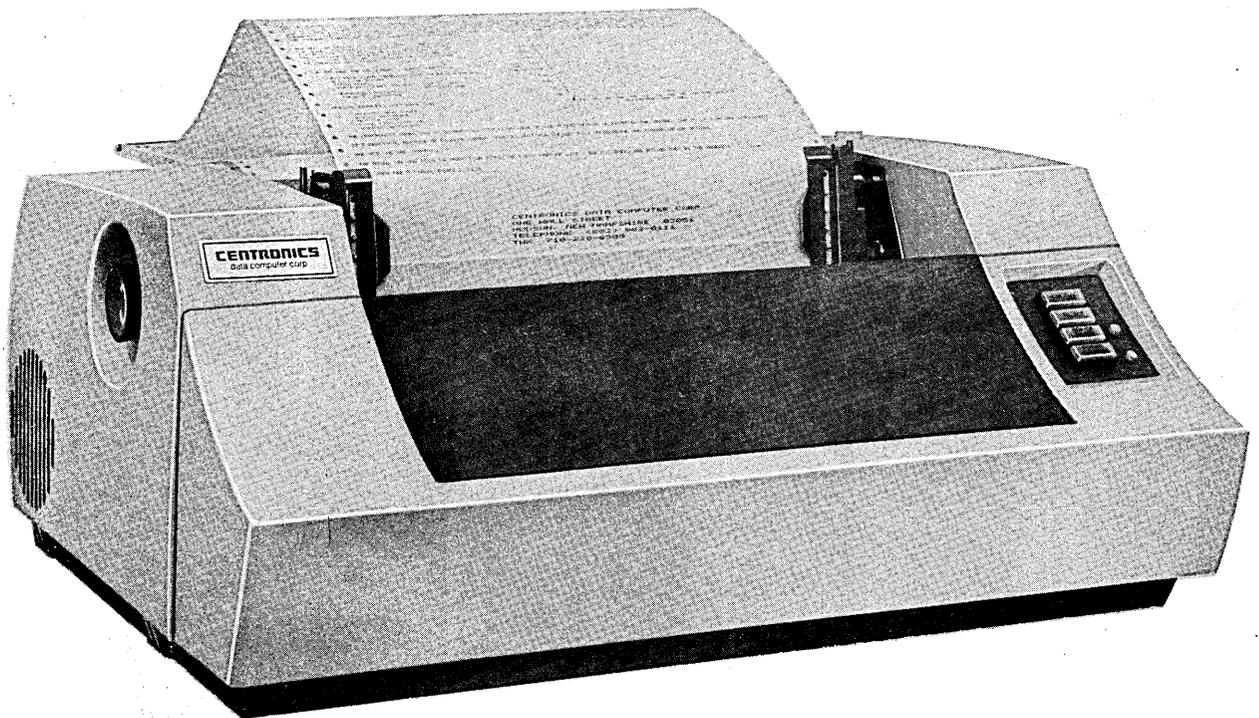


# TECHNICAL MANUAL

## MODEL 101AL PRINTER



MAY 1977

Centronics No. 37400050 Rev. E

### **CENTRONICS**

data computer corp.

HUDSON, NEW HAMPSHIRE 03051

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# TECHNICAL MANUAL

## MODEL 101AL PRINTER

MAY 1977

REVISION F

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#### NOTE

Refer to the Engineering Change Notice (ECN) sheets shipped with the printer for changes made to the printer which have not yet been incorporated into the drawings in this technical manual. Always keep these Engineering Change Notice sheets with the manual.

Revision level indications at the lower right-hand corner of a page reflect at what revision of the manual that page was updated.



## SECTION 1 INTRODUCTION

This manual describes the Model 101AL printer, manufactured by Centronics Data Computer Corporation. It provides general information, detailed theory of operation and maintenance information enabling field service personnel to maintain the printer. For serial input or other detailed interface information, a separate document for each interface is published for your reference.

The manual is grouped into eight sections, each with its specific purpose.

- Section 1 - INTRODUCTION, introduces the reader to the scope and content of the manual, and provides the reader with a general description of the printer.
- Section 2 - INSTALLATION, contains unpacking and installation instructions for the printer.
- Section 3 - OPERATION, describes the function of all operator controls and indicators and how they are used.
- Section 4 - THEORY OF OPERATION, contains a detailed description of each major operation performed by the printer electronics, including timing diagrams and, where applicable simplified circuit diagrams, all keyed to the schematic drawings.
- Section 5 - REMOVAL, REPLACEMENT AND ADJUSTMENT PROCEDURES, includes step-by-step removal and replacement procedures for all major assemblies and sub-assemblies in the printer.
- Section 6 - MAINTENANCE, includes preventive and corrective maintenance procedures and a maintenance schedule.
- Section 7 - ELECTRICAL DRAWINGS AND LIST OF MATERIALS, contains a complete set of schematic, wiring and component board layout diagrams and their associated list of materials for the electrical portion of the printer.
- Section 8 - MECHANICAL DRAWINGS AND PARTS LISTS, includes all printer assembly drawings and their associated parts lists for the mechanical portion of the printer.

At the end of the manual are several appendices which include a glossary of signal mnemonics, a standard 9 x 7, 64-character set, and parallel interface specifications.

### 1.1 GENERAL DESCRIPTION

The Model 101AL printer (Figure 1-1) is a medium speed impact printer which uses a 9 x 7 dot matrix for character generation. The unit prints at a rate of 165 characters per second with an average speed of 132 characters per second (including the return time for the printing head). The printer is capable of printing 132 columns, with paper width varying from 4 inches to 14-7/8 inches. The unit uses sprocket-fed paper and generates 6 lines to the inch vertically with 10 characters per inch, horizontally. The printer does not require special paper and can produce one original plus four copies.

The printer is completely self-contained. A single printed circuit board contains both the control logic and power supplies, made possible by the use of LSI (Large Scale Integration) circuitry.

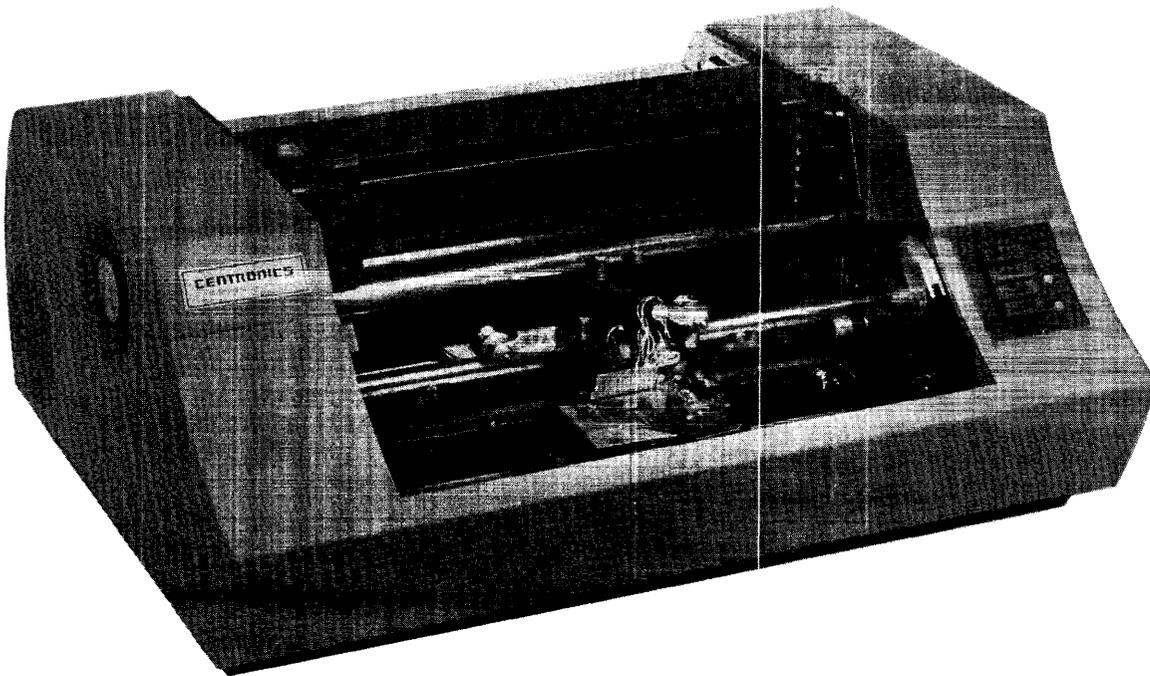


Figure 1-1. MODEL 101AL PRINTER (TOP COVER REMOVED)

## 1.2 LOGIC FLOW DIAGRAM (Figure 1-2)

If the input device transmits serial data (100-9600 Baud) then an optional RS232 interface is required to assemble the serial data, then transfer it in parallel to the input buffer in the printer.

Paper movement is initiated by a line feed, vertical tab and form feed function. The Vertical Format Unit (VFU) tape reader provides vertical tab and top of form spacing control by means of a perforated paper tape. In addition, the printer recognizes the following special control codes: bell, delete, select, de-select and elongated character, as described in Section 1.3.3.

Once a line of printable characters is stored in the buffer, head motion is initiated by activating the forward clutch, causing the print head to move from left to right across the paper. With the head in motion, data is transmitted from the buffer to the character generator. From there, character write pulses are sent to the driver circuits, which energize the print head solenoids causing the print wires to form the characters on the paper.

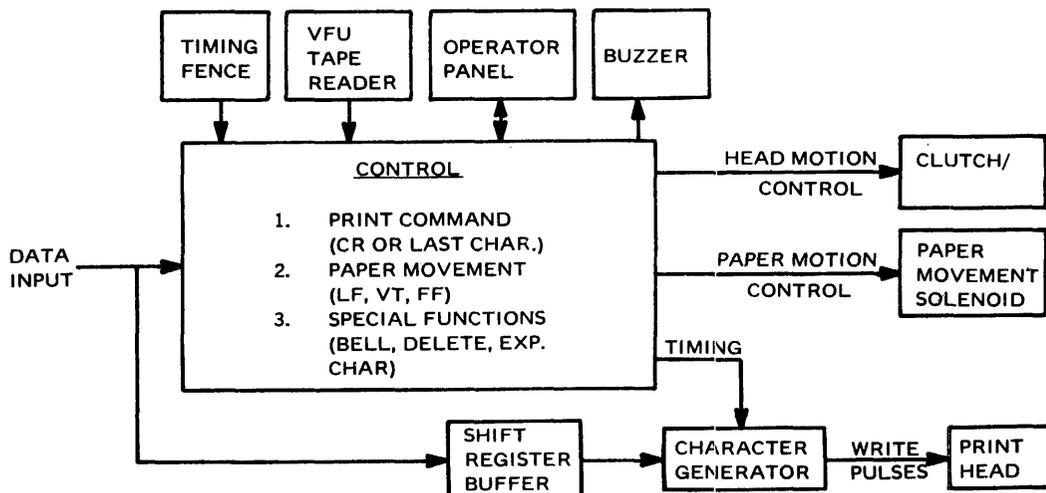


Figure 1-2. 101AL PRINTER LOGIC FLOW DIAGRAM

### 1.3 PRINTER OPERATION

Basically, all printer functions can be grouped into one of the following three categories: 1) character printing, 2) paper movement, and 3) other auxiliary functions such as printer select/de-select, delete, etc.

#### 1.3.1 CHARACTER PRINTING

A small aluminum carriage supports the print head assembly. During printing operation, the carriage travels along the print line from left to right at a constant rate of approximately 16.25 inches per second, and returns in approximately 240 milliseconds.

Printing is accomplished by selectively firing the print wires. These wires graphically construct the characters out of dots, as the print head moves from left to right across the print line.

Printing impulses energize the print solenoids and drive the print wires against the ribbon, paper and platen to form the characters in a dot matrix pattern. When the solenoids are de-energized, the wires are withdrawn so they are flush with the surface of the jewel. Each solenoid can fire independently up to five times for any one character. Figure 1-3 is an example of the dot matrix forming the letter H. All character formations in the standard 9 x 7 dot matrix are shown in Appendix B.

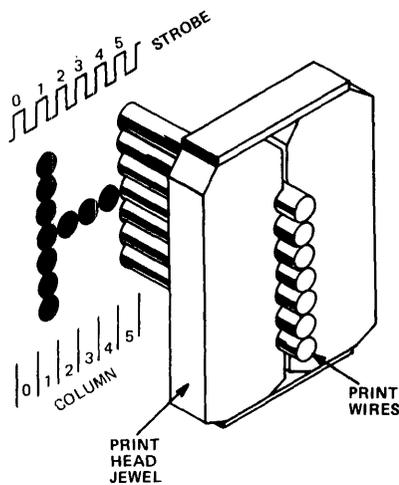


Figure 1-3. PRINTING THE LETTER (H)

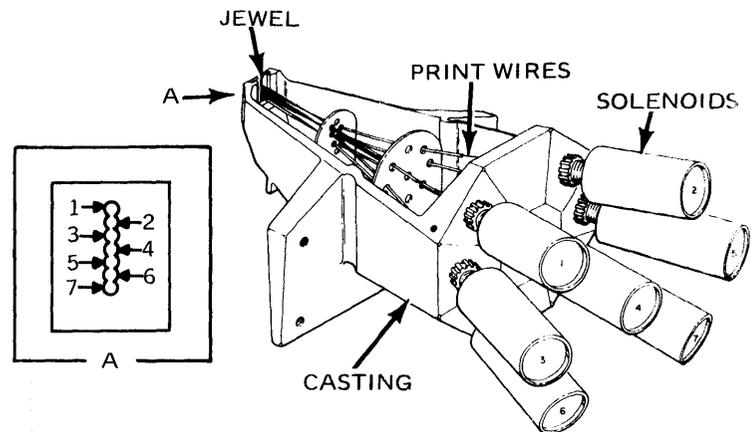


Figure 1-4. PRINT HEAD COMPONENTS

The print head (Figure 1-4) consists of the jewel, casting and seven solenoids with attached print wires. The seven print solenoids and their attached print wires are arranged around the print head. The free ends of the print wires pass through a wire guide at the front of the print head, which properly spaces the wires so that the correct wires pass through the correct hole in the print jewel.

Printing action is initiated when the input buffer has been filled or a carriage return (CR) character has been received. The print head then sweeps across the page until a CR command is decoded at the buffer output or the head reaches the 132-column limit right limit switch. At this time, the print head returns to the left margin and an automatic line feed is performed. As an option, the automatic line feed can be disabled.

#### 1.3.2 PAPER MOVEMENT

Paper can be moved manually by rotating the platen knob (shown in Figure 1-5) or automatically by any of three paper movement commands: line feed, vertical tab and form feed.

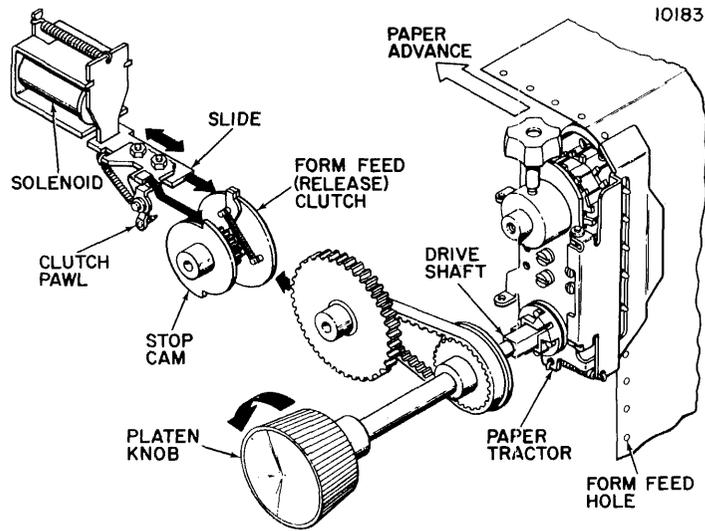


Figure 1-5. PAPER MOVEMENT

A small independent motor not shown in Figure 1-5, provides the power necessary to move the sprocket-feed tractors which control paper movement. To move the paper, the printer electronics activates a line feed solenoid which activates a clutch that mechanically links the motor to the sprocket-feed tractors.

To initiate a single line feed, the line feed solenoid is energized for 15 milliseconds to initiate paper motion. Upon completion of the line feed command, a 60 millisecond delayed line feed is generated. This allows the clutch pawl and clutch mechanism to return home before another line feed is allowed.

Vertical forms movement is accomplished by applying a DC level to the paper feed solenoid until a hole is detected in the Vertical Format Unit (VFU). The tape consists of two channels; one used for Top of Forms and the other for Vertical Tab. The movement of the paper tape is caused by direct mechanical linkage to the gear train which drives the paper feed tractors.

When the printer runs out of paper, a sensing switch activates a two-second audible tone in a speaker located in the rear of the printer. The printer also stops printing and lights the PAPER EMPTY light on the control panel.

### 1.3.3 SPECIAL FUNCTION

In addition to the printable characters shown in Appendix B, the printer can recognize the following special functions:

Carriage Return (Octal 015) - Initiates the printing of a line.

Form Feed (Octal 014) - Moves the paper until the top of the form hole in Tape Reader Channel 7 is reached.

Vertical Tab (Octal 013) - Moves the paper until the next hole in Taper Reader Channel 5 is reached.

Line Feed (Octal 012) - Advances the paper one line.

Delete (Octal 177) - Primes the printer electronics to an idle state and deletes any characters stored in the printer.

Bell (Octal 007) - Generates a two-second audible tone in the speaker at the rear of the printer.

Select (Octal 021) - Allows printer to receive data, same as activating SELECT switch.

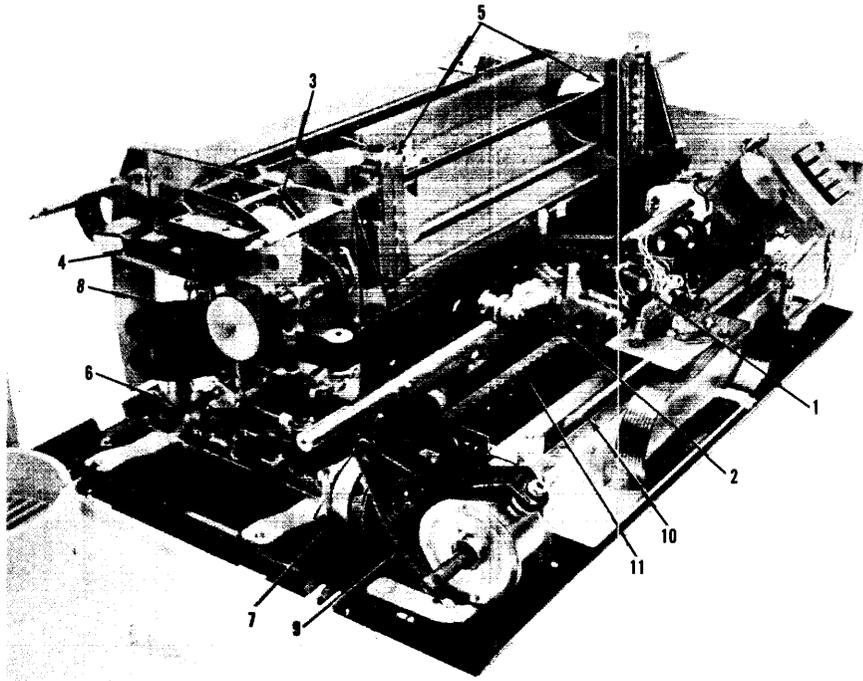
De-Select (Octal 023) - Inhibits printer from receiving data, same as deactivating SELECT switch.

## 1.4 SPECIFICATIONS

Printing Method:	Impact, character-by-character, one line at a time.
Printing Rate — Characters:	165 characters per second
— Full Lines:	55 ± 5 lines per minute (132 character line)
— Short Lines:	200 lines per minute (20-30 characters)
Transmission Rate — Serial:	100 to 9600 baud (with Serial option)
— Parallel:	See Timing Diagram - Appendix B
Data Input:	Parallel (Serial option available)
Character Structure:	9 x 7 dot matrix, 10-point type equivalent
Code:	USASCII — 64 characters printed, lower case characters recognized and printed as upper case equivalent.
Indicator - Switch Controls:	ON/OFF, SELECT, TOP OF FORM, FORMS OVERRIDE, LINE FEED.
Indicator:	PAPER OUT
Manual Controls:	Form Thickness, Paper Advance Knob
Character Buffer:	132 characters (1 line)
Format:	132 characters maximum per line, 6 lines per inch.
Paper Feed:	Sprocket feed, adjustable from 4" to 14-7/8" width.
Paper:	Standard sprocketed paper
Number of Copies:	Original and up to four carbon copies
Dimensions:	11½" high, 20" deep, 27¾" wide
Weight:	118 pounds
Electrical Requirements:	115 VAC ± 10% 60Hz or 115/230 VAC ± 10% 50 Hz.
Temperature — Operation:	40" to 100° F
— Storage:	-40" to 160" F
Humidity — Operating:	5% to 90% (no condensation)
— Storage:	0% to 95%
Standard Features:	Vertical Format Control Audio Alarm Elongated Boldface Characters Paper Runaway Inhibit Separate Prime Line and Fault Line to Output Connector Remote Select/De-Select Automatic Line Feed Disabled.
Optional Features:	Character sets of 64,96, or 128 characters Popular parallel and serial interfaces Automatic motor control Selectable single character elongation Elapsed time indicator

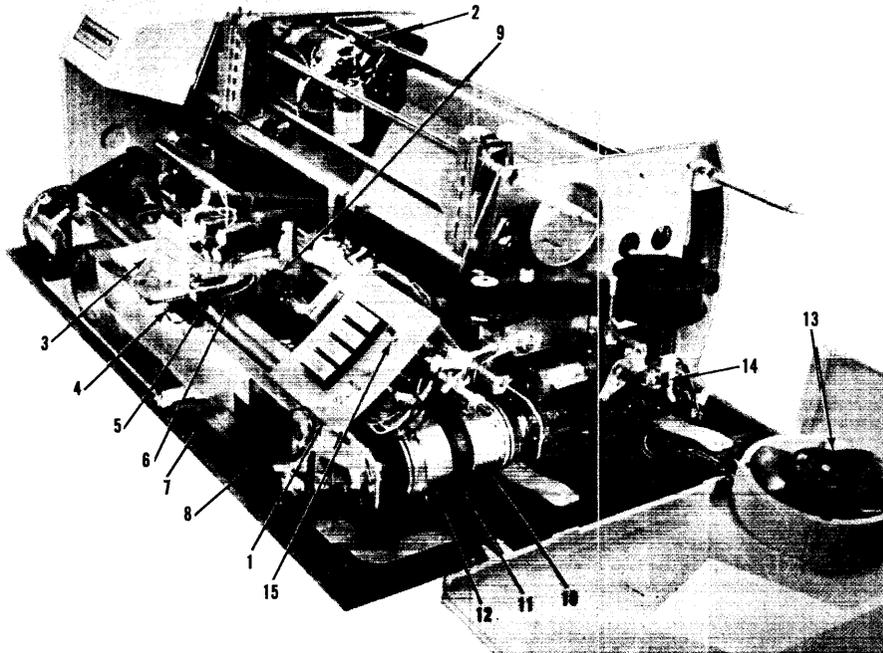
## 1.5 PHYSICAL DESCRIPTION

The printer is approximately 11½" high, 20" deep, 27-¾" wide and weighs approximately 118 pounds. Figures 1-6 through 1-9 are photographic views of the printer taken with the covers removed. Each major printer assembly is located on these figures and identified in the table below the photo.



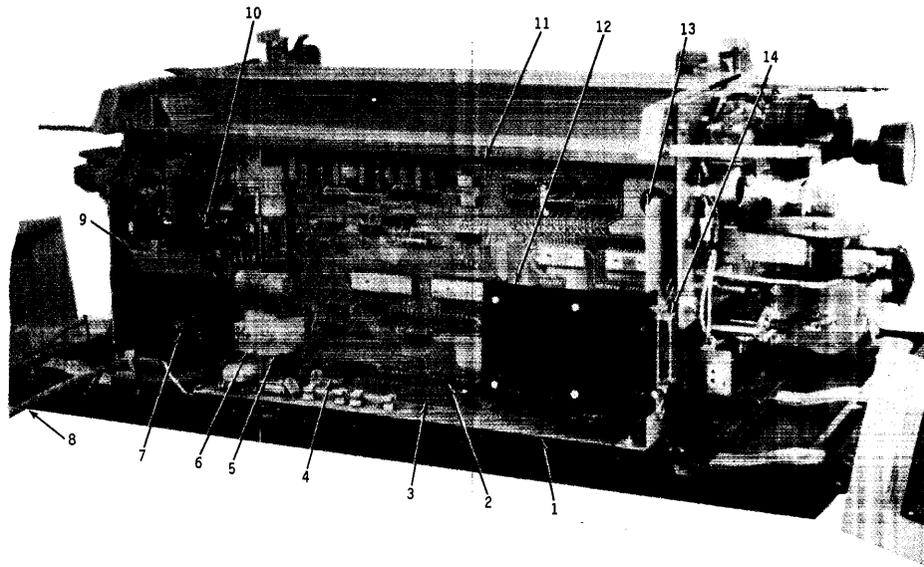
- |                        |                          |                |                     |
|------------------------|--------------------------|----------------|---------------------|
| 1. Print Head Assembly | 4. VFU Tape Reader       | 7. Spring Drum | 10. Timing Fence    |
| 2. Carriage            | 5. Pin Feed Mechanism    | 8. Platen Knob | 11. Main Drive Belt |
| 3. Form Feed Mechanism | 6. Ribbon Feed Mechanism | 9. Damper      |                     |

Figure 1-6. LEFT FRONT VIEW OF 101AL



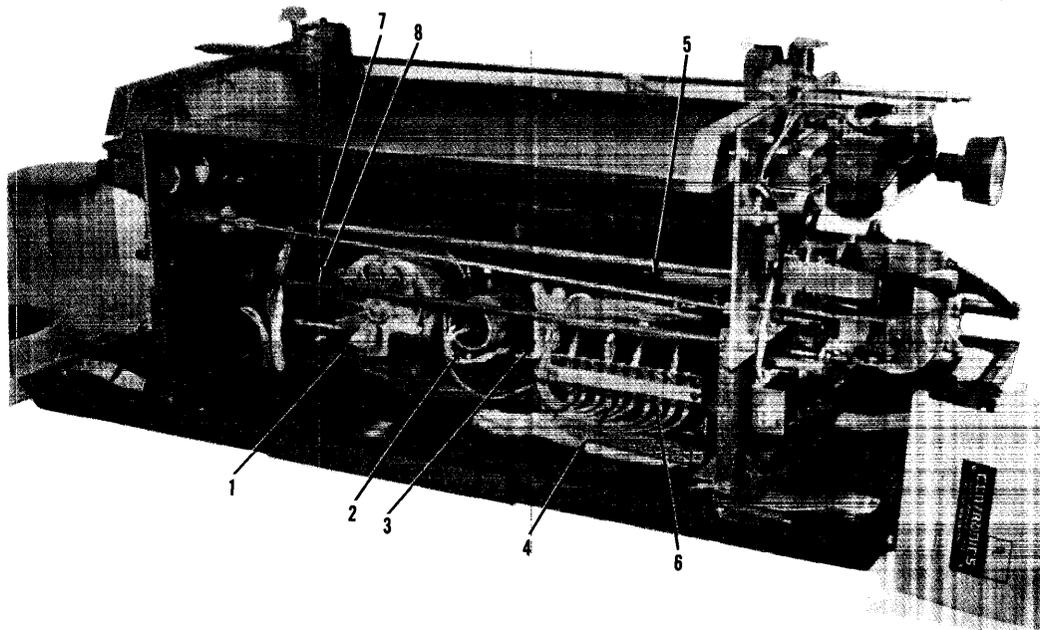
- |                                       |                       |                                |                           |
|---------------------------------------|-----------------------|--------------------------------|---------------------------|
| 1. Operator Control Panel             | 5. Optical Pick-Up    | 9. Penetration Control Knob    | 13. Cooling Fan           |
| 2. Form Feed Motor                    | 6. Optic Bundle       | 10. Forward Clutch             | 14. Ribbon Feed Mechanism |
| 3. Video Amplifier and Cable Assembly | 7. Ribbon Cable       | 11. Main Pulley and Drive Belt | 15. Line Feed             |
| 4. Light Source                       | 8. Power Driver Board | 12. Reverse Clutch             |                           |

Figure 1-7. RIGHT FRONT VIEW OF 101AL



- |                   |                      |                              |
|-------------------|----------------------|------------------------------|
| 1. Connector Card | 6. J1                | 11. Logic/Power Supply Board |
| 2. Connector J4   | 7. Fuse F5           | 12. Speaker                  |
| 3. Connector J6   | 8. AC Power Input    | 13. Electronics Cavity       |
| 4. Connector J3   | 9. +30V Power Supply | 14. Input Connector          |
| 5. Connector J2   | 10. Fuse F4          |                              |

Figure 1-8. REAR VIEW OF 101AL



- |                             |                          |                         |
|-----------------------------|--------------------------|-------------------------|
| 1. Main Motor               | 4. Electronics Connector | 7. Ribbon Reversing Rod |
| 2. Motor Starting Capacitor | 5. Power Transformer     | 8. Ribbon Drive Rod     |
| 3. AC Power Connector       | 6. Power Distribution    |                         |

Figure 1-9. REAR VIEW (101AL ELECTRONICS CAVITY REMOVED)



## SECTIONS 2 AND 3 INSTALLATION AND OPERATION

A separate operators manual (No. 37400001) contains most of the installation, set-up and operating procedures for the Series 100 printers. This operators manual should be referred to during normal printer installation and operation.

Included on the following pages is additional information not contained in the operators manual.

### 2.1 SITE PREPARATION (Figure 2-1)

A line drawing of the printer dimensions is shown in Figure 2-1. As shown in this drawing, the width of the installation site must take into account the side covers in an opened position.

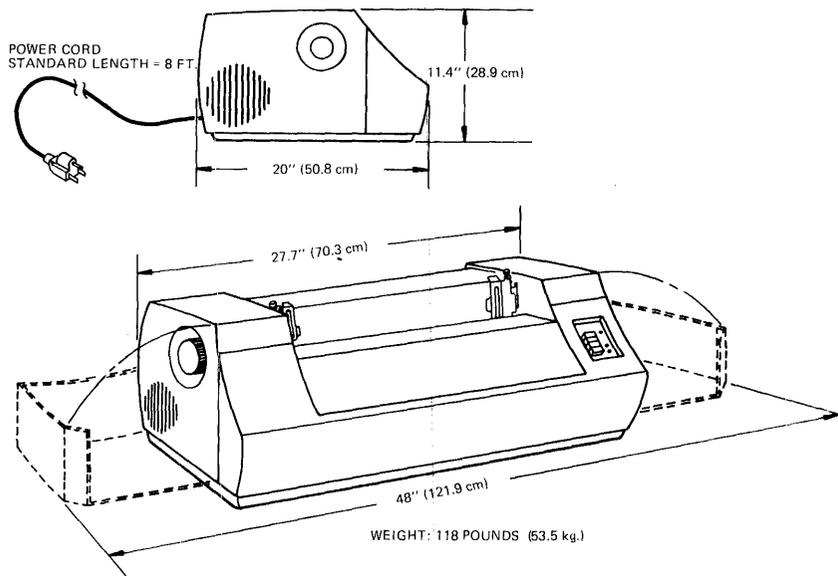


Figure 2-1. PRINTER DIMENSIONS

Environmental and electrical requirements at the installation site are as follows:

Temperature:	40° to 100° F (Operating) -40° to 160° F (Storage)
Humidity:	5% to 90% (no condensation) - Operating 0% to 95% - Storage
Electrical:	115 VAC $\pm$ 10%, 60Hz, 3 amps 115/230 VAC $\pm$ 10%, 50Hz, 1.6 amps

### 2.2 SHIPPING CRATE

The printer is shipped in a crate approximately 20 inches high, 27 inches deep and 32 inches wide. The crate is made of weatherized, triple-walled cardboard. When properly strapped, the packing crate and printer is capable of fork lift operation with a seven-high stacking capability.

Shipped with the printer are the following items:

- (1) If a special interface is used, the interface card is included with the printer. For certain interfaces such as the RS232, a special cable is also shipped. Cabling requirements for the standard parallel interface are defined in Appendix B.

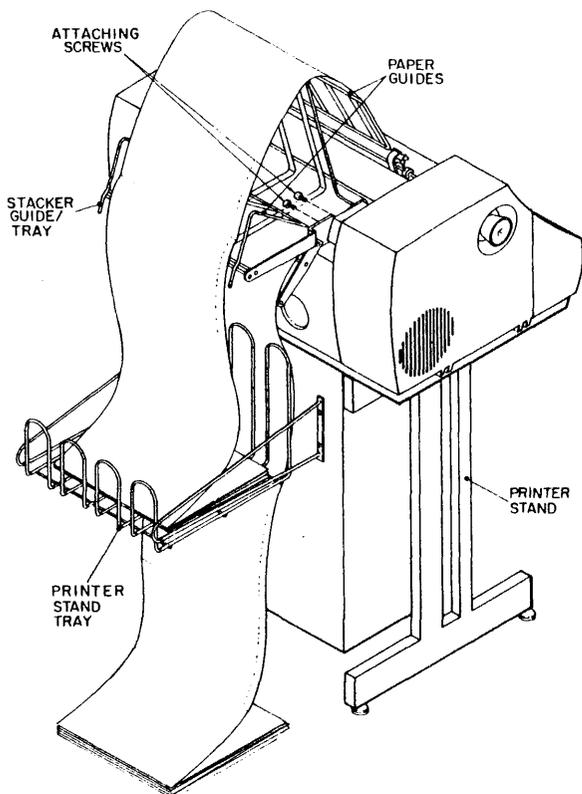
- (2) A standard vertical format paper tape providing six line feeds (one inch) for each vertical tab and 66 line feeds (11 inches) for each form feed code. This tape is a part of the vertical format unit. Refer to the Operators Manual for duplicating the existing tape, or if a different format is desired, for generating a new tape.
- (3) Documentation - All documentation describing that particular printer is included in a plastic under the printer. This documentation includes a technical manual for the printer and any optional interface, and a notice of all approved changes incorporated in the printer but not documented in the manual. Please keep this documentation with the printer at all times so that accurate information will be available for troubleshooting purposes.
- (4) Pin Feed Knobs - These knobs are contained in a small plastic bag stapled to the guide bar for the pin feed unit.
- (5) Print Sample - A sample printout from that particular printer is included in the upper paper pan.
- (6) Unpacking/Repacking and Set-up Instruction Sheet.

Shipped in a separate container is the paper guide and stacker assembly. Installation instructions for this assembly are included with the assembly and also in Section 2.3.

## 2.3 PAPER GUIDE AND STACKER ASSEMBLY (527001001)

### ASSEMBLY INSTRUCTIONS

Attach paper guide and stacker assembly (one piece) to the back, top of printer by first removing two screws from the left and right side, and install using a flat bladed screwdriver. Make sure rounded paper guides rest on top of printer in front of paper feed opening.



PRINTER STAND OPERATION

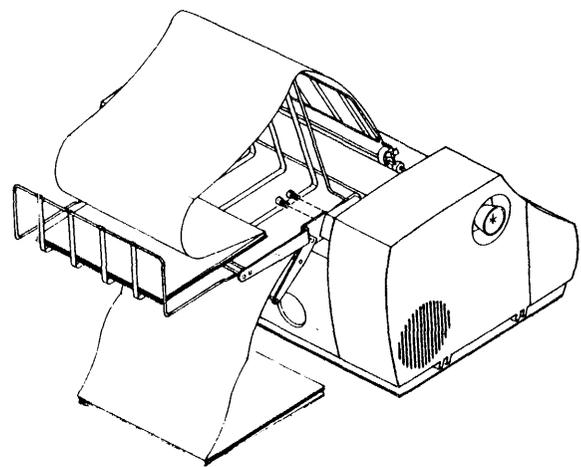


TABLE TOP OPERATION

Figure 2-2. PAPER GUIDE AND STACKER ASSEMBLY

## SECTION 4

### THEORY OF OPERATION

#### 4.1 INTRODUCTION

This section on the theory of operation contains a detailed description of each major function performed by the Model 101AL printer electronics. Figure 4-1 shows a basic functional diagram of the printer electronics.

Throughout this section, reference is made to the schematic diagrams contained in Section 7. The section is organized as follows:

- |           |      |  |
|-----------|------|--|
| Paragraph | 4.2  | Basic Timing   |
|           | 4.3  | Initializing the Printer (Prime, Select)                     |
|           | 4.4  | Data Input (Data, Strobe, Busy, Acknowledge)                 |
|           | 4.5  | Shift Register (Buffer)                                      |
|           | 4.6  | Character Printing   |
|           | 4.7  | Paper Movement (Line Feed, Vertical Tab, Form Feed)          |
|           | 4.8  | Special Functions (Bell, Paper Empty, Delete, Motor Control) |
|           | 4.9  | Power Supplies   |
|           | 4.10 | Outputs from LSI chips                                       |

#### 4.2 BASIC TIMING

The basic timing clock for the printer electronics is derived from signal OSC. This OSC signal is generated on LSI chip ME9 pin 25. The frequency of OSC, determined by the RC circuit (R41-C9) on pin 26 of this chip, ranges from 100 to 200 KHz.

This OSC clock is then used by both LSI chips (ME5 and ME9) for internal timing, and is inverted by ME4-6 to generate OSCXT. Signal OSCXT goes to the printer interface connector and if an optional interface is used, it also goes to this optional interface board (e.g., RS232 Serial Interface).

#### 4.3 INITIALIZING THE PRINTER

Before the printer can accept input data, it must first be PRIME'd and SELECT'ed. The prime operation initializes the printer logic to a ready state. The select operation after causing a prime condition, (which can be disabled by jumper (E14-E15), resets the busy line to the interface connector and makes the printer ready to receive data.

##### 4.3.1 PRIME

The PRIME signal, generated on LSI chip ME9-37, is generated by any of the following conditions.

- A. **Power Turn-On** - When the printer is turned on, capacitor C17 is initially discharged causing a low 100-500 msec PWRPRM signal into ME9-32. This generates a high PRIME signal at ME9-37. As C17 charges to +5V, PWRPRM goes high terminating the power prime operation.

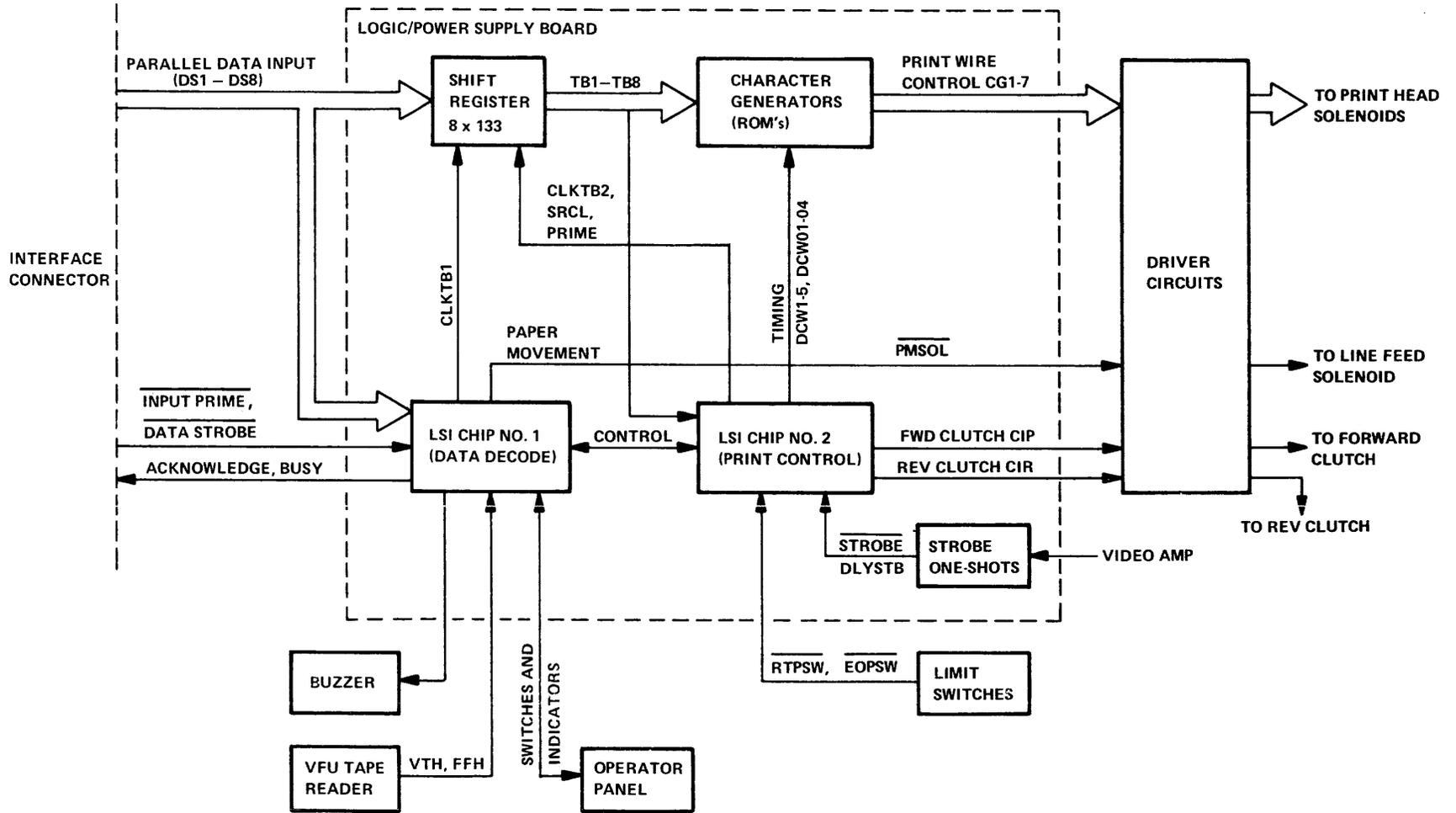


Figure 4-1. MODEL 101AL BLOCK DIAGRAM

- B. **Printer Selection** - If the Delete Inhibit option (DELINH) is not used (i.e., jumper E13 to E14 is connected), then a low  $\overline{SLCT}$  input to ME9-40 and a high DELINH to ME9-39 generates a 100-400 usec PRIME pulse at ME9-37.
- C. **End of a Printed Line** - At the end of a line of print, CIPX at ME9-30 goes high, turning off the forward clutch and generating a 100-400 usec PRIME pulse at LSI chip ME9-37.
- D. **Delete Code** - Receiving a delete code (octal 177)\* on input data lines  $\overline{DS1}$ - $\overline{DS7}$  generates a low  $\overline{DCPRM}$  output at LSI chip ME5-8. Signal  $\overline{DCPRM}$  then generates a 100-400 usec PRIME pulse out of LSI chip ME9-37.
- E. **Input Prime** - Reception of a low  $\overline{INPUT PRIME}$  level at the interface connector generates a high IP signal into LSI chip ME5-36. This produces a low  $\overline{DCPRM}$  output at LSI chip ME5-8 (same as the delete code), which in turn generates a 100-400 usec PRIME pulse out of LSI chip ME9-37.

In all of the above cases, the high PRIME signal out of LSI chip ME9-37 resets the printer logic including the shift register and places a dummy character in the first character position in the register. A diagram of the prime timing is shown in Figure 4-2.

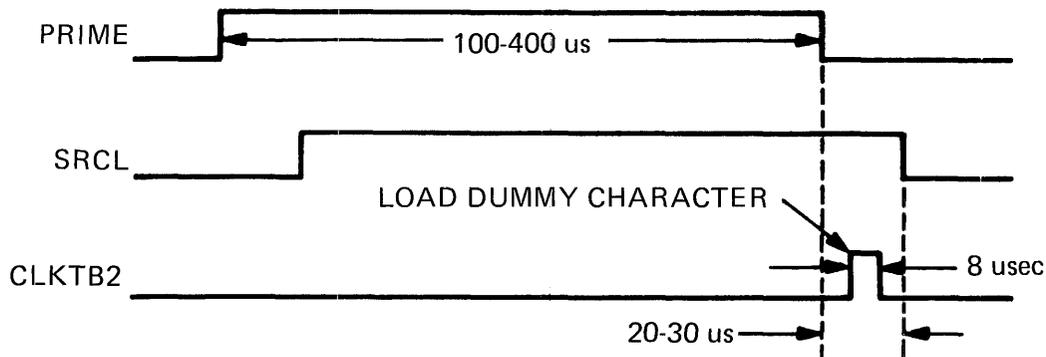


Figure 4-2. PRIME TIMING

The high PRIME signal into pin 3 of the two shift register elements (ME18 and ME19) disables all inputs to these elements and internally resets all stages of the shift register. When PRIME goes low, recirculate signal SRCL from LSI chip ME9-38 remains high and a single  $\overline{CLKTB2}$  pulse is generated at ME9-36. The high SRCL (and low PRIME) connect shift register outputs TB1-TB7 back to inputs  $\overline{DS1}$ - $\overline{DS7}$ , and enables a high (+5V) input to stage 8. Note that since the shift register uses inverted signals for both inputs and outputs (e.g., DS1 and TB1), a high input to stage 8 represents a ZERO into that stage.

The single  $\overline{CLKTB2}$  pulse then clocks a dummy character into the register (i.e., ONES into stages 1-7 and a ZERO into stage 8).

\*Throughout this section, input codes are defined only by their first seven bits. However, bit 8 into the function decoder contained in LSI chip 5 must be a ONE.

### 4.3.2 SELECT

Before the printer can receive data, it must first be selected. This can be done either by the SELECT switch on the operator panel or by an octal 021 code on the input data lines.

Pressing the SELECT switch (S4) generates a low SELSW signal into LSI chip ME5-31. The chip contains "anti-bounce" protection which requires the SELSW line to be noise-free for approximately 2-8msec before the level is recognized by the chip. After this delay, the low SELSW input sets a Select latch in the chip. The output of this latch appears as signal SLCT' on LSI chip ME5-40.

Similarly, a decoded octal 021 code on data inputs  $\overline{DS1-DS7}$  ANDed with ungated data strobe pulse DSTA also sets this Select latch.

The printer is deselected (i.e., the internal Select latch is reset) either by again pressing the SELECT switch or by an octal 023 on data lines  $\overline{DS1-DS7}$  and a DSTA pulse. Alternately pressing the SELECT switch alternately selects and deselects the printer. Note that when power is turned on, PWRPRM resets the internal Select latch so that the printer initially appears in a deselect state.

A high SLCT' signal at ME5-40 indicates that the printer is selected. This signal, inverted by ME22-6 ( $\overline{SLCT}$ ) turns on the SELECT lamp on the operator panel.  $\overline{SLCT}$  inverted by ME20-4 generates a SLCT signal to the interface connector.

If DELINH jumper E13 to E14 is connected, then selecting the printer will also cause a prime condition. If jumper E14 to E15 is used, select will not cause a prime condition.

## 4.4 DATA INPUT

Inputs to the printer consist of seven standard parallel data lines (DATA1-DATA7), an optional DATA8 line, an active low  $\overline{\text{DATA STROBE}}$  input, and an active low  $\overline{\text{INPUT PRIME}}$  line. The first seven data lines represent the 7 bit ASCII code shown in Appendix B. The optional eighth bit is used as a control bit either for specifying an elongated character or for selecting an additional character set. The data strobe is used to synchronize the input data with the printer electronics. The prime line is used to prime (initialize) the printer electronics.

The eight data inputs have a unity loading factor and are terminated by a 1K pull-up resistor to +5volts. The data strobe and prime inputs are terminated by a 470 ohm resistor to +5 volts. Note that with no input on DATA8 line, terminating resistor R15 holds the input at +5V, making bit 8 appear as a ONE on the logic card.

In response to received data, the printer generates an Acknowledge pulse to acknowledge reception of a character. If the received character caused the printer to perform some function such as paper movement, character printing, etc., the printer responds with a Busy signal.

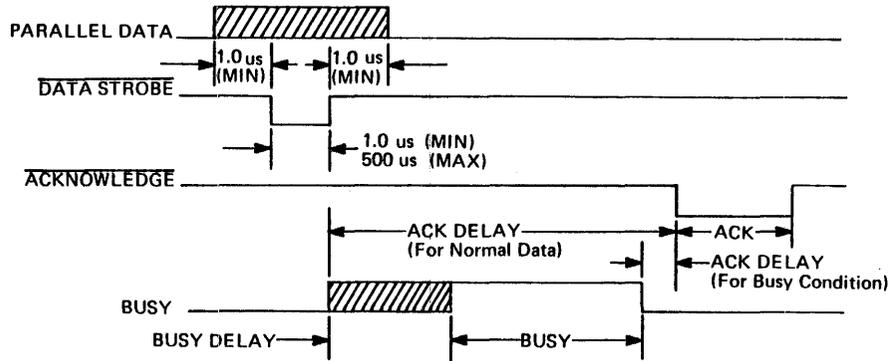
### 4.4.1 DATA INPUT TIMING

In general, the data transfer sequence consists of the input device placing the appropriate code on the data lines to the printer and then generating a data strobe pulse. The printer, after a slight delay, responds with an acknowledge pulse. Or if the received data caused a busy condition, the printer first activates the busy line for the duration of the busy condition and then responds with an acknowledge pulse.

If the received data does not cause a busy condition, the printer generates a 2.5 to 5.0 usec ACKNOWLEDGE pulse (some 2.5 to 10 usec after the trailing edge of DATA STROBE) indicating that it is ready to receive additional data.

If the received data causes a busy condition, the busy signal goes active 0 to 1.5 usec after the trailing edge of DATA STROBE, and the ACKNOWLEDGE pulse is generated 0 to 10 usec after BUSY is terminated.

The "gated strobe" feature in the 101AL prevents the printer from recognizing a data strobe unless the previous character has been acknowledged. A non-gated data strobe option, is available however to allow the printer to accept all data strobes. A data transfer timing diagram is shown in Figure 4-3.



NORMAL DATA INPUT TIMING	
ACK DELAY	2.5-10 usec
ACK	2.5-5.0 usec

BUSY CONDITION TIMING	
BUSY DELAY	0-1.5 usec
ACK DELAY	0-10.0 usec
ACK	2.5-5.0 usec

<u>BUSY DURATION:</u>	
Line Feed	75-105 msec
Vertical Tab (1-inch)	300-310 msec
Form Feed (11-inches)	3-3.5 sec
Delete	100-400 usec
Bell	0
Select	100-400 usec *
Deselect	Until printer is selected
Print Command	6 msec per character plus 75-105 msec line feed. Printer is not busy during return time (240 msec max.).

\* No busy if inhibit prime on select option is used.

Figure 4-3. DATA INPUT TIMING

#### 4.4.2 BUSY

A busy indication is developed by LSI chip ME5 pin 11. This  $\overline{\text{BUSY}}$  output, normally high when the printer is not busy, goes low when any of the following conditions occurs:

- (1)  $\overline{\text{CSBSY}}$  goes low - This occurs when a dummy character ( $\overline{\text{TB8}}$ ) is detected at the shift register output and a prime operation is not in progress. This indicates that the 132nd character has just been loaded into the shift register (without a carriage return code).
- (2) PRIME goes high - This occurs during a prime operation as described in Section 4.3.1.
- (3) LFF (internal to ME5) goes high - This occurs either when a form feed code (octal 014) is received, or if the optional TOP OF FORM switch on the operator panel is pressed. (Note: If the DSC option is used, the received FF code will first cause the line to be printed before activating LFF). LFF is normally reset by the trailing edge of DLYLF.
- (4) LLF (internal to ME5) goes high - This occurs when a line feed code (octal 012) is received or the optional LINE FEED switch on the operator panel is pressed. LLF is reset by the trailing edge of DLYLF.
- (5) LTF (internal to ME5) goes high - (Similar to the LFF signal) - LTF goes high when a vertical tab code (octal 013) is received and is reset by the trailing edge of DLYLF.
- (6)  $\overline{\text{DCPRM}}$  goes low - This occurs: (a) when a delete code (octal 177) is received, or (b) when an  $\overline{\text{INPUT PRIME}}$  signal is received at the interface connector, or (c) a power prime ( $\overline{\text{PWRPRM}}$ ) condition exists.
- (7) REMCR (internal to ME5) goes high - This occurs when a control character is clocked into the shift register, indicating the start of a character printing operation. In the standard 101AL printer, only the carriage return control code (octal 015) is stored in the shift register. However, if the DSC option is used (jumper E10 to E11), then a LF, VT, FF, or CR code (octal 012, 013, 014, and 015 respectively) may be loaded into the shift register.
- (8)  $\overline{\text{PMSOL}}$  goes low - This occurs while the paper movement solenoid is activated.
- (9) FAULT goes high - This occurs: (a) if the printer is deselected ( $\overline{\text{SLCT}}$  is low), or (b) if the printer is out of paper ( $\overline{\text{PE}}$  is low), or (c) during a paper time-out condition, or (d) during a Light Detect ( $\overline{\text{LD}}$ ) error condition.  $\overline{\text{LD}}$  goes low if no video signal is detected as the print head travels across the page.
- (10) DLYLF goes high - This 60-90 millisecond line feed delay occurs following a paper movement operation.

As shown in the timing diagram in Figure 4-3, BUSY can occur up to 1.5 usec following the trailing edge of DATA STROBE. The worst case (1.5 usec) condition arises when  $\overline{\text{CSBSY}}$  goes active. This occurs because of the accumulated delays in loading the 132nd character in the shift register, detecting the dummy character at the output, generating the  $\overline{\text{CSBSY}}$  on LSI chips ME16 and finally generating the  $\overline{\text{BUSY}}$  on LSI chip ME5.

#### 4.4.3 FUNCTION DECODER

The buffered data inputs are applied to a function decoder on LSI chip ME5. These data lines gated with a data strobe signal are decoded and if a control code is detected, specific functions occur as described in Table 4-1.

Table 4-1. CONTROL FUNCTIONS

Function	Octal Code	Jumpers	Strobe	Output Mnemonic	Printer Action
Bell	007	None	Gated	BELL	Generates an audible tone, 1 to 2 seconds in duration, in the speaker of the printer.
Line Feed *	012	None	Gated	CSLF, PMSOL	Advances the paper one line.
Vertical Tab*	013	None	Gated	PMSOL	Causes paper to advance until the next hole in channel 5 of the Vertical Format Unit (VFU) paper tape is reached.
Form Feed*	014	None	Gated	PMSOL	Causes paper to advance until the next hole in channel 7 of the VFU paper tape is reached.
Carriage Return	015	None	Gated	DSCR	Causes the received line of characters to be printed.
Elongated Character	016	E16-E18	Gated	UPSC	Causes all characters on the line to be printed at double the normal width.
Select	021	None	Ungated	SLCT'	Selects the printer. E14 to E15 inhibits a prime operation during select.
Deselect	023	None	Ungated	SLCT'	Deselects the printer.
Delete	177	None	Ungated	DCPRM	Primes the printer.

\*If the DSC option is used (jumper E10 to E11), LF, VT, and FF also cause the received line of characters to be printed.

In addition to the functions listed, the function decoder also monitors the input data for the first printable character (i.e., a ONE in bit 6 or 7). Detection of the first printable character, sets First Character Clock latch (FCCLK) internal to LSI chip ME5. Only when this latch is set will the printer respond to a carriage return code (or if the DSC option is used, to a LF, VT, or FF code) by printing the line of characters.

## 4.5 SHIFT REGISTER (BUFFER)

The printer storage buffer consists of two quad 133-bit shift register MOS elements (ME16 and ME17). These elements provide an 8 x 133-bit storage capacity or one full line of 132 characters. The extra character storage (i.e., 132 instead of 133) is used for storing a dummy character ( a ONE in bit 8). Detection of this dummy character at the shift register output indicates that the 132nd character for that line has just been shifted into memory.

A high PRIME input to ME16 and ME17, disables all other inputs and asynchronously resets the entire register. When PRIME is low, the shift register operates in either the normal or the recirculate mode. With the recirculate input (SRCL) low, each CLKTB1 or CLKTB2 pulse clocks the  $\overline{DS1}$ - $\overline{DS8}$  inputs into the shift register. With SRCL high, the register is in the recirculate mode. The first three stages in each shift register element are recirculated internally. The fourth stage in ME17 is recirculated by the external connection TB4 to the Recirculate Input (R.I.). The R.I. terminal for the fourth stage in ME17, however, is tied to +5V. As a result, when the SRCL input is high, CLKTB recirculates the  $\overline{TB1}$ - $\overline{TB7}$  outputs back to the inputs and forces a ONE into the eighth stage ( $\overline{TB8}$ ).

The actual shift register timing depends on which of the following printer operations is taking place: 1) a prime condition; 2) data reception 3) reception of a carriage return code (octal 015) prior to the 132th character in a line; or 4) printing a line of characters.

### (1) Priming the Shift Register

During a prime condition, LSI element ME9 generates a high PRIME signal. While PRIME is high, all shift register stages are automatically reset, independent of the data inputs. After PRIME goes low, SRCL remains high and a single CLKTB1 pulse is generated. At this time, a ONE is clocked into bit 8 (due to +5V at the recirculate input ME16 pin 15), generating a dummy character at that location.

### (2) Normal Data Input

During normal data input from the external device, LSI element ME5 generates a CLKTB1 pulse, slightly delayed from data strobe, each time a printable character or a CR code has been received. The trailing edge of CLKTB1 then clocks data lines  $\overline{DS1}$  -  $\overline{DS8}$  into the shift register.

### (3) Following a Carriage Return Code

Following the reception of a carriage return code, LSI chip ME16 generates CLKTB2 pulses to the shift register, at the same rate as the OSC clock. This shifts the register until the dummy character appears at the output ( $\overline{TB8}$  goes high). The high  $\overline{TB8}$  then terminates the CLKTB2 pulses.

### (4) During Character Printing

When printing a line of characters, during each DCWO interval (developed internally in LSI chip ME9), the video STROBE pulse generates a CLKTB2 pulse. This clocks the next consecutive character to the output of the shift register, where it remains until the next DCWO - STROBE interval.

## 4.6 CHARACTER PRINTING

When the dummy character appears at the shift register output ( $\overline{\text{TB8}}$ ), other than during a prime condition, the logic activates an electromechanical clutch which causes the print head to move from left to right across the page.

As the print head carriage moves across the page, the timing fence (and light source) generate timing inputs to the video amplifier board. These timing signals are used by the logic to register the five full columns of dots in the printed character.

The logic uses two ROM (Read-Only Memory) elements for each character set. One ROM defines the dot pattern for the five full-step columns, the other defines the dot pattern for the four half-step columns in a 9 x 7 matrix.

