Pull out the shaft.

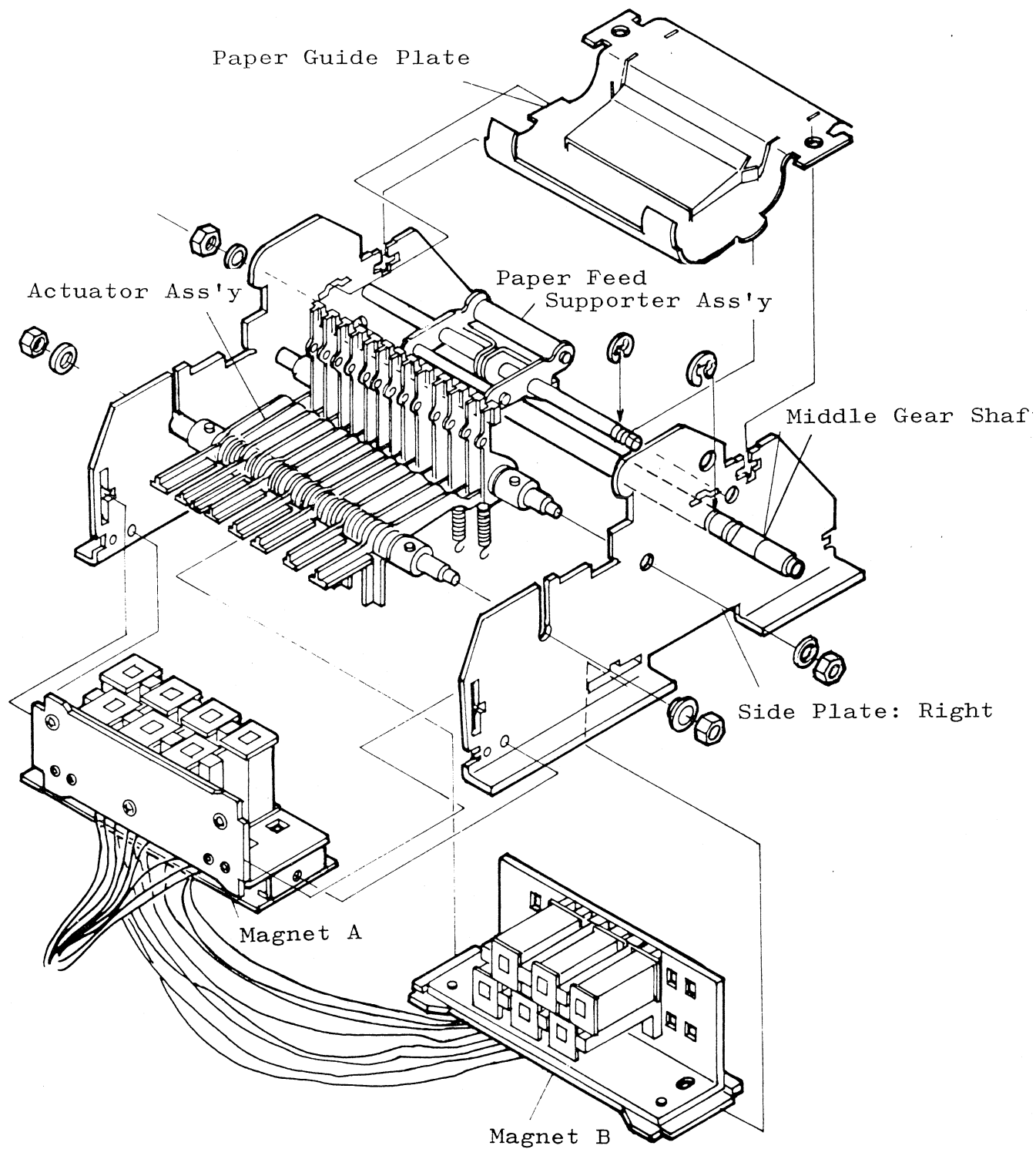


Fig. 1

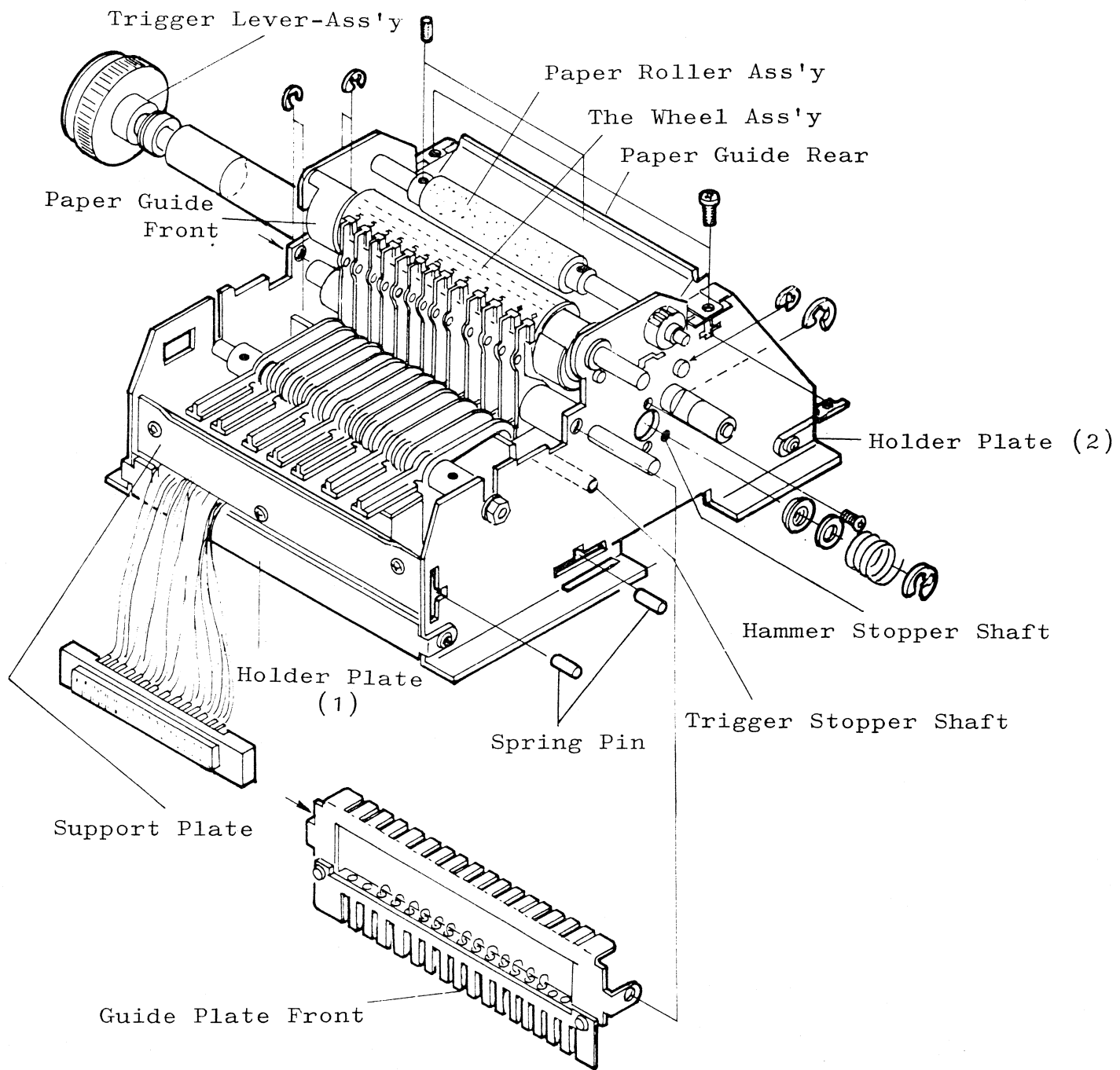


Fig. 2

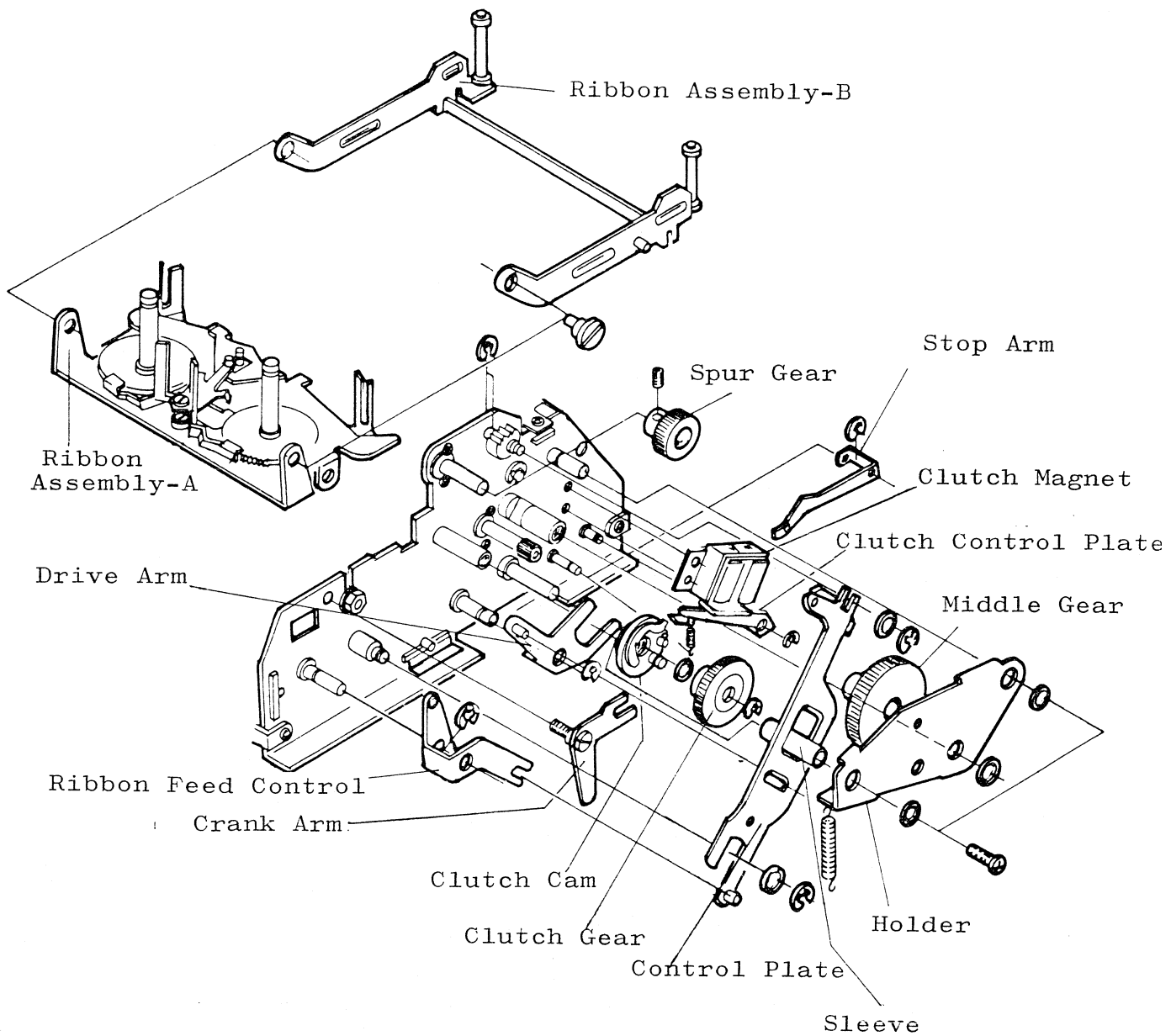


Fig. 3



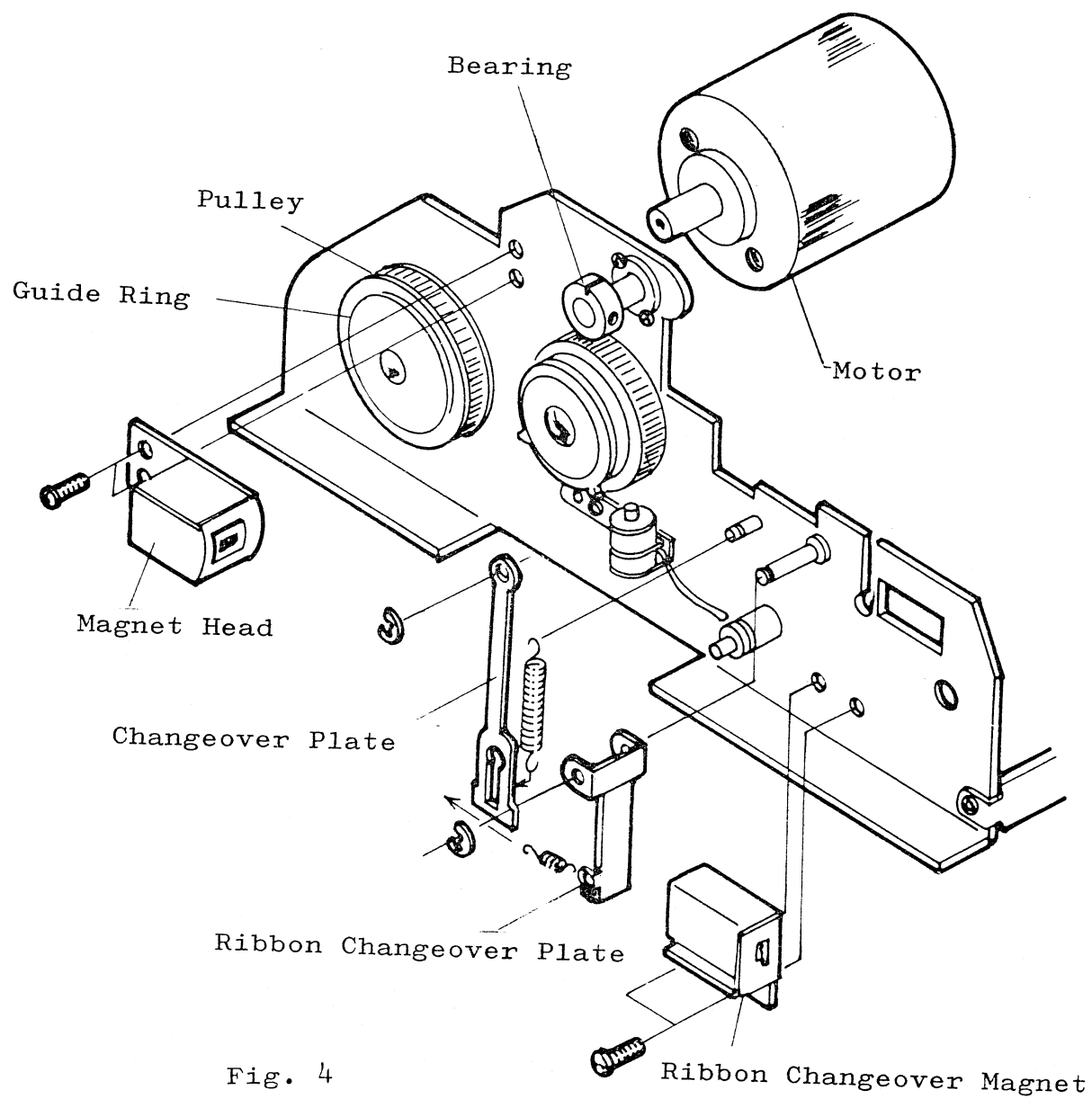
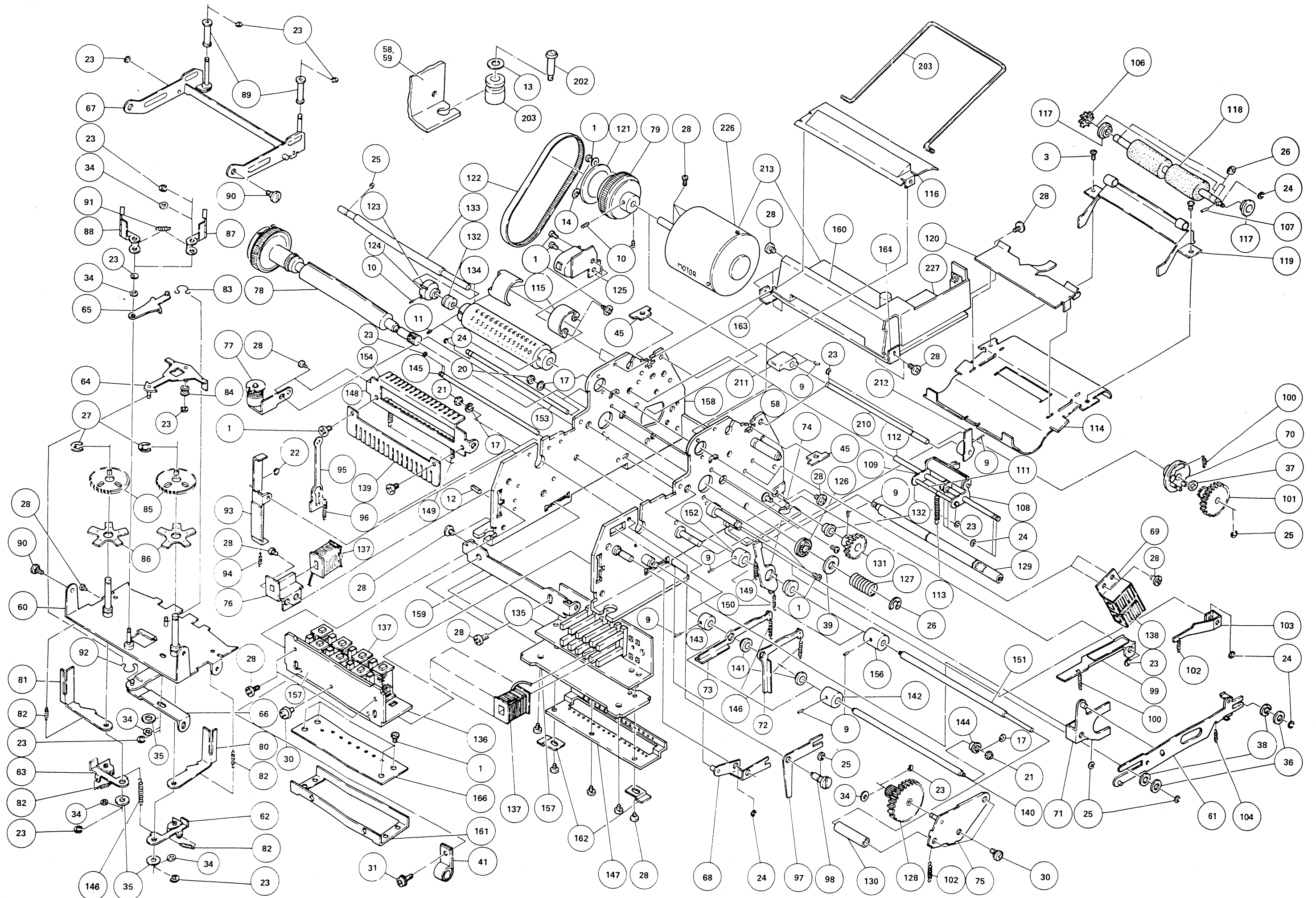


Fig. 4



# PARTS LIST - PRINTER

| Index No. | Part No.   | Description                       |
|-----------|------------|-----------------------------------|
| 1         | 02525040 B | Pan Head Screw: M 2,5 x 4         |
| 3         | 03130060 B | " " " : M 3 x 6                   |
| 9         | 05530030 E | Stopper Screw: M 3 x 3            |
| 10        | 05530040 E | " " : M 3 x 4                     |
| 11        | 05540040 E | " " : M 4 x 4                     |
| 12        | 06225050 E | Spring Pin 2,5 $\phi$ x 5         |
| 13        | 07000045 B | Flat Washer                       |
| 14        | 07010023   | " "                               |
| 15        | 07010030 B | " "                               |
| 17        | 07030030 B | Spring Washer: M 3                |
| 18        | 07030040 B | " " : M 4                         |
| 20        | 07100030 B | Hexagonal Nut: M 3                |
| 21        | 07120030 B | " " : M 3                         |
| 22        | 07200015 Z | E Ring: 1,5                       |
| 23        | 07200020 Z | " " : 2,0                         |
| 24        | 07200025 Z | " " : 2,5                         |
| 25        | 07200030 Z | " " : 3,0                         |
| 26        | 07200040 Z | " " : 4,0                         |
| 27        | 07200050 Z | " " : 5,0                         |
| 28        | 08010026 B | Pan Head Screw: M 3 x 4           |
| 30        | 08011126   | Screw With Spring Washer: M 3 x 4 |
| 31        | 08011128   | " " " " : M 3 x 8                 |
| 34        | 08072031   | Washer: d3 D5 t0,05               |
| 35        | 08072067   | Washer: Ribbon Change Plate       |
| 36        | 08073058   | Washer: d4,5 D7,2 t0,05           |
| 37        | 08073076   | Washer: Clutch Gear               |
| 38        | 08073077   | Washer: Paper and Ribbon Control  |
| 39        | 08074099   | Washer: Trigger Shaft             |
| 41        | 11050016   | Cord Cramp: HP 4 N                |
| 45        | 60610114   | T Type Nut                        |

