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MODEL 705

PRINTER

37400745 REV C FEBRUARY 1982

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TECHNICAL MANUAL

TP 7-80

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37400745 REV C FEBRUARY 1982

TECHNICAL MANUAL

TABLE OF CONTENTS

SECTION 7—REMOVAL/REPLACEMENT

APPENDIX A—ELECTRICAL DRAWINGS

APPENDIX B—INSTALLATION DRAWINGS FOR 705 CUSTOMER-SUPPLIED CONTROL PANEL AND FORMAT CONTROLLER

SECTION 1
INTRODUCTION

1.1 SCOPE

This manual describes the Model 705 printer manufactured by Centronics Data Computer Corporation. This manual also identifies the components that must be designed, built, and installed by the customer (customer-supplied components); theory of operation, and maintenance information for the Centronics-supplied electronics and printer mechanism.

1.2 GENERAL DESCRIPTION

The Model 705 printer consists of a print mechanism and print control logic with microprocessor control. The data input cable, input/output logic (Format Control), which interfaces the input device to the print control logic, and the control panel are designed, built, and installed by the customer (customer-supplied component). The character generators, which contain dot matrix character formation data and are used in the print control logic, are also customer supplied. Stepper motors are used to control bidirectional print head and paper movement. Basically, the printer is a single print head, 7 x 8 dot matrix, 132 column printer with a print speed of up to 180 characters-per-second (cps). Maximum throughput is achieved with a bidirectional print head that seeks the shortest path to the next line of data while printing successive lines. With bidirectional paper movement capability (only possible with rear feed), printing of subscripts, superscripts, overprinters, and graphics are also made possible. An underlining capability is provided by a ninth pin in the print head.

1.3 PHYSICAL DESCRIPTION

The printer is completely self-contained, including the print mechanism with microprocessor electronics and integral power supplies. Space is provided for customer-supplied electronics (format board and control panel). The printer stand and/or forms receiving tray (not shown) are optional. The forms receiving tray is standard with printer stand option.

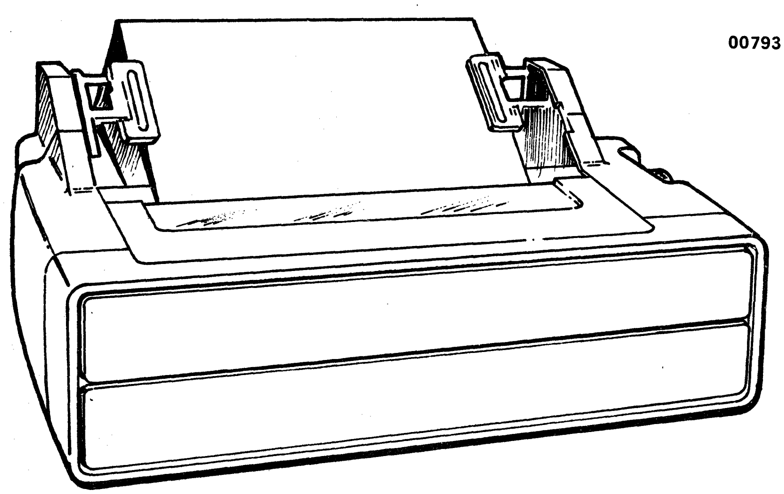


Figure 1-1 Model 705 Printer

The printer covers include several plastic covers and one sheet metal cover. The top cover, the two side covers, and the front cover are plastic, and the rear cover is sheet metal. The lower part of the front cover has an opening for a customer-supplied control panel.

The printer consists of three major units: the print mechanism, the electronics, and the paper handling mechanism. (See Figure 1-2)

1.3.1 PRINT MECHANISM—The print mechanism consists of the carriage assembly, drive mechanism, and print head. The drive contains a stepper motor which drives a continuous belt that transports the print head and carriage assembly back and forth along the platen.

1.3.2 ELECTRONICS—Printer control is provided by the electronics which contains the input power transformer, dc power supply, customer-supplied format control logic (Format Controller), print control logic (Print Controller), and power driver board. The Format Controller interfaces between the Print Controller and the customer-supplied control panel and input device. The Print Controller contains the microprocessor, firmware, control logic, and regulated power supplies. The Format Controller is a piggyback installed on the Print Controller. The Power Driver Board is located in front of the printer behind the front cover. It provides the drive signals for the print head solenoids and stepper motors. A Video Amplifier Board attached to the carriage assembly provides timing pulses for horizontal character registration.

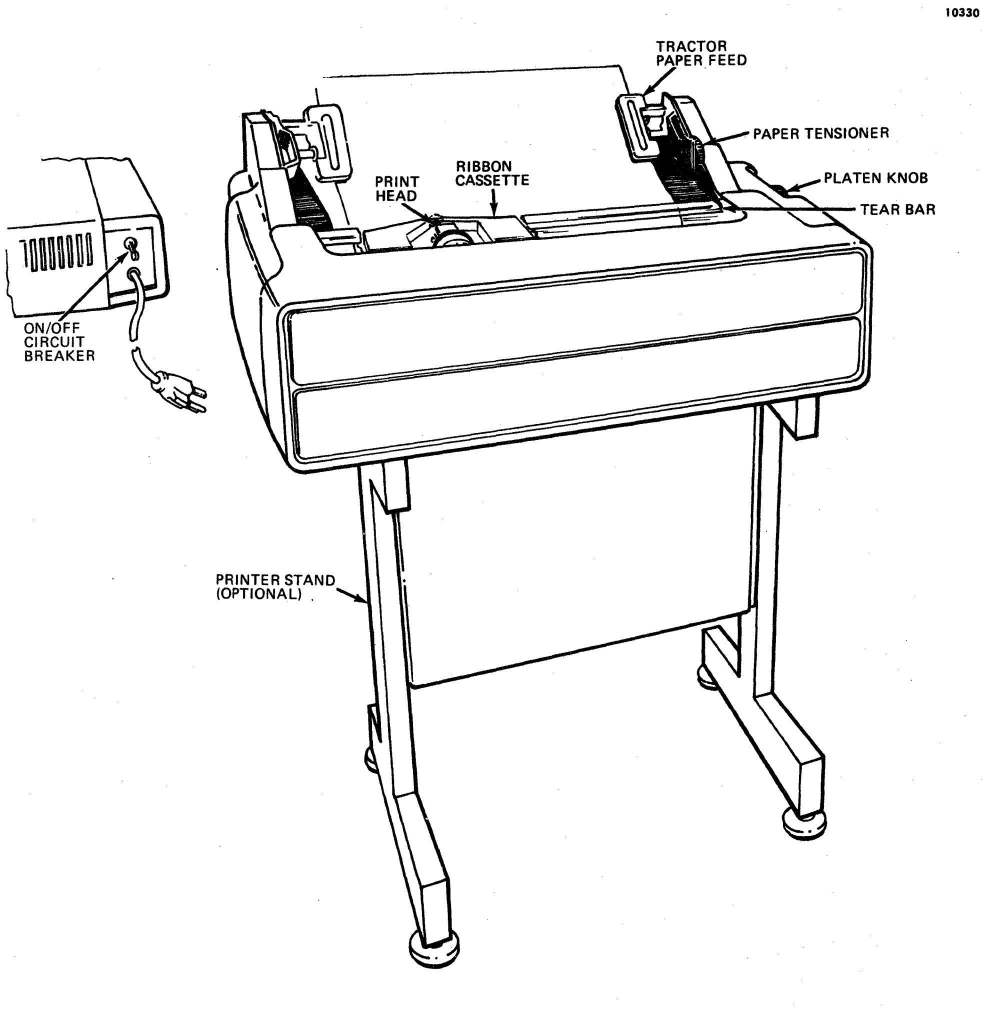


Figure 1-2 Major Assemblies

1.3.3 PAPER HANDLING MECHANISM—The paper handling mechanism is a tractor feed unit that can accommodate up to four part fanfold forms 4 inches (10.2 cm) to 17.3 inches (43.9 cm) wide with a 13.2-inch (33.5 cm) maximum print width.

The printer can have rear or bottom paper feed and can handle up to four-part forms at a slew rate of 15 inches per second (ips).

> **NOTE**
> When bottom feed is used, bidirectional paper feed is NOT possible. Paper can only be moved upward and maintain proper line registration.

The number of lines printed per inch (line density) is dependent on the customer-supplied Format Controller and Control Panel.

1.4 PRINTER OPERATION

Figure 1-3 is a basic block diagram of the printer, and Figure 1-4 is a pictorial diagram illustrating the particular printer components and how they relate to the format control and print control logic boards.

The printer uses a microprocessor to control printer operations. Under program control, the microprocessor, located on the main logic board (Print Controller), controls the receiving of parallel data in a particular format from the customer-supplied Format Controller. The microprocessor then acts on the data received to initiate such functions as an internal self-test and provide the results to the Format Controller, process printable data and move paper. During the printing operation, the microprocessor initiates movement of the print head, carriage and paper, and monitors feedback from the limit switches, video system, and paper empty switch to effect proper execution of these motion commands. It maintains a record of the print head position at all times; provides printer status information to the Format Controller; and performs other "housekeeping" functions.

Basically, all printer functions can be grouped into one of three categories: (1) character printing, (2) paper motion, and (3) auxiliary functions.

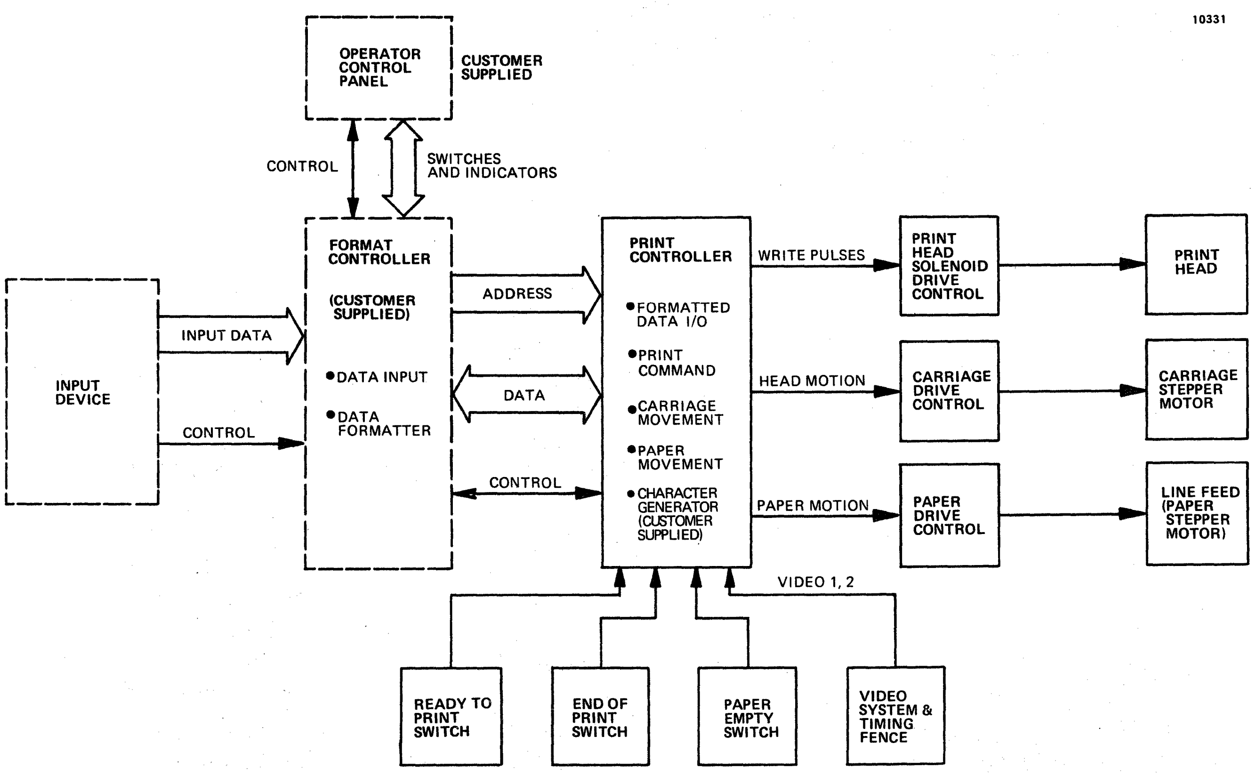


Figure 1-3 Basic Printer Block Diagram

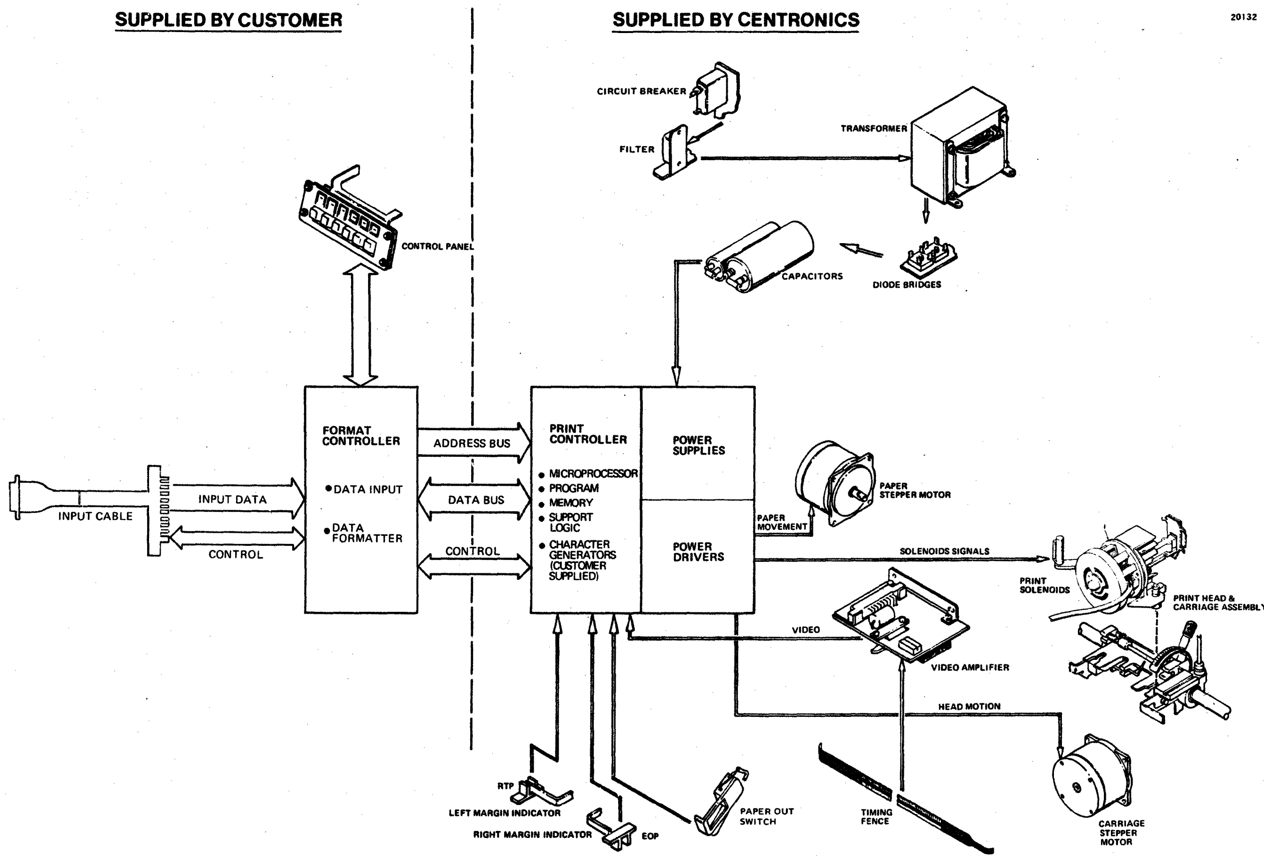


Figure 1-4 Printer Pictorial Diagram

1.4.1 CHARACTER PRINTING—In the printer, characters are printed by selectively activating eight print wires aligned in a vertical column in the print head. A ninth wire, under direct microprocessor control, provides the underlining capability. As the head moves across the paper, the appropriate print wires are momentarily activated, driving them against the ribbon, paper, and platen to form the specified dot pattern. The characters are printed at 10 characters per inch.

The print commands to the print wires are developed by customer-supplied read-only memories (PROMs or ROMs). To extract print information, the microprocessor addresses a PROM memory location for each column within a character.

As shown in Figure 1-5, the print head is attached to the carriage assembly, which in turn is attached to a rotating carriage drive belt. The carriage is driven in the forward direction or in the reverse direction by the carriage stepper motor which rotates the belt clockwise (forward direction) or counterclockwise (reverse direction).

1.4.2 PAPER MOTION—Paper can be moved manually by pushing in and rotating the platen knob, or electromechanically when paper movement information is received from the customer-supplied Format Controller. The information provided by the Format Controller establishes the direction and amount of paper movement, which can be from .00833 inch to 34.133 inches in .00833-inch increments per paper movement operation.

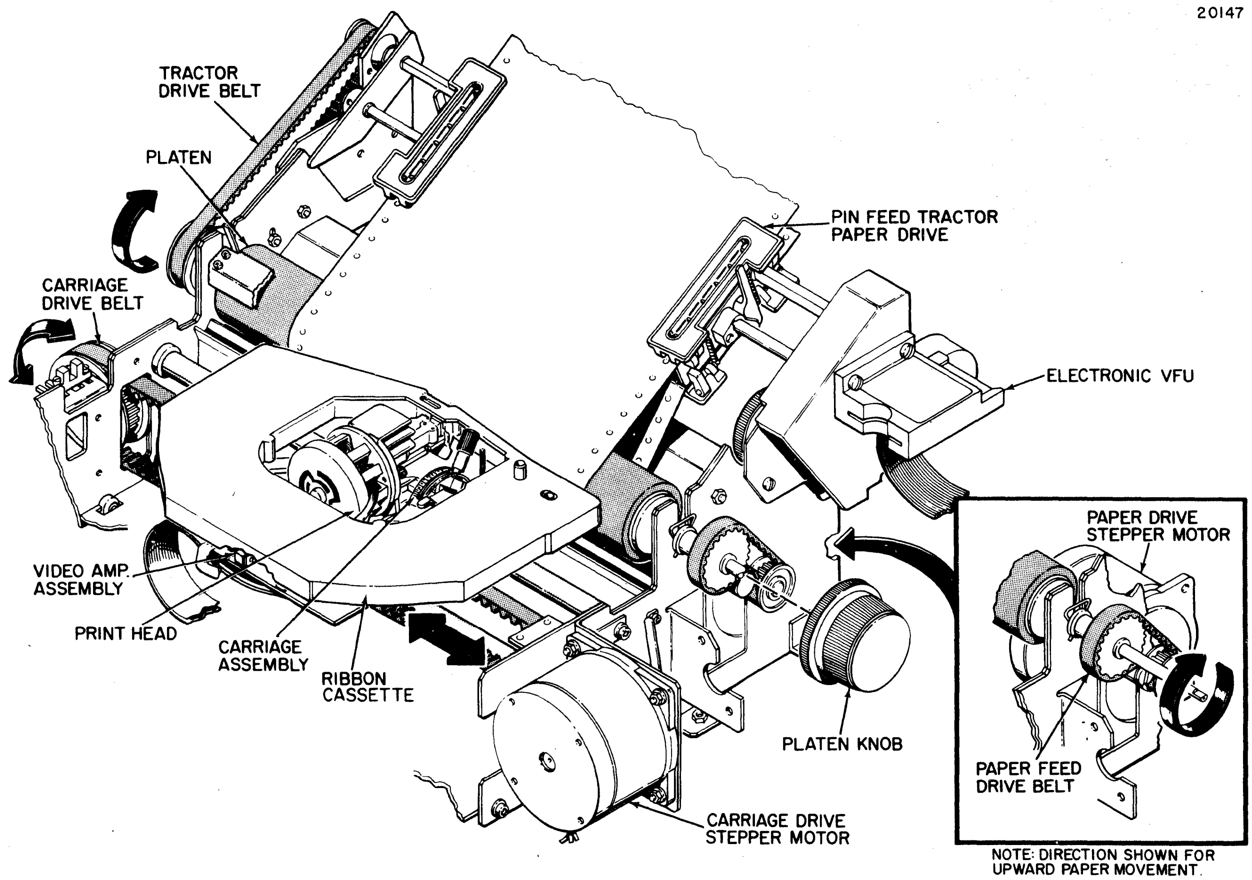


Figure 1-5 Character Printing/Paper Motion

Torque from the paper stepper motor is applied to the tractor unit drive gears. Paper is moved up as shown in Figure 1-5, or down by activating the paper stepper, which turns the drive gears to move paper until the prescribed amount of paper movement, contained in the paper movement information acted on by the microprocessor, has been accomplished.

1.4.3 SPECIAL FUNCTIONS—As a standard feature, the printer can detect if it is out of paper or the print head jams. These conditions are conveyed to the customer-supplied Format Controller via printer status information from the Print Controller.

1.5 RELATED PUBLICATIONS

The following publication provides additional documentation of the Model 705.

1.5.1 UNPACKING/REPACKING INSTRUCTIONS (P/N 37407827-9001)—The unpacking/repacking instructions are attached to the outside of the shipping container and provide the necessary information to unpack and/or repack the printer.

1.6 ACCESSORIES

The following printer accessories are available.

RIBBON CASSETTE (37740008-2001)—Throwaway longlife ribbon cassettes containing 70 yards of ribbon are available to the user.

UNIVERSAL PRINTER STAND (81100000-6070)—The printer stand provides a rigid pedestal for mounting the printer and allows for bottom or rear paper loading.

FORMS RECEIVING TRAY, TABLE TOP OPERATION (65008166-6002)—The forms receiving tray collects and neatly stacks the forms exiting from the rear of the printer.

TOOL KIT (63002399-6001)—A tool kit containing all the necessary tools (screwdrivers, nut drivers, pliers, etc.) to maintain the printer is available to the user.

1.7 SPECIFICATIONS

PRINT CONTROLLER INPUT/OUTPUT

Addressing Lines .... 8-bit parallel input, TTL levels, communication RAM (C-RAM) addressing (00_{16} to 93_{16}).

Bidirectional Data Lines .... 8-bit parallel input/output, TTL levels, input data is according to the following C-RAM addressing format.

Address	Data
05_{16}-08_{16} and $0A_{16}$-$0D_{16}$	Paper Motion Arguments
09_{16}	Print Command
10_{16}-93_{16}	Printable Data
00_{16}	Print Status
01_{16}-04_{16}	Paper Motion Status
$0E_{16}$	Printer Self-Test Status

Hold It Line .... Handshake line, TTL level, input establishing that Format Controller has read/write control of C-RAM when Got It Line is low.

Got It Line .... Handshake line, TTL level, output establishing that Print Controller has read/write control of C-RAM.

Select Line .... TTL level, input that selects C-RAM to enable transfer of incoming data to occur when Got It is low.

Read/Write Control Line .... TTL level, input that establishes direction of data transfer on bidirectional data lines when Got It is low.

PRINTING

Printing Method .... Impact, character by character, bidirectional

Dot Matrix .... 7 × 8 dot matrix

Print Width (Maximum) .... 13.2″

Print Density .... 10 cpi

Number of Copies .... Up to four carbon copies

Print Speed .... 180 cps

PAPER HANDLING

Paper Entry .... Rear or Bottom Feed

Paper Movement .... Bidirectional with rear feed

Paper Feed .... Rear or Bottom Tractor Feed
4.0 inches (102 mm) to 17.3 inches (439 mm) paper width
13.2 inches (335 mm) maximum print width

CONTROLS

Switch .... Power

Manual Controls .... Forms Thickness, Paper Advance, Paper Tensioner

PHYSICAL-ENVIRONMENTAL-ELECTRICAL

Height .... 8.0 inches (203 mm)

Depth .... 19.5 inches (495 mm)

Width .... 24.5 inches (622 mm)

Weight .... 60 lbs (27 kg) (Printer Only)

Temperature	Operating: 40° to 100°F (4° to 37°C) Storage: −35° to 130°F (−37° to 54°C)
Altitude	Operating: −1000 feet to 10,000 feet (−305m to 3048m) Storage: −1000 feet to 10,000 feet (−305m to 3048m) Maximum storage time above 10,000 feet (3048m) = 8 hours
Humidity	Operating: 20% to 90% (No condensation) Storage: 5% to 95% (No condensation)
Input Voltage/Frequency	115 VAC +10%, −15%; 60 Hz ±1 Hz 230 VAC +10%, −15%; 50 Hz ±1 Hz

SECTION 2
CUSTOMER-SUPPLIED COMPONENTS

2.1 INTRODUCTION

This section identifies the components that the customer designs, builds, and installs (customer-supplied components) to complete the 705 printer, and provides information to assist the customer in the design of the customer-supplied components.

To make the Model 705 complete and fully operational, the following customer-supplied components are needed:

- Format Controller—A piggyback logic board that contains the input/output logic to interface between the print control logic supplied with the printer and an external (host) system and customer-supplied control panel.
- Power Cable—A cable assembly that supplies the Format Controller and the Control Panel with operating voltages originating on the Print Controller.
- Data Interface Cable—A cable assembly that connects address, data and control lines between the Format Controller and Print Controller.
- Data Input Cable—A cable assembly that connects input/output lines between Format Controller and the host system. As shown in Figure 2-1, a cut-out is provided in the printer to facilitate cable routing.
- Control Panel—A printed circuit board and switch assembly that interfaces with the Format Controller to provide an operator with local control.
- Control Panel Cable—A cable assembly that connects the control panel to the Format Controller. Figure 2-1 shows a suggested cable routing through an existing cut-out in the printer.
- Character Generators—Two character generators defined as 1K×8 devices (2708 PROM or ROM equivalent), which contain the dot matrix information for 128 characters. The devices are programmed by the customer and installed on the Print Controller.

Details on area dimensions and mounting locations for the Format Controller and Control Panel are given in Appendix B.

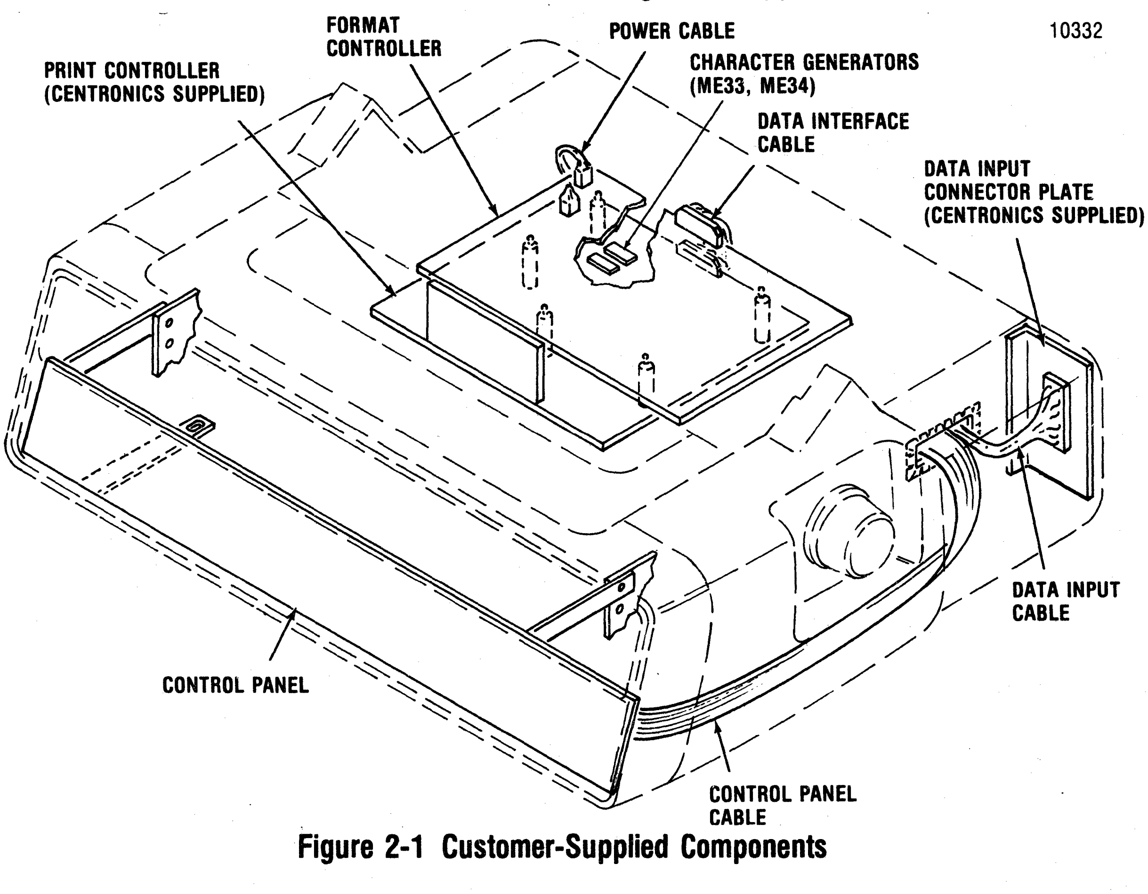


Figure 2-1 Customer-Supplied Components

2.2 FORMAT CONTROLLER

The customer-supplied Format Controller is a piggyback board that mounts on five standoffs located on top of the Centronics-supplied Print Controller. A 6-pin connector J004, located on the Print Controller, is provided to supply power to the Format Controller via a customer-supplied Power Cable. This power source is also used to power the customer-suppled Control Panel. A 26-pin connector J002, located on the Print Controller, connects address, data and control lines to the Format Controller via a customer-supplied Data Interface Cable.

The Format Controller serves as an interface between the Print Controller and customer-supplied Control Panel and host device. Communications between the controllers is by means of a shared 256 x 8 Communications Random Access Memory (C-RAM) located on the Print Controller. The C-RAM is addressed and data is written into memory according to an established format. On signal from the Format Controller, control of the C-RAM is taken over by the Print Controller, which reads the data stored in the C-RAM and operates on it. Control of the C-RAM is then returned to the Format Controller.

2.2.1 POWER CABLE—The customer-supplied Power Cable must be terminated at one end with a 6-pin connector compatible with the power connector J004, Molex receptacle, part number 1261-(03-09-1063) (Centronics P/N 31340006-1002), located on the Print Controller. See Figure 2-2 for location of connector J004. Pin-out identification and functional description is given in Table 2-1 below.

2.2.2 DATA INTERFACE CABLE—The customer-supplied Data Interface Cable should be constructed using 26-wire ribbon cable with a maximum cable length of 6 inches (15.3 cm) and terminated at one end with a 26-pin connector compatible with the 26-pin Data Interface connector J002, T&B/Ansley part number 609-2629M (Centronics P/N 31240052-1002), located on the Print Controller. See Figure 2-2 for location of connector J002. Refer to Table 2-2 for pin identification and functional description.

Table 2-1 Power Connector J004, Pin Identification

PIN NUMBER	DESCRIPTION
1	+5 VDC return
2	+12 VDC ±10% at 500 mA ±2% ripple
3	±12 VDC return
4	+5 VDC ±5% at 4A ±2% ripple
5	Reserved
6	−12 VDC ±10% at 500 mA

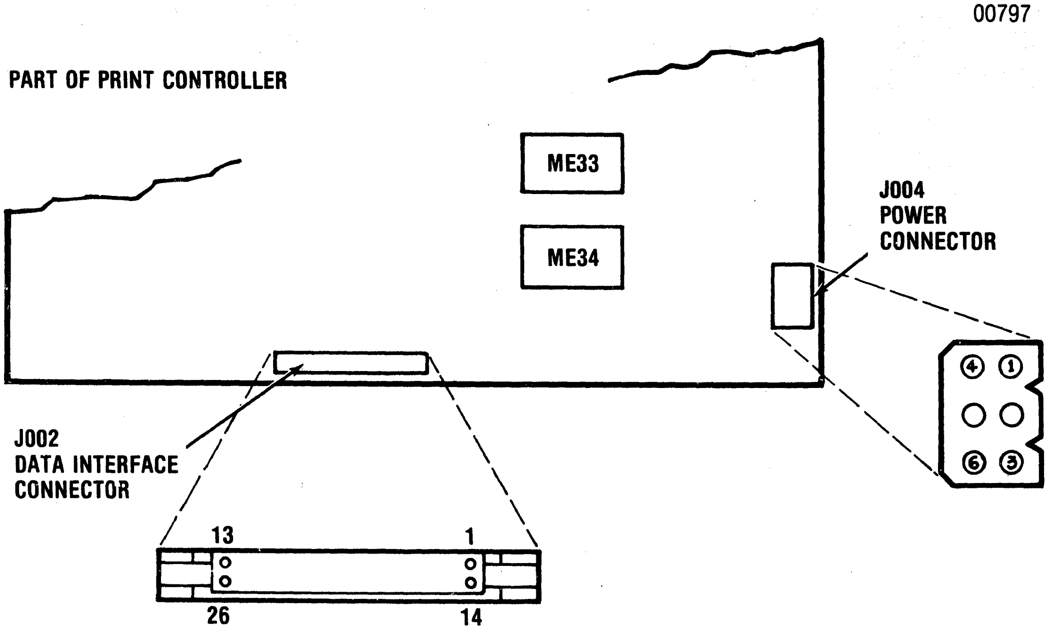


Figure 2-2 Data Interface and Power Connector Location

Table 2-2 Data Interface Connector J002, Pin Identification

PIN NO.	SIGNAL	SOURCE	DESCRIPTION
1	Address 0	Format Controller	Tri-state address lines that select C-RAM memory location according to a particular format during transfer of data via data lines Data 0-Data 7 from Format Controller to Print Controller and vice-versa. Least significant bit is Address 0.
14	Address 1	↕	
2	Address 2		
15	Address 3		
3	Address 4		
16	Address 5		
4	Address 6		
17	Address 7	Format Controller	
5	0V	Both Controllers	
18	0V	Both Controllers	
26	Data 0	Format or Print Controller	Bi-directional data lines that carry control or printable data from Format Controller to Print Controller or status data from Print Controller to Format Controller. All data is transferred in a particular format via C-RAM on the Print Controller. These lines are tri-stated when GOT IT is high. Least significant bit is Data 0.
13	Data 1	↕	
25	Data 2		
12	Data 3		
24	Data 4		
11	Data 5		
23	Data 6		
10	Data 7	Format or Print Controller	
9	0V		
22	0V		

Table 2-2 Data Interface Connector J002, Pin Identification (Cont.)