This section describes the character printing operation in the following sequence.

Paragraph	4.6.1	Initiating the Printing Operation
	4.6.2	Character Registration and Timing
	4.6.3	Character Generator (ROM)
	4.6.4	Print Head Operation
	4.6.5	Power Driver Circuits

### 4.6.1 INITIALIZING THE PRINTING OPERATION

As data is received by the printer, the dummy character is shifted through the shift register. As the 132nd character is received, the dummy character appears at the shift register output. If a carriage return code (octal 015) is received before the 132nd character, this code is stored in the register and LSI chip ME9 generates CLKTB2 pulses to shift the register until the dummy character appears at the output. A high  $\overline{\text{TB8}}$  indicates dummy character.

When  $\overline{\text{TB8}}$  goes high, LSI chip ME9 generates a low  $\overline{\text{CIPX}}$  signal.  $\overline{\text{CIPX}}$  is inverted by ME10-2 to generate CIP, which is in turn inverted by ME6-12 to generate  $\overline{\text{CIP}}$ .

The high CIP signal controls a driver circuit (via the optional Motor Control circuit) on the power driver board, the output of which activates the forward clutch.

A limit switch is located at the right and left end of the printer. These switches (RTP switch on the left, EOP switch on the right) are activated by a magnet mounted on the underside of the carriage mechanism. Actuation of the RTP switch indicates the carriage is at its leftmost position. Actuation of the EOP switch indicates the carriage is at its rightmost position. The output of these two switches are applied to LSI chip ME9 where they are used to control the forward clutch logic ( $\overline{\text{CIPX}}$ ) and to detect failures in the video signal from the timing fence (LD).

When the EOP switch is activated or when a control character is detected at the shift register output,  $\overline{\text{CIPX}}$  goes high, turning off the forward clutch. This fires one-shot ME7-4, generating a 40 millisecond Delayed Clutch (DCLT) interval. During this time, logic condition  $\overline{\text{CIP}} \cdot \text{RTP}$  generates a low  $\overline{\text{CIRX}}$  output from LSI chip ME9. After the delayed clutch interval, CIP goes low activating the reverse clutch and returning the print head to the left margin.

### 4.6.2 CHARACTER REGISTRATION AND TIMING

As the carriage moves, the optical pick-up head and light source on the video amplifier assembly generates the video signal for controlling the print timing. As the print head and optical head assembly moves across the timing fence, the vertical slots on the timing fence interrupt light to the optical pick-up head, generating a video signal. The VIDEO AMP output then triggers the STROBE one-shot ME11 on the logic card, initiating the print timing shown in Figure 4-5.

The STROBE one shot is adjusted for 450 usec. The leading edge of STROBE also triggers a delay one-shot (ME7-12) adjusted for a 500 usec output pulse. The trailing edge of this pulse triggers the Delayed Strobe (DLYSTB) one-shot which is adjusted to the same pulse width as STROBE. In normal character printing, STROBE is used for Full-Step timing and DLYSTB for the Half-Step timing.

#### 4.6.2.1 Video Amplifier

The circuit used to generate and amplify the video signal is located on the video amplifier board attached to the print head carriage.

The video amplifier is comprised of a dual slit sensor and operational amplifier ME1. Refer to the schematic drawing number 63002669 in Section 7. The dual slit sensor converts light energy monitored through the timing fence into electrical energy. As the carriage moves, the light source is interrupted by opaque bars on the timing fence and generates a pulsating output. The positive output generated on each light signal is applied to the positive input of ME1. The signal is amplified by ME1 and provides a high output for each light signal. The duty cycle of VIDEO output is set by adjusting R4.

#### 4.6.2.2 Timing Signals

For normal character printing, five consecutive STROBE inputs to LSI chip ME9, generate timing outputs  $\overline{DCW1}$ - $\overline{DCW5}$  as shown in Figure 4-4. These timing intervals correspond to the five full-step columns in the character matrix. The quiescent state of this strobe counter is DCW0 (internal to the chip) which corresponds to the space interval between characters. During DCW0, the STROBE input generates a CLKTB2 pulse which clocks the next character to the output of the shift register. The  $\overline{DCW1}$ - $\overline{DCW5}$  timing outputs are used to address the appropriate column in the "full-step" ROM (character generator).

During each video interval both a STROBE pulse and a DLYSTB pulse of the same width is generated as shown in Figure 4-4. During normal character printing, four consecutive DLYSTB inputs to LSI chip ME9, generate timing outputs  $\overline{DCW01}$ - $\overline{DCW04}$ . These four timing intervals correspond to the four additional ("half-step") columns in the 9 x 7 matrix. Timing signals ( $\overline{DCW01}$ - $\overline{DCW04}$ ) are used to address the appropriate column in the "half-step" ROM (character generator).

During elongated character printing, the UCC latch (internal to LSI chip ME9) allows alternate STROBE pulses to clock the internal strobe counter and alternate DLYSTB pulses to clock the delayed strobe counter. As a result, timing outputs  $\overline{DCW1}$ - $\overline{DCW5}$  and  $\overline{DCW01}$ - $\overline{DCW04}$  are twice as long during elongated character mode than during normal character mode.

During the space interval between characters (DCW0), timing signals  $\overline{DCW1}$ - $\overline{5}$  and  $\overline{DCW01}$ - $\overline{04}$  are all reset.

#### 4.6.3 CHARACTER GENERATOR (ROM)

The logic board can contain up to four ROM elements, depending on the selected character generating capabilities of that printer. The ROM'S in element locations ME18 and ME20 each provide full-step outputs (i.e., columns 1,3,5,7,9) for up to 64 characters. The ROM'S in locations ME24 and ME30 each provide half-step outputs (i.e., columns 2,4,6,8) for up to 64 characters.

Each ROM (Character Generator) element had three inputs (in addition to the input voltages):

- (1) The character address - Outputs  $\overline{TB1}$ - $\overline{TB5}$  from the shift register are buffered and applied to five of the six character inputs to all ROM'S. For the full-step and half-step ROM'S (ME18 and ME24), the sixth character address input is controlled by  $\overline{TB6}$ . For ROM'S ME20 and ME30, the sixth character address input is controlled by CHADD7. By jumper option, CHADD7 can be either  $\overline{TB7}$  (standard) or  $\overline{TB6}$  (optional).
- (2) Column Address - Timing outputs  $\overline{DCW1}$ - $\overline{DCW5}$  from LSI chip ME9 specify the five "full-step" columns in each 9 x 7 character matrix in ROM'S ME18 and ME20. Timing output  $\overline{DCW01}$ - $\overline{DCW04}$  specify the four "half-step" columns in each 9 x 7 matrix in ROM'S ME24 and ME30.
- (3) Timing - A low input to pin 28 of each ROM gates the 7 - bit dot configuration

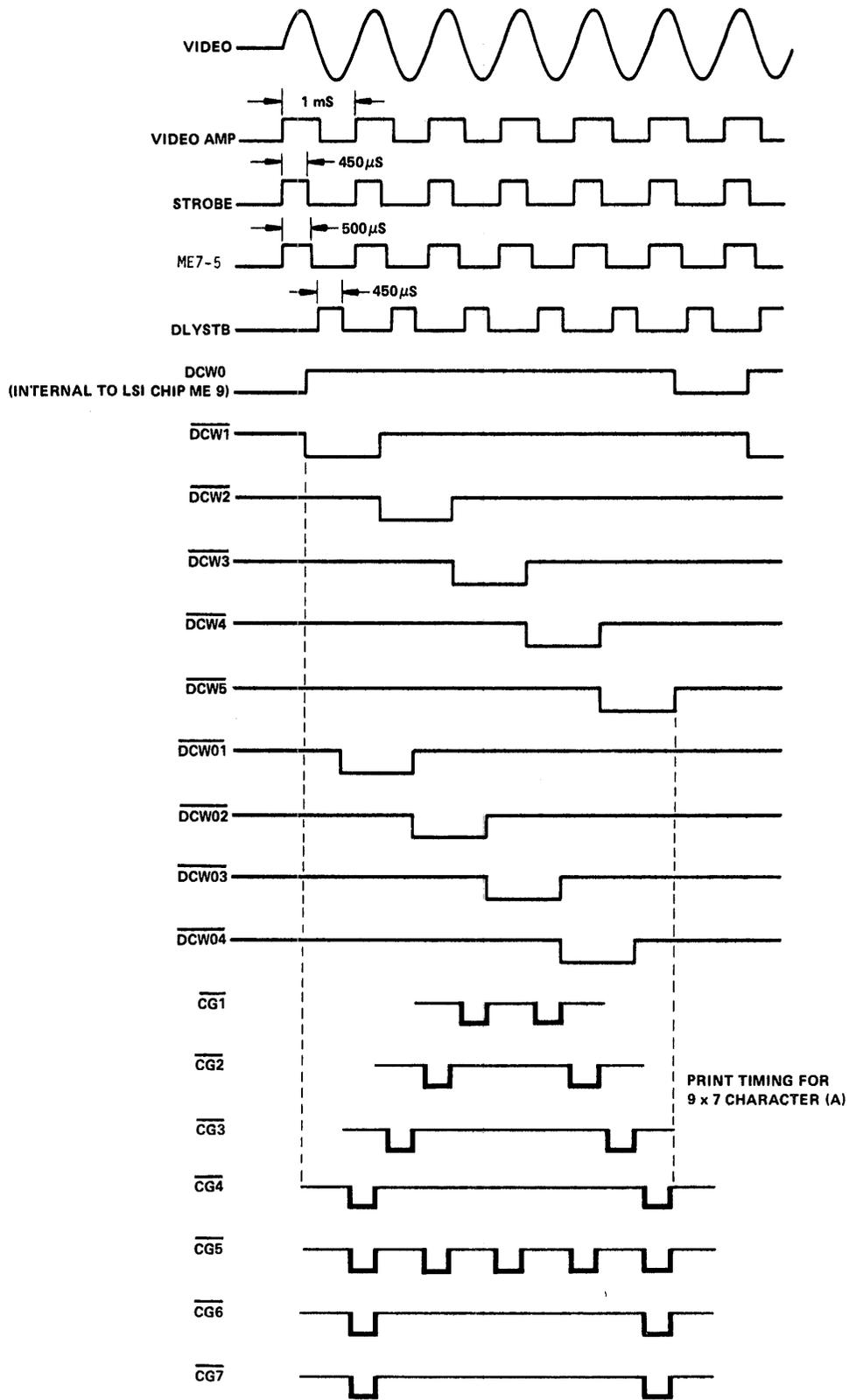


Figure 4-4. CHARACTER TIMING

of the addressed character and column to the output of that ROM. For the full-step ROM's (ME18 and ME20), this timing input is STROBE ANDed with ROMTB8 or  $\overline{\text{ROMTB8}}$ . By jumper option, ROMTB8 can be  $\pm 0V$ , +5V, CHADD7, TB8 or  $\overline{\text{TB8}}$ , allowing the selected one of these inputs to enable the ROM. The STROBE pulse provides the timing input for gating the 7-bit dot pattern to the print head solenoids.

For the half-step ROM's (ME24 and ME30), the timing input is ROME2 ANDed with ROMTB8 or  $\overline{\text{ROMTB8}}$ . For normal character printing, ROME2 generated by LSI chip ME9, is coincident with Delayed Strobe signal DLYSTB. This effectively interleaves the dot pattern from the half-step ROM's with the dot pattern from the full-step ROM's.

For elongated character printing, ROME2 is coincident with the STROBE signal. This combined with the fact that the DCW timing signals from LSI chip ME9 are twice as long during elongated character mode, causes the printed character to be twice as wide as normal characters. An example of the character (Y), both in normal and elongated style, is shown in Figure 4-5.

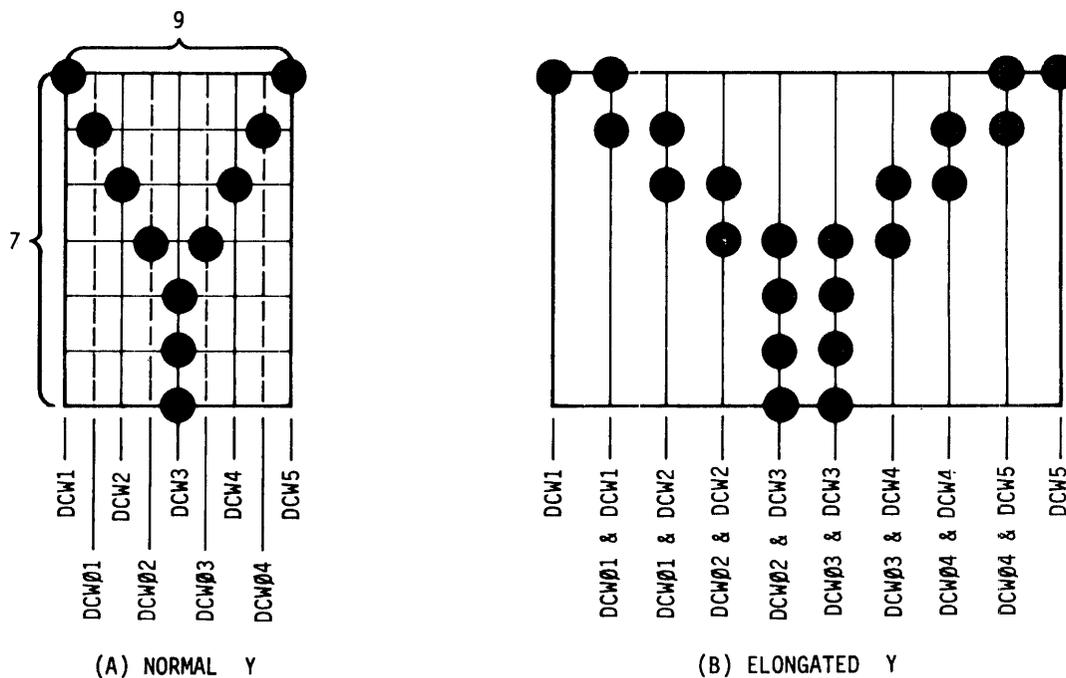


Figure 4-5. NORMAL AND ELONGATED CHARACTERS

The seven outputs from all four ROM's are wire ORed together and gated out to the Power Driver board as signals CG1 - CG7. Diodes CR16-CR32 clamp the ROM outputs to +5V to prevent overloading the inputs to the 74L00 gates. In normal operation, the STROBE or DLYSTB signal gates the addressed dot column to the Power Driver board. The input to ME28 pins 1 and 2 is normally low holding the output constantly high, enabling the output CG gates. If, however, a failure occurs in the -12V supply, then ME28-1 and 2 goes high forcing ME28-3 low disabling the CG gates.

#### 4.6.4 PRINT HEAD OPERATION

The print head is the device used to do the impact printing of the characters. The head contains seven solenoids that move the tungsten wires against the ribbon to form the column of dots on the paper. The position of these solenoids and the location of the tungsten wires in the head are shown in Section 1. Solenoid No. 1 controls the top dot and solenoid No. 7 controls the bottom dot in a column. The wires come from each solenoid and are positioned at a jewel located at the end of the head. The length of these wires is approximately 3.5 inches and each wire requires about one ounce of force to begin its movement. The amount of force needed to move the wires 0.015 inch (i.e., the distance necessary to make a dot on the paper) is about 12 ounces.

The total distance travelled by the wires is approximately 0.015-inch, but under normal operation, the end of the head is about 0.006 inch from the ribbon and paper. The reason for locating the wires closer than 0.015 inch from the paper, is to account for the amount of force absorbed by the ribbon and paper upon impact.

The electrical timing and mechanical movement of the wires is shown in Figure 4-6. As shown, a 450 microsecond pulse is used to complete the impact. The voltage used to drive the solenoids is +35 volts unregulated. This voltage is about +35 volts to +38 volts when the pins are in an idle state, but drops to about +30 volts when all pins are engaged at the same time. From the beginning of the 450 microsecond drive pulse, about 200 microseconds is required before the wire starts to move in each solenoid. Once the wire starts moving, an additional 300 microseconds is required before the wire makes an impact on the paper. Approximately 500 microseconds more are required for the wire to retract to its normal position.

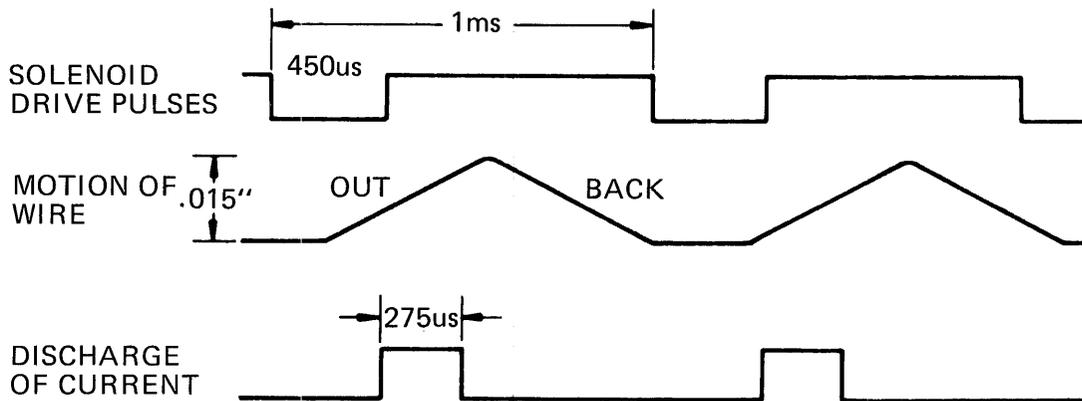


Figure 4-6. PRINT HEAD TIMING

#### 4.6.5 POWER DRIVER CIRCUITS

##### 4.6.5.1 Solenoid Drivers

- A. **Driver Circuit** - The wire ORed outputs from the character generator CG1-CG7 are applied to the solenoid power driver circuits where they are inverted, amplified and used to generate current pulses for firing the solenoid in each head.

Since all solenoid driver circuits are identical and operate in the same manner, only the first one, controlled by CG1 will be described.

Referring to Power Driver schematic No. 63002275, when CG1 goes high indicating an active condition for solenoid No. 1, current flows through R4. This current flows into the base of Q3, turning it on. The current through Q3 then develops a positive level across R5. This level causes Q2 and Q1 to act as emitter followers, developing a voltage of approximately 3.8 volts across R1. Resistor R2 limits power dissipation in Q2.

The 3.8V across R1 allows approximately a 2.5 amp current flow through solenoid No. 1 and transistor Q1. When Q1 is first turned on, the inductance of the solenoid prevents current flow through Q1. Transistor Q1 is saturated at this time. When current flow through the solenoid reaches approximately 2.5 amps, Q1 goes into the active region and limits the current to this value.

When CG1 goes inactive low, Q3 turns off, turning off Q2 and Q1. When Q1 turns off, the solenoid current flows through CR2 and C1. The value of C1 is chosen to act as a parallel resonant circuit with the inductance of the solenoid. Diode CR2 allows only a quarter-wave of the resonant frequency. A waveform diagram is shown in Figure 4-7.

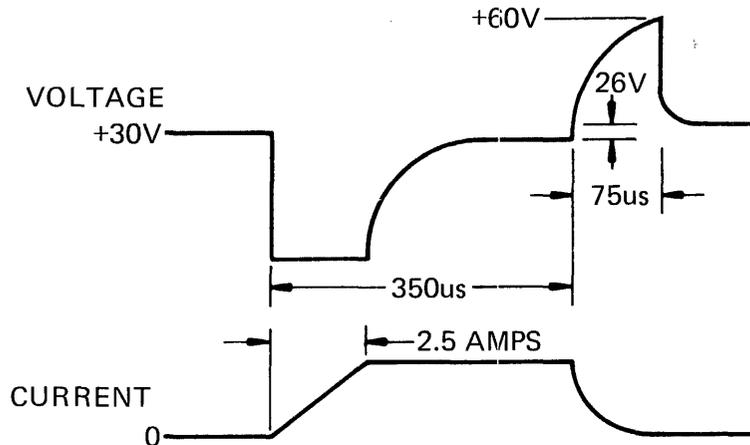


Figure 4-7. POWER DRIVER WAVEFORM

- B. **Capacitor Discharge Circuits** - After C1, C2, C3, C4, C6, C7 and C8 have charged to approximately 60 volts because of the discharging solenoid current, resistors R61, R62, R64, R65, R66 and R67 serve to bleed off this charge so that the capacitors will be at a 30 volt bias at the time of the next discharge. The value of the resistor is chosen so that a time constant of about 275 microseconds results.
- C. **Shut-Off Circuit** - Diodes CR39 through CR45 have their cathodes tied together and connected to the collector of Q33 and cathode of zener diode CR48. When the printer is turned on, the +5 volt supply prevents Q34 from conducting. This prohibits current from flowing through the voltage divider comprised of resistors R79 and R80. This prevents Q33 from conducting and applies the voltage developed across zener diode CR48 to the cathode of diodes CR39 through CR45. In this condition diodes CR39 through CR45 cannot shunt current away from the solenoid drivers.

When the printer is shut off, it is characteristic that the 5 volt supply output drops before the 30 volt supply output. When this happens Q34 turns on and current flows through the voltage divider comprised of resistors R79 and R80. Q33 is turned on and shunts the zener diode CR48. This clamps the base of the first emitter follower of each solenoid driver to ground through diodes CR39

through CR45, preventing any of the solenoids from firing during power turn off. The Clutch and Line Feed Drivers are also attached to the collector of Q33 through diodes CR36, CR37 and CR38. Therefore, during power turn off, the clutches are released and paper movement is inhibited.

#### 4.6.5.2 Forward Clutch Driver

Power for moving the print head from left to right across the page is transmitted from the main drive motor to an electromechanical clutch mechanism. The clutch is controlled by a low CIP signal from the logic board. This signal is applied via the optional Motor Control board to a driver circuit on the Power Driver card, the output of which activates the clutch.

Signal CIP is normally low thereby causing the current flowing through R42 to be shunted through CR31 ground. Diode CR30 offsets the diode drop of CR31. When signal CIP goes active high, CR31 becomes back biased, causing current to flow through CR30, R49, and transistor Q29, provided that diode CR37 is back biased. This current causes transistors Q29 and Q28 also flows through and activates the forward clutch. The clutch current is limited by R40.

When CIP goes low, Q29 and Q28 turn off. Diode CR29 provides a current path until the magnetic field of the forward clutch is dissipated.

#### 4.6.5.3 Reverse Clutch Driver

Power for moving the print head from right to left is transmitted from the main drive motor to a reverse clutch mechanism. Signal CIR from the logic board directly controls the reverse clutch driver on the Power Driver board, unaffected by the optional motor control circuit.

The reverse clutch driver operation is identical to that of the forward clutch driver except that it is controlled by signal CIR instead of CIP.

### 4.7 PAPER MOVEMENT

Three separate printer functions can cause a paper movement operation: line feed, form feed, and vertical tab. Each of these functions causes the paper to move by activating the Paper Movement Solenoid (PMSOL), which in turn activates a clutch that mechanically links the form feed motor to the paper-feed tractors.

For each line feed operation, the solenoid is energized 15 milliseconds for single line feeds and approximately 50 milliseconds for the double line feed option. At the end of this interval one 60-90 millisecond line feed delay is generated to allow the clutch pawl and clutch mechanism to return home before another paper movement operation is allowed.

In response to a form feed or vertical tab command, a dc level is applied to the solenoid, allowing continuous movement of the paper. This paper movement is terminated when a hole is detected in the appropriate channel of the vertical format paper tape. The operation of the VFU is described in Section 4.7.4.

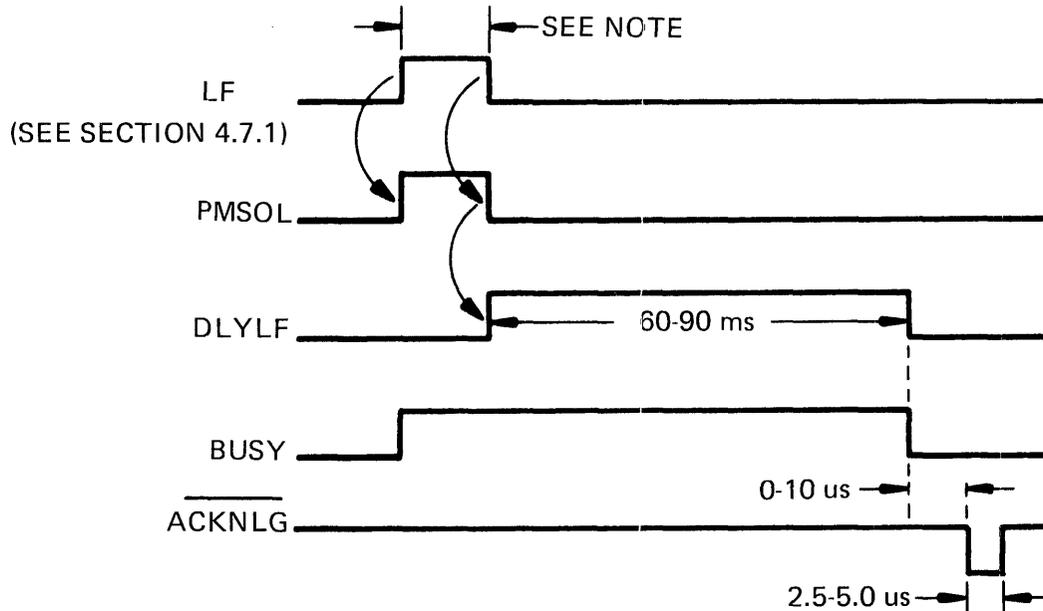
To prevent the printer from "hanging up" in a paper movement condition which would waste both time and paper, LSI chip ME5 contains a paper time-out circuit. This circuit is activated by any paper movement command. In the standard 101AL printer, the Paper Time-Out (PMTO) interval is factory-adjusted for approximately 6-9 seconds. If, at the end of this time, paper is still advancing, the line feed solenoid command (PMSOL) is immediately deactivated, terminating the paper movement operation, and the FAULT line to the interface connector is activated.

#### 4.7.1 LINE FEED (Figure 4-8)

The line feed operation can be generated by any of the following three conditions:

- (1) After printing a line of characters (if the automatic line feed is not disabled, E1 to E2 is connected) then the low-going forward clutch signal CIP, triggers the LF one-shot.
- (2) Receiving a line feed code (octal 012) - LSI chip ME5 decodes the line feed character and generates a 5-10 usec CSLF pulse, the trailing edge of which triggers the LF one-shot.
- (3) Pressing the LINE FEED switch on the operator panel - Pressing this switch causes REMLF to go low. This low input to LSI chip ME5 generates a 5-10 usec CSLF pulse, the trailing edge of which triggers the LF one-shot.

The width of the LF pulse generated by any of these three conditions is adjustable. In the standard 101AL printer, R22 and R23 are not used and jumper E5 to E6 is connected. In this configuration, R19 is adjusted so that a 15 millisecond LF pulse is generated.



NOTE: 15 MILLISECONDS FOR SINGLE LINE FEED,  
50 MILLISECONDS FOR DOUBLE LINE FEED OPTION

Figure 4-8. LINE FEED TIMING

If the double line feed option controlled by an optional switch on the operator panel is used, then jumper E4 to E5 is connected and R22 and R23 are used. With the switch in the "double line feed" position, DLF is an open circuit and R19 has no effect on pulse width. R22 should be adjusted to provide a 50 millisecond LF pulse. When the switch is placed in the "single line feed" position, DLF goes to +5V, placing R19 in parallel with R82 and R83. With the switch in this position, R19 should be adjusted to provide a 15 millisecond LF pulse.

While LF is high, LSI chip ME5 generates a low  $\overline{\text{PMSOL}}$  signal which activates the line feed solenoid via the Power Driver board. The trailing edge of  $\overline{\text{PMSOL}}$  triggers the 60-90 millisecond Delay Line Feed interval DLYLF. During both the LF and DLYLF intervals, the printer remains busy.

#### 4.7.2 FORM FEED (Figure 4-9)

A form feed operation can be generated by either of the following two conditions:

- (1) Receiving a form feed code (octal 014) - LSI chip ME5 decodes the form feed character and generates a low PMSOL signal to activate the line feed solenoid. If the DSC option is used (E10-E11), the line is printed before PMSOL is activated.
- (2) Pressing the TOP OF FORM switch on the operator panel - This generates a low TOFSW signal causing LSI chip ME9 to generate a low PMSOL signal.

The low PMSOL signal activates the line feed solenoid and generates a busy condition. This continues until a hole is detected in channel 7 of the paper tape. This generates a high FFH input to LSI chip ME5, which deactivates PMSOL.

For as long as PMSOL is active, the printer remains in a busy condition. If a paper time-out is detected, PMSOL is immediately deactivated and the FAULT line is activated.

#### 4.7.3 VERTICAL TAB (Figure 4-9)

A vertical tab operation is generated by receiving a vertical tab code (octal 013). LSI chip ME5 decodes the vertical tab character and generates a low PMSOL signal. If the DSC option is used (E10-E11), the line is printed before PMSOL is activated.

The low PMSOL signal initiates the paper movement and generates a busy condition. This continues until a hole is detected in channel 5 of the paper tape. This generates a high FFH input to LSI chip ME5, which deactivates PMSOL.

For as long as PMSOL is active, the printer remains in a busy condition.

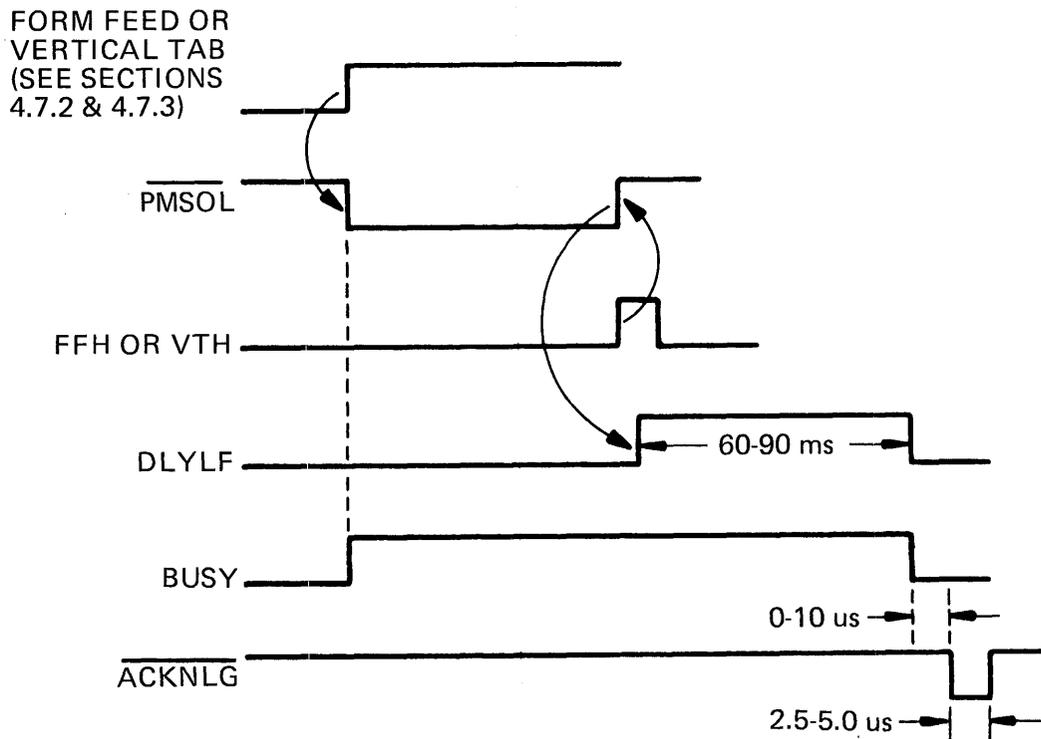


Figure 4-9. FORM FEED AND VERTICAL TAB TIMING

#### 4.7.4 VERTICAL FORMAT UNIT

The vertical format unit (VFU) consists of a standard 8-channel paper tape reader, located on the upper left side of the printer. Movement of the paper tape in the VFU is caused by direct mechanical linkage to the gear train that drives the paper feed tractors. As a result, each line feed advances the paper by one line and the tape by one sprocket hole.

Each form feed function advances paper until the next hole is detected in channel 7 of the paper tape. Similarly, each vertical tab function advances paper until the next hole is sensed in channel 5 of the paper tape. A schematic of the VFU amplifier is shown in Figure 4-10.

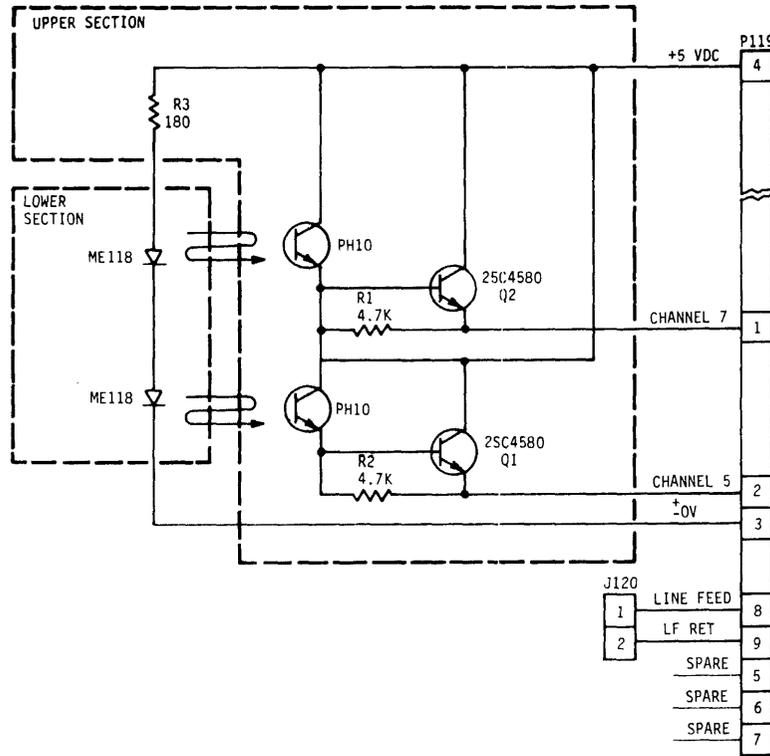


Figure 4-10. VFU TAPE READER AMPLIFIER (LOCATED IN VFU)

Holes detected in Channel 5 or 7 of the tape are amplified by a VFU amplifier contained in the tape reader unit. Each channel in the vertical format control tape reader contains an input photo transistor, driving an emitter follower amplifier. When the photo transistor receives light, current flows through it and into the base of the emitter follower generating a +5V output. The two amplifier outputs CHANNEL 5 and CHANNEL 7 are then applied to the logic board and ME25 as VTH and FFH. A 2-4 millisecond delay is designed into ME25 for noise immunity.

#### 4.7.5 LINE FEED SOLENOID DRIVER

Logic signal  $\overline{\text{PMSOL}}$  from LSI chip ME5 is buffered by ME10 to generate PMSOL to the Power Driver board. (Schematic No. 63002275).

Signal  $\overline{\text{PMSOL}}$  is normally low (inactive). In this state, current flows through R39 and CR28 to ground. The diode drop of CR27 balances the diode drop of CR28 thereby maintaining the line feed driver in the off condition.

When PMSOL goes active high, CR28 becomes back biased and current flows through R39, CR27, R48 and into the base of Q27, saturating it. The collector current, limited by R38, flows into transistor Q26, turning it on and causing current to flow through the Line Feed Solenoid. When signal PMSOL returns low, transistors Q27 and Q26 turn off. The fly-back voltage then appears across CR24, which provides a current path until the magnetic field of the line feed solenoid is dissipated.

## 4.8 SPECIAL FUNCTIONS

In addition to the paper movement and character printing functions, the printer also performs the following special functions: Bell, Delete, Paper Empty, and Motor Control (optional).

### 4.8.1 BELL

Reception of a bell code (007) or detection of a paper empty condition ( $\overline{PE}$  goes low) causes a BELL signal to be generated on LSI chip ME5 pin 39. This BELL signal is a 0.8 to 1.6 KHz output approximately one to two seconds in duration. BELL is amplified by Q7 and Q8 and the amplifier output (P5-D and E) drives the speaker.

### 4.8.2 DELETE

The delete code resets the printer logic by generating a prime condition. Reception of a delete code (octal 177) on the input data lines ANDed with the ungated data strobe DSTA, sets a latch in LSI chip ME5 causing a low DCPRM output at pin 8 of that chip. The low DCPRM into LSI chip ME9 causes a high PRIME signal to be generated at ME9-37, resulting in the prime operation as described in Section 4.3.1.

Note that since the delete code is gated with DSTA, the delete code is recognized by the printer even when the printer is busy.

### 4.8.3 PAPER EMPTY

A paper empty condition in the printer is detected by Paper Out switch S2 located in the path of the paper. With paper in the printer, signal PE is high. After the last page passes over the Paper Out switch, signal PE goes low. The low PE into LSI chip ME5: (1) sets a latch internal to the chip which causes a 1-2 second BELL output; (2) causes a high FAULT output, and (3) lights the PAPER OUT lamp on the operator panel.

The BELL output causes an audible alarm, warning the operator of the paper empty condition. The high FAULT output, in addition to causing a busy condition, also goes to the interface connector to indicate a fault status to the input device.

To allow the printer to print the last form, the operator can press the OVERRIDE switch on the operator panel. This causes PE to go high for as long as the switch is pressed.

### 4.8.4 MOTOR CONTROL (OPTIONAL)

This section contains a Motor Control Location Diagram, (Figure 4-11), a Motor Control Board Interconnection Diagram (Figure 4-12), and a Motor Control Timing Diagram (Figure 4-13). Referring to these figures, one-shot ME3 generates a 9-second interval during which time the Forward Clutch signal (FWDCLD or CIP), and the Paper Movement signal (PMSOL) are monitored. During any 9-second interval generated by one of these print or paper movement commands, the solid-state switching circuit is activated, thereby delivering 115 VAC to the motors. If the 9-second interval is exceeded without receiving another print or paper movement signal, then the switching circuit is deactivated removing 115 VAC from the motors. The next print or paper movement command automatically turns on the motors.

The solid-state switching circuit is connected in the 115 VAC power line to the motors. It consists of an optically coupled isolator (ME2), a silicon controlled rectifier SCR (Q2), a full-wave bridge rectifier (CR3,4,5,6) and a triac (Q1). ME2 provides isolation and is used as a switching network, containing an LED emitter and photo darlington sensor. The triac Q1 is basically two SCR's connected in parallel and oriented in opposite directions. Across Q1 and R9 and C7 which comprise an RC snubber network for preventing the line voltage rate of change from turning triac Q1 on without a valid gate signal.

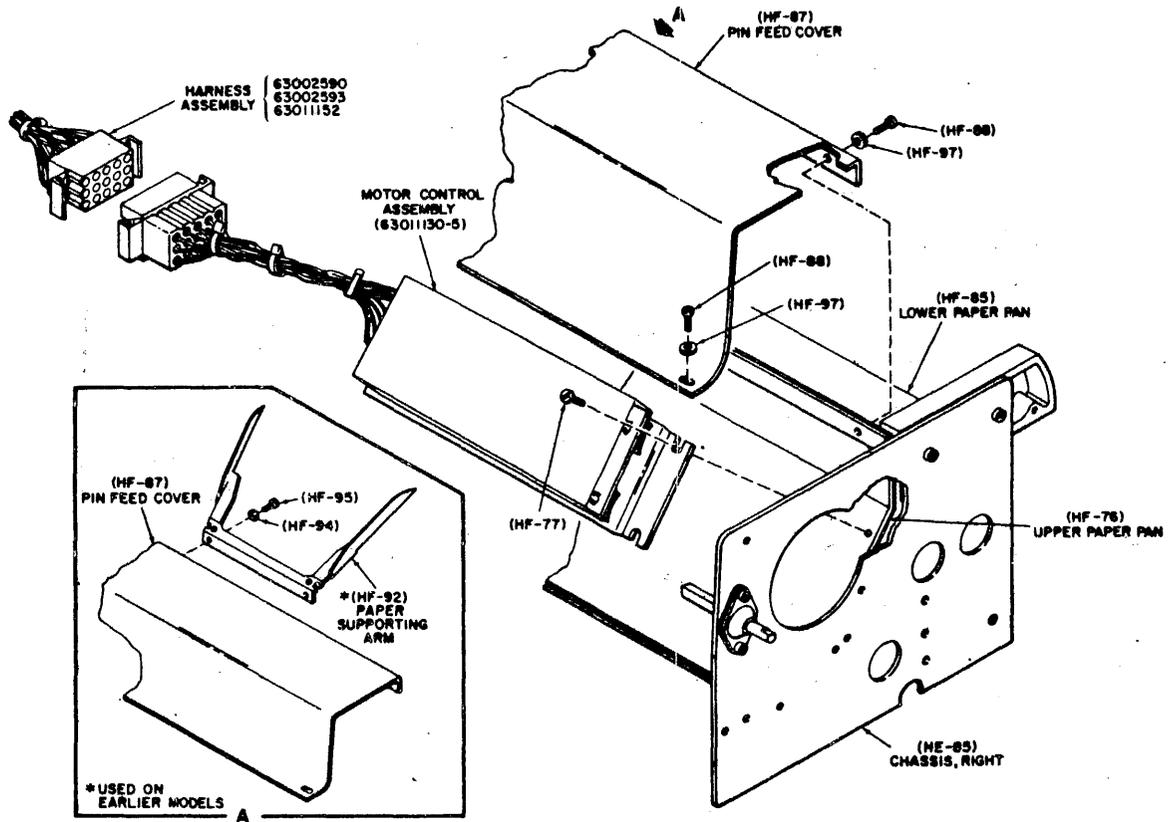


Figure 4-11. MOTOR CONTROL LOCATION

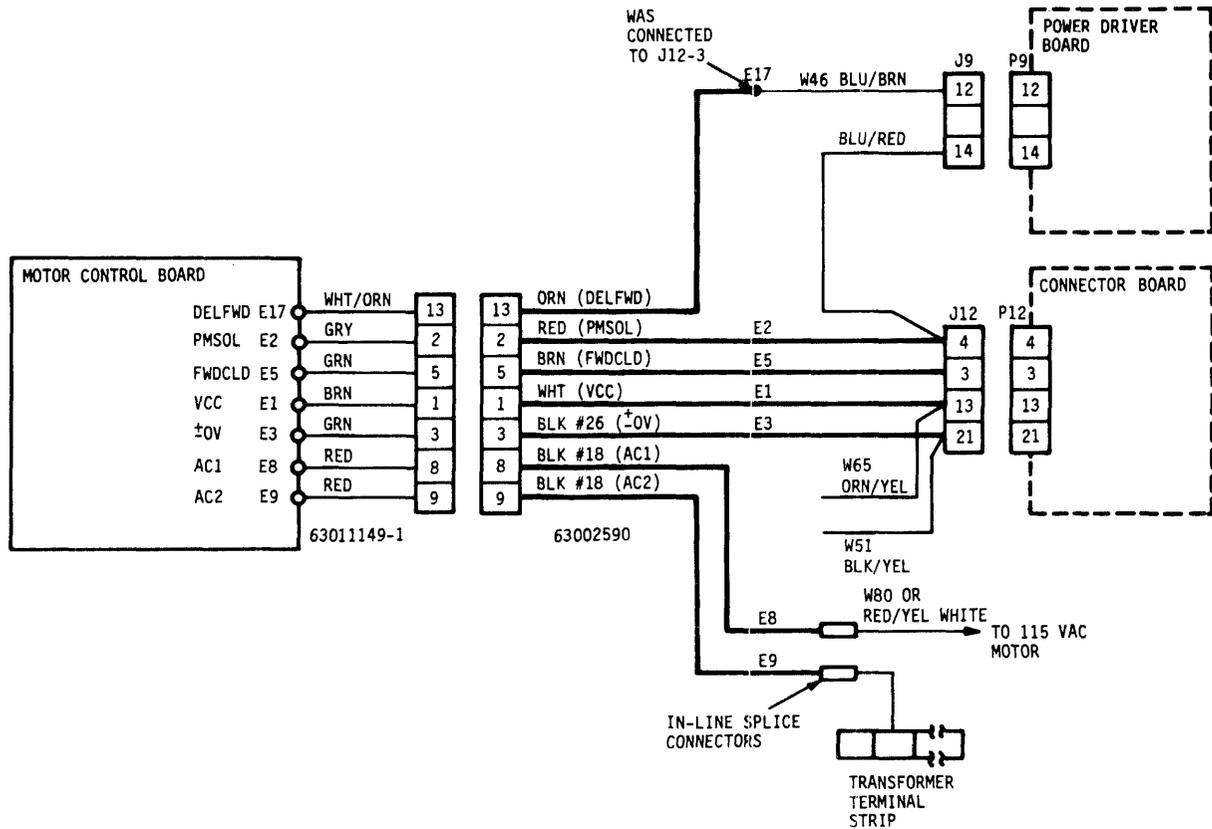


Figure 4-12. MOTOR CONTROL BOARD INTERCONNECTION DIAGRAM

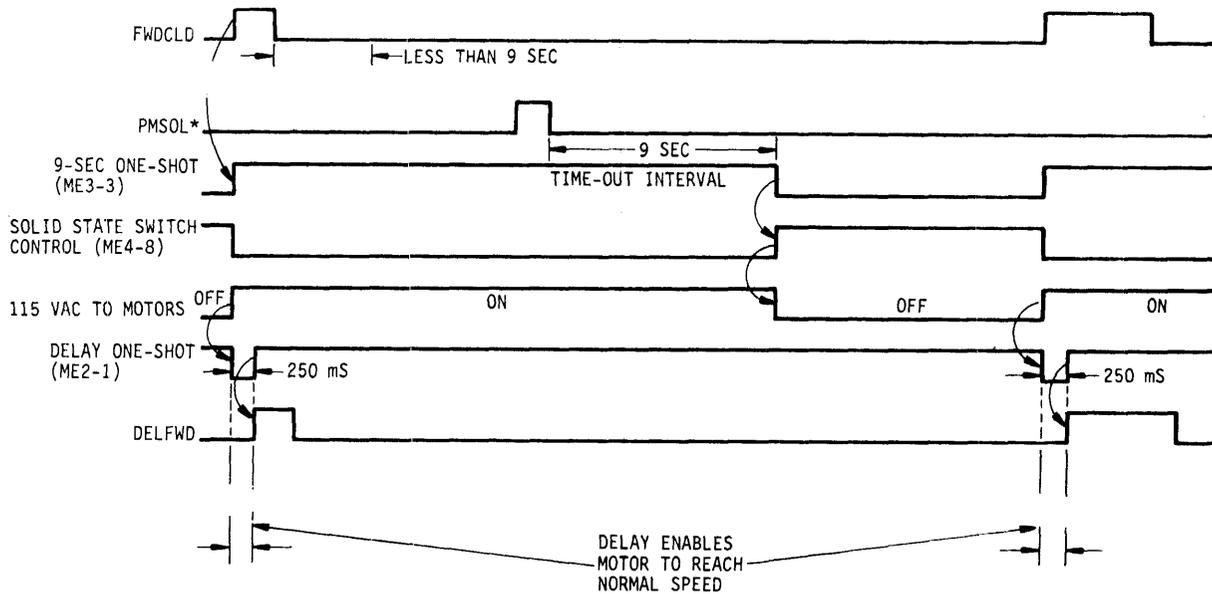
The leading edge of FWDCLD or PMSOL triggers the one-shot causing the output ME1, pin 3 to go high for a 9-second interval. The resulting low on ME5, pin 6 appears on the cathode (pin 2) of ME2. This turns on ME2 causing current to flow from ME1, pin 4 (emitter) into the gate of SCR Q2, turning it on. With Q2 conducting, thus "shorting" the full-wave bridge rectifier, a current pulse, produced by one half of the AC line voltage and passed by the "shorted" rectifier, flows into the gate of the triac (Q1) switching it to the ON state. Q1 then shunts current away from the rectifier, thus reducing the principle current to Q2, turning it off. Current then flows through Q1 to the motors for that half of the AC signal.

When the AC line current is zero, Q1 turns off. As the next half of the AC signal appears, current again flows to the bridge rectifier turning Q2 back on. This action, as before, pulses Q1 but with the opposite polarity, turning it on to pass this half of the AC signal to the motors.

The above operation keeps repeating itself during the 9-second interval, switching Q1 from the OFF state to the ON state, for either polarity of voltage applied to the main terminals of Q1.

Coincident with the activation of the motor control circuit from an OFF to an ON condition, the high output of ME1, pin 3 triggers Delay one-shot ME3, which generates a low at ME3, pin 1. If a FWDCLD signal was received, the signal is inhibited from generating DELFWD by this low being applied to ME5, pins 4 and 10. When one-shot ME2 times-out (approximately 250 milliseconds later), FWDCLD generates a DELFWD signal which activates the Forward Clutch Driver, depending on which signal was received. The purpose of the delay is to allow the main motor to reach normal speed before the clutch is activated.

If another FWDCLD, or PMSOL signal is received during a 9-second interval (motors ON), the leading edge re-triggers one-shot ME1 for another 9-second interval. The solid-state switch and Delay one-shot ME3 remain unaffected during this time. Therefore, the 115 VAC keeps being supplied to the motors and, if a FWDCLD signal was received, it is gated directly to the clutch driver without being delayed.



\*ACTIVATION OF THE PMSOL SIGNAL DEPENDS ON THREE FUNCTIONS: LINE FEED, VERTICAL TAB AND FORM FEED. IF TWO CONSECUTIVE LINE FEEDS ARE SENT TO THE PRINTER DURING A MOTOR-OFF CONDITION, THEY SHOULD BE SPACED 300 MILLISECONDS APART.

Figure 4-13. MOTOR CONTROL TIMING

If no FWDCLD or PMSOL signal is received during a 9-second interval, one-shot ME1 times-out causing its output ME1, pin 3 to go low. This turns off ME2 by delivering a high to ME2, pin 2, which in turn stops current flow out of ME2, pin 4 and prevents Q2 from turning on. With Q2 off, there is no current flow from the bridge rectifier to pulse Q1. Therefore, Q1 does not conduct, removing 115 VAC from the motors.

No further action occurs until another FWDCLD or PMSOL signal is received. At this time, any one of these signal inputs being active causes a high at ME1, pin 3 which: 1) activates the switch circuitry and turns on the motors, and 2) triggers Delay one-shot ME3. If a FWDCLD signal was received, the signal is delay approximately 250 milliseconds then gated through to the Power Driver board.

#### NOTE

**The motor control feature can be disabled by a jumper connection between E8 and E9, keeping switch K1 always activated.**

### 4.9 POWER SUPPLIES

The standard printer is pre-wired at the factory for 115 VAC, 60Hz. However, as an option, the printer can be wired for other input voltages. In addition, for a 50Hz input voltage, the 60Hz motor pulley HB-91 (Part No. 525841001) must be changed to a 50Hz pulley HB91-1 (Part No. 525344001). (See Figure HB, Section 8).

The input voltage is fused through F5 and applied to the input transformer through the ON/OFF switch on the front panel. A line filter located on the fuse bracket of the cavity assembly filters any transients generated by the switch or transformer.

The secondary of the multitap transformer develops the following voltages:

115 VAC  
35 VAC center-tapped  
27.5 VAC center-tapped  
11 VAC

The 115 VAC output is applied (via the optional motor control switch) to the drive and form feed motors.

The 35 VAC and 11 VAC voltages are used as inputs to the +5V, and -12V power supplies on the logic board, where they are rectified, filtered and regulated. The unregulated dc outputs from these three power supplies are also regulated on the optional connector board, to provide dc voltages for the optional interface board. The 27.5 VAC is used to generate +35V unregulated.

Connector P1-J1 is used for bringing the ac inputs to the logic card and connecting filter capacitor C1 to the +5V supplies. Connector P2-J2 is used for connecting the power supply outputs to the printer circuits.

#### 4.9.1 +5V REGULATOR (FIGURE 4-14)

The 11 VAC output from the secondary winding of the transformer is rectified by bridge rectifier CR5, CR6, CR24, CR25 and filtered by C1 located in the cavity. This filtered output is fused through F1 and regulated by regulator element VR1 which maintains the +5 Volt output. Capacitors C18 and C19 provide additional filtering for high frequency transients that might appear at the output. Resistor R42 is a bleeder resistor allowing some current flow through the regulator keeping it in the active region.

Overvoltage protection is provided by components CR23, R41 and Q1. With the output at a normal +5V, Zener diode CR23 inhibits current flow through R41, holding the gate of SCR Q1 at ground. However, when the output voltage exceeds +6.8V, the Zener diode CR23 conducts, developing voltage across R41 and turning on SCR Q1. This shorts the input and blows fuse F1.

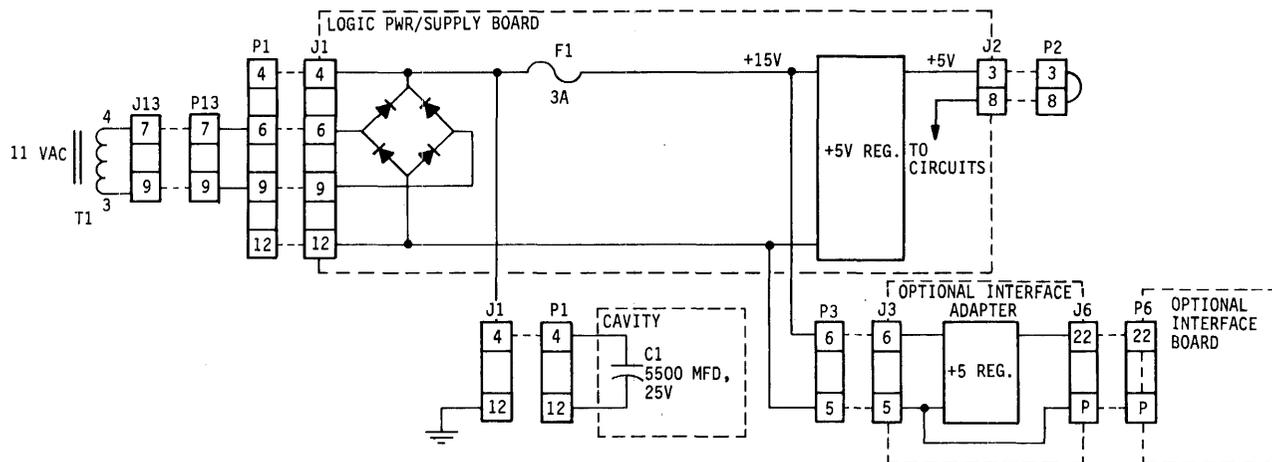


Figure 4-14. +5V REGULATOR INTERCONNECTION DIAGRAM

To simplify troubleshooting the +5V regulator, (as well as the 12V supply) the load may be removed from this supply by unplugging J2.

#### 4.9.2 -12V REGULATOR

The voltage generated by the 35 VAC center-tapped secondary winding of T1 is used as input to the -12V regulator. The operation of this circuit is identical to that of the +5V regulator described in Section 4.9.1.

As in the +5V regulator, the load may be removed from this supply simply by unplugging the J2 connector.

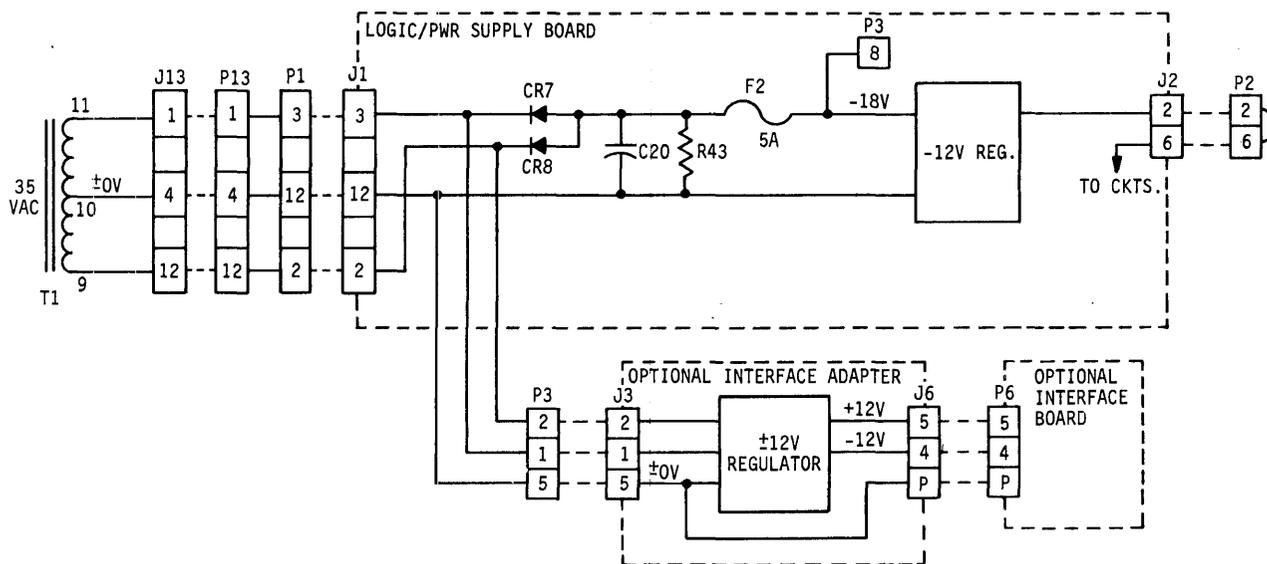


Figure 4-15. -12V REGULATOR INTERCONNECTION DIAGRAM

#### 4.9.3 +35V POWER SUPPLY, UNREGULATED

The 27.5 VAC output from the transformer is rectified by diode bridge MD1 and filtered by R1-C2 to generate the +35V unregulated voltage for the power driver circuits. All of these components are located in the cavity. This +35V output is fused through F4 and used as a voltage input to the power driver board.

## 4.10 OUTPUTS FROM LSI CHIPS

### 4.10.1 OUTPUTS FROM LSI CHIP ME5

#### $\overline{\text{BUSY}}$ (Busy)

Generated on LSI chip ME5 pin 11.  $\overline{\text{BUSY}}$  goes low when any of the following conditions occurs:

- (1)  $\overline{\text{CSBSY}}$  from LSI chip ME9 goes low,
- (2) During a prime condition (PRIME),
- (3) During a paper movement operation (PMSOL),
- (4)  $\overline{\text{DCPRM}}$  from LSI chip ME5 goes low
- (5) The carriage return code (or if the DSC option is used, the LF, VT or FF code) is clocked into the shift register.
- (6) FAULT from LSI chip ME5 goes high,
- (7) During the 60-90 msec delay following a paper movement operation (DLYLF).