| Index No. | Part No. | Description                       |
|-----------|----------|-----------------------------------|
| 58        | 74765001 | Side Plate: Right                 |
| 59        | 74765002 | " " : Left                        |
| 60        | 74765003 | Ribbon Plate                      |
| 61        | 74765004 | Control Plate                     |
| 62        | 74765005 | Ribbon Feed Stopper: Right        |
| 63        | 74765006 | " " " : Left                      |
| 64        | 74765007 | Swing Plate: Ribbon               |
| 65        | 74765008 | Ratchet Stopper Plate             |
| 66        | 74765009 | Contact Plate: Ribbon Feed        |
| 67        | 74765010 | Ribbon Frame                      |
| 68        | 74765011 | Ribbon Feed Control               |
| 69        | 74765012 | Magnet Holder: Clutch             |
| 70        | 74765013 | Clutch Cam                        |
| 71        | 74765014 | Drive Arm                         |
| 72        | 74765015 | Actuator: Front                   |
| 73        | 74765016 | " : Rear                          |
| 74        | 74765017 | Type Hammer                       |
| 75        | 74765018 | Holder Plate: Middle Gear         |
| 76        | 74765019 | Magnet Holder: Ribbon Change      |
| 77        | 74765025 | Bobbin: Check Magnet              |
| 78        | 74765026 | Trigger Shaft Assembly            |
| 79        | 74765028 | Pulley: Motor                     |
| 80        | 74765103 | Ribbon Change Plate: Right        |
| 81        | 74765104 | " " " : Left                      |
| 82        | 74765110 | Spring: Ribbon Feed Stopper       |
| 83        | 74765116 | Click Spring: Ratchet Stopper     |
| 84        | 74765121 | Roller: Ribbon                    |
| 85        | 74765126 | Ratchet: Ribbon                   |
| 86        | 74765127 | Spring Board: Ribbon              |
| 87        | 74765128 | Ribbon Spool Supporter: Right     |
| 88        | 74765129 | " " " : Left                      |
| 89        | 74765134 | Roller: Type Ribbon               |
| 90        | 74765137 | Screw With Shoulder: Ribbon Frame |

| Index No. | Part No. | Description                           |
|-----------|----------|---------------------------------------|
| 91        | 74765139 | Spring: Ribbon Spool Supporter        |
| 92        | 74765140 | Spring: Swing Plate                   |
| 93        | 74765152 | Armature: Ribbon Change               |
| 94        | 74765155 | Spring: Ribbon Armature               |
| 95        | 74765157 | Change Plate: Ribbon                  |
| 96        | 74765159 | Spring: Ribbon Change                 |
| 97        | 74765163 | Crank Arm: Ribbon Reset               |
| 98        | 74765164 | Screw With Shoulder: Ribbon Plate     |
| 99        | 74765170 | Clutch Control Plate                  |
| 100       | 74765174 | Spring Clutch Control                 |
| 101       | 74765176 | Clutch Gear                           |
| 102       | 74765181 | Spring: Clutch Pawl                   |
| 103       | 74765183 | Stop Arm: Clutch                      |
| 104       | 74765185 | Spring: Clutch Stop Arm               |
| 105       | 74765191 | Spring: Paper Feed Pawl               |
| 106       | 74765199 | Ratchet: Paper Feed                   |
| 107       | 74765200 | Pin: Paper Feed Ratchet               |
| 108       | 74765202 | Arm: Right: Paper Feed Roller Stopper |
| 109       | 74765203 | Arm: Left: " " " "                    |
| 110       | 74765204 | Roller: Paper Feed Stopper            |
| 111       | 74765205 | Shaft: Paper Feed Stopper: Small      |
| 112       | 74765206 | Shaft: Paper Stopper Arm Guide        |
| 113       | 74765207 | Spring: Paper Stopper                 |
| 114       | 74765208 | Paper Guide                           |
| 115       | 74765211 | Paper Guide: Front                    |
| 116       | 74765212 | Supporter Plate: Paper Guide          |
| 117       | 74765214 | Spacer: Paper Feed Roller             |
| 118       | 74765215 | Paper Feed Roller                     |
| 119       | 74765216 | Paper Guide: Rear                     |
| 120       | 74765217 | " " : Rear: 1                         |
| 121       | 74765221 | Flange: Motor                         |
| 122       | 74765222 | Belt                                  |
| 123       | 74765237 | Boss: Check Plate                     |

| Index No. | Part No. | Description                     |
|-----------|----------|---------------------------------|
| 124       | 74765238 | Magnet: Home Plate              |
| 125       | 74765239 | Magnet Head                     |
| 126       | 74765247 | Ball Bearing                    |
| 127       | 74765248 | Spring: Trigger Plate           |
| 128       | 74765249 | Middle Gear                     |
| 129       | 74765252 | Shaft: Middle Gear Supporter    |
| 130       | 74765254 | Spacer: Middle Gear Supporter   |
| 131       | 74765255 | Flat Gear: Type Wheel           |
| 132       | 74765256 | Bearing: Type Wheel             |
| 133       | 74765257 | Shaft: Type Wheel               |
| 134       | 74765258 | Type Wheel                      |
| 135       | 74765262 | Hammer Magnet: Rear             |
| 136       | 74765263 | " " : Front                     |
| 137       | 74765267 | Actuator Magnet                 |
| 138       | 74765268 | Clutch Magnet                   |
| 139       | 74765280 | Guide Board: Actuator           |
| 140       | 74765281 | Shaft: Actuator Guide           |
| 141       | 74765282 | Guide Bush: Actuator            |
| 142       | 74765283 | Spacer: Actuator Stopper: Right |
| 143       | 74765284 | " : " : Left                    |
| 144       | 74765285 | Sleeve: Actuator Guide          |
| 145       | 74765286 | Shaft: Actuator Stop            |
| 146       | 74765288 | Spring Actuator                 |
| 147       | 74765290 | Spring Hanger: Actuator         |
| 148       | 74765296 | Guide Plate: Type Hammer        |
| 149       | 74765301 | Spring: Type Hammer             |
| 150       | 74765302 | A Spring: Trigger Pawl          |
| 151       | 74765303 | Shaft: Type Hammer Guide        |
| 152       | 74765305 | Spacer: Hammer Stopper: Left    |
| 153       | 74765306 | Shaft: Hammer Stop              |
| 154       | 74765307 | Damper: Hammer Stopper          |
| 155       | 74765308 | Guide Bush: Type Hammer         |
| 156       | 74765309 | Spacer: Hammer Stopper: Right   |

| Index No. | Part No. | Description                       |
|-----------|----------|-----------------------------------|
| 157       | 74765312 | Supporter: Hammer Magnet          |
| 158       | 74765313 | " : Side Plate                    |
| 159       | 74765314 | " : Side Plate: Front             |
| 160       | 74765319 | Radiant Heat Plate: Governor      |
| 161       | 74765320 | Holder: Contact P.C.B.            |
| 162       | 74765321 | Plate: Cramp                      |
| 163       | 74765322 | Stopper Plate: Left               |
| 164       | 74765323 | " " : Right                       |
| 165       | 74765335 | Ribbon                            |
| 166       | 74766002 | P.C.B.: Wiring Terminal           |
| 202       | 74791526 | Stopper Screw: Printer            |
| 203       | 74791527 | Cushion: Printer                  |
| 210       | 74795101 | Shaft: Reset Arm                  |
| 211       | 74795102 | Reset Arm: Paper Supporter Roller |
| 212       | 74795105 | Push Lever                        |
| 213       | 74795500 | Motor + Governor Assembly         |
| 226       | 74799800 | Motor                             |
| 227       | 74799801 | P.C.B.: Governor                  |

## GENERAL INFORMATION FOR TROUBLE - SHOOTING

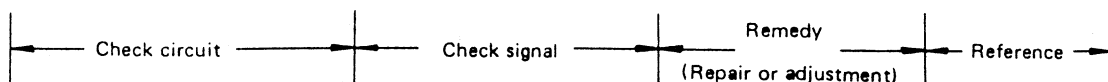
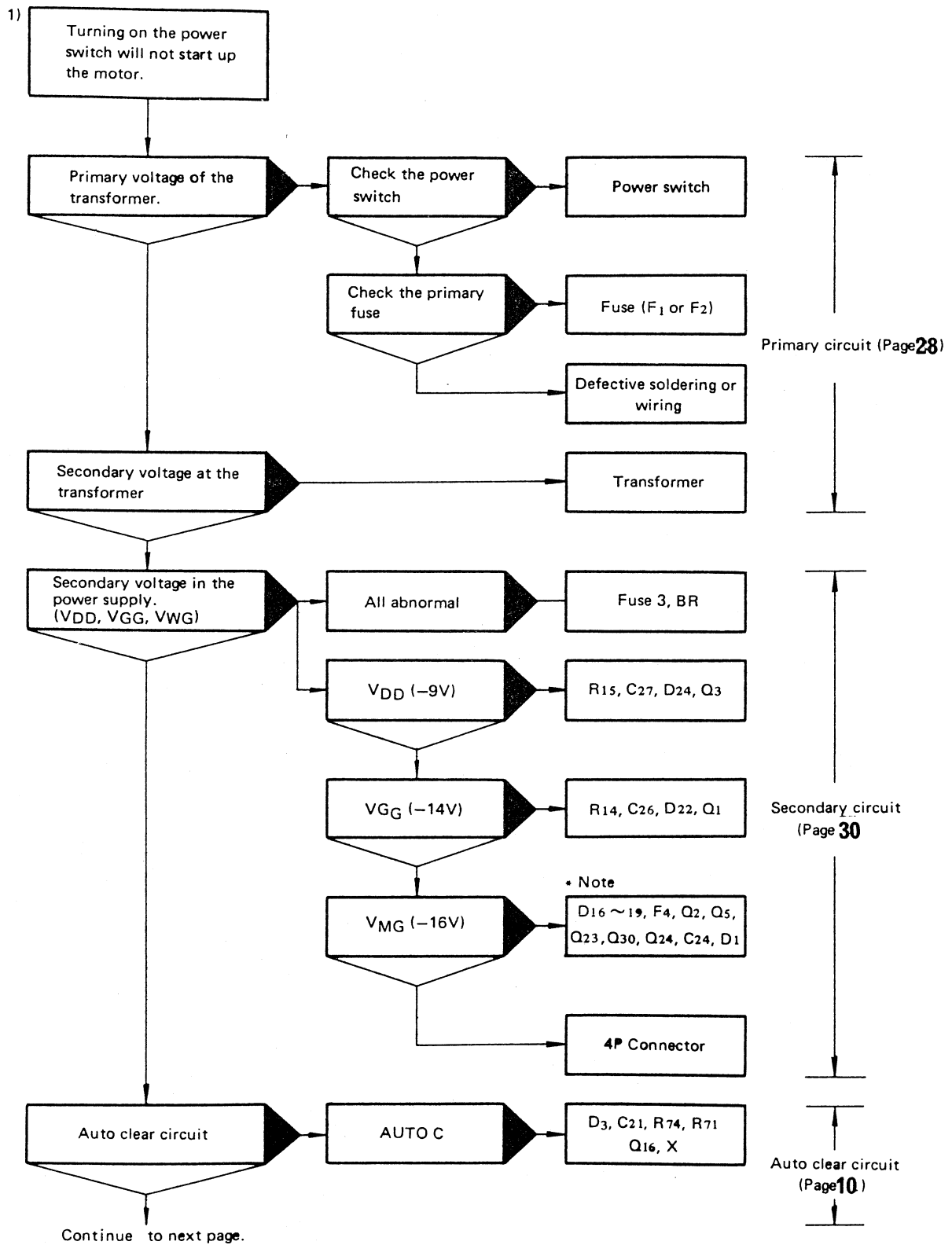
The operation check list should assist in logically tracing the reasons for defects.

