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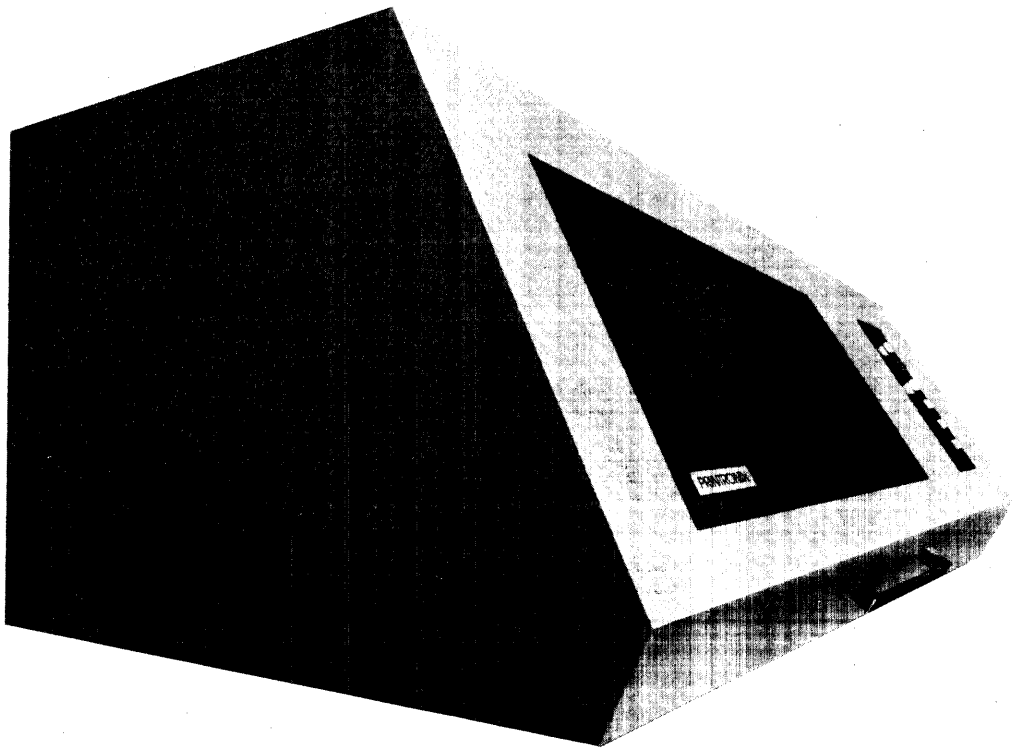
PRINTRONIX

Model 300 Printer Maintenance Manual



PRINTRONIX

Model 300 Printer Maintenance Manual

PART NO. 101691
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MAY 1977

PRINTRONIX

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SERVICE AND WARRANTY

This product has been rigorously tested by trained quality control personnel. Where practical, components have been selected from manufacturers' "off the shelf" stock. If a component fails, it may be readily replaced. The printer has been designed for "plug-in" modular replacement.

Printronix warrants its products to be free from defects in design, workmanship, and material under normal use and service for a period of 12 months after the date of shipment. Printronix will honor its warranty as long as inspection discloses no defects caused by alteration, misuse, improper maintenance, negligence, or accident to the product.

Read the manual thoroughly, noting operation and maintenance instructions and major assemblies. If additional assistance is needed, contact Printronix Customer Service Department. Trained service personnel will help you.

INTRODUCTION

This maintenance manual contains a theory of operation for the Printronix 300 printer; along with instructions for performing periodic maintenance, troubleshooting, and corrective maintenance.

The Printronix 300 *Drawings Manual* contains electrical, electronic, and assembly drawings to aid in maintaining the printer.

The Printronix 300 *Technical Manual* contains printer specifications and a general description of printer operation; and describes the Printer/controller interface, and commands and formats used in communicating with the printer.

The *Operator's Manual* contains instructions for installing and operating the printer.

The maintenance representative should be thoroughly familiar with material in the *Technical Manual* and the *Operator's Manual* before attempting to perform procedures outlined in this manual.

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Figure 1 Printronix 300 Printer

THEORY OF OPERATION

GENERAL

This section presents a theory of operation for the Printronix 300 printer (figure 1). This material is intended to aid the maintenance representative in understanding how the printer works, so that he can troubleshoot and repair the unit efficiently.

It is assumed that the maintenance representative is familiar with basic electronics, and understands the principles, and symbology and conventions, of solid-state digital electronics.

The following paragraphs present a general functional description of printer operation, followed by more detailed descriptions of the different functional elements of the printer.

GENERAL FUNCTIONAL DESCRIPTION

The printer consists, essentially, of the following functional elements (figure 2):

- printer mechanism
- ribbon transport
- paper transport
- control and character electronics
- print hammer drivers
- interface electronics
- electronic vertical format unit (VFU)
- controls and indicators

PRINTER MECHANISM

Unlike other dot matrix printers, which use a moving head and print one character at a time, the Printronix 300 prints a full line of characters simultaneously, as the paper advances vertically through the character height.

A hammer bank containing a line of 44 print hammers (figure 3) is fixed to a shuttle that moves horizontally through three character spaces (approximately 0.3 inch). Each hammer is used to print all dots of three adjacent characters (3 x 44 = 132, which is the printer line length).

Each hammer tip is near the free end of a stiff leaf spring, held rigidly in the hammer bank. A single permanent magnet holds all 44 hammer springs in a retracted (tensioned) state.

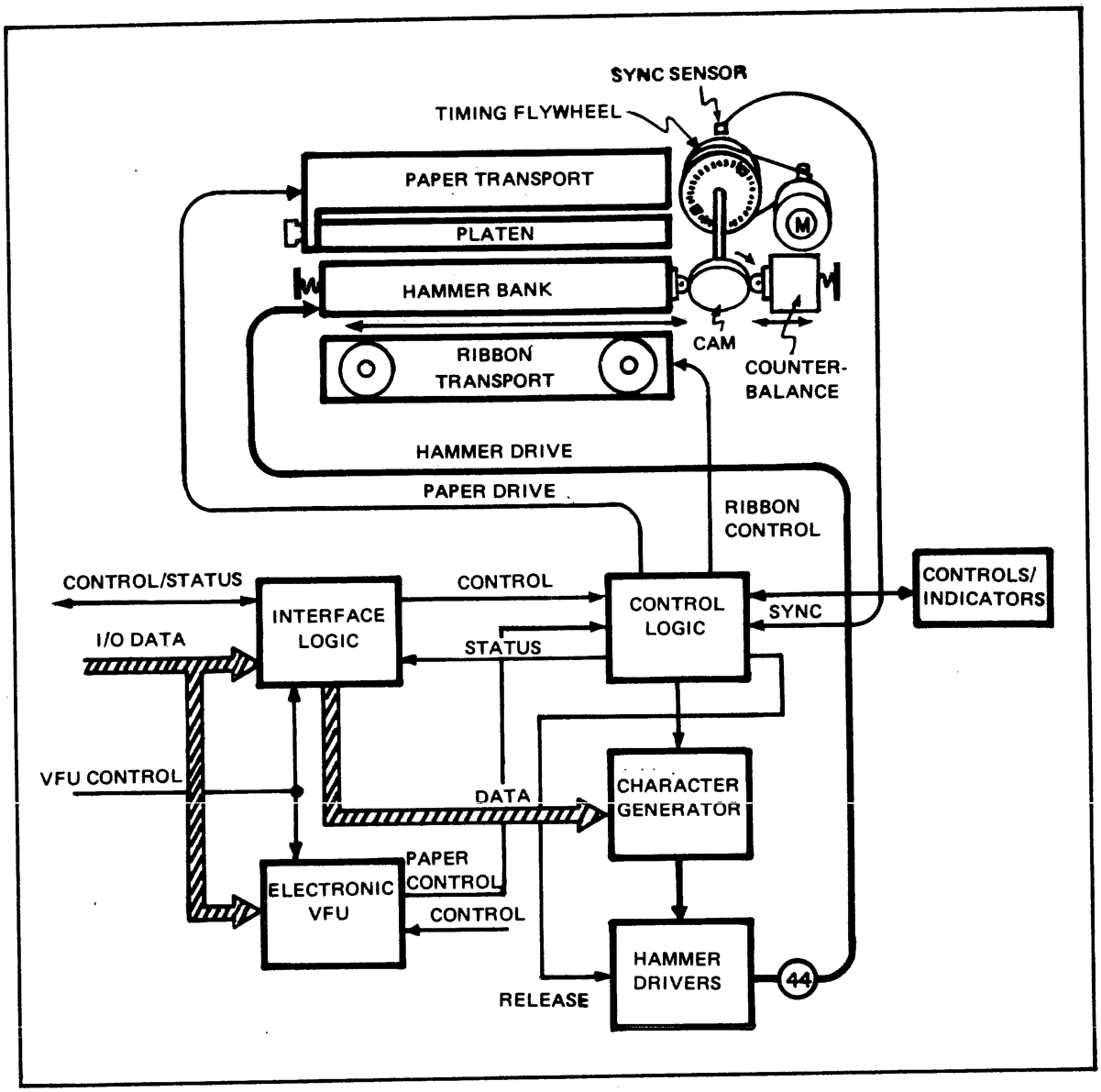


Figure 2 Printronix 300, General Functional Organization

Associated with each print hammer is a coil (normally de-energized) mounted on a magnetic pole pin which is in contact with the free end of the spring. When printer logic requires that a dot be printed by the hammer, a current pulse energizes the coil which generates an electromagnetic field opposing that of the permanent magnet. This releases the hammer from the magnet, and the hammer flies forward to impact the ribbon and paper against the platen. As the hammer rebounds, coil current has been cut off and it is again drawn back by the magnet and held ready for the next stroke. "Flight time" is the same for all 44 hammers, and any hammer may be actuated at a rate up to 1000 impacts per second.

All characters in a line are printed simultaneously in a scanning pattern (figure 4). That is, all dots in any row of the 9-by-7 dot matrix are printed in a single scan as the shuttle is moved from one side to the other through three character positions. Successive rows of dots are printed as the paper is advanced one dot row (0.0139 inch) at a time, with the shuttle moving in alternate directions for alternate rows of dots. A standard upper-case character comprises seven rows of dots, with the descender of a lower-case character formed by eighth and ninth rows.

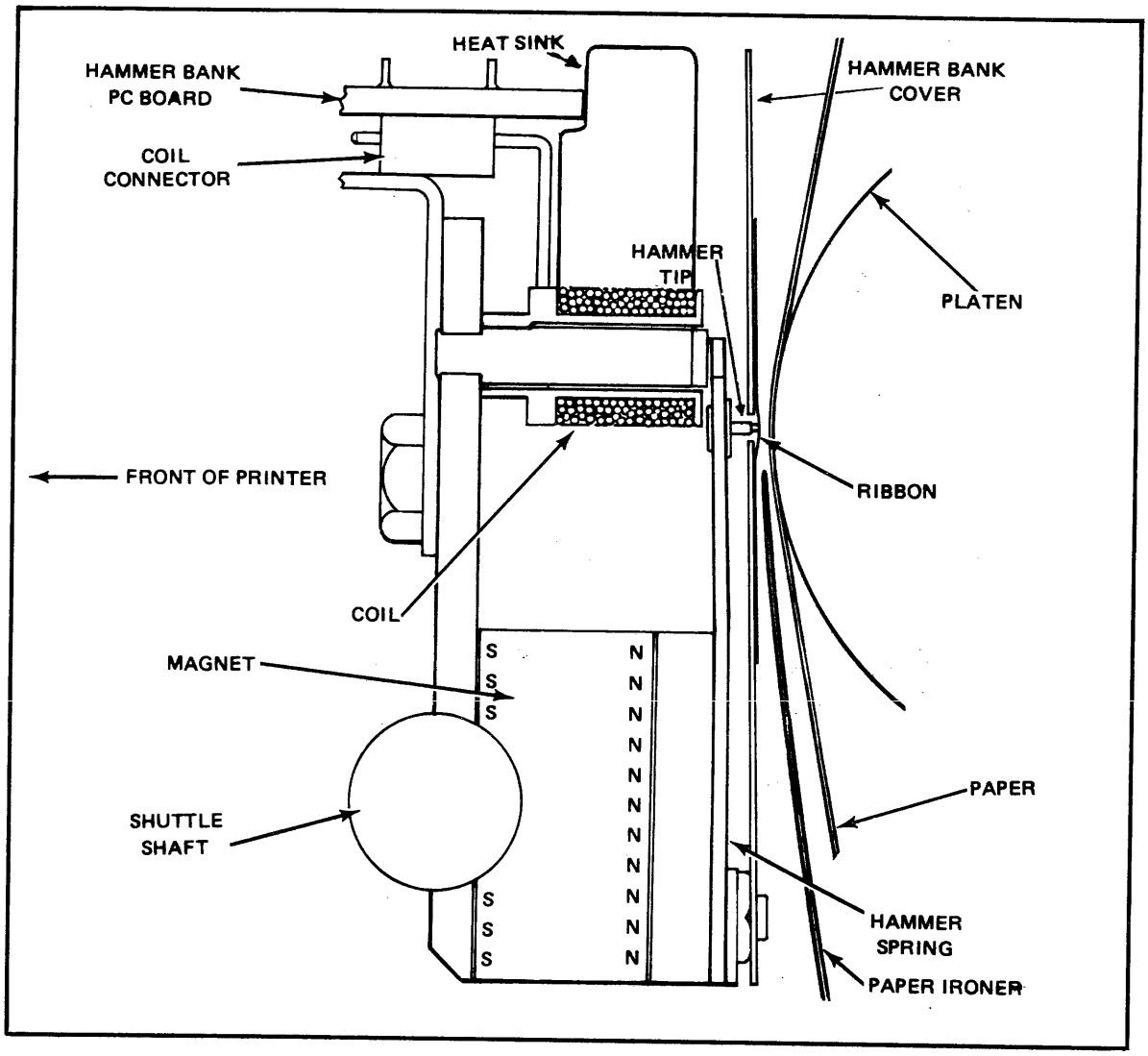


Figure 3 Hammer and Shuttle Arrangement, Cross Section

The shuttle is moved through its horizontal scan by a motor-driven, two-lobed cam producing two strokes in each direction for every revolution of the cam. The cam forces the shuttle to the left against a compression spring which returns the shuttle to the right as the cam turns to its low lobe. As the shuttle is driven to the left, a counterbalance is driven to the right, against a compression spring which returns the counterbalance to the left as the cam turns to its low lobe. This symmetrical arrangement reduces vibration by balancing the horizontal reaction force of the shuttle.

A flywheel on the cam shaft has a timing disk on its rear surface. A magnetic pickup senses apertures in the magnetic timing disk to provide hammer stroke timing and resynchronization for each horizontal scan. Each revolution of the disk synchronizes two 2-way scans of the shuttle. In each scanning motion, the shuttle covers three character positions, each of which contains 12 dot columns. Each 2-way scanning cycle is resynchronized by a double-wide aperture in the timing disk.

Paper is advanced while the shuttle is reversing direction between dot rows. After the last dot row of a character is completed, the paper is advanced for line separation and the next line of characters is begun. For 6-LPI printing, paper is advanced 12 dot rows per line; and for 8-LPI printing, paper is advanced 9 dot rows per line.

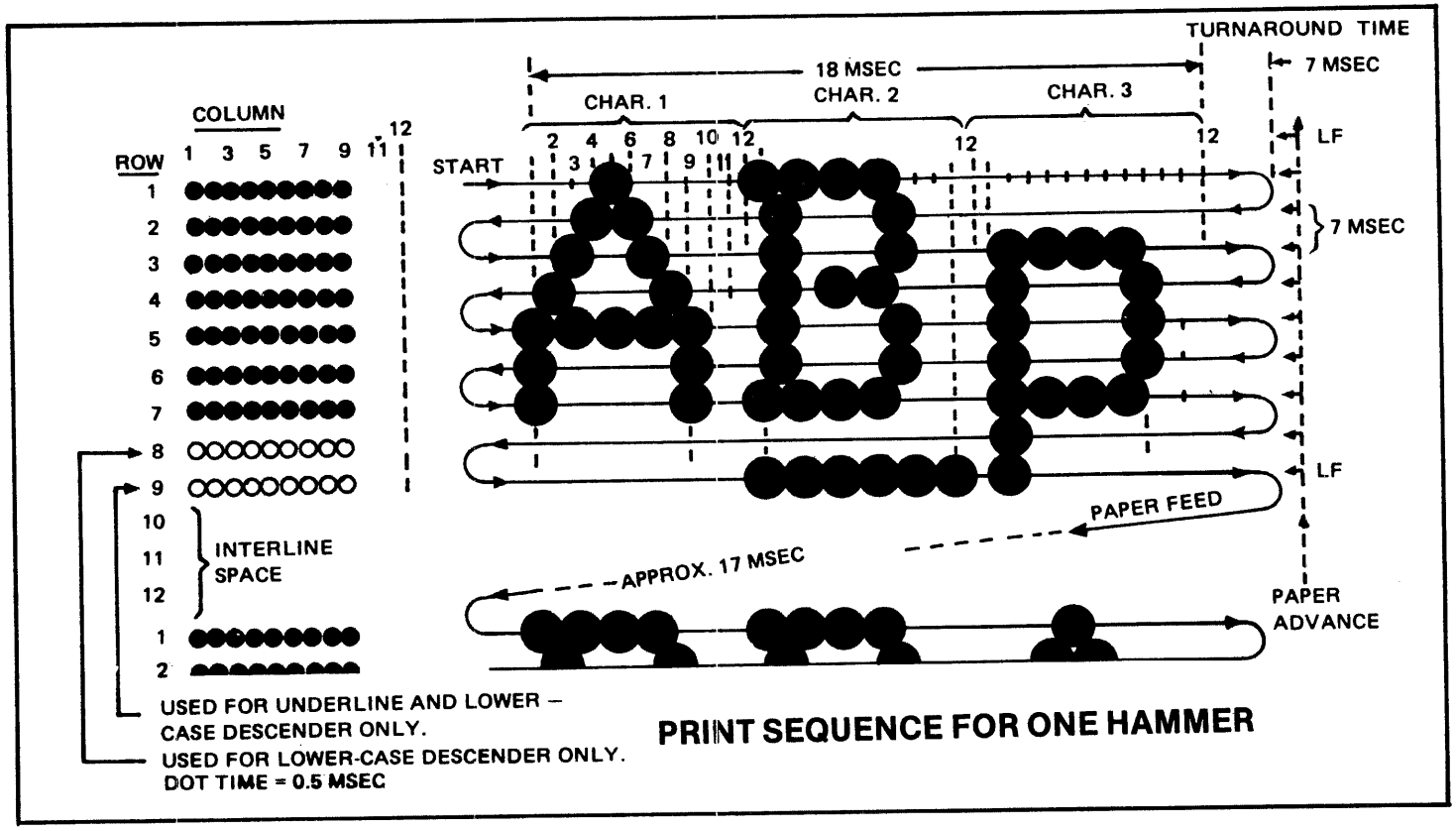


Figure 4 How Standard Characters Are Formed

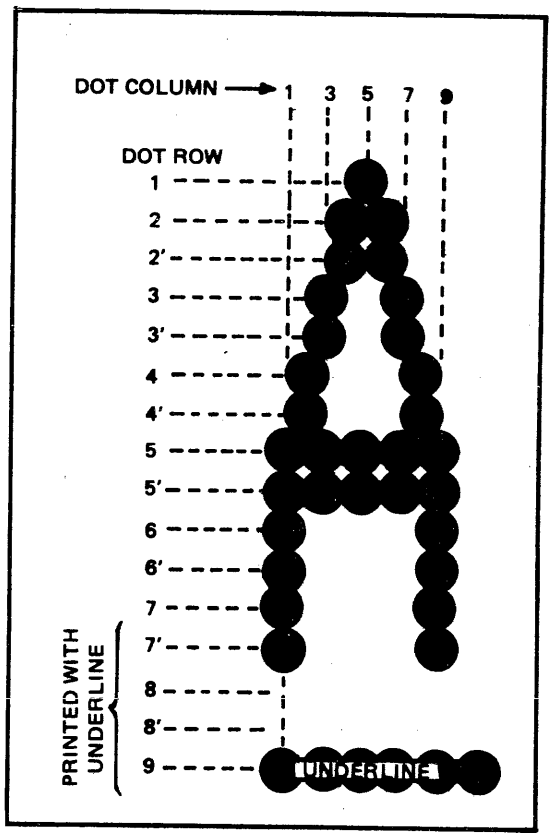


Figure 5 Typical Elongated Character

A vertically elongated character may be printed (figure 5). The elongated character is formed by printing each dot row (except the first and last) twice. An elongated character is made up of 13 dot rows (instead of 7), or 16 (instead of 9).

Operating in the "plot" mode (graphic mode), the printer advances only a single dot row if a "Plot" code precedes the previous Line Feed code. In the Plot mode, then, each input message defines information in a single dot row, instead of a line of characters.

INTERFACE LOGIC

Interface logic receives a line of incoming data and stores it in a 132-character register, and decodes commands that control the paper transport and other functions. This logic also controls the "hand-shaking" cycle with which the printer communicates with the controller or Printronix Exerciser. Figure 6 diagrams the interface elements and the relationships between them and other elements in the printer.

CONTROL LOGIC

Control logic receives line-sync and dot-sync pulses from the timing disk sensor and provides position information that: (1) relates each stored input character to a particular print hammer, and (2) provides timing that scans the required dot pattern information from the character generator for printing.

Control logic includes circuits to decode function and paper movement commands.

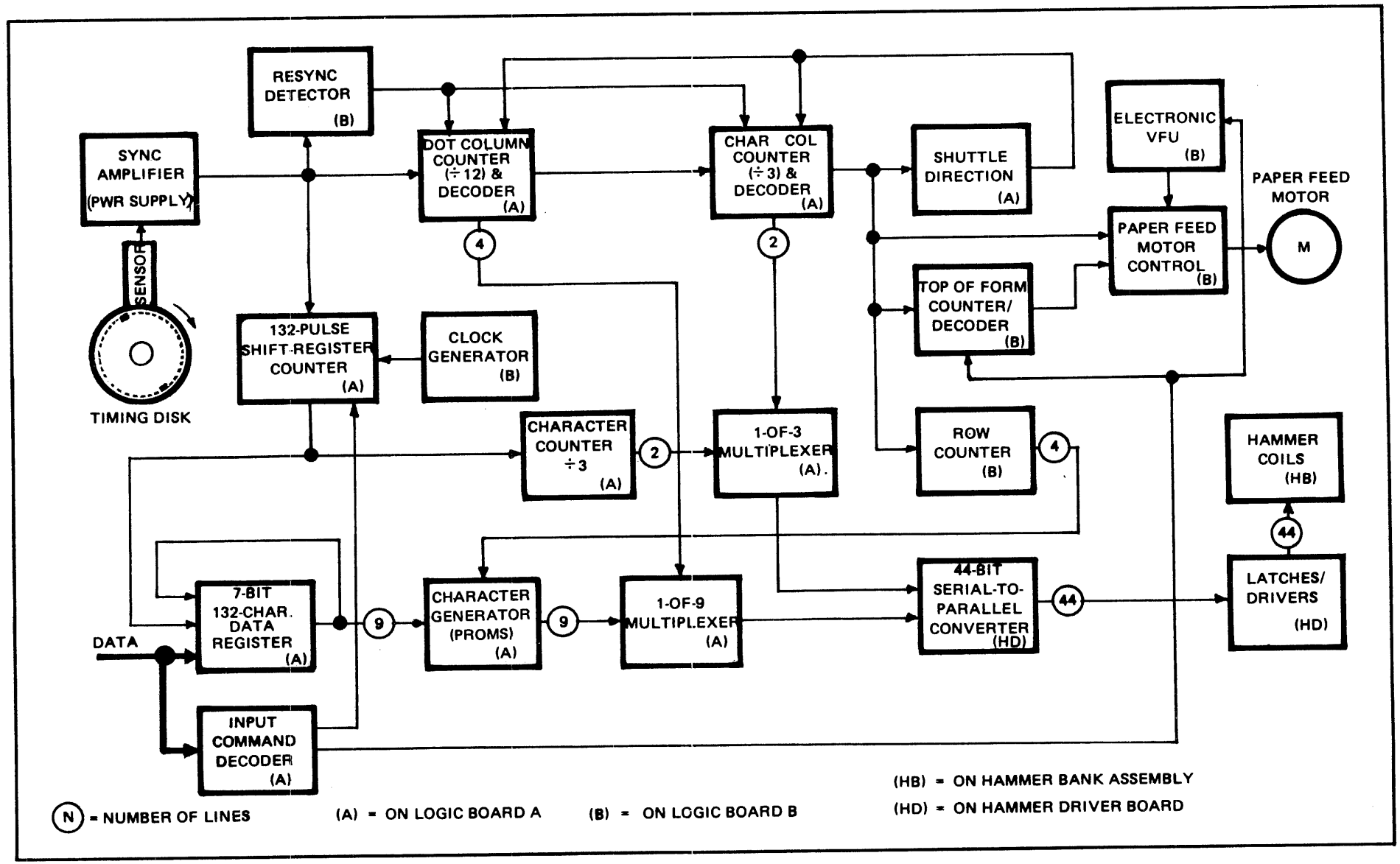


Figure 6 Printronix 300, Functional Block Diagram

CHARACTER GENERATOR

Character generator logic decodes each input character code and causes each type of input character to produce a specific pattern of dots, for each dot row, to represent that character. The character pattern, stored in programmable read-only memory devices (PROM's) appears for each dot row as a stream of pulses on nine lines (one for each possible horizontal dot position). Pulses representing dots are multiplexed to the hammer driver circuits.

The standard 96-character ASCII set is encoded on interface data lines 1 through 7. Plug-in PROM devices are installed for the standard set.

Additional PROM devices may be installed in other sockets to decode other characters (Katakana or other special character sets) up to a total of 160 characters. In this case, data line 8 is used as a "shift" command to select either the ASCII data set or the special set.

HAMMER DRIVERS

All "dot" bits multiplexed from the character generator for a particular dot row are stored until all 44 circuits contain a specified "print" or "no print" state. All hammer driver circuits containing the "print" state are then pulsed, delivering a current pulse of approximately 2 amperes to release the hammers. Because coil current is cut off during hammer flight, the rebounding hammer is recaptured by the magnetized pole pin.

ELECTRONIC VFU

An electronic vertical format unit (EVFU) is loaded with a program (up to 132 lines) used to compose forms. Up to 14 channels may be used to compose forms of virtually any practical length. The data comprising the program is loaded through the data interface following a "start load" code which routes incoming EVFU channel codes to the EVFU memory instead of to the printer buffer. Input is restored to the printer buffer by a "stop load" code following the EVFU program.

During printing, the incoming information may request advance to any specified channel in the EVFU memory (with simultaneous paper advance). A paper control command in the incoming information is identified (with the Dataproducts interface) by a "true" level on the EVFU command (PI) line. For a Centronics-type interface, a jumper is installed to disable the PI line and the EVFU is controlled directly by command codes on the data lines. The TOP OF FORM switch is illuminated while a format is stored in the EVFU memory.

PAPER TRANSPORT

The paper transport handles fan-fold, edge-perforated paper up to 16 inches wide. Horizontal positioning is controlled by two movable tractors (8-pin engagement), with the right-hand tractor movable over the full width of the hammer bank. A horizontal vernier adjustment permits moving paper over a two-character-wide range.

Paper is advanced by an incremental motor which moves the paper in 0.0139-inch increments for each dot row (one step), or advances the paper in response to a decoded Line Feed, Form Feed, or EVFU command.

A paper-out detector stops operation and turns on the CHECK indicator if there is no paper two inches below the print station, or if the Forms Thickness Adjustment lever is in the "load" position. Normal paper tension below the print station holds the detector switch open. The switch closes if there is no paper below the print station or the Forms Thickness Adjustment is in the "load" position. Printer operation is stopped and the CHECK indicator is turned on after paper has advanced two inches (the distance from detector switch to print station).

A paper-motion detector senses the movement of sprocket holes in the paper, and causes printing to stop if paper becomes stuck at the platen or pulls out of the paper tractors. Detection energizes the CHECK indicator.

RIBBON TRANSPORT

The ink ribbon is advanced continually while the shuttle motor is running, and is stopped while the shuttle is stopped. The ribbon transport automatically reverses when a wire threaded through either end of the ribbon is exposed and detected. Constant ribbon tension is achieved using dc servo motors operating in a differential drive circuit.

LOGIC DESCRIPTION

The following paragraphs describe the operation of printer logic and circuits. Refer to illustrations accompanying the text, and to logic, schematic, and assembly drawings contained in the Printronix 300 *Drawings Manual.*

Operation of printer logic is explained for each of the three principal modes of operation as follows:

a. Load Buffer mode, in which a line of data to be printed is received from the remote controller and stored;

b. Print mode, in which the line of data is printed; and

c. Paper Feed mode, in which paper is advanced to the next line, or slewed to top-of-form or to a line specified by a VFU command.

Described under separate headings are:

a. Interface logic which interfaces the Printronix 300 with the remote controller;

b. Circuits on the Hammer Driver Board;

c. The electronic Vertical Format Unit (VFU);

d. Ribbon control circuits; and

e. Power supply circuits.

Figure 7 is the overall timing diagram for printer operation.

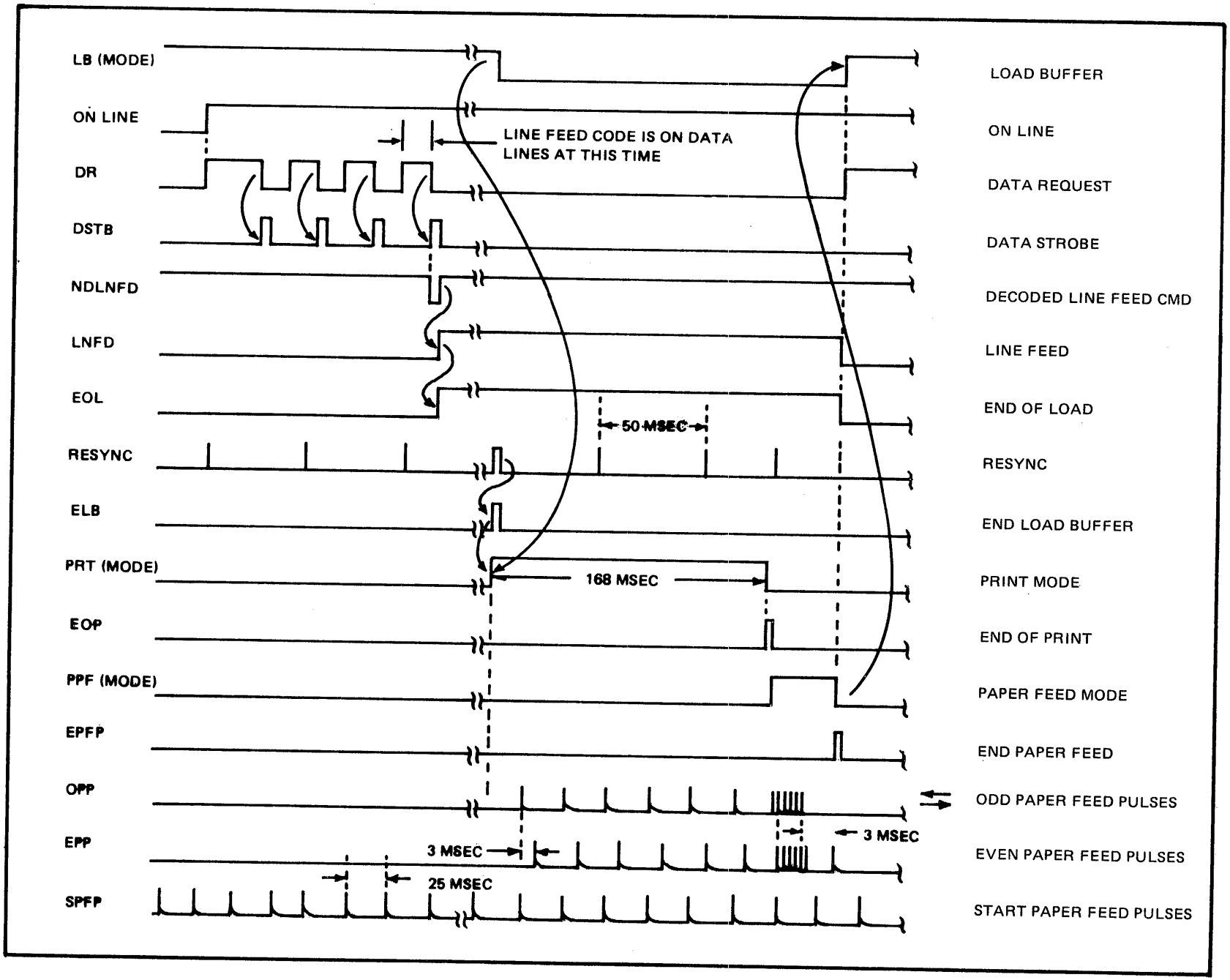


Figure 7 Printronix 300, Overall Timing

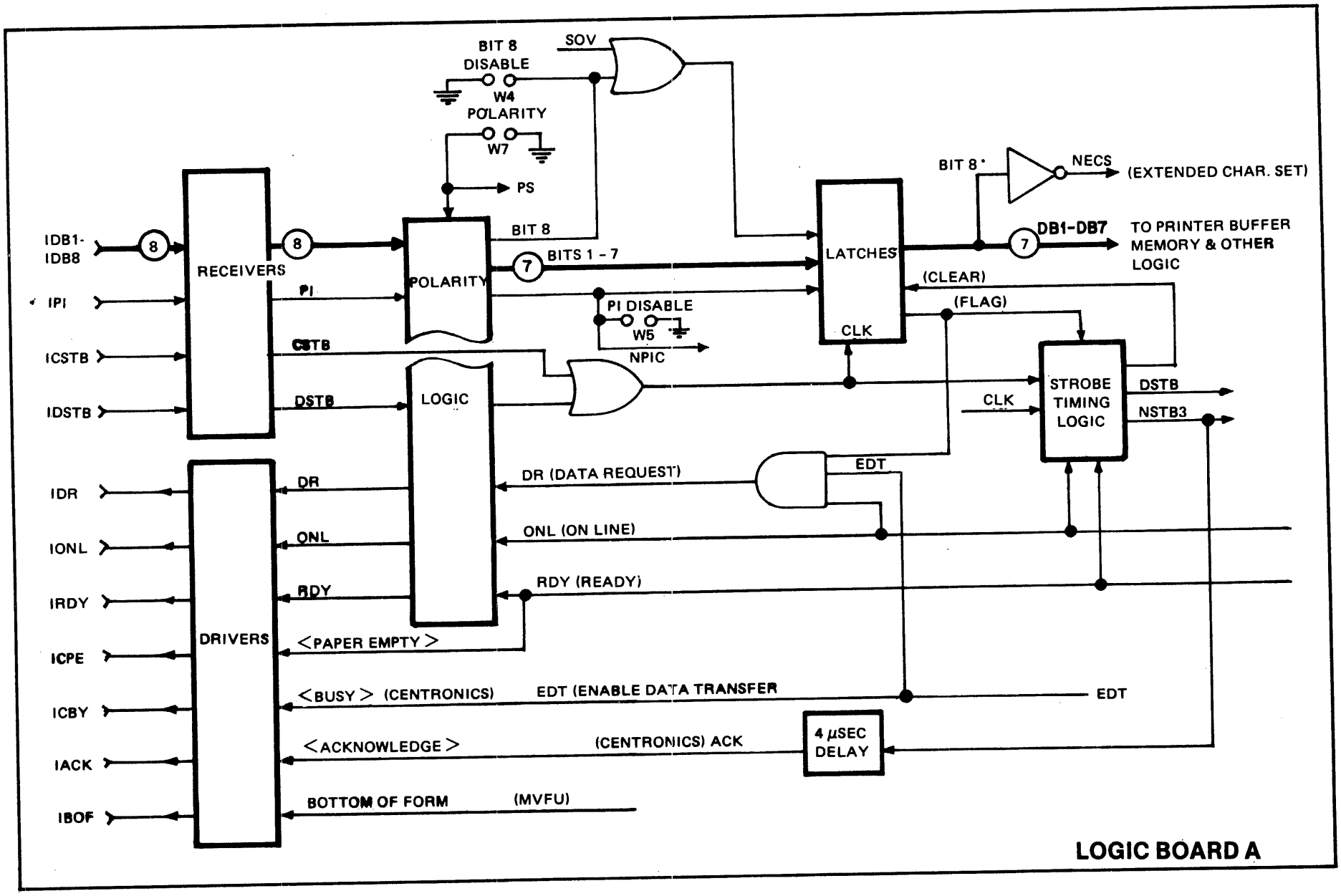


Figure 8 Interface Logic, Functional Block Diagram

Some conventions used in illustrations and logic diagrams include the following:

a. The letter N beginning a signal mnemonic indicates that the low level is true. For example: NDSTB (low true), DSTB (high true).

b. The letter D beginning a mnemonic indicates that the signal is decoded from a command code.

c. Interface signals are identified by the initial letter I. Example: IDR.

d. Except for shift register memory devices, all logic is TTL.

e. Letters in a block diagram locate the indicated logic elements on Logic Board A (A), Logic Board B (B), or the Hammer Driver Board (HD).

INTERFACE LOGIC

Interface logic (located on Logic Board A) links together the remote controller and the printer. Figure 8 is a block diagram of interface functions, and figure 9 shows timing of events in the logic.

Principal elements of the block diagram are:

a. Receiver circuits (Schmitt trigger input) which restore leading and trailing edges to the degraded digital signals, and provide noise immunity.

b. Open-collector-type drivers for transmission to the remote controller.

c. Polarity logic (exclusive-OR gates) to select either a high-true or low-true logic sense for a standard (Dataproducts) interface. Jumper W7 (at IC location 8K) is installed for a low true interface, and omitted for a high-true interface.

d. Latch circuits into which incoming data characters, function codes, and Paper Instruction bits are strobed and stored until they have been transferred into the buffer memory.

e. Strobe timing circuits which control timing of various internal functions, and control the outgoing Data Request (DR) signal (for Dataproducts-type controllers) or ACK signal (for Centronics-type controllers).

f. Terminators.

Signals that pass between printer and controller are listed and described in Table 1.

When the controller responds to DR by sending a strobe, DR is reset, the received data is loaded into the latches, and a flag bit is set true, initiating the strobe timing sequence shown in figure 9. This cycle resets the latches after data has been transferred into the printer buffer or a command code has been latched, and generates timing signals DSTB and NSTB3. Strobe timing logic is clocked by the basic 2-MHz clock CLK.

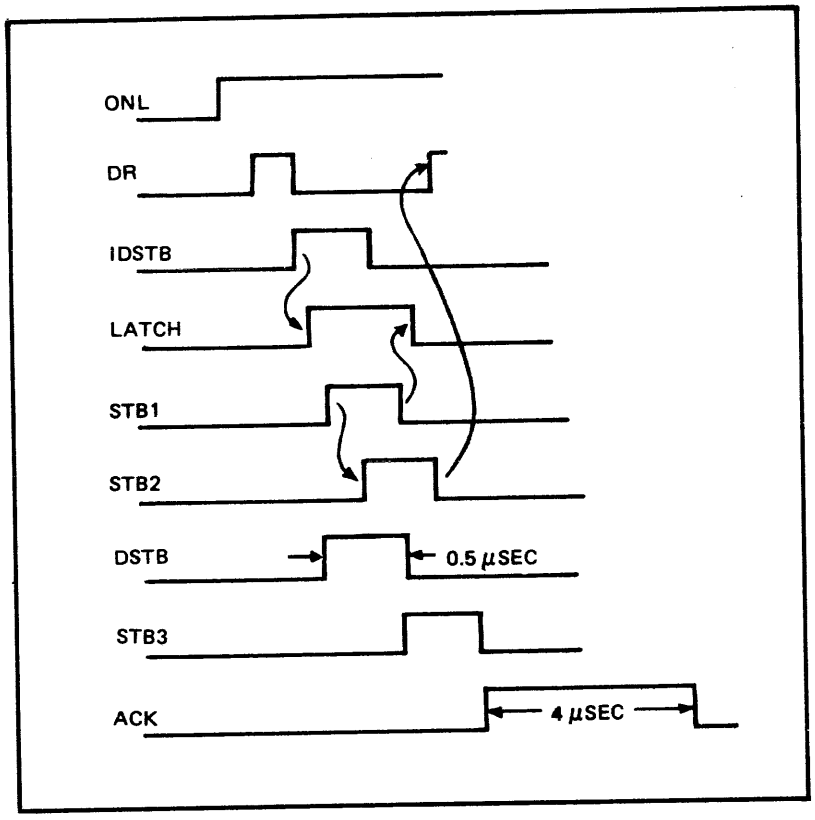


Figure 9 Interface Logic, Timing Diagram

Operation is essentially the same for a Centronics-type controller except that ACK is sent, instead of DR. ACK is generated by STB3, and reset by a count of eight CLK pulses (4 μsec).

LOAD BUFFER MODE OPERATION

Characters stored in the interface latches (and decoded "underline" bits) are clocked into the printer buffer (figure 10). This is a 9-bit, 132-character recirculating shift register made up of dual 132-bit shift register devices, with one 132-bit shift register reserved for underlines. Figure 11 shows logic for a typical 132-bit shift register.

The printer buffer can be loaded only in the Load Buffer mode of operation, while LB is true. LB is true whenever both the Print (PRT) and Paper Feed (PPF) mode control flip-flops are false.

Any printable character is loaded from interface latches into the buffer memory by a NSRCLK pulse (figure 12). A printable character or space (as opposed to a function code or VFU control character) is identified by NPTCH when either bit 6 or bit 7 is true, DSTB is generated, and the character is not accompanied by a VFU control bit on the PI line. NPTCH is used to generate the NSRCLK pulses.

NREC, true to enable loading, becomes false to enable data to be recirculated and read out to character generator logic. Other conditions that enable recirculation are:

- PRT true; or
- a CR character is received during loading (if followed by a printable character); or

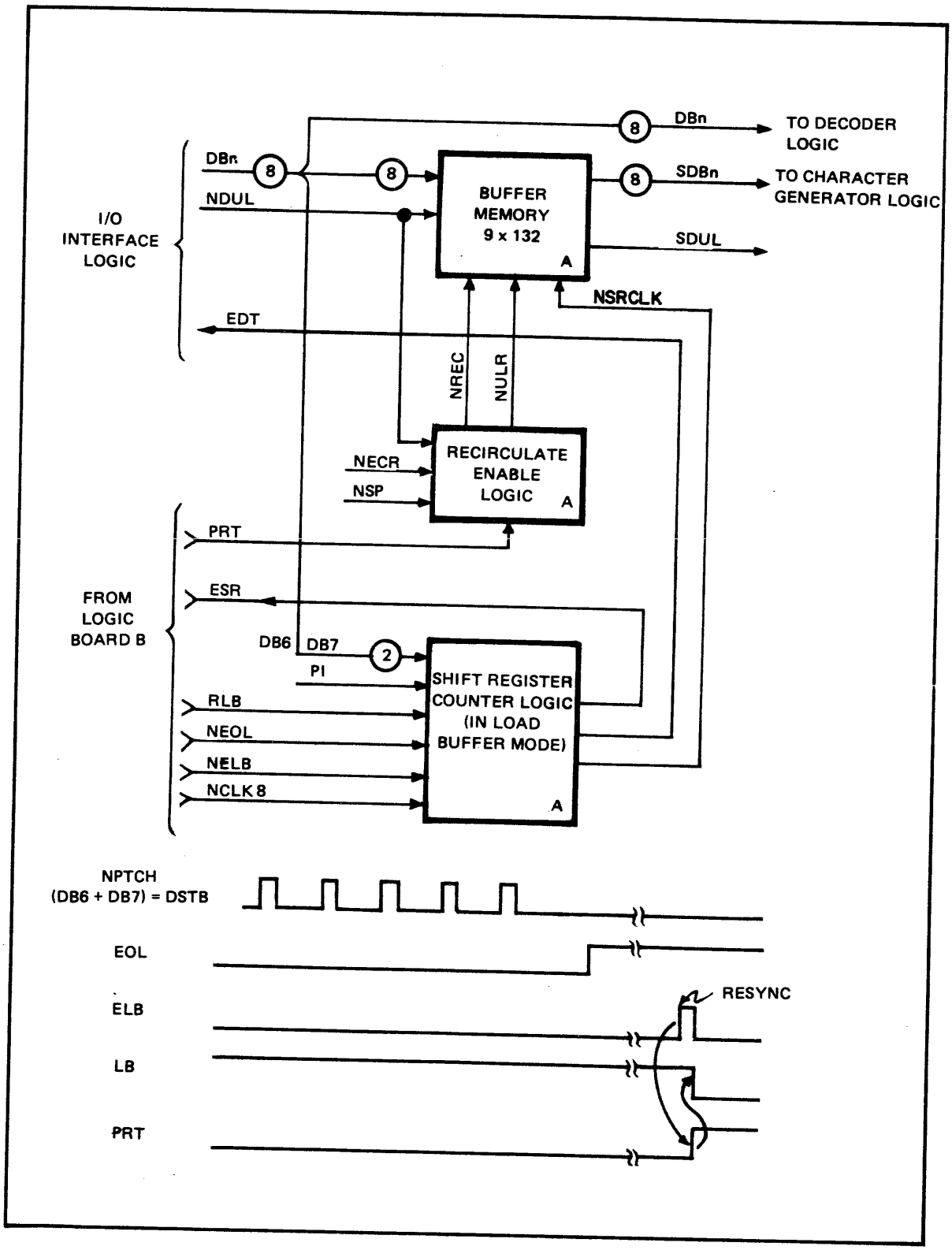


Figure 10 Buffer Memory Load Logic, Functional Block and Timing Diagram

Table 1. Interface Signals

Signal	Description
Received from Controller	
IDB1–IDB8	Seven-bit character or control code, with bit 8 used to select optional character set (same function as Shift Out code SOV). If bit 8 is not used, jumper W4 in location 8K to disable the bit. Bits 1 through 7 pass through receivers and polarity logic to latches for storage.
IPI	Indicates that bits on data lines are intended to control the VFU and are not to be loaded into the printer buffer. PI is applied through polarity logic and stored in a latch along with data bits. If PI is not to be used, jumper W5 must be installed in location 8K to disable the line.
ICSTB	Data strobe generated by Centronics-type controller in response to ACK signal from printer. Received and applied to strobe timing logic and to latch circuits. Leading edge loads data or function code into the latches.
IDSTB	Data strobe from Dataproducts-type controller, generated in response to printer-generated Data Request (DR) pulse. IDSTB is received and applied through polarity logic to strobe timing logic and latch circuits. Leading edge loads data, function code, and PI bit into the latches.
Sent to Controller	
IDR	Data Request signal sent to Dataproducts-type controller when On Line (ONL) is true, and printer is in Load Buffer mode (raises Enable Data Transfer), and latches have been reset ready to receive the next character.
IONL	On Line signal set by operator when the printer is ready to accept data. IONL is sent through polarity logic and a driver circuit.
IRDY	Ready, sent when printer is prepared to operate but ONL may or may not have been set. RDY is sent through polarity logic and a driver, and also appears on the ICPE line (bypassing polarity logic) for use by a Centronics-type controller.
ICPE	Same as IRDY, but conditioned for Centronics-type controller.
ICBY	Busy, the EDT signal sent through a driver.
IACK	Acknowledge, sent to a Centronics-type controller through a driver circuit to request the next character. Set by EDT.

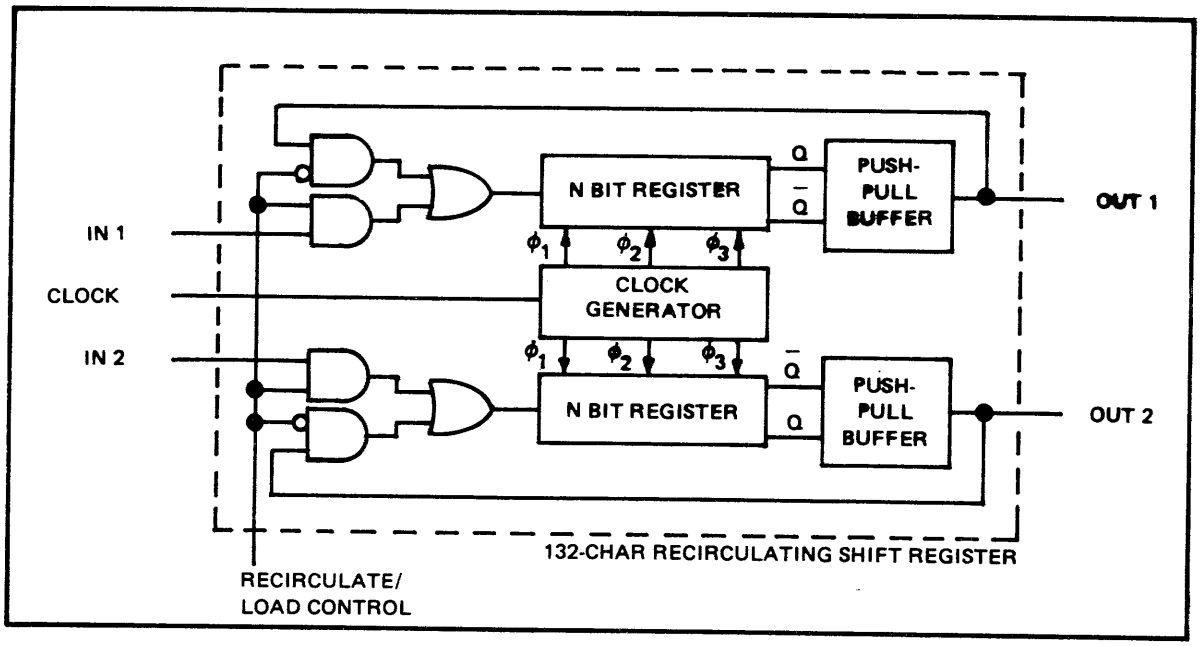


Figure 11 Printer Buffer Device, Logic Diagram

– a "space" is loaded (buffer is recirculated only one character); or

– "underline" is received, whereupon "underline" is loaded into its own shift register and other characters are simultaneously recirculated.

When the function code ending the input line is decoded, EOL raises the "busy" signal EDT which is sent through interface logic to the controller, inhibiting further loading until the printer buffer contents have been printed.

Shift register count logic, which has counted all printable input characters at this time, continues to count NSRCLK pulses (now a 1-MHz clock) as the characters in the printer buffer are shifted down to the output end of the memory (left-justified). At the maximum count of 132, ESR is set true, and enables the next RESYNC signal to raise ELB. ELB sets the Print mode of operation to end Load Buffer operation.

Function codes received in the input data stream are decoded to provide a number of control signals as follows:

Code (DB7 … DB1)	Function	Octal	Hex
0 000 101	Plot Mode (PM)	005	05
0 000 110	8 Lines per Inch (ND8LPI)	006	06
0 001 000	Elongated Character (NDELC)	010	08
0 001 010	Line Feed (NDLNFD)	012	0A
0 001 011	Vertical Tab (NDVT)	013	0B
0 001 100	Form Feed (NDFMFD)	014	0C
0 001 101	Carriage Return (NDCRR)	015	0D
0 001 110	Shift Out (SOV)	016	0E
0 001 111	Shift In	017	0F
P1 X X01 110	[1]Start VFU Load (NSTL)	356	EE
0 011 110	[2]Start VFU Load (NSTL)	036	1E
P1 X X01 111	[1]End VFU Load (NELD)	357	EF
0 011 111	[2]End VFU Load (NELD)	037	1F
1 011 111	Underline (NDUL)	137	5F
1 111 111	Delete (DEL)	188	

[1]Jumper W5 *not* in Logic Board A [2]Jumper W5 in Logic Board A X = don't care

The Shift Out command is clocked into a flip-flop which is reset by either a Shift In command or EPFP (End Paper Feed). Consequently, the Shift Out command must be specified for each line of data.

PRINT MODE OPERATION

The Print mode is entered when the following sequence is completed:

a. The Load Buffer mode is enabled (LB);

b. A function code ending the input line has been decoded (EOL true);

c. Data has been left-justified in the buffer memory (ESR true);

d. The buffer contains at least one printable character (PC true);

e. The shuttle is up to speed (SUS true); and

f. The next RESYNC pulse occurs (the shuttle is at the left-hand end of its movement).

The Print mode is ended, and the Paper Feed mode is begun, by EOP (End of Print) when the last dot row of a line has been printed. Figure 13 diagrams the principal logic elements involved in Print mode operation.

Print Synchronizing Circuits

Printing is synchronized with shuttle movement by signals generated by the magnetic pickup. The pickup senses each hole in the rotating timing disk as it turns at 600 rpm. Each of 198 holes generates a SYNC pulse which causes print hammers to release, printing dots held in hammer driver latch circuits.

Two double-sized holes in the timing disk, diametrically opposed, produce RESYNC signals which indicate the start of the next constant-velocity movement from the shuttle from left to right.

As shown in figure 14, each rotation of the timing disk controls two complete bidirectional shuttle cycles. Each cycle is divided into two 18-msec printing periods, each ended by a 7-msec period during which shuttle motion is reversed and paper is advanced to begin the next dot row or the next character line.

A dot row is printed during each print period, with each hammer printing dots in that row for three characters. Each character position is 12 dot columns wide, requiring 36 half-millisecond sync periods to print the three characters.

The low-level magnetic pickup signal is amplified by a hysteresis-amplifier circuit located on the Power Supply assembly. The amplified signal MPU appears at Logic Board B, where it is clocked by the 2-MHz clock CLK to synchronize its leading edge with other logic timing. The resulting 0.5 msec SYNC signal is used to control a number of logic functions and is gated to provide the actual "print" command NHCK.

