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APPROVED

Frequency

**IMPORTANT NOTICE**

**THIS TECHNICAL MANUAL IS SUPPLIED  
WITH DOCUMENTATION CARD READER SERIAL  
NUMBER**

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**THIS MANUAL SHOULD REMAIN WITH THAT  
CARD READER.**

## Technical Manual Change Record

This Technical Manual has been updated to reflect Customer Specifications. Minor changes to text or schematics are marked on the pages affected. Major changes to text or schematic are corrected by direct replacement of pages affected, or are contained in an Addendum.

Customer: COMPUTER HARDWARE  
 Model: M600L Voltage 230 Frequency 50  
 Options: 01, 02, 03, 23, 29 CS No.: \_\_\_\_\_  
 Addendums: \_\_\_\_\_  
 Text Changes: 4-10, 4-11, 4-13, 4-15  
 Schematic Changes: \_\_\_\_\_

<u>Title</u>	<u>Drawing No. or Modification</u>
Wiring Diagram, AC Power Distribution, 115 VAC, 60 Hz . . . . .	_____
Wiring Diagram, AC Power Distribution, 230 VAC, 50 Hz . . . . .	_____
Card Cage, P. C. Card Location . . . . .	_____
Wiring Diagram, Card Cage . . . . .	1241999
Wiring Diagram, Control Panel . . . . .	_____
5V Power Supply, 115 VAC, 60 Hz . . . . .	_____
5V Power Supply, 230 VAC, 50 Hz . . . . .	_____
Solenoid Driver, 115 VAC, 60 Hz . . . . .	_____
Solenoid Driver, 230 VAC, 50 Hz . . . . .	_____
Clock Card Assembly . . . . .	_____
Schematic, (sheet 1 of 3) . . . . .	_____
Schematic, (sheet 2 of 3) . . . . .	_____
Schematic, (sheet 3 of 3) . . . . .	MODIFIED (OPT. 02)
Error Card Assembly . . . . .	_____
Schematic, (sheet 1 of 2) . . . . .	1241716
Schematic, (sheet 2 of 2) . . . . .	1241716 (Mod. Opt. 01)
Sync Card Assembly . . . . .	_____
Schematic, (sheet 1 of 3) . . . . .	_____
Schematic, (sheet 2 of 3) . . . . .	_____
Schematic, (sheet 3 of 3) . . . . .	_____
Control Card Assembly . . . . .	_____
Schematic, (sheet 1 of 2) . . . . .	1241715
Schematic, (sheet 2 of 2) . . . . .	1241715
Special Cards:	_____
_____	_____
_____	_____
_____	_____
_____	_____

THIS READER HAS BEEN MODIFIED FOR AN AUTOMATIC MOTOR SHUTDOWN OF 30 SECONDS. TIMING FOR SHUTDOWN OCCURS IF UNIT IS IN REMOTE AND NO PICK COMMAND IS RECEIVED.

M3,6 (OPT. 23)

Doc. No. M6458 Verified Patricia B. Copeman

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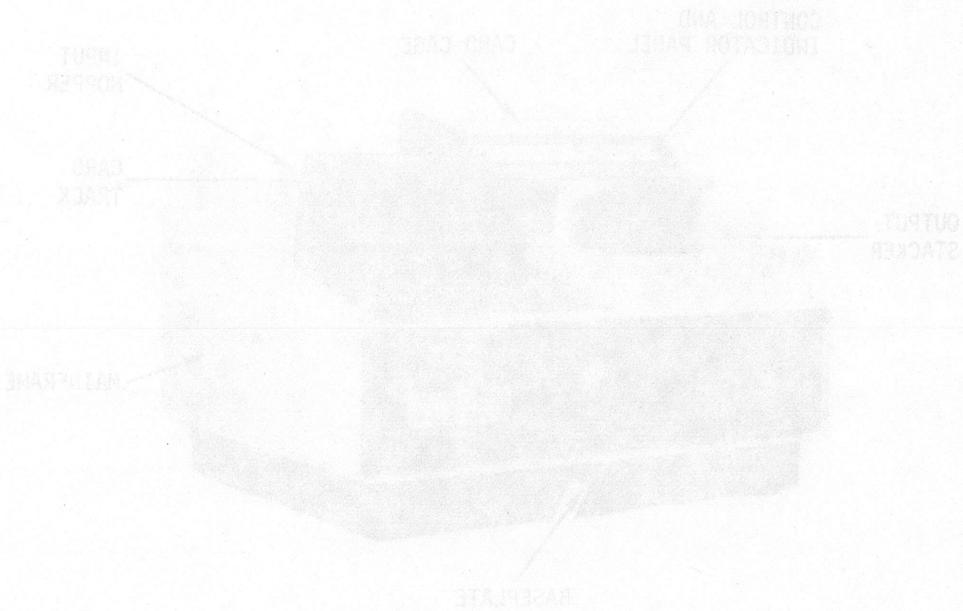


Figure 1-1. Card Reader, Three-Quarter Front View (Typical)

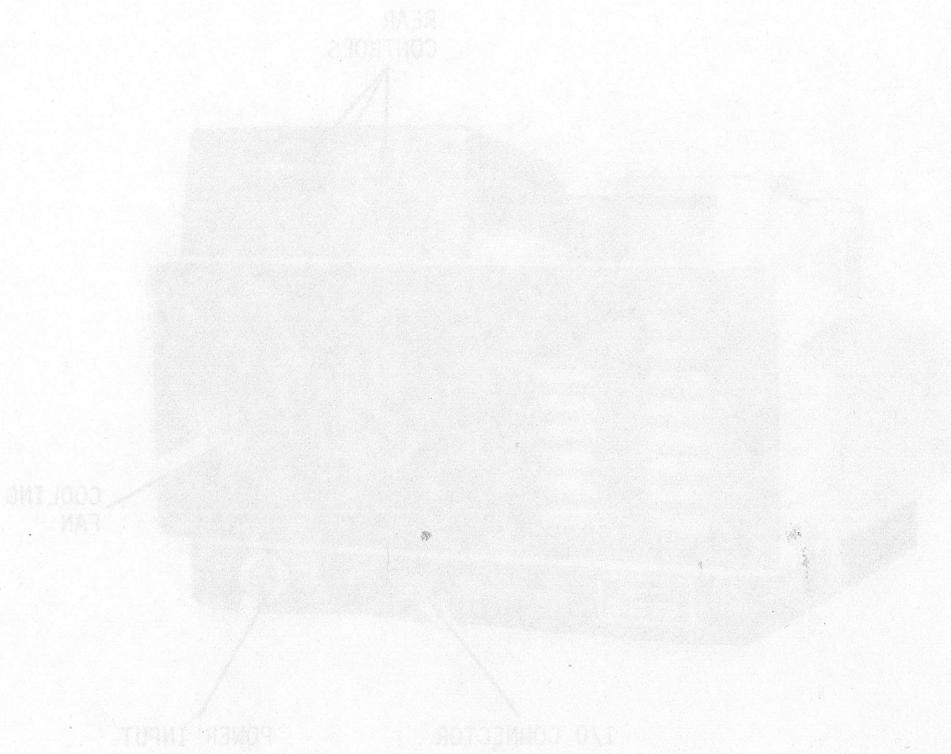


Figure 1-2. Card Reader, Three-Quarter Rear View (Typical)

# SECTION 1 INTRODUCTION

## 1.1 GENERAL

This technical manual contains operation, maintenance, interface and repair information to properly set up, operate, and maintain the Documentation Model M 600L Card Reader. An Illustrated Parts Breakdown is included in Section 12 to aid in locating and identifying parts if replacement becomes necessary.

The M 600L Card Reader shown in figures 1-1 and 1-2 is designed to read standard 12-row, 80 column punched cards. The hopper capacity is adequate to hold approximately 1000 cards of .007" thickness. These are separated from the stack sequentially and moved past a phototransistor read station where the data is recognized in a serial, column-by-column manner. The cards are then stacked into the output hopper in the same order as they were originally put into the reader. The reading cycle is externally controlled for single card selection or continuous run. In the continuous mode, the reader will read 600 cards per minute.

## 1.2 DESCRIPTION

The entire reader is constructed around a mainframe, figure 1-1. Mounted on top of the mainframe are the input hopper and output stacker, card track mechanism and control and indicator panel and printed circuit card cage. All logic circuitry is contained on printed circuit boards within the card cage. Located on the underside of the mainframe are the drive motor, drive train, and a portion of the card pick mechanism. The bottom of the mainframe contains a baseplate which mounts the vacuum pump motor assembly and the remainder of the electronics.

Located on the rear of the reader, figure 1-2, are three controls, a circuit breaker, the power input, the I/O connector, and a cooling fan.

## 1.3 SPECIFICATIONS

READING SPEED:	600 cards per minute maximum in continuous run. Single Card Cycle: 100 milliseconds.
CARD TYPE:	Standard 80 column cards.
CONTROL:	Demand feed, one card-at-a-time under external program control. Reader will continuously run as long as the Pick Command remains TRUE.
INPUT:	
Pick Command (PC)	Logic True for 1 $\mu$ sec -15 MaDC @ 0.8 VDC Max.

## SECTION 2 UNPACKING AND INITIAL CHECKOUT

### 2.1 UNPACKING

The M Series Card Readers are packed in a cardboard container, figure 2-1, with cushioning and padding to protect the equipment from damage during shipment. Inspect the outside of the container and report any physical damage to the carrier immediately.

Included in the container are the power cord and technical manual. After removing these items, lift the card reader straight up and place on a flat, sturdy, support area. Inspect the reader for any physical damage and report any damage to Documentation Incorporated. Locate a Phillips screwdriver and with the reader tilted in an upright position, remove the two red 8 x 32 screws in the bottom plate. These screws lock the blower motor plate in a solid position to prevent damage to the motor plate vibration isolators during shipment. If the reader is reshipped, these screws must be installed.

### 2.2 INITIAL CHECKOUT

Use the following instructions to test reader readiness.

- a. Make sure input voltage and frequency are correct. Plug in the AC power cord.
- b. Place the CIRCUIT BREAKER (rear connector panel) to ON.
- c. Set the MODE switch (rear panel) to LOCAL.
- d. Set the SHUTDOWN switch (rear panel) to AUTO.
- e. Depress the POWER switch to energize the reader. The POWER indicator illuminates and, after approximately a 3-second delay, the STOP and HOPPER CHECK indicator illuminates.
- f. Depress and hold momentarily the LAMP TEST switch (rear panel) and observe that all front panel indicators illuminate. Release switch.
- g. Pull the hopper follower back with one hand and load approximately 3 inches of unpunched cards into the hopper area.
- h. Depress the RESET switch. The RESET indicator will illuminate and the STOP indicator will extinguish. The drive motor and vacuum/blower should come on and, after approximately a 3-second delay, the cards should be picked and stacked. The drive motor and vacuum/blower will then shut off and the STOP and HOPPER CHECK indicators illuminate.
- i. Depress the POWER switch to turn off the reader. All indicators are extinguished.

## SECTION 3 OPERATION

### 3.1 LOADING THE INPUT HOPPER

Load the input hopper with punched cards to be read as follows:

- a. Pull the hopper follower back with one hand and load the card deck into the hopper area; the first card to be read must be placed at the front with the "9" edge down, column "1" to the left. Continue placing cards into the hopper until it is loosely filled (approximately 1000 cards).

#### CAUTION

DO NOT PACK THE INPUT HOPPER  
SO FULL THAT THE RIFFLE ACTION  
AT THE AIR RIFFLE CAP IS INHIBITED

- b. The hopper may be loaded while cards are being read if the operator is careful to keep tension on the front portion of the deck while loading additional cards at the rear. This is accomplished with the input hopper approximately one-half to one-third full. Use just enough pressure to maintain the riffle action.
- c. Unloading the input hopper is the reverse of the loading procedure. Normally all cards are processed through the reader; however, if it is necessary to unload the hopper, pull the follower back and remove the card deck. If the cards are arranged in a particular order, exercise care in repacking them in their storage container so that the order is maintained.

### 3.2 UNLOADING STACKER

To unload the stacker, perform the following steps:

- a. Pull stacker follower back with one hand and remove the front or rear portion of the card deck from the stacker area, being careful that deck order is maintained.
- b. To unload stacker during operation, pull stacker back and remove portion of deck taking care to allow stacker plate to return to its normal position gradually.

### 3.3 CONTROL AND INDICATOR DESCRIPTION

Reader controls and indicators, figure 3-1, are located on the front control panel, the rear of the card cage, and the rear subframe. Control and indicator descriptions are as follows:

Located within these switches are lighted indicators showing reader status; they are POWER ON (white), RESET (green), and STOP (red).

Four other "error" indicators are located on the front panel.

READ CHECK  
PICK CHECK  
STACK CHECK  
HOPPER CHECK

### 3.3.2 REAR READER CONTROLS

Located on the rear of the reader are two mode switches, a LAMP TEST switch and the main AC power circuit breaker. The two mode switches are:

SHUTDOWN - MAN/AUTO  
MODE - REMOTE/LOCAL

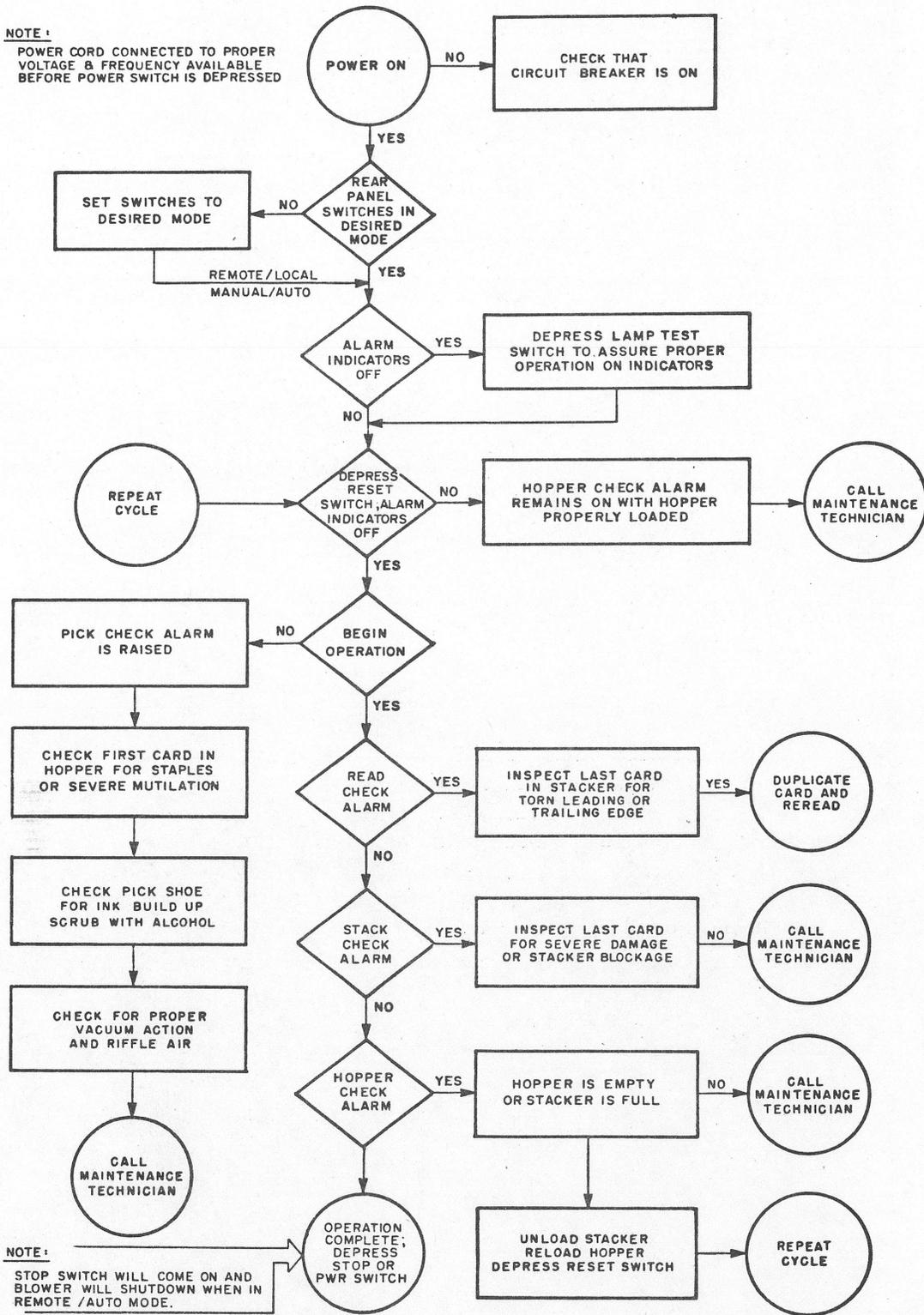
## 3.4 OPERATIONAL PROCEDURES

The following procedures explain both the operational sequence and some of the theory associated with the controls and indicators.

- a. Place the AC power circuit breaker in the ON position to allow power ON/OFF control from the front panel.
- b. Select the mode of operation, MANUAL or AUTO. When the MANUAL mode is selected, the drive motor and vacuum/blower will run continuously when AC power is applied. When the AUTO mode of operation is selected, all motors will turn off after the last card is read (30-sec delay).
- c. The second mode switch is used to select either REMOTE or LOCAL operation. When LOCAL operation is selected, card reader operations are controlled from the operator's control panel. In normal operation the card reader is connected to the appropriate interface logic and the switches should be in AUTO and REMOTE positions.
- d. With the LOCAL mode of operation established, depress the POWER switch on the front panel to apply primary power to the reader. The drive motor and vacuum/blower will not come on at this time due to the input hopper being empty and AUTO shutdown selection.
- e. Depress the LAMP TEST switch and check that all front panel indicators are lighted.

**NOTE:**

POWER CORD CONNECTED TO PROPER VOLTAGE & FREQUENCY AVAILABLE BEFORE POWER SWITCH IS DEPRESSED



**NOTE:**

STOP SWITCH WILL COME ON AND BLOWER WILL SHUTDOWN WHEN IN REMOTE /AUTO MODE.

Figure 3-2 - Operational Flow Chart

## SECTION 4 THEORY OF OPERATION

### 4.1 CARD FEEDING MECHANISM

The card feeding mechanism, figure 4-1, is designed around an air flow system that uses air pressure to separate the cards and a vacuum to pick the cards. Pressurized air ruffles the first half inch of cards in the input hopper so that they stand apart, individually "air cushioned" from the rest of the card deck and each other. This prevents the cards from sticking together in case of static electricity, hole locking, or torn webs and eliminates frictional forces between the cards. The vacuum picker pulls the bottom card in and holds it against the picker's rubber surface. When a pick command is received, the reader's electronics drives a rotary solenoid coupled to the picker sector causing it to rotate. As the solenoid moves the picker sector, the card is accelerated due to the friction forces caused by the vacuum between the picker's rubber surface and the card. The picker sector rotates pulling the card toward and into the drive rollers. When the leading edge of the card reaches the drive rollers, the rollers pull the card into the card track. The picker is now returned to its rest position by spring tension. As the card in the track clears the picker's surface, the next card is sucked down ready for the next pick command.

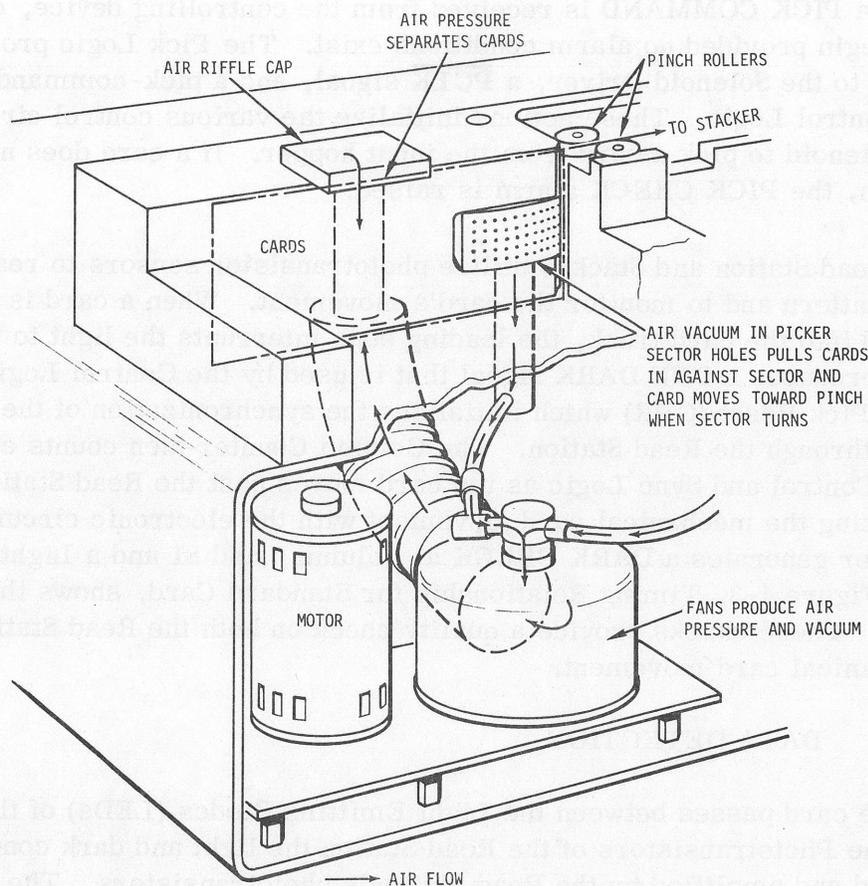


Figure 4-1. Card Feeding Air Flow

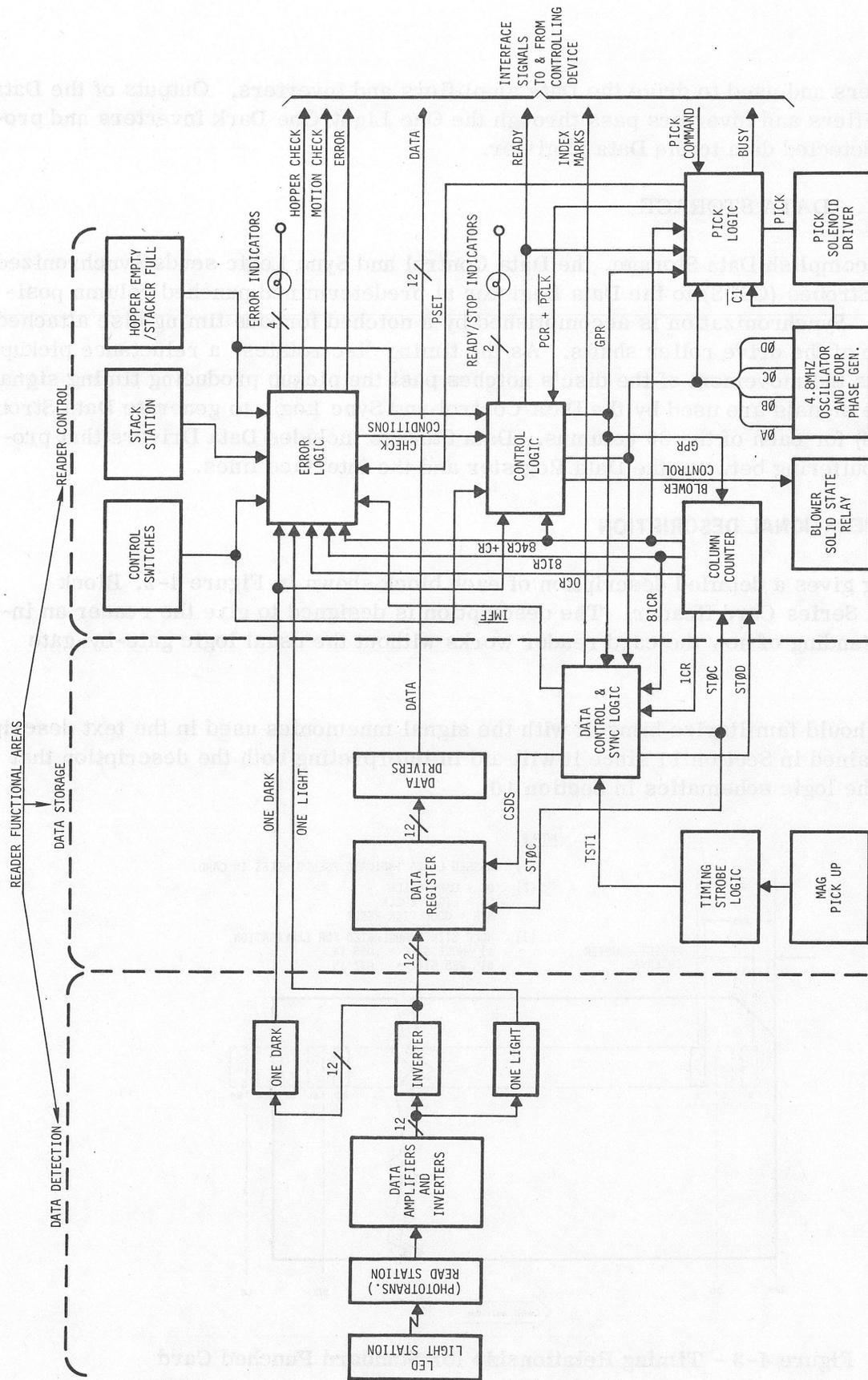


Figure 4-2. Block Diagram, M Series Card Reader

### 4.3.1 READER CONTROL

The following is a detailed description of each block shown under Reader Control in Figure 4-2, Block Diagram, M Series Card Reader.

#### 4.3.1.1 4.8 MHz Oscillator and Four-Phase Generator

The block diagram and timing diagram for the 4.8 MHz Oscillator and Four-Phase Generator is shown in Figure 4-4. The oscillator is crystal controlled and provides a TTL compatible 4.8 MHz squarewave as an output. The 4.8 MHz output is divided by ten in a decade counter and the counter's 480 KHz output used to drive the Four-Phase Generator. The Generator then divides the 480 KHz by four, generating signals  $\emptyset A$ ,  $\emptyset B$ ,  $\emptyset C$ ,  $\emptyset D$  and  $\overline{C1}$  as shown by the timing diagram of Figure 4-4.

$\emptyset A$ ,  $\emptyset B$ ,  $\emptyset C$ ,  $\emptyset D$  and  $\overline{C1}$  are used throughout the reader as a timing source.

#### 4.3.1.2 Control Logic

The Control Logic (Figure 4-5) contains the Ready/Stop Logic, Power On Reset, Blower Control, Reset Control and Good Pick Sync Control. At reader power turn on, a three-second Power On Reset (POR) is initiated. See timing of Figure 4-5. The long POR allows the blower to come up to speed before the controlling device or an operator can initiate a reader

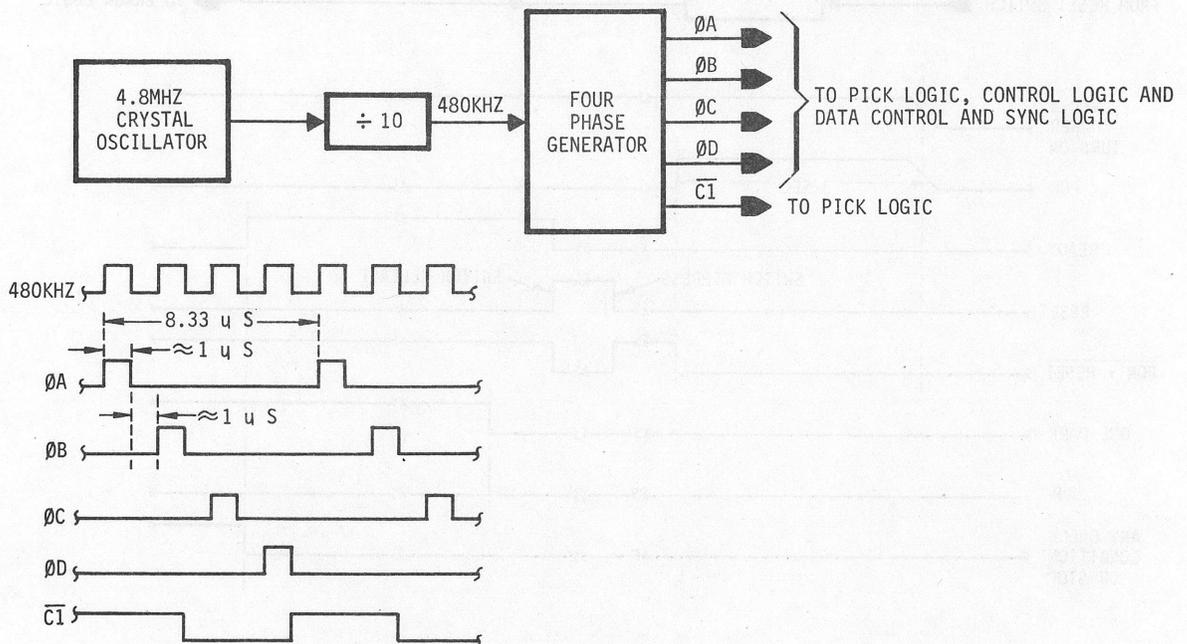


Figure 4-4 - Block and Timing Diagram, 4.8 MHz Oscillator and Four-Phase Generator

operation. POR is also used to initialize the Pick Logic and Column Counter. POR OR'ed with RESET to form POR + RESET resets the Error Logic. The reader is now brought to the ready state by the operator depressing and releasing the RESET switch. Note that while the RESET Switch is depressed, RESET is routed to initialize the Pick Logic and Column Counter and RESET activates the POR + RESET signal to the Error Logic. The Reset Control is designed to ignore all RESET switch signals while a read cycle is in progress. Signals PCLK and 84CR or CR identify the beginning and end of a read cycle.

