

IMPORTANT NOTICE

THIS TECHNICAL MANUAL IS SUPPLIED
WITH DOCUMENTATION CARD READER SERIAL
NUMBER *7404298*

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 schematics are corrected by direct replacement of pages affected, or are contained in an Addendum.

Customer: REGNACENTRALEN
 Model: M 200 Voltage 230 Frequency 50
 Options: n/a CS No.: 129 C
 Addendums: n/a
 Text Changes: n/a
 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	1142000
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)	_____
Error Card Assembly	_____
Schematic, (sheet 1 of 2)	MODIFIED PER CS
Schematic, (sheet 2 of 2)	MODIFIED PER CS
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:

_____	_____
_____	_____
_____	_____
_____	_____

Doc. No. M 2408

Verified Andrea Henshaw

TABLE OF CONTENTS

SECTION 1 INTRODUCTION

Paragraph		Page
1.1	General	1- 1
1.2	Description	1- 1
1.3	Specifications	1- 1

SECTION 2 UNPACKING AND INITIAL CHECKOUT

2.1	Unpacking	2- 1
2.2	Initial Checkout	2- 1

SECTION 3 OPERATION

3.1	Loading the Input Hopper	3- 1
3.2	Unloading Stacker	3- 1
3.3	Control and Indicator Description	3- 1
3.4	Operational Procedures	3- 3
3.5	Operational Flow Chart	3- 4

SECTION 4 THEORY OF OPERATION

4.1	Card Feeding Mechanism	4- 1
4.2	Data Recovery	4- 2
	4.2.1 Reader Control	4- 2
	4.2.2 Data Detection	4- 2
	4.2.3 Data Storage	4- 4
4.3	Detail Operational Description	4- 4
	4.3.1 Reader Control	4- 5
	4.3.1.1 4.8 MHz Oscillator and Four-Phase Generator	4- 5
	4.3.1.2 Control Logic	4- 5
	4.3.1.3 Pick Logic	4- 7
	4.3.1.4 Column Counter	4- 9
	4.3.1.5 Error Logic	4-12
	4.3.2 Data Detection	4-13
	4.3.2.1 Data Amplifiers and Inverters	4-13
	4.3.2.2 One Dark and One Light	4-13
	4.3.3 Data Storage	4-15
	4.3.3.1 Data Control and Sync Logic	4-15
	4.3.3.2 Data Amplifiers and Inverters	4-19

**SECTION 5
INTERFACE**

Paragraph	Page
5.1 General	5- 1
5.2 Timing	5- 1
5.2.1 Pick Control	5- 1
5.2.2 Data Readout	5- 3
5.2.3 Alarms	5- 3
5.2.3.1 Hopper Check	5- 3
5.2.3.2 Error	5- 4
5.2.3.3 Motion Check	5- 4
5.3 Connectors	5- 4
5.4 Signal Characteristics	5- 6
5.5 Grounding	5- 6

**SECTION 6
ADJUSTMENT PROCEDURES**

6.1 General	6- 1
6.2 Tension on the Main Drive Motor Belt	6- 1
6.3 Magnetic Pickup Adjustment	6- 3
6.4 Adjustment of Stack Photocell	6- 4
6.5 Roller Shaft Bearing Preload	6- 5
6.6 Hopper Empty Switch Adjustment	6- 6
6.7 Stacker Full Switch Adjustment	6- 6
6.8 Picker Sector Adjustment	6- 9
6.9 Stacker Adjustment	6-11

**SECTION 7
PREVENTIVE MAINTENANCE**

7.1 General	7- 1
7.2 Cleaning	7- 1
7.2.1 Picker Sector	7- 1
7.2.2 Casting Assemblies	7- 1
7.2.3 Cooling Fan	7- 2
7.2.4 Exterior Cleaning	7- 2
7.3 Lubrication	7- 2

**SECTION 8
TROUBLESHOOTING**

8.1 General	8- 1
Fault Isolation Chart	8- 1

**SECTION 9
REPAIR PROCEDURES**

9.1	General	9- 1
9.2	Required Tools	9- 4
9.3	Main Drive Motor Belt	9- 6
9.4	Magnetic Pickup	9- 6
9.5	Solenoid	9- 8
9.6	Stacker Casting	9-11
9.7	Stacker Roller Bearing Assemblies	9-14
9.8	Read Head Assembly	9-14
9.9	Light Station Assembly	9-16
9.10	Stacker Shaft Support Bearings	9-16
9.11	Vacuum Pump Motor Assembly Belt	9-17
9.12	Stacker Full Switch.	9-19
9.13	Hopper Empty Switch.	9-20
9.14	Picker.	9-21
9.15	Indicator Lamps	9-22
9.16	Picker Roller Bearings	9-23

**SECTION 10
DRAWINGS**

**SECTION 11
SIGNAL MNEMONICS AND ABBREVIATIONS**

**SECTION 12
ILLUSTRATED PARTS BREAKDOWN**

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Card Reader, Three-Quarter Front View (Typical)	1- 0
1-2	Card Reader, Three-Quarter Rear View (Typical)	1- 0
2-1	Unpacking	2- 2
3-1	Switch and Indicator Location	3- 2
3-2	Operational Flow Chart	3- 5
4-1	Card Feeding Air Flow	4- 1
4-2	Block Diagram, M Series Card Reader	4- 3
4-3	Timing Relationship for Standard Punched Card	4- 4
4-4	Block and Timing Diagram, 4.8 MHz Oscillator and Four-Phase Generator	4- 5
4-5	Block and Timing Diagram, Control Logic	4- 6
4-6	Block and Timing Diagram, Pick Logic	4- 8
4-7	Block and Timing Diagram, Column Counter	4-10
4-8	Block and Timing Diagram, Error Logic	4-11
4-9	Block and Timing Diagram, Data Amplifiers and Inverters	4-14
4-10	Block and Timing Diagram, One Dark and One Light	4-15
4-11	Block and Timing Diagram, Data Control and Sync Logic Drivers	4-17
4-12	Block and Timing Diagram, Data Register and Data Drivers	4-18
5-1	Interface Timing Diagram	5- 2
5-2	Circuit Characteristics	5- 6
6-1	Top Cover Removal	6- 2
6-2	Rear Panel Removal	6- 2
6-3	Drive Motor Belt Tension Adjustment	6- 3
6-4	Magnetic Pickup Adjustment	6- 3
6-5	Location of Stack Photocell and Photocell Set Screw	6- 4
6-6	Roller Shaft Bearing Preload Adjustment	6- 5
6-7	Hopper Empty Switch Adjustment	6- 6
6-8	Stacker Panel Removal	6- 7
6-9	Picker Sector Adjustment, Rear View	6- 7
6-10	Picker Sector Adjustment, Front View	6- 8
6-11	Removal of Vacuum Tube Adapter	6- 8
6-12	Stacker Spring Adjustment	6-12
7-1	Solenoid Lubrication	7- 2
9-1	Top Cover Removal	9- 2
9-2	Rear Panel Removal	9- 2
9-3	Rear View, Cover Removed	9- 5
9-4	Front View, Main Mounting Plate Removal	9- 5
9-5	Partial Front View, Cover Removed	9- 7
9-6	Bottom View, Main Mounting Plate	9- 7
9-7	Partial Top Left View, Cover Removed	9- 9
9-8	Solenoid Replacement and Adjustment	9-10
9-9	Side View, Main Mounting Plate	9-12
9-10	Rear View, Cover and Rear Connector Panel Removed	9-12

9-11	Stacker Casting Removal and Bearing Replacement	9-15
9-12	Front View, Main Wiring Connections	9-18
9-13	Vacuum Pump Belt Adjustment	9-18
9-14	Stacker Panel Removal	9-19
9-15	Stacker Full Switch Replacement	9-20
9-16	Top View Casting Assembly	9-22
10-1	Wiring Diagram, AC Power Distribution, 115V, 60 Hz	10- 1
10-1A	Wiring Diagram, AC Power Distribution, 230V, 50 Hz	10- 1A
10-2	Card Cage, P. C. Card Location	10- 2
10-3	Wiring Diagram, Card Cage	10- 3
10-4	Wiring Diagram, Control Panel	10- 4
10-5	Schematic Diagram, 5V Power Supply, 115V, 60 Hz	10- 5
10-5A	Schematic Diagram, 5V Power Supply, 230V, 50 Hz	10- 5A
10-6	Schematic Diagram, Solenoid Driver, 115V, 60 Hz	10- 6
10-6A	Schematic Diagram, Solenoid Driver, 230V, 50 Hz	10- 6A
10-7	Assembly Diagram, Clock Card	10- 7
10-8	Schematic Diagram, Clock Card (sheet 1 of 3)	10- 8
10-9	Schematic Diagram, Clock Card (sheet 2 of 3)	10- 9
10-10	Schematic Diagram, Clock Card (sheet 3 of 3)	10-10
10-11	Assembly Diagram, Error Card	10-11
10-12	Schematic Diagram, Error Card (sheet 1 of 2)	10-12
10-13	Schematic Diagram, Error Card (sheet 2 of 2)	10-13
10-14	Assembly Diagram, Sync Card	10-14
10-15	Schematic Diagram, Sync Card (sheet 1 of 3)	10-15
10-16	Schematic Diagram, Sync Card (sheet 2 of 3)	10-16
10-17	Schematic Diagram, Sync Card (sheet 3 of 3)	10-17
10-18	Assembly Diagram, Control Card	10-18
10-19	Schematic Diagram, Control Card (sheet 1 of 2)	10-19
10-20	Schematic Diagram, Control Card (sheet 2 of 2)	10-20

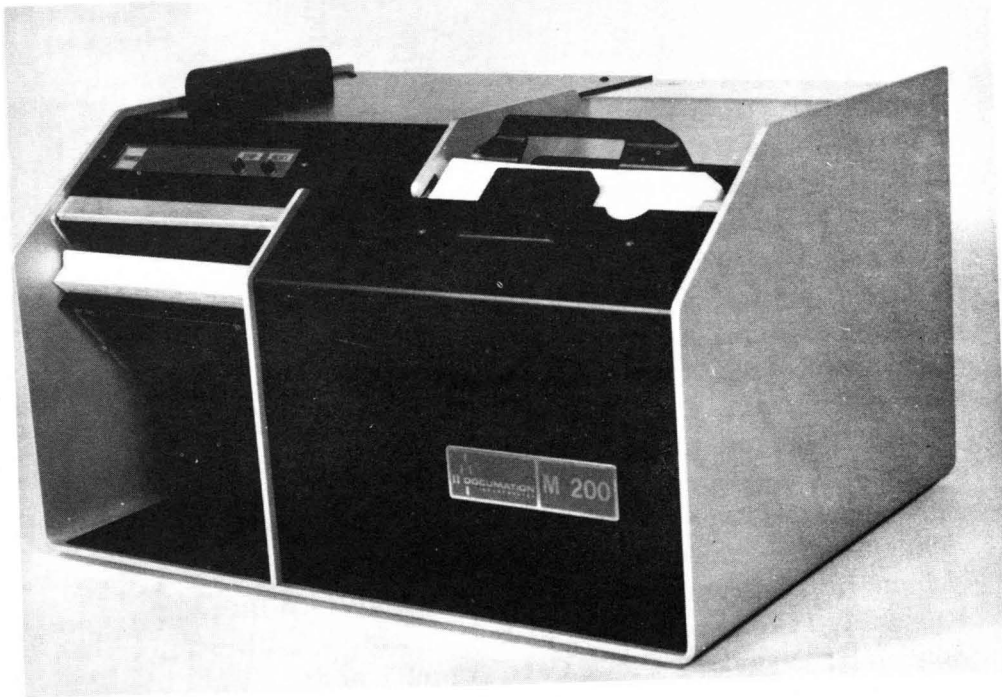


Figure 1-1. Card Reader, Three-Quarter Front View (Typical)

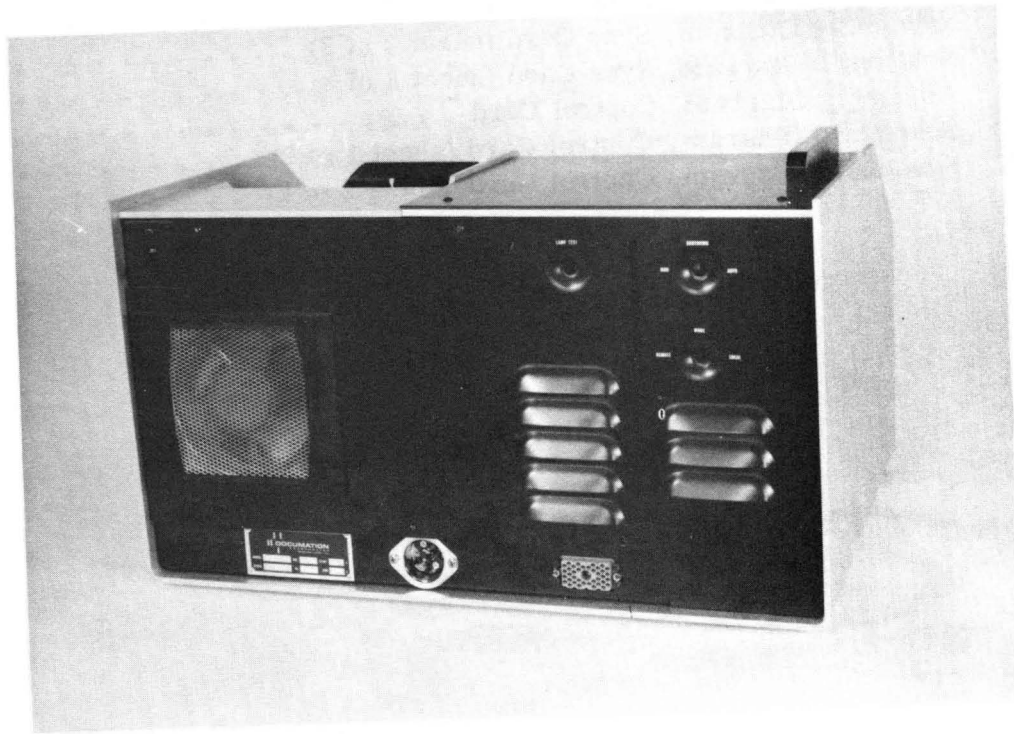


Figure 1-2. Card Reader, Three-Quarter Rear View (Typical)

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 M200 Card Reader. An Illustrated Parts Breakdown is included in Section 12 to aid in locating and identifying parts if replacement becomes necessary.

The M200 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 550 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 285 cards per minute.

1.2 DESCRIPTION

The entire reader is constructed around a mainframe, figure 1-1. Mounted within 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 mainplate assembly are the drive motor, drive train, and a portion of the card pick mechanism. The bottom area of the mainframe contains 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:	285 cards per minute maximum in continuous run. Single Card Cycle: 200 milliseconds.
CARD TYPE:	Standard 80 column cards.
CONTROL:	Demand feed, one card-at-a-time under external program control. Reader will continuous run as long as the Pick Command remains TRUE.
INPUT:	
Pick Command (PC)	Logic True for 1 μ sec -15 MaDC @ 0.8 VDC Max.

OUTPUT:

Data Lines and
Interface Signals

TTL Type 7404 or Equivalent.
I Source 2.2 MaDC
I Sink -15 MaDC @ 0.4 VDC Max.

HOPPER SIZE:

4.0 inches (approximately 550 cards of 7 mil thickness).

STACKER SIZE:

4.0 inches (approximately 550 cards of 7 mil thickness).

POWER REQUIREMENTS:

Voltage: 115 VAC \pm 10%, single phase, 60 Hz (standard model).
230 VAC \pm 10%, single phase, 50 Hz (export model).

Power: 1650 VA (MAX) starting load for 3 sec
570 VA (MAX) running load

SIZE:

Height: 11 inches 27.9 cm

Width: 19-1/4 inches 48.9 cm

Depth: 14 inches 35.5 cm

WEIGHT: 60 pounds 27.3 Kg

OPERATING ENVIRONMENT:

Dry Bulb Temperature 50 to 100^oF.
Relative Humidity 30 to 90% non-condensing
Wet Bulb Temperature 80^oF. maximum
Thermal Shock 15^oF. per hour
Altitude 1000 feet below to 6000 feet above sea level

STORAGE ENVIRONMENT:

Dry Bulb Temperature -25 to +135^oF.
Relative Humidity 5 to 95% non-condensing
Altitude 1000 feet below to 12,000 feet above sea level

CARD STOCK

The card must meet American National Standard's specification ANSI X3.11-1969, Specification for General Purpose Paper Cards for Information Processing.

PUNCH DATA

Punch data must meet American National Standard ANSI X3.21-1967 specifications.

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. Set the MODE switch (rear panel) to LOCAL.
- c. Set the SHUTDOWN switch (rear panel) to AUTO.
- d. Place the AC power (rear panel, top left) to ON to energize the reader. The POWER indicator illuminates and, after approximately a 3-second delay, the STOP and HOPPER CHECK indicators illuminate.
- e. Depress and hold momentarily the LAMP TEST switch (rear panel) and observe that all front panel indicators illuminate. Release switch.
- f. Pull the hopper follower back with one hand and load approximately 3 inches of unpunched cards into the hopper area.
- g. 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.
- h. Place the AC power to OFF. All indicators are extinguished.
- i. Pull the stacker plate down with one hand and remove the cards.
- j. This completes the initial off-line test.

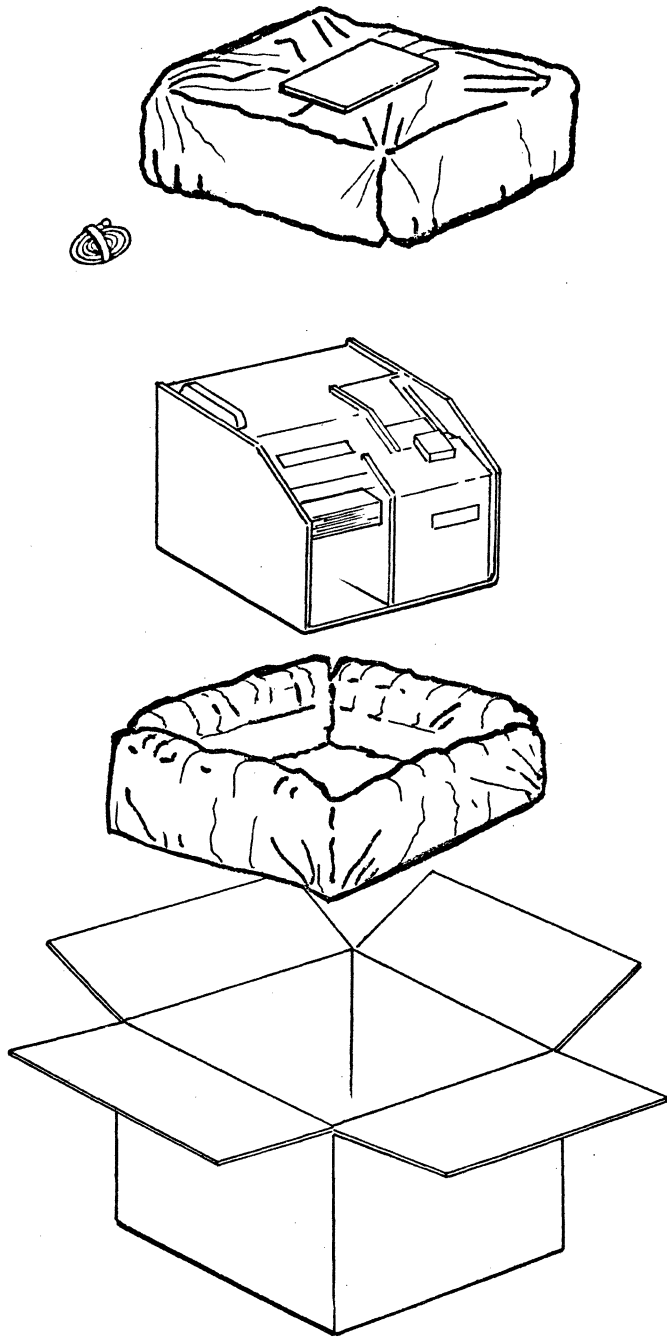


Figure 2-1. Unpacking

SECTION 3 OPERATION

3.1 LOADING THE INPUT HOPPER

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

- a. Remove the hopper follower 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 550 cards). Replace follower.

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, remove the follower 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.

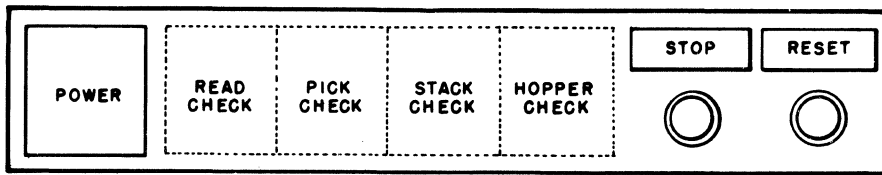
3.2 UNLOADING STACKER

To unload the stacker, perform the following steps:

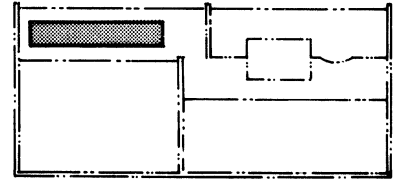
- a. Pull stacker follower down and remove the front or rear portion of the card deck from the stacker area, being careful that deck order is maintained.
- b. To unload stacker during operation, pull stacker down and remove portion of deck taking care to allow stacker plate to return to its normal position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

3.3 CONTROL AND INDICATOR DESCRIPTION

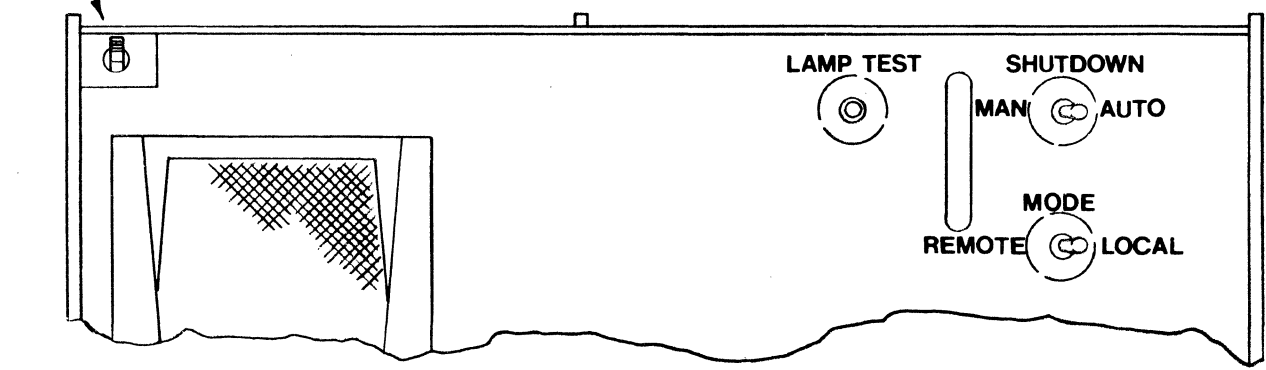
Reader controls and indicators, figure 3-1, are located on the front control panel, the rear of the card cage, and the rear subframe. Control and indicator descriptions are as follows:



FRONT CONTROL PANEL



AC POWER



REAR PANEL

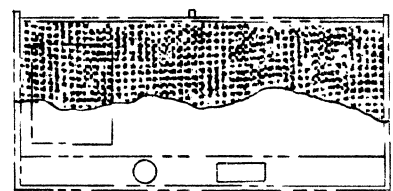


Figure 3-1. Switch and Indicator Location

3.3.1 FRONT PANEL CONTROLS AND INDICATORS

Located on the front panel are two pushbutton type switches; STOP and RESET.

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

Five other indicators are located on the front panel.

POWER
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. 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.
- b. 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.
- c. With the LOCAL mode of operation established, place the AC power circuit breaker on the rear panel to ON 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. The POWER indicator illuminates.
- d. Depress the LAMP TEST switch and check that all front panel indicators are lighted.

- e. Load the input hopper and depress the RESET switch. The RESET switch is a momentary action pushbutton switch used to clear any error conditions and establish the card reader "ready" condition. When the "ready" condition is established, the RESET indicator will light green. All motors will start and riffling action begins on the first half inch of cards.
- f. As the cards are being read, the PICK CHECK indicator will light if a card has failed to reach the read head after a pick command has been given. Inspect the cards in the input hopper for excessive leading edge damage, interlocked webs or cards stapled together. If no apparent card damage is present, check for excessive card warpage.
- g. The READ CHECK indicator will light and the "stop" condition will be established when any of the following conditions are detected.
 - 1. Failure of leading or trailing edge dark check.
 - 2. Failure of trailing edge light check.
 - 3. Card slippage.
 - 4. Control logic failure.
- h. The STACK CHECK will light if the previous card read has not reached the output stacker. Check the card track to make sure it is clear and check the output stacker for incorrectly stacked cards.
- i. The HOPPER CHECK indicator will light when the input hopper is empty or when the output stacker is full. This is normal operation.
- j. The STOP switch is a momentary action pushbutton switch used to terminate card reader operation at the end of a read cycle. The STOP indicator will light red when the "stop" condition is established.

3.5 OPERATIONAL FLOW CHART

Figure 3-2 shows a flow chart of the sequence of events which may be encountered in operating the reader. If trouble is experienced, refer to this check list before calling for maintenance.

NOTE 1

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

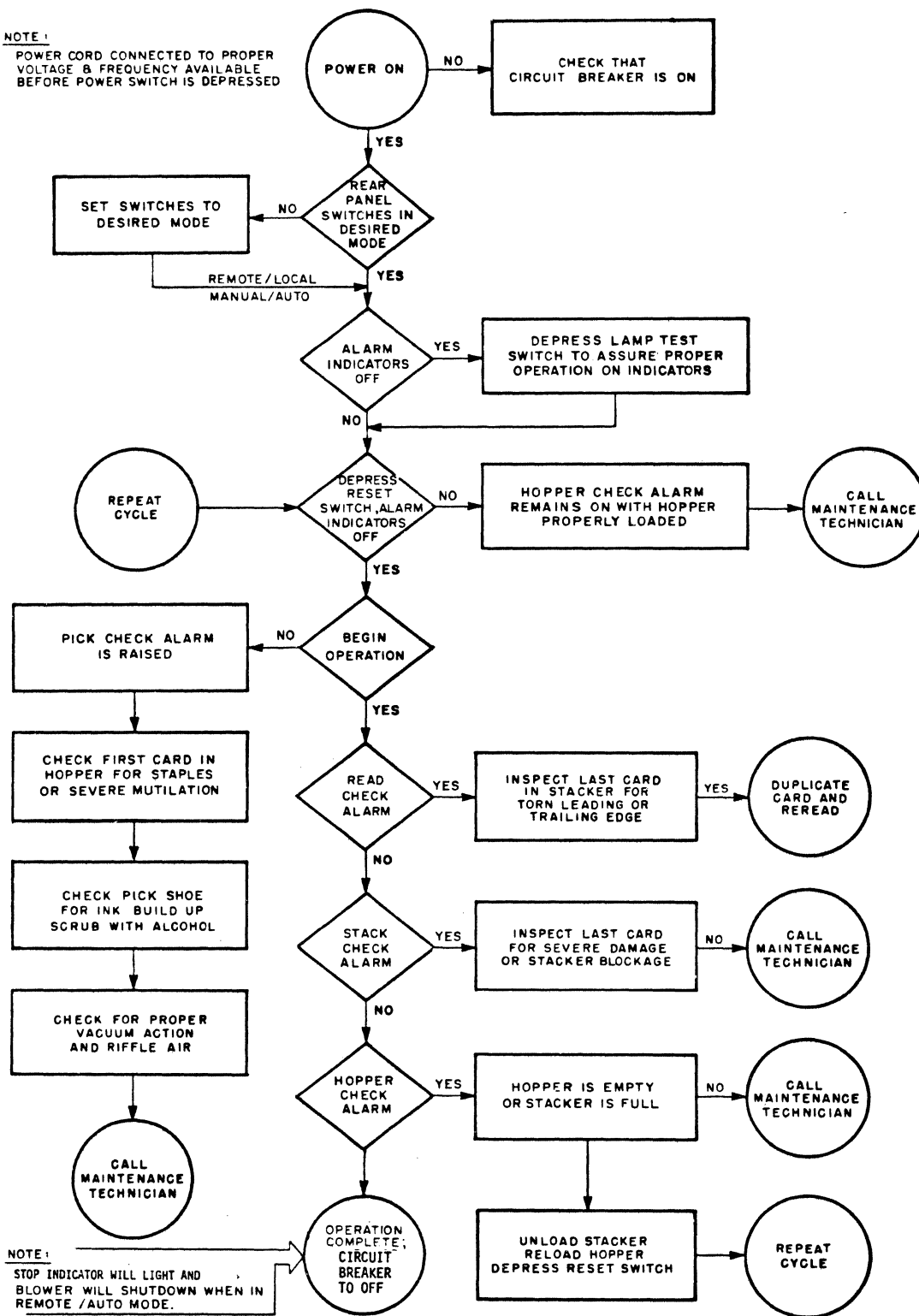


Figure 3-2 - Operational Flow Chart

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 riffles 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.