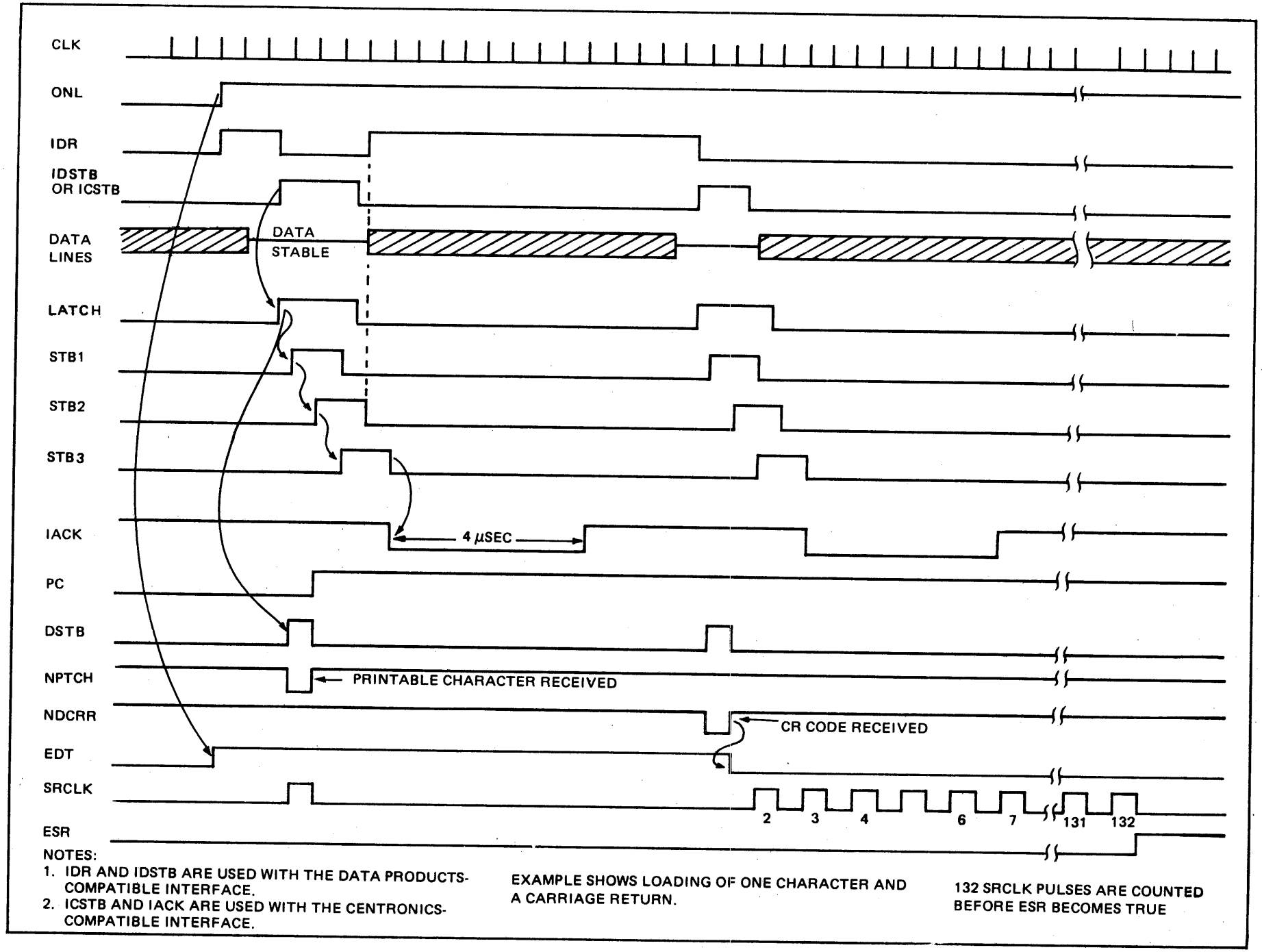


Figure 12 Printer Buffer Loading, Timing Diagram

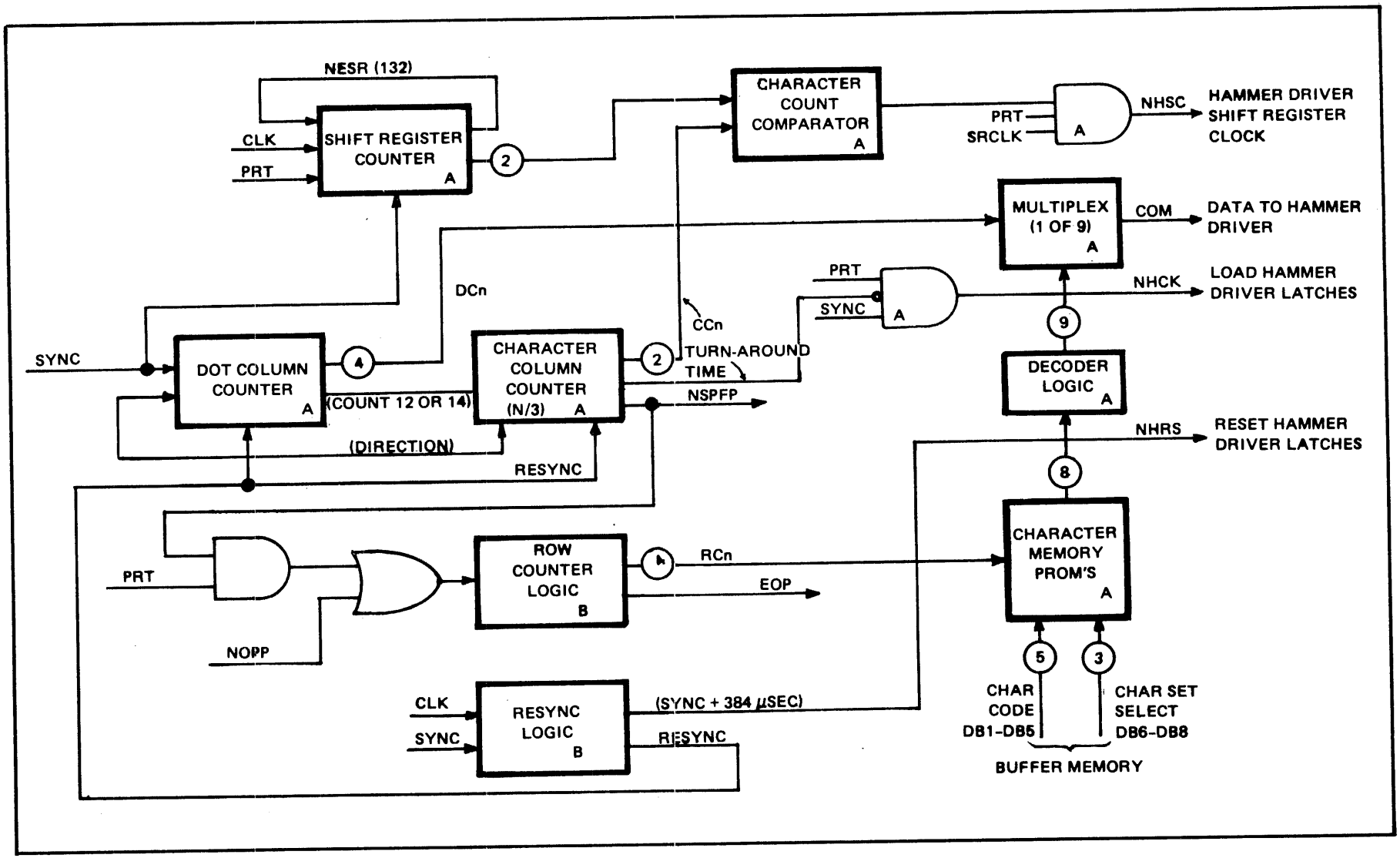


Figure 13 Print Mode Operation, Functional Block Diagram

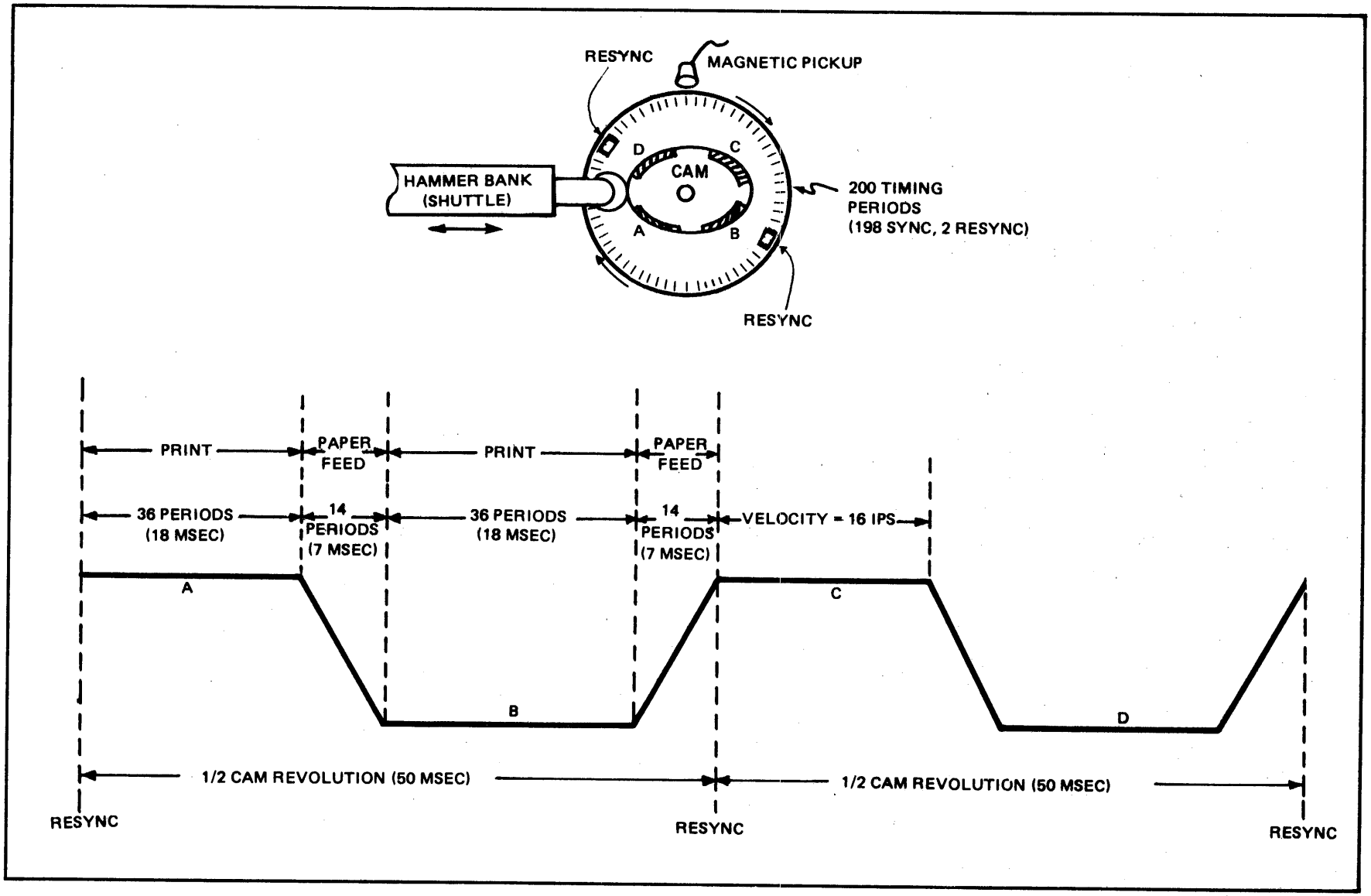


Figure 14 Hammer Timing with Timing Disk

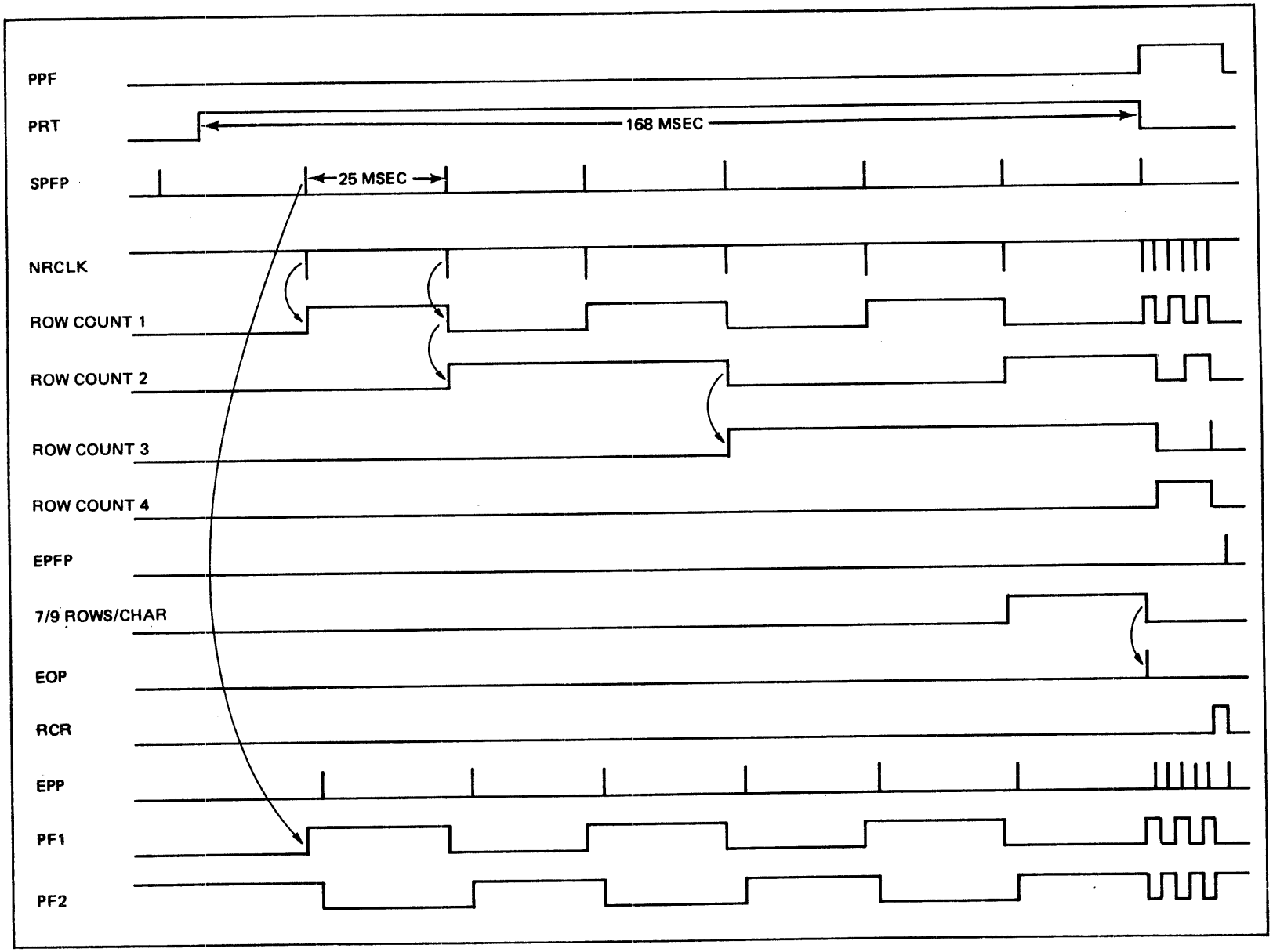


Figure 15 Row Counter Operation, Timing Diagram

The resynchronizing signal RESYNC is obtained by detecting the double duration of the resynchronizing signal, compared with that of a normal sync pulse. This is done by logic (on Logic Board B) which counts CLK pulses in a counter reset by SYNC, and sets the RESYNC flip-flop if the counter overflows before it is reset. RESYNC resets logic preparatory to printing each dot row.

Associated with RESYNC logic is another counter which counts CLK pulses up to 384 μsec following every SYNC pulse. The output of this logic, NHRS, resets hammer drive latch circuits 384 μsec after those circuits are clocked. That is, the 384-μsec period is the period during which hammer coils are energized.

Row Counter Logic

Row counter logic generates a 4-bit binary count (RC1-RC4) which identifies each row of dots as a character is printed. A character normally comprises seven dot rows, but an eighth and ninth row are added for a lower-case character having a descender, or for an underline. This logic also maintains a count of the total number of rows in a character line (including inter-line spaces) and provides an output EOP pulse to signal that the character line has been completed (End of Print).

When PRT is true (Print mode), the row counter is incremented by SPFP (Start Paper Feed). During paper feed time, however, odd paper feed pulses NOPP increment the row counter. If an elongated character is to be printed, NDELC causes only every second RCLK pulse (SPFP or NOPP) to increment the row counter. Figure 15 shows timing of events in row counter operation.

The 4-bit counter counts up to the selected rows-per-line count and is then reset by RCR. For 6-LPI printing, the counter is reset at the count of 12. When printing at 8 LPI, the signal 8LPI causes RCR to occur at the count of nine. RCR is reset by the following even paper pulse EPP.

The row-per-character decoder normally decodes a count of seven, but decodes nine if NPAL (derived from SDUL or Print-9-Rows flag from the PROMs) requests additional rows. The decoded row count is ORed with PM (for Plot mode operation) and gated with NSPFP (Start Paper Feed Pulse) to produce EOP (End of Print). EOP resets the PRT mode flip-flop and sets the Paper Feed mode PPF. NPAL and NDELC status is reset by the End of Paper Feed pulse EPFP.

The binary count RC1-RC4 is applied to the character memory to generate dots of the recognized character, row-by-row.

Dot Column Counter Logic

The dot column counter generates a 4-bit binary count (DC1-DC4) which identifies each of the 12 dot columns that comprise a character space (nine dot columns, plus three inter-character dot column spaces). The dot column count is used to multiplex the character memory output lines to the COM line that loads the hammer shift register.

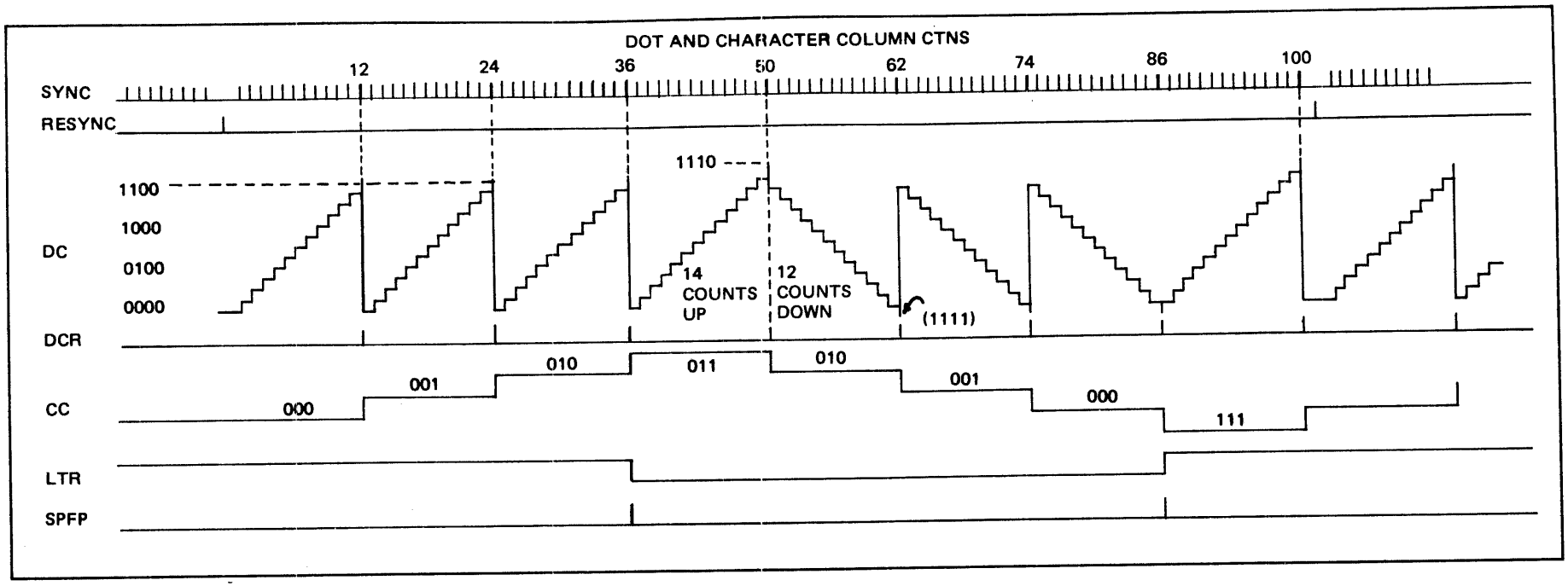


Figure 16 Row and Column Counter Logic, Timing Diagram

Because a count must be maintained as the shuttle moves in both directions, the counter is reversible, counting up during movement from left-to-right, and counting down during movement from right-to-left (figure 16).

Starting a cycle, the counter is reset by a RESYNC pulse as shuttle movement begins from left-to-right. The counter then counts SYNC pulses up to a count of 12, which resets the counter. The SYNC clock is routed to the "up" port during this part of the cycle, controlled by the direction flip-flop (in character column counter logic). The count of 12 acts as the clock for the character column counter, and is generated three times during shuttle travel in each direction.

When the character column count reaches three, and shuttle movement is to be reversed, a "turnaround" signal from the character column counter permits the dot column counter to count up to 14 SYNC pulses. This provdes 14 half-msec periods (7 msec) to time-out the "turnaround" period of the shuttle cam. This "turnaround" period is also generated following travel from right-to-left.

As shuttle travel is reversed for travel from right-to-left, the character column up/down counter logic sends control signals that: (1) pre-load a count of 12 into the dot column counter and (2) route subsequent SYNC pulses to the "down" port of the counter.

When subsequent SYNC pulses have decremented the count to 158, the 12 count resets the counter and clocks the character column counter. This part of the cycle, too, is repeated three times before the next RESYNC pulse initiates the cycle for the next left-to-right movement of the shuttle.

Character Column Counter Logic

Dots are distributed for three characters per print hammer during each stroke of the shuttle. Consequently, the count of characters (by threes) appearing at the character memory must be correlated with the position of the shuttle at any instant. This is the purpose of the character column counter.

Because the binary character count (CC1, CC2) must be maintained as the shuttle moves in either direction, the counter is reversible, counting up during movement from left-to-right, and counting down during movement from right-to-left.

A cycle is initiated when RESYNC resets the counter to zero at the beginning of left-to-right movement. The counter is clocked by subsequent "last dot column" pulses from the dot column counter. Each count increments the counter, as CC1-CC2 are compared with the actual character count in shift register counter logic.

Character counts one, two, and three (binary counts zero, one, and two) count characters during the left-to-right shuttle movement. The fourth count (binary three) enables an SPFP pulse which sets the direction flip-flop to start t rnaround, and enables the counter to count down.

Subsequent clocks count through binary two, one, and zero to count characters during the left-to-right shuttle movement, and then the next SPFP pulse sets the counter to a binary 7 and resets the direction flip-flop to begin the turnaround. The next RESYNC pulse initiates the following left-to-right cycle.

Printer Buffer and Shift Register Counter Logic

During Print mode operation, NREC enables NRSCLK pulses to recirculate the contents of the printer buffer so that every stored character appears at the output of the buffer during each SYNC period. In the Print mode, the clock is enabled except while the shift register counter holds a count of 132 (after all characters have been presented to the character memory PROMs).

A count-of-three counter (figure 17) identifies each of three characters printed by a given hammer. That is, during each movement of the shuttle, any hammer may print a dot in a given row and column in each of three character positions.

Each hammer prints three characters. That is, hammer 1 prints characters 1, 2, and 3; hammer 2 prints characters 4, 5, and 6, etc. Therefore, when dot data is loaded for character 1, it is also loaded for characters 4, 7, 10, and so on.

A character is read from the buffer, and the buffer is then recirculated for the next two characters. The buffer is then read for the next character and again recirculated twice. The third character is then read.

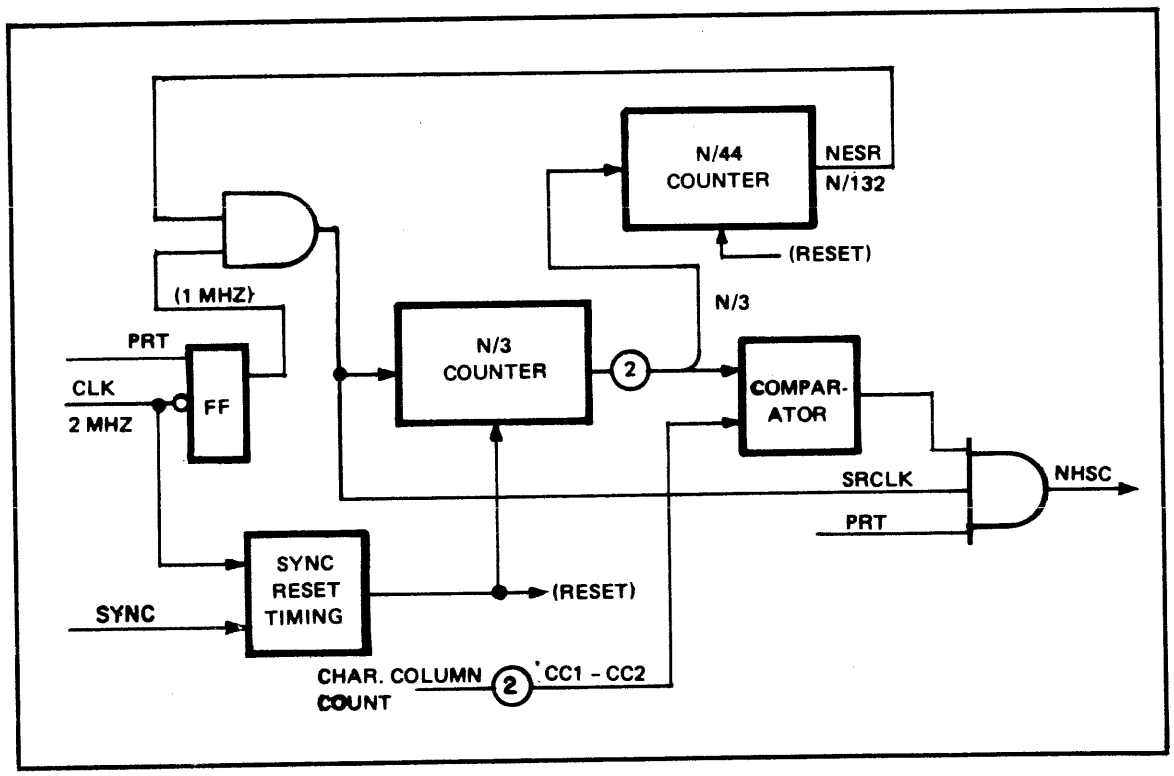


Figure 17 Character Counter/Comparator Logic, Functional Block Diagram

The counter is reset by each SYNC pulse, and repeatedly counts SRCLK pulses up to three. Each bit of the 2-bit binary count appears at an exclusive-OR gate which compares the bit with the corresponding bit (CC1 or CC2) of the character column count, which is synchronized with shuttle movement. When both pairs of bits match (every third character), a SRCLK pulse is gated to the NHSC line.

When data is printed for the left-most of the three columns, CC1 and CC2 are both zero, and the 3-counter is at zero.

The N/3 output of the count-of-three counter clocks a count-of-44 counter, also reset at SYNC time, which completes a total count of 132 characters – the maximum line length. At the count of 132, SRCLK is disabled, ending recirculation in the buffer memory and ending the count until again reset by SYNC.

Because 44 counts of three occur during each SYNC period, the hammer driver shift register clock NHSC is always a string of 44 pulses.

Character Memory Control and Organization

The standard character memory comprises six 256-by-4 PROM devices (two related pairs) on Logic Board A. Each PROM in a pair contains half the dot columns of the stored 32 characters.

PROMs in locations 1K and 2K normally store numeric characters (1-32), and those in locations 1H and 2H store alphabetic characters (33-64) of the upper-case ASCII set.

ASCII lower-case characters are stored in PROM pairs located at 1F and 2F (65-96), and additional optional character sets (Katakana, etc.) are located in locations 1E and 2E (97-128) and 1D and 2D (129-160).

Character sets are selected by bits DB6, DB7, and DB8. Characters 1 through 32 are selected by term DB6 · $\overline{DB7}$, and characters 33 through 64 are selected by $\overline{DB6}$ · DB7. ASCII characters 1 through 64 are inhibited when bit DB8 is true.

Lower-case ASCII characters (65 through 96) are selected by term DB6 · DB7.

Characters 97 through 128 of the optional set are selected by term DB6 · $\overline{DB7}$, and characters 129 through 160 of that set are selected by $\overline{DB6}$ · DB7. All characters of the optional set are selected only if bit DB8 is true or a Shift Out command is decoded. In this case NECS is true and underline is inhibited.

The dot matrix for any character is stored in a PROM pair in rows and columns, and is enabled when that character is encoded by bits DB1 through DB5. The matrix is read-out, however, one row at a time, by the binary row count RC1-RC4. Because a dot may appear in any of nine dot columns (none adjacent), and the PROMs provide only eight outputs, information is encoded within the PROMs and then decoded onto nine lines by external logic. A PROM stores 1024 bits arranged in a 256-by-4 pattern.

The nine dot-column lines are multiplexed on to the COM (hammer driver data) line by the dot column count DC1-DC4, and loaded into the hammer driver shift register by NHSC pulses.

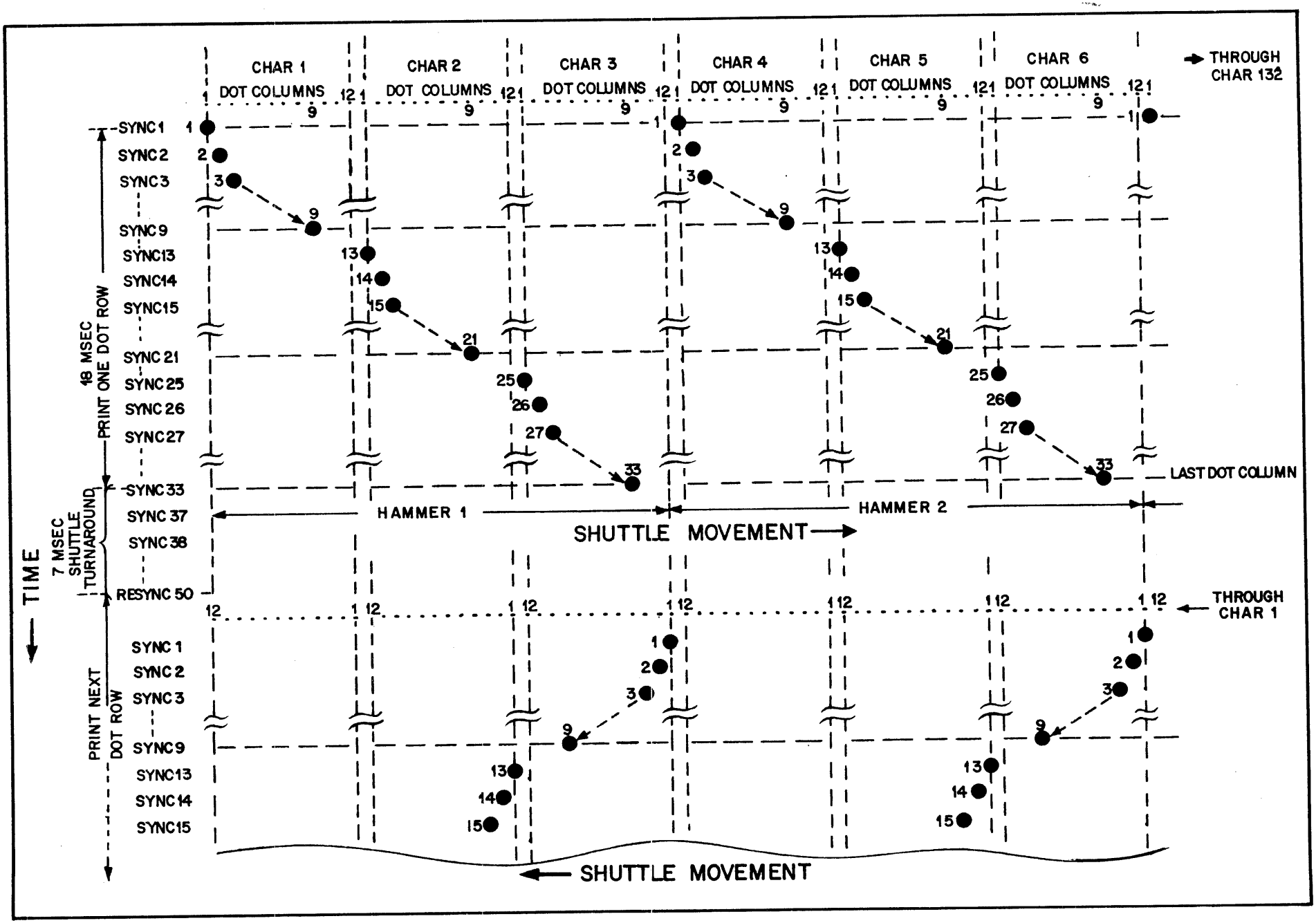


Figure 18 Order of Printing Dot Rows, Left-to-Right and Right-to-Left

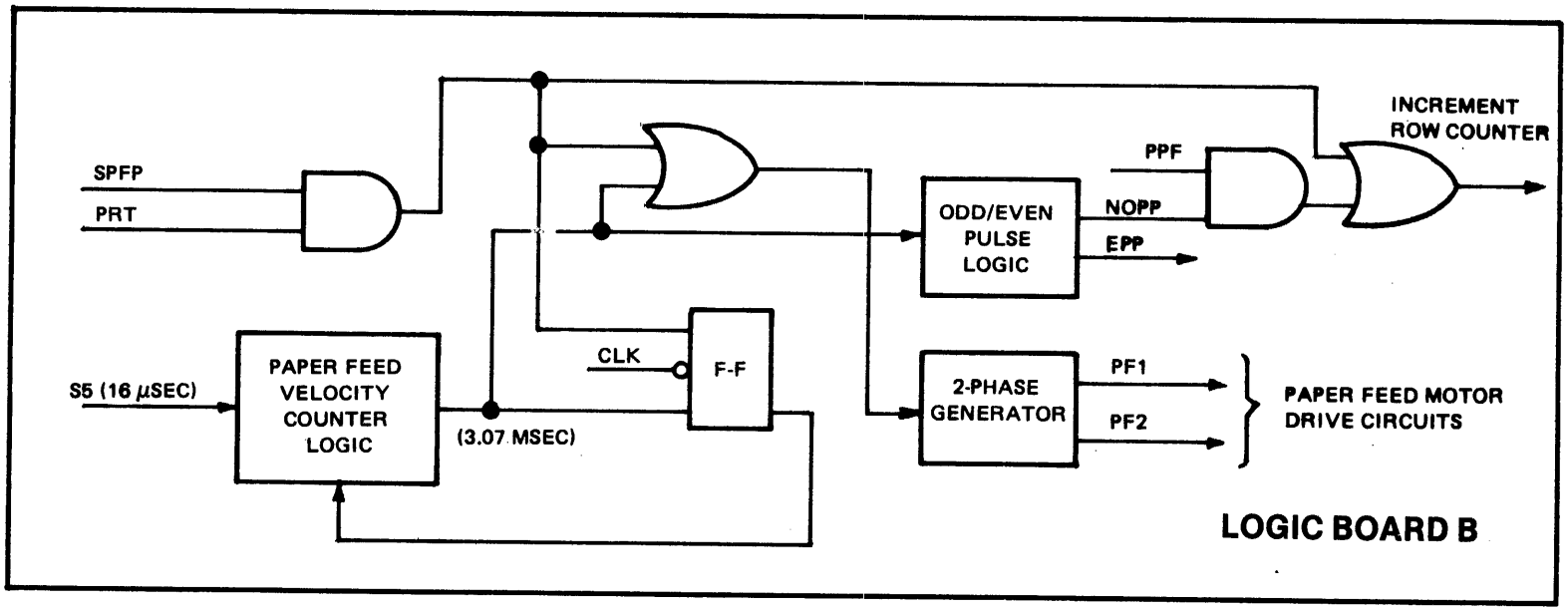


Figure 19 Paper Feed Logic for Next Dot Row, Functional Block Diagram

During the left-to-right movement of the shuttle, the binary dot column count increments from zero through 11 to read out dots from left to right. During the right-to-left movement, the dot column count is decremented from 11 to zero to read out the dots in inverse order.

During any SYNC period, information shifted into the hammer driver shift register consists of a dot (or no dot) in a given dot column of a given row, for every third character presented to the character memory PROMs (figure 18). Note that even though all characters in the buffer memory appear on the COM lines during each SYNC period, only information for every third character is shifted into the hammer driver shift register.

When the row counter has counted the last row of the character line (seventh for standard characters, or ninth for lower-case characters with descenders, or underline), row counter logic raises EOP. EOP resets the Print mode flip-flop and sets the Paper Feed mode (PPF).

Paper Feed to Next Dot Row

Paper is advanced to the next dot row of a character without leaving the Print mode. As the character column counter counts the third character, and constant-velocity shuttle movement ends, SPFP becomes true (figure 19). SPFP causes the first paper-feed increment and sets the enable flip-flop in paper feed velocity logic. This flip-flop then enables the velocity counter which counts 16-μsec pulses (S5) up to count of 3072 (3.07 msec). As this count is decoded, the flip-flop is reset and EPP causes the second paper-feed increment.

At this time, 4 msec remain of the 7-msec shuttle turnaround time. This time is required to permit the paper feed motor to settle.

Paper feed pulses drive a 2-phase counter which generates the 2-phase pulses PF1 and PF2, which are offset 90 degrees with respect to each other. These signals control paper feed motor drive circuits in the Power Supply assembly.

The two paper feed pulses, generated in a 3-msec period, cause the paper to advance one dot row during the 7-msec turnaround period of the cam.

This cycle is completed for each dot row except following the last dot row of the character line. In this case, the Paper Feed mode is entered and paper is advanced through the interline space to begin the first dot row of the next line.

PAPER FEED MODE OPERATION

The printer enters the Paper Feed mode to advance paper for:

a. the next character line,

b. the top of form,

c. the skip-over perforation function, or

d. VFU operation.

Paper Feed to Next Character Line

As the character column counter counts the third character, ending constant-velocity shuttle movement in either direction, NSPFP goes true; and as the last bit row of the character is printed, row counter logic raises End of Print (EOP). EOP resets the Print flip-flop and sets the Paper Feed mode flip-flop (PPF). (See figure 20.)

PPF is now true, holding set the enable flip-flop in paper feed velocity logic. This flip-flop permits the paper feed velocity counter to count 16-μsec pulses (S5) up to a count of 1280 (1.25 msec), at which time that count is decoded and the enable flip-flop is momentarily reset.

Each time the flip-flop is reset, a pulse is generated and the velocity counter is reset to begin a new count. The reset rate produces paper feed pulses at a rate that causes paper to advance at 5.5 ips.

Paper feed pulses drive 2-phase logic which generates the 2-phase square waves PF1 and PF2, which are offset 90 degrees with respect to each other. These signals control paper feed stepper motor drive circuits in the Power Supply Assembly.

The paper feed pulse rate is divided by two to produce odd paper pulses (NOPP). Even paper pulses (EPP) are generated between NOPP pulses. NOPP or EPP pulses clock the row counter and control timing of other functions.

As the paper feed motor advances the paper, NOPP pulses are counted until the dot rows-per-line count is decoded (9 for 8-LPI spacing, or 12 for 6-LPI spacing). As the last row count is decoded, row counter logic raises RCR. This signal disables paper feed velocity logic, and causes the last EPP pulse to appear on the EPFP line. EPFP resets the Paper Feed mode flip-flop, leaving the printer in the Load Buffer mode (neither PRT nor PPF), ready to accept the next line of information.

Figure 21 shows timing of events in printing a full character line and advancing paper to begin the next character line.

Paper Feed to Top of Form

A top-of-form command originates either at the TOP OF FORM pushbutton (STOF), or at the printer interface decoder (NDFMFD). The resulting NTOF signal sets the FMFD flip-flop in Top of Form logic (figure 22). As NFMFD goes true, it enables a decoder in paper feed velocity logic which permits paper feed pulses to be generated for a paper feed rate of 5.5 ips. Paper feed pulses control logic that causes paper to advance, and rows to be counted, in the same manner as for *Paper Feed to Next Character Line.*

NFMFD also raises SLW (Slew) which (1) inhibits EPFP (End Paper Feed Pulse), and (2) enables a count-of-eight counter clocked by NRCLK. At the count of eight rows, another velocity count decoder is enabled which causes paper feed pulses to be generated for a paper feed rate of 8.3 ips. Paper slews at this higher rate up to line 65, preceding the last line of the form (66).

A binary counter in Top of Form logic continually counts row counter clock pulses RCLK, as the paper is advanced from the initially reset top-of-form position (row count zero). Therefore, the counter always contains a count of dot rows from the top of form.

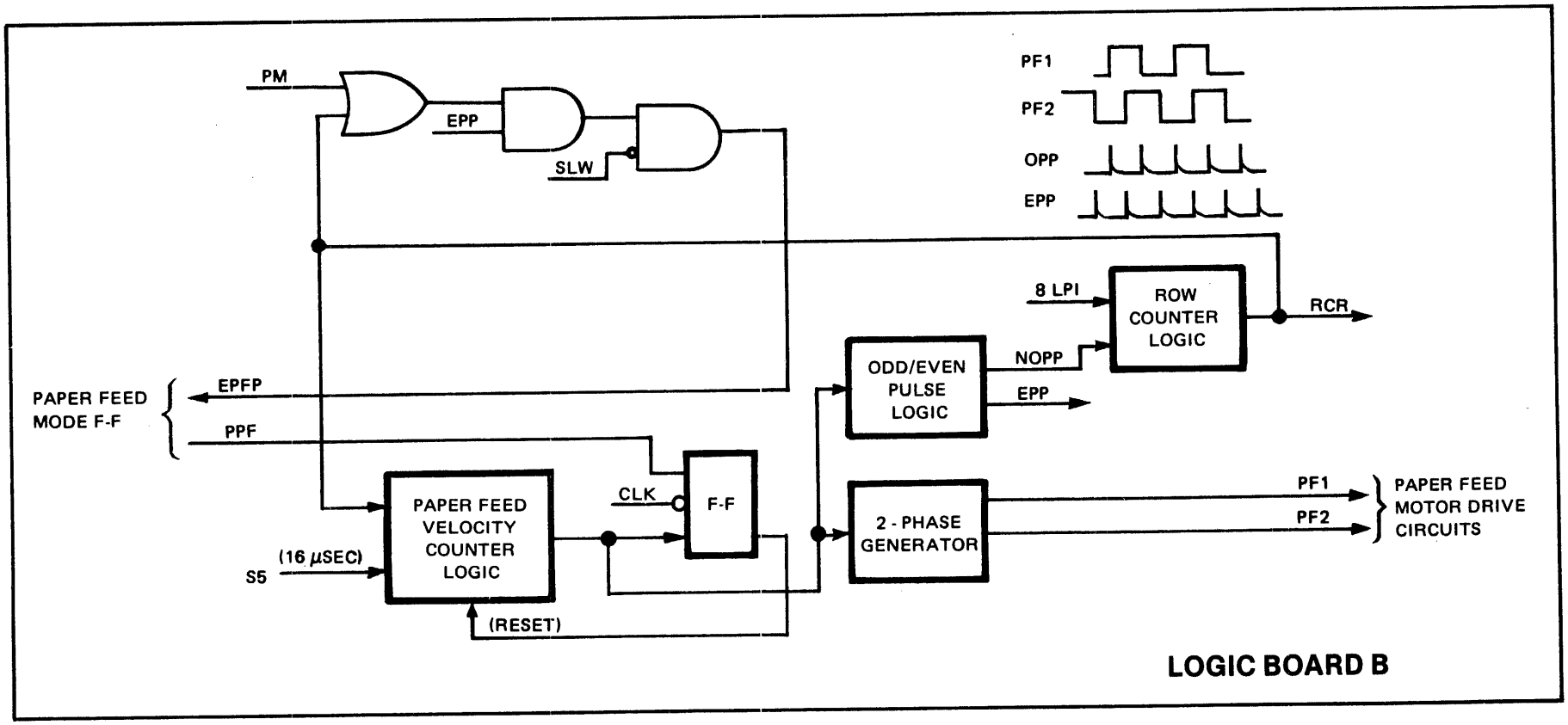


Figure 20 Paper Feed Logic for Next Character Line, Functional Block Diagram

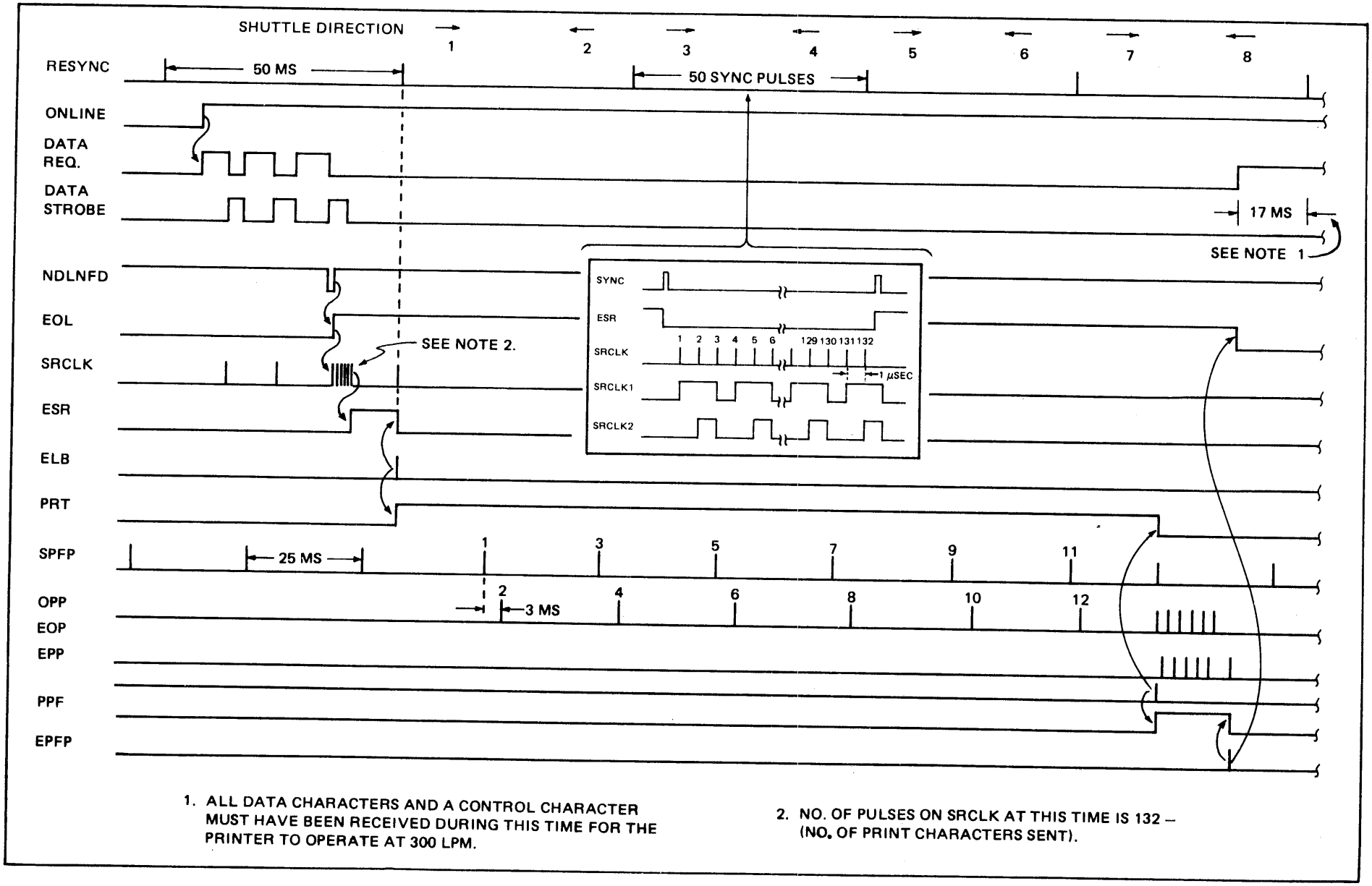


Figure 21 Typical Sequence in Printing One Character Line, Timing Diagram

The counter (figure 23) comprises a counter which resets itself at the count of 12 (row-per-line count), and a counter which resets itself at the count of 66 (maximum lines per form). The second counter is clocked by the 12-count from the first, allowing a capacity for 792 dot rows (12 x 66).

When the line count reaches 65, FLL becomes true, making NEFF false, and resetting SLW and the FMFD flip-flop. FLL resets the 8-counter to enable the 5.5 ips decoder. Line feed then proceeds at the lower rate of 5.5 ips until the 66th line is counted. A single 3-msec paper-pulse period is then produced to prevent the paper feed motor from overshooting.

NEFF sets the RCR flip-flop (in row counter logic), simulating the last row count. RCR is then clocked (by EPP) to the EPFP line, and EPFP resets the Paper Feed mode and initiates the Buffer Load mode.

Figure 24 shows timing for a typical top-of-form operation.

Skip-Over Perforation

The row and line counters in Top of Form logic continually count up to 792 rows (66 character lines), whether or not a Top of Form has been initiated. The count is always with respect to the reset Top of Form.

Jumpers may be installed (in the DIP platform in location 8K on Logic Board B) to cause paper to automatically advance a preset number of lines in advance of the 66th line, so that printing ends ahead of the bottom of the form, and resumes below the top of the next form. This is controlled by selecting (with the jumpers) a code comprising the two least-significant bits of the line count. The decoded count is ANDed with an encoded 60-line count so that a Top-of-Form signal is simulated (with a resulting Form Feed cycle) at line counts that cause paper to advance from three to six lines for 6-LPI printing, and from four to eight lines for 8-LPI printing, after detection of the count.

Paper Motion Detector

The paper motion detector detects the case when paper is not advancing during a printing operation – that is, a paper jam – and causes a CHECK indication and a not-ready condition at the interface.

Paper motion is detected by a photoelectric device attached to the left-hand paper tractor. This device comprises an infrared light source (LED), and a matched phototransistor (figure 25). Light emitted from the LED is reflected from the print paper back to the phototransistor. The light is focused on the paper in the line of sprocket holes so that the passage of each hole causes a current transition in the phototransistor.

A synchronous-type detector circuit is used to determine whether paper motion has stopped. The circuit, based on a phase-lock loop device, contains its own clock oscillator and is contained on the Power Supply printed circuit board.

Timing is such that the circuit looks for passage of a sprocket hole every eight lines (1-1/3 inch), during which two holes must have passed the sensor. Term PMD falls as a hole is sensed, disabling a gate which is interrogated by TC3 pulses, which occur as bit 4 of the top-of-form line count.