PIN NO.	SIGNAL	SOURCE	DESCRIPTION
8	Select	Format Controller	When Format Controller has access to C-RAM, this line, when high, selects the C-RAM to enable data transfer to occur in direction established by Read/$\overline{\text{Write}}$ line. Format Controller has access to C-RAM when control line HOLD IT is high and GOT IT is low.
21	Read/$\overline{\text{Write}}$	Format Controller	When SELECT and HOLD IT are high and GOT IT is low, this line, when it is high, enables Format Controller to read data from the C-RAMs via the Data 0-Data 7 lines. When this line is low, data from the Format Controller is written into C-RAM.
6	Hold It	Format Controller	A handshake signal. When this line is high and GOT IT is low, Format Controller has read/write control of C-RAM. Print Controller is prohibited from accessing C-RAM. NOTE: "HOLD IT" will only be recognized by Print Controller when "GOT IT" is low. When low, Format Controller has relinquished control of C-RAM and requests Print Controller to act on data in C-RAM.
19	Got It	Print Controller	A handshake signal. When this line is high, Print Controller has read/write control of C-RAM and data is being acted on. Format Controller is prohibited from accessing C-RAM. When low, Print Controller relinquished control of C-RAM to Format Controller because action caused by data has been completed.
7	Reserved		
20	Reserved		

NOTE: The following signal parameters apply to the Print Controller and must be met by the Format Controller.

1. All signal levels are TTL compatible.
2. Driving and loading requirements are equal to one (1) standard TTL load.

2.3 COMMUNICATIONS RAM (C-RAM) FORMAT

Printer action is dictated by the Format Controller placing parameters in the C-RAM, then lowering the HOLD IT line while GOT IT line is low to signal the Print Controller that action is requested. The parameters are written into C-RAM according to an address format which is basically divided into two sections. The first section is the Control Block and occupies memory locations 00_{16} to $0F_{16}$. The second section is the Data Block and occupies locations 10_{16} to 93_{16}.

The Control Block is dedicated to transferring a print command and paper motion arguments from the Format Controller to the Print Controller and transferring status information on printer action, paper motion and self test from the Print Controller to the Format Controller.

The Data Block is dedicated to transferring information on printable data from Format Controller to Print Controller. A memory map of the C-RAM is shown in Figure 2-3.

00935

	BYTE (HEX)	DESIGNATION	DATA SOURCE
CONTROL BLOCK	00	PRINTER STATUS	PRINT CONTROLLER
	01 02	ACCUMULATED PAPER MOTION STEPS, STATUS	PRINT CONTROLLER
	03 04	REMAINING PAPER MOTION STEPS, STATUS	PRINT CONTROLLER
	05 06	EVENT 1, REVERSE PAPER MOTION STEPS BEFORE PRINT	FORMAT CONTROLLER
	07 08	EVENT 2, FORWARD PAPER MOTION STEPS BEFORE PRINT	FORMAT CONTROLLER
	09	EVENT 3, PRINT COMMAND	FORMAT CONTROLLER
	0A 0B	EVENT 4, REVERSE PAPER MOTION STEPS AFTER PRINT	FORMAT CONTROLLER
	0C 0D	EVENT 5, FORWARD PAPER MOTION STEPS AFTER PRINT	FORMAT CONTROLLER
	0E	SELF TEST STATUS	PRINT CONTROLLER
	0F	RESERVED	
DATA BLOCK	10 TO 93	CHARACTER DATA/ PRINT BUFFER	FORMAT CONTROLLER
	94 TO FF	RESERVED	

Figure 2-3 C-RAM Memory Map

2.3.1 STATUS BYTES—As shown in Figure 2-3, memory locations 00_{16}-04_{16} are for status bytes and locations 05_{16}-$0D_{16}$ for arguments. Arguments for five events are defined as four for paper motion and one for print action. The five events are performed in sequence. However, if the self-test function is requested in the Print Command byte, only the self-test function is performed and no printing or paper movement takes place.

Status is updated by the Print Controller before each transfer of C-RAM control to the Format Controller. The print function arguments are not changed by the Print Controller, only acted on. After completion of a "Print Command" the print buffer (C-RAM locations 10_{16}-93_{16}) are returned in a reset mode (i.e., full of space codes 20_{16}), however, the Print Command byte is not changed. If no print action is requested (Bit 4 of Print Command byte equals 0), the print buffer is neither interrogated nor changed.

2.3.2 PAPER MOTION ARGUMENT DESCRIPTION—The four paper motion arguments (bytes 05_{16} through 08_{16} and $0A_{16}$ through $0D_{16}$) are written into C-RAM as 2-byte numbers by the Format Controller. The Format Controller changes each paper motion argument as needed to move paper before and/or after each print operation. The Print Controller reads and acts on each argument, but does not change it. Up to 4,095 steps (34.133 inches of paper movement) can be loaded into each argument.

As shown in Table 2-3, the argument forms a 12-bit binary number. Bits 0 through 7 of the lower order address bytes (e.g., byte 05_{16} of Event 1) contain the eight (8) least significant bits of the argument values. Bit 0 through 3 of the higher order address bytes (e.g., byte 06_{16} of Event 1) contain the four (4) most significant bits of the argument values. Bits 4 through 7 of the highest order address bytes are ignored.

Table 2-3 Paper Movement Argument

7	6	5	4	3	2	1	0	LS BYTE
7 to 4 DO NOT CARE				3	2	1	0	MS BYTE
2 BYTES FORM 12-BIT BINARY NUMBER, WHICH REPRESENTS THE NUMBER OF STEPS. EACH STEP = .00833 INCH OF PAPER MOVEMENT.								
120 STEPS = 1-IN. PAPER MOVEMENT 20 STEPS = 1/6-IN. PAPER MOVEMENT 15 STEPS = 1/8-IN. PAPER MOVEMENT								

2.3.3 PRINTER STATUS BYTE (ADDRESS 00_{16}, Bit 0 = LSB)—This byte provides the Format Controller with printer status information as described on the following page. The Print Controller writes this byte into C-RAM after each printer action before the return of C-RAM control to the Format Controller. The transfer of control from Format Controller to Print Controller with all events zero will only cause the Print Controller to update the status byte.

Table 2-4 Printer Status Byte

BIT NO.	DESIGNATION
7	EVENT ABORTED
6	ABORT ON EVENT 1
5	ABORT ON EVENT 2
4	ABORT ON EVENT 3
3	ABORT ON EVENT 4
2	ABORT ON EVENT 5
1	FAULT/TEST FAIL
0	PAPER OUT
(Bit 0 is least significant bit.)	

The function of each bit set (high) in the Printer Status byte is as follows:

Bit 7—Indicates that one of the five events was aborted because of either a fault or paper-out condition.

Bits 2 through 6—When bit 7 is set, indicating an event was aborted, one of the bits 2 through 6 is set to indicate the event in progress when the abort occurred.

NOTE

Events 1 through 5 are polled in sequence starting with event 1. Any event following the aborted event is not acted on.

Bit 0—Indicates a paper-out condition. This bit is set anytime the printer is out of paper including initialization or during a prime or self-test operation requested via the Print Command byte.

Bit 1—Two conditions can set this bit:

1. Print head stops moving (jams). If this occurs during prime or initialization, no other bits are set in this byte. If the head jams during a print cycle, bits 4 and 7 are also set to indicate a truncated print cycle.

2. Recognition of a self-test failure. When this occurs, Self-Test Status byte should be polled to determine cause of failure.

2.3.4 SELF-TEST STATUS BYTE (ADDRESS $0E_{16}$)—This byte provides the results of a self-test operation, which is initiated by the Format Controller when it sets bit 0 in the Print Command byte. The Print Controller performs the self-test, then writes the results in the self-test byte location $0E_{16}$ according to Table 2-5. When a bit is set (high), it indicates a failure in the test being performed. A failure due to a paper-out condition is flagged in the Printer Status byte.

Table 2-5 Self-Test Status Byte

BIT NO.	DESIGNATION	CHIP
7	Head Jam/No Head Movement	N/A
6	Bad Video Count	N/A
5	Bad Character ROM #2	ME33
4	Bad Character ROM #1	ME34
3	Scratch Pad RAM 8156 Check	ME7
2	C-RAM #2 Check	ME32
1	C-RAM #1 Check	ME31
0	CRC on 8755A	ME8

The function of each bit set (high) in the Self-Test Status byte is as follows:

Bit 7—Indicates incorrect print head movement caused by a problem in the head drive circuitry or a head jam.

Bit 6—Indicates problem caused by no video or poor video signals.

Bit 5—Indicates an illegal character set (i.e., successive pin firing or character set PROM/ROM #2 is not functioning correctly).

Bit 4—Indicates an illegal character set (i.e., successive pin firing or character set PROM/ROM #1 is not functioning correctly).

Bit 3—Indicates that 8156 is not functioning correctly when reading and writing the scratch pad RAM.

Bit 2—Indicates problem when reading and writing C-RAM #2 (i.e., the four high order bits are functioning incorrectly).

Bit 1—Indicates problem when reading and writing C-RAM #1 (i.e., the four low order bits are functioning incorrectly).

Bit 0—Indicates failure during cyclical redundancy check (CRC) on 8755A firmware program chip.

2.3.5 ACCUMULATED PAPER MOTION STEPS (ADDRESS 01_{16} AND 02_{16})—This two byte, 16-bit number, is a two's complement count of steps that paper has moved. This number is zeroed on initialization with forward paper motion steps added (in two's compliment, subtracted) to the number and reverse steps subtracted. The Format Controller can zero this number at each logical top of form to obtain the number of steps accumulated per form. Each step of motion is equal to .00833 inches (120 steps/inch).

2.3.6 UNCOMPLETED PAPER MOTION STEPS AFTER ABORT (ADDRESS 03_{16} AND 04_{16})—If the Print Controller is forced to abort a paper motion event, the number of paper motion steps that were not completed during that event are stored in this 16-bit number by the Print Controller.

2.3.7 REVERSE PAPER MOTION BEFORE PRINT (ADDRESS 05_{16} AND 06_{16})—Event No. 1, 12-bit number written by the Format Controller to request a number of paper motion steps in the reverse direction before print.

2.3.8 FORWARD PAPER MOTION BEFORE PRINT (ADDRESS 07_{16} AND 08_{16})—Event No. 2, 12-bit binary number written by the Format Controller to request a number of paper motion steps in the forward direction before print.

2.3.9 PRINT COMMAND (ADDRESS 09_{16}, BIT 0 = LSB)—Event No. 3, written by the Format Controller to request action other than paper motion as shown in Table 2-6. The Self-Test bit 0 is interrogated first. If it is set, no other bit is checked. If bit 0 is not set, Prime then Print Data bit is checked. When Print Data is set, Print Underline and Print Expanded bits are checked for special print function. When the Override bit is set, any event, 1 through 5, will be acted on regardless of a paper-out condition.

Table 2-6 Print Command Byte

BIT NO.	DESIGNATION
7	PRIME
6	PRINT UNDERLINE
5	PRINT EXPANDED
4	PRINT DATA
3	OVERRIDE
2	RESERVED
1	RESERVED
0	SELF-TEST
(Bit 0 is least significant bit.)	

The function of each bit set (high) in the Print Command byte is as follows:

Bit 7—Causes print head to move to left margin.

Bit 6—When set along with bit 4, causes underline printout from first through last character data loaded into print buffer.

Bit 5—When set along with bit 4, causes expanded printout of print buffer data.

Bit 4—Indicates that data is to be printed. This bit must be set to initiate any print action. To print underline and expanded, bits 6, 5, and 4 must be all set to ones. For normal print, only bit 4 is set.

Bit 3—Any event (1 through 5) requested will be processed regardless of a paper-out condition.

Bits 2 and 1—Reserved.

Bit 0—Causes the Print Controller to initiate a self-test. This includes a RAM check and the moving of the print head to the right-hand margin to verify the video count. Self-test result (pass/fail) is recorded in Printer Status Byte, bit 1, with the failure indicated in the Self-Test Status Byte. After a successful self-test, the head is returned to the left-hand margin. Note that a paper-out condition is not checked during the self-test but, it is checked after the head returns to the left-hand margin. The result of the check is only recorded in Printer Status Byte, bit 0.

NOTE

When this bit is set, no other request will be processed including paper motion.

2.3.10 REVERSE PAPER MOTION AFTER PRINT (ADDRESS $0A_{16}$ AND $0B_{16}$)—Event No. 4, 12-bit binary number written by Format Controller to request a number of paper motion steps in the reverse direction after print.

2.3.11 FORWARD PAPER MOTION AFTER PRINT (ADDRESS $0C_{16}$ AND $0D_{16}$)—Event No. 5, 12-bit binary number written by Format Controller to request a number of paper motion steps in the forward direction after print.

2.3.12 PRINT BUFFER (ADDRESS 10_{16} AND 93_{16})—The print buffer is located in the C-RAM memory section referred to as the Data Block. The Control Block of the C-RAM defines how to print the data in the print buffer. The print buffer can store up to 132 codes made up of 8-bit words. All of the codes can be printable with the exception of 20_{16} and 00_{16}. Code 20_{16} is defined as a space code. Code 00_{16} is defined as an underline space code when Print Underline bit is set with Print Data bit in Print Command byte 09_{16}.

When the Print Controller recognizes a Print Command, it examines the print buffer for printable codes, then uses a logic seeking routine to select the shortest head movement to start printing the next line. After the line is printed and before returning C-RAM control to the Format Controller, space codes (20_{16}) are written into all the print buffer locations.

Up to 132 characters per line (10 characters per inch) can be printed, therefore, the Print Controller interrogates all 132 bytes in the print buffer for printable codes. When bit 5 in the Print Command byte is set for expanded characters, only the first 66 characters in the print buffer are interrogated for printable codes. Characters outside these 66 will be written over with spaces even though they have no printing significance. For details on loading printable data, refer to paragraph 2.6.

2.4 CHARACTER GENERATORS

The character generators are two 1K×8-bit devices (2708 PROM or ROM equivalent), which can contain dot information for up to 128 characters. The character generators are programmed and installed by the customer in sockets located at ME33 and ME34 on the Print Controller. As shown in Figure 2-4, the dot information for codes 00_{16}, through $7F_{16}$ is contained in the character generator installed in ME34 location. Dot information for codes 80_{16} through FF_{16} are contained in the generator installed in ME33 location. A standard US ASCII character set is defined in Figure 2-4. Note that codes 00_{16} and 20_{16} must be spaces.

Dot information for a complete character is contained in eight consecutive ROM locations starting with code 00_{16} at address 00_{16}, code 01_{16} at address 08_{16} etc. Each byte contains the pin fire information for one column of the character with the least significant bit corresponding to the topmost pin. In the case of standard ASCII, the character matrix is defined as 7×8 (7 columns wide, 8 pins high). This means that the eighth byte of an ASCII character is always zero. It is possible to add eighth column information in this location giving added flexibility to character formation. In all cases the character and intercharacter space occupies nine columns. With standard ASCII there are seven columns of pinfire and two blank columns. The first of the blanks (column 8) is taken from the ROM and the second (column 9) is inserted by the microprocessor. If there is pin data in column 8 then the only spacing between characters is the columm 9 blank inserted by the microprocessor.

NOTE

When constructing a character set, the rule of not firing the pin in adjacent positions must be adhered to.

10333

b8 b7 b6 b5 Bits					0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
b4	b3	b2	b1	Column / Row	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0	0	0	0	0	$\not{S}$P		SP	0	@	P	`	p								
0	0	0	1	1			!	1	A	Q	a	q								
0	0	1	0	2			"	2	B	R	b	r								
0	0	1	1	3			#	3	C	S	c	s								
0	1	0	0	4			$	4	D	T	d	t								
0	1	0	1	5			%	5	E	U	e	u								
0	1	1	0	6			&	6	F	V	f	v								
0	1	1	1	7			'	7	G	W	g	w								
1	0	0	0	8			(	8	H	X	h	x								
1	0	0	1	9			)	9	I	Y	i	y								
1	0	1	0	10			*	:	J	Z	j	z								
1	0	1	1	11			+	;	K	[	k	{								
1	1	0	0	12			,	<	L	\	l	|								
1	1	0	1	13			-	=	M	]	m	}								
1	1	1	0	14			.	>	N	^	n	~								
1	1	1	1	15			/	?	O	—	o									

1K ROM, LOCATION ME34 (columns 0000–0111) 1K ROM, LOCATION ME33 (columns 1000–1111)

NOTE: The U.S. ASCII character set is only shown as an example. Only locations for $\not{S}$P and SP are defined. All other locations are defined by the customer.

Figure 2-4 Character Locations/Character Generators

2.4.1 2K CHARACTER GENERATORS—As previously discussed in paragraph 2.4, two 1K×8-bit devices (2708 PROM or ROM equivalent) are used to provide a total of 2K memory for character pin firing information. The addressing scheme for these two areas of memory in the Print Controller is hex 4800 through 4BFF for element location ME34 and hex 4C00 through 4FFF for element location ME33.

As a user alternative, a single 2K×8-bit device (2716 PROM) can be used in location ME34 only. To do this three jumpers must be changed on the Print Controller so that location ME34 will become the 2K of memory and addressed by hex 4800 to 4FFF. To convert from two 1K devices to one 2K device, locate jumper locations E1 through E8 on the 705 Logic Board, then proceed as follows:

1. Remove jumper from E1 to E2.

2. Disconnect jumper from E6 to E7, then connect from E6 to E3.

3. Disconnect jumper from E5 to E8, then connect from E5 to E4.

NOTE

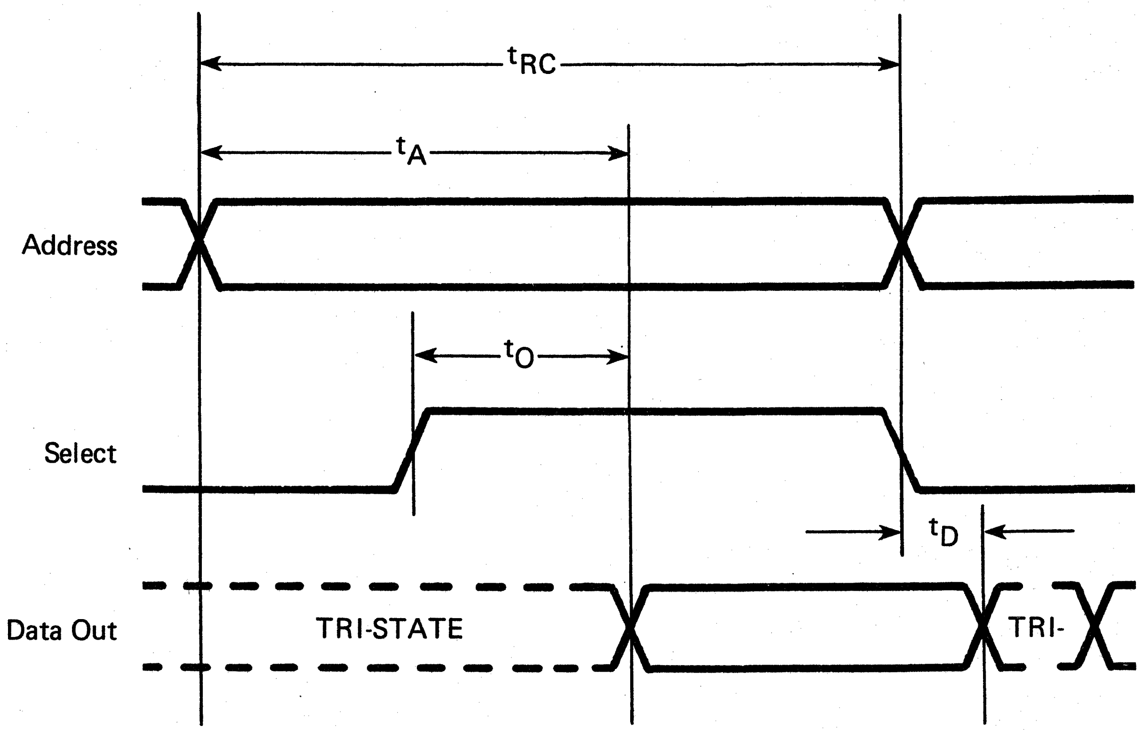
The jumper connections above only apply to the 705 Logic Board Rev. C and above.

2.5 DATA TRANSFER AND TIMING

On power up, the Format Controller must wait for the Print Controller to initialize the C-RAM. Signal "GOT IT" will go high for the duration of the initialization and then go low. The Format Controller can then read data out of, or write data into, C-RAM on the Print Controller. It should be noted that the Print Controller has master control of the C-RAM.

After initialization, the C-RAM can be accessed by both the Format Controller and Print Controller under control of handshake signals HOLD IT and GOT IT. When HOLD IT is high, while GOT IT is low, the Format Controller has read/write control of C-RAM. When GOT IT is high, the Print Controller has read/write control and the Format Controller is prohibited from accessing C-RAM.

Timing involved during Format Controller read and write cycles is given in Figures 2-5 and 2-6, respectively.



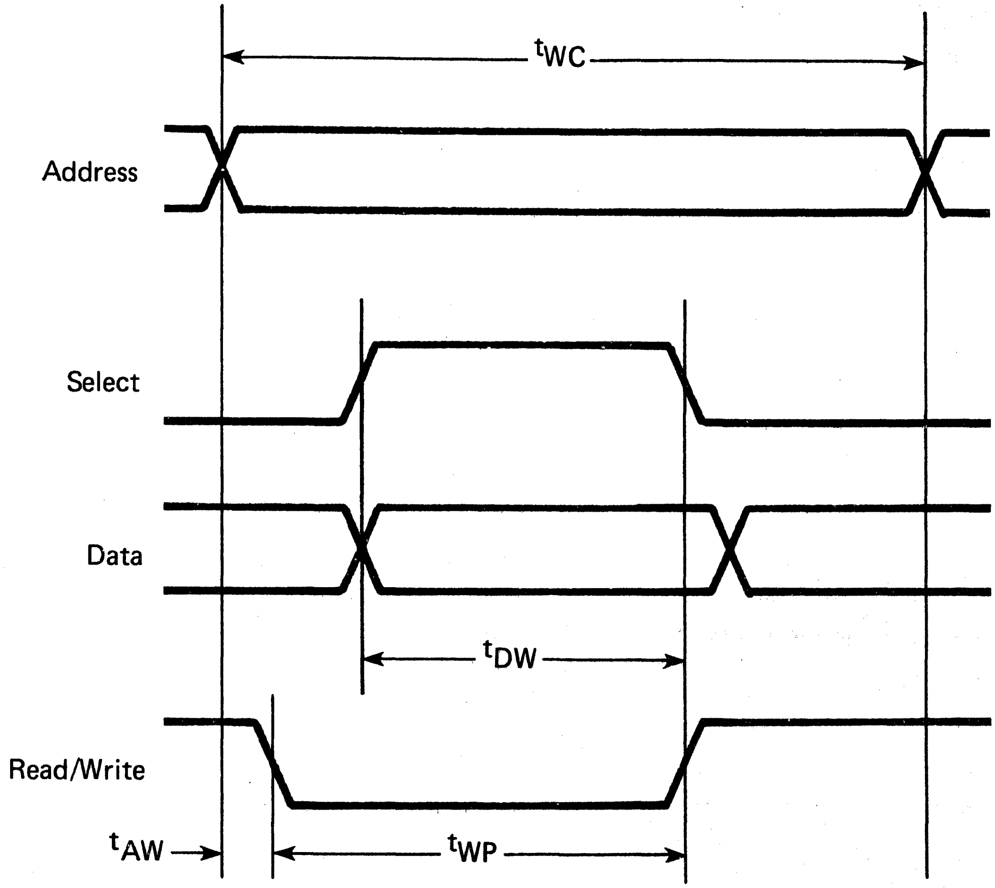
NOTE: Read/Write input must be true

Rise and fall times shall be less than 30 nanoseconds.

t_{RC}	Read Cycle	450 nsec.	MIN
t_A	Access Time	450 nsec.	MAX
t_O	Chip Enable to O/P Time	340 nsec.	MAX
t_D	Chip Enable to O/P Disable Time	300 nsec.	MAX

Figure 2-5 Format Controller Read Cycle

00832



Rise and fall times shall be less than 30 nanoseconds.

t_{WC}	Write Cycle	450 nsec.	MIN
t_{DW}	Set-Up Time	350 nsec.	MIN
t_{AW}	Address Set Up Time	20 nsec.	MIN
t_{WP}	Write Pulse Width	350 nsec.	MIN

Figure 2-6 Format Controller Write Cycle

2.6 LOADING DATA FOR PRINTOUTS

To initiate a printout, the Format Controller loads C-RAM on the Print Controller with:

1. Data to request and establish type of print action (normal, underline or expanded) via Print Data, Print Underline and Print Expanded bits 4, 5 and 6, respectively, in Print Command byte 09_{16}.

2. Data to establish (when appropriate) the number of paper motion steps in the forward and/or reverse direction before and/or after printing. This is done via arguments loaded into bytes 05_{16} and 06_{16} for reverse paper motion before printing; 07_{16} and 08_{16} for forward paper motion before printing; $0A_{16}$ and $0B_{16}$ for reverse paper motion after printing; and $0C_{16}$ and $0D_{16}$ for forward paper motion after printing.

3. Printable data. This data is loaded into C-RAM locations 10_{16} through 93_{16}, which are designated as the print buffer and associated with print colums 1 to 132, respectively. When printing expanded characters, only the first 66 locations (10_{16} through 51_{16}) are interrogated for printable data. Any data loaded into other print buffer locations are written over with space code 20_{16}.

NOTE

Except after an abort on event 3, the print controller always returns control of C-RAM to format controller with print buffer filled with space code 20_{16}.

In order to better illustrate how to use the data mentioned above to initiate a printout, the following seven examples are provided to describe and illustrate loading of data for the printout of a simple line of characters (Example 1), underlining (Examples 2 and 3), superscripts/subscripts (Examples 4 and 5), and expanded characters (Examples 6 and 7).

2.6.1 PRINTING SIMPLE LINE OF CHARACTERS, EXAMPLE 1

2.6.1 PRINTING SIMPLE LINE OF CHARACTERS, EXAMPLE 1—As shown in Figure 2-7, to print a simple line of characters in columns 6 through 19 followed by a line feed at 6 lines per inch (lpi), the Format Controller sets Print Data bit 4 in Print Command byte 09_{16}, loads printable characters into print buffer locations 15_{16} through 22_{16}, and loads a paper motion argument into bytes $0C_{16}$ and $0D_{16}$.

Print Data set
Argument, 20 forward after print

		6												19	Print Columns
		15_{16}												22_{16}	Memory Locations
Data loaded	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
Printed line	A	B	C	D	E	F	G	H	I	J	K	L	M	N	

Figure 2-7 Printing Simple Line of Characters, Example 1

2.6.2 UNDERLINING, EXAMPLES 2 and 3—To print an underline, the Format Controller must set Print Data bit 4 and Print Underline bit 6 in Print Command byte 09_{16}. When these conditions are set, the following considerations must be kept in mind:

1. When only one character or Space Underline code 00_{16} (S̸P̸) is loaded into the print buffer, the character or print column associated with the memory location loaded with S̸P̸ is underlined.
2. When characters, including the Space Underline code 00_{16} (S̸P̸), are loaded into the print buffer, all print columns are underlined starting with the first character through to the last character in the line as shown below in Figure 2-8.

NOTE

In the last three examples below, S̸P̸ codes can be used as character fillers between first or last S̸P̸ and printed characters or between two S̸P̸ codes (last example).

To underline one or more characters in the middle of a line requires two or more print cycles. Examples 2 and 3 show two ways to input data to print characters A through L in print columns 5 through 16 with E, F, and G underlined.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
OR,	A	B	C	D	E	F					G	H	I	J	K	L
OR,	A															B
OR,	S̸P̸						A	B	C	D	E	F	G	H	I	J
OR,	A	B	C	D	E										O	S̸P̸
OR,	S̸P̸															S̸P̸

Figure 2-8 Underline Codes

EXAMPLE 2:

As shown in the example below, it takes two print cycles to complete the line of print. In the first cycle, Print Data bit 4 is set in Print Command byte 09_{16} to request a printout of characters A through L loaded into print buffer locations 14_{16} through $1F_{16}$. There are no paper movement arguments loaded in this cycle because the characters E, F, and G will be underlying in the next print.

In the second print cycle, Print Data bit 4 and Print Underline bit 6 are set in the Print Command byte. Space Underline code 00_{16} ($\not{S}\not{P}$) is loaded into print buffer locations (hex 18, 19, and 1A) associated with the print columns (9, 10, and 11) where characters E, F, and G were printed during the first print cycle. A paper motion argument is loaded into bytes $0C_{16}$ and $0D_{16}$ for 20 paper motion steps in the forward direction after printing. (This is a line feed at 6 lpi.) When the second print cycle is executed, the letters E, F, and G are underlined, then followed by a line feed.

FIRST PRINT CYCLE
Print Data set

	5											16	Print Columns
	14_{16}											$1F_{16}$	Memory Locations
Data loaded	A	B	C	D	E	F	G	H	I	J	K	L	
Printed line	A	B	C	D	E	F	G	H	I	J	K	L	

SECOND PRINT CYCLE
Print Data set
Print Underline set
Argument, 20 forward after print

					9		11					
					18_{16}		$1A_{16}$					
Data loaded					$\not{S}\not{P}$	$\not{S}\not{P}$	$\not{S}\not{P}$					
Printed line	A	B	C	D	<u>E</u>	<u>F</u>	<u>G</u>	H	I	J	K	L

(Line feed after print)

Figure 2-9 Underlining, Example 2

EXAMPLE 3:

In this example, three print cycles are needed to complete the line of print. For the first print cycle, only Print Data bit 4 is set in Print Command byte 09_{16} to request the printout of A, B, C, and D loaded into print buffer locations 14_{16} through 17_{16}. No paper motion arguments are loaded. When this print cycle is executed, the four characters (A, B, C, D) are printed without a line feed.

For the second print cycle, Print Data bit 4 and Print Underline bit 6 are set in the Print Command. This requests a printout and underlining of the next three characters (E, F, and G) in the line, which are loaded into print buffer locations 18_{16} through $1A_{16}$, respectively. No paper motion argument is loaded in this cycle because the last characters in this line will be loaded and printed during the third print cycle.

For the third print cycle, Print Data bit 4 is set, characters H, I, J, K, and L are loaded into print buffer locations $1B_{16}$ through $1F_{16}$, and a paper motion argument is loaded into bytes $0C_{16}$ and $0D_{16}$ for 20 paper motion steps in the forward direction after print. The resulting printout is the last three characters H, I, and J followed by a line feed at 6 lpi.

FIRST PRINT CYCLE
Print Data set

	5			8	Print Columns
	14_{16}			17_{16}	Memory Locations
Data loaded	A	B	C	D	
Printed line	A	B	C	D	

SECOND PRINT CYCLE
Print Data set
Print Underline set

					9		11
					18_{16}		$1A_{16}$
Data loaded					E	F	G
Printed line	A	B	C	D	<u>E</u>	<u>F</u>	<u>G</u>

THIRD PRINT CYCLE
Print Data set
Print Underline set
Argument, 20 forward after print

								12				16
								$1B_{16}$				$1F_{16}$
Data loaded								H	I	J	K	L
Printed line	A	B	C	D	<u>E</u>	<u>F</u>	<u>G</u>	H	I	J	K	L

(Line feed after print)

Figure 2-10 Underlining, Example 3

2.6.3 SUBSCRIPTS AND SUPERSCRIPTS, EXAMPLES 4 AND 5—As in underlining, two or more print cycles are necessary to print a line of characters that include subscripts or superscripts. Figure 2-11, Example 4 and Figure 2-12, Example 5 show two methods of inputting data to print CODE 20_{16} IS A SPACE in print columns 5 through 24. Except for the paper movement arguments used to position paper for the subscript, the method of loading data for superscripts would be similar.