#### ACK (Acknowledge)

Generated on LSI ME5 pin 13. ACK is a 2.5-5.0 usec pulse generated 2.5-10 usec after the trailing edge of data strobe if the printer is not busy, or 2.5-10 usec after the trailing edge of the BUSY signal if the received data caused the printer to go busy.

#### FAULT (Fault Indication)

Generated on LSI chip ME5 pin 9. Any one of the following conditions generates FAULT:

- (1) The printer is deselected (SLCT is low).
- (2) A paper time out condition exists.
- (3) The printer is out of paper ( $\overline{\text{PE}}$  is low).
- (4) A failure is detected in the video signal ( $\overline{\text{LD}}$  is low).

#### SLCT' (Select)

Generated on LSI chip ME5 pin 40. Indicates the status of the Select latch within the chip. This latch is set either by receiving a select code (octal 021) or by pressing the SELECT switch on the operator panel when the printer is deselected. The flip-flop is reset either by receiving a deselect code (octal 023) or by pressing the SELECT switch when the printer is selected. The select and deselect codes affect the select latch even when the printer is busy.

#### BELL (Bell)

Generated on LSI chip ME5 pin 39. BELL is a 0.8 - 1.6 KHZ signal of 1 to 2 second duration, generated by either a received bell code (octal 007) or a paper empty condition.

#### $\overline{\text{CSLF}}$ (Cause Line Feed)

Generated on LSI chip ME5 pin 6. Any of the following input conditions will cause CSLF to go active (low):

1. Receiving a Line Feed code (octal 012) on input data lines  $\overline{\text{DS1}}-\overline{\text{DS7}}$ . If the DSC option is used (jumper E10 to E11), the complete line of characters will be printed before CSLF goes low.
2. Pressing the Line Feed switch on the operator panel.

### $\overline{\text{PMSOL}}$ (Paper Movement Solenoid)

Generated on LSI chip ME5 pin 7. Any paper movement command (i.e., line feed, form feed or vertical tab). The low PMSOL output activates a driver circuit on the Power Driver board, which in turn activates the paper movement solenoid on the form feed unit. This causes paper to advance in the printer.

$\overline{\text{PMSOL}}$  remains low until one of the following conditions occurs:

- (1) A paper time-out condition exists.
- (2) A power prime ( $\overline{\text{PWRPRM}}$ ) condition exists.
- (3) During a form feed operation, a hole in channel 7 of the Vertical Format Unit (VFU) paper tape is detected (FFH).
- (4) During a vertical tab operation, a hole in channel 5 of the VFU paper tape is reached (VTH).

### $\overline{\text{DSCR}}$ (Decoded Carriage Return)

Generated on LSI chip ME5 pin 12. DSCR goes active low when a control character (zeroes in bits 6 and 7) is loaded into the shift register. In normal operation, the only control code loaded into memory is a CR code (octal 015). However, with the DSC option (jumper E10 to E11), in addition to the CR code, any of the following control codes may be loaded into memory: LF (octal 012), FF (octal 014) and VT (octal 013).

DSCR goes active on the trailing edge of the gated data strobe and stays active until the printer is primed following the carriage return (and paper movement) operation.

### $\overline{\text{DCPRM}}$ (Decoded Prime)

Generated on LSI chip ME5 pin 8. Any of the following conditions will cause  $\overline{\text{DCPRM}}$  to go active (low):

- (1) Receiving a Delete code (octal 177)
- (2) Receiving a low INPUT PRIME signal at the interface connector.
- (3) A power prime condition ( $\overline{\text{PWRPRM}}$ )

### CLKTB1 (Clock Shift Register Pulse)

Generated on LSI chip ME5 pin 14. The CLKTB1 pulse is used to clock input data into the shift register. It is generated by data strobe signal DSTA whenever both inhibit levels INH1 and INH2 (internal to the chip) are inactive.

If the Guarded Strobe (GDSTB) option is used (jumper E7 to E8), INH1 is inactive when the printer is selected and the last input character has been acknowledged by the printer. If the GDSTB option is not used (jumper E8 to E9), then INH1 is always inactive. INH2 is inactive if the character on the input data lines can be stored in the shift register. This occurs whenever the input data lines contain a printable character (a ONE in bit 6 or 7) or after the first printable character is received, a carriage return code (octal 015) is present on the data lines. If the DSC option is used (jumper E10 to E11), a line feed (octal 012), vertical tab (octal 013) or form feed (octal 014) code, could be stored in the shift register after the first printable character is received.

### $\overline{\text{UPSC}}$ (Upper Case)

Generated on LSI chip ME5 pin 15. A low  $\overline{\text{UPSC}}$  pulse is generated whenever an elongated character code (octal 016) is present of the input data lines.

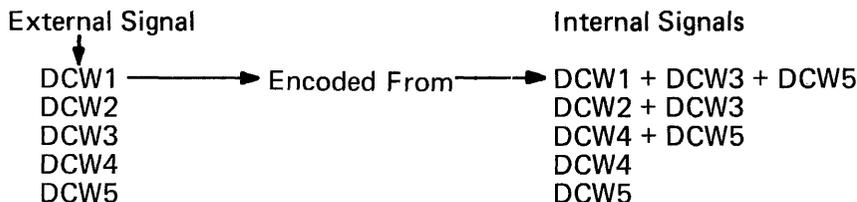
## 4.10.2 LSI CHIP ME9

### $\overline{DCW1}$ - $\overline{DCW5}$ (Strobe Counter Outputs)

Generated on LSI chip ME9 pins 12 ( $\overline{DCW1}$ ), 13 ( $\overline{DCW2}$ ), 14 ( $\overline{DCW3}$ ), 15 ( $\overline{DCW4}$ ) and 16 ( $\overline{DCW5}$ ). The strobe counter, which is internal to the chip, is reset by an internal  $\overline{DCW0}$  signal.  $\overline{DCW0}$ , which normally represents the space interval between characters, is generated by either a Prime condition or by  $\overline{DCW5}$ .

During normal character printing, each video STROBE pulse increments the counter. During elongated character printing, every alternate STROBE increments the counter, making each DCW interval twice its normal width.

If the special timing option SPCG is used (which consists of cutting the etch between pin 6 of ME9 and +OV), then the  $\overline{DCW1}$ - $\overline{DCW5}$  signals at the output pins of the chip are encoded from the internal  $\overline{DCW1}$ - $\overline{DCW5}$  signals as follows:

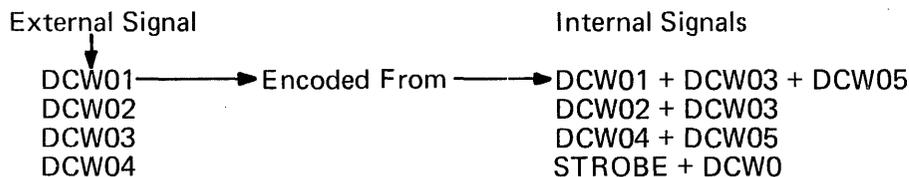


### $\overline{DCW01}$ - $\overline{DCW04}$ (Delayed Strobe Outputs)

Generated on LSI chip ME9 pins 7 ( $\overline{DCW01}$ ), 8 ( $\overline{DCW02}$ ), 9 ( $\overline{DCW03}$ ), and 10 ( $\overline{DCW04}$ ). The delayed strobe counter like the strobe counter is reset by  $\overline{DCW0}$ .

During normal printing of 9 x 7 characters, each DLYSTB pulse increments the counter. During elongated character printing, alternate STROBE pulses increment the counter making each  $\overline{DCW0}$  interval twice its normal width.

As in the strobe counter timing, if option SPCG is used, then the external  $\overline{DCW01}$ - $\overline{DCW04}$  signals are related to the internal  $\overline{DCW01}$  to  $\overline{DCW05}$  intervals as follows:



### ROME 2 (ROM Timing)

Generated on LSI chip ME9 pin 24. This signal is the timing input to the "half-step" character generator ROM (Read-Only Memory).

During normal printing of 9 x 7 characters, each DLYSTB, (Delayed Strobe) pulse generates a ROME 2 pulse. When printing elongated 9 x 7 characters, each video STROBE pulse generates a ROME 2 pulse.

### CLKTB 2 (Clock Shift Register Pulse)

Generated on LSI chip ME9 pin 36. This active high pulse is generated by any of the following three conditions:

1. During a prime condition, to load the dummy character into memory at the end of the PRIME interval, recirculate signal SRCL goes high and a single CLKTB 2 pulse is generated. This forces a single ONE into bit 8 of that shift register location, forming the dummy character.

2. During character printing, to shift the characters out of memory each STROBE pulse occurring during Strobe Counter interval DCW0 (internal to LSI chip ME9) generates a CLKTB 2 pulse. This shifts the next character to the output of the shift register where it remains until the next STROBE DCW0 interval.
3. During the interval following the reception of a carriage return code - A low  $\overline{\text{DSCR}}$  input to the chip is ANDed with  $\overline{\text{TB8}}$  to allow each  $\emptyset 2^*$  clock to generate a CLKTB 2 pulse.

#### $\overline{\text{CIPX}}$ (Forward Clutch)

Generated on LSI chip ME9 pin 30. This active low output is used to turn on the forward clutch when the printer is ready to print the received line of data.

Signal  $\overline{\text{CIPX}}$  goes low when the internal CIPF latch is set. CIPF gets set under the following conditions: (1) the printer is not being primed ( $\overline{\text{PRIME}}$ ), (2) the right limit switch is not activated ( $\overline{\text{EOPSW}}$ ), (3) a control character is not detected at the memory output (TB6 or TB7), (4) the left limit switch is activated (RTPSW), and (5) the dummy character is detected at the memory output ( $\overline{\text{TB8}}$ ). The internal CIPF latch then remains set either until the right limit switch is reached ( $\overline{\text{EOPSW}}$ ) or a control character appears at the memory output (TB6-TB7). Normally, this control character would be a carriage return code (octal 015). However, if the DSC option is used (jumper E10 to E11), the control character could be a carriage return (015), line feed (012), vertical tab (013), or form feed (014) code.

#### $\overline{\text{CIRX}}$ (Reverse Clutch)

Generated on LSI chip ME9 pin 29. This active low output is used to turn on the reverse clutch after the printer has printed a line of data. Signal  $\overline{\text{CIRX}}$  goes low whenever the forward clutch is not turned on ( $\overline{\text{CIPX}}$  is high) and the carriage is not activating the left limit switch (RTP is low).

#### SRCL (Shift Register Recirculate Input)

Generated on LSI chip ME9 pin 38. A high SRCL signal along with a single CLKTB2 pulse is generated at the end of each PRIME interval. This clocks a dummy character into the shift register.

#### $\overline{\text{LD}}$ (Light Detect)

Generated on LSI chip ME9 pin 17. Signal LD is normally high indicating no error in the video circuit. However, if the print head travels from the left limit switch (RTPSW) to the right limit switch ( $\overline{\text{EOPSW}}$ ) with no STROBE pulse generated by the timing fence, then a latch is set within the chip causing LD to go low. This indicates an error condition. The internal LD latch can be reset only by de-selecting the printer.

#### PRIME (Prime)

Generated on LSI chip ME9 pin 37. PRIME goes active high for 100-500 milliseconds during a Power Prime ( $\overline{\text{PWRPRM}}$ ) and approximately 100-400 microseconds during the following condition:

- (1) A low  $\overline{\text{DCPRM}}$  input from LSI chip ME5.
- (2) The printer has just been selected (a low  $\overline{\text{SLCT}}$  input to LSI chip ME9) and the Delete Inhibit (DELINH) option is not used (jumper E14 to E15 is not connected).
- (3) A line of data has just been printed ( $\overline{\text{CIPX}}$  out of LSI chip ME9 has just gone high).

Prime initializes the printer logic, resets the shift register and loads a dummy character.

#### $\overline{\text{CSBSY}}$ (Cause Busy)

Generated on LSI chip ME9, pin 35.  $\overline{\text{CSBSY}}$  goes active low when a dummy character ( $\overline{\text{TB8}}$ ) is detected at the shift register output and a Prime operation is not in progress. This condition indicates that the 132nd character has just been loaded into the shift register (without a carriage return code). The low  $\overline{\text{CSBSY}}$  signal then generates a low  $\overline{\text{BUSY}}$  output from LSI chip ME5.

#### OSC (Oscillator Output)

Generated on LSI chip ME9, pin 25. The frequency of this system clock is 100 KHz to 200 KHz.

\* $\emptyset 2$  is a phase clock internal to LSI chip ME9. The frequency of this  $\emptyset 2$  clock is the same as the OSC output from LSI ME9.



## SECTION 5 REMOVAL, REPLACEMENT AND ADJUSTMENT PROCEDURES

### 5.1 INTRODUCTION

This section describes the operation, removal, replacement and adjustment of each major mechanical assembly in the Series 101 printer.

### 5.2 MECHANICAL ASSEMBLIES

The mechanical assemblies and their reference figures are covered in the order listed below. Mechanical drawings, and parts lists, are contained in Section 8 of this manual.

Section	Title	Figure Reference Parts Symbol
5.2.1	Cover	Figure A
5.2.2	Carriage Mechanism	Figure HA
5.2.3	Driving Mechanism	Figure HB
5.2.4	Spring Drum	Figure HC
5.2.5	Damper	Figure HD
5.2.6	Frame	Figure HE
5.2.7	Paper Feed Mechanism	Figure HF
5.2.8	Pin Feed Unit	Figure HG
5.2.9	Form Feed Mechanism	Figure HH
5.2.10	Ribbon Feed Mechanism	Figure HI
5.2.11	Hardware, Electrical	*Figure HJ
5.2.12	Paper Guide	Section 2
5.2.13	Print Head and Associated Assemblies	Figure 8-12

\*Part List only

#### 5.2.1 COVER (FIGURE A)

##### 5.2.1.1 Operation

All covers permit internal access to the printer, and are completely removable.

##### 5.2.1.2 Removal/Replacement Procedure (Refer to Figure 8-2)

1. Pull outward and down, left cover assembly (A-4) and right cover assembly (A-3).
2. Remove cover assembly, rear (A-7) by unscrewing from each side of cover, standoff (A-39) with internal lockwasher (A-41), nut (A-32) and ball stud (A-19).
3. Remove front cover assembly (A-5) by removing screws, flatwasher and split lockwashers at (A-26) (A-34) and (A-35). Remove at two corners: A-27, A-34 and A-35. Lift cover from frame (HE-1).

## COVER CARRIAGE MECHANISM

### NOTE

**Before removing front cover assembly, elevate top cover assembly (A-6) to clear printer head, and slide the front cover assembly forward to avoid damaging ribbon cables which are connected from the video amplifier board 63002668-4001 to the power driver board 63002242-4001 (Fig. 8-14).**

4. Disconnect power cable (Refer Section 7, Electronic Cavity 63001105-1, item 9, and Fig. 8-2) from base (A-2) by removing screw, flatwasher and split lockwasher (A-25), (A-34), (A-35) and bracket (A-20).
5. Disconnect connector (A-16) from mating connector (HJ-46) at rear right on main frame (HE-1).
6. Remove screw (A-31) from ground strap (A-50).
7. To remove side covers (A-3, A-4), remove snap rings (A-21) and push, pins (A-14) through hinges.
8. To remove the base (A-2) from main frame, disassemble remaining hardware (four places) at (A-26), (A-34), (A-27) and lift main frame from base.
9. To reassemble, reverse order of disassembly beginning with step 8.

### 5.2.1.3 Adjustments

Side covers (A-4, A-3) lock into speed clips located on inside walls of covers. For perpendicular adjustment of covers, in relation to base, adjust length of ball stud (A-19) with nut (A-32) located at ends of standoffs (A-39), if required.

## 5.2.2 CARRIAGE MECHANISM (FIGURE HA)

### 5.2.2.1 Operation

The function of the carriage mechanism is to hold the head under the best condition to print characters against the platen and to move the head from left to right and return it to the starting position after printing the last character.

The carriage (HA-9) has two guide rollers (upper) (HA-10), a guide roller unit (HA-21) and two rollers (upper and lower) (HA-26, 31) to hold the carriage on the guide bar (HE-8) and guide plate (HE-23). The print head (HA-1) mounted on the carriage, is held by four screws and is movable back and forth up to 1 mm (0.039-in.). This adjustment is made by turning an eccentric shaft on the head penetration adjusting knob (HA-32). The adjustment is determined by the number of copies to be run. The head lock-knob (HA-33) is mounted on the left hand side of the carriage and locks the eccentric shaft after positioning head in relation to platen. Play between head bracket and carriage can be eliminated by gib (HA-45) which is fixed on carriage by two screws (HA-46) and positioned by set-screws (HA-48). When the carriage is positioned over the right or left-hand reed switch (HE-78), a magnet, mounted on lower portion of carriage, closes the reed switch and sends a signal to indicate the carriage position to electronic logic.

## CARRIAGE MECHANISM

The carriage is moved by the main driving belt (HA-36). Parts HA-41 through HA-44 and HA-58 through HA-64 are mounted on the underside portion of the carriage. These parts are designed to absorb shock on the belt tension and linear alignment.

The ribbon guide roller (HA-5), mounted on the carriage and head bracket (70), holds the ribbon at proper position insuring proper tension on the ribbon while printing. Bracket (50) is a part of the video amplifier ass'y and supports the video circuitry for print registration in conjunction with the timing fence (Fig. 8-8/135).

### 5.2.2.2. Removal/Replacement Procedure

#### A. Head

For removal and installation of print head, refer to Section 5.2.13.2.A.

#### B. Carriage (HA-9)

1. With carriage at mid-position, remove main driving belt (See next para. C.).
2. Remove complete damper unit by removing screws (HD-29).
3. Remove video amplifier and bracket (50) by removing screws, washers (55,56,57).
4. Loosen head lock knob (HA-33) and slide head back from platen to clear guide roller (HI-111) by turning head adjusting knob (HA-32). Release ribbon from ribbon from ribbon guide roller (HA-5).

### CAUTION

**AVOID DAMAGING LEFT REED SWITCH AND CASE (HE-78) WHEN CARRIAGE IS REMOVED FROM LEFT SIDE OF MACHINE IN NEXT STEP 5.**

5. Move carriage to left and remove it from guide bar and guide plate.
6. To install carriage, reverse above procedure.

#### C. Main Driving Belt (HA-36)

To remove belt, perform the following steps:

1. Loosen nut (HC-12) and screw (HC-11) on spring drum (HC-1).
  - a. Release main spring (part of HC-1) tension by intermittently pivoting pawl (HC-10) to slowly unwind internal spring. (Note, that spring may suddenly unwind with considerable noise, a normal occurrence).
2. Remove nuts, washers (HA-64, 63, 63) on shaft (A) (HA-59).

NOTE: It is not necessary to remove screws, washers (HA-41, 43) and Holder (A) (HA-58) attached to underside of carriage except for new assembly parts installation.
3. Remove left nut (HA-44) from screw (HA-43) with a 10 millimeter (0.4-in.) open-end wrench.
4. Using two 10 millimeter open-end wrenches, remove remaining two nuts from screw (HA-43). Belt will separate.
5. Remove left end of belt by feeding through left hole in base of printer chassis frame.
6. Continue to pull entire belt to the right feeding it through hole on right side of printer chassis and out.
7. If necessary, loosen clutch field assembly tabs (part of HB-140) (Fig. 8-5) attached to printer base and feed belt out through the tabs.
8. To install belt, reverse above procedure but first start with applying tension on spring of spring drum (refer to para. 5.2.4.3).

## CARRIAGE MECHANISM

- D. Guide Roller and Guide Roller Unit (HA-10, 21)
1. To remove guide roller unit, remove bolts (HA-22). This unit may be replaced as a complete assembly.
  2. To remove guide rollers from carriage, remove nut (HA-20) and spring washer (HA-19).

### 5.2.2.3 Adjustments

- A. To Adjust Play Between Carriage and Guide Bar (HE-8) or Guide Plate (HE-23).
1. Adjust the distance between carriage (HA-9) and guide plate (HE-23) by loosening nut (HA-29) and turning eccentric axle (HA-25) to allow gap of 0.01 through 0.03 mm (0.0004-0.0012-in.) between upper and lower rollers (HA-26, HA-31) and the guide plate.
  2. The carriage, without main driving belt (HA-36), should be able to move on guide bar (HE-8) and guide plate with no more than 100 grams (3.5 ounces) tension. Note, that the guide roller unit (HA-21) is adjusted to the carriage (HA-9) by the manufacturer prior to shipping, if a carriage is to be readjusted or replaced.
- B. To Adjust Play Between Carriage and Head Bracket (HA-1)
1. After loosening screws (HA-46) and nuts (HA-49), adjust play by positioning gib (HA-45) with set-screws (HA-48) and then tighten screws and nuts. Head bracket should be able to move smoothly using head adjusting knob (HA-32).
- C. To Adjust Ribbon Guide Roller (HA-5)
1. The eccentric shaft (HA-6) is used to make this adjustment from the mounting face of the bracket to the farthest point of tangency on roller, the dimension should be 53.50 mm (2.1-in.)
- D. To Adjust Tension of Main Driving Belt (HA-36)
1. Remove main driving belt (HA-36) from holder (HA-58) by loosening nuts (HA-64) and pushing down on belt. Adjustment of tension can now be made by turning nuts (HA-44) on screw (HA-43) with 10 mm (0.4-in.) open-end wrench. See next step No. 2 for belt tension specifications.
  2. For the Model 101 Series, apply main belt tension by the following method.:
    - a. Main belt is attached to carriage.
    - b. Carriage is at start position, (at rest).
    - c. At a point midway between spring drum assembly (HC-1) on the left , and reverse clutch on the right, deflect top of belt upward 9-11 millimeters (0.35-0.43-inch) using an upward pull equivalent to 500 grams, (17.6 ounces).
    - d. When correct tension has been attained, reverse step in para. D.1.
  3. Ensure that carriage returns from any run-out position under spring drum tension. (See para. 5.2.4.3).

## 5.2.3 DRIVING MECHANISM (FIGURE 8-4 AND FIGURE 8-5)

## 5.2.3.1 Operation

A. Motor Drive Chain (Figure 5-1)

Driving power of motor (HB-98) is transmitted to forward and reverse clutches as follows: Motor - intermediate gear for forward clutch (HB-30) - pulley (HB-60) for forward clutch. Motor - intermediate pulley with gear (HB-22) - intermediate shaft with riveted pulley (146) - pulley (HB-60) for reverse clutch. Looking from front, motor rotates counterclockwise; therefore, pulley for reverse clutch rotates counterclockwise. When either forward or reverse clutch actuates by signal, pulley (HB-63) for main driving belt rotates to move carriage.

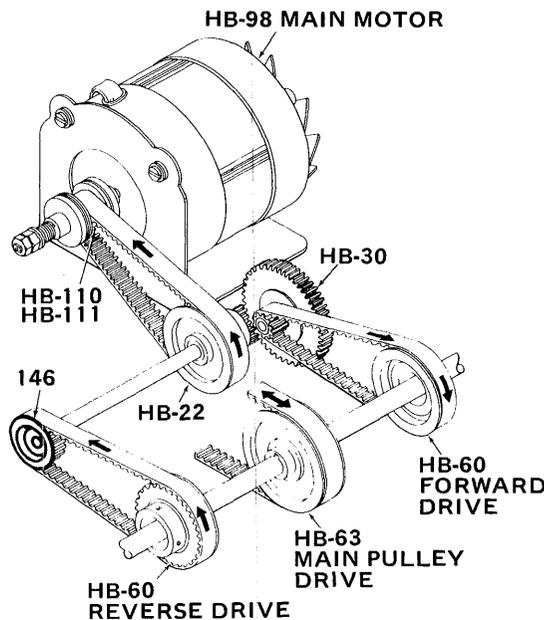


Figure 5-1. SERIES 101 DRIVE TRAIN

B. Clutch Alignment and Function (Fig. 8-5)

Alignment of clutches is as follows: Viewed from the front of the printer (right side), the order is reverse clutch assembly followed by forward clutch assembly. Because of a preload condition (surface to surface contact) between splined armature (HB-142) and keyed rotor (HB-141) no gap adjustment is required. Slight tension (preload) is maintained by a spring (HB-144) pressing against the fixed, forward and reverse driving pulley (HB-60) and its splined armature (HB-142).

The armature hub (HB-143) inserts into the splined armature maintaining torque drive for either forward or reverse drive. Clutch field assembly (HB-140) is prevented from rotating about its shaft (HB-50) by means of tabs (See Fig. 8-5, A and B) that extend from field assemblies (HB-140) and mount to the printer base. When a signal is sent from electronic logic to coil in forward or reverse clutch field assembly, the magnetized rotor (HB-141) holds the splined armature (HB-142), and friction torque is transmitted to shaft and drive pulley (HB-60) (forward or reverse). When signal current stops, torque chain between armature and rotor is discontinued, and the armature is restored to initial preload condition (surface to surface contact).

## DRIVING MECHANISM

### C. Operating Conditions, Drive Mechanism (Figure 5-2)

Alternate forces are exerted on timing belts (HB-48, and belt 49) including main drive belt (HA-36) and motor (HB-98) because of inertia of print head carriage and forward and reverse clutch timing peaks. These variations in the power transmission route are normally handled by the use of a motor clutch plate (HB-98) (part of motor) and motor pulley driver (HB-92) installed to protect belts and motor.

Normal cycle time of carriage and machine operating sounds are directly influenced by alternate dropping and raising time of torque on clutches, which also affect belt tensions. Therefore, all drive mechanism parts should be properly adjusted using recommended procedures where applicable.

### 5.2.3.2 Removal/Replacement Procedure

#### A. Main Motor (HB-98) (With Covers and Rear Electronic Cavity Removed) (Retain all Mounting Hardware and Parts if Replacing Motor)

Steps A.1. through A.5. are keyed to Figure HI

1. Remove right and left-hand bevel gears (HI-27) by loosening set-screws (HI-29).
2. Remove right and left-hand shaft bushing holders (HI-130, 133) by removing screws (HI-131).
3. Remove snap rings (HI-105) on both ends of shaft. Retain parts.
4. Loosen set-screw (HI-19) on driving bevel gear (HI-18).
5. Remove shaft (HI-103) and washers (HI-104).

Steps A.6. through A.7. are keyed to Figure HB (part 1)

6. Loosen nut (HB-19) and back off belt tensioner bolt (HB-18) up to maximum travel.
7. Remove four attaching screws (HB-17) from underneath the printer base and remove main motor with mounting bracket (HB-9).

Refer to Printer Wiring Diagram in Section 7 for wiring diagram in steps A.8. through A.10. if motor is being replaced.

8. Cut two wires (red), No. W18 and W19 as close to motor as possible. Insulate wires, when motor is newly installed.
9. Remove ground lug attached to motor.
10. Unsolder two wires (yellow) on motor capacitor (HB-13) retain capacitor and bracket if motor is being replaced. Insulate wires, when motor is newly installed.
11. Remove motor from mounting bracket (HB-9) by removing four screws with four external washers (HB-12 and 11).

#### B. Main Motor Belt Removal (HB-48)

When main motor is replaced, it is recommended that the belt (HB-48) be replaced at the same time.

1. Remove and discard main motor belt (HB-48) between motor pulley (HB-22) and pulley (HB-110/111) by first removing intermediate gear (HB-30) for forward clutch by removing nut and washers (HB-28, 29) at front of printer. Retain pulley and mounting hardware.

# DRIVING MECHANISM

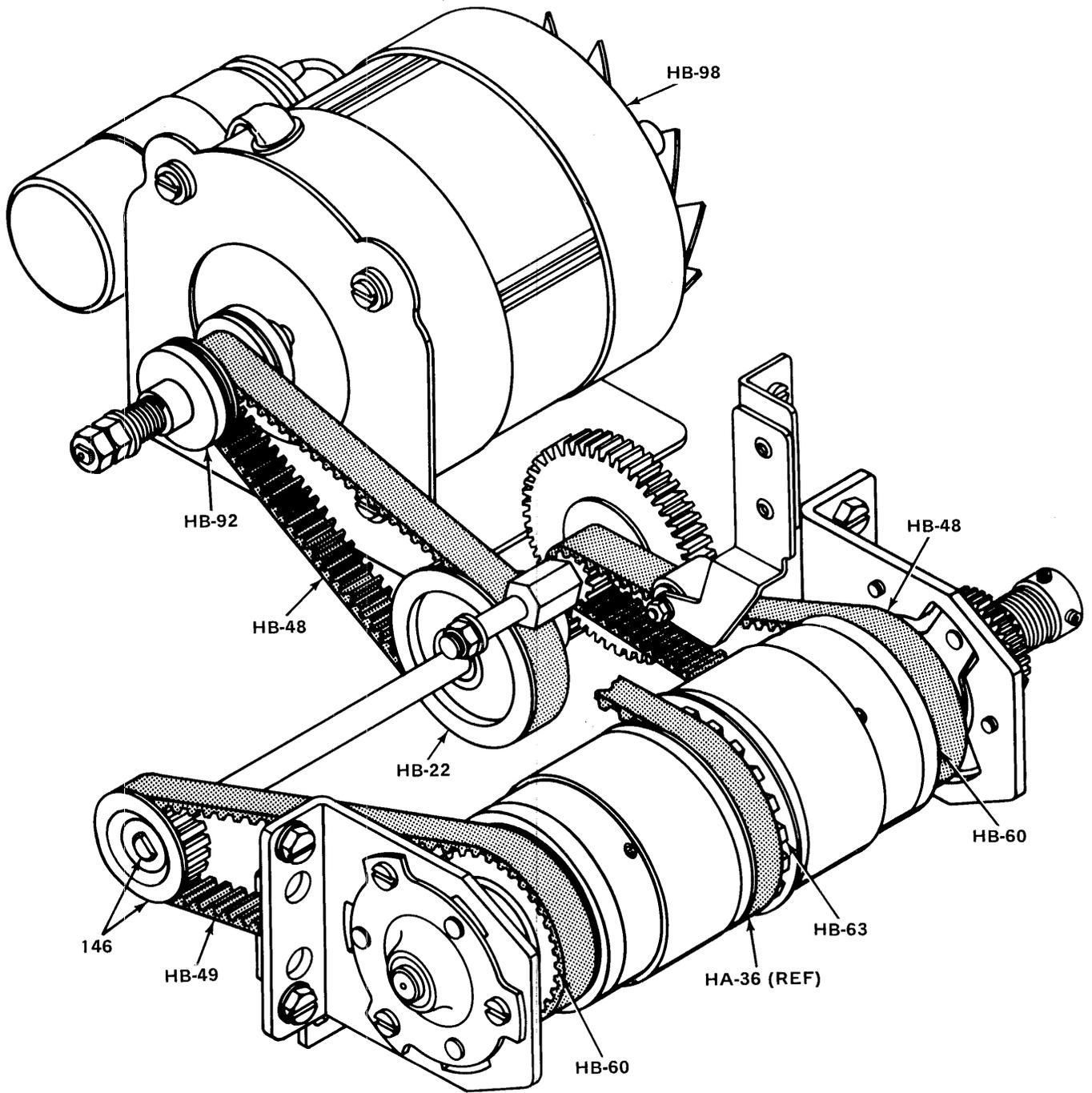


Figure 5-2. MAIN MOTOR DRIVE AND DRIVE BELT ARRANGEMENTS

## DRIVING MECHANISM

- C. Preparation of Main Motor W/Fan and Clutch Plate (HB-98) Prior to Installation
  - 1. Solder two capacitor wires (yellow) from motor to terminals of retained capacitor (HB-13).
- D. Installation of Motor Pulley Driver (HB-92) and Main Motor

### NOTE

**The following parts are to be added (in the order indicated, a through d), to the shaft of the motor in addition to the pinned clutch plate and fan that are factory delivered with the motor (HB-98). Refer to Figure (HB) (Part 1).**

- a. Motor pulley 60 Hz or 50 Hz (HB-110, HB-111).
  - b. Motor pulley driver (HB-92).
  - c. Spring for HB-92 (HB-93).
  - d. Nuts for HB-93 (HB-12).
- 1. Tighten nut (HB-112) so that spring coils squeeze together, but not overlapping. Tighten second check nut (HB-12).
  - 2. Insert motor into back of printer (shaft facing front of printer) and set over motor mounting holes.
  - 3. Install new belt (HB-48) over intermediate pulley (HB-22) and main motor pulley (HB-110, or HB-111).
  - 4. Insert mounting bolts (HB-17) into main motor through base underneath printer. Do not tighten until the following steps are performed:
    - a. Insert adjusting bolt (HB-18) into side flange of motor mounting bracket and turn. Motor belt will tighten.
    - b. Adjust motor and bracket parallel to front paper pan (HF-89) by sighting straight down on the top of two slotted-head screws (HB-12) of the mounting bracket (HB-9) and align screws parallel to the front paper pan.
    - c. Tighten four mounting bolts (HB-17).
    - d. Tighten nut (HB-19) on adjusting bolt.
    - e. Press ON/OFF switch on operator panel of printer to test alignment and operation of main motor and belt tension while operating. With switch OFF readjust adjusting bolt and mounting nuts, if required.
  - 5. Reinstall intermediate gear (HB-30) for forward clutch which was removed in step B.1. Ensure that forward clutch pulley belt (HB-48) is over hole when idle shaft (HB-27) is inserted so that belt fits over smaller gear of cluster gear (HB-30).
  - 6. Place other end of pulley belt over the forward clutch gear (HB-60).
  - 7. To adjust eccentric idle shaft (HB-27) (Fig. 8-4, part, 1, View A) and back lash for intermediate pulley (HB-30), refer to paragraph 5.2.3.3.C.
  - 8. For final installation of motor, reverse steps A.1. through A.7. at para. 5.2.3.2.A.
  - 9. Install ribbon through extended pins on right and left-hand control levers (HI-88, 90).

## DRIVING MECHANISM

- E. Forward and Reverse Clutch Drive Mechanism (Refer to Figure HB, Part 1 and 2 and HI)
1. Forward Clutch (HB-139)
    - a. Remove clutch spring (HI-4) on sleeve (HI-5) by loosening two set-screws (HI-6). Slide off spring and sleeve.
    - b. Remove clutch gear (HI-1).
    - c. Remove ribbon drive shaft unit by removing screws (HI-17) from right side of printer.
    - d. Slip off pulley belt (HB-48) between forward clutch pulley (HB-60) and intermediate pulley for forward clutch (HB-30).
    - e. Remove bushing bracket (HB-51) from shaft (HB-50) (Part 2) by removing screws (HB-52) and one washer (HB-96).
    - f. Remove sleeve (HB-62) from shaft.
    - g. Loosen screws (HB-61) and remove pulley (HB-60).
    - h. Remove clutch spring (HB-144), hub (HB-143), and splined armature (HB-142).
    - i. Slide clutch rotor (HB-141) over shaft, and remove both key (HB-64) and rotor.

### NOTE

To remove total parts of the forward and rear clutch assembly from its shaft, proceed with removal of the reverse clutch parts in paragraph 5.2.3.2.E., step 2 below, and then the removal of forward and reverse field assemblies (HB-140) and main belt pulley (HB-63) in step 3.

2. Reverse Clutch (HB-139)
  - a. Disengage belt (HB-49) between intermediate shaft with pulley (Fig. 8-4/146) and reverse pulley (HB-60).
  - b. Remove screws (HB-52) and two washers (HB-96) from bracket (HB-51) and slide off bushing (HB-53) with bracket from shaft.
  - c. Remove sleeve (HB-62) from shaft.
  - d. Loosen set-screws (HB-61), and remove reverse pulley (HB-60).
  - e. Remove spring (HB-144), hub (HB-143) and splined armature (HB-142).
  - f. Slide clutch rotor (HB-141) over shaft, and remove both key (HB-64) and rotor.
3. Forward and Reverse Field Assemblies (HB-140) and Main Belt Pulley (HB-63)
  - a. Cut forward clutch field assembly wires No. W39 (brn/yel) and W40 (red/blu) (See Fig. 8-5). Ensure that wires are properly identified prior to cut. Note that two blue wires emerge from the clutch field assembly and join these color coded wires. (Refer to wiring Diagram 63002333, Section 7).
  - b. Cut reverse clutch field assembly wires No. W34 (red/pur) and W43 (brn/grn) (See Fig. 8-5). Ensure that wires are properly identified prior to cut. Note that two blue wires emerge from the clutch field assembly and join these color coded wires. (Refer to wiring Diagram 63002333, Section 7).
  - c. Free mounted forward and reverse field assemblies (HB-140) by loosening two screws, washers, and brackets (HE-72, 73, 71) from right side of main frame (HE-1) and sliding each bracket away from field holder tabs A and B (Figure 8-5).
  - d. Slide main belt pulley (HB-63) off shaft. Retain key (HB-64).

## DRIVING MECHANISM

- e. For complete assembly replacement of forward and reverse clutches and main motor pulley, reverse step of paragraph 5.2.3.2.E., steps 1, 2 and 3.

### NOTE

When assembling forward and reverse clutch and shaft parts, begin assembly by adjusting main motor pulley (HB-63), keys (HB-64) spacer (HB-109) and clutch field assemblies (HB-140) on center of shaft.

- F. Timing Belts (HB-48, 49)
  1. For forward clutch belt (HB-48) remove intermediate gear for forward clutch (HB-30) by removing nut (HB-28) and use procedure in para. D.5. through 7. for installation.
  2. For reverse clutch belt (HB-49) removal, refer to procedure in para. E.2.a. through 2.c.
- G. Intermediate Shaft with Pulley (Fig. 8-4/146)
  1. First, remove idle shaft (HB-27) with attached intermediate gear (HB-30) for forward clutch by removing nut and washer (HB-28, 29). Slide belt (HB-48) off the two-part gear (HB-30) prior to removal of the shaft (HB-27).
  2. Loosen pulley (HB-22) on intermediate shaft (146) by loosening two set-screws (HB-23). Slide off pulley belt (HB-48).
  3. Pull out riveted pulley and shaft (146) toward front of printer. This step will free pulley (HB-22) and felt washers (HB-24).

### 5.2.3.3 Adjustments

- A. To Adjust Motor Pulley Driver (HB-92) (Motor Slip Clutch)
  1. Torque of slip clutch is 33.3 oz-in. (0.944 Kgm-cm) through 97.2 oz-in. (2.75 Kgm-cm). Adjust by changing tension of spring (HB-93) with nuts (HB-112).
  2. If compression of spring is increased beyond slip clutch limits, carriage accelerates, timing belt (HB-48) receives abnormal shock and squeaking noises will come from forward and rear clutches.

### NOTE

Make sure that there is no oil on surfaces of motor clutches (includes part of motor and motor driver HB-92).

- B. To Adjust Belt Tension (Timing Belt HB-48, 49)

Proper belt tension is obtained under the following conditions:

When about 300 grams (10.6 oz.) pressure is applied to upper half of belt, mid point between pulleys, belt depression is about 3 to 4 mm (0.12 to 0.16-in.).

Adjustments of belt tensions is as follows:

1. Belt (HB-48) between motor pulley (HB-110, HB-111) and pulley (HB-22); adjust belt tension by loosening nuts (HB-19) and screws (HB-17). Adjust bolt (HB-18) to change position of motor, then tighten all screws and nuts.

2. Belt (HB-48) between pulley (HB-30) and pulley (HB-60) for forward clutch; adjust belt tension by loosening screws (HB-79) washers (HB-114) and positioning tensioner bracket (rear) A (HB-75). Make sure that belt is pushed down horizontally and contacts tensioner L (HB-77) completely. If contact is not complete, adjust tensioner bracket (rear) B (HB-76) by loosening screws (HB-79) and washers (HB-114) and re-position bracket (HB-76). Then repeat above adjustment as in beginning of step 2.
  3. Belt (HB-49) between riveted pulley shaft (146) and reverse pulley (HB-60); adjust belt tension by loosening screws (HB-39, 79). Position tensioner bracket (front) (HB-33) by making sure tensioner (HB-34) is pushed up against the belt completely before tightening screws.
- C. Backlash Adjustment of Intermediate Pulley (HB-30) For Forward Clutch (Fig. 5-3)
1. With the spur gear on intermediate pulley (HB-22) meshed with intermediate pulley (HB-30) at the back of the printer, begin the following adjustments with some play between the teeth of both gears.
    - a. Turn offset idle shaft (HB-27) clockwise with a screwdriver until play ceases to exist between gears. Determine this by moving gears forward and backward by hand until there is no backlash movement between gear teeth.
    - b. When screwdriver slot of adjust shaft (HB-27) comes to rest after no backlash movement (See Example 1), rotate shaft counterclockwise 45 degrees or 1/8 of a turn (See Example 2).
    - c. Insert feeler gauge between the sides of two meshed gear teeth for a minimum gap of 0.012-inch through a maximum gap of 0.015-inch (0.30 to 0.38 mm max). (See Fig. 5-4).

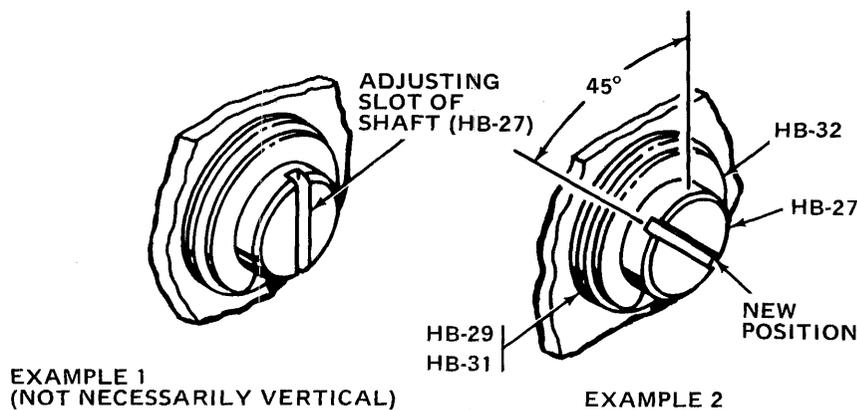


Figure 5-3. DETERMINING BACKLASH ADJUSTMENTS, SHAFT (HB-27)

## DRIVING MECHANISM

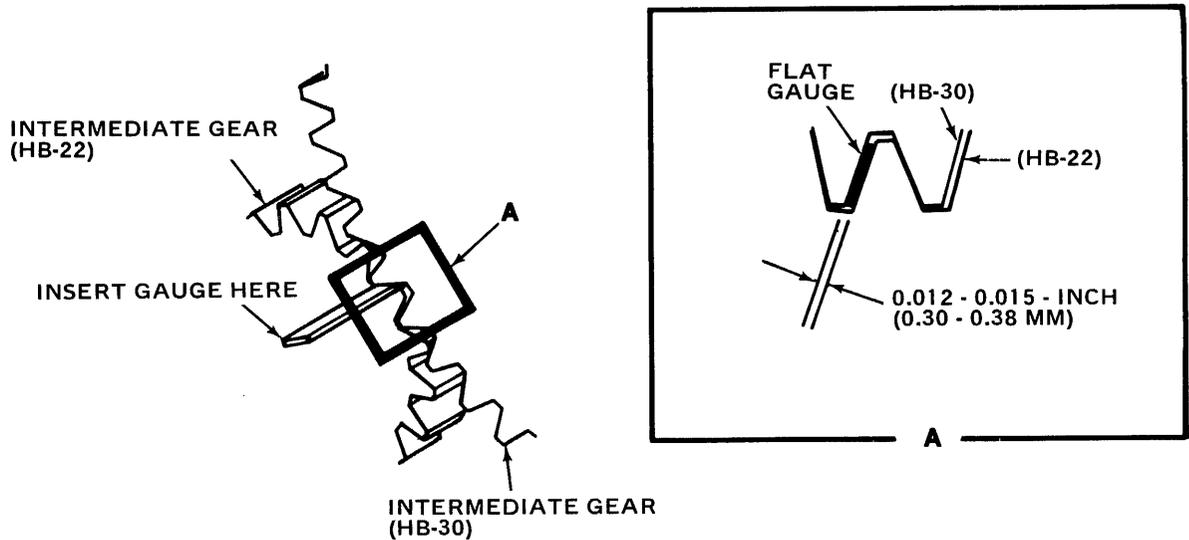


Figure 5-4. USE OF FEELER GAUGE FOR BACKLASH ADJUSTMENT, (HB-30, 22)

- d. When satisfactory movement of gear (HB-30) has been established, lock up nut and washers (HB-28, 29) with a 10 millimeter open-end wrench, while at the same time, holding correct adjusting screw position with screwdriver.
  - e. Complete re-assembly with the following steps:
    - 1) Add a few drops of Anderol No. 465 oil to eccentric idler shaft (HB-27) and on both felt washers (HB-31). (See Fig. 8-4).
    - 2) Forward and reverse pulley belts (HB-48, 49) and main motor pulley belt (HB-48) should be in position for operation. If motor is turned on, at this point, gears should operate with minimum noise, as torque of main motor is distributed without strain along intermediate shaft (HB-146) to forward and reverse clutches.
- D. Intermediate Shaft W/Pulley, Idle Shaft, Flat Washer Lubrication
1. Remove all external accessory covers.
  2. Remove cavity assembly 63001105-1 (Section 7 of manual).
  3. Remove power driver board assembly 63002242-4001 (See para. 5.2.13.2.D.).
  4. Tilt machine backwards, 90 degrees from site position, to expose underneath portion of printer.
  5. Apply anderol Oil No. 465 to two felt washers (HB-24) located on counter shaft w/pulley (146).
  6. Apply Anderol Oil No. 465 to two felt washers (HB-31) located on idle shaft (HB-27) for intermediate gear for forward clutch(HB-30).
- E. Intermediate Shaft Bushings - Lubrication
1. Check that shaft bushing (HE-7) are secure in printer machine support.
  2. Secure loose bushings by using loctite (or equiv.) on outside surfaces that contact base frame of printer. Clean surrounding support holes prior to installation. Avoid loctite touching inside surfaces of bushings where shaft rotates. Clean interior shaft hole of bushing.
  3. Lubricate inside surfaces of bushings and intermediate shaft (146) with Anderol No. 465 Oil prior to installation or replacement (See item 2, para. 6.3.C.).

## DRIVING MECHANISM

- F. Forward and Reverse Clutches (No Clutch Gap)
1. Since this section covers installation of new preload clutches (See Figure 8-5), there is no gap required between the rotor (HB-141) and splined armature (HB-142) for both forward and rear clutch.
- G. Bushing End-Play Adjustment (Pre-Load Clutch) (Refer Fig. 5-5)
- To ensure smooth rotation of clutch shaft (HB-50) (Preload) perform the following adjustments:
1. Tighten screws (HB-52) on rear (forward clutch) bushing bracket (HB-51).
  2. Loosen screws (HB-52) on front (rear clutch) bushing bracket (HB-51).
  3. Insert flat gauge between spacer (HB-62) and hub of drive pulley (HB-60). Maintain a gap of 0.002-0.004-in. max. (0.05-0.10 mm) and tighten bracket to this dimension.

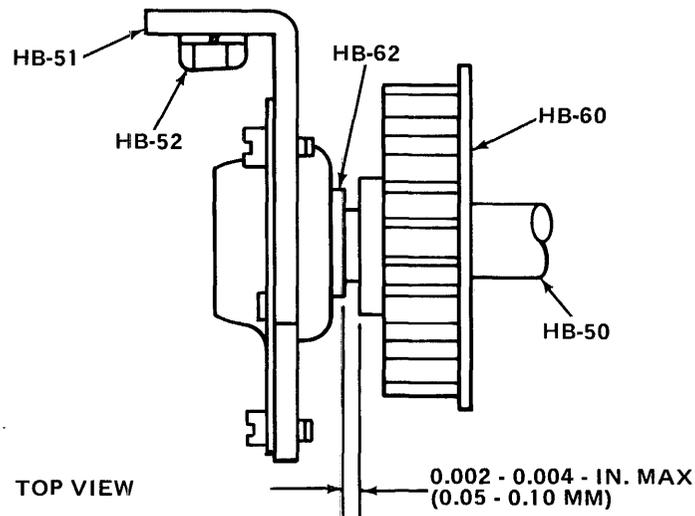


Figure 5-5. BUSHING END-PLAY ADJUSTMENT FOR PRELOAD CLUTCH SHAFT (HB-50)

## SPRING DRUM DAMPER

### 5.2.4 SPRING DRUM (FIGURE HC)

#### 5.2.4.1 Operation

1. Provides spring tension for return of head.

#### 5.2.4.2 Removal/Replacement Procedure (with left cover down)

1. Release spring pawl (HC-10) by slowly loosening nut (HB-12) and screw (HC-11).
2. Actuate pawl (HC-10) to release spring tension step-by-step.

#### NOTE

Spring may unwind suddenly with excessive noise.

3. Roll belt (HA-36) off pulley (HC-5).
4. Loosen nut (HC-9) and remove drum assembly from brackets (HC-6, 7).
5. Drum may be disassembled by removing nuts (HC-9) and shaft (HC-8).
6. To assemble, reverse above procedure.

#### 5.2.4.3 Adjustments

1. Spring drum w/main spring (HC-1) should have only enough tension to return carriage unit smoothly from any position to starting position without any other force.
2. To adjust main spring tension, loosen nut (HC-12) and back off screw (HC-11) slightly; this will release the holding pawl (HC-10). Rotate spring drum (HC-1) counterclockwise to increase tension, and rotate clockwise to decrease tension.
3. Proper tension will be obtained by winding spring drum about ten times when carriage is positioned at starting position. The purpose of the spring drum is to hold down carriage motion at home position, so that 11 windings is about maximum. Note that pawl is easily released from teeth on spring drum with main spring loosening at once if nut (HC-12) and screw (HC-11) are loosened too quickly.

### 5.2.5 DAMPER (FIGURE HD)

#### 5.2.5.1 Operation

1. Dampens return print head motion.

#### 5.2.5.2 Removal/Replacement Procedures

1. Remove screws (HD-29) to remove complete unit.
2. Loosen nut (HD-24) and back out center screw (HD-23). Remove unit damper cylinder (HD-1) from frame (HD-37).
3. Remove snap ring (HD-16) and remove pin (HD-21).
4. Remove lid (HD-11) by removing screws (HD-12).
5. Remove spring (HD-10).
6. Take off split pin (HD-9) from nut (HD-8).
7. Remove nut (HD-8).
8. Remove steel washer (HD-7) and packing (HD-6).

9. To install packing, reverse above procedure and coat inside of cylinder lightly with recommended NYE RHEOLUBE No. 723-MS, or equiv.

Note Following points of above procedure:

- a. Split pin (HD-9) should not interfere with movement of spring (HD-10).
- b. Piston Rod (HD-2) should be returned to normal position easily by spring (HD-10), when pushing down piston rod by hand and releasing.
- c. When replacing lid (HD-11), care should be taken that rod (HD-2) moves freely in bushings.

### 5.2.5.3 Adjustments

1. Tighten center screw (HD-23) with enough force to hold damper cylinder (HD-1). Additional tightening may lock piston rod (HD-2).
2. When replacing damper cushion (HD-33) on carriage stopper lever (HD-32), clean contact surface with alcohol and sandpaper. Fit cushion and cap (HD-34) using recommended Eastman 910 glue, or equiv.

## 5.2.6 FRAME (FIGURE HE)

### 5.2.6.1 Operation

The following two reed switches and flexible timing fence are located on frame of printer:

1. Left-hand reed switch w/case (HE-78). This switch should be closed to output signal of RTP (ready to print) while carriage is positioned over it.
2. Right-hand reed switch w/case (HE-78). This switch should be closed to output signal of EOP (end of print) when carriage is positioned over it.
3. Flexible Timing Fence (Fig. 8-8/135). The timing fence is used to interrupt light through vertical slots for the optical pickup, single track head (Fig. 8-12/24 and Fig. 5-6).

### 5.2.6.2 Removal/Replacement Procedures

- A The following removable parts are not described in a disassembly/assembly order, but their locations are on the frame (HE) drawing with their key numbers.
  1. Platen (HE-2) and Platen Holder (HE-3).
  2. Left chassis (HE-86) and right chassis (HE-85).
  3. Carriage stopper (HE-30).
  4. Right Clutch Stop (HE-70) and Left Clutch Stop (HE-71).
  5. Operator Panel (HE-89) and Support (HE-90).
  6. Rubber Feet (HE-24).
  7. Left guide plate (HE-63) and right guide plate (HE-62) for cavity.
  8. Limit Switch (Reed) w/case (HE-78).
- B. Flexible Timing Fence 63002440-1001 (Fig. 5-6).

**CAUTION**  
**IN ANY OPERATION INVOLVING TIMING  
FENCE, AVOID SURFACE CONTACT OR  
ABRASION TO EMULSION SIDE OF FENCE  
(SIDE MARKED, "RIGHT").**

## FRAME

1. Carefully remove video amplifier ass'y 63002668-4001 (Section 7) with attached optical pickup head 63002634-5003 (Fig. 5-6) from timing fence (135) by removing screws, washers (Fig. 8-3/55, 56, 57) holding the mounting bracket (See Fig. 8-3/50) to the carriage mechanism.
2. Loosen screws, washers (138,134) holding right-side clamp (136) to bracket (HE-54) on right side of printer frame (HE-1).
3. Unhook left side of flexible timing fence and remove from projection at back of clasp (133). Set timing fence aside.
4. To remove left-side clasp (133), remove two screws, washers (138, 134, 137) from left-side bracket (HE-55).
5. To remove right-side clamp (136), remove two screws, washers (138, 134) from right bracket (HE-54).
6. To re-install timing fence and video amplifier ass'y (with attached optical pickup head), reverse order of disassembly of para. 5.2.6.2.B.1 through B.5. (Refer to para. 5.2.6.3.A.B. and C. for adjustments).

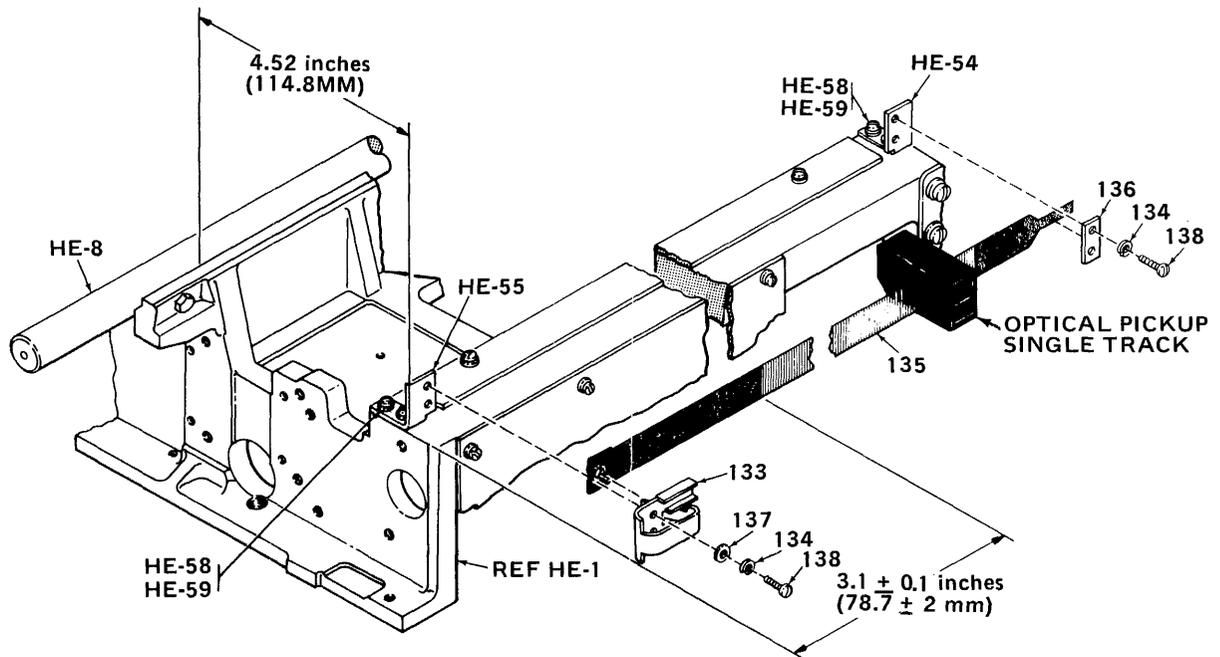


Figure 5-6. FLEXIBLE TIMING FENCE MOUNTING, SERIES 101

### 5.2.6.3 Adjustments

(The following paragraphs: A, B, C, should be done in sequence to combine all necessary and complete adjustments required for timing fence and video amplifier single track optional pick-up head).

- A. Positioning of Suspended Timing Fence (Flexible) for First Character Printout (Fig. 5-6)
  1. Loosen screws, washers (138, 134) on right-side clamp (136) and pull right end of tab of fence to the right so that the first window of fence is located  $3.1 \pm 0.1$  inches ( $78.7 \pm 2$  mm) from edge of printer casting (See Illustration, Fig. 5-6). (Note, that this dimension allows for a 5/8-inch nominal printout margin on the printing form).

## TIMING FENCE

2. When correct dimension has been applied, secure fence by tightening mounting hardware on the clamp (136).
- B. Establishing Fixed Parallelism for Suspended Timing Fence (Fig. 5-6).
1. Loosen screws, washers (HE-58, 59) on left and right brackets (HE-55, 54).
  2. From the front edge of guide bar (HE-8) measure 4.52 inches (114.8 mm) out to the left and right front edges of the positioned fence. Parallelism should be within 0.002-in. (0.05 mm) along entire length of fence. Tighten screws (HE-58) to maintain applied dimension.
- C. Single Track, Optical Pickup Assembly Alignment

**CAUTION**  
WHEN INSTALLING AND ADJUSTING VIDEO AMPLIFIER ASS'Y WITH MOUNTED OPTICAL HOUSING (FIG. 5-6) WITH RESPECT TO TIMING FENCE, AVOID SCRATCHING OF EMULSION ON TIMING FENCE (SIDE MARKED, "RIGHT").

1. Centering of Timing Fence in Slot of Optical Pickup (Fig. 5-7)  
With the optical housing normally in position on the video amplifier board 63002668-4001 (Section 7), guide mounted fence into slot of optics housing, but before tightening screws, washers (Fig. HA/55, 56, 57) on the video amplifier bracket (50) and carriage (HA-9), check the following:
  - a. Make sure fence is positioned in center of housing slot (Fig. 5-7).