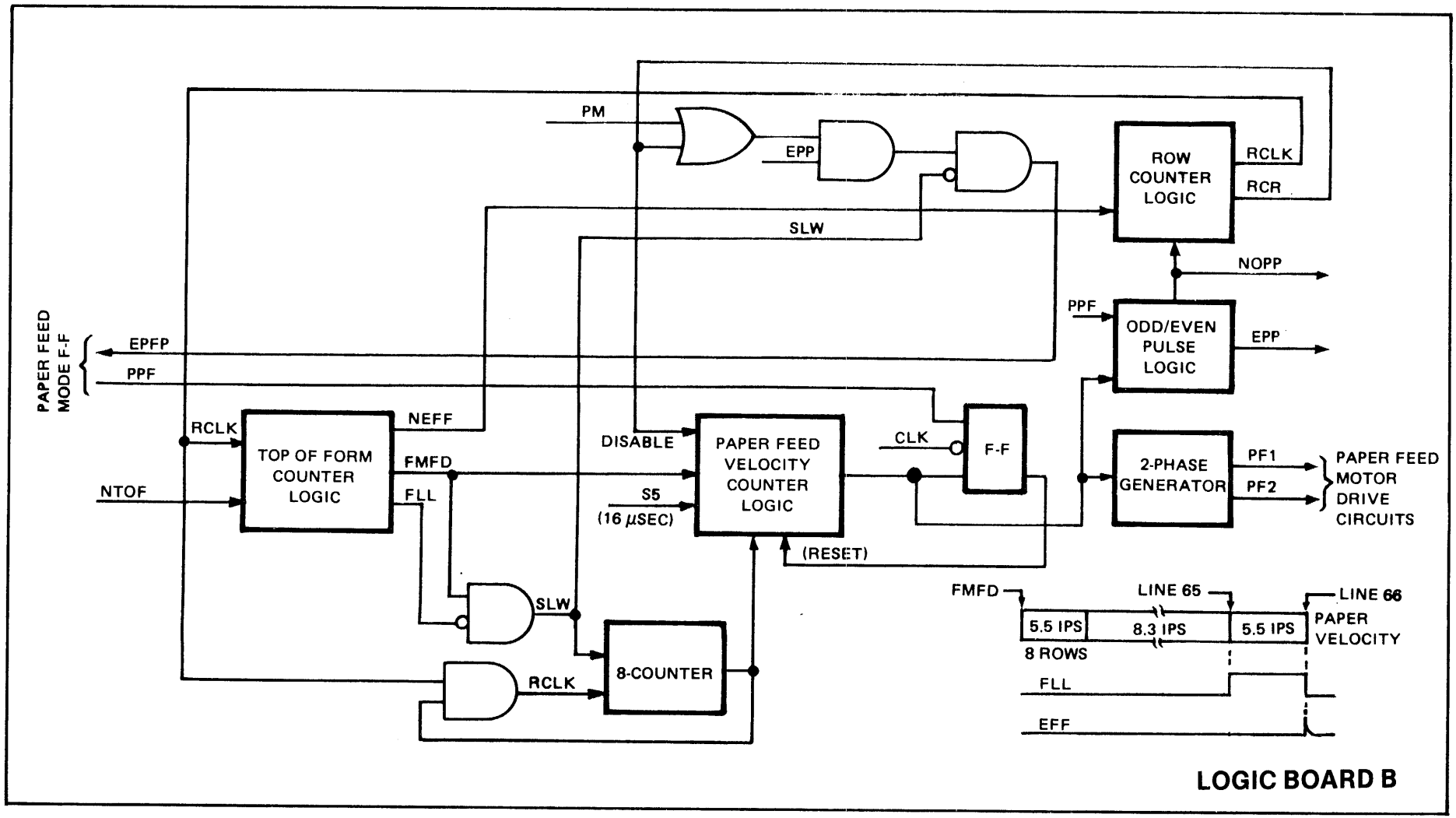


Figure 22 Paper Feed Logic for Top of Form Operation, Functional Block Diagram

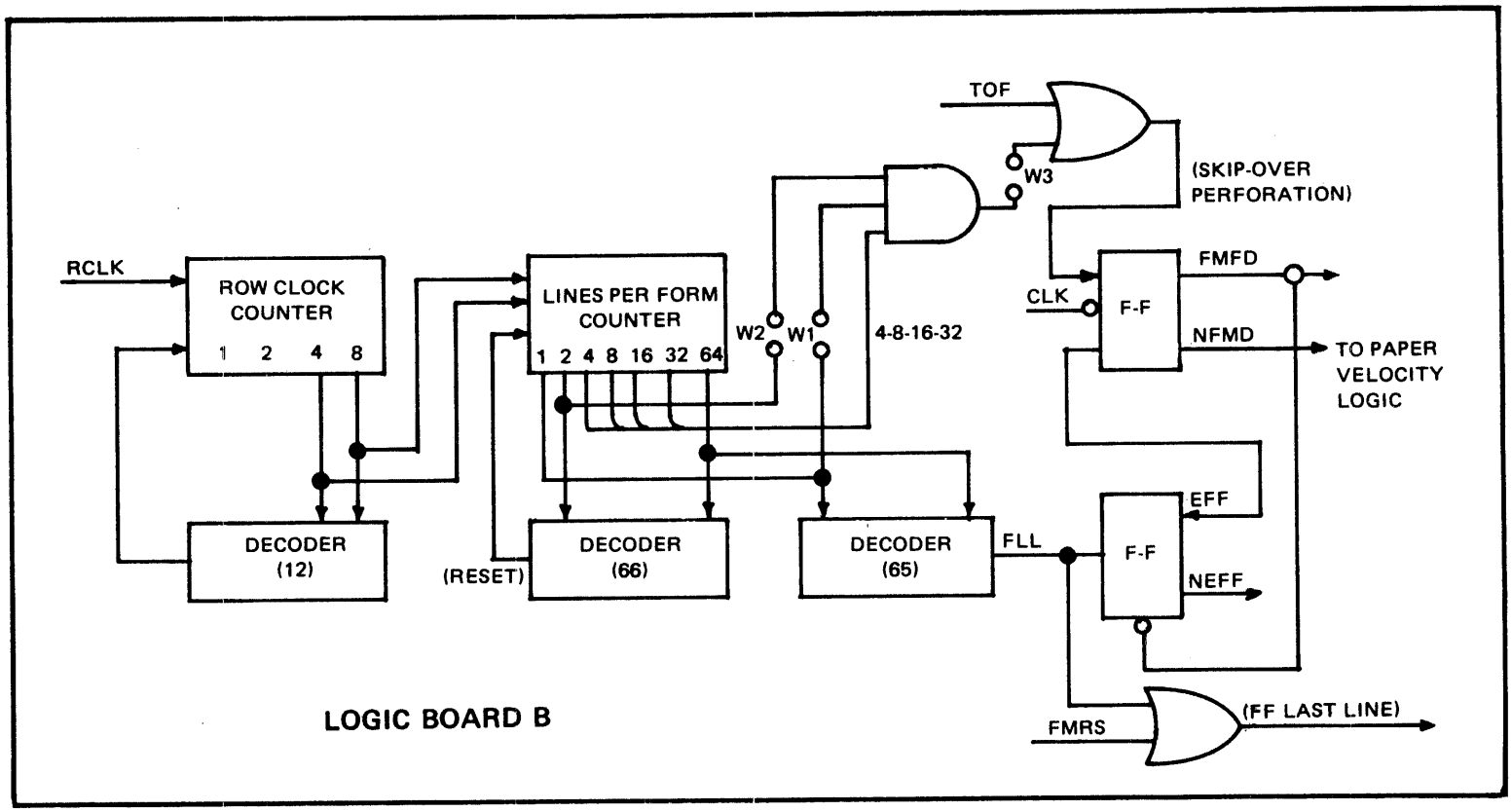
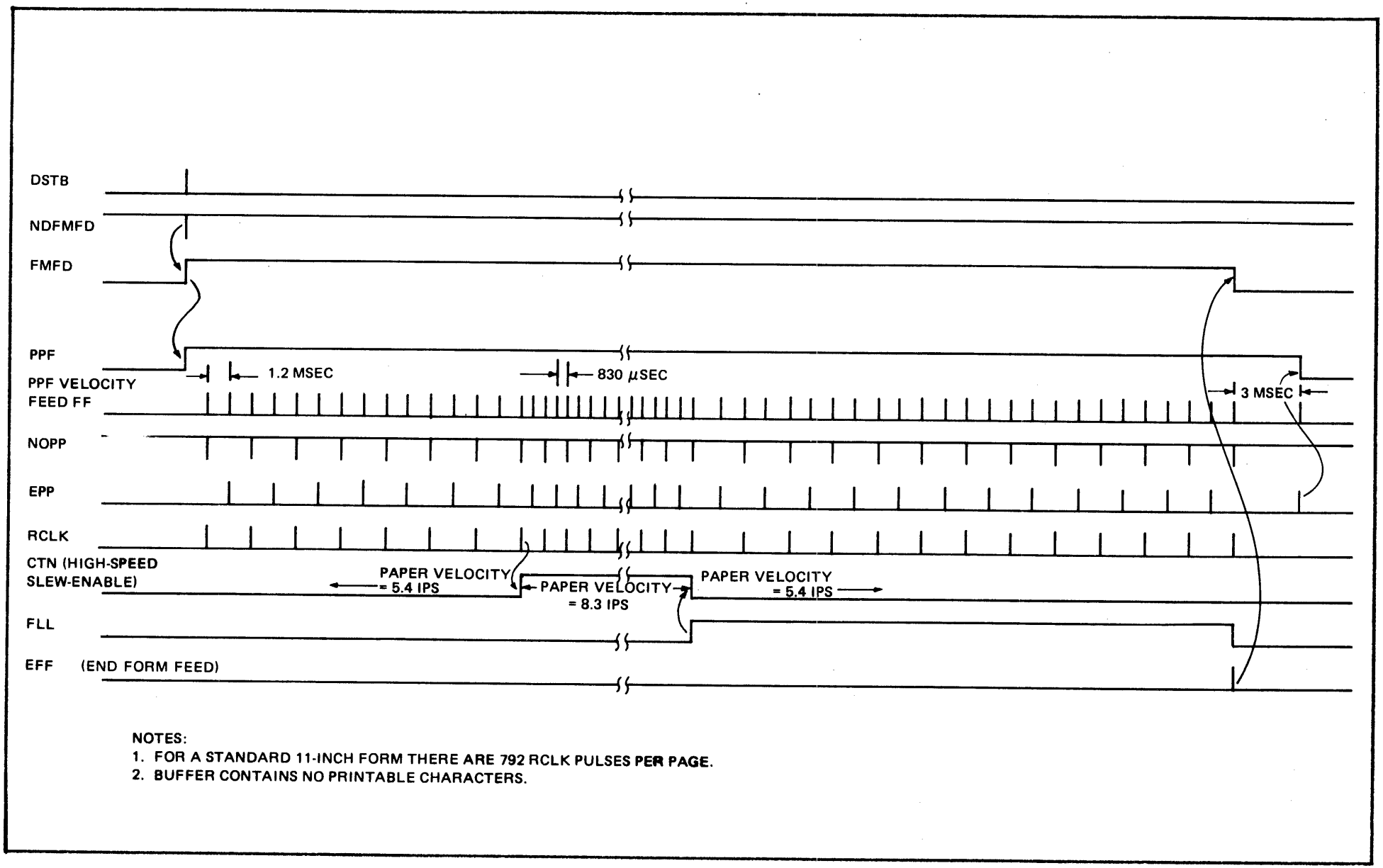


Figure 23 Top-of-Form Counter Logic, Functional Block Diagram



NOTES:
1. FOR A STANDARD 11-INCH FORM THERE ARE 792 RCLK PULSES PER PAGE.
2. BUFFER CONTAINS NO PRINTABLE CHARACTERS.

Figure 24 Paper Feed Logic for Top-of-Form Operation, Timing Diagram

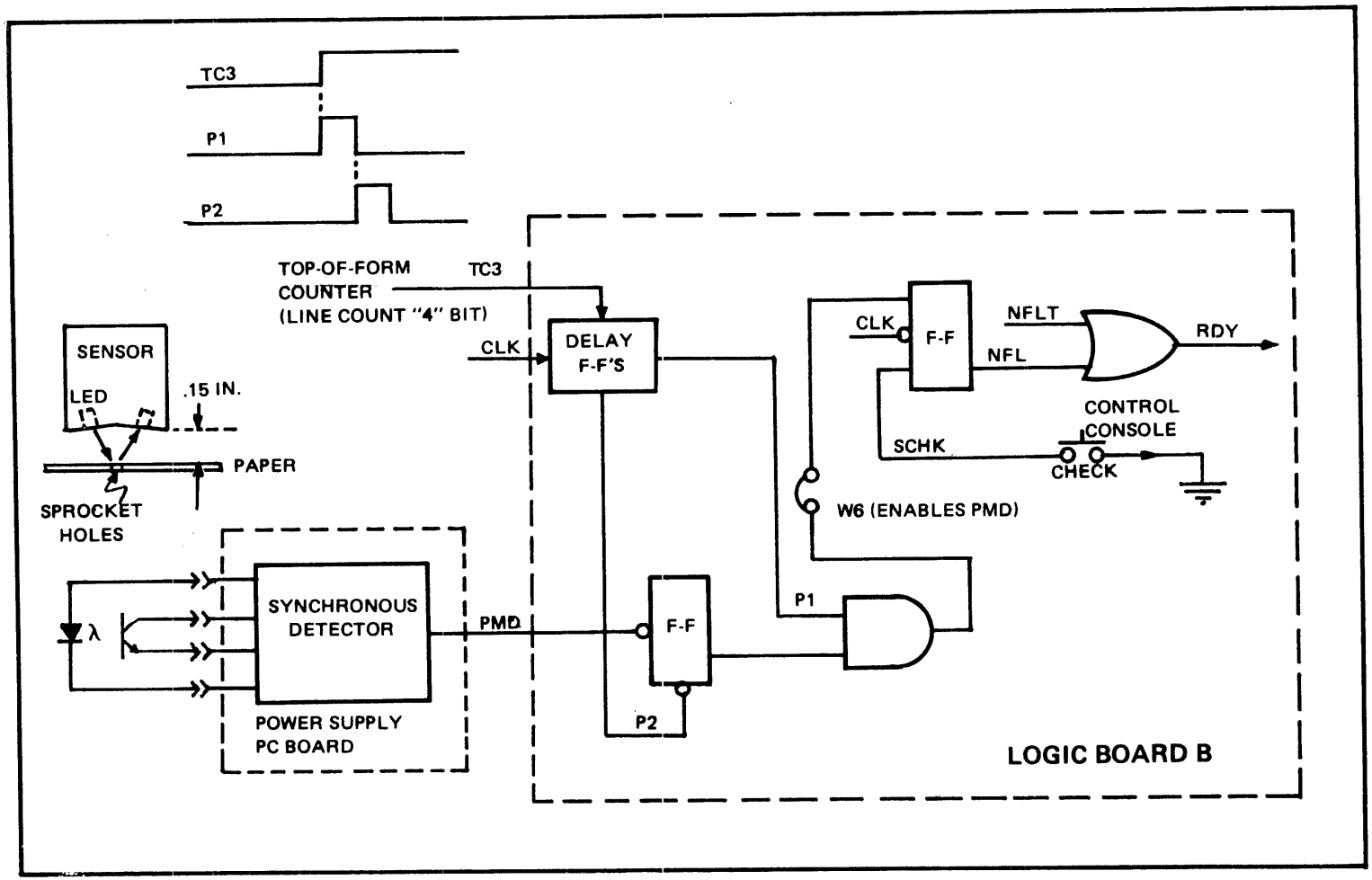


Figure 25 Paper Motion Detector Logic, Functional Block Diagram

If a TC3 pulse finds the gate enabled, a flip-flop is set, causing NFL to raise the NRDY line. This flip-flop remains set, maintaining the fault condition, until the operator clears the fault and then presses the CHECK pushbutton on the control console.

ELECTRONIC VERTICAL FORMAT UNIT

The electronic VFU permits executing forms up to 132 lines in length, and allows slewing within a form. As many as 14 channel numbers may be stored to specify different numbers of lines to be advanced to the next line.

There are three modes of VFU operation, as follows:

a. Loading the 132-character VFU channel memory.

b. Slewing a specified number of lines (binary count), and

c. Slewing to a specified channel number.

Loading the VFU Memory

The VFU Memory (a 4-bit MOS recirculating shift register) stores up to 132 channel numbers, from one through 14 (figure 26). Any channel number may be stored in any location.

The memory is loaded from data lines DB1-DB4 (from the interface). The memory is enabled by LD, which is set by the decoded Start VFU Load command NSTL. LD persists until the decoded End VFU Load command (NELD) occurs.

While LD is true, each input channel number code is clocked into the memory by NVSC (VFU shift clock) pulses from memory counter logic (refer to *Channel Number Search Operation*). NVSC pulses are derived from SPI pulses (from the input PI signal) so that each channel number is clocked by a corresponding PI signal. As the last channel number is clocked into the memory, ELD causes the memory counter to gate 1-MHz NVSC clocks to the memory until the channel number characters are right-justified in the memory. This stops the NVSC clock and loading is complete.

Figure 27 shows timing for a typical VFU loading sequence.

Slewing a Specified Number of Lines (Binary Count)

When the paper is to be slewed a given number of lines, DB1-DB4 specify the number (up to 15) and DB5 is true, defining the line-slew mode of VFU operation (figure 28).

The binary number is clocked (by SPI) into latches which store the number (VB1-VB4) and present it to a 4-bit comparator, which compares the number with the line count in a 4-bit binary counter. Term VB5 enables the comparator for binary count operation.

The counter counts RCR (end-of-line) pulses and, when the count equals the number VB1-VB4, the comparator output causes the latches and the counter to be reset to zero.

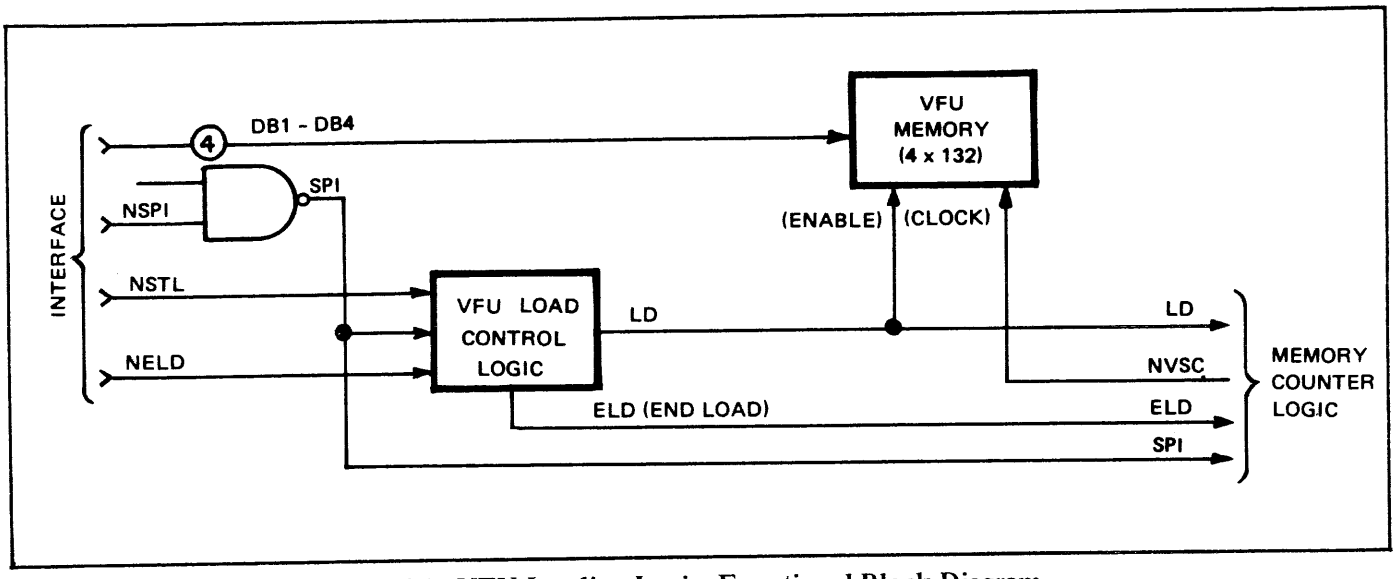


Figure 26 VFU Loading Logic, Functional Block Diagram

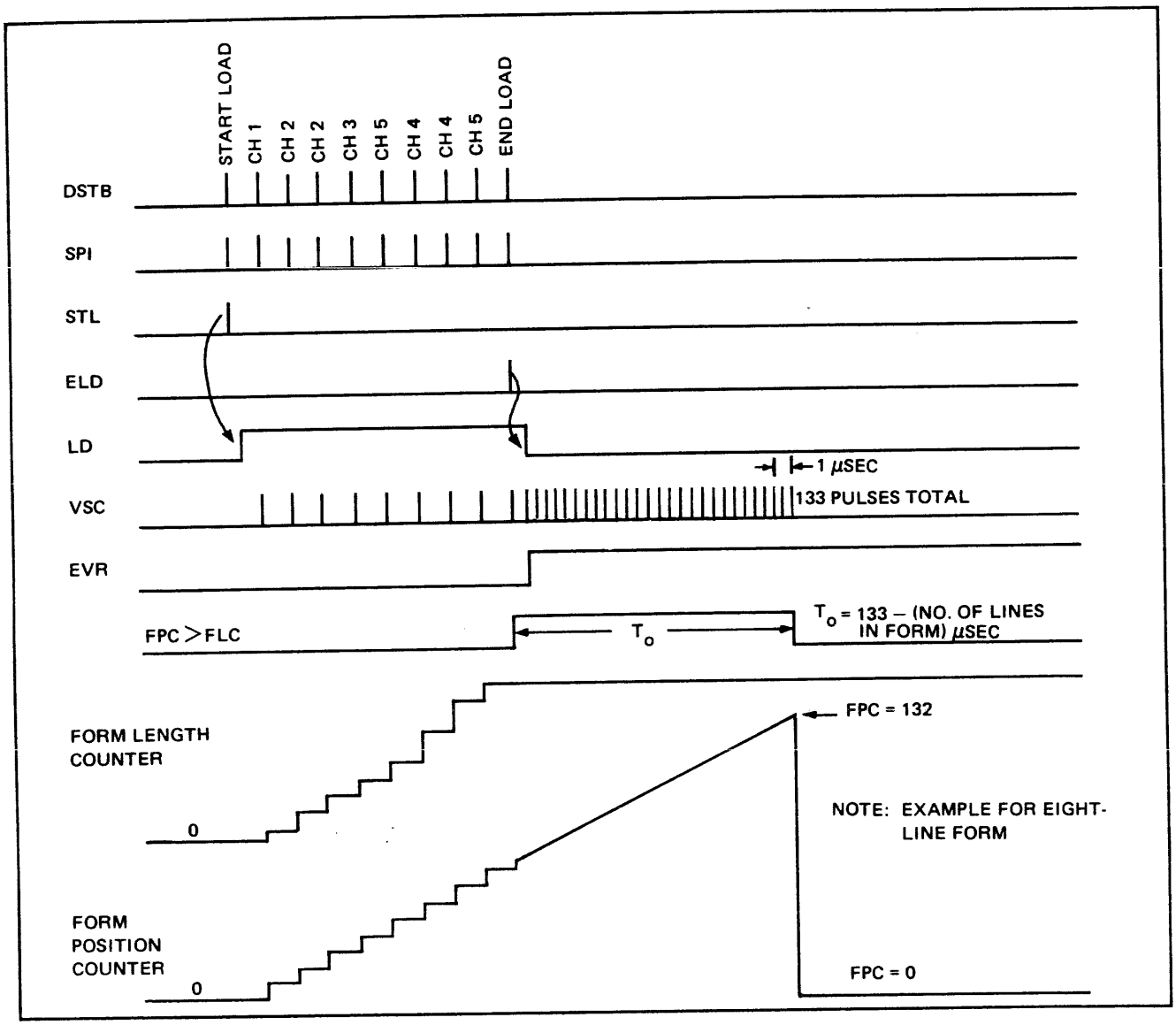


Figure 27 VFU Loading Sequence, Timing Diagram

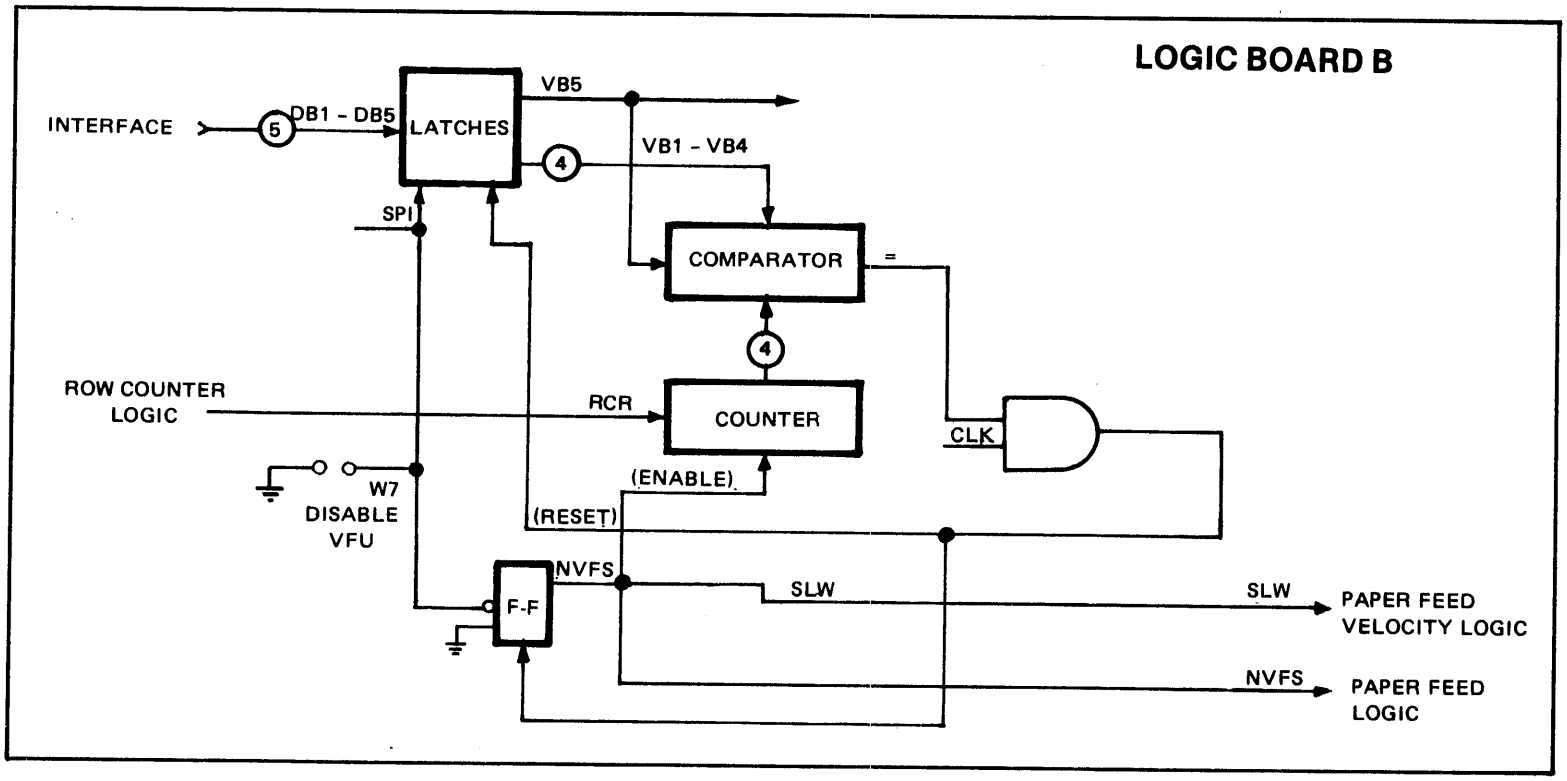


Figure 28 Electronic VFU in Binary Count Mode of Operation, Functional Block Diagram

Paper feed is initiated by the SPI pulse which sets the VFU flip-flop, raising VFS. NVFS raises the slew signal SLW. Paper is then slewed in the same manner as for form-feed operation, and stopped one row count after SLW is turned off (when the binary count comparator detects equality).

The VFU is disabled if jumper W7 is connected on the DIP platform in location 8K. The jumper prevents SPI from initiating VFU load, search, or binary count operations.

Channel Number Search Operation

Loading. As the VFU memory is loaded with 4-bit channel numbers, both 8-bit counters (figure 29) accumulate the number of characters loaded. As the last character is loaded and ELD becomes true, however, that character is counted only by the upper counter.

Because the number in the upper counter is now one greater than that in the lower counter, the comparator output enables a flip-flop which is triggered by 2-MHz CLK pulses. The resulting 1-MHz flip-flop output is ORed to the VSC (shift clock) line, clocking the contents of the VFU memory towards the output end of the memory, and incrementing the count in the upper counter.

When the upper counter counts the 132nd clock, that count is decoded and used to reset the upper counter to zero. Because the number in the lower counter is now higher than that in the upper counter, the comparator output disables the clock flip-flop. At this time the information in the VFU memory is right-justified in the memory.

Searching for a Specified Channel Number. When a channel number appears at the data interface, DB5 is false, and the PI line is true, SPI loads the channel number into the VFU latches. Latch output VB1-VB4 appear at a 4-bit comparator enabled by VB5 (false).

SPI initiates paper feed by setting the VFU flip-flop, raising VFS. NVFS raises slew signal SLW. Paper is then slewed in the same manner as for a form-feed operation, as the VFU searches the memory for the channel number requested by the binary number VB1-VB4.

As paper advances through each line space, the row count (RC1-RC4) recycles to zero. This count is detected and clocked by RCLK. The resulting signal NDLC (line clock) is ORed to the VSC line. Consequently, for each line of paper feed, the contents of the VFU memory are stepped one character towards the right and presented to the channel number comparator.

When the requested channel number appears at the memory output, the comparator output causes the data latches, and VFU slew-enable flip-flop, to be reset, ending the VFU sequence. Paper feed is stopped after the VFU flip-flop is reset.

If the interface requests a channel number not stored in the memory, the memory is searched and paper slewed for one full form-length cycle, and a flip-flop is set. When the next memory search reaches a count of 128, that flip-flop is reset, simulating an "equals" condition and resetting the VFU logic.

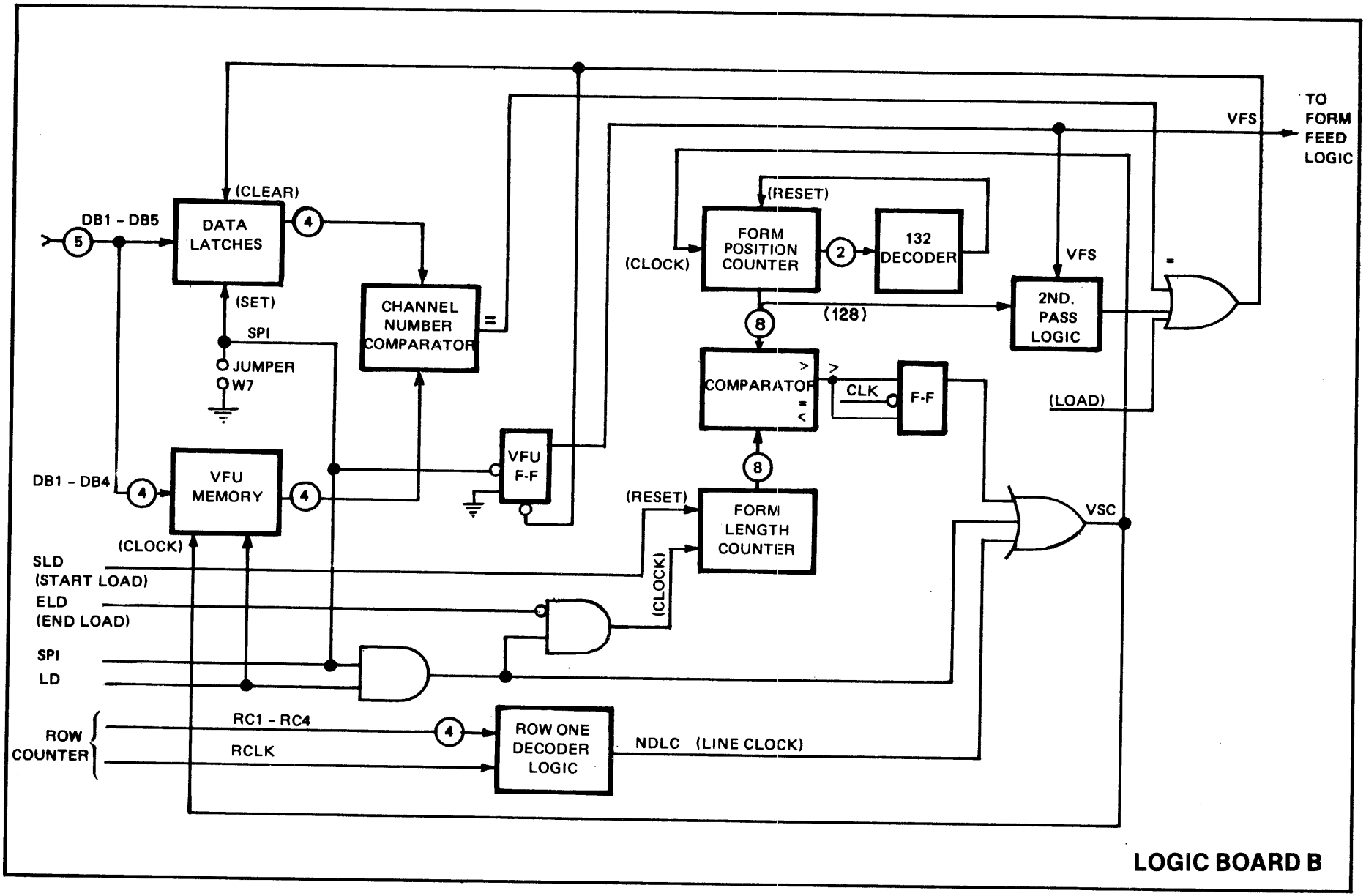


Figure 29 Electronic VFU in Channel Number Search Operation, Functional Block Diagram

The VFU can be disabled by connecting jumper W7 on the DIP platform in location 8K. That jumper disables the VFU flip-flop so that SPI has no effect.

Vertical Tab Function

The VFU is operated by a received VT code (013$_8$) which bypasses the PI line and causes an SPI pulse to load the vertical tab data (decimal 12) into the VFU latches. Because the code is always a channel 12 request, the VFU slews to channel 12. If a VT code is received and the VFU memory has not been loaded, a single line feed will result.

PLOT MODE OPERATION

Plot mode operation is initiated by a character (005$_8$) encoded in input data. The decoded command PM is stored and reset only by EPFP when the line has been completed. The signal PM performs the following functions:

a. Inhibits underline control (SDUL).

b. Enables data bits (SDBn) to be multiplexed to the COM line (hammer data).

c. Inhibits the rows-per-character count decode signal EDP so that data is plotted without regard to character height or line spacing. As a result, all dot rows are advanced at the 0.3-ips printing rate.

Jumper W4 (location 8K on Logic Board B) is normally omitted, and plotting takes place only during the left-to-right shuttle movement. If W4 is connected, plotting occurs during both halves of the shuttle cycle, at twice the normal speed. **Do not connect jumper W4 without first consulting your Printronix representative.**

HAMMER DRIVER BOARD

These circuits are located on the Hammer Driver Board. Figure 30 is a block diagram of functions on the Hammer Driver Board, and figure 31 shows timing of events in these circuits.

A 44-bit shift register stores data representing the dot in one dot column, and one dot row, of every third character of the 132-character line. Data (COM) is loaded into the shift register by the 330-kHz clock NHSC – always a string of 44 pulses.

The contents of the shift register are transferred into 44 latches by NHCK, which is essentially a gated SYNC signal (derived from timing disk rotation). After 384 μsec (after the dots have been printed), HRS clears the latches to receive the new contents of the shift register which has been loaded during the printing interval. HRS also triggers a timeout circuit. This circuit delivers a pulse to the NHRS input of the latches if an HRS pulse fails to appear within 3 msec after the latches are loaded. The timeout function protects hammer coils from damage in the event of a control logic malfunction.

The signal HMC prevents printing unless the +5V logic supply voltage is at its normal level.

The hammer drivers are controlled by the contents of the latches – that is, a stored "dot" causes the hammer to be energized. Each of 44 hammer drivers is a grounded-emitter

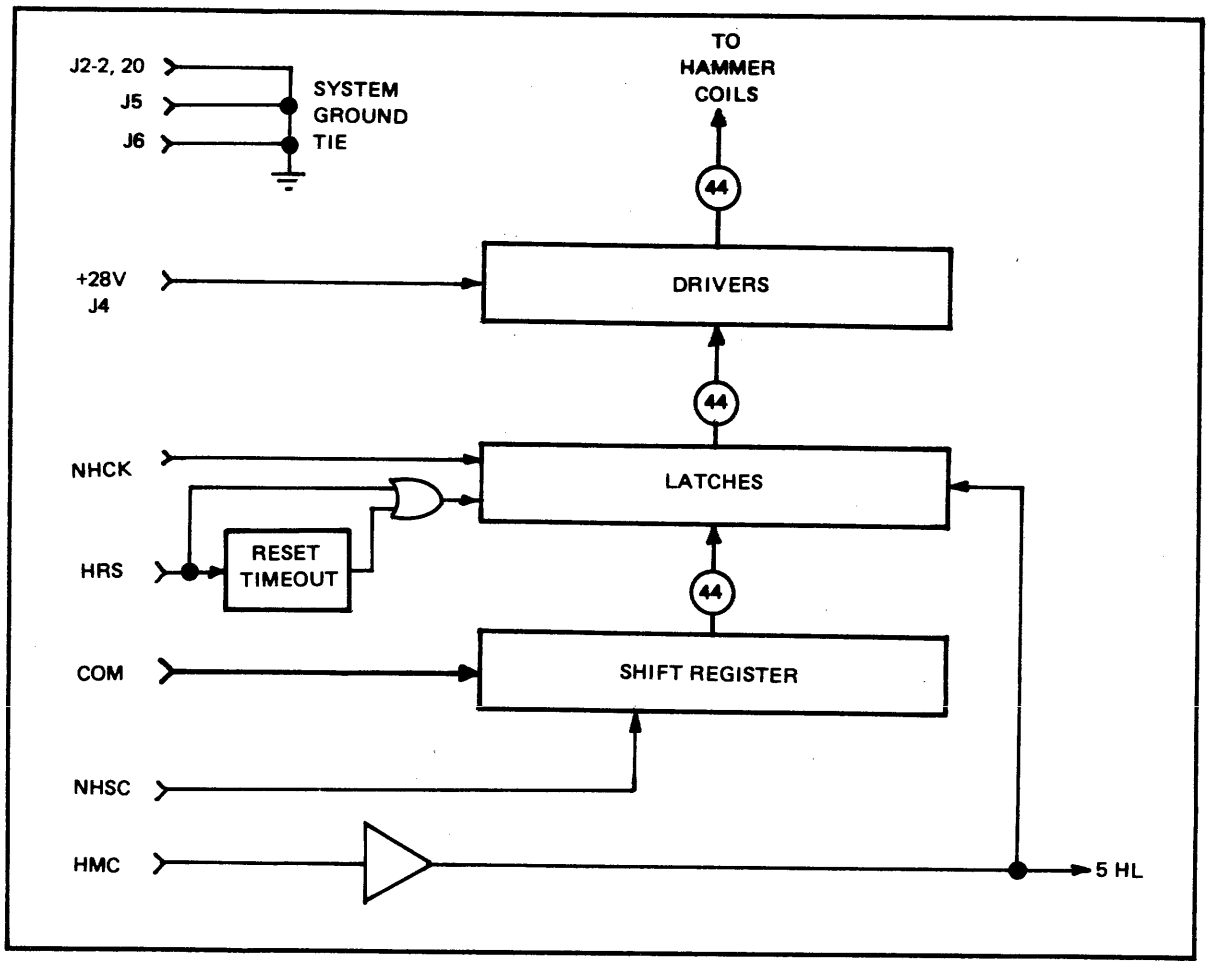


Figure 30 Hammer Driver Board, Functional Block Diagram

transistor with its collector connected through a related hammer coil (in the hammer bank) to +30V. The transistor is protected from inductive kick-back by a diode, and a forward-biased 12V zener diode, connected across the coil. Figure 31 shows the normal coil voltage waveform.

RIBBON CONTROL CIRCUITS

Ribbon control circuits cause the ink ribbon to travel from side to side between hammer bank and platen. Ribbon travel is automatically reversed as a wire, woven through the ribbon near either end of the ribbon, is detected by a sensor.

Ribbon is driven by two motors in a dc servo circuit. One motor acts as a driving motor, taking up ribbon from the other motor which exerts a resistance to the driving motor. This scheme maintains a constant ribbon speed and tension. When the end of the ribbon is detected at the ribbon guide, the two motors exchange roles, causing ribbon to travel in the opposite direction.

Figure 32 is a block diagram of ribbon control functions.

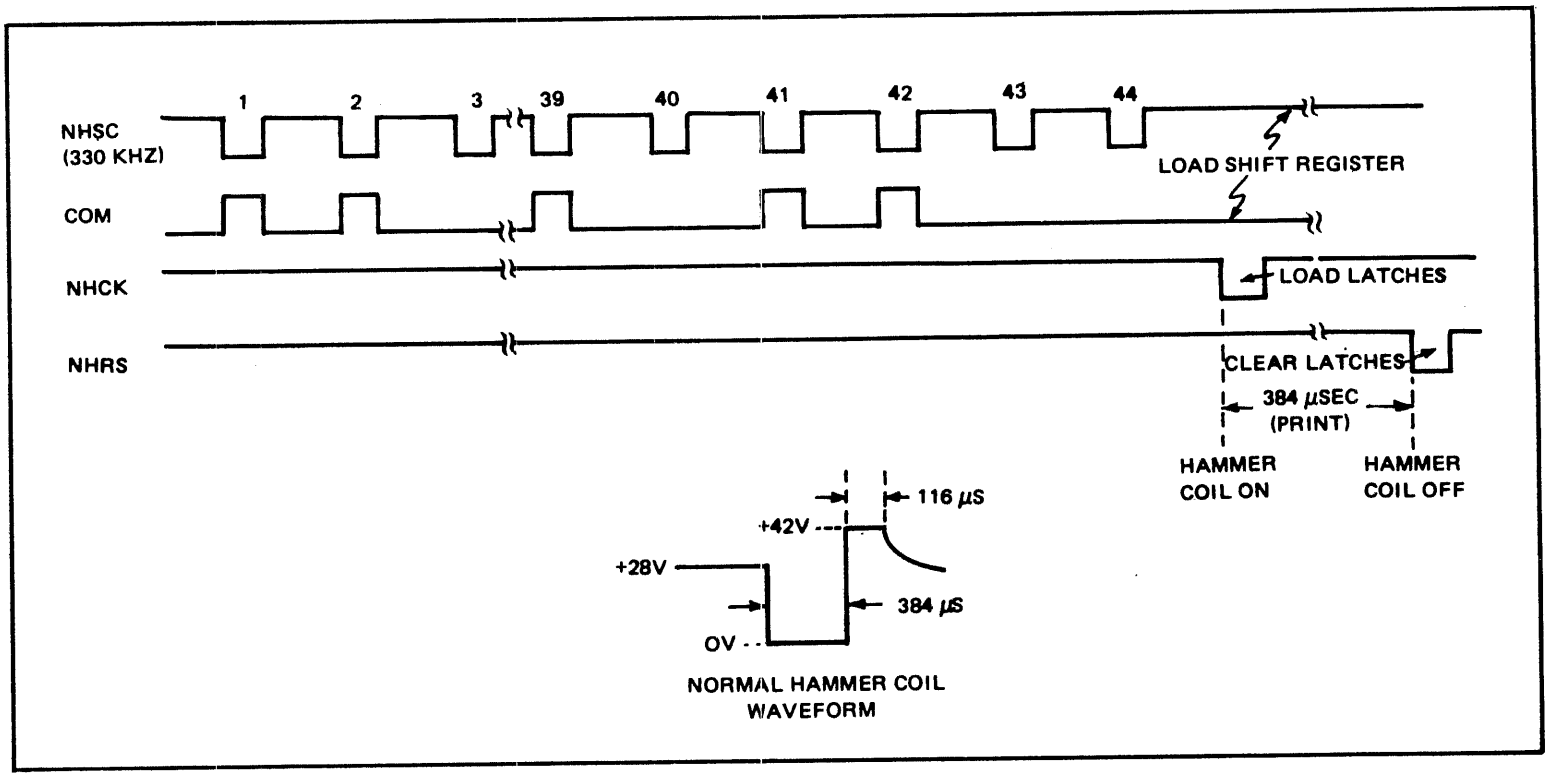


Figure 31 Hammer Driver Circuits, Timing Diagram

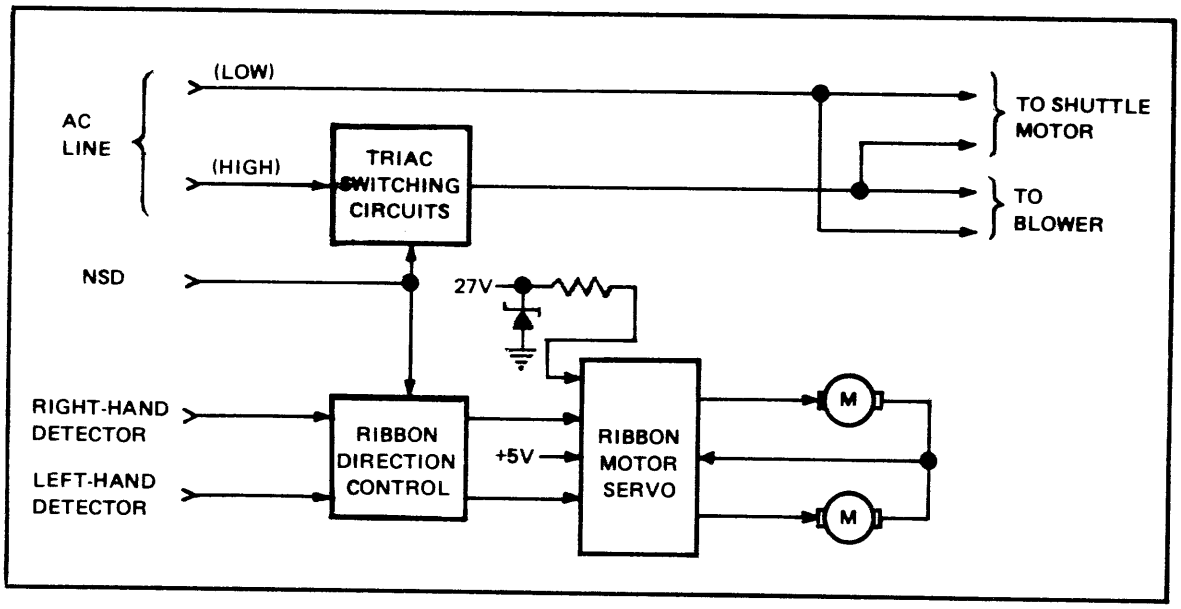


Figure 32 Ribbon Assembly Circuits, Functional Block Diagram

Ac power to both the shuttle drive motor, and the hammer bank blower, is switched by signal NSD (shuttle drive). NSD is optically coupled to a zero-crossing circuit which switches a triac which, in turn, controls the high side of the ac line. The zero-crossing circuit turns on the triac only when the ac waveform is near zero volts to prevent excessive switching currents. When the triac is enabled, the ac line drives the shuttle motor and the blower.

The ribbon motor control circuit (figure 33) consists of a circuit to switch motor functions, and the motor drive circuits.

The end-of-ribbon circuit closure at either end of the ribbon assembly sets a latch circuit to a corresponding state. The stored direction signal turns on a related FET. If, for example, the left-hand sensor sets the latch, FET Q1 appears as an open circuit and FET Q2 conducts, connecting the junction of R_{IN2} and R_{S2} to the upper (sensing) end of resistor R_C.

Now, motor M1 is connected to act as the driving motor, with drive current flowing through constant-voltage amplifier K1, motor M1, and resistor R_C. The voltage across R_C depends on the load on the motor. This voltage is sensed at amplifier K2, which permits current to flow through motor M2, adjusting the torque exerted by K2 so that the voltage across R_C is maintained at a constant level.

When the ribbon end is detected, the latch circuit is switched, and the motors reverse roles.

When NSD is high (the shuttle motor is not running), both FETs are held off so that both motors act as opposing driving motors during idle time. This stall condition is maintained during idle time, as resistor R_C acts as a feedback element to resist any attempt of motor movement.

The amplifiers are powered by the voltage across a 27V Zener diode, which protects the amplifiers from any overvoltage condition on the +28V dc line.

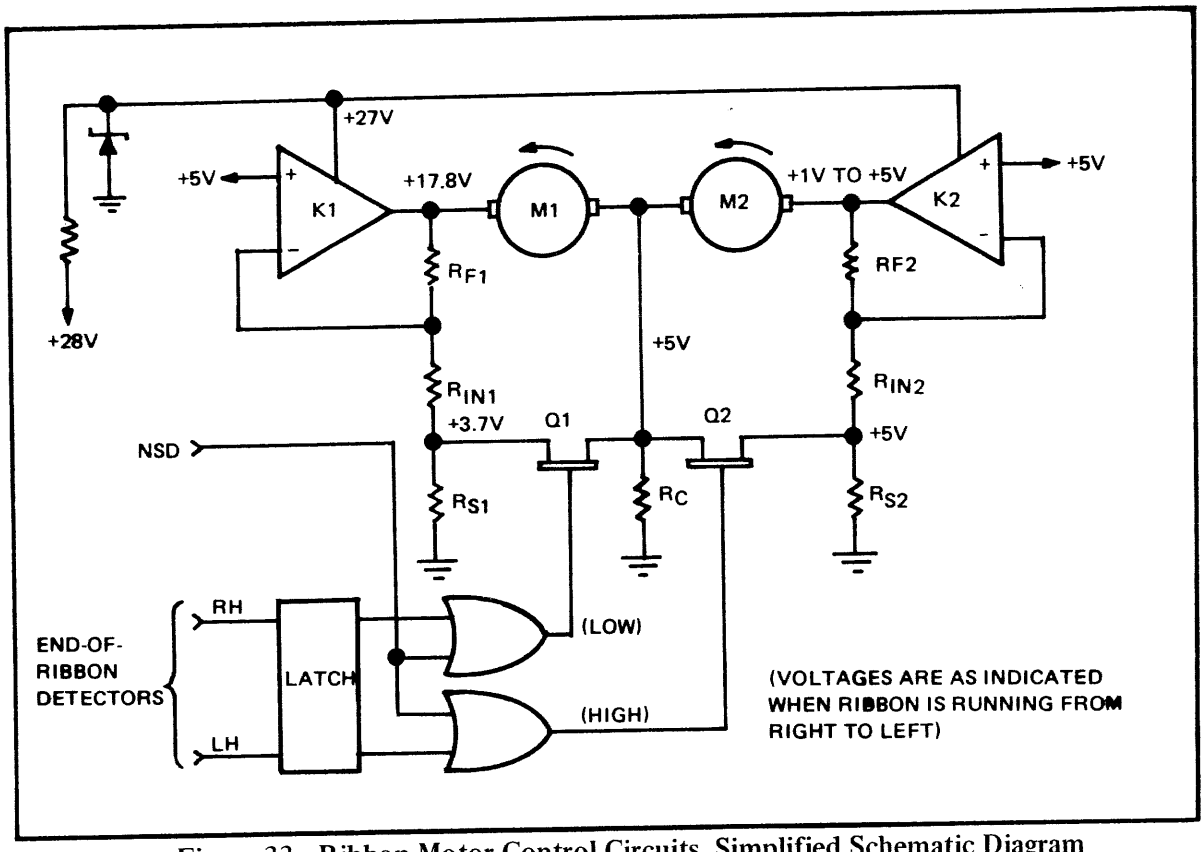


Figure 33 Ribbon Motor Control Circuits, Simplified Schematic Diagram

POWER SUPPLY

The Power Supply assembly contains the following principal elements:

a. Fused transformer-rectifier circuits providing unfiltered -30V dc and +45V dc and filtered +8V dc:

b. A printed circuit board containing:

1. A reference voltage source (4.5V dc),

2. A regulated +5V dc logic voltage supply furnishing up to 6 amperes.

3. A regulated +28V dc voltage supply furnishing up to 15 amperes to drive hammer coils.

4. A circuit to amplify the low-level current pulse generated by the magnetic pickup,

5. A comparator circuit to prevent hammer actuation unless the logic supply voltage is at a normal level,

6. Circuits to drive the paper feed motor,

7. Circuits to detect paper motion, and

8. Circuits to detect and indicate various fault conditions.

The functional block diagram for the printed circuit board circuits is figure 34.

Transformer/Rectifier Circuits – Ac line power appears at the transformer through primary winding taps selected for the line voltage in use. Either one side, or both sides, of the ac line may be fused, depending on the particular configuration dictated by line voltage and local preference.

Secondary windings deliver ac power to rectifiers providing +45V dc, and +8V dc which is delivered to the printed circuit board across a filter capacitor. The choke and 76,000-ufd capacitor filter the regulated +28V output from the pc board. Filtered (but unregulated) -30V dc is also produced for use by paper feed drive motor circuits, and to power the -12V supply regulator on each circuit board.

Reference Voltage Circuit – Filtered +8V dc enters the printed circuit board through fuse F2, and appears at both the reference voltage circuit and the +5V regulator. The reference voltage circuit uses a Zener diode to regulate its output voltage at approximately 4.5 volts. The reference voltage is used in the +28V regulator circuit, and at the HMC circuit which inhibits print hammer action unless the +5V logic supply voltage is up.

+28V Regulator – The unfiltered +45V is regulated by an SCR circuit which turns off and on at the level of each half-cycle that maintains the filtered +28V dc line at a constant level. The regulator is referenced to the 4.5V reference and is adjustable at the factory. Figure 35 shows elements of the +28V dc supply.

The unfiltered voltage appears at the SCR which, when turned on, applies voltage through the filter and fuse F1 to the regulated +28V line. The SCR is turned on by a circuit comprising a comparator amplifier which compares the 4.5V reference with the regulated +28V line, and a transistor driven by the comparator, which controls the SCR gate voltage. The reference voltage is established by selection of resistor R29.

The SCR is turned off when the waveform falls below the instantaneous regulated +28V level. The SCR is turned on again during the next half-cycle at the level determined by the comparator amplifier circuit. Note that the SCR can turn on only at the zero-crossover point of the ac waveform. The diode connected to the +8V dc line from the regulator output clamps the minimum output to +8V dc.

+5V Regulator – The +5V regulator is a conventional dc series-regulator circuit. The raw voltage supply is the +8V line, and voltage is referenced to a 4.7V Zener diode. The output voltage can be trimmed (by selecting resistor R14) to maintain the correct voltage (measured at Logic Board B) of +5V dc ±0.25V dc.

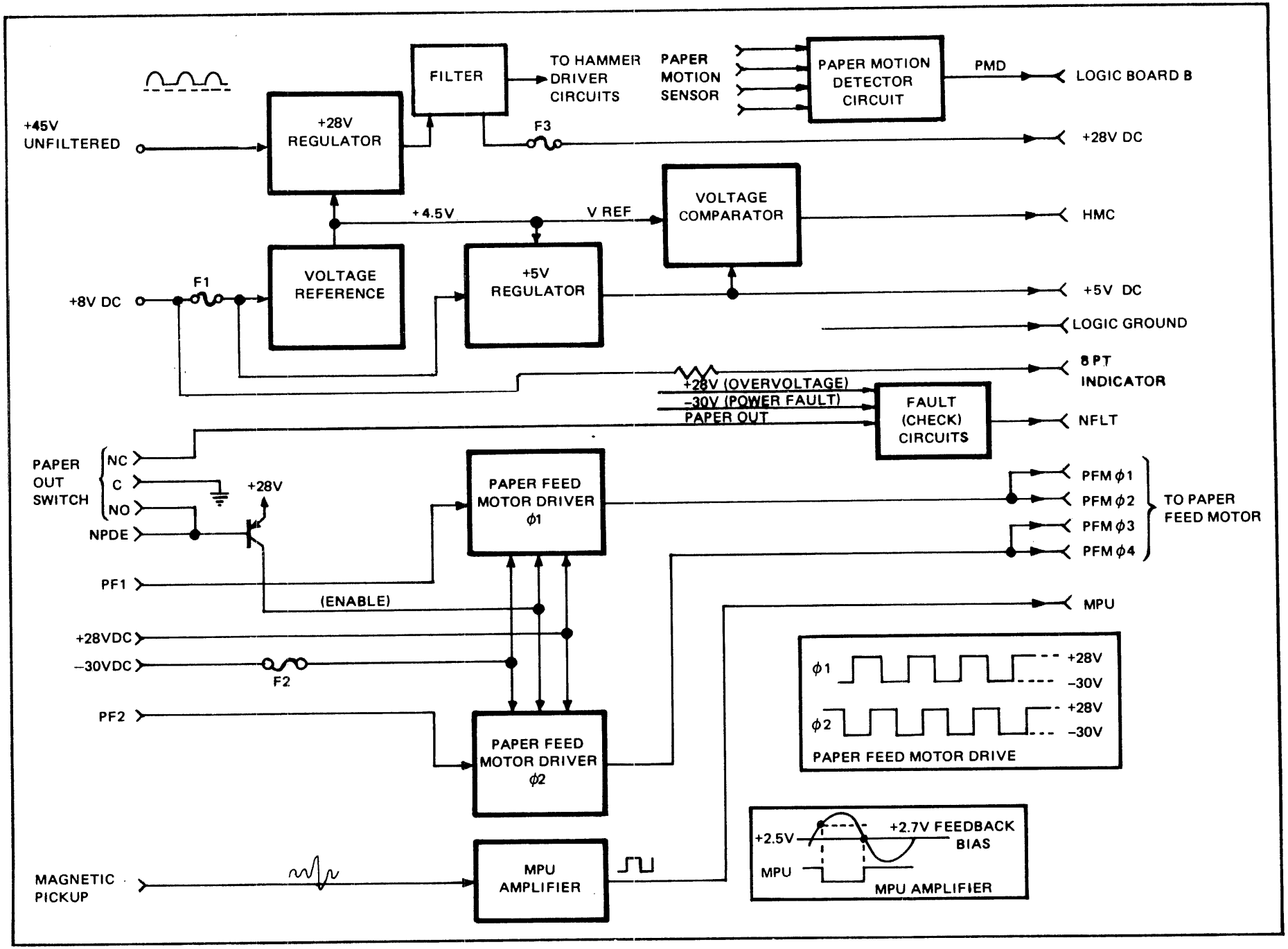


Figure 34 Power Supply Printed Circuit Board, Functional Block Diagram

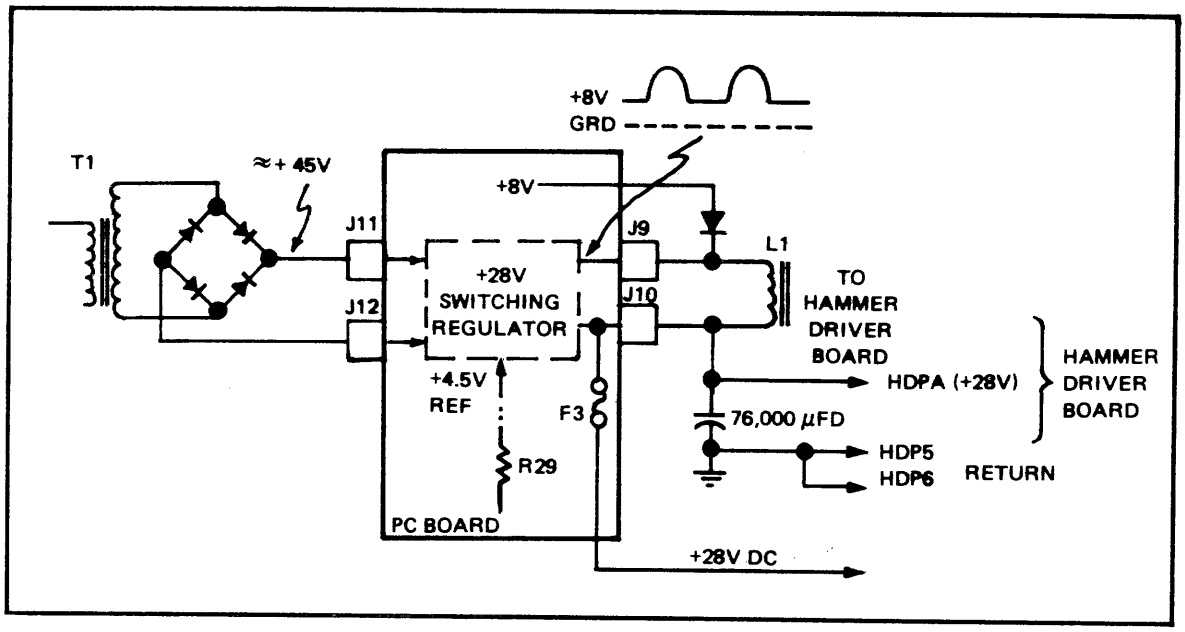


Figure 35 +28V DC Power Supply, Simplified Schematic Diagram

-28V Unregulated Supply – The -28V dc supply is furnished directly by the transformer-rectifier circuit, fused by F3, and used in paper feed motor circuits and MOS memory devices. Correct voltage level is -33V dc + 6.5V, -5V.