EXAMPLE 4:

As shown below, two print cycles are necessary to complete the line of print. In the first print cycle, Print Data bit 4 is set in Print Command Byte 09_{16} to request the printout of characters C, O, D, E, 2, 0, I, S, A, P, A, C, and E loaded into print buffer locations hex 14 through 17, 19, 1A, 1E, 1F, 21, 23 through 27, respectively. A paper motion argument is loaded into $0C_{16}$ and $0D_{16}$ for 10 paper motion steps in the forward direction after print. (This is a half-line feed at 6 lpi.) When this print cycle is executed, the loaded character data is printed, then followed by half a line feed. This positions the paper for printout of subscript 16.

For the second print cycle, Print Data bit 4 is set and characters 1 and 6 are loaded into buffer locations $1B_{16}$ and $1C_{16}$ respectively. A paper motion argument for 10 steps in the forward direction is again loaded into bytes $0C_{16}$ and $0D_{16}$. In this print cycle, subscript 16 is printed a half line down from the other characters and followed by half a line feed to complete the total line feed.

FIRST PRINT CYCLE

Print Data set
Argument, 10 forward after print (half-line feed at 6 lines per inch.)

	5	24	Print Columns
	14_{16}	27_{16}	Memory Locations
Data loaded	C O D E 2 0 I S A S P A C E		
Printed line	C O D E 2 0 I S A S P A C E		

(Half-line feed after print)

SECOND PRINT CYCLE

Print Data set
Argument, 10 forward after print

		12	13
		$1B_{16}$	$1C_{16}$
Data loaded		1	6
Printed line	C O D E 2 $0_{1\ 6}$ I S A S P A C E		

(Half-line feed after print)

Figure 2-11 Subscripts and Superscripts, Example 4

EXAMPLE 5:

In this example, three print cycles are required to complete the line of print. For the first print cycle, Print Data bit 4 is set in Print Command byte 09_{16} to request the printout of characters C, O, D, E, 2, and 0 loaded into print buffer locations 14_{16} through 17_{16}, respectively. No paper motion argument is loaded for this print cycle.

For the second print cycle, Print Data bit 4 is set and characters 1 and 6 are loaded into print buffer locations $1B_{16}$ and $1C_{16}$. Two paper motion arguments are loaded for this print cycle. One argument for 10 paper motion motion steps in the forward direction before print is loaded into bytes 07_{16} and 08_{16}. The other argument is for 10 steps in the reverse direction after print and it is loaded into bytes $0A_{16}$ and $0B_{16}$. When this print cycle is executed, there is half a line feed to position paper for the printout of subscript $_{16}$. After the subscript printout, the paper is moved half a line in the reverse direction to position paper for the remaining printout in the third print cycle.

For the third print cycle, Print Data bit 4 is set and remaining characters I, S, A, S, P, A, C, and E for the line are loaded into print buffer locations hex 1E, 1F, 21, 23 through 27, respectively. A paper motion argument for 20 steps in the forward direction after print is loaded into bytes $0C_{16}$ and $0D_{16}$. (This is a line feed at 6 lpi.) During the execution of this print cycle, a line feed follows the printout of: IS A SPACE.

```
FIRST PRINT CYCLE
Print Data set
                5              11    Print Columns
                14₁₆           1A₁₆    Memory Locations
                |              |
Data loaded     C  O  D  E  2  0
Printed line    C  O  D  E  2  0

SECOND PRINT CYCLE
Print Data set
Argument, 10 forward before print
Argument, 10 reverse before print
                            12     13
                            1B₁₆ ┐ ┌ 1C₁₆
Data loaded                      1 6
                (Half line feed before print)

Printed line    C  O  D  E  2  0 1 6
                (Half reverse line feed after print)

THIRD PRINT CYCLE
Print Data set
Argument, 20 forward after print
                                    15                  20
                                    1E₁₆                27₁₆
                                    |                   |
Data loaded                         I S  A  S P A C E
Printed line    C  O  D  E  2  0 1 6  I S  A  S P A C E
                (Line feed after print)
```

Figure 2-12 Subscript and Superscript, Example 5

2.6.4 PRINTING EXPANDED CHARACTERS, EXAMPLES 6 AND 7—To print expanded characters, the Format Controller must set Print Data bit 4 and Print Expanded bit 5 in Print Command byte 09_{16}. When these conditions are set, any character loaded into the first 66 memory locations (10_{16} through 51_{16}) of the print buffer are printed twice the normal width using two printed columns per character. Any characters loaded into print buffer locations 52_{16} through 93_{16} are not acted on as printable characters and are written over with space code 20_{16}. Because of the one-to-two relationship between print buffer locations and print columns (e.g. $10_{16} = 1$ and 2, $11_{16} = 3$ and 4, $12_{16} = 5$ and 6, etc.), the printout of an expanded character always starts in an odd print column. This must be kept in mind especially when printing normal and expanded characters on the same line.

To print expanded characters in the middle of a line, it takes two or more print cycles to complete the line of print. Figure 2-13, Example 6 and Figure 2-14, Example 7 show two methods of inputting data to print A, B, C, D, E, F, G in print columns 5 through 15 with D and E as expanded characters.

EXAMPLE 6:

In this example, two print cycles are required to complete the line of print. For the first print cycle, Print Data bit 4 is set in Print Command byte 09_{16} to request the printout of characters A, B, C, F, and G loaded into print buffer locations 14_{16} through 16_{16}, $1D_{16}$ and $1E_{16}$, respectively. Print buffer locations 17_{16} through $1C_{16}$ are not loaded, so that there will be six unprinted columns between C and F for the printout of expanded characters D and E in the second print cycle. Four columns are needed for the expanded characters (two columns per character) and two columns for a normal space to precede and follow the expanded characters.

For the second print cycle, Print Data bit 4 and Print Expanded bit 5 are set in the Print Command to request the expanded printout of characters D and E in columns 9 and 10, 11 and 12, respectively. A paper motion argument for 20 steps in the forward direction after print is loaded into bytes $0C_{16}$ and $0D_{16}$. (This is a line feed at 6 lpi.) During the execution of this print cycle, characters D and E are printed twice as wide with normal spaces between C and D, E and F.

FIRST PRINT CYCLE
Print Data set

	14_{16}		16_{16}	$1D_{16}$	$1E_{16}$	Memory Locations
Data loaded	A	B	C	F	G	
Printed line	A	B	C	F	G	
	5		7	14	15	Print Columns

SECOND PRINT CYCLE
Print Data set
Print Expanded set
Argument, 20 forward after print

					14_{16}		15_{16}					
Data loaded					D		E			F	G
Printed line*	A	B	C		~~D~~	~~D~~	~~E~~	~~E~~		F	G
				8	9	10	11	12	13	14	15

(Line feed after print)

* Line through character denotes expanded character, which takes two print columns.

Figure 2-13 Printing Expanded Characters, Example 6

EXAMPLE 7:

This method of inputting data to generate the line of print requires three print cycles. For the first print cycle, Print Data bit 4 is set in Print Command byte 09_{16} to request the printout of characters A, B, and C loaded into print buffer locations 14_{16} through 16_{16}, respectively. No paper motion arguments are loaded so that there is no paper feed after the printout of A, B, and C.

For the second print cycle, Print Data bit 4 and Print Expanded bit 5 are set in the Print Command. This requests an expanded printout of characters C and D loaded into print buffer locations 15_{16} and 16_{16}, respectively. No paper movement argument is loaded because the last two characters in the line will be printed in the next print cycle.

For the third print cycle, Print Data bit 4 is set in the Print Command to request the normal printout of character F and G loaded into 14_{16} and 15_{16}, respectively. An argument for 20 steps in the forward direction after print is loaded into bytes $0C_{16}$ and $0D_{16}$. This causes a line feed at 6 lpi after the printout of F and G.

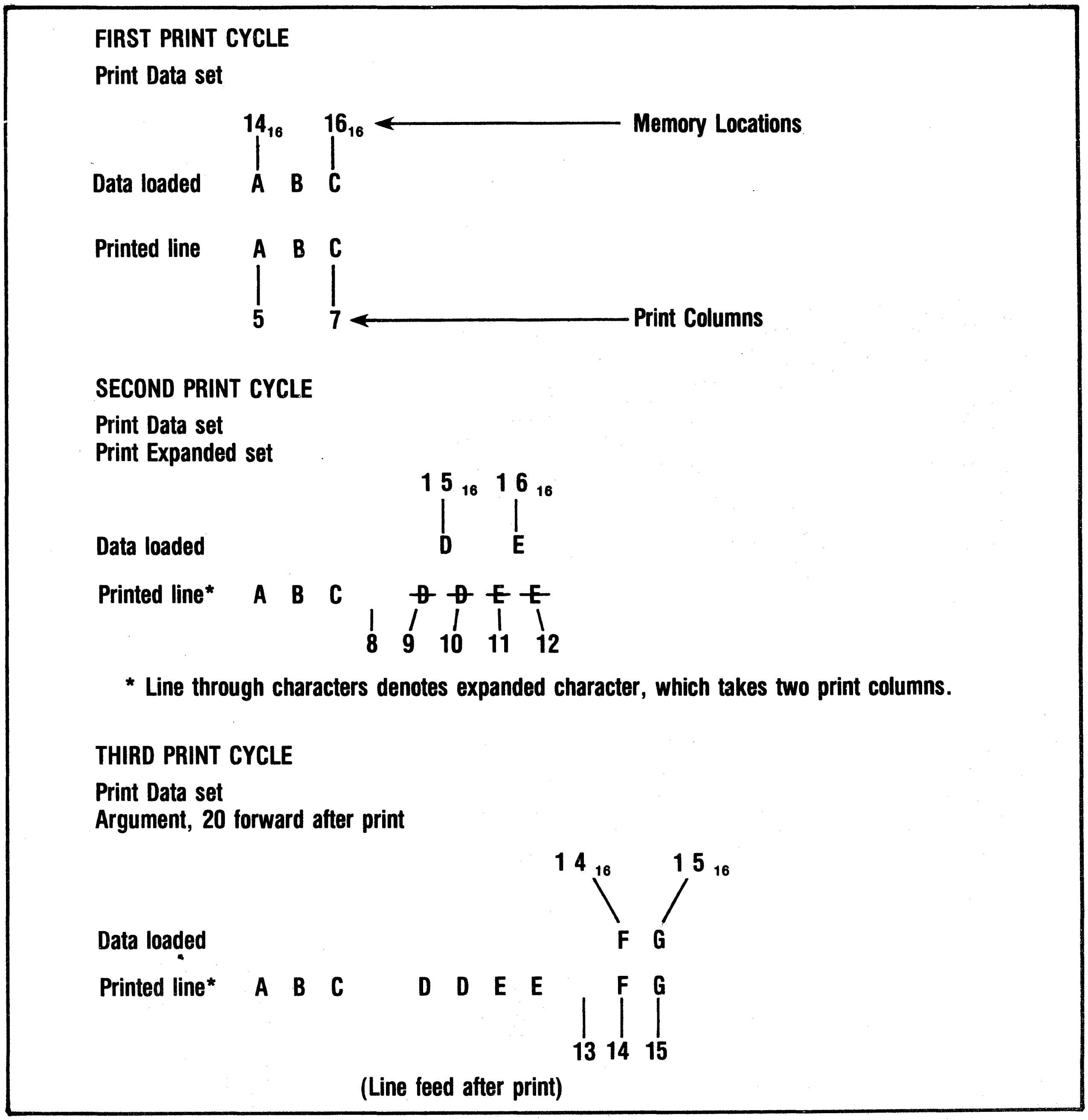


Figure 2-14 Printing Expanded Characters, Example 7

SECTION 3
INSTALLATION AND OPERATION

3.1 INTRODUCTION

This section provides installation information; set-up procedure; control description; operating notes; instructions for loading paper; removal and replacement of the ribbon cassette; information on operator level maintenance and operating checks for the Model 705 printer.

3.2 INSTALLATION

3.2.1 SITE CONSIDERATIONS—When selecting a site to install the printer, the following information should be taken into account.

WEIGHT

Printer 60 lbs (27 kg)
Stand 25 lbs (11.4 kg)

TEMPERATURE

Operating: 40° to 100°F (4° to 37°C)
Storage: –35° to 130°F (–37° to 54°C)

ELECTRICAL REQUIREMENTS

50/60 Hz, 115/230 VAC; +10%/–15% of nominal tappable transformer (100, 110, 115, 120, 200, 220, 230, 240 VAC)
Power Cord: 12 feet long

HUMIDITY

Operating: 20% to 90% (no condensation)
Storage: 5% to 95% (no condensation)

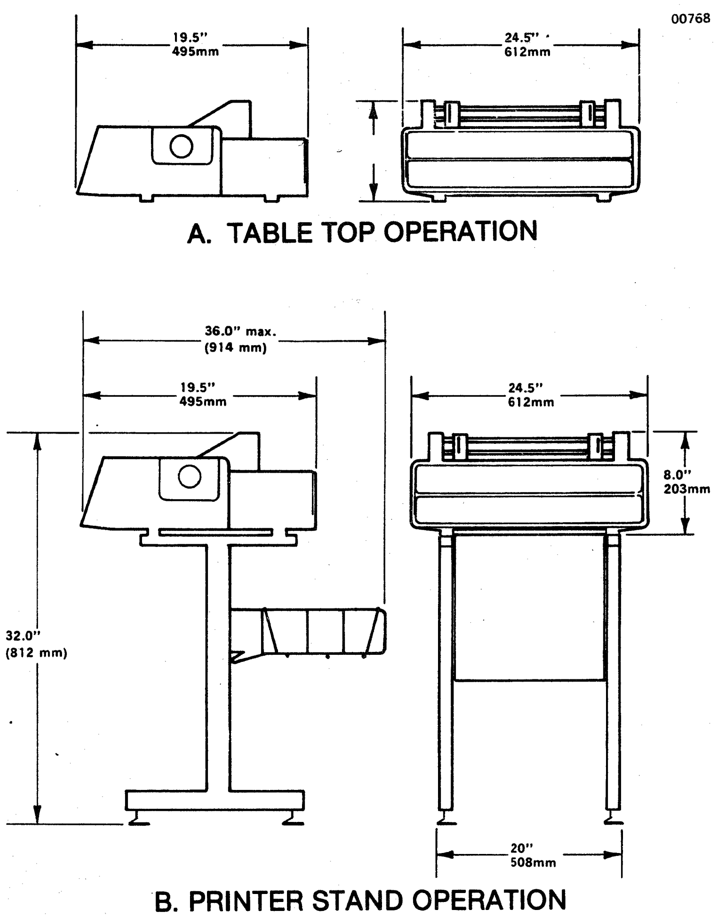


Figure 3-1 Printer Dimensions

3.3 SET-UP PROCEDURE

The following procedure details the set-up of the Model 705 printer mechanism prior to operation at the installation site. Refer to Figure 3-2 and perform the following:

1. Note any discrepancies in general printer appearance.
2. Remove the top clear cover from the printer and manually move the print head from left to right and check the following:
   - Optics block on the Video Amplifier does not contact the timing fence.
   - Carriage arms do not contact the READY-TO-PRINT (RTP) and END-OF-PRINT (EOP) switches.

NOTE

If either of the two above conditions occur, refer to Section 6, Adjustments.

3. Loosen penetration control knob and move backwards, away from platen, as far as possible and insert paper into printer as described in Section 3, paragraph 3.7.
4. Remove ribbon cassette from box and install on carriage assembly as described in Section 3, paragraph 3.8.
5. Adjust print head penetration for optimum print quality as follows:

SINGLE PART FORMS

- Loosen and move penetration control knob as far forward as possible.
- Tighten penetration control knob.

MULTI-PART FORMS

- While manually moving print head across the page, increase print head penetration by moving penetration knob forward until smudging occurs.
- Back off on penetration just to the point of no smudging.
- Tighten penetration control knob.

6. Plug printer into appropriate AC outlet. ALWAYS USE A 3-WIRE GROUNDED OUTLET.

3.4 CONTROLS

Figure 3-3 and Table 3-1 respectively illustrate and describe the various controls on the Model 705 printer.

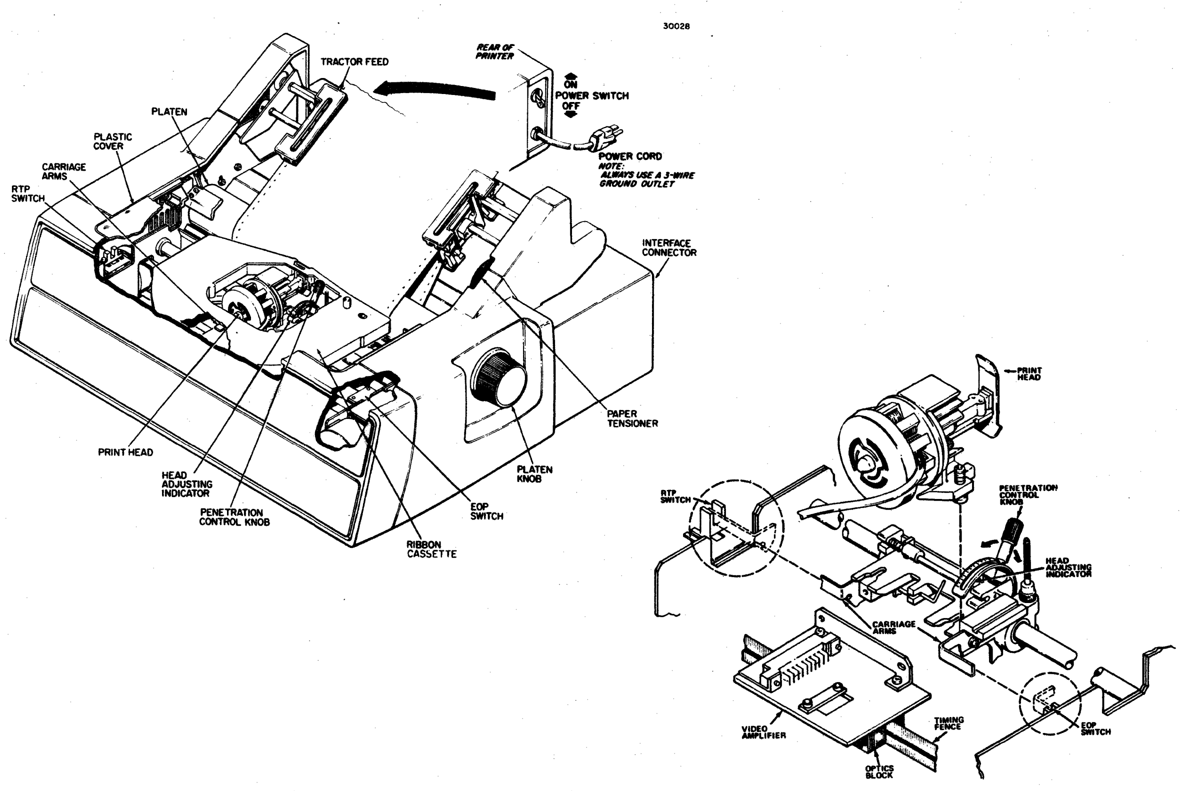


Figure 3-2 Set-Up Procedures

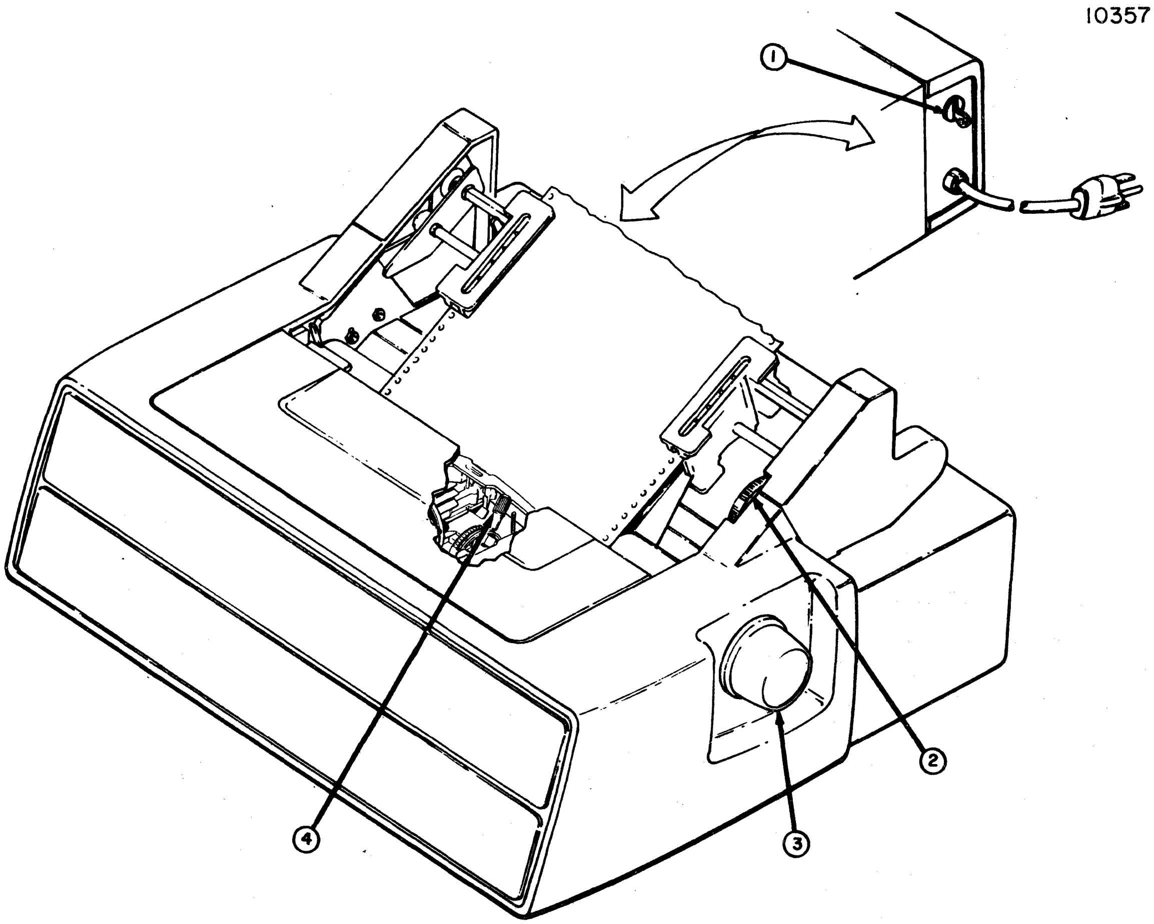


Figure 3-3 Controls, Printer Mechanism

Table 3-1 Controls, Printer Mechanism

INDEX NO.	CONTROL	FUNCTION
1	Power Switch	When set to the ON position, applies power to printer circuits.
2	Paper Tensioner	Adjusts paper tension for proper paper feeding.
3	Platen Knob	When turned, adjusts vertical paper position in printer.
4	Penetration Control Knob	Adjusts print head penetration for optimum print quality.

3.5 OPERATING NOTES

Before operating the printer check the following to ensure proper operation:

1. Always plug printer into a 3-wire grounded outlet.
2. Ensure all covers are closed and secured before operation.
3. Never operate the printer without paper.
4. Avoid leaning or placing objects on any part of printer. If an object accidentally falls into machine, turn power off and carefully remove object.
5. Turn power off before adjusting print head, replacing ribbon, or loading paper.
6. Use only a lint-free cloth when cleaning printer surface. Do not use solvents or harsh cleaning agents. A mild detergent solution or desk top cleaner may be used sparingly.

3.6 PAPER SPECIFICATIONS

Acceptable paper is continuous fan-fold, edge perforated paper conforming to the specifications in Figure 3-4.

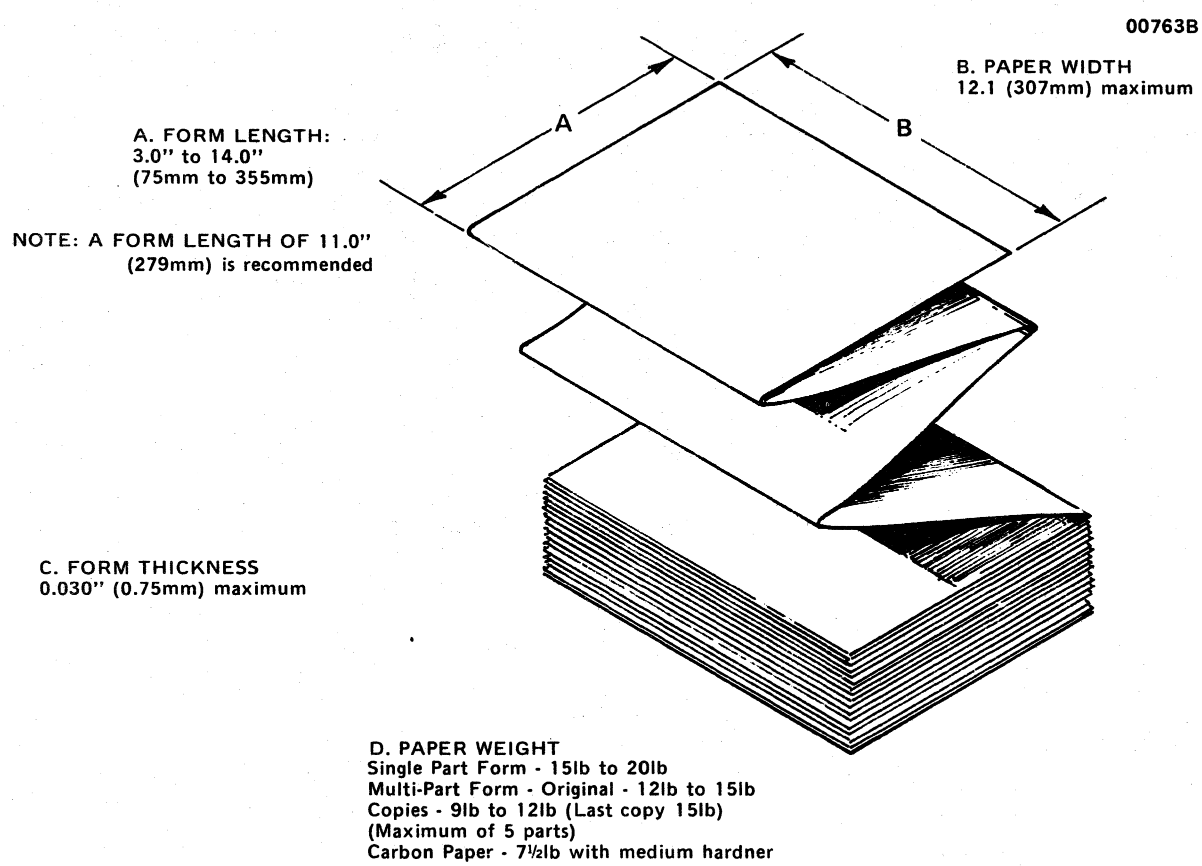


Figure 3-4 Paper Specifications

3.7 LOADING PAPER

3.7.1 REAR FEED

1. Ensure power is off and remove top clear cover.

2. Loosen and move penetration control knob away from platen.

3. Release tractor feed locking levers, then tilt tractor feed unit back so that tractor feed pins face up (Figure 3-5).

4. Open paper guides and feed paper underneath tractor assembly and up into left pin feed tractor. Close left paper guide to secure paper. Adjust right pin feed tractor to accommodate paper width. Ensure paper holes are aligned so that top sheet is parallel with top of printer. Close right paper guide.

5. Swing tractor feed unit forward and down. Lift column scale/tear bar. Release paper tensioner by rotating knob upward.

6. Feed paper under platen and rotate platen knob until paper is fed around platen and up between platen and column scale/tear bar to top of pin feed tractors.

7. Open paper guides and align paper so that top of paper is parallel with top of printer. Close paper guides.

8. Adjust pin feed tractors so that first character prints in desired column on paper. First character prints below "1" on graduated scale.

9. When properly adjusted, secure tractor locking levers, lower paper bail and tear bar, adjust paper tension with tensioner wheel, and readjust penetration control knob.

10. Replace top clear cover.

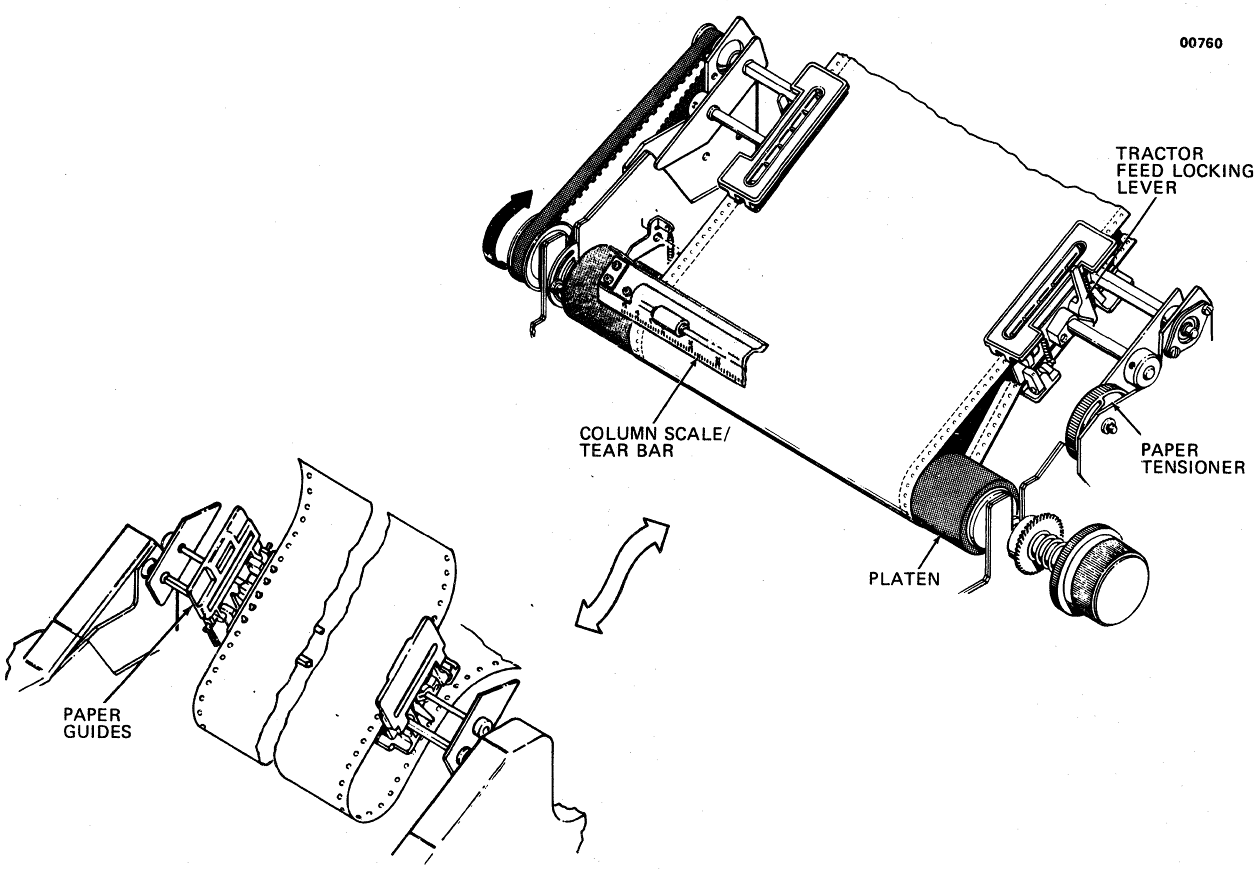


Figure 3-5 Loading Paper, Rear Tractor Feed

3.7.2 BOTTOM FEED

> **NOTE**
> If paper is going to be moved bidirectionally during printing operations, DO NOT feed paper from bottom. Only use rear feed.

1. Ensure power is off and remove top clear cover.
2. Loosen and move penetration control knob away from platen.
3. Release tractor feed locking levers.
4. Open paper guides and lift column scale/tear bar.
5. Place box of paper underneath printer as shown in Figure 3-6 and feed paper up through bottom of printer between platen and column scale/tear bar up into tractor feed.

> **NOTE**
> For best results, remove paper from box and ensure paper is centered and fed straight up into printer.

6. Ensure paper holes are aligned so that top of sheet is parallel with top of printer, close paper guides, secure tractor feed locking levers and lower column scale/tear bar.
7. Adjust paper tensioner so that plane of paper travel is tangent to the platen.
8. Adjust penetration control knob and replace top clear cover.

