OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,

AND GENERAL SUPPORT MAINTENANCE MANUAL

CARD READER UNIT RP-165/FYA.1O(V)

This copy is a reprint which includes current pages from Change 1.

DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE

JUNE 1972

WARNING

DEATH or SERIOUS INJURY may mull from hazards In this equipment, unless the proper safety measures are observed. READ AND OBSERVE the referenced warnings concerning the following hazards in this equipment:

DANGEROUS VOLTAGE (pare 4-2, 4-3, 4-4, 4-8q, 4-8r(1), 4-8r(2), 4-8r(2)(g))

CHANGE
No. 1 }

DEPARTMENTS OF THE ARMY,
THE NAVY, AND THE AIR FORCE
WASHINGTON, DC, 21 March 1973

Operator's, Organizational, Direct Support,

and General Support Maintenance Manual

CARD READER UNIT RP-165/FYA-10(V)

TM 11 5895-422-14-1 'NAVSHIPS 0967-301-5360 /TO 31S5-2FYA10-111-1, 14 June 1972, is changed as follows:

1. The Navy number is changed from "NAVSHIPS 0967-301-5360" to "NAVELEX 0967-301-5361"

2. New or changed material is indicated by a vertical bar.

Remove old pages and insert new pages as indicated below:

Remove pages	*Insert pages*
i and ii	i through iii
3-3 through 3-9	3-3 through 3-9
4-5 through 4-8	4-5 through 4-8
4-23 and 4-24	4-23 and 4-24
4-29 and 4-30	4-29 and 4-30
4-40a through 4-43	4-41 through 4-47
A-1	A-1 and A-2

4. File this change sheet in the front of the manual for reference purposes.

By Order of the Secretaries of the Army, the Navy, and the Air Force:

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Gen Dep (2) except
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11-75
11-85
11-95
11-158
11-302
29-134
29-136

ARNG & USAR None.

For explanation of abbreviation used. See AR 310-50.

MECHNICAL MANUAL
To. 11-5895-422-14-1
TECHNICAL MANUAL
TAVELEX 0967-301-5361
TECHNICAL ORDER
To 31S5-2FYA10-111-1

DEPARTMENTS OF THE ARMY,
THE NAVY, AND THE AIR FORCE

WASHINGTON, D.C., 14 June 1972

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND

GENERAL SUPPORT MAINTENANCE MANUAL

CARD READER UNIT RP-165/FYA-1O(V)

*This manual supersedes TM 11-5895-422-15/NlAVSHIPS 0967-301-5360/TO 31S5-2FYA10-111, 16 October 1968.

LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains operation and maintenance information for Card Reader Unit RP-165/FYA-10(V) (fig. 1-1), hereinafter referred to as the card reader. This manual contains five chapters, as follows: chapter 1 contains information regarding the purpose and capabilities of the card reader, a brief discussion of the functional relationship of the card reader to other units of the Automatic Digital Message Switch (AMDS), a list of the main technical characteristics of the card reader, and a brief physical description; chapter 2 contains information describing the purpose and location of the operator's controls and indicator; chapter 3 describes the functional operation of the card reader; chapter 4 contains information required for the preventive and corrective maintenance of the maintenance console; and chapter 5 contains Additional illustrations to support the text for this equipment.

b. The complete manual for the card reader Consists of two parts. Part one (TM 11-5895-422-1+-1) is described in a above. Part two (TM 1.1-5895-422-14-2) consists of the logic diagram drawings.

1-2. Indexes of Equipment Publications

a. New Editions, Changes, or Additional Publications. Determine whether there are any new editions, changes, or additional information pertaining to your equipment by referring to DA Naval Pam 310-4 (Army), NAVSANDA Publication 0451C, 2002 (Navy), or Numerical Index and Requirement Table T.O. 0-1-01N (Air Force).

b. Modification Work Orders. Refer to the latest edition of DA Pam 310-7 to determine whether there are any Modification Work Orders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. Report of Unsatisfactory Equipment. Report unsatisfactory equipment in accordance with procedures in TM 38-750 (Army), NW 00-25-546 (Navy), or TO-00-35D-54 (Air Force).

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army), NAVSUP Publication 378 (Navy), or AFR 31-4 (Air Force).

c. Discrepancy in Shipment Report. Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army), NAVSUP Publication 459 (Navy), or AFM 75-34 (Air Force).

d. Report of Maintenance. Records and reports of preventive maintenance and repairs must be made in accordance with procedures in TM 38-750 (Army), OPNAV Form 4700, Subject: Planned Maintenance System Feedback Report (Navy), or AFM 66-1 (Air Force).

e. Report of Equipment Manual Improvements. Reports of errors, omissions, and recommendations for improving this manual by the Individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded to: Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MA-CW, Fort Monmouth, N. J., 07703 (Army); NAVSHIPS 5600/2 (REV 10-67) (Formerly NAVSHIPS 4914) and forwarded to: Commander, Electronics System Command, ATTN: Washington, D. C. 20360 (Navy); or AFTO Form 22 (Technical Order System Publications Deficiency Report) and forwarded to: Commander, Oklahoma City Air Materiel Area, ATTN: OCNDT (B-F), Tinker Air Force Base, Okla., 73145 (Air Force).

f. Administrative Storage. For procedures, forms and records, and inspections required during administrative storage of this equipment, refer to TM 740-90-1.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

The card reader is a self-contained photoelectric unit that is used in the AUTODIN facility as an input device. Cards punched in either 8-bit ASCII or 12-bit Hollerith are read and processed at an effective speed of 1 to 400 cards per minute, depending upon program instructions. The punched cards are extracted from the input hopper and passed over a data-read station, where punched information is transformed into electrical impulses. The cards are then stacked in the output stacker in exactly the same order as they were extracted from the input hopper. The card reader is equipped with fault control circuits to detect malfunctions in the card transport and read photodiodes.

1-5. System Application Characteristics

The card reader, subsystem is used to decipher the information punched on the cards by the card punch unit. A punch card is illustrated in figure 1-2. A card consist of 80 columns and 12 rows. All the information punched into any one column is called a “Character.” The card reader reads this information column-by-column, and transfers the information to the memory buffer assembly for temporary storage. After all 80 character have been received and stored by the memory buffer assembly, the information is transferred to the processor unit on command from processor unit via the card controller. The memory buffer assembly and card controller are located in Control Groups, Peripheral Input/Output OK-31, /FYA-10(V) and OK 37/FYA-10 (V)T1. For details, see TM 11 5895 420-15. The overall function of the card reader is illustrated in figure 1-3.

1-6. Technical Characteristics

Table 1-2 is a listing of technical data, operating characteristics, and capabilities of the card reader

Environment conditions:	
Temperature	60: to 80'F
Humidity	40% to 65%
Pressure above sea level	0-10.000 feet
Primary power requirements	120v, 60 Hz, single-phase
Power consumption	1200 volt-amperes
Weight	500 lb (approx)
Capabilities:	
Nominal speed	400 cards lper minute
Input hopper capacity	1000 cards
Output stacker capacity	1400 cards Holletrith

1-7. Physical Characteristics

The physical characteristics of the card reader are given in table 1-3.

Table 1-3. Physical Characteristics

Characteristics	Value
Overall dimensions:	
Width	*21 3/8 in.*
Depth	32 3/8 in.
Height	52 ¾ in

1-8. Description of Equipment

A breakdown of the individual card reader, subassemblies and a brief discussion. of their functions are given in the following paragraphs. For identification and location of the subassemblies, see figure 1-4.

a. Card Reader Subassembly. 'The car*d reader* subassembly is an electromechanical device that transports the cards from the input hopper, across the data read station, to the output stacker. The photodiodes that read the punched information on the cards are located in the card reader subassembly.

b. Reader Control Logic. The reader control logic is mounted directly below the power supply timing circuitry is mounted on 57 printed-circuit cards to facilitate maintenance.

c. Power Supply Control. The power supply control contains relays for ac sequencing, the ac line filters, and the motor relay. TV fuses, one for the drive motor and the other for the -28 volts, are mounted on the left side of the power supply control.

The card reader uses power supply control, Philco part No. 398-7477-1.

d. Power Supply Subassemblies. The card reader power supplies are mounted on the left side of the cabinet, directly behind the power supply control.

(*1) DC logic supplies.* The -16 and -10 volt-. rd for the logic circuits are supplied by two separate power supplies. The , 1P volt dc is supplied by Power Supply PP-4739 FYA-10(V); the 10 .-volts dc . supplied by Power Supply PP i740'FYA-AI) V ab Both supplies- are highly regulated. solid-state devices, and can be adjusted over their operating ranges.

(2) Power Supply PP-4741/FYA-IO(V) Power Supply PP-4741/FYA-10(V) (-28 volt power supply) provides voltage for the picker. Its output is unregulated and not adjustable.

e. Cabinet. The cabinet is a mounting rack which houses the reader control logic, power supply control, and power supply subassemblies.

f. Table Top. The table top serves two functions: a mounting for the card reader subassembly, and a work area for preparing the cards for insertion into the input hopper.

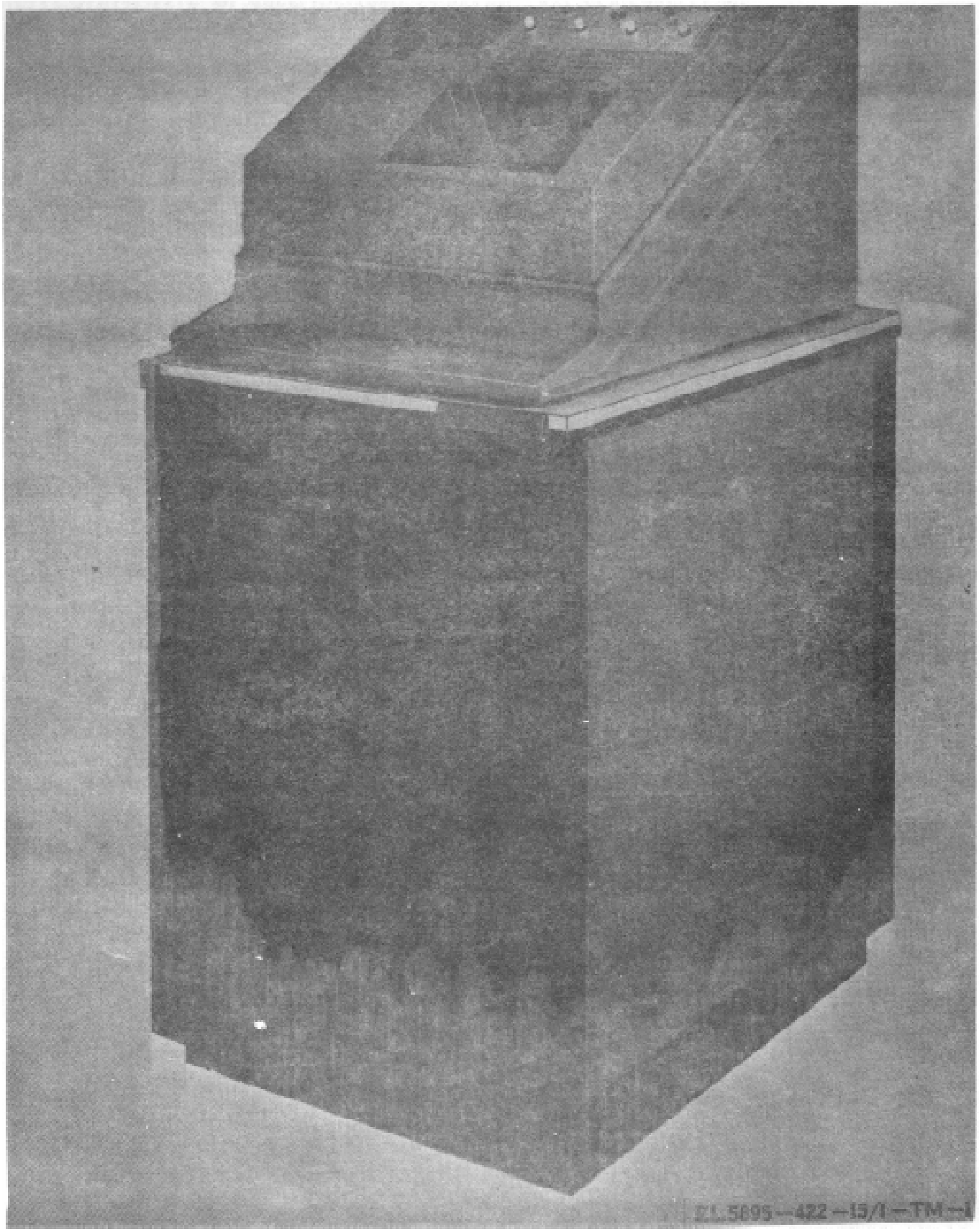


Figure 1-1. Card Reader

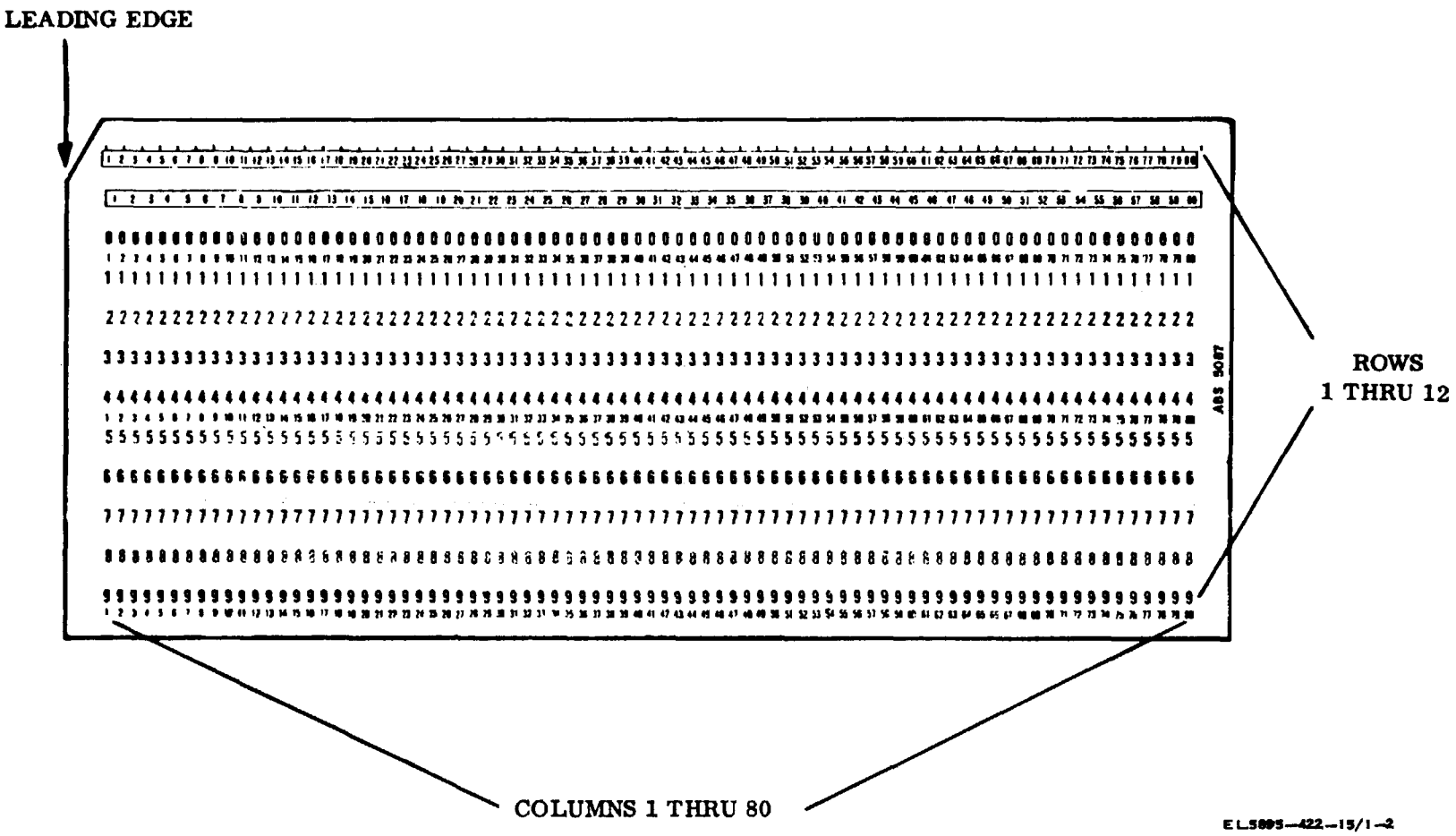


Figure 1-2. Punch card.

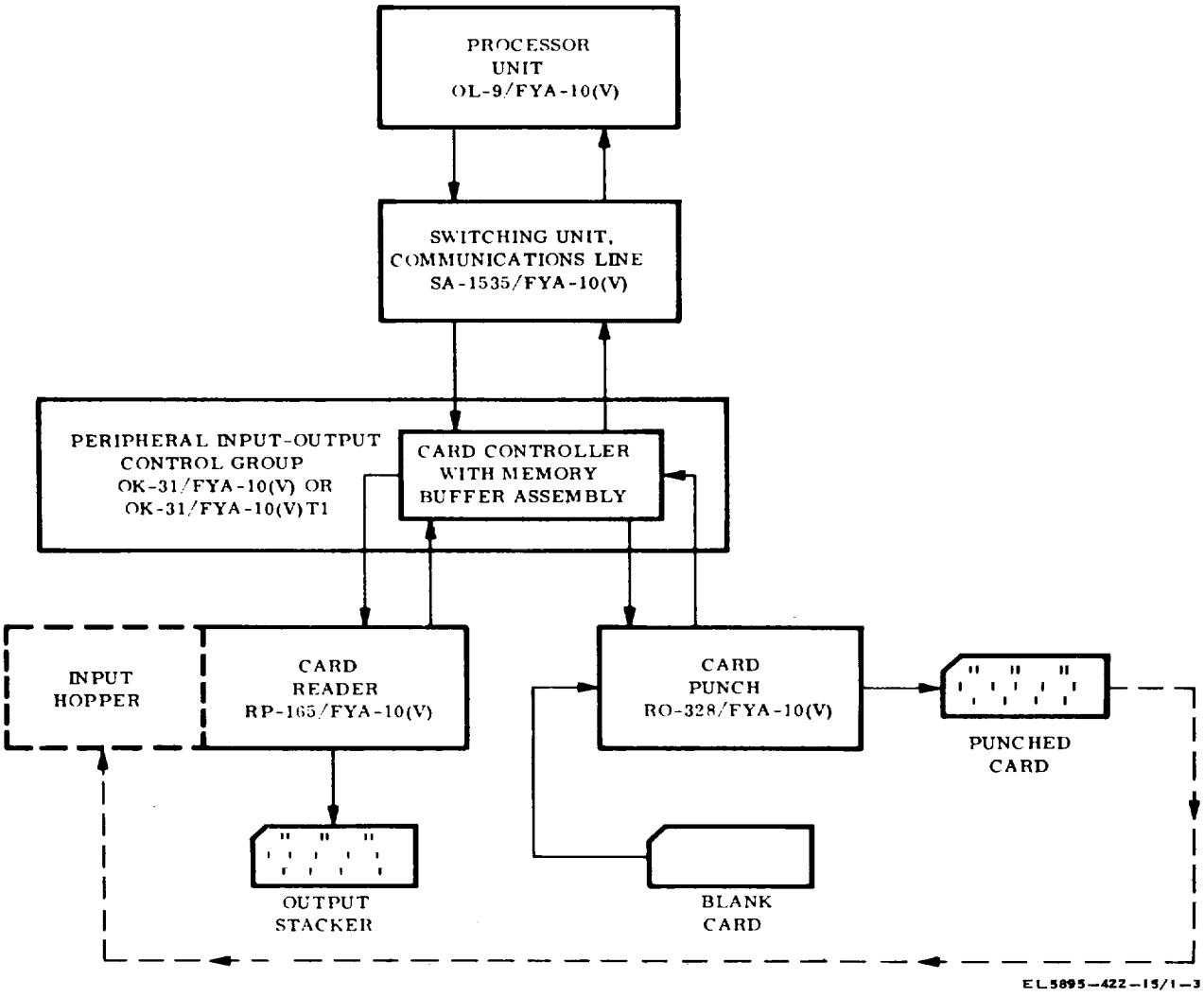


Figure 1-3. System application of card reader.

Figure 1-3. System application of card reader.

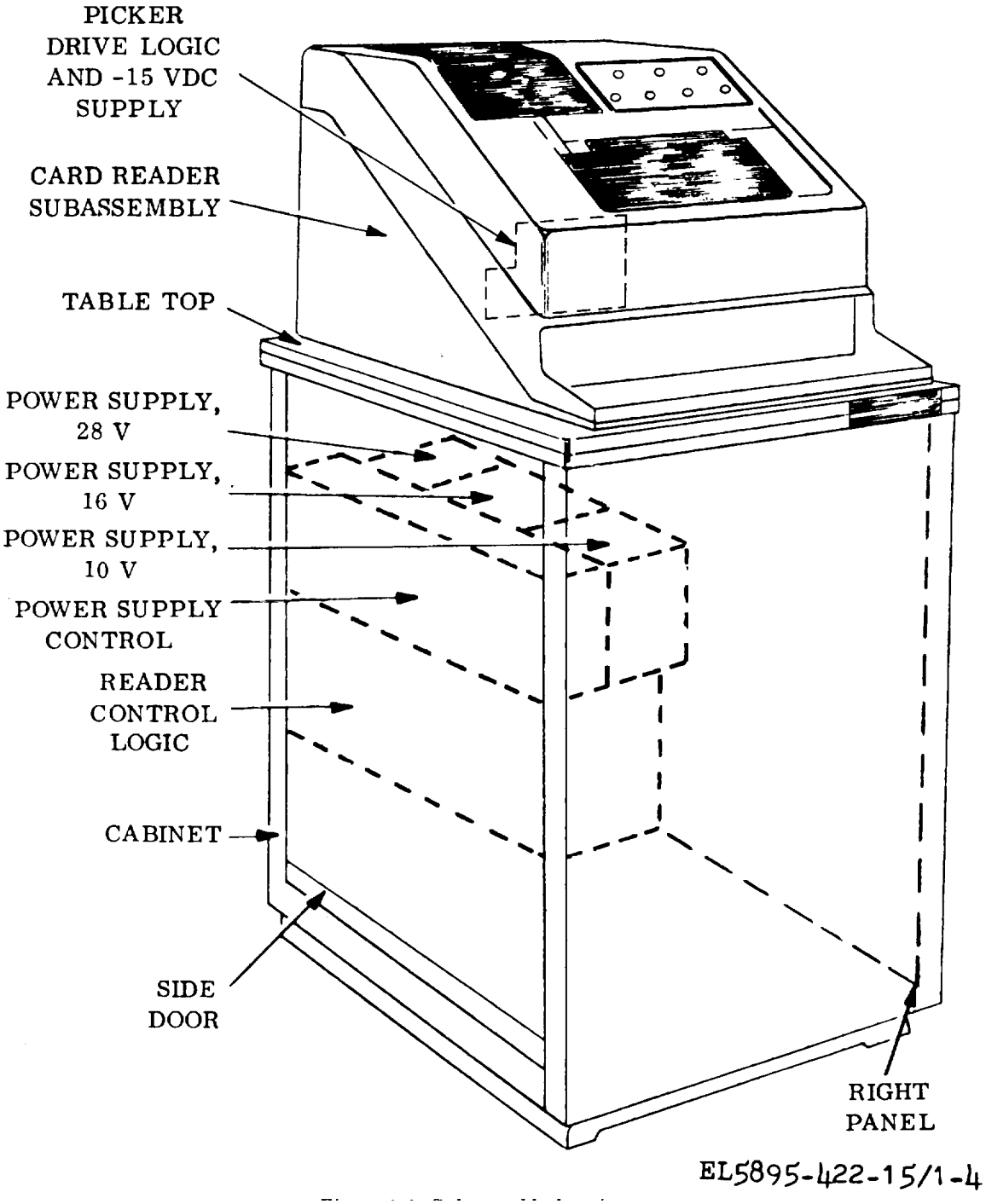


Figure 1-4. Subassembly location

CHAPTER 2
OPERATION

2-1. Operating Controls and Indicators

Table 2-1 lists all controls and indicators mounted on the card reader operator's control panel. The controls and indicators are shown in figure 2-1.

Table 2-1. Operating Controls and Indicators

Control or indicator	*Function*
ON-OFF switch/indicator	Turns power on or off.
HALT switch/indicator	Switch is used for a momentary halt of reader operation without disturbing reader logic. Indicator illuminates when the output stacker is full, when the input hopper is empty, or when the HALT switch has been depressed.
CLEAR switch	Resets card reader logic.
MISPICK	Indicates that card was not fed to transport.
PHOTODIODE	Indicates that card was not
ERROR	lamp failure
DATA ERROR	(not used)
JAM	Indicates that a card is jammed, either between the throat rollers and the read head, or at the corner rollers and the output stacker

2-2. Turn-On Procedure

To apply power to the card reader, depress the ON-OFF switch/indicator. The switch/indicator lamp should illuminate. The motor is not activated until the CLEAR switch has been depressed.

2-3. Card Preparation

a. Check for damaged cards before inserting the cards into the input hopper. All damaged cards should be replaced by repunching the information on a blank card.

b. Flex and tamp the cards until all sides, particularly the leading edges, are even and the cards lie flat. This can be done on the table top working area.

2-4. Input Hopper Loading

To load the input hopper, proceed as follows:

a. Slide the input hopper weight to the top Of the hopper.

b. Insert the cards with printed face down, column I to the right.

c. Slide the weight back until it rests on the Indicates that a card is

2-5. Preparations for Computer Control

To activate the motor, depress the CLEAR switch. This switch also clears the reader logic and places the reader under computer control.

2-6. Turn-Off Procedure

To remove power from the reader, depress the ON-OFF switch/indicator.

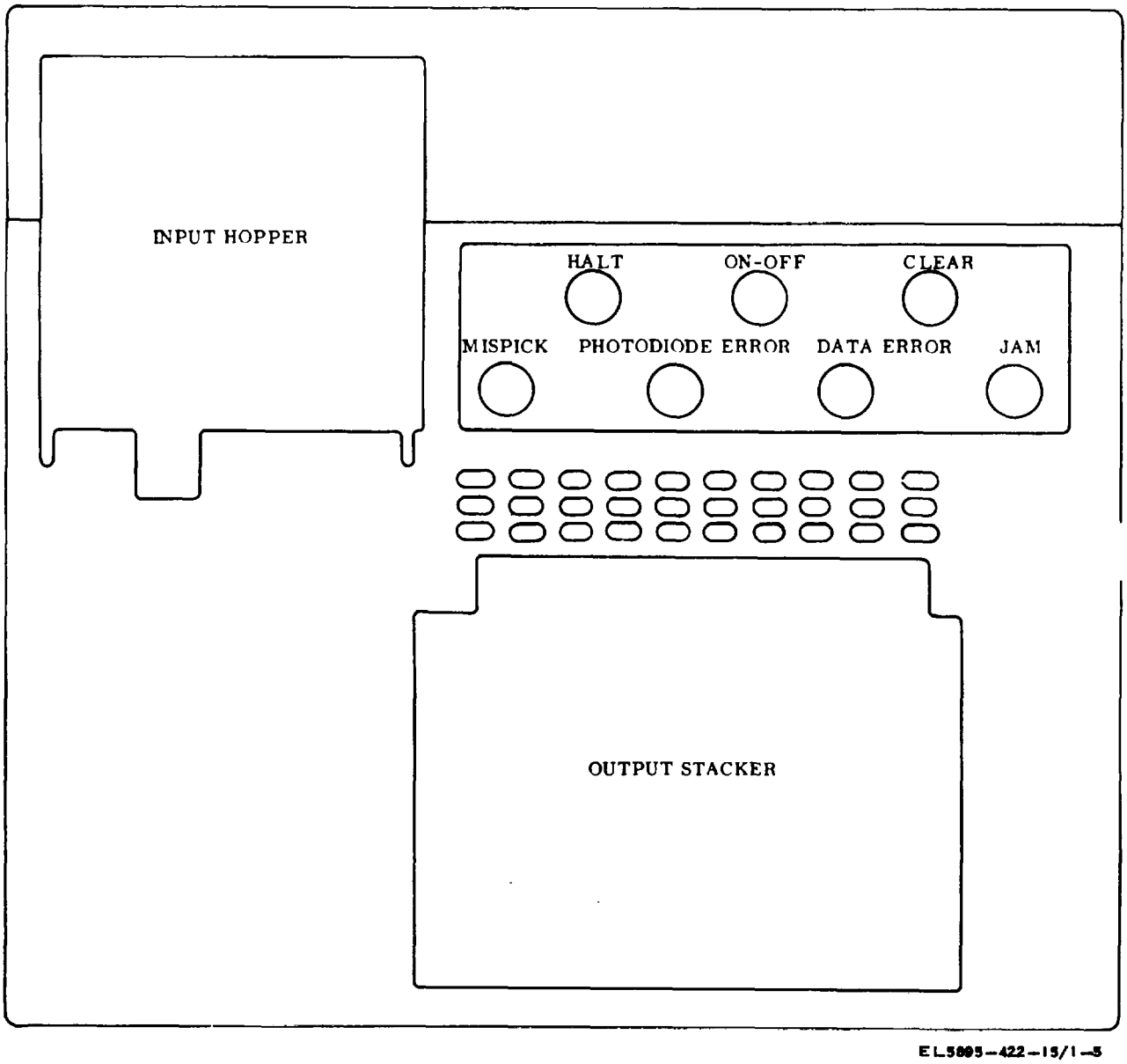


Figure 2-1. Operating controls and indicators.

