95445028 N

CONTROL DATA CORPORATION

CDC®

MATRIX PRINTER EQUIPMENT

CT104A-B-C-D-E

INTRODUCTION
OPERATING INSTRUCTIONS
PRINCIPLES OF OPERATION
INSTALLATION AND CHECKOUT
MAINTENANCE
FAULT ISOLATION
TEST AND ADJUSTMENTS
DIAGRAMS

FIELD SERVICE AND REFERENCE MANUAL

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REVISION RECORD

REVISION	DESCRIPTION
A 4-77	Initial release of the CDC 70/125 LPM Matrix Printer
B 7-77	To incorporate editorial comments.
C 10-77	To incorporate ECO's: PH14771 & PH14836 - Spec set up of VFU Brushes & adjusting procedure.
D 1-1-78	To incorporate ECO's" PH14903-Improve horizontal line to line registration, PH14911-Upper cabinet lock., PH14995-Update spec., PH15001-Replaceable head
D_1 1-8-78	Revised table of contents to reflect new section 10 and added new section 10 to manual.
E 4-78	To Incorporate Review Comments.
F 7-78	To Incorporate ECO's: PH15311-Character Rom, PH15318- Code disk, PH15381-Spec dimensions, PH15413-Needle driver PCB & Fuse harness and PE corrections.
F1 7-17-78	Revised to incorporate print head to platen set-up.
G 10-78	Revised to incorporate ECO's: PH15139-Controller-Head logic, PH15504-Character definition, PH15544-Adj. timing drive pulley, PH15568-Rom Set, PH15570-Needle Drivers, PH15578-Char Prom.
H 1-79	Revised to incorporate ECO's: PH15689-Character definition, PH15690-Character definition, PH15736-Character definition, PH15737-Character definition, PH15738-Character definition.
I 4-79	Revised to incorporate CE comments
J 4-80	Revised to incorporate ECO's: PH16513- Pots P1 & P3 factory adjust only, PH16529-Power cord receptacle.
K 7-80	Revised to incorporate ECO's: PH16589- Assy Adj; Spec Code strip note, PH16684-Cleaning & ADJ Code Strip.
L 10-80	Revised to incorporate-EECO PH17000- Code strip Brkt Adj.
M 1-81	NOT AFFECTED
N 7-81	Incorporate CE correction.

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95445028

PREFACE

This publication contains reference information for maintaining the CDC 70/125 LPM Matrix Printer.

Associated Publications

Parts Identification Manual (Publication No. 95445027)

* RS-232 Buffered and Unbuffered Interface Field Service, Reference and Parts Manual (Publication No. 95445069).

* Special interface used on some printers.

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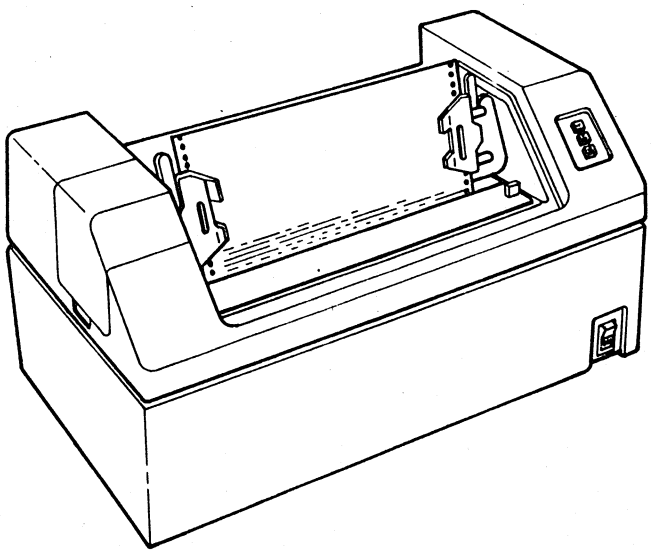


CDC 70/125 LPM MATRIX PRINTER

INTRODUCTION

GENERAL DESCRIPTION

This manual describes the 70 and 125 line per minute versions of the Matrix Printer. The characters printed by these printers are generated using the dot matrix method of character formation. Each character consists of a pattern of dots formed in any of several optional matrix patterns. The standard printer produces characters in a 7X7 matrix pattern. Optional matrix character patterns of 7X9, 9X7, 9X9 and 9X9 overlap are also available.

The characters are printed by a bi-directional print head using 9 vertically spaced print wires which are individually controlled.

Activation of one or more of the solenoid driven print wires forces an inked ribbon against the paper and platen to form either 7 or 9 rows of horizontal dots, depending on the optional matrix pattern being used. The printing mode is bi-directional and the nominal head velocity of the standard units is 18 inches per second in both directions. Optional character patterns and compressed character pitches require that the head velocity be reduced to correlate with the operating frequency of the print head solenoids. The print head transport and paper motion systems are each driven by a separate dc servo motor. The printer has a cassette type ribbon system. These printers have an internal micro-processor common controller which interfaces to the trunk and controls the operation of the printer. The printer drive and controller electronics is of discrete component and integrated circuit design and is controlled by an 8080 micro processor common controller.

70 LINE PER MINUTE PRINTER

This printer is a single head bi-directional printer having a print rate of 70 lines per minute (50/60 Hz) while printing a full line of 132 (7X7 pattern) characters and a maximum short line print rate of 200 lines per minute (33 contiguous columns, 7X7 pattern). The standard character pitch is 10 characters per inch with an optional compressed pitch of 16.5 characters per inch (not available for 9X9 over lap pattern).

Vertical line spacing is 6 lines per inch standard, with an operator selectable option of 6/8 lines per inch. The paper slew speed is 7.5 inches per second. The printer has position seeking capability for increased through put. The printer also has capability for optional operation in an interactive key board mode.

125 LINE PER MINUTE PRINTER

This printer is a two head bi-directional printer having a print rate of 125 lines per minute (50/60 Hz) when printing the 7X7 character pattern. The standard character pitch is 10 characters per inch and the maximum number of characters per line is 132.

Vertical line spacing is 6 lines per inch standard with an operator selectable option of 6/8 lines per inch. The paper slew speed is 7.5 inches per second.

DIMENSIONS-NOMINAL OUTSIDE

Height: 13.50 inches (344 mm)
Length: 28.75 inches (730 mm)
Depth: 17.30 inches (439 mm)

WEIGHT

The weight of the 70 line per minute printer is approximately 98 pounds (44.5 kg). The weight of the 125 line per minute printer is approximately 100 pounds (45.5 kg).

CABINET DESIGN

The standard printer is designed as a table-top unit having four rubber feet. An optional bolt on printer stand (pedestal) is also available.

The cabinet is cooled with a forced air cooling system. The air enters the printer cabinet through a rectangular opening on the left side of the base and is then fan driven and directed through the printed circuit card rack and exhausted through an opening on the right rear of the cabinet. The interface connector is located on the left rear of the cabinet and the power cord is located on the right rear of the cabinet. The cabinet is designed such that neither the interface cord or the line cord need be disconnected when removing the cover or cabinet parts for access or servicing.

PRINTER ACCESS (FIGURE 1-1)

The interior printer area can be accessed by removing the front cover, side cover, upper cabinet cover and lower cabinet skirt. The upper cabinet cover and lower cabinet skirt should only be removed by trained service personnel.

Front Cover (Figure 1-1)

Removal of the front cover permits access for chang-

ing ribbon cassettes and forms loading. To remove the front cover, grasp the two lifting tabs on either side of the cover and lift the cover up and off the upper cabinet.

When installing the front cover the beveled edge must be toward the rear of the machine facing downward. To install the cover reverse the removal procedure. Care should be taken that the four corner guides are engaged properly into the upper cabinet before seating the front cover.

Side Cover (Figure 1-1)

Removal of the side cover permits access to the format reader, format tape, 6/8 line per inch switch, compressed pitch switch and the load vertical format switch. To remove the side cover place your finger tips in the depression in the left side of the upper cabinet and under the bottom edge of the side cover and slide the side cover upward and off the upper cabinet.

To install, reverse the removal procedure.

Upper Cabinet Cover (Figure 1-1)

WARNING

THIS COVER SHOULD ONLY BE UNLOCKED OR REMOVED BY A TRAINED FIELD SERVICE REPAIRMAN DURING SERVICING AND SHOULD NEVER BE UNLOCKED OR REMOVED BY THE OPERATOR (USING CUSTOMER OR CUSTOMER OWNER). THE FIELD SERVICE REPAIRMAN SHALL ASSURE THAT THIS COVER IS REPLACED AND LOCKED IN PLACE WITH THE LOCKING SCREWS AFTER SERVICING.

Removal of the upper cabinet cover permits access to the control panel wiring, format reader, paper drive servo motor and access for removal of the print head. To remove cover, turn the two locking screws (Figure 1-1) in until they clear the plastic cover and bottom out against the right and left format plates. Remove the upper knob on the right side of cover by pulling it off its shaft and lift cabinet cover off the lower cabinet skirt.

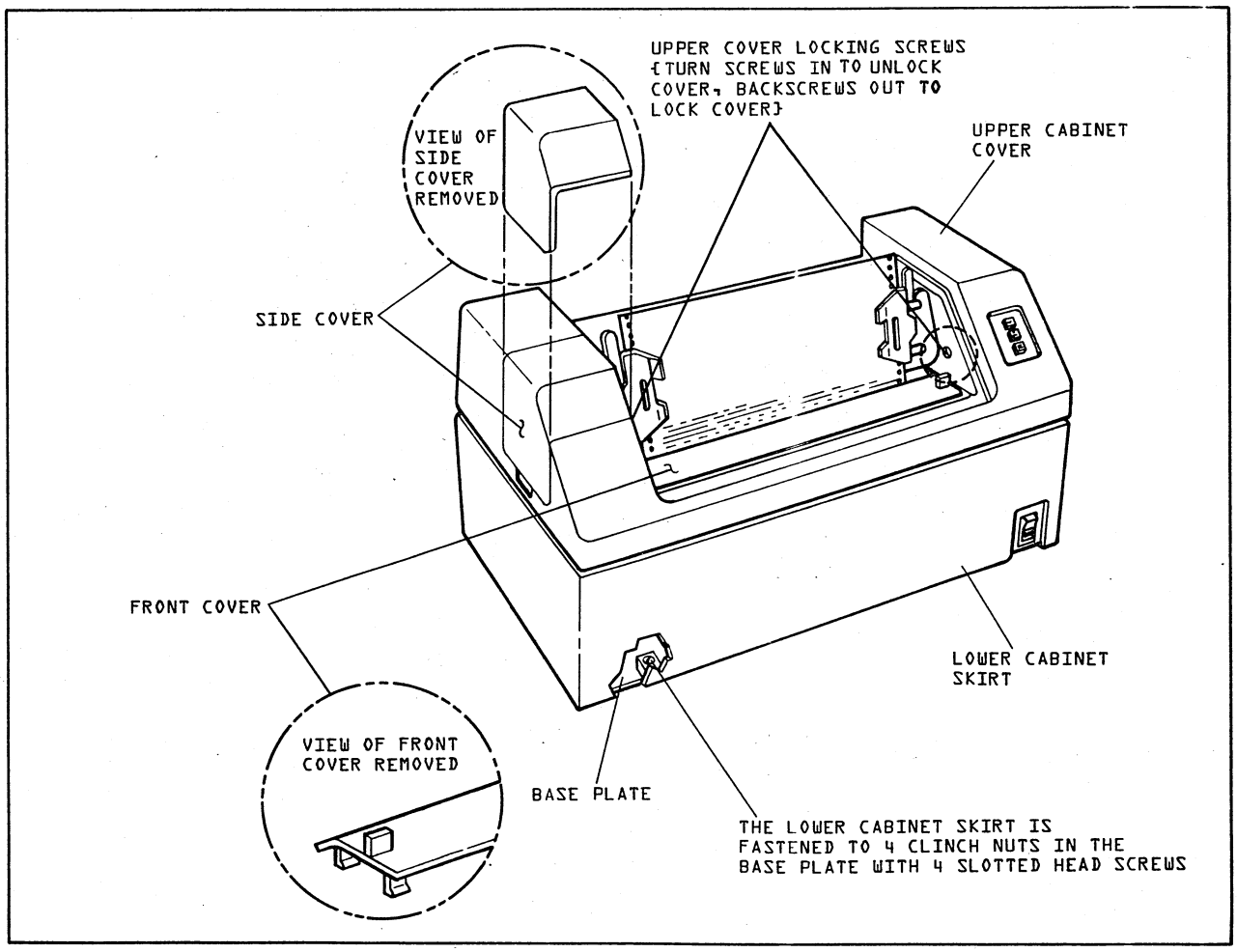


FIGURE 1-1. PRINTER ACCESS

To install, reverse the removal procedure and back locking screws out to the lock nut stops.

Lower Cabinet Skirt (Figure 1-1)

Removal of the lower cabinet skirt permits full access to all inner printer areas and must be removed to access or probe most of the printed circuit cards.

The lower cabinet skirt may not be removed without first removing the upper cabinet cover.

The lower cabinet skirt is fastened to clinch nuts in the base plate with 4 slotted head screws. Loosening of these 4 screws permits the lower cabinet skirt to be lifted up and off the base plate.

To install reverse the removal procedure.

POWER REQUIREMENTS

The printer is capable of operating within the following limits when supplied with two wires plus earth ground.

Frequency

50 Hz or 60 Hz (Single Phase)

Frequency Ranges

50 Hz = 49.0 to 50.5 Hz
60 Hz = 59.0 to 60.6 Hz

Voltage

Voltage ranges are tap selectable by changing field accessible input power terminal block connections. No component changes are required when changing from 60 Hz to 50 Hz operation. The tap selectable ranges are as follows:

Nominal (VAC)	Voltage Range
100	90 to 107
120	104 to 127
200	180 to 213
220	198 to 235
230	207 to 246
240	216 to 257
260	234 to 278

Current

125 Line Per Minute Printers:

Amps	Vac	Hz
Less than 1.75	220	50
Less than 3.2	120	60

70 Line Per Minute Printers:

Amp	Vac	Hz
Less than 1.53	220	50
Less than 2.8	120	60

Input Power

Lines Per Minute Printer	Volt Amps Maximum
125	384
70	336

Input Power Protection

A dual purpose double pole circuit breaker and illuminated on/off switch located in the front right corner of the printer cabinet provides input power protection and is rated as follows:

Full Load = 7.5 amps r.m.s.
Trip = 9.38 amps r.m.s.

Power Cord

The standard printer is wired for 120 vac and is provided with a 3 wire power cord of which approximately 7.5 ft. (2.3 meters) is external to the printer. The cord is terminated with a non-locking, 3 prong plug for use with 60 Hz outlets.

ENVIRONMENTAL AND SAFETY REQUIREMENTS

This printer is designed to meet the following operating requirements for electronic data processing equipment

Temperature Range - Dry Bulb

$10^{o}C$ to $40^{o}C$ ($50^{o}F$ to 105 F)

Temperature Change

$10^{o}C$ ($18^{o}F$) per hour max.

Relative Humidity Range

20-80%

Humidity Change

10% per hour-max.

Barometric Pressure

$10.5X10^{4}$ N/m^{2} to $6.9X10^{4}N/m^{2}$
(Maximum equivalent altitude 9850 feet - 3000 meters)

Operating Vibration

Continuous vibration over the following frequency ranges:

5-17 Hz = .02g or .004 inch (0.1 mm) double amplitude (whichever is smaller)
17-300 Hz = .2g or .0015 inch (0.038 mm) double amplitude (whichever is smaller)

Operating Shock

Intermittent shocks of up to 3g, not exceeding 10 millisecond duration. (The time between consecutive shocks shall be less than 5 seconds.

Acoustic Noise

Operating: 7.8 bels, max.
Idle: 7.0 bels, max.

Safety Requirements

These printers are U/L listed and CSA certified. These printers are also designed to meet non-domestic VDE and IEC safety requirements.

FORMS PATH

The forms supply for the standard table top unit must be placed directly behind the printer and at the same level as the printer. The forms are inserted under the tension weights and into the rear paper slide. The forms are then routed between the platen and print head. Above the platen they are engaged by the forms tractors which pull the form from the stack across the print station and then push the forms to the rear of the printer where the paper is stacked.

Front forms feed is also available as a special option and is normally used with units that are pedestal mounted. On front feed units the forms supply is placed under and to the front of the printer. The forms are slid up through an opening in the base plate, up a paper chute and between the platen and print head. Above the platen the forms are engaged by the forms tractors which pull the forms past the print station and then push the forms to the rear of the printer for stacking. An optional paper basket is also available. The paper basket attaches to the rear of the printer and catches the forms as they are pushed from the forms tractors.

PRINTER SUBSYSTEMS

All the printer subsystems are contained within a noise suppressing acoustical cabinet. The subsystems contain all the electrical and mechanical components necessary for the printer to operate as a free standing unit. There are eight major subsystems. These subsystems are discussed in the following order:

1. Power Distribution
2. Cooling System
3. Print System
4. Ribbon System
5. Paper Motion System
6. Logic Chassis
7. Control Panel
8. Interface

Power Distribution

Power distribution is split into two subsystems; ac distribution and dc distribution. The ac power enters the printer through a three conductor line cord which is connected to the line filter. The ac input voltage is then filtered through this filter and enters a dual purpose double pole circuit breaker and illuminated On/Off switch. When this On/Off circuit breaker switch is depressed to the on position, input voltage is supplied to the cooling system blower fan and to the primary of the power transformer.

The input to the transformer is stepped down to four ac output voltages. The four voltage outputs are: 30 vac, 55 vac and two separate 16 vac. The four ac output voltages then enter the power supply board where they are converted into dc voltages. The dc distribution is initiated on the power supply board. The power supply developes six dc voltages; +36 vdc, -36 vdc, +5 vdc, -5 vdc, +12 vdc and -12 vdc. The +36 vdc and the -36 vdc are used to supply power to the vertical (paper motion) and horizontal (print head transport) servo linear power amplifiers, which in turn supply power to drive the print head transport and and paper motion servo motors. The +36 vdc also provides power to the needle driver coils.

The +12 vdc and -12 vdc are used to power the servo linear control circuits.

The +5 vdc and -5 vdc are used to power the controller circuits. The +5 vdc also supplies power to the servo digital control circuits.

Cooling System

The inner cabinet is cooled with a forced air cooling system which is composed of a single ac muffin type fan. The air enters the printer cabinet through a rectangular opening on the left side of the printer base plate, is then fan driven and directed through the printed circuit card rack and exausted through an opening on the right rear of the cabinet.

An additional fan is required on units with the "Bottom Forms Feed Option" installed. This fan is located in the front left corner of the printer base plate and directs air across the Needle Driver Board Assembly.

Print System

Print Head (Figure 1-2). The print head contains the print wires and solenoids necessary to perform a print operation. The print head has nine steel print wires (sometimes refered to as print needles) that are guided through molded plastic guides. Each of these nine print wires is actuated by a solenoid driven armature. When a solenoid is actuated by the driver circuit, it propels its print wire toward the platen. The print wire impacts the ribbon, driving it against the form and platen, leaving a dot impression on the form. As the print head moves horizontally across the print station, the solenoids activate the print wires, creating a series of dot patterns within a programmed matrix. The pattern of these dots in the matrix forms the character. Two types of print heads are available, the standard nine wire head and the optional nine wire overlapping head. The standard nine wire print head has the wires arranged in a single vertical column The optional nine wire overlapping print head is identical to the standard 9 wire head with the exception that it has its print wires arranged in two vertical columns that allow the printed dots to overlap in the vertical direction. This is accomplished by the print head having two vertical rows of wires in a staggered 5-4 pattern that are located on an integral number of half dot positions apart. The controller is then programmed to delay information to one column of wires so that they will print in the same physical location as the other column of wires, thus producing an overlapped row of nine dots. Both the nine wire and the nine wire overlapping print heads are spared as assemblies only and are not intended to be reworked or repaired when rendered inoperable due to failure or end of life. The single print head used on 70 LPM printers is operator replaceable, with the exception of some early models. The two print heads required on the 125 LPM printer are not operator replaceable, since they require some head to head adjustment when being replaced.

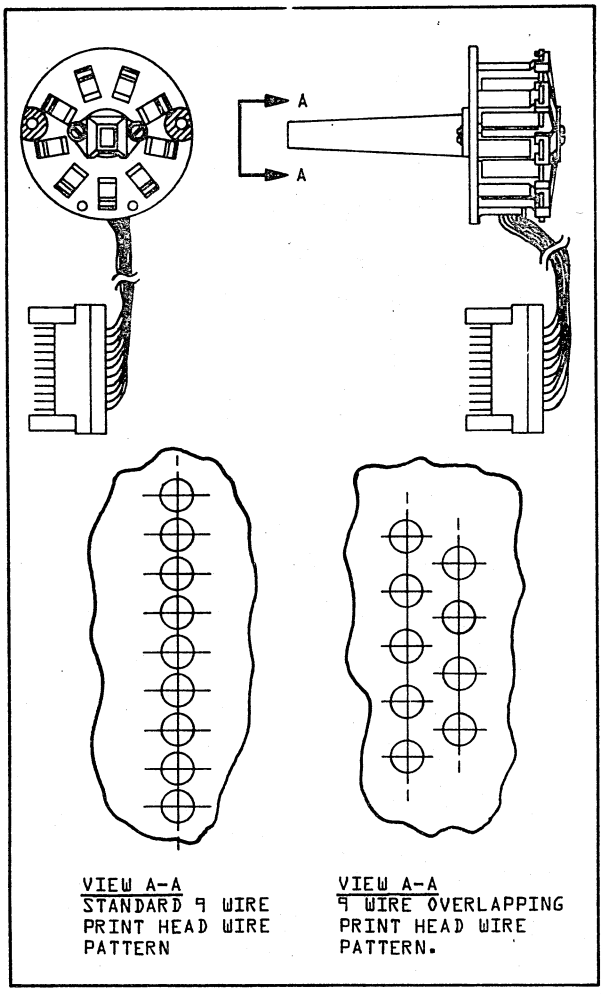


FIGURE 1-2. PRINT HEAD

Print Head Drive (Figure 1-3). The print head is attached to a print head support assembly that is belt driven horizontally back and forth along two print head support shafts by a dc servo motor.

Servo motor control circuits monitor and maintain the speed and control the direction of the print head by pulsing the voltage or reversing the current to the dc servo drive motor.

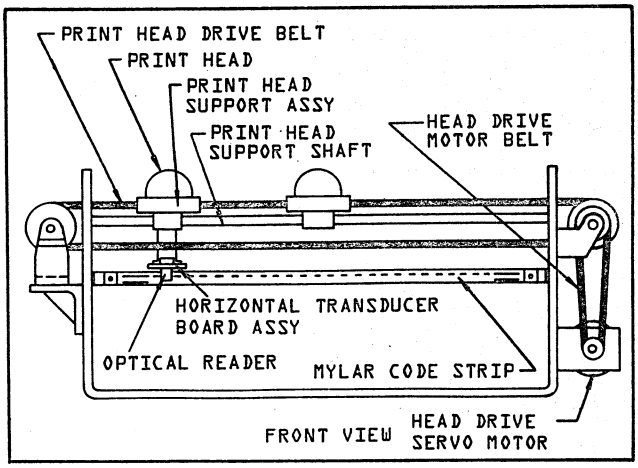


FIGURE 1-3. PRINT HEAD DRIVE AND MONITORING

Print Head Monitoring (Figure 1-3). The position of the print head is monitored by an optical reader mounted to the print head support assembly. As the print head moves horizontally back and forth the optical reader monitors a fixed mylar code strip. The code strip contains windows that when monitored indicate the 132 character positions as well as the left and right home position of the print head.

The 125 lpm printer with two heads uses a two channel optical reader and a code strip with two rows of horizontal windows. The first row of windows indicate the 132 character positions and the second row has two windows that indicate the left and right home positions.

The 70 lpm printer with one head uses a four channel optical reader and a code strip with 4 rows of windows. The first two rows of windows indicate the 132 character positions and the left and right home positions when printing in the standard 10 characters per inch mode. The bottom two rows of windows indicate the 132 character positions when printing in the optional (compressed pitch) 16.5 characters per inch mode. When printing in the compressed pitch mode, the long windows on all four rows are used to indicate the left and right home position of the print head.

In both the 10 and 16.5 characters per inch modes it should be noted that the odd character position windows are in one row and the even character position windows are in the adjacent row. The staggering of these windows is done to help keep track of the heads position seeking functions.

Ribbon System (Figure 1-4). The ribbon system consists of a disposable ribbon cassette that snaps over the print head and engages a cassette drive shaft on the print head support assembly. The cassette drive shaft is pulley and cord driven by two stationary cassette drive cords. Each of the drive cords drives one of the two cassette drive pulleys attached to the bottom of the print head support and pulley assembly. Each of these pulleys has a built in one-way clutch.

As the print head moves horizontally to the right, the upper drive pulley clutch engages the drive shaft and turns it counter clockwise, while the lower drive pulley clutch disengages. When the print head moves to the left the lower drive pulley clutch engages the drive shaft and turns it counter clockwise, while the upper drive pulley clutch disengages. As the cassette drive shaft turns counter clockwise the ribbon is in constant motion, from left to right across the print station.

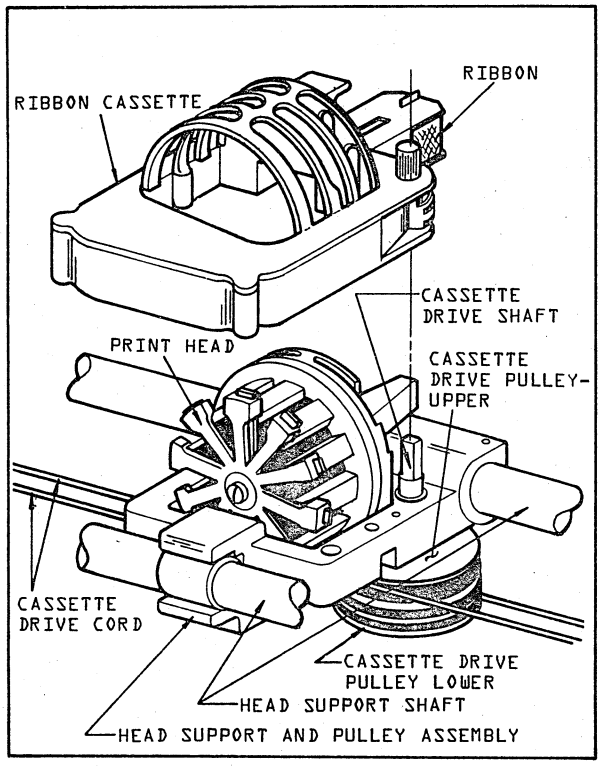


FIGURE 1-4. RIBBON SYSTEM

Each ribbon cassette contains an endless loop of nylon ribbon that is cycled through the cassette in one direction until the end of ribbon life is reached and a new ribbon cassette is installed. The ribbon system for the 125 L.P.M. printer is the same as the 70 L.P.M. printer except that it has to drive a ribbon cassette for each of its two heads. This is accomplished by each head having a separate ribbon drive system. The upper cassette drive pulleys on each support and pulley assembly are driven by one cassette drive cord and the two lower cassette drive pulleys are driven by the other drive cord.

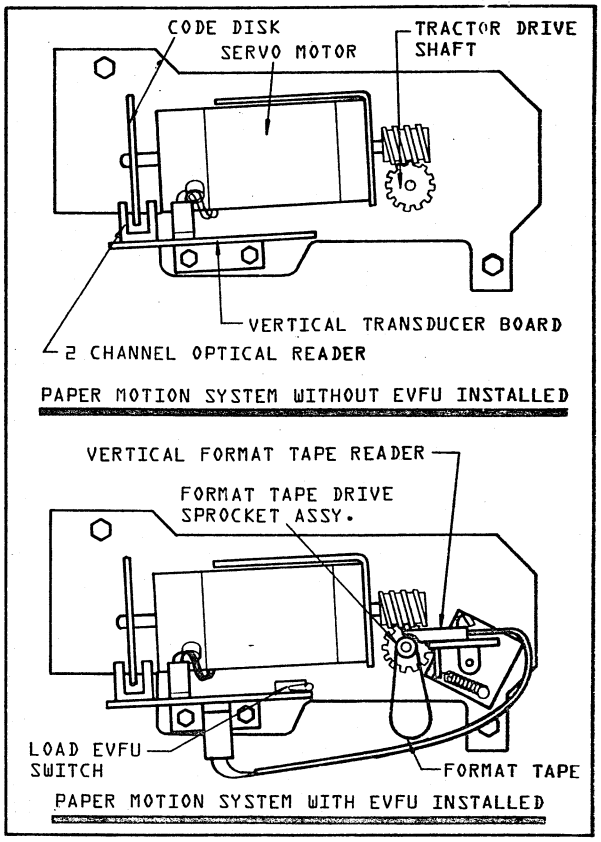


FIGURE 1-5. PAPER MOTION SYSTEMS

Paper Motion System (Figure 1-5).

The paper motion system can be activated by a manual control panel forms feed switch or by an electrical command from the controller.

The vertical forms advance is driven by a dc servo motor, while the distance the forms travel is controlled by a code disk and optical reader. The standard 70 and 125 L.P.M. printers are provided with 6 line per inch spacing. An optional operator selectable 6/8 line per inch option is also available.

When a paper motion pulse is received, forward drive current is applied to the servo motor. The servo motor gear drives the tractor drive shaft. The tractor drive shaft drives the tractor sprockets, which engage the forms, causing paper motion. Servo motor control circuits monitor and maintain the speed of the servo motor by controlling the amount of forward drive current applied to the motor. To stop the motor a reverse drive current is applied to the servo motor. Once the servo motor is stopped a one way bearing on the tractor drive shaft prevents reverse rotation of the drive shaft.

The distance the forms travel is measured by a code disk mounted on the servo motor drive shaft. The code disk, in conjunction with a two channel optical reader generates the pulses used to generate the stop the paper (STP) pulse. The standard code disk generates both

6 and 8 line per inch pulses which are read by the 2 channel optical reader and sent to the controller. On standard printers the controller only accepts the 6 line per inch pulses. On printers with the 6/8 line per inch option installed, the controller will only accept the pulses of the line per inch mode selected.

The standard controller will respond to the four ASCII control codes: Line Feed (LF), Form Feed (FF), Vertical Tab (VT), and Carrage Return (CR). The standard paper motion system without the EVFU (Electronic Vertical Format Unit) Option installed will not respond to two of the ASCII codes - Forms Feed (FF) and Vertical Tab (VT) and converts them into Line Feeds (LF) whenever they are detected at the interface.

EVFU (Electronic Vertical Format Unit) may be installed as an option to the standard paper motion system. The EVFU consists of a format brush reader and a load EVFU switch.

The primary function of the EVFU is to read a punched format tape and load it into a controller memory where it is combined with code disk pulses to determine the line spacing.

When the EVFU paper tape is loaded in the reader and the load switch (mounted on the Vertical Transducer Printed Circuit Card Assembly) is actuated, the tape will pass through the reader until two successive form feeds (channel 1 top of form) are sensed, then, the tape is automatically re-read to check the loaded data. The tape will stop when a successful load and check has occurred. The tape may then be removed.

The maximum length of the format tape loaded into EVFU may not exceed 176 lines. The format tape must be reloaded whenever the 6/8 line per inch mode is changed.

The Paper Runaway Option is required in the printer whenever the EVFU option is added, and prevents a runaway condition from occurring while loading the EVFU data. No controller hardware or software changes are required to use the EVFU option.

A manual vertical forms positioning lever and knob are also provided in the paper feed assembly. The clutch retractor lever when pressed, disengages the clutch on the tractor shaft and the forms can then be moved up or down as required by turning the tractor shaft knob.

An additional real time, vertical format tape brush reader unit is also available as a special option.

Logic Chassis and Printed Circuit Cards

The logic chassis is located at the rear of the printer and houses all the printed circuit boards with the exception of the Needle Driver Board Assembly, Vertical Transducer Board Assembly, Horizontal Transducer Board Assembly and Control Panel Board Assembly. All the boards in the logic chassis are hinged at the bottom and swing down for easy access. The following is a list of the logic chassis circuit boards and their locations in the logic chassis.

1PC1 Power Supply Board Assembly.
1PC2 Controller And Head Logic Board Assembly.
1A03 Interface (Any one of several interface boards may be installed in card location 1A03. This manual does not describe these interface boards. For information pertaining to the interface board installed, refer to the appropriate interface manual). Interface card location 1A03 may also be subdivided into positions 1A04 and 1A05 with the installation of a 7 X 10 inch (177.8 X 254 mm) interface adapter option. Interface adapter option kits are available to accept all previously designed 7 X 10 inch Matrix Printer interface boards

The Needle Driver Board Assembly (2PC1) is located in the front of the printer, just above the base plate. The Needle Driver Board may be moved forward out of its guides for service or removal. The Vertical Transducer Board Assembly (5PC1) is located on the left side of the printer and is mounted just below the vertical dc servo motor (Figure 1-5). The Horizontal Transducer Board Assembly (2PC2) is mounted to the print head support assy and is located in the front of the printer just under the print head (Figure 1-3).

The Control Panel Board Assembly (4PC1) is located in the upper front right hand corner of the printer and is mounted to the bottom of the control panel.

Control Panel (Figure 1-6)

The control panel is located in the upper right front corner of the printer.

The standard printer control panel contains a Stop/Start Switch/Indicator and a Forms Feed Switch. Four additional switch locations are available for optional control panel configurations. Two of these optional locations are reserved for the Test Print Switch Option and the Line Feed Switch Option, while the other two switch locations are not defined and may be used for any number of special options.

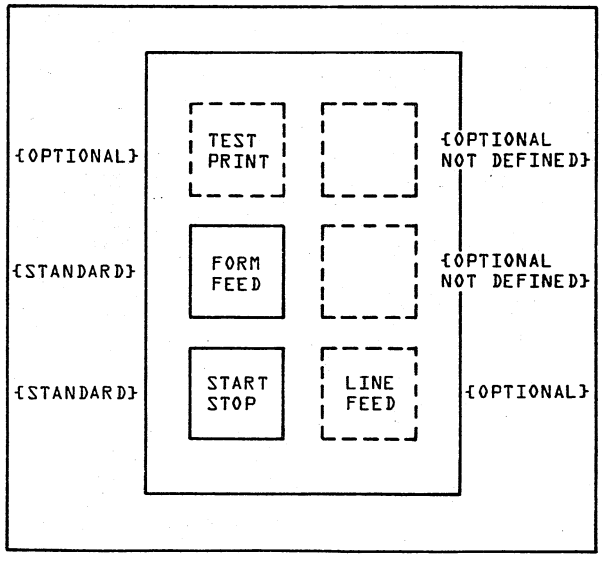


FIGURE 1-6. CONTROL PANEL SWITCH LOCATING

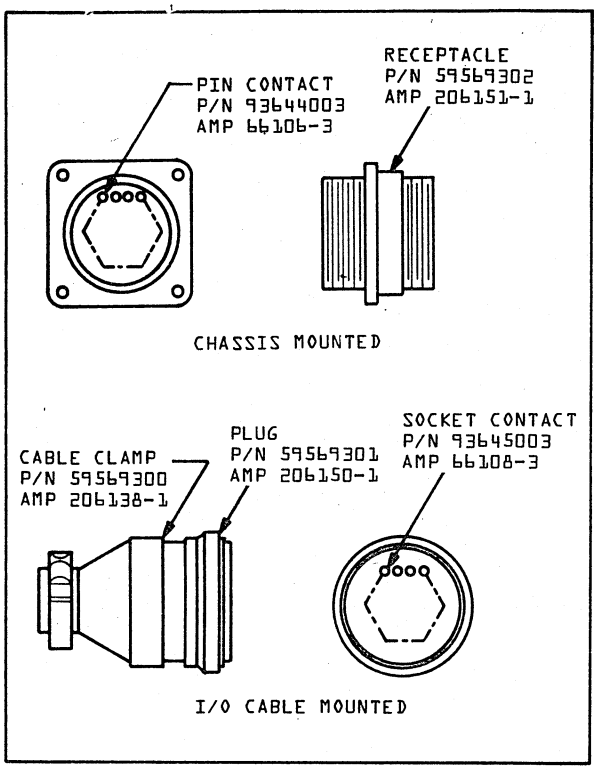


FIGURE 1-7. INTERFACE CONNECTORS

CONNECTOR	PIN NO.	SIGNAL
1J01	1	DATA BIT 1
	2	DATA BIT 1 RETURN
	3	DATA BIT 2
	4	DATA BIT 2 RETURN
	5	DATA BIT 3
	6	DATA BIT 3 RETURN
	7	DATA BIT 4
	8	DATA BIT 4 RETURN
	9	DATA BIT 5
	15	DATA BIT 5 RETURN
	14	DATA BIT 6
	13	DATA BIT 6 RETURN
	12	DATA BIT 7
	11	DATA BIT 7 RETURN
	10	DATA BIT 8
	16	DATA BIT 8 RETURN
	17	STROBE
	18	STROBE RETURN
	19	ACK
	20	ACK RETURN
	21	READY
	22	READY RETURN
	23	BUSY
	24	BUSY RETURN
	25	MASTER CLEAR
	26	MASTER CLEAR RETURN
	27	PAPER OUT
	28	PAPER OUT RETURN
	29	GROUND

FIGURE 1-8. I/O CONNECTOR PIN ASSIGNMENT

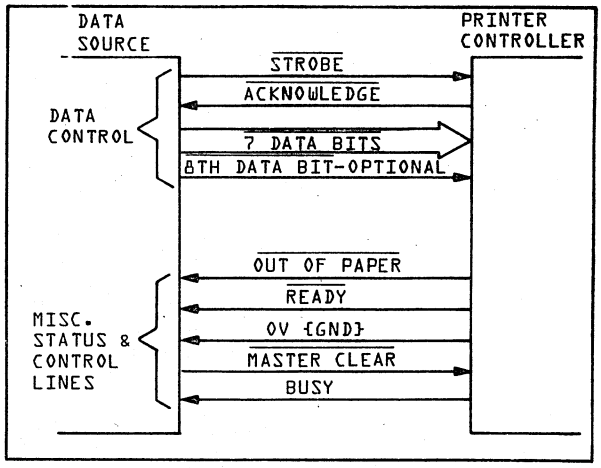


FIGURE 1-9. DATA SOURCE TO PRINTER CONTROLLER INTERFACE

The control panel switch pattern is layed out so that the control panel switches may be soldered into pre-assigned switch pin locations on the control panel printed circuit board.

For the switch functions, see the Operating Instructions section of this manual.

Interface (Figure 1-8 and 1-9)

The basic controller operates on an interlocked hand shaking technique that is controlled by a micro-processor. The interlocked feature simply means that there are no stringent timing requirements on the data interchange signals. The interchange of data is accomplished by switching from one logic level to the other rather than with the use of pulses.

The data source transmits a character by placing the (-) Strobe line at a logical "0". When the printer controller has sampled the data byte, the (-) ACK line will be placed at a logical "0". The (-) Strobe line may be removed concurrently or after the data source senses the (-) ACK line. When the printer controller senses the Strobe line at a logical "1", the ACK line will be placed at a logical "1". The Data lines must be stable a minimum of 200 nanoseconds before and after the generation of the strobe signal.

A full line of buffer memory allows the loading of zero through 132 characters and one control code. The data load cycle may be terminated at any time by the control code, in which case the print head will move only as far as is required to print the number of characters loaded. A control code must be loaded no later that the 133 rd character time; if not, a carriage return code will be automatically substituted for the 133 rd character and the print cycle initiated. The 133 rd character will not be printed since it exceeds the maximum line length and is not saved for the following line.

With the Compressed Pitch Option installed or the Elongated Character Feature enalbed, the buffer allows 217 characters to be loaded into memory.

The codes recognized as valid control codes which will terminate the input cycle are the ASCII codes: VT, FF, LF, and CR.

The standard common controller is electronically compatible with several other predesigned adapter option kits and space has been provided in the logic chassis to accept these optional interface printed circuit boards.

The standard printers are provided with a 36 pin, AMP type, CPC series, interface connector that is chassis mounted in the left rear of the printer (Figure 1-7). The mating cable mounted 36 pin, AMP type, CPC series interface connector is not supplied with the printer (Figure 1-7).

STANDARD FEATURES

The following seven controller features are provided as standard equipment on 70 and 125 lpm printers, but may only be activated at the factory or in the field by trained field service personnel.

Interactive Mode Feature (70 L.P.M. only)

Activation of this feature allows each character to be printed as it is loaded into the controller buffer. A full line need not be loaded to initiate printing. This mode allows the printer to be used with a key board.

Test Print Feature

A controller board mounted feature that controls off-line printer operation. Activation of the feature will cause the printer to alternately print groups of characters. The character printed is determined by the character generator ROM typically "B" followed by groups of blank characters. When a full line of this pattern is completed, a single line advance occurs. This operation is continued until the feature is deactivated.

Elongated Character Feature (70 L.P.M. only)

Activation of this feature allows the interface to select elongated character (double width) printing to be selected.

The elongated character mode is set when a (037) octal code is loaded and will be reset when a (036) octal code is loaded or a controller clear is generated. This print mode can only be enabled in the on-line mode. If the interface ready signal from the printer resets while the elongated character mode is enabled, the processor must reload the (037) octal code when the next data transfer occurs in order for this mode to be maintained. (Figure 1-10).

80 Column Feature (70 L.P.M. only)

Activation of this feature causes lines to be automatically terminated at 80 columns rather than 132 columns.

Automatic Terminate Feature

Activation of this feature causes lines to be automatically terminated at 132 columns rather than 133 columns.

Automatic Line Feed Feature

With this feature activated, a line feed paper motion function will automatically occur whenever the input data line is terminated with a CR (Carriage Return) control code.

Auto Double Space Feature

Activation of this feature converts all LF (Line Feed) control codes into two line skips. With both this feature and Auto Line Feed activated, a line termination in either CR (Carriage Return) or LF (Line Feed) will result in a double space paper motion operation.

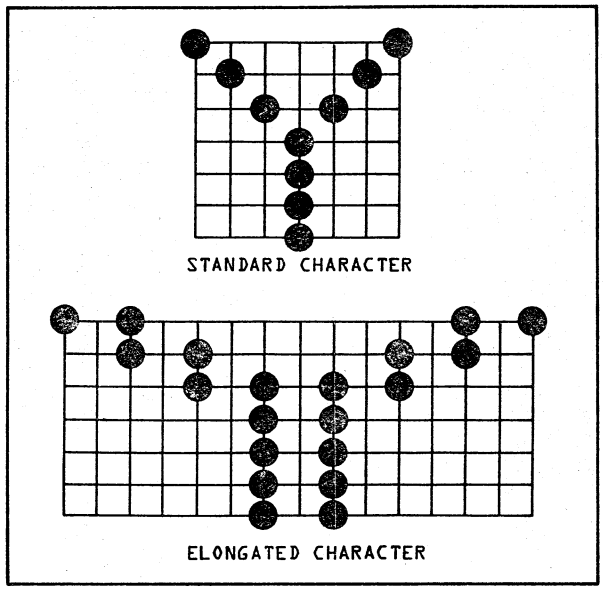


FIGURE 1-10. ELONGATED CHARACTER

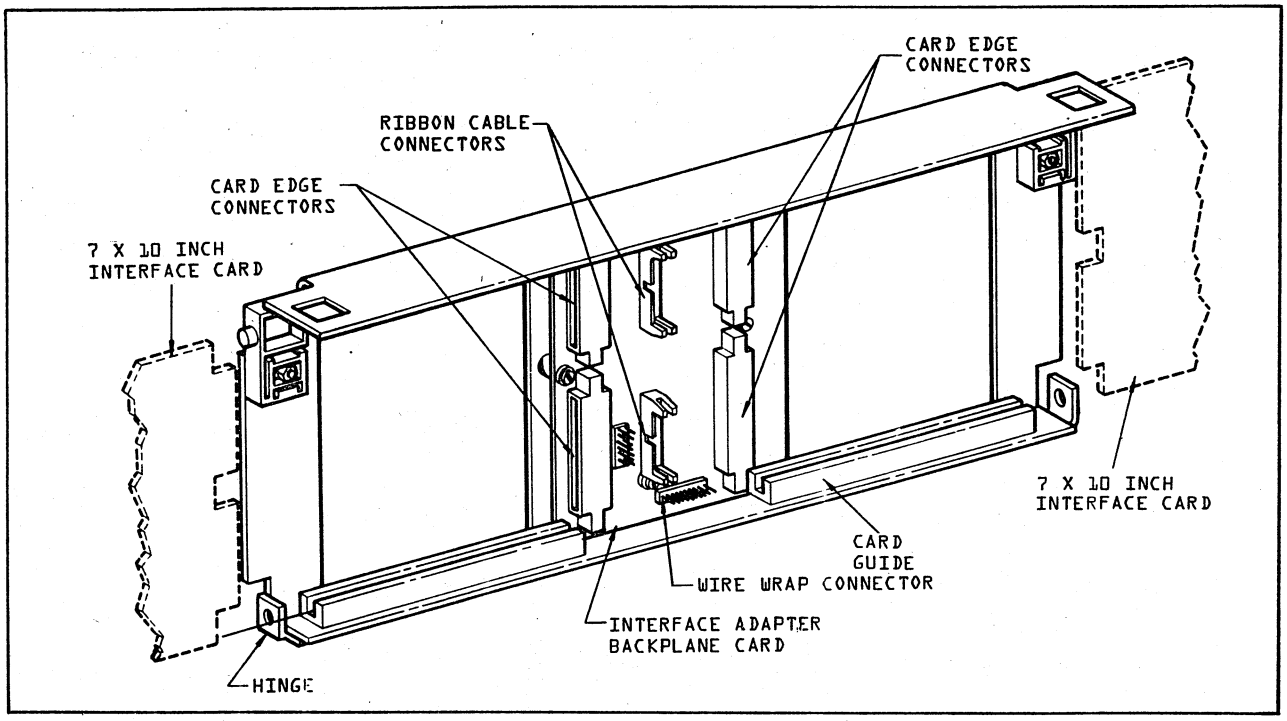


FIGURE 1-11. INTERFACE ADAPTER RACK

STANDARD OPTIONAL FEATURES

The following standard optional features are available on 70 and 125 LPM printers. These standard optional features may be factory installed as part of the original equipment configuration or field installed as standard option feature kits.

Interface Adapter Option (Figure 1-11)

An optional interface adapter rack may be installed in the printer logic chassis card location 1A03. This adapter rack is built to accept two 7 X 10 inch (177.8 X 254 mm) or one 10 X 11.5 inch (254 X 292.1 mm) optional interface adapter printed circuit cards.

By removing the interface adapter back plane card, the card rack may be converted to accept the larger 10 X 11.5 interface card.

The adapter rack is hinged at the bottom and will swing down for easy access.

Electronic Vertical Format Unit Option (Figure 1-12)

The Electronic Vertical Format Unit (EVFU) may be installed as an option to the standard paper motion system. The EVFU consists of a format brush reader and a load EVFU switch.

The primary function of the EVFU is to read a punched format tape and load it into a controller memory, where it is combined with code disk pulses to determine the line spacing.

When the EVFU paper tape is loaded into the reader and the load EVFU switch (mounted on the Vertical Transducer Printed Circuit Card Assembly) is activated, the tape will pass through the reader until two successive form feeds (channel one top of forms) are sensed. The tape is then automatically re-read to check the loaded data. The tape will stop when a successful load and check has occured. The tape may then be removed.

The maximum length of the format tape loaded into EVFU may not exceed 176 lines.

The format tape must be reloaded whenever the 6/8 LPI mode is changed.

The Paper Runaway Option is required in the printer when ever the EVFU option is added.

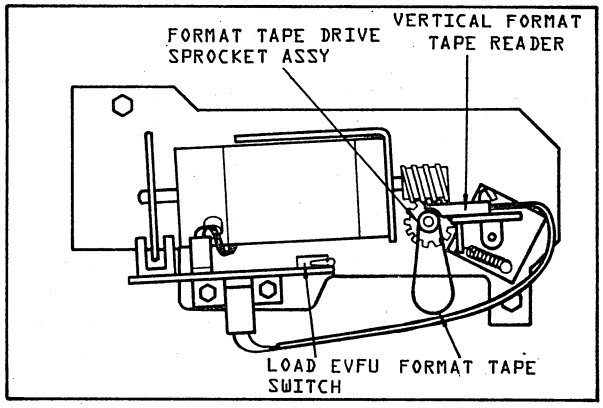


FIGURE 1-12. ELECTRONIC VERTICAL FORMAT UNIT

Paper Runaway Option

With the Paper Runaway Option installed, paper motion will stop whenever the forms slew for more than 16 seconds (approximately 4½ forms).

A runaway condition could occur if stop the paper pulses (STP) are not received by the controller or if EVFU load check errors occur. This option is located on the Controller And Print Head Electronics Board Assembly in card location 1PC2.

6/8 Line Per Inch Option

The 6/8 LPI option is located under the vertical format servo motor on the Vertical Transducer Board Assembly and consists of a toggle switch and chip. The standard code disk driven by the vertical format servo motor supplies both 6 and 8 LPI signals to the controller, but only accepts the 6 LPI signals. The switch provides the selection of either 6 LPI or 8 LPI mode by simply signaling the controller the line per inch mode required.

Audible Alarm Option

The Audible Alarm Option provides an audible buzzer signal to notify the operator that the printer is out of paper. The audible alarm buzzer is triggered through the controller by the out of paper switch.

The audible alarm consists of a printed circuit board mounted buzzer and associated circuitry. The audible alarm board is mounted at the rear of the printer, just above the interface connector, on the inside of the cabinet.

Tear Bar Option

The Tear Bar Option provides two new sectional tractor cover flaps and a tear bar to convert the printer paper feed tractors so that 8.5 inch (216.0 mm) wide non-perforated forms may be torn. This kit is designed to tear up to 5 part forms (with carbon paper) and may also be used to tear perforated forms on other than the perforations. The Tear Bar Option may be disabled by removing the tear bar and engaging a slide clamp on each of the tractor flap covers.

LED Diagnostics Option

The LED Diagnostics Option consists of 6 light emitting diodes mounted on the Controller Electronics Printed Circuit Card Assembly located in card location 1PC2.

With this option installed the controller electronics isolates and displays on six (6) LED lamps a binary code for a controller detectable error condition. A summary of the codes and their interpretation is given in Figure 1-13.

BINARY LED DISPLAY	STATUS/ERROR
00 0001	ROM Check Fault
00 0010	RAM Check Fault
00 0011	Start Switch Not Released
00 0100	Wait Loop for Switch Depression (stop NOT READY mode)
00 0101	Missing STP or FMT CHNL 1
00 0110	VFU Tape Load Error
00 0111	VFU Load Switch Not Released
00 1000	VFU Tape Longer Than 176 Lines
00 1001	Cannot Home Print Head
00 1010	Single Space SW Not Released
00 1011	Wait for Input Data
00 1100	Loading Data
00 1101	Interface Error
00 1110	FF Switch Not Released
00 1111	Test Print Switch Not Released
01 0000	(Position seek in process (PM70 only)
01 0001	(Not used)
01 0010	(Not used)
01 0011	(Not used)
01 0100	Missing MT3 O/S
01 0101	Missing Char Start O/S
01 0110	Char Start O/S at Constant "1"
01 0111	Char Start O/S #67 Missing (138/218 in PM70)
01 1000	Elongated char routine in process (PM70 only)
01 1001	(Not Used)
01 1010	(Not used)
01 1011	(Not used)
01 1100	STP at a Constant "1" (First Pass)
01 1101	STP at a Constant "1" (Interrupt Routine)
01 1110	Wait for STP Interrupt
01 1111	(Not Used)

1 = LAMP LIT IN THAT POSITION

0 = LAMP NOT LIT IN THAT POSITION

FIGURE 1-13. LED STATUS ERROR CHART

Test Print Switch Option (Figure 1-6)

This is an illuminated momentary contact push button switch/indicator located on the control panel and is only active when the printer is in off line Ready Not mode. Actuation of this switch will cause the printer to alternately print groups of characters (the character printed is determined by the character generator rom typically "B") followed by groups of blank characters. When a full line of this pattern is completed, a single line advance occurs. This operation will continue until the switch is actuated again removing the test print condition.

Line Feed Switch Option (Figure 1-6)

This is a non-illuminated, momentary contact, push button switch located on the control panel. Depression of this switch causes the paper motion system to advance forms one line space.

Compressed Pitch Option (70 L.P.M. only)

When the Compressed Pitch Option is installed and activated it will cause 16.5 characters per inch to be printed horizontally rather than the standard 10 characters per inch. The Compressed Pitch Option is activated by an alternate action toggle switch located under the vertical format servo motor on the Vertical Transducer Board Assemnly. This option also requires component changes and additions to the Controller Electronics Board Assembly located in card location 1PC2.

The compressed pitch mode will cause printing to occur horizontally compressed, enabling the use of narrower forms.

7 X 9 Character Set Option

This option prints a matrix consisting of seven horizontal dots and nine vertical dots. This option requires two extra needle driver circuits per head since all of the nine standard print head wires are used. A unique two character generator ROM set is also required.

9 X 7 Character Set Option

This option prints a matrix consisting of nine horizontal dots and seven vertical dots and requires a unique character generator ROM.

9 X 9 Character Set Option

This option prints a matrix consisting of nine horizontal dots and nine vertical dots. This option requires nine needle driver circuits per head plus a two character generator ROM set.

9 X 9 Overlapping Character Set Option

9 X 9 overlaping refers to dots overlapping in the vertical direction. It is accomplished by a special print head having two vertical rows of needles in a staggard 5-4 pattern, located on an integral number of half dot positions apart. The controller delays information to one row of needles so that they will print in the same vertical column as the other row, thus producing an overlapped vertical row of 9 dots. This option requires nine needle driver circuits per print head, a unique two character generator ROM set, plus program ROM set changer.

Bottom Forms Feed Option

This option consists of two paper shrouds that are added from the bottom of the printer to the print station. These shrouds form a path for the forms to be fed through the bottom of the printer from a forms supply located directly below the printer. An out of paper switch is provided to indicate the absence of forms, 2.5 inches below the print station. Due to the restriction of air flow caused by these shrouds, an additional fan is required to cool the Needle Driver Board Assembly. Units with this option installed have the capabiltiy of feeding forms from either the rear or the bottom of the printer.

OPERATING INSTRUCTIONS

INTRODUCTION

This section is designed to provide an operator with all the information necessary for a person to successfully operate and maintain the printer. This section is divided into four parts, Switches/Indicators And Controls, Operating Procedures, Operator Maintenance and Safety Precautions.

SWITCHES/INDICATORS AND CONTROLS

To operate the printer properly, it is necessary for the operator to fully understand the functions of the switches, indicators and various operator adjustments provided in the printer.

The standard switches and indicators provided in the printer are the On/Off Switch, the Start/Stop Switch and the Form Feed Switch. Optional switches and indicators that may also be provided with the printer are the Single Space Switch, Test Print Switch, the Electronic Vertical Format Unit Load Switch, the 6/8 Line Per Inch Option Switch, and the Compressed Pitch Option Switch.

The operator controls and adjustments provided include the Vertical Forms Positioning Knob, the Forms Density Control Knob, the Horizontal Forms Positioning, and the Tear Bar Option Controls.

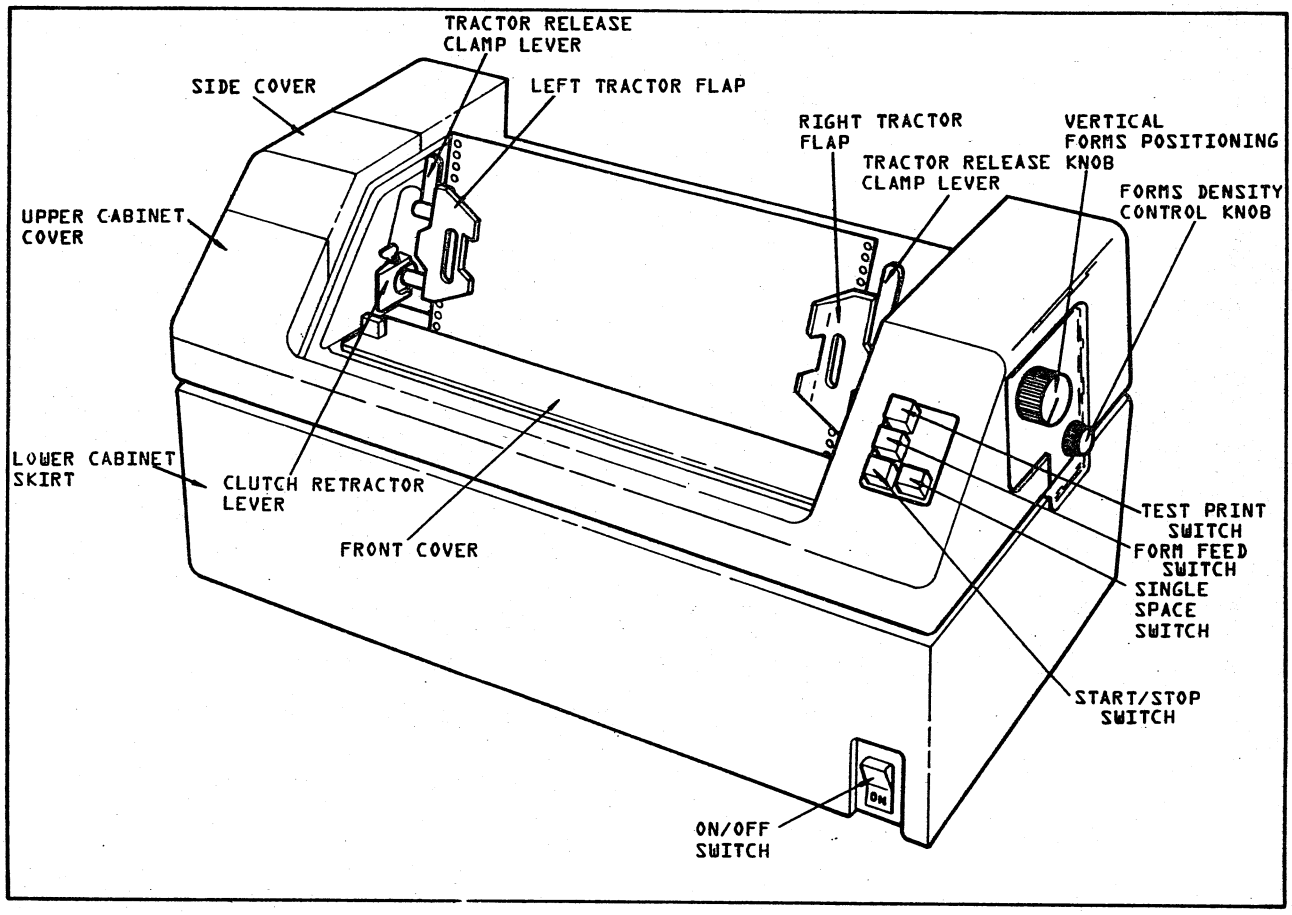


FIGURE 2-1. PRINTER CONTROLS AND INDICATORS

On/Off Switch Indicator (Figure 2-1)

Located in the lower front right corner of the printer, this switch is used to power the printer on or off. The switch is illuminated at all times when in the on position. When the printer is initially turned on, the switch generates a .1 to .2 second Master Clear pulse. This pulse clears all logic circuitry in preparation for operation. When the switch is toggled to the off position, the printer is turned off.

Start /Stop Switch Indicator (Figure 2-1)

Located on the control panel in the top right front corner of the printer, this switch is used to place the printer on or off line to the data source. The Start/Stop switch is illuminated whenever the printer is in an on-line (start) condition. It remains illuminated until the switch is actuated a second time and the printer goes to an off line (stop) condition. If the printer is printing or moving forms, the transition from on-line (start) to off line (stop) is delayed until the operation is complete. Once completed, the printer remains off-line until the Start/Stop switch is again actuated. A controller master clear pulse of 1 msec duration is generated to initialize the controller logic, when going from a stop mode to a start mode. If the switch is depressed while in the stop mode and not in test print, a start condition will be generated.

Form Feed Switch (Figure 2-1)

Located on the control panel in the top right front corner of the printer, this non-illuminated, momentary action, push button switch causes the forms to be advanced either a single space or to the top of form, depending on whether or not the Electronic Vertical Format Unit Option is installed.

Depression of the Form Feed Switch on standard printers (printers without the Electronic Vertical Format Option) causes the paper motion system to advance forms one line space and all form feed commands to be executed as single spaces.

Depression of the Form Feed Switch on printers with the Electronic Vertical Format Option installed causes the paper motion system to advance forms until the top of forms channel is detected in the electronic format tape memory.

This switch is only operable when the printer is in the off line (stop) condition.

Single Space Switch Option (Figure 2-1)

This non-illuminated, momentary action, push button switch is located on the control panel at the top right, front, corner of the printer. Depression of this switch causes the paper motion system to advance forms one line space. This switch is only operable when the printer is in the off line (stop) condition.

Test Print Switch Option (Figure 2-1)

This is an illuminated momentary action push button switch located on the control panel at the top, right, front, corner of the printer. Depression of this switch will cause the printer to alternately print groups of characters (the character printed is determined by the character generator ROM typically "B") followed by the groups of blank characters. When a full line pattern is completed, a single line advance occurs. This operation will continue until the switch is again activated, removing the test print condition. This switch is only operable when the printer is in the off-line (stop) condition.

Electronic Vertical Format Load Switch Option (Figure 2-2)

The load EVFU (Electronic Vertical Format Unit) switch is located on the left side of the printer and may be accessed by removing the side cover or the upper cabinet cover (Figure 2-1).

The switch is mounted on the Vertical Transducer Printed Circuit Board Assembly located under the vertical format servo drive motor. This switch activates the vertical format tape reader to read the form at tape and loads it into the format tape memory. For additional information on EVFU, see the operating procedures section of this manual.

6/8 Line Per Inch Switch Option (Figure 2-2)

The 6/8 line per inch switch is located on the left side of the printer and may be accessed by removing the side cover or the upper cabinet cover (Figure 2-1). This switch is mounted on the Vertical Transducer Printed Circuit Board Assembly located under the vertical format servo motor. This switch provides the selection of either 6 l.p.i. or 8 l.p.i. mode by simply signaling the controller the line per inch mode required.

When operating with the EVFU option, the EVFU will require a reload following a 6/8 l.p.i. mode change.

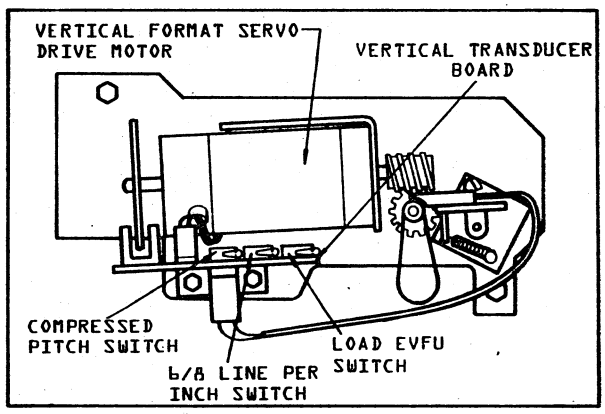


FIGURE 2-2. OPTION SWITCHES

Compressed Pitch Switch Option (Figure 2-2)

The compressed pitch switch is located on the left side of the printer and may be accessed by removing the side cover or the upper cabinet cover (Figure 2-1). This switch is mounted on the Vertical Transducer Printed Circuit Board Assembly located under the vertical format servo motor. This switch provides the selection of either 16.5 character per inch or the standard 10 characters per inch to be printed horizontally.

The 16.5 characters per inch compressed pitch mode will cause the printing to occur horizontally compressed, enabling the use of narrower forms.

Vertical Forms Positioning Knob (Figure 2-1)

The vertical forms positioning knob is located on the right side of the printer on the end of the lower tractor drive shaft. The knob is used to manually move the forms when vertical positioning and alignment are required. The vertical forms positioning knob is used in conjunction with the clutch retractor lever. When depressed the clutch retractor lever decouples the tractor shaft from the paper motion drive mechanism. This allows the forms to be moved independently of the drive mechansim, facilitating manual vertical forms alignment.

Forms Density Control Knob (Figure 2-1)

The forms density control knob is located on the right side of the printer on the end of the platen advance shaft. The forms density control is used to compensate for the difference in thickness of forms used in printing. As the control knob is turned clockwise the gap between the print mechanism and the print surface of the platen is increased, allowing accomodation of heavy weight and multiple part forms. The opposite is true of turning the knob counter clockwise. There are numerous detented positions the knob may be placed in. The detent positions do not correspond to the number of copies being handled, but are intended for operator reference when forms are changed frequently. The forms density control should always be set to provide the optimum print quality for the form in use. Care should be taken to assure that the forms density control knob is not turned counter clockwise to the point where the ribbon and forms are clamped between the platen and the face of the print head. Clamping of the form and ribbon can cause form tearing or ribbon damage.

WARNING

OPERATOR MUST SET DENSITY CONTROL KNOB FOR OPTIMUM PRINT QUALITY FOR FORM IN USE. IMPROPER SETTING OF DENSITY CONTROL KNOB CAN CAUSE PREMATURE PRINT HEAD FAILURE.

Horizontal Forms Positioning (Figure 2-1)

Horizontal forms positioning is accomplished by releasing the clamp lever on the tractor assembly and applying pressure to the side of the tractor to be moved. The tractors can be moved horizontally to compensate for different forms widths and desired marginal set-ups. The tractors are designed to accomodate forms widths of 4 inches up to 16.75 inches (101.6 mm up to 419 mm)

Tear Bar Controls (Option)

See the Operating procedures section of this manual for the tear bar option operator controls and instructions.

OPERATING PROCEDURES

This section covers the normal daily operations the operator would be expected to perform in the course of operating the printer. These operations include Ribbon Cassette Replacement, Forms Installation And Stacking, Electronic Vertical Format Unit Operation,

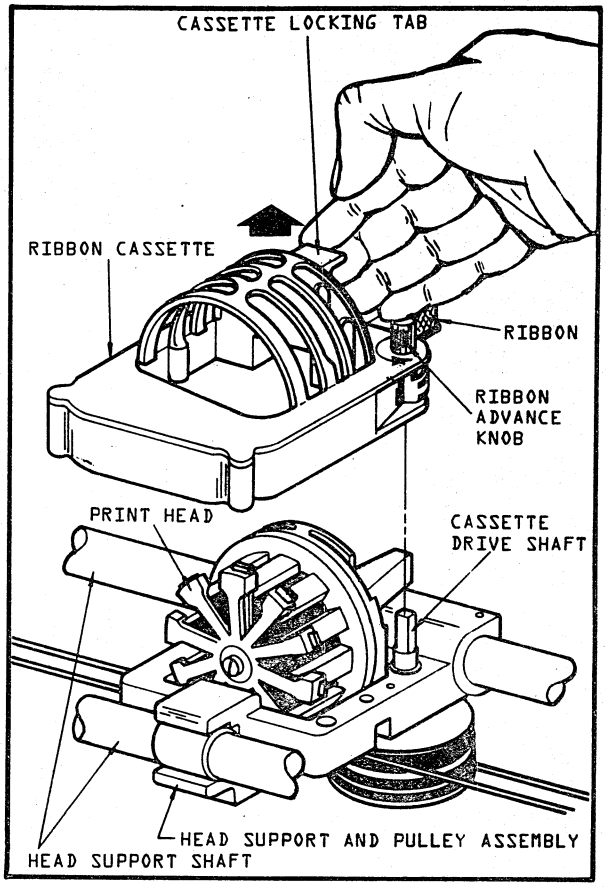


FIGURE 2-3. RIBBON CASSETTE REPLACEMENT

Format Tap Preparation, 6/8 Line Per Inch Operation, Compressed Pitch Operation, Tear Bar Operation, Paper Basket Operation, On Line Printing Operation and Print Head Replacement (Units With Operator Replaceable Heads).

Ribbon Cassette Replacement (Figure 2-3)

The ribbon used in this printer consists of a disposable ribbon cassette that snaps over the print head and engages a cassette drive shaft on the print head support assembly. Each ribbon cassette contains an endless loop of nylon ribbon that is cycled through the cassette in one direction until the end of life is reached.

The following steps should be followed when replacing cassettes:

1. Remove the front cover to gain access to the ribbon cassette.
2. Place your finger tips under the cassette locking tab and pull it upward until you hear a slight click, indicating that the cassette has disengaged from the head support and pulley assembly.
3. Remove the ribbon cassette by lifting it up and off of the print head.
4. Remove the new ribbon cassette from its wrappings and assure that the cassette locking tab is in the up (disengaged) position.

5. Place the new ribbon cassette over the print head so that the drive spline on the bottom of the cassette engages the cassette drive shaft on the head support. The ribbon advance knob on the top of the cassette may be turned counter clockwise very slightly to aid in the engagement of the spline and drive shaft.

6. While applying a slight pressure to the top of the cassette with one hand, press the cassette locking tab downward until you hear a slight click. The cassette should now be locked to the head support and pulley assembly.

7. Using the thumb and forefinger of one hand, grasp the cassette by both sides and lift upward using a moderate pressure. If the cassette lifts off the print head, it was not seated properly and steps 4 thru 7 should be repeated. Slide the Print Head Support Casting from side to side to assure that ribbon is moving.

8. Replace the front cover and assure that it is seated properly.

NOTE
A SAFETY INTERLOCK SWITCH DISABLES MECHANICAL MOTION WHEN THE FRONT COVER IS REMOVED OR NOT SEATED PROPERLY.

Forms Installation and Alignment For Standard Rear Loading Units (Figure 2-5).

1. Turn the printer off or place it in the stop mode. Remove the front access cover.

2. Place the stack of fan fold forms behind the printer, directly below the forms input slot.

3. Insert the top form into the rear forms input slot and under the paper tension weights. The four paper tension weights may be raised and locked in an up position during form loading. Continue feeding the forms between the upper and lower paper slides until the form is visible at the platen in the front of the printer. When loading multiple part forms it may be necessary to increase the gap between the print head face and the platen so the form may pass with ease. This is accomplished by turning the density control knob all the way clockwise.

4. Grasp the form and pull it upward until the top of the form is in line with the top of the tractor flaps.

5. Open the left tractor flap and position the forms on the tractor feed pins. Close the flap.

6. Replace the front access cover and use its column guide for forms position reference.

7. Release the left tractor clamp lever and position the left tractor for the desired margin on the form. Reclamp the tractor in place with the tractor clamp lever.

8. Open the right tractor flap and release its tractor clamp lever. Position the right tractor so that the tractor feed pins can be seen through the form feed holes.

9. Position the form on the tractor feed pins. Close the left tractor flap.

10. Slide the right tractor to the right very lightly until the form is taut. Reclamp the right tractor in place with the tractor clamp lever.

11. Using the vertical forms positioning knob, position the top edge of the first form at the top edge of the tractor flaps. If the top edge of the form does not line up with the top of both tractor flaps, the form is mis-aligned on the feed pins.

12. If your printer does not have the Electronic Vertical Format Option, skip to step 13. Turn the printer on and actuate the form feed switch. The format reader memory is now at the top of forms position.

13. Depress the clutch retractor lever and use the forms positioning knob to align the first line of print position on the forms to the print position on the line finder (Figure 2-4). Release the clutch retractor lever.

14. Reset the density control knob if it was moved during form loading. Care should be taken to assure that the forms density control knob is not turned counter clockwise to the point where the ribbon and forms are clamped between the platen and the face of the print head. Clamping of the forms and ribbon can cause form tearing or ribbon damage. Also lower the necessary paper tension weights. The forms should now be ready for printing. For single part forms use only the two center weights. Swing the outer two weights up away from the forms. For multiple part forms all four weights are normally used. For narrow forms any weight not covering the form with at least half of its width should be lifted. If forms tear at the sprocket holes. Weights should be lifted until the tearing is eliminated. If tearing continues, the density control knob may need adjusting.

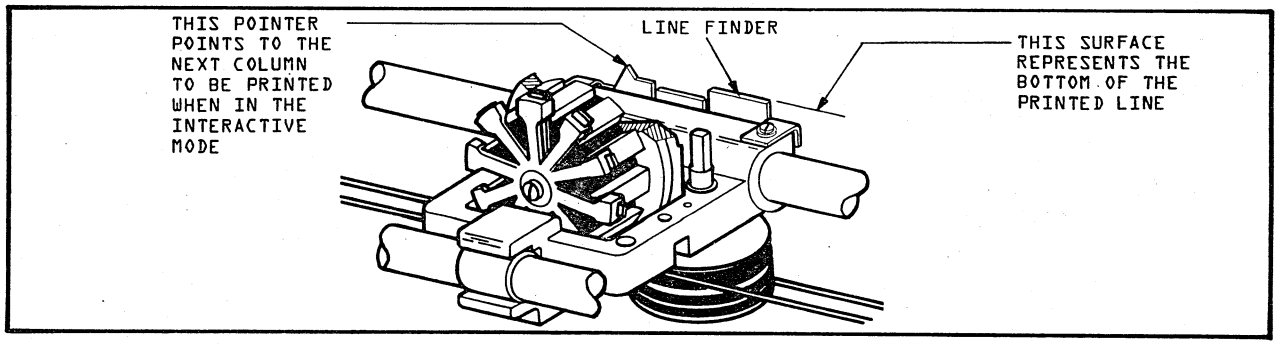


FIGURE 2-4. LINE FINDER AND COLUMN PRINTER

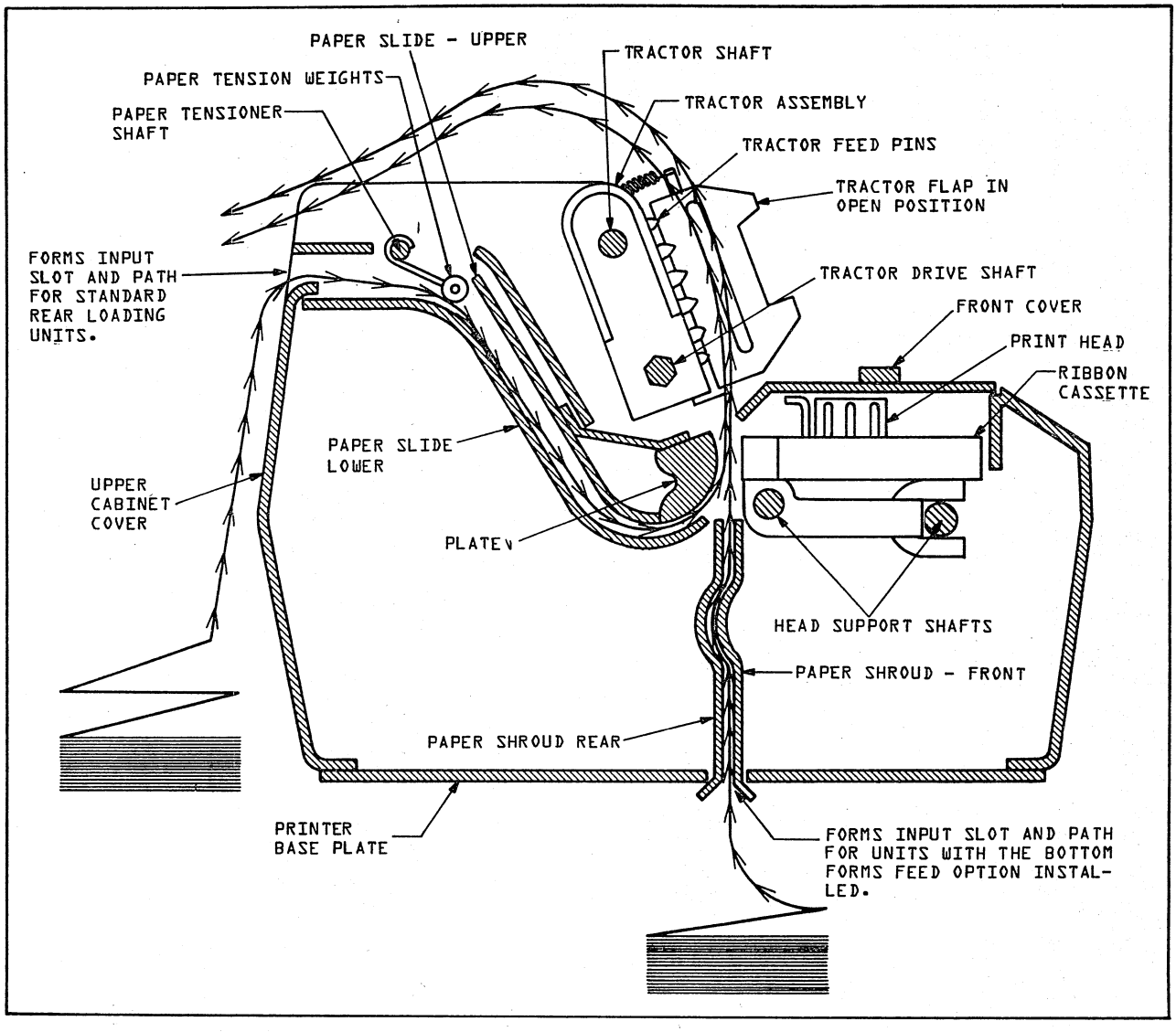


FIGURE 2-5. FORMS PATH FOR REAR AND BOTTOM LOADING UNITS

Forms Installation and Alignment For Units With The Bottom Forms Feed Option Installed (Figure 2-5).

1. Turn the printer off or place it in the stop mode. Remove the front access cover.

2. Place the stack of fan fold forms under the printer and directly below the front forms input slot.

3. Insert the top form into the front forms input slot. Continue feeding the forms up between the front and rear paper shrouds until the form is visible at the platen in the front of the printer. When loading multiple part forms it may be necessary to increase the gap between the print head face and the platen so the form may pass with ease. This is accomplished by turning the density control knob all the way clockwise.

4. Continue with setps 4 thru. 13 of "Forms Installation and Alignment For Standard Rear Loading Units."

5. Reset the density control knob if it was moved during form loading. Care should be taken to assure that the forms density control knob is not turned counter clockwise to the point where the ribbon and forms are clamped between the platen and the face of the print head. Clamping of the form and ribbon can cause form tearing or ribbon damage. The forms should now be ready for printing.

Electronic Vertical Format Unit Load Operation (Figure 2-6)

1. Power the printer on. Remove the side cover to gain access to the electronic vertical format unit and its load switch.

2. Lift the brush block away from the format tape drive sprocket by pulling the brush block retraction lever toward the front of the printer.

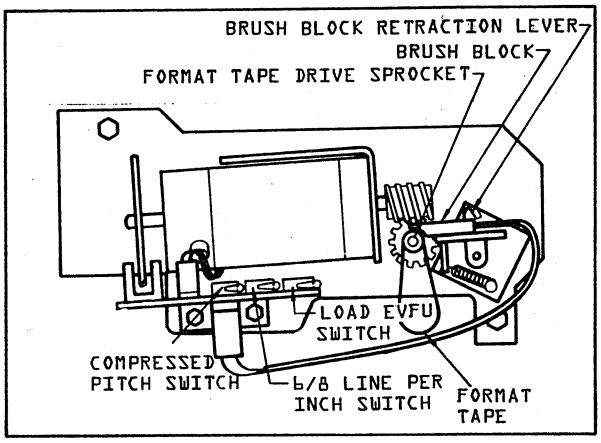


FIGURE 2-6. FORMAT TAPE LOAD OPERATION

3. Mount the format tape over the teeth on the format drive sprocket. Lower the brush block to hold the format tape in place. This is accomplished by pushing the brush block retraction lever toward the rear of the printer.

   Channel one on the format tape should be on the inside.

4. If your printer has the 6/8 Line Per Inch or the Compressed Pitch Options installed check to see that their switches are switched to modes required and that the proper line per inch tape is being loaded. The selector switches for 6/8 lpi and compressed pitch are located on the Vertical Transducer Board Assembly.

5. Load the format tape into the format tape memory by activating the load EVFU switch which is located on the Vertical Transducer Board Assembly. This is a momentary action switch and will return to it's original position after being actuated.

   Activation of the switch will cause the tape to pass through the reader until two successive form feeds (Channel 1 - top of forms) are sensed, then the tape is automatically re-read to check the loaded data. The tape will stop when a successful load and check has occured. The tape should then be removed and the brush block assembly raised so that the brushes are not contacting the sprocket wheel. The maximum format tape length that may be loaded is 176 lines.

   The tape must be reloaded whenever the 6/8 l.p.i. mode is changed or the printer is turned off.

   A minimum of 2 full pages of forms will be moved through the tractors during format tape loading. This paper loss can be prevented by depressing the tractor clutch retractor lever during the loading operation.

6. The format tape load operation is now completed.

Format Tape Preparation (Figures 2-7 and 2-8)

The format tape is a standard 1 inch (2.54 mm) wide tape with sprocket holes on .10 inches (2.54 mm) centers.

The standard format tape (95414500) comes with channel three already punched. Channel one should be punched to correspond to the top of forms positions.

Channel two may be punched at any vertical tab desired. The format tape may be any length from 5.5 to 12.5 inches (139.7 to 317.5 mm). Any punching of the format tape should only involve channels one and two of the tape. The standard tape already has channel three punched. When punching the format tape use tape punch 76657900 (Figure 2-8.)

The following procedures are intended to aid the operator in punching the format tape.

1. Raise the splicer arm out of the way during the punching operation.

2. Raise the tension arms and slide the punch channel selector to the rear and out of the way.

3. Place the format tape on the sprocket pins (Channel one inside) so that the desired top of forms (FF) is in line with the punch groove. Lower the two tension arms.

4. Move the punch channel selector to position one and depress the punch.

5. If vertical tab (VT) is desired at this location, move the punch channel selector to position two and depress the punch.

6. Count the number of holes in channel three (lines on the form) until the next desired top of forms (FF) or vertical tab (VT) location is reached.

7. Lift the tension arms and position the next line to be punched in line with the punch groove. Place the format tape over the sprocket pins and lower the tension arms.

8. Repeat step 4 and/or 5.

9. The pattern for each form may be repeated as many times as desired up to 12.5 inches (317.5 mm) of format tape.

10. When the desired length of tape is reached, align the end line with the groove under the tape splicer.

11. Lower the splicer arm and draw the cutting blade across the format tape.

12. To splice the tape raise the splicer arm and place the two ends of the format tape over the splicer sprocket pins so that they abut at the groove bereath the splicer.

13. Remove the adhesive backing from a format tape splice (76628200) and position the splice on the sprocket pins so that it equally covers both ends of the format tape.

14. Lower the splicer arm and depress the splicer handle.

15. Now reverse the format tape and apply another splice on the opposite side, so that the splice is displaced at least one or two sprocket holes from the first splice on the opposite side. This offset minimizes an abrupt change in tape thickness due to the splices. Repeat step 14.

16. Reverse the tape. The tape is now ready to be installed.

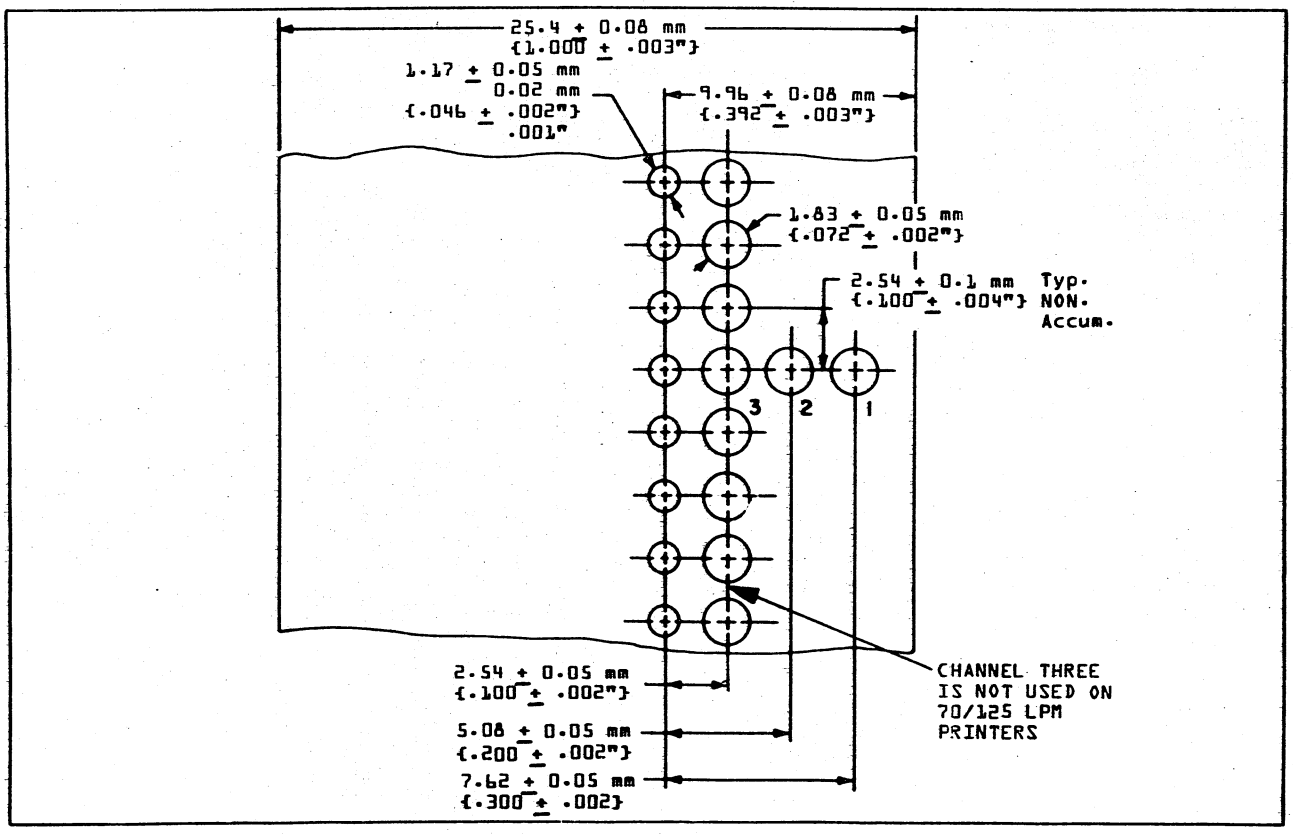


FIGURE 2-7. FORMAT TAPE CONFIGURATION

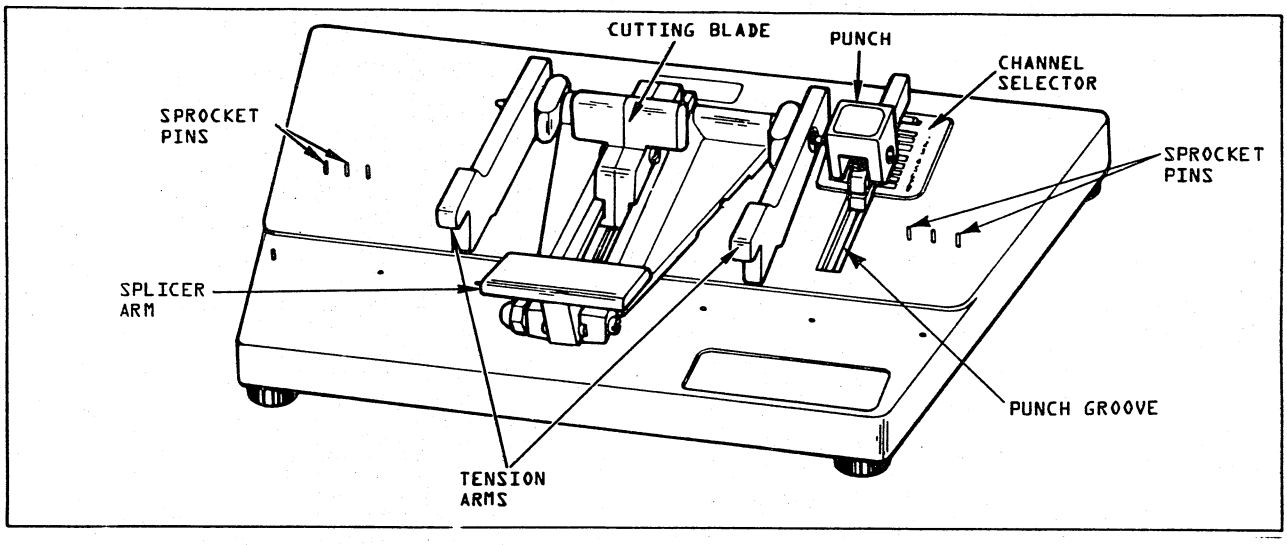


FIGURE 2-8. FORMAT TAPE PUNCH

6/8 Line Per Inch Operation (Figure 2-6)

The 6/8 LPI switch is mounted on the Vertical Transducer Printed Circuit Board Assembly which is located under the vertical format servo motor. This switch may be accessed by removing the side cover. The 6/8 LPI switch provides the selection of either 6 LPI or 8 LPI by simply signaling the controller the line per inch mode required.

When operating with the EVFU option, the EVFU will require a reload of a different format tape following each 6/8 LPI mode change.

6/8 LPI Operation For Standard Printers Without The Electronic Vertical Format Unit Option Installed (Figure 2-6).

1. Place the printer in the stop (not ready) mode.
2. Place the 6/8 l.p.i. switch in the mode required.
3. Depress the form feed switch on the control panel twice. The forms will advance two single spaces (form feed commands on non EVFU units are executed as single spaces). This will properly index the code disk to the line per inch mode selected.

6/8 LPI Operation For Printers With The Electronic Vertical Format Unit Option Installed (Figure 2-6)

1. Place the printer in the stop (not ready) mode.
2. Place the 6/8 LPI switch in the mode required.
3. Remove the format tape and replace it with the the new line per inch mode format tape.
4. Load the new format tape into the format tape memory per the EVFU Load Operation found in the operating procedures section of this manual.

Compressed Pitch Operation (Figure 2-6)

The compressed pitch switch is mounted on the Vertical Transducer Printed Circuit Board Assembly which is located under the vertical format servo motor. This switch may be accessed by removing the side cover. This switch provides the selection of either 16.5 characters per inch or the standard 10 characters per inch to be printed horizontally. The compressed pitch option is only available on 70 lpm printers.

1. Place the printer in the stop (not ready) mode.
2. Place the compressed pitch switch in either the 10 or 16.5 character per inch mode.
3. The printer is now ready to print in the mode selected.

Tear Bar Operation (Figure 2-9).

The tear bar option consists of two special two piece tractor flaps and a tear bar that convert the feed tractors so that 8.5 inch (216.00 mm) wide non perforated forms may be torn. The tear bar will tear up to 5 part forms (with carbon paper) and may also be used to tear perforated forms on other than the perforations.

Tear Bar Installation And Removal (Figure 2-9)

When using the tear bar, the slide clamp on the top right and top left tractor cover flap assemblies must be disengaged from the lower right and left tractor cover flap assemblies. This is accomplished by sliding the slide clamp to its upmost position (Figure 2-9).

When installing or removing the tear bar the top right and top left tractor cover flap assemblies must be in their open position (Figure 2-9). The tear bar is mounted between the lower left and lower right tractor cover flap assemblies and is held in place with two thumb screws. With the tear bar screwed in place, the tractors are tied together and will accept 8.5 inch (216.0 mm) wide forms (Figure 2-9).

Tear Bar Forms Installation (Figure 2-9)

The form installation procedure for printers with the tear bar option is identical to printers without it, with exception of tractor form loading which is described below.

1. Turn the printer off and remove the front cover. Open the right and left hand top tractor cover flap assemblies. Loosen the two thumb screws that retain the tear bar and remove the tear bar. Open the lower right and left hand tractor cover flap assemblies (Figure 2-9).
2. Insert the form into the printer following the form path shown in Figure 2-5 and until the form is visible just below the tractors.
3. Pull the form upward and position the holes in the forms on the left feed pins. Close the lower left tractor cover flap assembly.
4. Replace the front cover. Using the column guide mounted on the front cover for reference, position the left tractor for the desired margin on the form and lock the left tractor in place.
5. Slide the right tractor assembly under the right side of the forms until the holes in the forms are positioned on the right tractor feed pins. Close the lower right tractor cover flap assembly.
6. Install the tear bar and tighten the two thumb screws. Close the top left and right tractor cover flap assemblies and lock the right hand tractor in place.

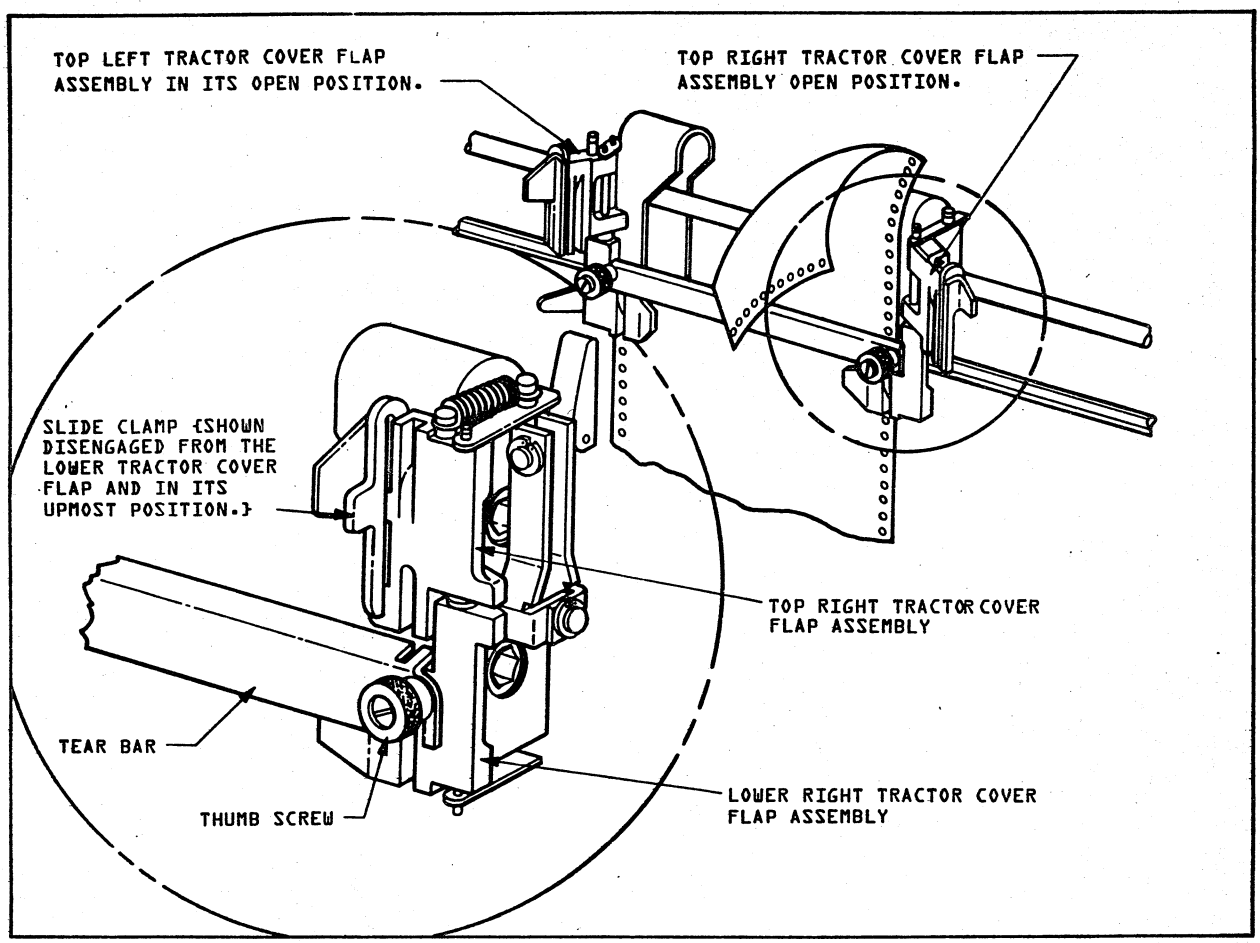


FIGURE 2-9. TEAR BAR OPERATION

7. Turn the printer on. If the printer has the Electronic Vertical Format Unit Option installed, actuate the form feed switch. The format reader memory is now at the top of forms position.

   It is not necessary to actuate the form feed switch on printers without the Electronic Vertical Format Unit Option, since form feed on these printers will only give you a single space and is not a true top of form switch.

8. Depress the clutch retractor lever and use the forms positioning knob to align the first line of print position on the forms to the print position.

9. Release the clutch retractor lever. The forms are now ready for printing.

Tear Bar-Forms Tearing Operation (Figure 2-9).

The top right and top left tractor cover flap assemblies must both be in the open position (as shown in Figure 2-9) before forms may be torn off against the tear bar. When tearing forms, grasp the forms in the upper left hand corner, pulling the form forward against the tear bar and to the right as shown in Figure 2-9. After tearing forms and before resuming printing, both the top right and top left tractor cover flap assemblies must be in the closed position.

Tear Bar-Slide Clamp Operation (Figure 2-10)

If it is necessary to use other than 8.5 inch wide forms, the tear bar may be removed and the tractors restored to full use by tying the top and lower cover flaps assemblies together using the slide clamps on each top tractor cover flap assembly. This is accomplished by sliding the slide clamps downward and engaging them into the lower tractor cover assemblies (Figure 2-10).

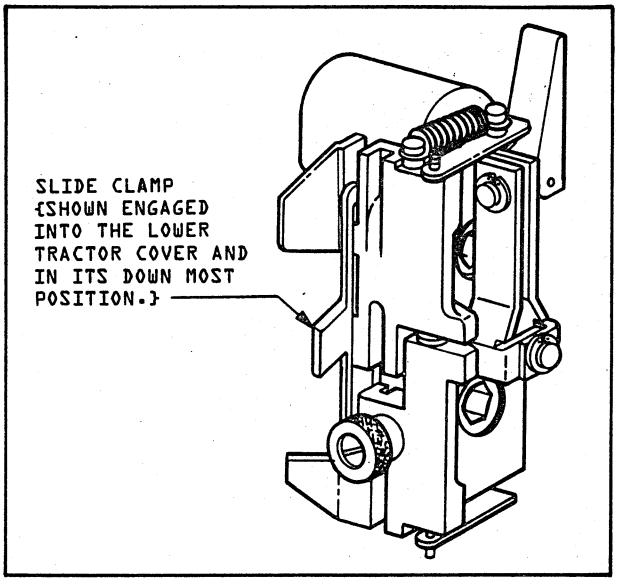


FIGURE 2-10. TEAR BAR SLIDE CLAMP

Tractor Clamp Operation (Figure 2-11)

The correct release position of the tractor clamp is to place the clamp in an upward direction. The tractor will then move freely along the tractor shaft (Figure 2-11). The correct clamped position of the tractor clamp is to place the clamp toward the rear of the printer at approximately 30 degrees from the upward (released) position. The tractor will then be clamped to the tractor shafts (Figure 2-11). Failure to use the tractor clamps in the correct manner may result in breakage of the clamp.

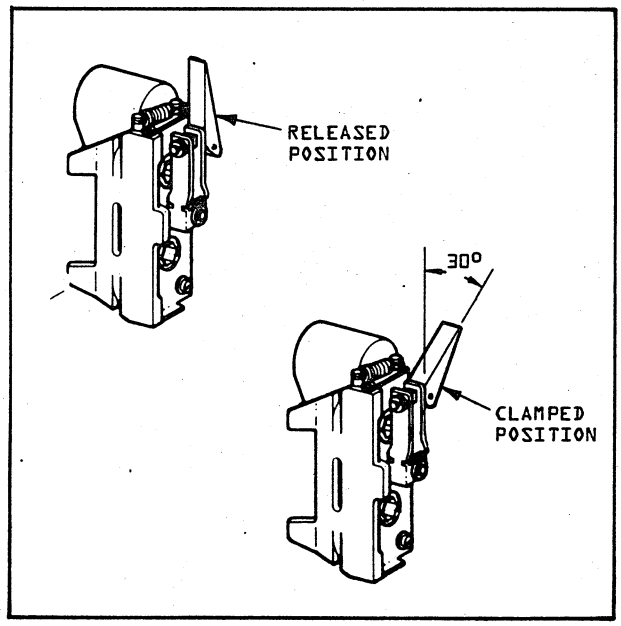


FIGURE 2-11. TRACTOR CLAMP OPERATION

Paper Basket Operation (Figure 2-12)

The paper basket consists of two pieces, a paper basket mounting rack and a paper basket. The paper basket mounting rack is mounted to the rear of the printer by hooking it over the paper tensioner shaft.

The paper basket mounts to the paper basket mounting rack. The paper basket may be mounted in the rack in either of two positions. The lower basket mounting position is used when the printer is pedestal mounted and the forms supply is located on the floor or under the printer. The upper basket mounting position is used when the printer is table mounted and the forms supply is located on the table behind the printer.

Both pieces of the paper basket must be removed before removing the upper cabinet cover.

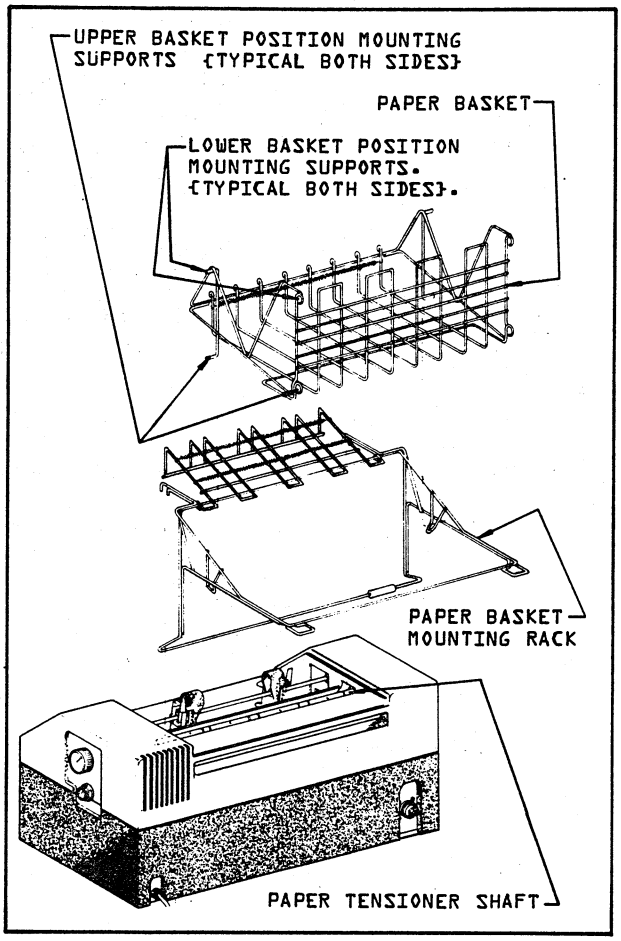


FIGURE 2-12. PAPER BASKET OPERATION
(Basket shown in lower mounting position)

On Line Printing Operation

1. Check to see that the printer has a ribbon cassette and that the forms are loaded and aligned properly. Install the paper basket.

2. Turn the on/ off switch to the on position.

3. If the printer has 6/8 Lines Per Inch or Compressed Pitch Options installed, set the 6/8 l.p.i. switch and/or the compressed pitch switch to the modes required.

4. If the printer has an Electronic Vertical Format Unit, check to see that you have the proper format tape before loading it into the format tape memory. Load the format tape into memory.

5. Depress the start/stop switch on the control panel to the start position. The printer is now on line with the data source and will start printing on command.

   The printer will continue printing on command until the stop switch on the control panel is depressed. The stop switch disconnects the printer from the data source.

Print Head Replacement (On Printers With Operator Replaceable Head Only

On some models the matrix printhead is a snap-in device easily replaceable upon wear-out or failure by the customer operator. Your service organization can determine whether your monthly maintenance cost includes printhead replacement.

This procedure describes the removal and replacement of the operator replaceable printhead used on 70 LPM Matrix Printers only. Replacement of the print head on 125 LPM printers and some early 70 LPM printers, that have the head mounted with two screws, must be replaced by a trained field serviceman.

The following steps whould be followed when replacing the printhead.

1. Disconnect the printer line cord from its power source.

2. Remove the front cover to gain access to the printhead.

3. Remove the ribbon cassette (see Cassette Replacement Procedure in this section of the manual).

4. Reach under the printhead support casting with your fingers and unplug the printhead harness connector from the printhead flat cable connector (Figure 2-12).

5. Unclamp the printhead from the support casting by gasping the right and left hand clamping levers (one with either hand) and pulling the levers toward the sides of the printer until they are disengaged from the printhead (Figure 2-13) .

6. Remove the printhead harness from the retaining hook located under the printhead support casting as shown in Figure 2-13.

7. Slide the printhead toward the front of the printer removing it from the print head support casting and out of the printer.

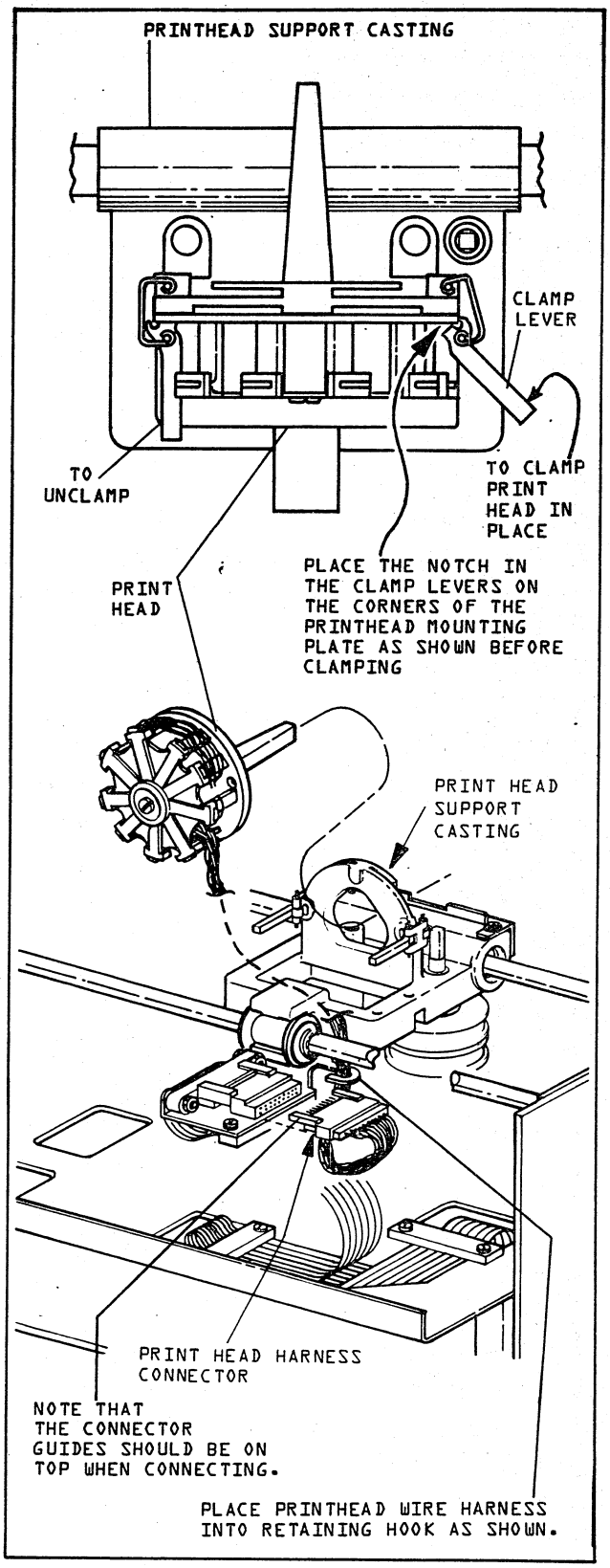


FIGURE 2-13. PRINTHEAD REPLACEMENT

8. Mount the new printhead to the printhead support casting. Note that the hole on either side of the printhead should be slid over the guide pins on either side of the mounting surface on the printhead support casting. Slide the printhead toward the rear of the printer and until it is seated against the mounting surface on the support casting (Figure 2-12).

9. While holding the printhead against the mounting surface of the support casting with one hand clamp it in place with the two clamping levers as shown in Figure 2-12. Caution should be taken to assure that the notches on the clamp levers are place on the corner of the printhead as shown in Figure 2-12 before clamping the printhead in place.

10. Route the printhead harness and connector as shown in Figure 2-12 and plug the printhead harness connector into the printhead flat cable connector. Note that the printhead harness connector guides should be on top when making the connection (Figure 2-12). Also assure that the printhead harness has been placed behind the retaining hook as shown in Figure 2-12.

11. Grasp the printhead support casting and move it from one side of the printer to the other assuring that the printhead harness does not rub on thr front support shaft or hit on the side of the printhead structure. Adjust the harness in the retaining hook as necessary.

12. Replace the ribbon cassette (see cassette replacement procedure in this section of the manual).

13. Replace the front cover and assure that it is seated properly. When installing the front cover the beveled edge must be toward the rear of the machine facing downward. Care should also be taken that the four corner guides are engaged properly into the upper cabinet before seating the cover.

12. Connect the printer line cord to it's power source.

13. Load paper and start printing. Adjust the density control knob as required.

OPERATOR MAINTENANCE

This section contains preventive and corrective maintenance procedures that will aid the operator in finding and correcting minor nonfunctional printer problems. This section also contains a list of suggested operator supplies. Turn the printer off before attempting any of the following maintenance procedures.

Preventive Maintenance

Check and replace, if required:

1. Ribbon. To replace, refer to ribbon cassette replacement section of this manual.

2. Format tape. To replace, refer to the Format Tape Preparation section of this manual.

3. Printhead (on single printhead, 70 LPM printers, with operator replaceable head only). All other units require that the head be replaced by a trained field serviceman. To replace operator replaceable in the operating procedures section of this manual.

Clean when required:

1. Clean the exterior of the printer cabinet with a clean lint free cloth and a mild commercial cleaning solvent or detergent. The clear plastic front cover should only be cleaned with water and a soft non-abrasive cloth.

2. A vacuum cleaner with a soft nozzle or a lint free cloth may be used to clean the paper and ribbon dust from the print station.

3. Care should be taken not to knock or twist the code strip out of adjustment during cleaning or maintenance operations.

4. Before leaving the printer site, field service personnel should check the alignment of the code strip marks in code strip windows and test print. See the tests and adjustments section of the printer manual for code strip to reader adjustment procedure.

Corrective Maintenance

This section is divided into three areas of corrective maintenance: Inoperative Problems, Forms Problems and Print Problems.

INOPERATIVE PROBLEMS
1. The power on switch is in the on position, but the switch is not illuminated. A. Check to see if printer is plugged into the power source. B. Have the building circuit breakers or fuses checked.
2. The printer is powered on and the start switch is depressed, but the start switch does not light up. A. Is the front access cover installed and seated properly. The printer will not start if the interlock switch under the front cover is not being held down by the front cover. B. No forms present.
3. The start switch is illuminated but the printer is not printing. A. The data source is not ready to send data. B. The data source has received an out of paper signal from the printer and has stopped sending data. Load forms.

FORMS PROBLEMS
1. Forms are jamming. A. Forms supply is not aligned with the entry to the printer. B. Tractors are not spaced properly (holding the forms to tight or not tight enough). C. The sprocket hole and sprocket on the left tractor is not in line with the sprocket hole and sprocket on the right tractor. 2. Forms are tearing at the sprocket holes. A. Form supply is not aligned with the entry to the printer. B. The forms density control is not set properly. C. To many of the paper tension weights are in the down position. 3. Forms are not spacing properly. A. Wrong format tape is being used. B. Improperly punched format tape. C. Worn format tape. D. Format tape has not been loaded into EVFU memory. E. 6/8 line per inch switch is in the wrong mode.

PRINT PROBLEMS
1. Light print A. The forms density control is not properly adjusted. B. The ribbon is worn out and the ribbon cassette needs replacing. 2. Missing dots or light dots A. The forms density control is not properly adjusted. B. Printhead is worn out and needs replacing.

TABLE 2-1. FORMS RECOMMENDATIONS

PARTS	WHITE SULPHITE BOND PAPER	CARBON PAPER
1	15 pound continuous bond (56 g/m^2)	
1	24 pound continuous bond (90 g/m^2)	
2 & 3	12 pound continuous bond (45 g/m^2)	8 pound (14 g/m^2)
2 & 3	15 pound continuous bond (56 g/m^2)	8 pound (19 g/m^2)
4 & 5	12 pound continuous bond (45 g/m^2)	6 pound (14 g/m^2)

TABLE 2-2. OPERATOR SUPPLIES

PART NUMBER	DESCRIPTION
76657900	FORMAT TAPE PUNCH
95414500	FORMAT TAPE
76628200	FORMAT TAPE SPLICE
44671690	RIBBON CASSETTE
	COMMERCIAL CLEANING SOLVENT (i.e. Brief, Formula 409, etc.)
	NON-ABRASIVE CLOTH

Forms And Operating Supplies

The printer will handle standard continuous forms with feed holes on each edge, with or without marginal perforations.

The form may be from 4 to 16.5 inches (101.6 to 425 mm) in width including margins, and 3.5 to 17 inches (88.9 to 431.8 mm) long from fold to fold. When using the output paper basket, the forms length is limited to 12 inches (304.8 mm) from fold to fold. The forms must have sprocket holes punched along both margins .25 $\pm$ .03 inches (6.35 $\pm$ 0.76 mm) from the paper edge to the hole centerlines. The distance between hole centerlines must be .500 $\pm$ .005 inches (12.7 $\pm$ 0.13 mm) non-accumulative, and the diameter of the holes should be .156 $\pm$ .010 inches (3.96 $\pm$ 0.25 mm). The distance across the sheet between sprocket hole centerlines must be uniform within .015 inches (0.38 mm). Multiple part forms shall be suitably locked with a non-metallic locking device. Locking the right edge only is not recommended.

SAFETY PRECAUTIONS

The upper cabinet cover should never be removed by the operator without first unpluging the printer line cord from its power source.

Safety Interlocks Switch

The printer is provided with a safety interlock switch which is located under the right front corner of the front cover. Removal of either the front cover or the upper cabinet cover while printing will cause the switch to open and the print head to stop.

PRINCIPLES OF OPERATION

GENERAL

This section explains the principles of operation for the Matrix Printer and should be used in conjunction with the Logic Diagrams section of this manual. The explanations are divided into two major sections: Print Head Electronics and Electro Mechanical Assemblies; and Controller Electronics. The first section is explained through the use of functional drawings, timing diagrams and detailed written explanations. The explanations are arranged by assembly functions to facilitate location and use of the information. The second section, Controller Electronics, also uses functional drawings, timing diagrams and detailed written explanations. In addition, flowcharts are employed to aid in establishing the sequence of logic events. These explanations are arranged in the sequence in which they would occur during normal printer operation.

FLOWCHART SYMBOLS

Eight symbols are used in the flowcharts which appear in this manual. The symbols are illustrated in Figure 3-1 and are explained in the following text.

Normal Event Symbol. The normal event symbol is used to indicate an event which occurs at a definite time within the flow.

Special Event Symbol. This symbol is used to indicate that the event is of special significance to the user of the flowchart. It may indicate that the event occurs in a machine other than the one in which most of the events occur or as a result of a series of events which are charted or described elsewhere in the document. This symbol may also be used to designate an event which may happen at any time during a series of other events. Used in this manner the symbol usually indicates such unpredictable events as a parity error or an out of paper condition.

Check-For-Condition (Decision) Symbol. This symbol indicates a decision which occurs at a definite point in the flow and always determines the direction the flow takes subsequently.

Entry Symbol. The entry symbol is used at the beginning of a flowchart and at any point where information from another flowchart enters the subject flowchart.

Termination Symbol. The termination symbol is used at the end of a flowchart. Depending on how the sequence of operations being charted occur, a flowchart may have one or several termination symbols.

Intraflow Exit and Entry Continuity Symbols. These symbols are used to show flow continuity within a particular flowchart. They may be used to represent an exit from one point of the flow and an entry into another point of the same flow or to show continuity where the flow extends for more than one page.

Interflow Continuity Symbol. This symbol indicates that the sequence of operations described in one flowchart leads directly to a sequence described in another flowchart. When this symbol is used a letter will appear inside of the symbol and the same letter will appear inside the entry symbol on the subsequent flowchart.

Logic Sheet Reference Numbers. These numbers are provided on most flowcharts after the written statement of the event which has occured. The numbers are provided to aid the user of the flowchart to locate the point in the detailed logic (in the Field Service Manual) where the event occurs. These numbers will appear in parentheses and have two parts. The first part indicates the exact logic sheet number and the second part indicates the logic element and pin number. For example the reference number (00301/A1-5) indicates that the event occurs on sheet 00301 in the logic. It further indicates that the event occurs or can be checked at pin 5 of logic element A1 on that sheet.

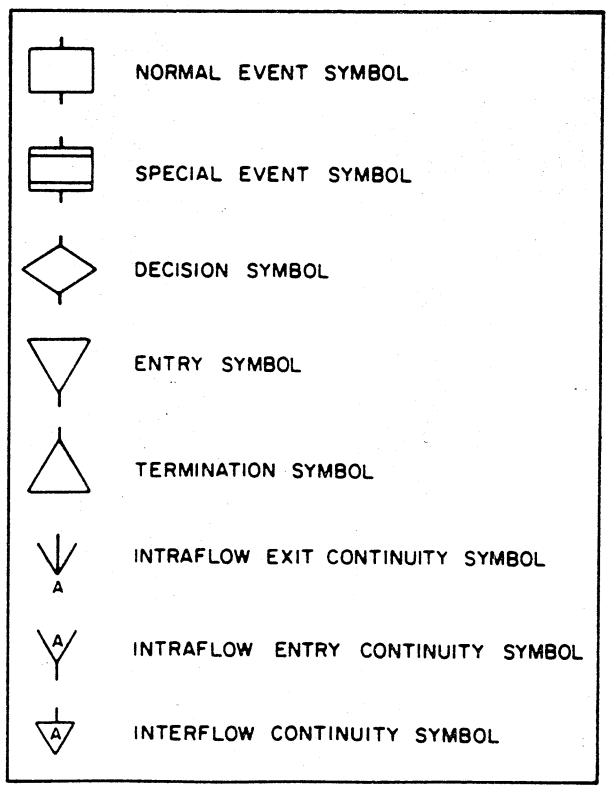


FIGURE 3-1. FLOWCHART SYMBOLS

POWER DISTRIBUTION

General Description (Figure 3-2)

Power distribution is split into two subsystems; ac distribution and dc distribution. The ac power enters the printer through a three conductor line cord which is connected to a dual purpose double pole circuit breaker and illuminated ON/OFF switch (3CB1). The ac input voltage is then filtered through line filter 3LF1. When this On/Off circuit breaker switch is depressed to the on position, input voltage is supplied through the line filter to the cooling system blower fan and to the primary of the power transformer.
Voltage ranges are tap selectable by changing field accessible input power terminal block connections. No component changes are required when changing from 60 Hz to 50 Hz operation. The tap selectable ranges are as follows:

Nominal (VAC)	Voltage Range
100	90 to 107
120	104 to 127
200	180 to 213
220	198 to235
230	207 to 246
240	216 to 257
260	234 to 278

The input to the transformer is stepped down to four ac output voltages. The four voltage outputs are: 30 vac, 55 vac and two separate 16 vac. On some units a special VDE/IEC fuse protection option is provided with the addition of fuses on the 30 vac and the two 16 vac outputs. The four ac output voltages then enter the power supply board where they are converted into dc voltages. The dc distribution is initiated on the power supply board. The power supply developes six dc voltages; 36 vdc, -36 vdc, +5 vdc, - vdc, +12 vdc and -12vdc. The +36 vdc and the - 36 vdc are used to supply power to the vertical (paper motion) and horizontal (print head transport) servo linear power amplifiers, which in turn supply power to drive the print head transport and paper motion servo motors. The +36 vdc also provides power to the needle driver coils.

The +12 vdc and -12 vdc are used to power the servo linear control circuits.

The +5 vdc and -5 vdc are used to power the controller circuits. The +5 vdc also supplies power to the servo digital control circuits.

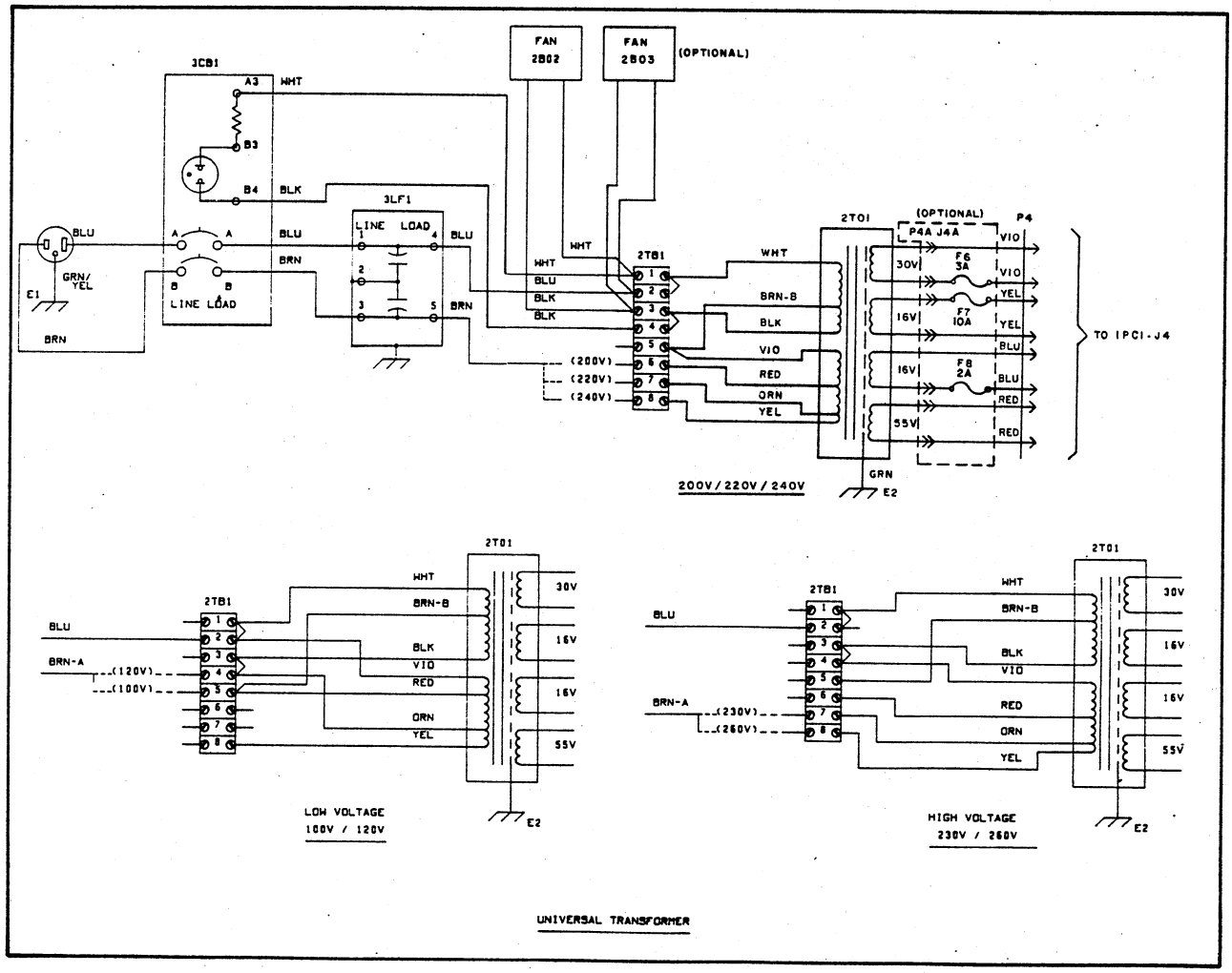


FIGURE 3-2 POWER DISTRIBUTION

+5 and +12 Volt Power Supply (Figure 3-3)

The +5 and 12 vdc are generated by a 16 vac rms output from th transformer that is full wave rectified by diode bridg CR16 through CR19. The rectified 16 vac is then filte ed by capacitor C15 to obtain approximately 20 vdc with several volts of ripple. The +20 volts is then routed to two independant (+12V) voltage regulators. These regulators are standard commercial 3 terminal integrated circuit devices. The +12 volt outputs are regulated by regulator action of VR1 and VR2 and capacitors C23 and C24. Diodes CR24 and CR26 protect the regulators when a fault condition occures that would cause SCR2 to Crowbar.