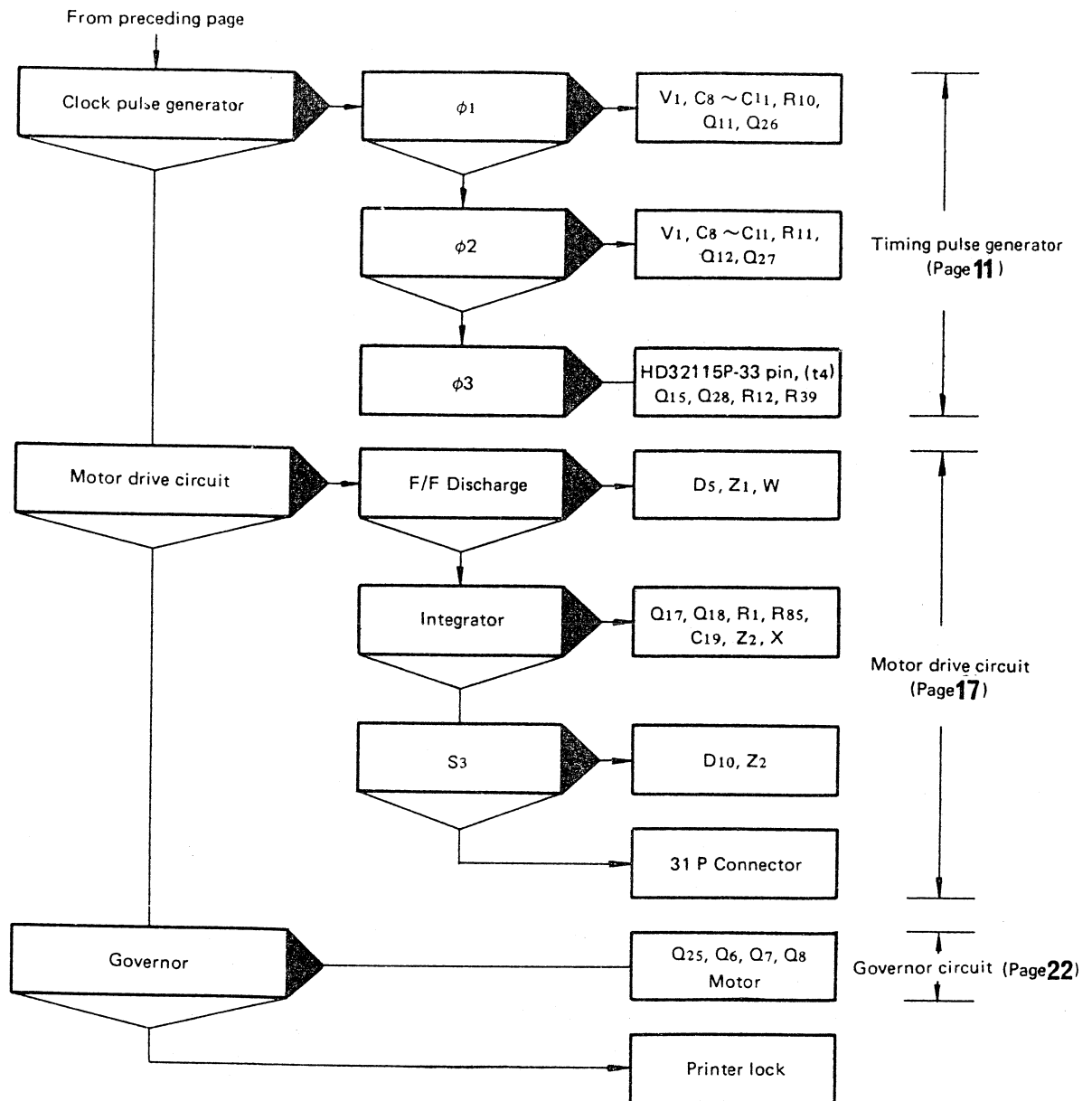
This can be made in the following way:

1. Recognizing uncorrect calculation by simple calculating examples.
2. It is necessary that at the LSI-IC elements all operating voltages, clocks and time pulses are applied within the admissible tolerance limits.
3. In case of a faulty LSI output signal, the PIN has to be unsoldered from the circuit board and to be measured freely.