Reader READY is signalled to the controlling device by the Ready/Stop Logic when the RESET Switch is released provided HOPPER CHECK is not being presented by the Error Logic. (All other Error Logic Check signals will be reset by POR or RESET.) Reader READY is indicated to the operator by the RESET Switch lighting green. The controlling device can now begin a read cycle by transmitting a PICK COMMAND to the reader. READY will be reset upon receipt of any CHECK signal from the Error Logic or if the STOP Switch is depressed by the operator and RESET INHIBIT is not present. The Ready/Stop Logic gates the STOP signal with RESET INHIBIT, preventing READY from being reset due to STOP during a card read cycle. RESET INHIBIT, generated by the Reset Control, is set by PCLK and reset by 84CR or CR. The Stop Condition is indicated by the STOP switch lighting red.

The Good Pick Sync Control is initialized by Pick Command Reset (PCR). During a card read cycle, the Good Pick Sync Control detects a ONE DARK and processes this signal with clock phase ØC and ØD to produce Good Pick Reset (GPR). GPR is used to:

- a. Initialize the Column Counter.
- b. Begin the data synchronization process by the Data Control and Sync Logic.
- c. Verify to the Pick Logic that a Pick Command has been successful.

The Blower Control provides signals to control AC power to the reader blower motor and drive motor. These motors automatically shut down when a HECK (Hopper Empty Check) condition exists and switch S1 is in the AUTO position. After the HECK condition is corrected by reloading the input hopper, depressing of the RESET switch will cause the Blower Control Logic to activate the 3-second (nominal) POR. When the SHUTDOWN switch is in the MAN position, all motors remain on as long as reader power is applied.

#### 4.3.1.3 Pick Logic

Once the reader is brought to ready condition, a PICK CMD from the

Counter. At the count of one the Pick Control Counter sets the Pick Flip-Flop (FF). This begins the PICK pulse interval. The Pick Control Counter continues to count the 1.2 KHz until count 10 (for M200, 300 and 600) or 6 (for M1000, M1200) is decoded generating a reset to the Pick FF ending the PICK pulse. PCR, generated by the Pick FF, is used by the Control Logic to initialize the Good Pick Sync Control. The Pick Control Counter continues to count the 1.2 KHz while awaiting a GPR. If no GPR is received by the count of 63, the Pick Control Counter resets to all zeros and begins its count cycle again generating another PICK and PCR pulse. PICK and PCR pulses will continue to be generated until a GPR is received or the PICK Attempt Counter counts six PCRs and the Pick Control Counter reaches Count 56. When six PCRs have been counted and count 56 is reached PSET is generated. PSET will cause READY to go false terminating PCLK.

Upon receipt of a GPR, the Pick Control signals Busy (BSY) to the controlling device to indicate a card has entered the read station. BSY remains true until 84CR or CR indicating the card has left the read station and another PICK CMD can be accepted.

The position of Switch S1 determines the source of the PICK CMD. In LOCAL, the PICK CMD signal is held true so that whenever the reader is READY, PICK CMDs are generated internally each time 84CR or CR is reached. When in REMOTE, only a PICK CMD from the controlling device can initiate a read cycle.

#### 4.3.1.4 Column Counter

The Column Counter (Figure 4-7) provides a record keeping control function by counting and decoding columns as the card passes through the Read Station. Following GPR, a STØC followed by a STØD (Refer to timing diagram of Figure 4-7) will be generated for each column by the Data Control and Sync Logic. STØC is used to drive the Column Counter and STØD to sample the Count Gating. The Column Counter generates OCR (0 column reset), 1CR, 81CR, 84CR and CR. These signals are used by the Control Logic, Data Control and Sync Logic, Pick Logic and Error Logic as follows:

#### COUNT

#### USED BY

OCR

1. Error Logic for a Dark Check

1CR

1. Data Control and Sync Logic to set the Index Mark Control Flip Flop (IMFF).

2. Pick Logic to enable the Pick Control for the next PICK CMD and reset BUSY.
3. Error Logic for a Light Check.
4. Data Control and Sync Logic to reset the Sync Control Logic.

- CR (M300 Only)
1. Control Logic to reset the RESET INHIBIT Flip Flop.
  2. Pick Logic to enable the Pick Control for the next PICK CMD and reset BUSY.
  3. Data Control and Sync Logic to reset the Sync Control Logic.

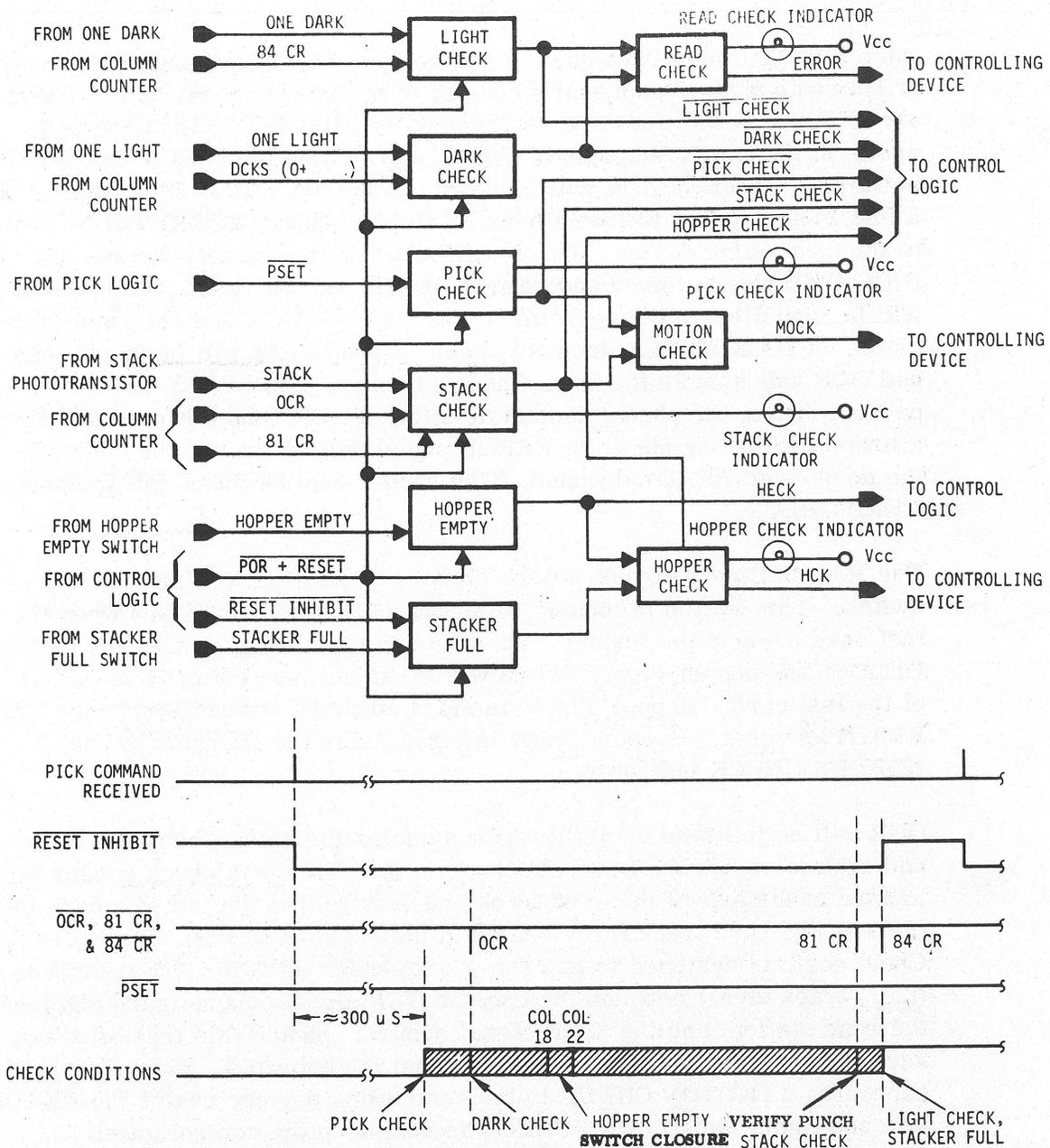


Figure 4-8. Block and Timing Diagram, Error Logic

excessive card slip in the read track. This error is signalled to the controlling device as an ERROR and the READY line is reset. The reader control panel will indicate READ CHECK.

Since 84CR or CR is also used to reset RESET INHIBIT, the Stacker Full circuit will be checked for a closure of the Stacker Full Switch. If the switch is closed, the Stacker Full circuitry will send HOPPER CHECK to the controlling device, Reset READY, and light the HOPPER CHECK Indicator.

All error conditions are cleared by the Reset Switch.

#### 4.3.2 DATA DETECTION

The following is a detailed description of each block shown under Data Detection in Figure 4-2 Block Diagram, M Series Card Reader.

##### 4.3.2.1 Data Amplifiers and Inverters

The Light Station contains one infrared Light Emitting Diode (LED) and the Read Station one Phototransistor for each of the 12 punched card rows. Light emitted by the LEDs is allowed to pass to the Phototransistors by the presence of punched holes in the tab card. Figure 4-9 presents a block diagram and typical waveform for the Data Amplifiers and Inverters. Light reaching the Phototransistor (PT) is amplified by the PT and converted into an electrical signal at its' emitter. A typical PT's emitter waveform is ROW 12 (A). As the leading edge of the card passes over the PT lens, the received light is reduced causing a reduction in the PT's output voltage. The emitter of the PT is coupled to pull down resistor R and the input of a high impedance TTL inverter. When the PT's emitter voltage drops through the switching threshold of the inverter (nominally 1.4 volts) the inverter changes states. The High Impedance Inverters output is amplified by the Inverter and then used to drive the One Light and One Dark Logic. As can be seen from the waveforms each time the High Impedance Inverters threshold is crossed the device switches states driving the inverter to produce waveform ROW 12(B).

##### 4.3.2.2 One Dark and One Light

In order to provide the Dark Check at 0CR and the Light Check at 84CR, the outputs of the Data Amplifiers and Inverters are OR'ed in a One Light nor gate and inverted and OR'ed in a One Dark nor gate. These nor gates consist of 12 each open collector, TTL inverters in a wired OR configuration. Figure 4-10 is a block and timing diagram for the One Dark and One Light logic.

The timing of Figure 4-10 shows the normal waveforms for ONE DARK and ONE LIGHT. When 0CR occurs, ONE LIGHT should be low indicating all PTs are dark. At 84CR, ONE DARK should be low indicating light is being received by all PTs. If the foregoing conditions are not met, a READ CHECK will result and the reader READY will be reset.

### 4.3.3 DATA STORAGE

The following describes the blocks shown under Data Storage in Figure 4-2 Block Diagram, M Series Card Reader.

#### 4.3.3.1 Data Control and Sync Logic

The Data Control and Sync Logic provides the synchronization and control necessary for data storage. Figure 4-11 is the block diagram, timing and illustration that should be referenced to fully understand the following description.

Following a GPR, the Data Control and Sync Logic must measure by means of logic counters two distances to determine where the Column Storage Data Strobe should begin. As shown on the card illustration,

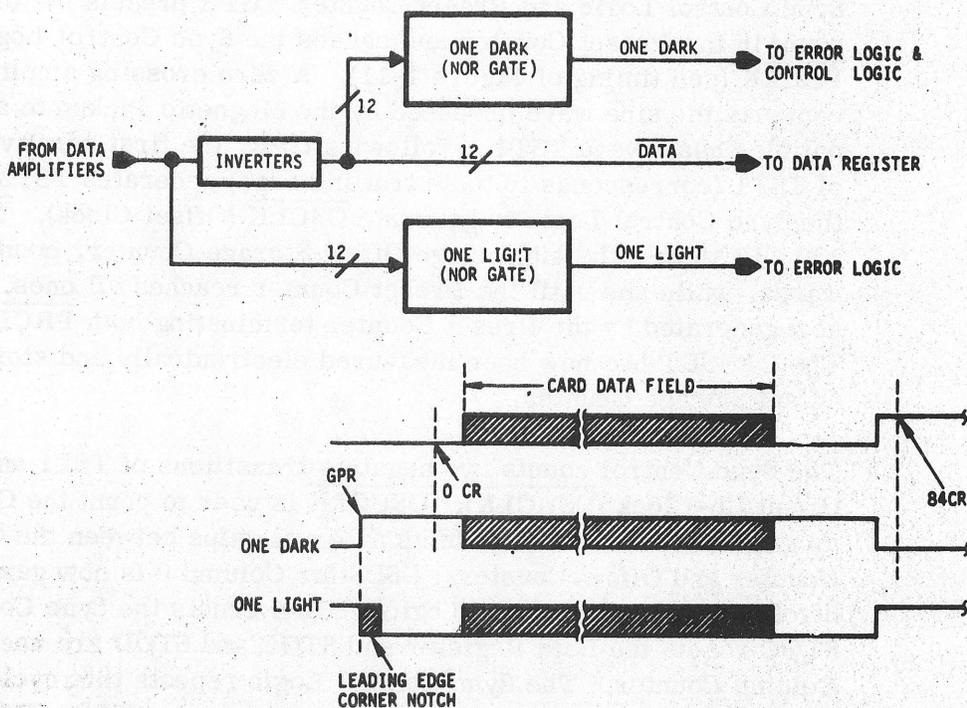


Figure 4-10. Block and Timing Diagram, One Dark and One Light

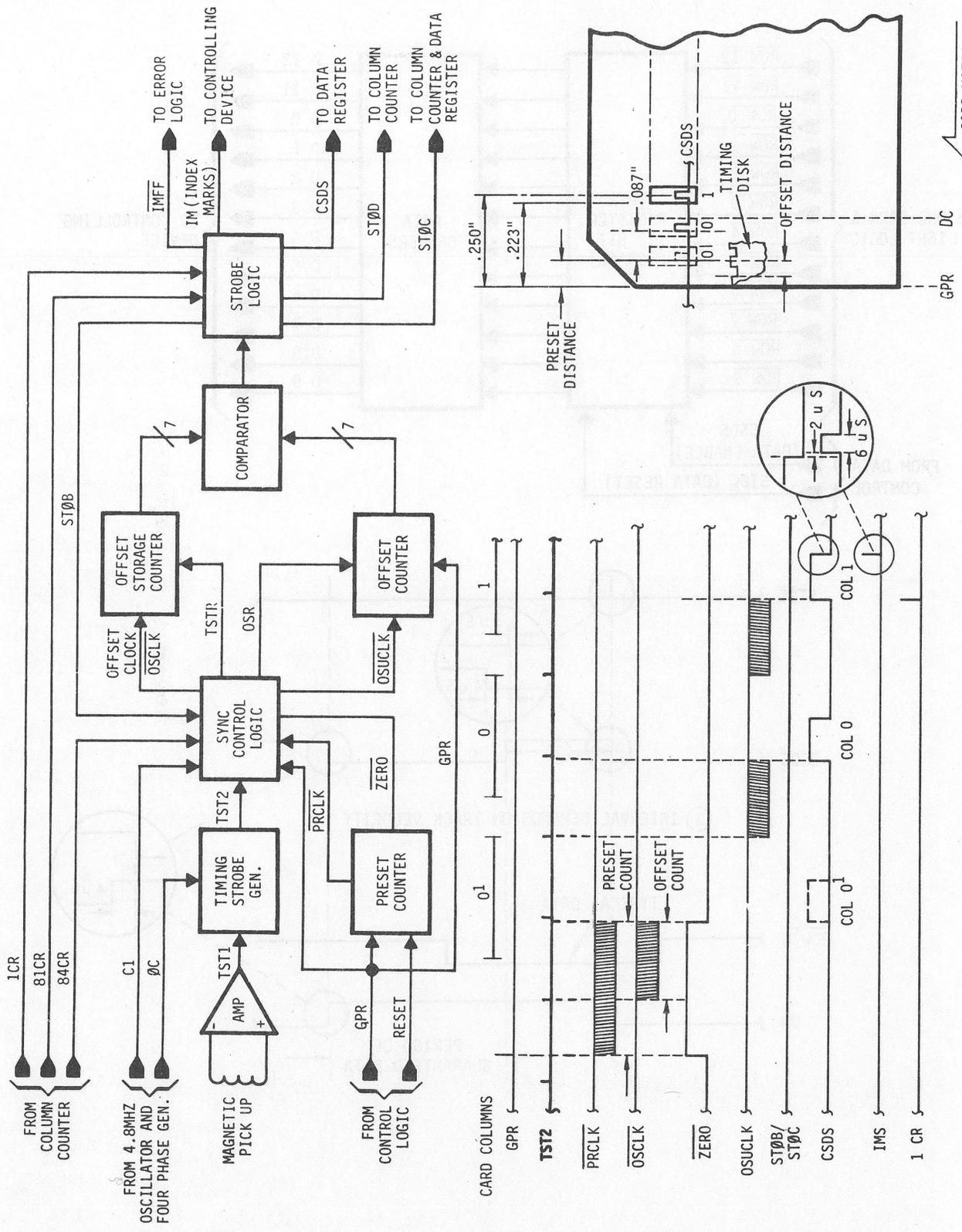


Figure 4-11. Block and Timing Diagram, Data Control and Sync Logic Drivers

1CR from the Column Counter sets the Index Mark Control Flip Flop (IMFF) in the Strobe Logic. The Strobe Logic generates  $6\mu s$  Index Marks (IM) for each Column. The IM indicates to the controlling device the beginning of the guaranteed data period. When the 81CR is received by the Strobe Logic, the IMFF resets preventing any further IM's from being sent to the Controlling Device. The Data Control and Sync Logic will continue to generate CSDS signals until 84CR (or CR) resets the Sync Control Logic.

#### 4.3.3.2 Data Registers

Data detected by the Data Amplifiers and Inverters is routed through the One Dark and One Light circuitry to the Data Register for transfer to the Controlling Device. Figure 4-12, Data Registers and Data Drivers diagram and timing details this sequence.

The 12 bit Data Register is reset each time  $ST\bar{O}C$  is generated by the Data Control and Sync Logic. The  $1\ \mu s$   $ST\bar{O}C$  is followed in approximately  $4\ \mu s$  by the Column Storage Data Strobe, CSDS. CSDS is synchronized with the card movement by the Data Control and Sync Logic so that they occur in the center of the card's data columns. Any ROW's input to the Data Register that is low during CSDS will cause a "1" to be stored for the row. When CSDS goes low, a period of guaranteed data occurs. This period lasts until CSDS again goes true.

The data drivers provide the necessary buffering between the Data Register and the Controlling Device.

## SECTION 5 INTERFACE

### 5.1 GENERAL

This section covers the interface between the M Series punched card readers and the equipment into which it transfers data.

### 5.2 TIMING

In interfacing the M Series card readers to an external system or card reader controller, three separate categories of interface signals must be considered. The first are the signals which control and report the status of card processing, the second are the data signals themselves with their associated index marks, and the third are the various alarm signals provided. In the description following, refer to the timing diagram shown in figure 5-1.

#### 5.2.1 PICK CONTROL

The PICK COMMAND initiates the card read cycle, and depending upon its duration, the card reader will either continuously run or operate in a card-at-a-time mode. This signal can be presented to the reader at any time, but the reader will only accept it when the READY line is TRUE. The READY signal indicates that the card reader is cleared of errors and is ready to receive a PICK COMMAND from the external program control. A visual indication of the READY line is the green RESET indicator on the front control panel.

The conditions which must be present for the READY line to be TRUE are:

1. Power applied and the 3-second run-up completed.
2. The input hopper has been loaded.
3. Depress and release of the RESET pushbutton.

Should all of the above conditions be satisfied, and the unit is in the remote mode of operation the presence of a PICK COMMAND signal will generate the PICK pulse to the picker solenoid. The first card is introduced into the card track, and after a delay (see A, figure 5-1), the leading edge will arrive at the read station. The BUSY signal will go TRUE as soon as the leading edge of the card enters the read station.

To initiate the card pick cycle, the PICK COMMAND must be present for at least 1 microsecond ( $\mu$ s) concurrently with the READY signal. Once the pick cycle is initiated, the PICK COMMAND line is ignored until the BUSY signal goes FALSE, indicating the end of the card read cycle. In card-at-a-time operation, it is suggested that the PICK COMMAND be retained TRUE until receipt of the column 1 index mark. In the continuous run mode, the PICK COMMAND may be left in the TRUE condition and a new PICK signal will be automatically generated within 1  $\mu$ s of the BUSY signal going FALSE.

Should the picker fail to engage the card, the Pick Control logic will wait 50 milliseconds (ms) and automatically try again. It will continue to generate a PICK pulse every 50 ms until 6 attempts have been made. After 6 attempts have been unsuccessful (300 ms), a PICK CHECK alarm will be generated, disabling the READY line.

### 5.2.2 DATA READOUT

The card read cycle starts with the recognition that the card leading edge has entered the read station. At this time the BUSY line goes TRUE. Eighty equally spaced Index Marks of 6 us duration are generated while the BUSY signal is present. The time spacing of the Index Marks and the BUSY signal are shown by intervals, B, D, and E on figure 5-1.

It can be seen from the timing diagram that data signals may appear on the data output lines before the occurrence of the associated Index Mark. Since torn webs are sometimes encountered which could partially obscure the hole, all Documentation card readers feature a wide data acceptance interval to provide greater tolerance to this damage. During this interval, any signal from the read station sensors indicates a hole, and therefore is recognized as a valid data bit and is stored into the Character Buffer. Since the contents of the Character Buffer are subject to change throughout this interval, the data is not guaranteed until the end of the acceptance interval. This period is terminated 2 us prior to the Index Mark.

By the time the Index Mark is generated, the data will have been read, stored, and the data lines settled. Data levels are guaranteed to remain on the output lines available for transfer to the external equipment for interval C.

### 5.2.3 ALARMS

A description of the standard alarm signals provided in the M Series reader follows:

#### 5.2.3.1 Hopper Check

The HOPPER CHECK signal remains FALSE during normal card reader operation, but goes TRUE if either the input hopper is empty or the output stacker is full. If the input hopper is empty and the SHUTDOWN switch is in AUTO position, the motors are also automatically switched off; when the input is reloaded and RESET depressed, the motors will automatically turn on.

The standard M Series pin assignment configuration is listed as follows: \*

### J2 I/O SIGNAL CONNECTOR PIN LIST

PIN	SIGNAL	DESCRIPTION	PIN	SIGNAL	DESCRIPTION
A	D12	Row 12 Data	X	D7 (RET)	
B	D11	Row 11 Data	Y	D8	Row 8 Data
C	D0	Row 0 Data	Z	D9	Row 9 Data
D	D1	Row 1 Data	AA	IM	Index Mark
E	D12 (RET)		BB	RDY	Ready
F	D11 (RET)		CC	D8 (RET)	
H	D0 (RET)		DD	D9 (RET)	
J	D1 (RET)		EE	IM (RET)/GRD	Signal Ground
K	D2	Row 2 Data	FF	RDY (RET)	
L	D3	Row 3 Data	HH	ERROR	Error
M	D4	Row 4 Data	JJ	HCK	Hopper Check
N	D5	Row 5 Data	KK	MOCK	Motion Check
P	D2 (RET)		LL	PC	Pick Command
R	D3 (RET)		MM	BSY	Busy
S	D4 (RET)		NN	Error (RET)	
T	D5 (RET)		PP	HCK (RET)	
U	D6	Row 6 Data	RR	MOCK (RET)	
V	D7	Row 7 Data	SS	PC (RET)	
W	D6 (RET)		TT	BSY (RET)	

### POWER CONNECTOR PIN LIST

PIN	SIGNAL	
W	Safety Ground	(green)
X	Neutral	(white)
Y	115 Volts	(black)

\* For Non-Standard Units, see Wiring Diagram, figure 10-3.

## SECTION 6 ADJUSTMENT PROCEDURES

### 6.1 GENERAL

The adjustment procedures necessary for proper reader operation are listed separately in this section for ease in reference. These adjustments should be checked when minor malfunctions occur and before major repair is attempted. They will also be used after major repair and replacement.

To perform any of the adjustments in this section, it will be necessary to remove the front, top and rear panels. Remove all three panels using a 5/64 Allen wrench.

- a. Remove six screws (1) which hold front panel and remove panel, figure 6-1.
- b. Remove four screws (3) which hold top cover and remove cover
- c. Remove six screws (2) which hold rear panel, figure 6-2.
- d. Move rear panel out slightly and disconnect fan, then remove panel.

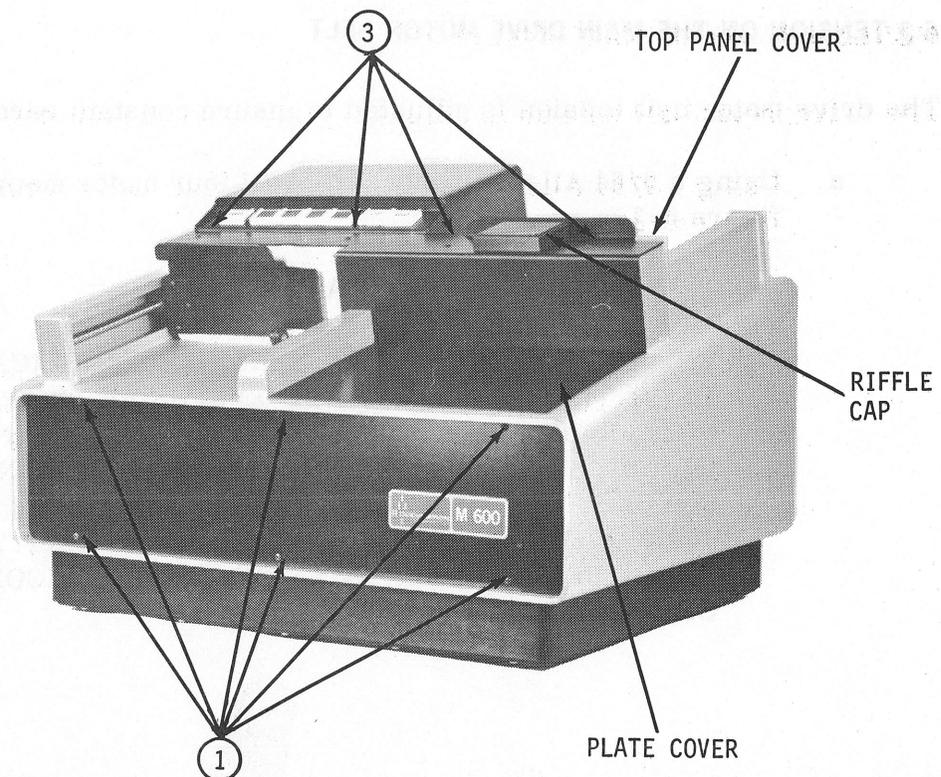


Figure 6-1, Front Panel and Top Cover Removal

- b. Move motor mounting plate back and forth to be sure it slides freely. Attach spring scale to motor so that pulling on spring scale from rear of card reader and in line with motor mounting slots will apply tension to main drive motor belt. Pull on spring scale until it reads 24 ounces. Hold tension at that level and tighten four motor mounting plate screws.

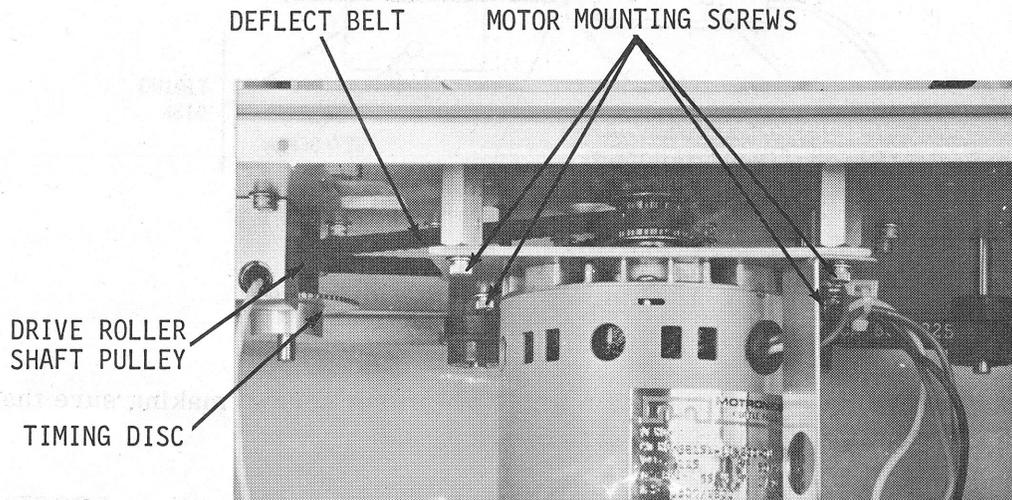


Figure 6-3. Drive Motor Belt Tension Adjustment

### 6.3 MAGNETIC PICKUP ADJUSTMENT

The magnetic pickup is adjusted to ensure that timing pulses are developed correctly. There are two adjustments: horizontal alignment and air gap. Refer to figure 6-4.

- a. Using a 1/16 Allen wrench, LOOSEN set screw that is holding timing disc on drive roller shaft and position timing disc on drive roller shaft so that it is in a horizontal plane with center of magnetic pickup tip.

#### CAUTION

IF THE TIMING DISC MUST BE REMOVED, EXERCISE EXTREME CAUTION. DAMAGE TO DISC WILL RESULT IN ERRONEOUS MACHINE OPERATION.