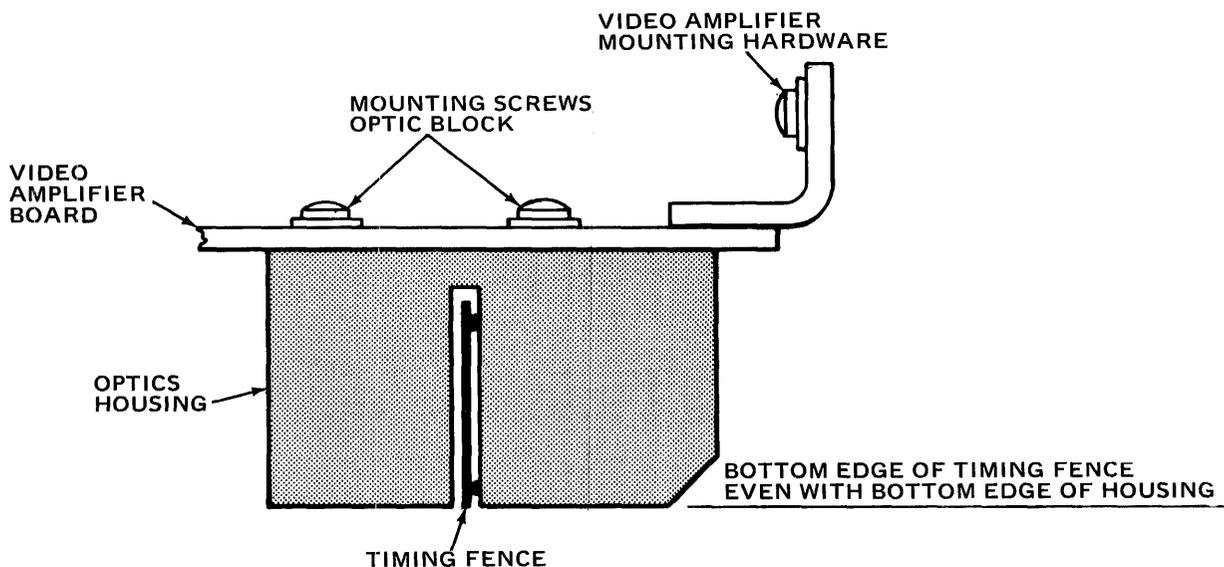


Figure 5-7. FENCE ADJUSTMENT AND OPTIC HOUSING

- b. If required, loosen mounting screws on video amplifier board (Fig. 5-7) and adjust optical housing so that fence is positioned in center line of the housing slot. Tighten screws.

## TIMING FENCE

- c. Make sure that when the timing fence is positioned in the center line of the slot, the bottom of the fence is in the same plane with the bottom surface of the optical pickup housing (Fig. 5-7).
  - d. When conditions have been met at para. C.1.(a) through C.1.(c), tighten mounting screws and washers on video amplifier board (Fig. 5-7).
2. Vertical and Horizontal Alignment of Optic Housing (Fig. 5-8)
- a. Vertical  
Sight right side of optic housing and make sure of parallel alignment with respect to vertical timing fence slots. If required, loosen screws, washers (HA-55, 56, 57) holding the video amplifier board and bracket to maintain this alignment. Tighten screws, washers when vertical alignment is attained.
  - b. Horizontal  
If required, make sure screws, washers (HA-55, 56, 57) holding video amp. bracket (Fig. 8-2/50) are tight and slightly bend bracket up or down so that the bottom of the optic housing is parallel with printer base (bend metal portion of bracket only).
  - c. Re-check step 2.(a) above if step (b) was performed.

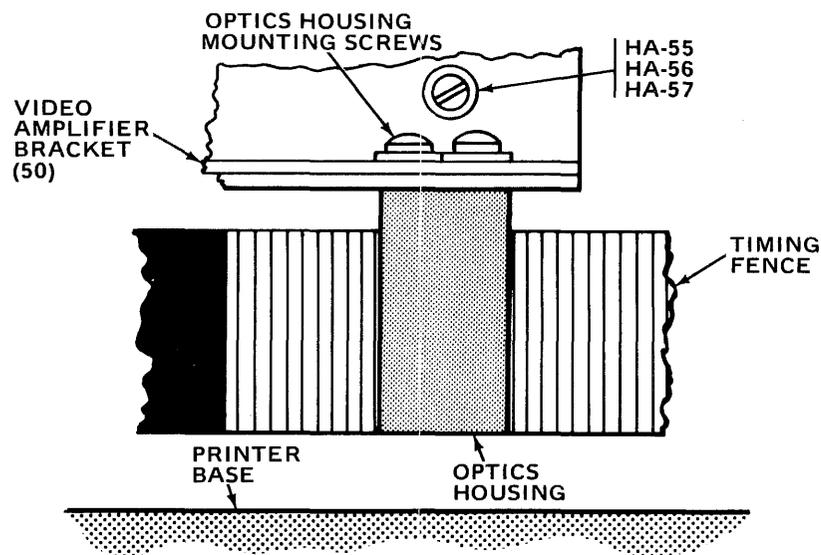


Figure 5-8. VERTICAL AND HORIZONTAL ALIGNMENT OF SINGLE CHANNEL OPTICS HOUSING

3. Carriage to Timing Fence Alignment Checkout
  - a. Move carriage to right margin by hand, and observe tracking of fence in housing slot.
  - b. Timing fence should be in the center line of the optic housing slot throughout full carriage movement (forward, and back to starting margin). If optic pickup travel is not uniformly parallel and vertical to centered timing fence, recheck para. 5.2.6.3.B. through C.
- D. Maintenance of Flexible Mylar Timing Fence  
Timing fence can be wiped clean using lint free, non-abrasive material.

**CAUTION: DO NOT USE ANY ORGANIC SOLVENTS.**

## FRAME PAPER FEED MECHANISM

### E. Static Adjustment/Limit (Reed) Switch (Figure 5-9)

Proper location of left-hand reed switch is approximately 1.07-inches (27.2 mm) to right from machined surface, where damper frame (HD-37) is mounted on frame (HE-1), to center of right-hand reed switch case itself.

Proper location of right-hand reed switch center of case is 3 to 5mm (0.12 to 0.20-in.) to right from last slit on timing fence assembly (Fig. 8-8/135, View C).

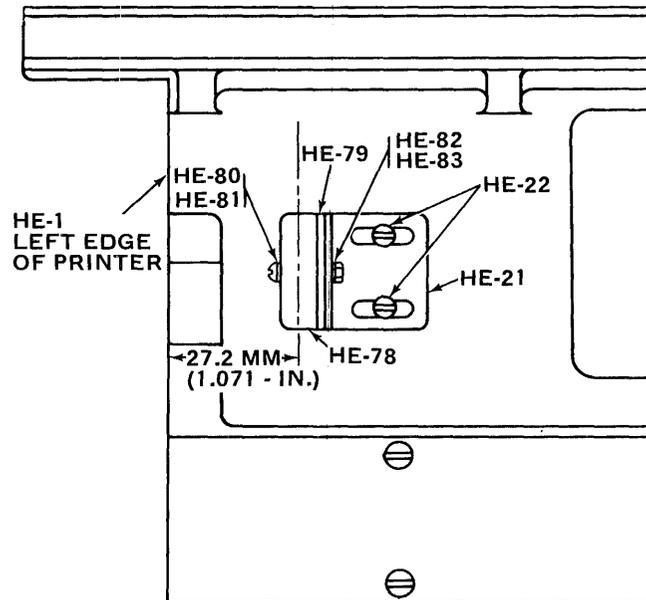


Figure 5-9. LOCATION OF LEFT REED SWITCH (TOP VIEW)

### F. Dynamic Adjustment/Limit (Reed) Switches

This adjustment follows the above static settings. The test for the left-hand limit (reed) switch is single character line check for smooth operation of printer capability.

The test for the right-hand limit (reed) switch is to ensure 132 characters printed. Lines should be transmitted without a carriage return (CR) signal, if possible, to ensure that limit switch (reed) returns print head to start of print position.

## 5.2.7 PAPER FEED MECHANISM (FIGURE HF)

### 5.2.7.1 Operation

Paper is fed manually between the paper pan (upper) (HF-76) and the paper pan (lower) (HF-85). As paper appears at paper pan (front) (HF-89), pull up and place left and right sprocket holes of paper on corresponding left and right pins of pin feed belt units (Fig. 8-10/32) on the same horizontal plane.

When setting printing position of paper, move paper up or down by first pulling paper feed knob (HF-99) outward. To move paper down, pull out knob (HF-99) and rotate knob in a clockwise position. Paper moves up by turning knob in a counterclockwise motion. Direct coupling, non-slip movement of paper is accomplished by serrated portion of knob inserted into opposing serrated coupler (HF-100). Pulling knob outward disconnects the direct coupling of serrated parts on the paper drive shaft (HF-98) and allows upward and downward motion of paper.

## PAPER FEED MECHANISM

### 5.2.7.2 Removal/Replacement Procedures

#### A. Paper Feed Knob (HF-99) (With Side Covers Down)

1. Pry out cap (HF-107) from knob.

#### **CAUTION**

**WHEN PERFORMING NEXT STEP 2, PARTS ARE UNDER SPRING TENSION, AND MAY SCATTER WHEN SNAP RING (HF-106) IS REMOVED.**

2. Remove snap ring (HF-106), collar (HF-103), spring (HF-104), knob (HF-99) and spring (HF-105).

#### B. Pin Feed Pulley (HF-14), FF Reader Gear (HF-16) And Paper Feed Drive Shaft (HE-98).

1. Refer to para. 5.2.7.2.A and remove paper feed knob and parts.
2. Remove snap ring (HF-6).
3. Loosen set-screws (HF-102) on coupler (HF-100).
4. Loosen set-screws (HF-15) on pin feed pulley (HF-14).
5. Remove coupler (HF-100), with sleeve (HF-101) and attached FF reader gear (HF-16).
6. Loosen locking knobs (HG-16) (left and right) at top of pin feed holders (HG-11/38).
7. Slide pin feed units apart and using a small slotted head screwdriver, loosen two small screws, lockwashers (HG-22, 23) located on set-plate (HG-21) of left or right pin feed units.
8. Remove holder, bushing and retainer (HF-2,3,4) supporting shaft (HE-98) on left and right side of printer by removing screws (HF-5).
9. Slide shaft to the right, and when shaft is flush with left chassis support (HE-86), remove pin feed pulley (HF-14) from belt (HH-28).
10. Remove shaft to the right and out from the pin feed units (Fig. 8-10).
11. To install paper feed drive shaft (HF-98), reverse removal/replacement procedure in para. 5.2.7.2A and B. Note, that cap (HF-107) may require an adhesive to retain.

#### C. Guide Bar (HF-7) (For Pin Feed Units, HG)

(With side Covers in Down Position)

1. Remove left and right standoffs (Fig. 8-2/9, 10) (with studs 19).
2. Loosen two locking knobs (Fig. 8-10/16) on left and right pin feed units and slide both units to the right out of the way.
3. Loosen set-screw (HF-9) on collar (HF-8) of guide bar (HF-7) Slide collar to right.
4. Remove outside nut (HF-11) on right end of guide bar.
5. Remove screw (HF-10) supporting left end of guide bar. Slide bar with collar (HF-8) from two pin feed units (HF) to the left and out.

### 5.2.7.3 Adjustments

#### A. Paper Empty Switch (170) (Fig. 8-9)

1. Remove pin feed cover (HF-87).
2. Loosen mounting screws, nut, washers (HF-79, 80,81) holding switch to bracket (part of upper paper pan HF-76, back wall).
3. Pivot switch on lower slot of mounting bracket to meet the following conditions:

- a. Actuator arm (part of switch) extends above on/off button of switch and downward through slot of upper paper pan into path of paper when paper is inserted normally (switch open, button in).
- b. Switch is closed when no paper exists (button out).
- c. Tighten mounting screws when conditions in para. 3.a. and 3.b. are met.
- d. Check wiring diagram 63002333 in Section 7 for detailed wiring of switch.

## 5.2.8 PIN FEED UNIT (FIGURE 8-8) HG

### 5.2.8.1 Operation

Pin feed units, left and right, provide belt units (32) for paper to travel vertically up or down. To move paper down, pull paper feed knob (HF-99) outward and rotate counterclockwise; to move paper upward, rotate clockwise. Pin feed units can be positioned laterally and are locked in position by locking knob (16). When paper is installed on the pin feed belt units, left and right (32), spring activated paper guide plates, left and right (12, 37) when closed, function to hold the paper on the belts. As paper moves over the individual links of the pin feed belts, a pin attachment guide (17) aligns the link pins with respect to paper contact resulting in an even motion of the pin feed belt.

Direct coupling of paper feed knob and paper feed shaft (HF-98) is accomplished by serrated portion of spring activated knob (HG-99) inserting into opposing serrated coupler (HF-100). When this occurs, while printer is operating, paper is moved by logic signals affecting function of the form feed mechanism (Refer to Figure HH).

Finally, a set-plate (21) is used to tighten on the paper feed drive shaft eliminating possible backlash affecting drive pins for print registration.

### 5.2.8.2. Removal/Replacement Procedures

- A. Left and Right Pin Feed Units (HG), (Fig. 8-10)
  1. Perform removal/replacement procedures found in para. 5.2.7.2.A, B, and C to remove left and right pin feed assemblies.

#### NOTE

**The following removal/replacement procedure (Fig. 5-10) applies to either a left or right pin feed unit. But where there is a part difference, key numbers will be indicated in the text so that the operation being applied will cover both units.**

2. Orient unit so that spring (15) is at bottom of unit while being held in hand. Paper holder gate (12, 37) is closed.
3. Rotate belt (32) by hand, and locate two set-screws (27) between pins on drive pulley (26) for drive sleeve (24) at bottom of unit.
  - a. Insert a 1½ mm allen-wrench, and loosen two set-screws (27).

## PIN FEED UNIT

4. Loosen two screws, washers (18, 19, 20) holding the pin attachment guide (17) on the pin feed holder (11, 38).
  - a. Open gate (12, 37) and slide pin attachment guide (17) outward so that when belt is compressed each side, the clearance between belt and guide is approximately ¼-in. (6.3 mm) (not critical).
5. Using a medium sized slotted head screwdriver, remove two screws, lockwashers, (34, 35) and plate nut (36) holding pin feed holder (11, 38) and belt guide (33) together.
6. Separate and remove belt guide (33) from remaining portion of pin feed unit. Keep sleeve (24) in position.
7. Remove two screws, lockwashers (29, 19, 30) and recessed nut (31) holding the idler slide (28) to the pin feed holder unit (11, 38). Keep sleeve (24) in position.
8. Lay unit on bench with gate (12, 37) open. The set plate (21) is facing downward, the sleeve (24) is projecting upward, (See Fig. 5-10). (Set plate is not shown).

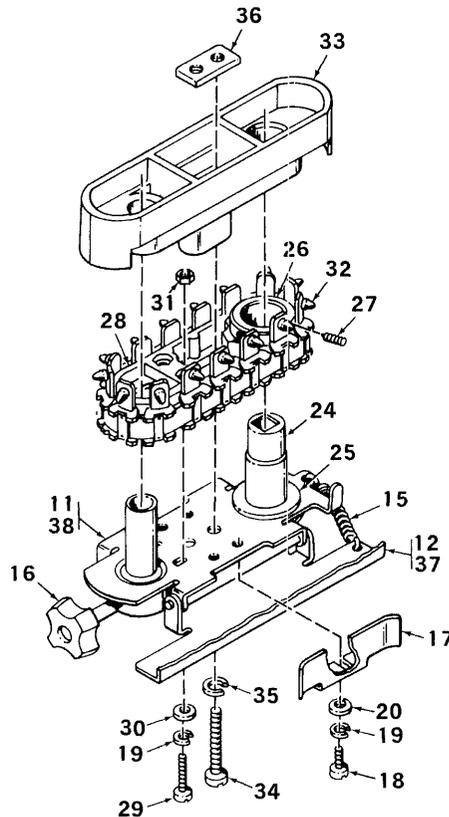


Figure 5-10. REMOVAL OF BELT (32) IDLER SLIDE (28), AND DRIVE PULLEY (26)

9. Remove the following three assembled parts together as one unit from sleeve (24); (1) belt (32), (2) idler slide (28) and (3) drive pulley (26). Note, that the drive pulley slides up over the sleeve (24) with the other two parts.
10. Remove spacer (25) from sleeve (24).
11. Lift up remaining pin feed holder unit (11), (38), from bench and remove sleeve (24) from pin feed holder (11, 38).

12. To re-assemble pin feed unit (left and right), reverse steps indicated at para. 5.2.8.2. A.1. through A.11.

**B. Paper Holder Gate (Left and Right) (12, 37) (Fig. 8-10)**

1. Remove paper holder gate from pin feed units, if required, with pin feed units in position on the printer.
  - a. Using spring removal tool, remove spring (15) located at bottom of paper holder gate when gate is closed.
  - b. Remove snap ring (14) at bottom of pin (13) on gate. Remove pin.
  - c. To replace gate, reverse order of disassembly B.1.a. through B.1.b.

**5.2.8.3 Adjustments**

**A. Paper Holder Gate (Left and Right) (12, 37) (Fig. 8-10)**

(Adjustment can be done with assembly mounted on printer).

1. Clearance between belt guide unit (33) and the paper holder gate, when closed, should be  $0.065 \pm 0.015$ -inch ( $1.65 \pm 0.4$  mm) to hold paper in place when printer is operating.
2. Adjust for clearance by bending right angle metal stopper at bottom of pin feed holder (11,38), (See Fig. 5-11).

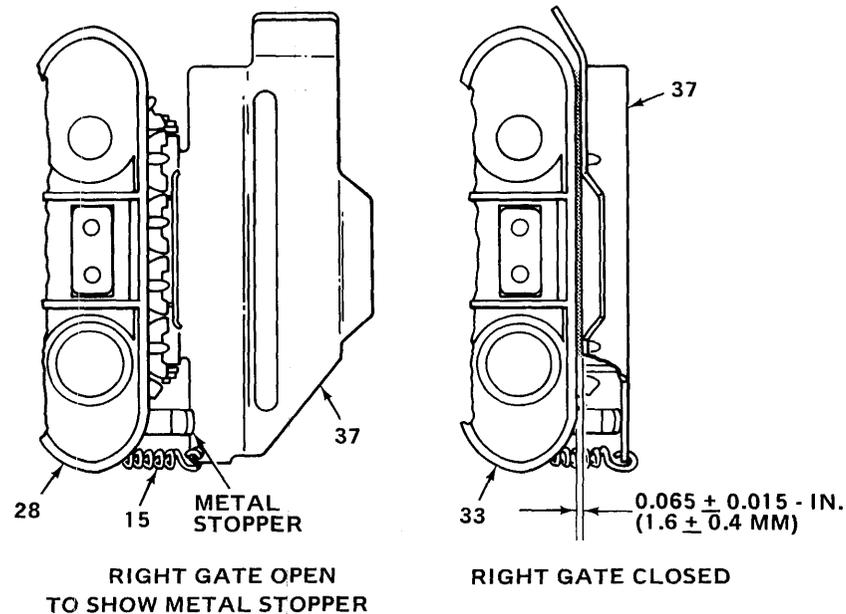


Figure 5-11. ADJUSTMENT FOR PAPER HOLDER GATE

**B. Pin Feed Stopper (5) (Maintaining 5/8-in. (15.9 mm) Nominal Paper Margin (Fig. 8-10)**

1. Loosen lock-knob (16) at top of pin feed holder (11) and slide out of the way on paper feed drive shaft (7).
2. Using a 2 mm allen-wrench, loosen set-screw (6) on stopper (5) located at left end of printer on paper feed drive shaft (7).
3. Maintain 0.2 in. (5 mm) dimension between stopper and left chassis frame (Ref. Fig. 8-10/86). Tighten screw, (See Fig. 5-12).

## PIN FEED UNIT FORM FEED MECHANISM

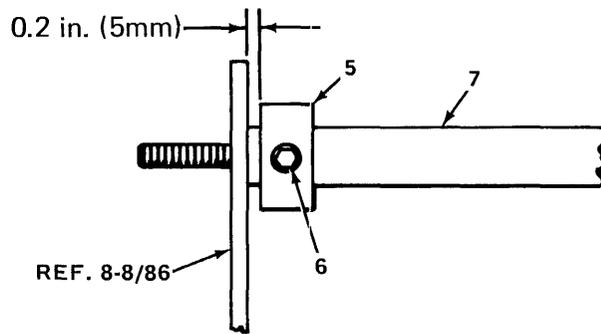


Figure 5-12. MAINTAINING 5/8-IN. (15.9 MM) NOMINAL PRINT MARGIN

4. Set left pin feed holder (11) flush to right side of stopper (5), and tighten lock-knob (16).
  5. Perform para. 5.2.6.3A for locating timing fence for operation, if required.
  6. Run a line of print, or more, and check for nominal 5/8-in. (15.9 mm) beginning print margin.
  7. Recheck fence dimension adjustment (step 5) if margin is not 5/8-in. (15.9 mm) nominal.
- C. Pin Attachment Guide (17) (Lift and Right) (Fig. 8-10), (Fig. 5-10)  
(Adjustment is required only if part becomes misaligned or replaced)
1. With paper gate closed (12, 37), loosen lock knob(16) at top of pin feed holder (11, 38) of left and right pin feed unit.
  2. Slide pin feed units out of the way, as required, and loosen two screws, washers (18, 19, 20) holding the pin attachment guide (17) on the pin feed holder.
  3. Open paper feed gate (12, 37) and move pin attachment guide so that it is completely inserted under mounting screws (18) and parallel with idler slide (28). Tighten screws, lockwashers.
- D. Set-Plate (21) for Paper Drive Slide Shaft (10) (Fig. 8-10)
1. Ensure that both halves of the set plate (21) contact the paper drive slide shaft to avoid backlash with respect to forward paper feed motion.
    - a. Using a small slotted head screwdriver, loosen two screws, lockwashers (22, 23) on one-half of the set plate (21) located on sleeve (24) of the pin feed unit (left).
    - b. Push set-plate against the shaft (10) and tighten screws, lockwashers.
    - c. Repeat steps in para. D.1.a. and D.1.b., and adjust the other half of the set plate in the same manner.
    - d. Repeat steps in para. D.1.a. through D.1.c., and adjust the other set plate (11) for the right-hand pin feed unit.

### 5.2.9 FORM FEED MECHANISM (FIGURE HH)

#### 5.2.9.1 Operation

- A. Form Feed Torque Transmission  
Torque of form feed motor (HH-71) is transmitted via paper drive shaft (HF-98) to pin feed units for upward paper movement in the following manner:
1. Motor (HH-71) - motor gear (HH-12).

## FORM FEED MECHANISM

2. FF Clutch Unit (contained between FF chassis, right) (100) and FF Chassis, left (HH-2) - FF Clutch gear (HH-18) - FF Clutch inside cam (HH-14) - gear with stop cam (HH-23) - FF idle gear (HH-27) with belt drive (HH-28).
  3. Paper Feed Mechanism (Fig. 8-9 (HF) - paper shaft (HF-98) and pin feed pulley (HF-14) - FF reader gear (HF-16).
  4. FF Clutch and Magnet Unit - FF reader idle gear (HH-38) - gear (HH-47) (on shaft HH-46) - sprocket (HH-44) for paper tape rotation.
- B. Form Feed Assembly  
Motor (HH-71) with fan; form feed clutch assembly; gear train; and tape reader (with standard 6 line/inch paper tape 63002292-3001) are included in the form feed (FF) mechanism.
- C. Rotation of Clutch Cam and Pawl  
Upon receiving a signal for electronic logic, the solenoid (HH-84) in the form feed (FF) clutch and magnet unit (See Fig. 8-9) energizes and pulls in the clutch slide pawl (101) releasing the tab (part of FF clutch inside cam, HH-14) and FF clutch releasing pawl (95). The pawl controls the FF clutch releaser (HH-15) containing three roller bearings (HH-19) that allows the constant speed motor (HH-71) and clutch shaft (HH-25) to rotate freely (CLUTCH OFF) prior to incoming logic signals.
- D. Operation of Clutch Inside Cam (HH-14) with Paper Movement Solenoid Signal (PMSOL)  
As the clutch slide pawl (101) pulls away from the inside cam (HH-14) and pawl (HH-95) (towards the solenoid), activated by logic command Paper Movement Solenoid (PMSOL), the roller bearings (HH-19) grip the clutch shaft (HH-25) and a rotation of one-half revolution takes place that is equal to a paper movement of 1/6 - inch or one line feed (LF).
- E. Tape and Paper Movement - VT and FF Signal.  
During a form feed (FF) or Vertical Tab (VT) function, both paper and tape advance continuously until phototransistors (upper tape reader) are energized by light detection through the holes in the tape from the LED's (light emitting diodes) in the lower tape reader. Logic signals immediately deactivate the form feed solenoid controlling VFU tape movement as well as paper movement. The clutch slide pawl (101) returns to home position and holds both the tab on the rotating FF cam (HH-14) and the clutch releasing pawl (HH-95). Paper and tape cannot move until the solenoid is activated again by logic signal.
- F. Prevention of Paper Counter Movement  
The paper movement is always in one direction when the clutch cam (HH-14) is mechanically linked to the form feed shaft and motor. To prevent counter motion of paper feed mechanism, a small spring activated back stopper (HH-74) continually rides the periphery of gear with stop cam (HH-23) and is mechanically adjusted to fall into place against the cam at each half revolution when the FF clutch inside cam (HH-14) and FF clutch releasing pawl (HH-95) return to the underside of the clutch slide pawl (101). At this point additional lines of print are activated by selective logic signals affecting paper movement.

### 5.2.9.2 Removal/Replacement Procedure

- A. Tape Reader Unit (Upper and Lower) 63002671-4001
1. Disconnect two connectors (P119, J119) at left side of printer (Front view). Refer to schematic 63002333-9001 in Section 7.
  2. Cut tie-wraps holding wire of line feed resistor (Fig. 8-8, HJ-62, View D).

## FORM FEED MECHANISM

3. Disconnect two small connectors (J120, P120) at left side of printer (front view). Wires are identified as brown/blue and red/blue. Refer to schematic 63002333-9001, Section 7.
4. Remove clamp, screw and flatwasher (Fig. 8-8/17, 64, 21) holding logic cable of upper tape reader 529419001-5001.
5. Cut nylon tied to threaded cross supports of FF left chassis (Fig. 8-11/2) releasing the tape reader logic harness.
6. Remove snap-ring (Fig. 8-11/68) releasing upper tape reader assembly from shaft (Fig. 8-11/66).
7. To remove tape reader unit, lower 528532001-5001 and upper tape reader together, remove two nuts and screws (Fig. 8-11/56, 55) holding lower tape reader to FF Chassis (Fig. 8-11/2).
8. To separate upper and lower tape readers, cut two wires (orange and black). Splice and insulate wires on new installation of readers.
9. To separate paper tape guide (Fig. 8-11/69) from chassis frame (Fig. 8-11/2), pivot upward and pull outward.
10. To install Tape Reader Unit 63002671-4001 (upper and lower) reverse order of removal, steps A.1. through A.9.

### 5.2.9.3 Adjustments

- A. Gear With Stop Cam (HH-23) and Back Stopper (HH-74) (Refer to Figure 8-11 (HH) and Fig. 5-13).

When FF (form feed) clutch releasing pawl (HH-95) is not held by clutch slide pawl (101), the shaft for FF clutch (HH-25) is being rotated for a line feed (clutch-on condition).

As each line feed rotation terminates, the FF clutch releasing pawl, which is slightly off-set and precedes the tab on the FF clutch inside cam (HH-14), strikes the underside of the clutch slide pawl (101) releasing the FF shaft so that FF motor (HH-71) is disconnected from the form feed mechanism by this clutch-off effect.

It is at this point, when the shaft is released, that adjustment must be made to the gear with stop cam (HH-23) to prevent counter-movement of paper. (Refer to Figure 5-13).

1. Set the back stop cam for correct working adjustment in the following manner:
  - a. Move slide (101) and armature (HH-33) by hand toward armature solenoid (HH-84).
  - b. While holding armature, rotate FF idle gear (HH-27) counterclockwise (clutch-on condition).
  - c. Release slide and armature so that cam (HH-14) and pawl (95) is held against the underside of the clutch slide pawl (101) (clutch off).
  - d. Make sure that when the tab of the cam and the pawl are against the slide pawl (101) (clutch-off condition) that the back stopper (HH-74) drops off the notched end of gear with stop cam (HH-23). Refer to next step for adjustments.
  - e. Maintain a gap of 0.1 to 0.2 mm (0.003 to 0.007-in.) between the notch of cam (HH-23) and back stopper (HH-74) (clutch-off condition) by loosening allen-head screws (HH-24), and adjust cam accordingly.

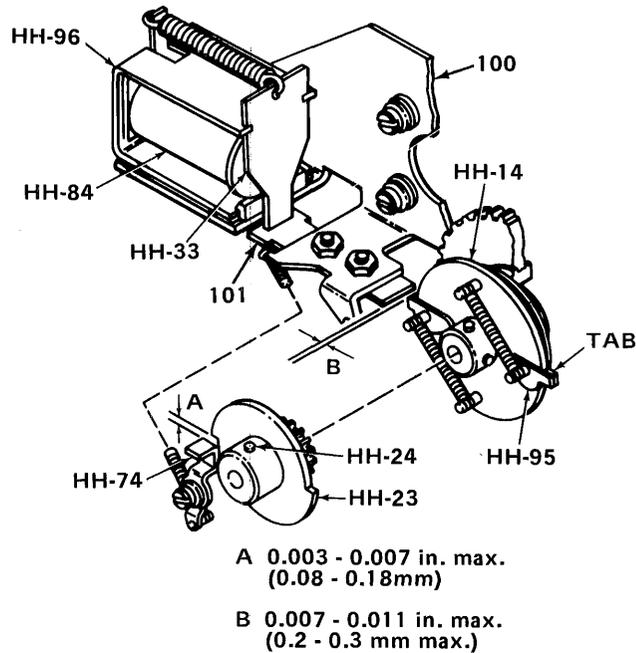


Figure 5-13. TWO ADJUSTMENTS, GEAR WITH STOP CAM (HH-23) AND INSIDE CAM (HH-14)

- B. Clutch, Inner Cam (HH-14) - Clutch Slide Pawl (101) (Refer to Figure 5-13 and 8-11)
1. To adjust proper distance of clutch slide pawl (101) to hold raised tab on paper feed clutch, inner cam (HH-14) prior to line feed release, perform the following steps:
    - a. Loosen screws, washers (Fig. 8-9/86, 82) on clutch magnet frame (HH-96) mounted to paper feed chassis (100).
    - b. Slide magnet frame on paper feed chassis (100) slots so that the distance between clutch slide pawl (101) and tab on inner cam (HH-14) is from 0.2 to 0.3 mm (0.007-0.011-in.). Tighten screws and washers.
- C. Timing Belt (HH-28) (Fig. 8-11)
1. The timing belt (HH-28) located between FF idle gear (HH-27) and pin feed pulley (HF-14) has the following adjustments:
    - a. Loosen three nuts (HH-70) holding right FF chassis (100) to left frame chassis (HE-86). (Rotate left frame to change tension on belt).
    - b. For proper tension of timing belt (HH-28) move belt downward 3-5 millimeters (0.118-0.197-inch) when load of 100 grams (3.5 ounces) is applied on belt at mid-point between both pulleys.
    - c. Tighten three support nuts (HH-70) at right FF chassis (100) when proper tension has been applied.

## RIBBON FEED MECHANISM

### 5.2.10 RIBBON FEED MECHANISM (FIGURE HI)

#### 5.2.10.1 Operation

- A. Ribbon Movement - Forward Clutch Drive  
Torque for feeding ribbon is transmitted while head is moving from left to right as clutch spring (HI-4) engages sleeve (HI-5) mounted on shaft (HB-50). Torque is transmitted to ribbon as follows:
- B. Ribbon Feed Mechanism (From Front of Printer)
1. Drive, Right Side  
Shaft (HB-50) - clutch gear (HI-1) - driving gear (HI-75), bevel gear (HI-81) - driving belt gear (HI-18) - sleeve (HI-20) - driving slide shaft A, (HI-103) - bevel gear (right-hand) (HI-27) - bevel gear (right) (HI-43) ribbon spool shaft (right) (HI-38) - ribbon.
  2. Drive, Left Side  
Bevel gear (HI-27) - bevel gear (HI-59) - ribbon spool shaft (HI-57) - ribbon.
- C. Driving Slide Shaft  
Torque transmission route for left and right ribbon feed mechanism is determined by position of driving slide shaft A (HI-103) (Fig. 5-16) controlled with control spring (HI-39) (Fig. 5-18) and left and right reverse control lever (Fig. 5-18/90, 88).

Tension of ribbon is applied by ribbon holding plate (HI-137) and guide rollers (HI-19). When one of ribbon spools becomes empty, eyelet (or stop plate) on ribbon pulls guide pins on either reverse control lever (HI-90, 88) (right) or (left) to change ribbon feeding direction by setting washer (HI-104) against reverse control lever (right) or (left) on sliding drive shaft A (HI-103). When ribbon does not feed, or ribbon feed mechanism binds for some reason, a safety feature releases ball (HI-76) from hole in driving shaft (HI-79), and torque of driving gear (HI-75) no longer transmits drive to driving shaft HI-79).

#### 5.2.10.2 Removal/Replacement Procedure

Note that all removal/replacement procedures will be done from the back of the printer . (Fig. 1-9)

- A. Preliminary Disassembly  
Perform the following steps prior to removing ribbon reversing rod (HI-92), sliding drive shaft A (HI-103) or ribbon spool holders (HI-35, 55).
1. Place left and right side covers in down position.
  2. Remove the rear cover.
  3. Loosen screw (A-25 of Section 8, Fig. 8-1) on strain relief bracket (A-13) and set aside cable.
  4. Remove screws from cavity (Fig. 1-8) at back of printer.
  5. Unplug cable harness from cavity to molex connector (P-13) (Refer to Fig. 1-9/3).
  6. Remove interface connector (J12) (See Fig. 7-13) from connector (P8) (part of electronic logic, connector board 63015104 (Section 7)).
- B. Ribbon Reversing Rod (Fig. HI)
1. On the right-hand side of printer, unscrew threaded coupler (HI-94) from connector (HI-91).
  2. Loosen allen-head screw (HI-96) on stopper (HI-95) on left side of ribbon reversing rod (HI-92) using a 1.5 millimeter (0.06-in) allen wrench.

## RIBBON FEED MECHANISM

3. Loosen locking nut (HI-98) with a 7 millimeter (0.28-inch) open-end wrench on left side of ribbon reversing rod.
  4. Unscrew ribbon reversing rod from left coupler and remove.
- C. Driving Slide Shaft - A
1. On the right side of the printer, remove two screws (HI-131) from holder (HI-133) supporting driving slide shaft A (HI-103) and drop the shaft slightly.
  2. Using a 1½ millimeter (0.06-in.) allen-wrench, remove two allen-head screws (HI-29) on bevel gear (HI-27) on right side of printer.
  3. Remove bevel gear and bushing.
  4. Remove snap ring (HI-105) and washer (HI-140) from drive shaft A on right side of printer.
  5. Repeat step C.1. through C.4. on left side of printer, but remove left holder (HI-130) in step C.1.
  6. Remove driving slide shaft A to the right of the printer.
  7. To reassemble, reverse order of disassembly.
- D. Ribbon Spool Holder (Left and Right)
1. Remove both ribbon spools (left and right).
  2. Remove left and right spool holders (HI-35, 55) by removing bolts (HI-54) from left and right chassis (HE-86, 85).
- E. Ribbon Spool Shaft (Left and Right)
1. To remove left and right ribbon spool shaft (HI-38, 57), first loosen allen-head screws (HI-42) on bevel gears (HI-43, 59) and remove gear.
  2. Loosen allen-head screws (HI-42) using 1½ millimeter (0.06-in.) allen wrench, on left and right collars (HI-41) located on ribbon spool shafts (HI-57, 38).
  3. Remove left and right spool shaft (HI-38, 57).
  4. Remove left and right nut (HI-37).
  5. Remove left and right sleeve bearing (HI-36, 56).
  6. To reassemble, reverse steps 1 through 4.
- F. Ribbon Holding Plate (Left and Right)
1. To remove left and right ribbon holding plate (HI-137) from left and right ribbon spool holders (HI-55, 35), remove left and right snap rings (HI-45).
- G. Reverse Control Lever (Left and Right)
1. To remove left and right ribbon reverse control levers (HI-90, 88) from left and right ribbon spool holders (HI-55, 35), remove left and right snap rings (HI-48) and remove levers.
- H. Reversing Rod Connectors (Left and Right)
1. To remove left and right reversing rod connectors (HI-90,88) from left and rings (HI-51) from pins (HI-50) and remove pins.
- I. Reassembly of Ribbon Spool Holders
1. To reassemble ribbon spool holders (HI-35, 55) reverse order of disassembly para. D. through H.

## RIBBON FEED MECHANISM

- J. Ribbon Driving Shaft Assembly
1. To disassemble and remove ribbon driving shaft assembly (HI-79), perform the following steps:
    - a. Remove screws (HI-17) from left side of printer and remove bushing holder (HI-84).
    - b. Remove screws (HI-86) holding cover (HI-85) and holder (HI-84) together, releasing entire driving shaft (HI-79). Note, that clutch spring (HH-80) must be unhooked from cover (HI-85).
    - c. Remove snap ring (HI-87) on left end of driving shaft.
    - d. Release and remove driving gear (HI-75) by unscrewing allen-head set-screw (HI-78) and releasing spring (HI-77) and ball HI-76). (Note, that caution must be taken to avoid losing spring and ball).
    - e. Remove bushing (HI-83) and clutch spring (HI-80) from shaft (HI-79).
    - f. Remove bevel gear (HI-81) from shaft by releasing allen-head screw (HI-82) at right end of shaft.
  2. To reassemble ribbon driving shaft assembly (HI-79), reverse order of disassembly.
- K. Clutch Gear (HI-1) (Direct Drive Transmitted from Forward and Reverse Clutch Shaft (Ref: Fig. 8-5, HB-50) , and on the same Drawing, (Ref.: HI-1)
1. Prior to removing clutch gear (HI-1), the bushing holder (HI-84) must be removed (Refer to para. J.1.a. and J.1.b.).
  2. To remove clutch gear (HI-1), loosen two allen-head screws (HI-6) from sleeve (HI-6) from sleeve (HI-5) and slide off sleeve, clutch spring (HI-4) and gear.
  3. To reassemble, reverse order of disassembly, steps K.1. through K.3.

### 5.2.10.3 Adjustments

All adjustments, unless otherwise specified, will be called out from a rear view (left and right) at the back of the printer.

- A. Bevel Gears (Left and Right) (HI-27, 43) and (HI-27, 59) (Refer to Figure 5-14)
1. Slide ribbon reversing rod (HI-92) to left. Arm (part of reverse control lever) (HI-88) contacts washer (HI-104) on driving slide shaft A (HI-103) and moves bevel gear (HI-27) into mesh with bevel gear (HI-43).
  2. Adjust bevel gear (HI-27) (left side) with respect to bevel gear (HI-43) by loosening and tightening allen-head screws (HI-29) to obtain engagement A of approximately one millimeter (0.039-in.) . See Fig. 5-14, and View A.

## RIBBON FEED MECHANISM

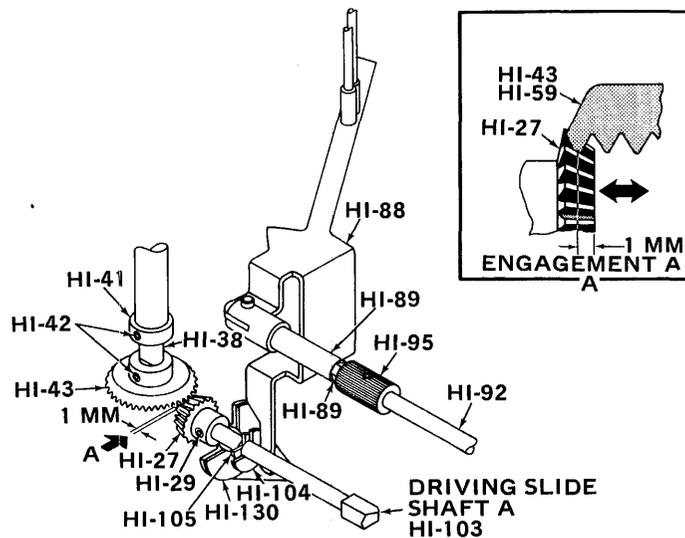


Figure 5-14. RIBBON FEED MECHANISM (REAR OF PRINTER, LEFT SIDE)

**B. Backlash Adjustment for Gears (HI-27, 43) and (HI-27, 59)**

When engagement A (Figure 5-14) has been properly adjusted between gears (HI-27) with respect to bevel gears (HI-43, 59), adjust bevel gears (HI-43, 59) alternately to obtain correct backlash operation of gears in the following manner:

**NOTE**

When performing the next two steps, adjust one set of gears for proper backlash, then move ribbon reversing rod (HI-92) in opposite direction (to engage gears) and adjust the other set of gears (HI-27, 43) or (HI-27, 59), repeating steps B1 through B2. (See Figure 5-15).

1. Loosen allen-head screws (HI-42) on the bevel gears (HI-43, 59).
2. Adjust bevel gear up or down on ribbon spool shaft (HI-38, 57) to obtain a vertical adjustment (engagement B) of 0.05 to 0.2 millimeters (0.002-0.008-in.) between the teeth of the opposing gears (HI-27) as they mesh (See Figure 5-15). Tighten allen-head screws on bevel gear (HI-43, 59).

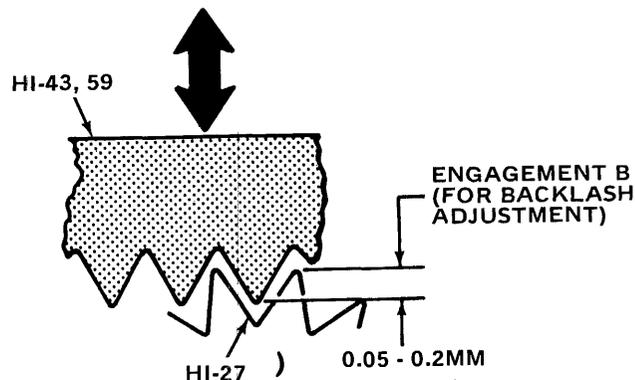


Figure 5-15. BACKLASH ADJUSTMENT, BEVEL GEAR (HI-43, 59)

## RIBBON FEED MECHANISM

### C. Driving Slide Shaft A (HI-103)

If driving slide shaft A (HI-103) is removed to replaced, adjust ribbon mechanism parts in the following manner:

1. When engagement A and B of bevel gears has been made (Figure 5-14, 5-15), one snap ring (HI-105) always contacts support bushing (HI-130); the distance between other snap ring (HI-105) and the support bushing (HI-130) on shaft (HI-103) is 3 to 4 millimeters (0.12-0.16-in.). (See Figure 5-16). Note that distance between bevel gear (HI-59) and bevel gear (HI-27) is also 3-4 mm.
2. When bushings and holders (HI-133, 130) on left and right side of printer are installed, the driving slide shaft A (HI-103) should move freely and travel an overall distance to 3.0 to 4.0 millimeters (0.12-0.16-in.) when engaged alternately in either direction with bevel gears (HI-27, 43) or (HI-27, 59). (See Fig. 5-16).

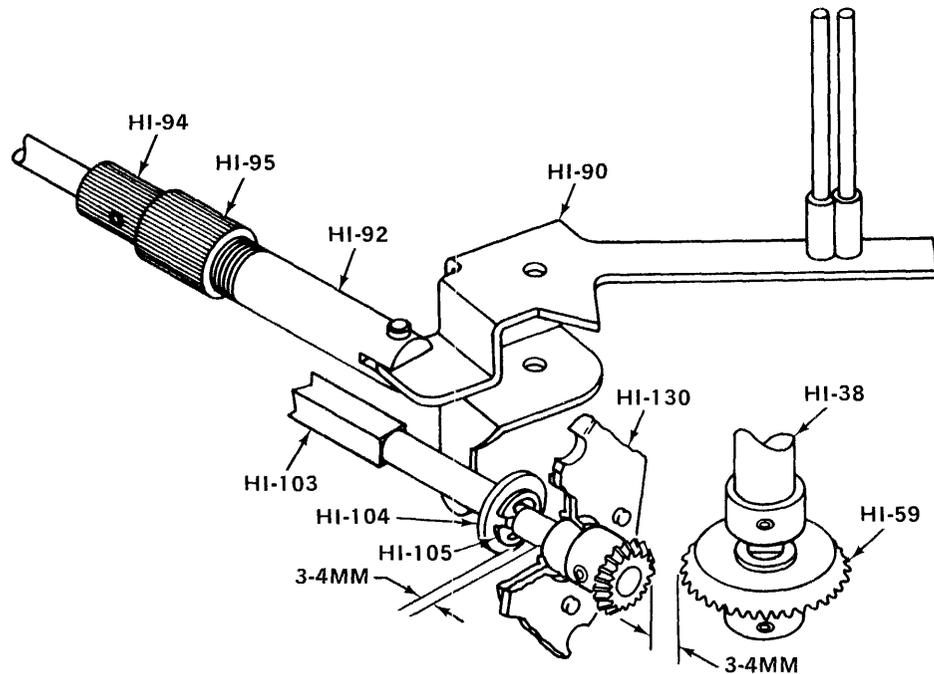


Figure 5-16. DRIVING SLIDE SHAFT A - ADJUSTMENT

### D. Ribbon Reversing Rod (HI-92)

If ribbon reversing rod (HI-92) is removed, adjust ribbon mechanism in the following manner:

1. Thread right-hand coupler (HI-94) clockwise all the way (Refer to Figure 8-12).
2. With right bevel gears engaged (HI-27, 59), (right side, rear view) adjust gap between washer (HI-104) and ribbon reverse control arm (HI-88) between 3 and 4 millimeters (0.12-0.16-in.) by rotating ribbon reversing rod (HI-92) to control the distance. (Refer to Figure 5-17).
3. Tighten locking nut (HI-98) to prevent further rotation of ribbon reversing rod.
4. Slide both stoppers (HI-95) into place (left and right) and lock by tightening allen-screws (HI-96).

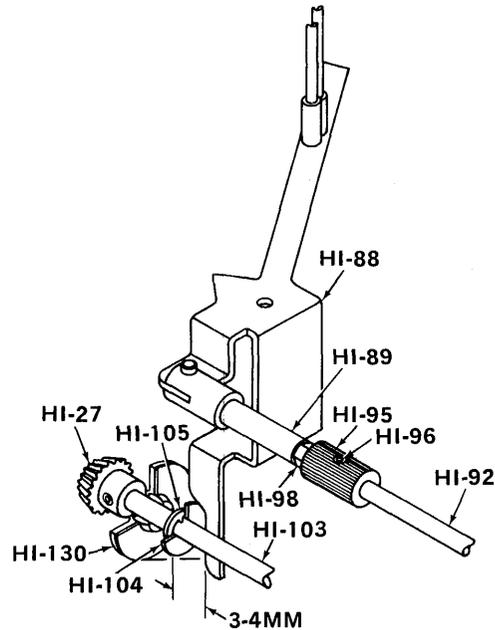


Figure 5-17. RIBBON REVERSING ROD ADJUSTMENT

E. Control Spring (HI-39) - Ribbon Reverse Timing (Fig. 5-18)

1. When reverse control lever (HI-88) turns left by moving ribbon reversing shaft (HI-92) to left, and if Engagement A (Fig. 5-14) between bevel gear (HI-27) and bevel gear left (HI-43) is decreased to approximately 1.0 mm (0.039-in.), adjust position of control spring (HI-39) by loosening screws (HI-40) and flatwashers (HI-123) to just pass roller mounted on control spring (HI-39), (located underneath left ribbon spool shaft HI-38) over top of ramp of reverse control lever (left) (HI-88). Note, that both ribbon spools will rotate freely when driving slide shaft A (HI-103) is in neutral position (top of ramp).

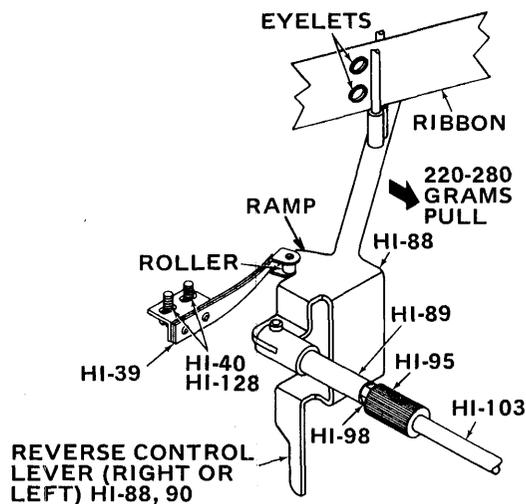


Figure 5-18. RIBBON REVERSE TIMING

**RIBBON FEED MECHANISM  
ELECTRICAL HARDWARE  
PAPER STACKER AND GUIDE**

2. When ribbon of spool (empty condition) containing eyelets (or small plate) is blocked by ribbon guides (part of HI-88, 90), a pull of 220-280 grams (7.7 oz-9.8 oz) is exerted on the reverse control levers (either left or right), which reverses the ribbon movement (See Figure 5-18).
3. Re-check bevel gear (HI-27) (right) and bevel gear (HI-59) (right) to the same gap as indicated in para. 5.2.10.3. A.2 and B. to ensure proper ribbon reverse timing.

**NOTE**

**Both bevel gear (HI-27) and bevel gear (right and left) (HI-42, 59) should be timed so that they engage together after roller, mounted on control spring, passes over top of ramp of reverse control lever (HI-88). (Fig. 5-18).**

- F. Clutch Gear and Driving Gear Engagement (Fig. 8-12, HI-1, 75)
1. To ensure clutch gear (HI-1) and driving gear (HI-75) are meshed properly, adjust by loosening screws (HI-17). Also ensure both bevel gears (HI-18, 81) are meshed properly and positioned on driving shaft unit. Proper backlash between clutch gear (HI-75) is 0.05 to 0.2 mm (0.002-0.008-in.).
  2. Ensure that torque of driving gear (HI-75) does not transmit to driving shaft (HI-79) when spool holder is held by hand. Adjust pressure on ball (HI-76) by turning set-screw (HI-78). After making above adjustment, check the following points:
    - a. When carriage is moved by hand and ribbon feed direction is changed, see that there is no slippage between driving gear (HI-75) and driving shaft (HI-79).
    - b. When carriage is moved by hand, and spool is held by hand, ensure that torque of driving gear (HI-75) does not transmit to driving shaft (HI-79).
- G. Ribbon Winding
1. Top Edge Curling  
When the ribbon winds normally into ribbon spool, the edge of the ribbon should not be curled. If the top edge of the ribbon is curled, adjust position of ribbon spool holder (right or left) (HI-35, 55) by loosening bolts (HI-54) to incline ribbon spoolshaft (right or left) (HI-38, 57) slightly backward.
  2. Bottom Edge Curling  
If the lower edge of the ribbon becomes curled, adjust position of ribbon spool holder (HI-35, 55) by loosening bolts (HI-54) to incline spool holder shaft (HI-57, 58) slightly forward.
- H. Guide Roller Adjustment (HI-106, 114)
1. Adjust level of guide roller (right or left) (HI-106, 114) by loosening screws (HI-117) to position guide rollers (HI-119) perpendicular and parallel to side of machine.

## 5.2.11 ELECTRICAL HARDWARE (HJ)

In general, the parts list for this section reflects electrical and mechanical items required for the operator panel and cabling found on the main frame of the printer. There is no illustrative drawing for the accessories parts list.

## 5.2.12 PAPER STACKER AND GUIDE

Refer to Section 2.3

## 5.2.13 PRINT HEAD AND ASSOCIATED ASSEMBLIES (FIGURE 8-14)

### 5.2.13.1 Operation

- A. Print Head (4) and Solenoids (2)  
Acts as a guide to keep seven print wires in line as each one drives against the ribbon (solenoid fired) to form characters from dots.
- B. Carriage (10)  
Supports print head for full line of characters and returns to "home" position.
- C. Power Driver Board Ass'y (33)  
Supplies control signals to printer solenoids and forward and rear clutches for head movement from logic boards.
- D. Video Amplifier, PC Board Ass'y (101 Series)  
Amplifier and shapes video pulse with cables (29) carrying power driver outputs to the solenoids of head. Mounts to the carriage ass'y (10) via attached video amp. bracket (20).

### 5.2.13.2 Removal/Replacement Procedure

- A. Print Head (4)
  1. Refer to Section 5.2.1.2, steps 1 and 3, and remove covers.
  2. Release lock-knob (33) (Fig. 8-3) , and then rotate penetration knob (32) so that head moves to maximum travel away from platen (HE-4) (Fig. 8-8) allowing sufficient gap between print head and print ribbon.
  3. Unplug print head fingerboard connector (1) from video amplifier connector (16).
  4. Remove upper screws, washers (5,6,7) and lower screws, washers (8,6,7) holding the print head to print head support bracket (9). Use diagonal method of screw removal, e.g., upper left, lower right, upper right, lower left and remove head.
  5. To install print head, reverse removal/replacement procedure, and refer to Operator Manual, Series 100 for Forms Thickness Control prior to printing.
- B. Solenoid/s (2)
  1. Turn power off.
  2. Perform operation found in para. 5.2.13.2.A.1. through A.4 to remove print head.
  3. Cut tie-wraps of solenoid wires attached to print head fingerboard 63001039-4001.
  4. Unsolder two wires from the fingerboard (1) going to the solenoid/s (2) being replaced.
  5. Using a small, phillips-head screwdriver, remove the cover from the print head.
  6. Using a Centronics' spanner wrench, loosen the solenoid lock-nut (3) and remove solenoid and print wire together from print head.
  7. To replace solenoid/s reverse procedure para. B., steps 1. through 6.
- C. Carriage (10)
  1. Refer to removal/replacement procedure of para. B., 5.2.2.2.B to remove carriage.
- D. Power Driver Board Ass'y (33)  
(With front cover (Fig. 8-1/5 removed).)
  1. Unplug ribbon cable fingerboard (34) from power driver board connector (16).

## POWER DRIVER BOARD VIDEO AMPLIFIER

2. Remove ribbon cables (29) and attached fingerboard (34) from cable clamp (38) by removing screw, washer nut (37, 6, 18) and removing clamp from cable tray (40) of power driver board.
  3. To remove heatsink bracket and power driver board together, remove four metric screws (37) attached to front printer base frame (Ref. HE-1).
- E. Video Amplifier, PC Board Ass'y (101 Series)
1. For removal of video amplifier board (15), attached cables (29), and attached bracket (20), first perform operation found at para. 5.2.13.2.D., steps 1 and 2 of this section to remove ribbon cables from power driver board (33).
  2. Unplug print head fingerboard (1) from video amplifier connector (16).

**CAUTION**  
**WHEN REMOVING THE VIDEO AMPLIFIER  
ASS'Y IN NEXT STEP (3), AVOID SURFACE  
CONTACT WITH TIMING FENCE (14).**

3. Remove video amplifier ass'y and cables by removing screws, washers (11,12,13) holding video amplifier bracket (20) to carriage mechanism (10).

### 5.2.13.3 Adjustments (Fig. 8-14)

- A. Print Head (4)  
Reverse steps found in para. 5.2.13.2. A.1. through A.5. to replace head.
- B. Solenoid/s (2)
1. Perform removal/replacement procedures found in para. 5.2.13.2 B.1. through B.6.
  2. Install new solenoid/s. Using flat object (feeler gauge, flat screwdriver, etc.) guide print wire into correct hole on the print head jewel. (Refer to Section 1, para. 1.3.1 for print wire configuration.
  3. Using an eye loupe, verify that all print wires align flush with the front face of print head jewel (rotate solenoid in or out).
  4. Tighten solenoid lock nut/s (3).
  5. Re-solder new solenoid wires to fingerboard of print head.
  6. Replace cover, and remount print head to carriage ass'y (Reverse steps of para. 5.2.13.2.A.1. through A.5. to replace print head).
- C. Ribbon Cables (29)
1. To position ribbon cables for operating condition, loosen screws (37) on clamp (38) of power driver tray (40) at front of printer.
    - a. Move cables left or right so that when print head is operating normally the cables do not strike damper (Fig. HD), or that cables are not too tight between print head and tray clamp at starting position of head.
  2. Secure cables, when adjusted properly, by tightening screws, washer and nuts (37, 6, 18) on clamp (38).

## HANDLING LSI CHIPS

1. **REMOVING A CHIP FROM THE SHIPPING CONTAINER**
  - a. Before touching the chip, reference yourself to the container by touching and holding the metalized rubber containing the chip pins.
  - b. While holding the rubber, lift out chip and hold lightly by the pins.
  - c. You can now safely carry the chip, by holding the pins.
2. **REPLACING THE CHIP IN ITS CONTAINER**
  - a. While holding pins touch and hold rubber and replace.
3. **GIVING CHIP TO ANOTHER PERSON**
  - a. While holding pins of chip in one hand, make contact with the other person until he is holding the chip by its pins.
4. **REMOVE AND REPLACE CHIP IN PRINTER**
  - a. Before removing or replacing chip, touch signal ground (large ground plane on LSI Component Board) and hold.
  - b. While holding signal ground, remove or replace chip.
  - c. In general, something other than the chip (e.g., your hand) should make the first contact with the circuit.

<b>CAUTION</b>
<b>WHEN OPERATING PRINTER WITH COVERS OFF, KEEP PAPER AWAY FROM LOGIC TO PREVENT PAPER STATIC DISCHARGE FROM DAMAGING LSI CHIPS.</b>



## SECTION 6

### MAINTENANCE

This section contains the following maintenance information:

Paragraph	Description
6.1	Electrical Adjustments
6.2	Mechanical Adjustments
6.3	Preventive Maintenance
6.4	Recommended Tools
6.5	Troubleshooting Guide

#### 6.1 ELECTRICAL ADJUSTMENTS

All electrical adjustments are performed on the Logic/Power Supply Board (Assembly No. 63015102) and are summarized in the following table.

ITEM NO.	FUNCTION	SIGNAL NAME	ELEMENT-PIN	CARD*	ADJ RESISTOR	PULSE WIDTH
1	Single Line Feed (STD)	LF	ME3-13	Logic/P.S.	R19	15 msec
2	Single/Double Line Feed (OPT)	LF	ME3-13	Logic/P.S.	R22	50 msec
3	} Strobe Pulse Strobe Delay Pulse Delayed Strobe	STROBE	ME11-6	Logic/P.S.	R25	500 ± 25 usec
4		—	ME7-12	Logic/P.S.	R27	600 usec
5		DLYSTB	ME13-6	Logic/P.S.	R29	500 ± 25 usec

*TIMING FENCE STROBE*

\*Reference Schematic Diagram - 63015124.