CHAPTER 3
PRINCIPLES OF OPERATION

Section I. FUNCTIONAL SYSTEM OPERATION

3-1. Introduction

This chapter describes Card Reader Unit RP-165, 'FYA-10(V) in terms of its operation. Section I briefly explains the overall operation of access time of the reader is 30 milliseconds with the card reader in terms of a functional diagram. Section II provides a brief description of the electronic circuits and input/output data flow. Section III provides a mechanical description of the card reader.

3-2. General

The purpose of the card reader is to transform the Information contained on the punched cards Stacked upright in the stacker. When the stacker to electrical signals which are transferred to the input-output controller. The electrical functions of the reader are shown in TM 11-5895-422-14-2 and are explained in paragraphs 3-4 and 3-5.

3-3. Card Path

(fig. 3-1)

a. Input Hopper. The input hopper has a capacity of 1000 cards. The cards are stacked printed face down (toward picker) with column 1 of the card to the right. A weight placed on top of the card stack exerts a downward force on the cards. The pressure of the cards depresses the hopper empty switch. After the last card is picked, the hopper empty switch is released and enables the logic circuitry to turn off the motor.

b. Drive Motor. The drive motor, through a belt and pulley arrangement, drives all pulley, idlers, and rollers in the picker and transport assemblies.

c. Picker. The picker is a continuously rotating polyurethane roller. The engaging and disengaging of the picker are controlled by the storage circuitry is composed of inverters picker solenoid. When a feed pulse is received by the picker solenoid, the roller is pressed against a card. Each feed pulse moves one card from the input hopper to the transport assembly.

d. Transport Assembly. The picker moves the cards through the knife throat. The transport assembly has two sets of rollers, minor and major, which move the card through the read station at a velocity of 4498 inches per minute The total read time for a card is 87 milliseconds The time between 80-column cards at the rated speed being 51.5 milliseconds. The presence of a card in the read station is detected by the throat jam photodiode (fig. 4-4), which prevents any other card from being fed into the read station until the read station is clear.

e. Stacker. The stacker receives the cards from the transport assembly The cards are stacked upright in the stacker. When the stacker is full, the motor is turned off by the stacker full switch and associated logic circuitry.

3-4. Data and Control Circuits

a. Read Station. The read station is composed of photodiodes arranged as shown in figure 3-2.The photodiodes in the read station serve two functions. The 12 data photodiodes sense the data on the card one column at a time. The eight timing photodiodes are used to trigger the column timing and resynchronize the timing chain.

b. Photodiode Amplifiers. Each photodiode output is applied to a separate amplifier. The data amplifier outputs are applied to the data storage circuits; and the timing photodiode amplifier outputs are applied to the timing circuits.

c. Data Storage Circuitry. The data storage circuitry is composed of inverters and storage flip-flops. The inverters are fed by the data pulse from the photodiodes. The inverter outputs are fed to the storage flip-flops, and through data amplifiers to the interface circuitry.

d. Data Compare .Deleted.

e. Fault, Error, and Control Circuitry. The fault and error circuitry is used to9 detect errors and faults of the card reader, including mispick faults, stacker full and hopper empty signals, and jam signals. The circuitry is also used to control the card reader. The error and fault circuitry is used in conjunction with the control circuitry to establish the operating conditions of the card reader and to signal any errors to the card reader control panel or input, /output controller.

f. Timing. The timing circuitry can be divided into two sections: edge timing and control timing. The edge timing photodiodes are used to synchronize the timing chain and trigger the column timing. The control timing circuit generates pulses to control the operation of the card reader, including data strobe pulses, recycling pulses, and data clear pulses.

g. Interface Circuitry. The interface circuitry consists of line transmitter and line receiver circuits. There are 12 data output lines and a line for each of the following: data error, data strobe, photodiode error, halt, reader continue, and mispick. The input lines consist of run reader, card complete, and reader interlock signal lines.

3-5. Power Supplies

The dc power required to operate the card reader is obtained from three internal power sources. Power Supply PP-4741/FYA-10(V), a 28-vdc power supply, provides power for the picker coil. Power Supply PP-4739/FYA-10(V), the -10-vdc power supply, and Power Supply PP-4740/FYA-10(V), the +*16* -vdc power supply, provide power for the transistor logic circuits, including the data and timing lamp.

Section II. FUNCTIONAL OPERATION OF ELECTRONIC CIRCUITS

3-6. General

The electronics of the card reader consist of seven functional circuits as follows:

a. Data circuits
b. Jam detection circuits
c. Pick and mispick circuits
d. Dark check
e. Timing
f Interface circuits

3-7. Data Circuits

a. The data circuits consist of a reading station and associated logic circuits (see TM 11- 5895-422-14-2). The reading station contains one row of 12 photodiodes, arranged perpendicular to the transport base and card path. All photodiodes are lighted by a single light source. is distributed by fiber optics. The card being read passes between the photodiodes and the light sources. Since all data rows operate in the same manner, only one data row will be discussed .When the card being read passes over the read head, the data is read one column at a time. Wherever there is a hole in the card, the light illuminates its associated photodiode and the photodiode produces a low output.

b. The photodiode output, which is adjusted by the photodiode adjustment potentiometer (PDAP card), is applied to the photodiode input of the PDSD amplifier. The PDSD amplifier output is high, causing the associated 4FA storage flip-flop to set. When set, the flip-flop produces a low output on the data = 1 line and a high output on the data = 0 The light line. The data = 0 line on flip-flops for row 1 through row 11 and the data = 1 line

on the row 12 flip-flop are connected to the dark neck circuit. The data = 1 line is applied to the interface circuits (para 3-13) for forwarding to the -card controller with memory buffer assembly. All orage flip-flops are reset by the clear pulse, a 10 .crosecond pulse occurring immediately before the 'ata strobe signal.

c. The PDSD amplifier circuit incorporates a feature that permits the equipment to differentiate between a photodiode and lamp failure and the lack of photodiode output due to an unpunched row. This feature causes the PDSD amplifier output to go high with a high photodiode output if no low photodiode output has been applied to the PDSD amplifier for some time. Such low photo-low photo- diode output has been applied to the PDSD amplifier for some time. Such low photodiode output is normally applied to the PDSD amplifier during the interval between the passage of successive cards through the read station. Accordingly, only the dark output due to an unpunched row will produce a low PDSD output, while the dark output due to a lamp or photodiode failure produces a high PDSD output.

3-8. Data Timing Circuits

a. When the card's leading edge is detected by PD"0, " single-shot 14E5A is triggered. As the card's leading edge crosses PD";'0, " the 12 data photodiodes go dark. CTSS (13D4B) is triggered at the same time as 14E5A. CTSS clears the data register (13C4A and 13C4B). When CTSS times out, the load data single-shot (13D3A) is triggered. The load data single-shot enables the Data Strobe driver (13D3B) which strobes output gates 15D3B, 15D3C, and 15D3D.

b. As the card advances, its leading edge crosses Edge Cell 1, and the column one position is over the read station. Edge Cell 1 detects a dark condi- tion (input high). The output of PDSD (5E4B) goes low, and the inverter output high. The signal from the 5E4D lengthened by the Integrating single-shot 5E3C. The output of 5E3C is inverted by 5D3A, which triggers one of the Edge Cell Timing single-shots (5C3A). The Edge Cell Timing single-shot inhibits the re- cycling timing chain by DOT ANDing the output of Recycle Timing single-shot RTSS4 (13E5A) and inverter 13E6A. After the Edge Cell Timing single- shot times out, ECSS1 is triggered (13E6B).

c. ECSS1 provides one of the inputs to the Cont- .rol Timing flip-flop (13E5B). The Card in Read --Station (14E4A) flip-flop is also set at this time. This flip-flop enables the recycling timing chain to function (13D5A-10), and it also enables the data strobe to the Reader-Punch Buffer Controller (15D3C).

d. The Card in Read Station flip-flop is reset at the end of the card by an Operation Complete signal from the Reader-Punch Buffer Controller. The conditions at this time are as follows:

The leading edge of the card has partially crossed Edge Cell 1.

The Row Data flip-flop register loads data from column one as it crosses the read station. The setting of the Control Timing flip-flop triggers CTSS1 (13D4A).

e. After CTSS1 times out, CTSS2 is triggered (13D4B). CTSS2 enables CLEAR (13C4A, 13C4B) to reset the Row Data register. After CTSS2 times out, a strobe is triggered (13D3A), which samples gate 15D3B for presence of a photodiode error. During CTSS2 time out, the data strobe (15D3C) line will also be high. The reader data lines must be sampled during this interval.

f. The time out of the Data Strobe single-shot (13D3A) then triggers three Delaying single-shots, RTSS1 (13E2A), RTSS2 (13E2B),and RTSS3 (13F5A). RTSS1 and RTSS3 are variable pulse length single-shots and may be trimmed to modify the position of the Load Data single-shot with regard to a data pulse. RTSS2 resets the Control Timing FF and also counts the four bit Column Access counter (14F2A, 14D2A, 14C2A, 14B2A).

g. The time out of RTSS3 triggers RTSS4, which sets the Control Timing flip-flop (13E5B). The Control Timing flip-flop triggers the timing to read the next column. All timings necessary to accom- plish reading will be generated by the recycling chain mentioned in the preceding three paragraphs. When the Column Access counter equals nine, the Data Strobe generated by CTSS1 sets an Inhibit flip-flop (14E3A). The DOT ANDed output of the (5E4D) goes flip-flop inverter (14C3A) then inhibits the output is shaped and of RTSS4 (13E5A).

h. The next timing chain will be initiated when the leading edge of the card crosses Edge Cell 2. As Edge Cell 2 goes dark (input high), the output of PDSD (5E4A) goes low, while its inverted output (5E4C) goes high. Since PDSD for Edge Cell 1 output (5E4B) 'tries to stay low, the input to 5E4D will follow the high output of 5E4C. The output of inverter 5E4D will go low, and the output of inverter 5E3A will go high. A high input to the Integrating single-shot edge cell 2 (5E3D) will trigger Edge Cell single-shot 4 (5C3B), which in

turn triggers ECTSS 1 (13E6B) and subsequently the recycling timing chain for the next ten columns.

i. The Edge Cell timing sensors EC1 through EC8 detect the leading edge of the card and alternately trigger Integrating single-shots 5E3C and 5E3D, which then resyne the column timings with the movement of the card. In order to alternately trig- ger the two Integrating single-shots 5E3C and 5E3D, the output.of inverter 5E4D must be a symmetrical square wave -with an approximate 22-millisecond period.

3-9. Jam Detection Circuits

a The passage of a card into the stacker inter- rupts the light path of the stacker lamp to the stacker-photosensor. The deficiency of light takes the photosensor out of conduction and applies a positive level to the input of inverter 12E6A (TM 11-5895-422-14-2). The threshold which trips in verter 12E6A may be adjusted by turning the stacker diode potentiometer The potentiometer is located inside the rear dot, r of the card reader, and is wired to the interface line A51-37 A low output from 12E6A will not produce an output from The Integrating single-shot 12D5A until the single-shot times out If a card interrupts the light beam for more than 200 milliseconds the output of 1D5A will go high and the Card Jam FF will be set. If the light beam is interrupted for a period of time less than 200 milliseconds the output of 12D5A () less- than 200 milliseconds, the output of 12D5A will stay low. The negative output now present on JAM FF = I line is inverted and amplified by indicator driver 4E3C illuminating the jam in- dicator. The Card Jam flip-flop may also be set by a card jammed in the throat area. When the card covers the throat, diode, pin 13 of gate 11E3A is negative. Pin 1-1 is also negative because of the run reader signal from 11F2A. When the trailing Edge of single-shot 11E6A (85 milliseconds after successful pick was made) goes positive, single- shot 11F3A is triggered Since an Edge Cell timing pulse has not occurred, all inputs to gate 11E3A are satisfied. setting Card Jam flip-flop 12D5B.

b, . If either a hopper-empty or a stacker-full indi- cation is present, the signal is amplified by receiver 4E6D. The amplified signals sets Halt flip-flop 4D5A When the high output on the "0" output line of the Halt flip-flop is applied to motor stop magnet driver 12C4A, the drive motor control relay releases, shut- ting the drive motor off. A high output on the “0” output line when Card Jam flip-flop 12D4A is set also causes the drive motor relay to release. The Halt and Card Jam flip-flops may be reset by operating the CLEAR swtich.

3-10. Pick and Mispick Circuits

a. Pick Circuits.

(1) The card controller initiates a run reader- signal through the interface circuitry. The presence of the run reader, mispick = 0, and throat diode signals in coincidence at AND gate 11F6A, enabl an output which triggers single-shot 11E6A. If their is no card in the read station, PD "0" will be nega tive on pin 5 of single-shot llE5A, which allows single-shot 11E5A to be triggered by the positive- going signal received from gate 11E6A. (Note that negative pulse of single-shot l11E6A is inverted through gate l11C6A, which triggers single-shot llE5A on leading edge of pulse produced by single- shot llE6A.) The output generated by single-shot llE5A will trigger single-shot llE5B on its trailing edge; however, the main function of the 40-milli- second output of single-shot fuE5A is to energize magnet driver 11C5A to initiate a pick signal. The 40-millisecond pulse produced by single-shot llE5A will actuate the picker logic via s1C5A if the stacker is not full, if the hopper is not empty, and if no card is in the throat of the reader.

(2) The picker drive logic (fig. 4-25) changes the direction of current flow through the picker coil when the pick command changes state, providing positive control of the picker roller's position.

(a) A pick command (high at C3 pin 14) results in the following logic outputs; OE5A (TP2) low, OD4A (TP1) high, OE3A (TP1) low, and OD3A (TP1) high. The low output at OF3A (TPI) pin 12 is a result of current flow through the picker coil in the direction indicated by the solid arrow. This direction of current flow causes the picker .roller to extend into the pick position land advance a card into the card reader throat.

(b) A low (non-pick) at C3 pin 14 results in the following logic outputs; OE5A (TP2) high, OD4A (TP1) low, OE3A (TP1) high, and OD3A (TP1) low. The low output at OD3A (TP1) pin 12 is a result of current flow through the picker coil in the direction indicated by the dashed arrow. Thus direction of current flow causes the picker roller to be retracted into the non-pick position.

b. If the card does not reach the throat within 40-imilliseconds. a second pick attempt is made The second pick is initiated by single-shot llE5 via inverter11lD5Aand AND gate 11C6A. (Note that the length of the output of single-shot 11E6A allows one additional pick attempt after the first attempt since gate 11C6A is enabled ft 85-millllseconds only.) In the event that a card is not picked within the 110 milliseconds, the Mispick

flip-flop is set through gate 11C4A. The 1- mispick signal is generated through the coincidence of the output of single-shot 11E5B, throat diode not cov- ered, and no output from single-shot 11E6A. The resultant output produced on mispick = 1 illumi- ites the mispick indicator on the reader control , nel (lamp driver 4E4C) and prevents any pick Attempts through gate 11F6A during the mispick condition. A mispick signal is also sent to the card controller (15D2A) to disable the run reader signal, to set the Halt FF to inform the card controller of the fault status of the card reader.

3-11. Dark Check

After a card has been picked and passes the throat, the data photodiodes are verified by the dark check circuit. When the card's leading edge covers PD"0" diode, one-shots 14E5A and 13D4B are triggered. The PD *"0"* SS1 output from 14E5A sets photo- diode error flip-flop 14D6A, and the clear output from 13D4B clears all of the 4FA data storage flip- flops. After 10 microseconds, the clear signal to the data storage flip-flops is removed. At this time, the blank portion of the card (leading edge) is covering the photodiodes, and they should all be dark. If any of them indicate a light condition, storage flip-flop is set. The set flip-flop's data - 0 line outputs a high signal to the dark check gate, which outputs a high signal to the photodiode error flip-flop, causing it to be held in the set state after its set input is removed. An error signal is generated that causes the PHOTO-DIODE ERROR indicator to light, and a photodiode error signal to be sent to the controller. If none of the data photo-diodes indicate a light condition, all of the data storage flip-flops remain in the clear state, and the dark check gate maintains a clear signal on the photodiode error flip-flop. This causes the photo- diode error flip-flop to clear as soon as the set signal is removed. No error signal is generated. error signal in coincidence with a data strobe, an

3-12. Timing.

(Refer to TM 11-5895-422-14-2.)

a. With no card present, all photosensors detect light, which is a "low" level to the PDSD input. All PDSD outputs for Edge Cells 1 through 8 are there- ore high, and the output of their associated in- erter "tries" to be low. It cannot be low, because the PDSD to which its output is wired will clamp it in the high state. b. When Edge Cell I detects the leading edge of a card, the output of the PDSD (5E4B) goes low. It --will stay low until the leading edge of the card passes Edge Cell 2. The output of PDSD (5E4A) now goes low and its associated inverter 5E4C goes high, which clamps the output of Edge Cell 1 PDSD (5E4B) in the high state. The output of PDSD (5E4B) for Edge Cell 1 has now gone through a negative and a positive transition as Edge Cells 1 and 2 were sensed. Each Edge Cell produces a "dark" output as long as a card covers that sensor. When Edge Cell 3 detects the leading edge of the card, the output of PDSD (5E5C) goes low. which forces the output of 5E5F to go high. The output of inverter 5E4C will go low, and force the output of will cause the output of 5E4D to go through similar transitions. As Edge Cell 8 is covered, the output inverter 5E4D to go high. Edge Cells 4 through 8 of inverter 5E4D will go low When the trailing edge of the card exposes Edge Cell 1 to light, the output of PDSD (5E4D) will go high and continue to clamp the output of inverter 5E4C high. As succeeding Edge Cells are uncovered, no transition will be oh- served at the outputs of inverters 5E4C, 5E4D. and 5E3A; therefore, no timings will be triggered.

3-13. Interface Circuits

The interface circuits between the card reader, memory buffer assembly, and card controller trans- mit various data and command signals (TM 11- 5895-422-14-2). They also provide the necessary amplification of error and fault signals to operate the reader control panel indicators. The logic "1" output of the Data Storage flip-flops is amplified by the 2XRAA transmitter There are 12 amplifiers one for each row of data from the Data Storage flip-flops. The reader HALT switch, mispick -= 0, and Card Jam FF signals are fed to an OR gate The output of OR gate 15E2A i, - amplified and fed to the card controller as a halt signal. Operation of the CLEAR switch triggers Integrating single-shot 15F2A. The resultant 1.0-nmicrosecond output from 15F2A is amplified and fed to the card controller as a reader continue signal If there is a photodiode error output is produced. Each error signal has its own AND gate. The outputs to the card controller are: photodiode error, data .strobe and data error. The data strobe output notifies the card controller to be ready to accept the card reader output The mispick error output from 11C4A is amplified by 15D1A and fed to the controller as an error signal. The CLEAR switch on the reader control panel sup- plies a signal which is amplified by 4E6C and used to reset Card Jam (12D4A), Mispick (tlD3A), Halt (4D5A), Photodiode Error (14D6B), and Card in Read Station (14E4B) flip-flops. The CLEAR switch is used to transmit the continue signal (4E6B) to the

card controller with memory buffer assembly. The reader HALT switch signal is amplified (4E6A) and sent to the card controller and the Mispick flip-flop (llD4B). The run reader signal from the card controller is amplified and enables gate 11F6A, which triggers the Run Reader single-shot (llE6A). When a card complete signal is received from the card controller, it is amplified and used to reset the Card in Read Station flip-flop. The halt, mispickl photodiode, error, data error, and jam signals are all amplified and fed to their respective indicator- on the card reader control panel.

Section III. MECHANICAL OPERATION

3-14. Knife Throat and Card Transport

The card transport, shown in figure 4-1, has two roller assemblies, consisting of minor throat rollers and major throat rollers, which are driven by the drive motor through a belt and gear. As the card passes through the knife throat, the leading edge is picked up by the minor throat rollers. These rollers move the card toward the major throat rollers, which propel the card through the read assembly.

3-15. Picker

The picker, shown in figure 4-2, is a continuously rotating roller driven by the picker drive belt. When the coil plunger is actuated by the picker coil, the picker is pressed against the cards in the input hopper, propelling a card through the knife throat.

3-16. Stacker

After passing through the read assembly, the leading edge of the card follows the timing head guides, which gradually bend the card downward to the point where the card is intercepted by the corner roller. The rotation of the corner roller aids the downward motion of the card. The downward motion is arrested by the stacker pillow. The shaker plate and shaker arm then move the card toward the stacker empty switch. The stacker is shown in figure 4.4.

3-17. Motor and Drive Assembly

The motor, shown in figure 4-11, drives the various drive assemblies through rubber belts and pulleys. The motor is turned on with the reader, and rotate continuously, operating the transport drive, the cor nor roller assembly, and the picker.

Section IV. ELECTRICAL OPERATION OF PICKER DRIVER AND SOLENOID DRIVER CARDS.

3-18. Picker Driver (PCBA 310072)

a. General.

(1) The picker driver circuit card (fig. 4-29) consists of two cascade inverters whose input logic (PICK COMMAIAND) 1> supplied to pin 14. The in- put is from the 3MDDC -magnet driver card.

(2) The two outputs of the picker driver pro- vide signals at opposite logic levels to control the solenoid driver cards. Output pin 17 controls the C1 card and output pin 10 controls. the C2 card.

3) Operating voltages and ground are supplied (high). The positive voltage present at the

b. *Non-p*ick. In the non-pick state the output transistor- on card 31I*D*)C i.> cut off, and the voltage at its collector (pin 14 , f picket driver) becomes negative (low). The negative voltage present at the base causes transistor Q2 to be forward-biased. Transistor Q2 conduct.- and clamps its collector to ground (high). The conduction of transistor Q2 presents a positive voltage to the base of transistor Q1 causing Q1 to be reverse-biased. As a result, transistor Q1 cuts off an4 its collector becomes neg- ative (low). The ground (high) at transistor Q2's collector is connected to (TP2) pin 17 and routed to pin 1 of solenoid driver card C1. The negative volt- age (low) at transistor Ql's collector is connected to (TP1) pin 10 and routed to pin 1 of solenoid driver card C2.

c. Pick. In the pick state the output transistor on card 3MDDC is conducting and the voltage at its collector (pin 14 of picker driver) is clamped to ground to pins; 18 (GND). 19 (IOV), and 20 (416V). base, causes transistor Q2 to be reverse-biased Transistor Q2 is cut off and its collector voltage be comes negative (low). The negative voltage present at the base, causes transistor Q1 to be forward- biased. Transistor Q1 conducts and clamps its col- lector to ground (high). The negative voltage (low) at transistor Q2's collector is connected to (TP2) pin 17 and routed to pin 1 of solenoid driver card

C1. The ground (high) at transistor Q1's collector , connected to (TP1) pin 10 and routed to pin 1 of 'solenoid driver card C2.

3-19. Solenoid Driver (PCBA 32490)

a. General.

(1) The solenoid driver (fig. 4-31) is repre- sentative of both the C1 and C2 cards. The pick and non-pick function will be analyzed with the under- standing that only one card is active during any given function. Card C1 is active during the pick function and card C2 is active during the non-pick.

(2) Transistors Q1, Q2, Q6, and Q7 make up the active switching circuits while transistors Q3. Q4. and Q5 are protective circuits for transistors Q6 and Q7

(3) Operating voltages and ground are sup- plied to pins; 6 (-15V regulated, fig. 4-25), 18((GND), and 20 (416V)

b. Card (C1 or C2) active. A negative voltage source at pin 20 is present, transistors Q2 and Q4 clamping its collector to ground. Transistor Q2 (NPN) will be forward-biased, shunting resistor R7, which forward-biases transistor Q6. Transistor Q6 conduction, forward-biases transistor Q7 and pro- ides a current path from the -15V source through; transistor Q6 to pin 12, picker coil to pin 16, tran- sistor Q7 to ground. The current flow resulting will cause the TP1 voltage to drop to approximately -13V (low), refer to figure 4-25 for waveforms and direction of current flow.

c. Card (C1 or C2) inactive. A ground (high) at pin 1 reverse-biases transistor Q1, and its collector becomes negative. Transistor Q2 (NPN), reverse- biased will not shunt resistor R7, and transistor Q6 will be reverse-biased. Transistor Q6 cut-off, reverse-biases transistor Q7 and the current path through the picker coil is interrupted. Test point (TP1) of the inactive card will now be OV (high), refer to figure 4-25 for waveforms. *d. Protective circuits for loss of bias, shorts, or loss of logic control.*

(*1) General. 'If* not protected, the loss or low level of +16V at pin 20 would saturate transistors Q6 and Q7, which by its self is not detrimental as we saturate them each time the card is active. How- ever the input logic no longer controls this card and it remains active at all times. The damage results when both cards are in an active state at the same time figs. 4-25 and 4-31). The current leaving pin 12 of C1 card is seeking ground, and since pin 16 of C2 card is at ground. this will be the current flow path The same condition exists at pin 12 of C2 and pin 16 of C1. Since the picker' coil is not electrically in the circuit the current would like to increase from the nominal value of 1A. to a value of 7 5A. This current increase would damage resistor- R12 and Transistors Q6 and Q7 on both boards and must be limited to some safe value. A short in picker coil or across pins 12 and 16 of the card must be protected against.

2) *Loss of -16V.* Circuit protection transistor, Q3 and Q4 protect against excessive current due t(i loss of bias voltage (fig. 4-31) When the +16V source at pin 20 is present, transistor Q6 and 7. A are reverse-biased and effectively out of the circuit having no control over transistors Q6 and Q7 A loss of the +16V source results in transistors Q3 and Q4 being forward-biased with their collectors clamped to ground. Since the collectors of transistors Q3 and Q4 are common to the bases of transistors Q6 and Q7 respectively, Q6 and Q7 will be reverse- biased at all times and will not conduct.

(3) *Shorts.* When transistors Q6 and Q7 are drawing normal currents. transistor Q5 is reverse- biased and transistors Q1 and Q2 are in complete control of transistors Q6 and Q7. If current flow-.v through transistors Q6 and Q7 increase above the normal value due to a short, transistor Q5 is for- ward-biased. Transistor Q5 conducting through re- sistor R6 changes the biasing point of transistor Q2, thereby controlling the bias to, and the current through transistors Q6 and Q7 to a safe value.

(4) Loss of logic control. The loss of logic con- trol over a card could result in both cards being active at a given time. Due to the increased current condition, transistors Q6 and Q7 will be protected in the same manner as in (3) a, hove

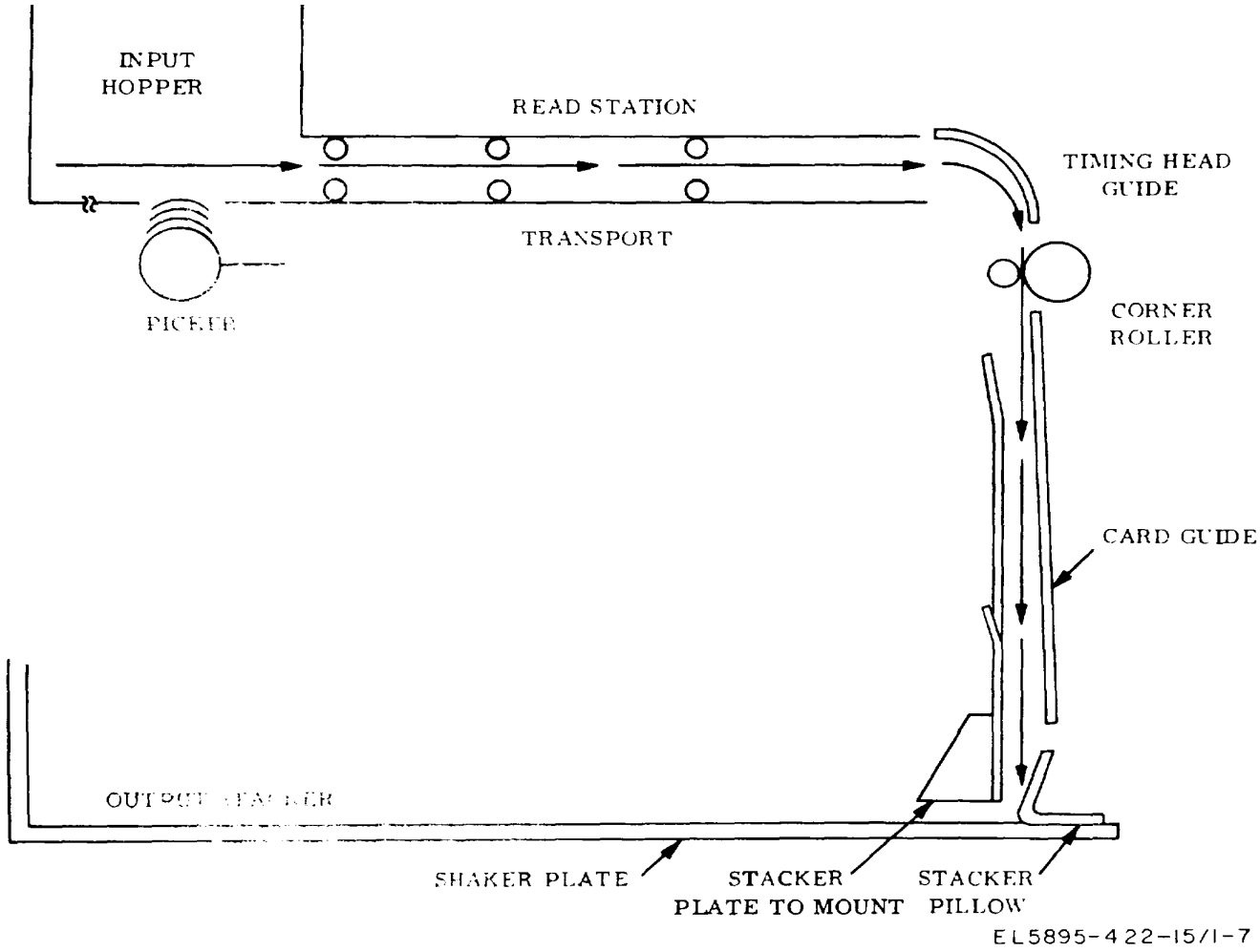


Figure 3-1. Card Path

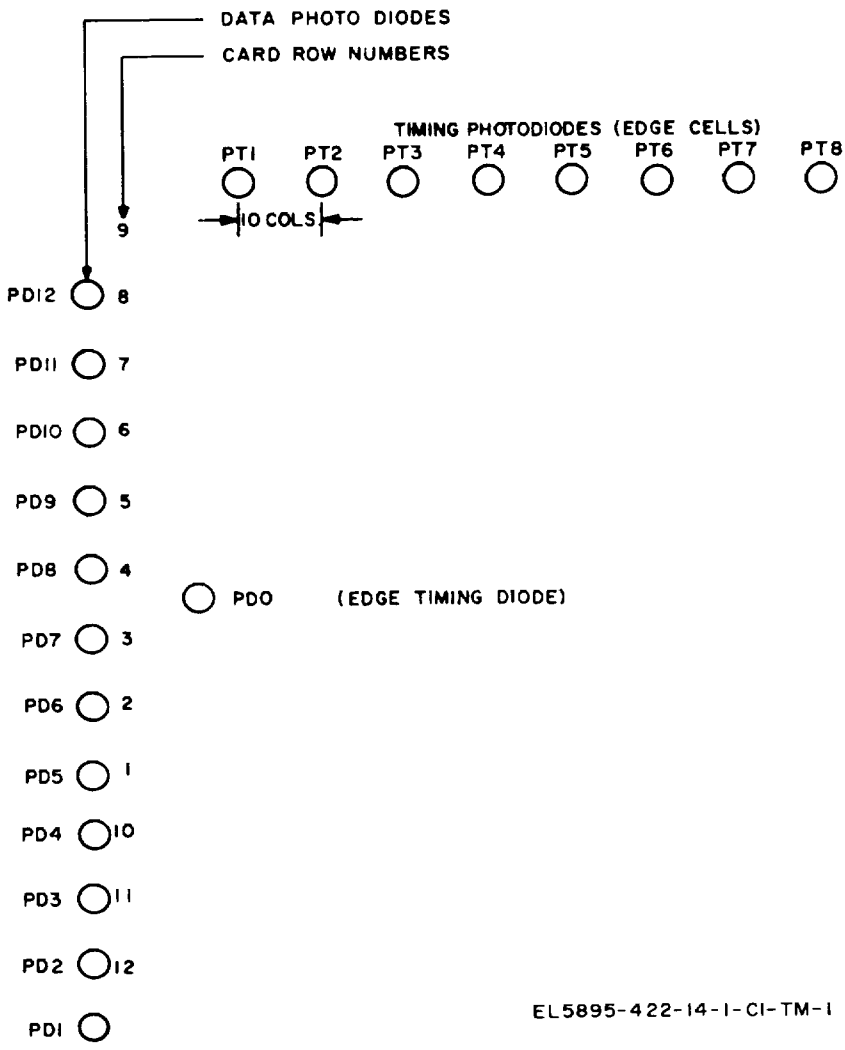


Figure 3-2. Read station

CHAPTER 4

MAINTENANCE

Section I. PREVENTIVE MAINTENANCE

4-1. General

Preventive maintenance procedures for the equipment include those procedures which are to be performed on a scheduled basis and are required to ensure maximum equipment reliability. These procedures include such operations as inspection, cleaning, lubrication, and electrical and mechanical checks. Some of the preventive maintenance procedures can be performed while the equipment is in one-line status. Other procedures can be performed only when the equipment is in off-line status. Corrective maintenance is defined as unscheduled maintenance which is required to correct an equipment malfunction or failure.