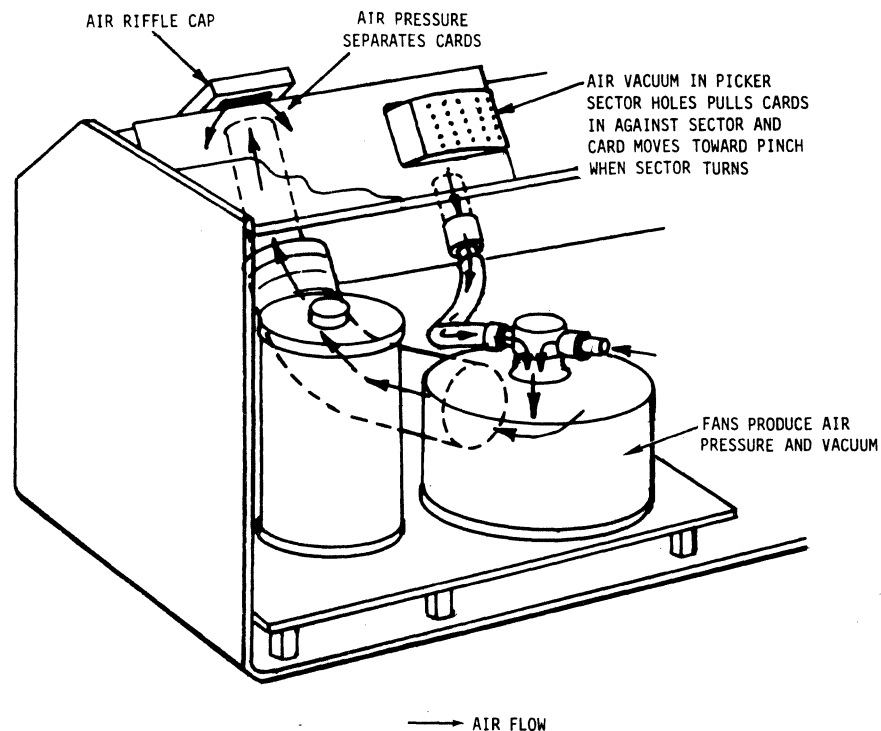


Figure 4-1. Card Feeding Air Flow

4.2 DATA RECOVERY

The logic block diagram for the M Series Card Reader is shown in Figure 4-2.

Data recovery is accomplished by the functions of Reader Control, Data Detection and Data Storage. Reader Control synchronizes the electronic scanning of the card with the mechanical actions of the reader. This provides card picking, card movement through the read station, data flow control and card stacking. Data Detection converts the light/dark conditions of the read station into usable digital signals for Data Storage. Data Storage provides the data synchronization, buffering and retainment required for data transfer from the reader.

4.2.1 READER CONTROL

Primary control timing is established by the 4.8 MHz Crystal Oscillator and the Four-Phase Generator. These are used to shift, store and control other logic operations.

When a PICK COMMAND is received from the controlling device, card processing will begin provided no alarm conditions exist. The Pick Logic produces a PICK signal to the Solenoid Driver, a $\overline{\text{PCLK}}$ signal, and a pick-command reset (PCR) to the Control Logic. These actions initialize the various control circuits and energize the solenoid to pick a card from the input hopper. If a card does not reach the read station, the PICK CHECK alarm is raised.

The Read Station and Stacker utilize phototransistor sensors to read the card's hole pattern and to monitor the card's movement. When a card is picked and moved into the card track, the leading edge interrupts the light to the Read Station. This produces a ONE DARK signal that is used by the Control Logic to generate a Good Pick Reset (GPR) which initializes the synchronization of the card's movement through the Read Station. The Column Counter then counts columns via the Data Control and Sync Logic as the card moves past the Read Station, thus synchronizing the mechanical card movement with the electronic circuits. The Column Counter generates a DARK CHECK at Column 0 and 81 and a Light Check at Column 84. Figure 4-3, Timing Relationship for Standard Card, shows these check positions. These checks provide a quality check on both the Read Station and the mechanical card movement.

4.2.2 DATA DETECTION

As the card passes between the Light Emitting Diodes (LEDs) of the Light Station and the Phototransistors of the Read Station the light and dark conditions are sensed and amplified by the Read Station's phototransistors. The light (punched hole) and dark conditions are converted to electronic signals at the Phototransistor's

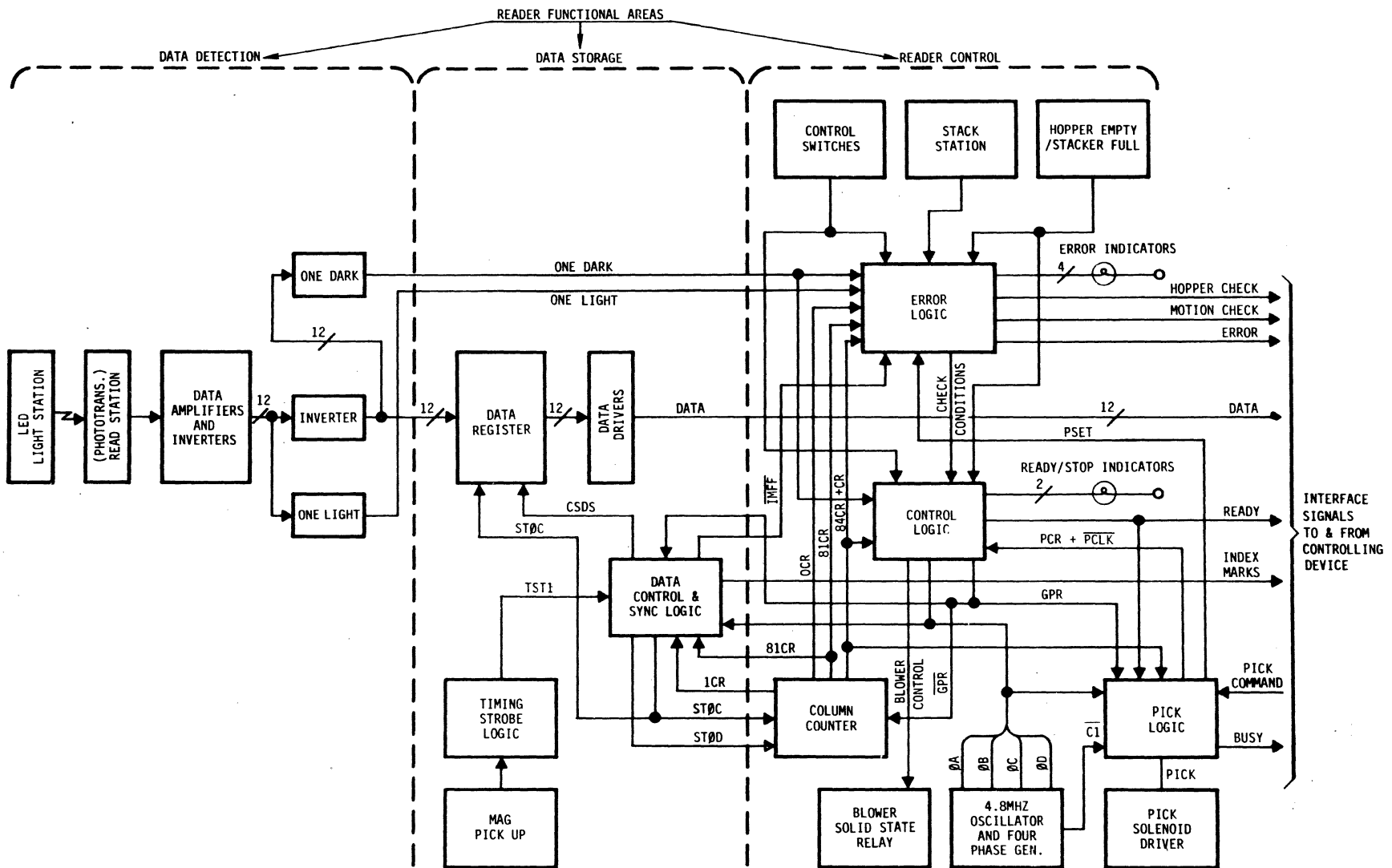


Figure 4-2. Block Diagram, M Series Card Reader

emitters and used to drive the Data amplifiers and inverters. Outputs of the Data Amplifiers and Inverters pass through the One Light/One Dark inverters and provide detected data to the Data Register.

4.2.3 DATA STORAGE

To accomplish Data Storage, the Data Control and Sync Logic sends Synchronized Data Strokes (CSDS) to the Data Register at predetermined punched column positions. Synchronization is accomplished by a notched ferrous timing disc attached to one of the drive roller shafts. As the timing disc rotates, a reluctance pickup senses the movement of the disc's notches past the pickup producing timing signals. These signals are used by the Data Control and Sync Logic to generate Data Strokes (CSDS) for each of the 80 columns. Data Storage includes Data Drivers that provide buffering between the Data Register and the interface lines.

4.3 DETAIL OPERATIONAL DESCRIPTION

The following gives a detailed description of each block shown in Figure 4-2, Block Diagram - M Series Card Reader. The description is designed to give the reader an in-depth understanding of how the card reader works without the usual logic gate-by-gate description.

The reader should familiarize himself with the signal mnemonics used in the text description and contained in Section 11 since it will aid in interpreting both the description that follows and the logic schematics in Section 10.

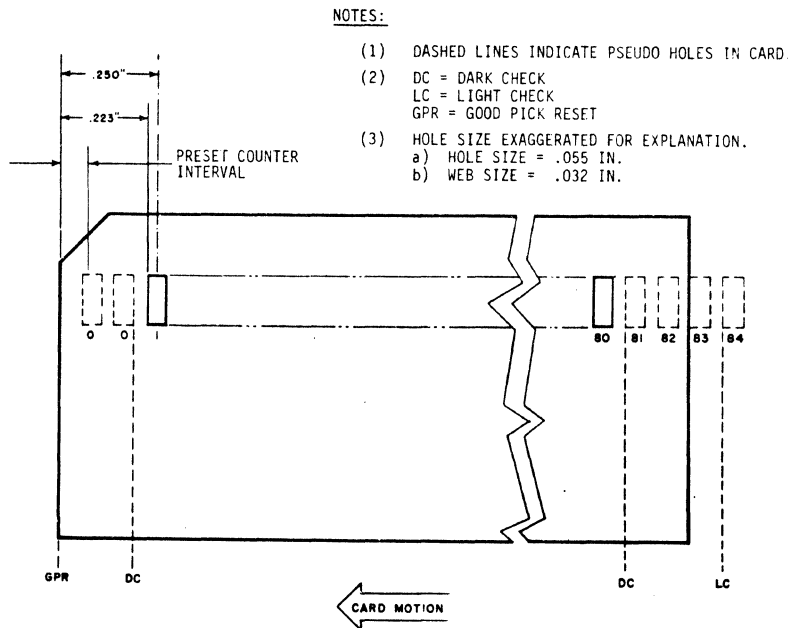


Figure 4-3 - Timing Relationship for Standard Punched Card

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

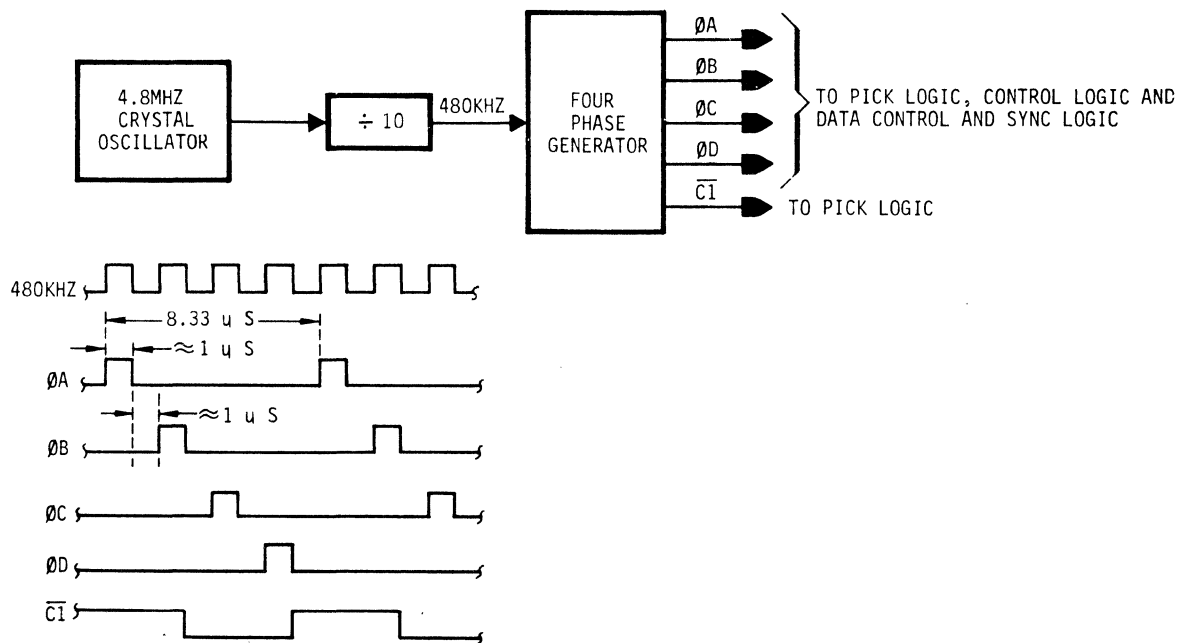


Figure 4-4 - Block and Timing Diagram, 4.8 MHz Oscillator and Four-Phase Generator

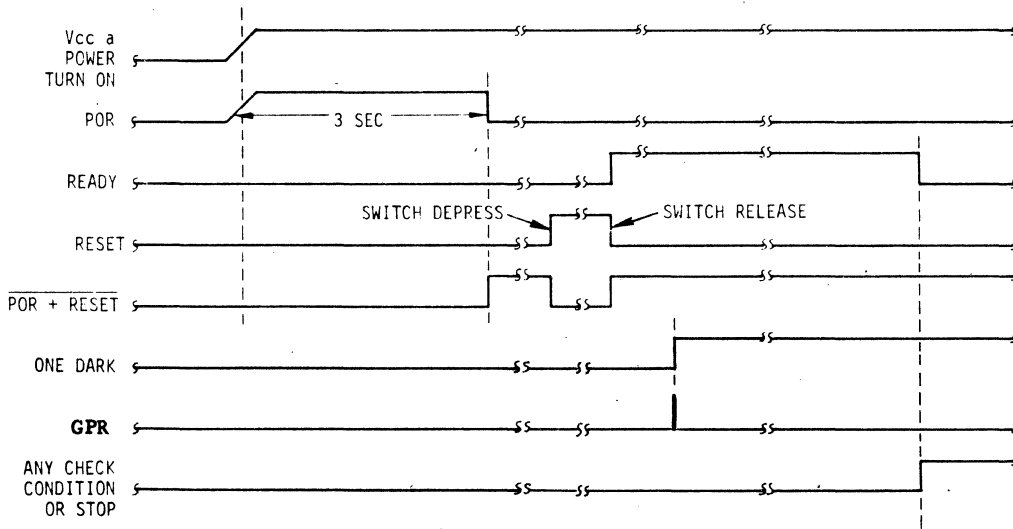
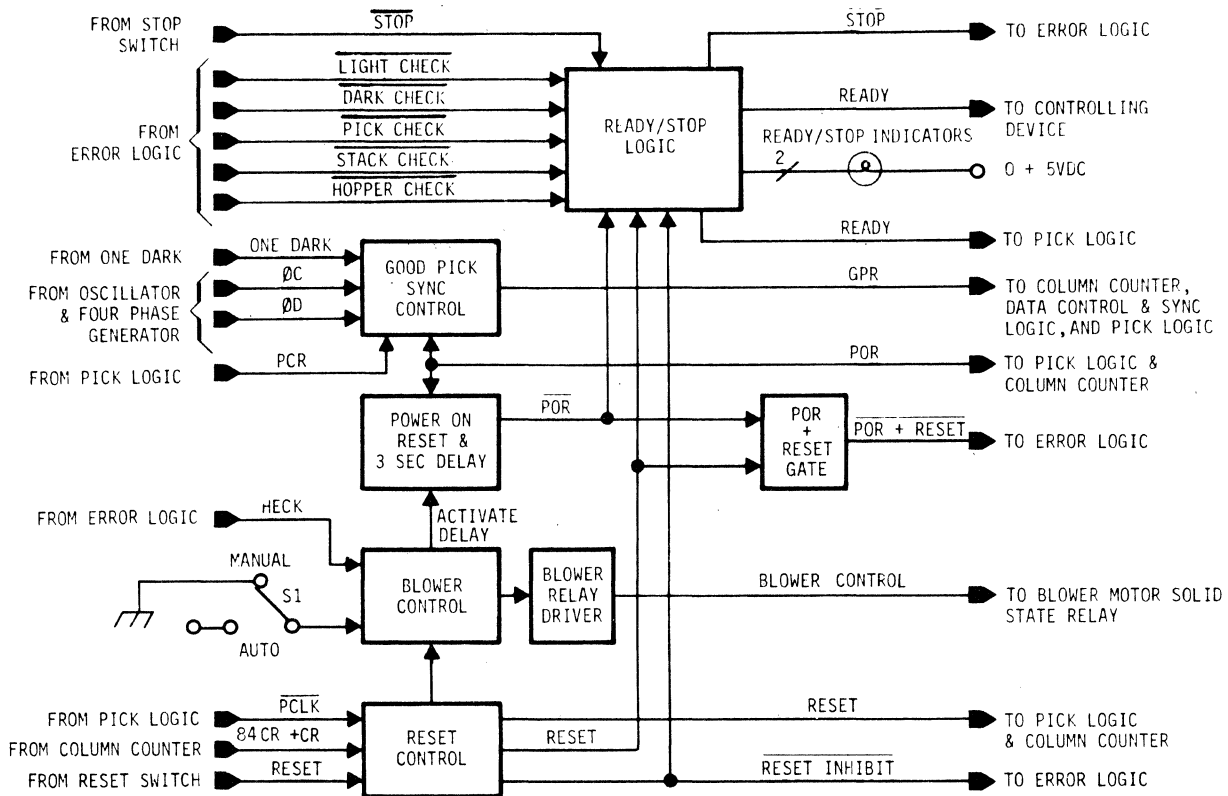


Figure 4-5 - Block and Timing Diagram, Control Logic

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

controlling device can be accepted by the Pick Control. (Figure 4-6, see diagram and timing.)

The Pick Logic will then:

1. Generate \overline{PCLK}
2. Initiate a PICK pulse that drives the picker solenoid.
3. Control the PICK pulse length.
4. Wait out the interval while the card leading edge is accelerated to the read station (14 to 27 ms).
5. If the leading edge has not arrived in 50 ms, generate another pick pulse.
6. Repeat the pick attempt six times and if the leading edge has not appeared, generate a pick fail alarm (\overline{PSET}).

The Pick Control generates \overline{PCLK} (Figure 4-6 timing) until a GPR is received or READY goes false due to the pick fail signal (\overline{PSET}). \overline{PCLK} gated from Pick Control is divided by two decade MSI counters to a frequency of 1.2 KHz. The 1.2 KHz is then counted by the Pick Control

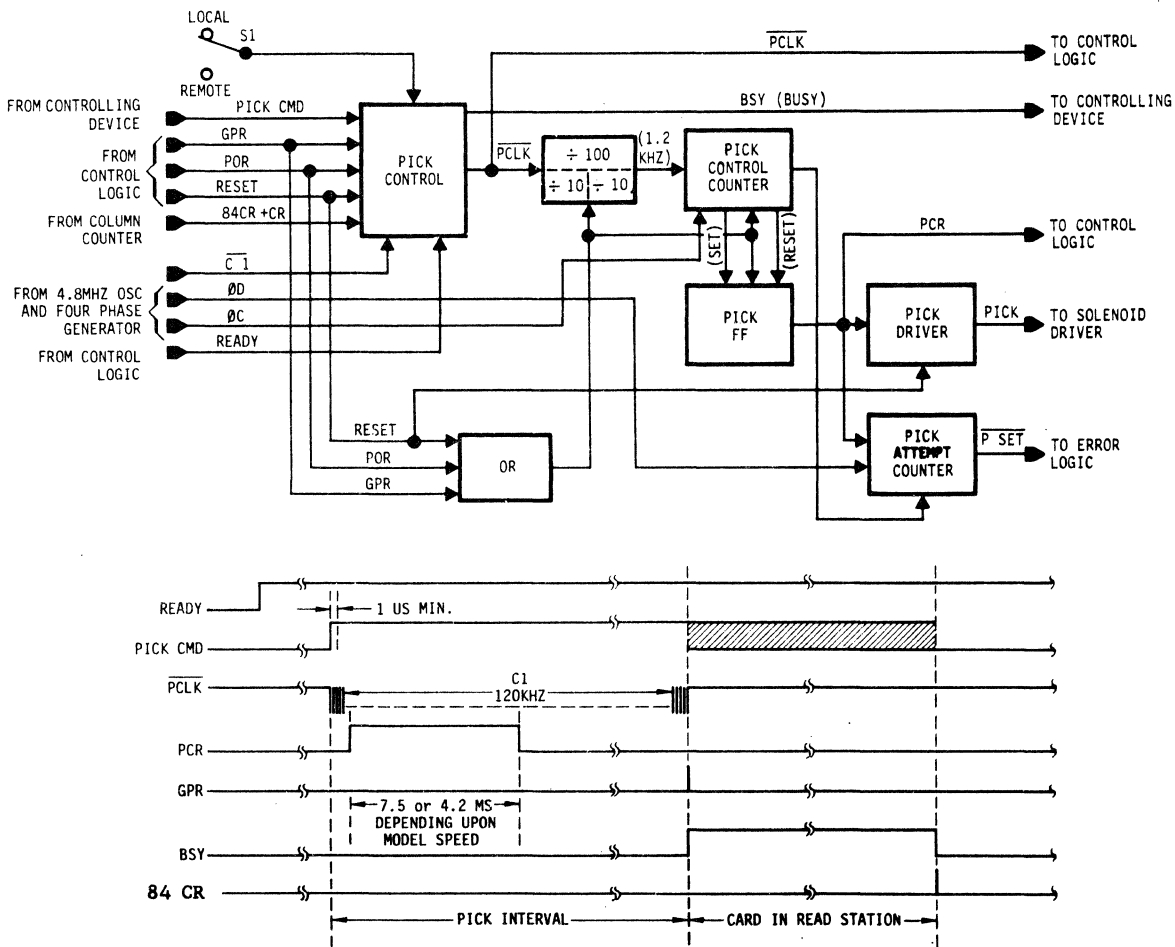


Figure 4-6 Block and Timing Diagram, Pick Logic

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 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 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. These signals are used by the Control Logic, Data Control and Sync Logic, Pick Logic and Error Logic as follows:

<u>COUNT</u>	<u>USED BY</u>
OCR	1. Error Logic for a Dark Check and set Stack FF.
1CR	1. Data Control and Sync Logic to set the Index Mark Control Flip Flop (IMFF).

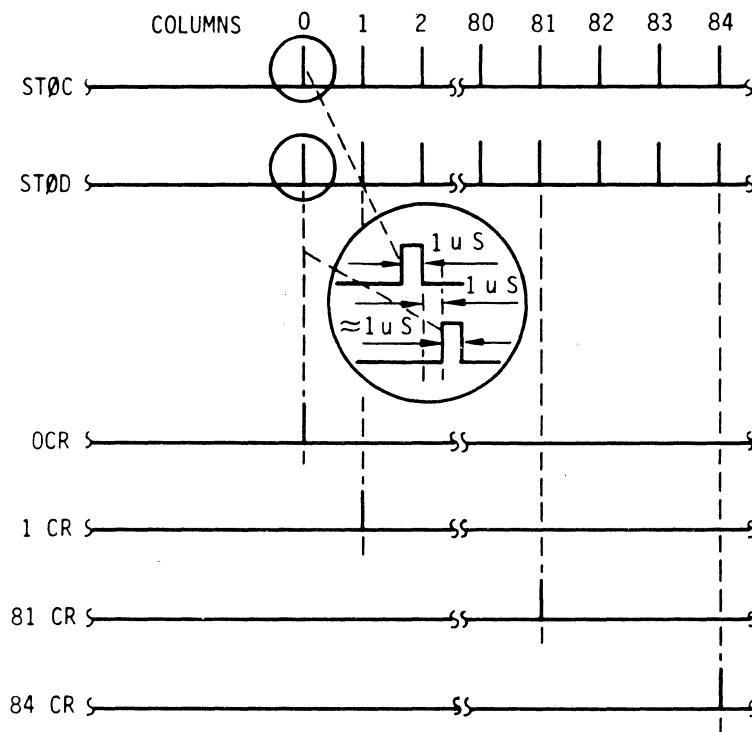
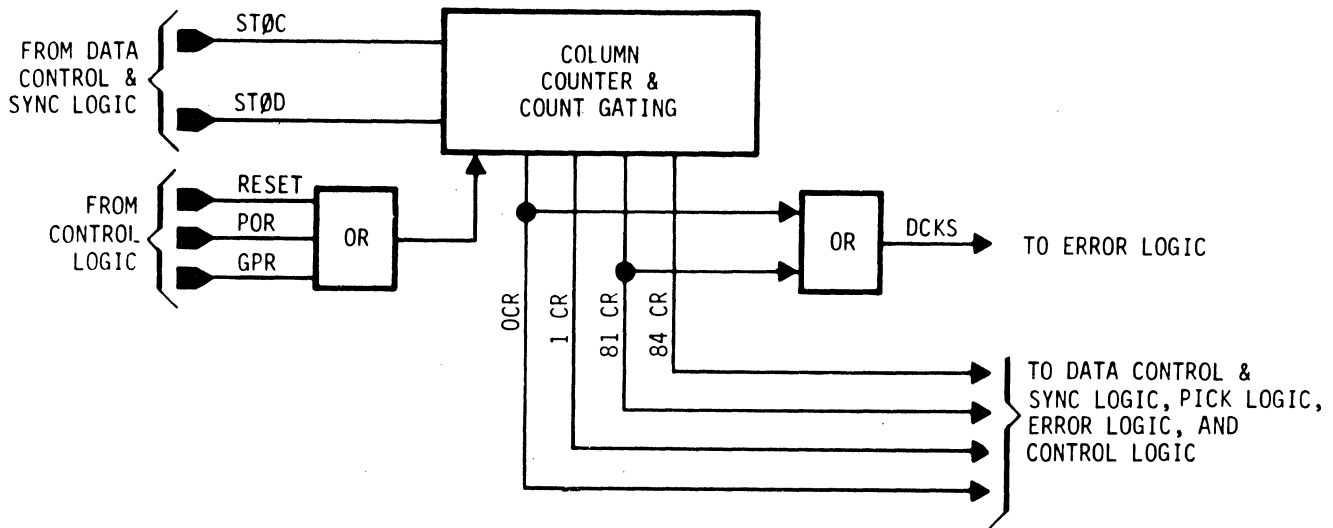


Figure 4-7 - Block and Timing Diagram, Column Counter

COUNT

USED BY

81CR

1. Data Control and Sync Logic to Reset the IMFF.
2. Error Logic for a Dark Check.
3. Error Logic for a Stack Check.

84CR

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. Error Logic for a Light Check.
4. Data Control and Sync Logic to reset the Sync Control Logic.

