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TM 11-6660-263-24-3

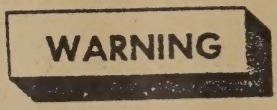
TECHNICAL MANUAL

ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR METEOROLOGICAL DATA PROCESSING GROUPS OL-192/GMD-1 (NSN 6660-01-065-4467) AND OL-192A/GMD-1 (NSN 6660-01-065-4466) READER-PERFORATOR RP-263/GMD-1 (NSN 6660-01-068-8642) (REMEX MODEL RAB612XBA)

HEADQUARTERS, DEPARTMENT OF THE ARMY

17 APRIL 1980

FOR YOUR SAFETY

Before undertaking any maintenance procedure, whether it be a specific trouble-shooting or maintenance procedure described herein or an exploratory procedure aimed at determining whether there has been a malfunction, read the applicable section of this manual and note carefully the 

and 

contained therein.

The equipment described in this manual contains voltages hazardous to human life and safety and may contain mechanical components capable of inflicting personal injury. The cautionary and warning notes are included in this manual to alert operator and maintenance personnel to the electrical and mechanical hazards and thus prevent personal injury and damage to equipment.

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TECHNICAL MANUAL
No. 11-6660-263-24-3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *17 April 1980*

Organizational, Direct Support, and General Support Maintenance Manual For

METEOROLOGICAL DATA PROCESSING GROUPS OL-192/GMD-1 (NSN 6660-01-065-4467) AND OL-192A/GMD-1 (NSN 6660-01-065-4466) READER-PERFORATOR RP-163/GMD-1 (NSN 6660-01-068-8642) (REMEX MODEL RAB612XBA)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703.

In either case, a reply will be furnished direct to you.

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SECTION 0
INTRODUCTION

0-1. Scope

a. This manual in conjunction with TM 11-6660-263-24-1, TM 11-6660-263-24-2, and TM 11-6660-263-24-4 comprise the organizational, direct support, and general support maintenance manuals for Meteorological Data Processing Groups OL-192/GMD-1 and OL-192A/GMD-1. Refer to Appendix A for titles of manuals and equipments covered. Refer to Appendix B of TM 11-6660-263-24-1 for the Maintenance Allocation Chart (MAC).

b. Reader-Perforator RP-263/GMD-1 is the nomenclature assigned to REMEX Model RAB612XBA. Therefore, all the material in this manual that applies to REMEX Model RAB612XBA applies to Reader-Perforator RP-263/GMD-1.

c. The Repair Parts and Special Tools Lists (RPSTL) are included in TM 11-6660-263-20P and TM 11-6660-263-34P.

0-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

0-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DLAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

0-4. Reporting Equipment Improvement Recommendations (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703. We'll send you a reply.

0-5. Administrative Storage

Refer to TM 11-6660-263-10, chapter 1, for administrative storage.

0-6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

SECTION I

GENERAL DESCRIPTION

1.1 EQUIPMENT DESCRIPTION

This manual has been prepared to assist the user in operating, installing and maintaining the following REMEX reader/perforators: RAB612X (Figure 1-1, RAR612X (Figure 1-2), and RAF6120(Figure 1-3). All units punch tape at 120 characters/second and read tape at up to 300 characters/second. A complete description of the model number is given in Section 1.6 and the spe cifications are listed in Table 1-2. Material covered in this manual is applicable to all models except as specifically noted. The operation and maintenance of the punch mechanism itself is described in a separate manual.

Incorporating its highly successful tape punch, Model RPM612X, these reader/perforator combinations provide a selection for most applications where punched tape is used. Tape is supplied from a standard 1000 foot roll (RAB612X and RAR612X) or a box of 1000 feet of fanfolded tape (RAF612X) mounted on a deck assembly above the chassis and threaded through the perforator. Punching is controlled by means of input signals which are processed and used to operate the punch at speeds up to 120 characters/second. The roll type punched tape is fed through an opening in the front panel where it is available for customer take-up. Fanfolded tape, after it is punched, is folded into a bin on the front panel.

The function of the reader is to convert the information stored in the form of punched holes into electronic signals. A plug-in circuit board provides the logic control for tape movement in either direction from external signals or the front panel switches. The outputs from the card control a step motor which drives the tape via a sprocket wheel. Data outputs are generated from the readhead which contains the photocells. As tape passes over the photocells, changes in light intensity are sensed by the photocells, amplified, and brought out to an external connector. Operation of the reader is independent of the punch so that they can both be operated at the same time if required.

Several options are available as listed in Table 1-2 including 6 or 8 track punch mechanism and selectable AC power input.

1.2 EQUIPMENT SUPPLIED

Various items have been included with the tape reader/perforator system for spare parts, installation, and maintenance. These items are listed in Table 1-1.

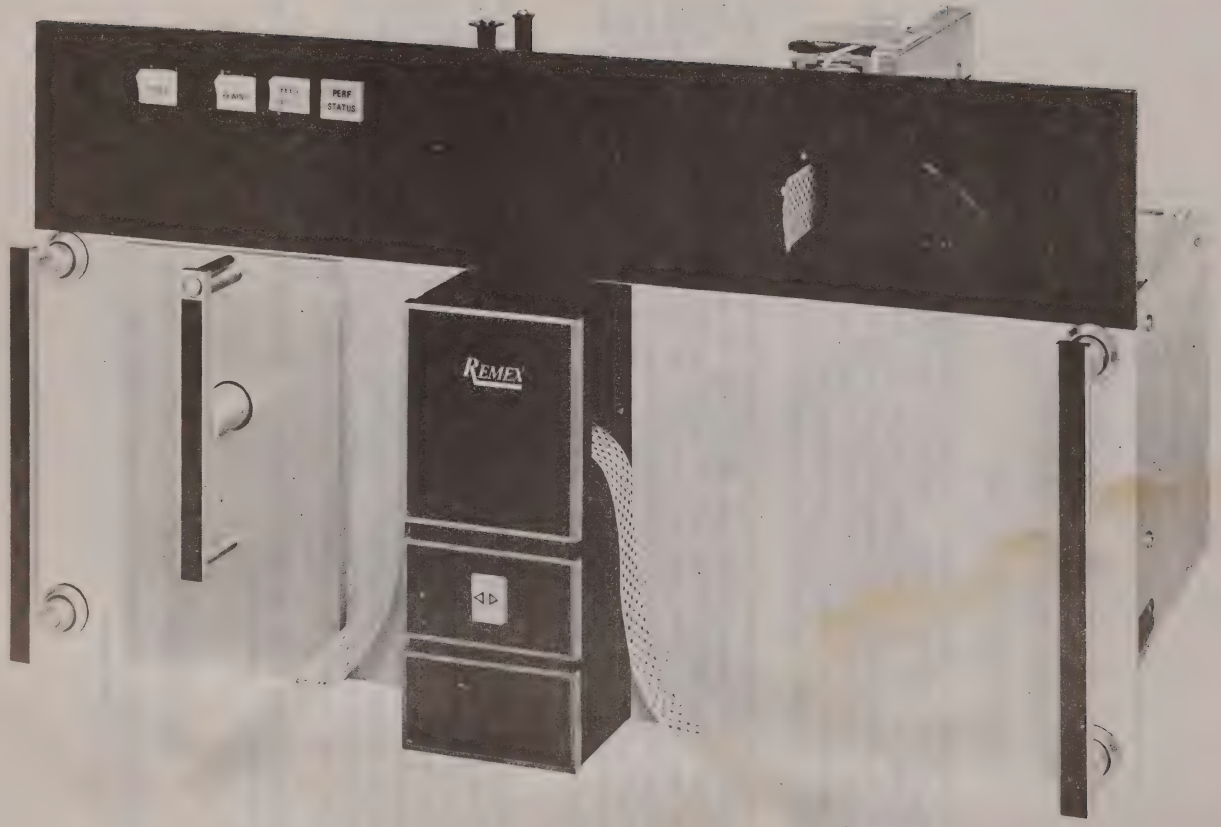


Figure 1-1. REMEX Punched Tape Reader/Perforator System, Model RAB612XBA Series.

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Figure 1-2. Not Used.

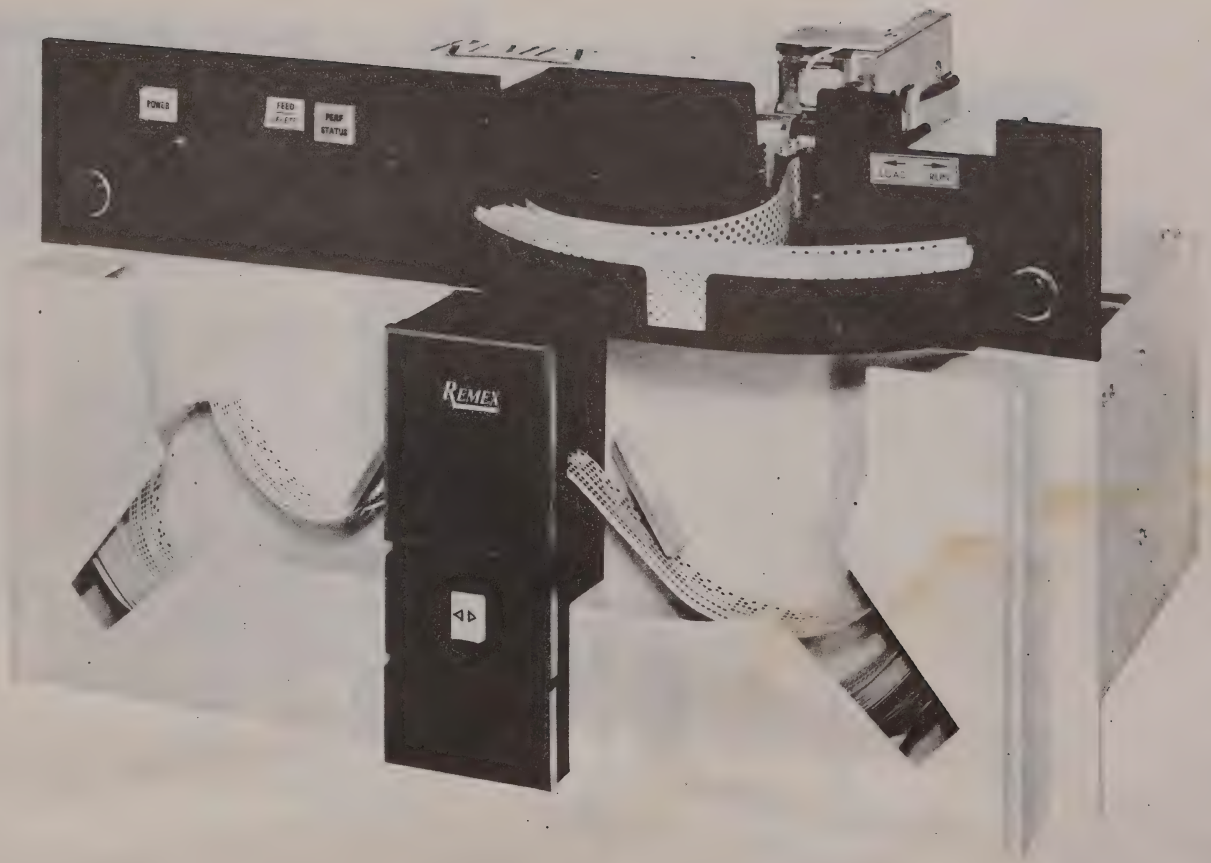


Figure 1-3. REMEX Punched Tape Reader/Perforator System, Model RAF612XBA.

Table 1-1. Equipment Supplied

Item	REMEX Part No.	RAR RAB	RAF
Brush, Right Angle	716003-104	1	1
Brush	716003-101	1	1
Connector, P1, Cannon DP-25P	706500-231	1	1
Cover, Connector	706540-144	2	2
Fuse, 4A, Slow Blow, F101 (100, 115 or 127 VAC Operation Only)	705710-128	1	1
Fuse, 2A, Slow Blow, F101 (220 to 240 VAC Operation Only)	705710-139	1	1
Fuse. 2A Perforator Driver Card, F1-F9	705725-110	3	3
Fuse, 1/4A, F1, F3, Power Supply Card	705725-102	1	1
Fuse, 4A, F2, Power Supply Card	705725-112	1	1
Fuse, 1A, F4, Power Supply Card	705725-108	1	1
Installation Drawing, Chassis Slide	112142	1	1
Instruction Drawing, Perforator Greasing	112210	1	1
Manual	112670-052	1	1
Screw Lock Assembly, Set of 2 (P1)	706540-124	2	2
Tape, Roll	715200-002	1	-
Tube, Grease, 1 oz	716004-163	1	1
Tape, Fanfold	715200-001	-	1
Connector, P2, Cannon DB-25S	706510-211	1	1
Washer, #10 lock	713541-306	-	4
Screw, 10-32 x 3/4	709931-812	-	4
Striker Plate Assembly, Left	109925-1	-	1
Striker Plate Assembly, Right	109925-2	-	1
Syringe, 30 cc	716056-108	1	1

1.3 EQUIPMENT WARRANTY

Not applicable.

1.4 MAINTENANCE EQUIPMENT REQUIRED BUT NOT SUPPLIED

The maintenance procedures in Section 5 require equipment that is not supplied. This equipment is listed in Table 5-1.

1.5 SPECIFICATIONS

Listed in Table 1-2 are the characteristics and specifications of the REMEX tape reader/perforator combinations. Also see Section 1.6 for complete model number description and Figure 1-6 which indicates how the options are incorporated into the model structure. An X in a particular digit designator denotes any of the combinations given in Figure 1-6 (for that designator) can be used. Model designations using X's are frequently used throughout the manual, especially the parts list. Refer to Table 3-1 for signal descriptions.

Table 1-2. Specifications for the Perforator/Reader Combinations.

Characteristics	Perforator	Reader
Tape Material and Dimensions	Perforates standard 6 track typesetter (except RPF) or 8 track unoiled (preferred) or oiled paper tapes as well as most Mylar-paper-Mylar and Mylar-foil-Mylar laminate tapes with a thickness between 0.0026 and 0.0043 inch.	Reads tape of any material with thickness between 0.0026" and 0.0043" whose transmissivity does not exceed 57% (oiled buff paper tape). Tape must be prepared to ANSI X3.18 or ECMA 10 standards for base material and perforations. Reads 1", 8-channel tapes. There is a 6 track typesetter option available
Tape Form	1,200 foot roll (2 inch core) (RAR, RAB) or fanfolded (RAF).	Loop, Strip, or Fanfolded (RAF only).
Tape Direction	Bidirectional with backspacing limited to 10 rows (1" max.)	Bidirectional (left-to-right or right-to-left)
Speed	Up to 120 characters per second asynchronously.	Asynchronously, up to 300 characters per second. Greater than 300 characters/sec. in continuous mode.
Timing	Timing Diagram shown in Figure 3-1.	Timing Diagram shown in Figure 3-2.
Life Expectancies	Minimum punch life expectancy is 8.4×10^7 characters when used with oiled or unoiled paper tape. Models using carbide punch block exhibit a punch life approximately 3 times greater.	Reader lamp has been derated approximately 10% to provide a life expectancy in excess of 13,000 hours.
Operational Modes	Tape Feed/Delete: Under control of front panel switch unit will feed tape forward at approximately 120 cps while punching sprocket holes only in FEED or all holes in DELETE. Asynchronous Forward: Tape moves forward one row and is punched at a rate up to 120 cps. See Section 3.3.3. Asynchronous Reverse: Tape moves in reverse direction without punching data or sprocket holes. See Section 3.3.4.	Asynchronous Operation: Reader drives tape at up to 300 characters/sec. min., with pulse drive signal. See Section 3.4.2. Continuous Mode Operation: Reader drives tape at greater than 300 cps with continuous drive signal. See Section 3.4.3.

Table 1-2. Specifications for the Perforator/Reader Combinations - Continued.

Characteristics	Perforator	Reader
Input-Output Control Signals	See Table 3-1, Interface Signal Descriptions.	See Table 3-1, Interface Signal Descriptions

The following specifications apply to the entire reader/perforator systems.

Input Power	100, 115, or 127VAC ± 10%, 47 to 64 Hz, single phase, 2 amps max; 220 or 240 VAC, ± 10% 47 to 64 Hz, single phase, 1 amps max.
Environmental	Temperature: Operating: +5°C to 55°C (free air). Humidity: Operating: 10% to 90% relative humidity without condensation. Non Operating: All conditions without condensation of either water or frost.
Dimensions	See Installation Drawing, Figures 1-3 and 1-4.
Weight	RAF 612X: 47.5 lbs RAB612X and RAR612X: 46.5 lbs.
Options (Coded as part of model number or as option. See Table 1-3).	1. +5V Active (Mode 5) logic on Punch Command and Punch Data input lines. OV Active (Mode 6) logic selected by grounding J1-14. 2. +5V Active (Mode 5) logic on Punch Ready and Tape Handling Error output lines. OV Active (Mode 6) logic selected by grounding J1-15. 3. Tape Handling Error being true will not inhibit Punch Ready Output or Punch Command input. 4. 100, 115, 127, 220 or 240 VAC, 47-64 Hz power input (customer wirable) 5. OV Active (Mode 6) logic on Reader Output. +5 Active (Mode 5) logic selected by grounding J2-10. 6. The following chassis slide assembly is available. 110960-1: Two 22-inch long x 3/8" wide slides with 14" travel, mounting brackets and hardware

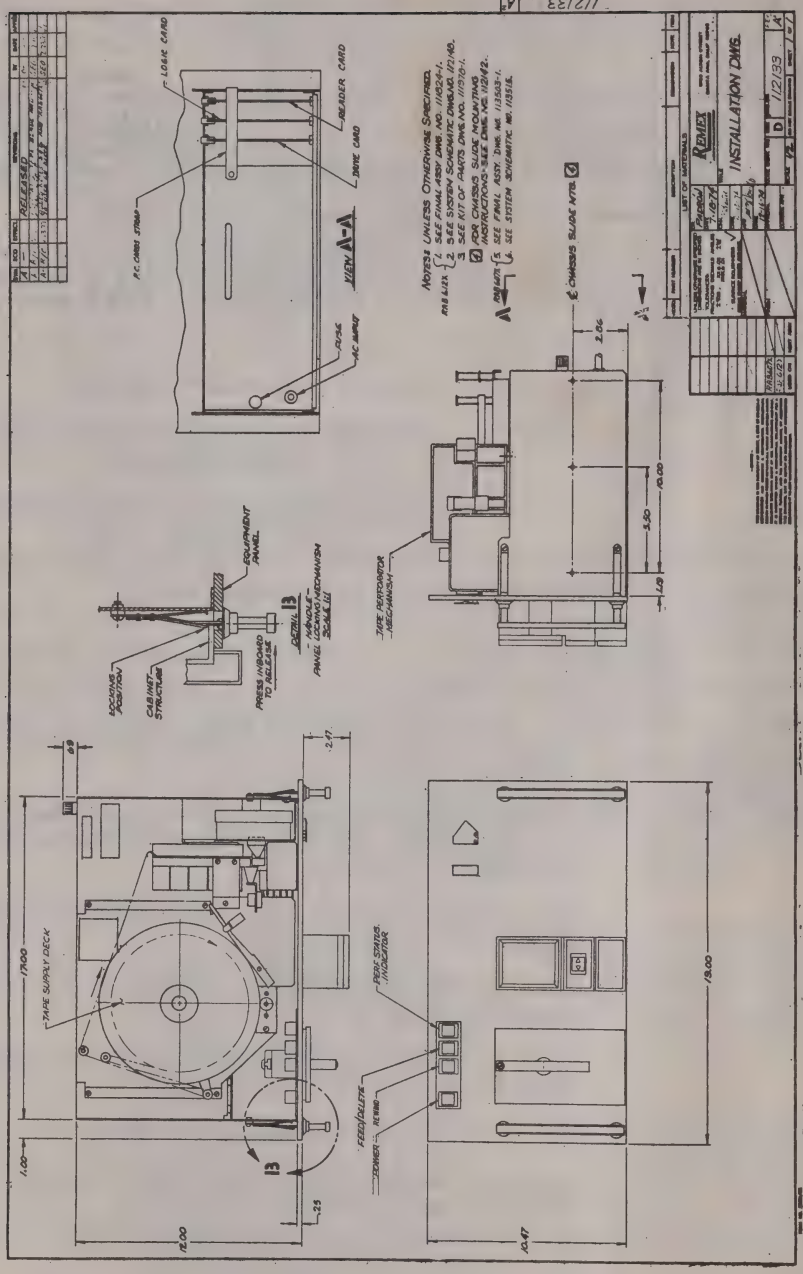


Figure 1-4. Installation Drawing, Models RAR612X and RAB612X.

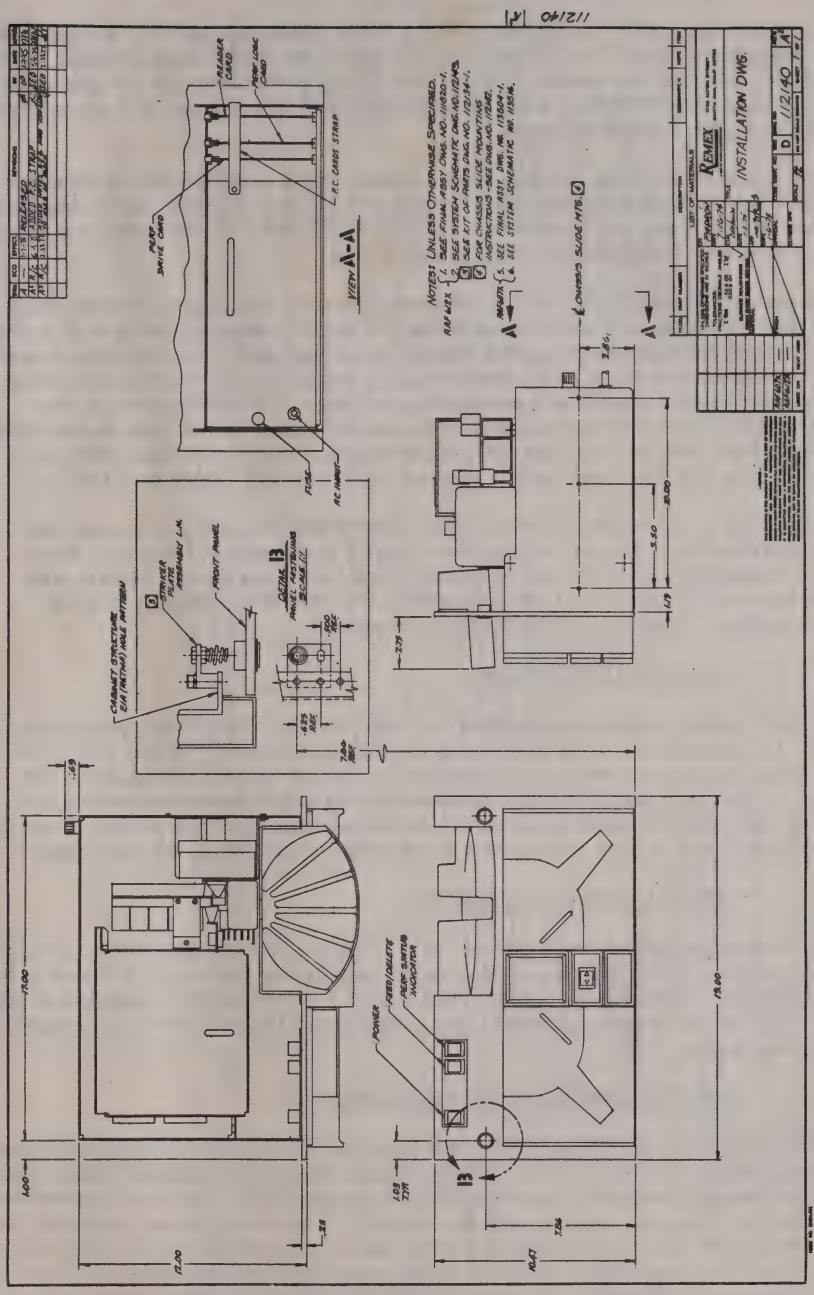


Figure 1-5. Installation Drawing, Model RAF612X.

1.6 MODEL NUMBER DESIGNATION

The REMEX model designation is used to code the basic functions, options, and configurations of a particular product line. Figure 1-6 illustrates the model code structure for the 612X series and indicates the various options. An X in a particular digit designator (as used in many parts of this manual, especially the parts list) denotes any of the combinations given in Figure 1-6 can be used.

Nonstandard (special) units use the last three numbers of the model number to denote a special unit. The difference between any special unit and the standard unit is described in an addendum at the end of the manual. Units with 000 and 901 and higher are standards and are covered in this manual without addendums.

Standard options not shown in Figure 1-6 are used in the 901 and higher numbers (standard units only) and are listed on the serial tag below the model number in the form of a series of three digit numbers depending uponthe number of options used. For example, a unit with 902 in the last three digits of the model number would list two three digit numbers. Because the list of possible options is constantly changing, it is not included in the manual. Generally, this list consists of special customer requirements that do not affect the operation of the unit and includes such things as special paint, no logo, mill edge panel, etc. Table 1-3 lists those option numbers which are applicable to all units.

Always consult the serial number tag for proper voltage and frequency to be used and for model identification. Failure to do so could result in damage to the unit. The serial tag is located on one of the rear surfaces. In all correspondence, always refer to the complete model number including the mode, the last three numbers, and the unit's serial number. Refer to the CAUTION in Section 2.4.

1.7 PHYSICAL DESCRIPTION

The REMEX tape reader/perforator combinations are mounted on a 10-inch panel with a height of 10 1/2 inches. Detailed dimensions are shown in Figures 1-4 and 1-5. The electronic chassis and supply deck is mounted at the rear of the unit and contains the circuit cards. The front panel contains the tape reading and transport mechanism and fanfold tanks (RAF models) which extend 2.48 inches out from the front panel. Chassis slides are also provided to give easy access to the supply deck and punch mechanism.

1.8 TAPE CHANNEL NUMBERING

REMEX tape reader/perforator combinations are available to punch tape of the configurations shown in Figure 1-7. The type of tape guide used in any given unit is coded in the seventh digit as part of the model number. See Figure 1-6. Note that regardless of the width of the tape or the number of tracks, the numbering of the track holes is always the same. Also see Section 1.9.

1.9 TAPE PREPARATION SPECIFICATIONS

Tape specifications as given in Figure 1-7, are based on the American National Standards Institute Standard X3.18-1967 (ANSI; formerly United States of America Standards Institute). A tape gauge is available from REMEX (part number 110597) so that longitudinal and perpendicular transverse spacings can be checked. To use the gauge, place the feed hole of one end of a 5-inch span in the arc until one of the cross hairs is centered in the feed hole. Read the measurement adjacent to that cross hair (plus tolerances to the right and minus tolerances to the left). A second 5-inch gauge is printed at the bottom to check longitudinal and perpendicular transverse center line spacing.

REMEX	Perforator/ Reader (A)	BASIC MODEL (see Remarks)	MODEL SERIES	PUNCHING SPEED 12 IN/SEC	MECH-ANISM TYPE	BI-DIRECTIONAL	MODEL CHANGE (a)	NOT USED	Reader Input Mode	Reader Output Mode(c)	Other Circuit Options	Perf. Input Mode (b)	Perf. Out-put Mode (b)	Other Perf. Op-tions	INPUT VOLTAGE/ FREQ.	SPECIAL NUMBER (d)	REMARKS
R	A	B	6	12	X	B	A	-	6	6	-	5	5	X	U	XXX	Perforator/Reader with roll supply spooling and rewinder.
R	A	R	6	12	X	B	A	-	6	6	-	5	5	X	U	XXX	Perforator/Reader with roll supply spooling only.
R	A	F	6	12	X	B	A	-	6	6	-	5	5	X	U	XXX	Perforator/Reader with fanfold supply and take-up tray.

1	= 8 Track Steel Block
2	= 8 Track Carbide Block
3	= 6 Track Steel Block with advanced feed hole
4	= 6 Track Carbide Block with advanced feed hole

5	= TTL Levels, 5V Active
6	= TTL Levels, 0V Active

U = 100, 115, 127, 220 or 240 VAC, 47-63 Hz. Unit comes wired for 115 VAC, easy wire change for other voltages.

0	Tape Handling Error Inhibits Punch Ready Signal
1	Tape Handling Error Does Not Inhibit Punch Ready Signal (e)

NOTES:

(a) Letter changes with each model change, Current letter is A.

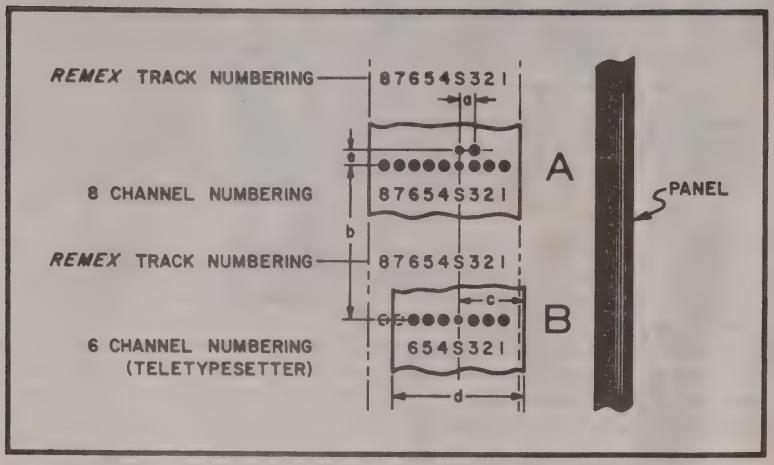
(b) Unit is supplied with perforator mode 5 for input and output. Mode 6 is selected by grounding J1-14 for input and J1-15 for output.

(c) Unit supplied with Reader mode 6 for output. Mode 5 output is selected by grounding J2-10.

(d) These digits are assigned by REMEX. If the unit is standard, these are 000. 9XX is used to describe the total number (XX) of additional standard options. All other numbers are specials.

(e) Does not apply to RAF612X units.

Figure 1-6. REMEX Model Number Code



MMC 371

Tape Configuration	c ±0.003	d ±0.003
A	0.392	1.000
B	0.434	0.875

In all configurations:

a = 0.100 ± 0.002

b in any span of five inches is ±0.025

e = 0.100 ± .003

Data hole diameter is 0.072 + 0.001/-0.002

Sprocket hole diameter is 0.046 + 0.002/-0.001

NOTE: The 6 channel teletypesetter has the sprocket hole center line advanced by 0.013 inch with respect to the data track center line.

Figure 1-7. Tape Channel Numbering and Dimensions, Perforator and Reader.

Table 1-3. RAX612XBA Options

Option Number	Description	Model Affected	Description of Change
001	Desk Top Enclosure added	RAR612XBA	Add enclosure 111600-2
002	Desk Top Enclosure added	RAB612XBA	Add enclosure 111600-2
003	Desk Top Enclosure added	RAF612XBA	Add enclosure 111600-2
004	Tape Guide changed to 8-track and 6-track typesetter	All models	Change 112411-1 tape guide to 112411-2
005	Tape Guide changed to 8-track and 6-track, 0.875 wide	All models	Change 112411-1 tape guide to 112411-3
006	Tape Guide changed to 8-track and 5-track (two tracks between feedhole and panel)	All models	Change 112411-1 tape guide to 112411-4
007	Tape Guide changed to 8-track and 5-track (three tracks between feedhole and panel)	All models	Change 112411-1 tape guide to 112411-5.
008	Tape Guide changed to 8-track and 6-track (6-track reversed)	All models	Change 112411-1 tape guide to 112411-6
009	No logo	RAR612XBA	Logo removed.
010	No logo	RAB612XBA	Logo removed.
011	No logo	RAF612XBA	Logo removed.
013	Desk Top Assembly Kit (Grey)	RAB612XBA	Add 112175-6 enclosure per drawing 112175.
014	Desk Top Assembly Kit (Grey)	RAF612XBA	Add 112175-6 enclosure per drawing 112175
015	Desk Top Assembly Kit (Black)	RAB612XBA	Add 112175-5 enclosure per drawing 112175
016	Desk Top Assembly Kit (Black)	RAF612XBA	Add 112175-5 enclosure per drawing 112175
017	Duplicator Option	RAF612XBA	Delete part 112018-1 and add 113518-1
018	Duplicator Option	RAB612XBA	Delete part 112020-1 and add 113517-1.

SECTION II

INSTALLATION

2.1 UNPACKING

Specially designed, reinforced packing cartons have been used in the shipment of the tape reader/perforator systems to provide the best possible protection during transit. Also packed with the unit in separate plastic bags and packages is the kit of parts listed in Table 1-1. A careful visual inspection of the unit should be made as soon as it is removed from the carton for any apparent damage incurred during shipping. In the event the unit has been damaged as a result of shipping, the carrier and REMEX should be notified as soon as possible. When carrying or removing the unit from the carton, it is important that it be lifted by the handles, front panel, or chassis. Never attempt to lift it by the covers, tape tanks, chassis slides or other parts which may not support the weight of the unit.

2.2 SYSTEM MOUNTING

The unit contains chassis slides which mount to the cabinet wall. See Figure 1-4 or 1-5. Figure 2-3 illustrates the installation of the slides. The mounting dimensions of all slide options are the same. RAR and RAB units are secured to the cabinet by the front panel handles which are spring loaded. To release the unit, push the handles inward. RAF units use two mounting studs which snap into sockets of two release push buttons. The studs are part of two striker plates which are mounted on each side of the rack by two screws each. To release the sockets from the studs, depress the buttons. Figure 1-5 illustrates the mounting of the striker plates and chassis slide mounting hole pattern. Mounting should be in such a manner that adequate cooling is provided. The ambient temperature should not exceed the value listed in Table 1-2. It is recommended that two people be used when installing or removing the unit from the chassis slides.

CAUTION

When operating the unit, make sure it is elevated sufficiently such that the intake air flow through the fan at the bottom of the unit is not restricted. Damage to the punch will result if sufficient cooling by the fan is impeded.

2.3 INITIAL ADJUSTMENTS

Each unit has been accurately adjusted and aligned before leaving the factory. No adjustments or calibrations are required prior to installation or use.

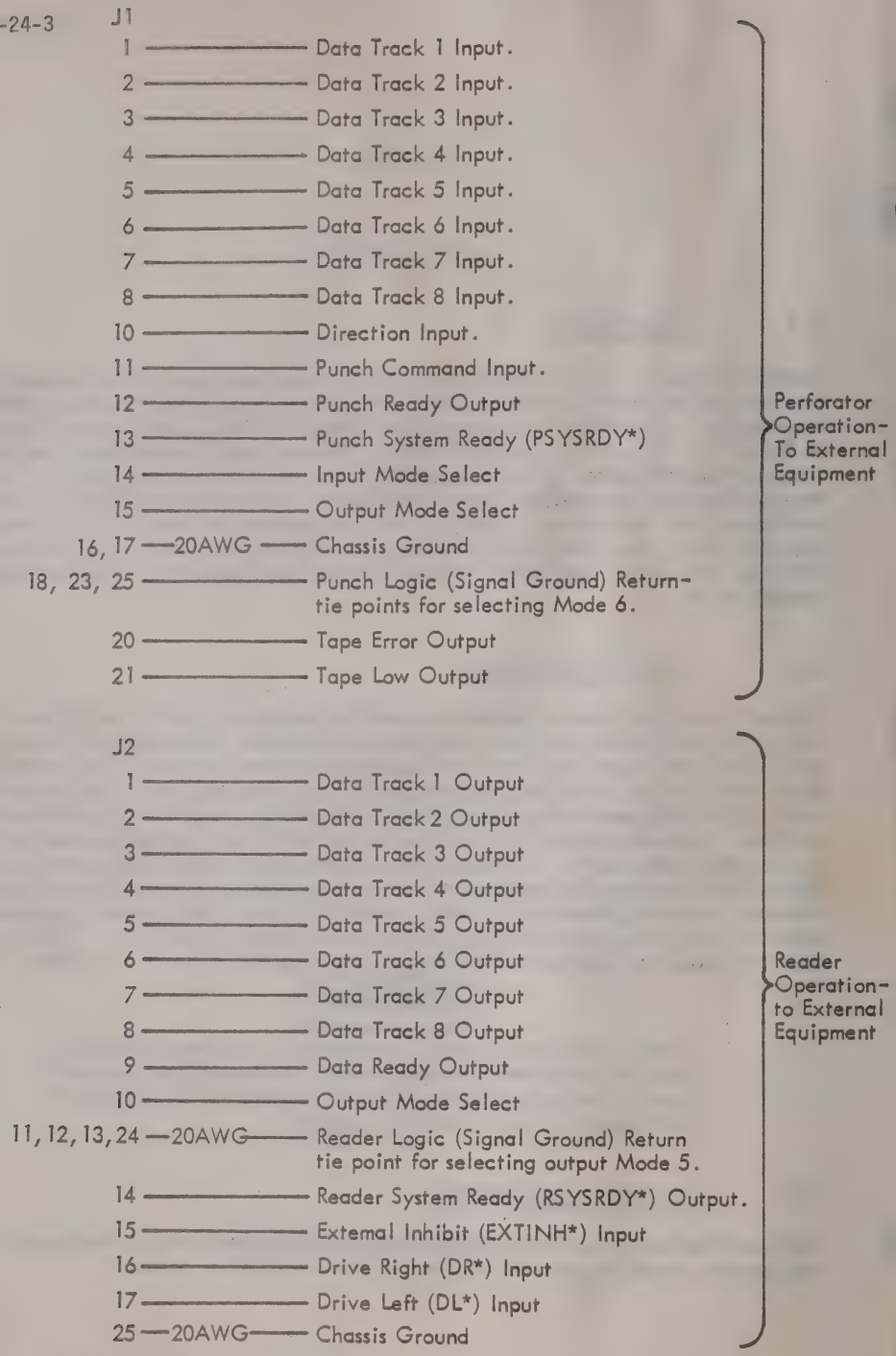


Figure 2-1. Reader/Perforator System Connections to External Equipment. See Table 3-1 for signal descriptions.

2.4 POWER AND SYSTEM CONNECTIONS

A.C. power is applied to the unit through a standard three-wire cord located at the rear of the unit.

CAUTION

All units come wired for 115 VAC, 47-64 Hz operation. If another voltage is to be used, a wire change on the transformer must be made as described in Section 2.4.1. In addition, before operating the system, the proper fuse value (as indicated in Table 1-1) must be inserted from the kit of parts. Discard the other fuse (unless, of course, a different voltage operation is anticipated).

Refer to the serial tag for proper operating modes of the unit. See Section 1-6 and Figure 1-6 for an explanation of the model number and operating modes.

All control signals and output signals are routed through J1 for the perforator and J2 for the reader which are also located at the rear of the unit. Figure 2-1 lists the signals associated with each pin and their description is given in Table 3-1. All wire sizes are 22 AWG unless noted in Figure 2-1. The proper mating connectors for J1 and J2 have been supplied with the unit. The location of J1 and J2 are shown in Figure 5-1, page 5-17.

NOTE: It is recommended that the Punch Command Input line (J1-11) and Punch Logic Return (Signal Ground) line (J1-25) be a twisted pair to eliminate interference in high-noise environments.

2.4.1 TRANSFORMER WIRE CHANGES FOR DIFFERENT AC SUPPLY VOLTAGES

Units are supplied with a transformer which allows any of five input voltages to be used: 100, 115, 127, 220 or 240 VAC, 47-64 Hz. Unless otherwise directed by the customer, all units are wired for 115 VAC.

WARNING

Disconnect the power plug before changing the transformer wire.

If it becomes necessary to use one of the other four voltages, a simple wire change is required. See schematic for power supply, Figure 8-8. To make this change it is necessary to separate the power supply assembly from the chassis. See Section 6.4. Power from the AC plug (hi-line) is routed through F101, to TB1-1, to P15-1 to S1 to P15-2 and back to TB1-5. Change the wire (white) coming from J15, pin 2 at TB1-5 (115 VAC) to TB1-4 for 100 VAC, to TB1-6 for 127 VAC, to TB1-7 for 220 VAC or to TB1-8 for 240 VAC. The white wire is the only one that requires changing. The black wire from fan M1 must remain tied to TB1-5. See Figure 5-1 for TB1 pin location.

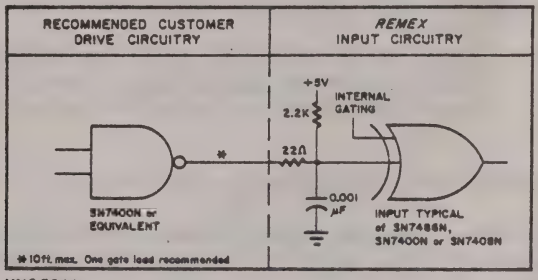
2.5 INTERFACE CIRCUITRY

Figure 2-2 illustrates suggested drive and output circuitry with which to interface with the REMEX circuitry as referenced in Table 3-1. Note the termination network for the output signals. This should be incorporated in the external equipment for maximum noise immunity. See Figures 3-4 and 3-5 for proper timing.

NOTES: All input and output logic signals are defined for positive logic (mode 5) i.e., inactive = 0V and active = +5 V. Therefore, signals that are 0V active (mode 6) are written with a asterisk next to the designation, e.g., Punch System Ready (PSYSRDY*).