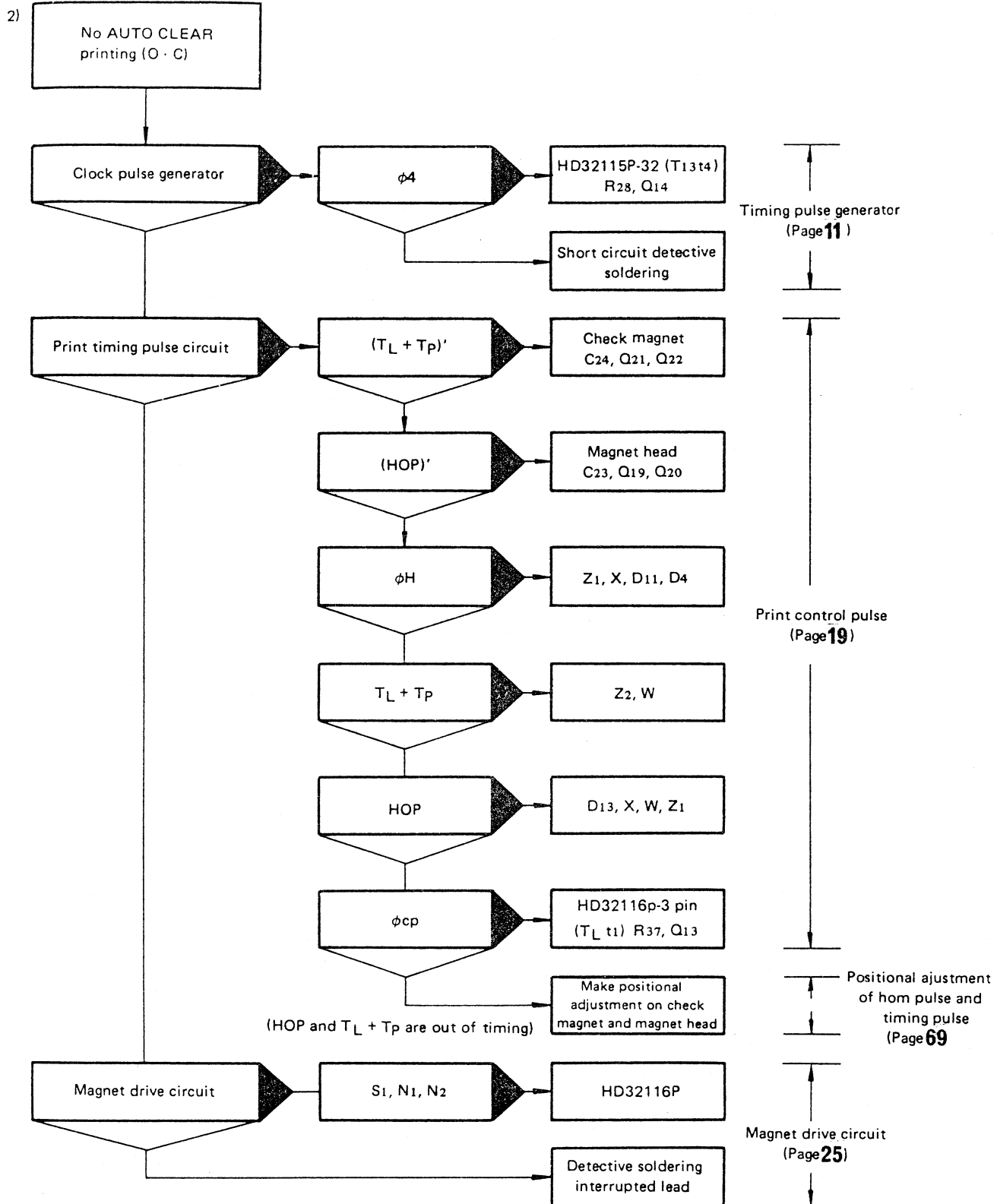
# OPERATION CHECK LIST

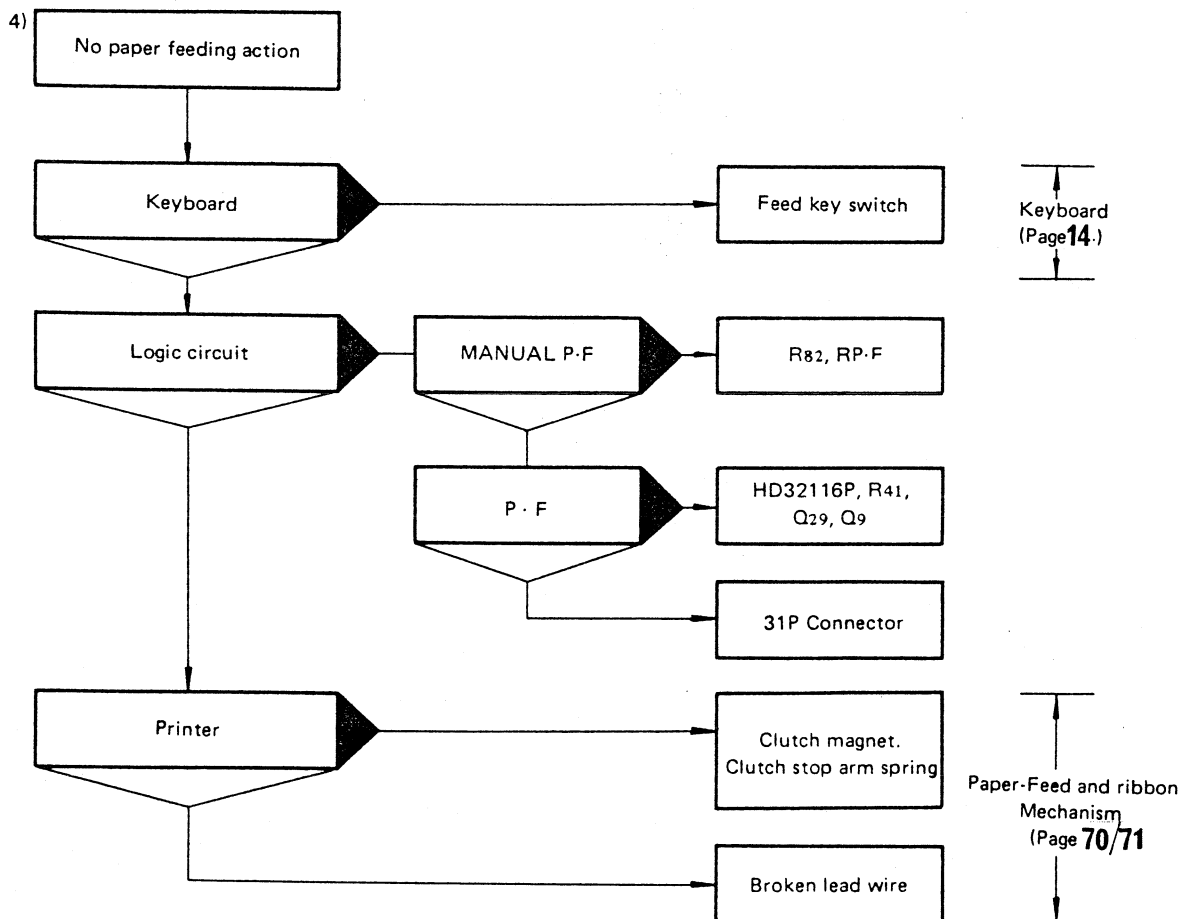
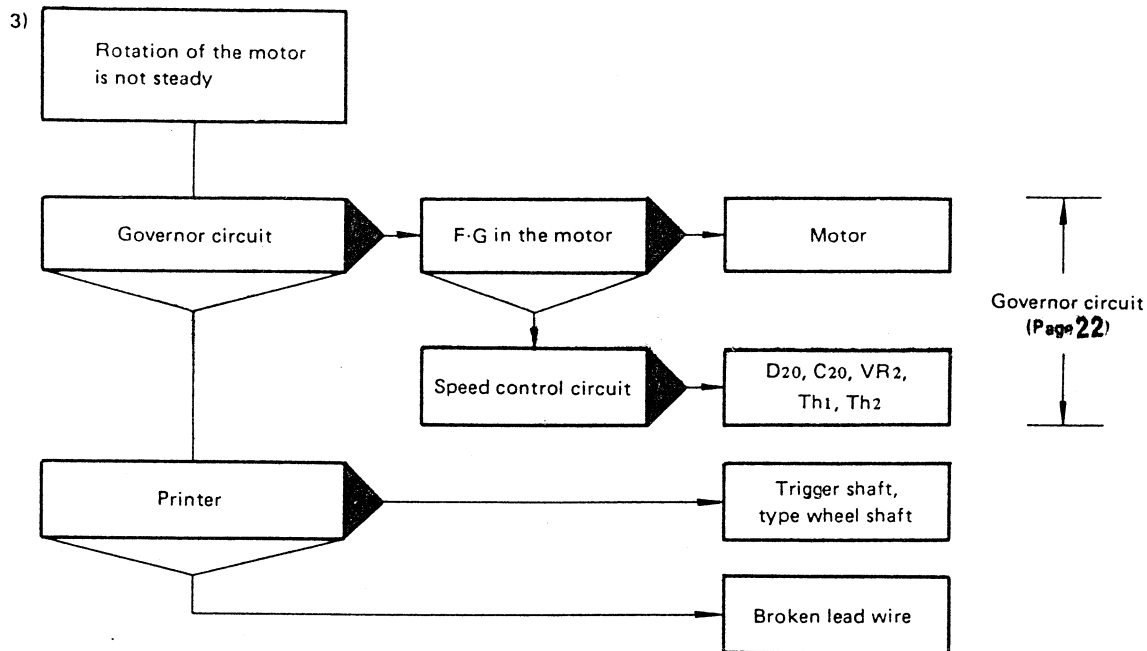


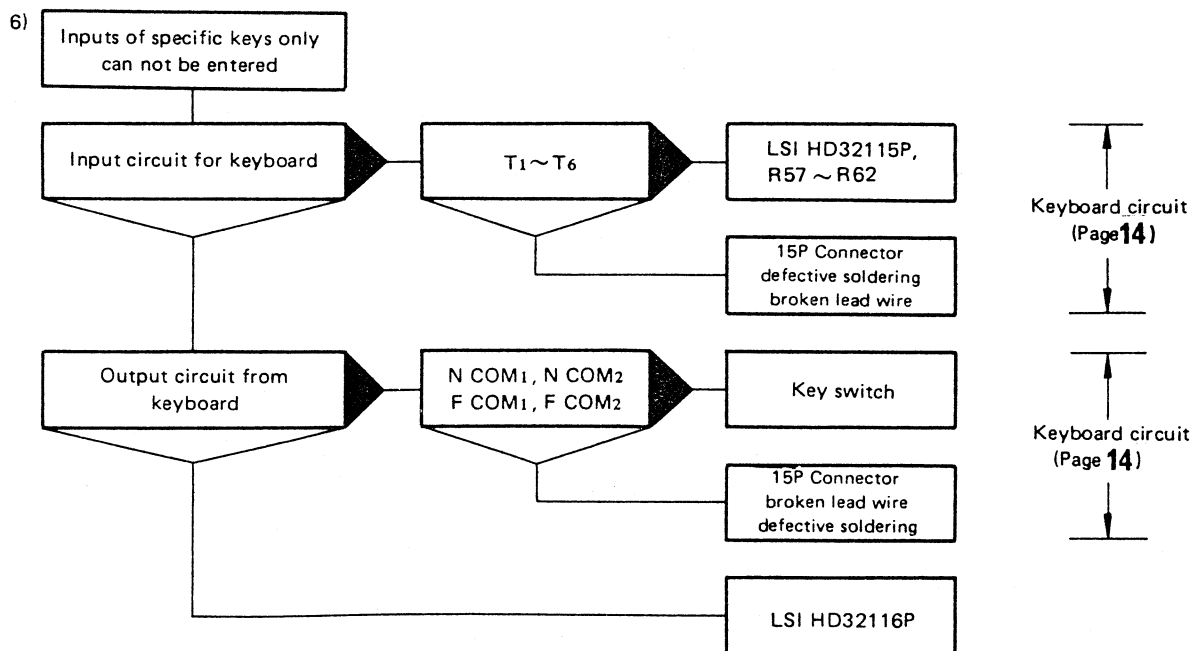
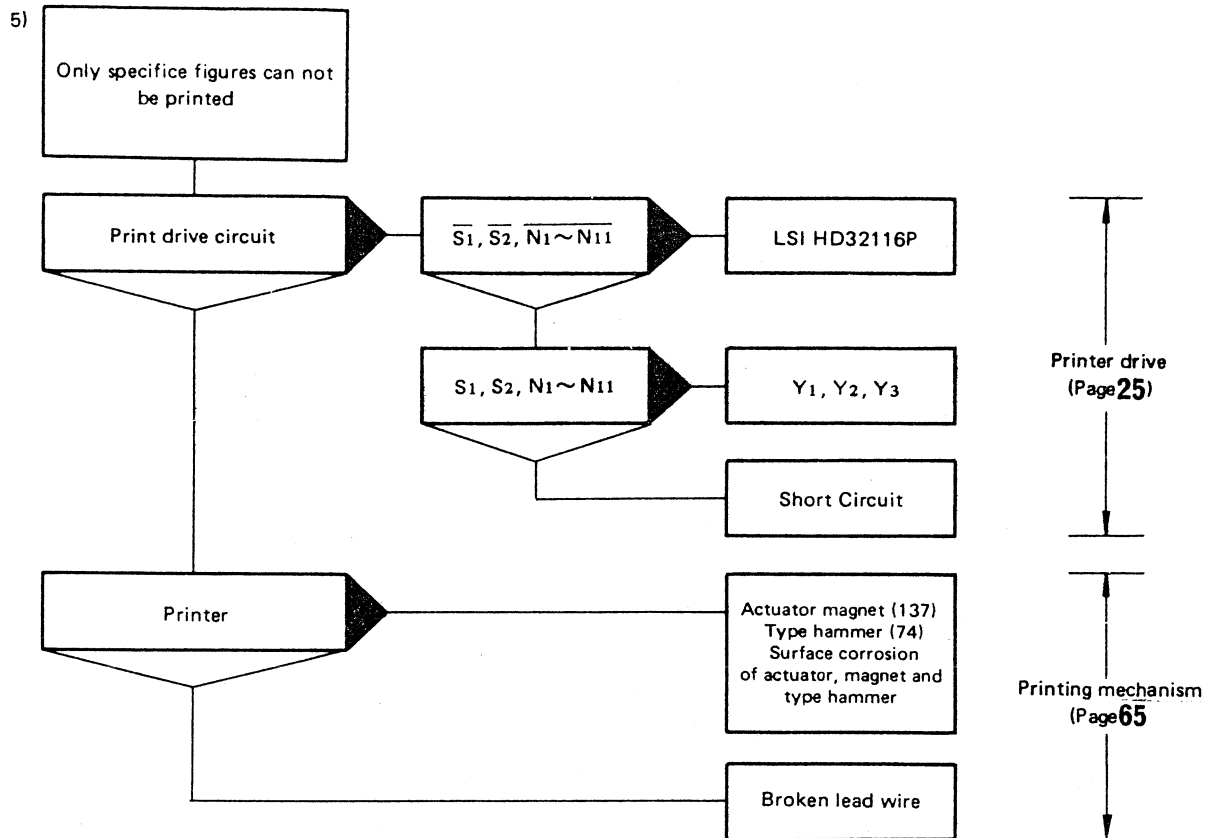