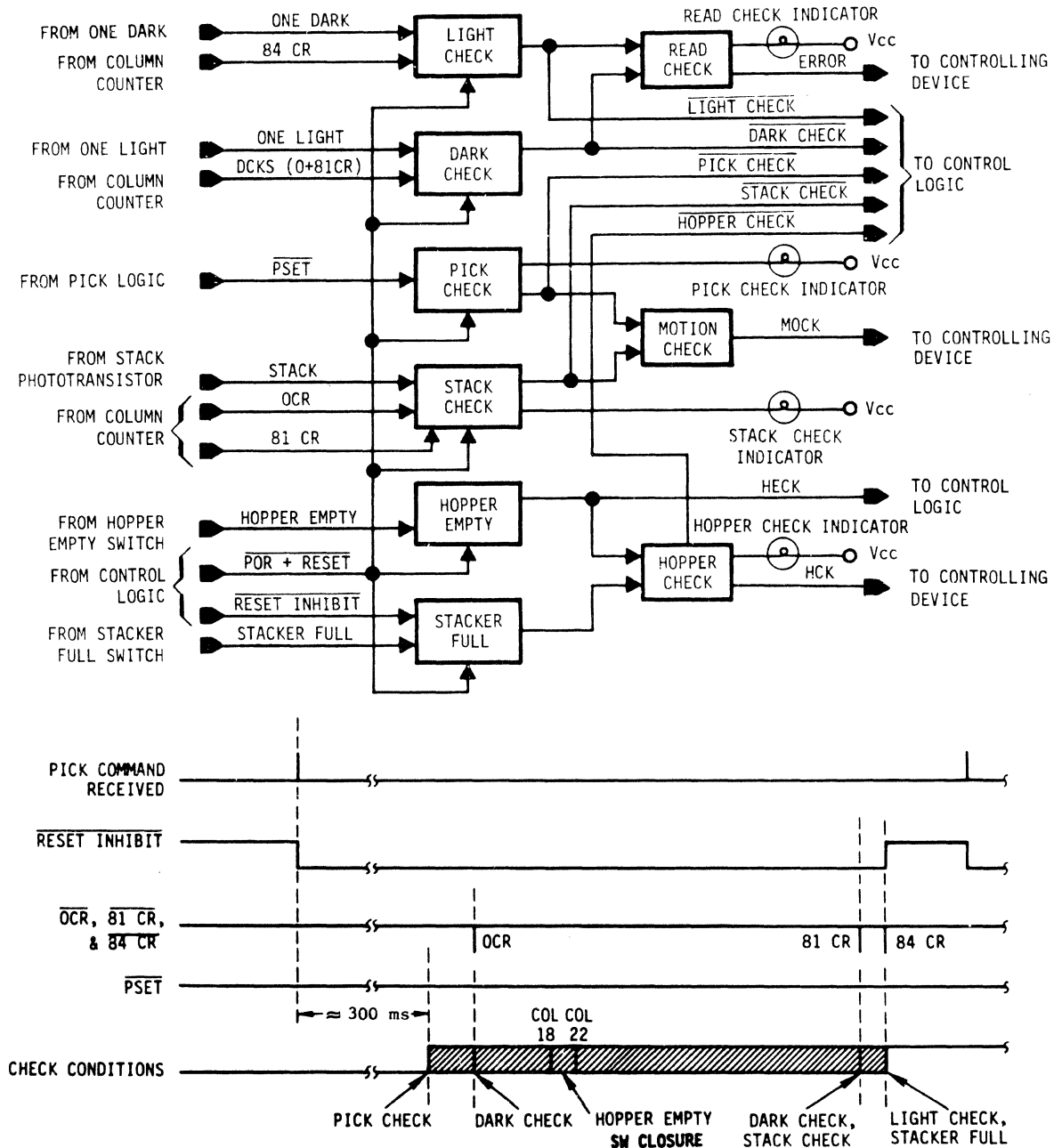


Figure 4-8. Block and Timing Diagram, Error Logic

The Column Counter counts until 84CR is generated. The Column Counter is reset to zero by each GPR and RESET or POR.

4.3.1.5 Error Logic

The Error Logic of Figure 4-8 contains the error/alarm detection circuits.

Once a PICK CMD is accepted by the reader, the Error Logic is sampled at intervals of card processing for error and reader conditions. These error/reader conditions are referred to as CHECK CONDITIONS and shown in the timing diagram of Figure 4-7. Should a CHECK CONDITION occur the reader READY will be reset. The first test is Pick Check. If a PSET is signalled to Pick Check, a Motion Check (MOCK) will be sent to the controlling device. PSET will occur approximately 300 ms after PICK CMD was received and reader READY will be reset. Pick Check will be signalled to the operator by the PICK CHECK control panel indicator. If PICK CHECK does not occur, a read cycle will be in process and OCR will sample the Dark Check circuits. Should ONE LIGHT be present during the check, indicating a failed LED, phototransistor, or a torn card leading edge, an ERROR signal will be sent to the controlling device and READY dropped. The reader control panel will indicate READ CHECK.

The Hopper Empty circuit senses closure of the Hopper Empty micro-switch. This switch is located under the riffle cap and senses when the last card has left the Hopper. As shown in the timing for CHECK CONDITIONS the hopper empty switch will close between columns 18 and 22 of the last card. Hopper Empty is signalled to the controlling device and READY is reset. Hopper Empty is signalled to the operator by the HOPPER CHECK indicator.

OCR will be followed by 81CR which samples the Stack Check circuits and again samples the Dark Check circuits. The stack check sensor is located at the exit of the card track and detects that the tail of a card is clear of the card track (fully seated in the output stacker). The Stack Check logic is designed to test the stack sensor light-to-dark transition (i. e., track clear) between the time an OCR signal occurs (card entering the read station) and the 81CR signal occurs. Should this transition not have taken place, a STACK CHECK alarm is generated. This signal generates a MOTION CHECK to the controlling device, resets the READY line and lights the STACK CHECK indicator on the control panel.

84CR occurs next in the read cycle and samples the Light Check circuitry. A ONE DARK present at 84CR indicates a failed LED phototransistor or

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 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 STACKER FULL to the controlling device, Reset READY, and light the HOPPER/STACKER 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 OCR and 81CR 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.

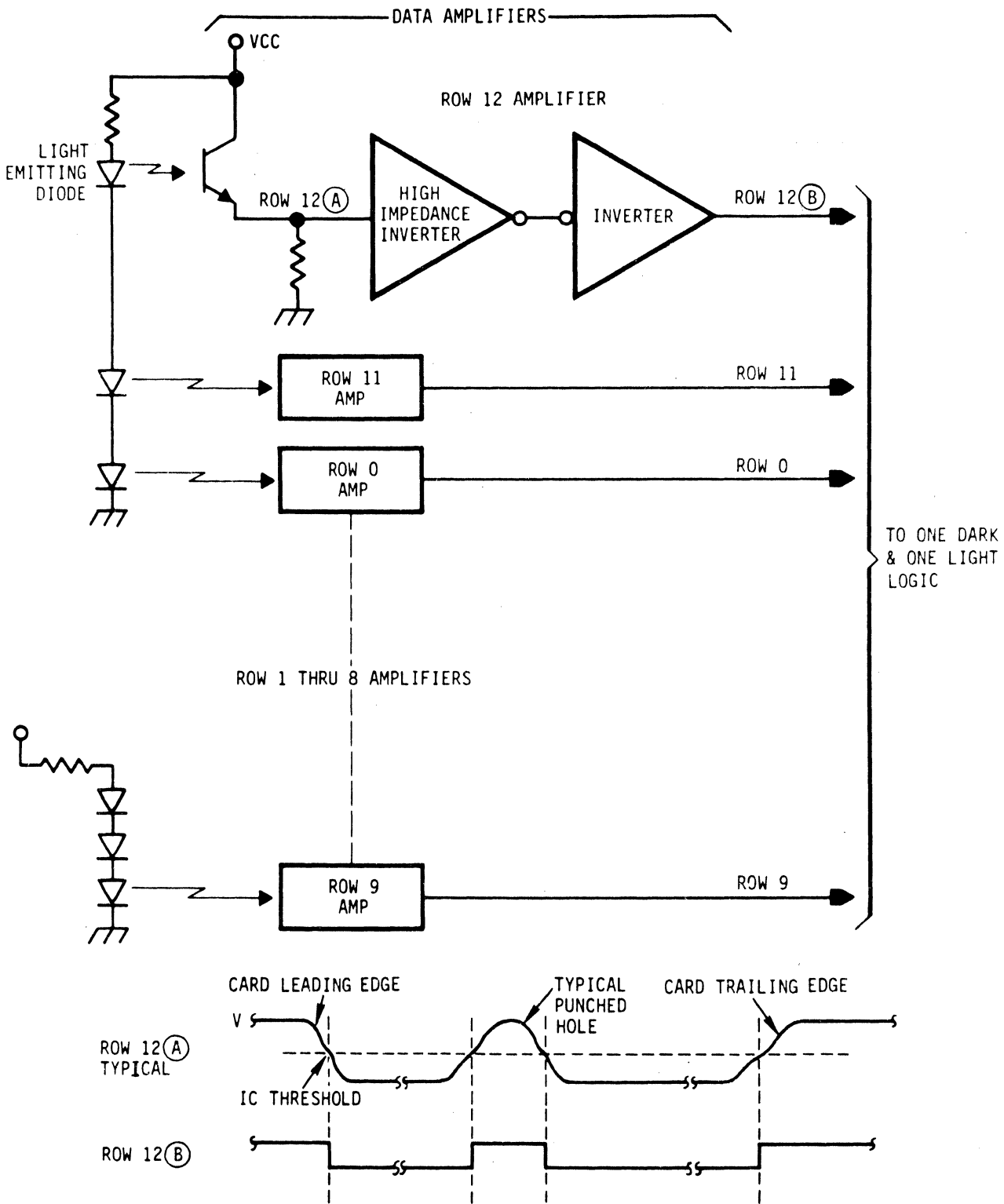


Figure 4-9. Block and Timing Diagram, Data Amplifiers and Inverters

The timing of Figure 4-10 shows the normal waveforms for ONE DARK and ONE LIGHT. When OCR occurs, ONE LIGHT should be low indicating all PTs are dark. The same is true for 81CR. 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,

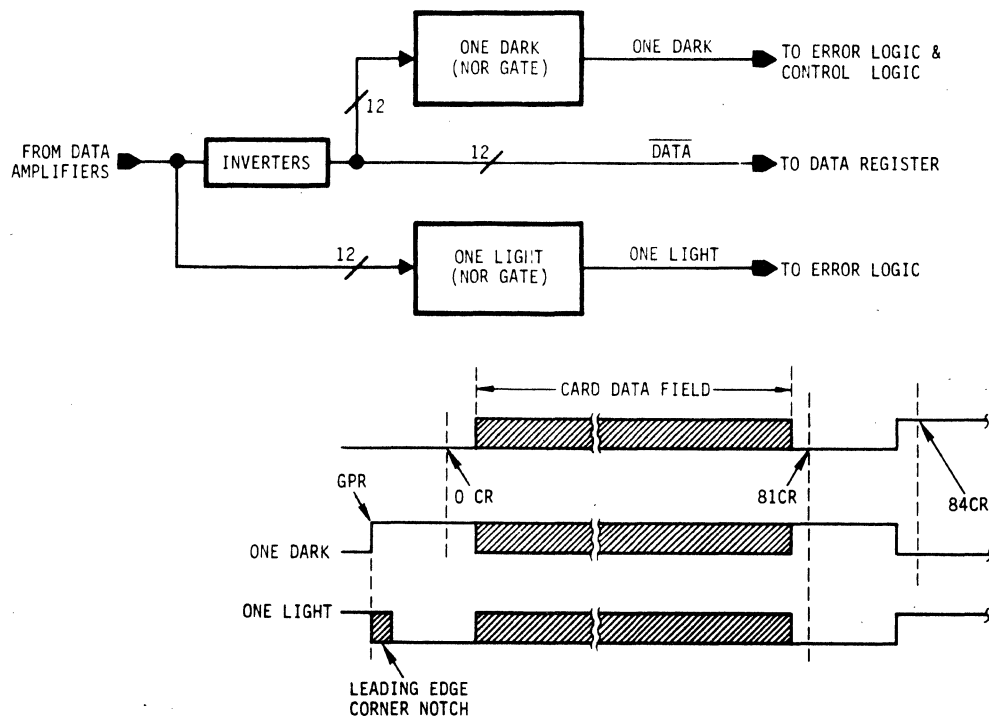


Figure 4-10. Block and Timing Diagram, One Dark and One Light

the first measurement is the PRESET DISTANCE. PRESET is the distance from the card's leading edge (GPR) to the point in column 0¹ where the Column Storage Data Strobe (CSDS) should begin. This distance is equal to .063 inch. The PRESET DISTANCE is predetermined and a PRESET count calculated by knowing the PRESET distance, card velocity and the Preset Counter's input clock rate. The sole purpose of the PRESET DISTANCE is to establish an end point for measuring OFFSET.

As the PRESET DISTANCE is being counted, the OFFSET DISTANCE is measured. The OFFSET is the distance from the trailing edge of the last Timing Disc tooth to pass the magnetic pickup to where the CSDS should begin. Since there are precisely two timing disc teeth for each Column on the card, the reader logic can now count the next two teeth's trailing edges, add the Offset Count and again be positioned to provide CSDS.

Because the Timing Disc's teeth rotate past the magnetic pickup asynchronously with respect to the arrival of the card's leading edge in the Read Station, the OFFSET DISTANCE is a variable and subsequently measured and stored for each card read.

The Synchronization process is initialized when a GPR is received by the Sync Control Logic and Preset Counter. GPR presets the predetermined count in the Preset Counter and causes the Sync Control Logic to generate PRCLK (see timing of Figure 4-11). A zero crossing amplifier (AMP) converts the sine wave produced by the Magnetic Pickup to a TTL compatible squarewave TST1. Following GPR, the first negative transition of TST1 (corresponds to tooth trailing edge) generates TST2 that causes the Sync Control Logic to generate OSCLK (Offset Clock). OSCLK at 120 KHz drives the eight stage Offset Storage Counter, counting it upwards, while and until the Preset Counter reaches all ones. ZERO is now generated by the Preset Counter terminating both PRCLK and OSCLK. The OFFSET has now been measured electronically and stored in the Offset Storage Counter.

The Sync Control counts two negative transitions of TST1 and generates Offset Up-Clock (OSUCLK). OSUCLK is used to count the Offset Counter up until the Comparator detects an equal value between the Offset Storage Counter and Offset Counter. CSDS for Column 0 is now generated by the Strobe Logic. The Strobe Logic's STØB resets the Sync Control Logic, STØC resets the Data Register and STØC and STØD are used to drive the Column Counter. The Sync Control Logic repeats this cycle for every other TST1 causing the Strobe Logic to generate CSDS, STØB, STØC and STØD each time.

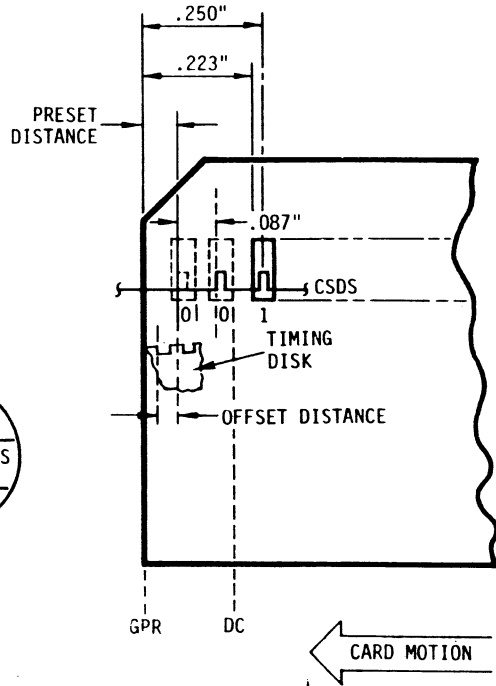
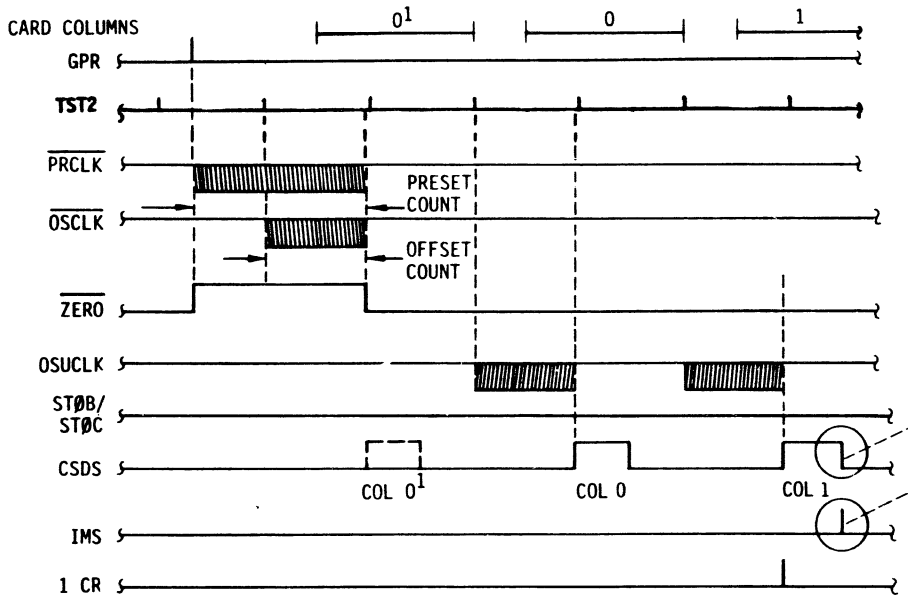
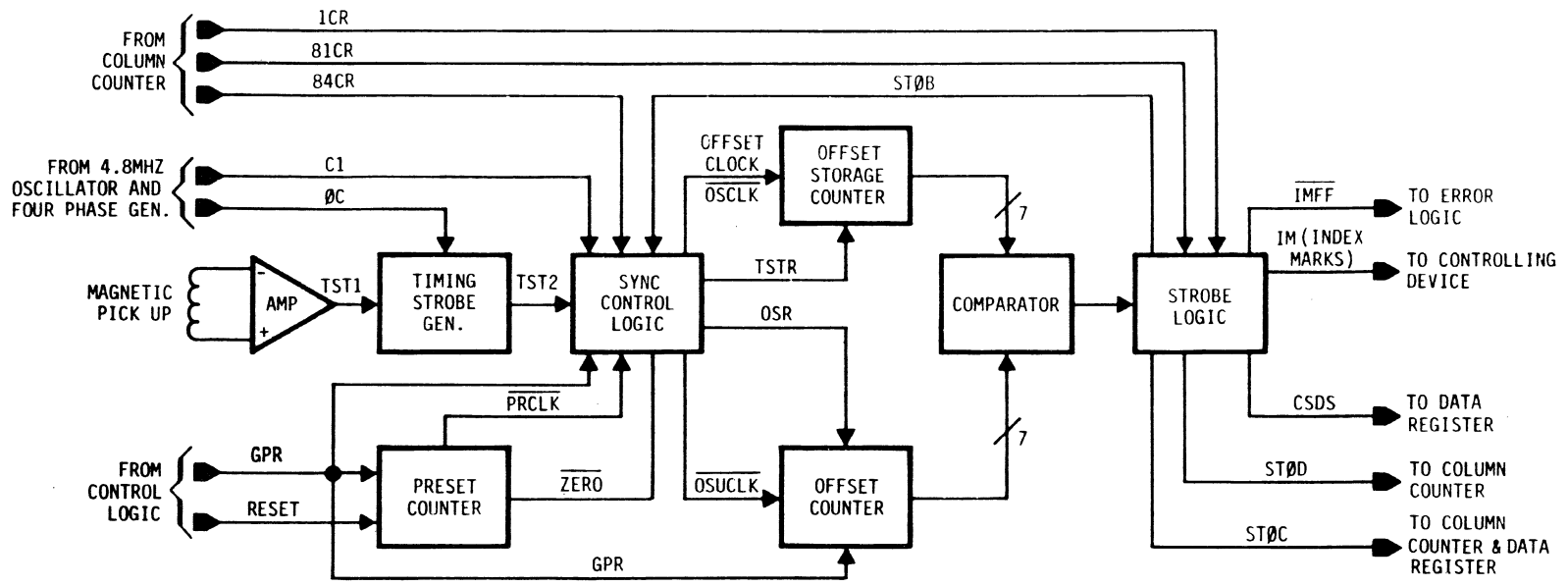


Figure 4-11. Block and Timing Diagram, Data Control and Sync Logic Drivers

4-17

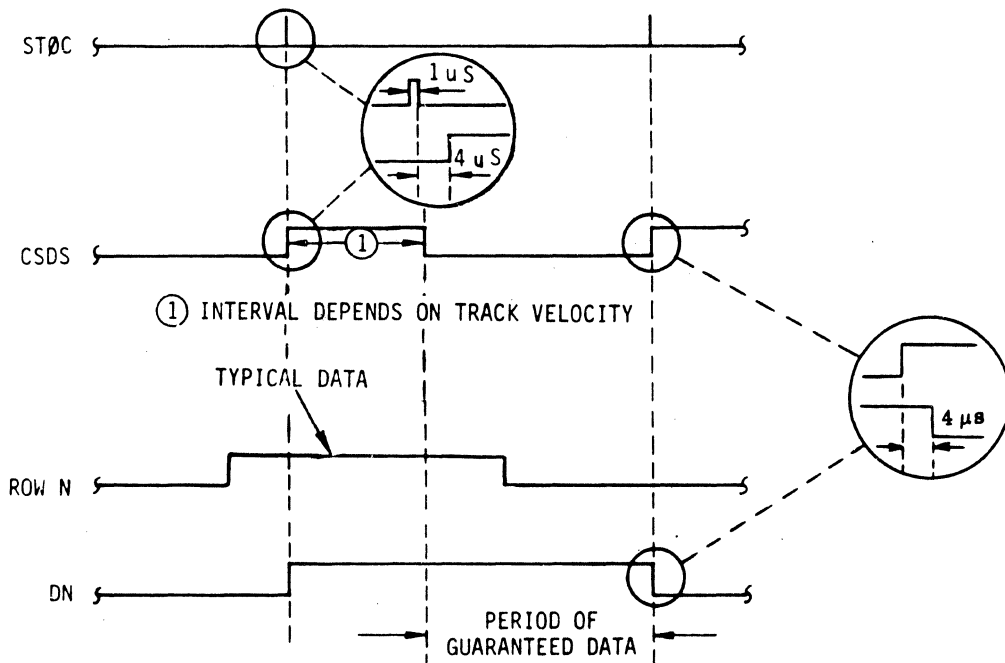
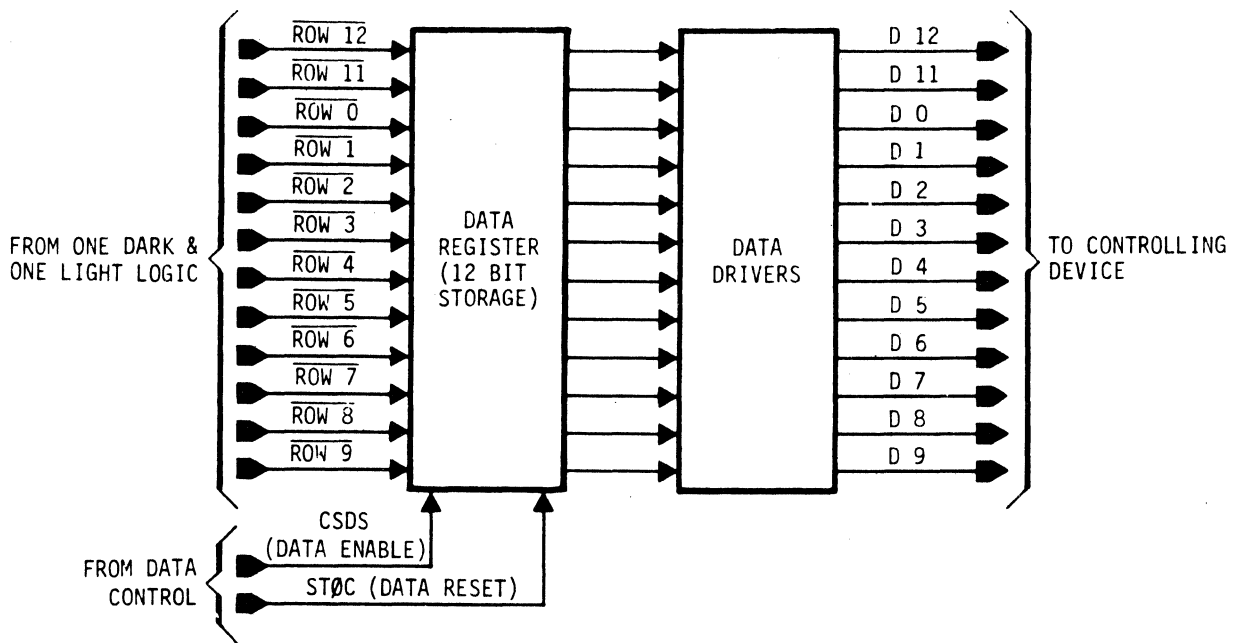


Figure 4-12. Block and Timing Diagram, Data Register and Data Drivers

1CR from the Column Counter sets the Index Mark Control Flip Flop (IMFF) in the Strobe Logic. The Strobe Logic generates $6\mu\text{s}$ 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 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 $1\ \mu\text{s}$ $ST\bar{O}C$ is followed in approximately $4\ \mu\text{s}$ 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

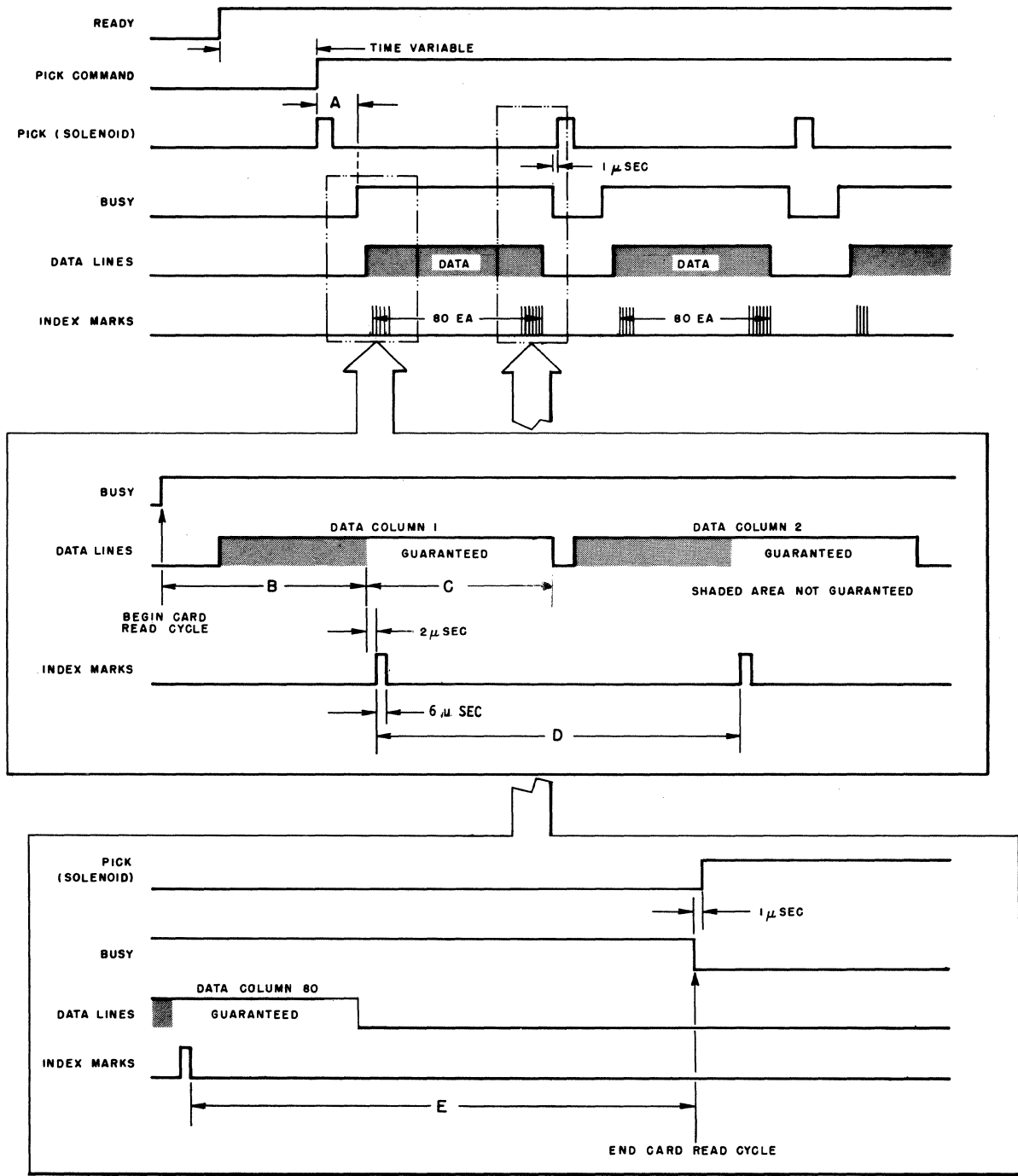
The PICK COMMAND initiates the card read cycle, and depending upon its duration, the card reader will either continuous run or operate in a card-at-a-time mode. This signal can be presented to the reader at any time, but the reader will only accept it when the READY line is TRUE. The READY signal indicates 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. REMOTE is selected on the LOCAL/REMOTE MODE switch.
4. Depress and release of the RESET pushbutton.