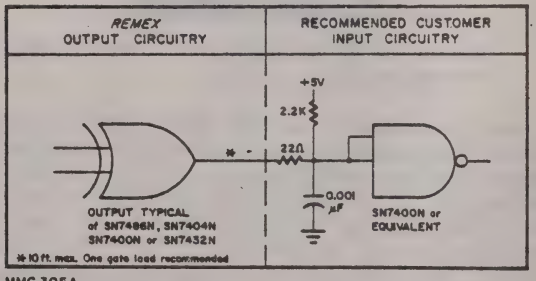
2.6 RAX6120 ADAPTER CABLE

Adapter cable 110364-1 is used when a RAX6120 has replaced a RDF/RDB/RAF/RAB 3075 a RAX6120, or is used with equipment designed for these models. By typing pin 10 to pin 11 on P2 (25 pin connector) the track outputs and the Reader Ready Output will be mode 5. Allowing pin 10 to float puts these outputs in mode 6.



MMC 304A

CIRCUIT A



MMC 305A

CIRCUIT B

Figure 2-2. Recommended Interface Circuitry

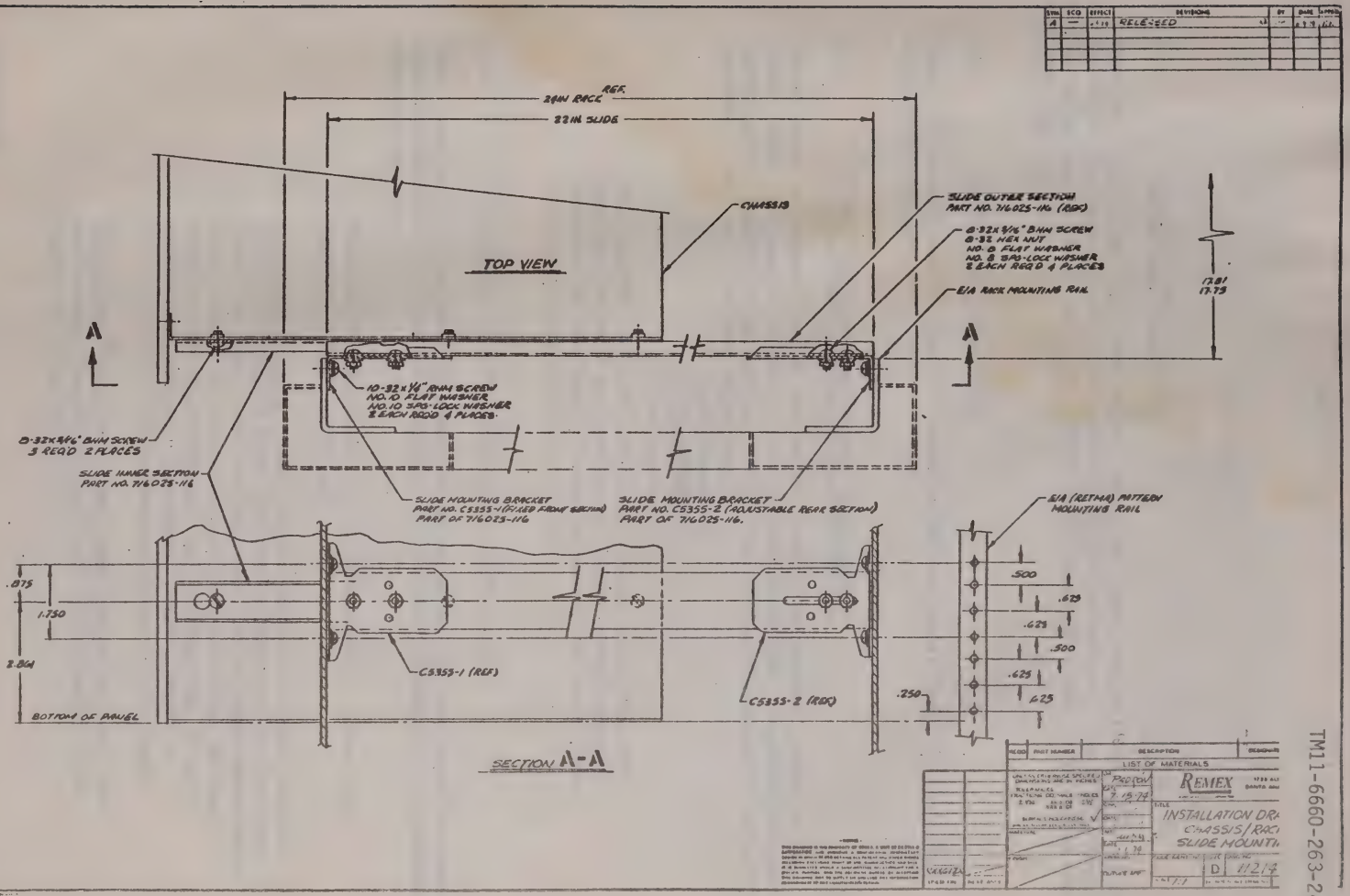


Figure 2-3. Chassis Slide Installation

OPERATION

3.1 INPUT-OUTPUT SIGNALS

Table 3-1 lists the input and output signals which are routed through J1 and J2. The definition and/or usage of these signals are also included in the table. Figure 3-4 shows the timing diagram for the perforator and Figure 3-5 shows the reader timing. Also see Note, Section 2.5.

3.2 CONTROL FUNCTIONS

Table 3-2 lists the operating controls located on the front panel along with their descriptions and functions.

3.3 OPERATING INSTRUCTIONS, PERFORATOR

The following procedures should be used when operating the perforator portion of the system. Refer to Figures 1-1 through 1-3 for location of switches. The reader and perforator portions operate independently, so either the reader or the perforator can be operated or both can be operated at the same time.

CAUTION

When operating the unit, make sure it is elevated sufficiently such that the intake air flow through the fan at the bottom of the unit is not restricted. Damage to the unit will result if sufficient cooling by the fan is impeded.

3.3.1 TAPE LOADING AND THREADING, PERFORATOR

Tape is supplied from the tape deck located at the top of the unit and above the chassis and is threaded through the punch mechanism. The following procedure is recommended when loading tape:

a. Place the POWER switch S1 in its ON position. Power is on when the POWER switch is lit.

b. RAR and RAB Units: Place a spool of tape on the supply reel and thread it through the punch and out the opening in the front panel. Thread the tape so that the supply arm is in the approximate center of its travel. On some units the actuation of either the tape supply switch, S6, or the tape supply error switch, S7 will inhibit tape punching. The threading path is shown in Figure 3-1 and on a decal mounted adjacent to the punch.

RAF Units: Place a box of fanfolded tape on the supply deck and thread it through the punch and out the opening in the front panel. See Figure 3-2.

The threading of the tape through the punch is shown in Figure 3-3. To thread the punch, depress the punch LOAD button. This will rotate the pivot tape guide allowing access to the sprocket. Thread tape under the edge guide assembly through the punch block, over the sprocket and out through the opening in the panel. Close the pivot tape guide.

CAUTION

When operating the unit, make sure it is elevated sufficiently such that the intake air flow through the fan at the bottom of the unit is not restricted. Damage to the unit will result if sufficient cooling by the fan is impeded.

c. Place the FEED/DELETE switch in to the FEED position and verify that tape is advancing properly. The Punch Command line must be held in the false state while feeding with the FEED switch. When starting a new roll of unpunched tape, allow a few feet of feed holes only to be punched so that the sprocket holes engage properly with the sprocket teeth. Under some conditions, especially with stiff tapes, it may be necessary to give a slight tug to start the tape and engage the feed holes. On RAF units, approximately three folds of tape must be placed in the take-up tray so the tape will fold properly. Depress the FEED switch again and verify that tape is folding properly in the take-up tray.

d. Empty the chad bin each time a new box or roll of tape is installed. This is important to prevent chad from backing up into the punch.

To empty the chad box on newer units using the metal chad tube assembly, raise the cover (part of chad tube assembly) to its maximum stop. Tilt plastic chad box away from perforator and remove. To replace, raise cover to maximum stop. Place chad box inside metal enclosure and push cover down through the opening in the plastic chad box. Cover will hold chad box firmly in place.

e. The tape perforator portion may now be operated in one of the three modes described in Sections 3.3.2 through 3.3.4. It is recommended that the punching of fanfolded tapes be limited to 140 feet or less at one time since this is the maximum unattended storage capacity of the fanfold bin on the front panel.

CAUTION

Whenever the punch is operated in mode 5 (especially when the punch is not connected to the normal system, i.e., bench operation), all false level inputs must be tied to 0V (not open circuited). Since most inputs are internally biased to +5V, not tying them to the false (0V) condition in mode 5 could cause erratic operation. Mode 5 systems will not advance tape via the FEED/DELETE switch unless the Punch Command (J1-11) is held low. If the FEED/DELETE switch is activated while the Punch Command is at the true level, the logic will lock up and inhibit all punching. To reset this condition, turn power off and then back on.

f. If this unit is equipped with a duplicator option, refer to Section 3.8 for operating instructions.

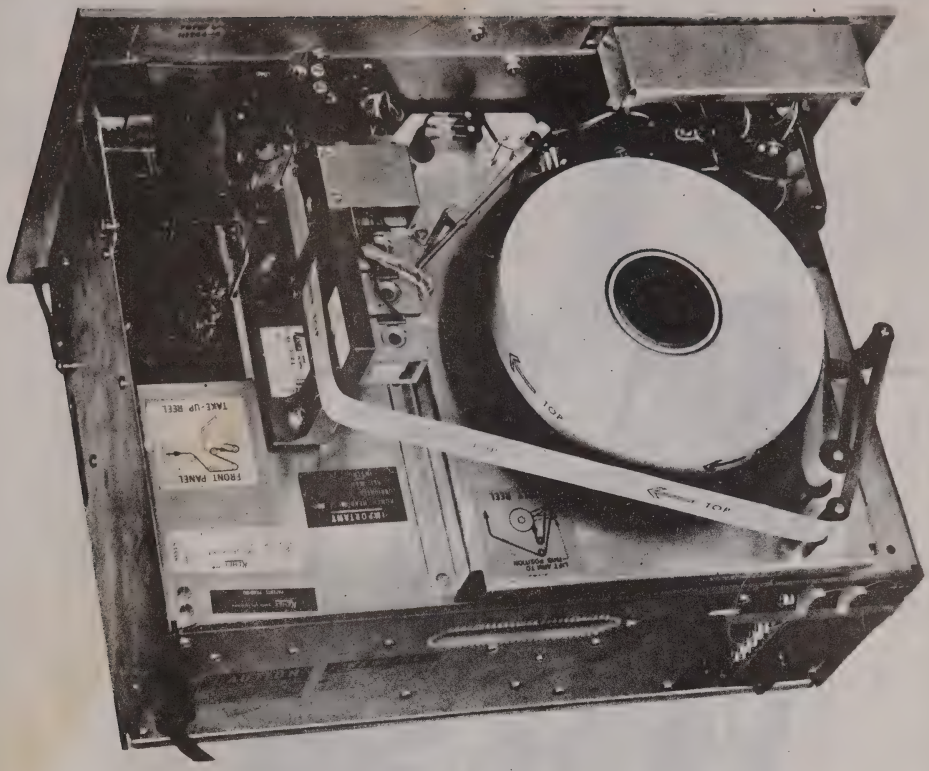


Figure 3-1. Tape Loading, Roll Type Tape

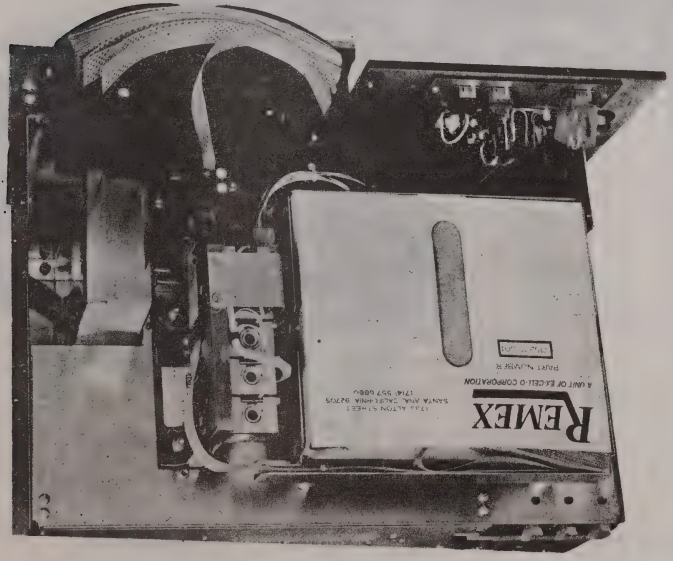


Figure 3-2. Tape Loading, Fanfolded Type Tape

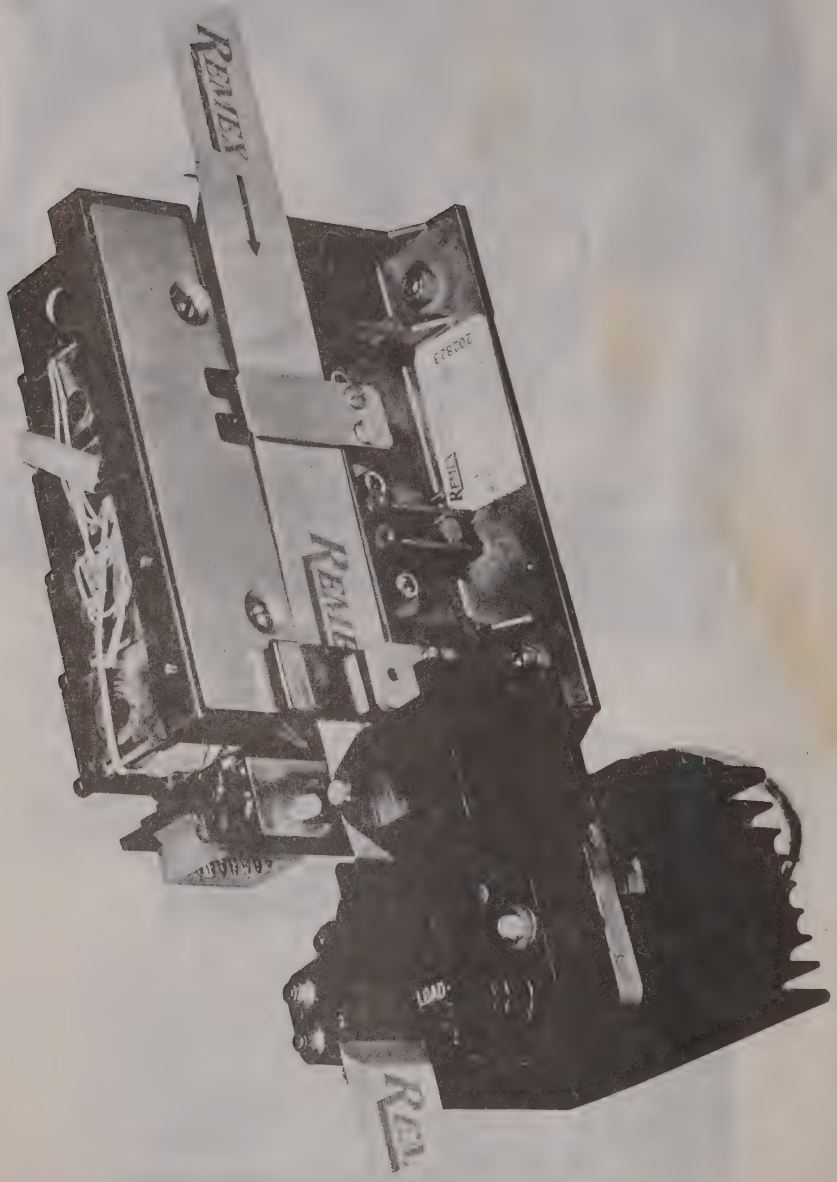


Figure 3-3. Tape Threading Through the Punch Mechanism.

Table 3-1. Interface Signal Descriptions

Connector Pin	Description	I.C. Type Interface See Figure 2-2.	Mode 5 Levels		Mode 6 Levels	
			Inactive Condition	Active Condition	Inactive Condition	Active Condition
	PERFORATOR OPERATION					
J1-1 thru J1-8	Tracks 1-8 Data Input. Active condition causes a hole to be punched for that track when a true punch command is given. Data must be present at the time a punch command is initiated and must remain on the line for 2 μsec. (min.) after the punch command input reaches the true level. Mode selected by J1-14.	A SN7486N	0<V<+0.4 @4.2 mA max. (ext. sink) No Hole	+2.4<V<+5 or open circ. Hole	+2.4<V<+5 or open circ. No Hole	0<V<+0.4 @4.2 mA max. (ext. sink) Hole
J1-10	Direction (DIR) Input. Active condition enables forward tape movement and inactive condition enables reverse tape movement as described in Operating Specifications, Modes of Operation, Table 1-2.	A SN7486N	0<V<+0.4 @9.0 mA max. (ext. sink) Reverse Tape Movement	+2.4<V<+5 or open circ. Forward Tape Movement	NOT SELECTABLE - OPERATES IN MODE 5 ONLY	
J1-11	①Punch Command (PC) Input. Active condition moves tape and initiates punching at up to 120 char/sec. as described in Operating Specifications, Modes of Operation, Table 1-2. This input line is disabled under the following conditions: 1) Punch Ready output is inactive or, 2) Tape Error output is active. Mode selected by J1-14.	A SN7486N	0<V<+0.4 @4.2 mA max. (ext. sink) Tape Stopped	+2.4<V<+5 or open circ. (transition) Tape Advances one row and punches.	+2.4<V<+5 or open circ. Tape Stopped	0<V<+0.4 @4.2 mA max. (transition; ext. sink). Tape advances one row and punches.
J1-12	Punch Ready (PRDY) Output. Active condition indicates unit is ready to accept a punch command. Output is inactive under the following conditions: 1) During advance and punch cycle (approx. 8.33 msec. following a punch command), or 2) Whenever Tape Error output (J1-20) is active. Inactive condition lags punch command by 1 μs maximum. Mode selected by J1-15.	B SN7486N	0<V<+0.4 @TTL fan-out of 10 Perforator Not Ready	+2.4<V<+5 @TTL fan-out of 10 Perforator Ready	+2.4<V<+5 @TTL fan-out of 10 Perforator Not Ready	0<V<+0.4 @TTL fan-out of 10 Perforator Ready
J1-13	System Ready Output (SYSRDY*). Active condition indicates internal voltages have stabilized after power turn on. Inactive condition indicates power is off or internal voltages have not stabilized.	B SN7404N	NOT SELECTABLE - OPERATES IN MODE 6 ONLY		+2.4<V<+5 or open circ. TTL fan-out of 9. Perf System Not Ready	0<V<+0.4 @TTL fan-out of 10. Perf. System Ready
J1-14	Punch Input Mode Select (IMS). Selects Mode 5 or Mode 6 on both Punch Command and Punch Data Input lines.	A SN7486N	+2.4<V +5.0 (or open circuit) Punch Command and Data Input lines operate in Mode 5.		0<V+0.4 @16 ma. max. Punch Command and Data Input lines operate in Mode 6.	
J1-15	Punch Output Mode Select (OMS) Selects Mode 5 or Mode 6 on both Punch Ready and Tape Error Output lines.	A SN7486N	+2.4<V<+5.0 (or open circuit) Punch Ready and Tape Error output lines operate Mode 5.		0<V<+0.4 @5.0 ma. max. Punch Ready and Tape Error output lines operate in Mode 6.	
J1-16, 17	Chassis Ground. Output connection to chassis (isolated from signal ground).					
J1-20	Tape Error (TE) Output. (RAR and RAB only). Active condition indicates tape from supply is loose, broken or tight. Mode selected by J1-15. In perforator system mode XX0 (see Figure 1-8) an active signal disables Punch Command input (J1-11); does not inhibit in mode XX1.	B SN7404N	0<V<+0.4 @TTL fan-out of 9 No Tape Malfunction	+2.4<V<+5 @TTL fan-out of 9 Tape Malfunction	+2.4<V<+5 @TTL fan-out of 9 No Tape Malfunction	0<V<+0.4 @TTL fan-out of 9 Tape Malfunction

① Punch Input line and Signal Ground line (J1-25) must be a twisted pair.

Table 3-1. Interface Signal Descriptions (Continued)

Connector Pin	Description	I.C. Type Interface See Figure 2-2	Mode 5 Levels		Mode 6 Levels	
			Inactive Condition	Active Condition	Inactive Condition	Active Condition
J1-21	Tape Low (TL) Output. Active condition indicates tape supply nearly exhausted. Inactive condition indicates supply is greater than preset low tape level. For informational purposes only; does not affect operation of the system.	B SN7432N	0<V<+0.4 @TTL fan-out of 9 - Tape supply above preset level.	+2.4<V<+5 @TTL fan-out of 9 - Tape Low	NOT SELECTABLE - OPERATES IN MODE 5 ONLY	
J1-18, 23, 25	Signal Ground, 0V signal ground reference for all inputs and outputs (isolated from chassis ground). Tied internally to J2-11, 12, 13, 24.					
AC Plug	AC Power Input. See Input Power Specifications, Table 1-2.					
	READER OPERATION		Active Condition		Inactive Condition	
J2-1 thru J2-8	Data Track Outputs. Active signal indicates data track hole and inactive condition indicates no hole condition. Mode 5 or 6, selectable (see J2-10).	B SN7486N	Mode 5: +2.4<V<+5 @0.2 mA source) Hole (or Data Ready)		Mode 5: 0<V<+0.4 @16 mA (sink) No Hole (or Data Not Ready)	
J2-9	Data Ready Output (DATRDY). Active signal indicates data track outputs are in "on character" condition. Signal active with leading edge of feed hole and remains active until next drive signal is accepted (minimum Data Ready time is 50 μsec). Data Ready signal is forced inactive by a load condition, external inhibit signal or out-of-tape signal. Mode 5 or 6, selectable (see J2-10).	B SN7486N	Mode 6: 0<V<+0.4 @16 mA (sink) Hole (or Data Ready)		Mode 6: +2.4<V<+5 @0.2 mA (source) No Hole (or Data Not Ready)	
J2-10	Reader Output Mode Select. Active drive signal places data outputs and data ready output in Mode 5. Inactive signal places data outputs and data ready output in Mode 6.	A SN7486N	0<V<+0.4 @16 mA max. Data Track & Data Ready signals in Mode 5.		+2.4<V<+5.0 (or open circuit) Data Track & Data Ready signals in Mode 6.	
J2-11 thru J2-13, J2-24	Signal Ground (0V) to External Equipment. 0V ground reference for all inputs and outputs (isolated from chassis ground). Tied internally to J1-18, 23 and 25.					
J2-14	Reader System Ready (RSYSRDY*) Output. Active signal indicates RUN-LOAD Switch is in RUN (reader door closed) and power is on (system ready). Inactive indicates RUN-LOAD switch is in LOAD (reader door open) or if drive signal is accepted and new feed hole is not sensed within 15 ms, indicates either no tape or torn tape and serves as the out-of-tape signal (system not ready).	B SN7400N	0<V<+0.4 @16 mA (sink) System Ready		+2.4<V<+5.0 @0.2 mA (source) System Not Ready	
J2-15	External Inhibit (EXT INH*)Input. Active signal inhibits reader operation and causes RSYSRDY* and Data Ready signals to go inactive. Inactive signal allows reader to operate in normal manner.	A SN7408N	0<V<+0.4 @16 mA (sink) Reader inhibited.		+2.4<V<+5.0 (or open circuit) Reader not externally inhibited.	
J2-16	Drive Right (DR*) Input. Active signal drives tape to right in either continuous mode or asynchronous mode. See Sections 3.3.1 and 3.3.2.	A SN7400N	0<V<+0.4 @ 5.0 mA max. Reader drives tape to right.		+2.4<V<+5.0 (or open circuit) Reader does not drive tape to right.	
J2-17	Drive Left (DR*)Input. Same as drive right except drive to the left.	A SN7400N				
J2-25	Chassis Ground. Output connection to chassis (isolated from signal ground).					

3.3.2 TAPE FEED/DELETE MODE

This mode of operation allows either unit to feed tape through the punch mechanism at approximately 120 cps and punch feed holes only or an all hole delete code.

a. Make sure tape has been threaded into the punch. See Section 3.3.1, steps a through c.

b. Place the POWER switch in the on position.

c. Make sure the Direction input at J1-10 is +5V or open circuit. A OV signal at this pin will cause tape to go in the reverse direction.

d. Place the FEED/DELETE switch into its FEED position to punch tape with feed holes only or into its DELETE position to punch tape with the all hole delete code until the desired amount of tape has been punched.

Table 3-2. Front Panel Controls

Switch	Position	Function
POWER	ON	Applies AC power to unit.
	OFF	Removes AC power from unit.
SPOOL (RAB Units Only)	Momentary On	Operates manual spooler which winds tape counter-clockwise
	OFF	Removes control of spooler.
◁▷	(Momentary)	Causes reader to drive tape to the right.
	(Momentary)	Causes reader to drive tape to the left.
	OFF	Allows reader to be controlled by external signals.
READER LOAD	ON (door open)	Inhibits Reader and applies false signal to RSYSRDY* output at J2-14.
	OFF (door closed)	Allows Reader to operate and applies true signal to RSYSRDY* output at J2-14.
FEED/ DELETE	FEED (Momentary)	Causes punch to feed tape and punch feed holes only, at approximately 170 cps. Data input lines will be inhibited. (Note: The punch command line J1-11 must be held false while operating this switch.)
	DELETE (Momentary)	Same as FEED except enters an all-hole character on each line of the tape.
PERFORATOR STATUS LAMP	Illuminated	Indicates tape supply is nearly exhausted but does not affect punch system operation.

3.3.3 ASYNCHRONOUS FORWARD MODE

In this mode of operation, the unit will punch feed holes and data holes at up to 120 cps in the forward direction under control of input signal lines. See Figure 3-4 for proper timing.

a. Perform Section 3.3.1, steps a through e.

b. Check to see that the Punch Ready Output at J1, pin 12, is in the Ready state, depending upon the mode. See Table 3-1.

c. Check J1-14 to see that the proper signal is present for the desired input mode. Check J1-15 to see that the proper signal is present for the desired output mode. See Table 3-1.

d. Check to see that the PSYSRDY* Output at J1, pin 13, is between OV and +0.4V.

e. Make sure the perforator status lamp is not lighted. If it is lighted it indicates a low supply of tape.

f. Check to see that the Tape Error Output at J1, pin 20, is in the false (No Malfunction) state, depending upon mode. See Table 3-1, J1-20.

g. Apply a forward signal $+2.4 < V < +5.0$ or open circuit to the Direction Input Line at J1, pin 10. Direction input must be stable for 500 nsec., min., before the punch command is given (step h). See Figure 3-4.

h. Apply a true (hole) signal to each pin (J1, pin 1 through J1, pin 8) for the desired tracks to be punched depending upon the mode. See Table 3-1 and and Figure 3-4. Data commands must be present at the time a punch command is initiated (step i) and must remain on the line for 2 usec. (min.) after the punch command input reaches the true level.

i. Apply the true (punch command) signal to J1, pin 11, depending upon the mode. See Table 3-1. Punching is initiated by the leading edge of the Punch Command signal which must be true for 2 usec., min., with a rise time of 1 used., max. The tape will advance one row and punch a feed hole plus those data tracks which are true (step h). The Punch Ready output will remain true for 1 usec max. after Punch Command is given.

j. Repeat steps b through i for each line to be punched.

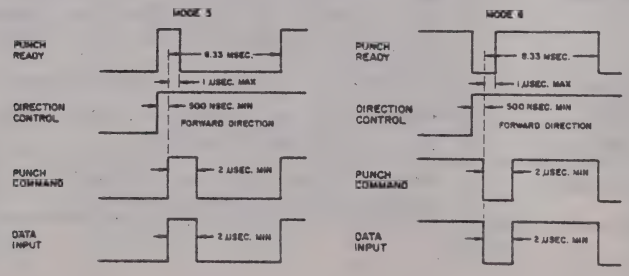


Figure 3-4. Timing Diagram, Perforator Section

3.3.4 ASYNCHRONOUS REVERSE MODE

In this mode of operation, the unit will move tape in the reverse direction under control of input signals up to 120 cps for 10 rows (1 inch), without punching data or feed holes.

a. Perform Section 3.3.1, steps a through e.

b. Check to see that the Punch Ready Output at J1, pin 12 is in the Ready state, depending upon the mode. See Table 3-1.

c. Check J1-14 to see that the proper signal is present for the desired input mode. Check J1-15 to see that the proper signal is present for the desired output mode. See Table 3-1.

d. Check to see that the PSYSRDY* Output at J1, pin 13, is between OV and +0.4V.

e. Make sure the perforator status lamp is not lighted. If it is lighted it indicates a low supply of tape.

f. Check to see that the Tape Error Output at J1, Pin 20, is in the false (No Malfunction) state, depending upon mode. See Table 3-1, J1-20.

g. Apply a reverse signal between OV and +0.4V to the Direction Input line at J1, pin 10. Direction input must be stable for 500 n sec., min., before the punch command is given (step h). See Figure 3-4.

h. Apply the true (punch command) signal to J1, pin 11, depending upon the mode. See Table 3-1. The tape will backspace one row without punching sprocket or data.

i. Repeat steps b through h for each line to be backspaced up to 10 lines (1 inch) maximum.

3.4 OPERATING INSTRUCTIONS, READER

The following procedure should be followed when reading a tape. Refer to Figures 3-5 and 3-6 during the following descriptions.

3.4.1 TAPE LOADING AND THREADING, READER

Use the following procedure when loading tape into the reader:

a. Connect J2-P2 and plug the line cord into the proper AC outlet. See Caution in Section 2.4

b. Depress the power switch. Power is on when the switch is lit.

c. Pull forward and down on the Door Assembly. This will raise the Upper Tape Guide allowing tape to be loaded.

d. Check the number showing on the Tape Guide. If a two sided Tape Guide is supplied and the other width of tape is required, depress and rotate the Tape Guide Latch 180°. The Tape Guide can now be removed and then reinserted with the other guiding edge up. One sided guides, of course, do not need to be removed. The Tape Guide supplied with the unit is coded as part of the model number as indicated in Figure 1-6.

e. Insert the tape as shown in Figure 3-6.

f. Raise the Door Assembly up to its closed position.

g. Make sure the RSYSRDY* output signal at J2-14 is in the true condition, i.e., $0 < V < +0.4$.

h. The reader may now be operated in either of the two modes listed in Sections 3.4.2 and 3.4.3.

i. To unload tape, stop tape movement, lower the Door Assembly and remove the tape.

j. To remove power, depress the POWER switch. The reader lamp will turn off.

3.4.2 TAPE DRIVE, ASYNCHRONOUS MODE

In this mode of operation, the reader is controlled in a line-at-a-time step mode. Each pulse input steps the tape one line. This mode is performed as follows:

a. Perform Section 3.4.1, steps a through g.

b. Apply the step pulse to the drive left (DL*) line, pin 17 of J2, or the drive right (DR*) line, pin 16 of J2 as follows. Make sure the Data Ready signal at pin 9 of J2 is in the true condition depending upon mode and that the (EXTINH)* input signal at J2, pin 15, is false ($+2.4 < V < +5.0$ or open circuited). See Table 3-1 and Figure 3-5.

Stop: $+2.4 < V < 0.4$ @ 5 ma.
Run: $0 < V < +0.4$ @ 5 ma.

The minimum pulse width for the run signal is 1 usec. Pulse to be maintained until Data Ready signal goes false (up to 100 usec., if next pulse is given coincident with Data Ready signal going true). Pulse to be removed within 50 usec. after leading edge of Data Ready signal to stop on that character.

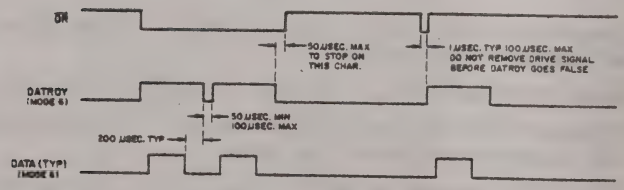


Figure 3-5. Timing Diagram for Reader

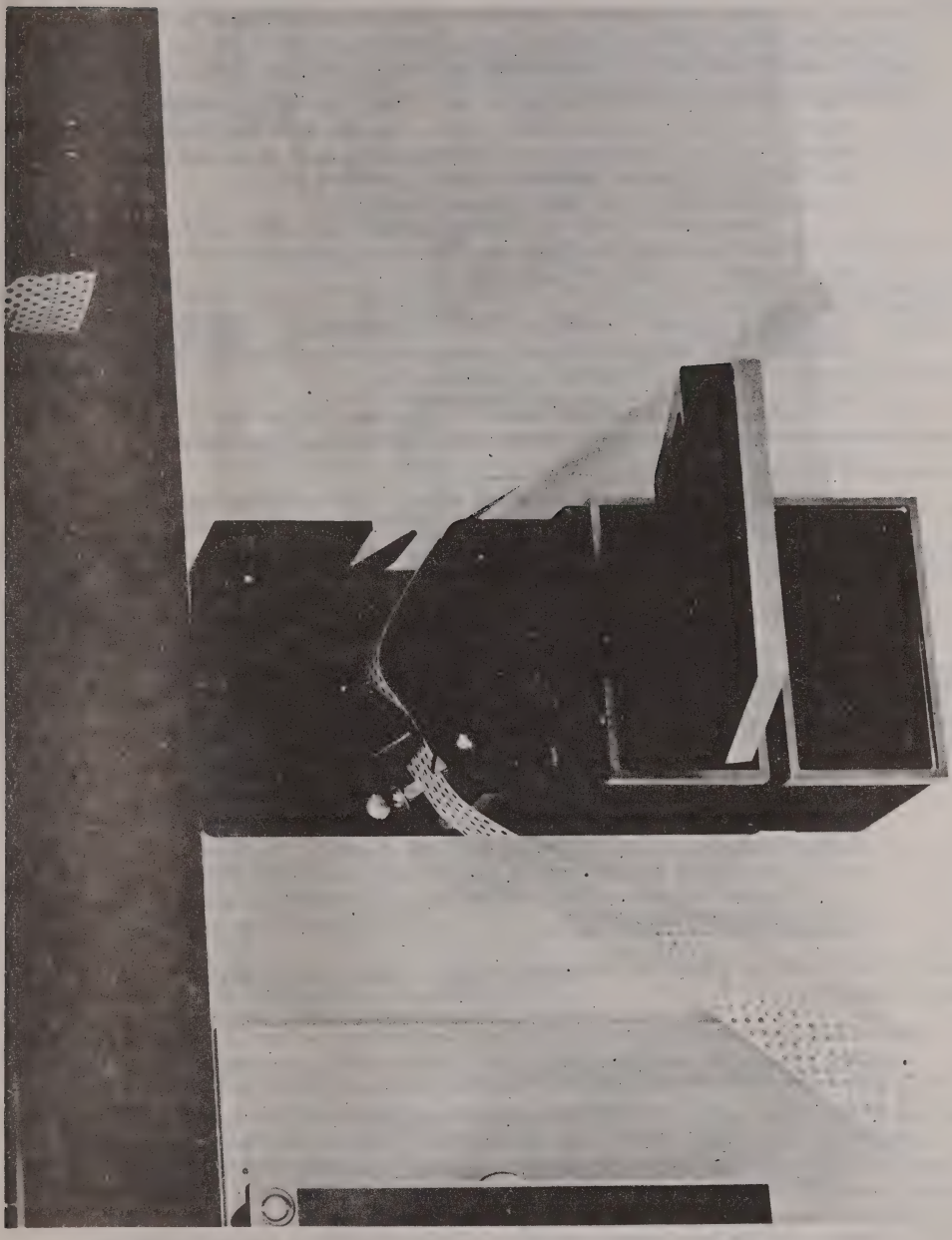


Figure 3-6. Tape Loading, Reader Section

3.4.3 TAPE DRIVE, CONTINUOUS MODE

In this mode of operation, the reader is controlled from an external signal as follows:

a. Perform Section 3.4.1, steps a through g.

b. Apply the drive left (DL*) signal to pin 17 of J2 or the drive right (DR*) signal to pin 16 of J2 as required. Make sure the Data Ready signal at pin 9 of J1 is in the true condition depending upon mode and that the (EXT INH)* input signal at J2, pin 15, is false (+2.4 < V < +5.0 or open circuited). See Table 3-1 and Figure 3-5.

   Stop: +2.4<V< +5.0 (2.2K to +5V) or an open circuit
   Run: 0 < V < +0.4 @ 5 ma.

   Tape will be driven in excess of 300 characters/second. To stop on character, the drive signal must be removed within 50 usec after the leading edge of the Data Ready signal.

c. Only one run signal must be present at one time. If both run signals are present, the reader will drive in the last previously commanded direction.

d. The reader may also be driven either right or left in the continuous mode by the front panel direction switch S10. Operation of this switch in conjunction with external drive signals is not an allowed operating condition and should be avoided.

3.4.4 EXTERNAL INHIBIT

In this mode of operation, the reader is inhibited and the Reader System Ready (RSYSRDY*) output (J2-14) and the Data Ready output (J2-9) are set to the false state. To place the reader in the inhibit mode apply the following signal to pin 15 of J2:

Reader Not Inhibited: +2.4 < V < +5.0 (2K to 5V) or an open circuit

Reader Inhibited: 0 < V < +0.4 @ 5 ma.

3.5 TAPE RECOMMENDATIONS

Table 3-3 lists the tapes REMEX recommends for use. Basic tape specifications are given in Table 1-2.

3.6 OPERATIONAL MAINTENANCE

After every 6 to 8 hours of reader use, the operator should check the tape transport area of the reader for cleanliness. Dirtier environments may require more frequent cleaning of the tape transport area. This is extremely important since any dirt or foreign material covering the readhead can cause readout errors. For general cleaning, use the bristle brush supplied. Cleaning of the photocell assembly is described in Section 5.3.1.1. Make sure the tape remains clean at all times since any residue picked up by the tape can be deposited on the readhead. It has been found in certain cases that

residue picked up by the tape comes from soiled hands. It is important that care be exercised when handling tape especially in machining areas or other areas where grease, oil and sprays are present.

It is important that the chad tray alongside the punch mechanism be emptied periodically to prevent chad from backing up into the punch and creating punching errors. A good practice to follow is to empty the tray when each new roll of tape is installed. See Section 3.3.1, step f.

Table 3-3. Acceptable Tapes

REMEX has found the following tapes acceptable for use on the system.

Type	Manufacturer	Part Number
Paper, Unoiled or oiled (see note) except black carbon filled tapes	REMEX	1000 ft Roll, 715200-002 1000 ft Fanfold, 715200-001
	Paper Manufacturer's Inc.	Perfection Series
	Bemis	Paper Tape Series
	Crown Zellerbach	Paper Tape Series
	Friden	Paper Tape Series
Special Paper (roll only)	Nova Tech	Syntosil Machine Tool Tape
Special Mylar, Paper-Mylar or Polyester (roll only)	Numeridex	2000
	Arvey	RVCZ 60, RVCT 52
	Chase Foster	PMP01151

NOTE: Oiled paper tapes may be used but with more frequent punch cleaning periods. ALSO ACCEPTABLE, BUT WITH REDUCED PUNCH LIFE: Black Carbon Filled Tapes. NOT ACCEPTABLE FOR THIS PUNCH APPLICATION: Mylar-Foil, 2.6 mil, Arvey RVCP23, Numeridex #0500, all vulcanized fiber tapes, Chase Foster MFM-153515 and MFM-103515, and 3M Brand N/C Tape #401 and #301.

3.7 TAPE PREPARATION REQUIREMENTS

Proper tape reader operation requires that the maximum accumulated longitudinal error between feed hole centers in the punched tape be $\pm$ 0.025 inch within any span of 5 inches, as specified in the American National Standards Institute Standard X3. 18-1967 (ANSI: formerly United States of America Standards Institute). In the event a user has, because of punching problems, a number of tapes which do not conform to this specification by an amount consistently out of tolerance, the reader may be set up as in Section 5.7 using one of these tapes rather than the type specified.

A tape gauge is available from REMEX (part number 110597) so that the ±0.025 tolerance specification can be checked. To use the gauge, place the feed hole of one end of a 5 inch span (50 characters) at the single cross hair and swing the other end of the 5 inch span in the arc until one of the cross hairs is centered in the feed hole. Read the measurement adjacent to that cross hair (plus tolerances to the right and minus tolerances to the left). A second 5 inch gauge is printed at the bottom to check both longitudinal and perpendicular transverse center line spacing. A metal tape gauge (part number 103569-4) is also available which will verify the longitudinal tolerance.

3.8 DUPLICATOR OPTION

Units equipped with the -017 or -018 Duplicator Option (see Section 1.6 and Table 1-3) require the following special instructions:

a. To operate the reader/perforator combination in the normal modes, connect the system as indicated in Section 2.4, and operate as described in Section 3.3 and 3.4.

b. To operate the reader/perforator as a duplicator, connect P1 to J1 and P2 to J2 which is part of the harness assembly attached to control switches on the front panel. Load the tape to be duplicated into the reader by performing Section 3.4.1. Depress the DUP switch until the required amount of tape has been duplicated. The punch will duplicate the tape being read in the reader a line at a time.

SECTION IV

THEORY OF OPERATION

4.1 BLOCK DIAGRAM DESCRIPTION

The REMEX tape reader/perforator system performs two basic functions: (1) controls the operation of the RPM 6120 punch mechanism in response to input control signals, and (2) reads small rolls (RAB and RAR units) or fanfolded (RAF units) tapes. Each function is described below in block diagram form and illustrated in Figures 4-1 and 4-2. See also the system schematics, Figures 8-1 through 8-3. Electronic descriptions are given in Section 4.2.