## 6.4 ADJUSTMENT OF STACK PHOTOCELL

The stack photocell is adjusted to ensure that it correctly monitors the stacking of cards and so that it is not in the way of the cards entering the output stacker.

The card cage must be repositioned in this adjustment to allow easy access to the rear of the stacker photocell.

- a. Using a 5/64 Allen screwdriver, remove the 4 button head screws retaining the rear card cage cover, figure 6-5.
- b. Using the same tool, remove the 4 screws retaining the main card cage cover.
- c. Use a 9/64 Allen screwdriver to remove the 3 socket head screws from the underside of the mainframe which is holding the card cage in place, figure 6-5.
- d. Move the card cage to the rear of the reader, approximately 3 inches and replace one of the two rear mounting screws.
- e. To gain access to the stack photocell set screw, the drive roller must be removed. Using a 1/16 Allen screwdriver loosen the set screw in the drive roller and remove the roller, figure 6-6.
- f. Using the same tool, loosen the set screw in the stacker casting which retains the stack photocell, figure 6-6.

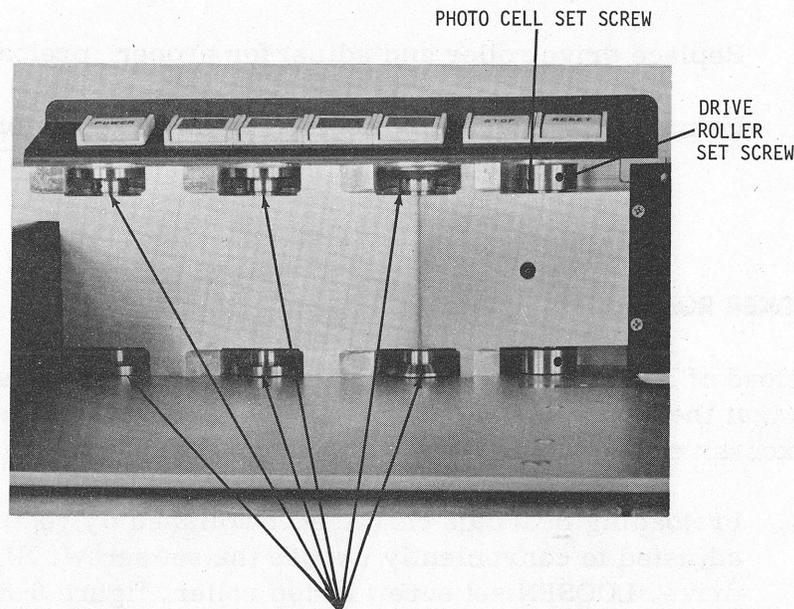


Figure 6-6. Location of Photo Cell Set Screw

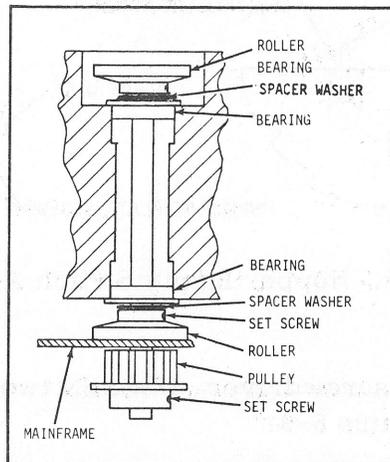


Figure 6-8. Roller Shaft Bearing Preload Adjustment

- c. Using a feeler gauge set, select gauge that will shim shaft in this position. Place selected gauge between bottom roller and main frame.

#### NOTE

The size of the gauge required may be different for each shaft (5 to 25 mils).

- d. Ensure that set screw is on flat side of shaft.
- e. With feeler gauge in place, exert downward pressure on top roller and tighten set screw.

If the end play is excessive, a chattering noise will be detected when drive motor is on.

### 6.6 HOPPER EMPTY SWITCH ADJUSTMENT

The adjustment of hopper empty switch, located under riffle air cap, ensures that input hopper empty condition is detected.

- a. Using a 3/32 Allen wrench, remove two screws holding riffle air cap, figure 6-1.
- b. Check that operating arm of switch is parallel to top of picker casting, and that arm is not bent.

- b. After a few moments, the STOP indicator should illuminate. Pull stacker follower toward front of reader. Approximately 1/8" before end of travel, HOPPER CHECK light should illuminate. If this condition is not met, stacker full switch must be repositioned.
- c. Using a small Phillips screwdriver, LOOSEN two screws retaining stacker full switch bracket, figure 6-10.
- d. Adjust switch bracket horizontally until HOPPER CHECK indicator illuminates when stacker follow is approximately 1/8" before end of travel. Secure bracket mounting screws.

### 6.8 PICKER SECTOR ADJUSTMENT

The picker sector is adjusted to ensure that cards are picked properly. There are six adjustments to picker sector assembly; height, vacuum adapter air gap, rest stop, throat block, solenoid coupling, and forward bumper stop.

#### CAUTION

IT IS VERY IMPORTANT THAT THE ADJUSTMENTS BE FOLLOWED IN THE SEQUENCE STATED.

- a. Check picker sector height adjustment. Using a 6" steel rule, measure distance from top of mainframe to center of middle row of holes in picker sector. This should be exactly 1-5/8", figure 6-11.

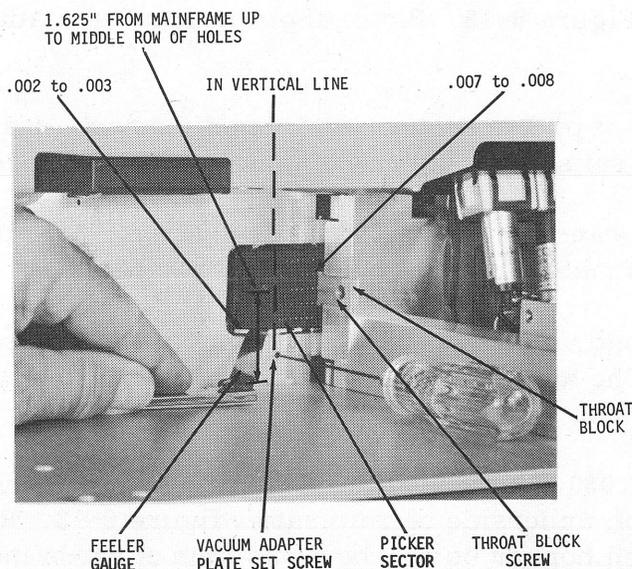


Figure 6-11. Picker Sector Adjustment, Rear View

- f. Using a .050 Allen wrench, LOOSEN vacuum adapter plate set screw, figure 6-11.
- g. Insert a .002 feeler gauge between picker sector and vacuum adapter plate. From bottom side of mainframe push vacuum adapter plate upward. Exert upward pressure and tighten vacuum adapter plate set screw.
- h. Replace vacuum tube adapter elbow.
- i. Check picker sector rest position. The back edge of last row of holes on the picker sector should line up with middle of vacuum adapter plate set screw hole. The position is established by placement of the rest stop.
- j. Using a 5/64 Allen wrench, LOOSEN two picker stop screws, figure 6-12.
- k. Using a 6" steel rule to gauge picker sector rest position, and while holding picker sector firmly in alignment push rest stop against picker sector and tighten the screws.
- l. Check gap between throat block and picker sector. The gap should be .008 inches to ensure that only one card is picked at a time.
- m. Using a small Phillips screwdriver LOOSEN screw holding throat block, figure 6-11.
- n. Place an .008 feeler gauge between throat block and picker sector face.
- o. Exert slight pressure on rear of throat block and tighten the mounting screw.
- p. Check solenoid coupling adjustment. The solenoid coupling is used to transfer rotational solenoid motion to picker sector.
- q. Using a 1/16 Allen screwdriver, LOOSEN two set screws in the top of the solenoid coupling, figure 6-14.
- r. Depress coupling slightly with fingers and while maintaining pressure, tighten two coupling set screws, ensuring one set screw is on flat portion of shaft. Remove return spring on load shaft and check that solenoid return tension is just sufficient to return load on its stop position. Too much tension could cause solenoid to not provide enough drive action to load shaft.
- s. Replace return spring and check solenoid action, by operating picker sector manually while power is applied, vacuum is applied, and cards are in the input hopper.

## 6.9 VACUUM PUMP BELT TENSION ADJUSTMENT

The vacuum/blower motor belt tension is a critical adjustment. A reduction in amount of vacuum or riffle air can cause erratic picking. The vacuum/blower assembly must be removed from base plate to accomplish adjustment procedure.

- a. Using a Phillips screwdriver, remove four screws from rear subframe panel, (1), figure 6-15.
- b. Remove five screws (2) from bottom of baseplate retaining rear subframe panel.
- c. Cut the cable tie holding main connector cable to baseplate. Move subframe panel backward and bend outward.

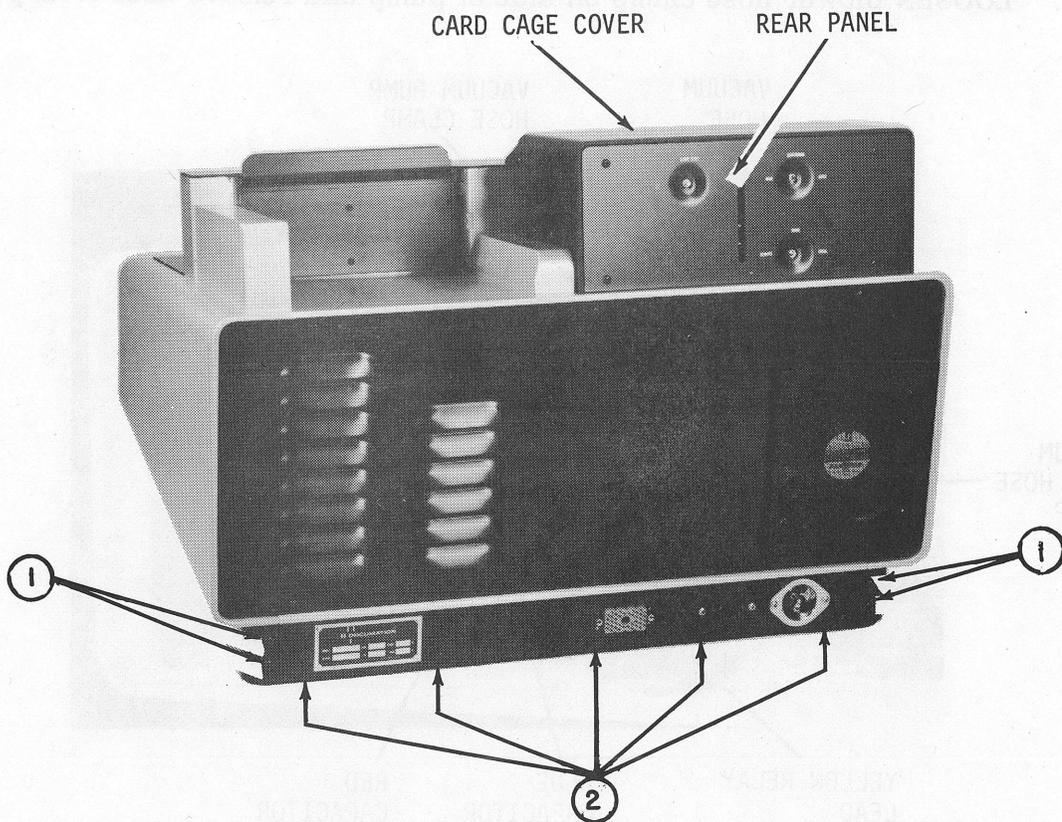


Figure 6-15. Removal of Rear Subframe Panel

- g. LOOSEN vacuum adapter clamp on top of pump and remove from pump , figure 6-17.
- h. Using a Phillips screwdriver, remove ground strap from pump mounting plate.

**CAUTION**

USE A  $\frac{1}{2}$  INCH OPEN-END WRENCH TO HOLD MOUNTING POSTS TO AVOID TWISTING OFF THE PUMP PLATE RUBBER SHOCK MOUNTS.

- i. Remove four Phillips head mounting screws ① holding the vacuum pump motor assembly.
- j. The pump assembly can now be removed from reader and belt tension adjusted.

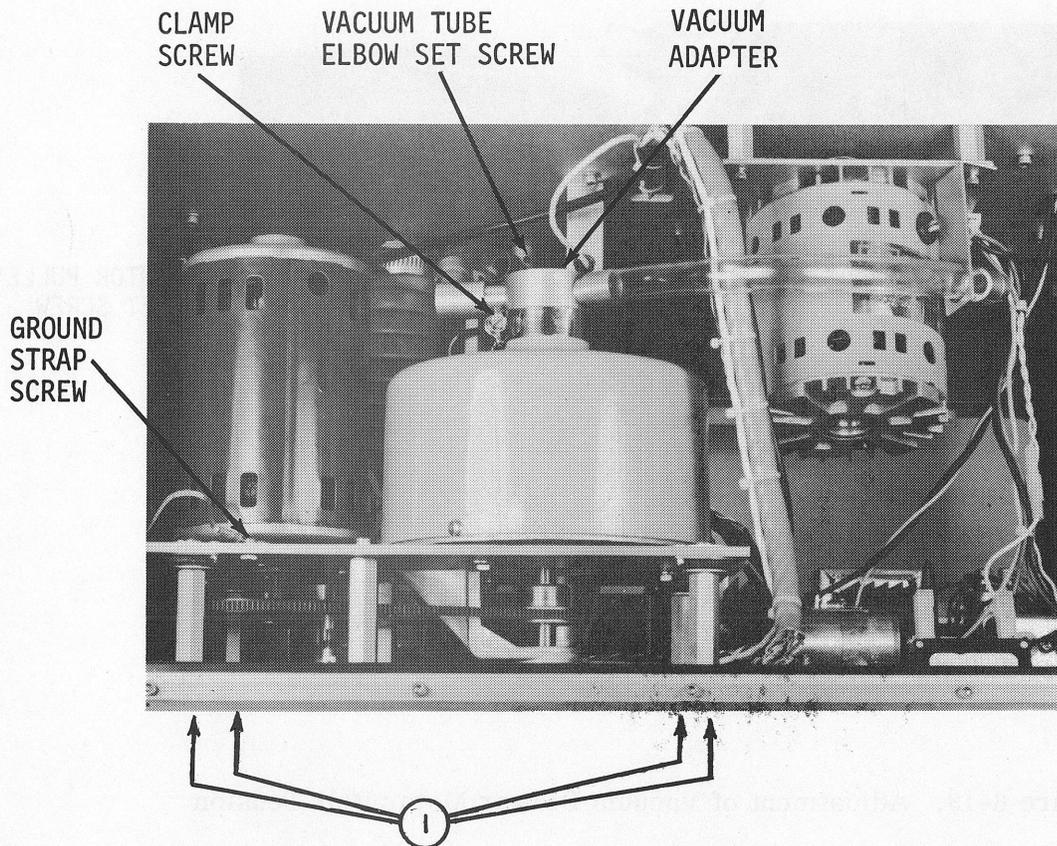


Figure 6-17. Removal of Vacuum Blower Motor Assembly

## 6.10 PICKER CASTING ADJUSTMENT

- a. Position picker casting in place, insert mounting screws but do not fully tighten.
- b. Make a gauge using 8 new unpunched cards cut to 2 x 5 inches and staple together.
- c. Insert gauge between picker casting and stacker casting but avoid covering read station window. Apply even pressure to picker casting toward stacker casting and tighten picker casting mounting screws.
- d. Using extender board on control card, connect voltmeter between R17 and card ground. Verify voltage is  $> 2.3$  vdc and  $< 4.3$  vdc. (Nominal 3 to 4 vdc)
- e. Repeat step d. at R18 through R28.
- f. If any reading is outside limits, LOOSEN picker casting mounting screws and reposition for optimum reading. Tighten screws and re-check per paragraph d. and e.
- g. If a dial caliper is available, measure distance from outside face of stacker casting to outside face of picker casting. This measurement should be  $2.98$  inches  $\pm$  1 mil.

# SECTION 7

## PREVENTIVE MAINTENANCE

### 7.1 GENERAL

The following paragraphs provide information for preventive maintenance and general care of the M-Series card readers. The card readers are of rugged construction and are designed to provide many hours of failsafe, reliable operation; as such, preventive maintenance consists primarily of routine cleaning.

### 7.2 CLEANING

Keeping the card reader clean is very important and can prevent problems which appear to be major malfunctions.

#### 7.2.1 PICKER SECTOR

The picker sector is the heart of the card reader; it is the mechanism that must operate properly to remain on-line.

After each 40 hours of operation, the neoprene surface of the picker sector should be wiped with a cloth or paper wiper saturated with a solvent such as Freon TF. This will remove the glaze buildup from the ink which rubs off of the cards. This is especially prevalent where new cards are used exclusively. If this glaze is allowed to remain, it reduces the coefficient of friction of the picker sector to the point that erratic pick operation may result.

After each 160 hours of operation, the picker sector should be examined to see if any of the vacuum holes have become plugged with lint, trash, or card meal which the solvent scrub has failed to dislodge. If so, gently push this debris through the holes with a paper clip while the reader is on. The vacuum system will remove the debris.

#### 7.2.2 CASTING ASSEMBLIES

After each 160 hours of operation, the card track should be cleaned. Using a 5/64 Allen wrench, remove four button head screws ③, Figure 9-1, holding top panel cover. Remove this cover and use a vacuum cleaner to remove any card debris buildup around the picker and stacker castings. Use a small brush to clean around the picker and stacker rollers and picker sector.

## SECTION 8 TROUBLESHOOTING

### 8.1 GENERAL

If trouble persists after checking the adjustment procedures in Section 6, use the following fault isolation chart to analyze the problem. If it is determined that a part is defective and needs replacement, use the repair and replacement procedure in Section 9, and the illustrated parts breakdown.

FAULT ISOLATION CHART

SYMPTOM	PROBABLE CAUSE	REMEDY
POWER indicator fails to light.	<ol style="list-style-type: none"> <li>1. Power cord is not connected to reader or power source.</li> <li>2. Circuit breaker CB1 is not on</li> <li>3. Fuse F1 is defective.</li> <li>4. Lamp is burned out.</li> <li>5. +5 volt power regulator defective.</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect power cord to reader and power source.</li> <li>2. Place circuit breaker CB1 to ON position.</li> <li>3. Replace F1.</li> <li>4. Replace lamp.</li> <li>5. Replace +5 volt power regulator.</li> </ol>
A given lamp fails to light when lamp test switch is activated (POWER indicator excluded).	<ol style="list-style-type: none"> <li>1. Lamp is burned out.</li> <li>2. Defective Error Card.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace defective lamp.</li> <li>2. Replace Error Card.</li> </ol>
When LAMP TEST switch is activated, none of the lamps on the control panel will light. (POWER indicator excluded).	<ol style="list-style-type: none"> <li>1. Defective lamp test switch.</li> <li>2. Defective Error Card</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace lamp test switch.</li> <li>2. Replace Error Card.</li> </ol>
HOPPER CHECK indicator does not light when hopper goes empty or stacker goes full. No other error indications.	<ol style="list-style-type: none"> <li>1. Lamp is burned out.</li> <li>2. Defective Error Card.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace lamp.</li> <li>2. Replace Error Card.</li> </ol>
HOPPER CHECK indicator does not light when hopper goes empty and PICK CHECK indicator is lit.	<ol style="list-style-type: none"> <li>1. Hopper empty switch not adjusted properly.</li> <li>2. Defective hopper empty switch.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust hopper empty switch per paragraph 6. 6.</li> <li>2. Replace hopper empty switch.</li> </ol>

SYMPTOM	PROBABLE CAUSE	REMEDY
Reader picks two to six cards and then stops with a PICK CHECK.	Pick attempt counter is not being reset at good pick reset time. Defective Sync Card.	Replace Sync Card
Reader picks one card but the reader will not pick additional cards. Unable to stop the reader by pressing the STOP switch.	<ol style="list-style-type: none"> <li>1. Column "84CR or CR" output is missing from the Clock Card.</li> <li>2. Column strobe phase "B" or phase "D" is missing from Sync Card.</li> <li>3. Clock phase "C" or phase "D" is missing from Clock Card.</li> <li>4. Clock phase "B" is missing from Clock Card.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace Clock Card</li> <li>2. Replace Sync Card.</li> <li>3. Replace Clock Card.</li> <li>4. Replace Clock Card.</li> </ol>
Reader reads erroneous data.	<ol style="list-style-type: none"> <li>1. Defective Clock Card.</li> <li>2. Defective Sync Card.</li> <li>3. Defective Control Card.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace Clock Card.</li> <li>2. Replace Sync Card.</li> <li>3. Replace Control Card.</li> </ol>
Sharp, metallic noise from picker sector while reading cards.	<ol style="list-style-type: none"> <li>1. Picker sector maladjusted.</li> <li>2. Rubber roller worn.</li> <li>3. Bearing bad.</li> <li>4. Belt too tight.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust picker sector per procedure in paragraph 6.8.</li> <li>2. Replace roller.</li> <li>3. Replace bearing.</li> <li>4. Readjust belt.</li> </ol>

NOTE

When using test equipment for troubleshooting, connect test equipment ground to card logic ground to obtain accurate values.

## SECTION 9 REPAIR PROCEDURES

### 9.1 GENERAL

The following repair procedures detail step by step methods for those parts for which replacement may be required during the life of the reader. It is recommended that these procedures are followed closely and performed by a technician familiar with tools, their use and disassembly/assembly techniques.

### 9.2 REQUIRED TOOLS

The following tools are required to perform removal and replacement procedures in this section and adjustment procedures in Section 6.

Description	Manufacturer and Part Number of Special Tools
1/16" Allen Screwdriver	
3/32" Allen Wrench (long arm)	
5/64" Allen Wrench (long arm)	
7/64" Allen Wrench (long arm)	
1/8" Allen Wrench (long arm)	
9/64" Allen Wrench (long arm)	
.050" Allen Wrench (short arm)	
1/16" Allen Wrench (short arm)	
AMP Extraction Tool	AMP 91022-1
"AMP Leaf Contact" Extraction Tool	AMP 465195-2 or 465275-1
"AMP Modified Fork" Contact Extraction Tool	AMP 91037-2
"AMP Mod IV" Contact Extraction Tool	AMP 91029-1A
Deutsch Insertion/Extraction Tool (on base plate)	M15570-16
IC Removal Tool	AMP 91049-1
Elco Extraction Tool	Elco 061877-04
Elco Insertion Tool	Elco 061742-04
Feeler Gauge Set 0.0015" thru 0.025"	
Long Nose Pliers	
IC Test Clip	AP Inc. 923700
Medium Flat Blade Screwdriver 3" long	
Medium Flat Blade Screwdriver 6" long	
6" Metal Scale, decimal/fraction per inch	
1/4" - Open End or Socket Wrench	
1/2" - Open End Wrench	
11/32" - Open End or Socket Wrench	
7/16" - Open End or Socket Wrench	
#1 Phillips Screwdriver 6" long	
#2 Phillips Screwdriver 6" long	
Printed Circuit Card Extender	Documation P/N 103099501
#2 Retaining Ring Remover	
Side Cutter	
Solder Removal Tool	
60-Watt Soldering Iron	
32-oz. Spring Scale	

### 9.3 MAIN DRIVE MOTOR BELT

- a. Using a 5/64 Allen wrench, remove six 6 x 32 button head screws ① holding front panel and remove front panel, figure 9-1.
- b. Using a 5/64 Allen wrench, remove six 6 x 32 button head screws ② holding rear panel, move rear panel out slightly, disconnect fan motor connector, and remove rear panel, figures 9-2 and 9-14.
- c. Using a 9/64 Allen wrench, LOOSEN three 8 x 32 socket head motor mounting plate screws (bottom of mainframe). Remove fourth motor mounting plate screw, figure 9-3.
- d. Using a 1/16 Allen wrench, LOOSEN 8 x 32 set screw in timing disc, figure 9-4.

#### CAUTION

REMOVE TIMING DISC USING EXTREME CARE NOT TO DAMAGE TEETH ON DISC. WRAP DISC IN SOFT TISSUE WHILE NOT IN READER.

- e. Using a 1/16 Allen wrench, LOOSEN set screw in fifth stacker roller pulley, figure 9-5.
- f. Remove fifth stacker roller pulley from stacker-roller shaft.
- g. Using a 3/32 Allen wrench, LOOSEN set screw in bottom fourth stacker roller pulley.
- h. Remove bottom fourth stacker roller pulley.
- i. Remove main drive motor belt, figure 9-4.
- j. To replace main drive motor belt:

#### CAUTION

PULLEY CONFIGURATION MUST BE MAINTAINED. ALWAYS REPLACE PROPER PULLEY IN ITS CORRECT POSITION (UPPER OR LOWER) ON ITS RESPECTIVE SHAFT. FIGURE 9-6 SHOWS THE CORRECT CONFIGURATION.

1. Place belt over main drive motor pulley.
2. Slip belt over upper fourth stacker roller pulley, figure 9-5.
3. Place belt over fifth stacker roller pulley and replace this pulley on fifth stacker roller shaft.
4. Replace bottom fourth stacker roller pulley
5. Locate fourth stacker roller pulley so that set screw is on flat side of shaft and carefully tighten set screw.

#### **CAUTION**

USE MODERATE TORQUE TO TIGHTEN  
PULLEY SET SCREW. DO NOT OVER-  
TORQUE OR DAMAGE WILL RESULT TO  
PULLEY.

6. Push fifth stacker roller pulley up against mainframe, then pull VERY SLIGHTLY downward making sure pulley is free from mainframe.
  7. Locate fifth stacker roller pulley so that set screw is on flat side of shaft and carefully tighten set screw.
- k. Replace timing disc on fifth stacker roller shaft and tighten set screw lightly.
- l. The main drive motor belt tension must be adjusted first. Refer to paragraph 6.2.
  - m. Second, the magnetic pickup and timing disc must be adjusted. Refer to paragraph 6.3.

#### **9.4 THIRD STACKER ROLLER DRIVE BELT**

- a. Using steps a. and b. of paragraph 9.3, remove front and rear panels, figures 9-1 and 9-2.
- b. Using a 3/32 Allen wrench, LOOSEN set screw in bottom fourth stacker roller pulley, figure 9-5.
- c. Pull bottom pulley down to disengage third stacker drive belt. Remove pulley and belt.

- d. Replace third stacker drive belt on bottom third stacker roller pulley and around fourth stacker roller shaft.
- e. Replace bottom pulley of fourth stacker roller on shaft and push up until it engages with belt and is against top pulley.
- f. Position fourth stacker roller pulley so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
- g. Replace front and rear panels.

### 9.5 FIRST STACKER ROLLER DRIVE BELT

#### CAUTION

USE MODERATE TORQUE TO TIGHTEN PULLEY SET SCREW. DO NOT OVERTORQUE OR DAMAGE WILL RESULT TO PULLEY.

- a. Using steps a. and b. of paragraph 9.3, remove front and rear panels, figures 9-1 and 9-2.
- b. Using a 3/32 Allen wrench, LOOSEN set screw in bottom second stacker roller pulley, figure 9-5.
- c. Pull bottom pulley down to disengage first stacker drive belt. Remove pulley and belt.
- d. Replace first stacker drive belt on bottom first stacker roller pulley and around second stacker roller shaft.
- e. Replace bottom pulley of second stacker roller on shaft and push up until it engages with belt and is against top pulley.
- f. Position second stacker roller pulley so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
- g. Replace front and rear panels.

- j. Position top second stacker roller pulley so that set screw is on flat side of shaft and belt lines up with top pulley of third stacker roller. Carefully tighten set screw.
- k. Replace first stacker drive belt on bottom first stacker roller pulley and around second stacker roller shaft.
- l. Replace bottom pulley of second stacker roller on shaft and push up until it engages with belt and is against top pulley.
- m. Position second stacker roller on shaft so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
- n. Replace third stacker drive belt on bottom third stacker roller pulley and around fourth stacker roller shaft.
- o. Replace bottom pulley of fourth stacker roller on shaft and push up until it engages with belt and is against top pulley.
- p. Position fourth stacker roller pulley so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
- q. Replace front and rear panels.

## 9.7 FIRST, SECOND, AND THIRD STACKER ROLLER BEARING ASSEMBLIES

### NOTE

Replace both bearings and shaft with new matched assembly to assure proper operation.

- a. Using steps a. and b. of paragraph 9.3, remove front and rear panels, figures 9-1 and 9-2. Also remove four screws ③, figure 9-1, holding top panel cover.
- b. Use a 1/2 inch thick group of cards to prop stacker follower in extended position.
- c. To replace first stacker roller bearings, perform step d; to replace second stacker roller bearings, perform step e; to replace third stacker roller bearings perform step f.
- d. To replace first stacker roller bearing assembly perform the following substeps.