To adjust the video amplifier in the Model 101AL perform the following:

1. Monitor voltage level at ME1 pin 2 with oscilloscope while moving carriage slowly to the right.
2. Voltage varies as optic blocks passes over light and opaque sections of timing fence. Record highest voltage level observed.
3. Monitor level at ME1 pin 3 and adjust R4 to set voltage at one-half level recorded at ME1 pin 2. This sets up reference level for proper output duty cycle.

#### 6.2 MECHANICAL ADJUSTMENTS

All mechanical adjustments are summarized in Section 5. Listed below are the mechanical assemblies where adjustments are required and the reference paragraph in Section 5 where the adjustment is described.

ITEM NO.	MECHANICAL ASSEMBLY	REFERENCE PARAGRAPH	REFERENCE FIGURE
		SECTION 5	SECTION 8
1	Cover	5.2.1.3	8-2
2	Carriage Mechanism	5.2.2.3	8-3
3	Driving Mechanism	5.2.3.3	8-4, 8-5
4	Spring Drum	5.2.4.3	8-6
5	Damper	5.2.5.3	8-7
6	Frame	5.2.6.3	8-8
7	Paper Feed Mechanism	5.2.7.3	8-9
8	Pin Feed Unit	5.2.8.3	8-10
9	Form Feed Mechanism	5.2.9.3	8-11
10	Ribbon Feed Mechanism	5.2.10.3	8-12
11	Print Head and Associated Assemblies (Video Amplifier Bd., Power Driver Bd.)	5.2.13.3	8-14

### 6.3 PREVENTIVE MAINTENANCE (P.M.)

#### A. Preventive Maintenance Procedures

The following P.M. procedures apply to the Series 101 printers.

1. Frequency of P.M. - 6 months
2. Time Required - ½ Hr. Approximately
3. Cleaning Material - Two Soft Clean Cloths  
Medium Bristle Cleaning Brush

#### B. Recommended Tools

1. Refer to Section 6.5 of the Maintenance Section.

#### C. Lubricants Recommended:

Kit, Lube 62000187-6001

Note: This kit contains  
item 1 through 4

- |    |   |               |                      |
|----|---|---------------|----------------------|
| 1. | Lubricant, DTE OIL, Light                       | 30050005-0001 | 2 oz. plastic bottle |
| 2. | Lubricant, SAE 10-30W                           | 30050002-0001 | 2 oz. plastic bottle |
| 3. | Lubricant, RPVNTV WPG,<br>(Degreaser/Lubricant) | 20050009-0001 | 2 oz. can            |
| 4. | Lubricant, grease<br>(Rheolube 723)             | 30050004-0001 | 11 oz. tube          |

#### D. Preparation

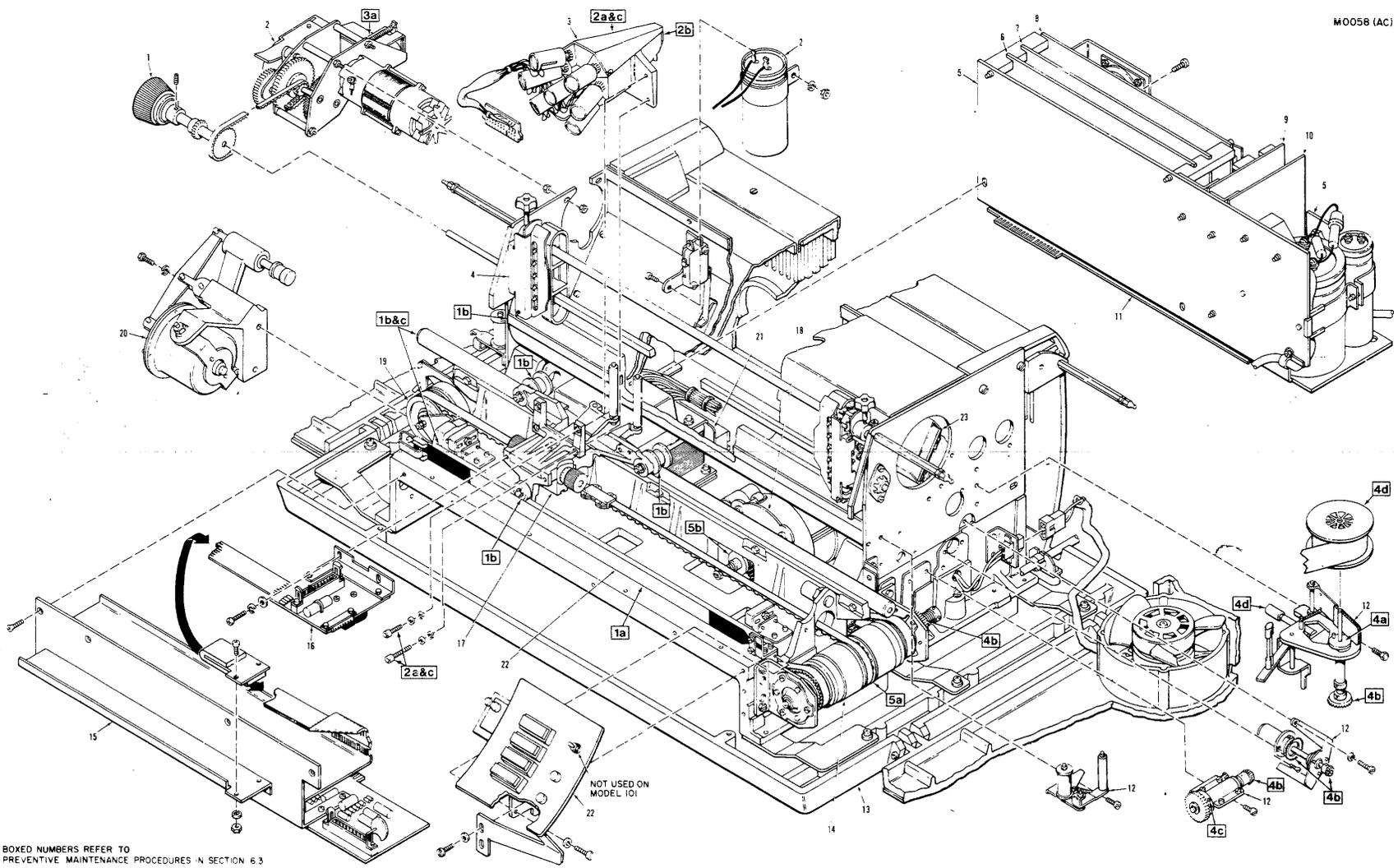
1. Obtain print sample prior to beginning P.M.
2. Clean printer with vacuum cleaner, if available.

#### NOTE

The following P.M. procedures are keyed to the  
printer assembly drawing shown in figure 6-1  
Refer to that drawing for the location of  
assemblies specified within each procedure.

1. Carriage Assembly and Timing Fence
  - a. Using a soft, clean cloth, wipe both sides of timing fence.
  - b. Wipe the carriage guide bars, all rollers and guide plate.
  - c. Lightly lubricate guide bars using lightweight oil.
2. Print Head Assembly
  - a. Remove print head from carriage
  - b. Using an eye loupe, verify that print wires align flush with the face of the print head jewel. (Make sure that print wires are not recessed in the jewel.)
  - c. Re-mount print head on carriage assembly.
3. Paper Feed Assembly
  - a. Apply a drop of lightweight oil on the paper feed clutch gear and clutch slide pawl connected to the solenoid armature.
4. Ribbon Feed Assembly
  - a. Inspect ratchets, pawls, and springs for wear and mesh (left and right).
  - b. Clean and lubricate all gears and springs with grease as indicated.
  - c. Clean and lubricate all gears and springs with oil as indicated.
  - d. Verify that both ribbon spools rotate freely when ribbon releasers are in neutral position (neither spool engaged).
5. Drive Assembly
  - a. Inspect gears for proper mesh and wear.
  - b. Oil intermediate shaft and felt washer at forward and reverse bushings.  
(Use Anderol 465 Only).

**NOTE: Avoid use of any lubricant on the forward and reverse clutch surfaces.**



BOXED NUMBERS REFER TO PREVENTIVE MAINTENANCE PROCEDURES IN SECTION 6.3

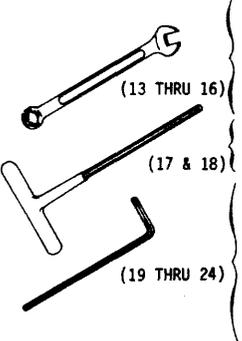
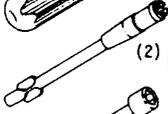
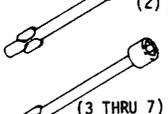
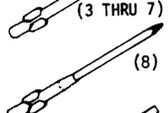
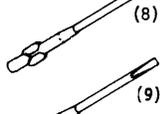
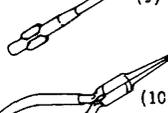
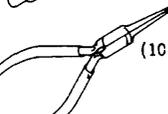
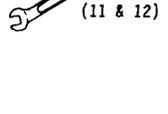
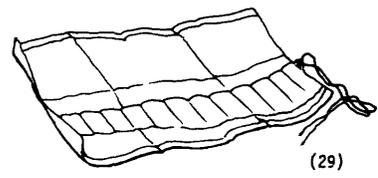
NOT USED ON MODEL 101

Figure 6-1. MODEL 101 MECHANICAL ASSEMBLER (PREVENTIVE MAINTENANCE REFERENCE DRAWING)

6.4 Recommended Tools

Rev. F

6-4

CENTRONICS data computer corp. HUDSON, NEW HAMPSHIRE U.S.A.		CENTRONICS TOOL KIT (63002399-6001)				
ITEM	DESCRIPTION	PART NUMBER		ITEM	DESCRIPTION	PART NUMBER
	1. Universal Handle	30600002-3001		13.	8 mm Combination Open End, Box Wrench	30600002-3012
	2. Extension 4-Inch	30600002-3002		14.	10 mm Combination Open End, Box Wrench	30600002-3013
	3. 4 mm Nut Driver	30600002-3003		15.	17 mm Combination Open End, Box Wrench	30600002-3014
	4. 5.5 mm Nut Driver	30600002-3004		16.	19 mm Combination Open End, Box Wrench	30600002-3015
	5. 7 mm Nut Driver	30600002-3005		17.	3/32-Inch "T" Handle Hex Key	30600002-3016
	6. 8 mm Nut Driver	30600002-3006		18.	5/32-Inch "T" Handle Hex Key	30600002-3017
	7. 10 mm Nut Driver	30600002-3007		19.	1/16-Inch Hex Key	30600002-3025
	8. Phillips Head Screwdriver	30600002-3009		20.	.050-Inch Hex Key	30600002-3024
	9. Slotted Head Screwdriver	30600002-3008		21.	1.5 mm Hex Key	30600002-3020
	10. Needle Nose Plier	30600002-3010		22.	2.0 mm Hex Key	30600002-3019
	11. 5 x 5.5 mm Open End Wrench	30600002-3023	23.	2.5 mm Hex Key	30600002-3021	
	12. 6 x 7 mm Open End Wrench	30600002-3011	24.	3.0 mm Hex Key	30600002-3022	
				25.	Spanner Wrench	63003105-3001
				26.	4 mm Snap Ringer Holder	63002399-3018
				27.	5 mm Snap Ring Holder	63002399-3019
				28.	Spring Hook	63002399-3020
				29.	Tool Pouch	30600002-3018
						

# Troubleshooting Guide

CENTRONICS  
SERIES 101 PRINTERS  
SERVICE GUIDE

The following information is intended to aid service personnel in developing good service procedures and troubleshooting techniques of any of Centronics' Series 100 printers.

When servicing the printer for any reason, a brief inspection and verification of the printer areas described below, may well prevent potential failures in the future.

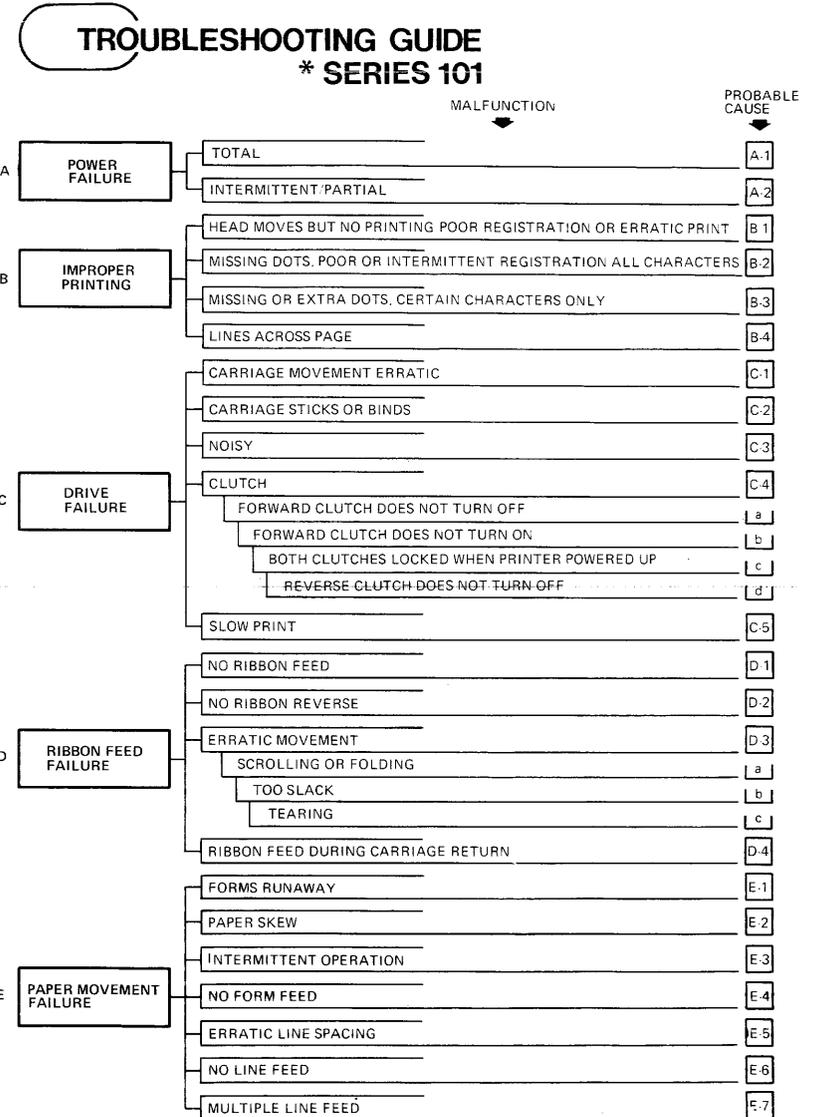
To perform this inspection, it is only necessary to open, not remove, the printer covers.

With printer power off:

1. Verify that the timing fence is clean and that timing fence is centered properly in optic block.
2. Verify that the carriage guide bar is clean and free of caked-on dirt.
3. Verify proper tension on the main drive belt.
4. Verify smooth, free carriage motion.
5. Verify that the RTP and EOP switches are not loose.
6. Verify that the rubber bumper on the damper is not loose.
7. Verify that the backstop pawl spring is in place and not loose.
8. Check the pin alignment on the pin-feed tractor units.

With printer power on:

9. Check position of VFU paper tape over the LED holes to insure proper detection of vertical tab and form feed signals.
10. Check damper operation and verify that there is no binding of the carriage stopper lever.
11. Check for smooth operation of the line feed clutch.



\*TTL: MODELS 101, 101A, 101S ONLY  
LSI: MODEL 101AL ONLY

**A. POWER FAILURE****A-1 TOTAL**

1. Damaged power cord.
2. Open AC line fuse.
3. Open 5V supply fuse (F1).

**A-2 INTERMITTENT/PARTIAL**

1. Defective +5V Regulator.
2. Defective ±12V Regulator.
3. Defective 30V unregulated supply.
4. Improper AC line voltage.

**B. IMPROPER PRINTING****B-1 HEAD MOVES BUT NO PRINTING/POOR REGISTRATION OR ERRATIC PRINT**

1. Dirty or defective timing fence.
2. Optic block out of adjustment.
3. Improper head position.
4. Defective Video amplifier.
5. Defective ribbon cable.
6. Defective LED's.
7. Dirty board or cavity connectors.
8. Improper alignment of timing fence to optic slit.
9. Improper alignment of optics block.
10. Improper main belt tension.
11. Defective Logic board (TTL).
12. Defective Driver board.
13. Defective ±12V or +5V regulator (TTL).
14. Defective Electronic Card No. 2 (TTL).

**B-2 MISSING DOTS, POOR OR INTERMITTENT PIN REGISTRATION ALL CHARACTERS**

1. Improperly aligned, dirty or damaged timing fence.
2. Defective damper assembly.
3. Defective RTP or EOP switch.
4. Defective Video Amplifier.
5. Defective Ribbon Cable.
6. Dirty head connector or board contacts.
7. Defective Driver board.
8. Improper alignment of optics block.
9. Defective Logic board or fuses (LSI).
10. Defective Electronic Card No. 1 (TTL).
11. Defective Electronic Card No. 2 (TTL).
12. Improper print head position.
13. Improper adjustment of print head solenoid/s.

**B-3 MISSING OR EXTRA DOTS, CERTAIN CHARACTERS ONLY**

1. Defective ROM's.
2. Defective P.C. runs in character generator.
3. Improperly aligned dirty or scratched timing fence.

**B-4 LINES ACROSS PAGE**

1. Improperly installed print head cover.
2. Improper penetration adjustment.
3. Dragging print wires.
4. Defective ribbon cable.
5. Poor logic board/s to Drive board connection.
6. Defective Driver board.
7. Defective Logic board (LSI).
8. Defective Electronic Card No. 2 (TTL).

**C. DRIVE FAILURE****C-1 CARRIAGE MOVEMENT ERRATIC**

1. Improperly adjusted main drive belt.
2. Spring drum unbound or broken.
3. Main drive belt touching driver board cables.
4. Defective bushings.
5. Worn or missing teeth on main timing belt.
6. Defective RTP switch.
7. Defective motor pulley.
8. Improperly adjusted motor clutch plate.
9. Defective drive pulleys or gears.
10. Dirty carriage guide bar.

**C-2 CARRIAGE STICKS OR BINDS**

1. Optics block touching timing fence.
2. Drive belt too tight.
3. Clutch assembly and brackets too tight.
4. Spring drum too tight.
5. Reverse clutch not releasing.
6. Restricted ribbon drive.

**C-3 NOISY**

1. Belts too tight.
2. Belt idler worn or rubbing against casting.
3. Improperly adjusted intermediate pulley.
4. Worn intermediate shaft or bushings.
5. Corroded clutch rotors or armature.
6. Poorly lubricated spring drum.

**C-4 CLUTCH****C-4A Forward Clutch Does Not Turn Off**

1. Defective EOP switch.
2. Defective Driver board.
3. Defective Logic board (LSI).
4. Defective Electronic Card No. 1 (TTL).
5. Defective Electronic Card No. 2 (TTL).
6. No video signal.
  - a. Defective Video Amplifier.
  - b. Defective optics block.
  - c. Defective ribbon cable.
  - d. Improperly adjusted optic block.
  - e. Dirty timing fence.

**C-4B Forward Clutch Does Not Turn On**

1. Defective -12V supply.
2. Defective Driver board.
3. Defective Logic board (LSI).
4. Defective Electronic Card No. 2 (TTL).
5. Dirty or loose board connectors.

**C-4C Both Clutches Locked When Printer Powered Up**

1. Improperly seated electronic boards.
2. Defective driver board.
3. Defective logic board (LSI).
4. Defective Electronic Card No. 2 (TTL).

**C-4D Reverse Clutch Does Not Turn Off**

1. Defective RTP switch (check continuity to cavity).
2. Defective driver board.
3. Defective logic board (LSI).

4. Defective Electronic Card No. 1 (TTL).
5. Defective Electronic Card No. 2 (TTL).
6. Dirty board or cavity connectors.

**C-5 SLOW PRINT**

1. Improper main drive motor friction clutch adjustment.
2. Defective drive motor.
3. Dirty guide bars.
4. Improper belt tension.
5. Improper bushing seating in clutch end brackets.

**D. RIBBON FEED FAILURE****D-1 NO RIBBON FEED**

1. Broken ribbon feed clutch springs.
2. Improper ribbon drive shaft gear mesh.
3. Loose ribbon drive slip clutch setting.
4. Improperly seated ribbon spool.
5. Improperly engaged bevel gears.

**D-2 NO RIBBON REVERSE**

1. Improper ribbon drive shaft gear mesh.
2. Loose ribbon drive slip-clutch setting.
3. Broken clutch spring.
4. Frozen ribbon reversing rod (earlier design).
5. Improperly adjusted ribbon reversing rod.

**D-3 ERRATIC MOVEMENT****D-3A Scrolling or Folding**

1. Improperly adjusted guide roller.
2. Improperly adjusted rod linkage.

**D-3B Too Slack**

1. Worn tension arm pads (earlier units).

**D-3C Tearing**

1. Improperly adjusted drive linkage.
2. Sticking solenoid wires.
3. Defective driver board.

**D-4 RIBBON FEED DURING CARRIAGE RETURN**

1. Broken clutch control on ribbon feed clutch gear.

**E. PAPER MOVEMENT FAILURE****E-1 FORMS RUNAWAY**

1. Defective or missing VFU tape.
2. Defective VFU LED's.
3. Excessive gap between VFU upper and lower reader bracket.

4. Improper alignment of reader bracket LED's to tape holes.
5. Defective logic board (LSI).
6. Defective Electronic Card No. 1 (TTL).
7. Continuously energized solenoid.
  - a. Defective driver board.
  - b. Driver resistor shorted to bracket.
  - c. Defective Electronic Card No. 1 (TTL).
8. Clutch slide pawl movement restricted.

**E-2 PAPER SKEW**

1. Non-aligned pin feed sprockets.
2. Paper pan friction against forms.
3. Pin feed holder, paper thickness setting too small.
4. Print head too close to paper.
5. Incorrect paper feed (mostly in units without paper rack).

**E-3 INTERMITTENT OPERATION**

1. Improperly adjusted platen knob.
2. See Erratic Line Spacing (E-5).

**E-4 NO FORM FEED**

1. Gear mesh too tight.
2. Form feed motor clutch roller/s binding (FF Clutch Inside Cam).
3. Defective driver board.
4. Defective logic board (LSI).
5. Defective Electronic Card No. 1 (TTL).
6. Defective form feed resistor.
7. Defective solenoid.
8. Defective ±12V supply.
9. Defective 30V unregulated supply.
10. Defective TOP OF FORM switch.

**E-5 ERRATIC LINE SPACING**

1. Excessive back stop pawl and cam mechanism play.
2. Improper upper and lower reader bracket gap.
3. Loosen set plate, paper drive slide shaft.

**E-6 NO LINE FEED**

1. Improperly adjusted form feed magnet.
2. Solenoid loose on pole (must be seated in bracket).
3. Gap between slide and paper feed clutch cam tab.
4. Defective Driver board.
5. Defective Logic board (LSI).
6. Defective Electronic Card #1 (TTL).
7. Improper Logic board jumpers (LSI).
8. Defective platen knob assembly.
9. Defective solenoid.
10. Defective form feed resistor or bad solder connection.
11. VFU belt worn or slipping.
12. Clutch slide pawl binding.

**E-7 MULTIPLE LINE FEED**

1. Improperly adjusted solenoid.
2. Defective solenoid armature spring.
3. Defective Driver board.
4. Defective Logic board (LSI).
5. Defective Electronic Card No. 1 (TTL).
6. Excessive line feed pulse width.
7. Clutch slide pawl binding.
8. Gap between slide and paper feed clutch inner cam tab.

**SECTION 7**  
**ELECTRICAL DRAWINGS AND LISTS OF MATERIALS**

This section contains the schematic wiring and assembly diagrams and lists of materials for all electronic assemblies in the Model 101AL.

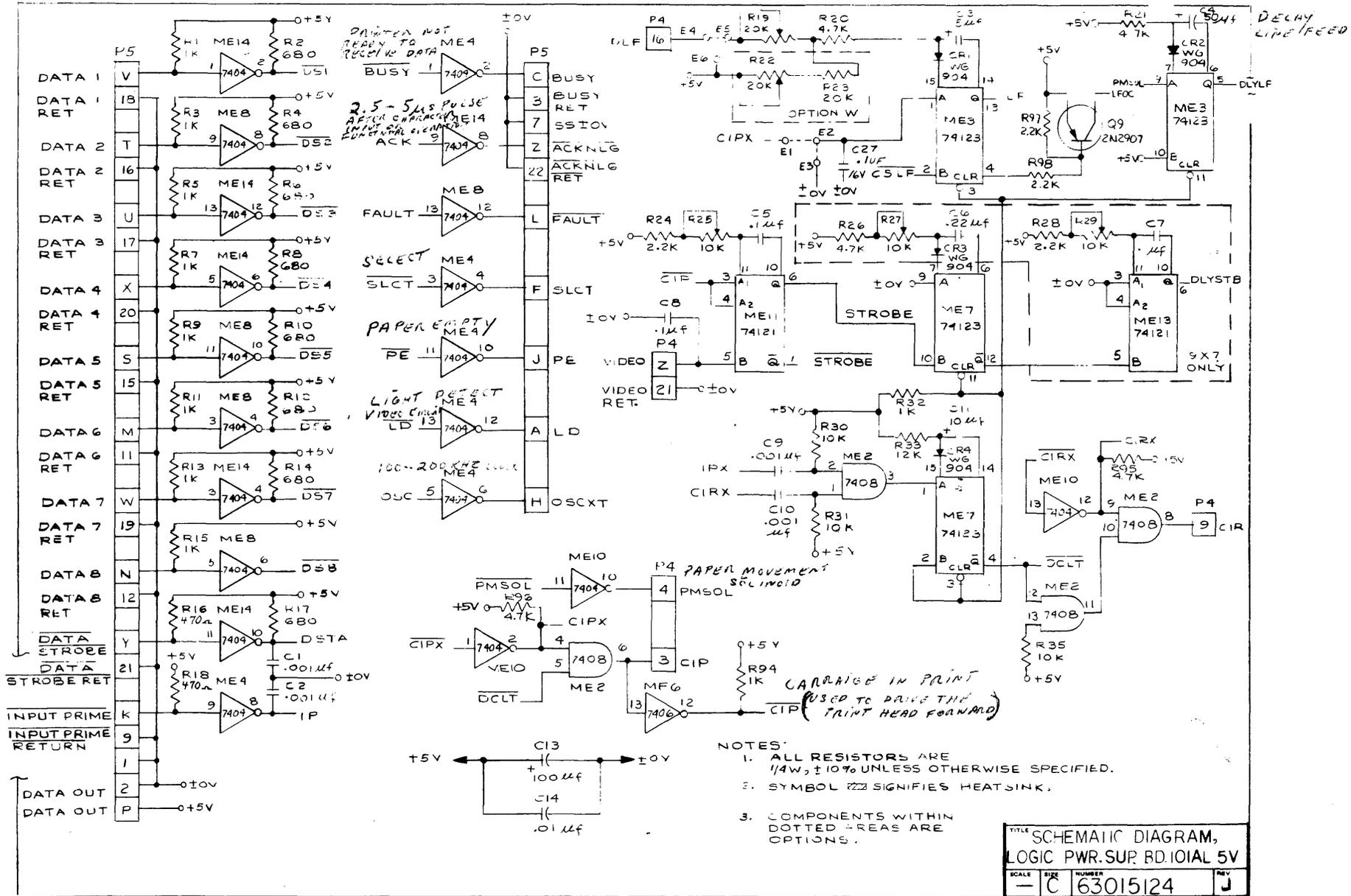


Figure 7-1. SCHEMATIC DIAGRAM, LOGIC/POWER SUPPLY +5 VOLTS (SHEET 1)

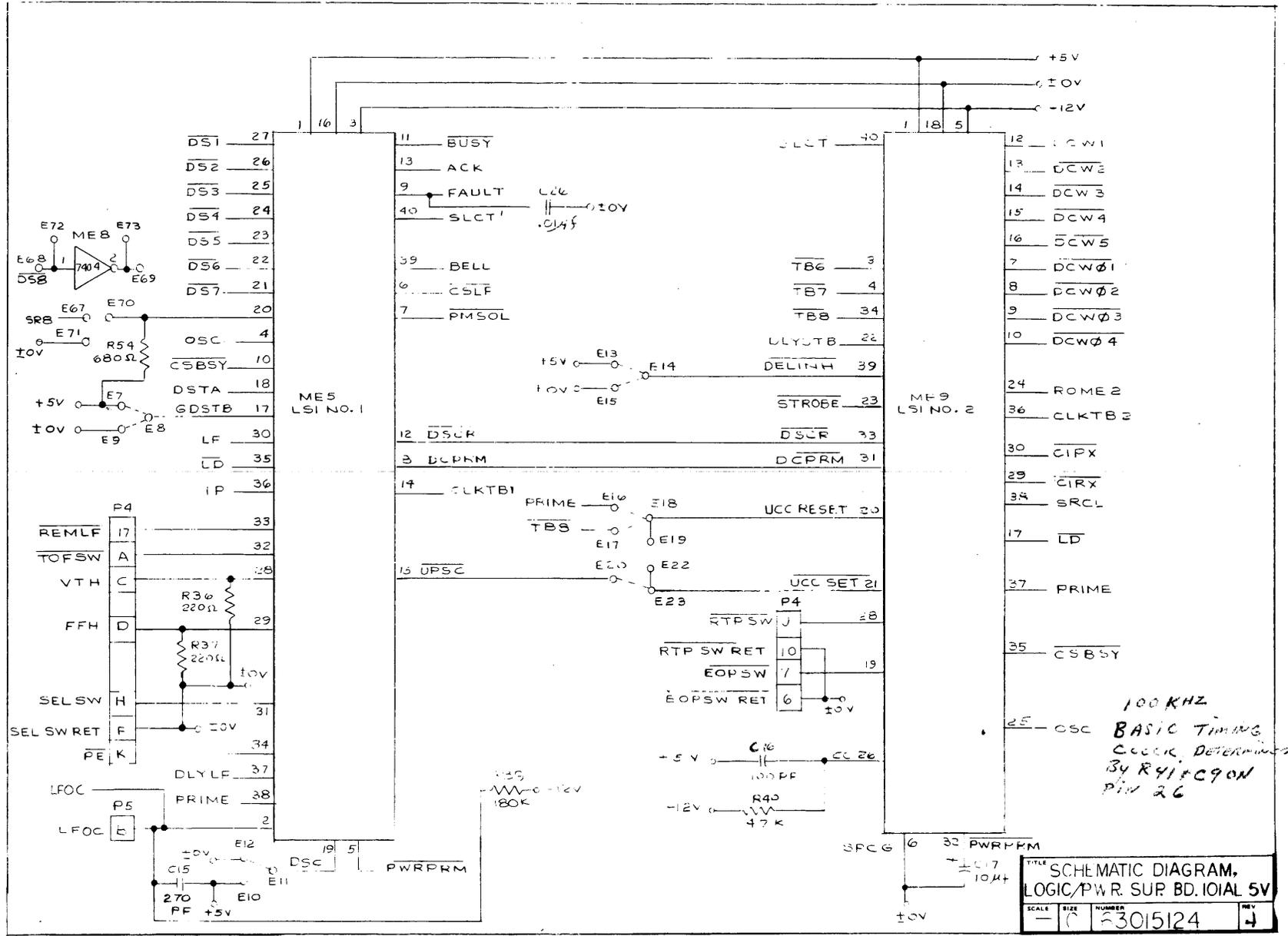


Figure 7-2. SCHEMATIC DIAGRAM, LOGIC/POWER SUPPLY +5 VOLTS (SHEET 2)



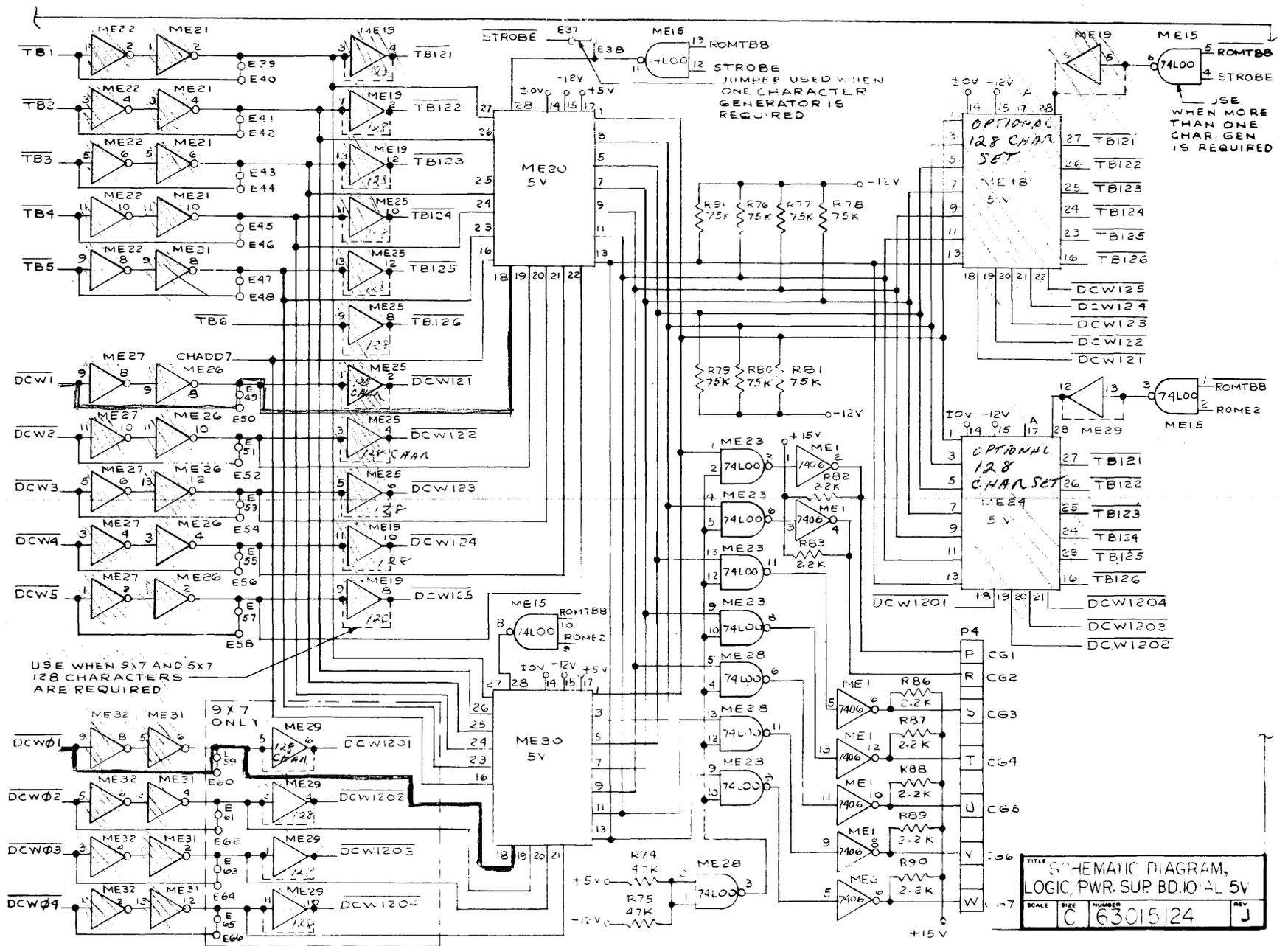
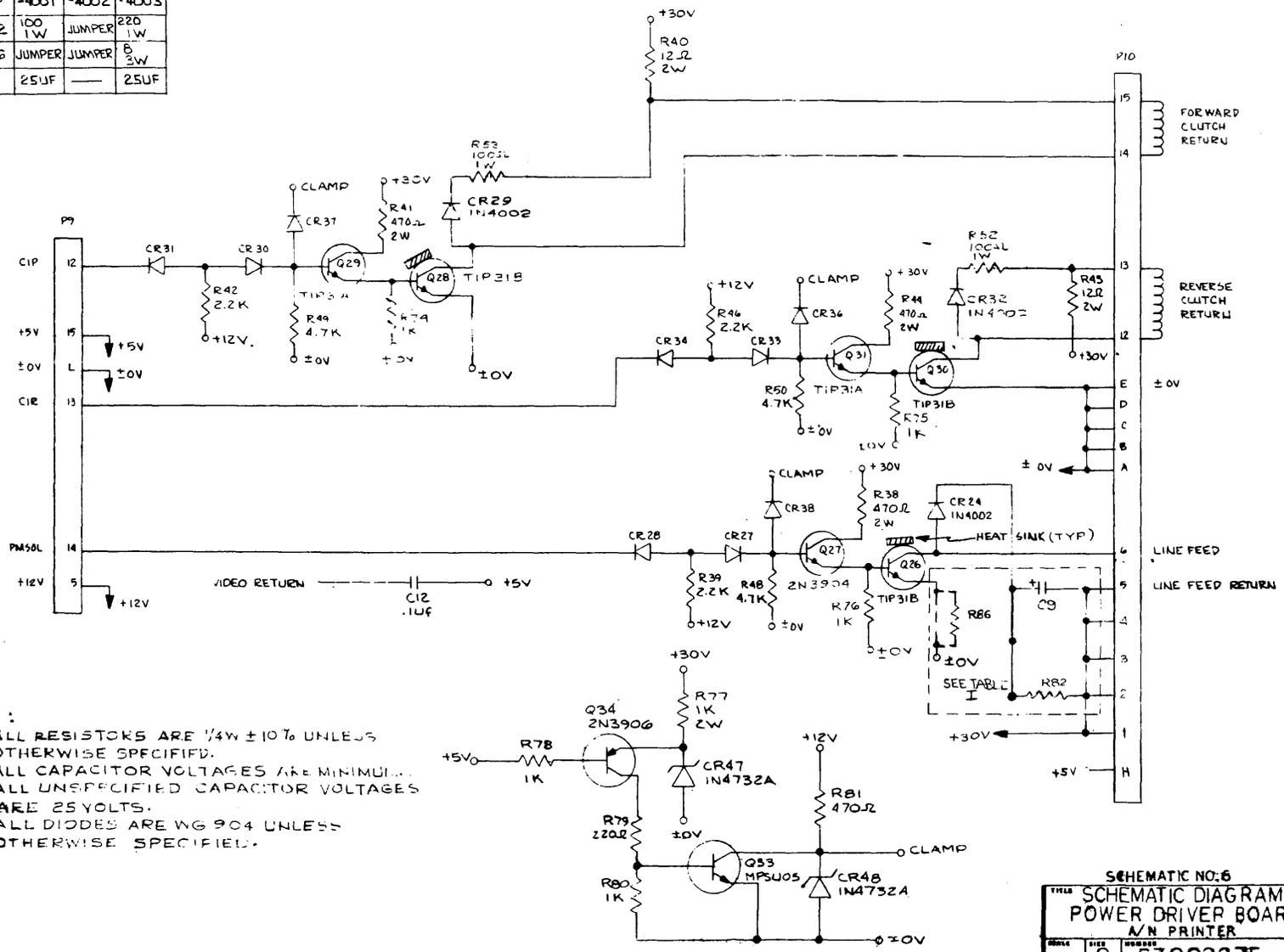


Figure 7-4. SCHEMATIC DIAGRAM, LOGIC/POWER SUPPLY +5 VOLTS (SHEET 4)

THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF CENTRONICS data computer corp.

COMP	-4001	-4002	-4003
RB2	100 1W	JUMPER	220 1W
RB6	JUMPER	JUMPER	6 3W
C9	25UF	—	25UF



- NOTES:
1. ALL RESISTORS ARE 1/4W ± 10% UNLESS OTHERWISE SPECIFIED.
  2. ALL CAPACITOR VOLTAGES ARE MINIMUM. ALL UNSPECIFIED CAPACITOR VOLTAGES ARE 25 VOLTS.
  3. ALL DIODES ARE WG 904 UNLESS OTHERWISE SPECIFIED.
  - 4.

SCHEMATIC NO: 6  
 TITLE SCHEMATIC DIAGRAM,  
 POWER DRIVER BOARD  
 M/N PRINTER  
 REV C 63002275

Figure 7-5. SCHEMATIC DIAGRAM, POWER DRIVER BOARD (SHEET 1)  
 (No. 63002275 Rev. K)

THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF CENTRONICS data computer corp.

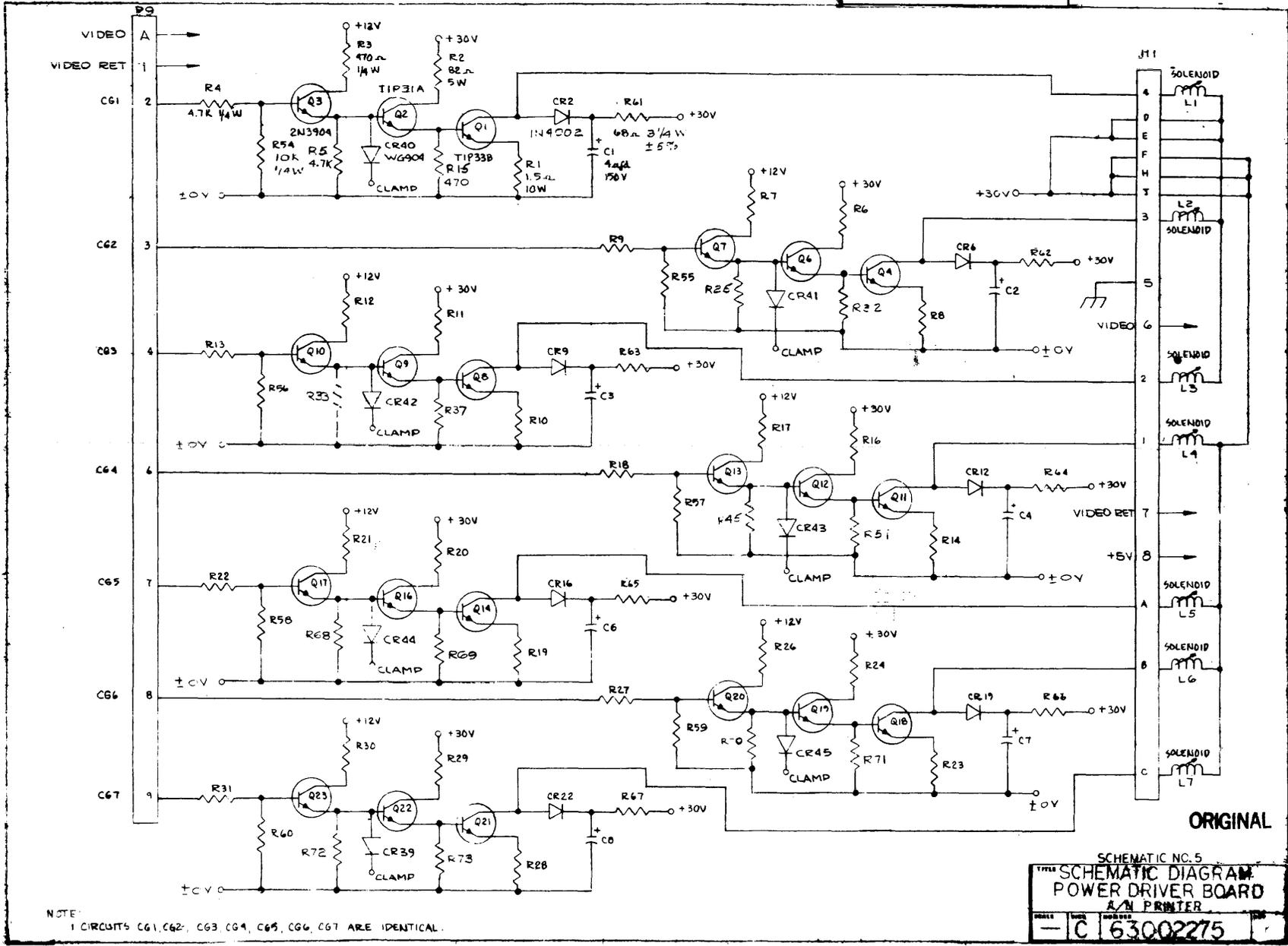


Figure 7-6. SCHEMATIC DIAGRAM, POWER DRIVER BOARD (SHEET 2)  
(No. 63002275 Rev. K)

7-7

Rev. E

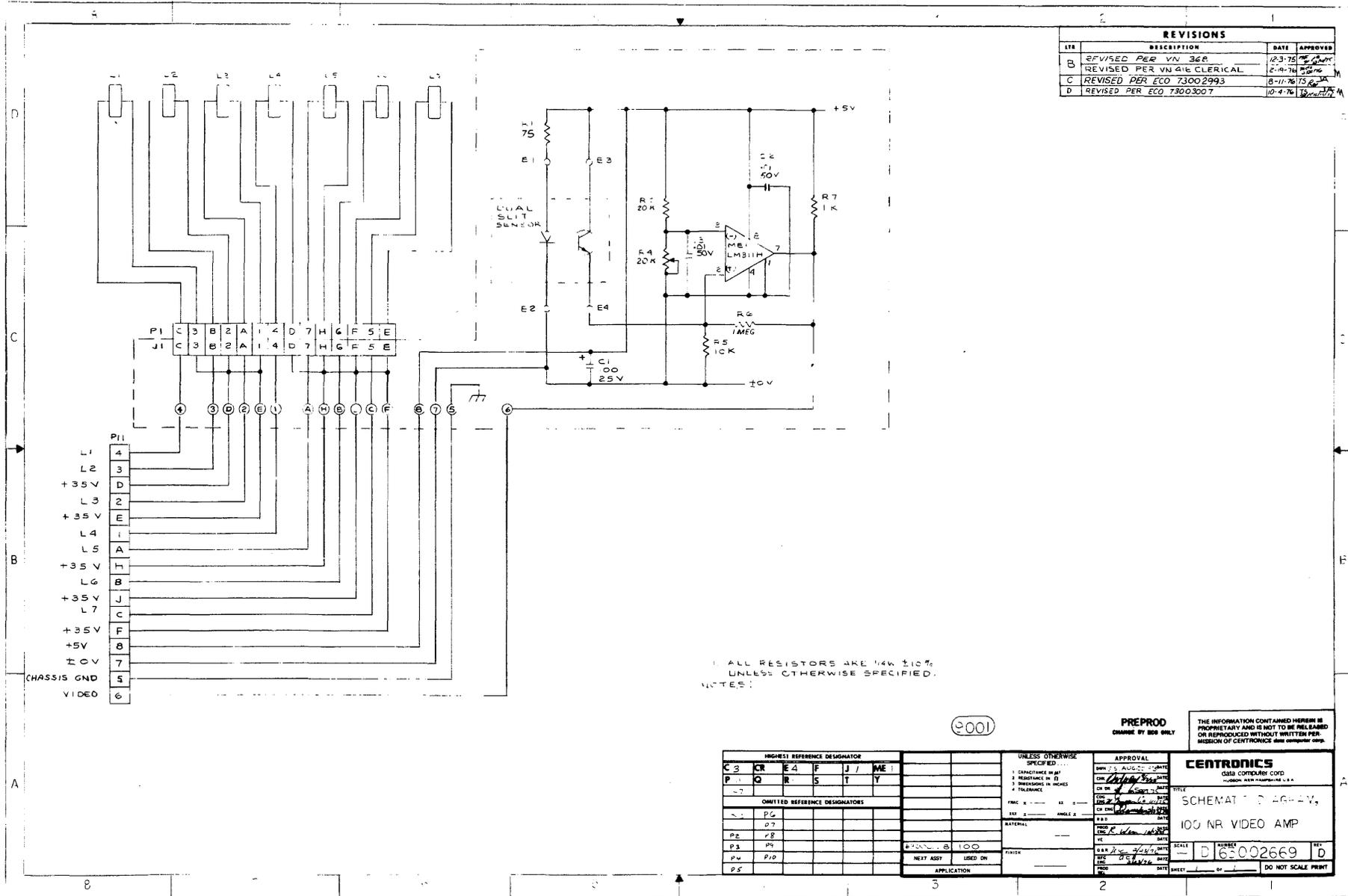
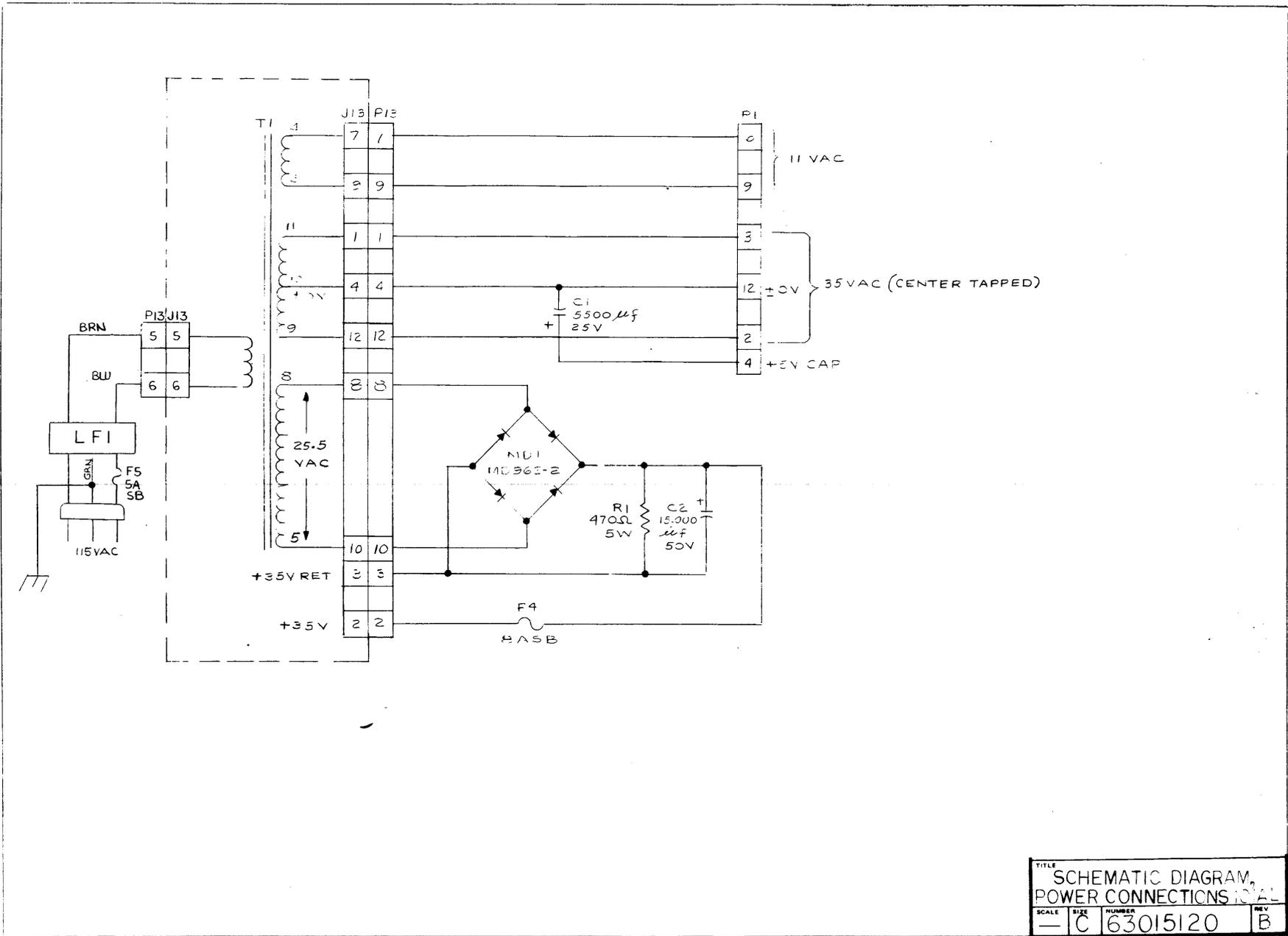


Figure 7-7. SCHEMATIC DIAGRAM, VIDEO AMPLIFIER



TITLE			
SCHEMATIC DIAGRAM, POWER CONNECTIONS 101AL			
SCALE	SIZE	NUMBER	REV
— C	63015120	B	

Figure 7-8. SCHEMATIC DIAGRAM, POWER CONNECTIONS 101AL



THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF CENTRONICS data computer corp.

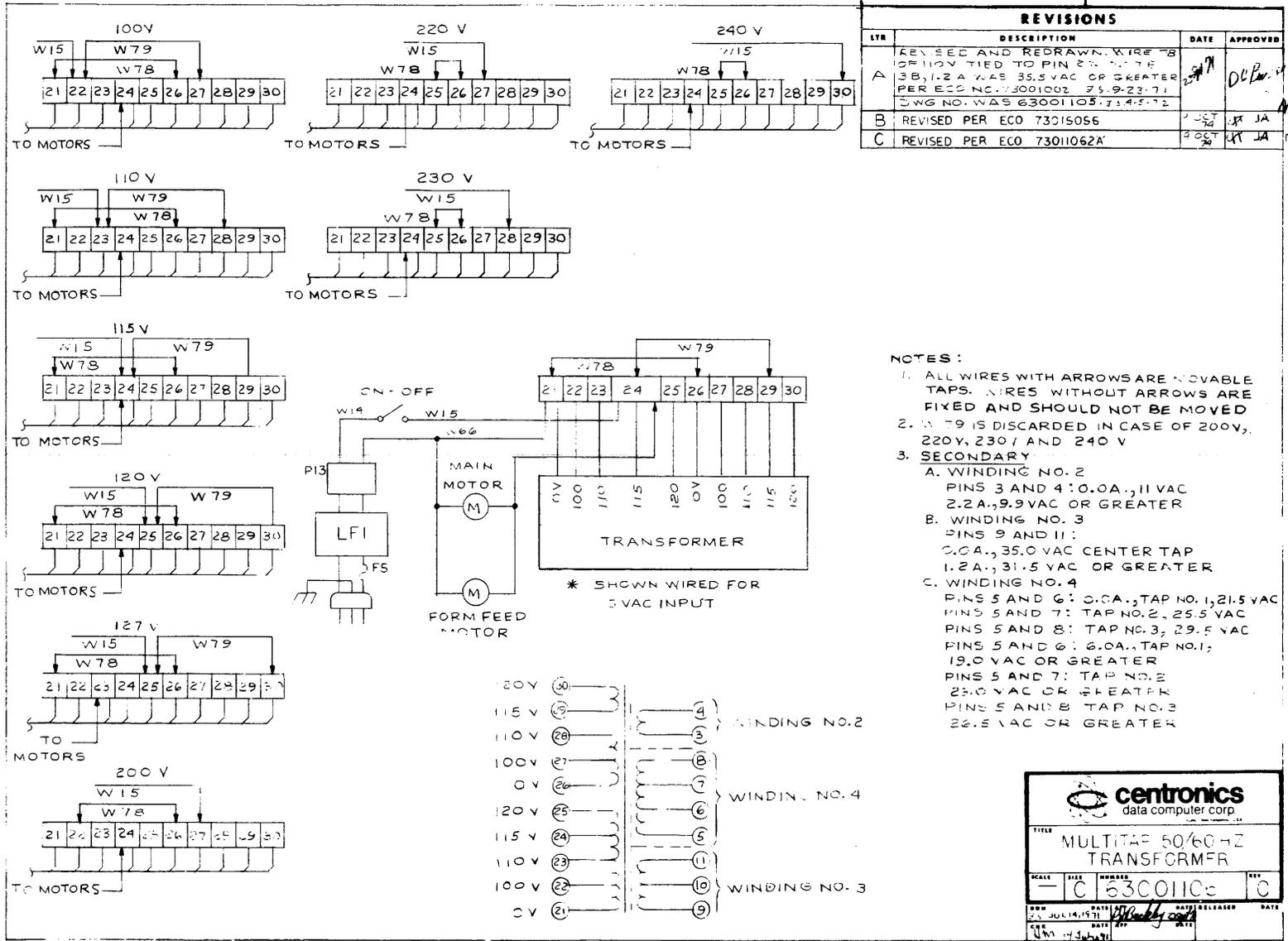


Figure 7-10. MULTITAP TRANSFORMER 50/60 Hz.



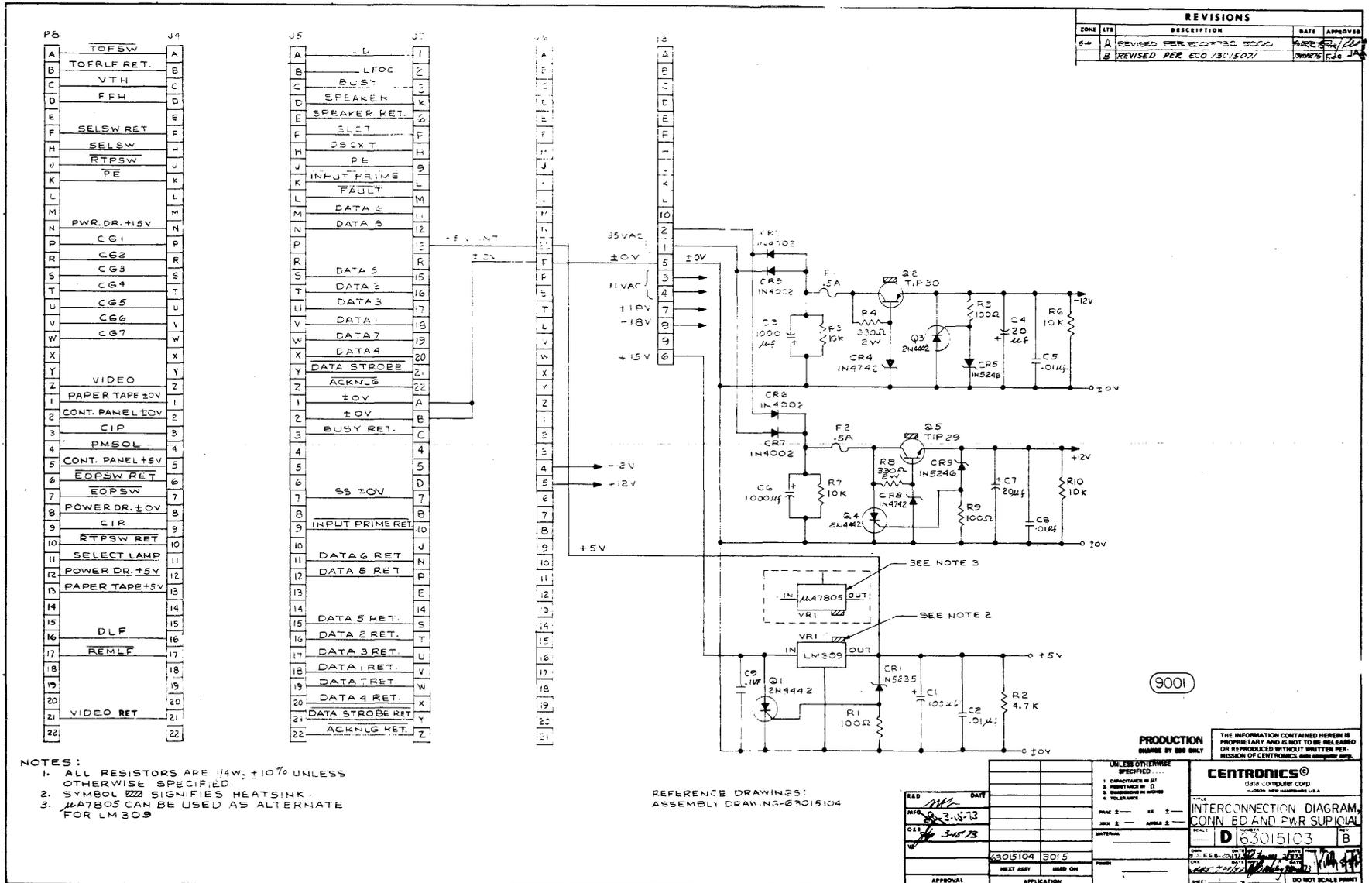


Figure 7-12. INTERCONNECTION DIAGRAM, CONNECTOR BOARD AND POWER SUPPLY

This illustration is intended to aid the reader in following the 101AL printer wiring diagram (Dwg. #63002333).