Silicon controlled rectifier (SCR2) is a fault protection device that grounds the input voltage to the regulator through current limiting resistor R28. The +5 volt output voltage is sensed at the Gate of SCR2 through zener diode CR22 and resistor R29. The two +12 volt outputs are sensed through Zener CR25, R41 and Zener CR27 and R42. The +5 volt regulator is a switching mode regulator. IC2 (723C) is used as a voltage reference source as well as voltage comparing device which controls the Turn On/Turn Off Action of series transistor switch Q5. When Q5 is turned on the current flows from the input 20 volt dc voltage source through Q5, through storage inductor CL3, through the current limiting sense resistor R38 to the load and energy storage capacitors C20 and C21. When the output voltage at the load slightly exceed 5 volts, it is sensed at IC2 pin 2 via R36. Voltage regulator IC2 then turns off transistor switch Q5, disconnecting the 20 volt input source. The energy stored in inductor CL3 and capacitor C20 and C21 maintain current flow through the load. This closed loop action of current flow is provided by fast recovery diode CR23. When the output voltage drops to a value slightly below 5 volts, series switch Q5 turns on and the cycle is repeated. This constant switching action to the +20 input by the collector of Q5 maintains a 5 volt output at the load. The switching frequency is in the range of 5 to 12 KHz. Resistors R37, R38 and R39 are used for the current limit sensing circuitry internal to voltage regulator IC2. Potentiometer P2 is used to adjust the output voltage regulated by IC2 to 5 volts.

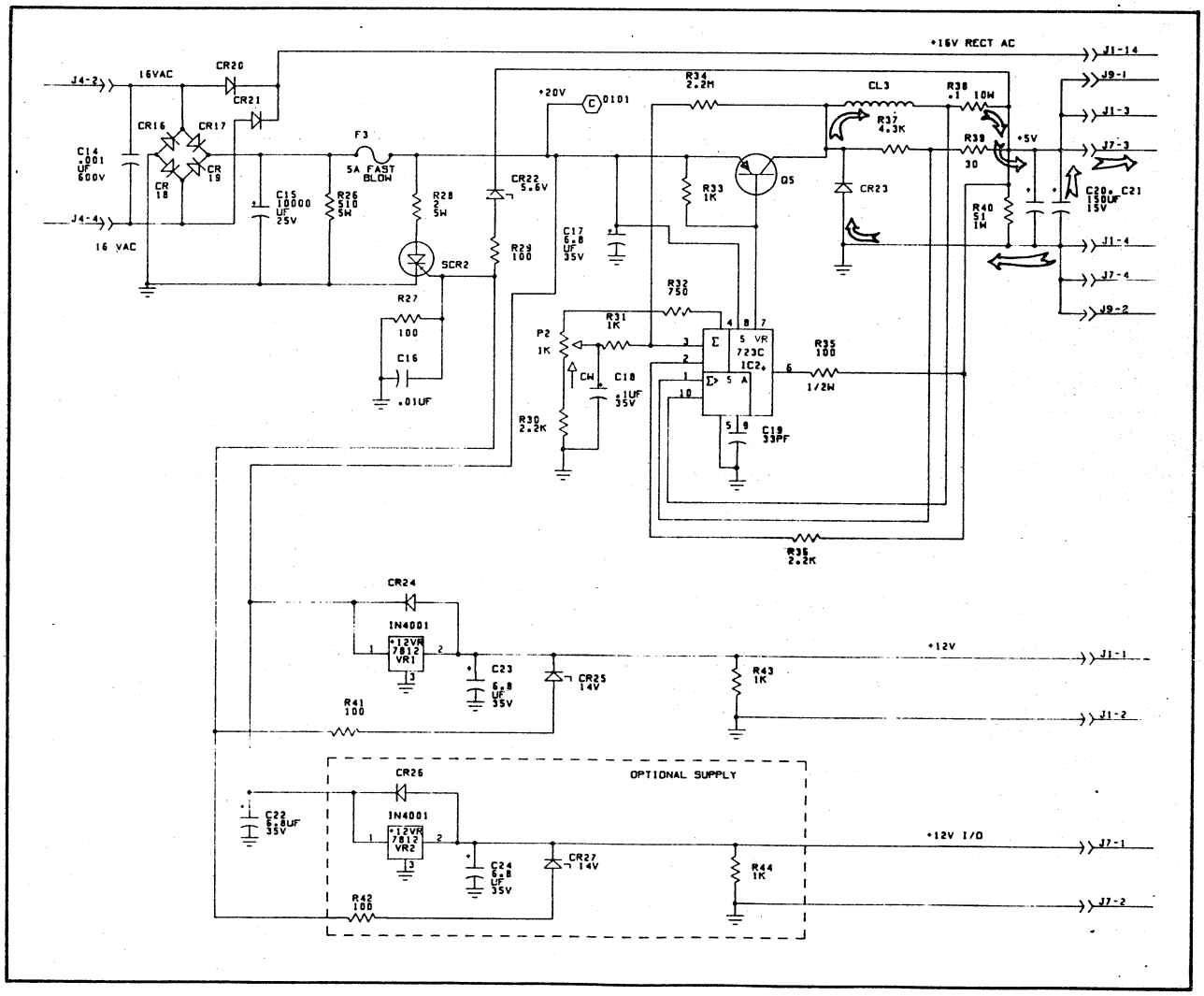


FIGURE 3-3 +5 and +12 VOLT POWER SUPPLY (9PC1)

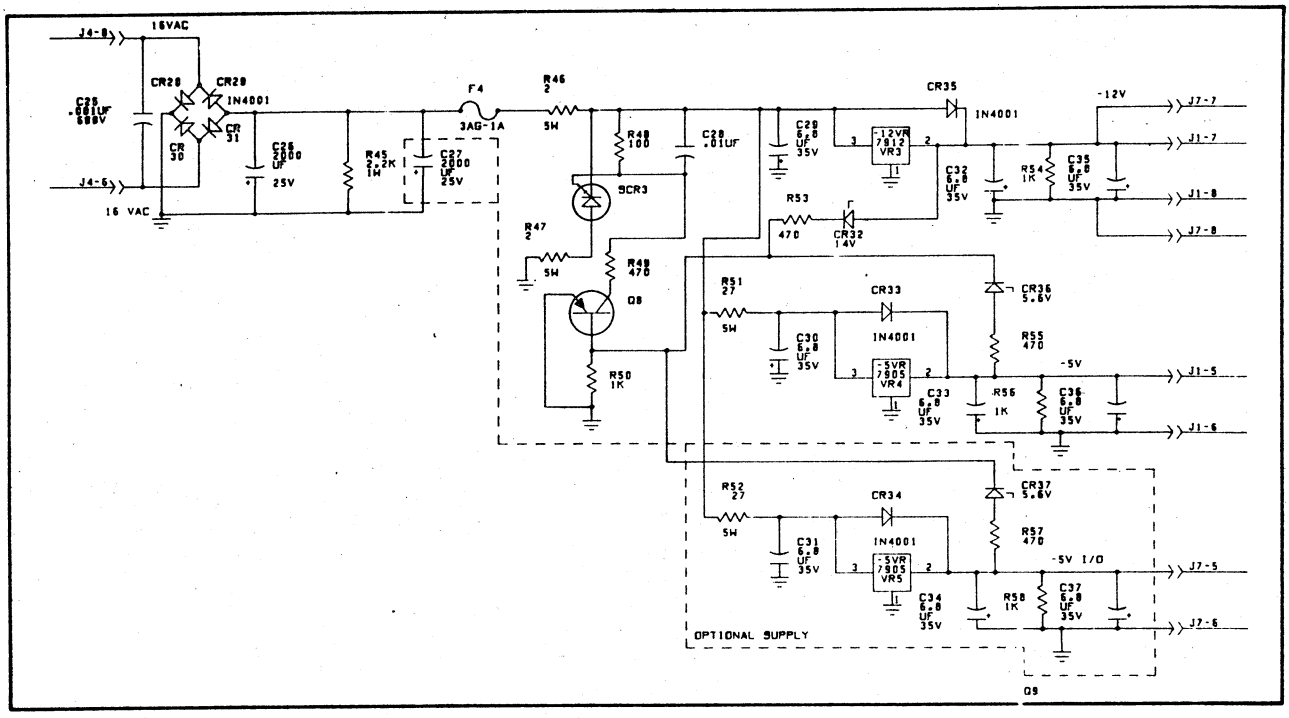


FIGURE 3-4. -5 AND -12 VOLT POWER SUPPLY (1PC1)

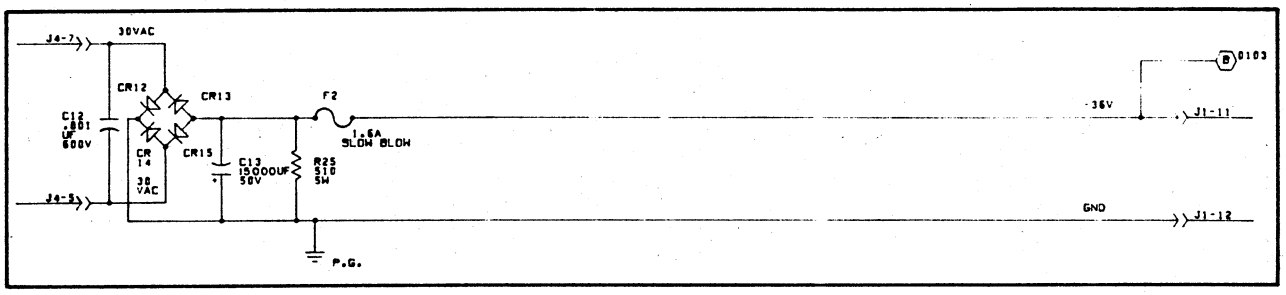


FIGURE 3-5. -36 VOLT POWER SUPPLY (1PC1)

-5 and -12 Volt Power Supply (Figure 3-4)

The -5 and -12 vdc are generated by a 16 vac rms output from the transformer that is full wave rectified by diode bridge CR28 through CR31. The rectified 16 vac is then filtered by capacitor C26 to obtain approximately -20 vdc. The -20 volts is then routed to three independant voltage regulators VR3 (-12V), VR4 (-5V) and VR5 (-5V). Resistors R51 and R52 reduce the input voltage to the two -5 volt regulators VR4 and VR5, thus reducing heat generation. Zener diodes CR32 CR36 and CR37 in ocnjunction with transistor Q8 are used to sense over voltage at the regulated outputs of regulator VR3, VR4 and VR5 by causing Selecon Controlled Rectifier SCR3 to Crowbar. SCR3 is a fault protection device, that when closed, grounds the input voltage to the regulators through current limiting resistor R46 and R47.

-36 Volt Power Supply (Figure 3-5)

The -36 vdc is generated by a 30 vac rms output from the transformer that is full wave rectified by diode bridge CR12 through CR15. The rectified 30 vac is then filtered by capacitor C13 to obtain -36 vdc.

+36 Volt Power Supply (Figure 3-6)

The +36 vdc switch mode regulator, operates in a similar manner as described for the +5 volt switch regulator. The +36 vdc is generated by a 55 vac rms output from the transformer that is full wave rectified by diode bridge CR1 through CR4. The rectified 55 vac is then filtered by capacitor C2 to obtain approximately 72 volts dc. Voltage regulator IC1 (723), which is powered from the +20 volt source, is again used as a reference source and voltage comparitor that controls the Turn On/Turn Off action of series transistor switches Q1 and Q2. Transistors Q3, Q4 and Zener diode CR10 are used to voltage translate the 20 volt operating level of IC1 to the 72 volt operationg level of transistors Q1 and Q2. Similarly as in the +5 volt switch mode regulator, the input source current flows through the transistor switch Q1, through energy storage inductor CL1, to energy storage capacitors C8 and C9 to the load. The current then returns through current limit sense resistor R10 and back to the input source common. Transistor switch Q2, inductor CL2 and fast recovery diode CR9 are affectivly used in parallel with transistor switch Q1, inductor CL1 and diode CR8 to boost the power output capability required

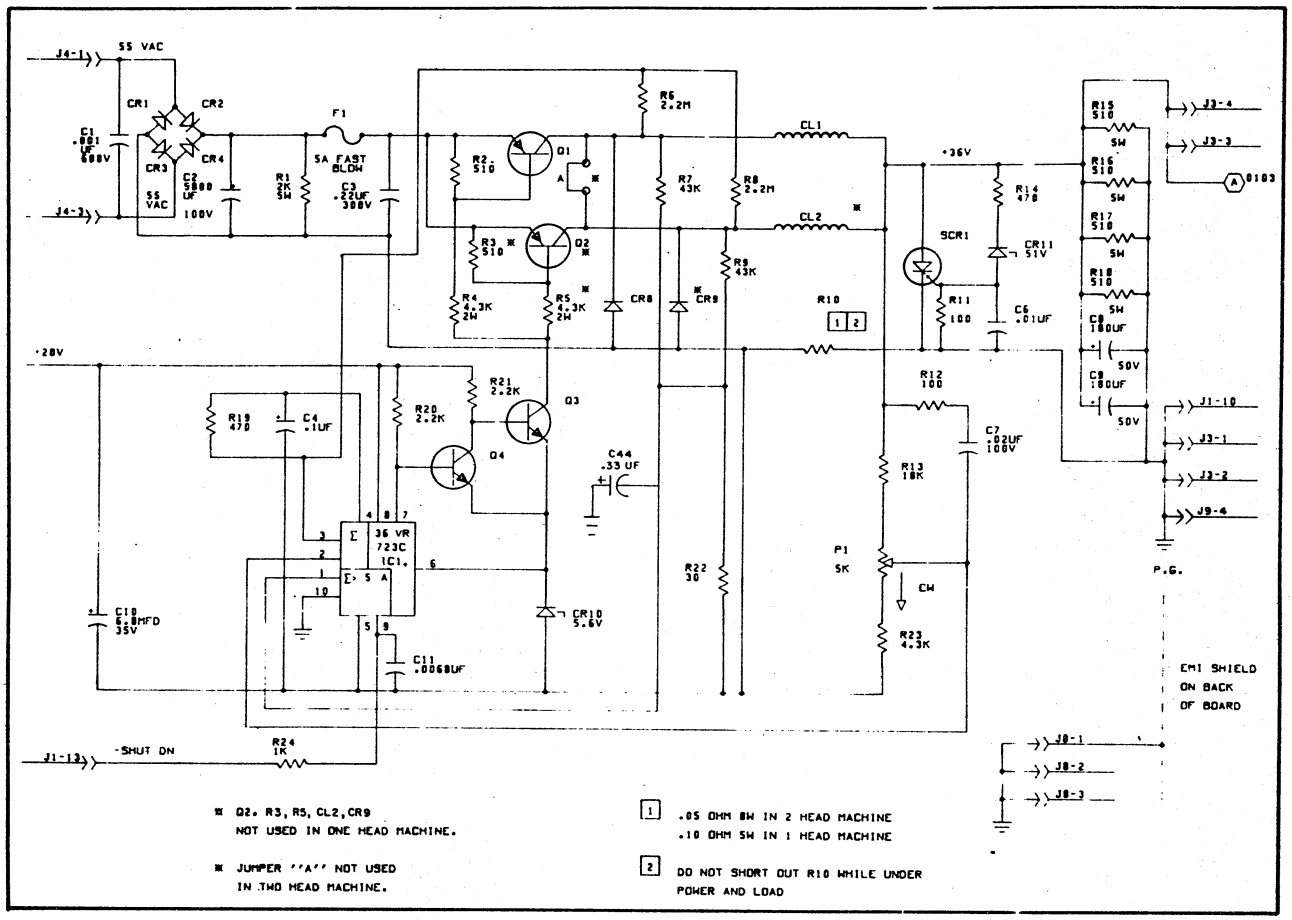


FIGURE 3-6. +36 VOLT POWER SUPPLY (1PC1)

by a single head (70 LPM) machine to that required by a two head (125 LPM) machine. When the output voltage at the load slightly exceeds 36 volts it is sensed by IC1 pin 2 through voltage divider network R13, P1, R23 and speed up response network R12 and C7. Voltage regulator IC1 then turns off the series transistor switches Q1 and Q2 disconnecting the 72 volt input source.

The stored energy in inductors CL1, CL2 and capacitors C8 and C9 maintain current flow through the load. This closed loop action of current flow is provided through resistor R10 and fast recovery diodes CR8 and CR9. When the output voltage drops to slightly below 36 volts, transistor switch Q1 and Q2 are again turned on to repeat the cycle. The switching rate is in the range of 6 to 15 KHz. Zener diode CR11 is used to sense an over voltage condition at the output and turns on Crowbar SCR 1 to short the output to ground.

Resistors R7, R9, R10, R22 and capacitor C44 are used in the current limiting circuits of IC1 to provide current limiting action.

Pot P1 is used to set the output voltage at 36 volts.

Resistor R24 is used to isolate and current limit the electronic shut down input at IC1, pin 9. When the shut down line at terminal J1-13 is grounded it causes IC1 to turn off the series switches Q1 and Q2, thus turning off the 36 volt power supply. This feature is used for the needle driver current fault sensing.

HEAD READY CIRCUITS

The HD RDY circuit samples all the power supply voltages (+5V, +12V and +36V) on the Common Controler Board, plus a rectified 16 vac coming from the Power Supply Board rectifiers CR20 and CR21 (Figure 3-3 and 3-7).

The 16 vac is full wave rectified by CR16, CR18, CR20 and CR21 (Figure 3-3) which is then filtered by C50 (Figure 3-7) such that the crest of the full wave rectified ac is 2.5 volts minimum. This keeps transistor Q22 on and thus Q23 Open (Figure 3-7). If ac power is lost, the base drive to Q22 will be removed turning it Off and allowing Q23 to turn On. This inturn causes Q20 and Hd RDY output transistor Q21 to turn On.

The 16 volt full wave rectified ac is used to detect when the machine is powered Off or looses ac power to generate a logical "0" level. HD RDY signal thus inhibiting p paper and head motion. Similarly a logical "0" level HD RDY and logical "1" level inhibit signal is generated when anyone of the power supply voltages is not up. All voltages are sensed by resistor divider/diode gate neworks CR10, CR11, CR7, CR8, and CR9 (Figure 3-7). Loss of a supply voltage will cause Q20 and Q21 or just Q21 to turn on, thus effecting a Head Not Ready signal. Head Ready signal can be monitored at test point 40 (Figure 3-7). This signal will be at a logical "0" level when the head electronics is not able to operate.

When a Head Not Ready is generated a Servo Inhibit is also generated. When no fault is sensed and the Head Ready is at a logical "1" the following happens. Head Ready is applied to inverting gates R4 whose outputs are held at a logical "0" (Figure 3-7). This causes current flow through the series connected LED's (Light Emitting Diodes) in photocouplers S2 and T2 (Figures 3-8 and 3-9). the LED's in turn, turn on there respective photo transistors which are connected across the base to the Emitter of Q10 and Q11 (Figures 3-8 and 3-9). Since these photo transistors are on, effectively shorting base to emitter, their emitter to collector terminals are open circuited. This open circuited condition has no affect on the operation sources Q13, Q4, Q15 and Q6 of the servo output predrive circuits (Figures 3-8 and 3-9).

When a fault occures the Head Ready signal is in a logical "0" state (Head Not Ready). This causes the outputs of R4 gates (Figure 3-7) to be forced to a logical "1" (open circuit condition) thus interrupting current flow through the LED's in the photo couplers S2 and T2 (Figure 3-8 and 3-9). The LED's in turn, turn off there respective photo transistors which were connected accross the base to the emitter of Q10 and Q11 (Figures 3-8 and 3-9). Since the bases of Q10 and Q11 are no longer shorted to their emitters they are forced to conduct by base drive current through R30 and R36. Q10 and Q11 now being a short circuit from collector to emitter causes base drive to be removed through current sources Q13, Q4, Q15 and Q6 of the servo output predrive circuits. This in turn causes the remaining servo drive transistors Q12, Q5, Q14 and Q7 to also be in an off or non conducting state. Thus preventing any base drive current flow from opperating the final output drivers Q6, Q7, Q9 and Q10 on the Power Supply Board.

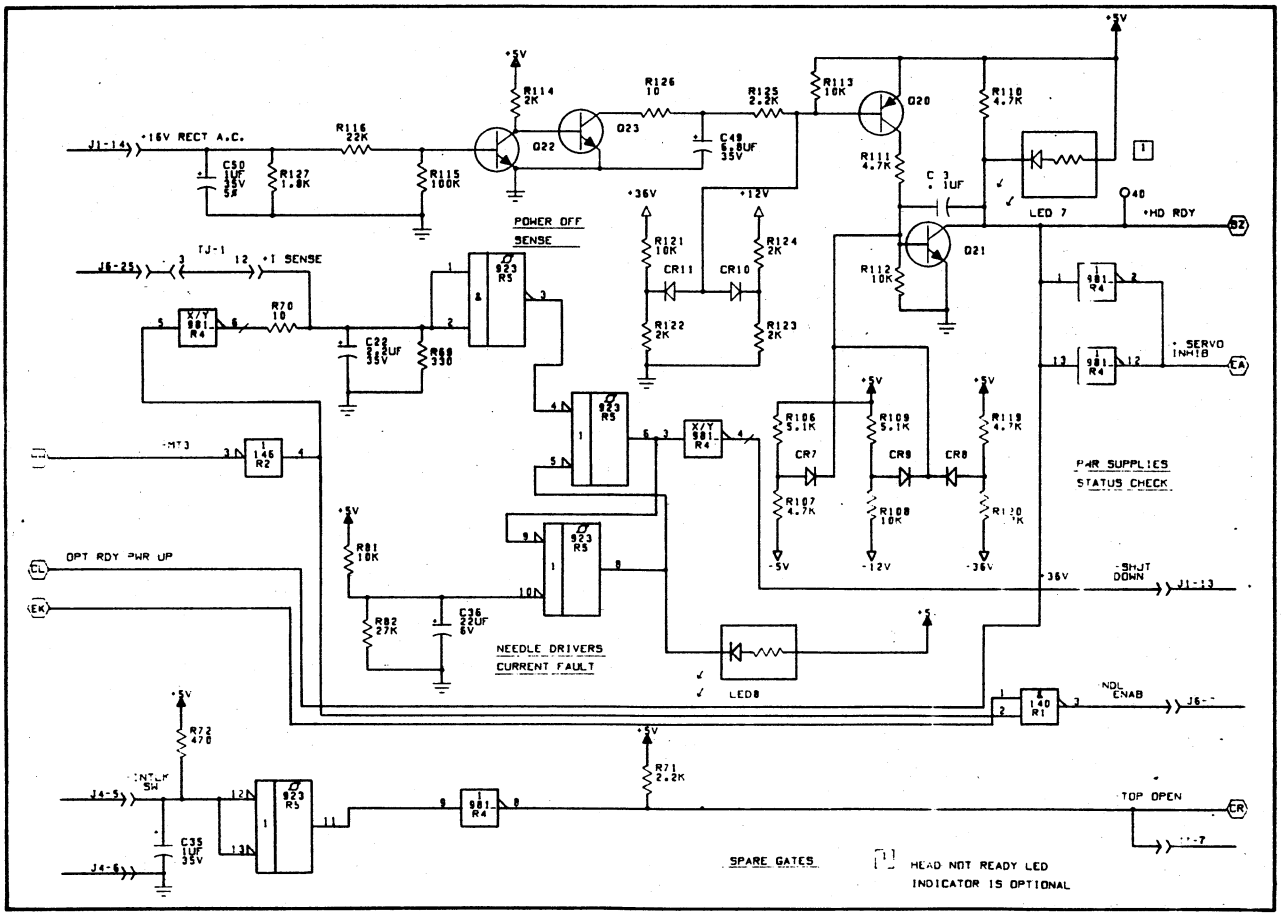


FIGURE 3-7 HEAD READY CIRCUITS (1PC2)

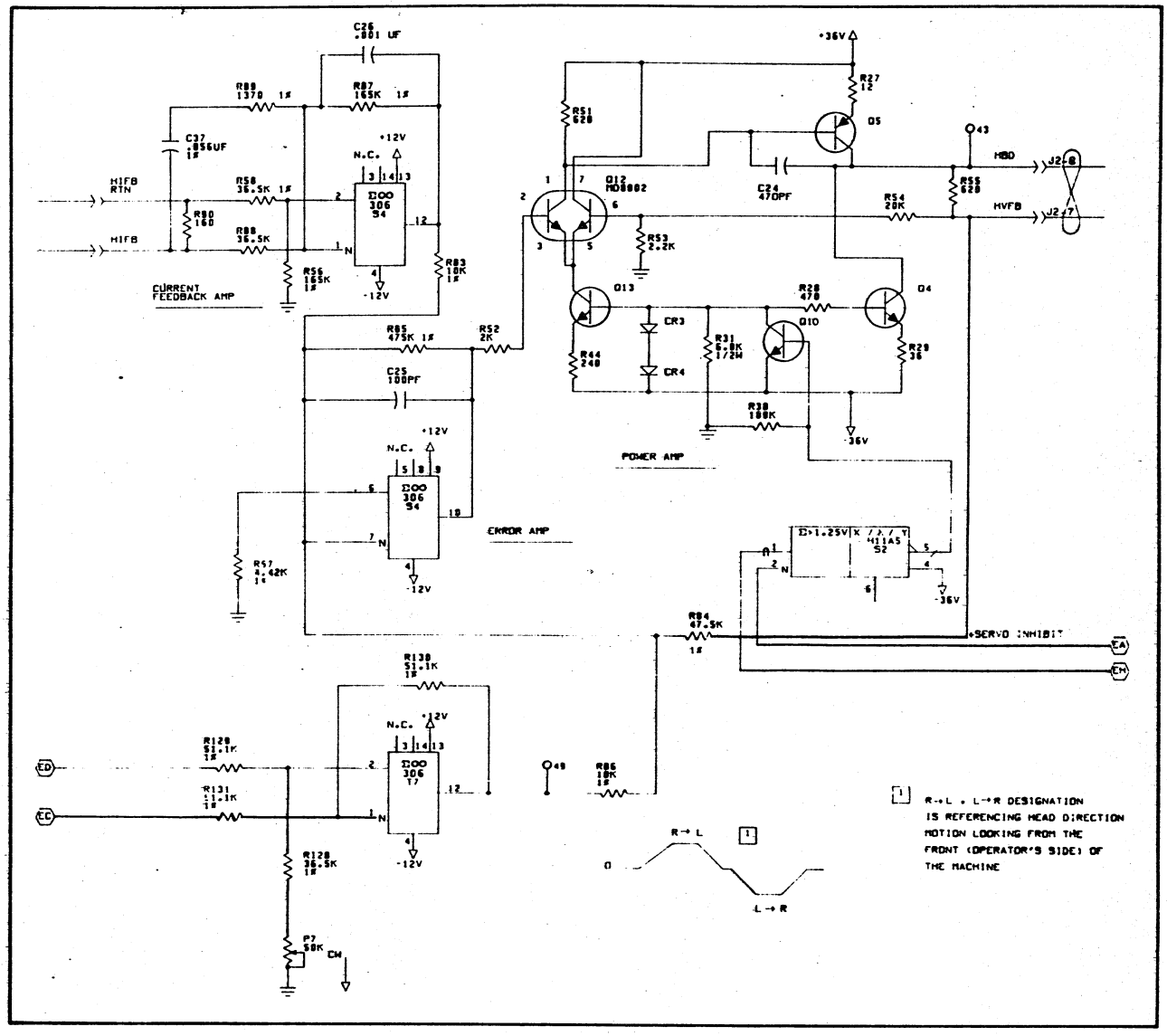


FIGURE 3-8 HEAD READY CIRCUITS (1PC2)

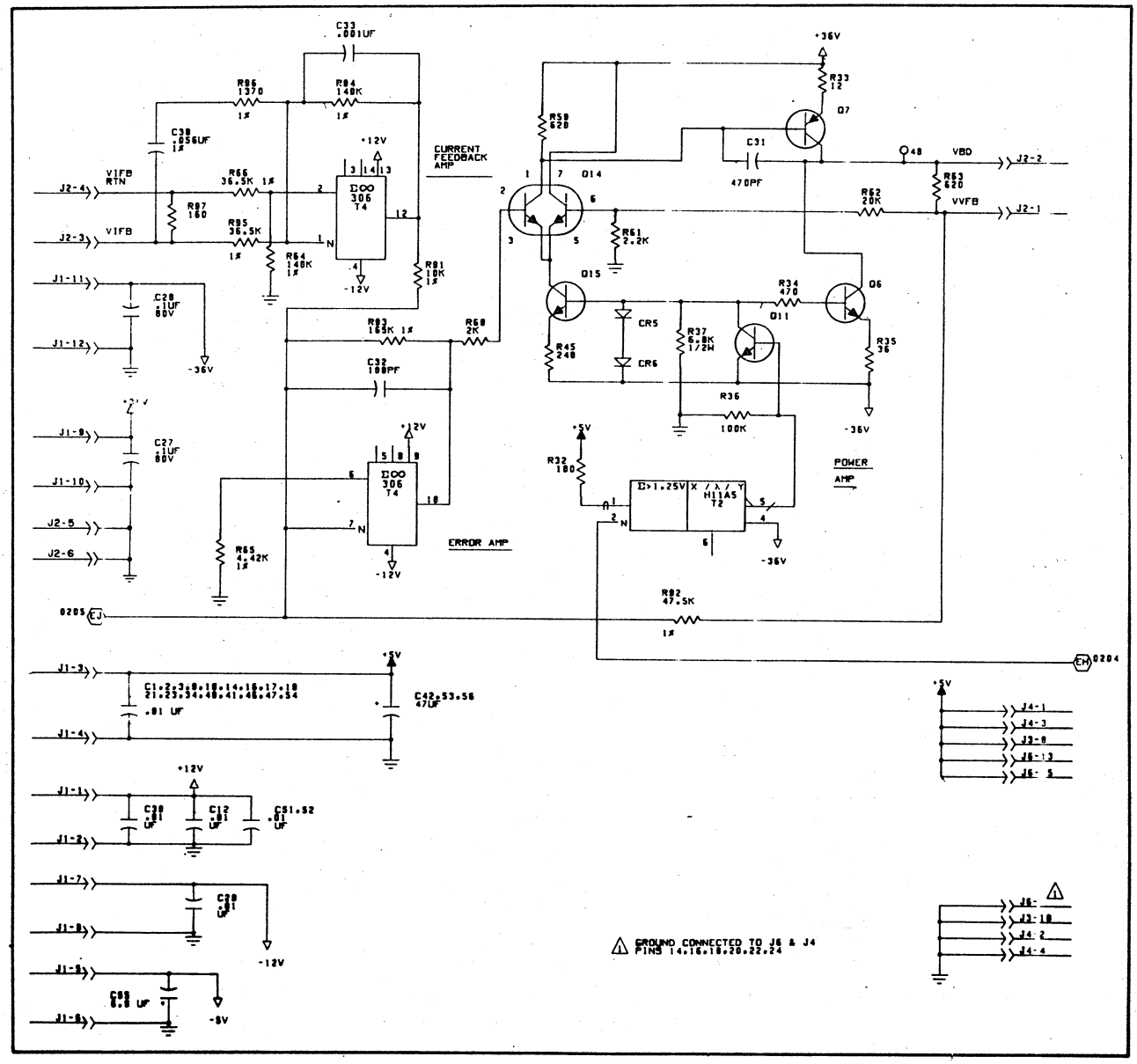


FIGURE 3-9 HEAD READY CIRCUITS (1PC2)

PRINT HEAD AND NEEDLE DRIVERS

Print Head (Figure 3-10)

The print head contains the print wires and solenoids necessary to perform a print operation. The print head has nine steel print wires (sometimes refered to as print needles) that are guided through molded plastic gu des. Each of these nine print wires is actuated by a solenoid driver armature. When a solenoid is actuated by the driver circuit, it propels its print wire toward the platen. The print wire impacts the ribbon, driving it against the form and platen, leaving a dot impression on the form. As the print head moves horizontally across the print station, the solenoids activate the print wires, creating a series of dot patterns within a programmed matrix. The pattern of these dots in the matrix forms the character. Two types of print heads are available, the standard nine wire head and the optional nine wire overlapping head. The standard nine wire print head has the wires arranged in a single vertical column. The optional nine wire overlapping print head is identical to the standard 9 wire head with the exception that it has its print wires arranged in two vertical columns that allow the printed dots to overlap in the vertical direction. This is accomplished by the print head having two vertical rows of wires in a staggered 5-4 pattern that are located on an integral number of half dot positions apart. The controller is then programmed to delay information to one column of wires so that they will print in the same physical location as the other column of wires, thus producing an overlapped row of nine dots. Both the nine wire and the nine wire overlapping print heads are spared as assemblies only and are not intended to be reworked or repaired when rendered inoperable due to failure or end of life.

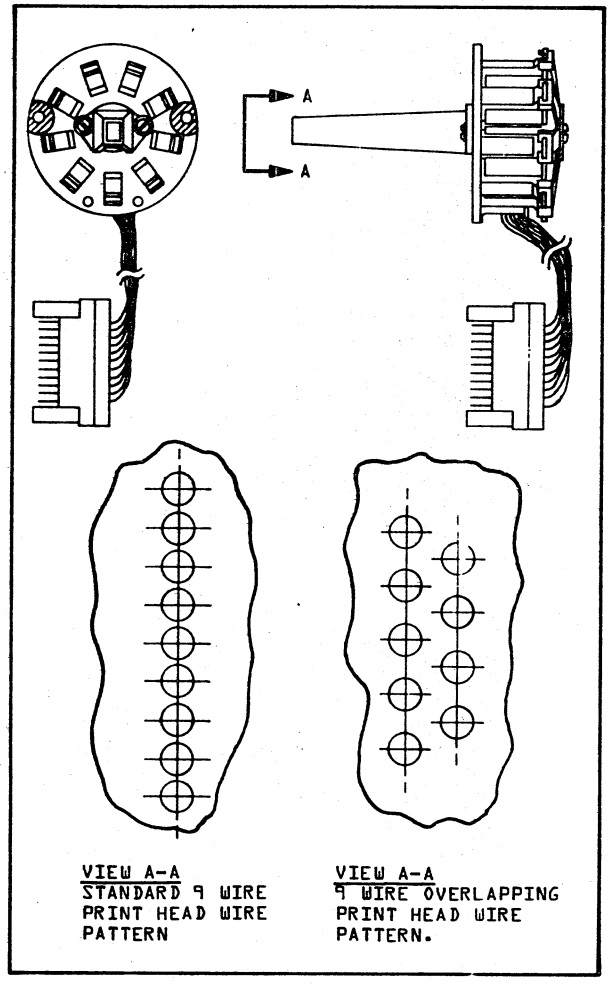


FIGURE 3-10 PRINT HEAD

Needle Drivers (Figure 3-11)

Either 7,9,14 or 18 identical Needle Driver circuits may be used on 70/125 LPM Matrix Printers and is dependent on the number of heads used (one or two) and the number of print needles being fired on each head (7 or 9).

Since each of the needle driver circuits is identical, only one will be discribed below.

Each of these circuits are basiclly constant current pulse width modulation switching circuits. In conjuction with each of these circuits is a common Strobe or Needle Enable (NDL/ENAB) line which is activated at every possible dot location during a character time. The input control circuit of this common Strobe line is a pulse approximately 550 micro seconds in duration with an approximate repetitive rate of 625 micro seconds (Figure 3-7). Current flow into the needle drivers is sensed by a diode transistor network to detect current flow at invalid times and through further logic, giving us a current fault sense detection capability.

The average current through the needle solenoids is adjusted by a potentiometer (P1) setting a reference voltage for all needle driver circuits through a common bus.

When this needle driver is not selected and not enabled, the needle driver switching operation is as follows (Figure 3-1). The logical "0" of the select line is transferred at the output of the non inverting, 7407, open, collector gate, thus holding output transistor Q2 off. The logical "0" at the base of Q2 is then coupled through diode CR2 to operational amplifier/comparitor IC01, thus holding the output (IC01 pin 8) off. Since there is no base current of Q1 flowing through R4, transistor Q1 is also held off. Q1 and Q2 being off allows no current flow through the needle driver solenoid that is connected between the collectors of Q1 and Q2, thus causing the needles not to fire.

When the needle driver is selected, enabled and allowed to fire, the needle driver switching operation is as follows (Figure 3-11).

A logical "1" of the Select line (SEL) is transferred through the 7407 gate to the base of Q2. The needle enable bus is activated to a +36 volt level making available base drive current to Q2 through R8. The potential at the base of Q2 immediately rises above 1 volt, thus reverse biasing CR2 and removing the inhibit of IC01.

Since at the beginning of the cycle there was no current flow through the needle solenoid that was sensed by Q2's emitter resistor R1, and the voltage developed across R1 is less than the reference voltage applied at pin 3 of IC01, this causes IC01 to turn on. This also causes the output of IC01 pin 8 to go low, thus causing Q1 to turn on and allowing current to flow through the needle driver solenoid. This state is maintained until the current flow through the solenoid reaches approximately 2.8 amps. This current amplitude causes the voltage drop across sense resistor R1 to exceed the reference voltage compared by IC01, IC01 then turns off causing Q1 to also

turn off, interrupting the +36 V current flow from the power supply to the needle solenoid. Current flow through the needle solenoid is maintained through the fast recovery, free wheeling diode CR3 via Q2. In this state the needle current flow is looped through the series connected network of the needle solenoid, CR3, Q2 and current sense resistor R1. When the current amplitude drops below approximately 1.8 amps, the voltage drop across R1 is less than the voltage reference and causes IC01 and Q1 to turn on again repeating the cycle. This Turn On/Turn Off switching state is maintained until the end of the drive cycle determined by the needle enable pulse width. When the end of the pulse drive cycle is completed by the needle enable buss going to "0" volts, the base drive to Q2 is removed. The output of IC01 is then inhibited through diode CR2, thus turning off Q1. The solenoid current is now decayed to zero through free wheeling diodes CR1 and CR3. In this state the needle solenoid is connected across the +36 volt supply acts as a 36 volt Zener, however the current is absorbed by C7 and not disipated as heat as would be the case in an actual Zener diode.

Any current flow to the solenoid driver circuits is through R9 in parallel with CR4. The voltage drop across R9, clamped by CR4, is sufficient to turn on Q3. Q3 then applies +36 volts through R12 on the Current Fault Sense 1 line (ISENSE). This voltage level is further processed by the needle drivers current fault circuits on the Common Controller Board (1PC2).

The needle driver current fault circuit as shown in Figure 3-7 operates as follows.

Cross coupled gates R5 are connected as a Set/Reset Flip/Flop and is reset to a logical "0" at pin 6 of R5 by a resistor capacitor network connected to pin 10 of R5 when the machine is powered up. A current fault will set the Flip Flop output pin 6 or R5 to go to a logical "1" which is then coupled to the open collector of inverting gate R4 pin 3. The output or R4 pin 4 is routed to the +36 volt control regulator IC1 on the Power Supply

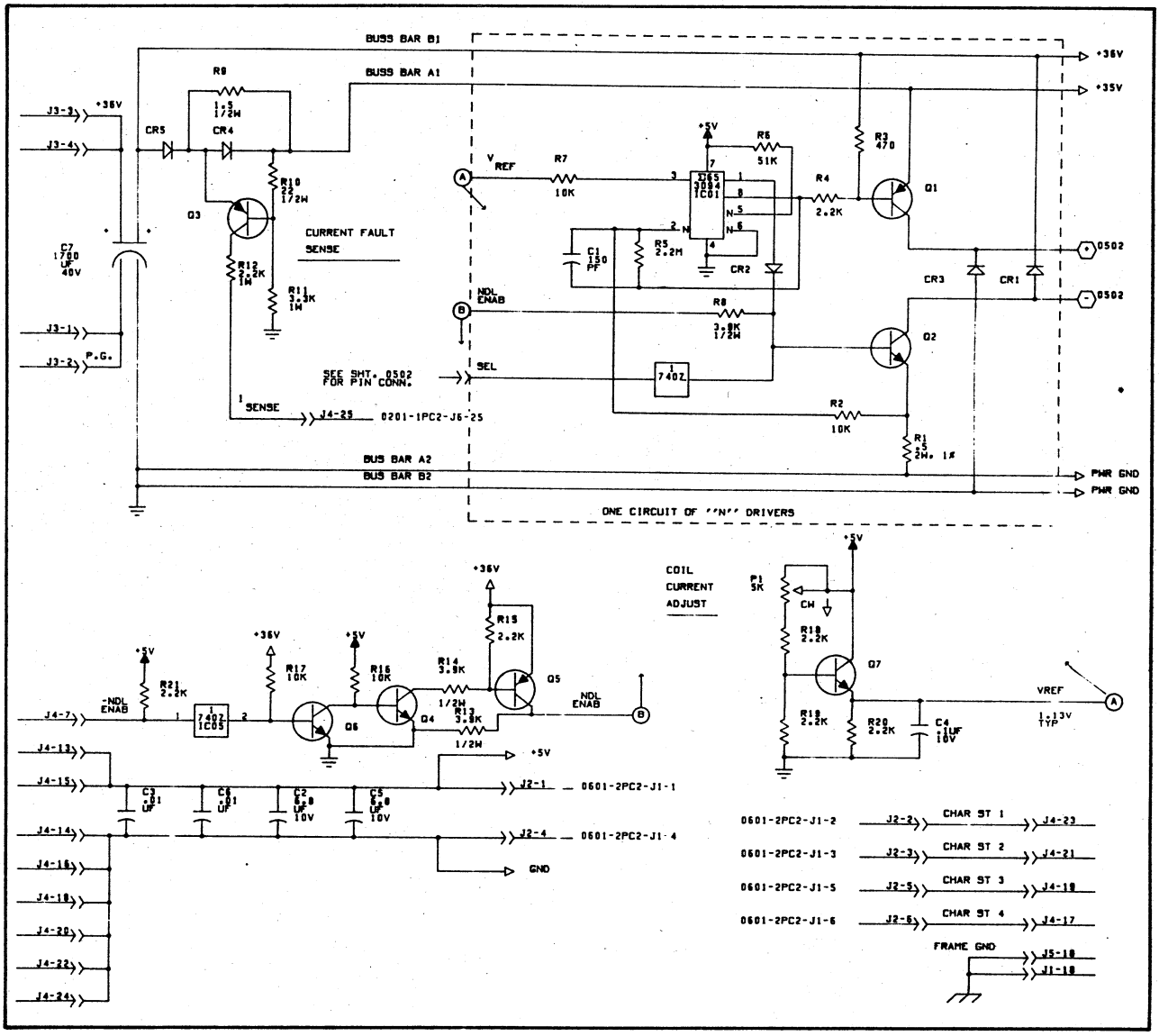


FIGURE 3-11 NEEDLE DRIVERS (2PC1)

Board (Figure 3-6). In the fault condition the control regulator is forced to turn off, thus shutting down the +36 volt supply and removing the fault current. This causes the head not ready signal to be activated. The Flip/Flop set by the fault can only be reset by powering down the machine. If fault is still sensed after the power up sequence, the power supply will shut down again. A needle driver current fault is sensed and sets the Flip/Flop R5 as follows (Figure 3-7).

Whenever needle solenoid current flow occurrs (determined by the MT3 signal), the output of gate R4 pin 6 is held low. The current sense signal coming from the needle driver as previously described is logically "Anded" at this junction and coupled to the input of gate R5 pins 1 and 2. Since the logic level in this normal state is"0", the output of gate R5 pin 3 is held at a logical "1" and has no affect on the state of Flip/Flop R5. A fault occures whenever (ISENSE) Current Sense line is in a logical "1" active state and MT3 is at a logical "1" inactive state. The output of gate R4 pin 6 no longer holds the input of gate R5 pins 1 and 2 at logical "0". The voltage at gate R5 pins 1 and 2 is thus allowed to rise to a level sufficient to turn the gate on and apply a logical"0" Set signal to the Flip/Flop. The time delay by C22 and R69 on the Controller Board and R12 on the Needle Driver Board.

PRINT HEAD AND PAPER MOTION SYSTEMS

Print Head Drive (Figure 3-12. The print head is attached to a print head support assembly that is belt driven horizontally back and forth along two print head support shafts by a dc servo motor.

Servo motor control circuits monitor and maintain the speed and control the direction of the print head by pulsing the voltage or reversing the current to the dc servo drive motor.

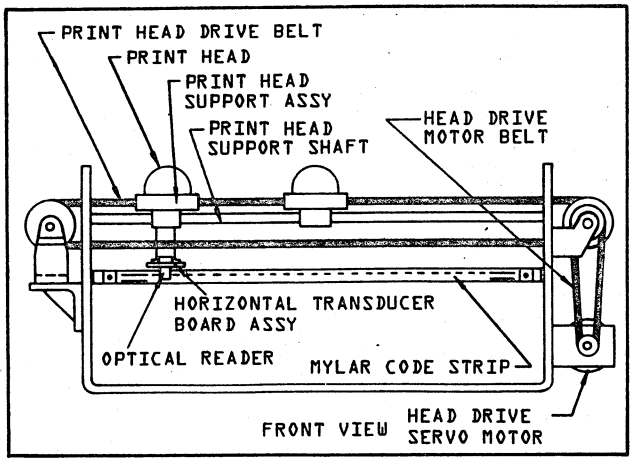


FIGURE 3-12. PRINT HEAD DRIVE AND MONITORING

Print Head Monitoring (Figure 3-12). The position of the print head is monitored by an optical reader mounted to the print head support assembly. As the print head moves horizontally back and forth the optical reader monitors a fixed mylar code strip. The code strip contains windows that when monitored indicate the 132 character positions as well as the left and right home position of the print head.

The 125 lpm printer with two heads uses a two channel optical reader and a code strip with two rows of horizontal windows. The first row of windows indicate the 132 character positions and the second row has two windows that indicate the left and right home position.

The 70 lpm printer with one head uses a four channel optical reader and a code strip with 4 rows of windows. The first two rows of windows indicate the 132 character positions and the left and right home positions when printing in the standard 10 characters per inch mode. The bottom two rows of windows indicate the 217 character positions when printing in the optional (compressed pitch) 16. 5 characters per inch mode. When printing in the compressed pitch mode, the long windows on all four rows are used to indicate the left and right home position of the print head.

In both the 10 and 16. 5 characters per inch modes it should be noted that the odd character position windows are in one row and the even character position windows are in the adjacent row. The staggering of these windows is done to help keep track of the heads position seeking functions.

Paper Motion System (Figure 3-13)

The paper motion system can be activated by a manual control panel forms feed switch or by an electrical command from the controller.

The vertical forms advance is driven by a dc servo motor, while the distance the forms travel is controlled by a code disk and optical reader. The standard 70 and 125 L. P. M. printers are provided with 6 line per inch spacing. An optional operator selectable 6/8 line per inch option is also available.

When a paper motion pulse is received, forward drive current is applied to the servo motor. The servo motor gear drives the tractor drive shaft. The tractor drive shaft drives the tractor sprockets, which engage the forms, causing paper motion. Servo motor control circuits monitor and maintain the speed of the servo motor by controlling the amount of forward drive current applied to the motor. To stop the motor a reverse drive current is applied to the servo motor. Once the servo motor is stopped a one way bearing on the tractor drive shaft prevents reverse rotation of the drive shaft.

The distance the forms travel is measured by a code disk mounted on the servo motor drive shaft. The code disk, in conjunction with a two channel optical reader generates the pulses used to generate the stop the paper (STP) pulse. The standard code disk generates both 6 and 8 line per inch pulses which are read by the 2 channel optical reader and sent to the controller. On standard printers the controller only accepts the 6 line per inch pulses. On printers with the 6/8 line per inch option installed, the controller will only accept the pulses of the line per inch mode selected.

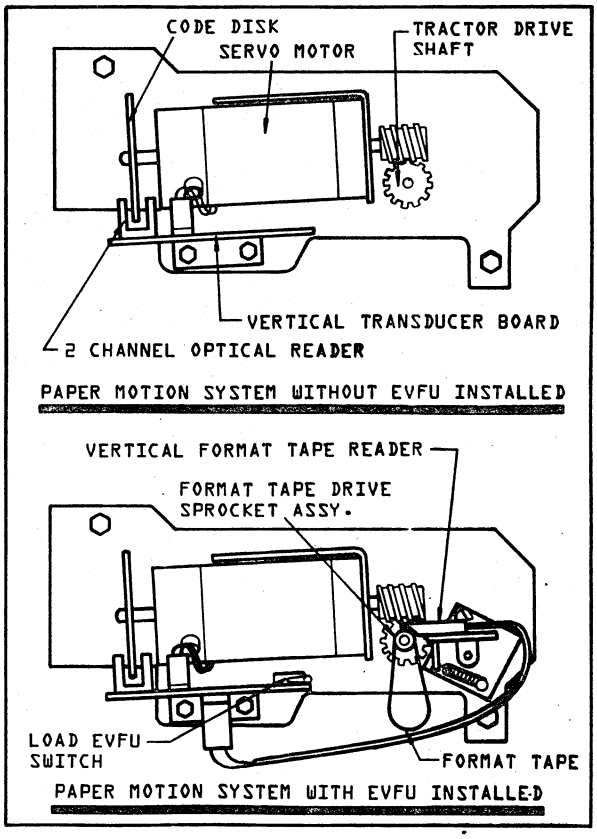


FIGURE 3-13. PAPER MOTION SYSTEMS

The standard controller will respond to the four ASCII control codes: Line Feed ((LF), Form Feed (FF), Vertical Tab (VT), and Carrage Return (CR),. The standard paper motion system without the EVFU (Electronic Vertical Format Unit) Option installed will not respond to two of the ASCII codes -Forms Feed (FF) and Vertical Tab (VT) and converts them into Line Feeds (LF) whenever they are detected at the interface.

EVFU (Electronic Vertical Format Unit) may be installed as an option to the standard paper motion system. The EVFU consists of a format brush reader and a load EVFU switch.

The primary function of the EVFU is to read a punched format tape and load it into a controller memory where it is combined with code disk pulses to determine the line spacing.

When the EVFU paper tape is loaded in the reader and the load switch (mounted on the Vertical Transducer Printed Circuit Card Assembly) is actuated, the tape will pass through the reader until two successive form feeds (channel 1 top of form) are sensed, then, the tape is automatically re-read to check the loaded data. The tape will stop when a successful load and check has occurred. The tape may then be removed.

The maximum length of the format tape loaded into EVFU may not exceed 176 lines. The format tape must be reloaded whenever the 6/8 line per inch mode is changed.

The Paper Runaway Option is required in the printer whenever the EVFU option is added, and prevents a runaway condition from occurring while loading the EVFU data. No controller hardware or software changes are required to use the EVFU option.

A manual vertical forms positioning lever and knob are also provided in the paper feed assembly. The clutch retractor lever when pressed, disengages the clutch on the tractor shaft and the forms can then be moved up or down as required by turning the tractor shaft knob. An additional real time, vertical format tape, brush reader unit is also available as a special option.

HORIZONTAL AND VERTICAL SERVO SYSTEMS

General

Since the control loop for both the horizontal (head motion) and vertical (paper motion) servo amplifiers are identical, only one (the vertical paper motion) will be explained up to the point where the velocity command section diverges.

Servo Control Loop (Figures 3-14 and 3-15)

The servo operates by the back EMF (Electro Motor Force) voltages feedback control theory. For example a voltage scaled to a desired velocity is introduced at the summing input of the error amplifing T4 chip. The actual voltage on the motor is then fed back to the summing input to drive an error correction voltage which is then amplified by a power amplifier to a sufficient level to drive the motor. The motor current which is indicative of the load on the motor is sampled and converted to a voltage proportionate to the current and amplified by T4 chip. This voltage is added to the original velocity command voltage signal and compensates for a varying load on the motor.

The detailed operation of the Servo Control Loop is as follows (Figure 3-9). The velocity command voltage is injected at the inverting summing input of error amplifier T4 together with the motor terminal voltage feedback through R92 and motor current sampling through R91. Motor current is sampled and converted to a voltage by a . 39 ohm resistor on the Power Supply Board and applied to the input pins 1 and 2 of differential amplifier T4. The resistor capacitor networks around the amplifier selects the amplifier gain and forms a lead/lag network for servo loop stability. The combined signals applied to error amplifier T4 pin 7 are amplified to obtain an error control signal at the input of the power amplifier. The power amplifier then raises the small error signal to a voltage and current level sufficient to operate the DC motor. The power amplifier quiescent operating point is set by two constant current sources implemented by transistor Q15 or Q6. Diodes CR5 and CR6 establish approximately a 1. 3 volt level on the base of Q15 and Q6. The emitters will naturally be . 65 volts below the base potential. This forces the remaining . .65 volts to be dropped across the remaining resistors R45 or R35. Since this voltage is constant the value of the emitter current is nearly identical to the collector current. Q15 then operates with a collector current of approximately 2. 7 milli amps. This current is equally divided between the 2 collectors of Q14. The 1. 35 milli amps of one collector is divided between current flow through collector load R59 and base current from Q7. The base current of Q7 is amplified by transistor action of Q7 such that Q7 collector current will equal A6's collector current established at approximately 18 milli amps by resistor R6. The output voltage at the collectors of Q7 adn Q6 is fed back through R63 and R62 to the inverting input of differentail amplifier Q14. Resistors R62 and R61 voltage divide the output voltage to set the power amplifier gain to approximately 10. The output voltage is forwarded to a pair of high power transistors on the Power Supply Board which drive the servo motors. When a control voltage is applied to the non inverting input of differential amplifier Q14 pin 2, it basically reflects in a change of the current sourcing level of Q7. Since Q6 operates as a constant current sink, the difference in collector currents between Q6 and Q7 is forwarded to the base of the power output transistors which in turn raises or lowers their collector currents which are then applied to the servo motor.

Vertical Servo System (Figure 3-14, 3-15 and 3-16)

The general operation of the paper motion velocity command circuit is as follows. The -ADJ signal coming from the microprocessor is processed through a set of logic gaves and timing one shorts to a discrete voltage translating transistor switch Q19.

The 0 to 5 volt TTL logic signal is converted to a +12 volt and a -12 volt signal at the collector of Q19 (Figure 3-16). The +12V and -12V swing is then converted to a negative trapazoidal wave form at the emitter of Q24. This wave form conversion is accomplished by operational amplifier T7 and emitter follower Q24 connected as an operational integrater. The generated trapazoidal waveform is then applied to the summing input of the servo control amplifier through pit P10. The shape of the trapazoidal waveform defines the shape of the velocity profile that the paper motion motor must operate.

The detailed operation of the paper motion velocity command circuit is as follows (Figure 3-16). The -ADV

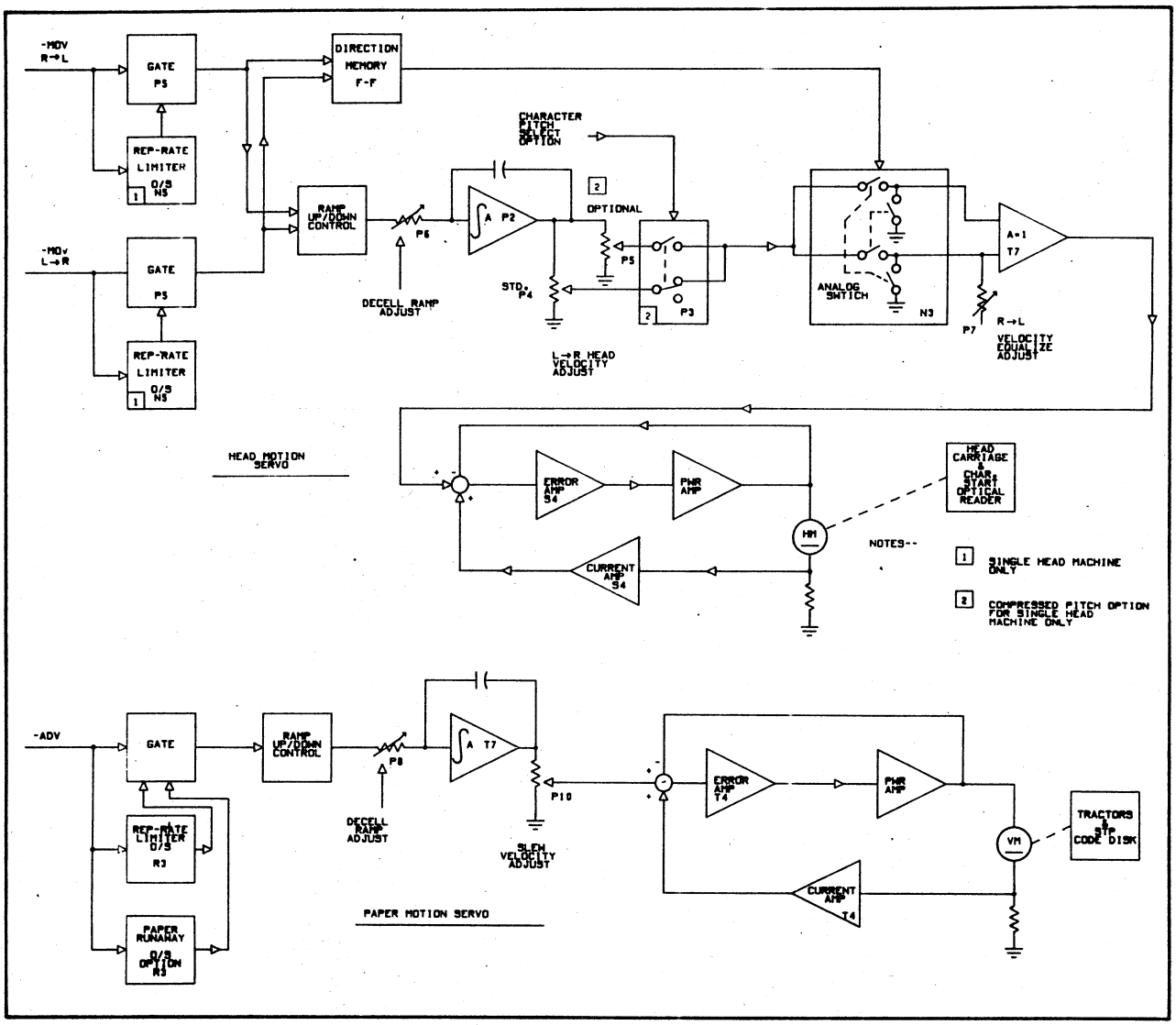


FIGURE 3-14. SERVOS FUNCTIONAL BLOCK DIAGRAM

signal from the controller is supplied to a parallel path of logic gates and fault detecting timing one shots. The optional paper runaway one shot R3 is triggered, if present, from the leading edge of the -ADV signal. If the -ADV signal is not removed before the one shot R3 times out, the -ADV Signal will be inhibited from rippling through gate R1 output Pin 8. The paper motion repetative rate limiter one shot is triggered by the trailing edge of the -ADV signal and inhibits any further advance commands from rippling through at gate R1 pin 6 during the timing period of the one shot.

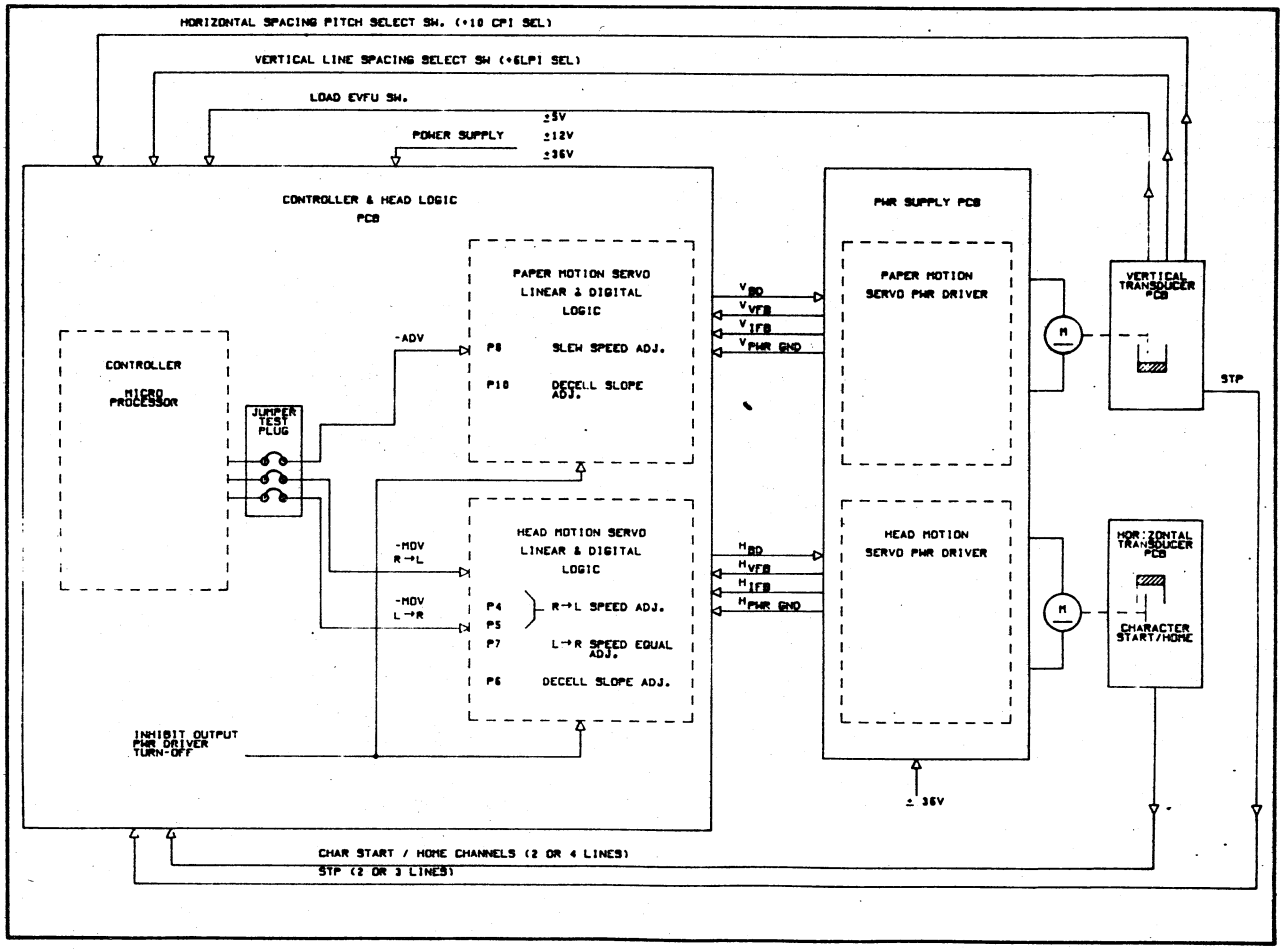
Horizontal Servo System (Figure 3-8, 3-14 and 3-17)

The general operation of the head motion velocity command circuit is as follows. The Head Motion Control signal is generated in a similar manner as the Paper Advance Not command signal with the important difference that there are 2 digital inputs for the heads bi-directional requirements (Figure 3-17). The two inputs are processed to obtain the bi-polar trapazoidal velocity command (Figure 3-8 test point 49). Again similar to the paper motion circuits there is a repetition rate limiting one shot timer N5 chip for each Move Right/Move Left input. Also there is a head runaway timer/one shot M4 (Figure 3-17) which automatically haults head-motion and disables the needle drivers when a move command exceeds approximately three (3) seconds, resulting from a logic fault. The digital signal is then converted to a positive trapazoidal waveform and then routed through a group of analog "C" MOS switches to operational amplifier T7 whose output is fed to the input of the servo control amplifiers. The signal polarity at the operational amplifiers output is controlled by the state of the "C" MOS switches which are connected in a double pole double throw switch (N3) configuration at the input of the operational amplifier T7 (Figure 3-8 and 3-17).

The detailed operation of the head motion velocity command circuit is as follows (Figure 3-17). The controller logic level signals -Mov L and-Mov R are routed through gates P5 in parallel path with the repetetive

rate limiting one shots N5, which are then combined in Or Gate P4 output pin 6. At this output a -Mov L or a -MovR command will force a logical "1", which is then processed to generate an analog trapazoidal Velocity Voltage command. A repetitive rate limiting circuit is required on 70 LPM printers only and is triggered at the trailing edge of the Move Not commands to inhibit a successive -Mov command in the same direction for a period of approximately 300 milliseconds. This 300 millisecond delay circuit is required (on 70 LPM printers only) to prevent a high repetitive rate. Due to this printers position seeking capability a high rep rate could cause overheating of the servo motor. The -Mov L or -Mov R direction command is stored in the cross coupled gate latches P4 which operate a "C" MOS quad analog switch N3, which is connected as a double pole double throw switch to route the positive voltage command signal to the inverting input or the non inverting input of operational amplifier T7 (Figure 3-8). The output of T7 then develops a positive or negative voltage level that corresponds to the selected direction of motion commanded by the controller. Recall, as stated before that the -Mov R and -Mov L signals were combined into one move signal at the otuput of gate P4 pin 6 (Figure 3-17). The leading edge of this signal triggers head runaway one shot M4 to enable "And Gate" P4 output pin 8 to pass the move command to the ramp generator portion of the circuit. When one shot times out it inhibits passing the move signal to the analog section and causes the head to stop. In addition the output of the one shot is anded with MT3 pulses at gate R1 output drivers from operating. Thus should a fault accure that would cause a constant move command, head motion and printing will automatically be haulted. Resetting of this fault condition is accomplished by powering down the printer. The move command is passed to the ramp generator through voltage level translating translator Q2 (Figure 3-18). The +12 V or -12V signal generated at the collector of Q2 is passed to the integrating amplifier, operational amplifier P2 and emitter follower Q1. Resistor R4, R19, R25, pot P6 and C11 define the up and down ramp time of the trapazoidal waveform generated at the emitter of Q1. Potentiometer P6 is used to adjust the ramp time to the required timing specifications. The peak positive level of the waveform at the emitter of Q1 is fixed by zener clamp CR1. The zero output level is maintained by the fact that CR2 clamps the output of operational amplifier P2 pin 10 at approximately -. 6V. This causes the reverse biasing of the base emitter junction of Q1 cutting off any emitter current flow. The +7 volt trapazoidal waveform at the emitter of Q1 is picked off by potentiometers P4 and P5 and is used to adjust the waveform amplitude sent to

FIGURE 3-15. SERVO MOTORS CONTROL LOOP BLOCK DIAGRAM



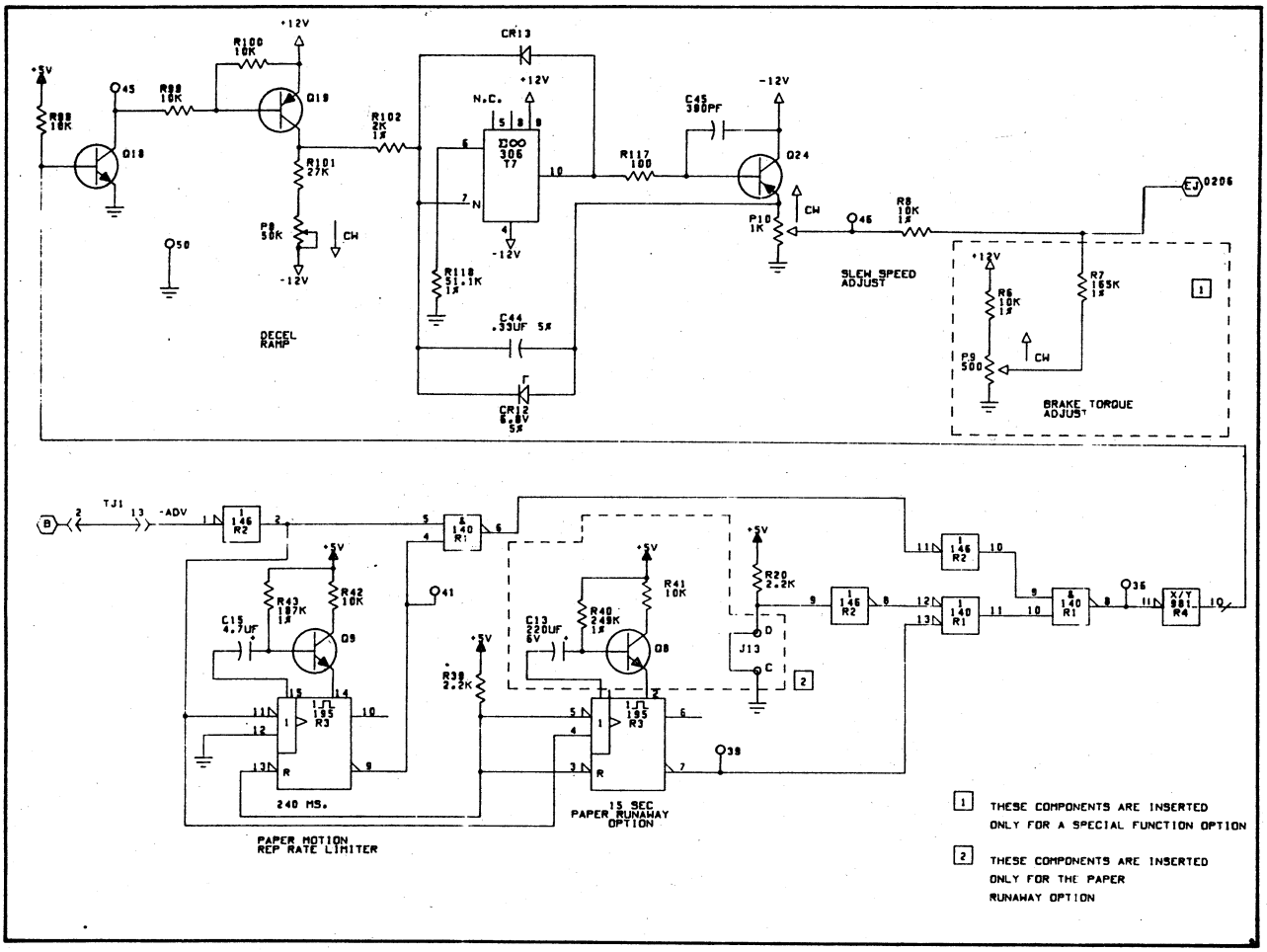


FIGURE 3-16. VERTICAL SERVO (PAPER MOTION) SYSTEM (1PC2)

the servo control amplifier and thus adjusting the head motion velocity according to the timing specification. The outputs of the potentiometers are routed through a pair of "C" MOS analog switches P3. These switches then select the amplitude setting of either potentiometer P4 (standard head velocity) or P5 (compressed head velocity). Switch selection is accomplished by a logic level signal coming from the controller. The positive trapazoidal waveform is then routed to the inverting/ non-inverting amplifier T7 from the previously described direction selection "C" MOS analog switch N3 (Figure 3-17). Potentiometer P7 (Figure 3-8) on the inverting/non-inverting amplifier is used to balance the head velocity in both directions of motion. Again as previously described the bi-polar trapazoidal velocity control voltage signal generated at the output of amp T7 pin 12 (Figure 3-8) is then sent to the servo loop control amplifier circuits.

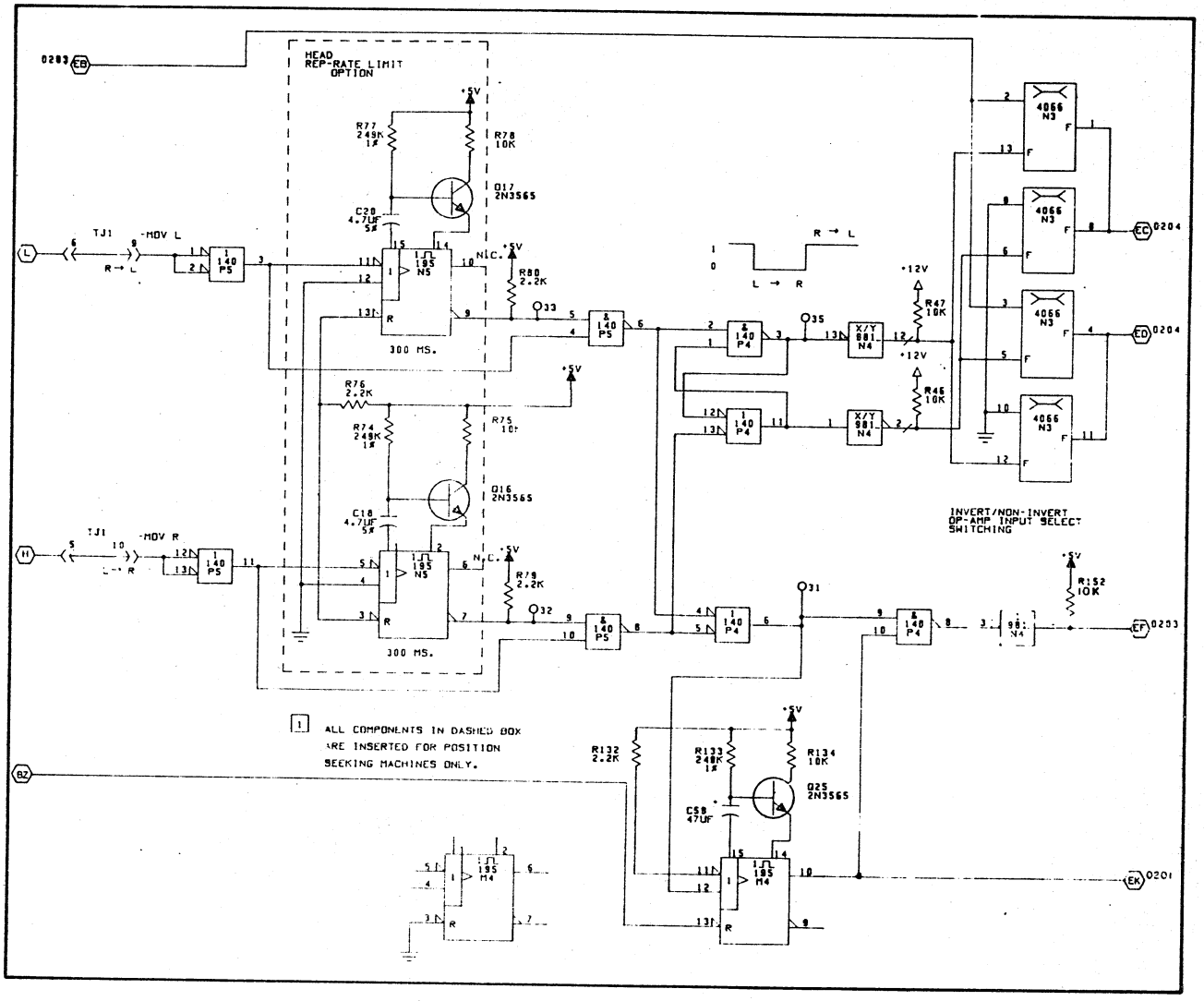


FIGURE 3-17. HORIZONTAL SERVO (HEAD MOTION) SYSTEM (1PC2)

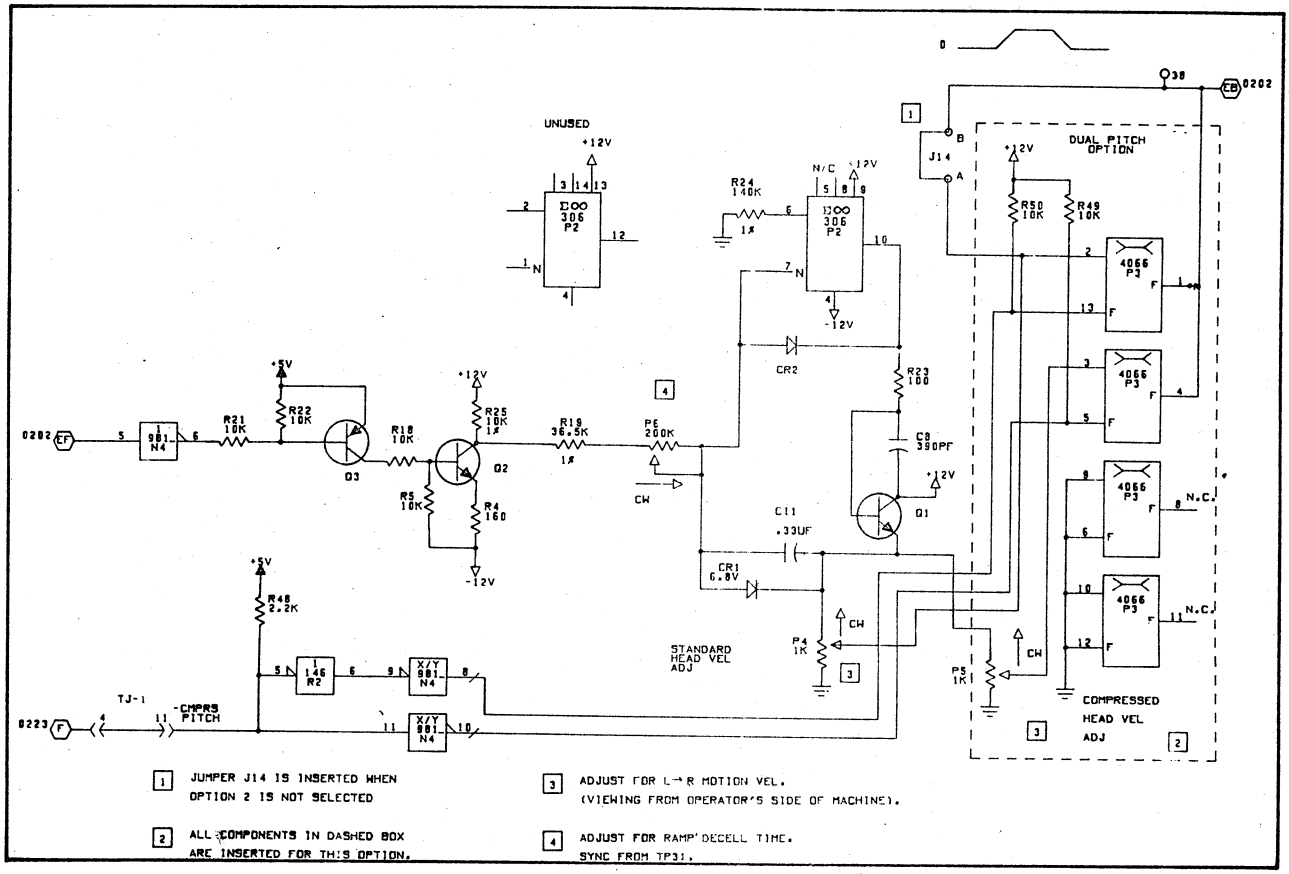


FIGURE 3-18. HORIZONTAL SERVO (HEAD MOTION) SYSTEM (1PC2)

DATA INTERCHANGE TECHNIQUE

The basic controller operates on an interlocked handshaking technique. The interlocked feature simply means that there are no stringent timing requirements on the data interchange signals. Transitions from one logic level to the other rather than pulses are used to exchange data.

The data source transmits a character by placing the (-) STROBE line at a logical "0". When the printer controller has sampled the data byte, the (-) ACK line will be placed at a logical "0". The (-) STROBE line may be removed concurrently or after the data source senses the (-) ACK line. When the printer controller senses the STROBE line at a logical "1", the ACK line will be placed at a logical "1". The data lines must be stable a minimum of 200 nanoseconds before and after the generation of the STROBE signal.

DATA SEQUENCING

A full line buffer memory allows the loading of 0 through 132 characters and 1 Control Code. The data load cycle may be terminated at any time by the control code, in which case the print head will move only as far as is required to print the number of characters loaded. A control code must be loaded no later than the 133rd character time; if not, a carriage return code will be automatically substituted for the 133rd character and the print cycle initiated.

The 133rd character will not be printed since it exceeds the maximum line length and is not saved for the following line.

The code recognized as valid control codes which will terminate the input cycle are the ASCII codes: VT, FF, LF, and CR.

CONTROL CODES

Carriage Return (CR)

The ASCII code CR (or any other valid control code) terminates the print cycle. It has no function with regard to paper motion; however, it is recognized as a control code which will terminate the input cycle.

Line Feed (LF), Form Feed (FF), and Vertical Tab (VT)

The ASCII Code LF results in an advance of one line. The ASCII Code FF results in the selection of the Top of Form Channel (Channel 1). The ASCII Code VT results in the selection of Channel 2. Channel 3 and 4 are not selectable with the standard controller.

INTERFACE REQUIREMENTS

The interface voltage levels required are: Logic 1 of 2.0V to 5.5V (inputs) and 2.4V to 5.5V (outputs). Logic 0 of 0.0V to 0.8V (inputs) and 0.0V to 0.4V (outputs). The Drivers for the signals (-) Data Bits (DBI-DB8), (-) Strobe and (-) Master Clear must be able to sink 30 MA in the logical zero state.

INTERFACE SIGNALS (FIGURE 3-19)

The definitions of the I/O adapter signals can either be used by an external device or with special interface adapters.

The 70/125 LPM interface allows use of al existing 7 X 10 inch matrix printer special adapters.

The signal names are preceeded by a (+) or (-) which indicates the assertion or negation respectively. For example (-) Ready, indicates that a Ready condition exists when this signal is at a logical 0.

(-) Ready (From Controller)

This line will become active (logical "0") when the START/STOP Switch is depressed if no detectable faults exist. This line will remain active until either the START/STOP Switch is depressed or a detectable fault occurs. If this should occur while a data transfer is in process, the I/O will not accept any more data and the partial line stored in the "Print Line Buffer" will not be printed. Print cycles or paper motion cycles in progress will be completed due to depressing the START/STOP Switch and going not READY, but these cycles will not be completed due to a detectable fault (loss of + 36V, +12V, -5V, -12V, or -36V which causes (-) Inhibit to become active).

(+) Busy (From Controller)

This line will become active (logical "1") upon receipt of a control code and remains active until either the print cycle has been completed, or in the case of format with no data (control code being the first byte in a transmitted line), until paper motion has been initiated. Further data codes will not be accepted while the (+) BUSY signal is at logical "1".

(-) Acknowledge (From Controller)

This line when false (logical "0") indicates to the data source that the data lines have been sampled. This signal is an interlocked signal whose duration is determined by the (-) STROBE signal.

(-) Strobe (To Controller)

This line when false (logical "0") indicates to the printer that the data lines are stable and may be sampled at the discretion of the printer. If the (-) READY is a logical "1" or (+) BUSY is at a logical "1", the printer will not respond to the (-) STROBE line.

(-) Data Bits (To Controller)

Eight (8) data lines (-) DB1 through (-) DB8 carry the information (control codes and data characters) to the printer controller. (-) DATA BIT 8 is optional and should be left in the open or high state when a 7 bit interface is used. The data must be stable on the data lines a minimum of 200 nano-seconds before and after the generation of the (-) STROBE Signal.

(-) Out of Paper (From Controller)

This line when false (logical "O") indicates that paper is not present below the print station. This signal will become active (logical "O") when the paper out switch detects the absence of paper.

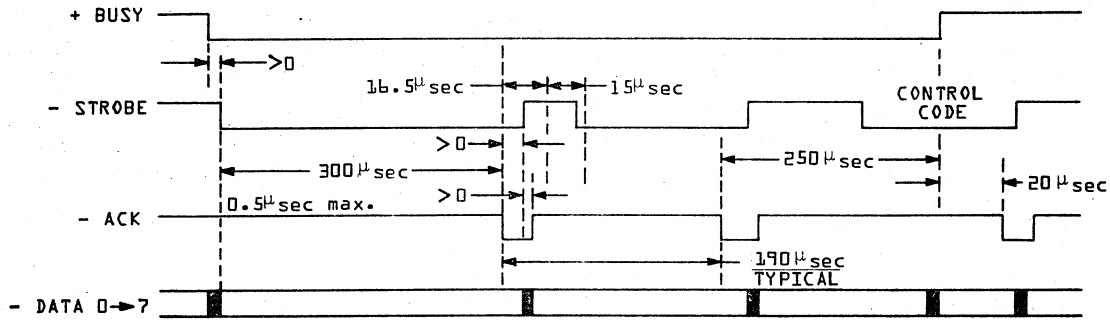
A Paper Out condition will not inhibit further print or paper motion cycles in the printer. The data source must sense this condition and refrain from loading more data until paper is restored in the printer.

When the data source senses an "Out of Paper" condition during loading or (+) BUSY, either a (-) Master Clear should be generated within 1.5 milliseconds after sensing the OOP condition to inhibit the oncoming print cycle, or if the data source is keeping track of the position of the form, allow the print cycle to be initiated as normal.

If a (-) MASTER CLEAR is sent as described above, the data line must be retransmitted in order to print that line.

(-) Master Clear (To Controller)

This line when false (logical "O") resets the printer electronics. This signal when active resets all the input logic but will not remove the printer from the Ready state and will not reset the vertical or horizontal motion electronics. The duration of the "O" level must be a minimum of 2.0 milliseconds.



NOTE

1. DATA MUST BE STABLE PRIOR TO GENERATION OF STROBE.
2. STROBE MUST BE DROPPED WITHIN 16.5 USEC AFTER ACK IS ISSUED IN ORDER TO MAINTAIN MAXIMUM DATA TRANSFER RATE.
3. A NEW STROBE MUST BE BROUGHT UP WITHIN 31.5 USEC AFTER ACK IS ISSUED IN ORDER TO MAINTAIN MAXIMUM DATA TRANSFER RATE.
4. MAXIMUM OF 500 USEC.
5. INTERNAL INTERRUPT STRUCTURE MAY CAUSE THIS TIME TO INCREASE TO 335 USEC, 2 TO 4 TIMES PER LINE TRANSFER, OR TO 685 USEC 1 TO 3 TIMES PER LINE TRANSFER.
6. INTERNAL INTERRUPT STRUCTURE MAY CAUSE THIS TIME TO INCREASE TO 745 USEC ONCE PER LINE TRANSFER.

FIGURE 3-19 INTERFACE TIMING

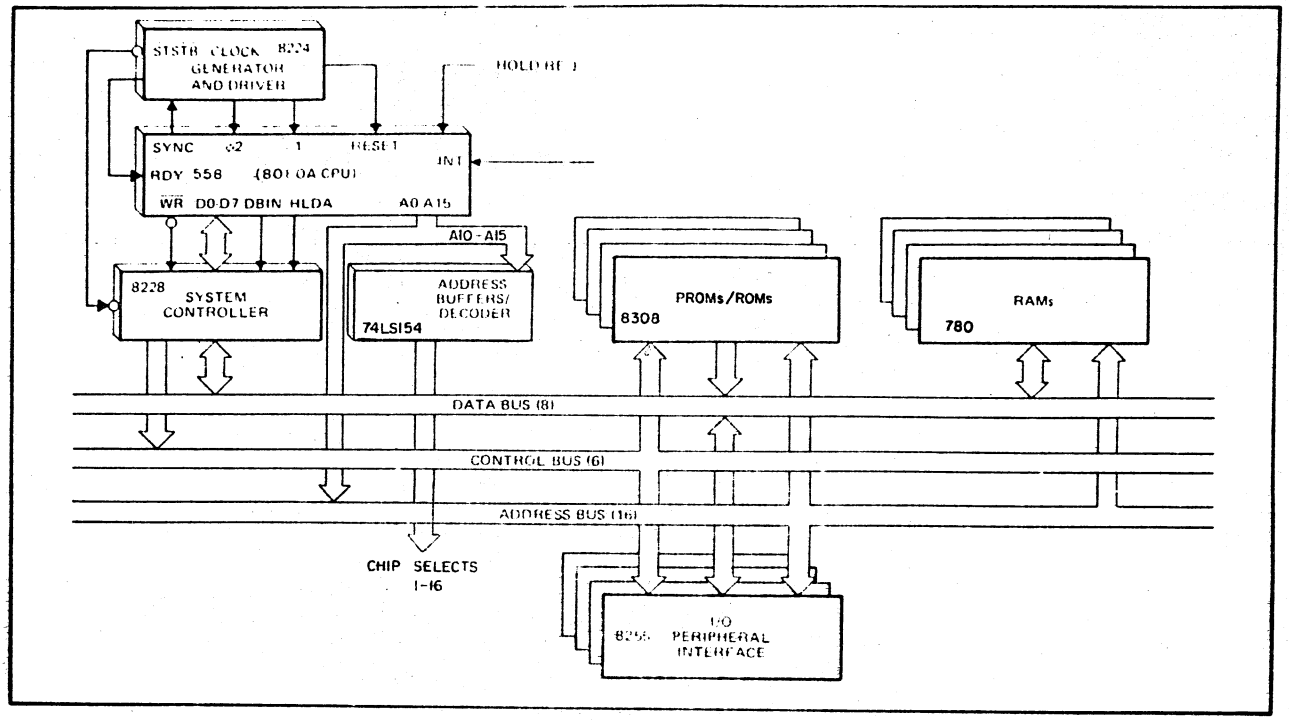


FIGURE 3-20. MICROPROCESSOR BLOCK DIAGRAM

MICROPROCESSOR SYSTEM

The following information provides the theory of operation flow of the microprocessor system. Refer to Figure 3-20 for a block description of the microprocessor. Refer to Table 3-1 for a cross-reference and identification of the chips and there location in the logic section.

Data Buss: A bi-directional path on which data can flow between the CPU and memory or I/O.

Address Buss: A uni-directional group of lines that identify a particular memory location or I/O device.

Control Buss: A uni-directional set of signals that indicate the type of activity in current process.

Type of activites:
1. Memory Read
2. Memory Write
3. I/O Read
4. I/O Write
5. Interrupt Acknowledge.

TABLE 3-1. CHIP CROSS-REFERENCE AND IDENTIFICATION

CHIP	LOGIC CROSS-REFERENCE NO.	DESCRIPTION
558	00207	LSI Microprocessor (8080A)
74LSI54	0209, 16, 17, 24	Address Buffers/Decoder
8224	00207	Clock Generator and Driver
8228	00208	Systems Controller
8255	0213, 14, 15, 23	I/O Peripheral Interface
8308(2708)	0210, 11	Program ROM (PROM)
8308	0212	Character Generator ROM
8111	0209	Buffer Memory (RAM)
8111	0218	Buffer Scratch Pad Memory (RAM)

TABLE 3-2. MEMORY MAP

CHIP SEL.	ADDR.	DEVICE
$\overline{CS1}$	0000 03FF	PROGRAM ROM 8308
$\overline{CS2}$	0400 07FF	PROGRAM ROM 8308
$\overline{CS3}$	0800 08FF	PROGRAM ROM 8308
$\overline{CS4}$	0C00 0FFF	PROGRAM ROM 8308
$\overline{CS5}$	1000 13FF	EXPANSION PROGRAM ROM 8308
$\overline{CS6}$	1400 17FF	EXPANSION PROGRAM ROM 8308
$\overline{CS7}$	1800 18FF	EXPANSION PROGRAM ROM 8308
$\overline{CS8}$	1C00 1FFF	EXPANSION PROGRAM ROM 8308
$\overline{CS9}$	2000 20FF	BUFFER MEMORY 8111 8111
	2100 21FF	BUFFER MEMORY SCRATCHPAD RAM 8111 8111
	2200 23FF	
$\overline{CS10}$	2400 24FF	
	2500 25FF	
	2600 27FF	
$\overline{CS11}$	2800 2803	PPI #1 8255 REF. PGZ
	2804 28FF	
$\overline{CS12}$	2C00 2C03	PPI #2 8255 REF. PGZ
	2C04 2FFF	
$\overline{CS13}$	3000 3003	PPI #3 8255 REF. PGZ
	3004 33FF	
$\overline{CS14}$	3400 3403	PPI #4 8255 REF. PGZ
	3404 37FF	
$\overline{CS15}$	3800 38FF	
$\overline{CS16}$	3C00 3FFF	
	4000 7FFF	
	8000 87FF	CHAR GEN ROM (8308) LOWER 8 BITS
	8800 8FFF	
	C000 C7FF	CHAR GEN ROM (8308) UPPER 8 BITS
	C800 FFFF	

POWER ON INITIALIZATION		0000
TEST PRINT		0009
PRINT CYCLE		0183
OUTPUT CYCLE		01E3
EXEC		0400
LOAD VFU		04B1
FORM FEED		053F
PAPER MOTION		0557
START HEAD MOTION		06CB
LOAD DATA		0743

	BUFFER RAM	2000 210F
VFUTP	VFU FORMAT CODES 176 LOCATIONS	2110 21BF
	END CODE (FF)	21C0
		21C1
VFPTR	VFU FORMAT POINTER	21C2, 21C3
PICM	LAST DATA SENT TO PIC	21C4
P2BM	LAST DATA SENT TO PZB	21C5
CONCK	COINCIDENCE 6/8 CHECK DATA	21C6
CCODE	CONTROL CODE STORAGE	21C7
A FLAG	TEST PRINT STATUS FLAGS	21C8
CL9AL	COL 9 DATA FOR SOL 1A-8A	21C9
CL9U	COL 9 DATA FOR 59A & 59B	21CA
CL9BL	COL 9 DATA FOR SOL 1B-8B	21CB
OUTAL	COL "N" DATA FOR SOL 1A-8A	21CC
OUTUP	COL "N" DATA FOR 59A & 59B	21CD
OUTBL	COL "N" DATA FOR SOL 1B-8B	21CE
COLMS	WIDTH OF PRINTED LINE	21CF
STEPN	STEP NUMBER STORAGE	21DO
TIMER	REITERATION COUNT	21D1
PTEND	LAST PRTABLE CHAR ADD	21D2
		21D3
LCCOD	LAST CONTROL CODE	21D4
	SPARES	21EB
	STACK (20 LOCATIONS)	21EC 21FF

TABLE 3-3. PORT DEFINITIONS AND FLAG LOCATIONS

MNEN	ADDRESS	IN/OUT	MODE	FORMAT 7	6	5	4	3	2	1	0
P1A	2800	OUT	1	SOL 8L	SOL 7L	SOL 6L	SOL 5L	SOL 4L	SOL 3L	SOL 2L	SOL 1L
P1B	2801	OUT	0	SOL 8R	SOL 7R	SOL 6R	SOL 5R	SOL 4R	SOL 3R	SOL 2R	SOL 1R
P1C	2802	OUT	-	OBF	MT3	PM CMP	LF 015	COL RDY	NXT CON CHK	SOL 9L	SOL 9R
P1 IND	2803			CTL 1	MODE 0 1		AI/O 0	CUI/O 0	MODE 0	B I/O 0	CL I/O 0
P2A	2C00	IN	0	TEST PRT	FORM FEED	LD VFU	ACK OUT	STP 8 LPI	STP 6 LPI	CHAR START OIS	NXT COL RDY
P2B	2C01	OUT	0	START ENAB	PRT BSY	8080 RDY	TEST PRT MODE	ADV	MOVE R	MOVE L	GATED OSC
P2C	2C02	IN	-	START SW	RDY ENAB	HOME R	HOME L	ODD CHST	EVEN CHST	FMT CH 2	FMT CH 1
P2 IND	2C03			CTL 1	MODE 0 0		AI/O 1	CUI/O 1	MODE 0	B I/O 0	CL I/O 1
P3A	3000	IN	1	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
P3B	3001	IN	0	6/8 LINE	EN DW	AUTO LF	SGL SPACE	FMS ADV	80 COL	DBL SP	AUTO TERM
P3C	3002	OUT/IN	-	STOP	ACK INT	CHNL 1	CHNL 2	STROBE	INT ACT	MC	INHB SW
P3 IND	3003			CTL 1	MODE 0 0		AI/O 1	CUI/O 0	MODE 0	BI/O 1	CLI/O 1
P4A	3400	IN	0	TP SW 7	TP SW 6	TP SW 5	TP SW 4	TP SW 3	TP SW 2	TP SW 1	TP SW 0
P4B	3401	OUT	0	SPARE	NC	LED 5	LED 4	LED 3	LED 2	LED 1	LED 0
P4C	3402	IN/OUT	-	HD RDY	6 SEC DEL	SPARE SW	CMP IN	SPARE	SEL 30 LPI	PWR ON ST.	CMP OUT
P4 IND	3403			CTL 1	MODE 0 0		AI/O 1	CUI/O 1	MODE 0	BI/O 0	CLI/O 0

FLAG B REGISTER

7	6	5	4	3	2	1	0
TEMP FLAG 1	TEMP FLAG 2	TEMP FLAG 3	REV D12	9 HIGH CHAR (ROWS)	UNUSED	START	9 WIDE CHAR (COLS)

TABLE 3-4. STEP DEFINITIONS

ROUTINE	STEP NO.	FUNCTION
POMC	1.	ROM CHECK
POMC	2.	RAM CHECK
EXEC	3.	WAIT FOR START SWITCH TO BE RELEASED
EXEC	4.	LOOP FOR SWITCH DEPRESSION
LDVFU	5.	LOOP FOR STP ("1" THEN "0") & FMT CH 1
LDVFU	6.	LOADING & CHECKING VFU CODES
LDVFU	7.	LOAD COMPLETED, WAIT FOR SWITCH RELEASE
LDVFU	8.	VFU TAPE LONGER THAN 176 LINES
STHDM	9.	MOVE HEAD TO LEFT (CANNOT FIND HOME)
EXEC	A.	SINGLE SPACE SW NOT RELEASED
LDATA	B.	WAIT FOR INPUT DATA
LDATA	C.	LOADING DATA
INTRP	D.	INTERRUPT SERVICE ROUTINE (INTERFACE LINES NOT RESET)
FMFD	E.	WAIT FOR FORM FEED SWITCH TO BE RELEASED
TSPRT	F.	WAIT FOR TEST PRINT SWITCH TO BE RELEASED
	10.	
	11.	
	12.	
	13.	
OTPUT	14.	WAIT FOR NXT COL RDY
OTPUT	15.	WAIT FOR CHAR ST O/S = 1
OTPUT	16.	WAIT FOR CHAR ST O/S = 0 (REV MOTION)
OTPUT	17.	WAIT FOR CHAR ST O/S #67 = 1 (LINE COMPLETE)
	18.	
	19.	
	1A.	
	1B.	
PMOTN	1C.	LOOKING FOR STP = 0 (FIRST PASS)
PMOTN	1D.	LOOKING FOR STP = 0 (INTERRUPT ROUTINE)
PMOTN	1E.	WAIT FOR STP INTERRUPT
	1F.	
	20.	

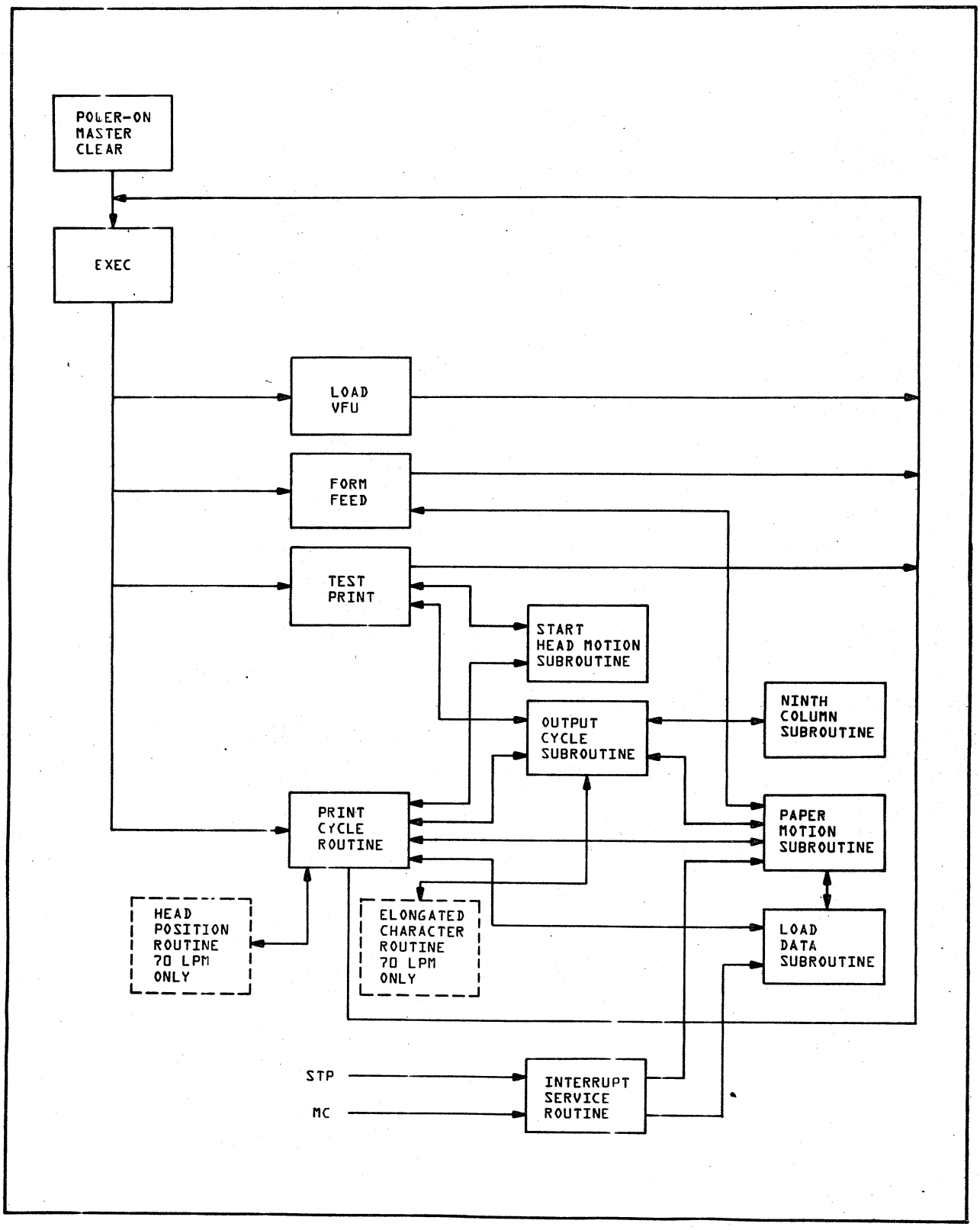
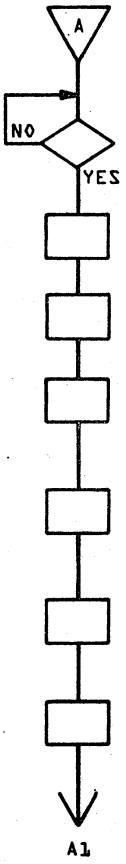


FIGURE 3-21. SYSTEM BLOCK FLOWCHART



Is A.C. applied to 3CB1?

Toggle the ON/OFF Circuit Breaker on (3CB1)

Fan turns on (2TB1-1 and 3)

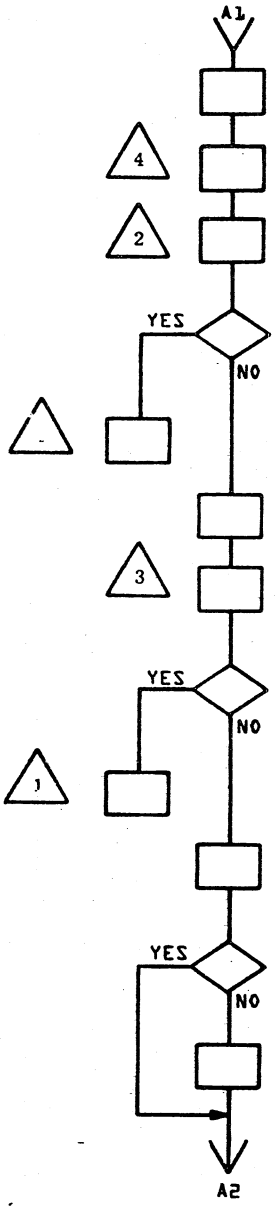
Generate A.C. voltages: 30V (P4-5&7); 16V (P4-2&4): 16V (P4-6&8) and 55V(P4-1&3)

Generate D.C. Voltages: (-) 36V (1PC1); 5V (1PC2) and 16V Rect. A.C. (0201) (-) 12V (1PC2) and (-) 5V (0103/J7-5) and (-) 5V I/O (0103/J1-5); 36V (Buss) respectively.

As the 5V supply is coming up (0207/A5-2) a Reset Prgm Cntr (0207/A2-12) signal holds the Microprocessor in a disabled state, until the 5V supply is up.

After the Reset Prgm Cntr signal goes away, the program will start at location zero in memory and execute POMC routine.

THIS ROUTINE IS ENTERED ONLY AFTER INITIAL POWER UP TO PERFORM THE FOLLOWING FUNCTIONS:
1-VERIFY COMPLETE PROGRAM IN ROM MEMORY
2-VERIFY ALL RAM READ/WRITE CAPABILITY
NOTE-RAM SET TO ALL 00 CODE ON LAST CHECK
3-INITIALIZE ALL I/O PORTS
4-INITIALIZE ALL CONSTANTS AND FLAGS
UPON COMPLETION CONTROL IS TRANSFERRED TO EXECUTIVE



Initialize the I/O ports 1, 2, 3, & 4.

Microprocessor is at Step 1 (LED's are 00 0001)

Perform a ROM check

Are there any errors?

Halt program execution

Microprocessor is at Step 2 (LED's are 00 0010)

Perform a RAM check

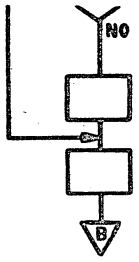
Are there any errors?

Halt program execution

Initialize program constants and flags

Is the character a 7 column character?

Set 9 wide character flag



Set 9 high character flag

Enable the START F/F at port 3C.

Jump to EXECUTIVE

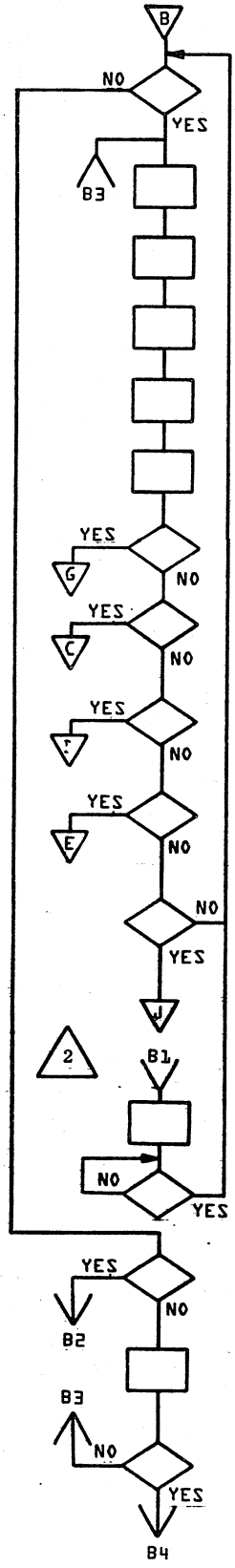
1. The program will not advance beyond this point until the problem causing ROM or RAM errors is repaired and POMC is re-initialized.

2. Verifies complete program is in ROM memory.

3. Verifies Read/Write capability of all RAM.

4. Step codes are displayed in hex code on LED's

THIS ROUTINE MONITORS FOR CONTROL PANEL SWITCH DEPRESSIONS AND UPON SENSING BRANCHES TO THE APPROPRIATE SERVICE ROUTINE.



Is cabinet open (inhibit switch on)?

Microprocessor is now at Step 04 (LED's are 00 0100)

Reset 8080 RDY (0214/G3-23)

Reset Start Enable (0214/G3-25)

Clear the Start Mode flag in the microprocessor

Reset the EN Ready F/F (0215/E5-10)

Is data loaded?

Is Test Print Switch pressed?

Is Forms Feed switch pressed?

Is Load VFU switch pressed?

Is Line Feed switch pressed? (Set Paper Motion Command = Line Feed 0000 1010 to control code storage RAM locator). See Memory Map

Call PAPER MOTION subroutine

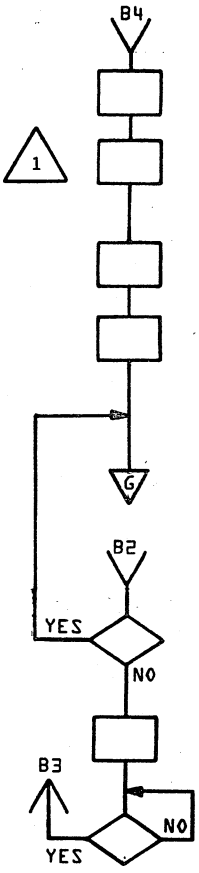
Microprocessor is now at Step A (LED's are 00 1010)

Is the LF switch released?

Is printer in Start mode?

Output Start Enable (0214/G3-25)

Is Ready Enable F/F set? (0219/F2-9) (Has Start switch been pressed?)



Check for 80 or 132 column mode (0215/E5-20)

Check for - AUTOTRM (Deletion of the 133rd control code character transfer) mode (0215/E5-18). Assumes that no control code will be transmitted to the printer at the end of print data transfer.

Set Start mode flag in Microprocessor.

Set 8080 RDY signal (0214/G3-23)

Jump to PRINT CYCLE

Is Ready Enable F/F set? (0219/F2-9)

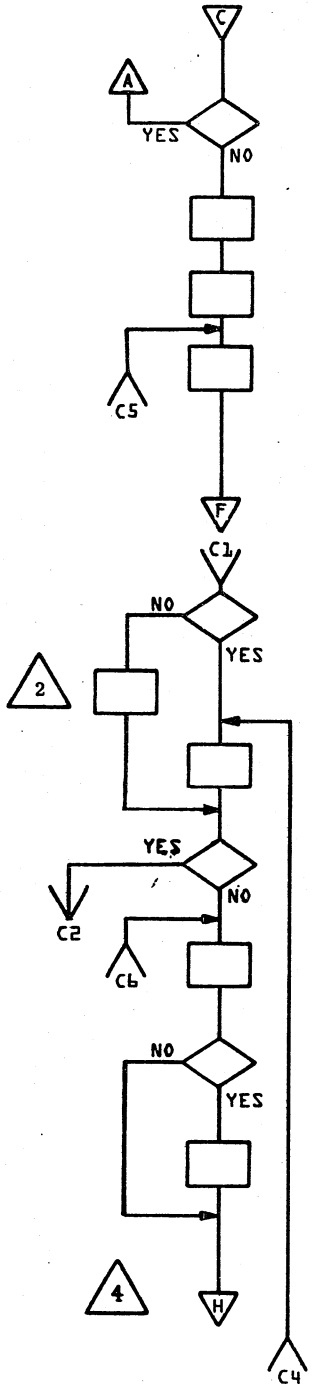
Microprocessor is at Step 03 (LED's are 00 0011)

Is start switch released?

1 The auto terminate mode terminates data transfer after the 80th (80 Col. mode) or 132nd (132 Col. mode) character has been transmitted, and generates a carriage return for a control code. If auto terminate is disabled, an 81st 80 Col. mode) or 133rd (132 Col. mode) character should be transmitted as a control code.

2 Single space line advance

THE TEST PRINT ROUTINE IS ENTERED WHENEVER THE EXECUTIVE DETECTS THAT THE TEST PRINT SWITCH HAS BEEN DEPRESSED. ALL FLAGS, MEMORY LOCATIONS, AND OUTPUTS ARE THEN SETUP SO THAT THE OUTPUT CYCLE AND PAPER MOTION ROUTINES WILL EXECUTE THE TEST PRINT PATTERN (4 CHARACTERS PRINTED FOLLOWED BY 4 BLANK POSITIONS, REPEATED ACROSS THE ENTIRE PAGE). AT THE COMPLETION OF THE PAPER MOTION SUBROUTINE, PROGRAM CONTROL RETURNS TO TEST PRINT AND PRINTING CONTINUES UNTIL THE ROUTINE DETERMINES THAT THE TEST PRINT SWITCH HAS BEEN DEPRESSED A SECOND TIME. THE ROUTINE THEN RESETS TEST PRINT MODE AND THE PROGRAM RETURNS TO EXECUTIVE.



Is the cabinet open (inhibit switch on)?

Output Test Print Mode from port 2B (0214/G3-22)

Set single space mode into control code position (see memory map)

Read the test print character from the Character Generator ROM (0212/E1&F1)

Call START HEAD MOTION subroutine

Is head motion from Right to Left?

Set print character counter to zero for head "A" (left head) of C register.

Set print character counter to 65 for head "A" (left head) in C register.

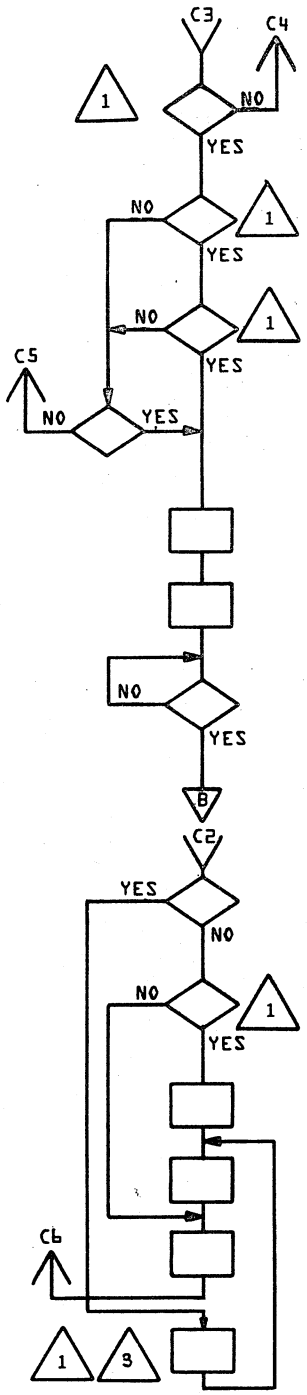
Does bit 2 of C register = 1?

Add 66 to Print Character Counter (C register)

Does bit 2 of C register = 1?

Set Head B inhibit flag

Call OUTPUT subroutine



Is Print Complete? (A flag bit 2)

Is Test Print Released flag set? (A flag bit 0). This indicates that the switch is held in after the initial depression

Is Stop Test Print flag set? (A flag bit 1)

Is the cabinet open (inhibit switch on)?

Microprocessor is at Step F (LED's are 00 1111)

Reset Test Print mode from port 2B (0214/G3-22)

Has the Test Print switch been released?

Jump to EXECUTIVE

Has the Test Print switch been released?

Was Test Print switch released previously? (A flag bit O)

Set the Stop Test Print flag (A flag bit 1)

Store a flag in buffer memory

Set Head "A" Inhibit Print flag

Set Test Print Swt. Released flag (A flag bit O)

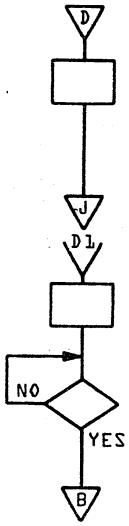
(1) A Flag indicates the status of The Test Print switch and the completion of a line of print. Bit 0 = Test Print switch released. Bit 1 = Test Print switch depressed (Stop Test print). Bit 2 = Print complete.

(2) This counter is decremented from 65 to 0 in Right to Left head motion and incremented from 0 to 65 in Left to Right head motion in a OUTPUT CYCLE subroutine. It is decremented or incremented once for each character optioned, but not necessarily printed by Head "A" or "B".

(3) If the answer is yes, this means that the Test Print switch was depressed while in the test print mode, as indicated by the Test Print switch Released flag. This action will terminate the Test Print mode when the Stop Test flag is detected.

(4) One character per print head is set up for each output cycle.

THIS IS THE SERVICE ROUTINE FOR THE FORM FEED SWITCH. INITIAL ENTRY IS FROM EXECUTIVE, WHEREBY THE ROUTINE LOADS THE PROPER CONTROL CODE AND BRANCHES TO PAPER MOTION. UPON COMPLETION, PAPER MOTION WILL RETURN TO FORM FEED WHICH THEN RETURNS TO EXECUTIVE ONLY AFTER THE FORM FEED SWITCH HAS BEEN RELEASED.



Generate and store the Form Feed Control Code in C code (See Memory map)

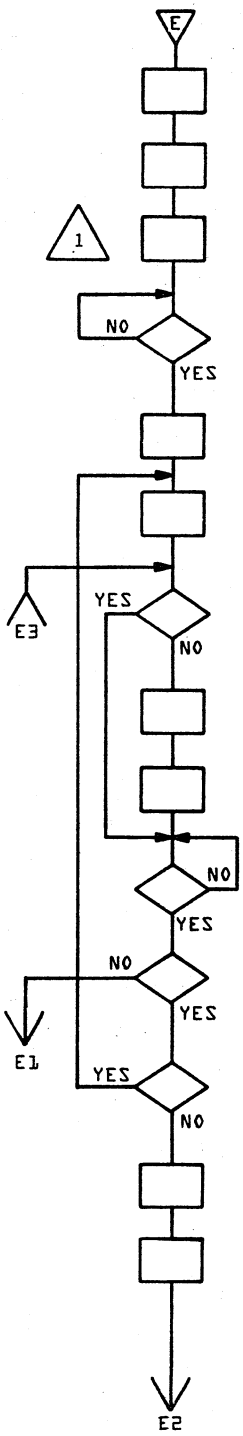
Call PAPER MOTION subroutine

Microprocessor is at Step E (LED's) are 00 1110)

Is the Form Feed switch released?

Jump to EXECUTIVE

THE LOAD VFU ROUTINE READS FORMAT DATA FROM THE OPTIONAL VFU INTO RAM MEMORY FOR LATER USE DURING PAPER MOTION ROUTINES.
ONE PAGE OF VFU DATA IS LOADED INTO MEMORY FOLLOWED BY ANOTHER PAGE BEING LOADED INTO MEMORY TO CHECK FOR ERRORS. SUCCESSIVE LOADS WILL OCCUR UNTIL NO ERRORS ARE DETECTED OR UNTIL A PAPER RUNAWAY OCCURS AT WHICH TIME PAPER MOTION WILL STOP.
IF THIS ROUTINE IS NOT ENTERED BEFORE ON-LINE PAPER MOTION COMMANDS OCCUR, ALL ACTIVE FORMAT COMMANDS WILL DEFAULT TO A LINE FEED.



Microprocessor is at Step 05 (LED's are 00 0101)

Paper Motion Motor Turns on

Look for 6 LPI STP

Has format tape advanced to FMT CH 1? (0214/G3-14)

Microprocessor is at Step 06 (LED's are 00 0110)

Reset Channel Loaded Flag (Temporary Flag 1)

Was format channel loaded previously into EVFU?

Store Format Channel into EVFU

Set Channel Loaded Flag

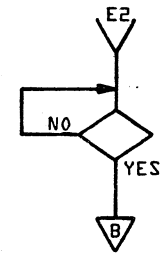
Has VFU advanced to next VFU channel?

Has format tape advanced to FMT CH 1 ? (0214/G3-14)

Is Channel Loaded Flag set?

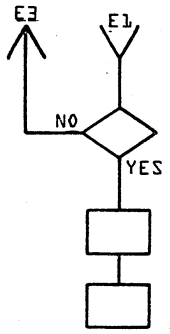
Microprocessor is at Step 07 (LED's are 00 0111)

Turn off Paper Motion motor



Is the Load VFU switch released?

Jump to EXECUTIVE



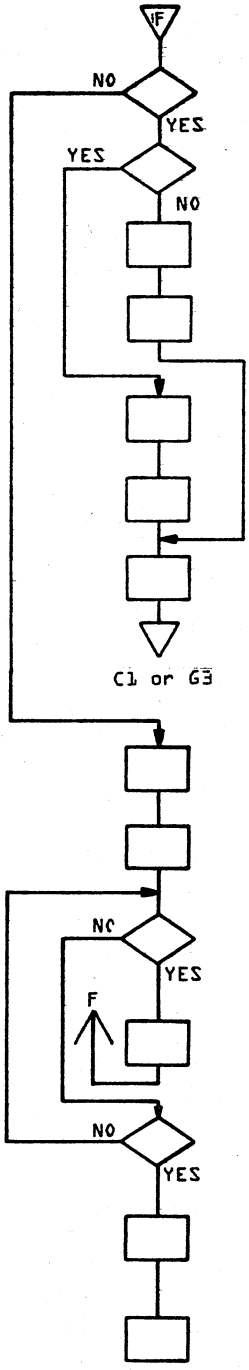
Are 176 codes stored?

Microprocessor is at Step 08 (LED's are 00 1000)

Halt program. Maximum Form length has been exceeded

1 EVFU must be loaded in the 6 LPI paper advance mode

THE ROUTINE ASSURES THAT THE PRINT HEAD IS IN A HOME POSITION AND THE REV FLAG AGREES WITH THAT POSITION. WHEN THESE CONDITIONS ARE SATISFIED PROGRAM CONTROL IS RETURNED TO THE CALLING ROUTINE, WHICH MAY BE EITHER PRINT CYCLE OR TEST PRINT.



Are the printheads at Home Left or Home Right?

Are the heads at Home Right?

Reset the reverse flag

Set-up move right.

Set reverse flag

Set-up move left

Output move L/R to port 2 B

Microprocessor is at Step 9 (LED's are 00 1001)

Move head to the Left (Port 2 B) and set 1 second time-out

Are the heads at Home Left? (0222/K3-8)

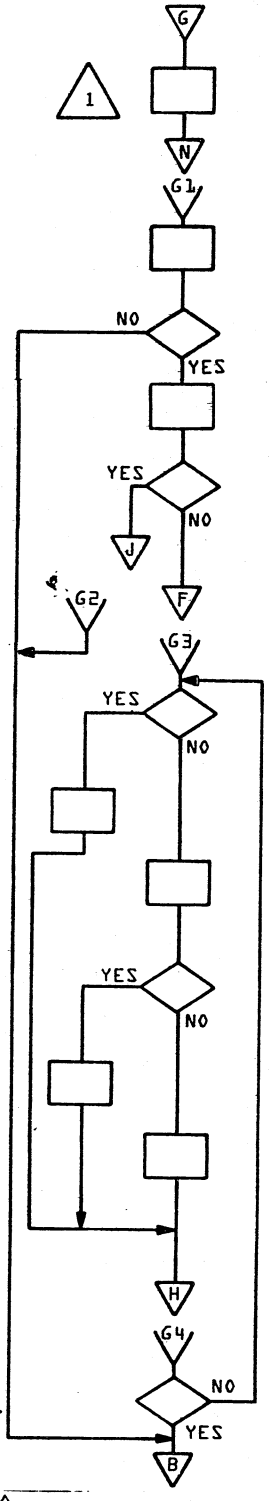
Reset Move Left (0208/H2-8)

Has the 1 second time-out timed-out?