Paper Feed Motor Drivers – The paper feed motor is driven by a 2-phase pulse train, with the square-wave in each phase between +28V and -30V. Output phases (PFMØ1/PFMØ2 and PFMØ3/PFMØ4) are produced by separate and identical amplifier circuits. The circuits are enabled only when NPDE (Paper Drive Enable) is low, and are driven by square waves PF1 and PF2, respectively, received from Logic Board B.

Magnetic Pickup Amplifier – This linear amplifier circuit amplifies the low-level ac pickup signal and sends it, as a digital signal, to circuits on Logic Board B.

Typical input signal levels are:

SYNC 2.0 to 3.5V peak-to-peak

RESYNC 4V to 6V peak-to-peak

The circuit output provides hysteresis feedback with input bias set at +2.5V dc.

-12V MOS Supplies – A -12V supply is used by MOS devices. A -12V supply, on both Logic Board A and Logic Board B, is a Zener diode regulator operating from the -30V dc line.

MAINTENANCE

GENERAL

This section contains information for preventive and corrective maintenance of the Printronix 300. It is assumed that the maintenance representative is thoroughly familiar with the theory of operation of the unit, as well as with the functional and operational information and instructions contained in the Printronix 300 *Operator's Manual*.

PREVENTIVE MAINTENANCE

Perform the following maintenance procedures at least every three months or following every 250 hours of operation. More frequent maintenance might be necessary depending on varying site conditions.

The performance and useful lifespan of the printer very much depend on regular maintenance, especially on cleaning and lubrication. Failure to perform these procedures could result in the warranty being voided.

CLEANING THE PRINTER

Operating personnel are expected to keep the printer exterior clean, and to vacuum the printer interior to prevent a gross buildup of paper dust and chaff, ribbon lint and debris, or ink.

Cleaning Exterior

Clean the printer exterior using a soft cloth and mild detergent. Chips and scratches in the paint finish may be touched-up at this time.

Cleaning Interior

If the printer is operated with the front cover closed, little environmental dust will be accumulated within the printer. However, ribbon lint and paper dust and chaff will build up and could interfere with proper machine performance and print quality if not periodically removed. To clean the interior of the printer, proceed as follows:

a. Open front cover and remove paper from the printer.

b. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*). and set aside (with its cables connected, if convenient).

c. Use a soft brush and vacuum to dislodge and remove paper dust and ribbon lint. Remove from paper tractors, from the area of the hammer bank, and from the base pan.

d. If the hammer bank is to be cleaned, or the air filter cleaned or replaced, perform those procedures, then replace the ribbon assembly and restore the printer to operation.

e. If paper dust has been built up on the platen by impact at the print station, rotate the platen approximately 90 degrees from the printing position, then remove the line of paper dust and ink using alcohol and a clean cloth.

Cleaning Hammer Bank

The hammer tips could accumulate enough ribbon chaff, ink, and paper dust to impair print quality, if not cleaned periodically. To clean the hammer tips, proceed as follows:

a. Turn off ac power.

b. Set Forms Thickness Adjustment lever to Load position (fully raised).

c. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*), leaving external cables connected if convenient.

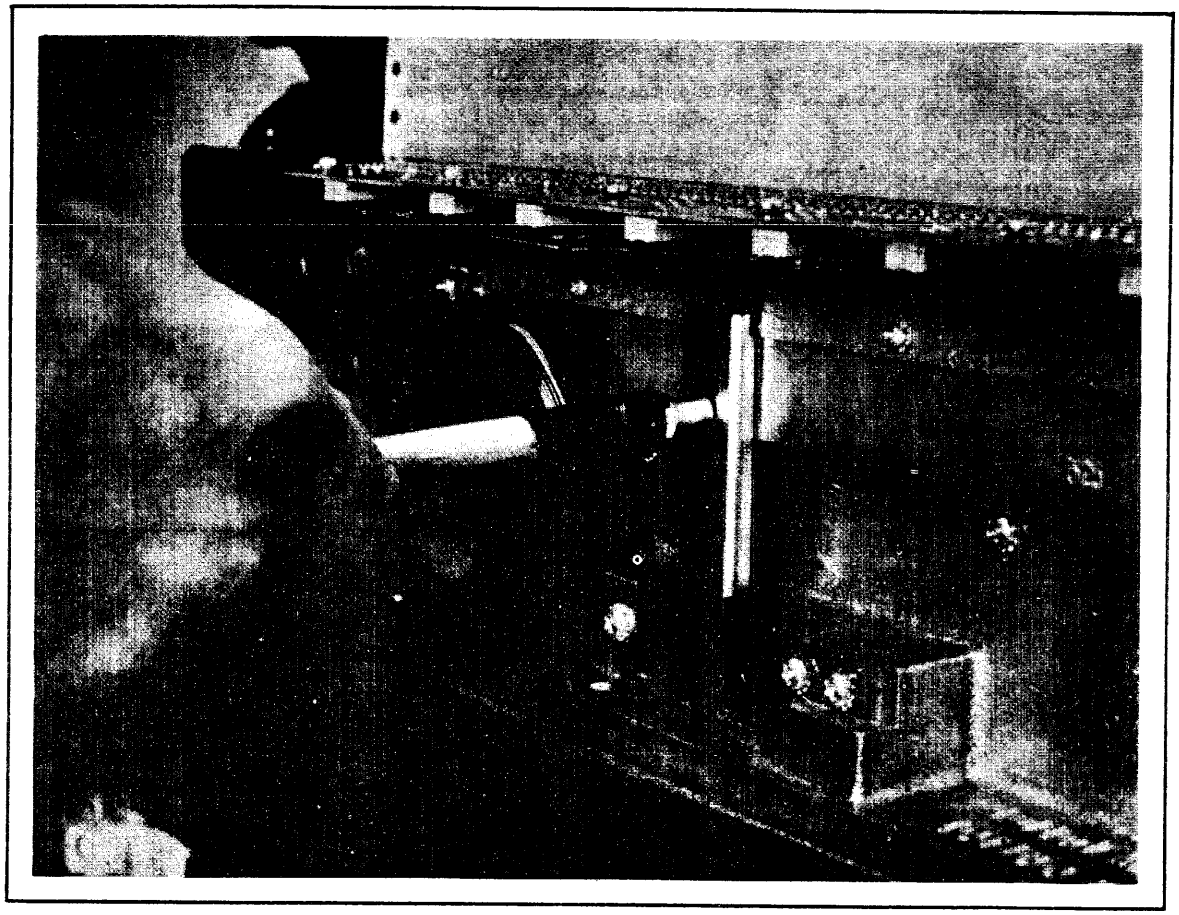


Figure 36 Removing Anti-Rotation Arm

d. Remove the two hex-head screws from the anti-rotation arm (figure 36), disengage anti-rotation arm from the anti-rotation spring, and remove the arm. Be careful to protect the lubricated area of the arm from dirt and debris.

e. Grasp hammer bank printed-circuit board and pivot hammer bank upwards, 90 degrees away from the platen (figure 37).

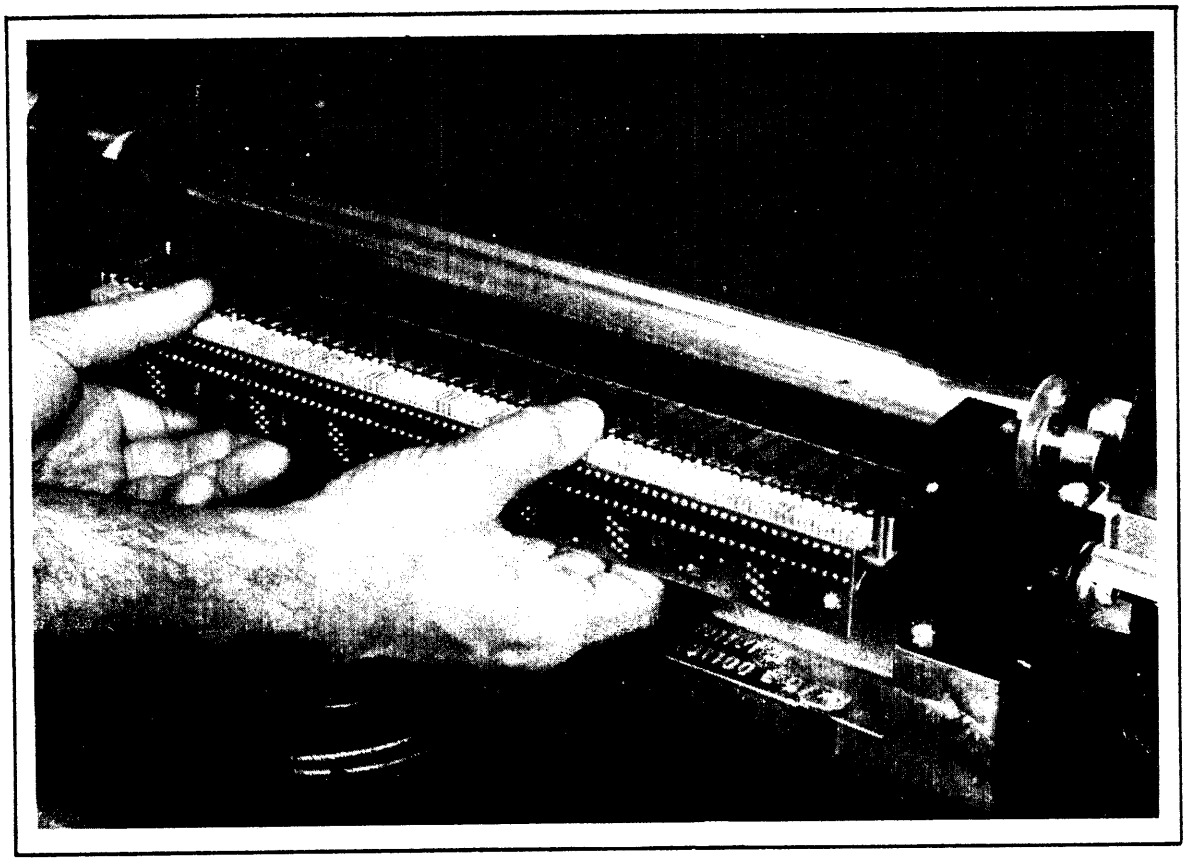


Figure 37 Hammer Bank Assembly, In Open Position for Cleaning

f. Carefully remove hammer bank front cover by first lifting two lower corners from the roll pins, then lifting cover out. The front cover is magnetic and will tend to stick to the hammer bank assembly.

g. Using a dry, stiff bristle brush, clean around hammer tips to remove accumulated ribbon lint and paper dust.

h. Clean up loosened material on a dry cotton swab, wiping hammer tips clean.

i. Wipe ink and ribbon debris from both sides of the hammer bank front cover, then replace cover by placing on the roll pins.

j. Be sure tape side of front cover is against support pins and hammer tips are centered in cover holes, then pivot hammer bank back into operating position. Re-install anti-rotation arm, with arm held between the Oilon rear bearing and the anti-rotation spring. Torque screws to 12-14 inch-pounds.

k. Replace Ribbon assembly. This completes hammer bank cleaning procedures.

Cleaning Air Filter

The foam air filter (located under the ribbon assembly) must be cleaned periodically, or when obviously dirty. The filter may be cleaned superficially using a vacuum applied to the air exhaust vent at the front of the printer. For more thorough cleaning, perform the following steps:

a. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly),* then lift out filter holder and remove filter. (See figure 38.)

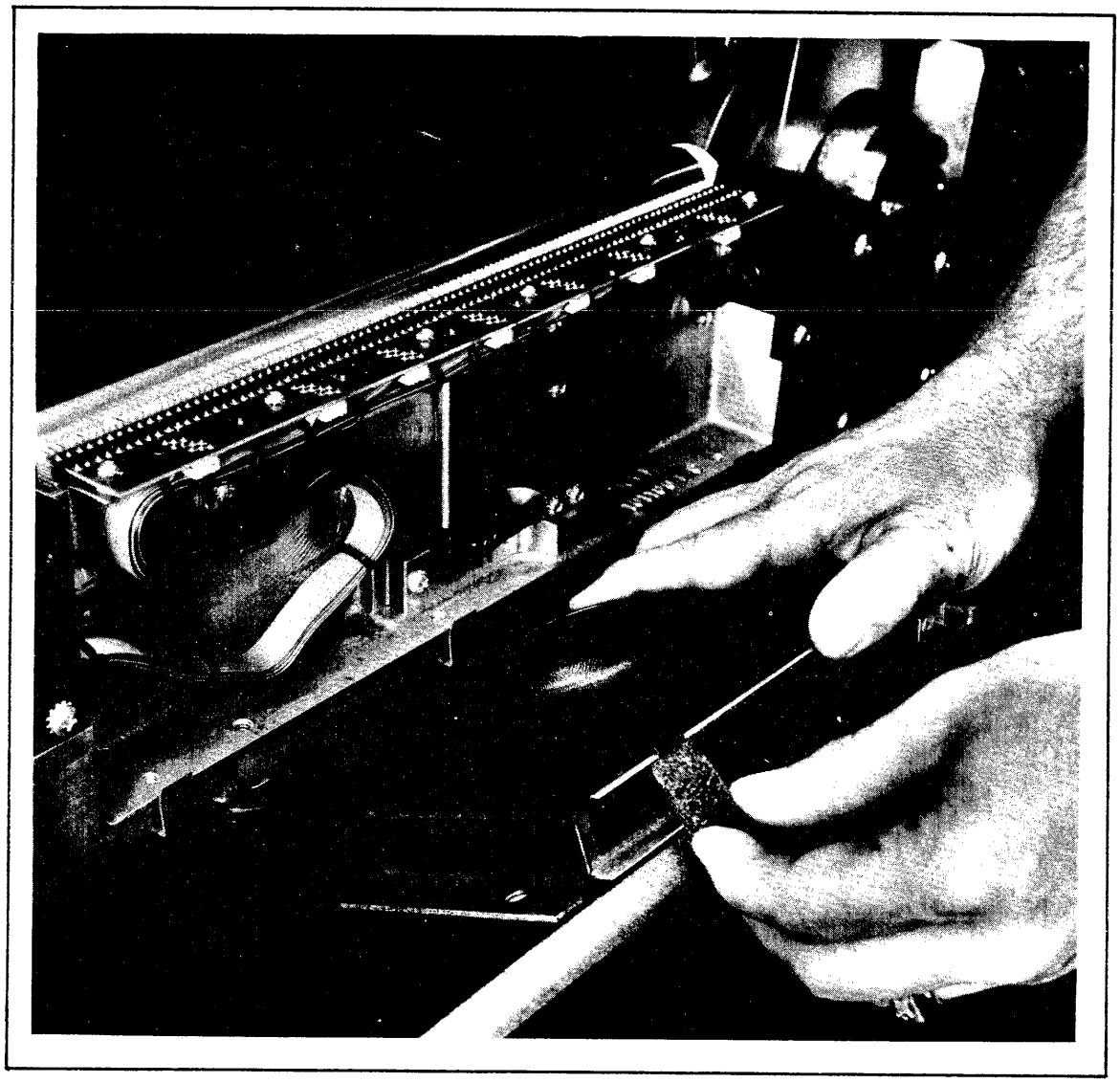


Figure 38 Removing Front Air Filter

b. Clean filter with vacuum. If vacuum does not clean filter sufficiently, clean in detergent and warm water, then dry before replacing in the printer. If filter is very dirty, replace it with a new one.

LUBRICATION

Only four points on the printer require periodic lubrication. They are:

a. the cam,

b. the counterbalance,

c. the anti-rotation arm,

d. the O-rings on ribbon hubs (dc servo ribbon assembly only).

Lubricating Cam

The cam rotates over an oil-saturated wick and picks up oil with each revolution of the flywheel. The cam will become galled and worn if permitted to run dry. To check and perform cam lubrication, proceed as follows:

a. Remove cam top cover and gasket, then check for oil film on the cam surface.

b. Press a pen or narrow tool down into the wick between the hammer bank cam follower and the end of the yoke. If the tool does not pick up some oil from the wick, or oil does not appear on surface of the wick, slowly apply medium-weight oil (SAE 20 or equivalent) until wick is saturated. Do not apply more oil than is needed to just saturate the wick.

c. Replace cam top cover and gasket. Note that the tooth washers used under the screws may leave some loose metal flash on the cover. Carefully wipe off any loose flash before installing the cover to make sure the flash does not get into the cam area.

Lubricating Counterbalance

The counterbalance has four oil ports, each containing a wick. To lubricate the wicks, proceed as follows:

a. Remove top cam cover, then pull out plastic plugs from oil ports in counterbalance.

b. Pour a few drops of medium-weight motor oil (SAE 20 or equivalent) on each wick, adding oil until each wick is saturated. Replace plastic plugs in oil ports.

c. Replace cam cover. Note that the tooth washers used under the screws may leave some loose metal flash on the covers. Carefully wipe off any loose flash before installing the covers to make sure the flash does not get into the counterbalance area.

Lubricating Anti-Rotation Arm

The anti-rotation arm moves against the fixed and spring-mounted Oilon surfaces, but requires a grease lubricant. To check and lubricate those surfaces, proceed as follows:

a. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

b. Check to see that there is a film of grease on both bearing surfaces of the anti-rotation arm.

c. If there is insufficient grease on the bearing surfaces, wipe off the anti-rotation assembly and then re-grease surfaces using a standard high-quality ball and roller bearing grease (Master Lubricants Type M-3).

Lubricating Older Shuttle Motors

Older shuttle motors (identified by oiling tubes in both ends of the motor shaft) do not have ball bearings and must be lubricated annually (or after 1000 printing hours) through the oiling tubes. To lubricate the motor, proceed as follows:

a. Remove printer cover (refer to *Removing and Replacing Printer Cover*).

b. Apply three or four drops of SAE 20 or 30 motor oil to the tube at both ends of the motor shaft.

c. Replace printer cover.

Lubricating O-Rings

Occasionally remove O-ring from each ribbon hub (on ribbon assemblies using dc servo) and lubricate ring using a silicone-type lubricant. Then replace O-ring on ribbon hub.

CHECKING SHUTTLE DRIVE BELT TENSION

There are two procedures for adjusting tension of the shuttle drive belt. Use either procedure.

In the first procedure, the Printronix tensiometer P/N 900082 is used for measurement. The second procedure makes use of a 6-inch steel scale and a conventional force gauge.

Using the tensiometer, proceed as follows:

a. Remove the screws and washers holding the cam top cover, then remove cover and gasket.

b. Lay the tensiometer along the upper surface of the shuttle drive belt with the smaller end resting on the drive motor pulley, the pin on the belt surface, and the larger end pressed down and resting on the belt over the flywheel (figure 39). The guide plate should bear against the motor mount bracket to properly position the pin along the belt.

The tensiometer indicator should rest between the upper and lower limit marks.

c. If tension is not correct, perform adjustment procedures outlined in *Adjusting Shuttle Drive Belt.*

d. If tension is correct, replace cam top cover and gasket.

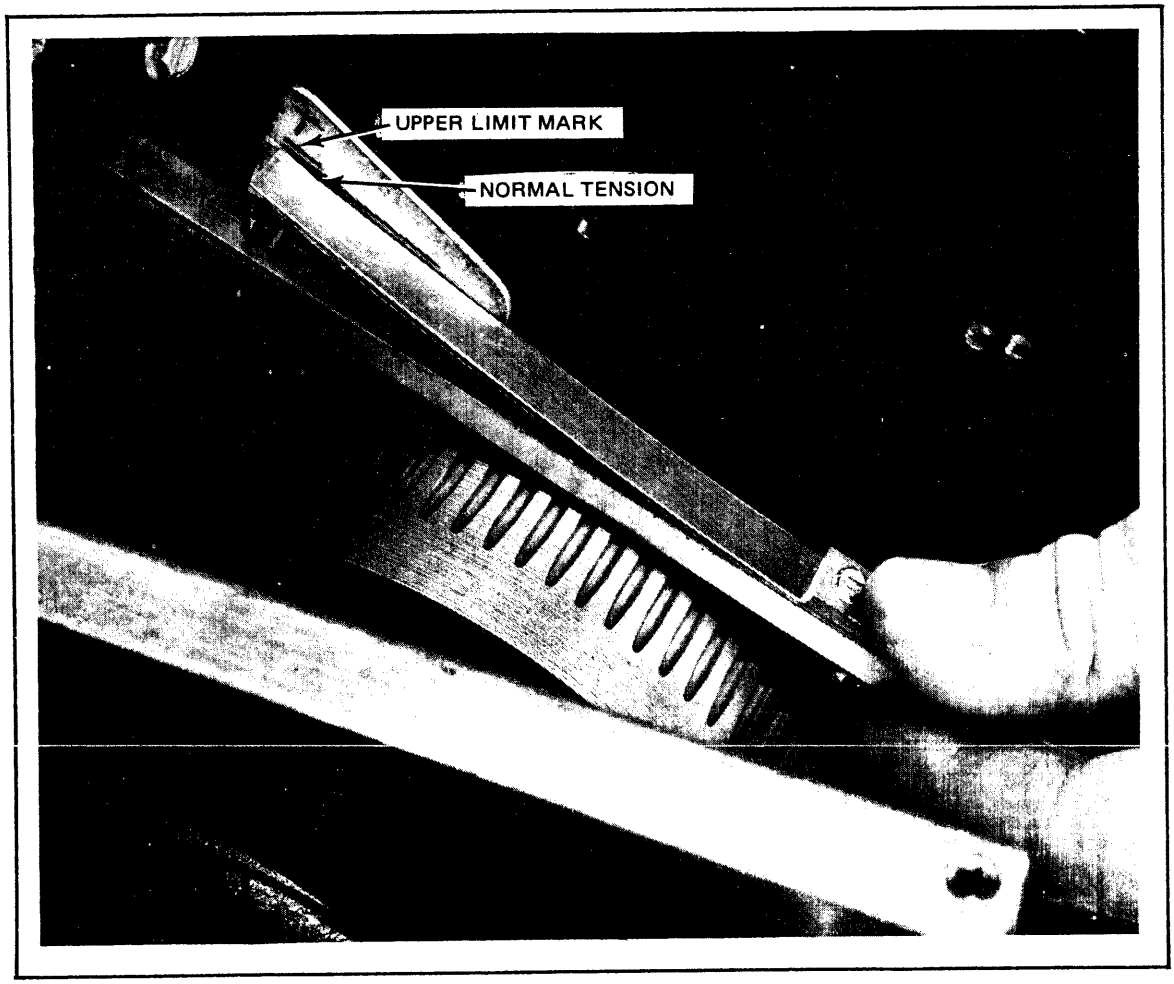


Figure 39 Checking Shuttle Drive Belt Tension, Using Tensiometer

If the tensiometer is not used, perform the following alternate procedure:

a. Mark a point 1/4 inch from the tip of a force gauge (tape is useful for this).

b. Remove the screws and washers holding the cam top cover, then remove cover and gasket.

c. Holding a scale against the belt (figure 40), press tip of the force gauge against the belt, midway between the pulleys. Press gauge down against the belt until the lower edge of scale is aligned with the 1/4-inch mark on the gauge tip. The force gauge should indicate 16 ounces (±two ounces).

d. If tension is not correct, perform adjustment procedures outlined in *Adjusting Shuttle Drive Belt*).

e. If tension is correct, replace cam top cover and gasket. Be sure to wipe off any flash (caused by the star washers) from the cover before re-installing the cover.

CHECKING PAPER FEED BELT TENSION

There are two procedures for adjusting tension of the paper feed belt. Use either procedure:

In the first procedure, the Printronix tensiometer P/N 900083 is used for measurement. The second procedure makes use of a 6-inch scale and a conventional force gauge.

Using the tensiometer, proceed as follows:

a. Make sure belt is centered on the smaller pulley. If it is not, loosen set screws and adjust pulley to center the belt. Then tighten set screws. Rotate pulleys several turns clockwise to be sure that belt seeks the center of the smaller pulley, and readjust if necessary.

b. Lay the tensiometer along the upper surface of the paper feed belt with the rear angle of the tensiometer held snugly against the belt around the drive motor pulley (fig-

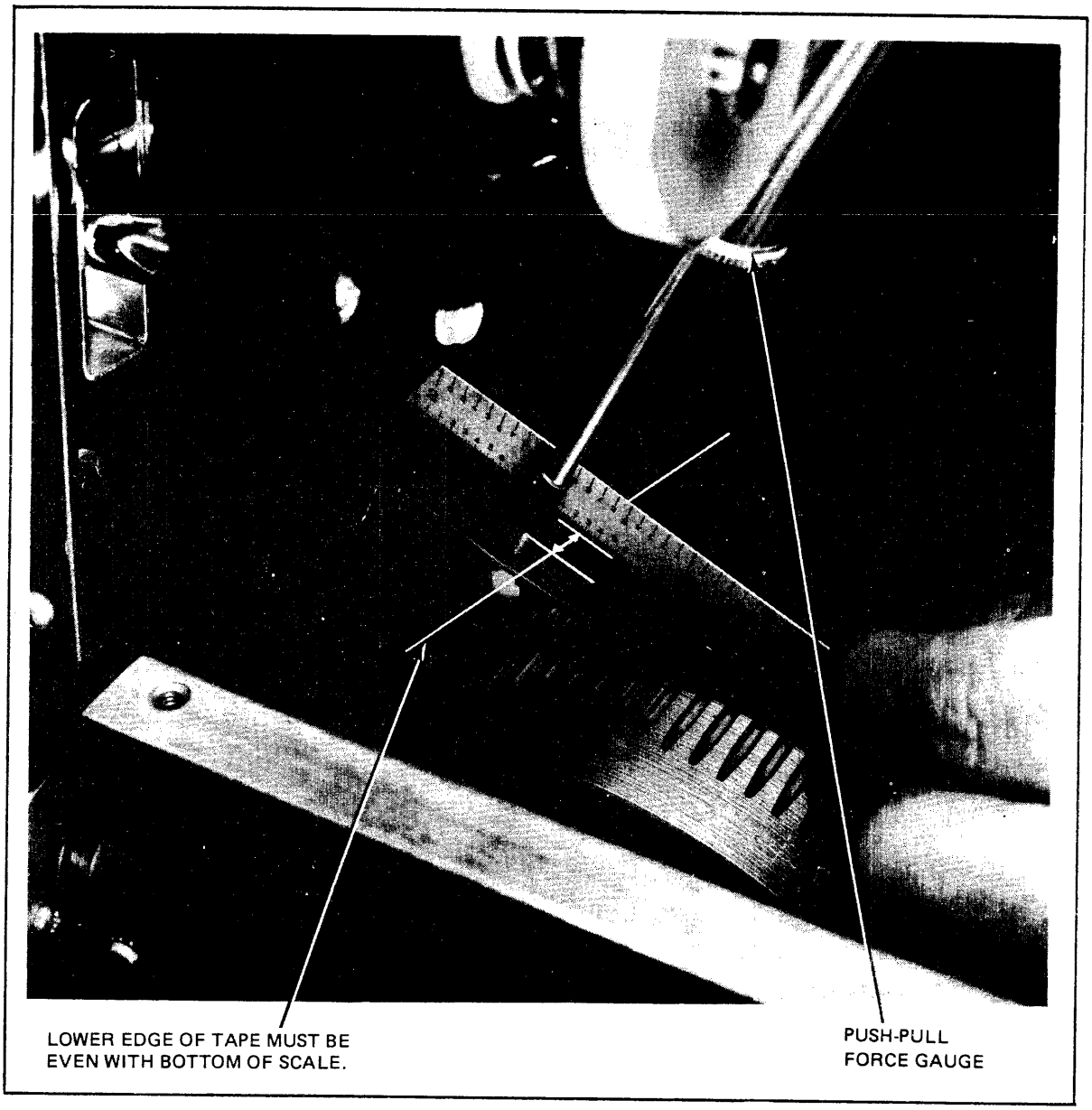


Figure 40 Checking Shuttle Drive Belt Tension, Using Force Gauge

ure 41). Press the lower point of the tensiometer against the belt until the front end of the tensiometer rests on the belt over the spline shaft pulley.

The tensiometer indicator should rest between the upper and lower limit marks (16 ounces of pressure at the point should deflect the belt 1/16 in.).

c. If tension is not correct, perform adjustment procedures outlines in *Adjusting Paper Feed Belt.*

If the tensiometer is not used, perform the following alternate procedures:

a. Make sure belt is centered on the smaller pulley. If it is not, loosen set screws and adjust pulley to center the belt. Then tighten set screws. Rotate pulleys several turns to be sure that belt seeks the center of the pulleys, and readjust if necessary.

b. Mark a point 1/16-inch from the tip of a force gauge (tape is useful for this).

c. Holding the scale against the belt and resting on the belt over both pulleys (figure 42), press tip of the force gauge against the belt, midway between the pulleys. Press gauge down against the belt until lower edge of the scale is aligned with the mark on the gauge tip. The force gauge should indicate one pound (±two ounces).

d. If tension is not correct, perform adjustment procedures outlined in *Adjusting Paper Feed Belt.*

CHECKING TRACTOR BELT TENSION

To check tension of either tractor belt, lift belt lightly, with fingertip, away from rear of tractor frame. If belt moves away from the frame more, or much less, than 1/16-inch, perform procedures outlined in *Adjusting Paper Tractor Belt.*

ROUTINE PERFORMANCE TESTS

Perform the following tests, using the Exerciser, to check general performance of the printer.

Test 1 – E Characters, Line Feed

a. Connect Printronix Exerciser to the external interface connector.

b. Load 14-7/8 inch, six-part paper into printer and otherwise prepare printer for operation.

c. Set Exerciser controls as follows:

L.L. = 132
CHAR = E
SPEC = NONE
FUNCT = LF
POLARITY = HI if jumper W7 is *not* installed in Logic Board A, LOW if W7 is installed.

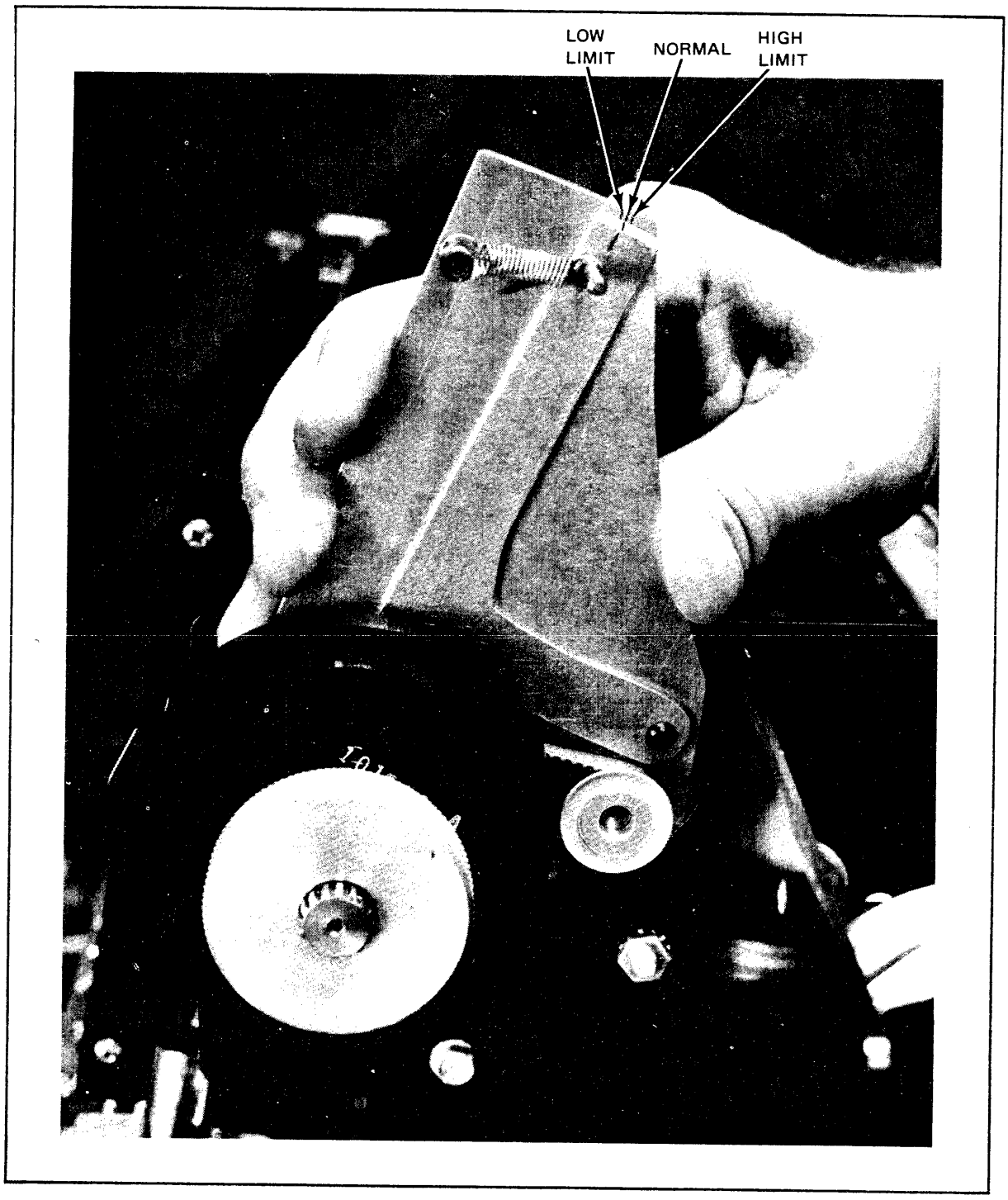


Figure 41 Checking Paper Feed Belt Tension, Using Tensiometer

d. Press ON LINE pushbutton and permit printer to print two pages of the letter E, then press ON LINE pushbutton off.

e. Examine second page. Printing should be clear and uniform, with no faded characters on any part of the form. If printing is not satisfactory, check hammer tip-to-platen alignment.

Test 2 – E Characters, Form Feed

a. Load 14-7/8-inch-wide, single-part paper into printer, and otherwise prepare printer for operation.

b. Set Exerciser controls as follows:

L.L. = 132
CHAR = E
SPEC = NONE
FUNCT = FF
POLARITY = Same as for Test 1

c. Press ON LINE pushbutton, then permit printer to print five pages, performing a top-of-form operation for each page. Then press ON LINE pushbutton off.

d. Examine printed pages to see that the last line of print has remained at the same position on each page. If printing has shifted more than 0.02 inch vertically (figure 43), corrective maintenance (Top of Form function) may be required.

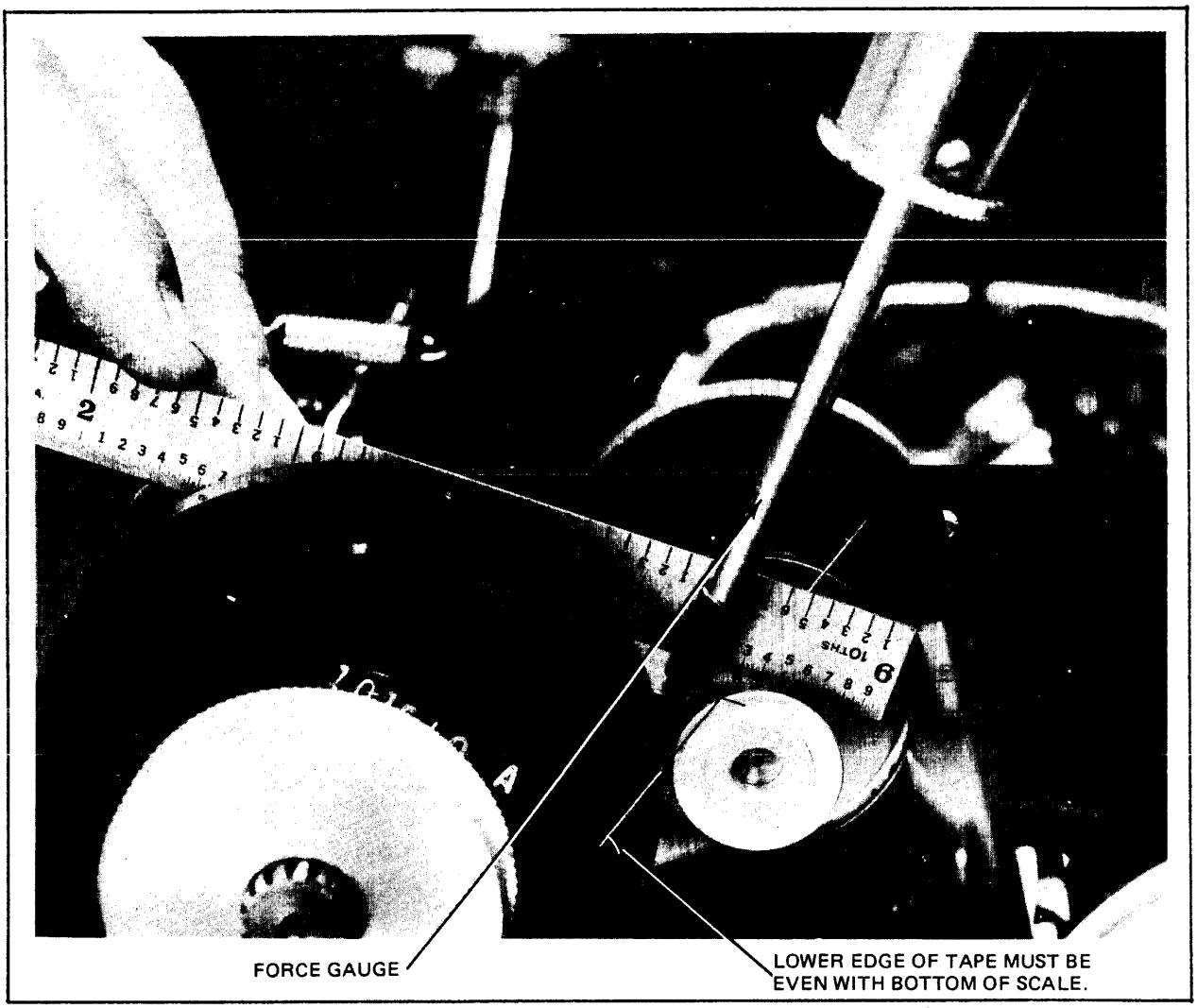


Figure 42 Checking Paper Feed Belt Tension, Using Force Gauge

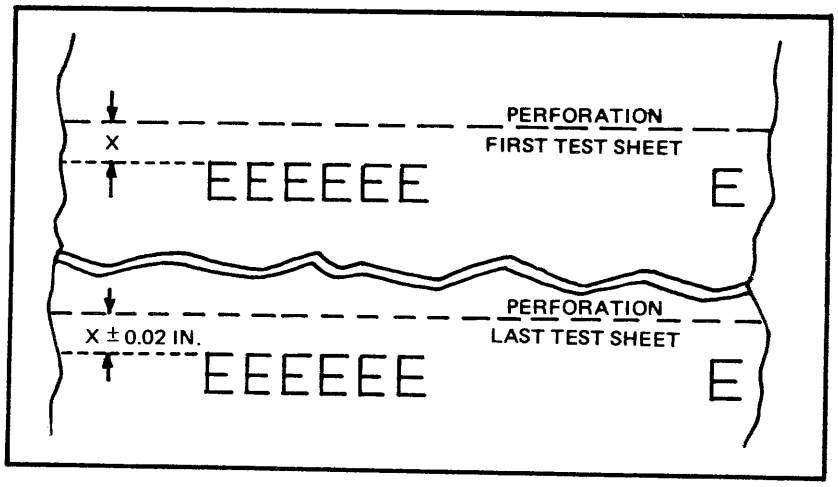


Figure 43 Form Feed Test Criteria

Test 3 – Normal Print

a. With 14-7/8-inch-wide, single-part paper in printer, prepare printer for operation.

b. Set Exerciser controls as follows:

L.L. = 132
CHAR = SR0-96 (sliding pattern of characters 0-96)
SPEC = SO-SI (if printer contains special character set. Otherwise NONE)
FUNCT = LF

c. Press ON LINE pushbutton and print one-half page of the shift-recycle (sliding) pattern, then press ON LINE pushbutton off.

d. Check printed page. All characters should appear in each line of print.

Test 4 – Plot Mode

a. With printer loaded with 14-7/8-inch-wide, single-part paper, prepare printer for operation.

b. Set Exerciser controls as follows:

L.L. = 132
CHAR = DELETE (prints solid black)
SPEC = PLOT
FUNCT = LF

CAUTION

Make sure that jumper W3 on Logic Board B (location 8K) is *not* installed (skipover perforation disabled); and that jumper W4 is *not* installed (fast plot mode disabled).

c. Press ON LINE pushbutton and print one-half page of solid (black) print, then press ON LINE pushbutton off.

d. Examine printed page. There should be no dropout of dots, and any white area should be no larger than 0.005 inch in diameter.

Test 5 – Sync Phasing

a. With printer loaded with 14-7/8-inch-wide, single-part paper, prepare printer for operation.

b. Set Exerciser controls as follows:

L.L. = 132
CHAR = H
SPEC = NONE
FUNCT = LF

c. Press ON LINE pushbutton and permit printer to print one-half page of the letter H, then press ON LINE pushbutton off.

d. Examine print for horizontal alignment of dots in alternate dot rows. Staggered dot alignment (more than 0.005 inch) indicates need for magnetic pickup adjustment (refer to *Adjusting Magnetic Pickup*).

Test 6 – Vertical Hammer Alignment

a. With printer loaded with 14-7/8-inch-wide, single-part paper, prepare printer for operation.

b. Set Exerciser controls as follows:

L.L. = 132
CHAR = SPACE
SPEC = UNDERLINE
FUNCT = LF
POLARITY = Same as for Test 1

c. Make sure jumper W3 (underline disable) on Logic Board A (location 8K) is *not* installed.

d. Press ON LINE pushbutton and permit printer to print one-half page of underlines, then press ON LINE pushbutton off.

e. Examine print to verify that underlines are printed and that vertical separation of hammers is not greater than 0.005 inch.

This completes routine performance tests.

CORRECTIVE MAINTENANCE

Corrective maintenance includes locating the cause of a malfunction, and repairing the printer to correct the malfunction. It is assumed that the field- or depot-level maintenance technician is thoroughly familiar with material in the Printronix 300 *Operator's Manual* and with the *Theory of Operation* contained in this manual.

Refer to illustrations accompanying the text of this manual, and to logic, schematic, and wiring diagrams contained in the *Drawings* manual.

In general, on-site repair consists of performing procedures outlined in *Adjustment and Replacement Procedures*. Failure of an electronic component is repaired on-site by replacing the affected printed circuit board or assembly.

In depot-level maintenance, the failed printed circuit board or assembly is tested to determine the cause of failure, the failed part is replaced, and the circuit board or assembly is made available for further service.

Following completion of any repair, be sure to perform *Routine Performance Tests* before returning the printer to normal service.

TOOLS REQUIRED

The following tools and accessories are needed to support depot-level maintenance of the Printronix 300.

RECOMMENDED TOOLS

Item No.	Item	Printronix No.	Mfg. No. (Suggested)
1	Hammer Tip Alignment Tool (large)	102394	–
2	Hammer Tip Alignment Tool (small)	102393	–
3	Exerciser	10635	–
4	Exerciser Cable, Dataproducts	101491	–
5	Exerciser Cable, Centronix	101507	–
6	Screwdriver, Allen Hex	102356	Xcelite 99 PS40
7	Nut Driver Set	102375	Xcelite PS120
8	Screwdriver, Torque	102358	Utica TS-30
9	Screwdriver, Torque Adapter	102359	Utica HW-18
10	Screwdriver, Torque Hex Socket	102362	Utica W-9A
11	Rule, Steel, 6-inch	102369	General 616
12*	Feeler Gauge Set, .0015 to .0350 in.	102381	Proto 000AA
13	Gauge, Force	102382	Chatillon 719-40
14	Pliers, Grip Ring	102383	Truarc 1120
15	Diagonal Cutters	102384	Erem 91EH
16	Pliers, Chain-nose	102385	Erem 11DH
17	Tool, Lamp Removal	102386	Switchcraft P2460
18	Screwdriver, Phillips	102387	Xcelite X100
19	Screwdriver, Slot	102388	Xcelite R184
20	Soldering Station	102389	Weller WTCP-L
21	Tip, Soldering	102390	Weller PTC6
22	Digital Voltmeter	102391	Dana Labs 2000A
23	Switch, DIP Rocker	102392	Grayhill 76BID

Items 1 through 5 are available from Printronix only. Other tools are available from a number of commercial sources and listed manufacturers numbers are intended for reference only.

General

Figure 44 is a flow chart diagramming procedures and events that occur as the printer is prepared for operation, and tested using the Printronix Exerciser. In general, a fault may be categorized as related to paper feed, printing action, or ribbon control. Flow charts indicated by circled letters A, B, and C further aid troubleshooting within each of the three categories.

In a flow chart, a rectangle indicates action to be taken, and a diamond shape indicates a question to be asked and answered by the troubleshooter.

In approaching the cause of any failure, first check security of related connectors and quick-disconnect terminals, and check dc supply voltages (refer to *Power Supply*).

Interface

Figure 8 shows circuits of the printer/controller interface. Always make sure the fault is not in the remote controller before attempting to troubleshoot interface logic. Refer to figure 9 for interface timing.

Paper Feed

Events that initiate paper feed are:

a. an input Line Feed command during Print mode operation; or

b. a full count (7 or 9) from the row counter after a line of characters has been completed; or

c. an input Form Feed command, or actuation of the FORM FEED pushbutton, or arrival of paper at the selected skip-over perforation line, to advance paper to the top of the next form; or

d. an input binary number, Vertical Tab command, or VFU channel number (on data lines), along with a VFU Control signal (for the standard interface), to cause paper to slew a specified number of lines.

The Paper Feed Flow Chart, figure 45, provides information helpful in troubleshooting paper feed circuits.

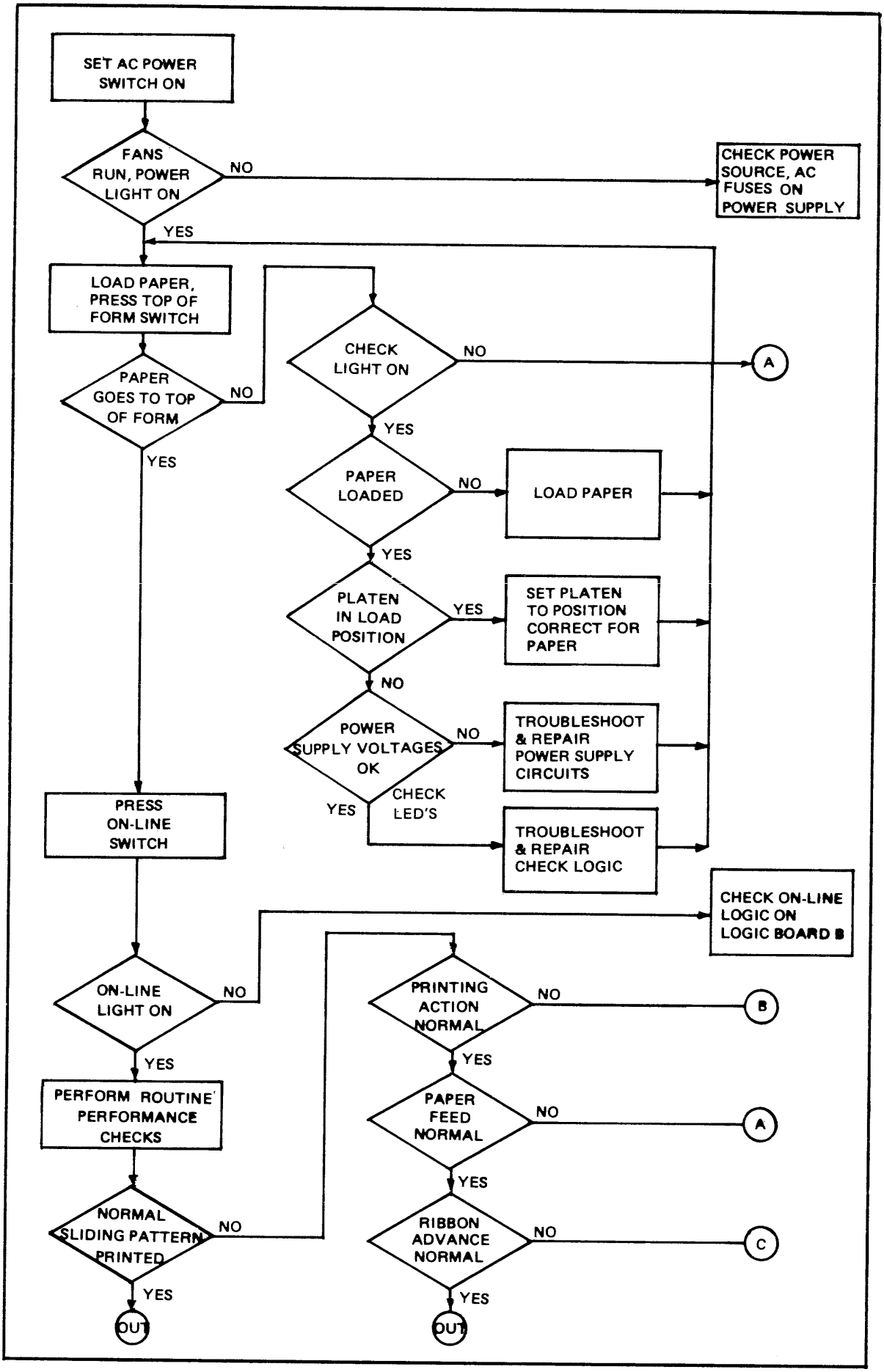


Figure 44 Printer Preparation and Operational Checks, Troubleshooting Flow Chart

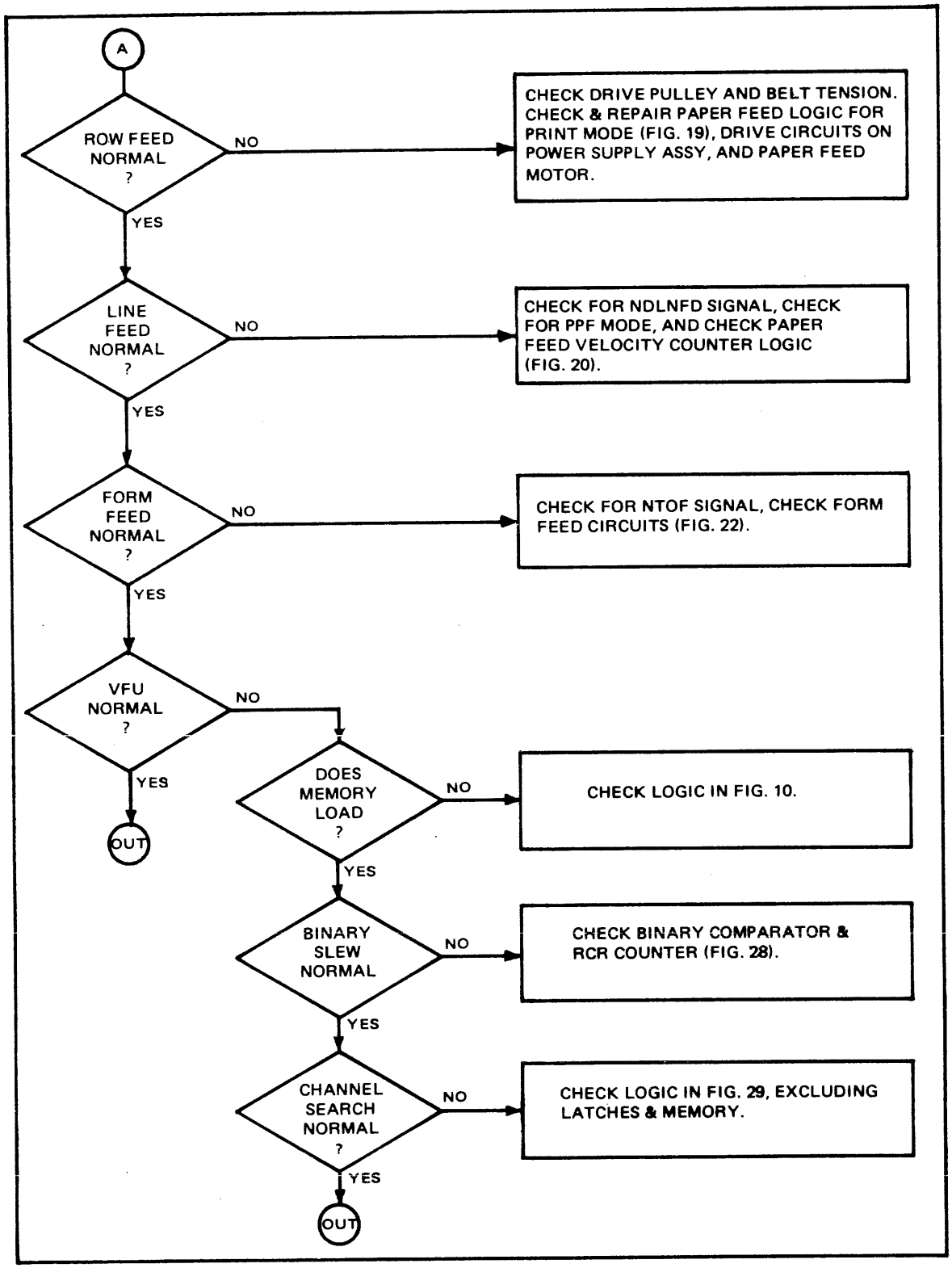


Figure 45 Paper Feed Logic, Troubleshooting Flow Chart

Printing Action

Events that produce printing include:

a. Receipt and storage of data in the interface;

b. operation of the shuttle mechanism and detection of sync and resync information by the magnetic pick-up;

c. correct sequences in reading characters from the character memory, involving correct dot row, dot column, and character counts;

d. correct sequences in reading encoded characters from the character memory, involving multiplexing code bits into a single serial line (COM).

e. Correct operation of hammer driver circuits and print hammers.