Should all of the above conditions be satisfied, 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 (us) 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 us of the BUSY signal going FALSE.



NOTE:
WAVEFORMS NOT SHOWN TO SCALE.

MODEL	A (MIN)	B	C	D	E	CARD PICK CYCLE
M 200	24	6250	1314	2014	8050	200
M 300	24	2600	435	870	102,660	200
M 600	24	2600	435	870	3480	100
M1000	15	1860	240	478	1910	60
M1200	14	1120	240	405	1529	50
	M SEC	μ SEC	μ SEC	μ SEC	μ SEC	M SEC

Figure 5-1. Interface Timing Diagram

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.

When the last card leaves the input hopper, the switch which senses the empty condition immediately signals a HOPPER CHECK and disables the READY signal. This occurs at the 81st data column. The reader continues the read cycle; however, when the BUSY line next goes FALSE the reader is stopped. In the case of a full output stacker, the HOPPER CHECK signal only appears at the end of the read cycle during which it occurred.

5.2.3.2 Error

The ERROR signal is produced by failure of the LIGHT or DARK check. This usually indicates that a card has a tear at the leading or trailing edge (DARK CHECK). If the read station should experience an emitter/sensor failure while reading a card, the LIGHT CHECK will pick it up. Either type of failure will be signalled by the ERROR line going TRUE and a READ CHECK indication on the front panel.

5.2.3.3 Motion Check

The MOTION CHECK signal is a composite of the PICK CHECK and STACK CHECK alarm. Both alarms are conditions requiring operator intervention and are furnished to the interface as a single alarm line. The condition is displayed on the front panel indicator lights as either a PICK CHECK or a STACK CHECK. The MOTION CHECK signal will occur within 300 ms of the initiation of an unsuccessful pick attempt or in time to inhibit the picking of the second card after the stacker sensor detects that a card is not completely clear of the card track.

5.3 CONNECTORS

The 38-pin output connector provides access for all control, data and alarm lines. The output connector is Elco part no. 00-8016-038-000-707 and the mating connector is Elco part no. 00-8016-038-217-704 with solder-type pins (#60-8017-0513). This mating connector assembly is available from Documation and is shipped unassembled as a kit (P/N 10139401).

The power connector is Hubbell part no. 7486. The mating connector is Hubbell part no. 7484. The mating AC power connector is supplied on the standard accessory power cord; however, it is identified if it is desired to fabricate a special power interface.

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)

5.4 SIGNAL CHARACTERISTICS

The standard interface is supplied as the output of TTL type 7404. Signal sense is specified as a Logical TRUE and is a positive level; logical FALSE is a ground level. Circuit characteristics are shown in figure 5-2. Other output drive configurations are available.

5.5 GROUNDING

Grounding within the M Series card readers maintains AC power and signal ground separate. Signal ground is the logic power return (Vcc return) and is transformer isolated from the AC power distribution system. The chassis is protected by connection to the safety wire (green) in the AC power cord.

It is recommended that twisted pair cable be used to connect the M Series card readers to external equipment. The signal returns should be terminated as close as possible to the signal receivers. It should be noted that pin EE (Index Mark return) is designated as SIGNAL GROUND on the pin assignment chart. If twisted pair interconnection is not used, it is recommended that pin EE be connected to the external equipment signal return.

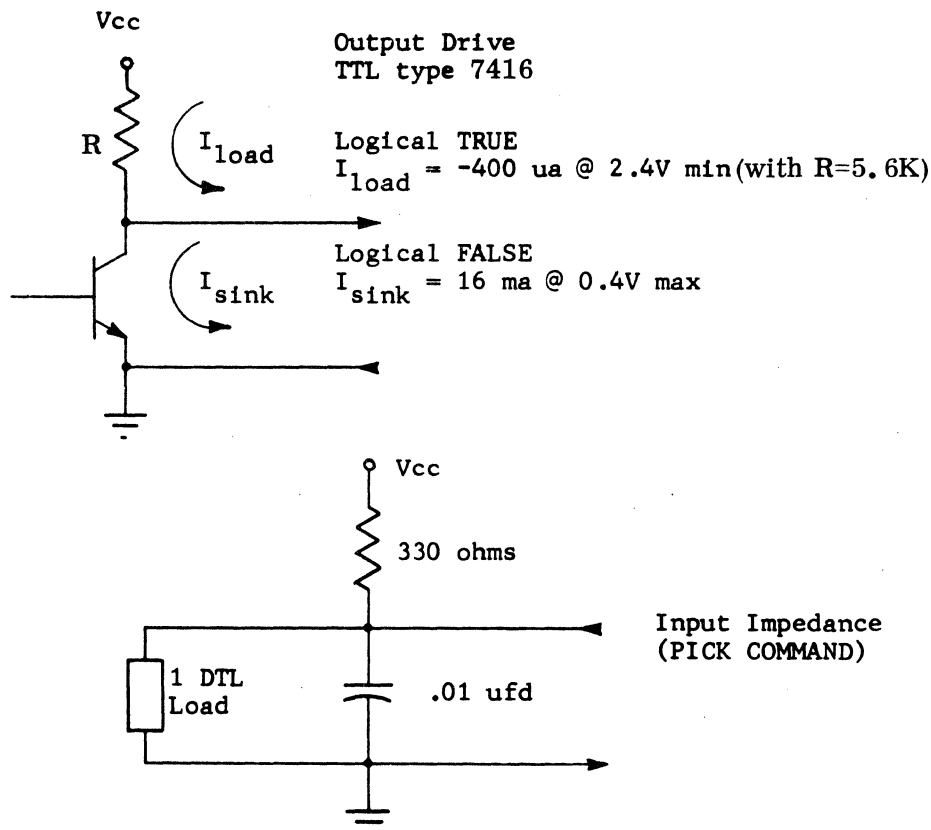


Figure 5-2. Circuit Characteristics

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 adjustment procedures in this section, it is necessary to remove the top cover and/or the rear panel as follows:

- a. Using a 5/64 Allen wrench, remove five screws (1), figure 6-1, which hold the top cover.
- b. Lift cover sufficiently to disconnect the control panel connector, figure 6-3, and remove cover.
- c. Using a 5/64 Allen wrench, remove six screws (2), figure 6-2, which hold the rear panel.
- d. Move panel out slightly, disconnect fan connector and remove panel.
- e. After adjustments have been completed, replace top cover and/or rear panel removed.

6.2 TENSION ON THE MAIN DRIVE MOTOR BELT

- a. Using a Phillips screwdriver, LOOSEN three motor mounting screws (1), figure 6-3.

CAUTION

THE DRIVE MOTOR BELT TENSION IS CRITICAL. TOO MUCH TENSION CAN CAUSE EXCESSIVE WEAR OF DRIVE ROLLER BEARING. IT MAY ALSO CAUSE DEFLECTION OF DRIVE ROLLER BEARING SHAFT RESULTING IN READ CHECKS. TOO LITTLE TENSION MAY CAUSE BELT TO JUMP A COG OR CREATE A NON-CONSTANT TRACK SPEED RESULTING IN LOSS OF TIMING, INCORRECT DATA, OR READ CHECKS.

- b. Move motor back and forth to be sure it slides freely. Attach spring scale to motor stand off so that pulling on spring scale from front 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 three motor mounting screws.

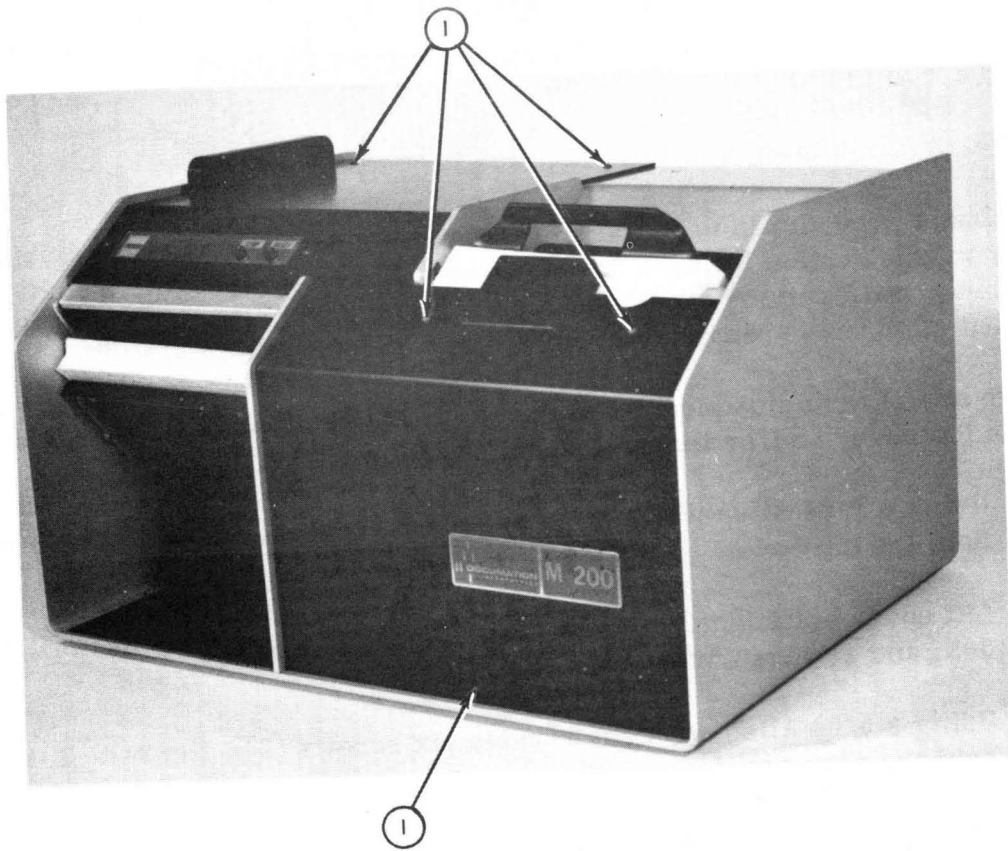


Figure 6-1. Top Cover Removal

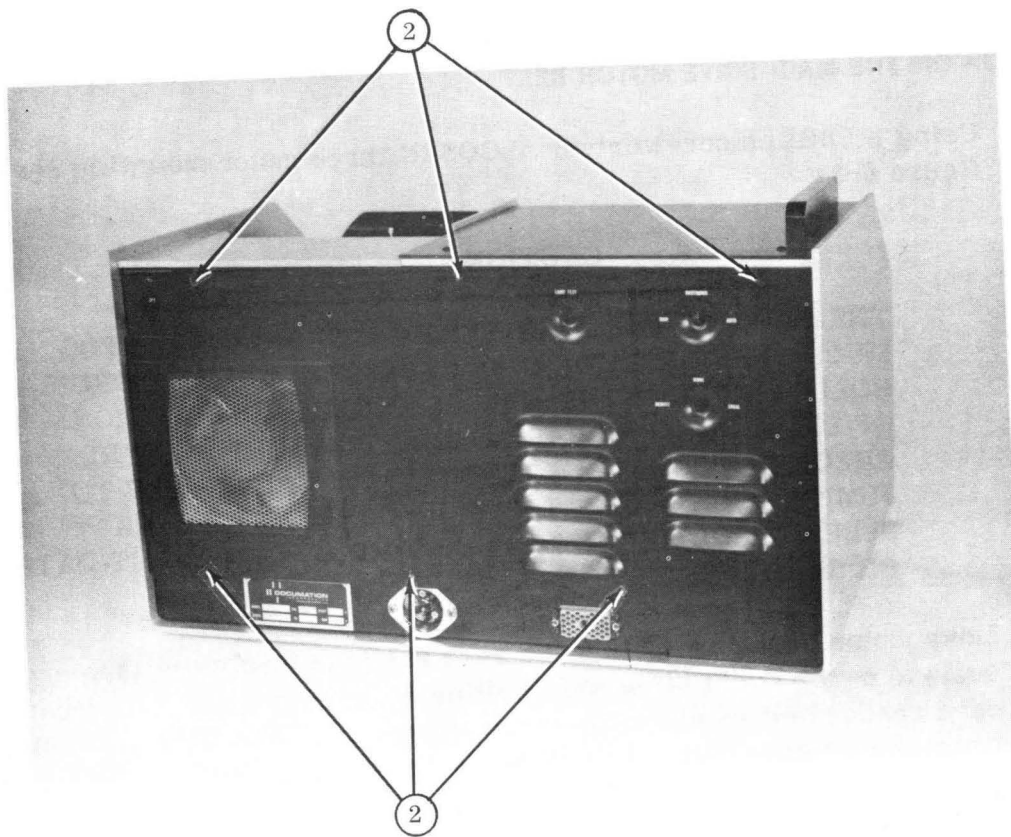


Figure 6-2. Rear Panel Removal

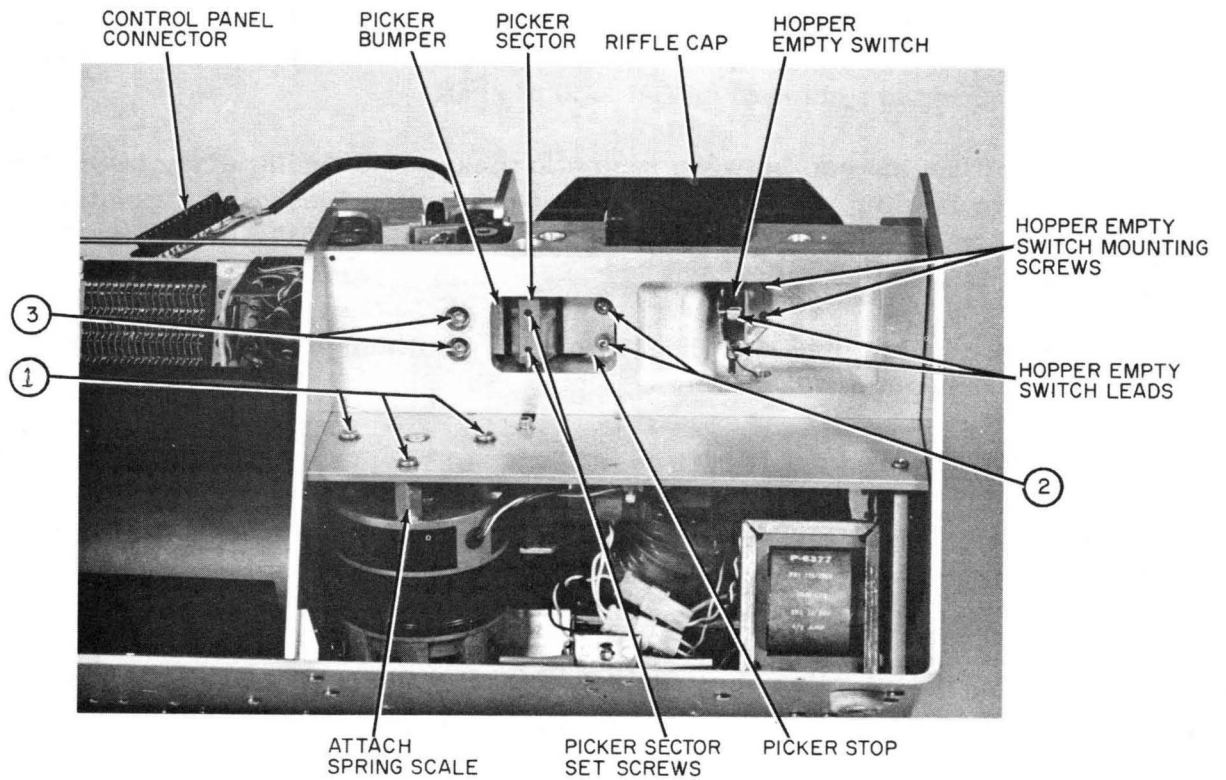


Figure 6-3. Drive Motor Belt Tension Adjustment

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 5/64 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.

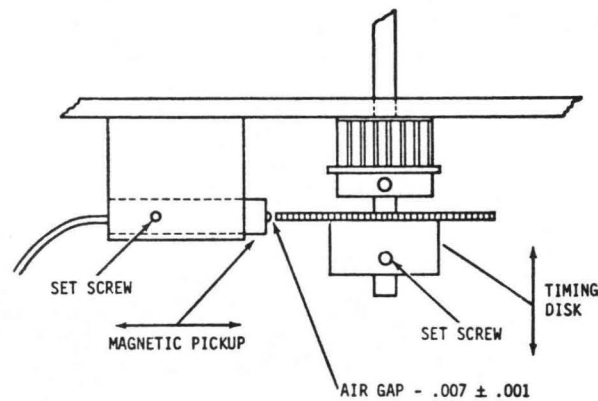


Figure 6-4. Magnetic Pickup Adjustment

- b. Align disc in correct position and tighten set screw , making sure that set screw is tightened on flat side of shaft .
- c. To adjust air gap between magnetic pickup and timing disc , LOOSEN set screw holding magnetic pickup in its mounting block and reposition pickup . The air gap should be set to $.007" \pm .001"$. (One punch card may be used as gauge .)
- d. Rotate timing disc and check two other positions to make sure that air gap is maintained .

6.4 ADJUSTMENT OF STACK PHOTOCELL

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

- a. Using a 1/16 Allen screwdriver , LOOSEN the set screw in the stacker casting which retains the stack photocell ① , figure 6-5.
- b. Remove photocell from stacker casting and inspect photocell lens for any damage .
- c. Replace stack photocell and align photocell lens flush with surface of stacker casting .
- d. Tighten photocell set screw .

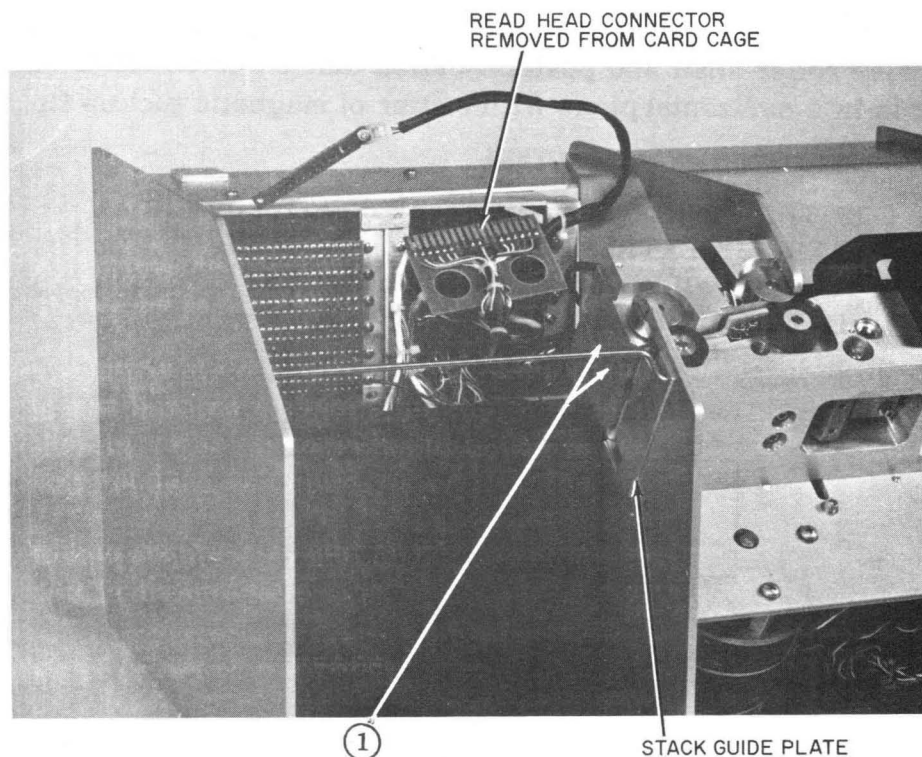


Figure 6-5. Location of Stack Photocell and Photocell Set Screw

6.5 ROLLER SHAFT BEARING PRELOAD

The preload of bearings on drive and stacker roller shafts is very important. This ensures that there is not detectable end play in shafts. If there is any detectable end play, excessive wear of the support bearings will result.

- a. Preloading bearings can be accomplished by rotating roller of shaft to be adjusted to conveniently expose the set screw. Using a 1/16" Allen screwdriver, LOOSEN set screw in top roller, figure 6-6.
- b. From bottom side of mainframe push shaft upwards as far as possible.

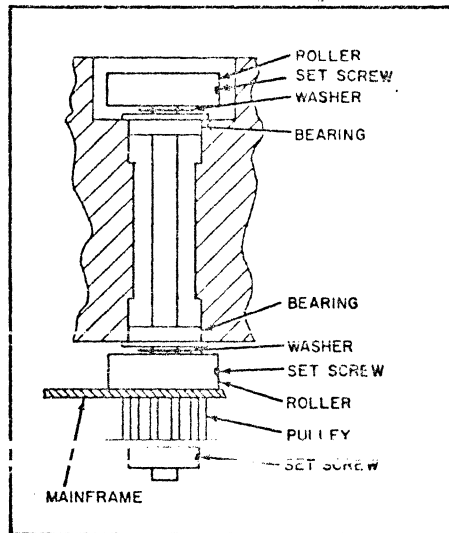


Figure 6-6. Roller Shaft Bearing Preload Adjustment

- c. Using a feeler gauge set, select gauge that will shim shaft in this position. Place selected gauge under roller.

NOTE

The size of the gauge required may be different for each shaft.

- 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.
- b. Check that operating arm of switch is parallel to top of picker casting, and that arm is not bent, figure 6-7.

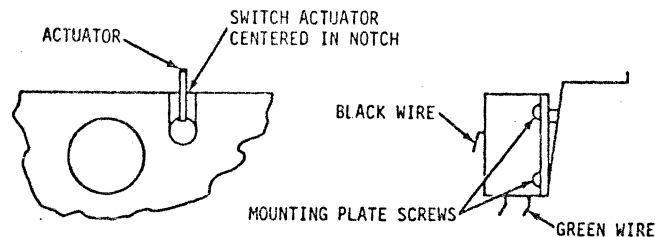


Figure 6-7. Hopper Empty Switch Adjustment

- c. Using a 1/16 Allen screwdriver, LOOSEN two screws holding switch mounting plate.
- d. Center switch arm in picker casting counterbore. Exert slight pressure on switch arm, pressing arm into casting. Tighten switch mounting plate set screws.
- e. Replace riffle air cap.

6.7 STACKER FULL SWITCH ADJUSTMENT

The stacker full switch is adjusted to ensure that output stacker full condition is detected.

- a. Remove two screws from bottom of mainframe holding stacker front panel (1), figure 6-8.
- b. Place approximately one inch of cards in hopper. Place AC power circuit breaker to ON.
- c. 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 indicator should illuminate. If this condition is not met, stacker full switch must be repositioned.