Reset Move Left at port 2B (0214/G3-19)

Halt program; can't find Home Left

THE PRINT CYCLE ROUTINE LOADS DATA INTO THE BUFFER MEMORY USING THE LOAD DATA SUBROUTINE AND THEN DETERMINES IF BOTH PRINTING AND PAPER MOTION ARE TO OCCUR OR ONLY PAPER MOTION. IF PRINTING IS TO OCCUR, THE CHARACTER CODES FROM THE BUFFER MEMORY ARE LOADED FOR EACH HEAD AND THE OUTPUT SUBROUTINE IS CALLED FOR EACH CHARACTER PAIR. AT THE COMPLETION OF PRINTING, OR IF NO PRINTING IS TO OCCUR, THE PAPER MOTION SUBROUTINE IS CALLED. AT THE END OF EACH LINE CONTROL IS RETURNED TO EXECUTIVE.



Enable Interrupts

Call LOAD DATA subroutine

Disable Interrupts

Is Load Data complete?

Reset Load Complete

Was the only data loaded a Control Code?

Call PAPER MOTION subroutine

Call START HEAD MOTION subroutine

Is Head A beyond the last character to be printed?

Set Head A and Head B Inhibit flags

Load Head A character into the Output register from Buffer Memory

Is Head B beyond the last character to be printed?

Set Head B Inhibit flag

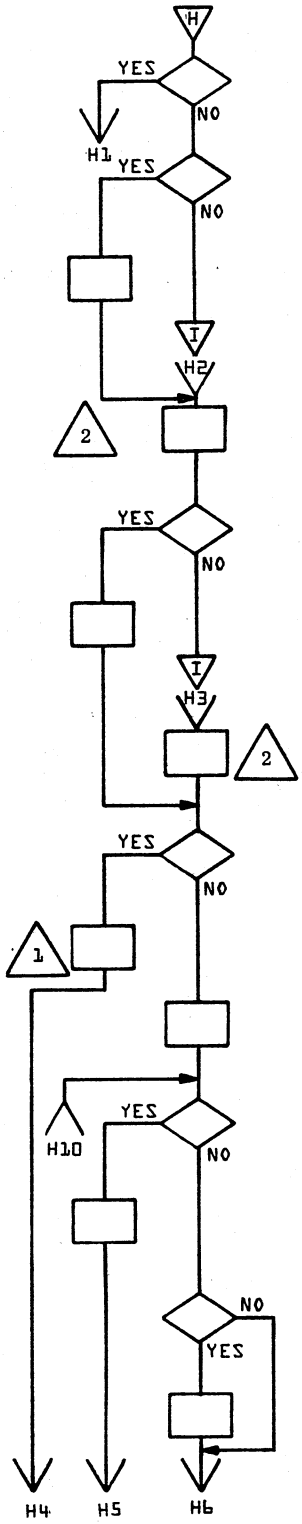
Load Head B character into the Output register from Buffer Memory

Call OUTPUT subroutine

Is print complete (A flag bit 2)

(1) Allows a Master Clear interrupt during Load Data.

THE OUTPUT CYCLE SUBROUTINE CONSTRUCTS THE NINTH COLUMN PATTERNS, AND THEN PROVIDES THE PROPER SOLENOID OUTPUT DATA USING BOTH THE CHAR GEN ROM AND THE PREVIOUSLY CONSTRUCTED NINTH COLUMN DATA. THE PRINT HEADS ARE LOCATED 66 CHARACTER POSITIONS APART AND PRINTING WILL OCCUR ALTERNATELY R TO L AND L TO R. THE PRINTED CHARACTER MAY BE EITHER 7 OR 9 ROWS HIGH, DEPENDING UPON THE CHARACTER GENERATOR ROM USED.



Is the printer a 7 column unit?

Is the Head A Inhibit Print flag set?

Clear Head A Column 9 print data storage register

Call the 9TH COLUMN subroutine

Store print data for Head A column 9

Is the Head B Inhibit Print flag set?

Clear Head B Column 9 Print Data storage register

Call the 9TH COLUMN subroutine

Store Print Data for Head B Column 9

Is the head moving from Right to Left?

Set Column Counter to Column 9

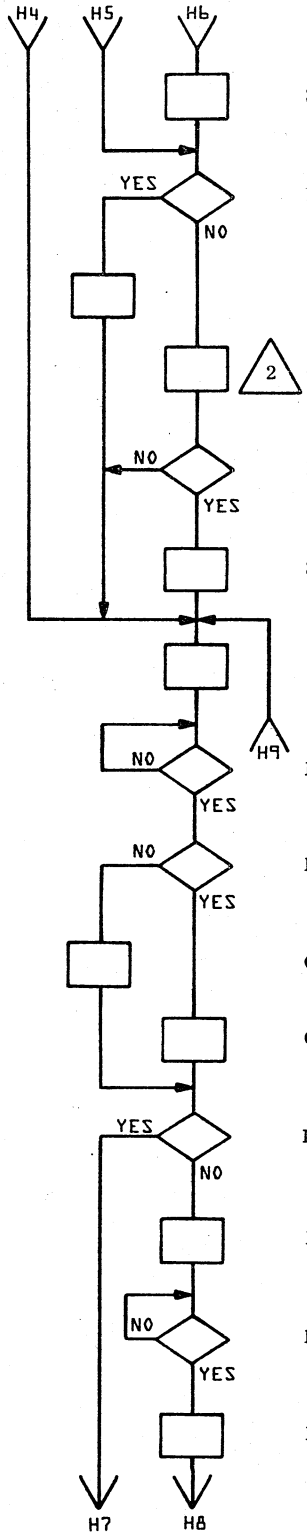
Set Column Counter to Column 1

Is the Head A Inhibit Print flag set?

Clear Head A Column N print data storage register

Is the character a 9 high character?

Store print data for Head A column N (needles 8&9)



Store print data for Head A column N (needles 1-7)

Is the Head B Inhibit Print flag set?

Clear Head B column N Print Data storage register

Store print data for Head B column N (needles 1-7)

Is the character a 9 high character?

Store print data for Head B column N (needles 8&9)

Microprocessor is at Step 14 (LED's are 01 0100)

Is the next column ready to be printed?

Does the column counter = 9?

Output Head A and Head B column N print data

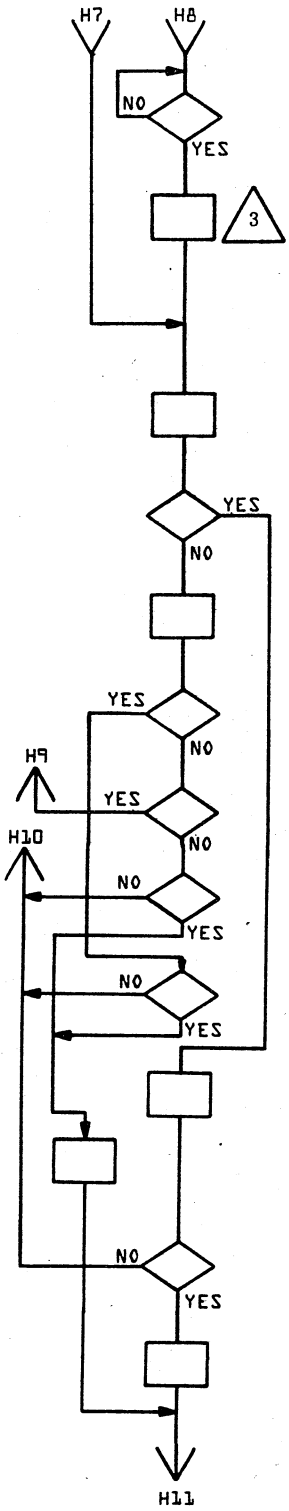
Output Head A and Head B column 9 print data

Is the Mt3 O/S Generate on? (220-G1-13)

Microprocessor is at Step 15 (LED's are 01 0101)

Is the Character Start O/S = 1?

Microprocessor is at Step 16 (LED's are 01 0110)



Is the Character Start O/S = 0?

Start MT 3 O/S Generator

CHECK FOR LAST COLUMN OF CHARACTER

Microprocessor is at Step 18 (LED's are 01 1000)

Is head motion from Right to Left?

Increment the Column Counter to the next column to be printed

Is the printer a 7 column unit?

Is column 9 next?

Have all columns been printed?

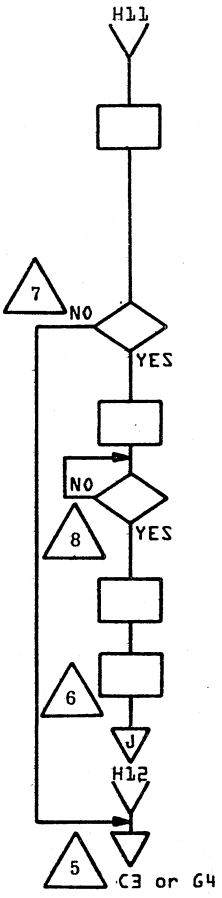
Have all columns been printed?

Decrement the Column Counter to the next column to be printed

Increment print position counter

Have all columns been printed?

Decrement the print position counter



Stop MT 3 O/S Generator (0220/H1-4)

CHECK FOR LAST CHARACTER OF PRINT LINE

Does the print position counter = FF or 66?

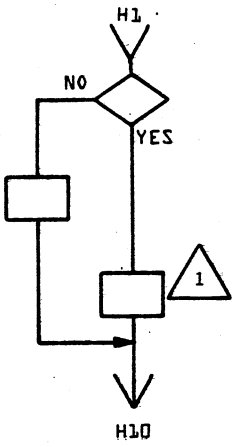
Microprocessor is at Step 17 (LED's are 01 0111)

Does the character O/S = 1?

Reset Move Heads L/R (0214/G3-19&20)

Toggle Reverse flag

Call PAPER MOTION subroutine



Are the Heads moving from Right to Left?

Set column counter to column 1

Set column counter to column 7

1. The column counter determines which column of a character will be printed next

2. Print data for Heads A & B are read out of the upper & lower character generator ROM's. This data determines which needles are to be fired in a particuliar column of a character.

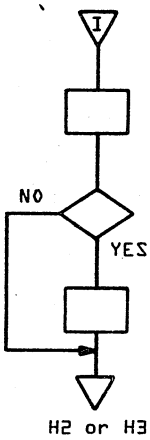
3. MT 3 O/S fires the needles in Heads A & B. Seven MT 3 O/S pulses are generated for a 7 column character and 9 pulses for a 9 column character.

5. Return to TEST PRINT or PRINT CYCLE subroutine

6. The reverse flag determines the direction of head motion. "O" = Left to Right Head Motion, "1" = Right to Left Head motion.

7. A FF (Hex) code means that head motion was right to left and head A has passed by the last character column of its print line (Column 0). A 66 code means that head motion was left to right and head A has passed by the last character column of its print line (Column 63).

8. When the next character start is detected after head A has passed through the last character column of its print line (Column 0 or 6) Move L/R is reset and the head coasts into a home position.



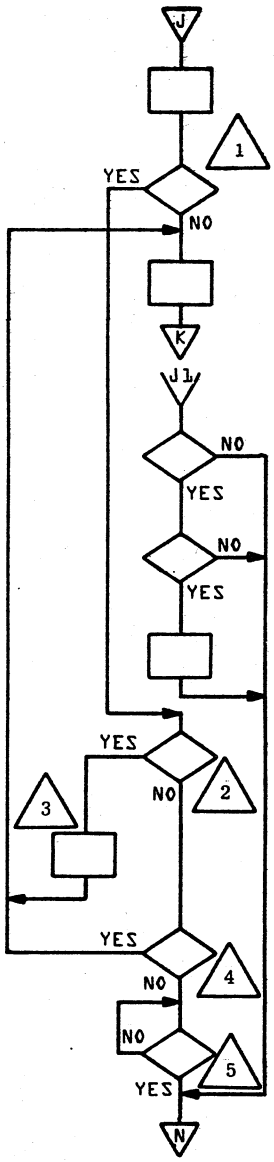
Read and store 9th column data from lower character ROM (0212/E1)

Is this a 9 high character?

Read and store the 9 high character data from upper character ROM

Return to OUTPUT CYCLE subroutine

THE PAPER MOTION ROUTINE CONTROLS FORMS MOTION FOR : TEST PRINT, FORM FEED, AND ON-LINE OPERATION.
IF A CR CODE IS LOADED, A 50 MS DELAY WILL OCCUR TO RESTRICT PRINT HEAD HORIZONTAL MOTION CYCLES.
IF AN ERROR OCCURS IN THE STORED CONTROL CODE, OR IF THE FORMAT TAPE WAS NOT LOADED, PAPER MOTION WILL DEFAULT TO A LINE FEED.
IF THE AUTO LINE FEED OPTION IS ENABLED, CR CODES WILL GENERATE LINE FEED COMMANDS.
IN THE STANDARD PRINTER, ONLY 2 CHANNELS OF THE VFU TAPE WILL BE LOADED INTO MEMORY.



Microprocessor at STP 1C (LED's are 01 1100)

Is the Control Code a carriage return?

Start paper moving from port 2B

Call EVFU POINTER UPDATE SUBROUTINE.

Is the Control Code a Line Feed?

Is the printer in double space mode?

Reset the Stop Paper Motion flag to zero.

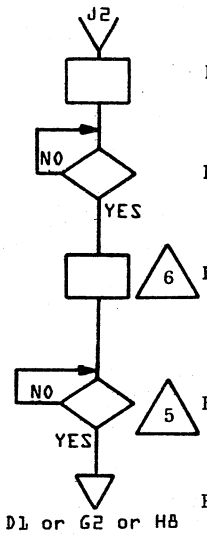
Is the printer in Auto Line Feed mode?

Set the Control Code to Line Feed.

Has the interface sent a Forms Advance?

Has the 20 M sec delay timed-out?

Call the LOAD DATA subroutine.



Microprocessor is at Step 1 E (LED's are 01 1110)

Is the Paper Motion complete?

Disable interrupts

Has the 30 M sec Delay timed-out?

Return to: FORM FEED, PRINT CYCLE OR OUTPUT CYCLE subroutine.

△1 If the control code is a carriage return, then no paper motion command was transmitted with the line of data.

△2 Activated by switch on printed circuit board.

△3 If in double space mode, this flag will be set again by the first STP interrupt to call the PMUPD subroutine (EVFU POINTER UPDATE). This will allow the next (second) STP interrupt to stop the paper, thus achieving a double space advance.

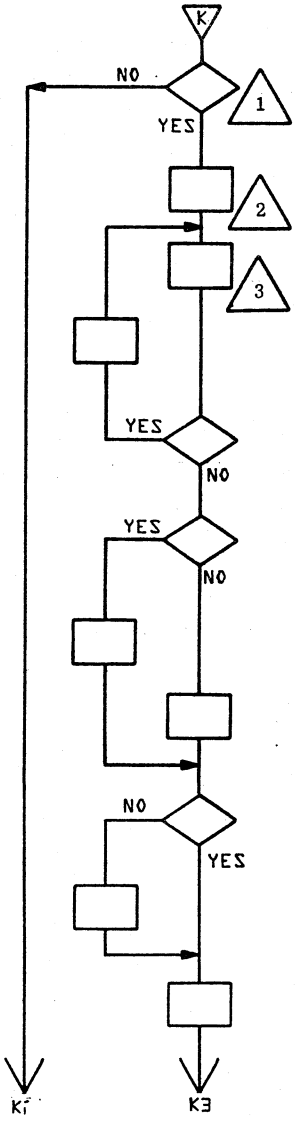
△4 A forms advance that would originate from an interface adapter: a line counter advance.

△5 The 30 M sec Delay is for paper settle. If no paper motion occurs, a 20 M sec Delay is added to this, because the print heads require a 50 M sec set-up time before they can be re-advanced.

△6 Interrupts are disabled, because this routine may return to an uninterruptable subroutine. M. C. or STP are the only interrupts.

NOTE:

This subroutine may also be interrupted whenever a STP or a MC is generated which CALLS the INTERRUPT SERVICE subroutine.



Is the EVFU loaded?

Advance the EVFU pointer to next line.

Retrieve the EVFU format code at this location

Point EVFU to VFU TOP (EVFU Top of Forms)

Is the EVFU format code = FF?

Is the EVFU channel 1 bit set?

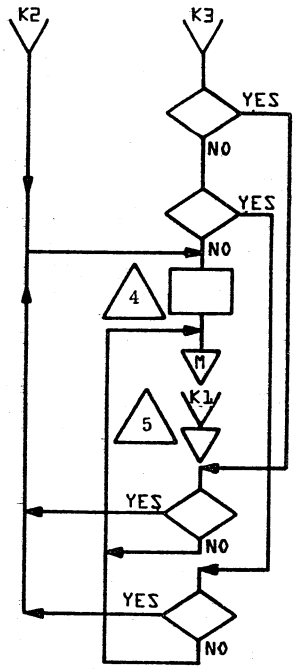
Output channel 1 to port 3 C (Top of Forms)

Reset channel 1 port 3 C

Is the data load complete?

Store C code into LCCOD

Load last Control Code (LCCOD) into A register



Is the last Control Code a Vertical Tab?

Is the last Control Code a Form Feed?

Set the Stop Paper motion flag = 1

Call the PAPER MOTION INTERRUPT ENABLE subroutine

Is the Vertical Tab bit loaded into the EVFU at this location?

Is the Form Feed bit loaded into the EVFU at this location?

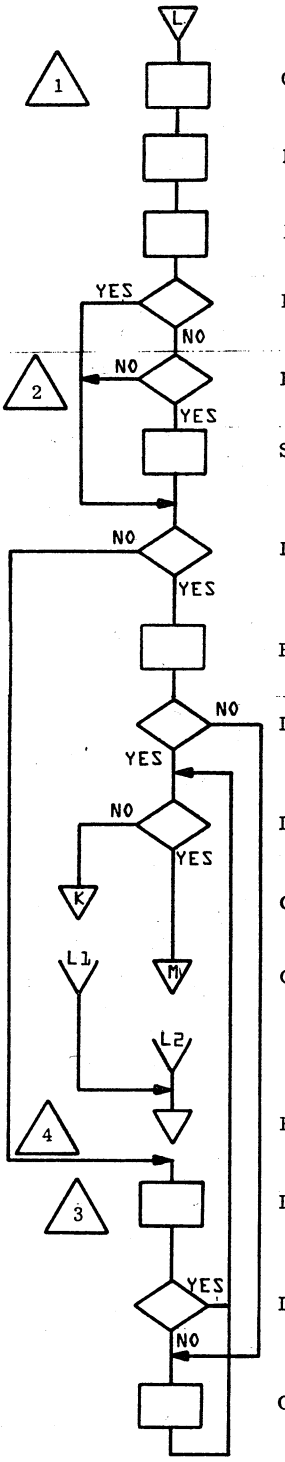
1. Loading the EVFU is accomplished by installing a VFU tape and depressing the load VFU switch. The tape may then be removed.

2. The EVFU pointer is a flag that points to the present forms line number that is in front of the print station. (See memory map)

3. The EVFU format code will be a form feed (channel 1), or vertical tab (channel2), or the absence of both channels which is interrupted as a line feed command.

4. When this flag is set, paper motion will be terminated by the next STP pulse. See PAPER MOTION INTERRUPT subroutine.

5. Returns to the PAPER MOTION subroutine or PAPER MOTION INTERRUPT subroutine.



Output Line Feed O/S

Microprocessor is at Step 1 D (LED's are 01 1101)

Reset Line Feed O/S

Has a forms advance been initiated by the Adapter?

Is the Stop Paper Motion flag = 1?

Stop paper motion

Is there 6/8 line coincidence?

Reset coincidence error

Is paper coincidence check at the proper count?

Is paper motion complete?

Call EVFU POINTER UPDATE subroutine

Call the PAPER MOTION INTERRUPT ENABLE subroutine

Return to: PAPER MOTION or LOAD DATA subroutine.

Increment the coincidence check

Is the coincidence check at the proper count?

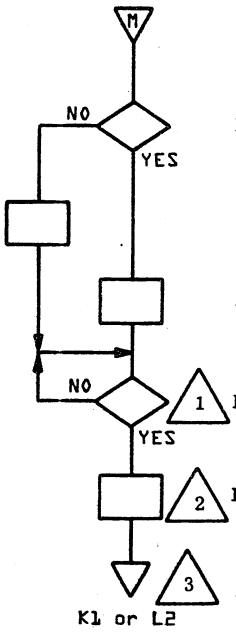
Output a coincidence error.

1. One Line Feed O/S is generated for each line of print. This is an interface adapter signal only and does not affect the basic printer operation

2. This flag is set in the electronic VFU UPDATE subroutine. When detected paper motion is terminated.

3. A memory location that is updated at every STP interrupt to point at the proper 6/8 LPI Count (0, 1, 2, 0, 1, 2 for 6 LPI and 0, 1, 2, 3, 0, 1, 2, 3, for 8 LPI)

4. STP generates an interrupt which would immediately interrupt a PAPER MOTION or LOAD DATA subroutine. When this interrupt has been serviced by this PAPER MOTION INTERRUPT subroutine, program control will return to the interrupted subroutine.



Is the printer in 6 LPI mode?

Monitor the 8 LPI STP.

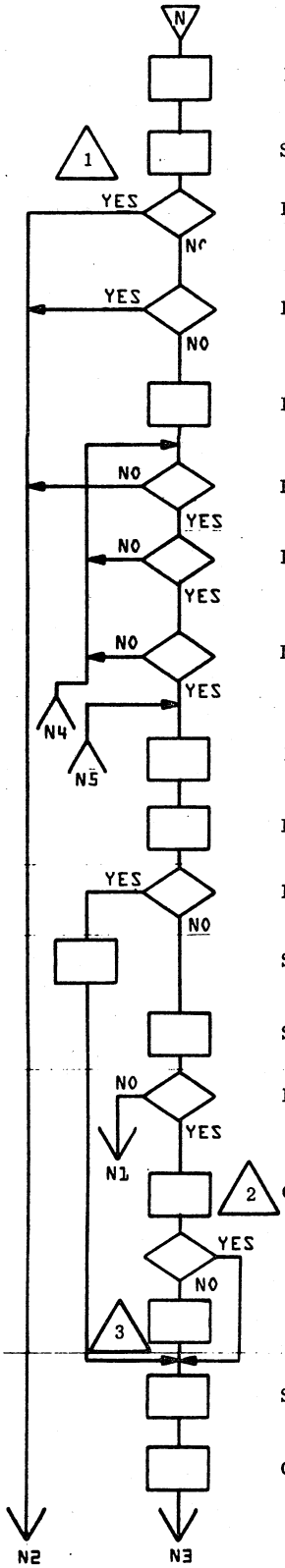
Monitor the 6 LPI STP

Is STP equal to 0?

Enable the interrupts

1. Waiting for STP that generates interrupt to go false.
2. Allows STP interrupt during paper motion operations.
3. Returns to EVFU UPDATE or PAPER MOTION INTERRUPT subroutine.

THIS SUBROUTINE TRANSFERS DATA FROM THE INTERFACE INTO THE BUFFER MEMORY. DATA IS ACCEPTED UNTIL A CONTROL CODE HAS BEEN RECOGNIZED OR A SUFFICIENT NUMBER OF CHARACTERS HAVE BEEN RECEIVED TO FILL THE OUTPUT LINE. VALID CONTROL CODES ARE FF, LF, VT, & CR.



Microprocessor is at Step B (LED's are 00 1011)

Set the Interrupt Enable flag

Is Load Complete set?

Is the cabinet off and the Inhibit switch activated (Port 2 C)?

Reset Print Busy at port 2 B

Is Ready Enable on?

Is the Acknowledge F/F reset?

Does Data Strobe = 1? (215 E5-17)

Microprocessor is at Step C (LED's are 00 1100)

Read Data Lines at port 3A

Is data a Control Code?

Store the Control Code for Paper Motion command.

Store the data

Is the buffer full?

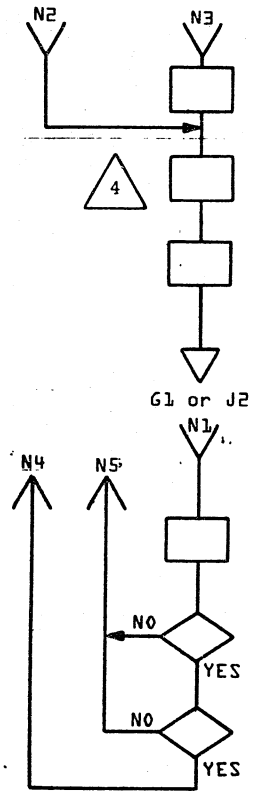
Generate a carriage return for a control code.

Is AUTOTERM not equal to 1?

Decrement columns by 1

Set Print Busy at port 2B

Generate ACK OUT pulse



Set Load Complete

Store columns in PTEND

Clear Interrupt Enable flag

Return to: PRINT CYCLE, or PAPER MOTION subroutine

Generate ACK Output pulse (Port 2A)

Is the ACK Output pulse reset (Port 2 A)?

Has the next data strobe been received (Port 3C)? (215 E5-17)

1. Allows this subroutine to be interrupted by MC or STP

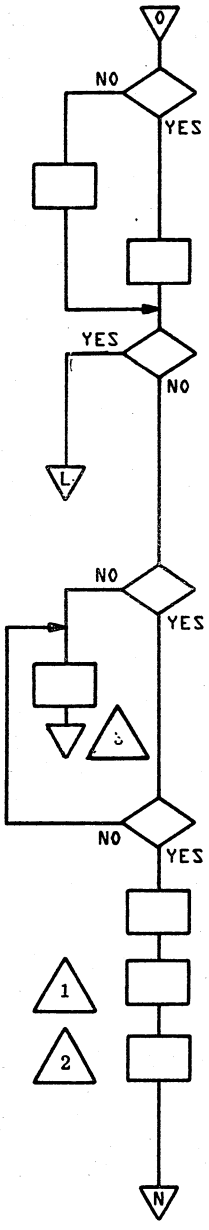
2. Inhibits paper motion

3. If this path was taken, it means the 81 print characters have been loaded, rather than 80 characters and a control cod Therefore, columns must be decremented by one, so 80 and not 81 columns will be printed, if the printer is in the 80 column mode.

4. PTEND is used in the print cycle subroutine to determine if the print heads are beyond the last character to be printe in a line. If so, Head B or Head A and Head B printing is inhibited.

NOTE:

This subroutine may also be interrupted whenever a STP or MC is generated which CALLS the INTERRUPT SERVICE subroutine.



Is the printer in 6 LPI mode?

Monitor 8 LPI STP

Monitor 6 LPI STP

Does STP = 1?

Jump to PAPER MOTION INTERRUPT routine.

Was the program in Load Data subroutine?

Enable Interrupts

Return to a PAPER MOTION or LOAD DATA subroutine

Does MC = 1?

Microprocessor is at Step D (LED's are 00 1101)

Reset Data Loaded flag (PT END)

Enable Interrupts

Jump to LOAD DATA subroutine

(1) Reset = FF. When PT END is other than FF, this indicates that data is to be printed. It must be cleared, because this path will re-enter the LOAD DATA subroutine.

(2) When the Microprocessor receives an interrupt, it locks out further interrupts. Therefore, enable interrupts must be set when leaving this routine.

(3) Return to the PAPER MOTION or LOAD DATA subroutine which was interrupted.

INSTALLATION AND CHECKOUT

WARNING

THE INSTALLATION AND CHECKOUT OF THESE PRINTERS REQUIRES THE REMOVAL OF PROTECTIVE COVERS PROVIDED TO PROTECT THE CUSTOMER AND FIELD SERVICE REPAIRMEN FROM HAZARDOUS VOLTAGES AND MECHANISMS. THE INSTALLATION AND CHECKOUT OF THESE PRINTERS SHALL ONLY BE PERFORMED BY TRAINED FIELD SERVICE REPAIRMEN WHO HAVE BEEN TRAINED TO WORK ON THESE PRINTERS WITH THE PROTECTIVE COVERS REMOVED.

INTRODUCTION

This section covers Site Planning., Unpackaging and Assembly, Installation, Check out and Disassembly and Repackaging of the 70/125 line per minute Matrix Printer. The installation and checkout of these printers should only be attempted by trained field service personnel. This entire section plus the Operating Instructions Section and the Principals of Operation Section should be read before attempting to install or check out the printer.

NOTE

WHEREVER EIGHT DIGIT PART NUMBERS APPEAR IN THE TEXT, THE PREFIX 70 SHOULD BE ADDED TO THE NUMBER TO CREATE THE TEN DIGIT NCR PART NUMBER.

SIGHT PLANNING

The important factors to be considered when choosing the printer's location include the access space necessary for operating and servicing, availability of electrical power and the environmental requirements of the printer.

SPACE REQUIREMENTS

Adequate access space must be provided for the operation and maintenance of the printer. Figure 4-1 shows the overall dimensions of the printer and Figure 4-2 shows the suggested minimum access area required around the printer for its operation and maintenance. Other points to keep in mind in selecting the printer location are: personnel traffic patterns, storage of printing forms and operator supplies.

The printers weight may very a few pounds depending upon model, but generally, the printer will weigh approximately 100 lbs (45.5 kg).

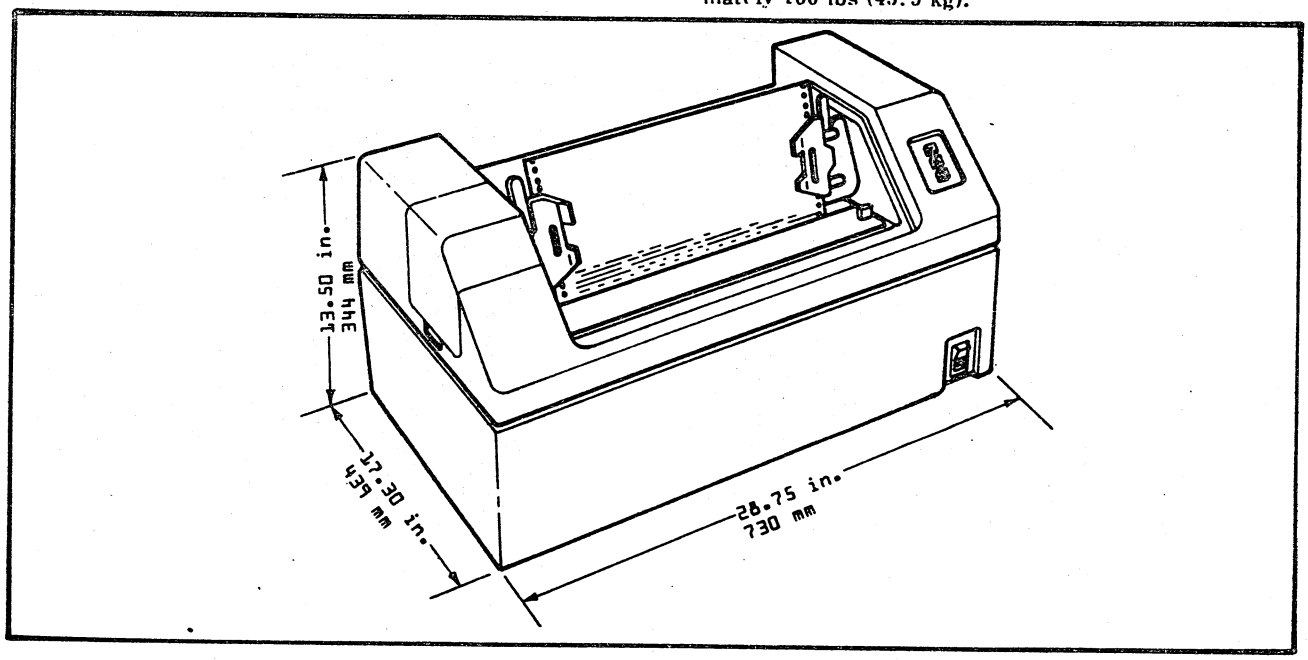


FIGURE 4-1. PRINTER DIMENTIONS

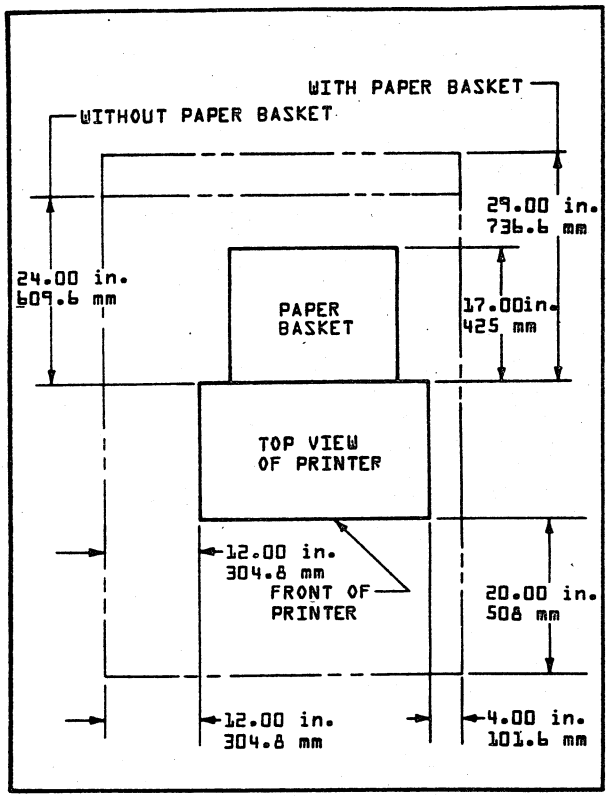


FIGURE 4-2. PRINTER ACCESS

Electrical Requirements

Power Cord. The standard printer is provided with a three wire (hot, neutral and earth ground) power cord of which 8 feet (2.44 meters) is external ot the printer. The standard power cord is terminated with a non-locking 3 prong plug for use with 60 Hz outlets. The cord may also be fitted with plugs for use with 50 Hz outlets. Before changing power cord configurations ensure the printer is wired for the required voltage. For details on changing voltage configurations, see voltage requirements below.

Frequency. The printer may be operated from a 50 or 60 Hz (single phase) power source within the following frequency ranges:

Nominal Frequency	Tolerance Range
50 Hz	49.0 to 50.5 Hz
60 Hz	59.0 to 60.6 Hz

Voltage Requirements. Due to the difference in nominal voltage inputs between countries the printer is equipped with a multi-tap input transformer. Voltage ranges can be tap selected by changing field accessible input power connections to terminal block 2TB01.

No component changes are required when changing from 60 Hz to 50 Hz operation. The tap selectable ranges available are as follows:

Nominal (VAC)	Voltage Range
100	90 to 107
120	104 to 127
200	180 to 213
220	198 to 235
230	207 to 246
240	216 to 257
260	235 to 278

For detailed instructions and wiring diagrams on how to convert the printer to any of the above voltage ranges, see the installation section of this manual.

Current. The current requirements are as follows:

Printer	Amps	VAC	Hz
125 lpm	1.75	220	50
125 lpm	3.2	120	60
70 lpm	1.53	220	50
70 lpm	2.8	120	60

Input Power. The input power requirements are as follows:

Printer	Volt/Amps
125 lpm	384
70 lpm	336

Heat Generation. The heat generation is as follows:

Printer	Watts
125 lpm (printing)	278 (239 kcal/hour)
125 lpm (idling)	100 (86 kcal/hour)
70 lpm (printing)	243 (209 kcal/hour)
70 lpm (idling)	100 (86 kcal/hour)

Input Power Protection. A dual purpose double pole circuit breader and illuminated On/Off switch located in the front right corner of the printer cabinet provides input power protection and is rated as follows:

Full Load = 7.5 amps rms.
Trip = 9.38 amps rms.

Cooling. The printer has internal forced air ventilation to ensure proper cooling of internal parts if the specified printer environmental requirements are maintained.

Environmental Requirements

Operating Temperature And Humidty. The printer has been designed to operate within the following ambient conditions:

Temperature Range: $10^{o}C$-$35^{o}C$ ($50^{o}F$-$95^{o}F$)

Temperature Change: $10^{o}C$ ($18^{o}F$) per hour max.

Humidity Range: 20-80% (non condensing).

Humidity Change: 10% per hour max.

Storage Temperature And Humidity. The printer can withstand the following temperature and humidity ranges when properly packaged for up to three months of storage:

Temperature Range: -10°C to 50°C (14°F to 122°F)

Temperature Change: 15°C (27°F) per hour max.

Humidity Range: 10% to 90% (non condensing).

Barometric Pressure. The maximum operating altitude for this printer is 6560 feet (2000 meters). Printers operating above this altitude require a special option, high altitude cooling kit.

UNPACKAGING AND ASSEMBLY

Read this entire section before unpackaging and assembling the 70/125 Line Per Minute Printer and its associated options.

The following tools are required to unpackage and assemble the printer and its associated options:

1. Tin snips or sheet metal shears.
2. Screwdriver 1/4 (0.25 inch-6.35 mm) blade.
3. Pocket knife (to cut tape, card board, cloth straps, plastic bags, etc).
4. Crescent wrench (adjustable spanner) 6 to 8 inches long.

Pedestal (Optional) Unpackaging And Assembly.

1. Open the pedestal box.
2. Remove the pedestal parts, bag of assembly hardware and the assembly instructions.
3. Check the parts against the assembly instructions to assure that none of the parts are missing or damaged.
4. Assemble the pedestal per the assembly instructions

Printer Unpackaging And assembly (Figure 4-3)

1. Cut and remove the steel strapping securing the printer carton to the wood skid (if applicable).
2. Cut the carton sealing tape and open the printer carton flaps. Remove the printer manuals.
3. Reach into the carton and remove the cushion from the top of the printer.
4. Lift the dust cover off the printer.
5. Carefully remove the printer from the box and lower cushion. Place the printer on a solid bench or table.

CAUTION

THE PRINTER WEIGHS 100LBS (45.5KG). TRYING TO LIFT THE PRINTER FROM THE CARTON WITHOUT ADAQUATE ASSISTANCE COULD CAUSE BODILY INJURY. TO PREVENT INJURY, IT IS RECOMMENDED THAT THE CARTON BE PLACED ON A TABLE AND THAT THE PRINTER BE REMOVED BY CUTTING OPEN ONE END OF THE CARTON AND SLIDING THE PRINTER OUT ON THE BOTTOM CUSHION. PLASTIC DUST COVER IS VERY SLIPPERY AND CARE SHOULD BE TAKEN WHEN LIFTING PRINTER WITH DUST COVER IN PLACE.

6. Remove the filament tape and wrapping material that was used to hold the Print Head Support Casting and Paper Weights in place during shipment.
7. Inspect the printer for shipping damage.
8. Remove the two hex head shipping screws that lock the floating printer structure to the printer base plate during shipping. These two screws are located on the bottom of the printer base plate. One screw is located on the left side, half way between the left front and left rear rubber feet. The other screw is located on the right side, half way between the right front and right rear rubber feet. These screws should be saved for re-use if the printer is ever repackaged for shipping. When removing these screws do not tilt the printer up on an edge so that its weight is resting on the cabinet. Slide one side of the printer at a time over the edge of a table until the screw is accessible.
9. If the printer is to be pedestal mounted, install the optional pedestal at this time (Figure 4-4). For detailed instructions on how to mount the printer to the pedestal, see the assembly instructions provided with the pedestal. The mounting hardware is provided with the pedestal.
10. If the printer is provided with an optional paper basket or any of the other option kits, unpackage them and install them to the printer using the assembly and installation instructions provided with each kit.
11. The printer is now ready for installation and checkout.

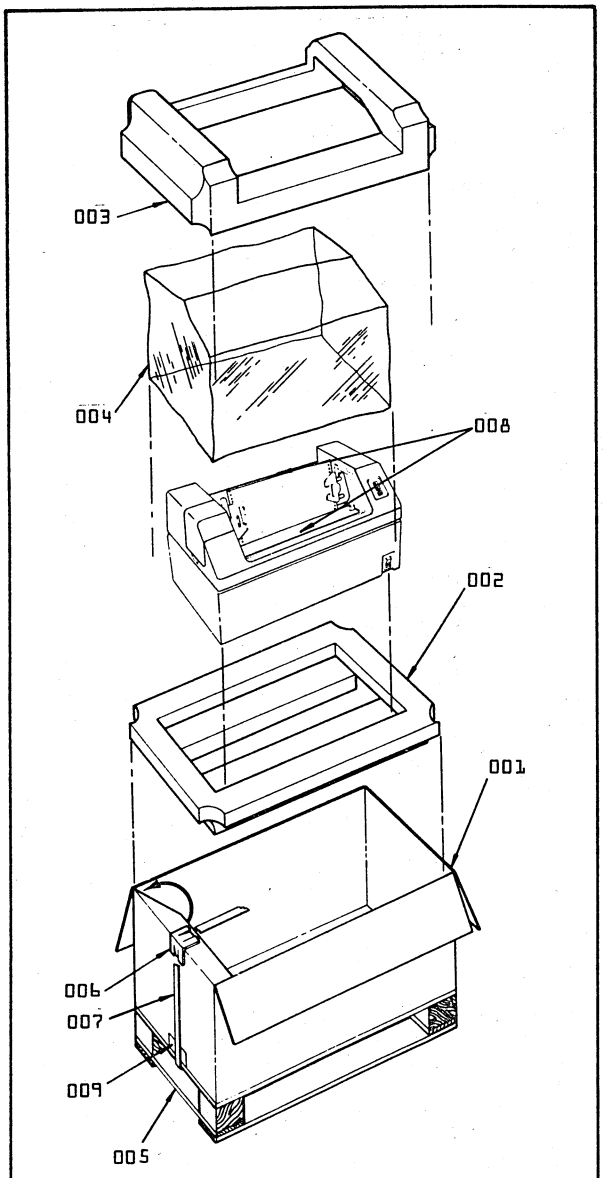
Paper Basket (Optional) Unpackaging And Assembly (Figure 4-5)

1. Open the paper basket box.
2. Remove the two piece paper basket and grounding strip bracket assembly, bag of assembly hardware and the assembly instructions.
3. Check the parts against the assembly instructions to assure that none of the parts are missing or damaged.
4. Mount the grounding strip and bracket assembly to the printer base plate as shown in Figure 4-5.
5. Hook the paper basket mounting rack over the printer paper tensioner shaft at the top rear of the printer (Figure 4-5)
6. Mount the paper basket into the paper basket mounting rack (Figure 4-5).

PRINTER INSTALLATION

1. Install the printer on a fairly level surface, so that the printers weight is resting evenly over all four rubber feet.

   If the printer is to be installed on a table, bench or cabinet, level the top surface before placing the printer on it. If the table, bench or cabinet does not have built in levelers use shims under the legs or corners. If the printer is installed on



FIND NO.	PART NUMBER	DESCRIPTION	QTY
001	59126301	CARTON (PRINTER)	1
002	59126302	BOTTOM CUSHION	1
003	59126303	TOP CUSHION	1
004	59125407	DUST COVER	1
005	59126310	SKID (WOODEN)	1
006	59136123	EDGE PROTECTOR	4
007	59136107	STEEL STRAP	2
008	59136109	FILAMENT TAPE	30"
009	59136111	CARTON SEALING TAPE	136"

FIGURE 4-3. PRINTER PACKAGING

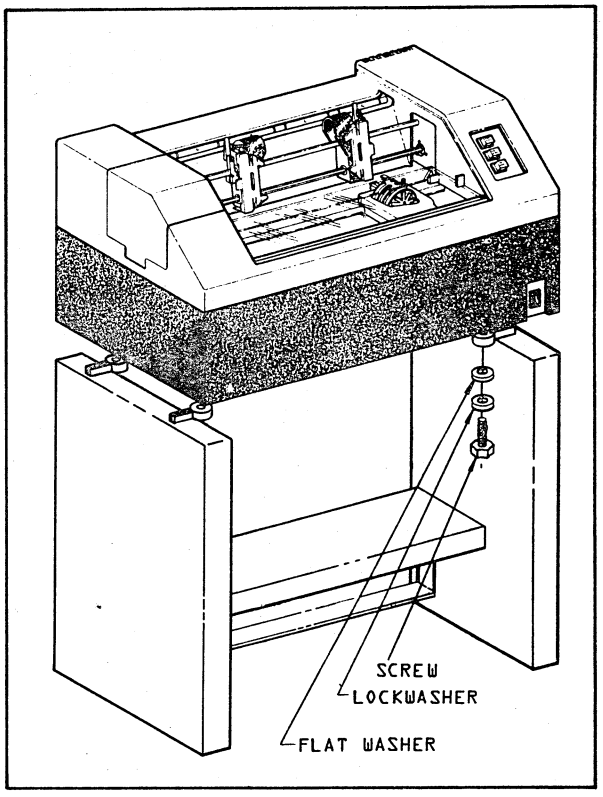


FIGURE 4-4. PRINTER TO PEDESTAL MOUNTING

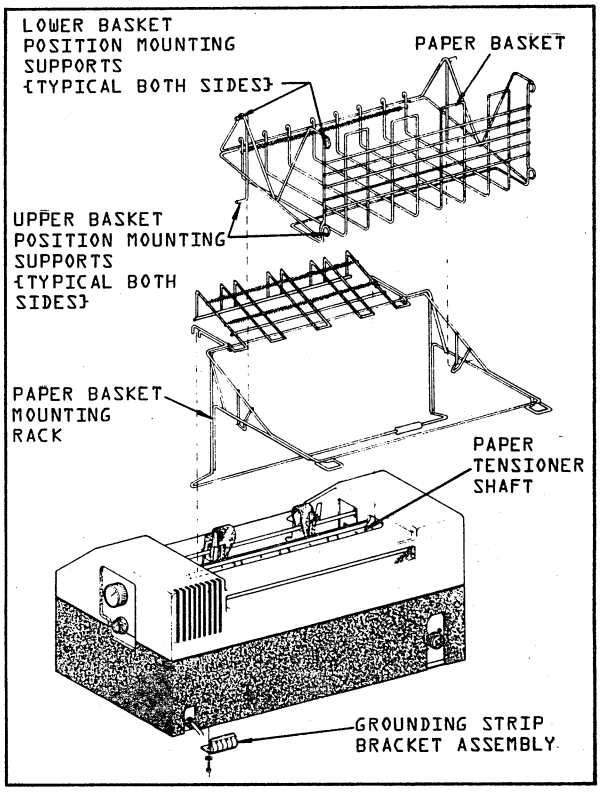


FIGURE 4-5. PAPER BASKET INSTALLATION

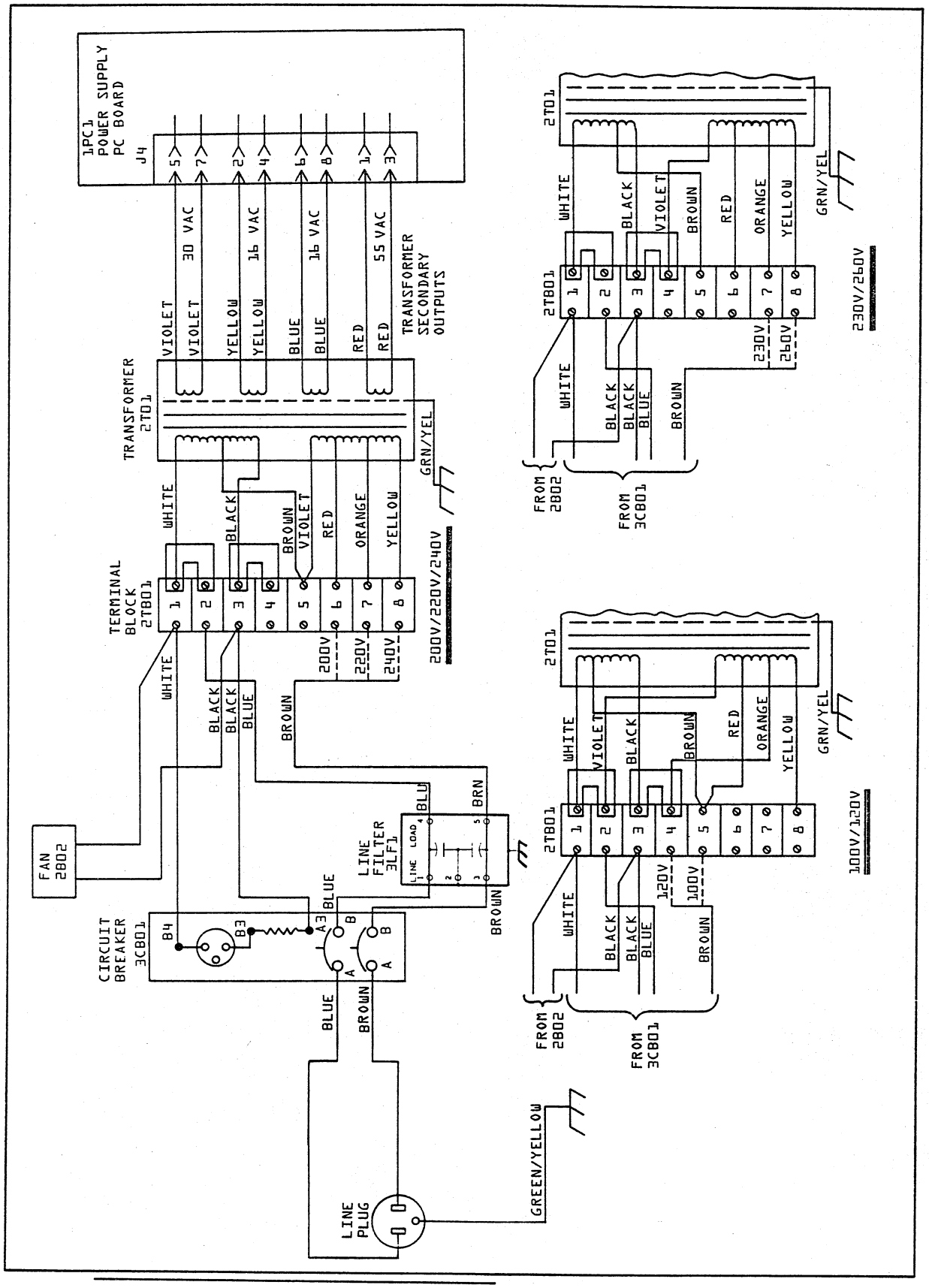


FIGURE 4-6. ALTERNATE POWER CONFIGURATION FOR WIRING THE UNIVERSAL TRANSFORMER

a printer pedestal, the pedestal may or may not have optional built in adjustable levelers or casters for leveling the printer. Pedestals without levelers or casters may be leveled using shims under the legs. In general the printer will operate on a fairly unlevel surface as long as it is not allowed to rock. The main reason for requiring that the printer be level, is for form feed purposes. If the top surface of the form stack is not fairly level with the printer, the tension on the forms will be uneven as it enters the printer. Uneven tension on the forms could cause form tearing or paper jams.

2. Remove the upper cabinet cover and the lower cabinet skirt. (Figure 1-1).

3. With a volt meter, check the building line voltage at the wall socket or power outlet provided for the printer.

4. Using the wiring diagrams shown in Figure 4-6 check the wiring configuration of your printers universal transformer and the circuit breaker to terminal block 2TB01. If your printer is not wired correctly, change the wiring of terminal block 2TB01 to obtain the voltage requirements found in step 3 above. When making these wire changes make sure that the brown wire from the circuit breaker is changed along with the transformer leads.

5. The standard printer power cord is terminated with a non locking 3 prong plug for use with 120 volt 60 Hz outlets. The cord may also be fitted with plugs for use with 50 Hz outlets. If the plug supplied with the printer does not meet with local safety or electrical requirements, the plug should be removed and replaced with a plug that does.

6. The printer is now ready for checkout.

PRINTER CHECKOUT

The checkout of these printers should only be attempted by trained field service personnel.

1. Do not plug the printer power cord plug into the wall or power outlet at this time.

2. If they are not already removed, remove the upper cabinet cover and the lower cabinet skirt.

3. Using the wiring diagram shown in Figure 4-6 check to see if terminal block 2TB01 is wired for your required voltage configuration.

4. In the logic chassis at the rear of the printer, unlatch and swing down the Controller And Print Head Board (card location 1PC2) and the Power Supply Board (card location 1PC01).

5. Using Figure 4-7 locate and inspect the five fuses on the power supply board. Also inspect the connections to circuit breaker 3CB1 and line filter 3LF01.

6. Inspect and trace all interconnecting ribbon cables. Insure that all ribbon cable connectors are connected and seated properly.

7. Inspect all the printed circuit cards and insure that all chips and ROM's are seated properly.

CAUTION

INTEGRATED CIRCUITS AND MOS CHIPS ARE PRESENT ON THE PRINTED CIRCUIT BOARDS IN THIS PRINTER. THESE DEVICES ARE EASILY DESTROYED IF A STATIC ELECTRICAL CHARGE IS ACCIDENTALLY APPLIED TO A PIN THROUGH IM-

IDENT	LOCATION	FUNCTION	PART No.	AMPS	TYPE
F1	POWER SUPPLY (1PC1)	+36 VOLTS	24536202	5A	MTH5
F2	POWER SUPPLY (1PC1)	-36 VOLTS	24521723	1.6A	MDL1.6 (SLO BLOW)
F3	POWER SUPPLY (1PC1)	+5 AND +12 VOLTS	24536202	5A	MTH5
F4	POWER SUPPLY (1PC1)	-5 AND -12 VOLTS	24512920	1A	AGC1
F5	POWER SUPPLY (1PC1)	+36 VOLTS	24521723	1.6A	MDL1.6 (SLO BLOW)
3CB01	FRONT OF PRINTER	MAIN POWER BREAKER	76647100	7.5A	203-22-1-3291-1
F-6	P4A-J4A-7	30V	24521727	3A	MDL-3 (SLO BLOW)
F-7	P4A-J4A-2	16V	24521733	10A	MDL
F-8	P4A-J4A-8	16V	95650916	2A	MDL

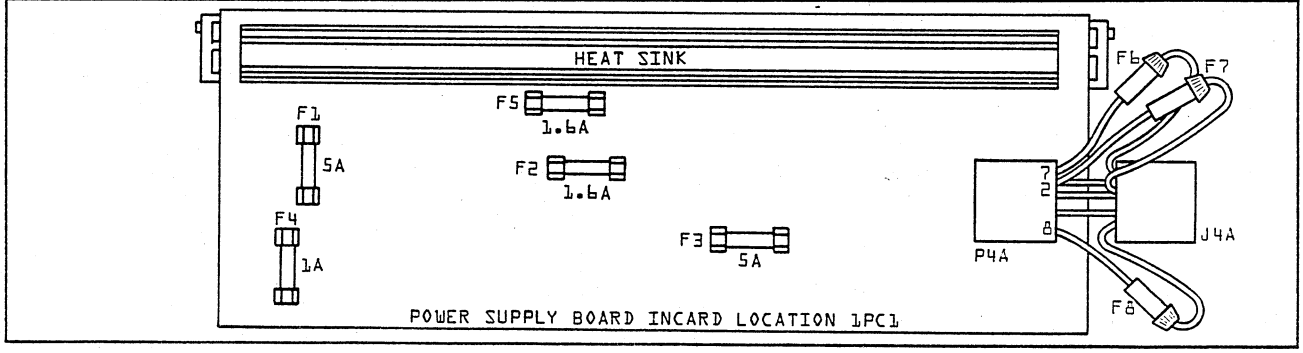


FIGURE 4-7. FUSES AND CIRCUIT BREAKER LOCATIONS

PROPER HANDLING OR REPAIR. THESE STATIC CHARGES CAN BE MINIMIZED OR ELIMINATED IF PROPER PRECAUTIONS ARE OBSERVED.

A. WHEN HANDLING INTEGRATED CIRCUITS OR PLUG-IN BOARDS, DO NOT TOUCH THE CIRCUITS PINS OR PLUG-IN BOARD CONNECTOR PINS. HANDLE BY THE EDGE ONLY.

B. WHEN REMOVING OR INSERTING A CONNECTOR OR BOARD, GROUND YOURSELF TO THE UNIT FRAME BEFORE TOUCHING THE BOARD OR CONNECTOR. DO NOT REMOVE OR INSERT A CONNECTOR OR BOARD WITH THE UNIT POWERED ON.

C. DO NOT REMOVE A PLUG IN BOARD OR CHIP FROM ITS SHIPPING CARTON UNTIL READY TO INSERT IT INTO THE PRINTER.

D. USE ONLY A THREE WIRE SOLDERING IRON WHEN REPAIRING PRINTED CIRCUIT BOARDS. LAY THE BOARD ON AN INSULATED PIECE OF MATERIAL. DO NOT LAY THE BOARD ON METAL OR PLASTIC.

8. Inspect the Controller And Print Head Board (card location 1PC2) to insure that the program and character generator ROM's are installed. Follow the precautionary measures inidcated in step 7 above when installing these ROM's. See Figure 4-9 for a quick check to see whether your printer has the correct number of program and character generator ROM's for your basic printer configuration.

9. With the aid of Figure 4-10, locate switches SWN4-1 through SWN4-8, which are mounted on the controller and print head board (card location 1PC2).

   Select and actuate, the switch selectable standard features required for your printer site.

   For detailed descriptions of these features see the standard features section of Section I in this manual.

10. Locate and inspect all major assemblies for damage or loose parts.

11. With your hand, move the print head back and forth on the print head support shafts several times to assure that it moves freely.

12. Unlock the right and left tractors and slide them both from right to left. The tractors should both slide easily.

    Lock both tractors in place. The tractors should not be able to slide.

13. If the printer requires a special interface, make sure the interface adapter option kit is installed in the logic chassis at card location 1A03. See the interface kit manual for installation and checkout instructions.

14. Make sure the printer on/off switch is in the off position. Plug the printer into its power outlet.

15. Install a ribbon cassette to each head (Figure 2-3).

16. Install the forms and lower the necessary paper tension weights (Figure 2-5).

17. The printer is now ready to power on.

    To operate the printer with the cabinet removed, the interlock switch, located to the left of the control panel, must be pulled up.

    Press the on off switch to the on position.

18. Actuate the Test Print Switch located on the Controller And Print Head Board in card location 1PC2. (Figure 4-6).

    NOTE

    IF THE TEST PRINT CONTROL PANEL SWITCH IS ADDED, ACCESS TO THE CARD MOUNTED SWITCH IS NOT NEEDED.

19. This switch causes the printer to print the character "B" alternating with blanks across the page and then performs a single line advance (Figure 4-8). Use this pattern to check vertical and horizontal alignment of the forms.

20. Actuate the Test Print Switch. This second actuation will terminate the Test Print Operation.

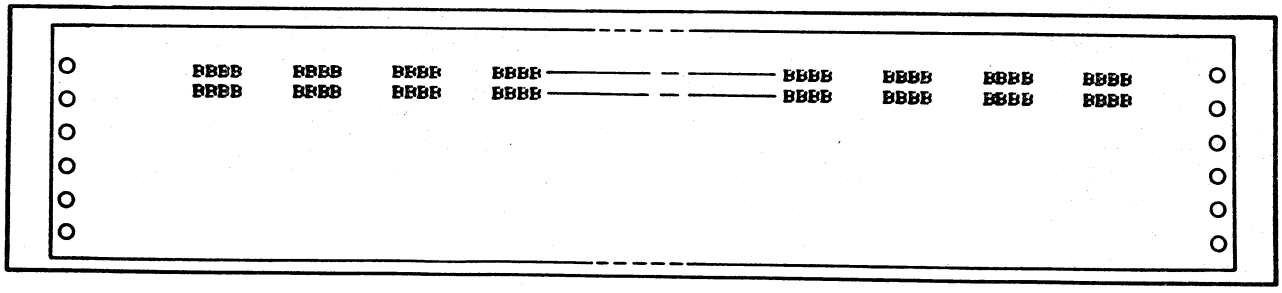


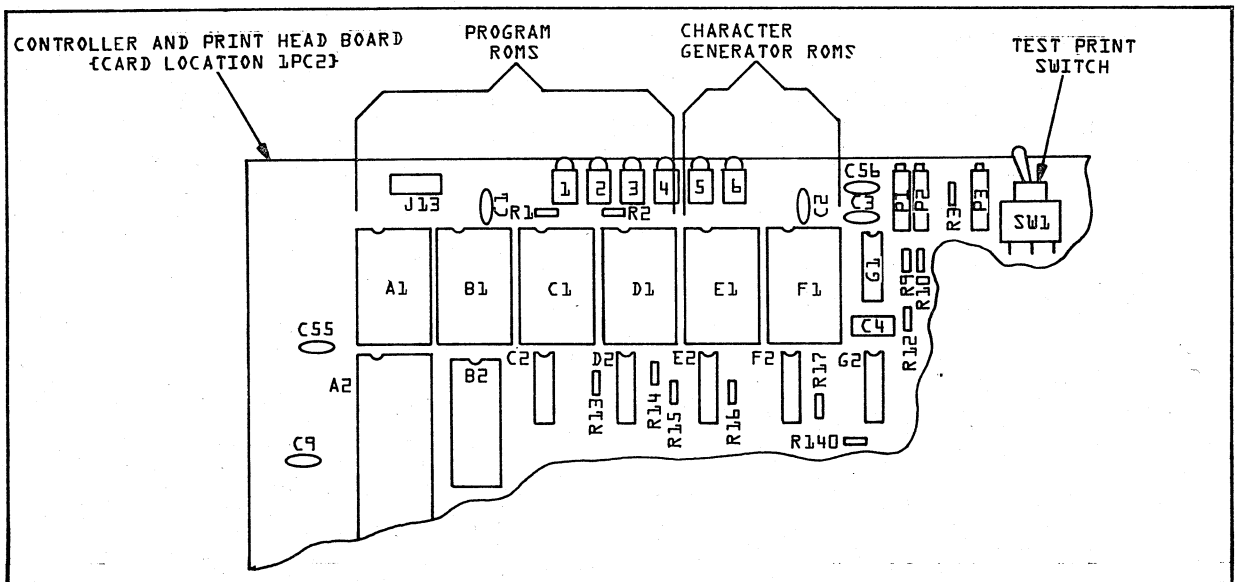
FIGURE 4-8. TEST PRINT SAMPLE

21. If your printer has the 6/8 Line Per Inch Option or the Compressed Pitch Option, check them out at this time.

    Do not actuate the 6/8 LPI Switch or the Compressed Pitch Switch when the printer is printing in the Test Print Mode. Terminate the Test Print Operation, actuate the option switch and then re-enter the Test Print Mode.

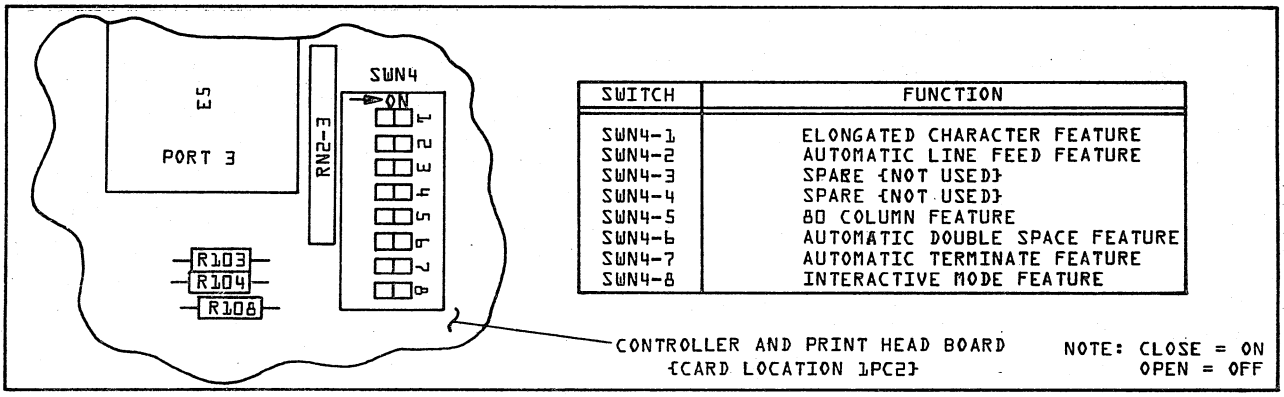
22. If your printer has an Electronic Vertical Format Unit installed, load the format tape into the reader. Actuate the Load EVFU Switch and load the tape into memory. Press the Form Feed Switch on the control panel. The printer should slew paper to the top of form.

23. Power off the printer by placing the on/off switch in the off position. Remove the forms from the printer.



DESCRIPTION	ROM IN LOCATION A1	ROM IN LOCATION B1	ROM IN LOCATION C1	ROM IN LOCATION D1	ROM IN LOCATION E1	ROM IN LOCATION F1
125 LPM PRINTER WITH 7 NEEDLE DRIVERS PER HEAD	X	X			X	
70 LPM PRINTER WITH 7 NEEDLE DRIVERS	X	X	X	X	X	
125 LPM PRINTER WITH 9 NEEDLE DRIVERS PER HEAD	X	X	X	X	X	X
70 LPM PRINTER WITH 9 NEEDLE DRIVERS PER HEAD	X	X	X	X	X	X

FIGURE 4-9. PROGRAM AND CHARACTER ROM REQUIREMENTS AND TEST PRINT SWITCH LOCATION



SWITCH	FUNCTION
SWN4-1	ELONGATED CHARACTER FEATURE
SWN4-2	AUTOMATIC LINE FEED FEATURE
SWN4-3	SPARE (NOT USED)
SWN4-4	SPARE (NOT USED)
SWN4-5	80 COLUMN FEATURE
SWN4-6	AUTOMATIC DOUBLE SPACE FEATURE
SWN4-7	AUTOMATIC TERMINATE FEATURE
SWN4-8	INTERACTIVE MODE FEATURE

FIGURE 4-10. CONTROLLER AND PRINT HEAD BOARD SWITCH SELECTABLE FEATURES

24. Replace the lower cabinet skirt (Figure 1-1), replace the upper cabinet cover and knobs. Assure that the two upper cabinet locking screws are backed out to their locked positions (Figure 1-1).

25. Power the printer on.

26. Load forms.

27. If the printer has Electronic Vertical Format Unit, load the format tape into memory.

28. Install the interface cable and actuate the Start/Stop Switch. The switch will illuminate and the printer is ready for on line operation.

DISASSEMBLY AND PACKAGING

Printer Disassembly And Repackaging (Figure 4-3).

1. Unplug and coil the line cord. Tape or tie the coiled cord so it will not uncoil. Place the cord on top of the printer.

2. Remove the Paper Basket, Paper Basket Mounting Rack and the Paper Basket Grounding Strip Bracket Assembly. Retain all basket mounting hardware to be packaged with the basket.

3. If the printer is pedestal mounted, remove the four screws that mount the pedestal to the printer. Retain the pedestal mounting hardware for repackaging with the pedestal.

4. Assure that all printer covers are in place and that the two upper cabinet cover locking screws (Figure 1-1) are screwed all the way in to their unlocked positions.

5. Install the two hex head (M6X8) metric shipping screws that lock the floating printer structure to the printer base plate during shipping. These two screws are installed from under the printer. One screw is installed on the left side of the base plate half way between the front and left rear rubber feet. The other screw is installed on the right side of the base plate, half way between the right front and right rear rubber feet.
   If the printer is pedestal mounted, install these screws before removing the printer from the pedestal.
   When installing these shipping screws on non-pedestal mounted printers, do not tilt the printer up on an edge so that its weight is resting on the cabinet. Place non-pedestal mounted printers on a table. Slide one side of the printer at a time over the edge of the table until the screw installation holes are accessable.

6. Tape the print head support castings in place with filament tape so they will not move during shipment. Wrap & tape the paper weights in place so they will not cause damage during shipment.

7. Assemble the printer carton using carton sealing tape.

8. Place the carton on the shipping skid.

9. Place the bottom cushion in the bottom of the carton.

10. Place the printer into the box and bottom cushion.

CAUTION

THE PRINTER WEIGHS 100 LBS (45.4 KG). TRYING TO PLACE THE PRINTER INTO THE CARTON WITHOUT ADAQUATE ASSISTANCE COULD CAUSE BODILY INJURY.

11. Place the dust cover over the printer.

12. Place the top cushion on top of the printer.

13. Place the printer manuals on top of the top cushion.

14. Close the carton flaps and seal them with carton sealing tape.

15. Strap the carton to the skid using steel strapping and edge protectors.

16. The printer is now packaged and ready for shipment.

Pedestal (Optional) Disassembly And Repackaging (Figure 4-11)

1. Disassembly the pedestal and place each of the following in polyethylene bags:

   A. Left Upright
   B. Right Upright
   C. Bottom Frame Cross Member

2. Assembly the pedestal carton, using carton sealing tape.

3. Place the Left and Right Pedestal Uprights into the carton with a separator pad between them.

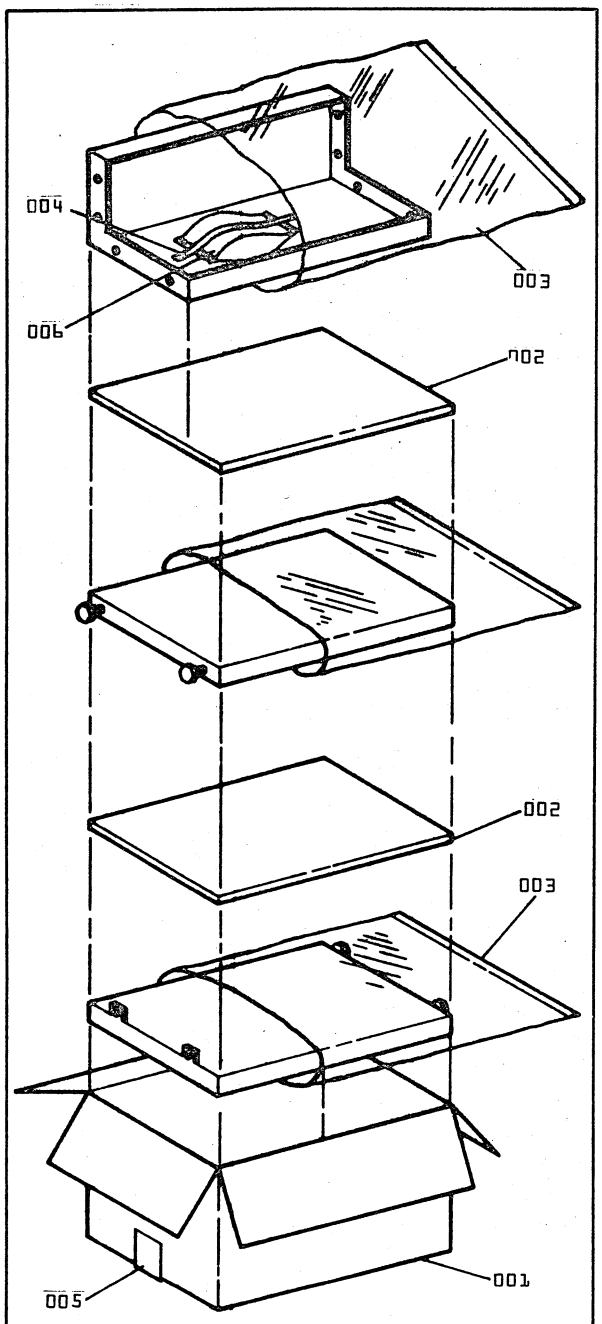
4. Place a separator pad on top of the top pedestal upright.

5. Place the Bottom Frame Cross Member into the pedestal carton on top of the separator pad.

6. Place the pedestal assembly and mounting hardware in a plastic or paper bag along with the installation instructions. Tape the bag to the inside of the bottom frame cross member, using filament tape.

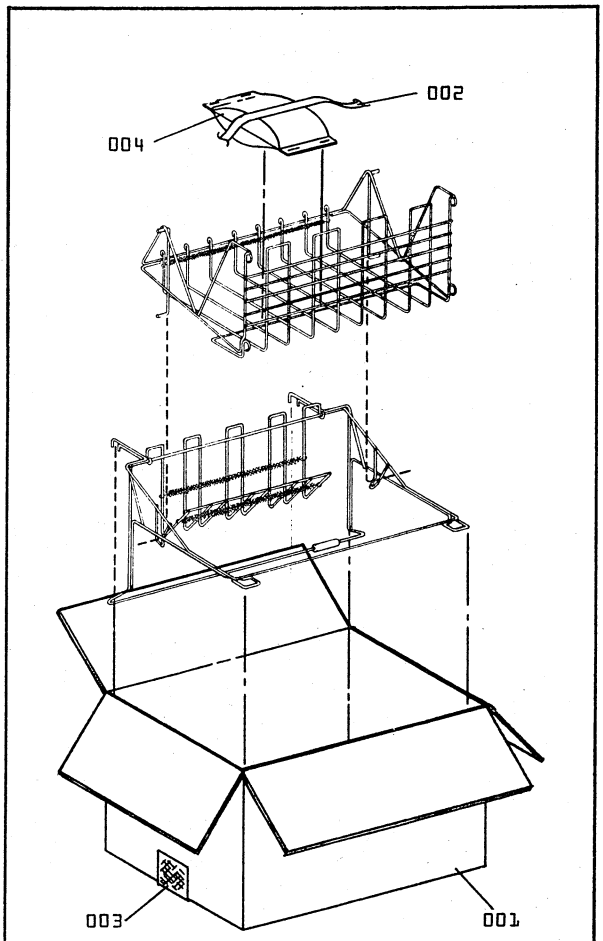
7. Place crushed newspaper or packaging material on top of the bottom frame cross member to keep it from moving during shipment.

8. Close the carton flaps and seal them with carton sealing tape.



FIND NO	PART NUMBER	DESCRIPTION	QTY
001	59126304	CARTON (PEDESTAL)	1
002	59126305	SEPARATOR PAD	2
003	59125605	POLYETHYLENE BAG	3
004	59136109	FILAMENT TAPE	10"
005	59136111	CARTON SEALING TAPE	100"
006	NONE	PLASTIC OR PAPER BAG	1

FIGURE 4-11. PEDESTAL PACKAGING



FIND NO	PART NUMBER	DESCRIPTION	QTY
001	59126306	CARTON (PAPER BASKET)	1
002	59136109	FILAMENT TAPE	40"
003	59136111	CARTON SEALING TAPE	100"
004	NONE	PLASTIC OR PAPER BAG	1

FIGURE 4-12. PAPER BASKET PACKAGING

Paper Basket (Optional) Disassembly And Repackaging (Figure 4-12)

1. Assemble the carton using carton sealing tape.
2. Using filament tape, tape the paper basket to the paper basket mounting rack.
3. Place the basket Grounding Strip Assembly and its mounting hardware in a plastic or paper bag along with the paper basket installation instructions. Tape the bag to the bottom of the paper basket.
4. Place the Paper Basket Mounting Rack and Paper Basket into the carton.
5. Close the carton flaps and seal them with carton sealing tape.

MAINTENANCE

INTRODUCTION

This section contains information to aid the service personnel in maintaining the printer. Information presented in this section includes:

Maintenance Aids
Preventive Maintenance

MAINTENANCE AIDS

Maintenance aids refers to tools, materials and built in printer features that aid the service personnel in performing maintenance on the printer.

Tools And Materials

Tools and materials required to maintain the printer are listed in three groups: Standard Maintenance Tools, Special Maintenance Tools, and Maintenance Materials. Standard Maintenance Tools are items normally used by service personnel and are specifically needed for maintaining this printer (Table 5-1). Special Maintenance tools are items or special design which are not normally carried by service personnel (Table 5-2). Maintenance Materials are basic supplies used during maintenance of the printer (Table 5-3).

Test Print

The Test Print feature and option enables off line testing. The Test Print Feature is standard on all printers and is located on the Controller And Print Head Board in card location 1PC2 (Figure 4-6).

If the optional control panel mounted Test Print Switch is added, access to the card mounted switch is not needed. Activation of either switch will cause the printer to alternately print groups of characters (character "B") followed by groups of blank characters.

When a full line of this pattern is completed a single line advance occurs. The Test Print Operation will continue until the switch is activated again removing the Test Print Condition.

TABLE 5-1. STANDARD MAINTENANCE TOOLS

	DESCRIPTION
	OSCILLOSCOPE, DUAL TRACE, DC-10MHZ MIN., CALIBRATED TRIGGERED SWEEP.
	MULTIMETER, DC: 0-50V, ACCURACY 2% MIN., 20K /VOLT, AC: 0-260V., ACCURACY 3% MIN.
	RETAINING RING PLIERS, REVERSIBLE INTERNAL/EXTERNAL COMBINATION TYPE.
	SCREW DRIVER ASSORTMENT, FLAT BLADE AND PHILLIPS.
	SOLDERING IRONS, 25-27 WATT AND 37-40 WATT (RECOMMENDED).
	HEX KEY (ALLEN)-WRENCH SET, METRIC (1.5 MM -5 MM)
	WRENCH SET-OPEN END OR COMBINATION OPEN AND BOX END, METRIC (3MM-14MM)
	ADJUSTABLE CRESENT WRENCH, 6 TO 8 INCHES LONG
	GAUGE SET, THICKNESS (THICKNESS IN MILLIMETERS OR 1000 ths OF AN INCH)
	MEASURING RULER (15 CM METRIC OR 6 INCH 10-50 PARTS TO THE INCH)

TABLE 5-2. SPECIAL MAINTENANCE TOOLS

	DESCRIPTION
	VACUUM CLEANER, WITH HAND HELD BRUSH AND NOZZLE.
	PUSH-PULL SPRING SCALE WITH READINGS IN EITHER GRAMS OR OUNCES (100-1200 GRAMS OR 1/2 OZ - 3LBS)
	EYE-LOUPE MAGNEFIER (4X, WITH HEAD BAND).
	SOCKET SET, METRIC (1/4 INCH, DRIVE)
	DIGITAL COUNTER ,DC TO 10 MHZ 1 MOHM INPUT INPEDANCE, ± 1 MICROSECOND RESOLUTION, TTL INPUT COMPATABLE

TABLE 5-3. MAINTENANCE MATERIALS

	DESCRIPTION
	LINT FREE CLOTH
	SOFT DUSTING BRUSH
	LUBRICATING OIL-SUN OIL CO., SUNEP 1150 (FOR LUBRICATING THE PAPER ADVANCE WORM GEAR)
	MILD COMMERCIAL CLEANING SOLVENT OR DETERGENT (FOR CLEANING THE EXTERIOR CABINET).

PREVENTIVE MAINTENANCE

The 70/125 line per minute printers must receive a minimum of one half hour of preventative maintenance every 1280 power on hours or every 75 million characters printed. (which ever occurs first).

The preventive maintenance should be performed by trained field service personnel. It is recommended that all maintenance personnel become throughly familiar with the mechanical functions, logic circuits and interface requirements of the printer prior to performing any maintenance checks or adjustments. General safety precautions must be observed at all times when working within the printer. High voltage is present at the line filter (3LF01), circuit breaker (3CB01), fan (2B02), terminal block (2TB01) and power supply p.c. board 1PC1. To avoid personel injury when working on the printer with the covers removed, always unplug the printer line cord from its power source. The following preventive maintenance procedures should be performed on the 70/125 LPM printers every 1280 power on hours or every 75 million characters printed:

Cleaning

1. Press the on/off switch to the off position. Unplug the printer line cord from its power source.
2. Remove the upper cabinet cover and the lower cabinet skirt.
3. Brush and vacuum clean the interior of the printer.
4. Clean the exterior of the cabinet with a clean lint free cloth and a mild commercial cleaning solvent or detergent. The clear plastic front cover should only be cleaned with water and a soft non-abrasive cloth.
5. Plug the printer line cord into its power source.

Lubrication

1. Lubricate the felt wick over the worm gear on the paper advance servo motor with 3 to 4 drops of lubricating oil. Use the special oil indicated in Table 5-3.

Part Replacement

1. Replace the ribbon cassette drive cords (refer to the replacement section of this manual).

Checks And Adjustments

1. Inspect the Print Head Drive Belt and the Print Head Motor Belt for sign of wear and for proper belt tension. Adjust or replace belts if necessary. (Refer to the "Mechanical Tests And Adjustments and Replacement" sections of this manual).
2. Check and adjust the Out Of Paper Switch. (Refer to the Mechanical Tests and Adjustments section of this manual).
3. Check the printout in the Test Print Mode for light or missing dots, for proper character width, and for vertical character alignment. If a problem exists adjust or replace parts as necessary (refer to the "Mechanical Test And Adjustments" and the "Replacement" section of this manual).
4. Function test all switches and options.
5. Replace the lower cabinet skirt and upper cabinet cover.

FAULT ISOLATION

INTRODUCTION

This section on fault isolation is intended to be used with the Principals Of Operation Section, Tests And Adjustments Section and the Diagrams Section of this manual. The Fault Isolation Section is divided into three parts; Fuse Functions And Locations, Binary Code And LED Display Diagnostics, and Fault Isolation Flow Charts.

FUSE FUNCTIONS AND LOCATIONS

For fuse functions, locations and part numbers see Figure 6-1.

IDENT.	LOCATION	FUNCTION	PART NO.	AMPS	TYPE
F1	POWER SUPPLY (1PC1)	+36 VOLTS	24536202	5A	MTH5
F2	POWER SUPPLY (1PC1)	-36 VOLTS	24521723	1.6A	MDL1.6 (SLO BLOW)
F3	POWER SUPPLY (1PC1)	+5 AND +12 VOLTS	24536202	5A	MTH5
F4	POWER SUPPLY (1PC1)	-5 AND -12 VOLTS	24512920	1A	AGC1
F5	POWER SUPPLY (1PC1)	+36 VOLTS	24521723	1.6A	MDL 1.6 (SLO BLOW)
3CB1	FRONT OF PRINTER	MAIN POWER BREAKER	76647100	7.5A	203-22-1-3291-1
F6	P4A-J4A-7	30 VOLTS	95650910	3A	MDL
F7	P4A-J4A-2	16 VOLTS	24521733	10A	MDL
F8	P4A-J4A-8	16 VOLTS	95650916	2A	MDL

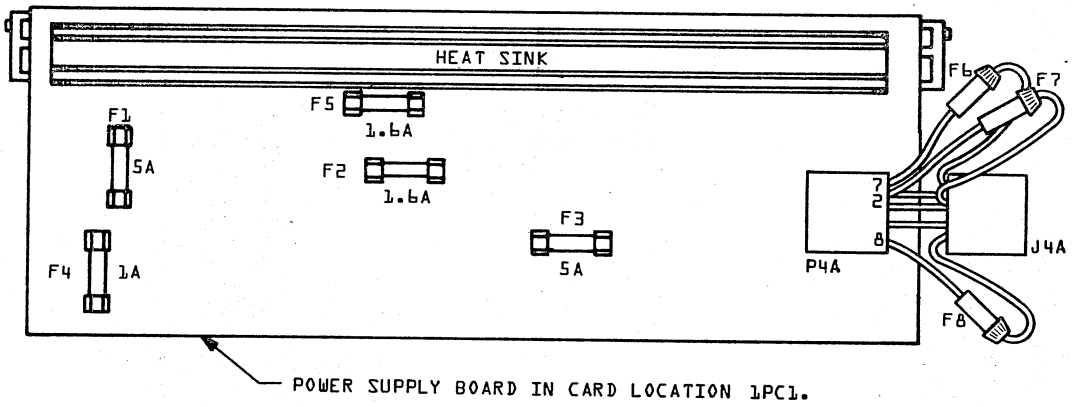
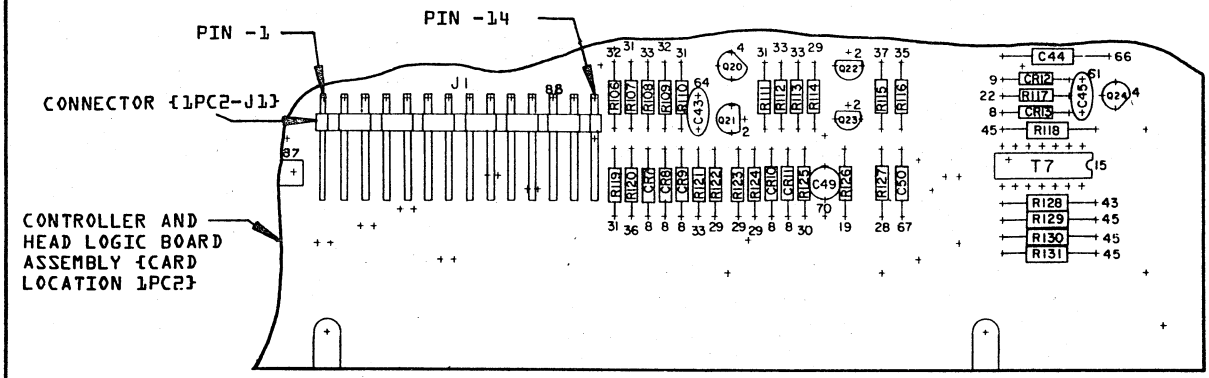
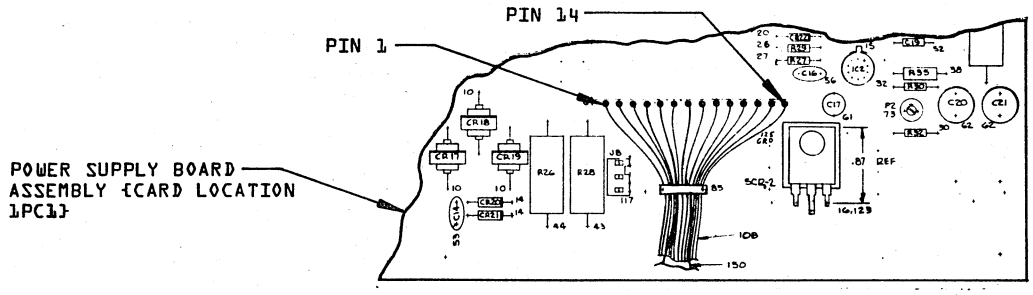


FIGURE 6-1. FUSE FUNCTIONS AND LOCATIONS CHART

CONNECTOR 1PC2-J1 AND 1PC1-J1

PIN	VOLTAGE	PIN	VOLTAGE
1	+12 VDC	9	+36 VDC
2	LOGIC GND (+12 VDC)	10	LOGIC GND (+36 VDC)
3	+5 VDC	11	-36 VDC
4	LOGIC GND (+5 VDC)	12	LOGIC GND (-36 VDC)
5	-5 VDC	13	
6	LOGIC GND (-5 VDC)	14	RECTIFIED A. C. (16 VAC)
7	-12 VDC		
8	LOGIC GND (-12 VDC)		





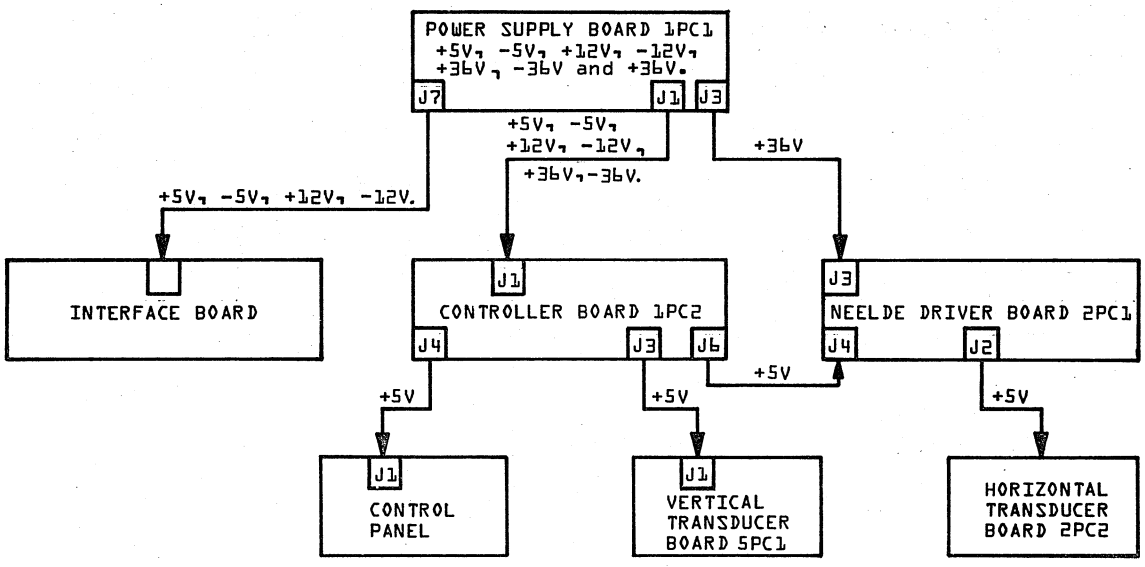


FIGURE 6-2 POWER SUPPLY VOLTAGE TEST POINTS AND VOLTAGE DISTRIBUTION

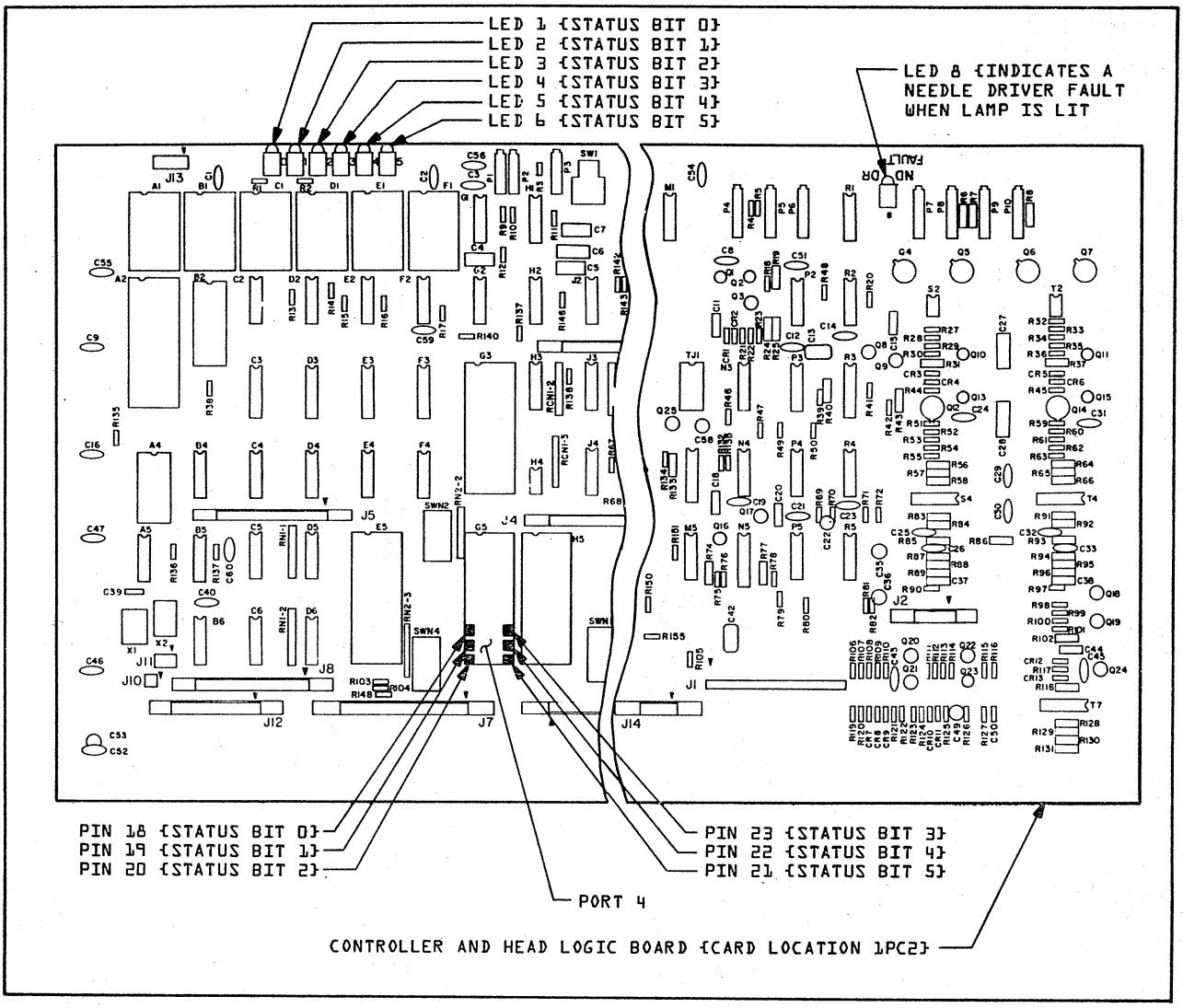


FIGURE 6-3. LIGHT EMITTING DIODE (LED) DIAGNOSTICS

BINARY CODE AND LED DISPLAY DIAGNOSTICS

LED Binary Display Diagnostics

The LED Diagnostics (standard optional feature) consists of 6 light emitting diodes (LED 0 thru LED 5) mounted on the Controller And Head Logic Board Assembly located in card location 1PC2 (Figure 6-3)

With this option installed the controller electronics isolates and displays on (6) LED lamps a binary code for a controller detectable error condition. A chart or these codes and their interpretation is given in Figure 6-4.

A special LED Diagnostics Display option is also available. This optional display is mounted on the left side of the printer and is accessable for viewing by removing the side cover. This led display performs the same functions as the display on 1PC2 (Figure 6-5).

Needle Driver Fault LED

A single light emitting diode (LED 8) is provided on the Controller And Head Logic Board. This LED is provided on all printer as standard equipment and when lit indicates that the current to one of the needle drivers has not turned off after firing (Figure 6-3).

Binary Diagnostics Without LED

The binary codes for LED diagnostics are generated from Port 4, pins 18 through 23 (Figure 6-3). By looking for "one's" and "zero's" at pins 18 through 23 with an oscilloscope, a binary code may be generated and applied to Figure 6-3 to identify the fault. Port 4 comes standard on 70 LPM printers, but is optional on 125 LPM printers.

BINARY LED DISPLAY*	DESCRIPTION OF THE STATUS FAULT BEING DISPLAYED
00 0001	ROM CHECK - THE SUMMATION OF "EXCLUSIVE OR" THROUGH MEMORY DOES NOT RESULT IN ZERO. THIS IS A SPECIAL MEMORY CHECK TO INSURE INTEGRITY OF ALL STORED DATA. A SPECIAL CHECK SUM IS USED TO CHECK THE "EXCLUSIVE OR SUM OF ALL STORED DATA.
00 0010	RAM CHECK - RAM IS MALFUNCTIONING AND NOT "READING" OR "WRITING" PROPERLY. THIS IS A CHECK OF THE RAMS "READ" AND "WRITE" CAPABITITY OF "ONE'S" AND "ZERO'S" INTO THE RANDOM ACCESS MEMORY.
00 0011	START SWITCH NOT RELEASED - START SWITCH IS BEING HELD DOWN WHEN GOING INTO A STOP MODE.
00 0100	WAIT LOOP FOR SWITCH DEPRESSION - NO CONTROL PANEL SWITCH HAS BEEN DEPRESSED. EXECUTIVE LOOP WHICH MONITORS ANY CONTROL PANEL SWITCH DEPRESSION.
00 0101	MISSING STP OR FMT CHANNEL 1 - LOAD ELECTRONIC VERTICAL FORMAT UNIT ERROR INDICATING NO STP OR MISSING FORMAT CHANNEL 1.
00 0110	EVFU TAPE LOAD ERROR - LOAD ELECTRONIC VERTICAL FORMAT UNIT ERROR INDICATING INCORRECTLY PUNCHED TAPE OR EVFU PROGRAM ERROR.
00 0111	EVFU LOAD SWITCH NOT RELEASED - LOAD SWITCH HAS BEEN ACTUATED BUT HAS NOT BEEN RELEASED.
00 1000	EVFU TAPE LONGER THAN 176 LINE - THE MAXIMUM LENGTH OF FORMAT TAPE LOADED INTO EVFU MAY NOT EXCEED 176 LINES.
00 1001	CANNOT HOME PRINT HEAD - AN ATTEMPT TO MOVE THE HEAD TO LEFT HOME POSITION HAS NOT RESULTED IN MOVING THE HEAD TO THE LEFT HOME POSITION AFTER A ONE SECOND TIME OUT.
00 1010	SINGLE SPACE SWITCH NOT RELEASED - THE SINGLE SPACE SWITCH HAS BEEN ACTIVATED BUT HAS NOT BEEN RELEASED.
00 1011	WAIT FOR INPUT DATA - PRINTER IS ATTEMPTING TO LOAD DATA BUT NO STROBE HAS OCCURRED.
00 1100	LOADING DATA - FIRST CHARACTER HAS BEEN LOADED BUT THE LOAD CYCLE IS NOT COMPLETE.
00 1101	INTERFACE ERROR- A PROCESSOR MASTER CLEAR HAS BEEN RECEIVED.
00 1110	FORM FEED SWITCH NOT RELEASED - THE FORM FEED SWITCH HAS BEEN ACTIVATED BUT HAS NOT BEEN RELEASED.
00 1111	TEST PRINT SWITCH NOT RELEASED - THE TEST PRINT SWITCH HAS BEEN ACTIVATED BUT HAS NOT BEEN RELEASED.
01 0000	POSITION SEEK IN PROCESS (PM70 ONLY).
01 0001	(NOT USED)
01 0010	(NOT USED)
01 0011	(NOT USED)
01 0100	MISSING MT 3 O/S - CONTROLLER IS ATTEMPTING TO PRINT THE NEXT COLUMN OF DOTS IN A PARTICULAR CHARACTER.
01 0101	MISSING CHARACTER START O/S - CONTROLLER IS WAITING FOR AN INDICATION OF A CHARACTER START POSITION.

FIGURE 6-4. LED AND BINARY CODE FAULT CHART

CONTINUED

BINARY LED DISPLAY*	DESCRIPTION OF THE STATUS FAULT BEING DISPLAYED
01 0110	CHARACTER START O/S AT CONSTANT "1" - CHARACTER START O/S IS STAYING AT A CONSTANT "1".
01 0111	CHARACTER START O/S NUMBER 67 MISSING - THE CHARACTER O/S FOR CODE STRIP CHARACTER POSITION 67 IS MISSING (138/218 IN PM70).
01 1000	ELONGATED CHARACTER HAS STARTED- THE ELONGATED CHARACTER ROUTINE IS IN PROCESS (PM70 ONLY)
01 1001	(NOT USED)
01 1010	(NOT USED)
01 1011	(NOT USED)
01 1100	STP AT A CONSTANT "1" (FIRST PASS) - PROCESSOR HAS BEEN INTERUPTED BY AN STP AND STP IS MAINTAINED A CONSTANT "1".
01 1101	STP AT A CONSTANT "1" (INTERRUPT ROUTINE) - PROCESSOR HAS BEEN INTERRUPTED BY AN STP AND STOP IS MAINTAINED A CONSTANT "1".
01 1110	WAIT FOR STP INTERRUPT - WAITING FOR AN STP INTERRUPT FOR COMPLETION OF PAPER MOTION CYCLE.
01 1111	(NOT USED)

1 = LAMP LIT IN THAT POSITION

0 = LAMP NOT LIT IN THAT POSITION

* = THE MOST LEAST SIGNIFICANT DIGIT IS TO THE RIGHT

FIGURE 6-4. LED AND BINARY CODE FAULT CHART (CONTINUED)

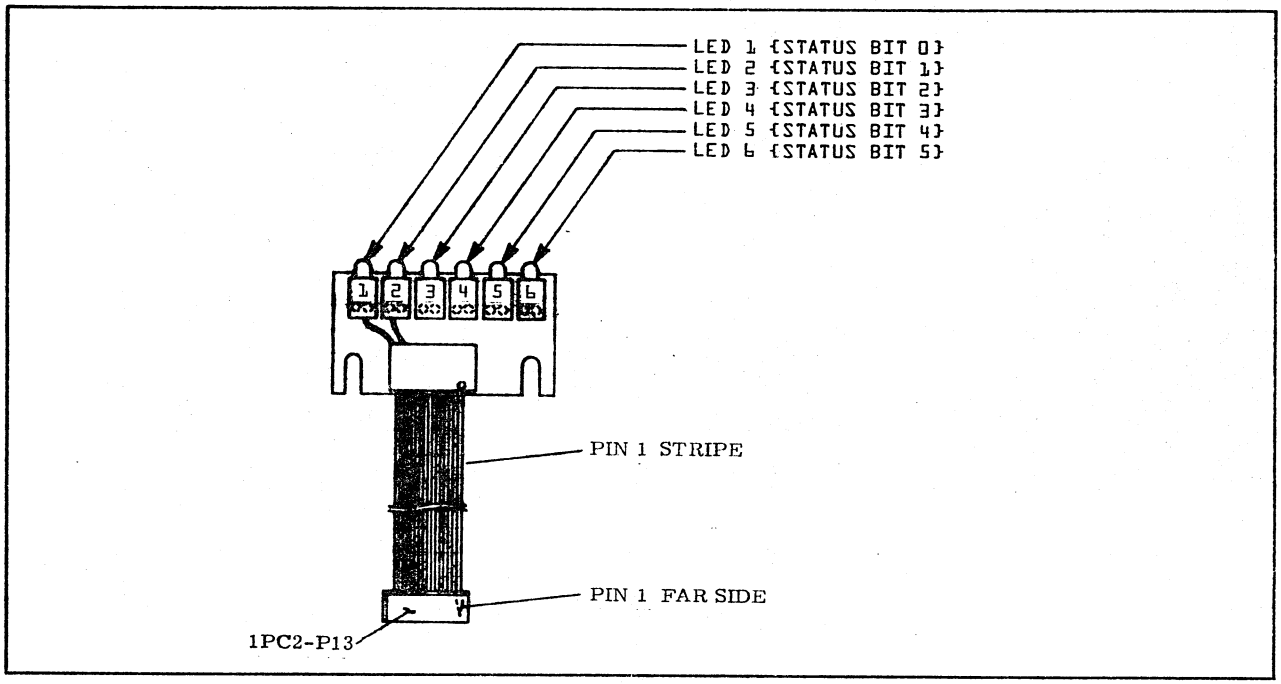
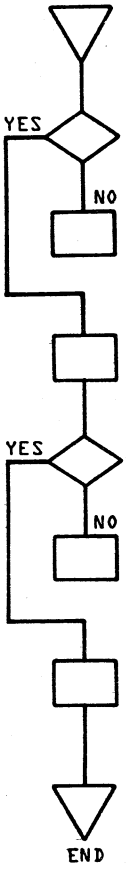


FIGURE 6-5. LIGHT EMITTING DIODE (LED) DIAGNOSTICS



PRINTER DOES NOT POWER ON (FIGURES 3-2, 6-1 AND 6-2)

Is the building line voltage present at the wall socket or power outlet provided for the printer? Is the line cord connected to the power source?

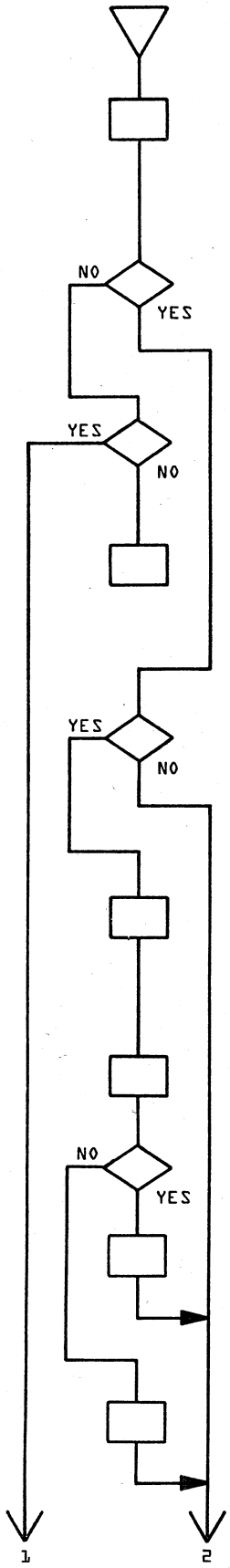
Connect printer to proper power source and power the printer on.

Unplug the printer and check the continuity across the on/off circuit breaker switch 3CB01 when it is in the on position.

Does continuity exist?

Replace circuit breaker switch 3CB01.

Either the line filter (3LF01) is open or shorted, or their is a wiring fault (short or wire disconnected) between the power source and circuit breaker switch (3CB01). If there is a short the circuit breaker will continue to kick off on power up.



START LAMP DOES NOT COME ON WHEN START SWITCH IS DEPRESSED (FIGURES 6-1 AND 6-2)

Check the Head Ready signal (Ready = "1", Not Ready = "0" monitored at 1PC2 test point 40). All voltages must be present for Head Ready signal to go Ready. Check power supply voltages at 1PC2-J1 and adjust voltages if necessary (Figure 6-2)

Are any fuses blown?

Are any voltages low?

Bad Controller Board or bad lamp on control panel.

Are +36V (F5) or -36V (F2) fuses blown?

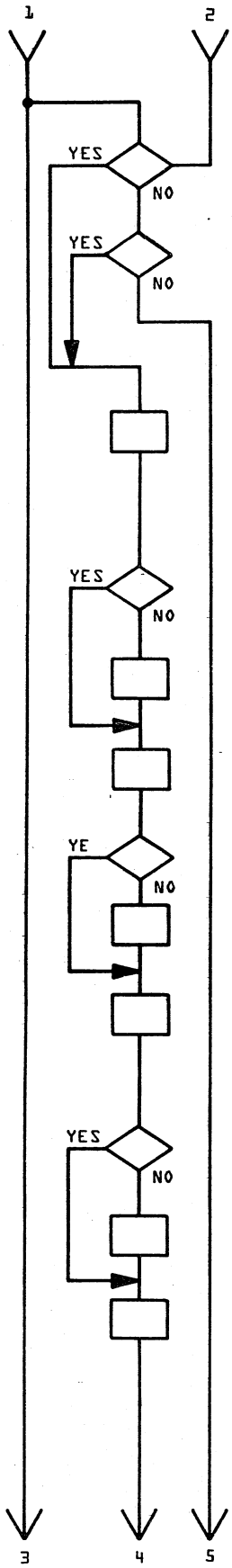
Probable servo driver amplifier problem. Check head servo output driver transistors Q6 and Q7 on 1PC1 for a short. Check paper motion servo output driver transistors Q9 and Q10 on 1PC1 for a short. If short exists replace board or components.

Disconnect plug 1PC2-J2 and replace +36V fuse F5 or -36V fuse F2. Power printer up, but do not go Start.

Is IPC2 test points 43 or 48 greater than +0. 5V?

Board 1PC2 is bad. Replace board and reconnect 1PC2-J2

Board 1PC2 is good. The only problem was with Q6, Q7, Q9 or Q10 servo output drivers. Connect plug 1PC2-J2.



Is the +5V or +12V (F3) fuse blown, or are these voltages low?

Isthe -5V or -12V (F4) fuse blown, or are these voltages low?

Disconnect Controller Board plug 1PC2-J1 to isolate the voltages on Power Supply Board 1PC1. At the interface, disconnect the plug that comes from 1PC1-J7 so that the voltages will be isolated on 1PC1. Replace blown fuse and power up.

Are the proper voltages at 1PC1-J1-1 (+12V), 1PC1-J1-3 (+5V), 1PC1-J1-5 (-5V) and 1PC1-J1-7 (-12V).

Power Supply Board 1PC1 is bad. Replace or repair board and adjust voltages.

At the interface, connect the plug that comes from 1PC1-J7. Replace blown fuses and power up.

Are the proper voltages at 1PC1-J1-1 (+12V), 1PC1-J1-3 (_5V), 1PC1-J1-5 (-5V) and 1PC1-J1-7 (-12V).

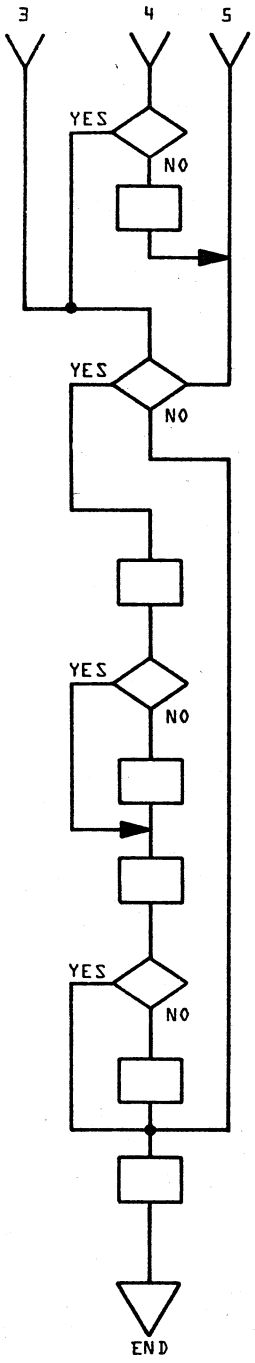
The Interface Board is bad. Replace or repair board.

Disconnect 1PC2-J3 (From Vertical Transducer Board 5PC1).
Disconnect 1PC2-J4 (Fron Control Panel).
Disconnect 1PC2-J6 (From Needle Driver Board 2PC1).
Connect 1PC2-J1 (From the Power Supply Board). Replace blown fuses and power up.

Are the proper voltages at 1PC2-J1-1 (+12V), 1PC1-J1-3 (+5V) 1PC1-J1-5 (-5V) and 1PC1-J1-7 (-12V).

The Controller Board 1PC2 is bad. Replace or repair board and adjust as necessary.

By powering down and then powering up again after each connection, connect 1PC2-J3 (from Vert. transducer Board 5PC1), 1PC2-J4 (from Control Panel) and 1PC2-J6 (from Needle Driver Board 2PC1), one at a time until the +5 voltage at 1PC2-3 is either lost or found to be low. The connection that causes the lost or low voltage will identify the faulty P.C. board. If when pluging in 1PC2-J6, a faulty +5 voltage is detected, also unplug 2PC1-J2 (from the Horiz. Transducer Board 2PC2). If the +5 voltage is present, then 2PC2 is bad.



Is +5 volts present on 5PC1, the control panel, 2PC1 and 2PC2?

Replace or repair the faulty board/boards. Replace all below fuses and plugs.

Is the +36V (F1) fuse blown or is this voltage low?

Disconnect 1PC1-J3 (from the Needle Driver Board 2PC1) Replace blown fuses and power up.

Is the proper voltage at 1PC1-J1-9 (+36V)?

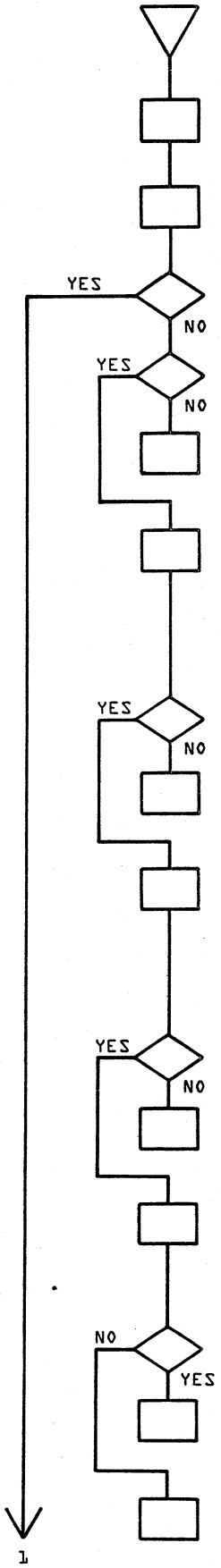
Power supply board 1PC1 is bad. Replace or repair board and check adjustments.

Reconnect 1PC1-J3 (from the Needle Driver Board 2PC1). Replace blown fuses and power up.

Is the proper voltage at 1PC1-J1-9 (+36V)?

Needle Driver Board 2PC1 is bad. Replace or repair board and adjust needle current.

Replace all blown fuses. Reconnect all plugs. Power up and go Start. The Head Ready signal at 1PC2 test point 40 should be at a logical "1" indicating that all voltages are present on all boards.



PRINTER GOES START BUT NOTHING HAPPENS

Power off printer to clear logic and center print head between the two side plates.

Power printer on. While monitoring test point 43 on 1PC2 for plus (+) or minus (-) 10 to 20 volt drive voltage, enter the Test Print mode by throwing the Test Print switch on 1PC2.

Did print head move at least to the left Home position?

Within two (2) seconds after entering test print was the plus or minus 10 to 20 volts present at test point 43?

Bad Controller Board 1PC2. (head electronics section). Repair or replace 1PC2.

Power off printer to clear logic. Unplug 1PC1-J6 (harness to horizontal servo drive motor). Power printer on. While monitoring the voltage on 1PC1-J6 pin 1 to pin 2 for a plus or minus 10 to 20 volt motor drive voltage, enter the Test Print switch on 1PC2.

Within two (2) seconds after entering Test Print, was plus or minus 10 tp 20 volts present at 1PC1-J6 pin 1 to pin 2?

Bad Power Supply Board 1PC1 or bad harness from 1PC2-J2 to 1PC1-J2. Repair or replace 1PC1 or harness.

Power off printer to clear logic. Connect 1PC1-J6 (harness from 1PC2 to horizontal servo drive motor). Power printer on. While monitoring the voltage accross the horizontal servo motor terminals for a plus or minus 10 to 20 volt motor drive voltage, enter the Test Print mode.

Within two (2) seconds after entering Test Print was plus or minus 10 to 20 volts present accross the motor terminals?

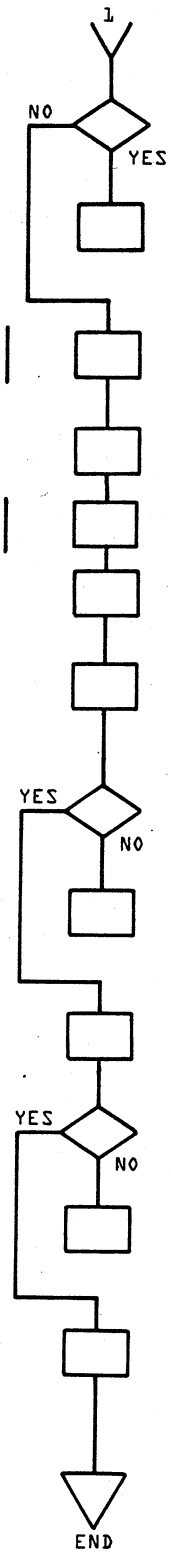
Wiring fault exists between 1PC1-J6 and motor. Repair wiring fault.

Problem is mechanical or you have a bad motor.

Are any of the head drive belts broken or off their pulleys? Are any or the head drive pulleys loose on their shafts?

Replace necessary belts and tighten loose pulleys.

Bad horizontal servo drive motor. Replace motor.



Is the print head motion operating correctly?

Interface or data source problem or data source has no data to send.

Code strip is misaligned, or dirty, bad code strip reader or bad Controller Board 1PC2.

Power printer off and disconnect motor drive harness at 1PC1-J6.

Clean the code strip with water and a soft, non-abrasive cloth.

Check and adjust if necessary the code strip alignment to the code strip reader.

Move the head to the right home position. Power the printer on and check the reader outputs on 1PC2 at chip K4 pins 1,3,11, and 13 for single head machines and at chip K4 pins 1 and 3 for double head machines.

Are the outputs from the reader at a logical "0"?

Bad reader or wiring fault in wiring to reader. Check wiring and replace Horizontal Transducer Board 2PC2 if necessary.

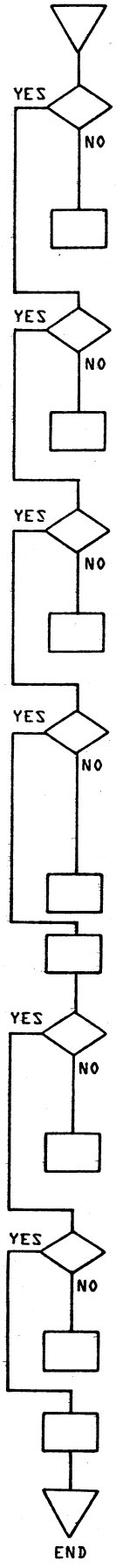
With the head in the right home position, move the head slightly to the left so that the reader is off the Home window, but not in the first character window.

Are the outputs from the reader at a logical "1"?

Bad reader or wiring fault in the wiring to the reader. Check wiring and replace Horizontal Transducer Board 2PC2 if necessary.

The code strip reader is good. The fault is with 1PC2 Controller Board. Repair or replace 1PC2.

PRINT HEAD MOVES, BUT DOES NOT PRINT



Is the print head connector connected and seated to its mating flat cable connector (connection is made on the connector mounting plate under the printhead)?

Make connections and assure that connectors are properly seated.

Are the Needle Driver Board (2PC1) connectors J1, J3, J4 and J5 connected and properly seated?

Make connections and assure that connectors are properly seated.

Is +36 volts present across capacitor C7 on Needle Driver Board 2PC1.

Bad cable from Power Supply Board to 2PC1-J3 or cable is unplugged at power supply board 1PC1-J3.

Is approximately 1.13 volts present across resistor R20 on Needle Driver Board 2PC1 (Note: +5 volts is required on this board to get the 1.13 volt level. Absence of the +5 volts would cause improper horizontal head motion from an inoperative transducer)?

Bad 2PC1. Repair or replace 2PC1.

Enter test print mode.

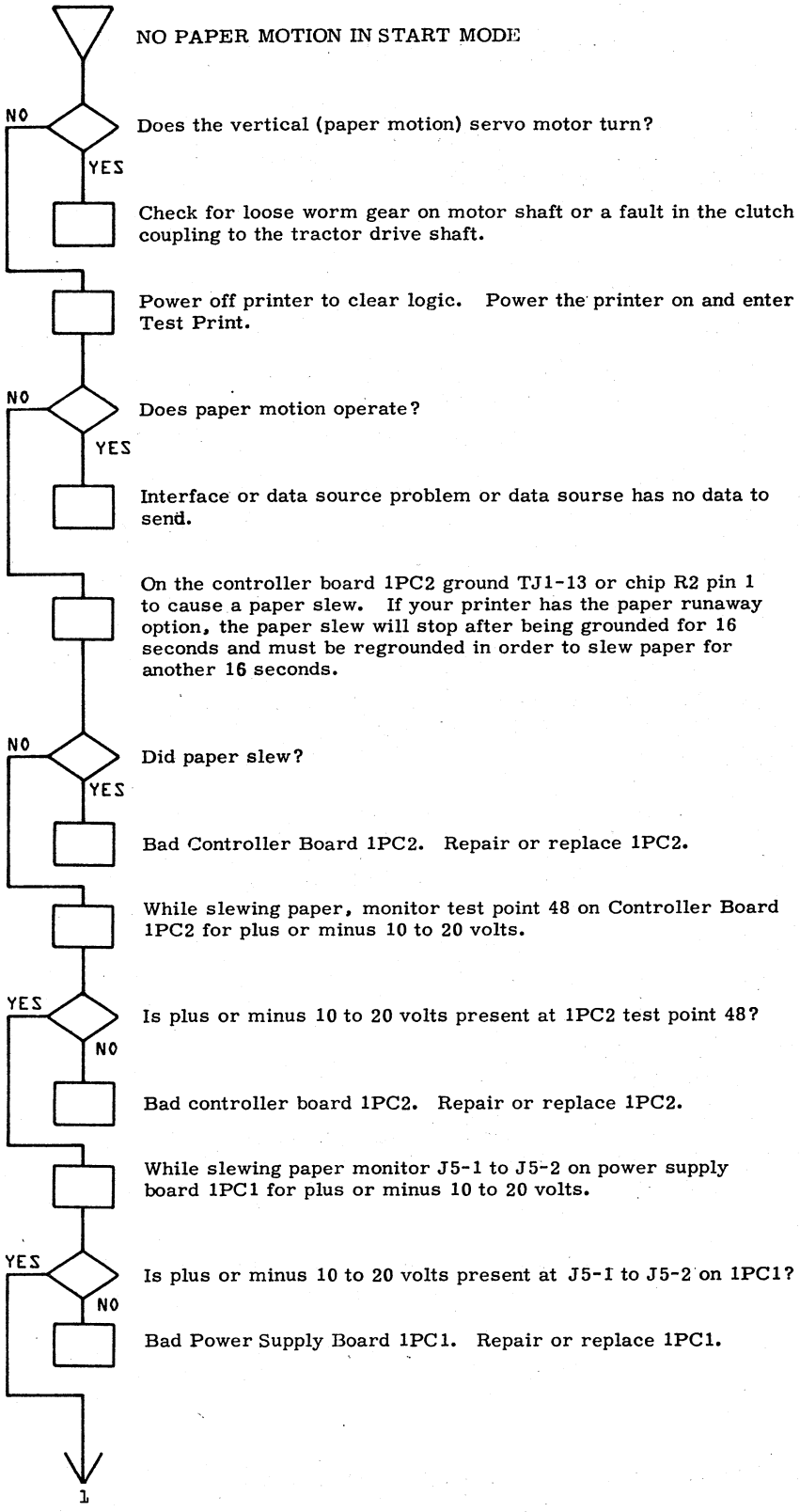
Are -NDL ENAB pulses present on Needle Driver Board (2PC1) IC05 pin 1 (each pulse is approximately 550 micro seconds at a 625 micro second rep rate. 7 pulses equal a character)?

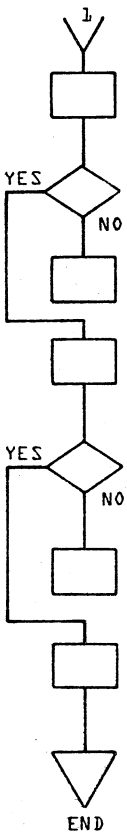
Bad J4 cable to the Needle Driver Board (from 1PC2-J6), bad Controller Board 1PC2 or bad character generator Rom on 1PC2.

Are SELECT pulses present on needle driver board (2PC1) IC04 pin 5?

Bad J4 cable to the Needle Driver Board (from 1PC2-J6), bad Controller Board 1PC2 or bad character generator ROM on 1PC2.

Bad Needle Driver Board (2PC1). Repair or replace 2PC1.


NO PAPER MOTION IN START MODE
NO
Does the vertical (paper motion) servo motor turn?
YES
Check for loose worm gear on motor shaft or a fault in the clutch coupling to the tractor drive shaft.
Power off printer to clear logic. Power the printer on and enter Test Print.
NO
Does paper motion operate?
YES
Interface or data source problem or data sourse has no data to send.
On the controller board 1PC2 ground TJ1-13 or chip R2 pin 1 to cause a paper slew. If your printer has the paper runaway option, the paper slew will stop after being grounded for 16 seconds and must be regrounded in order to slew paper for another 16 seconds.
NO
Did paper slew?
YES
Bad Controller Board 1PC2. Repair or replace 1PC2.
While slewing paper, monitor test point 48 on Controller Board 1PC2 for plus or minus 10 to 20 volts.
YES
Is plus or minus 10 to 20 volts present at 1PC2 test point 48?
NO
Bad controller board 1PC2. Repair or replace 1PC2.
While slewing paper monitor J5-1 to J5-2 on power supply board 1PC1 for plus or minus 10 to 20 volts.
YES
Is plus or minus 10 to 20 volts present at J5-I to J5-2 on 1PC1?
NO
Bad Power Supply Board 1PC1. Repair or replace 1PC1.
1



While slewing paper, monitor J9-2 to J9-1 on Controller Board 1PC2 for plus or minus 10 to 20 volts.