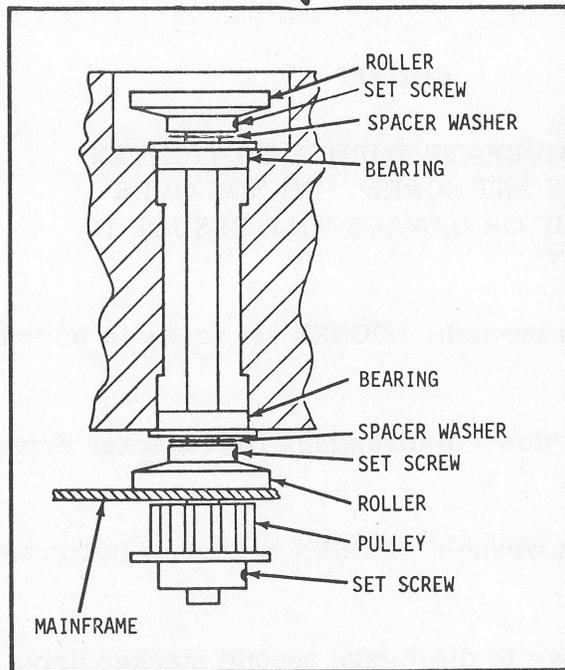
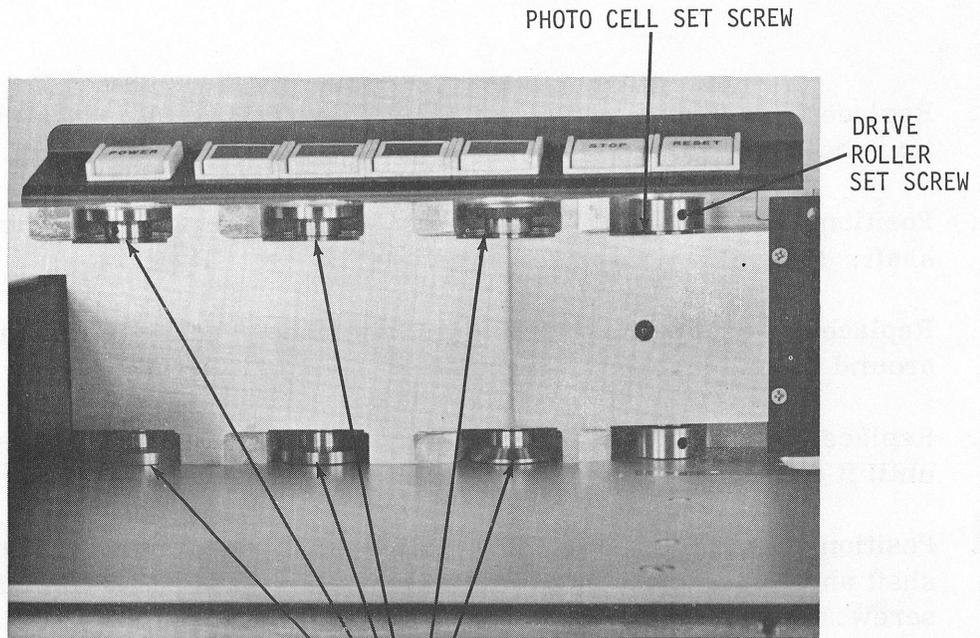


Figure 9-7. Pictorial, Stacker Roller Bearing Assembly

5. Perform step d.4. to replace bearing assembly.
  6. Place second stacker drive belt on third stacker roller pulley and around second stacker roller shaft.
  7. Replace top pulley of second stacker roller on shaft and push up until it engages with belt.
  8. Position second stacker roller pulley so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
  9. Place first stacker drive belt on first stacker roller pulley and around second stacker roller shaft.
  10. Replace bottom pulley of second stacker roller on shaft and push up until it engages with belt.
  11. Position second stacker roller pulley so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
- f. To replace third stacker roller bearing assembly perform the following substeps.

#### **CAUTION**

USE MODERATE TORQUE TO TIGHTEN PULLEY SET SCREW. DO NOT OVERTORQUE OR DAMAGE WILL RESULT TO PULLEY.

1. Using a 3/32 Allen wrench, LOOSEN set screw in bottom second stacker roller pulley.
2. Pull bottom pulley down to disengage first stacker drive belt. Remove pulley and belt.
3. Using a 3/32 Allen wrench, LOOSEN set screw in bottom fourth stacker roller pulley.
4. Pull bottom pulley down to disengage third stacker drive belt. Remove pulley and belt.
5. Using a 3/32 Allen wrench, LOOSEN set screw in bottom third stacker roller pulley. Remove pulley.

21. Replace bottom pulley of second stacker roller on shaft and push up until it engages with belt.
  22. Position second stacker roller pulley so that set screw is on flat side of shaft and belt is parallel to other drive belts. Carefully tighten set screw.
- g. Remove cards used to prop stacker in extended position.
  - h. Replace front and rear panels and top panel cover.

## 9.8 SOLENOID

- a. Using steps a. and b. of paragraph 9.3, remove front and rear panels, figures 9-1, and 9-2.

### NOTE

Hold lugs on board with long nose pliers while unsoldering or soldering leads in the following procedure. This will prevent the lugs from being disconnected from the land on the bottom side of the board.

- b. Unsolder two white leads from solenoid drive circuit board.
- c. Remove solenoid return spring from spring post and arm stud, figure 9-8.
- d. Using a 1/16 Allen wrench, LOOSEN two set screws in top solenoid coupling.
- e. Using a 9/64 Allen wrench, remove two screws ① holding solenoid mounting plate. Remove solenoid downward.

### NOTE

Viewing the bottom of the solenoid plate, note that the solenoid mounting holes are not in line with the mounting plate holes. To ensure that the solenoid is reinstalled correctly, make sure the wires are extending from the right side (viewed from the front of the reader) and that the forward-most solenoid mounting hole is on the right side.

- f. Using an 11/32 wrench, remove two mounting nuts ② .
- g. Using a 1/16 Allen wrench, LOOSEN two set screws retaining coupling on solenoid shaft. Remove coupling.

NOTE

Remove the set screws from the coupling. Apply LOCTITE GRADE C to the screws and replace. LOCTITE GRADE C should be applied to all operational and mounting type hardware, with the exception of panel screws.

- h. Place coupling on new solenoid shaft locating bottom coupling set screws on two flat sides of the shaft.
- i. Tighten bottom coupling set screws and replace solenoid on mounting plate making sure holes are in proper position, with wires extending from right side.
- j. Replace solenoid on mounting post, sliding top coupling onto picker shaft.
- k. Replace solenoid return spring between spring post and arm stud.
- l. Solder two white leads to solenoid drive circuit board, terminals 3 and 4.
- m. Preload solenoid coupling per paragraph 6.8, steps q., r., and s.

NOTE

If proper pick action does not result after preloading the solenoid, perform the Picker Sector Adjustment, paragraph 6.8.

- n. Replace front and rear panels.

### 9.9 VACUUM PUMP MOTOR ASSEMBLY BELT

- a. Remove front and rear panels. Refer to steps a. and b. of paragraph 9.3, figures 9-1 and 9-2.
- b. Remove four Phillips head screws ① at rear of subframe panel, figure 9-9.

- c. Remove five Phillips head screws ② on bottom, rear edge of card reader, holding subframe panel.

#### NOTE

Tag the wires to be removed in the following step. They must be replaced on the proper terminals.

- d. Remove two connectors from capacitor and one connector from relay to disconnect vacuum pump motor, figure 9-10.
- e. Loosen vacuum hose clamp on vacuum pump and remove hose from pump.
- f. Using a .050 Allen wrench, LOOSEN set screw in vacuum tube elbow and pull elbow downward, figure 9-11.
- g. LOOSEN vacuum adapter clamp screw at top of vacuum pump assembly and remove adapter from card reader with a slight upward pressure.
- h. Remove screw holding ground strap to subframe.

#### CAUTION

USE A  $\frac{1}{2}$  INCH OPEN-END WRENCH TO HOLD MOUNTING POSTS TO AVOID TWISTING OFF THE PUMP PLATE RUBBER SHOCK MOUNTS.

- i. Remove four Phillips head mounting screws holding vacuum pump motor assembly, figure 9-11.
- j. The vacuum pump assembly may now be removed from card reader.
- k. LOOSEN three hex vacuum pump mounting bolts ① figure 9-12.
- l. Replace vacuum pump belt.
- m. Using a spring scale, adjust vacuum pump for a belt tension of 4-6 ounces. This is about  $\frac{3}{64}$ " belt deflection.
- n. With appropriate belt tension applied, tighten three hex vacuum pump mounting bolts.
- o. Check pulleys to make sure they are in the same plane. Also check each pulley set screw to make sure it is secure.

- p. Reinstall vacuum pump assembly into card reader in reverse order of disassembly.
- q. Replace panels removed.

#### 9.10 MAGNETIC PICKUP

- a. Using step b. of paragraph 9.3, remove rear panel, figures 9-2 and 9-14.
- b. Using a 1/16 Allen wrench, LOOSEN set screw in magnetic pickup mounting block, figure 9-13.
- c. Remove magnetic pickup from mounting block.
- d. Remove two button head screws on each side of card cage cover, slide backward, and lift off, figure 9-9.
- e. Remove four button head screws holding rear panel of card cage and remove rear panel.
- f. Using a 9/64 Allen wrench, remove three socket head screws ① holding card cage in place. Move card cage to rear and remount using two rear screws, figures 9-14 and 9-15.
- g. Remove all cards from card cage using card extractor levers, figures 9-15.

#### NOTE

Tag magnetic pickup wires so that they can be identified with their proper position in the card cage connector, figure 9-15.

- h. Using AMP tool 465195-2, remove two magnetic pickup wires and shield from card cage connectors.
- i. Replace wires from new magnetic pickup unit into their proper positions in card cage connector, figure 10-3.
- j. Insert the pickup unit into mounting block, figure 9-13.
- k. Refer to paragraph 6.3 for adjustment of magnetic pickup.
- l. Reassemble reader in reverse order of disassembly.

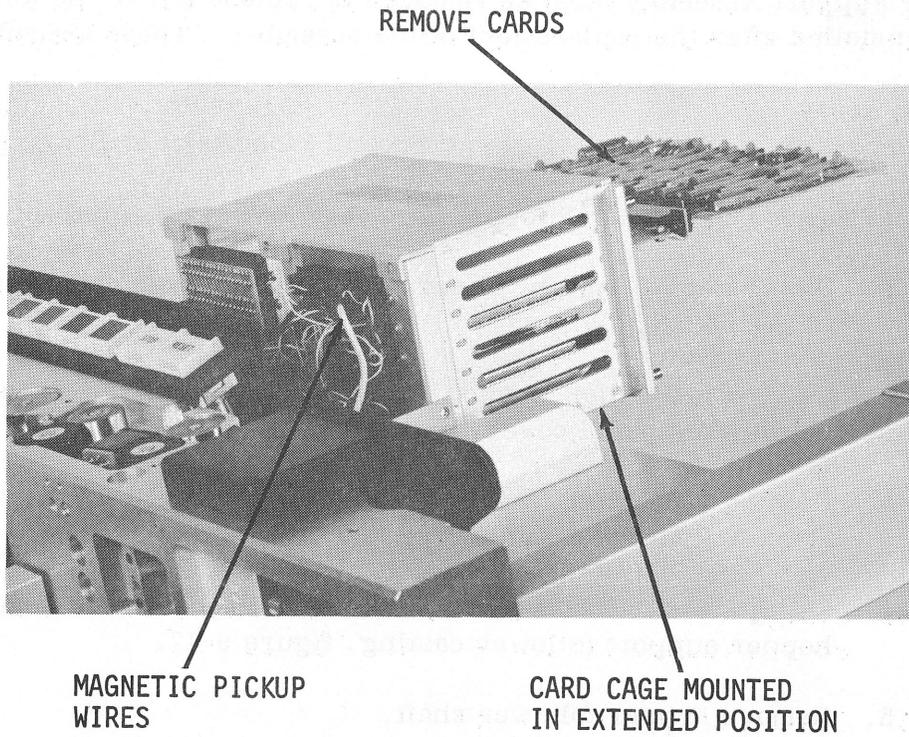


Figure 9-15. Card Cage in Extended Position

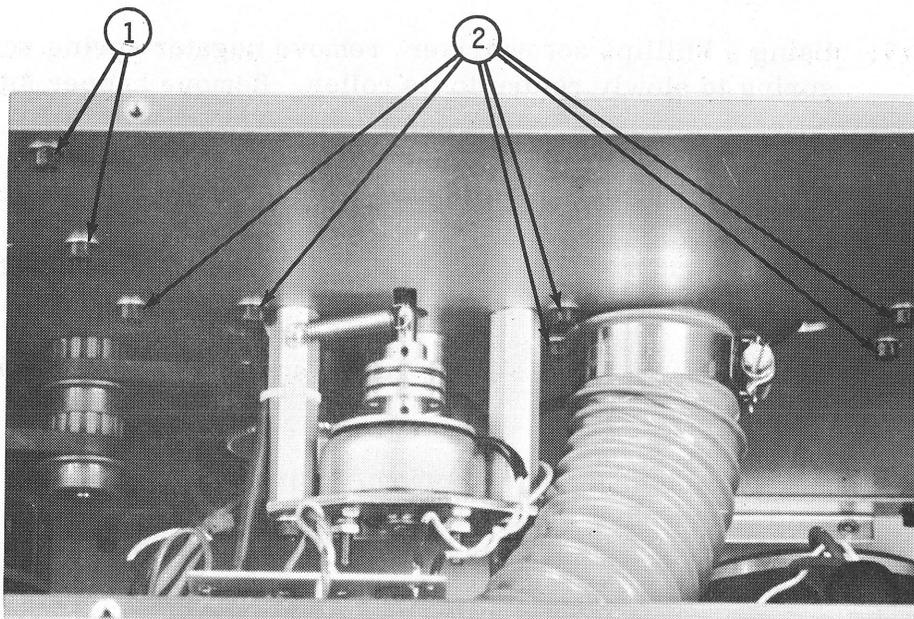


Figure 9-16. Picker Casting Removal

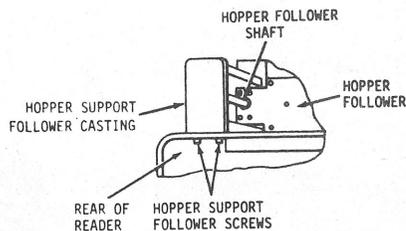
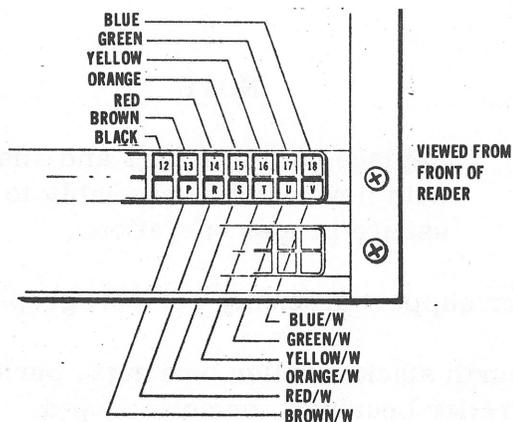


Figure 9-17. Hopper Follower Assembly Removal

14. Using a 9/64 Allen wrench, remove six socket head screws ② holding picker casting.
  15. Remove plastic tie-down holding light station cable on solenoid mounting post.
  16. Remove plastic tie-down holding hopper empty switch cable, figure 9-19.
  17. Lift picker casting straight up and lay on chassis, figure 9-18.
- b. To replace the Picker Support Assembly proceed as follows:
1. Set picker casting in place, figure 9-19.
  2. Using LOCTITE GRADE C, set all six socket head screws ②, figure 9-16, BUT DO NOT TIGHTEN.
  3. Adjust position of picker casting per paragraph 6.10.
  4. The remainder of the reader may now be assembled in reverse order of disassembly.
  5. Readjust the picker sector per paragraph 6.8.

## 9.12 READ HEAD

- a. Remove picker support assembly per paragraph 9.11 a.
- b. Remove two button head screws each side of card cage cover and remove main card cage cover sliding back slightly and lifting upward, figure 9-9.
- c. Remove four button head screws and remove rear card cage panel.
- d. Using a 9/64 Allen wrench, remove three socket head screws ① holding card cage in place. Move card cage to rear and remount using two rear screws. figures 9-14 and 9-15.
- e. Remove all cards from card cage using extractor levers, figure 9-15.
- f. Using AMP tool 465195-2, remove read head wires from connector per the following diagram.



- g. Remove two flat head Phillips screws ① to remove read head, figure 9-18.
- h. Replace read head and connectors in card cage making sure wires are installed in proper color coded positions.
- i. Replace picker support assembly per paragraph 9.11 b.

5. Using a 1/16 Allen wrench to LOOSEN set screw in bottom roller of fourth stacker roller assembly, figure 9-7.
6. Lift fourth stacker shaft from stacker casting. Observe that there is a spacer washer between the top roller and the bearing seat. Remove top roller from shaft.
7. To remove top bearing, use L-shaped tool to lift bearing from casting.
8. To remove bottom bearing, slide out bottom roller and spacer. Use a straight tool to tap edge of bearing from inside shaft hole to drop bearing from casting.
9. Replace bearing, place spacer washer on top bearing and slide bottom spacer and roller under shaft hole.
10. Replace top roller on new shaft, flush with (or SLIGHTLY below) shaft end.
11. Place main drive motor belt around hole for fourth stacker roller shaft. Replace roller shaft in hole. Select feeler gauge (5 to 25 mils) to force roller against bearing.
12. Insert feeler gauge between top plate and bottom roller. Apply firm finger pressure on top roller and tighten set screw in bottom roller.
13. Check for vertical play in fourth stacker shaft. If there is vertical play, LOOSEN set screw in bottom roller and repeat substep 12 to eliminate play.
14. Place main drive motor belt on motor pulley, on fifth stacker roller pulley, and around fourth stacker roller shaft. Hold drive belt in this position.
15. Replace top pulley of fourth stacker roller on shaft and push pulley upward until it is engaged with main drive motor belt, figures 9-5 and 9-6.
16. Adjust drive motor belt and top pulley, if necessary, so that drive belt is completely engaged with motor pulley, and fourth and fifth stacker roller pulleys.

3. Pull pulley downward to disengage it from main drive motor belt. Remove pulley.
4. Use a 1/16 Allen wrench to LOOSEN set screw in bottom roller of fifth stacker roller assembly, figure 9-7.
5. Lift fifth stacker shaft from stacker casting. Observe that there is a spacer washer between top roller and bearing seat. Remove top roller from shaft.
6. To remove top bearing, use L-shaped tool to lift bearing from casting.
7. To remove bottom bearing, slide out bottom roller and spacer. Use a straight tool to tap edge of bearing from inside shaft hole to drop bearing from casting.
8. Replace bearings. Place spacer washer on top bearing and slide bottom spacer and roller under shaft hole.
9. Replace top roller on new shaft, flush with (or SLIGHTLY below) shaft end.
10. Place main drive motor belt around hole for fifth stacker roller shaft. Replace roller shaft in hole. Select feeler gauge (5 to 25 mils) to force roller against bearing.
11. Insert feeler gauge between top plate and bottom roller. Apply firm finger pressure on top roller and tighten set screw in bottom roller.
12. Check for vertical play in first stacker shaft. If there is vertical play, LOOSEN set screw in bottom roller and repeat substep 11 to eliminate play.
13. Place main drive motor belt on motor pulley, on fourth stacker roller pulley, and around fifth stacker roller shaft. Hold drive belt in this position.
14. Replace fifth stacker roller pulley on shaft and push pulley upward until it is engaged with main drive motor belt, figures 9-5 and 9-6.
15. Adjust drive motor belt and pulley, if necessary, so that drive belt is completely engaged with motor pulley, and fourth and fifth stacker roller pulleys.

6. Apply firm finger pressure on top and bottom rollers and tighten set screw in bottom roller.
  7. Check for vertical play in first picker shaft. If there is play, LOOSEN set screw in bottom roller and repeat substep 6 to eliminate play.
- d. To replace either of the second picker roller bearings, perform the following substeps.
1. Using a 1/16 Allen wrench, LOOSEN set screw in roller. Remove shaft and retaining ring, roller, and spacer.
  2. To remove bearing use a slender straight or L-shaped tool to either push or pull bearing from picker assembly.
  3. Replace bearing, shaft and retaining ring, spacer, and roller.
  4. Apply firm finger pressure to retained ring and roller, and tighten set screw in roller.
- e. Install picker support assembly per paragraph 9.11.b.

#### **9.16 PICKER SECTOR**

- a. Using a 5/64 Allen wrench, remove four button head screws ③ holding top panel cover, figure 9-1.
- b. Perform steps a. and c. through f. of paragraph 9.8. Prop open input hopper follower by taping together 3/4 inch of cards and placing in hopper at right angles.
- c. Using a #2 retaining ring remover tool, remove the retaining ring from the top of the picker shaft, figure 9-19.
- d. Remove spacers located under the retaining ring, figure 9-19.

#### **CAUTION**

**ALL OF THE SPACERS MUST BE  
REPLACED IN REASSEMBLY.**

- e. Using a 5/64 Allen wrench, LOOSEN two set screws holding picker sector.
- f. Remove picker shaft from bottom of chassis.

## 9.17 STACKER PHOTOCCELL

- a. Using a 5/64 Allen wrench, remove four button head screws ③ holding top panel cover, figure 9-1.
- b. Remove two button head screws each side of card cage cover, slide backward about 2" and lift off, figure 9-9.
- c. Remove four button head screws from rear card cage panel and remove panel.
- d. Using a 5/64 Allen wrench, remove six 6 x 32 button head screws holding rear panel, move rear panel out slightly, disconnect fan motor connector, and remove rear panel, figures 9-2 and 9-14.
- e. Using a 9/64 Allen wrench, remove three socket head screws 8 holding card cage in place. Move card cage to rear and remount using two rear screws, figures 9-14 and 9-15.
- f. Remove all cards from card cage using extractor levers, figure 9-15.
- g. Using a 1/16 Allen wrench, LOOSEN set screw in top fourth stacker roller figure 9-7. Remove stacker roller and preload washer.
- h. Using a 1/16 Allen screwdriver, LOOSEN set screw in stacker casting holding stacker photocell.
- i. Tag black and white wires from photocell. Using AMP tool 465195-2, remove connectors from card cage.
- j. Remove photocell from rear of stacker casting, figure 9-21.
- k. Replace photocell, align flush with stacker casting faceplate, and tighten photocell set screw.

### CAUTION

- MAKE SURE PHOTOCCELL DOES NOT EXTEND BEYOND SURFACE OF CASTING OR DAMAGE MAY RESULT TO PHOTOCCELL OR CARDS.

- l. Replace connectors in card cage.
- m. Replace stacker roller making sure there is no vertical play in stacker roller shaft. Refer to paragraph 6.5 for preloading bearings.
- n. Reassemble in reverse order of disassembly.

- c. Using a 9/64 Allen wrench, remove two socket head screws ① holding front stacker shaft support, figure 9-22.
- d. LOOSEN set screw in rear stacker shaft support, figure 9-23.
- e. Remove stacker shaft, figure 9-22.
- f. Move stacker follower sufficiently beyond front edge of chassis to reveal negator spring screw.
- g. Hold spring, remove screw, and pull spring from roller.
- h. Reroll new spring onto roller and replace spring screw.
- i. Reassemble in reverse order of disassembly.

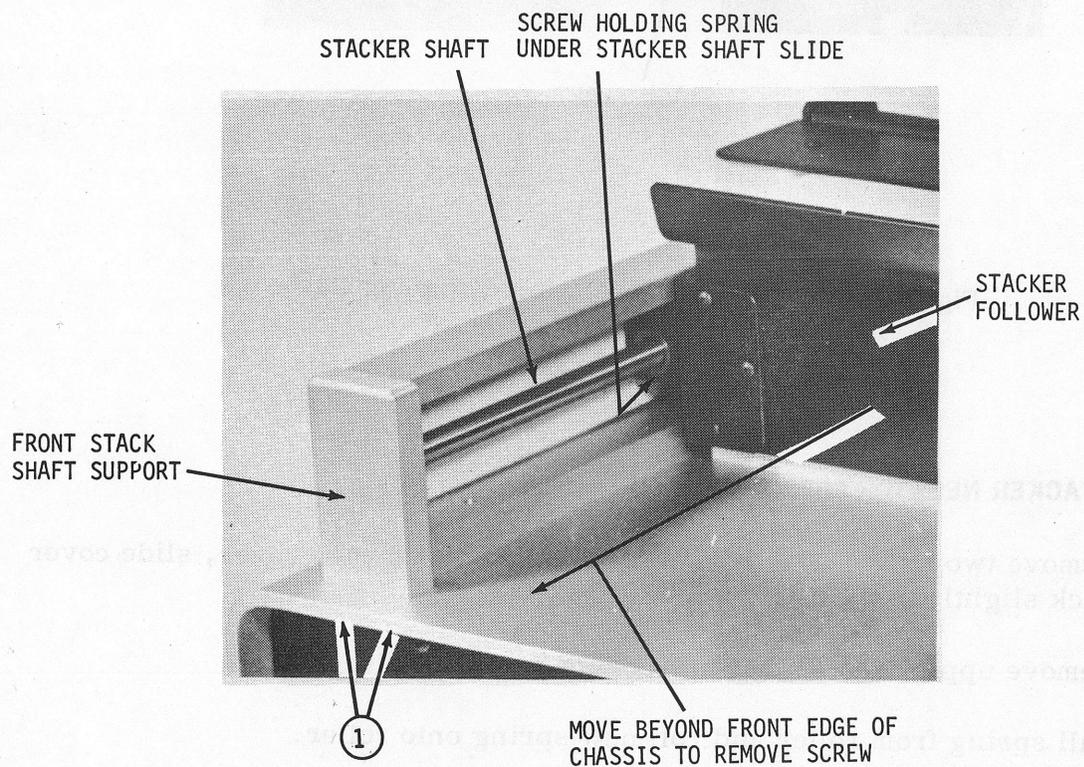


Figure 9-22. Stacker Negator Spring Replacement

### 9.21 HOPPER EMPTY SWITCH

- a. Using a 5/64 Allen wrench, remove four button head screws ③ , figure 9-1, holding top panel cover.
- b. Using a 3/32 Allen wrench, remove two socket head screws holding rifle cap.
- c. Remove two connectors from hopper empty switch, figure 9-19.
- d. Using a 1/16 Allen wrench, remove two button head screws holding switch.
- e. Replace switch and adjust per paragraph 6.6.
- f. Reassemble in reverse order of disassembly.

### 9.22 STACKER FULL SWITCH

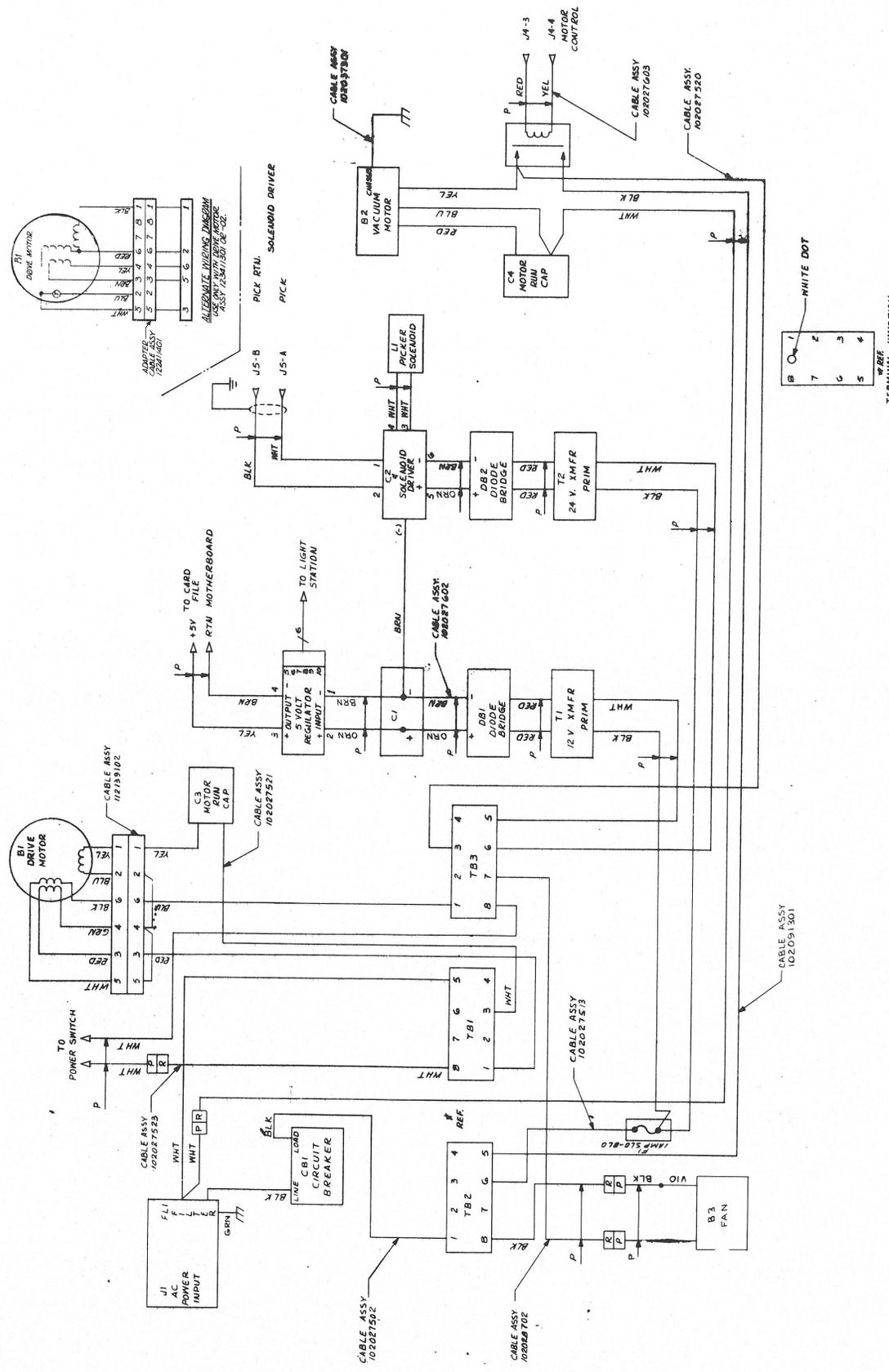
- a. Remove two button head screws on each side of card cage cover, slide cover back slightly and lift off.
- b. Remove two Phillips head screws holding stacker full switch, figure 9-23.
- c. Unsolder leads from switch, and solder to new switch.
- d. Mount switch and adjust per paragraph 6.7.
- e. Replace card cage cover.