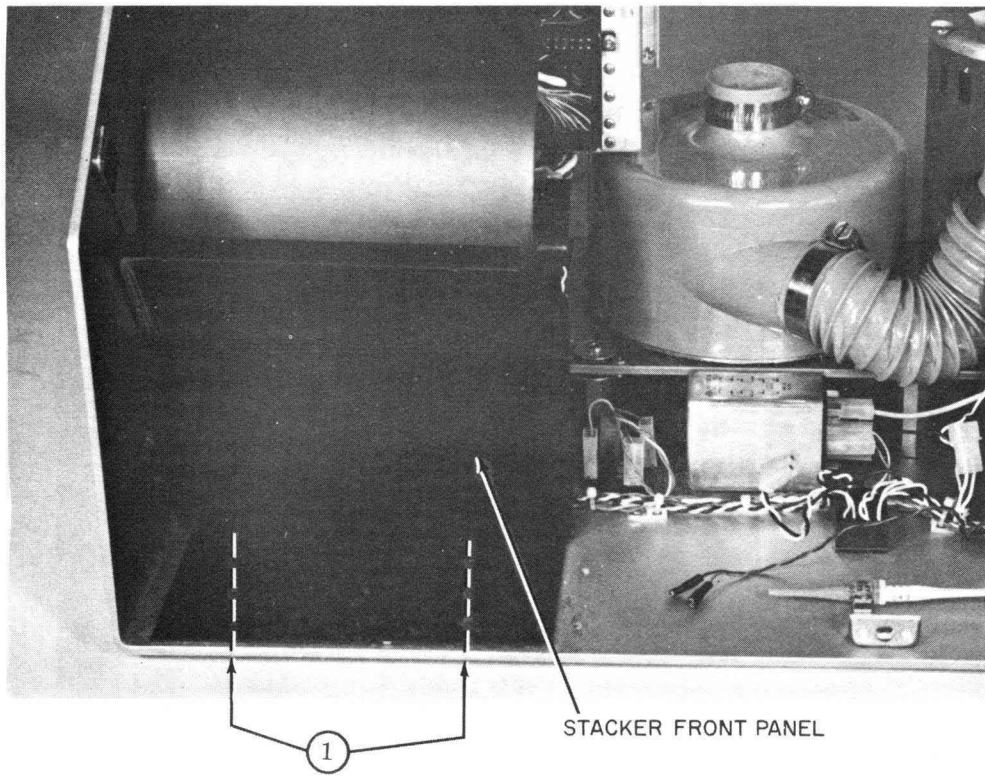


Figure 6-8. Stacker Panel Removal

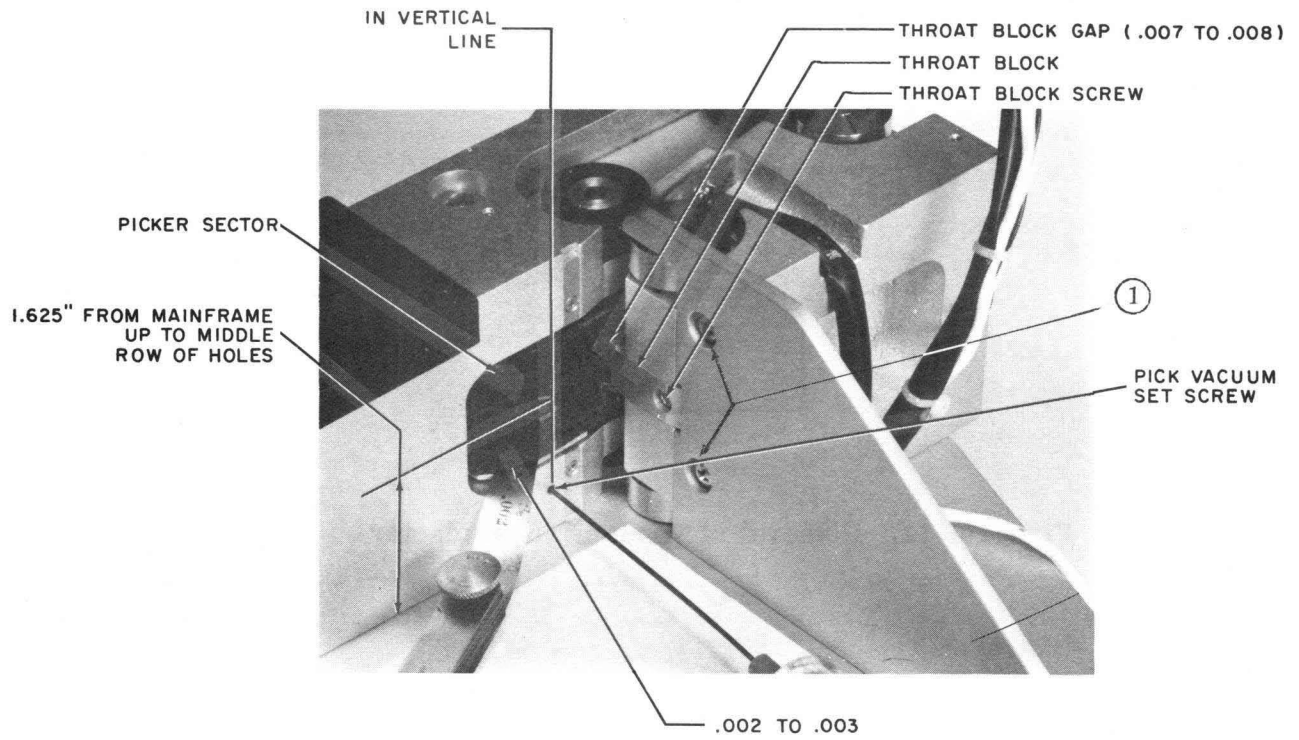


Figure 6-9. Picker Sector Adjustment, Rear View

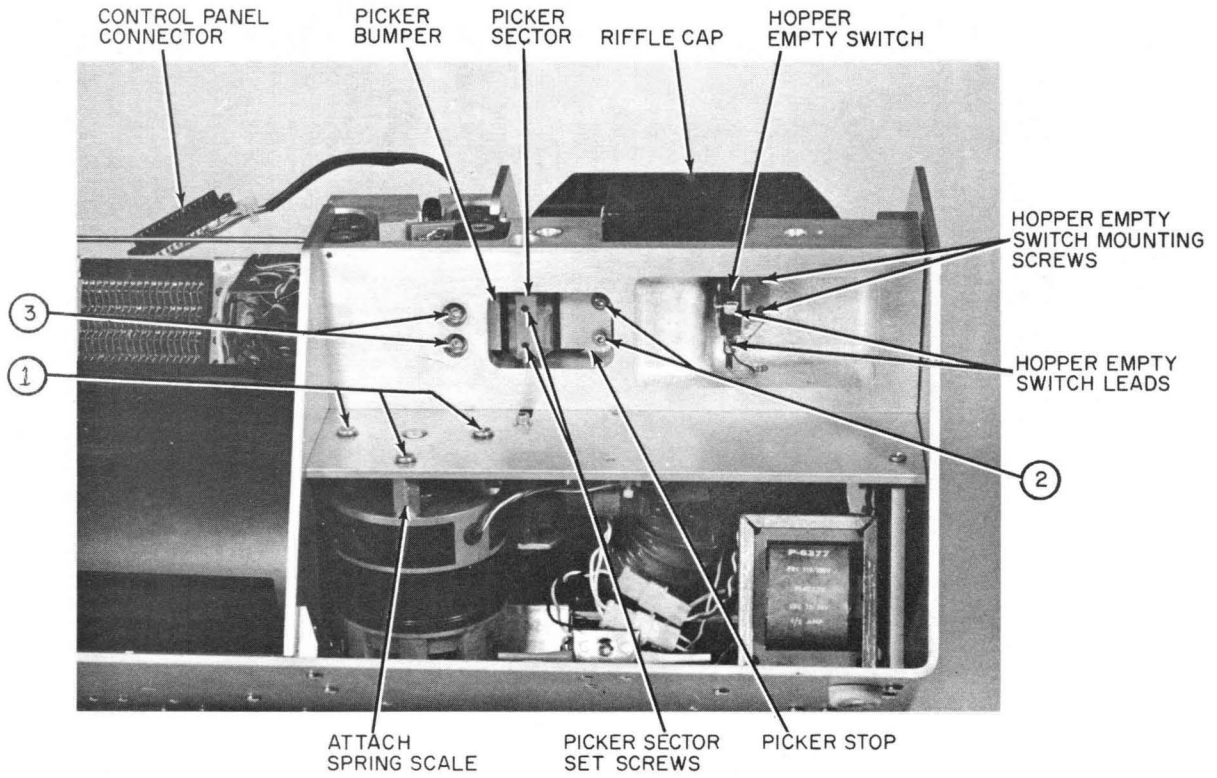


Figure 6-10. Picker Sector Adjustment, Front View

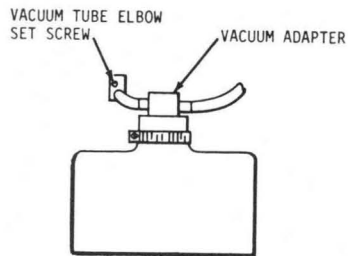


Figure 6-11. Removal of Vacuum Tube Adapter

- d. Using a small Phillips screwdriver, LOOSEN two screws retaining stacker full switch bracket.
- e. Adjust switch bracket until HOPPER CHECK indicator illuminates when stacker follow is approximately 1/8" before end of travel. Secure bracket mounting screws.
- f. Replace stacker front panel.

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 adaptor air gap, rest stop, throat block, forward bumper stop, and solenoid coupling. For solenoid coupling adjustments, see paragraph 9.5.

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 6-9.
- b. If height of picker sector requires adjustment, use a 5/64 Allen wrench and LOOSEN set screws in back of picker sector, figure 6-10.
- c. Adjust picker sector until there is exactly 1-5/8" between mainframe and center of middle rows of holes on picker sector.
- d. The second adjustment is air gap between picker sector and vacuum adapter plate. From bottom side of mainframe push vacuum adapter plate upward. Exert slight upward pressure and tighten vacuum adapter plate set screw. Recheck air gap and ensure that pick sector does not touch vacuum adaptor.
- e. Using a .50 Allen wrench, LOOSEN set screw in vacuum tube adapter elbow located on underside of mainframe, figure 6-11. Remove elbow from sleeve. Prop open hopper using about one inch of cards inserted at a right angle.
- f. Using a .050 Allen wrench, LOOSEN vacuum adapter plate set screw, figure 6-9.

- g. Insert a .002 feeler gauge between picker sector and vacuum adapter plate. From bottom side of mainframe push vacuum adapter plate upward. Exert slight upward pressure and tighten vacuum adapter plate set screw. Re-check air gap and ensure that picker sector does not touch vacuum adapter.
- 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 ②, figure 6-10.
- 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 6-9.
- 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. Be sure that sector does not rotate.
- p. Check adjustment of picker sector bumper. This bumper is used to limit picker sector over-travel to .020 inches beyond point where card is delivered to pinch rollers.
- q. Place about 2" of cards in the input hopper. Place AC power circuit breaker to ON. With reader in LOCAL, depress RESET switch and run a few cards into stacker. Depress STOP switch.
- r. Manually operate picker sector. Note point at which card readers pinch rollers. After card is picked, there should be approximately .020" of over-travel of sector before it reaches bumper.
- s. Using a 9/64 Allen wrench, LOOSEN two picker bumper socket head screws, ③, figure 6-10
- t. Adjust picker bumper to proper position and tighten screws.

6.9 STACKER ADJUSTMENT

- a. Remove top cover per paragraph 9.1, steps a. and b.
- b. Locate stacker spring behind left side of stacker tray, figure 6-12.

NOTE

The spring is adjusted at the factory for cards with approximately 3 punches per column (or 25% density).

- c. Adjust for cards with many punches by placing end of spring in one of the holes of spring plate toward front of plate.
- d. Adjust for cards with few punches by placing end of the spring in one of the holes of spring plate toward rear of plate.
- e. Place top end of spring in the hole which will allow sufficient clearance for card to drop into stacker tray, and cards then continue to load evenly and smoothly.

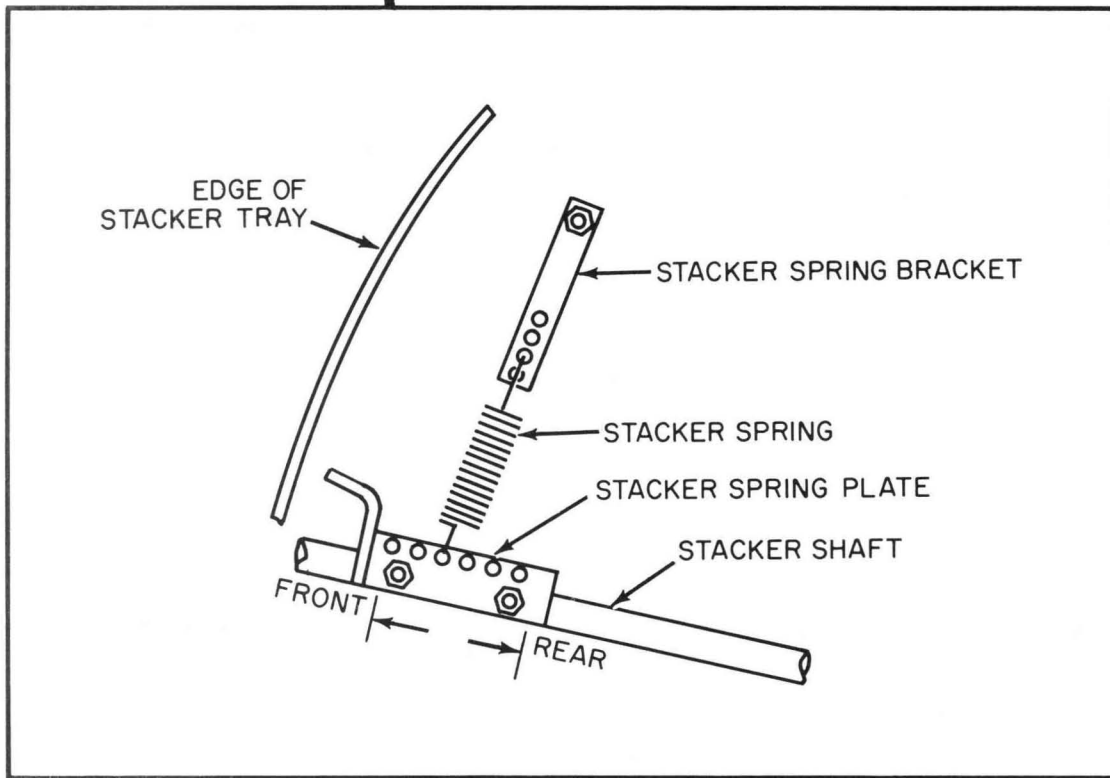
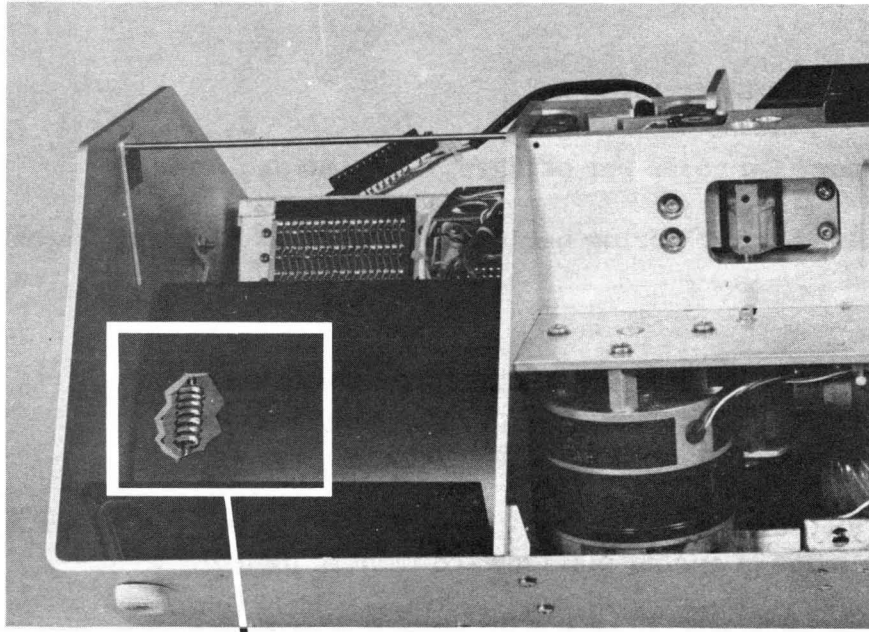


Figure 6-12. Stacker Spring Adjustment

SECTION 7

PREVENTIVE MAINTENANCE

7.1 GENERAL

The following paragraphs provide information for preventive maintenance and general care of the M200 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 five screws ①, 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.

7.2.3 COOLING FAN

The cooling fan air-intake screen performs the function of preventing dirt and dust from entering the card reader interior. Depending upon the operational atmosphere, the screen should be cleaned as necessary. Use a flat-blade screwdriver and remove the screen, then clean in a solvent or use a vacuum cleaner as necessary.

7.2.4 EXTERIOR CLEANING

The exterior should be cleaned as often as practical. Wipe the exterior with a clean, lint-free cloth saturated with a mild solvent such as denatured alcohol or household ammonia after each 40-hour operational period. If persistent dirt buildup is present, the exterior should be rubbed down with a heavier solvent. Attention to this routine will keep the anodized finish of the reader with a like-new appearance indefinitely.

7.3 LUBRICATION

The rollers of the rotary solenoid should be checked and one drop of lubricant applied to each roller every four months of operation. The amount of lubricant required will be determined by the humidity, use, and speed of the machine, but the four month application will maintain a safe level. Sparingly apply light lubricant, (Part No. 124048-001), to each of the three roller grease points (Figure 7-1). This is available from Documation or Ledex, Inc., Dayton, Ohio.

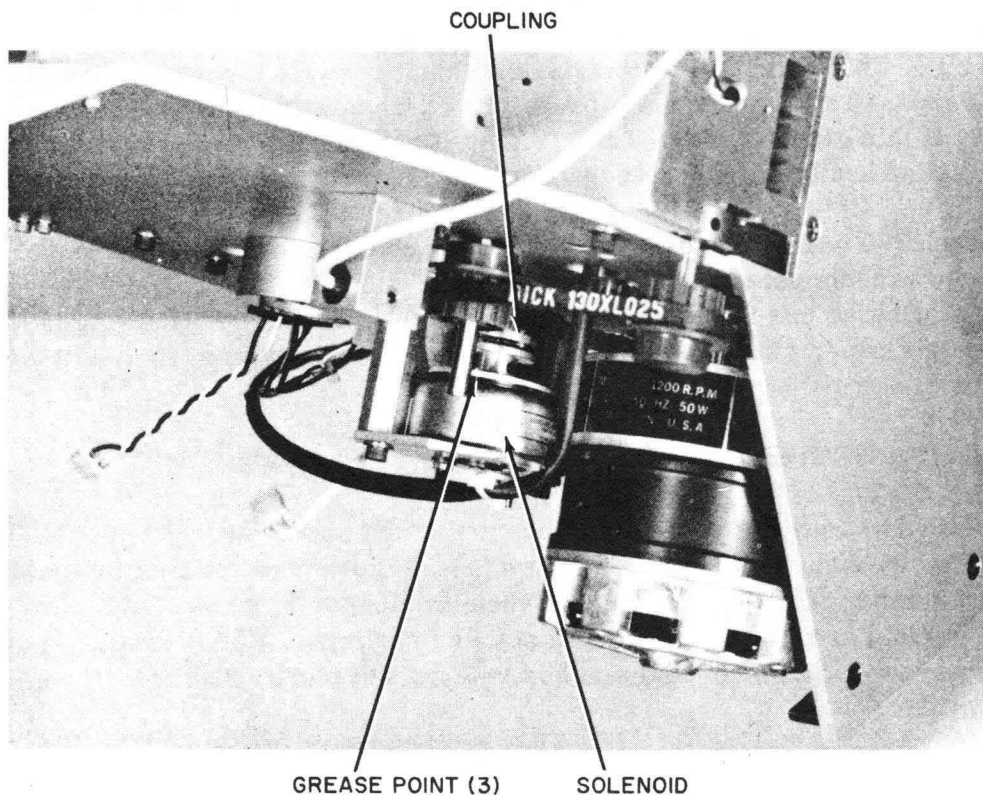


Figure 7-1. Solenoid Lubrication

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

SYMPTOM	PROBABLE CAUSE	REMEDY
HOPPER CHECK indicator does not light when stacker goes full.	<ol style="list-style-type: none"> 1. Stacker full switch is not adjusted properly. 2. Defective stacker full switch. 	<ol style="list-style-type: none"> 1. Adjust stacker full switch per paragraph 6.7. 2. Replace stacker full switch.
PICK CHECK indicator fails to light when reader makes six attempts and fails to pick a card.	<ol style="list-style-type: none"> 1. Lamp is burned out. 2. Defective Error Card. 	<ol style="list-style-type: none"> 1. Replace lamp. 2. Replace Error Card.
STACK CHECK indicator fails to light when there is a stack check condition.	<ol style="list-style-type: none"> 1. Lamp is burned out. 2. Defective Error Card. 	<ol style="list-style-type: none"> 1. Replace lamp. 2. Replace Error Card.
PICK CHECK indicator lights regularly after making six pick attempts.	<ol style="list-style-type: none"> 1. Dirty picker sector. 2. Maladjustment of picker stops, vacuum plate, throat clearance, or solenoid coupling. 3. Defective Sync Card. 4. Defective Error Card. 5. Defective Clock Card. 	<ol style="list-style-type: none"> 1. Clean picker sector with denatured alcohol. 2. Readjust picker sector per paragraph 6.8. 3. Replace Sync Card. 4. Replace Error Card. 5. Replace Clock Card.
READ CHECK indicator fails to light when a dark check or light check condition occurs.	<ol style="list-style-type: none"> 1. Lamp is burned out. 2. Column "0" output or Column "81" output is missing from the Clock Card. 3. One light or one dark output missing from the Control Card. 4. Defective Error Card. 	<ol style="list-style-type: none"> 1. Replace lamp. 2. Replace Clock Card. 3. Replace Control Card. 4. Replace Error Card.
Reader picks three cards, and then stops with a PICK CHECK.	<ol style="list-style-type: none"> 1. Good pick reset output is missing from the Clock Card. 2. Clear pick control is missing on the Sync Card. 3. Pick attempt counter is not being cleared out properly. 	<ol style="list-style-type: none"> 1. Replace Clock Card. 2. Replace Sync Card. 3. Replace Sync Card.

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"> 1. Column "84CR" output is missing from the Clock Card. 2. Column strobe phase "B" or phase "D" is missing from Sync Card. 3. Clock phase "C" or phase "D" is missing from Clock Card. 4. Clock phase "B" is missing from Clock Card. 	<ol style="list-style-type: none"> 1. Replace Clock Card 2. Replace Sync Card. 3. Replace Clock Card. 4. Replace Clock Card.
Reader reads erroneous data.	<ol style="list-style-type: none"> 1. Defective Clock Card. 2. Defective Sync Card. 3. Defective Control Card. 	<ol style="list-style-type: none"> 1. Replace Clock Card. 2. Replace Sync Card. 3. Replace Control Card.
Sharp, metallic noise from picker sector while reading cards.	<ol style="list-style-type: none"> 1. Picker sector maladjusted. 2. Rubber roller worn. 3. Bearing bad. 4. Belt too tight. 	<ol style="list-style-type: none"> 1. Adjust picker sector per procedure in paragraph 6.8. 2. Replace roller. 3. Replace bearing. 4. Readjust belt.

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 be followed closely and performed by a technician familiar with tools, their use and disassembly/assembly techniques.

The procedural steps necessary to remove and replace one or more assemblies, prior to performing any repair/adjustment, are provided below and the applicable steps are referenced in the repair/adjustment procedure.

(Top Cover Removal)

- a. Using a 5/64 Allen wrench, remove five screws ①, figure 9-1, which hold top cover.
- b. Lift cover sufficiently to disconnect control panel connector, figure 9-7, and remove cover.

(Rear Panel Removal)

- c. Using a 5/64 Allen wrench, remove six screws ②, figure 9-2, which hold rear panel.
- d. Move panel out slightly, disconnect fan connector and remove panel.

(Rear Connector Panel Removal)

- e. Using a Phillips screwdriver, remove three screws ①, figure 9-3, which hold rear connector panel to bottom plate.

(Main Mounting Plate Removal)

- f. Disconnect light station connector, figure 9-10.
- g. Disconnect motor AC connector, figure 9-12.
- h. Disconnect solenoid driver connector.
- i. Disconnect relay connector, yellow lead.
- j. Lift rubber protective cover from capacitor and disconnect red and blue leads.
- k. Disconnect hopper empty switch leads, figure 9-5.

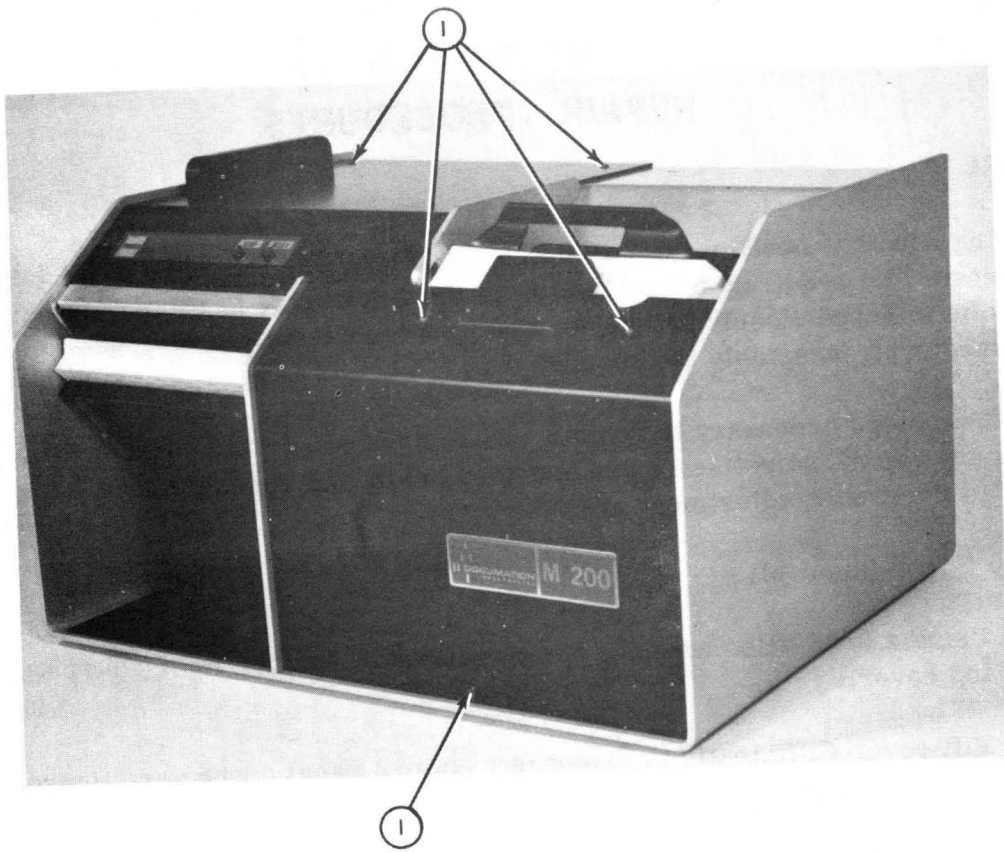


Figure 9-1. Top Cover Removal

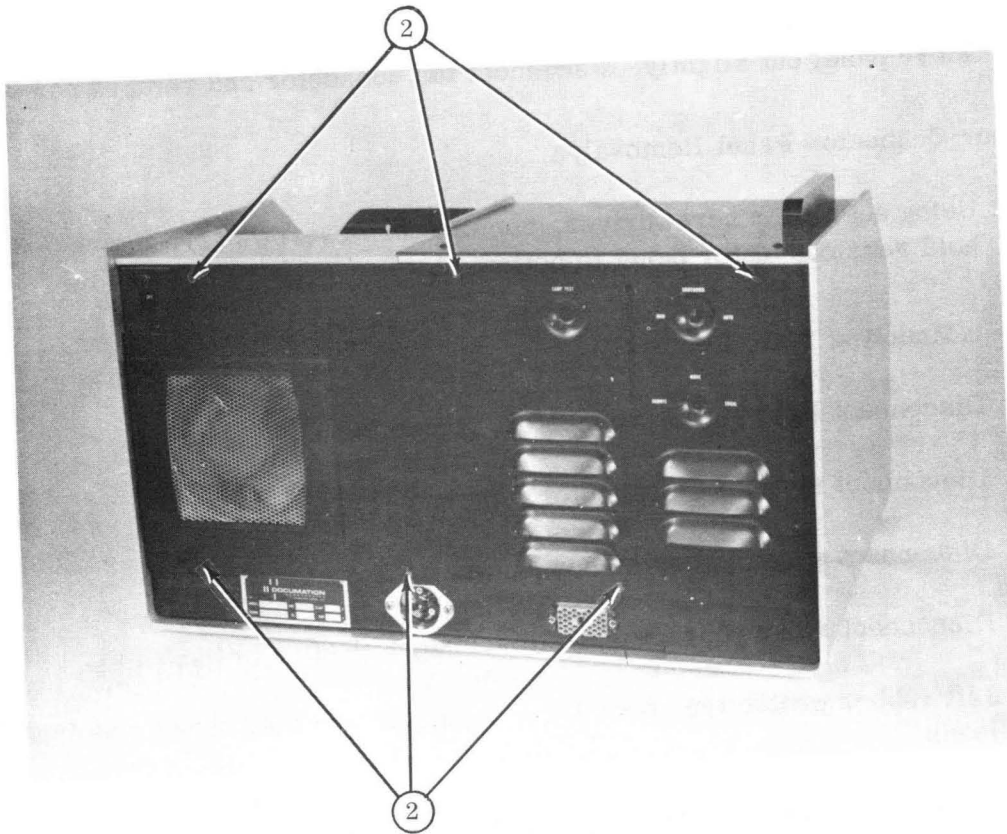


Figure 9-2. Rear Panel Removal

- l. LOOSEN vacuum hose clamp screw and remove hose from main mounting plate, figure 9-12.
- m. LOOSEN vacuum adapter clamp screw and lift adapter off from pump, figure 9-3.
- n. Disconnect read head connector from card cage, figure 9-7.
- o. Using a Phillips screwdriver, remove three screws (8); one from main mounting plate, and two from under mainframe, figure 9-4.
- p. Using a flat blade screwdriver, remove two screws (9) from top of main mounting plate.
- q. Remove main mounting plate and set to one side.