Is plus or minus 10 to 20 volts present at J9-2 to J9-1 on 1PC2?

Bad cable from 1PC1-J5 to 1PC2-J9. Repair cable.

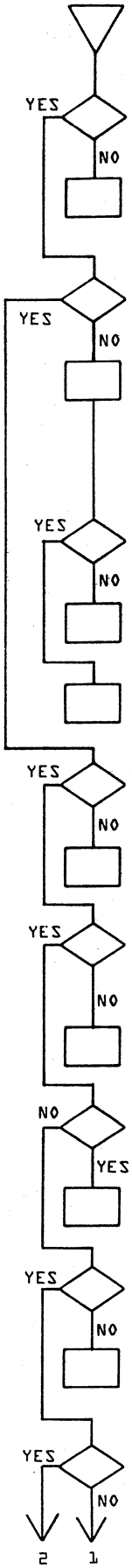
While slewing paper, monitor J2-2 to J2-1 on the Vertical Transducer Board 5PC1 for plus or minus 10 to 20 volts.

Is plus or minus 10 to 20 volts present at J2-2 to J2-1 on 5PC1.

Bad harness 1PC1-J3 to 5PC1-J1 or 1PC2 foil from J3 to J9 is broken. Repair harness or replace board.

Bad motor or motor wiring to 5PC1-J2 is bad. Repair motor wiring or replace motor.

ELECTRONIC VERTICAL FORMAT UNIT (EVFU) DOES NOT LOAD



Is printer in STOP mode?

Printer must be in STOP mode to load EVFU. Power the printer off and then back on, but do not go START.

Does paper motion occur when EVFU Load Switch is actuated?

Power printer OFF and unplug 1PC2-J3 on the Controller Board and perform a continuity check of the EVFU Load Switch at the 1PC2-J3 connector end. Check the switch while actuated as well as non actuated. 1PC2-J3-10 is GROUND, 1PC2-J3-17 is N.C. contact and 1PC2-J3-16 is N.O. contact.

Is continuity present?

Bad EVFU Load Switch or bad 1PC2-J3 cable to 5PC1-J1. Replace or Repair.

Bad Controller Board 1PC2. Repair or replace 1PC2.

Is connector 5PC1-J3 plugged in and properly seated?

Assure proper connection of 5PC1-J3.

Is format tape correctly punched and installed on the reader properly?

Punch and install format tape correctly.

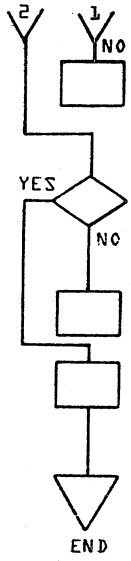
Is the brass format tape drive sprocket dirty?

Clean dirt from the brass surface of sprocket.

Are the brushes in good condition and adjusted properly?

Replace damaged brushes and adjust brush block and brushes as necessary.

Is code disc syncronized to format reader (See Page 7-6 for adjustments)?



Syncronize code disc to format reader (See Page 7-6 for adjustments).

Are brush output signals present on Controller Board 1PC2 chip ICH3 pins 5 and 9?

Bad cable from 1PC2-J3 to 5PC1-J1. Repair or replace cable.

Bad Controller Board 1PC2. Repair or replace 1PC2.

TESTS AND ADJUSTMENTS

MECHANICAL TESTS AND ADJUSTMENTS

PULLEY ASSEMBLY-RIGHT HAND

Tools Required

1. Feeler gage .005 in. (0.13 mm) thick.
2. Allen wrench 2 mm hex (metric).
3. Screwdriver (flat blade type).

Tests (Figure 7-1)

1. Check for .003 to .014 in. (0.08 to 0.38 mm) clearance between the large 44 tooth pulley and the thrust bearing.

Adjustments (Figure 7-1)

1. Loosen the screws that hold the two pulleys to the shaft.
2. Center the shaft so that its ends are sticking out the same distance on either side of the pulley support casting.
3. Slide the small 30 tooth pulley and thrust bearing to the left against the needle bearing in the pulley support casting. Rotate the pulley so that its two screws are in line with the flats on the shaft. Tighten the pulley to the shaft.
4. Place a .005 in. (0.13 mm) feeler gage between the large 44 tooth pulley and the thrust bearings on the right. While pushing the shaft to the left, push the large pulley, feeler gage and thrust bearings to the right. Tighten the pulley screws to the flats on the shaft.

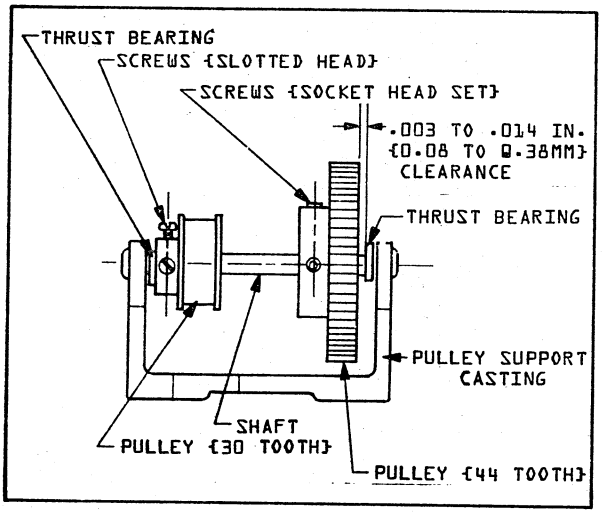


FIGURE 7-1. PULLEY ASSEMBLY - RIGHT HAND

PULLEY ASSEMBLY-LEFT HAND

Tools Required (Figure 7-2)

1. Feeler gage .005 in. (0.13 mm) thick.
2. Screwdriver (flat blade type).

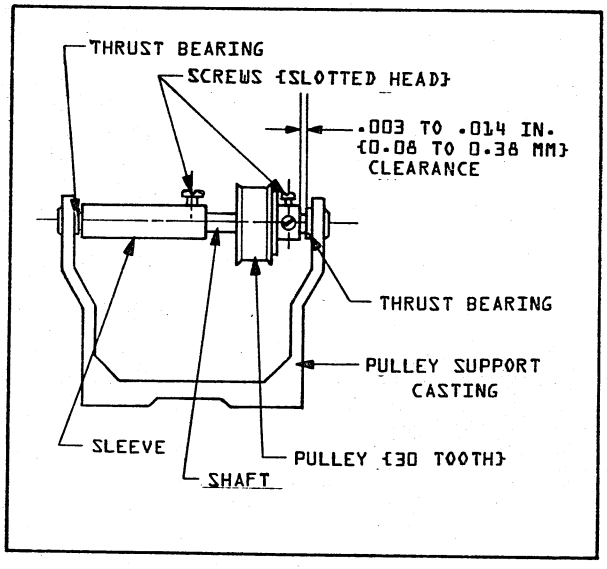


FIGURE 7-2. PULLEY ASSEMBLY - LEFT HAND

Tests (Figure 7-2)

1. Check for . 003 to . 014 in. (0. 08 to 0. 38 mm) clearance between the 30 tooth pulley and the thrust bearing.

Adjustments (Figure 7-2)

1. Loosen the screws that hold the pulley and the sleeve to the shaft.

2. Center the shaft so that its ends are in line with or sticking out the same distance on either side of the pulley support casting.

3. Slide the sleeve and thrust bearing to the left against the needle bearing in the pulley support casting. Rotate the sleeve so that its screw is in line with the flat on the shaft. Tighten the sleeve to the shaft.

4. Place a . 005 in. (0. 13 mm) feeler gage between the 30 tooth pulley and the thrust bearing on the right. While pushing the shaft to the left, push the pulley, feeler gage and thrust bearing to the right. Tighten the pulley screws to the flats on the shaft.

HEAD DRIVE BELT TENSION AND ALIGNMENT

Tools Required

1. Push pull spring scale with readings in either grams or ounces (100-1200 grams or $\frac{1}{2}$ oz. - 3 lb.)

2. 7 mm open end or box wrench.

3. Screwdriver - flat blade type.

4. Measuring ruler (15 cm metric or 6 inch 10-50 parts to the inch).

Tests (Figure 7-3)

1. Remove the two screws that hold the belt retaining clamp to the bottom of the print head support casting. On units with two heads, remove the clamp from each head.

2. Position the end of a measuring ruler against the plate under the head drive belt. Center the ruler in the belt span so it is perpendicular to the belt.

3. Note the reading on the ruler where the upper belt span crosses the ruler.

4. Apply a force that will cause a . 39^{+}_{-} . 04 in. (10^{+}_{-} 1 mm) deflection of the belt. Note the spring scale reading. The reading should be 0. 77 lbs. (350 G).

5. The left and right hand pulley assemblies should be adjusted so that the belt has minimal side contact with it's flanged pulleys.

6. With the belt retaining clamps in place, slide the print heads from side to side. The print head should cause a minimum amount of deflection or lift to the belt. This check is accomplished by standing a measuring ruler on end at either side of the structure and checking the deflection and lift of the upper belt span as the heads are moved from side to side.

Adjustments (Figure 7-3)

1. The Left Hand Bracket Support, Left Hand Pulley Assembly and Right Hand Pulley Assembly have been positioned with fixtures at the factory to assure proper print head drive belt tension and alignment. Adjustments to the Right And Left Hand Pulley Assemblies or the Left Hand Bracket Support should not be necessary for the life of the printer, except when it is necessary during parts replacement. The location of these pulley assemblies and brackets should be marked with a pencil or scribe before removal or adjustment is attempted.

2. Belt Tension Adjustment

   a. Mark the location of the left hand pulley assembly on the left hand bracket support, using a pencil or scribe.

   b. Loosen the two left hand pulley assembly mounting screws (use a 7 mm open end or box wrench).

   c. Move the left hand pulley assembly to achieve the proper belt tension. Use the pencil or scribe marks to aid in the alignment. Align the belt before tightening the two mounting screws.

   d. Replace the belt retaining clamps.

3. Belt Alignment

   a. After adjusting the belt tension, manually move the print head across the print line to see if the belt is tracking in the center of the pulleys. If the belt is dragging on a pulley edge, the left pulley assembly may be turned slightly or moved sideways to align the belt travel.

   b. The ideal alignment of the printhead drive belt should be such that when the print head is moved from side to side, the print head does not lift or deflect the belt. This alignment should not require adjusting unless the right hand pulley assembly is moved or replaced or the left hand bracket support is moved. This adjustment is made by moving the left hand bracket support and/or the right hand pulley assembly either up or down to achieve minimum print head lift or deflection of the belt.

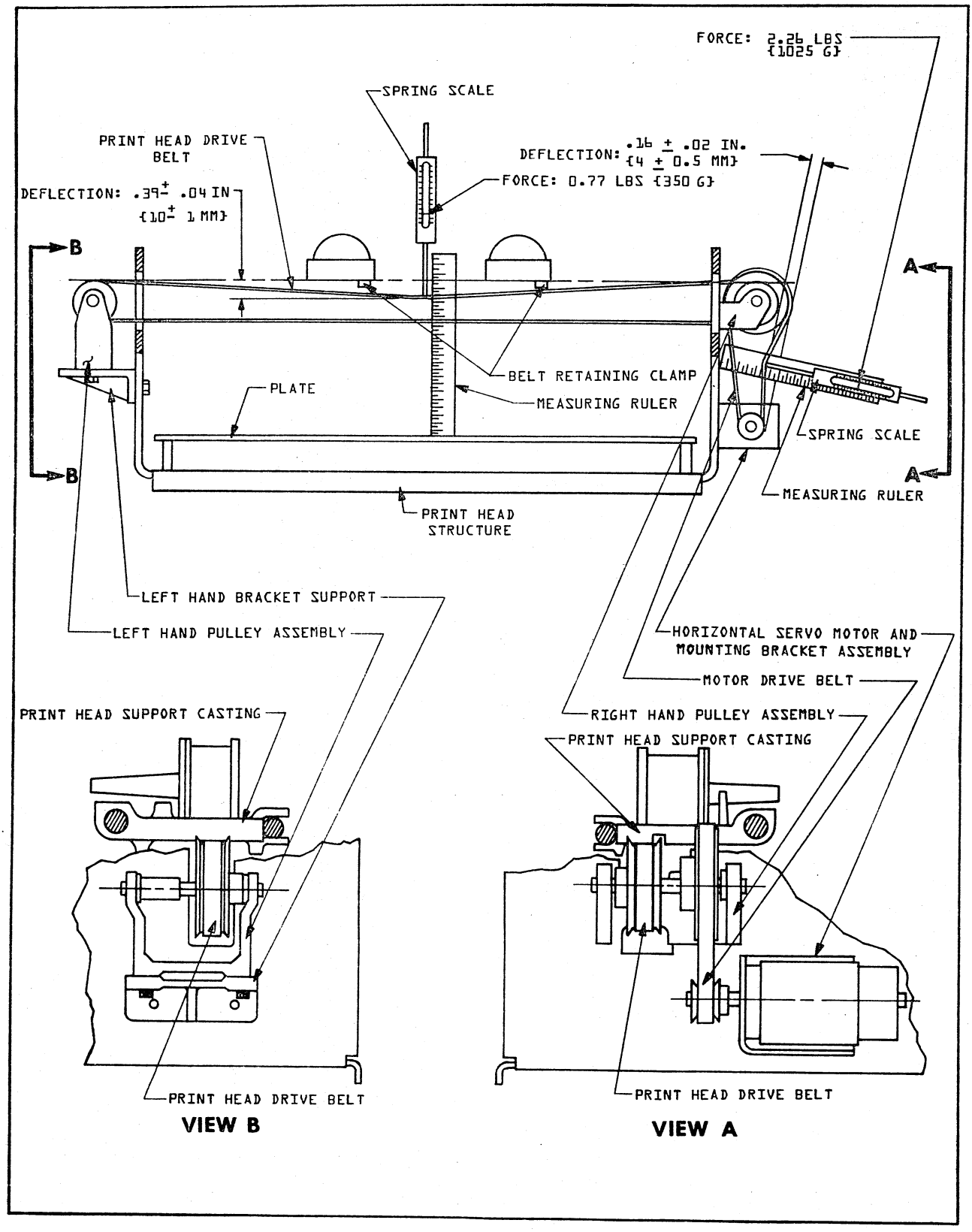


FIGURE 7-3 PRINT HEAD BELT DRIVE SYSTEM - ADJUSTMENTS

APR., 78

PRINT HEAD MOTOR AND DRIVE BELT

Tools Required

1. Push-pull spring scale with readings in either grams or ounces (100-1200 grams or $\frac{1}{2}$ oz. - 3 lbs.).
2. 7 mm open end or box wrench.
3. Screwdriver-flat blade type
4. Measuring ruler (15 cm metric or six inch 10-50 parts to the inch).
5. 2 mm hex key (allen) wrench.

Tests (Figure 7-3)

1. Position the end of a measuring ruler against the right side of the print head structure so it is perpendicular to the belt. Center the ruler in the belt span and note the reading on the ruler where the belt crosses the ruler.
2. Apply a force that will cause a .16 in. (4 mm) deflection of the belt. Note the spring scale force reading. The reading should be 2.26 lbs. (1025 G).
3. Slide the print head from one side of the printer to the other. The motor drive belt should track in the center of the 44 tooth pulley on the right hand pulley assembly.

Adjustments (Figure 7-3)

1. Belt Tension Adjustments
   a. Mark the location of the motor mounting bracket on the side of the print head structure using a pencil or scribe.
   b. Loosen the three screws that mount the horizontal servo motor and mounting bracket assembly to the right side of printhead structure (use a 7 mm open end or box wrench). Swing logic cards down to gain access.
   c. Move the horizontal servo motor and mounting bracket assembly down to achieve the proper belt tension. Use the pencil or scribe marks to aid in the alignment. Align the belt before tightening the three mounting screws.
2. Belt Alignment
   a. After adjusting the belt tension, manually move the print head across the print line to see if the motor drive belt is tracking in the center of the pulleys. If the belt is not tracking properly, the horizontal servo motor and mounting bracket may be turned slightly or the servo motor pulley may be adjusted. The belt is permitted to wander, provided that it does not overlap either edge of the large 44 tooth pulley.

VERTICAL SERVO WORM GEAR ALIGNMENT

Tools Required

1. Screwdriver - flat blade type
2. 1.5 mm hex key (allen) wrench.
3. Measuring ruler (15 cm metric or six inch 10-50 parts to the inch)
4. 7 mm open end or box wrench.

Tests (Figure 7-5)

1. The location of the worm gear on the motor shaft should be .16 $\pm$ .04 inches (4 $\pm$ 1 mm) from the front surface of the motor mounting bracket as shown in Figure 7-5.
2. Check for maximum backlash of .002 inch (0.05 mm) between the worm gear on the motor and the gear on the clutch assembly, assuring that there is no binding and that the motor runs freely.
3. With the clutch engaged with the tractor drive shaft and the tractors locked at any position between the left and right format plates, the motor slew current should average .3 amps, with maximum peaks of .8 amps.

Adjustments (Figure 7-5)

1. Loosen the set screws that secure the worm gear to the motor shaft. Position and tighten the gear on the shaft to the dimension shown above and in Figure 7-5.
2. Loosen the three screws that mount the vertical servo motor assembly to the side of the print head structure. Adjust and tighten the servo motor assembly so that minimum backlash exists between shaft and the gear on the clutch assembly. Assure that there is no binding and that the motor runs freely.

CODE DISK AND OPTIONAL READER CLEARANCE

NOTE

CHECK THAT FORMAT TAPE IS INSTALLED

Tools Required

1. 5.5 mm open end or box wrench.
2. Screwdriver - flat blade type.

Tests (Figure 7-5)

1. Check to see if the vertical transducer board assembly is 90° to the code disk and that the code disk is centered in the optical reader.
2. Check to see if the optical reader is positioned to the code disk as shown in Figure 7-5.

Adjustments (Figure 7-5)

1. Loosen the two screws that mount the vertical transducer board assembly to the format plate assembly. Adjust the vertical transducer board assembly and its optical reader to the code disk as shown in Figure 7-5. Tighten the two mounting screws.

FORMAT READER BRUSH BLOCK

Tools Required

1. Screwdriver - flat blade type
2. 1.5 mm hex key (allen) wrench.

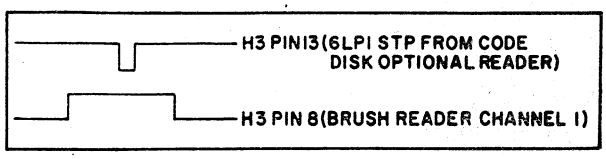


FIGURE 7-4. FORMAT READER AND CODE DISK SYNCHRONIZATION.

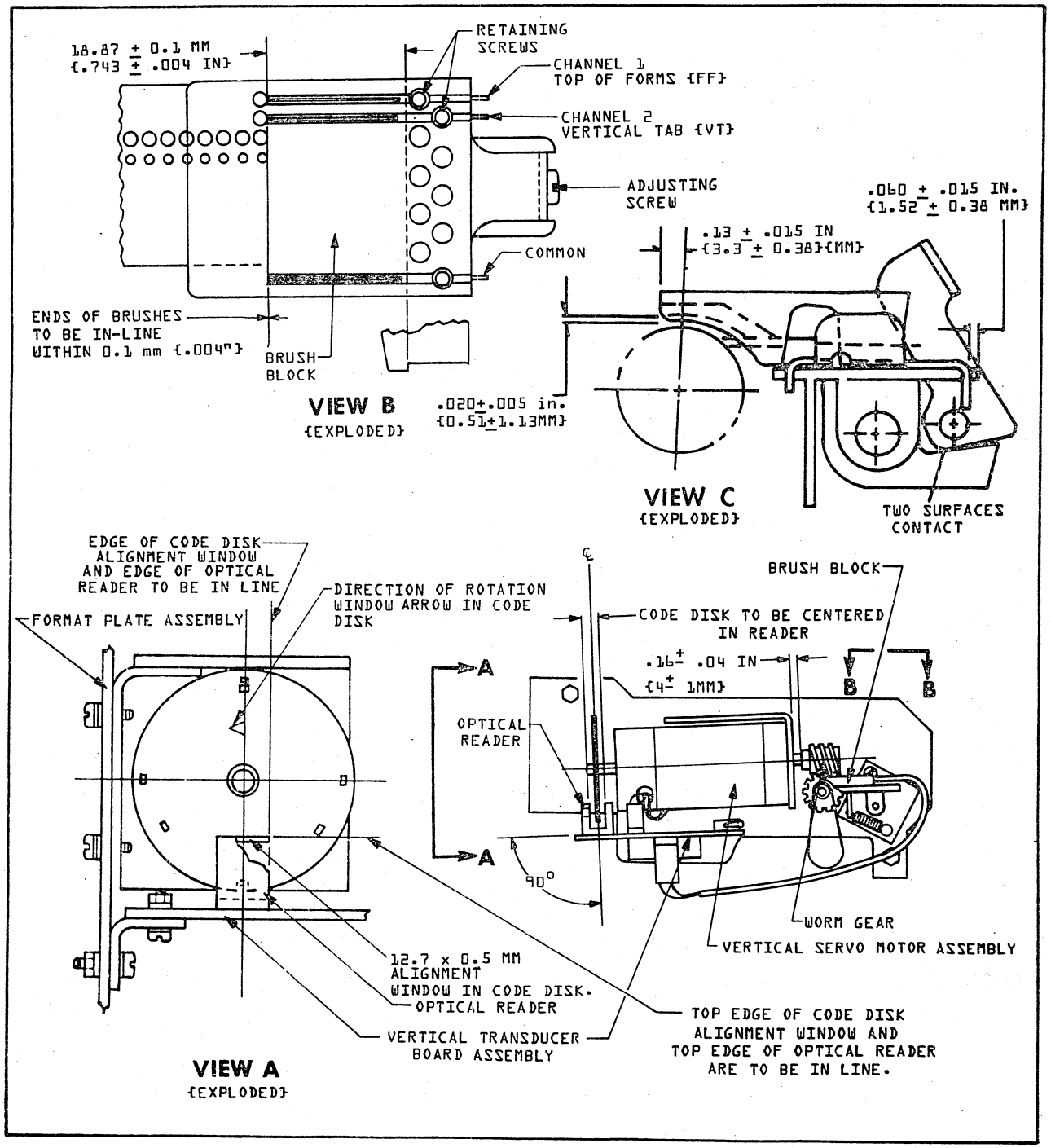


FIGURE 7-5. VERTICAL PAPER MOTION AND FORMAT READER ADJUSTMENTS

3. Measuring ruler (15 cm metric or six inch 10-50 parts to the inch.

4. Oscilloscpoe, dual trace, DC-10 MHz min, calibrated triggered sweep.

Tests (Figure 7-4/7-5)

1. Check the distance the ends of the three brushes are from the step in the brush block (Figure 7-5).

2. With an Oscilloscope monitor chip H3 pin 8 (brush reader format channel 1). Now ground pin 13 of test plug TJ1 or pin 1 of chip R2 to logic ground to cause a constant paper slew. Chip H3, test plug TJ1 and chip R2 are located on the Controller And Head Logic board in card location 1 PC2. The format channel 1 signal should be visible and pulsing.

Adjustments (Figure 7-4/7-5)

1. Loosen the brush retaining screws and locate the brushes at the proper length per Figure 7-5.

2. Adjust the adjusting screw which is located on the front of the brush block. Turn the screw clockwise until you see format channel 1 as a pulsing signal on the oscilloscope while monitoring chip H3 pin 8. The sprocket should deflect the tips of the brushes from .03 to .06 inches (0.76 to 1.52 mm) when adjusted properly.

3. When the brush adjusting screw is turned counterclockwise, the bracket holding the brush block must be free to move by the action of the spring force with no external help.

FORMAT READER AND CODE DISK SYNCHRONIZATION (FIGURE 7-4/7-5)

Tools Required

1. Screwdriver - flat blade type.

2. Oscilloscope dual trace, DC-10 MHz min., calibrated triggered sweep.

Tests (Figure 7-4/7-5)

1. Install a 6 LPI format tape in the format reader and power the printer on.

2. With an oscilloscope monitor chip H3 pin 8 (brush reader format channel 1) and chip H3 pin 13 (6 LPI STP from the code disk optical reader). Now ground pin 13 of test plug TJ1 or pin 1 of chip R2 to logic ground to cause a constant paper slew. Chip H3, test plug TJ1 and chip R2 are located on the Controller And Head Logic Board (card location 1PC2). Trigger the oscilloscope on the positive edge of format channel 1 signal. If the format reader and the code disk are synchronized properly, the 6 LPI STP signal should be centered within the brush reader channel 1 signal as shown in Figure 7-4.

Adjustments (Figure 7-4/7-5)

1. Continue to monitor chip H3 pins 8 and 13 per step 2 of tests above.

2. Remove ground from TJ1 pin 13 or chip R2 pin 1, stopping paper slew and code disk movement. Loosen the screw that retains the code disk. Rotate the code disk slightly and tighten the screw.

3. Repeat steps 1 and 2 until the 6 LPI STP signal is centered within the brush reader channel 1 signal as shown in Figure 7-4.

TRACTOR ASSEMBLY

Tools Required

1. Screwdriver - flat blade type

2. Feeler gage set

Tests (Figure 7-6)

1. Check the clearance between the front face of the tractor body and the tractor body cover per Figure 7-6.

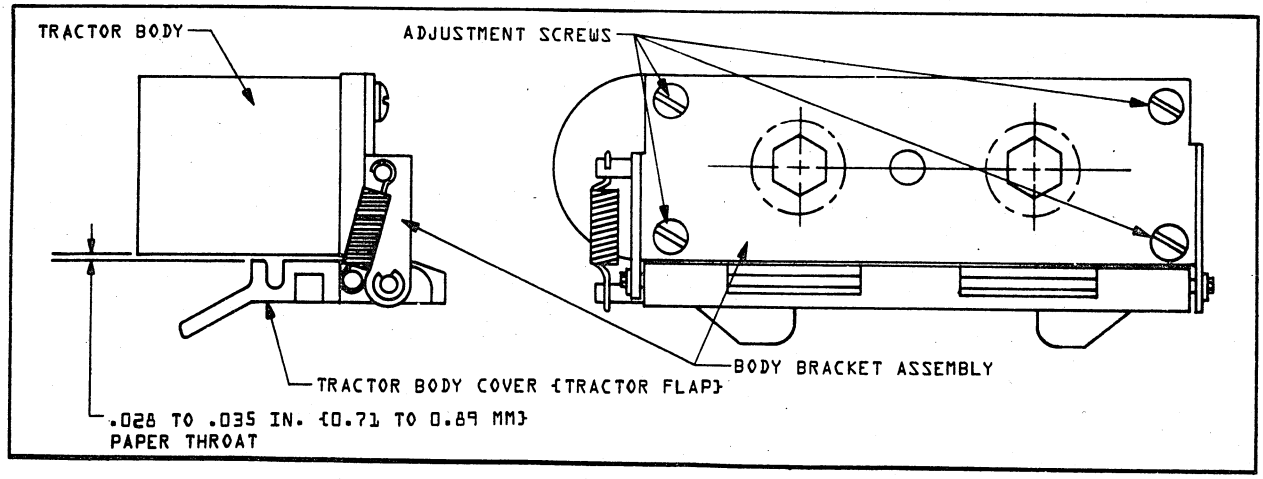


FIGURE 7-6 TRACTOR ASSEMBLY

Adjustments (Figure 7-6)

1. Loosen the four screws that mount the body bracket assembly to the tractor body.

2. Adjust the body bracket assembly to obtain the clearance shown in Figure 7-6.

3. Tighten the four screws that hold the body bracket assembly in place.

PAPER FEED ASSEMBLY

Tools Required

1. Screwdriver - flat blade type

2. Retaining ring pliers, reversible internal/external external combination type.

3. Feeler gage set.

4. 1.5 mm hex key (allen) wrench.

Tests (Figure 7-7)

1. Tractor Drive Shaft And Bearing End Play (Figure 7-7)

   a. Grasp the tractor drive shaft and move it from side to side. Check .001 in (0.02 mm) maximum end play between the shaft retaining ring and the spacer.

2. Clutch Hub Engagement (Figure 7-7)

   a. With the clutch release lever in its released position, try to rotate the lower tractor shaft counter clockwise. The shaft should not turn.

   b. With the clutch release lever held against the left hand format plate assembly, hand rotate the lower tractor shaft. There should be no contact of the teeth on the clutch gear with the teeth on the clutch hub.

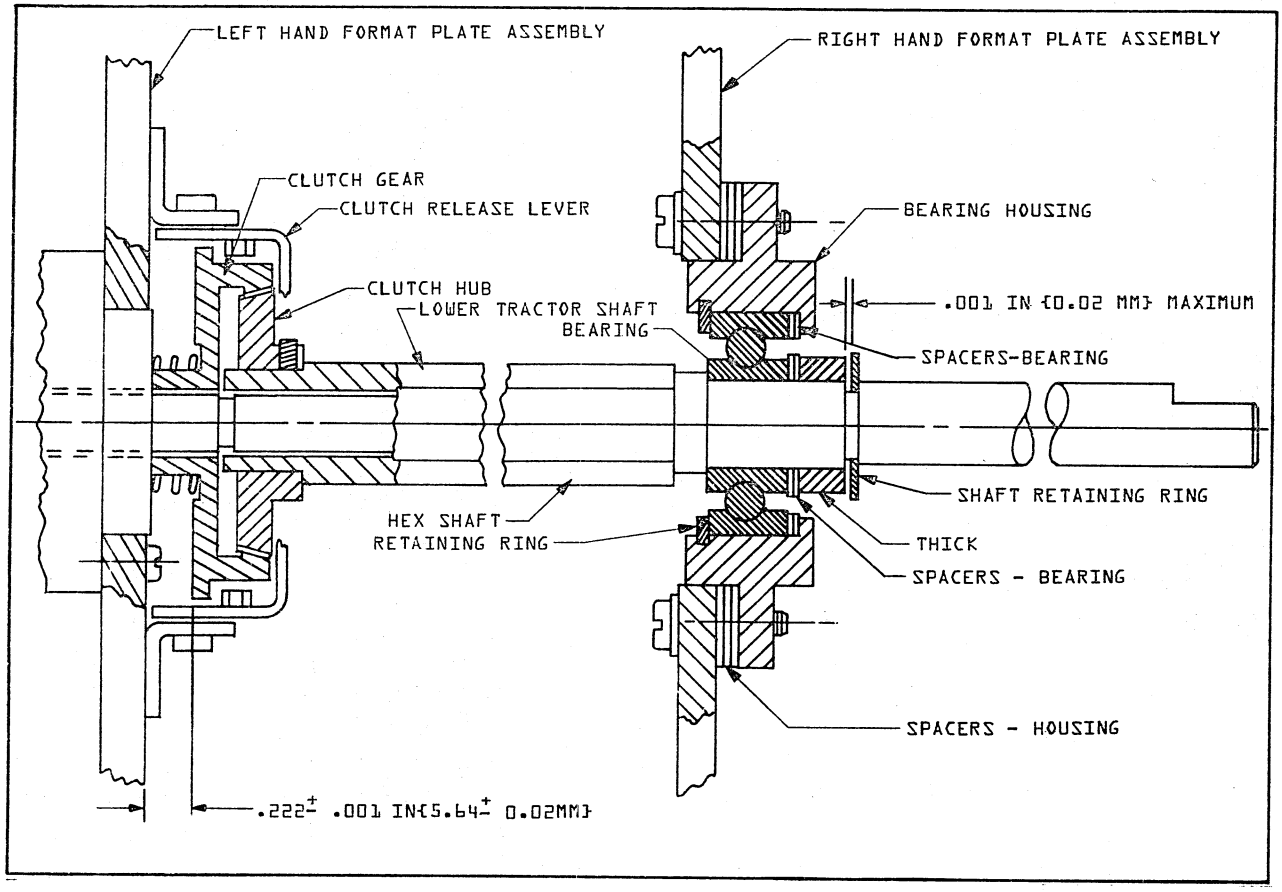


FIGURE 7-7. PAPER FEED ASSEMBLY

Adjustments (Figure 7-7)

1. Tractor Drive Shaft And Bearing End Play Adjustments (Figure 7-7)

   a. Remove as much bearing end play as possible by adding shims between the bearing housing and the bearing.

   b. Remove as much tractor shaft end play as possible by adding shims between the thick spacer and the bearing.

2. Clutch Hub Engagement Adjustment (Figure 7-7)

   a. Add or remove spacers between the right hand format plate assembly and the bearing housing until the clutch gear engages and disengages the clutch hub properly (Figure 7-7). This can be accomplished by shimming the bearing housing so that the distance between the left hand format place assembly and the clutch gear is .222 $\pm$ .001 in. (5.64 $\pm$ 0.02 mm).

SHAFT ALIGNMENT BRACKETS (FIGURE 7-8)

The shaft alignment brackets are located on either side of the print head structure. These brackets are used to locate the two print head support shafts to the platen. The shaft alignment brackets have been located to the print head structure at the factory, using a special setup fixture and should never need adjusting in the field.

CAUTION

DO NOT ADJUST OR LOOSEN THE SHAFT ALIGNMENT BRACKETS. THE MOUNTING SCREWS FOR THESE BRACKETS HAVE BEEN MARKED WITH RED GLYPTOL VARNISH FOR IDENTIFICATION AND SHOULD NEVER BE LOOSENED.

PRINT HEAD TO PLATEN

Tools Required

1. Screwdriver - flat blade type.
2. 7 mm open end wrench.
3. Feeler gage set.

Tests (Figure 7-8)

1. Platen To Head Parallelism

   a. Turn the density control knob counter clockwise so that the distance between the platen and the print head face can be measured with a feeler gauge.

   b. Move the print head all the way to the right and check the clearance between the print head face and the platen.

   c. Move the print head to the center and then all the way to the left checking the clearance between the print head face and the platen.

   d. The clearances should be the same within $\pm$ .001 in. ($\pm$ 0.02 mm).

2. Head To Platen Clearance (Not required on 70 LPM printers with operator replaceable head)

   a. Turn the density control knob all the way counter clockwise so that the platen is in its forward most position.

   b. Printers with five detent positions ; Move the print head along the platen from one side to the other checking the clearance between the print head face and the platen. The clearance should be .020 $\pm$ .001 in. (0.5 $\pm$ 0.02 mm).

   c. Printers with multiple detent positions; Move the print head along the platen from one side to the other checking the clearance between the print head face and the platen. The clearance should be .010 to .020 in. (0.25 to 0.50mm).

Adjustments (Figure 7-8)

1. Platen To Head Parallelism

   a. This is a factory adjustment and should only require readjusting when the platen is removed or replaced.

      Loosen the stop screws on the right and/or left platen advance bracket assembly and rotate the adjusting eccentric nuts until an identical clearance is achieved between the platen and the print head face.

   b. Tighten the stop screws and recheck.

2. Head To Platen Clearance (Not required on 70 LPM printers with operator replaceable head)

   a. Printers with five detent positions; Loosen the two print head retaining screws and shim the print head to achieve .020 $\pm$ .001 in. (0.5 $\pm$ 0.02mm) clearance between the print head face and the platen (Figure 7-8).

   b. Printers with multiple detents positions; Loosen the two print head retaining screws and shim the print head to achieve .010 to to .020 in. (0.25 to 0.50mm) clearance between the print head and the platen (figure 7-8).

LOWER PAPER SLIDE TO PLATEN

Tools Required

1. Screwdriver - flat blade type.

2. Feeler gage set.

Tests (Figure 7-8)

1. With the platen in it's forward most position check for a clearance of .010 to .059 in (.25 to 1.50 MM) between the lower paper slide and the platen. This check should be made along the entire edge of the paper slide.

Adjustments (Figure 7-8)

1. Loosen the two lower paper slide mounting screws located on the inside of the print head structure and just under the platen on either side. Adjust the lower paper slide to achieve the required clearance between the slide and the platen.

2. Tighten the mounting screws and recheck.

LINE FINDER TO PLATEN

Tools Required

1. Screwdriver - flat blade type.

2. Feeler gage set.

Tests (Figure 7-8)

1. With the platen set at .020 ± .001 in (0.5 ± 0.02 mm) from the face of the print head check for a clearance of .005 to .009 in. (0.125 to 0.225 mm) between the line finder and the platen.

Adjustments (Figure 7-8)

1. Loosen the two line finder mounting screws located on the top surface of the print head support casting. Adjust the line finder to achieve the required clearance between the line finder and the platen.

PRINT HEAD TO PRINT HEAD (125 L.P.M. ONLY)

Tools Required

1. Screwdriver - flat blade type.

2. 7 mm open end wrench.

Tests (Figure 7-8)

1. Vertical Alignment

   a. Using the test print mode print several full lines of 132 characters. Visually check the vertical alignment of columns 67 through 132. The eye should not be able to see any vertical misalignment.

   b. Visually look at the straight side of the "B"s printed by both heads. The straight sides of the "B"s should be parallel from line to line and perpendicular to the print line.

2. Horizontal Alignment

   a. Using the test print mode print several full lines of 132 characters. With a measuring ruler check the horizontal alignment (distance between the print wires of the two heads). This measurement should be 6.6 ± .005 in. (167.6 ± 0.13 mm) and should be measured between the leading edge of column 1 to the leading edge of column 67. This measurement should only be made on lines printed from left to right.

   b. If a measuring ruler is not available, the visual check method may be used. Visually check the distance between column 66 and 67. This distance should be the same as the distance between adjacent columns.

Adjustments (Figure 7-8)

1. Vertical Alignment

   a. Loosen the two screws that mount either one of the print heads to it's support casting. Move the print head up or down so that the head mounting screws are centered in the vertical adjusting slots in the support casting. Make sure the line of print wires is perpendicular to the print line before tightening the screws.

   b. Using the test print mode, obtain a print sample.

   c. If the other print head is vertically misaligned, loosen its mounting screws and move it up or down as required. Make sure the line of print wires are perpendicular to the print line before tightening the screws.

   d. Run the test print program and readjust the print head if necessary until proper alignment is obtained.

2. Horizontal Alignment

   a. The distance between print heads may be adjusted by turning the adjustment eccentrics which are located at either end of the print head adjustment brace. The adjustment brace joins the two print head casting. Loosen the two belt retaining clamps that clamp the drive belt to the bottom of the print head support castings before loosening or adjusting the eccentrics. Loosen one or both of the eccentric locking screws and adjust the eccentrics to obtain the proper horizontal alignment between the two print heads.

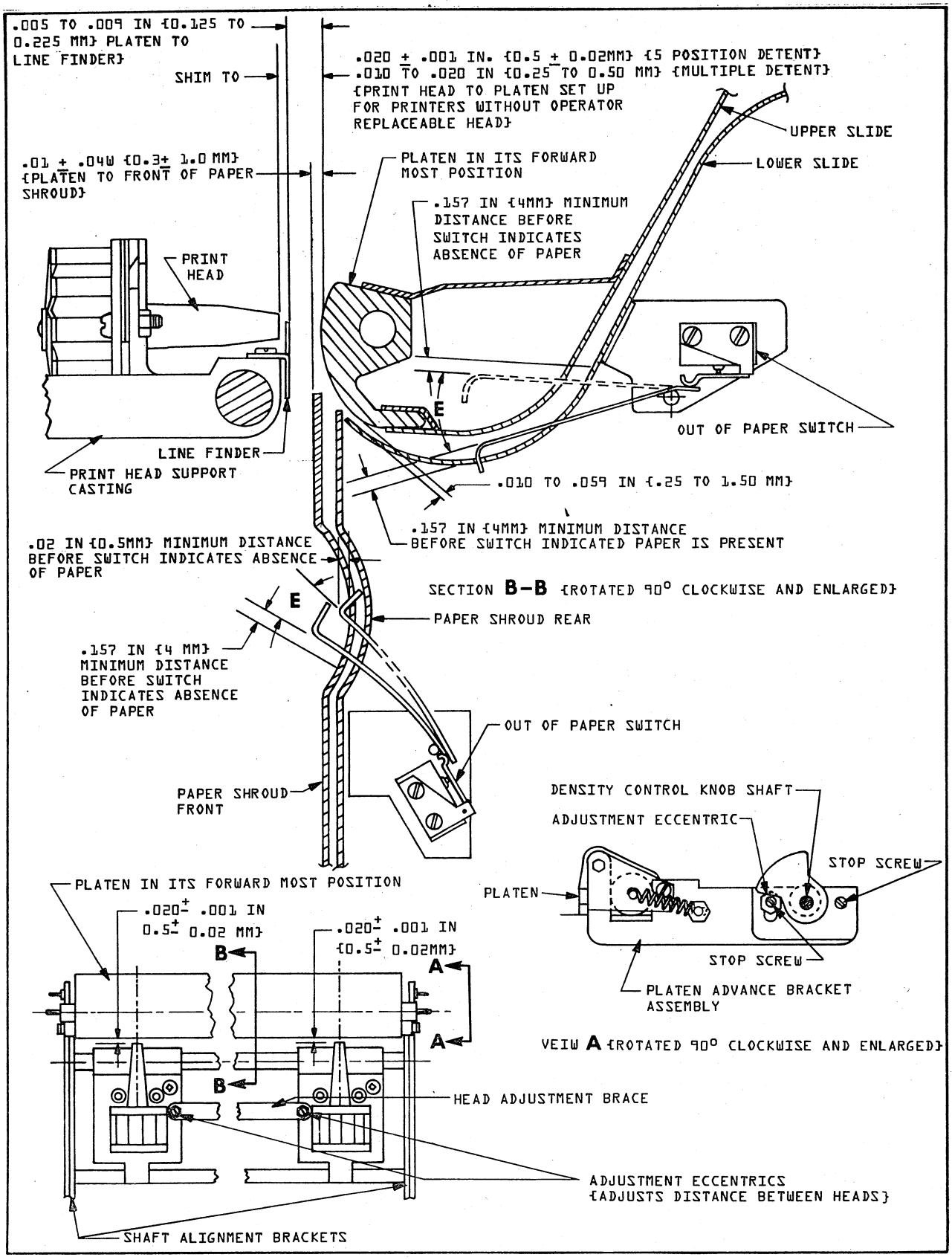


FIGURE 7-8 PRINT HEAD, PLATEN, LINE FINDER, PAPER SLIDE AND OUT OF PAPER SWITCH ADJUSTMENTS.

b. Tighten the two eccentric locking screws. Tighten the belt retaining clamps on each print head support casting. Enter the test print mode and recheck horizontal alignment.

OUT OF PAPER SWITCHES (FIGURE 7-8)

All printers are provided with an out of paper switch on the lower paper slide which is located to the rear of the platen. Units with the optional bottom form feed have an additional out of paper switch mounted on the rear paper shroud which is located under the platen.

Tools Required

1. Screwdriver - flat blade type.
2. Measuring ruler.

Tests (Figure 7-8)

1. The switches must indicate paper presence when the lever arms are prevented from passing through the slots in the upper paper slide and the front paper shroud. The lever arms must indicate the absence of paper when the levers extend through both slots in the upper and lower paper slides and the front and rear paper shrouds. The switches must activate in both directions within the angle "E" shown in figure 7-8.

Adjustments (Figure 7-8)

1. Adjust the out of paper switches and bend the lever arms to accomplish the functions indicated in the tests above.

CODE STRIP TO READER ALIGNMENT

Tools Required

1. Screwdriver - blade type

Tests (Figure 7-9)

1. While moving the print head and horizontal transducer board from one side of the printer to the other, make the following checks:
   a. The code strip should be clean and free of smudges.
   b. The code strip should be centered in the optical reader and parallel to its sides when the reader is in its right and left home positions.
   c. The tension on the code strip should be such that the strip is straight for its entire length. Bend the finger of the bracket in or out for spring tension.
   d. The alignment marks on the side of the optical reader should be centered in the top two rows of the windows on the code strip when the reader is in its right and left home positions.

Adjustments (Figure 7-9)

1. Loosen the three screws on either side of the print head structure that mount the right and left hand code strip brackets and adjust the code strip to the optical reader. Tighten the screws and retest.

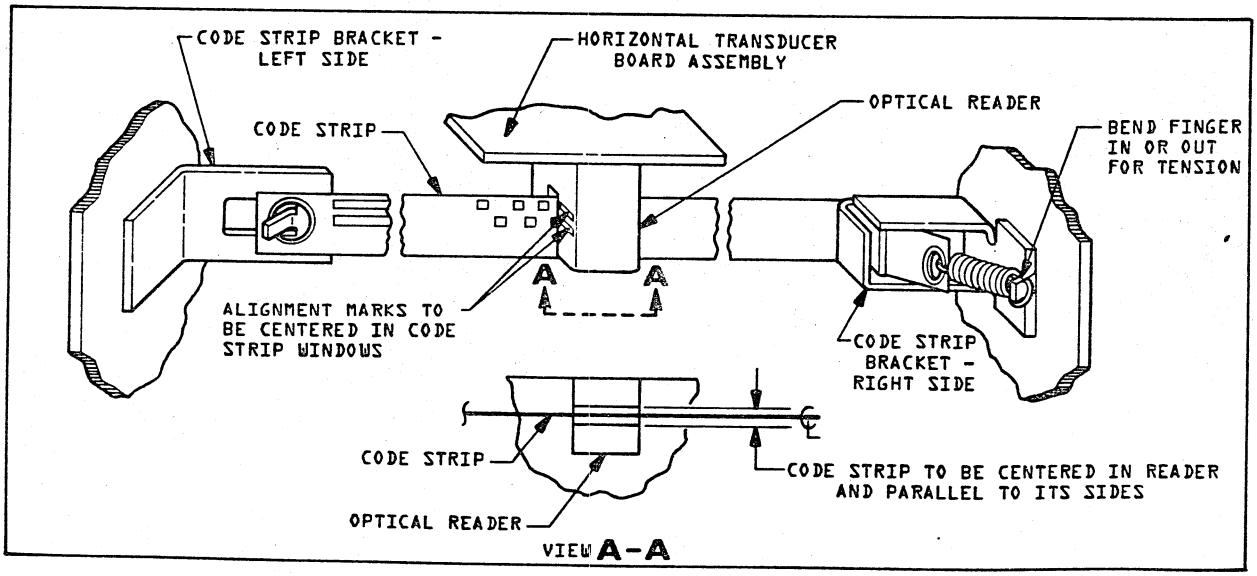


FIGURE 7-8. CODE STRIP ALIGNMENT

POWER SUPPLY BOARD ASSEMBLY

Tools Required

1. Multimeter.
2. Screwdriver flat blade type.
3. Use digital meter to check voltages.

Tests And Adjustments (Figure 7-10, 7-17 and 7-18).

1. With power supplied to the card, adjust potentiometer P1 to obtain +36V ± 0.5V on a multimeter between connector J3 pin 1 and J3 pin 3 (voltage may also be checked at 1PC2-J1 between pin 9 and pin 10).
2. With power supplied to the card, adjust potentiometer P2 to obtain +5V ± 0.02V on a multimeter between connector J1 pin 3 and J1 pin 4 (voltage may also be checked at 1 PC2-J1 between pin 3 and pin 4).

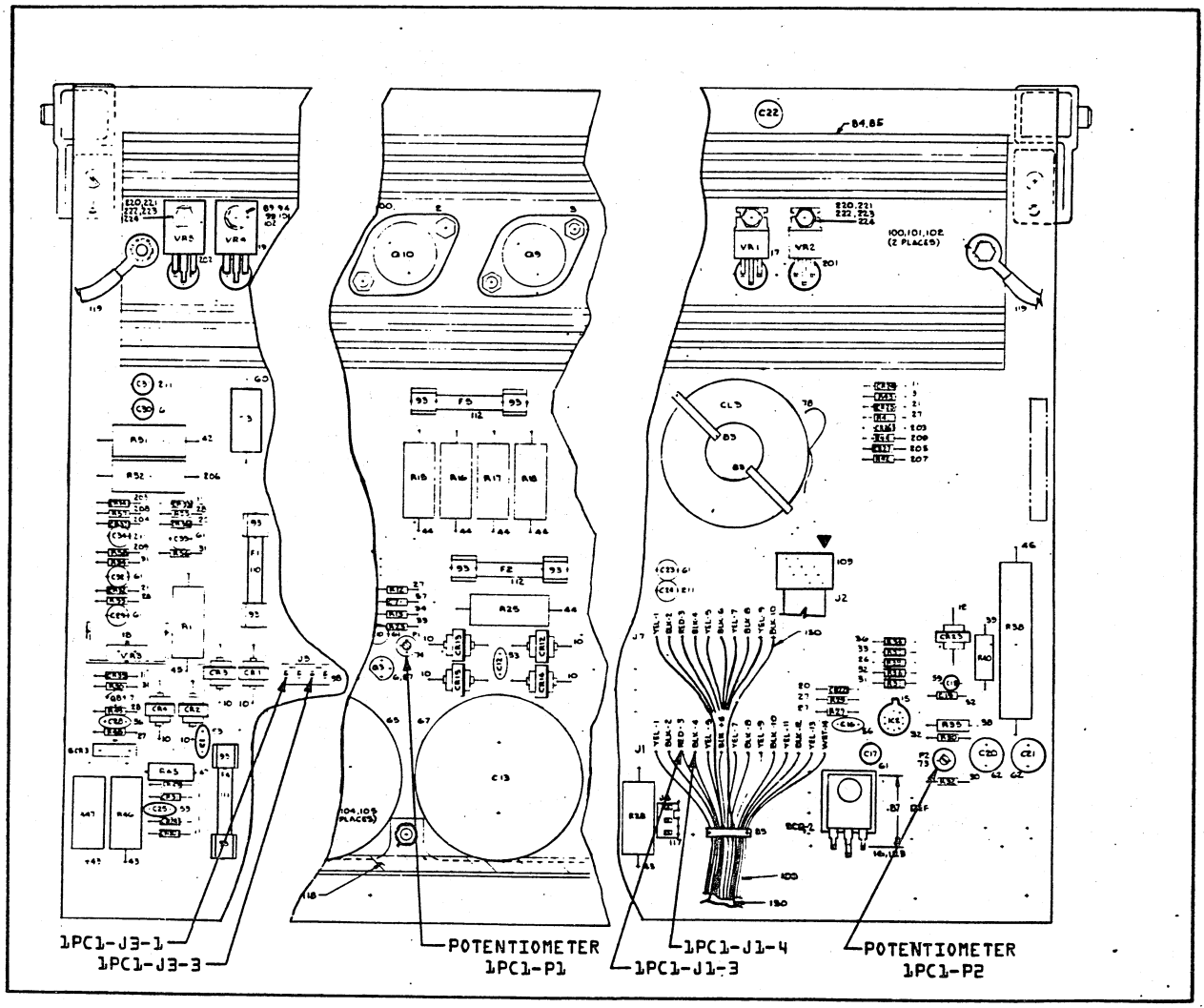


FIGURE 7-10. POWER SUPPLY BOARD ASSEMBLY (CARD LOCATION 1PC1)

NEEDLE DRIVER BOARD ASSEMBLY

Tools Required

1. Multimeter.
2. Oscilloscope.
3. Screwdriver - flat blade type.

Tests And Adjustments (Figure 7-12 and 7-17).

1. With power applied, set potentiometer P1 to obtain 1.13 $\pm$ .03V on a multimeter across resistor R20. Enter the printer into the test print mode.

NOTE

TO PREVENT THE PRINTHEAD NEEDLES FROM FIRING DURING ADJUSTMENT UNPLUG CONNECTOR J3 ON POWER SUPPLY BOARD.

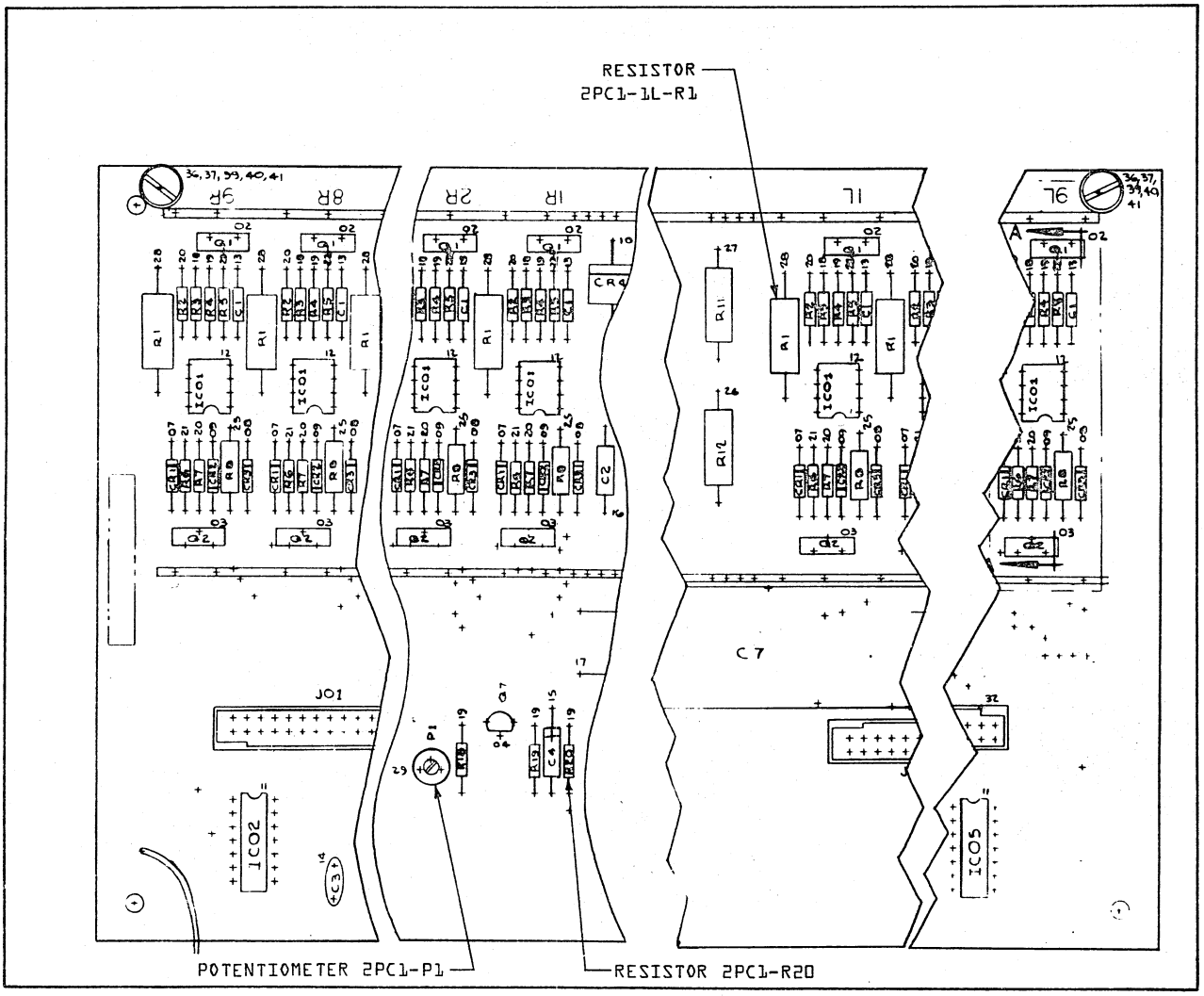


FIGURE 7-12. NEELDE DRIVER BOARD ASSEMBLY (CARD LOCATION 2PC1)

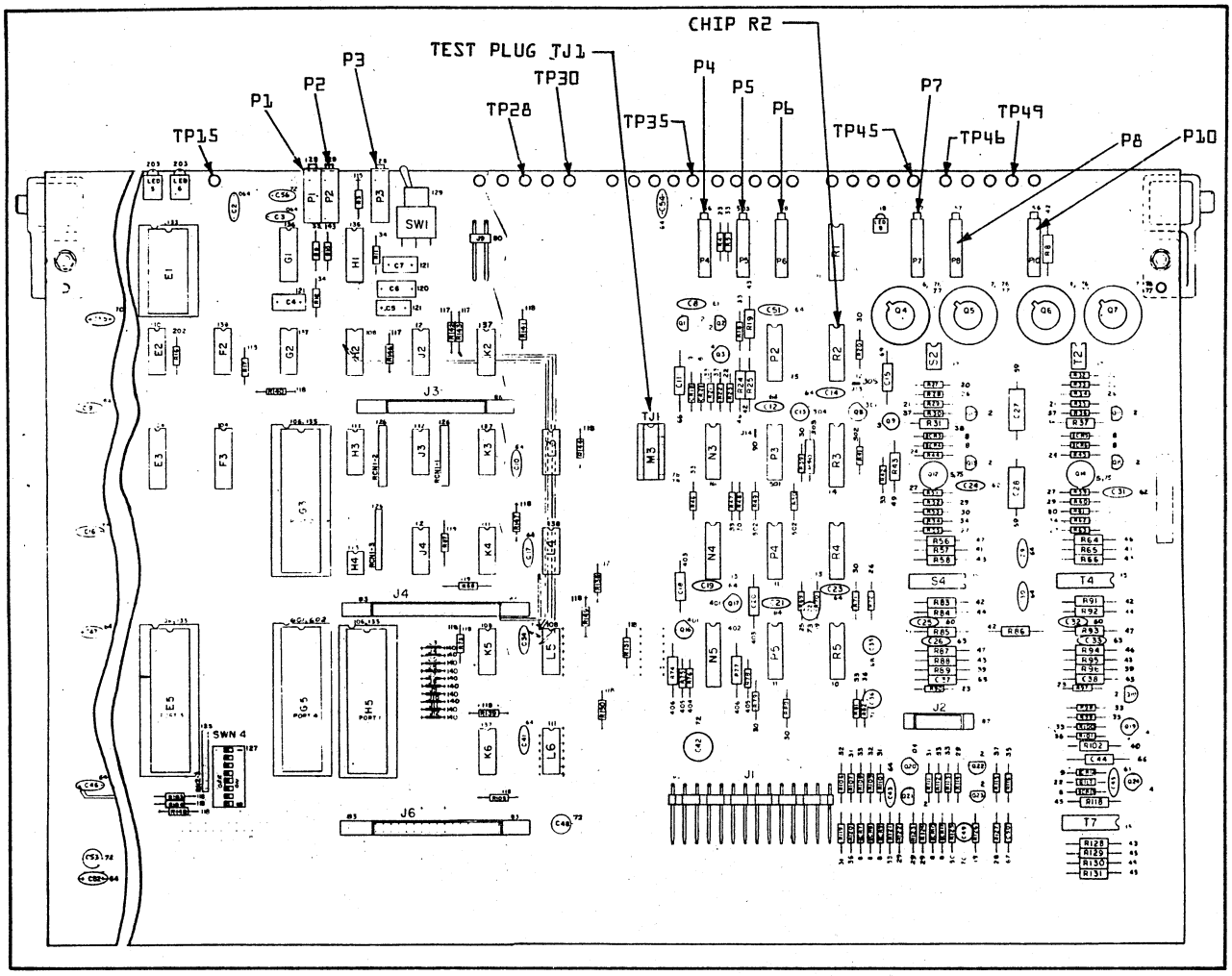


FIGURE 7-13. CONTROLLER AND HEAD LOGIC BOARD ASSEMBLY (CARD LOCATION 1PC2)

HORIZONTAL SERVO SYSTEM (PRINT HEAD MOTION)

Tools Required

1. Oscilloscope.
2. Screwdriver - flat blade type.

Test And Adjustments (Figure 7-13 and 7-17).

1. To prevent the print head needles from firing during adjustment steps 2 through 6, unplug connector J3 on the power supply board.

2. While in the Test Print Mode, trigger the oscilloscope on the zero-going edge of TP35 and observe wave from at TP49. Set potentiometer P6 to obtain a 30 ± 1 milliseconds slope at the leading edge of waveform (Figure 7-14).

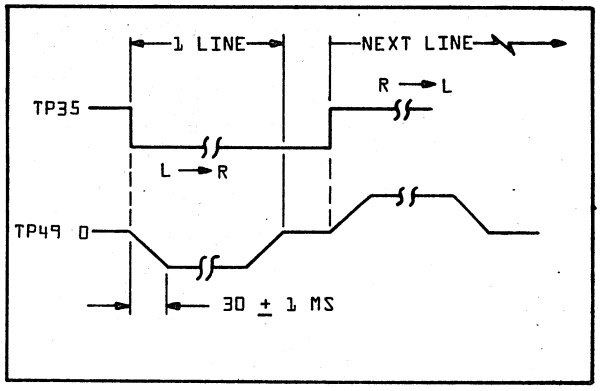


FIGURE 7-14. WAVEFORM (POT P6)

NOTES FOR STEPS 3 AND 4:

1. These adjustments are best made when the machine is warm after several hours of operation.
2. If excessive jitter is encountered, it may frequently be corrected by cleaning the code strip with a mild household window cleaner and a soft cloth. Alignment of the code strip to the horizontal transducer should be rechecked after this cleaning procedure. Slowing the head velocity slightly to reduce the jitter effect is acceptable provided the average period does not exceed 5.6 milliseconds; otherwise, replacement of the transducer and/or code strip may be required.

3. Head Speed should be set up by looking at the odd channel only, namely K4-2 of controller and head logic P.C.B:
   Synchronize and measure the positive going edges of K4-2. Adjust head speed (Pot P4) and balance head speed (Pot P7) so that the average period T, is 10930 usec $\pm$ 180 μsec in both directions this corresponds to an average head speed of 18.3 $\pm$ .31PS (Figure 7-15).

a. If a digital counter is not available, head speed should be set up while triggering on and observing character start pulses at TP 15 with a calibrated-sweep oscilloscope. Adjust head speed (P4) and balance head speed (P7) so that the average period (positive-going edge to positive going edge) is 5.5 milliseconds in both directions of head travel. Confirm that in no case does the period drop below 5.0 milliseconds with jitter.

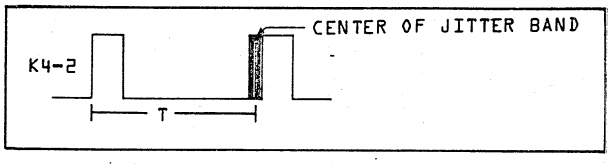


FIGURE 7-15. HEAD SPEED (POT P4)

4. Potentiometer P5 is used for units with the Compressed Pitch option only. Set P5 to obtain 5.5 $\pm$ .01 milliseconds rep rate on the character start pulses when the head is moving from left to right in the Compressed Pitch Mode (viewed from front of machine). P7 does not need to be readjusted for compressed pitch. Trigger the oscilloscope and observe the pulses of the Character Start One Shot at TP15 (TP15 comes from 1PC2-H1 pin 5) while adjusting potentiometers.

5. While viewing the printout, adjust pot P2 until right to left and left to right printing of the character columns are aligned from one line of print to the next. This alignment should be examined on characters within the center of the print line and can be done more easily while in the 8 LPI mode. After standard width characters have been aligned as accurately as possible, the printer should be put on line and run in Elongated character mode (enable Elongated mode by activating dip switch 4, switch 1, as shown in Figure 4-10). The alignment of left to right and right to l left printing is adjusted by the character start O/S (Pot P2) while in test print or printing all one character on line (e.g. h's). Standard characters should be aligned first, as accurately as possible near the center of the print line. However, slight misalignment of up to .008" (.210 mm) is allowable, but only in one direction. The horizontal line-to-line misalignment for the entire line may not exceed .015" (Figure 7-17). Check alignment of Elongated Characters from one line of print to the next. If characters are out of alignment, adjust pot P2 until the Elongated characters are in line. Standard with characters should then be re-examined to insure that they are in line.

FACTORY ADJUSTMENT ONLY RTV SEALED POTENTIOMETERS P1 AND P3

Potentiometer P1 was adjusted at the factory with a digital counter. Do not attempt to readjust this potentiometer in the field without a digital counter. To adjust the print head needle firing rate, connect a digital counter to TP28 to monitor the -MT3 signal. A counter mode must be selected which allows measurement of the rep rate of the -MT3 signal (negative edge ot negative edge). While operating the printer in the Test Print Mode, adjust potentiometer P1 until the -MT3 rep rate (negative edge to negative edge) is set from 620 to 625 microseconds (Figure 7-16). The resolution of the digital counter used, must be $\pm$ 1 microsecond.

Potentiometer P3 was adjusted at the factory with a digital counter. Do not attempt to readjust this potentiometer in the field without a digital counter. Connect a digital counter to TP28 and adjust potentiometer P3 until the -MT3 pulse width (negative going edge to positive going edge) is set from 540 to 550 microseconds (Figure 7-16).

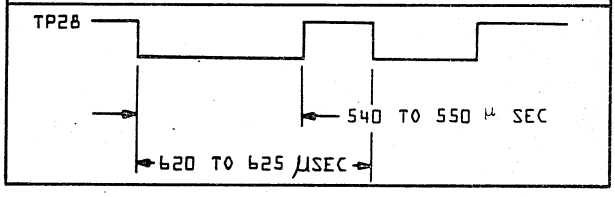


FIGURE 7-16. WAVEFORM (POT P1 AND P3)

VERTICAL SERVO SYSTEM (PAPER MOTION)

Tools Required

1. Oscilloscope
2. Screw driver - flat blade type.

Tests And Adjustments (Figure 7-13)

1. Trigger the oscilloscope from TP45 and observe wave form at TP46.
   On positive going edge of TP45 signal, set potentiometer P8 to obtain a ramp of 9 $\pm$ 1 milliseconds of wave form at TP46 (Figure 7-18).

2. Ground pin 13 of test plug TJ1 or pin 1 of chip R2 to logic ground to cause a constant paper slew (with paper removed) and observe STP pulses at TP30 (TP30 comes from 1PC2-H3 pin 13). Set pot P10 to obtain a rep rate of 22 $\pm$ 1 milliseconds for the 6 L.P.I. channel STP.

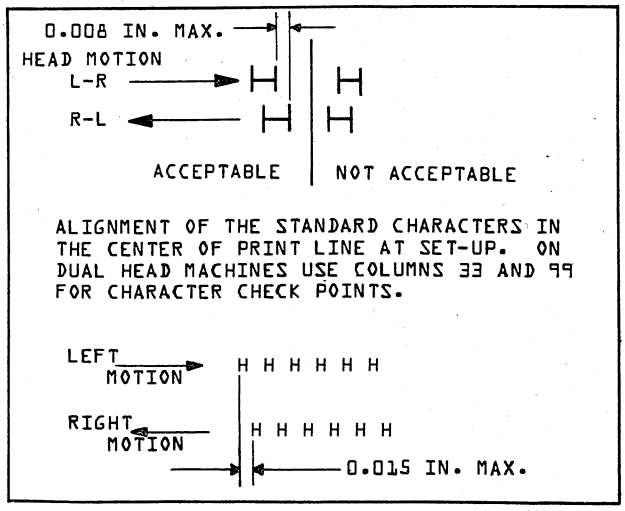


FIGURE 7-17. CHARACTER ALIGNMENT

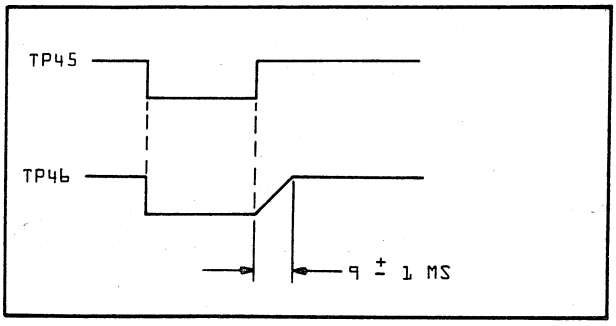


FIGURE 7-18. WAVEFORM (POT P8)

POWER SUPPLY BOARD ASSEMBLY (CARD LOCATION 1PC2)	
POTENTIOMETER	POTENTIOMETER FUNCTION
1PC1-P1	USED TO ADJUST THE +36 VDC
1PC1-P2	USED TO ADJUST THE + 5 VDC
NEEDLE DRIVER BOARD ASSEMBLY (CARD LOCATION 2PC1)	
POTENTIOMETER	POTENTIOMETER FUNCTION
2PC1-P1	USED TO ADJUST THE CURRENT SUPPLIED THE PRINT HEAD SOLENOIDS
CONTROLLER AND HEAD LOGIC BOARD ASSEMBLY (CARD LOCATION 1PC2)	
POTENTIOMETER	POTENTIOMETER FUNCTION
1PC2-P1	USED TO SET THE HORIZONTAL DOT REP RATE (-MT3 REP RATE). ALSO AFFECTS CHARACTER WIDTH
1PC2-P2	USED TO ALIGN THE CHARACTER COLUMNS FROM ONE LINE OF PRINT TO THE NEXT.
1PC2-P3	USED TO ADJUST THE PRINT HEAD SOLENOID CURRENT PULSE WIDTH (-MT3).
1PC2-P4	USED TO ADJUST THE LEFT TO RIGHT HEAD VELOCITY. ALSO USED IN CONJUNCTION WITH POTENTIOMETER 1PC2-P7 TO CONTROL HEAD SPEED IN RIGHT TO LEFT DIRECTION.
1PC2-P5	USED TO ADJUST THE RIGHT TO LEFT AND LEFT TO RIGHT HEAD SPEED FOR COMPRESSED PITCH. (70 LPM PRINTERS ONLY).
1PC2-P6	USED TO ADJUST THE ACCELERATION AND DECELERATION VELOCITY OF THE PRINT HEADS HORIZONTAL MOTION.
1PC2-P7	USED TO EQUALIZE THE RIGHT TO LEFT AND LEFT TO RIGHT HEAD VELOCITIES.
1PC2-P8	USED TO ADJUST THE DECELERATION (STOPPING DISTANCE) OF VERTICAL PAPER MOTION.
1PC2-P9	NONEXISTENT
1PC2-P10	USED TO ADJUST THE SLEW VELOCITY OF PAPER MOTION

FIGURE 7-19. POTENTIOMETER FUNCTION CHART

CONNECTOR 1PC2-J1			
PIN	VOLTAGE	PIN	VOLTAGE
1	+12 VDC	9	+36 VDC
2	LOGIC GND (+12 VDC)	10	LOGIC GND (+36 VDC)
3	+5 VDC	11	-36 VDC
4	LOGIC GND (+5 VDC)	12	LOGIC GND (-36 VDC)
5	-5 VDC	13	
6	LOGIC GND (-5 VDC)	14	RECTIFIED A. C. (16 VAC)
7	-12 VDC		
8	LOGIC GND (-12 VDC)		

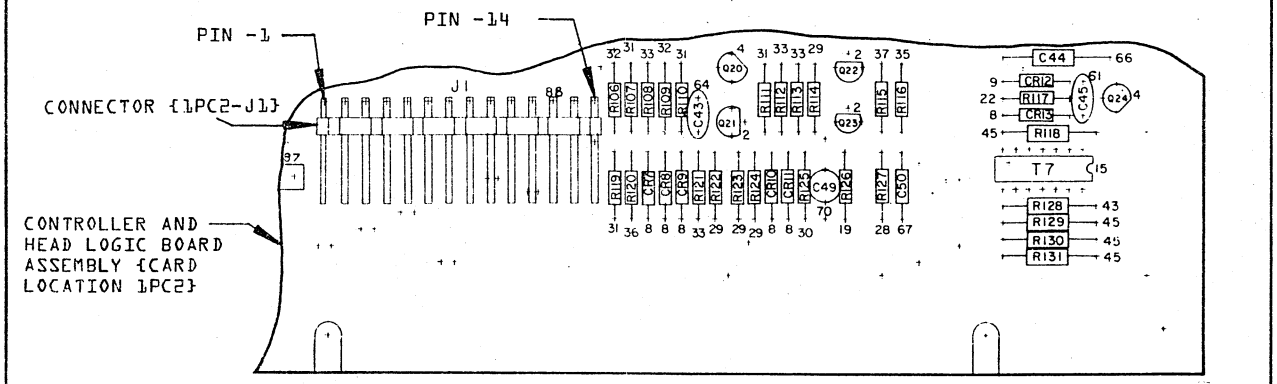


FIGURE 7-20. POWER SUPPLY VOLTAGE TEST POINTS

INTRODUCTION

This section includes disassembly and assembly procedures required for parts replacement in the field. This section should be used in conjunction with the printer Assembly Parts Lists and the Tests And Adjustments section in this manual.

PRINTHEAD REPLACEMENT (FOR UNITS WITHOUT OPERATOR REPLACEABLE HEAD)

Tools Required

1. Screwdriver - flat blade type.

Removal (Figure 8-1)

1. Remove the ribbon cassette from the top of the print head support casting.
2. Remove the spring clip that clamps the print head harness connector to the print head flat cable connector and unplug the print head connector.
3. Remove the ty-rap that secures the print head wire harness to the print head support casting.
4. Remove the two screws and related mounting hardware that mount the print head to the print head support casting.
5. Remove the print head and print head shims. These shims may vary in quantity from printer to printer and head to head. Retain the shims removed with the print head so they may be used with that same print heads replacement.

Installation (Figure 8-1)

1. Mount the new print head to the print head support casting using the same shims and mounting hardware removed with the old print head.
2. Plug the new print head harness connector into the print head flat cable connector and replace the spring clip that clamps these two connectors together.
3. Secure the print head harness to the side of the print head support casting with a ty-rap. If a ty-rap is not available, lacing cord, electrical tape or insulated solid wire may be used. The print head harness should be secured so when the head is moving from side to side the harness does not touch the print head support shaft, print head drive belt or the right side of the print head structure.
4. Using the Mechanical Tests And Adjustments section of this manual check and adjust the print head to platen clearance.
5. If the unit is two headed 125 line per minute printer check the Mechanical Test And Adjustments section of this manual for necessary print head to print head tests and adjustments.
6. Replace the Ribbon Cassette.
7. Check ribbon drive cords for wear.

PRINTHEAD REPLACEMENT (FOR UNITS WITH OPERATOR REPLACEABLE HEAD)

1. See Operating Procedures section of this manual for printhead replacement procedure.

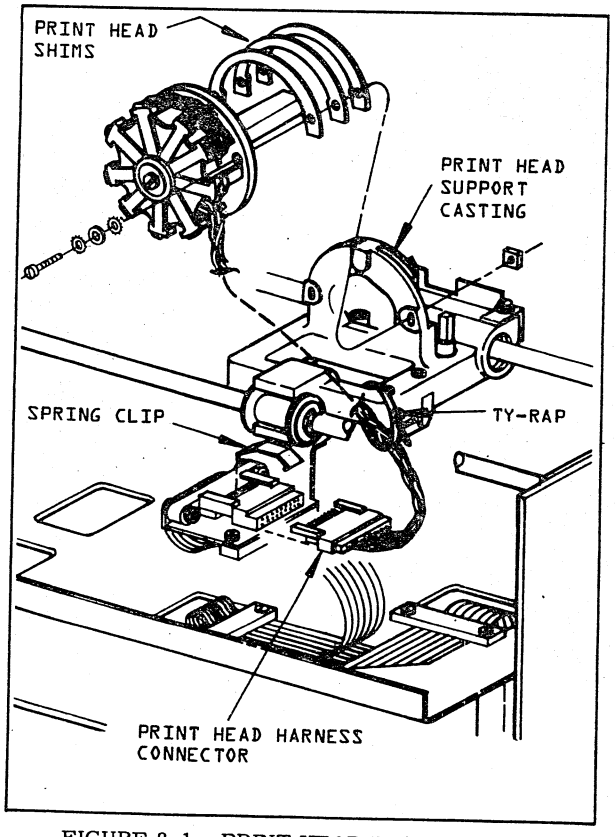


FIGURE 8-1. PRINT HEAD REPLACEMENT

PRINT HEAD FLAT CABLE ASSEMBLY REPLACEMENT (70 AND 125 LPM)

Tools Required

1. Screwdriver - flat blade type.
2. 5.5 mm open end or box wrench.

Removal (Figure 8-2)

1. Remove the spring clip that clamps the print head harness connector to the print head flat cable assembly connector (Figure 8-1). Unplug the print head harness connector.
2. Unplug the print head flat cable from the Needle Driver Board Assembly.
3. Remove the cable clamp that secures the print head flat cable to the bottom of the connector mounting plate.
4. Remove the two cable clamps that secure the print head flat cable to the top of the front plate.
5. Remove the two screws that mount the print head flat cable assembly connector to the connector mounting plate.
6. Remove the print head flat cable assembly from the printer.

Installation (Figure 8-2)

1. Using the old print head flat cable assembly as a pattern, bend and lightly crease the new print head flat cable to match the bend and creases in the old flat cables.
   The connectors on either end of the print head flat cable are not the same and care should be taken to assure that the connectors on the old and new harnesses are matched before folding the new cable.

CAUTION

THESE CABLES SHOULD NOT BE CREASED MORE THAN ONCE IN THE SAME PLACE OR DAMAGE COULD OCCUR.

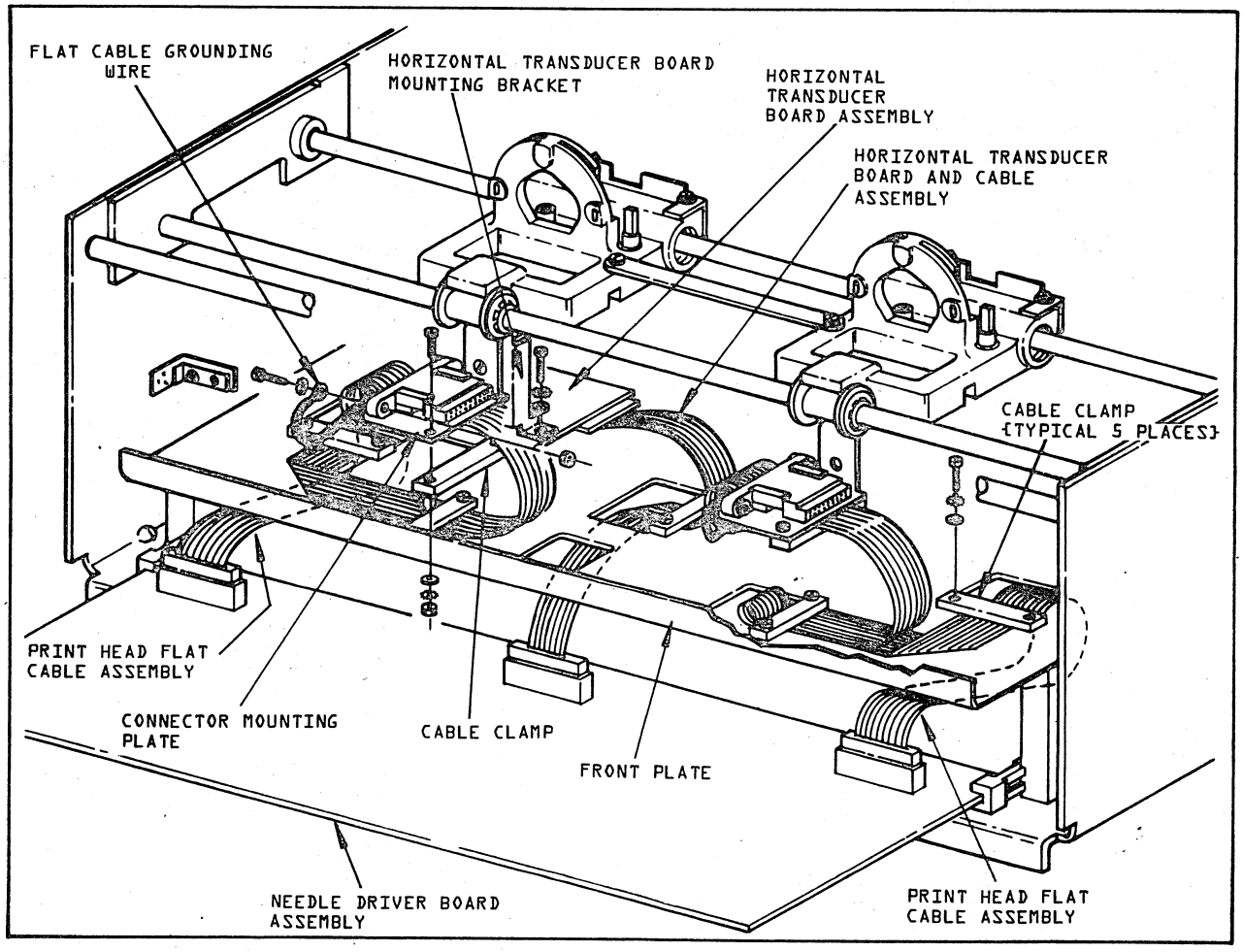


FIGURE 8-2. PRINT HEAD FLAT CABLE ASSEMBLY REPLACEMENT, AND HORIZONTAL TRANSDUCER BOARD AND CABLE ASSEMBLY REPLACEMENT.

2. Reversing the removal procedure, mount and clamp the new print head flat cable assembly in place. Assure that the flat cable grounding wire is connected to the mounting plate.

HORIZONTAL TRANSDUCER BOARD AND CABLE ASSEMBLY REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

Removal (Figure 8-2)

1. Unplug the horizontal transducer board cable connector from the Needle Driver Board Assembly.

2. Remove the cable clamp that secures the horizontal transducer board flat cable to the front plate.

3. Remove the two screws that mount the Horizontal Transducer Board Assembly to the horizontal transducer board mounting bracket.

4. Remove the Horizontal Transducer Board and Cable Assembly from the printer.

Installation (Figure 8-2)

1. Using the old Horizontal Transducer Board and Cable Assembly as a pattern, bend and lightly crease the new horizontal transducer board flat cable to match the bends and creases in the old flat cable.

CAUTION

THIS CABLE SHOULD NOT BE CREASED MORE THAN ONCE IN THE SAME PLACE OR DAMAGE COULD OCCUR.

2. Reversing the removal procedure, mount and clamp the new horizontal transducer board and cable assembly in place. Use Figure 8-2 to aid in cable routing.

CODE STRIP REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

Removal (Figure 8-3)

1. Loosen the code strip adjustable bracket locking screw that holds the adjustable code strip bracket in place.

2. Unhook the code strip spring from the code strip bracket (right side) and remove the spring from the code strip grommet hole.

3. Remove the code strip mounting screw that fastens the code strip to the adjustable code strip bracket.

4. Thread the code strip through the rectangular cut out in the code strip bracket (right side) and remove the code strip from the printer.

Installation (Figure 8-3)

1. Thread the new code strip through the rectangular cut out in the code strip bracket (right side). The code strip should be installed such that the code strip part number is to the right and can be read correctly when standing in front of the printer.

2. Mount the code strip to the adjustable code strip bracket with the code strip mounting screw. Do not tighten screw.

3. Hook one end of the code strip spring through the grommet hole in the code strip and the other end of the spring over the tab on the code strip bracket (right side).

4. While putting a slight tension on the code strip by pushing the adjustable code strip bracket to the left, tighten the code strip mounting screw. Care should be taken to assure that the tightening of this screw does not distort the code strip.

5. Adjust the code strip to the reader per the Mechanical Tests And Adjustments section of this manual.

CASSETTE DRIVE CORD ASSEMBLY REPLACEMENT (70 AND 125 LPM)

Tools Required

1. Pliers - long nose or needle nose

Removal (Figure 8-4)

1. Disconnect both ends of the upper and lower cassette drive cord assemblies from the four cassette drive cord brackets and remove both drive cord and springs.

Replacement (Figure 8-4)

1. With the aid of Figure 8-4, install the new cassette drive cord assemblies. Care should be taken to assure that the ring terminals and springs are attached to the proper side of the printer as shown in Figure 8-4. Figure 8-4 shows the typical installation of drive cords on a two headed (125 L. P. M.) printer. Installation of drive cords on one head (70L. P. M.) printers is identical except for the additional full turn of the cords around the right hand cassette drive pulleys.

2. With the ribbon cassettes installed move the heads from side to side to assure that there is ribbon motion and that the cords are tracking properly.

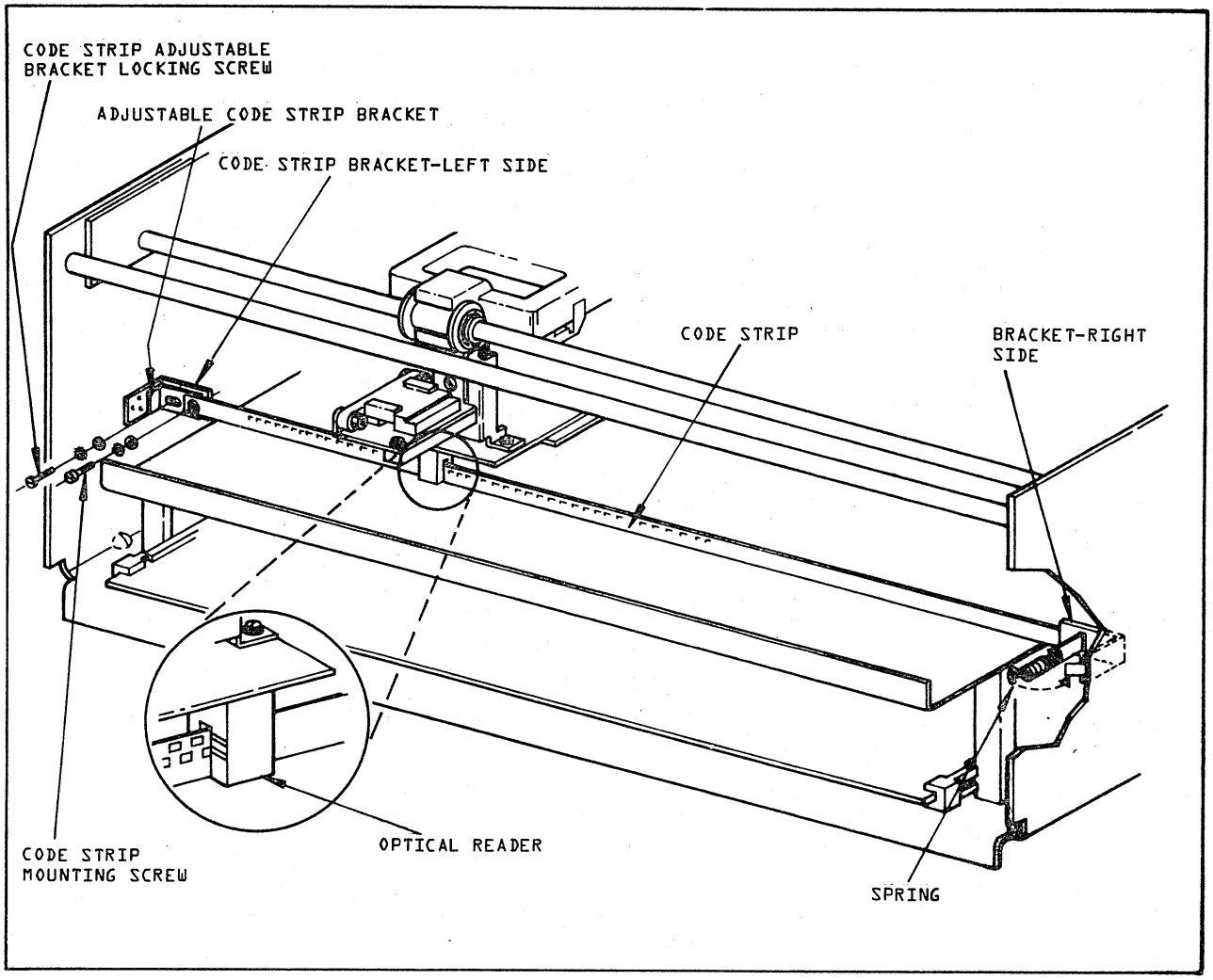


FIGURE 8-3. CODE STRIP REPLACEMENT

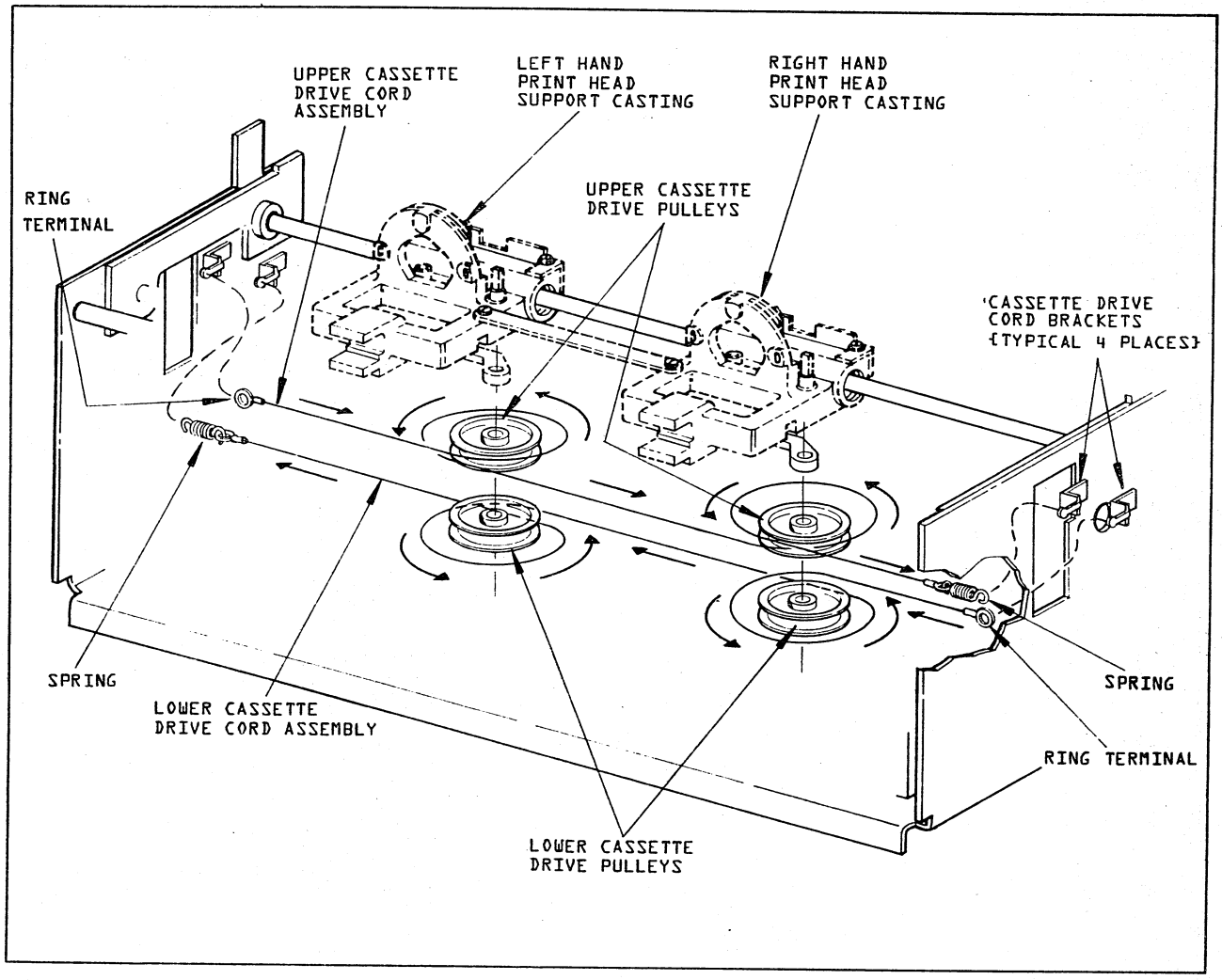


FIGURE 8-4. CASSETTE DRIVE CORD REPLACEMENT

PULLEY ASSEMBLY-LEFT HAND (DISASSEMBLY AND ASSEMBLY)

Tools Required

1. Screwdriver - flat blade type

Disassembly (Figure 8-5)

1. Loosen the screws that hold the pulley and the sleeve to the shaft.

2. Remove the shaft, thrust bearing, sleeve, pulley, belt and thrust bearing.

Assembly (Figure 8-5)

1. Insert the shaft through the left side of the pulley support casting, thrust bearing, sleeve, pulley, thrust bearing, belt and right side of the pulley support casting.

2. Adjust the pulley assembly and belt per the Tests And Adjustments section of this manual.

PULLEY ASSEMBLY-RIGHT HAND (DISASSEMBLY AND ASSEMBLY)

Tools Required

1. 2 mm hex key (Allen) wrench.

2. Screwdriver - flat blade type

Disassembly (Figure 8-6)

1. Loosen the screws that hold the two pulleys to the shaft.

2. Remove the shaft, thrust bearing, 30 tooth pulley, 44 tooth pulley, belts and the two thrust bearings.

Assembly (Figure 8-6)

1. Insert the shaft through the left side of the pulley support casting, thrust bearing, 30 tooth pulley, 44 tooth pulley, two thrust bearings, belts and right side of the pulley support casting.

2. Adjust the pulley assembly and belts per the Tests And Adjustments section of this manual.

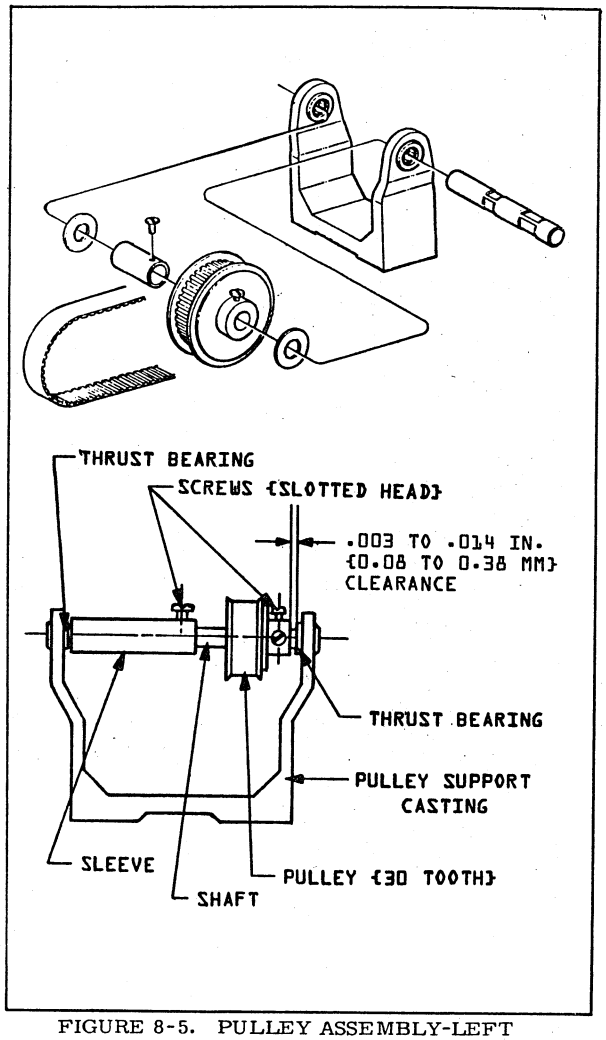


FIGURE 8-5. PULLEY ASSEMBLY-LEFT HAND (DISASSEMBLY AND ASSEMBLY)

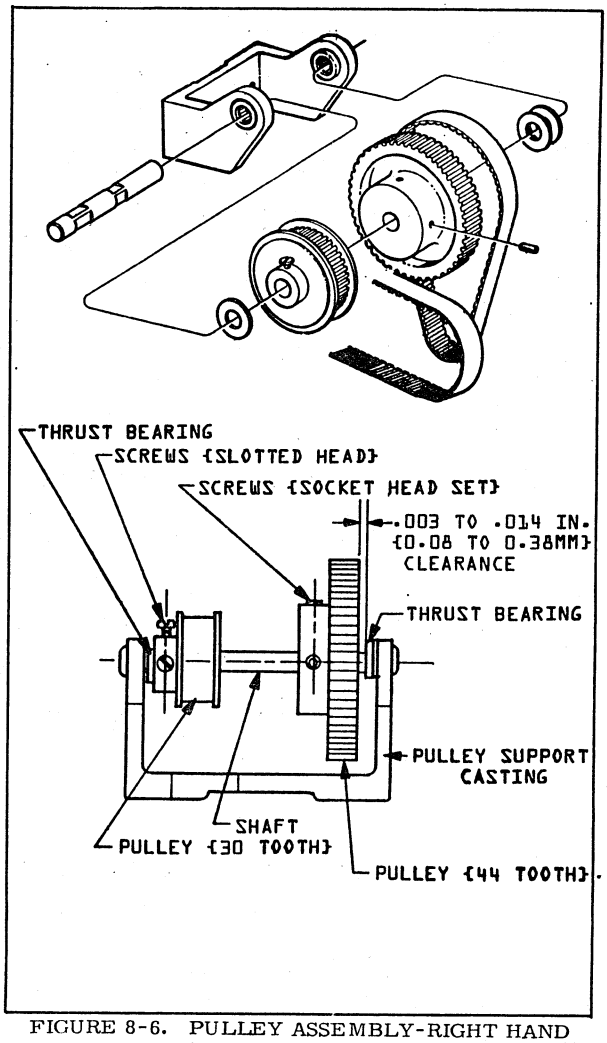


FIGURE 8-6. PULLEY ASSEMBLY-RIGHT HAND (DISASSEMBLY AND ASSEMBLY)

HORIZONTAL SERVO MOTOR REPLACEMENT

Tools Required

1. 7 mm open end or box wrench.
2. Screwdriver - flat blade type..
3. 2 mm hex key (Allen) wrench.

Removal (Figure 8-7)

1. Loosen the three screws that mount the horizontal servo motor mounting bracket to the right hand side of the print head structure. Slide the bracket and motor upward to relieve tension of the motor drive belt.
2. Remove the motor drive belt from the motor pulley.
3. Remove the screw that mounts the green ground wire to the rear of the motor.
4. Unplug the red and black wires from the motor terminals.
5. Remove the motor pulley from the motor shaft.
6. Remove the three screws that mount the motor to the motor mounting bracket and remove the motor.

Installation (Figure 8-7)

1. Mount the motor to the motor mounting bracket using the three mounting screws.
2. Mount the motor pulley on the motor shaft.
3. Mount the motor drive belt.
4. Connect the green ground wire to the rear of the motor with its mounting screw.
5. Adjust the tension on the print head motor drive belt and align the motor per the Test And Adjustment section of this manual.

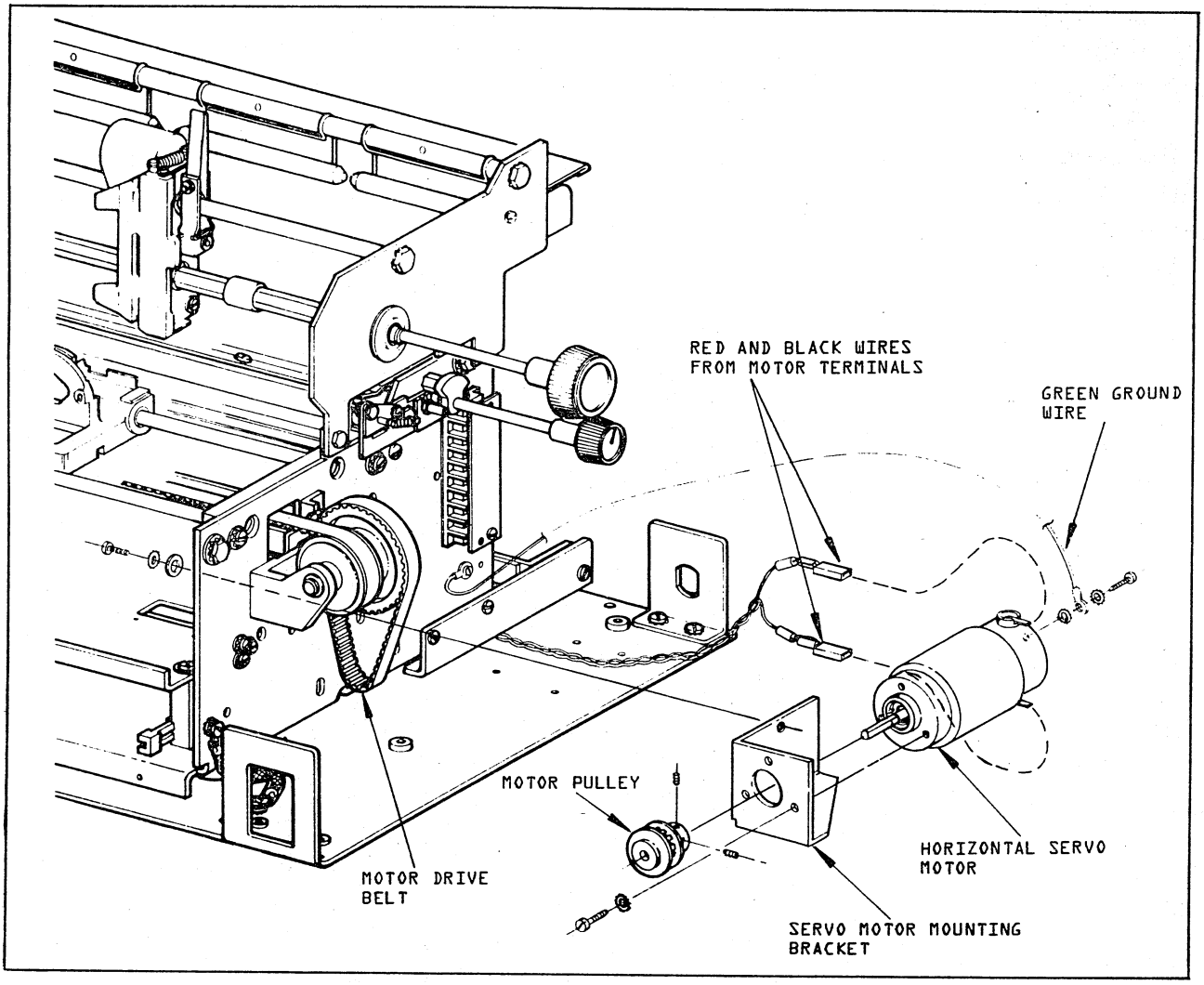


FIGURE 8-7. HORIZONTAL SERVO MOTOR REPLACEMENT

6. Plug the red and black motor harness wires onto the motor terminals (connect either wire to either terminal at this time).

7. Move the print head/heads to the center of the printer. Enter the printer into test print while watching the print head/heads. If the head/heads move to home left and start printing, the red and black motor wires are connected correctly. If the head moves to the right and stops, power the printer off and reverse the red and black wire connections on the motor.

VERTICAL SERVO MOTOR REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

2. 1.5 mm hex key (Allen) wrench.

3. Measuring ruler (15 cm metric or six inch 10-50 parts to the inch).

4. 7 mm open end or box wrench.

Removal (Figure 8-8)

1. Remove the code disk from the rear of the motor.

2. Remove the oiler pad assembly.

3. Remove the screw that mounts the green ground wire to the rear of the motor.

4. While holding the motor with one hand remove the three screws that mount the motor mounting bracket to the left side of the paper motion assembly.

5. Unplug the red and black wires from the motor terminals and remove the motor from the printer.

6. Remove the worm gear from the motor shaft.

7. Remove the three screws that mount the motor to the motor mounting bracket and remove the motor.

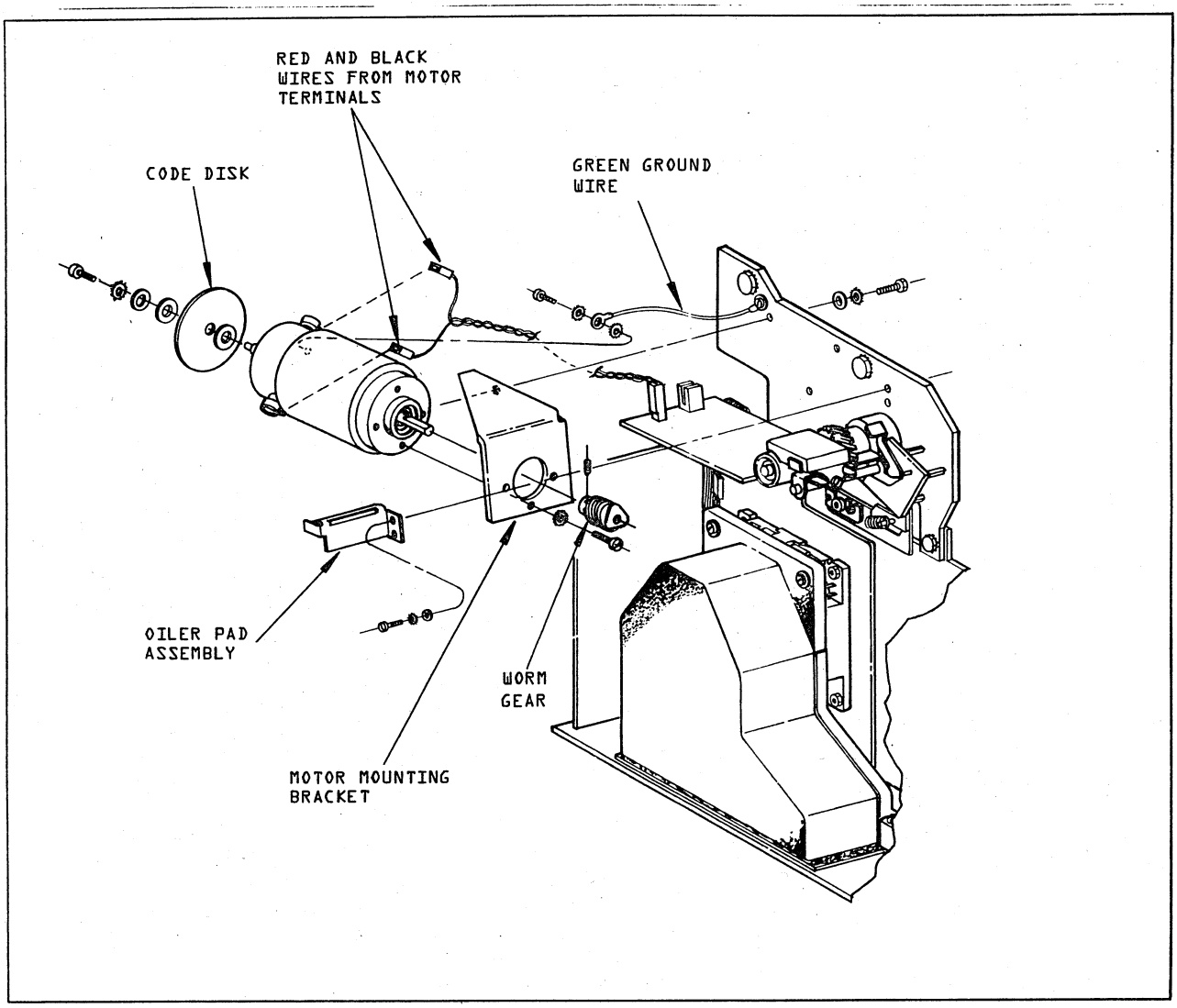


FIGURE 8-8. VERTICAL SERVO MOTOR REPLACEMENT

Installation (Figure 8-8)

1. Mount the motor to the motor mounting bracket using the three mounting screws.

2. Mount the worm gear to the motor shaft. See Figure 7-5 for gear mounting dimension.

3. While holding the motor in your hand plug the red and black motor harness wires on to the motor terminals (connect either wire to either terminal at this time).

4. Power the printer on and press the form feed or single space switch while looking at the worm gear end of the motor. The worm gear should be rotating counter clockwise, if the gear is rotating clockwise, power the printer off and reverse the red and black wire connection on the motor.

5. Mount the motor mounting bracket to the left side of the paper motion assembly with the three mounting screws.

6. Mount the green ground wire to the rear of the motor with its mounting screw.

7. Per the Tests And Adjustment section of this manual adjust for minimum back lash between the worm gear on the motor and the gear on the clutch assembly.

8. Mount the code disk to the rear of the motor. The vertical transducer board may need adjusting in order to mount the code disk.

9. Mount the oiler pad assembly. Make sure the felt pad is in contact with the worm gear.

10. Per the Tests And Adjustments section of this manual adjust the optical reader to the code disk.

11. If your printer has an Electronic Vertical Format Unit, syncronize the format reader and code disk per the Tests And Adjustments section of this manual.

TRACTOR ASSEMBLY REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.
2. 10 mm open end or box wrench.
3. 1.5 mm hex key (Allen) wrench.

Removal (Figure 8-9)

1. Release both tractor clamp levers and slide both tractors to the center of the printer.
2. Remove the three screws that mount the bearing housing to the right hand format plate.
3. Slide the lower tractor shaft and bearing housing to the right until the clutch hub clears the clutch gear and is approximatly 6 inches from the left hand format plate assembly.
4. Remove the bearing housing spacers.
5. Loosen the set screw and remove the clutch hub.
6. Slide the tractor spacer to the left and off the end of the lower tractor shaft.
7. Remove the two screws that mount the upper tractor shaft.
8. Lift the left end of the upper tractor shaft until it clears the left hand format plate assembly. Slide the shaft to the left and out of the two tractor assemblies.
9. The tractor assemblies may now be removed by sliding them to the left and off of the lower tractor shaft.

Installation (Figure 8-9)

1. Slide the tractor assemblies onto the lower tractor shaft.

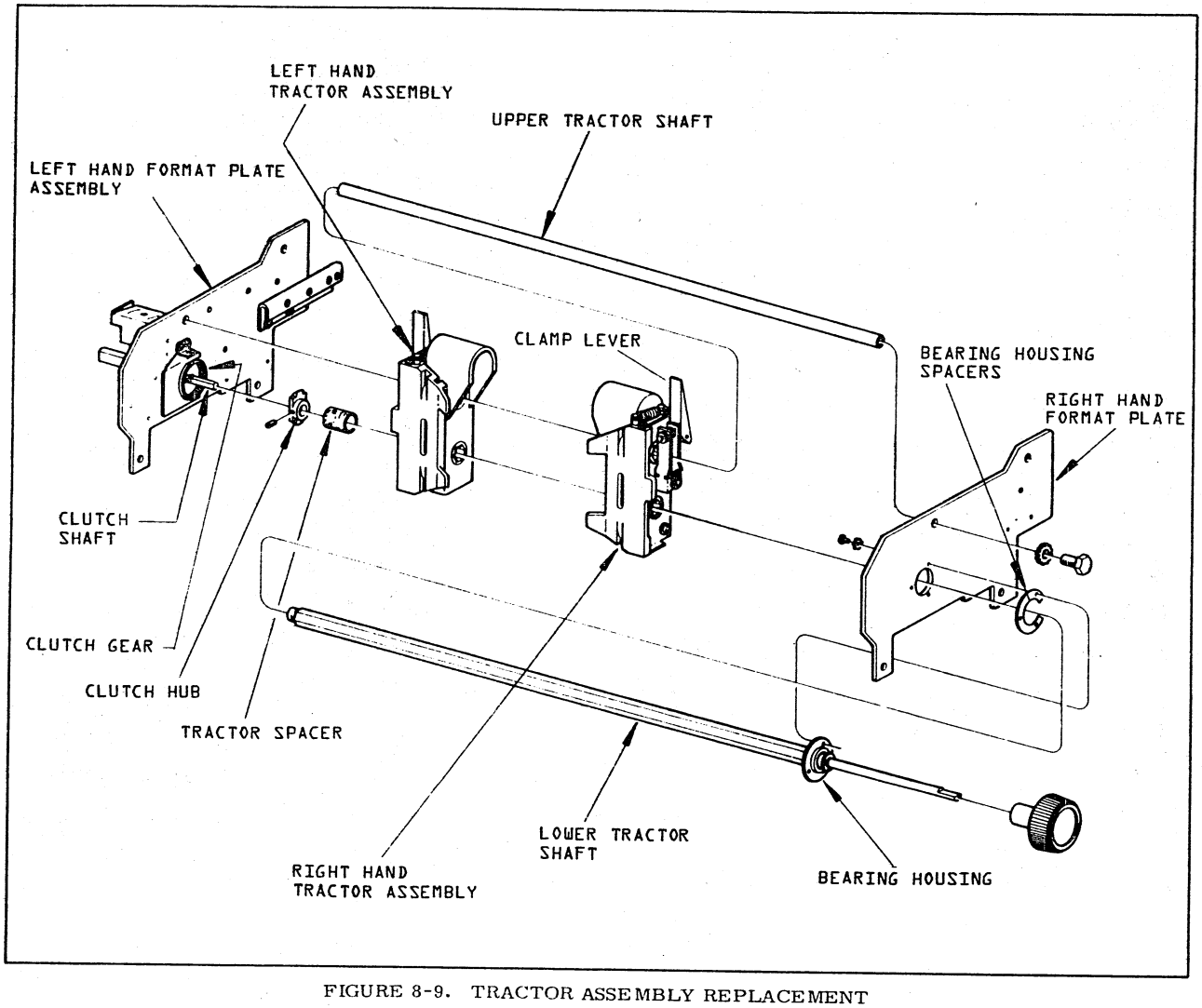


FIGURE 8-9. TRACTOR ASSEMBLY REPLACEMENT

2. Lift the left end of the lower tractor shaft and the two tractor assemblies until there is clearance above the left hand format plate to install the upper tractor shaft into the upper holes in the tractors.

3. Slide the upper tractor shaft through the upper holes and clamps on the tractors.

4. Mount the upper tractor shaft between the right and left format plates with its two mounting screws.

5. Slide the tractor spacer over the end of the lower tractor shaft until it is flush with the end of the hex portion on the shaft.

6. Mount the clutch hub on the end of the lower tractor shaft with its set screw.

7. Install the bearing housing spacers between the bearing housing and the right hand format plate.

8. Slide the lower tractor shaft to the left. Slide the hole in the end of the tractor shaft over the clutch shaft until the clutch hub and clutch gear are engaged.

9. Mount the bearing housing and bearing housing spacers to the right hand format plate with the three mounting screws.

TRACTOR FLAP REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

2. Pliers - long nose or needle nose

Removal (Figure 8-10)

1. Remove the tractor flap spring.

2. Remove the upper retaining ring from the tractor flap hinge pin.

3. Slide the hinge pin down slightly and remove the lower retaining ring from the hinge pin.

4. Slide the hinge pin upwards and remove it from the tractor flap and body bracket assembly.

5. Remove the tractor flap.

Installation (Figure 8-10)

1. Reverse the removal procedures and install the new tractor flap.

2. Adjust the tractor flap per the Tests And Adjustments section of this manual.

TRACTOR TIMING BELT REPLACEMENT

Tools Required

1. Screwdriver - flat blade type

Removal (Figure 8-10)

1. Remove the tractor assembly per Tractors Assembly Replacement instructions found in this section of the manual.

2. Remove the four screws that mount the body bracket assembly to the tractor body and remove the body bracket assembly.

3. Remove the drive pulleys and tractor timing belt.

Installation (Figure 8-10)

1. Mount the drive pulleys and tractor timing belt to the tractor body.

2. Mount the body bracket assembly to the tractor with the four mounting screws.

3. Install the tractor assembly per Tractor Assembly Replacement instructions found in this section of the manual.

4. Adjust the tractor flap per the Tests And Adjustments section of this manual.

CLUTCH ASSEMBLY REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

Removal (Figure 8-11)

1. Release both tractor clamp levers and slide both tractors to the center of the printer.

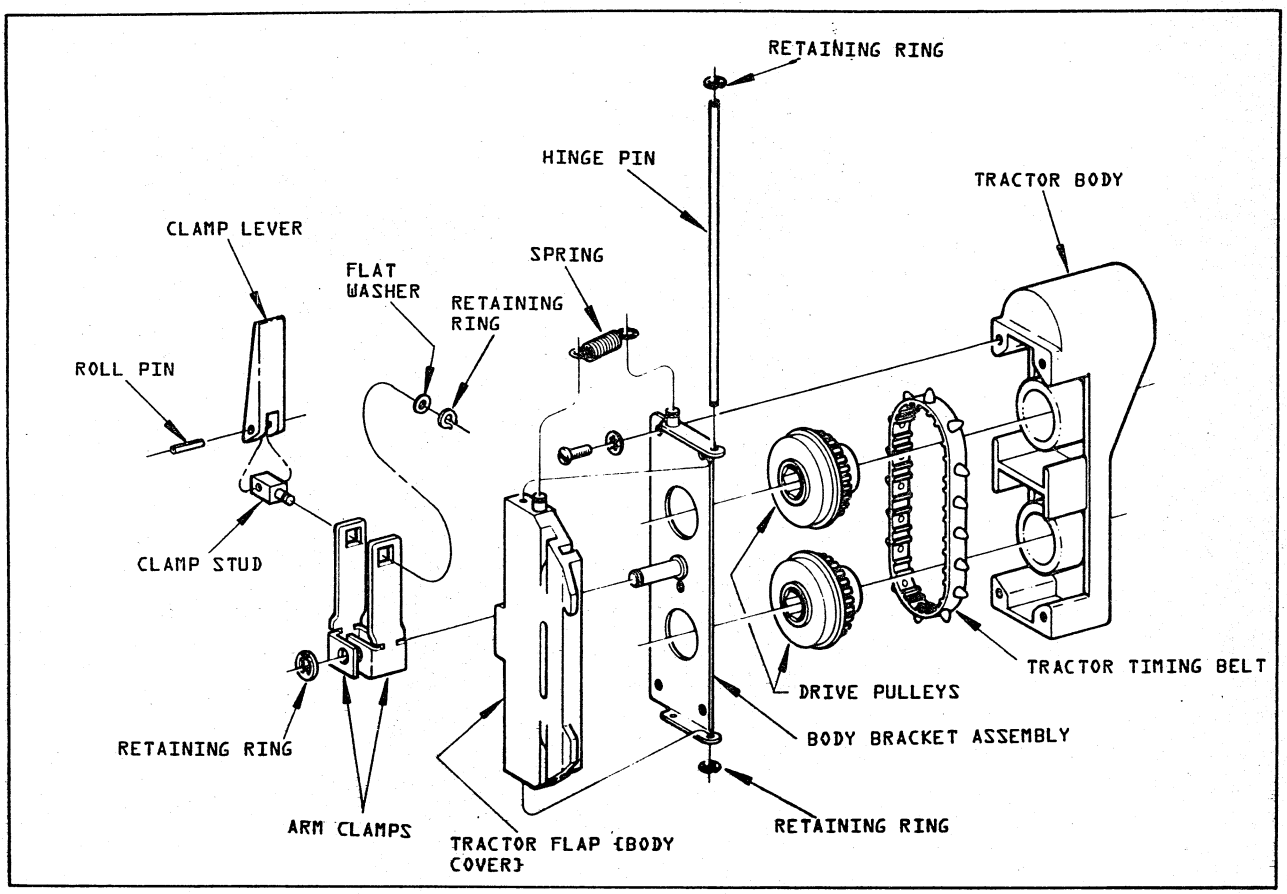


FIGURE 8-10. TRACTOR FLAP AND TIMING BELT REPLACEMENT

2. Remove the three screws that mount the bearing housing to the right hand format plate (Figure 8-9).

3. Slide the lower tractor shaft and bearing housing to the right until the clutch hub clears the clutch gear and is approximatly 6 inches from the left hand format plate assembly (Figure 8-9).

4. Remove the bearing housing spacers (Figure 8-9).

5. Remove the oiler pad assembly.

6. Remove the four screws that mount the two clutch lever brackets.

7. Remove the two clutch lever brackets, clutch lever, two plastic spacers and roller spacer.

8. Remove the clutch gear and clutch lever spring.

9. Remove the three screws that mount the clutch assembly to the left hand format plate.

10. Remove the clutch assembly. It may be necessary to loosen the vertical servo motor mounting bracket and slide the bracket and motor upward in order to remove the clutch assembly.

Installation (Figure 8-11)

1. Reversing the removal procedures, install the new clutch assembly. Use Figure 8-11 to aid with the installation.

2. Adjust the vertical motor worm gear and optical reader per the Tests And Adjustments section of this manual.

3. If your printer has an Electronic Vertical Format Unit, syncronize the format reader and code disk per the Tests And Adjustments section of this manual.

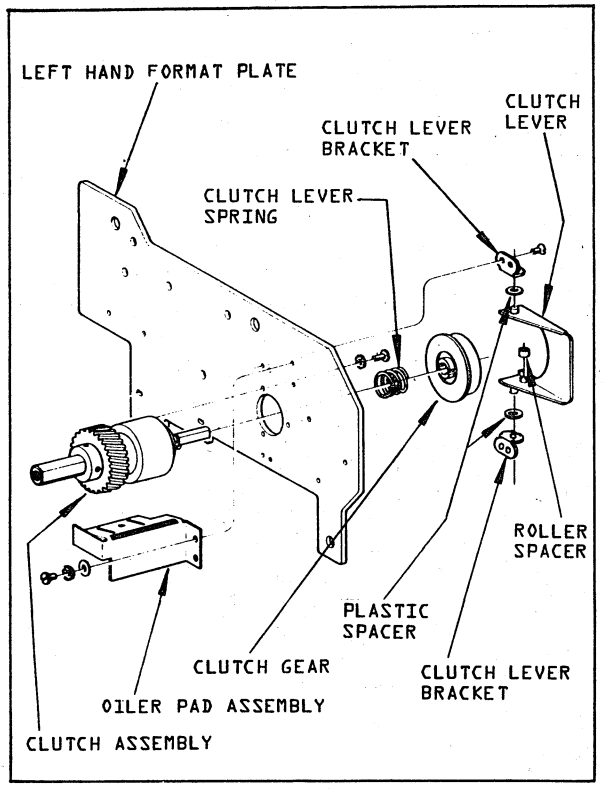


FIGURE 8-11. CLUTCH ASSEMBLY REPLACEMENT

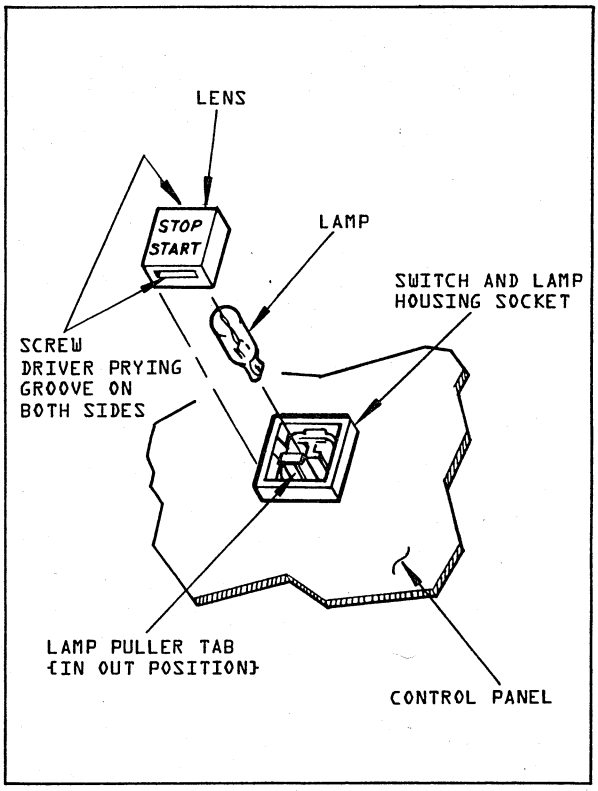


FIGURE 8-12. CONTROL PANEL LENS AND LAMP REPLACEMENT

CONTROL PANEL LENS AND LAMP REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

Removal (Figure 8-12)

1. Remove power to the printer at the power source.
2. Remove the lens by placing a screwdriver in the screwdriver prying groove on the top or bottom edge of the lens and pry up.
3. Place a screwdriver under the tab on the lamp puller and pull it out until the lamp is disengaged from it's socket.
4. Remove the lamp.