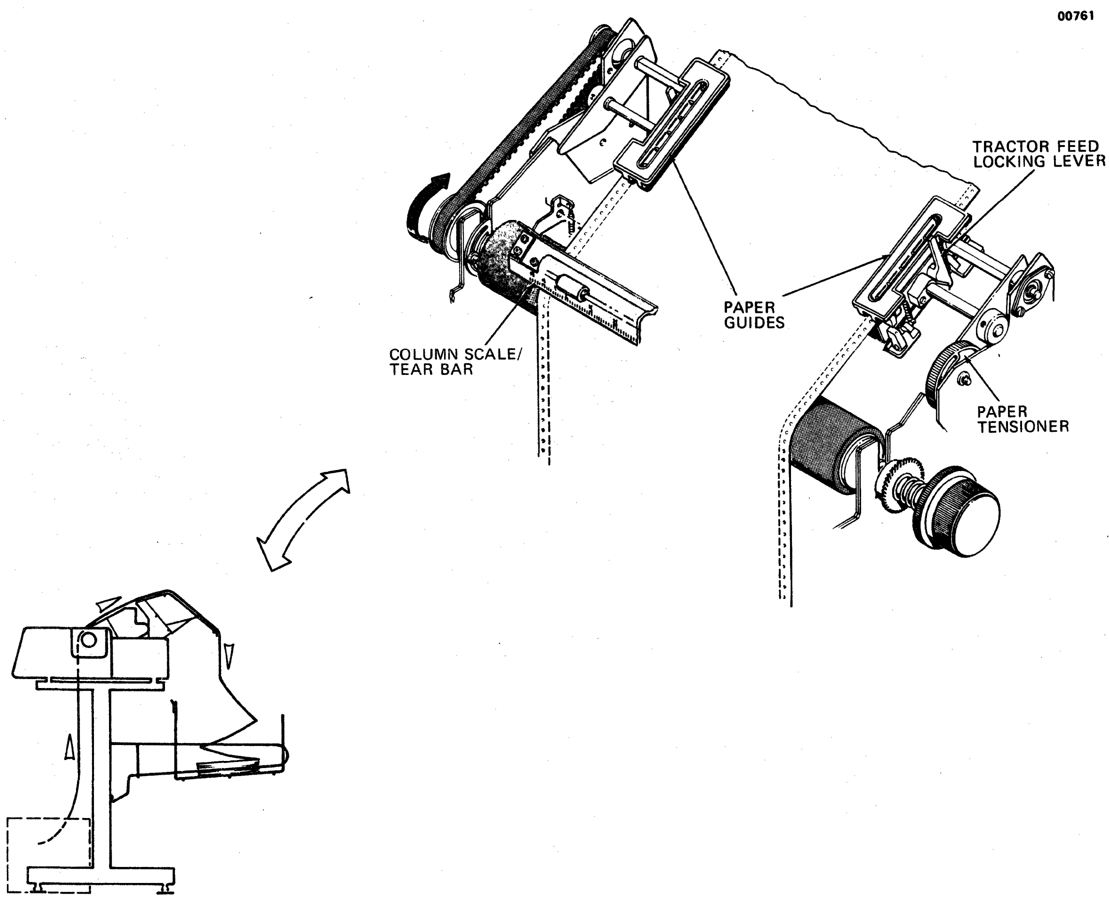


Figure 3-6 Loading paper, Bottom Tractor Feed

3.8 RIBBON CASSETTE

The Model 705 printer uses a throw-away 70-yard ribbon cassette, Centronics part number 37740008-2003. To remove and replace the cassette, refer to Figure 3-7 and perform the following procedure:

1. Turn power off and remove the top cover.

2. Move the print head to center position in the printer. Loosen the penetration control knob and move fully away from platen.

3. Release cassette latch by moving the latch towards the front of the printer and remove the cassette taking care not to damage the rear ribbon guide. Discard the used ribbon cassette.

4. Hold the new cassette above the print head and lower it, tipping the rear edge of the cassette downward so that it clears the edge of the front cover.

5. Lower the cassette until the retaining tab rests on the sloping portion of the retaining latch.

6. Carefully press the cassette downward until the latch snaps into position above the retaining tab. Ensure the ribbon is properly positioned between the rear paper guide and the platen.

7. Turn the ribbon drive gear knob clockwise several turns to ensure proper engagement of the cassette with the cassette drive gear and to ensure proper ribbon movement between the rear ribbon guide and the platen.

8. Reset the penetration control.

9. Install the top cover and turn the power on.

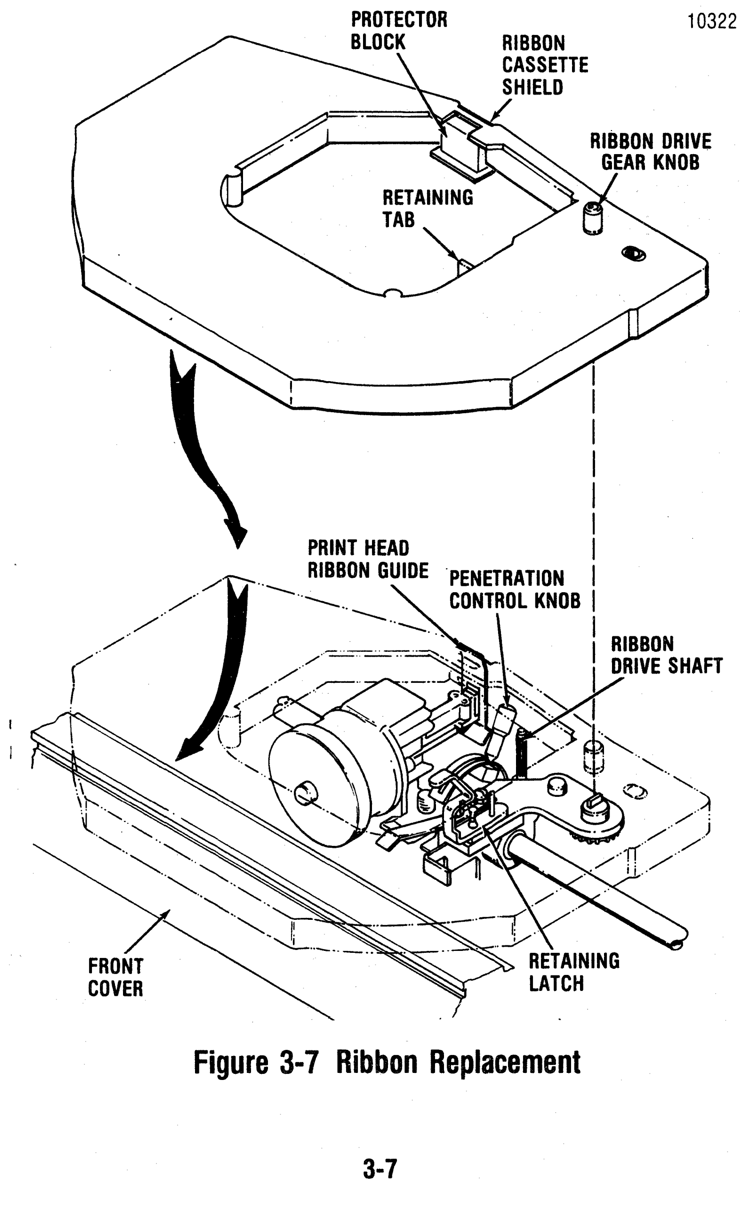


Figure 3-7 Ribbon Replacement

3.9 OPERATOR MAINTENANCE

When performing the maintenance on the printer be visually alert for possible problems. Look for loose wires and pins, loose hardware, chafing of cables and badly worn parts. On an operator-level, maintenance can be performed as outlined in Table 3-2.

3.10 OPERATING CHECKS

If printer does not operate properly, check for symptoms outlined in Table 3-3 for possible sources of error before calling for service.

Table 3-2 Operator Maintenance

ASSEMBLY	FREQUENCY	CLEAN/INSPECT
Covers	As Required	Clean all covers using a mild detergent.
Character Printing Assembly	6 Months	Clean print area of all paper dust, dirt, etc. (use vacuum cleaner, if available.)
Print Head Assembly	Each Ribbon Change	Using a soft, clean cloth remove all dried ink from the front of the print head.
Ribbon Cartridge Assembly	Each cassette change	Inspect cassette for proper ribbon feeding.
Timing Fence Assembly	6 Months	Clean both sides of timing fence using a soft, clean cloth. **CAUTION: Never use an organic solvent as this will damage timing fence.**
Platen Assembly	6 Months	Clean platen assembly using a mild detergent.
Column Scale/Tear Bar	6 Months	Clean column scale/tear bar using a mild detergent.
Frames	6 Months	Clean the upper and lower guide bars using a soft, clean cloth.

Table 3-3 Operating Checks

SYMPTOM	REMEDY
Paper skewing.	Position paper feed tractors and secure locking lever.
Ink ribbon tracking problem.	Ensure ribbon is installed as outlined in ribbon replacement procedure.
Poor print quality (e.g., smudging or light print).	Adjust head penetration as outlined in set-up procedures.
Missing data in printed character.	Lift front cover and carefully wipe timing fence with clean dry cloth.
Erratic carriage movement.	Lift front cover and wipe carriage guide bars with clean dry cloth.

SECTION 4
THEORY OF OPERATION

4.1 INFORMATION

The following theory of operation of the Model 705 printer is based on the overall functional block diagram shown in Figure 4-1. The active components contained within the functional blocks in the diagram are identified by their reference designators and are easily cross-referenced to the appropriate schematic diagram in Section 8.

4.2 FUNCTIONAL BLOCK DIAGRAM DESCRIPTION

Basically, the Format Controller supplies operating parameters to the 705 Logic Board (Print Controller) based on data received from the host device and/or a control panel, when one is installed on the printer. The parameters are written according to an address format, which is basically divided into two sections as shown in the C-RAM Memory Map in Figure 4-2. The first section is the Control Block and occupies memory locations 00_{16} through $0F_{16}$. The second section is the Data Block and occupies locations 10_{16} through 93_{16}. This part of memory is also referred to as the print buffer.

The Control Block is dedicated to transferring a print command and paper motion arguments from the Format Controller to the Print Controller and transferring status information from the Print Controller to the Format Controller concerning printer action, paper motion and self test results.

The Data Block is dedicated to transferring information on printable data from the Format Controller to the Print Controller.

For a complete description of the parameters and their bit structure, and input timing, refer to Section 2, starting with paragraph 2.2.2.

As shown in the 705 Overall Functional Block Diagram, Figure 4-1, the Model 705 printer electronics operates on regulated +12 Vdc, −12 Vdc, +5 Vdc, −5 Vdc and unregulated +35 Vdc. Operating voltages (+12, −12 and +5 Vdc) for the customer-supplied Format Controller are provided via connector J004.

In order to discuss how data is processed in the Model 705 printer, assume that the printer has just been turned on. This causes the CPU to go through an initialization routine to set up its electronics and perform the following functions:

- Raise the GOT IT line and lower the $\overline{\text{ECHO}}$ line to set the outputs of Receiver ME29 and Transceiver ME24 in the tri-state condition. This isolates the Address Bus (A0-A7) and the Data Bus (D0-D7) from the Latched Address Bus (LADD0-LADD7) and the Buffered Data Bus (BDATA0-BDATA7), respectively. The high GOT IT line also signals the Format Controller via connector J002 that data cannot be transferred.

- Lower $\overline{\text{GOT IT}}$, inversion of GOT IT, to set C-RAM Selector ME18 to select the A12 and $\overline{\text{WR}}$ lines from the CPU. These lines control the chip enable and read/write function of C-RAM.

- If the print head is not at the extreme left margin (RTP IN is low), causes the print head to move to that location (RTP IN goes high).

- Clear the C-RAM and then write the printer status information into C-RAM location 00_{16}. The LADD0-LADD7 bus and BDATA0-BDATA7 bus are used by the CPU during the read/write functions to C-RAM.

After the status information is loaded into C-RAM, the CPU relinquishes control of C-RAM to the Format Controller by deactivating GOT IT, $\overline{\text{GOT IT}}$ and $\overline{\text{ECHO}}$. This enables the Format Controller to control C-RAM with the Select and Read/$\overline{\text{WRITE}}$ (R/$\overline{\text{W}}$) lines. The lowering of GOT IT signals the Format Controller that it has control of C-RAM and that the HOLD IT line will be monitored by the Print Controller.

Not knowing how the Format Controller is going to be designed, assume that upon recognition of the deactivated GOT IT line, the Format Controller performs the following functions:

- Activates the HOLD IT line to establish that it has C-RAM control.

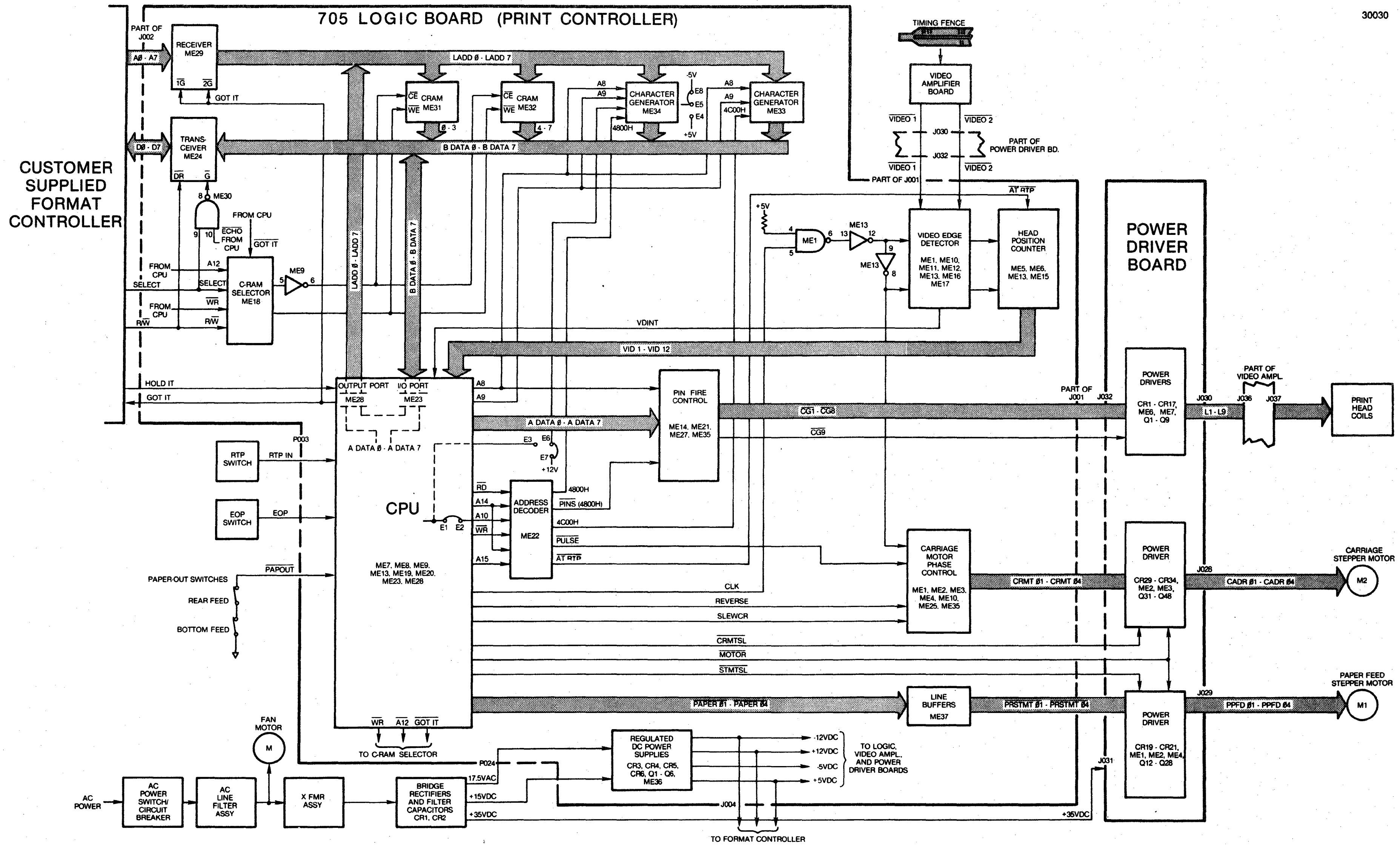


Figure 4-1 Overall Functional Block Diagram

00935

	BYTE (HEX)	DESIGNATION	DATA SOURCE
	00	PRINTER STATUS	PRINT CONTROLLER
	01 02	ACCUMULATED PAPER MOTION STEPS, STATUS	PRINT CONTROLLER
	03 04	REMAINING PAPER MOTION STEPS, STATUS	PRINT CONTROLLER
	05 06	EVENT 1, REVERSE PAPER MOTION STEPS BEFORE PRINT	FORMAT CONTROLLER
CONTROL BLOCK	07 08	EVENT 2, FORWARD PAPER MOTION STEPS BEFORE PRINT	FORMAT CONTROLLER
	09	EVENT 3, PRINT COMMAND	FORMAT CONTROLLER
	0A 0B	EVENT 4, REVERSE PAPER MOTION STEPS AFTER PRINT	FORMAT CONTROLLER
	0C 0D	EVENT 5, FORWARD PAPER MOTION STEPS AFTER PRINT	FORMAT CONTROLLER
	0E	SELF TEST STATUS	PRINT CONTROLLER
	0F	RESERVED	
DATA BLOCK	10 TO 93	CHARACTER DATA/ PRINT BUFFER	FORMAT CONTROLLER
	94 TO FF	RESERVED	

Figure 4-2 C-RAM Memory Map

- Polls the C-RAM status byte 00_{16} to check if: 1) there was an abort on an event; 2) the printer is out of paper; 3) there was a head jam, or; 4) there was a failure during a requested self test.

- Polls C-RAM location 01_{16} and 02_{16} to determine how much paper has been moved since the last top of form.

- Polls C-RAM location 03_{16} and 04_{16} to determine the number of paper motion steps that were not completed during an aborted paper motion event, if there is one.

After obtaining all the status information and taking the appropriate action on it, the Format Controller can now load the parameters into C-RAM to request various printer operations. The Format Controller writes each parameter into C-RAM according to the format described in Section 2. This is done using the Address Bus (A0-A7) and Data Bus (D0-D7) under control of the SELECT and R/$\overline{W}$ control lines. Refer to Section 2, paragraph 2.2.4, for the input timing that must be used by the Format Controller during the read and write cycles to C-RAM.

After the parameters are loaded into C-RAM, the Format Controller lowers the HOLD IT line, indicating to the CPU in the Print Controller that the parameters are loaded. The CPU activates GOT IT, $\overline{GOT IT}$ and $\overline{ECHO}$ to take control of C-RAM with its A12 and $\overline{WR}$ control lines and isolate the LADD0-LADD7 bus and BDATA0-BDATA7 bus from the input buses A0-A7 and D0-D7, respectively.

Now that the CPU has control of C-RAM, the CPU addresses the location of each of the five events in C-RAM, starting with Event 1. If data is stored in a location, it is acted on before proceeding to the next location so that the five events are acted on in sequence.

The five events can dictate the CPU to do the following functions:

- Activate the Paper Feed Stepper Motor (M1) for a particular number of steps in the forward or reverse direction before and/or after a print operation.

- Activate the Carriage Stepper Motor (M2) and fire the print head solenoids during a print cycle.

To move paper in the forward or reverse direction, the CPU activates the $\overline{\text{MOTOR}}$ signal to enable the selection of the stepper motor power drivers on the Power Driver Board. This is followed by the CPU activating the Stepper Motor Slew ($\overline{\text{STMTSL}}$) signal and applying negative going pulses on the four-line bus ($\overline{\text{PAPER 01}}$-$\overline{\text{PAPER 04}}$). These pulses are applied in a particular sequence to the four phase inputs of the Paper Feed Stepper Motor (M1). This causes incremental motor shaft movement (steps) in either direction, depending on the pulse sequence. The motor shaft, in turn, drives the paper feed mechanism in the forward or reverse direction to move paper at 0.0083 inch per step.

Before each step is executed, the CPU updates the status on accumulated and uncompleted paper motion steps as described in Section 2. If the CPU detects a paper out condition ($\overline{\text{PAPOUT}}$ activated) during the paper movement operation, the CPU deactivates $\overline{\text{MOTOR}}$ to stop paper movement and recognizes the situation as an abort during the event. The abort condition is written into the Printer Status Byte in C-RAM before the CPU returns control of C-RAM to the Format Controller.

The Format Controller can load arguments into C-RAM for events 1, 2, 4, and 5 to request paper movement from 1 step to 4,095 steps (0.00833 inch to 34.133 inches) in each event. Refer to Section 2 for details on the paper motion arguments.

A print cycle is initiated when the CPU polls the Print Command byte 09_{16}, Event 3, in C-RAM and detects that the Print Data bit, bit 4, is set high. This causes the CPU to examine the Data Block (print buffer) in C-RAM for printable data, then uses a logic seeking routine to determine the minimum head movement prior to printing the next line. To determine minimum head movement, the CPU examines the printable data to establish line length and its positions, which is then compared to the print head position. The position of the head is given to the CPU by the Head Position Counter output appearing on the 12-line bus VID1-VID12. If it is determined that the first character in the line is closer to the head position than the last character in the line, the head is moved to the left to the beginning of the line where printing starts with the first character and progresses from left to right to the last character in the line. If the head position is closer to the last character in the line, the head is moved to the right to the last character in the line where printing starts with the last character and progresses from right to left to the first character in the line. If the head position is closer to the last character in the line, the head is moved to the right to the last character in the line where printing starts with the last character and progresses from right to left to the first character in the line. Note that the Head Position Counter output is continuously updated during head movement to reflect the head position with respect to the Ready-to-Print (RTP) switch and End-of-Print (EOP) switch which identify the extreme left and right margins, respectively.

After the CPU has determined the direction to move the print head, it activates $\overline{\text{MOTOR}}$ and Carriage Motor Select (CRMTSL) to enable the power drivers for the Carriage Stepper Motor (M2). The REVERSE output to the Carriage Motor Phase Control logic is set either high or low for print head movement to the left or right, respectively. Then the CPU writes a series of 8800_{16} codes to the Address Decoder ME22 to generate the $\overline{\text{PULSE}}$ output to the Carriage Motor Phase Control logic. The pulses on this output are used during start up (ramp up) and shut down (ramp down) of the Carriage Stepper Motor. Once the stepper motor is up to speed, the CPU discontinues the $\overline{\text{PULSE}}$ output and sets its Slew Carriage (SLEWCR) output high until it is time to ramp down prior to stopping the motor.

Both the $\overline{\text{PULSE}}$ and the SLEWCR inputs to the phase control logic establish the timing and duration of the positive going pulses on the four-line carriage Motor Phase (CRMT01-CRMT04) bus. The $\overline{\text{PULSE}}$ input enables the CPU to have direct control during ramp up and ramp down of the stepper motor. The SLEWCR input enables a one-shot in the Carriage Motor Phase Control to provide constant timing after ramp up and before ramp down. The one-shot is triggered by the inverted clock (CLK) output from the CPU.

The print head and Video Amplifier Board are mounted on the carriage assembly, which is driven along the timing fence by the Carriage Stepper Motor. As the print head moves along the timing fence, the transparent and opaque areas of the timing fence cause two optical pick-ups on the video amplifier to generate electrical pulses. The electrical pulses are shaped and properly phased to generate the two video outputs $\overline{\text{VIDEO 1}}$ and $\overline{\text{VIDEO 2}}$, which are 90° out of phase. The leading and trailing edge of each video pulse generates a Video Interrupt (VDINT) pulse to the CPU and increments or decrements the Head Position Counter output VID1-VID12 as the head moves to the right or left, respectively. The VID1-VID12 ouput is reset to zero by $\overline{\text{ATRTP}}$ from the Address Decoder whenever the CPU detects that the print head is at the extreme left margin (RTP IN goes high).

While the print head is in motion, the CPU monitors VID1-VID12 to keep track of the head position. When the head reaches the print column to start printing, the CPU enables the VDINT interrupt input, reads the pin fire data for the entire character out of the appropriate Character Generator (ME33 or ME34) and writes the pin fire data for the appropriate column on the Address Data Bus (ADATA0-ADATA7) to the Pin Fire Control logic.

Usually two character generators are used to provide 2K of memory for character pin fire information. As a user alternative a single character generator with 2K of memory can be used in location ME34 only. This is accomplished by moving jumpers at points E1 through E8. Jumpers shown in Figure 4-1 are for operation with two 1K character generators. See Section 2 for more details.

On the leading edge of VDINT, the CPU writes a clock pulse via 4800H to the Address Decoder, which decodes the pulse as PINS. This pulse causes the Pin Fire Control to latch the pin fire data for a preset time. The latched data appears on CG1-CG9 to drive the print head coils via the power drivers on the Power Driver Board.

While the pins are being fired, the CPU is writing pin fire data on ADATA0-ADATA7 for the next column in the character then waits for the leading edge of the next VDINT pulse. This routine is continued until the line of characters is printed. At the end of the line the CPU ramps down the carriage stepper motor and then deactivates CRMTSL and $\overline{\text{MOTOR}}$.

It should be noted that if the print cycle is not completed in approximately 920 milliseconds, the CPU deactivates the $\overline{\text{MOTOR}}$ signal and recognizes the situation as an abort during Event 3.

After all events (1 through 5) have been acted on, the appropriate status information is written into the control block in C-RAM by the CPU. Zeros are written into the remaining memory in the control block and all of the data block in C-RAM. Now the CPU deactivates $\overline{\text{ECHO}}$, GOT IT and $\overline{\text{GOT IT}}$ to return control of C-RAM to the Format Controller and then awaits the next rising and falling edge of HOLD IT from the Format Controller. Note that $\overline{\text{ECHO}}$ is actually deactivated a short time before GOT IT and $\overline{\text{GOT IT}}$ to ensure proper set up time before relinquishing control of C-RAM to the Format Controller. Upon recognition of the deactivated GOT IT line, the Format Controller activates the HOLD IT line and repeats the data transfer cycle.

SECTION 5
MAINTENANCE

5.1 INTRODUCTION

This section contains maintenance information on the Model 705 printer and is organized as follows:

5.2 Centronics Nameplate
5.3 Recommended Preventive Maintenance
5.4 Troubleshooting Guide
5.5 Recommended Tools

WARNING

To ensure personal safety and avoid potential damage to the printer, observe all warning and caution labels. Always keep hands and clothing away from moving parts (belts, carriage, etc.) while printer is operating.

5.2 CENTRONICS NAMEPLATE

The nameplate is located on the rear of the printer on the electronic module cover. The nameplate provides the model number, serial number, operating voltage (VAC), current (Amps) and frequency (Hz). In the event of a field conversion of the operating voltage and amperage, or frequency, it is recommended that the nameplate be changed to reflect the conversion.

5.3 RECOMMENDED PREVENTIVE MAINTENANCE (P.M.)

The recommended preventive maintenance (P.M.) schedule, if followed closely and accomplished at the intervals noted, will ensure maximum operating efficiency and maximum mean time between failures. The recommended cleaning materials and tools for the P.M. are as follows:

- Cleaning Materials: Medium bristle cleaning brush, two soft clean cloths, mild detergent
- Tools: Refer to paragraph 5.4 of this section

NOTE

When performing the Preventive Maintenance (P.M.), be visually alert for possible problems. Look for loose wires and pins, loose hardware, chafing of cables and badly worn parts. Do only the scheduled P.M. on a printer that is operating properly.

Table 5-1 Recommended Preventive Maintenance

ASSEMBLY	FREQUENCY	CLEAN	INSPECT
Cover Assemblies	As required	Clean all cover assemblies using a mild detergent, as required.	
Character Printing Assemblies	6 Months	Clean print area of all paper dust, dirt, etc. (Use vacuum cleaner, if available.)	
Print Head Assembly	Each Ribbon Change	Using a soft clean cloth, wipe the front of the print head of all dried ink.	
Timing Fence Assembly	6 Months	Using a soft clean cloth, wipe both sides of timing fence. *CAUTION: Never use an organic solvent as this will damage timing fence.*	Inspect for scratches in the encoder lines and for proper mechanical alignment of timing fence. Timing fence should not contact video amplifier assembly.
Stepper Motor Assembly, Carriage Drive	6 Months		Inspect for proper tension of main drive belt.
Stepper Motor Assembly, Paper Drive	6 Months		Inspect for proper tension of paper feed timing belt.
Platen Assembly	6 Months	Clean platen assembly using a mild detergent.	
Column Scale Tear Bar Assembly	6 Months	Clean column scale/tear bar using a mild detergent.	
Frame Assemblies	6 Months	Clean the upper and lower guide bars using a soft clean cloth.	

NOTE: After performing the preventive maintenance, operate the printer to ensure good, clean print quality.

5.4 TROUBLESHOOTING GUIDE

Table 5-2 lists some malfunctions which may occur, the symptom of the malfunction and the probable cause. The remedies to the malfunctions should be performed by qualified service personnel who have been trained to repair complex electronic and electromechanical equipment.

Table 5-2 Troubleshooting Guide

MALFUNCTION	SYMPTOM	CAUSES
Power Failure	Total	Damaged power cord. Open 5V supply fuse.
	Intermittent/Partial	Defective logic board. Improper A.C. line voltage.
Improper Printing	Head moves, but no print/poor registration or erratic print	Improper print head position. Dirty fingerboard connector from print head. Dirty or defective timing fence. Improper alignment of optical pickup assembly. Defective video amplifier. Defective ribbon cable. Defective logic board.
	Missing dots, poor or intermittent pin registration all characters	Improper print head position. Dirty fingerboard connector from print head. Dirty or defective timing fence. Defective logic board. Defective driver board. Defective ribbon cable. Defective video amplifier. Defective print head.
	Missing or extra dots certain characters only	Defective character generator chip. Defective logic board.
	Line across page	Improper print head penetration. Defective print wires. Defective ribbon cable. Defective video amplifier.
Drive Failure	Erratic carriage movement	Improper carriage drive belt tension. Dirty carriage guide bars. Defective idle pulley, drive pulley, and drive belt.
	Carriage sticks or binds	Optics block contacting timing fence. Improper carriage drive belt tension. Head penetration too tight. Defective driver board.
	Carriage moves forward, but does not return	Defective EOP switch. Defective logic board. Missing video amplifier signal $\overline{V1}$ or $\overline{V2}$.

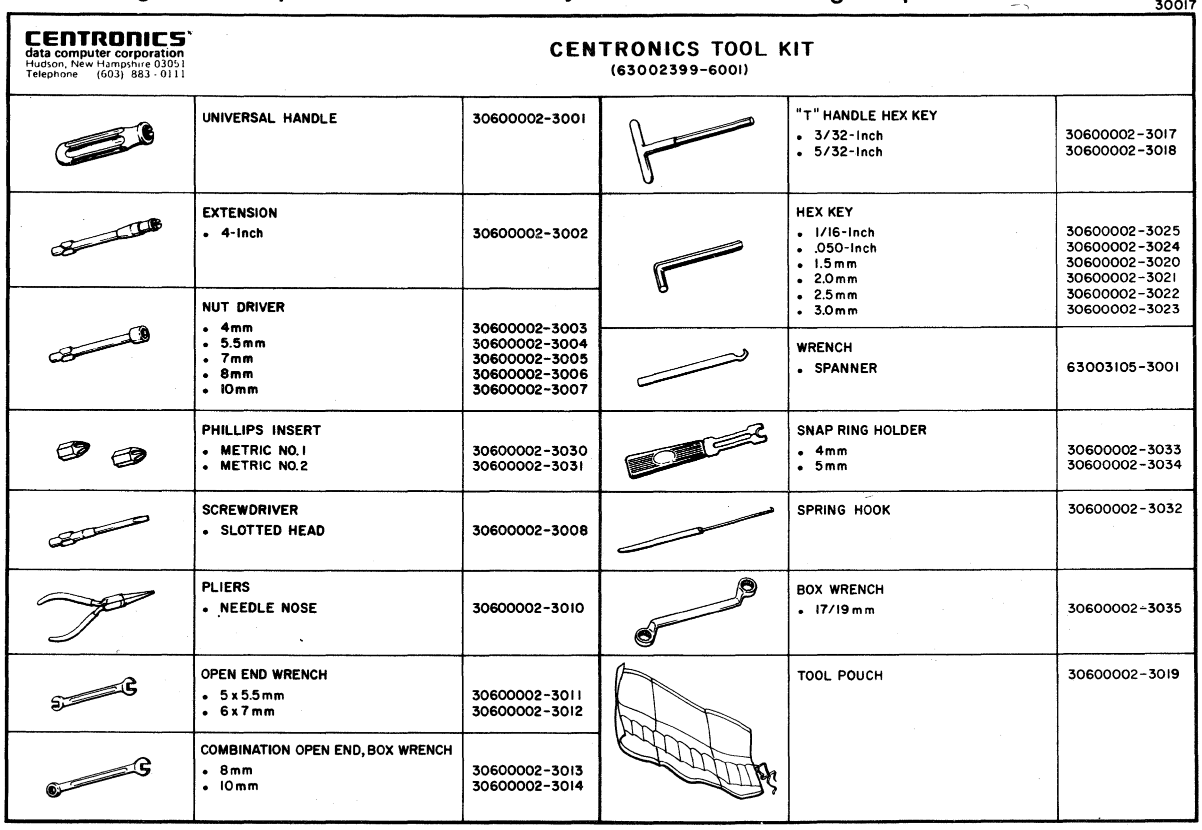
Table 5-2 Troubleshooting Guide (Cont.)

MALFUNCTION	SYMPTOM	CAUSES
Defective driver board	Carriage does not move forward	Defective RTP switch. Defective stepper motor. Defective logic board. Inappropriate input data. Defective driver board.
Ribbon feed failure	No ribbon feed	Ribbon twisted or jammed in ribbon cassette. Ribbon drive gear not meshed with ribbon cassette gear. Ribbon feed mono-filament line loose or broken.
Paper movement failure	Paper skew or jam	Torn paper. Print head too close to paper. Improper pin feed sprocket align-ment. Improper tractor drive belt adjust-ment. Paper pan friction against forms.