4-2. Daily Maintenance

Warning: **Remove all power before performing cleaning procedures**.

a. Cleaning. Unless otherwise specified, use a cloth dampened (not wet) with cleaning compound to remove dirt and dust from the equipment.

Warning: **Prolonged breathing of cleaning compound is dangerous; make certain that adequate ventilation is provided. Cleaning compound is flammable; DO NOT use near a flame. Avoid contact with the skin; wash off any that spills on your hands.**

(1) Face plate and photodiodes (figs. 4-4 and 4-9). To clean the face plate and photodiodes, perform the following procedure: Note: Do not use cleaning compound on face plate and photodiodes.

(*a*) the cover from the card reader subassembly.

(b) Unlatch the face plate and lay it back.

(c) Clean the underside of the face plate.

(d) Clean the surfaces covering the photodiodes.

(e) Wipe the surfaces dry with a clean, soft cloth.

(2) *Rollers and card guide* (fig. 4-4). Clean the picker roller, all metal rollers, and polyurethane rollers, corner rollers, and the card guide of all foreign material such as dust, ink, and paper. Close the face plate.

(3) Input hopper and output stacker. Clean the input *hopper and output stacker, using a damp cloth.* After cleaning, dry both assemblies and buff thoroughly with a clean cloth. Replace the card reader cover.

b. Electrical Checks.

(1) Check to determine that the throat and stacker jam lamps are on (figs. 4-1 and 4-4).

(2) Check to determine photodiode light source is on (figure 4-4).

(3) Check to determine that the cabinet blower assembly is operating; inspect for excessive noise or vibration.

c. Mechanical Checks. Deleted.

4-3. Weekly Maintenance *Warning:* Remove all power before performing cleaning procedures.

a. Cleaning. Perform the daily cleaning procedures given in paragraph 4-2a. After cleaning the input hopper and the output stacker, apply a coat of hard paste wax to the polished surfaces and, when dry, buff thoroughly with a clean cloth.

b. Cleaning Air Filter (fig. 4-3). The air filter, located in the base of the card reader cabinet, is a permanent washable filter of the self-charging, electrostatic type. Preventive maintenance for the air filter consists of a weekly cleaning, using a vacuum cleaner to remove surface dust and dirt.

(1) To remove the air filter from the cabinet, proceed as follows:

(a) Open the side door of the cabinet.

(b) Grasp the filter handle and withdraw the filter assembly from the filter slide assembly.

(2) Vacuum the air filter each week to remove entrapped surface dust and dirt. Position the nozzle of the vacuum cleaner on the filter surface, and vacuum from the inlet side of the filter only; move the nozzle gently over the entire surface to withdraw entrapped dust or dirt in a direction opposite that of normal air flow.

(3) Replace the air filter as follows:

Caution: **Make certain that the arrow on the filter assembly coincides with the direction of air flow before inserting the filter assembly into place in the filter slide assembly**.

(*a*) Grasp the filter handle and slide the filter assembly into the filter slide assembly at the base of the cabinet.

*(*b) Close the side door of the cabinet.

c. Electrical Checks.

(*1) Data photodiode amplifier.* Check the output of the data photodiode amplifiers for a pulse width of 950 to 1050 microseconds. The items of test equipment required to perform these tests are an oscilloscope and a test deck of cards. The oscilloscope must be equipped with a dual-trace plug-in vertical preamplifier and sweep delay. All cards of the test deck must have all rows punched in column 1.

(a) Set up the oscilloscope to check the output of the data and compare photodiode amplifiers as follows.

1. Obtain external negative sync at PD "O" test point module location All pin 14.
2. Set the TIME, /CM control to the 10 mSEC position.
3. Trigger the sweep from the A time base.
4. Set the plug-in preamplifier for 0.5 v/cm.
5. Connect the oscilloscope probe to test point module location A13 pin 14.

*(*b) Feed the test deck of cards through the card reader and synchronize the oscilloscope trace to obtain a negative signal of approximately 92 milliseconds duration.

(*c)* Deleted.

(d) Connect the oscilloscope probe to row 12 data pulse test point module location A01 pin 05; set the TIME/CM control to the 200 use c. position.

(*e*) Feed the test deck of cards through the card reader and adjust the oscilloscope to position the negative signal on the oscilloscope face. Measure the signal width at the 50-percent amplitude points for the output pulse; the pulse width should be 700 to 850 microseconds. (Each division on the oscilloscope reticule is equal to 200 microseconds.)

(*f*) Repeat the pulse width measurements for the data photodiode amplifiers as directed in step *(e)* above, with the oscilloscope probe connected to the following test points:

1. Module A01 pin 11 for row 11.
2. Module A01 pin 14 for row 0.
3. Module A02 pin 05 for row 1.
4. Module A02 pin 11 for row 2.
5. Module A02 pin 14 for row 3.
6. Module A03 pin 05 for row 4.
7. Module A03 pin 11 for row 5.
8. Module A03 pin 14 for row 6.
9. Module A04 pin 05 for row 7.
10. Module A04 pin 11 for row 8.
11. Module A04 pin 14 for row 9.

(g) Deleted.

(h) If the pulse width measurement on ::any data photodiode amplifier is greater than 1050 microseconds or less than 950 microseconds, adjust the corresponding PDAP potentiometer for the correct pulse width (fig. 4-24).If a minimum pulse width of 950 microseconds cannot be obtained by adjusting the potentiometer, replace the 2K fixed resistor associated with the PDAP read amplifier potentiometer network by repeatedly doubling the resistance and testing the pulse width. The fixed resistor may be increased in resistance to a maximum value of 50K.

If the minimum pulse width (950 μsec) cannot be obtained by increasing the resistance of the fixed resistor, check the photodiode current by using the procedure described in paragraph 4-9c.

(2) *Power supplies* (fig. 1-4). The 10-vdc and 4-16-vdc power supplies should be checked weekly for nominal operating voltages and ripple. The items of test equipment used to perform these tests are a vtvm and an oscilloscope. (Refer to table 4-1 for a listing of the test equipment required.) Test points for checking the -10-vdc and -F16-vdc logic supply voltage are pins 1 and 16, respectively, and ground, pin 8, of any logic board. The logic boards are located on the reader control logic subassembly, shown in figure 4-3.

(a) Check the --l0-vdc logic power supply for nominal voltage as follows:

1. Set the voltmeter SELECTOR switch to (negative).
2. Set the voltmeter RANGE switch to 30V.
3. Connect the common probe to pin 8 of any logic board.
4. Connect the dc (black) probe to pin 1 of any logic board.
5. The voltmeter should indicate 10 volts tO.5 volt.

(b) Check the +16-vdc logic power sup ply for nominal voltage as follows:

1. Set the voltmeter SELECTOR switch to + (positive).
2. Set the voltmeter RANGE switch to 30V.
3. Connect the common probe to pin 8 of any logic board.
4. Connect the dc (black) probe to pin 16 of any logic board.
5. The voltmeter should indicate 16 volts +0.5 volt.

(c) The -10-vdc or + 16-vdc supply voltages are adjustable over their operating range. Access is obtained to the screwdriver adjustment through a punched hole in the power supply top cover.

(d) To check the -10-vdc logic power supply for ripple, use an oscilloscope with a signal input probe connected to pin 1 of any logic board; connect the signal ground lead to pin 8 of any logic board. The ripple voltage displayed should not exceed 500 microvolts, peak-to-peak.

(e) To check the +16-vdc logic power supply for ripple, use an oscilloscope with the signal input probe connected to pin 16 of any logic board; connect the signal ground lead to pin 8 of any logic board. The ripple voltage displayed should not exceed 500 microvolts, peak-to-peak.

(3) *Timing amplifier.* Check the timing amplifier for proper switching as directed in paragraph *4-9a.*

(d) Mechanical Checks. Visually check all moving parts of the card reader. Direct special attention to the belts, picker, transport and corner rollers, and nylon gears for signs of wear. Replace worn parts as necessary. (See figures 4-1 and 4-4.)

(1) Throat knife (fig. 4-1). Lift the card reader subassembly cover. Using a feeler gauge, check the throat knife for a gap of 0. 009 To 0.010 inch. If the gag is more or less than this amount, refer to paragraph 4-9hfor adjustment procedure.

(2) Picker penetration (fig. 4-2). Check the picker roller for proper penetration into the input hopper. Use a scale or template to measure the picker roller penetration at the apex of the roller. Best results are obtained with a setting which is between 1/64 and 1/8 inch penetration; however, this may vary, depending on the card material, density of punching, cleanliness of card surfaces, etc. If the penetration is more or less than the specified amount, refer to Paragraph *4-9d* for adjusting picker roller penetration.

4-4. Monthly Maintenance

The purpose of performing monthly maintenance procedures is to detect and correct abnormal conditions that may exist in the card reader, but are undetected during daily and weekly maintenance.

Warning: **Before performing the maintenance procedures, remove all power by operating the card reader wall circuit breaker to the "off' position.**

a. Cleaning Air Filter. Perform monthly cleaning of the air filter as follows:

(1) Vacuum the air filter, using the procedure outlined in paragraph 4-3b.

(2) Prepare a solution of warm water and detergent in a container large enough to permit complete immersion of the air filter.

(3) Place the filter in the container, and allow it to soak for several minutes in the solution.

(4) Thoroughly wash the filter by agitating it in the solution.

(5) Rinse the filter in clean water, using the same procedure as was used for washing.

(6) Shake off excess water from the filter, and either set the filter aside to drain and dry for tightness.

at room temperature, or use a low-pressure (15 psi)source of dry, compressed air to dry filter.

(7) When dry, replace the air filter, using the procedure given in paragraph 4-3b(3).

b. Electrical Checks. In addition to checking the -10-vdc and +16-vdc power supplies as directed in paragraph 4-3c(2), check the -28vdc power supply, using a vtvm and an oscilloscope as follows:

(1) Remove the six screws and remove the cover from the power supply control (fig. 4-3); then check the -28- vdc power supply for nominal voltage as follows:

(a) Set the voltmeter SELECTOR switch to - (negative).

(b) Set the voltmeter RANGE switch to 30V.

(c) Connect the common probe to ground (chassis).

(d) Connect the dc (black) probe to fuse F002.

(e) The voltmeter should indicate 28 volts :I volt.

(2) To check the -28-vdc power supply for ripple, use an oscilloscope with the signal input probe connected to fuse F002; connect the signal ground lead to ground (chassis). The ripple voltage displayed should not exceed 1 volt, peak-to-peak.

(3) Replace the cover on the power supply control and secure with the six screws.

c. Mechanical Inspection. During the operation of the card reader, vibrations may cause The 'mounting hardware to loosen and impair operation of the card reader. Perform the following checks monthly to assure continued operation of the card reader:

(1) Inspect all cabinet mounting hardware for tightness.

(2) Check the pulleys for tightness, the rollers for pr6per interference, etc.

(3) Check for abnormal oil or grease deposits

(4) Check for any visual sign of rubbing or abnormal wear of mechanical parts.

(5) Check the card reader mechanism for binding by turning the driven belts by hand.

(6) Check for deposits for foreign particles such as shavings from belts, nylon pulleys or gears, etc.

d. Lubrication. The card reader mechanism is equipped with all moving parts permanently lubricated, and requires no additional lubrication.

Section II. CORRECTIVE MAINTENANCE

4-5. General This section contains corrective maintenance procedures to assist in the troubleshooting and repair if the card reader. Included are maintenance aids to assist in trouble analysis, repair instructions for the removal and replacement of critical parts, and adjustment procedures necessary to assure optimum performance of the card reader.

4-6. Maintenance Aids

a. Card Reader Punch Test Program. The test program is an aid in localizing defects in the operative system. A complete description, as well as instructions for running the CRDTEST program on the punch card subsystem and, in particular, the card reader, can be found in the Description of Test and Diagnostic Routines DD4-TD-102-09.

b. Test Equipment. The test equipment required for performing preventive and corrective maintenance is listed in table 4-1. Special tools are listed in table 4-2 and are illustrated in figure 4-19. Common hand tools are not included in this listing.

c. Waveforms. Waveforms, when taken at vital locations throughout the equipment, are an invaluable aid to the technician when performing maintenance procedures. To this end, waveforms essential to determining the operability of the card reader are shown in figures 4-5 (a) and (b), and 4-25.

Table 4-1. Maintenance Test Equipment

Test equipment	*Characteristics*
Differential voltmeter model 803B John Fluke Mfg. Co.	Voltage range: 0-500 vac or vdc DC accuracy: 0.05 percent AC accuracy: 0.2 percent, 20 Hz to 20 kHz DC resolution: 50 uv dc AC resolution: 5 uv dc
Multimeter, model 260 Simpson Electric Co.	DC Voltage Ranges: 0 to 250 mv; 0 to 2.5, 0 to 10, 0 to 50, 0 to 250, 0 to 1000, and 0 to 5000 volts AC voltage ranges: 0 to 2.5, 0 to 10, 0 to 50, 0 to 250, 0 to 1000, and 0 to 50000 volts DC current ranges: 0 to 50 ua; 0 to 1, 0 to 10, 0 to 100, and 0 to 500 ma; and 0 to 10 amp. Resistance ranges: 0 to 2000 ohms (R x 1), 0 to 200, 000 ohms (R x 100), and 0 to 20 meg (R x 10K). Frequency response: 20 Hz to 200 kHz.
Oscilloscope (Tektronix Inc., model 585A or equivalent)	Accuracy: D.C voltage: ±2 percent, all ranges up to 0 to 100; ±3 percent 0 to 5000 volts AC voltage ±3 percent, all ranges up to 0 to 1000, ±4 per cent 0 to 5000 volts DC current ±1.5 percent 0 to 50 ua; ±2 percent all other ranges Resistance:±2.5 degrees of arc for R x 1; ±2.0 degrees of arc for R x 100 and R x 10K. Frequency range: dc to 85 MHz (-3db). Sweep range: 50 nsec/cm to 2 sec/cm Sweep delay: 1 u sec to 10 sec Rise time (nominal): 4.1 nsec
Dual-trace plug-in unit, type 82 (part of oscillo scope, model 585A) Tektronix Inc.	Sensitivity: 1 mv/cm to 5 v/cm Coupling: ac or dc Rise time (nominal): 4 nsec
Probe, passive, oscine scope, part No. P6006 Tektronix Inc.	Attenuation ratio: 10:1 Input resistance: 10 megaohms Input capacitance approx. 47 pf Maximum input voltage: 600 vdc or 600 vac peak to-peak
Vacuum-tube voltmeter (Hewlett-Packard model 410B or equivalent)	Voltage ranges: AC: 0 to 1, 0 to 3, 0 to 10 0 to 30, 0 to 100, and 0 to 300 volts DC: 0 to 1, 0 to 3, 0 to 10, 0 to 30, 0 to 100, 0 to 300, and O to 1000 volts Resistance ranges: 0 to 500 ohms (R x 1) 0 to 5000 ohms (R x 10), 0 to 50,000 ohms (Rx 100), 0 to 500, 000 ohms (R x 1K), 0 to 5 megaohms (R x 10K), to 50 megohms (R x100K) and 0 to 500 megohms (Rx1 meg) Frequency range: 20 Hz to 700 MHz Frequency response: flat within ±1 db to 700 MHz Accuracy: AC ranges: ±3 percent (sinusoidal) DC ranges: ±3 percent

Table 4-2. Special Tools

Tool	*Part No.*	
Wrench, spanner	DPC	10209
Press, roll pin	DPC	10117
Press, bearing	DPC	10134
Pliers, external snap ring	DPC	70040
Card gauge	DPC	10226
Pliers, external snap ring	DPC	70041
Puller, bearing	DPC	10147
Feeler gauges (1 set)	Starrett 66	
spring scale (15 lb)	(none)	
Key set	DPC	10300

d. Diagrams. The main group of diagrams are logic and schematic. Diagrams are explained in the following paragraphs.

(*1) Logic diagrams.*

(a) A listing of logic diagrams for the equipment is described in chapter 5 of this manual.

(b) The picker drive logic diagram is figure 4-25 of this manual.

(2) diagrams.

(a) Schematic diagrams of the power supplies and power supply control for the card reader are provided in the ADMS power supplies manual TM 11-5895-552-15/1-/2-, !3

(b) Schematic diagrams of logic cards (less picker drive) are provided in the ADMS printed circuits manual TM 11-5895-402-15/2.

(c) Schematic diagrams of picker driver and solenoid driver cards are in figures 4-29 and 4-31 follows: of this manual.

(*3) Wiring Diagrams.*

*(*a) Wiring diagram information for this equipment (less picker logic cards and -15VDC supply) is found in chapter 5 of this manual.

(b) Wiring diagram information for the picker logic cards and the -15VDC supply is found on figure 4-26 of this manual.

e.Parts Location and Identification.

(1) Parts location and identification illustrations are provided in TM 11-5895-422-40P as an aid to locating specific components of the card reader.

(2) Parts location and identification illustrations for power supplies and power supply controls are provided in TM 11-5895-552-15'1-/'2-, '3.

(3) Parts location and identification illustrations for picker drive circuits are in figures 4-27 4-28, and 4-30 of this manual.

4-7. Troubleshooting

a. General. The troubleshooting information provides typical fault examples with procedures necessary to isolate the malfunction. These typical examples will serve as a guide to the overall trouble shooting approach. The maintenance flow chart shown in figure 4-6 indicates the steps required to isolate the trouble. When a failure is indicated, the card reader can be tested, using the CRDTEST program. The test program (CRDTEST) is loaded into the processor via a tape transport. The processor; set up in accordance with the instructions on the CRDTEST program. If the card reader functions properly, the tests can be rerun for verification; if an error is produced, the unit will halt. The trouble must be isolated and corrected using the appropriate sections of the manual and all necessary test equipment, after which the defective modules are replaced and the test program rerun. A detailed explanation of the test program is contained in document DD4-TD-102-09. Troubleshooting instructions for the power supplies are provided in the power supplies manual, TM 11-5895-552-15/1/2-/3.

b. *Typical Faults.* The following paragraphs describe three examples of fault conditions and the Steps taken to determine and correct the malfunctions.

(1) *Fault No.1.* The card reader operates erratically. The error light on the controller comes on at random intervals and thereby indicates a trouble. As the trouble is of a random nature, the first section to suspect would be the timing section of the Card reader. Proceed as described below.

(a) up the card reader for operation as follows:

NOTE

For physical placement of module cards, refer to the logic diagrams (9LO8968)module location chart in TM 11-5895-42214-2.

1. Operate the manual pick switch to ON.
2. Load a group (stack) of pre-punched timing cards (row 3, columns 1, 11, 21, 31, 41, 51, 61, 71, and 80 punched) into the card reader.

(b) A delayed trace oscilloscope with a dual trace plug-in unit (model 585A and type 82 plug-in unit) is required. Connect one probe to PDSD 6E3B (A02) pin 14, and the second probe to single-shot 13D3A (B24) pin 3. The synchronization for the Scope comes from point 13E4B (B30) pin 3.

(c) Refer to figure 4-5(a). The data put in column 1 and the first strobe generated by first edge cell are shown in this figure. The strobe should occur about 510 microseconds after the leading edge of the data pulse.

(d) All Edge Cells should be checked in a similar manner. If any are off they may be adjusted by the trimpot associated with the board. If all are

off in the same direction, a mechanical adjustment must be made. Remove the ground at the output of Recycle single-shot 13F5A (B22-3) and the timing should start free-running. There should be approximately 1.1 milliseconds between the leading edges the pulses.

(e) All read amplifier outputs, A01 through A04, shown in the logic diagrams (TM 11-5895-422- 14-2) should be checked for an output pulse width of 700-850 microseconds. If any board does not have the required pulse width, it may be adjusted by its associated trimpot.

(f) Connect one probe to single-shot 13D3A (B24-3) and the second probe at the data read amplifier outputs. The strobe pulse should appear somewhere in the data pulse, as shown in figure 4-5 (a).

(g) The pre-punched spiral deck should be loaded into the card reader, and the test rerun. The situation should have been cleared up and the test should proceed without error.

(2) Fault No. 2. Assume that the card reader is operating normally and then suddenly stops. The card reader control panel indicates a card jam. First, remove the card reader subassembly cover and check the transport for the card jam. If none is located, replace the cover and depress the CLEAR switch. The motor should start; however, if the motor stops as soon as the CLEAR switch is re- leased, trouble exists in the logic circuitry and further troubleshooting is necessary.

(a) Connect the oscilloscope to the input of receiver 12E6A (B08) pin 11 (refer to logic diagrams in TM 11-5895-422-14-2). Lift the card reader top cover and manually insert a card between the stacker jam photodiode and its light source. As the card breaks the light, a voltage level change should be indicated on the oscilloscope, assuring that the photodiode and its light source are functioning. Re- connect the oscilloscope to the output of receiver 12E6A (B08) pin 10 and observe the level. Figure 4-5 (b) represents the switching of the 12E6A receiver. It is negative when a card is inserted between the photodiode and its light source, and switches in the positive direction when the card is removed. Assume that as the card breaks the light beam a voltage level change is not evidenced on the Oscilloscope; this condition indicates that receiver 12E6A is defective.

(b) Replace receiver 12E6A and the card eader top cover. Depress the CLEAR switch; the motor should start, returning the reader to normal operation.

(3) *Fault No. 3.* Assume that the card reader suddenly stops with the control panel indicating a mispick. First, depress the CLEAR switch and at- tempt to run card reader again, if the card reader stops and the control panel indicates a mispick, then proceed as described below.

(a) Set up card reader for operation as follows:

1. Operate the manual pick switch to ON.
2. Insure that cards are properly placed into the input hopper.

(b) Connect one probe of oscilloscope (model 585A and type 82 plug-in unit) to picker drive logic chassis assembly, C3 card, pin 14 (figs. 4-25, 4-26, and 4-27).

(c) Depress CLEAR switch and observe oscilloscope for PICK COMMAND waveform (fig. 4-25), if present proceed to next step. If waveform of PICK COMMAND is not present, then trouble exists in the logic circuitry prior to the picker drive logic cards (refer to logic diagrams in TM 11-5895- 422-14-2 and troubleshoot circuitry).

(d) Connect second probe to the following (TP) test points and check for proper waveform timing and amplitude. (To run reader depress and release the CLEAR switch (figs. 4-25 and 4-28).)

1. Card C3, TP2.
2. Card C3, TP1.
3. Card C1, TP1.
4. Card C2, TP1.

(e) If waveform timing or amplitude varies from that given on figure 4-25, change the respective card and run reader again to test for proper operation.

(f) Amplitude variations from those given in *(d)* 3 and 4 above could result from a defective picker coil or power supply input voltages. If found defective; replace the picker coil using caution to observe proper rewiring polarity, troubleshoot the power supply.

(g) If waveform timing and amplitude are as stated on figure 4-25, then check the mechanical adjustment of the picker roller (4-9d and e).

(h) Disconnect test equipment, turn manual operate switch to OFF and return the card reader to normal operation.

4-8. Repair

a. Picker Roller Assembly.

(1) Removal. To remove the picker roller assembly, refer to figures 4-2, 4-4, and 4-7, and proceed as follows:

(a) Remove the power from the card reader

subassembly by depressing the ON-OFF indicator switch on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly and secure the supporting arm.

(c) Disconnect picker coil wires from TB7.

(d) Deleted.

(e) Remove the upper arm mounting screw (fig. 4-7), and lift off the upper arm.

(f) Slip the belt (fig. 4-7) over the pulley

(g) Remove the three cap screws and washers (fig. 4-2) that secure the assembly to the base plate.

(h) Lift the picker assembly from the card reader.

(2) Replacement. The picker roller assembly may be replaced by performing the following procedure:

(a) Place the picker assembly in the machine.

(b) Insert the picker assembly mounting screw, and turn until snug; then back off two turns.

(c) Replace the belt, upper arm, and upper, arm mounting screw; then tighten the screw.

(d) Slide the entire picker assembly until proper belt tension is obtained, with the picker roller protruding 1 8 inch into the hopper. The belt should not be so tight as to interfere with the picker movement, nor-should it be so loose that the belt skips teeth on the pulley.

(e) Tighten the picker assembly mounting screws, and check for proper penetration and clearance, (para 4-9 and 4-9e.)

(f) Reconnect the picker coil wires to TB7.

(g) Deleted.

b. Picker Actuator Shaft and Coil. The picker actuator shaft and coil cannot be removed separately. If replacement is required, replace the picker roller assembly. (Refer to paragraph 4-8a.)

c. Picker Roller.

(*1) Removal.* Access to the picker roller assembly can be obtained by lifting the top cover of the card reader subassembly. Refer to figure 4-7 'for aid in the removal of the picker roller. To remove the picker roller, proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly, and secure the supporting arm.

(c) Remove the upper arm mounting screw (fig. 4-7), and lift off the upper arm.

(d) Slip the belt off the pulley.

(e) Lift off the entire roller assembly.

(f) Unscrew the pulley from the bearing housing (right-hand thread), using a spanner wrench.

(g) Remove the picker roller and the pulley from the bearing housing.

(2) Replacement. To replace the picker roller, proceed as follows:

(a) Slide the roller onto the bearing housing and install the lock washer.

(b) Screw the pulley onto the bearing housing.

(c) Place the entire roller assembly onto the picker assembly.

(d) Slip the belt over the pulley.

(e) Replace the upper arm, placing the roll pin on the picker roller shaft between the two pins on the upper arm.

(f) Replace the upper arm mounting screw.

(g) Adjust for proper penetration and clearance (see paragraphs 4-9d and 4-9e).

d. Throat Housing Assembly.

(1) Removal. Remove the throat housing assembly as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch indicator on the operator's control panel.

(b) Remove the rear access panel of the card reader subassembly.

(c) At the bottom of the base plate, remove the two screws (fig. 4-11 and 4-15) used for mounting the input step.

(d) Raise the upper cover of the card reader subassembly and secure the supporting arm.

(e) At the top of the base plate, remove the input step (figs. 4-4 and 4-15).

(f) Remove the two flat-head Phillips screws near the input step, and remove the card plate (figs. 4-4 and 4-11).

(g) Remove the picker roller assembly as directed in paragraph 4-8a(1).

(h) At the bottom of the base plate, remove the motor drive belt and remove the drive pulley (fig. 4-1) by loosening the setscrews.