4.1.1 SYSTEM OVERVIEW

Figures 8-1 through 8-3 give the complete signal and card interconnection for the system. All cards and electronically active components are tied to the Master Interconnect Card, Figure 8-4, which routes the various signals. Perforator input signals are applied to J1 on the Perforator Logic card where the timing and logic occurs. The output signals from this card are then routed through the Master Interconnect card to the Perforator Driver card where they are amplified and fused. The routing then returns to the Master Interconnect card and to the punch mechanism.

Reader inputs are applied to J2 on the reader card where the control of the reader occurs. Reader motor drive signals are outputed to the Master Interconnect card which routes them to the reader. All switch operations occuring in the reader are also routed through the Master Interconnect card to the Reader Driver card.

4.1.2 TAPE PERFORATION CONTROL

P.C. Card 111821 (schematic 111822) and 111831 (schematic 111832) are used to operate the punch mechanism by controlling (1) the logic and timing of the perforator and the direction of tape movement and (2) the data logic and solenoid driver amplifiers. Refer to Block Diagram, Figure 4-1.

Proper operation requires that the Direction (DIR) and Data (DATA) inputs be present when the Punch Command (PC) is given. Applying the PC signal triggers the clock pulse one-shot, SS1, which inturn triggers the punch delay one-shot, SS2 and the voltage doubler one-shot, SS7. In addition, SS1, also triggers the Damp Delay (DAMPD) one-shot SS5 and the motor control flip-flops FF9 and FF10. These flip-flops comprise a three stage counter which is advanced one count and causes the sprocket to move to its next position. SS1* output also serves as the data strobe which latches the input data at Z13 and Z18.

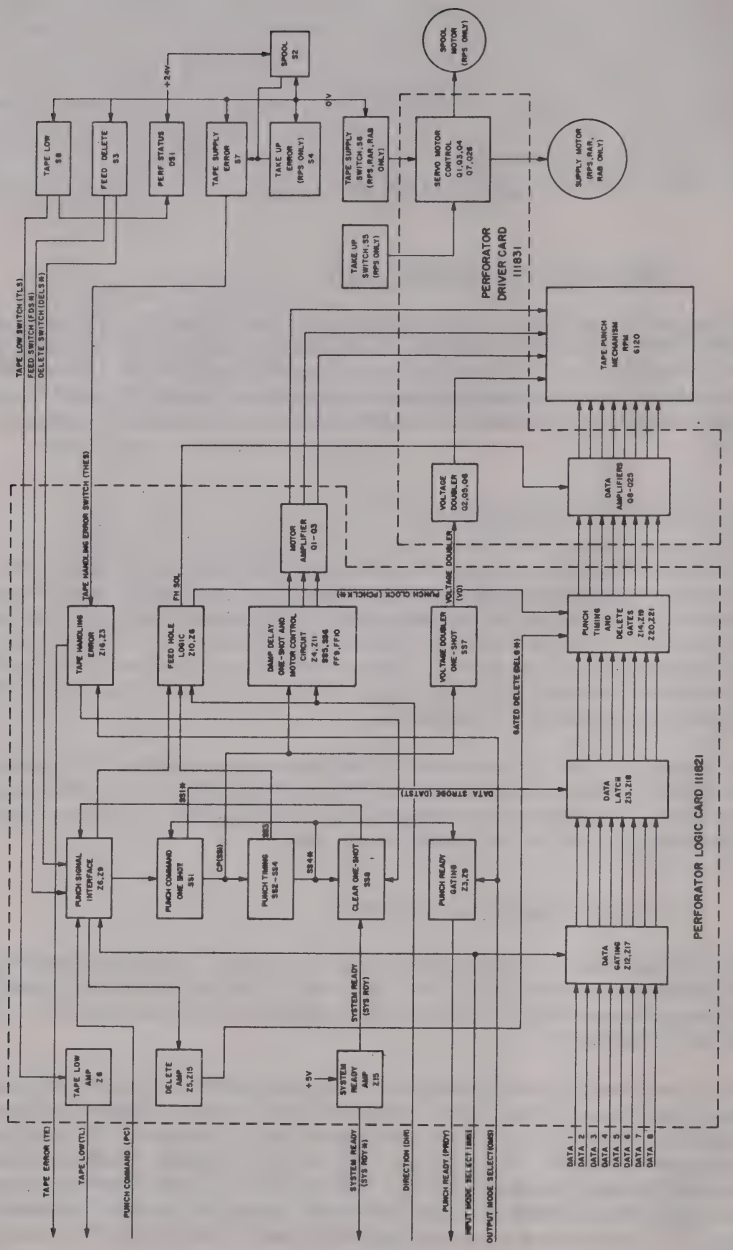


Figure 4-1. Block Diagram, Perforator Section

When SS2 times, the Punch Delay (PD*) signal triggers the Punch Timer (PT) one-shot, SS3, and the Punch Return one-shot, SS4, the PT (SS3) output is used to operate the punch solenoids. At the end of the SS3 time, the solenoids will start their return stroke while SS4 continues to hold the system in the punch cycle (PRDY still in inactive state) until the return stroke is completed. At the end of the SS4 time, the clear one-shot, SS8, is triggered which clears the Feed and Delete circuits in the event they have been set. At this time the Punch Ready (PRDY) output goes to the active level.

Switch S3, FEED/DELETE, provides a second input to the perforator interface logic which also triggers SS1. An identical sequence is produced as previously described for the Punch Command except that in the FEED position, only the feed hole solenoid is energized. In the DELETE position all solenoids will be energized.

Switch S7 (RAR and RAB units only) is provided as a Tape Error (TE) signal at J1-20. This signal is present when a supply error is present (supply tape too loose causing S7 to actuate). On RAR and RAB units, tape supply switch S6 is used as the servo control to unwind tape. S8, Tape Low switch provides an external indication that the amount of tape remaining is below a preset level. This is for informational purposes only and does not affect the operation of the system.

4.1.3 READER BLOCK DIAGRAM DESCRIPTION

Reader Card 110801 performs two basic functions: (1) it drives tape in either direction over the read station and (2) converts the tape information into electrical signals. These two functions are shown in block diagram form in Figure 4-2. The electronic details are described in Section 4.2.3.

The drive system consists of a four phase stepping motor which is directly coupled to the sprocket drive wheel. Two phases of the motor are energized at a time in a sequence which advances the sprocket and tape one line either to the left or right depending upon the sequence order of the phases. The tape then stops on character and waits for the energizing of the next two motor phases.

The required motor phase signals are generated in response to the drive inputs. A OV active drive signal or step pulse applied to the Drive Left (DL*) or Drive Right (DR*) input line or a drive command from the SLEW switch, S10, will set the direction memory, Z8, to the desired state and will generate the first system clock pulse, CP. The input signal also establishes the direction of rotation for the motor through the motor phase control circuit. The CP is used to advance the motor control circuit which steps the motor. A 1.5 ms singleshot, SS2, is also triggered by the CP so that any initial jitter in the sprocket is locked out as the sprocket goes off character.

When the next sprocket hole is read (approximately 3 ms. after the drive command), the Sprocket Sensing flip-flop FF2 is set which (1) latches up the data (through FF2* and the Data Ready line) and (2) triggers the 75 us single-shot, SS3. This allows the external equipment approximately 75 us (specified as 50 us max) to examine data and make the stop-go decision.

An additional function performed by the CP signal is to trigger the 15 ms delay SS4. This is a retriggerable type single-shot which is recycled by each CP pulse. SS4 is used to program the step motor supply voltage, VMOT, up and down in order to reduce the

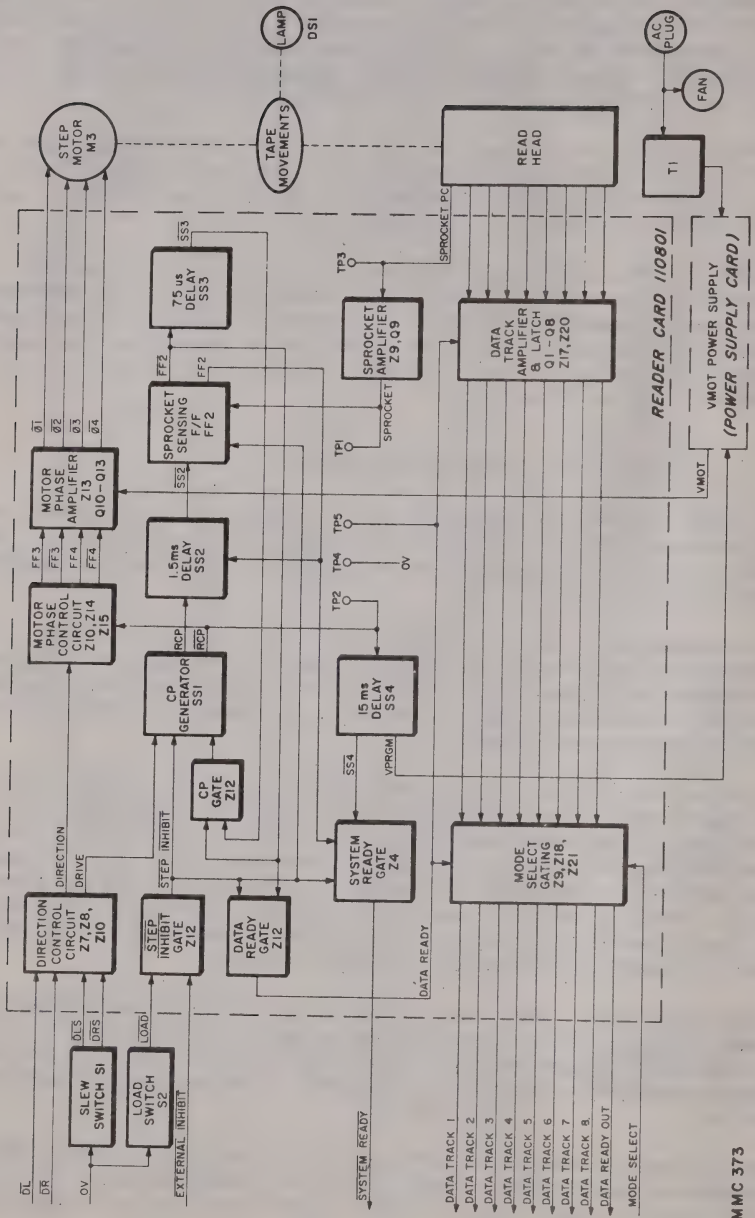
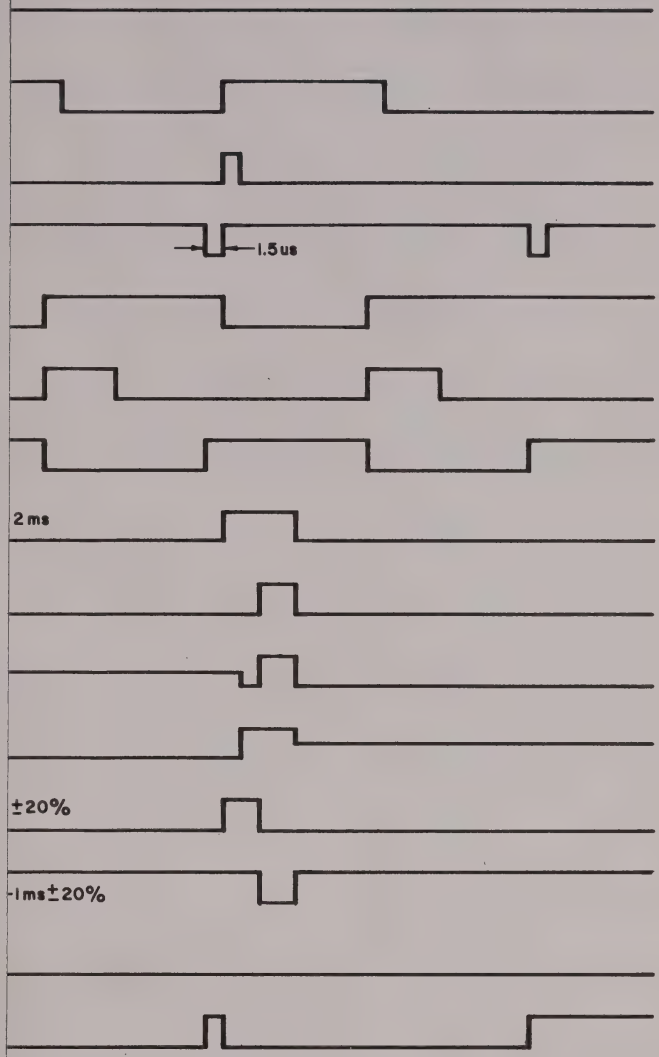


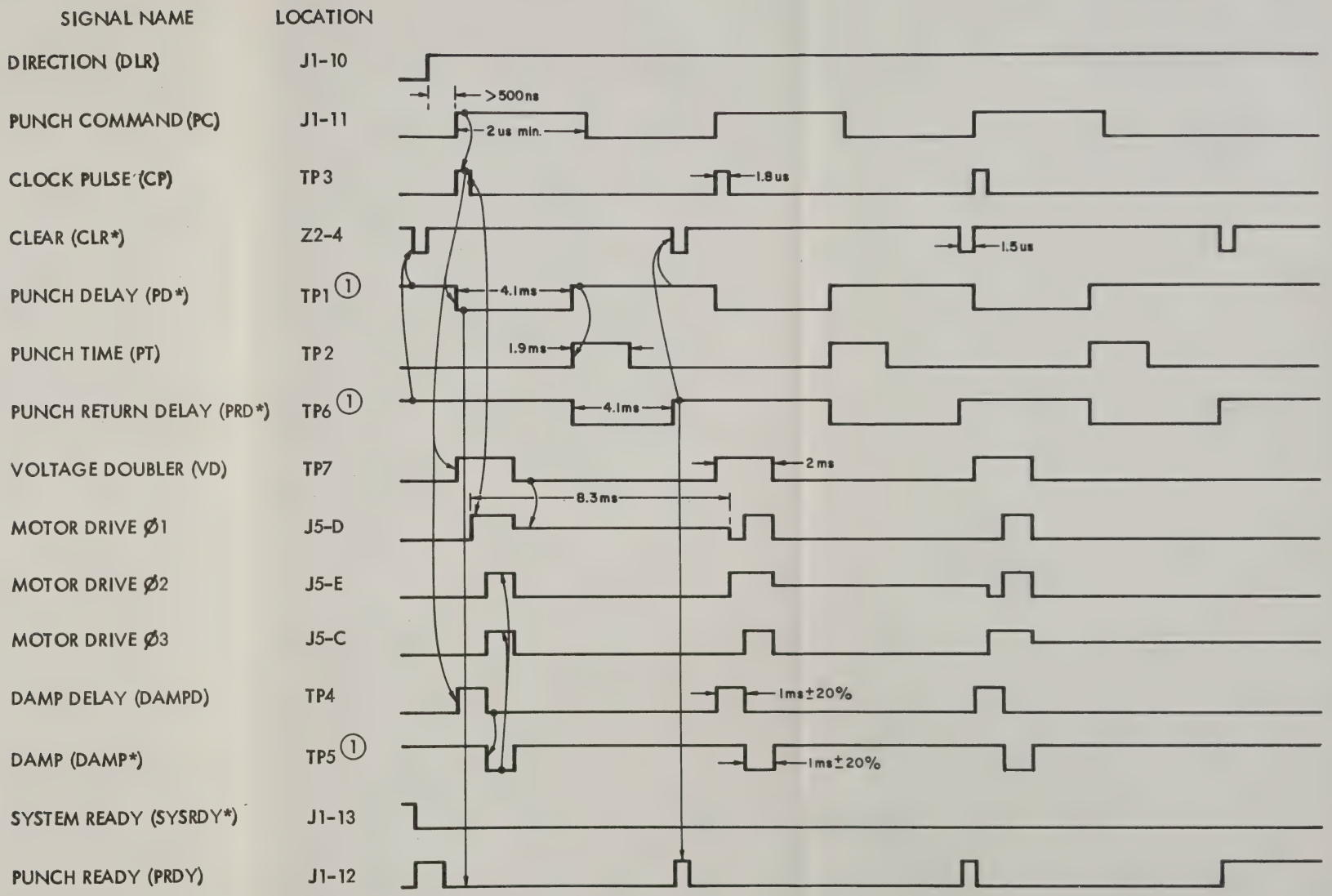
Figure 4-2. Block Diagram, Reader Section

motor power dissipation during inactive periods. In addition, if no new sprocket is sensed (i.e., FF2 is not triggered) during the 15 ms, the Reader System Ready (RSYSRDY)* signal goes false indicating the reader is at the end of tape (EOT) or broken tape.

The CP generator is inhibited by either the LOAD switch or a true OV (External Inhibit)* signal. Either signal generates the (Step Inhibit)* signal which clears and locks up SS1 and FF2, inhibits the Data Ready signal and places the (System Ready)* in the inactive condition (system not ready).

The readhead is located under the fiber optics and contains photovoltaic cells which are used to sense the tape perforations. As tape is advanced over the readhead by the sprocket drive, the photovoltaic cells are energized by the light source when the corresponding holes are present in the tape. The outputs from the readhead are then applied to the data track amplifiers and latch circuits on the card. A true, +5V, Data Ready signal locks up the two latch circuits, Z17 and Z20 storing that line of data and causing the Data Ready output signal to go true. The outputs of the latch circuits are applied to the Mode Select gates which produces either mode 5 or 6 outputs depending upon the mode selection made at the reader output select line.


1.5us
2ms
±20%
-1ms±20%



① These test points show the inversion of the signal given in the waveform.

MMC 571

Figure 4-3. Perforator Logic Timing Diagram

4.2 CIRCUIT DESCRIPTIONS

This section describes the theory of operation and electronic details of the two circuit cards used in the tape perforator system.

4.2.1 PERFORATOR LOGIC CARD 111821

The logic card is used to control the punch timing and logic of the punch mechanism motor and solenoids. Punching is accomplished by using the following inputs: (1) the external Punch Command, Direction and Data Input signals, (2) the FEED switch to punch feed holes only, or (3) the Delete switch to punch the all hole delete code on the tape. In addition this card generates four output signals: (1) Tape Error, (2) Tape Low, (3) (Punch System Ready)*, and (4) Punch Ready. During the following discussion, refer to Figure 4-3 which shows the waveforms at selected points on the Perforation Logic Card. Figure 8-5 contains the schematic for this card.

Mode selection is accomplished by applying OV or +5V to J1-14 for the mode selection of the Punch Command and Data Inputs and to J1-15 for the mode selection of the Ready and Tape Error outputs. OV at these pins selects mode 5 (+5V active) while +5V selects mode 6 (0V active). A jumper is added between terminals G and H if it is required that the Tape Handling Error inhibit the punch ready signal (card assembly 111821-1). The jumper is removed if the inhibiting feature is not required (card assembly 111821-2).

4.2.1.1 Punch Command Control

Before the Punch Command (PC) input signal can be applied, the following signals must be present as described in Sections 3.3.3 and 3.3.4: (1) the Punch Ready (PRDY) and the Punch System Ready (SYSRDY*) signals at J1-12 and J1-13 must be active indicating the punch is cleared and ready to accept data, (2) a +5V Direction signal (for forward direction) at J1-10, (3) the desired Data input signals at J1-1 through J1-8 and (4) the FEED/DELETE switch must be off. See Table 3-1 for the voltage levels of the input signals corresponding to the particular mode being used.

Applying the PC signal to J1-11 produces a +5V signal at Z9-3 since the active level of the PC signal is of the opposite polarity to that of the input mode select signal at Z9-2. See Figure 8-5. As Z9-3 and Z6-13 go to +5V, Z6-11 (Punch Start, PSTRT) also goes to +5V which triggers the Clock Pulse (CP) one-shot, SS1. The CP* (SS1*) signal is inverted at Z15-12 and is used as the Data Store Pulse (DATST) to lock the input data latches at Z13 and Z18. The CP (SS1) output is used to per form the following functions: (1) at Z6-2 it is used to hold the clear input (Z2-11) at +5V until SS1 times out, (2) to trigger the Punch Delay (PD) one-shot, SS2, (3) to trigger the Voltage Doubler (VD) one-shot, SS7, (4) to trigger the Damp Delay (DAMPD) one-shot, SS5 and (5) to advance the motor phase counter, FF9 and FF10, by one. Each of these is discussed in detail in subsequent paragraphs.

The Punch Delay time (4.1 ms) is required to step the punch motor to advance the motor to the next character in preparation for the punch cycle. Flip-flops FF9 and FF10 are connected through Z9 and Z10 to form a three state counter which determines the energizing sequence of the punch step motor windings ϕ 1, ϕ2 and ϕ3. The direction of counting is determined by the Direction (DIR) line which places Z9-5 and Z9-13 at +5V for the forward direction (ϕ1, ϕ2 and then ϕ3 energizing sequence) or 0V for reverse direction (ϕ1, ϕ3 and then ϕ2 energizing sequence). The outputs of

FF9 and FF10 are gated at Z7 and Z10 with the Damp (DAMP*) signal to cause Q1, Q2 or Q3 to turn on depending upon the state of the counter. The DAMP signal is generated approximately 1 ms after the step has started. When the DAMP D signal (SS5) has timed out, the DAMP* turns on all three motor phases, for 1 ms, which minimizes the oscillations in the motor. At the same time the motor counter is updated, SS7 is triggered causing the VD and VD* outputs to turn on the voltage doubler circuit contained on the Perforator Driver card. This circuit generates a 70V, 2 ms pulse which is applied as the motor supply voltage to increase the acceleration rate.

When SS2 times out, the positive going edge of SS2* triggers SS3 and SS4. The Punch Time (PT) signal from SS3 is gated at Z10-4 with the DIR signal. If the direction signal is +5V (forward), Z10-6 is switched to 0V which energizes the feed hole solenoid through Z15-8 and Q17 and Q8 on the Perforator Driver card. A 0V DIR signal signal causes Z10-6 to remain at +5V and no FH to be punched. The 0V active signal at Z10-6 is gated with an inverted 0V signal from Z5-11 (tape feed switch inactive), causing a 0V active Punch Clock (PCHCLK*) output at Z6-8. This signal is used by the data gates Z20 and Z21 to activate those solenoids which have their data lines active during SS3. When the feed switch is activated, Z6-10 is +5V, causing Z6-8 to remain at +5V, thereby inhibiting data. The pulse width of SS3 is set to 1.9 ms when punching all holes and is adjusted by R17. SS3 time will vary between 1.6 ms when punching FH only and 1.9 ms when punching all holes.

SS4 time is set by R21 for a 4.1 ms time period which is approximately twice the time of SS3. This extra time is inserted to make sure the punch pins have returned and that the system is ready for the next punch command. When SS4 times out, the positive going SS4* signal is gated at Z3-13 causing Z3-11 and Z3-1 to rise to +5V (SS2 at Z3-12 is already at +5V). This causes Z3-3 to go to +5V which triggers the Clear (CLR) one-shot, SS8. The CLR output is used to unlatch the feed and delete circuits as described later. The punch ready output at Z9-8 then becomes active (0V or +5V depending upon the selected output mode) and indicates to the external equipment that the Punch System is ready for the next PC input. The logic card allows the mode of the PRDY and TE outputs to be selected by applying +5V (or open circuit) to J1-15 for mode 5 or 0V for mode 6 when B and C are jumpered (normal condition). Inverted output logic can be obtained by jumpering A to C.

4.2.1.2 FEED/DELETE Switch Operation

Placing the FEED/DELETE switch into the FEED position generates almost the same sequence as described for the PC input. Actuation of the FEED switch places 0V at Z5-12 which sets the flip-flop composed of Z5 pins 11-13 and Z5 pins 1-3 and places 0V at Z10-2. This, in turn, causes both Z10-3 and Z6-11 to rise to +5V which triggers SS1. The same sequence as described for the PC signal occurs except only the feed hole is punched since the +5V signal at Z6-10 inhibits the PCHCLK* signal. When SS4 has timed out and Z3-1 goes to +5V, Z3-3 also rises to +5V which triggers SS8. The resulting 0V CLR* pulse at Z5-2 resets the feed flip-flop. The cycle is then repeated, providing the FEED switch is still actuated. It is necessary when using the FEED or DELETE switch that the Direction input at J1-10 be +5V or open circuit to be able to feed the tape in the forward direction.

The DELETE switch is provided as a means of placing an all hole code on the tape manually. Actuating the DELETE places 0V at Z5-9 which sets the flip-flop composed of Z5, pins 4-10 and places 0V at Z5-6. This, in turn, causes both Z10-3 and Z6-11

to rise to +5V which triggers SS1. In addition, the +5V signal at Z5-8 is inverted at Z15-6 and applied to the data logic, Z14 and Z19, causing all holes to be punched. When SS4 has timed out causing Z3-1 to go positive, Z3-3 goes to +5V which triggers SS8. This places a 0V 1.5 us pulse at Z5-5 which resets the delete flip-flop. If the DELETE switch is still actuated, the cycle is repeated. It is necessary when using the DELETE switch that DIR at J1-10 be +5V or open circuit to place the FF9-FF10 counter in the forward sequence of operation.

4.2.1.3 (System Ready)* Signal Description

The System Ready (SYSRDY*) signal indicates that the system's voltages have reached the proper operating levels. When power is first turned on, C10 begins charging and continues charging until it reaches the level sufficient to switch the SYSRDY* output at Z15-2 to 0V. Before this level of voltage is reached, the SYSRDY signal at Z15-10 begins at 0V and is applied to the clear input of FF9 and FF10 to set the counter to zero. It also applied to Z5-2 and Z5-5 through Z3, pins 5 and 6 to place the feed and delete flip-flops in their reset states. SS8 is also inhibited during this period of time. After C10 charges to a sufficient level, SYSRDY switches to +5V which enables SS8, FF9, FF8 and the feed and delete flip-flops.

4.2.1.4 Tape Handling Error Description

The Tape Handling Error Signal (THES) at its input (Z16-10) is normally 0V. Activation of S7 removes the 0V signal which places the Tape Error (TE) output at J1-20 at +5V for mode 5 or 0V for mode 6. Optional mode jumpers for inverted mode selection are provided as discussed previously in Section 4.2.1.1. On systems requiring that the Tape Handling Error inhibit the PRDY output, the 0V signal at Z16-8 is applied to Z3-2 through jumpered terminals G and H. The resulting 0V output at Z3-3 places the PRDY signal at 0V and resets and holds SS1 in the cleared state. Systems which do not require the THE signal inhibit operation have the jumper between G and H removed.

4.2.1.5 Tape Low Signal Description

The Tape Low Signal (TLS) is normally 0V when tape supply is sufficient. When the tape roll drops below a preset level (approximately 100 ft. remaining), S8 on the tape deck opens and removes the 0V signal from Z6-4 and 5, causing Z6-6 and J1-21 to go to +5V. In addition, the actuation of S8 applies 0V to J8/P8-5 causing the Perforator Status Lamp (PERF STATUS) to lite.

4.2.1.6 Data Logic Control

Data to be punched is applied to J1, pins 1-8. The Input Mode Signal (IMS) at J1-14 allows the mode of the Data and PC inputs to be selected by applying +5V (or open circuit) to J1-14 for mode 5 or 0V for mode 6 during normal operation (terminals E and F are jumpered). Inverted mode selection is accomplished by jumpering D to F. Because the operation of all eight tracks are identical, only Track 1 will be used in this discussion. Applying the active data 1 signal to Z12-5 switches Z12-6 to +5V since Z12-4 is the opposite polarity to that of the required true data signal. The input to latch Z13, then, is always +5V for an active data input, regardless of the mode. Latch Z13 stores the input information at input 1D and transfers it to the output 1Q* at DATST time (see

Section 4.2.1.1). The 1Q* output will follow the data input at 1D as long as DATST remains high (approximately 1.7 us). When DATST goes to 0V, the information is retained at 1Q* until DATST again goes high. Thus with +5V at Z13-2, the output at Z13-1 will be 0V and remain 0V until DATST drops to 0V and clocks in the new input data. DATST occurs simultaneously with CP at Z2-5. It is therefore important that the Data input be stable at the time DATST falls (approximately 1.5 usec after the leading edge of CP).

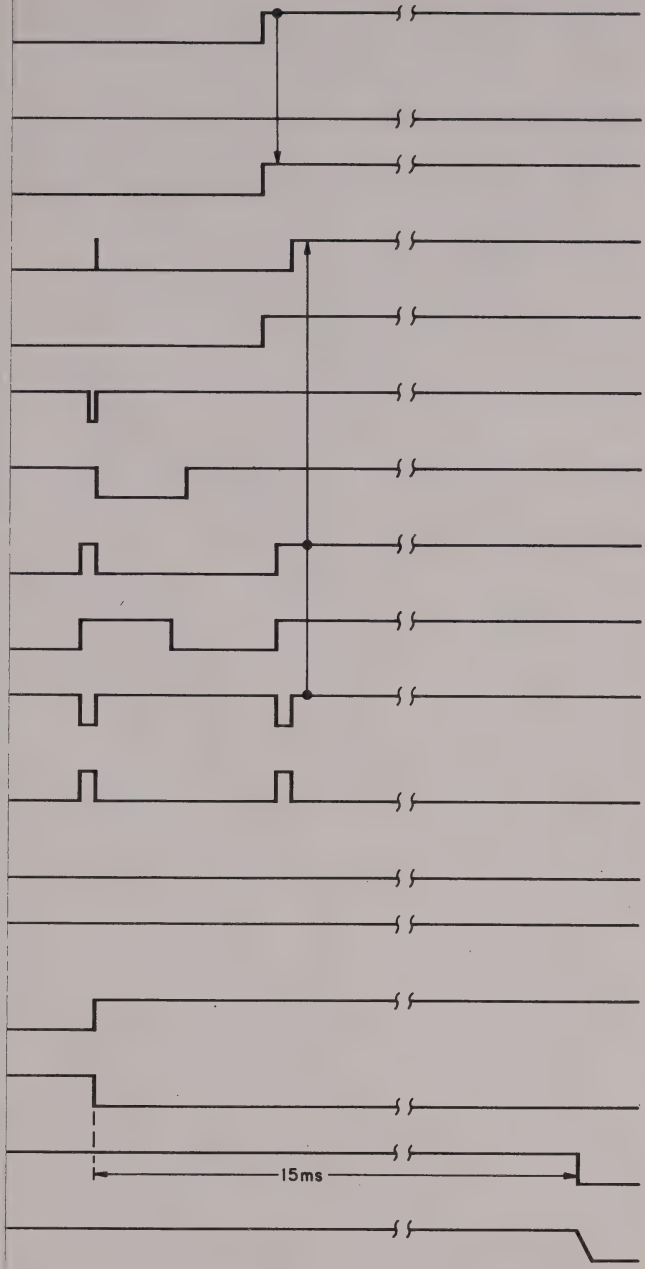
During the SS3 time period, the 0V PCHCLK* is generated (See Section 4.2.1.1) and applied to Z20-3 for track 1. If data track 1 is active, Z14-6 will be 0V causing Z20-1 to go positive. This turns on data track 1 solenoid amplifier (on the Perforator Driver Card; See Section 4.2.2) and punches track 1.

4.2.2 PERFORATOR DRIVER CARD

The Perforator Driver Card, 111831 contains the driver solenoid amplifiers, the Voltage Doubler circuit for the perforator stepper motor, and the supply voltages for the tape supply and take-up motor. Refer to Figure 8-6 for the schematic for this card. As described in Section 4.2.1.1, during the SS7 (VD) one-shot time a 70V, 2 ms pulse is applied to the perforator step motor to increase the acceleration rate. The VD and VD* signals are applied to the Perforator Driver card and cause Q5 to turn off and Q6 to turn on. This places C7 in series with the +35V supply and the step motor (VD OUT) for approximately 2 ms causing VD OUT to rise to 70V as shown on the waveform for TP2 in Figure 8-6.

Amplifiers Q8-Q25 are used to operate the nine punch solenoids. As described in Section 4.2.1.6, a +5V signal represents the active state for a punch solenoid. Illustratine track 1, a +5V applied to P4-H turns both Q18 and Q9 on which energizes punch solenoid 1.

Q4 is used only on the RAR and RAB systems and is turned on by a +28V signal from S5 when tape take-up is required (S5 deactuated). The tape supply circuity is used only on the RAR and RAB systems and operated by switch S6. When S6 is actuated (N.O. closed), it indicates tape is too tight (arm rotated too far clockwise) and requires that the supply reel be unwound. This transfers 0V from S6-N.C. to S6-N.O. which turns on Q1 and supplies +12V through R3 to the Tape Supply Motor. Tape is unwound and the spring loaded arm follows the tape in a counter clockwise direction. When enough tape is supplied S6 deactuates and transfers 0V to the N.C. contact. This triggers the Brake (BRK) single-shot SS9 which causes Z1-1 to go to 0V. The 65 to 95 ms, 0V signal is inverted by current amplifier Q26 which operates into level shifter Q7. The collector of Q7 switches to 0V which turns on Q3. A-12V is thereby supplied to the motor as a reverse voltage, causing the tape supply platter to decelerate.


15ms

Section 4.2.1.1). The 1Q* output will follow the data input at 1D as long as DATST remains high (approximately 1.7 us). When DATST goes to 0V, the information is retained at 1Q* until DATST again goes high. Thus with +5V at Z13-2, the output at Z13-1 will be 0V and remain 0V until DATST drops to 0V and clocks in the new input data. DATST occurs simultaneously with CP at Z2-5. It is therefore important that the Data input be stable at the time DATST falls (approximately 1.5 usec after the leading edge of CP).

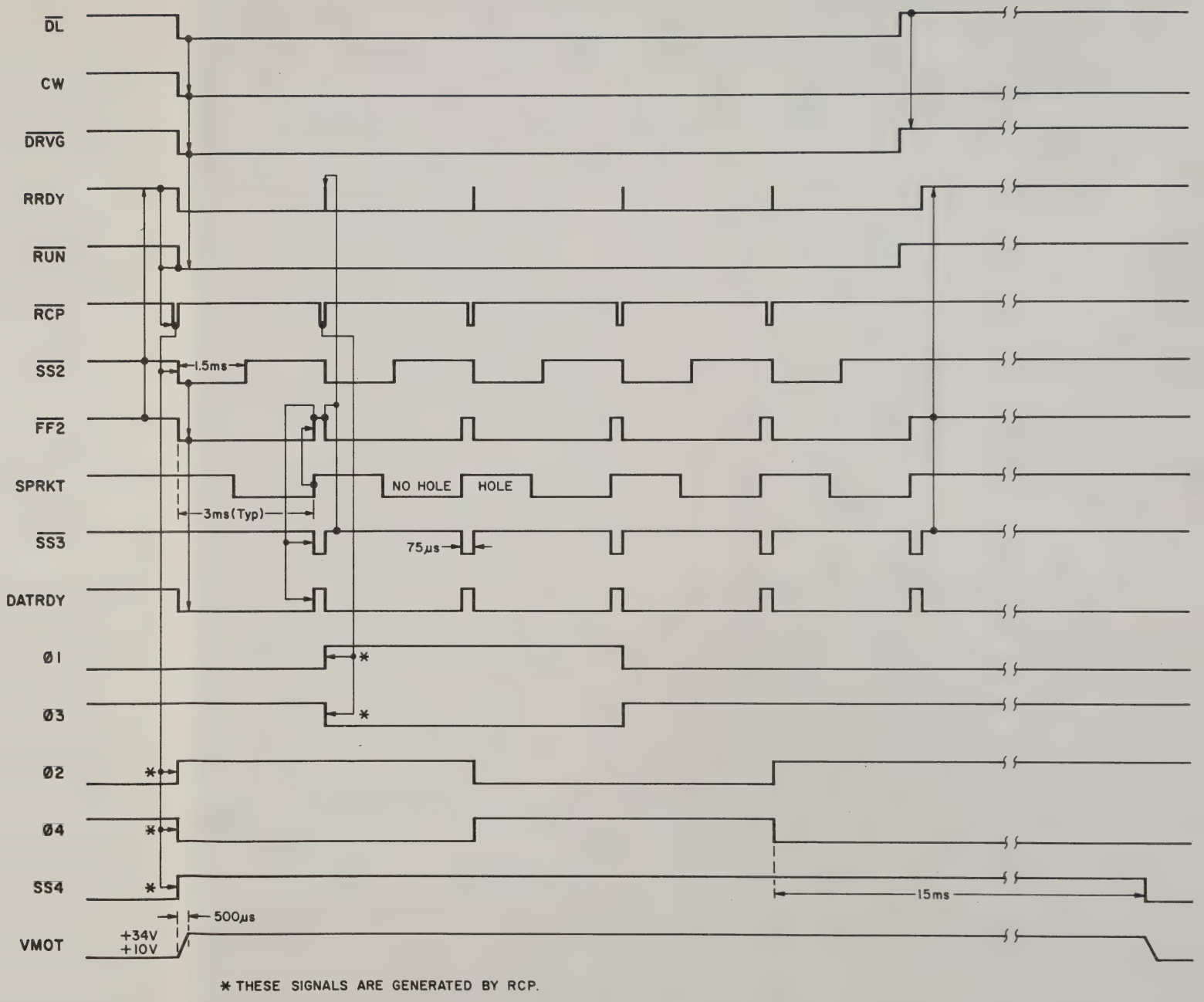
During the SS3 time period, the 0V PCHCLK* is generated (See Section 4.2.1.1) and applied to Z20-3 for track 1. If data track 1 is active, Z14-6 will be 0V causing Z20-1 to go positive. This turns on data track 1 solenoid amplifier (on the Perforator Driver Card; See Section 4.2.2) and punches track 1.

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Q4 is used only on the RAR and RAB systems and is turned on by a +28V signal from S5 when tape take-up is required (S5 deactuated). The tape supply circuity is used only on the RAR and RAB systems and operated by switch S6. When S6 is actuated (N.O. closed), it indicates tape is too tight (arm rotated too far clockwise) and requires that the supply reel be unwound. This transfers 0V from S6-N.C. to S6-N.O. which turns on Q1 and supplies +12V through R3 to the Tape Supply Motor. Tape is unwound and the spring loaded arm follows the tape in a counter clockwise direction. When enough tape is supplied S6 deactuates and transfers 0V to the N.C. contact. This triggers the Brake (BRK) single-shot SS9 which causes Z1-1 to go to 0V. The 65 to 95 ms, 0V signal is inverted by current amplifier Q26 which operates into level shifter Q7. The collector of Q7 switches to 0V which turns on Q3. A-12V is thereby supplied to the motor as a reverse voltage, causing the tape supply platter to decelerate.



MMC 380

Figure 4-4. Timing Diagram, Reader Card 110801.

4.2.3 READER CARD 110801

This card is used (1) to generate outputs to drive the four phases of the stepping motor in response to the drive inputs, (2) and to provide amplification and gating of the read-head outputs. Refer to the Schematic Figure 8-7, sheets 1 and 2 during this discussion.

4.2.3.1 Drive Circuits

Normal operations begin with the loading of the tape. Opening the Door Mechanism Assembly actuates S9. This applies OV to pin 10 of Z12 causing Z12-8 (the Step Inhibit line, STPINH*) to drop to its OV active state. See Figure 8-7, sheet 1. The STPINH* line performs four functions: (1) it clears and inhibits single-shot SS1, thereby preventing any drive signal from being recognized, (2) it clears and inhibits flip-flop FF2, thereby preventing any sprocket from being recognized, (3) it places the Data Ready (DATRDY) line at Z12-11 in the OV state and (4) it places the System Ready (SYSRDY*) output at J2-14 in the +5V inactive state (not ready). Note also that a OV External Inhibit (EXTINH*) signal applied to J2-15 will also generate these same four conditions.

After tape has been loaded, the Door Mechanism Assembly is closed and the inhibit effects of S9 are removed allowing the drive signals to be applied. During the following description, refer to Figure 4-4 which shows the waveforms and timing diagrams for the drive and step operations. This figure is intended as a guide to show the sequence of events and which signals initiate other signals. It must be cautioned that due to the wide range of pulse widths, no attempt has been made to draw the time axis to scale. Refer also the the schematic, Figure 8-7, sheet 1 during this description.

With the reader stopped on character, the sprocket signal (TP1) is +5V placing the FF2* signal and, in turn, the Data Ready (DATRDY) signals at +5V. This indicates the reader is ready to accept the next command. Applying a 0V Drive Left (DL*) signal at J1, pin 17, sets the direction flip-flop composed of Z8, pins 8-13, which places the CCW line at +5V. The following sequence of events occurs: DCCW* at Z8-3 drops to 0V, DRV at Z10-6 rises to +5V DRVG* at Z10-3 goes to 0V and because pin 2 of Z11 is tied to +5V for the -1 and -3 assemblies, the RUN* signal at pin 3 of Z11 is 0V. In addition, the Reader Ready Line (RRDY) at Z5-10 is +5V due to both SS3* and FF2* being at +5V. When Z11-3 drops to 0V, single-shot SS1 is triggered producing the Reader Clock Pulse (RCP) and its inverted signal RCP* (TP2) (approximately 1 μs width). The RCP* signal is used two places: (1) to trigger the two motor phase control flip-flops FF3 and FF4 and (2) to trigger the programmed voltage single-shot SS4. RCP is used to trigger the 1.5 ms single-shot SS2.

Single-shot output SS2 sets the FF2 flip-flop causing the Sprocket signal to be locked out for 1.5 ms. Since FF2* is held at 0V, any noise or start-up jitter from the sprocket signal is prevented from generating a true Data Ready signal. At the end of the 1.5 ms period, FF2 is released. By this time, the tape is up to speed and the only signal available to reset FF2 is the positive-going sprocket signal.