(Assembly/Assemblies Replacement)

- r. Replace in reverse order of disassembly.

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 Leaf Contact" Extraction Tool "AMP Modified Fork" Contact Extraction Tool "AMP Mod IV" Contact Extraction Tool Deutsch Insertion/Extraction Tool(on base plate) IC Removal Tool Elco Extraction Tool Elco Insertion Tool Feeler Gauge Set 0.0015" thru 0.025" Long Nose Pliers IC Test Clip 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 #2 Retaining Ring Remover Side Cutter Solder Removal Tool 60-Watt Soldering Iron 32-oz. Spring Scale	AMP 91022-1 AMP 465195-2 or 465275-1 AMP 91037-2 AMP 91029-1A M15570-16 AMP 91049-1 Elco 061877-04 Elco 061742-04 AP Inc. 923700 Documentation P/N 103099501

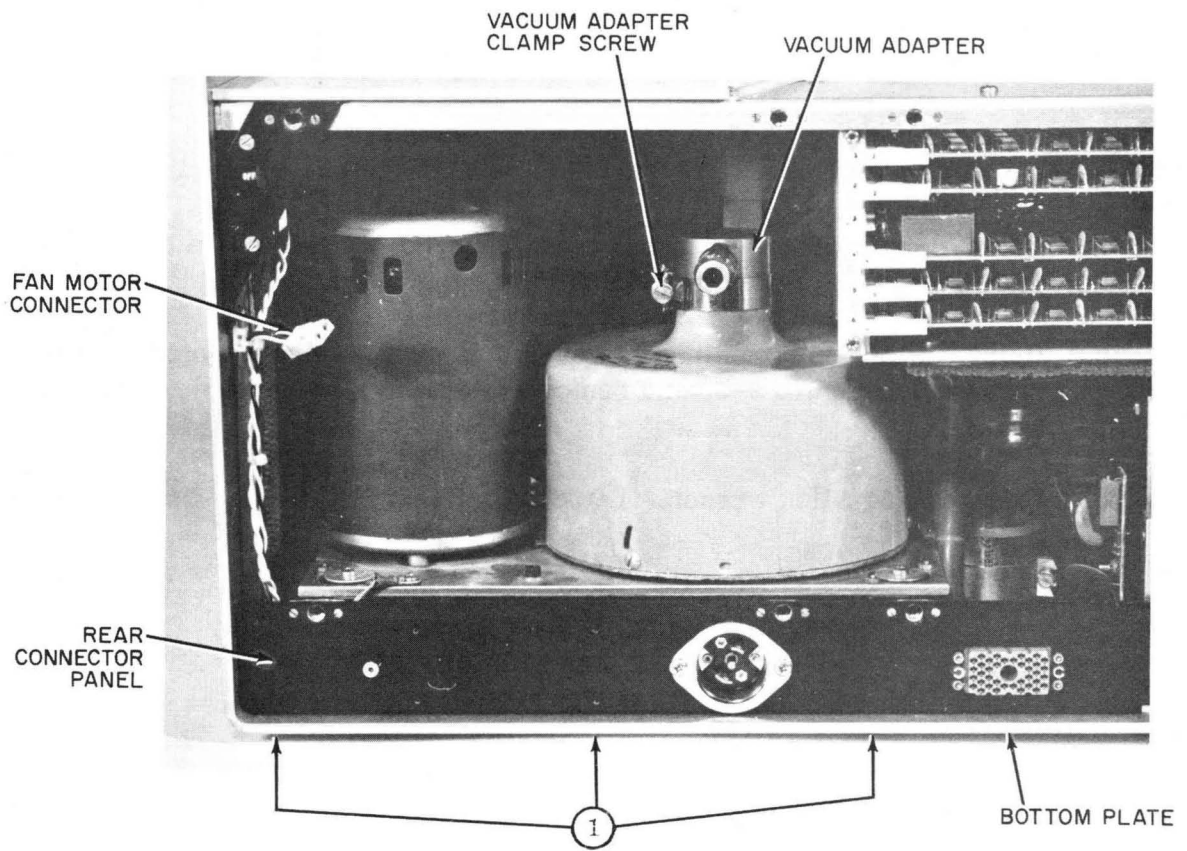


Figure 9-3. Rear View, Cover Removed

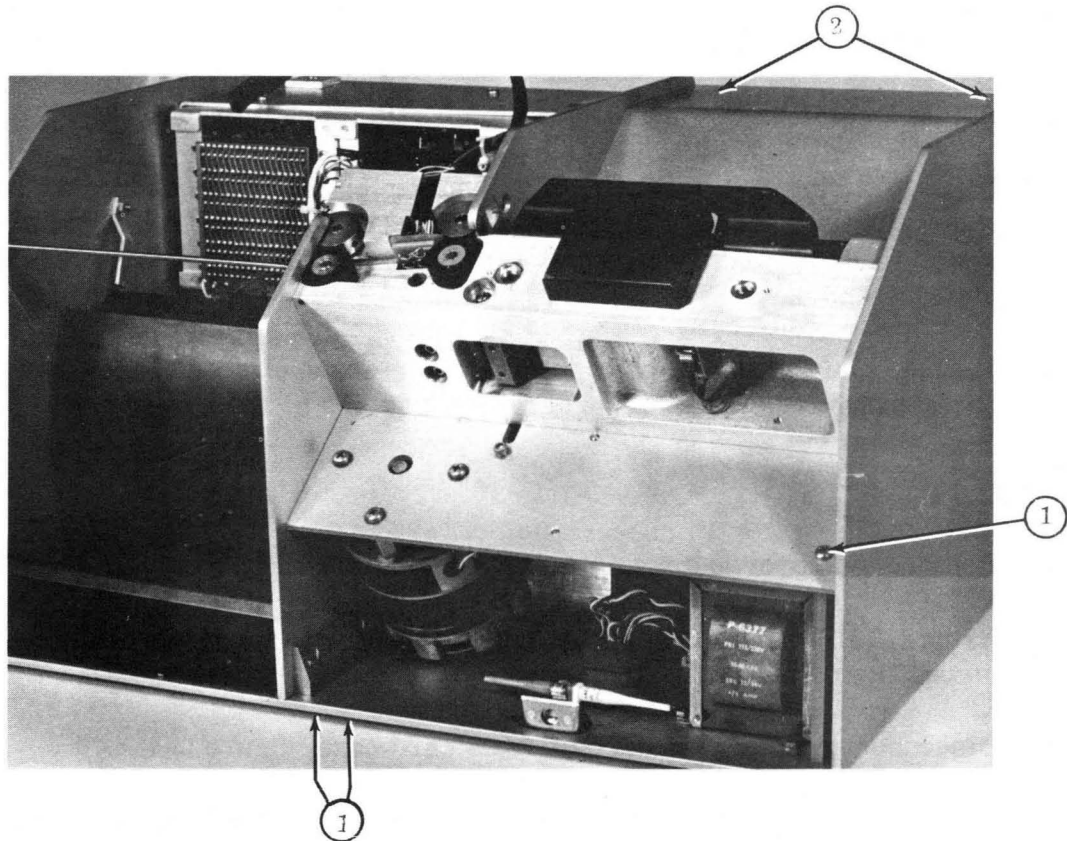


Figure 9-4. Front View, Main Mounting Plate Removal

9.3 MAIN DRIVE MOTOR BELT

- a. Remove top cover, rear panel, rear connector panel, and main mounting plate per paragraph 9.1, steps a. through q.
- b. Using a Phillips screwdriver, remove three main drive motor mounting screws ①, figure 9-5, and remove belt from motor pulley. Set motor aside.
- c. Using a 5/64 Allen wrench. LOOSEN set screw in timing disc, figure 9-6.

CAUTION

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

- d. Remove main drive motor belt.
- e. Replace belt over timing disc pulley and roller pulley.
- f. Reposition motor to replace belt over motor pulley, and replace motor mounting screws but do not tighten.
- g. Adjust tension on the main drive motor belt per paragraph 6.2.
- h. Replace timing disc on shaft, align with tip on magnetic pickup, figure 6-4, and tighten set screw. Check for $.007 \pm .001$ inch clearance between magnetic pickup tip and timing disc. Adjust if necessary per paragraph 6.3, steps c. and d.
- i. Replace main mounting plate, rear connector panel, rear panel, and top cover in reverse order of paragraph 9.1 (steps q. through a.).

9.4 MAGNETIC PICKUP

- a. Remove top cover and rear panel per paragraph 9.1, steps a. through d.
- b. Using a 1/16 Allen wrench, LOOSEN set screw in magnetic pickup mounting block, figure 9-6.
- c. Disconnect read head connector from card cage, figure 9-7.
- d. Free magnetic pickup cable from read head connector cable and unsolder wires (note colors) from pins J, K, and L on read head connector, figure 10-3.

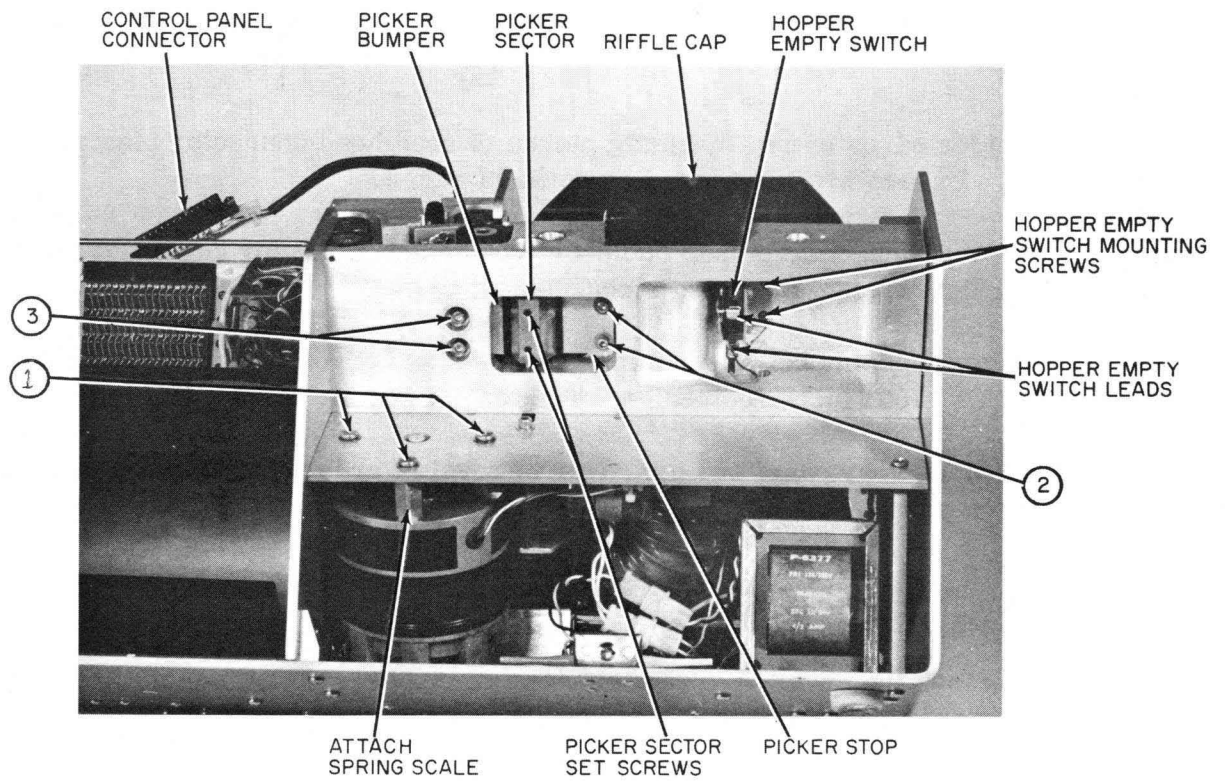


Figure 9-5. Partial Front View, Cover Removed

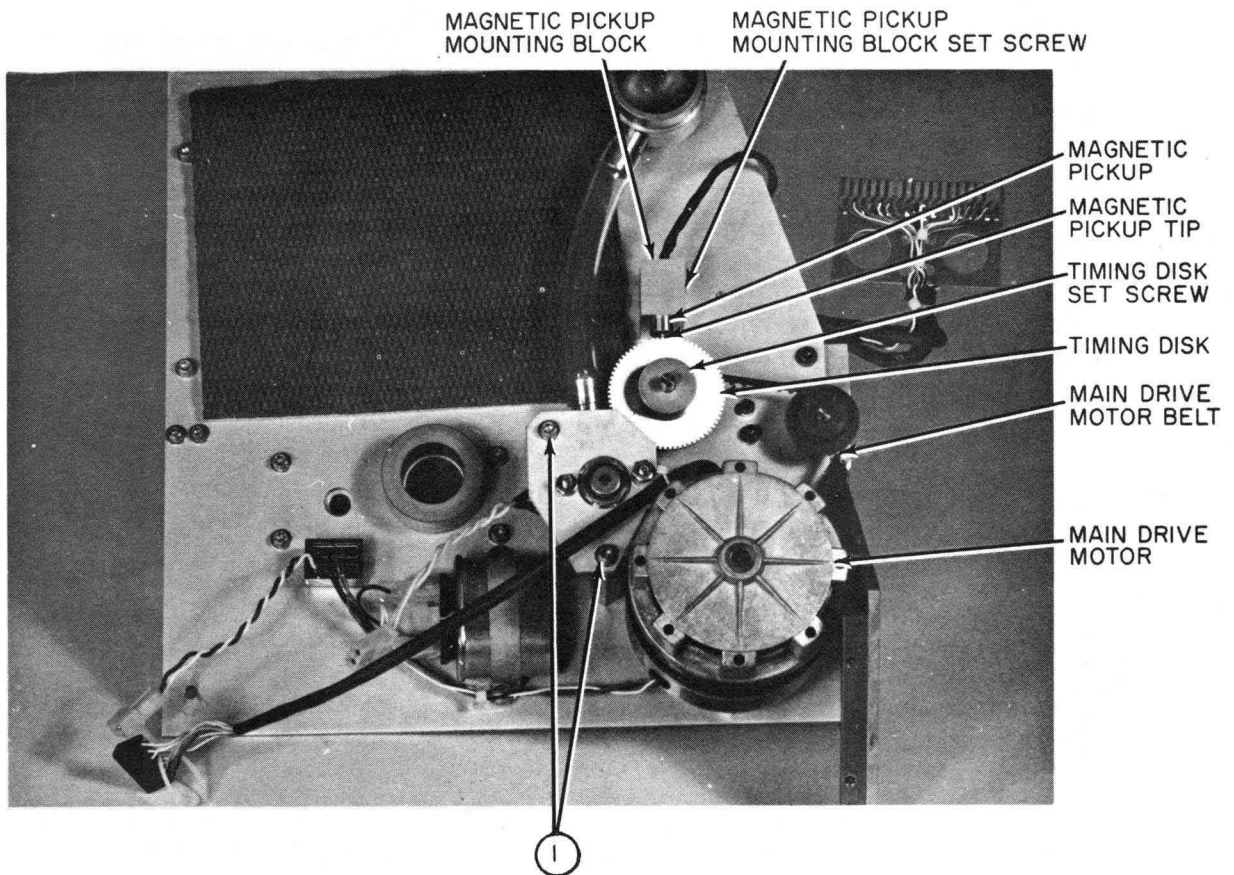


Figure 9-6. Bottom View, Main Mounting Plate

- e. Solder wires of new magnetic pickup to read head connector pins J, K, and L. Ensure wires replaced as noted in step c.
- f. Rewrap magnetic pickup cable and read head connector cable and insert new pickup unit into mounting block.
- g. Adjust spacing between timing disc teeth and tip of magnetic pickup for $.007 \pm .001$ inch, figure 6-4. Tighten set screw.
- h. Replace rear panel and top cover in reverse order of paragraph 9.1 (steps d. through a.).

9.5 SOLENOID

- a. Remove top cover, rear panel, rear connector panel, and main mounting plate per paragraph 9.1, steps a. through q.
- b. To adjust solenoid, perform steps l. through n. only. To replace solenoid perform steps c. through n. Refer to figure 9-8.
- c. Remove solenoid spring from spring post and arm stud.
- 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.
- f. Using a 11/32 wrench, remove two mounting nuts ② to remove solenoid from mounting plate.
- g. Using a 1/16 Allen wrench, LOOSEN two set screws holding 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 shaft.
- i. Tighten bottom coupling set screws and replace solenoid on mounting plate making sure holes are in proper position, with wires extending from left side, as viewed from bottom of main mounting plate.

- j. Replace solenoid on mounting posts, sliding top coupling onto picker shaft.
- k. Replace solenoid return spring between spring post and arm stud.
- l. With two screws in top solenoid coupling LOOSE, depress top of solenoid sufficiently to result in .010 to .015 inch clearance between the wafers of the coupling. Check by using feeler gauge.
- m. Maintain proper pressure on coupling and tighten two set screws, ensuring set screws are on two flat sides of shaft.

NOTE

When this adjustment is made properly, the picker sector will have sufficient driving force to reliably pick cards and be capable of fully returning to rest position. If picker sector does not return to rest position, coupling has been compressed too far.

- n. Replace main mounting plate, rear connector panel, rear panel, and top cover in reverse order of paragraph 9.1 (steps q. through a.).

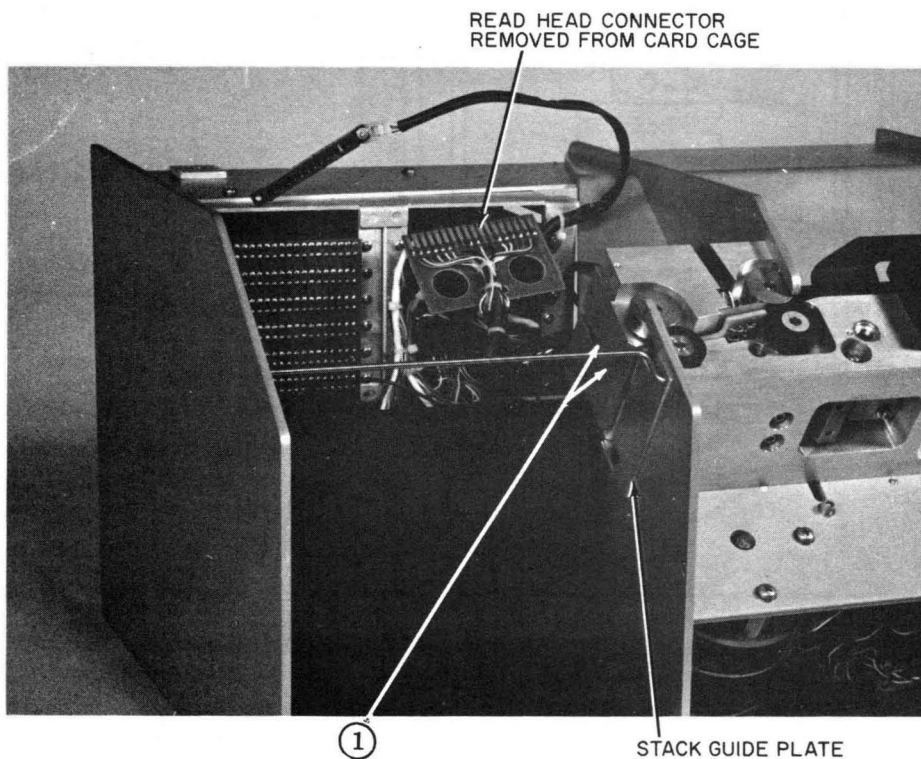


Figure 9-7. Partial Top Left View, Cover Removed

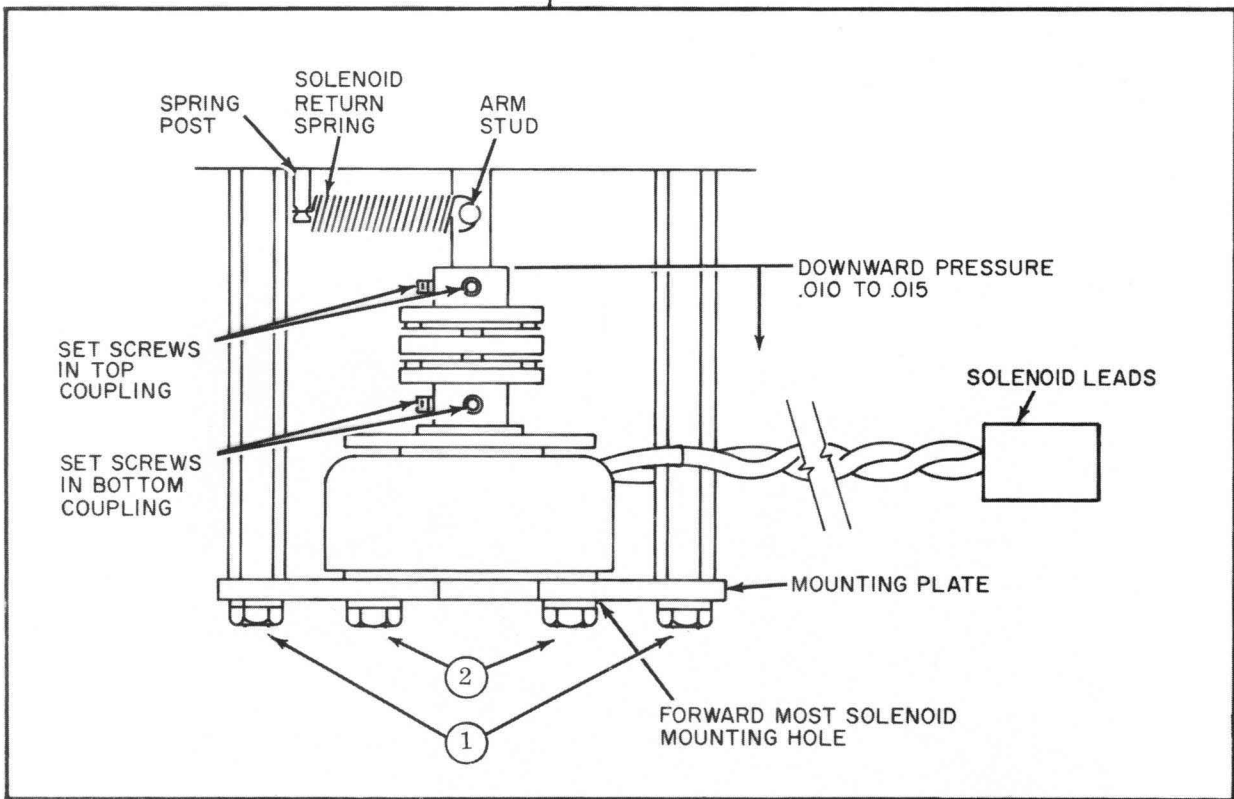
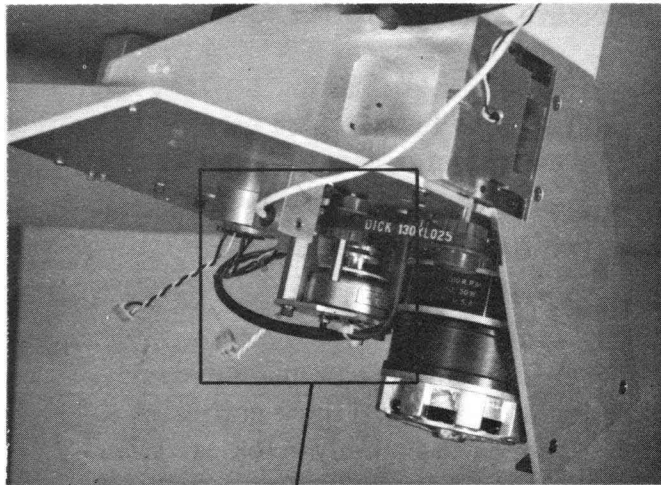


Figure 9-8. Solenoid Replacement and Adjustment

9.6 STACKER CASTING

The stacker casting must be removed to replace any of the following assemblies and installed after the replacement of the assembly. These assemblies are: Roller Bearings, Read Head, or Light Station.

- a. To remove stacker casting, proceed as follows:
 1. Remove top cover, rear panel, rear connector panel, and main mounting plate per paragraph 9.1, steps a. through q.
 2. Using a flat blade knife, remove stack guide plate, figure 9-7.

NOTE

The stack guide plate is fastened on with Pliobond cement. The old cement must be cleaned off and new cement applied when replacing stack guide plate.

3. Using a Phillips screwdriver, remove two screws $\bar{1}$ holding side support plate, figure 9-9.
4. Remove two screws $\bar{1}$ from input hopper wall, figure 6-9.
5. Using a 5/64 Allen wrench, LOOSEN set screw in timing disc. Remove timing disc, figure 9-6.

CAUTION

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

6. LOOSEN three screws $\bar{1}$ holding main drive motor, figure 9-5.
7. Remove main drive motor belt.
8. Using a 3/32 Allen wrench, LOOSEN set screws in two stacker pulleys, figure 9-9. Remove pulleys.
9. Remove tie-wrap on solenoid mounting plate holding light station cable.
10. Using a 9/64 Allen wrench, remove three screws holding stacker casting. Set stacker casting to one side.