A sound understanding of the theory of operation of the printer is necessary to efficiently troubleshoot printing logic and mechanisms.

Figure 46 is a flow chart to aid in troubleshooting logic involved in printing action.

Ribbon Control

Ribbon control circuits are relatively easy to troubleshoot. Remember that the shuttle drive signal (NSD) must be true in order for ribbon (and shuttle drive) control circuits to operate.

Figure 47 is a flow chart to aid in troubleshooting ribbon control circuits.

ADJUSTMENT AND REMOVAL AND REPLACEMENT PROCEDURES

The following paragraphs outline procedures for performing mechanical adjustments that may be required, especially following replacement of an assembly; and for removing and replacing principal assemblies and certain parts of the printer. Figure 48 identifies some assemblies.

Special and standard tools required to perform these procedures are listed. Tools listed in *Corrective Maintenance* may also be required.

Unless stated otherwise, these procedures are performed with ac power disconnected from the printer.

Replacing Circuit Boards in Card Cage

Before removing any printed circuit board from the card cage, turn off ac power. Lower back cover, then swing open the card cage which is held by a magnetic latch at its right-hand end.

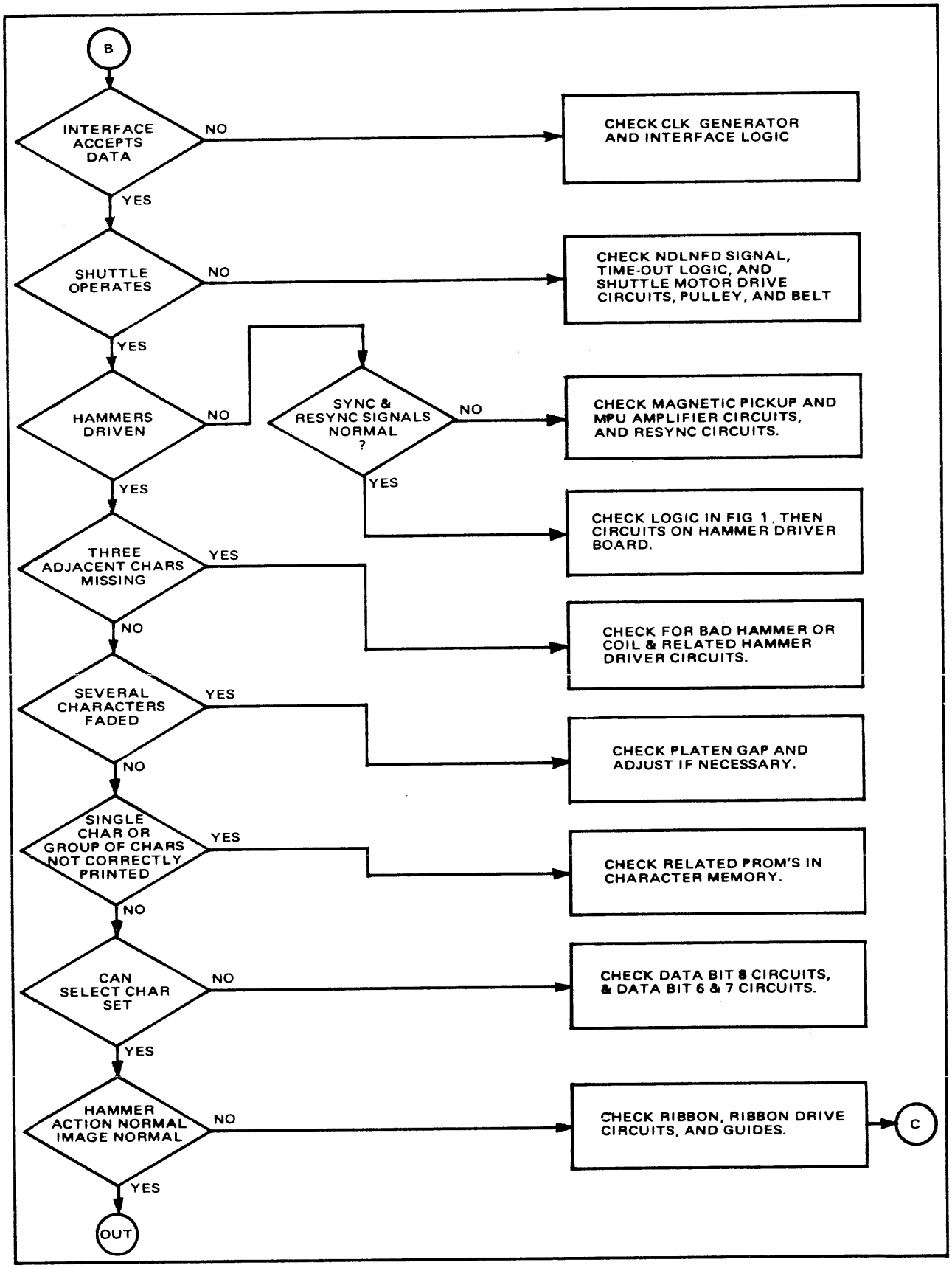


Figure 46 Logic and Mechanisms for Printing Action, Troubleshooting Flow Chart

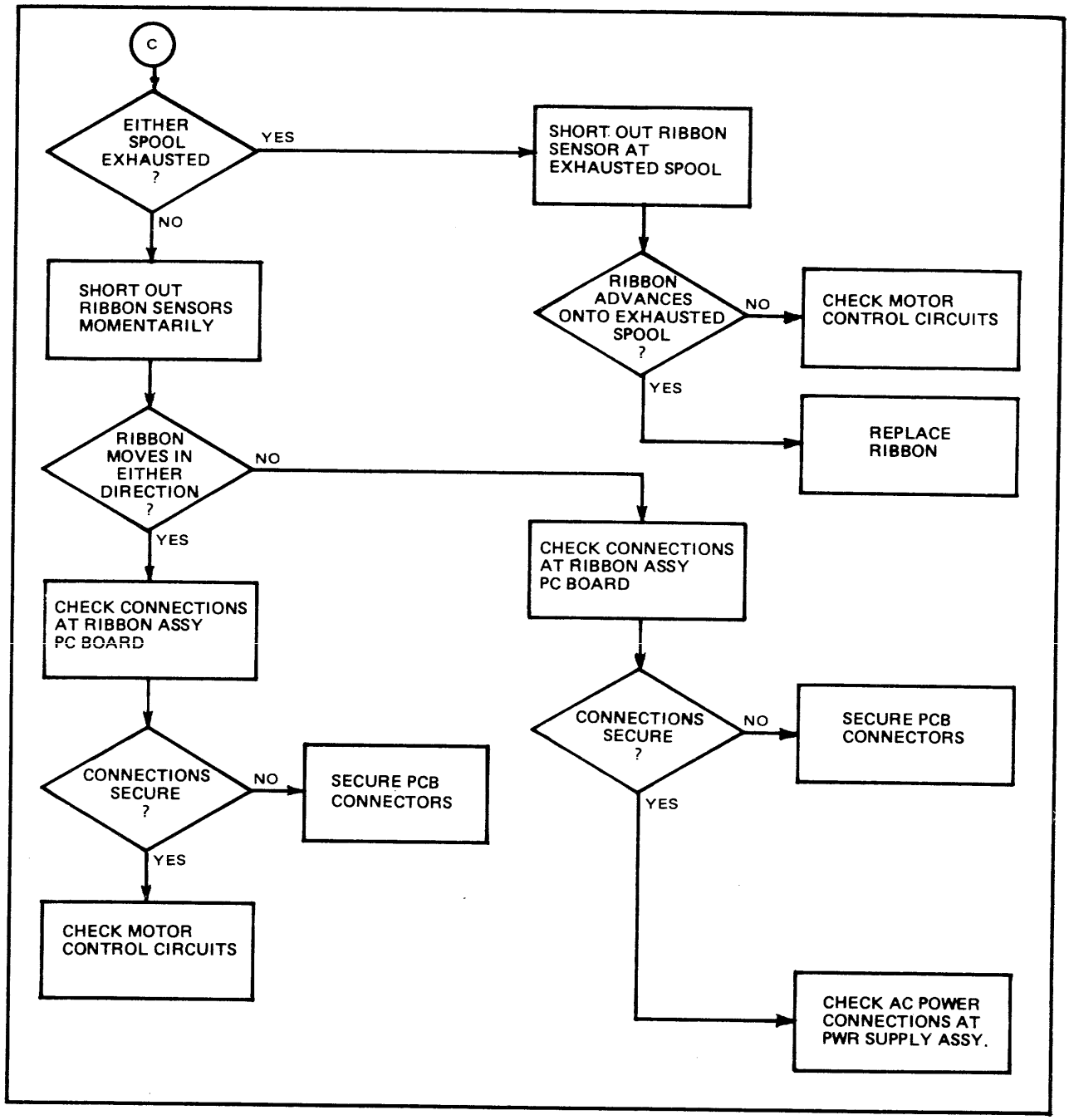


Figure 47 Ribbon Assembly Circuits, Troubleshooting Flow Chart

To remove the Hammer Driver board, proceed as follows:

a. Disconnect the three quick-disconnect-terminated wires labelled 4, 5, and 6, respectively, from terminals on the Hammer Driver Board.

b. Lift ejector levers on circuit board to release circuit board from connectors, then withdraw board from card cage.

To remove either Logic Board A or Logic Board B, lift ejector levers on circuit board to release circuit board from connectors, then withdraw board from card cage.

NOTE

Before replacing Logic Board A, be sure to remove jumper platforms (location 8K), terminations (locations 2A, 3A, and 9A), and PROMs from the board being replaced, and install them in same locations in the new circuit board.

To re-install any circuit board in the card cage, insert the board until connector fingers engage the connectors, then press into the connectors by returning the ejector levers to their normal positions. Be sure to correctly connect wires 4, 5, and 6 to respective terminals (J4, J5, and J6) at the Hammer Driver board.

Be sure to observe printed circuit board identification on the card cage. Boards are designed so that no damage will occur if a board is inserted in the wrong slot. The board cannot be installed upside down – never attempt to force a board into the connector.

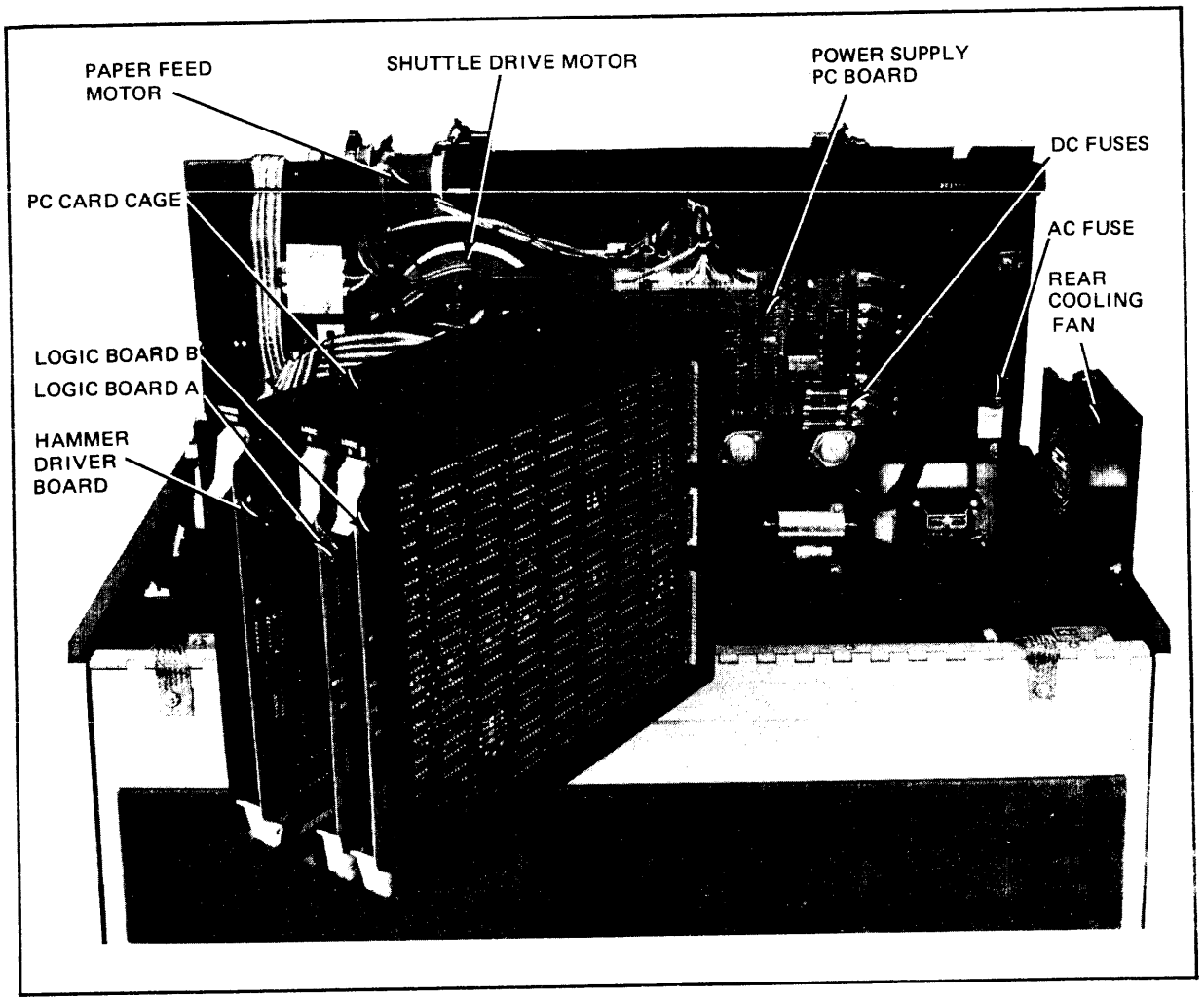


Figure 48 Principal Assemblies, Rear View

CAUTION

When mounting a printed circuit board on an extender board for maintenance, remember that it *is* possible to mount the printed circuit board upside down. Be sure printed circuit is oriented on extender board in the same way it would be in the card cage.

Removing and Replacing Printer Cover

It may be necessary to remove the printer cover in order to perform some maintenance procedures.

WARNING

When cover is removed from printer and power is on, it is possible to encounter hazardous voltages when working within the printer. Take care not to touch points carrying ac line voltage, and keep metal tools away from power supply voltages.

To remove the printer cover, proceed as follows:

a. Turn off ac power.

b. Open front cover.

c. Remove the four nuts and washers that hold the control panel and remove panel rear cover.

d. Remove the wire clip that guides the cable to the front cover, then remove control panel on its cable.

e. Remove the three screws under the printer cover on each side of the base support assembly.

f. Disconnect the rear cover stop (wire rope) from rear of printer cover.

g. Lift cover straight up to remove from the printer. On earlier models having a cover interlock switch, be careful to clear the interlock switch on the left-hand side of the printer.

WARNING

When cover is removed from printer and power is on, moving machinery offers a potential hazard to personnel. When shuttle is operating, keep hands, arms, and clothing away from areas of the shuttle drive belt, flywheel assembly, and hammer bank assembly.

Re-install cover by reversing removal procedures.

Removing and Replacing Control Panel Components

The control panel is held to the back of the printer front cover by nuts attached to four screws captive to the cover. The nuts also hold a non-conductive decorative cover over the rear of the control panel.

The control panel must be removed in order to remove the printer cover, and may be removed when removing and replacing a switch or indicator mounted on it. In most cases, the control panel cable is permitted to remain connected at the card cage to permit printer operation.

To mount the control panel for convenient operation while the printer cover is off, mount the panel to two clips on the edge of the right-hand side plate gusset.

Replacing Control Panel – To remove and replace the control panel, proceed as follows:

a. Open printer front cover.

b. Remove the four nuts and washers that hold the control panel and control panel rear cover, remove the wire clip that guides the cable to the front cover (the clip just slips under the soundproofing pad), and then remove both cover and control panel (on its cable).

c. To completely remove the control panel, along with its cable, remove screws holding connector J3 (for Logic Board B) at the card cage, then cut spot ties as necessary to remove the cable and control panel.

d. To replace control panel, reverse removal procedures, installing spot ties after cable connector and control panel have been secured.

Replacing Indicator Lamp – To replace a lamp in a control panel switch/indicator, proceed as follows:

a. Grasp upper and lower slots in lens, and pull lens away from the panel.

b. Use relamping tool to grasp and remove the lamp.

c. With relamping tool, install a new lamp.

d. Press lens back into place until it snaps into normal position.

Replacing Control Panel Switch/Indicator – To replace a failed control panel switch or indicator assembly, proceed as follows:

a. Open printer front cover.

b. Remove the four nuts and washers that hold the control panel and control panel rear cover, and remove both cover and control panel (on its cable).

c. Unsolder leads from the switch or indicator to be replaced, labeling connections to insure correct re-connection.

d. With long-nose pliers, bend flat the retaining clips on either side of the switch or indicator.

e. Press retaining spring clips against the switch or indicator body, then press the switch or indicator out through the front of the panel.

f. Insert new switch or indicator through front of panel (making sure wire terminals are correctly oriented) until retaining clips open behind the panel.

g. With long-nose pliers, bend back corners of the retaining clips to insure tension against the rear of the panel.

h. Solder wires (removed in step c.) to terminals of the switch or indicator.

i. Replace control panel rear cover and secure with nuts and washers removed in preceding step b.

j. Close printer front cover, completing these procedures.

Ribbon Drive Assembly

The ribbon drive assembly (ribbon assembly) is secured to the hammer bank linear bearing blocks and contains dc drive motors, ribbon spool hubs, a blower to cool the hammer bank, and a printed circuit board. Cables are connected from other assemblies by connectors at the printed circuit board.

Removing and Replacing Ribbon Assembly – To remove and replace the ribbon assembly in order to repair that assembly, or for access to the hammer bank assembly, proceed as follows:

a. Turn off ac power to the printer.

b. Set Forms Thickness Adjustment lever to Load position (fully raised).

c. Lift spool locks, then remove ribbon spools from ribbon assembly.

d. Remove the two screws that hold the upper-rear of the ribbon assembly to the hammer bank linear bearing blocks.

e. Raise ribbon assembly approximately 3/8 inch, then lift assembly off the retaining clips at bottom-rear of assembly.

f. For most ribbon assembly or hammer bank maintenance procedures, it is not necessary to disconnect cables from the printed circuit board. Instead, remove assembly on its cables, then slip keyhole-shaped hole in right-hand end of assembly over shoulder screw on front cam cover, with vertical support pin on printer base passing through mating hole in ribbon assembly chassis. This holds the assembly in a position convenient for maintenance and permits printer operation (without printing).

If ribbon assembly is to be replaced, or removed for convenience while performing other procedures, disconnect cable connectors from the ribbon assembly printed circuit board, and remove ground wire from quick-disconnect terminal on weldment. Note connector locations to insure correct re-connection.

To replace ribbon assembly, reverse removal procedures, being careful to:

a. Connect cables correctly at the ribbon assembly printed circuit board, and

b. Be sure that ribbon assembly retainer clips at bottom-rear of assembly are engaged, and that assembly is pushed firmly down against upper surfaces of linear bearing blocks while the two retainer screws are tightened.

Replacing Ribbon Assembly Printed Circuit Board – To remove and replace ribbon assembly printed circuit board (figure 49), perform the following procedures:

a. Remove the ribbon assembly, following procedures outlined in *Removing and Replacing Ribbon Assembly*.

b. Disconnect all connectors from the printed circuit board. Note connections to insure correct re-connection.

c. Remove the two screws that hold the printed circuit board to the ribbon assembly chassis.

d. Remove printed circuit board from the ribbon assembly.

e. To replace the printed circuit board, reverse the preceding removal procedures, being careful to install connectors in the correct locations. Note that connectors are keyed to prevent inadvertent mis-connection. Do not force connectors.

f. Replace ribbon assembly in the printer (refer to *Removing and Replacing Ribbon Assembly*.

Adjusting Ribbon Guides and Hubs – Misadjusted ribbon guides or hubs may cause the ribbon to fold over, resulting in missed printing and possible damage to the ribbon. In general, misadjusted guides cause foldover, and misadjusted spool hubs cause ribbon to ride off-center in the guides. The adjustments are interrelated.

Perform the following procedures to insure that the ribbon tracks evenly across the guides and lays flat at the printer station.

a. Unlock and remove ribbon spools.

b. Lossen set screw in radius of each spool hub, and adjust each hub vertically so that its top flange surface is 0.360 inch above the surface of the motor gear box. Then tighten set screw.

c. Install ribbon spools, with full spool (supply) on left-hand hub, and then close spool locks.

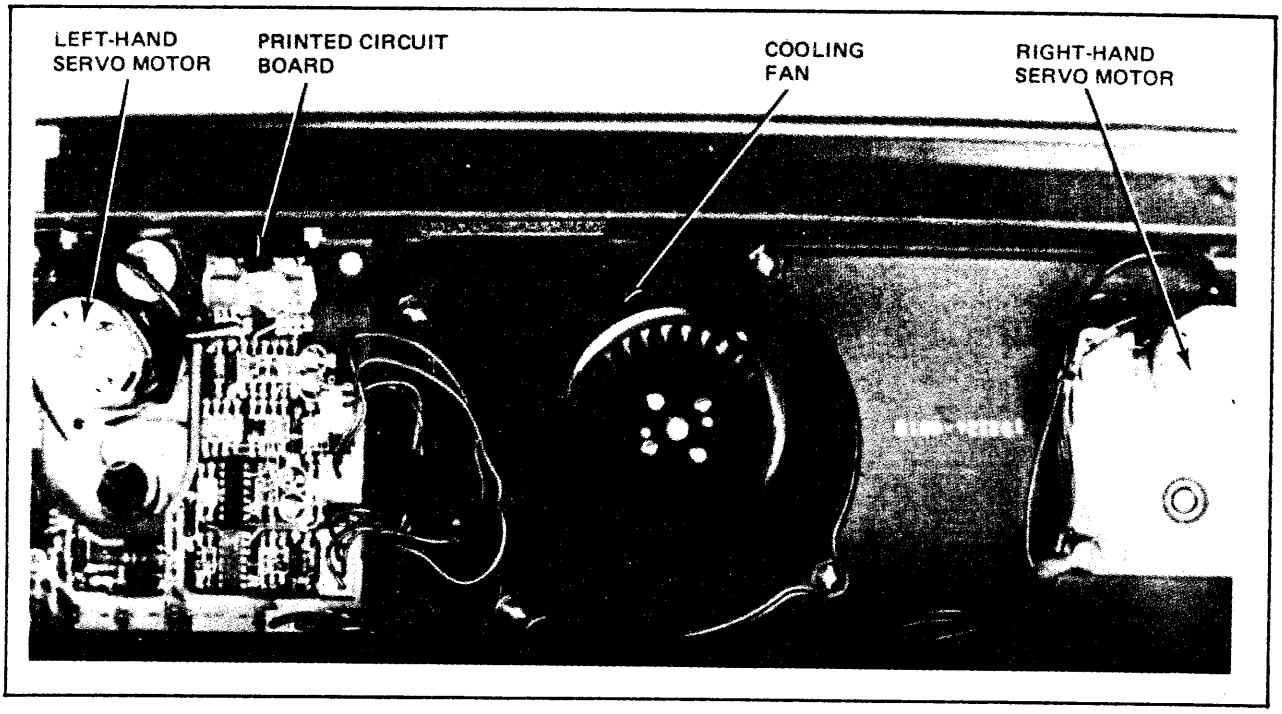


Figure 49 Ribbon Assembly, Underside

d. Set up printer to run the ribbon assembly only, as follows:

1. Disconnect connector J4 (MPU) at upper left-hand corner of the power supply printed circuit board. This disables all printing and paper feed functions.

2. Set Forms Thickness Adjustment lever to a position between Load (fully raised) and position 6 which just permits CHECK indicator to remain off.

3. Apply power to printer and set ON LINE.

e. Short across the left-hand ribbon guide skids to cause ribbon to run from left to right, and see how ribbon runs over the right-hand ribbon guide. Ribbon should run across guide equidistant from upper and lower guide flange surfaces.

f. If ribbon runs high or low on the guide, *slightly* loosen (but leave snug) the two screws that hold the ribbon guide (figure 50). Pivot the guide on its locating pin (on top of guide) so that the ribbon runs centered on the guide, then tighten the screws.

g. Check to be sure ribbon runs onto the spool without interference at either the upper or lower spool flanges. (Check by "picking" edge of ribbon, both upwards and downwards, and seeing it re-center itself on the guide.) If necessary, lift off spool and re-adjust hub height so that ribbon runs onto center of spool.

h. After ribbon is guided correctly at right-hand guide, momentarily short together ribbon guide skids at right-hand guide, in order to cause ribbon to reverse.

i. Perform steps e. through h. for the left-hand guide and hub.

When these procedures are completed, repeat steps e. through i., beginning with the right-hand spool full (supply). Ribbon should then run smoothly over guides without folding or other interference.

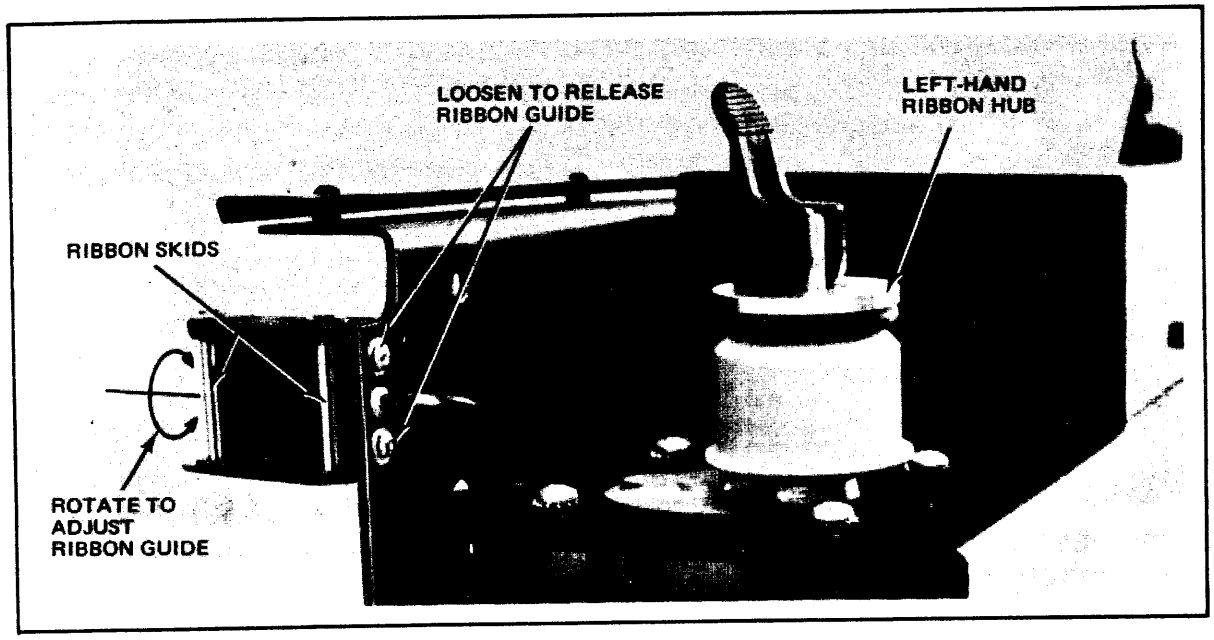


Figure 50 Adjusting Ribbon Guide

Be sure to reconnect MPU connector to J4 (disconnected in step d.) before restoring printer to normal operating conditions.

Replacing Ribbon Drive Motor – If either servo motor in the ribbon assembly has failed, remove and replace as follows:

a. Remove ribbon assembly, following procedures in *Removing and Replacing Ribbon Assembly.*

b. Disconnect motor cable connector from ribbon assembly printed circuit board, and cut spot ties holding the cable.

c. Loosen set screw in spool hub and remove hub from motor shaft.

d. Remove the four screws that hold the motor to the ribbon assembly chassis, then remove motor from the assembly.

e. Replace motor by reversing the preceding removal procedures.

f. Replace ribbon assembly in the printer, following procedures in *Removing and Replacing Ribbon Assembly.*

Replacing Ribbon Assembly Blower – To remove and replace the blower in the ribbon assembly, proceed as follows:

a. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

b. Remove screw that holds blower motor cover on the top of the ribbon assembly.

c. Invert ribbon assembly and remove BLOWER connector from the ribbon assembly printed circuit board.

d. Remove the four nuts and washers (on top of the ribbon assembly) that hold the blower to the ribbon assembly. Then remove motor, shroud, and screws.

e. Run leads of new blower through hole in top of the ribbon assembly, and install blower on ribbon assembly using screws, nuts, and washers removed in preceding step d.

f. Connect BLOWER connector to its terminals on ribbon assembly printed circuit board.

g. Replace blower motor cover on top of ribbon assembly, and secure with screw removed in step b.

h. Replace ribbon assembly in printer, following procedures in *Removing and Replacing Ribbon Assembly*.

Adjusting Paper Scale – The paper scale on the ribbon assembly must be adjusted to match the print mechanism of the printer in which it is installed. Readjust paper scale only when the ribbon assembly is to be installed in a different printer.

To adjust the paper scale, proceed as follows:

a. Prepare printer for operation.

b. Loosen screws holding paper scale to ribbon assembly chassis.

c. Run a few lines of print, then adjust paper scale in its elongated screw holes until guide lines are aligned with actual columns of printed characters.

d. Tighten paper scale retaining screws to complete adjustment procedures.

Printing Mechanism

The printing mechanism comprises the shuttle drive motor and belt, flywheel assembly, hammer bank and shuttle mechanisms, and the magnetic pickup and its mounting arm.

Although the hammer bank and flywheel assemblies may be serviced with the printer cover in place, other maintenance procedures require that the printer cover be removed.

Replacing Hammer Spring – To replace a failed hammer spring, perform the following steps:

a. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

b. Remove the two hex-head screws from the anti-rotation arm, disengage arm from the anti-rotation spring, and remove the arm.

c. Grasp hammer bank printed circuit board and pivot hammer bank 90 degrees upwards and away from the platen.

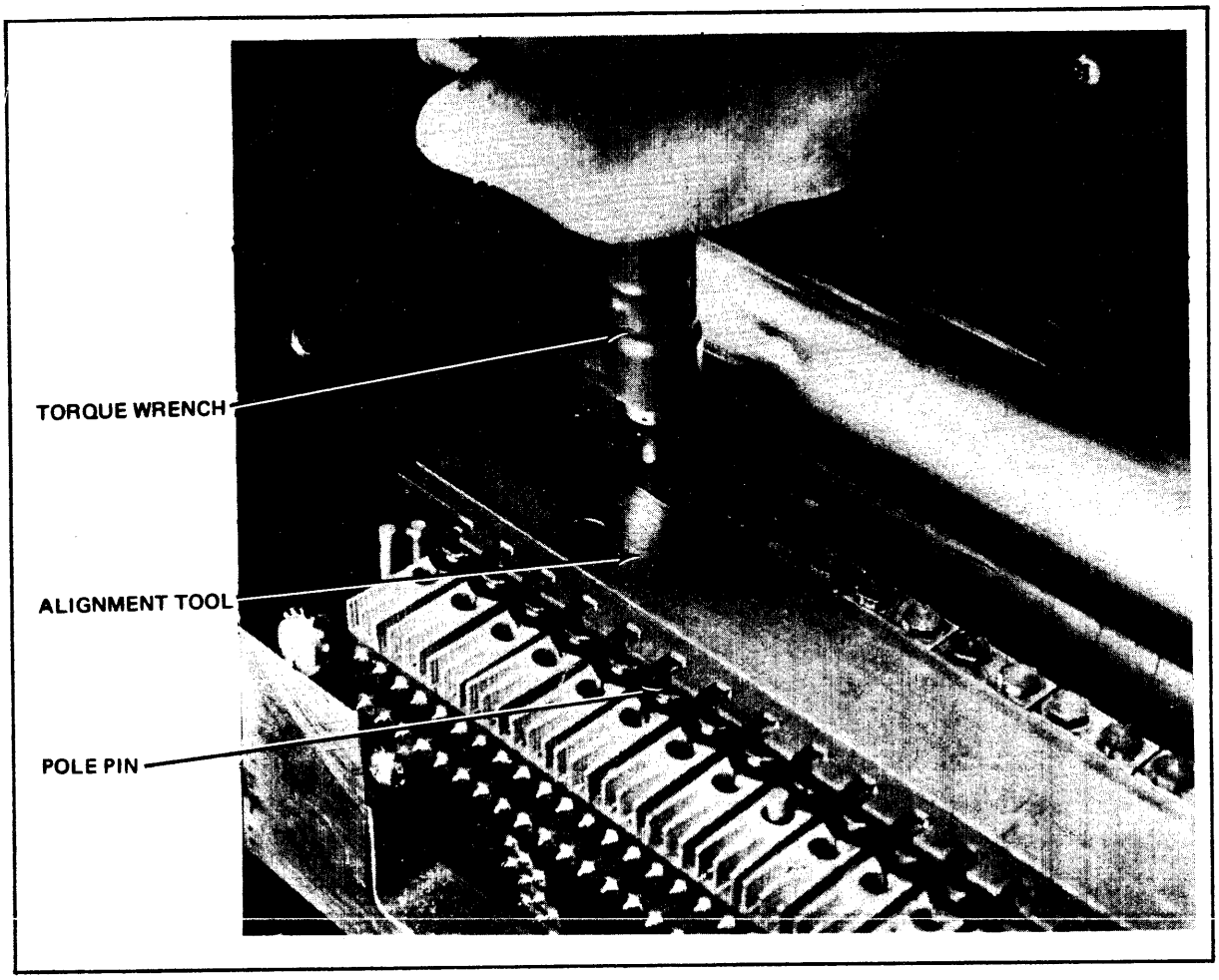


Figure 51 Using Notched Hammer Alignment Tool

d. Carefully remove hammer bank front cover (which is magnetic and will tend to "stick" to the hammer bank assembly). First lift cover carefully from the roll pins at either end, and then remove, being careful not to bend the cover where it contacts the roll pins.

e. Remove the hex-head screw holding the failed hammer spring.

f. Remove hammer spring by sliding it over the pole pin.

CAUTION

Handle hammer springs carefully to avoid damage. Carry and store hammer springs, flat and unstressed, in a dessicant bag.

g. Install a new hammer spring, cover with clamp plate, and replace (but do not tighten) hammer spring screw. Be sure that all parts and mounting surfaces are clean and free of chips, burrs, etc. Check to see that the related coil is seated against the back plate and that the pole pin clears the coil end and is clear of chips or other debris.

CAUTION

Use only the specified screw (P/N 101254-001) to hold the hammer spring. Any other type of screw may damage the hammer bank assembly.

h. If the notched hammer alignment tool is used (figure 51), fit the tool over hammer springs with the wide side down and aligned with hammer tips on both sides of the hammer spring to be adjusted (figure 52). Each hammer tip should rest in the corner of its respective notch as illustrated. Align tip of the hammer spring at the correct corner of its respective notch.

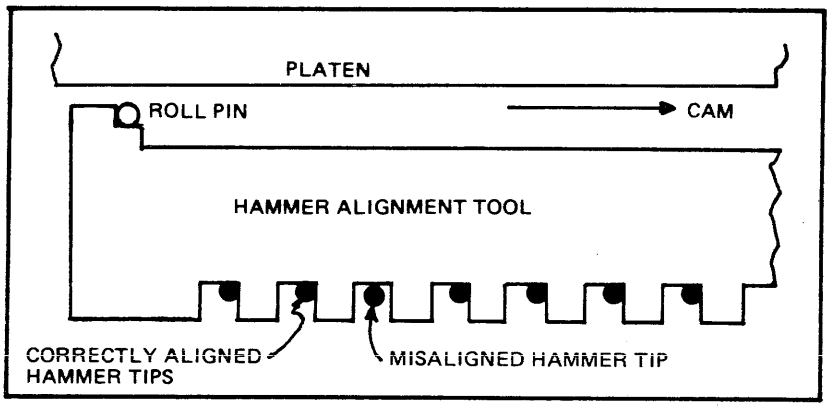


Figure 52 Correct Hammer Tip Alignment

i. If the short drilled hammer alignment tool is used (figure 53), fit hammer pins adjacent to the pin to be adjusted, with the adjusted pin resting in its respective hole.

j. Using a torque wrench set to 12-14 inch-pounds, tighten hammer spring screw on the clamp plate. Recheck position of hammer tip to be sure it has not moved. Note that torque is critical for correct printer operation.

k. Remove hammer alignment tool.

l. Carefully replace hammer bank front cover tape side down, placing it in position aligned with the roll pins, then seating it over the roll pins. Be careful not to bend the front cover.

m. Pivot hammer bank back into its operating position.

n. Re-install anti-rotation arm, with arm held between the Oilon rear bearing and the anti-rotation spring. If there is not sufficient grease on bearing surfaces, apply a high-quality ball and roller bearing grease (Master Lubricants Type M-3, or equivalent). Install retaining screws in anti-rotation arm, then run in screws to seat them finger-tight. (This insures that they will not be "bottomed" forcibly in the holes and damage the hammer bank.) Then torque the screws to 12-14 inch-pounds.

o. Replace ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

Replacing Hammer Coil – To replace a failed hammer coil, perform the following steps:

a. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

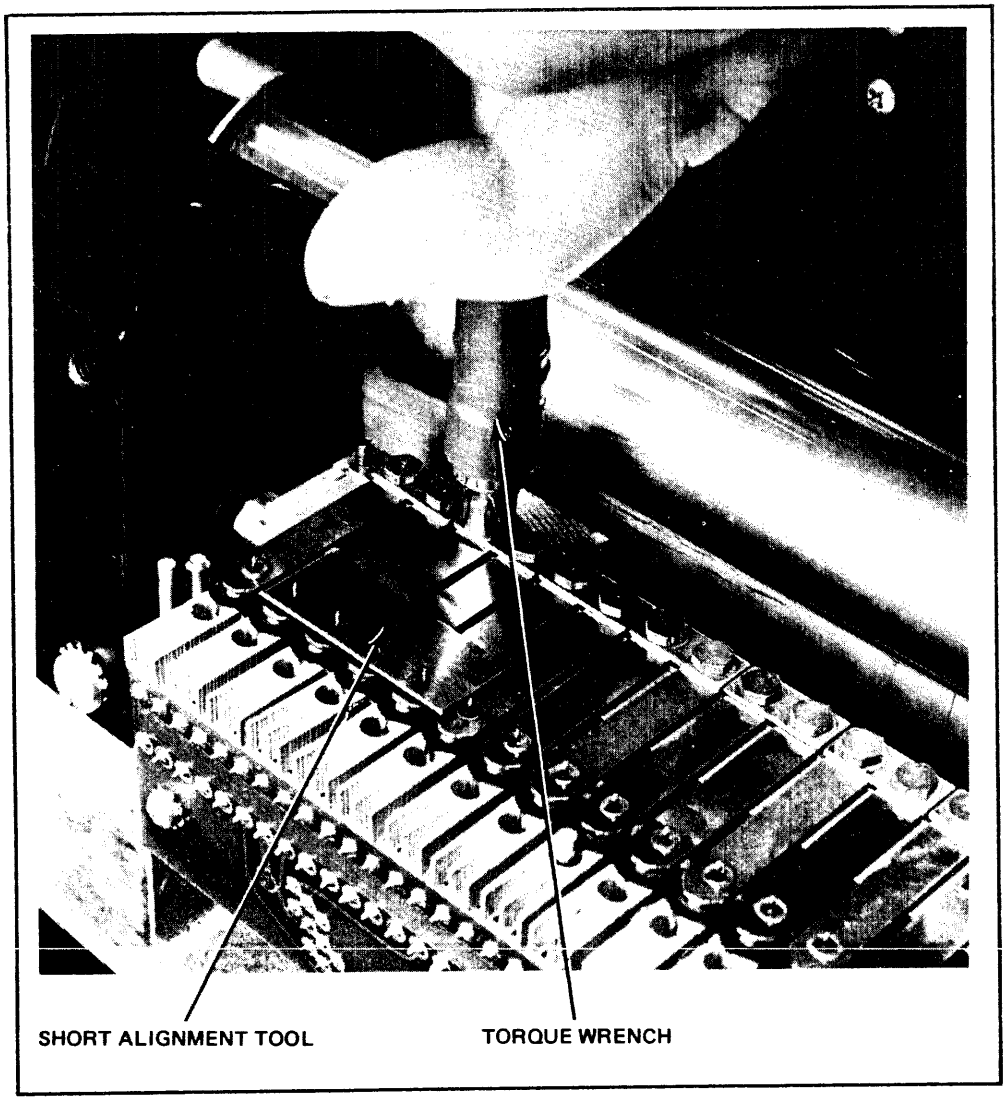


Figure 53 Using Short Drilled Hammer Alignment Tool

b. Remove the two hex-head screws from the anti-rotation arm, disengage anti-rotation arm from the anti-rotation spring, and remove the arm.

c. Grasp the hammer bank printed-circuit board and pivot it 90 degrees upwards and away from the platen.

d. Carefully remove hammer bank front cover (which is magnetic and will tend to "stick" to the hammer bank assembly). First lift cover carefully from the roll pins at either end, and then remove, being careful not to bend the cover.

e. Remove hex-head screw retaining the hammer spring associated with the failed coil, and slide hammer spring back to clear the coil.

f. Insert a narrow screwdriver between the leads (figure 54), and under the base, of the failed coil. Gently pry upwards to lift coil and extract leads from printed circuit board connector. Use long-nose pliers, if necessary, to pry leads, a little at a time, out of the connector. Remove the coil, and discard.

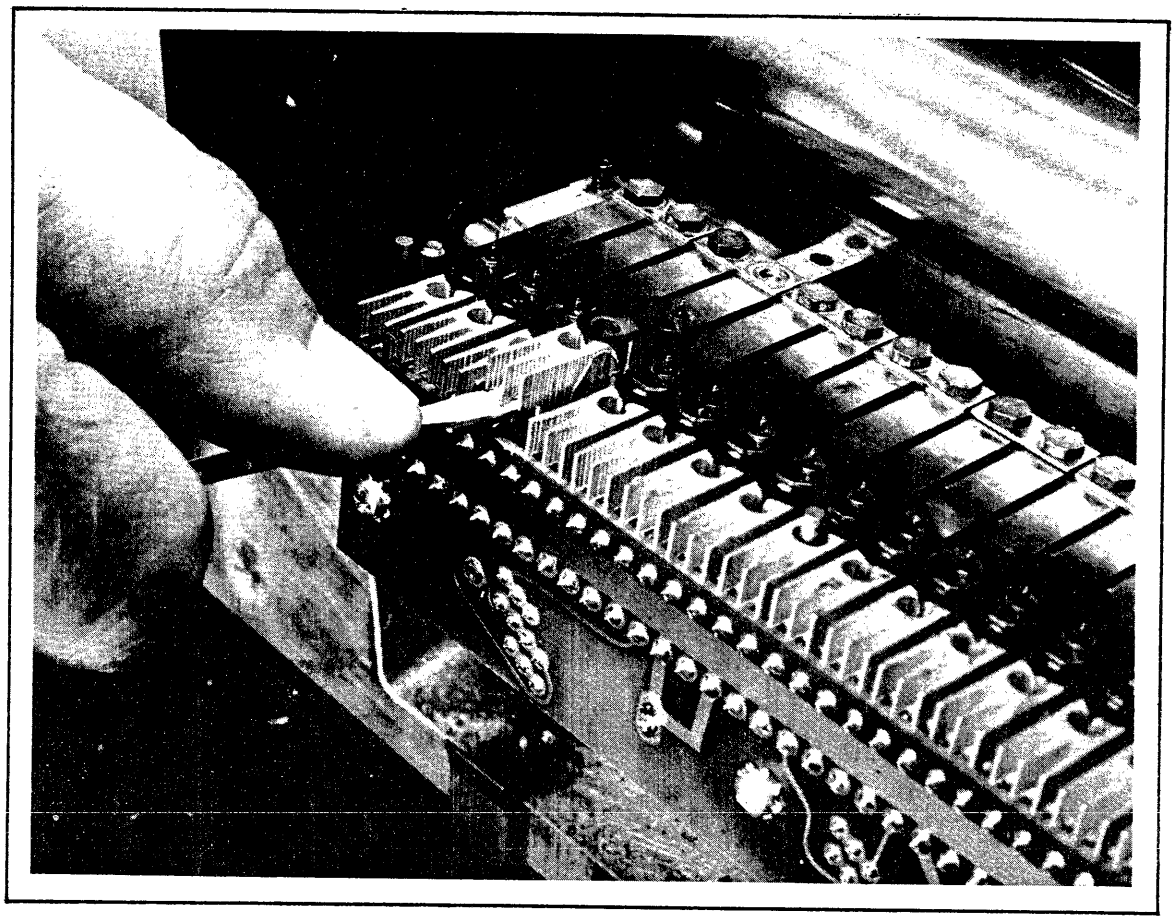


Figure 54 Removing Hammer Coil

g. Using an ohmmeter, check resistance between leads of the *new* coil. Resistance of about 5 ohms is normal.

h. Press the new coil onto the pole pin, at the same time gradually working leads into the connector until coil is firmly seated against backplate at the base of the pin. Make sure the pole pin extends past the end of the coil. Be careful not to bend coil leads. Maintain the 90-degree bend in the leads.

i. Replace hammer spring and align hammer tip (refer to *Replacing Hammer Spring*) and then complete re-assembly as outlined in those procedures.

Replacing Shuttle Assembly – A shuttle assembly has two field-correctable repairs: that is, replacement of a hammer spring, or hammer coil. For other repairs the entire assembly must be replaced. To remove the shuttle assembly, perform the following procedures:

a. Remove printer cover (refer to *Removing and Replacing Printer Cover*).

b. Set Form Thickness Adjustment to the "load" position (maximum open position).

c. Remove Ribbon Assembly (refer to *Removing and Replacing Ribbon Assembly*).

d. Remove the two hex-head screws from the anti-rotation arm, disengage anti-rotation arm from the anti-rotation spring, and remove the arm.

CAUTION

There are two recessed socket-head screws in the upper surface of both the right-hand and left-hand linear bearing blocks. *Do not touch the smaller screws* (nearer the front of the bearing blocks) - these screws adjust bearing tightness for slight movement along the hammer bank shaft, and should be adjusted only at the factory.

e. Remove the screws at the *rear* of the upper surface of both the right-hand and left-hand linear bearing blocks.

f. Remove screws at front surfaces of the linear bearing blocks.

g. At hinged end of card cage, remove screws holding connectors J1 and J3 at the hammer driver board. These connectors and ribbon cables are integral with the hammer bank assembly. J1 (at the top) terminates three cables. J3 terminates four cables and is the lower connector on the card cage.

h. Disconnect two sets of black wires in hammer bank assembly cable bundle from quick-disconnect terminal at larger (+30V) capacitor in power supply assembly, noting their position for re-assembly.

i. Cut spot ties holding hammer bank assembly cables to the printer, then lift off entire hammer bank assembly including hammer bank front cover.

To replace the shuttle assembly, reverse removal procedures, observing the following steps when replacing the linear bearing blocks:

CAUTION

Note that the cable bundle from the shuttle assembly is clamped in a cut-out under the left-hand linear bearing block. Dress cables so that there is a full loop in the cable (figure 55) permitting the hammer bank to move freely, and so that the black wires are placed *to the rear* of (never upon!) the ribbon cable bundle in the cut-out. *Cables should be held loosely and able to move through the cut-out after the bearing block has been installed.*

a. Tighten bearing block retaining screws (in upper surface), moving the cable bundle back and forth in the cut-out as the screw in the left-hand bearing block is tightened to insure that the wires are not pinched. Then back-off screws one-half turn.

b. Insert and *moderately* tighten screws in front surface of bearing blocks.

c. Tighten screws in upper surface of bearing blocks, then tighten screws in front surface.

d. Dress and spot-tie cable bundle after connectors are re-installed on the card cage.

e. If the installed hammer bank assembly is not the same unit removed in preceding steps, check for shuttle spring force and shim if necessary (refer to *Adjusting Shuttle Spring Force*).

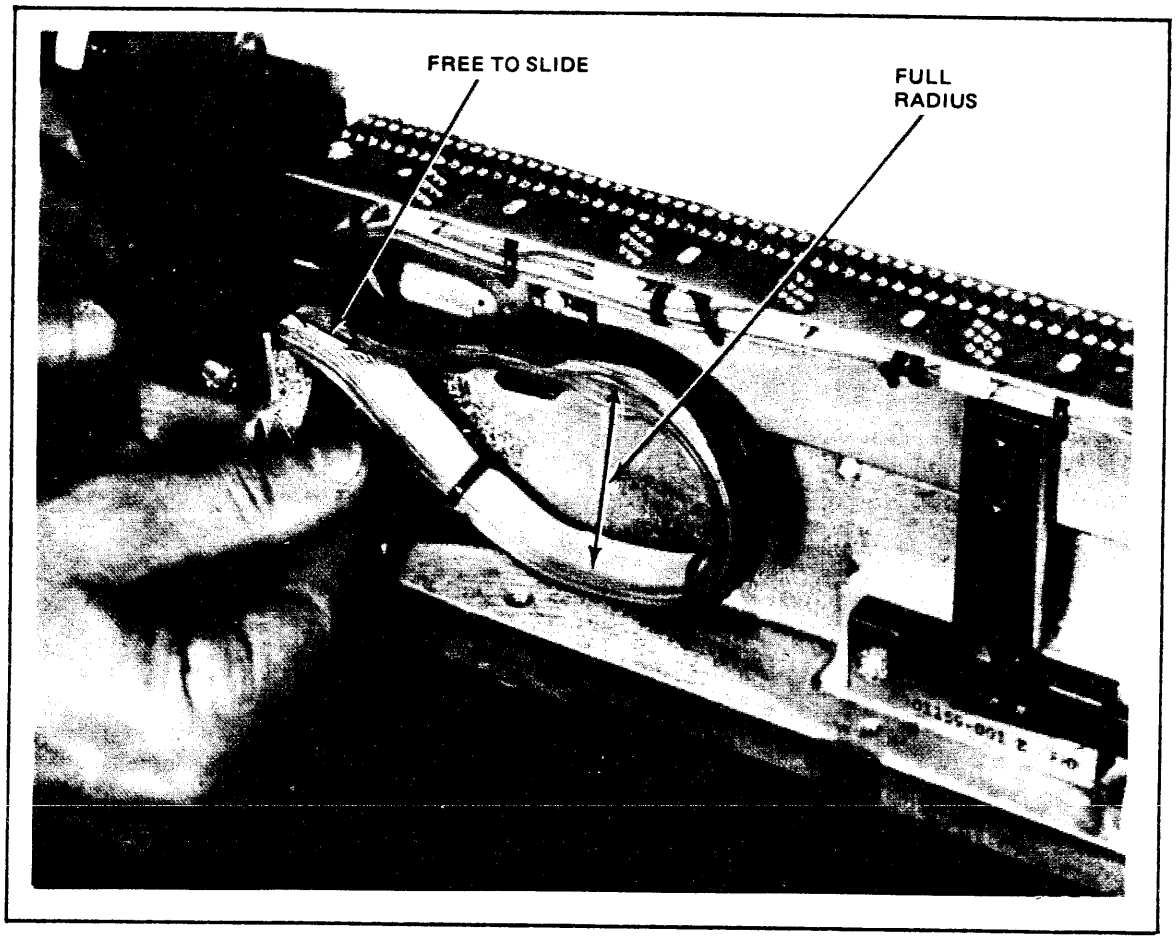


Figure 55 Dressing Hammer Bank Cable Bundle

Adjusting Shuttle Spring Force – If the hammer bank assembly installed is not that originally furnished on the printer, it is necessary to check for correct shuttle spring force after the assembly is installed. Shims may be needed to adjust the force exerted on the cam by the shuttle spring.

To check spring force, proceed as follows:

a. Turn off ac power to the printer.

b. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

c. Remove the screw and washers that hold down the cam top cover, then remove the cover with its gasket. (Before removing cover, first wipe off all metal flash, caused by the star washers, from the cover).

d. Remove the screws and washers that hold the cam front cover, then remove the cover with its gasket.

e. Set cam exactly at its low-lobe position, fully extending springs (figure 56).

f. Hook tip of force gauge over anti-rotation arm and pull gauge to the left, as shown in figure 56. Shuttle cam follower should just separate from the cam with an applied force of 12 pounds ±2 pounds. To detect separation, hold 0.003-inch shim stock between

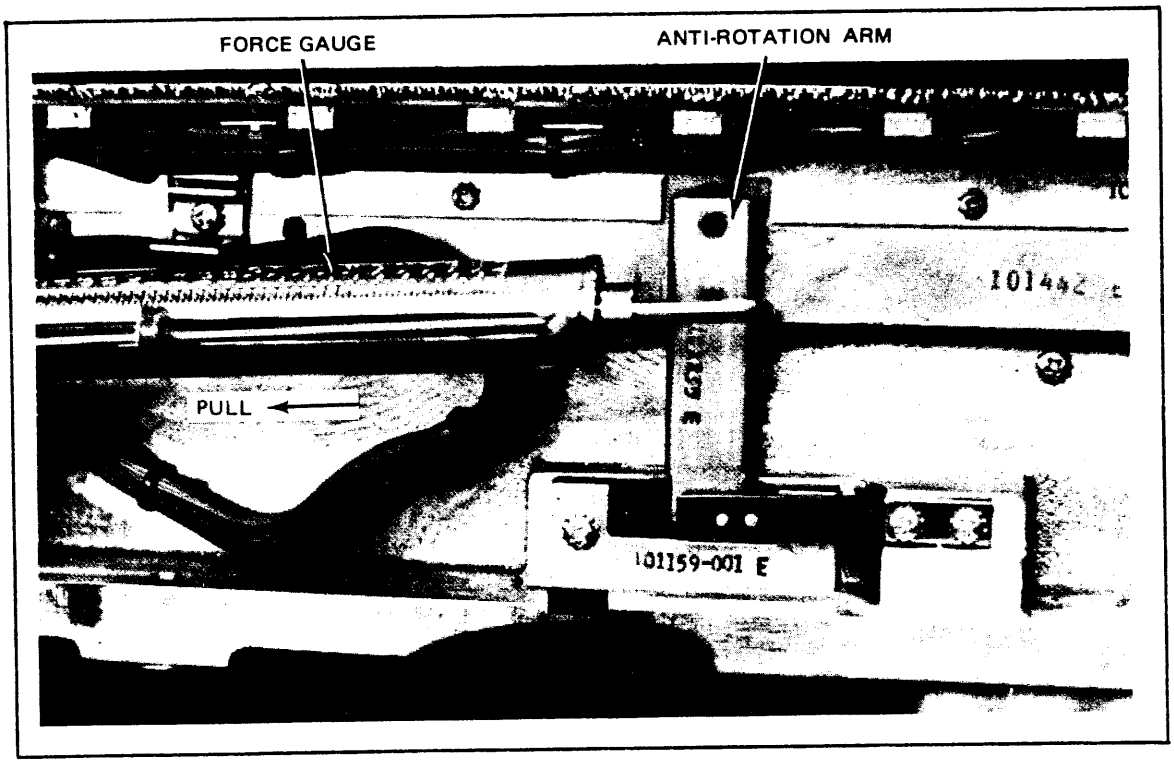


Figure 56 Checking Shuttle Spring Force

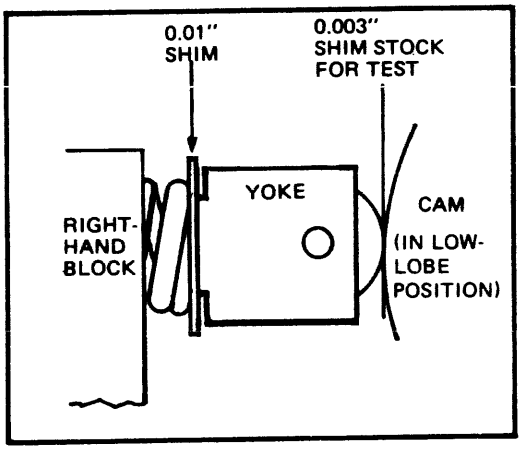


Figure 57 Location of Shuttle Spring Shim

cam and follower (figure 57), exerting a slight pull on the shim stock. Separation is indicated when the shim stock is released. Note that force gauge must be held as parallel as possible to the hammer bank.

g. If shuttle spring force is less than 12 pounds ±2 pounds, insert a 0.01-inch shuttle spring shim (P/N 101565-001) between shuttle cam follower yoke and the spring. Use a sharp screwdriver to pry the spring away from the yoke, insert the shim, and press down shim until it is flush with the yoke. Test with force gauge after shim is installed. More than one shim may be required to achieve the required force.

h. Replace cam front cover and gasket, and cam top cover and gasket, then replace ribbon assembly. Be sure to replace ground lead on lower right-hand shoulder screw on cam front cover.