Flip-flops FF3 and FF4 are gated with Z15 to energize the phase windings of the motors in the desired sequence. The order in which the windings are energized is determined by the direction line at Z9, pin 8 which places 0V at pin 13 of Z15 for drive right or +5V for drive left. Outputs FF3, FF3*, FF4 and FF4* are connected through Z13 in such a manner that two phase (Ø)* lines are true (0V) at a time. The sequencing order for drive left is. Ø1* and Ø4*, Ø4* and Ø3*, Ø3* and Ø2*, and then Ø2* and Ø1*. Drive right is the reverse order.

SS4 is a retriggerable single-shot which is timed for 15 ms. The first CP signal to trigger SS4 places SS4 at +5V and, in turn, Z13-8 at 0V. This has the effect of raising voltage VMOT from +10 Vdc to +34 Vdc. See Section 4.2.4. If SS4 is not retriggered within 15 ms, VMOT shuts down to reduce power when tape movement is not required. Output SS4* is combined with FF2 to reproduce an end-of-tape sensor. After a drive command, if SS4 is not retriggered within 15 ms (SS4* will go high) and if no sprocket is sensed (FF2 remains high) then the EOT* signal at Z4-6 drops to 0V. The SYSRDY* signal at Z4-3 then rises to the +5V inactive state, indicating that the system is not ready.

Then the tape comes back on character, the positive going sprocket signal resets FF2. The positive going output FF2* is, in turn, used three places: (1) to trigger single-shot SS3, (2) to generate the positive going Data Ready (DATRDY) signal at pin 11 of Z12, and (3) is gated at pin 1 of Z12 along with SS3* to hold the Reader Ready (RRDY) line in the +0V inactive state during the SS3 time period. The function of SS3 is to provide a 75 µs time delay so that the external equipment can examine the data and make the go/no-go decision. If the decision to stop is made, the DL* input line must be taken high within 50 µs (actually 75 µs but conservatively specified at 50 µs). Otherwise, when SS3 times out, the positive going SS3* will cause RRDY to go high, thereby generating the next CP and causing the tape to advance to the next character.

On units using the teletypesetter advanced feed hole tapes (110801-3 cards) SS5 is added. The jumper between terminals D and C is removed and jumpers between D and E and A and B are added. SS5 is a single-shot which provides a 150 µs delay of the leading edge of the sprocket. This gives the electronic appearance of a non-advance sprocket which then resets FF2 in the manner previously described.

4.2.3.2 Tape Reading Circuits

Nine photovoltaic cells in the readhead assembly sense the perforations in the tape. An illumination system consisting of a lamp and fiber optics provides a continuous beam which covers the area of the photocells. The tape is driven over the top of the photocell block and when a hole in any track appears between the photocell and the light source, the light energizes the photocell.

Each cell output is applied to the amplifier-latch circuit Q1-Q8, Z20 and Z17. Track 1 is used in the following discussion since it is typical of tracks 1-8 (the Sprocket signal is developed differently as described in a subsequent paragraph). When track 1 becomes energized, the negative going signal at the cathode of the photocell turns Q1 off. See Figure 8-7, sheet 2. Q1 is interconnected with pins 6 and 11 of Z20 in a manner which allows Q1 and the first stage of Z20 to function as a Schmitt trigger. The latching circuit follows all changes in the photocell until the Data Ready (DATRDY) signal is +5V (see Section 4.2.3.1). The +5V DATRDY signal is inverted at Z13-12 and locks up Z17 and Z20.

Track 1 output at Z20, pin 10 is +5V for a hole and is gated with the Mode Select signal at Z21, pins 9 and 10. A 0V input Mode Select input will provide mode 5 outputs at J2, pin 1, i.e., when Z21, pin 9 is 0V for the no hole condition, J2-1 will be 0V. When Z21, pin 9 is +5V for the hole condition, J2-1 will be +5V. Conversely, when the Mode Select signal is +5V (or open) and Z21, pin 9 is 0V, J2-1 will be +5V. The Data Ready Output (DATRDY OUT) is gated in the same manner as the track outputs at pins 12 and 13 of Z9.

The sprocket track is somewhat different than the other eight tracks in that its Schmitt trigger uses an inverter Q9 (sheet 1) rather than a latch. It is used to start the DATRDY signal and is not gated with the Mode Select Signal.

4.2.4 POWER SUPPLY CARD 111841-1

Power Supply card 111841-1 supplies the various voltages used throughout the 6120 systems +35 VDC, +24 VDC, +5 VDC, ±12 VDC, and VMOT. AC voltages are applied from the secondary windings of transformer T1 to the Power Supply card. See Figure 8-8. The +35 VDC is rectified from the 37.5 VRMS winding by CR5 and CR6, clamped by the 36V Zener CR11, filtered by C103 and passed through Q101 (located on the chassis). CR3 and CR4 generate the +24 VDC by rectifying the 20.4 VRMS output. It is then filtered by CR102 which is located on the chassis and applied to J109, pins 1-3. R1 and CR2 provide a discharge path for C102 when the POWER switch S1 is turned off and R4 and CR1 provide the discharge path for C103.

Diodes CR7 and CR8 rectify the 11 VRMS output which is filtered by R3 and C3 and applied to pin 1 of the five volt regulators Z1 and Z2 (an LM309K). R7 and R5 are in the ground pathes of Z1 and Z2 and provide the adjustment for the +5V logic level output. Four diodes CR12-CR15 form a full bridge rectifier for the 12 VRM windings to generate the unregulated +12V and -12V.

CR9 and CR10 rectify the 75 VRMS from the transformer to produce approximately 52 VDC unregulated at the output of the filter network composed of C104 and R6. This voltage is applied to the collectors of the series pass darlington transistor Q102 (located on the heat sink assembly 111838-2) and to a constant current source comprised of Q1 and its bias network (located on the Power Supply card). Q1 on the card supplies the base drive (VMOT CONT) for Q102. Control of the pass transistor is achieved by shunting some of the current from Q1 through Q2 instead of allowing it to reach the base of the pass transistor, Q101. A resistive divider network composed of R14 - R16 applies a voltage proportional to VMOT to the base of Q2. Q2 compares this voltage to the 6.2 volts developed by Zener diode CR21 and shunts more or less of the pass transistor's base current as required to maintain VMOT constant.

When the step motor is stepping, the junction of R16 and R18 is held at ground potential by the VPRGM line and VMOT is set by R15 for approximately +34 VDC. During periods when the motor is stopped for longer than 15 ms, VPRGM appears as an open circuit and allows current to flow through R18 to 0V. This change in the divider network forces VMOT to regulate at approximately 1/3 of the running potential, thereby reducing motor dissipation during periods of inactivity.

4.3 RPM 612X PUNCH MECHANISM

The operation and maintenance of the RPM612X Punch Mechanism is described in a separate manual. The RPM 612X consists of punch head, punch pin drive linkage, solenoids, stepper motor, tape guide and pathways. The three windings of the stepper motor control the movement of the tape and their energizing sequence determines the direction of movement. See the description of the punch control logic as described in Section 4.2.1.1 for the Perforator Logic Card. The solenoids are operated from Q8-Q25 along with suppression diods CR5 and CR13 all of which are mounted on the Perforator Driver Card. Zener diode CR14 is used to speed the suppression process. Each solenoid is fused with a 2A, 250V fuse. These fuses are mounted on the Perforator Driver Card.

4.4 LIGHT SOURCE

A filament type lamp rated at 5.0 VDC is used as the light source. It is operated at approximately 15% below rated voltage to provide a long life expectancy. The lamp is mounted in a sleeve at the rear of the front panel. A lens contained in the lamp focuses the light to the fiber optics system which, in turn, conducts the light to the photocells.

SECTION V

MAINTENANCE

5.1 GENERAL

The REMEX tape perforator/reader systems are designed to keep maintenance as a simple and infrequent as possible. Table 5-1 lists the maintenance equipment required for the various procedures. To prolong the life of the equipment and minimize downtime, certain checks and preventive procedures are set up in Section 5.2 and 5.3 and Table 5-2 with suggested schedules. Section 5.4 outlines possible malfunctions along with probable cause and remedies. The remaining sections describe the required adjustment procedures. Replacement procedures are given in Section 6.

Table 5-1. Maintenance Equipment Required

Extended Board, REMEX Part Number 111041	1
Extractor Tool (for pin removal on Amp plastic connectors) Amp 45447-1, REMEX P/N 716056-113	1
* Flexible Feeler Gauge, 0.010 to 0.011 inch or three pieces of 3.7 mil mylar tape stapled together. Plastic shim stock is available from the Artus Corp. Englewood, N.J. 07631	1
* Frequency Counter, 10 Hz to 10 MHz, 5V input	1
Miller-Stephenson MS-200 Magnetic Tape Head Cleaner (REMEX Part Number 716004-150)	1
* Pulse Generator, 10 Hz to 1MHz, up to +5V amplitude, 1 μs to 100 ms width	1
* Oil, non-detergent, SAE-10	-
* Oscilloscope, DC to 10 MHz, single sweep	1
Spring Scale, 1 lb.	1
* Voltmeter, Digital, 0-0.1 ma, 0-100 m V dc, 0-100V dc, 100K impedance or greater	1

*Not available from REMEX

5.2 PREVENTIVE MAINTENANCE, PERFORATOR SECTION

Preventive maintenance, which includes inspection, cleaning and lubrication, should be done as described in Sections 5.2.1 through 5.2.3 in order to maintain peak performance. In addition, in order that the warranty remain in effect, the unit must be maintained in accordance with instructions outlined below (see Section 1.3 and page iii).

A preventive maintenance schedule and log are presented in Table 5-2 which indicates the item, frequency of action, and references the maintenance paragraph. For customer convenience the table is arranged so that a log can be kept of when each maintenance procedure was performed. Periodic service is determined by the number of rolls of tape punched (1000 ft. rolls). See Section 5.3 for preventive maintenance of the reader section.

NOTE

The frequency of service as listed in Table 5-2 has been adopted for clean environmental conditions and usage. These intervals, however, may vary from one installation to another. The punching of oiled paper tapes may increase the frequency of service. See the note in Section 5.2.1.

Table 5-2 gives the Preventive Maintenance Schedule for only the tape supply and take-up portion of the perforator system. Preventive maintenance and adjustment procedures for the RPM 6120 Punch are given in REMEX Technical Manual for the RPM 6120 Punch and must also be followed.

5.2.1 100 ROLL SERVICE

Preventive maintenance after every one hundred (100) rolls of tape consists of dust removal from the punch, a functional check and lubrication when used with certain types of tape. See the REMEX RPM 6120 Technical Manual for the details of the 100 roll service for the punch mechanism.

NOTE

When punching oiled paper tapes, more frequent dust removal is necessary since the dust and oil mixture will tend to adhere to the punch parts and may affect registration.

5.2.1.1 Functional Check

The following items should be checked for the proper operation after every 100 rolls of tape:

a. Check each of the front panel control switches to see that they perform the functions outlined in Table 3-2.

b. Check each data line to verify that the appropriate track is punched when the data input line is in the true condition as described in Section 3.3.3.

c. Verify the proper operation of Asynchronous Reverse Operation as described in Section 3.3.4.

d. Verify the presence of the Punch Ready and (Punch Systems Ready)* outputs at J1, pins 12 and 13, as described in Table 3-1.

e. Check for proper hole registration as shown in Figure 1-6.

Table 5-2. Preventive Maintenance Schedule and Log, Perforator Section

Frequency, Rolls of Tape	Date	Initial	Frequency, Rolls of Tape	Date	Initial	5.2.1	5.2.1.1	5.2.2.1	5.2.2.2	5.2.2.3	5.2.2.4	5.2.2.4.1	5.2.2.4.2	5.2.2.4.3	5.2.2.4.4
						100 Roll Service		700 Roll Service							
100			800			X	X								
200			900			X	X								
300			1000			X	X								
400			1100			X	X								
500			1200			X	X								
600			1300			X	X								
700			1400			X	X	X	X	X	X	X	X	X	X

5.2.2 700 ROLL SERVICE

Preventive maintenance after every 700 rolls of tape consists of those items outlined in Section 5.2.1 and those items called out after 700 rolls in the REMEX Technical Manual for the RPM 6120 Punch Manual. In addition, a check of those items listed in Section 5.2.2.1 through 5.2.2.5 is required.

5.2.2.1 Bearing Checks (RAB, RAR Units Only)

The bearings in the following areas should be checked and replaced if required:

a. Supply Platter
b. Tape Low Sensor Arm
c. Tape Guide Rollers
d. Supply Tension Arm

5.2.2.2 Control Logic

Check the adjustments on the control logic circuitry as described in Section 5.5.2. Line voltage should be set a nominal value for the voltage being used, not the ± 10% tolerance levels.

5.2.2.3 Power Supply Voltages

Measure and record all voltages listed in Table 5-3 with a voltmeter. All test points are located on the Power Supply Card. A change in voltage may be indicative of a gradual component failure. Before taking any measurements, allow a short period of time for warm up after turning on power. The +28V measurement should be made while punching all holes. The section describing each voltage adjustment is listed in the Table. All voltages given are with AC at nominal value for the voltage being used; not the ± 10% tolerance levels.

CAUTION

Care should be taken not to short the probe to the chassis when measuring the test points on the power supply card.

Table 5-3. Power Supply Voltage Measurements on Power Supply Card

Voltage	Measure		Pot Adjustment	Procedure Section
	From	To		
-12 ± 2.4VDC	TP2	TP1	-	-
+12 ± 2.4VDC	TP3	TP1	-	-
+34 ± 3V	TP5	TP1	-	-
+28 + 7/-5 VDC	TP4	TP1	-	-
+5.20 ± 0.05 VDC	TP6	TP1	R 7	5.5.3
4.3 - 4.7 VDC (Lamp Voltage)	TP7	TP1	R 5	5.6
VMOT	TP8	TP1	R 15	5.7

5.2.2.4 Supply Deck Checks (RAB and RAR Units Only)

Sections 5.2.2.4.1 through 5.2.2.4.4 describe the areas of the supply deck which should be checked after every 700 rolls of tape.

5.2.2.4.1 Tape Tension Arm

Measure the force on the supply take-up arm at the center of its travel area. The force on the arm should be between 1-1/2 and 2-1/2 ounces when measured at the tape roller. Measure the force required to lift the arm off the bumper nearest the front panel. This force at the tape roller should be between 0.75 and 1.25 ounces when the arm is 1/8" away from the bumper. If either force is not as described, replace the arm spring.

5.2.2.4.2 Tape Low Switch Actuation

Measure the distance from inside edge of the tape low sensing arm to the hub at the point when the PERF STATUS lamp lights (S8 actuated). This distance should be 5/16" ±1/32". If this is not the case, perform Section 5.5.5.1.

5.2.2.4.3 Supply Switch S6

Rotate the tape arm clockwise toward the rear bumper. S6 should deactuate when rear edge of the arm is 0.20" ±0.02" from the rear bumper (tight tape position). If the switch does not operate as described, perform Section 5.5.5.2.

5.2.2.4.4 Supply Error Switch, S7

Rotate the tape arm clockwise toward the rear bumper. S7 should actuate when the arm is 0.40" ±0.02" from the stop. If the switch does not operate as described, perform Section 5.5.5.2.

5.3 PREVENTIVE MAINTENANCE, READER SECTION

Preventive maintenance, which includes cleaning, should be checked periodically in order to maintain peak performance. In addition, in order that the warranty remain in effect, the unit must be maintained in accordance with the instructions outlined below (see Section 1.3 and page iii). A preventive maintenance schedule and log are presented in Table 5-4 which indicates the item, frequency of action and references the maintenance paragraph in this section. For customer convenience, the table is arranged so that a log can be kept of when each maintenance procedure was performed. Also refer to Section 3.6, Operational Maintenance.

NOTE

The frequency of cleaning as listed in Table 5-4 has been adopted for clean environmental conditions and usage. These times, however, may vary greatly from one installation to another. For example, a reader used in a machine shop to program numerical controls may require maintenance procedures considerably more frequently.

5.3.1 CLEANING

CAUTION

In all cleaning procedures, avoid using cleaning methods and materials other than those recommended in this manual. Certain cleaning compounds will damage parts of the reader, especially in the readout assembly area. REMEX primarily recommends the use of Miller-Stephenson MS-200 Magnetic Tape Head Cleaner (REMEX Part No. 716004-150) for most areas requiring cleaning. However, due to the degreasing nature of the cleaner, it should not be used in areas where the spray may come in contact with bearings or other oiled parts. This cleaner may be obtained from REMEX or directly from Miller-Stephenson Chemical Company at one of the following locations.

1001 East First Street
Los Angeles, California
90012

1350 West Fullerton Avenue
Chicago, Illinois 60614

Route 7
Danbury, Connecticut 06810

To use the cleaner, hold the spray can 4 to 6 inches from the area to be cleaned and allow spray to flush the dirt off. If a heavy buildup is present, loosen with the spray mist and scrub with a cotton swab. A 6-inch pin-point, spray nozzle extension is available for hard-to-reach areas or for delicate applications. Avoid spraying on lubricated surfaces or parts.

If the Miller-Stephenson cleaner is not available, a small amount of isopropyl alcohol applied to a clean, lint-free cloth or cotton swab may also be used. However, it should be used carefully and sparingly since damage to the photocell and the finish on the plastic covers may result. Use only clear, unadulterated isopropyl alcohol. Do not use ethyl alcohol or denatured alcohol as the denaturing agents vary and may damage reader.

CAUTION

It is important that, whether the MS-200 cleaner or the isopropyl alcohol is used, only the amount required to clean the surfaces be applied. Never saturate or drench the areas to be cleaned. Never apply these materials to the lamp assembly.

5.3.1.1 Readhead Assembly Cleaning

The top surface of the readhead assembly should be cleaned every two weeks (for most installations having clean environments; dirtier environments which contain dust, oil and sprays, such as machining areas, may require cleaning as much as every eight hours). Cleaning is extremely important because any dirt or foreign material in this area can create errors in readout. Use the bristle brush supplied or the cleaning materials and methods described in Section 5.3.1 and clean the surfaces of the readhead assembly and the upper tape guide assembly. Care should be exercised so that no residue remains from the recommended cleaning materials when the cleaning operation is completed.

5.3.1.2 Sprocket Cleaning

The sprocket wheel should be checked for cleanliness every two weeks. Depending upon tape conditions, accumulations may build up on the sprocket and be transferred to the sprocket holes in the tape which may cause readout errors. Use the recommended cleaning materials described in the caution in Section 5.3.1. Care should be taken so that the alignment of the sprocket wheel is not disturbed. If the sprocket wheel requires adjustment, refer to Section 5.7.

5.3.1.3 Tape Inspection

Repeated handling and usage of the tape leads to a build up of grease, oil and dirt on the tape. When the build up becomes excessive, this material will become lodged in the tape transport areas and could cause tape reading errors. To prevent this, the tape should be thoroughly inspected every two weeks and repunched if required.

5.3.1.4 General Cleaning

The entire reader should be cleaned every year. Use the following procedure:

> Using the bristle supplied with the unit and/or low pressure compressed air, remove all dust and dirt, paying particular attention to all moving parts. Use the recommended materials described in the caution in Section 5.3.1 to remove any grease or other accumulations. When cleaning, use care not to damage components on the circuit board.

5.3.2 LUBRICATION

All points of rotation on the system have permanently lubricated bearings and should not require lubrication for the life of the part. The mechanism requires lubrication as described in the manual for that unit.

5.4 TROUBLE-SHOOTING

Trouble-shooting is presented in the form of a chart, Table 5-5, which should be consulted whenever the performance of the system is unsatisfactory. The chart is divided into three columns: Indication – the way in which the malfunction became evident, Probable Cause – the possible reason or reasons for the malfunction, and Remedy – the manner in which the malfunction may be corrected.

CAUTION

> When operating the unit either in the rack or on a test bench, make sure it is elevated sufficiently such that the intake air flow through the fan at the bottom of the unit is not restricted. Damage to the unit, especially the punch, will result if sufficient cooling by the fan is impeded. Note also that the fan is attached to the power supply assembly. Thus, when the power supply is removed the source of cooling for the punch mechanism is also removed.

5.5 ADJUSTMENTS, PERFORATOR SECTION

5.5.1 GENERAL

Proper operation depends upon making and maintaining accurate adjustments. Although all adjustments are made at the factory, the following adjustments should be checked periodically (refer to Section 5.2 and Table 5-2) and should be performed when the perforator performance is unsatisfactory or when certain assemblies are replaced. Adjustments of the punch are covered in the REMEX Technical Manual for the RPM6120.

Table 5-4. Preventive Maintenance Schedule and Log, Reader Section

Frequency* Of Action Weeks	Date	Initial	Frequency* Of Action Weeks	Date	Initial	5.3.1.1	5.3.1.2	5.3.1.3	5.3.1.4	5.3.3	5.6	5.7
						Cleaning				Check Adjustments		
2			28			X	X	X				
4			30			X	X	X				
6			32			X	X	X				
8			34			X	X	X				
10			36			X	X	X				
12			38			X	X	X				
14			40			X	X	X		X	X	X
16			42			X	X	X				
18			44			X	X	X				
20			46			X	X	X				
22			48			X	X	X				
24			50			X	X	X				
26						X	X	X		X	X	X
			52			X	X	X	X	X	X	X

*See Note on page 5-6.

Table 5-5. Trouble Shooting Chart

Indication	Probable Cause	Remedy
1. Tape does not punch.	1. AC power not present.	1. Check to see if ac power cord is plugged in.
	2. Fuse faulty.	1. Check fuse F1 and replace if blown. 2. Check fuses F1 through F9 on Perforator Driver Card and replace if faulty.
	3. Switch S1 faulty.	1. Check switch S1 and replace if faulty.
	4. Tape Error present.	1. Check for presence of tape error at J1, pin 20. If present, correct supply error problem.
	5. +28V. not present.	1. Check T1 and CR3 and CR4 on power supply card for proper operation.
	6. +5V not present or not properly adjusted.	1. Check for presence +5VDC at TP6 on Power Supply Card. Readjust as described in Section 5.5.3. If not present, check the following for proper operation: T1 for 11 V RMS, CR7, CR8, C3, R3, R7, R8, CR19 or Z1 on Power Supply Card.
2. Tape punches but does not feed.	1. Perforator logic card faulty.	1. Check operation of card for presence and proper sequencing of $\phi 1$, $\phi 2$, and $\phi 3$ outputs. Replace card if outputs are not correct.
	2. Drive Motor Malfunction	1. Check operation of drive motor for proper operation.
	3. +35V not present.	1. Check the following components on the Power Supply Card for proper operation: CR5, CR6, CR11, C5, C4, R2. Also check Q101 on the neat sink and T1.
	4. Voltage Doubler on Perforator Driver faulty.	1. Check the Voltage Doubler circuitry on the Perforator Driver Card.

Indication	Probable Cause	Remedy
3. Tape feeds but does punch any data holes.	1. Data Input signals not present at input or improperly timed.	1. Check to see that data inputs are present and of correct timing. See Section 3.3.3.
	2. Perforator Logic card faulty; no Punch Clock signal.	1. Check Z6, pin 8 on Perforator Logic Card for negative going PCHCLK* signal. If not present, replace card.
		2. Check Z15, pin 12 on Perforator Logic card for positive going DATST. If not present, replace card.
4. No feed holes being punched. Data holes ok.	1. Perforator Logic	1. Check for presence of PFSDR output at Z15-8 on Perforator Logic card. Replace card if output is not present.
		2. Check operation of Q7 and Q8 on Perforator Driver card for proper operation and replace if faulty.
	2. Punch Solenoid or fuse faulty.	1. Check feed hole solenoid on punch and replace if faulty. Refer to Punch Mechanism Manual.
		2. Check fuse F1 on Perforator Driver Card and replace if faulty.
5. One data track not being punched when true input signal is present.	1. Perforator Logic card faulty.	1. Check associated output on Perforator Logic card for positive active signal when Data and Data Clock are present. If output not present, replace card.
	2. Perforator Driver Card faulty.	1. Check appropriate drive circuitry on Perforator Driver and replace if faulty.
	3. Punch Solenoid or fuse faulty.	1. Check appropriate solenoid on punch and replace if faulty. Check fuse on Perforator Driver Card.
	4. Card connector contacts dirty.	1. Clean connector contact.

Table 5-5. Trouble Shooting Chart (Continued)

Indication	Probable Cause	Remedy
6. Punched holes incomplete or ragged.	1. Timing improperly adjusted.	1. Adjust control logic timing as described in Section 5.5.2.
7. Supply reel unwinds too much tape; Supply switch actuates (RAB and RAR units)	1. Servo faulty	1. Check servo on Perforator Driver Card and replace card if faulty.
	2. Brake circuitry faulty.	1. Check brake circuitry on Perforator Driver card and replace if faulty.
	3. S6 malfunction.	1. Check for proper operation of S6 as described in Section 5.5.5.2.
8. No low tape indication when tape supply is low.	1. PERF STATUS light burned out.	1. Check PERF STATUS lamp and replace if burned out.
	2. Tape Low Switch Actuator misadjusted.	1. Adjust Tape Low Switch Actuator as described in Section 5.5.5.1.
	3. Switch S8 faulty.	1. Check S8 for proper operation and replace if faulty.
9. Tape FEED/DELETE Switch, S3, depressed, tape does not feed.	1. Switch S3 faulty.	1. Check switch S3 for proper operation and presence of OV at J8, pin 2, when switch is in FEED position or OV at J8, pin 1, when switch is in DELETE position.
	2. Perforator Logic card faulty.	1. Check operation of Z5, Z10 and Z15 on card and replace if faulty.
10. Tape FEED/DELETE switch, S3, in FEED position, Tape feeds, data tracks not inhibited.	1. PCHCLK* not inhibited.	1. Check for presence of OV at pin 8 of Z6 during punch cycle. If present, replace Perforator Logic card.
11. Same data line repunched on next line with new data present at input.	1. Perforator Logic card faulty.	1. Check for presence of positive going DATST signal at Z15, pin 18. If not present, replace Perforator Logic card.
		2. Check for proper operation of data latches Z13 and Z18.

Table 5-5. Trouble Shooting Chart (Continued)

Indication	Probable Cause	Remedy
12. Punch advances tape in one direction only.	1. Proper Direction Signal not present.	1. Check for presence of proper direction input signal as listed in Table 3-1.
	2. Perforator Logic card faulty.	1. If proper input is present, replace Perforator Logic card.
13. Wrong data being punched (more than one hole).	1. Perforator Logic card faulty.	1. Check for proper inputs at J1, pins 1-8. If correct inputs are present, replace Perforator Logic card.
	2. Data inputs not stable before Punch Command is issued.	2. Check operating instructions, Sections 3.3.3 and 3.3.4.
14. Holes being punched instead of no holes and no holes punched where holes are required.	1. Input mode not compatible.	1. Check inputs to see if they conform to the input mode selected at J1-14.
15. Short registration or double punching.	1. Punch mechanism faulty.	1. Check trouble shooting chart in punch manual.
	2. Incorrect control logic timing.	1. Check adjustments in Section 5.5.2.
	3. Punch pins sticking.	1. Lubricate punch per instruments in the RPM6120 manual.
16. No track outputs on any track.	1. Readhead dirty	Clean Readhead Assembly as described in Section 5.3.1.1.
	2. Fiber Optics Light misaligned	Check alignment of the Lamp Source as described in Section 5.7.
17. Outputs present on all but one track or one track intermittent.	1. Readhead dirty	Clean Readhead Assembly as described in Section 5.3.1.1.
	2. Defective Photocell	Check the output of the Readhead assembly as described in Section 5.7 and replace if defective as described in Section 6.7.
	3. Defective component on Reader Card	Check the components and IC modules associated with the particular track output. Refer to Tape Reading Circuit description, Section 4.2.3.2.

Table 5-5. Troubleshooting Chart (Continued)

Indication	Probable Cause	Remedy
18. Track output present with no hole punched in tape.	1. Tape transmissivity	Tape must have a transmissivity of 57% or less as specified in Table 1-2.
	2. Defective Photocell	Check the output of the Readhead assembly as described in Section 5.7 and replace if defective as described in Section 6.7.
	3. Defective component on Reader card	Check the components and IC modules associated with the particular track output. Refer to Tape Reading Circuit description, Section 4.2.3.2.
19. Window closed, POWER switch is ON, correct drive signals present; tape does not move.	1. POWER switch, S1, defective	Check switch S1 and replace if defective as described in Section 6.11.
	2. RUN-LOAD switch, S9, defective	Check switch S9 and replace if defective as described in Section 6.12.
	3. Defective component on reader card	Check operation of Reader card. Refer to description of Driver Circuits, Section 4.2.3.1.
	4. Step Motor defective	Check ϕ1 thru ϕ4 outputs from Reader card to see if they are present. If so, replace stepper motor as described in Sec. 6.9.
20. Tape does not stop on character	1. Improper reader alignment	Perform Section 5.7
	2. Defective component on Reader card	Check operation of Reader card. Refer to description of Driver Circuits, Section 4.2.3.1.
21. POWER switch ON; lamp does not turn on, no DC voltages	1. No AC power	Make sure AC power cord is plugged into outlet.
	2. Fuse F1 blown	Check fuse and replace if required.
	3. POWER switch, S1 defective	Check switch S1 and replace if defective as described in Section 6.11.
	4. Power Supply defective	Check Reader card for proper operation of +5V power supply. See Power Supply description, Section 4.2.4.
	5. Defective Transformer, T1	Check T1 and replace if faulty as described in Section 6.10.

Table 5-5. Troubleshooting Chart (Continued)

Indication	Probable Cause	Remedy
22. Continuous tape speed less thatn 300 characters/second	1. Tape out of registration	Check tape registration to make sure tape conforms to specifications as described in Section 3.7.
	2. Sprocket out of rotational alignment	Check alignment of reader as described in Section 5.7.
	3. Defective component on Reader card	Check Reader card for proper operation of drive circuits and single shot timings. See Drive Circuit Discussion, Section 4.2.3.1 and timing diagram, Figure 4-4.
23. Irregular movement of tape	1. Drive system improperly adjusted	Perform Reader alignment as described in Section 5.7.
	2. Sprocket wheel bent or worn	Replace sprocket wheel as described in Section 6.9.
	3. Tape guide assembly worn	Replace tape guide assembly
24. +5V supply voltage too low or too high	1. Defective regulator	Check operation of Z1 or power supply card and replace if required.
	2. T1 malfunction	Check for presence of 11 VRMS across the red and grey terminals of T1. Replace T1 if not present.

5.5.2 PERFORATOR LOGIC TIMING ADJUSTMENTS

The following single-shot adjustments on the Perforator Logic card control the punching cycle and are required any time the Perforator Logic card or punch is replaced. This procedure is to be performed with a nominal line voltage of 115 VAC or that voltage on which the transformer is set to run; not the 10% high or low tolerance. See Figure 5-1 for location of potentiometers and test points. Figure 4-3 shows the timing relationship of these signals.

a. Install a roll of tape (RAR, RAB units) or a box of fan folded tape (RAF units) of the type to be used and thread it through the system. See Section 3.3.1.

b. Perform Section 5.5.3. It is important that the +5V Power Supply be adjusted before finishing this procedure.

c. Place the FEED/DELETE switch in the DELETE position. The remaining steps are to be performed with a nominal line voltage of 115 VAC (or that voltage on which the transformer is set to run; not the 10% high or low tolerance). The remaining procedure is performed while punching a delete (all hole pattern).

d. Observe the positive pulse at TP1 and adjust R18 for pulse width of 4.1 +0 -0.1 msec. Ground can be picked up at J1, pins 18, 23 or 25.

e. Place the scope probe at TP6 and adjust R21 for pulse width of 4.1 +0 -0.1 msec.

f. Measure the solenoid dc voltage from TP4 to TP1 on the Power Supply Card.

g. Place the scope probe at TP2 on the Perforator Logic Card and adjust R17 for a positive pulse as given in Table 5-6 depending upon the solenoid dc voltage measured in step f.

h. Place the scope probe at TP4 and adjust R20 for a positive going pulse of 1.0 ±0.2 ms.

i. Place the scope probe at TP5 and adjust R19 for a positive going pulse of 1.0 ±0.2 ms.

j. Continue punching approximately 50 feet with all holes after steps d through h have been performed. Check punching performance at line voltages of 105 VAC and 125 VAC. Be sure holes are cleanly punched without ragged edges or elongation and that complete penetration is occurring. Repeat for each data channel punching alone at 10 cps and 120 cps.

Table 5-6. Solenoid D.C. Voltage vs Single-Shot Pulse Width

Solenoid Voltage	One Shot Time, ms +0.00 - 0.05	Solenoid Voltage	One Shot Time, ms +0.00 - 0.05
24	2.00	27	1.75
25	1.90	28	1.67
26	1.80		

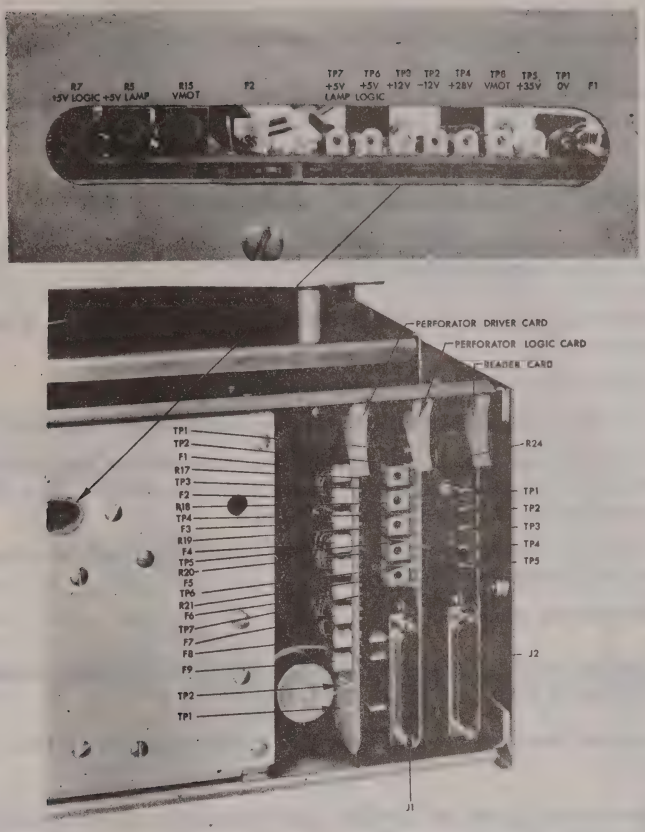


Figure 5-1. Location of Circuit Card Potentiometers and Test Points

5.5.3 +5V POWER SUPPLY

The following procedure describes the adjustment of the +5V power supply:

a. Place the POWER switch into the ON position.

b. Place a digital voltmeter across TP6 and TP1 on the Power Supply card.

c. Adjust R7 until the meter reads +5.2 ± 0.05 VDC. Note: Circuit cards have noise filters that result in +5.0 VDC in circuits.

d. Remove the meter leads.

e. If the Power Supply card is ever replaced, the logic +5V must be adjusted prior to installing the other cards.

5.5.4 SUPPLY DECK ADJUSTMENTS (RAR and RAB UNITS ONLY)

The following adjustments are required to insure proper mechanical operation of the supply deck.

5.5.4.1 Tape Low Switch Actuator (RAR and RAB Units Only)

The adjustment of the tape low switch S8 actuator is performed as follows: All items in parenthesis refer to the items in Figure 5-2.

a. Remove all power from the system by disconnecting P1, P2 and the power cord.

b. Remove any tape from the deck assembly.

c. Place an ohmmeter across the NO and C contacts of switch S8.

d. Move the low tape arm in toward the hub and note the distance at which the switch actuates (meter read zero ohms). This distance should be 5/16" ± 1/32" from the hub.

e. If it is not, loosen nut (A) and rotate screw (B) until S8 actuates at the distance specified in step d.

f. Remove the ohmmeter.

5.5.4.2 Supply Servo Switch S6 and Supply Error Switch S7 Adjustment (RAR and RAB Units Only)

The following procedure describes the adjustment of the servo supply switch, S6, and the supply error switch S7.

a. Remove all power and control signals from the system by disconnecting P1, P2 and the power cord.

b. Remove any tape from the deck assembly.

c. Remove the set screw which holds the supply platter to the shaft. Remove the supply platter. Be careful not to lose the ball bearing in the shaft hole in the platter.

d. Attach an ohmmeter across the NO and C contacts of S6. The ohmmeter should read infinite ohms (switch deactuated) with the arm in its extreme counterclockwise position.

e. Rotate the arm clockwise toward its extreme bumper stop. S6 should actuate (ohmmeter reads zero ohms) when the edge of the arm nearest the bumper is between 1.62 and 1.00 inch from the bumper. Continue rotating the arm clockwise toward the extreme bumper. S6 should deactuate when the edge of the arm nearest the bumper is 0.30 ±0.05 inch from the bumper. If either or both of these conditions do not exist, loosen the screws which hold S6 and adjust S6 until these conditions are present.

f. Attach the ohmmeter across the C and NO contacts of S7. The ohmmeter should read infinite ohms (switch deactuated) with the arm in its extreme counterclockwise position.

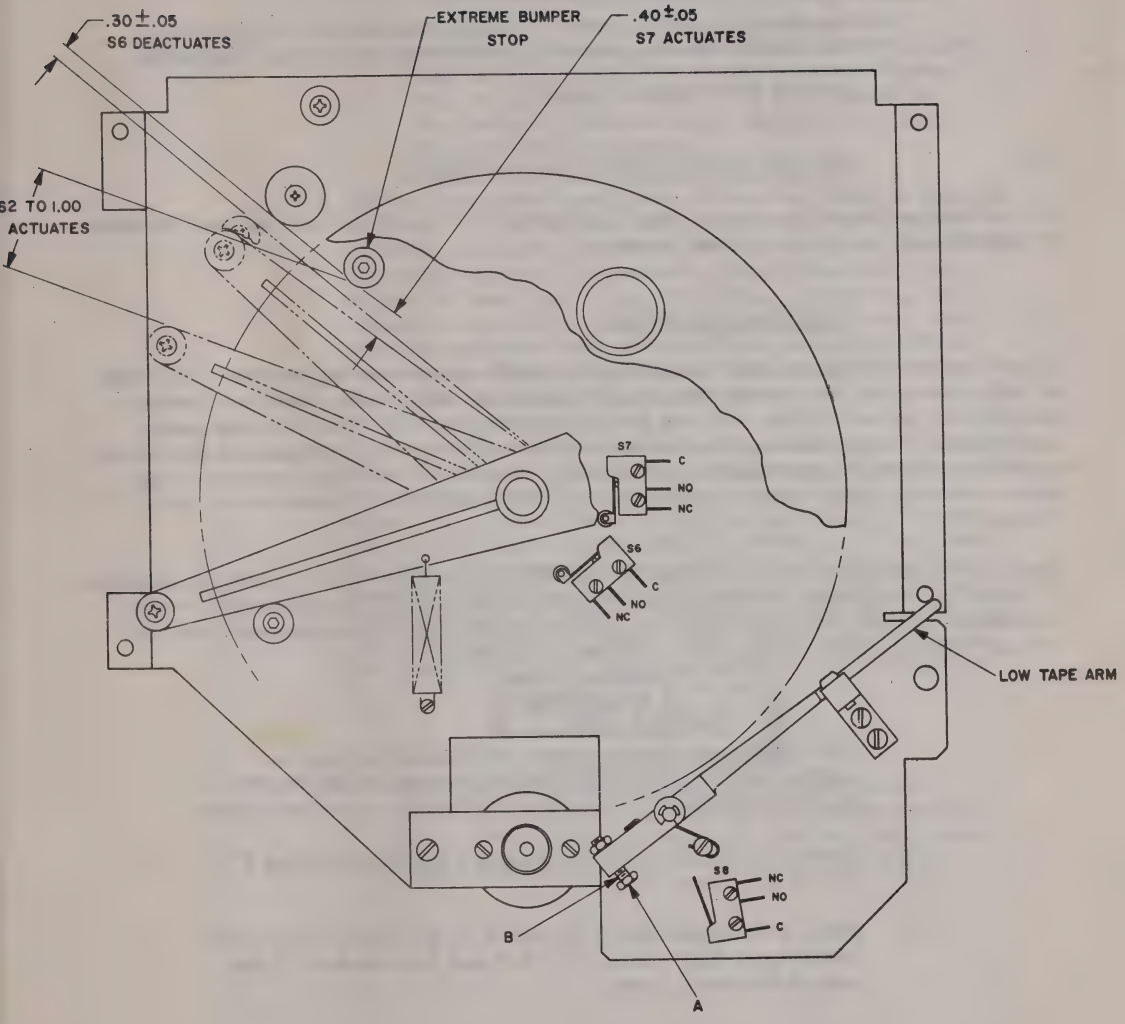


Figure 5-2. Supply Deck Adjustments

g. Rotate the arm clockwise toward its extreme bumper stop. S7 should actuate (ohmmeter reads zero ohms) when the edge of the arm nearest the bumper is 0.40 ±0.05 inch from the bumper. Rotate the arm counterclockwise to its extreme bumper position. S7 should actuate when the edge of the arm nearest the bumper is 1/8 ± 1/32 inch from the bumper. If either or both of these conditions do not exist, loosen the screws which hold S7 and adjust S7 until these conditions exist.

h. Replace the supply platter. It may be necessary to slightly push the drive roller away from the platter area to reinstall the platter.

i. Perform the reverse of step a.