Installation (Figure 8-12)

1. Push down on the lamp puller tab until it is seated.
2. Place a new lamp in the switch and lamp housing socket so that the lamp contacts are in line with the right and left socket contacts.
3. Using your little finger push down on the top of the lamp until it is seated in the lamp housing socket.
4. Place the lens on top of the switch and lamp housing socket and push down on the lens until it snaps in place.

REAR FAN REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.
2. 7 mm open end or box wrench.

Removal (Figure 8-13)

1. Remove the two screws that mount the rear fan duct to the rear fan. Remove the fan duct.
2. Remove the four screws that mount the rear fan to the left side panel. Remove the fan.
3. Unplug the two wires from the fan.

Installation (Figure 8-13)

1. Reversing the removel procedures, install the new fan.

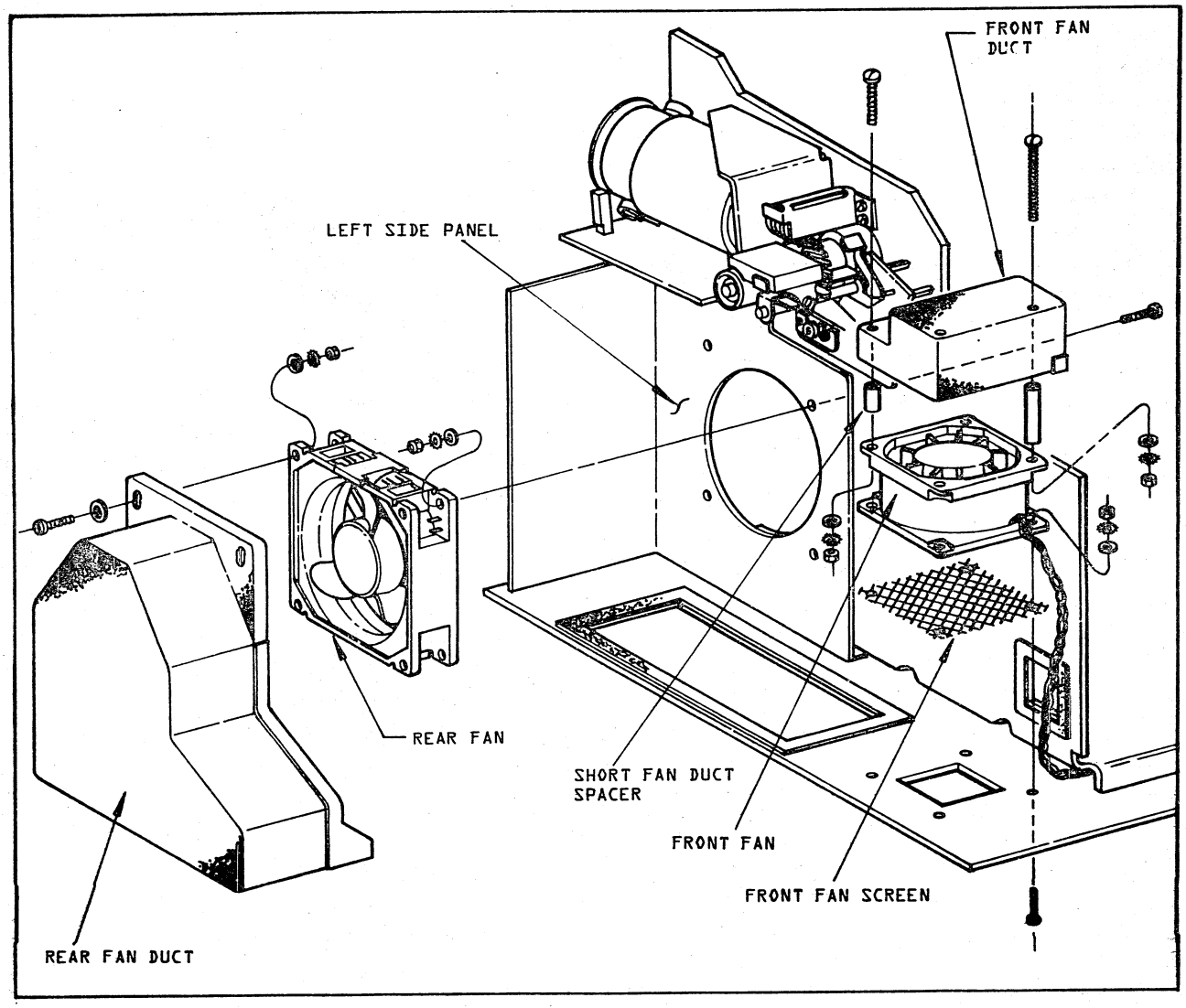


FIGURE 8-13. FRONT AND REAR FAN REPLACEMENT

FRONT FAN REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.
2. 7 mm open end or box wrench.

Removel (Figure 8-13)

1. Remove the four screws, two short spacers and two long spacers that mount the front fan duct to the front fan. Remove the front fan duct.
2. Remove the four screws that mount the front fan and screen to the base plate. Remove the fan and screen.
3. Trace and remove the white and black wires that run from the fan to terminal block 2TB01, which is located on the right side of the print head structure.
4. Remove the terminal block cover and disconnect the white fan wire from 2TB01-2 and the black fan wire from 2TB01-4.

Installation (Figure 8-13)

1. Reversing the removal procedures, install the new fan and harness assembly.

PLATEN ADVANCE SHAFT ASSEMBLY REPLACEMENT

Tools Required

1. 2 mm hex key (Allen) wrench.
2. Screwdriver - flat blade type.

Removal (Figure 8-14)

1. Remove the three mounting screws that mount the upper paper slide to the platen assembly and

remove the paper slide. The out of paper switch arm on the lower paper slide should be held in the down position to prevent damage to the arm when removing the upper paper slide.

2. Loosen the allen set screw in the left hand platen adjustment eccentric and remove the eccentric.

3. Remove the platen advance shaft retaining ring from the platen advance shaft.

4. Withdraw and remove the platen advance shaft assembly from the right side of the printer. Remove the flat washer from the shaft as it is removed.

Installation (Figure 8-14)

1. Reversing the removal procedures, install the platen advance shaft assembly.

PLATEN ASSEMBLY REPLACEMENT

Tools Required

1. Screwdriver - flat blade type.

2. 7 mm open end wrench.

Removal (Figure 8-14)

1. Remove the three mounting screws that mount the upper paper slide to the platen assembly and remove the paper slide. The out of paper switch arm on the lower paper slide should be held in the down position to prevent damage to the arm when removing the upper paper slide.

2. Remove the left and right platen springs.

3. Remove the rear mounting screw on both the left hand and right hand platen advance supports.

4. Remove the screw that mounts the platen ground wire to the platen assembly.

5. Remove the front mounting screw, two nuts and two lock washers that mount both the left hand and right hand platen advance supports to the platen assembly.

Remove both platen advance supports.

6. Remove the platen assembly from the printer.

Installation (Figure 8-14)

1. Reversing the removal procedures, install the platen assembly.

2. Adjust the platen and print head per the Tests And Adjustments section of this manual.

HEAD SUPPORT SHAFTS AND PRINT HEAD SUPPORT CASTING REPLACEMENT

Tools Required

1. Screwdriver - flat blade type

Removal (Figure 8-15)

1. Remove the ribbon cassettes.

2. Remove the code strip.

3. Remove the cassette drive cords.

4. Remove the belt retainer clamps.

5. Remove the head support casting connecting rod and eccentrics (on 125 L. P. M. units only).

6. Unplug the head connectors at the print head connector mounting plate.

7. Remove the two screws that mount the print head flat cable connectors to the print head connector mounting plates.

8. Remove the cable clamps that secure the print head flat cable to the bottom of the print head connector mounting plate.

9. Remove the two screws that mount the horizontal transducer board to the bottom of the print head.

10. Remove the screw that mounts the front print head support shaft to the left side of the print head structure.

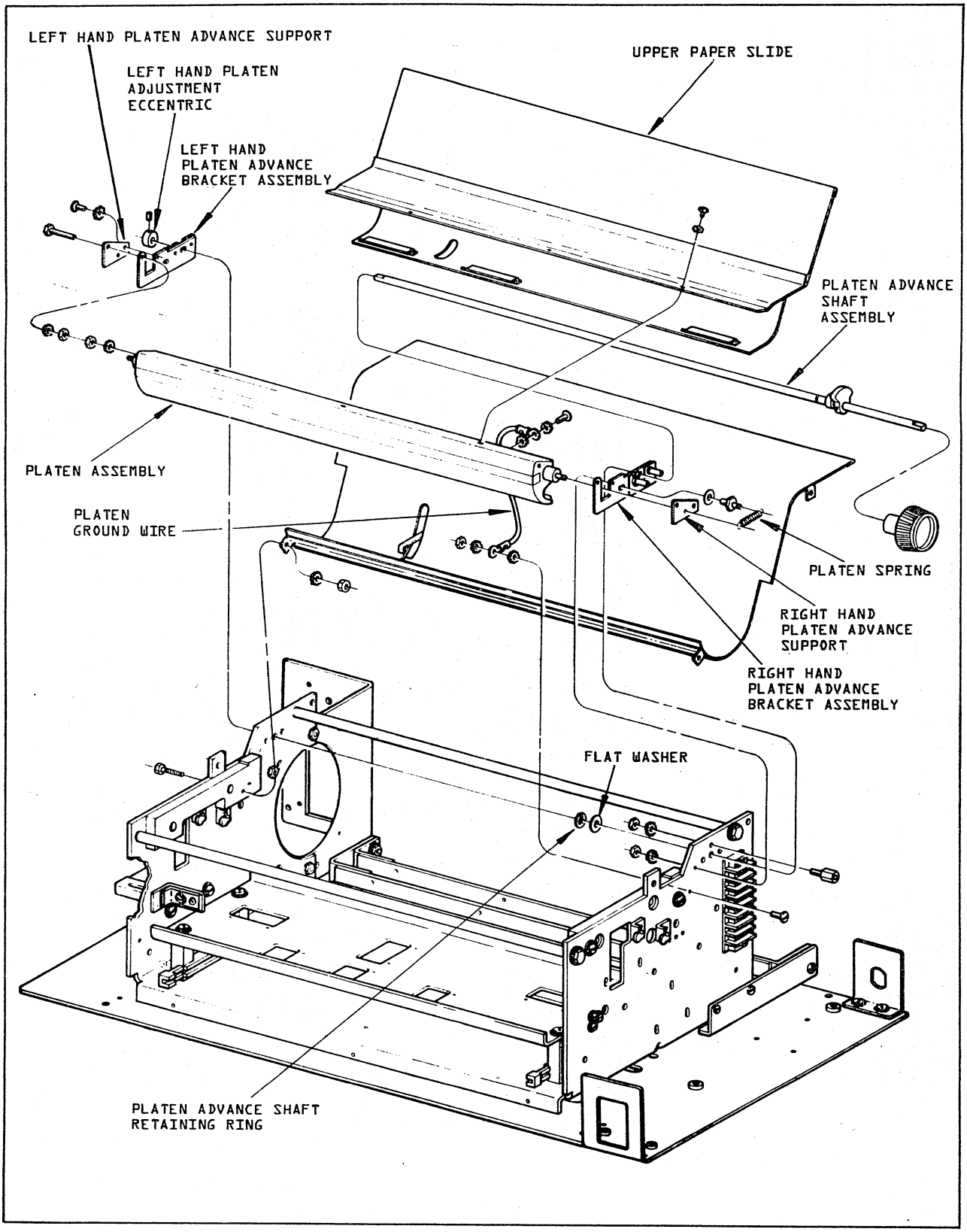


FIGURE 8-14. PLATEN ADVANCE SHAFT ASSEMBLY REPLACEMENT AND PLATEN ASSEMBLY REPLACEMENT

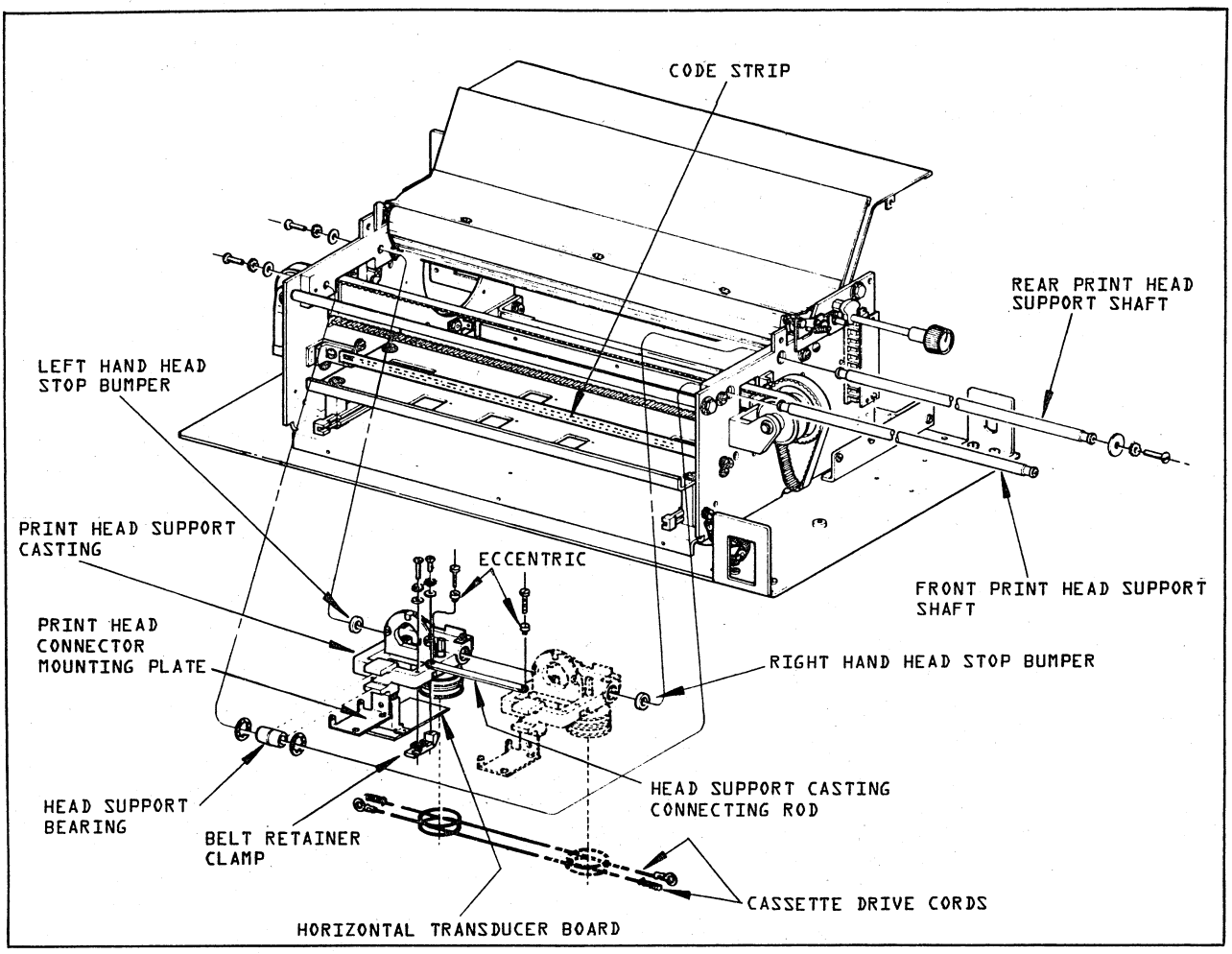


FIGURE 8-15: HEAD SUPPORT SHAFTS AND PRINT HEAD SUPPORT CASTING REPLACEMENT

11. Slide the front print head support shaft to the right through the head support bearings and out the right side of the print head structure. Remove the head support bearings as the shaft is withdrawn from them.

12. Remove the screw in either end of the rear print head support shaft that mount it to the right and left sides of the print head structure.

13. Slide the rear print head support shaft to the right through the left hand head stop bumper, through the print head support castings, through the right hand head stop bumper and out the right side of the print head structure. Remove the print head support castings and bumpers as the shaft is withdrawn from them.

Installation (Figure 8-15)

1. Reversing the removel procedures, install the print head support castings and support shafts.

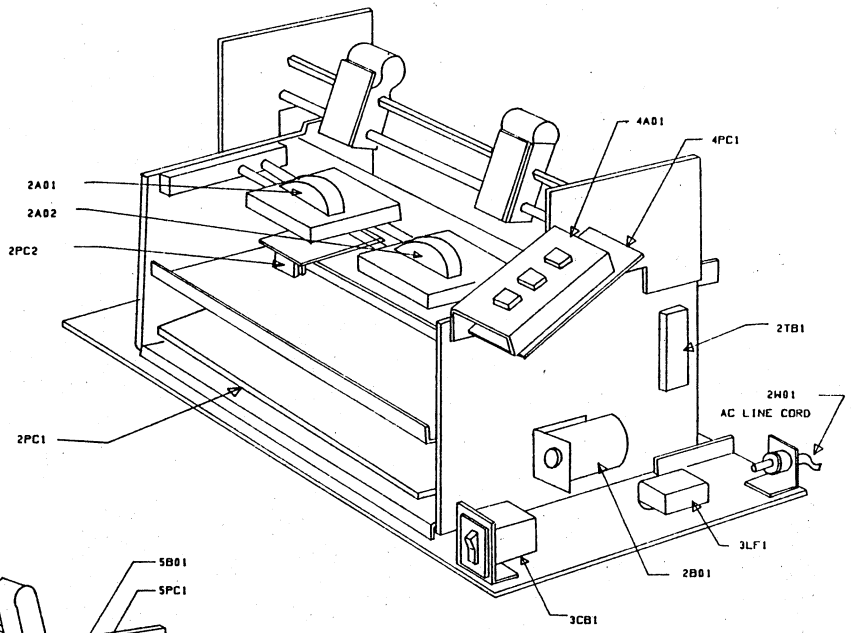
2. Adjust the code strip, print heads and platen as necessary per the tests and adjustments section of this manual.

DIAGRAMS

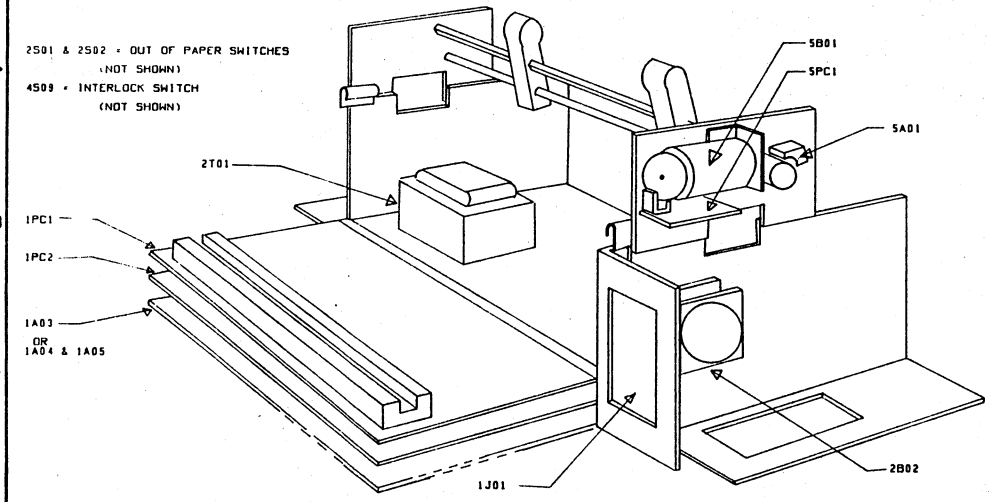
SHEET NO.	REV	CROSS REF. NO.	MODULE LOCATION	TITLE
1	F			CONTENTS SHEET
2	A			KEY TO DIAGRAMS-PARTS LOCATOR
3	A			KEY TO DIAGRAMS-PCB COMPONENT LOCATIONS
4	A			KEY TO DIAGRAMS-PCB COMPONENT LOCATIONS
5	A			SPECIAL NOMENCLATURE
6	C			GENERAL NOTES & ELECTRICAL ADJUSTMENTS
7	A	WD01		WIRING DIAGRAM-CONNECTOR LOCATIONS
8	G	WD02		WIRING DIAGRAM-AC POWER
9	A	WD03		WIRING DIAGRAM-PRINT HEADS,CONTROL PANEL
10	B	WD04		WIRING DIAGRAM-NEEDLE DRIVER,HORIZ XDCR
11	A	BD01		BLOCK DIAGRAM-LOGIC
12	A	BD02		BLOCK DIAGRAM-SERVOS FUNCTIONAL
13	A	BD03		BLOCK DIAGRAM-SERVO MOTORS CONTROL LOOP
14	A	TD01		TIMING DIAGRAM-SERVO WAVEFORMS
15	A	0101	1PC1	POWER SUPPLY PCB -+36V -36V
16	A	0102	1PC1	POWER SUPPLY PCB- +5V +12V
17	F	0103	1PC1	POWER SUPPLY PCB- -12V -5V SERVO DRIVERS
18	B	0200	1PC2	PRINT HEAD & CONTROLLER JUMPERS
19	E	0201	1PC2	CONTROLLER & HEAD LOGIC PCB-NEEDLE DRIVER STROBES
20	B	0202	1PC2	CONTROLLER & HEAD LOGIC PCB-HEAD MOTION CONTROL
21	A	0203	1PC2	CONTROLLER & HEAD LOGIC PCB-HEAD MOTION CONTROL
22	B	0204	1PC2	CONTROLLER & HEAD LOGIC PCB-HEAD MOTION LINEAR AMPS
23	A	0205	1PC2	CONTROLLER & HEAD LOGIC PCB-PAPER MOTION
24	A	0206	1PC2	CONTROLLER & HEAD LOGIC PCB-PAPER MOTION
25	A	0207	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
26	A	0208	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
27	A	0209	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
28	A	0210	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
29	A	0211	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
30	A	0212	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
31	A	0213	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
32	G	0214	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
33	A	0215	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
34	A	0216	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
35	B	0217	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
36	A	0218	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
37	G	0219	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
38	E	0220	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
39	A	0221	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
40	A	0222	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
41	C	0223	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
42	A	0224	1PC2	CONTROLLER & HEAD LOGIC PCB-MICRO PROCESSOR
43	A	0401	4PC1	CONTROL PANEL PCB
44	F	0501	2PC1	NEEDLE DRIVER PCB
45	A	0502	2PC1	NEEDLE DRIVER PCB
46	A	0601	2PC2	HORIZONTAL TRANSDUCER PCB
47	A	0701	5PC1	VERTICAL TRANSDUCER & OPTION SELECT PCB
48				
49				
50				

PARTS ABBREVIATION CODE
AO = ASSEMBLY
BO = MOTOR OR FAN
CB = CIRCUIT BREAKER
JO = CONNECTOR
LF = LINE FILTER
PC = PRINTED CIRCUIT BOARD
SO = SWITCH
TB = TERMINAL BLOCK
WO = WIRE OR CABLE

AREA 1 = CARD RACK (3 CARDS)
AREA 2 = MAIN STRUCTURE
AREA 3 = BASE PLATE
AREA 4 = CONTROL PANEL
AREA 5 = PAPER MOTION STRUCTURE

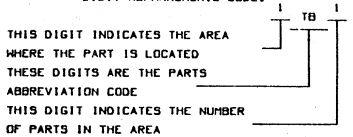


2S01 & 2S02 = OUT OF PAPER SWITCHES (NOT SHOWN)
4S09 = INTERLOCK SWITCH (NOT SHOWN)



PARTS IDENTIFIER CODE

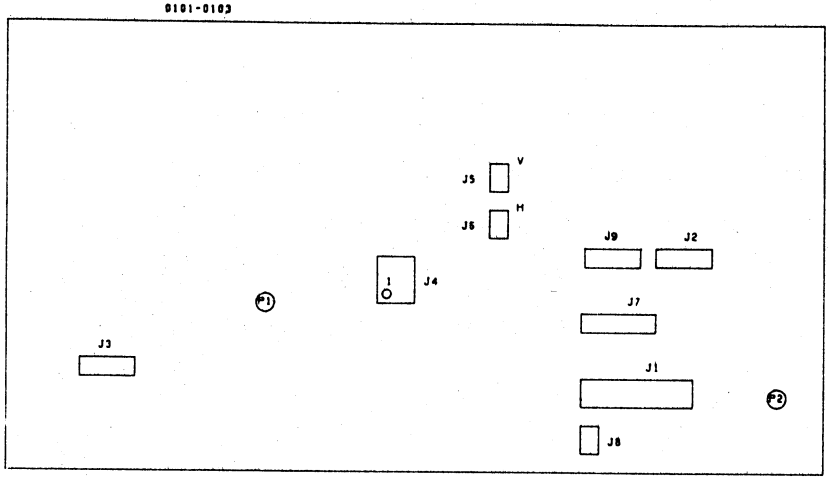
PARTS ARE IDENTIFIED BY A FOUR DIGIT ALPHANUMERIC CODE.



MACHINE AREA AND PARTS LOCATOR	DATA BASE A	C	DWG NO	REV A
	PM70/125	SHEET 2		

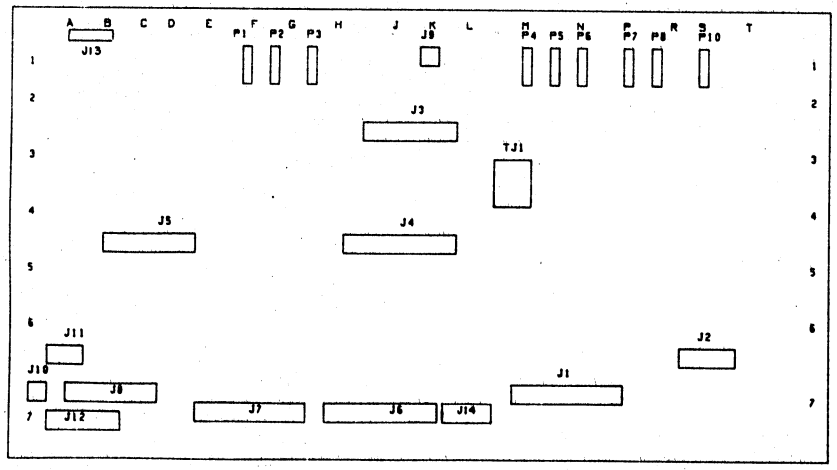
POWER SUPPLY
0101-0103

IPC1



CONTROLLER &
PRINT HEAD ELECTRONICS
0200-0224

IPC2



PHYSICAL LOCATION CODES

THE DRAWINGS TO THE LEFT DEPICT A TYPICAL STANDARD PC BOARD USED IN THIS EQUIPMENT. SEE INDIVIDUAL ASSEMBLY DRAWINGS FOR COMPLETE COMPONENT LOCATION INFORMATION.

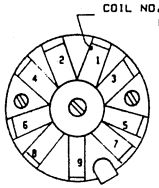
THE 2 DIGIT LOCATION CODE SHOWN INSIDE THE COMPONENT OUTLINES IS USED INSIDE THE SYMBOL OUTLINE ON THE LOGIC SHEETS. THE PACKAGE LOCATION CODE, WHERE APPLICABLE, FOLLOWS A COORDINATE NUMBERING SYSTEM.

CONNECTORS — ALL WIRING CONNECTIONS TO THE BOARDS ARE DESIGNATED "J" IF CONNECTION IS MADE BY A PLUG & SOCKET CONNECTION OR WIRED DIRECTLY TO THE BOARD.

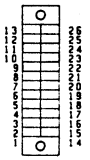
TEST POINTS — ALL TEST POINTS ARE LOCATED ALONG THE EDGE OF THE PC BOARDS. TEST POINTS ARE SHOWN ON THE LOGIC SHEET AS AN OPEN CIRCLE CONNECTED TO SIGNAL LINE.

KEY TO DIAGRAMS- PCB COMPONENT LOCATIONS	DATA BASE A	C	DWG NO	REV A
	PM 70/125		SHEET 3	

PRINT HEAD
2A01 & 2A02
(VIEWED FROM FRONT
OF PRINTER)

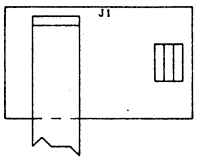


PRINT HEAD
CONNECTOR
WIRING SIDE



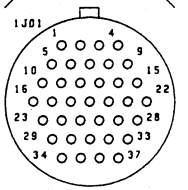
HORIZONTAL
TRANSDUCER BOARD
0601

2PC2



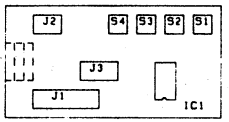
CHASSIS MAP &
COMPONENT LOCATIONS

POWER SUPPLY 0101 THRU 0103	1PC1
CONTROLLER & HEAD LOGIC PCB 0200 THRU 0224	1PC2
INTERFACE OPTION 0300	1A03



VERTICAL
TRANSDUCER BOARD
0701

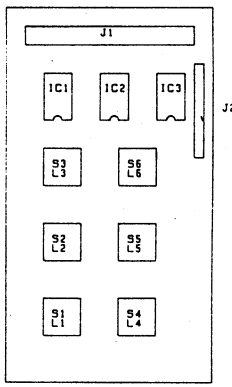
5PC1



J3, S1, S2, S3, S4
OPTIONAL

CONTROL PANEL
BOARD
0401

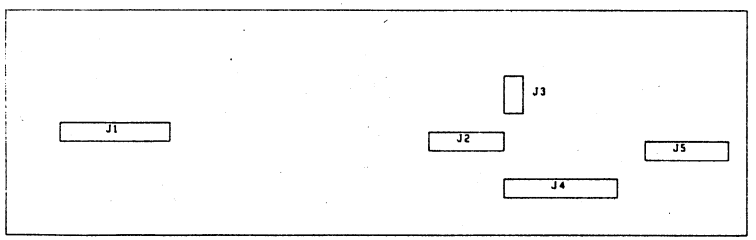
4PC1



I/O CONNECTOR AS
VIEWED FROM REAR OF PRINTER

NEEDLE DRIVER BOARD
0501 THRU 0502

2PC1



KEY TO DIAGRAMS- PCB COMPONENT LOCATIONS	DATA BASE A	C	DWG NO	REV A
	PM 70/125		SHEET 4	

SPECIAL NOMENCLATURE

ABBREVIATION	DEFINITION
CHAR ST 1 *	CHARACTER START 1
CHAR ST 2 *	CHARACTER START 2
CHAR ST 3 *	CHARACTER START 3
CHAR ST 4 *	CHARACTER START 4
CMPRS PITCH *	COMPRESSED PITCH SELECT
HD RDY *	HEAD READY
H BD *	HORIZONTAL BASE DRIVE (HEAD MOTION SERVO)
H IFB *	HORIZONTAL CURRENT FEEDBACK
H VFB *	HORIZONTAL VOLTAGE FEEDBACK
INTLK *	INTERLOCK SWITCH
I SENSE *	CURRENT SENSE
MOV R→L *	MOVE HEAD FROM RIGHT TO LEFT
MOVE L→R *	MOVE HEAD FROM LEFT TO RIGHT
MTR *	VERTICAL MOTOR (PAPER MOTION SERVO)
NDL ENAB *	NEEDLE ENABLE
P.G. *	POWER SUPPLY GROUND
SEL *	SELECT
SHUT DN *	36V SUPPLY SHUT DOWN
V REF *	VOLTAGE REFERENCE
V BD *	VERTICAL BASE DRIVE (PAPER MOTION SERVO)
V VFB *	VERTICAL VOLTAGE FEEDBACK
V IFB *	VERTICAL CURRENT FEEDBACK
6 LPI STP *	6 LINES PER INCH STOP THE PAPER
6 LPI SEL *	6 LINES PER INCH SELECT
10 CPI SEL *	10 CHARACTERS PER INCH SELECT
+16V REC AC *	+16V RECTIFIED AC REFERENCE

SPECIAL NOMENCLATURE	DATA BASE A C	DWG NO	REV A
	PM 70/125	SHEET 5	

GENERAL NOTES

1. DUE TO THE LARGE NUMBER OF CIRCUITS ON EACH BOARD , MORE THAN ONE LOGIC SHEET IS USUALLY REQUIRED FOR EACH BOARD. THE BOARD NAME,MODULE LOCATION AND CROSS REFERENCE NUMBERS APPEAR ON EACH SHEET.EACH SYMBOL IN THE DIAGRAMS REFLECTS THE LOGIC FUNCTION PERFORMED,COMPONENT TYPE OR ELEMENT IDENTIFIER AND LOCATION OF ALL OR PART OF AN IC PACKAGE OR DISCRETE COMPONENT(S).FOR DETAILED INFORMATION ON SYMBOLS AND PACKAGE TYPE REFER TO CIRCUIT DESCRIPTIONS IN THE KEY TO THE LOGIC SYMBOLS-CPI DWG NO.95387500-MANUAL NO.95390100.

2. OFFSHEET REFERENCES TO 1A03 INDICATE CONNECTIONS TO THE OPTIONAL INTERFACE ASSEMBLY.SEE INTERFACE LOGIC SET(S).

3. LOGIC LEVELS
   HIGH OUTPUT VOLTAGE=5.5V MAX TO 2.4V MIN
   LOW OUTPUT VOLTAGE=0.4V MAX TO 0V MIN

   HIGH INPUT VOLTAGE=5.5V MAX TO 2V MIN
   LOW INPUT VOLTAGE=0.8V MAX TO 0V MIN

4. POWER SUPPLY CONNECTIONS
   ALL STANDARD IC PACKAGES HAVE THE FOLLOWING POWER SUPPLY CONNECTIONS WHICH ARE NOT SHOWN AS PART OF THE LOGIC SYMBOL.
   14 PIN DEVICE -GROUND ON PIN 7 AND +5V ON PIN 14
   16 PIN DEVICE -GROUND ON PIN 8 AND +5V ON PIN 16

   ALL NON STANDARD IC PACKAGES WILL HAVE THE NON STANDARD GROUND AND SUPPLY CONNECTIONS SHOWN AS PART OF THE LOGIC SYMBOL.

5. REPETITIVE DETAILS
   ALL LOGIC PRINTED CIRCUIT CARDS HAVE FILTER CAPACITORS GENERALLY LOCATED CLOSE TO THE INPUT CONNECTOR.FILTER CAPACITORS FROM 33UF TO 150UF ARE USED DEPENDING ON THE BOARD. HIGH FREQUENCY FILTER CAPACITORS (.01UF) ARE LOCATED BETWEEN USED IC LOCATIONS (1 CAP PER 3 IC'S).THESE CAPACITORS ARE NOT SHOWN ON LOGIC DRAWINGS.

ELECTRICAL ADJUSTMENTS

1. POWER SUPPLY BOARD (1PC1)

1.1 ADJUST POT P1 TO OBTAIN +36V ± 0.5V BETWEEN CONNECTOR J3- PINS 1 & 3

1.2 ADJUST POT P2 TO OBTAIN +5V ± 0.02V BETWEEN CONNECTOR J1- PINS 3 & 4

2. SERVO SYSTEMS (1PC2) -HORIZONTAL DRIVE (PRINT HEAD MOTION)

2.1 TRIGGER OSCILLOSCOPE FROM TP35 AND OBSERVE WAVEFORM FROM TP48. SET POT P6 TO OBTAIN A 30 ± 1 MILLISEC SLOPE AT LEADING EDGE OF WAVEFORM.

2.2 TRIGGER SCOPE AND OBSERVE PULSES OF CHARACTER START TRANSDUCER AT TP15.

2.3 SET P4 TO OBTAIN 5.5 ± 0.1 MILLISEC REP RATE ON THE CHARACTER START PULSES WHEN THE HEADS ARE MOVING LEFT TO RIGHT (VIEWED FROM FRONT OF MACHINE)

2.5 SET P7 TO OBTAIN EQUAL REP RATE TIME IN STEP 2.3 ABOVE FOR RIGHT TO LEFT MOTION.NOTE-- P4 AFFECTS HEAD SPEED IN BOTH DIRECTIONS OF TRAVEL.P7 AFFECTS ONLY ONE DIRECTION OF TRAVEL AND IS USED TO EQUALIZE VELOCITIES.

2.6 POT P5 IS USED IN THE SAME MANNER AS POT P4 FOR MACHINES WITH COMPRESSED PITCH OPTIONS.POT P7 DOES NOT NEED TO BE RE-ADJUSTED FOR THIS PURPOSE.

2.7 A DIGITAL COUNTER IS REQUIRED TO ADJUST THE NEEDLE FIRING RATE. CONNECT COUNTER TO TP28 TO MONITOR THE -MT3 SIGNAL. COUNTER MODE MUST BE SELECTED WHICH ALLOWS MEASUREMENT OF THE REP RATE OFTHE -MT3 SIGNAL. (NEG EDGE TO NEG EDGE). WHILE OPERATING IN TEST PR. ADJUST POT P1 UNTIL REP RATE IS 620TO625 USEC. COUNTER RESOLUTION MUST BE ±1 USEC.

2.8 ON TP28 ALSO ADJUST POT P3 UNTIL THE -MT3 PULSE WIDTH (NEGATIVE GOING EDGE TO POSITIVE GOING EDGE) IS SET TO FROM 540 TO 550 USEC.

2.9 TRIGGER SCOPE AND OBSERVE PULSES ON TP15 WHILE IN TEST PRINT OR PRINTING ALL ONE CHARACTER ON LINE. ADJUST POT P2 UNTIL RIGHT TO LEFT AND LEFT TO RIGHT PRINTING ARE ALIGNED. TYPICAL +CHAR START O/S PULSE WIDTH (POSITIVE TO NEGATIVE EDGE) IS 1.2 MILLISEC.

3. VERTICAL SYSTEM (PAPER MOTION)

3.1 TRIGGER SCOPE FROM TP45 AND OBSERVE WAVEFORM AT TP46.

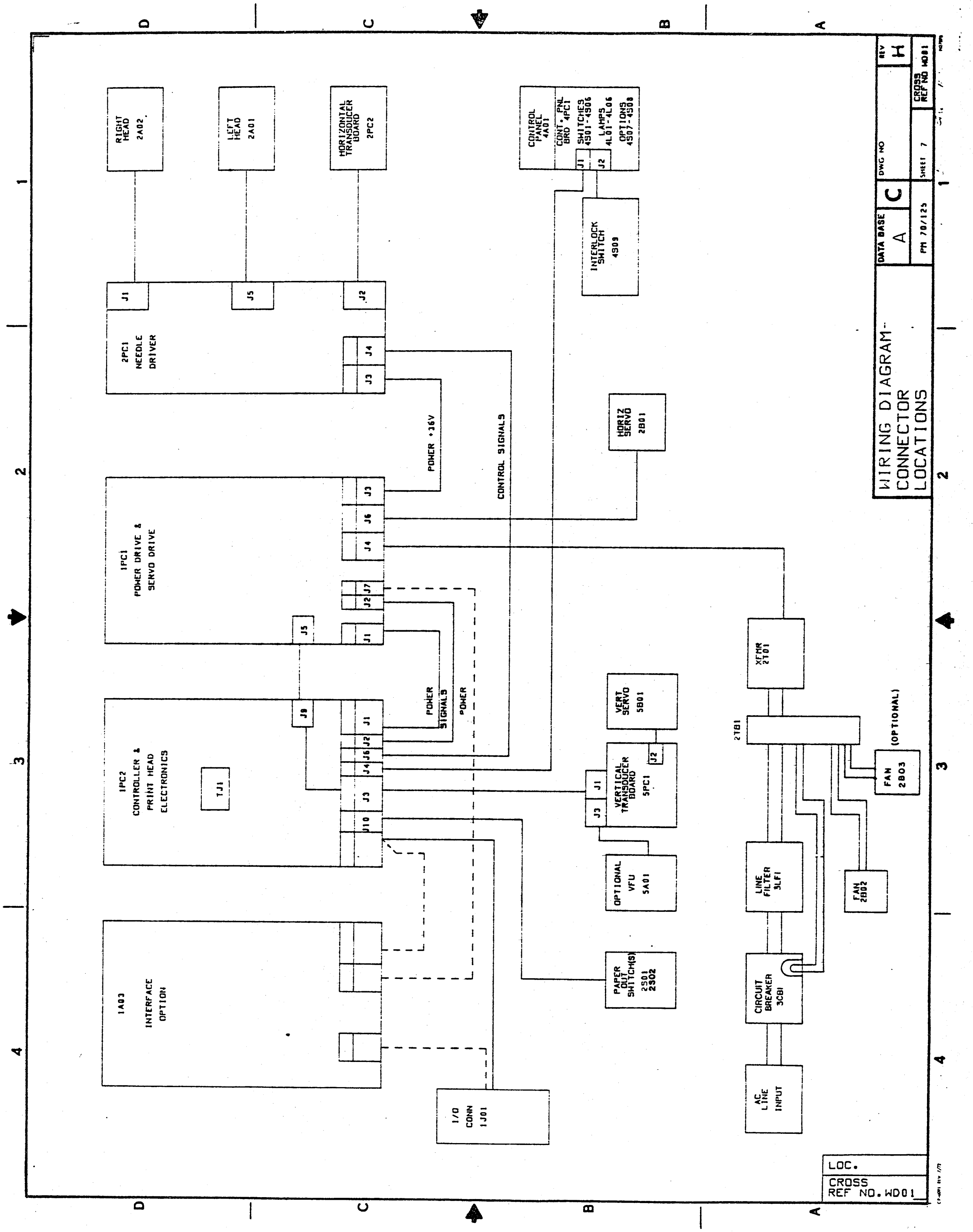
3.2 ON POSITIVE GOING EDGE OF TP45 SIGNAL SET P8 TO OBTAIN A RAMP OF 8 ± 1 MILLISEC OF WAVEFORM AT TP46

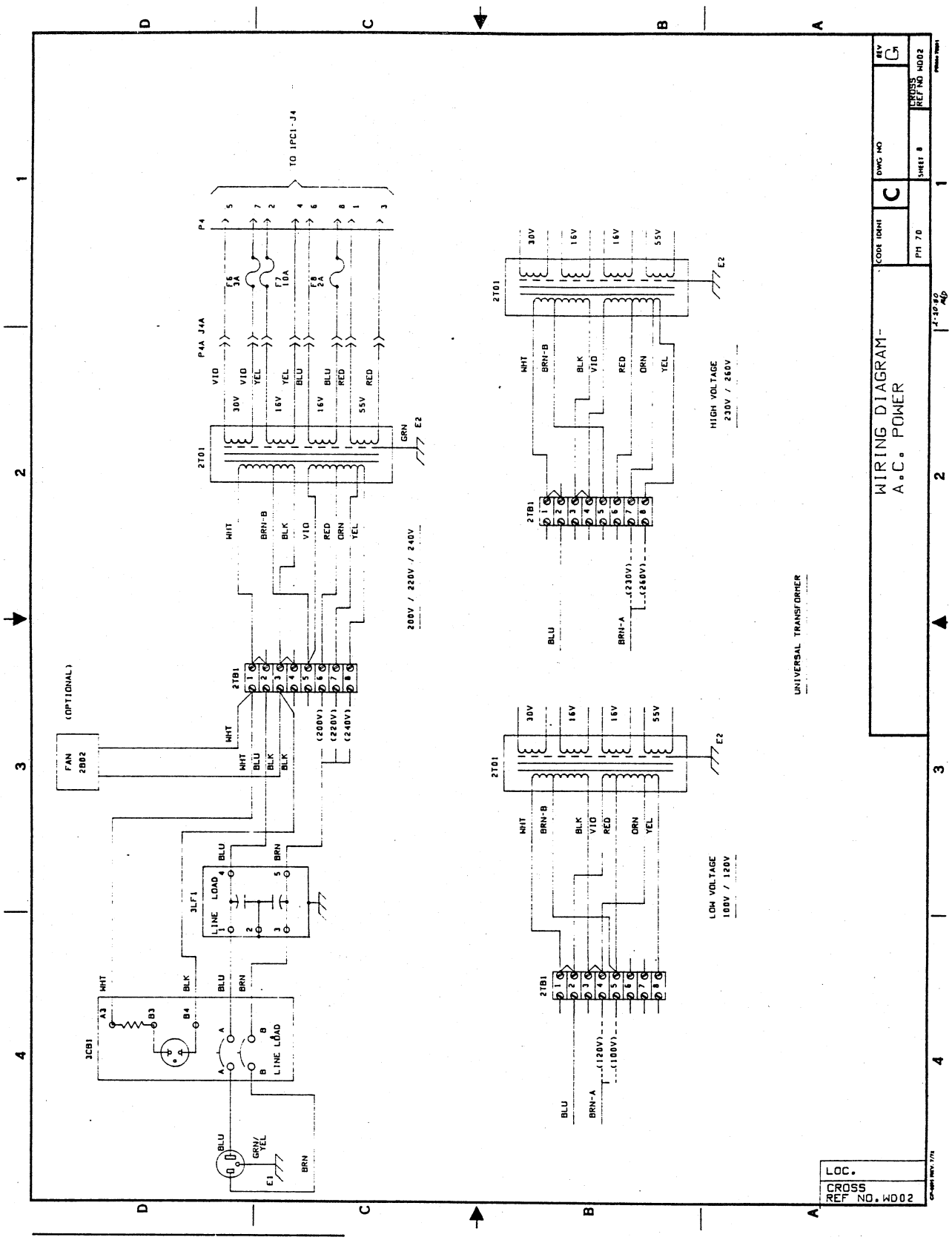
3.3 GROUND PIN 13 OF TEST PLUG TJ1 OR PIN 1 OF CHIP R2 TO LOGIC GROUND TO CAUSE A CONSTANT PAPER SLEW AND OBSERVE STP PULSES AT TP(30). SET POT P10 TO OBTAIN A REP RATE OF 22 ± 1 MILLISEC FOR THE 6 LPI CHANNEL STP.

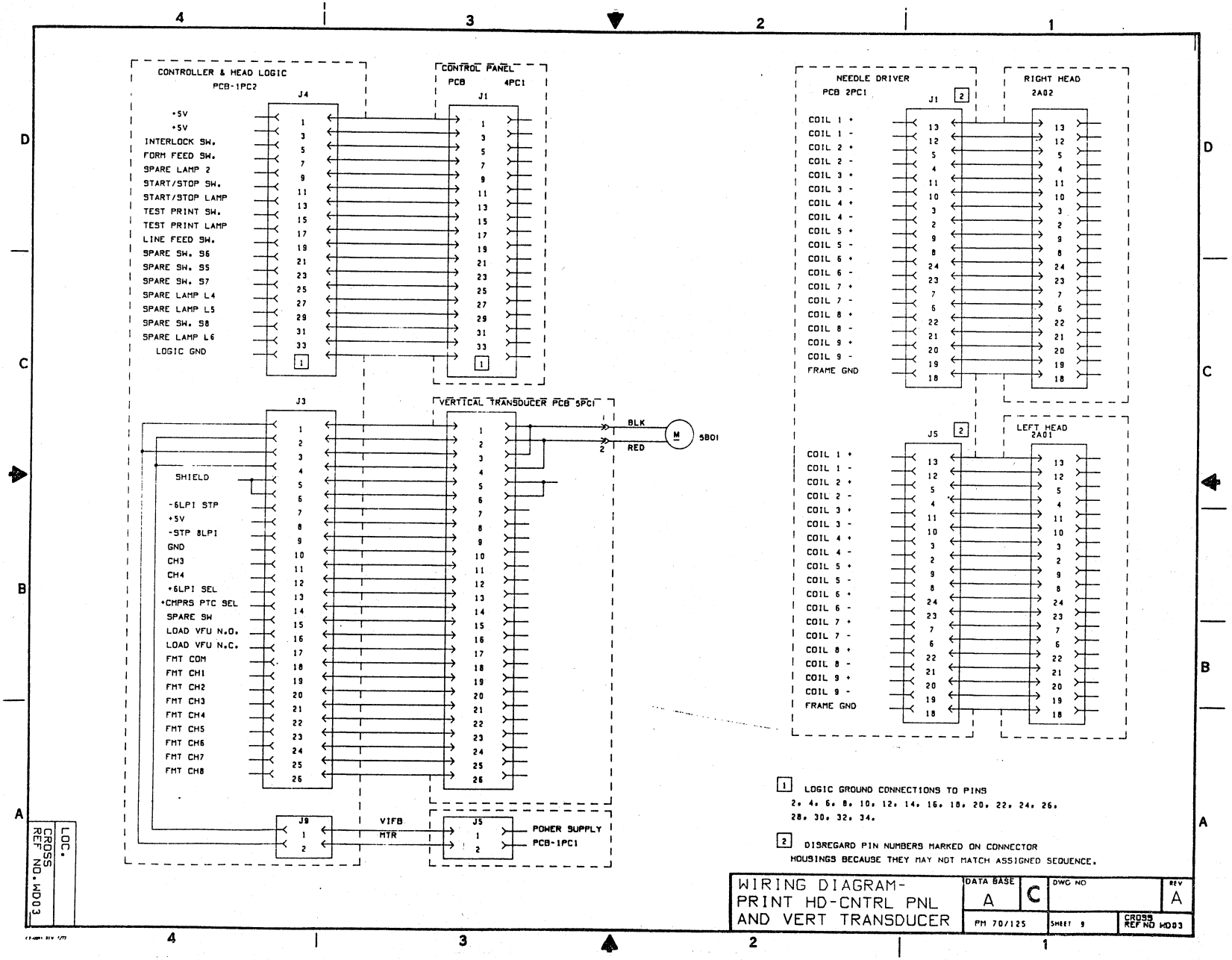
4. NEEDLE DRIVER

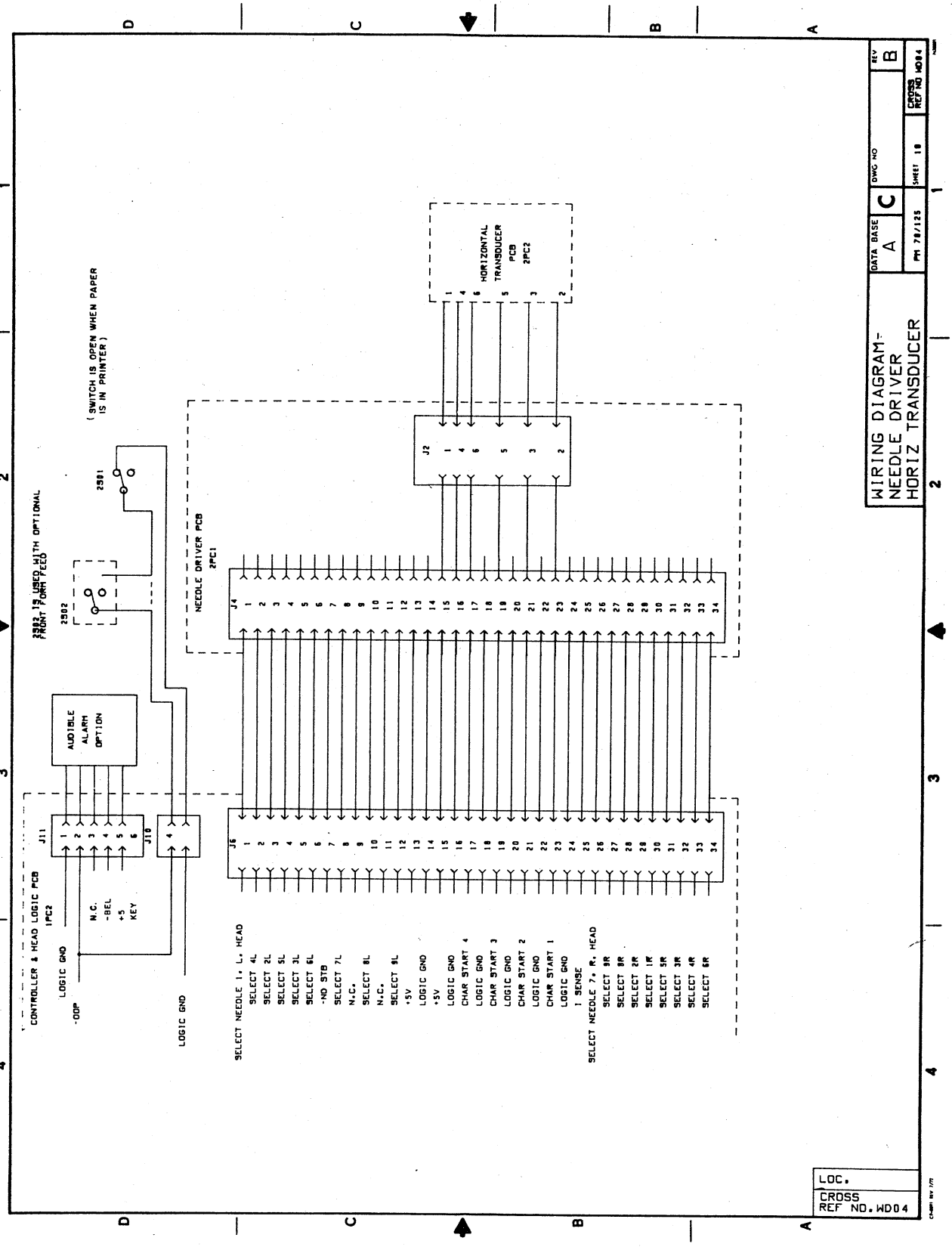
4.1 SET POT P1 ON NEEDLE DRIVER PCB TO OBTAIN 1.13V ± 0.03V MEASURED ACROSS RESISTOR R20.

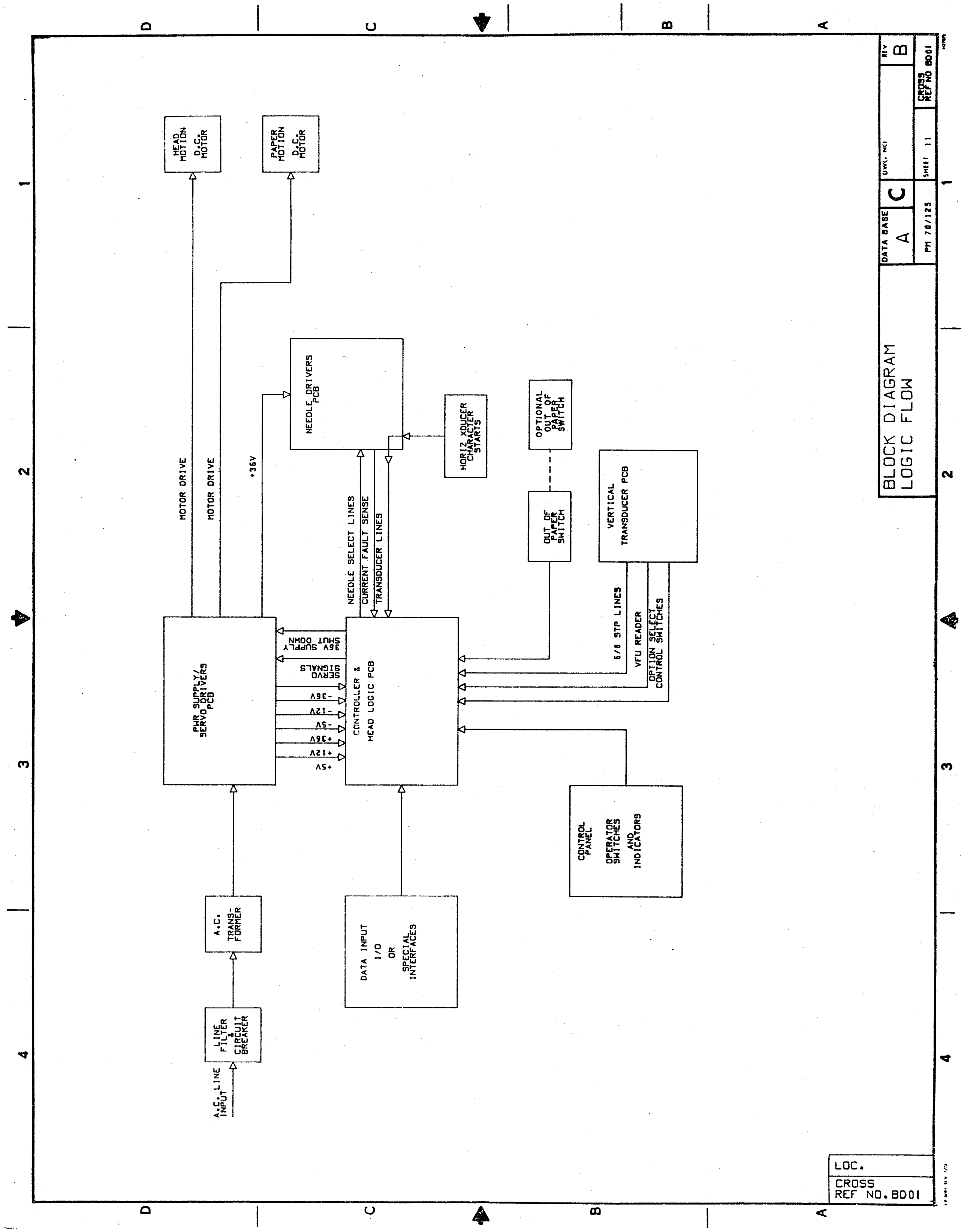
GENERAL NOTES & ELECTRICAL ADJUSTMENTS	DATA BASE A	C	DWG NO	REV C
	PM 78/125		SHEET 6	

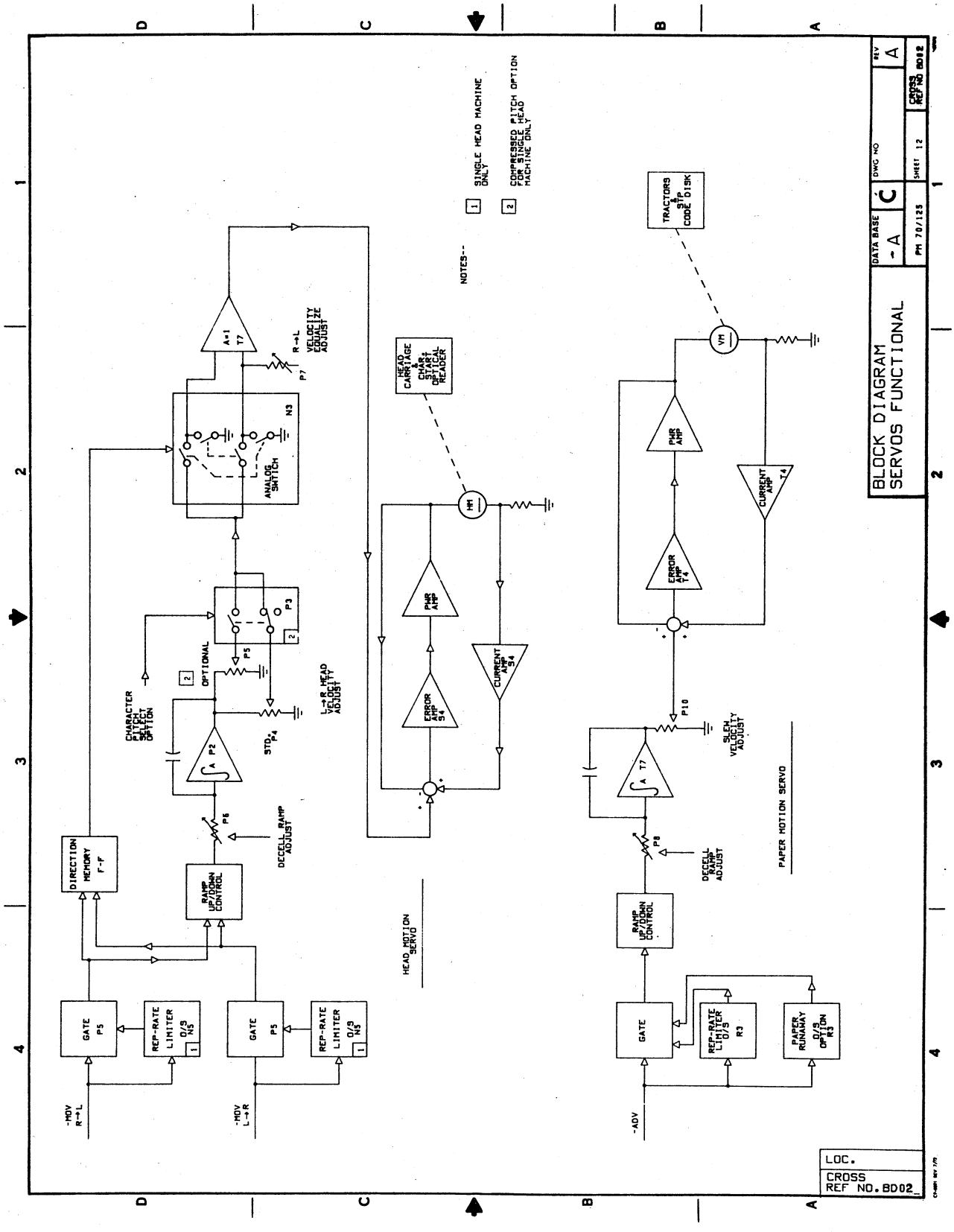

WIRING DIAGRAM-
CONNECTOR
LOCATIONS
DATA BASE
A
DWG NO
C
REV
H
CROSS REF NO WD01
SHEET 7
RIGHT HEAD 2A02
LEFT HEAD 2A01
HORIZONTAL TRANSDUCER BOARD 2PC2
CONTROL PANEL 4A01
CONT. PNL BRD 4PC1
SWITCHES 4S01-4S06
LAMPS 4L01-4L06
OPTIONS 4S07-4S08
INTERLOCK SWITCH 4S09
2PC1 NEEDLE DRIVER
POWER +36V
CONTROL SIGNALS
HORIZ SERVO 2B01
1PC1 POWER DRIVE & SERVO DRIVE
XFMR 2T01
2TB1
(OPTIONAL)
FAN 2B03
VERT SERVO 5B01
VERTICAL TRANSDUCER BOARD 5PC1
POWER
SIGNALS
POWER
1PC2 CONTROLLER & PRINT HEAD ELECTRONICS
TJ1
OPTIONAL VFU 5A01
LINE FILTER 3LF1
FAN 2B02
PAPER OUT SWITCH(S) 2S01 2S02
CIRCUIT BREAKER 3CB1
1A03 INTERFACE OPTION
AC LINE INPUT
I/O CONN 1J01
LOC.
CROSS REF NO. WD01

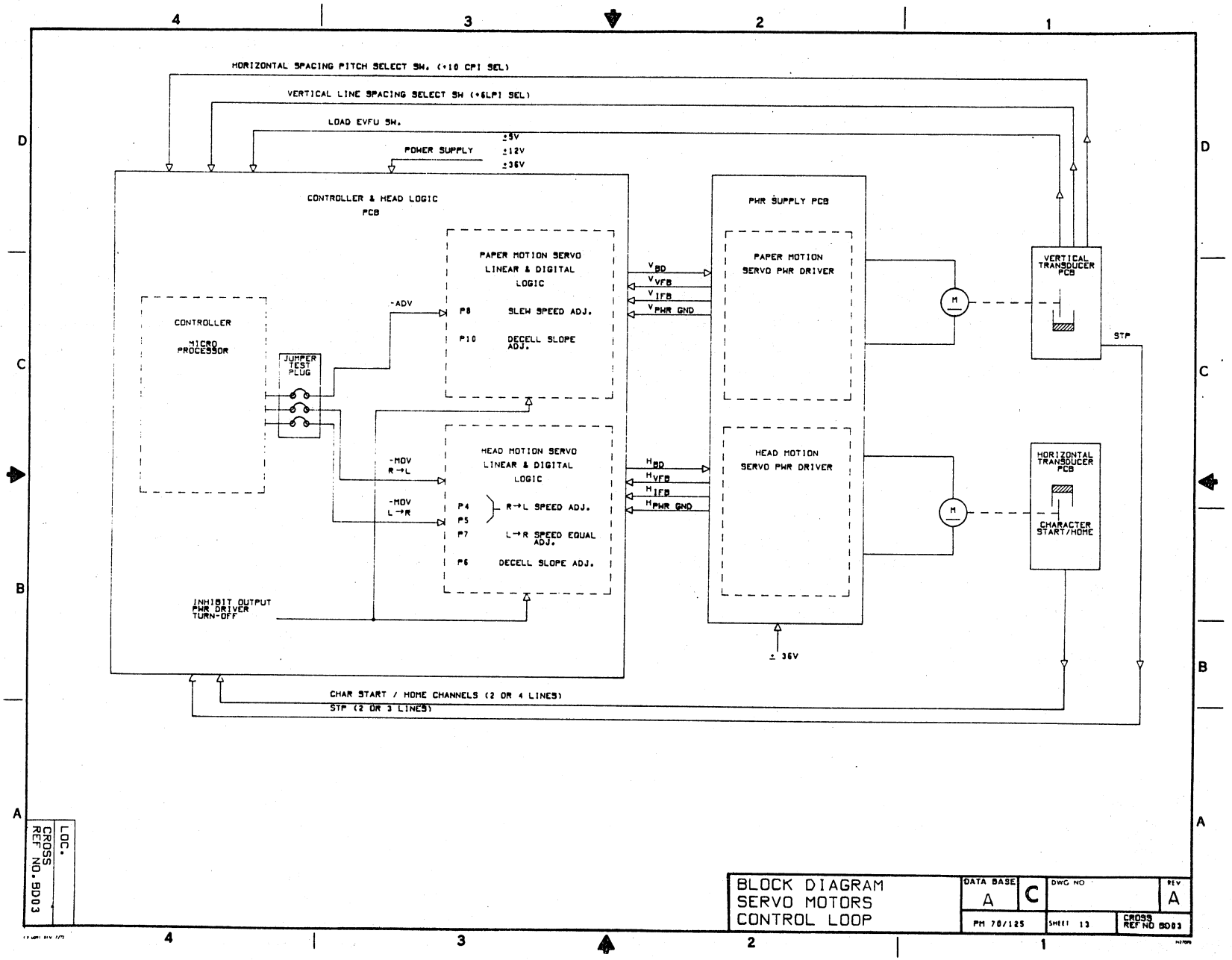

WIRING DIAGRAM-
A.C. POWER
TO 1PC1-J4
P4
P4A J4A
F6 5A
F7 10A
F8 2A
2T01
2TB1
3LF1
LINE LOAD
3CB1
FAN 2B02
(OPTIONAL)
E1
E2
200V / 220V / 240V
HIGH VOLTAGE 230V / 260V
LOW VOLTAGE 100V / 120V
UNIVERSAL TRANSFORMER
LOC.
CROSS REF NO. WD02

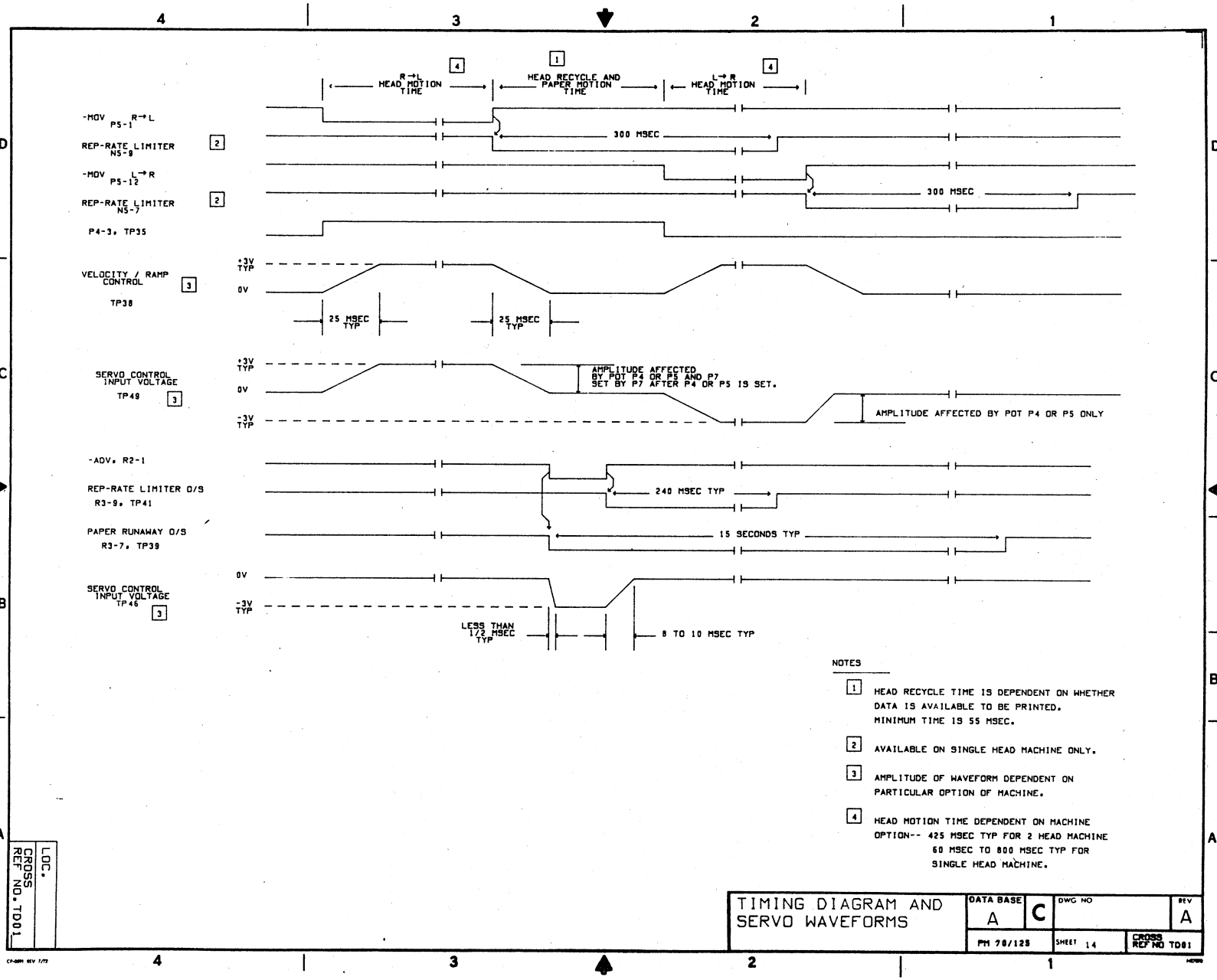

CONTROLLER & HEAD LOGIC
PCB-1PC2
J4
+5V
+5V
INTERLOCK SW.
FORM FEED SW.
SPARE LAMP 2
START/STOP SW.
START/STOP LAMP
TEST PRINT SW.
TEST PRINT LAMP
LINE FEED SW.
SPARE SW. S6
SPARE SW. S5
SPARE SW. S7
SPARE LAMP L4
SPARE LAMP L5
SPARE SW. S8
SPARE LAMP L6
LOGIC GND
CONTROL PANEL
PCB 4PC1
J1
J3
SHIELD
-6LPI STP
+5V
-STP 8LPI
GND
CH3
CH4
+6LPI SEL
+CMPRS PTC SEL
SPARE SW
LOAD VFU N.O.
LOAD VFU N.C.
FMT COM
FMT CH1
FMT CH2
FMT CH3
FMT CH4
FMT CH5
FMT CH6
FMT CH7
FMT CH8
VERTICAL TRANSDUCER PCB 5PC1
BLK
RED
5B01
J9
VIFB
MTR
J5
POWER SUPPLY
PCB-1PC1
NEEDLE DRIVER
PCB 2PC1
J1
COIL 1 +
COIL 1 -
COIL 2 +
COIL 2 -
COIL 3 +
COIL 3 -
COIL 4 +
COIL 4 -
COIL 5 +
COIL 5 -
COIL 6 +
COIL 6 -
COIL 7 +
COIL 7 -
COIL 8 +
COIL 8 -
COIL 9 +
COIL 9 -
FRAME GND
RIGHT HEAD
2A02
LEFT HEAD
2A01
J5
1 LOGIC GROUND CONNECTIONS TO PINS
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26,
28, 30, 32, 34.
2 DISREGARD PIN NUMBERS MARKED ON CONNECTOR
HOUSINGS BECAUSE THEY MAY NOT MATCH ASSIGNED SEQUENCE.
LOC.
CROSS REF NO. WD03
WIRING DIAGRAM-
PRINT HD-CNTRL PNL
AND VERT TRANSDUCER
DATA BASE
A
C
DWG NO
REV
A
PM 70/125
SHEET 9
CROSS REF NO WD03


WIRING DIAGRAM-
NEEDLE DRIVER
HORIZ TRANSDUCER
DATA BASE A
C
DWG NO
REV B
SHEET 18
CROSS REF NO WD04
HORIZONTAL TRANSDUCER PCB 2PC2
NEEDLE DRIVER PCB 2PC1
CONTROLLER & HEAD LOGIC PCB 1PC2
AUDIBLE ALARM OPTION
(SWITCH IS OPEN WHEN PAPER IS IN PRINTER)
2S01 IS USED WITH OPTIONAL FRONT FORM FEED
2S02
J11
J10
J6
J4
J2
LOGIC GND
-DDP
N.C.
-BEL
+5
KEY
SELECT NEEDLE 1, L, HEAD
SELECT 4L
SELECT 2L
SELECT 5L
SELECT 3L
SELECT 6L
-NO STB
SELECT 7L
N.C.
SELECT 8L
N.C.
SELECT 9L
+5V
LOGIC GND
+5V
LOGIC GND
CHAR START 4
LOGIC GND
CHAR START 3
LOGIC GND
CHAR START 2
LOGIC GND
CHAR START 1
LOGIC GND
I SENSE
SELECT NEEDLE 7, R, HEAD
SELECT 9R
SELECT 8R
SELECT 2R
SELECT 1R
SELECT 5R
SELECT 3R
SELECT 4R
SELECT 6R
LOC.
CROSS REF NO. WD04


HEAD MOTION D.C. MOTOR
PAPER MOTION D.C. MOTOR
MOTOR DRIVE
MOTOR DRIVE
+36V
NEEDLE DRIVERS PCB
HORIZ XDUCER CHARACTER STARTS
OPTIONAL OUT OF PAPER SWITCH
NEEDLE SELECT LINES
CURRENT FAULT SENSE
TRANSDUCER LINES
OUT OF PAPER SWITCH
VERTICAL TRANSDUCER PCB
6/8 STP LINES
VFU READER
OPTION SELECT CONTROL SWITCHES
PWR SUPPLY/ SERVO DRIVERS PCB
36V SUPPLY SHUT DOWN
SERVO SIGNALS
-36V
-12V
-5V
+36V
+12V
+5V
CONTROLLER & HEAD LOGIC PCB
CONTROL PANEL OPERATOR SWITCHES AND INDICATORS
A.C. TRANS- FORMER
DATA INPUT I/O OR SPECIAL INTERFACES
LINE FILTER & CIRCUIT BREAKER
A.C. LINE INPUT
BLOCK DIAGRAM LOGIC FLOW
DATA BASE A
DWG NO C
REV B
PM 70/125
SHEET 11
CROSS REF NO BD01
LOC.
CROSS REF NO. BD01


BLOCK DIAGRAM
SERVOS FUNCTIONAL
DATA BASE - A
C
DWG NO
REV A
PM 70/125
SHEET 12
CROSS REF NO BD02
NOTES--
1 SINGLE HEAD MACHINE ONLY
2 COMPRESSED PITCH OPTION FOR SINGLE HEAD MACHINE ONLY
HEAD MOTION SERVO
PAPER MOTION SERVO
HEAD CARRIAGE & CHAR. OPTICAL READER
TRACTORS & STP CODE DISK
DIRECTION MEMORY F-F
RAMP UP/DOWN CONTROL
DECELL RAMP ADJUST
CHARACTER SELECT OPTION
OPTIONAL
STD
L→R HEAD VELOCITY ADJUST
ANALOG SWITCH
VELOCITY EQUALIZE ADJUST
R→L
PWR AMP
ERROR AMP
CURRENT AMP
SLEW VELOCITY ADJUST
GATE
REP-RATE LIMITER
PAPER RUNAWAY
-MOV R→L
-MOV L→R
-ADV
LOC.
CROSS REF NO. BD02


HORIZONTAL SPACING PITCH SELECT SW. (+10 CPI SEL)
VERTICAL LINE SPACING SELECT SW (+6LPI SEL)
LOAD EVFU SW.
POWER SUPPLY
±5V
±12V
±36V
CONTROLLER & HEAD LOGIC PCB
CONTROLLER
MICRO PROCESSOR
JUMPER TEST PLUG
-ADV
PAPER MOTION SERVO LINEAR & DIGITAL LOGIC
P8 SLEW SPEED ADJ.
P10 DECELL SLOPE ADJ.
-MOV R→L
-MOV L→R
HEAD MOTION SERVO LINEAR & DIGITAL LOGIC
P4
P5
R→L SPEED ADJ.
P7 L→R SPEED EQUAL ADJ.
P6 DECELL SLOPE ADJ.
INHIBIT OUTPUT PWR DRIVER TURN-OFF
VBD
VVFB
VIFB
VPWR GND
HBD
HVFB
HIFB
HPWR GND
PWR SUPPLY PCB
PAPER MOTION SERVO PWR DRIVER
HEAD MOTION SERVO PWR DRIVER
± 36V
M
VERTICAL TRANSDUCER PCB
HORIZONTAL TRANSDUCER PCB
CHARACTER START/HOME
STP
CHAR START / HOME CHANNELS (2 OR 4 LINES)
STP (2 OR 3 LINES)
LOC.
CROSS REF NO. 8D03
BLOCK DIAGRAM
SERVO MOTORS
CONTROL LOOP
DATA BASE
A
C
DWG NO
REV
A
PM 70/125
SHEET 13
CROSS REF NO 8083


R→L HEAD MOTION TIME
HEAD RECYCLE AND PAPER MOTION TIME
L→R HEAD MOTION TIME
-MOV P5-1 R→L
REP-RATE LIMITER N5-9
300 MSEC
-MOV P5-12 L→R
REP-RATE LIMITER N5-7
300 MSEC
P4-3, TP35
VELOCITY / RAMP CONTROL
TP38
+3V TYP
0V
25 MSEC TYP
25 MSEC TYP
SERVO CONTROL INPUT VOLTAGE
TP49
+3V TYP
0V
-3V TYP
AMPLITUDE AFFECTED BY POT P4 OR P5 AND P7 SET BY P7 AFTER P4 OR P5 IS SET.
AMPLITUDE AFFECTED BY POT P4 OR P5 ONLY
-ADV, R2-1
REP-RATE LIMITER O/S R3-9, TP41
240 MSEC TYP
PAPER RUNAWAY O/S R3-7, TP39
15 SECONDS TYP
SERVO CONTROL INPUT VOLTAGE TP46
0V
-3V TYP
LESS THAN 1/2 MSEC TYP
8 TO 10 MSEC TYP
NOTES
1 HEAD RECYCLE TIME IS DEPENDENT ON WHETHER DATA IS AVAILABLE TO BE PRINTED. MINIMUM TIME IS 55 MSEC.
2 AVAILABLE ON SINGLE HEAD MACHINE ONLY.
3 AMPLITUDE OF WAVEFORM DEPENDENT ON PARTICULAR OPTION OF MACHINE.
4 HEAD MOTION TIME DEPENDENT ON MACHINE OPTION-- 425 MSEC TYP FOR 2 HEAD MACHINE
60 MSEC TO 800 MSEC TYP FOR SINGLE HEAD MACHINE.
LOC.
CROSS REF NO. TD01
TIMING DIAGRAM AND SERVO WAVEFORMS
DATA BASE A C
DWG NO
REV A
PM 78/128
SHEET 14
CROSS REF NO TD01

LOCATION

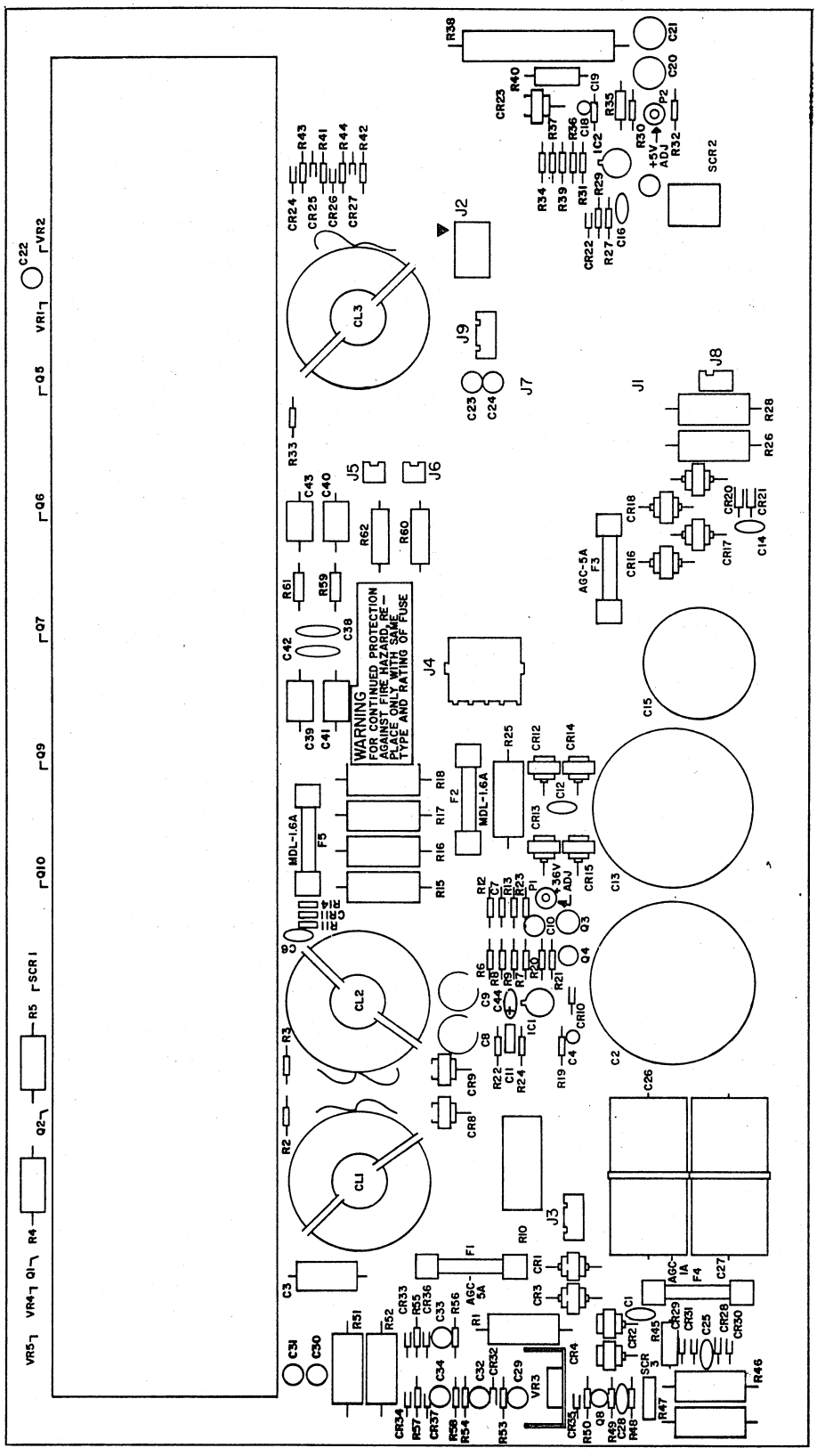
1PC1

POWER SUPPLY BOARD

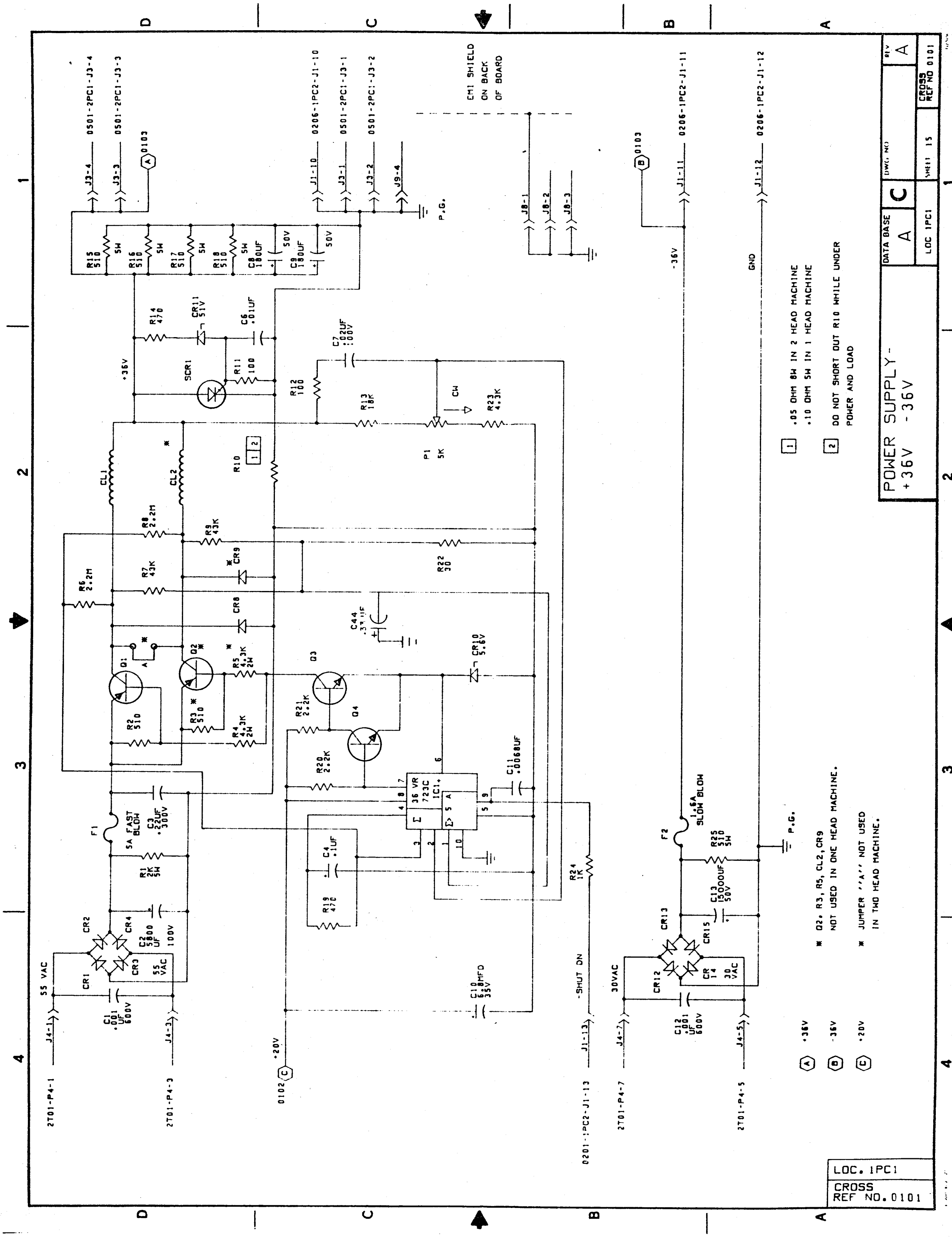
BOARD NUMBER
See Chart Below

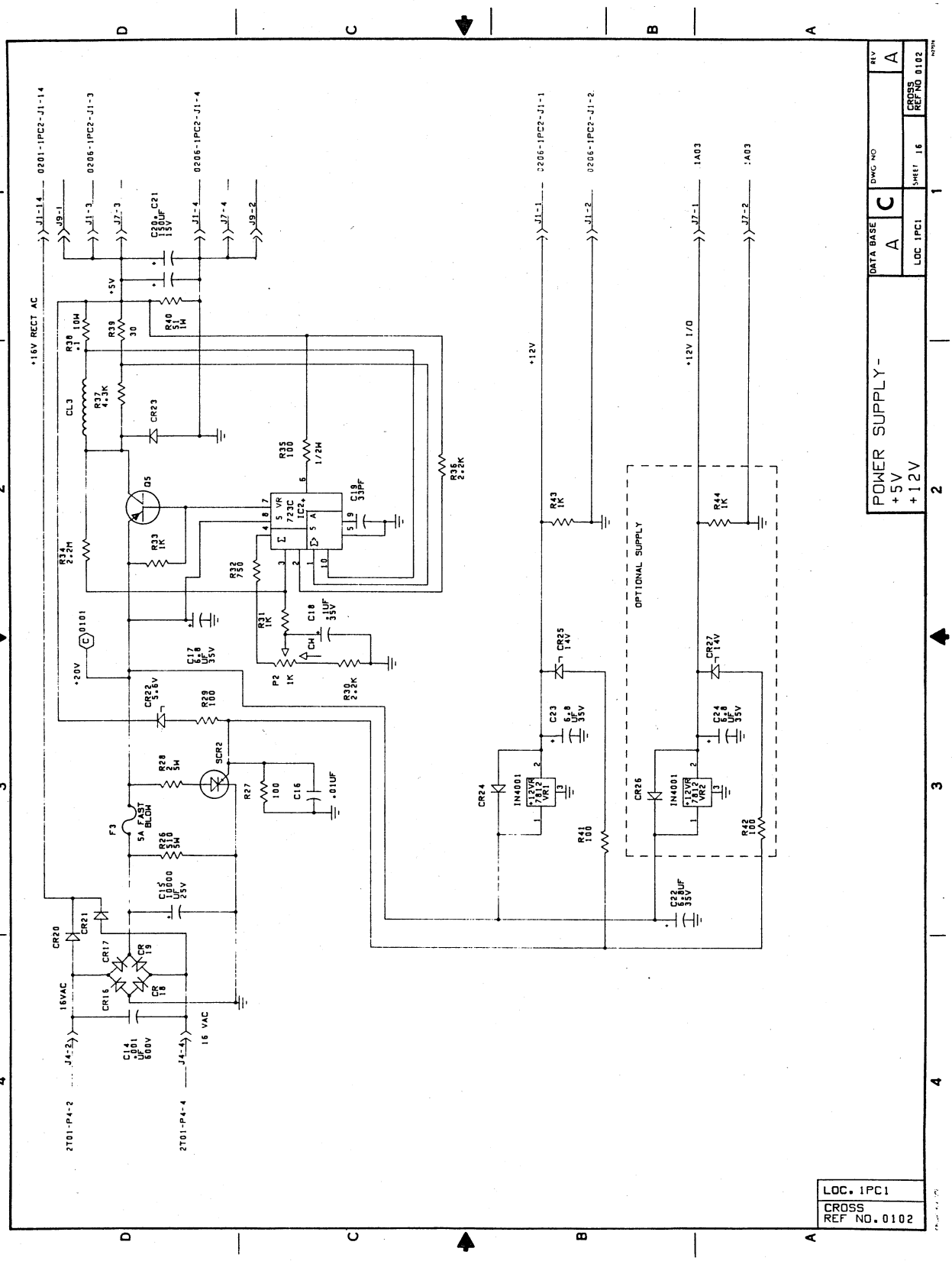
PAGE NO.
9-16 A-D/E

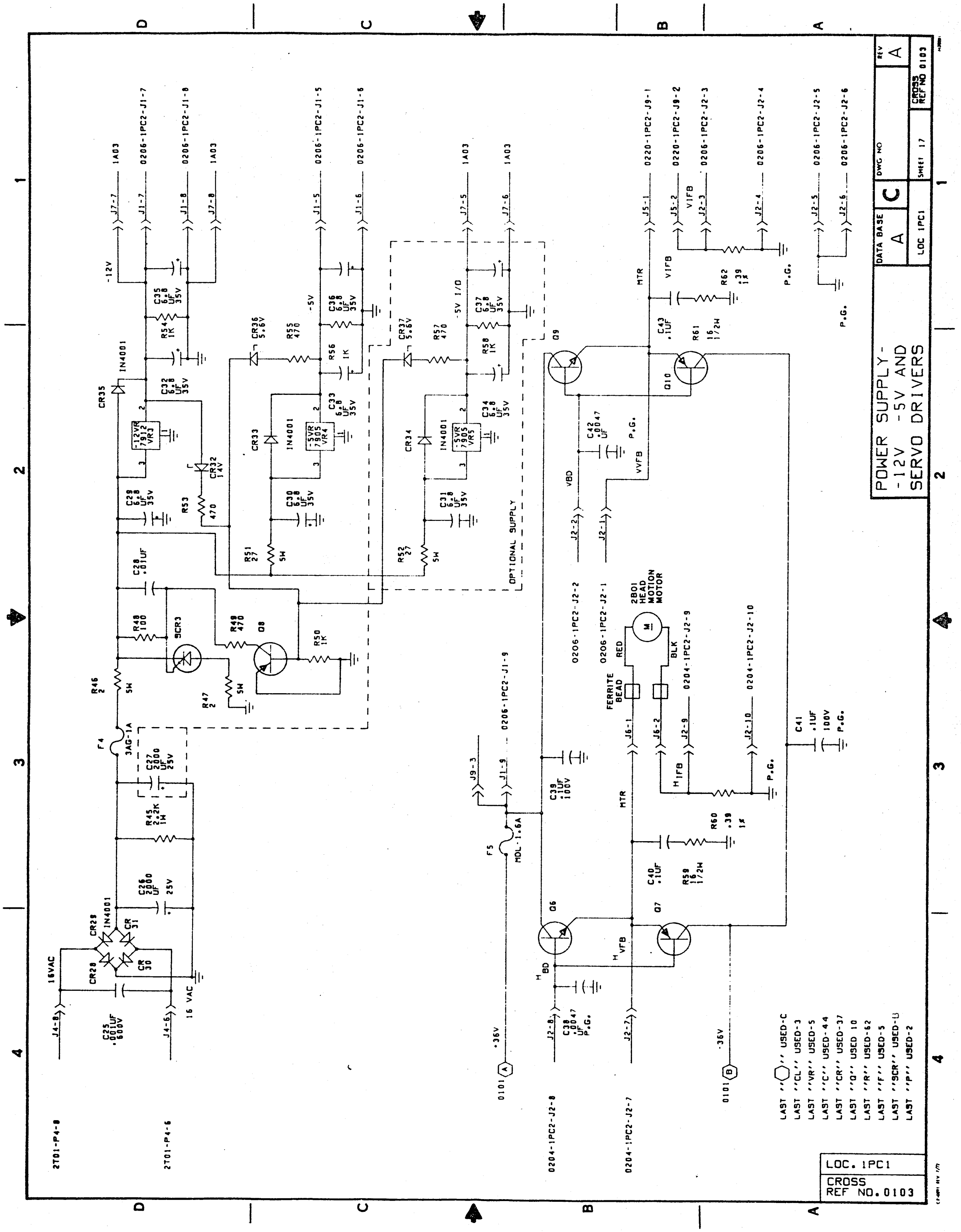
1PC1 POWER SUPPLY ASSEMBLY	MODEL	I/O HARNESS 44671709	I/O SUPPLY 44671994
95419903	PM 125	-	-
95419904	PM 125	X	-
95419905	PM 125	X	X
95419953	PM 70	-	-
95419954	PM 70	X	-
95419955	PM 70	X	X



POWER SUPPLY BOARD 95419903/04/05/53/54 and 55


POWER SUPPLY-
+36V -36V
DATA BASE A
DWG. NO. C
SHEET 15
REV A
LOC 1PC1
CROSS REF NO 0101
1 .05 OHM 8W IN 2 HEAD MACHINE
.10 OHM 5W IN 1 HEAD MACHINE
2 DO NOT SHORT OUT R10 WHILE UNDER POWER AND LOAD
* Q2, R3, R5, CL2, CR9 NOT USED IN ONE HEAD MACHINE.
* JUMPER "A" NOT USED IN TWO HEAD MACHINE.
A +36V
B -36V
C +20V
CM1 SHIELD ON BACK OF BOARD
LOC. 1PC1
CROSS REF NO. 0101


POWER SUPPLY-
+5V
+12V
DATA BASE A
C
LOC 1PC1
DWG NO
SHEET 16
REV A
CROSS REF NO 0102
OPTIONAL SUPPLY
LOC. 1PC1
CROSS REF NO. 0102

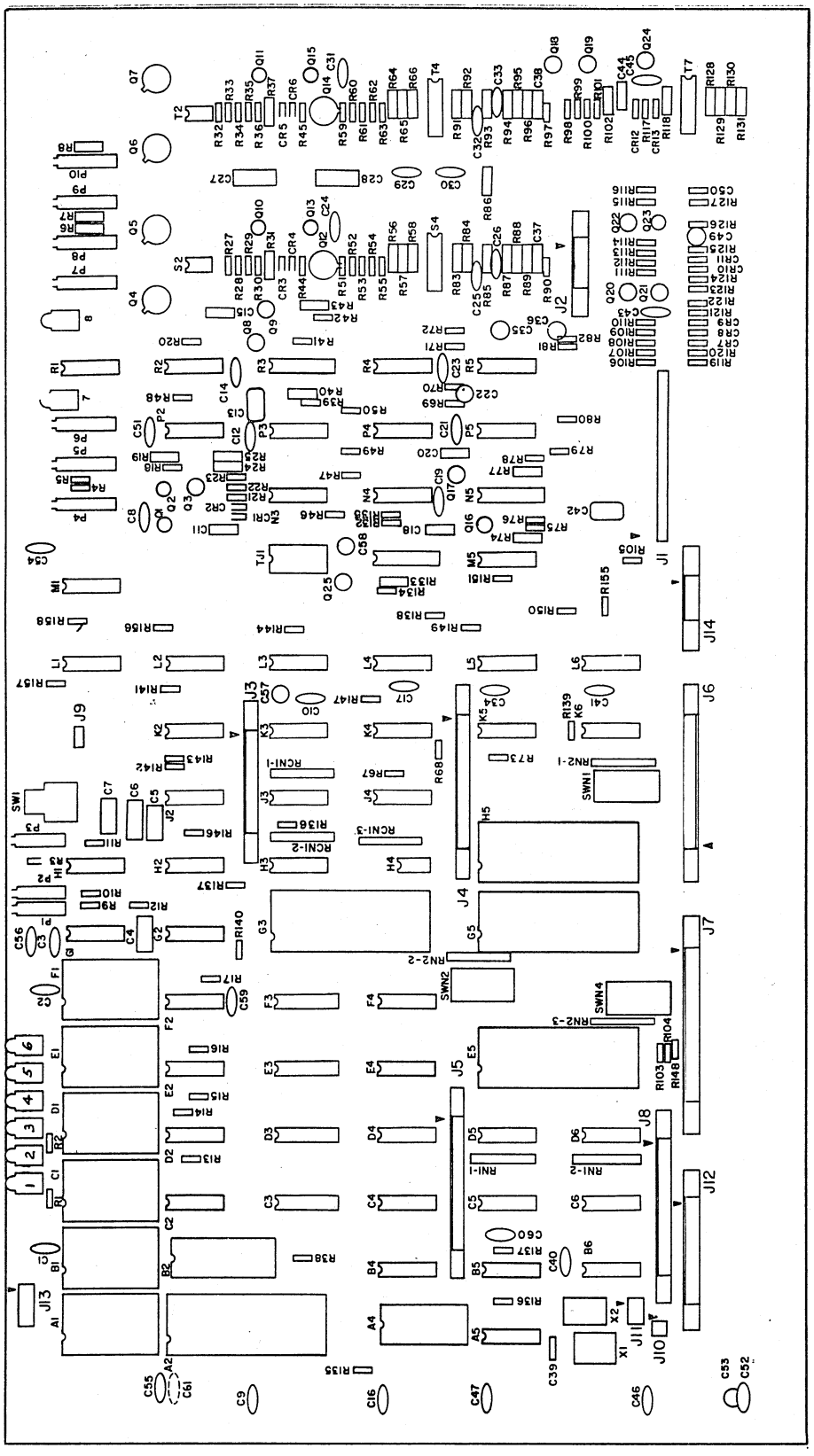

POWER SUPPLY-
-12V -5V AND
SERVO DRIVERS
DATA BASE A
DWG NO C
SHEET 17
LOC 1PC1
REV A
CROSS REF NO 0103
LOC. 1PC1
CROSS
REF NO. 0103

LOCATION

1PC2

CONTROLLER AND HEAD LOGIC BOARD

BOARD NUMBER	PAGE NO.
95440196/95440195	9-18 A-Z/AA



CONTROLLER AND HEAD LOGIC BOARD 95440196/95440195

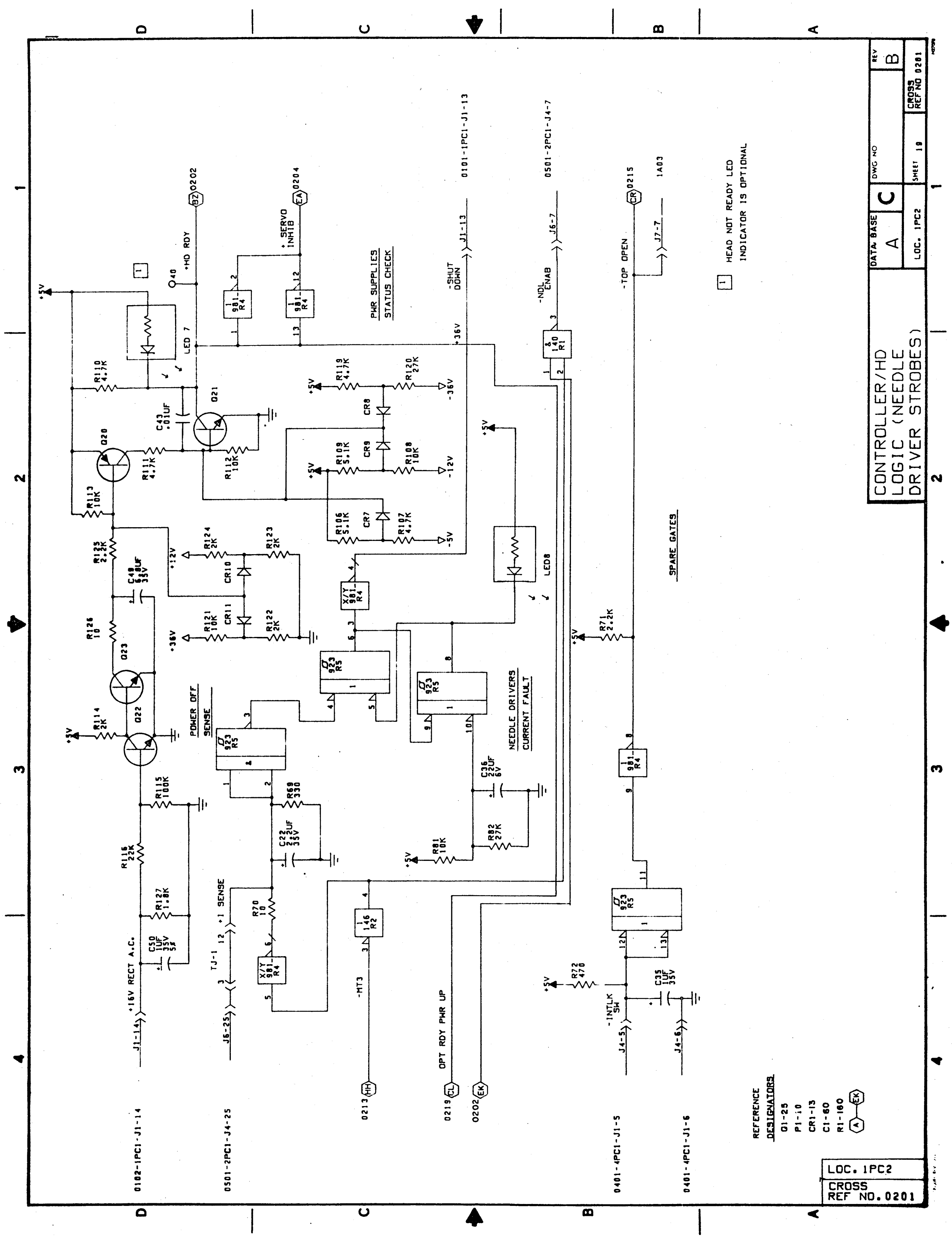
CROSS REF NUMBER		+HOLD	-SEL BUS	-CMP (SOFTWARE CONT)	-CMP (OPERATOR CONT)	-CMP GND	-CMP GND	SINGLE HEAD MACHINE	TWO HEAD MACHINE	-CHAR ST 3	PAPER RUNAWAY	-DUAL PITCH	BLANK CODE 7	BLANK CODE 6	BLANK CODE 5	BLANK CODE 4	BLANK CODE 3	BLANK CODE 2	BLANK CODE 1	BLANK CODE 0	TEST PRINT BIT 7	TEST PRINT BIT 6	TEST PRINT BIT 5	TEST PRINT BIT 4	TEST PRINT BIT 3	TEST PRINT BIT 2	TEST PRINT BIT 1	TEST PRINT BIT 0	+6 SEC SEL SEL		-EN DW	-AUTLF	-INTERAC	-80 COL	-DBL SP	AUTCRM	-DIEN DATA BUS	-CS DATA BUS	+START / STOP (STD MACH)	+START / STOP (W/ INTERFACE)
0208	J1	X																																						
0207	J2		X																																					
0223	J3			X																																				
0223	J4				X																																			
0223	J5					X																																		
0223	J6						X																																	
0222	J7							X																																
0222	J8							X																																
0222	J8								X																															
0222	J10							X		X																														
0222	J11								X																															
0222	J12								X																															
0205	J13										X																													
0203	J14											X																												
0221	SW1-1												X																											
0221	SW1-2													X																										
0221	SW1-3																			X																				
0221	SW1-4														X																									
0221	SW1-5															X																								
0221	SW1-6																	X																						
0221	SW1-7																X																							
0221	SW1-8																		X																					
0217	SW1-9																																					X		
0217	SW1-10																																				X			
0218	SW2-1																				X																			
0218	SW2-2																					X																		
0218	SW2-3																						X																	
0218	SW2-4																							X																
0218	SW2-5																								X															
0218	SW2-6																									X														
0218	SW2-7																										X													
0218	SW2-8																											X												
0215	SW4-1																													X										
0215	SW4-2																														X									
0223	SW4-3																												X											
0215	SW4-5																																X							
0215	SW4-6																																	X						
0215	SW4-7																																		X					
0215	SW4-8																															X								
0219	J15																																						X	
0219	J16																																							X

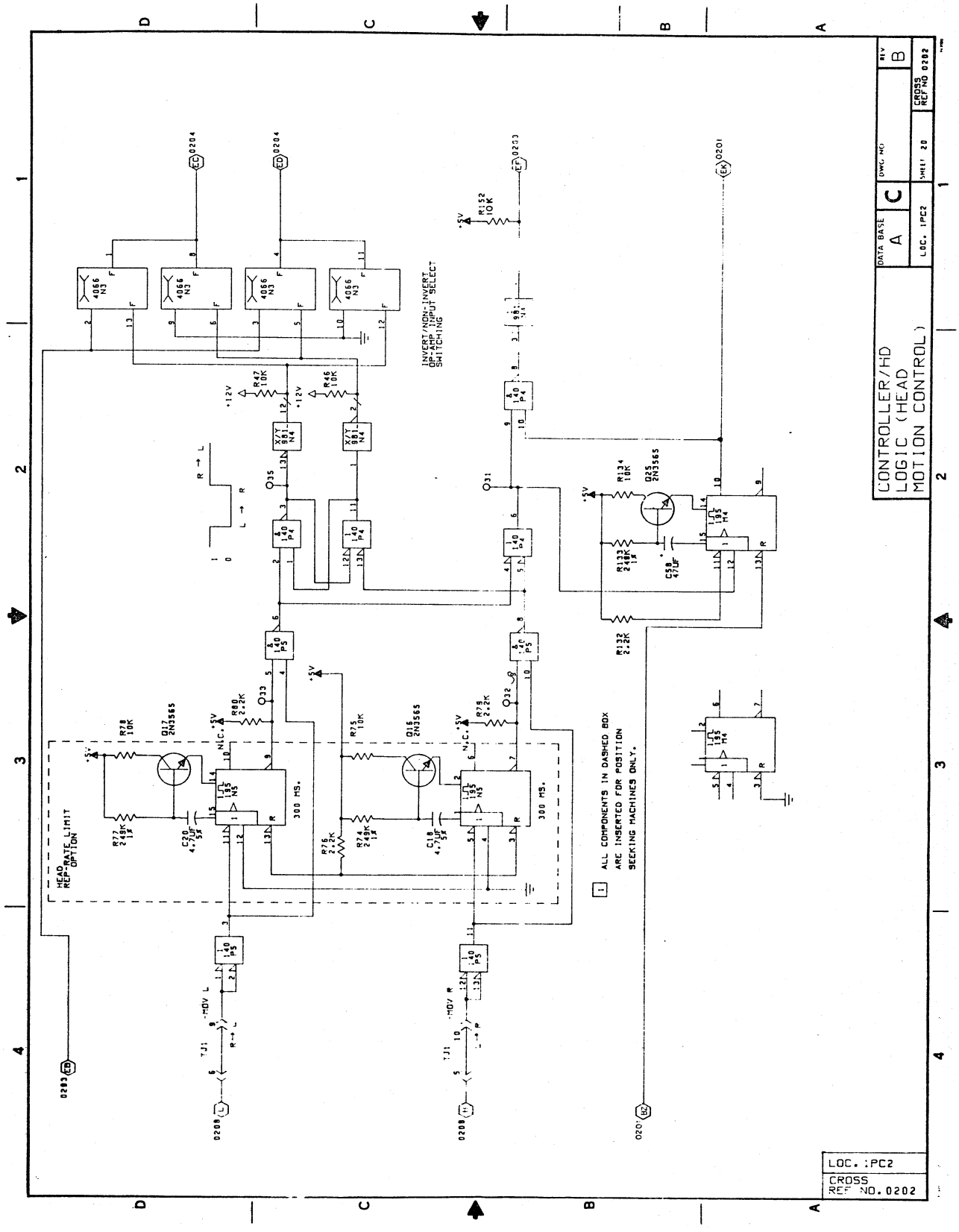
NOTE.
SEE APPLICABLE ASSY DWG FOR POSITION OF SWITCHES AND FOR JUMPERS ASSEMBLED.