(i) At the bottom of the base plate, remove the other belt on the smaller pulley.

(j) At the top of the base plate, remove the input hopper (fig. 4-4) by removing the eight Phillips head mounting screws.

(k) Unsolder the ground and +14-vdc supply wires for the throat jam lamp at terminals 1 and 2 on the throat and transport assembly (fig. 4-1).

(l) At the bottom of the base plate, remove the four socket head cap screws which secure the throat housing assembly (fig. 4-1).

(m) Remove the throat housing assembly

(2) Replacement. The throat housing assembly may be replaced by reversing the procedure for removal.

e. Major Throat Roller.

(1) *Removal.* Remove the throat housing assembly as directed in paragraph 4-8d(1). Proceed as follows:

(a) Remove the three socket head cap screws located on the throat housing cover (fig. 4-1), and remove the cover.

(b) Tighten the three jack screws into the cover.

Note: Before removing any spring washer, note its location on the shaft, it must be replaced in the same relative position.

(c) Remove the roll pin from the roller (fig. 4-1), using the roll pin press. (See figure 4-8.)

(d) Remove the set screw from the nylon pulley (gear)(fig. 4-1).

(e) Remove the snap ring from the pulley end of the shaft.

(f) Press the shaft out of the pulley end, and remove the bearing with a bearing puller.

(g) Remove the major throat roller assembly.

(2) Replacement. Before the major throat roller assembly is replaced, the minor throat roller must be in place. Proceed as follows:

(a) Insert the major throat roller into the assembly, simultaneously placing nylon pulley on the shaft.

(b) Replace the small snap ring.

(c) Slide the bearing onto the shaft, beyond the hole in the shaft, and press the bearing onto the snap ring, using the bearing press.

(d) Replace the spring washer (see note in removal procedure), and the large snap rings.

(e) Loosen the jack screws, and replace the throat housing cover.

(f) Replace the nylon gear with the minor throat roller gear, and tighten.

(g) Replace the drive pulley.

f. Minor Throat Roller.

(*1) Removal.* For aid in the removal of the minor throat roller assembly, refer to figure 4-1 and proceed as follows:

*(*a) Remove the throat housing assembly as directed in paragraph *4-8d* above.

(b) Remove the knife throat.

(c) Remove the major throat roller assembly as directed in paragraph 4-8*e.*

(d) Deleted.

(e) Remove the large snap ring, on the gear end of the shaft, which retains the bearing.

(f) Remove the minor throat roller assembly.

(2) Replacement. Replace the minor Throat roller assembly in the reverse order of removal. Make sure that the spring washer is in the proper location adjacent to the bearing and retainer.

g. Face Plate.

(*1) Removal.* For aid in the removal and replacement of the face plate assembly, refer to figures 4-4 and 4-9. Proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel

(b) Raise the upper cover of the card reader subassembly and secure the supporting arm.

(c) Remove A screws.

(d) Remove diode block (two D screws).

(e) Grasp the assembly and lift it directly up and away from the card reader.

(2) Replacement. To replace the face plate assembly, reverse the removal procedure.

h. Timing Head.

(1) Removal. Refer to figure 4-4 for aid in the removal and replacement of the timing head. To remove the timing head, proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly and secure the supporting arm.

(c) Remove timing head cover (two screws).

(d) Unlatch face plate assembly and lay it back.

(e) Unsolder and tag the 10 leads to the timing head.

(f) Loosen the two mounting screws one or two turns.

(g) Slide the head assembly fully to the right.

(h) Alternately loosen the mount screw, a few turns at a time, until both are removed.

(i) Lift the head assembly from the card reader subassembly.

(j) Remove the eccentric screw.

(2) Replacement.

(a) Insert the timing head into the card reader subassembly.

(b) Line the mounting holes and replace the screws.

(c) Alternately tighten the mounting screws.

(d) Slightly loosen the mounting screws and insert the eccentric screw.

(e) Solder the 10 leads to the timing head.

(f) Perform the timing head adjustment directed in paragraph *4-9a(1).*

i. Data Head

(1) Removal. For the removal of the data head, refer to figures 4-4 and 4-10 and proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly and secure the supporting arm; unlatch the face plate and lay it back.

(c) Remove the rear panel of the card reader subassembly.

(d) At the bottom of the base plate, remove screw B (fig. 4-10), which secures the data head to the base plate.

(e) At the top of the base plate, remove the two screws A (fig. 4-10), which secure the data head to the read plate.

(f) Remove the timing head para. 4-8, h, c through 4-8, h, j).

(g) Lift data head out.

(h) Unsolder and tag the 14 leads to the data head.

(2) Replacement. To replace the data head, reverse the above procedure; then perform the data head alignment as discussed in para- graph *4-9k.*

Caution: **In the following procedures, use caution when removing a roll pin. Do not pound on the roll pin while the pulley is installed on the shaft. To do so may result in bending the shaft. For aid in the removal and replacement of pulleys, and for information on the proper use of tools, refer to figures 4-8 and 4-20.**

j. Nylon Pulley.

(*1) Removal.* To remove a nylon pulley, proceed as follows:

*(*a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Slip the belt off the pulley.

(c) Using the roll pin press, remove the roll pin.

(d) Pull the pulley off the shaft.

(2) Replacement. To replace the pulley, proceed as follows:

(a) Insert the roll pin approximately /4 inch into the pulley.

(b) Observe the flange on the pulley belted to the replacement pulley. Install the replacement pulley with the flange opposite the flange on the belted pulley.

(c) Push the pulley onto the shaft until the index hole is aligned with the hole on the shaft.

(d) Using the roll pin press, install the roll pin until it is approximately centered on the shaft.

k. Steel Pulley.

(1) Removal. To remove a steel pulley, proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel

(b) Loosen the setscrews and pull the pulley off the shaft. If the pulley has a roll pin, remove the pin as directed in paragraph 4-8j.

(2) *Replacement.* Replace the pulley in the reverse order of removal as outlined above.

l. Picker Belt. For aid in the removal and replacement of the picker belt, refer to figures 4-1 and 4-7.

(1) Removal. To remove the picker belt, replace the data

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly and secure the supporting arm.

(c) Remove the upper arm mounting screw (fig. 4-7)

(d) Remove the upper arm.

(e) Remove one end of the belt.

(f) Remove the three socket head cap screws located on the throat housing cover (fig. 4-1).

(g) Tighten the three jack screws into the cover and remove it.

(h) Remove the other end of the belt.

(2) Replacement. Replace the picker belt by reversing the removal procedure. Adjust the

picker belt for proper tension, as directed in paragraph 4-8a(2) *(d).*

m. Corner Roller (Roller Assembly). For aid in the removal and replacement of the roller assembly, refer to figures 4-4 and 4-12.

(1) Removal. To remove the roller assembly, proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly, and secure the supporting arm.

(c) Loosen the locking screw, and rotate the roller assembly 90 degrees.

(d) Remove the shoulder screw.

(e) Remove the polyurethane roller, ball bearings, and spacers.

(f) Remove the roller assembly.

(2) Replacement. Replace the roller assembly by reversing the removal procedure. Adjust the polyurethane roller for interference as directed in paragraph 4-9n.

n. Shaker Arm Bearing. For aid in the

(b) Raise the upper cover of the card removal and replacement of the shaker arm bearings, refer to figures 4-4, 4-21, and B-4.

(1) Removal. To remove the shaker arm bushings, proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly, and secure the supporting arm.

(c) Remove the three flathead screws A (fig. 4-21) that mount the card guide.

(d) Remove the card guide.

(e) Remove the two flathead screws B (fig. 4-21) that mount the deflector plate.

(f) Remove the deflector plate.

(g) Remove spring retainer.

Caution: **Use extreme caution when removing the negator spring. Do not allow it to snap or twist during removal.**

(h) Remove the negator spring assembly.

(i) Remove shaker arm retaining screws C.

(j) Loosen set screws in stacker rollers (fig. B-4).

(k) Remove snap rings and bearings from end of stacker shaft.

(l) Lower stacker shaft until upper stacker roller and snap ring can be remove,

(m) Remove upper stacker roller and snap ring.

(n) Slip shaker arm and bearing clear of stacker shaft.

(o) Press bearing out of shaker arm.

(2) Replacement. Replace shaker arm and bearing by reversing the removal procedure.

o. Stacker Housing.

(1) Removal. To remove the stacker housing, refer to figures 4-4 and 4-21, and proceed as follows:

(a) Remove the power from the card reader subassembly by depressing the ON-OFF switch/indicator on the operator's control panel.

(b) Raise the upper cover of the card reader subassembly, and secure the supporting arm.

(c) Remove shaker arm as described in paragraphs 4-8, n, 1, a through h.

(d) Remove the rear access panel from the card reader subassembly.

(e) At the bottom of the base plate, remove the drive belt and the four stacker housing socket head capscrews D.

(f) Remove the stacker housing at the bottom of the base plate.

(2) Replacement. Replace the stacker housing by reversing the removal procedures.

Note. When installing the drive belt on the stacker housing drive pulley, make certain that the belt is transposed to obtain correct rotation of the stacker housing shaft.

p. Printed Circuit Cards. Printed circuit cards are located in both the card reader subassembly and the reader control logic subassembly. No special procedures are required for removing and replacing printed-circuit cards, other than obser-

vation of the following precautions:

(1) Remove the power by depressing the ON-OFF switch/indicator.

(2) Open the side door of the card -eader cabinet, or remove the rear access Panel of the card reader subassembly.

(3) Release the retaining latch (fig. 4-3) and simultaneously swing the reader control logic outward, locking it in place.

(4) When removing printed-circuit cards, use a card puller.

(5) During maintenance, when testing of a printed-circuit card is required, do not use probes with the printed-circuit card fully seated in its slot. Use the card extender to provide adequate access for connecting the probes.

(6) When replacing printed-circuit cards, be sure to insert them in their proper slots. The module placement diagram within the logic diagram set lists the card number, and shows the card location and mating slot number.

Caution: **It is possible to insert a card in the wrong slot. If this happens, considerable damage is likely to result.**

(7) When installing a printed-circuit mod- ale, gently align it with the receptacle and with he guide pins on the connector. Firmly push the module in place until it is seated. Double- check to see that the installed module is not misaligned.

(8) When replacing a printed-circuit module, check to see that the type of module being replaced is the same as the required type.

q. Power Supply Control Components. The individual components of the power supply control (fig. 4-3) are made accessible by performing the following procedure:

Warning: **Removing the power supply control cover exposes 120 vac. Remove the power by operating the card reader wall circuit breaker to the "off" position before performing this procedure.**

(1) Open the side door of the card reader cabinet.

(2) Remove the six power supply control cover mounting screws.

(3) Remove the cover.

(4) After completing the repairs, replace the cover and return the power to the unit by operating the wall circuit breaker to the "on" position.

r. Power Supplies.

(1) The individual components of the -10- vdc and +16-vdc power supplies (fig. 1-4) are accessible by performing the following procedure:

Warning: **Make certain that all primary ac power is disconnected from the card reader before removing and replacing power supplies and power supply control**.

(a) Open the side door of the card reader cabinet.

(b) Remove the four screws that hold the card reader right panel (fig. 1-4), and remove the panel.

(c) Unsolder the wires that connect the power supply to the card reader circuits.

(d) Remove the four hex head nuts that hold the power supply to the mounting brackets.

(*e*) Lift out the power supply.

(*f)* After completing repairs, replace the unit by reversing the removal procedure.

(2) The individual components of the -28- vdc power supply are accessible by performing the following procedure:

Warning: **Make certain that all primary ac power is disconnected from the card reader before removing and replacing power supplies and power supply control**.

Caution: **Removing the -28-vdc power supply is a two-man operation. Obtain assistance before performing the following removal procedure.**

(a) Open the side door of the card reader cabinet.

(b) Remove the four screws that hold the card reader right panel, and remove the panel.

(c) Unsolder the wires that' connect the power supply to the card reader circuits.

(d) Remove the six power supply control cover mounting screws, and remove the cover.

(e) Remove the four power supply mounting screws which fasten the power supply to the power supply control while the second man holds the power supply.

(f) Carefully remove the power supply.

(g) After completing the repairs, replace the power supply by reversing the removal procedure.

Warning: **Make sure that the power supply control cover is in place before restoring power to the unit. Voltages up to 120 vac exist on exposed terminals.**

s. Control Panel Indicators. The control panel indicator lamps (fig. 2-1) are of two types. The HALT and ON-OFF indicator lamps are removed by pulling. The remaining four indicator lamps are removed by unscrewing in a counter- clockwise direction.

t. Cabinet Blower Assembly.

(*1) Removal.* For aid in the removal of the blower assembly, refer to figure 4-3. Proceed

(a) Make certain that all primary ac power is disconnected from the card reader and that the ON-OFF switch, indicator on the operator's control panel is off.

(b) Open the side door of the card reader cabinet.

(c) Remove the eight screws that secure the close-off plate to the mounting frame, and remove the close-off plate.

*(*d) At the rear of the blower assembly, disconnect the connector.

*(*e) Remove the eight screws (four on each side) that secure the close-off grill to the blower assembly mounting frame, and remove the close-off grill.

(f) Remove the six screws that secure the mounting plate of the blower assembly to the bottom frame of the cabinet.

(g) Being careful not to allow the assembly to contact other assemblies, lift out the blower assembly.

(2) Replacement. Replace the blower assembly by reversing the removal procedure.

u. Drive Motor.

(*1) Removal.* For aid in the removal of the drive motor, refer to figures 4-11 and 4-17 and proceed as follows:

(a) Make certain that all primary ac power is disconnected from the card reader and that the ON-OFF switch/indicator on the operator's control panel is off.

(b) Open the side door of the cabinet.

(c) Disconnect drive motor power plug P56 from the side connector (fig. 4-3) on the power supply control.

(d) Remove the rear access panel from the card reader subassembly.

(e) Place the disconnected plug and cord (step c above) in the top of the card reader subassembly.

(f) Remove four motor mount screws.

(g) Remove drive motor belt.

(h) Remove drive motor and motor mount from card reader subassembly.

(i) Remove drive motor from motor mount (3 screws).

(2) Replacement. Replace the drive motor by reversing the removal procedure.

v. Photodiodes.

(1) Removal. To remove a photodiode, carefully unsolder each lead and extract the photodiode from the rubber compound in which it is potted.

(2) *Replacement.* To replace a photodiode, proceed as follows:

(a) Moisten the photodiode and insert it in the same position in the rubber compound as originally occupied by the photodiode removed in step (1) above.

(b) Solder the photodiode lead which is identified by a red dot to the amplifier input terminal; solder the remaining lead to the -10- vdc common bus.

4-9. Adjustment and Alignment

a. Timing Amplifier.

(1) Before electrical adjustments are performed on the timing amplifier, the timing track should first be adjusted for proper mechanical position with respect to the data station. Refer to figures 3-2 and 4-4 and to table 4-3 for aid in the location and identification of timing head parts. Proceed as follows:

(a) Loosen the timing head mounting screws approximately two turns.

(b) Obtain a card with column 1 punched in all rows, and place the leading edge of the column 1 slot across the center of the data. Maintaining this card position, rotate the eccentric screw to align the leading edge of the card over the center of the first timing diode.

Table 4-3. Edge Cell Outputs

Photodiode	***Column***	***Module location***
EC 8	2	A38 circuit 1
EC ’7	12	A38 circuit 2
EC 6	22	A38 circuit 3
EC 5	32	A38 circuit 4
EC 4	42	A38 circuit 5
EC 3	52	A38 circuit 6
EC 2	62	A38 circuit 7
EC I	72	A38 circuit 8
PD "DO"	I	A38 circuit 9

(c) Tighten the mounting screws, being careful not to disturb the setting.

*(*d) Recheck the distance between the slots.

(2) The timing track should now be set so that the timing photodiodes switch 480 micro- seconds earlier than the exact center of the data pulses. In normal operation, these switch times are delayed 480 microseconds so that the data is strobed in the center of the data pulses. To examine the correct timing, perform the following steps:

(a) Prepare a test deck of cards with properly registered punched in columns 1, 11, 21, 31, 41, 51, 61, 71, and 80 of row 3.

(b) Using an oscilloscope with a dual race plug-in vertical preamplifier and sweep delay, set up the oscilloscope as follows:

1. Use the B time base trigger input (delaying trace) and obtain sync for the oscilloscope at test point module location B08 pin 7 (5E2A).

2. Set the B time base TIME/CM control to 10 mSEC, the B trigger source to external AC, and the trigger slope to negative.

3. Set the A time base TIME/CM control to 500 -SEC, the delay time multiplier to 0.00, and the stability control fully clockwise.

4. Connect oscilloscope probe A to test point module A02 pin 14, and probe B to test point module B24 pin 03.

(c) Deleted.

*(*d) Feed the test deck of cards through the card reader and adjust the oscilloscope to synchronize the signal on the oscilloscope face; then switch the HORIZONTAL DISPLAY control to the A DLY’D BY B position.

(e) Turn the delay time multiplier control slowly clockwise, and, with the MODE
switch set at the CHOP position, display both the probe A and probe B traces. The probe B trace should be located at the center of the data pulse for column 1.

(f) Using the delay time multiplier control, move the trace to column 11 and observe the position of the data pulse and the "data" strobe. (See fig. 4-5 a.) If the strobe is not in the center of the data pulse, record the relative position of the strobe with respect to the data pulse, and move to the next data pulse from column 21 Observe the relation of the strobe to the data pulse.

(g) If both of these data pulses are being strobed at the same relative position, then the timing head should be repositioned to place the strobe in the center of both data pulses.

(h) If the strobe cannot be positioned in the center of a data pulse, then adjust the potentiometer located on the upper circuit of module B09. Adjust the potentiometer to move the strobe for column 1 and all odd-numbered Edge Cells (EC 1, 3, 5, and 7); the potentiometer on the lower circuit will move the strobe for column 11 and all even- numbered Edge Cells (EC 2, 4, 6, and 8).

(i) Examine subsequent data and the strobe for columns 21, 31, 41, 51, 61, and 71. The position of the strobe on the data pulse may be trimmed or finely positioned by turning the potentiometer associated with the Edge Cell. The trimming potentiometer can move the strobe approximately 100 microseconds. If this adjustment is not satisfactory, it may be necessary to rotate the photodiode. Imperfections in the lens and the placement of the lens on the photodiode cause wide variations in the response of the photo device; therefore, by rotating the photodiode it is possible to vary the turnoff point. If the timing cannot be modified by any of the foregoing methods, replace the amplifier. If this fails, then replace the photodiode (para *4-8v).*

(j) Deleted.

b. Throat Jam, Stacker Jam, and PD "0" Photodiodes.

(1) The adjusting potentiometers, TH (R001) and ST (R002), for the throat jam and stacker jam photodiodes are located on a bracket inside the card reader subassembly (fig. 4-11). The adjusting potentiometer (R9) for the PD "0" photodiode is located on the PDAP printed-wiring board at module location A38 (fig. 4-24).

(2) To adjust the throat jam photodiode (PJ1), connect the oscilloscope probe to the output of the receiver (5E2A) module B08 pin 7, and proceed as follows:

(a) Check to determine that the throat housing assembly is clear and that there is no obstruction between the throat jam lamp and the photodiode. At this time test point B08 pin 7 should be at ground potential.

*(*b) Adjust potentiometer TH (RO01) to a setting where the output just starts to go in the negative direction, and then back the adjustment off slightly.

(c) Feed cards through the card reader and observe the output of the amplifier, using the oscilloscope to determine that the amplifier is switching to -5 volts.

(3) To adjust the stacker jam photodiode (PJ2), connect the oscilloscope probe to the out- put of the receiver (12E6A) module B08 pin 10, and proceed as follows:

(a) Check to determine that the corner roller assembly is clear and that there is no obstruction between the stacker jam lamp and the photodiode (fig. 4-4). At this time test point B08 pin 10 should be at ground potential.

(b) Adjust potentiometer ST (R002) to a setting where the output just starts to go in the negative direction, and then back the adjustment off slightly.

(c) Feed cards through the card reader and observe the output of the amplifier, using the oscilloscope to determine that the amplifier is switching to -5 volts.

(4) To adjust the PD "0" photodiode, connect the oscilloscope probe to the output of PDSD amplifier (5E3B) module All pin 14,
and proceed as follows:

(a) The PD "0" adjustment must be made while cards are being fed through the card reader. At this time, test point All and 14 should switch from -9 volts to ground and should be approximately 100 milliseconds in duration.

(b) If the amplifier is not switching at approximately the voltage value and time duration indicated in step *(a)* above, adjust potentiometer R9 for the PD "0" photodiode to obtain the correct switching operation within the above limits. (See figure 4-24.)

(c) If adjustment is not possible, it is necessary to rotate the photodiode 90 degrees and repeat the adjustment procedure. (Be sure to turn off the power before rotating the photo- diode.) If, after several attempts to correct the operation by rotating the photodiode 90 degrees, the operation is not satisfactory, the photodiode (PD "0") must be replaced.

c. Photodiode Current Measurement.

(1) To measure the photodiode light cur- rent, perform the following procedure:

(a) Remove the appropriate PDSD card (module location Al through A4 and A9 through All) and the associated PDAP card (module location A36 and A38) to pre- sent an open circuit to the photodiode.

(b) Connect a multimeter (set to the 1-ma dc range) in series with a 1.1K resistor; connect the meter positive lead to ground pin 8 (or 9), and connect the resistor to the module terminal (A36 or A38) corresponding to the photodiode being checked. (See figure 4-23 for the terminal corresponding to the photo- diode.)

(c) The light current should exceed 800 microamperes.

(2) If the photodiode current is less than 800 microamperes, the photodiode is probably defective; however, before replacing the photo- diode, check all surfaces between the photo- diode and its light source for cleanliness. Also, try rotating the photodiode 90 degrees in its socket to expose another section of the light- sensitive element to the light source. If the photodiode current is still below 800 microamperes, the photodiode must be replaced (para 4-8v).

Table 4-4. Repair Data

Note. For penetration, clearance, and gap dimensions, reference the Item :1 entry with respect to the Item #2 entry.

Item #1	***Item #2***	***Penetration***	***Clearance***	***Gap***
Picker roller	Input hopper'	1/64 to 1/8 in.		
Picker roller/ in hopper	Bottom card		1/32 in.	
Data head	Card in transport		0.001 in.	
Knife throat	Throat step			0.009 to 0. 010 in.
Knife throat edge	Point "A"			0.010 to 0.020 in.

Warning: **Before attempting to perform any mechanical adjustments, it is essential that all power be removed from the unit.**

(3) For access to the card reader mechanical assemblies, simply lift the top cover and lock in place. When necessary, for ease of adjustment, the photodiode face plate may be opened.

(4) When the measurements have been completed, return the PDSD card and associated PDAP card to the proper module location from which they were removed in step 4-9c (1) (a) above.

Caution: **Mechanical adjustments should be performed by qualified personnel, and only after a definite need for the adjustments has been determined.**

d. Picker Roller Penetration

(1) For aid in the performance of the following procedure, refer to figures 4-2 and 4-16, and to table 4-4.

(2) To adjust the picker roller penetration, proceed as follows:

Note. A simple bridge template for use in step (b) below may be constructed locally from punch card or metal stock. Cut a notch 1 1/2 inches long on one side of the card to a depth of 1/64 inch, to represent minimum picker roller penetration, and a second notch on the opposite side to a depth of 1/8 inch, to represent maximum picker roller penetration. The measurements are made with respect to the apex of the picker roller. See figure 4-16.

(a) Turn power to card reader subassembly off.

(b) Use light finger pressure to force the picker roller through surface C.

(c) Turn adjustment screw B until the 1/64-inch minimum penetration is achieved.

e. Picker Roller Clearance. The purpose of this procedure is to obtain a minimum time for the picker roller to contact the cards. Refer to figure 4-2 and to table 4-4. Using a scale, ruler, or bridge template as a measure, turn adjustment screw "A" until the outer edge of the picker roller clears the cards in the input hopper by 1/32 inch.

f. Picker Coil Adjustment. Deleted.

g. Picker Return Spring. Deleted.

h. Knife Throat.

(1) The throat gap must be adjusted for 0. 009 to 0. 010 inch, with the knife throat and throat step remaining parallel. For aid in the location of parts, refer to figure 4-1.

Note: The throat guide does not have to be adjusted if the throat knife and throat step are parallel.

(2) To adjust the knife throat, proceed as follows:

(a) Loosen the throat guide and knife throat mounting screws.

(b) Apply pressure to the throat guide in the direction of the pin (located in the transport casting), and simultaneously push the knife throat against the throat step.

(c) Tighten the throat guide mounting screws.

(d) Adjust the knife throat for a gap of 0.009 to 0.010 inch.

(e) Tighten the knife throat mounting screws.

(f) Check the gap for parallelism by sliding the feeler gauge from one tip of the throat step to the other. The gap must not vary.

i. Throat Step.

(1) To aid in the adjustment of the throat step, refer to figure 4-14.

(2) To adjust the throat step, proceed as follows:

(a) Loosen the throat step mounting screws.

(b) Line up the scribed line on the throat step with the edge of the knife throat.

(c) Tighten the mounting screws.

(d) A gap of 0.010 inch minimum and 0.021) inch maximum should now exist from point A to the knife throat edge, and the throat step should be parallel with the edge of the throat housing.

j. Input Step. To adjust the input step, refer to figure 4-15 and proceed as follows:

(1) Insert a card into the input hopper.

(2) Slide the card to the right until its leading edge is just starting through the knife throat.

(3) The trailing edge of the card will be starting off the slope and down the 1/32-inch step. If adjustment of the input step is required, proceed with steps (4), (5), and (6).

(4) Loosen the input step mounting screws.

(5) Turn the input step on its mounting screws until the card is in the proper position.

(6) Tighten the mounting screws.

k. Data Head. No head to card adjustment is required because the head is pinned in place.

Note. The data head adjustment for skew is factory-set, and normally does not require adjustment through out the life of the equipment. If, however, the need for skew adjustment arises, add shims to one side or the other of the data head mounting screw ("B"), as required to achieve correct alignment.

(1) Deleted.

(2) Deleted.

(3) Deleted.

l. Face Plate. The face plate may be adjusted by following the procedure below. Refer to figure 4-9 for aid in the adjustment of the face plate assembly.

(1) Loosen four A screws.

(2) Place .028-inch shims (4 strips of card stock) between base plate and face plate as shown.

(3) Press down on the top of the face plate and tighten four A screws.

(4) Remove shims.

(5) Place a .014-inch to .017-inch shim (2 strips of card stock) between the face plate and timing track lens.

(6) Loosen two B screws.

(7) Position the latch snugly against the catch and tighten two B screws.

(8) Turn two C screws in until they just touch the timing head.

m. Belt Tension. For aid in the performance of this procedure, refer to figure 4-17. For access to the motor belt, the rear cover panel must be removed. Proceed as follows:

(1) Loosen the three drive motor mounting screws.

(2) Slide the motor back and forth to obtain the proper belt tension (when a 3-pound pull causes the belt to move 1/8 inch).

(3) Tighten the mounting screws.

n. Corner-Roller Assembly. The purpose of this adjustment is to maintain proper interference and parallelism between the polyurethane roller and the steel shaft. Refer to figure 4-12 for aid in this adjustment. Proceed as follows:

(1) Free the roller assembly by loosening the locking screw.

(2) Compress the polyurethane roller (from 0.005 to 0.010 inch) against the steel shaft, maintaining parallelism.

(3) Tighten the locking screw and recheck the interference.

(4) Test-run the card reader and carefully observe the corner roller action. The cards must run parallel with the deflector plate (fig. 4-21).

o. Transport Rollers. Refer to figure 4-9 and open the face plate to expose the lower transport rollers. For aid in the adjustment of both transport roller assemblies, refer to figure 4-18. The purpose of this procedure is to adjust the polyurethane (upper) transport rollers for proper interference with the steel (lower) rollers. After adjustment of the rollers, the interference should be such that turning the polyurethane rollers will not affect movement of the steel rollers, but

turning the steel rollers will result in movement of the polyurethane rollers. To adjust the polyurethane rollers loosen the three mounting screws of the upper transport r6ller housing, and force the polyurethane rollers into the steel rollers; then tighten the three mounting screws. When the above conditions are satisfied, the adjustment is complete.

p. Card Stop and Card Positioner. The card positioner (figures 4-13 and 4-21) should be parallel to the card guide and extend .093 inch past the card guide. This is a nominal setting that may be varied to accommodate different card stocks. The card stops (figures 4-13 and 4-21) are a polyurethane compound to provide a resilient card stopping surface. The stops should be moved as their surfaces wear. Both the card positioner and card stops can be adjusted in the following manner (see fig. 4-21):

(1) Remove spring retainer.

Caution: Use extreme caution when removing negator spring assembly. Do not allow it to snap or twist during removal.

(2) Remove negator spring assembly.

(3) Loosen screws C.

(4) Position the stops or positioner and tighten screws C.

(5) Replace negator spring assembly and spring retainer.

q. Timing Head. The timing head may be adjusted by following the procedure below. Refer to figures 4-4 and 4-10.

Caution: Do not disturb the timing head wiring during this adjustment.

(1) Loosen two mounting screws.

(2) Adjust eccentric screw until there is 0.180-inch between the trailing edge of the data read slot and the leading edge of the first timing diode slot.

(3) Tighten mounting screws.

(4) Recheck setting.