5.6 READER LAMP VOLTAGE ADJUSTMENT

The voltage setting of the reader lamp is a function of the cell outputs and must be made as described in Section 5.7, steps w and x.

5.7 READER ALIGNMENT

Proper operation depends upon making and maintaining accurate adjustments. Although all adjustments are made at the factory, the following adjustments should be checked periodically (refer to Table 5-4) and should be performed only when the tape reader performance is unsatisfactory or when any of the following items is replaced: distributor, readhead assembly, upper tape guide assembly, mechanism assembly, sprocket, step motor or circuit card. Letter designations in parenthesis refer to items called out in Figure 7-1.

Improper adjustment of this procedure will result in one or both of the following problems: (1) Reading errors, especially in computer applications and (2) Restriction of the tape tolerances capable of being read, i.e., either long or short tolerance tapes, not the ±0.025 inch in either direction as specified in Section 3.7.

CAUTION

This is a factory set adjustment and should not require readjustment unless one of the aforementioned components has been replaced or the reader performance is unsatisfactory.

a. Remove all power and control signals by disconnecting P1, P2 and the power cord plug.

b. Remove the Upper Cover Assembly (1) by loosening the two 6-32 binder head screws (A), flat and lock washers at the rear of the reader panel.

c. Remove the Reader Panel Assembly from the Front Panel Assembly. Leave the cables attached to the unit. See Section 6.13. The Reader Panel Assembly should be moved out far enough to allow access the various items at the rear.

CAUTION

The procedure outlined in steps d through k should not be performed unless the readhead assembly, mechanism assembly, sprocket or step motor has been replaced or the reader performance is unsatisfactory. Prior to adjustment, steps d, f, g and h should be checked and corrective steps e and/or i, j, k and l performed only if necessary.

d. Remove the Upper Tape Guide. Check the clearance between the readhead housing tape riding surface and the sprocket perimeter high point by placing the end of a small steel rule on the surface and rock the sprocket in both directions. See Figures 5-3 and 5-4. Observe that the perimeter high point clears the steel rule by a few thousandths of an inch. The sprocket teeth must have maximum tape penetration with no interference when driving tape. If the sprocket is not positioned as described perform step e.

e. If the conditions of step d do not exist, loosen two screws (D) which hold the motor heat sink to the panel. Adjust the height of the motor so that the conditions in step d exist. Tighten screws (D). On some units it may also be necessary to loosen the four 8-32 socket head screws (B) at the rear of the panel which hold the Mechanism Assembly to the Front Panel and move the Mechanism Assembly to achieve the required setting. This should only be attempted if the adjustment cannot be made with the motor only. Tighten screws (B) if required. Check the conditions in step d again and perform step e as required.

WARNING

If the motor has been running for a period of time, it or the heat sink may be too hot to touch comfortably. Allow sufficient time for the motor and heat sink to cool before any adjustment or use a cloth or pair of gloves.

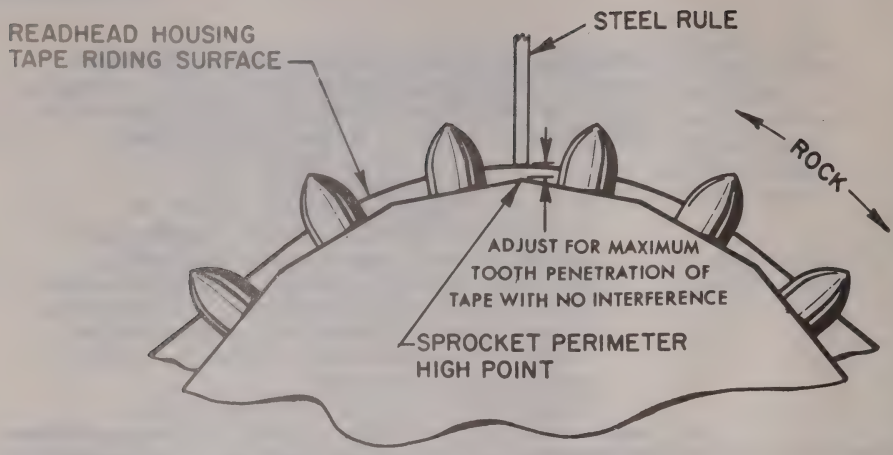


Figure 5-3. Sprocket Relation to the Tape Riding Surface.



Figure 5-4. Setting of the Sprocket in Relation to Tape Riding Surface.

f. Insert a loop of tape known to have been punched to within ±0.0025 inch in a 5-inch span (0.05% error).

NOTE

Since repeatability of the feedhole placement in either direction is essential, a tape whose accumulated error in a 5-inch span is considerably better than ±0.025 inches (as specified in Section 3.6) must be used in this procedure. Remex specifies a tape known to be punched to within ±0.0025 inch in a 5-inch span (±0.05% tolerance). Note that most Remex punches are specified at ±0.025 and therefore these tapes should not be used for this adjustment unless the tape has been checked on a registration gauge and found to be within ±0.0025 inch.

g. Loosen nut (T) which holds the fiber optics light source to the reader panel and rotate the light source away from the light tunnels.

h. With the rear edge of the tape parallel to the front panel, align the holes over the light columns in the readout assembly so that they are concentric. See Figure 5-5. The tape must remain parallel to the front panel so that no skew is present. With the tape in this position, the sprocket teeth should be centered in the sprocket holes in the tape. Skewing is indicated by tracks 1 and 8 not being concentric.

i. If the conditions of step h do not exist, loosen the two set screws (J) which hold the sprocket to the motor shaft move the sprocket in or out on the shaft until the teeth are centered in the feed holes and the tape holes remain concentric with the light tunnels. Tighten screws (J). Recheck the adjustment and readjust as required.

j. Connect the power plug and place the POWER switch into the ON position. The motor should be energized.

k. Loosen the single screw (S) which holds the motor to the heat sink (some earlier models may have two sets screws).

l. Rotate the motor so that the holes in the tape are concentric with the light columns in the read head and the sprocket teeth are centered in the feed holes. Tighten the set screws. Recheck the adjustment and readjust as required.

m. Remove the 0.05% tape.

n. Place the POWER switch in the OFF position.

o. Make sure jack screw (E) is not protruding below the surface of the Upper Tape Guide.

p. Insert three layers of 0.0037 mylar tape (approximately 0.011 inch) stapled together at one end or a piece of 0.010 plastic shim stock (see Table 5-1) between the Upper Tape Guide and the Readhead Assembly.

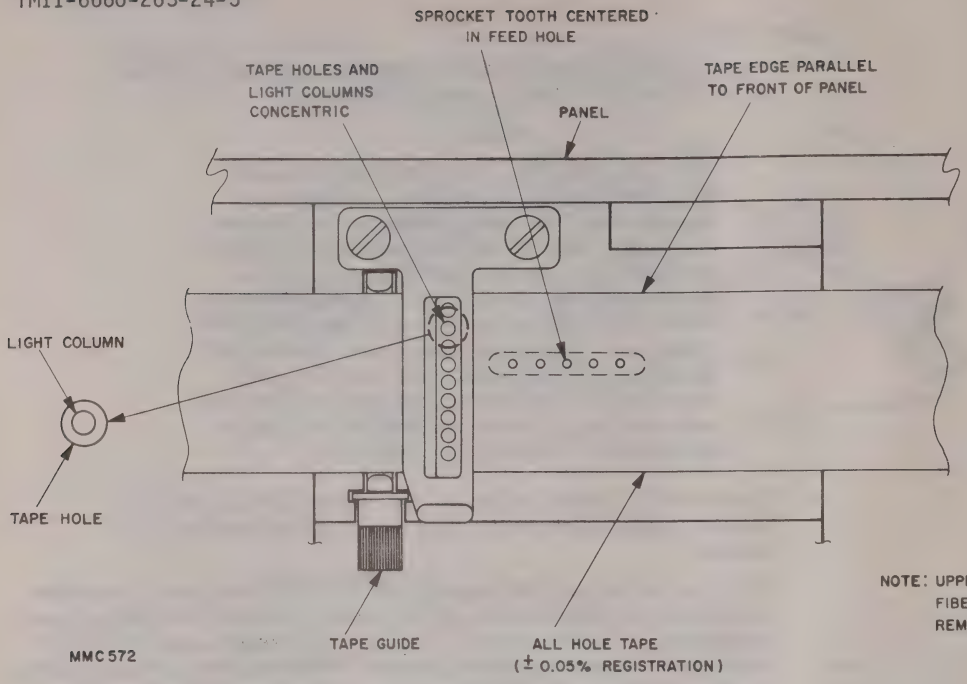
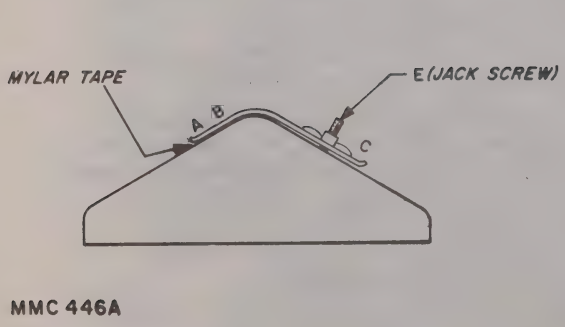


Figure 5-5. Alignment of the Sprocket with the Light Columns.



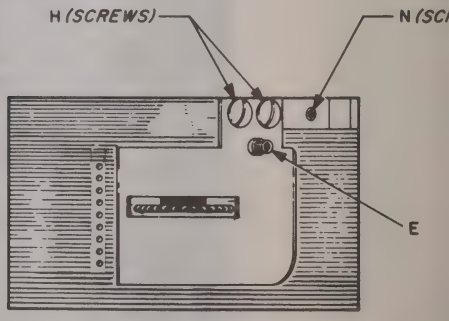


Figure 5-6. Adjustment of the Upper Tape Guide.

q. Referring to Figure 5-6 use screws (H) and (N) to adjust the Upper Tape Guide so that there is maximum contact, firm pressure on the tape, and parallelism from A to B. Use screw (H) for lateral movement and screw (N) for rotational movement. From points B to C, the Upper Tape Guide will not show this parallelism.

r. Remove the three layers of tape.

s. Insert two layers of tape between points A and B only or a strip of 0.0075 shim stock.

t. Screw down jack screw (E) which will raise the Upper Tape Guide slightly. Adjust screw (E) until there is free movement of two layers of tape or shim stock between points A and B. This should provide a gap of between 0.009 and 0.011 inch.

u. Remove the two layers of tape or shim stock.

v. Connect P11 coming from the Readhead Assembly to a test circuit as shown in Figure 5-7. Connect a digital voltmeter in parallel with a 1K resistor. Place the POWER switch in its ON position.

w. Place a digital voltmeter across TP7 and TP1 on the Power Supply card and adjust R5 until the meter reads +4.3 Vdc. This is only a preliminary step. The final lamp voltage is set in step x.

x. The nut (T) holding the fiber optic light source to the front panel should already be loose (step g). Rotate the fiber optic light source until the current through the 1K resistor is between 100 and 110 microamps for the sprocket cell. If the current is excessive reduce the lamp voltage. If the current is below the minimum requirements, loosen nut (U) which locks the lamp in the sleeve and screw the lamp in or out to obtain the required current. Tighten nut (U). If the current is still below the minimum requirement, increase the lamp voltage slightly to obtain the required current. Do not increase the lamp voltage above +4.7 Vdc. When the required current is obtained for the sprocket, the minimum current for each of the data cells should be 80 microamps. The maximum output from any data cell should be 160 microamps so that tapes with the highest permitted transmissivity can be read without error.

y. Place the POWER switch in the OFF position and reconnect P11.

z. Place the POWER switch in the ON position and insert the 0.05% described in step f.

aa. Drive tape in either direction using the direction switch or the external drive lines in continuous drive mode. Continuous drive is recommended rather than step mode operation since the tape speed must be above 60 cps.

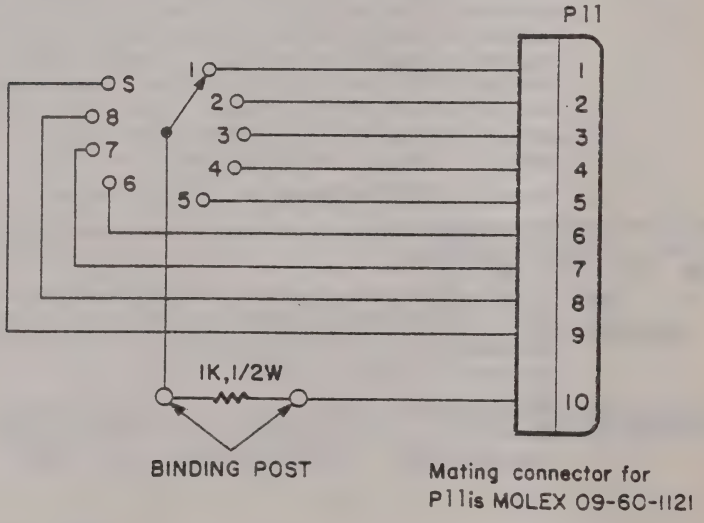
bb. Place a digital voltmeter across TP8 (VMOT) and TP1 (0V) on the Power Supply Card and adjust R15 for +34 Vdc at TP8. This is a preliminary step. The final voltage is set in step ff.

cc. Connect a pulse counter to TP2 (Data Ready) and TP4 (0V) on the Reader Card.

dd. Measure the drive left speed using a DL* signal tied to 0V at J2-17. Repeat using a DR* signal tied to 0V at J2-16. If the lowest speed is more than 5% slower than the highest speed, loosen screw (S) which holds the motor to the heat sink. Rotate the motor slightly so that the difference in drive left and drive right speeds is less than 5%. Tighten screw (S). Repeat step dd as required. When rotating the motor, make sure it is kept tight to the panel so that the adjustment in step i not disturbed. If steps i and l have been performed correctly only a slight adjustment of the motor should be necessary to obtain the 5% difference in speeds.

NOTE

The importance of steps cc and dd is not a specific interest in matching speeds, but rather that balancing speeds insures proper placement of the feedhole (via the sprocket) in relation to its aperture in the readhead. The 0.05% tape used virtually assures that there are no feedhole placement errors which are attributable to tape registration errors, but only to the position of the sprocket in relation to the feedhole aperture in the readhead. Thus measuring and balancing the slew speed is only an accurate, electronic method of assuring that this relationship exists. When the speeds in the two directions are properly balanced, feedhole placement error will be minimal and independent of the direction of the tape, thereby increasing tape readability to a maximum.



MMC 354

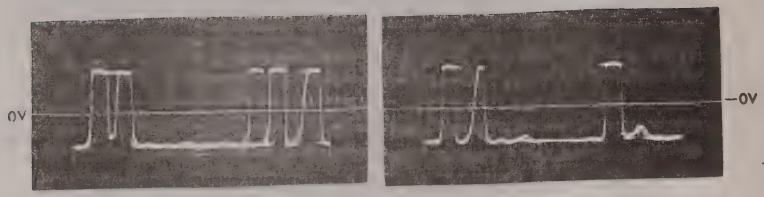
Figure 5-7. Photocell Output Test Circuit.

ee. Connect a pulse generator to the DR* input, J2-16. Set the pulse generator for 300 pps.

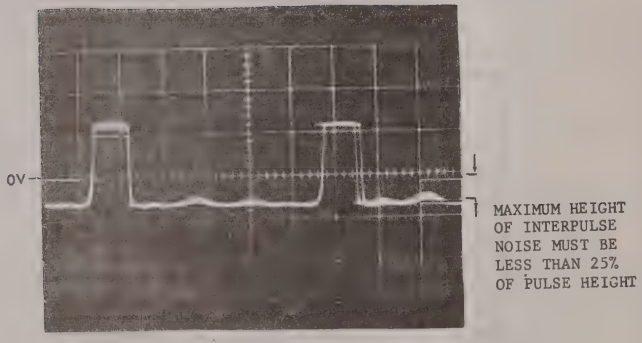
ff. Connect an oscilloscope to the sprocket cell output at TP3 on the Reader Card and observe the jitter at the -0.3 Vdc level (do not be concerned about the jitter at the +0.6 Vdc level nor the time jitter in the leading or trailing edges of the waveform). Minimize the jitter by loosening the two set screws (R) which hold the collar to the motor shaft and move the collar in or out as required to obtain the least amount of jitter. See Figure 5-8. Cycle the reader between 20 and 330 characters/sec and adjust for minimum jitter. It may also be necessary to reduce the VMOT voltage set in step bb in addition to moving the collar. VMOT should not, however, be adjusted lower than +30 Vdc nor higher than +34 Vdc. Repeat steps ee and ff as required.

gg. Repeat steps ee and ff for the DL* input, J2-17.

hh. Remove the tape loop, pulse generator, oscilloscope and counter and perform the reverse of steps b and then a.



Two Examples of Misadjustment



MMC204A

Upper Tape Guide and VMOT Properly Adjusted

Figure 5-8. Sprocket Cell Output Adjustment for Minimum Jitter.

5.8 TAPE SPLICING

If tape breakage occurs, this break may result in damage to one, two, or possibly three characters. When splicing tape for this reader, great care should be used to ensure that the proper sprocket hole spacing be preserved. A lap splice should not be used; use only a but type splice. To repair the tape without loss of characters, the process shown in Figure 5-9 is recommended and is accomplished as follows:

a. Bring the tape ends together as shown in Figure 5-9A.

b. Make a sketch of character(s) at the break (A-B-C) and five additional characters to the left (5-4-3-2-1) and five to the right (1-2-3-4-5) of the broken character(s) (A-B-C).

c. Place the left end of the broken tape over a section of blank tape containing only feed holes so that at least eight or ten feed holes in each tape are aligned with one another as shown in Figure 5-9B. Cut the tapes at the third undamaged character to the left of damaged characters(A-B-C). Use care to insure that feed holes are aligned and make cut through the center of the holes in the third undamaged character. Characters 5, 4, and half of 3 should remain on the broken tape.

d. Place the right end of the broken tape over the section of blank tape so that at least eight or ten feed holes are aligned with one another. Feed holes for one-half of 3, 2, and 1 on the blank tape cut in step c should be visible to the left of the broken tape end as shown in Figure 5-9C. Cut the tapes at the third undamaged character to the right of the damaged character. Be sure that feed holes are aligned and make the cut through the center of the holes in the third undamaged character.

NOTE

One half of character 3 and characters 4 and 5 should remain in the broken tape.

e. Place tape ends and new section on a flat surface with feed holes forward as shown in Figure Figure 5-9D (tape is bottom side up). Using Silver Scotch® tape, No. 852, splice the new section and the old tape ends as shown. That portion of tape that secures the old tape ends must cover the first two and a half characters (one-half of 3, 4, and 5) on the old tape ends. The edges of the tape should be between characters as shown. Use of 1/2 inch wide splicing tape is recommended as shown in Figure 5-9D.

f. Repunch the characters recorded in step d.

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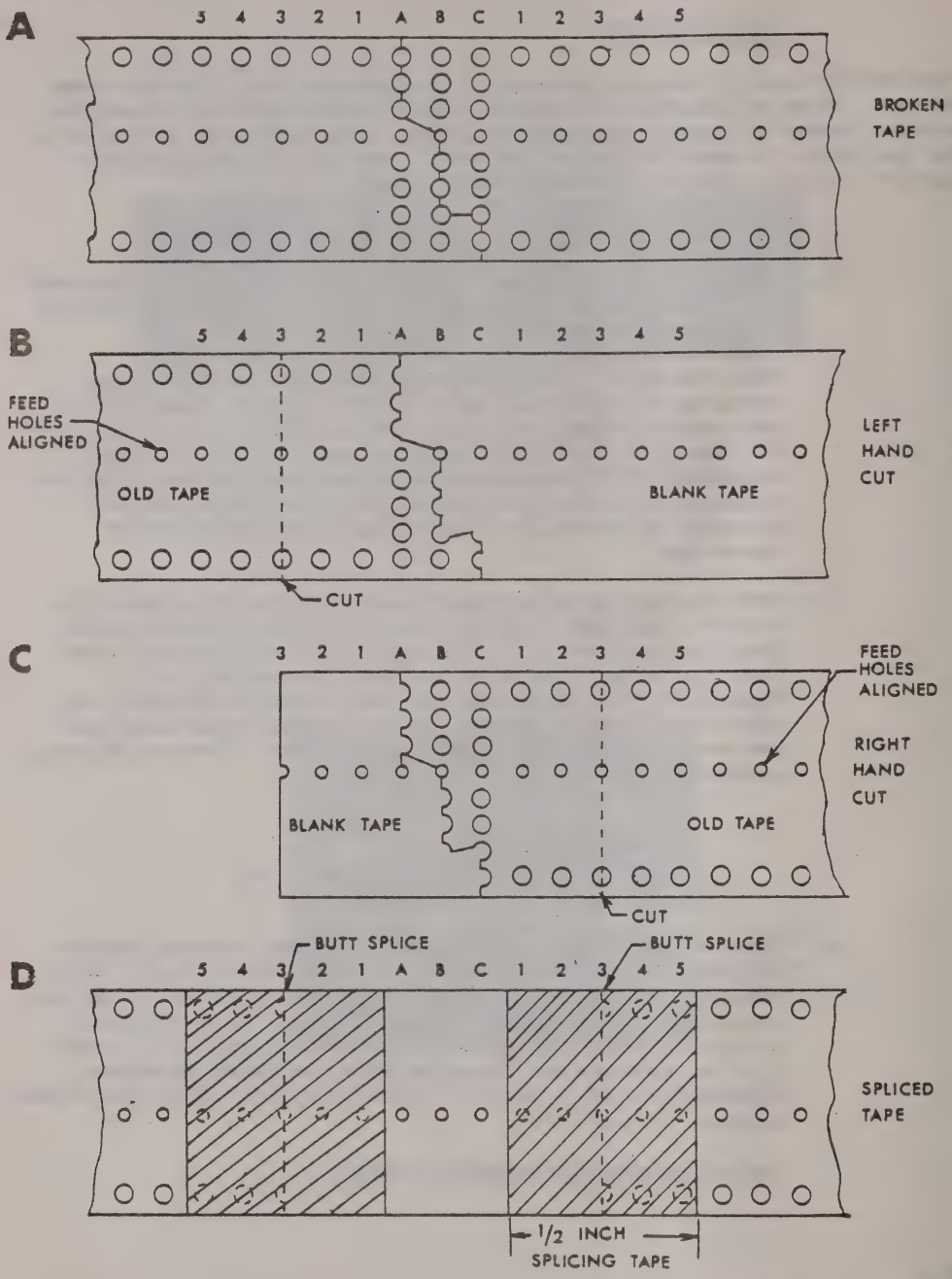


Figure 5-9. Tape Splicing Procedure

SECTION VI

PARTS REPLACEMENT

6.1 GENERAL

REMEX maintains service facilities at its manufacturing location and at service centers in major population areas for repair or replacement of components for their products. It is recommended that one of these centers be contacted for assistance in case of equipment malfunction. For the locations of service facilities in any area, contact REMEX at the address or telephone listed on the title page of the manual. Please direct inquiries to the attention of the Service Department.

When any part of the system requires replacement or disassembly, the procedures outlined below should be followed closely. The warnings and cautions are included to protect personnel and equipment. Notes are included to assist persons unfamiliar with the equipment. Before attempting any procedure, all instructions for that disassembly should be read and understood.

Quantities of replaceable items suggested as spares are listed in Section 7. All system components are identified in Section VII of this manual, along with illustrations showing part location. This information may be used to locate parts below unit level if replacement is required. Always reference the complete model number and serial number when making inquiries.

WARNING

Potentially dangerous line voltage is applied to components within this equipment. If adjustments must be performed with power applied, these points must be located and avoided. High voltage can be accidentally contacted at TB1 and TB2, at the OFF-ON switch/wiring connections, and on the circuit cards (rear of the unit).

6.2 PUNCH REMOVAL

The following procedure should be used when removing the punch.

a. Remove all power and control signals from the unit by disconnecting P1/J1, P2/J2 (on RAB, RAR and RAF units only) and the power cord.

b. Disconnect P14/J14. Remove the chad box.

c. Loosen the two screws (items A, Figure 7-8) which holds the punch to its support bracket.

d. Loosen and remove the two screws (items B, Figure 7-8) which hold the punch mounting bracket to the punch shock mounts.

e. The punch is now free and can be removed from the system.

f. Replacement is the reverse of steps e, d, c, and then b.

g. Perform Section 5.5.2.

6.3 FRONT PANEL-CHASSIS SEPARATION

The following procedure should be used when separating the front panel from the chassis.

a. Remove all power and control signals from the unit by disconnecting P1/J1, P2/J2 (RAR, RAB and RAF units only) and the power cord.

b. Remove the two screws which hold each handle to the chassis. Use care not to lose the attached spacers.

c. From the rear of the front panel remove the four nuts which hold the front panel to the chassis.

d. Carefully lower the front panel down and away from the chassis and allow room to perform step e.

e. Disconnect P8/J8(green). On RAR, RAB and RAF units, also disconnect P7/J7 (yellow), P10/J10 (orange) and P11/J11 (red).

f. Slide the quick disconnect wires off S1 at terminals 2 (white wire), 3 (black) and 4 (red). Note terminals for proper replacement.

g. The front panel is now free from the chassis.

h. Reassembly is the reverse of steps g, f, e, d, c, b, and then a.

6.4 POWER SUPPLY ASSEMBLY REMOVAL

The following procedure should be used when separating the power supply assembly from the chassis.

a. Remove all power and control signals from the unit by disconnecting P1/J1, P2/J2 and the power cord.

b. Remove the four screws at the rear which hold the power supply to the chassis.

c. Slide the power supply out sufficiently far to be able to disconnect P15/J15 (red, white and black wires coming from S1).

d. Disconnect P16/J16 (white) and P109/J109 (red) on the power supply card.

e. The chassis and power supply with the fan attached are now free.

CAUTION

Never operate the punch without the fan in place to provide airflow. Permanent damage to the punch could result.

f. Replacement is the reverse of steps e, d, c, b and then a.

6.5 CARD REMOVAL

The following precautions should be used when replacing or removing the printed circuit cards.

a. Remove all power and control signals by disconnecting P1, P2 (on RAB, RAR and RAF units only), and the power cord.

b. Never force a card into its connector. The cards pull out and push in firmly, but excessive force should never be required.

c. If the Perforator Logic Card is replaced, perform Section 5.5.2.

d. If the Power Supply card is replaced, perform Sections 5.5.3, 5.6, and steps t and u of Section 5.7.

e. If the Reader card is replaced, perform Section 5.7.

6.6 READER UPPER COVER ASSEMBLY

The Upper Cover Assembly is held to the front panel by two 6-32 round head screws (Item A, Figure 7-1). It should be replaced as a complete assembly.

6.7 READHEAD MECHANISM DISASSEMBLY

This procedure is required when replacing the Upper Tape Guide Assembly, the Readhead Assembly (consisting of the Readhead Housing, Photocell Assembly and Light Columns), or the Mechanism Assembly (consisting of the Door Mechanism Assembly, Tape Guide Cam, Tape Guide Actuator, Slide and Spring). For ease of assembly, it is recommended that the Readhead Assembly (part number 113168-1) and Mechanism Assembly (part number 113170-1) be replaced as a complete assembly. However, Figure 7-2 is provided for those desiring to order the subassemblies that comprise the Mechanism Assembly. Figure 7-1 should be folded out from Section 7 to follow during this procedure. The following procedure is recommended when replacing any of the above mentioned items:

a. Remove all power and control signals by disconnecting P1/J1, P2/J2, and the power cord.

b. Remove the Upper Cover Assembly by performing Section 6.6.

c. Disconnect P10/J10 and P11/J11.

d. Loosen the four 8-32 socket head screws (Item B, Figure 7-1) which holds the Mechanism Assembly to the Front Panel at the rear of the front panel. The entire Readhead Mechanism Assembly consisting of the Tape Guide Assembly, the Readhead Assembly, and the Mechanism Assembly is now free to be removed from the panel.

e. Remove the two 4-40 binder head screws (Item H, Figure 7-1) which hold the Tape Guide Assembly to the Mechanism Assembly. If no further disassembly is required, install the new Upper Tape Guide Assembly and perform the reverse of steps f through c. Perform Section 5.7.

f. From the underside of the Mechanism Assembly remove the two 4-40 round head screws (Item I, Figure 7-1) which hold the Readhead Assembly to the Mechanism Assembly. The Readhead Assembly and the Mechanism Assembly are now separated and can be replaced as individual assemblies. It is not recommended that Mechanism Assembly be disassembled beyond this level.

g. Reassembly is the reverse of steps f, e, d, and then c.

h. Perform Section 5.7.

6.8 LAMP REPLACEMENT

The following procedure should be followed when replacing the Lamp:

a. Remove all power and control signals by disconnecting P1/J1, P2/J2, and the power cord.

b. Remove the two quick connect terminals at the rear of the lamp.

c. Unscrew the lamp from the sleeve.

d. Replacement is the reverse of steps c, b and then a.

e. Perform Section 5.7, steps v, w and x.

6.9 MOTOR AND/OR SPROCKET REPLACEMENT

The following procedure should be followed when replacing the motor and/or sprocket:

a. Separate the Reader Panel Assembly from the unit. See Section 6.13.

b. Remove the Readhead Mechanism Assembly by performing Section 6.7, steps a through e.

c. Loosen the two set screws (Item J, Figure 7-1) which hold the sprocket to the motor shaft. If only the sprocket needs replacing proceed to step g.

d. Loosen the two set screws (Item G, Figure 7-1) which hold the motor to the heat sink and back the motor out. On some models the two set screws have been replaced with single screw S.

e. Install the new motor by performing the reverse of step d. The motor should be up flush against the panel. Tighten set screws G of screw S.

f. Install the sprocket wheel so that: (1) the distance of the back side of the sprocket to the front panel is 0.862 ± .003 inch (see Figure 7-1) and (2) the 1/8 inch long set screw tightens on the flat of the motor shaft. Tighten set screws J.

g. Install the Mechanism Assembly by performing the reverse of step b.

h. Perform the reverse of step a.

i. Perform Section 5.7.

6.10 TRANSFORMER REPLACEMENT

The following procedure is recommended when replacing the transformer:

a. Remove the Power Supply from the chassis by performing Section 6.4.

b. Disconnect P103/J103 (black) connector.

c. Remove the six quick disconnect wires as follows: white/green at TB1-8, white/yellow at TB1-7, white/orange at TB1-6, white/red at TB1-5, white brown at TB1-4, white at TB1-3.

d. Remove the four screws which hold the transformer to the power supply chassis.

e. Replacement is the reverse of steps d, c, b, and then a.

6.11 FRONT PANEL SWITCH REPLACEMENT

When replacing any switch located on the front panel, it is recommended that the following procedure be used.

a. Remove all power and control signals by disconnecting P1/J1, P2/J2, and the power cord.

b. Remove the two screws which hold the switch plate cover to the front panel.

c. Slide off the terminals of the switch to be replaced. Note each wire for correct replacement.

d. Snap the switch out the front of the panel by pressing from the rear.

e. Remove the switch. Lamps located inside certain switches are accessible after removing the rocker cap.

f. Install the new switch by performing the reverse of steps e, d, c and b and then a.

6.12 SWITCHES S9 AND S10 REPLACEMENT

The following procedure is recommended when replacing either S9 or S10.

a. Remove all power and control signals by disconnecting P1/J1, P2/J2 and the power cord.

b. Remove the two 4-40 round head screws (Item L, Figure 7-1) which holds Lower Cover Frame to the Mounting Block Assembly and drop the Lower Cover Frame.

c. If the Slew Switch, S10, is to be replaced, unsolder the following wires: Orange at S10-1, Yellow at S10-2 and Green at S10-3. If the LOAD switch, S9, is to be replaced proceed to step f.

d. Snap out the out switch S10.

e. Replacement is the reverse of steps d, c, b and then a.

f. If the LOAD switch, S9, is to be replaced, loosen the two 2-56 screws, (Item M, Figure 7-1) washers, and hex nuts which hold S9 to the Mounting Block Assembly.

g. Unsolder the following wires: Blue at S9-C, and Violet at S9-NC.

h. Replacement of S9 is the reverse of steps g, f, b, and then a.

6.13 READER PANEL ASSEMBLY REMOVAL

The following procedure is recommended when removing the Reader Panel Assembly.

a. Remove all power and control signals by disconnecting P1/J1, P2/J2 and the power cord.

b. Remove the two 6-32 socket screws which hold the lower cover frame to the panel assembly.

c. The three 6-32 binder head screws should now be accessible which hold the reader panel assembly to the front panel. Remove these screws.

d. On the RAF 612X, the tape tray may have to be removed to allow the reader panel assembly to be separated from the unit.

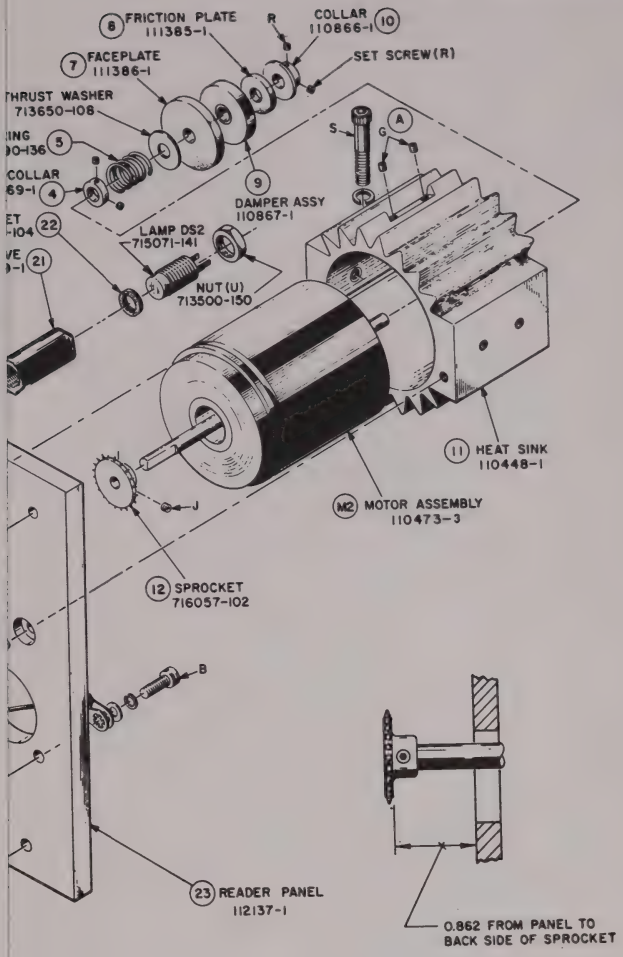
SECTION VII
PARTS LIST

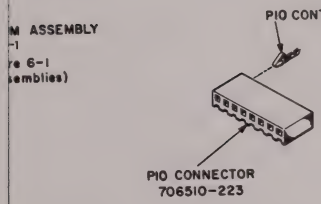
7-1. General

Refer to TM 11-6660-263-20P and TM 11-6660-263-34P for Repair Parts and Special Tools List (RPSTL).

7-2. Illustrations

Parts location illustrations are included in this section for use in the repair and replacement of parts. These illustrations are also included in the RPSTL manuals.





NOTE: CIRCLED NUMBERS REFER TO ITEMS IN REFERENCE DESIGNATION COLUMN IN TABLE 7-2

(A) DELETED ON LATER MODEL WHICH USE SCREW (S)

ader Panel Assembly 111980-1.

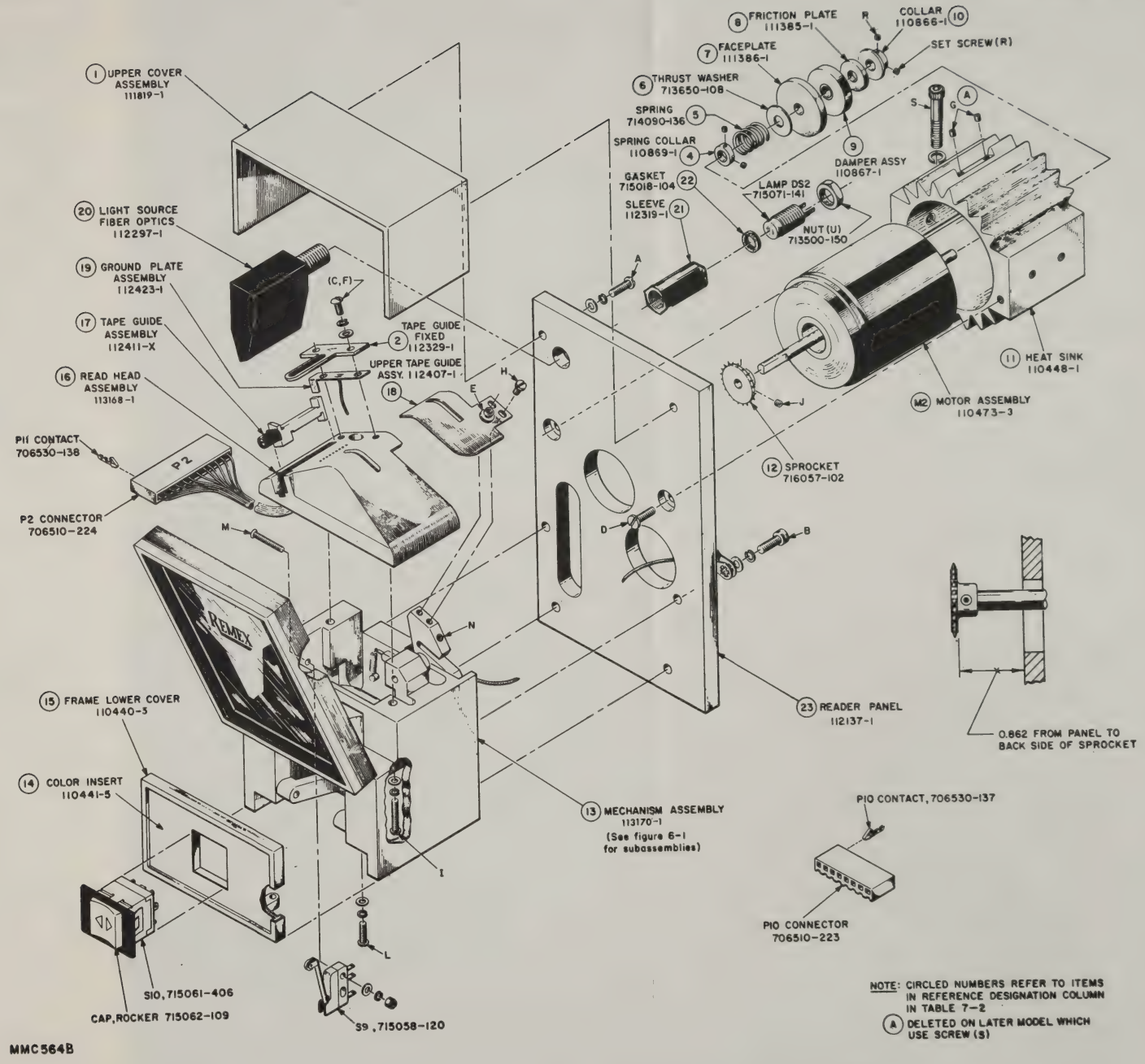


Figure 7-1. Reader Panel Assembly 111980-1.

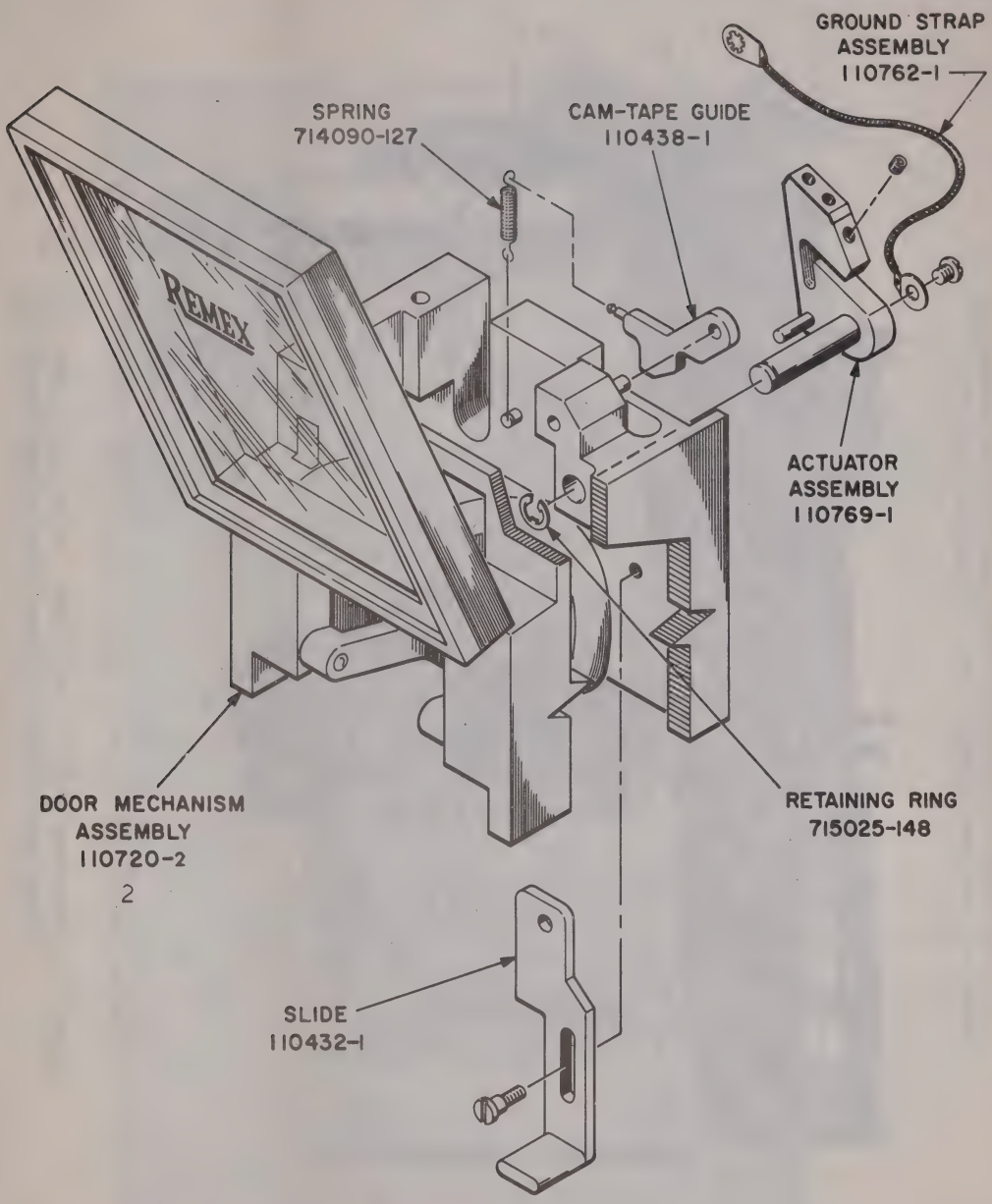


Figure 7-2. Mechanism Assembly 110740-1.