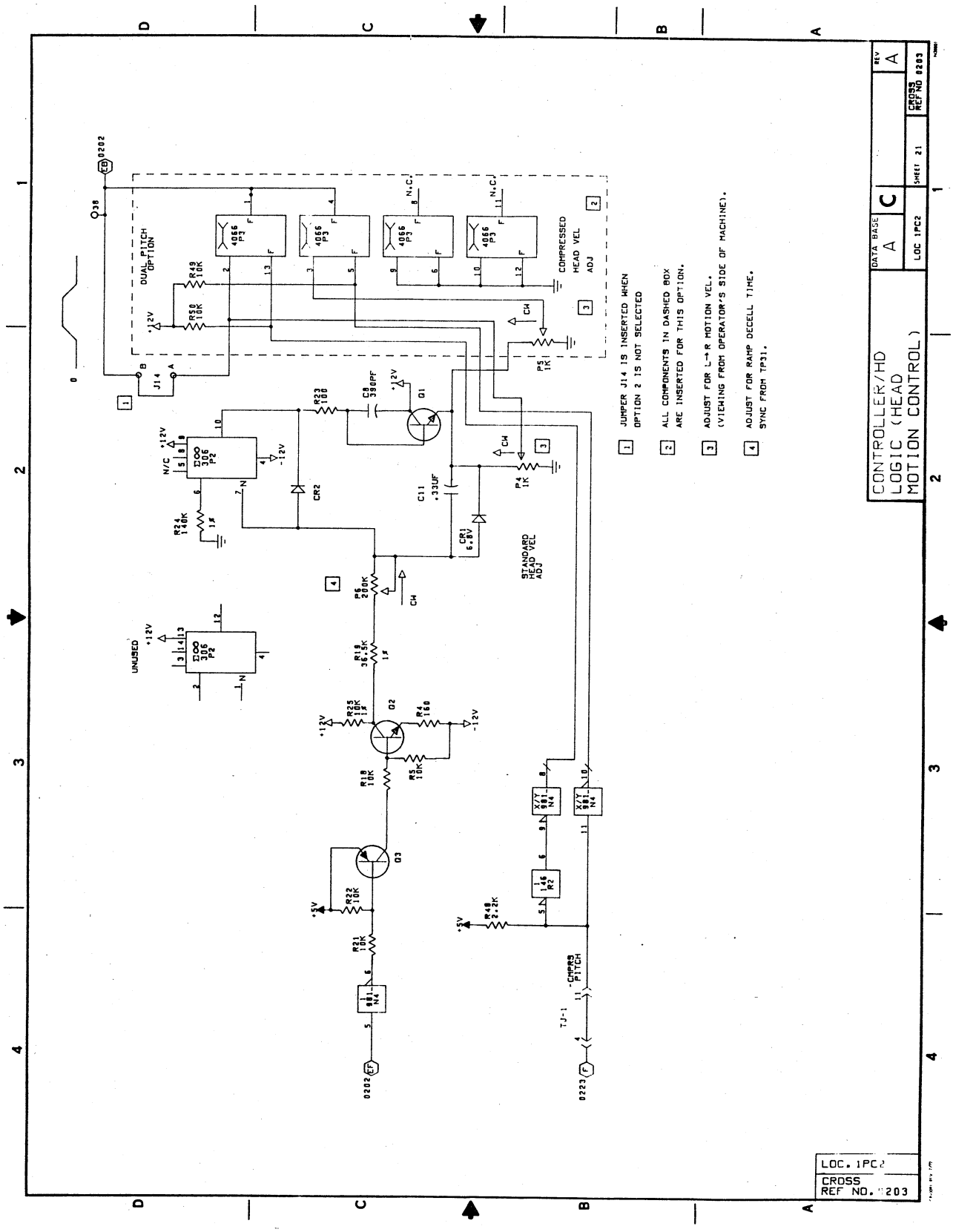
CODE IDENT	DWG. NO.	REV
DATA BASE A	C	B
LOC. 1PC2	SHEET 18	CROSS REF NO 0200

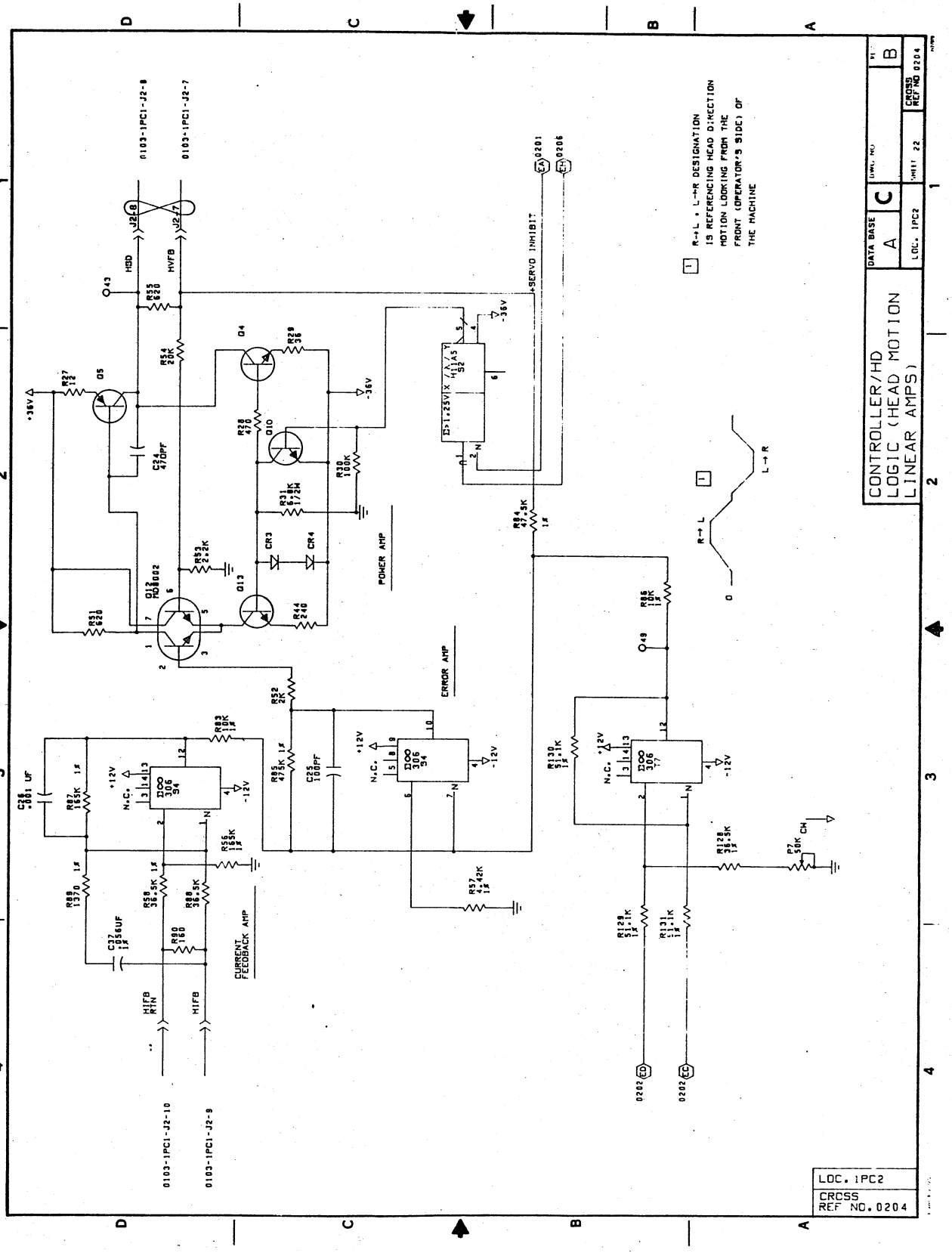
PRINT HEAD & CONT. JUMPERS

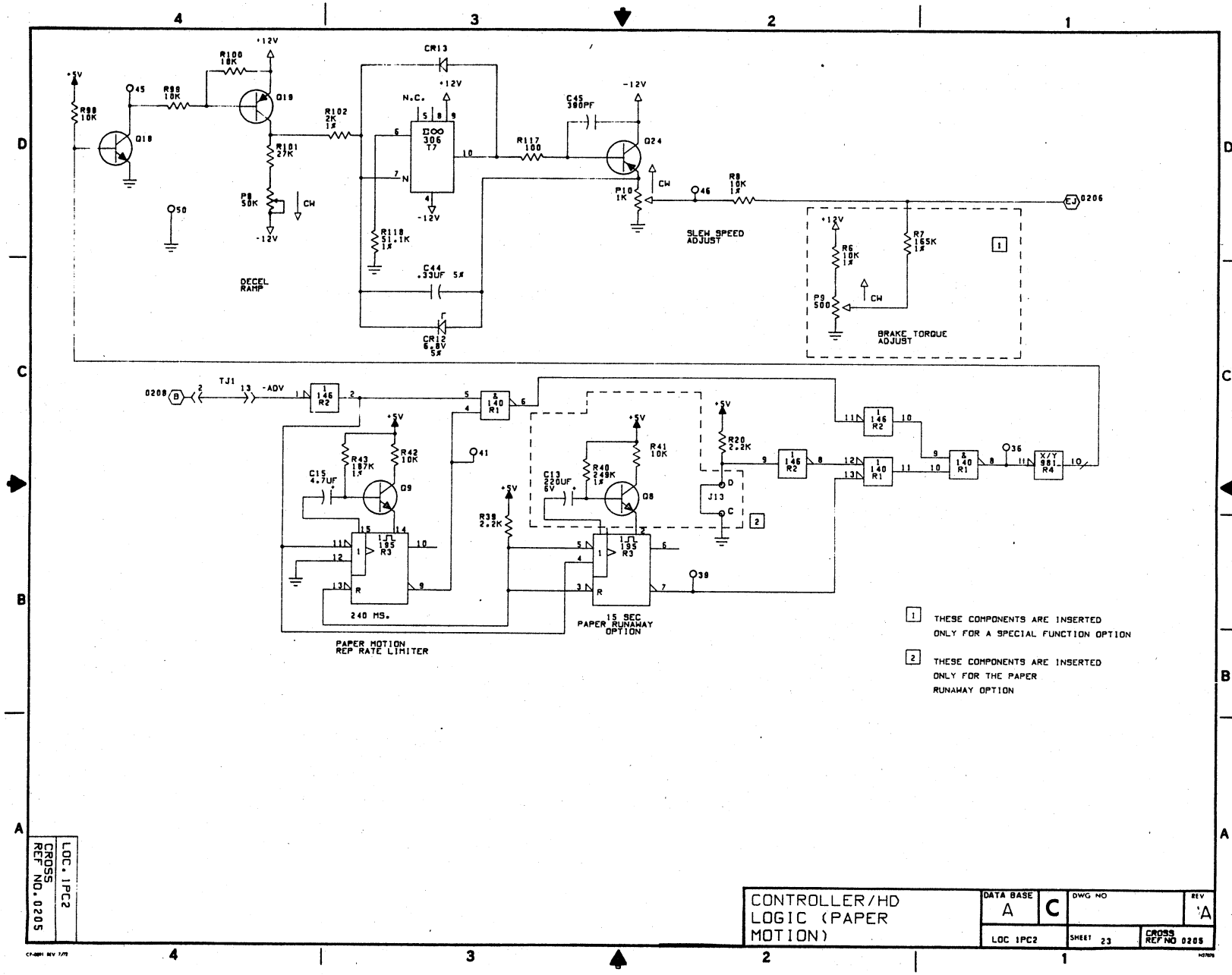
LOC. 1PC2
CROSS REF NO. 0200

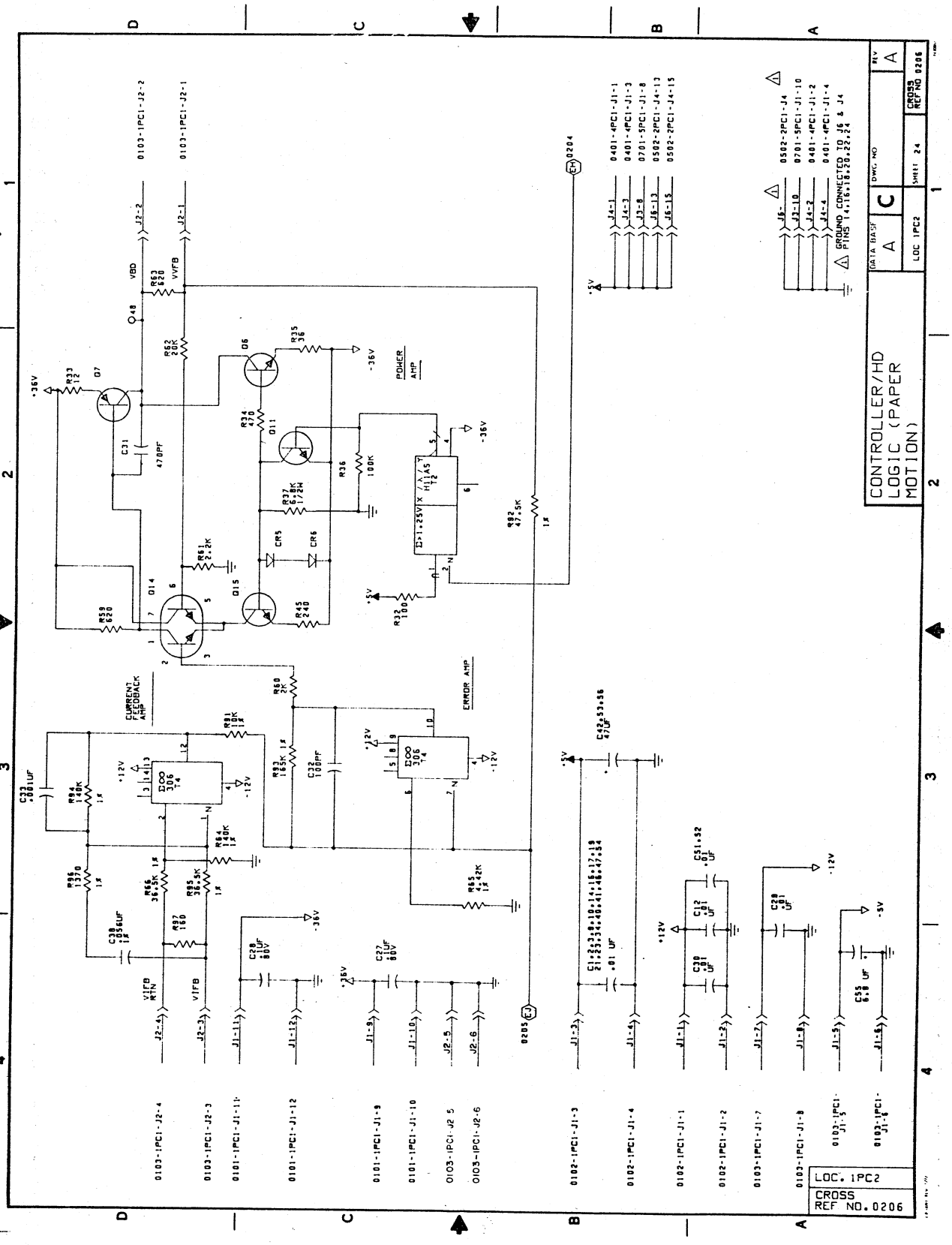

CONTROLLER/HD LOGIC (NEEDLE DRIVER STROBES)
DATA BASE A
DWG NO C
REV B
LOC. 1PC2
SHEET 19
CROSS REF NO 0201
LOC. 1PC2
CROSS REF NO. 0201
PWR SUPPLIES STATUS CHECK
POWER OFF SENSE
NEEDLE DRIVERS CURRENT FAULT
SPARE GATES
HEAD NOT READY LED INDICATOR IS OPTIONAL
REFERENCE DESIGNATORS
Q1-25
P1-10
CR1-13
C1-60
R1-160
+16V RECT A.C.
+1 SENSE
-MT3
OPT RDY PWR UP
-INTLK SW
+HD RDY
+SERVO INHIB
-SHUT DOWN
-NDL ENAB
-TOP OPEN
0102-1PC1-J1-14
0501-2PC1-J4-25
0401-4PC1-J1-5
0401-4PC1-J1-6
0101-1PC1-J1-13
0501-2PC1-J4-7
1A03

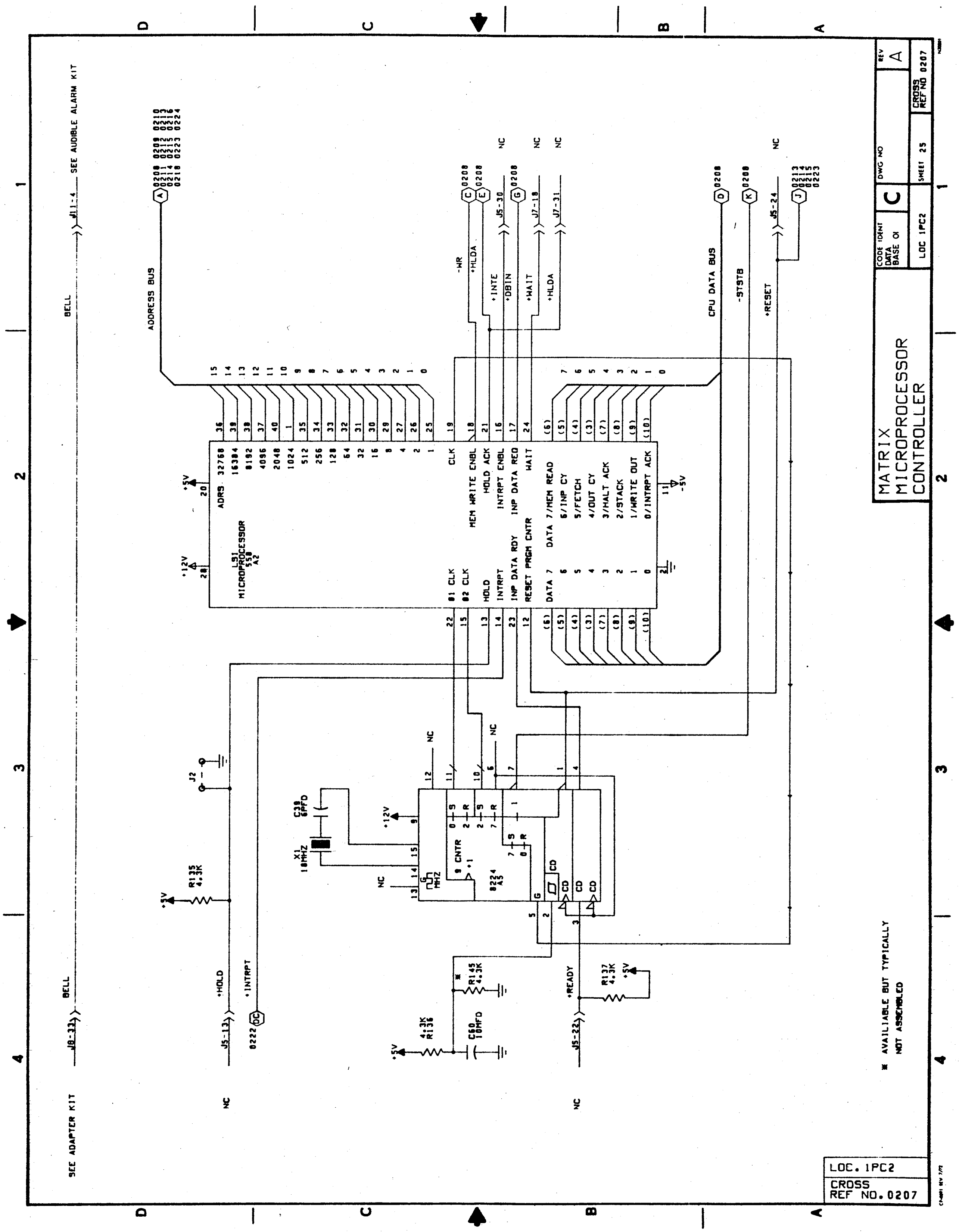

CONTROLLER/HD
LOGIC (HEAD
MOTION CONTROL)
DATA BASE
A
C
LOC. 1PC2
DWG NO
SHEET 20
REV
B
CROSS
REF NO 0202
INVERT/NON-INVERT
AND INPUT SELECT
SWITCHING
HEAD
REPRATE LIMIT
OPTION
300 MS.
300 MS.
ALL COMPONENTS IN DASHED BOX
ARE INSERTED FOR POSITION
SEEKING MACHINES ONLY.
LOC. :PC2
CROSS
REF NO. 0202

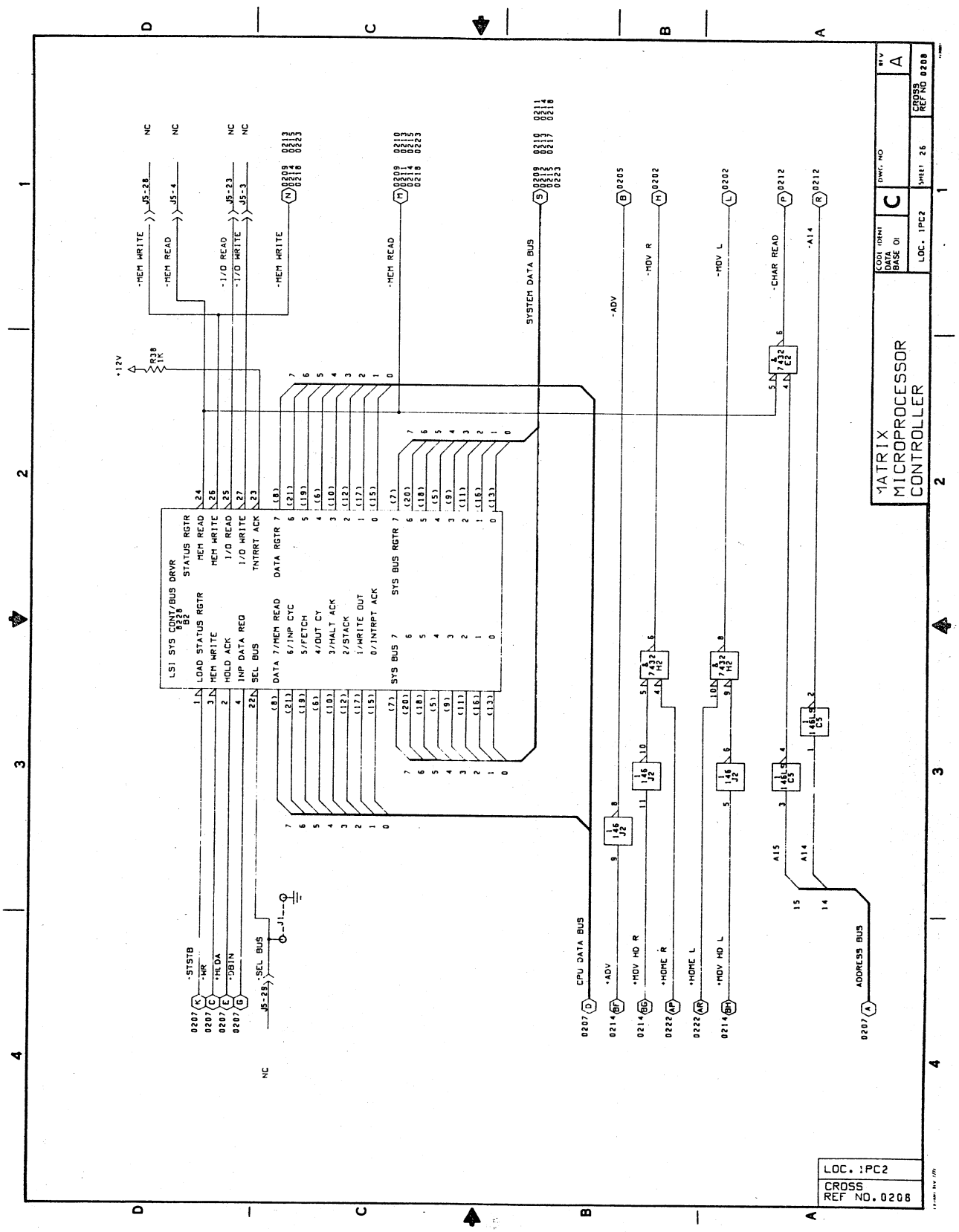

CONTROLLER/HD
LOGIC (HEAD
MOTION CONTROL)
DATA BASE
A
C
REV
A
LOC 1PC2
SHEET 21
CROSS
REF NO 0203
DUAL PITCH
OPTION
COMPRESSED
HEAD VEL
ADJ
STANDARD
HEAD VEL
ADJ
UNUSED
N.C.
1 JUMPER J14 IS INSERTED WHEN OPTION 2 IS NOT SELECTED
2 ALL COMPONENTS IN DASHED BOX ARE INSERTED FOR THIS OPTION.
3 ADJUST FOR L→R MOTION VEL. (VIEWING FROM OPERATOR'S SIDE OF MACHINE).
4 ADJUST FOR RAMP DECELL TIME. SYNC FROM TP31.
LOC. 1PC2
CROSS
REF NO. 0203

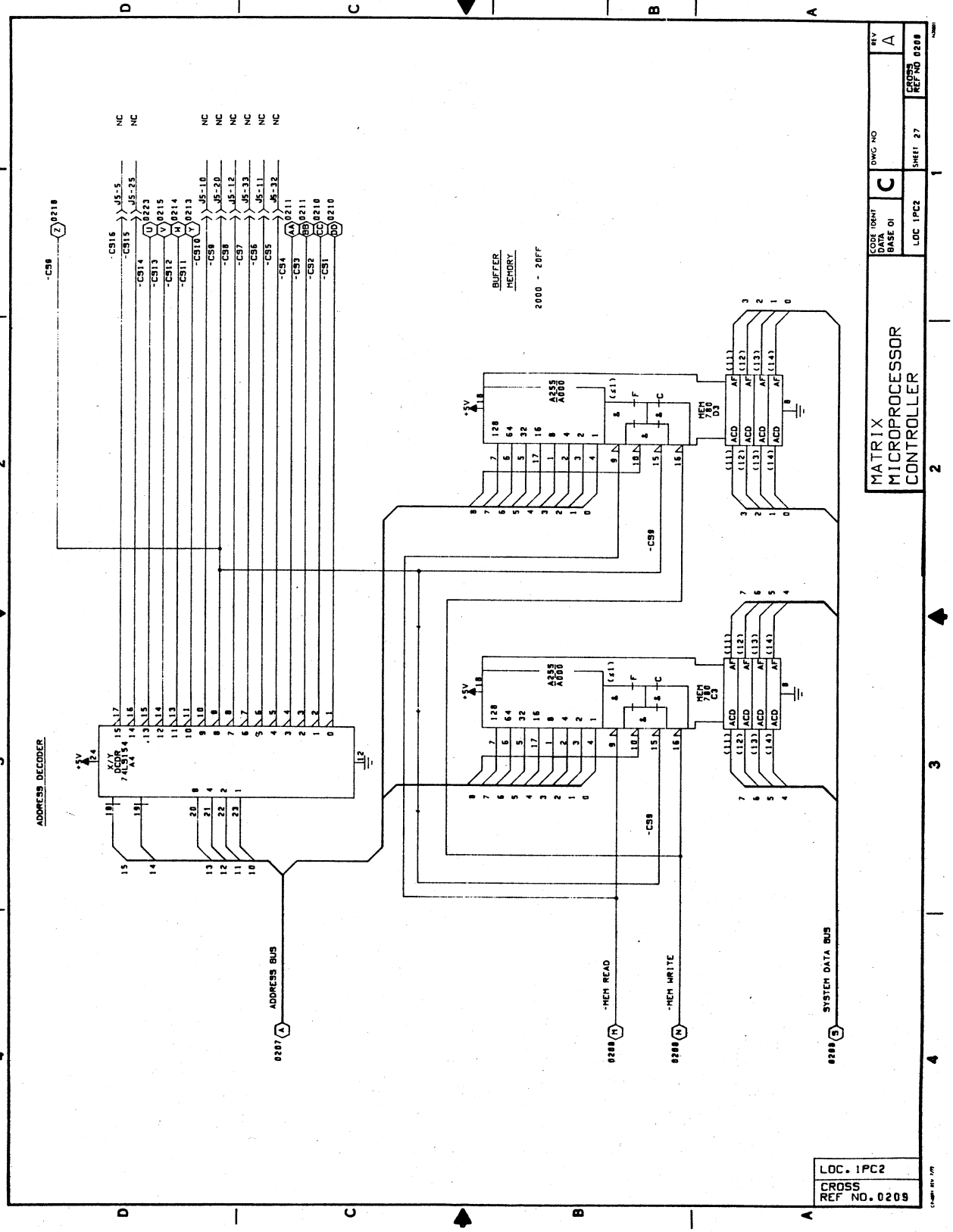

CONTROLLER/HD
LOGIC (HEAD MOTION
LINEAR AMPS)
DATA BASE
A
C
B
LOC. 1PC2
CROSS
REF NO. 0204
R→L , L→R DESIGNATION
IS REFERENCING HEAD DIRECTION
MOTION LOOKING FROM THE
FRONT (OPERATOR'S SIDE) OF
THE MACHINE
R→L
L→R
POWER AMP
ERROR AMP
CURRENT
FEEDBACK AMP
+SERVO INHIBIT
HSD
HVFB
HIFB
RTN
HIFB
0103-1PC1-J2-10
0103-1PC1-J2-9
0103-1PC1-J2-8
0103-1PC1-J2-7
0202
0201
0206
+36V
-36V
+12V
-12V
N.C.

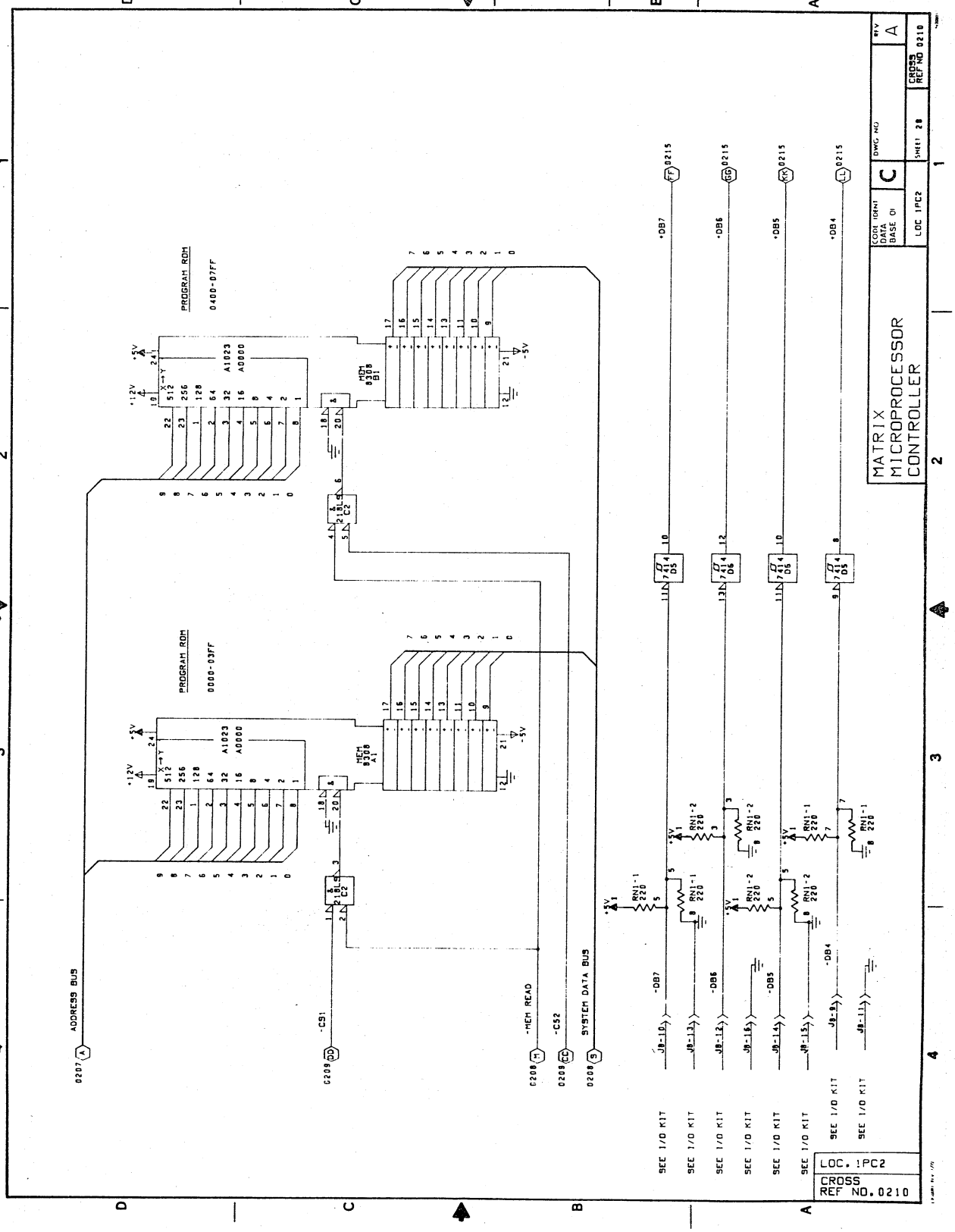

DECEL RAMP
SLEW SPEED ADJUST
BRAKE TORQUE ADJUST
PAPER MOTION REP RATE LIMITER
240 MS.
15 SEC PAPER RUNAWAY OPTION
1 THESE COMPONENTS ARE INSERTED ONLY FOR A SPECIAL FUNCTION OPTION
2 THESE COMPONENTS ARE INSERTED ONLY FOR THE PAPER RUNAWAY OPTION
CONTROLLER/HD LOGIC (PAPER MOTION)
DATA BASE A C
DWG NO
REV A
LOC 1PC2
SHEET 23
CROSS REF NO 0205
CROSS REF NO. 0205
LOC. 1PC2

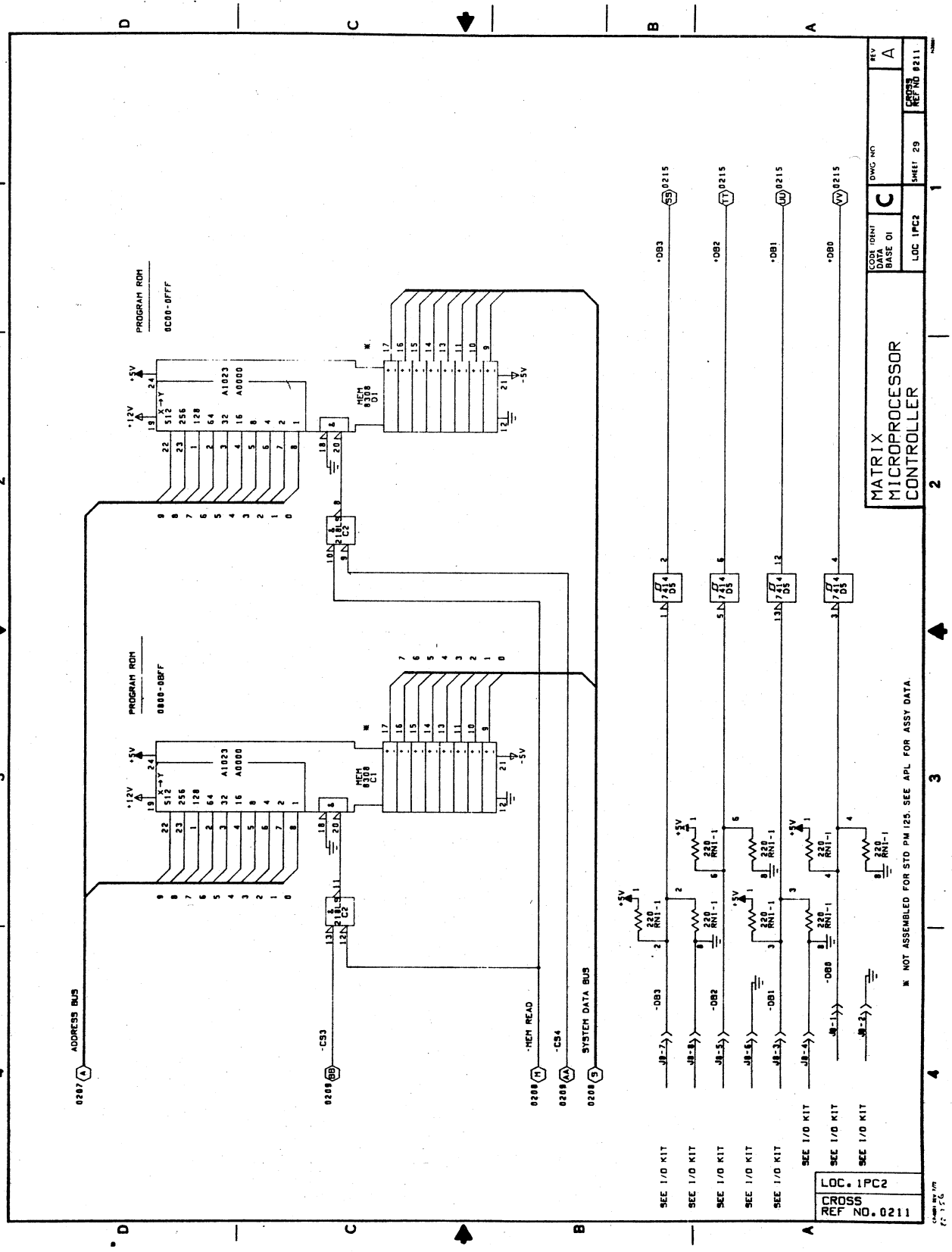

CONTROLLER/HD
LOGIC (PAPER
MOTION)
DATA BASE
A
C
LOC 1PC2
DWG. NO
SHEET 24
CROSS REF NO 0206
REV
A
LOC. 1PC2
CROSS
REF NO. 0206
CURRENT FEEDBACK AMP
ERROR AMP
POWER AMP
GROUND CONNECTED TO J6 & J4 PINS 1,4,10,16,20,22,24

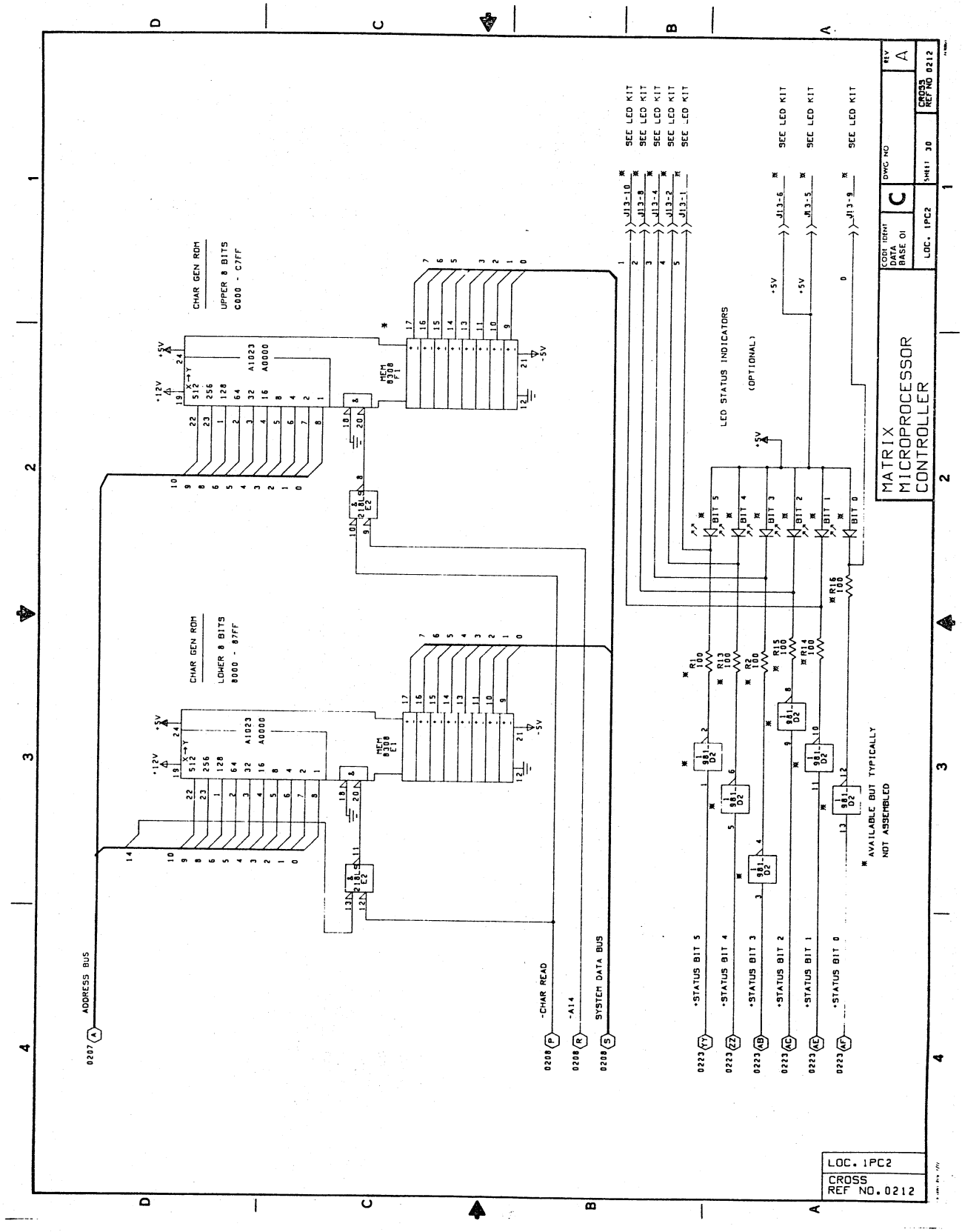

MATRIX
MICROPROCESSOR
CONTROLLER
CODE IDENT DATA BASE 01
DWG NO C
REV A
LOC 1PC2
SHEET 25
CROSS REF NO 0207
LOC. 1PC2
CROSS REF NO. 0207
LSI MICROPROCESSOR
8224 A3
ADDRESS BUS
CPU DATA BUS
BELL
SEE AUDIBLE ALARM KIT
SEE ADAPTER KIT
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED

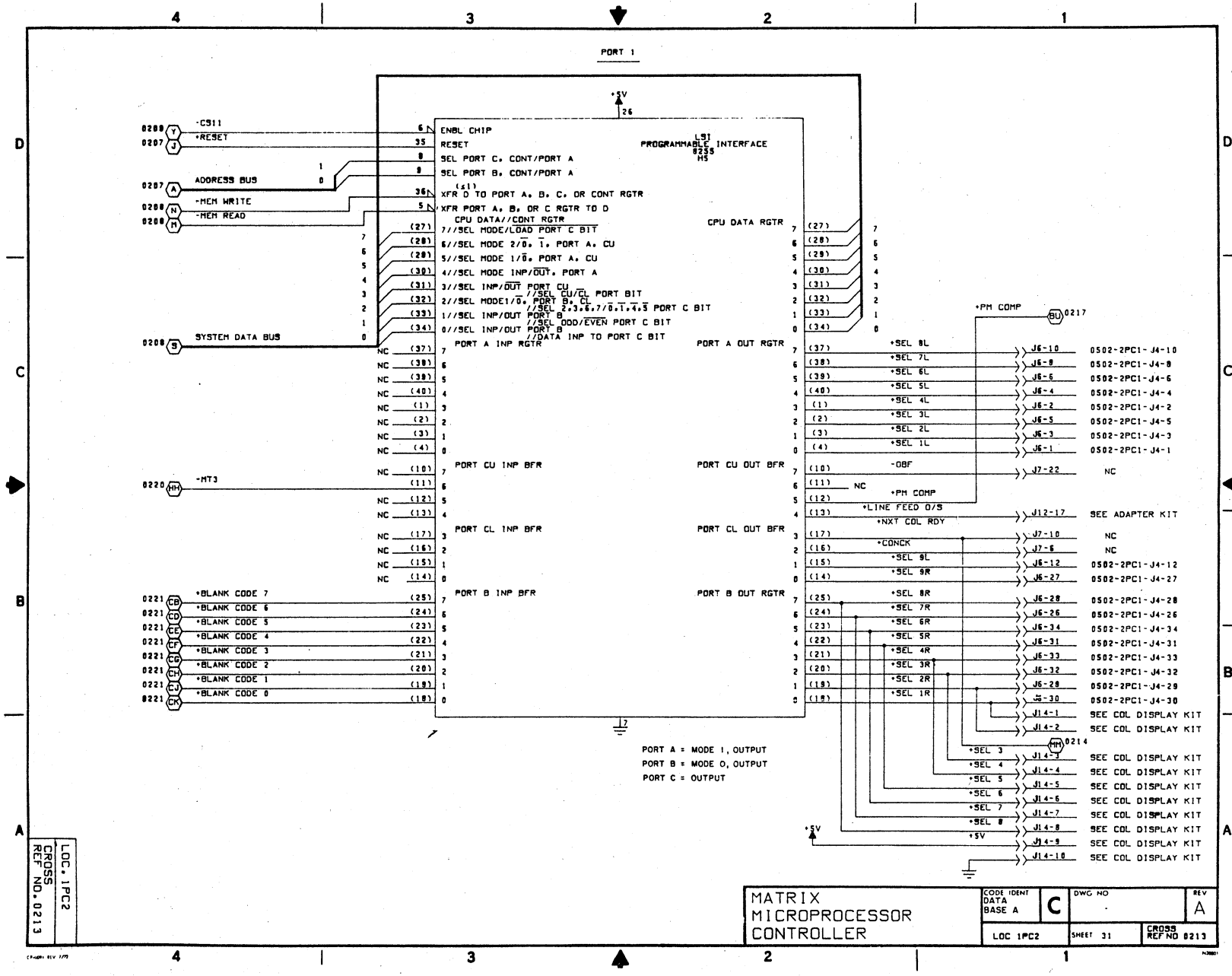

MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0208
LSI SYS CONT/BUS DRVR
0220
B2
LOAD STATUS RGTR
MEM WRITE
HOLD ACK
INP DATA REQ
SEL BUS
STATUS RGTR
MEM READ
MEM WRITE
I/O READ
I/O WRITE
INTRRT ACK
DATA RGTR 7
DATA 7/MEM READ
6/INP CYC
5/FETCH
4/OUT CY
3/HALT ACK
2/STACK
1/WRITE OUT
0/INTRPT ACK
SYS BUS RGTR 7
SYS BUS 7
-MEM WRITE
-MEM READ
-I/O READ
-I/O WRITE
-MEM WRITE
-MEM READ
SYSTEM DATA BUS
-ADV
-MOV R
-MOV L
-CHAR READ
-A14
+12V
R38
1K
-STSTB
-WR
*HLDA
-DBIN
-SEL BUS
CPU DATA BUS
*ADV
*MOV MD R
*MOVE R
*MOVE L
*MOV MD L
ADDRESS BUS
A15
A14
NC

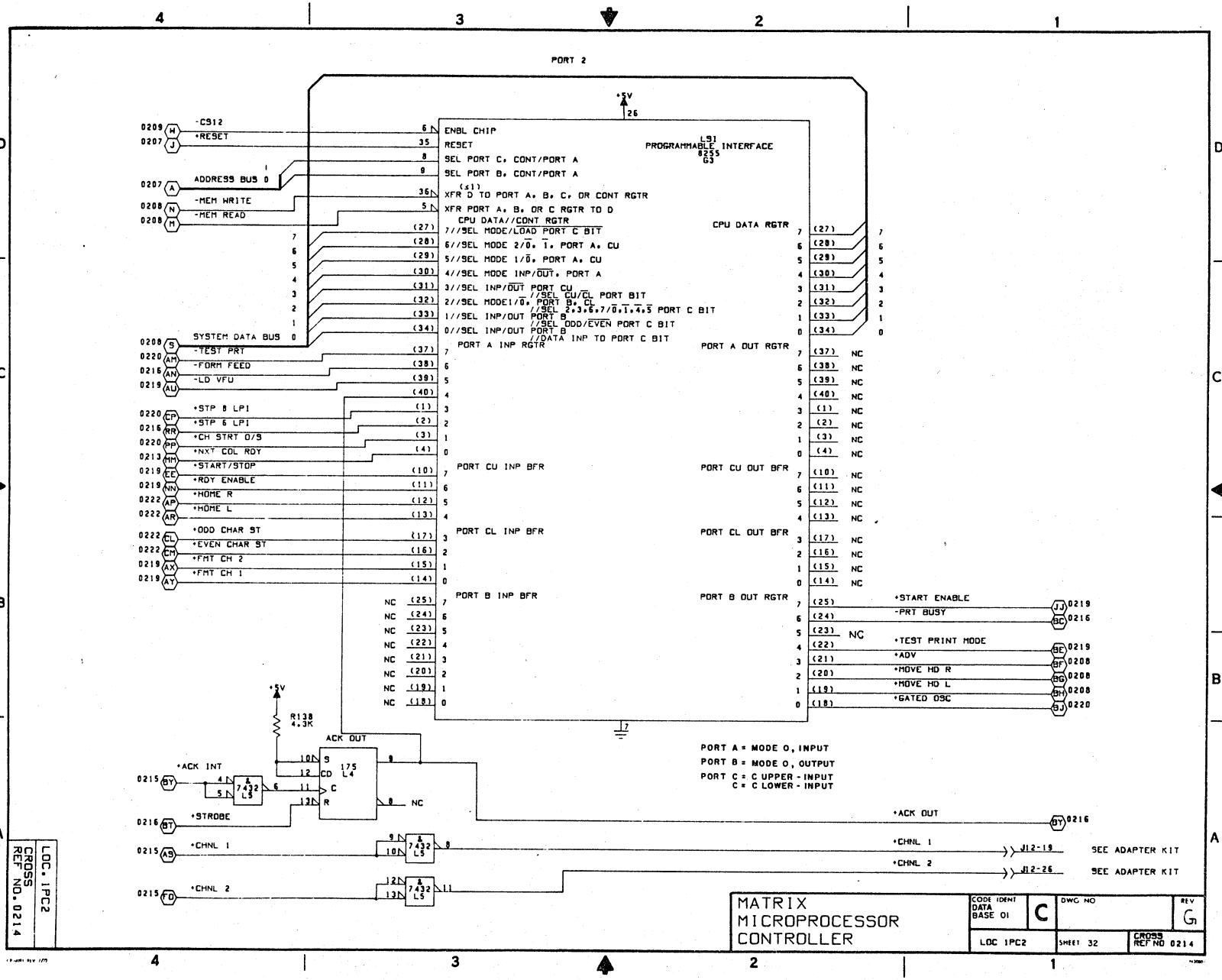

MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0209
ADDRESS DECODER
BUFFER
MEMORY
2000 - 20FF
ADDRESS BUS
-MEM READ
-MEM WRITE
SYSTEM DATA BUS

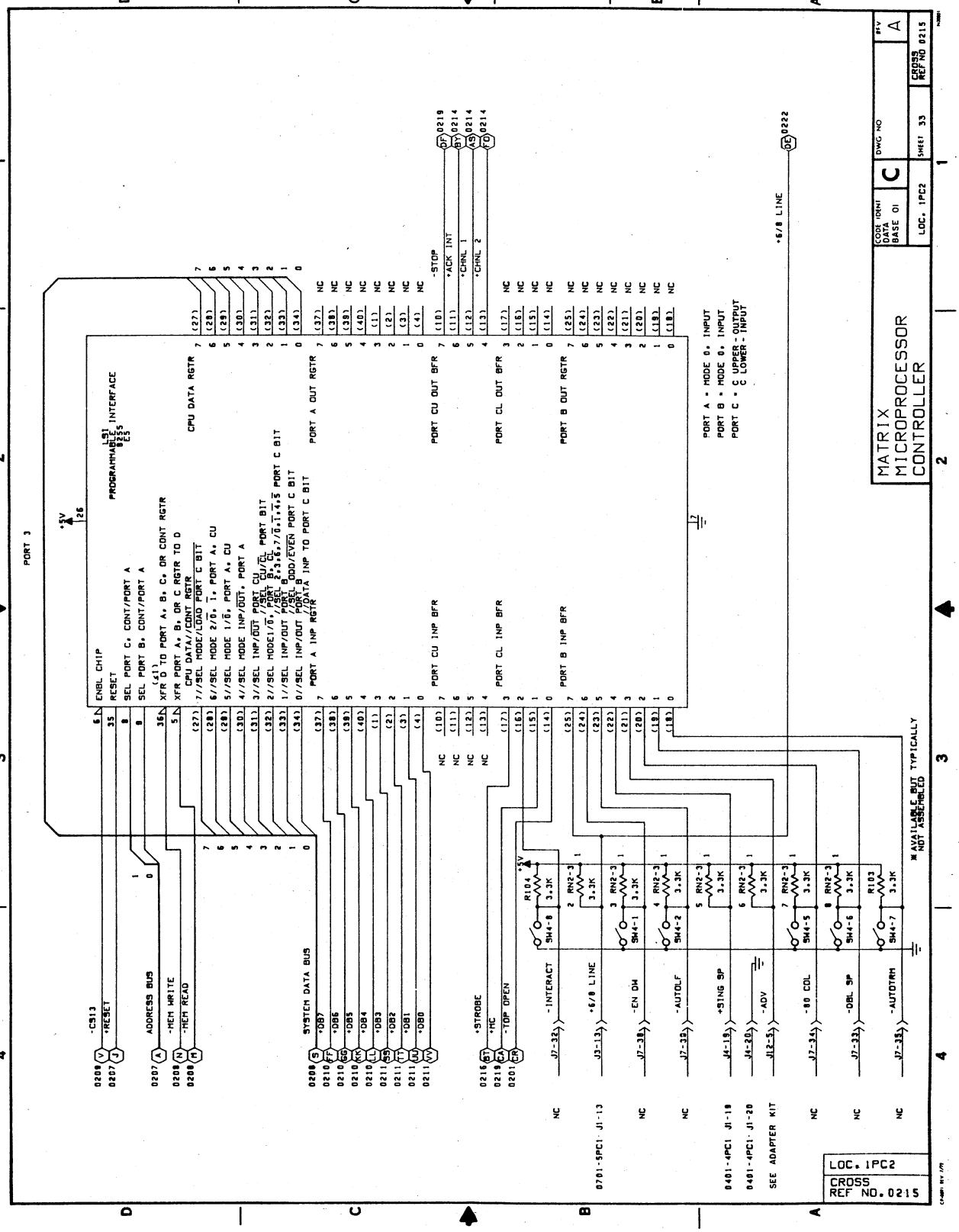

MATRIX
MICROPROCESSOR
CONTROLLER
PROGRAM ROM
0000-03FF
PROGRAM ROM
0400-07FF
ADDRESS BUS
-CS1
-MEM READ
-CS2
SYSTEM DATA BUS
-DB7
-DB6
-DB5
-DB4
SEE I/O KIT
LOC. 1PC2
CROSS
REF NO. 0210

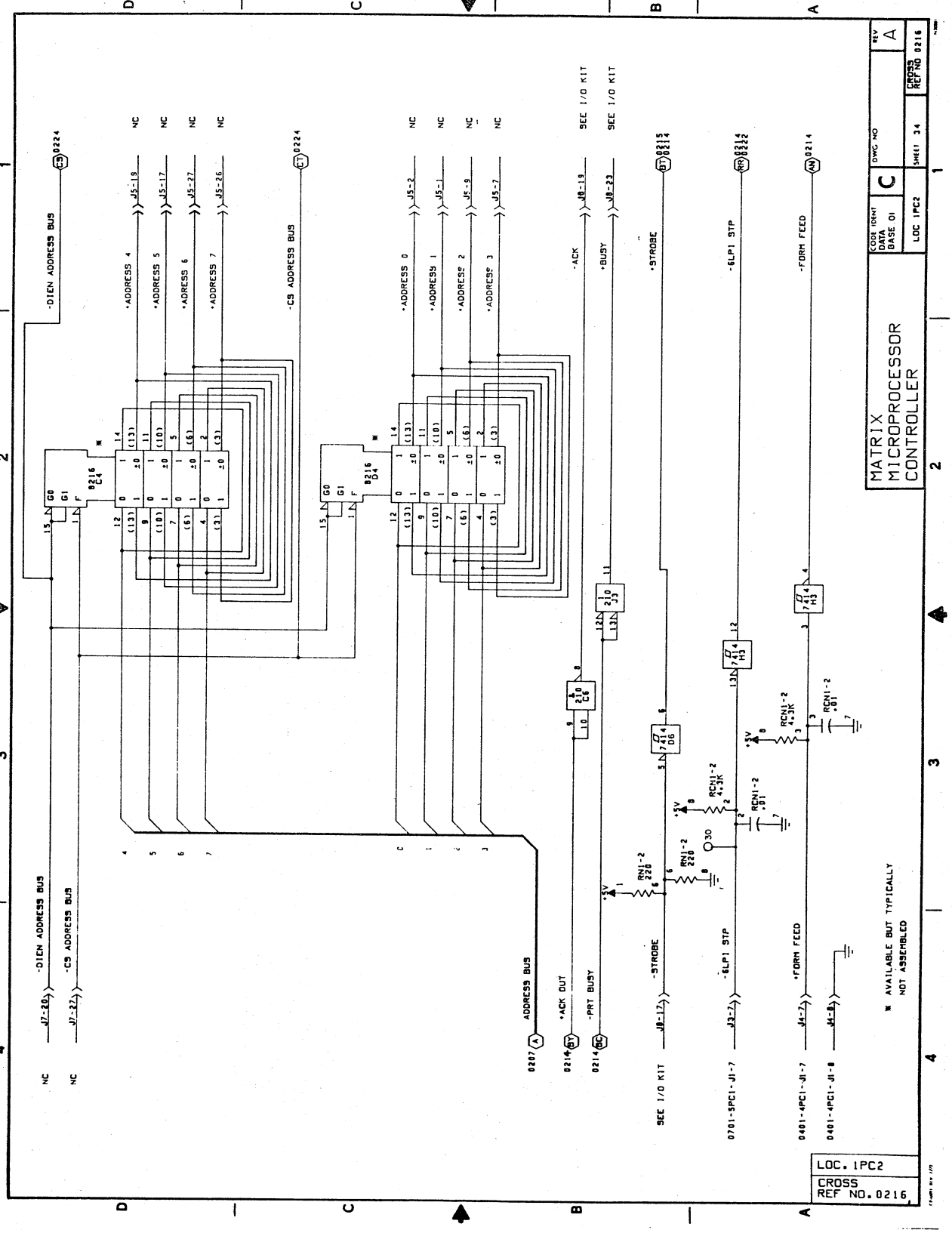

MATRIX
MICROPROCESSOR
CONTROLLER
PROGRAM ROM
0C00-0FFF
PROGRAM ROM
0800-0BFF
ADDRESS BUS
SYSTEM DATA BUS
-MEM READ
-C53
-C54
NOT ASSEMBLED FOR STD PM 125. SEE APL FOR ASSY DATA
SEE I/O KIT
LOC. IPC2
CROSS
REF NO. 0211

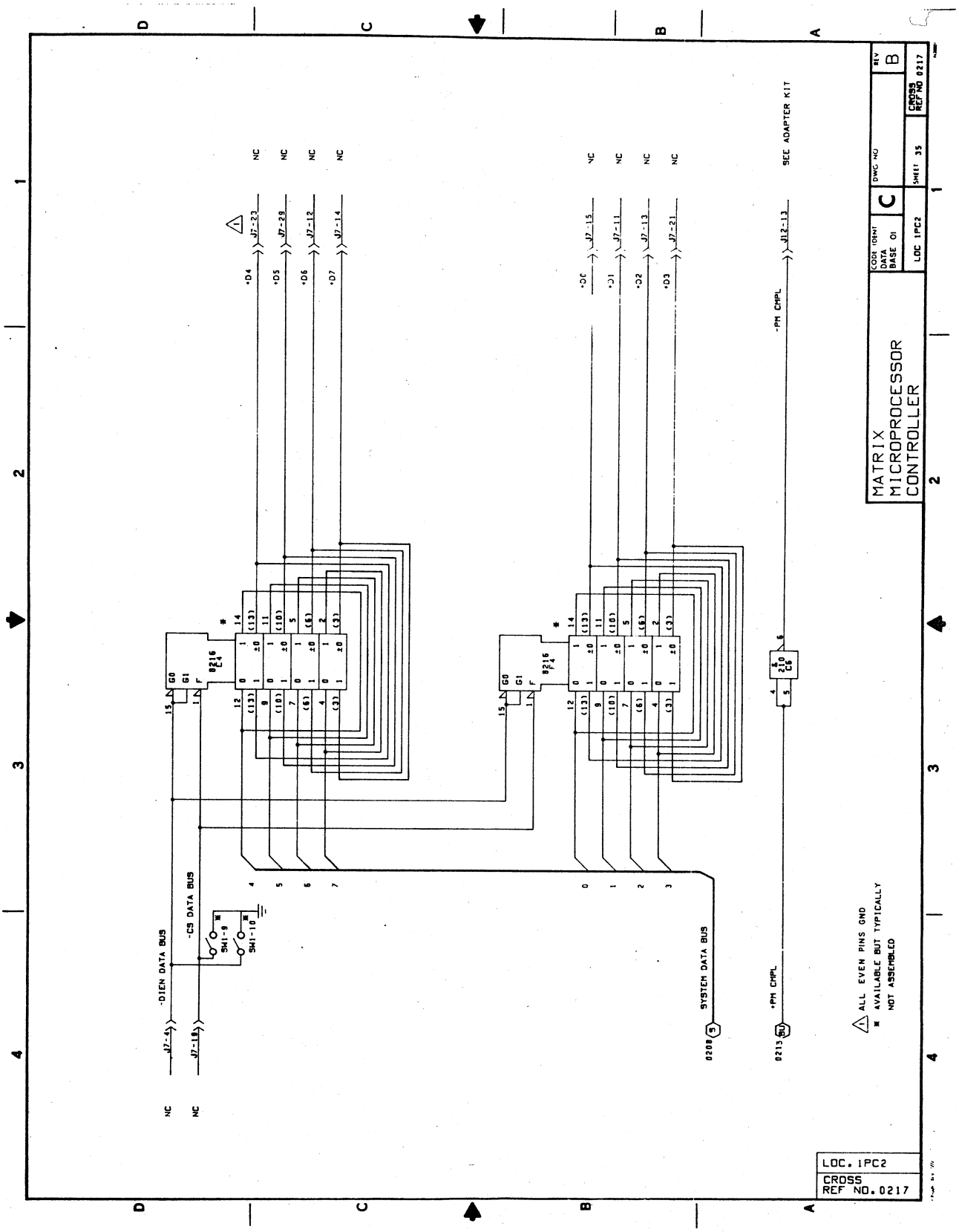

MATRIX
MICROPROCESSOR
CONTROLLER
CODE IDENT
DATA
BASE 01
C
DWG NO
REV
A
LOC. 1PC2
SHEET 30
CROSS
REF NO 0212
CHAR GEN ROM
UPPER 8 BITS
C000 - C7FF
CHAR GEN ROM
LOWER 8 BITS
8000 - 87FF
LED STATUS INDICATORS
(OPTIONAL)
SEE LED KIT
ADDRESS BUS
-CHAR READ
-A14
SYSTEM DATA BUS
*STATUS BIT 5
*STATUS BIT 4
*STATUS BIT 3
*STATUS BIT 2
*STATUS BIT 1
*STATUS BIT 0
* AVAILABLE BUT TYPICALLY
NOT ASSEMBLED
LOC. 1PC2
CROSS
REF NO. 0212

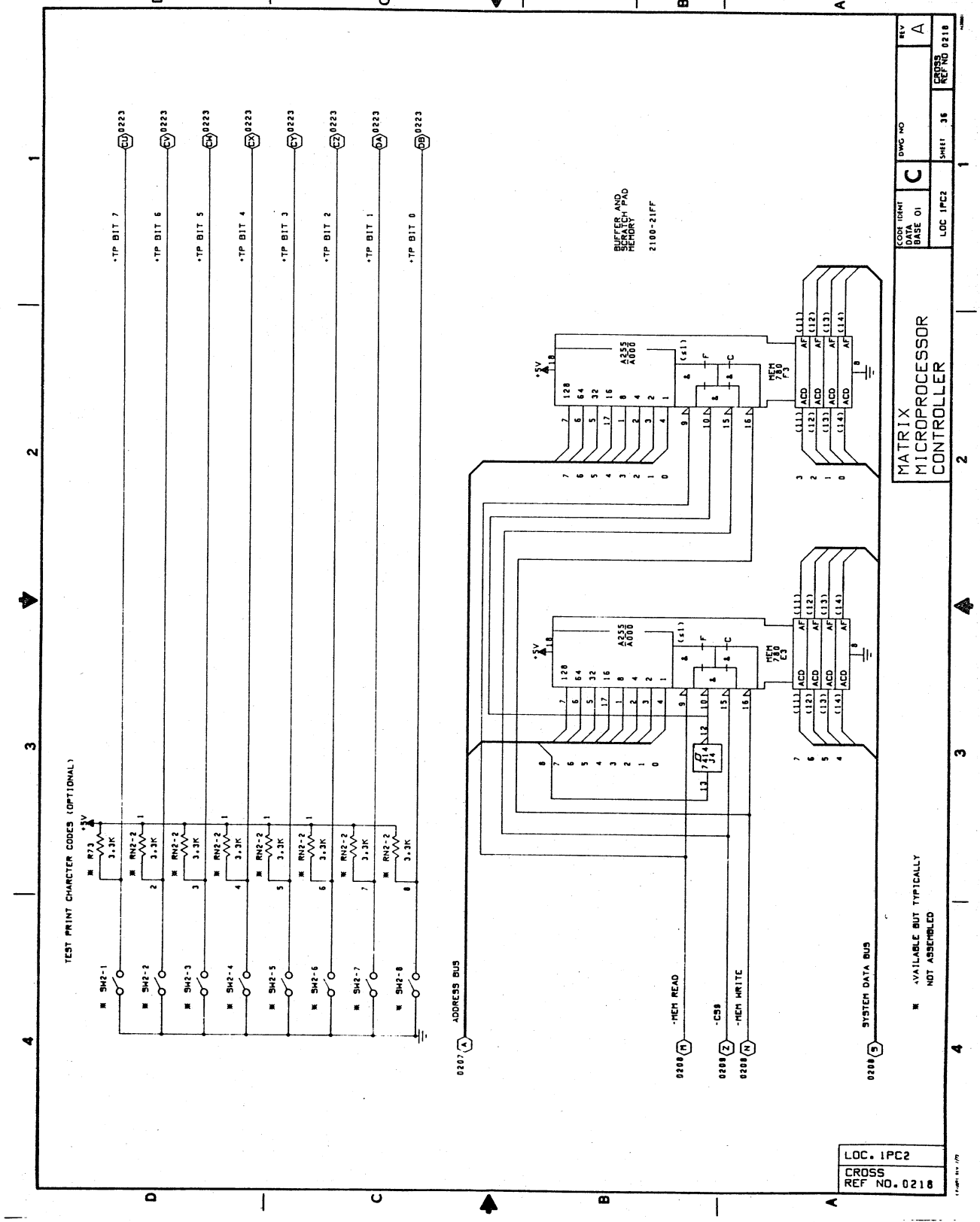

PORT 1
+5V
26
ENBL CHIP
RESET
SEL PORT C, CONT/PORT A
SEL PORT B, CONT/PORT A
XFR D TO PORT A, B, C, OR CONT RGTR
XFR PORT A, B, OR C RGTR TO D
CPU DATA//CONT RGTR
7//SEL MODE/LOAD PORT C BIT
6//SEL MODE 2/0, 1, PORT A, CU
5//SEL MODE 1/0, PORT A, CU
4//SEL MODE INP/OUT, PORT A
3//SEL INP/OUT PORT CU
2//SEL MODE1/0, PORT B, CL
1//SEL INP/OUT PORT B
0//SEL INP/OUT PORT B
PORT A INP RGTR
PORT CU INP BFR
PORT CL INP BFR
PORT B INP BFR
LSI
PROGRAMMABLE INTERFACE
8255
HS
CPU DATA RGTR
PORT A OUT RGTR
PORT CU OUT BFR
PORT CL OUT BFR
PORT B OUT RGTR
-CS11
*RESET
ADDRESS BUS
-MEM WRITE
-MEM READ
SYSTEM DATA BUS
-MT3
*BLANK CODE 7
*BLANK CODE 6
*BLANK CODE 5
*BLANK CODE 4
*BLANK CODE 3
*BLANK CODE 2
*BLANK CODE 1
*BLANK CODE 0
*SEL 8L
*SEL 7L
*SEL 6L
*SEL 5L
*SEL 4L
*SEL 3L
*SEL 2L
*SEL 1L
-OBF
NC
*PM COMP
*LINE FEED O/S
*NXT COL RDY
*CONCK
*SEL 9L
*SEL 9R
*SEL 8R
*SEL 7R
*SEL 6R
*SEL 5R
*SEL 4R
*SEL 3R
*SEL 2R
*SEL 1R
*PM COMP
0217
*SEL 3
*SEL 4
*SEL 5
*SEL 6
*SEL 7
*SEL 8
*5V
0214
J6-10 0502-2PC1-J4-10
J6-8 0502-2PC1-J4-8
J6-6 0502-2PC1-J4-6
J6-4 0502-2PC1-J4-4
J6-2 0502-2PC1-J4-2
J6-5 0502-2PC1-J4-5
J6-3 0502-2PC1-J4-3
J6-1 0502-2PC1-J4-1
J7-22 NC
J12-17 SEE ADAPTER KIT
J7-10 NC
J7-6 NC
J6-12 0502-2PC1-J4-12
J6-27 0502-2PC1-J4-27
J6-28 0502-2PC1-J4-28
J6-26 0502-2PC1-J4-26
J6-34 0502-2PC1-J4-34
J6-31 0502-2PC1-J4-31
J6-33 0502-2PC1-J4-33
J6-32 0502-2PC1-J4-32
J6-29 0502-2PC1-J4-29
J6-30 0502-2PC1-J4-30
J14-1 SEE COL DISPLAY KIT
J14-2 SEE COL DISPLAY KIT
J14-3 SEE COL DISPLAY KIT
J14-4 SEE COL DISPLAY KIT
J14-5 SEE COL DISPLAY KIT
J14-6 SEE COL DISPLAY KIT
J14-7 SEE COL DISPLAY KIT
J14-8 SEE COL DISPLAY KIT
J14-9 SEE COL DISPLAY KIT
J14-10 SEE COL DISPLAY KIT
PORT A = MODE 1, OUTPUT
PORT B = MODE 0, OUTPUT
PORT C = OUTPUT
LOC. 1PC2
CROSS REF NO. 0213
MATRIX
MICROPROCESSOR
CONTROLLER
CODE IDENT DATA BASE A
C
DWG NO
REV A
LOC 1PC2
SHEET 31
CROSS REF NO 0213

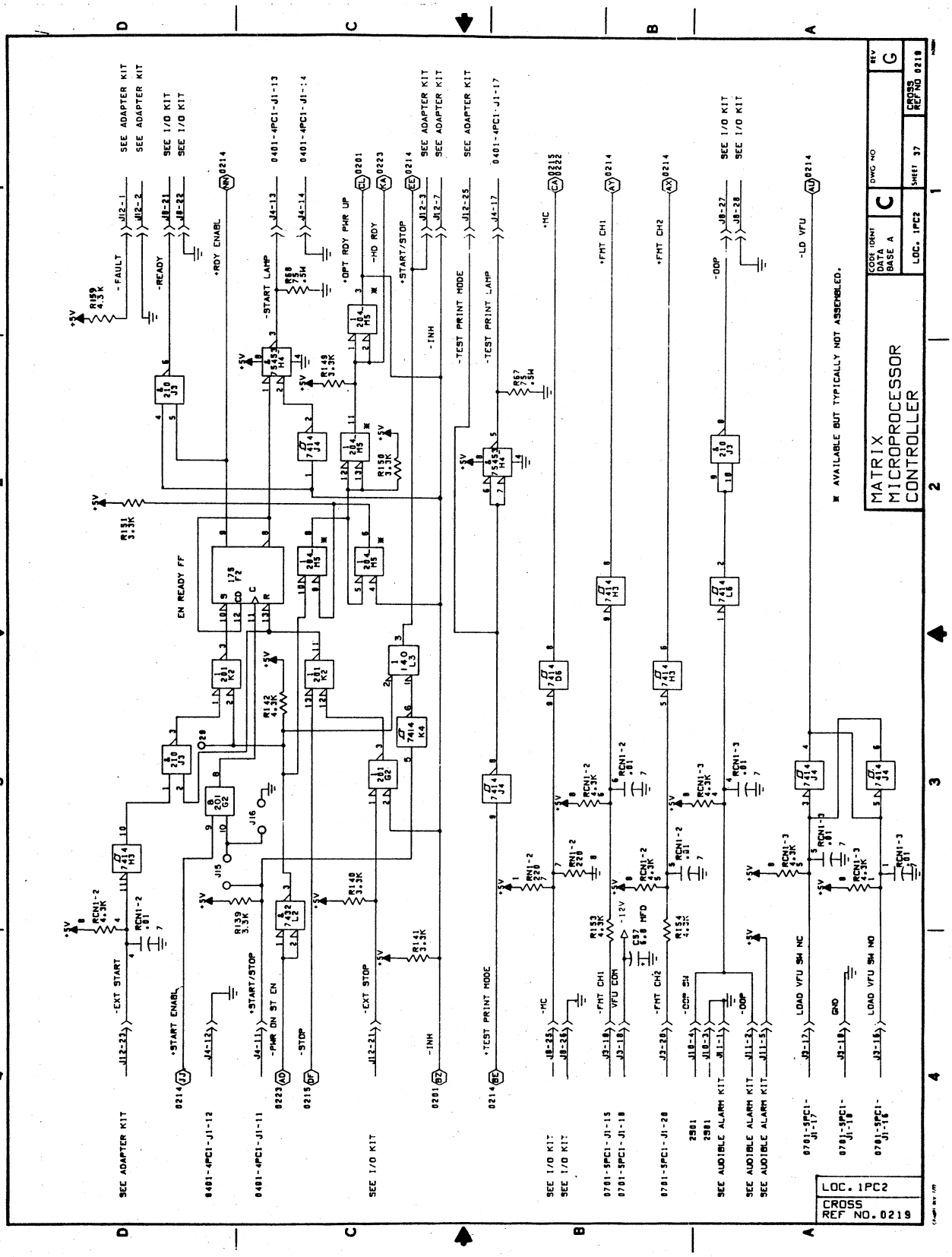

PORT 2
+5V
26
ENBL CHIP
RESET
SEL PORT C, CONT/PORT A
SEL PORT B, CONT/PORT A
XFR D TO PORT A, B, C, OR CONT RGTR
XFR PORT A, B, OR C RGTR TO D
CPU DATA//CONT RGTR
7//SEL MODE/LOAD PORT C BIT
6//SEL MODE 2/0, 1, PORT A, CU
5//SEL MODE 1/0, PORT A, CU
4//SEL MODE INP/OUT, PORT A
3//SEL INP/OUT PORT CU
2//SEL MODE1/0, PORT B, CL
1//SEL INP/OUT PORT B
0//SEL INP/OUT PORT B
PORT A INP RGTR
PORT CU INP BFR
PORT CL INP BFR
PORT B INP BFR
PROGRAMMABLE INTERFACE
8255
G3
CPU DATA RGTR
PORT A OUT RGTR
PORT CU OUT BFR
PORT CL OUT BFR
PORT B OUT RGTR
//SEL CU/CL PORT BIT
//SEL 2,3,6,7/0,1,4,5 PORT C BIT
//SEL ODD/EVEN PORT C BIT
//DATA INP TO PORT C BIT
-CS12
*RESET
ADDRESS BUS 0
-MEM WRITE
-MEM READ
SYSTEM DATA BUS 0
-TEST PRT
-FORM FEED
-LD VFU
*STP B LPI
*STP A LPI
*CH STRT O/S
*NXT COL RDY
*START/STOP
*RDY ENABLE
*HOME R
*HOME L
*ODD CHAR ST
*EVEN CHAR ST
*FMT CH 2
*FMT CH 1
NC
*START ENABLE
-PRT BUSY
*TEST PRINT MODE
*ADV
*MOVE HD R
*MOVE HD L
*GATED OSC
PORT A = MODE 0, INPUT
PORT B = MODE 0, OUTPUT
PORT C = C UPPER - INPUT
C = C LOWER - INPUT
R138
4.3K
ACK OUT
*ACK INT
*STROBE
*CHNL 1
*CHNL 2
*ACK OUT
J12-19
J12-26
SEE ADAPTER KIT
SEE ADAPTER KIT
LOC. 1PC2
CROSS REF NO. 0214
MATRIX
MICROPROCESSOR
CONTROLLER
CODE IDENT DATA BASE 01
C
DWG NO
REV
G
LOC 1PC2
SHEET 32
CROSS REF NO 0214

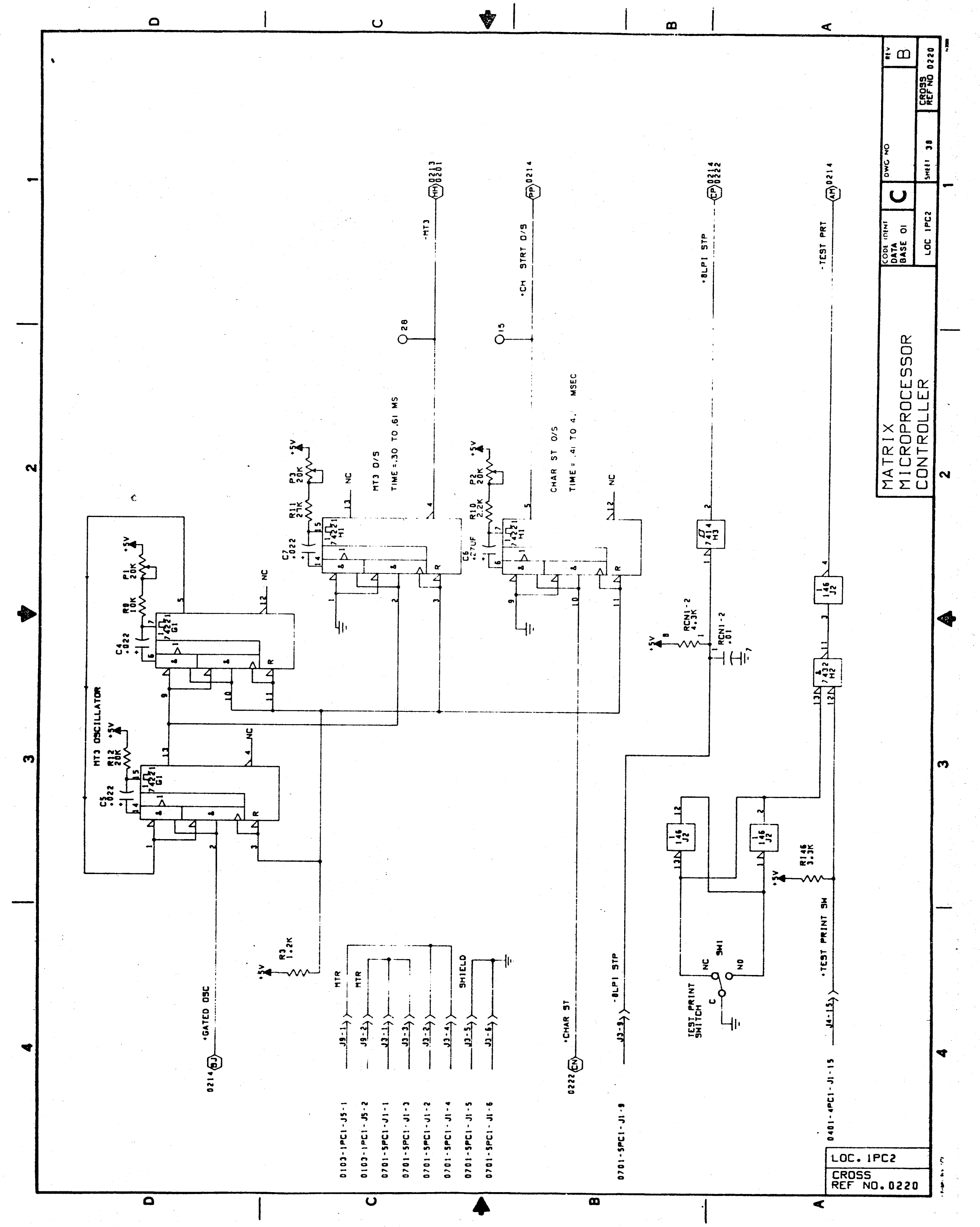

MATRIX
MICROPROCESSOR
CONTROLLER
PORT 3
ENBL CHIP
RESET
SEL PORT C, CONT/PORT A
SEL PORT B, CONT/PORT A
XFR D TO PORT A, B, C, OR CONT RGTR
XFR PORT A, B, OR C RGTR TO D
CPU DATA//CONT RGTR
7//SEL MODE/LOAD PORT C BIT
6//SEL MODE 2/0, 1, PORT A, CU
5//SEL MODE 1/0, PORT A, CU
4//SEL MODE INP/OUT, PORT A
3//SEL INP/OUT PORT CU
2//SEL MODE1/0, /SEL CU/CL PORT BIT
1//SEL INP/OUT PORT B
0//SEL INP/OUT PORT B ODD/EVEN PORT C BIT
PORT A INP RGTR //DATA INP TO PORT C BIT
PROGRAMMABLES INTERFACE
CPU DATA RGTR
PORT A OUT RGTR
PORT CU INP BFR
PORT CU OUT BFR
PORT CL INP BFR
PORT CL OUT BFR
PORT B INP BFR
PORT B OUT RGTR
-STOP
*ACK INT
*CHNL 1
*CHNL 2
PORT A - MODE 0, INPUT
PORT B - MODE 0, INPUT
PORT C - C UPPER - OUTPUT
C LOWER - INPUT
*5V
SYSTEM DATA BUS
ADDRESS BUS
-MEM WRITE
-MEM READ
-C313
*RESET
*STROBE
*MC
-TOP OPEN
-INTERACT
*6/8 LINE
-EN DW
-AUTOLF
+SING SP
-ADV
-80 COL
-DBL SP
-AUTOTRM
SEE ADAPTER KIT
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED
LOC. IPC2
CROSS REF NO. 0215
CODE IDENT DATA BASE 01
C
DWG NO
SHEET 33
REV A

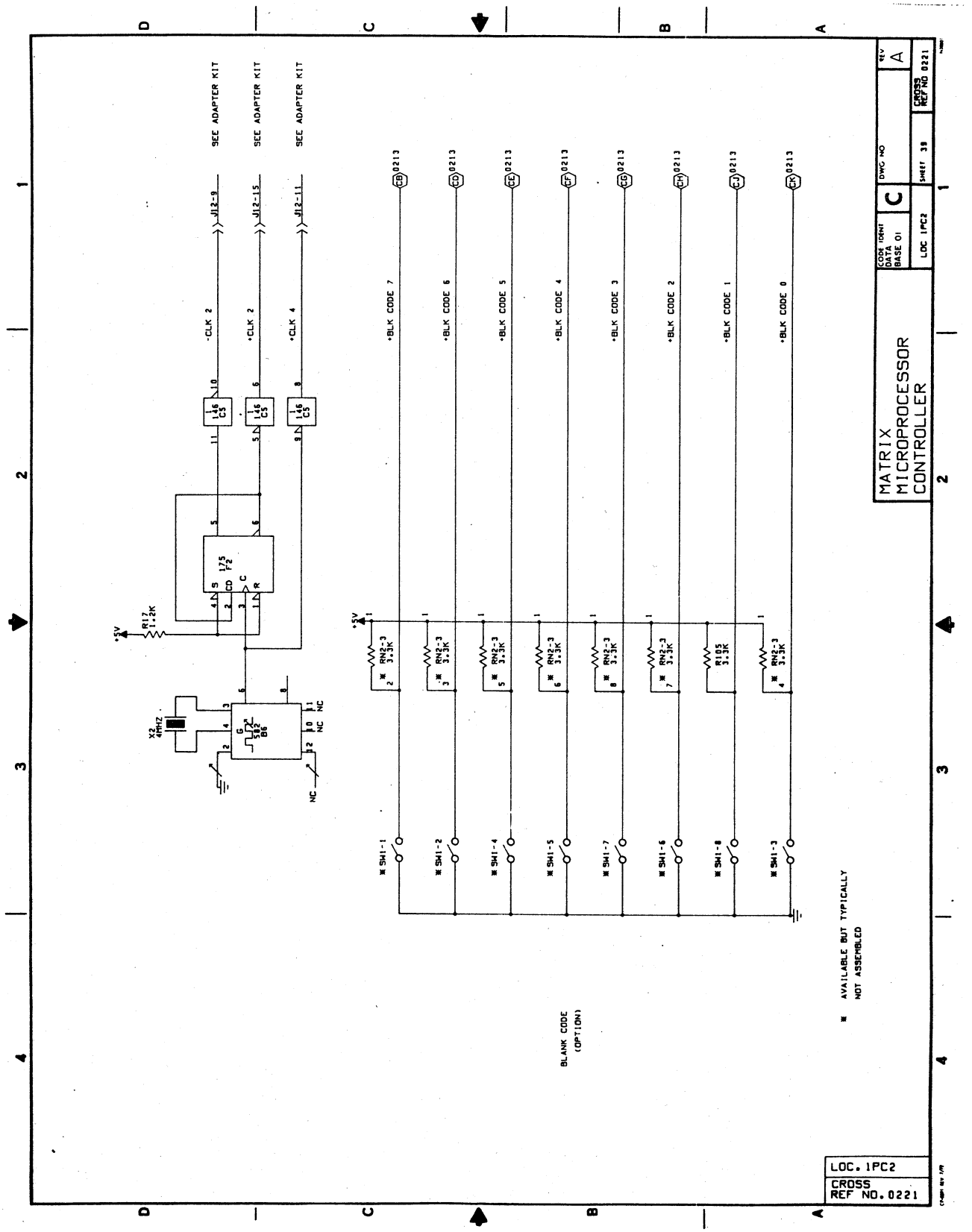

MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0216
-DIEN ADDRESS BUS
-CS ADDRESS BUS
*ADDRESS 4
*ADDRESS 5
*ADDRESS 6
*ADDRESS 7
*ADDRESS 0
*ADDRESS 1
*ADDRESS 2
*ADDRESS 3
-ACK
*BUSY
*STROBE
-SLP1 STP
-FORM FEED
-ACK OUT
-PRT BUSY
ADDRESS BUS
SEE I/O KIT
NC
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED

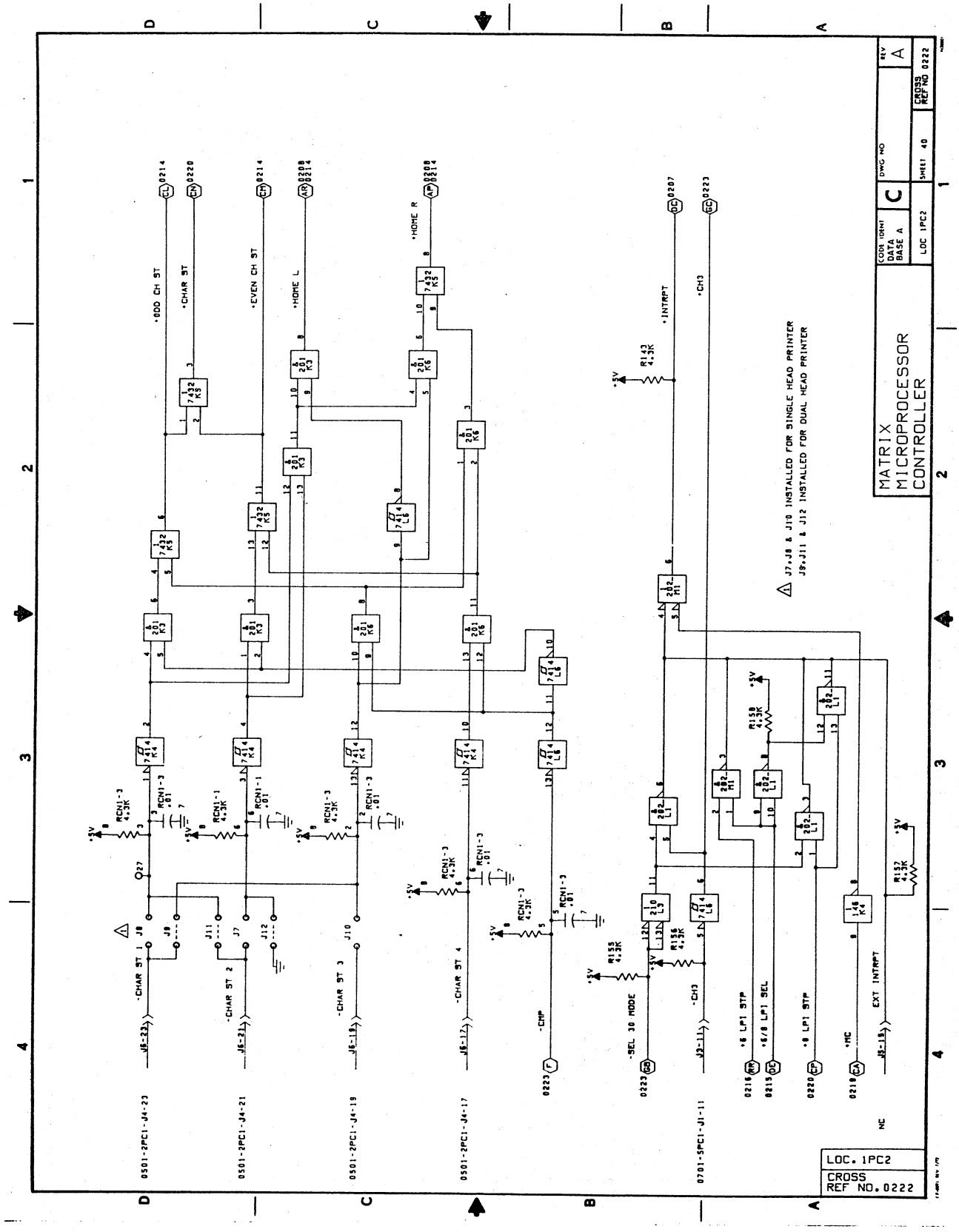

MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0217
SEE ADAPTER KIT
SYSTEM DATA BUS
-DIEN DATA BUS
-CS DATA BUS
-PM CMPL
ALL EVEN PINS GND
AVAILABLE BUT TYPICALLY
NOT ASSEMBLED

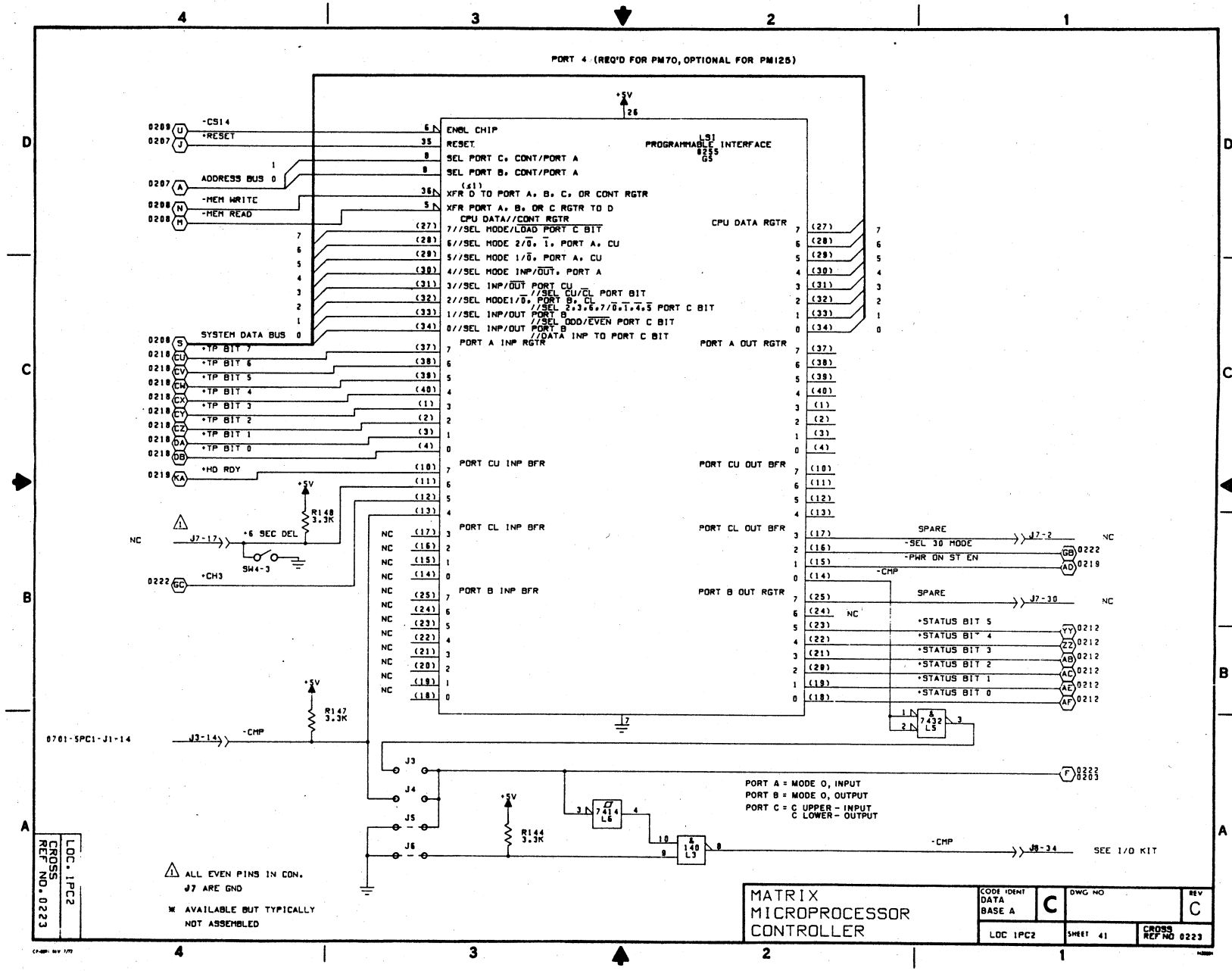

MATRIX
MICROPROCESSOR
CONTROLLER
BUFFER AND
SCRATCH PAD
MEMORY
2100-21FF
TEST PRINT CHARCTER CODES (OPTIONAL)
ADDRESS BUS
SYSTEM DATA BUS
-MEM READ
-CS9
-MEM WRITE
LOC. 1PC2
CROSS
REF NO. 0218

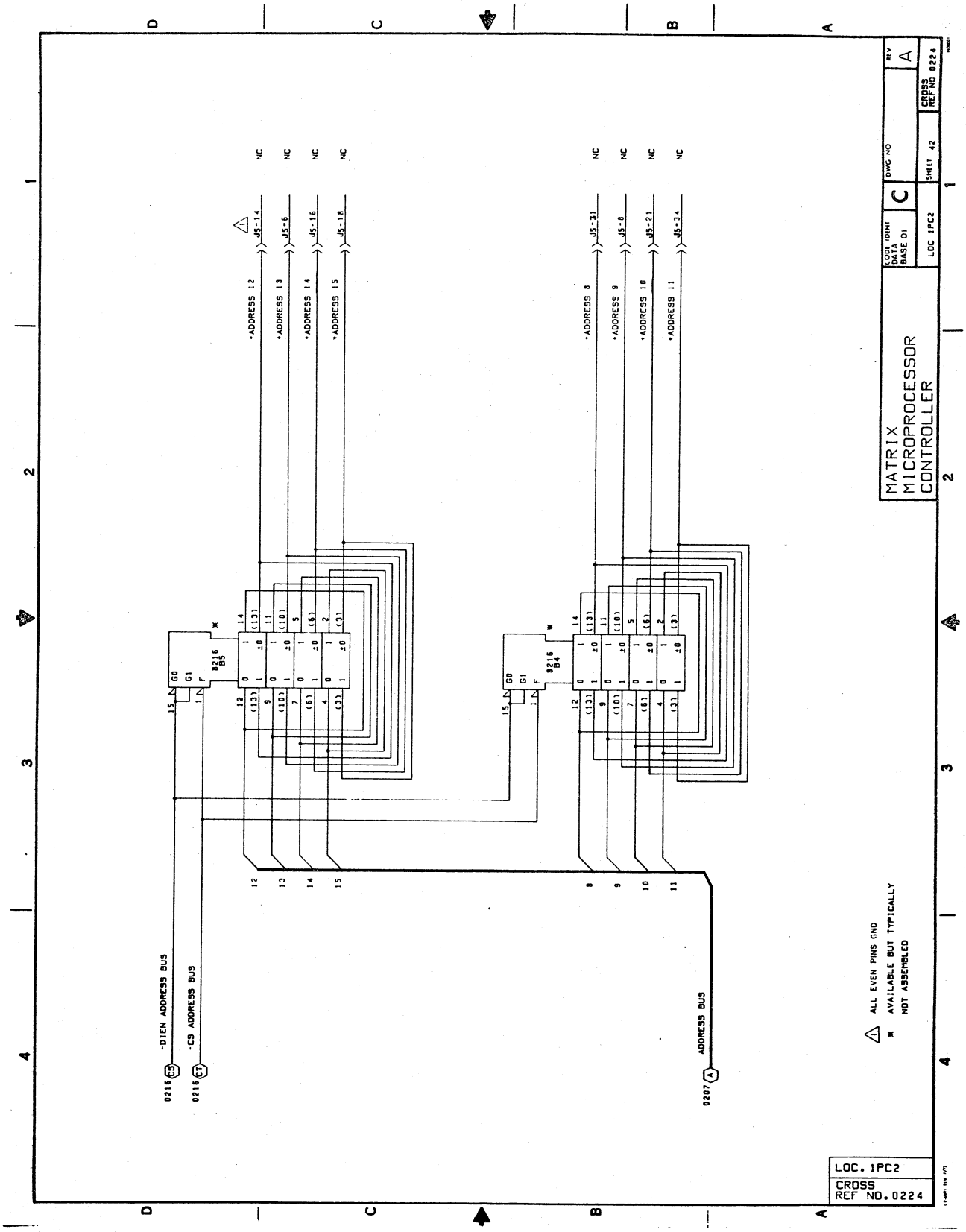

MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0219
* AVAILABLE BUT TYPICALLY NOT ASSEMBLED.


MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0220
MT3 OSCILLATOR
MT3 O/S
TIME=.30 TO .61 MS
CHAR ST O/S
TIME=.41 TO 4. MSEC
-MT3
-CH STRT O/S
-8LPI STP
-TEST PRT
-GATED OSC
-CHAR ST
TEST PRINT SWITCH
-TEST PRINT SW
SHIELD
MTR


MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0221
SEE ADAPTER KIT
SEE ADAPTER KIT
SEE ADAPTER KIT
-CLK 2
+CLK 2
+CLK 4
J12-9
J12-15
J12-11
+5V
R17
1.2K
X2
4MHZ
NC
NC
NC
+BLK CODE 7
+BLK CODE 6
+BLK CODE 5
+BLK CODE 4
+BLK CODE 3
+BLK CODE 2
+BLK CODE 1
+BLK CODE 0
RN2-3
3.3K
R105
3.3K
SW1-1
SW1-2
SW1-4
SW1-5
SW1-7
SW1-6
SW1-8
SW1-3
BLANK CODE
(OPTION)
AVAILABLE BUT TYPICALLY
NOT ASSEMBLED


MATRIX
MICROPROCESSOR
CONTROLLER
LOC. 1PC2
CROSS
REF NO. 0222
J7, J8 & J10 INSTALLED FOR SINGLE HEAD PRINTER
J9, J11 & J12 INSTALLED FOR DUAL HEAD PRINTER
*ODD CH ST
*CHAR ST
*EVEN CH ST
*HOME L
*HOME R
*INTRPT
*CH3
*CHAR ST 1
*CHAR ST 2
*CHAR ST 3
*CHAR ST 4
*CMP
-SEL 30 MODE
*6 LPI STP
*6/8 LPI SEL
*8 LPI STP
*MC
EXT INTRPT
NC


PORT 4 (REQ'D FOR PM70, OPTIONAL FOR PM125)
LSI PROGRAMMABLE INTERFACE 8255 G5
ENBL CHIP
RESET
SEL PORT C, CONT/PORT A
SEL PORT B, CONT/PORT A
XFR D TO PORT A, B, C, OR CONT RGTR
XFR PORT A, B, OR C RGTR TO D
CPU DATA//CONT RGTR
7//SEL MODE/LOAD PORT C BIT
6//SEL MODE 2/0, 1, PORT A, CU
5//SEL MODE 1/0, PORT A, CU
4//SEL MODE INP/OUT, PORT A
3//SEL INP/OUT PORT CU
2//SEL MODE1/0, PORT B, CL
1//SEL INP/OUT PORT B
0//SEL INP/OUT PORT B
PORT A INP RGTR
PORT CU INP BFR
PORT CL INP BFR
PORT B INP BFR
CPU DATA RGTR
PORT A OUT RGTR
PORT CU OUT BFR
PORT CL OUT BFR
PORT B OUT RGTR
-CS14
*RESET
ADDRESS BUS 0
-MEM WRITE
-MEM READ
SYSTEM DATA BUS 0
*TP BIT 7
*TP BIT 6
*TP BIT 5
*TP BIT 4
*TP BIT 3
*TP BIT 2
*TP BIT 1
*TP BIT 0
*HD RDY
*6 SEC DEL
*CH3
R148 3.3K
R147 3.3K
R144 3.3K
SW4-3
J7-17
0701-SPC1-J1-14
J3-14
-CMP
SPARE
-SEL 30 MODE
-PWR ON ST EN
*STATUS BIT 5
*STATUS BIT 4
*STATUS BIT 3
*STATUS BIT 2
*STATUS BIT 1
*STATUS BIT 0
J7-2
J7-30
J9-34
SEE I/O KIT
PORT A = MODE 0, INPUT
PORT B = MODE 0, OUTPUT
PORT C = C UPPER - INPUT
C LOWER - OUTPUT
ALL EVEN PINS IN CON. J7 ARE GND
AVAILABLE BUT TYPICALLY NOT ASSEMBLED
MATRIX MICROPROCESSOR CONTROLLER
CODE IDENT DATA BASE A
DWG NO
REV C
LOC 1PC2
SHEET 41
CROSS REF NO 0223
CROSS REF NO.-0223
LOC.-1PC2


MATRIX
MICROPROCESSOR
CONTROLLER
CODE IDENT
DATA
BASE 01
C
DWG NO
REV
A
LOC 1PC2
SHEET 42
CROSS
REF NO 0224
*ADDRESS 12
*ADDRESS 13
*ADDRESS 14
*ADDRESS 15
*ADDRESS 8
*ADDRESS 9
*ADDRESS 10
*ADDRESS 11
J5-14
J5-6
J5-16
J5-18
J5-31
J5-8
J5-21
J5-34
NC
8216
B5
8216
B4
-DIEN ADDRESS BUS
-CS ADDRESS BUS
ADDRESS BUS
0216
0207
ALL EVEN PINS GND
AVAILABLE BUT TYPICALLY
NOT ASSEMBLED
LOC. 1PC2
CROSS
REF NO. 0224

LOCATION

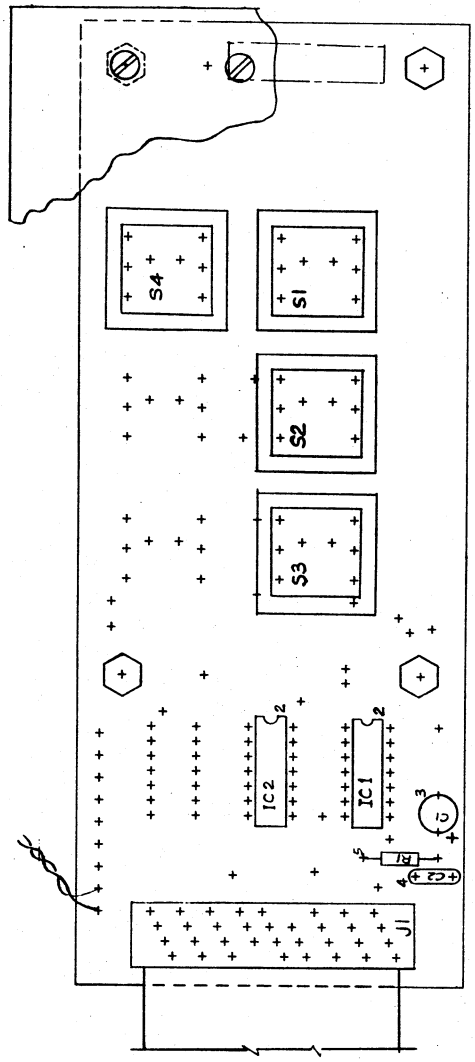
4PC1

CONTROL PANEL BOARD

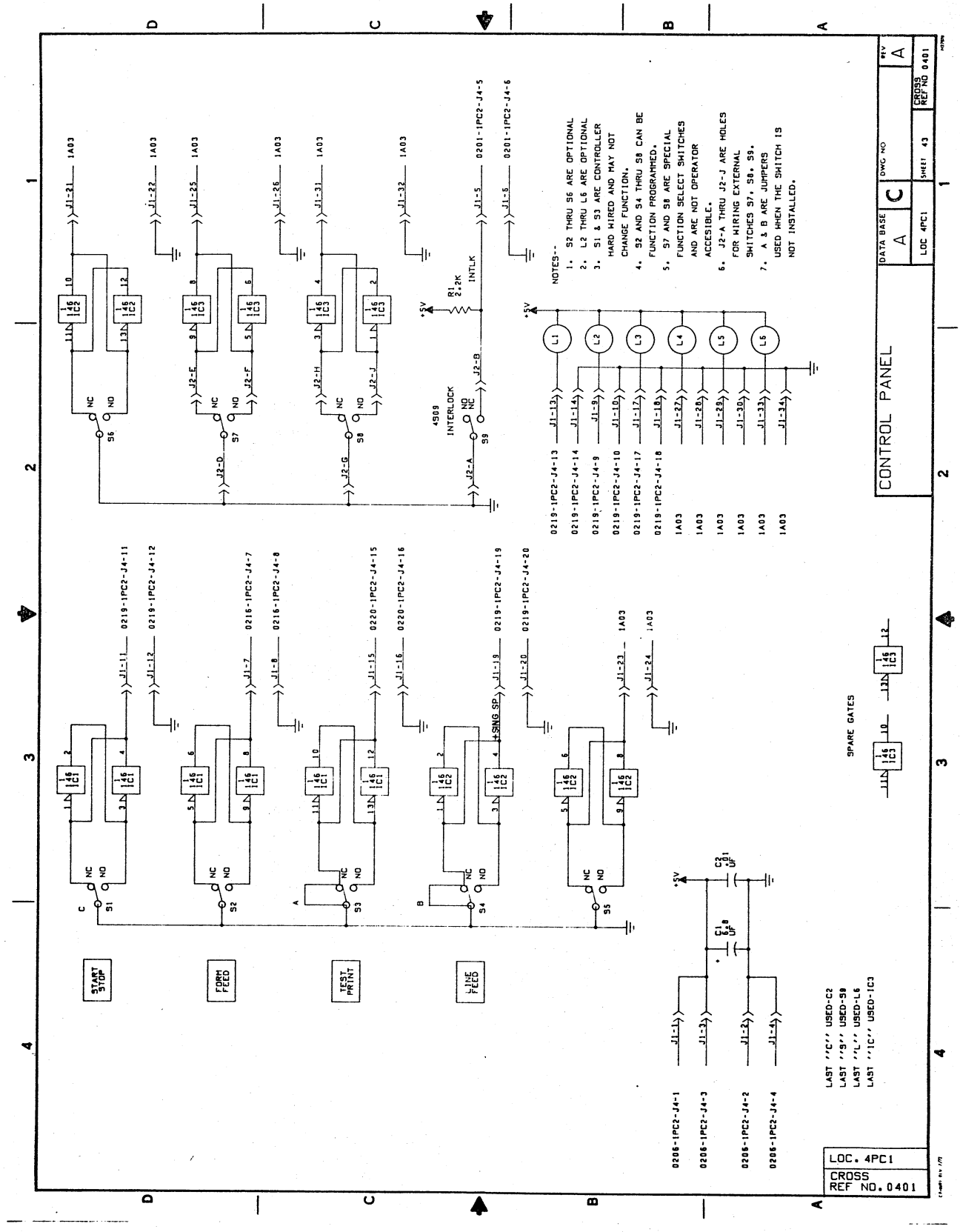
BOARD NUMBER
See Chart Below

PAGE NO.
9-20 A-B/C

4PC1 CONTROL PANEL ASSY	SWITCHES AND LAMPS											
	S1	L1	S2	L2	S3	L3	S4	L4	S5	L5	S6	L6
95440400	START STOP	X	FORM FEED	-	-	-	-	-	-	-	-	-
95440401	START STOP	X	FORM FEED	-	-	-	SINGLE SPACE	-	-	-	-	-
95440402	START STOP	X	FORM FEED	-	TEST PRINT	X	SINGLE SPACE	-	-	-	-	-
95440403	START STOP	X	FORM FEED	-	TEST PRINT	X	—	-	-	-	-	-



CONTROL PANEL BOARD 95440400/01/02 and 03


CONTROL PANEL
LOC. 4PC1
CROSS REF NO. 0401
NOTES--
1. S2 THRU S6 ARE OPTIONAL
2. L2 THRU L6 ARE OPTIONAL
3. S1 & S3 ARE CONTROLLER HARD WIRED AND MAY NOT CHANGE FUNCTION.
4. S2 AND S4 THRU S8 CAN BE FUNCTION PROGRAMMED.
5. S7 AND S8 ARE SPECIAL FUNCTION SELECT SWITCHES AND ARE NOT OPERATOR ACCESIBLE.
6. J2-A THRU J2-J ARE HOLES FOR WIRING EXTERNAL SWITCHES S7, S8, S9.
7. A & B ARE JUMPERS USED WHEN THE SWITCH IS NOT INSTALLED.
START STOP
FORM FEED
TEST PRINT
LINE FEED
INTERLOCK
SPARE GATES
LAST "C" USED-C2
LAST "G" USED-S8
LAST "L" USED-L6
LAST "IC" USED-IC3

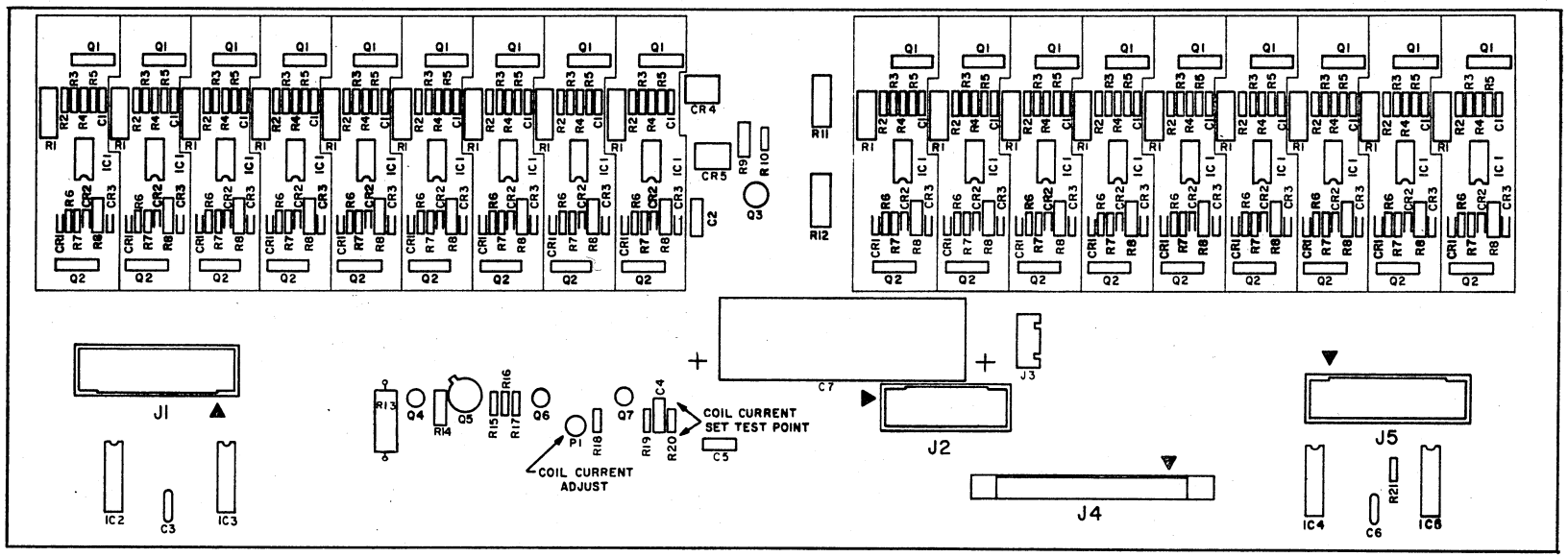
LOCATION

2PC1

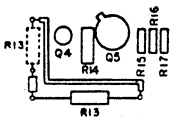
NEEDLE DRIVER BOARD

BOARD NUMBER	PAGE NO.
See Chart Below	9-22 A-C

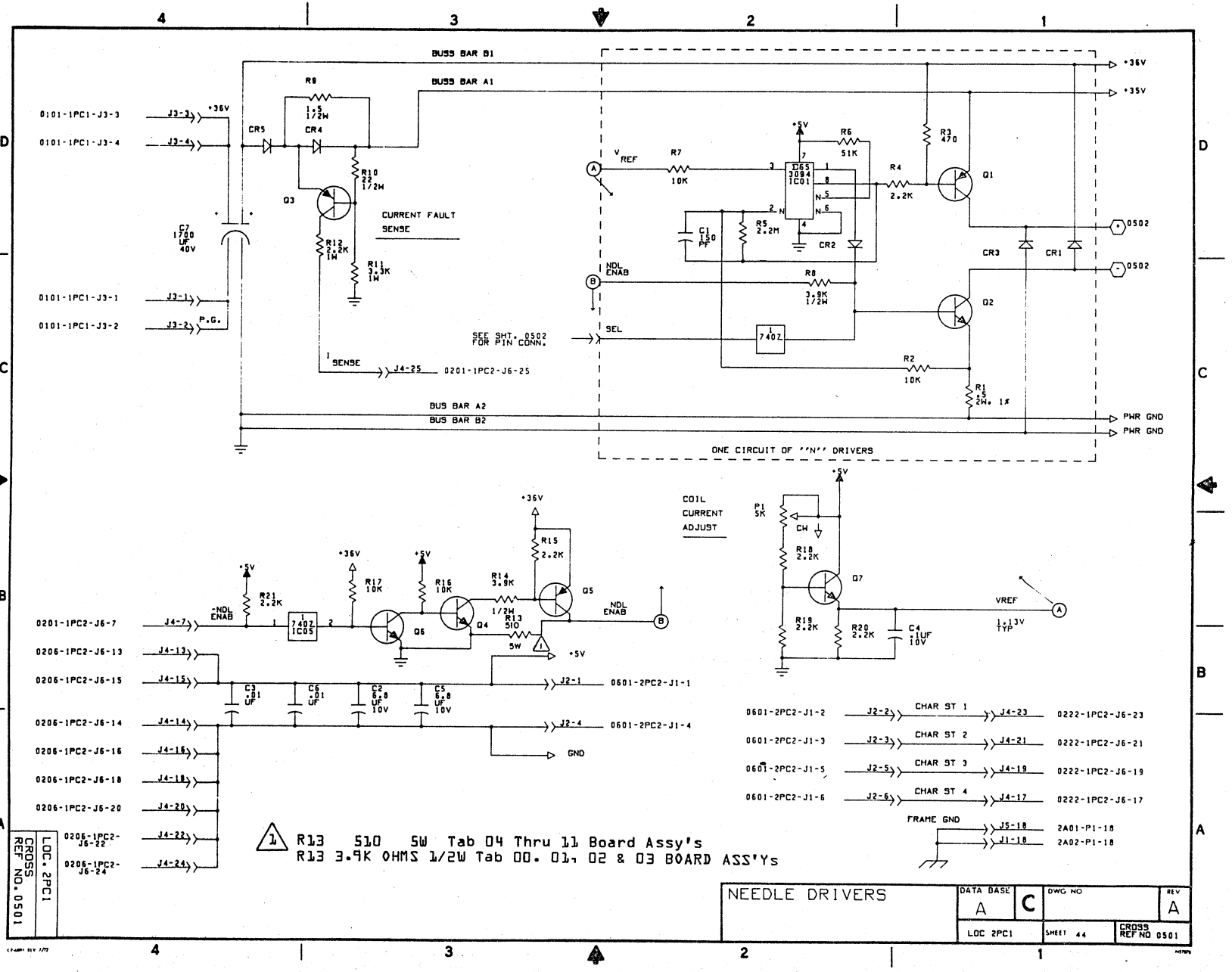
2PC1 NEEDLE DRIVER ASSY	MODEL
9542020/04/08	PM 70 - 7 WIRE
9542020/05/09	PM 125 - 7 WIRE
9542020/06/10	PM 70 - 9 WIRE
9542020/07/11	PM 125 - 9 WIRE



Tabs 00 Thru 03 dotted lines



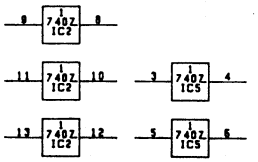
NEEDLE DRIVER BOARD 95420200/-1/02/03/04/05/06/07/08/09/10/11


BUSS BAR B1
BUSS BAR A1
BUS BAR A2
BUS BAR B2
+36V
+35V
PWR GND
PWR GND
0502
0502
ONE CIRCUIT OF "N" DRIVERS
CURRENT FAULT SENSE
SEE SHT. 0502 FOR PIN CONN.
NDL ENAB
SEL
SENSE
J4-25
0201-1PC2-J6-25
0101-1PC1-J3-3
0101-1PC1-J3-4
0101-1PC1-J3-1
0101-1PC1-J3-2
P.G.
R8
1.5 1/2W
CR5
CR4
R10 22 1/2W
Q3
C7 1700 UF 40V
R12 2.2K 1W
R11 3.3K 1W
R7 10K
R6 51K
R3 470
R4 2.2K
Q1
C1 150 PF
R5 2.2M
CR2
CR3
CR1
R8 3.9K 1/2W
Q2
R2 10K
R1 5.0 2W, 1%
0201-1PC2-J6-7
0206-1PC2-J6-13
0206-1PC2-J6-15
0206-1PC2-J6-14
0206-1PC2-J6-16
0206-1PC2-J6-18
0206-1PC2-J6-20
0206-1PC2-J6-22
0206-1PC2-J6-24
R21 2.2K
R17 10K
R16 10K
R14 3.9K 1/2W
R15 2.2K
R13 510 5W
Q4
Q5
Q6
C3 .01 UF
C6 .01 UF
C2 6.8 UF 10V
C5 6.8 UF 10V
0601-2PC2-J1-1
0601-2PC2-J1-4
GND
COIL CURRENT ADJUST
P1 5K
CW
R18 2.2K
Q7
R19 2.2K
R20 2.2K
C4 1UF 10V
VREF
1.13V TYP
0601-2PC2-J1-2
0601-2PC2-J1-3
0601-2PC2-J1-5
0601-2PC2-J1-6
CHAR ST 1
CHAR ST 2
CHAR ST 3
CHAR ST 4
0222-1PC2-J6-23
0222-1PC2-J6-21
0222-1PC2-J6-19
0222-1PC2-J6-17
FRAME GND
2A01-P1-18
2A02-P1-18
1 R13 510 5W Tab 04 Thru 11 Board Assy's
R13 3.9K OHMS 1/2W Tab 00, 01, 02 & 03 BOARD ASS'Ys
CROSS REF NO. 0501
LOC. 2PC1
NEEDLE DRIVERS
DATA BASE A
C
DWG NO
REV A
LOC 2PC1
SHEET 44
CROSS REF NO 0501

OFF SHEET REFERENCES	DATA INPUT CONN. J4	FUNCTION	I.C. GATE			DRIVER COIL OUTPUT		
			IDENT	INPUT	OUTPUT	CONN	+PIN	-PIN
0213-1PC2-P6-30	30	SELECT 1R	IC3	5	6	J1	13	12
0213-1PC2-P6-29	29	SELECT 2R	IC3	3	4	J1	5	4
0213-1PC2-P6-32	32	SELECT 3R	IC3	1	2	J1	11	10
0213-1PC2-P6-33	33	SELECT 4R	IC3	9	8	J1	3	2
0213-1PC2-P6-31	31	SELECT 5R	IC3	11	10	J1	9	8
0213-1PC2-P6-34	34	SELECT 6R	IC3	13	12	J1	24	23
0213-1PC2-P6-26	26	SELECT 7R	IC2	5	6	J1	7	6
0213-1PC2-P6-28	28	SELECT 8R	IC2	3	4	J1	22	21
0213-1PC2-P6-27	27	SELECT 9R	IC2	1	2	J1	20	19
0213-1PC2-P6-1	1	SELECT 1L	IC4	5	6	J5	13	12
0213-1PC2-P6-3	3	SELECT 2L	IC4	3	4	J5	5	4
0213-1PC2-P6-5	5	SELECT 3L	IC4	1	2	J5	11	10
0213-1PC2-P6-2	2	SELECT 4L	IC4	13	12	J5	3	2
0213-1PC2-P6-4	4	SELECT 5L	IC4	11	10	J5	9	8
0213-1PC2-P6-6	6	SELECT 6L	IC4	9	8	J5	24	23
0213-1PC2-P6-8	8	SELECT 7L	IC5	13	12	J5	7	6
0213-1PC2-P6-10	10	SELECT 8L	IC5	11	10	J5	22	21
0213-1PC2-P6-12	12	SELECT 9L	IC5	9	8	J5	20	19

SPARE GATES

LAST "C" USED-C7
LAST "CR" USED-CR5
LAST "R" USED-R21
LAST "Q" USED-Q7



LOC. 2PC1
CROSS REF NO. 0502

NEEDLE DRIVER	DATA BASE A	C	DWG NO	REV A
	LOC 2PC1		SHEET 45	CROSS REF NO 0502

LOCATION

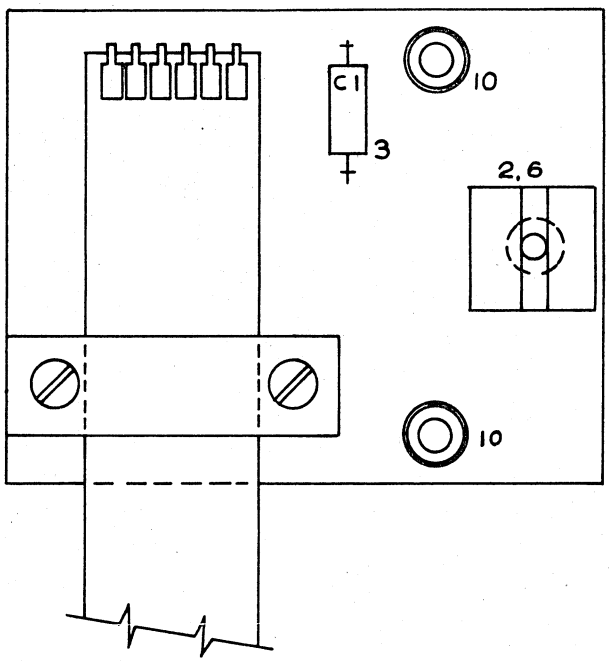
2PC2

HORIZONTAL TRANSDUCER BOARD

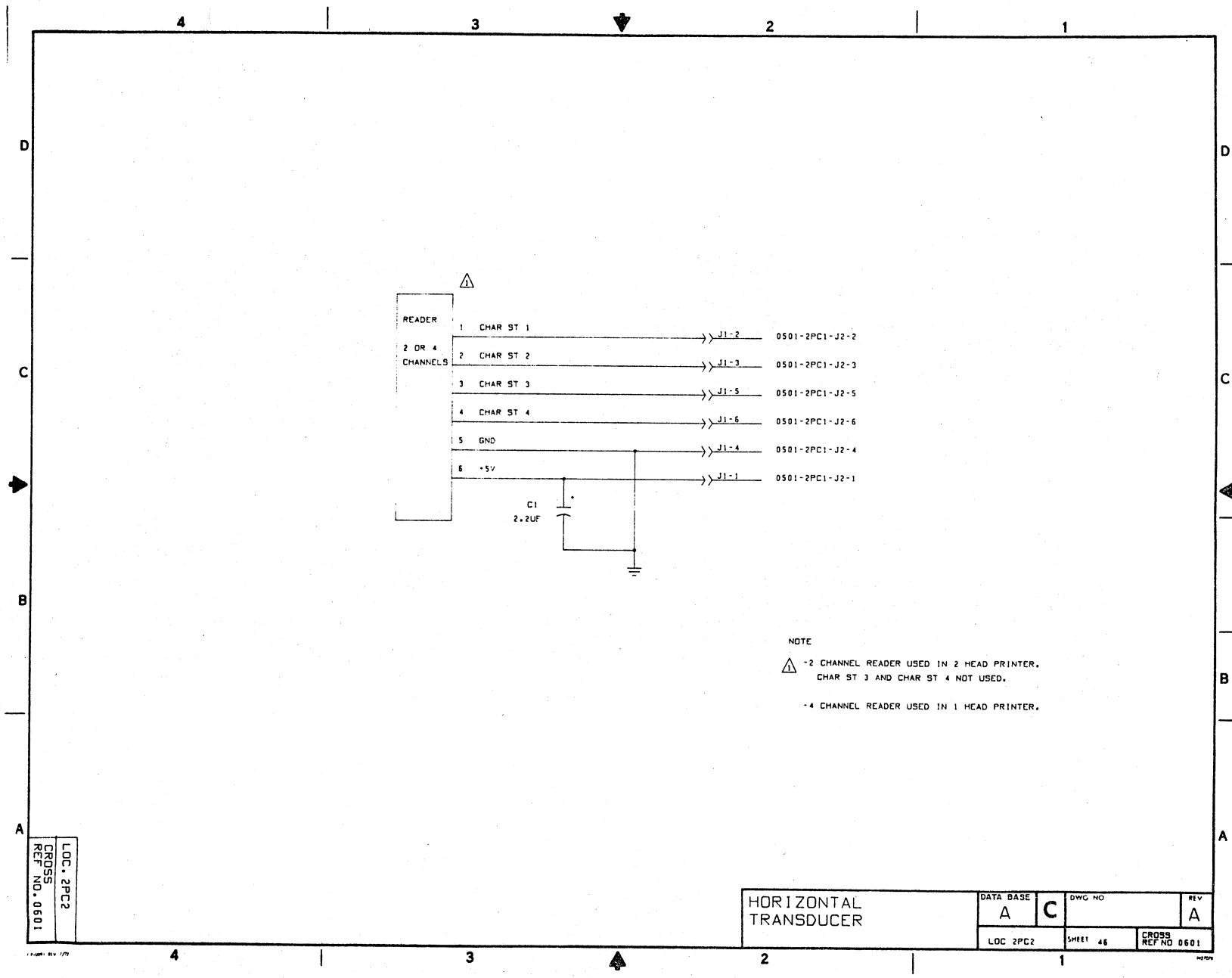
BOARD NUMBER
See Chart Below

PAGE NO.
9-24 A-B/C

2PC2 HORIZONTAL TRANSDUCER	MODEL
44670302	PM 125
44670303	PM 70



HORIZONTAL TRANSDUCER BOARD 44670302 and 03.


READER
2 OR 4 CHANNELS
1 CHAR ST 1
2 CHAR ST 2
3 CHAR ST 3
4 CHAR ST 4
5 GND
6 +5V
J1-2
J1-3
J1-5
J1-6
J1-4
J1-1
0501-2PC1-J2-2
0501-2PC1-J2-3
0501-2PC1-J2-5
0501-2PC1-J2-6
0501-2PC1-J2-4
0501-2PC1-J2-1
C1
2.2UF
NOTE
1 -2 CHANNEL READER USED IN 2 HEAD PRINTER. CHAR ST 3 AND CHAR ST 4 NOT USED.
-4 CHANNEL READER USED IN 1 HEAD PRINTER.
CROSS REF NO. 0601
LOC. 2PC2
HORIZONTAL TRANSDUCER
DATA BASE A C
DWG NO
REV A
LOC 2PC2
SHEET 46
CROSS REF NO 0601

LOCATION

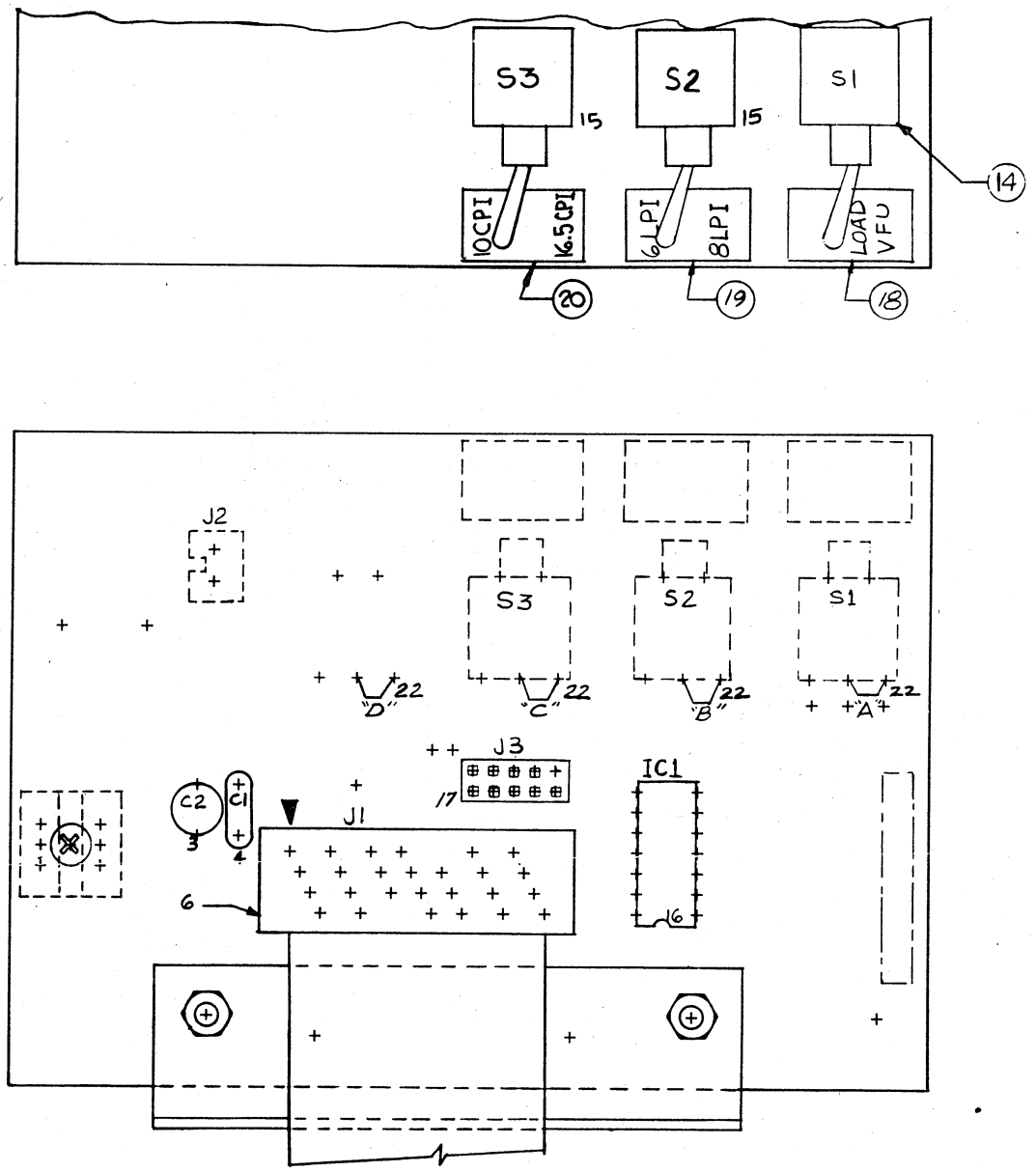
5PC1

VERTICAL TRANSDUCER BOARD

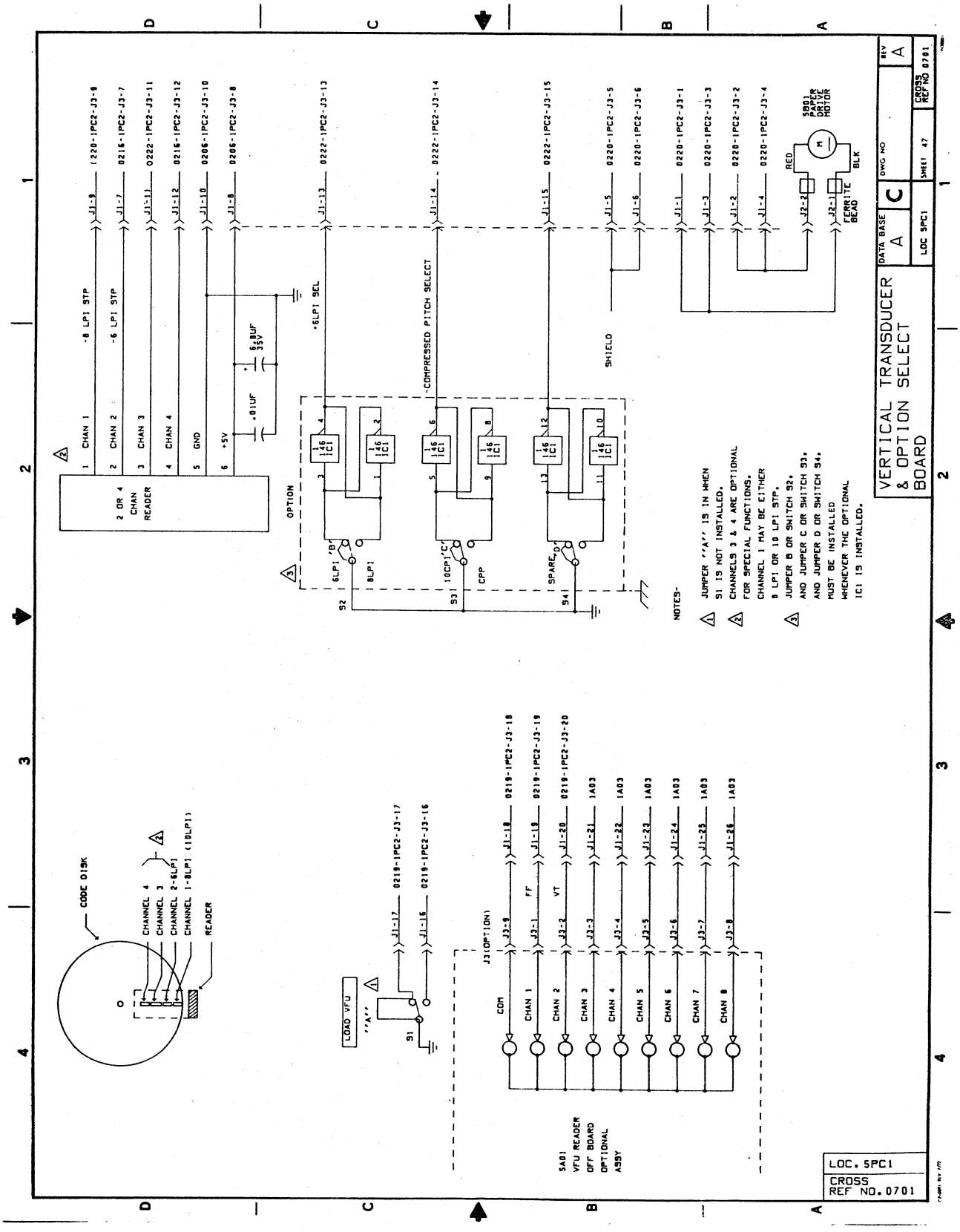
BOARD NUMBER
See Chart Below

PAGE NO.
9-26 A-B/C

5PC1 VERTICAL TRANSDUCER ASSY	SWITCHES				READER		EVFU OPTION
	S1 EVFU	S2 6/8 LPI	S3 10/16.5 LPI	S4 SPARE	2 CH	4 CH	
95432100 {6}					X		
95432101 {4}	X				X		X
95432102 {2}		X			X		
95432103 {0}					X		
95432104 {8}						X	
95432105 {6}			X		X		
95432106	X	X	X		X		X
95432107	X	X			X		X



VERTICAL TRANSDUCER BOARD 95432100/01/02/03/04/05/06 and 07


VERTICAL TRANSDUCER & OPTION SELECT BOARD
DATA BASE A
C
LOC 5PC1
DWG NO
SHEET 47
CROSS REF NO 0701
REV A
LOC. 5PC1
CROSS REF NO. 0701
2 OR 4 CHAN READER
CHAN 1
CHAN 2
CHAN 3
CHAN 4
GND
+5V
-8 LPI STP
-6 LPI STP
.01UF
6.8UF 35V
OPTION
6LPI 'B'
8LPI
10CPI 'C'
CPP
SPARE 'D'
+6LPI SEL
-COMPRESSED PITCH SELECT
SHIELD
S1
S2
S3
S4
SA01 PAPER DRIVE MOTOR
RED
BLK
FERRITE BEAD
CODE DISK
CHANNEL 4
CHANNEL 3
CHANNEL 2-6LPI
CHANNEL 1-8LPI (10LPI)
READER
LOAD VFU
"A"
J3(OPTION)
COM
CHAN 1
CHAN 2
CHAN 3
CHAN 4
CHAN 5
CHAN 6
CHAN 7
CHAN 8
FF
VT
SA01 VFU READER OFF BOARD OPTIONAL ASSY
NOTES-
1 JUMPER "A" IS IN WHEN S1 IS NOT INSTALLED.
2 CHANNELS 3 & 4 ARE OPTIONAL FOR SPECIAL FUNCTIONS. CHANNEL 1 MAY BE EITHER 8 LPI OR 10 LPI STP.
3 JUMPER B OR SWITCH S2, AND JUMPER C OR SWITCH S3, AND JUMPER D OR SWITCH S4, MUST BE INSTALLED WHENEVER THE OPTIONAL IC1 IS INSTALLED.