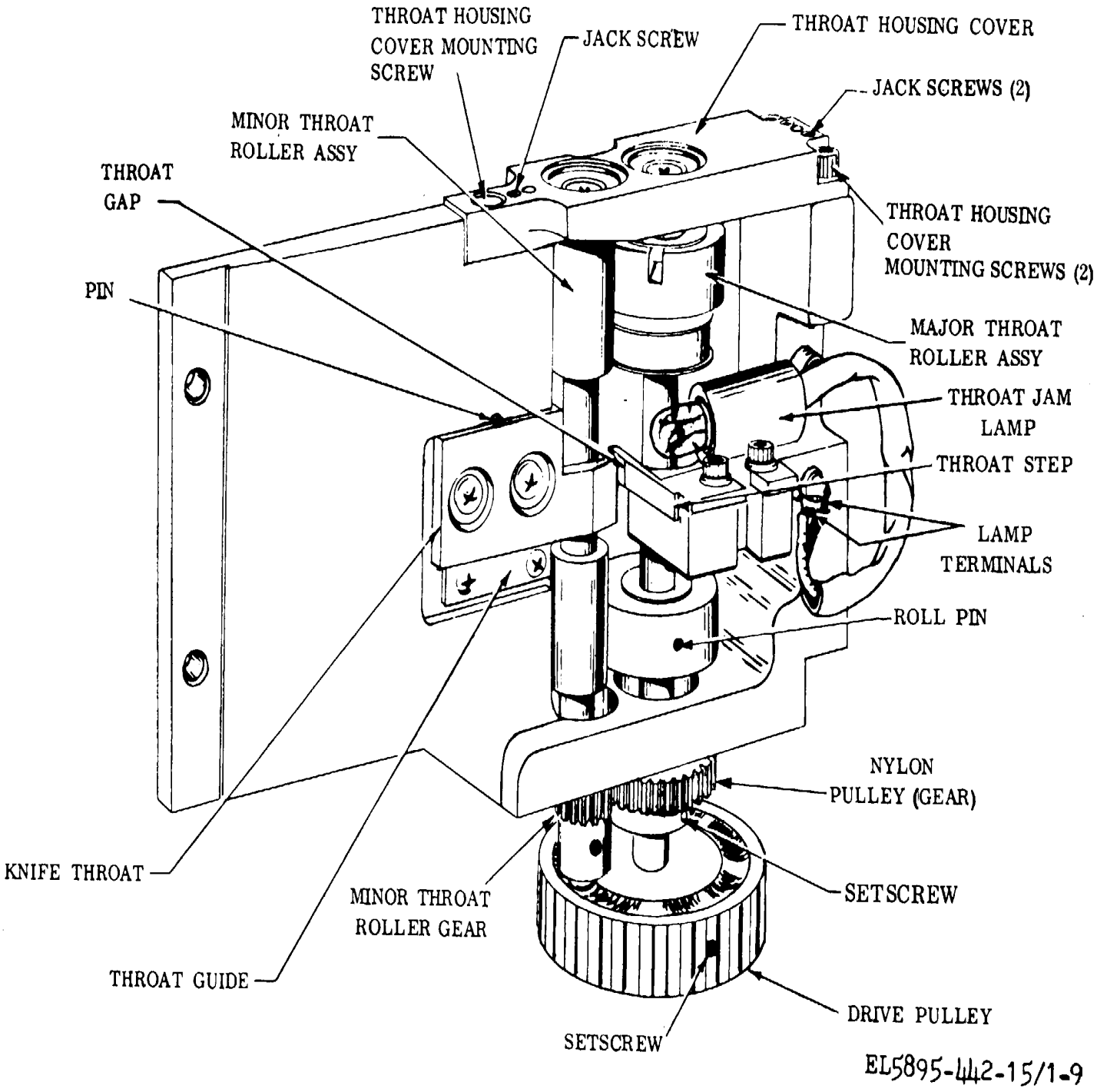


Figure 4-1. Throat and transport assembly

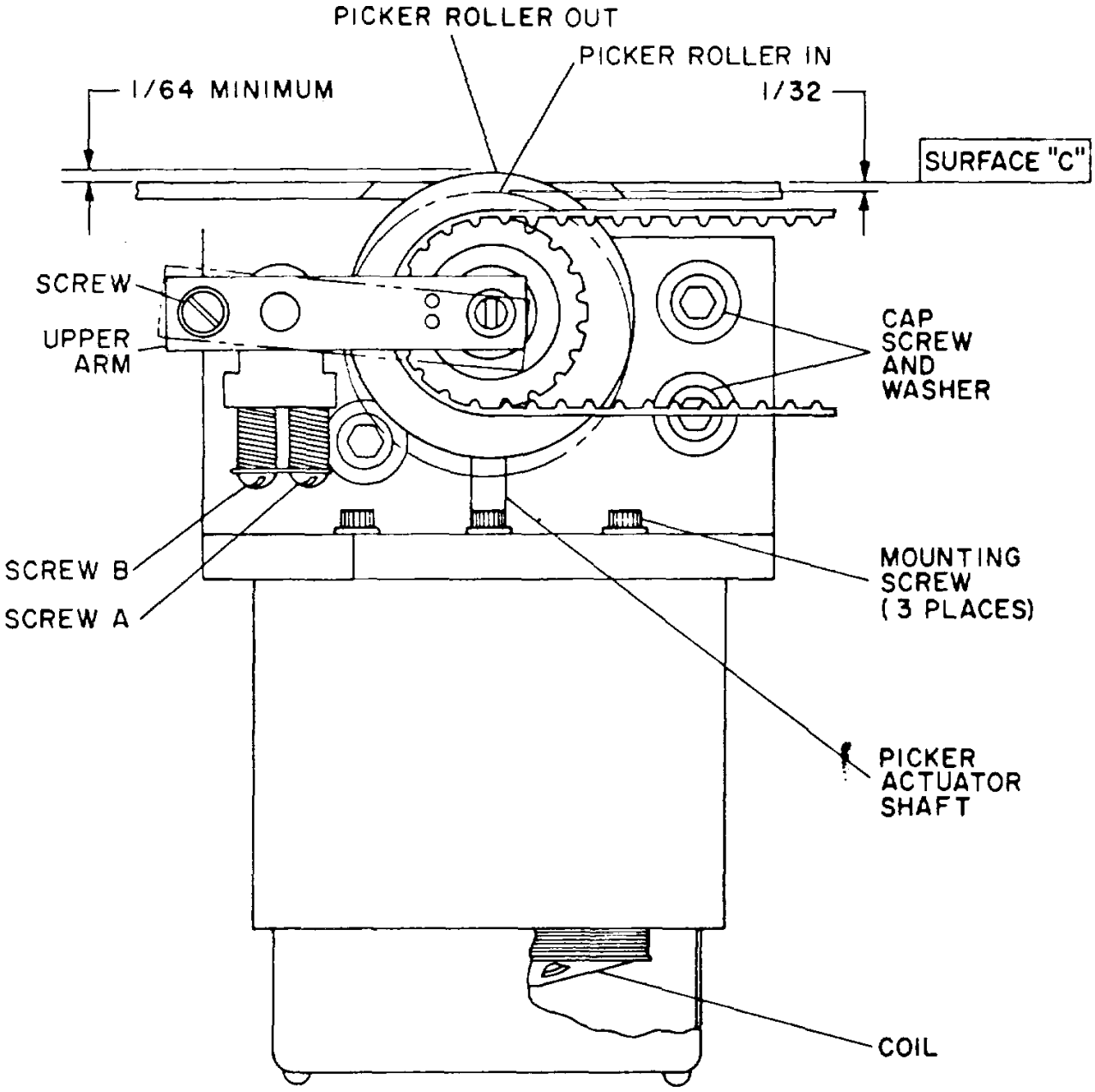


Figure 4-2. Picker assembly. EL5895-422-1 5/1 -1 0

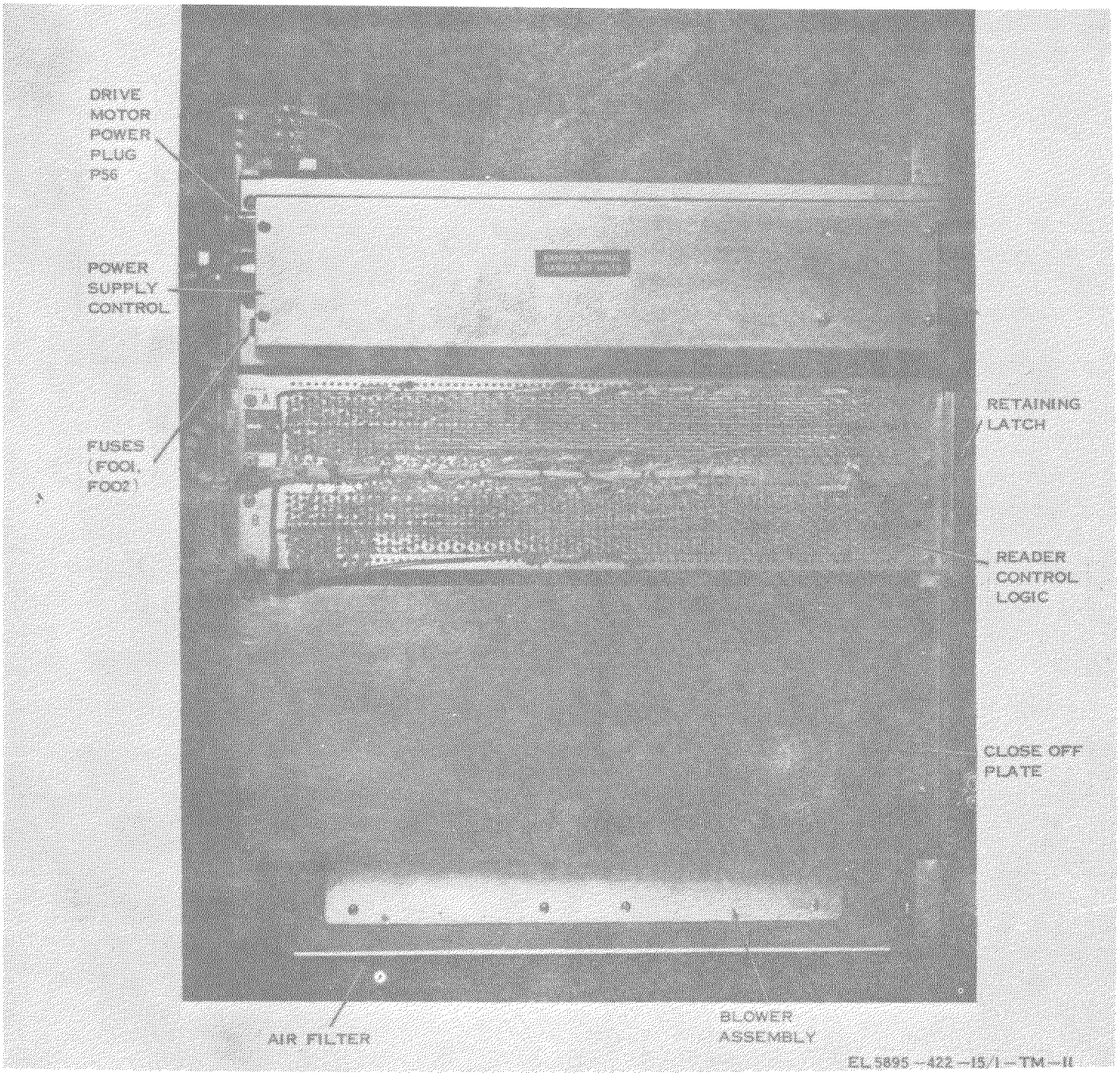

DRIVE MOTOR POWER PLUG P56
POWER SUPPLY CONTROL
FUSES (F001, F002)
RETAINING LATCH
READER CONTROL LOGIC
CLOSE OFF PLATE
AIR FILTER
BLOWER ASSEMBLY
EL 5895-422-15/1-TM-II

Figure 4-3.

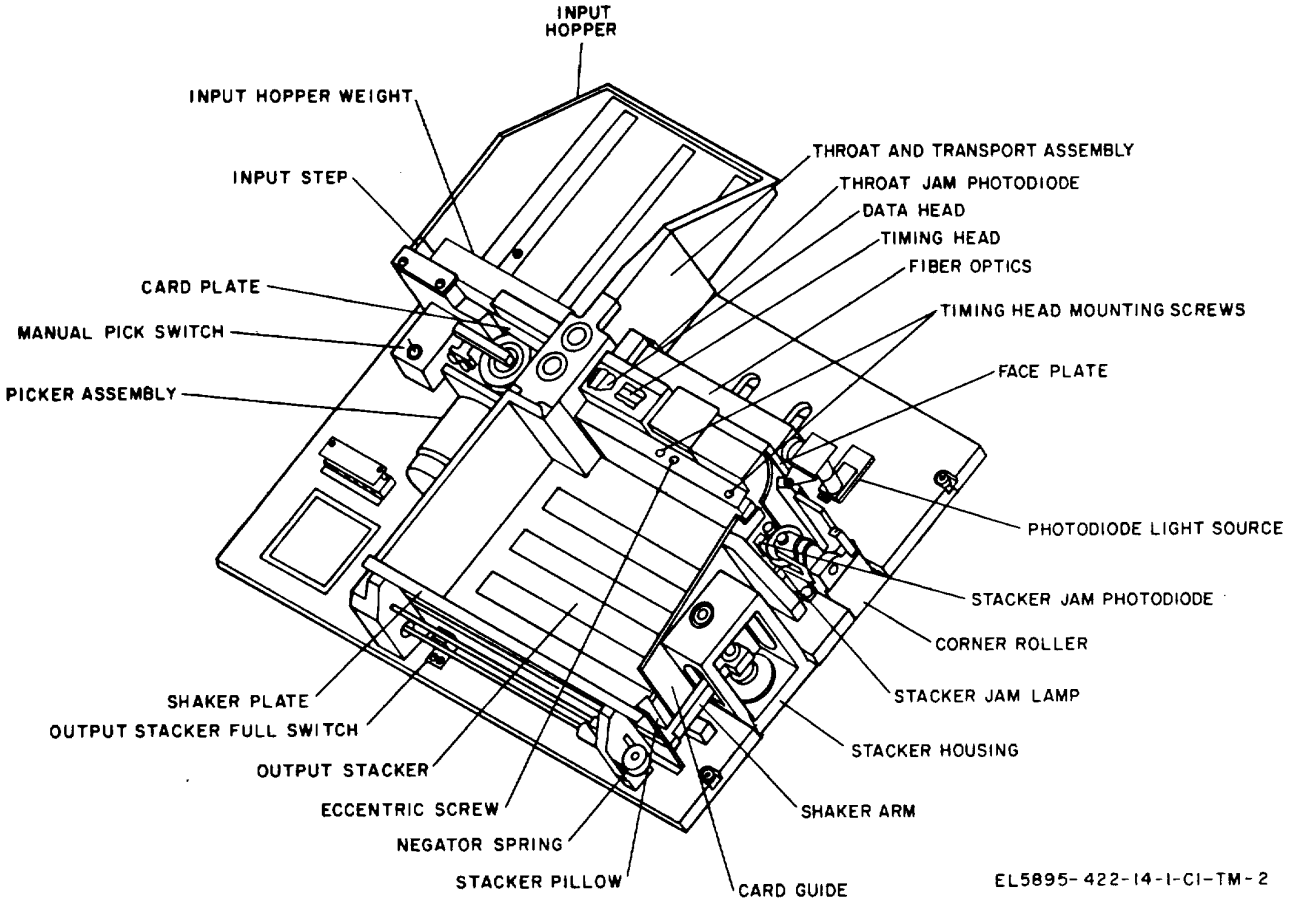
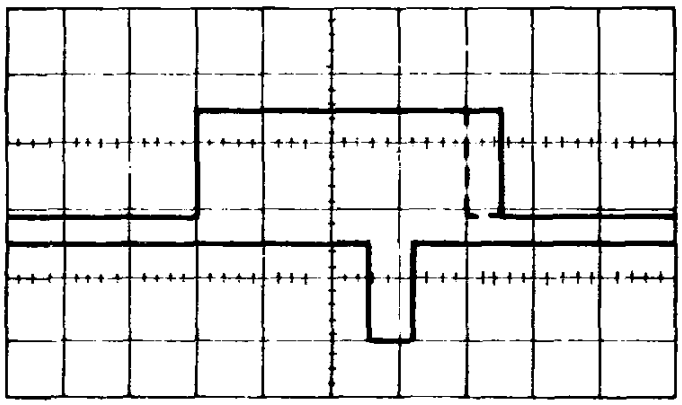


Figure 4-4. Card reader subassembly, top view, cover removed.

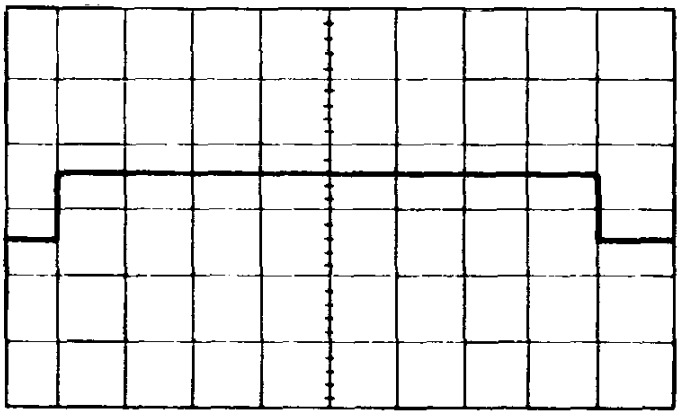


(a) Data pulse column 1 row 3.

First Edge Cell Strobe

Oscilloscope settings:

1. 5 volts/cm
2. Time .2 ms/cm



(b) Switching of 12E6A receiver.

Oscilloscope settings:

1. 50 ms/cm
2. 5 volts/cm

EL5895-422-15/1-13

Figure 4-5. Data and switching waveforms.

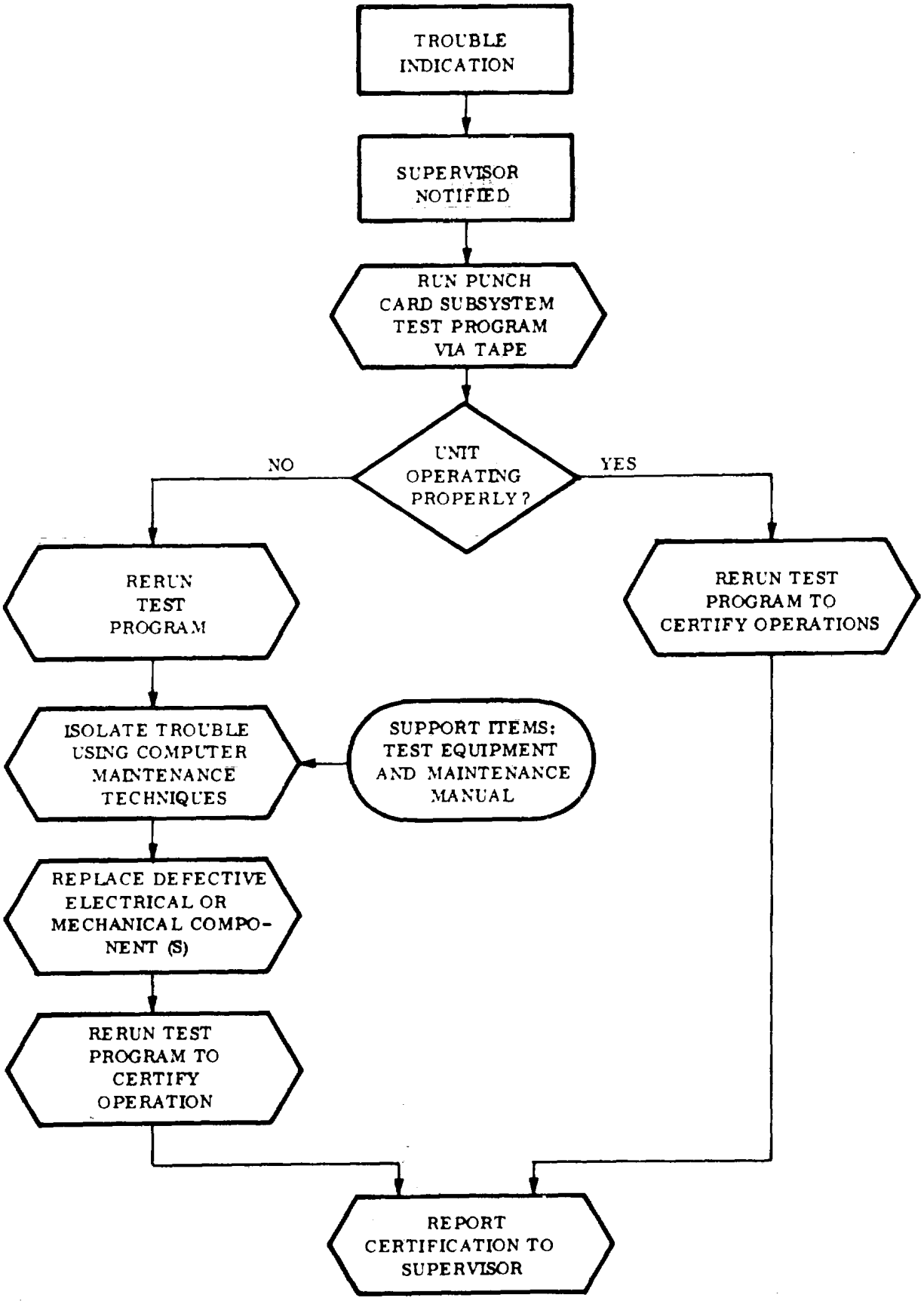


Figure 4-6. Maintenance flow chart

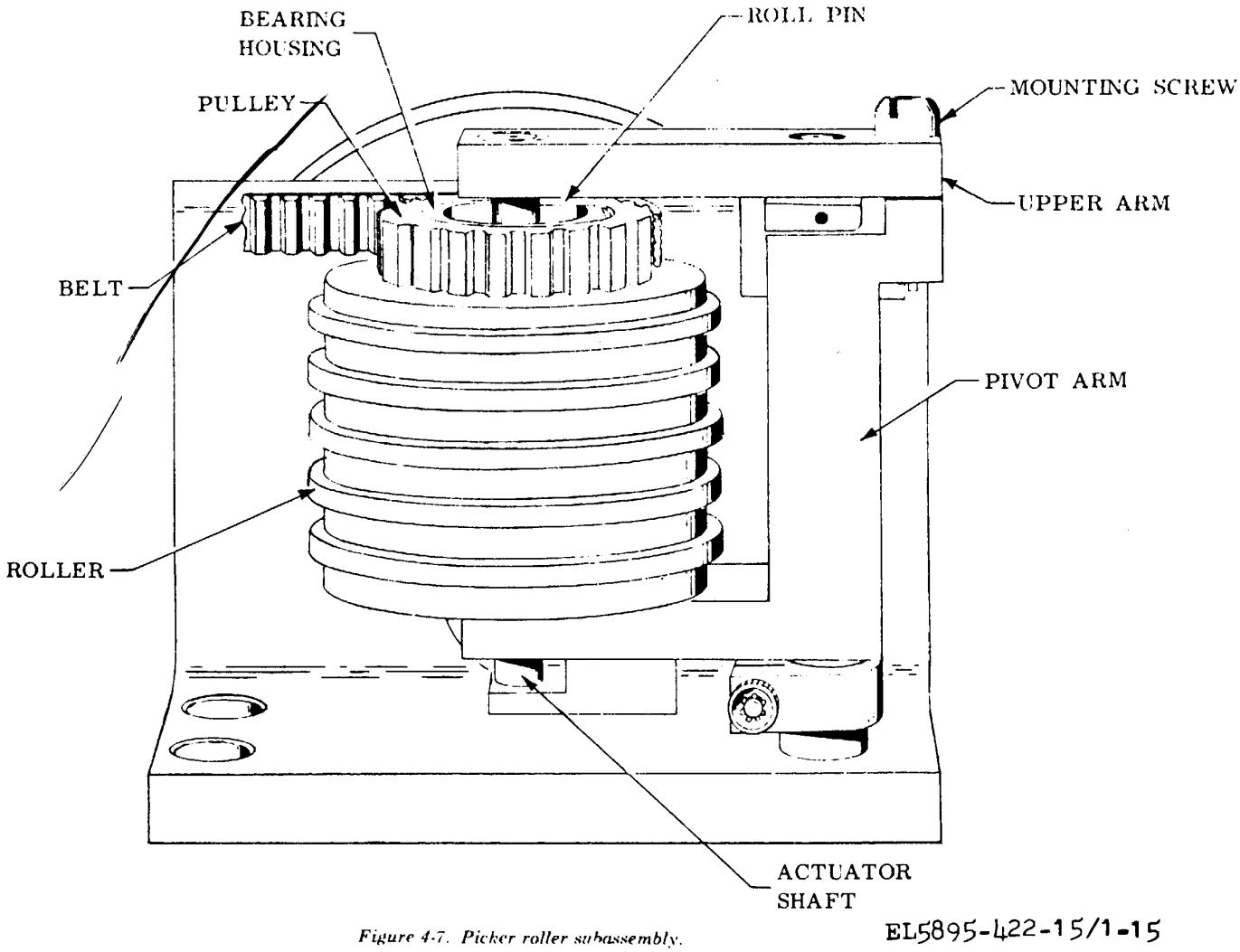


Figure 4-7. Picker roller subassembly.

Figure 4-7. Picker roller subassembly

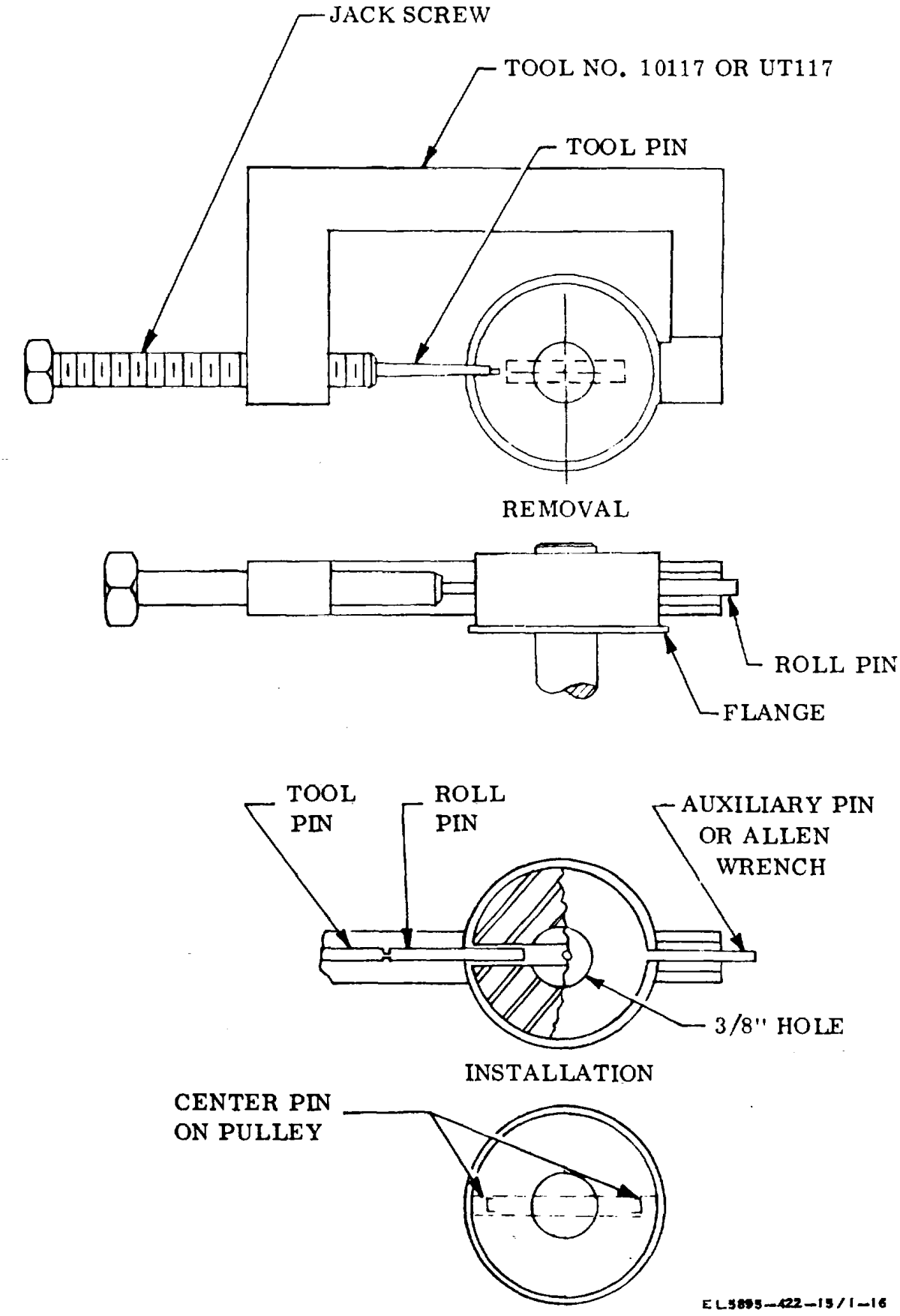


Figure 4-8. Use of roll pin press.