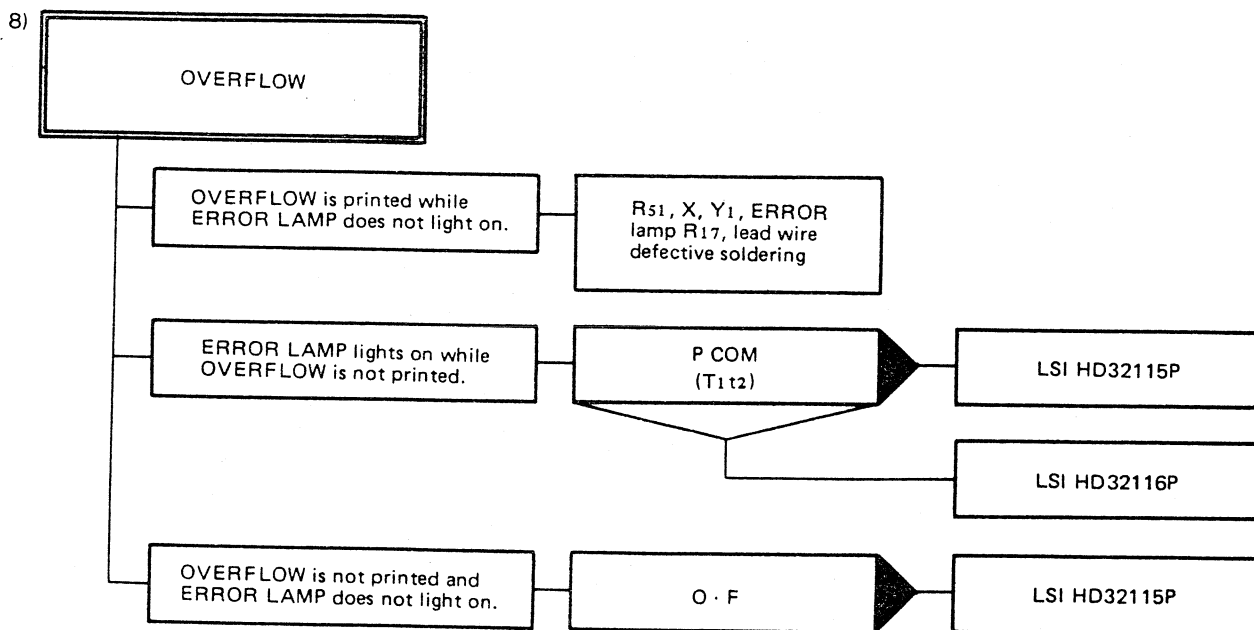
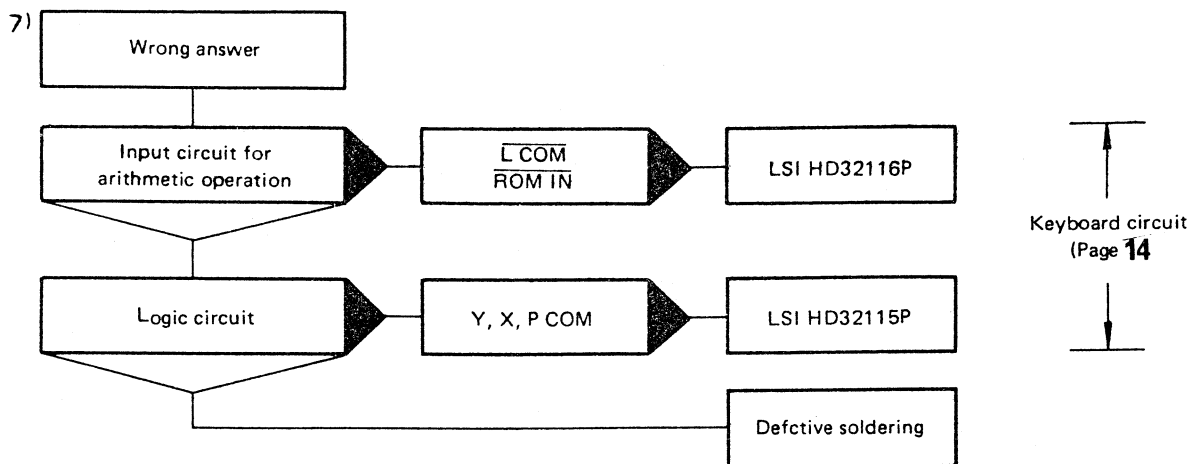
**NOTE:** In case the fuse  $F_4$  at the VMG side is open so frequently, the  $O_{cp}$  generator must be checked since abnormality of  $O_{cp}$  may be considered.

In case the motor does not stop at the period of suspension, check the motor drive circuit as well as the governor circuit.

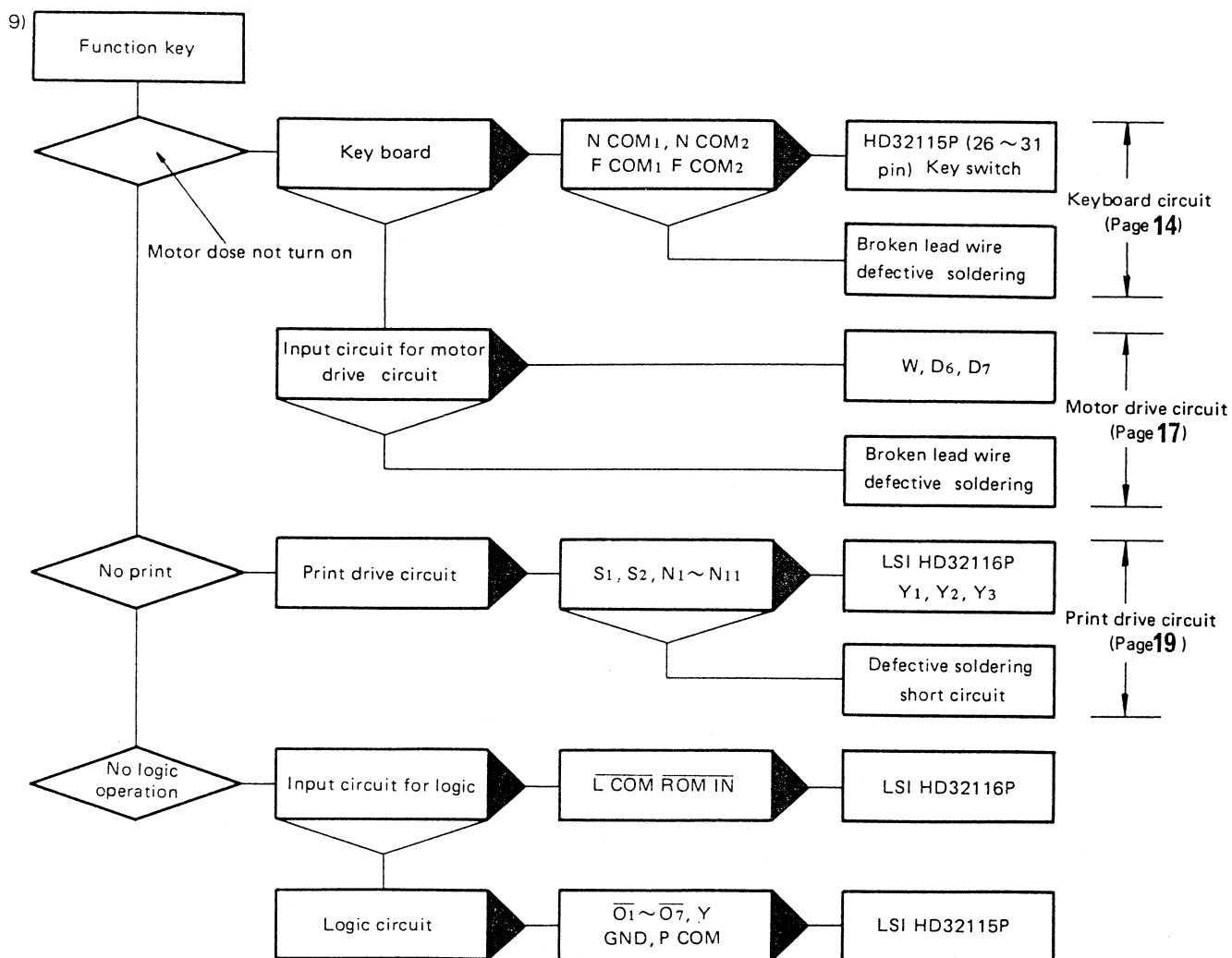








The figure shown below is the trouble-shooting flow-chart when the function key is depressed.



# TEST PROGRAM

Set on the Keyboard

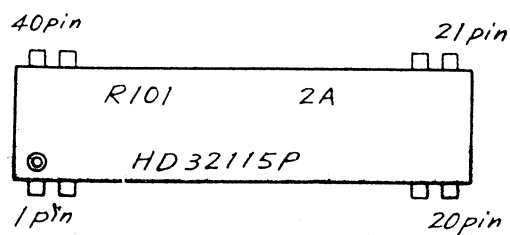
Print out

|              |              |         |                 |
|--------------|--------------|---------|-----------------|
| switching on | _____        | _____   | 0 • C           |
| decimal 0    | _____        | * _____ | 0 • *           |
|              |              | C _____ | 0 • C           |
| 123456789    | # _____      | _____   | 123456789 • #   |
| 999999999    | + _____      | _____   | 999999999 • +   |
| 1            | + _____      | _____   | 1 • +           |
|              | ◇ _____      | _____   | 1000000000 • ◇  |
|              | - _____      | _____   | 1000000000 • -  |
|              | ◇ _____      | _____   | 0 • ◇           |
|              | * _____      | _____   | 0 • *           |
| 5            | x _____      | _____   | 5 • x           |
|              | = _____      | _____   | 5 • =           |
|              |              |         | 25 • ◇          |
| 1            | = _____      | _____   | 1 • =           |
|              |              |         | 5 • ◇           |
| 8            | ÷ _____      | _____   | 8 • ÷           |
| 2            | = _____      | _____   | 2 • =           |
|              |              |         | 4 • ◇           |
| 6            | = _____      | _____   | 6 • =           |
|              |              |         | 3 • ◇           |
| 123456       | + _____      | _____   | 123456 • +      |
| decimal 1    | + _____      | _____   | 123456 • 0 +    |
| decimal 2    | + _____      | _____   | 123456 • 00 +   |
| decimal 3    | + _____      | _____   | 123456 • 000 +  |
| decimal 4    | + _____      | _____   | 123456 • 0000 + |
|              |              |         | 617280 • 0000 * |
| 1            | • 23 x _____ | _____   | 1 • 23 x        |
|              | = _____      | _____   | 1 • 23 =        |
|              |              |         | 1 • 5129 ◇      |
| 10           | • = _____    | _____   | 10 • =          |
|              |              |         | 12 • 3000 ◇     |
| 8            | • 96 ÷ _____ | _____   | 8 • 96 ÷        |
| 2            | • 5 = _____  | _____   | 2 • 5 =         |
|              |              |         | 3 • 5840 ◇      |
| 6            | • 3 = _____  | _____   | 6 • 3 =         |
|              |              |         | 2 • 5200 ◇      |
|              |              |         | * _____ 0 • *   |