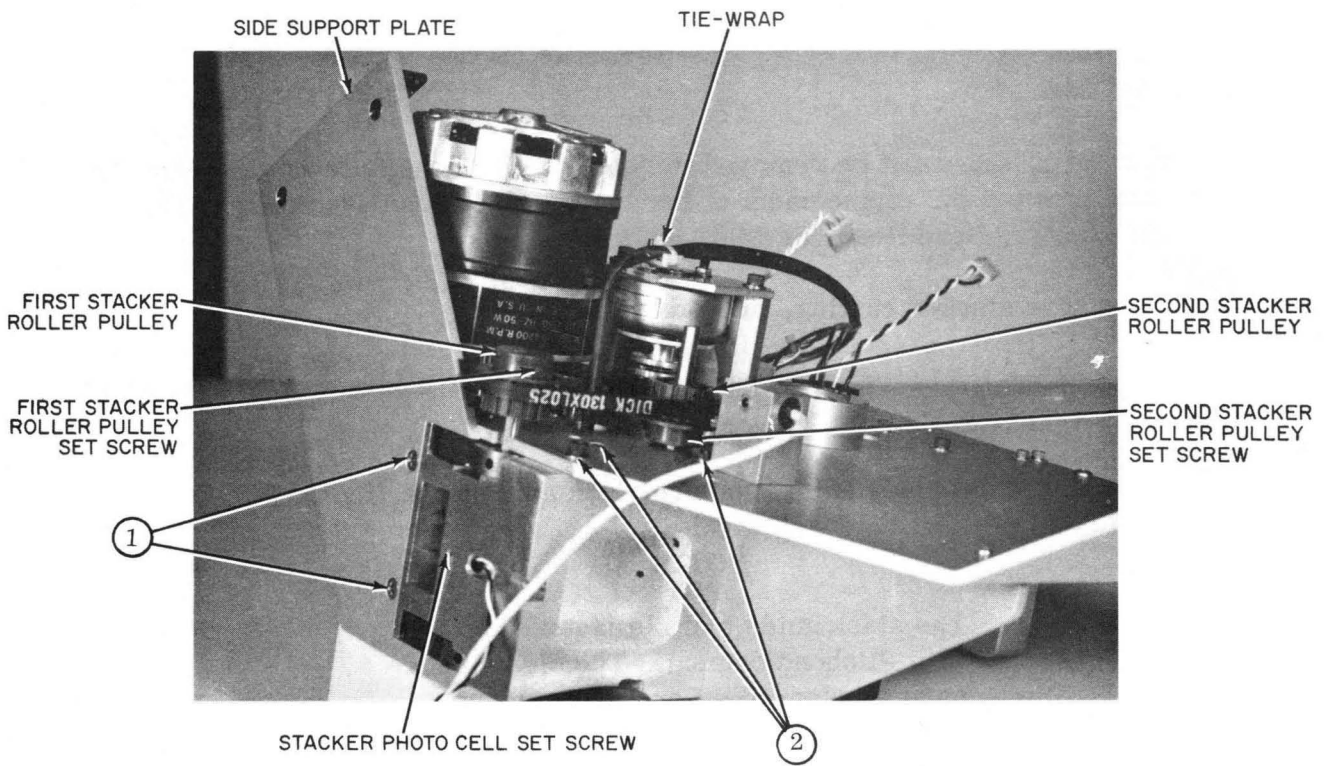


Figure 9-9. Side View, Main Mounting Plate

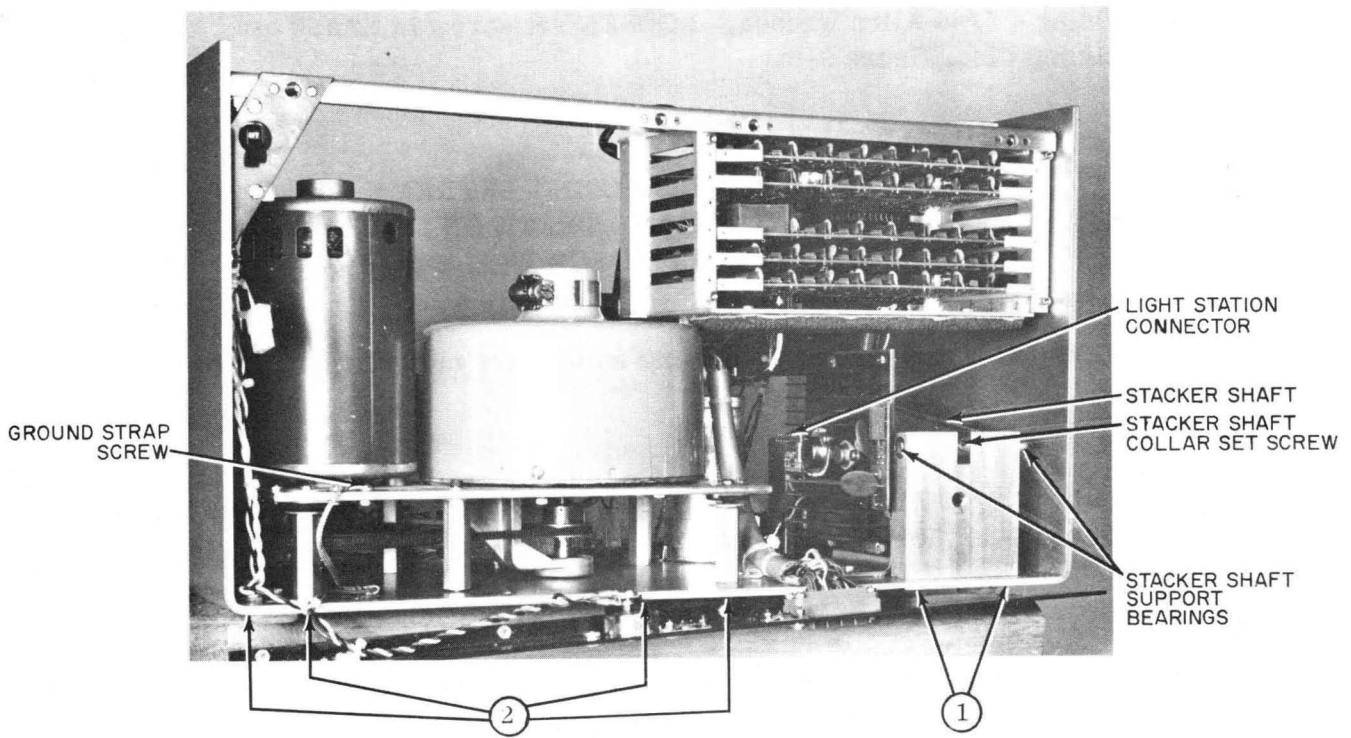


Figure 9-10. Rear View, Cover and Rear Connector Panel Removed

- b. To replace stacker casting proceed as follows:
1. Reposition stacker casting and insert three mounting screws but do not fully tighten.
 2. Make a gauge using eight new unpunched cards cut to 2 x 5 inches.
 3. Insert gauge between picker casting and stacker casting but avoid covering read station window. Apply even pressure to stacker casting toward picker casting and tighten stacker casting mounting screws. Remove gauge. Observe that steel rollers cause a slight depression on rubber rollers.
 4. Position main mounting plate on reader in order to test read head output voltage.
 5. Connect read head connector to card cage, figure 9-7.
 6. Connect light station connector, figure 9-10.
 7. Using extender board on control card and, with power applied, connect voltmeter between R17 and card ground. Verify voltage is > 2.3 vdc and < 4.3 vdc. (Nominal 3 to 4 vdc)
 8. Repeat step 7. at R18 through R28.
 9. If any reading is outside limits, LOOSEN stacker casting mounting screws and reposition for optimum value. Tighten screws and re-check per steps 7. and 8.
 10. Remove extender board and replace control card in card file.
 11. Remove main mounting plate from reader.
 12. Replace cable wrap holding light station cable.
 13. Replace two stacker pulleys.

CAUTION

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

14. Replace timing disc and adjust per paragraph 6.3.
15. Complete stacker casting replacement in reverse order of paragraph 9.6, a (steps 4. through 1.).

9.7 STACKER ROLLER BEARING ASSEMBLIES

- a. Remove stacker casting per paragraph 9.6, a.
- b. Using a 1/16 Allen wrench, LOOSEN set screw in bottom roller of assembly to be removed. Remove roller and spacer washer, figure 9-11.
- c. Lift shaft straight up out of casting. Observe spacer washer between top roller and bearing seat.
- d. To remove top bearing, use L-shaped tool to lift bearing from assembly.
- e. To remove bottom bearing, use a straight tool to tap edge of bearing from inside of shaft hole to drop bearing from casting.
- f. Install new bearings. Place spacer washer on top bearing and replace shaft in shaft hole.
- g. Replace bottom roller with spacer washer between roller and bearing seat.
- h. Apply firm finger pressure between top and bottom rollers and tighten set screw in bottom roller.
- i. Check for vertical play in stacker shaft. If there is vertical play, repeat step h.
- j. Replace stacker casting per paragraph 9.6, b.

9.8 READ HEAD ASSEMBLY

- a. Remove stacker casting per paragraph 9.6, a.
- b. Using a Phillips screwdriver, remove two screws ①, figure 9-11, to remove read head, and disconnect read head connector. Unwrap read head cable.
- c. Using a 1/16 Allen wrench, LOOSEN set screw in magnetic pickup mounting block and remove magnetic pickup, figure 9-6.
- d. Using a 1/16 Allen wrench, LOOSEN set screw in stacker casting holding stacker photocell and remove photocell, figure 9-9. Read head assembly is now free.
- e. Replace read head assembly, insert two mounting screws and tighten.
- f. Insert magnetic pickup in mounting block and adjust per paragraph 6.3, c.

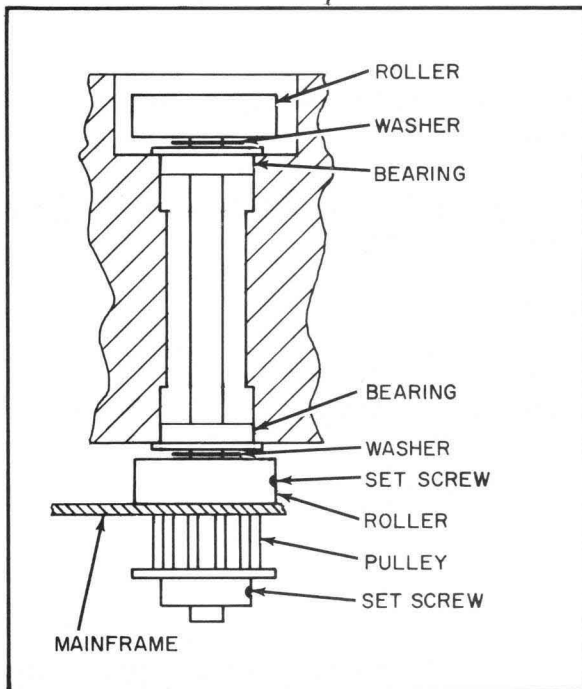
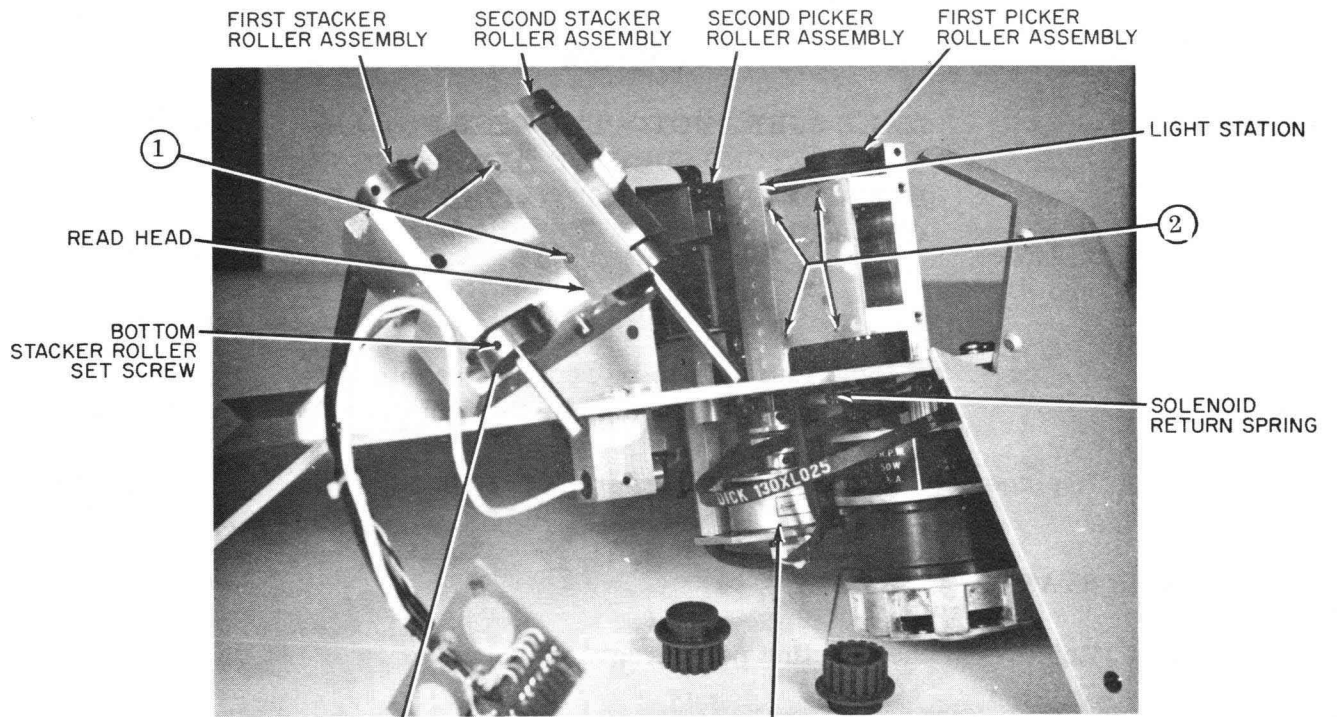


Figure 9-11. Stacker Casting Removal and Bearing Replacement

- g. Replace photocell in stacker casting, align flush with stacker casting face-plate, and tighten photocell set screw.

CAUTION

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

NOTE

If light station is to be replaced at this time, see paragraph 9.9, step b. through d.

- h. Replace stacker casting per paragraph 9.6, b.

9.9 LIGHT STATION ASSEMBLY

- a. Remove stacker casting per paragraph 9.6, a.
- b. Using a Phillips screwdriver, remove four screws ②, figure 9-11, to remove light station assembly.
- c. Remove cable wrap and disconnect light station connector, figure 9-10. Light station assembly is now free.
- d. Replace light station assembly and tighten four mounting screws. Replace cable wrap and connect light station connector.

NOTE

If read head is to be replaced at this time, see paragraph 9.8, steps b. through g.

- e. Replace stacker casting per paragraph 9.6, b.

9.10 STACKER SHAFT SUPPORT BEARINGS

- a. Remove top cover, rear panel, and rear connector panel per paragraph 9.1, steps a. through e.
- b. Using a 5/16 Allen wrench, LOOSEN stacker shaft collar set screw.

- c. Using a Phillips screwdriver, remove two screws ① from underneath main-frame holding stacker shaft support casting, figure 9-10.
- d. Move stacker shaft support casting to rear and slide off shaft to left.
- e. Using an arbor press, remove and replace two bearings in stacker shaft support casting.
- f. Reassemble in reverse order of disassembly.
- g. Replace rear connector panel, rear panel, and top cover in reverse order of paragraph 9.1 (steps e. through a.).

9.11 VACUUM PUMP MOTOR ASSEMBLY BELT

- a. Remove top cover, rear panel, rear connector panel, and main mounting plate per paragraph 9.1, steps a. through q.
- b. Remove screw holding ground strap to subframe.

CAUTION

USE A 1/2 INCH OPEN-END WRENCH TO HOLD MOUNTING POST TO AVOID TWISTING OFF THE PUMP PLATE RUBBER SHOCK MOUNTS.

- c. Remove four Phillips head mounting screws ② holding vacuum pump motor assembly, figure 9-10.
- d. The vacuum pump assembly may now be removed from card reader.
- e. LOOSEN three hex vacuum pump mounting bolts ①, figure 9-13.
- f. Replace vacuum pump belt.
- g. Using a spring scale, adjust vacuum pump for a belt tension of 4-6 ounces. This is about 3/64" belt deflection.
- h. With appropriate belt tension applied, tighten three hex vacuum pump mounting bolts.
- i. Check pulleys to make sure they are in the same plane. Also check each pulley set screw to make sure it is secure.
- j. Replace vacuum pump motor assembly in reverse order of disassembly.
- k. Replace main mounting plate, rear connector panel, rear panel, and top cover in reverse order of paragraph 9.1 (steps q. through a.).

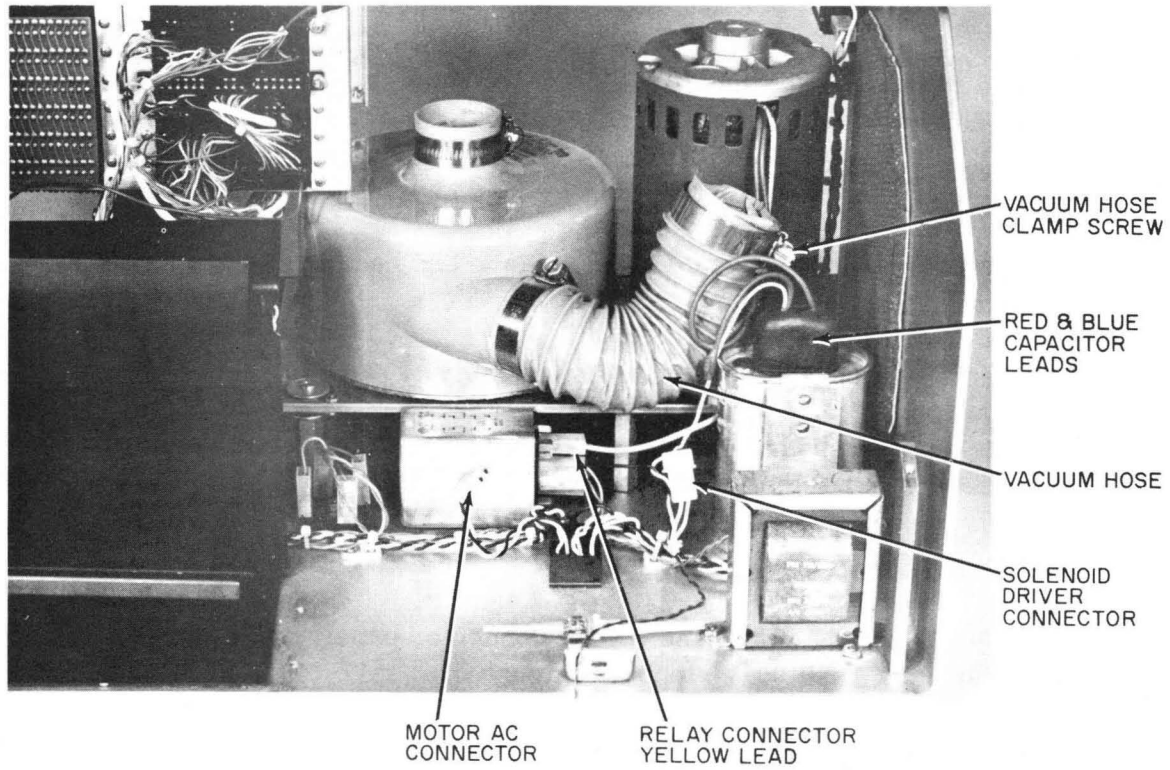


Figure 9-12. Front View, Main Wiring Connections

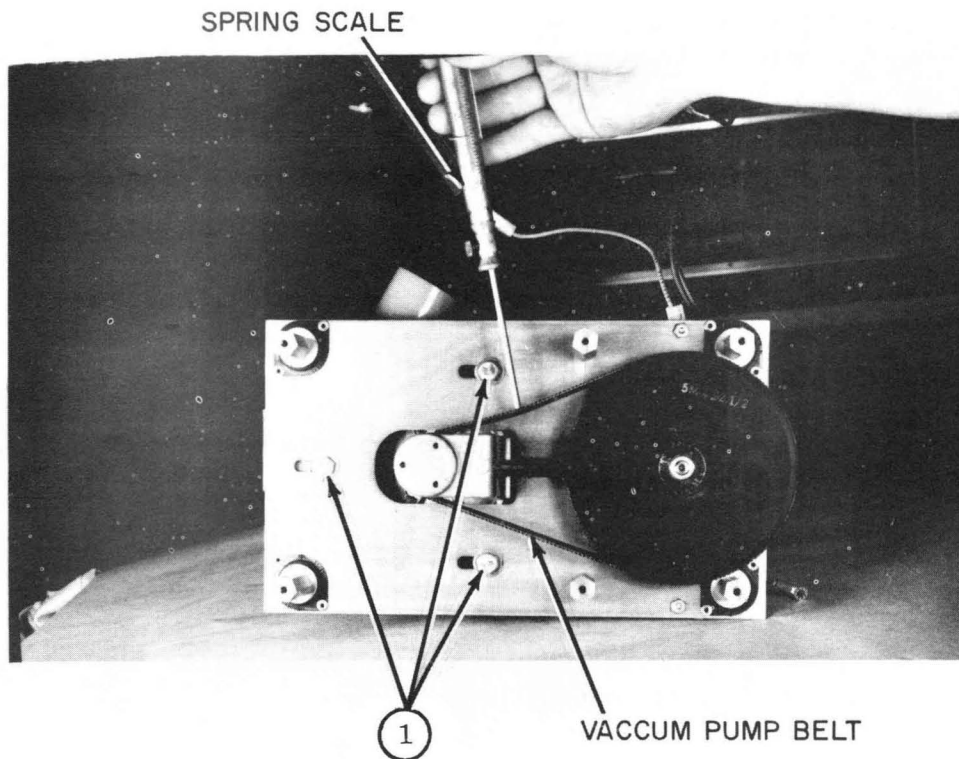


Figure 9-13. Vacuum Pump Belt Adjustment

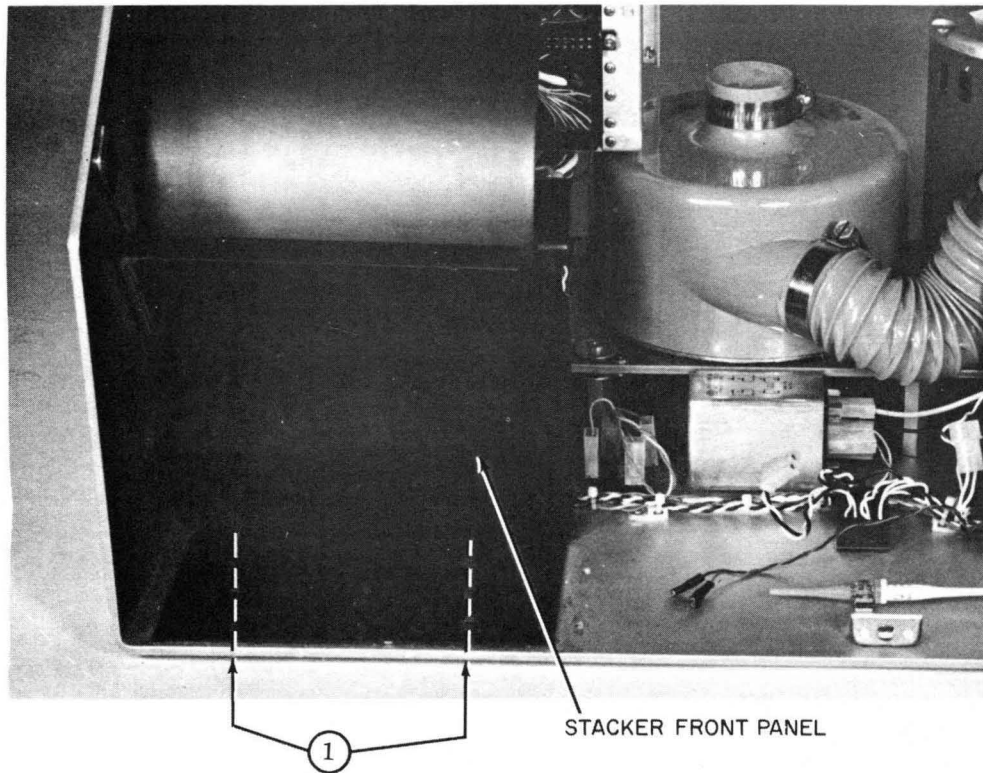
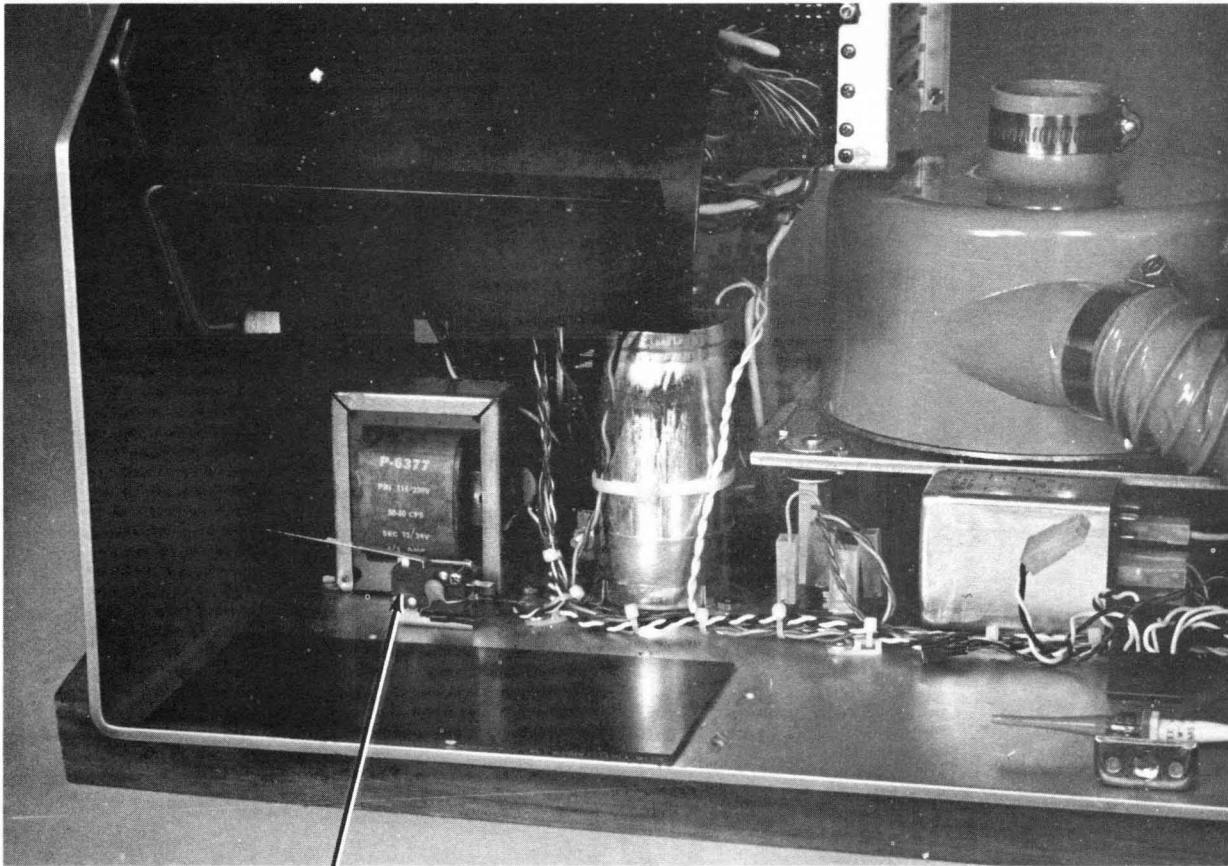


Figure 9-14. Stacker Panel Removal

9.12 STACKER FULL SWITCH

- a. Remove top cover per paragraph 9.1, steps a. and b.
- b. Using a Phillips screwdriver, remove two screws ① from underside of mainframe holding stacker front panel, figure 9-14.
- c. Remove two leads from stacker full switch, figure 9-15.
- d. Using a Phillips screwdriver, remove two screws holding switch.
- e. Replace switch, connect leads, and adjust per paragraph 6.7.
- f. Replace top cover in reverse order of paragraph 9.1 (steps b. and a.).