### 9.23 INDICATOR LAMPS

- a. Grasp indicator lens with thumb and forefinger and pull upward with a rocking motion to remove lens.
- b. Pull lamp from lens.
- c. Insert new lamp into lens.
- d. Press lens firmly into switch.

**SECTION 10**  
**DRAWINGS**





WHT  
 1  
 2  
 3  
 4  
 5  
 6  
 7  
 8

Figure 10-1A. Wiring Diagram, AC Power Distribution, 230 VAC, 50 Hz  
 (Dwg. No. 1041603)

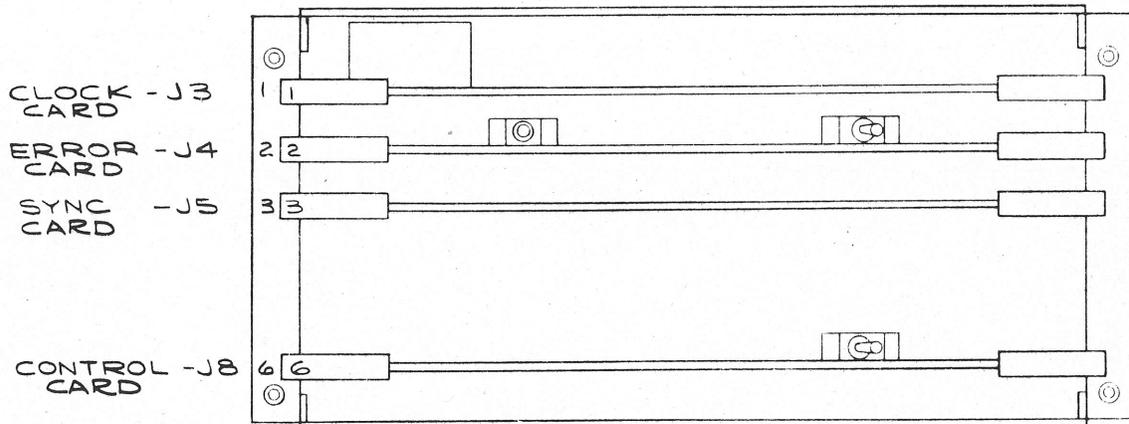
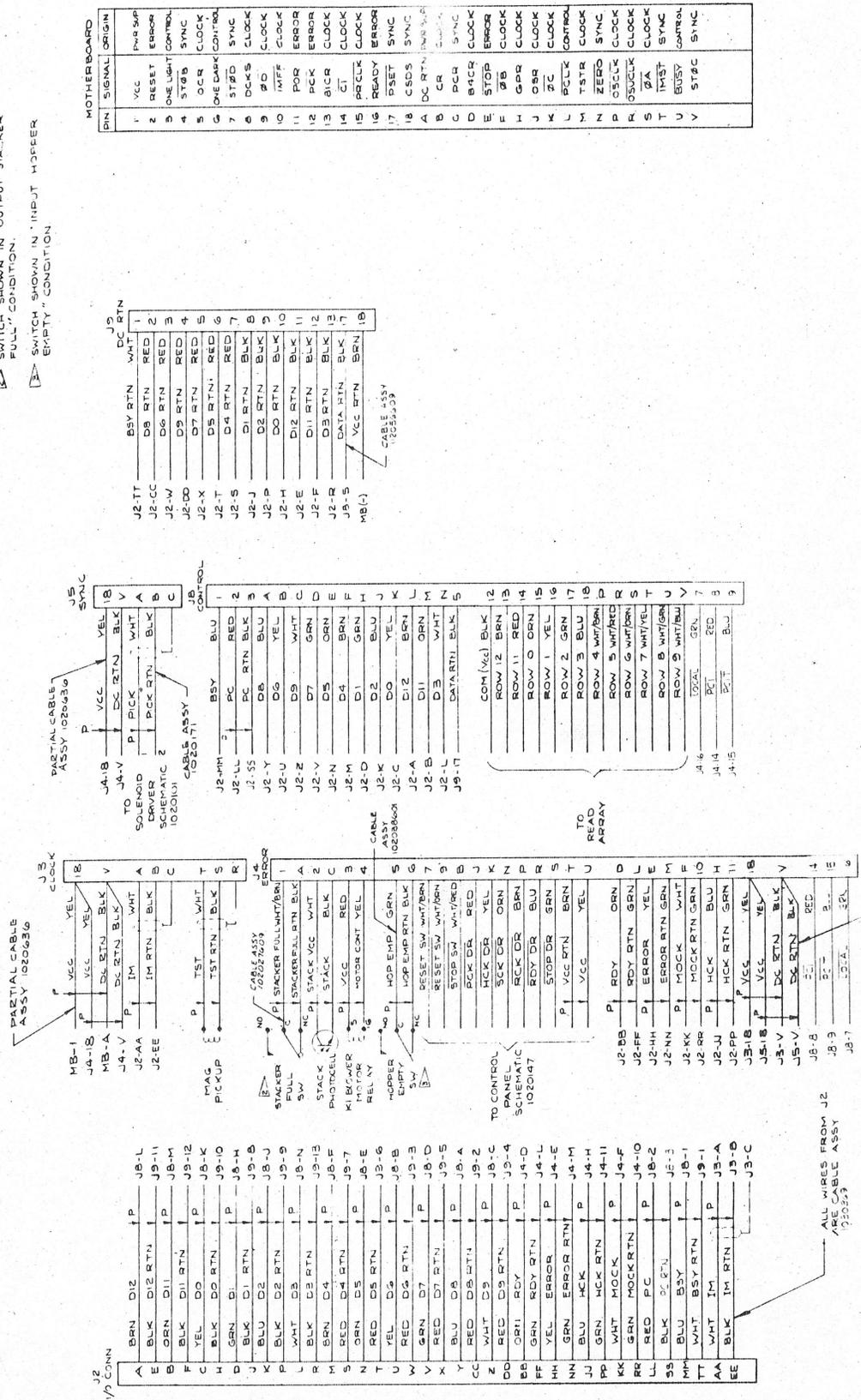


Figure 10-2. Card Cage, P.C. Card Location

NOTES:  
 [Symbol] SWITCH SHOWN IN "OUTPUT STACKER FULL" CONDITION.  
 [Symbol] SWITCH SHOWN IN "INPUT WADDER EMPTY" CONDITION.



TO J8  
CONTROL  
CARD  
(FIG. 10-3)

TO POWER  
SUPPLY

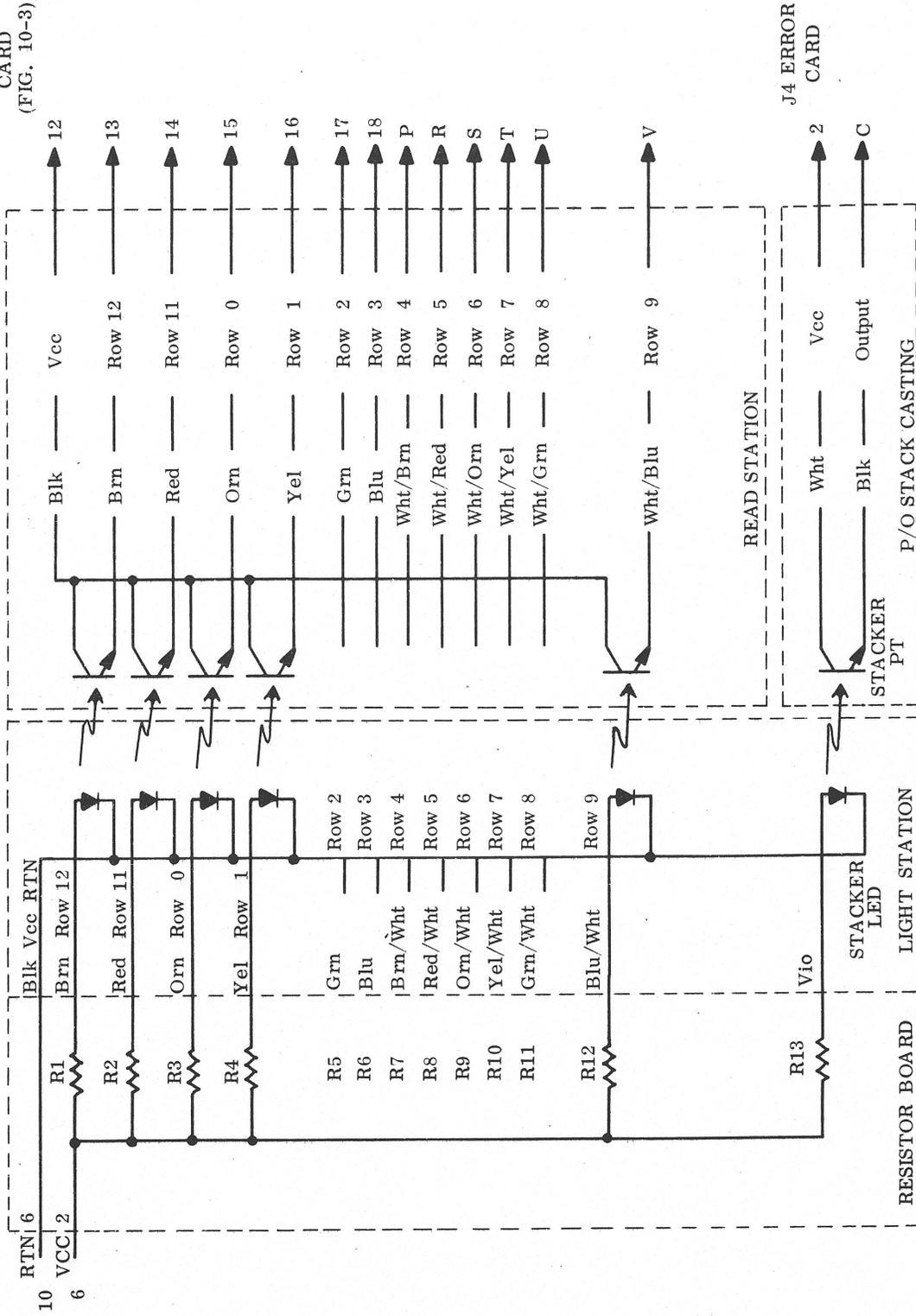


Figure 10-3A. Wiring Diagram, Read/Light Station

See AC Wiring Diagram

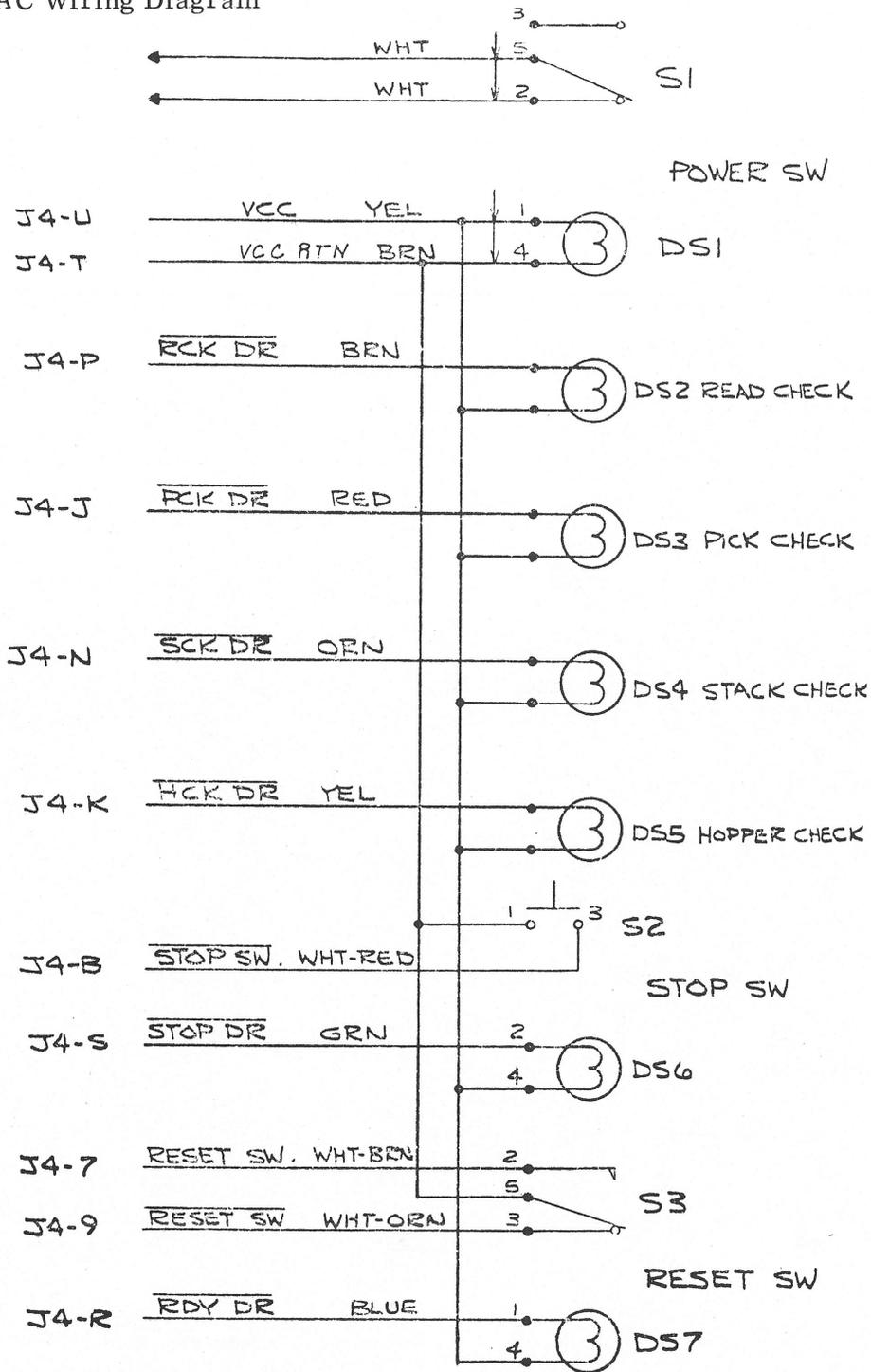


Figure 10-4. Wiring Diagram, Control Panel  
(Dwg. No. 1020147)

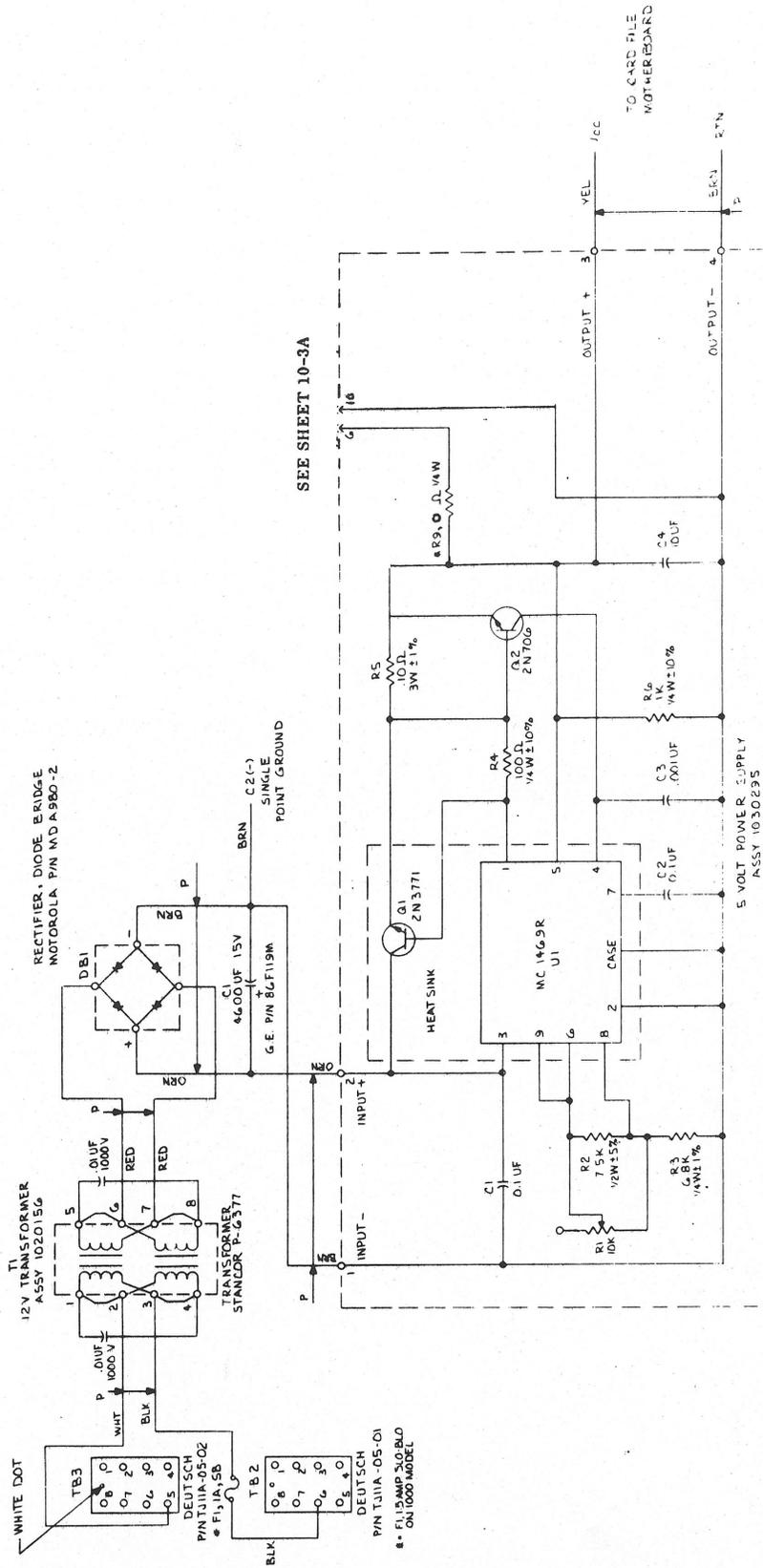


Figure 10-5. Schematic Diagram, 5V Power Supply, 115 VAC, 60 Hz (Dwg. No. 1040506)



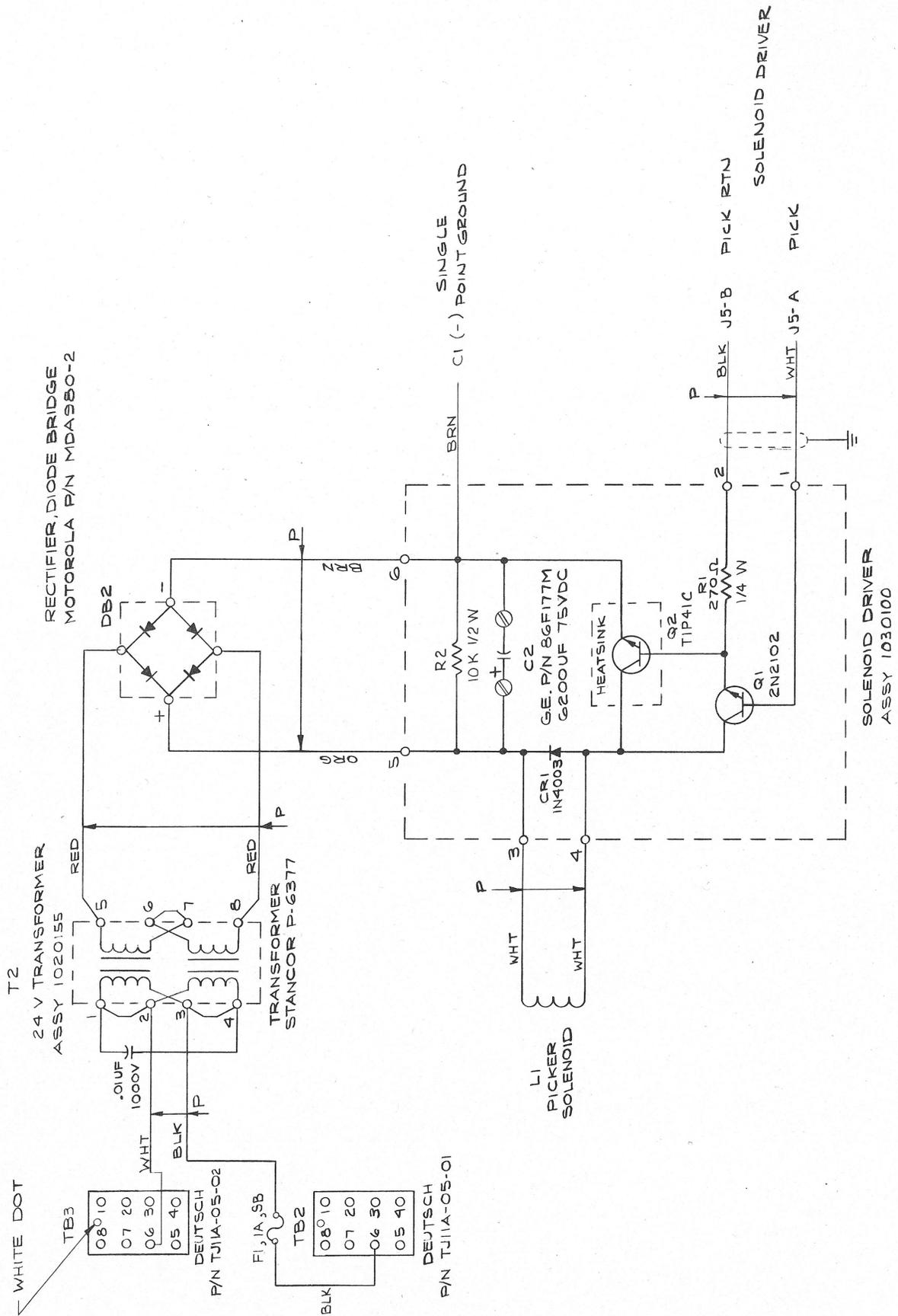


Figure 10-6. Schematic Diagram, Solenoid Driver, 115 VAC, 60 Hz (Dwg. No. 1040505)



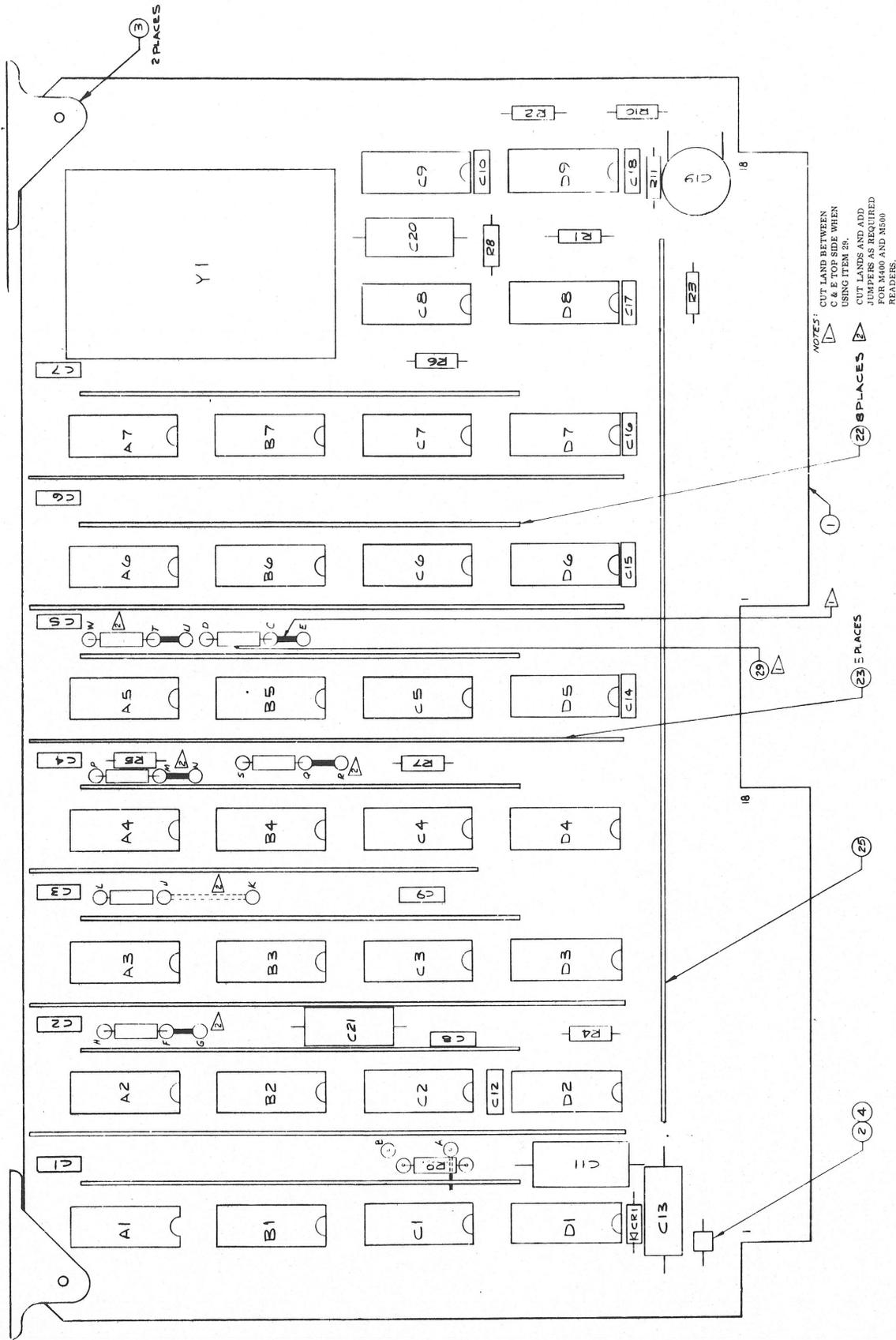


Figure 10-7. Assembly Diagram, Clock Card (Dwg. No. 1040765)



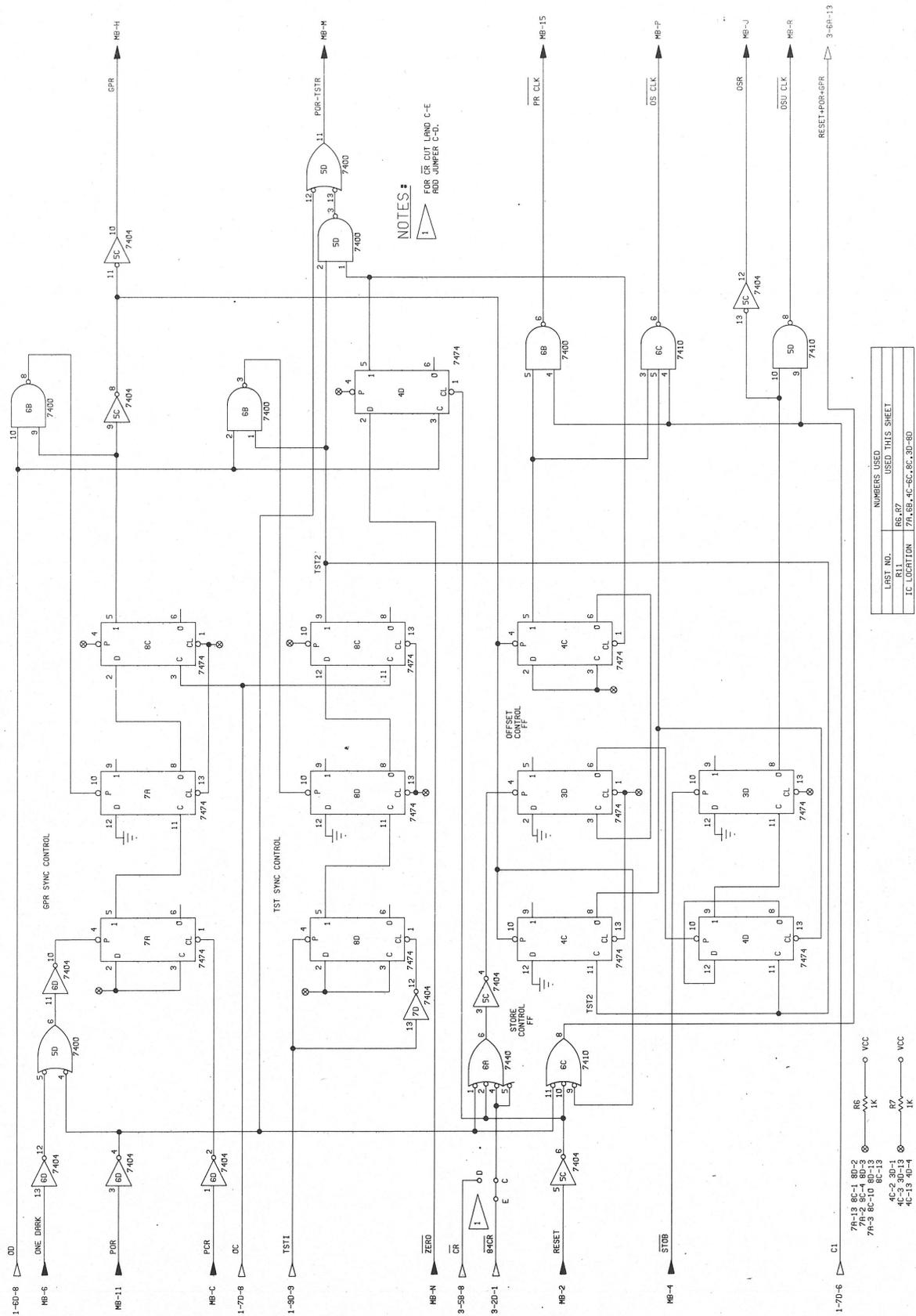


Figure 10-9. Schematic Diagram, Clock Card (Sh. 2 of 3)