Adjusting Counterbalance Spring Force – If the counterbalance or counterbalance spring is not that originally furnished in the printer, it is necessary to check for correct counterbalance spring force after the assembly is installed. Misadjusted spring force will result in excessive operating noise or vibration and ultimate damage and malfunction.

To check counterbalance spring force, proceed as follows:

a. Turn off ac power to the printer.

b. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

c. Remove the screws and star washers that hold down the cap top cover. First wipe off any metal flash left by the star washers, then remove cover with its gasket.

d. Remove screws and washers that hold the cam front cover, then remove the cover with its gasket.

e. Set cam exactly at its low-lobe position, fully extending the counterbalance spring.

f. Hook force gauge to hole in face of counterbalance (figure 58) and pull gauge to the right *keeping it parallel to face of counterbalance.* Cam follower should just separate from the cam with a force of 14 pounds ±2 pounds. To detect separation, hold a 0.003-inch feeler gauge between cam and follower, exerting a slight pull on the feeler gauge as counterbalance is pulled to the right. Separation is indicated when the feeler gauge is released.

g. If counterbalance spring force is less than 14 pounds, insert a 0.01-inch counterbalance spring shim (P/N 101565-00) between end of spring and flange of shim guide. Use a sharp screwdriver to pry the spring away from the guide, insert the shim, and press down shim until it is flush with the guide flange. Test with force gauge after shim is installed. More than one shim may be required to achieve the required force.

h. Replace cam front cover, top cover, and gaskets. Be sure to replace ground lead on lower right-hand screw on cam front cover, placing star washer, terminal lug, star washer, and screw, in that order.

i. Replace ribbon assembly.

Adjusting Shuttle Drive Belt – The shuttle drive belt must be adjusted to obtain correct tension between motor pulley and flywheel. If tension is not correct (as determined by procedures in *Checking Shuttle Drive Belt Tension*), proceed as follows:

a. Loosen screws that hold shuttle drive motor to its mount, and adjust motor up or down until drive belt is correctly tensioned. Then tighten motor mount screws.

b. Recheck shuttle belt tension and readjust if necessary. If tension is correct, replace cam top cover and gasket and secure with screws and star washers, then restore printer to normal operation.

Replacing Shuttle Drive Belt – To replace the shuttle drive belt, perform the following procedures:

a. Remove screws and washers holding the cam top cover. First wipe off any metal flash left by the star washers, then remove cover and gasket.

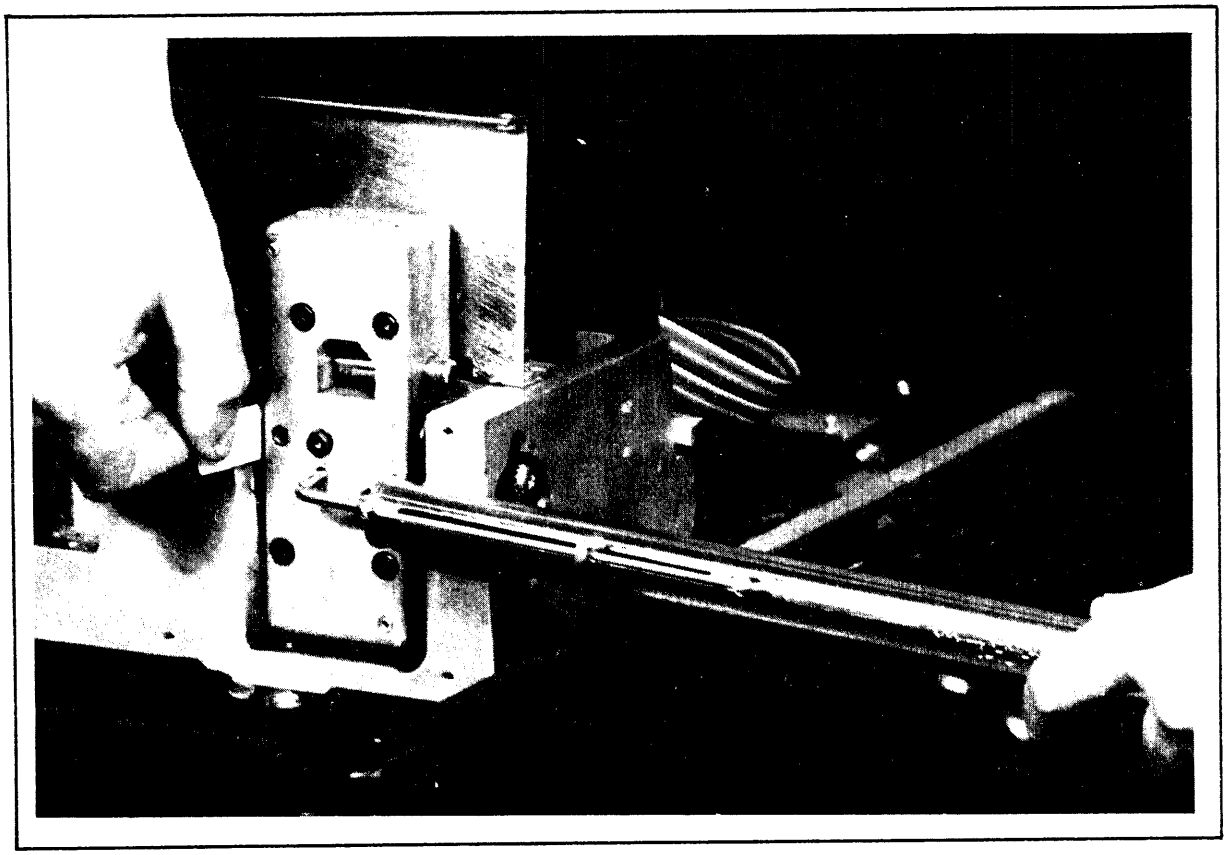


Figure 58 Checking Counterbalance Spring Force

b. Back-off magnetic pickup so that it is well clear of the flywheel assembly. To do this, loosen screw behind magnetic pickup arm, and then move pickup to the rear, away from flywheel.

c. Remove shaft retainer screw at each end of the flywheel shaft.

d. Lift rear end of flywheel shaft and slip shuttle drive belt off the flywheel rim, and then off the rear end of shaft.

e. Remove belt from the drive motor pulley. (Make sure pulley is secure on the shaft.)

f. Install the new belt over drive motor pulley and over the rear flywheel shaft and flywheel rim, being sure belt teeth are aligned with grooves in pulley.

g. Be sure that rear end of flywheel shaft is against the pin stop in the main casting (figure 59), then insert and tighten screws that hold each end of the flywheel shaft.

h. Rotate flywheel a few turns to align belt with drive motor pulley.

i. Adjust belt tension (refer to *Adjusting Shuttle Drive Belt*).

j. Perform procedures for *Adjusting Magnetic Pickup*.

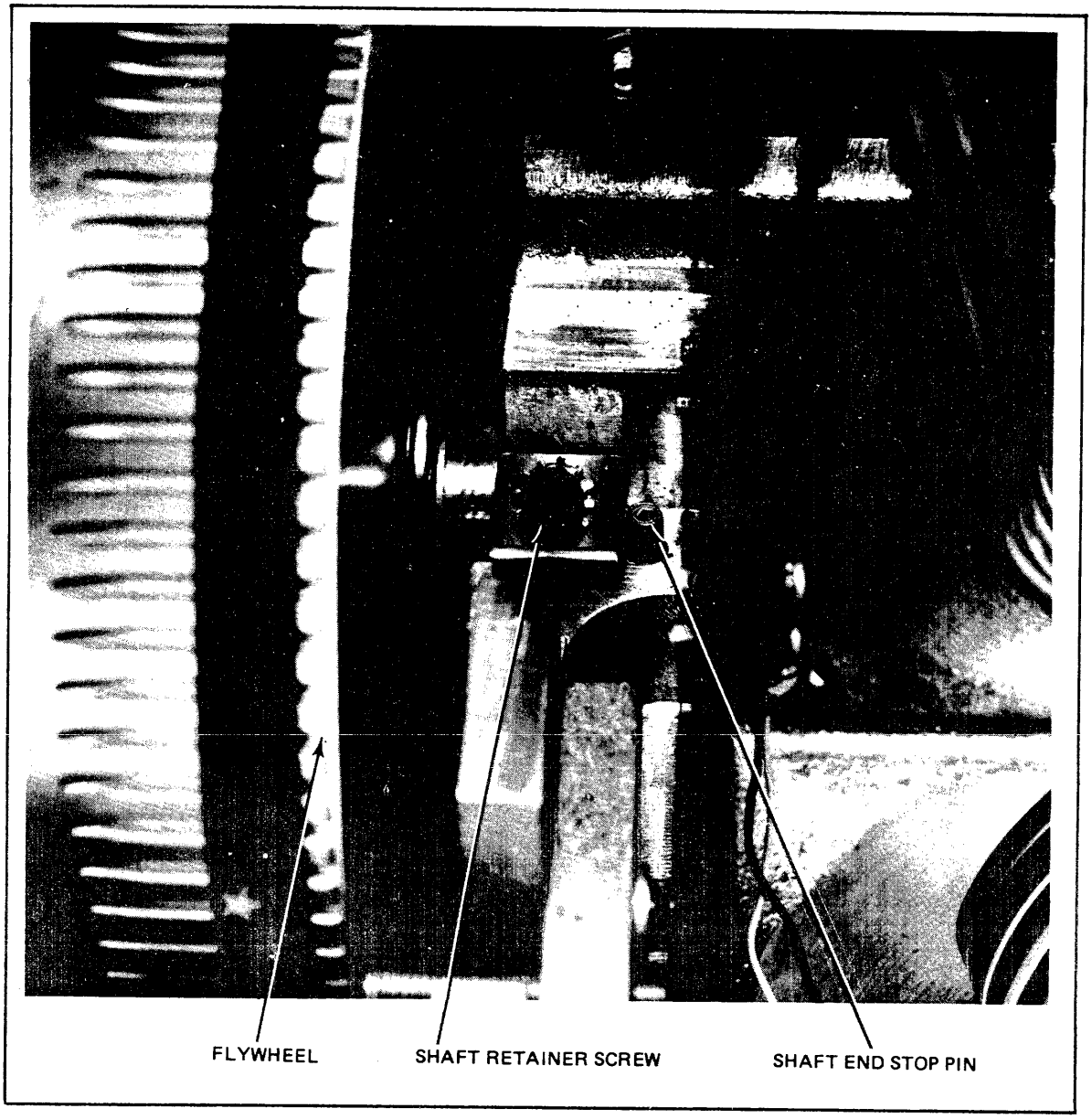


Figure 59 Positioning Flywheel Shaft

Replacing Shuttle Drive Motor and Pulley – To remove a shuttle drive motor, or to change the pulley (to adapt the printer for 50-Hz or 60-Hz line frequency), proceed as follows:

NOTE

When changing the printer to operate on a different line frequency, be sure to refer to *Adapting Printer for Line Frequency* for parts identification.

a. Disconnect ac power from the printer.

b. Remove printer cover (refer to *Removing and Replacing Printer Cover*).

c. Remove the two screws and star washers in cam top cover. First wipe off any metal flash left by star washers, then remove cover and gasket.

d. Loosen the four screws that hold shuttle drive motor to its mount, permitting motor to lower to the bottom of the screw slots.

e. Slip drive belt off drive motor pulley.

f. Remove cover from adjacent terminal strip, then remove motor leads (tagged with numbers to match terminal numbers) from terminals.

g. Disconnect motor ground lead at its terminal.

h. Supporting weight of the motor, remove the four screws and washers from motor mount, releasing the motor.

i. Remove motor, moving it rearwards to clear the paper feed motor, and then lifting it upwards.

j. To remove and replace pulley, perform the following steps:

1. Remove the three screws and star washers that hold pulley assembly to face of adapter (attached to motor shaft).

2. Remove flanges and pulley from end of motor shaft.

3. Slip new pulley and flanges onto motor shaft.

4. Align screw holes in inner and outer flanges and pulley, then replace and tighten the three screws and star washers.

To replace the shuttle drive motor, reverse removal procedures. When connecting motor wires, be sure that labelled leads are connected to same-numbered terminals of the terminal strip.

Perform procedures outlined in *Adjusting Shuttle Drive Belt*.

Replacing Counterbalance Assembly – The counterbalance assembly may need to be removed to replace a worn shaft, bushing, or spring, or to remove and replace the flywheel assembly. To remove and replace the counterbalance assembly, perform the following steps:

a. Remove the screws and washers holding the cam top cover. First wipe off any metal flash left by the star washers, then remove cover and gasket.

b. Remove the screws and star washers holding the cam front cover, then remove the plate with its gasket.

c. Remove the two screws and star washers that retain the counterbalance leaf spring (which holds the upper guide shaft), then remove the spring by pressing the sides of the split spring together.

d. Remove the four screws and star washers from the lower shaft assembly, then pull the lower shaft assembly out of the counterbalance (figure 60).

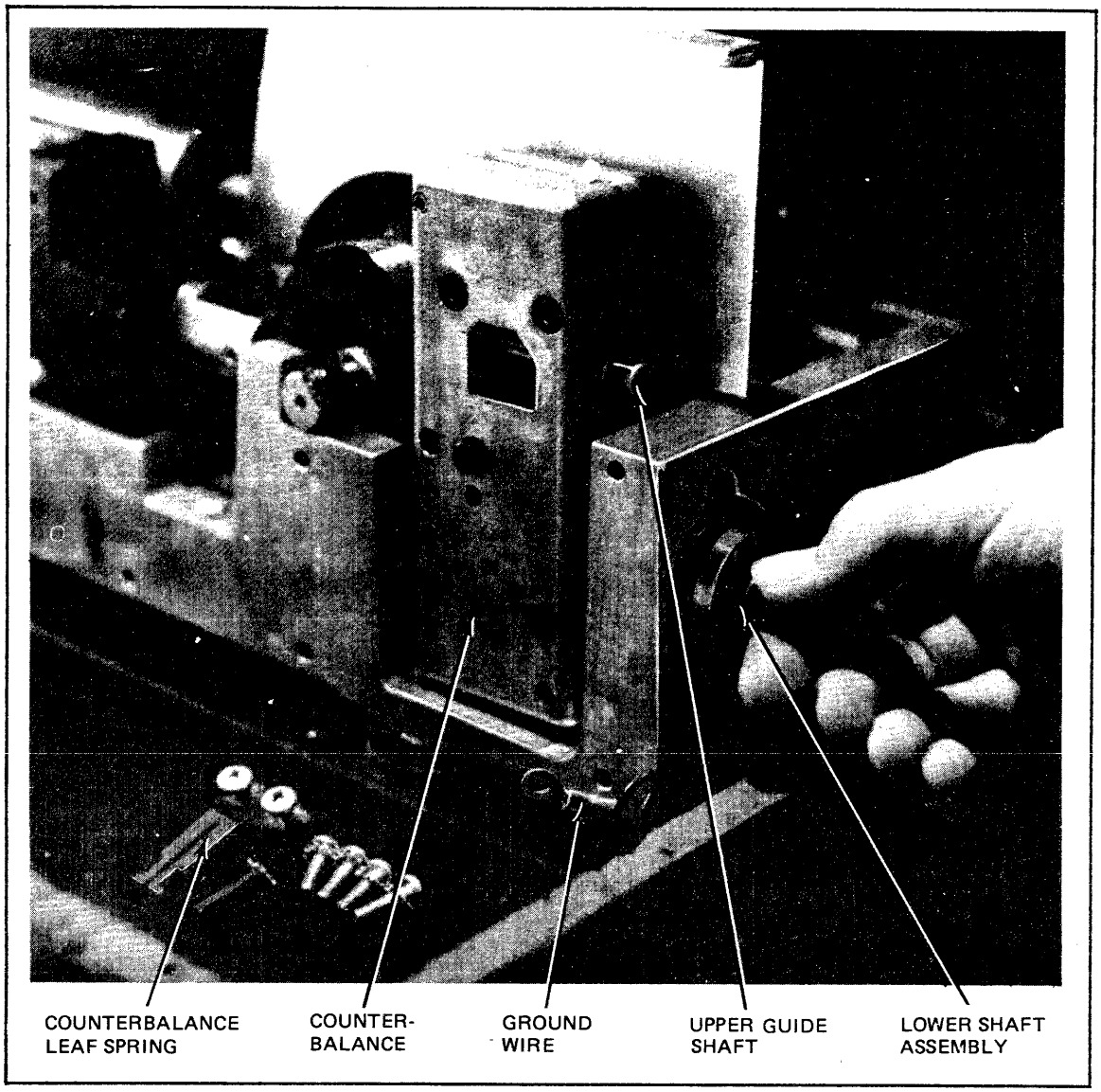


Figure 60 Removing Counterbalance Assembly

e. Remove the screw that holds the shuttle spring guide to the casting.

f. Pull the left-hand side of the counterbalance forward, while compressing spring, to move it off the cam. The counterbalance, with spring guide, shims, and upper guide shaft, will come free as it clears the cam.

To replace the counterbalance assembly, reverse the preceding removal steps. When replacing the same assembly removed in preceding steps, replace the same shims. If a different assembly is installed, perform procedures outlined in *Adjusting Counterbalance Spring Force.*

Replacing Flywheel Assembly – The flywheel assembly may need to be replaced because of worn bearings, galled or worn cam, or damaged timing disk. To remove the flywheel, proceed as follows:

a. Remove counterbalance assembly, following procedures in *Replacing Counterbalance Assembly.*

b. Back-off magnetic pickup so that it is well clear of the flywheel assembly. To do this, loosen screw at rear of magnetic pickup arm, and then move pickup arm to the rear, away from the flywheel.

c. Remove the screw holding each end of the flywheel shaft.

d. Lift flywheel assembly, slip shuttle drive belt drive off flywheel rim and rear flywheel shaft, and remove flywheel assembly.

To replace the flywheel assembly, perform the following steps:

a. Lift new flywheel into position, slipping shuttle drive belt over rear shaft and onto flywheel rim. Be sure belt teeth engage grooves in pulley.

b. Making sure that rear shaft is in contact with stop pin in main casting, tighten shaft retaining screws.

c. Rotate flywheel a few turns to align shuttle drive belt with drive motor pulley.

d. Replace counterbalance assembly, following replacement procedures in *Replacing Counterbalance Assembly*, but do not replace cam covers.

e. Position magnetic pickup in approximately its normal operating position, then tighten the screw behind magnetic pickup arm. Then adjust magnetic pickup in accordance with procedures outlined in *Adjusting Magnetic Pickup*.

f. Check shuttle drive belt adjustment and adjust tension if necessary (refer to *Adjusting Shuttle Drive Belt*).

g. Check cam oiling wick to be sure it is in contact with the cam.

h. Replace cam top and front covers, along with their gaskets. This completes flywheel replacement procedures.

Adjusting Magnetic Pickup There are two procedures in adjusting the pickup. The first procedure establishes the optimum gap between the pickup and the timing disk. The second sets timing so that dots printed in alternate shuttle movements are vertically aligned.

To adjust the gap between pickup and timing disk, proceed as follows:

a. Make sure that the screw at rear of magnetic pickup arm is tight.

b. Loosen screw on upper surface of magnetic pickup arm so that pickup may be rotated in its threads.

c. Using a feeler gauge between pickup and timing disk (figure 61) rotate pickup until the narrowest pickup-to-disk gap (throughout disk revolution) is 0.010 in. ±0.002 in.

CAUTION

Be certain that magnetic pickup is adjusted and locked in place before the flywheel is turned. The pickup and timing disk may be destroyed if rotating disk contacts the magnetic pickup.

To adjust hammer phasing, perform the following steps (gap must first be set in accordance with the preceding steps):

a. Slightly loosen phasing-adjustment screw (figure 61) on rear of magnetic pickup arm so that the arm can be manually pivoted through a vertical arc with some force applied. Arm *must not* swing freely.

b. Load printer with 14-7/8-inch-wide, single-part paper, then connect Exerciser to the external interface connector, and set-up Exerciser as follows:

L.L. = 132
CHAR = H
SPEC = NONE
FUNCT = LF
POLARITY = LO if W7 on Logic Board A is installed, HI if that jumper is not installed

c. Press ON LINE pushbutton and observe relative horizontal position of dots in alternate rows. Rotate magnetic pickup arm until dots in alternate rows are aligned within tolerances (figure 62). Note that for a letter such as H, dots can be aligned perfectly in only one of the two vertical strokes. Adjust phasing to optimize alignment in both strokes.

d. When alignment is correct, tighten phasing-adjustment screw at rear of magnetic pickup arm.

Replacing Magnetic Pickup – To replace a failed magnetic pickup, proceed as follows:

a. Loosen screw on upper surface of magnetic pickup arm so that pickup assembly may be rotated in its threads.

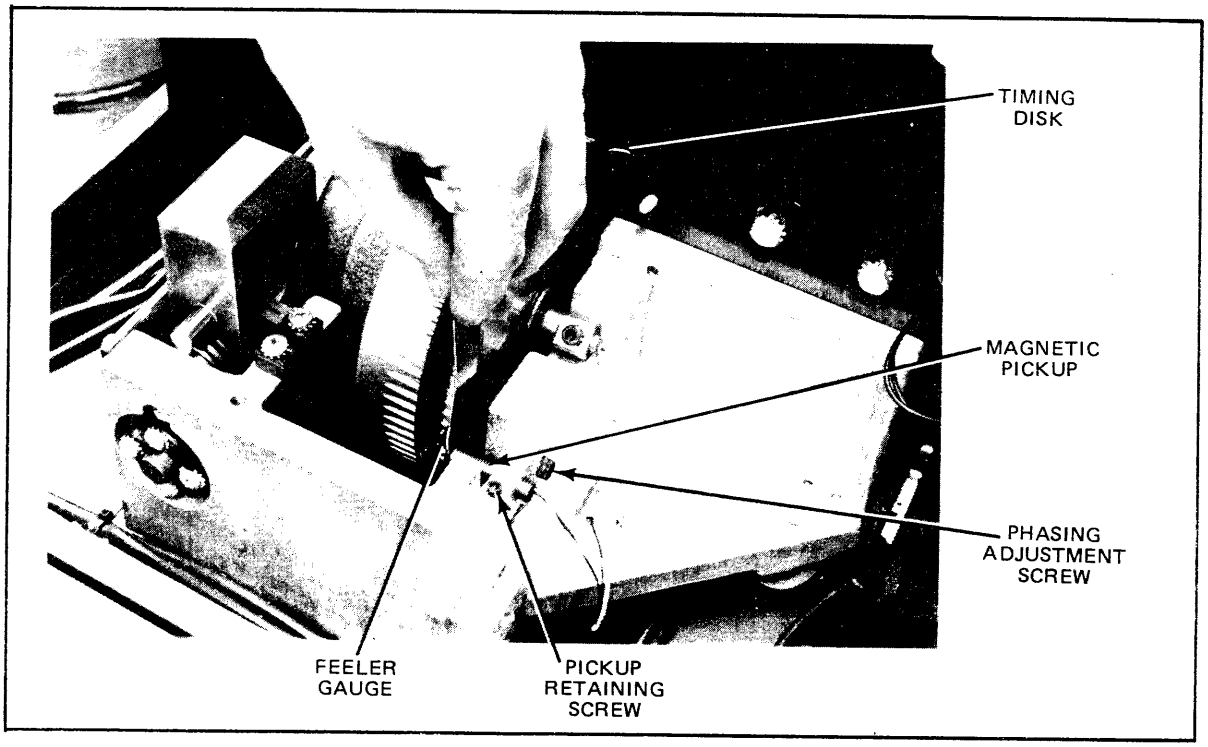


Figure 61 Adjusting Magnetic Pickup Gap

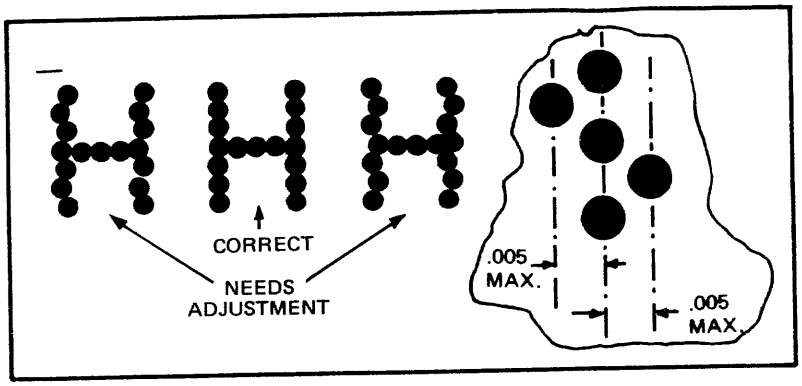


Figure 62 Effect of Magnetic Pickup Phasing Adjustment

b. Remove pickup leads from terminals 1 and 2 of adjacent terminal strip.

c. Unscrew magnetic pickup assembly until it is clear of the magnetic pickup arm, then remove from the printer.

d. Screw new magnetic pickup assembly into magnetic pickup arm until pickup is approximately 1/8 inch from timing disk.

e. Connect pickup leads to terminals 1 and 2 of the adjacent terminal strip (black lead to black, white lead to red).

f. Perform procedures outlined in *Adjusting Magnetic Pickup*.

Paper Feed Mechanism

The paper feed mechanism includes the paper feed motor and pulley, paper feed belt, spline shaft assembly and pulley, vertical forms adjustment controls, paper tractors, the lower tractor support shaft, platen, and paper ironer (figure 63).

Adjusting Paper Feed Belt -- The paper feed belt must be adjusted to obtain correct tension between motor and spline shaft pulleys. If tension is not correct (as determined by procedures in *Checking Paper Feed Belt Tension*), proceed as follows:

a. Loosen the four screws holding paper feed motor to its mount.

b. Adjust motor position to either loosen, or tighten, the belt to achieve the specified tension, then tighten motor mounting screws.

c. Recheck belt tension, and make sure belt is centered on smaller pulley. Readjust and recheck tension if necessary.

Replacing Paper Feed Belt -- To replace a paper feed belt, proceed as follows:

a. Loosen set screw in knurled Vertical Forms Adjustment knob.

b. Remove knob, coil spring, washer, and Vertical Forms Adjustment disk from spline shaft.

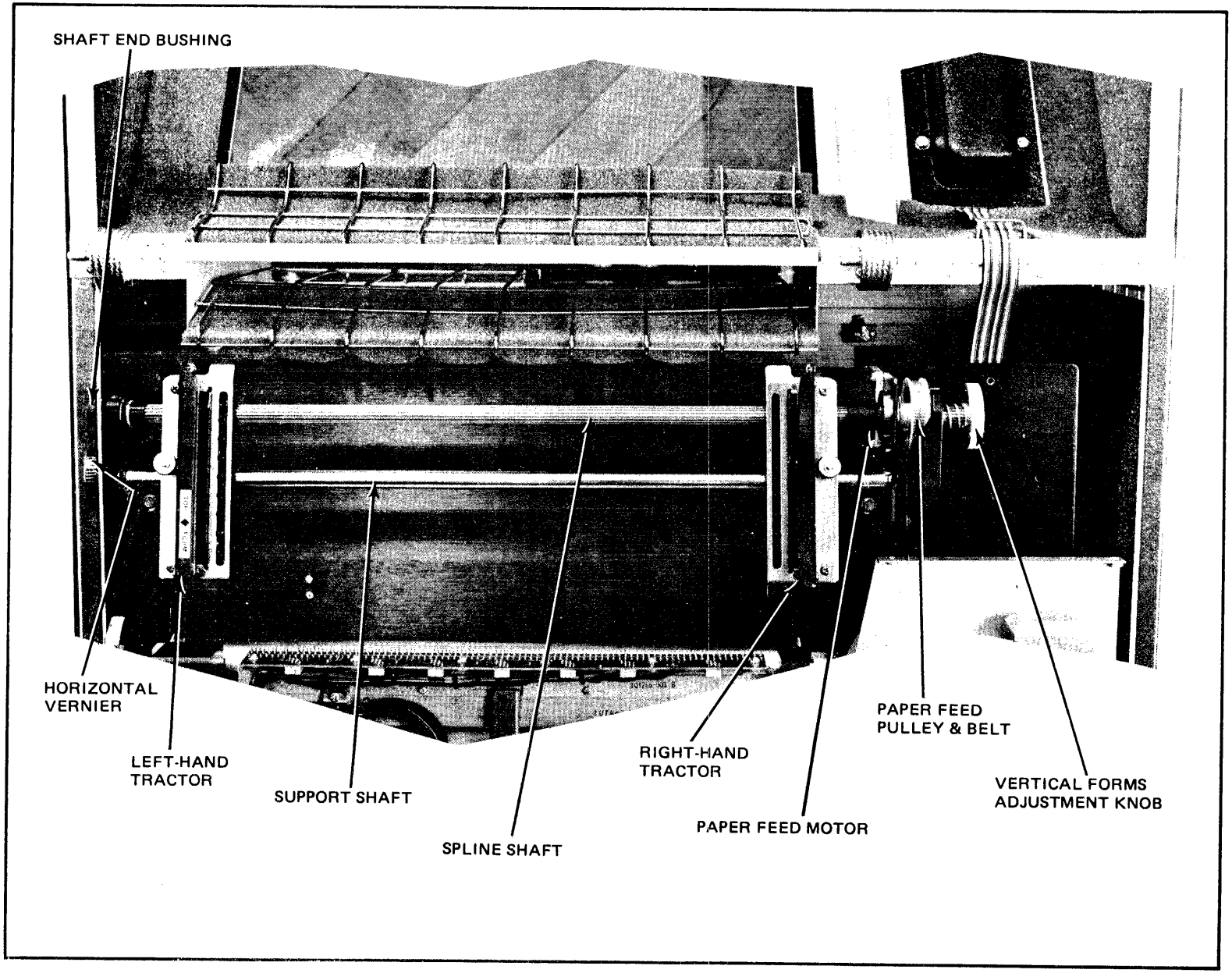


Figure 63 Parts of Paper Feed Assembly

c. Loosen set screws in paper feed motor pulley, then pull pulley from paper feed motor shaft. If necessary, loosen set screw in bushing at left-hand end of spline shaft and slide entire shaft to the right along with paper feed belt and motor pulley until pulley is free of motor shaft.

d. Remove paper feed belt from paper feed motor pulley, then from spline shaft pulley, and remove belt over end of spline shaft.

e. Install new belt over end of spline shaft and spline shaft pulley, then over paper feed motor pulley, and replace paper feed motor pulley on motor shaft.

f. Slide spline shaft back to the left and replace bushing on shaft. Allow an axial clearance between bushing and support frame of 0.005 in. to 0.010 in.

g. Apply Loctite to threads of bushing set screw, then tighten set screw in bushing. Use Loctite carefully, being careful not to drop the compound onto shaft or pulley.

h. Align paper feed motor pulley with spline shaft pulley, and center paper feed belt on motor pulley.

i. Apply Loctite to threads of motor pulley set screws. Use Loctite carefully, being careful not to drop the compound onto shaft or pulley.

j. Tighten set screws in motor pulley, making sure screws are perpendicular to flat of shaft.

k. Install Vertical Forms Adjustment disk, washer, coil spring, and knurled knob on spline shaft.

l. Apply Loctite to threads of knob set screw. Apply Loctite carefully, being careful not to drop the compound on shaft or knob.

m. Replace set screw in knob and tighten.

n. Check tension of paper feed belt and adjust, if necessary, following procedures in *Adjusting Paper Feed Belt.*

o. Make sure that paper tractors have remained parallel on the shafts, and adjust if necessary.

Replacing Paper Feed Motor -- To remove a paper feed motor, remove printer cover, then perform the following steps:

a. Rotate Vertical Forms Adjustment knob so that set screws in paper feed motor pulley are exposed.

b. Disconnect PF MOTOR cable from power supply circuit board.

c. Cut spot ties holding motor cable.

d. Loosen set screws in paper feed motor pulley.

e. Remove the four screws and star washers holding the paper feed motor, then back-out motor from its mount, slipping pulley off the shaft.

f. Remove paper feed motor and cable.

Perform the following steps to replace the paper feed motor:

a. Position new motor so that pulley can be pressed over motor shaft. Make sure that set screws in pulley are aligned perpendicular to flats on motor shaft.

b. Remove set screws and apply a drop of Loctite to threads of each, then install screws loosely in pulley. Be sure that excess Loctite does not drip onto pulley or motor shaft, or into other mechanisms.

c. Insert and tighten star washers and screws that hold the paper feed motor.

d. Align paper feed belt by adjusting position of pulley on motor shaft, then tighten set screws in pulley.

e. Connect motor cable to PF MOTOR connector on power supply circuit board.

f. Install new spot ties to hold paper feed motor cable.

g. Perform procedures in *Adjusting Paper Feed Belt* before restoring the printer to operation.

h. Replace printer cover.

Adjusting Paper Feed Tractor Belt – Both tractor belts should be adjusted so that moderate finger pressure will lift belt approximately 1/16th inch from the rear of the tractor frame. Tension is adjusted by changing the distance between upper and lower tractor sprocket wheels.

a. With fingertip, lift belt away from rear of tractor frame. If belt moves away from the frame more or less than 0.05 in. ±0.02 in., perform the following steps.

b. Hold hex nut at outer side of lower sprocket wheel hub and, with an Allen wrench wrench, loosen screw on inner side of hub (figure 64).

c. If belt is too loose, press lower sprocket wheel downwards (tightening the belt), and then tighten Allen screw.

d. If belt is too tight, raise lower sprocket wheel (loosening the belt), and then tighten Allen screw.

e. Check belt tension and readjust, if necessary, until tension is correct.

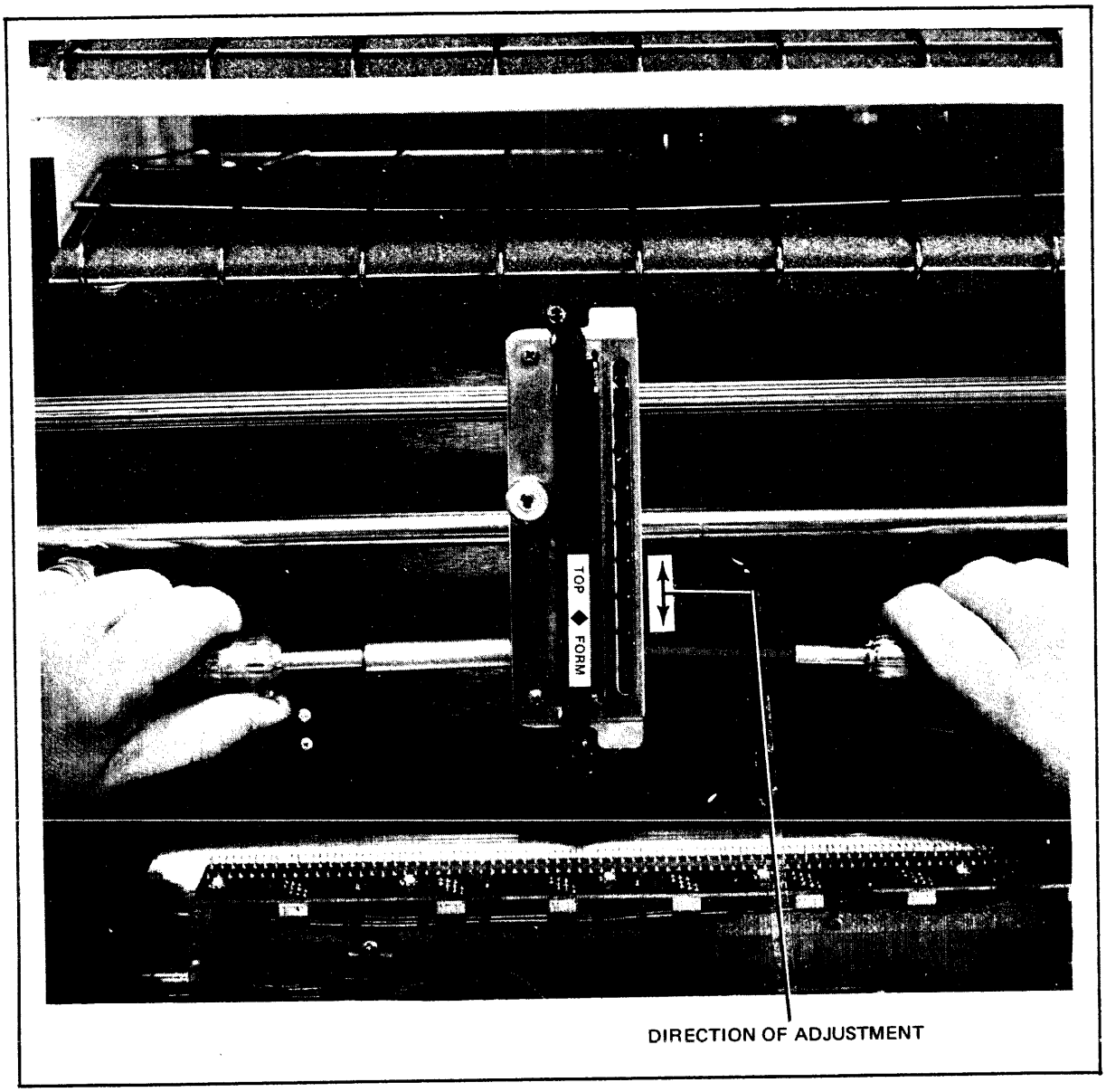


Figure 64 Adjusting Tractor Belt Tension

Adjusting Tractor Shoe – The tractor shoe should rest 0.035 in. ±0.005 in. from the tractor frame. Check the gap using a feeler gauge and, if necessary, adjust as follows:

a. Insert 0.035-inch feeler gauge between shoe and frame (do not lift shoe with gauge).

b. Adjust the Nylon screw at each end of tractor gate (figure 65) clockwise to increase the gap, or counterclockwise to decrease the gap. Adjust both screws so that the gap is 0.035 in. ±0.005 in. at both ends of the tractor shoe. *Be careful* not to overtighten – and break – nylon screws.

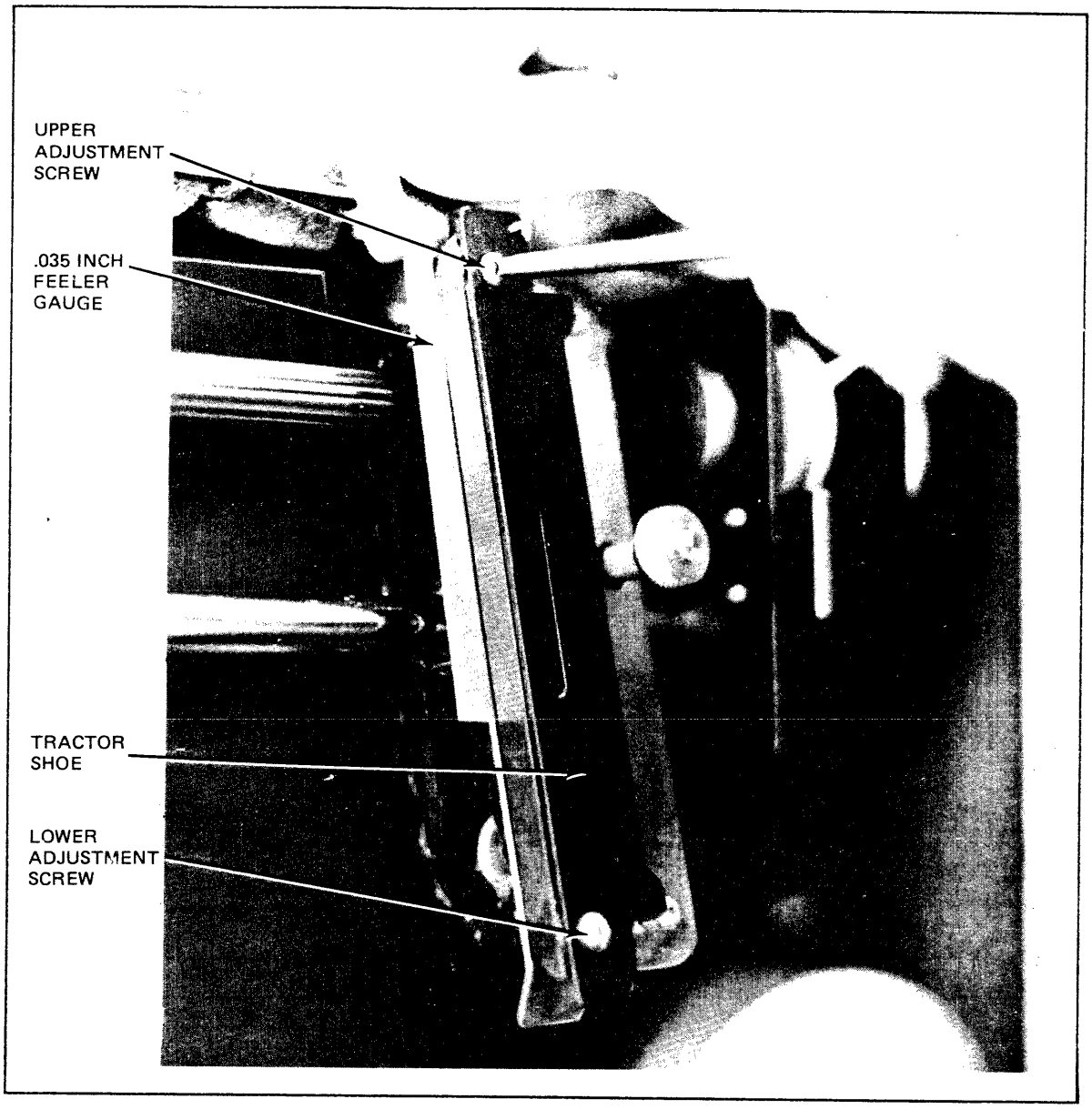


Figure 65 Adjusting Tractor Shoe

Replacing Paper Tractor -- If either paper tractor fails, remove and replace using the following procedures:

a. Remove ac power from printer.

b. Remove paper from printer.

c. Free the left-hand end of the support shaft in the following manner:

1. Remove the two set screws from Horizontal Vernier knob (figure 66); and then remove the axial locking screw, star washer, and flat washer from knob center.

2. Unscrew Horizontal Vernier knob until vernier assembly is free of the tractor support shaft. Do not disassemble Horizontal Vernier assembly.

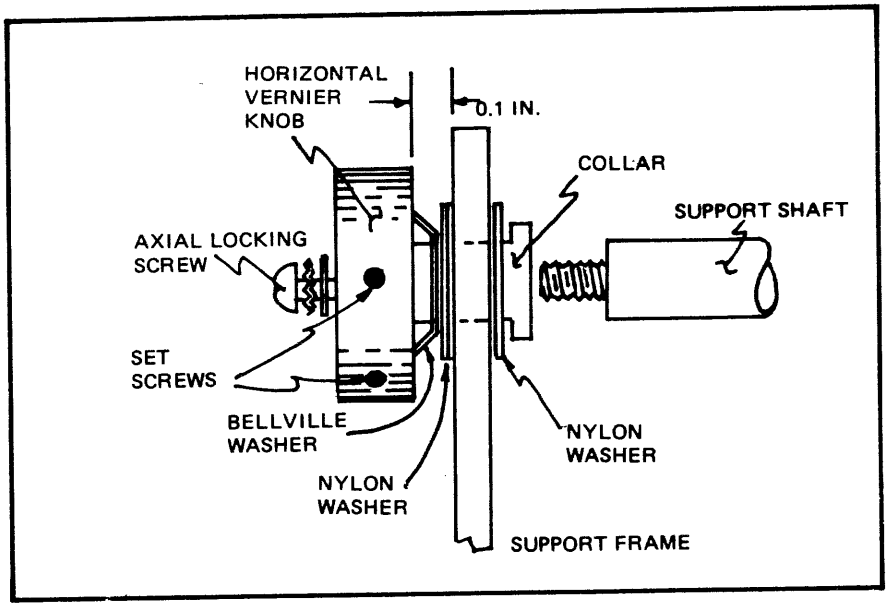


Figure 66 Horizontal Vernier Assembly

d. Free the left-hand end of the spline shaft in the following manner:

1. Remove set screw from bushing on left-hand end of spline shaft, and remove bushing. Use a file to remove burrs (caused by set screw) from spline shaft.

2. Remove set screw from Vertical Forms Adjustment knob, then remove knob, coil spring, washer, and Vertical Forms Adjustment disk from right-hand end of spline shaft.

3. Remove set screws from paper feed motor pulley, then pull pulley from motor shaft.

4. Slide spline shaft (along with paper feed belt and motor pulley) to the right.

NOTE

If printer includes paper-motion detector, be sure to remove detector assembly from left-hand tractor before removing tractor (refer to *Removing and Replacing Paper Motion Detector.*

e. Slide left-hand tractor off left-hand end of spline and support shafts.

f. If left-hand tractor is to be replaced, slide new tractor over ends of spline and support shafts, then reassemble mechanism (step k.).

g. If right-hand tractor is to be replaced, use grip-ring pliers to remove grip ring from support shaft, slipping ring off the left-hand end of the shaft.

h. Slide right-hand tractor off left-hand ends of spline and support shafts, and then slide new tractor onto both shafts.

i. Using grip-ring pliers, slide grip ring over left-hand end of support shaft and position ring four inches from left-hand end of shaft (excluding threaded portion).

j. Slide left-hand tractor onto spline and support shafts.

k. Reassemble spline shaft assembly as follows:

1. Replace paper feed motor pulley (with paper feed belt) on motor shaft.

2. Slide spline shaft back to the left and replace bushing on left-hand end of spline shaft. Allow an axial clearance between bushing and support frame of 0.005 in. to 0.010 in.

3. Apply Loctite to threads of bushing set screw, then install and tighten set screw.

NOTE

Wherever Loctite is used, be careful not to let the compound drop on any part of the printer except the screw threads.

4. Align paper feed motor pulley with spline shaft pulley and center paper feed belt on motor pulley.

5. Apply Loctite to threads of motor pulley set screws, then install and tighten set screws in motor pulley. Make sure screws are perpendicular to flat of shaft.

6. Install Vertical Forms Adjustment disk, washer, coil spring, and Vertical Forms Adjustment knob on spline shaft.

7. Apply Loctite to threads of Vertical Forms Adjustment knob set screw, then install and tighten set screw in knob.

l. Reassemble support shaft and Horizontal Vernier assembly as follows:

1. Slide support shaft to the left to engage threads in bushing of Horizontal Vernier assembly, then rotate Horizontal Vernier knob clockwise to thread support shaft into bushing.

2. Install star washer, then flat washer, on axial locking screw, then install and tighten screw in axis of knob.

3. Apply Loctite to threads of Horizontal Vernier knob set screws, then install and tighten set screws in knob.

m. Check tension of paper feed belt and adjust, if necessary, following procedures in *Adjusting Paper Feed Belt.*

n. Make sure that paper tractors are parallel on the shafts, and adjust if necessary.

Adjusting Paper Out Detector – The paper out detector causes a CHECK condition if either: (1) the Forms Thickness Adjustment lever is in the "load" position, or (2) there is no paper at the platen. The detector is actuated by the platen, pressing against the nylon button behind the platen; or by paper pressing against the switch actuator below the platen.

To adjust the detector, perform the following steps (with printer power on and without paper in printer).

a. Set Forms Thickness Adjustment to position 1.

b. Turn nylon button so that its tip is from 0.01 in. to 0.02 in. from platen surface.

c. Set Forms Thickness Adjustment so that pointer is 1/4 to 1/2 inch from position 6, towards "load" position.

d. Turn nylon button clockwise until CHECK indicator turns off (if it is on), then turn counterclockwise until CHECK indicator turns on.

e. Check paper out detector operation by demonstrating that paper motion stops when either the Forms Thickness Adjustment lever is in the "load" position, or the lever is in any operating position and paper runs out at the platen.

Replacing Paper Out Detector Switch – A failure of the paper out detector will generally be caused by failure of the microswitch actuated by the mechanism. To replace this switch, proceed as follows:

a. Remove ac power from printer, and remove paper.

b. Remove printer cover.

c. Remove the two screws that hold the rear of the power supply assembly to the printer, and slide power supply as far as possible to the rear of the printer.

d. Remove belt cover (the large vertical metal panel to which paper out detector is mounted) in the following manner:

1. Disconnect paper out detector cable from connector on power supply circuit board.

2. If printer includes paper motion detector, cut cable ties that secure its cable to the belt cover.

3. Remove sheet metal screw, at each end of belt cover, that holds belt cover to lower support frame.

4. Remove sheet metal screw, at *rear* of belt cover at each end, that holds upper bracket part of belt cover to support frame.

5. Move right-hand end of belt cover rearwards, then move left-hand end rearwards, then slide belt cover to the left, out of the printer.

e. Remove two screws that hold paper out detector assembly to the belt cover, and swing lower end of assembly out the front of belt cover to expose the switch.

f. Tag the three wires that are soldered to the switch (NC, C, and NO) to match markings on the switch body.

g. Unsolder wires from switch.

h. Remove screw, washers, and nut that hold switch to arm, and remove failed switch.

i. Secure new switch to arm using hardware removed in preceding step, and then solder tagged wires to switch terminals.

j. Reassemble paper out detector assembly, reinstall belt cover, and replace power supply assembly by reversing removal procedures. Replace all cable ties and reconnect paper-out and paper-motion detector cables to power supply printed circuit board.

k. Restore power to printer, then perform procedures outlined in *Adjusting Paper Out Detector*.

Adjusting Paper Motion Detector – Operation of the paper motion detector depends on reflection of infra-red light from the back surface of paper moving through the printer. The distance from detector to paper must be checked and adjusted as follows:

a. With paper in the printer, insert a 0.150-inch feeler gauge between taut paper and face of paper motion detector (located on bottom of left-hand tractor frame.

b. If distance between paper and detector is not 0.150 in. ±0.050 in., loosen screw that holds detector to tractor frame, and position detector at correct distance.

c. Tighten screw that holds detector, then recheck detector-to-paper gap and readjust if necessary. Be sure that front edge of detector is parallel with paper surface.

d. If gap is correct, restore printer to normal operation.

Removing and Replacing Paper Motion Detector – The paper motion detector assembly comprises the detector and its mating connector, cable, and connector which plugs into a mating connector on the power supply printed circuit board. The detector assembly must be removed from the left-hand paper tractor only when: (1) either tractor is to be removed from the printer, or (2) the detector has failed and must be replaced.

Proceed as follows:

a. Remove power from printer, and remove paper.

b. Remove screw and star washer that hold detector on paper tractor frame, and mating nut and washer on bottom of frame.

c. Cut cable ties that hold detector cable to left-hand side of tractor frame. The detector may now be moved out of the way on its cable, to permit removal of paper tractor.

d. If paper motion detector is to be removed from printer, continue to cut cable ties and disconnect connector from power supply circuit board to free assembly.

To replace the paper motion detector, proceed as follows:

a. Position detector on top of horizontal part at bottom of left-hand tractor frame.

b. Install screw and star washer (removed in removal step b.) through top of detector and slot in tractor frame, and then install washer and nut under frame.

c. Run detector cable horizontally to the left and secure with cable tie through hole in lower left-hand side of tractor frame.

d. Run cable up along left-hand side of tractor frame and secure with cable tie through hole in upper left-hand side of frame. Be sure to allow slack in cable to permit left-hand paper tractor to move as far as snap ring on support shaft.

e. Run cable to the left, around rear of belt cover, securing it with cable ties at the hole in left-hand side of support frame, and at assigned points on rear of belt cover.

f. Connect detector cable connector to mating connector on rear of power supply printed circuit board.

g. Perform procedures outlined in *Adjusting Paper Motion Detector*.

Replacing Paper Ironer – The paper ironer should touch the platen all along its length when the platen is in position 1. If the paper ironer becomes bent or kinked and does not evenly contact the paper, it will cause ribbon misguiding and folding. Replace it in the following manner:

a. Set platen to Load position (fully open).

b. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

c. Remove shuttle assembly (refer to *Replacing Hammer Bank Assembly*). Removing the shuttle assembly exposes the four paper ironer retaining screws.

d. Loosen the four recessed screws that hold the paper ironer.

e. Lift the paper ironer up and out of the printer.

f. Carefully align slots of a new paper ironer with the four retaining screws (figure 67), and insert it between the frame and the retainer plate until slots bottom-out against the screws.

g. To tension paper ironer to keep it absolutely flat, first tighten screw nearest the center of paper ironer length. Then, holding paper ironer at upper corners (being careful not to deform corners), pull downwards and outwards, tightening screws successively towards the ends.

h. When all retaining screws are tightened, check to be sure paper ironer touches the platen along its length, when platen is in position 1. Readjust if necessary.

i. Replace shuttle assembly and ribbon assembly, then restore printer to normal operation.

Adjusting Platen Spacing – In order to obtain correct and uniform print density, the gap between the platen and each hammer tip must be made very uniform.

To check and adjust platen spacing, proceed as follows:

a. Turn off ac power and remove paper from printer.