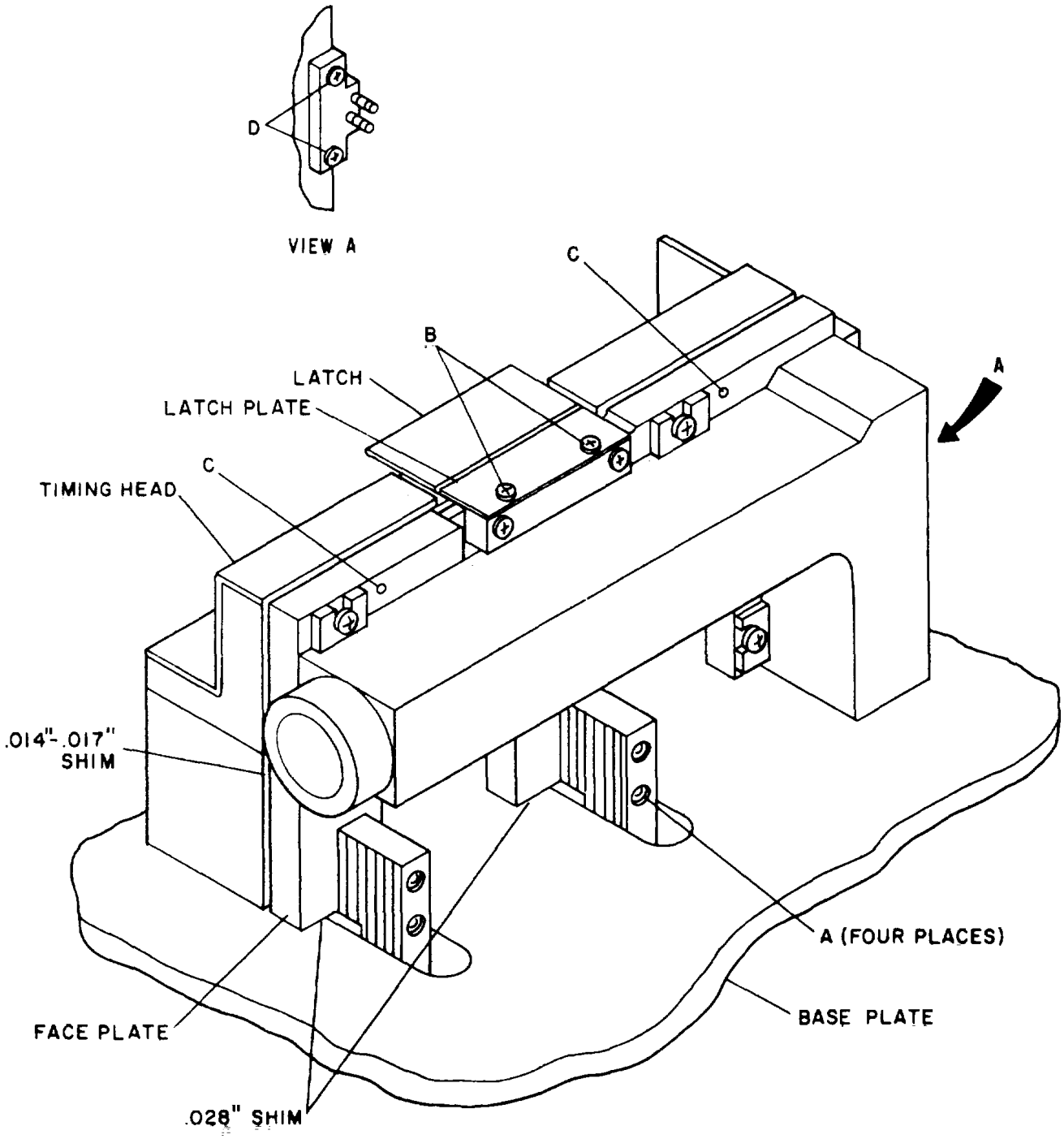


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Figure 4-9. Face plate.

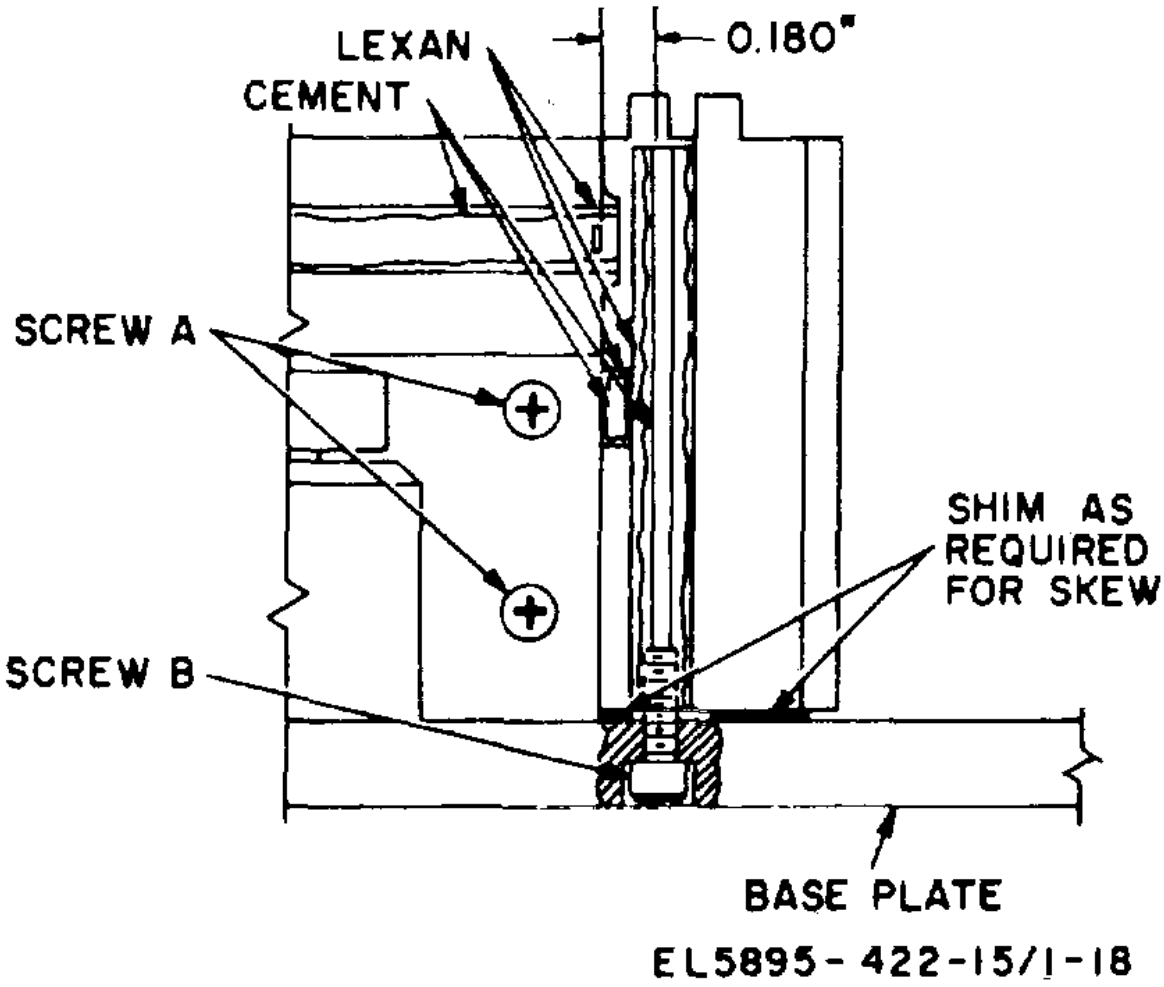


Figure 4-10. Data head.

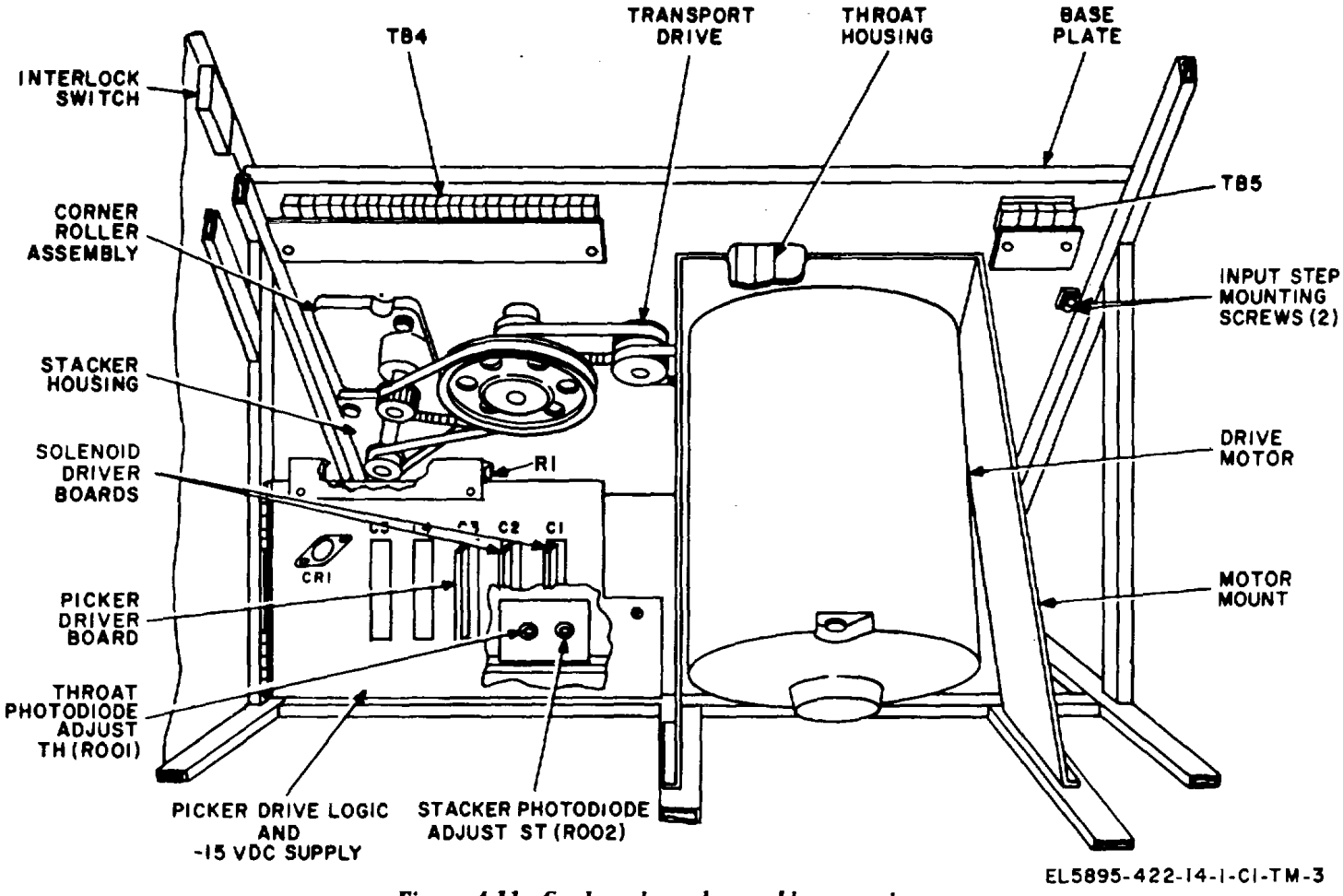


Figure 4-11. Card reader subassembly, rear view.

Figure 4-11. Card reader subassembly, rear view.

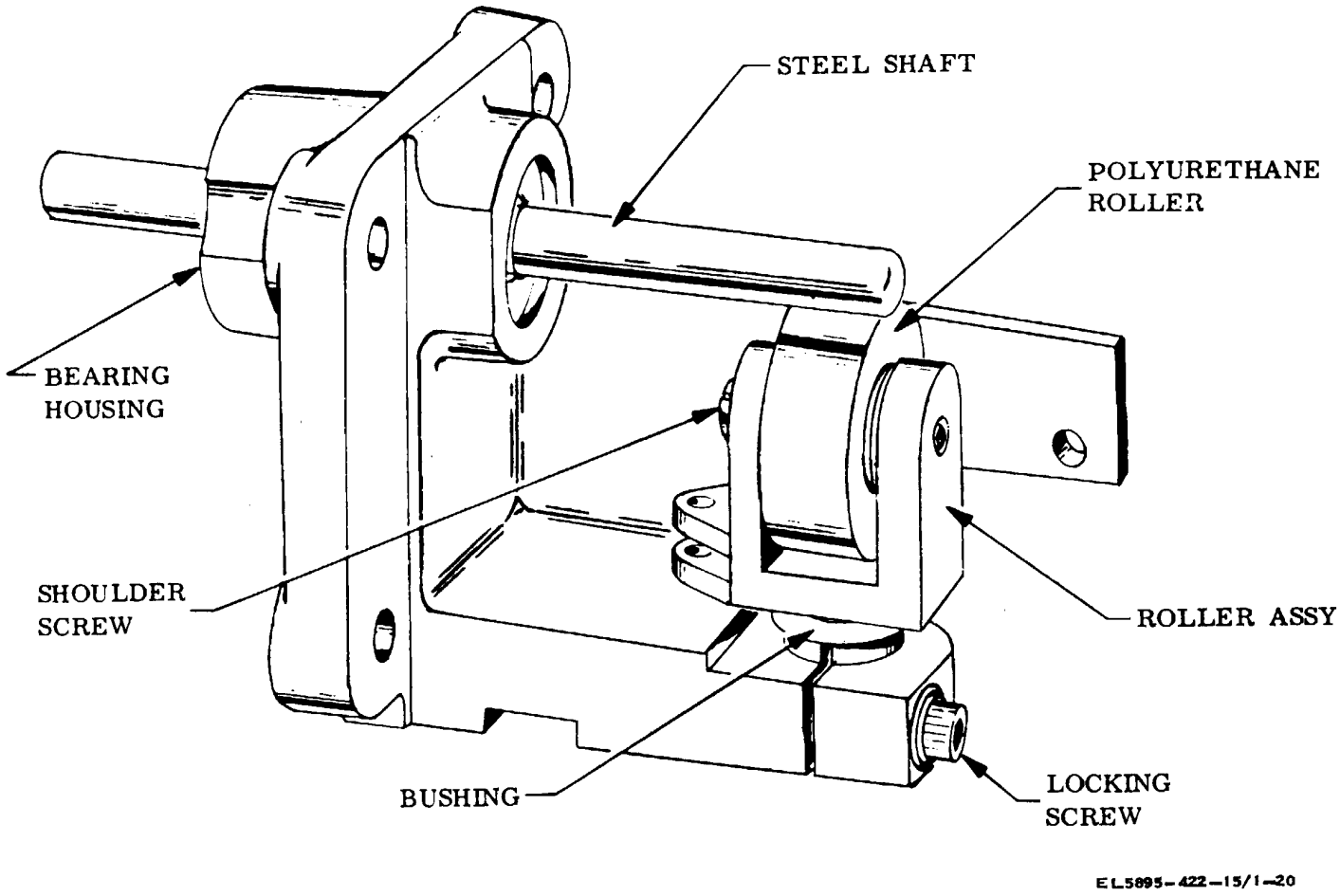
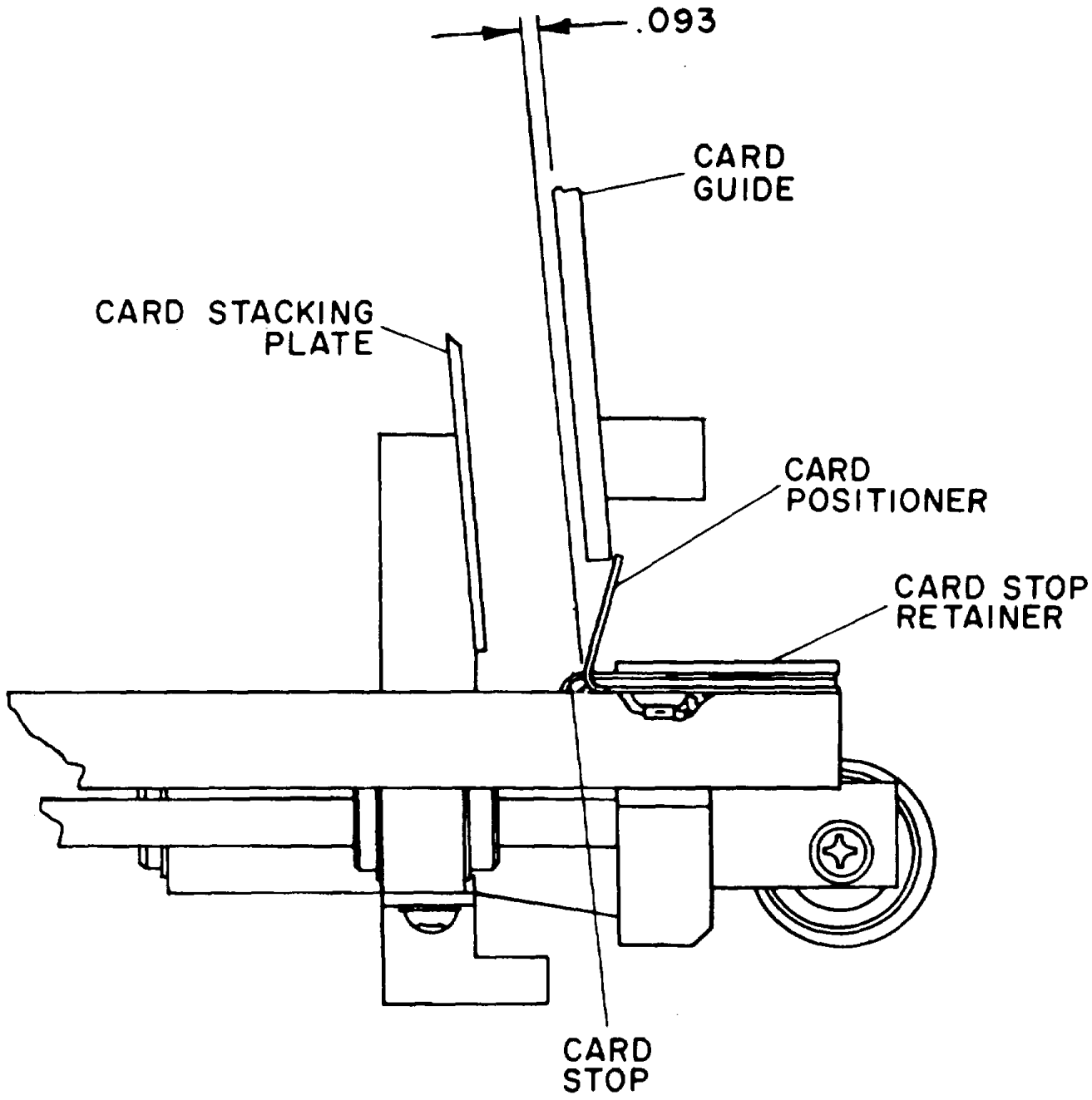


Figure 4-12. Corner roller assembly



EL5895-422-15/1-21

Figure 4-13. Card stop and card positioner adjustment.

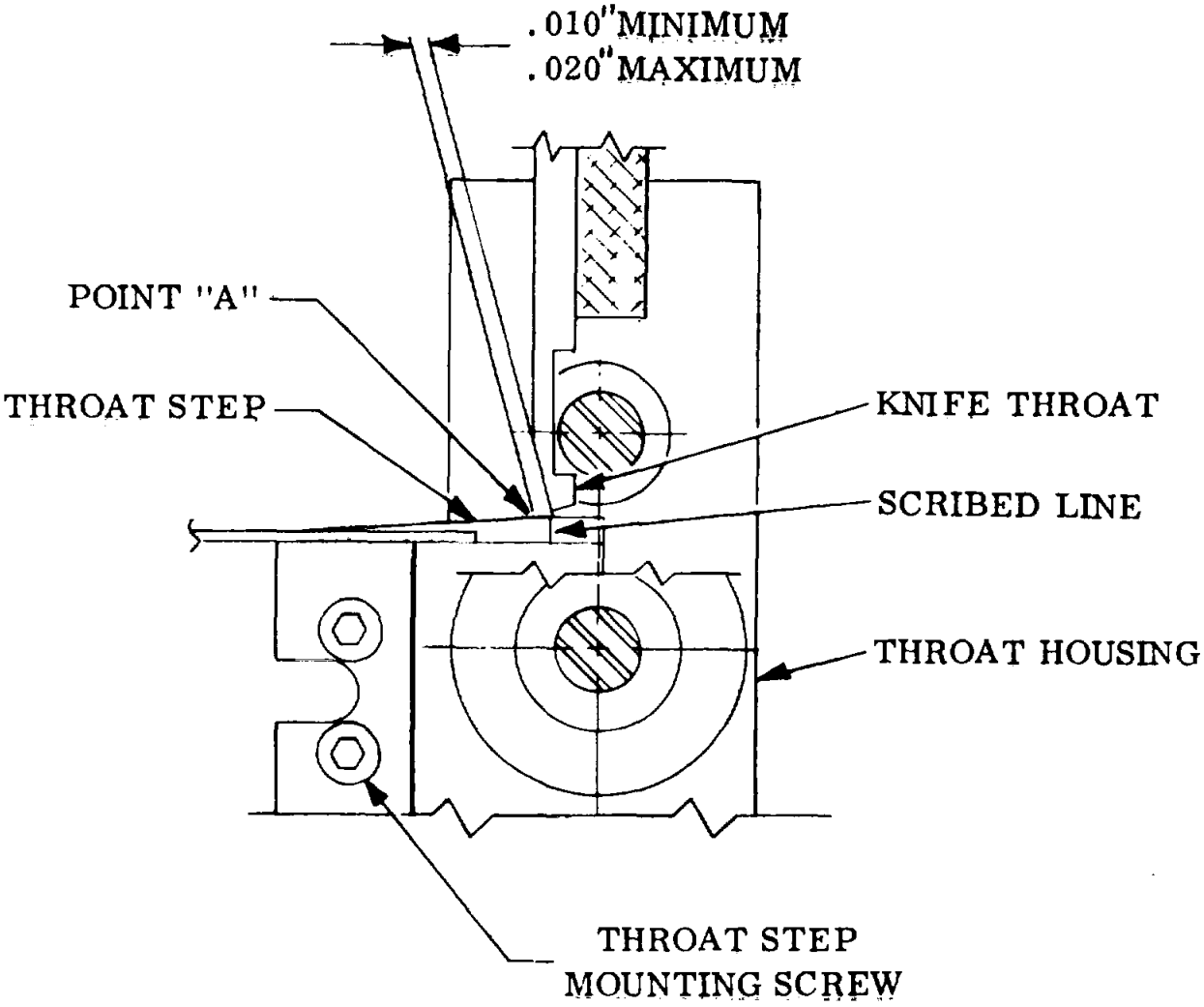


Figure 4-14. Throat step.

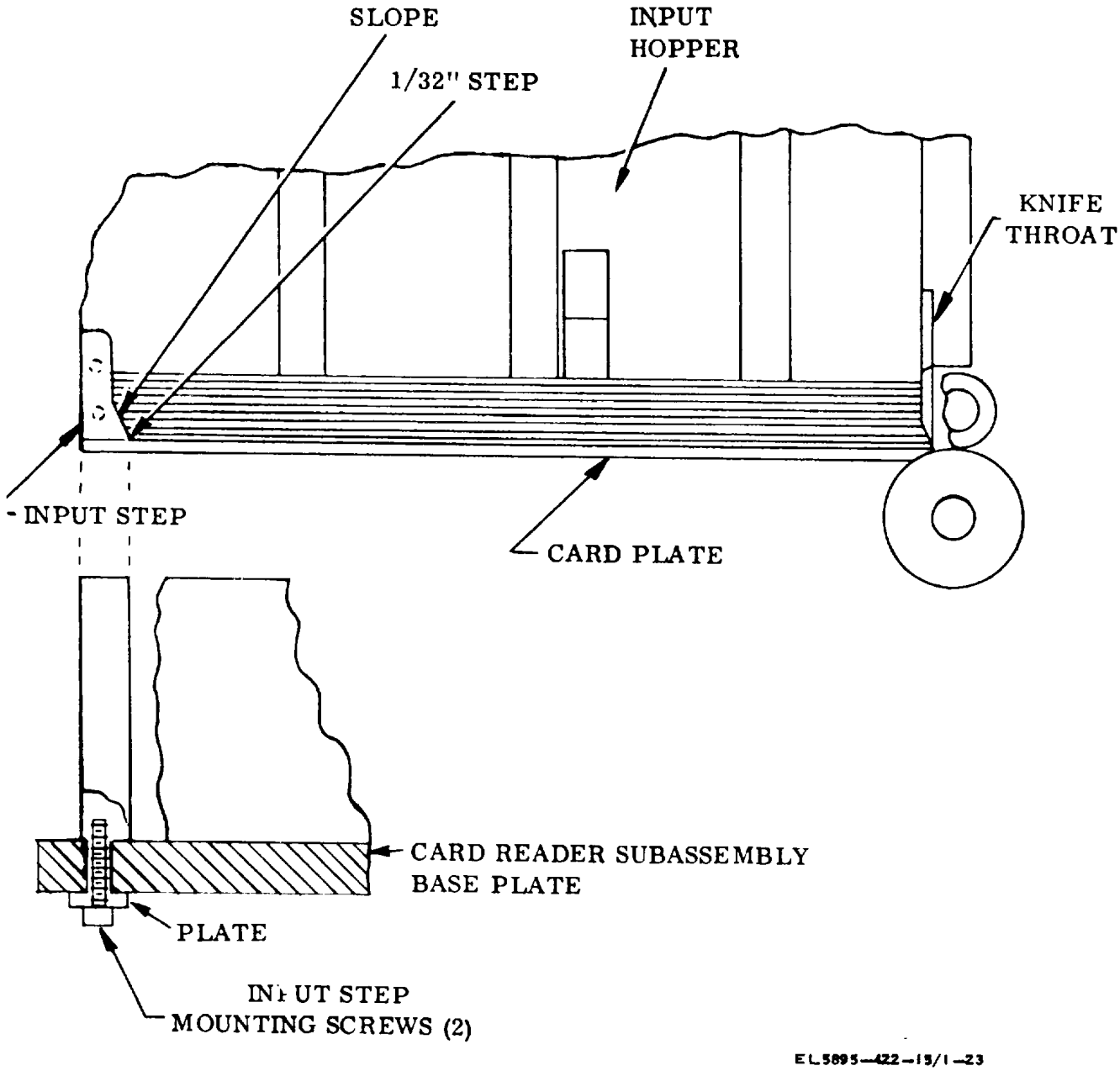


Figure 4-15. Input step.

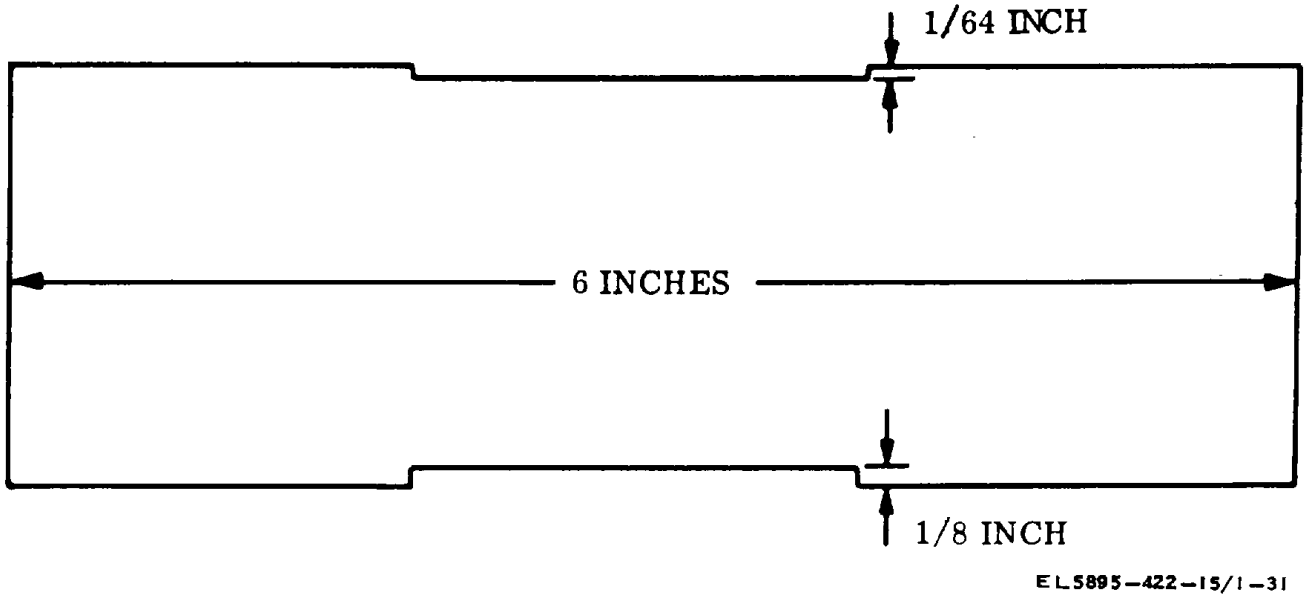


Figure 4-16. Picker roller penetration template.