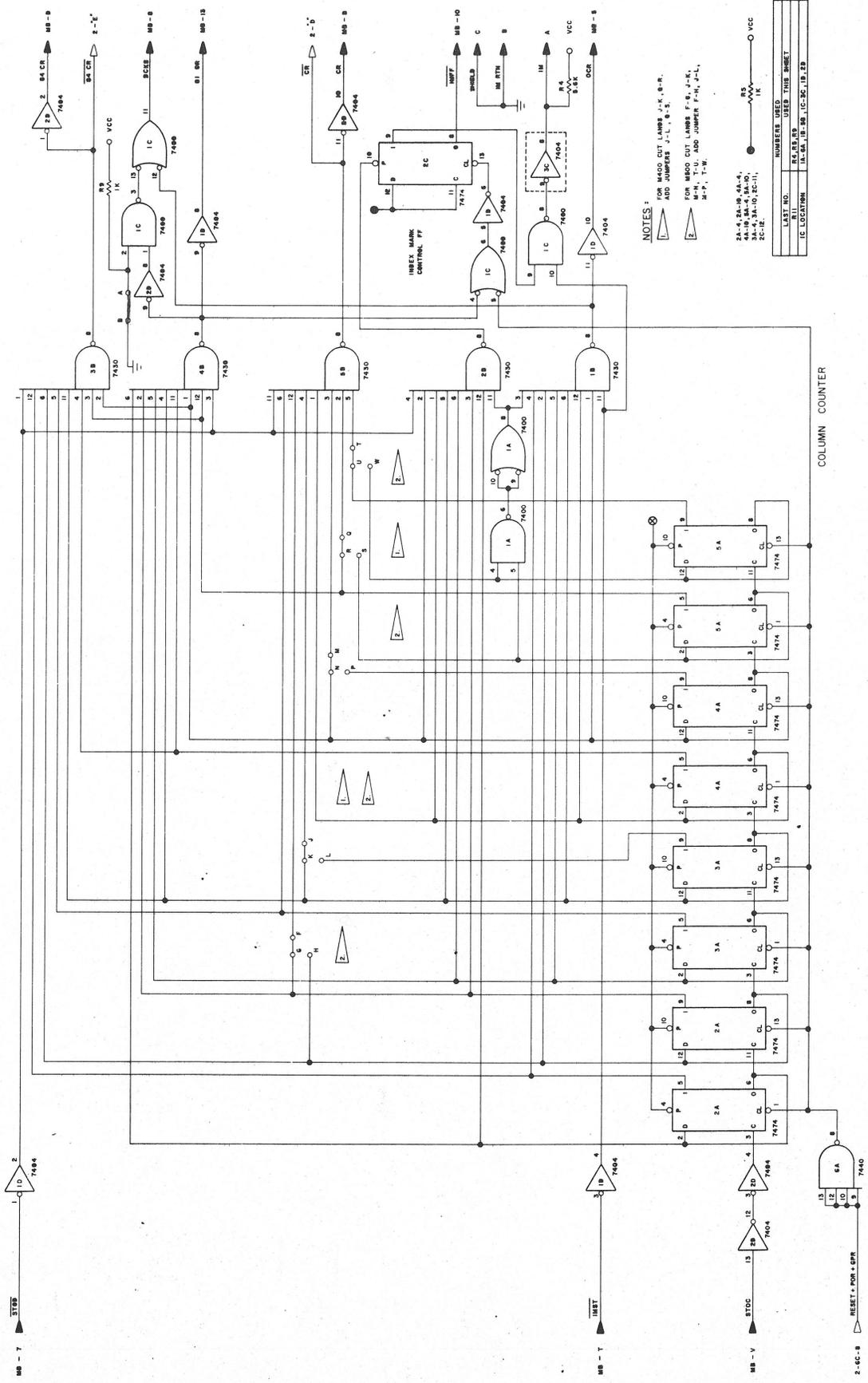


Figure 10-10. Schematic Diagram, Clock Card (Sh. 3 of 3)

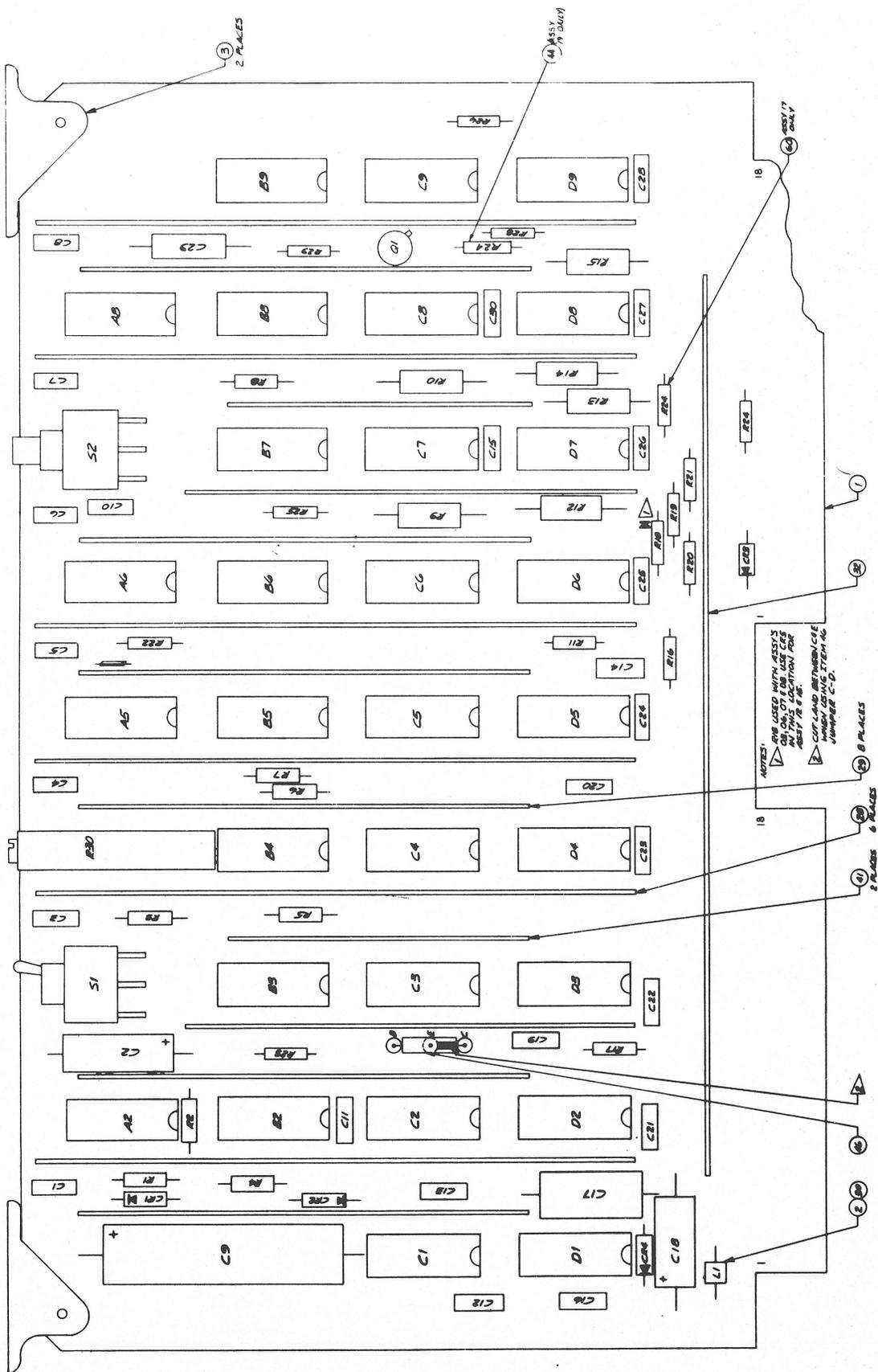


Figure 10-11. Assembly Diagram, Error Card (Dwg. No. 1040610)



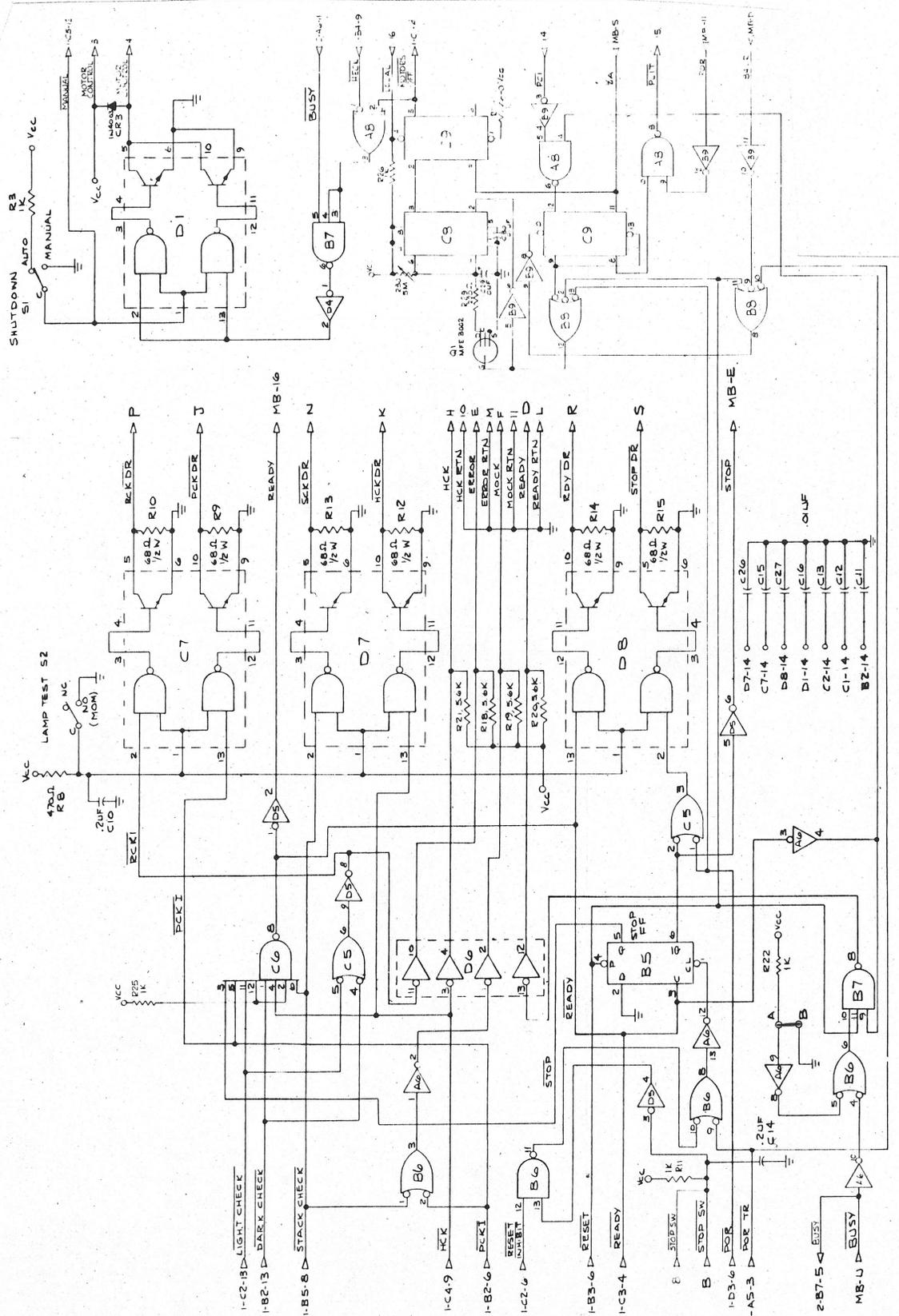


Figure 10-13. Schematic Diagram, Error Card (Sh. 2 of 2)

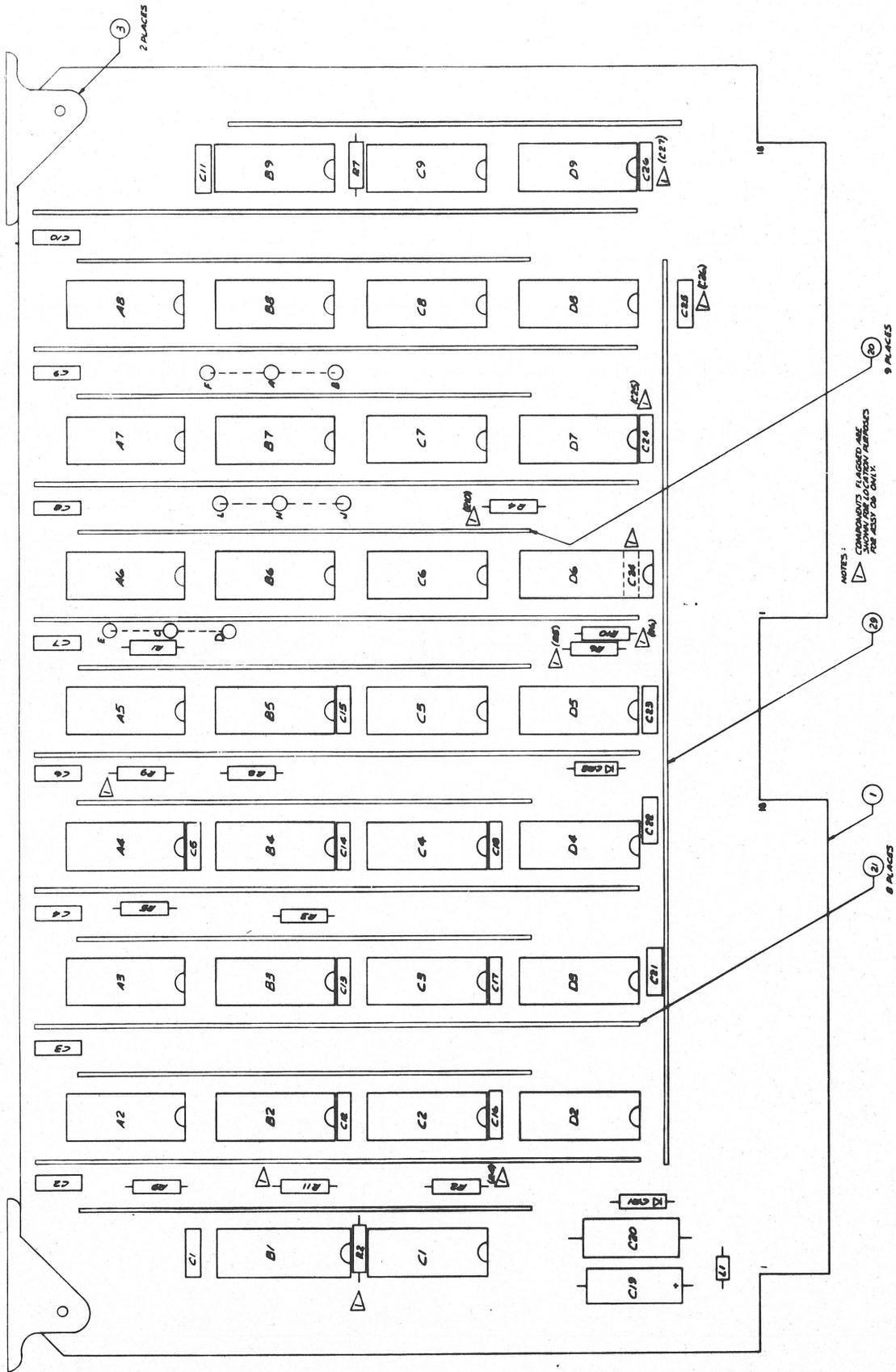


Figure 10-14. Assembly Diagram, Sync Card  
 (Dwg. No. 1040353)

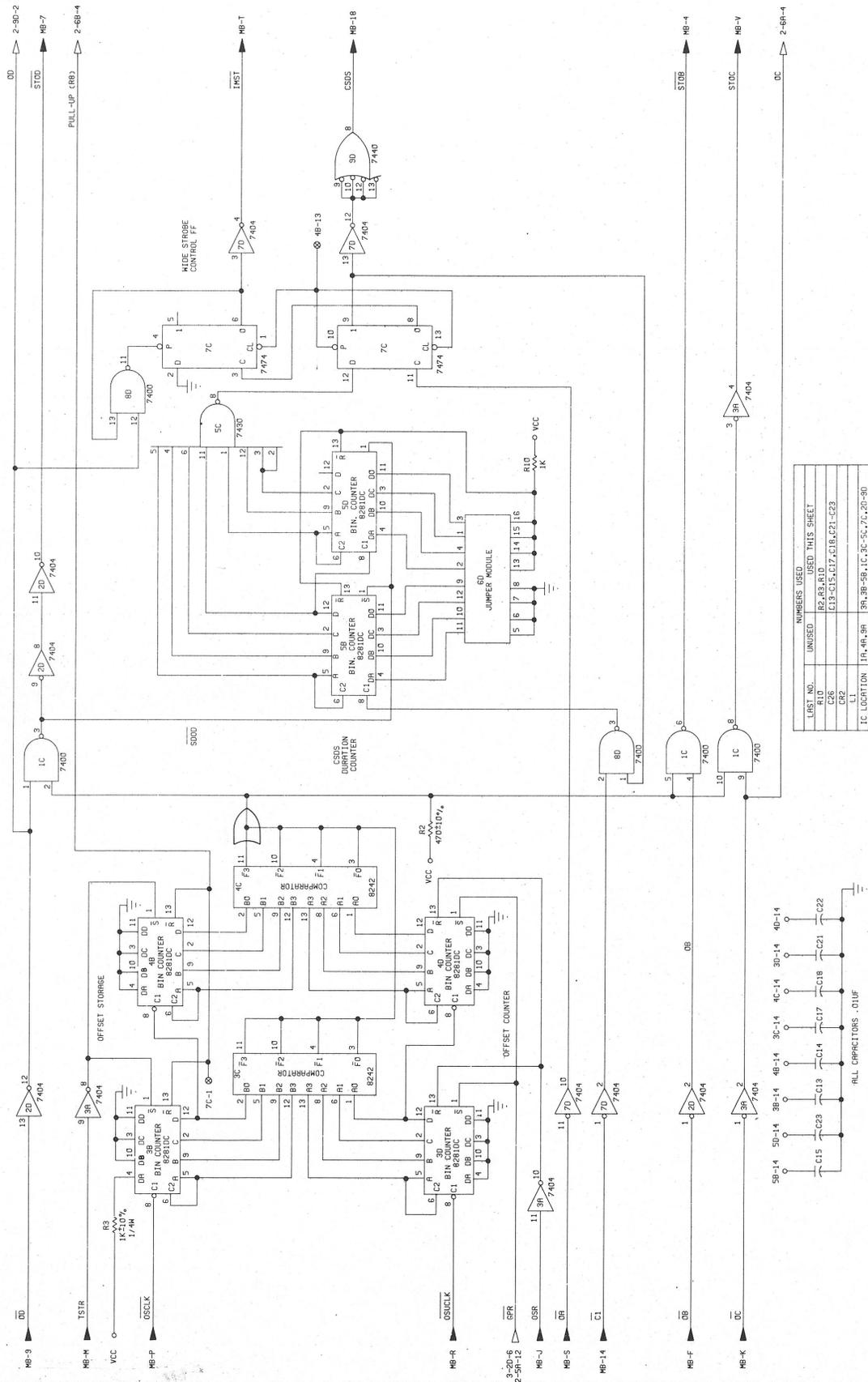


Figure 10-15. Schematic Diagram, Sync Card (Sh. 1 of 3)  
(Dwg. No. 1640943)

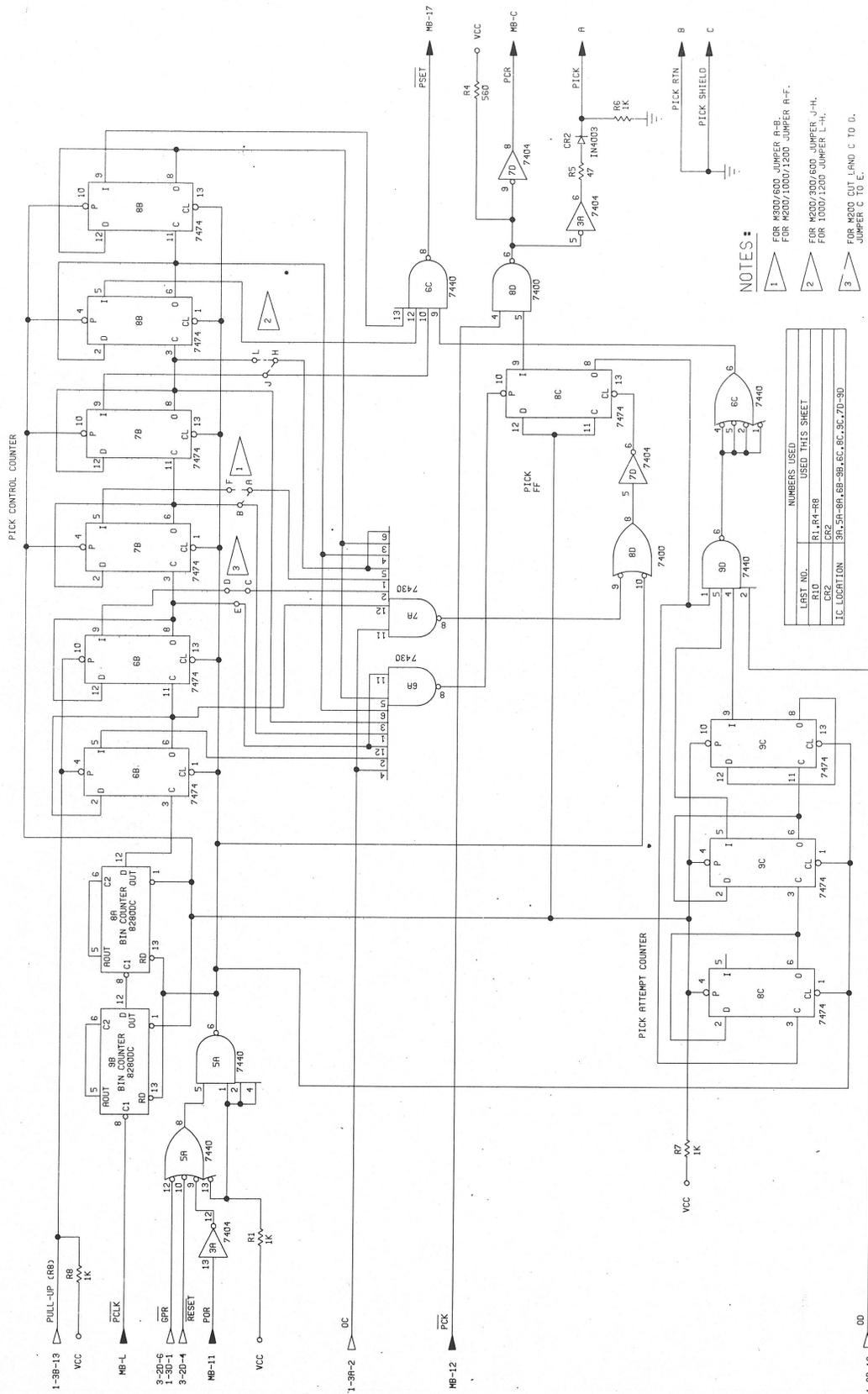
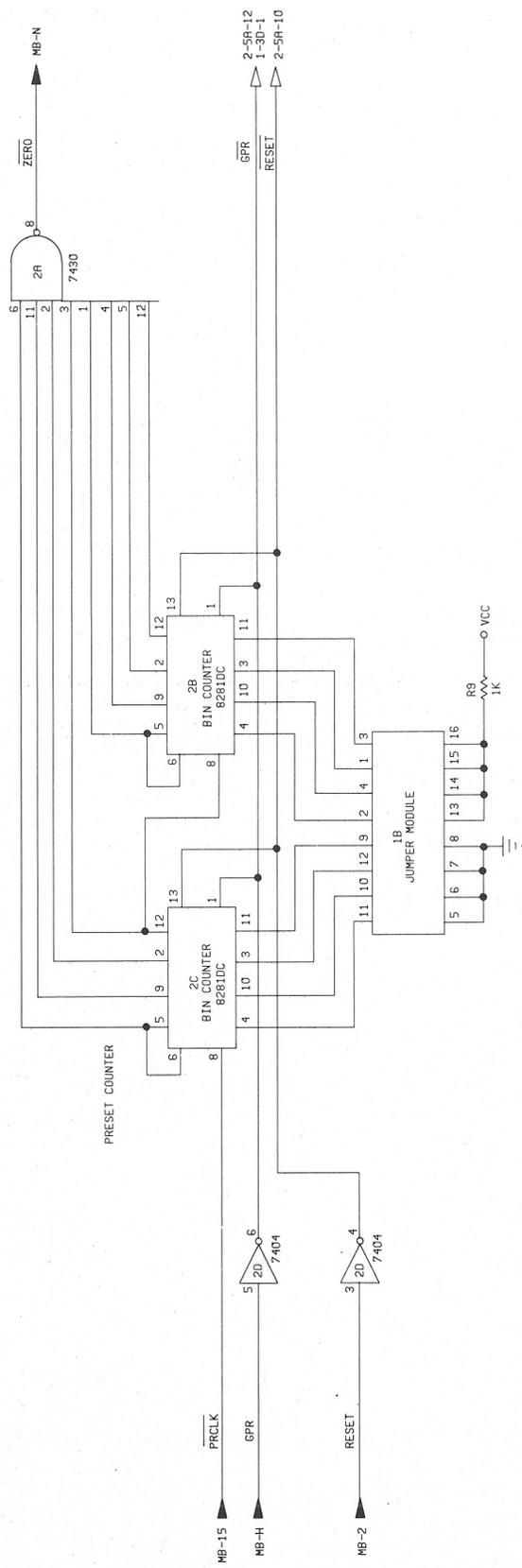
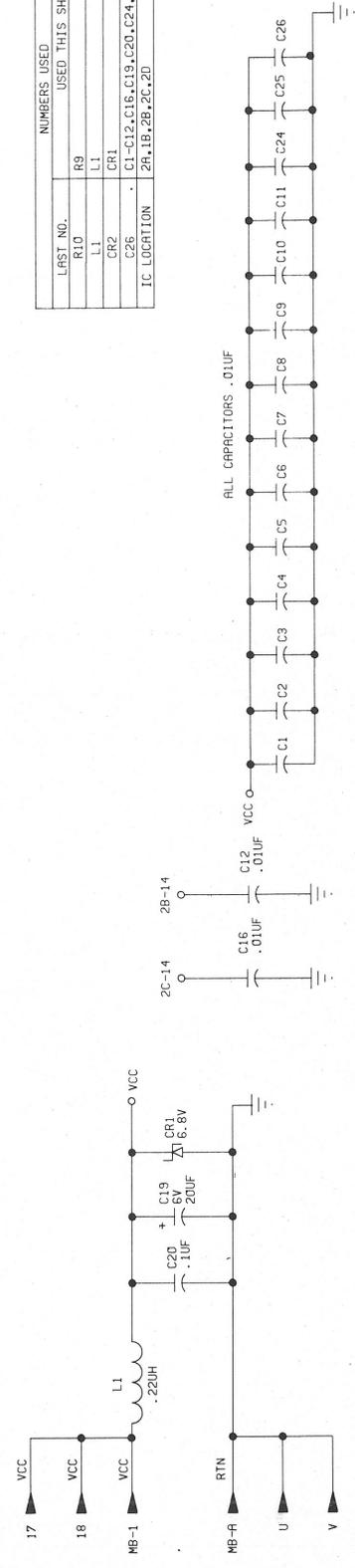


Figure 10-16. Schematic Diagram, Sync Card (Sh. 2 of 3)

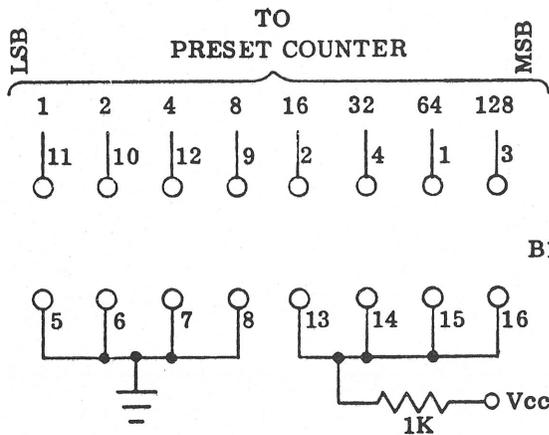


LAST NO.	NUMBERS USED
R10	R9
L1	L1
CR2	CR1
C26	C1-C12, C16, C19, C20, C24, C25, C26
IC LOCATION	2A, 1B, 2B, 2C, 2D



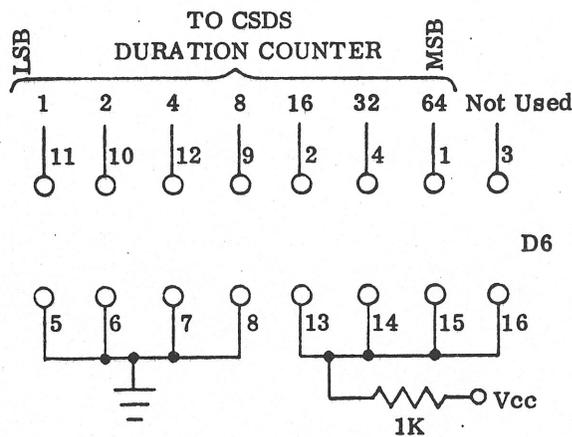
ALL CAPACITORS .01UF

Figure 10-17. Schematic Diagram, Sync Card (Sh. 3 of 3)



M-SERIES  
PRESET TIMING REQUIREMENTS

Model	Count	Time in $\mu\text{sec}$
M 200	176	1466.0
M 200 (310 CPM)	164	1366.6
M 300/600	75	625.0
M 1000	43	358.3
M 1200	35	291.7



CSDS TIMING REQUIREMENTS

Model	Count	Time in $\mu\text{sec}$
M 200	72	600.0
M 200 (310 CPM)	72	600.0
M 300/600	31	258.3
M 1000	18	150.0
M 1200	15	125.0

To program the counters, so that they are loaded with the complement of the required count, proceed as follows:

- a. Let ground represent logic "1", and strap pins 5, 6, 7 and/or 8 to create the required count.
- b. Strap all other pins to Vcc, at pins 13, 14, 15 and/or 16.