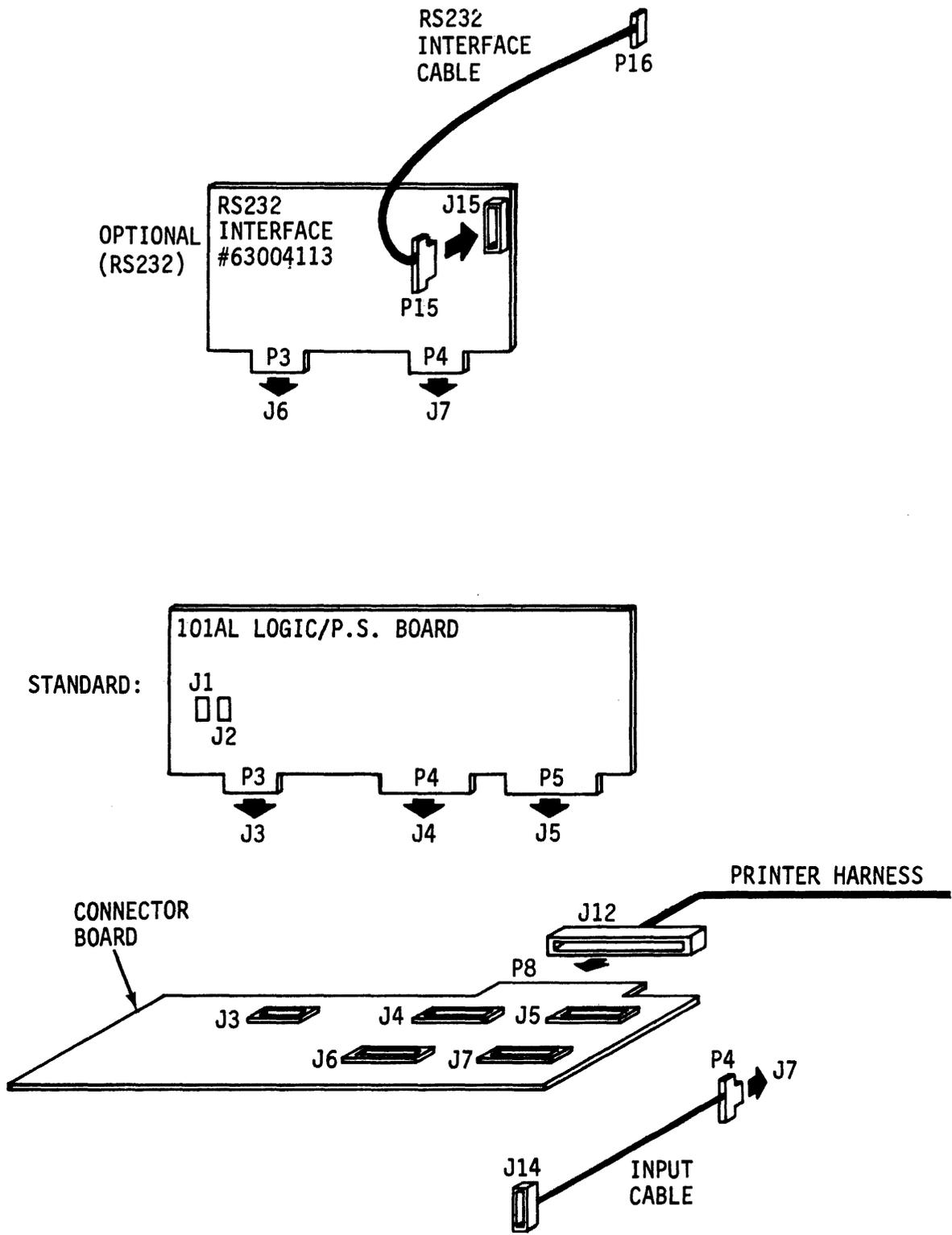
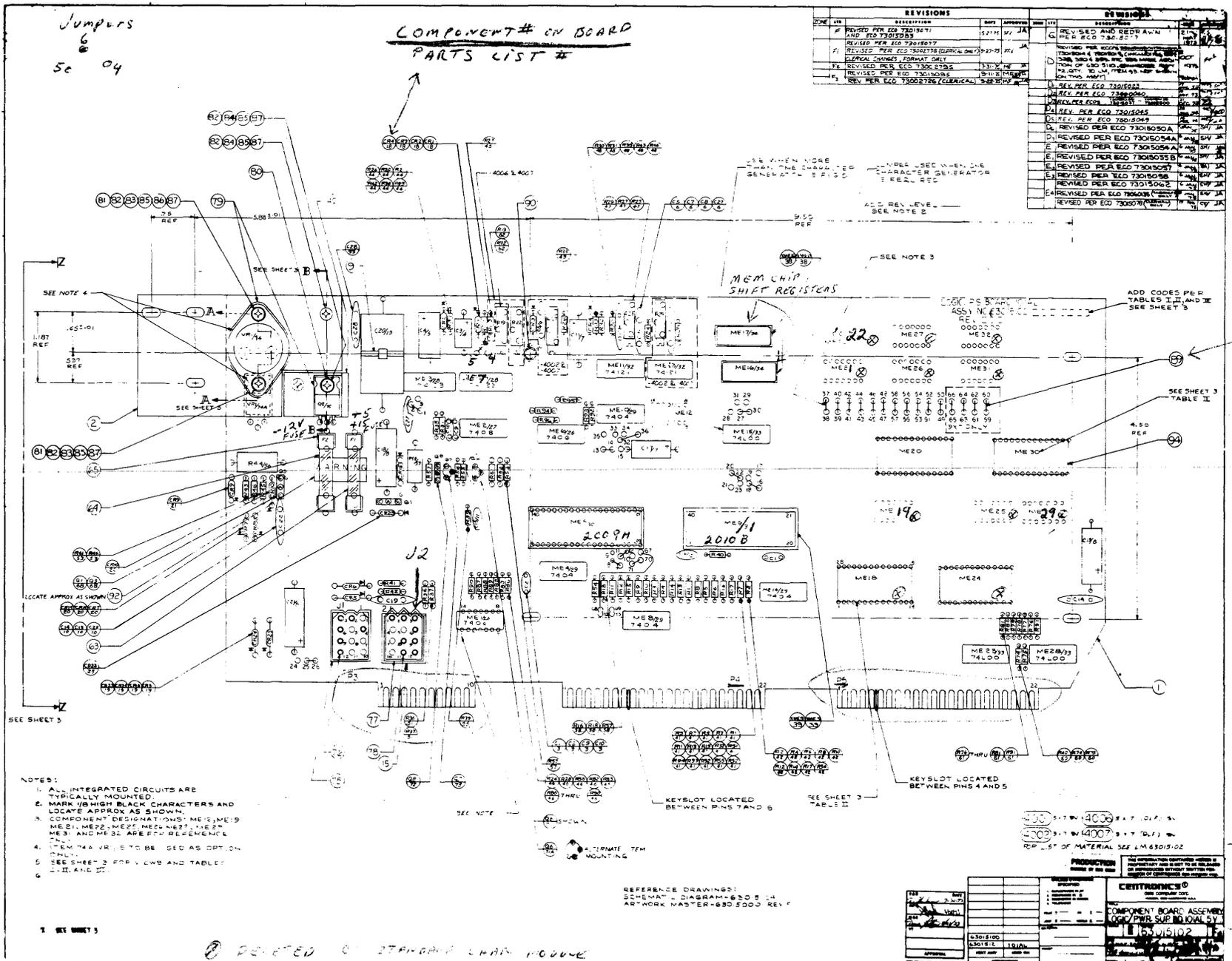


Figure 7-13. 101AL CONNECTOR CONFIGURATION



- NOTES:
1. ALL INTEGRATED CIRCUITS ARE TYPICALLY MOUNTED.
  2. MARK HIGH BLACK CHARACTERS AND LOCATE APPROX AS SHOWN.
  3. COMPONENT DESIGNATIONS ME1, ME2, ME3, ME4, ME5, ME6, ME7, ME8, ME9, ME10, ME11, ME12, ME13, ME14, ME15, ME16, ME17, ME18, ME19, ME20, ME21, ME22, ME23, ME24, ME25, ME26, ME27, ME28, ME29, ME30, ME31, AND ME32 ARE FOR REFERENCE ONLY.
  4. ITEM 74A (R) IS TO BE SLD AS OPT. ON ONLY.
  5. SEE SHEET 3 FOR PINS AND TABLET I, II, AND III.
  6. SEE SHEET 3.

REFERENCE DRAWINGS:  
 SCHEMATIC - DIAGRAM 6300 1-14  
 ARTWORK MASTER - 630 5000 REV F

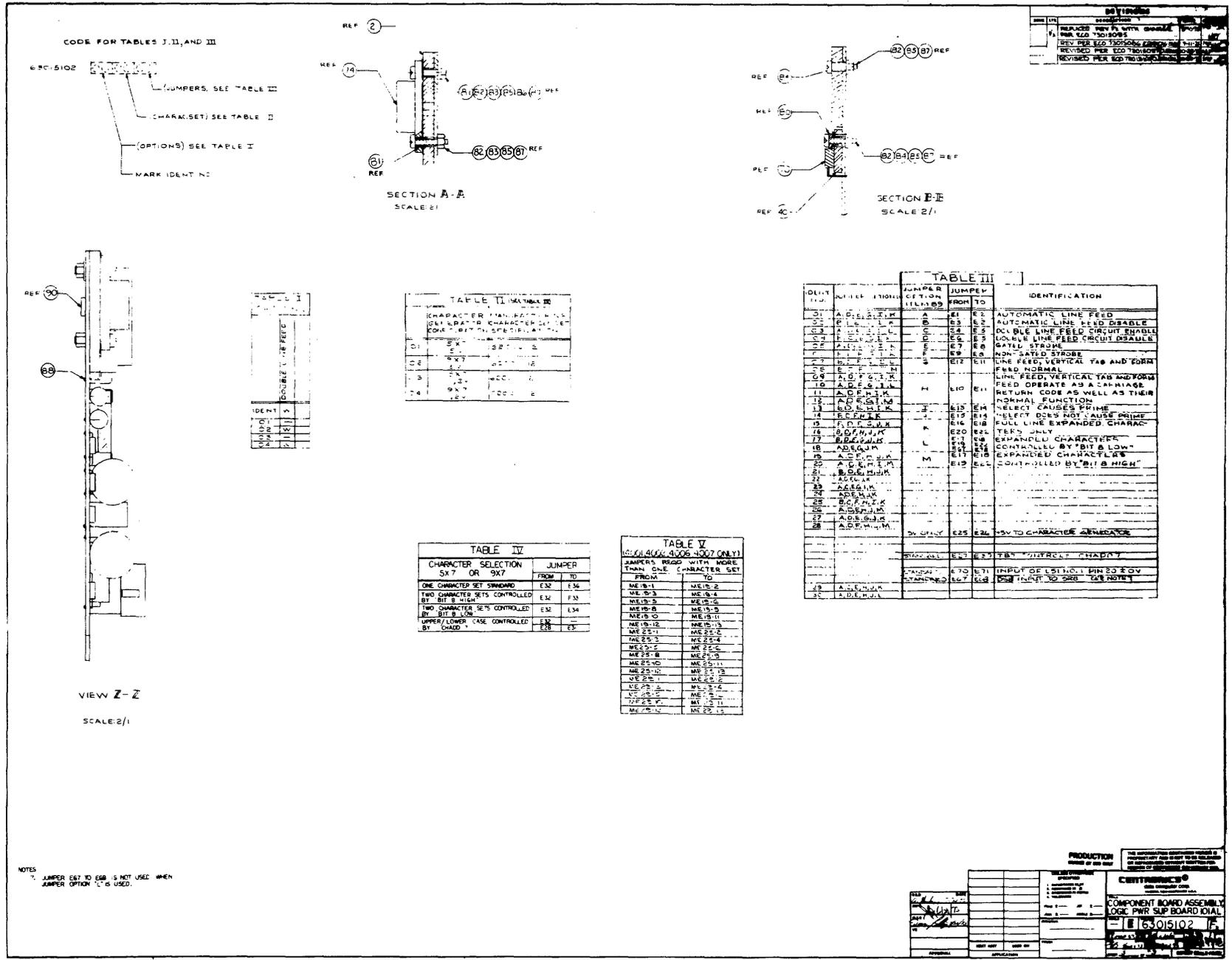
REV	DATE	DESCRIPTION	BY	CHKD
1	2-27-73	ISSUED FOR PRODUCTION	JA	JA
2	3-1-73	REVISED PER ECD 73015077	JA	JA
3	3-1-73	REVISED PER ECD 73015078 (GENERAL CHANGES)	JA	JA
4	3-1-73	REVISED PER ECD 73015079	JA	JA
5	3-1-73	REVISED PER ECD 73015080	JA	JA
6	3-1-73	REVISED PER ECD 73015081	JA	JA
7	3-1-73	REVISED PER ECD 73015082	JA	JA
8	3-1-73	REVISED PER ECD 73015083	JA	JA
9	3-1-73	REVISED PER ECD 73015084	JA	JA
10	3-1-73	REVISED PER ECD 73015085	JA	JA
11	3-1-73	REVISED PER ECD 73015086	JA	JA
12	3-1-73	REVISED PER ECD 73015087	JA	JA
13	3-1-73	REVISED PER ECD 73015088	JA	JA
14	3-1-73	REVISED PER ECD 73015089	JA	JA
15	3-1-73	REVISED PER ECD 73015090	JA	JA
16	3-1-73	REVISED PER ECD 73015091	JA	JA
17	3-1-73	REVISED PER ECD 73015092	JA	JA
18	3-1-73	REVISED PER ECD 73015093	JA	JA
19	3-1-73	REVISED PER ECD 73015094	JA	JA
20	3-1-73	REVISED PER ECD 73015095	JA	JA
21	3-1-73	REVISED PER ECD 73015096	JA	JA
22	3-1-73	REVISED PER ECD 73015097	JA	JA
23	3-1-73	REVISED PER ECD 73015098	JA	JA
24	3-1-73	REVISED PER ECD 73015099	JA	JA
25	3-1-73	REVISED PER ECD 73015100	JA	JA

Figure 7-14. COMPONENT BOARD ASSEMBLY, LOGIC/POWER SUPPLY BOARD +5 VOLTS

7-15

REV. E

ASSY NO. 63015100  
 (REVISED PER ECD 73015100)



**LIST OF MATERIALS**  
**LOGIC/P.S. BOARD 101AL (9 X 7)**  
(Ref: Ass'y No. 63015102 - 4002, Rev. F3)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63015000-2001	PC BD AW LOGIC/PWR SUP 101AL	1
2	63015109-2001	HEAT SINK LOGIC CARD	1
3	21102000-1001	CAP CERAMIC DISC .001UF 1KV	4
4	22505002-1001	CAP ELECTROLYTIC 5UF 16V	1
5	22506002-1001	CAP ELECTROLYTIC 50UF 25V	1
6	21104001-1001	CAP CERAMIC DISC .1UF 16V	4
7	22106002-1001	CAP ELECTROLYTIC 10UF 25V	2
8	22107002-1001	CAP ELECTROLYTIC 100UF 25V	3
9	21224000-1001	CAP CERAMIC DISC .22UF 12V	1
10	21103003-1001	CAP CERAMIC DISC .01UF 1KV	3
10A	21103004-1001	CAP CERAM GLASS SEAL .01UF 50V	A/R
11	21271000-1001	CAP CERAMIC DISC 270PF 3KV	1
12	21101001-1001	CAP CERAMIC DISC 100PF 1KV	1
13	22507000-1001	CAP ELECTROLYTIC 500UF 50V	1
15	63015110-4001	CONNECTOR ASSY P2 101 AL	1
18	38100904-1001	DIODE WG904	4
19	38130901-1001	DIODE S1 RECTIFIER 30S1	4
20	38040020-1001	DIODE S1 RECTIFIER IN4002	3
21	38047420-1001	DIODE IN4742	1
22	38052460-1001	DIODE ZENER IN5246	1
22A	38052461-1001	DIODE IN5246A	A/R
22B	38052462-1001	DIODE IN5246B	A/R
23	38052350-1001	DIODE ZENER IN5235	1
23A	38052351-1001	DIODE ZENER IN5235A	A/R
23B	38052352-1001	DIODE ZENER IN5235B	A/R
26	35474060-1001	INTEGRATED CIRCUIT 7406	2
27	35474080-1001	INTEGRATED CIRCUIT 7408	1
28	35474123-1001	INTEGRATED CIRCUIT 74123	2
29	35474040-1001	INTEGRATED CIRCUIT 7404	4
30	35512011-1002	I C SMC 2009 H OR HIGHER	1
31	35512010-1001	INTEGRATED CIRCUIT 2010 SMC	1
32	35474121-1001	INTEGRATED CIRCUIT 74121	2
33	35574000-1001	INTEGRATED CIRCUIT 74L00	3
34	35514811-1001	INTEGRATED CIRCUIT C2042	2
34A	35514813-1001	INTEGRATED CIRCUIT 5012-133	A/R
34B	63002664-4001	PC BOARD ASSY QUAD/DUAL NO 1	A/R
38	31410001-2006	SOCKET 16 CONTACTS	2
39	31410000-2001	SOCKET 40 CONTACTS	2
40	63015122-2001	HEAT SINK TRANSISTOR	1
41	41102926-1001	RES CARBON 1 K 1/4W 10%	15
42	41681926-1001	RES CARBON 680 OHM 1/4W 10%	9
44	41472926-1001	RES CARBON 4.7 K 1/4W 10%	6
46	41222926-1001	RES CARBON 2.2 K 1/4W 10%	10
47	46103910-1001	POTENTIOMETER 10K 1W 10%	3
48	41103926-1001	RES CARBON 10 K 1/4W 10%	5
49	41123926-1001	RES CARBON 12K 1/4W 10%	1
51	41221926-1001	RES CARBON 220 OHM 1/4W 10%	2

LIST OF MATERIALS  
 LOGIC/P.S. BOARD 101AL (9 X 7)  
 (Ref: Ass'y No. 63015102 - 4002, Rev. F3)

ITEM	PART NO.	NOMENCLAURE	QTY PER
53	41101926-1001	RES CARBON 100 OHM 1/4W 10%	2
55	41184926-1001	RES CARBON 180 K 1/4W 10%	1
56	41331026-1001	RES CARBON 330 OHM 2W 10%	1
57	41752926-1001	RES CARBON 7.5 K 1/4W 10%	1
58	41471926-1001	RES CARBON 470 OHM 1/4W 10%	3
59	41220016-1001	RES CARBON 22 OHM 1W 10%	1
60	41473926-1001	RES CARBON 47 K 1/4W 10%	3
61	41753926-1001	RES CARBON 75 K 1/4W 10%	7
62	46203381-1001	POTENTIOMETER 20K 1W 10%	1
63	39030011-1001	FUSE 3 AMP 250 V	1
64	39030018-1001	FUSE 1/2 AMP	1
65	31350003-2001	FUSE CLIP	4
68	38244420-1001	TRANSISTOR 2N4442	2
70	38200300-1001	TRANSISTOR TIP30	1
71	38229071-1001	TRANSISTOR A5T2907	1
71A	38229070-1001	TRANSISTOR 2N2907	A/R
72	38300050-1001	TRANSISTOR NPN HI VOLT MPS V05	1
73	38239040-1001	TRANSISTOR NPN GEN PUR 2N3904	1
74	35203090-1001	VOLTAGE REGULATOR	1
74A	35207800-1001	VOLTAGE REGULATOR WA7805	A/R
75	31300008-1001	CONN PLUG W/OUT MTG EARS 12PIN	1
76	31240021-2002	PIN TERMINAL MALE	6
77	31340008-1002	CONNECTOR W/OUT EARS	1
78	31240021-2001	PIN TERMINAL FEMALE	8
79	30050001-0001	THERMAL JOINT COMPOUND	A/R
80	35000004-2005	WASHER-NYLON INSULATOR #4X3/16	2
81	39690200-0009	TUBING TEFLON TFT 200 #9 NAT	A/R
82	30000000-0001	INSULATING VARNISH	A/R
83	34517207-2001	SCREW 4-40X5/8 PAN HD PHIL	2
84	34517167-2001	SCREW 4/40X1/2 PAN HD PHIL	3
85	34815007-2001	WASHER #4 INT TOOTH LOCK	5
86	34912007-2001	WASHER #4 FLAT	1
87	34712007-2001	NUT HEX 4/40	5
88	30070000-0001	SOLDER	A/R
89	39610000-0005	WIRE BUSS #22AWG	A/R
90	34000051-2003	NUT THREADED 6-32	1
91	39690010-2002	CABLE TIE 1/16-1 3/4 X 5 1/2	1
92	62000111-3001	WARNING DECAL FUSE RATING	1
93	21104000-1001	CAP CERAMIC DISC .1UF 25V	1
REF	62000112-9001	CHAR GENERATOR LOCATION CHART	A/R
REF	63015001-9001	PC BD DD LOGIC/PWR SUP 101AL	A/R
REF	63015102-9000	OPTION SUMMARY 101AL LOG/PS BD	A/R
REF	63015124-9001	SCHEM DIA LOG/PWR SUP BD 101AL	A/R

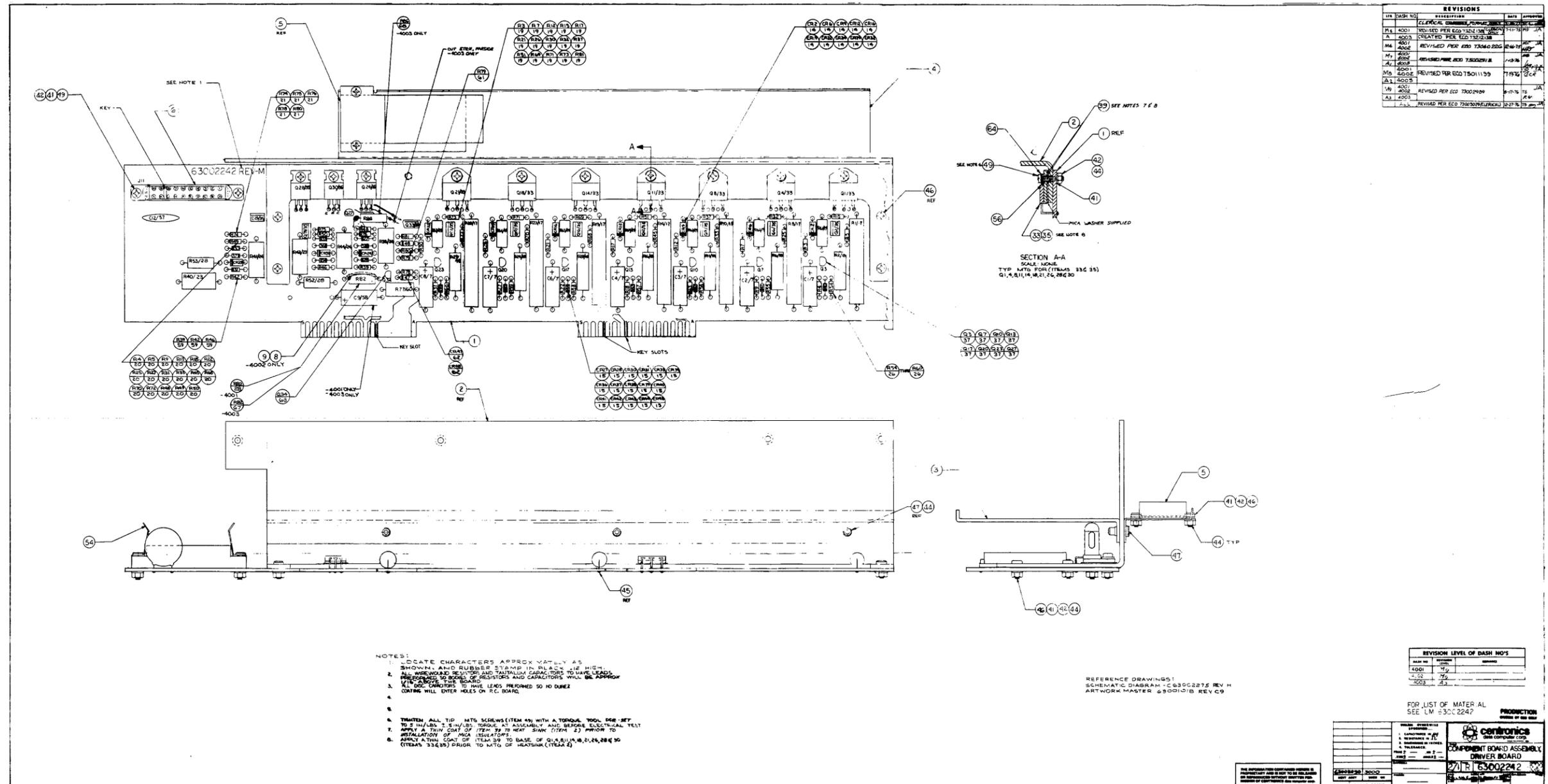


Figure 7-16. COMPONENT BOARD ASSEMBLY, POWER DRIVER

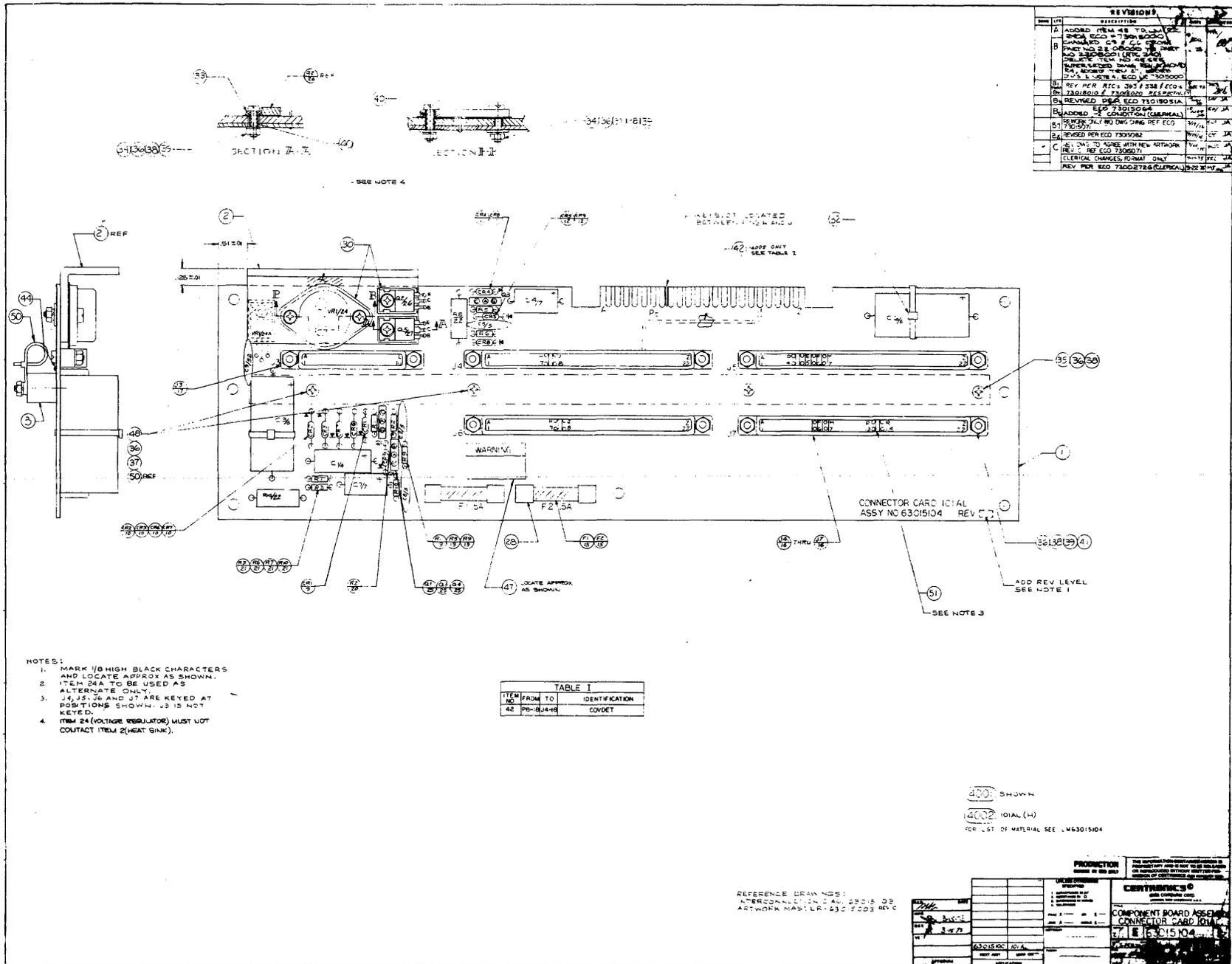
**LIST OF MATERIALS**  
**POWER DRIVER BOARD**  
(Reference: Ass'y Dwg. No. 63002242 - 4001, Rev. M5)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63001018-2001	PC BD AW POWER DRIVER BOARD	1
2	63002200-2001	BRKT HEAT SINK DRIVER BOARD	1
3	63002233-5001	SHIELD 101/101A	1
4	63002234-2001	CABLE TRAY 101/101A	1
5	63002247-5001	CABLE CLAMP ASSY 101/101A	1
6	31230011-1001	CONNECTOR EDGE 20 PIN	1
7	22405002-1001	CAP ELECTROLYTIC 4UF 150V	7
8	39610000-0005	WIRE BUSS #22AWG	A/R
9	39690200-0022	TUBING TEFLON TFT 200 #22 NAT	A/R
14	38040020-1001	DIODE S1 RECTIFIER IN4002	10
14A	38049980-1001	DIODE IN4998	A/R
15	38100904-1001	DIODE WG904	16
17	43158105-1001	RES WW 1.5 OHM 10W 5%	7
18	43820055-1001	RES WW 32 OHM 5W 5%	7
19	41471926-1001	RES CARBON 470 OHM 1/4W 10%	15
20	41472926-1001	RES CARBON 4.7 K 1/4W 10%	17
21	41102926-1001	RES CARBON 1 K 1/4W 10%	5
23	41120026-1001	RES CARBON 12 OHM 2W 10%	2
24	41471026-1001	RES CARBON 470 OHM 2W 10%	3
26	41103926-1001	RES CARBON 10 K 1/4W 10%	7
28	41101016-1001	RES CARBON 100 OHM 1W 10%	3
29	40680325-1001	RES 68 OHM 3-1/4W 5%	7
33	38200332-1001	TRANSISTOR TIP 33B	7
35	38200312-1001	TRANSISTOR TIP 31B	12
35A	38200311-1001	TRANSISTOR TIP 31A	A/R
36	38300050-1001	TRANSISTOR NPN H1 VOLT MPS V05	1
37	38239040-1001	TRANSISTOR NPN GEN PUR 2N3904	8
39	30050000-0001	SILICONE COMPOUND	A/R
40	34517145-2001	SCREW 4/40X7/16 PAN HD PHIL SS	10
41	34815005-2001	WASHER #4 INT TOOTH LOCK SS	21
42	34712005-2001	NUT HEX 4/40 SS	18
44	30000000-0001	INSULATING VARNISH	A/R
45	30070000-0001	SOLDER	A/R
46	34517105-2001	SCREW 4/40X5/16 PAN HD PHIL SS	6
47	34517205-2001	SCREW 4/40X5/8 PAN HD PHIL SS	3
49	34517165-2001	SCREW 4/40X1/2 PAN HD PHIL SS	2
54	63002300-2001	CLIP, P.C. BOARD	2
56	35000004-2005	WASHER-NYLON INSULATOR #4X3/16	10
57	21104000-1001	CAP CERAMIC DISC .1UF 25V	1
58	22256000-1001	CAP ELECTROLYTIC 25UF 12V	1
59	41222926-1001	RES CARBON 2.2 K 1/4W 10%	3
60	41102026-1001	RES CARBON 1 K 2W 10%	1
61	41221926-1001	RES CARBON 220 OHM 1/4W 10%	1
62	38047321-1001	DIODE ZENER IN4732A	2
63	38239060-1001	TRANSISTOR PNP GEN PUR 2N3906	1
REF	63001019-9001	PC BD DD POWER DRIVER BOARD	A/R
REF	63002275-9001	SCHEM DIAG PWR DRIVER BOARD	A/R



LIST OF MATERIALS  
 PC BOARD ASS'Y  
 VIDEO AMPLIFIER  
 (Ref: Ass'y #63002668-4001, Rev. A9)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63001096-2001	PC BD AW VIDEO AMP 100 SER NR	1
2	63508104-2001	BRACKET MTG VIDED AMP BOARD	1
3	39660029-0001	CABLE FLEXIBLE 8/C *	4.2
4	63060116-5001	CLAMP ASSY	2
5	63002300-2001	CLIP, P.C. BOARD	2
6	63002634-5001	OPT PICKUP SINGLE TRK PHOTRANS	1
8	21103004-1001	CAP TBAX GLASS .01UF 50V 20%	2
9	22107002-1001	CAP ELCTLT 100UF 25V -10+75%	1
10	41750926-1001	RES CARBON 75 OHM 1/4W 10%	1
11	41203926-1001	RES CARBON 20K OHM 1/4W 10%	1
12	41103926-1001	RES CARBON 10K OHM 1/4W 10%	1
13	41105926-1001	RES CARBON 1MEG OHM 1/4W 10%	1
14	41102926-1001	RES CARBON 1K OHM 1/4W 10%	1
15	35203110-1003	IC VOLTAGE COMPARATOR 311	1
16	31230011-1001	CONN EDGE 10POSN 2-ROW MDM	1
17	39610000-0003	WIRE UN-INSUL SOLID 26AWG	A/R
18	39690200-0018	TUBING PLSTC 1,AWG ID NAT	A/R
19	31240456-2002	KEY PLZ BETW CONTACT	1
20	30000000-0001	VARNISH INSULATING RED	A/R
21	34104087-2001	SCR CAP HEX SOC 2-56X.25L	2
23	34517167-2001	SCR PNH REC 4-40X.50L	2
24	34902007-2001	WSHR FLAT #2X.00 DD	2
26	34818007-2001	WSHR LOCK SPLIT #4	2
27	34712005-2001	NUT HEX 4-40 X MDM THK SST	5
28	34712007-2001	NUT HEX 4-40 X MDM THK	2
29	39695231-2001	STRAP CABLE ADJ LKG .625BDL	1
30	30070000-0001	SOLDER 60/40 .0320 WIRE	A/R
31	30040000-0001	CONFORMAL COATING	A/R
33	63001021-2001	PC BD AW RIBBON CAB FINGER BD	1
34	35060005-0001	TAPE TRANS REINF .75W X.006THK	A/R
35	34912007-2001	WSHR FLAT #4X.00 DD	4
36	63011158-2001	SPACER,LARGE	1
38	34815005-2001	WSHR LOCK INTL TOOTH #4 SST	6
39	34517125-2001	SCR PNH REC 4-40X.38L SST	3
40	34912005-2001	WSHR FLAT #4X.00 DD SST	4
41	34517185-2001	SCR PNH REC 4-40X.56L SST	2
42	46203381-1001	POT PC MTG 20K OHM 1W 10%	1
43	35060020-0012	TAPE DBL-SIDE .75W X.0035THK	.2
REF	63001022-9001	PC BD DD RIBBON CAB FINGER BD	
REF	63001097-9001	PC BD DD VIDEO AMP 100 SER NR	
REF	63002669-9001	SCHEM DIAG VIDEO AMP 100 SERNR	



REVISIONS		DATE	BY
A	ADDED ITEM 48 TO LIST		
B	REVISION 1 TO BOARD		
B1	REV PER RVC 385 P 388 ECD		
B2	REV PER RVC 385 P 388 ECD		
B3	REV PER RVC 385 P 388 ECD		
B4	REV PER RVC 385 P 388 ECD		
B5	REV PER RVC 385 P 388 ECD		
B6	REV PER RVC 385 P 388 ECD		
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B97	REV PER RVC 385 P 388 ECD		
B98	REV PER RVC 385 P 388 ECD		
B99	REV PER RVC 385 P 388 ECD		
B100	REV PER RVC 385 P 388 ECD		

- NOTES:
1. MARK 1/8 HIGH BLACK CHARACTERS AND LOCATE APPROX AS SHOWN.
  2. ITEM 24A TO BE USED AS ALTERNATE ONLY.
  3. J4, J5, J6 AND J7 ARE KEYS AT POSITIONS SHOWN. J3 IS NOT KEYS.
  4. ITEM 24 (VOLTAGE REGULATOR) MUST NOT CONTACT ITEM 2 (HEAT SINK).

ITEM	FROM	TO	IDENTIFICATION
42	PR-104-18		CONDET

400 SHOWN  
400 ICIAL (+)  
FOR LIST OF MATERIAL SEE L 63015104

REFERENCE DRAWING NO: INTERCONNECTIONAL 63015 02 ARTWORK MASTER: 6301503 REV C

PRODUCTION

CERTIFIED

COMPONENT BOARD ASSEMBLY  
CONNECTOR CARD ICIAL

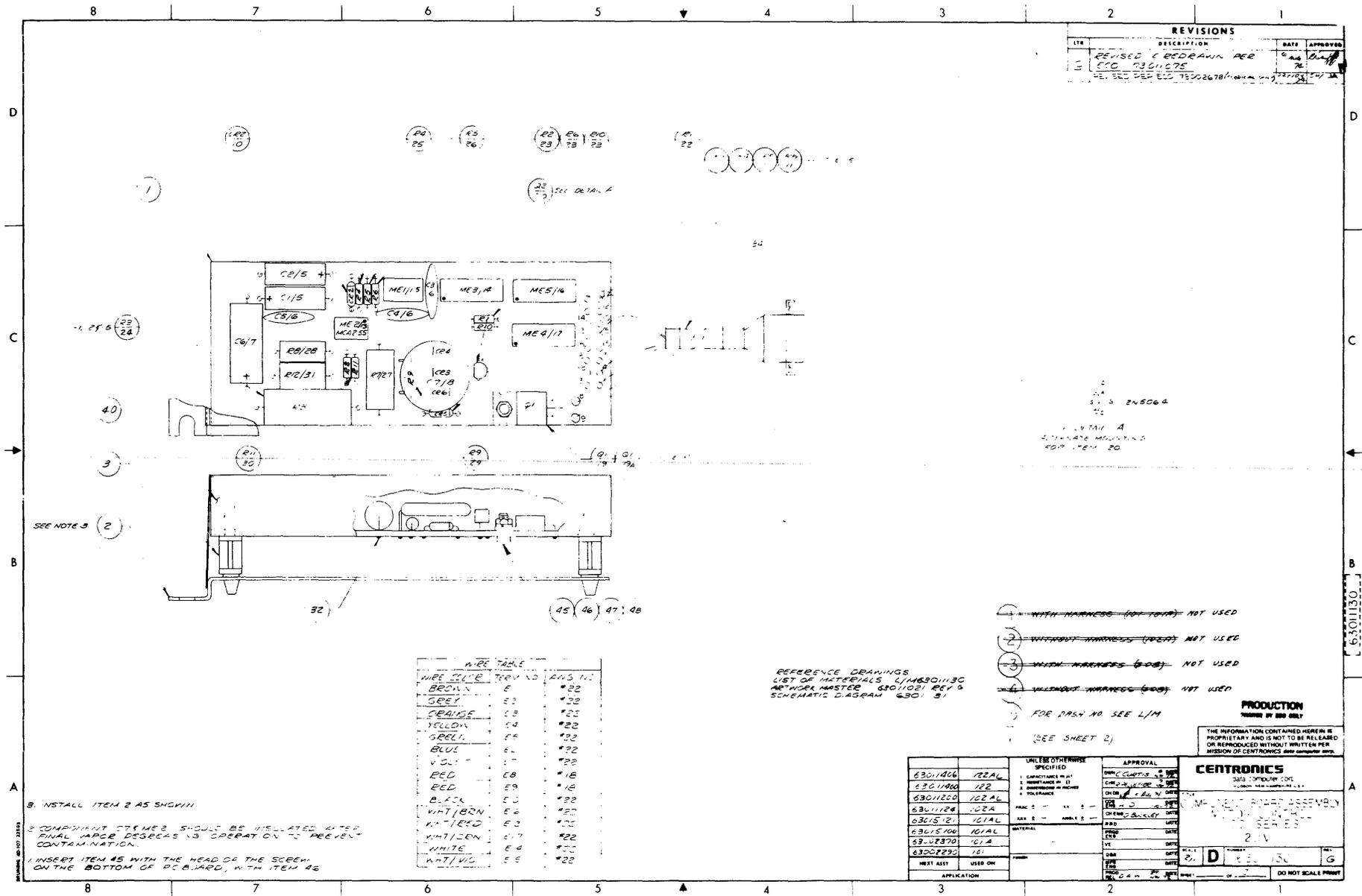
63015104

Figure 7-18. COMPONENT BOARD ASSEMBLY, CONNECTOR CARD

**LIST OF MATERIALS**  
**P.C. BOARD ASS'Y**  
**CONNECTOR CARD**  
(Ref: Ass'y No. 63015104 - 4001, Rev. C)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63015003-2001	PC BD AW CONNECTOR CARD 101AL	1
2	63015116-2001	HEAT SINK CONNECTOR CARD	1
3	63015118-2001	BAR STIFFENER	1
4	22107002-1001	CAP ELECTROLYTIC 100UF 25V	1
5	21103003-1001	CAP CERAMIC DISC .01UF 1KV	3
6	22108001-1001	CAP ELECTROLYTIC 1000UF 35V	2
7	22206002-1001	CAP ELECTROLYTIC 20UF 25V	2
9	38052350-1001	DIODE ZENER IN5235	1
9A	38052351-1001	DIODE ZENER IN5235A	A/R
9B	38052352-1001	DIODE ZENER IN5235B	A/R
10	38040020-1001	DIODE S1 RECTIFIER IN4002	4
11	38047420-1001	DIODE IN4742	2
12	38052460-1001	DIODE ZENER IN5246	2
12A	38052461-1001	DIODE IN5246A	A/R
12B	38052462-1001	DIODE IN5246B	A/R
15	39030018-1001	FUSE 1/2 AMP	2
16	31230037-1001	CONNECTOR EDGE 44 PIN	4
17	31230011-1001	CONNECTOR EDGE 20 PIN	1
19	41101926-1001	RES CARBON 100 OHM 1/4W 10%	3
20	41472926-1001	RES CARBON 4.7 K 1/4W 10%	1
21	41103926-1001	RES CARBON 10 K 1/4W 10%	4
22	41331026-1001	RES CARBON 330 OHM 2W 10%	2
24	35203090-1001	VOLTAGE REGULATOR	1
24A	35207800-1001	VOLTAGE REGULATOR WA7805	A/R
25	38244420-1001	TRANSISTOR 2N4442	3
26	38200300-1001	TRANSISTOR TIP30	1
27	38200290-1001	TRANSISTOR TIP29	1
28	31350003-2001	FUSE CLIP	4
30	30050001-0001	THERMAL JOINT COMPOUND	A/R
32	39690010-2002	CABLE TIE 1/16-1 3/4 X 5 1/2	2
33	35000004-2005	WASHER-NYLON INSULATOR #4X3/16	2
34	34517187-2001	SCREW 4/40X9/16 PAN HD PHIL	4
35	34517247-2001	SCREW 4-40X3/4 PAN HD PHIL	2
36	34815007-2001	WASHER #4 INT TOOTH LOCK	18
37	34912007-2001	WASHER #4 FLAT	4
38	34712007-2001	NUT HEX 4/40	18
39	30000000-0001	INSULATING VARNISH	A/R
40	39690200-0009	TUBING TEFLON TFT 200 #9 NAT	A/R
41	34517167-2001	SCREW 4/40X1/2 PAN HD PHIL	10
44	30070000-0001	SOLDER	A/R
47	62000111-3001	WARNING DECAL FUSE RATING	1
48	34517287-2001	SCREW 4/40X7/8 PAN HD PHIL	2
50	39695333-2001	CABLE TIE DIA 1/16-5/8	2
51	31240456-2002	KEY POLARIZING BETWEEN CONTACT	4
52	21104000-1001	CAP CERAMIC DISC .1UF 25V	1
53	39690200-0018	TUBING TEFLON TFT 200 #18 NAT	A/R
REF	63015004-9001	PC BD DD CONNECTOR CARD 101AL	A/R

7-25



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
1	REVISED & REDRAWN PER EEC 7301075	6 AUG 76	[Signature]
2	REVISED PER EEC 730226781	12 FEB 77	[Signature]

1. 2F 5 (22 24)

SEE NOTE 3 (2)

1. 2F 5  
2. 3. 3 2N5064  
3. 1. 2F 5  
4. 1. 2F 5  
5. 1. 2F 5

WIRE TABLE		
WIRE COLOR	TERMINAL NO.	WHS NO.
BROWN	8	*22
GREEN	23	*22
ORANGE	28	*22
YELLOW	29	*22
GREEN	25	*22
BLUE	64	*22
VIOLET	17	*22
RED	28	*16
RED	29	*16
BLACK	20	*22
WHT/BRN	26	*22
WHT/RED	23	*22
WHT/LEN	27	*22
WHITE	24	*22
WHT/VIO	25	*22

REFERENCE DRAWINGS  
LIST OF MATERIALS 63011021130  
AIR WAGER MASTER 63011021 REVISION 9  
SCHEMATIC DIAGRAM 63011021

- 1. WITH HARNESS (NOT FORM) NOT USED
  - 2. WITHOUT HARNESS (PART) NOT USED
  - 3. WITH HARNESS (600) NOT USED
  - 4. WITHOUT HARNESS (600) NOT USED
- FOR DASH NO. SEE LIM  
(SEE SHEET 2)

PRODUCTION  
NUMBER BY 200 ONLY

THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF CENTRONICS, 6000 UNIVERSITY DRIVE, FORT WORTH, TEXAS 76102

UNLESS OTHERWISE SPECIFIED		APPROVAL	
6301106	PCBA	DESIGNED BY	DATE
6301100	122	CHECKED BY	DATE
6301120	102A	CHKD. BY	DATE
6301124	102A	DATE	DATE
6301521	101A	DATE	DATE
63015100	101A	DATE	DATE
63012370	101A	DATE	DATE
63002220	101	DATE	DATE
63002220	101	DATE	DATE
63002220	101	DATE	DATE

**CENTRONICS**  
DATA COMPUTER CORP.  
11000 UNIVERSITY DRIVE  
FORT WORTH, TEXAS 76102

PCBA BOARD ASSEMBLY  
SERIES 100  
SERIES 100  
SERIES 100

2 V

DO NOT SCALE PRINT

Figure 7-19. COMPONENT BOARD ASSEMBLY, MOTOR CONTROL

REV. E

LIST OF MATERIALS  
MOTOR CONTROL 100 SERIES  
(Reference: Ass'y Dwg. No. 63011130 - 4005, Rev. G)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63011021-2001	PC BD AW MTR CTRL	1
2	63002380-2001	BRACKET MOUNTING	1
3	36600004-2004	STANDOFF LCBS-8 PLASTIC	4
5	22106002-1001	CAP ELECIROLYTIC 10UF 25V	2
6	21104001-1001	CAP CERAMIC DISC .1UF 16V	3
7	22107002-1001	CAP ELECTROLYTIC 100UF 25V	1
8	21104002-1001	CAP CERAMIC DISC .1UF 500V	1
10	38100904-1001	DIODE WG904	1
11	38040020-1001	DIODE S1 RECTIFIER IN4002	4
13	37220015-1001	PHOTOTRANSISTOR CA2-55	1
13A	37220016-1001	PHOTOTRANSISTOR MCA2-55	A/R
14	35474121-1001	INTEGRATED CIRCUIT 74121	1
15	35205550-1001	INTEGRATED CIRCUIT NE555	1
16	35474040-1001	INTEGRATED CIRCUIT 7404	1
17	35474100-1001	INTEGRATED CIRCUIT 7410	1
19	38200002-1001	TRANSISTOR SCR	1
19A	38200146-1001	TRANSISTOR SC146	A/R
20	38200001-1001	TRANSISTOR SCR	1
22	41221926-1001	RES CARBON 220 OHM 1/4W 10%	1
23	41102926-1001	RES CARBON 1 K 1/4W 10%	3
24	43153055-1001	RES WW 15K 5W 5%	1
25	41393926-1001	RES CARBON 39 K 1/4W 10%	1
26	41684926-1001	RES CARBON 680 K 1/4W 10%	1
27	41101025-1001	RES CARBON 100 OHM 2W 5%	1
28	41510015-1001	RES 51 OHM 1W 5%	1
29	41101946-1001	RES CARBON 100 OHM 1/2W 10%	1
30	41105926-1001	RES CARBON 1 MEG 1/4 W 10%	1
31	43502035-1001	RES WW 5K 3W 5%	1
32	30070000-0001	SOLDER	A/R
34	63011149-4001	HARNESS ASSEMBLY	1
35	63002590-4001	HARNESS ASSY RETROFIT 101 LONG	1
40	63011137-2001	COVER MTR CTRL	1
45	34517107-2001	SCREW 4/40X5/16 PAN HD PHIL	1
46	34912004-2001	WASHER #4 FLAT NYLON	1
47	30000000-0001	INSULATING VARNISH	A/R
48	34712007-2001	NUT HEX 4/40	1
REF	63011022-9001	PC BD DD MTR CTRL	A/R
REF	63011131-9001	SCHEM DIAGRAM MTR CTRL	A/R



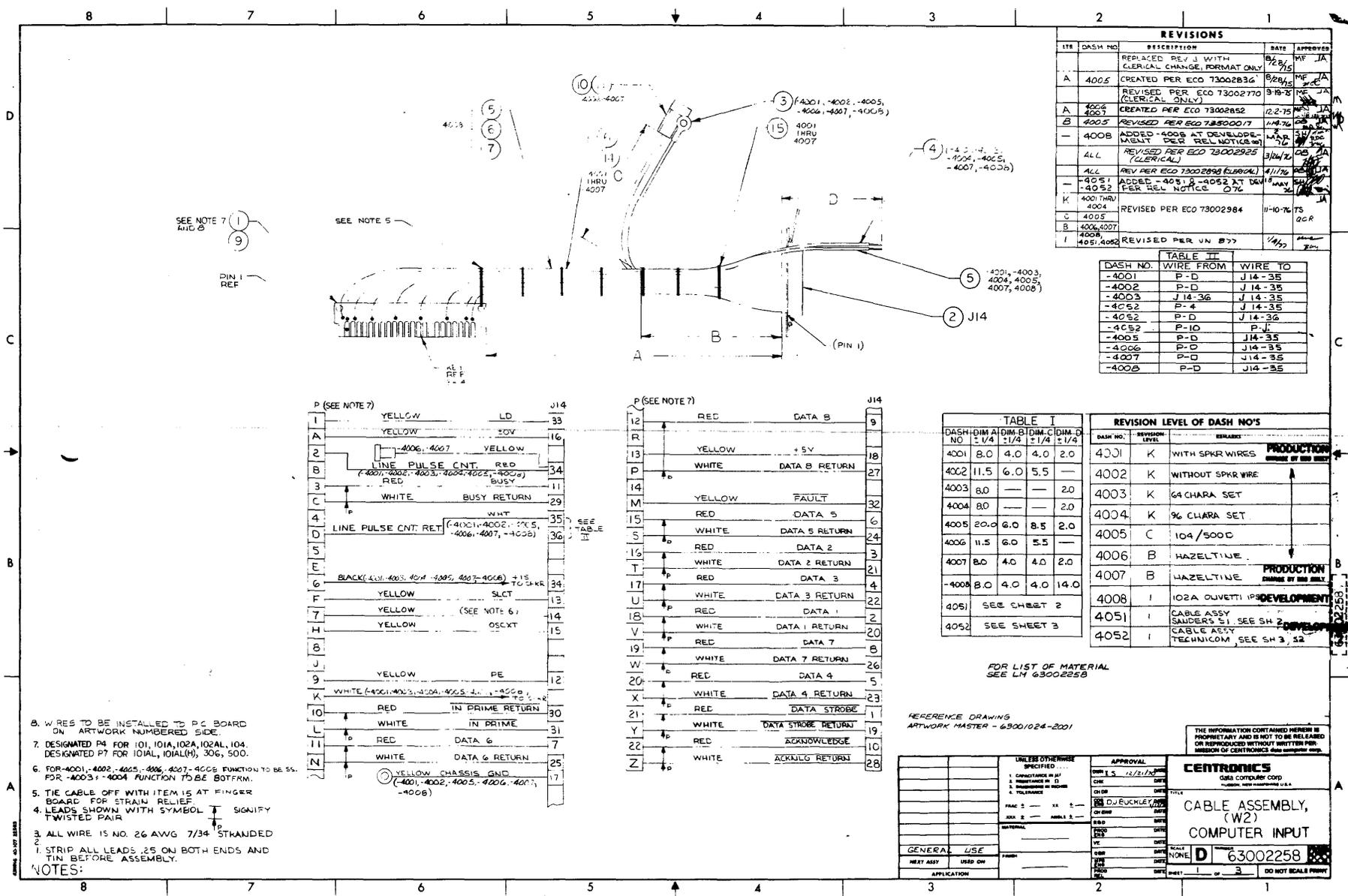
LIST OF MATERIALS  
ELECTRONIC CAVITY ASSEMBLY  
(Ref: Ass'y No. 63015105 - 4001, Rev. L)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63002227-5001	CHASSIS ASSY ELEC CAVITY	1
2	63002332-4001	COMP BD ASSY CONNECTOR BD 101A	1
3	63002237-5001	CLAMP CAPACITOR 101/101A	1
4	63002353-2001	SPEAKER BRKT 101/101A	1
6	30470000-1001	SPEAKER 8 OHM .5W 3.0SQ	1
7	33400000-2001	RIVET DOME HD MDRL .125D X.25L	2
9	63002252-4001	POWER CABLE ASSY W3	1
9A	63002494-4001	POWER CABLE ASSY W3 110V	A/R
11	39030012-1001	FUSE GL .25DIA 8A SLOW 1.25L	1
12	22229000-1001	CAP CYL 22000UF 50V -10+75%	1
13	22828000-1001	CAP CYL 8200UF 50V -10+75%	1
14	43471056-1001	RES WW 470 OHM 5W 10%	1
15	38125021-1001	DIODE BRIDGE	1
16	38040020-1001	SEMICOND DIODE TBAX 1N4002	1
17	39030002-1001	FUSE GL .25DIA 2A 1.25L	2
18	39030011-1001	FUSE GL .25DIA 3A 250V 1.25L	1
19	39030004-1001	FUSE GL .25DIA 5A SLOW 1.25L	1
20	31350000-2001	FUSEHOLDER PNL MTG 250V 15A	5
22	36150001-2004	CLAMP CABLE .312D PLSTC	1
23	31460014-2003	TERM RING INSUL #10 22-18AWG	2
27	34517127-2001	SCR PNH REC 4-40X.38L	4
28	34517287-2001	SCR PNH REC 4-40X.87L	1
30	34517207-2001	SCR PNH REC 4-40X.62L	16
32	34527087-2001	SCR PNH REC 6-32X.25L	1
34	34712007-2001	NUT HEX 4-40 X MDM THK	25
37	34912007-2001	WSHR FLAT #4X.00 OD	2
39	34815007-2001	WSHR LOCK INTL TOOTH #4	25
40	34517107-2001	SCR PNH REC 4-40X.31L	2
42	30070000-0001	SOLDER 60/40 .0320 WIRE	A/R
43	30000000-0001	VARNISH INSULATING RED	A/R
49	63011146-5001	STRAP BRKT ASSY 101/101A 102A	2
54	63011151-5002	FUSE BRKT & FLTR ASSY 101 SER	1
57	31460013-2001	TERM RING INSUL #6 16-14AWG	1
58	34517087-2001	SCR PNH REC 4-40X.25L	4
59	39620006-2003	WRAP HARNESS .18-1.5DIA PLSTC	.7
60	39690011-2002	STRAP CABLE SELF MTG 1.75BDL	1
REF	63002267-9001	WIRING DIAG ELECTRONICS CAVITY	A/R
REF	63004104-9001	WIRING DIAG ELECTRONICS CAVITY	A/R



**LIST OF MATERIALS  
HARNESS ASSEMBLY (W1)  
(Ref: Ass'y No. 63015115 - 4001, Rev. F)**

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	31340007-1001	CONN RECEPT W/EARS 15P .093	1
2	31240020-2004	PIN TERMINAL FEMALE	17
3	39640000-0008-2	WIRE TYPE E 18AWG RED	A/R
4	39640000-0009-0	WIRE TYPE E 16AWG BLACK	A/R
5	39640000-0009-9	WIRE TYPE E 16AWG WHITE	A/R
6	39690000-0002	TAPE LACING BLACK .010X1/16W	A/R
7	31460014-2003	TERM,RING,INS,22-18AWG,NO.10	4
8	30070000-0001	SOLDER	A/R
9	36550002-3001	WIRE MARKER NO 1	2
10	36550002-3012	WIRE MARKER NO 12	2
11	36550002-3070	WIRE MARKER NO 70	2
12	31350001-2001	FUSE HOLDER IN-LINE	1
13	31460002-2003	SPLICE INSULATED 18-22 AWG	1
15	31340008-1002	CONN RECEPT 12P .093	1
17	31460013-2003	TERM,RING,INS,16-14AWG,NO.10	1
18	36550002-3002	WIRE MARKER NO 2	2
19	36550002-3003	WIRE MARKER NO 3	2
20	36550002-3004	WIRE MARKER NO 4	2
21	36550002-3005	WIRE MARKER NO 5	2
22	36550002-3006	WIRE MARKER NO 6	2
23	36550002-3007	WIRE MARKER NO 7	2
24	36550002-3008	WIRE MARKER NO 8	2
25	36550002-3009	WIRE MARKER NO 9	2
26	36550002-3010	WIRE MARKER NO 10	2
27	36550002-3071	WIRE MARKER NO 71	2
REF	63015120-9001	SCHEM DIAG PWR CONNECT 101 AL	A/R



REVISIONS				
ITA	DASH NO.	DESCRIPTION	DATE	APPROVED
		REPLACED REV J WITH CERCIAL CHANGE, FORMAT ONLY	8/28/75	WF JA
A	4005	CREATED PER ECO 73002836 REVISED PER ECO 73002770 (CERICAL ONLY)	9/28/75	ME JA
A	4004	REVISED PER ECO 73002852 (CERICAL ONLY)	9/18/75	ME JA
B	4005	REVISED PER ECO 73002852 (CERICAL ONLY)	12-2-75	ME JA
-	4008	ADDED 4008 AT DEVELOPE- MENT DEP REL NOTICE 07	1/14/76	ME JA
-	ALL	REVISED PER ECO 73002925 (CERICAL)	3/10/76	ME JA
-	ALL	REV PER ECO 73002898 (CERICAL)	4/11/76	ME JA
-	4051	ADDED 4051 AT DEVELOPE- MENT DEP REL NOTICE 07	1/14/76	ME JA
-	4052	ADDED 4052 AT DEVELOPE- MENT DEP REL NOTICE 07	1/14/76	ME JA
K	4001 THRU 4004	REVISED PER ECO 73002984	11-10-76	TS
C	4005			
B	4006, 4007			
I	4008	REVISED PER UN 877	1/1/77	ME JA

TABLE III		
DASH NO.	WIRE FROM	WIRE TO
-4001	P-D	J14-35
-4002	P-D	J14-35
-4003	J14-36	J14-35
-4052	P-4	J14-35
-4052	P-D	J14-36
-4052	P-10	P-J
-4005	P-D	J14-35
-4006	P-D	J14-35
-4007	P-D	J14-35
-4008	P-D	J14-35

TABLE I				
DASH NO	DIM A ±1/4	DIM B ±1/4	DIM C ±1/4	DIM D ±1/4
4001	8.0	4.0	4.0	2.0
4002	11.5	6.0	5.5	—
4003	8.0	—	—	2.0
4004	8.0	—	—	2.0
4005	20.0	6.0	8.5	2.0
4006	11.5	6.0	5.5	—
4007	8.0	4.0	4.0	2.0
-4008	8.0	4.0	4.0	14.0
4051	SEE SHEET 2			
4052	SEE SHEET 3			

REVISION LEVEL OF DASH NO'S			
DASH NO.	REVISION LEVEL	REMARKS	PRODUCTION CHANGE BY WHO
4001	K	WITH SPKR WIRES	PRODUCTION
4002	K	WITHOUT SPKR WIRE	
4003	K	64 CHARA SET	
4004	K	96 CHARA SET	
4005	C	104 / 5000	
4006	B	HAZELTINE	
4007	B	HAZELTINE	PRODUCTION CHANGE BY WHO
4008	I	102A OLIVETTI IP	DEVELOPMENT
4051	I	CABLE ASSY SANDERS S1	DEVELOPMENT
4052	I	CABLE ASSY TECHNICON	DEVELOPMENT

FOR LIST OF MATERIAL SEE LH 63002258

REFERENCE DRAWINGS ARTWORK MASTER - 63001024-2001

UNLESS OTHERWISE SPECIFIED:		APPROVAL	
1. CONDUCTANCE IN PLY	DATE: 12/21/76	DESIGNER: S	DATE: 12/21/76
2. DIMENSIONS IN ( )	CHK: ME	DATE: 12/21/76	
3. DIMENSIONS IN [ ]	CHK: ME	DATE: 12/21/76	
4. TOLERANCES	CHK: ME	DATE: 12/21/76	
MATERIAL		DUPLICATE	
FRAC: 1/8 1/4 1/2 3/4 1	DATE: 12/21/76	CHK: ME	DATE: 12/21/76
ANG: 30 45 60 90 120 150 180	DATE: 12/21/76	CHK: ME	DATE: 12/21/76
FINISH: NONE	DATE: 12/21/76	CHK: ME	DATE: 12/21/76
GENERAL USE	DATE: 12/21/76	CHK: ME	DATE: 12/21/76
NEST ASSY	DATE: 12/21/76	CHK: ME	DATE: 12/21/76
APPLICATION	DATE: 12/21/76	CHK: ME	DATE: 12/21/76

**CENTRONICS**  
CABLE ASSEMBLY, (W2)  
COMPUTER INPUT  
63002258

Figure 7-22. INPUT CABLE ASSEMBLY

LIST OF MATERIALS  
 CABLE ASS'Y DATA INPUT  
 (Ref: Ass'y No. 63002258 - 4001, Rev. J)

ITEM	PART NO.	NOMENCLATURE	QTY PER
1	63001024-2001	PC BD AW PARALLEL TIMER FIN BD	1
2	31310019-1016	CONN RCPT PNL 36POSN NON-PLZ	1
3	31460015-2003	TERM RING INSUL #8 26-22AWG	1
4	39648505-0004-0	WIRE TYPE B 26AWG BLACK	2.1
5	39648505-0004-9	WIRE TYPE B 26AWG WHITE	2
6	39648505-0004-4	WIRE TYPE B 26AWG YELLOW	11
9	30070000-0001	SOLDER 60/40 .032D WIRE	A/R
14	39660015-0001	CABLE 1TW PR 26AWG	10.1
15	39695231-2001	STRAP CABLE ADJ LKG .625BDL	6
REF	63001025-9001	PC BD DD PARALLEL TIMER FIN BD	





## SECTION 8

### DRAWINGS AND PARTS LISTS, MECHANICAL

This section contains drawings and parts lists for the major mechanical assemblies in the 101 Series printer. Two revision levels are shown on each mechanical drawing and parts list page:

1. **The page revision level**, located in the lower outside corner of any page, indicates at what revision of the manual that particular page was changed.
2. **The revision level** of the drawing to the parts list is located in the upper right-hand corner of the artwork. This revision method will start at AA and be updated on both the drawing and parts list whenever there is a change affected.