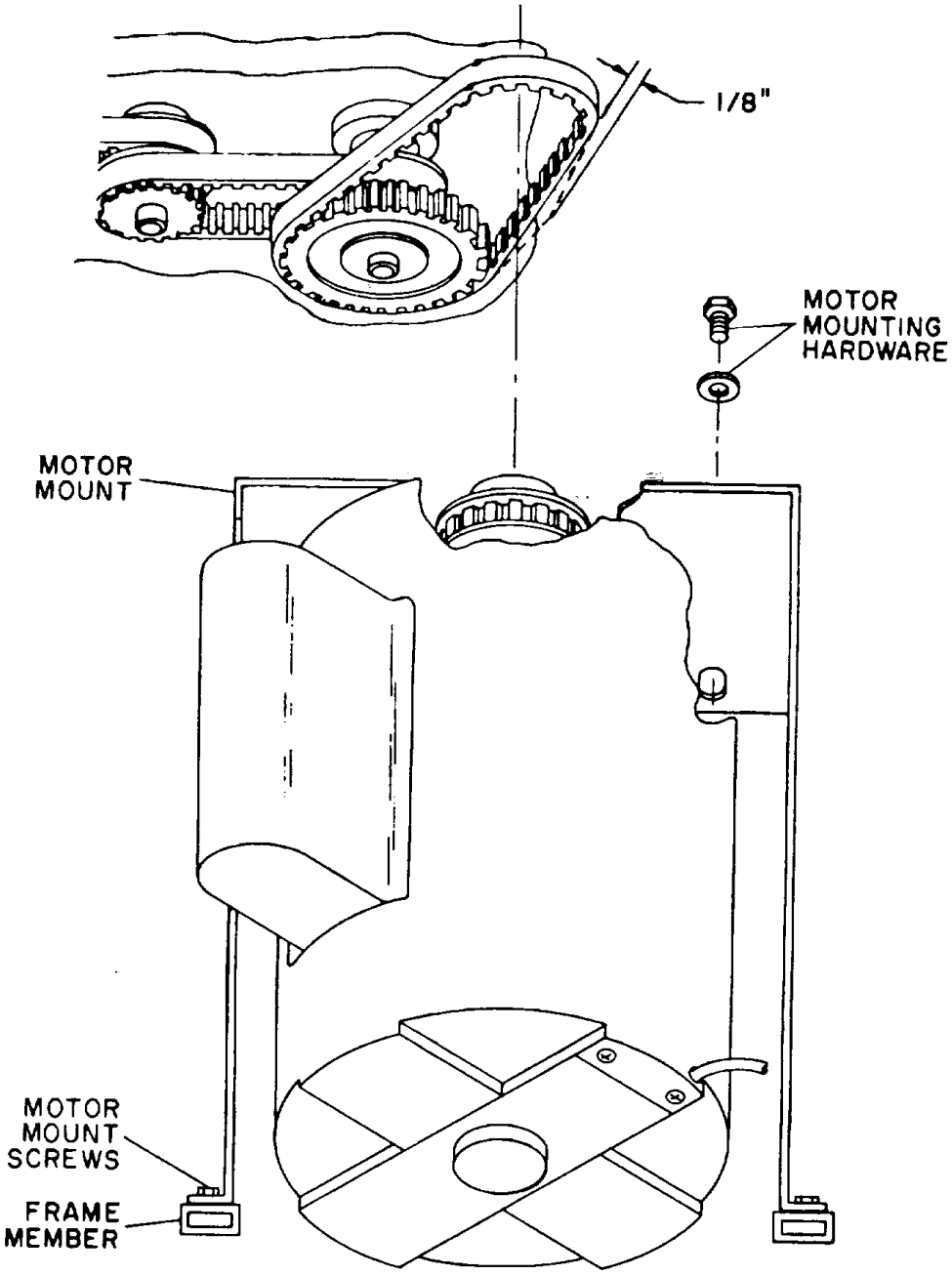


Figure 4-17. Drive motor.

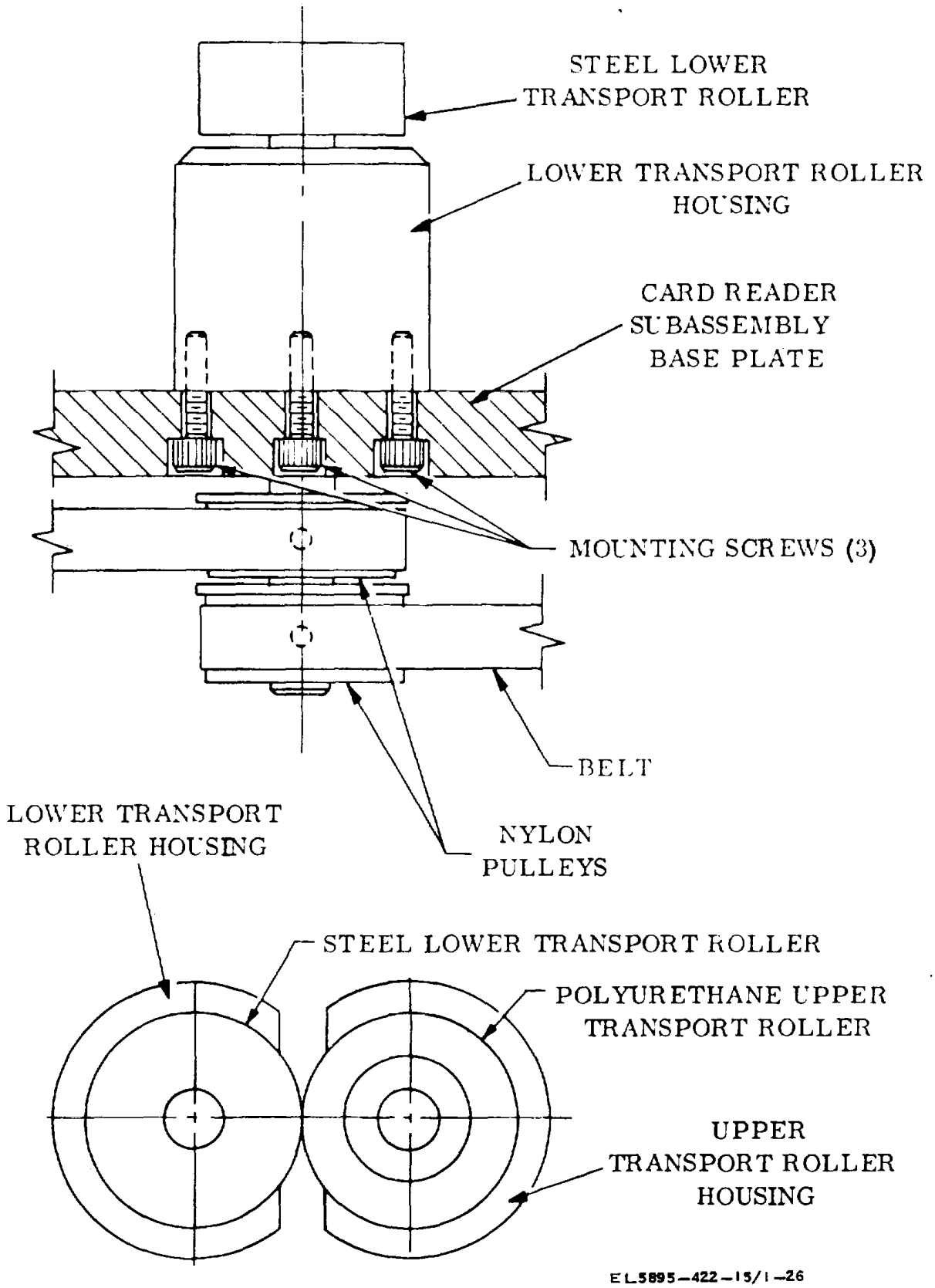


Figure 4-18. Transport roller assembly.

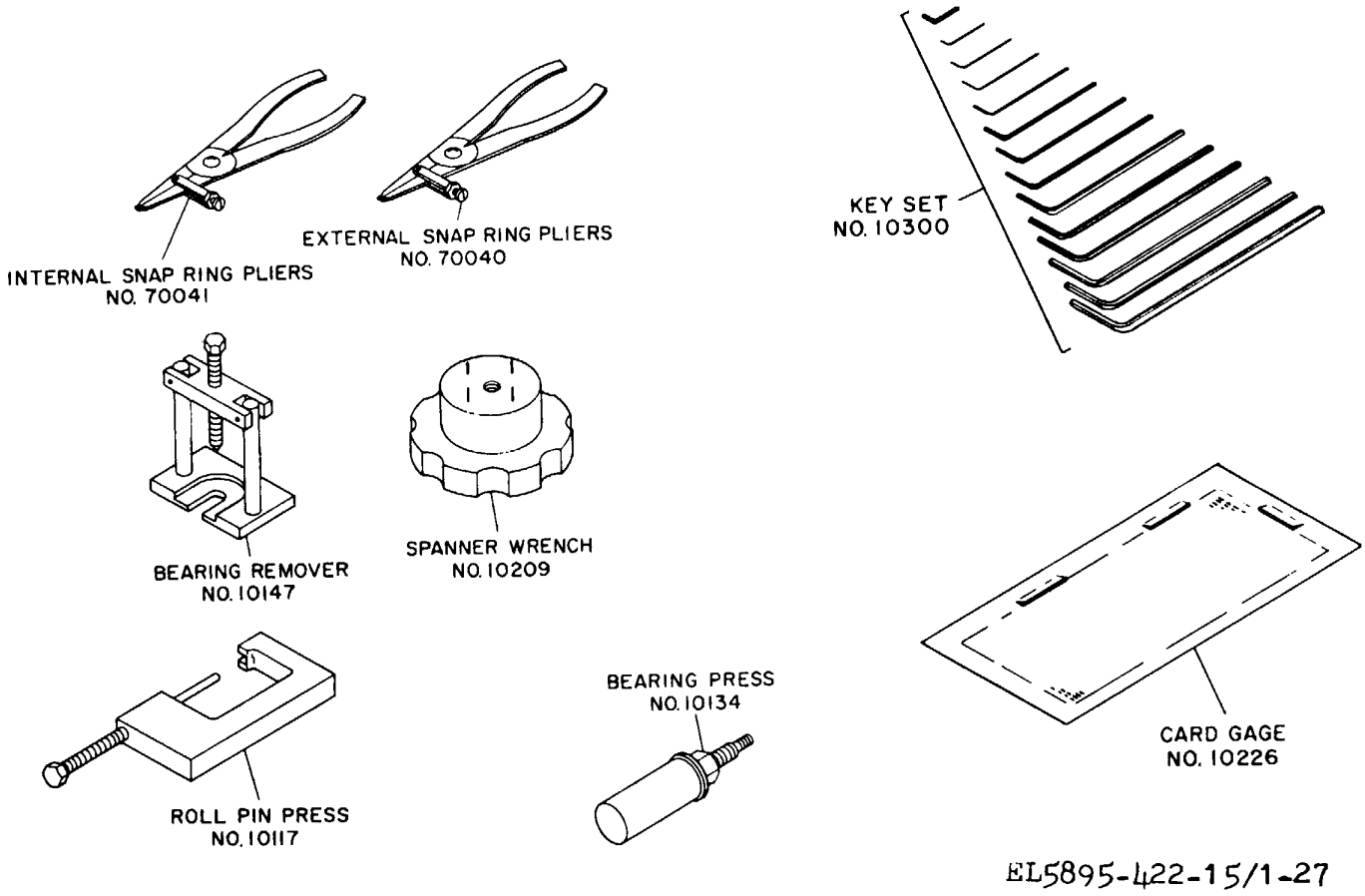


Figure 4-19. Special tools

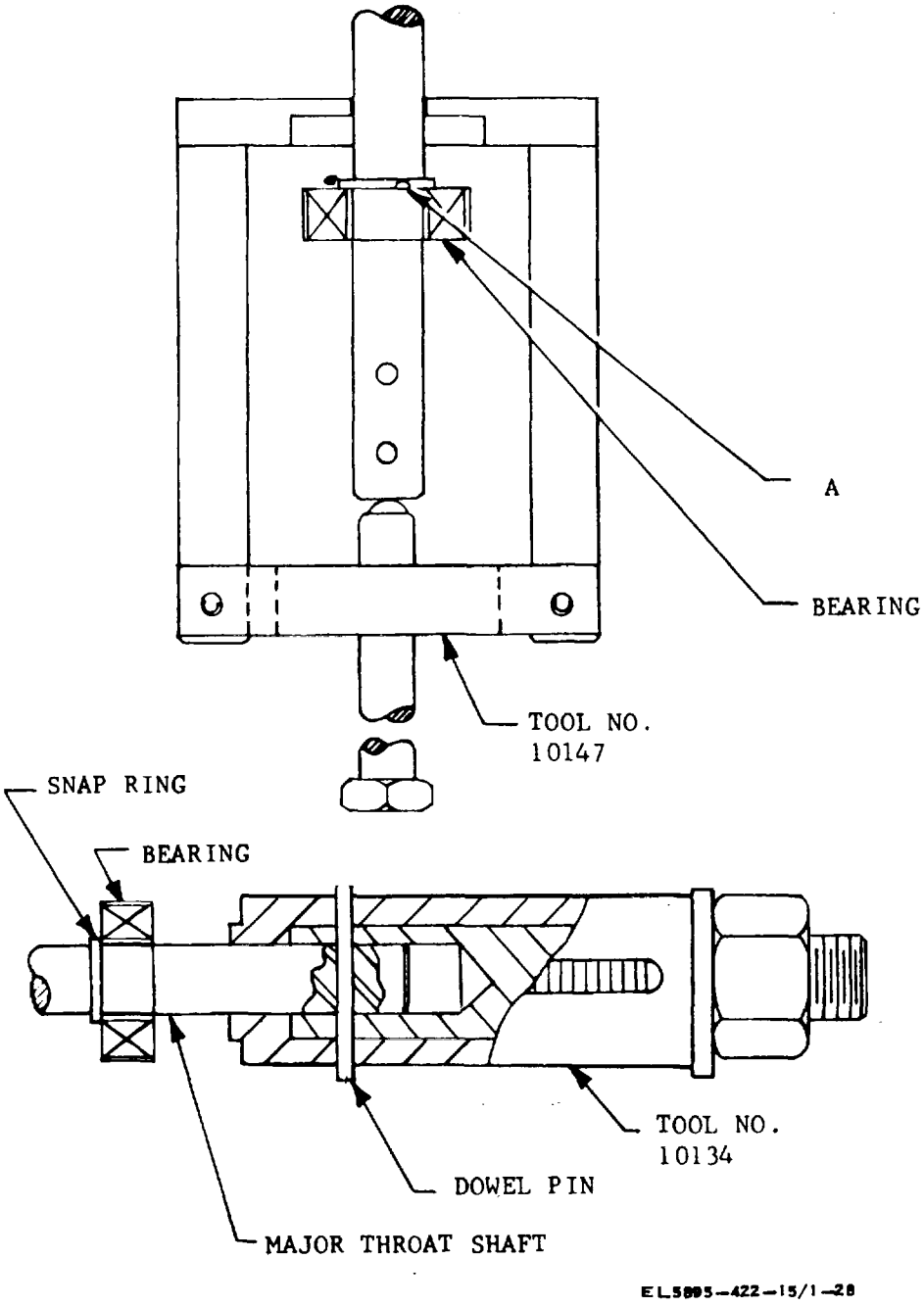


Figure 4-20. Use of special tools.

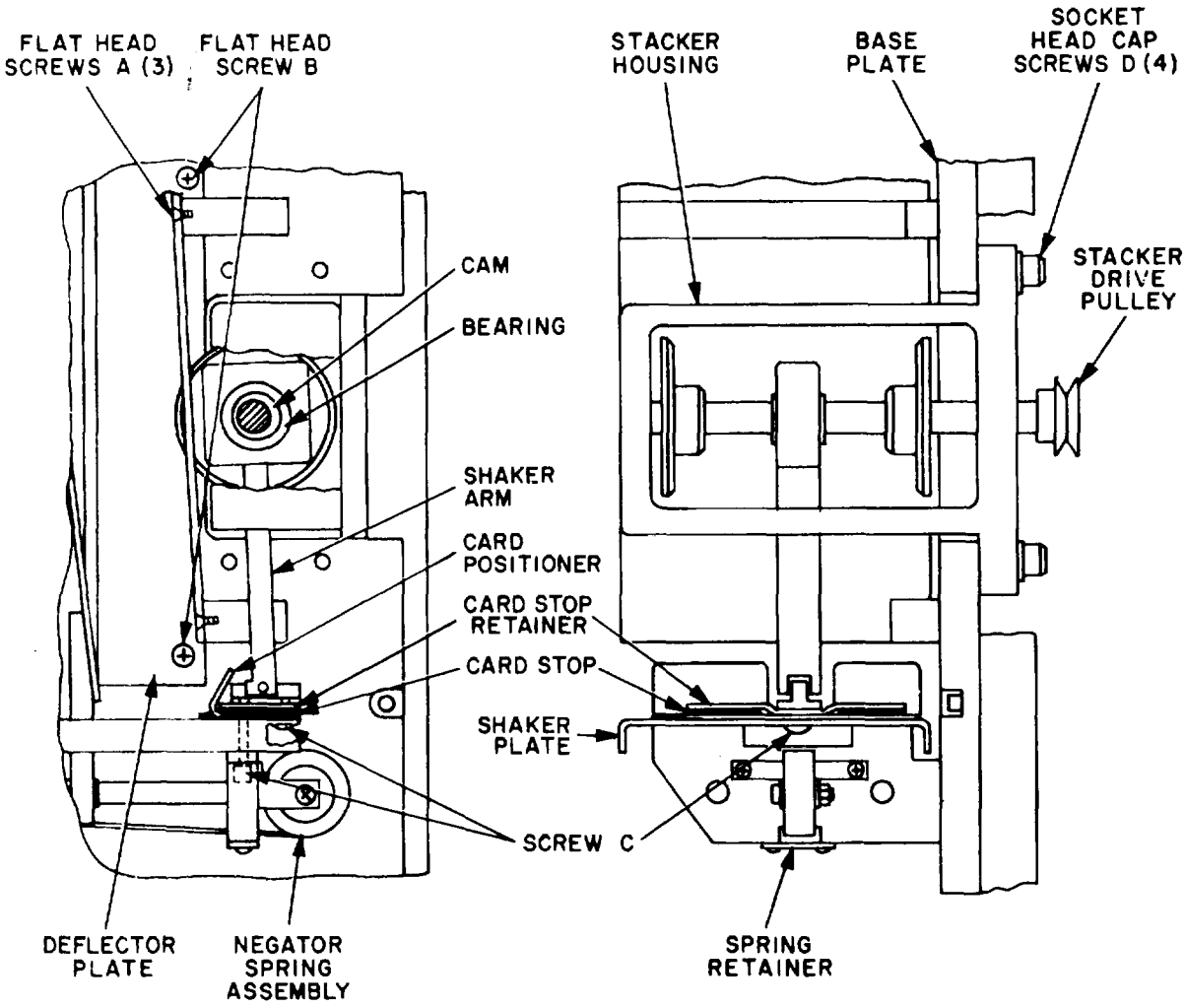


Figure 4-21. Shorter housing

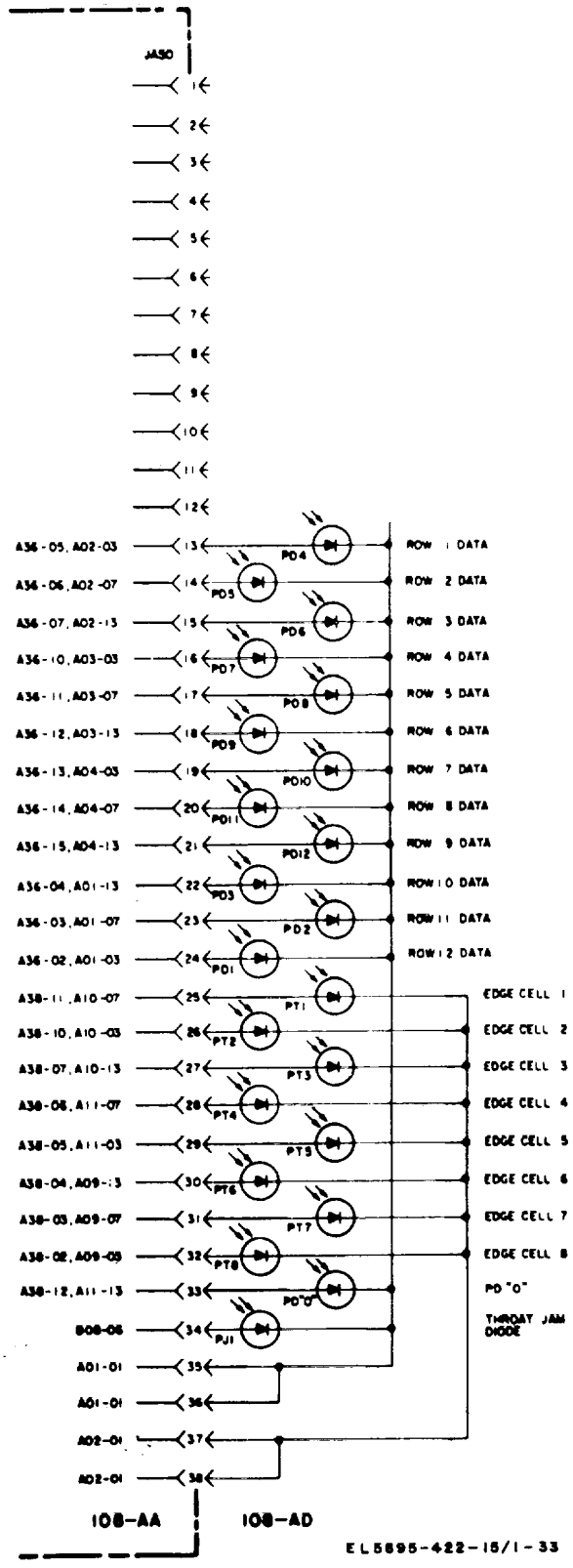


Figure 4-23. Photodiode schematic diagram

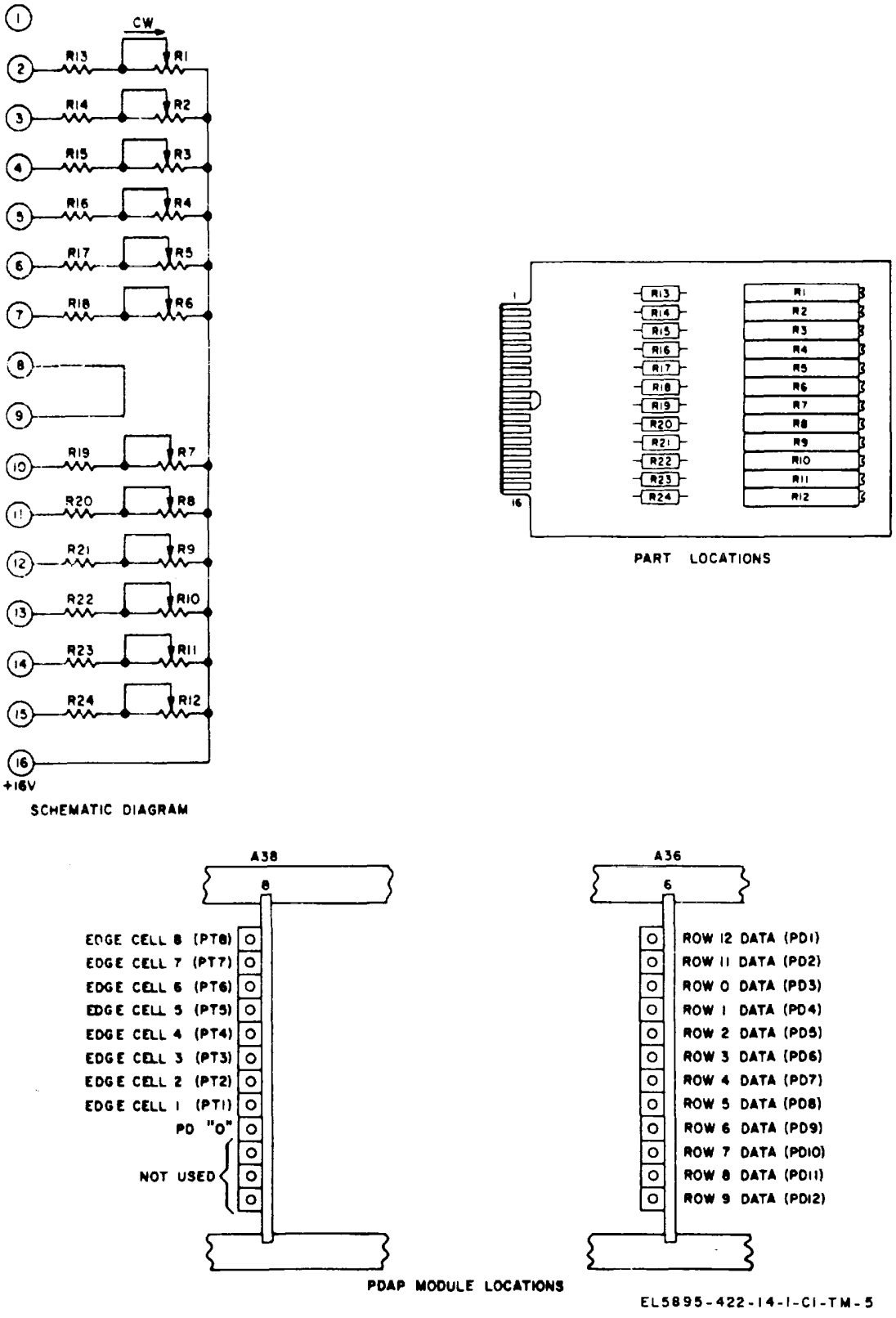


Figure 4-24. Photodiode adjustment potentiometer (PDAP) printed wiring board assembly

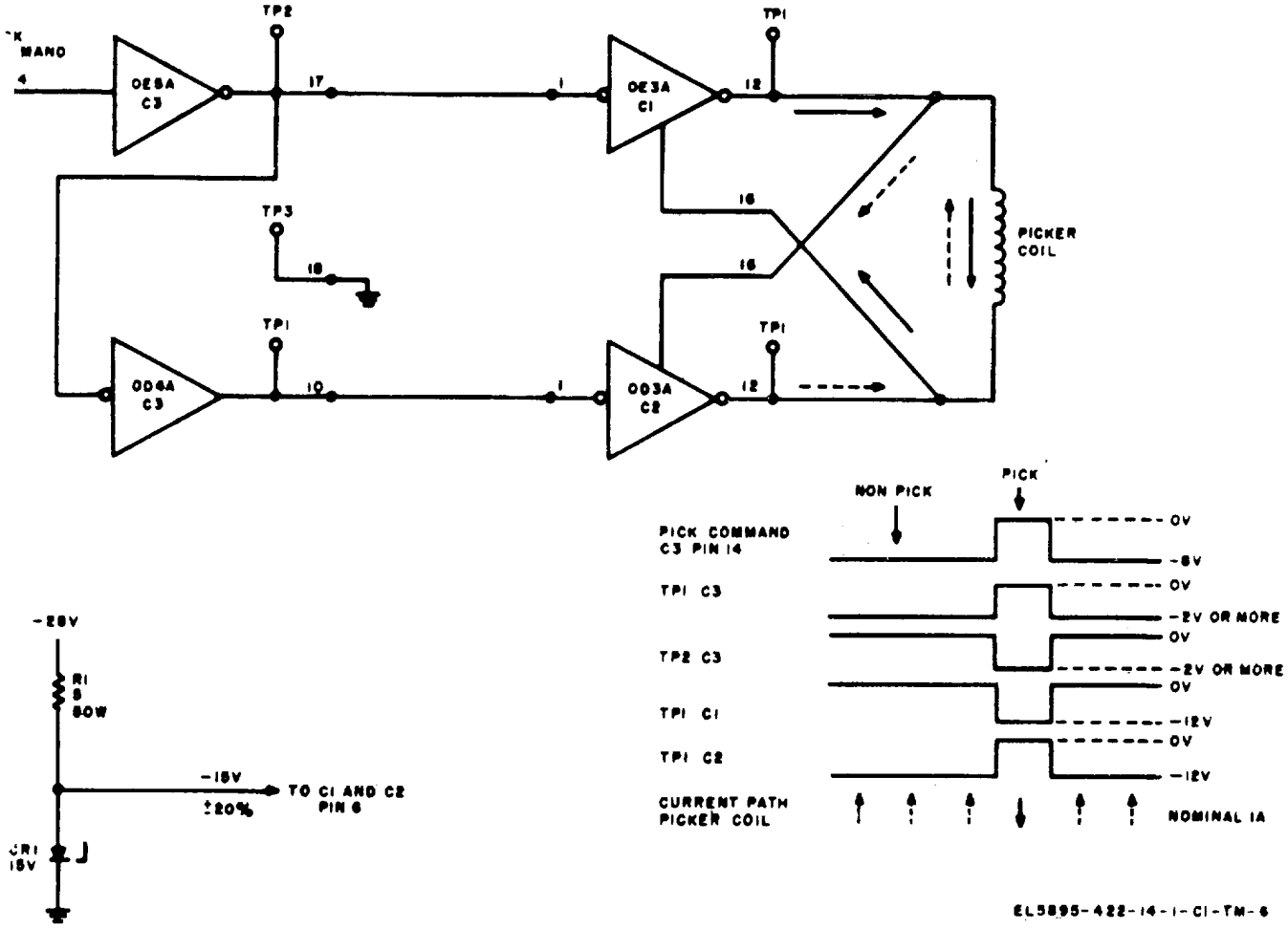


Figure 4-25. Picker drive logic and —15 VDC supply.

Figure 4-25. Picker Drive logic and --15 VDC supply.