Figure 10-17A. Preset and CSDS Counter Strapping





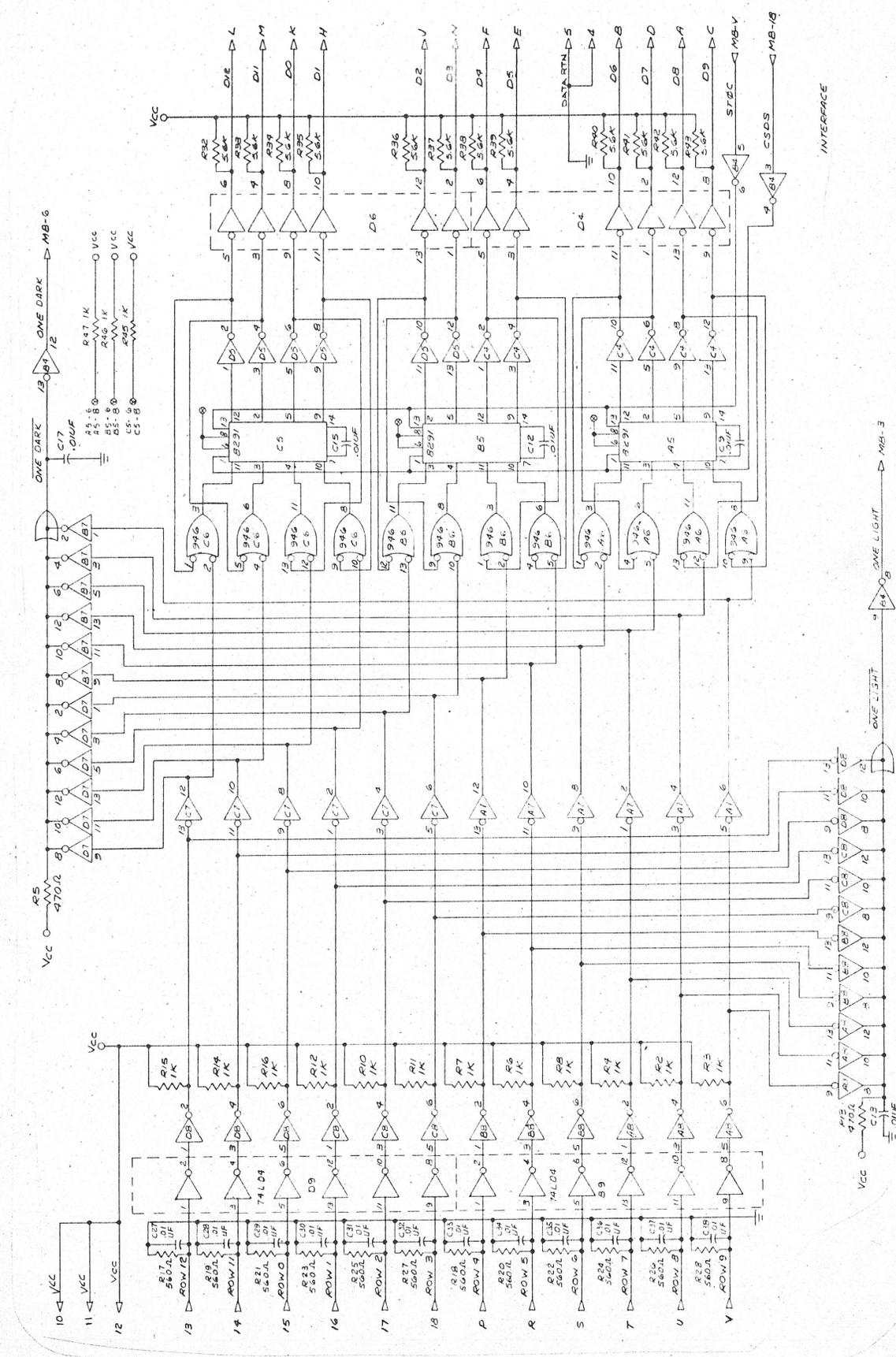


Figure 10-20. Schematic Diagram, Control Card (Sh. 2 of 2)

## SECTION 11

### SIGNAL MNEMONICS AND ABBREVIATIONS

MNEMONIC	DESCRIPTION	LOCATION	ORIGINATING SOURCE
Vcc	+5 volts	MB-1	5 volt power supply (Mother Board)
RTN	+5 volt return	MB-A	5 volt power supply (Mother Board)
ØA	Clock Phase A	MB-S	Clock Card
ØB	Clock Phase B	MB-F	Clock Card
ØC	Clock Phase C	MB-K	Clock Card
ØD	Clock Phase D	MB-9	Clock Card
81CR	81st Column Reset	MB-13	Clock Card
84CR	84th Column Reset	MB-D	Clock Card
BUSY	Busy Output	J8-1	Control Card
BUSY	Busy Signal	MB-U	Control Card
C1	Basic Clock	MB-14	Clock Card
CR	Column Reset	MB-B	Clock Card
CSDS	Column Storage Data Strobe	MB-18	Sync Card
D0	Data Row 0 Output	J8-K	Control Card
D1	Data Row 1 Output	J8-H	Control Card
D2	Data Row 2 Output	J8-J	Control Card
D3	Data Row 3 Output	J8-N	Control Card
D4	Data Row 4 Output	J8-F	Control Card
D5	Data Row 5 Output	J8-E	Control Card
D6	Data Row 6 Output	J8-B	Control Card
D7	Data Row 7 Output	J8-D	Control Card
D8	Data Row 8 Output	J8-A	Control Card
D9	Data Row 9 Output	J8-C	Control Card
D11	Data Row 11 Output	J8-M	Control Card
D12	Data Row 12 Output	J8-L	Control Card
DCKS	Dark Check Strobes	MB-8	Clock Card
DARK CHECK	Dark Check	B2-9	Error Card
ERROR	Error Output	J4-E	Error Card
ERROR RTN	Error Output Return	J4-M	Error Card
GPR	Good Pick Reset	MB-H	Clock Card
HCK	Hopper Check Output	J4-H	Error Card
HCK	Input or Output Hopper Check	C4-9	Error Card
HCK DR	Hopper Check Lamp Driver	J4-K	Error Card
HCK RTN	Hopper Check Output Return	J4-10	Error Card
HECK	Hopper Empty Check	B4-8	Error Card

MNEMONIC	DESCRIPTION	LOCATION	ORIGINATING SOURCE
Row 6	Read Sensor Input Row 6	J8-S	Control Card
Row 7	Read Sensor Input Row 7	J8-T	Control Card
Row 8	Read Sensor Input Row 8	J8-U	Control Card
Row 9	Read Sensor Input Row 9	J8-V	Control Card
Row 11	Read Sensor Input Row 11	J8-14	Control Card
Row 12	Read Sensor Input Row 12	J8-13	Control Card
RTN	Data Drivers Return	J8-5	Control Card
SCK DR	Stack Check Lamp Driver	J4-N	Error Card
SHIELD	Shield for Index Marks	J3-C	Clock Card
SHIELD	Shield for PICK	J5-C	Sync Card
SHIELD	Shield for Timing Strobe	J3-R	Reluctance Pickup
SHUTDOWN STATUS	Mode Switch Input	S1-C	Error Card
STACK	Stack Sensor Input	J4-C	Error Card
STACK CHECK	Output Stacker Check	B5-8	Error Card
STACK Vcc	Stack Sensor +5 volts	J4-2	Error Card
ST $\phi$ B	Column Strobe Phase B	MB-4	Sync Card
ST $\phi$ C	Column Strobe Phase C	MB-V	Sync Card
ST $\phi$ D	Column Strobe Phase D	MB-7	Sync Card
STOP	Stop	MB-E	Error Card
STOP DR	Stop Lamp Driver	J4-S	Error Card
STOP SW	Stop Switch Input	J4-B	Error Card
TST	Timing Strobe	J3-T	Reluctance Pickup
TST RTN	Timing Strobe Return	J3-S	Reluctance Pickup
TST1	Timing Strobe One	D9-9	Clock Card
TST2	Timing Strobe Two	C8-9	Clock Card
TSTR + POR	Timing Strobe Reset	MB-M	Clock Card
Vcc	+5V to Read Sensor Array	J8-12	Control Card
ZERO	Preset Decode	MB-N	Sync Card

**SECTION 12**  
**ILLUSTRATED PARTS BREAKDOWN**  
**(RECOMMENDED SPARES ONLY)**

M300/600/1000

The figures contained herein call out only the recommended spares and show their location in the specified reader. The numbered callouts for each figure are listed together with the corresponding eight-digit part number and item description. For all other parts not in the recommended spares list, contact Spares Department.

NOTE

When ordering any part, spared item or otherwise, be sure to include the model and serial number (or numbers) of the reader (or readers) for which the part is to be used. This precaution will avoid the possibility of ordering a standard item instead of a customer specified item.

**DOCUMATION INCORPORATED**

**P. O. Box 1240**

**Melbourne, Florida 32901**

**Telephone: (305)-724-1111**

**TWX: 510-959-6286**

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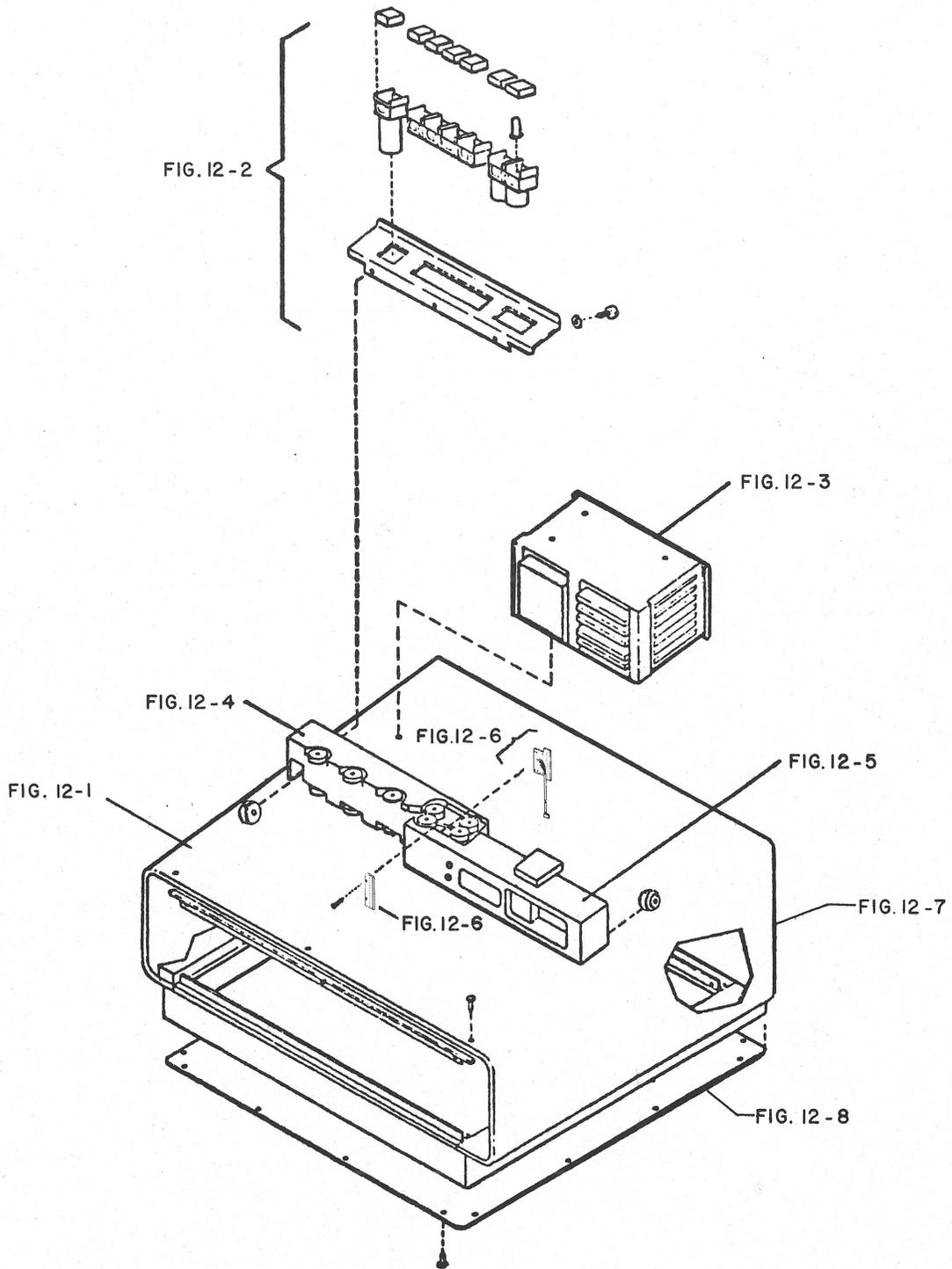


Figure 12-0. Figure Reference

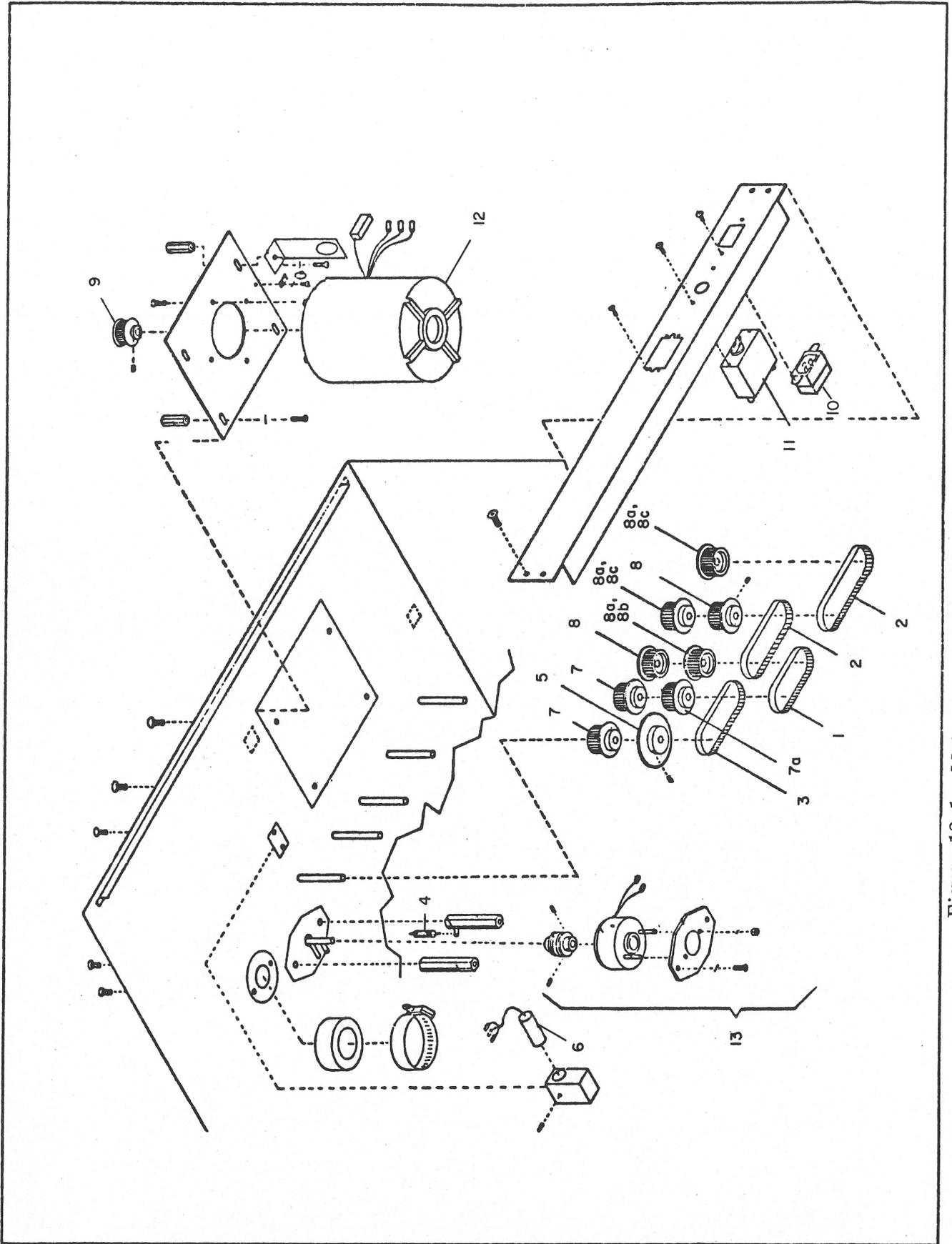


Figure 12-1. Main Frame Assembly (Sheet 1 of 2)

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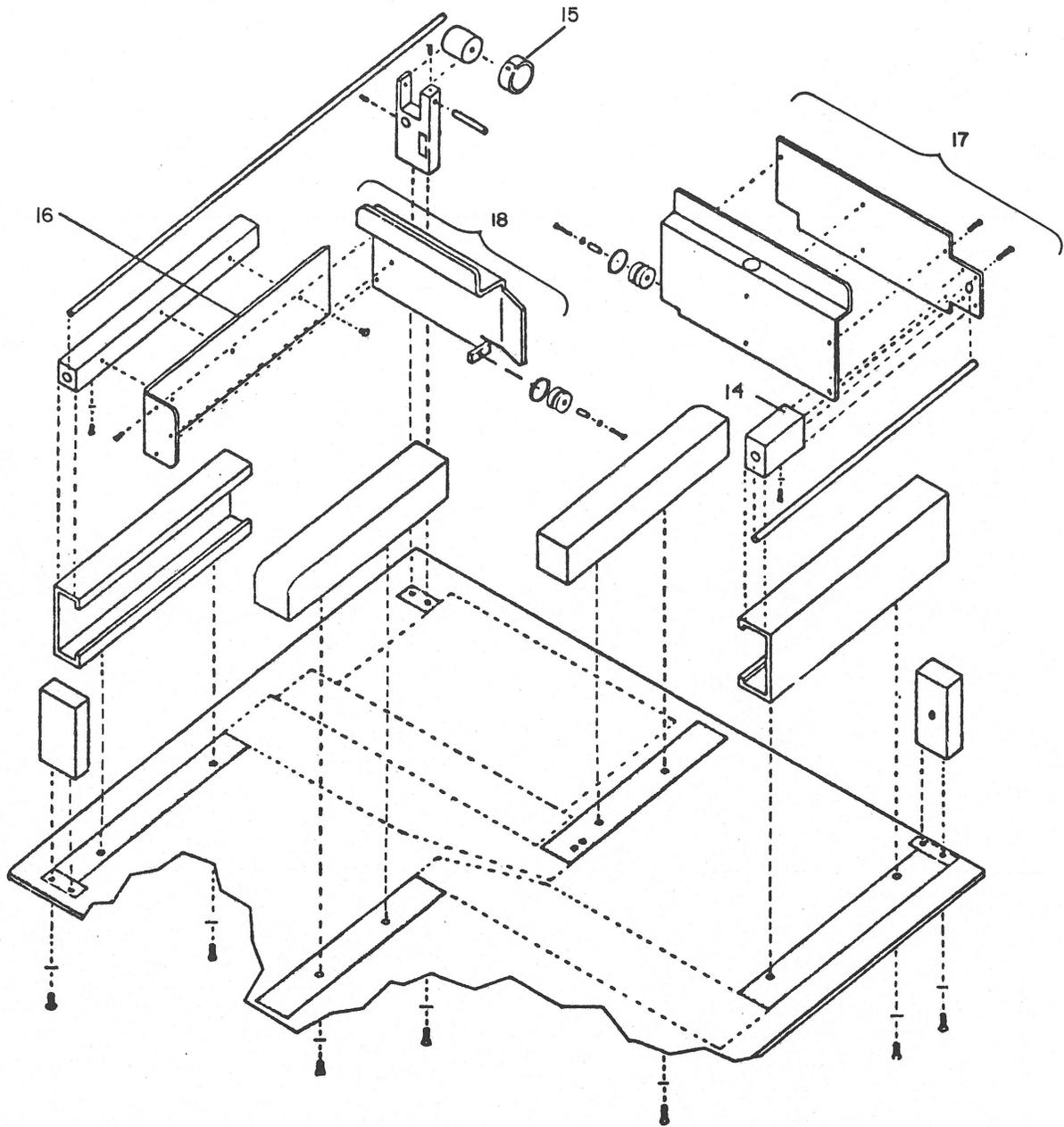


Figure 12-1. Main Frame Assembly (Sheet 2 of 2)