5.5 RECOMMENDED TOOLS

The following tool kit provides the necessary tools for maintaining the printer.

30017



CENTRONICS data computer corporation
Hudson, New Hampshire 03051
Telephone (603) 883-0111

CENTRONICS TOOL KIT
(63002399-6001)

Tool	Part No.	Tool	Part No.
UNIVERSAL HANDLE	30600002-3001	"T" HANDLE HEX KEY • 3/32-Inch • 5/32-Inch	 30600002-3017 30600002-3018
EXTENSION • 4-Inch	 30600002-3002	HEX KEY • 1/16-Inch • .050-Inch • 1.5mm • 2.0mm • 2.5mm • 3.0mm	 30600002-3025 30600002-3024 30600002-3020 30600002-3021 30600002-3022 30600002-3023
NUT DRIVER • 4mm • 5.5mm • 7mm • 8mm • 10mm	 30600002-3003 30600002-3004 30600002-3005 30600002-3006 30600002-3007	WRENCH • SPANNER	 63003105-3001
PHILLIPS INSERT • METRIC NO.1 • METRIC NO.2	 30600002-3030 30600002-3031	SNAP RING HOLDER • 4mm • 5mm	 30600002-3033 30600002-3034
SCREWDRIVER • SLOTTED HEAD	 30600002-3008	SPRING HOOK	30600002-3032
PLIERS • NEEDLE NOSE	 30600002-3010	BOX WRENCH • 17/19mm	 30600002-3035
OPEN END WRENCH • 5x5.5mm • 6x7mm	 30600002-3011 30600002-3012	TOOL POUCH	30600002-3019
COMBINATION OPEN END, BOX WRENCH • 8mm • 10mm	 30600002-3013 30600002-3014		

Figure 5-1 Recommended Tools

SECTION 6
ADJUSTMENTS

6.1 INTRODUCTION

This section contains adjustment procedures on the following printer assemblies:

6.2 Character Printing
6.3 Paper Motion
6.4 Electrical

Adjustment procedures should be performed whenever an affected printer assembly is replaced or an improper operation is corrected. Check the adjustment parameters before performing the adjustment to ensure it is necessary.

6.2 CHARACTER PRINTING ADJUSTMENTS

6.2.1 PENETRATION ADJUSTMENT, PRINT HEAD ASSEMBLY—Refer to Figure 6-1.

1. Loosen penetration control knob.
2. Move penetration control knob away from platen.
3. Loosen hardware securing the adjusting stop plate.
4. Insert a 0.177 mm (0.007 in.) feeler gauge between front of print head and platen.
5. Move penetration control knob and adjusting stop plate forward until 0.177 mm (0.007 in.) gap is met.
6. Tighten adjusting stop plate hardware and penetration control knob.

NOTE

If replacing print head assembly and 0.177 mm (0.007 in.) gap is not met, loosen adjusting stop plate hardware and adjust per steps 4 through 6 above.

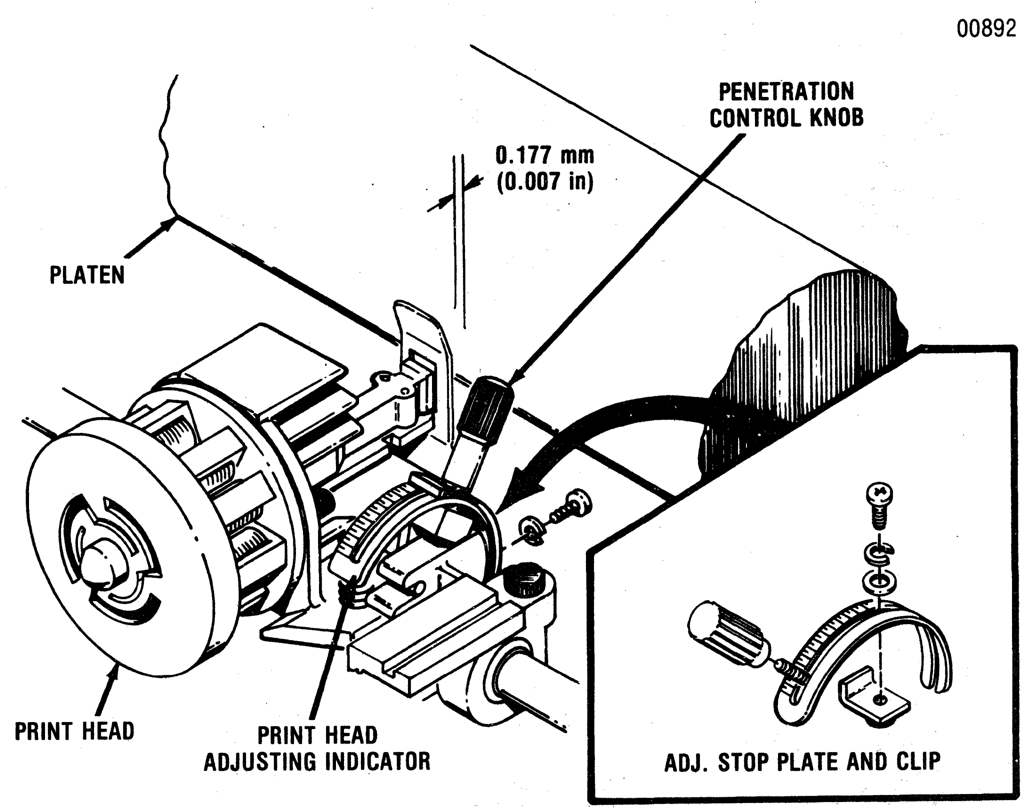


Figure 6-1 Penetration Adjustment

6.2.2 TIMING FENCE ADJUSTMENT—Refer to Figure 6-2.

1. Loosen four socket head screws and move fence left or right so that first window of fence is located 106 mm (4.2 in.) from left frame.
2. Tighten four socket head screws securing fence.
3. Move video amplifier left to right and ensure optics block on underside of video amplifier does not contact fence. If optics block should contact fence, refer to paragraph 6.4.1 for adjustment.

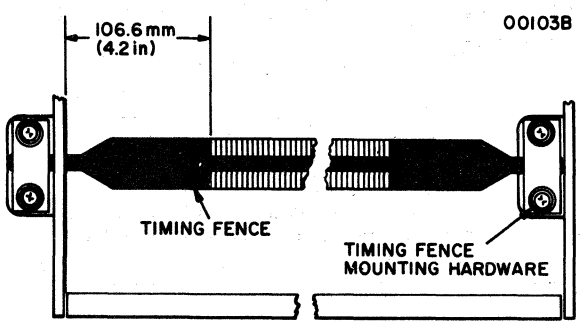


Figure 6-2 Timing Fence Adjustment

6.2.3 CARRIAGE ACTUATOR ARMS ADJUSTMENT—Refer to Figure 6-3.

1. Bend ready to print (RTP) switch actuator arm parallel to and 59 mm (2.3 in.) from center of upper guide bar.
2. Bend end of print (EOP) switch actuator arm parallel to and 55 mm (2.1 in.) from center of upper guide bar.
3. After actuator arms have been adjusted, slowly move carriage assembly from left to right ensuring arms do not contact the RTP and EOP optics switches.
4. If actuator arm should contact switch, loosen two optical switch mounting screws and position so that actuator arm is centered in slot of switch.
5. Tighten optical switch mounting screws, if necessary.

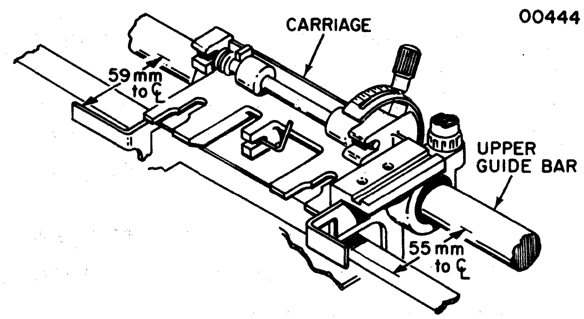


Figure 6-3 Carriage Actuator Arms Adjustment

6.2.4 MAIN DRIVE BELT ADJUSTMENT—With the carriage assembly in the left most position, adjust belt tension by turning clockwise (tighten) or counterclockwise (loosen) two adjusting screws on idle pulley assembly so that deflection at center of belt is 8 to 9 mm (9/16 in.) when a 300 gram (11 oz.) load is applied at the center of the belt. Refer to Figure 6-4.

NOTE

It is best to use a wide load distributed 64 mm to 74 mm (2½ in. to 3 in.) over the belt.

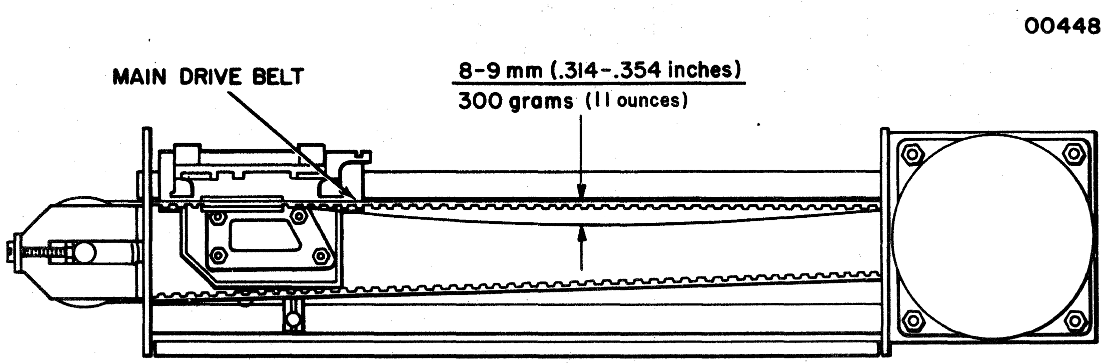


Figure 6-4 Main Drive Belt Adjustment

6.3 PAPER MOTION ADJUSTMENTS

6.3.1 PAPER FEED TIMING BELT ADJUSTMENT—At a point equidistant from the line feed pulley and paper feed pulley, adjust tension of belt by moving tension roller underneath belt up or down for a deflection of 4 to 5 mm (9/32 in.) when a 300 gram (11 oz.) load is applied. Refer to Figure 6-5.

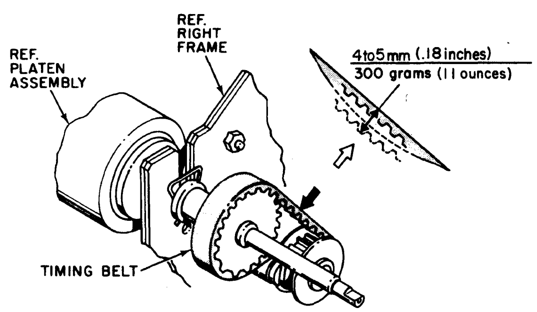


Figure 6-5 Paper Feed Timing Belt Adjustment

6.3.2 PLATEN ADJUSTMENT—Refer to Figure 6-6.

1. Operate printer and ensure quality is uniform for the full line of characters printed. If print quality is not uniform (light to dark), the platen assembly is not parallel to the travel of the carriage. Adjust per steps 2 and 3.

2. On left end of platen, loosen bolt and rotate adjusting plate and eccentric bushing slightly. Repeat steps 2 and 3 as required.

3. Tighten mounting hardware.

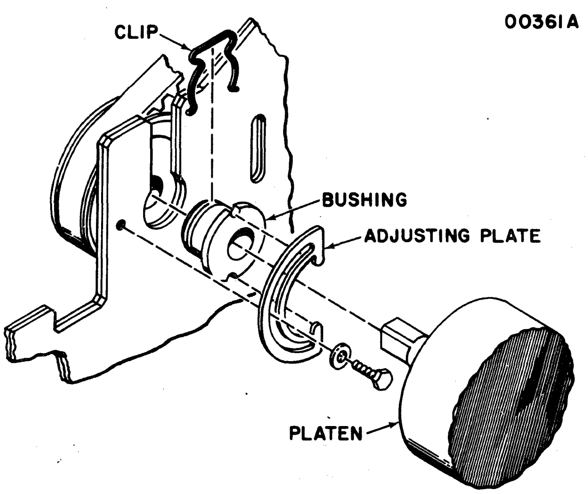


Figure 6-6 Platen Adjustment

6.3.3 TRACTOR DRIVE TIMING BELT TENSION
Using adjustable tensioner on left side of frame, adjust belt tension so that deflection is 5 to 6 mm (1/4 in.) when a load of 300 grams (11 ounces) is applied at the middle of the belt. Refer to Figure 6-7.

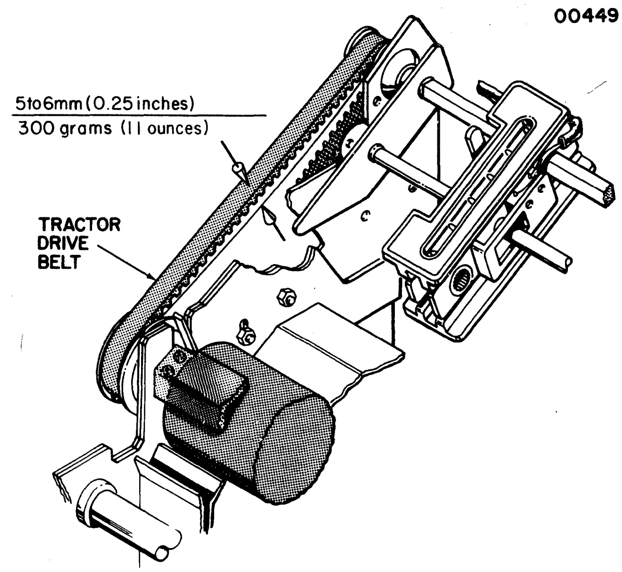


Figure 6-7 Tractor Drive Timing Belt Tension

6.3.4 PAPER TENSION ADJUSTMENT
Adjust pin feed tractors, by turning eccentric knob on right side of tractor drive assembly, so plane of paper travel (top side of tractor unit) is tangent to the platen. Refer to Figure 6-8.

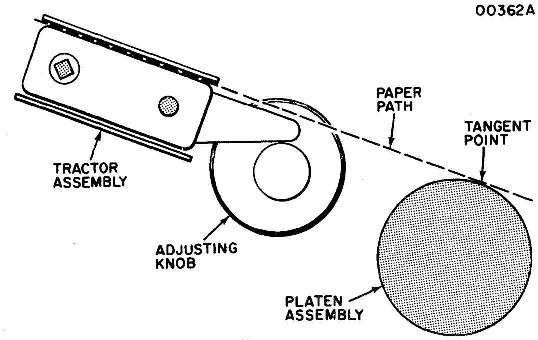


Figure 6-8 Paper Tension Adjustment

6.4 ELECTRICAL ADJUSTMENTS

6.4.1 VIDEO AMPLIFIER ADJUSTMENTS—The video amplifier contains an optical pickup assembly which must be adjusted. The optical pickup vertical alignment and optical pickup/timing fence alignment should be performed simultaneously with the timing fence adjustment, paragraph 6.2.2. The electrical adjustment of the optical pickup assembly is also described. Refer to Figure 6-9.

VERTICAL ALIGNMENT OPTICAL PICKUP

1. Loosen the four screws mounting the timing fence assembly and move the fence up or down until the opaque line in the middle of the fence is centered between the two LEDs in the optical pickup assembly.

2. Once the timing fence is adjusted, tighten the four screws mounting the fence.

3. Sight along the right edge of the optical pickup assembly and ensure it is parallel with respect to the timing fence encoder lines.

4. If the optics block is not parallel, loosen the left side video amplifier mounting hardware and move video amplifier up or down until the optical pickup assembly is parallel with the encoder lines.

5. Once the optical pickup assembly is parallel to the encoder lines, tighten the left side video amplifier mounting hardware.

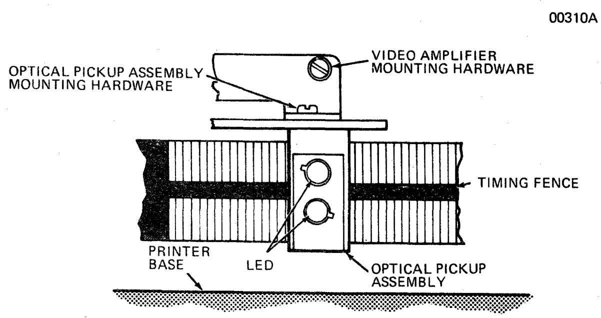


Figure 6-9 Vertical Alignment Optical Pickup

OPTICAL PICKUP/TIMING FENCE ALIGNMENT—Refer to Figure 6-10.

1. Sight along the timing fence and ensure fence is centered in the slot of the optical pickup assembly.

2. If the timing fence is not centered in the slot, loosen the optical pickup mounting hardware and position optical pickup so that the timing fence is centered in the slot.

3. Once the timing fence is centered, tighten the optical pickup mounting hardware.

VIDEO AMPLIFIER ELECTRICAL ADJUSTMENT—Refer to Figure 6-11.

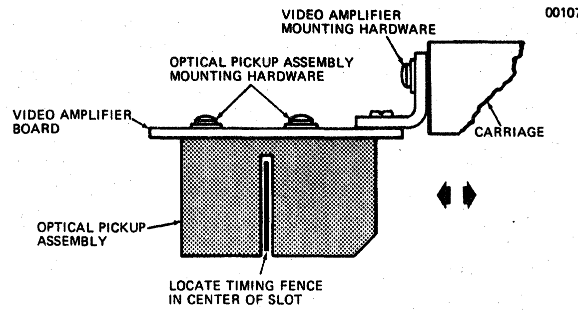


Figure 6-10 Optical Pickup/Timing Fence Alignment

> **NOTE**
> The video amplifier generates the timing signals used for horizontal character registration. The VIDEO No. 1 ($\overline{V1}$) and VIDEO No. 2 ($\overline{V2}$) signals are generated and amplified by the video amplifier as the optics block moves across the timing fence. The logic board determines the forward and reverse direction of the print head by comparing the leading and trailing edges of one video channel signal with the other video channel signal. Both channel outputs, $\overline{V1}$ and $\overline{V2}$, are adjusted for a 50% duty cycle and a constant 90° phase shift between channels. The duty cycle and phase adjustments are performed separately as follows:

Duty Cycle Adjustment

1. Ensure that the optics block on the underside of the video amplifier is centered over the timing fence.

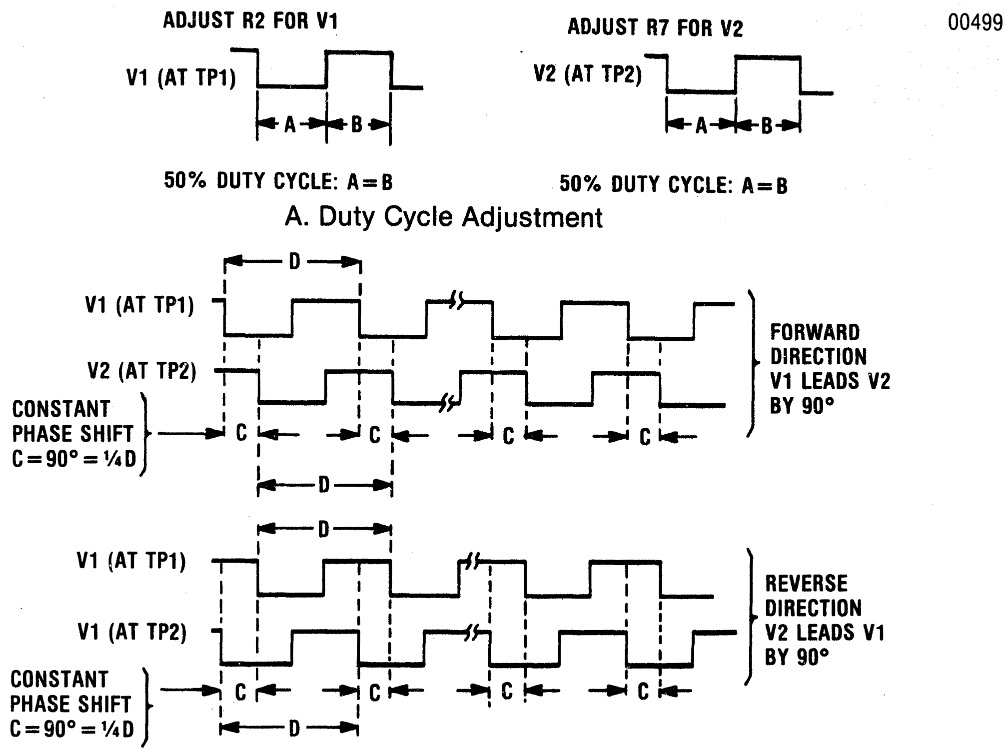
2. While manually moving the carriage back and forth, monitor and record the voltage level at E1 on the power driver board.

> **NOTE**
> The voltage varies as the optics block passes over the light and opaque lines on the timing fence. Record the highest voltage observed.

3. Monitor and record the voltage level at E2 on the power driver board.

4. By adjusting resistor R2 on the video amplifier, set the voltage level to one-half the level recorded at E1. This reference voltage set-up approximates the proper video output duty cycle.

5. Monitor $\overline{V1}$ at E1 and check the duty cycle while the print head is moving at a constant speed. If the duty cycle is not 50%, stop the print head, adjust R2 slightly, start the print head motion and recheck the duty cycle. Repeat the procedure until the 50% duty cycle is achieved.



A. Duty Cycle Adjustment

B. Phase Adjustment of $\overline{V1}$ and $\overline{V2}$

Figure 6-11 Duty Cycle and Phase Adjustment of Video Amplifier

6. To adjust the duty cycle of V2, repeat steps 1 through 5 while monitoring voltage at E2 and adjusting resistor R7 on the video amplifier.

Phase Shift Adjustment

1. Simultaneously monitor $\overline{V1}$ at E1 and $\overline{V2}$ at E2 on the power driver board while the print head is moving at a constant speed.
2. Check phase relationships between $\overline{V1}$ and $\overline{V2}$ as the carriage moves in the forward and reverse direction. The phase difference between $\overline{V1}$ and $\overline{V2}$ should be a constant 90° over the entire travel of the carriage (i.e. width C equals 90° when it equals ¼ width D). If the phase adjustment is required, proceed to step 3.
3. Stop carriage, turn power off, and manually move carriage to the EOP switch.
4. Loosen, approximately one turn, the left side video amplifier mounting screw.
5. Move the left side of the video amplifier board up until the bottom of the slotted mounting hole touches the mounting screw.
6. Turn power on, start moving carriage and recheck phase adjustment.
7. If further adjustment is required, turn power off, move left side of board down slightly and recheck phase.
8. Repeat steps 6 and 7 until phase adjustment of $\overline{V1}$ and $\overline{V2}$ is correct.

6.4.2 LOGIC BOARD ADJUSTMENTS—The electrical adjustments listed in Table 6-1 may be required on the Print Controller.

Table 6-1 Logic Board Adjustments

SIGNAL FUNCTION	NAME	ELEMENT/PIN	ADJUSTMENT	PULSE WIDTH
+5 Volts	+5 Volts	Test Point TP-4	R30	Adjust to +5V level
Print Head Speed	----	ME3-10	R27	430-440 usec
Pin Fire	----	ME35-6	R22	425-450 usec.

SECTION 7
REMOVAL/REPLACEMENT

7.1 REMOVAL/REPLACEMENT

This section covers the removal/replacement procedures for the recommended spare parts in the printer. The section is organized as follows:

PARAGRAPH	RECOMMENDED SPARE	PART NUMBER
7.2	Cover Assemblies*	-----
7.3	Print Head Assembly	62001136-5007
7.4	Ribbon Guide Assembly	-----
7.5	Power Driver Board Assembly	63703180-4002
7.6	Timing Fence Assembly	63703159-6001
7.7	Video Amplifier Assembly	63703164-4003
7.8	Carriage Assembly	81700217-5001
7.9	Stepper Motor Assembly, Carriage Drive	-----
7.10	Stepper Motor Assembly, Paper Drive	-----
7.11	Platen Assembly	81700228-5001
7.12	Tractor Drive Assembly	81700243-5001
7.13	Pin Feed Tractors, Left/Right	63701749-2001/ 36950201-2002
7.14	Primary Voltage Assembly	63703115-6001
7.15	Capacitor/Rectifier Bridge Assemblies	-----
7.16	Fan Assembly	63703161-6001
7.17	Logic Board Assembly	91330004-4001
7.18	Fuses	-----
7.19	Recommended Spare Parts Listing	-----

*NOTE: The cover assemblies are not recommended spare parts and are detailed for reference purposes only.

7.2 COVER ASSEMBLIES

The covers protect the printer mechanism and electronics and are removed using a Phillips head screwdriver and a slotted head screwdriver. To remove the covers, refer to Figure 7-1 and perform the following steps:

1. WINDOW COVER—Lift the cover (8) to release the tension on the clamping springs and remove the cover from the printer.
2. COVER, FRONT—Unsnap the six front cover clips from the left and right covers and remove the front cover (9).
3. COVER ASSEMBLY, LEFT—Remove the cover (1) by loosening the three screws, lockwashers, and flatwashers attaching the cover to the printer base.
4. COVER ASSEMBLY, RIGHT—Remove the cover (7) by loosening the three screws, lockwashers, and flatwashers attaching the cover to the printer base.
5. COVER, ELECTRONIC MODULE—Remove the two snap rings, screws, and four flatwashers mounting the cover (4) to the electronic module frame.
6. COVER, TRACTOR DRIVE, LEFT—Remove the cover (3) by removing the two screws and flatwashers mounting the cover to the left side frame.
7. COVER, TRACTOR DRIVE, RIGHT—Remove the cover (6) by removing the two screws and flatwashers mounting the cover to the right side frame.

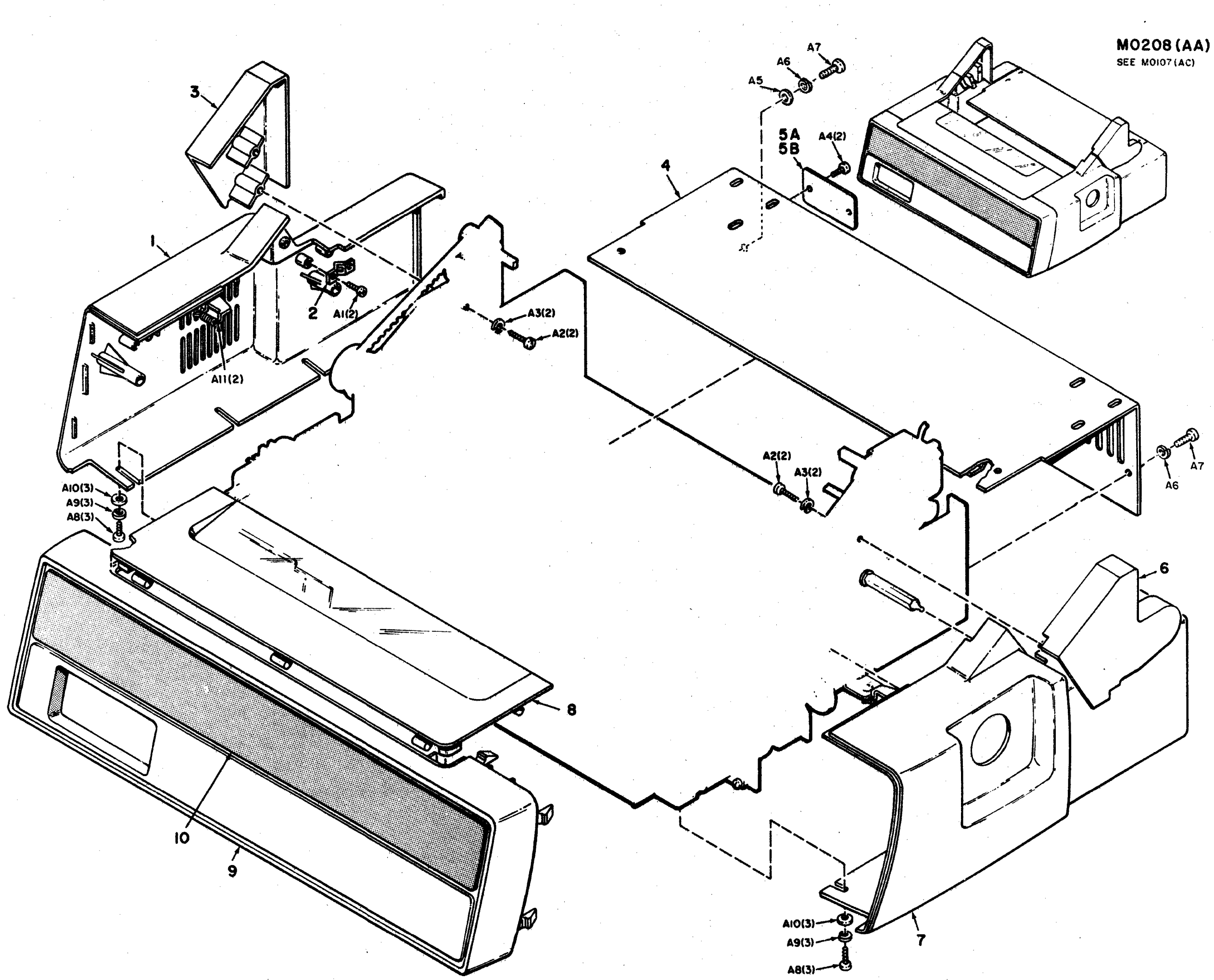


Figure 7-1 Removal/Replacement, Cover Assemblies

7.3 PRINT HEAD ASSEMBLY

The print head is attached to the carriage assembly and no tools are required to remove the head. To remove the print head, refer to Figure 7-2 and perform the following procedures:

1. Remove the window cover from the printer.
2. Remove the ribbon cassette from the printer.
3. Remove fingerboard P037 on the print head cable from connector J037.
4. Release the clamping spring tension, on the left side off the carriage assembly, by pulling the spring up and over the spring retainer.
5. Remove ground wire from print head.
6. Remove the print head assembly (1) by sliding the head towards the front of the printer and off the carriage assembly.
7. To install the print head, reverse steps 1 through 7.

NOTE

When installing the print head assembly, ensure the clamping spring catches the lip underneath the print head then pull the spring up and over the spring retainer.

8. Refer to Section 6, Adjustments, for the adjustment procedures on the print head assembly.

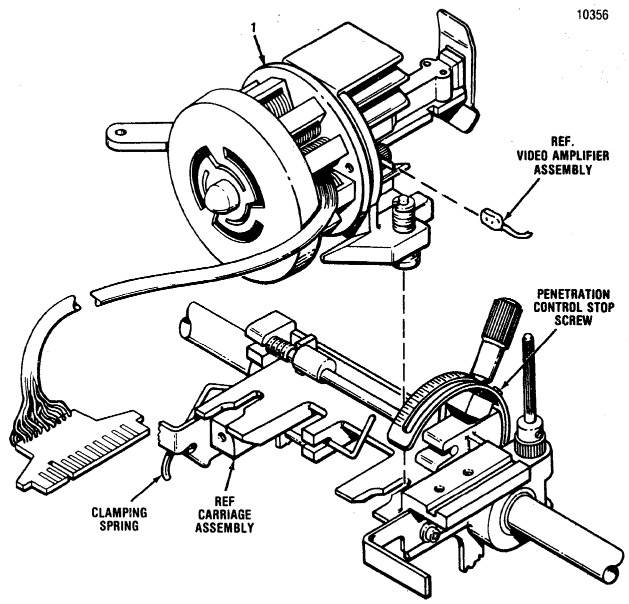


Figure 7-2 Removal/Replacement, Print Head Assembly

7.4 RIBBON GUIDE ASSEMBLY

The ribbon guide on the print head assembly is removable with a Phillips head screwdriver. Refer to Figure 7-3 and perform the following steps:

1. Remove the window cover from the printer.
2. Remove the print head assembly as per paragraph 7.2.
3. Remove ribbon guide (1) by removing two Phillips head screws (2) mounting guide to the bottom of the print head.
4. To install the ribbon guide, reverse steps 1 through 3 above.

NOTE

When installing the ribbon guide, ensure that the print-head cone rests inside the guide opening, and the jewel surface of the print head is exactly flush with the outer surface of the guide.