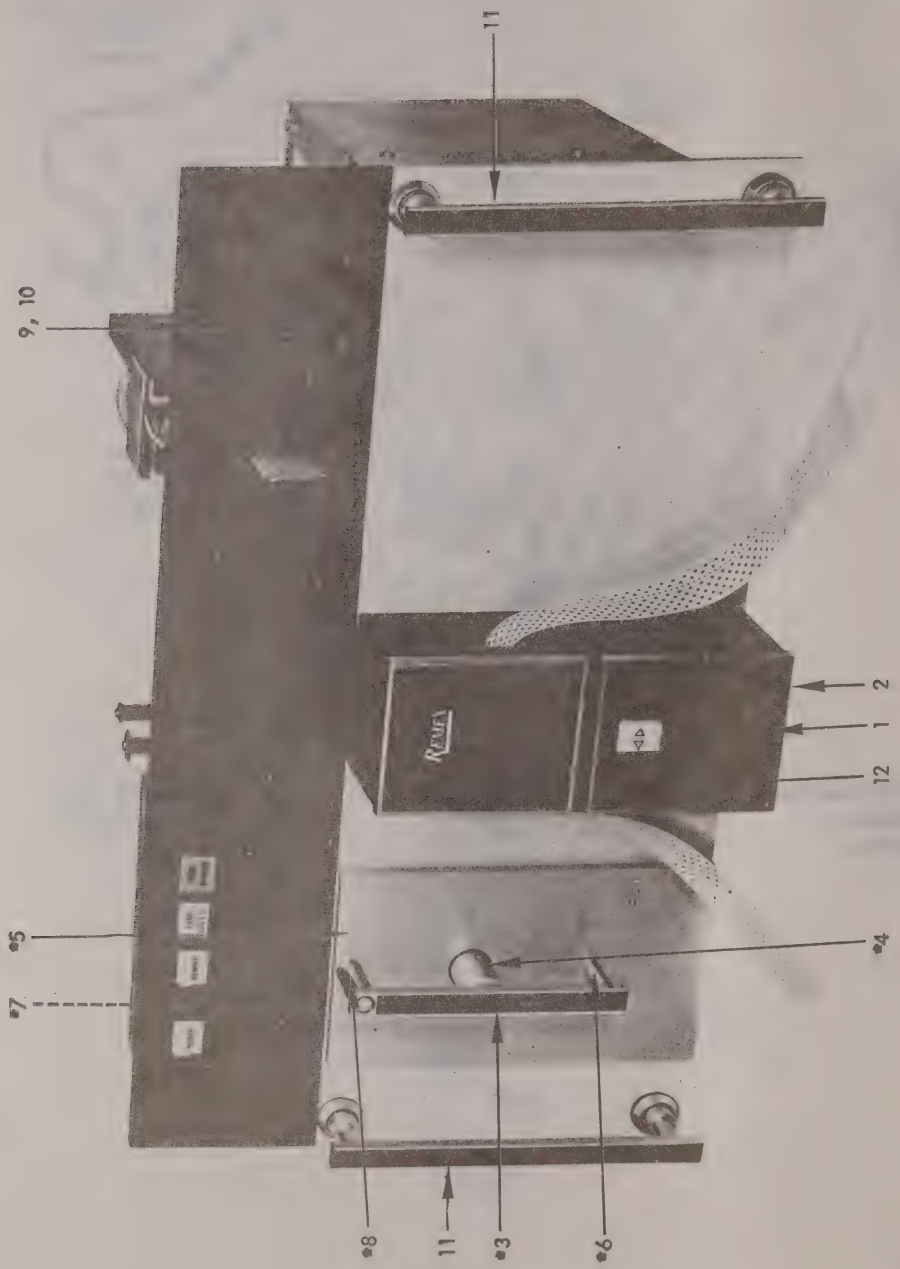


Figure 7-3. Front Panel RAB612X, Front View. The RAR6120 is Identical Except for the Deletion of Items Marked with an Asterisk (*).

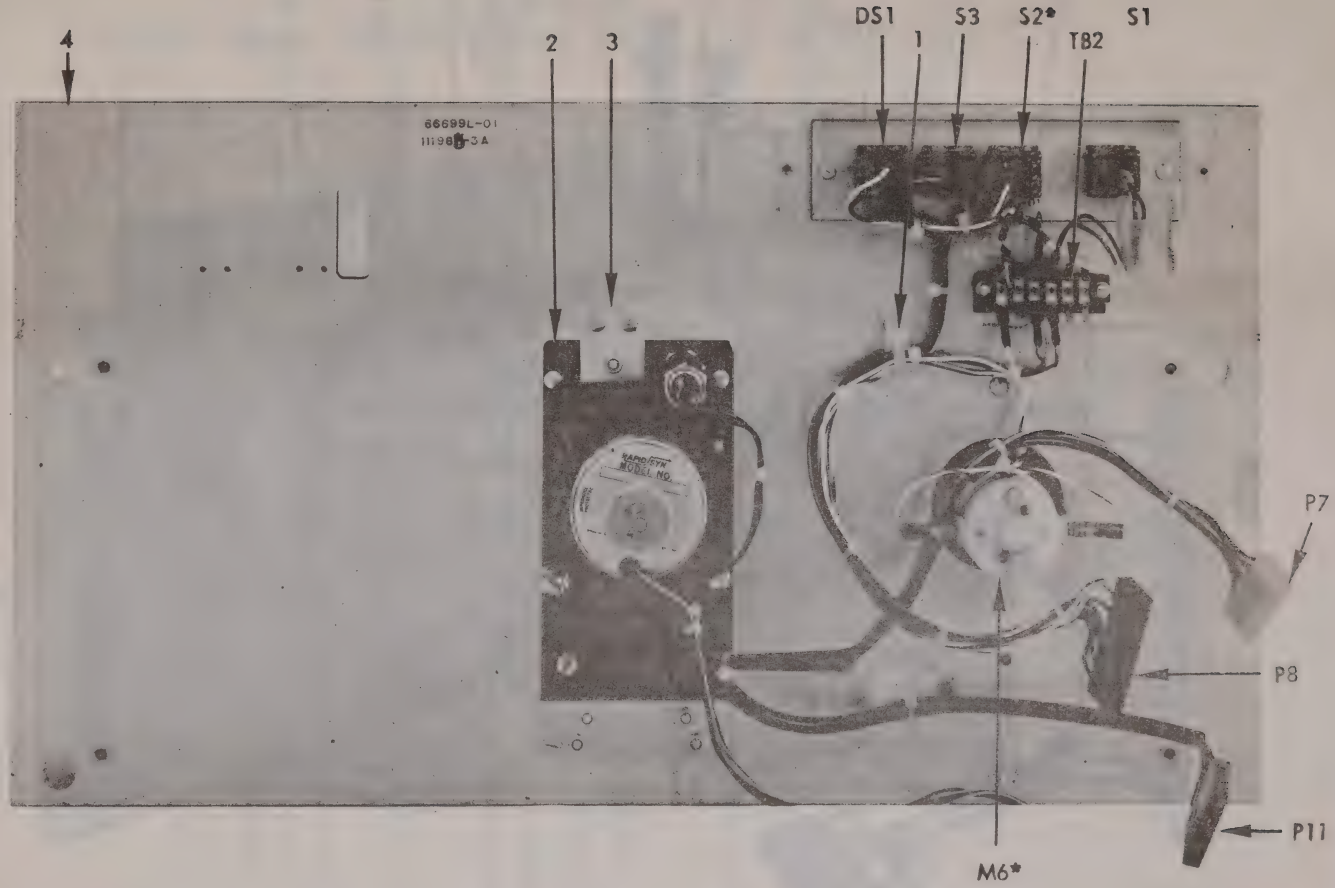


Figure 7-4. Front Panel RAB612X, Rear. The RAR6120 is Identical Except for the Deletion of Items Marked with an Asterisk (*).

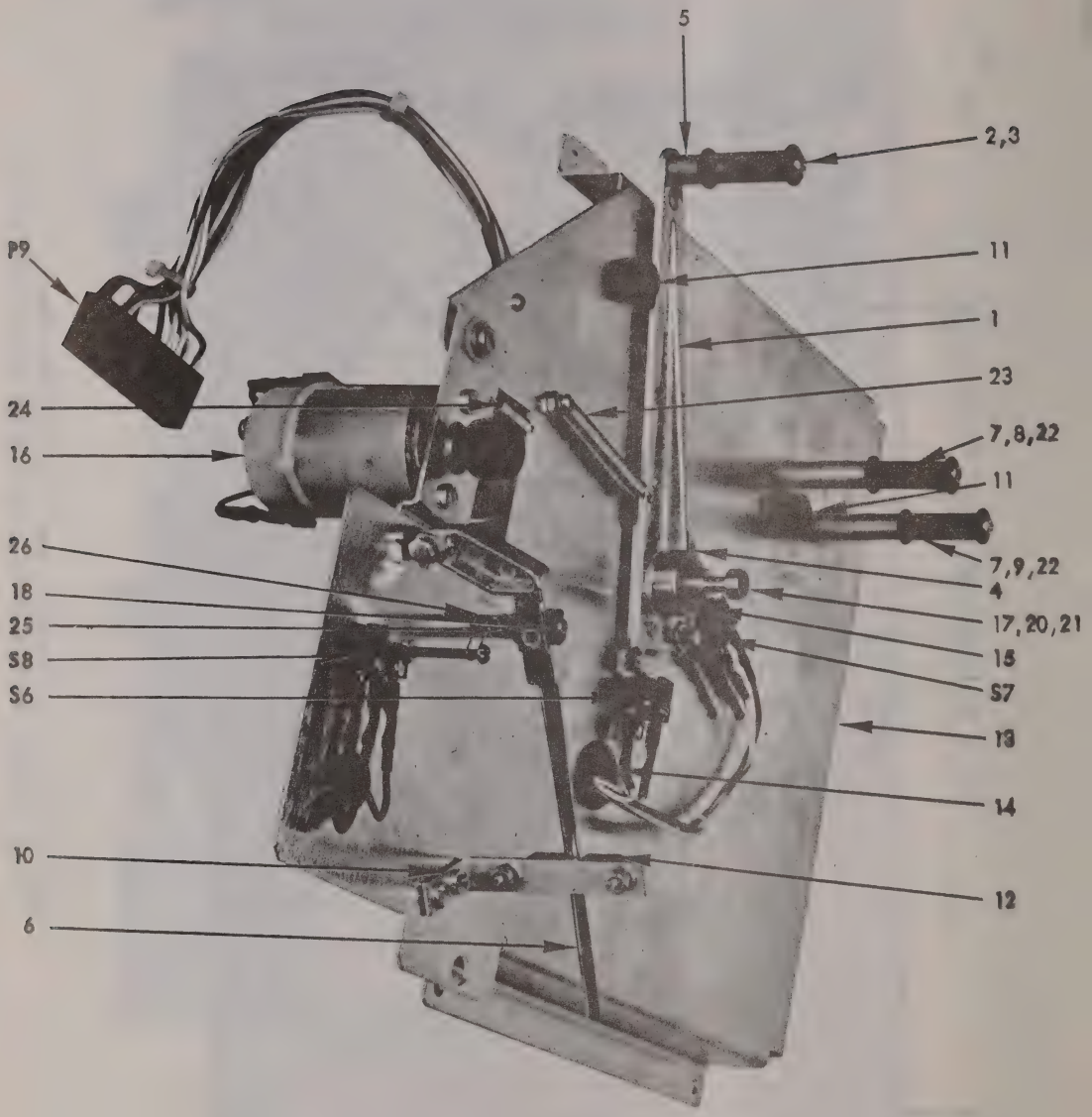


Figure 7-5. Deck Assembly, Tape Supply 112274-1.

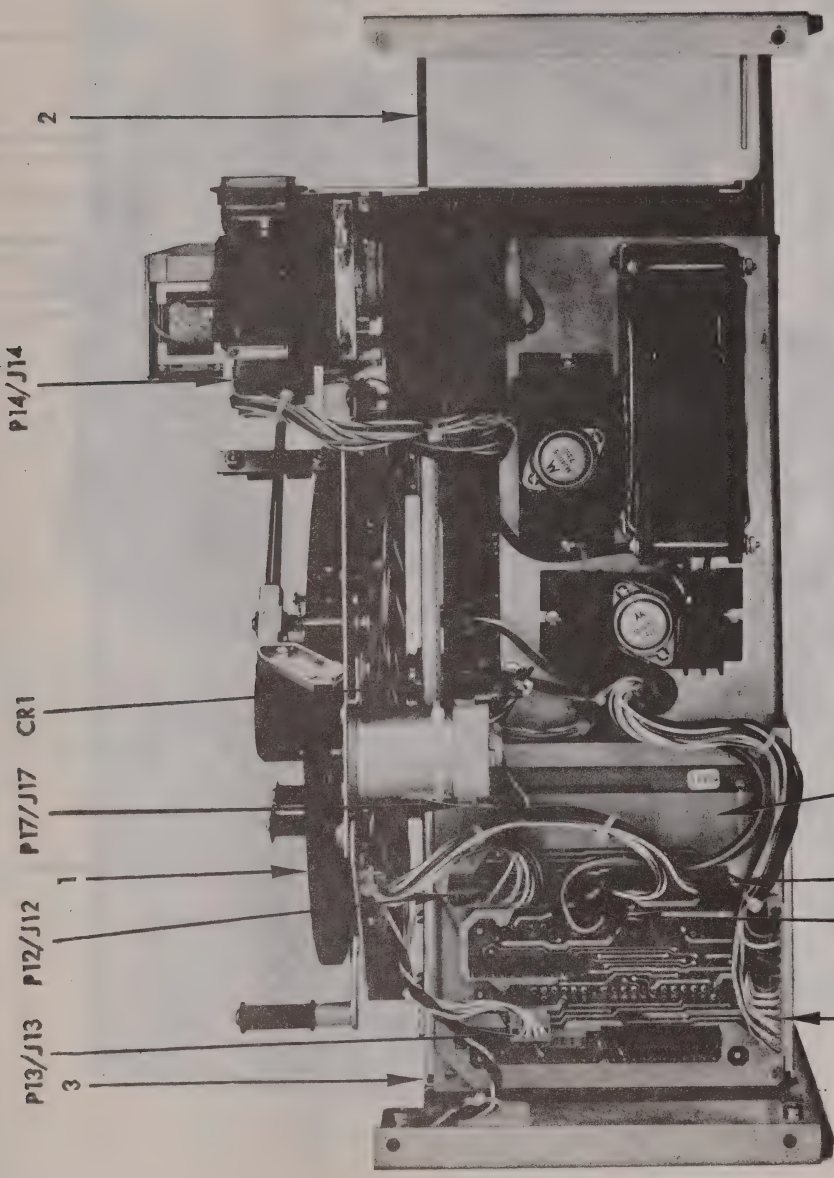


Figure 7-6. Chassis Assembly 112000-1, Inside View.

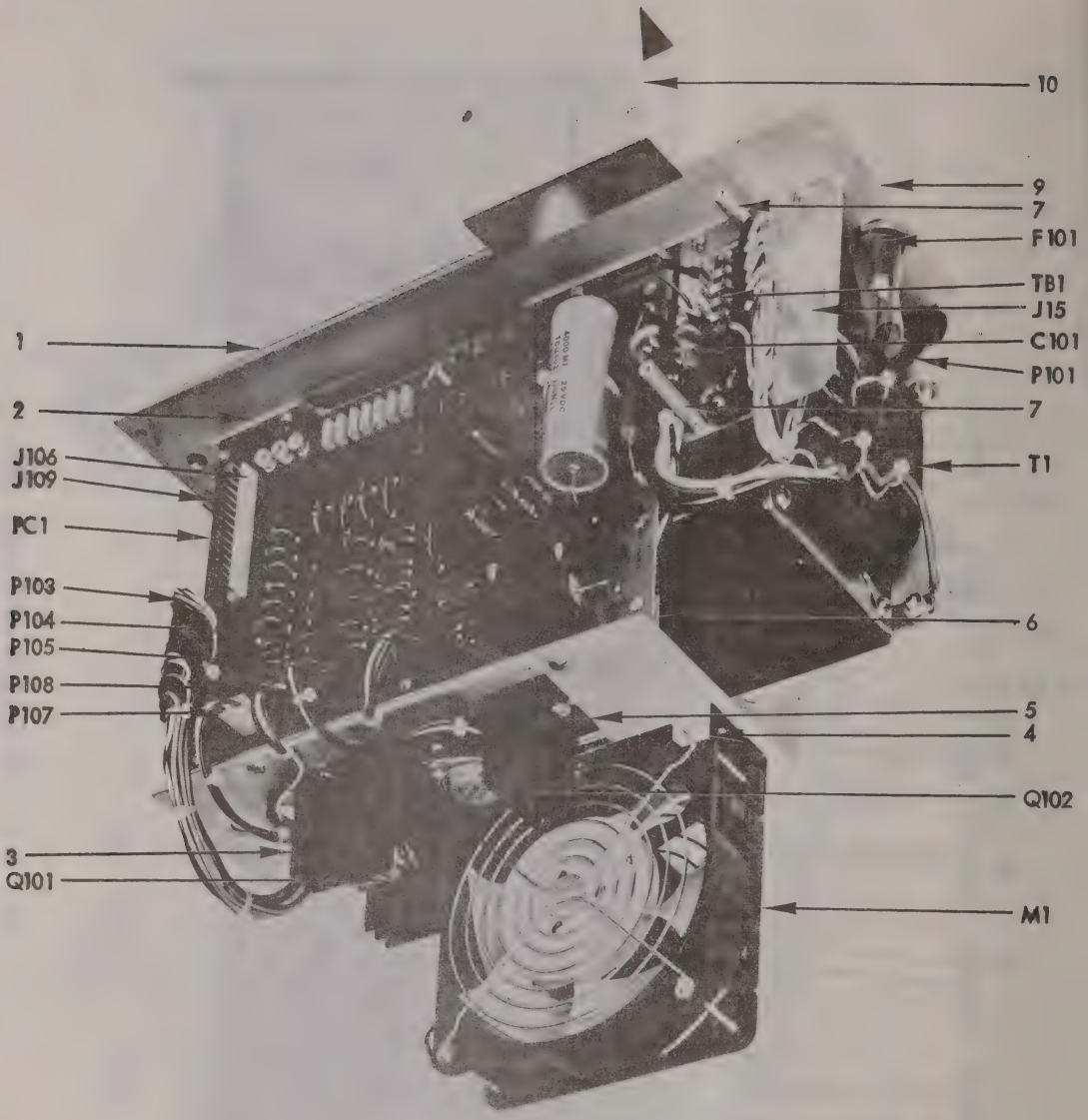


Figure 7-7. Power Supply, 111839-1.

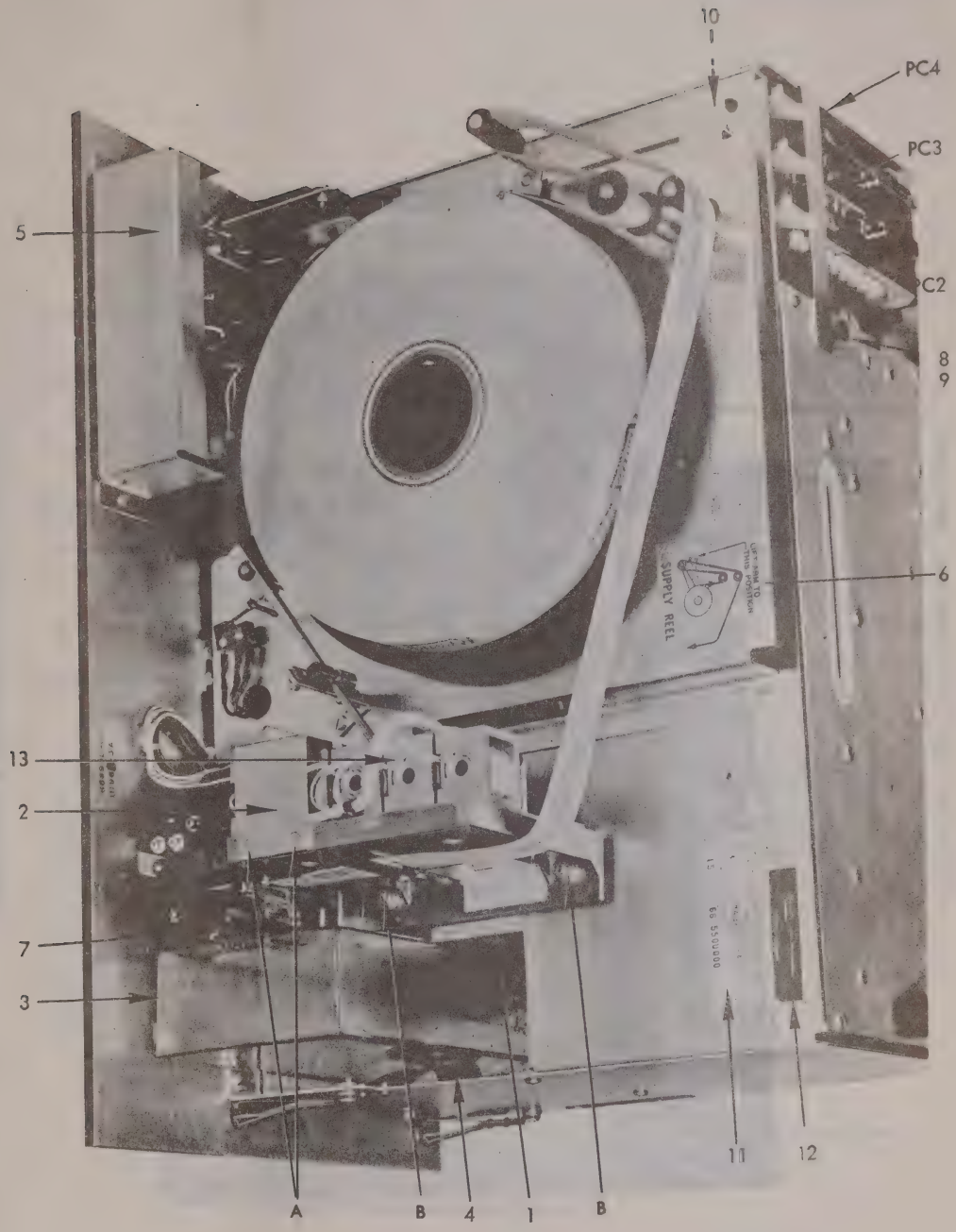


Figure 7-8. Top View, RAB612X. The Top View of the RAR612X is identical.

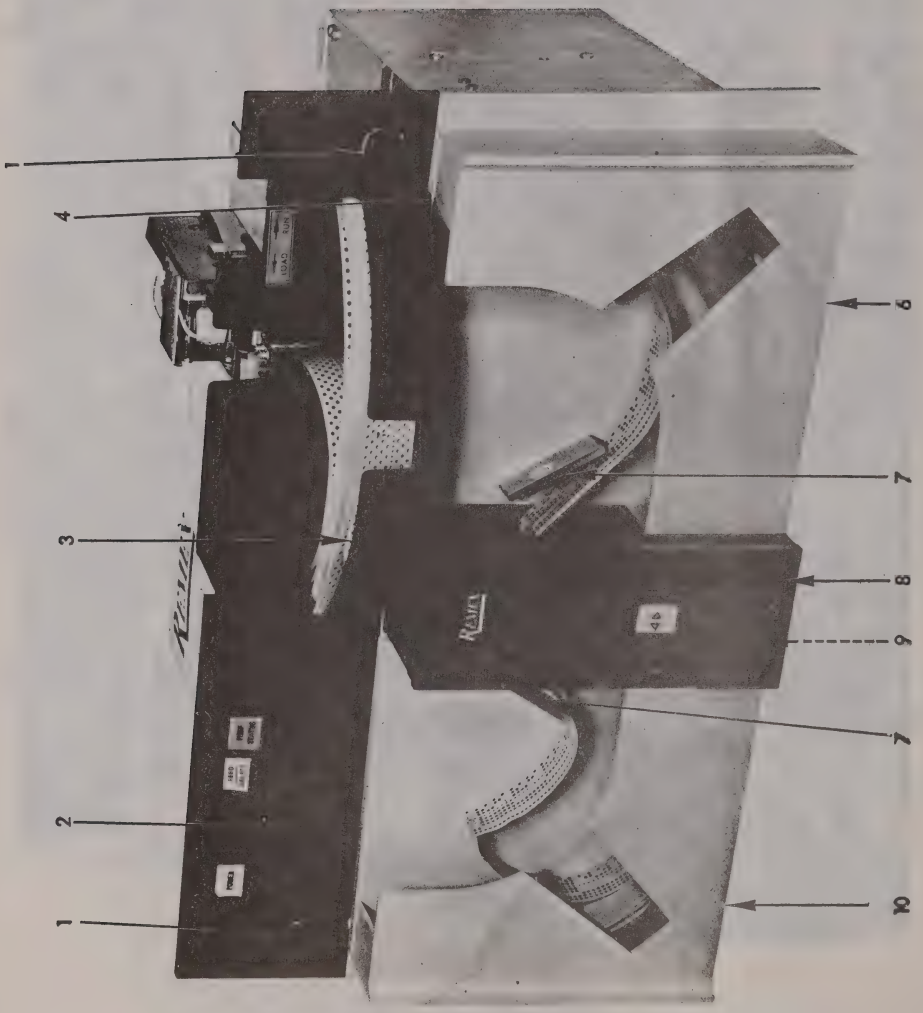


Figure 7-9. Front Panel, RAF612X, Front View.

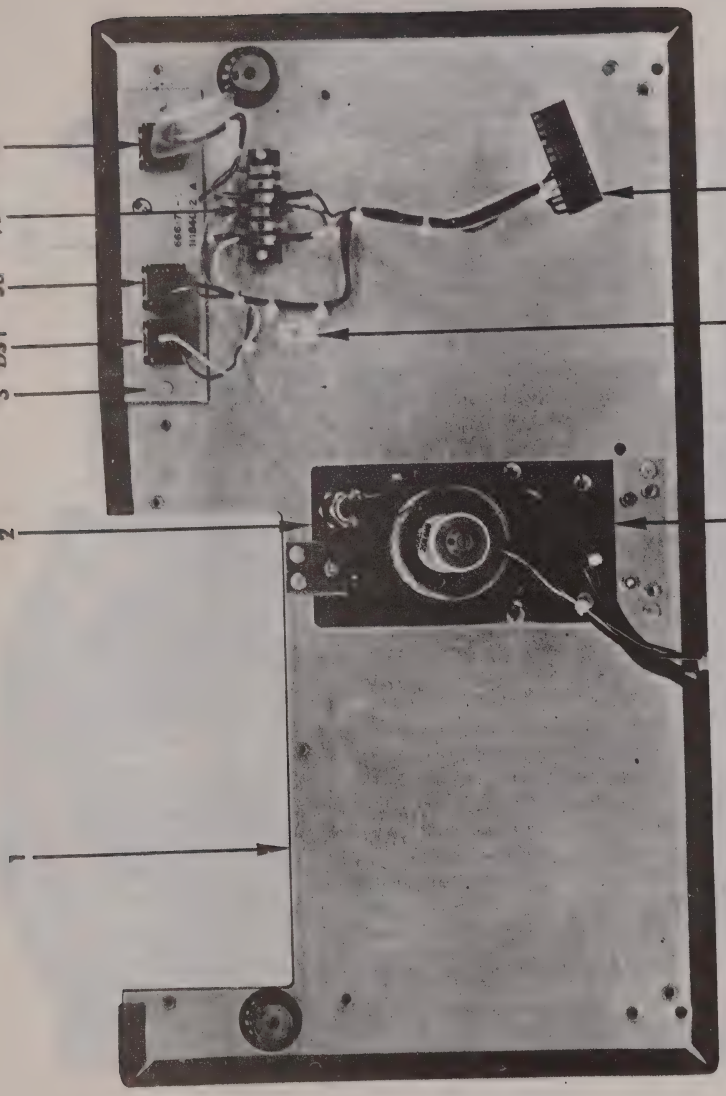


Figure 7-10. Front Panel RAF612X, Rear View.

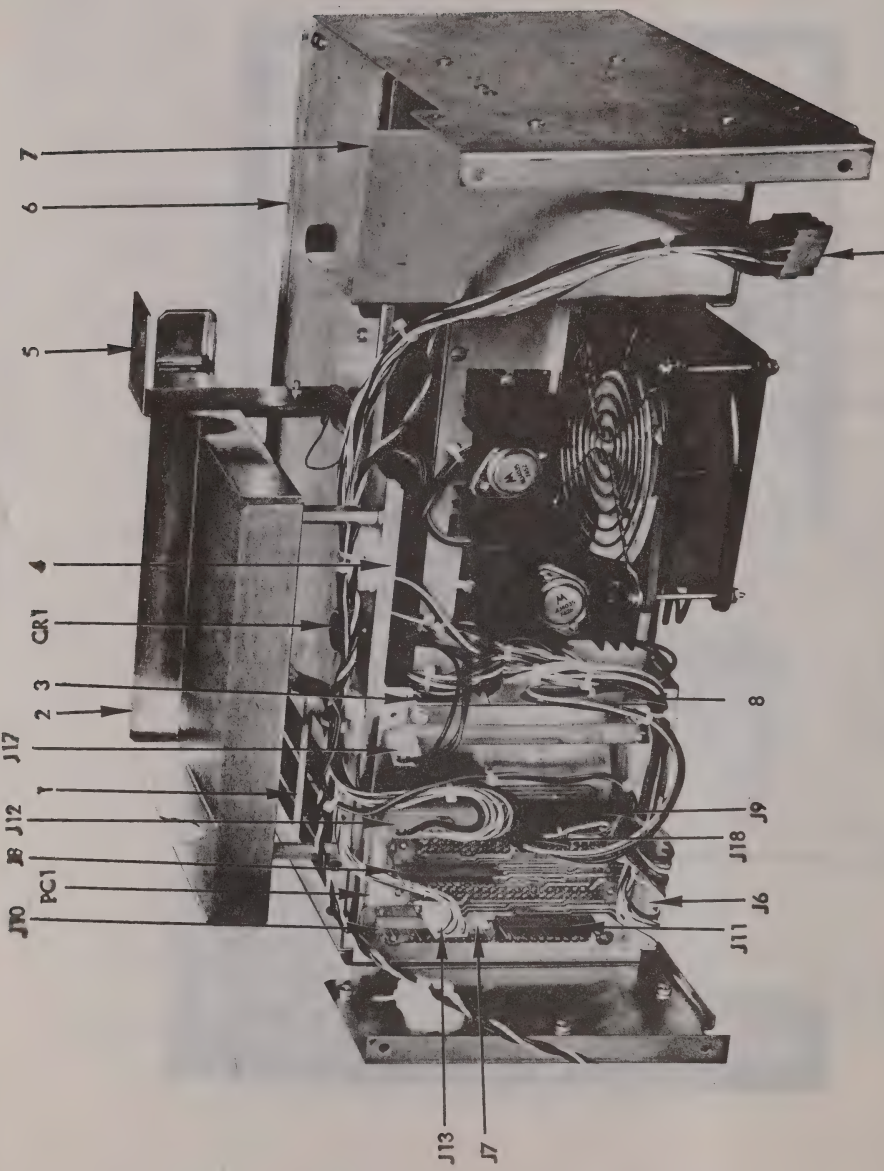


Figure 7-11. Chassis Assembly 111998-1, Inside View.

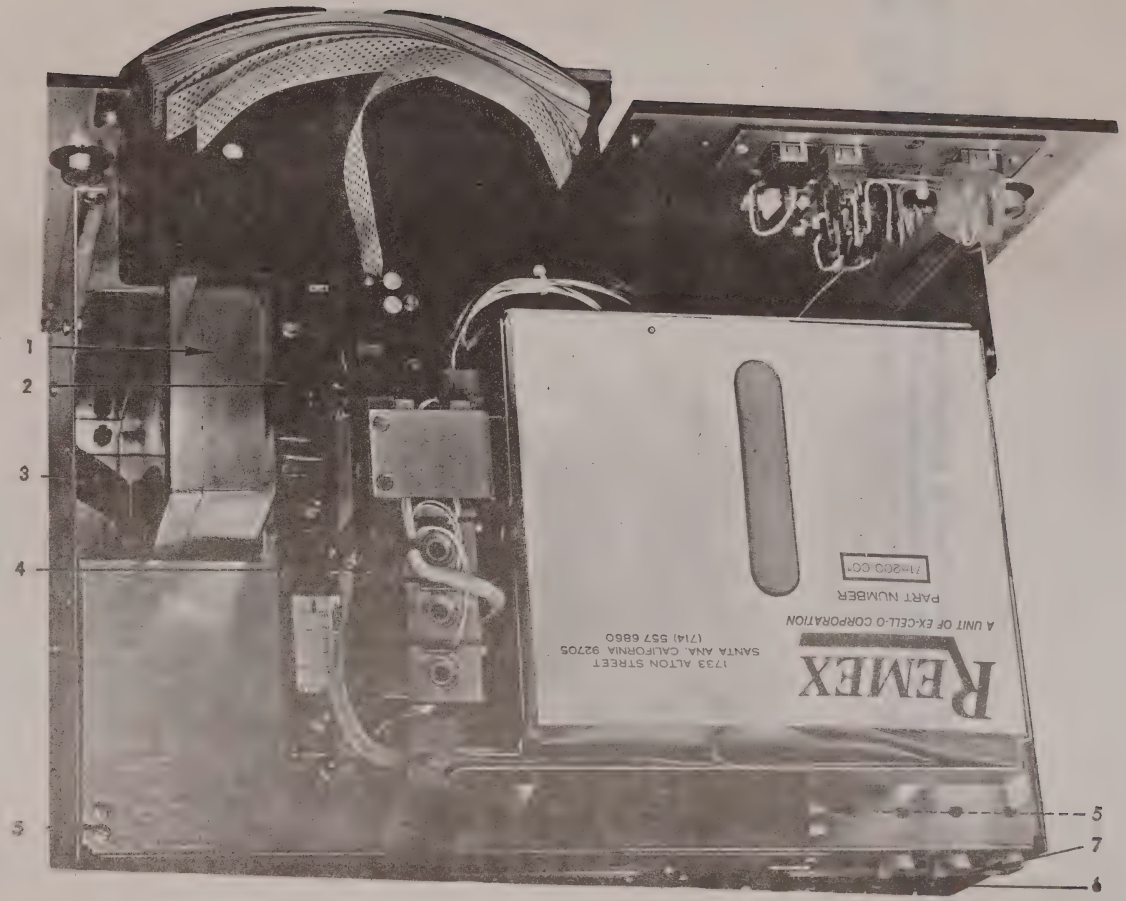


Figure 7-12. Top View, RAF612X.



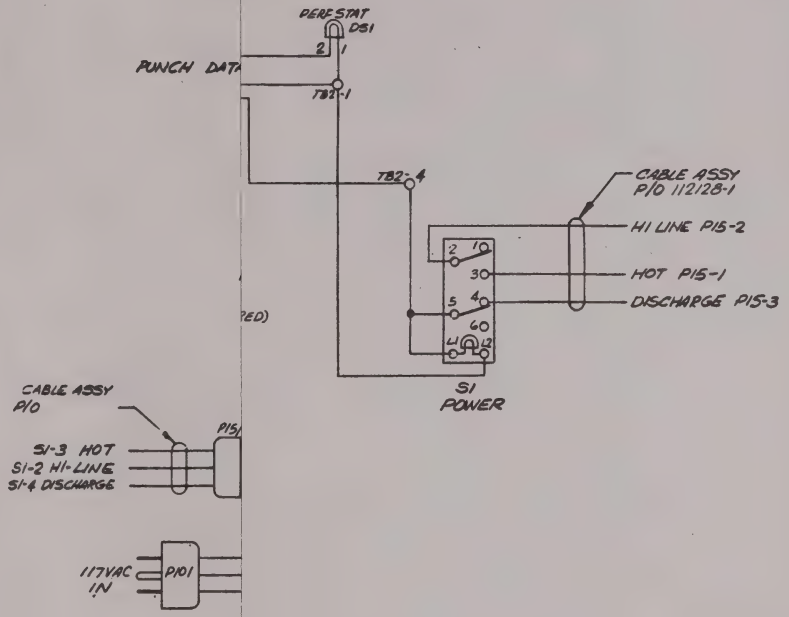
SECTION VIII

SCHEMATICS

8.1 GENERAL

Figures 8-1 through 8-10 contain the schematics of the RAX612X systems and their cards. All I.C. Module outlines and truth tables are reproduced courtesy of Texax Instruments except for the 9602 which is reproduced courtesy of Fairchild Semiconductor.

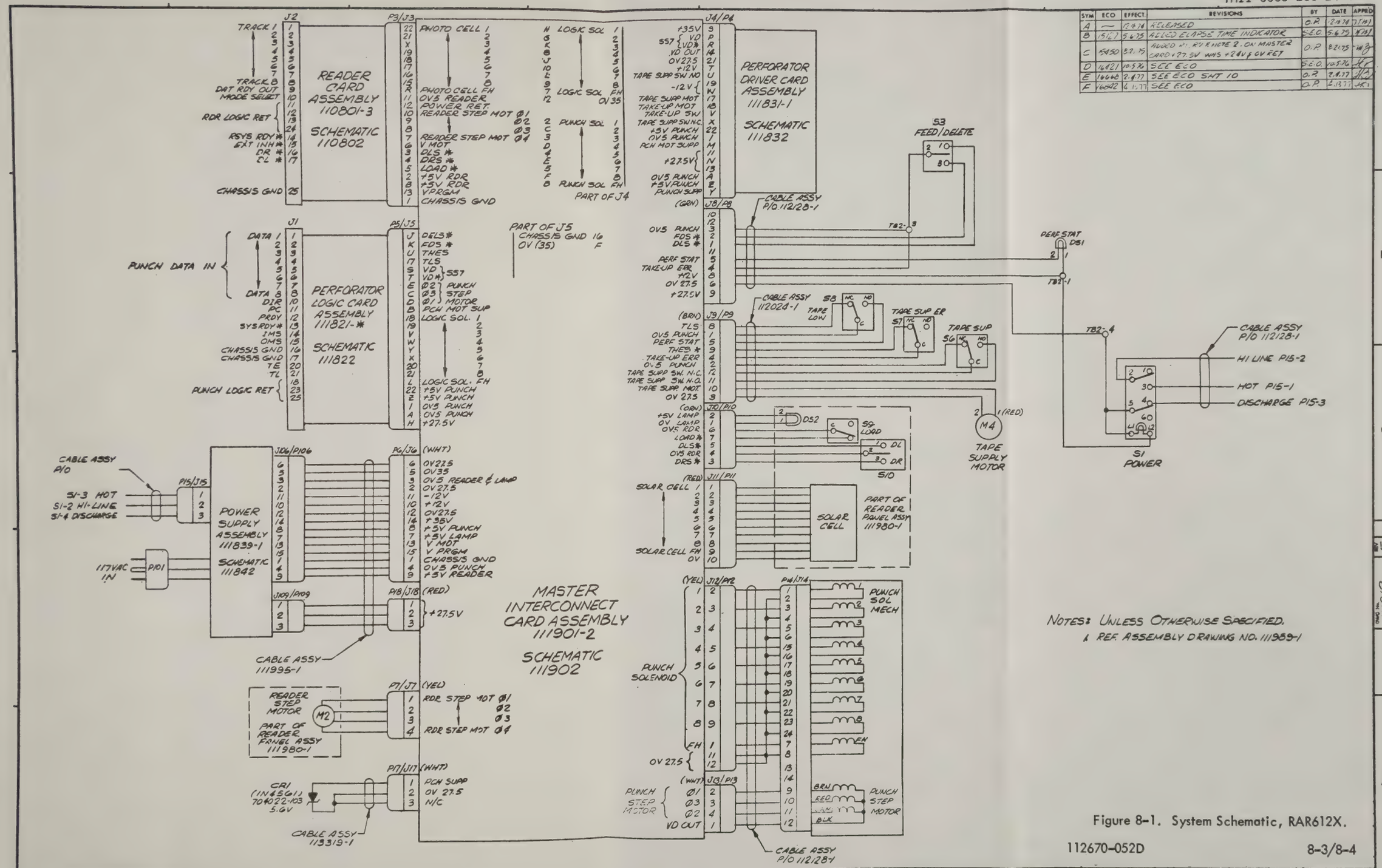
SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
A	—	12.14.74	RELEASED	O.R.	12.19.74	[illegible]
B	15167	5.6.75	ADDED ELAPSE TIME INDICATOR	S.E.O.	5.6.75	[illegible]
C	5450	8.21.75	ADDED R1, RV1 & NOTE 2. ON MASTER CARD +27.5V WAS +24V & 0V RET	O.R.	8.21.75	[illegible]
D	16421	10.5.76	SEE ECO	S.E.O.	10.5.76	[illegible]
E	16648	2.1.77	SEE ECO SHT 10	O.R.	2.1.77	[illegible]
F	16642	4.13.77	SEE ECO	O.R.	4.13.77	[illegible]



NOTES: UNLESS OTHERWISE SPECIFIED.
1. REF. ASSEMBLY DRAWING NO. 111989-1

Figure 8-1. System Schematic, RAR612X.