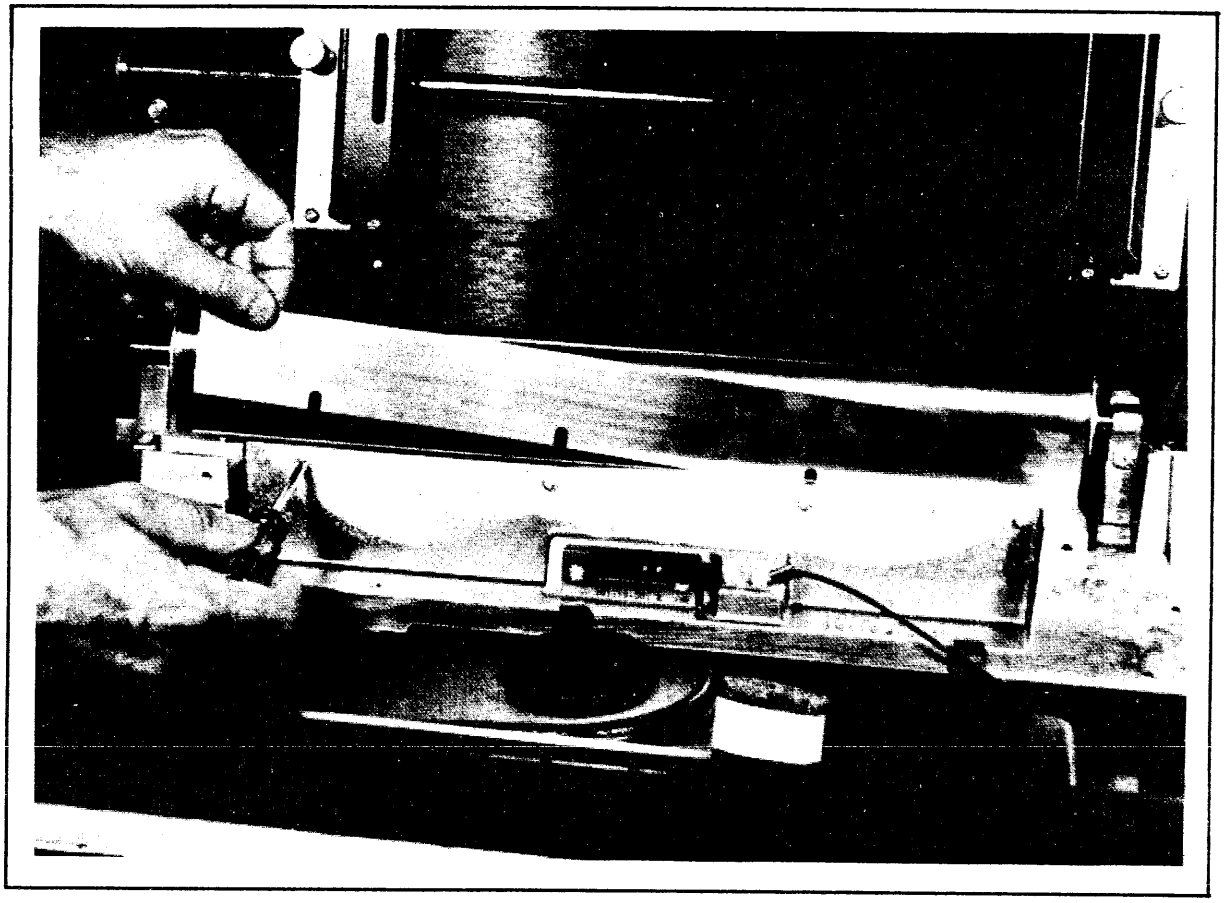


Figure 67 Replacing Paper Ironer

b. Remove ribbon assembly (refer to *Removing and Replacing Ribbon Assembly*).

c. Set Forms Thickness Adjustment lever to Load position (platen fully open).

d. Insert a 0.012-inch feeler gauge between platen and hammer tips, and then carefully move Forms Thickness Lever to position 1. *Do not force* into position 1 against the feeler gauge. With platen fully closed (position 1), the gap should be 0.012 in. ±0.0005 in., and feeler gauge should slip between hammer tips and platen with very little friction but in contact with both surfaces. Do *not* try to "poke" edge of gauge between contacting surfaces.

e. If gap is not as specified, at *both ends* of the platen, adjust screw (at each end of platen) that limits rearward travel of the platen shaft. Using a 5/32-inch socket wrench on a 12-inch extension, and working through the rear door of the printer, rotate adjustment screw clockwise to decrease the gap, and counterclockwise to increase the gap. The adjustment is approximately 0.007 inch per 90 degrees of screw rotation. Screws rotate in self-locking nuts.

f. When gap is correctly adjusted at each end, replace ribbon assembly and restore printer to normal operation.

Power Supply

Power supply circuits include elements of the power supply contained directly on the chassis of the power supply, components contained on the circuit board/heat sink subassembly, the rear cooling fan and the ac power switch, all of which are mounted on the power supply chassis (figure 68).

The power supply circuit board may be removed from the power supply chassis with the printer cover and chassis in place. Other maintenance procedures (other than fuse replacement) require either that the power supply assembly be removed from the printer, or that the printer cover be removed.

Replacing Ac Line Fuses – Ac line fuses are located in fuse holders in the transformer cover at the rear of the power supply assembly. They are accessible when the card cage is swung open.

For printers operating at line voltages up to 120V ac, only the right-hand fuse holder (facing rear of printer) contains a fuse (12-ampere Slo-Blo). For printers operating with a 220V ac line, both sides of the line are fused and both fuse holders contain a fuse (8A Slo-Blo).

When rewiring a fuse holder for any reason, be sure that the fused side of the line connects to the exposed part of the fuse holder.

To remove an ac line fuse, first turn off ac power, then twist out the fuse holder cap, replace fuse, and replace fuse holder cap in the power supply assembly.

Replacing Dc Supply Fuses – Fuses for the dc power supplies are held in clips on the lower part of the power supply printed circuit board, and are accessible when the card cage has been swung open. Fuses are fast-blow types.

Fuses (from top to bottom) are:

Fuse	Type	Supply
F1	6A3AG	+8V
F2	3A3AG	-28V
F3	3A3AG	+30V

WARNING

To avoid injury and possible damage, be sure to turn-off the ac power switch before handling fuses on the power supply printed circuit board. Do not replace fuse until ac power has been off for at least 15 seconds.

Replacing Power Supply Circuit Board – It is necessary to remove the Power Supply Circuit Board/Heat Sink Assembly in order to replace components (other than fuses) on the board. To remove the Circuit Board/Heat Sink Assembly, perform the following steps:

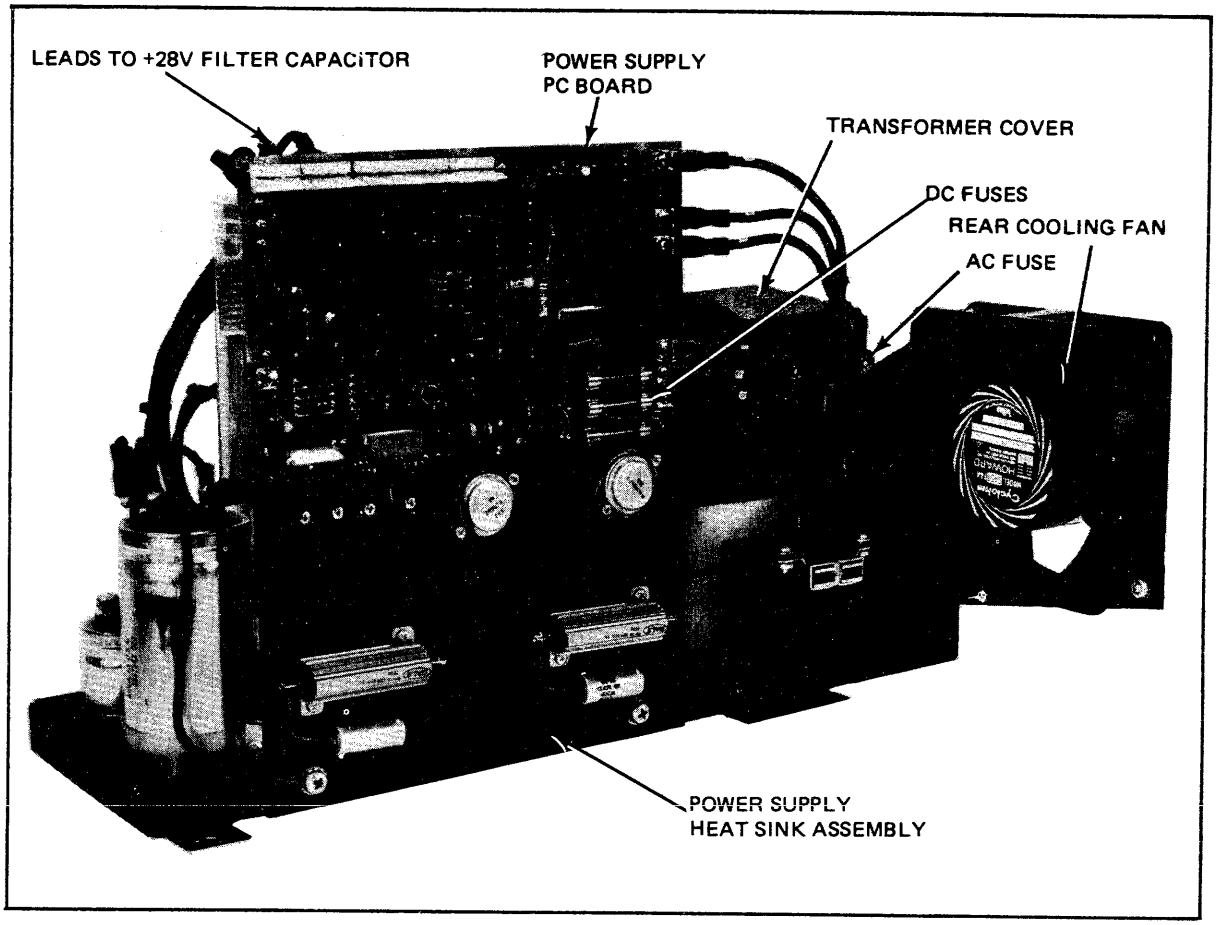


Figure 68 Power Supply Assembly

a. Disconnect the four Molex-type multi-pin connectors at upper edge of the circuit board, and ribbon cable connector (J2) at its left-hand edge.

b. Disconnect wires from all quick-disconnect terminals on the right- and left-hand edges of the circuit board. Note that wire identification matches numerals identifying terminals on the board.

c. Remove the two screws at the lower edge of the heat sink, and then remove the circuit board heat sink assembly.

To replace the Circuit Board/Heat Sink Assembly, reverse procedures outlined in steps a., b., and c.

Test power supply voltages as follows:

a. Remove +28V wires from power supply (at the larger, +28V filter capacitor), and from the hammer driver board.

b. Turn on ac power (nominal line voltage).

c. With ambient temperature near +25°C, with paper installed in printer, Exerciser connected, and platen set to turn off CHECK indicator, measure voltages as follows, using digital voltmeter:

1. At Logic Board B, measure:

   +5V dc ±0.25V dc
   −12V dc ±1.2V dc

2. At power supply printed circuit board, measure:

   +28V dc ±1.0V dc
   −30V dc (−40V dc to −28.5V dc).

d. If all voltages are within tolerances, turn off ac power, reconnect +28V dc wires to power supply and hammer driver board, and restore printer to normal operation.

If voltages are out of tolerance, troubleshoot and repair power supply circuits.

Removing and Replacing Power Supply Assembly – A failure in the power supply that is not caused by a component on the power supply printed circuit board will usually necessitate removal of the entire power supply assembly. It is possible to remove the power supply assembly with the printer cover in place. To remove the power supply assembly, proceed as follows:

a. Open printed circuit card cage.

b. Disconnect all connectors from the upper edge, and left-hand edge (looking from the rear of the printer) of the power supply circuit board.

c. Remove screws and washers at the bottom-rear of the power supply assembly.

d. Disconnect quick-disconnect terminals at the ac line filter at the rear of the printer (note lead connections to be sure they are not reversed in re-assembly).

e. At the larger (+28V) filter capacitor, disconnect wires that go to the Hammer Driver board and to Logic Board A.

f. Loosen screws that hold power supply printed circuit board to power supply assembly, then loosen nut that retains the power transformer cover and swing the right-hand end of the cover up to expose wiring.

g. Disconnect ribbon assembly power wires from transformer terminals, then return transformer cover to its closed position.

h. Lift rear of power supply assembly slightly and pull rearwards, being careful not to hit ac power switch against cabinet. Then shift power supply assembly to the left, pivot right-hand end towards the rear of the printer, and move assembly towards the rear until it clears the printer cover.

To replace the power supply assembly, reverse removal procedures, being sure to correctly connect wires to the larger capacitor and to the power supply transformer. Connect ac power wires so that the *high* side of the ac line connects to the AC POWER switch, and the other side of the AC POWER switch connects to the fuse.

Replacing Rear Cooling Fan – Perform the following procedures to remove and replace the rear cooling fan:

a. Turn off ac power to the printer.

b. Remove printer cover.

c. Remove two screws that hold bottom of power supply printed circuit board to power supply assembly, then move printed circuit board to the left to expose left-hand rear of transformer cover.

d. Remove nut and washers at left-hand rear of transformer cover, and loosen nut at right-hand rear of cover.

e. Lift off transformer cover to expose terminal strip at rear of transformer.

f. Loosen screws at terminals 1 and 5 (numbered from left-hand end) and remove fan wires from terminals.

g. Remove the three screws that hold fan to side of chassis, then remove fan.

h. Replace with new fan, reversing removal procedures.

Adapting Printer for Line Frequency – If the printer is configured for either 50-Hz or 60-Hz line power but is to be operated in a location supplying power at the other frequency, the shuttle drive motor pulley assembly must be replaced in order to maintain shuttle timing relationships.

Refer to *Replacing Shuttle Drive Motor and Pulley* for procedures. Be sure that correct parts are installed as follows:

Frequency	Pulley	Flanges
50 Hz	101778-002	101779-002
60 Hz	101778-001	101779-001

MNEMONIC DICTIONARY

The following list presents and defines, in alphabetical order, the mnemonics used in logic diagrams contained in the *Drawings* manual. (Initial N denotes negative-true.)

BC	Binary Count (EVFU · · · DB5 True)
CC1, CC2	Character Column Binary Count
CLK, CLK A, CLK B	Clock (2-MHz system clock)
COM	Serial Data to Hammer Bank Shift Register
DB1-DB8	Latched Data Bits
DC1-DC4	Dot Column Binary Count
EDT	Enable Data Transfer
EOP	End of Print
EPFP	End Paper Feed Pulse
EPP	Even Paper Pulse
ESR	End Shift Register (shift register justified)
EVR	Enable EVFU Ready
FLL	Form Feed Last Line (line 65)
FMFD	Form Feed
GND	Ground
HB21	Hammer Bank Hammer 21
HC1-HC44	Hammer Coil Drive
HMC	Hammer Master Clear (+5V dc up)
IACK	Acknowledge (interface)
IBOF	Bottom of Form (interface)
ICBY	Busy (interface)
ICPE	Ready (interface)
ICSTB, IDSTB	Strobe (interface . . . from controller)
IDB1-IDB8	Data Bits (interface)
IDR	Data Request (interface . . . "demand")
IONL	On Line (interface)
IPI	EVFU Control (interface)
IRDY	Ready (interface)
LCHK	Check Lamp
LD	Load EVFU
L8LPI	8 LPI Lamp (control panel)
LONL	On Line Lamp (control panel)
LVRDY	Top of Form Lamp (control panel EVFU loaded)
MAG PICKUP	MPU Timing Disk Sense (ac wave)
MC	Master Clear (Power-up Start)
MC3	Master Clear to MVFU
MPU	Magnetic Pickup (amplified)
NBOF	Bottom of Form (EVFU)
NDBEL	(not used)
NDCRR	Decoded Carriage Return
ND8LPI	Enable 8 LPI (decoded command)
NDELC	Elongated Character (decoded command)
NDFMFD	Form Feed (decoded command)
NDLC	Delayed Last Count (EVFU · · · RC=0)

NDLNFD	Line Feed (decoded command)
NDSTB	Delayed Strobe
NDUL	Underline (decoded command)
NDVT	Vertical Tab (VFU . . . decoded command)
NECR	End Carriage Return
NECS	Extended Character Set (SOV+IDB8)
NEFF	End Form Feed (line 66)
NELB	End Load Buffer (RESYNC · EOL)
NELD	End Load (VFU)
NEMV	MVFU Move
NEOL	End of Load (buffer loaded)
NEVC	MVFU Runaway
NFIR	0-64 Character Enable
NFL	Paper Motion Fault
NFMRS	Form Feed Reset
NFLT	Fault (power supply or interlock)
NHCK	Hammer Latch Clock
NHRS	Hammer Reset
NHSC	Hammer Shift Clock (330 KHz)
NLC	Lower Case Strobe
NMVE	MVFU Enable
NOCD	Output Clock Disable (for test)
NONL	On Line
NOPP	Odd Paper Pulse
NPADV	Paper Advance
NPAL	Print Additional Lines
NPC	Latched Printable Character
NPDE	Print Disable
NPT	Printable Character (no strobe)
NPTCH	Printable Character (strobed)
NPSYNC	Print More Resync
NRCR	Reset Row Counter
NREC	Recirculate (buffer memory)
NSD	Shuttle Drive
NSLW	Slew
NSP	Space Code
NSPFP	Start Paper Feed Pulse
NSPI	Strobed Paper Instruction (PI · DSTB)
NSPT	Start Print
NSTB3	Strobe 3
NSRCLK	Shift Register Clock
NSTL	Start Load (VFU)
NTFLC	Final Line Count (TOF counter clock)
NULR	Underline Recirculate (buffer memory)
NVFS	VFU Slew
NVSC	VFU Shift Register Clock
PAPER OUT SW	Paper Out Detector on Platen
PF1	Paper Feed 1
PF2	Paper Feed 2
PFMØ1-PFMØ4	Paper Feed Motor Phases 1-4
PIC	Centronics Paper Instruction

5HL	+5V dc Supply to Hammer Latches
+8V DC	Filtered +8V dc Supply
+28VH	+28V dc Supply
-30V DC	Filtered -30V dc, Paper Feed
PM	Plot Mode
PMD	Paper Motion Detect
PPF	Paper Feed Mode
PRT	Print Mode
PS	Polarity Select (interface polarity)
RC1-RC4	Row Clock Binary Count
RCLK	Row Clock
RESYNC	Resync Pulse from MPU (50 msec)
RLB	Load Buffer
S5	16-μsec Clk Count
S8LPI	8 LPI Switch (control panel)
S45	(Test)
SCHK	Check Switch
SDB1-SDB7	Shift Register Data Bits
SDUL	Shift Register Underline
SONL	On Line Switch (control panel)
SOV	Shift Out (special character set)
STOF	Top of Form Switch (control panel)
SUS	Shuttle Up to Speed
SYNC	Sync Pulse from MPU (0.5 msec)
TC3	Top of Form Counter
VB1-VB4	VFU Data Bits 1-4
VB5	VFU Bit 5 (enable binary count)
VRDY	VFU Memory Loaded (Ready for Commands)
VREF	4.7V dc Reference Voltage

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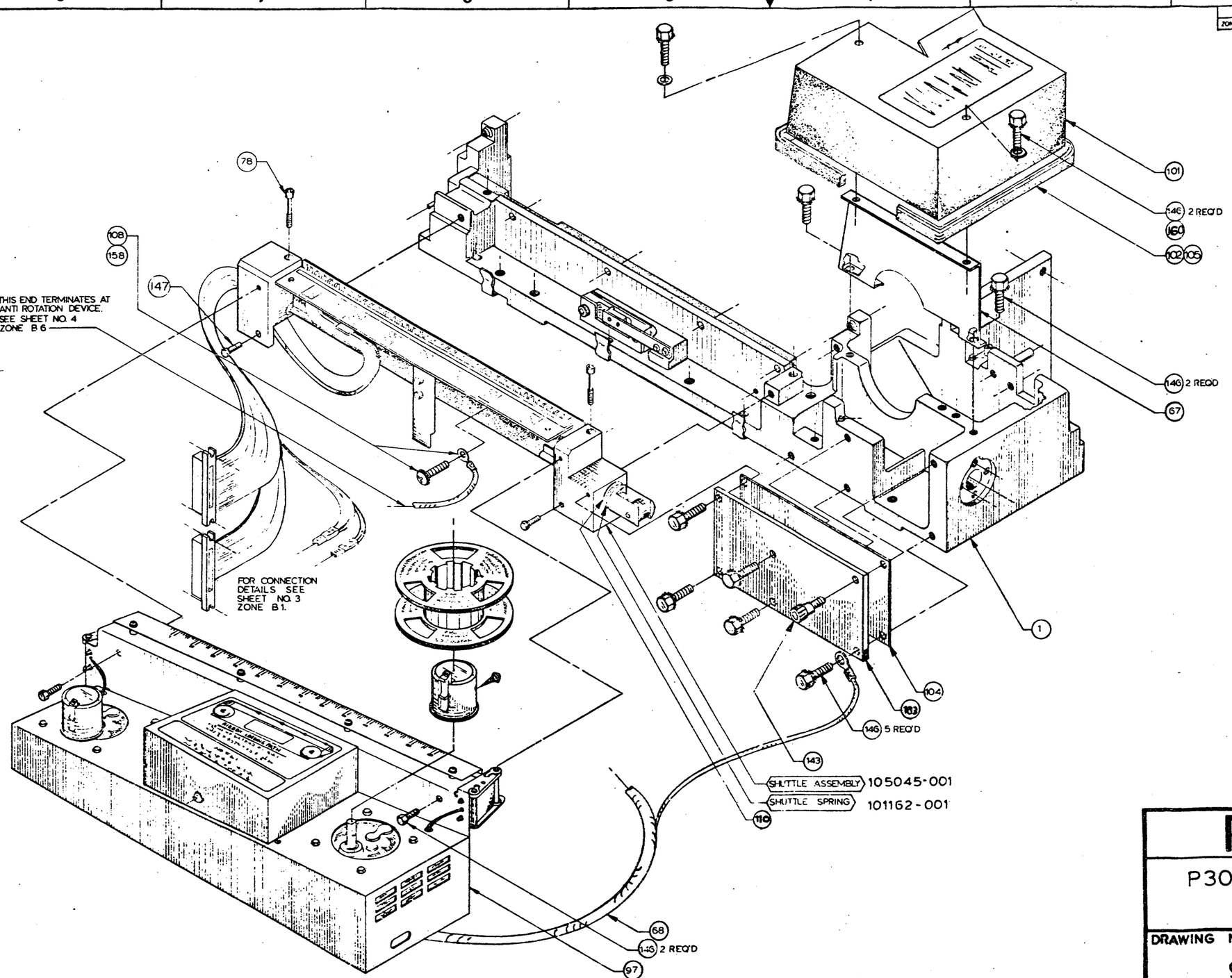
MATERIAL LIST DWG. No. 984007

ITEM NO.	PART NO	DESCRIPTION
1	101101-001	BASE SUPPORT
67	101683-001	OIL SHIELD
68	102816-001	ASSY, RIBBON CONTROL CABLE
78	102997-132	SCREW, BEARING BLOCK
97	102180-001	ASSY, RIBBON DECK DRIVE
101	101682-001	COVER, CAM
102	101806-001	U-CHANNEL, EXTRUDED
103	101257-001	PLATE, CAM COVER
104	101437-001	GASKET, CAM COVER FRONT
105	101537-001	ADHESIVE
108	102046-001	ASSY, GROUND WIRE, HAMMER BANK
110	101565-001	SHIM, SHUTTLE SPRING
143	102453-001	SCREW, SHOULDER
146	102786-108	SCREW, HEX HD "SEMS"
147	102786-110	SCREW, HEX HD "SEMS"
158	102786-404	SCREW, HEX HD "SEMS"
160	101526-003	WASHER, FLAT #10

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



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PRINTRONIX

P 300
MATERIAL LIST DWG. No. 984007

ITEM NO.	PART NO	DESCRIPTION
5	102959-001	GROUND STRAP
11	101888-001	BASE, PRINTER CABINET
12	101798-001	PLATE, CONN. COVER
13	101360-001	SHOCK MOUNT
14	101570-001	FOOT, RUBBER
25	102505-001	FILTER, RFI
28	101467-001	MAG. P.U. CABLE ASSY.
45	102759-001	LABLE, POWER
57	101152-001	CARD CAGE
58	101153-001	SUPPORT COLUMN
68	102816-001	ASSY, RIBBON CONTROL CABLE
84	101200-001	ASSY, HAMMER DRIVER BD
85	104056-001	ASSY, POWER SUPPLY
86	102012-001	BRKT, CAB. CATCH
95	101550-001	ASSY, CABLE, HAMMER
96	104115-001	ASSY, CABLE, POWER SUPPLY
98	101497-001	CABLE ASSY, LOGIC A TO LOGIC B
100	102016-001	PLENUM, BLOWER
106	102106-001	TAPE, GASKET
107	101661-001	CARD CAGE DECAL
17	101480-001	TIE WRAP
120	102786-606	SCREW, HEX HD
123	101514-008	SCREW, SOC HD CAP
124	101514-017	SCREW, SOC HD CAP
127	101514-026	SCREW, SOC HD CAP
133	101527-002	LOCK WASHER, EXT. TOOTH
134	101527-003	LOCK WASHER, EXT. TOOTH
136	101539-003	CONN. MALE FAST-ON
137	101568-002	WASHER, FLAT
138	101634-002	HOLDER, CABLE TIE
142	102288-002	SCREW, BUTTON HD SOCKET
145	102748-001	NUT, NYLON ACORN
146	102786-108	SCREW, HEX HD "SEMS"
148	102786-408	SCREW, HEX HD "SEMS"
149	102786-605	SCREW, HEX HD "SEMS"
153	102788-100	NUT, "SEMS"
155	102997-020	SCREW, SOC HD CAP
161	102786-106	SCREW, HEX HD "SEMS"

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

THIS END CONNECTS ON SHEET NO. 5 ZONE D 2

NOTE: NO SCREWS REQ'D THIS END.

2 REQ'D PER CONNECTOR

TYP AT FRONT CORNERS

MOUNTING HOLES; CABINET LID ARM

BASE SUPPORT CASTING MOUNT

POWER SUPPLY SWITCH ACCESS HOLE

THIS END ATTACHES TO RIGHT SIDE PLATE. SEE SHEET 6, ZONE B 1.

GREEN/YELLOW GRND. WIRE TO SHUTTLE MTR. REAR BOTTOM AS SHOWN ON SHEET 7, ZONE C5.

BOTH ENDS

2 PER CONNECTOR

A = GROUND STRAP STUD

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P300 PRINTER MECHANICS ASSEMBLY

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	B4

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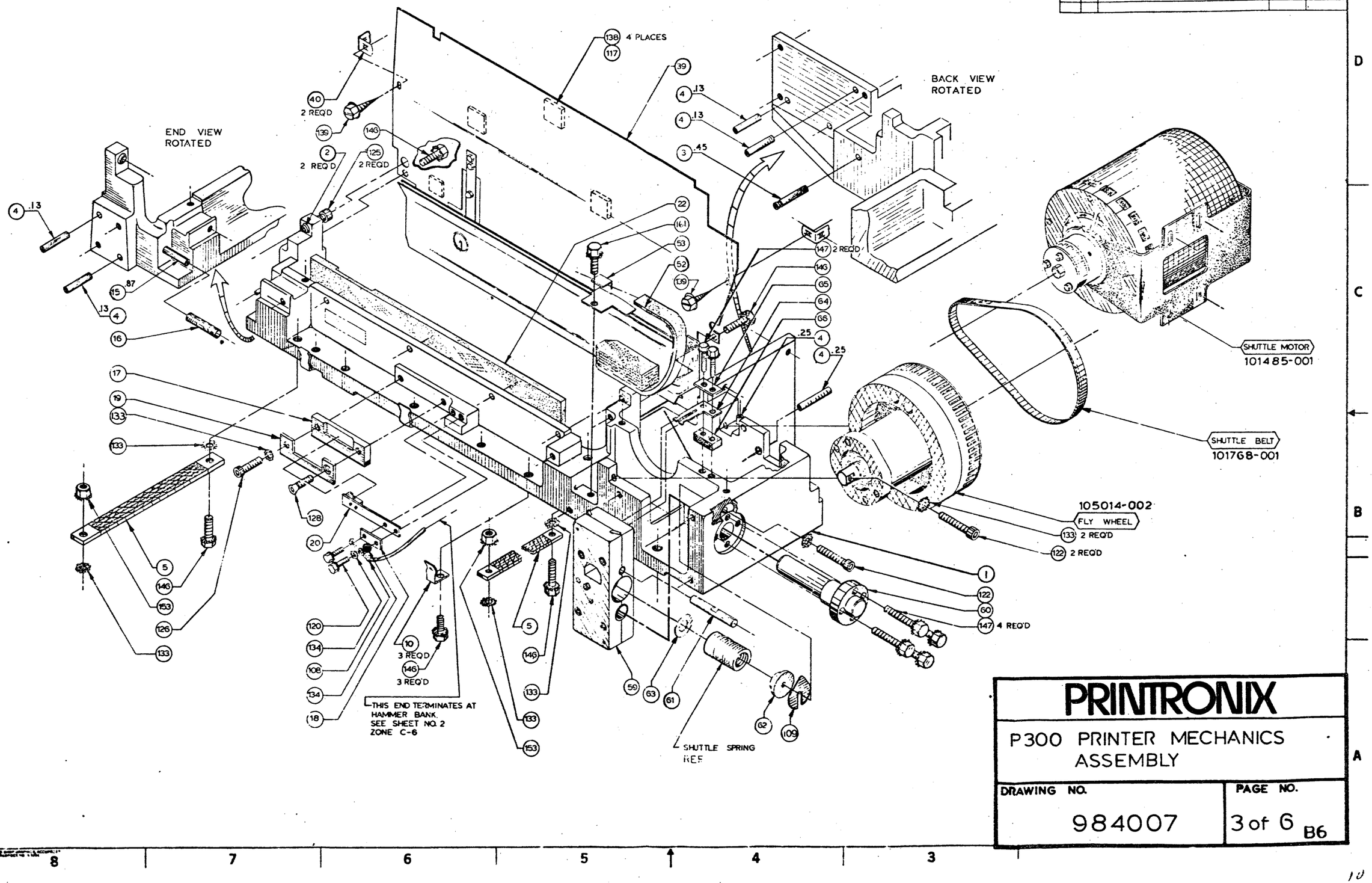
P300
MATERIAL LIST DWG No 984007

ITEM NO.	PART NO	DESCRIPTION
1	101101-001	BASE SUPPORT
2	101563-002	NUT, SPLINE
3	101556-004	GROOVE-PIN, TYPE "G"
4	101306-050	SPIROL PIN
5	102959-001	GROUND STRAP
10	101302-001	RETAINING CLIP
15	101556-002	GROOVE-PIN, TYPE "D"
16	101511-006	TUBING, HEAT SHRINK
17	101161-001	ANTI-ROTATION BRG PLATE
18	101166-001	SPRING CLAMP PLATE
19	101159-001	DOUBLER PLATE
20	101452-001	SPRING, ANTI-ROTATION
22	101717-001	FOAM, ACOUSTIC, FRONT
39	102654-001	ASSY., BELT COVER
40	101554-001	CLIP, 90°
52	102745-001	ASSY, PRE-OILED WICK KIT
53	102754-001	CLAMP, CAM WICK
59	102064-001	ASSY, COUNTERWEIGHT
60	101449-001	ASSY, SHAFT, LOWER COUNTER
61	101232-001	UPPER COUNTERBALANCE
62	101292-001	SPRING GUIDE COUNTERWEIGHT
63	102865-001	WASHER COUNTERWEIGHT
64	101429-001	LEAF SPRING
65	101430-001	DOUBLER, LEAF SPRING
66	101431-001	SPACER, LEAF SPRING
108	102046-001	ASSY, GROUND WIRE, HAMMER BANK
109	101564-001	SHIM, COUNTERWEIGHT SPRING GUIDE
117	101480-001	TIE, WRAP
120	102786-606	SCREW, HEX HD
122	101514-004	SCREW, SOC HD CAP
125	101514-019	SCREW, SOC HD CAP
126	101514-028	SCREW, SOC HD CAP
128	101524-002	SCREW, 100° CSK SOCKET
133	101527-002	LOCK WASHER, EXT. TOOTH
134	191527-003	LOCK WASHER, EXT. TOOTH
138	101634-002	HOLDER, CABLE TIE
139	101710-001	SCREW, SHEET METAL, SLOTTED HEX
146	102786-108	SCREW, HEX HD "SEMS"
147	102786-110	SCREW, HEX HD "SEMS"
153	102788-100	NUT, "SEMS"
161	102786-106	SCREW, HEX HD "SEMS"

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



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DRAWING NO.	PAGE NO.
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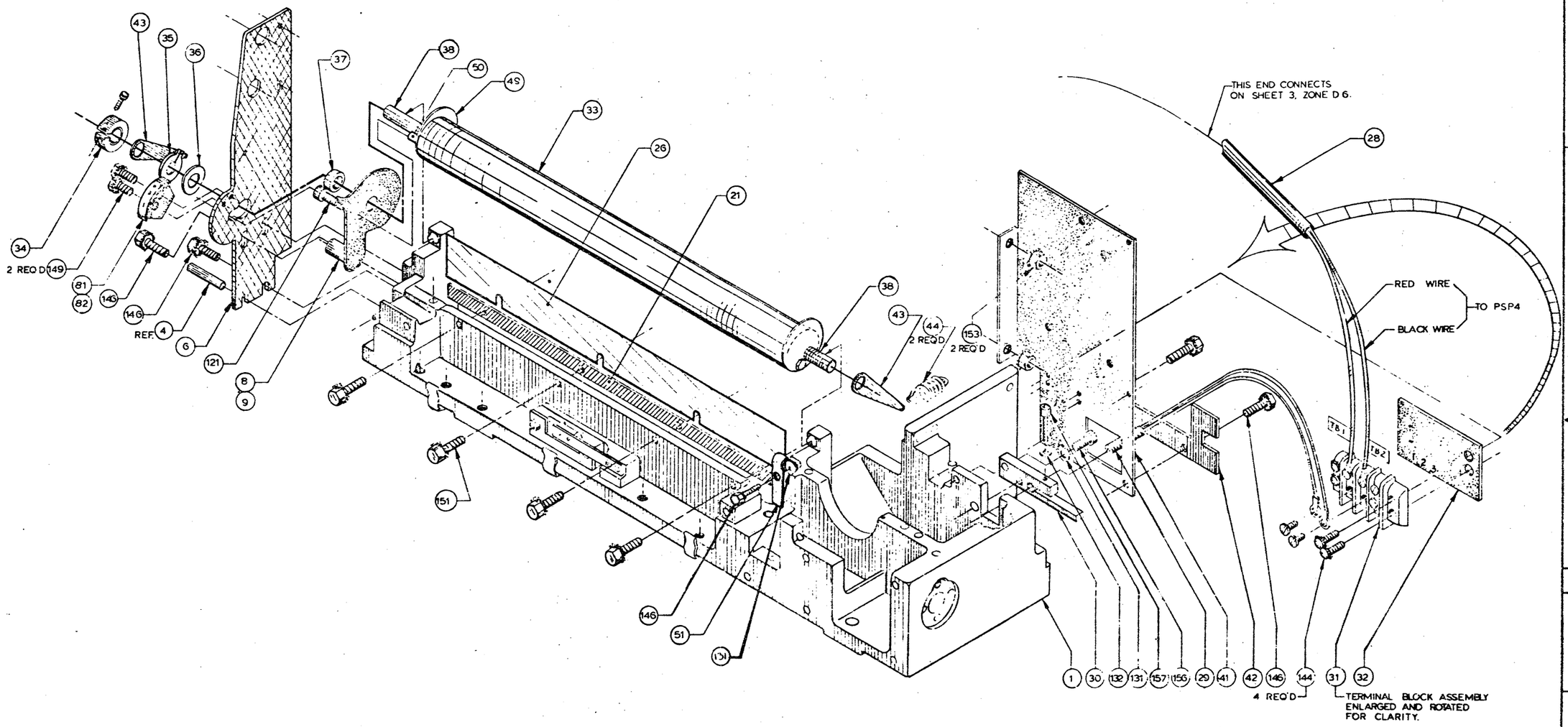
PRINTRONIX

P 300
MATERIAL LIST DWG No 984007

ITEM NO.	PART NO	DESCRIPTION
1	101101-001	BASE SUPPORT
4	101306-050	SPIROL PIN
6	102097-001	PLATE, LEFT SIDE
8	101102-001	PLATEN LEVER
9	101134-001	PLATEN LEVER HANDLE
21	101183-001	PLATE, RETAINING, IRONER
26	101163-001	PAPER IRONER
28	101467-001	MAG P.U. CABLE ASSY
29	101494-001	ASSY, MAG P.U.
30	101240-001	ARM, MAG P.U.
31	101544-001	TERM, BLOCK
32	101555-001	MARKER STRIP
33	101784-001	ASSY, PLATEN
34	102400-001	COLLAR, SHAFT
35	101551-001	RING, GRIP
36	101552-001	WASHER CURVED
37	102709-001	SPACER, PLATEN LEVER
38	101805-001	LUBRICANT, BEARING
41	101132-001	PLATE, RT. SIDE GUSSET
42	102633-001	BRKT., GUARD, MAG P.U.
43	101662-001	LUG, PLATEN SPRING
44	101663-001	SPRING, EXTENSION
49	101151-001	WASHER, PLATEN
50	101150-001	SPACER, PLATEN
51	101642-001	CLIP, PLATEN SHIPPING
81	101594-001	BRACKET, FORM THICKNESS
82	104515-001	LABEL, FORM THICKNESS
121	101514-001	SCREW, SOC HD CAP
131	101526-010	WASHER, FLAT
132	101525-002	WASHER, FLAT
144	102559-608	SCREW, PAN HD PHIL
146	102786-108	SCREW, HEX HD "SEMS"
149	102786-605	SCREW, HEX HD "SEMS"
151	102786-612	SCREW, HEX HD "SEMS"
153	102788-100	NUT, "SEMS"
156	102997-112	SCREW, SOC HD CAP
157	102997-612	SCREW, SOC HD CAP

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



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P300 PRINTER MECHANICS ASSEMBLY

DRAWING NO.	PAGE NO.
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PRINTRONIX

P300
MATERIAL LIST DWG No 984007

ITEM NO.	PART NO	DESCRIPTION
5	102959-001	GROUND STRAP
6	102097-001	PLATE, LEFT SIDE
7	101410-001	PIN, PLATEN SPRING
23	101474-001	ASSY, PAPER FEED MOTOR
24	104373-001	BRACKET, TOP-OF-FORM
27	101548-005	GROMMET
28	101467-001	MAG P.U. CABLE ASSY
36	101552-001	WASHER, CURVED
48	101854-001	LOCTITE ADHESIVE
69	101545-001	TRACTOR, RIGHT HAND
70	102095-001	SHAFT, TRACTOR SUPPORT
71	102061-001	ASSY. PAPER MOTION SENSOR
72	102094-001	BUSHING
73	101547-003	WASHER, FLAT NYLON
74	102100-001	KNOB, ADJUST
75	101143-001	BUSHING, LEFT
76	101309-001	BEARING, "NYLINER"
77	102957-001	RING, RETAINING
79	102049-004	CLAMP, CABLE
80	102682-001	WASHER, "D"
83	101603-001	LABEL, VERTICAL POSITION
117	101480-001	TIE WRAP
118	101509-002	SET SCREW
119	101509-003	SET SCREW
132	101526-002	WASHER FLAT
133	101527-002	LOCKWASHER, EXT. TOOTH
138	101634-002	HOLDER, CABLE TIE
139	101710-001	SCREW, SHEET METAL, SLOTTED HEX
141	102158-005	WASHER, LOCK
146	102786-108	SCREW, HEX HD "SEMS"
149	102786-605	SCREW, HEX HD "SEMS"
150	102786-607	SCREW, HEX HD "SEMS"

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

119 75 149 76 80 79 139 73 72 71 118 2 REQ'D 36 74 73 6 7 83

101502-001
SPLINE SHAFT

77 70

150 4 REQ'D 69 141 4 REQ'D 132 4 REQ'D 23

PAPER FEED BELT
103188-001

48-LOCTITE

28 27 117 138

24 149 2 REQ'D 139

RIGHT SIDE PLATE
102098-001

146 4 REQ'D FOR THRU HOLES MARKED

5 REF 133

THIS END ATTACHES TO BASE PRINTER CABINET. SEE SHEET 3, ZONE B5.

PRINTRONIX

P300 PRINTER MECHANICS ASSEMBLY

DRAWING NO.	PAGE NO.
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PRINTRONIX

P 300
MATERIAL LIST DWG No 984007

ITEM NO.	PART NO	DESCRIPTION
23	101474-001	ASSY, PAPER FEED MOTOR
54	101470-001	ASSY, CAPACITOR
55	101473-001	BRACKET, CAPACITOR
56	101472-001	END CAP
87	102351-001	ASSY, VARISTOR
88	102351-002	ASSY, VARISTOR
89	102495-001	JUMPER, TERM. BLOCK
90	101544-004	TERMINAL BLOCK
91	101724-003	COVER, BARRIER STRIP
92	102628-001	MARKER STRIP
93	102591-001	ASSY, CAPACITOR
94	102590-001	ASSY, JUMPER WIRE
129	101524-005	SCREW, 100° CSK SOCKET
130	101525-001	NUT, HEX, PLAIN
146	102786-108	SCREW, HEX HD "SEMS"
152	102786-614	SCREW, HEX HD "SEMS"
154	102788-600	NUT, "SEMS"
162	103954-001	CARRIAGE BOLT
163	102788-140	NUT, HEX HD W/EXT. TOOTH LOCK WASHER
164	101526-012	WASHER, FLAT

B11

18

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

MOTOR ROTATED TO SHOW REAR VIEW GROUND WIRE ATTACHMENT

GREEN/YELLOW GROUND WIRE

REF 154
TO AC CAP
TO RIBBON DECK DR 89
TO CHASSIS GRND GREEN/YELLOW 94
TO RIBBON DECK DR 90
87
92
91
154 2 REQ'D
130 4 REQ'D
90
92
129 2 REQ'D
56
54
55

SHUTTLE MTR BLK
SHUTTLE MTR YELLOW
93
88
SHUTTLE MTR. GRND. WIRE GREEN/YELLOW
SHUTTLE MOTOR WHITE
SHUTTLE MOTOR BROWN

GRN/YEL GROUND WIRE. ATTACHES TO PRINTER BASE PAN. SEE SHEET 3, ZONE B 5.

SHUTTLE MOTOR
101485-001

62
23
146 2 REQ'D FOR THRU HOLES MARKED 'A'
152
RIGHT SIDE PLATE
102098-001
164
163

PRINTRONIX

P300 PRINTER MECHANICS ASSEMBLY

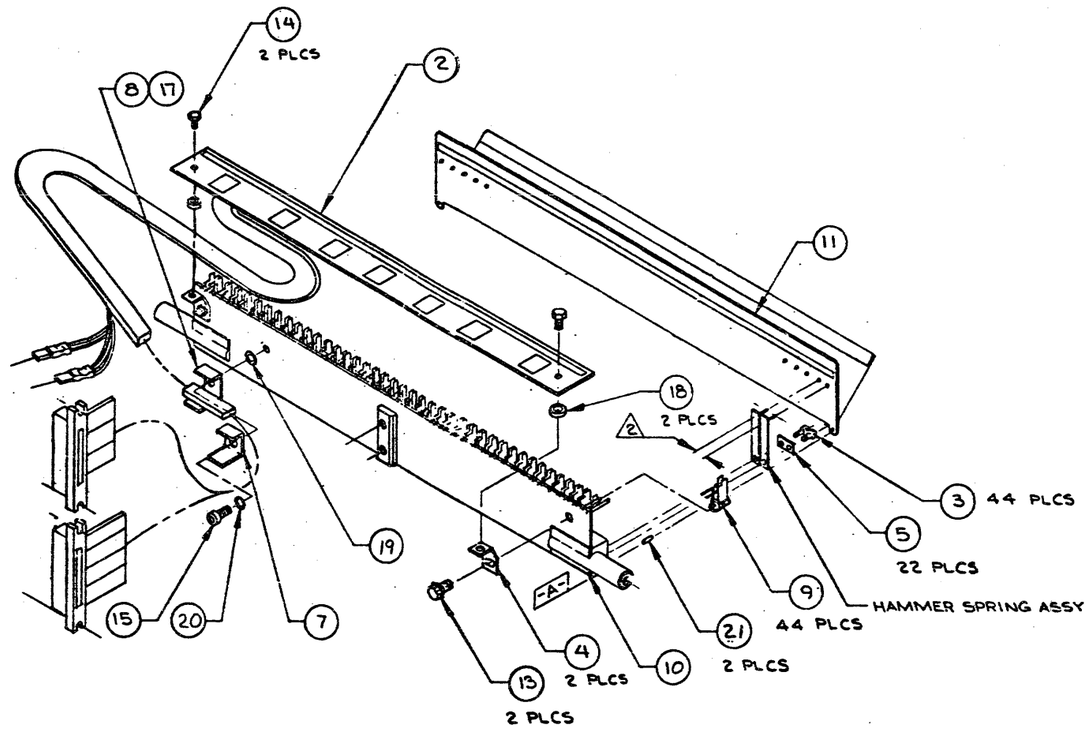
DRAWING NO.	PAGE NO.
984007	6 of 6 B12

PRINTRONIX

SHUTTLE ASSY, BASIC, P300 DWG NO. 985045

ITEM NO.	PART NO	DESCRIPTION
1	—	—
2	101195-001	HAMMERBANK PCB ASSY
3	101254-001	HAMMER SPRING SCREW
4	101754-001	HAMMERBANK PCB BRKT
5	101873-001	CLAMP PLATE-HAMMER
6	—	—
7	101377-001	HAMMERBANK CABLE CLAMP, INNER
8	101378-001	HAMMERBANK CABLE CLAMP, OUTER
9	101711-001	COIL, HAMMERBANK HEATSINK ASSY
10	102186-001	HAMMERBANK EPOXY ASSY
11	105075-002	HMR BANK COVER ASSY
12	102786-108	SCREW, HEX HD. IND. EXT TH L.W.
13	102786-404	SCREW, HEX HD, IND EXT TH L.W.
14	102786-406	SCREW, HEX HD. IND EXT TH L.W.
15	101514-025	SCREW, CAP SOC. HD
16	—	—
17	101511-007	TUBING PLASTIC
18	101547-002	NYLON FLAT WASHER
19	101527-002	WASHER, LOCK EXT TH
20	101527-003	WASHER, LOCK
21	101319-001	ROLL PIN
22	101167-001	YOKE
23	101184-001	YOKE WASHER
24	101315-001	CAM FOLLOWER
25	101235-001	ARM, ANTI-ROTATION
26	101316-001	PIN, SPIROL
27	101565-001	SHIM, SHUTTLE SPRING
28	104302-001	RIGHT BEARING BLOCK ASSY
29	104303-001	LEFT BEARING BLOCK ASSY
30	900076-000	TEST PROCEDURE, T/P SHUTTLE ASSY

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



PRINTRONIX

P300 SHUTTLE ASSY.

DRAWING NO.	PAGE NO.
985045	1 of 2 B14

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
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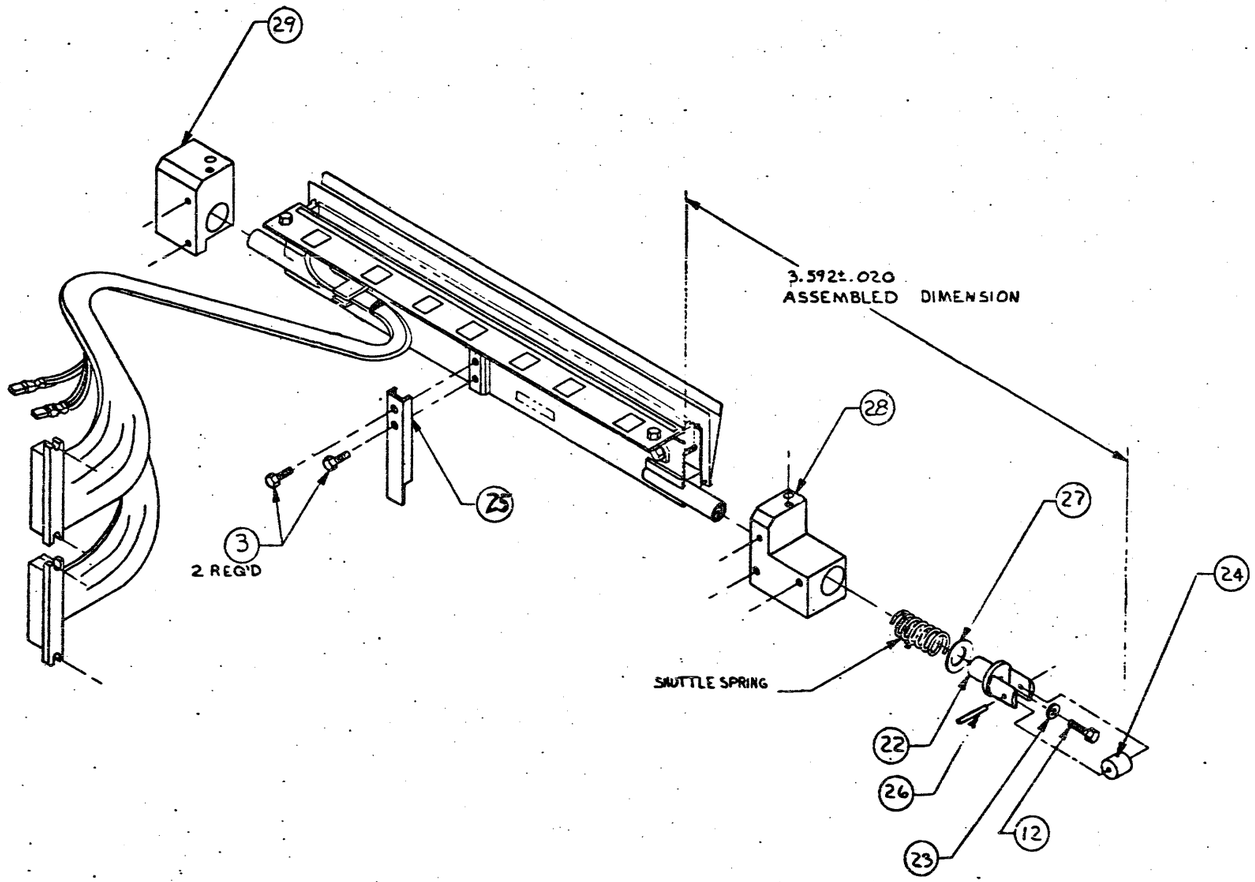


NOTES: UNLESS OTHERWISE SPECIFIED

PRINTRONIX

P300 SHUTTLE ASSY

DRAWING NO.	PAGE NO.
985045	2 of 2 B15

ITEM NO.	PART NO	DESCRIPTION
46	102788-100	NUT, HEX/EXT TH. L.W.
47	102788-400	NUT, HEX/EXT TH. L.W.
48	102788-600	NUT, HEX/EXT TH. L.W.
49	102788-800	NUT, HEX/EXT TH. L.W.
50	102789-100	NUT, HEX/EXT TH. L.W.
51 (REF)	900428-000	TEST PROCEDURE, POWER SUPPLY TESTER
52 (REF)	103861-000	SCHEMATIC, PCB, POWER SUPPLY
53		
54		
55		

TEKTRONIX

P300

POWER SUPPLY ASSY. DWG NO. 984056

ITEM NO.	PART NO	DESCRIPTION
1	103991-001	CHASSIS
2	101832-001	TRANSFORMER
3	104740-001	COVER, TRANSFORMER
4	102039-001	CHOKE
5	103862-001	PCBA, POWER SUPPLY
6	101372-001	CAPACITOR, 78K µF, 40 VDC
7	102147-001	CAPACITOR, 31K µF, 15 VDC
8	102148-001	CAPACITOR, 4K µF, 40 VDC
9	101389-001	HOLDER, FUSE
10	102146-001	DIODE, IN3890
11	101402-001	RECTIFIER
12	101529-001	SWITCH, POWER
13	101388-001	FAN
14	101402-002	RECTIFIER
15	101531-001	LATCH, MAGNETIC
16	101824-001	HEAT SINK, POWER SUPPLY
17	102681-001	COVER, SWITCH, POWER SUPPLY
18	102029-001	SPACER, ROUND
19	101387-120	FUSE, SLOW BLOW
20	101511-006	TUBING, HEAT SHRINKABLE
21	101480-001	TIE WRAP
22	103718-002	CONNECTOR, MALE 45°, .250
23	103718-003	CONNECTOR, MALE 45°, .250
24	101615-002	GREASE, SILICONE
25	101634-002	HOLDER, CABLE TIE
26	102516-001	BUSHING, TEFLON
27	102703-001	WIRE HARNESS, POWER SUPPLY
28	101524-002	SCREW, HEX SOCKET, FLAT HEAD
29	102786-406	SCREW, HEX, IND/EXT TH. L.W.
30	102786-610	SCREW, HEX, IND/EXT TH. L.W.
31	102786-106	SCREW, HEX, IND/EXT TH. L.W.
32	102786-824	SCREW, HEX, IND/EXT TH. L.W.
33	102559-603	SCREW, PHILLIPS W/EXT. TH. L.W.
34		
35		
36	101527-002	WASHER, LOCK EXT. TOOTH
37	101526-005	WASHER, FLAT
38	101526-002	WASHER, FLAT
39	101526-003	WASHER, FLAT
40	101526-010	WASHER, FLAT
41	101526-011	WASHER, FLAT
42	101526-014	WASHER, FLAT
43		
44		
45	102515-001	WASHER, MICA

⚠5 TRANSFORMER WIRING	
FROM REF DES.	TO REF DES.
T1 - GREEN	BR 2-2
T1 - GREEN	BR 2-4
T1 - RED	BR 1-2
T1 - RED	BR 1-4
T1 - YELLOW	BR 3-2
T1 - YELLOW	BR 3-4
T1 - 2	P1-1 (SOLDER)
T1 - 10	P1-2 (SOLDER)

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

PRINTRONIX

POWER SUPPLY ASSY.