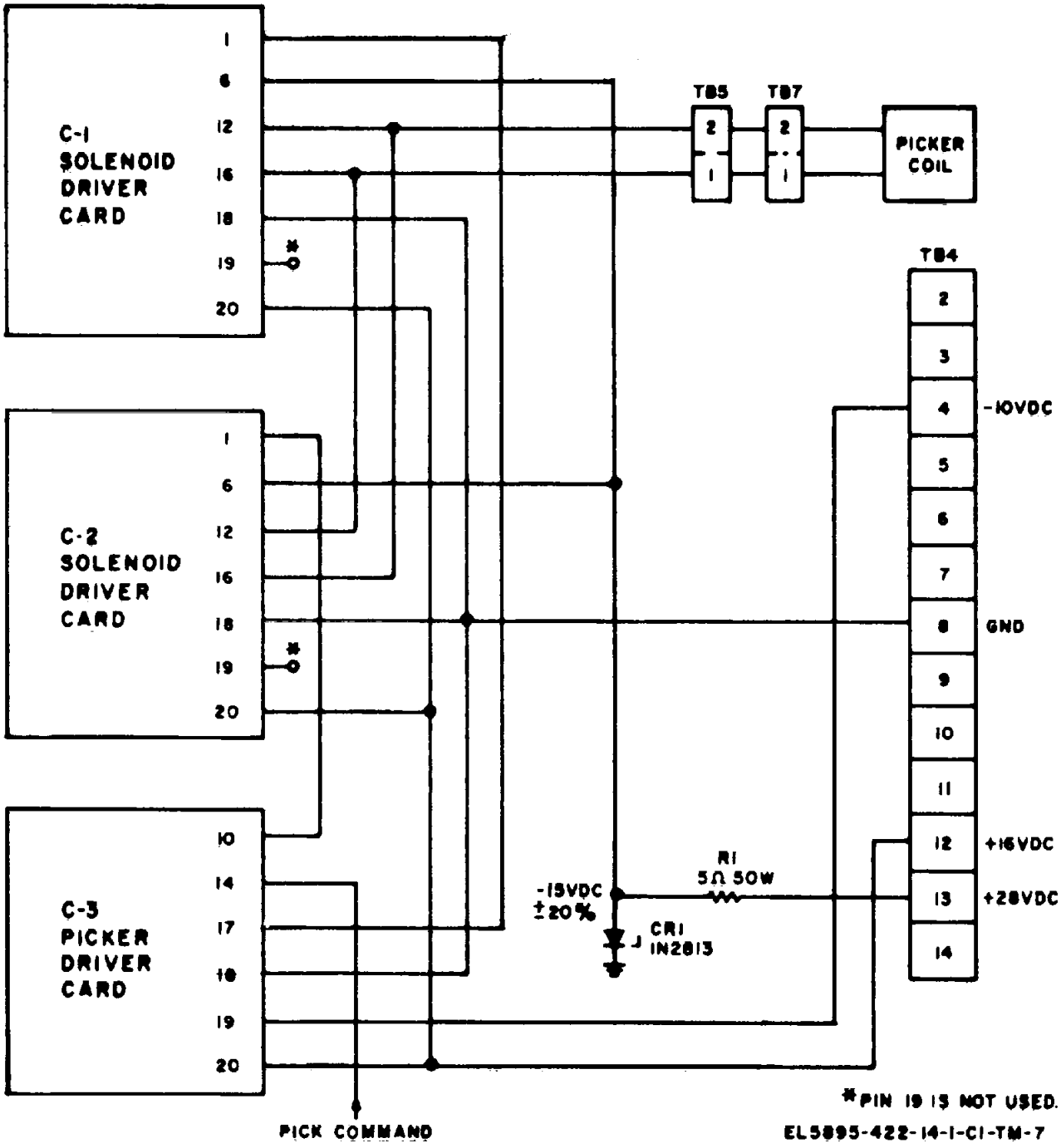


Figure 4-26. Picker logic circuits and –15 VDC power supply wiring diagram

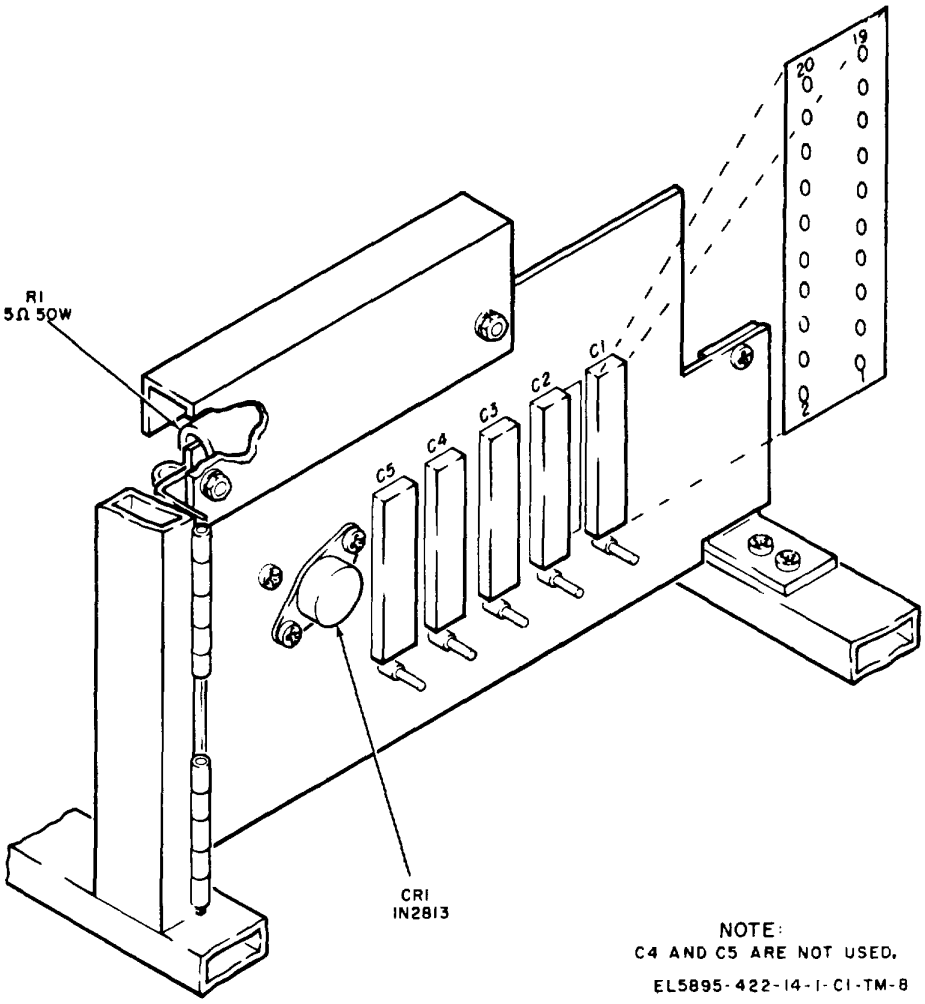


Figure 4-27. Picker drive logic chassis assembly.

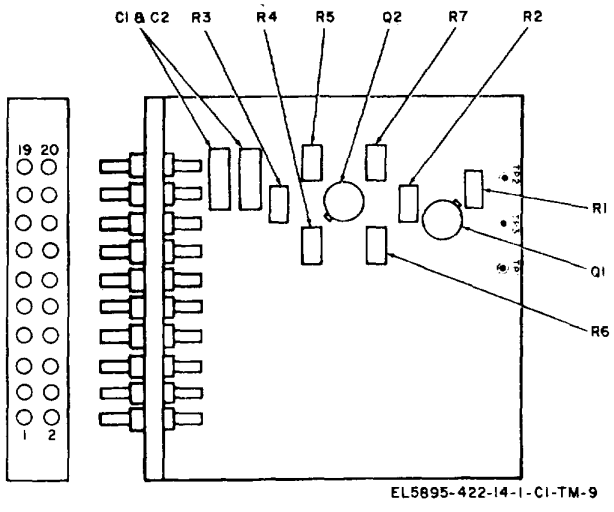


Figure 4-28. Picker driver printed circuit card, component layout

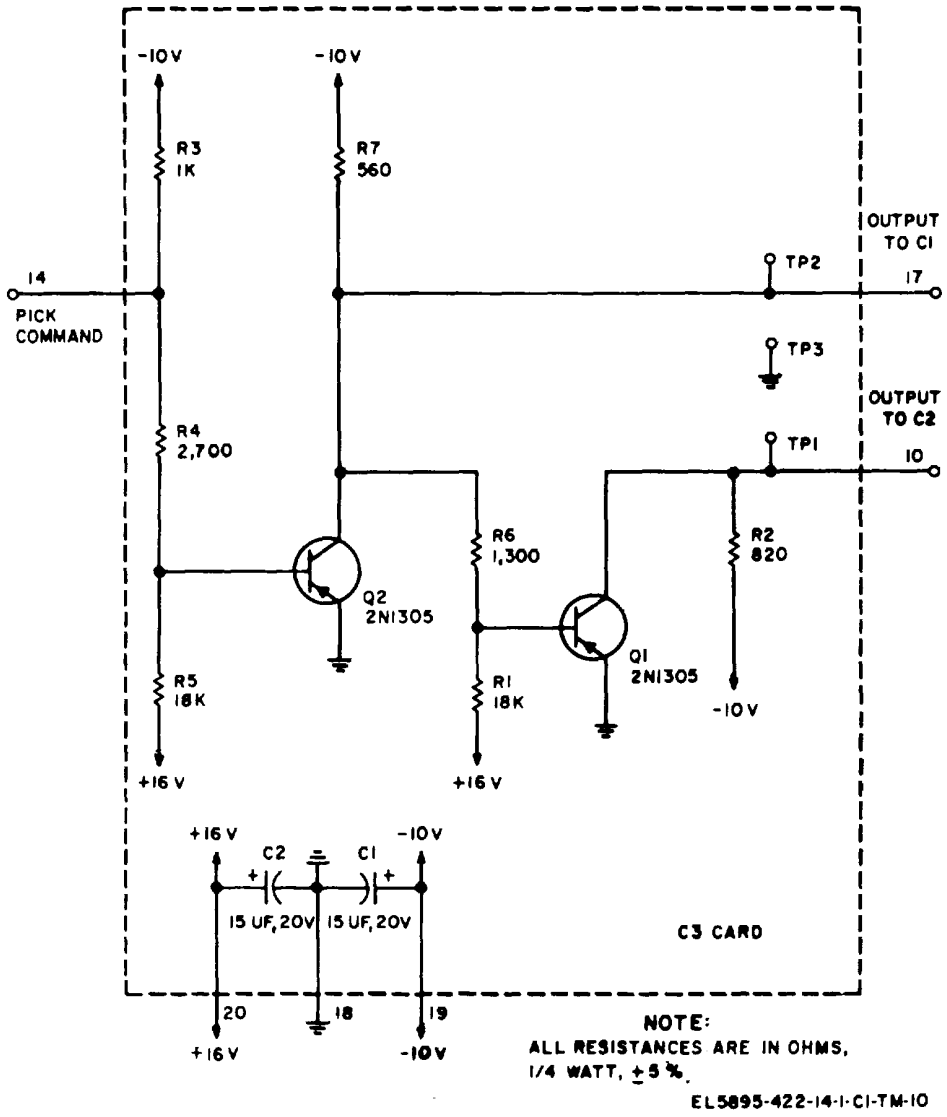


Figure 4-29. Picker driver printed circuit card. Schematic diagram

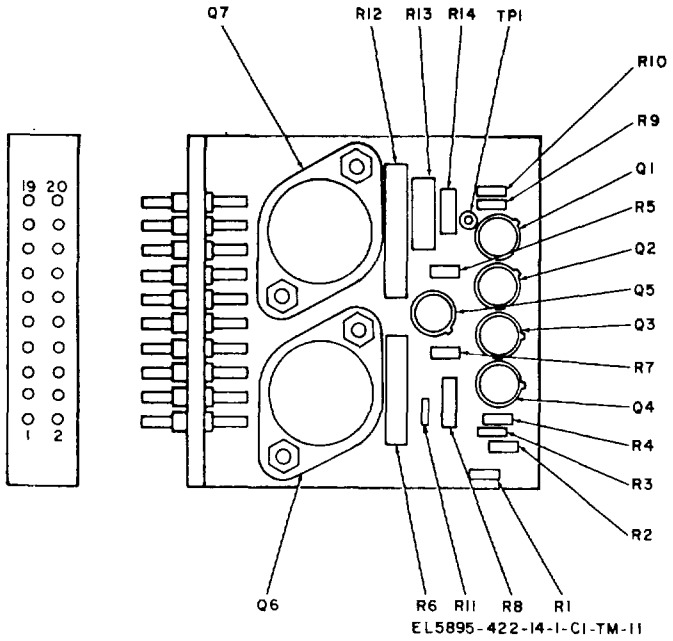


Figure 4-30. Solenoid driver printed circuit card, component layout.

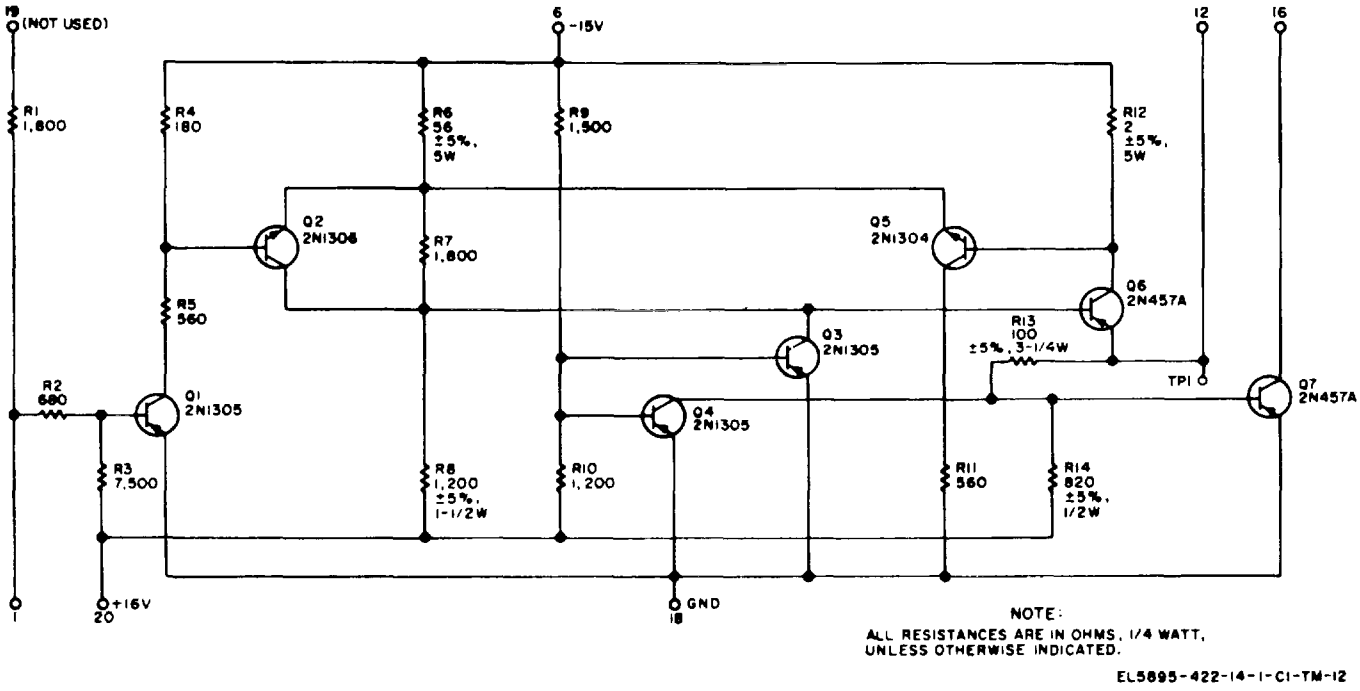


Figure 4-31. Solenoid driver printed circuit card. Schematic diagram.

CHAPTER 5

ILLUSTRATIONS AND DRAWINGS

5-1. Introduction

This chapter contains figure 5-1, Card Reader Cabling Interface Diagram.

5-2. Description of the Logic Diagram Set

This paragraph describes the logic diagram set for the equipment covered by this manual. The logic diagram set contained in TM 11-5895-422-14-2 provides a complete package of func tional logic diagrams for the card reader, as described in the following paragraphs.

a. Block Diagram. A general block diagram of the unit is provided with the logic diagram set. It illustrates the relationship of the principal functional circuits of the unit.

b. Logic Diagrams. The logic diagrams provide a detailed functional diagram of the unit. Included for each circuit element (gate, FF, SS, a. These documents provide a tabulation of etc.) are the sheet and zone identification, circuit type, and module location. Circuit interconnections between modules, as well as between functional elements, are also shown.

c. Interface Connections. The interface connection table provides a tabulation of the termination point and signal identification at the interface of the card reader unit, and the corresponding logic backpan connector and pin.

d. Module Placement Diagram. A module placement diagram illustrates the location within the cabinet of each of the printed-circuit cards contained within the cabinet. The diagram also identifies the module type and the circuit

e. Timing (chart. The timing chart shows the relative timing of the principal operations of the equipment.

f. Flow Charts. The flow charts illustrate the sequence of events and/or operations performed by the equipment. These flow charts are annotated to provide a reference to the operative circuit element associated with a specific event on the flow chart.

5-3. Cabling Diagrams

Figure 5-1 shows the cabling interface for signal cables terminating at the card reader. Special interface cabling for the card reader is given in drawing No. 590-1207; interface cabling for the card reader, which terminates at the card reader buffer controller, is given in drawing No. 590-1208.

5-4. Schematic Diagrams

The schematic diagram for the power supply of the card reader is provided in the power supply manual, TM 11-5895-552-15.

5-5. Supplementary Diagrams

The following paragraphs provide a description and introduction to the supplementary diagrams listed in table 5-1.

the primary ac power wiring within the equipment cabinet, a tabulation of the dc power supply output distribution and wiring, and a tabulation of the supplementary wiring within the equipment cabinet.

b. The debugging edit and node list provides a listing of the backpan wiring and distribution for the card reader.

Table 5-1. AC-DC Wiring and Supplementary Tables

Drawing No.	Type	Unit
590-1207	AC-DC	Card Reader
590-1195	Supplementary Table	Sequencer (power supply control)
590-1206	Supplementary Table	Controller (Same as Card Punch Unit)
591-1403	Debugging Edits and Node List	Reader Controller

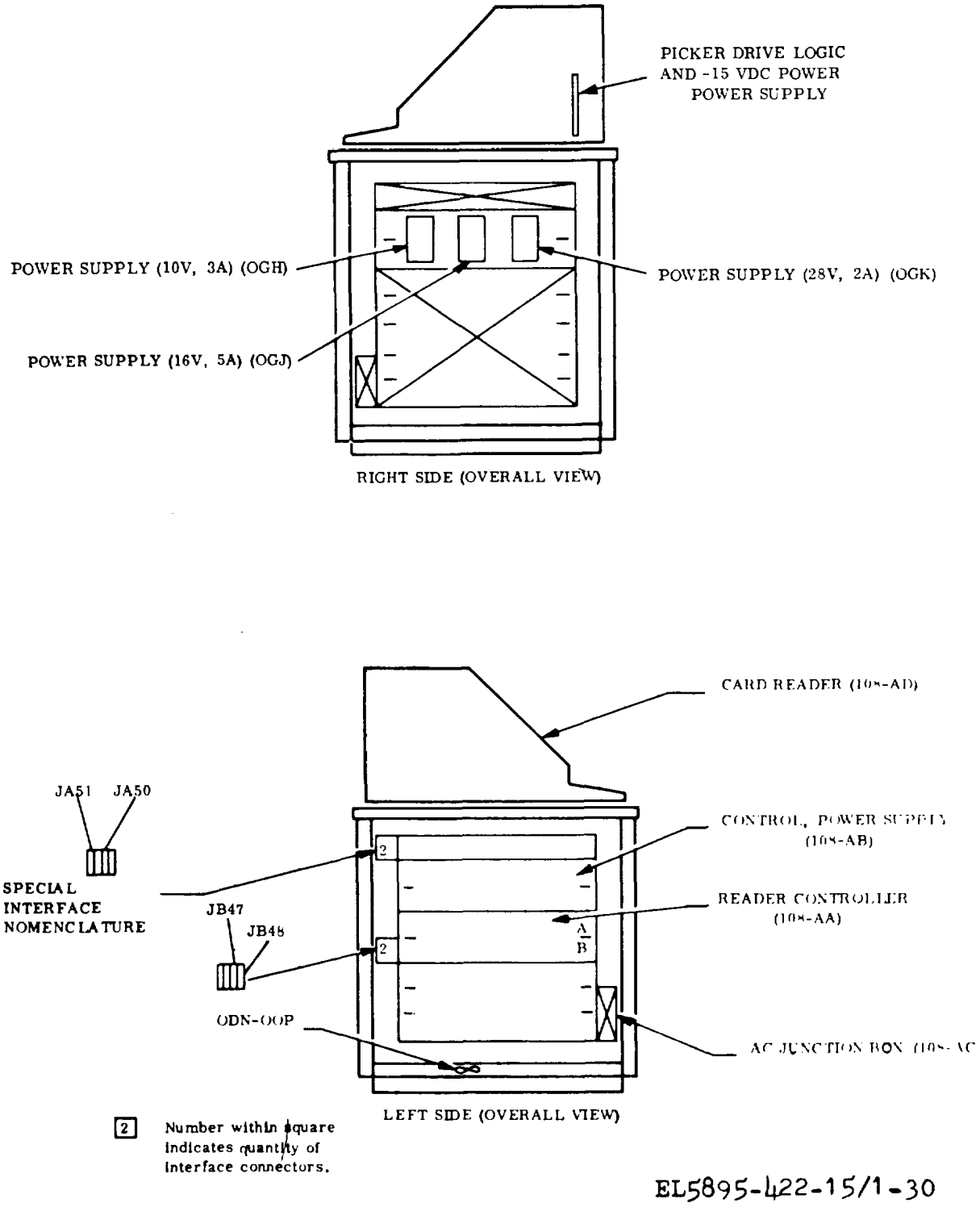


Figure 5-1. Card reader cabling interface diagram.

APPENDIX A
REFERENCES

AFM 66-1	Maintenance Management (Air Force).
Commercial Literature	Test Equipment for Automatic Digital Message Switching Centers AN, FYQ-42 (V) 1 Through AN//FYQ-42 (V) 12 and AN/FYQ-42 (V) T1.
DA Pam 310-4,	Technical Bulletins, Supply Manuals Index of Technical Manuals (.
DA Pam 310-7	Types 7, 8, and 9), Supply Bulletins, and Lubrication Order U.S. Army Equipment Index of Modification Work Orders.
DD4-TD-102-09 .	CRDTEST-Philco Model 145 Punched Card Control Unit Philco Model 156 Crd Reading Unit Philco Model 159 Card Punching Unit
NAVSANDA Publication 2002	Navy Stock List of Forms and Publications Cognizance Symbol I.
NWV 00-15PA-1	Soldering for Electric and Electronic Applications.
TB SIG 222	Solder and Soldering. Equipment.
TB 746-10	Field instructions for painting and Preserving Electronics Command equipment.
TM 11-5895-391-15,/NAVSHIPS 0967-301-5010, TO 31S5-2FYQ42-1	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Automatic Digital Message Switching Centers AN/FYQ-42(V)1 Through AN/FYQ-42(V)12 and AN/FYQ-42(V)T1.
TM 11-5895-402-15/1/ NAVSHIPS 0967-301-5050,' TO 31S5-2FYA10-11-1	Operator, Organizational, DS, GS and Depot Maintenance Manual; Printed Circuits For Automatic Digital Message Switching Groups AN/FYA-10 (V) 1 through AN/FYA-10 (V) 7 and AN/FYA-10 (V)T1
TM 11-5895-402-15/'2/ NAVSHIPS 0967-301-5060, TO 31S5-2FYA10-11-2	Operator, Organizational, DS, GS, and Depot/ Maintenance Manual, Printed Circuits For Automatic Digital Message Switching Groups AN, FYA-10(V) 1 through AN, F#A-10 (V) 7, and AN/,FYA-10 (V) T1.
TM 11-5895-420-15/1/NAVSHIPS 0967-301-5320/TO 31S5-2FYA10-91	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Control Group, Peripheral Input-Output OK-31,/FYA-10(V) and OK-37/FYA-10 (V) T1.
TM 11-5895-420-15/2/NAVSHIPS 0967-301-5330/TO 31S5-2FYA10-91 OK-37, FYA-10 (V) T1.	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Control Group, Peripheral Input-Output OK-31,FYA-10(V) and
TM 11-5895-552-15/1,'NAVSHIPS 0967-301-5510,/TO 31S5-2FYA10-161	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Power Supplies for Automatic Digital Message Switching Groups AN, FYA-10 (V)1 Through AN, FYA-10(V)7 and AN FYA-10(V)T
TM 11-5895-552-15/2/NAVSHIPS 0967-301-5520,,TO 31 S5-2FYA10-161	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Power Supplies for Automatic Digital Message Switching Groups AN,, FYA-10 (V) 1 Through AN, FYA-10 (V) 7 and AN FYA-10 (V) T1.
TM 11-5895-552-15/3,/NAVSHIPS 0967-301-5530,'TO 31S5-2FYA10-161	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Power Supplies for Automatic Digital Message Switching Groups AN, FYA-10(V)1 Through AN, FYA-10(V)7 and AN FYA-10(V)Tl

TM 11-5895-747-15/1/ AN,'FYA-10(V)T1 of NAVELEX 0967-372-7011' (V) 1 TO 31S5-2FYQ42-181-1	Operator's, Organizational, and Depot Maintenance Manual: Data Wiring List, Automatic Digital Message Switching Groups AN FYA-10(V)1 Through AN FYA-10(V)7 and Automatic Digital Message Switching Centers AN FYQ-42 Through AN FYQ-42 (V)12 and AN FYQ-42(V)T1 (Part I of IT
TM 11-5895-474-15/2/ NAVELEX 0967-372-7021,' TO 31S5-2FYQ42-181-2 42(V)1	Wiring List, Automatic Digital Message Switching Groups AN FYA-10(V)1 Through AN FYA-10(V)7 and AN,FYA-l0(V)T1 of Automatic Digital Message Switching Centers AN FYQ- Through AN, FYQ-42 (V)12 and AN FYQ-42(V)T1 (Part II of II).
TM 38-750 TO--00-25-234 Maintenance	The Army Maintenance Management System (TAMMS). General Shop Practice Requirements for the Repair, and Tests of Electronic Equipment.
TO-0-1-O1N	Numerical Index and Requirements Tables, Numerical Category 00).
TO-31-1-75. Practices	Maintenance Engineering Standard General Maintenance

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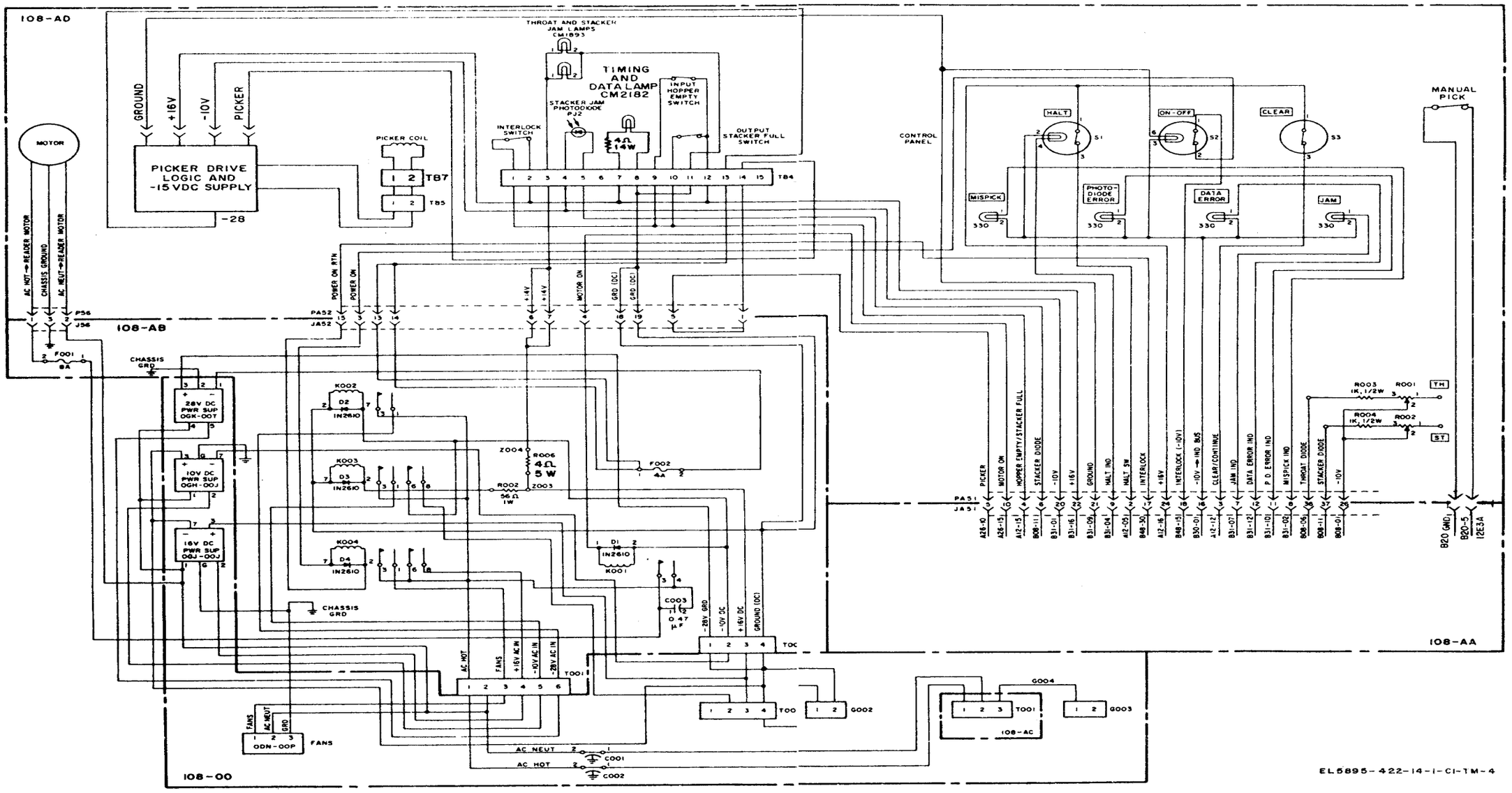

Figure 4-22. Card reader unit schematic diagram (partial).

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USAINTS (3)
Army Dep (2) except
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TOAD (10)
ATAD (5)
LEAD (5)
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Sig Dep (2)
Gen Dep (2) except
Pirmasens (10)
Sig Sec, Gen Dep (2)
ICC (1)
USACSA (4)
SATCOM (2)
USAERDAA, (1)
USAERDAW (1)
Sig FLDMS (1)
Units org under fol TOE (1 ea.):
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11-85
11-95
11-158
11-302
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29-136

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For explanation of abbreviations used, see AR 30-50

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