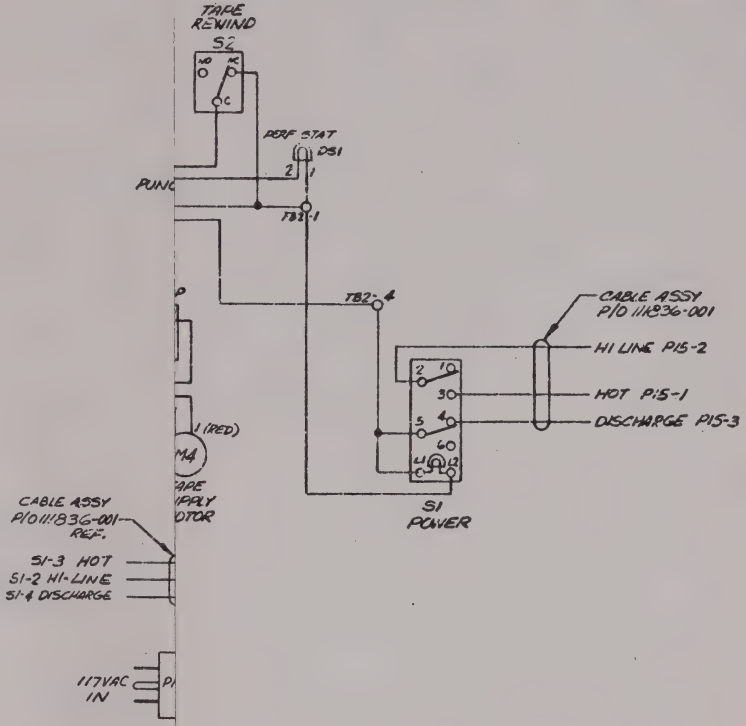
SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPRD
A	—	12-8-76	RELEASED	O.P.	12-8-76	JFH
B	15167	5-6-75	ADDED ELAPSE TIME INDICATOR	S.E.O.	5-6-75	JFH
C	15450	8-21-75	ADDED W1, W2 & NOTE 2. ON MASTER CARD +27.5V WAS +24V & 0V FET	O.P.	8-21-75	JFH
D	16421	10-5-76	SEE ECO	S.E.O.	10-5-76	JFH
E	16646	2-4-77	SEE ECO SHT 10	O.P.	2-4-77	JFH
F	16642	4-1-77	SEE ECO	O.P.	4-13-77	JFH



NOTES: UNLESS OTHERWISE SPECIFIED.
1. REF. ASSEMBLY DRAWING NO. 111989-1

Figure 8-1. System Schematic, RAR612X.

SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR.
11	—		RELEASED	S.E.Q.		

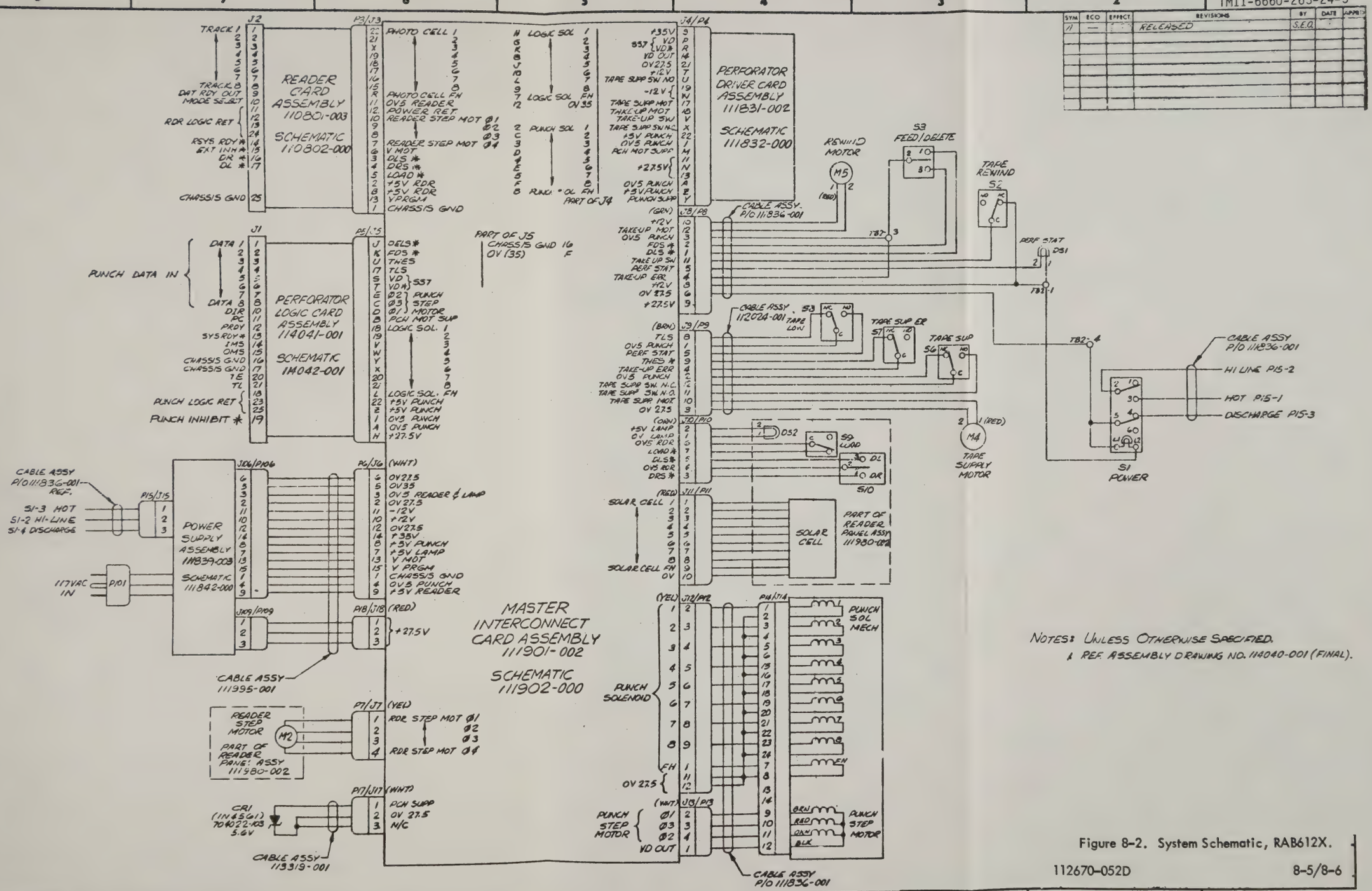


NOTES: UNLESS OTHERWISE SPECIFIED.

1. REF ASSEMBLY DRAWING NO. 114040-001 (FINAL).

Figure 8-2. System Schematic, RAB612X.

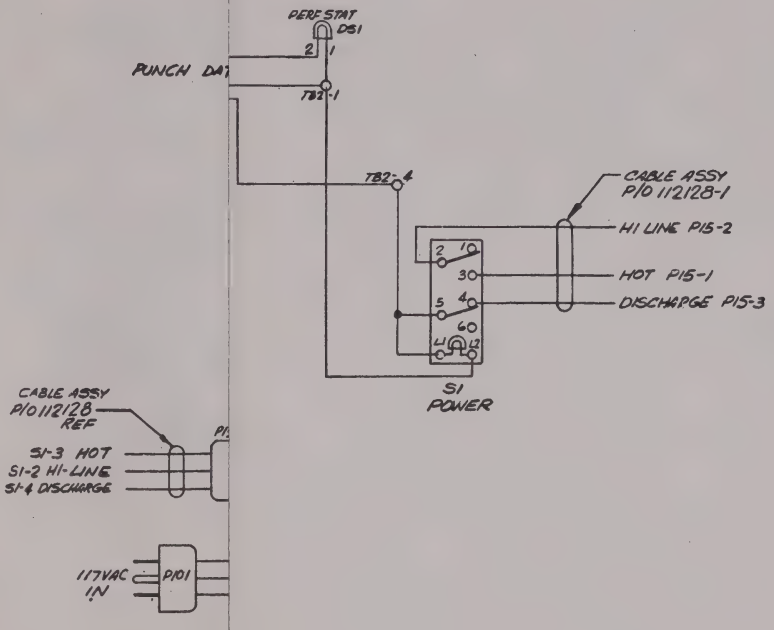
SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPR
11	—		RELEASED	S.E.Q.		



NOTES: UNLESS OTHERWISE SPECIFIED.
1. REF. ASSEMBLY DRAWING NO. 114040-001 (FINAL).

Figure 8-2. System Schematic, RAB612X.

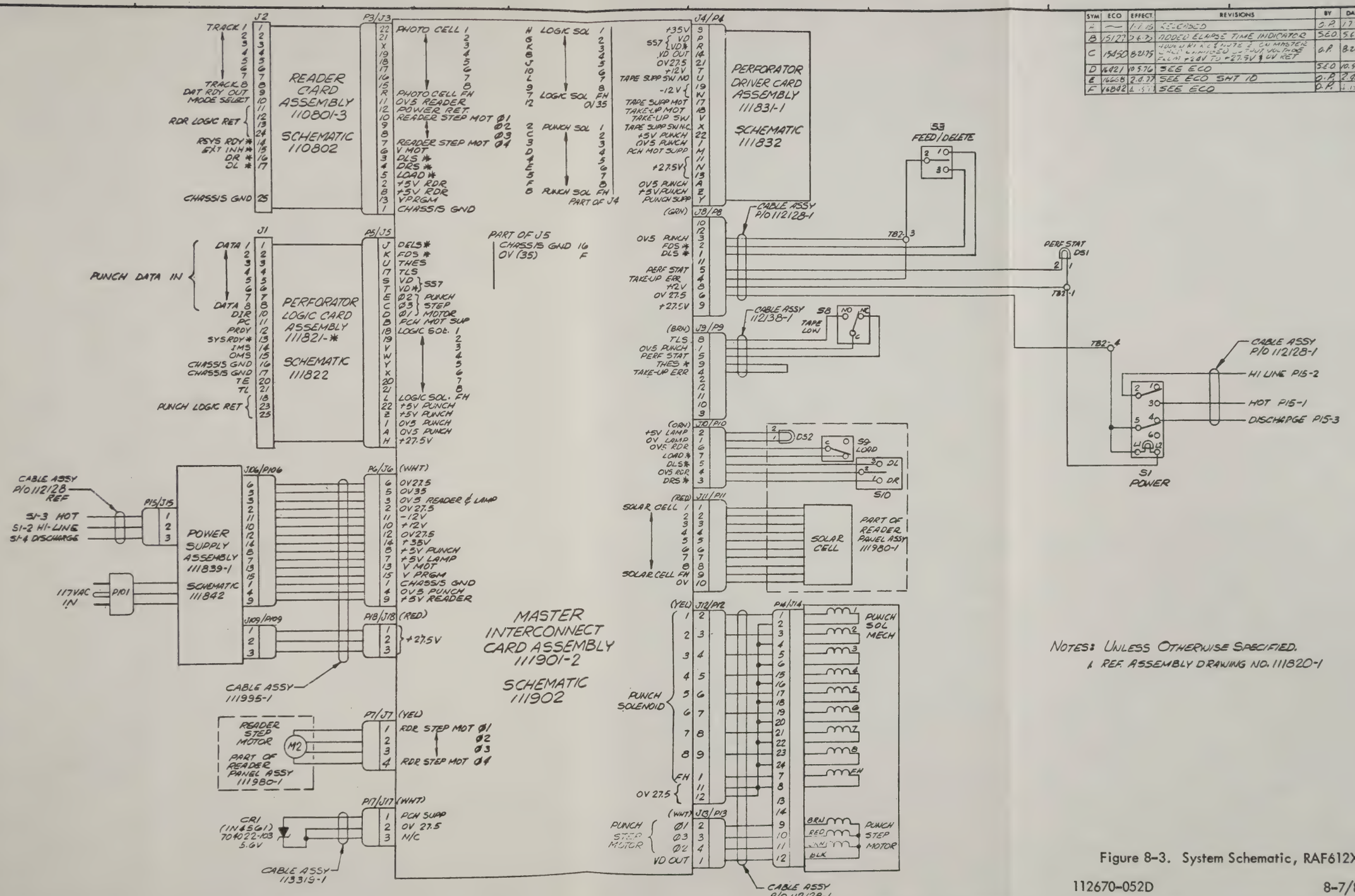
SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPRD
A	—	1-1-75	RELEASED	D.P.	1-7-75	[illegible]
B	15127	2-6-75	ADDED ELAPSE TIME INDICATOR	SEO	5-6-75	[illegible]
C	15450	8-21-75	ADDED NOTE 2 ON MASTER CHG'D CAPACITOR C2 FROM 1UF VOLTAGE FROM +18V TO +27.5V & 0V RET	D.P.	8-21-75	[illegible]
D	16421	10-5-76	SEE ECO	SEO	10-5-76	[illegible]
E	16628	2-9-77	SEE ECO SHT 10	D.P.	2-9-77	[illegible]
F	16892	4-15-77	SEE ECO	D.P.	4-15-77	[illegible]



NOTES: UNLESS OTHERWISE SPECIFIED.
1. REF. ASSEMBLY DRAWING NO. 111820-1

Figure 8-3. System Schematic, RAF612X.

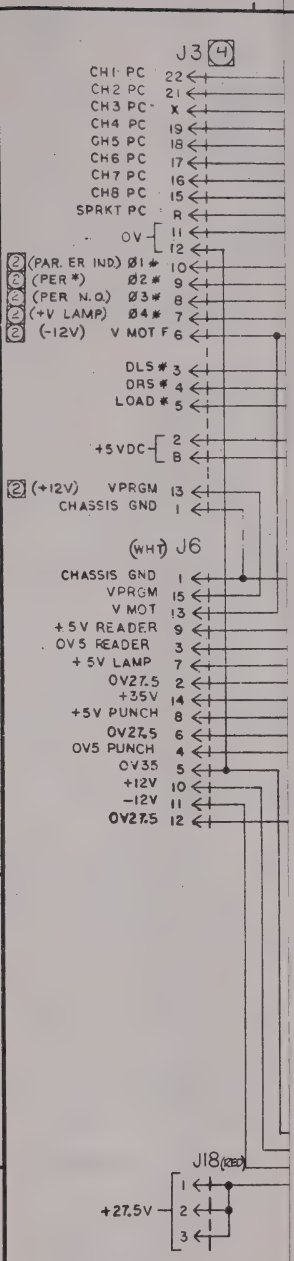
FORM NO. ED623/912



SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPRD
–	—	1-1-73	RELEASED	G.P.	1-7-73	[illegible]
B	15127	2-6-73	ADDED ELAPSE TIME INDICATOR	S.E.O.	5-6-73	[illegible]
C	15450	8-21-73	WHEN W1 & W2 NOT CONNECTED TO CN MASTER 5 VOLTS SHOULD NOT BE PRESENT ON PIN 4 OF J1	G.P.	8-21-73	[illegible]
D	16421	10-5-76	SEE ECO	S.E.O.	10-5-76	[illegible]
E	16668	2-8-77	SEE ECO SHT 10	G.P.	2-8-77	[illegible]
F	16802	4-13-77	SEE ECO	G.P.	4-13-77	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED.
1. REF. ASSEMBLY DRAWING NO. 111820-1

Figure 8-3. System Schematic, RAF612X.



SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
A	—	[illegible]	RELEASED	[illegible]	[illegible]	[illegible]
B	[illegible]	[illegible]	[illegible] ECO	[illegible]	[illegible]	[illegible]
C	15127	[illegible]	SEE ECO	SEO	[illegible]	[illegible]
D	[illegible]	[illegible]	[illegible] J17-3 TO J17-3	JL	[illegible]	[illegible]
E	15453	[illegible]	+27.5V & 0V27.5 WAS +24V & 0V24	O.P.	[illegible]	[illegible]
E'	—	8-27-74	REVISED REV. STATUS BLOCK	W.M.	8-27-74	[illegible]
F	16627	1-27-77	REVISED NOTE 2,3,4 & DESIGNATIONS 17 & 23.	ELB	1-27-7	[illegible]

REVISION STATUS		
FAB	SCH	ASSY
A	A	A
B	B	B
B	C	B
B	D	B1
B	E	C
B	E'	D
B	F	E

NOTE: UNLESS OTHERWISE SPECIFIED

1. REF ASSY DWG NO. 111901-*

(2) SIGNAL DESIGNATIONS IN PARENTHASIS FOR -3 ASSY ONLY.

(3) NOT USED ON -3 ASSY.

(4) NOT USED ON -2 ASSY.

5. NOTIFY APPLICATIONS ENGINEERING OF CHANGES.

DWG No. 111902 REV F

Figure 8-4. Schematic, Master Interconnect Card 111901.

SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPRD
A	—	—	RELEASED	—	—	—
B	—	—	—	—	—	—
C	15127	—	SEE ECO	SEO	—	—
D	15468	7-27-76	— TO J17-2	DL	7-27-76	—
E	A5453	—	+27.5V & OV27.5 WAS +24V & OV24	O.P.	8-27-76	—
E'	—	8-27-76	REVISED P/N STATUS BLOCK	N.M.	9-27-76	—
F	16627	1-27-77	ADDED NOTE 2,3,4 & DESIGNATIONS	ELB	1-27-77	—

REVISION STATUS		
FAB	SCH	ASSY
A	A	A
B	B	B
B	C	B
B	D	B1
B	E	C
B	E'	D
B	F	E

NOTE: UNLESS OTHERWISE SPECIFIED

1. REF ASSY DWG NO. 111901-*

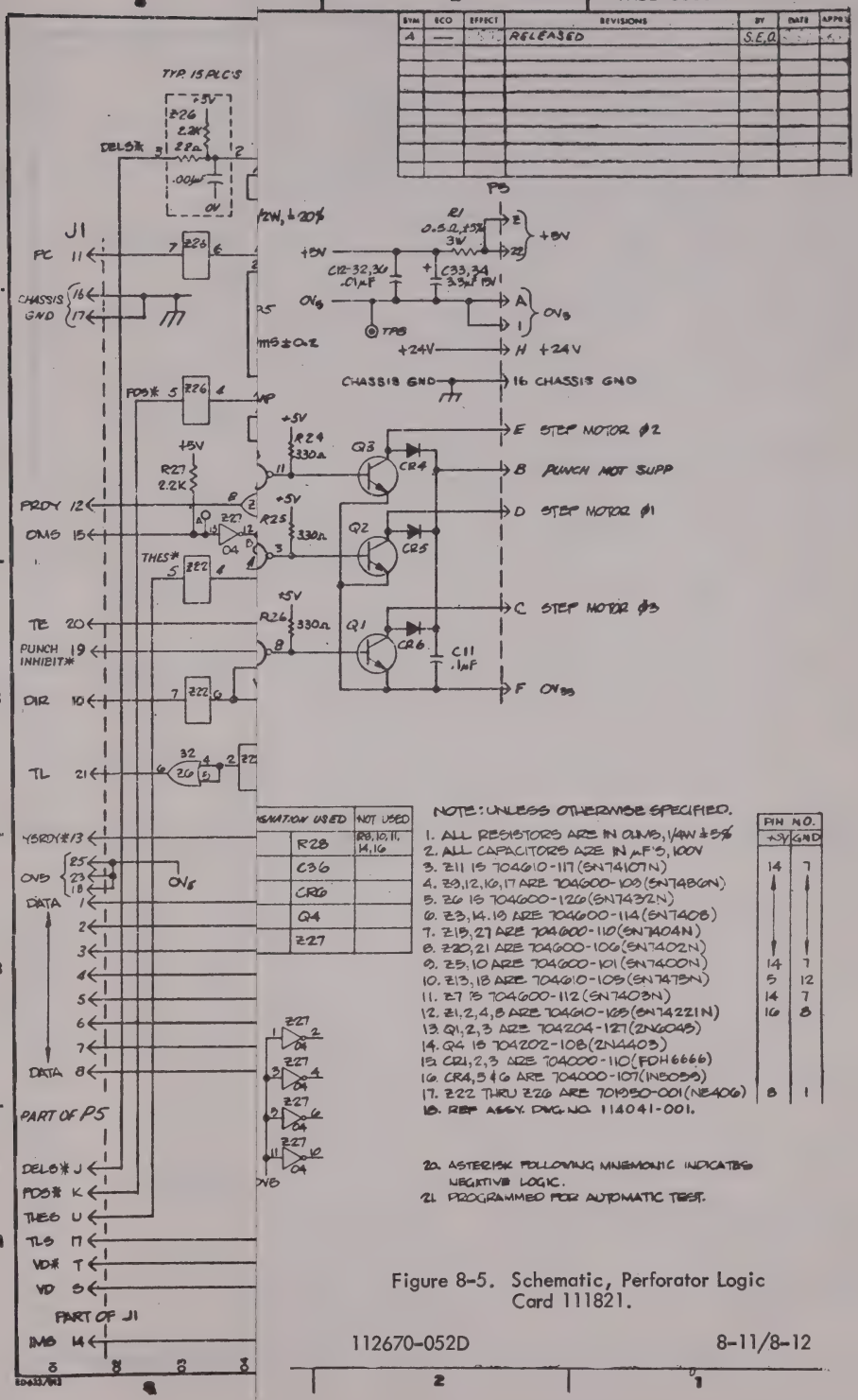
(2) SIGNAL DESIGNATIONS IN PARENTHASIS FOR -3 ASSY ONLY.

(3) NOT USED ON -3 ASSY.

(4) NOT USED ON -2 ASSY.

5. NOTIFY APPLICATIONS ENGINEERING OF CHANGES.

Figure 8-4. Schematic, Master Interconnect Card 111901.



SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPD
A	—		RELEASED	S.E.Q.		

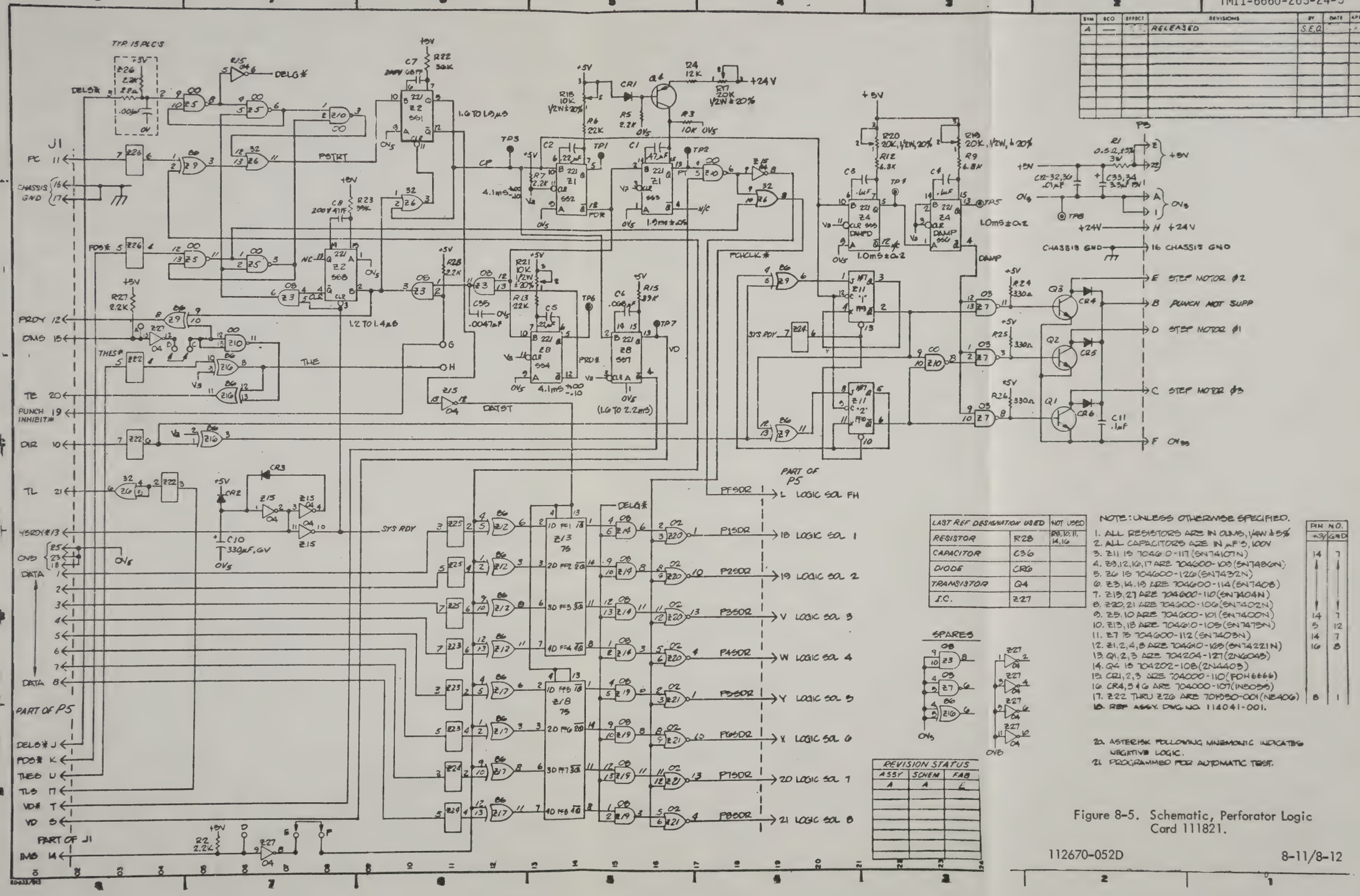
DESIGNATION USED	NOT USED
R28	R8,10,11, 14,16
C36	
CR6	
Q4	
Z27	

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W ±5%
2. ALL CAPACITORS ARE IN μF'S, 100V
3. Z11 IS 704610-117 (SN74107N)
4. Z9,12,16,17 ARE 704600-103 (SN7486N)
5. Z6 IS 704600-126 (SN7432N)
6. Z3,14,18 ARE 704600-114 (SN7408)
7. Z15,27 ARE 704600-110 (SN7404N)
8. Z20,21 ARE 704600-106 (SN7402N)
9. Z5,10 ARE 704600-101 (SN7400N)
10. Z13,18 ARE 704610-105 (SN7438N)
11. Z7 IS 704600-112 (SN7403N)
12. Z1,2,4,8 ARE 704610-103 (SN74221N)
13. Q1,2,3 ARE 704204-127 (2N6045)
14. Q4 IS 704202-108 (2N4403)
15. CR1,2,3 ARE 704000-110 (FDH6666)
16. CR4,5,6 ARE 704000-107 (IN5059)
17. Z22 THRU Z26 ARE 701950-001 (NE406)
18. REF ASSY. DWG NO. 114041-001.
20. ASTERISK FOLLOWING MNEMONIC INDICATES NEGATIVE LOGIC.
21. PROGRAMMED FOR AUTOMATIC TEST.

PIN NO.	+5V	GND
	14	7
	14	7
	5	12
	14	7
	16	8
	8	1

Figure 8-5. Schematic, Perforator Logic Card 111821.



SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPD
A	—		RELEASED	S.E.Q.		

LAST REF DESIGNATION USED	NOT USED
RESISTOR	R28	R8,10,11, 14,16
CAPACITOR	C36	
DIODE	CR6	
TRANSISTOR	Q4	
I.C.	Z27	

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W ±5%
2. ALL CAPACITORS ARE IN µF'S, 100V
3. Z11 IS 7046 0-117 (SN74107N)
4. Z9,12,16,17 ARE 704600-108 (SN7486N)
5. Z6 IS 704600-126 (SN7432N)
6. Z3,14,15 ARE 704600-114 (SN7408)
7. Z19,27 ARE 704600-110 (SN7404N)
8. Z20,21 ARE 704600-106 (SN7402N)
9. Z5,10 ARE 704600-101 (SN7400N)
10. Z13,18 ARE 704610-105 (SN7475N)
11. Z7 IS 704600-112 (SN7403N)
12. Z1,2,4,8 ARE 704610-103 (SN74221N)
13. Q1,2,3 ARE 704204-121 (2N6045)
14. Q4 IS 704202-108 (2N4403)
15. CR1,2,3 ARE 704000-110 (FDH6666)
16. CR4,5,6 ARE 704000-107 (IN6054)
17. Z22 THRU Z26 ARE 701850-001 (NE406)
18. REF ASSY. DWG NO. 114041-001.
20. ASTERISK FOLLOWING MNEMONIC INDICATES NEGATIVE LOGIC.
21. PROGRAMMED FOR AUTOMATIC TEST.

PIN NO.	
+5V	GND
14	7
14	7
5	12
14	7
16	8
8	1

REVISION STATUS		
ASSY	SCHEM	FAB
A	A	E

Figure 8-5. Schematic, Perforator Logic Card 111821.

SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
-	-	7-5-71	RELEASED	GL	7-0-71	[illegible]
P	M611	11-10-71	REL FCO	GL	11-5-71	[illegible]
C	12514	1-7-72	LEVICED REVISION STATUS FLOCL	GL	1-7-72	[illegible]
D	13956	1-29-73	UPDATED REV STATUS BLOCK REF B [illegible]	[illegible]	[illegible]	[illegible]
E	14591	2-5-73	[illegible] REV STATUS BLOCK REF B [illegible]	GL	2-5-73	[illegible]
F	15440	8-29-73	[illegible]	[illegible]	8-31-73	[illegible]
G	15514	9-16-75	ADDED GEN. NOTE 16, CN 2275 WAS 0 [illegible]	N.M	9-16-75	[illegible]

LOGIC SOL FH 7
LOGIC SOL 1 H
LOGIC SOL 2 G
LOGIC SOL 3 K
LOGIC SOL 4 E
LOGIC SOL 5 J
LOGIC SOL 6 M
LOGIC SOL 7 L
LOGIC SOL 8 9
1K
+5V E
+5V 22
+5V A
+5V 1
+5V 21

(14) 2mS

NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE IN OHMS, 1/4W, ±5%.
2. REF ASSY DWG. NO. 111831
3. CAPACITORS ARE IN MICROFARADS, 100V.
4. CR4 IS 704005-130 (IN5624)
5. CR1, 5 THRU 13 ARE 704000-107 (IN5059)
6. CR2, 3 ARE 704014-127 (IN4747A)
7. CR14 IS 704022-107 (IN2608)
8. Q1, 6, 8 THRU 16 ARE 704212-108 (MJE 1090)
9. Q2, 17 THRU 26 ARE 704203-114 (2N4401)
10. Q3, 4, 5 ARE 704204-115 (MJE 1100)
11. Q7 IS 704202-109 (MPS A56)

	BY	USN
12. Z1 IS 704610-115 (SN7412N)	7	14

13. CR15 IS 704000-110 (FDG666)

(14) VOLTAGE DOUBLER TIME IS DETERMINED BY VD ONE SHOT ON PERF-LOGIC CARD (TP7)

(15) R7, 21, 24, 27, 30, 33, 36, 39, 42, 45 REF. DESIGNATIONS ARE NOT USED.

16. PROGRAMMED FOR AUTOMATIC TEST.

+5V
R17 2K
R18 1K
TP1
Z1 121
B2K
C8 .33MF 15V
R16 33K
R46 2K
Q26
SSD
CR15
C9 5.3MF 15V
+5V
C6 TO 20 MFD

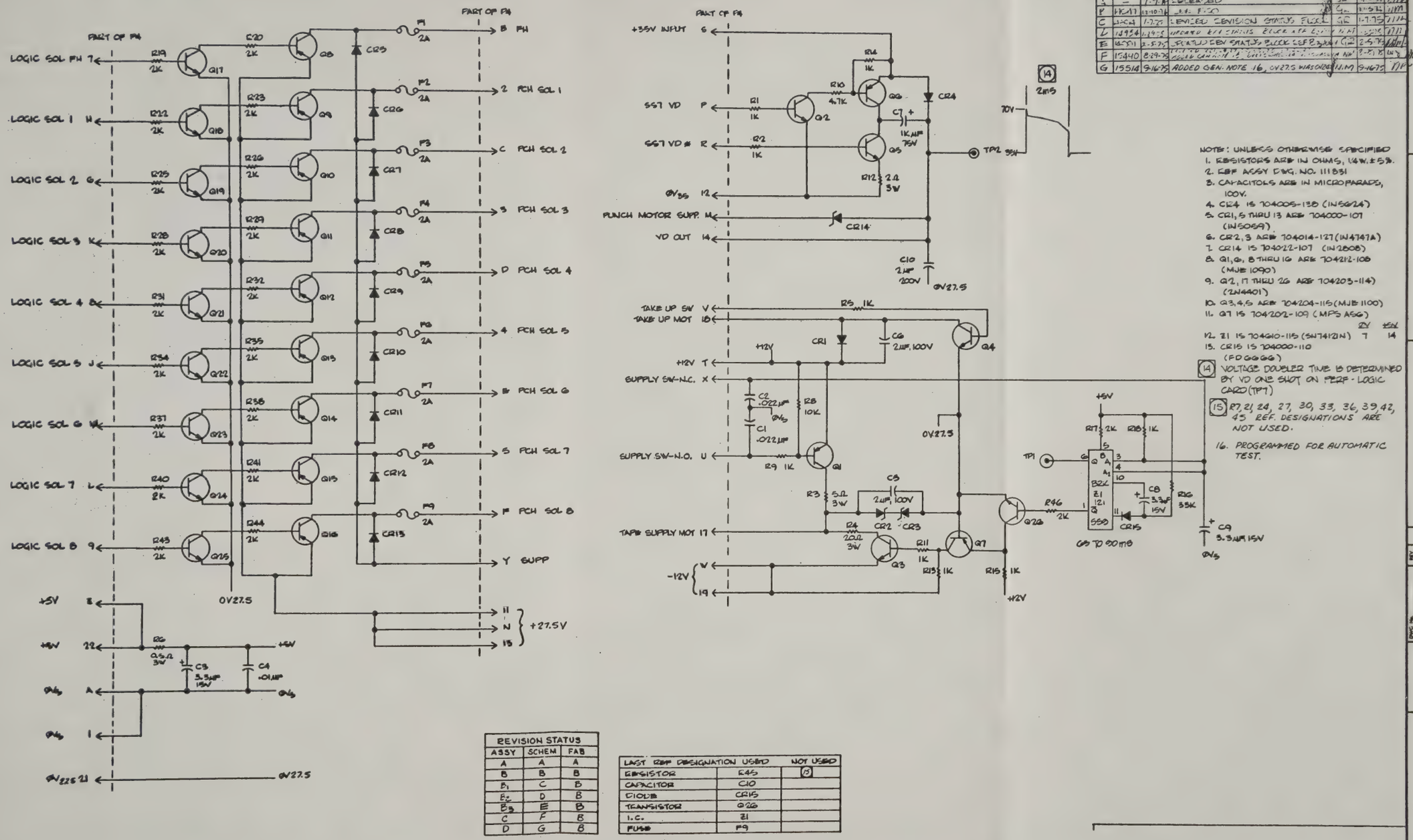
DWG NO. 111832 REV G

ure 8-6. Schematic, Perforator Driver Card 111831

8-13/8-14

FORM NO. EC625/852

8 2 1



SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
-	-	7-9-71	RELEASED	[illegible]	7-9-71	[illegible]
P	H5617	12-10-74	[illegible]	[illegible]	12-5-74	[illegible]
C	H5708	1-7-75	ENTIRE REVISION STATUS BLOCK	[illegible]	1-7-75	[illegible]
D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
E	H5811	2-5-75	ADDED REV STATUS BLOCK REF 3244	[illegible]	2-5-75	[illegible]
F	15640	8-29-75	[illegible]	[illegible]	9-5-75	[illegible]
G	15518	9-16-75	ADDED GEN. NOTE 16, 0V27.5 WAS 0V22	[illegible]	9-16-75	[illegible]

NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE IN OHMS, 1/4W, ±5%.
2. REF ASSY DWG. NO. 111831
3. CAPACITORS ARE IN MICROFARADS, 100V.
4. CR4 IS 704005-138 (IN5624)
5. CR1, 5 THRU 13 ARE 704000-107 (IN5059)
6. CR2, 3 ARE 704014-127 (IN4747A)
7. CR14 IS 704022-107 (IN2608)
8. Q1, 6, 8 THRU 16 ARE 704212-108 (MJE 1090)
9. Q2, 17 THRU 26 ARE 704203-114) (2N4401)
10. Q3, 4, 5 ARE 704204-115 (MJE 1100)
11. Q7 IS 704202-109 (MPS A56)

	ZY	±5V
12. Z1 IS 704610-115 (SN74121N)	7	14

13. CR15 IS 704000-110 (FDG666)
14. VOLTAGE DOUBLER TIME IS DETERMINED BY VD ONE SHOT ON PERF-LOGIC CARD (TP1)
15. R7, 21, 24, 27, 30, 33, 36, 39, 42, 45 REF. DESIGNATIONS ARE NOT USED.
16. PROGRAMMED FOR AUTOMATIC TEST.

REVISION STATUS		
ASSY	SCHEM	FAB
A	A	A
B	B	B
B_1	C	B
B_2	D	B
B_3	E	B
C	F	B
D	G	B

LAST REF DESIGNATION USED		NOT USED
RESISTOR	R45	10
CAPACITOR	C10	
DIODE	CR15	
TRANSISTOR	Q26	
I.C.	Z1	
FUSE	F9	

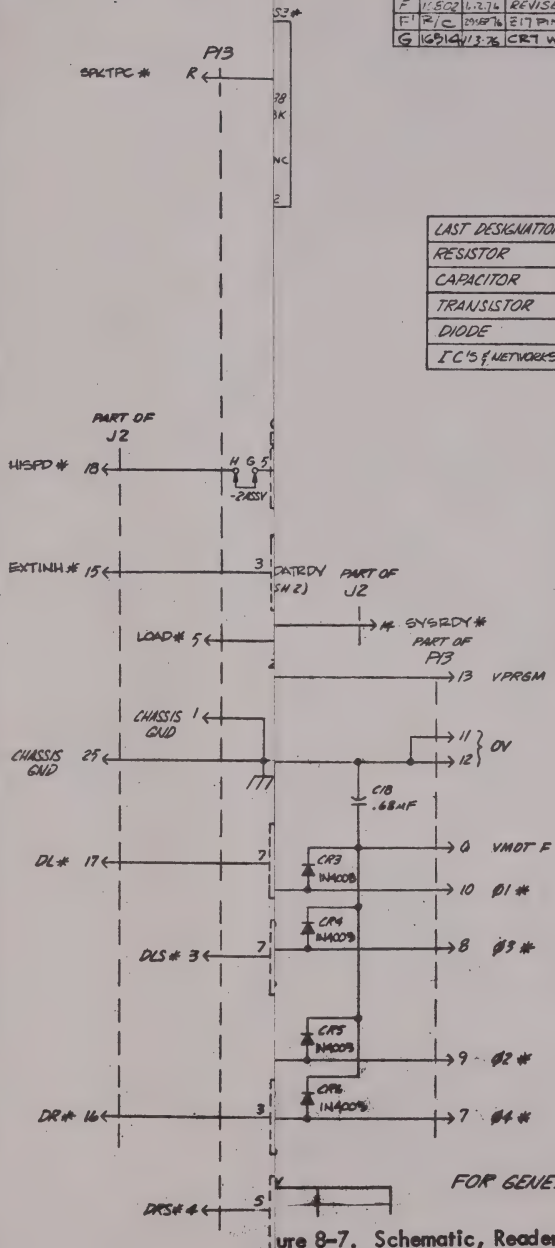
112670-052A

Figure 8-6. Schematic, Perforator Driver Card 111831

8-13/8-14

DWG NO. 111832 REV G

SYM	ECO	EFFECT	REVISIONS	BY	DATE	APPD
D						
E			EDIT BLOCK, C16 WAS 1UF, R32 WAS 47K			
F			REVISED REV. STATUS BLOCK	N.M.		
F'	R/C		E17 PIN 15, WAS 17, REVISED REV. STAT	JL		
G			CR7 WAS IN4003	JL		



LAST DESIGNATION USED	
RESISTOR	R39
CAPACITOR	C21
TRANSISTOR	Q13
DIODE	CR7
IC'S & NETWORKS	Z23

C12 & C20 NOT USED

REVISION STATUS		
FAB	SCH.	ASSY
B	B	A
B	B	B
C	B	B
C	B	C
C	B	D
C	C	D
D	D	E
D	E	E1
E	F	F1
E	F1	F
E	G	G

PART NO. 110802

ure 8-7. Schematic, Reader Card 110801, Sheet 1 of 2.
Refer to Page 7-35A/7-35B for previous changes.