7.5 POWER DRIVER BOARD ASSEMBLY

The power driver board assembly is mounted in the front of the printer to the printer base and is removed using a Phillips head screwdriver. To remove the board, refer to Figure 7-4 and perform the following steps:

1. Remove the window and front covers from the printer.

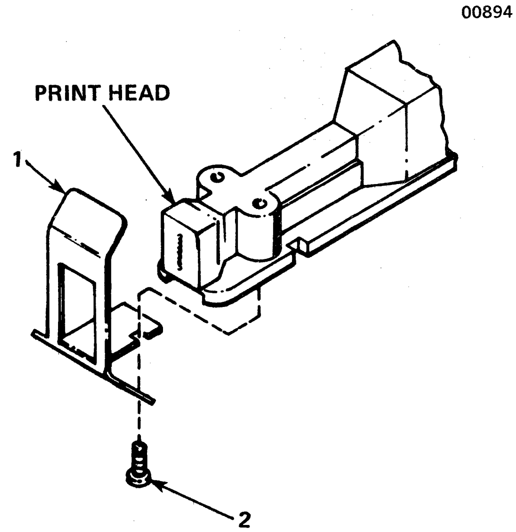


Figure 7-3 Removal/Replacement, Ribbon Guide

2. Disconnect all connectors from the power driver board assembly.
3. Remove hardware (3) securing ground wire from driver board to frame.
4. Remove the five mounting screws, lock-washers, flatwashers, and spacers (2) and remove the power drive board assembly.
5. To install the power driver board, reverse steps 1 through 4.

7.6 TIMING FENCE ASSEMBLY

The timing fence is mounted to two brackets attached to the left and right side frames. An M3 hex key is required to remove the timing fence. To remove the fence, refer to Figure 7-5 and perform the following steps:

1. Remove the window and front covers from the printer.
2. Loosen the four hex head screws (2) and remove the fence (1) from the printer.
3. To install the timing fence, observe the note below while performing steps 1 and 2 in the reverse order.

NOTE

Before installing a new timing fence, wipe it clean with a soft dry cloth. Avoid scratching the fence during installation.

4. Refer to Section 6, Adjustments, for the adjustment procedures on the timing fence.

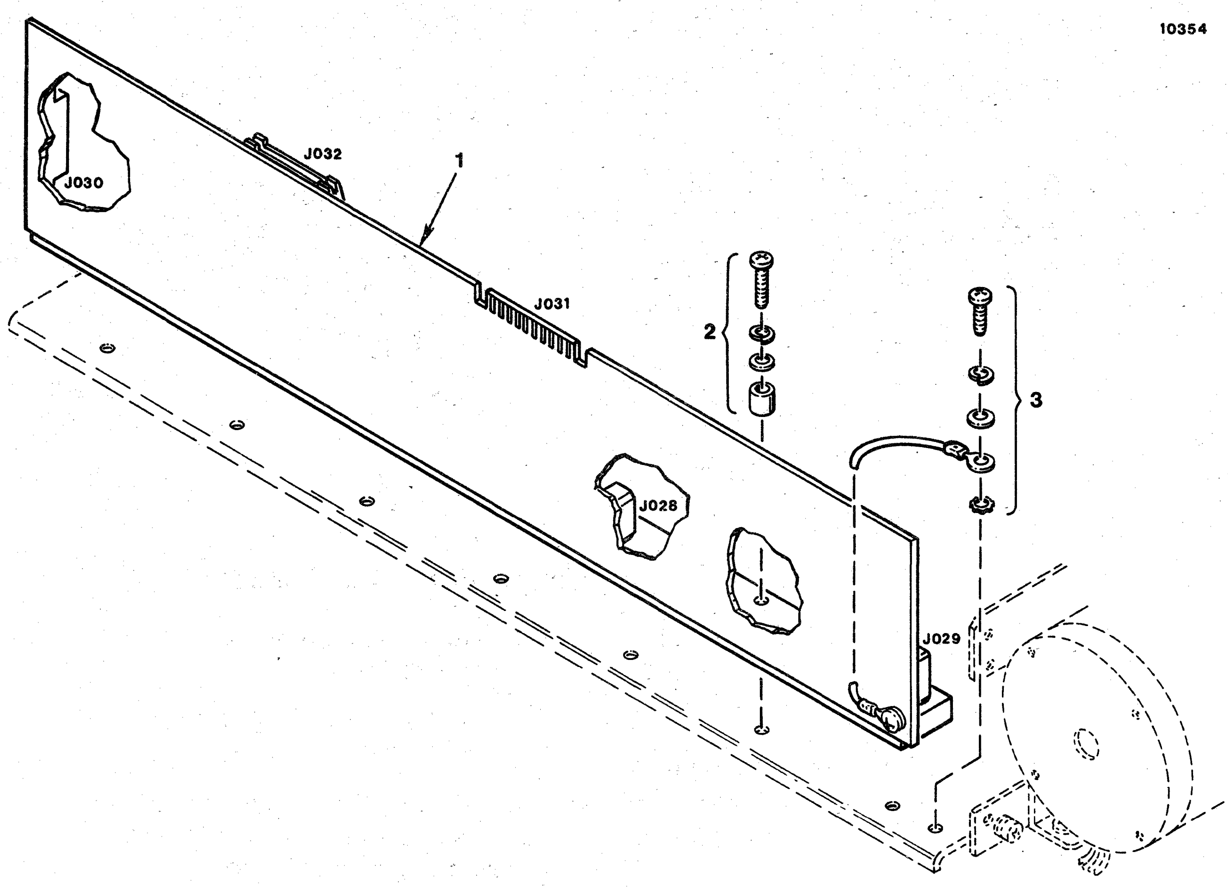


Figure 7-4 Removal/Replacement, Power Driver Board Assembly

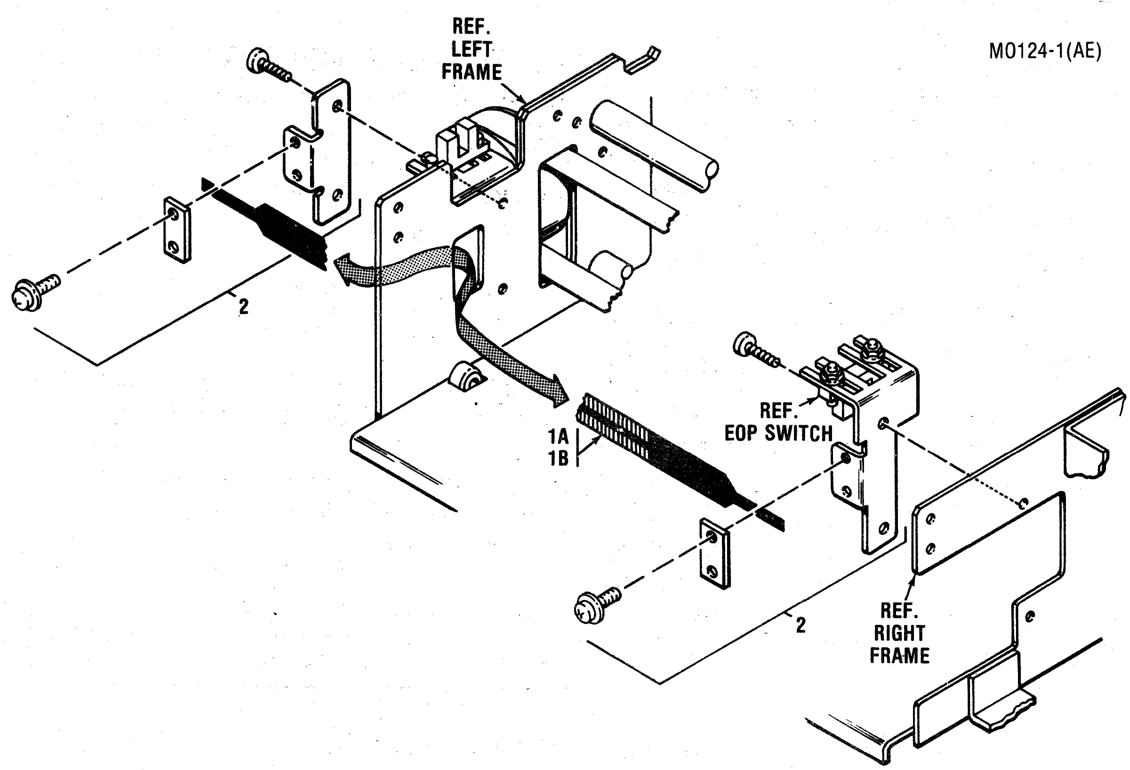


Figure 7-5 Removal/Replacement, Timing Fence Assembly

7.7 VIDEO AMPLIFIER ASSEMBLY

The video amplifier is mounted to the carriage assembly and is removed using a Phillips head screwdriver. To remove the board, refer to Figure 7-6 and perform the following steps:

1. Remove the window and front covers from the printer.
2. Remove the print head cable fingerboard P037 from connector J037 on the video amplifier.
3. Remove connector J036 of video amplifier cable from connector P036 on the power driver board.
4. Remove the two screws, lockwashers, flatwashers (2), and ground lead mounting the video amplifier to the carriage and remove the video amplifier (1).
5. To install the video amplifier, reverse steps 1 through 4 above.
6. Refer to Section 6, Adjustments, for the adjustment procedures on the video amplifier.

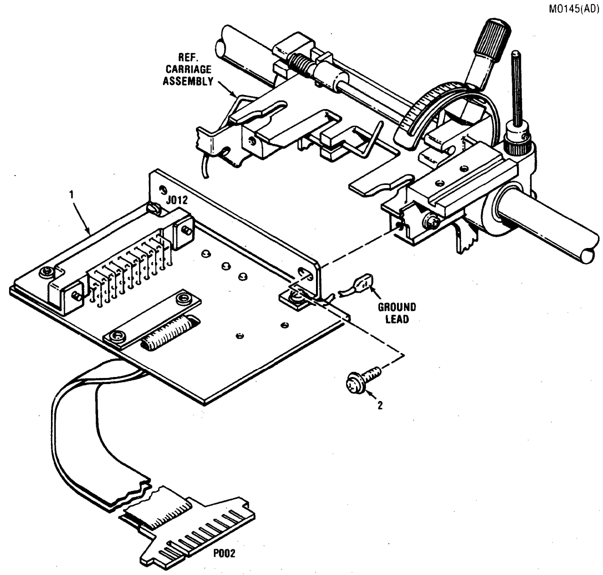


Figure 7-6 Removal/Replacement, Video Amplifier Assembly

7.8 LIGHTWEIGHT CARRIAGE ASSEMBLY

The lightweight carriage assembly is mounted on the carriage guide bars between the left and right side frames. A slotted and Phillips head screwdriver are required to remove the carriage. To remove the carriage assembly, refer to Figure 7-7 and perform the following procedures:

1. Remove the top, front, left, and right covers from the printer.
2. Remove the ribbon cartridge, print head assembly, power driver board assembly, timing fence, and video amplifier, as described previously.
3. Loosen the carriage drive belt (1) by loosening two locknuts (2) and turning, counterclockwise, the two adjusting screws (3) on the idle pulley assembly.
4. Remove the retaining ring (4) from the left end of the upper guide bar (5).
5. Remove the screw (6), bolt (7), lockwashers (8), and guide bar support (9) mounting the upper guide bar to the right side frame.
6. Loosen the locknut and screw (10) attaching the bottom of the carriage (11) to the bottom guide bar (12).
7. Remove the upper (13) and lower (14) ribbon drive wires from the ribbon drive pulleys.
8. Remove the two screws and lockwashers (15) clamping the carriage drive belt to the carriage assembly.
9. While supporting the carriage, slide the upper guide bar to the right through the carriage assembly and remove the carriage. Retain the rubber carriage stop (16) removed from the left end of the upper guide bar.
10. To replace the carriage assembly, reverse steps 1 through 9.

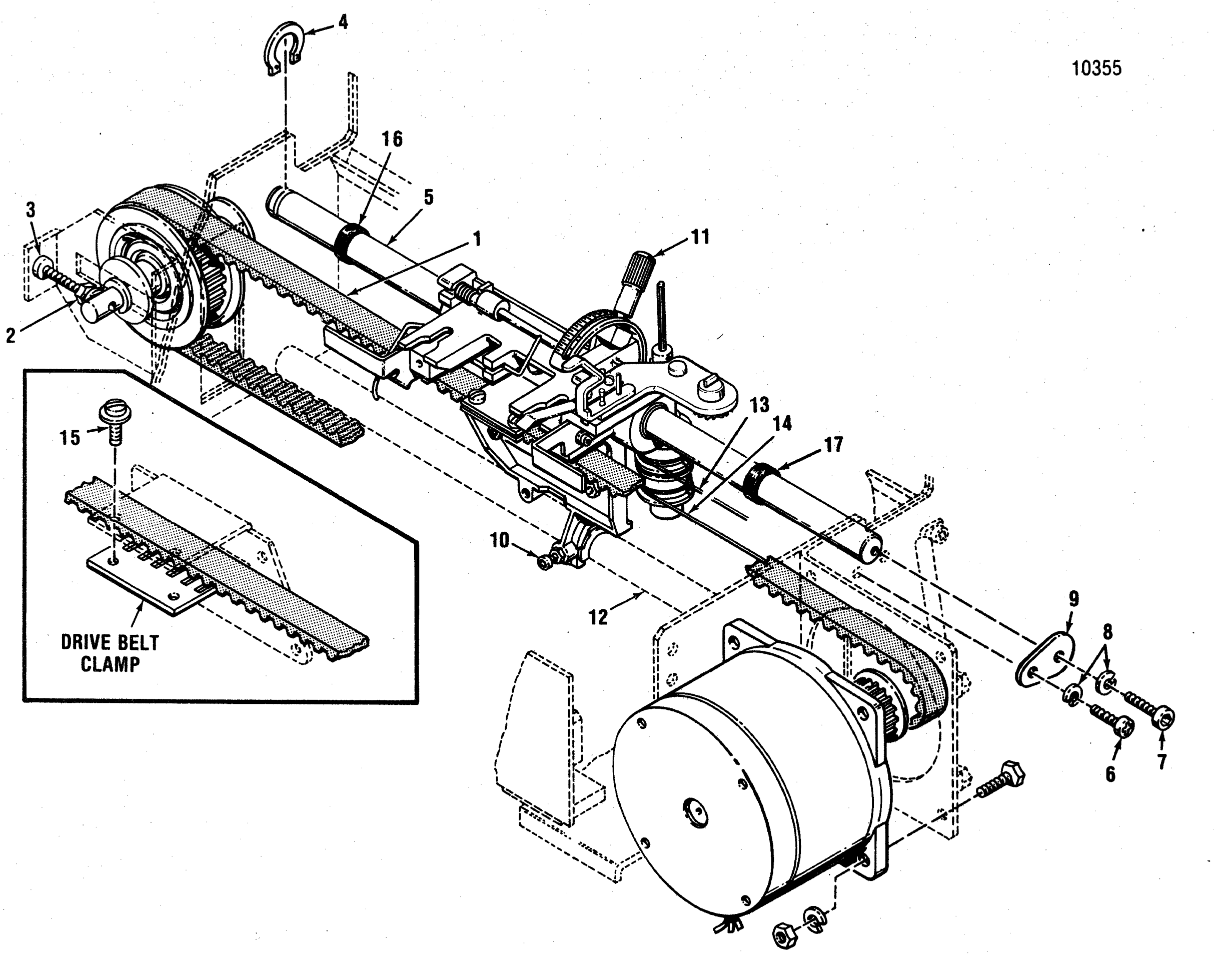


Figure 7-7 Removal/Replacement, Carriage Assembly

7.9 STEPPER MOTOR ASSEMBLY, CARRIAGE DRIVE

The carriage drive stepper motor assembly consists of the carriage drive stepper motor, drive belt, and idle pulley assembly. The assembly is removed using an M5 nut driver and Phillips head screwdriver. To remove the assembly, refer to Figure 7-8 and perform the following procedures:

1. Remove the top, front, left, and right covers from the printer.

2. Disconnect connector P028 on the stepper drive motor (1) from connector J028 on the power driver board assembly.

3. Loosen the tension on the carriage drive belt (2) by loosening two locknuts (3) and turning, counterclockwise, the two adjusting screws (4) on the idle pulley assembly.

4. Remove the four mounting bolts (5, 6), lockwashers (7) and nuts (8) and remove the stepper drive motor (1) from the printer.

5. Remove the carriage drive belt (2) and idle pulley (9) by removing the two snap rings (10), adjusting screws (4) and slide idle pulley shaft (11) through the idle pulley.

6. To install the items in the carriage drive stepper motor, reverse steps 1 through 5.

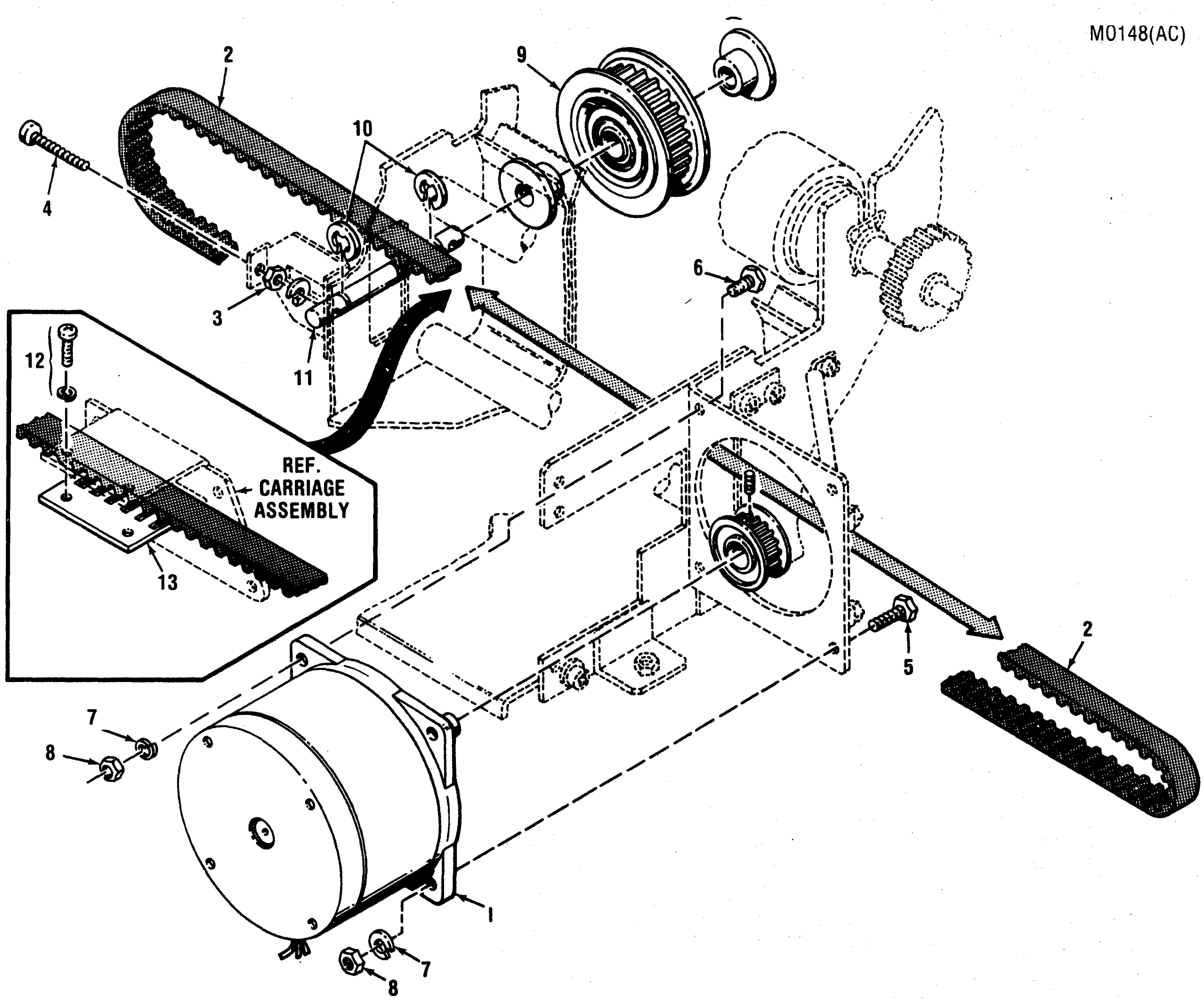


Figure 7-8 Removal/Replacement, Stepper Motor Assembly, Carriage Drive

7.10 STEPPER MOTOR ASSEMBLY, PAPER DRIVE

The paper drive stepper motor assembly is mounted to the right side frame and is removed using an M5 nut driver. To remove the stepper motor, refer to Figure 7-9 and perform the following procedures:

1. Remove the right cover and the electronic module cover from the printer.
2. Disconnect two pin connector P029 from connector J029.
3. Loosen the tension on the paper feed timing belt by loosening the stud screw mounting the tension roller to the right side frame.
4. Remove the line-feed pulley (5) by loosening two setscrews (4) and sliding the pulley off the stepper motor shaft.
5. Remove the mounting screw assemblies, lockwashers, and nuts (2, 3) and remove the stepper motor assembly (1) from the printer.
6. To install the paper drive stepper motor assembly, reverse steps 1 through 5.
7. Refer to Section 6, Adjustments, for adjustment procedures on the paper drive stepper motor assembly.

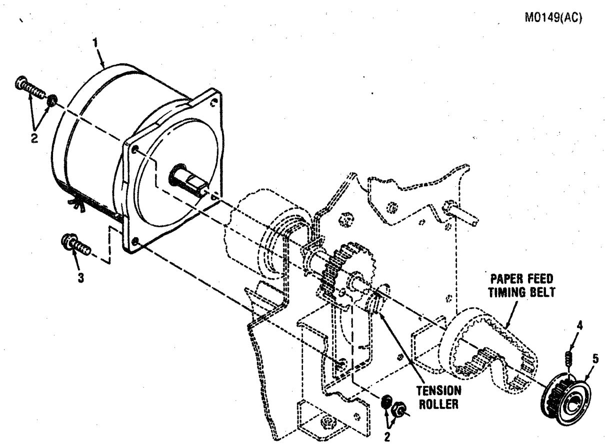


Figure 7-9 Removal/Replacement, Stepper Motor Assembly, Paper Drive

7.11 PLATEN ASSEMBLY

The platen assembly is mounted between the left and right side frames and is removed using an M4 hex key, flat blade screwdriver, and M4 open end wrench. To remove the platen, refer to Figure 7-10 and perform the following procedures:

1. Remove the window, front, right, and left covers from the printer.
2. At the right end of the platen, loosen the tension on the paper feed timing belt by loosening the stud screw mounting the tension roller to the right side frame. Refer to Figure 7-9 for tension roller location.
3. Slip the paper feed timing belt off the paper feed pulleys.
4. Loosen two set-screws (1) mounting the tractor drive pulley (2) to left end of platen and remove pulley.
5. Remove the two stop collar springs (3) from each end of the platen.
6. Loosen the bolt and lockwasher (4) mounting, the adjusting plate (5), and remove adjusting plate from left bushing (6) mounting slots.
7. Slide the two brass bushings (6, 8) towards the center of the printer, and lift the platen assembly (7) from the printer.
8. To install the platen assembly, reverse steps 1 through 8 above.
9. Refer to Section 6, Adjustments, on the platen assembly.

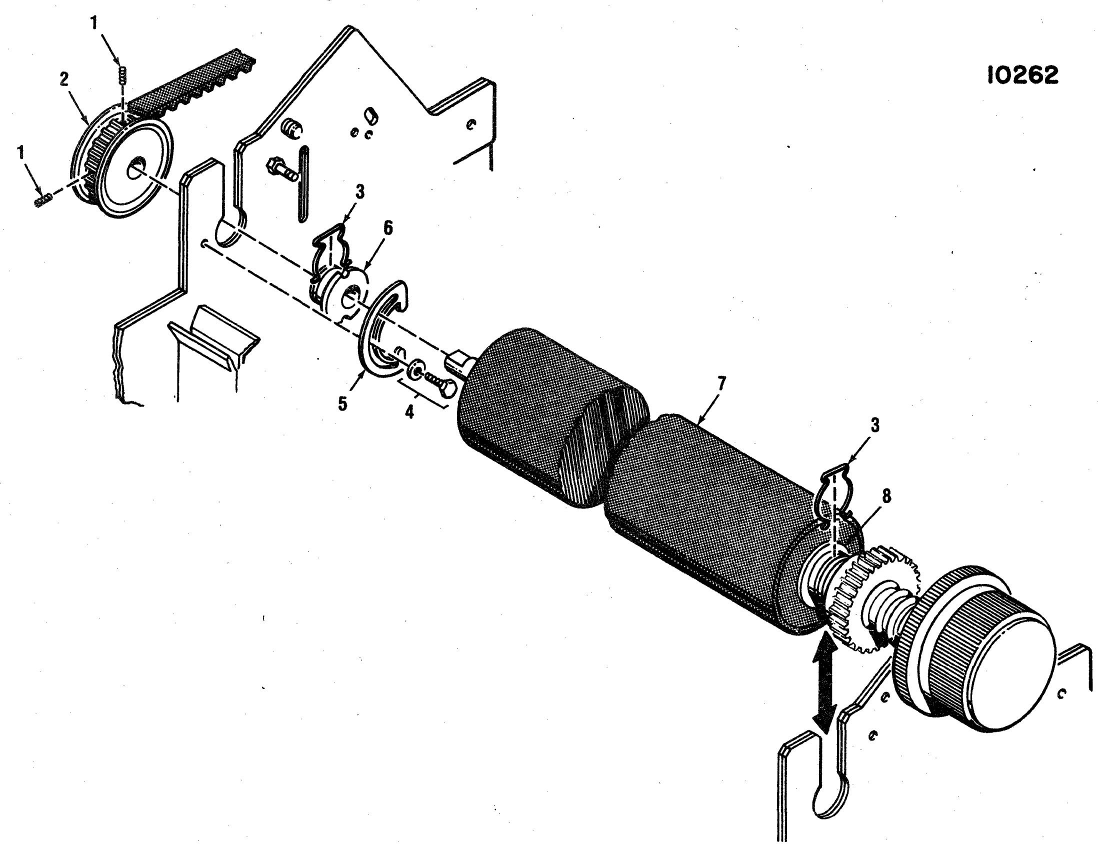


Figure 7-10 Removal/Replacement, Platen Assembly

7.12 TRACTOR DRIVE ASSEMBLY

The tractor drive assembly is the standard paper feed assembly for the Model 705 printer. The tractor drive assembly contains the left and right pin feed tractors which are also recommended spare parts. The tools required to remove the tractor drive assembly are a Phillips head screwdriver and M4 open end wrench. To remove the tractor drive assembly, refer to Figure 7-11 and perform the following procedures:

1. Remove the left/right side covers, electronic module cover, and the left/right tractor drive covers from the printer.
2. Disconnect the two pin connector P044 of the paper empty switch (1) from connector J044.
3. Remove the left (2) and right (3) stud screws, two lockwashers, and four flatwashers (4) and two nuts (5) attaching the tractor drive assembly (7) to the left and right side frames.
4. Remove the two screw assemblies (6) mounting the tractor drive assembly (7) to the left and right side frames and remove the tractor drive assembly from the printer.
5. To install the tractor drive assembly, reverse steps 1 through 4 above.
6. Refer to Section 6, Adjustments, for the adjustment procedures on the tractor drive assembly.

7.13 PIN FEED TRACTORS, LEFT/RIGHT

The left and right pin tractors are removed by removing the sub-tractor drive assembly from the printer. The tools required to remove the tractors are a Phillips head and M3 allen wrench. To remove the tractors, refer to Figure 7-11 and perform the following procedures:

1. Remove the left and right tractor drive covers and electronic module cover from the printer.
2. Disconnect two-pin connector P044 of the paper empty switch (1) from connector J044.
3. Remove the four screw assemblies (8) mounting the sub-tractor drive assembly (9) to the left and right side frames and remove the sub-tractor drive assembly from the printer.
4. On the right side of the sub-tractor drive assembly, loosen the setscrew (10) and remove collar (11), bearing (12), and bearing support (13).
5. Loosen the setscrews (14) mounting the right support plate (15) and remove the right support plate from the tractor drive shafts.
6. Slide the right (16) and left (17) pin feed tractors off the drive shaft and support bar of the sub-tractor drive assembly.
7. To install the pin feed tractors, reverse steps 1 through 6 above.

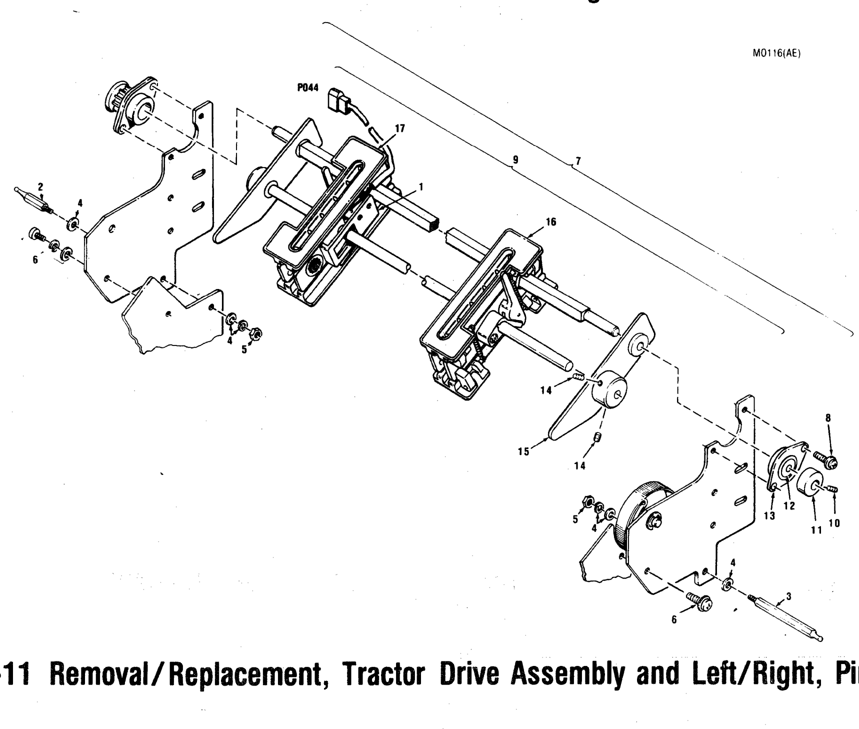


Figure 7-11 Removal/Replacement, Tractor Drive Assembly and Left/Right, Pin Feed Tractors

7.14 PRIMARY VOLTAGE ASSEMBLY

The primary voltage assembly is located in the electronic module assembly and consists of the power bracket assembly, line filter and transformer adapter cable assembly. The primary voltage assembly is removed using a Phillips head screwdriver. To remove the primary voltage assembly, refer to Figure 7-12 and perform the following procedures:

1. Remove the electronic module cover from the printer.
2. Disconnect all wires from the power bracket assembly (1) and the line filter assembly (2).
3. Remove the two screws, lockwashers, and flatwashers (3) mounting the power bracket assembly.
4. Remove the screw (4), two external tooth lockwashers (5), and nuts (6) connecting the ground wire of the AC power cord and remove the power bracket assembly.
5. Remove the three line filter mounting screws, lockwashers, and flatwashers (7) and remove the line filter assembly (2).
6. To install the primary voltage assembly, reverse steps 1 through 5 above.

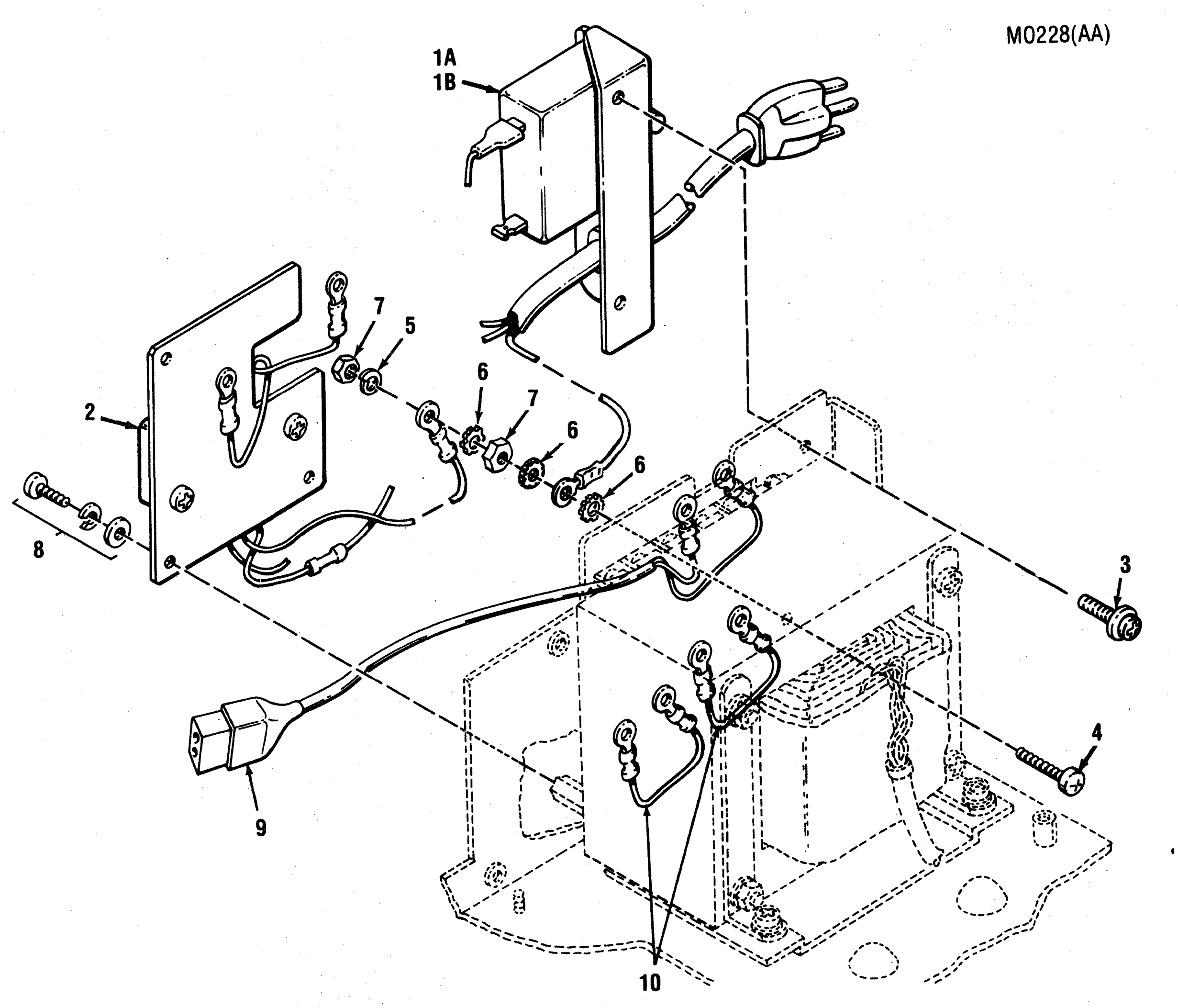


Figure 7-12 Removal/Replacement, Primary Voltage Assembly

7.15 CAPACITOR/RECTIFIER BRIDGE ASSEMBLIES

The two power supply capacitors and rectifier bridges are located in the electronic module assembly. An M4 nut driver is required to remove the rectifier bridges. To remove the capacitors and rectifier bridges, refer to Figure 7-13 and perform the following procedures:

1. Remove the electronic module cover from the printer.
2. Remove the four screws connecting the four wires and two resistor assemblies (5, 9) to the terminals of the two capacitors (4, 6).
3. Remove screw (1), lockwasher and flatwasher (2) and saddle strap (3) to remove the 25,000 uF capacitor (4).
4. Remove screw (8), lockwasher and flatwasher (2) and spacer bar (10) to remove the 20,000 uF capacitor (6).
5. Remove the eight fasten connectors from the two bridge rectifiers (11).
6. Remove the two mounting nuts, lockwashers and flatwashers (12), then remove the two bridge rectifiers (11) from the printer.
7. To install the bridge rectifiers and capacitors, reverse steps 1 through 6.