LOCATION	REF. NO.	TERM
A		
1PC2	0216	-ACK
1PC2	0215	ACK INT
1PC2	0214	ACK OUT
1PC2	0216	ADDRESS 0 - ADDRESS 7
1PC2	0224	ADDRESS 8 - ADDRESS 15
1PC2	0207	ADDRESS BUS
1PC2	0214	ADV
1PC2	0208	-ADV
1PC2	0208	-A14
B		
1PC2	0207	BELL
1PC2	0221	BLK CODE 0-7
2PC2	0501	BUSS BAR A1 + B1
1PC2	0216	BUSY
C		
1PC2	0222	CH3
5PC1	0701	CHAN 1-8
1PC2	0208	-CHAR READ
1PC2	0222	CHAR ST
2PC2	00501	CHAR ST 1-4
1PC2	0215	CHNL 1
1PC2	0215	CHNL 2
1PC2	0220	CHR STRT O/S
1PC2	0221	CLK 2
1PC2	0221	-CLK 2
1PC2	0221	CLK 4
1PC2	0223	-CMP
5PC1	0701	COM
5PC1	0701	-COMPRESSED PITCH SELECT
1PC2	0213	CONCR
1PC2	0207	CPU DATA BUS
1PC2	0209	-CS 1 - -CS 16
1PC2	0216	CS ADDRESS BUS
D		
1PC2	0217	D0 - D7
1PC2	0211	DB0 - DB3
1PC2	0210	DB4 - DB7
1PC2	0207	DBIN
1PC2	0216	-DIEN ADDRESS BUS
E		
1PC2	0222	EVEN CH ST
F		
1PC2	0219	FMT CH 1
1PC2	0219	FMT CH2
1PC2	0216	-FORM FEED
G		
1PC2	0214	GATE OSC
1PC1	0101	GND
H		
1PC2	0204	HBD
1PC2	0201	HD RDY
1PC1	0103	HIFB
1PC1	0103	HIFB RETURN
1PC2	0207	HLDA
1PC2	0222	HOME L
1PC2	0222	HOME R
1PC2	0204	HVFB
I		
1PC2	0207	INTE
4PC1	0401	INTLR
1PC2	0222	INTRPT
1PC2	0208	-I/O READ
1PC2	0208	-I/O WRITE
2PC1	0501	I SENSE

LOCATION	REF. NO.	TERM
L		
1PC2	0219	-LD VFU
1PC2	0213	LINE FEED O/S
M		
1PC2	0219	MC
1PC2	0208	-MEM READ
1PC2	0208	-MEM WRITE
1PC2	0214	MOVE HD L
1PC2	0214	MOVE HD R
1PC2	0208	-MOV L
1PC2	0208	-MOV R
1PC2	0220	-MT 3
1PC1	0103	MTR
N		
1PC2	0201	-NDL ENAB
1PC2	0213	NXT COL RDY
O		
1PC2	0213	OBF
1PC2	0222	ODD CH ST
1PC2	0219	-OOP
P		
1PC2	0217	-PM CMPL
1PC2	0213	PM COMP
1PC2	0214	-PRT BUSY
1PC2	0223	-PWR ON ST EN
R		
1PC2	0219	-READY
1PC2	0207	RESET
1PC2	0219	RDY ENABL
S		
1PC2	0213	SEL 1L - 9L
1PC2	0213	SEL 1R - 9R
1PC2	0223	-SEL 30 MODE
1PC2	0201	SERVO INHIB
1PC2	0201	-SHUT DOWN
1PC2	0223	SPARE
1PC2	0214	START ENABL
1PC2	0219	-START LAMP
1PC2	0219	START/STOP
1PC2	0223	STATUS BIT 0-5
1PC2	0215	-STOP
1PC2	0216	STROBE
1PC2	0207	-STST B
1PC2	0208	SYSTEM DATA BUS
T		
1PC2	0220	-TEST PRINT
1PC2	0219	-TEST PRINT LAMP
1PC2	0214	TEST PRINT MODE
1PC2	0201	-TOP OPEN
1PC2	0218	TP BIT 0 - 7
V		
1PC2	0206	VBD
1PC1	0103	VIFB
2PC1	0501	VREF
1PC2	00206	VVFB
W		
1PC2	0207	WAIT
1PC2	0207	-WR

LOCATION	REF. NO.	TERM
NUMERIC		
1PC2	0212	0
1PC2	0212	1 - 5
1PC2	0212	5V
1PC1	0103	-5V
1PC1	0103	-5V I/O
5PC2	0201	6 LPI SEL
1PC2	0216	6 LPI STP
5PC1	0701	-6 LPI STP
1PC2	0215	6/8 LINE
1PC2	0220	8 LPI STP
5PC1	0701	-8 LPI STP
1PC2	0214	8080 RDY
1PC1	0102	12V
1PC1	0103	-12V
1PC1	0102	12V I/O
1PC1	0101	-36V

UNIQUE CDC PRINTER CONFIGURATIONS

INTRODUCTION

This section is designed to supplement Sections 1 through 9 of this manual by defining the unique CDC configurations and special features not previously defined. This section is divided into two parts; Special Features, and Configurations.

SPECIAL FEATURES

This section defines the unique CDC special features that have been factory installed in the various models of the CT104 Matrix Printers as part of the original equipment configurations.

These special features are described in detail below.

Operator Visible LED Diagnostics Feature

The operator visible LED diagnostics feature consists of 6 light emitting diodes mounted on the left side plate of the printer and replaces the standard LED diagnostics option which is available on the controller electronics card 1PC2.
With this feature installed, the operator may view the LED indicators without having to remove the printer covers to gain access to 1PC2 board assembly.
The operator visible LED indicators may be viewed by removing the side cover on the left side of the cabinet cover.
With this feature installed, the controller electronics isolates and displays on the six (6) LED lamps, a binary code for a controller detectabel error condition. A summary of these codes and their interpretation is given in Figure 6-4 in the Fault Isolation Section of this manual.
The operator visible LED diagnostics feature functions in the same manner as the 1PC2 mounted version, with the exception that the fault signals are routed by a cable from connector 1PC2-J13 to the side of the printer for display (see Figure 10-2).

Printer To Data Source Fault Detection Feature

With this feature installed, the printer isolates and transmits a binary code to the data source whenever the printer controller detects an error condition or operation (a summary of these binary codes and their interpretation is given in Figure 6-4 in the Fault Isolation Section of this manual). The data source then uses this binary code information to control data transmission and printer status. In addition to the standard interface signals, there are six (6) status lines which convey these binary codes through the printer interface connector to the data source (see Figure 10-1).

Printer Interfaces

Three different interfaces are presently used on CDC printers, the Standard Interface, the Standard Interface With Fault Detection Feature and the RS-232 Interface. The Standard Interface and the Standard Interface With Fault Detection Feature are both shown in Figure 10-1. For additional information on the Standard Interface see Page 1-8 or the Introduction to this manual. The RS-232 Interface is shown in Figure 10-2. For additional information on the RS-232 Interface see the seperate RS-232 Interface manual, publication number 95445069.

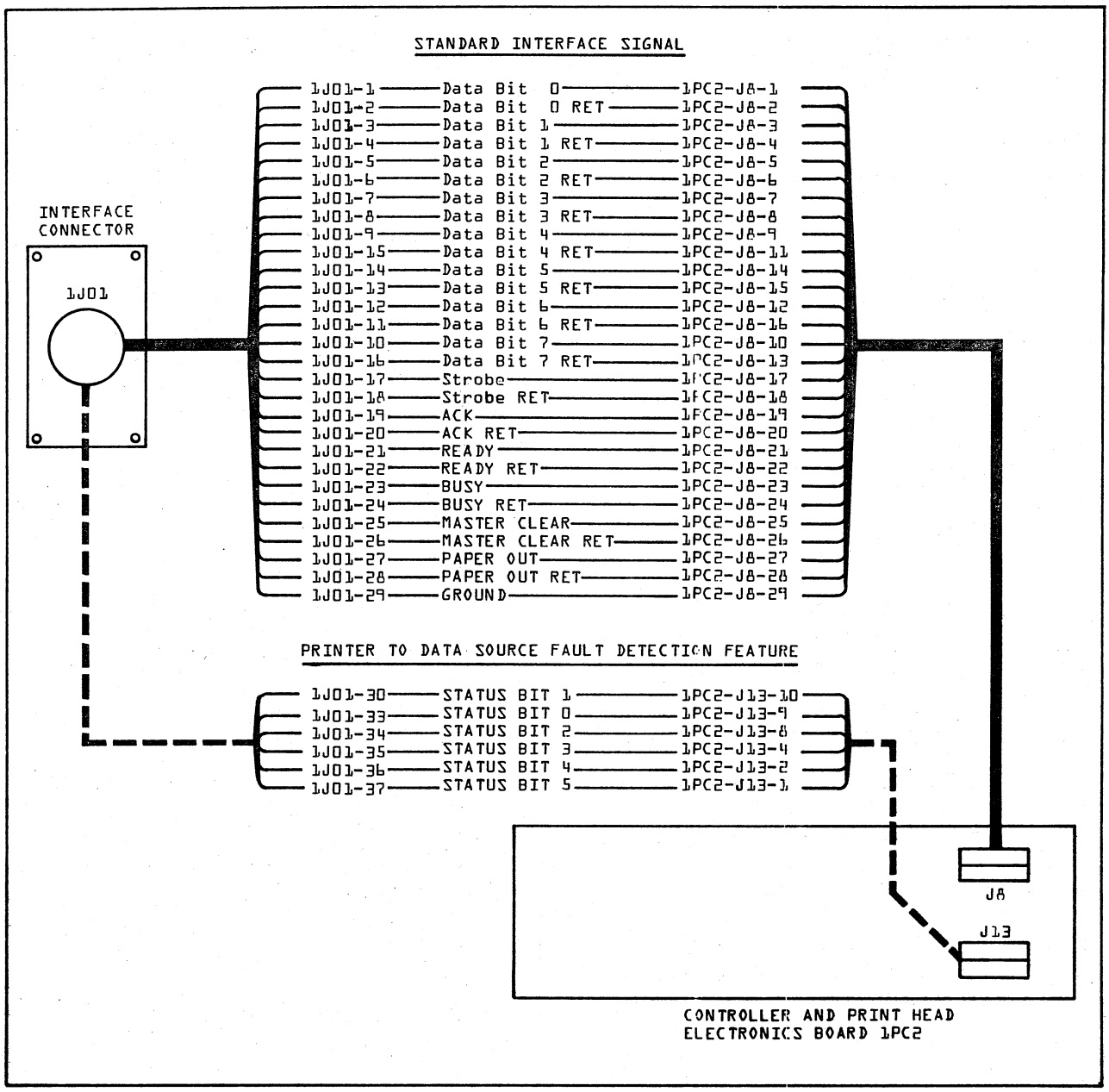


FIGURE 10-1. STANDARD INTERFACE PIN ASSIGNMENTS

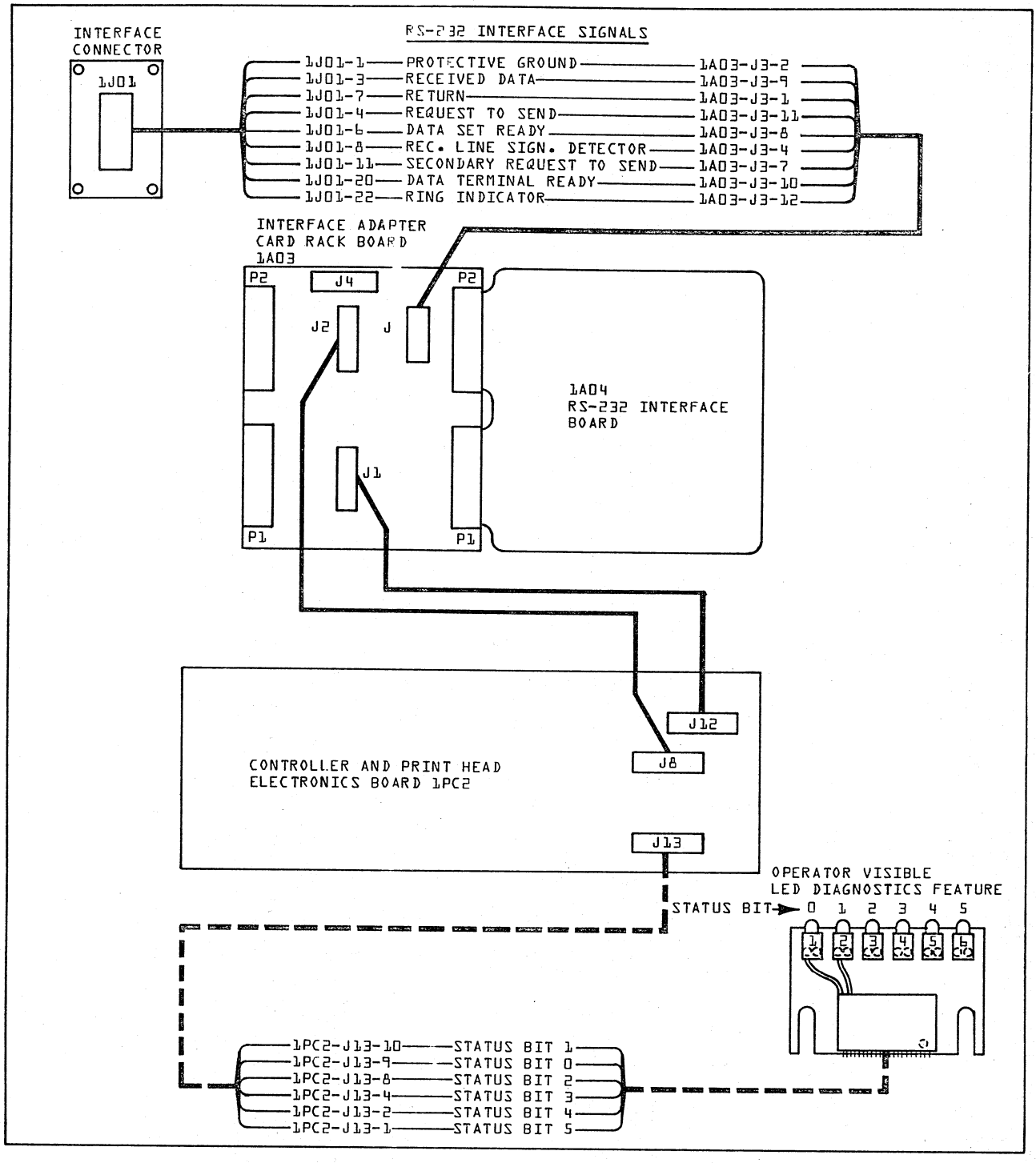


FIGURE 10-2. RS-232 INTERFACE PIN ASSIGNMENTS

CONFIGURATIONS

This section defines the basic configuration of CDC equipments CT104A, CT104B, CT104C, CT104D and CT104E.

CDC Matrix Printer Equipment CT104A (TLA 95453000)

Printing Rate = 70 lines per minute (7x7 character pattern).

Character Pitch = 10 characters per inch.

Characters Per Line = 132 max. via a 4 channel code strip reader.

Print Head = One, nine wire print head capable of printing matrix dot patterns of 7x7, 7x9, 9x7 and 9x9.

Vertical Line Spacing = 6 Lines per inch via a 2 channel code disc reader and a 2 channel Electronic Vertical Format Unit (EVFU) brush reader.

Voltage and Frequency = 120 VAC standard with tap selectable ranges from 90 VAC to 278 VAC. Frequency is 50/60 HZ (49.0 to 60.6 HZ)

Control Panel Switches = Start/Stop and Form Feed.

Interface = RS-232 Buffered Interface (Figure 10-2).

Features:

1.	Automatic Line Feed	Pg. 1-9 and 4-8
2.	Automatic Double Space	Pg. 1-9 and 4-8
3.	Test Print (1PC2 Controller Board mounted)	Pg. 1-9
4.	Electronic Vertical Format Unit (EVFU)	Pg. 1-10, 2-2 and 2-5
5.	Elongated Character	Pg. 1-9 and 4-8
6.	80 Column	Pg. 1-9 and 4-8
7.	LED Diagnostics (1PC2 Controller Board mounted)	Pg. 1-11.
8.	Character Generator Rom Set (U.S. 64 Char ASCII, 7x7) 95448900.	Pg. A-3

CDC Matrix Printer Equipment CT104B (TLA 95453001)

Printing Rate = 70 lines per minute (7x7 character pattern)

Character Pitch = 10 characters per inch.

Characters Per Line = 132 max. via a 4 channel code strip reader.

Print Head: One, nine wire print head capable of printing matrix dot patterns of 7x7, 7x9, 9x7 and 9x9.

Vertical Line Spacing = 6 lines per inch via. a 2 channel code disc reader and a 2 channel Electronic Vertical Format Unit (EVFU) brush reader.

Voltage and Frequency = 120 VAC standard with tap selectable ranges from 90 vac to 278 VAC. Frequency is 50/60 HZ (49.0 to 60.6 HZ).

Control Panel Switches = Start/Stop and Form Feed.

Interface = None (unit is not supplied with interface connector or interface).

Features:

1.	Automatic Line Feed	Pg. 1-9 and 4-8
2.	Automatic Double Space	Pg. 1-9 and 4-8
3.	Test Print (1PC2 Controller Board mounted)	Pg. 1-9
4.	Electronic Vertical Format Unit (EVFU)	Pg. 1-10, 2-2 and 2-5
5.	Elongated Character	Pg. 1-9 and 4-8.
6.	80 Column	Pg. 1-9 and 4-8
7.	LED Diagnostics (1PC2 Controller Board mounted)	Pg. 1-11.
8.	Character Generator Rom Set (U.S. 64 Char. ASCII 7x7) 95448900.	Pg. A-3

CDC Matrix Printer Equipment CT104 C (TLA 95453002).

Printing Rate = 70 lines per minute (7x7 character pattern).

Character Pitch = 10 characters per inch.

Characters Per Line = 132 max. via a 4 channel code strip reader.

Print Head = One, nine wire print head capable of printing matrix dot patterns of 7x7, 7x9, 9x7 and 9x9.

Vertical Line Spacing = 6 lines per inch via a 2 channel code disc reader and a 2 channel Electronic Vertical Format unit (EVFU) brush reader.

Voltage and Frequency = 120 VAC standard with tap selectable ranges from 90 VAC to 278 Vac. Frequency is 50/60 HZ (49.0 to 60.6 HZ).

Control Panel Switches = Start/Stop , Form Feed and Test Print.

Interface = Standard 36 pin interface connector connected directly to the printer Controller Board 1PC2 (Figure 10-1).

Features:

1. Automatic Line Feed	Pg. 1-9 and 4-8
2. Automatic Double Space	Pg. 1-9 and 4-8.
3. Test Print (1PC2 Controller Board mounted switch plus control panel mounted switch)	Pg. 1-9 and 1-12.
4. Electronic Vertical Format Unit (EVFU)	Pg. 1-10, 2-2 and 2-5
5. Elongated Character	Pg. 1-9 and 4-8
6. 80 Column	Pg. 1-9 and 4-8
7. LED Diagnostics (1PC2 Controller Board mounted)	Pg. 1-11.
8. Character Generator Rom Set (U.S. 64 Char ASCII, 7x7) 95448900.	Pg. A-3

CDC Matrix Printer Equipment CT104D (TLA 95453003).

Printing Rate = 70 lines per minute (7x7 character pattern).

Character Pitch = 10 characters per inch (standard pitch) or 16.5 characters per inch (compressed pitch).

Characters Per Line = 132 max. via a 4 channel code strip readed.

Print Head = One, nine wire print head capable of printing matrix dot patterns of 7x7, 7x9, 9x7, and 9x9.

Vertical Line Spacing = Switch selectable 6 or 8 lines per inch via a 2 channel code disc reader and a 2 channel Electronic Vertical Format Unit (EVFU) brush reader.

Voltage and Frequency = 120 VAC standard with tap selectable range from 90 VAC to 278 VAC. Frequency is 50/60 HZ (49.0 to 060.6 HZ).

Control Panel Switches = Start/Stop, Form Feed and Test Print.

Interface = RS-232 Buffered Interface (Figure 10-2).

Features:

1. Automatic Line Feed	Pg. 1-9 and 4-8.
2. Automatic Double Space	Pg. 1-9 and 4-8.
3. Test Print (1PC2 Controller Board mounted switch plus control panel mounted switch)	Pg. 1-9 and 1-12.
4. Electronic Vertical Format Unit (EVFU)	Pg. 1-10, 2-2 and 2-5
5. Elongated Character	Pg. 1-9 and 4-8
6. 80 Colum	Pg. 1-9 and 4-8.
7. LED Diagnostics (operator visible LED display mounted on side plate of printer)	Pg. 10-1
8. 6 x 8 Line Per Inch	Pg. 1-11 and 2-8.
9. Compressed Pitch	Pg. 1-12 and 2-8.
10. Character Generator Rom Set (U.S. 96 Char. ASCII, 9x7) 44676070.	Pg. A-3

CDC Matrix Printer Equipment CT014E (TLA 95453004)

Printing Rate = 70 Lines per minute (7x7 character pattern).

Character Pitch = 10 characters per inch (standard pitch) or 16.5 character per inch (compressed pitch).

Characters Per Line = 132 max. via a 4 channel code strip reader.

Print Head = One, nine wire print head capable of printing matrix pot patterns of 7x7, 7x9, 9x7, and 9x9.

Vertical Line Spacing = Switch selectable 6 or 8 lines per inch via a 2 channel code disc reader and a 2 channel Electronic Vertical Format Unit (EVFU) brush reader.

Voltage and Frequency = 120 VAC standard with tap selectable range from 90 VAC to 278 VAC. Frequency is 50/60 HZ (49.0 to 60.6 HZ).

Control Panel Switches = Start/Stop, Form Feed and Test Print.

Interface. = Standard 36 pin interface connector connecting 29 interface signals and 6 diagnostic status bits directly to and from the printer Controller Board 1PC2 (Figure 10-1).

Features:

1.	Automatic Line Feed	Pg. 1-9 and 4-8.
2.	Automatic Double Space	Pg. 1-9 and 4-8.
3.	Test Print (1PC2 Controller Board mounted Switch plus control panel mounted switch)	Pg. 1-9 and 1-12.
4.	Electronic Vertical Format Unit (EVFU)	Pg. 1-10, 2-2 and 2-5.
5.	Elongated Character	Pg. 1-9 and 4-8
6.	80 Column	Pg. 1-9 and 4-8
7.	Diagnostics (Printer To Data Source Fault Detection)	Pg. 10-1
8.	6/8 Line Per Inch	Pg. 1-11 and 2-8.
9.	Compressed Pitch	Pg. 1-12 and 2-8.
10.	Character Generator Rom Set (U.S. 96 Char ASCII, 9x7) 44676070.	Pg. A-3

APPENDIX A
PROGRAM AND CHARACTER ROM SETS

GENERAL

This appendix contains all of the various Program and Character ROM sets presently offered for use with the 70/125 LPM Matrix Printers. Also included in this appendix are tables to insure that the ROMS from any given Character or Program set are installed in their correct locations.

This appendix also contains the Character Definition and Code Drawings for each of the Character ROM sets.

CAUTION

INTEGRATED CIRCUITS AND MOS CHIPS ARE ABOUT TO BE HANDLED AND ARE PRESENT ON THE PRINTED CIRCUIT BOARDS IN THIS PRINTER. THESE DEVICES ARE EASILY DESTROYED IF A STATIC ELECTRICAL CHARGE IS ACCIDENTALLY APPLIED TO A PIN THROUGH IMPROPER HANDLING OR REPAIR. THESE STATIC CHARGES CAN BE MINIMIZED OR ELIMINATED IF PROPER PRECAUTIONS ARE OBSERVED.

A. WHEN HANDLING INTEGRATED CIRCUITS OR PLUG-IN BOARDS, DO NOT TOUCH THE CIRCUITS, PINS OR PLUG-IN BOARD CONNECTOR PINS. HANDLE BY THE EDGE ONLY.

B. WHEN REMOVING OR INSERTING A CHIP OR BOARD, GROUND YOURSELF TO THE UNIT FRAME BEFORE TOUCHING THE CHIP OR BOARD. DO NOT REMOVE OR INSERT A CHIP OR BOARD WITH THE UNIT POWERED ON.

C. DO NOT REMOVE A PLUG IN BOARD OR CHIP FROM ITS SHIPPING CARTON UNTIL READY TO INSERT IT INTO THE PRINTER.

D. USE ONLY A THREE WIRE SOLDERING IRON WHEN REPAIRING PRINTED CIRCUIT BOARDS. LAY THE BOARD ON AN INSULATED PIECE OF MATERIAL. DO NOT LAY THE BOARD ON METAL OR PLASTIC.

PROGRAM ROM SET AND LOCATION TABLE

PROGRAM ROM SET (1)	LOCATION A1 (2)	LOCATION B1 (2)	LOCATION C1 (2)	LOCATION D1 (2)	LPM 50	LPM 70	LPM 125	STATUS	REPLACED BY
44673465	44673466	44673467	44673468	44673469		X		INACTIVE	44674588
44674088	44674090	44674089	Not Used	Not Used			X	INACTIVE	44674879
44673463	44673464	44673470	Not Used	Not Used			X	INACTIVE	44674882
44674091	44674092	44674093	44674094	44674095		X		INACTIVE	44673471
44674588	44674589	44674590	44674591	44674592		X		INACTIVE	44675515
44674879	44674880	44674881	Not Used	Not Used			X	ACTIVE	--------
44674882	44674883	44674884	Not Used	Not Used			X	ACTIVE	--------
44673471	44673480	44673481	44673482	44673483		X		INACTIVE	44675513
44675513	44673480	44673481	44675514	44673483		X		INACTIVE (3)	
44675513	15153216	15153217	15153218	15153219		X		ACTIVE (3)	--------
44675515	44674589	44674590	44675516	44674592		X		ACTIVE	--------
44675651	44675653	44674590	44675654	44674592	X			ACTIVE	--------

(1) THE PART NUMBERS SHOWN IN LOCATIONS A1, B1, C. AND D1 ARE FOR INSTALLATIOLN IDENTIFICATION PURPOSES ONLY. WHEN ORDERING REPLACEMENT ROMS REFER TO THE PROGRAM ROM SET NUMBERS.

(2) SEE PAGE A4 TO DETERMINE THE LOCATION OF A1, B1, C1 AND D1 ON THE CONTROLLER AND PRINT HEAD BOARD IN CARD LOCATION IPC2.

(3) PROGRAM ROM SET 44675513 IS LISTED TWICE, THE FIRST LISTING USES EPROMS IN LOCATIONS A1 THRU D1 AND HAS BEEN REPLACED BY THE SECOND LISTING WHICH US ES ROMS IN LOCATIONS A1 THRU D1. BOTH OF THESE PROGRAM RO M SETS ARE INTERCHANGEABLE.

CHARACTER GENERATOR ROM SET AND LOCATION TABLE

GENERATOR ROM SET (1)	DESCRIPTION	LOCATION E1 (2)	LOCATION F1 (2)	FOR CHARACTER DEFINITION SEE PAGE
44674594 (3)	FARSI (9x9)	44674595	44674596	A-5 AND A-6
44674158	RETAIL APPLICATION	44674159	44674160	A-7, A-8, A-9 AND A-10
95452100	U.S. 64 CHAR. ASCII (. 7x7)	15153201		A-11
95452200	WEST EUROPEAN (7x7)	95452200 or 15153204		A-12
95452300	KATAKANA (9x7)	95452300 or 15153205		A-13 AND A-14
95452400	SPANISH (7x7)	95452400 or 15153203		A-15
95452500	UNITED KINGDOM (7x7)	95452500 or 15153202		A-16
95452600	U.S. UPPER/LOWER (9x7)	95452600 or 15153206		A-17 AND A-18
95452700	PORTUGESE (7x7)	95442700		A-19
95452800	SWEDEN-FINLAND (7x7)	95452800		A-20
95452900	DENMARK-NORWAY (7x7)	95452900		A-21
95454100	U.S. 96 CHAR. ASCII (7x7)	95454100		A-22 AND A-23
95454600	CYRILLIC/LATIN (7x7)	95454600		A-24 AND A-25
44675194 (3)	FARSI -(9x9)	44676895	44676896	A-26 AND A-27
44675197	SWEDISH (7x7)	44675197		A-28 AND A-29
44674653	UNITED KINGDOM 95 CHAR ASCII (7x7)	44674653		A-30 AND A-31
44674889	DANISH (7x7)	44674889		A-32 AND A-33
44676913	UK ASCII (96 CHAR)	44676913		A-34 AND A-35
44676914	SWEDISH-FINNISH (96)	44676914		A-36 AND A-37
44676915	DANISH-NORWAY (96)	44676915		A-38 AND A-39
44676070	U.S. 96 CHAR ASCII (7x9)	95455600	95455601	A-40 AND A-41
95455652	SCANDINAVIAN (7x7)	95455652		A-42 AND A-43
95455659	HEBREW 96 CHAR (7x7)	95455659		A-44 AND A-45
95455667	SOUTH AFR 64 CHAR (7x7)	95455667		A-46
95455668	TURKISH 64 CHAR (7x7)	95455668		A-47
95455669	GREEK 64 CHAR (7x7)	95455669		A-48
95455670	YUGOSLAV 64 CHAR (7x7)	95455670		A-49
44677533	THAILAND 128 CHAR (9x9)	95455671	95455672	A50 AND A-51
44681888 (4)	KOREAN 97 CHAR (9X7)	95455678		A-53
44682594	GERMAN 96 CHAR (7x9)	95455682	95455683	A-55
44683798	ESC 95 CHAR (7x7)	95455684		A-57
44685284	ESC 96 CHAR (7x7)	95455685		A-59
44685591	ESC 96 CHAR (7x7) (Greek)	95455686		A-61

(1) THE PART NUMBERS SHOWN IN LOCATIONS E1 AND F1 ARE FOR INSTALLATION IDENTIFICATION PURPOSES ONLY. WHEN ORDERING REPLACEMENT ROMS REFER TO THE GENERATOR ROM SET NUMBERS.

(2) SEE PAGE A-4 TO DETERMINE THE LOCATION OF E1 AND F1 ON THE CONTROLLER AND PRINT HEAD BOARD IN CARD LOCATION 1PC2. THE PART NUMBERS IN E1 & F1 ARE THE PART NUMBERS THAT WILL APPEAR ON TEH ROMS.

(3) A FINAL HORIZONTAL SERVO ADJUSTMENT PROCEDURE IS NECESSARY IN SETS UTILIZING 9 WIDE CHARACTER GENERATOR ROMS. FOR REFERENCE LOCATION OF CONTROLLER AND PRINT HEAD BOARD (CARD LOCATION 1PC2) SEE FIGURES ON PAGE A-4.

A. MAKE THE ADJUSTMENTS IN THIS STEP WITH THE 7 WIDE CHARACTER GENERATOR ROM INSTALLED:

1. TRIGGER THE OSCILLOSCOPE ON THE CHARACTER START O/S PULSES AT TP15 (TP15 COMES FROM 1PC2-H1, PIN 5)

2. SET THE OSCILLOSCOPE HORIZONTAL TIME BASE TO 1 MSEC. /DIVISION.

3. ADJUST HEAD SPEED (POT P4) AND BALANCE HEAD SPEED (POT P7) SO THE TIME BETWEEN THE CHARACTER START PULSES IS 9.2 MSEC. ± .1 MSEC. IN BOTH DIRECTIONS.

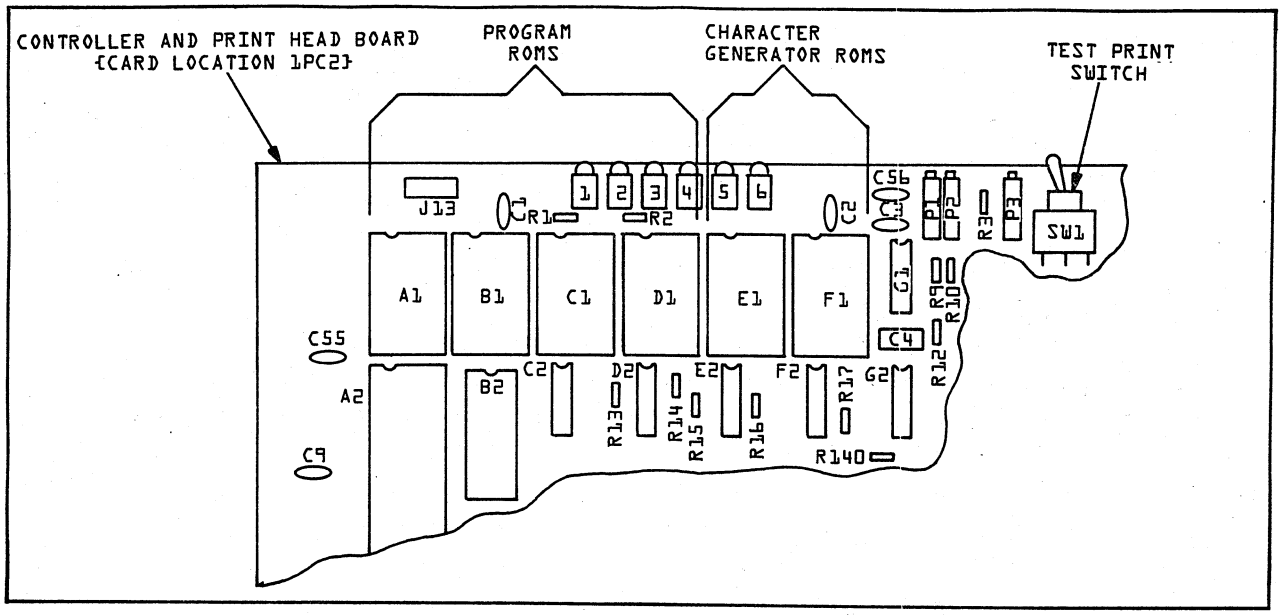
NOTE

THE SLOWER SPEED MAY CAUSE THE PRINT HEAD TO HANG UP NEAR THE RIGHT OR LEFT HOME POSITION. IF THIS OCCURS THE PRINTER MUST BE POWERED OFF AND ON, AND THE ADJUSTMENT PROCEDURE RESUMED.

B. REMOVE THE 7 WIDE CHARACTER GENERATOR ROM FROM CHIP SOCKET LOCATION E1 AND INSTALL THE 9 WIDE CHARACTER GENERATOR ROM.

C. ADJUST POT P2 UNTIL RIGHT-TO-LEFT AND LEFT-TO-RIGHT PRINTING OF THE CHARACTER COLUMNS ARE ALIGNED FROM ONE LINE OF PRINT TO THE NEXT.

(4) ALSO USED IN HANGUL CHARACTER KIT 44681896


CONTROLLER AND PRINT HEAD BOARD
(CARD LOCATION 1PC2)
PROGRAM ROMS
CHARACTER GENERATOR ROMS
TEST PRINT SWITCH
J13
R1
R2
C2
C56
P1
P2
P3
SW1
A1
B1
C1
D1
E1
F1
G1
C4
R9
R10
R12
C55
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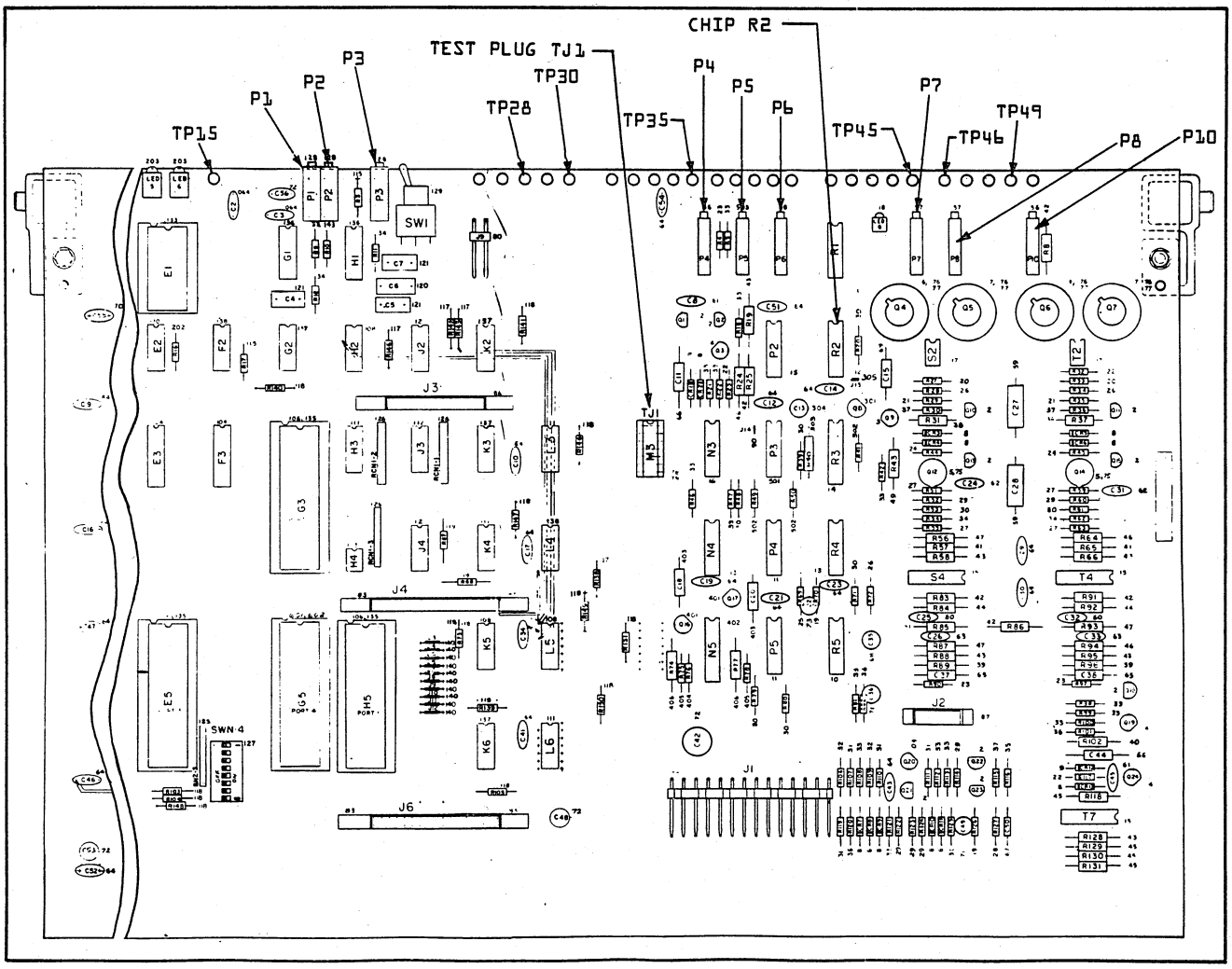
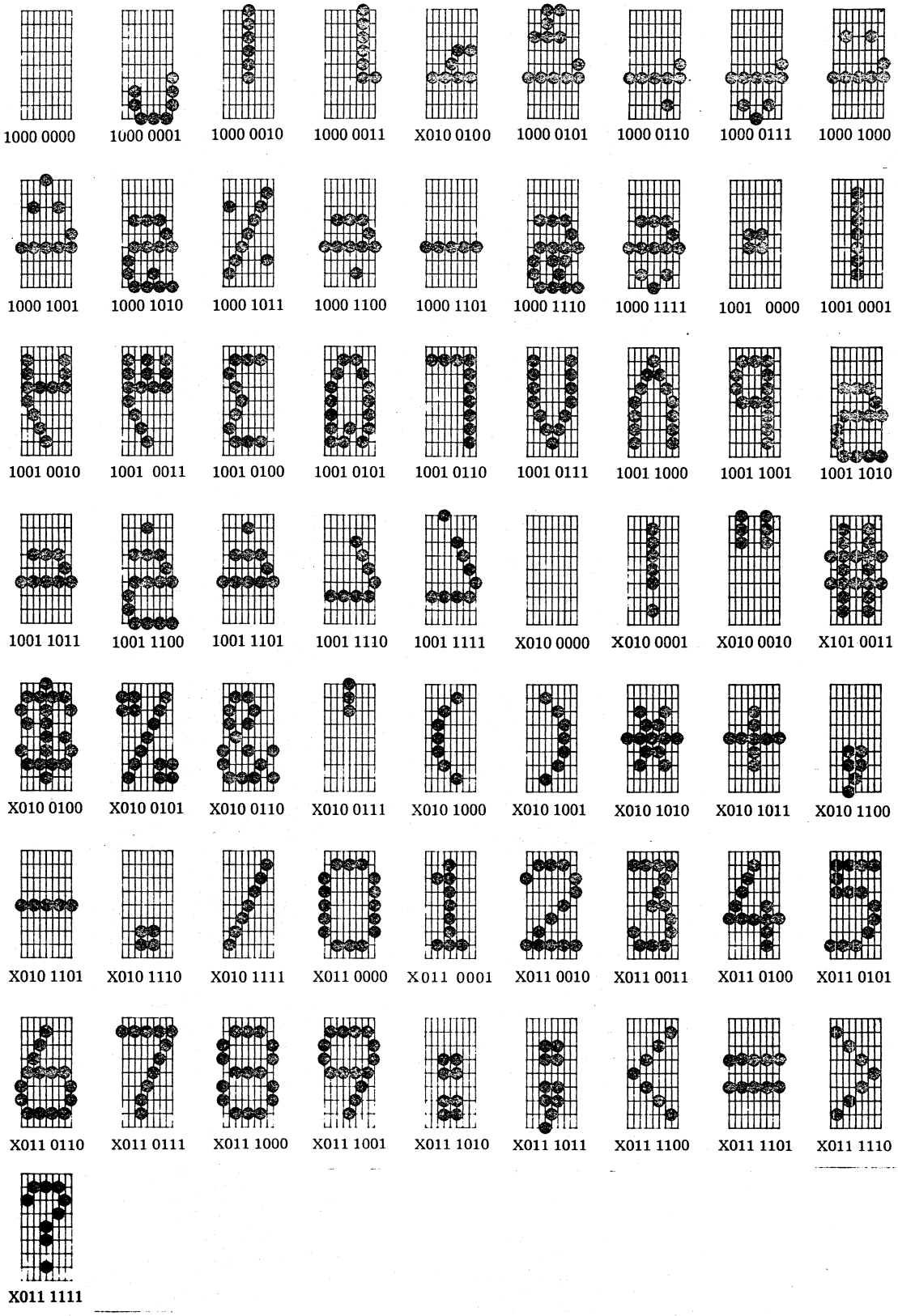
C2
D2
E2
F2
G2
R13
R14
R15
R16
R17
R140
C9


CHIP R2
TEST PLUG TJ1
P3
P4
P5
P7
P1
P2
TP30
TP28
TP35
P6
TP45
TP49
TP46
P8
P10
TP15
SW1
TJ1
J3
J4
J6
J1
J2
SWN-4
S2
S4
T2
T4
T7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1000 0001
1000 0010
1000 0011
X010 0100
1000 0101
1000 0110
1000 0111
1000 1000
1000 1001
1000 1010
1000 1011
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1000 1101
1000 1110
1000 1111
1001 0000
1001 0001
1001 0010
1001 0011
1001 0100
1001 0101
1001 0110
1001 0111
1001 1000
1001 1001
1001 1010
1001 1011
1001 1100
1001 1101
1001 1110
1001 1111
X010 0000
X010 0001
X010 0010
X101 0011
X010 0100
X010 0101
X010 0110
X010 0111
X010 1000
X010 1001
X010 1010
X010 1011
X010 1100
X010 1101
X010 1110
X010 1111
X011 0000
X011 0001
X011 0010
X011 0011
X011 0100
X011 0101
X011 0110
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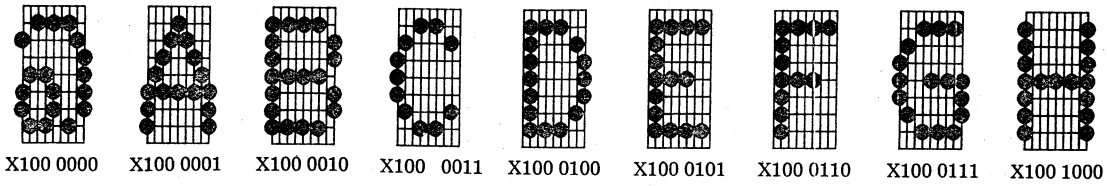
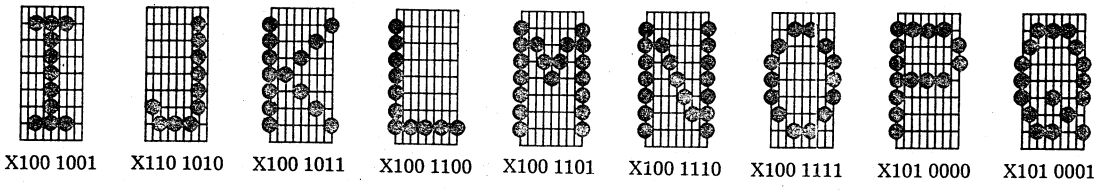
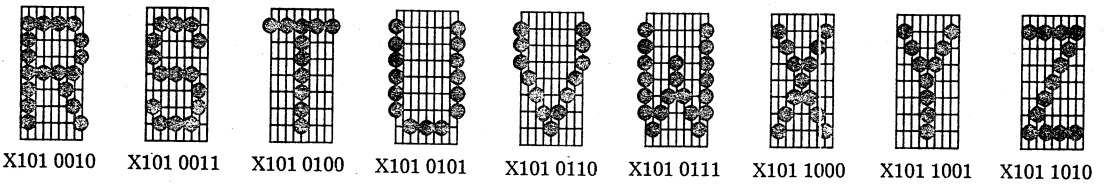
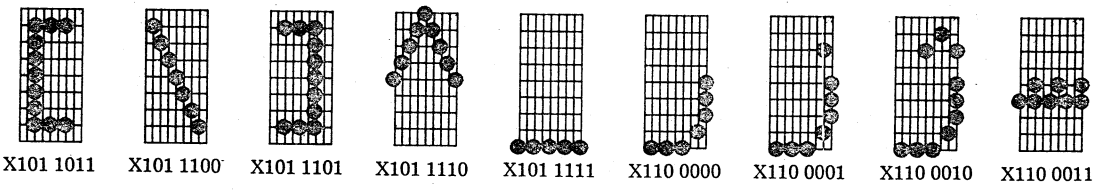
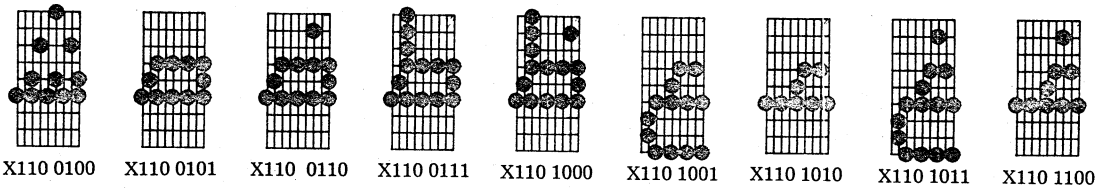
X011 1000
X011 1001
X011 1010
X011 1011
X011 1100
X011 1101
X011 1110
X011 1111

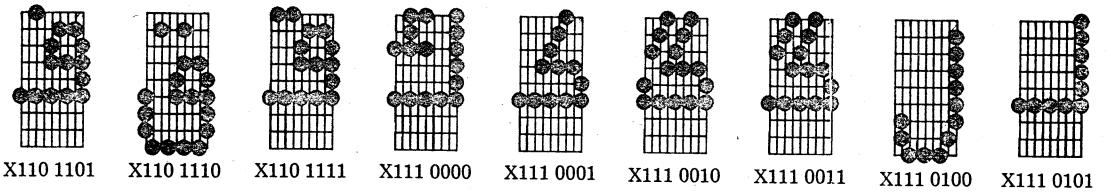

X100 0000 X100 0001 X100 0010 X100 0011 X100 0100 X100 0101 X100 0110 X100 0111 X100 1000

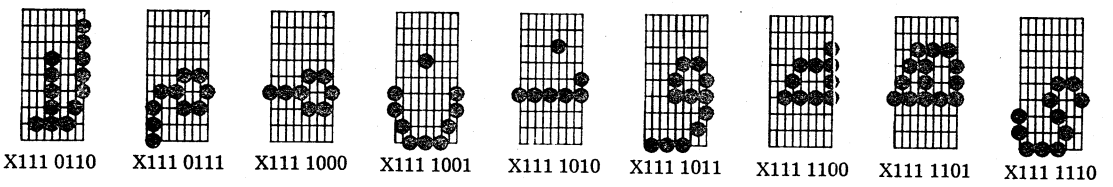

X100 1001 X110 1010 X100 1011 X100 1100 X100 1101 X100 1110 X100 1111 X101 0000 X101 0001

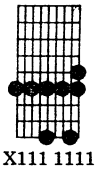

X101 0010 X101 0011 X101 0100 X101 0101 X101 0110 X101 0111 X101 1000 X101 1001 X101 1010


X101 1011 X101 1100 X101 1101 X101 1110 X101 1111 X110 0000 X110 0001 X110 0010 X110 0011

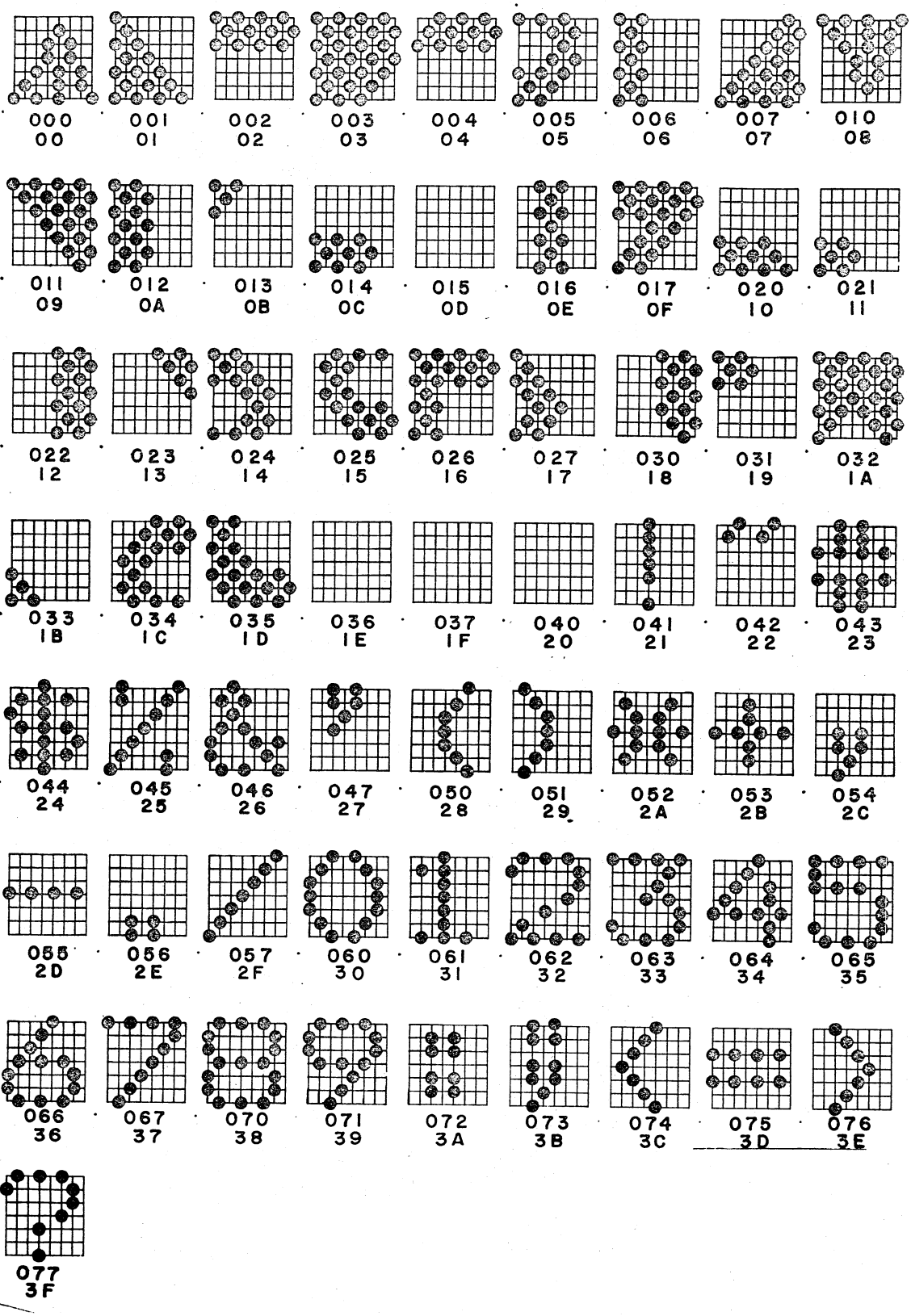

X110 0100 X110 0101 X110 0110 X110 0111 X110 1000 X110 1001 X110 1010 X110 1011 X110 1100


X110 1101 X110 1110 X110 1111 X111 0000 X111 0001 X111 0010 X111 0011 X111 0100 X111 0101

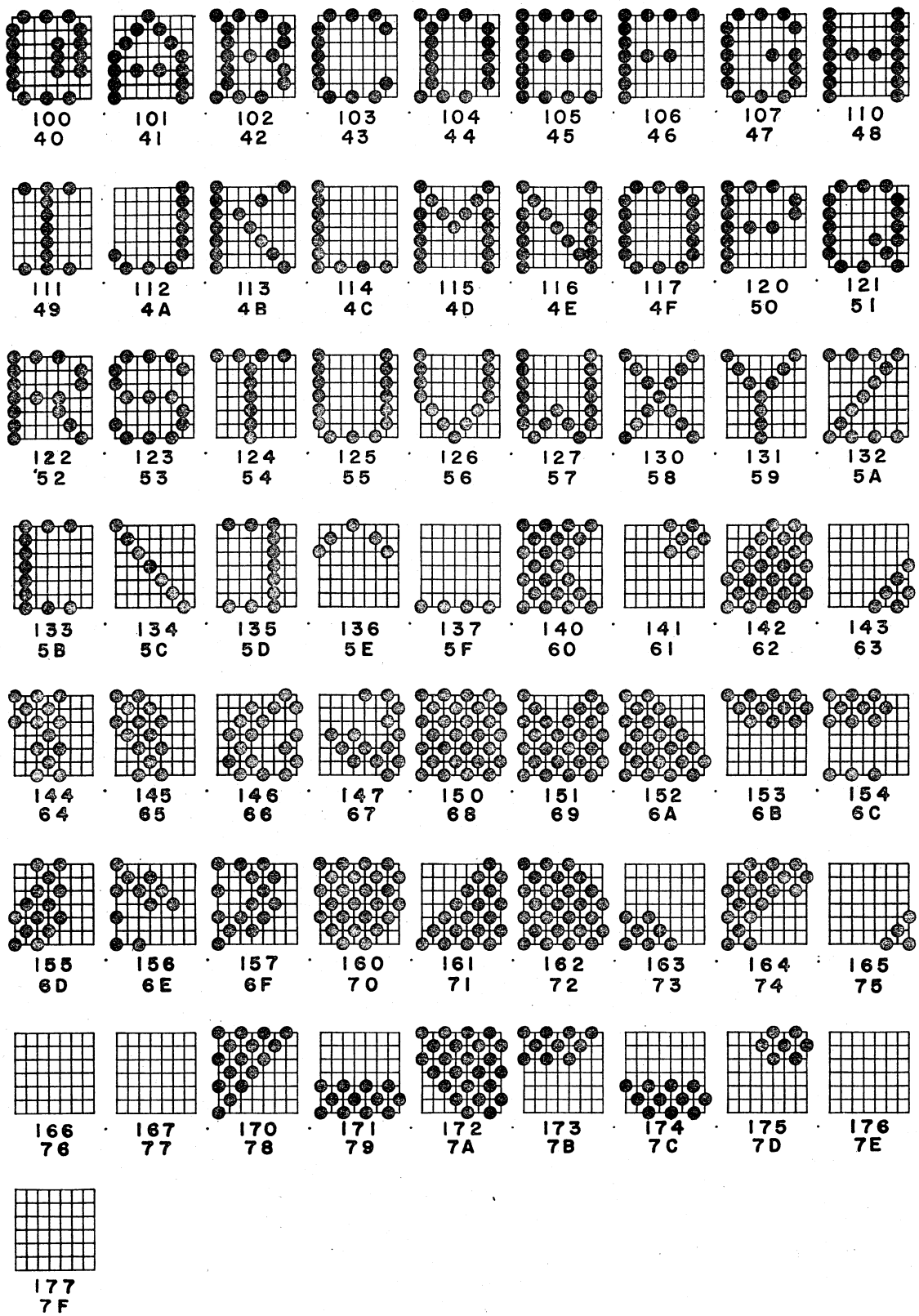

X111 0110 X111 0111 X111 1000 X111 1001 X111 1010 X111 1011 X111 1100 X111 1101 X111 1110


X111 1111

44674158 (44674159)



44674158 (44674159)



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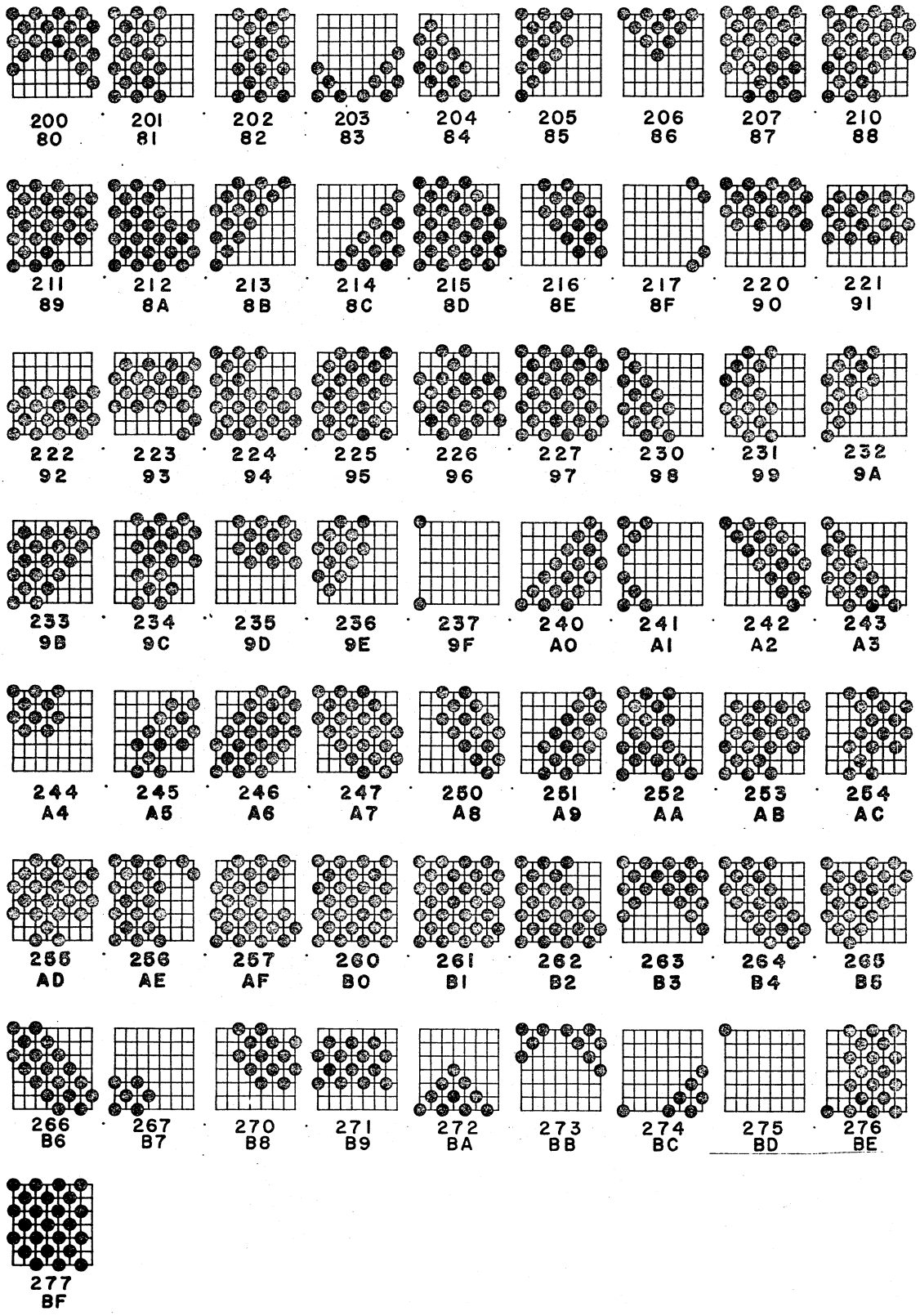

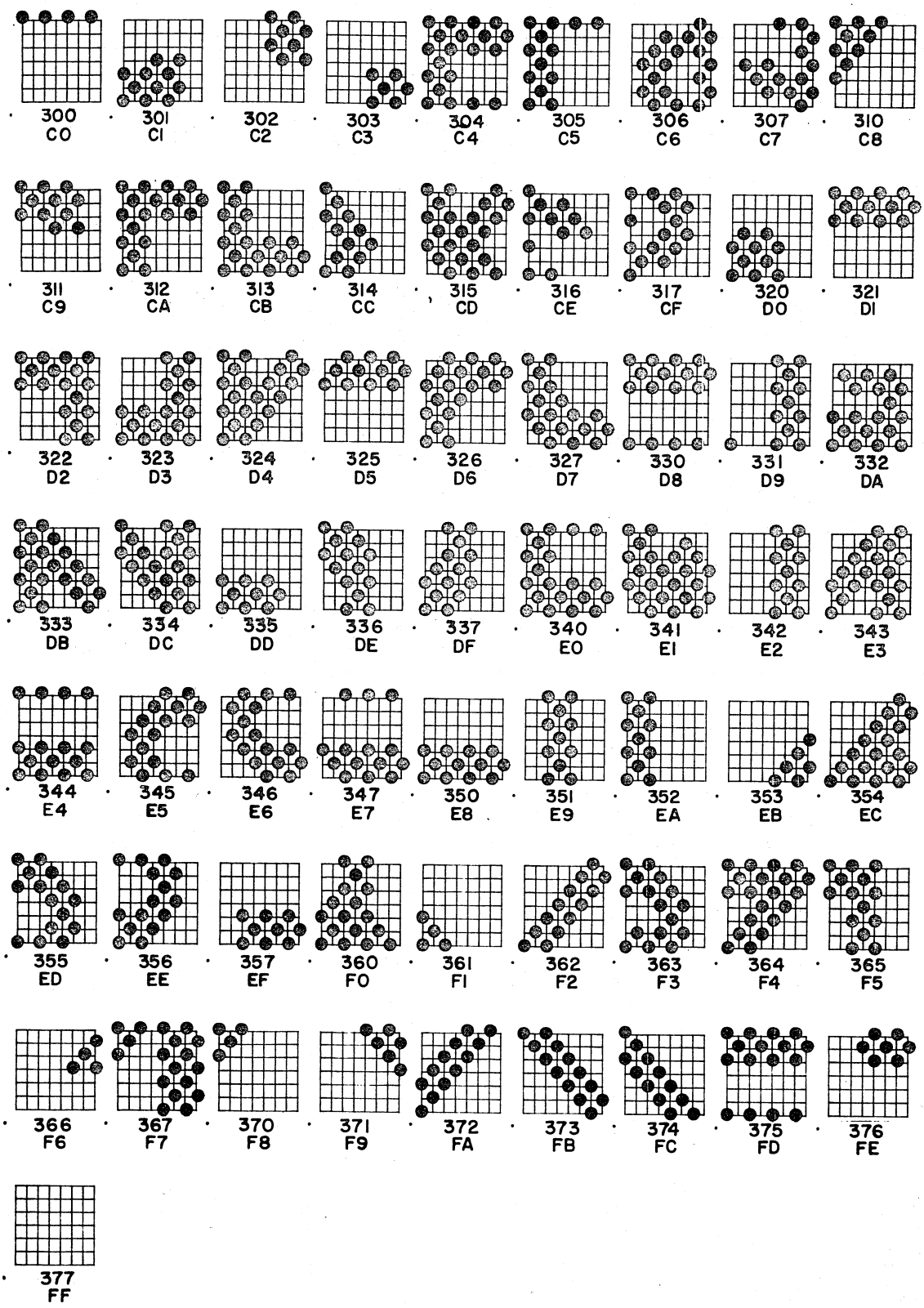
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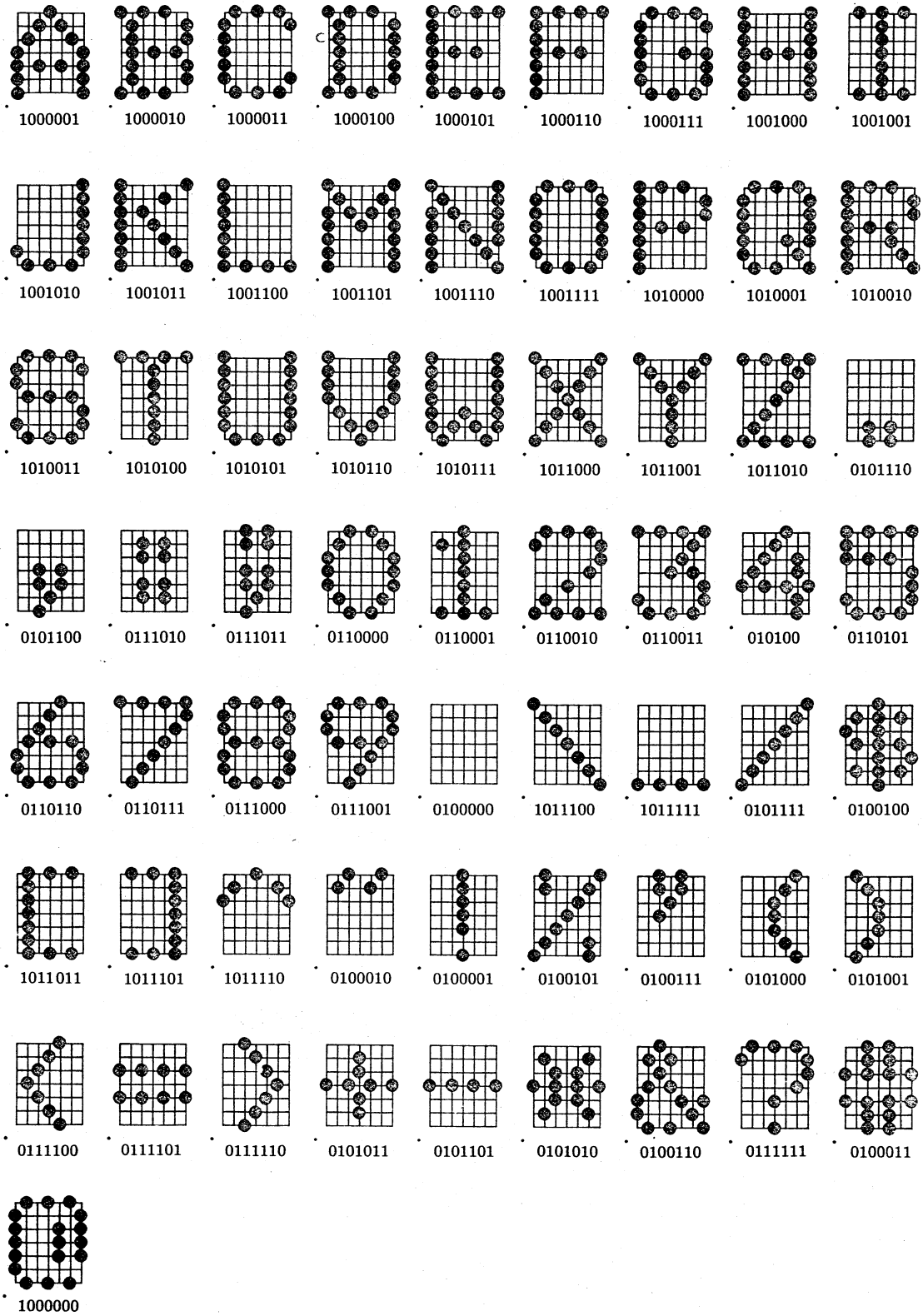
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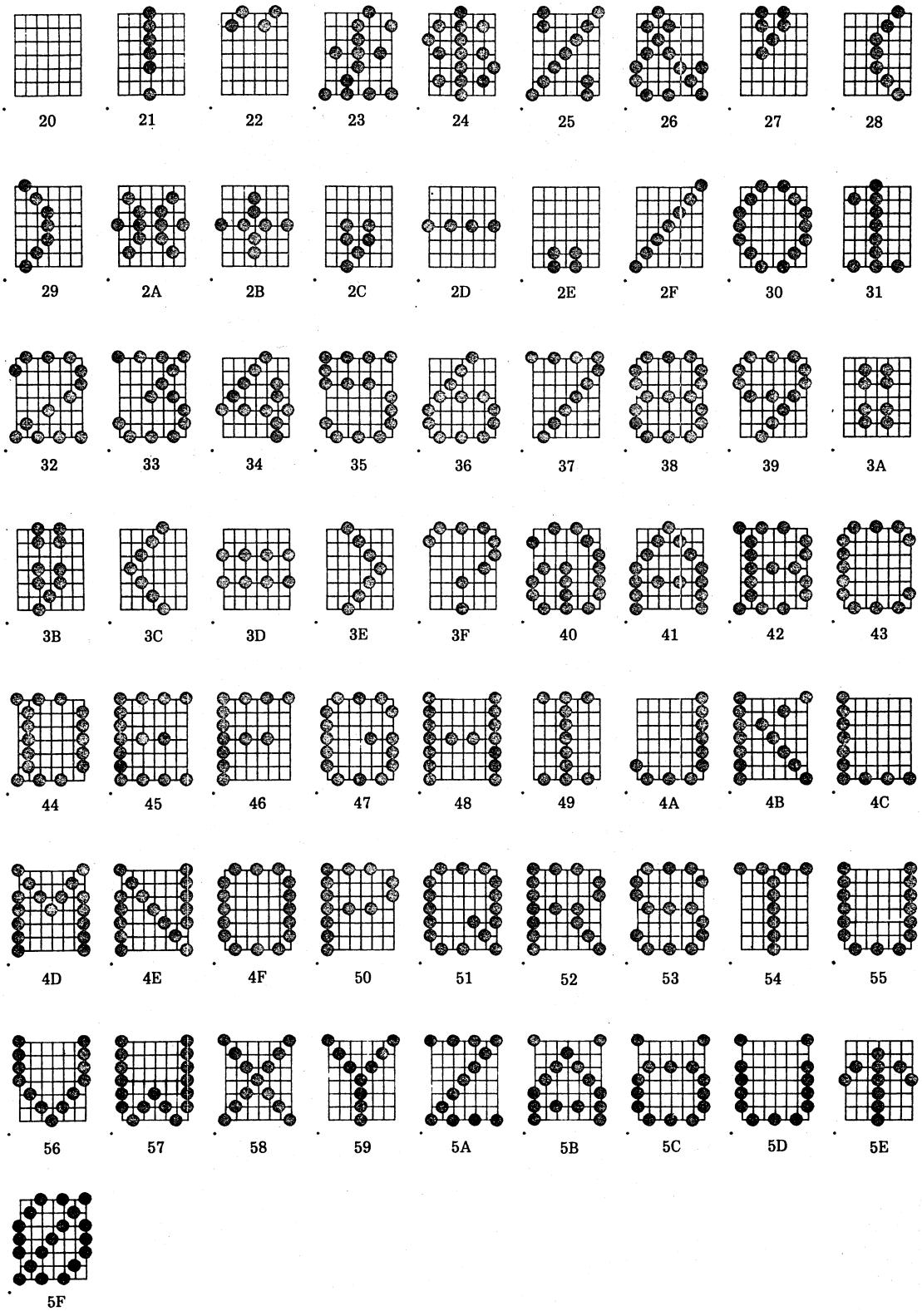
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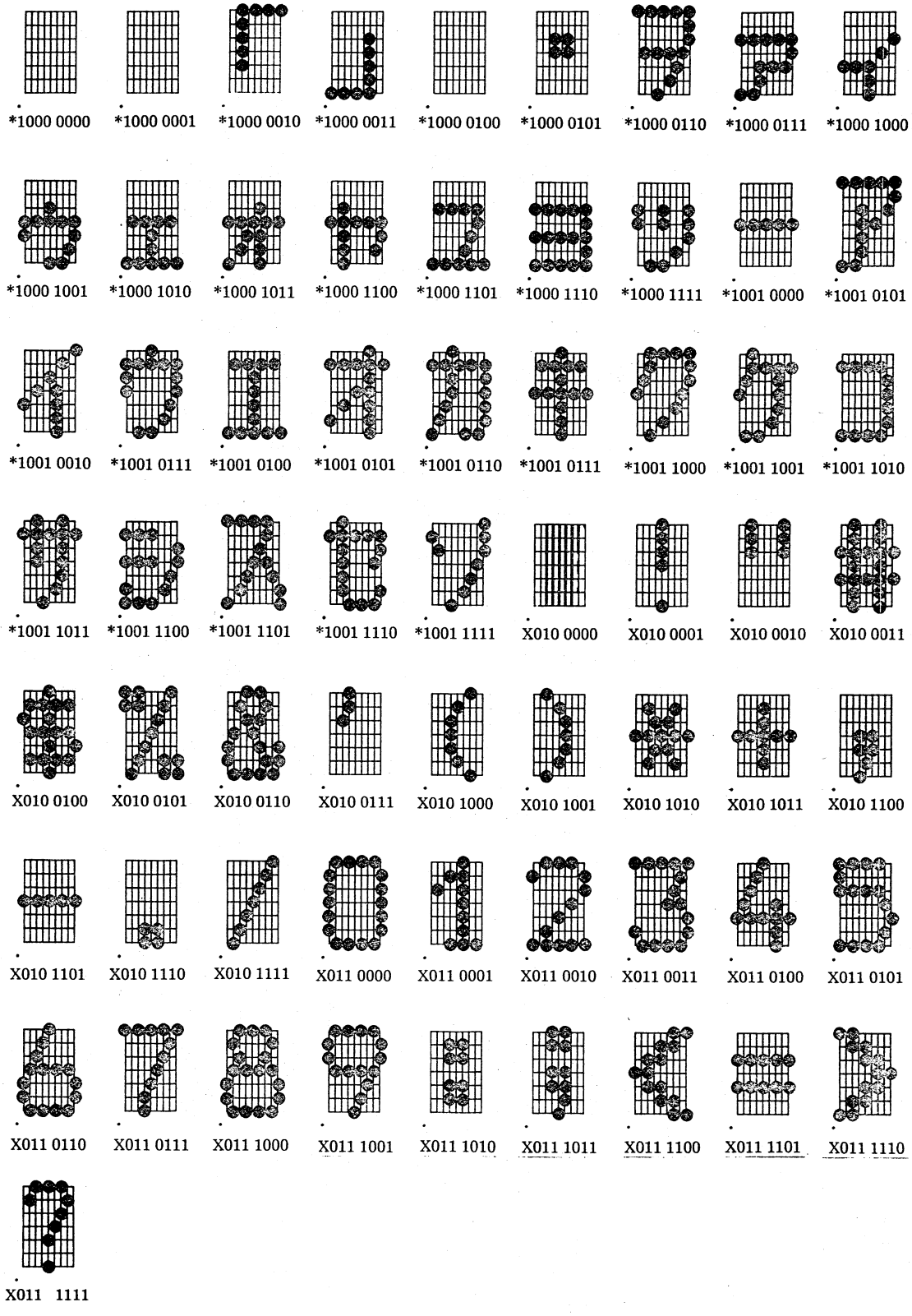
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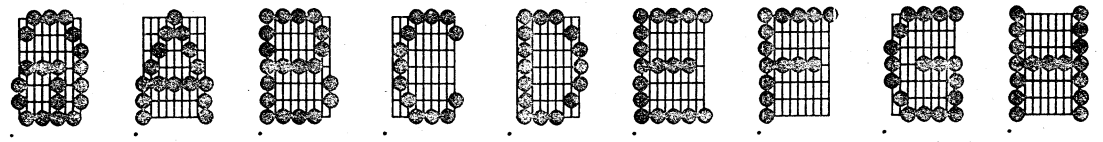
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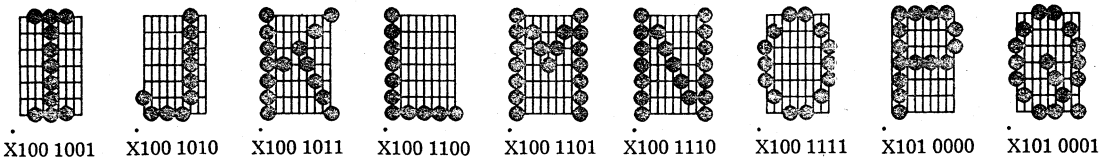
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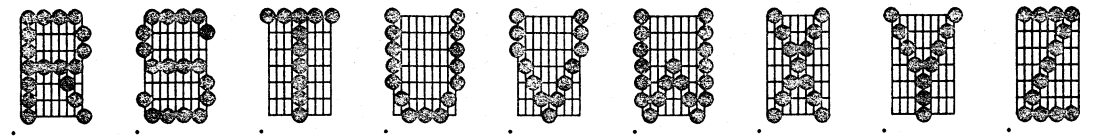
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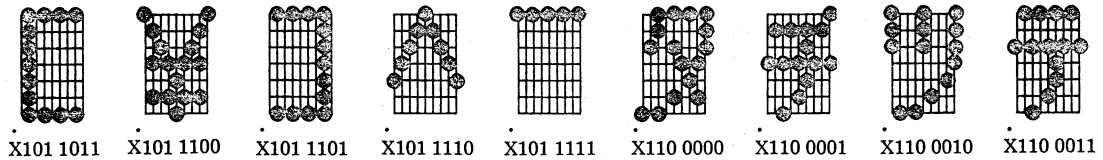
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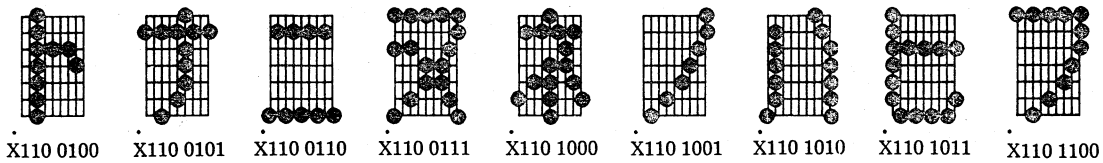
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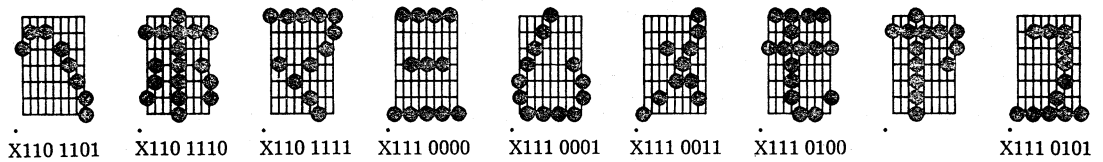
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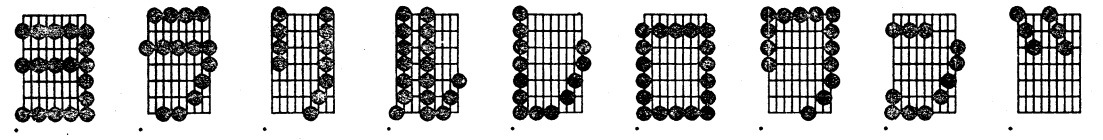
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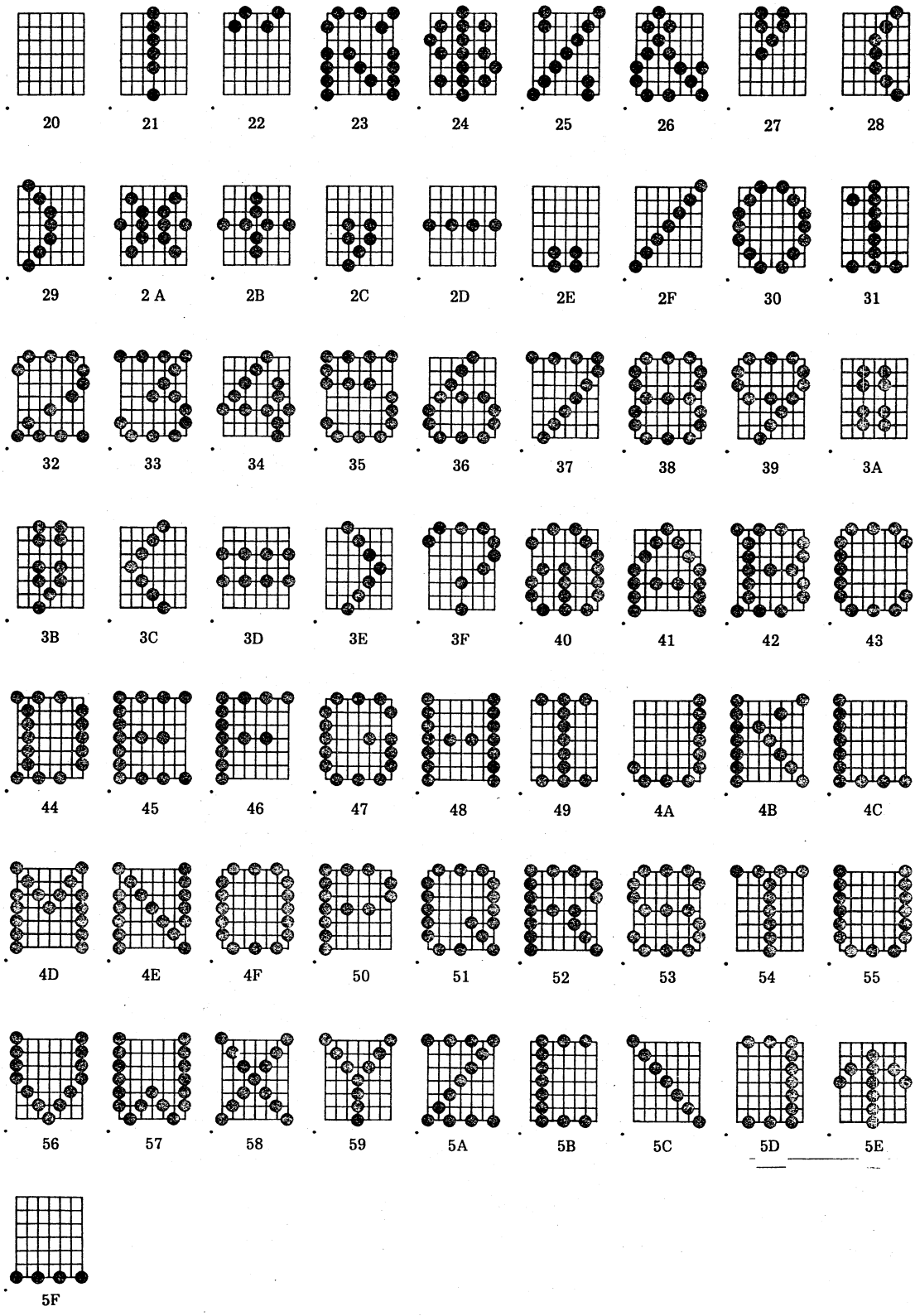
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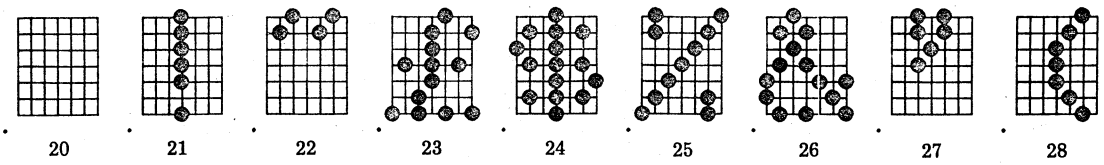
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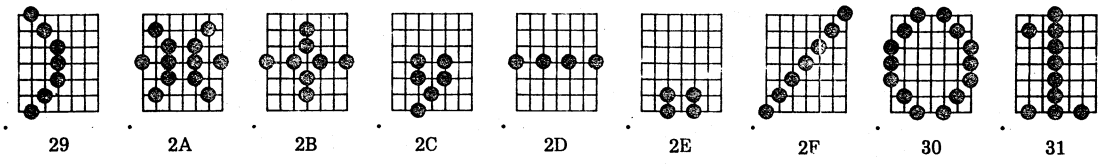
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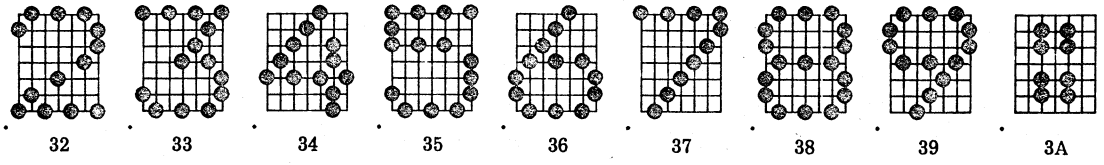
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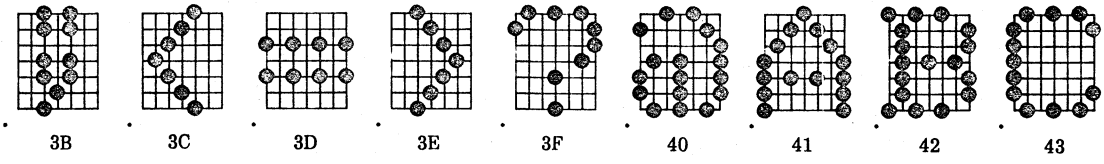
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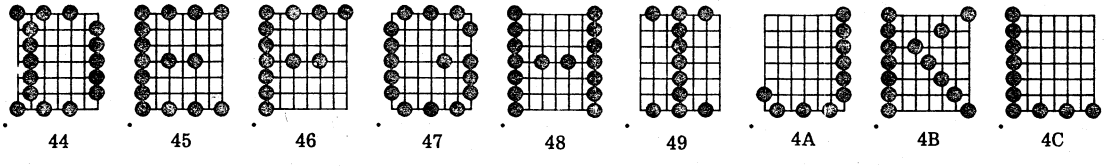
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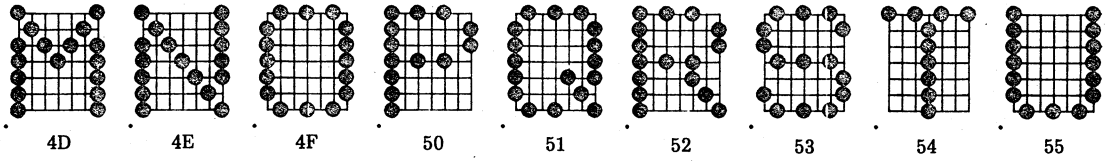
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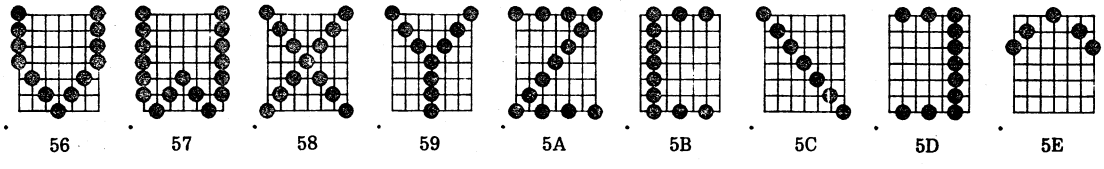
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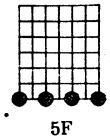
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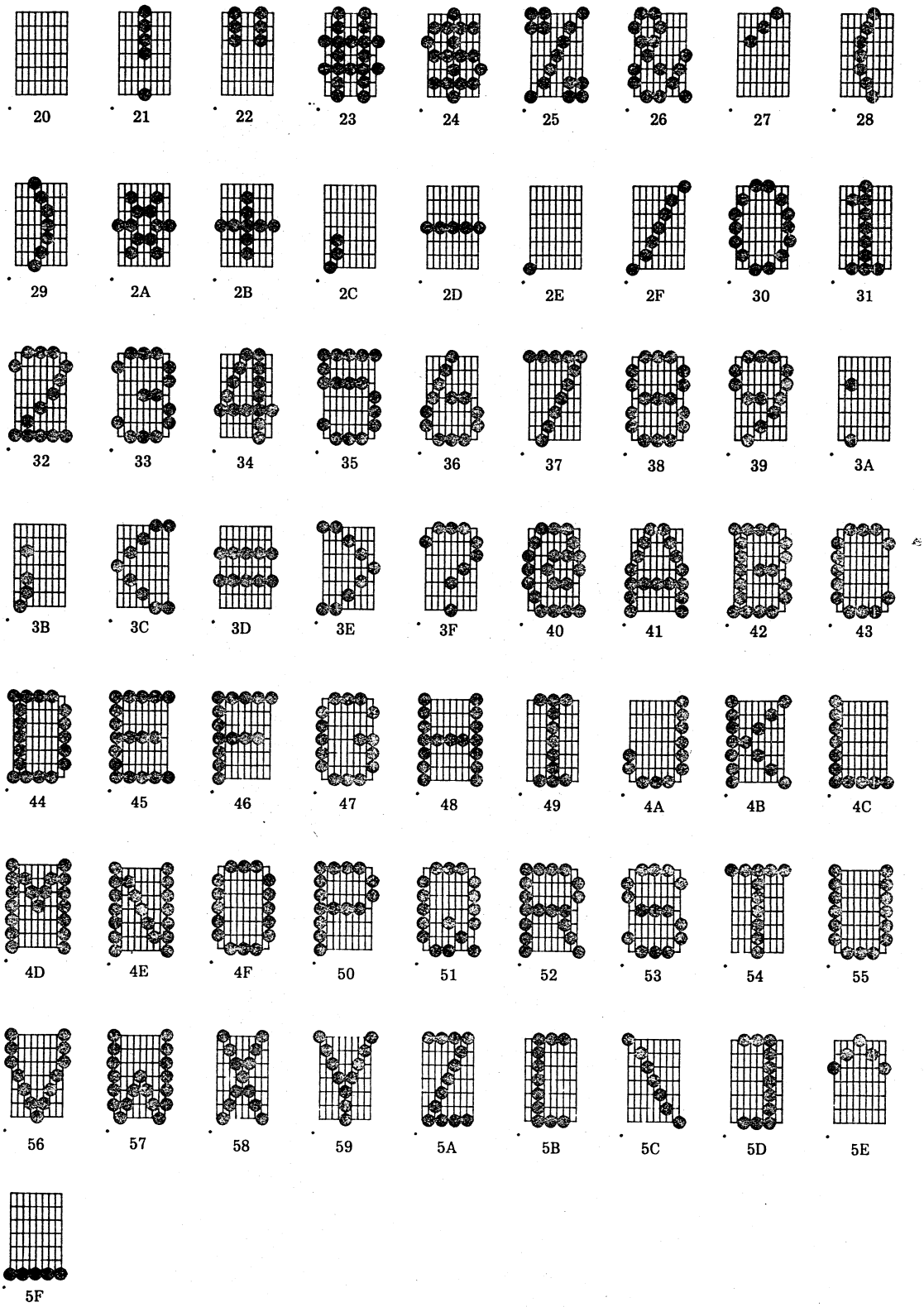
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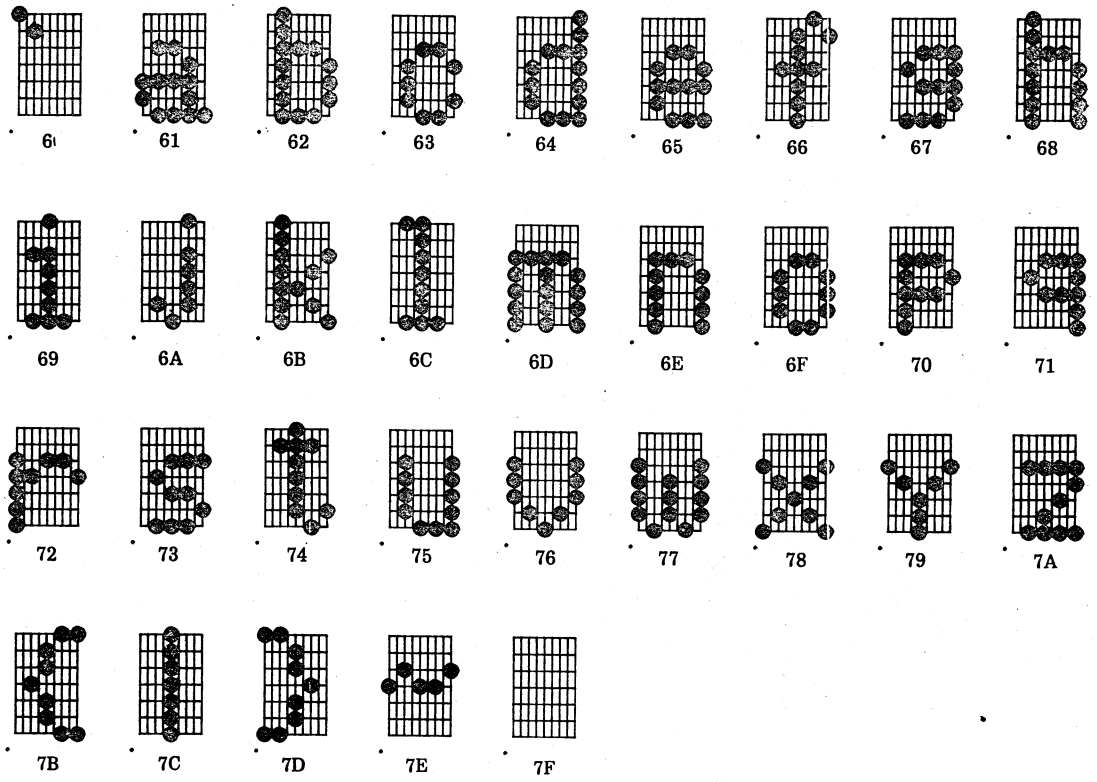
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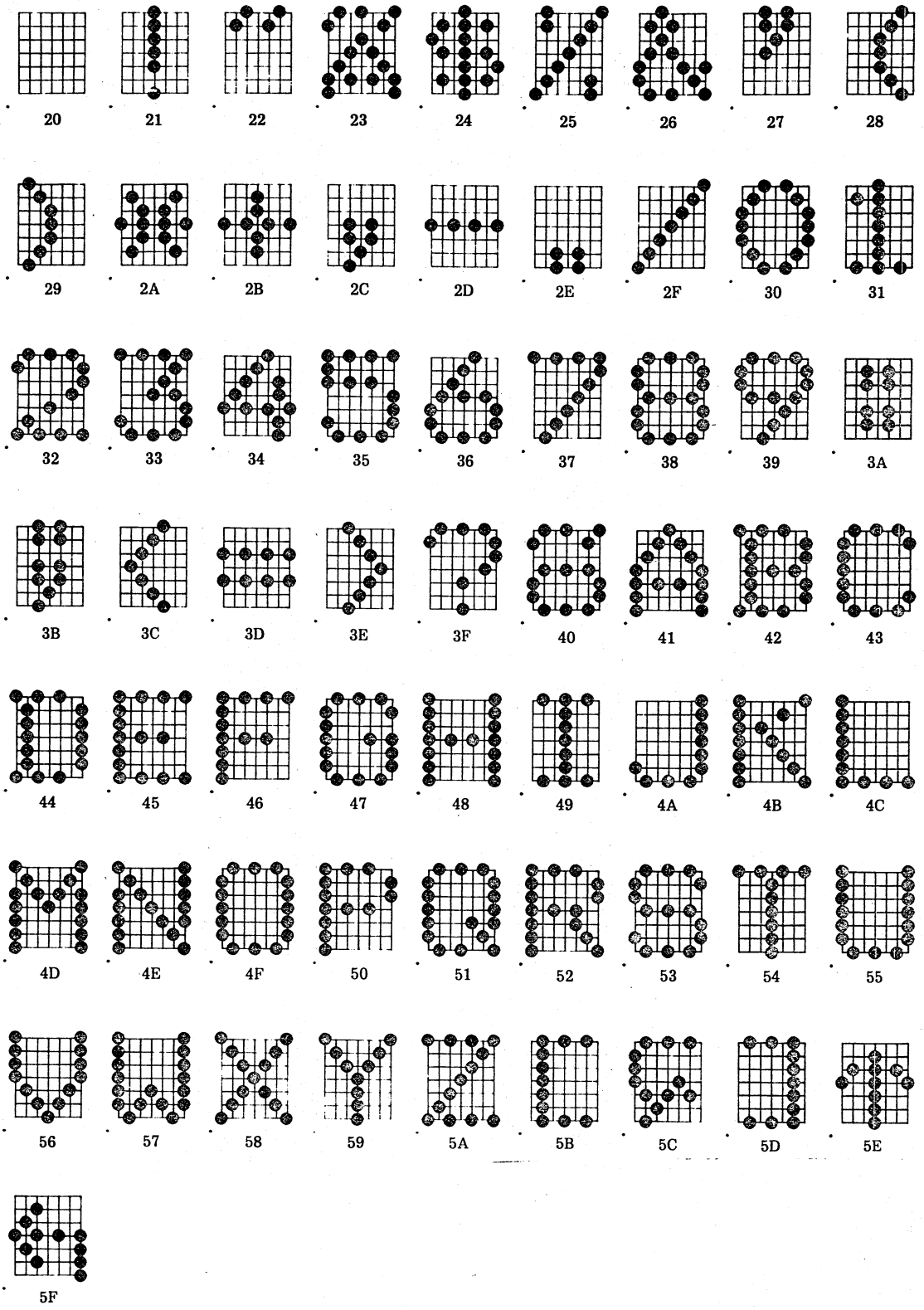
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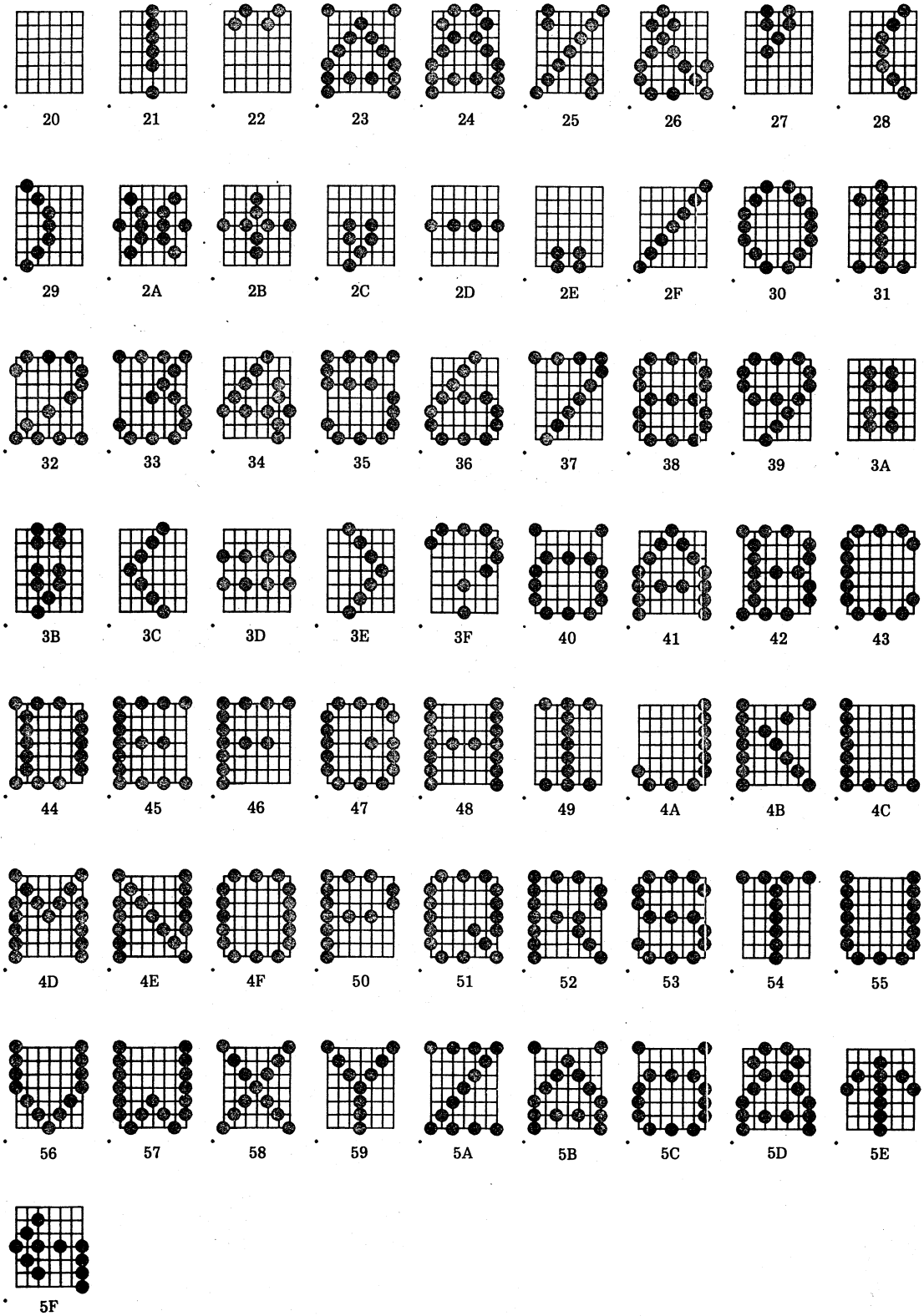
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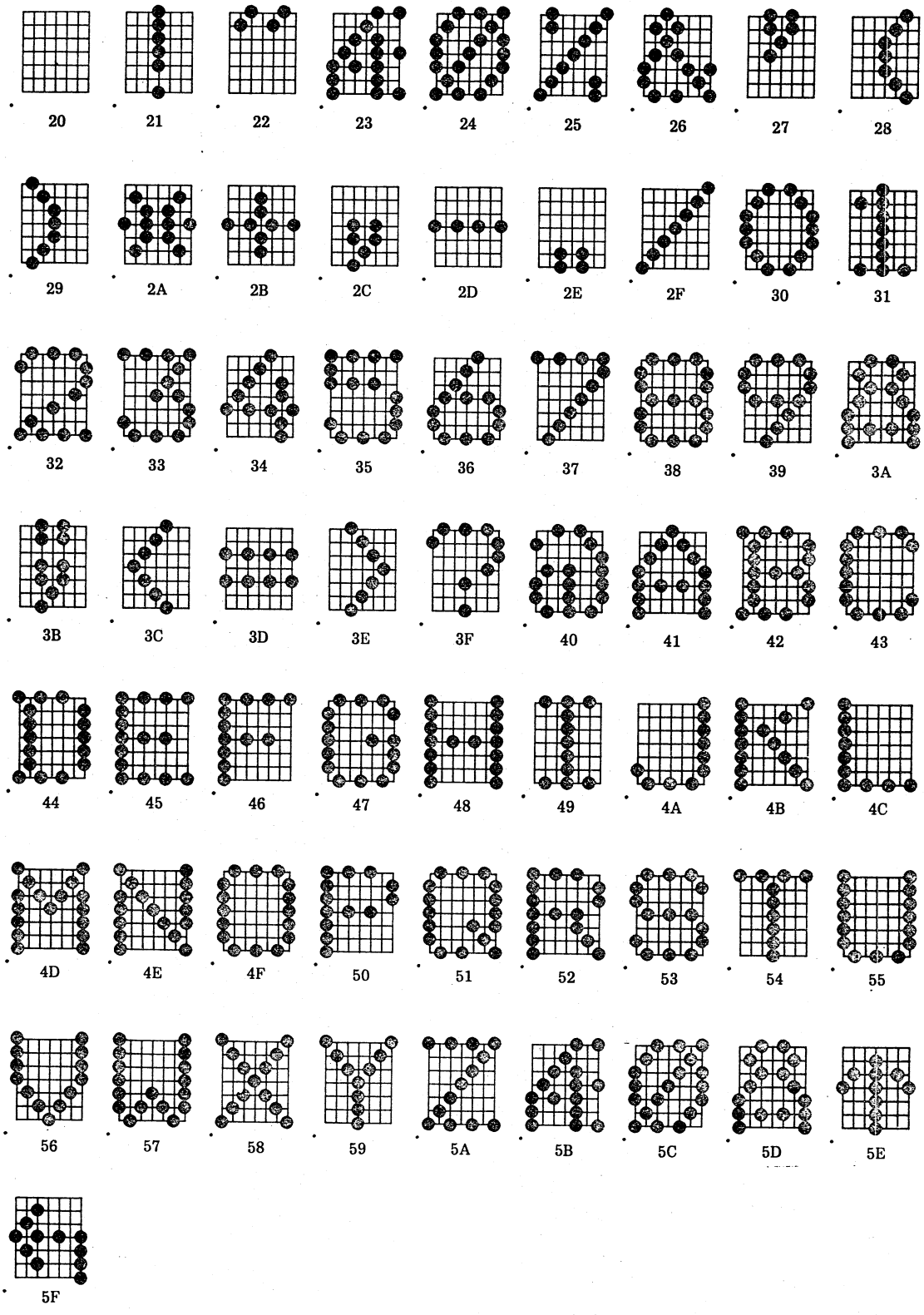
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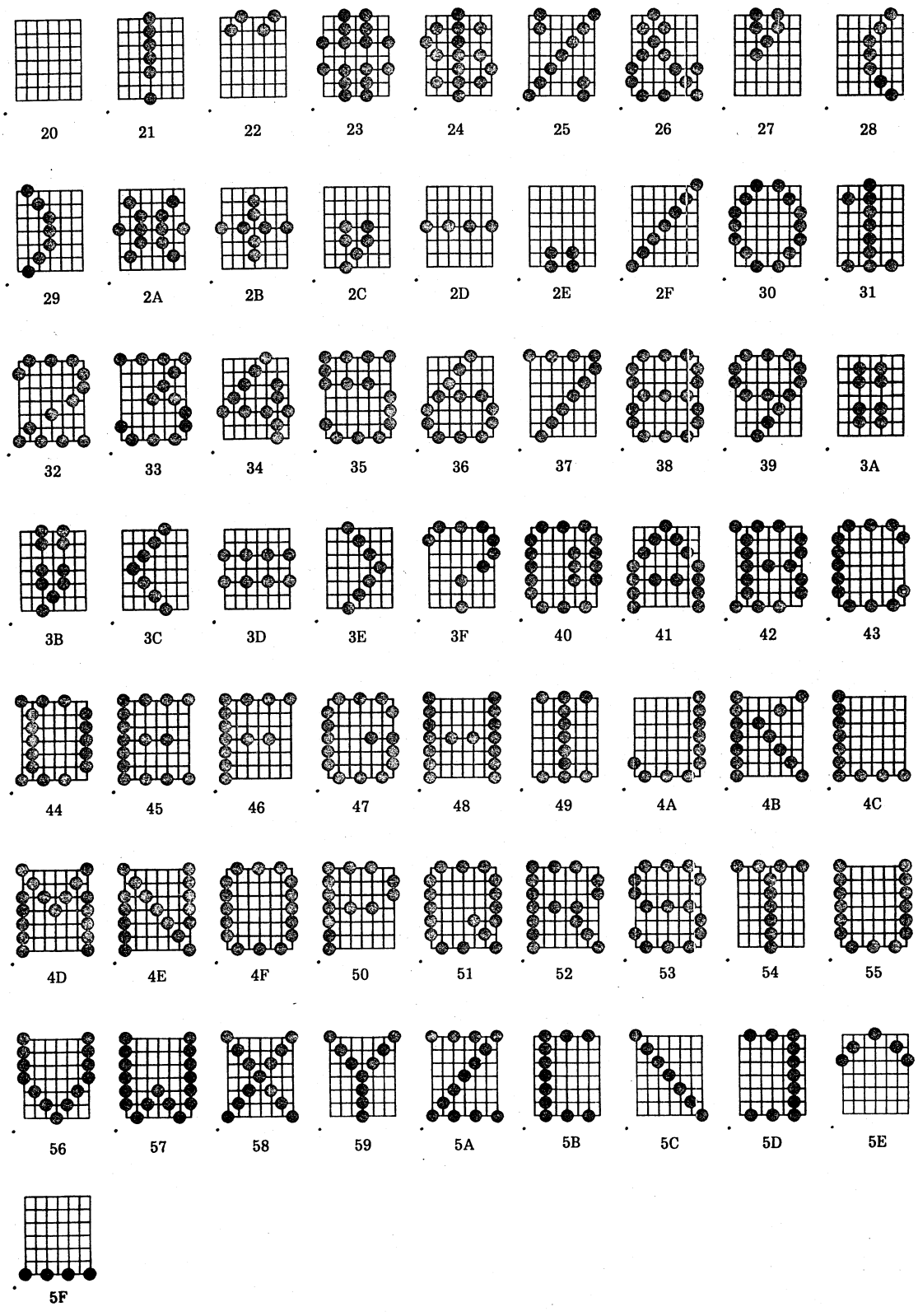
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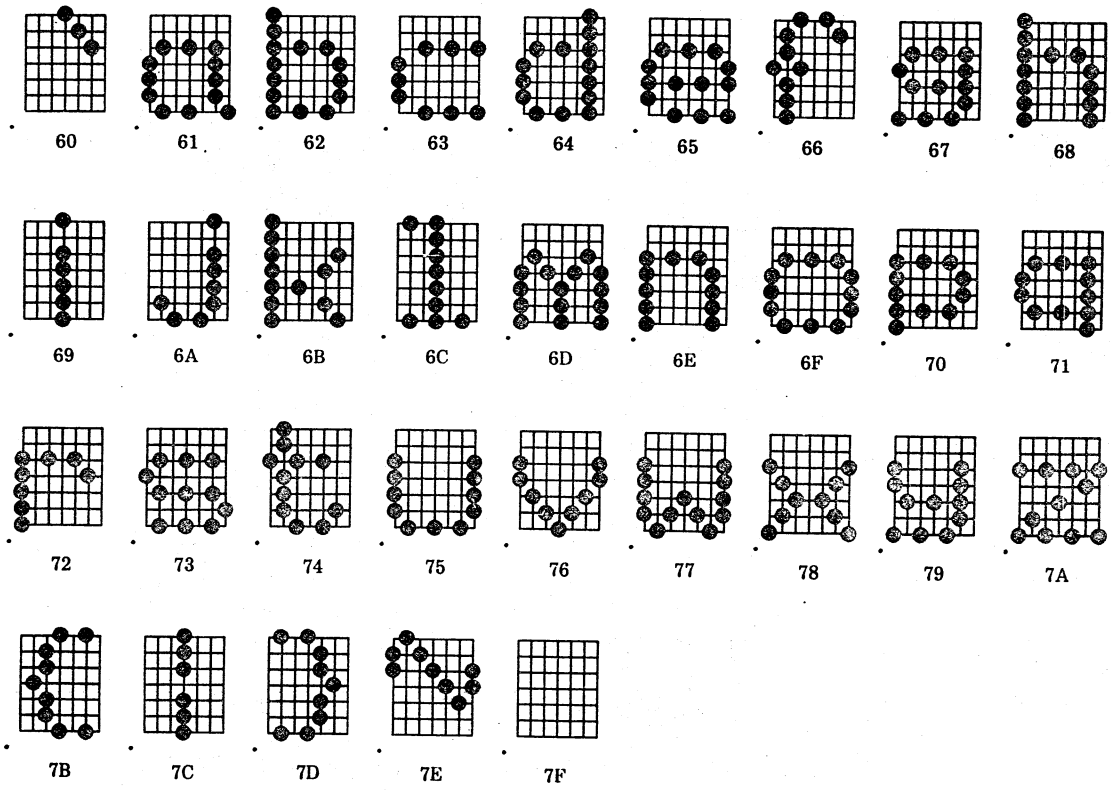
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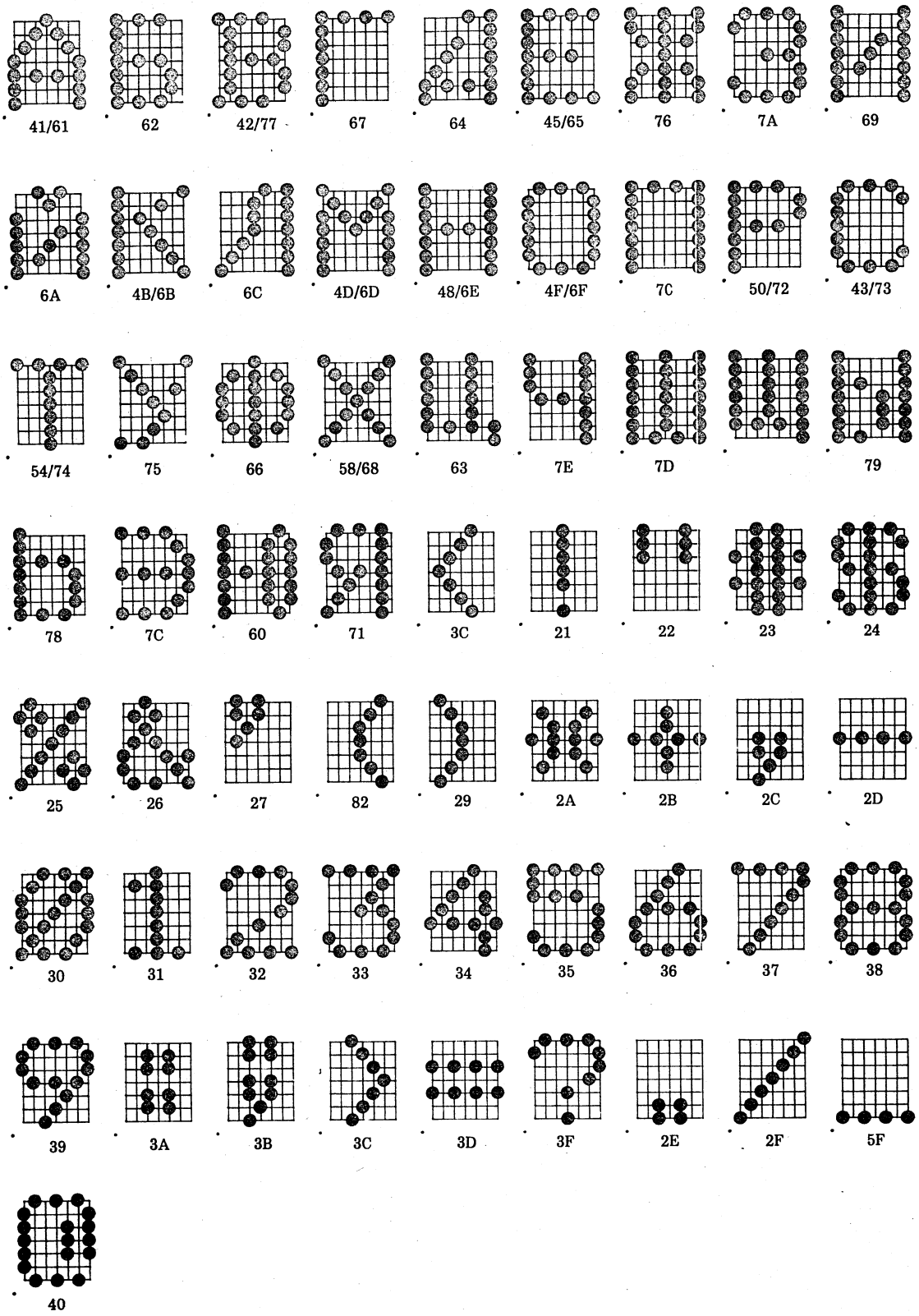
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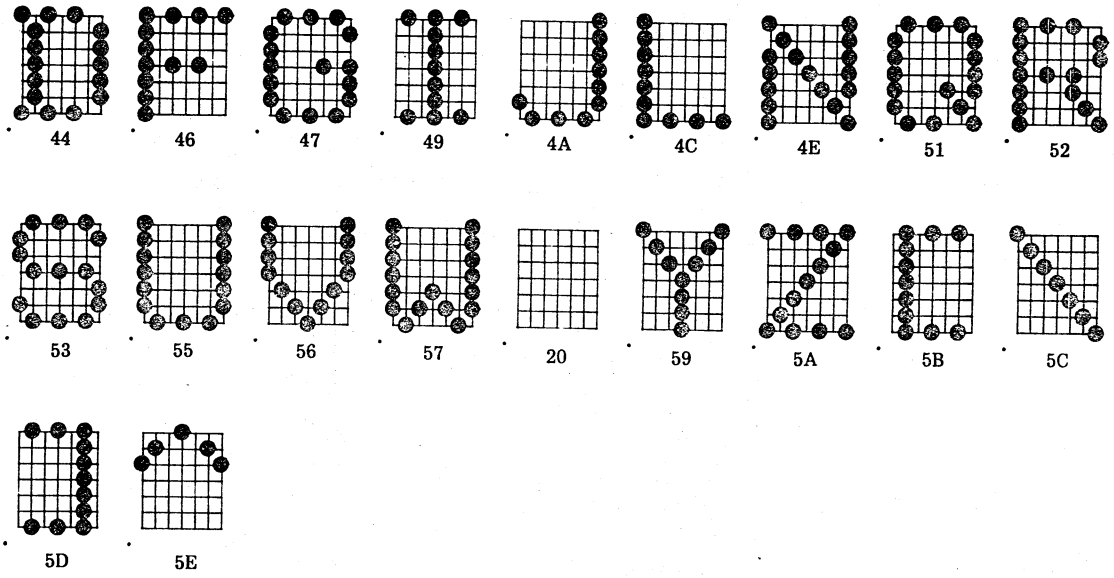
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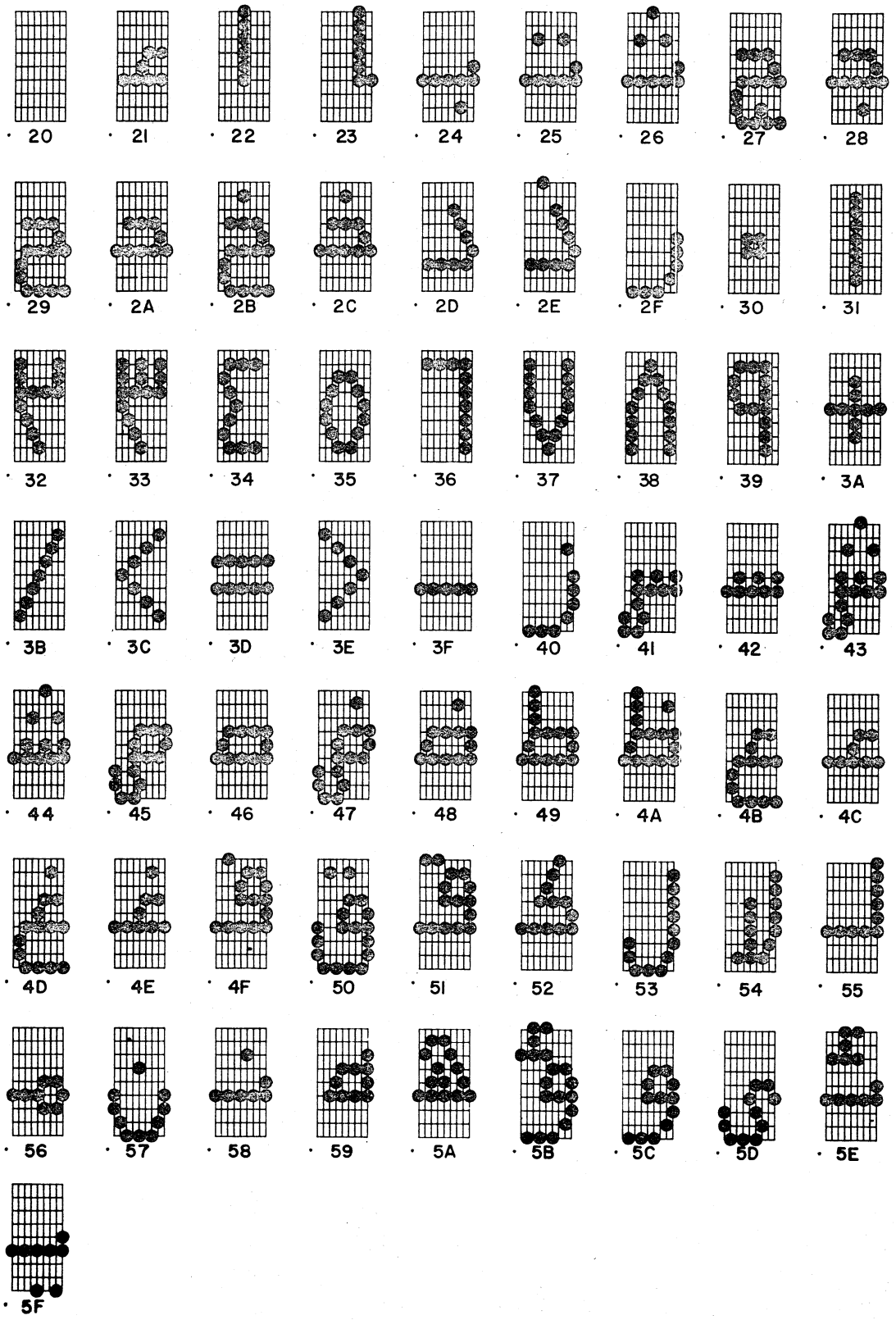
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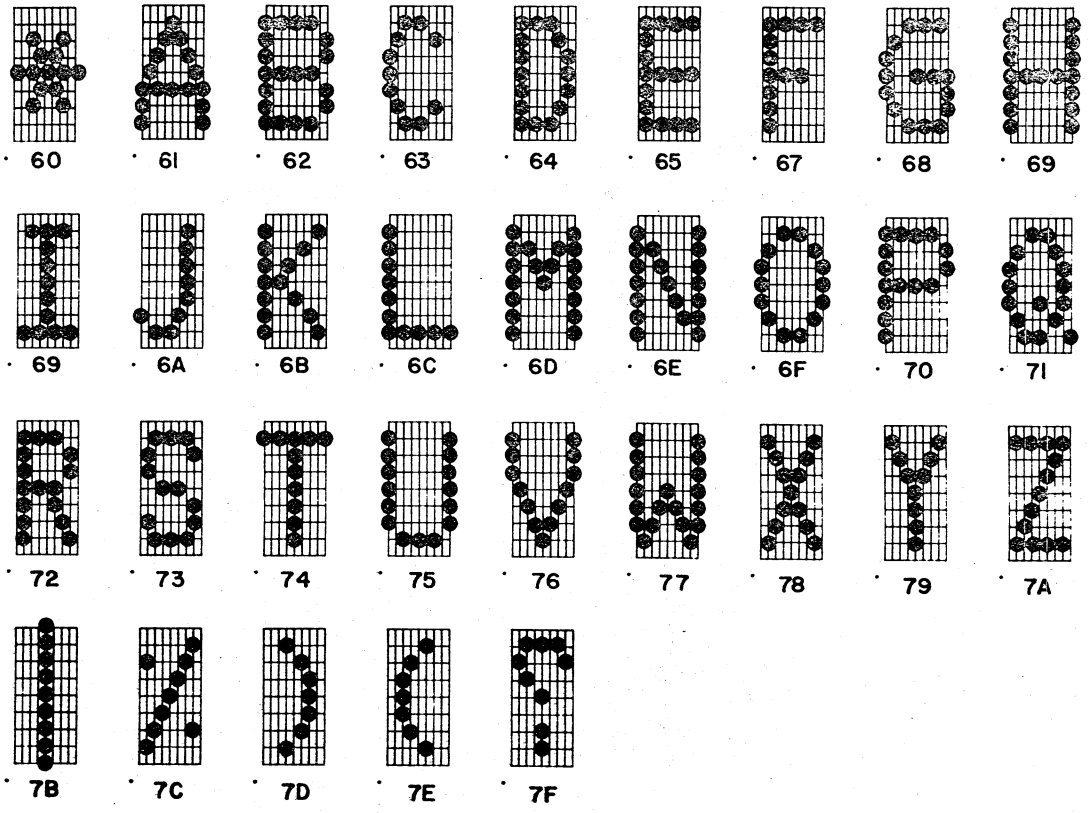
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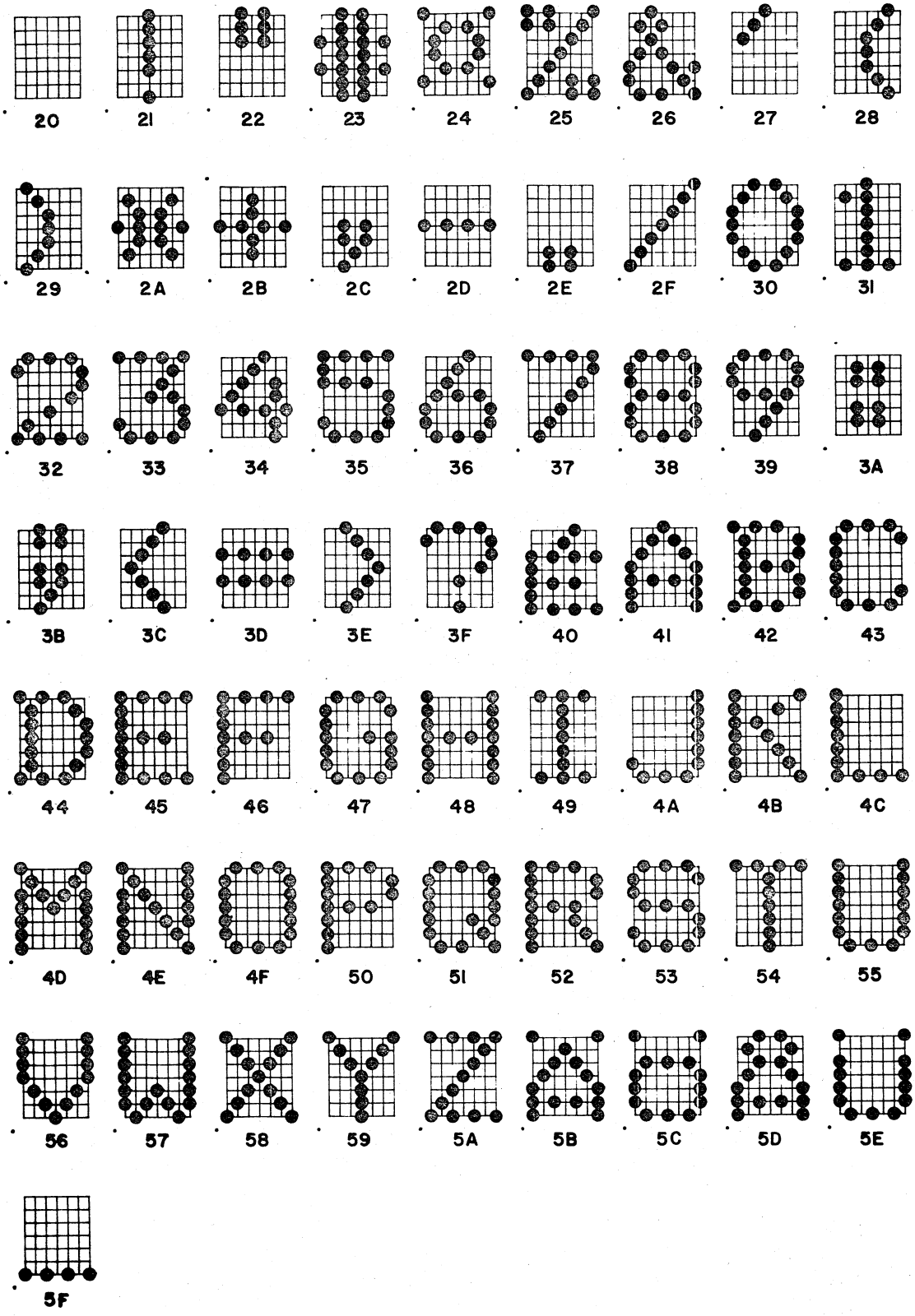
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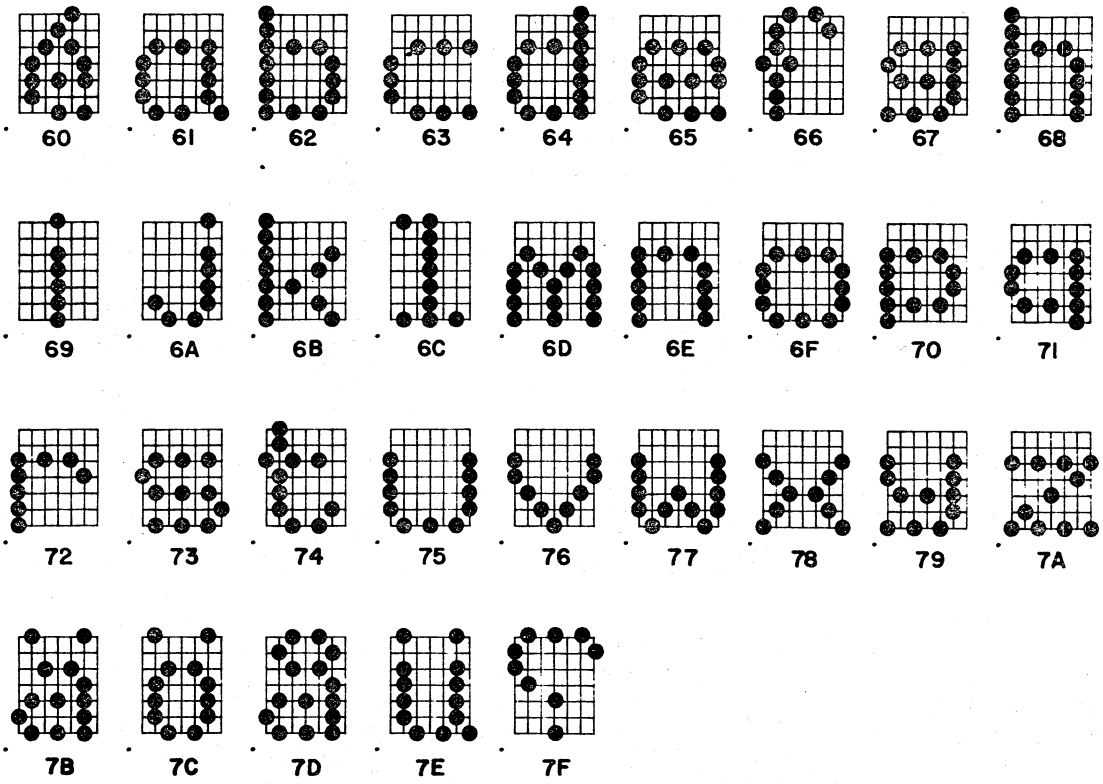
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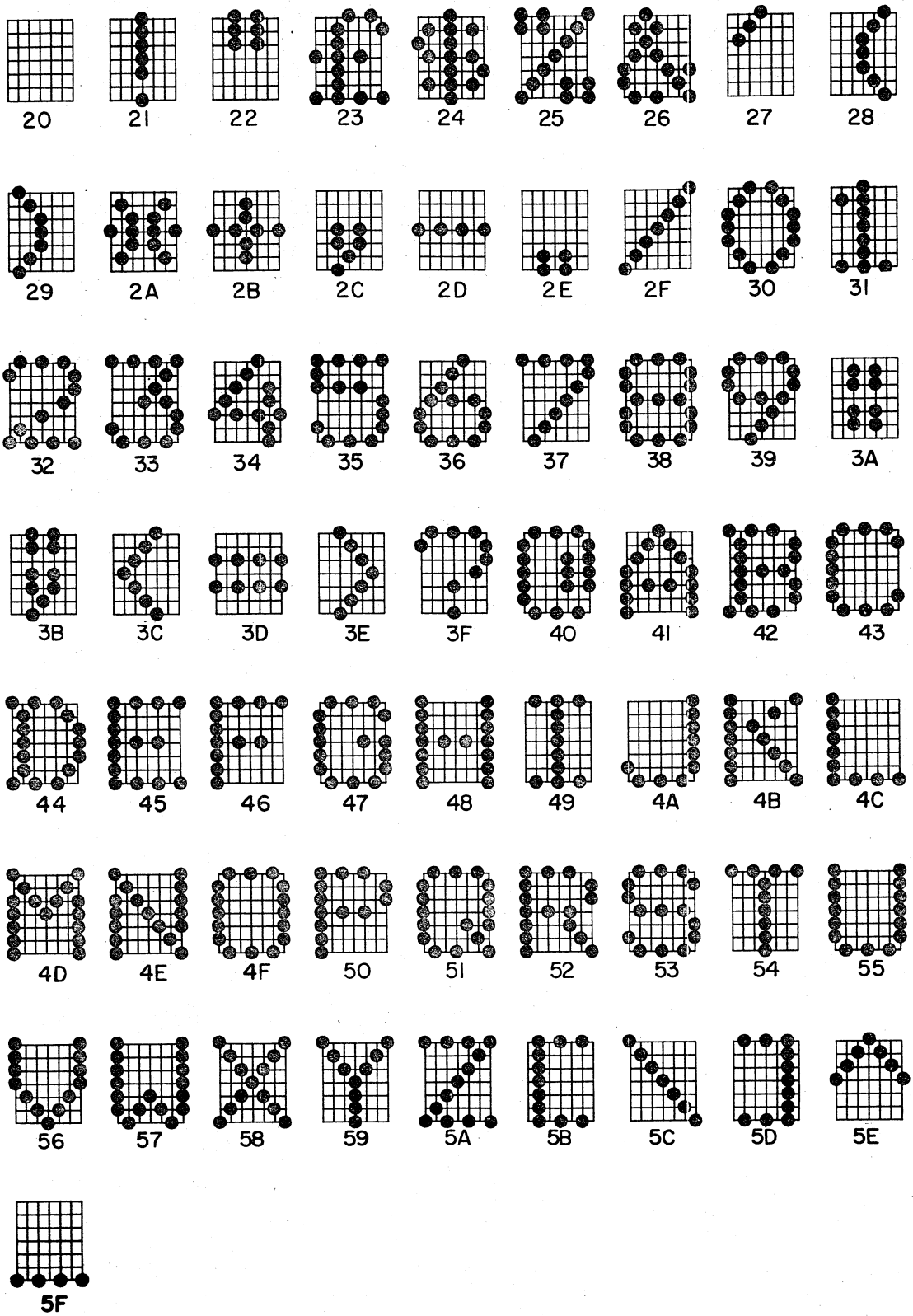
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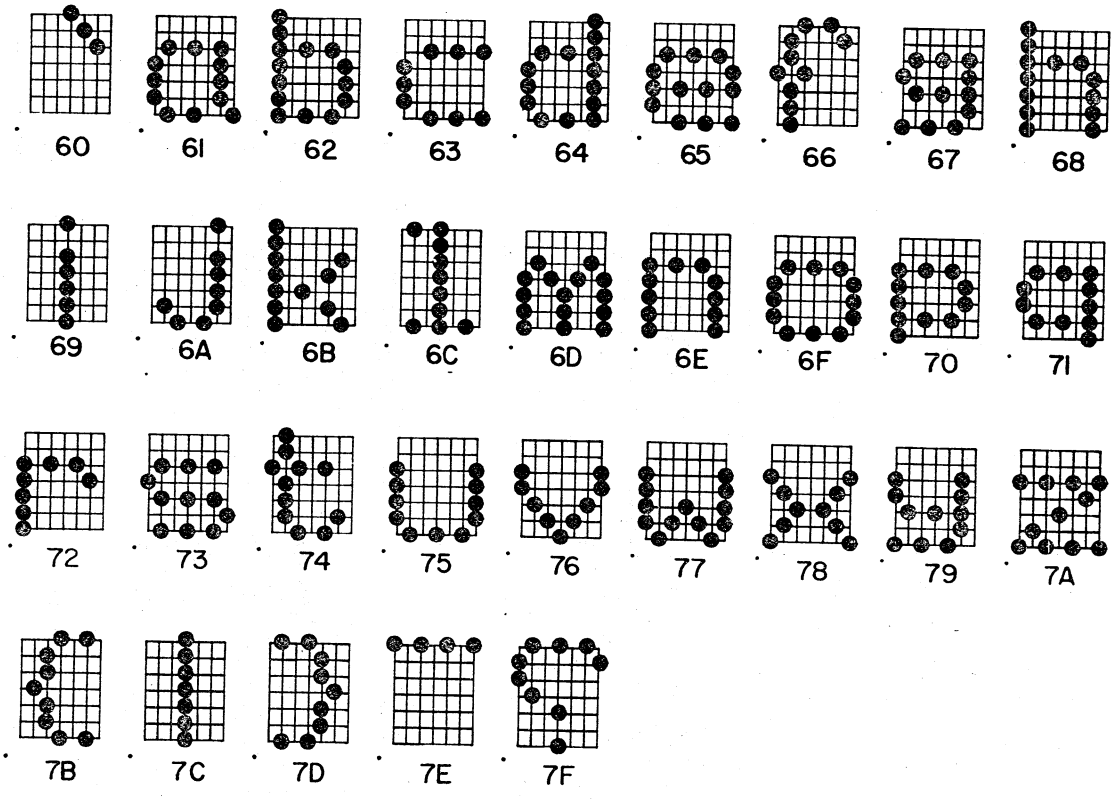
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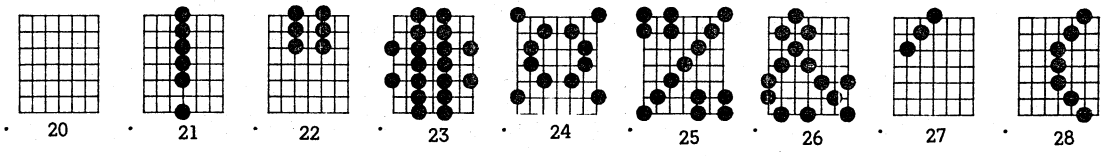
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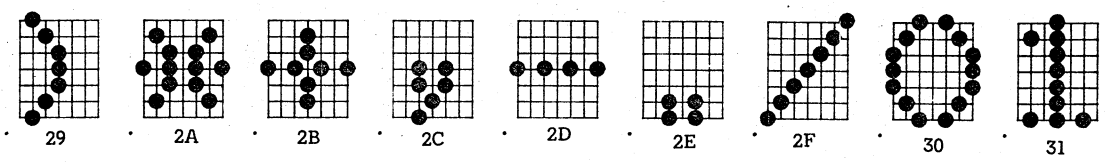
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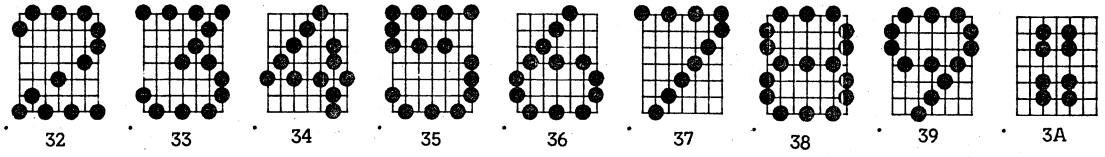
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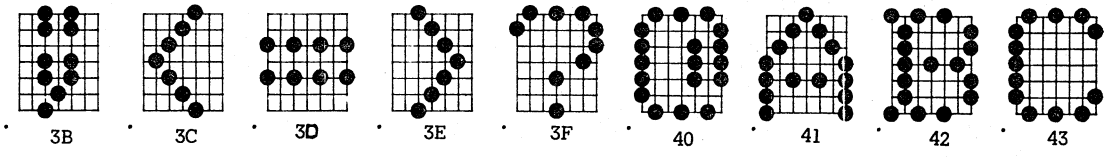
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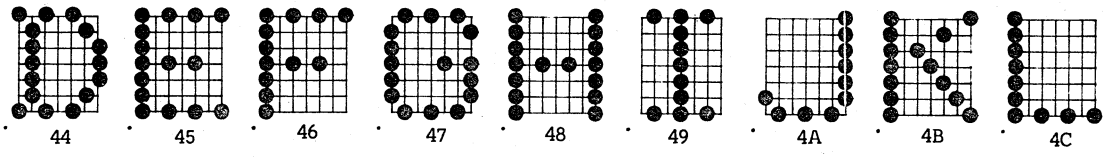
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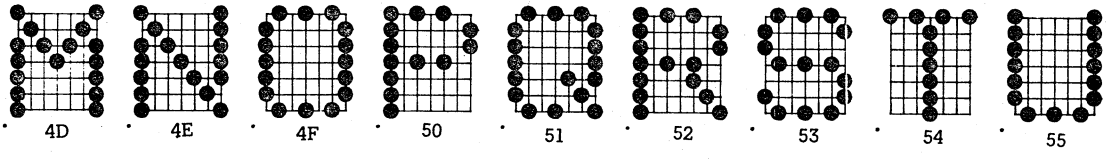
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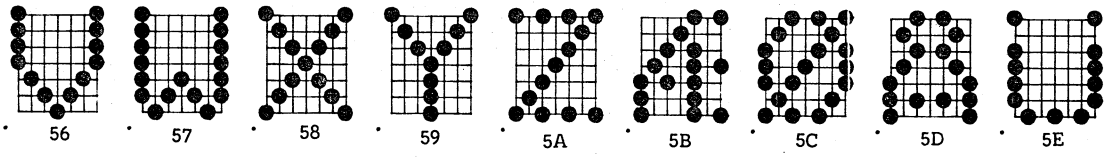
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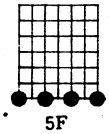
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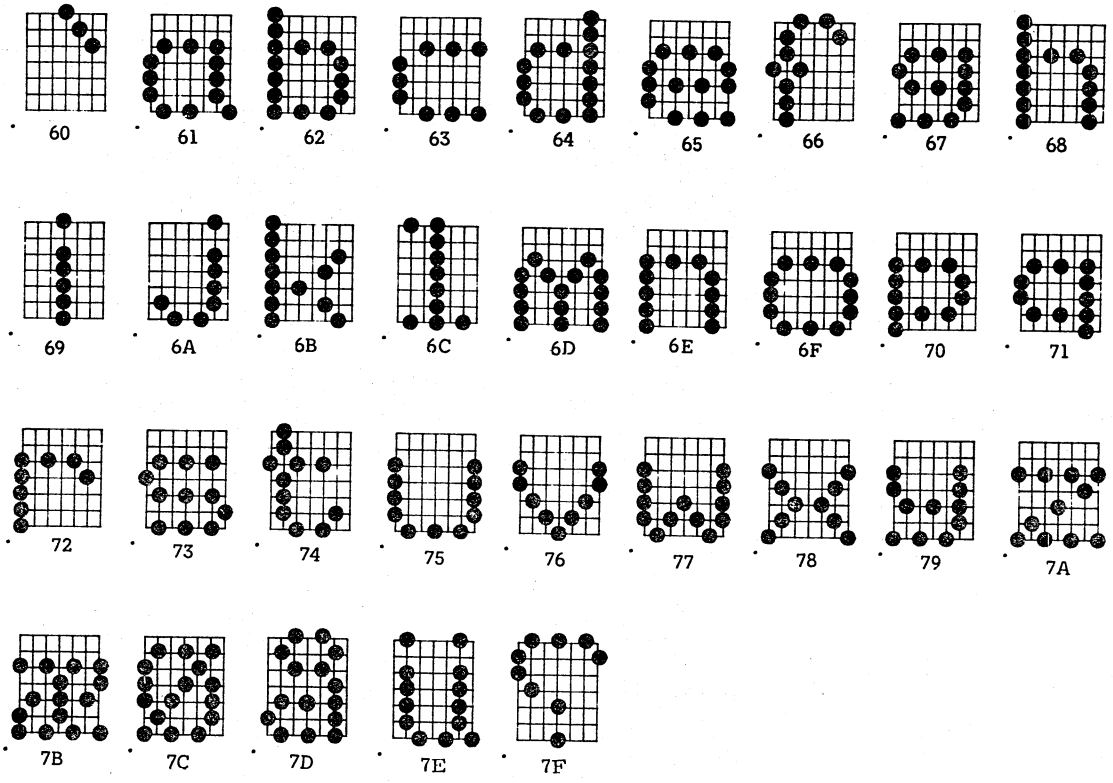
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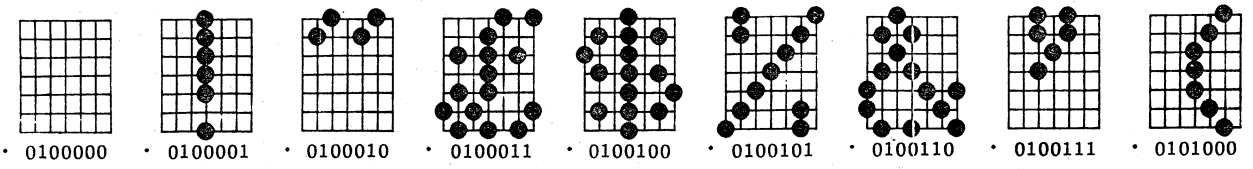
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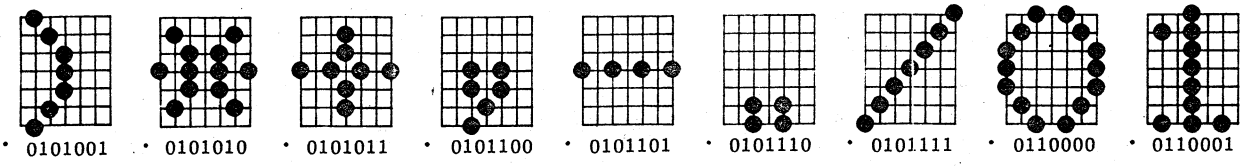
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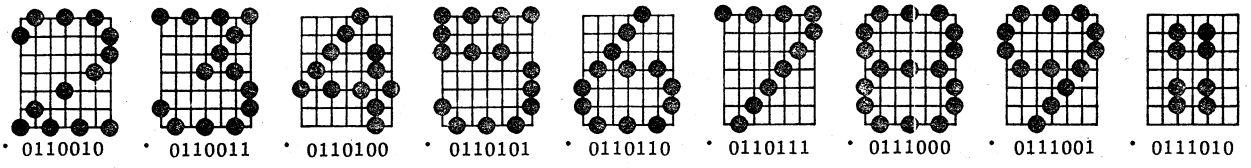
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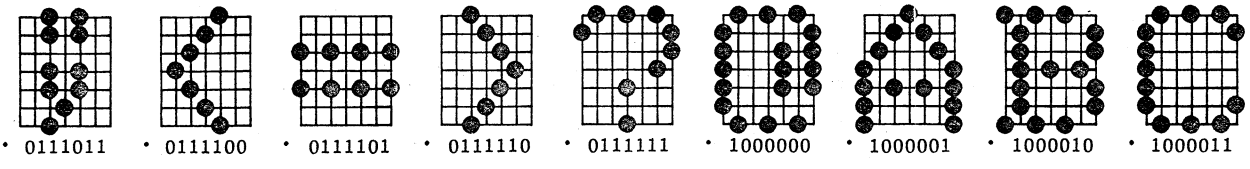
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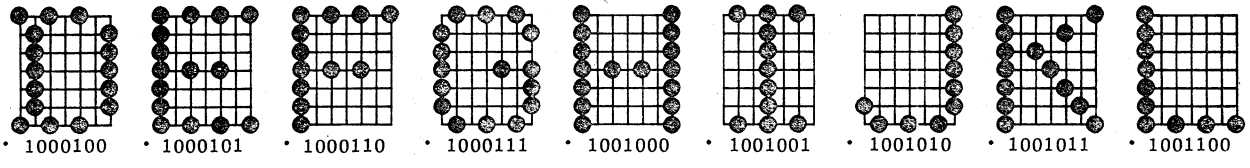
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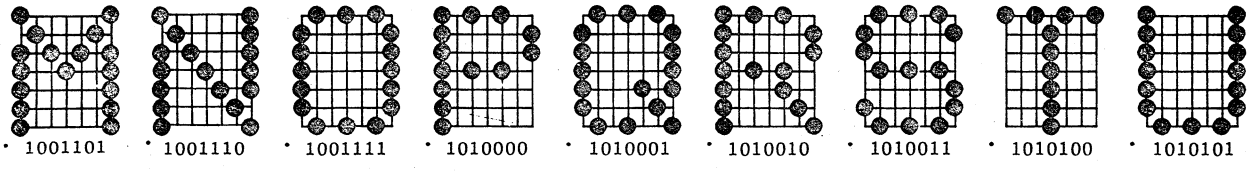
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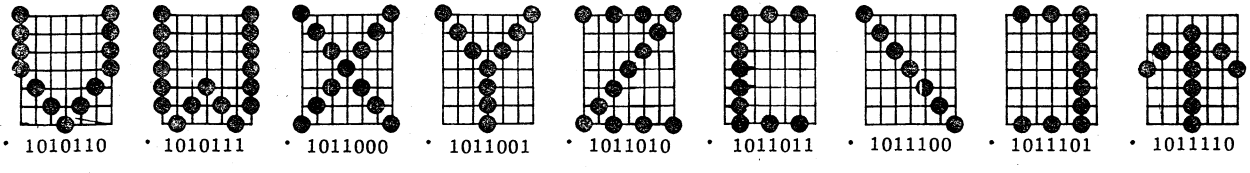
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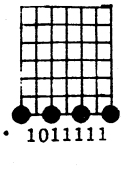
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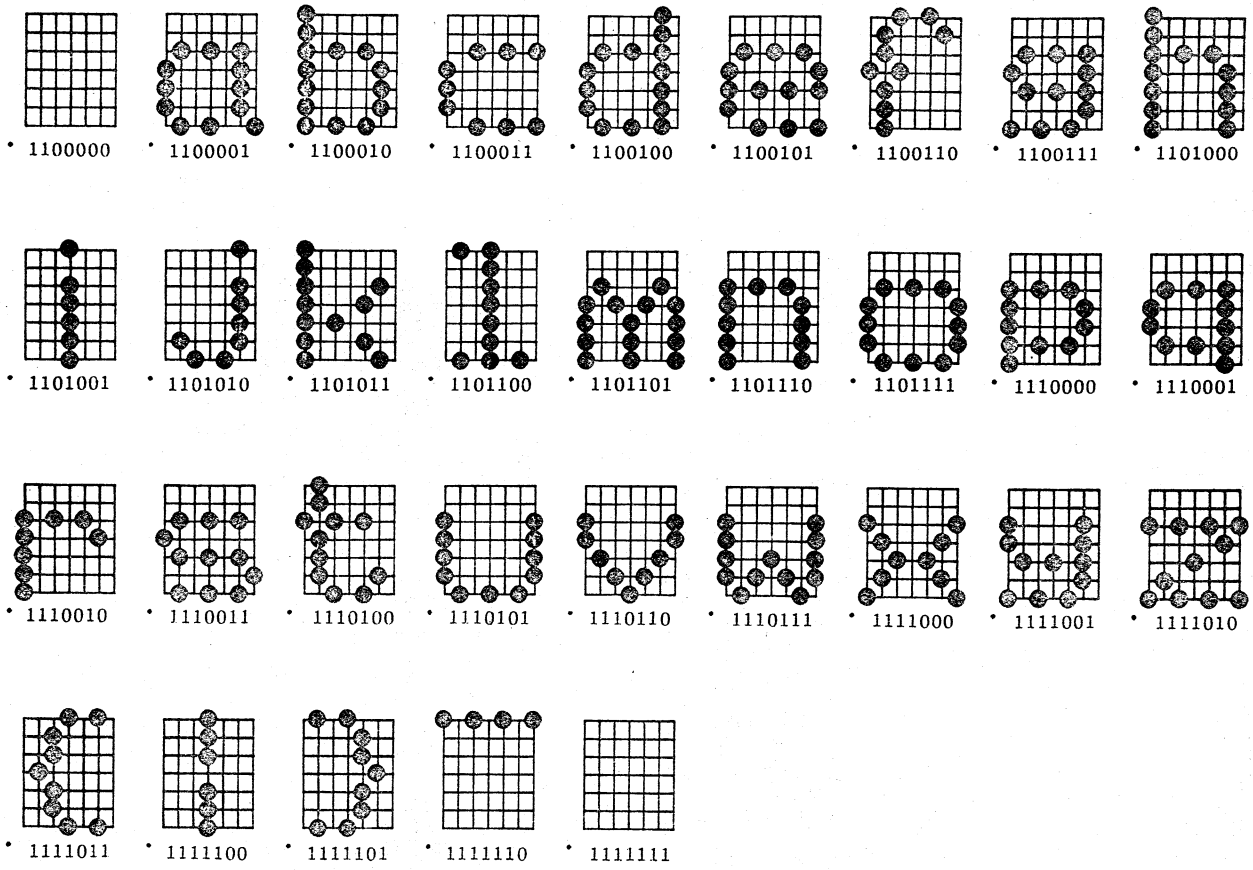
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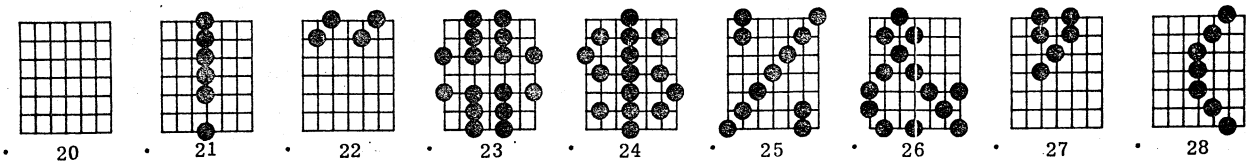
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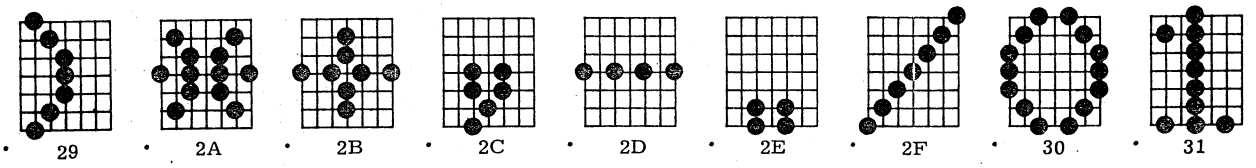
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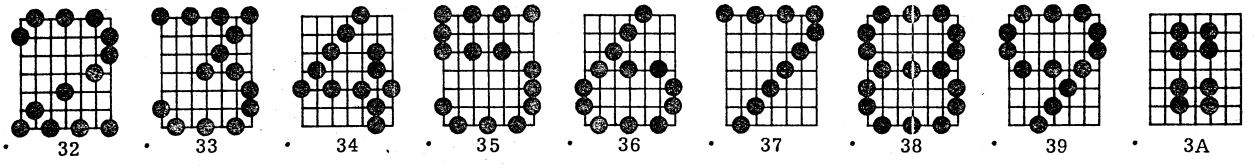
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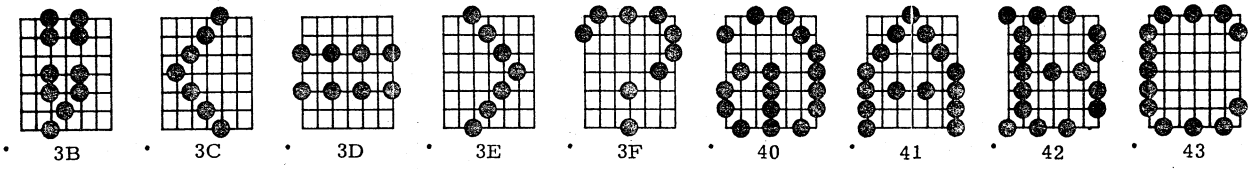
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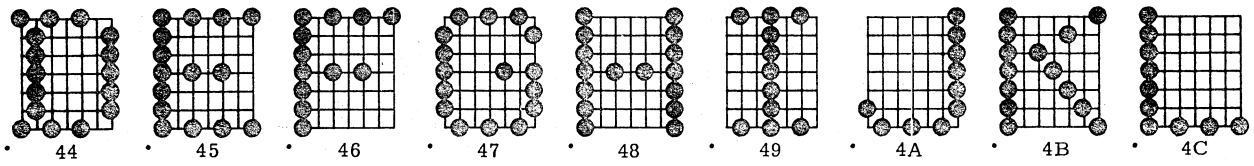
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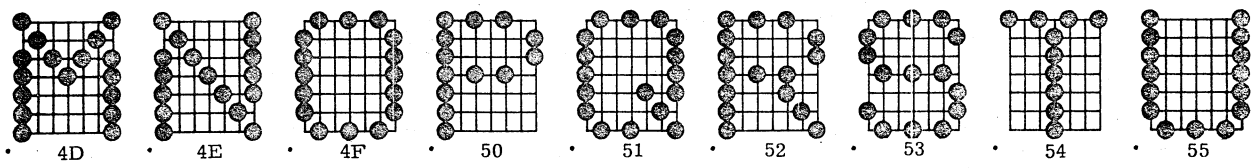
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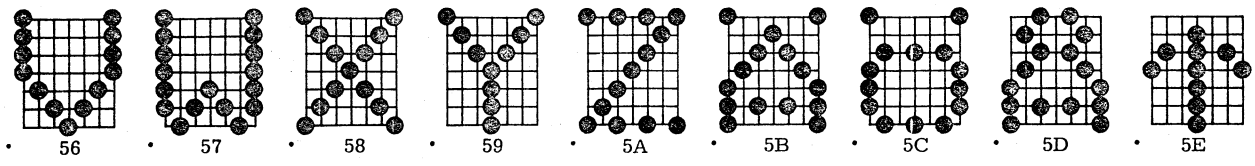
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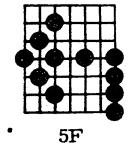
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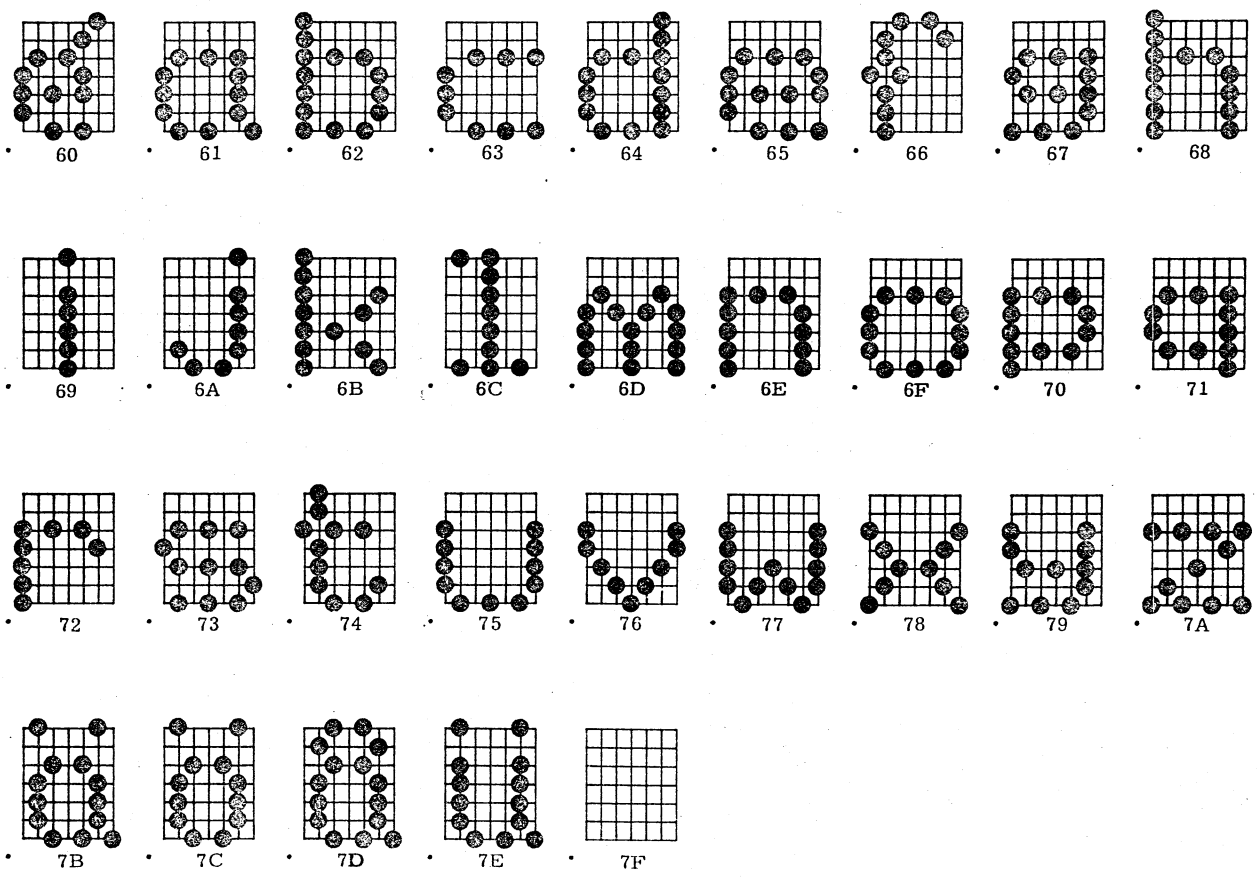
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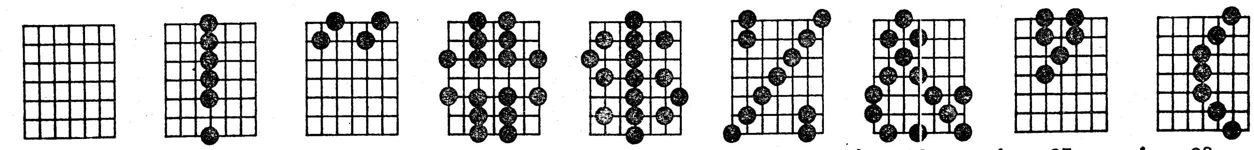