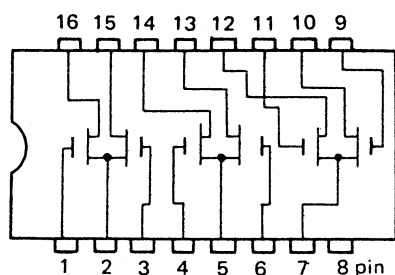


# SPECIFICATION OF LSI, IC, TRANSISTOR UND DIODE

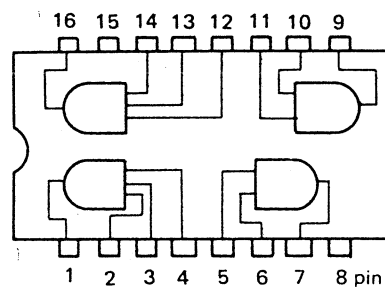
LSI (HD 32115 P and HD 32116 P) Part No. 14070176 and 14070177



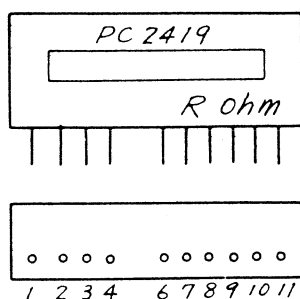
MOS IC HD 3233 P  
(Part No. 14070148)



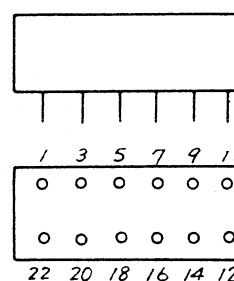
MOS IC HD 3226 P  
(Part No. 14070152)



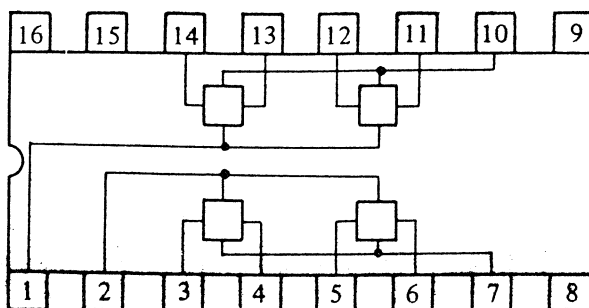
HIC: PC 2419  
(Part No. 14070178)



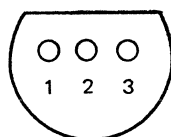
HIC: PC 2902  
(Part No. 14070179)



MOS IC HD 3227 P (Part No. 14070207)

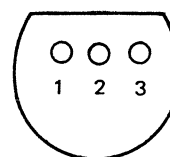


2SA628 (Silicon Transistor)  
(Part No. 14000079)



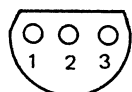
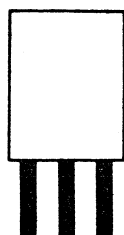
1 Base  
2 Collector  
3 Emitter

2SA628 A (Silicon Transistor)  
(Part No. 14000080)



1 Base  
2 Collector  
3 Emitter

2SC711 (Silicon NPN Transistor)  
(Part No. 14000081)

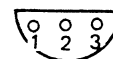


1 Base  
2 Collector  
3 Emitter

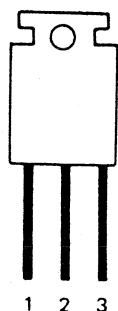
2SC945 (Silicon NPN Transistor)  
(Part No. 14000082)



1 Emitter  
2 Collector  
3 Base



2SA473 Y (Silicon PNP Transistor)  
(Part No. 14000097 and  
14010057 with accessory)



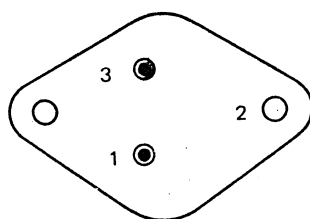
1 Base  
2 Collector  
3 Emitter

2SA509 Y (Silicon PNP Transi  
(Part No. 14000098)



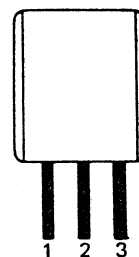
1 Emitter  
2 Collector  
3 Base

2SD111 (Silicon NPN Transistor)  
(Part No. 14010042)



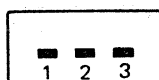
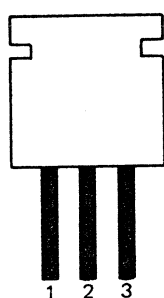
- 1 Base
- 2 Collector
- 3 Emitter

2SC1096 (Silicon NPN Transistor)  
(Part No. 14010043)



- 1 Base
- 2 Collector
- 3 Emitter

2SA490 (Silicon PNP Transistor)  
(Part No. 14010053)



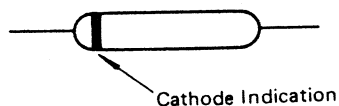
- 1 Base
- 2 Collector
- 3 Emitter

2SC454 (Silicon NPN Transistor)  
(Part No. 14000136)

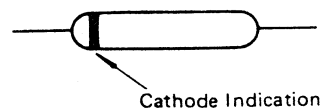


- 1 Base
- 2 Collector
- 3 Emitter

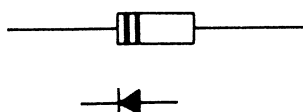
1S1588 (Silicon Diode)  
(Part No. 14010611)



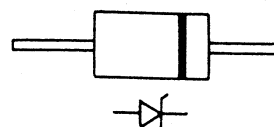
1N34A (Germanium Diode)  
(Part No. 14010620)



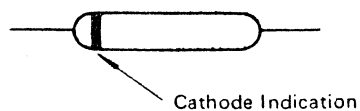
SD46 (Germanium Diode)  
(Part No. 14010657)



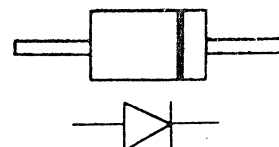
EQA01-10 (Silicon Zener Diode)  
(Part No. 14010665)



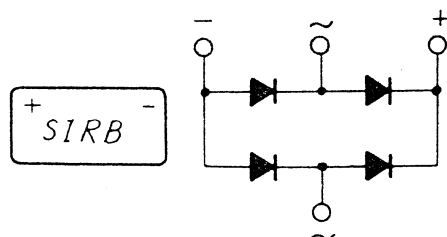
1S2095 A (Silicon Diode)  
(Part No. 14010658)



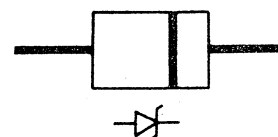
1S1885 (Silicon Diode)  
(Part No. 14010668)



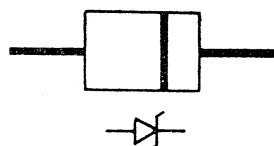
SIRB-10 (Silicon Rectifier)  
(Part No. 14020129)



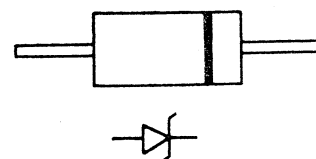
EQA01-10 RA (Silicon Zener Diode)  
(Part No. 14020177)



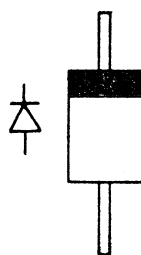
EQA01-15 (Silicon Zener Diode)  
(Part No. 14020178)



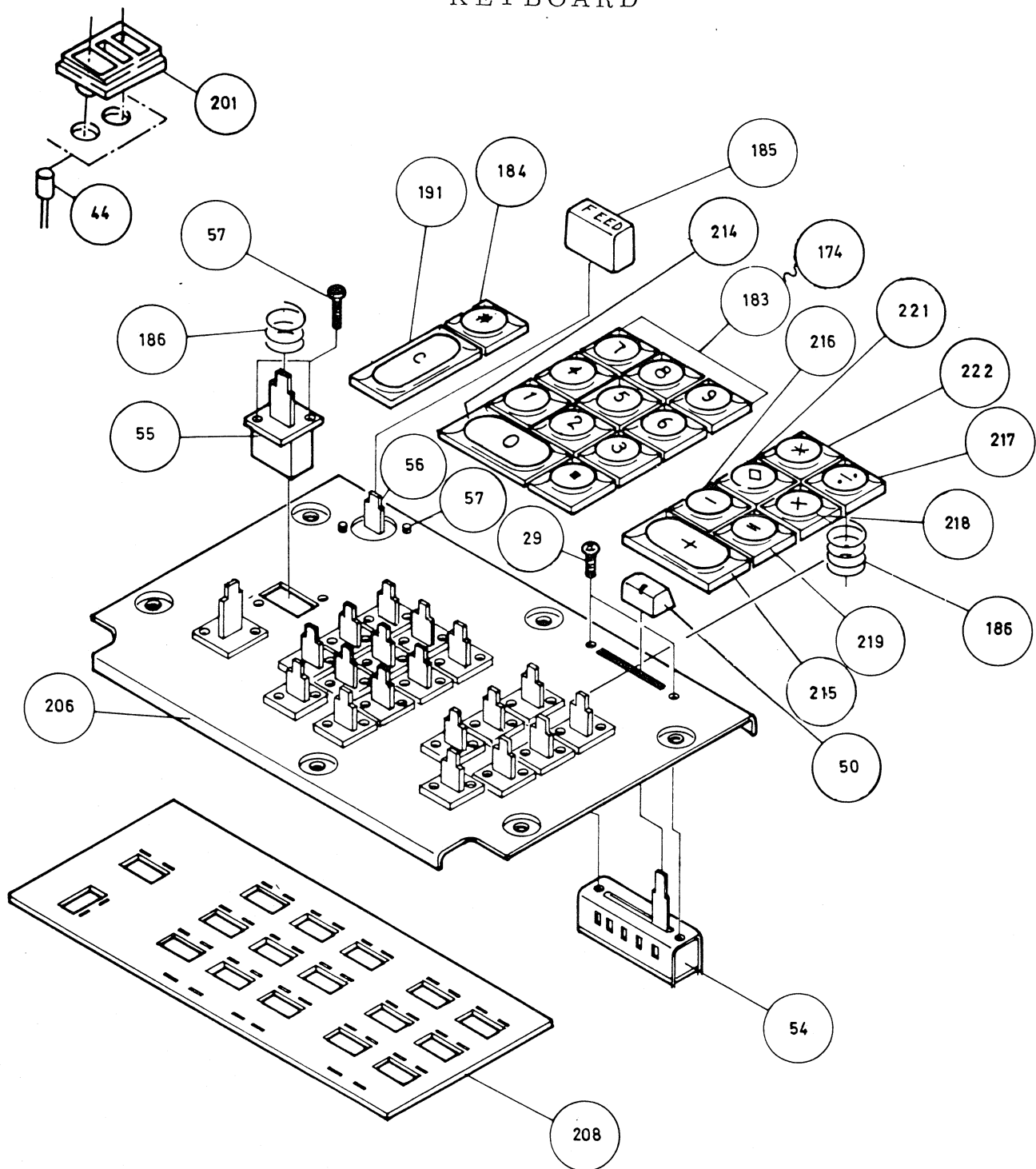
MZ212 (Silicon Zener Diode)  
(Part No. 14010675)