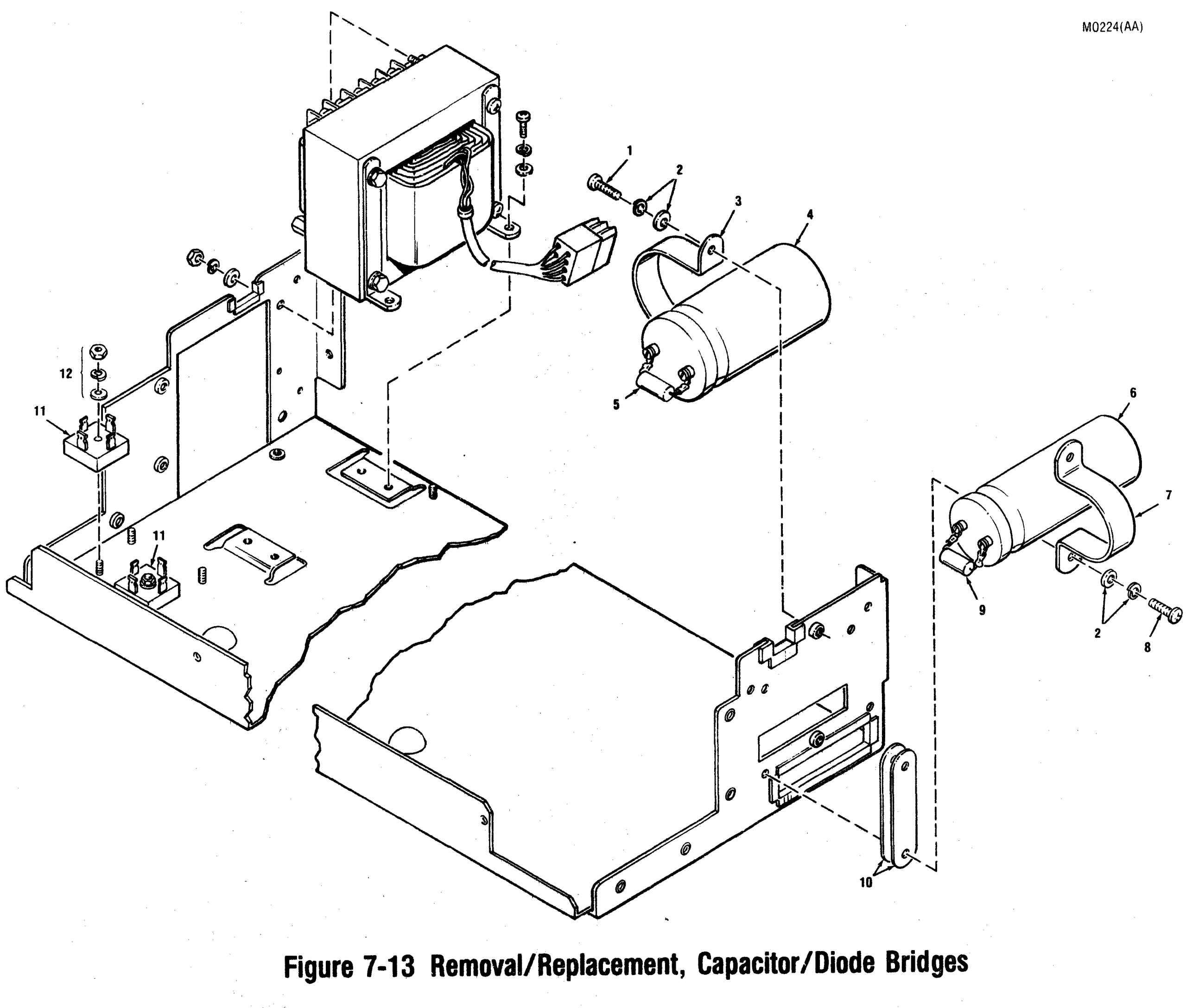


Figure 7-13 Removal/Replacement, Capacitor/Diode Bridges

7.16 FAN ASSEMBLY

The fan assembly is mounted to the left side of the printer frame and is removed using an M3 hex key. To remove the fan, refer to Figure 7-14 and perform the following procedures:

1. Remove the left side cover and the electronic module cover from the printer.

2. Disconnect connector J033 from connector P033 on the fan assembly (1).

3. Remove the two screws, lockwashers, and flatwashers (2) and remove the fan assembly from the printer.

4. To install the fan assembly, reverse steps 1 through 3 above.

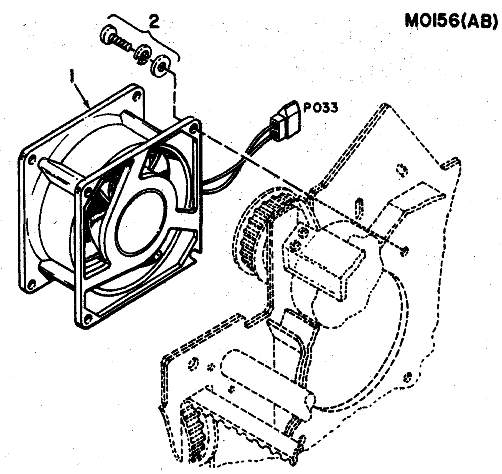


Figure 7-14 Removal/Replacement, Fan Assembly

7.17 LOGIC BOARD ASSEMBLY

The logic board assembly is located in the electronic module assembly and is removed using a Phillips head screwdriver. To remove the board, refer to Figure 7-15 and perform the following procedures:

1. Remove the electronic module cover from the printer.

2. Disconnect all connectors and wires from the logic board assembly (1).

3. Remove the screw assembly (2) mounting the front of the logic board to the electronic module.

4. Remove the two screw assemblies (3) mounting the rear of the logic board to the electronic module base.

5. Remove the logic board from the printer.

6. To install the logic board assembly, reverse steps 1 through 5 above.

7. Refer to Section 6 for the adjustment procedures on this logic board.

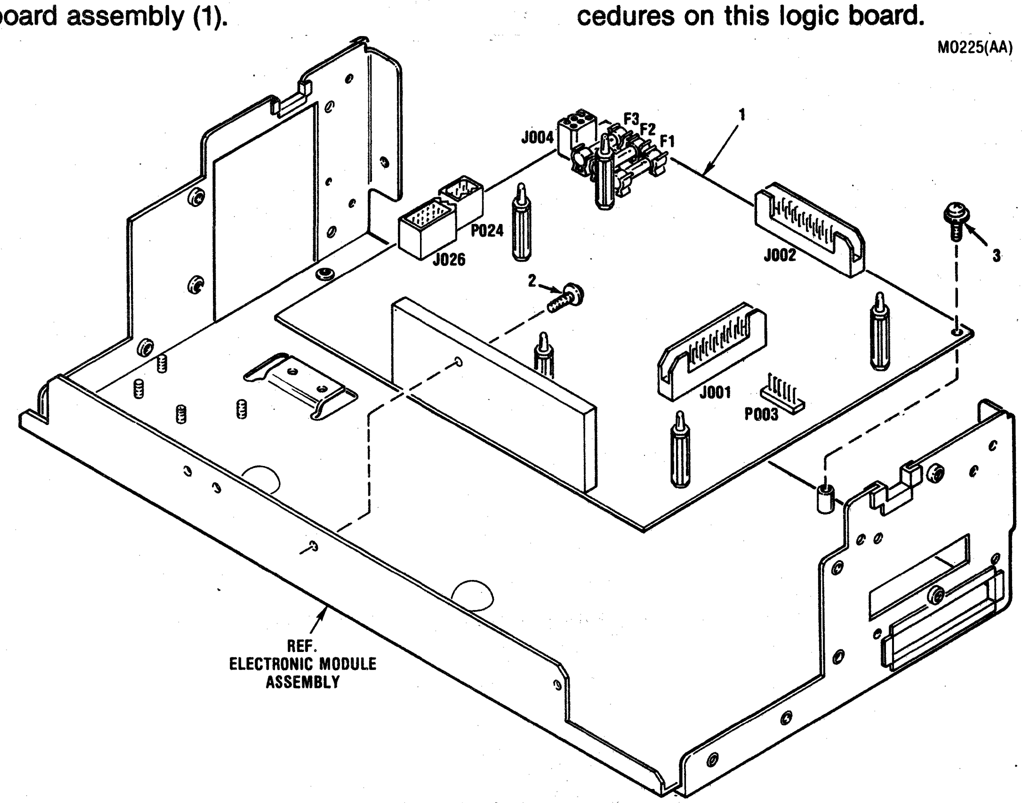


Figure 7-15 Removal/Replacement, Logic Board Assembly

7.18 FUSES

TOOLS REQUIRED: Phillips Screwdriver

1. Remove electronic module cover from printer.
2. Remove fuse (F1, F2 and/or F3) as appropriate from the associated fuse holder on the logic board.
3. To install fuse(s), reverse steps 1 and 2.

7.19 RECOMMENDED SPARE PARTS LIST

Table 7-1 lists the part numbers and descriptions for all the parts referenced on the removal/replacement figures in this section of the manual.

Table 7-1 Recommended Spares Listing

FIGURE NUMBER	ITEM NUMBER	PART NUMBER	PART DESCRIPTION
7-2	1	62001136-5007	Print Head Assembly
7-3	1	63701528-2001	Ribbon Guide
	2	34000053-2001	Screw, Pan Hd., Phillips, Self-Tapping, No. 2-28 x .25 in. Lg.
7-4	1	63703180-4002	Power Driver Board Assembly
	2	34000351-2021	Screw, Fillister Hd., Phillips, M3 x 16 mm Lg.
		34000455-2004	Washer, Split Lock, M3
		34000452-2004	Washer, Flat, M3
		36614403-2050	Spacer, .18 Lg. x .25 Dia
	3	34000351-2018	Screw, Fillister Hd., Phillips, M3 x 8 mm
		34000455-2004	Washer, Split Lock, M3
		34000452-2004	Washer, Flat, M3
		34000451-2054	Washer, External Tooth Lock, M3
7-5	1	63753159-3001	Timing Fence, 10/10 CPI, Special
	2	81700193-2001	Bracket, Left
		81700181-2001	Clamp, Timing Fence
		34000355-2010	Screw, Assembly, Pan Hd. Phillips, M6 x 8 mm Lg.
		81700192-2001	Bracket, Right
7-6	1	63703269-4003	Video Amplifier Assembly
	2	34000775-2044	Screw Assy, Pan Hd., Phillips, M3 x 10 mm Lg.
		63701703-4001	Assy., Cable, Head Grounding
7-7	1	364000034-2001	Carriage Drive Belt
	2	34000661-2004	Nut, Hex, M3
	3	34000660-2043	Adjusting Screws, Pan Hd., Slotted, M3 x 35 mm Lg.
	4	33115554-2013	Snap Ring
	5	81700156-2001	Upper Guide Bar
	6	34000773-2084	Screw Assy., Pan Hd., Phillips, M4 x 8 mm Lg.
	7	34000657-2024	Screw, Cap Hex Head, M5 x 8 mm Lg.
	8	34000455-2007	Lockwasher, M5
	9	81700206-2001	Guide Bar Support
	10	81700571-2001	Screw Assy., Pan Hd., Phillips, M3 x 12 mm Lg.
		34000661-2004	Nut, Hex, M3
		34000662-2004	Lockwasher, M3
	11	81700218-5001	Carriage
	12	81700156-2001	Bottom Guide Bar
	13	81700276-5001	Upper Ribbon Drive Wire
	14	81700278-2001	Lower Ribbon Drive Wire
	15	37400775-2044	Screw Assy., Pan Hd., Phillips, M3 x 8 mm Lg.
	16	81700184-2001	Stop, Carriage, Left
	17	81700184-2002	Stop, Carriage, Right

Table 7-1 Recommended Spares Listing (Cont.)

FIGURE NUMBER	ITEM NUMBER	PART NUMBER	PART DESCRIPTION
7-8	1	30420003-1002	Stepper Drive Motor
	2	36400034-2001	Main Drive Belt
	3	34000661-2004	Nut, Hex, M3
	4	34000660-2043	Adjusting Screw
	5	34000657-2029	Screw, Cap, Hex Hd., M5 x 20 mm Lg.
	6	34000657-2027	Screw, Cap, Hex Hd., M5 x 16 mm Lg.
	7	34000662-2007	Washer, Split, Lock, M5
	8	34000658-2006	Nut, Hex, M5
	9	81700198-5001	Idle Pulley
	10	33100001-2008	Snap Ring
	11	81700201-2001	Idle Pulley Shaft
	12	34000773-2044	Screw Assy., M3 x 8 mm Lg.
	13	81700195-2001	Main Drive Belt Holder
7-9	1	30420003-1002	Stepper Motor Assembly, Paper Drive
	2	34000664-2054 34000662-2007 34000661-2007	Screw, Pan Hd., Phillips, M5 x 18 mm Lg. Washer, Split Lock, M5 Nut, Hex, M5
	3	34000773-2106	Screw Assy., Pan Hd., Phillips, M5 x 13 mm Lg.
	4	34000656-2033	Set-Screw, M4 x 6 mm Lg.
	5	81700204-5001	Line Feed Pulley
7-10	1	34000656-2033	Set-Screw
	2	81700167-5001	Tractor Drive Pulley
	3	81700254-2001	Spring Stopper Clip
	4	34000667-2003 34000663-2004	Screw, M3 x 6 mm Lg. Washer, Flat, M3
	5	81700144-2001	Adjusting Plate
	6	81700143-2001	Bushing, Plate
	7	81700228-5001	Platen Assembly
	8	81700186-2001	Bushing, Right
7-11	1	63701438-4001	Paper Empty Switch
	2	81700044-2001	Stud Screw (Cover L-Rear)
	3	81700044-2002	Stud Screw (Cover R-Rear)
	4	34000663-2006 34000662-2006	Washer, Flat, M4 Washer, Split Lock, M4
	5	34000661-2006	Nut, Hex, M4
	6	34000775-2105	Screw Assy., Pan Hd., Phillips, M5 x 10 mm Lg.
	7	81700243-5001	Tractor Drive Assembly
	8	34000773-2083	Screw Assy., Pan Hd., Phillips, M4 x 6 mm Lg.
	9	----	Sub Tractor Drive Assembly
	10	34000656-2031	Set-Screw M4 x 4 mm Lg.
	11	81700255-2001	Collar
	12	36000009-2004	Ball Bearing
	13	81700137-2001	Bearing Support
	14	34000656-2040	Set-Screw, M5 x 5 mm Lg.
	15	81700052-5002	Right Support Plate
	16	36950201-2002	Tractor Assembly, Right
	17	63701748-5001	Tractor Assembly, Left, with switch

Table 7-1 Recommended Spares Listing (Cont.)

FIGURE NUMBER	ITEM NUMBER	PART NUMBER	PART DESCRIPTION
7-12	1	63703115-5001	Power Bracket Assembly, 115 VAC
	2	63703144-5001	Line Filter Assembly
	3	34000775-2085 34000455-2006 34000452-2006	Screw Assy., Pan Hd., Phillips, M4 x 10 mm Lg. Washer, Split Lock, M4 Washer, Flat, M4
	4	34000351-2040	Screw, Fillister Hd., Phillips, M4 x 16 mm Lg.
	5	34000451-2056	Washer, External Tooth, M4
	6	34000451-2056	Washer, External Tooth Lock, M4
	7	34000652-2006	Nut, Hex, M4
	8	34527125-2001 34828005-2001 34922105-2001	Screw, Pan Hd., Phillips, ÷6-32 x .38 in. Lg. Washer, Split Lock, #6 Washer, Flat, #6
	9	63761184-4001	Cable Assembly, Adapter
	10	63779114-4001	Jumper Wires, Transformer
7-13	1	34000772-2001	Screw, Hex Hd., Phillips, Power Lock, M5 x 8 mm Lg.
	2	91330029-2001	Strap, Saddle, 063.5 mm I.D.
	3	22259001-1001	Capacitor, 25,000 uF, 50V
	4	63010138-5001	Assembly, Resistor, 470 Ohm
	5	91900042-1001	Capacitor, 20,000 uF, 40V
	6	91330030-2001	Strap, Saddle, 50.8 mm I.D.
	7	34000772-2001	Screw, Hex Hd., Phillips, Power Lock, M5 x 8 mm Lg.
	8	63010138-5002	Assembly, Resistor, 82 Ohm
	9	91330031-2001	Bar, Spacer
	10	38125021-1002	Rectifier, Bridge
	11	34000652-2004 34000455-2004 34000452-2004	Nut, Hex, M3 Washer, Split Lock, M3 Washer, Flat, M3
7-14	1	63703161-4001	Fan Assembly
	2	34000355-2010 34000455-2004 34000452-2004	Screw, Socket Head, M3 x 10 mm Lg. Washer, Split Lock, M3 Washer, Flat, M3
7-15	1	91330004-4001	Logic Board Assembly
	2	34000775-2086 34000455-2004 34000452-2004	Screw Assy., Fillister Hd., Phillips, M4 x 16 mm Lg. Washer, Split Lock, M3 Washer, Flat, M3
	3	33724717-2008	Screw Assy., Pan Hd., Phillips, M3 x 13 mm Lg.
	F1, F2	39030016-1001	Fuse GL, Slow Blow, 0.25 in dia, 0.5A, 250V
	F3	39030003-1001	Fuse GL, 0.25 in dia, 5.0A, 250V

APPENDIX A
ELECTRICAL DRAWINGS

This section contains the schematic, wiring and assembly drawings for the Model 705 Printer. A list of the drawings follows:

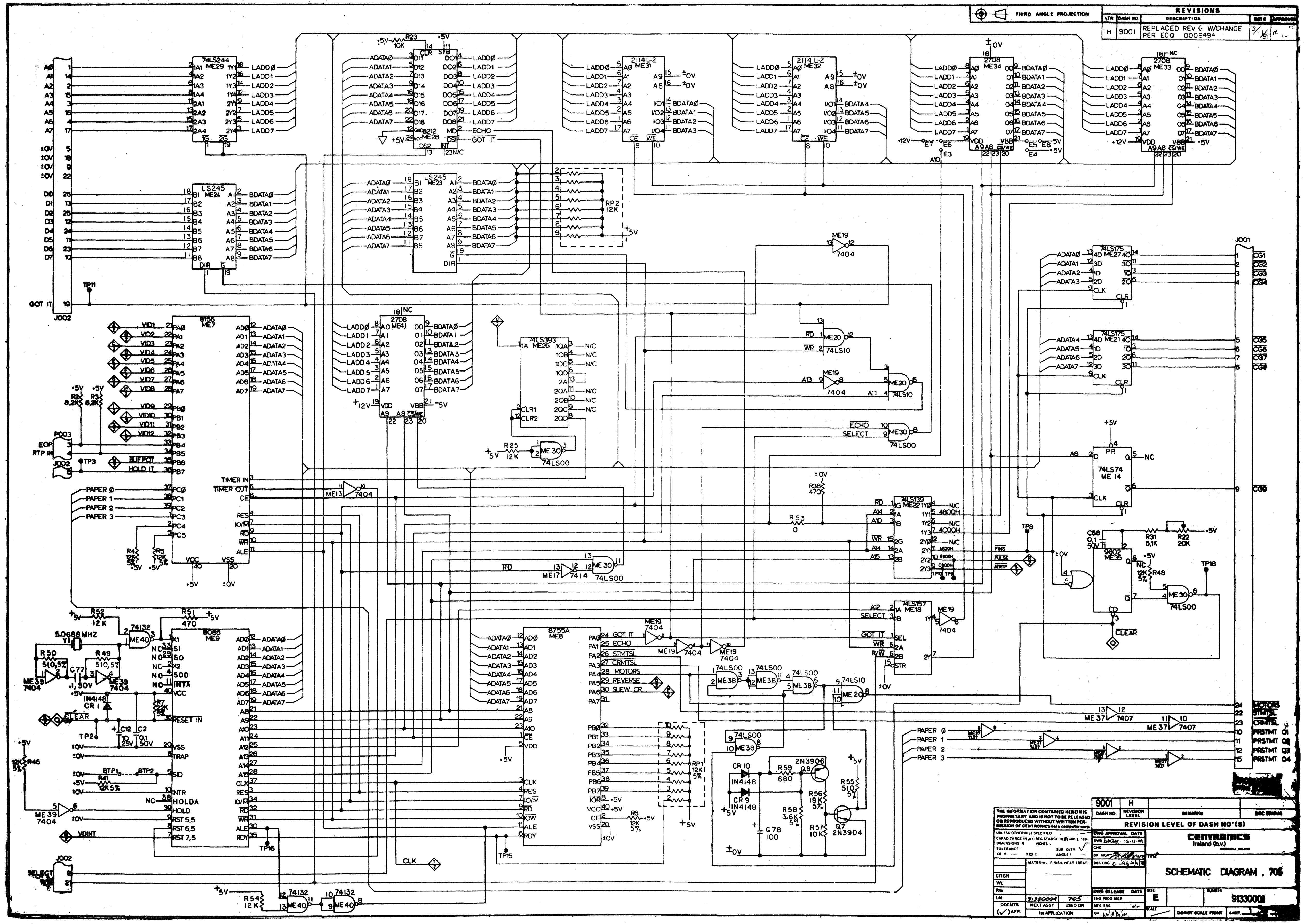


Figure A-1 Schematic Diagram, Model 705
Logic Board (Revision E, Sheet 1 of 2)

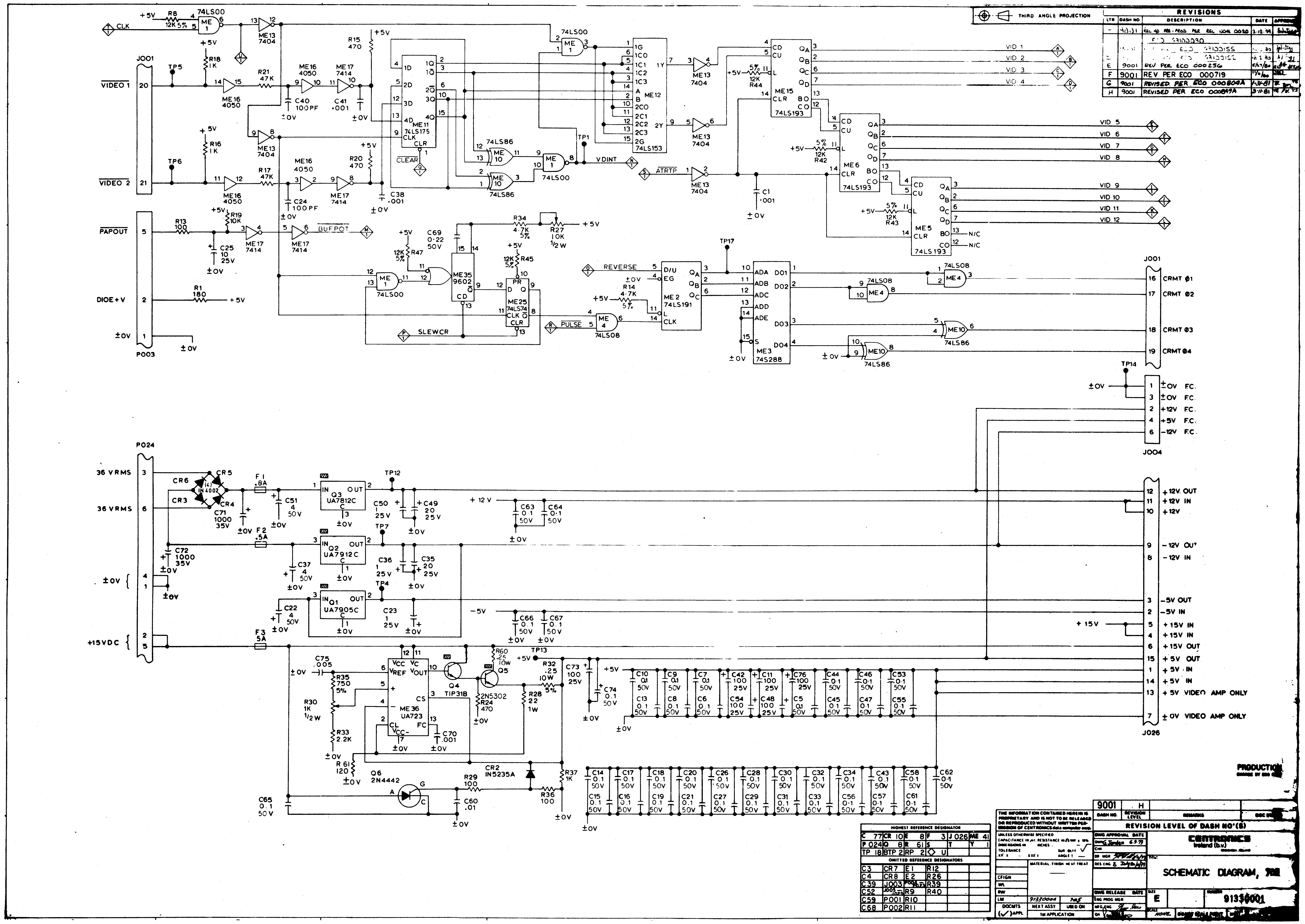


Figure A-2 Schematic Diagram, Model 705
Logic Board (Revision E, Sheet 2 of 2)

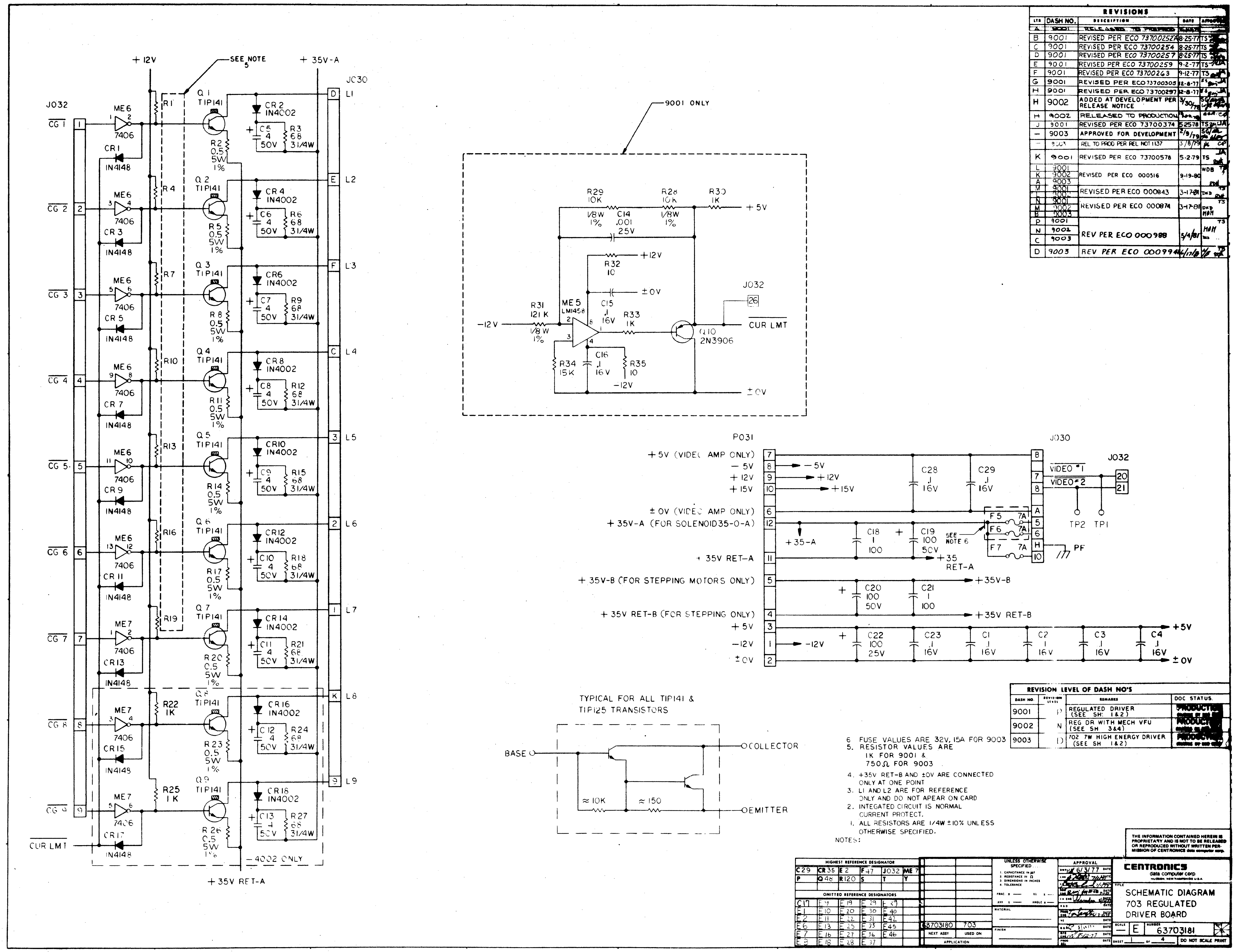


Figure A-3 Schematic Diagram, Power Driver Board (Sheet 1 of 2)