A reference number attached to each mechanical drawing and parts list is shown in the following example:

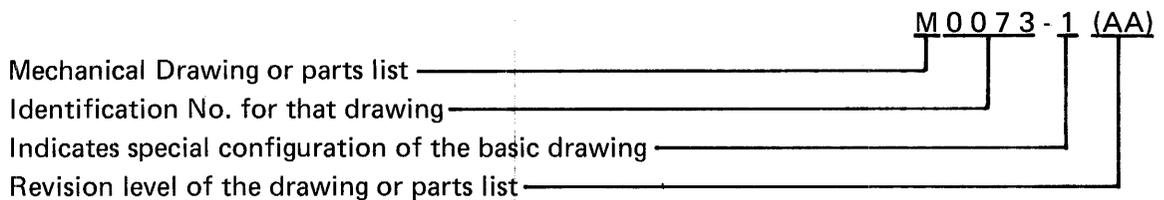
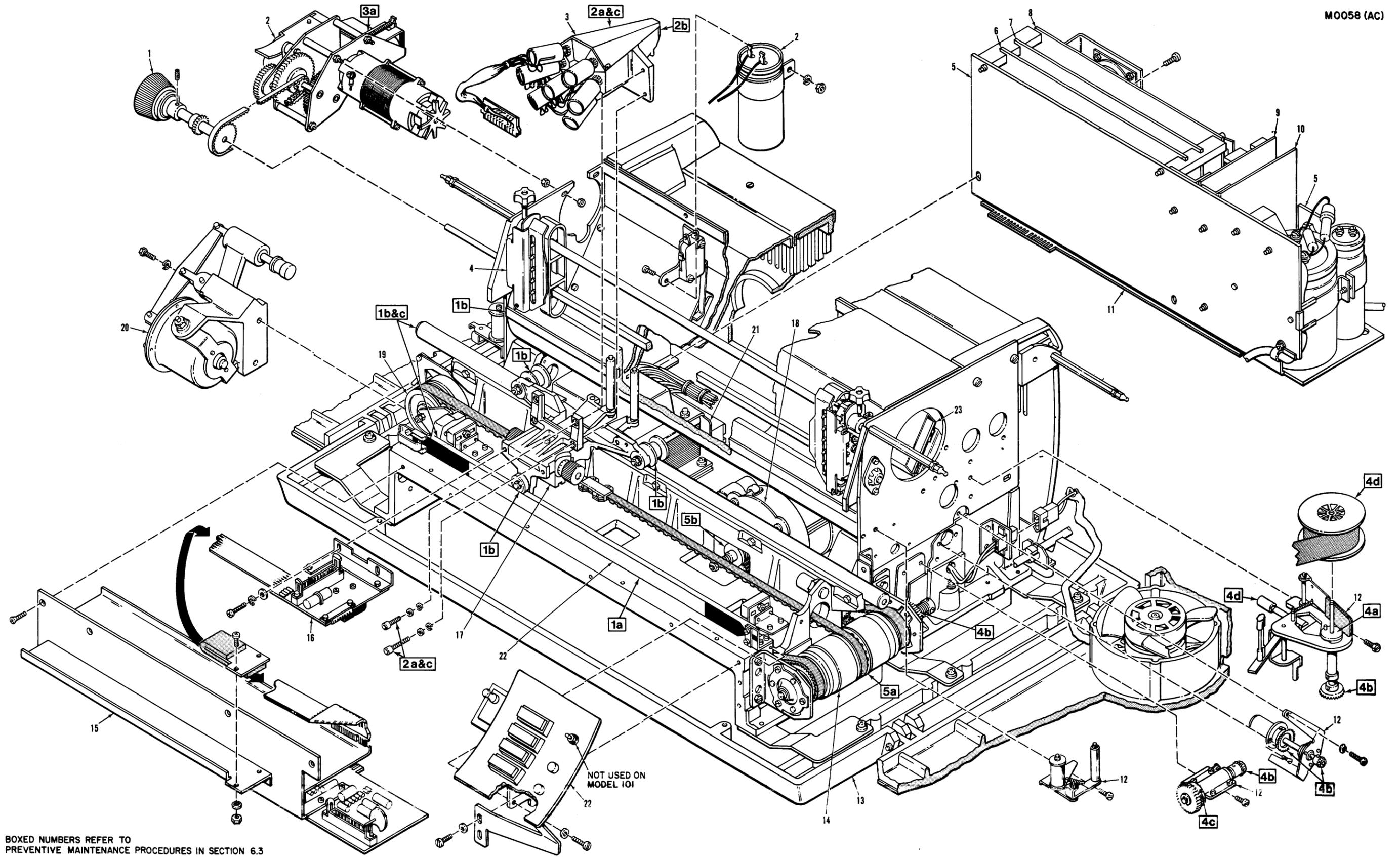


FIGURE	FIGURE DESIGNATION	DESCRIPTION
8-1	—	Mechanical Subassemblies, Series 101
8-2	A	Cover Assembly
8-3	HA	Carriage Mechanism
8-4	HB	Drive Mechanism, Part 1
8-5	HB	Driving Mechanism (Preload Clutches), Part 2
8-6	HC	Spring Drum
8-7	HD	Damper
8-8	HE	Frame
8-9	HF	Paper Feed Mechanism
8-10	HG	Pin Feed Units (Left and Right)
8-11	HH	Form Feed Mechanism
8-12	HI	Ribbon Feed Mechanism
8-13	HJ	Electrical Hardware (No drawing included)
8-14	—	Print Head and Associated Assemblies





BOXED NUMBERS REFER TO PREVENTIVE MAINTENANCE PROCEDURES IN SECTION 6.3

Figure 8-1. MECHANICAL SUBASSEMBLIES SERIES 101

Figure 8-1. MECHANICAL SUBASSEMBLIES, SERIES 101

M0058 (AC)

Reference Number	Figure	Part Name	Removal/Replacement
1	8-9	Paper Feed Mechanism (HF)	Para. 5.2.7.2.
2	8-11	Form Feed Mechanism (HH)	5.2.9.2
3	8-14	Print Head & Associated Ass'ys	5.2.13.2.A
4	8-10	Pin Feed Units (HG)	5.2.8.2.
5	7-25 (101/101A), 7-20 (101AL)	Electronics Cavity Ass'y	—
*6	7-17 (101/101A)	Electronic Card No. 1	—
*7	7-18 (101/101A)	Electronic Card No. 2	—
8	8-1, item 8 (101/101A), 7-13 (101AL)	Interface Card Option	—
*9	7-20 (101/101A), 101AL (None)	± 12-Volt Regualtor	—
*10	7-19 (101/101A), 7-14 (101AL)	+5Volt Regulator	—
11	7-21 (101/101A), 7-18 (101AL)	Connector Board Ass'y	—
12	8-12	Ribbon Feed Mech. (HI)	5.2.10.2
13	8-2	Cover Ass'y (A)	5.2.1.2
14	8-5	Forward Reverse Clutches (Preload) (HB) (Part 2)	5.2.3.2.E
15	7-22 (101/101A), 7-16 (101AL)	Power Driver Board Ass'y	5.2.13.2.C
16	7-23 (101/101A), 7-17 (101AL)	Video Amplifier & Cable Ass'y	5.2.13.2.D
17	8-3	Carriage Unit (HA)	5.2.2.2.B
18	8-4	Driving Mechanism (HB) (Part 1)	5.2.3.2
19	8-6	Spring Drum (HC)	5.2.4.2
20	8-7	Damper (HD)	5.2.5.2
21	8-13	Electrical Accessories (HJ)(Includes Multitap Xformer)	5.2.11
22	8-8	Frame (HE)	5.2.6.2
23	7-29(101/101A), 7-19 (101AL)	Motor Control Ass'y 63011130-4005 (Series 101) with harness 63002593	—

\*NOTE: Items 6, 7, 9 and 10 is contained on single logic card 63015102 of Model 101AL (Figure 7-14,7-15).

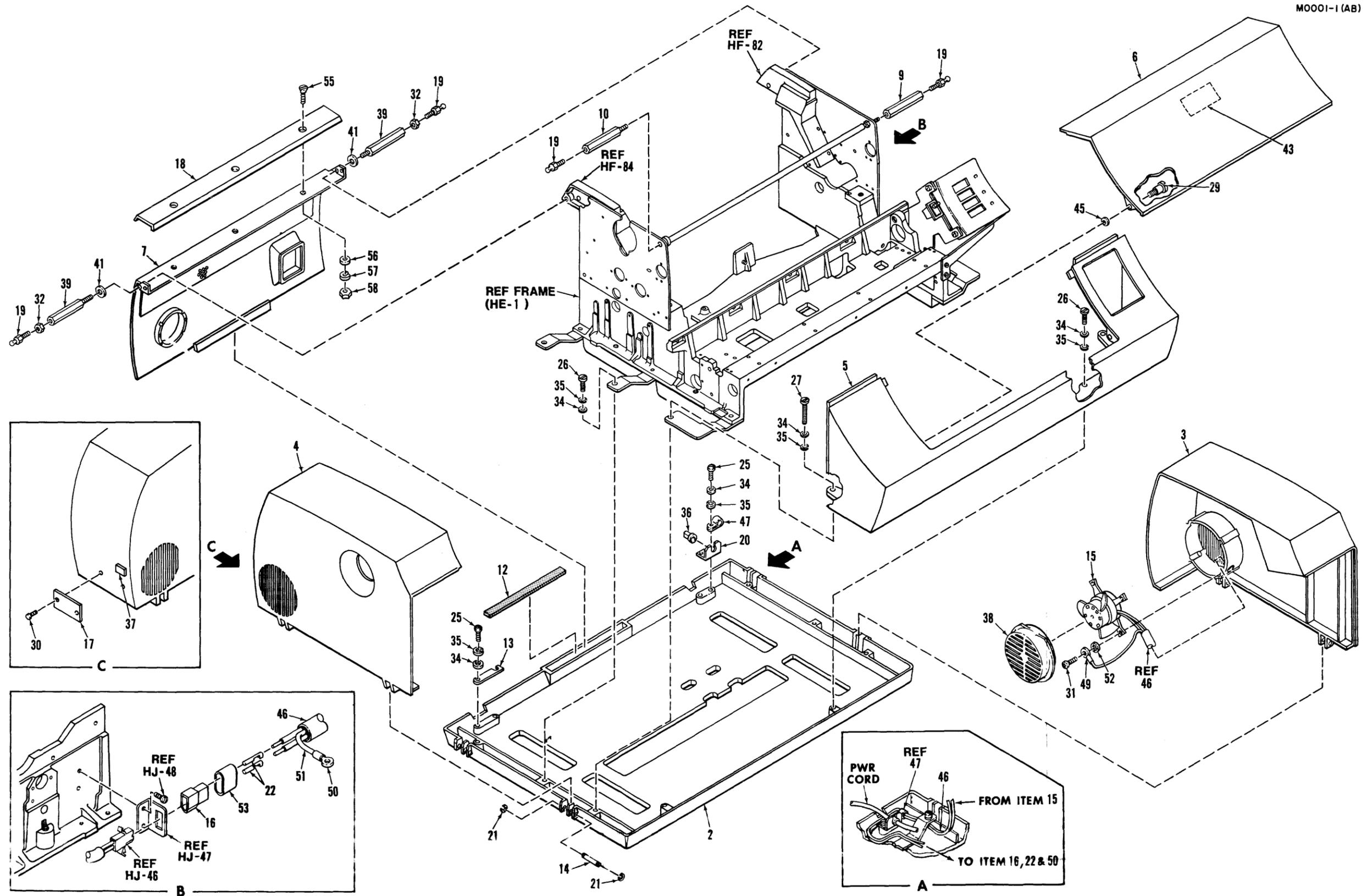


Figure 8-2. COVER ASSEMBLY - A

Figure A. COVER ASSEMBLY 63002354- XXXX

M0001-1 (AB)

Item Number	Part Number	Description	Quantity
1	525151001-2001	Basic Printer Machine (Shown for Reference only).	1
2	63002334-xxxx	Cover Ass'y,Base (Non-Slotted)	1
3	63002336-xxxx	Cover Ass'y,Right	1
4	63002335-xxxx	Cover Ass'y, Left	1
5	63002337-xxxx	Cover Ass'y, Front	1
6	63002338-xxxx	Cover Ass'y, Top (Pivot)	1
7	63002339-xxxx	Cover Ass'y, Rear	1

The above Cover assembly sub-units are assembled with parts contained in the two following kits designated A and B (6001/6002).

Kit A. Cover Assembly Mounting Hardware 63002601-6001 (Rev. Level F)

9	63002356-2001	Standoff, Ball Stud	1
10	63002357-2001	Standoff, Ball Stud	1
13	63212244-5001	Cable Clamp Ass'y	1
16	31305451-1002	Connector, Plug 2-position w/o ears	1
19	33164087-2001	Stud (0.187),ball (6-32 ext. THD)	4
20	63002371-2001	Bracket, Strain Relief	1
25	34527125-2001	Screw, 6-32 x 3/8-in.lg.,Pan Hd.	4
26	34527165-2001	Screw, 6-32 x 1/2-in. lg, Pan Hd.	6
27	34527245-2001	Screw, 6-32 x 3/4-in. lg, Pan Hd.	2
32	34722005-2001	Nut, 6-32, Hex	2
34	34922007-2001	Washer, No. 6, Flat	12
35	34828007-2001	Washer, No. 6, Split Lock	12
36	36150003-2001	Bushing, Clamp, Strain Relief (0.360 Dia.)	1
37	62000109-3001	Nameplate, UL	1
39	63002355-2002	Standoff, Ball Stud	2
45	34000071-2013	Washer, Flat, No. 10 x 0.3540D	2
46	39690001-0006	Sleeving, Shrink, 1/4-in. ID	AR
47	36150001-2005	Cable Clamp, 3/8	1
49	31460014-2001	Ring, Terminal, Insul, 22-18 AWG, 2 No. 6	2

Item Number	Part Number	Description	Quantity
50	31460014-2003	Ring, Terminal, Insul,22-18 AWG,No.10	1
51	39648505-0008-5	Wire, Type B, 18 AWG, Green	AR
52	34815005-2001	Washer, Int Tooth, Lock, No. 4	1
53	39690001-0009	Sleeving Shrink, 3/4-in. ID, BLK.	AR
Kit B. Printer/Cover Assembly Hardware Kit 63002601-6002 (Rev. Level —)			
12	63002324-2001	Rubber Pad	1
14	63002358-2001	Dowel Pin	4
15	32810000-2001	Fan	1
18	525513001-2001	Decorating Plate	1
21	33115103-2025	Ring, Retaining	8
22	31240020-2002	Pin, Terminal, Male	2
29	34000024-2001	Screw, 10-32,Shoulder	2
30	33723717-2010	Screw, 4-24 x 5/16-in. Lg, Pan Hd.,Self-Tap	2
31	33723717-2016	Screw, 4-24 x 1/2-in. Lg,Pan Hd.,Self-Tap	4
38	63002395-2001	Fan Guard	1
41	34932007-2001	Washer, Flat, No. 8	2
55	34312205-2001	Screw, 4-40 x 5/8-in. Flat/Phil/Hd.	3
56	34912005-2001	Washer, Flat, No. 4	3
57	34818005-2001	Washer, Split Lock, No. 4	3
58	34712005-2001	Nut. Hex, 4-40	3
17	62000179-6001	Kit, Serial No. Tag (Not an A or B Kit item) -- supplied with basic machine).	1
43	63002408-3001	Decal, Ribbon Change (Not an A or B kit item--supplied with basic machine).	1

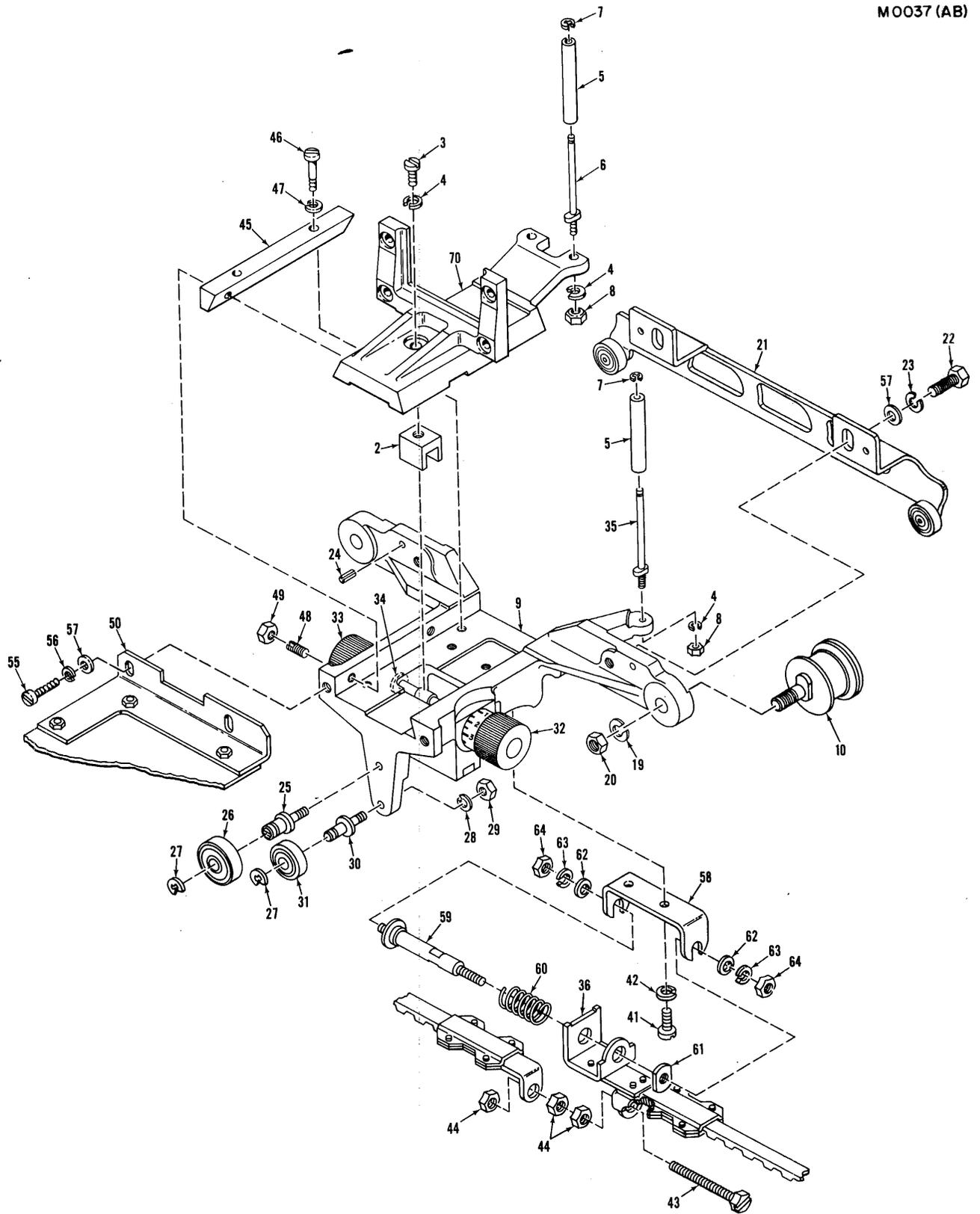


Figure 8-3. CARRIAGE MECHANISM – HA.

Figure HA. CARRIAGE MECHANISM

M0037 (AB)

Item Number	Part Number	Description	Quantity
HA-2	525002001-2001	Fork for head adjustment	1
HA-3	007400716-2001	Screw for HA-2	1
HA-4	028040247-2001	Spring washer for HA-3, 6, 35	3
HA-5	525003000-2001	Ribbon guide roller for head	2
HA-6	525004001-2001	Eccentric shaft for HA-5	1
HA-7	048020346-2001	Snap ring for HA-6, 35	2
HA-8	021400106-2001	Nut for HA-6, 35	2
	525005001-5001	Carriage Unit	1
		Note: This unit is assembled with parts covering reference number HA-9 and HA-10, also HA-19 through HA-35 and HA-41, 42, 57, 58.	
HA-9	525006001-5001	Carriage with control magnet	1
HA-10	525009001-2001	Guide roller unit (upper)	2
HA-19	028060247-2001	Spring Washer for HA-10	2
HA-20	021060106-2001	Nut for HA-10	2
HA-21	525016001-2001	Guide roller unit (lower)	1
HA-22	017061206-2001	Bolt for HA-21	2
HA-23	028060247-2001	Spring washer for HA-22	2
HA-24	047310642-2001	Spring pin for HA-21	2
HA-25	525020001-2001	Eccentric Axle for HA-26	1
HA-26	527242001-2001	Roller (upper) for HE-23	1
HA-27	048030346-2001	Snap ring for HA-25, 30	2
HA-28	028040247-2001	Spring washer for HA-25, 30	2
HA-29	021400106-2001	Nut for HA-25, 30	2
HA-30	525022001-2001	Axle for HA-31	1
HA-31	527243001-2001	Roller (lower) for HE-23	1
HA-32	525544001-2001	Head penetration knob	1
HA-33	525025001-2001	Head lock knob	1
HA-34	028040247-2001	Spring washer for HA-33	1
HA-35	525027001-2001	Shaft for HA-5	1
HA-36	525029001-5001	Main driving belt	1
HA-41	007300716-2001	Screw for HA-58	2
HA-42	028030247-2001	Spring washer for HA-41	2
HA-43	007064016-2001	Screw for HA-36	1
HA-44	021060106-2001	Nut for HA-43	3
HA-45	525047000-2001	Gib for HA-1	1
HA-46	007301416-2001	Screw for HA-45	2
HA-47	028030247-2001	Spring washer for HA-46	2
HA-48	011401016-2001	Set screw for HA-45	2
HA-49	021400106-2001	Nut for HA-48	2
50	63508104-2001	Bracket, Mtg., Video Amp. Board	1
HA-55	007400816-2001	Screw for item 50	2
HA-56	028040247-2001	Spring washer for HA-55	2
HA-57	025060236-2001	Flat washer for HA-22, 50	4
HA-58	525689001-2001	Holder (A) for HA-59	1
HA-59	525690001-2001	Shaft (A) for HA-36	1
HA-60	525716001-2001	Spring (S) for HA-36	1
HA-61	525691001-2001	Adjusting nut for HA-59	1
HA-62	025040236-2001	Flat washer for HA-59	2
HA-63	550719002-2001	Spring washer for HA-59	2
HA-64	021400106-2001	Nut for HA-59	2
70	529129001-2001	Head Bracket	1

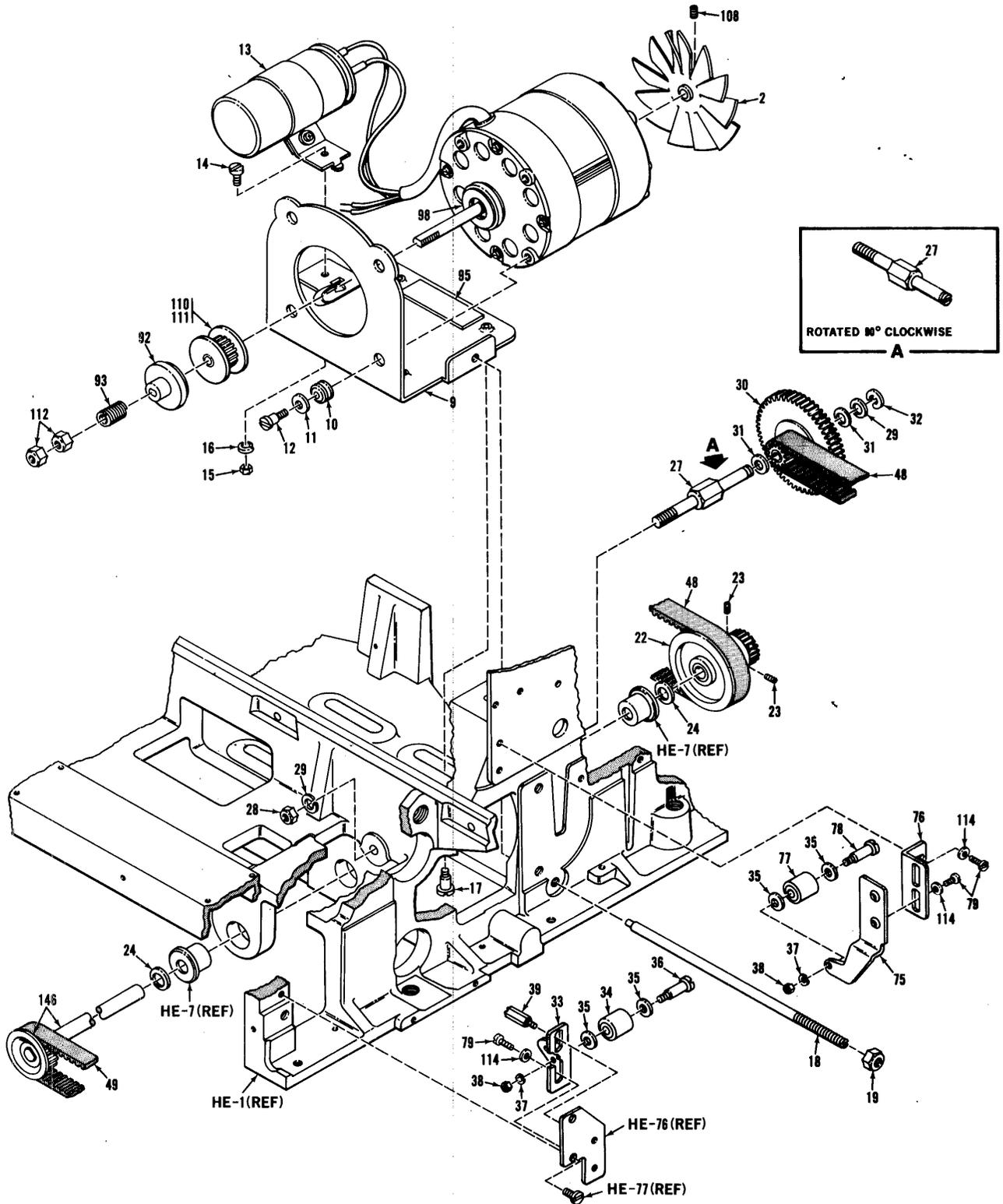


Figure 8-4. DRIVE MECHANISM – HB (PART 1), SERIES 101

Figure HB. DRIVE MECHANISM (PART 1)

M0003-1 (AB)

Item Number	Part Number	Description	Quantity
HB-2	527313001-5001	Main Motor Fan Blade, W/Set-Screw	1
HB-9	525059001-5001	Motor Bracket W/Pad	1
HB-10	510101001-2001	Grommet for HB-98	4
HB-11	510061001-2001	Washer for HB-10	4
HB-12	525063001-2001	Screw for HB-9	4
HB-13	525064001-1001	Capacitor Unit for HB-98	1
HB-14	007400716-2001	Screw for HB-13	1
HB-15	021400106-2001	Nut for HB-14	1
HB-16	028040247-2001	Spring Washer for HB-14	1
HB-17	525066001-2001	Screw for HB-9 and Frame	4
HB-18	525067001-2001	Adjusting bolt for HB-48	1
HB-19	021060106-2001	Nut for HB-18	1
HB-22	525069001-2001	Intermediate Pulley with Gear	1
HB-23	525745001-2001	Set-Screw for HB-22	2
HB-24	525071001-2001	Felt Washer for HB-146	2
HB-27	525075001-2001	Idle Shaft for HB-30	1
HB-28	021060106-2001	Nut for HB-27	1
HB-29	028060236-2001	Spring Washer for HB-27	1
HB-30	525076001-2001	Intermediate Gear for Forward Clutch	1
HB-31	525074001-2001	Felt Washer for HB-30	2
HB-32	048040346-2001	Snap Ring for HB-27	1
	525078001-5001	Tensioner Unit (Front)	1
		Note: This unit is assembled with parts covering from reference number HB-33 to HB-39.	
HB-33	525079001-2001	Tensioner Bracket (Front)	1
HB-34	525080001-2001	Tensioner	1
HB-35	511146001-2001	Felt Washer for HB-34	4
HB-36	525082001-2001	Axle for HB-34	1
HB-37	028030243-2001	Spring Washer for HB-36, 78	2
HB-38	021300106-2001	Nut for HB-36, 78	2
HB-39	525530001-2001	Screw for HB-33	1
HB-48	525672001-2001	Timing Belt (100XL)	2
HB-49	525671001-2001	Timing Belt (130XL)	1
HB	525741001-5001	Tensioner Unit (Rear)	1
		Note: This unit is assembled with parts covering from reference number HB-75 through HB-79, including HB-35.	
HB-75	525694001-2001	Tensioner Bracket (Rear) A	1
HB-76	525695001-2001	Tensioner Bracket (Rear) B	1
HB-77	525703001-2001	Tensioner (L)	1
HB-78	525696001-2001	Axle for HB-77	1
HB-79	007400616-2001	Screw for HB-75, 76	5
HB-92	525839001-2001	Motor Pulley Driver	1
HB-93	525749001-2001	Spring for HB-92	1
HB-95	525846001-2001	Cushion Rubber for HB-9	1
HB-98	525836001-5001	Main Motor W/Fan and Clutch Plate	1
HB-108	525748001-2001	Set-screw for HB-2	1
HB-110	527037001-5001	Motor Pulley (60Hz) (Metal)	1
HB-111	527035001-5001	Motor Pulley (50Hz) (Metal)	1
HB-112	021060306-2001	Nut for HB-93	1
HB-114	025040236-2001	Washer for HB-79	5
HB-146	529574001-2001	Intermediate Shaft W/Pulley (Riveted)	5



Figure HB. DRIVE MECHANISM (PART 2)

M0039-1 (AA)

Item Number	Part Number	Description	Quantity
—	529202001-5001	Pre-load Clutch, Complete NOTE: This unit is assembled with parts covering stem No.'s 50, 60, 61, 63, 64, 109, including Pre-load Clutch Unit Sub. Ass'y (forward and reverse).	1
HB-50	525089001-2001	Shaft for Clutches (with keyway)	1
HB-51	525090001-5001	Bushing Bracket Ass'y	2
HB-52	525752001-2001	Screw for HB-51	4
HB-53	525092001-5001	Bushing Unit for HB-50	2
HB-54	007400616-2001	Screw for HB-53	6
HB-60	525711001-2001	Pulley for Forward and Reverse Clutch	2
HB-61	525744001-2001	Set-Screw for HB-60	4
HB-62	525102001-2001	Sleeve for HB-50	2
HB-63	525104001-2001	Pulley for Main Belt (HA-36)	1
HB-64	525103001-2001	Key for HB-63, 141	3
HB-96	025060236-2001	Washer for HB-52	4
HB-109	525923001-2001	Spacer for HB-140 (Reverse Clutch Side)	1
—	527378001-5001	Pre-Load Clutch Unit Sub. Ass'y (forward, reverse) NOTE: This unit is assembled with parts covering item no. 140, 141, 142, 143 and 144.	2
HB-140	525095001-2001	Clutch Field Ass'y	1
HB-141	527376001-2001	Drive Clutch Rotor	1
HB-142	527329001-2001	Splined Armature	1
HB-143	527328001-2001	Hub	1
HB-144	527327001-2001	Clutch Spring	1

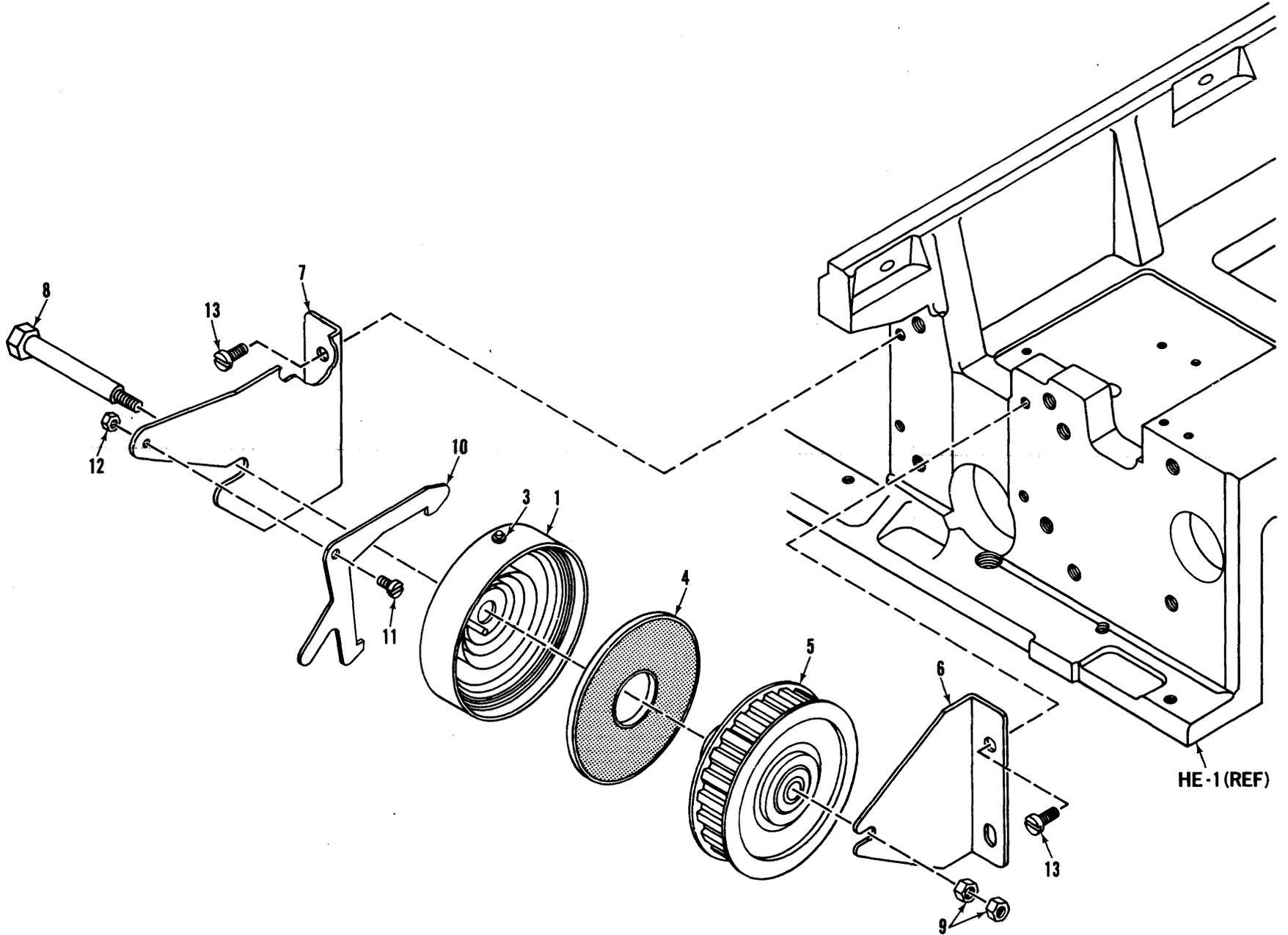


Figure 8-6. SPRING DRUM – HC

Figure HC. SPRING DRUM

M0035 (AA)

Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity
	525108001-5001	Spring drum complete unit	1	HC-6	525120001-2001	Bracket (front) for HC-1	1
		Note: This is assembled with parts covering reference number HC-1 and HC-3 through HC-13.		HC-7	525121001-2001	Bracket (rear) for HC-1	1
HC-1	525636001-5001	Spring drum W/main spring	1	HC-8	525119001-2001	Shaft for HC-1,5	1
HC-3	048015346-2001	Snap ring for HC-1	1	HC-9	021400106-2001	Nut for HC-8	2
HC-4	525637001-5001	Shielding plate for HC-1	1	HC-10	525122001-2001	Pawl for HC-1	1
HC-5	525115001-5001	Pulley for HC-1	1	HC-11	007300616-2001	Screw for HC-10	1
				HC-12	021300106-2001	Nut for HC-11	1
				HC-13	007400516-2001	Screw for HC-6 , 7	4



Figure HD. DAMPER

M0036 (AA)

Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity
	527363001-5001	Damper complete unit	1	HD-20	525146001-2001	Pin for HD-17	1
		Note: This unit is assembled with the parts covering from reference number HD-1 to HD-12, HD-14 to HD-21, HD-23 to HD-25 and HD-27 through HD-34 , HD-37 and HD-38.		HD-21	525147001-2001	Pin for HD-2, 14	1
				HD-23	525148001-2001	Center screw for HD-1	1
				HD-24	021060106-2001	Nut for HD-23	1
				HD-25	028060247-2001	Spring washer for HD-24	1
HD-1	525124001-5001	Damper cylinder	1	HD-27	007300516-2001	Screw for HD-31	1
HD-2	525128001-2001	Piston rod	1	HD-28	028030247-2001	Spring washer for HD-27	1
HD-3	525547001-3001	Cushion rubber for HD-4	1	HD-29	525149001-2001	Screw for HD-22	2
HD-4	025100236-2001	Washer for HD-2	1	HD-30	028060247-2001	Spring washer for HD-29	2
HD-5	525129001-2001	Piston	1	HD-31	525661001-2001	Spring for HD-14	1
HD-6	525130001-3001	Packing	1		527318001-5001	Carriage stopper lever unit	1
HD-7	525131001-2001	Steel Washer for HD-6	1			Note: This unit is assembled with the parts covering from reference number HD-33, HD-34, and HD-38.	
HD-8	525132001-2001	Nut for HD-7	1	HD-33	525669000-2001	Damper cushion for HD-32	1
HD-9	045161806-2001	Split pin for HD-8	1	HD-34	525919001-2001	Cap for HD-33	1
HD-10	525133001-2001	Spring for HD-2	1	HD-37	527316001-5001	Frame for HD-1	1
HD-11	525134001-5001	Lid for HD-11	4	HD-38	527319001-2001	Carriage Stopper Lever	1
HD-12	007300416-2001	Screw for HD-11	4				
HD-14	525142001-2001	Arm, Pivot	1				
HD-15	525143001-2001	Pin for the HD-14, 32	1				
HD-16	048020346-2001	Snap ring for HD-15, 21	2				
HD-17	525144001-2001	Link for HD-14	1				
HD-18	525145001-2001	Pin for HD-14, 17	1				
HD-19	048030346-2001	Snap ring for HD-18, 20	2				

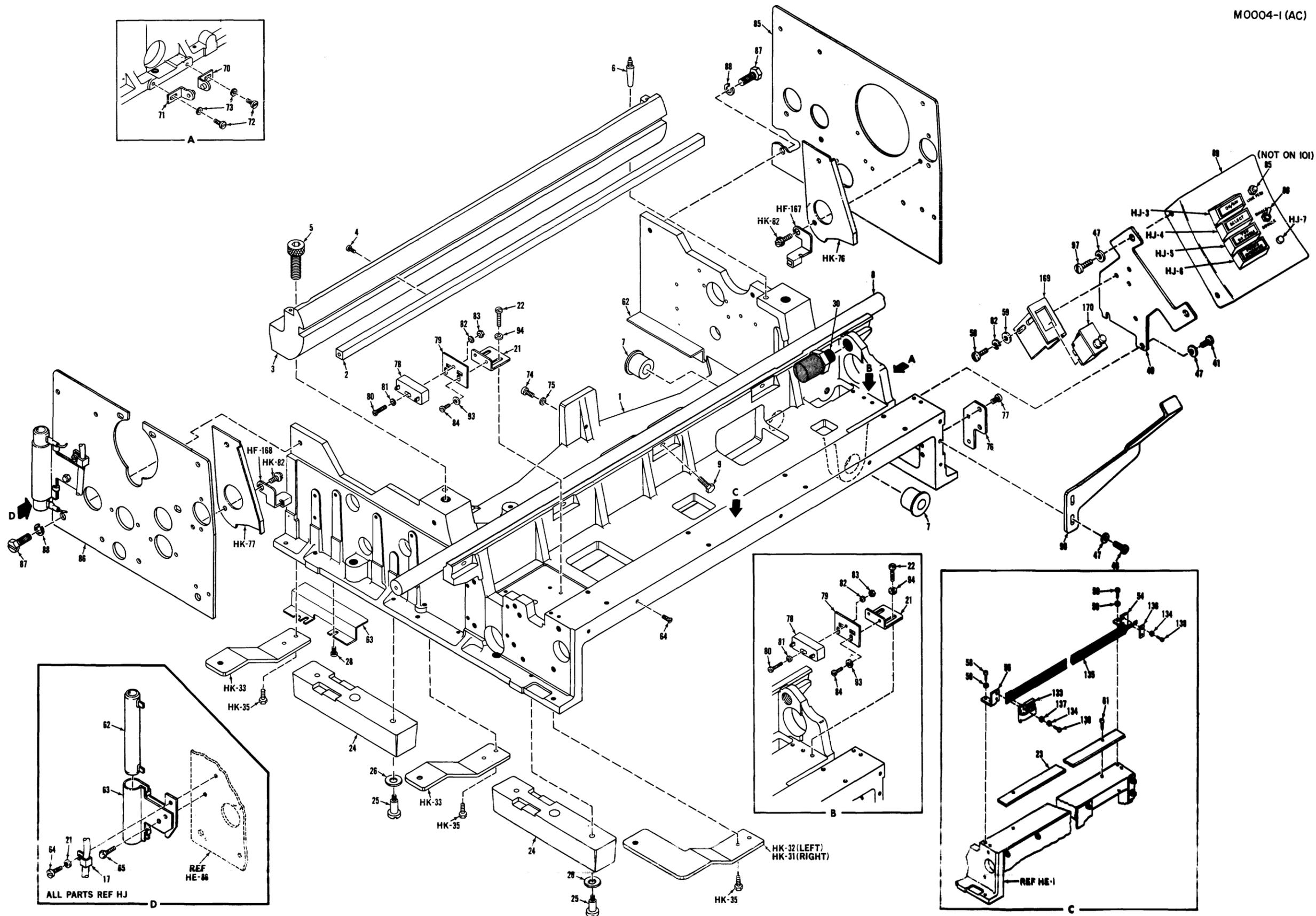


Figure 8-8. FRAME - HE

Figure HE. FRAME

M0004-1 (AC)

Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity
HE-1	525151001-5001	Frame	1	HE-81	025030133-2001	Washer for HE-78	1
HE-2	525762001-5001	Platen	1	HE-82	028030247-2001	Spring washer for HE-78, 171	1
HE-3	525761001-2001	Platen holder	1	HE-83	021300106-2001	Nut for HE-78	1
HE-4	007300716-2001	Screw for HE-2	9	HE-84	007300516-2001	Screw for HE-79	2
HE-5	018012826-2001	Bolt for HE-3	2	HE-85	525935001-2001	Chassis (right)	1
HE-6	525154001-2001	Locating bolt for HE-3	2	HE-86	525936001-2001	Chassis (left)	1
HE-7	525155000-2001	Bushing for HB-80	2	HE-87	525752001-2001	Bolt for HE-85, 86	4
HE-8	525866001-2001	Guide bar to carriage	1	HE-88	028060247-2001	Spring washer for HE-87	4
HE-9	017401416-2001	Bolt for HE-8	5	HE-89	525852001-2001	Operator panel (A)	1
HE-21	525169001-2001	Reed switch Holder	2	HE-90	525854001-2001	Support for HE-89	1
HE-22	007300716-2001	Screw for HE-21	4	HE-93	025030133-2001	Washer for HE-84	2
HE-23	525171001-2001	Guide plate for carriage	1	HE-94	025030236-2001	Washer for HE-22	2
HE-24	525181001-2001	Rubber feedt	4	HE-97	007400716-2001	Screw for HE-40	2
HE-25	525182001-2001	Screw for HE-24	8	133	63508140-2001	Clasp, timing fence	1
HE-26	025060335-2001	Washer for HE-25	8	134	34000032-2001	Lockwasher, 3 millimeters (alternate: 028030247)	4
HE-28	007300516-2001	Screw for HE-62, 63	4	135	63002440-1001	Flexible mylar timing fence	1
HE-30	527048001-5001	Carriage stopper right	1	136	63508106-1001	Clamp, timing fence	1
HE-40	525203001-2001	Operator panel holder	1	137	34000052-2001	Washer, flat, 3 millimeter (alternate: 025030236)	2
HE-41	007400616-2001	Screw for HE-40	2	138	34000048-2001	Screw, fill HD M3 P05 x 6mm lg. (alternate:001300716, MP3 x 7mm lg)	4
HE-47	025040235-2001	Washer for HE-48, 41, 97	6	The HK drawing has been deleted but the following parts have been retained for 100 Series Printers.			
HE-48	007401016-2001	Screw for HE-90	2	HK-31	525642001-2001	Cover, holder (front right)	1
HE-54	525617001-2001	Bracket (right)	1	HK-32	525643001-2001	Cover, Holder (front, left)	1
HE-55	525616001-2001	Bracket (left)	1	HK-33	525644001-2001	Cover, Holder	4
HE-58	007300615-2001	Screw for HE-54, 169	4	HK-35	017501016-2001	Bolt for HK-31, 32, 33	12
HE-59	025030235-2001	Flat washer (M3) for HE-58	4	HK-76	525658001-2001	Cover, (right)	1
HE-61	001400713-2001	Screw for HE-23	4	HK-77	525659001-2001	Cover, (left)	1
HE-62	525647001-2001	Guide plate (right) for cavity	1	HK-82	527984001-2001	Screw for items HK-76,77 and HF-167, 168	2
HE-63	525648001-2001	Guide plate (left) for cavity	1	85	39092502-1001	Switch, pushbutton (SPST), Manual Line Feed	1
HE-64	005300814-2001	Screw for power driver board cavity	4	86	39092000-1001	Switch, toggle (SPDT), single/double Line feed, option	1
HE-70	525633001-5001	Clutch stop (right) (View A)	1	HF-167	527895001-2001	Pin feed cover holder (R)	1
HE-71	525631001-5001	Clutch stop (left) (View B)	1	HF-168	527896001-2001	Pin feed cover holder (L)	1
HE-72	007400616-2001	Screw for HE-70, 71	2	—	63002687-6001	Kit, Top Cover Switch	1
HE-73	025040236-2001	Washer for HE-72	2	Note: This kit is assembled with parts covering items 169, 170 HE-58, HE-59 and HE-82.			
HE-74	007400816-2001	Screw for cavity	2	169	63002686-2001	Switch, support	1
HE-75	028040247-2001	Washer for HE-74	2	170	39097501-2001	Switch, pushbutton	1
HE-76	525187001-2001	Holder for HB-33	1				
HE-77	007400616-2001	Screw for HE-76	2				
—	525720001-5001	Encased limit switch (reed) complete unit	2				
		Note: This unit is assembled with parts including reference numbers HE-78 through HE-84, and HE-21, HE-22.					
HE-78	525721001-5001	Limit switch (reed) w/case	1				
HE-79	525725001-2001	Adjusting holder for HE-78	1				
HE-80	001301403-2001	Screw for HE-78	1				

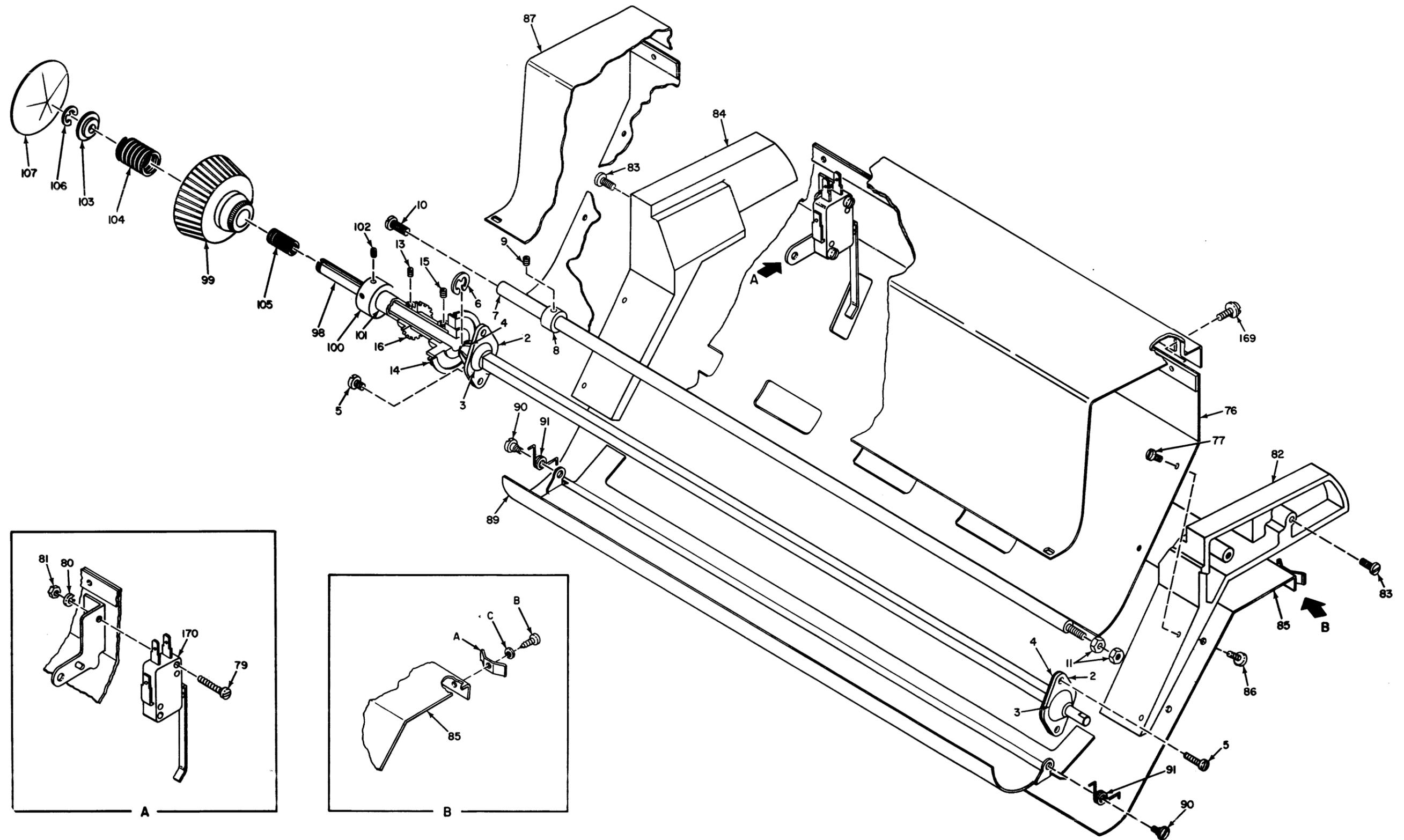


Figure 8-9. PAPER FEED MECHANISM — HF

Figure HF. PAPER FEED MECHANISM

M0005 (AC)

Item Number	Part Number	Description	Quantity
HF-2	525207001-2001	Holder for HF-3	2
HF-3	525208001-2001	Bushing for HF-98	2
HF-4	527981000-2001	Retainer for HF-3	2
HF-5	007400516-2001	Screw for HF-2, 4	4
HF-6	048050346-2001	Snap ring for HF-98	1
HF-7	525210001-2001	Guide bar for pin feed unit	1
HF-8	525551001-2001	Collar for pin feed unit	1
HF-9	525743001-2001	Set-screw for HF-8	1
HF-10	007401016-2001	Screw for HF-7	1
HF-11	021400106-2001	Nut for HF-7	2
HF-13	525747001-2001	Set-screw for HF-16	4
HF-14	525213001-2001	Pin feed Pulley	1
HF-15	525743001-2001	Set-screw for HF-14	2
HF-16	525215000-2001	FF reader gear	1
HF-76	525855001-5001	Paper pan (upper)	4
HF-77	007400816-2001	Screw for HF-76	4
HF-79	007021616-2001	Screw for item 170	2
HF-80	028020247-2001	Spring washer for HF-79	2
HF-81	021020106-2001	Nut for HF-79	2
HF-82	525273000-2001	Guide (right) for HF-77, 85	1
HF-83	007401016-2001	Screw for HF-82, 84	4
HF-84	525274000-2001	Guide (left) for HF77, 85	1
HF-85	525859001-5001	Paper pan (lower)	1
HF-86	007400816-2001	Screw for HF085	4
HF-87	525276001-2001	Pin feed cover	1
HF-89	525763001-5001	Paper pan (front)	1
HF-90	525278001-2001	Screw for HF-89	2
HF-91	525861001-2001	Spring for HF-89	2
HF-98	527081001-2001	Paper feed drive shaft	1
HF-99	525764001-2001	Paper feed knob	1
HF-100	525769001-2001	Coupler for HF-99	1
HF-101	525770001-2001	Sleeve for HF-100	1
HF-102	525748001-2001	Screw for HF-100	2
HF-103	525766001-2001	Collar for HF-99	1
HF-104	525767001-2001	Spring for HF-99	1
HF-105	525768001-2001	Spring for HF-99	1
HF-106	048040345-2001	Snap ring for HF-99 (4.0mm OD x 3.51 mm ID)	1
HF-107	525227001-2001	Decorative cap for HF-99	1
HF-108	025630236-2001	Washer for HF-79	2
A	529023000-2001	Clip, static ground	1
B	33723717-2010	Screw, Sheet metal, No. 4	1
C	34815005-2001	Washer, Internal, Lock	1
HF-111	529316001-6001	Platen knob kit	1
		Note: This kit is assembled with parts covering from HF-98 through HF-107.	
HF-169	527975001-2001	Screw for item HF-87	4
HF-170	525272001-1001	Micro switch (paper empty) (with attached activator arm)	1