75254-M3/6/10

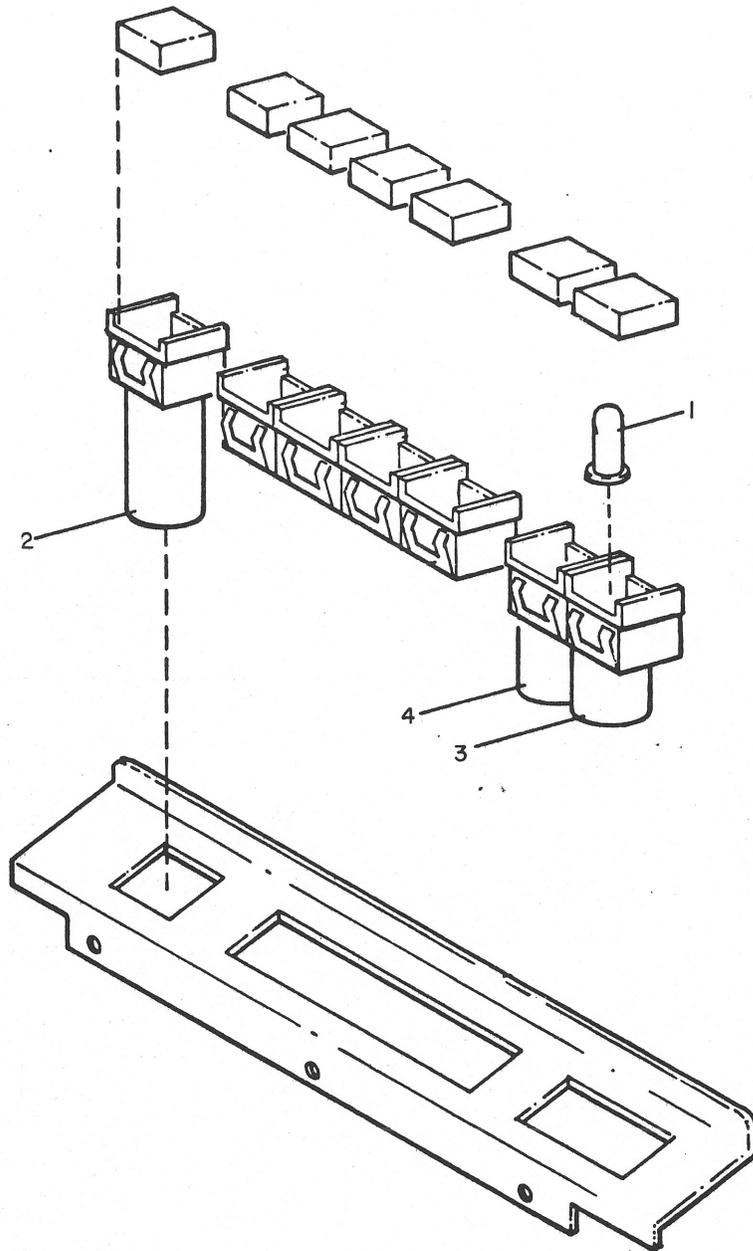


Figure 12-2. Control Panel Assembly

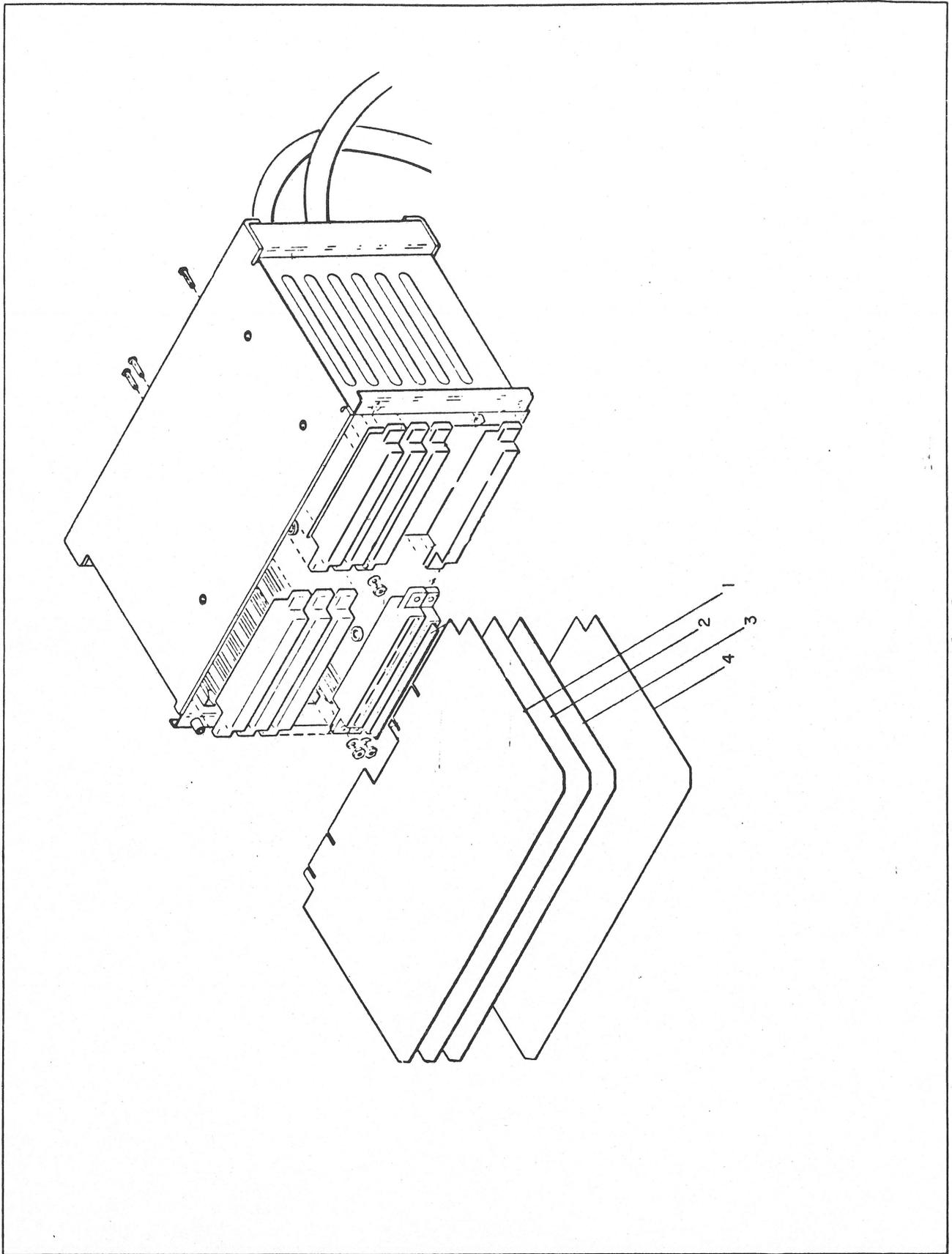


Figure 12-3. Card File Assembly

75261-M3/6/10

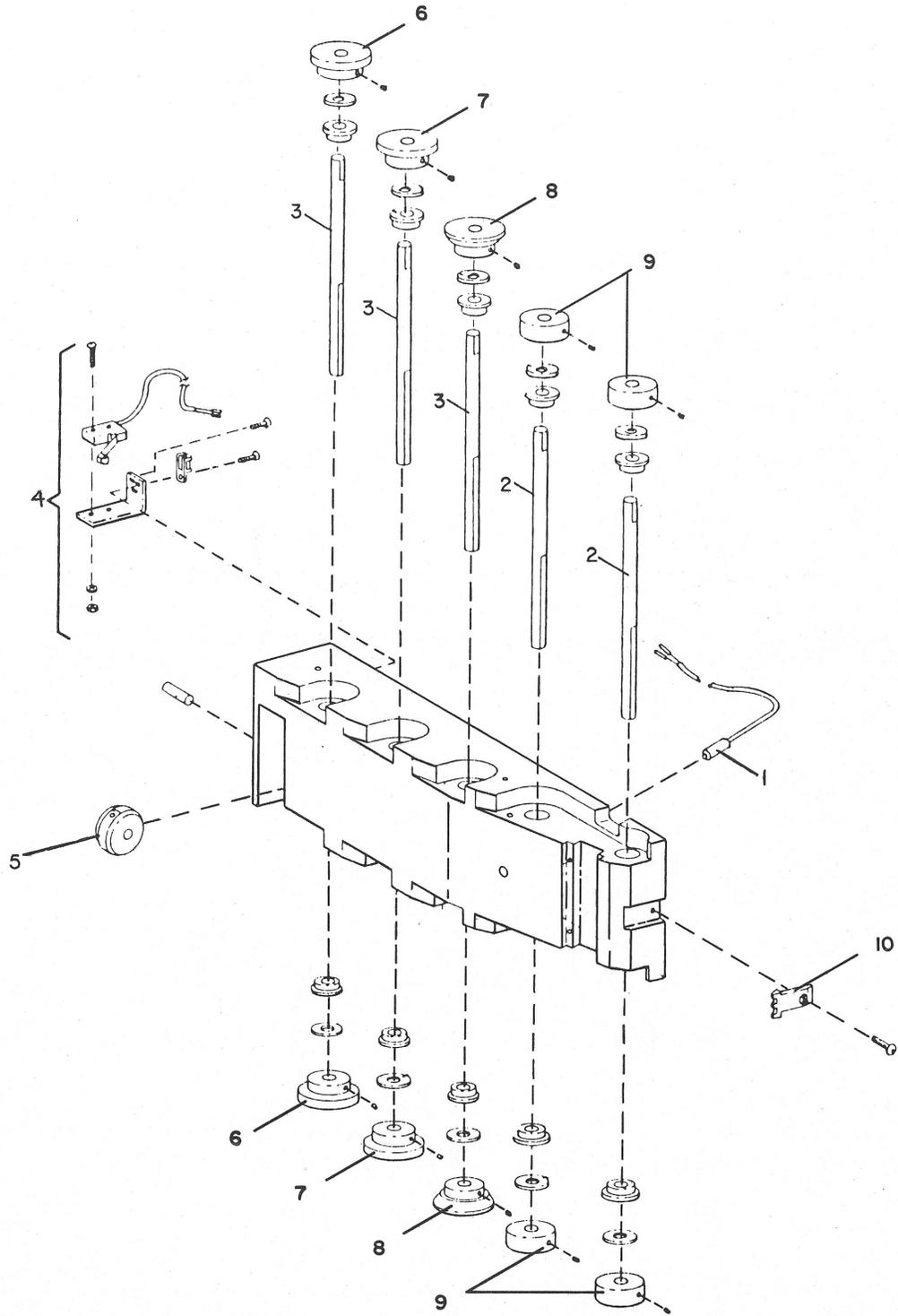


Figure 12-4. Stack Support Assembly

75261-M3/6/10

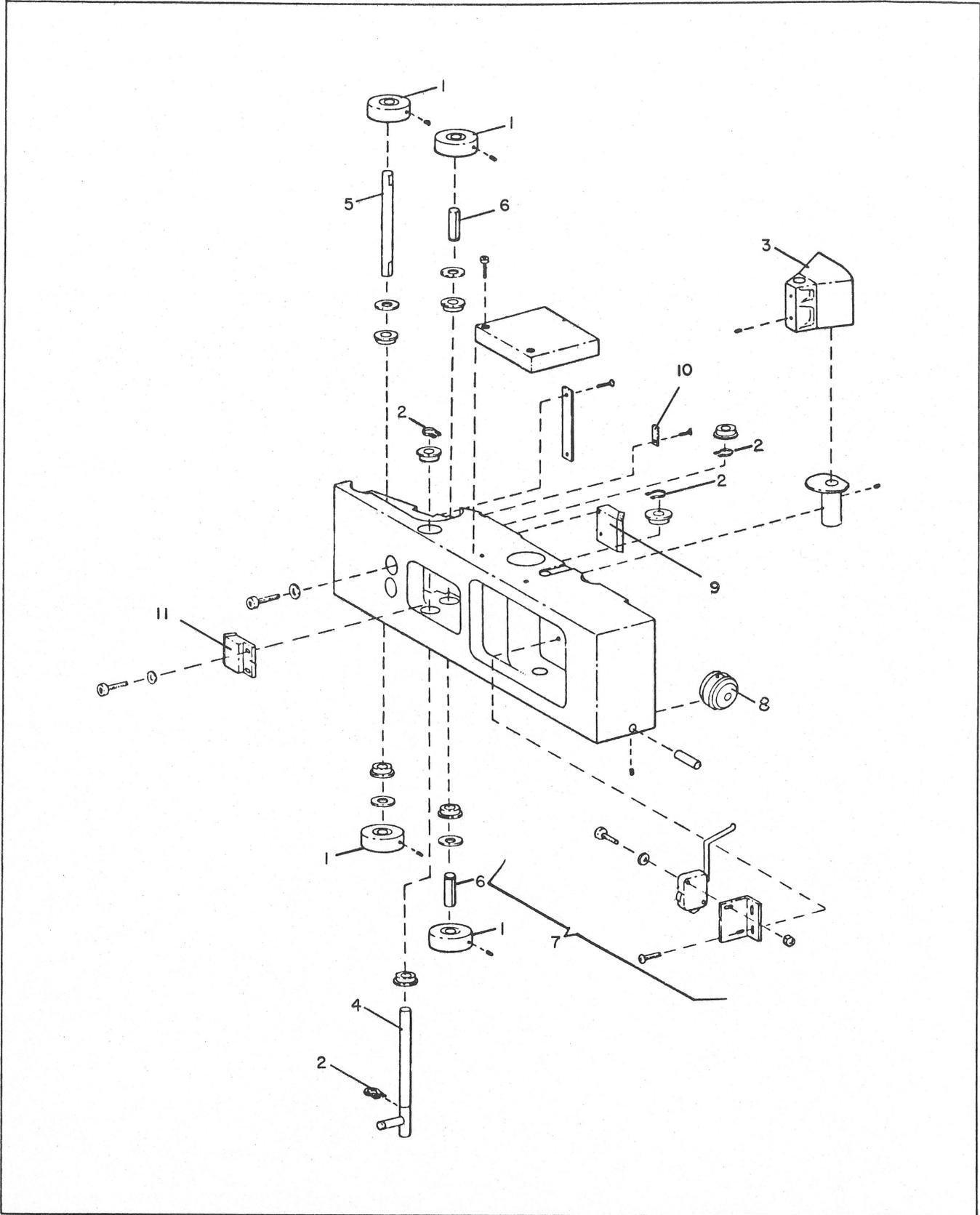


Figure 12-5. Pick Support Assembly

75254-M3/6/10

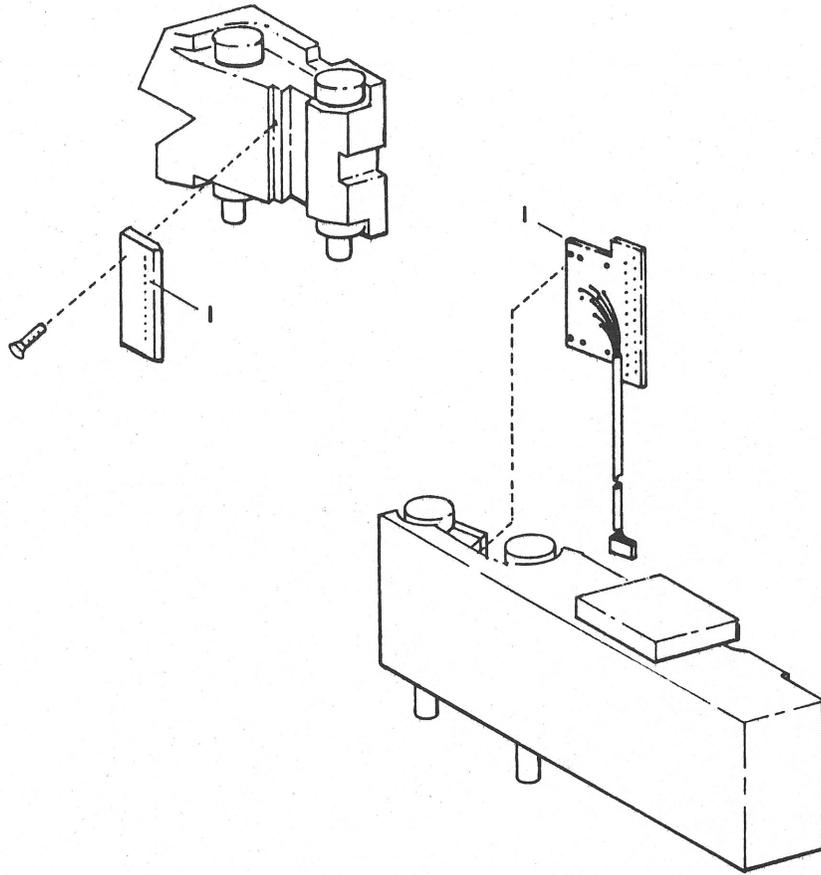


Figure 12-6. Read/Light Station Assembly

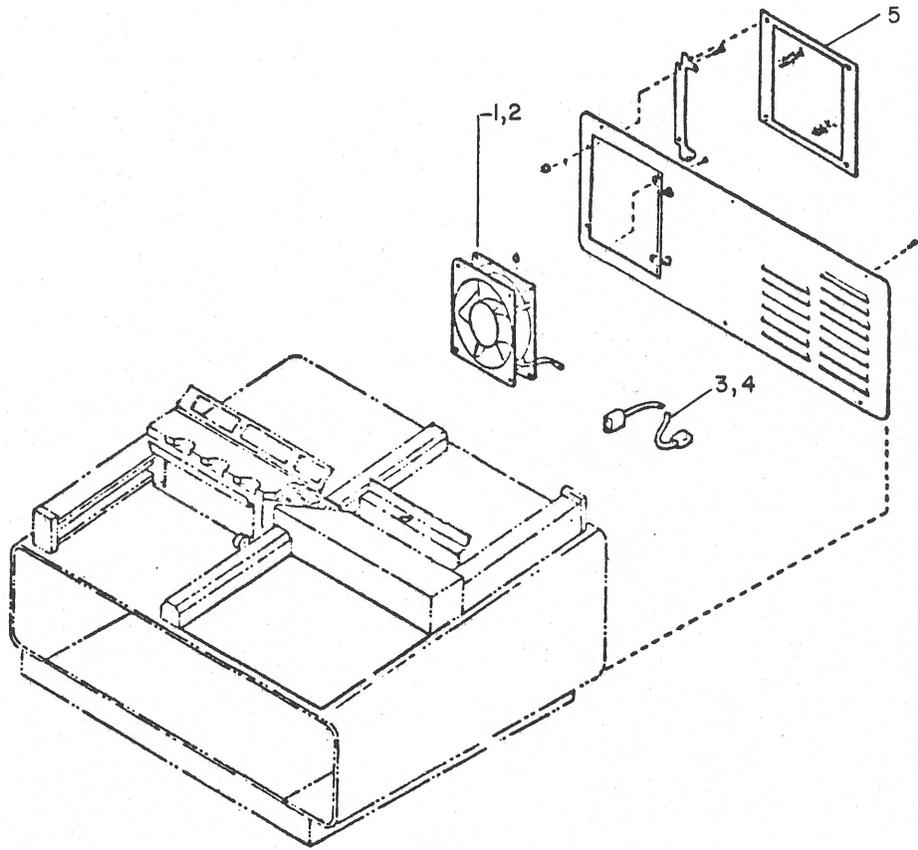


Figure 12-7. Rear Panel Assembly

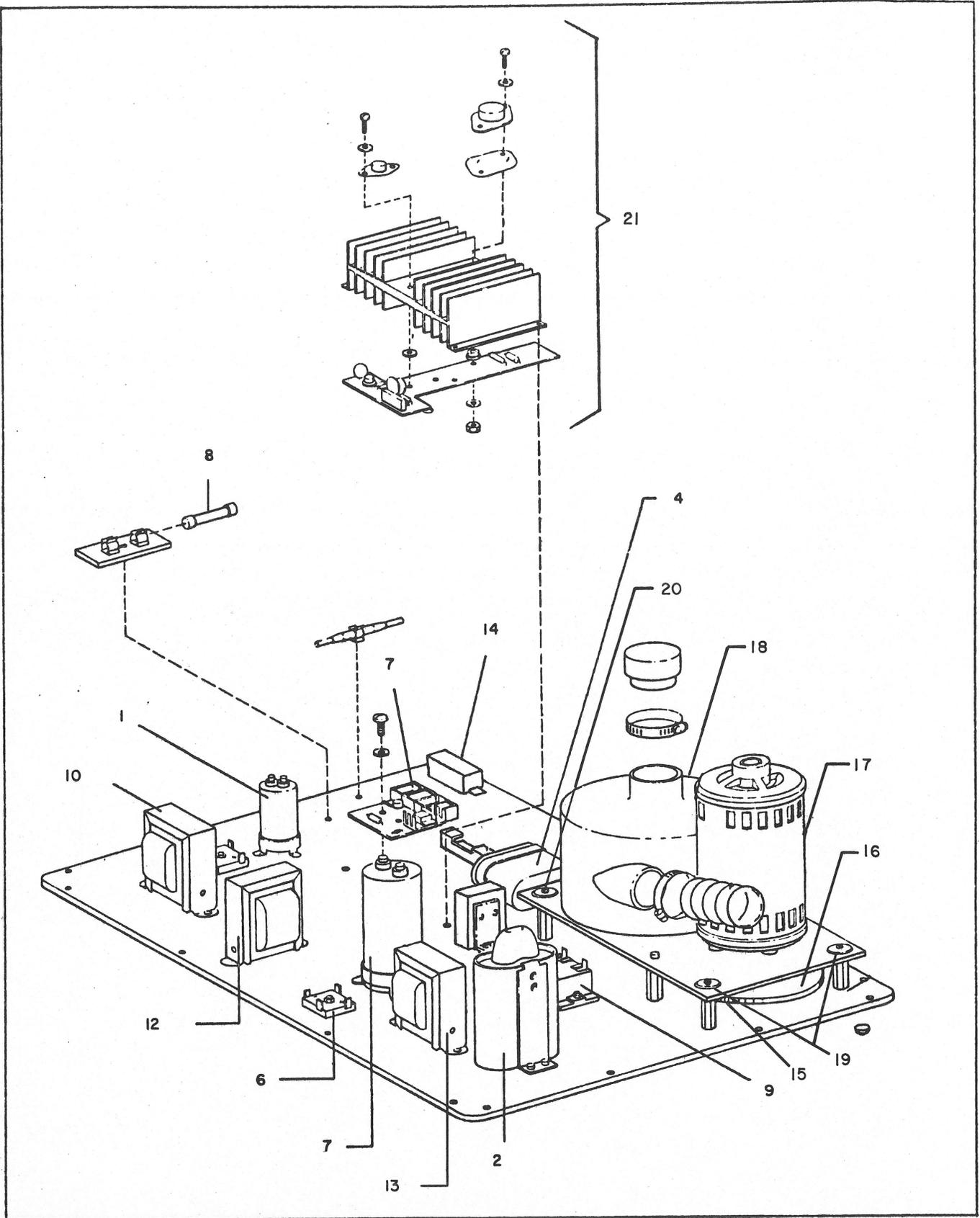


Figure 12-8. Base Plate Assembly

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FIG. & INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR
		1	2	3	4	5	6	7		
12-1		<u>MAIN FRAME ASSEMBLY</u>								
-1	00000280	BELT, Timing, NPRN Drive							1	Dick
-2	00000281	BELT, Timing, NPRN Drive							2	Dick
-3	00000283	BELT, Timing, NPRN Drive							1	Dick
-4	00000285	SPRING, Solenoid							1	Lee
-5	20125801	DISC ASSEMBLY, Timing							1	Documation
-6	20016101	PICKUP ASSEMBLY, Magnetic							1	Documation
-7	20127003	PULLEY, Drive, 14 Grv, Metal, (50/60 Hz) - (50 Hz, M10)							2	Documation
	20127004	PULLEY, Drive, 15 Grv, Metal (60 Hz, M10)							2	Documation
-7a	00000273	PULLEY, Drive, 14 Grv, Nylon							1	Documation
-8	20080404	PULLEY, Drive, 15 Grv, Nylon							2	Documation
	20080401	PULLEY, Drive, 15 Grv, Nylon (M10)							2	Documation
-8a	00000274	PULLEY, Drive, 15 Grv, Nylon							3	Documation
-8b	00000274	PULLEY, Drive, 15 Grv, Nylon (M10)							1	Documation
-8c	00000275	PULLEY, Drive, 16 Grv, Nylon (M10)							2	Documation
-9	20127008	PULLEY, Timing, 15 Grv, Metal (60 Hz)							1	Documation
	20127007	PULLEY, Timing, 14 Grv, Metal (60 Hz, M10)							1	Documation
	20127006	PULLEY, Timing, 18 Grv, Metal (50 Hz)							1	Documation
	20127009	PULLEY, Timing, 16 Grv, Metal (50 Hz, M10)							1	Documation
-10	20102602	FILTER, Receptacle, 230V							1	Comp. Corp.
-11	00000188	CIRCUIT BREAKER, 8A, 115V/60 Hz							1	Documation
	00000185	CIRCUIT BREAKER, 6A, 230V/50 Hz							1	Documation
-12	00001104	MOTOR SPECIAL ASSEMBLY, Drive, 230V/50 Hz (M10)							1	Documation
	00001105	MOTOR SPECIAL ASSEMBLY, Drive, 115V/60 Hz (M10)							1	Documation
	00001098	MOTOR ASSEMBLY, Drive, 115/230V, 50/60 Hz							1	Documation
-13	20022501	SOLENOID ASSEMBLY							1	Documation
	10010501	COUPLING, Solenoid (Inc. w/Solenoid Assembly)							1	Documation
-14	00000900	SUPPORT ASSEMBLY, Picker Follower w/Bushings							1	Documation
-15	00000306	SPRING, Negator							1	Hunter
-16	40104303	CARD BUMPER ASSEMBLY							1	Documation
-17	30104401	PICK FOLLOWER ASSEMBLY							1	Documation
-18	40104301	STACK FOLLOWER ASSEMBLY							1	Documation
12-2		<u>CONTROL PANEL ASSEMBLY</u>								
-1	00000318	LAMP, Incand., 6V, .20A, T- 1 3/4							7	Gen. Illum.
-2	00000319	SWITCH, PB SPDT, Altn Action (Power)							1	Dialco
-3	00000320	SWITCH, PB SPDT, Mom Snap Action (Reset)							1	Dialco
-4	00000321	SWITCH, PB SPDT, N. O. Mom Non-Snap (Stop)							1	Dialco
12-3		<u>CARD FILE ASSEMBLY</u>								
-1	400765XX	P. C. ASSEMBLY, Clock Card							1	Documation
-2	400610XX	P. C. ASSEMBLY, Error Card							1	Documation
-3	400353XX	P. C. ASSEMBLY, Sync Card							1	Documation
-4	400619XX	P. C. ASSEMBLY, Control Card							1	Documation
		} See Page 12-17								

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FIG. & INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR
		1	2	3	4	5	6	7		
12-4		<u>STACK SUPPORT ASSEMBLY</u>								
-1	20038201	PHOTOCELL ASSEMBLY, Stack							1	Documation
-2	00000871	SHAFT ASSEMBLY, 4th, 5th Stack Roller (Incl. Bearing)							2	Documation
-3	00000872	SHAFT ASSEMBLY, 1st, 2nd, 3rd Stack Roller (Incl. Bearing)							4	Documation
-4	20021101	SWITCH ASSEMBLY, Stacker Full							1	Documation
-5	00000499	SPRING, Negator							1	Hunter
-6	20001505	ROLLER, Drive, 1st Stack							2	Documation
-7	20001504	ROLLER, Drive, 2nd Stack							2	Documation
-8	20001506	ROLLER, Drive, 3rd Stack							2	Documation
-9	20002101	ROLLER, Drive, 4th & 5th Stack							4	Documation
-10	10075801	THROAT, Block							1	Documation
12-5		<u>PICK SUPPORT ASSEMBLY</u>								
-1	20005901	CAPSTAN, Drive							4	Documation
-2	00000467	RING, Retaining, External, 1/4 Inch							4	Waldes
-3	30003702	SECTOR ASSEMBLY, Picker							1	Documation
-4	00002513	SHAFT ASSEMBLY, Picker							1	Documation
-5	00001513	SHAFT ASSEMBLY, 1st Pick Drive (Incl. Bearing)							1	Documation
-6	00001514	SHAFT ASSEMBLY, 2nd Pick Drive							1	Documation
-7	20027701	SWITCH ASSEMBLY, Hopper Empty							1	Documation
-8	00000306	SPRING, Negator							1	Hunter
-9	10004701	BUMPER ASSEMBLY, Pick							1	Documation
-10	20072801	INSERT, Pick Support							1	Documation
-11	10004101	STOP ASSEMBLY, Pick							1	Documation
-12	30023303	RIFFLE CAP (Std)							1	Documation
12-6		<u>READ/LIGHT STATION ASSEMBLY</u>								
-1	10158908	READ HEAD/LIGHT STATION (Matched Assembly)							1	Documation
12-7		<u>REAR PANEL ASSEMBLY</u>								
-1	20098302	FAN ASSEMBLY, 230V/50 Hz							1	Documation
-2	00000325	FAN, Cooling, 115V, 50/60 Hz							1	Pamotor
-3	20014801	POWER CORD ASSEMBLY, 9 Ft. (115V)							1	Documation
-4	00000456	POWER CORD ASSEMBLY, 9 Ft. (230V)							1	Belden
-5	30269001	GRILL, Fan, Metal Screen							1	Pamotor
12-8		<u>BASE PLATE ASSEMBLY</u>								
		<u>NOTE</u>								
		Previous P/N								
-1	00000200	CAPACITOR, Alum., 4600 $\mu$ f, 15 VDCW							1	GE
-2	00002051	CAPACITOR, 10 $\mu$ f, 230V/50 Hz							1	GE
	00002049	CAPACITOR, 17.5 $\mu$ f, 115V/60 Hz							1	GE
	00002052	CAPACITOR, 25 $\mu$ f, 100V, 50/60 Hz							1	GE
-4	00001566	CAPACITOR, 3 $\mu$ f, 115V/60 Hz (100V/60 Hz)							1	GE
	00002050	CAPACITOR, 4 $\mu$ f, 230V/50 Hz (100V/50 Hz)							1	GE
	00001743	CAPACITOR, 6 $\mu$ f, 115V/60 Hz (M10)							1	GE
	00002051	CAPACITOR, 10 $\mu$ f, 230V/50 Hz (M10)							1	GE

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR
12-8		<u>BASE PLATE ASSEMBLY (Cont'd)</u>		
-6	00000143	DIODE BRIDGE, 100V	2	Motorola
-7	30010001	DRIVER ASSEMBLY, Solenoid	1	Documation
	30010002	DRIVER ASSEMBLY, Solenoid (M10)	1	Documation
-8	00000147	FUSE, 1A, Slo-Blo	1	Littlefuse
	00000874	FUSE, 1.5A, Slo-Blo (M10)	1	Littlefuse
-9	00000901	RELAY, AC, 25A, 120-240 VAC, 50/60 Hz	1	G. Bart
-10	20015601	TRANSFORMER ASSEMBLY, 12V-115V	1	Documation
	20073901	TRANSFORMER ASSEMBLY, 12V-230V	1	Documation
-12	20015501	TRANSFORMER ASSEMBLY, 24V-115V	1	Documation
	20074001	TRANSFORMER ASSEMBLY, 24V-230V	1	Documation
-12, 13	30030301	TRANSFORMER ASSEMBLY, 48V-115V (M10)	1	Documation
	30074101	TRANSFORMER ASSEMBLY, 48V-230V (M10)	1	Documation
*	00000134	TRANSFORMER, 50/60 Hz, 115/230V	1	Stancor
-14	00000311	FILTER, RFI, 50-400 Hz, 10A, 115/230 VAC	1	Comp. Corp.
-15	00000519	BELT, Timing, Peu-Blower, 60 Hz	1	Gates
	00000520	BELT, Timing, Peu-Blower, 50 Hz	1	Gates
-16	20076101	PULLEY ASSEMBLY, Blower Drive, 60 Hz	1	Documation
	20076102	PULLEY ASSEMBLY, Blower Drive, 50 Hz	1	Documation
-17	00001091	MOTOR ASSEMBLY, Blower, 2850 RPM, 230V/50 Hz	1	Documation
	00001092	MOTOR ASSEMBLY, Blower, 2850 RPM, 115V/50 Hz	1	Documation
	00001093	MOTOR ASSEMBLY, Blower, 3350 RPM, 115V/60 Hz	1	Documation
	10095405	MOTOR, Blower, 100V, 50/60 Hz	1	Documation
-18	00000541	BLOWER, Windjammer	1	Lamb
	00002571	COVER, Blower	1	Lamb
-19	00000291	MOUNT, Shock, Rubber	2	Lord
-20	00000505	MOUNT, Shock, Rubber	2	Lord
-21	30029505	POWER SUPPLY ASSEMBLY, 5V	1	Documation
		*Transformer only for Items 10, 12, 13		
		<u>ACCESSORIES</u>		
	00000032	CONNECTOR, Elec., 18 Cont., Single Row	1	Amp
	00000033	CONNECTOR, Elec., 18 Dual Pos.	4	Amp
	00000029	CONNECTOR, Housing, Elec., 18 Dual Pos.	4	Amp
	00000028	CONNECTOR, Output/J2/	1	Elco
	00000523	CONTACT, Connector, Solder	100	Elco
	00000510	CONTACT, Junction	100	Deutsch
	00000516	CONTACT, Leaf, 18-21 AWG	100	Amp
	00000036	CONTACT, Leaf, 22-26 AWG	100	Amp
	00000034	CONTACT, Leaf	100	Amp
	00000037	CONTACT, Modified Fork	100	Amp
	00000508	LUBRICANT, No. 2	1	Ledex
	30099501	P. C. BOARD ASSEMBLY, Extender Card	1	Documation
	00000663	SEALANT, Grade C, 10cc, Blu	1	Loctite
	00000431	SPACER, Shaft, .004	4	W. Berg
	00000432	SPACER, Shaft, .006	4	W. Berg
	00000433	SPACER, Shaft, .016	6	W. Berg
	00000058	TIE, Cable	40	Panduit
	00000090	TIE, Cable	10	Panduit

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FIG. & INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR
		1	2	3	4	5	6	7		
	00002301	TOOL KIT AMP EXTRACT CONTACT EXTRACT, Leaf CONTACT INSERT/EXTRACT ELCO EXTRACT RETAINING RING REMOVER MOD. FORK CONTACT EXTRACT MOD. IV CONTACT EXTRACT GAUGE, Punch GAUGE, Card HEXDRIVER SET (Inch) HEXDRIVER SET (Metric)							1	Documation
	00001178	HARDWARE KIT							1	Documation
	00003256	HOSE, Blue, 1 3/4 Inch, 4 Ft							1	Air Prod.
	00003255	HOSE, Clear, 3/4 Inch, 3 Ft							1	B & D
	10420201	MATING CONNECTOR KIT, 56 Pins							1	Elco
	10139401	MATING CONNECTOR KIT, 38 Pins							1	Documation
	00004104	PAINT TOUCH-UP KIT, Black							1	Documation
	00004103	PAINT TOUCH-UP KIT, White							1	Documation

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\*To complete last two digits of all (PC Assy) part numbers, use following charts. All incomplete part numbers will be rejected by computer.

PC ASSY, CLOCK CARD - 400765 - XX

<u>Dash No.</u>	<u>M Readers</u>	<u>Output Interface</u>
01	200, 600, 1000, 1200	PT
02	200, 600, 1000, 1200	GTOC
03	200, 600, 1000, 1200	GTRP
04	300	GTRP
05	200, 600, 1000, 1200	PTRP
07	300	PT
08	300	GTOC
09	300	PTRP
10	300	PTOC
11	200, 600, 1000, 1200	PTOC

PC ASSY, ERROR CARD - 400610 - XX

<u>Dash No.</u>	<u>M Readers</u>	<u>Output Interface</u>
01	200, 600, 1000, 1200	PT
02	200, 600, 1000, 1200	GTOC
03	200, 600, 1000, 1200	PTRP
04	300	PT
05	300	GTOC
06	300	PTRP
07	200, 600, 1000, 1200	GTRP
08	300	GTRP
10	300	PTOC
11	200, 600, 1000, 1200	PTOC

PC ASSY, CONTROL CARD - 400619 - XX

<u>Dash No.</u>	<u>Readers</u>	<u>Output Interface</u>
01	M200, M600, M1000, M1200	PT
02	M200, M600, M1000, M1200	GTOC
03	M300	PT
04	M300	GTOC
05	M200, M600, M1000, M1200	PTRP
06	M300	PTRP
07	M200, M600, M1000, M1200	GTRP
08	M300	GTRP
09	M300	PTOC
10	M200, M600, M1000, M1200	PTOC

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<u>Dash No.</u>	<u>M Readers</u>	<u>Output Interface</u>
01	300/600	A11
02	1200	A11
03	200	A11
05	1000	A11

OUTPUT INTERFACE DEFINITIONS

PT - Positive True  
 GTOC - Ground True Open Collector  
 PTRP - Positive True Resistive Pull-Up  
 GTRP - Ground True Resistive Pull-Up  
 PTOC - Positive True Open Collector