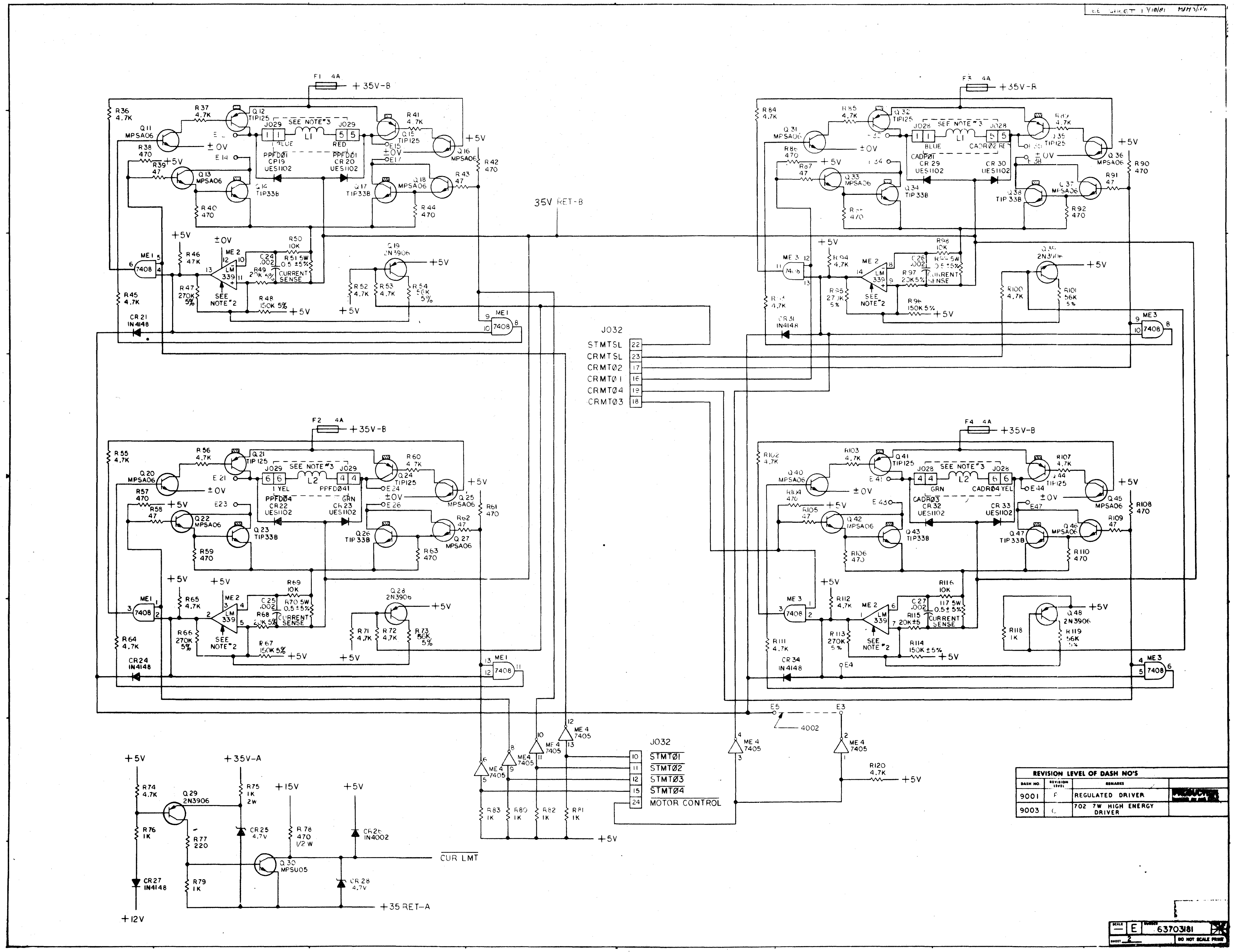


Figure A-4 Schematic Diagram, Power Driver Board (Sheet 2 of 2)

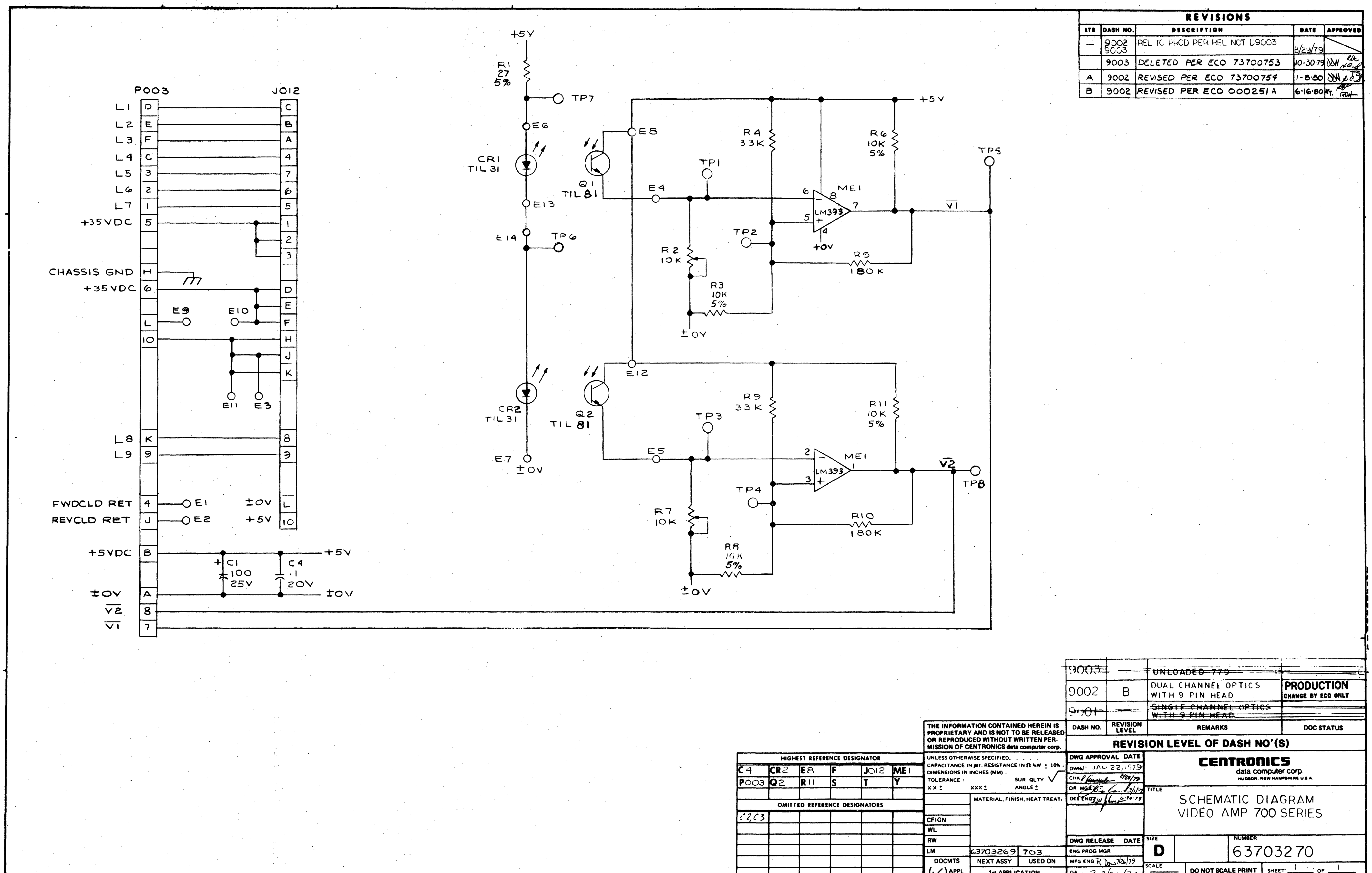


Figure A-5 Schematic Diagram, Video Amplifier Board

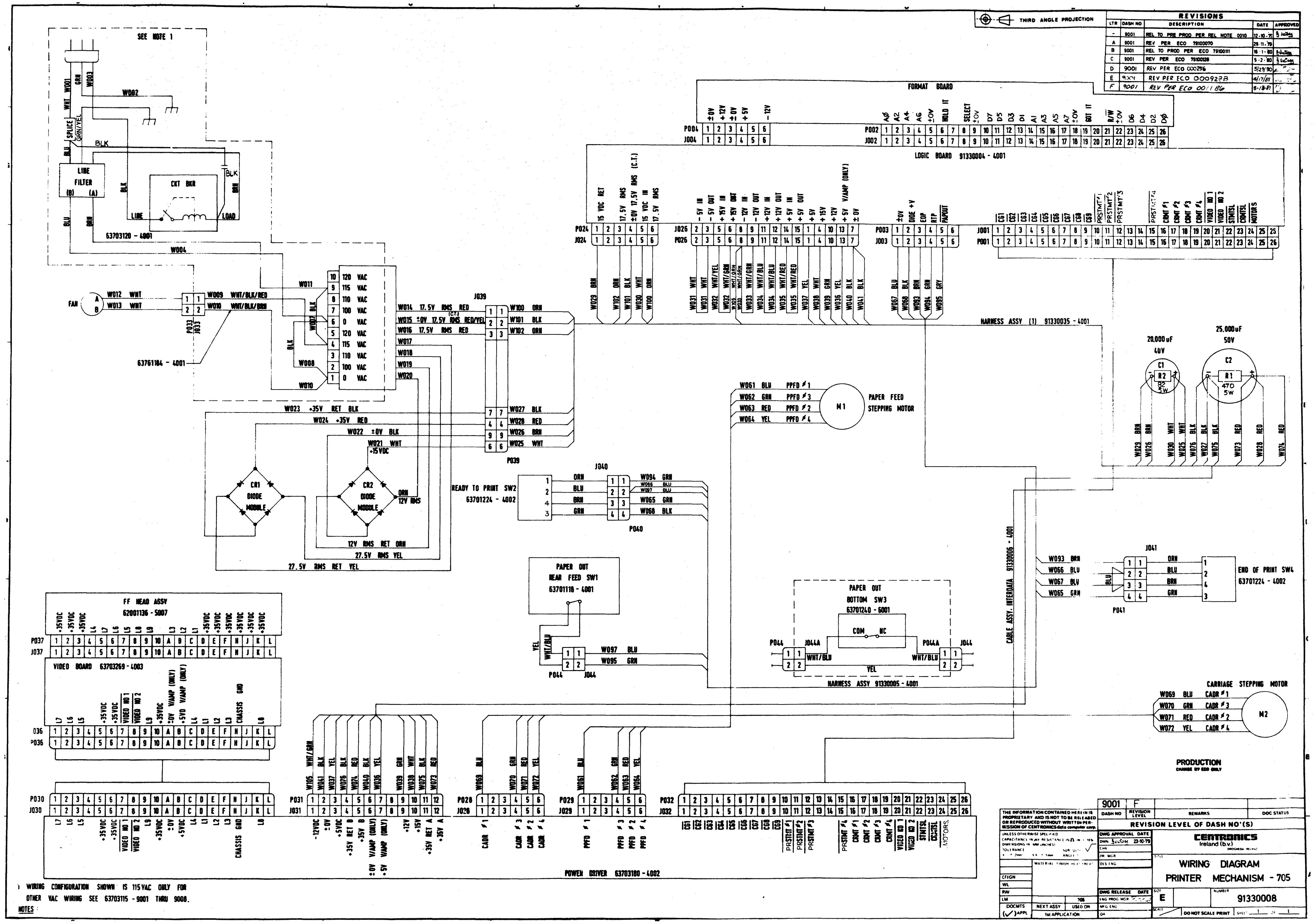


Figure A-6 Wiring Diagram, Printer Mechanism

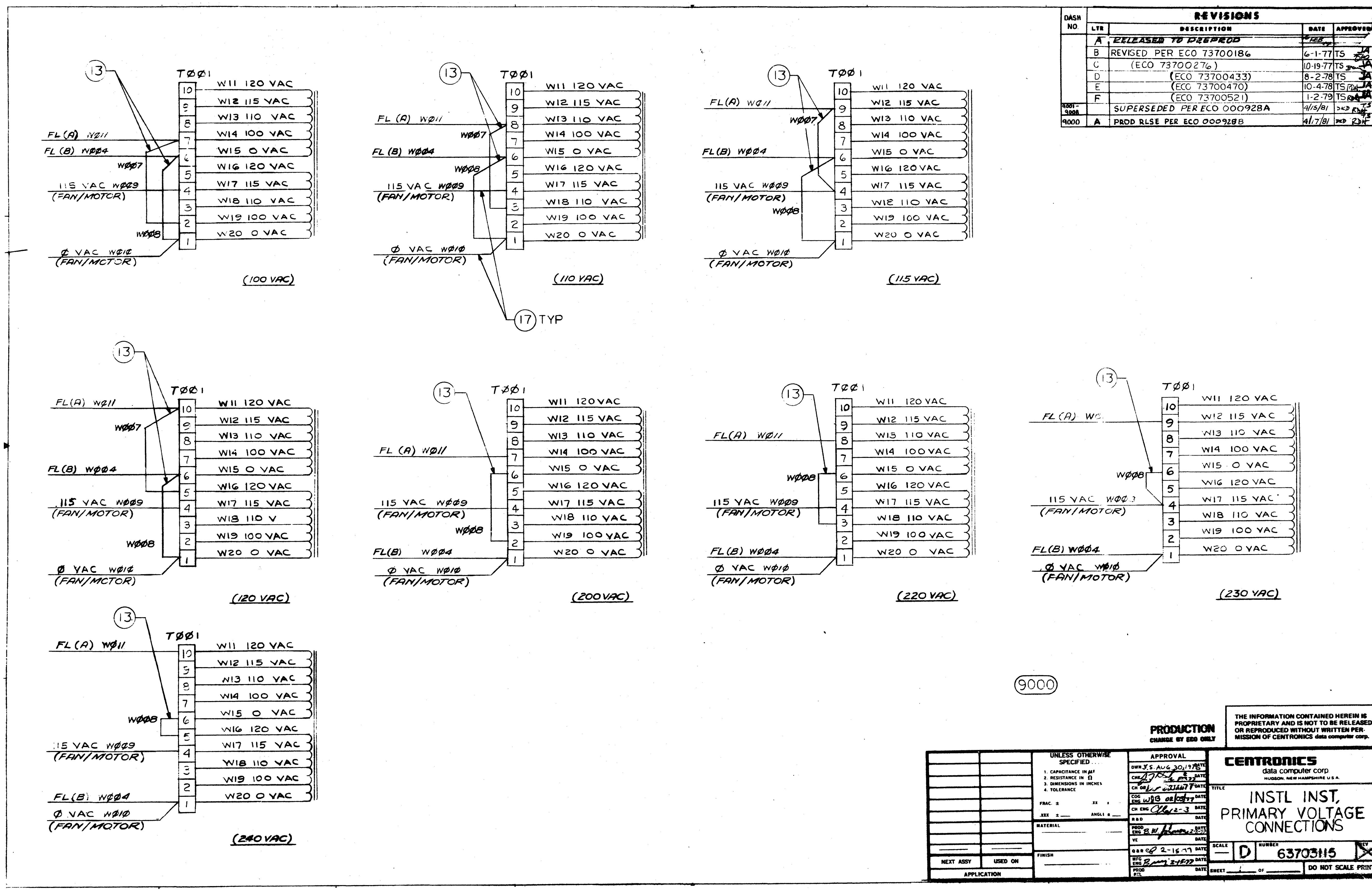


Figure A-7 Wiring Diagram, Primary Voltage Kit

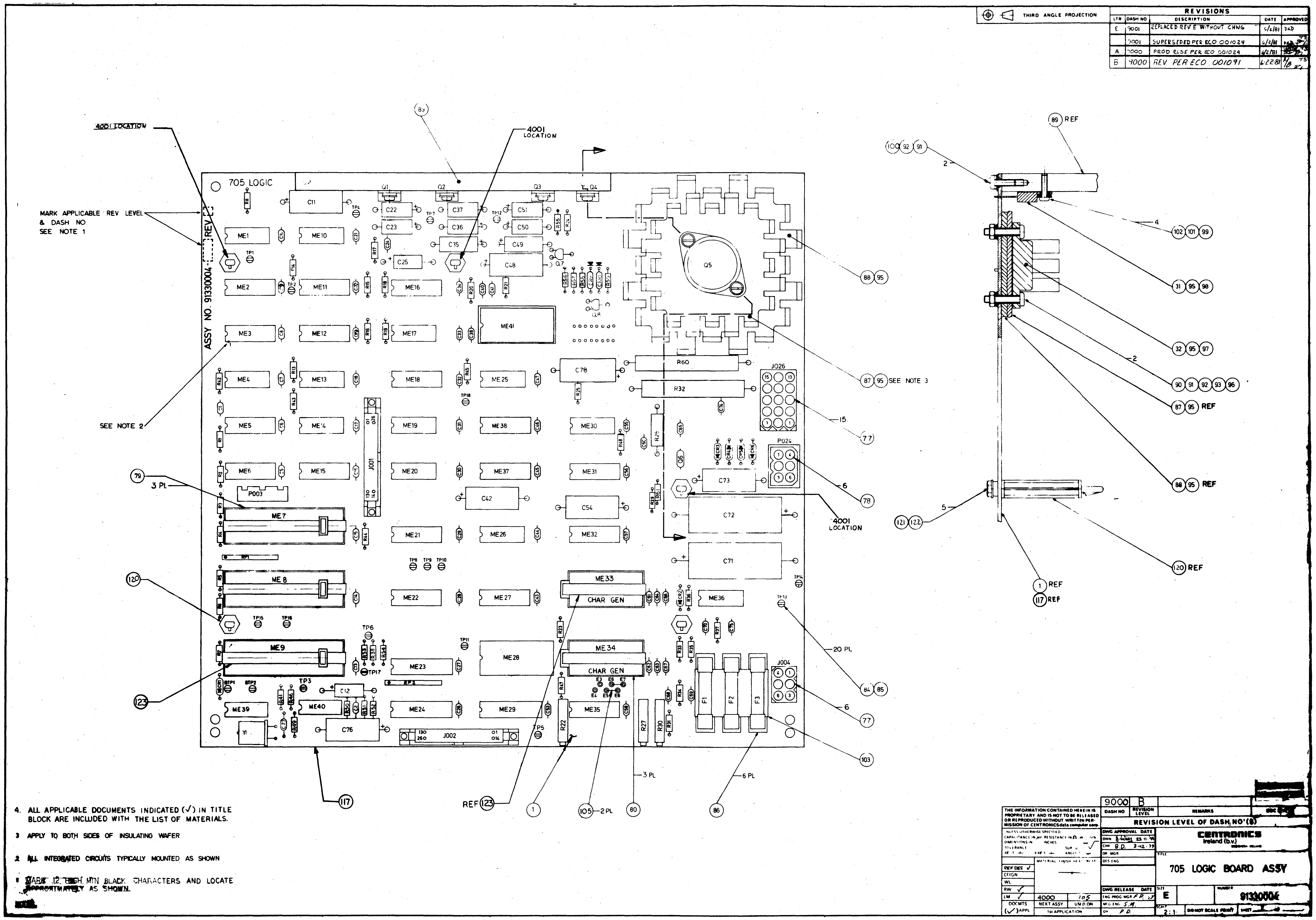


Figure A-8 Assembly Drawing, Model 705 Logic Board (Revision B, -4001)

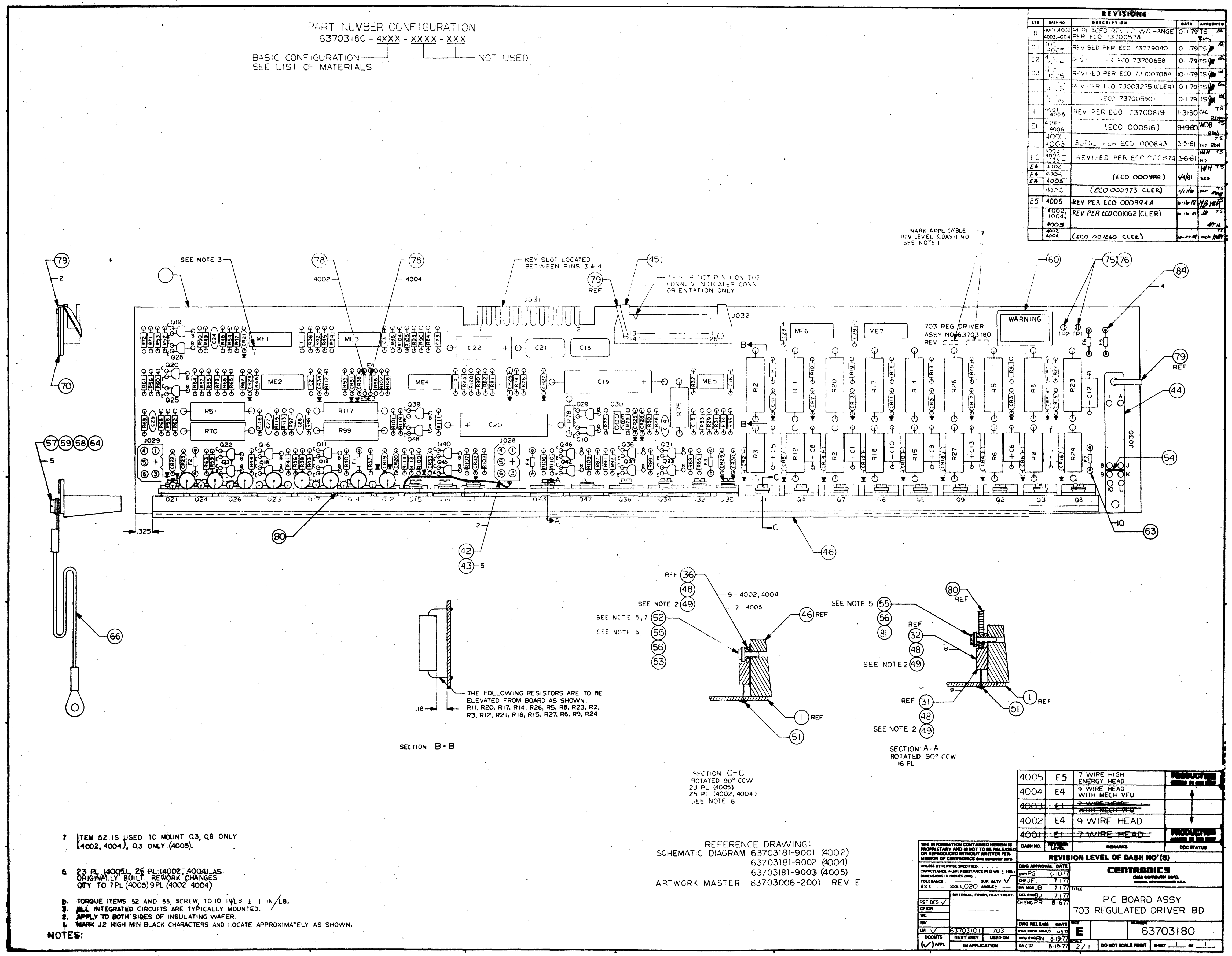


Figure A-9 Assembly Drawing, Power Driver Board (-4002)

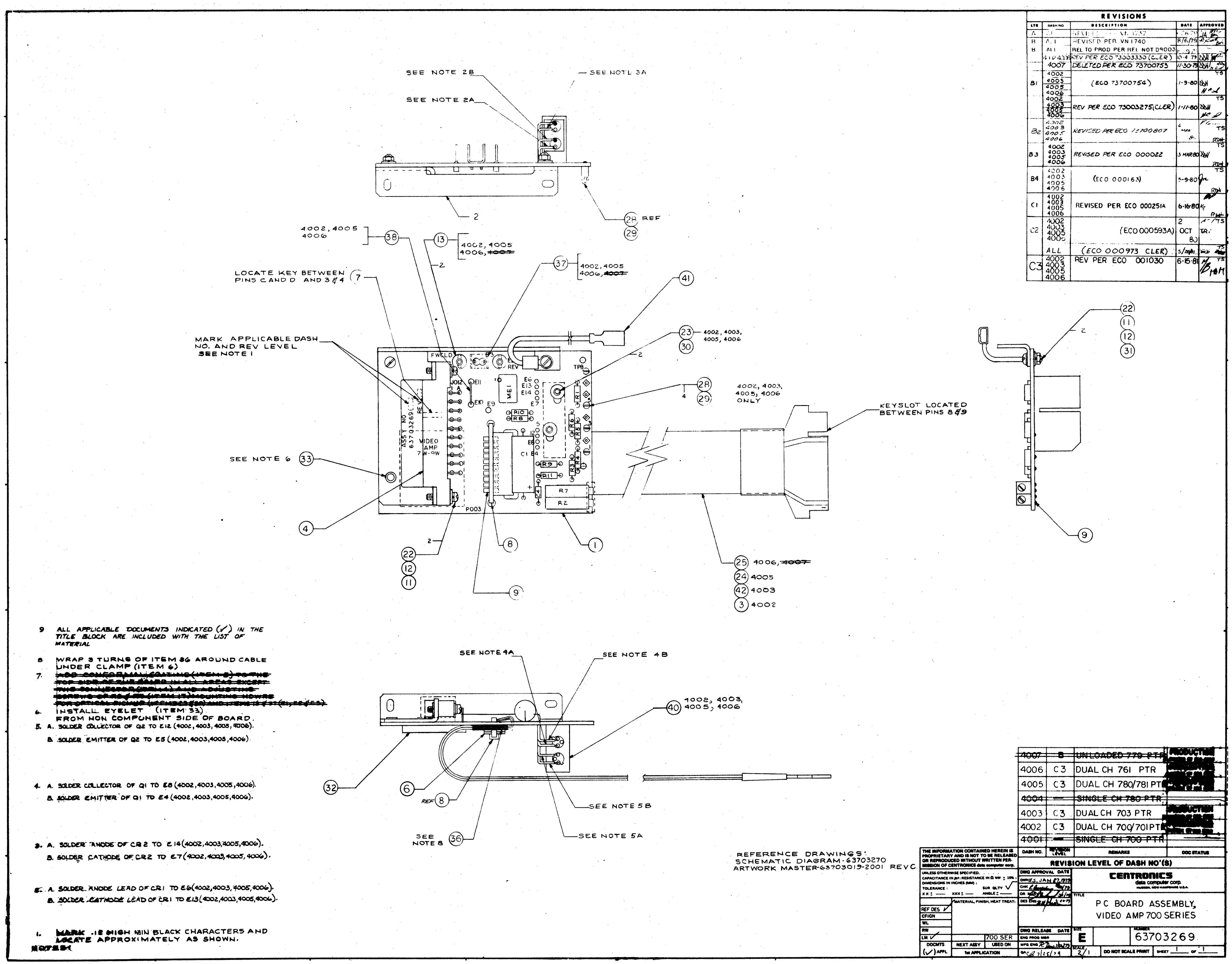


Figure A-10 Assembly Drawing, Video Amplifier Board (-4003)

APPENDIX B
INSTALLATION DRAWINGS FOR 705 CUSTOMER-SUPPLIED CONTROL PANEL AND FORMAT CONTROLLER

This appendix contains two drawings that provide dimensions and mounting locations to aid the customer in the engineering of the Control Panel and Format Controller.

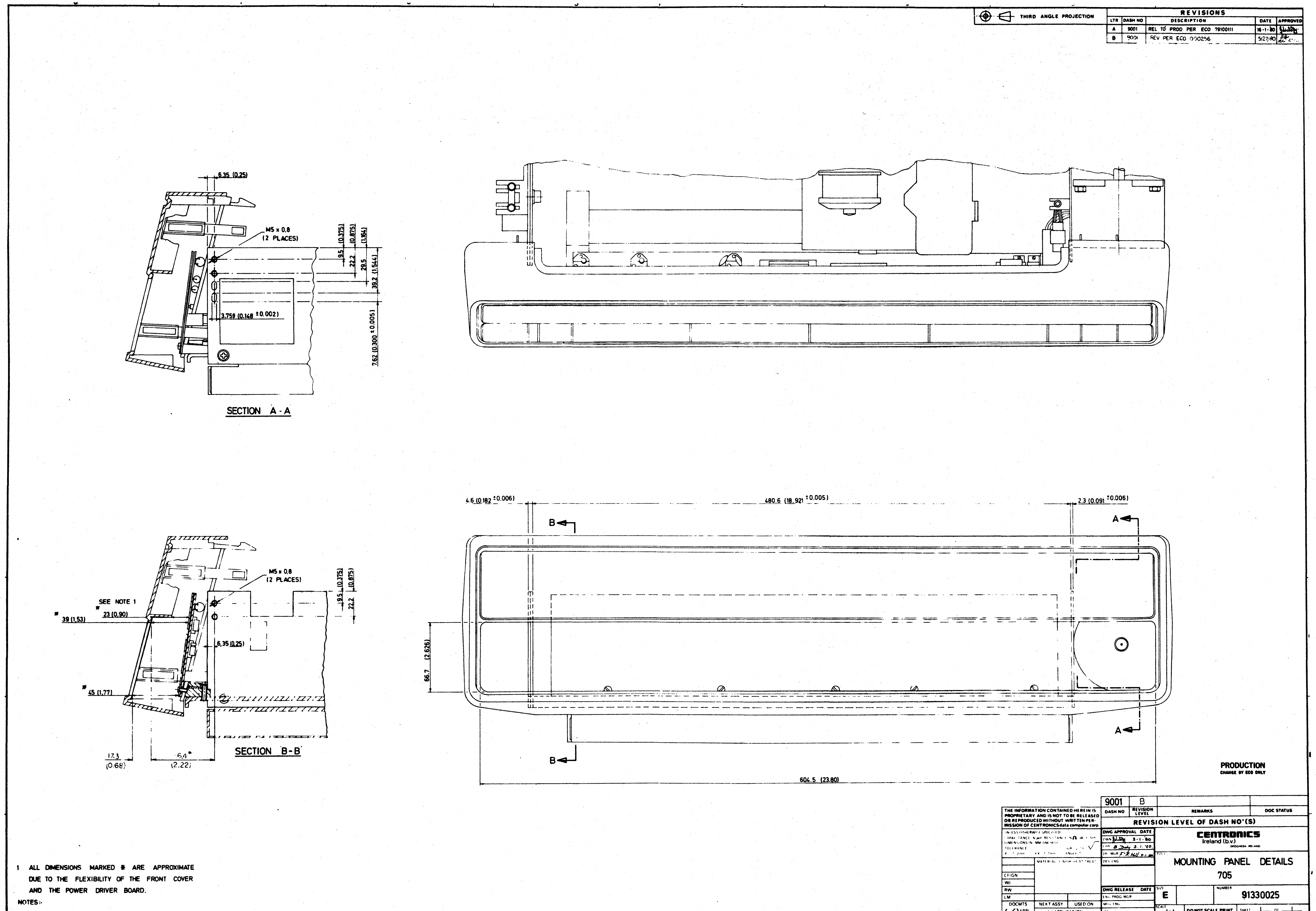


**Figure B-1 Control Panel,
705 Installation Dimensions**

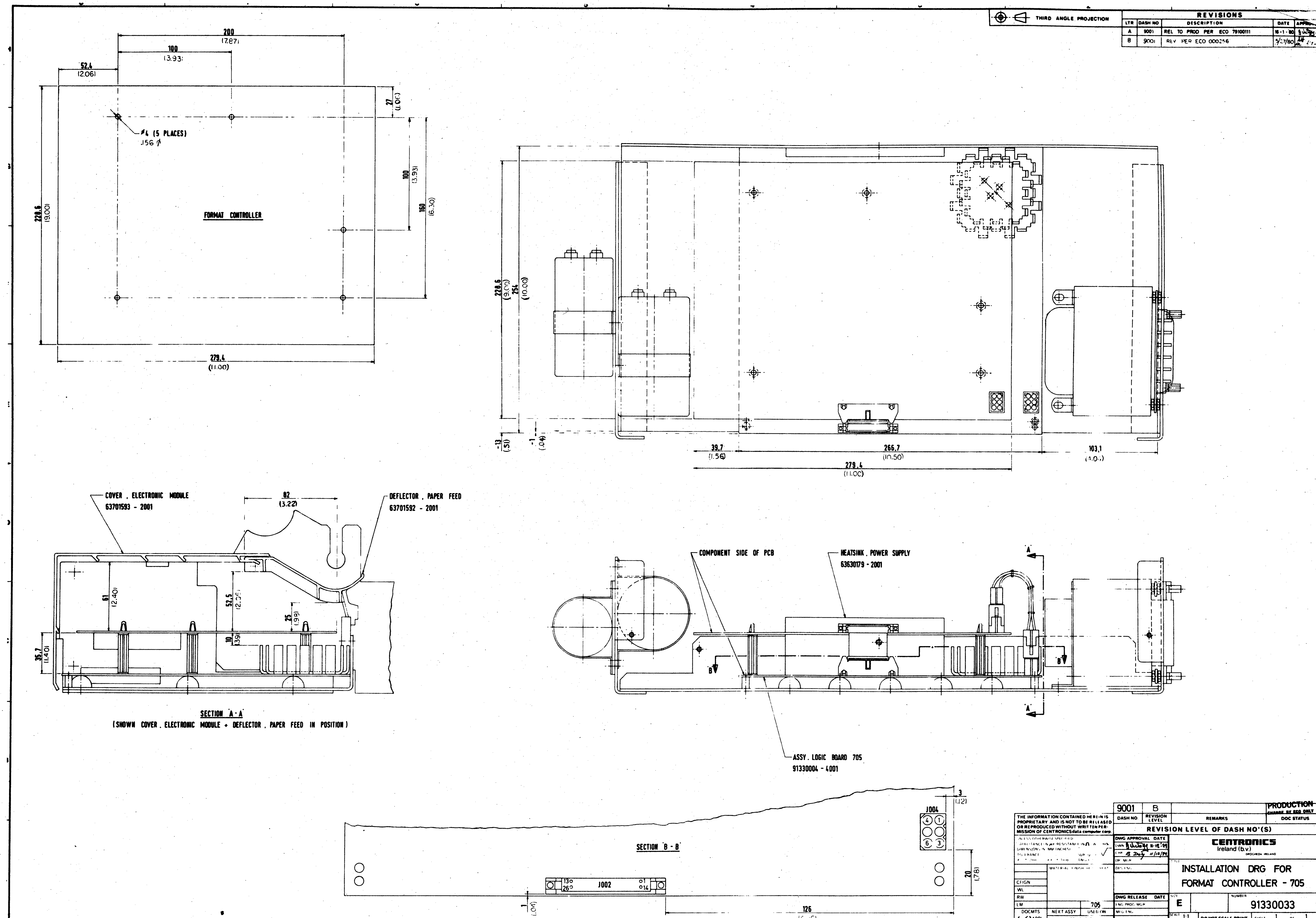


Figure B-2 Format Controller 705 Installation Dimensions

READERS COMMENTS

Publications Title Model 705 Printer Technical Manual

Publications No. 37400745-9001 Revision C Date February 1982

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