SIR1FM-2 (Silicon Diode)  
(Part No. 14010676)



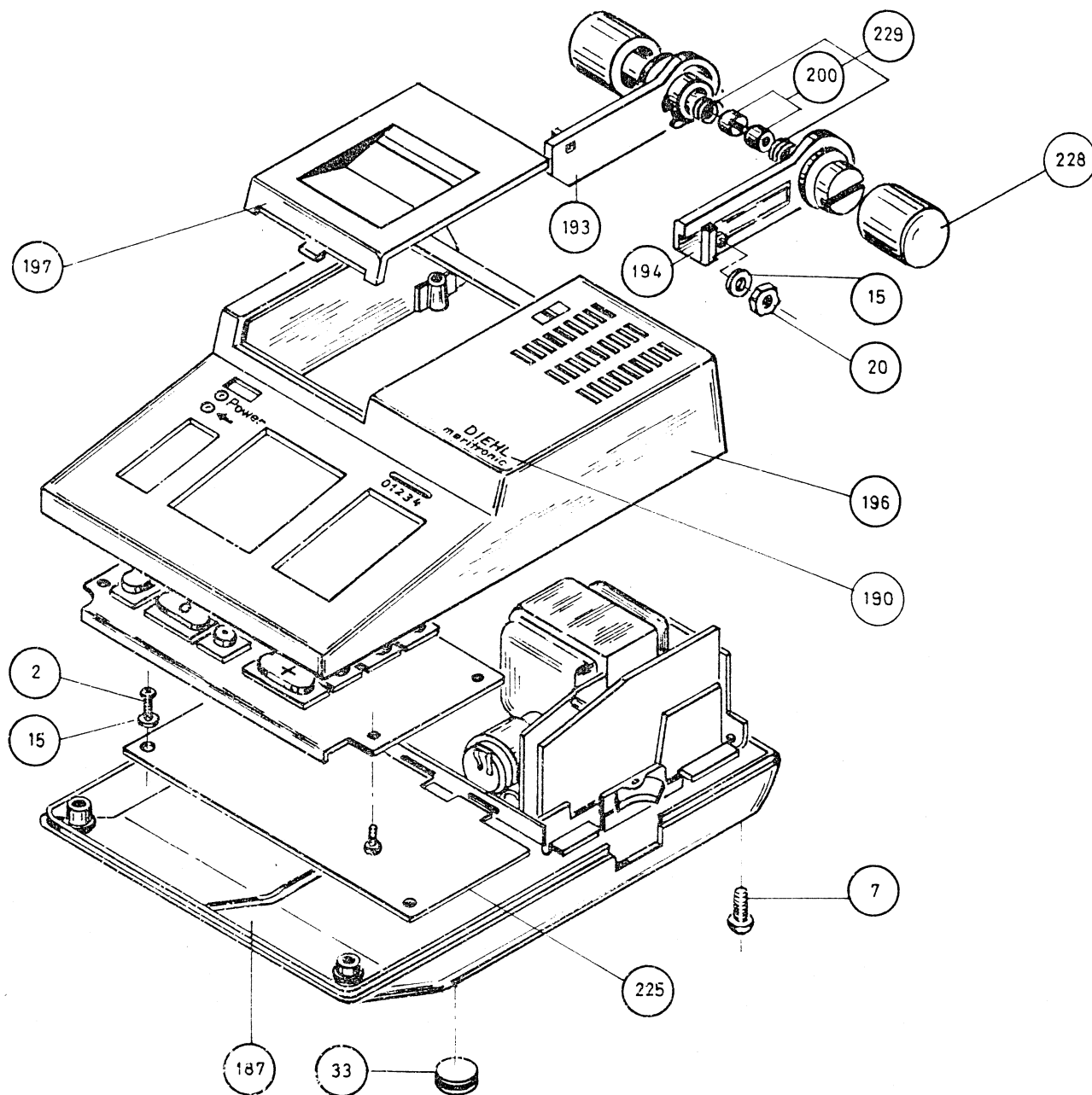
## KEYBOARD



# PARTS LIST

| Index No. | Parts No.  | Description                          |
|-----------|------------|--------------------------------------|
| 29        | 08010026 W | Pan Head Screw: M 3 x 4              |
| 44        | 13020080   | Read Lamp: 28 V, 40 mA               |
| 54        | 74762003   | Slide Switch: Decimal Point Selector |
| 55        | 74762006   | Mechanical Switch: Function Key      |
| 56        | 74762007   | Mechanical Switch: Feed Key          |
| 57        | 74762008   | Screw: Mechanical Switch             |
| 174       | 74769201   | Key Top 1                            |
| 175       | 74769202   | " " 2                                |
| 176       | 74769203   | " " 3                                |
| 177       | 74769204   | " " 4                                |
| 178       | 74769205   | " " 5                                |
| 179       | 74769206   | " " 6                                |
| 180       | 74769207   | " " 7                                |
| 181       | 74769208   | " " 8                                |
| 182       | 74769209   | " " 9                                |
| 183       | 74769210   | " " .                                |
| 184       | 74769211   | " " #                                |
| 185       | 74769220   | " " FEED                             |
| 186       | 74769221   | Spring: Key Stem                     |
| 191       | 74789201   | Key Top C                            |
| 201       | 74791525   | Lamp Holder                          |
| 206       | 74792502   | Keyboard Panel                       |
| 208       | 74792511   | P.C.B.: Keyboard                     |
| 214       | 74799200   | Key Top 0                            |
| 215       | 74799201   | " " +                                |
| 216       | 74799202   | " " -                                |
| 217       | 74799203   | " " ÷                                |
| 218       | 74799204   | " " x                                |
| 219       | 74799205   | " " =                                |
| 221       | 74799207   | " " ◊                                |
| 222       | 74799208   | " " *                                |
| 223       | 74799209   | Key Stem 0, +                        |

# COVER



# PARTS LIST

| Index No. | Part No.   | Description             |
|-----------|------------|-------------------------|
| 2         | 03130050 B | Pan Head Screw: M 3 x 5 |
| 7         | 03140160 B | " " " : M 4 x 16        |
| 8         | 04330060 B | Tapping Screw: M 3 x 6  |
| 15        | 07010030 B | Flat Washer: M 3        |
| 20        | 07100030 B | Hexagonal Nut: M 3      |
| 33        | 08056005   | Rubber Foot             |
| 50        | 74692503   | Knob: Slide Switch      |
| 51        | 74761510   | Base Cover              |
| 187       | 74769501   | Base Cover Assembly     |
| 190       | 74781511   | Brand: DIEHL meritronic |
| 193       | 74791510   | Paper Holder: Left      |
| 194       | 74791511   | " " : Right             |
| 196       | 74791516   | Upper Cover             |
| 197       | 74791520   | Upper Panel             |
| 200       | 74791524   | Shaft: Paper Holder     |
| 207       | 74792510   | Keyboard Assembly       |
| 225       | 74799700   | Logic P.C.B Assembly    |
| 228       | 74861017   | Knob: Paper Holder      |
| 229       | 74861019   | Spring: Paper Holder    |



# MAIN PARTS LIST

| Index No. | Part No.   | Description                       |
|-----------|------------|-----------------------------------|
| 1         | 02525040 B | Pan Head Screw: M 2,5 x 4         |
| 2         | 03130050 B | " " " : M 3 x 5                   |
| 3         | 03130060 B | " " " : M 3 x 6                   |
| 4         | 03130080 B | " " " : M 3 x 8                   |
| 5         | 03130200 B | " " " : M 3 x 20                  |
| 6         | 03140060 B | " " " : M 4 x 6                   |
| 7         | 03140160 B | " " " : M 4 x 16                  |
| 8         | 04330060 B | Tapping Screw: M 3 x 6            |
| 9         | 05530030 E | Stopper Screw: M 3 x 3            |
| 10        | 05530040 E | " " : M 3 x 4                     |
| 11        | 05540040 E | " " : M 4 x 4                     |
| 12        | 06225050 E | Spring Pin 2,5 $\phi$ x 5         |
| 13        | 07000045 B | Flat Washer                       |
| 14        | 07010023   | " "                               |
| 15        | 07010030 B | " "                               |
| 16        | 07010040 B | " "                               |
| 17        | 07030030 B | Spring Washer: M 3                |
| 18        | 07030040 B | " " : M 4                         |
| 19        | 07040040 B | Crown Washer: M 4                 |
| 20        | 07100030 B | Hexagonal Nut: M 3                |
| 21        | 07120030 B | " " " : M 3                       |
| 22        | 07200015 Z | E Type Stopper Ring: 1,5          |
| 23        | 07200020 Z | " " " " : 2,0                     |
| 24        | 07200025 Z | " " " " : 2,5                     |
| 25        | 07200030 Z | " " " " : 3,0                     |
| 26        | 07200040 Z | " " " " : 4,0                     |
| 27        | 07200050 Z | " " " " : 5,0                     |
| 28        | 08010026 B | Pan Head Screw: M 3 x 4           |
| 29        | 08010026 W | " " " : M 3 x 4                   |
| 30        | 08011126   | Screw with Spring Washer: M 3 x 4 |