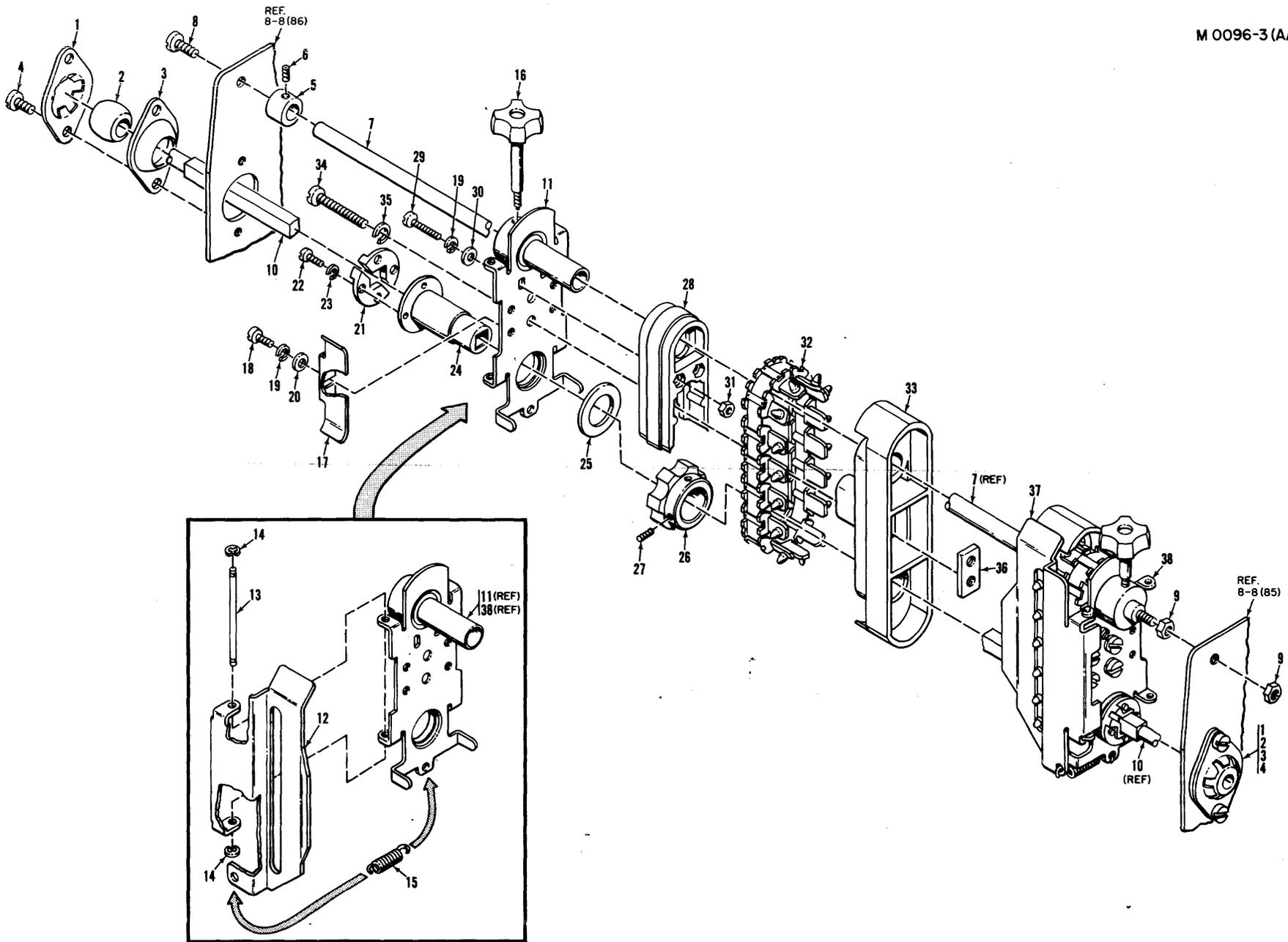


Figure 8-10. PIN FEED MECHANISM (LEFT AND RIGHT) – HG

Figure HG. PIN FEED MECHANISM

M0096-3 (AA)

Item Number	Part Number	Description	Quantity	Ref. Symbol	Item Number	Part Number	Description	Quantity	Ref. Symbol
1	527981000-2001	Holder, Retainer (B)	2	HF-4	20	025030236-2001	Washer for item 8	4	—
2	525208001-2001	Bearing, Retainer (D)	2	HF-3	21	527415001-2001	Set Plate, Paper Drive Slide Shaft	4	HG-27
3	525207001-2001	Holder, Retainer (A)	2	HF-2	22	007029316-2001	Screw for item 21	8	—
4	007400515-2001	Screw for Items 1, 2, 3	4	HF-5	23	028020247-2001	Washer, lock, spring	8	—
5	525551001-2001	Pin Feed Stopper	1	HF-8	24	527406001-2001	Drive Sleeve	2	HG-26
6	525743001-2001	Set-screw for item 5	1	HF-9	25	527407001-2001	Spacer for item 26	2	HG-31
7	525210001-2001	Shaft, Guide, Paper Feed	1	HF-7	26	527408001-2001	Drive Pulley for item 24	2	HG-30
8	007401015-2001	Screw for item 7	1	HF-10	27	525747001-2001	Set-Screw for item 26	4	HG-32
9	021400105-2001	Nut for item 8	2	HF-11	28	527405000-2001	Idler Slide	2	HG-33
10	527081001-2001	Shaft, Paper Feed	1	HF-98	29	007301616-2001	Screw for item 28	4	—
<b>PIN FEED ASSEMBLY</b>					30	025030136-2001	Washer, Flat for item 29	4	—
—	527447001-5001	Pin Feed Unit (Left), Complete Note: This unit is assembled with parts covering item No. 11 through 36.	1	HG-52	31	021300106-2001	Nut for item 29	4	HG-36
					32	527449001-5001	Pin Feed Belt Unit	2	HG-38
					33	527793001-5001	Belt Guide Unit	2	HG-39
					34	007402806-2001	Screw for item 33	4	HG-40
11	527792001-5001	Holder, Pin Feed (left)	1	HG-53	35	028040247-2001	Washer, Lock, Spring for item 34	4	HG-41
12	527419001-2001	Gate, Paper Holder (left)	1	HG-54	36	527414001-2001	Plate Nut for item 34	2	HG-42
13	527418001-2001	Pin for item 12, 37	2	HG-48	37	527417001-2001	Gate, Paper Holder (right)	1	HG-47
14	048015346-2001	Snap-Ring for item 13	4	—	38	527448001-5001	Pin Feed Holder (right)	1	HG-25
15	527806001-2001	Spring for item 12, 37	2	HG-50	—	527446001-5001	Pin Feed Unit (right), complete	1	HG-24
16	527422001-2001	Knob, Locking (all models)	2	HG-51	Note: This unit is assembled with part numbers covering from items 13 through 38.				
17	527416001-2001	Guide, Pin Attachment	2	HG-43					
18	007309406-2001	Screw for item 17	4	—					
19	028030243-2001	Washer, lock, spring	8	—					

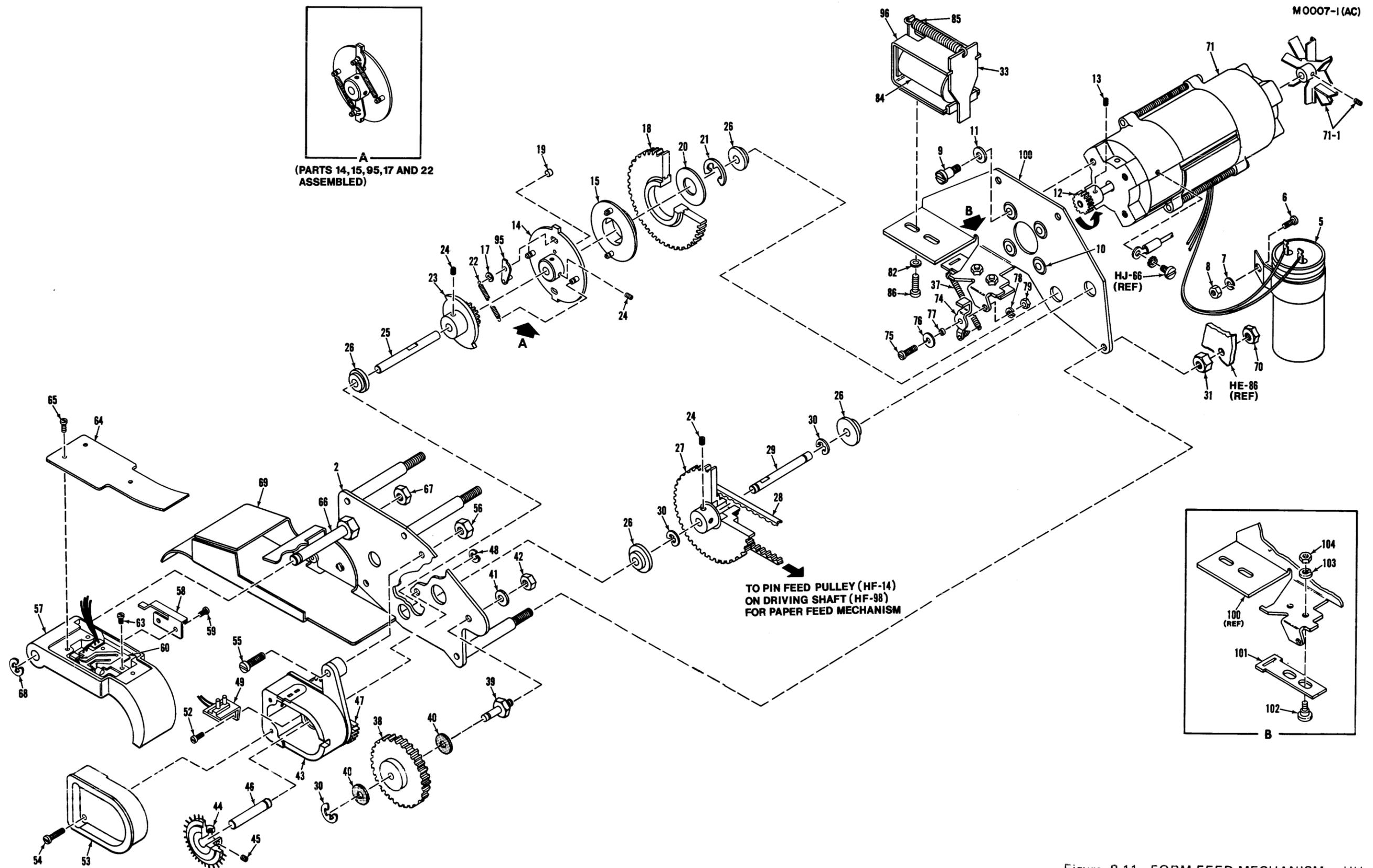


Figure 8-11. FORM FEED MECHANISM – HH

Figure HH. FORM FEED MECHANISM

M0007-1 (AC)

Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity
HH-0	529217001-6001	Form feed complete unit (light emitting diode) Note: This unit is assembled with parts covering from reference No. HH-2, HH-5 through HH-31 and HH-33, HH-37 through HH-49, HH-52 through 60, HH-63 through HH-71-1, and HH-74 through HH-80, HH-82 through HH-86, 95, HH-96 and 100 through 104.	1	HH-27	525344001-2001	FF idle gear	1	—	529419001-5001	Tape reader unit (upper) Note: This unit is assembled with parts covering from reference No. HH-57 to HH-60 and HH-63 to HH-65.	1
HH-2	525316001-2001	FF Chassis (left)	1	HH-28	525346001-2001	Timing belt (70XL) for HH-27	1	HH-57	525376001-2001	Reader bracket (upper)	1
HH-5	525323001-1001	Capacitor with bracket for HH-71	1	HH-29	525355001-2001	Shaft for HH-27	1	HH-58	525377001-2001	Plate spring for HH-57	1
HH-6	007400615-2001	Screw for HH-5, M4, 6mm lg. Flat/ Fil Hd.	1	HH-30	048040346-2001	Snap ring for HH-29, 39	3	HH-59	007300416-2001	Screw for HH-57	2
HH-7	028040247-2001	Spring washer for HH-6	1	HH-31	525356001-2001	Nut for HH- 2	3	HH-60	529386001-4001	Reader P/C board unit (upper)	1
HH-8	021400106-2001	Nut for HH-7	1	HH-33	525351001-2001	FF clutch and magnet unit Note: This unit is assembled with parts covering from reference No. HH-33, HH-84, HH-85, and HH-76.	1	HH-63	007020416-2001	Screw for HH-60	2
HH-9	525326001-2001	Stud screw for HH-71	4	HH-37	511091001-2001	Armature for HH-96	1	HH-64	525388001-2001	Lid for HH-57	1
HH-10	510101001-2001	Rubber Grommet, for HH-71	4	HH-38	525357001-2001	Spring for backstopper	1	HH-65	007020416-2001	Screw for HH-64	3
HH-11	510061001-2001	Washer for HH-9	4	HH-39	525359001-2001	FF reader idle gear	1	HH-66	525389001-2001	Shaft for HH-57	1
HH-12	525328001-2001	FF motor gear	1	HH-40	511146001-2001	Shaft for HH-38	1	HH-67	021400106-2001	Nut for HH-66	1
HH-13	525743001-2001	Set-screw for HH-2	1	HH-41	025040236-2001	Felt washer for HH-38	2	HH-68	048040346-2001	Snap ring for HH-66	1
	525329001-5001	FF clutch unit Note: This unit assembled with parts covering from reference No. HH-14 to HH-22, HH-24 and 95.	1	HH-42	021400106-2001	Washer for HH-42	1	HH-69	525390001-2001	Tape guide	1
HH-14	525330001-5001	FF clutch inside cam	1	—	63002671-4001	Nut for HH-39	1	HH-70	021400106-2001	Nut for form feed complete unit	3
HH-15	525333001-4001	FF clutch releaser	1	HH-43	527172001-2001	Tape reader ass'y, light emitting diode, Metric Note: This two-part ass'y is made up of the following items: tape reader Unit, (lower) 528532001-5001, and Tape reader unit (upper) 529419001-5001	1	71	525319001-1001	FF motor/fan blade	1
HH-17	048020346-2001	Snap ring for HH-15, 16	2	HH-44	525363001-2001	Tape reader unit (lower) Note: This unit is assembled with parts covering from reference No. HH-43 to HH-49 and HH-52 to HH-54.	1	71-1	527314001-5001	Fan w/set - screw, FF motor	1
HH-18	525339001-2001	FF clutch gear	1	HH-45	525746001-2001	Reader bracket (lower)	1	HH-74	525753001-5001	Back stopper	1
HH-19	508532001-2001	Roller for HH-14	3	HH-46	525365001-2001	Sprocket for tape	1	HH-75	007300803-2001	Screw for HH-74	1
HH-20	525341001-2001	Guide for HH-19	1	HH-47	525366001-2001	Set-screw for HH-44	2	HH-76	503092001-2001	Washer for HH-74	1
HH-21	048080346-2001	Snap ring for HH-20	1	HH-48	048030346-2001	Shaft for HH-44	1	HH-77	525756001-2001	Collar for HH-74	1
HH-22	510062001-2001	Spring for HH-14, 16	2	HH-49	528534001-4001	Gear for HH-46	1	HH-78	028030247-2001	Spring washer for HH-74	1
HH-23	525342001-2001	Gear with stop cam	1	HH-52	007020416-2001	Snap ring for HH-46	1	HH-79	021300106-2001	Nut for HH-74	1
HH-24	525743001-2001	Set-screw for HH-14, 23, 27	6	HH-53	525374001-2001	Reader, LED holder unit (lower)	1	HH-82	025030236-2001	Washer for HH-83	2
HH-25	525354001-2001	Shaft for FF clutch	1	HH-54	007301216-2001	Screw for HH-49	1	HH-84	527027001-1001	Solenoid for HH-96	1
HH-26	525353001-2001	Bushing for HH-25, 28	4	HH-55	007401416-2001	Screw for HH-43	1	HH-85	527026001-2001	Spring (for HH-33)	1
				HH-56	021400106-2001	Screw for HH-43	2	HH-86	527249001-2001	Screw (for HH-96)	2
						Nut for HH-55	2	95	527853001-2001	FF clutch releasing pawl	2
								HH-96	527856001-1001	FF magnet (A) (air-gap)	1
								—	529861001-5001	P.F. Chassis Assembly Note: This unit is assembled with parts covering ref. No. 100 through 104.	1
								100	525902001-2001	FF Chassis , right	1
								101	525903001-2001	Clutch slide pawl for item 100	1
								102	529461001-2001	Screw, shoulder for item 101	2
								103	02830243-2001	Spring washer M3 for item 102	2
								104	021300105-2001	Nut, hex, M3 PO.5 for item 102	2



Figure HI. RIBBON FEED MECHANISM

M0008-1 (AB)

Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity	Item Number	Part Number	Description	Quantity
HI-1	525391001-2001	Clutch gear	1	—	525446001-5001	Ribbon spool holder complete unit (left).	1	HI-96	525746001-2001	Set-screw for HI-95	2
HI-2	525392001-2001	Bushing for HI-1	1			Note: This part is assembled with parts reference No. HI-37, 41, 42, 44, 45, 46, 48, 50,51 and HI-55 through HI-59 and HI-90, 91.		HI-97	028040247-2001	Spring washer for HI-89	1
HI-3	525393001-2001	Spacer for HI-1	1					HI-98	021400106-2001	Nut for HI-89	1
HI-4	525394001-2001	Clutch spring	1					HI-99	525667001-5001	Tension roller holder (right)	1
HI-5	525395001-2001	Sleeve for HI-4	1					HI-103	525730001-2001	Driving slide shaft A	1
HI-6	525744001-2001	Set-screw for HI-5	2					HI-104	525731001-2001	Washer for HI-103	2
HI-17	007400516-2001	Screw for HI-84	2					HI-105	048050347-2001	Snap ring for HI-103	2
HI-18	525404001-2001	Driving bevel gear	1	HI-55	525447001-5001	Ribbon spool holder (left)	1	—	525464001-5001	Guide roller unit (right)	1
HI-19	525743001-2001	Set-screw for HI-18	2	HI-56	525450001-2001	Bearing for HI-57	1			Note: This part is assembled with parts covering reference No. HI-106 HI-113, HI-119, thru HI-122	
HI-20	525407001-2001	Sleeve for HI-19	1	HI-57	525451001-5001	Ribbon spool shaft (left)	1				
HI-21	048140145-2001	Snap ring for HI-20	1	HI-59	525454001-2001	Bevel gear (left) for HI-57	1				
HI-22	525408001-2001	Bushing for HI-20	1	—	525396001-5001	Driving shaft unit	1	HI-106	525465001-5001	Guide roller holder (right)	1
HI-23	005300814-2001	Screw for HI-22	2			Note: This part assembled with parts covering reference No. HI-75 through HI-87.		HI-109	048025346-2001	Snap ring for HI-106, 114	2
HI-27	525411001-2001	Bevel gear for HI-103	2					HI-110	512463001-2001	Spring for HI-106, 114,123,124	4
HI-29	525746001-2001	Set-screw for HI-27	4					HI-113	028030247-2001	Spring washer for HI-120	2
—	525420001-5001	Ribbon spool holder complete unit (right)	1	HI-75	525398001-2001	Driving gear for HI-79	1	—	525475001-5001	Guide roller unit (left)	1
		Note: This unit is assembled with parts covering reference No. HI-35 through HI-51 and HI-88, HI-89.		HI-76	071039750-2001	Ball for HI-75	1			Note: This part is assembled with parts covering reference HI-110 through HI-117, and HI-119 through HI-122	
HI-35	525421001-5001	Ribbon spool holder (right)	1	HI-77	525630001-2001	Spring for HI-76	1	HI-114	525476001-5001	Guide roller holder (left)	1
HI-36	525426001-2001	Bearing for HI-38	1	HI-78	012500516-2001	Set-screw for HI-77	1	HI-116	025030236-2001	Washer for HI-120	2
HI-37	525427001-2001	Nut for HI-36, 56	2	HI-79	525397001-2001	Driving shaft	1	HI-117	007400516-2001	Screw for HI-106, 114	4
HI-38	525429001-5001	Ribbon spool shaft (right)	1	HI-80	525399001-2001	Clutch spring for HI-79	1	HI-119	525932000-2001	Guide roller	2
HI-39	525441001-5001	Control spring for HI-88	1	HI-81	525400001-2001	Bevel gear for HI-79	1	HI-120	525992001-2001	Screw for HI-119	2
HI-40	007300516-2001	Screw for HI-39	2	HI-82	525748001-2001	Set-screw for HI-81	2	HI-121	025030336-2001	Washer for HI-119	2
HI-41	525433001-2001	Collar for HI-57, 38	2	HI-83	525401001-2001	Bushing for HI-79	1	HI-122	021300106-2001	Nut for HI-120	2
HI-42	525747001-2001	Set-screw for HI-41, 43, 59	8	HI-84	525402001-2001	Holder for HI-83	1	HI-123	527049001-5001	Tension lever unit (right)	1
HI-43	525434001-2001	Bevel gear (right) for HI-38	1	HI-85	525403001-2001	Cover for HI-83	1	HI-124	527202001-5001	Tension lever unit (left)	1
HI-45	048020346-2001	Snap ring for HI-137	2	HI-86	007300416-2001	Screw for HI-85	4	HI-128	025030133-2001	Washer for HI-40	2
HI-46	512462001-2001	Spring for HI-137, 35, 55	4	HI-87	048070346-2001	Snap ring for HI-79	1	HI-130	527322001-2001	Holder for HI-103 (right)	1
HI-48	048025346-2001	Snap ring for HI-35, 55	2	HI-88	525681001-5001	Reverse control lever (right)	1	HI-131	007400816-2001	Screw for HI-130 and HI-133	4
HI-50	525440001-2001	Pin for HI-89, 91	2	HI-89	525697001-2001	Connector (R.A.) for HI-92	1	HI-132	028040247-2001	Washer, spring for HI-131	4
HI-51	048020346-2001	Snap ring for HI-50	2	HI-90	525682001-5001	Reverse control lever (left)	1	HI-133	527323001-2001	Holder for HI-103 (left)	1
HI-54	525541001-2001	Bolt for HI-35, 55	4	HI-91	525698001-2001	Connector (L.A.) for HI-92	1	HI-137	526817001-6001	Ribbon holding plate ass'y (with Pad)	2
				HI-92	525700001-2001	Ribbon reversing rod	1	HI-138	63002293-5001XP	Twin ribbon spool ass'y 3-inches(Black)	2
				HI-93	048030346-2001	Snap ring for HI-92	1	HI-139	63002294-2001	Cap for item HI-88, 90	2
				HI-94	525699001-2001	Coupler for HI-91	1				
				HI-95	525702001-2001	Stopper for HI-89, 94	2				

**Figure 8-13 ELECTRICAL HARDWARE HJ (No Illustration)**

Item Number	Part Number	Description	Quantity
HJ-1	525733001-4001	Transformer unit (multitap)	1
HJ-2	007402216-2001	Screw for HJ-1 and frame	4
HJ-3	525492001-1001	ON/OFF switch (1820-RL-Molex)	1
HJ-4	525493001-1001	SELECT switch (1820-RL-Molex)	1
HJ-4A	37253790-1001	Lamp, (GE 379 equiv. -screw-base) 5-volt for HJ-3,4	1
HJ-5	525494001-1001	TOP OF FORM switch	1
HJ-6	525495001-1001	FORMS OVERRRIDE switch	1
HJ-7	525496001-1001	Lamp for PAPER EMPTY, multiple purpose	2
HJ-8	525542000-2001	Clip for HJ-7	2
HJ-9	525564000-1001	*In-line connector (molex 1375-P2) (See item 1 for mating connector (P13) on LM of Harness Assembly (W1), Ref. Dwg. 63002253, Section 7).	1
HJ-9A	527234000-1001	Connector cover for item HJ-9	1
HJ-10	525548001-2001	Bracket for HJ-9	1
HJ-11	007400716-2001	Screw for HJ-10	2
HJ-12	028030247-2001	Spring washer for HJ-11	2
HJ-13	525862001-4001	Wire Harness	1
HJ-14	525558001-1001	Bushing for HJ-13	1
HJ-15	525565001-1001	Terminal (4P)	1
HJ-16	007300516-2001	Screw for HJ-15	1
HJ-17	120370001-2001	Holder for HJ-13 (A)	1
HJ-18	120679001-2001	Holder for HJ-13 (B)	3
HJ-19	525664000-2001	Holder for HJ-13 (No. 6)	4
HJ-21	025030236-2001	Washer for HJ-20	13
HJ-22	207216000-1001	Splicer (No. 2)	8
HJ-23	525570001-1001	Wire (W-66)	1
HJ-30	525674001-1001	Splicer cap (No. 3)	1
HJ-31	516218001-1001	Groundwire for transformer	2
HJ-32	515456001-1001	Groundwire for main motor	1
HJ-33	007400516-2001	Screw for HJ-31, 32	5
HJ-34	550719002-2001	External lock-washer for HJ-33	5
HJ-35	525675001-1001	Insulating tube (No. 7) for main motor capacitor	2
HJ-40	025040236-2001	Washer for HJ-18	1
HJ-41	340400001-2001	Nylon Band	7
HJ-42	525864001-2001	Cap for operation panel	1
HJ-43	525865001-2001	Spiral cord holder	1
HJ-44	525758000-2001	Cord holder for HJ-13 (No.5)	2
HJ-46	525924000-1001	Connector receptacle for cooling fan (for mating connector, see A-16) (Series 100)	1
HJ-47	525899001-2001	Bracket for HJ-46	1
HJ-48	007300516-2001	Screw for HJ-47	2
HJ-49	525975001-2001	Connector Holder	1
HJ-50	525898001-2001	Splicer cap (No. 8)	2
HJ-51	525896001-1001	Head wire for HJ-9, pin 13, W90	1
HJ-52	525897001-1001	Head wire for HJ-9, pin 15, W91	1
HJ-53	525894001-1001	Cooling fan wire No. 1 (from main frame harness)	1
HJ-54	525895001-1001	Cooling fan wire No. 2 (from main frame harness)	1
HJ-62	527029001-1001	Resistor 40 ohms, 40W, (for solenoid HH-84)	1
HJ-63	527028000-2001	Heat sink (for HJ-62)	1
HJ-64	007401016-2001	Screw (for HJ-18, 63)	13
HJ-65	017501016-2001	Bolt (for HJ-18, 63)	13
HJ-66	007400416-2001	Screw for gnd wire on HH-71	1

\*For Model 101AL, see 63015115 , Section 7



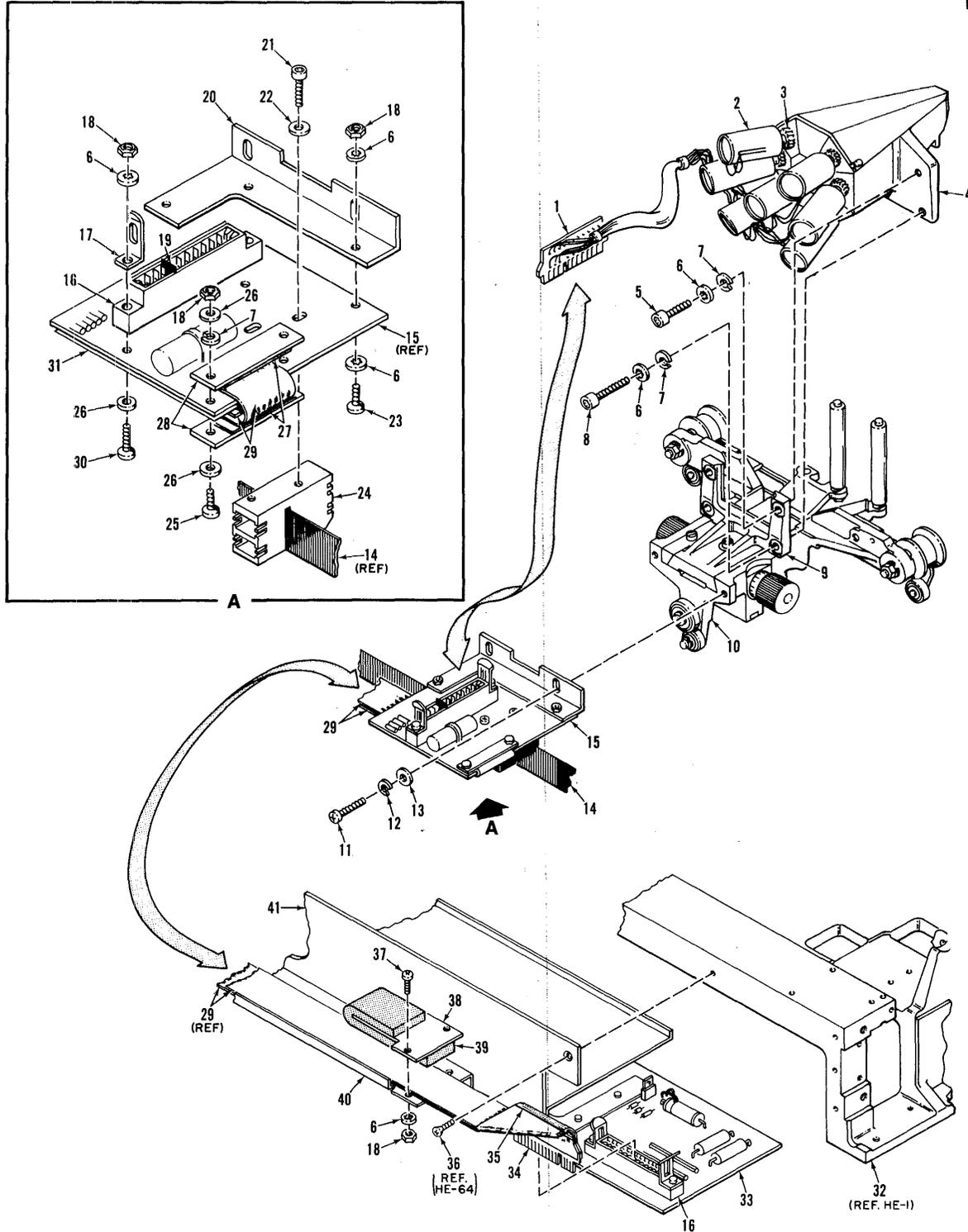


Figure 8-14. PRINT HEAD AND ASSOCIATED ASSEMBLIES

Figure 8-14. PRINT HEAD AND ASSOCIATED ASSEMBLIES

M0038 (AB)

Item Number	Part Number	Description	Quantity
—	63002437-4001	Print Head Ass'y 7 wire Ruby Note: This unit is assembled with items 1 through 4.	1
1	63001039-2001	Fingerboard, solenoid	1
2	63002476-4001	Solenoid ass'y (L1 through L7)	7
3	63002122-2001	Nut, locking, solenoid	1
4	63002462-4001	Head, subassembly	1
5	34114161-2001	Screw, hex, socket-cap, 4-40 x 1/2-in lg.	2
6	34815005-2001	Washer, lock, int. tooth No. 4	10
7	34818007-2001	Washer, lock, split, No. 4	6
8	34114201-2001	Screw, hex, socket-cap, 4-40 x 5/8-in. lg.	2
9	529129001-2001	Head bracket	1
10	525005001-5001	Carriage unit	1
11	007400815-2001	Screw, M4 x 8mm lg., F/Fil Hd.	2
12	028040247-2001	Washer, lock, spring, M4	2
13	025040235-2001	Washer, flat, M4	2
14	63002440-5001	Flexible mylar fence ass'y	1
—	63002668-4001	P.C. board ass'y 100NR, video amplifier Note: This unit is assembled with items 5 through 31.	1
15	63001096-2001	P.C. board, Video Amp. 100 Series NR	1
16	31230011-1001	Conn., edge, 10-position, 2-Row, Mdm	2
17	63002300-2001	Clip, P.C. board	2
18	34712005-2001	Nut, hex, 4-40	5
19	31240456-2001	Key, contact polarizing	1
20	63508104-2001	Bracket, Mtg., video amplifier bd.	1
21	34104087-2001	Screw, hex, socket-cap, 2-56 x 0.25-in. lg.	2
22	34902007-2001	Washer, flat, No. 2	2
23	34517125-2001	Screw, 4-40 x 0.38-in lg. Phil/Hd.	3
24	63002634-5001	Optical pickup, single track ass'y	1
25	34517167-2001	Screw, 4-40 x 0.50-in. lg.	2
26	34912007-2001	Washer, flat, No. 4	4
—	63060116-5001	Clamp Ass'y Note: This unit is assembled iwth items 27, 28	2
27	63060116-2003	Clamp	2
28	63060116-3002	Sponge, clamp	2
29	39660029-0001	Cable, Ribbon	4.2 Ft.
30	34517185-2001	Screw, 4-40 x 0.56-in. lg. Pan/Fil. Hd.	2
31	63011158-2001	Spacer, large	1
32	525151001-5001	Printer Frame (ref. HE-1)	1
—	63002242-4001	Comp. bd. ass'y, power driver bd. Note: This unit is assembled with items 16, 33, 38, 39, 40.	1
33	63001018-2001	PC board, power driver bd.	1
34	63001021-2001	Finger board, ribbon cable	1
35	35060005-0001	Tape, reinforcing, 0.75W x 0.006-in.	A/R
36	005300814-2001	Screw, M3 x 8mm lg. (ref. HE-64)	4
37	34517105-2001	Screw, 4-40 x 5/16-in. lg. Pan/Phil	2
—	63011159-5001	Clamp ass'y Note: This unit is assembled with items 38, 39.	1
38	63011159-2001	Clamp	1
39	35060003-0253	Tape foam, 0.025thk x 1-in wide	0.4Ft
40	63002234-1001	Cable tray	1
41	63002200-2001	Bracket, Heat sink	1

\* Figure 8-14, is keyed to paragraph 5.2.13 and is a partial parts list used to show the removal/replacement of these four mechanically related assemblies only. See Section 7 for both the complete video amplifier Bd. 630002668-4001 and power driver bd. 63002242-4001. The complete carriage mechanism is shown in Figure 8-3.

## APPENDIX A SIGNAL GLOSSARY

This signal listing is keyed directly to the 101AL printer schematic drawings. All signal mnemonics contained on those drawings are listed alphabetically with their source and destinations.

The following notation is used to identify the source and destination locations: 5-13/24-2 signifies element ME5, pin 13 located on schematic 63015124, sheet 2.

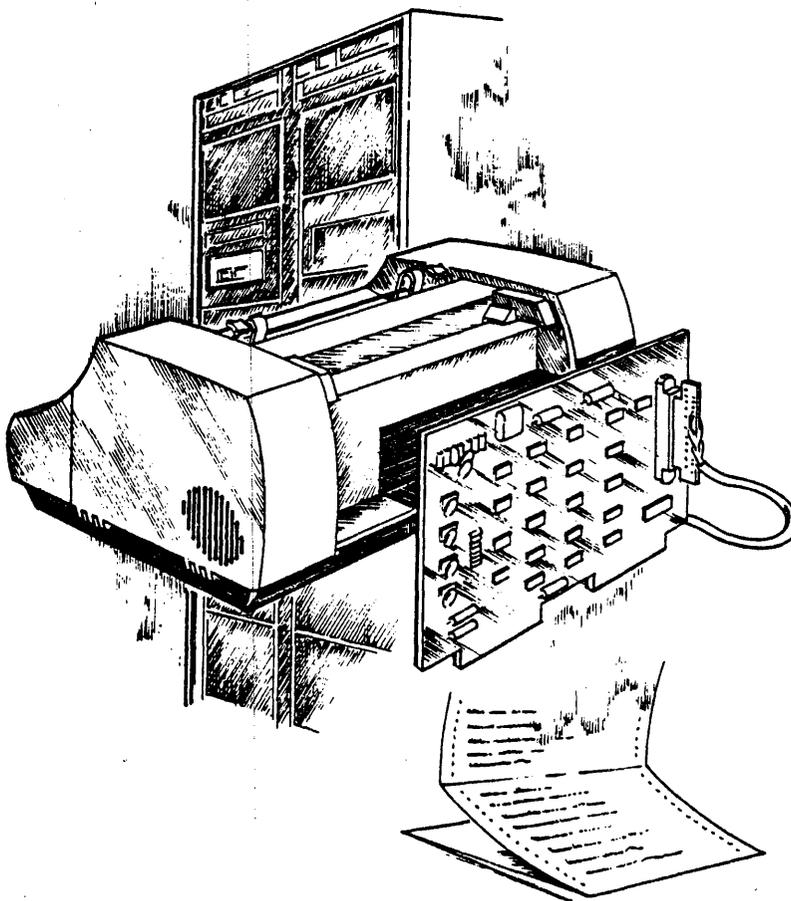
SIGNAL NAME	DESCRIPTION	SOURCE	DESTINATION
ACK	Acknowledge - A 2.5-5.0 usec pulse used to indicate completion of the input of a character or end of a functional operation.	5-13/24-2	P5-Z/24-1
BELL	A 1 to 2-second pulse used to produce an audible tone in the optional speaker located at the rear of the printer.	5-39/24-2	R56/24-3
BUSY	Status signal indicating to the input device that the printer is not ready to receive data.	5-11/24-2	P5-C/24-1 20-1/03-1
CG1-CG7	Seven signal LINES from the character generators to the driver board, which fire print wires 1-7.	ME1 & ME7	P4-P,R,S,T, U,V,W
CHADD7	Character address line 7.	6-2/24-3	20-16/24-4
CIP	Carriage in Print - Signal used to drive the print head forward.	6-12/24-1	P9-12/75-1
CIPX	Carriage in Print - Signal from LSI chip #2, command to turn on forward clutch.	9-30/24-2	10-1/24-1
CLKTB1	Clock pulse used to clock input data into memory register. Used for loading data only.	5-14/24-2	6-11/24-3
CLKTB2	Clock pulse used to shift memory. Not used when loading data.	9-36/24-2	6-9/24-3
CSBSY	Cause Busy - Command from LSI chip 2 to LSI chip 1 to cause a busy condition, when dummy character is detected at memory output.	9-35/24-2	5-10/24-2
CSLF	Cause Line Feed - Line feed command from LSI chip #1.	5-6/24-2	3-2/24-1
DATA 1 DATA 8	The 8 input data lines coming from the input device to the printer.	P5-V,T,U, X,S,M,W, N/24-1	
DATA STROBE	A 1.0 usec (min.) pulse used to clock data from the input device to the printer logic.	P5-Y/24-1	14-11/24-1

SIGNAL NAME	DESCRIPTION	SOURCE	DESTINATION
DCPRM	Decoded Prime - Prime command from LSI chip #1 to LSI chip #2 causes prime condition.	5-8/24-2	9-31/24-2
DCWI-DCW5	Five full step data write pulses from LSI chip #2 to ROM character generator.	ME9-24-2	ME20-24-4
DCW01-DCW04	Four half step data write lines to half-step ROM for 9 x 7 dot matrix.	ME9-24-2	ME30-24-4
DLYLF	Delay Line Feed - A 90 ms pulse following any paper movement command. Allows settle-out time for the form feed mechanical parts.	3-5/24-1	5-37/24-2
DLYSTB	Delay Strobe - A 450 us pulse used to generate data write signals in LSI chip #2 for the half step character generators.	13-6/24-1	9-22/24-2
DSI-DS8	Buffered input data 1 to 8.	ME8 & ME14/ 24-1	ME17 & ME16/ 24-3
DSCR	Decoded Carriage Return - Command from LSI chip #1 to LSI #2 to shift data to memory output and backfill shift register with zeroes.	5-12/24-2	9-33/24-2
DSTA	Data Strobe A signal used to inform LSI chip #1 that input data lines should be strobed into memory.	14-10/24-1	5-18-24-2
EOPSW	End of Print Switch - Terminates a full line of print, 132 characters.	P4-7/24-2	9-19/24-2 16-19/03-2
FAULT	Printer fault signal to interface connector.	5-9/24-2	P5-L/24-1
FFH	Form Feed Hole - Vertical Format Unit.	P4-D/24-2	5-29/24-2
INPUT PRIME	A level from the interface connector causing the printer electronics to be printed.	P5-K/24-1	4-9/24-1
GDSTB	Gated Strobe - Gates strobe with ACK which prevents CLKTB1 until the rising edge of ACK and prevent over-running the buffer.	5-17/24-2	E8/24-2

SIGNAL NAME	DESCRIPTION	SOURCE	DESTINATION
LD	Light Detect - Status signal to interface connector, indicating the video circuit is not functioning.	9-17/24-2	P5-A/24-1
LF	Line Feed - 15 ms signal generates PMSOL during line feed.	3-13/24-1	5-30/24-2
LFOC	Low frequency oscillator (option), allows 3-12 second paper movement time out.	P5-8/24-2	5-2/24-2
OSC	Oscillator - 100 KHz to 200 KHz clock provides timing for printer operations.	9-25/24-2	5-4/24-2
PE	Paper Empty signal indicating a paper empty condition.	5-34/24-2	P5-J/24-1
PMSOL	Paper Movement solenoid - Used to activate line feed solenoid during a line feed, form feed or vertical tab operation.	5-7/24-2	P4-4/24-1
PRIME	Prime signal, 100-400 usec pulse from LSI chip #1 used to reset printer logic.	5-38/24-2	9-37/24-2
PWR PRM	Power Prime - Automatic prime generated by turning on power to the printer.	5-5/24-2	9-32/24-2
REMLF	Remote Line Feed signal. Operator panel, LINE FEED switch.	P4-17/24-2	5-33/24-2
ROME2	Signal which enables half-step ROM character generators.	9-24/24-2	15-9/24-4
ROMTB8	Enable signal used to select optional character sets by use of TB8.	10-8/24-3	15-13/24-4
RTPSW	Ready to Print switch, informs LSI chip #2 that carriage is at left position.	P4-J/24-2	9-28/24-2
SELECT LAMP	Operator panel, SELECT indicator.		
SELSW	Operator panel, SELECT switch.	P4-4/24-2	5-31/24-2
SLCT'	Select	5-40/24-2	6-3/24-3

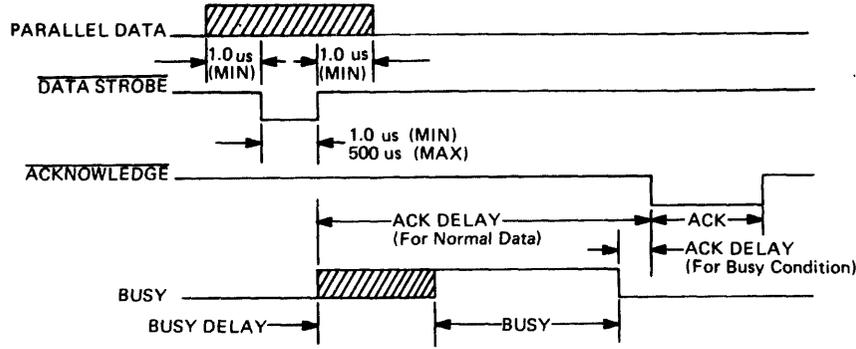
SIGNAL NAME	DESCRIPTION	SOURCE	DESTINATION
SLCT	Select status signal to input connector.	9-40/24-2	P5-F/24-1
SPEAKER	Speaker		
SRCL	Shift Register Clear - Signal from LSI chip 2 used to clear shift registers.	9-38/24-2	17-2 & 16-2/24-3
STROBE	Strobe - A 450 usec pulse used to generate character address signals to the ROM during character printing.	11-1/24-1	E37/24-4
TBI-TB7	Shift register outputs 1-7.	ME17 & ME16/24-3	ME22/24-4
TB8	Shift register output 8.	10-4/24-3	E33/24-3
TB8	Shift register output 8 used to select additional ROM or individual elongated characters.	10-6/24-3	E34/24-3 9-34/24-2 E-17/24-2
TB8'	Same as TB8	10-3/24-3	
TOFSW	TOP OF FORM switch.	P4-A/24-2	5-32/24-2
UPSC	Elongated Character Mode - Command from LSI chip 1 to chip 2 to print elongated characters.	5-15/24-2	E20/24-2
VIDEO	Video Amplifier Output - 1.0 ms square wave used to trigger STROBE one shot.	P4-Z/24-1 P3-9/03-1	11-5/24-1
VTH	Vertical Tab Hole - Vertical Format Unit.	P4-0/24-Z	5-28/24-2

APPENDIX B  
PARALLEL INTERFACE SPECIFICATIONS



All standard Centronics printers contain a common 7-bit parallel interface. An optional eighth bit is available, as required by the user. Detailed information describing the standard interface timing, signal descriptions, connectors and other specifications are contained in this appendix. The intent is to provide the user with the technical information required to interface directly to a standard Centronics printer, or if necessary to design a special interface to adapt the printer to a particular terminal. Note that specifications and descriptions within this appendix apply to Centronics standard RO printer models and do not necessarily apply to Centronics teleprinter models 308, 330, 508, 530 and 761.

# INTERFACE TIMING



NORMAL DATA INPUT TIMING

	101/101A/101S	101AL	102A	102AL	103	104	301	306	306C	306SC
ACK DELAY	7 usec.	2.5-10 usec.	7 usec.	2.5-10 usec.	2.5-10 usec.	2.5-10 usec.	2.5-10 usec.	2.5-10 usec.	2.5-10 usec.	2.5-10 usec.
ACK	4 usec.	2.5-5.0 usec.	4 usec.	2.5-5.0 usec.						

BUSY CONDITION TIMING

	101/101A/101S	101AL	102A	102AL	103	104	301	306	306C	306SC
BUSY DELAY	0	0-1.5 usec.	0	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.
ACK DELAY	0	0-10 usec.	0	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.
ACK	4 usec.	2.5-5.0 usec.	4 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.
<b>BUSY DURATION:</b>										
Line Feed	75-105 msec.	75-105 msec.	75-105 msec.	16 msec. (single LF) 75-105 msec. (multiple LF)	16 msec. (single LF) 51 msec. (double LF) 25-75 msec. (multiple LF)	10 msec. (single LF) 25 msec. (double LF) 70-77 msec. (multiple LF)	70-100 msec.	75-105 msec.	75-105 msec. (single LF)	35-50 msec.
Vertical Tab (1-inch)	300-310 msec.	300-310 msec.	300-310 msec.	300-310 msec.	125 msec.	125 msec.	160-200 msec.	300-310 msec.	300-310 msec.	155-170 msec.
Form Feed (11-inches)	3-3.5 sec.	3-3.5 sec.	3-3.5 sec.	3-3.5 sec.	1.4 sec.	1.4 sec.	1.5-2.0 sec.	3-3.5 sec.	3-3.5 sec.	1.40-1.42 sec.
Delete	3 msec.	100-400 usec.	3 msec.	100-400 usec.	160-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.
Bell	2 sec.	0	2 sec.	0	0	0	0	0	0	0
Select	3 msec.	100-400 usec.	3 msec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.
Deselect	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected
Print Command	6 msec./char plus 75-105 msec. LF	6 msec./char plus 75-105 msec. LF	470-500 msec. (total)	410-415 msec. (total)	6 msec./char plus 16 msec. LF	300 msec.	6 msec./char plus 70-100 msec. LF	8.4 msec./char plus 75-105 msec. LF	10/8.4/6.6/6.0 msec./char (10/12/15/16.5 cpi)	8.4 msec./char plus 35-50 msec. LF
(Return time-no busy)	(240 msec. max)	(240 msec. max)	(0)	(0)	(0)	(0)	(270 msec. max)	(270 msec. max)	(270 msec. max)	(270 msec. max)

NORMAL DATA INPUT TIMING

	500	501	503	588	500D	501D	588D	700	701
ACK DELAY	2.5-10 usec.								
ACK	2.5-5.0 usec.								

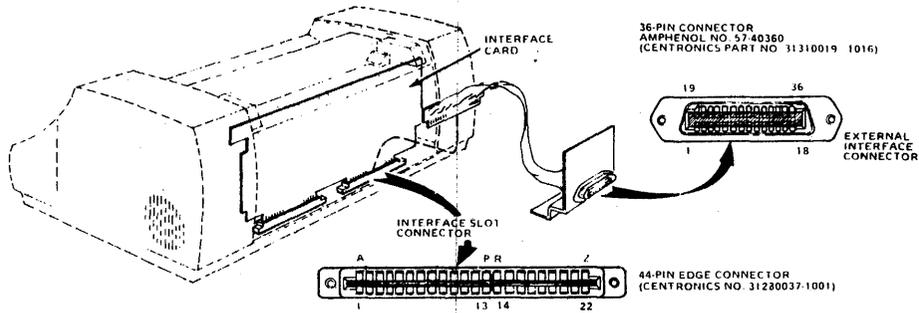
BUSY CONDITION TIMING

	500	501	503	588	500D	501D	588D	700	701
BUSY DELAY	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.	0-1.5 usec.
ACK DELAY	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.	0-10 usec.
ACK	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.	2.5-5.0 usec.
<b>BUSY DURATION:</b>									
Line Feed	75-105 msec.	70-100 msec.	16 msec. (single LF) 51 msec. (double LF) 25-75 msec. (multiple LF)	75-105 msec.	20 msec.	20 msec.	20 msec.	75-105 msec.	75-105 msec.
Vertical Tab (1-inch)	300-310 msec.	160-200 msec.	125 msec.	300-310 msec.	20 msec.	20 msec.	20 msec.	240-270 msec.	240-270 msec.
Form Feed (11-inches)	3-3.5 sec.	1.5-2.0 sec.	1.4 sec.	3-3.5 sec.	20 msec.	20 msec.	20 msec.	2.07-2.11 sec.	2.07-2.11 sec.
Delete	100-400 usec.	100-400 usec.	160-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.
Bell	0	0	0	0	0	0	0	0	0
Select*	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.	100-400 usec.
Deselect	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected	Until printer is selected
Print Command	8.4 msec./char plus 75-105 msec. LF	6 msec./char plus 70-100 msec. LF	6 msec./char plus 16 msec. LF	11.3 msec./char plus 75-105 msec. LF	8.4/7 msec./char (10/12 cpi) +20 msec. LF	6 msec./char +20 msec. LF	11.3/9.4/6.9 msec./char (10/12/16.5 cpi) +20 msec. LF	16.7 msec./char	16.7 msec./char
(Return time-no busy)	(400 msec. max)	(400 msec. max)	(0)	(400 msec. max)	(400 msec. max)	(400 msec. max)	(400 msec. max)	2.2 sec (max)	(0)

\*No busy, if inhibit prime on select option is used.

## STANDARD INTERFACE SIGNALS

The following table describes the standard interface signals available at both the interface slot connector and the external interface connector of all Centronics Printers.



SIGNAL NAME	INTER-FACE CONN.	INTER-FACE SLOT	SOURCE	DESCRIPTION
(DATA STROBE)	Pin 1, 19	Pins 21, Y	Input Device	A 1.0 usec pulse (min.) used to clock data from the processor to the printer logic.
DATA 1	2, 20	18, V	Input Device	Input data levels. A high represents a binary ONE, a low represents a ZERO. All printable characters (i.e., codes having a ONE in DATA 6 or DATA 7) are stored in the printer buffer. Control characters (i.e., codes having a ZERO in both DATA 6 and DATA 7), are used to specify special control functions. These codes are not stored in the buffer except when they specify a print command and are preceded by at least one printable character in that line.
DATA 2	3, 21	16, T	Input Device	
DATA 3	4, 22	17, U	Input Device	
DATA 4	5, 23	20, X	Input Device	
DATA 5	6, 24	15, S	Input Device	
DATA 6	7, 25	11, N	Input Device	
DATA 7	8, 26	19, W	Input Device	
DATA 8	9, 27	12, P	Input Device	
ACKNLG	10, 28	22, T	Printer	Acknowledge pulse indicates the input of a character into memory or the end of a functional operation.
BUSY	11, 29	3, C	Printer	A level indicating that the printer cannot receive data. For conditions causing BUSY, refer to Busy Condition Timing Table.
PE	12	9	Printer	A level indicating that the printer is out of paper.
SLCT	13	F	Printer	A level indicating that the printer is selected.
± OV	14	7	Printer	Signal ground (Formerly SS signal, older version)
OSCXT	15	H	Printer	A 100 KHz signal (Models 101, 101A, 102A, 101S) or 100-200 KHz signal (All other models).
± OV	16	A		Signal ground
Chassis Gnd	17	—	Printer	Frame ground
+5V	18	13	Printer	+5 Volt power buss
(INPUT PRIME)	31, 30	L, 10	Input Device	A level which clears the printer buffer and initializes the logic. (Not in 101).
FAULT	32	M	Printer	A level that indicates a printer fault condition such as paper empty, light detect, or a deselect condition. (Not in 101).
Line Count Pulse	34, 35	2, D		Both sides of the line count switch appear at the interface connector. This switch is opened and closed during each line feed operation. A level delivered to the switch would be pulsed off and on each time a line feed operation is performed. (Series 300 and 500 except 306SC, 503).
Not Used	36			

### NOTES:

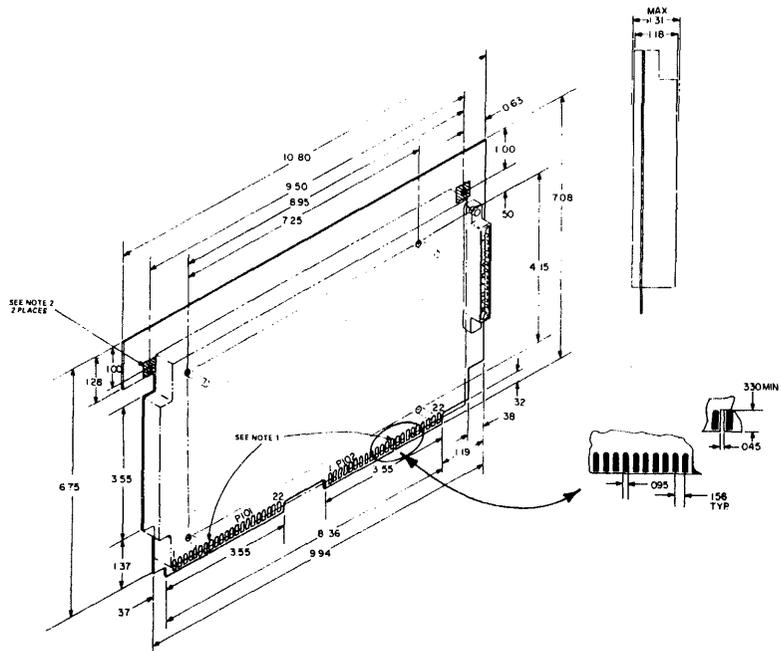
1. Second pin number indicates twisted pair return (±OV).

## INTERFACE SPECIFICATIONS

- INTERFACE ADAPTER:** All Centronics printers are designed to accept a special interface board. In some models, this interface slot is a standard feature. Other models must have an optional interface adapter to accommodate the interface card. Models which require this optional adapter are the 301, 306, 306C, 500, 501, 588, 700 and 701.
- INTERFACE SLOTS:** Models 102AL, 103, 104, 306SC and 503 have two interface slots. All other models have one slot.
- TOTAL AVAILABLE INTERFACE POWER:**
- +5 Volts  $\pm$  5% at 800 ma.
  - +12 Volts  $\pm$  10% at 200 ma.
  - 12 Volts  $\pm$  10% at 200 ma.
- INTERFACE CIRCUIT SPECIFICATIONS:**
- Voltage Levels:** 0V and +5V (nominal), TTL logic (SN7400 series)
- Logic Levels:** A logic ONE (or high) signal is defined as a voltage in the range of +2.4 Volts to +5 Volts, not to exceed a peak positive voltage of +5.5 Volts.
- A logic ZERO (or low) signal is defined as a voltage in the range of 0.0 Volt to +0.4 Volt, not to exceed a peak negative voltage of -.5 Volt.
- Current Requirements:** The printer interface can source up to 0.320 ma at +2.4 Volts for a high signal output, and sink up to 14 ma for a low output.
- Similarly, the sending device interface must be able to source 0.320 ma at +2.4 Volts for a high signal output and sink up to 14 ma for a low output.
- Line Termination:** The printer interface terminates input data lines DATA1 - DATA8 with 1000 ohms to +5 Volts, and control lines DATA STROBE and INPUT PRIME with 470 ohms to +5 Volts.
- MAXIMUM DISTANCE:** A local interface should be located no more than 10 feet from the printer, when using the standard printer interface circuits.
- PHYSICAL DIMENSIONS:** The diagram below shows the maximum envelope of a pc board which can be accommodated by the interface slot in all current Centronics printers. The Series 102 printers may, however, require a slight modification to accept this board. Depending on its depth, if the card is used in the 102A or in the second interface slot (nearest the speaker) of a 102AL, the speaker may have to be relocated to the fan housing.
- More detailed information on allowable dimensions for the interface board is contained on Centronics drawing 62000215.

3. ALL DIMENSIONS IN INCHES.
2. .50 x .50 AREA FREE OF COMPONENTS AND ETCH BOTH SIDES, 2 PLACES.
1. LOCATE KEYSLOTS AS FOLLOWS:  
CONNECTOR P101 BETWEEN PINS 7 AND 8.  
CONNECTOR P102 BETWEEN PINS 13 AND 14.

NOTES:





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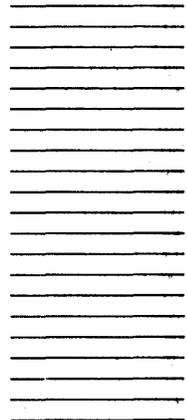
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