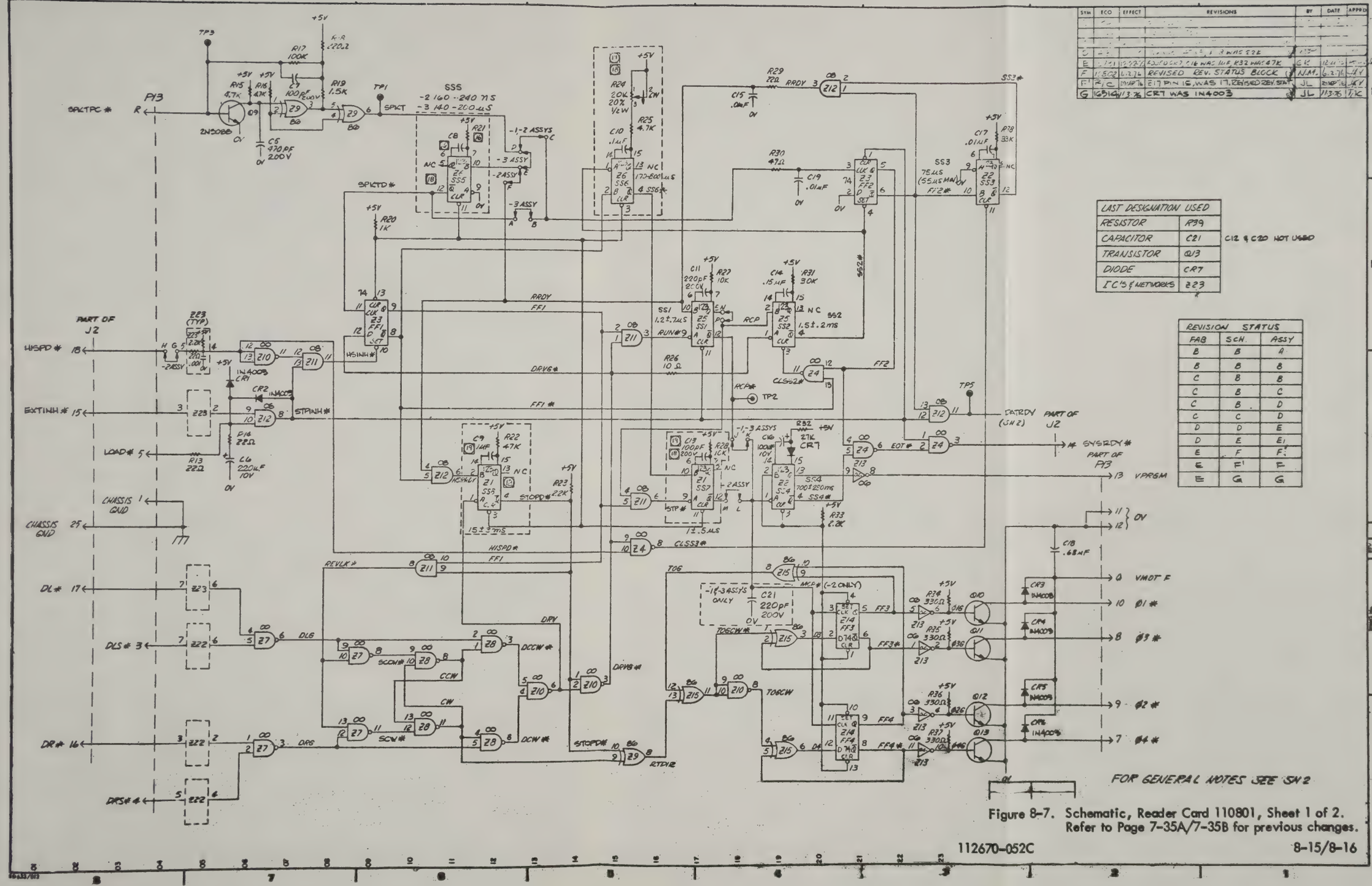


Figure 8-7. Schematic, Reader Card 110801, Sheet 1 of 2.
Refer to Page 7-35A/7-35B for previous changes.

SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPR'D
F	[illegible]	[illegible]	SEE SHEET 1	DK	[illegible]	[illegible]
F'	[illegible]	[illegible]	27 PIN 15 WAS 17. U4 WIRED AS SHOWN	JL	[illegible]	[illegible]
G	6814	11-3-76	CR7 WAS IN4003	JL	11-3-76	[illegible]

T OF

>1 CH1 OUT

>2 CH2 OUT

>3 CH3 OUT

>4 CH4 OUT

>9 DATRDY OUT

>5 CH5 OUT

>6 CH6 OUT

>7 CH7 OUT

>8 CH8 OUT

>10 MODE SELECT

>11
>12
>13
>24
} 0V

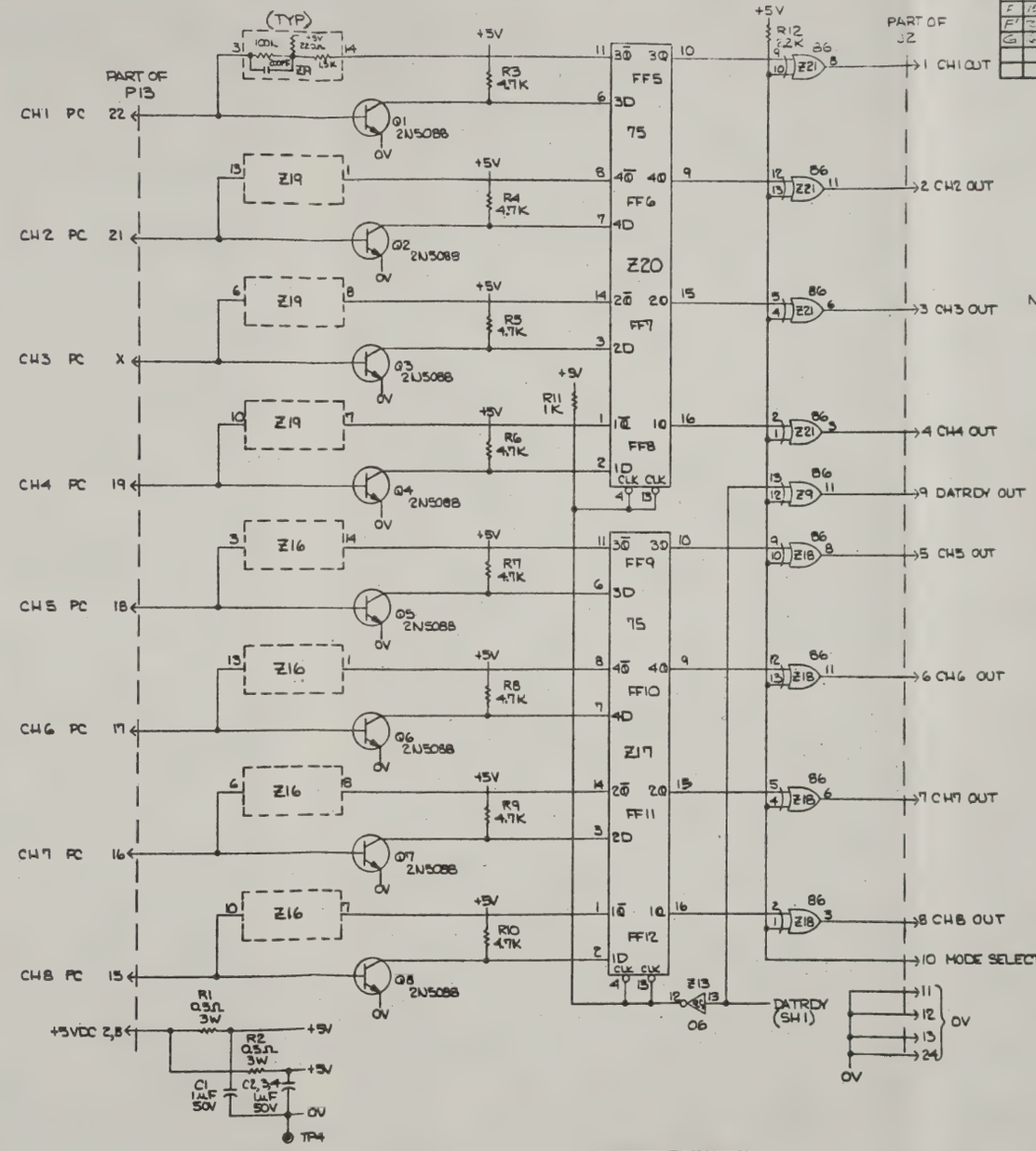
NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE 1/4 W ±5%
2. CAPACITORS ARE 100V ±10%
3. REF ASSY DWG NO. 110801
4. Z16,Z19 ARE 701950-004 (1899-4102-0)
5. Z17,20 ARE 704610-105 (SN74175N)
6. Z9,15,18,21 ARE 704600-109 (SN7486N)
7. Z3,14 ARE 704610-110 (SN74174N)
8. Z4,7,8,10 ARE 704600-101 (SN7400N)
9. Z13 IS 704600-111 (SN7406N)
10. Z11 Z12 ARE 704600-114 (SN74081N)
11. Z1,2,5,6 ARE 704610-119 (SN74123N)
12. Z22,23 ARE 701950-001 (KD406)
13. -3 ASSY IS TYPE SETTER.
14. Q1-Q9 ARE 704203-119 (2N5088)
15. Q10-Q13 ARE 704204-113 (MJE1100) (POWER DARLINGTON)
16. R21 IS 5.6K, C8 IS 100 PF, 200V (-2ASSY) R21 IS 33K, C8 IS .015 μF (-3ASSY)
17. CR1-CR6 ARE 704005-137 (IN4003)
18. FOR -1 ASSY (STANDARD) OMIT Z1,Z6,C8,C9 C10,C13,R21,R22,R24,R25 & R28
19. FOR -3 ASSY OMIT Z1,C9,C10,C13,R22,R24, R25 & R28
20. C12 & C20 ARE OMITTED ON ALL ASSY'S.
21. SYMBOL * MEANS THE SAME AS —— OVER A LOGIC FUNCTION TO MAKE IT A COMPLIMENTARY FORM.
22. CR7 IS 704000-110 (FDH6666).

PIN NO.	
+5V	0V
11	-
5	12
14	7
14	7
14	7
14	7
16	8
3	1

REV G
DWG NO. 110802

Schematic, Reader Card 110801, Sheet 2 of 2.
Refer to Page 7-35A/7-35B for Previous Changes.

8-17/8-18



SYM	ECO	EFFECT.	REVISIONS	BY	DATE	APPRD
F	1[illegible]	[illegible]	SEE SHEET 1	D.A.	[illegible]	[illegible]
F'	[illegible]	[illegible]	2:7 PIN 15 WAS 17. [illegible]	JL	[illegible]	[illegible]
G	0514	[illegible]	CR7 WAS IN4003	JL	1/13/76	[illegible]

NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE 1/4 W ±5%
2. CAPACITORS ARE 100V ±10%
3. REF. ASSY DWG NO. 110801
4. Z16,Z19 ARE 701950-004 (1899-4102-0)
5. Z17,20 ARE 704610-105 (SN74175N)
6. Z9,15,18,21 ARE 704600-109 (SN7486N)
7. Z3,14 ARE 704610-110 (SN74174N)
8. Z4,7,8,10 ARE 704600-101 (SN7400N)
9. Z13 IS 704600-111 (SN7406N)
10. Z11 Z12 ARE 704600-114 (SN7408N)
11. Z1,2,5,6 ARE 704610-119 (SN74123N)
12. Z22,23 ARE 701950-001 (KD406)
13. -3 ASSY IS TYPE SETTER.
14. Q1-Q9 ARE 704203-119 (2N5088)
15. Q10-Q13 ARE 704204-113 (MJE1100) (POWER DARLINGTON)
16. R21 IS 5.6K, C8 IS 100 PF, 200V (-2 ASSY) R21 IS 33K, C8 IS .015 μF (-3 ASSY)
17. CR1-CR6 ARE 704005-137 (IN4003)
18. FOR -1 ASSY (STANDARD) OMIT Z1,Z6,C8,C9 C10,C13,R21,R22,R24,R25 & R28
19. FOR -3 ASSY OMIT Z1,C9,C10,C13,R22,R24, R25 & R28
20. C12 & C20 ARE OMITTED ON ALL ASSY'S.
21. SYMBOL # MEANS THE SAME AS —— OVER A LOGIC FUNCTION TO MAKE IT A COMPLIMENTARY FORM.
22. CR7 IS 704000-110 (FDH666G).

PIN NO.	
+5V	0V
11	-
5	12
14	7
14	7
14	7
14	7
14	7
16	8
5	-

RAR612X	111989
RAF612X	111820
RAB612X	111824
RAB6375	110950
RAF6375	110948
USED ON	NEXT ASSY

Figure 8-7. Schematic, Reader Card 110801, Sheet 2 of 2.
Refer to Page 7-35A/7-35B for Previous Changes.

112670-052C

8-17/8-18

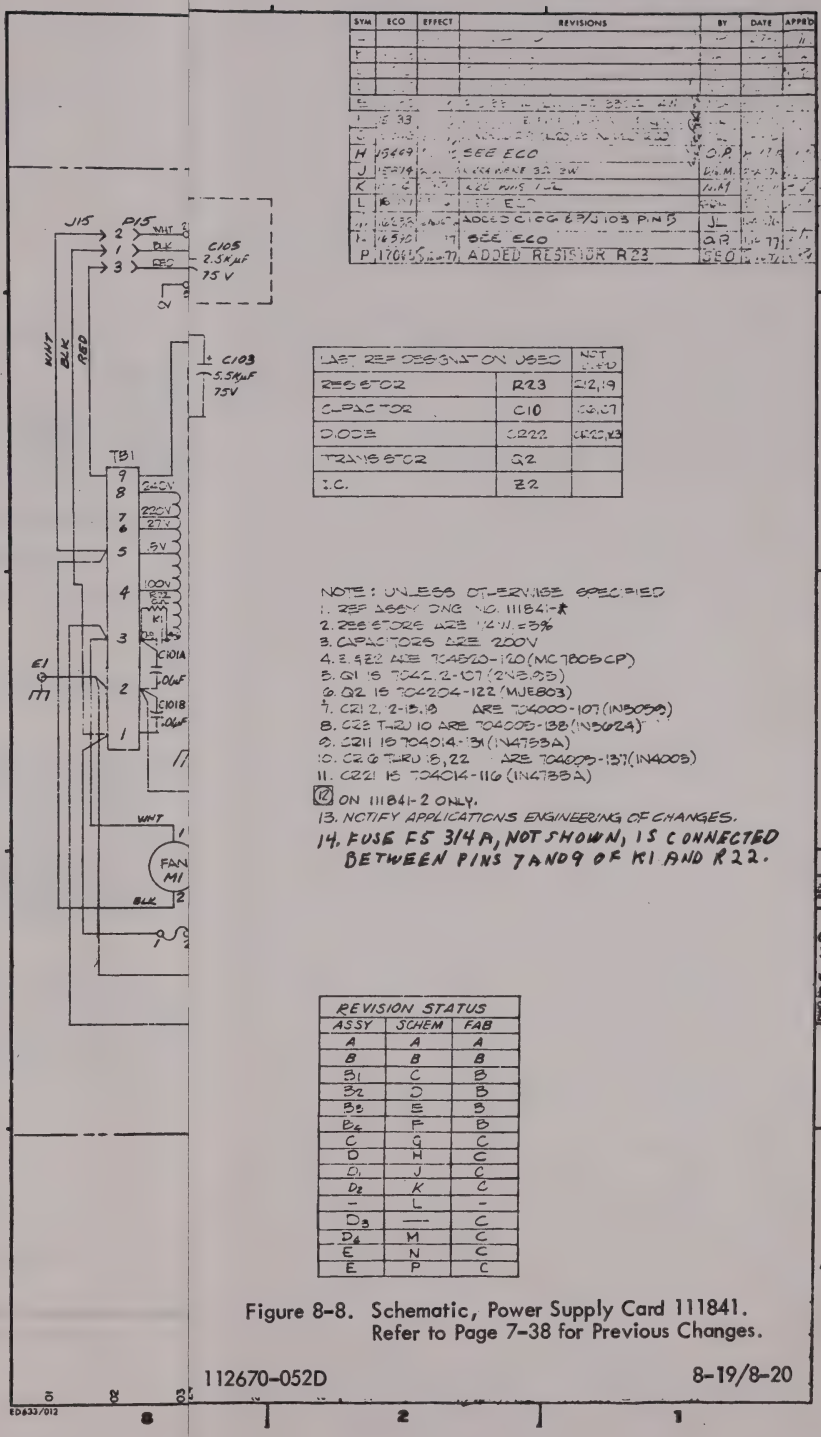
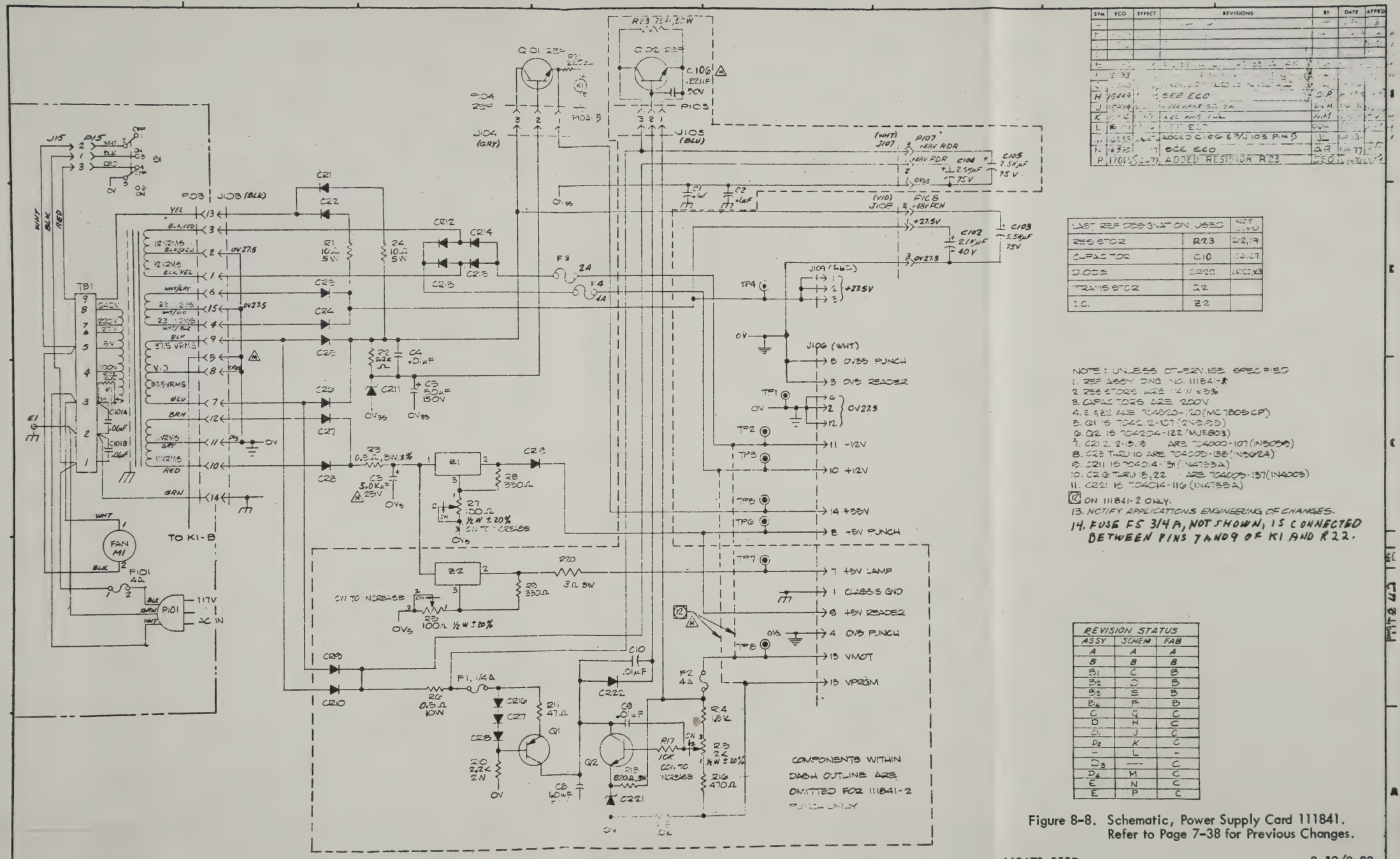


Figure 8-8. Schematic, Power Supply Card 111841. Refer to Page 7-38 for Previous Changes.



LAST REF DESIGNATION USED		NOT USED
RESISTOR	R23	R21,19
CAPACITOR	C10	C8,C7
DIODE	CR22	CR20,K3
TRANSISTOR	Q2	
I.C.	Z2	

NOTE: UNLESS OTHERWISE SPECIFIED
1. ASSY DWG NO. 111841-*
2. RESISTORS ARE ½W ±5%
3. CAPACITORS ARE 200V
4. Z1 & Z2 ARE 704510-120 (MC7805CP)
5. Q1 IS 704212-107 (2N3638)
6. Q2 IS 704204-122 (MJE803)
7. CR1 & 2, 18, 19 ARE 704000-107 (IN5059)
8. CR3 THRU 10 ARE 704003-138 (IN3024)
9. CR11 IS 704014-31 (IN4733A)
10. CR6 THRU 15, 22 ARE 704003-137 (IN4003)
11. CR21 IS 704014-116 (IN4735A)
12. ON 111841-2 ONLY.
13. NOTIFY APPLICATIONS ENGINEERING OF CHANGES.
14. FUSE FS 3/4 A, NOT SHOWN, IS CONNECTED BETWEEN PINS 7 AND 9 OF K1 AND R22.

REVISION STATUS		
ASSY	SCHEM	FAB
A	A	A
B	B	B
B1	C	B
B2	D	B
B3	E	B
B4	F	B
C	G	C
D	H	C
D1	J	C
D2	K	C
—	L	—
D3	—	C
D4	M	C
E	N	C
E	P	C

Figure 8-8. Schematic, Power Supply Card 111841.
Refer to Page 7-38 for Previous Changes.

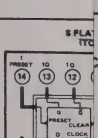
SN7474

DUAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS

TRUTH TABLE (Each Flip-Flop)

t_n	t_{n+1}	
INPUT	OUTPUT	OUTPUT
D	Q	$\bar{Q}$
0	0	1
1	1	0

NOTES: 1. t_n = bit time before clock pulse.
2. t_{n+1} = bit time after clock pulse.



positive logic: Low l
Low l
Preset

SN74123

RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH CLEAR

NOTES:

A. H = high level (steady state), L = low level (steady state), ↑ = transition from low to high level, ↓ = transition from high to low level, ⌐⌐ = one high-level pulse, ⌐⌐ = one low-level pulse, X = irrelevant (any input, including tra
B. NC = No internal connection.
C. To use the internal timing resistor of SN54122/SN74122 (10 kΩ nominal), connect R_{int} to V_{CC}.
D. An external timing capacitor may be connected between C_{ext} and R_{ext}/C_{ext} (positive).

TTL/ MONOSTABLE 9602 RETRIGGERABLE RESETTABLE MONOSTABLE M

GENERAL DESCRIPTION – The TTL/Monostable 9602 is a dual retriggerable, re multivibrator which provides an output pulse whose duration and accuracy is a timing components. The 9602 has excellent immunity to noise on the V_{CC} an 9602 uses TTL inputs and outputs for high speed and high fanout capability and is members of the Fairchild TTL family.

TRIGGERING TRUTH TABLE

PIN NO'S. 5(11)	4(12)	3(13)	Operation
H→L	L	H	Trigger
H	L→H	H	Trigger
X	X	L	Reset

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
H→L = HIGH to LOW Voltage
L→H = LOW to HIGH Voltage

MMC 381

PIN NUMBERS

R GATE

A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

Y = $\overline{A \cdot B}$ (1,4,9,12 / 2,5,10,13 → 3,6,8,11)

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

Y = $\overline{A+B}$ (3,6,9,12 / 2,5,8,11 → 1,4,10,13)

A	B	Y
H	H	H
H	L	L
L	H	L
L	L	L

Y = A·B (1,4,9,12 / 2,5,10,13 → 3,6,8,11)

A	B	Y
H	H	H
H	L	H
L	H	H
L	L	L

Y = A+B (1,4,9,12 / 2,5,10,13 → 3,6,8,11)

A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

Y = A⊕B (1,4,9,12 / 2,5,10,13 → 3,6,8,11)

A	B	C	Y
L	L	L	H
L	L	H	H
L	H	L	H
L	H	H	H
H	L	L	H
H	L	H	H
H	H	L	H
H	H	H	L

Y = $\overline{A \cdot B \cdot C}$ (1,3,9 / 2,4,10 / 13,5,11 → 12,6,8)

(Open Collector)

Y = $\overline{A}$ (1,3,5 / 9,11,13 → 2,4,6 / 8,10,12)

listed in the order in which they are related, on SN7410, pins 1, 2, 13 and 12 function gate.

* Pin 7 is Gnd, Pin 14 is Vcc

SN7474

DUAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS

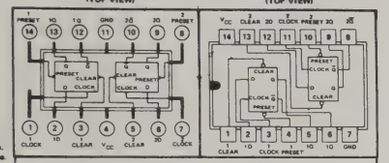
TRUTH TABLE (Each Flip-Flop)

t_n INPUT	t_{n+1} OUTPUT	t_{n+1} OUTPUT
D	Q	$\bar{Q}$
0	0	1
1	1	0

NOTES: 1. t_n = bit time before clock pulse.
2. t_{n+1} = bit time after clock pulse.

S FLAT PACKAGE (TOP VIEW)

J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



positive logic: Low input to preset sets Q to logical 1
Low input to clear sets Q to logical 0
Preset and clear are independent of clock

SN74123

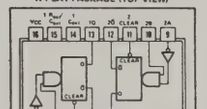
RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH CLEAR

NOTES:
A. H = high level (steady state), L = low level (steady state), ↑ = transition from low to high level, ↓ = transition from high to low level, ⎍L = one high-level pulse, ⎎ = one low-level pulse, X = irrelevant (any input, including transitions).
B. NC = No internal connection.
C. To use the internal timing resistor of SN54122/SN74122 (10 kΩ nominal), connect R_{int} to V_{CC}.
D. An external timing capacitor may be connected between C_{ext} and R_{ext}/C_{ext} (positive).

TRUTH TABLE (See Note A)

INPUTS A	INPUTS B	OUTPUTS Q	OUTPUTS $\bar{Q}$
H	X	L	H
X	L	L	H
L	↑	⎍	⎎
↓	H	⎍	⎎

J OR N DUAL-IN-LINE OR W FLAT PACKAGE (TOP VIEW)†



positive logic:
Low input to clear resets Q to low level and inhibits data inputs

TTL/ MONOSTABLE 9602 RETRIGGERABLE RESETTABLE MONOSTABLE MULTIVIBRATOR

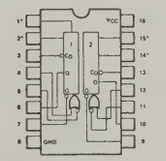
GENERAL DESCRIPTION — The TTL/Monostable 9602 is a dual retriggerable, resettable monostable multivibrator which provides an output pulse whose duration and accuracy is a function of external timing components. The 9602 has excellent immunity to noise on the V_{CC} and ground lines. The 9602 uses TTL inputs and outputs for high speed and high fanout capability and is compatible with all members of the Fairchild TTL family.

TRIGGERING TRUTH TABLE

PIN NO'S. 5(11)	4(12)	3(13)	Operation
H→L	L	H	Trigger
H	L→H	H	Trigger
X	X	L	Reset

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
H→L = HIGH to LOW Voltage Level transition
L→H = LOW to HIGH Voltage Level transition

CONNECTION DIAGRAM DIP (TOP VIEW)



*Pins for external timing.

MMC 381

SN7473, SN74107

DUAL J-K MASTER-SLAVE FLIP-FLOPS

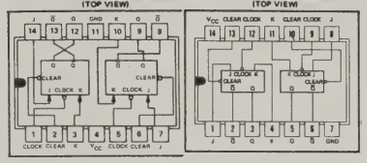
TRUTH TABLE (Each Flip-Flop)

t_n J	K	t_{n+1} Q
0	0	Q_n
0	1	0
1	0	1
1	1	$\bar{Q}_n$

NOTES: 1. t_n = Bit time before clock pulse.
2. t_{n+1} = Bit time after clock pulse.

SN5473, SN7473 J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)

SN54107, SN74107 J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



positive logic: Low input to clear sets Q to logical 0.
Clear is independent of clock.

SN7475, SN7477

8-BIT AND 4-BIT BISTABLE LATCHES

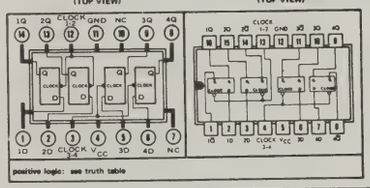
TRUTH TABLE (Each Latch)

t_n D	t_{n+1} Q
0	0
1	1

NOTES: 1. t_n = bit time before clock pulse transition.
2. t_{n+1} = bit time after clock pulse transition.
NC—No Internal Connection

SN5477/SN7477 5 FLAT PACKAGE (TOP VIEW)

SN5475/SN7475 J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



positive logic: see truth table

SN74121

MONOSTABLE MULTIVIBRATORS

TRUTH TABLE (See Notes 1 thru 3)

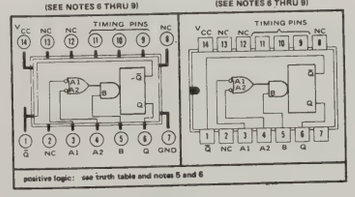
t_n INPUT A1	A2	B	t_{n+1} INPUT A1	A2	B	OUTPUT
1	1	0	1	1	1	Inhibit
0	X	1	0	X	0	Inhibit
X	0	1	X	0	0	Inhibit
0	X	0	0	X	1	One Shot
X	0	0	X	0	1	One Shot
1	1	1	X	0	1	One Shot
1	1	1	0	X	1	One Shot
X	0	0	X	1	0	Inhibit
0	X	0	1	X	0	Inhibit
X	0	1	1	1	1	Inhibit
0	X	1	1	1	1	Inhibit
1	1	0	X	0	0	Inhibit
1	1	0	0	X	0	Inhibit

1 = $V_{in(1)} \geq 2$ V
0 = $V_{in(0)} \leq 0.8$ V

NOTES: 1. t_n = time before input transition.
2. t_{n+1} = time after input transition.
3. X indicates that either a logical 0 or 1, may be present.
4. NC = No Internal Connection.

S FLAT PACKAGE (TOP VIEW) (SEE NOTES 6 THRU 9)

J OR N DUAL-IN-LINE PACKAGE (TOP VIEW) (SEE NOTES 6 THRU 9)



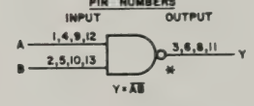
positive logic: see truth table and notes 5 and 6

5. A1 and A2 are negative-edge-triggered logic inputs, and will trigger the one shot when either or both go to logical 0 with B at logical 1.
6. B is a positive Schmitt-trigger input for slow edges or level detection, and will trigger the one shot when B goes to logical 1 with either A1 or A2 at logical 0. (See Truth Table)

112670-052A

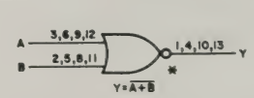
SN7400 SN7403 (Open Collector) Positive Logic NAND GATE

PIN NUMBERS



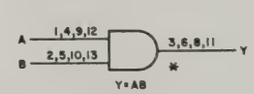
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

SN7402 Positive Logic NOR GATE



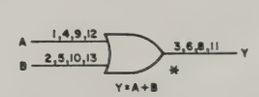
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

SN7408 Positive Logic AND GATE



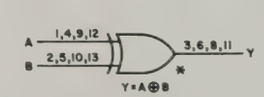
A	B	Y
H	H	H
H	L	L
L	H	L
L	L	L

SN7432 Positive Logic OR GATE



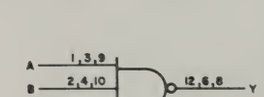
A	B	Y
H	H	H
H	L	H
L	H	H
L	L	L

SN7486 Positive Logic EXCLUSIVE-OR GATE



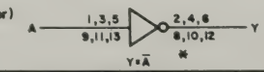
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

SN7410 Positive Logic NAND GATE



A	B	C	Y
L	L	L	H
L	L	H	H
L	H	L	H
L	H	H	H
H	L	L	H
H	L	H	H
H	H	L	H
H	H	H	L

SN7404 SN7406, SN7416 (Open Collector) Positive Logic HEX INVERTER



NOTE: Pin numbers are listed in the order in which they are related, for EXAMPLE, on SN7410, pins 1, 2, 13 and 12 function together on one gate.

* Pin 7 is Gnd, Pin 14 is Vcc

Figure 8-9. I.C. Modules Used in the Systems

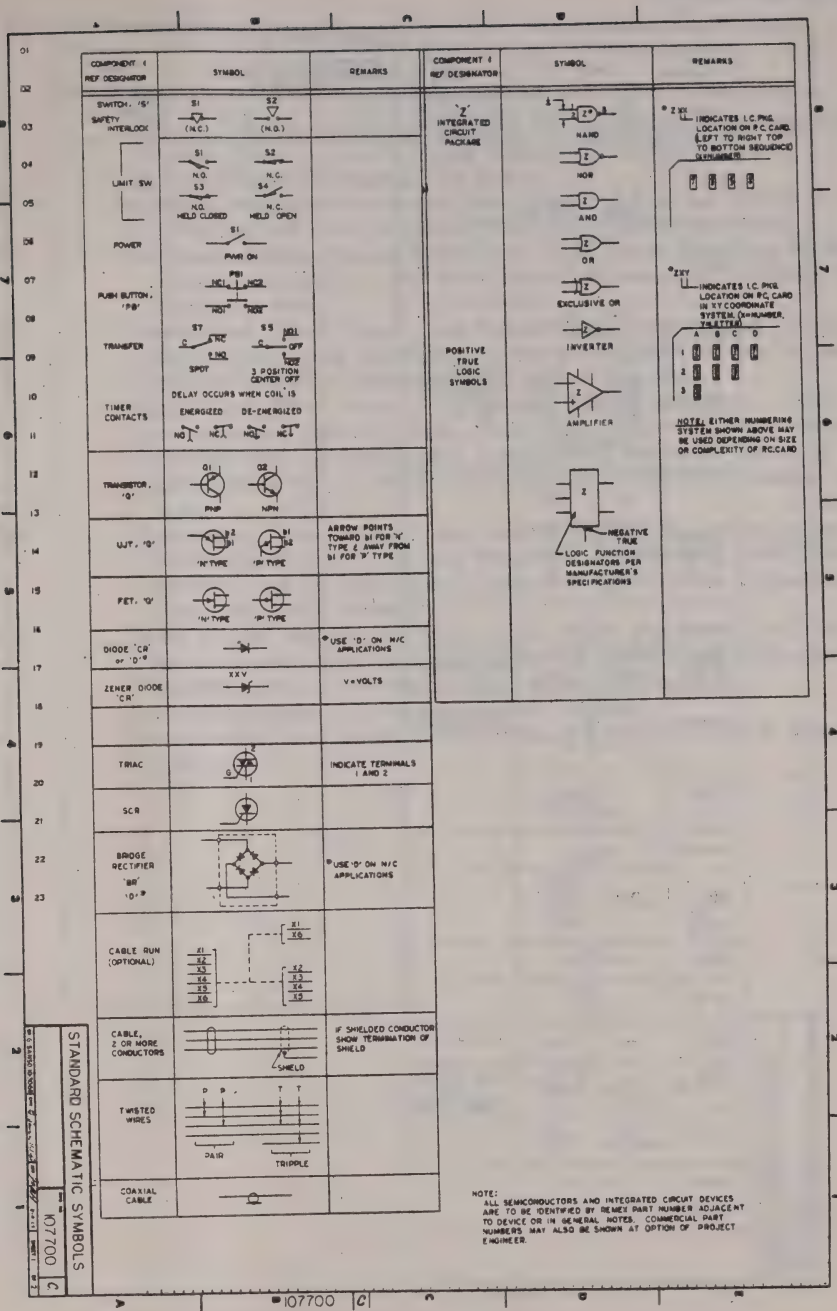


Figure 8-10. REMEX Standard Schematic Symbols, Sheet 1 of 2

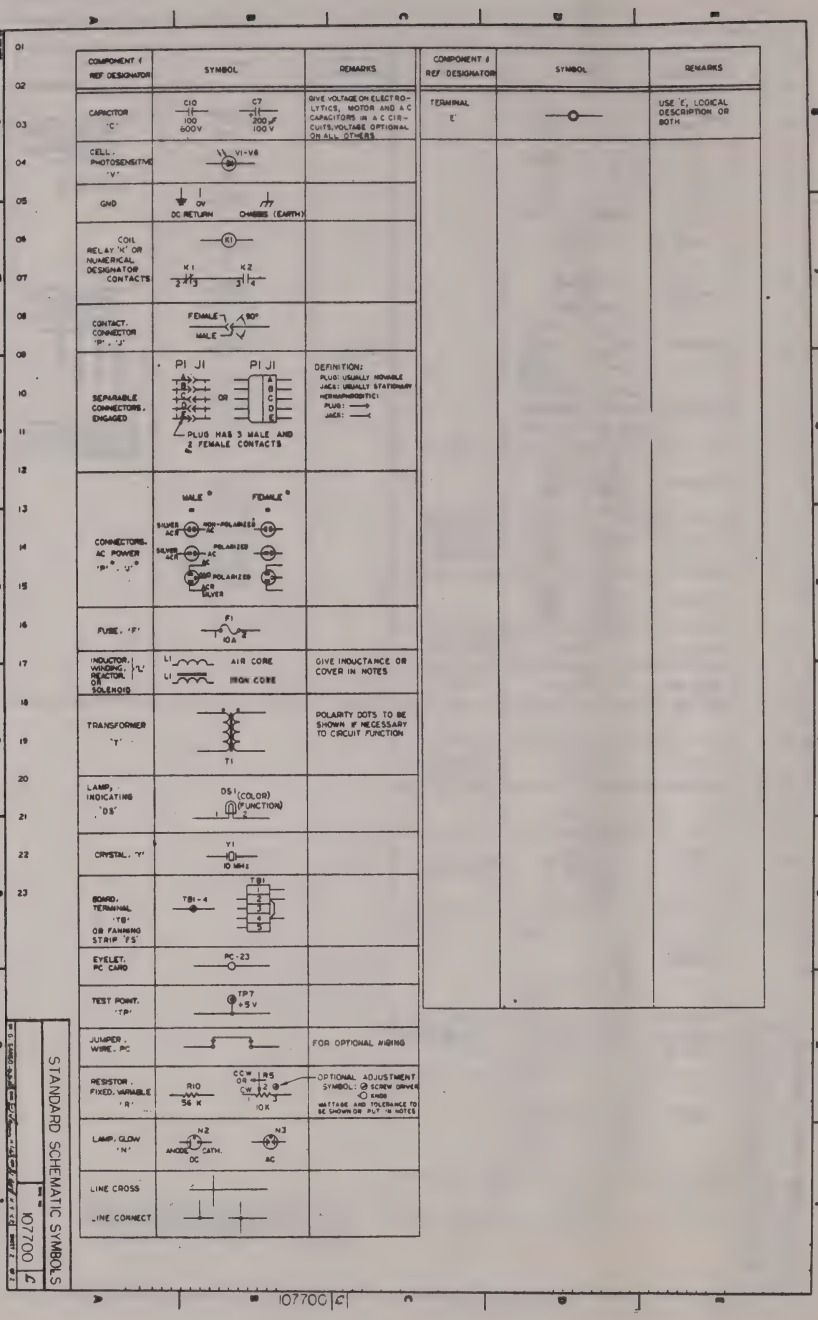


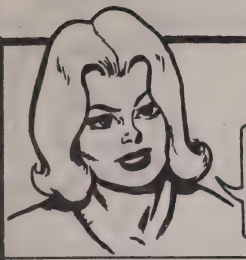
Figure 8-10. REMEX Standard Schematic Symbols, Sheet 2 of 2

APPENDIX A
REFERENCES

DA Pam 310-4	Index of Technical Publications: Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Index of Modification Work Orders.
TM 11-6660-263-10	Operator's Manual for Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 11-6660-263-20P	Organizational Repair Parts and Special Tools List for Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 11-6660-263-24-1	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 11-6660-263-24-2	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6600-01-065-4466), Calculator, Programmable CP-1387/U (NSN 7420-01-026-2686) (HP 9825A Desktop Computer).
TM 11-6660-263-24-4	Organizational, Direct Support, and General Support Maintenance Manual for Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6660-01-065-4466), Cable Assembly Special Purpose CX-13096/U.
TM 11-6660-263-34P	Direct Support and General Support Repair Parts and Special Tools List for Meteorological Data Processing Groups OL-192/GMD-1 (NSN 6660-01-065-4467) and OL-192A/GMD-1 (NSN 6660-01-065-4466).
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980-603-128/124

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS



SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/APC-76

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of [illegible] knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE: SSG I. M. DeSpiritof

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