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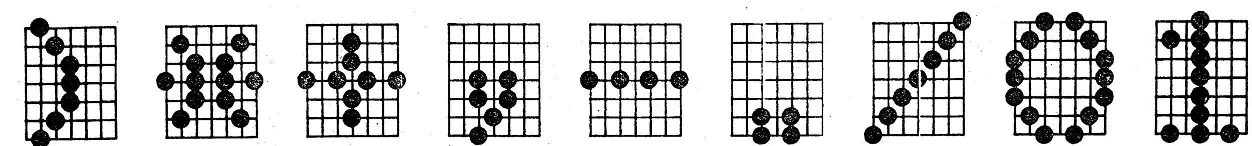

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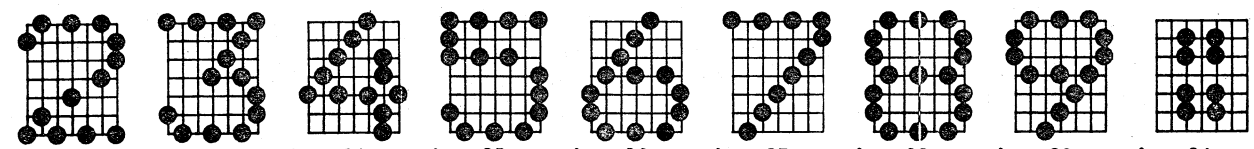

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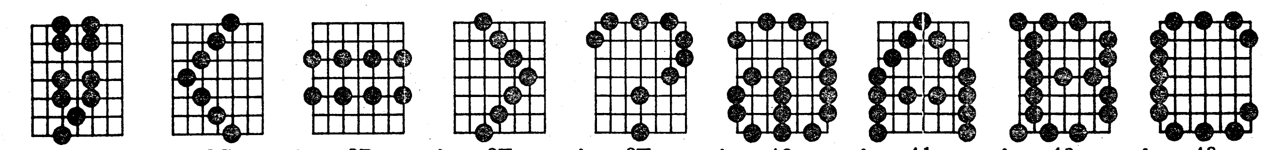

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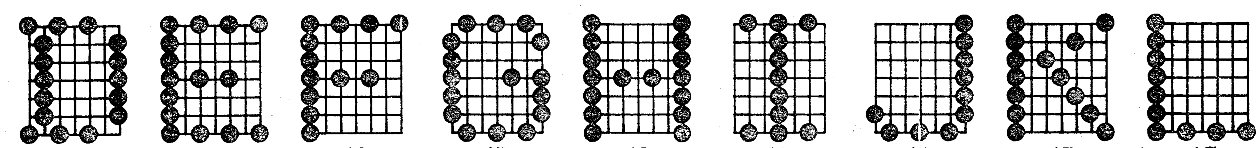

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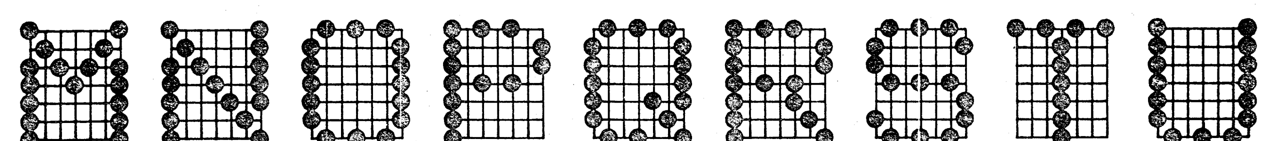

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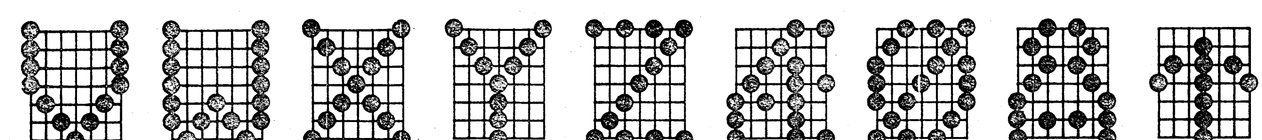

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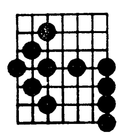

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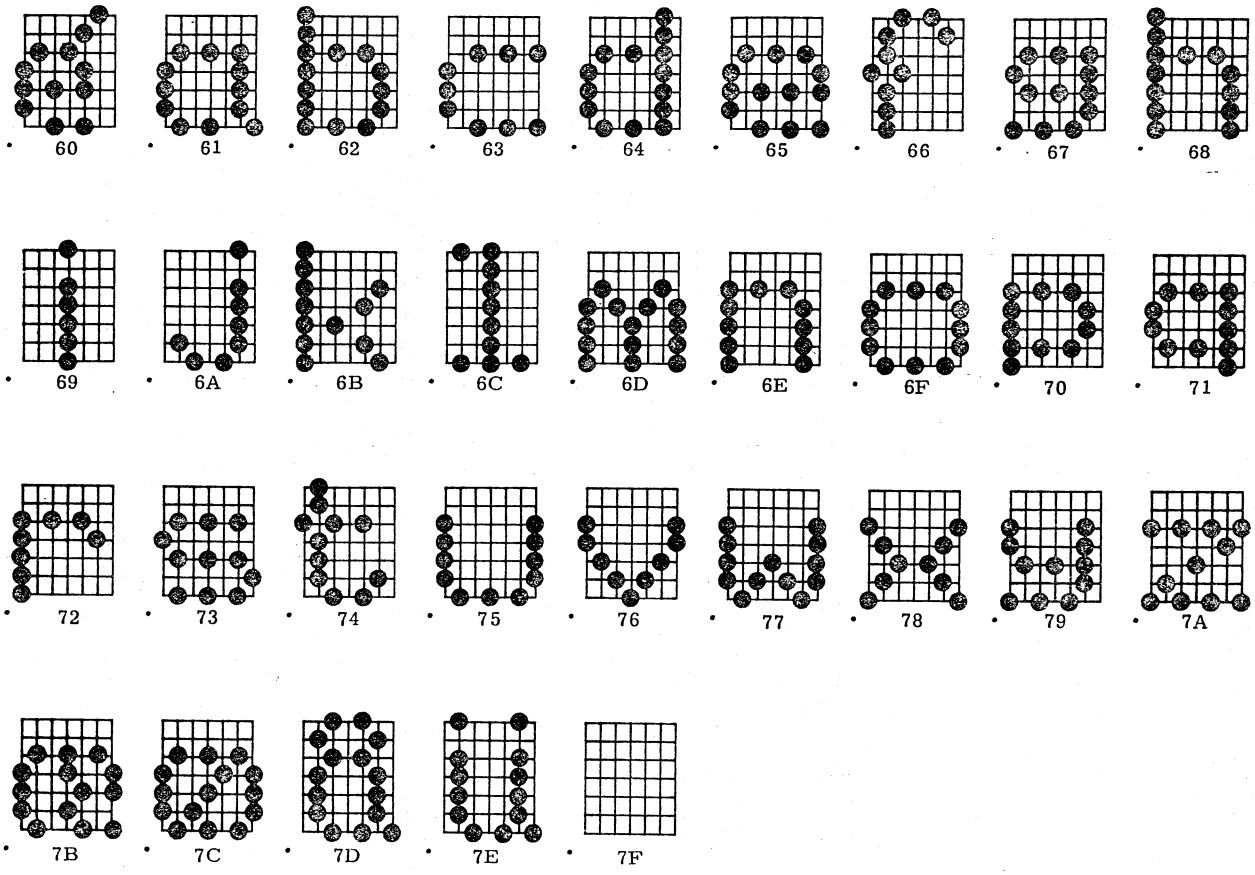
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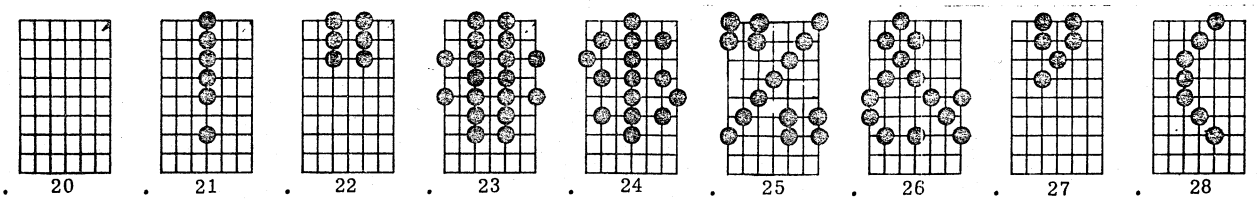
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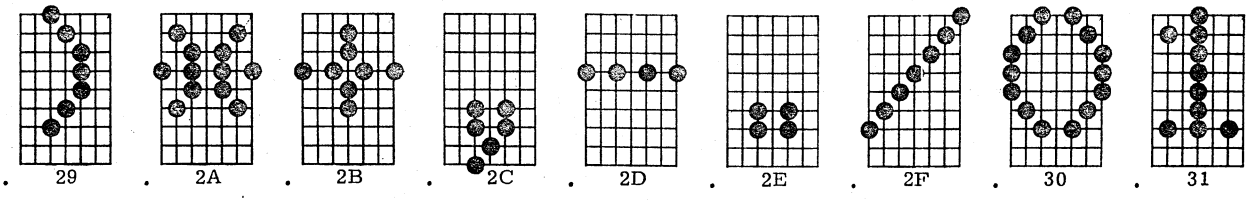
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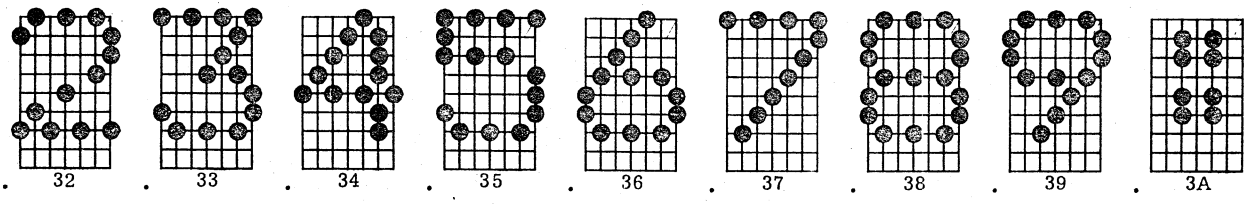
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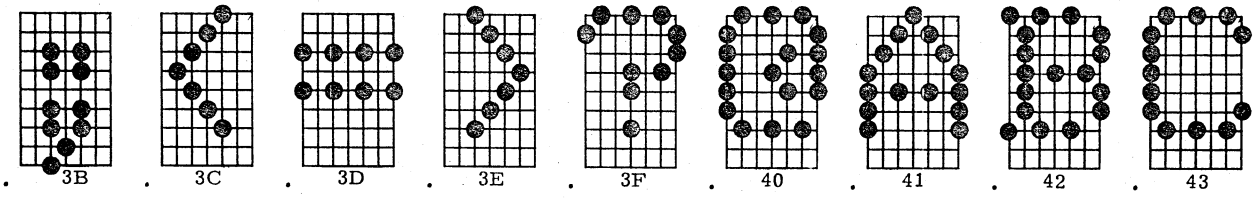
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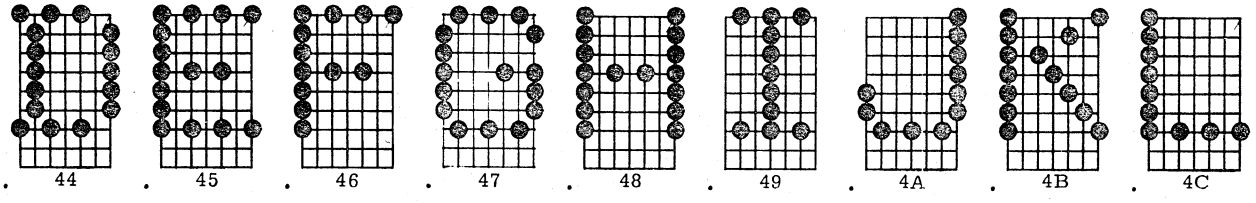
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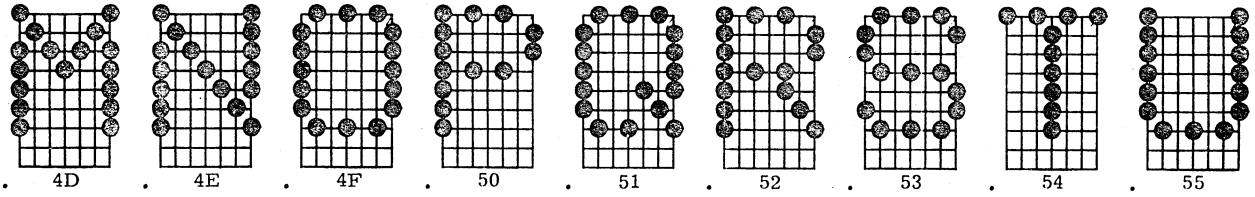
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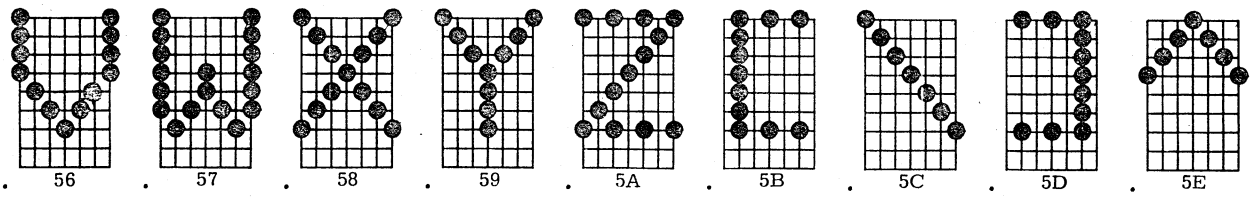
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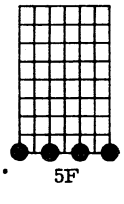
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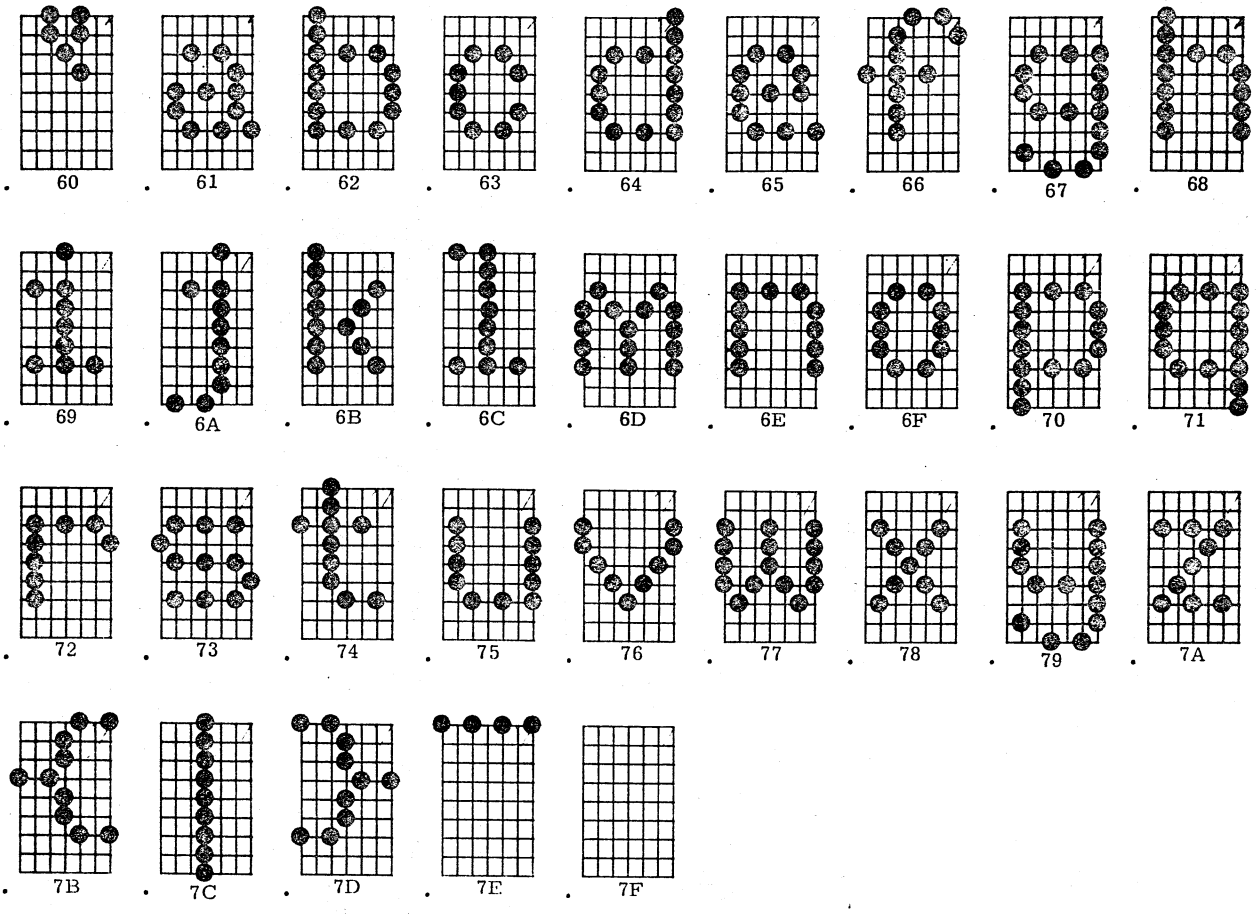
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CODE CHARACTER DEFINITION SCANDINAVIAN (7x7)
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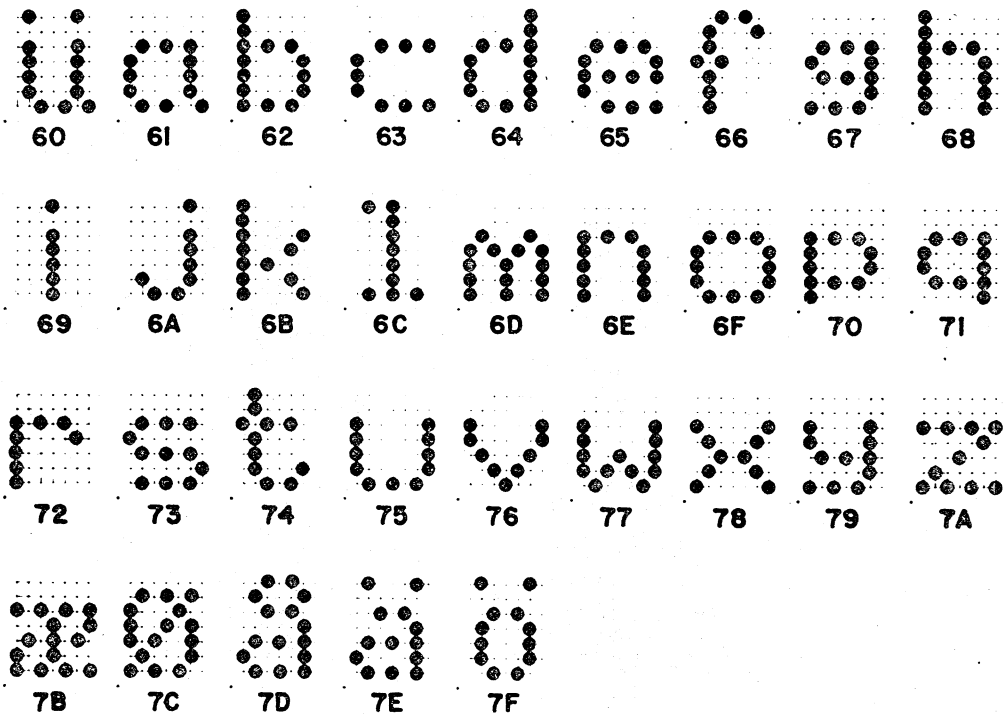

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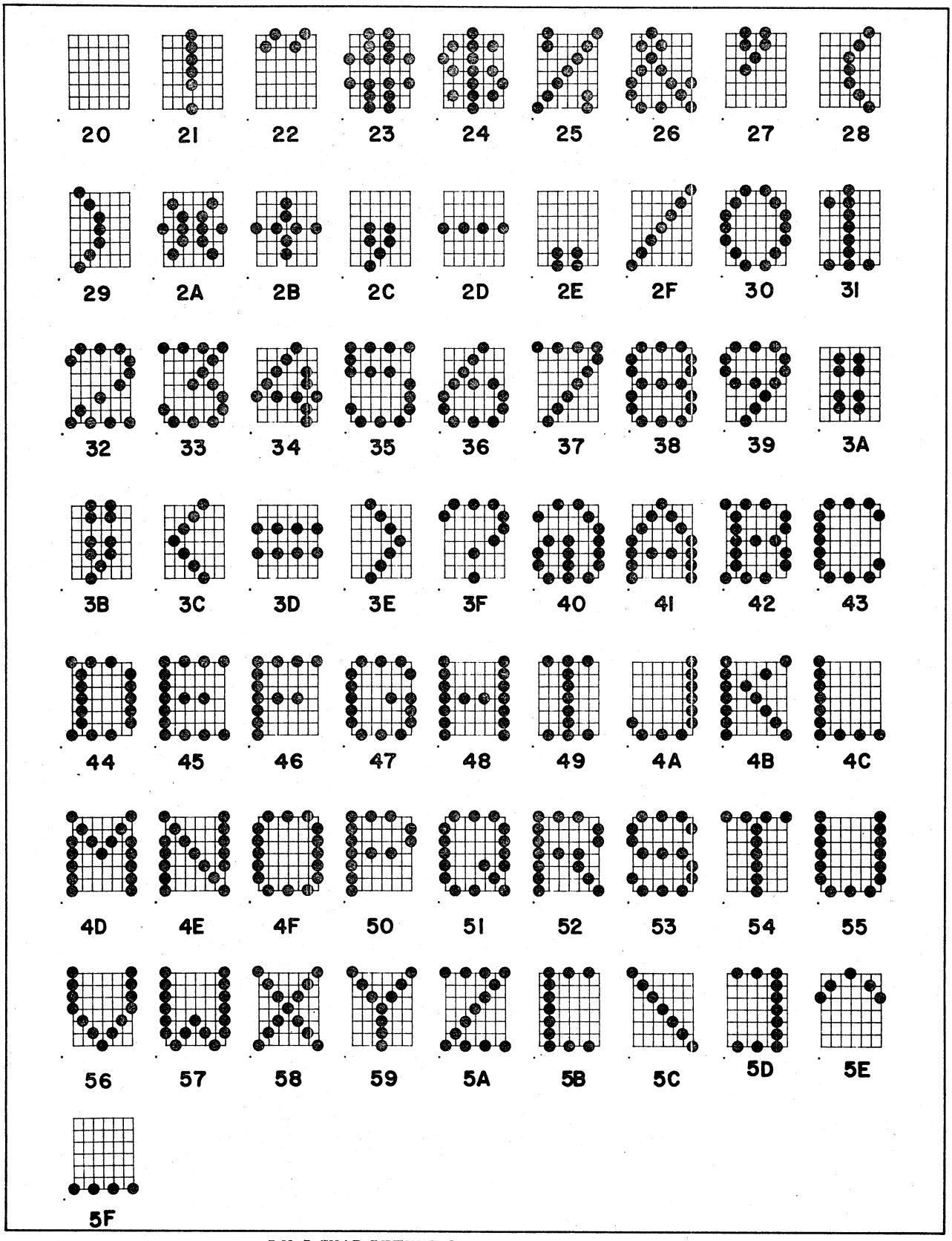

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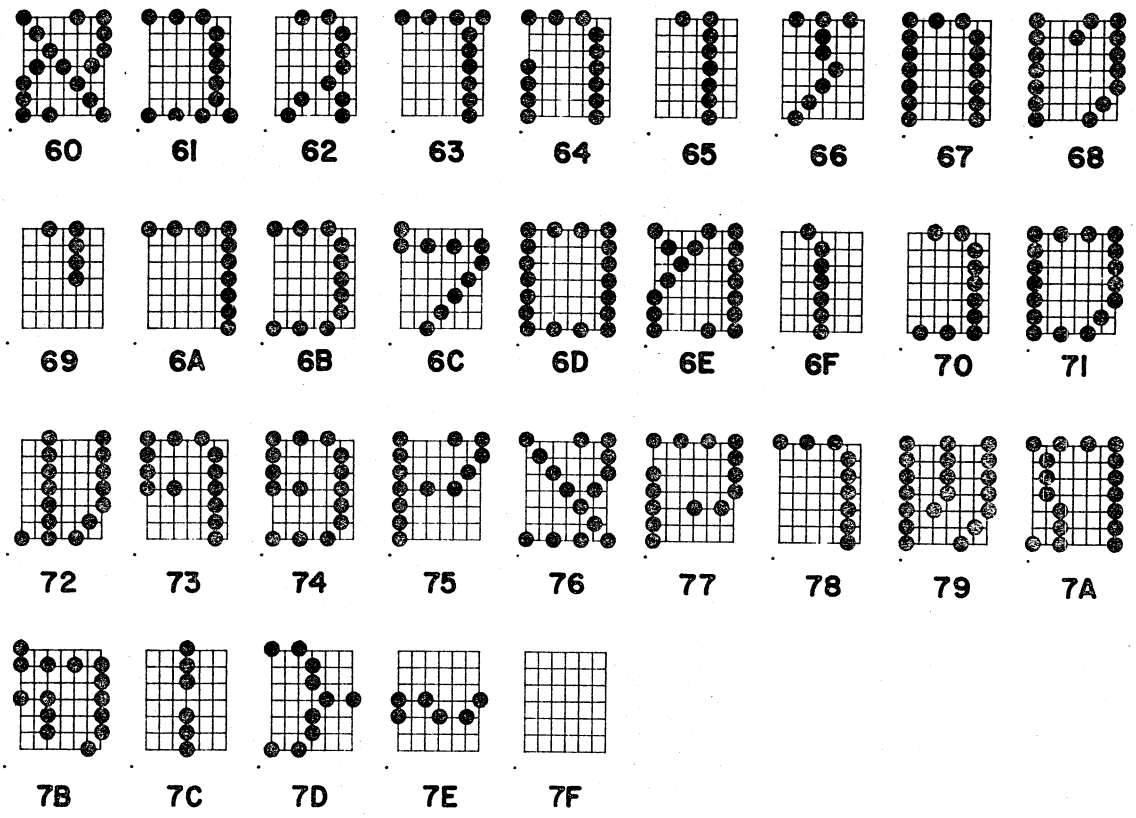
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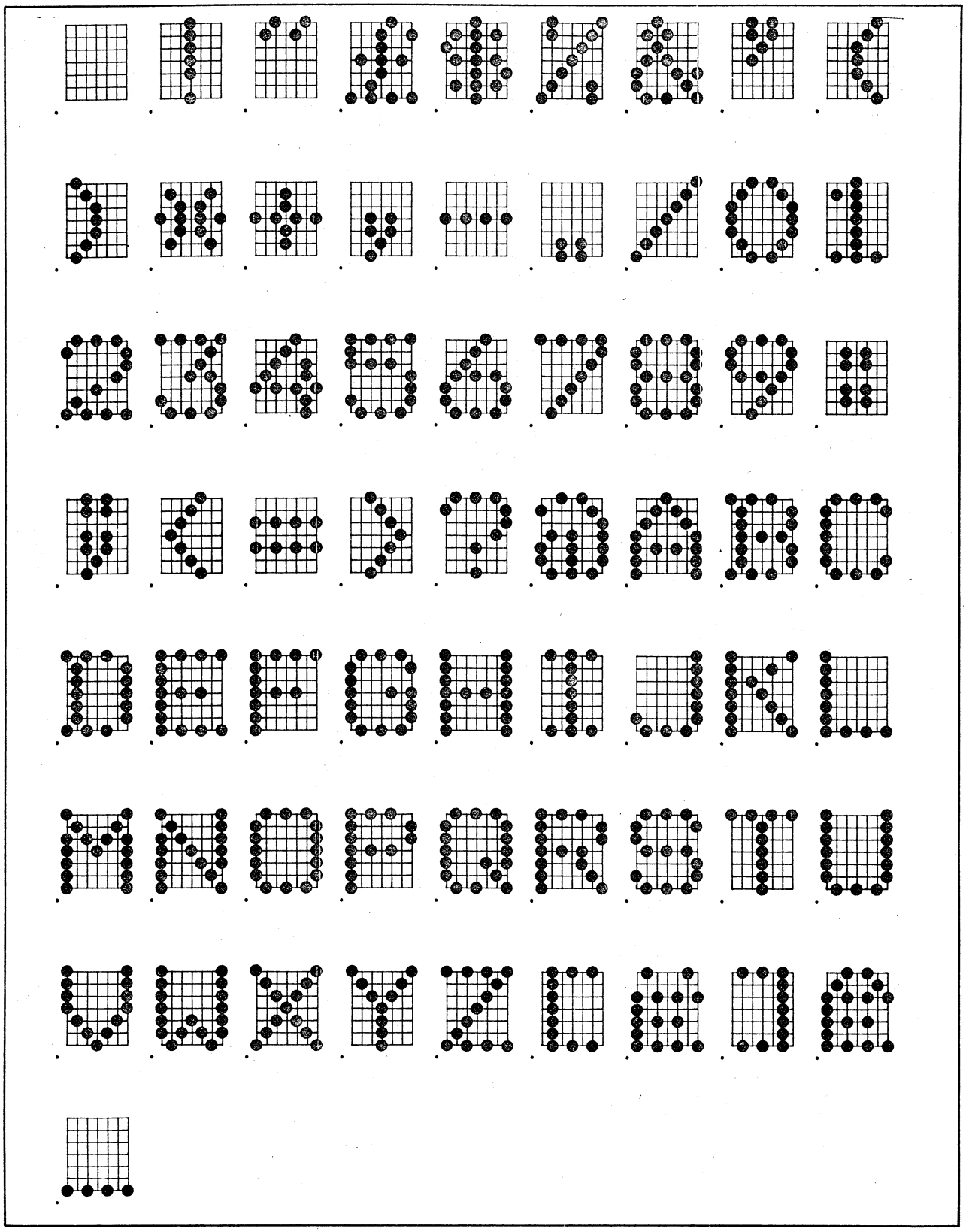

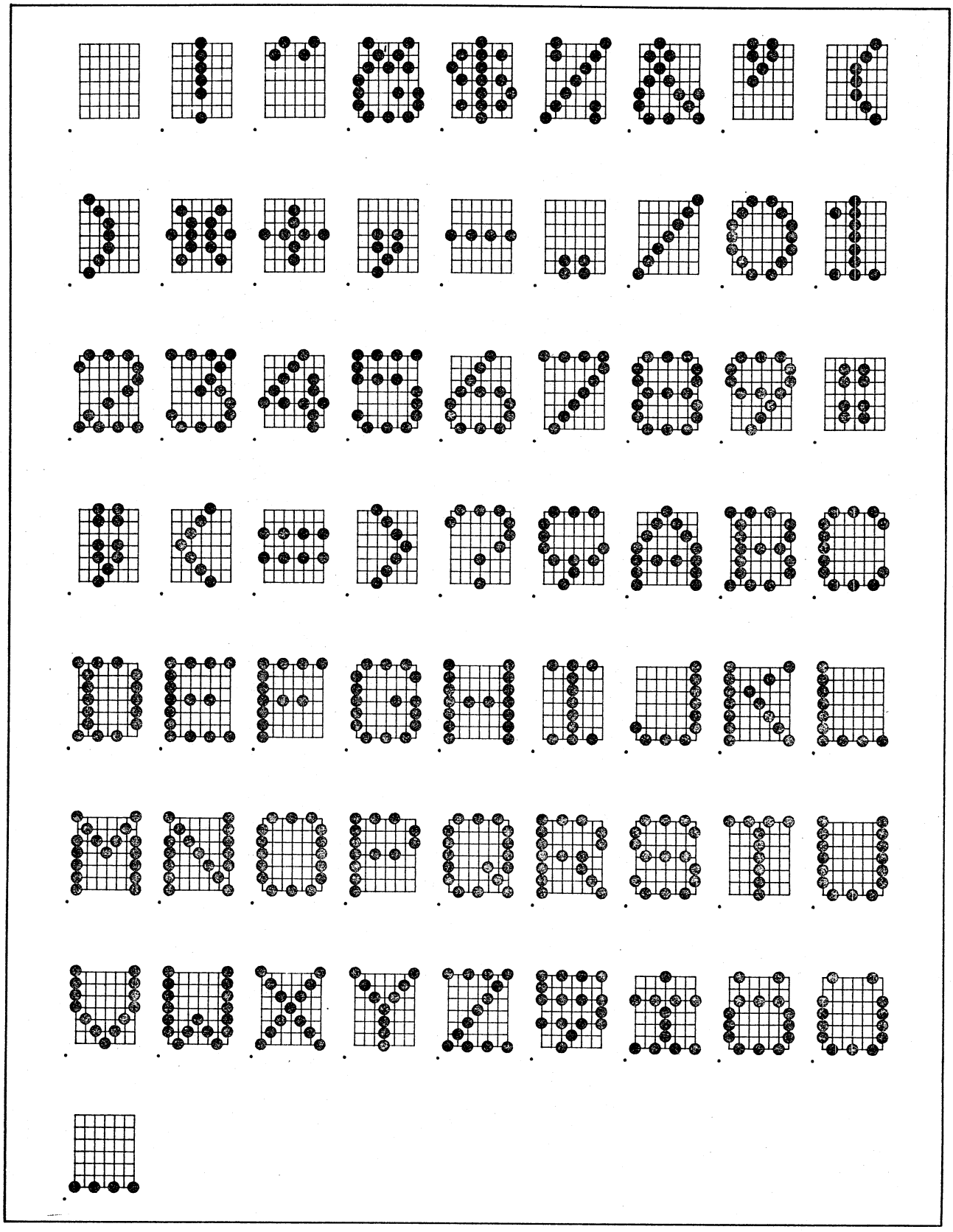

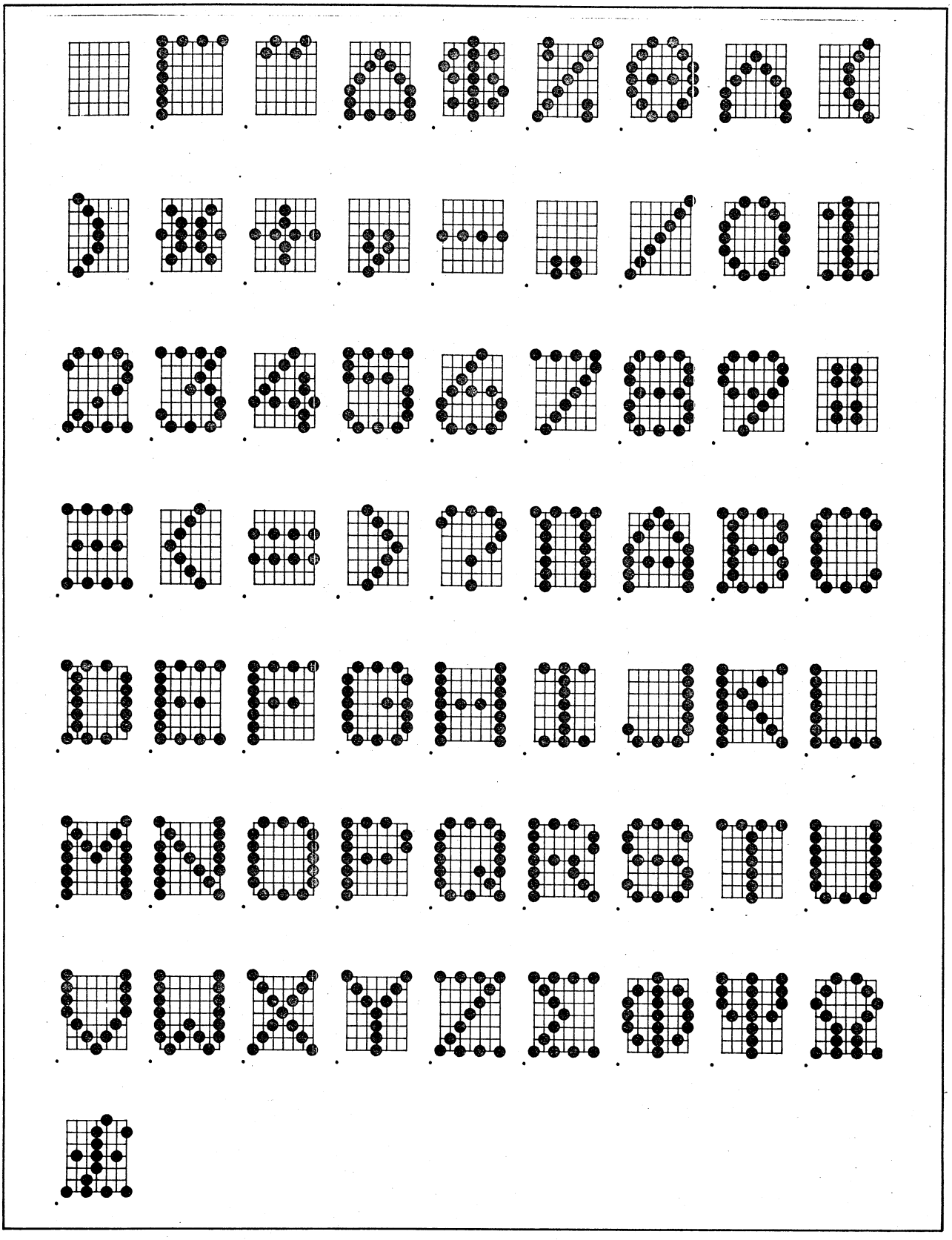

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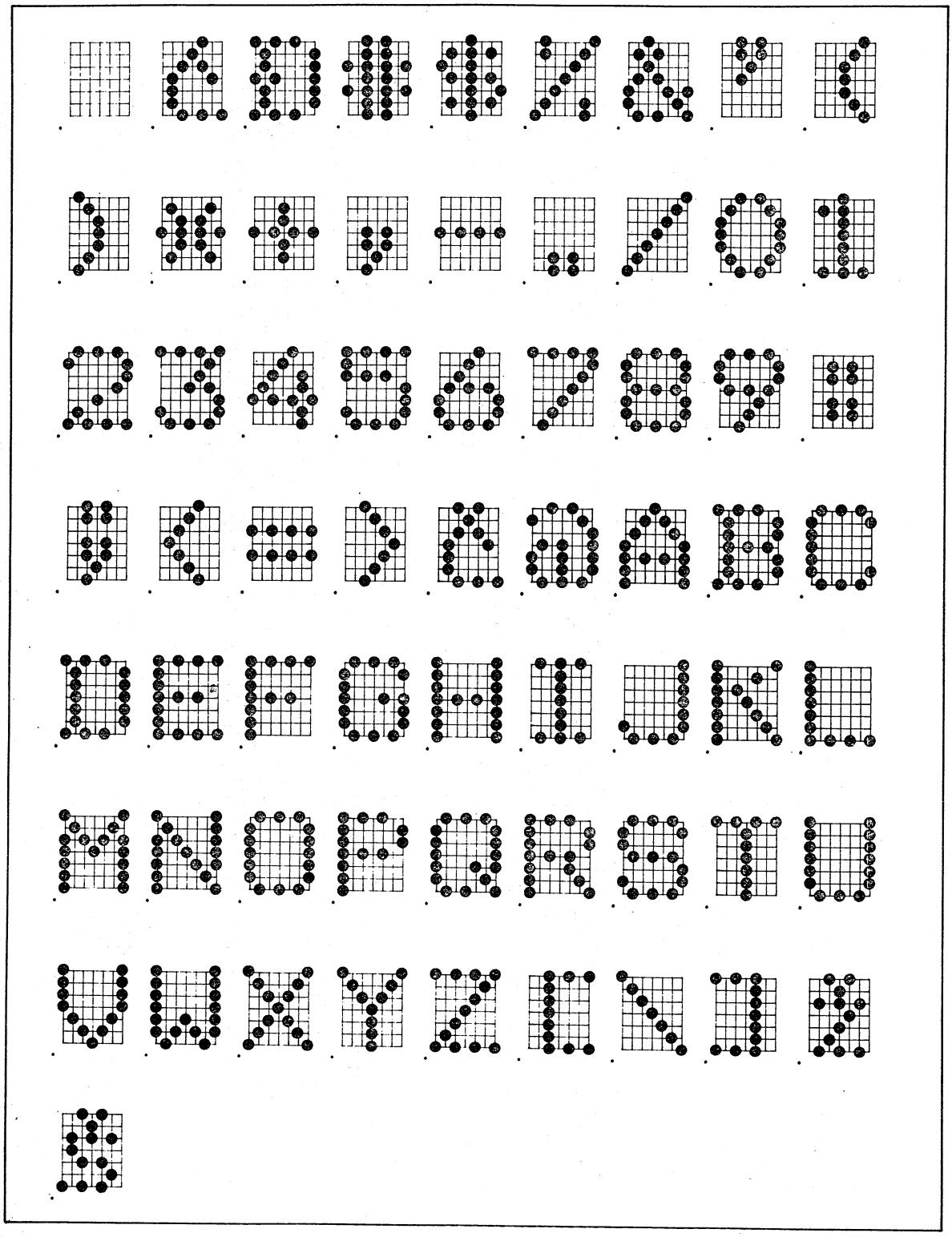

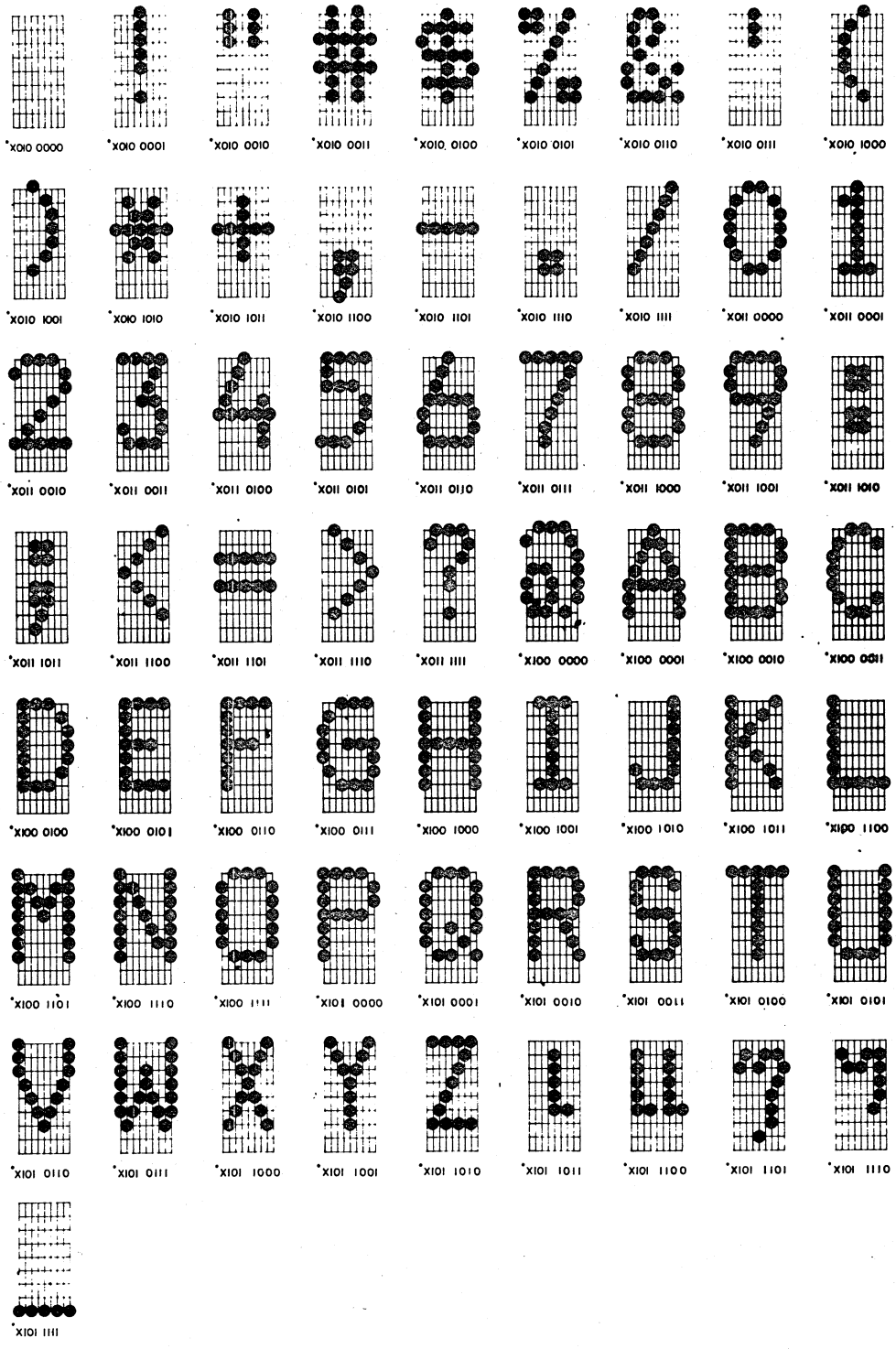
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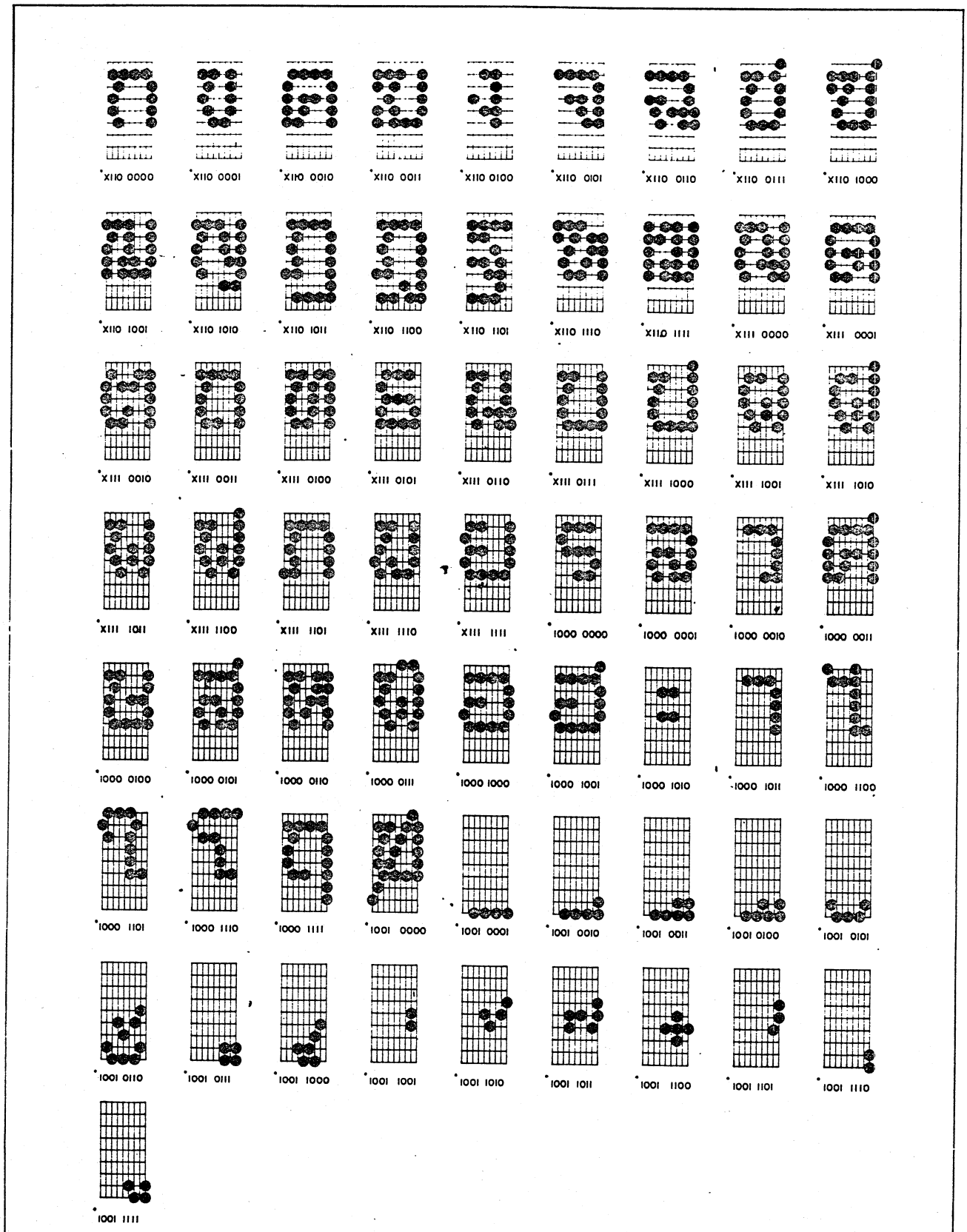
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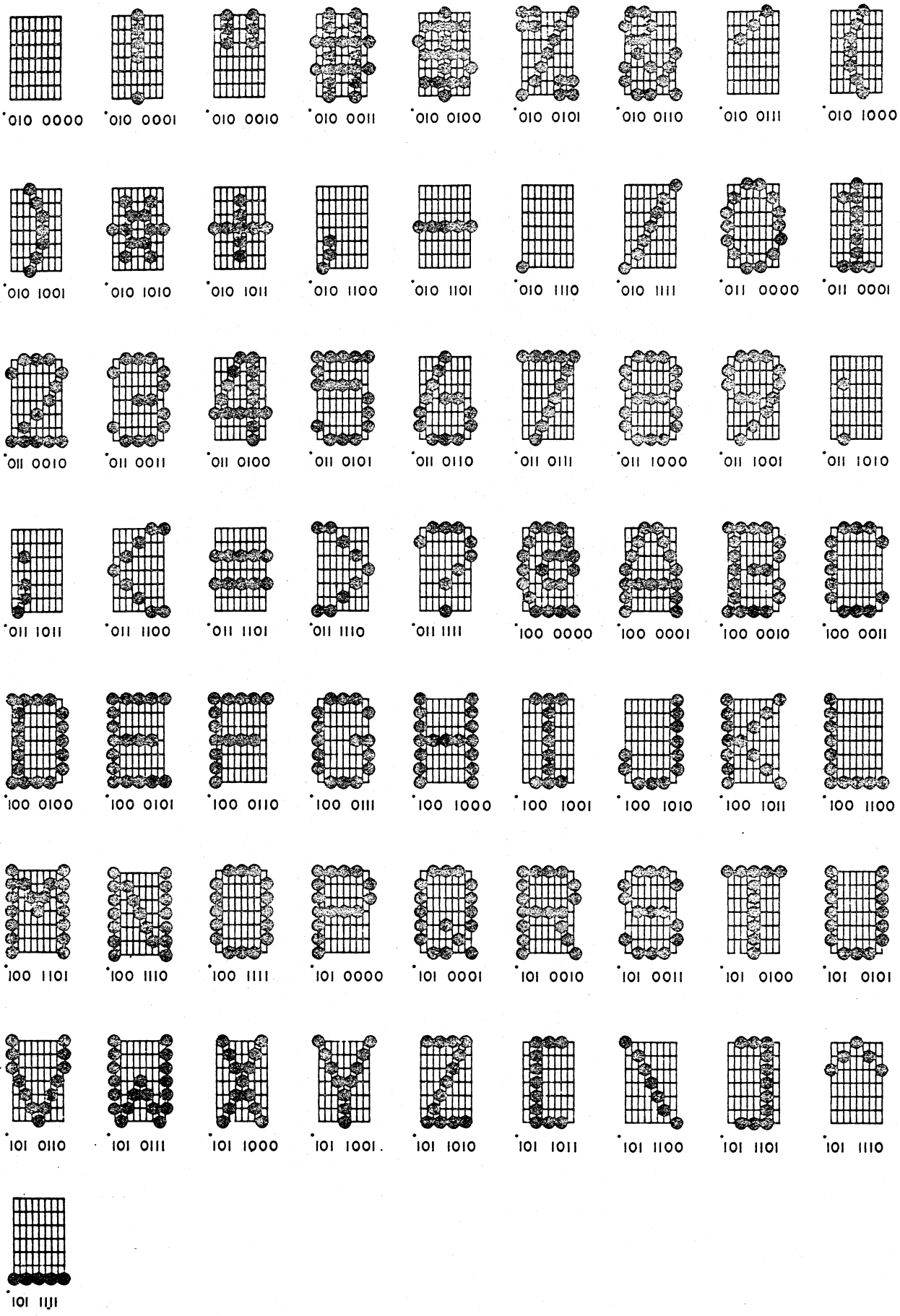
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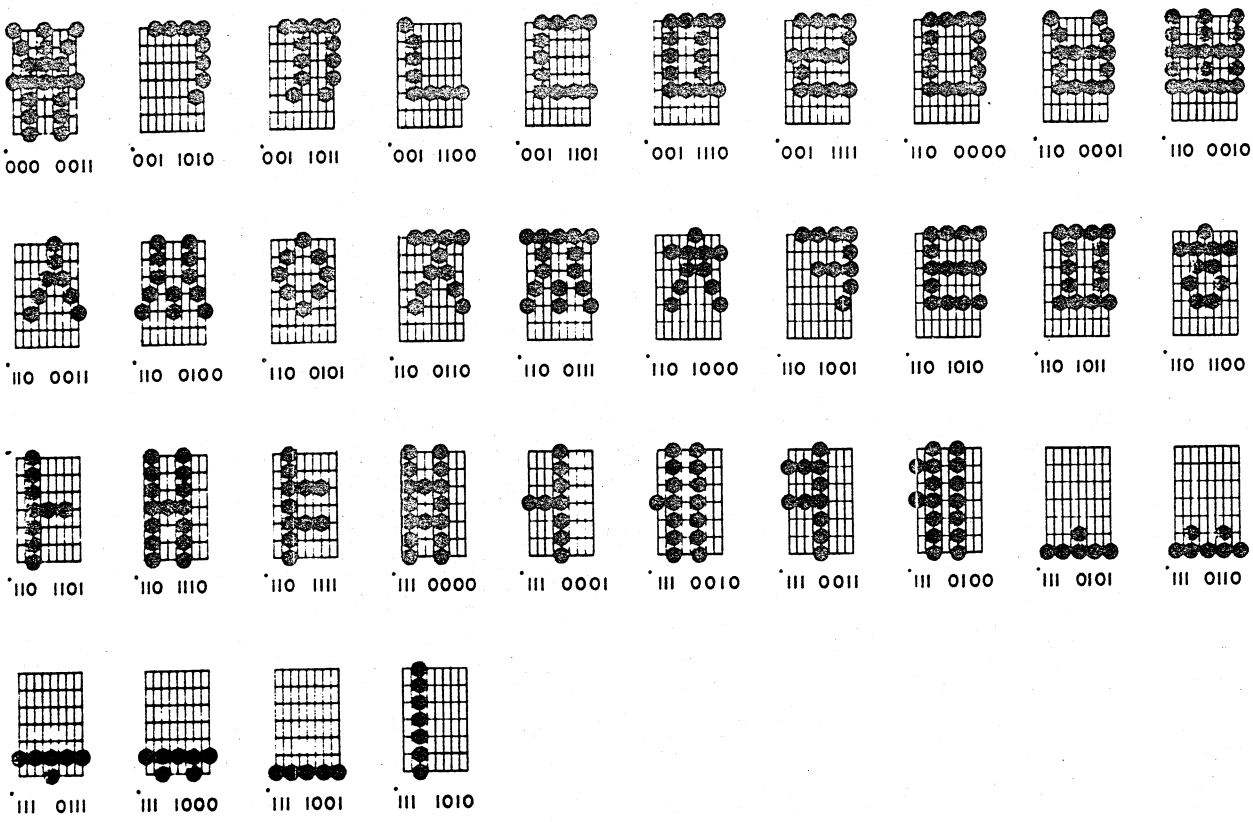
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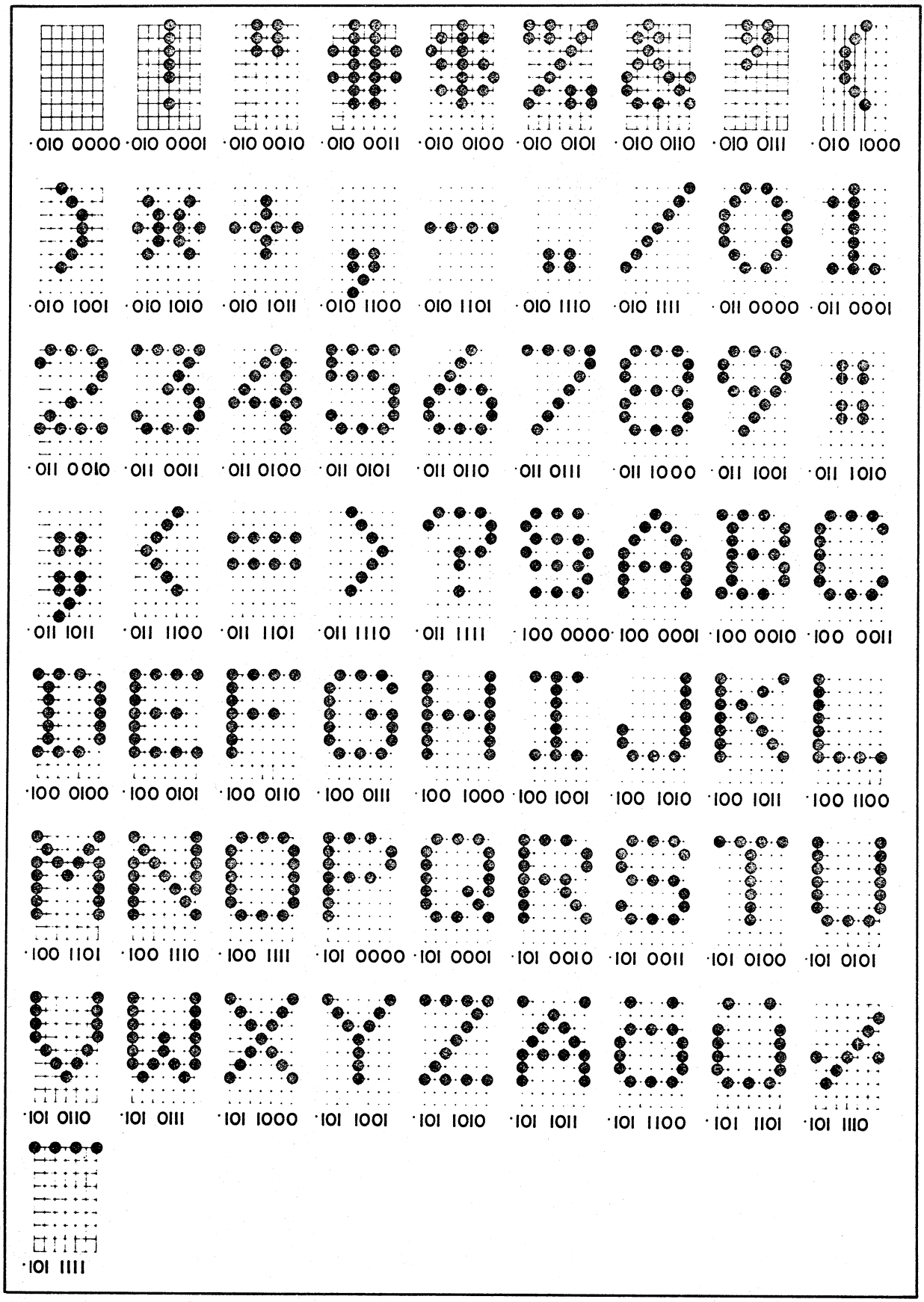
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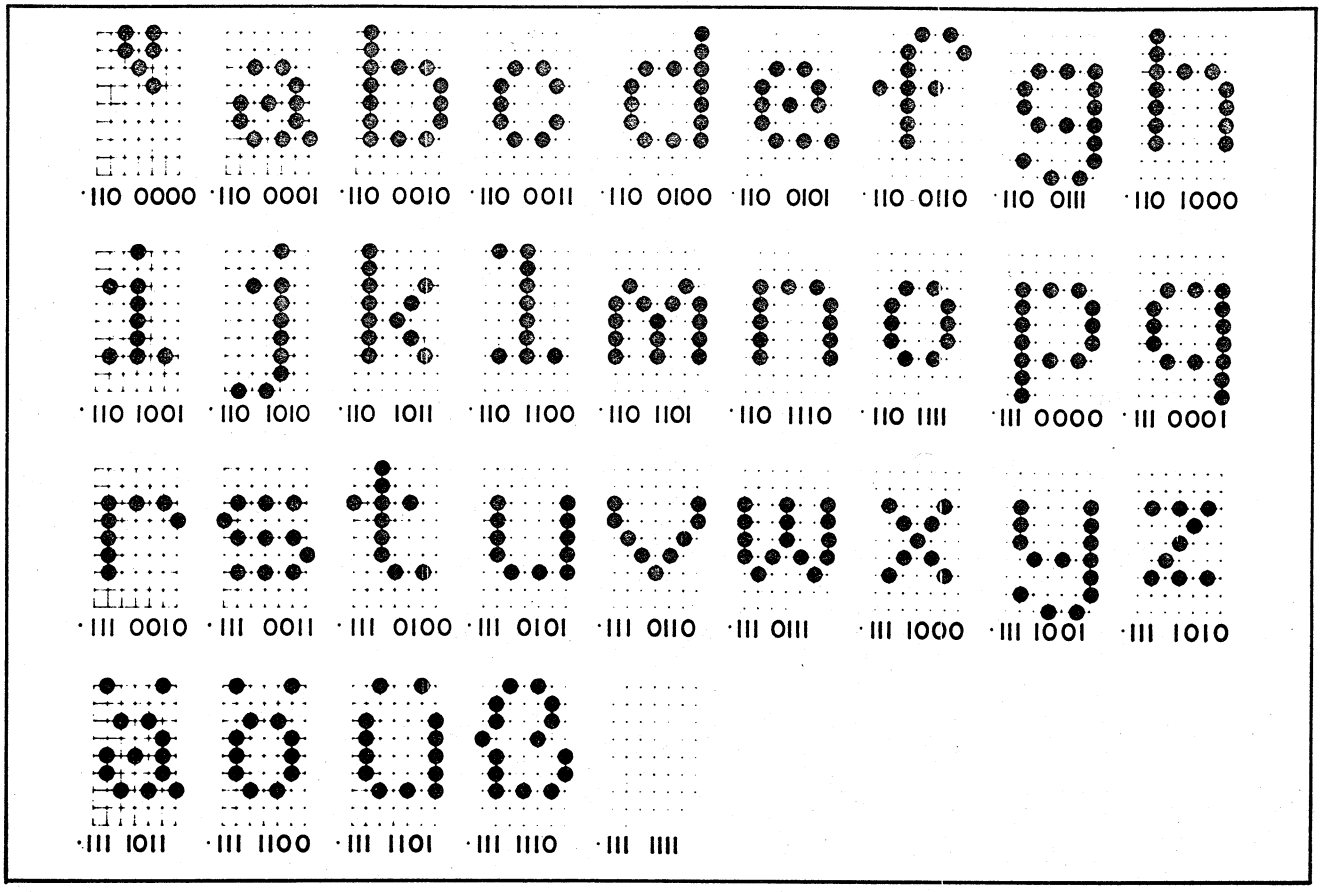
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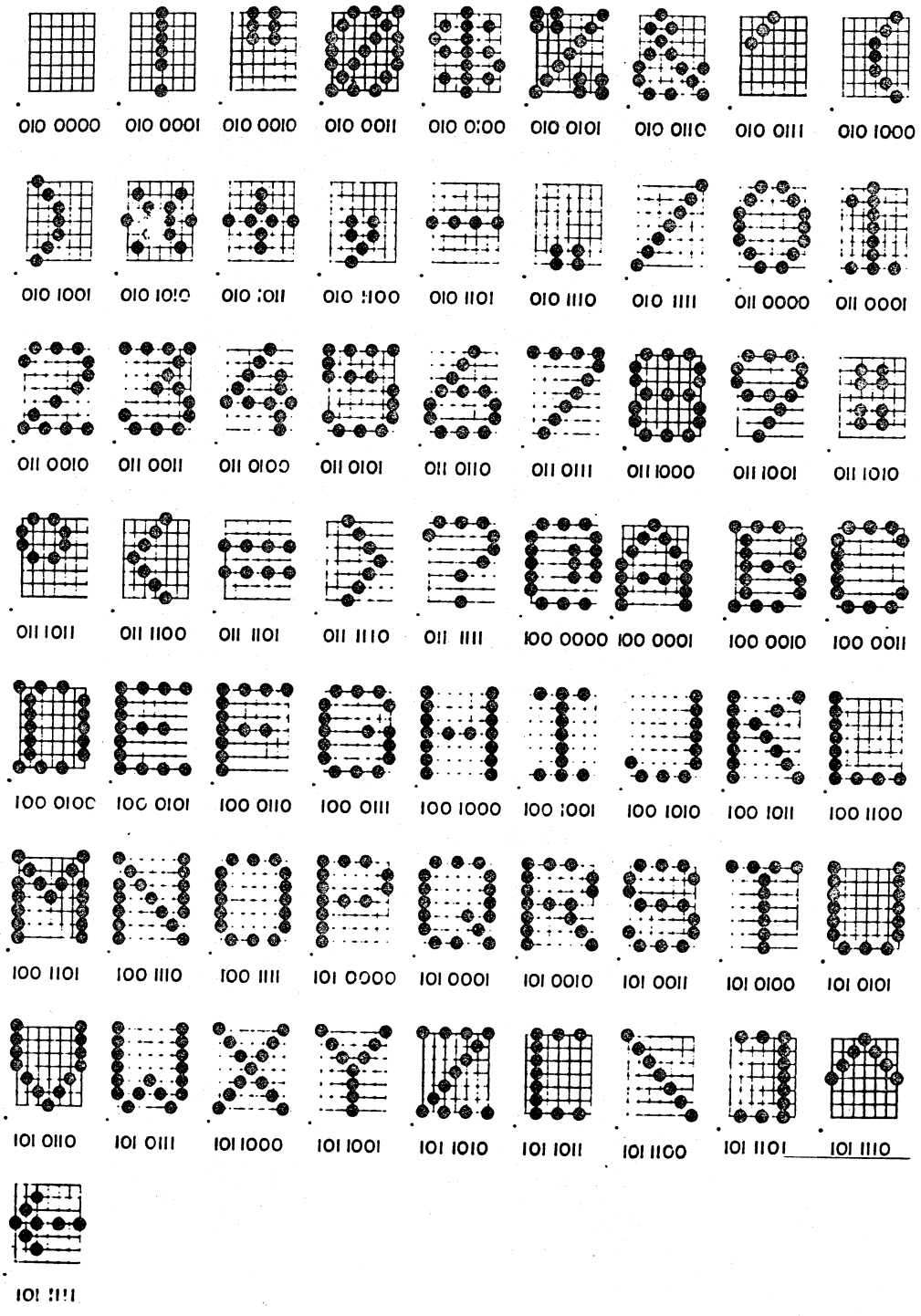
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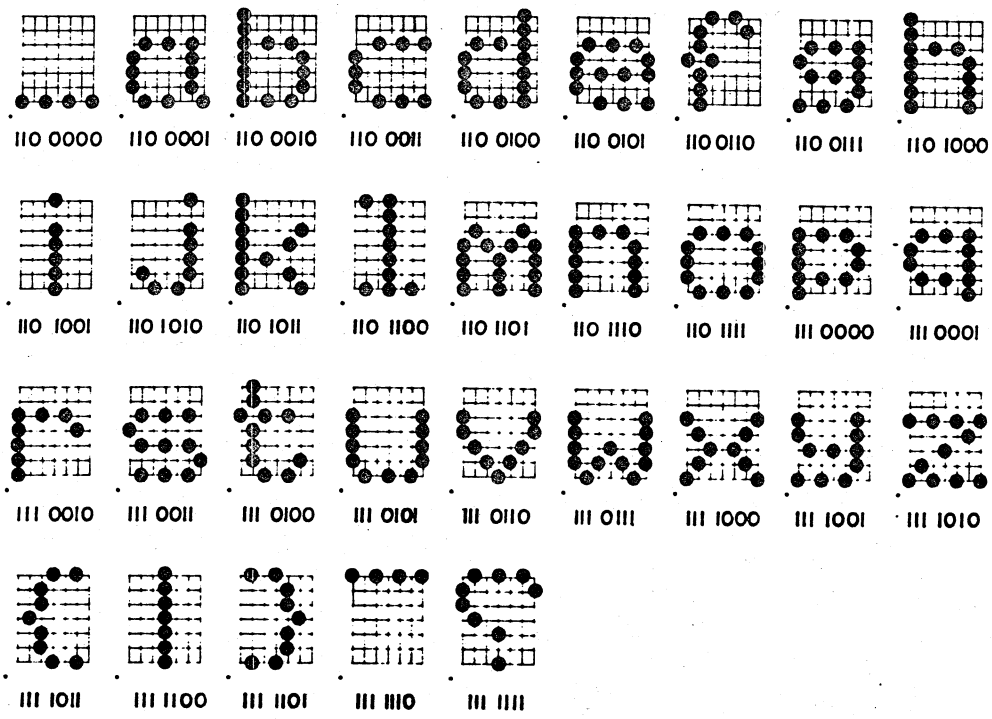
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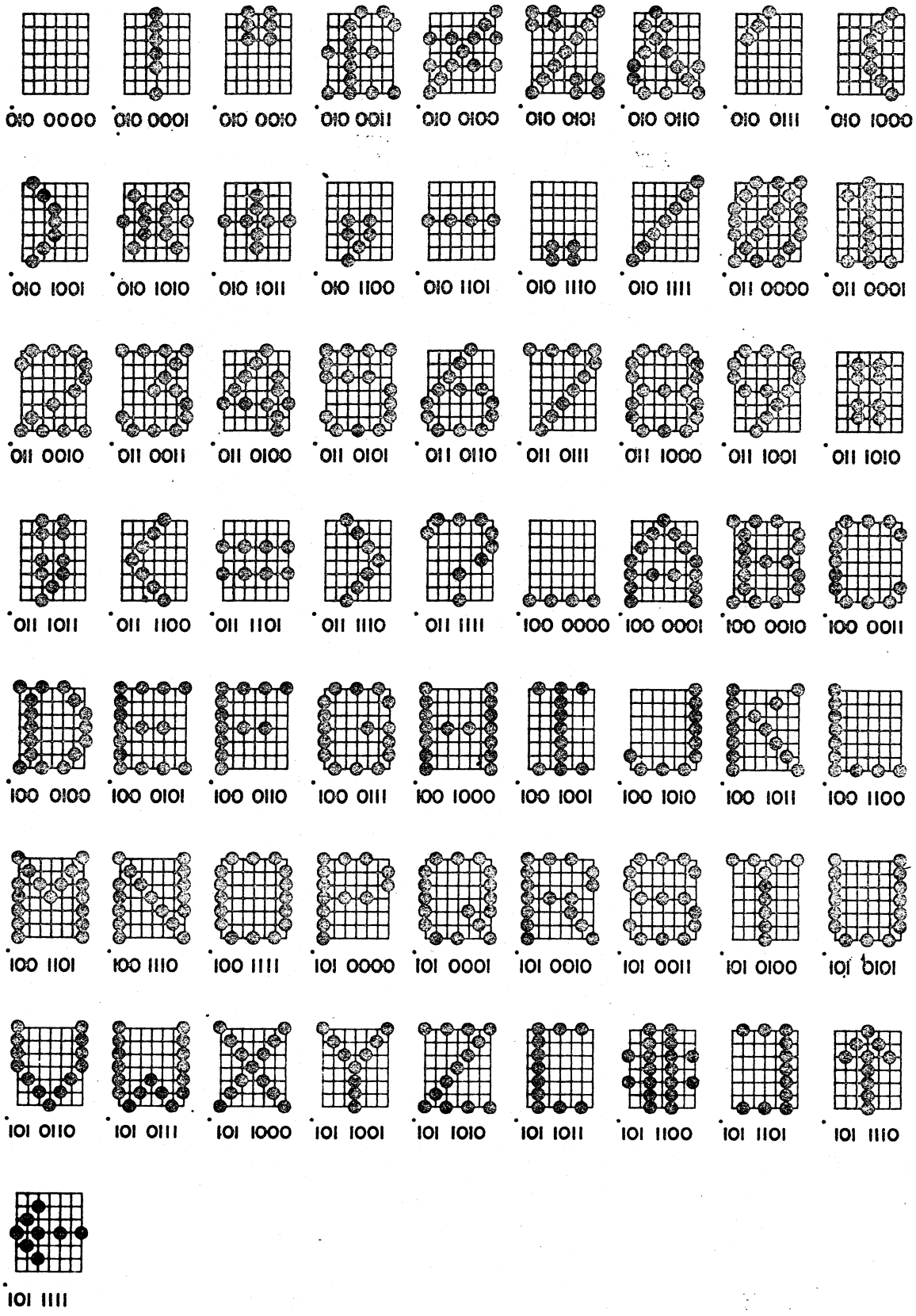
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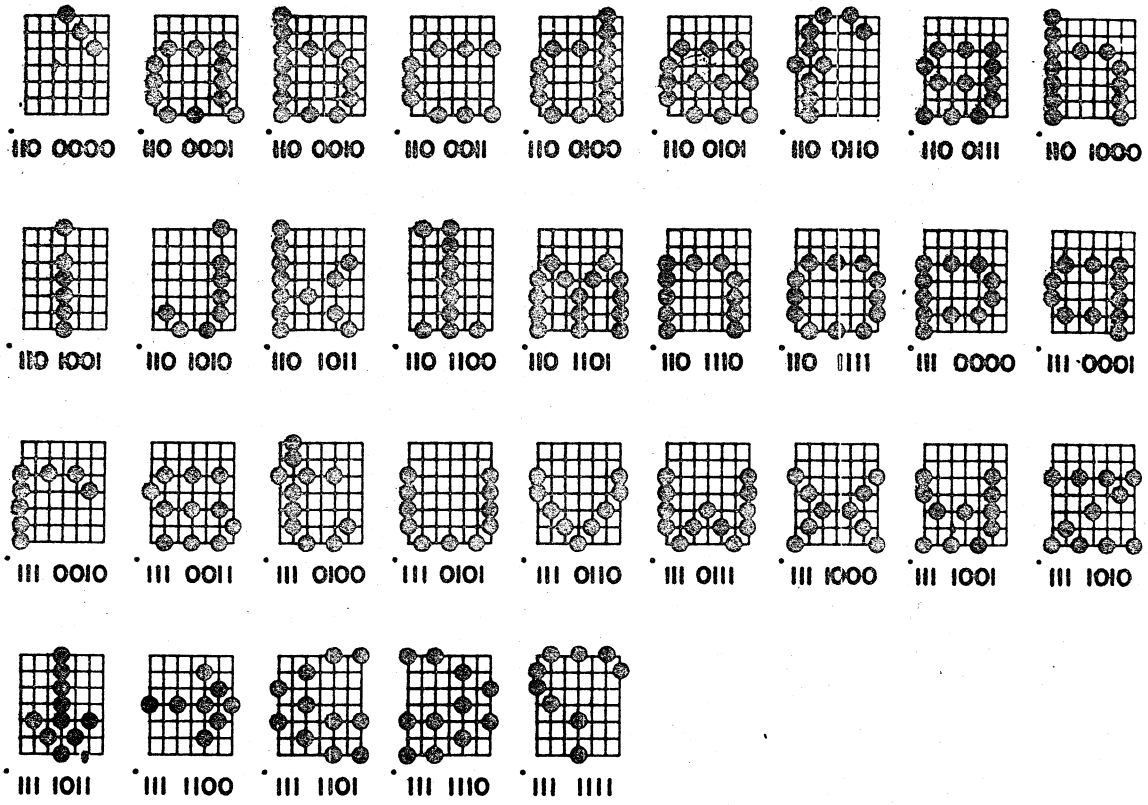
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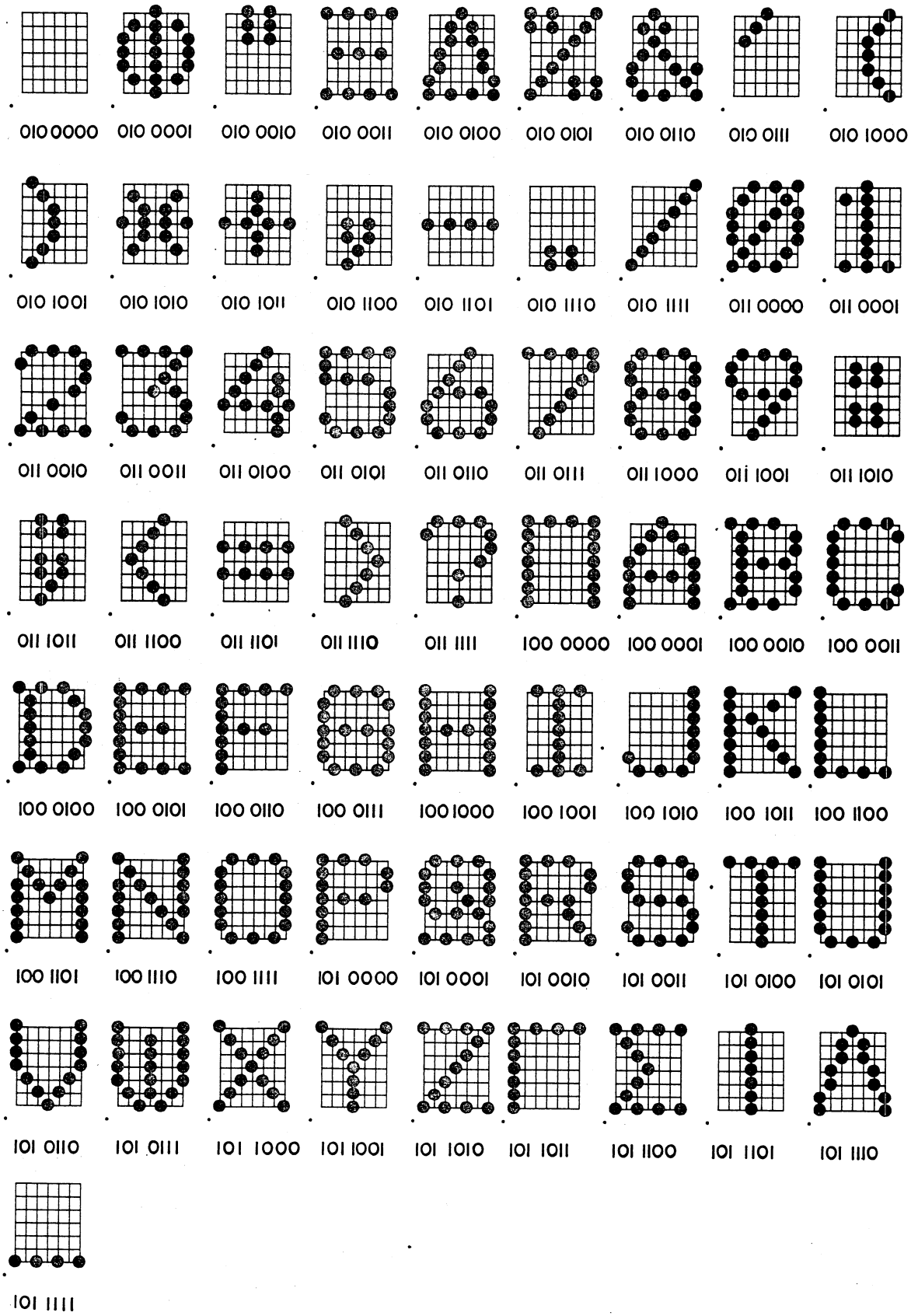
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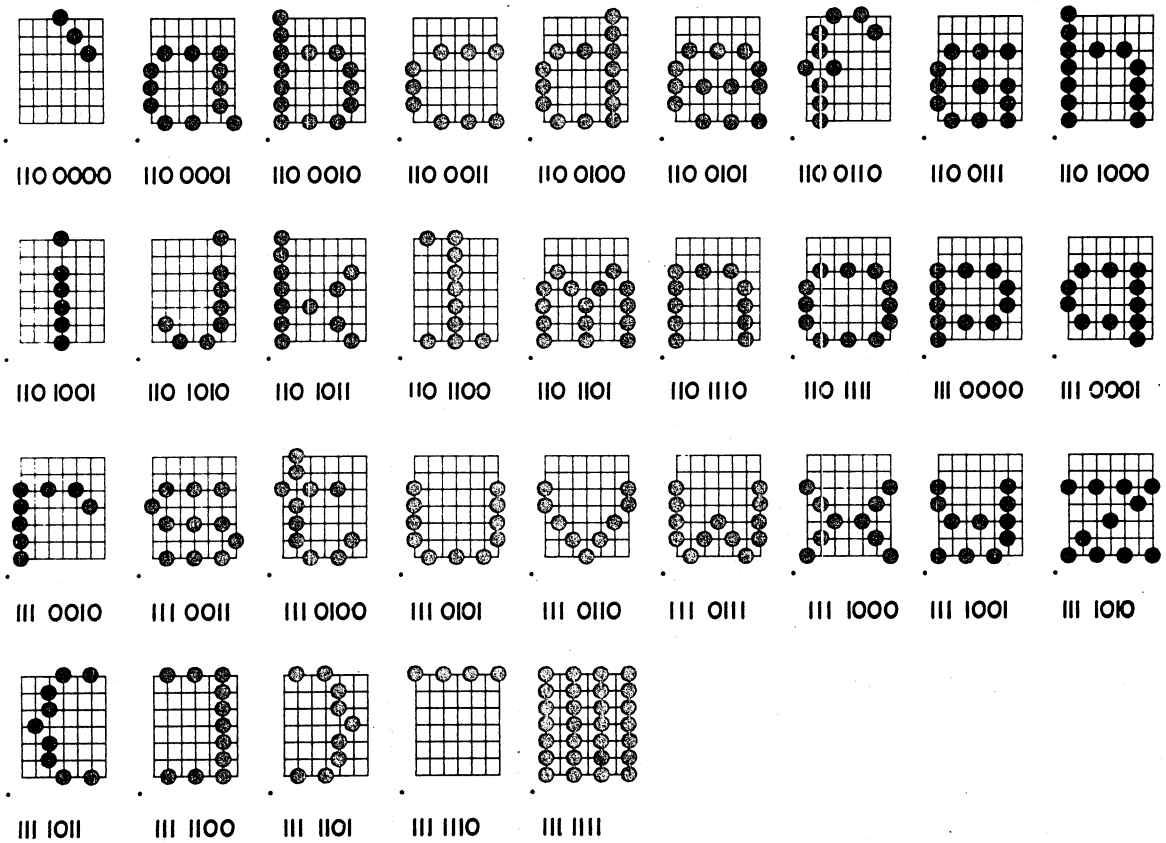
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