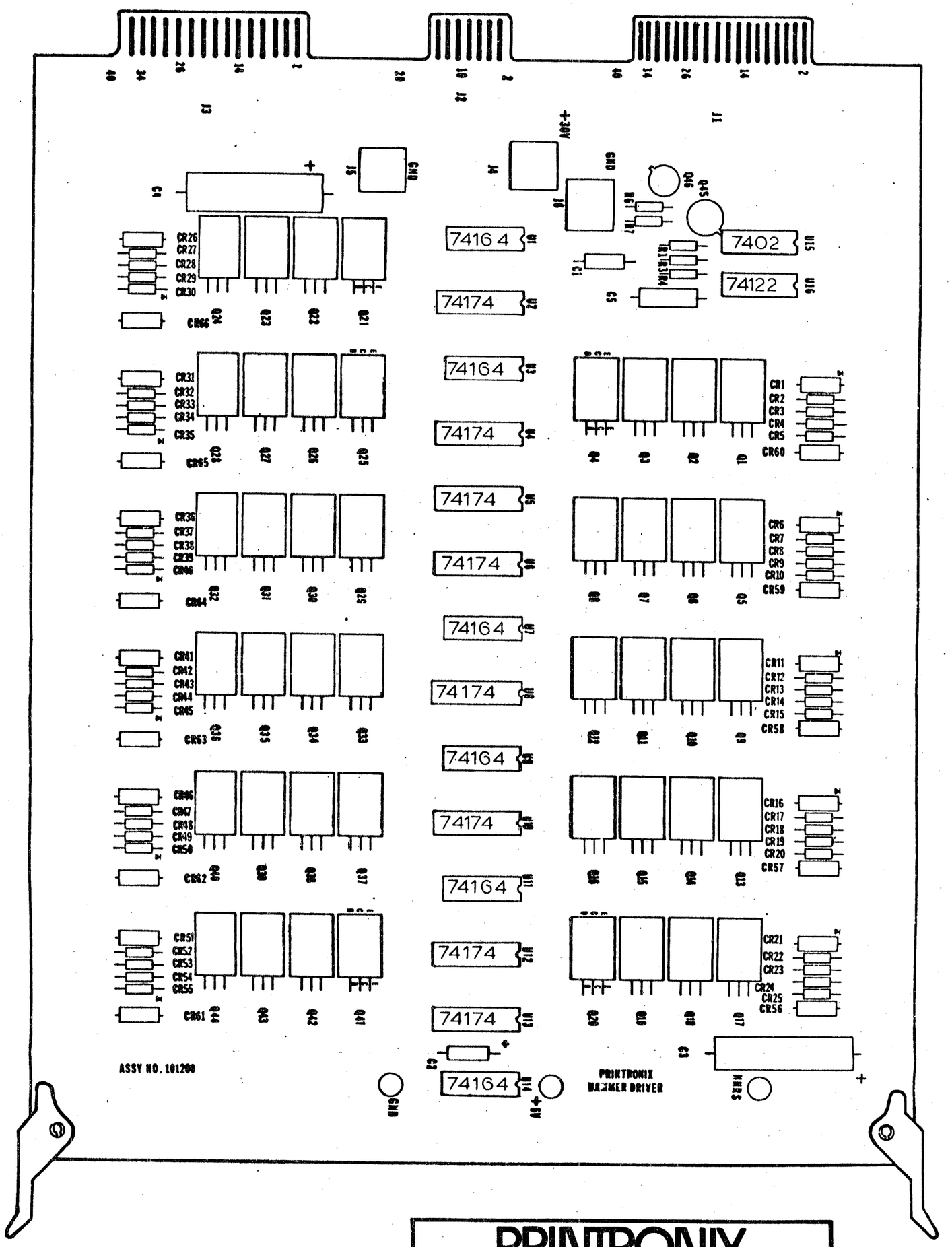
DRAWING NO.	PAGE NO.
984056	B18

PRINTRONIX

HAMMER DRIVER

ASSY. NO. 981200

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
C1,C2	101362-001	2	CAPACITOR, TANTALUM, ±20%, 15V,3.3µf
C3,C4	101425-002	2	CAPACITOR, 22µf
C5	101764-001	1	CAPACITOR, .33µf 50V, 20%
CR1,6,11,16,21,26,31,36,41,46,51 THRU 66.	102427-001	26	DIODE, ZENER, UZ1585
CR2-5,CR7-10,CR12-15,CR17-20, CR22-25,CR27-30, CR32-35,CR37-40, CR42-45,CR47-50,CR2-55	101336-001	44	DIODE, IN4004
CR67	101894-001	1	DIODE IN5257B
J4	101426-001	1	CONNECTOR, FAST ON MALE .188
J5, J6	101539-002	2	CONNECTOR, FAST ON MALE 45° .250
J4, J5, J6	103864-001	3	EYELOT, ROLLED FLANGE
Q1, TO Q44	101364-001	44	TRANSISTOR, TIP 121
Q45	101368-001	1	TRANSISTOR, 2N4234
Q46	101266-001	1	TRANSISTOR, 2N2906A
R1, R3	101337-333	2	RESISTOR, 1/4W, 5%, 3.3K
R4, R6	101337-103	2	RESISTOR, 1/4W, 5%, 1K
R7	101337-122	1	RESISTOR, 1/4W, 5%, 120 OHMS
R8	101337-152	1	RESISTOR, 1/4W, 5%, 150 OHMS
U1, 3, 7, 9, 11, 14	101352-001	6	IC 74164
U2, 4, 5, 6, 8, 10, 12, 13	101353-001	8	IC 74174
U15 (REF)	101339-001	1	IC 7402
U16	101350-001	1	IC 74122
-	104276-001	1	HAMMER DRIVER, PCB DRILL & BLANK
-	101380-001	3	TERMINAL, TURRET
-	101382-001	2	INJECTOR 25607
-	101203-000	REF	PCBA HAMMER DRIVER SCHEMATIC
-	101319-010	2	PIN, ROLL



PRINTRONIX	
HAMMER DRIVER	
DRAWING NO. 981200	PAGE NO.

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PRINTRONIX

RIBBON CONTROL

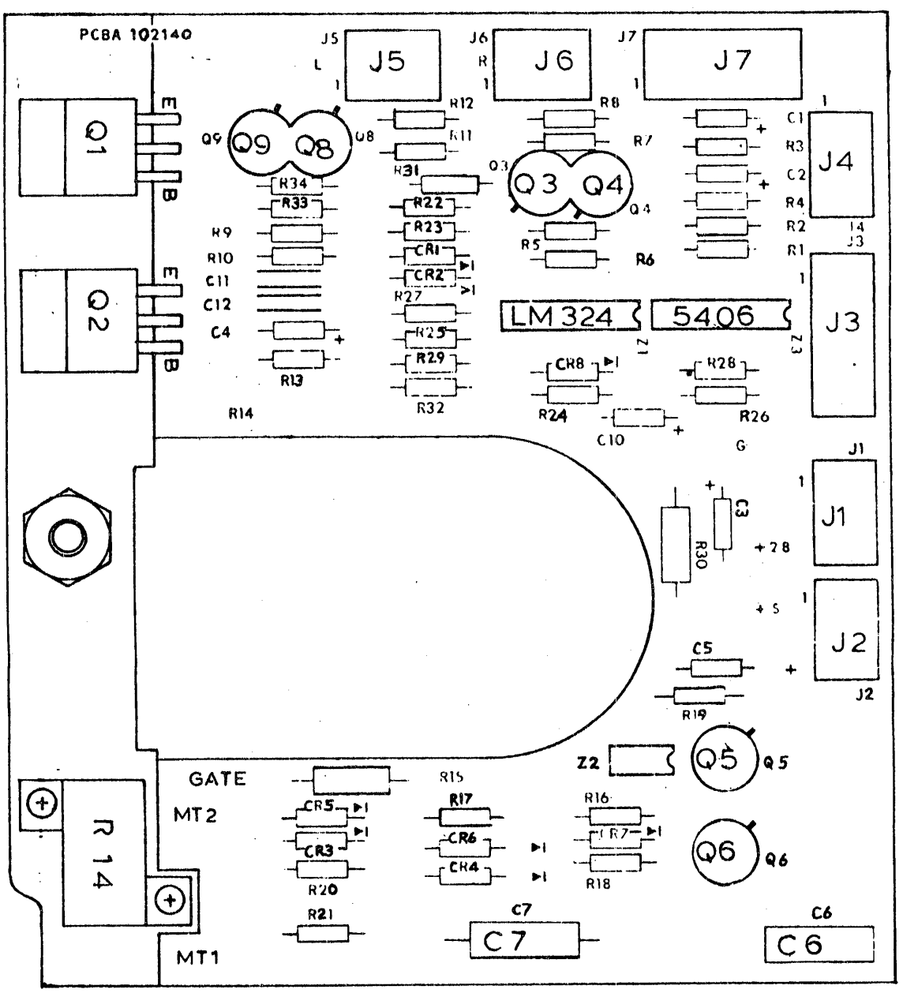
ASSY. NO. 982140 - P150, 300, 600

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
C6, C11, C12	102335-001	3	CAPACITOR, .01MF 20%
G, +5, +28	101380-001	3	TERMINAL TURRET
R16	101337-273	1	RESISTOR, ¼W, 5% 2.7K
4-40 X .31	102953-002	2	SCREW, NYLON, BINDER HEAD
1/4 - 28	101525-008	1	NUT, PLAIN HEX
1/4	101527-006	1	WASHER, LOCK EXT. TOOTH
1/4	101526-012	1	WASHER, FLAT
—	101621-003	A/R	TEFLON TUBING
R33,R34	101399-114	2	(-2 only) RESISTOR 1/8W 1% 113K
—	103637-001	-	PCB, RIBBON CONTROL DRILL & BLANK

PRINTRONIX RIBBON CONTROL

ASSY. NO. 982140 P150,300, 600

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
J1, J2, J4, J5, J6	101331-001	5	CONNECTOR, MALE MOLEX 3 PIN
J3, J7	101332-001	2	CONNECTOR, MALE MOLEX 5 PIN
	102138-001	1	HEATSINK, PCB RIBBON CONTROL
2-56 X .31	101513-012	2	SCREW, PAN HD. PHILLIPS
4-40 X .25	102786-404	2	SCREW, HEX HD INDENTED/EXT. TH.L.W.
Q1, Q2	101518-002	2	WASHER, NYLON SHOULDER #4
Q1, Q2	101650-001	2	INSULATOR, TRANSISTOR, TIP 121
	101526-009	2	WASHER, FLAT #4
CR1,CR2,CR3,CR4,CR5,CR6,CR7	101336-001	7	DIODE, IN4004
Q5, Q6	101365-001	2	TRANSISTOR, 2N2219A
Q8, Q9	101366-001	2	TRANSISTOR, 2N2906A
Q1, Q2	101364-001	2	TRANSISTOR, TIP-121
Q3, Q4	102230-001	2	TRANSISTOR, 2N4393
Z3	102316-001	1	I.C. 5406
Z2	101333-001	1	SCR PHOTO OPTO ISOLATOR
Z1	102231-001	1	I.C. LM324
Q7	102120-001	1	TRIAC, 15 AMPS
Z8	102232-001	1	DIODE, ZENER 1N4750
C1, C2, C5	101362-001	3	CAPACITOR, 3.3 µf 15V 20%
C3, C4,C10	102233-001	3	CAPACITOR, 1 µf 50V 20%
Q5, Q6	101695-001	2	TRANSISTOR MOUNTING PADS
C7	101723-001	1	CAPACITOR, .1 µf 400V 20%
R15	102129-391	1	RESISTOR, 1W 5% 39Ω
R31	101422-221	1	RESISTOR, ½W, 5% 22Ω
R14	102235-001	1	RESISTOR, 10W 5% 25Ω
R30	101400-562	1	RESISTOR, 1W 5% 560Ω
R7, R8, R18	101337-105	3	RESISTOR, ¼W, 5% 100K
R24, R26	101337-104	2	RESISTOR, ¼W, 5% 10K
R17	101337-154	1	RESISTOR, ¼W 5% 15K
R9,R10,R20	101337-471	3	RESISTOR, ¼W 5% 47Ω
R11, R12	101337-472	2	RESISTOR, ¼W 5% 470Ω
R3,R4,R28	101337-103	3	RESISTOR, ¼W 5% 1K
R1, R2	101337-102	2	RESISTOR, ¼W 5% 100Ω
R25, R27	101337-824	2	RESISTOR, ¼W 5% 82K
R13	101337-474	1	RESISTOR, ¼W 5% 47K
R32	101337-334	1	RESISTOR, ¼W 5% 33K
R33, R34	101399-105	2	RESISTOR 1/8W 1% 113K (-1 ONLY)
R29	101337-335	1	RESISTOR ¼W 5% 330K
R22, R23	101399-104	2	RESISTOR 1/8W 1% 10K
R5, R6	101399-294	2	RESISTOR 1/8W 1% 29.4K
R21	101337-332	1	RESISTOR ¼W 5% 330Ω
GATE, MT1,MT2,R14,R14	101479-007	A/R	WIRE STRANDED 18GA
R19	101337-821	1	RESISTOR, 82Ω, ¼W, 5%



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RIBBON CONTROL	
DRAWING NO. 982140	PAGE NO.

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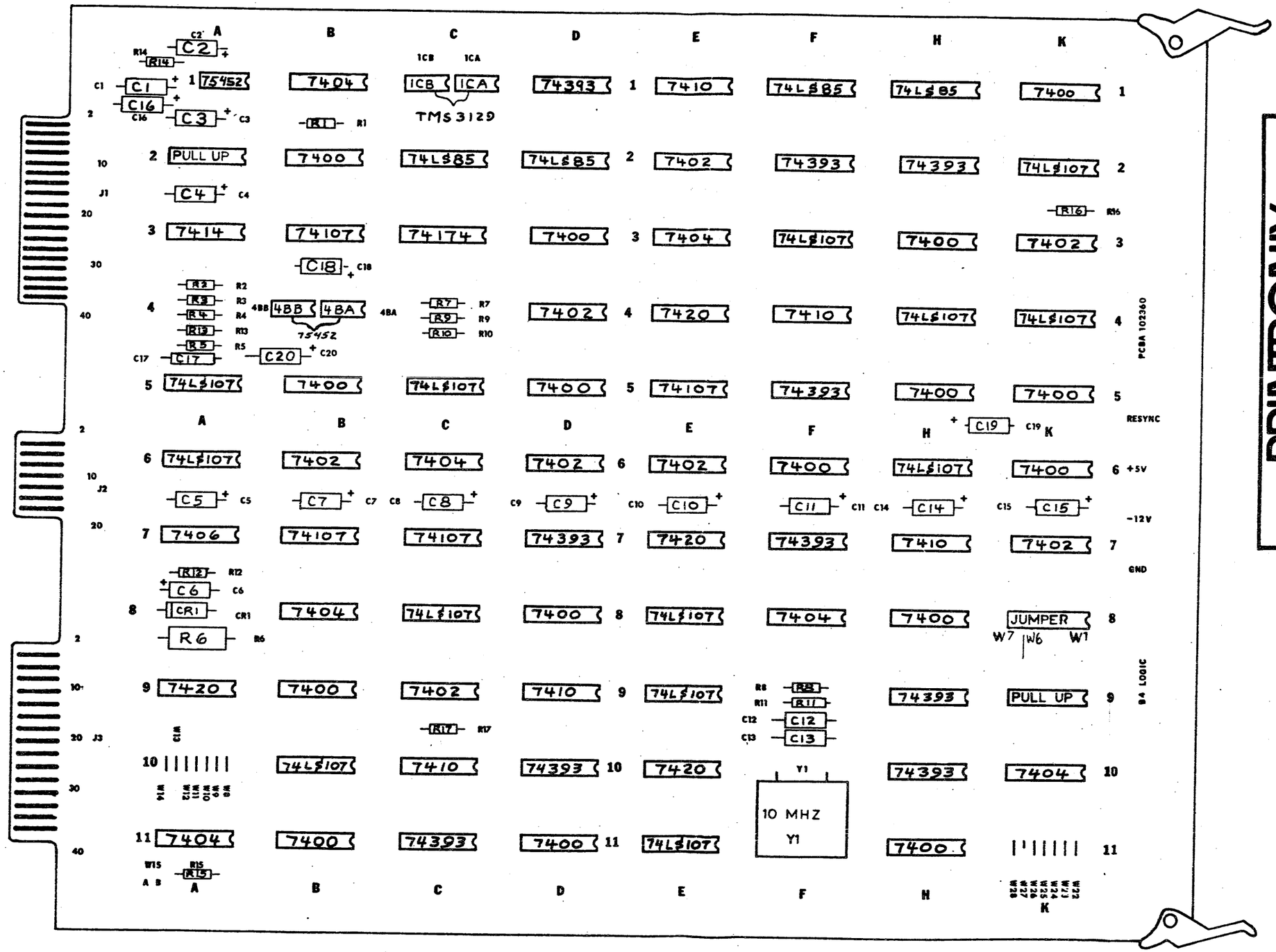
PRINTRONIX LOGIC B4

ASSY. NO. 982360

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
C1, thru C11, C14, 15, 16	101362-001	14	CAPACITOR, 3.3µF, 15V, 20%
C12, 13	101363-001	2	CAPACITOR, .01µF, 200V, 20%
C17	102291-472	1	CAPACITOR, 470PF, 100V
C18, 19, 20	102233-001	3	CAPACITOR, 1µF, 50V, 20%
CR1	101371-001	1	DIODE, IN5349B, 12V, 5W
R1, 7, 9, 10, 14	101337-272	5	RESISTOR, 270Ω, ¼W, 5%
R2, 3, 4, 5, 13	101337-271	5	RESISTOR, 27 Ω, ¼W, 5%
R6	101421-332	1	RESISTOR, 330Ω, 2W, 5%
R8, 11	101337-472	2	RESISTOR, 470Ω, ¼W, 5%
R12	101337-154	1	RESISTOR, 150KΩ, ¼W, 5%
R15, 16, 17	101337-103	3	RESISTOR, 1KΩ, ¼W, 5%
1A,4BA,4BB	101356-001	3	I.C. 75452
1B,8B,6C,3E,8F,10K	101340-001	6	I.C. 7404
2H,9H,10H,11C,1D,7D,10D,2F,5F,7F	101355-001	10	I.C. 74393
10C,9D,1E,4F,7H	101342-001	5	I.C. 7410
2C,2D,1F,1H	102303-001	4	I.C. 74LS85
1K,11A,5B,9B,3D,5D,8D,11D,11H,6F, 3H,5H,8H,6K,2B,11B,5K	101338-001	17	I.C. 7400
2A,9K	101381-102	2	I.C. RESISTOR NETWORK IK
6B,9C,4D,6D,2E,6E,7K,3K	101339-001	8	I.C. 7402
5A,2K,4K,11E,6H,3F,9E,8C,10B,8E, 4H,6A,5C	102302-001	13	I.C. 74LS107
3A	101343-001	1	I.C. 7414
7B,5E,7C,3B	101349-001	4	I.C. 74107
3C	101353-001	1	I.C. 74174
9A,4E,7E,10E	101344-001	4	I.C. 7420
7A	101341-001	1	I.C. 7406
Y1	101375-001	1	CRYSTAL, 10 MHZ
ICA, ICB	101357-001	2	I.C.TMS 3129
8K	101384-001	1	SOCKET I.C. 14 PIN
-	101382-001	2	INJECTOR 25607
-	101621-004	8"	TEFLON TUBING
-	101621-001	1"	TEFLON TUBING
-	101319-010	2	PIN, ROLL
-	101617-001	A/R	WIRE, SOLID #30 BLUE
GND,+5V,-12V,RESYNC	101380-001	4	TURRET, TERMINAL
REFERENCE	102363-001	-	PCB LOGIC BY SCHEMATIC
-	104535-001	1	PCB, B4 LOGIC



PRINTRONIX

LOGIC B4

PAGE NO.

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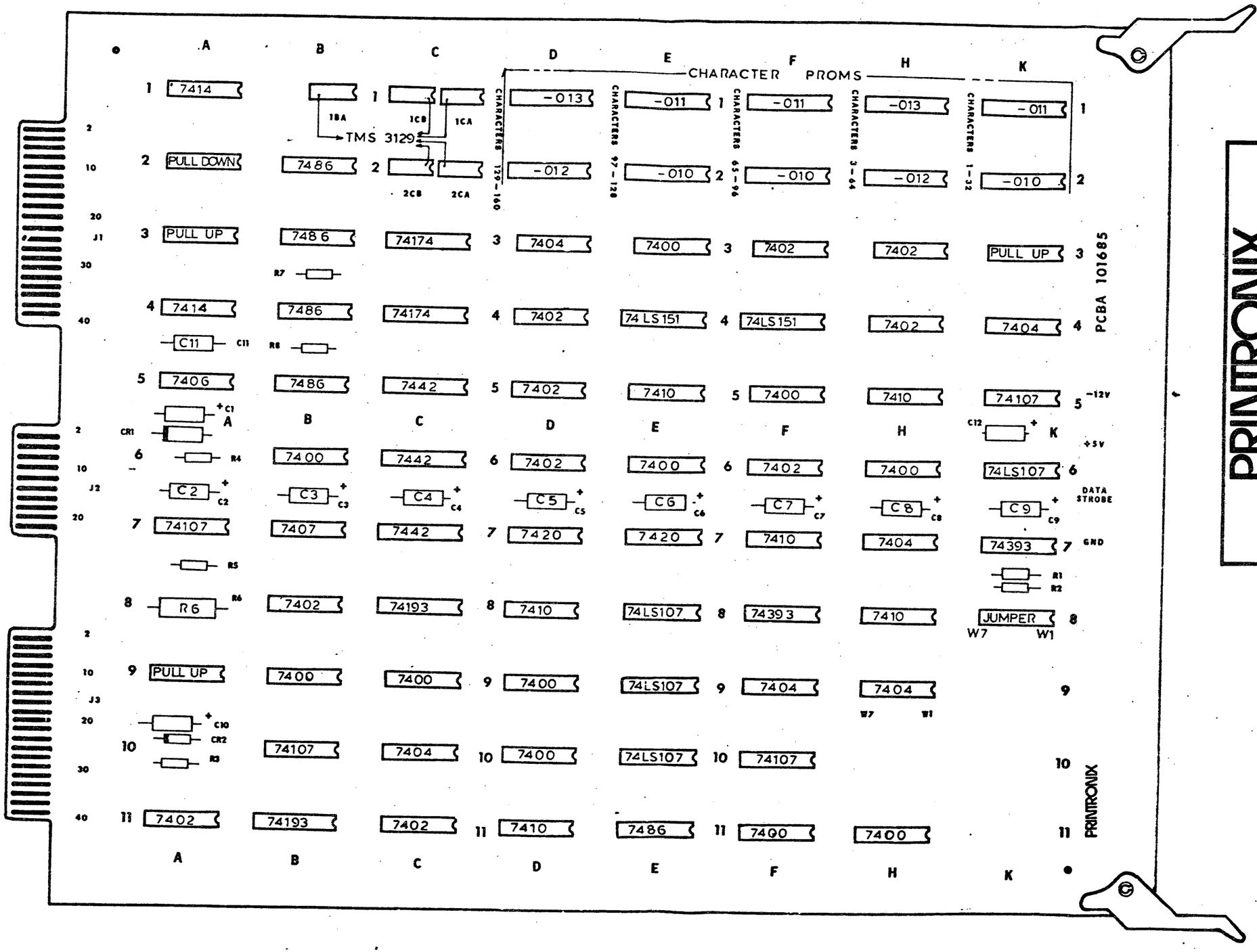
PRINTRONIX LOGIC A1

ASSY. NO. 981685

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
C1 THRU 9	101362-001	9	CAPACITOR 3.3 µf ± 20%, 15V
C10	101362-005	1	CAPACITOR, TANTALUM 22 µf ± 20% 15V
C11	101363-001	1	CAPACITOR, .01 µf ± 20%, 200V
C12	102233-001	1	CAPACITOR, 1 µf ± 20%, 50V
CR1	101371-001	1	DIODE IN5349B, 12V, 5W
CR2	101336-001	1	DIODE IN4004
R1, R2	101337-103	2	RESISTOR, 1K OHMS ¼W, 5%
R3	101337-104	1	RESISTOR, 10K OHMS ¼W, 5%
R4, R5 & R7	101337-472	3	RESISTOR, 470 OHMS ¼W, 5%
R6	101398-122	1	RESISTOR, 120 OHMS 5W 10%
R8	101337-102	1	RESISTOR, 100 OHMS ¼W 5%
1A, 4A	101343-001	2	IC 7414
2A,3A,9A,8K	101384-001	4	IC SOCKET 14 PIN
5A	101341-001	1	IC 7406
7A,10B,10F,5K	101349-001	4	IC 74107
9A,3A,3K	101381-102	3	IC RESISTOR NETWORK, 1K
11A,8B,11C,4D,5D,6D,3F,6F,3H,4H	101339-001	10	IC 7402
3B,4B,5B,11E	101348-001	5	IC 7486
9B,9C,9D,10D,3E,6E,5F,6H,11F,11H	101338-001	11	IC 7400
7B,10C,3D,9F,7H,4K,9H	101340-001	7	IC 7404
11B,8C	101354-001	2	IC74193
3C,4C	101353-001	2	IC 74174
5C,6C,7C	101345-001	3	IC 7442
1D,2D,1K,2K,1H,2H,1F,2F,1E,2E	101385-001	10	IC SOCKET 16 PIN
7D,7E	101344-001	2	IC 7420
8D,11D,5E,7F,5H,8H	101342-001	6	IC 7410
4E,4F	102301-001	2	IC 74LS151
8E,9E,10E,6K	102302-001	4	IC 74LS107
8F,7K	101355-001	2	IC 74393
1CA,1CB,2CA,2CB,1BA	101357-001	5	IC TMS3129
GND,+5,-12V,DATA STROBE	101380-001	4	TURRET, TERMINAL
	104197-001	1	PCB LOGIC A1


A
B
C
D
E
F
H
K
CHARACTER PROMS
CHARACTERS 129–160
CHARACTERS 97–128
CHARACTERS 65–96
CHARACTERS 33–64
CHARACTERS 1–32
1 7414
2 PULL DOWN
3 PULL UP
4 7414
5 7406
6
7 74107
8 R6
9 PULL UP
10
11 7402
1BA
1CB
1CA
TMS 3129
2CB
2CA
7486
74174
7404
7400
7402
7402
PULL UP
7486
7486
74174
74LS151
74LS151
7402
7404
C11
R7
R8
7442
7402
7410
7400
7410
74107
C1
CR1
R4
7400
7442
7402
7400
7402
7400
74LS107
C2
C3
C4
C5
C6
C7
C8
C9
DATA STROBE
7407
7442
7420
7420
7410
7404
74393
GND
R5
R1
R2
7402
74193
7410
74LS107
74393
7410
JUMPER
W7
W1
7400
7400
7400
74LS107
7404
7404
W7
W1
C10
CR2
R3
74107
7404
7400
74LS107
74107
7402
74193
7402
7410
7486
7400
7400
PCBA 101685
-12V
+5V
GND
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LOGIC A1
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PRINTRONIX

ASSY. NO. 983862 P150/300 POWER SUPPLY

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
U4,U5	102871-001	2	IC LM 358AN
U6	101878-001	1	IC 78L02AC
W1,W2,W3,W4,W5	101479-007	A/R	JUMPER 18AWG STRANDED BLACK
	103811-001	1	PCB POWER SUPPLY
	102955-001	1	HEAT SINK

PRINTRONIX

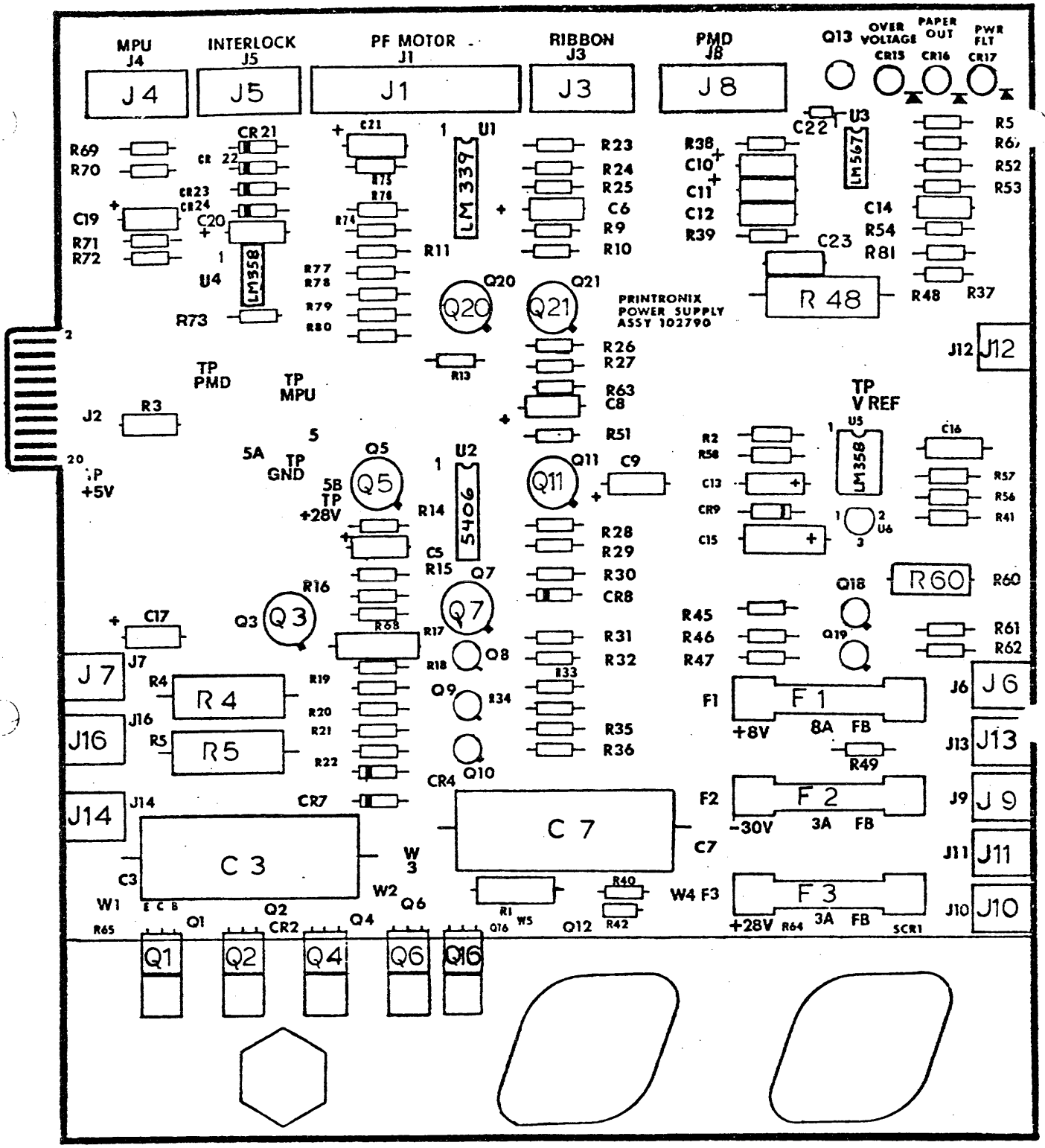
ASSY. NO. 983862 P150/300 POWER SUPPLY

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
R3	101422-331	1	RESISTOR 33 OHMS ½W 5%
R4,R5,R48	101398-103	3	RESISTOR 1K OHMS 5W 10%
R9,R15,R16,R18,R21,R22,R23,R28,R32, R33,R34,R35,R36,R46,R51,R53,R68,R29, R47	101337-103	19	RESISTOR 1K OHMS ¼W, 5%
R11,R52	101337-224	2	RESISTOR 22K OHMS ¼W 5%
R10,R61,R62	101337-472	4	RESISTOR 470 OHMS ¼W 5%
R14,R31	101337-102	2	RESISTOR 100 OHMS ¼W 5%
R17	101400-123	1	RESISTOR 1.2K OHMS 1W 5%
R13,R67,R73,R79	101337-474	4	RESISTOR 47K OHMS ¼W 5%
R19,R20,R49,R75	101337-563	4	RESISTOR 5.6K OHMS ¼W 5%
R24	101337-105	1	RESISTOR 100K OHMS ¼W 5%
R25	101399-911	1	RESISTOR 910 OHMS 1/8W 1%
R26	101399-563	1	RESISTOR 5.62K OHMS 1/8W, 1%
R27,R58			
R30	101337-562	1	RESISTOR, 560 OHMS ¼W, 5%
R37,R50,R63	101337-182	3	RESISTOR 180 OHMS ¼W 5%
R38	101399-825	1	RESISTOR 82.5 OHMS 1/8W 1%
R39,R69,R76	101337-104	3	RESISTOR 10K OHMS ¼W 5%
R40	101337-333	1	RESISTOR 3.3K OHMS ¼W 5%
R41	101339-182	1	RESISTOR 182 OHMS 1/8W, 1%
R42	101337-152	1	RESISTOR 150 OHMS ¼W, 5%
R45	101337-394	1	RESISTOR 39K OHMS ¼W, 5%
R54	101337-184	1	RESISTOR 18K OHMS ¼W, 5%
R57	101337-822	1	RESISTOR 820 OHMS ¼W, 5%
R60	101400-152	1	RESISTOR 150 OHMS 1W, 5%
R64, R65	101396-301	2	RESISTOR 30 OHMS 5W 5%
R70	101399-334	1	RESISTOR 33.2K OHMS 1/8W, 1%
R71, R72	101399-103	2	RESISTOR 1K OHMS 1/8W 1%
R73,R77	101337-823	2	RESISTOR 8.2 OHMS ¼W 5%
R74	101337-125	1	RESISTOR 120K OHMS ¼W, 5%
R80	101337-124	1	RESISTOR 12K OHMS ¼W, 5%
R81	101337-334	1	RESISTOR 33K OHMS ¼W, 5%
SCR1	101391-001	1	MCR 649AP-3
SCR1,Q12	102956-001	2	INSULATOR
SCR1,Q12,Q1,Q2,Q4,Q6,Q16	101615-002	A/R	SILICONE GREASE
SCR1,Q12,R64,R65	101513-021	8	SCREW,PAN HD 4X40X.50
SCR1,Q12,HEAT SINK	101525-004	6	NUT, HEX 4X40
SCR1,Q12,R64,R65, HEAT SINK	101527-001	10	WASHER, LOCK #4
SCR1,Q12,HEAT SINK	101526-005	6	WASHER, FLAT #4
U1	101358-001	1	IC LM339
	102316-001	1	IC 5406
U3	102311-001	1	IC LM567

PRINTRONIX

ASSY. NO. 983862 P150/300 POWER SUPPLY

REFERENCE DESIGNATOR	PART NUMBER	QTY	DESCRIPTION
C3,C7	102042-001	2	CAPACITOR NON ELECTROLYTIC 20µf 50/100V
C6,C17,C5,C19,C21,C20,C13,C16,C23	101362-001	7	CAPACITOR 3.3µf 15V 20%
C8	101362-002	1	CAPACITOR 1µf 15V 20%
C9,C15	101362-005	2	CAPACITOR 22µf,15V 20%
C10,C11	101362-003	2	CAPACITOR .22µf,15V ±20%
C12	102291-105	1	CAPACITOR .1µf,100V 10%
C14	102291-223	1	CAPACITOR CERAMIC .22µf 10%
C16,C23	101884-001	2	CAPACITOR .0022µf 200V 20%
C22	102291-222	1	CAPACITOR CERAMIC 220µf 10%
CR4,CR7	102130-001	2	DIODE 3052
CR15,CR16,CR17	101593-001	3	L.E.D. 5082-4684
CR23,CR24,CR21,CR22	102872-001	4	DIODE IN914
CR2	102149-001	1	DIODE IN4554B
CR2 - MOUNTING	103199-001	1	MOUNTING KIT
CR8	101894-001	1	DIODE IN5257B (33V)
CR9	101336-001	1	DIODE IN4004
F1,F2,F3	101390-001	6	FUSE CLIP
F1	101386-080	1	FUSE, 8AMP FAST BLOW
F2,F3	101386-030	2	FUSE, 3AMP FAST BLOW
GND,+28V,+5V,VREF,MPU,PMD	101380-001	6	TURRET TERMINALS
HEAT SINK	102786-406	2	SCREW, HEX HD IND/EXT TH. L.W.
JUMPER 5A OR 5B	101617-001	A/R	WIRE, 30 GA, BLUE
J1	101392-001	1	CONN. MOLEX 10 PIN
J3,J4,J5	101332-001	3	CONN. MOLEX 5 PIN
J7	101426-001	1	CONN. FASTON .188 MALE
J8	101331-002	1	CONN. MOLEX 6 PIN
J6,J9,J10,J11,J12,J13	102659-001	6	CONN. FASTON .250 MALE STRAIGHT
J6,J7,J9,J10,J11,J12,J13,J14,J16	103864-001	9	EYELET ROLLED FLANGE
J14,J16	101539-001	2	CONN. FASTON .250 MALE
Q1,Q2,Q4,Q6	101364-001	4	TRANSISTOR TIP 121
Q5,Q7,Q11,Q20,Q21	101365-001	5	TRANSISTOR 2N2219A
Q3	101368-001	1	TRANSISTOR 2N4234
Q9,Q10,Q8,Q19,Q18	101366-001	5	TRANSISTOR 2N2906A
Q13	102981-001	1	TRANSISTOR MPS-A14
Q12	102004-001	1	TRANSISTOR 2N4399
Q16	101750-001	1	TRANSISTOR TIP 32A
Q1,Q2,Q4,Q6,Q16	101650-001	5	INSULATOR, TRANSISTOR TO-220A3
Q3,Q5,Q7,Q11,Q20,Q21	101695-001	6	MOUNTING PAD, TRANSISTOR TO 5
Q1,Q2,Q4,Q6,Q16	101547-004	5	WASHER FLAT NYLON
Q1,Q2,Q4,Q6,Q16	102952-001	5	NUT, HEX,NYLON LOCK
Q1,Q2,Q4,Q6,Q16	102953-001	5	SCREW, NYLON
R1	101421-151	1	RESISTOR, 15 OHMS, 2W, 5%
R2	101399-104	1	RESISTOR, 10K OHMS 1/8W 1%



PRINTRONIX

POWER SUPPLY

DRAWING NO.	PAGE NO.
983862	

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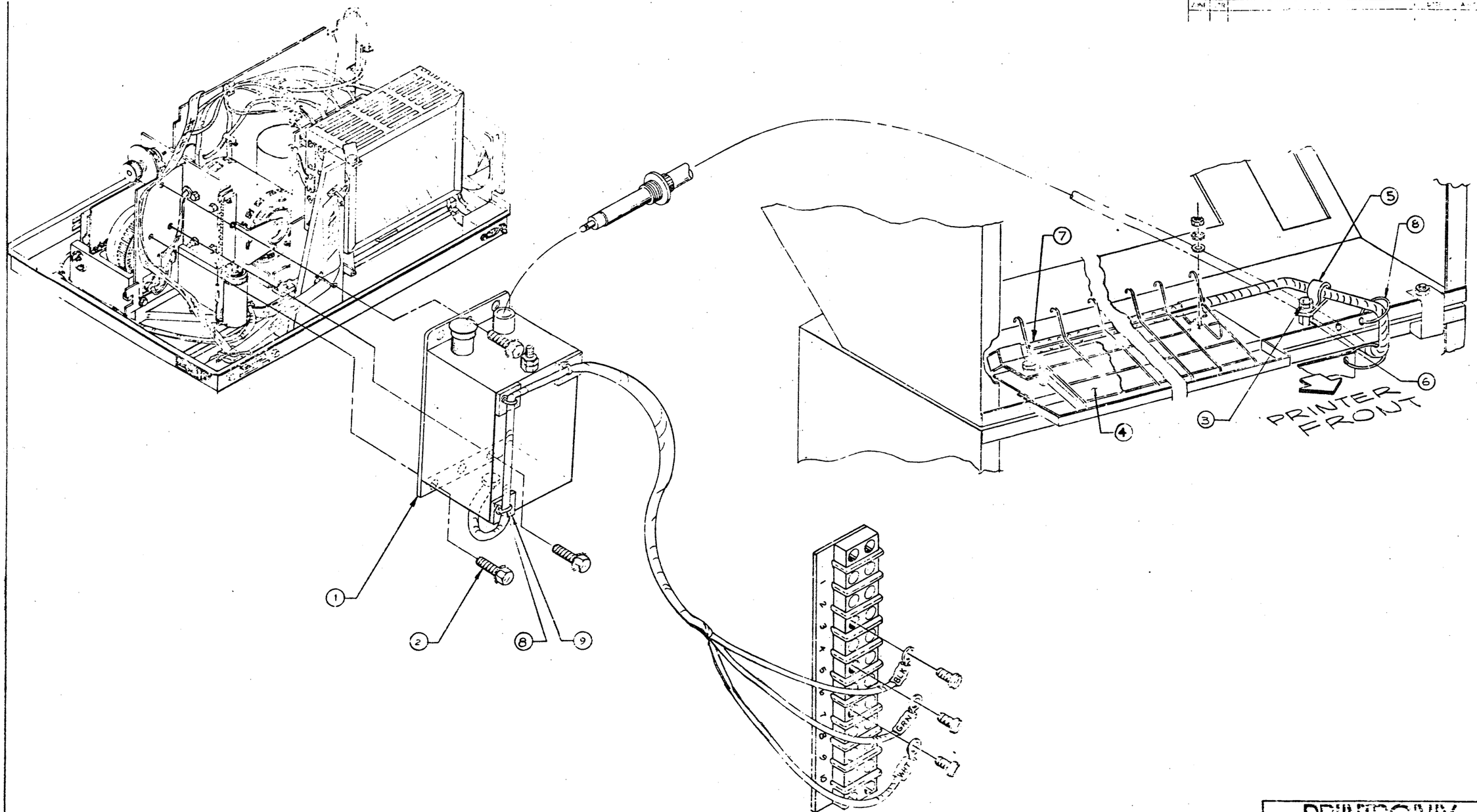
u4

PRINTRONIX - STATIC ELIMINATOR DWG. NO. 980003

ITEM NO.	PART NO	DESCRIPTION
1	104934 - 001	POWER SUPPLY
2	102786 - 105	SCREW, HEX HD IND/EXT TH. L.W.
3	102788 - 100	NUT, HEX W/EXT TH. L.W.
4	102048 - 001	FOAM, ACOUSTIC
5	102049 - 001	CLAMP, CABLE
6	102176 - 005	STAND OFF, HEX
7	102041 - 001	BAR, STATIC ELIMINATOR
8	101480 - 001	TIE WRAP
9	101634 - 002	HOLDER, CABLE TIE

E16



PRINTRONIX

STATIC ELIMINATOR

DRAWING E17

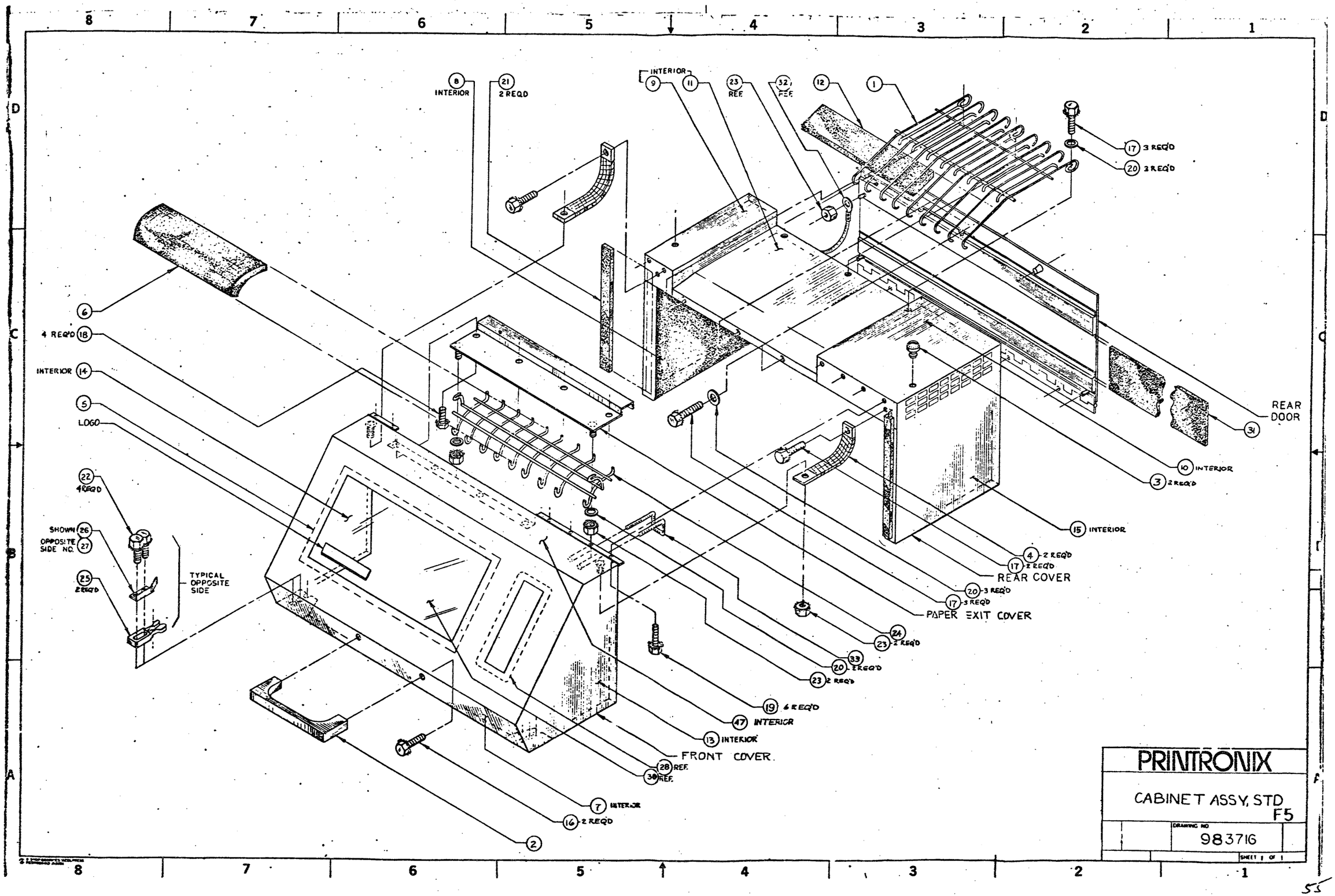
PRINTRONIX STANDARD PRINTER CABINET ASSY. DWG. NO: 983716

ITEM NO.	PART NO	DESCRIPTION
26.	102047-001	SPRING, GROUNDING COVER CATCH
27.	102047-002	SPRING, GROUNDING COVER CATCH
28.	101446-001	COVER, CONTROL PANEL
29.	102132-002	SPACER, ROUND ALUM.
30.	101415-001	WINDOW
31.	101718-001	ACOUSTIC FOAM - REAR DOOR
32.	101607-001	WIRE ROPE, REAR DOOR
33.	101714-001	CABLE RETAINER
34.	102439-001	FASTENER, OVAL HEAD
35.	105002-001	RING, FASTENER LOCKING
36.		
37.	102786-608	SCREW HEX HD. INDENTED/EXT. TH. L.W. 6-32 x .50
38.		
39.		
40.	102490-001	LABEL, UL LISTING
41.	102881-001	LABEL, CSA LISTING
42.	102250-001	GASKET, VINYL
43.	103716-000	CABINET ASSY, STANDARD
44.	103717-000	PRINTER/CABINET INSTALLATION
45	104954-001	NEST, ACOUSTIC FOAM, REAR SHROUD
46	104955-001	NEST, ACOUSTIC FOAM, FRONT SHROUD, STD
47	104955-104	FRONT SHROUD

PRINTRONIX

STANDARD PRINTER CABINET ASSY. DWG. NO. 983716

ITEM NO.	PART NO	DESCRIPTION
1.	102051-001	GUIDE, PAPER TOP REAR
2.	101820-001	HANDLE, ZINC DIECAST
3.	102684-001	BUMPER, CABINET
4.	102959-001	GROUND STRAP
5.	101562-002	TAPE, DOUBLE CONTACT
6.	101706-001	ACOUSTIC FOAM, FRONT PAPER GUIDE
7.	104955-103	FRONT SHROUD
8.	104954-103	REAR SHROUD
9.	104954-101	REAR SHROUD
10.	104954-102	REAR SHROUD
11.	104954-105	REAR SHROUD
12.	102243-001	ACOUSTIC FOAM, UPPER PAPER GUIDE
13.	104955-101	FRONT SHROUD
14.	104955-102	FRONT SHROUD
15.	104954-104	REAR SHROUD
16.	102787-108	SCREW, HEX HD. INDENTED/ EXT. TH. L.W. 10-32 x .50
17.	102786-108	SCREW, HEX HD. INDENTED/ EXT. TH. L.W. 10-24 x .50
18.	102786-605	SCREW, HEX HD. INDENTED/ EXT. TH. L.W. 6-32 x .31
19.	102786-604	SCREW, HEX HD. INDENTED/ EXT. TH. L.W. 6-32 x .25
20.	101526-006	WASHER, .201 I.D. x .700 O.D. x .071 THK, CRES.
21.	102250-003	GASKET, VINYL
22.	102786-110	SCREW, HEX HD. INDENTED/ EXT. TH. L.W. 10-24 x .62
23.	102788-100	NUT, HEX/EXT. TH. L.W. 10/24
24.	101270-001	GUIDE, PAPER TOP FRONT
25.	102006-001	CATCH, CABINET

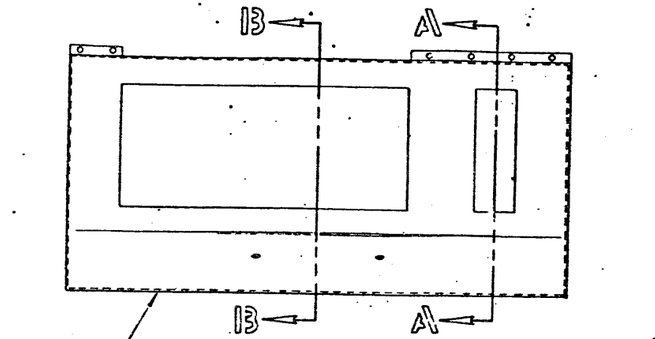


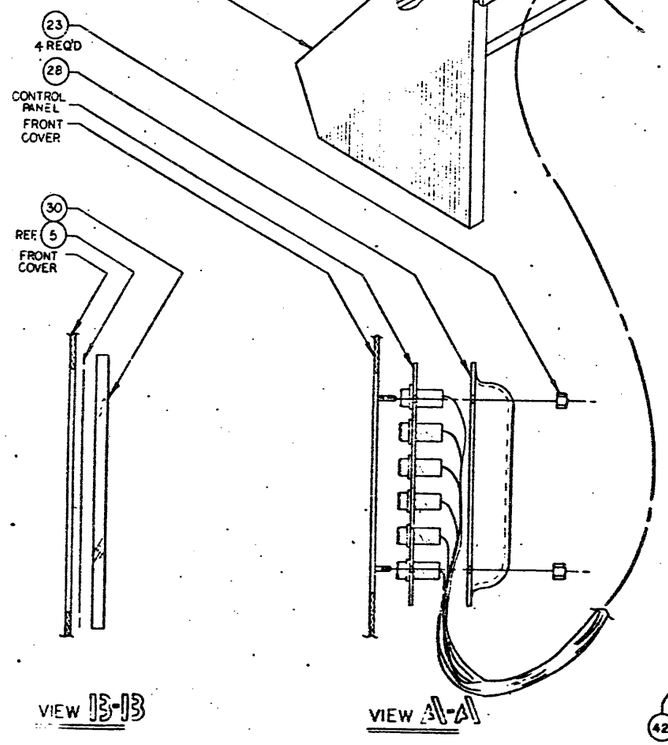
PRINTRONIX

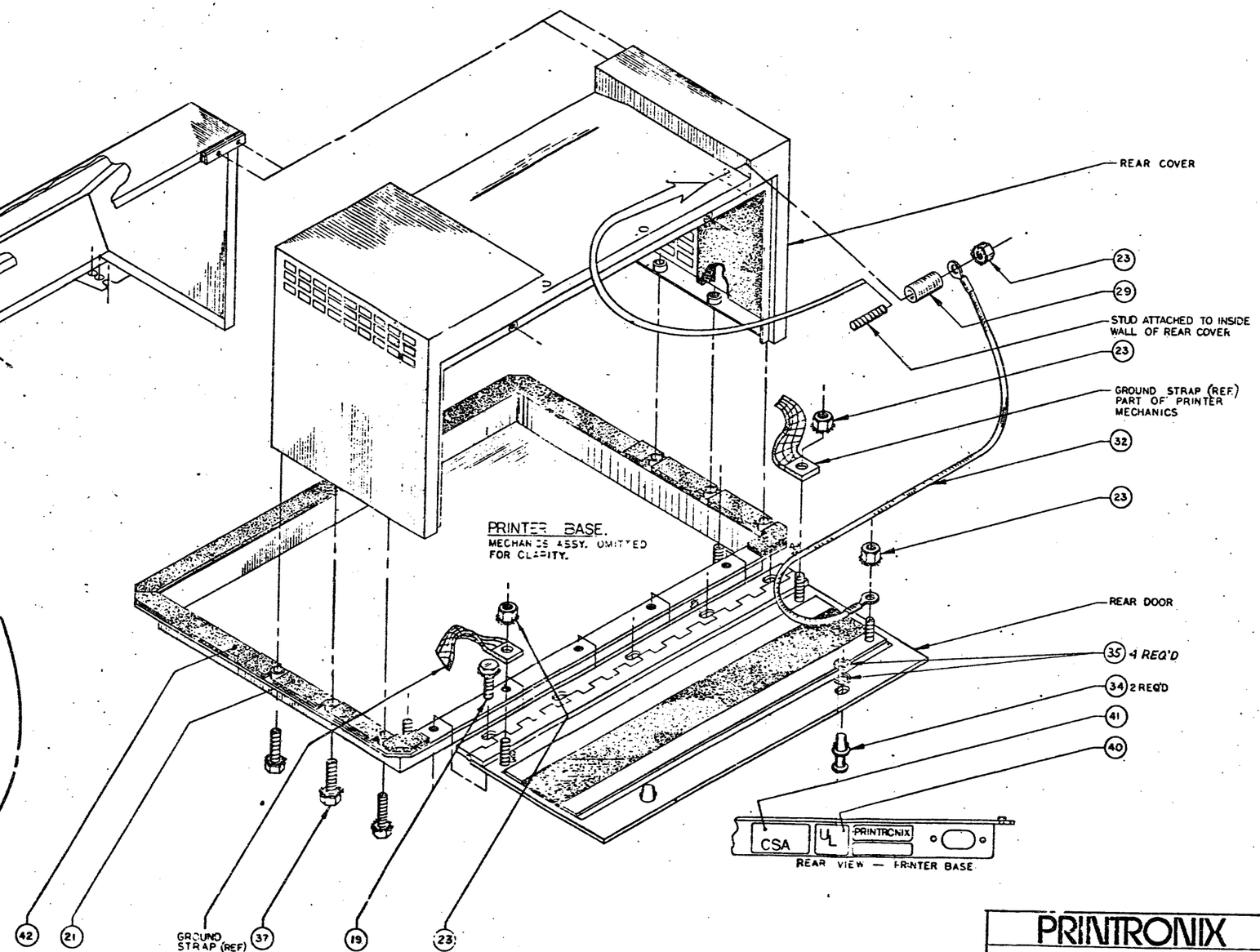
CABINET ASSY, STD
F5

DRAWING NO
983716

SHEET 1 OF 1







PRINTRONIX

PRINTER/CABINET INSTALLATION

F6

DRAWING NO. 983717

SHEET 1 OF 1

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PRINTRONIX
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