STACKER FULL SWITCH

Figure 9-15. Stacker Full Switch Replacement

9.13 HOPPER EMPTY SWITCH

- a. Remove top cover per paragraph 9.1, steps a. and b.
- b. Using a 3/32 Allen wrench, remove two screws holding raffle cap, figure 9-5.
- c. Remove two leads from hopper empty switch.
- d. Using a 1/16 Allen wrench, remove two screws holding switch.
- e. Replace switch, connect leads, and adjust so that switch is activated with card in hopper and disengaged with hopper empty. See paragraph 6.6 for adjustment.
- f. Replace top cover in reverse order of paragraph 9.1 (steps b. and a.).

9.14 PICKER

- a. Remove top cover, rear panel, rear connector panel, and main mounting plate per paragraph 9.1, steps a. through q.
- b. Remove solenoid per paragraph 9.5, steps c. through e.
- c. Using a #2 retaining ring remover tool, remove retaining ring from top of picker shaft, figure 9-16.
- d. Remove spacers from picker shaft.

CAUTION

ALL SPACERS MUST BE REPLACED
IN REASSEMBLY.

- e. Using a 5/64 Allen wrench, LOOSEN two set screws holding picker sector, figure 9-5.
- f. Remove picker shaft from underside of main mounting plate.
- g. Using a Phillips screwdriver, remove throat block, figure 6-9.
- h. Remove picker sector from rear side of picker casting.
- i. Replace picker sector, shaft, all spacers and retaining ring.
- j. Rotate shaft to place flat side of shaft under picker sector set screws.
- k. Adjust per paragraph 6.8, steps a. through k.
- l. Replace solenoid per paragraph 9.5, steps j. through m.
- m. Replace throat block, insert screw, but do not fully tighten.
- n. Using a feeler gauge, adjust pick throat for a clearance of .008 between throat block and picker sector. Tighten throat block.
- o. Replace main mounting plate, rear connector panel, rear panel, and top cover in reverse order of paragraph 9.1 (steps q. through a.).

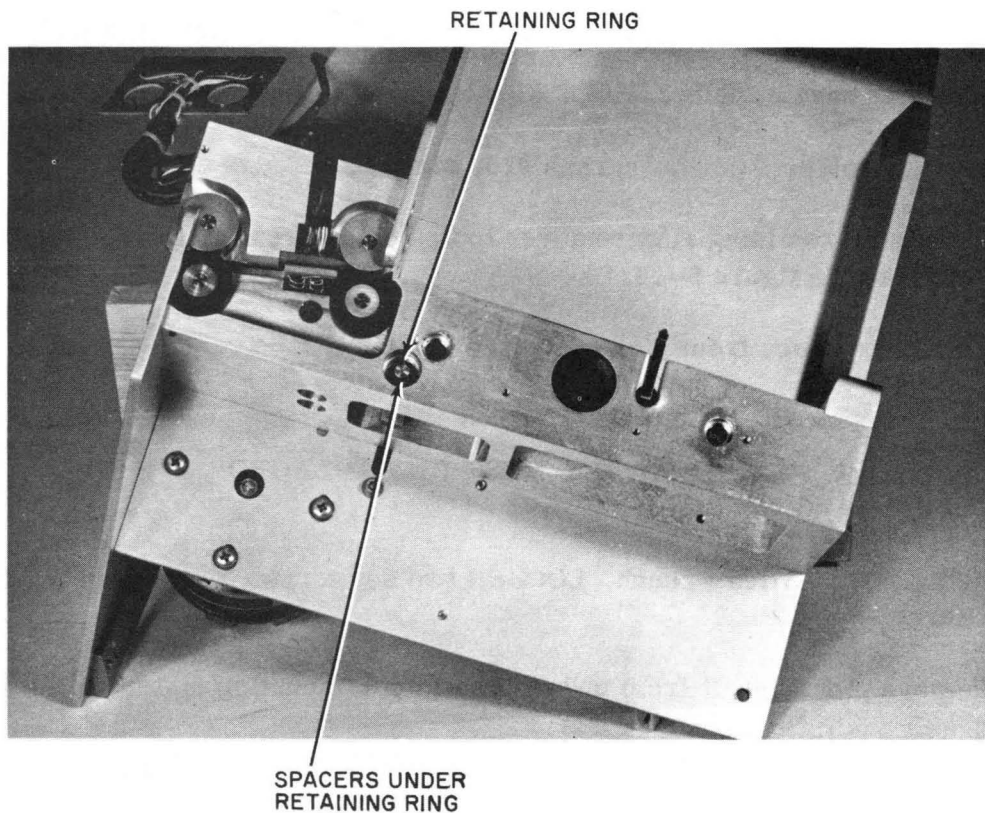


Figure 9-16. Top View Casting Assembly

9.15 INDICATOR LAMPS

- a. Remove top cover per paragraph 9.1, steps a. and b.
- b. To replace any indicator lamp, push center terminal, at base of lamp socket, to one side.
- c. Remove old lamp, replace with new lamp, and push center terminal back to center of lamp socket.
- d. Replace top cover in reverse order of paragraph 9.1 (steps b. and a.).

9.16 PICKER ROLLER BEARINGS

- a. Remove picker casting as follows:
 1. Remove top cover, rear panel, rear connector panel, and main mounting plate per paragraph 9.1, steps a. through q.
 2. Using a flat blade knife, remove stacker guide plate figure 9-7.

NOTE

The stack guide plate is fastened on with Pliobond cement. The old cement must be cleaned off and new cement applied when replacing stack guide plate.

3. Using a Phillips screwdriver, remove two screws (1) holding side support plate, figure 9-9.
 4. Using a Phillips screwdriver, remove three main drive motor mounting screws (1), figure 9-5, and remove belt from motor pulley. Set motor aside.
 5. Remove solenoid spring from spring post and arm stud, figure 9-8.
 6. Using a 1/16 Allen wrench, LOOSEN two set screws in top solenoid coupling.
 7. Using a 9/64 Allen wrench, remove two screws holding solenoid mounting plate. Move solenoid down and set aside.
 8. Using a Phillips screwdriver, remove screw holding throat block to stacker casting and remove throat block, figure 6-9.
 9. Using a 9/64 Allen wrench, remove six screws holding picker casting to main mounting plate and remove picker casting.
- b. Replace first picker roller bearings per paragraph 9.7, steps b. through i.

c. Replace second picker roller bearings as follows:

NOTE

The second picker rollers are each mounted on its own shaft.

1. Using a 1/16 Allen wrench, LOOSEN set screw in roller and remove roller and washer.
2. Remove shaft from center of casting.
3. Using a straight tool, tap edge of bearing from inside shaft hold to drop bearing from casting.
4. Install new bearing. Place shaft into shaft hole from center of casting.
5. Replace washer and roller on shaft. Apply firm finger pressure between roller and shaft end and tighten set screw in roller.
6. Check for vertical play in shaft. If there is vertical play, repeat step 5.

d. To replace picker casting proceed as follows:

1. Reposition picker casting and insert six mounting screws but do not fully tighten.
2. Make a gauge using eight new unpunched cards cut to 2 x 5 inches.
3. 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. Remove gauge. Observe that steel rollers cause a slight depression on rubber rollers.
4. Position main mounting plate on reader in order to test read head output voltage.
5. Connect read head connector to card cage, figure 9-7.
6. Connect light station connector, figure 9-10.
7. Using extender board on control card and, with power applied, connect voltmeter between R17 and card ground. Verify voltage is > 2.3 vdc and < 4.3 vdc. (Nominal 3 to 4 vdc.)
8. Repeat step 7. at R18 through R28.

9. If any reading is outside limits, LOOSEN picker casting mounting screws and reposition for optimum value. Tighten screws and re-check per steps 7. and 8.
10. Remove extender board and replace control card in card file.
11. Remove main mounting plate from reader.
12. Replace solenoid on mounting posts, sliding top coupling onto picker shaft. Tighten screws holding solenoid.
13. Replace solenoid return spring between spring post and arm stud.
14. With two screws in top solenoid coupling LOOSE, depress top of solenoid sufficiently between the wafers of coupling. Check by using feeler gauge.
15. Maintain proper pressure on coupling and tighten two set screws, ensuring set screws are on two flat sides of shaft.

NOTE

When this adjustment is made properly, the picker sector will have sufficient driving force to reliably pick cards and be capable of fully returning to rest position. If picker sector does not return to rest position, coupling has been compressed too far.

16. Replace throat block, insert mounting screw, but do not tighten. Adjust gap between throat block and picker sector to .008 inch.
17. Complete picker casting replacement in reverse order of paragraph 9.16, a (steps 3. through 1.).

**SECTION 10
DRAWINGS**

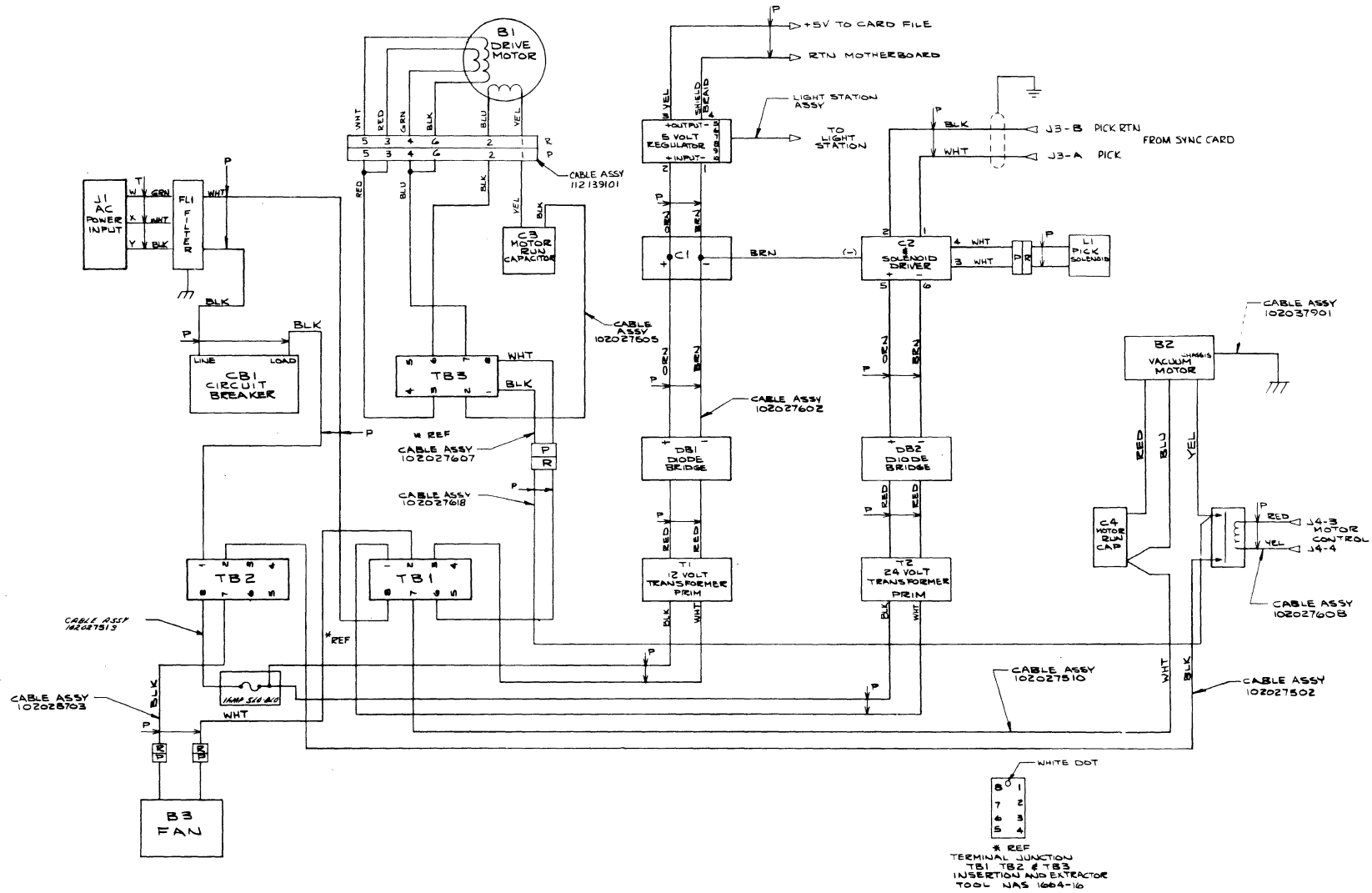


Figure 10-1. Wiring Diagram, AC Power Distribution, 115 VAC, 60 Hz (Dwg. No. 1040755)

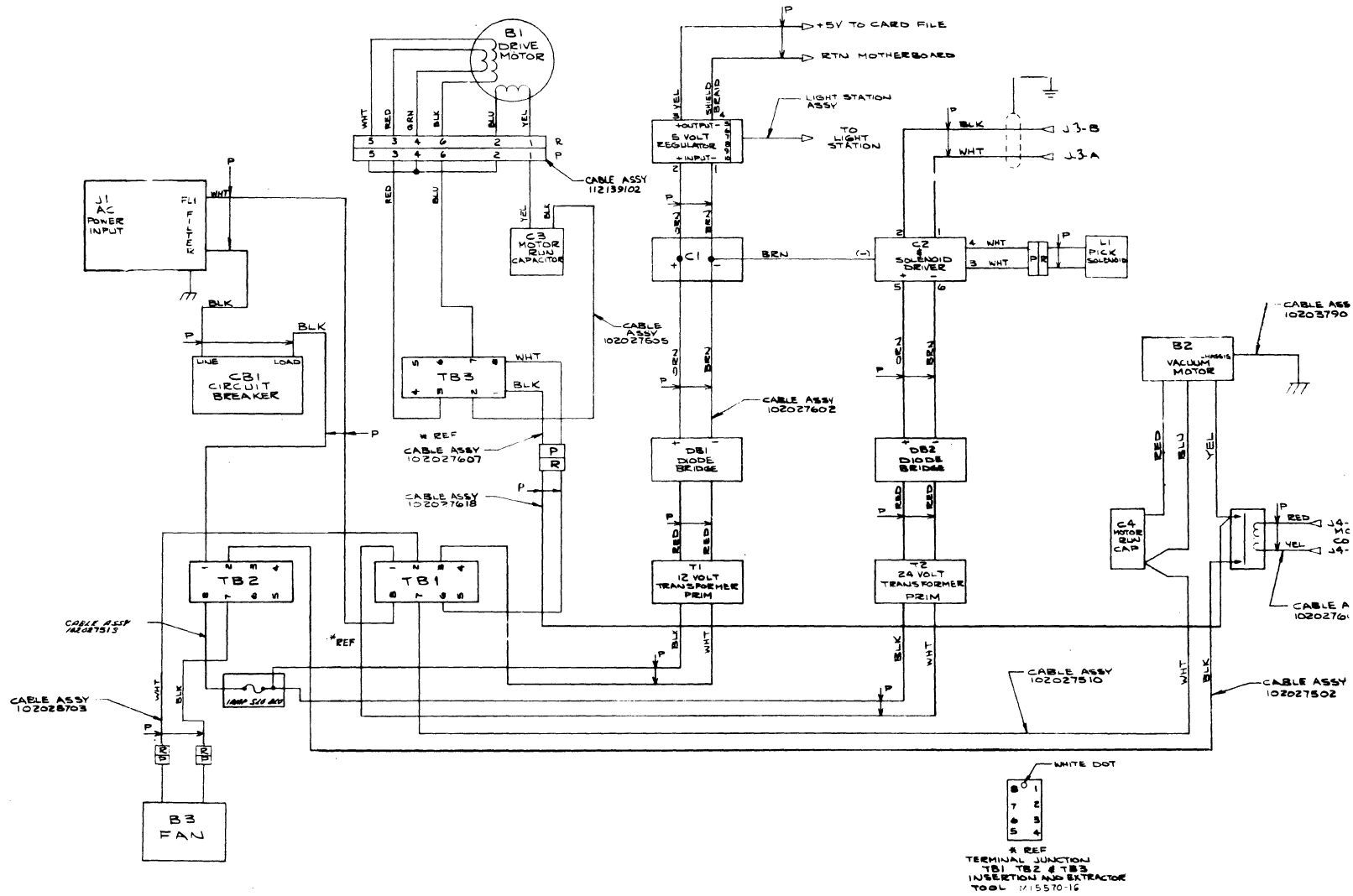
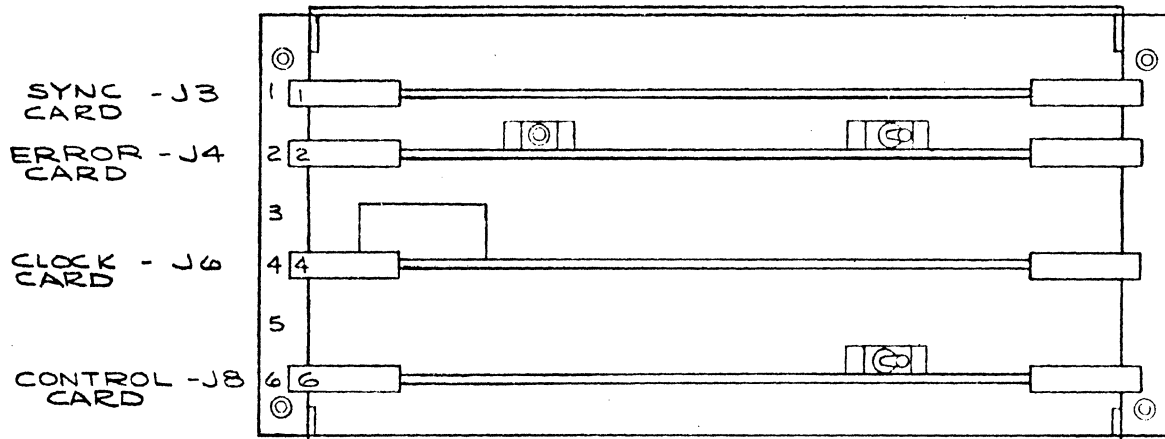
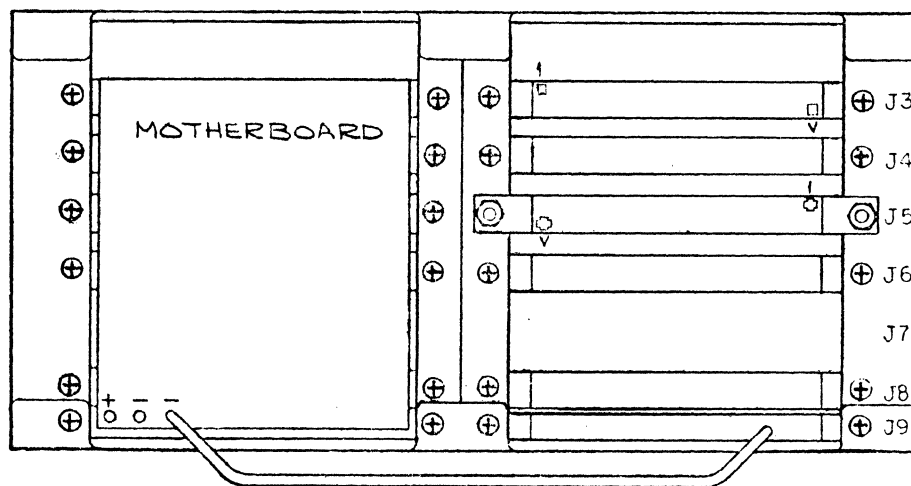


Figure 10-1A. Wiring Diagram, AC Power Distribution, 230 VAC, 50 Hz
(Dwg. No. 1040819)



CARD FILE, REAR VIEW
COVER REMOVED



CONNECTOR VIEW

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

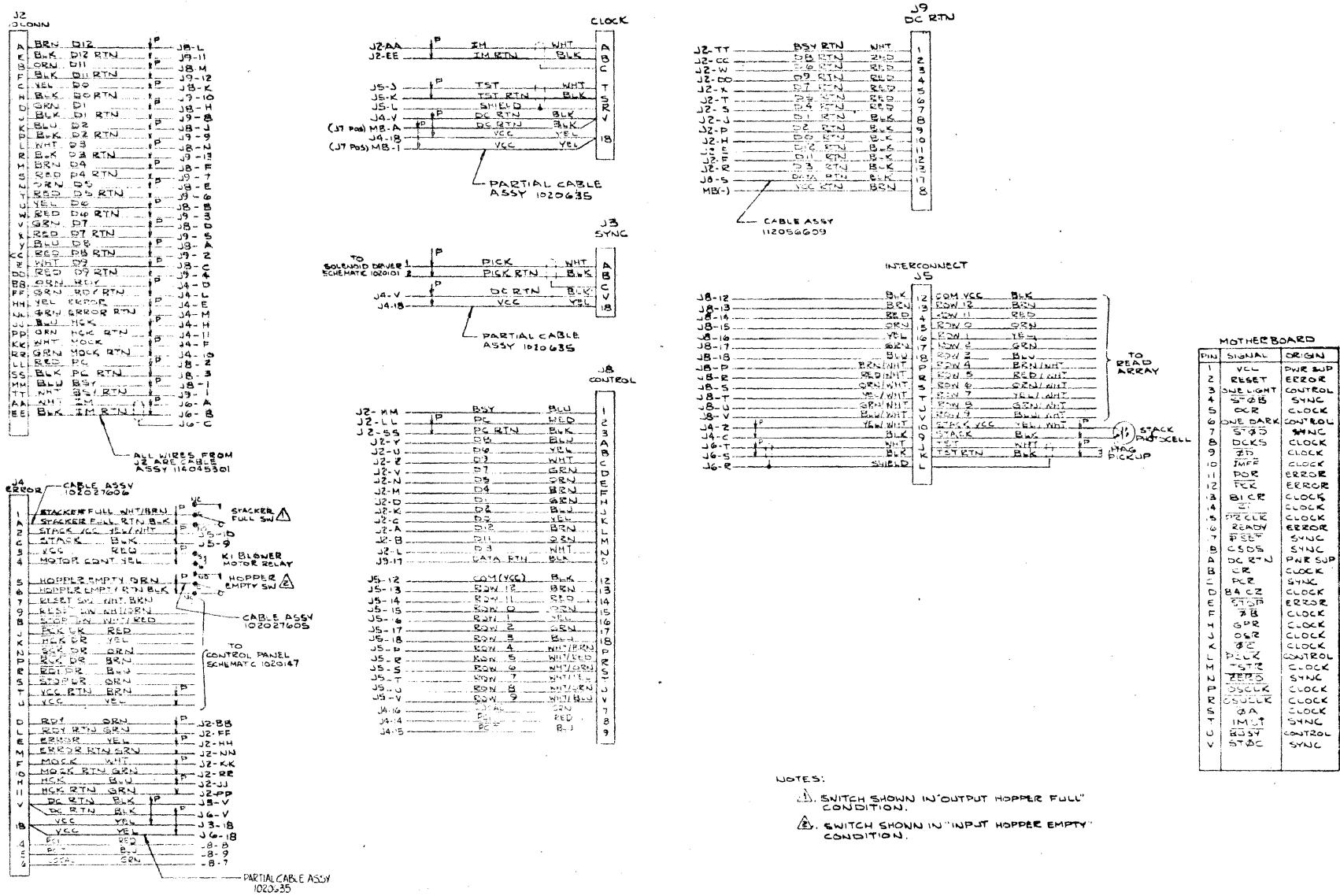


Figure 10-3. Wiring Diagram, Card Cage (Dwg. No. 1142000)

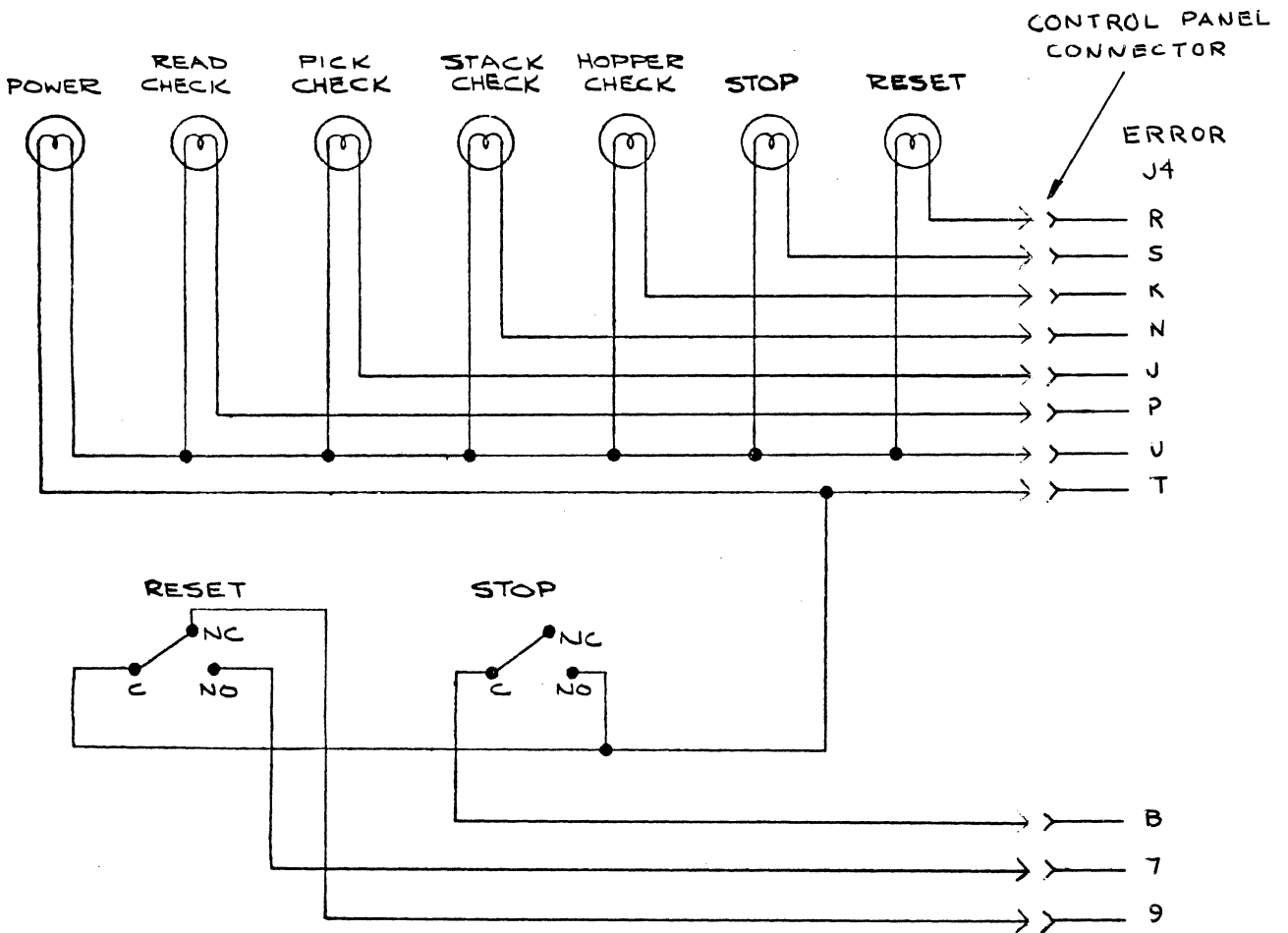


Figure 10-4. Wiring Diagram, Control Panel
(Dwg. No. 1130366)

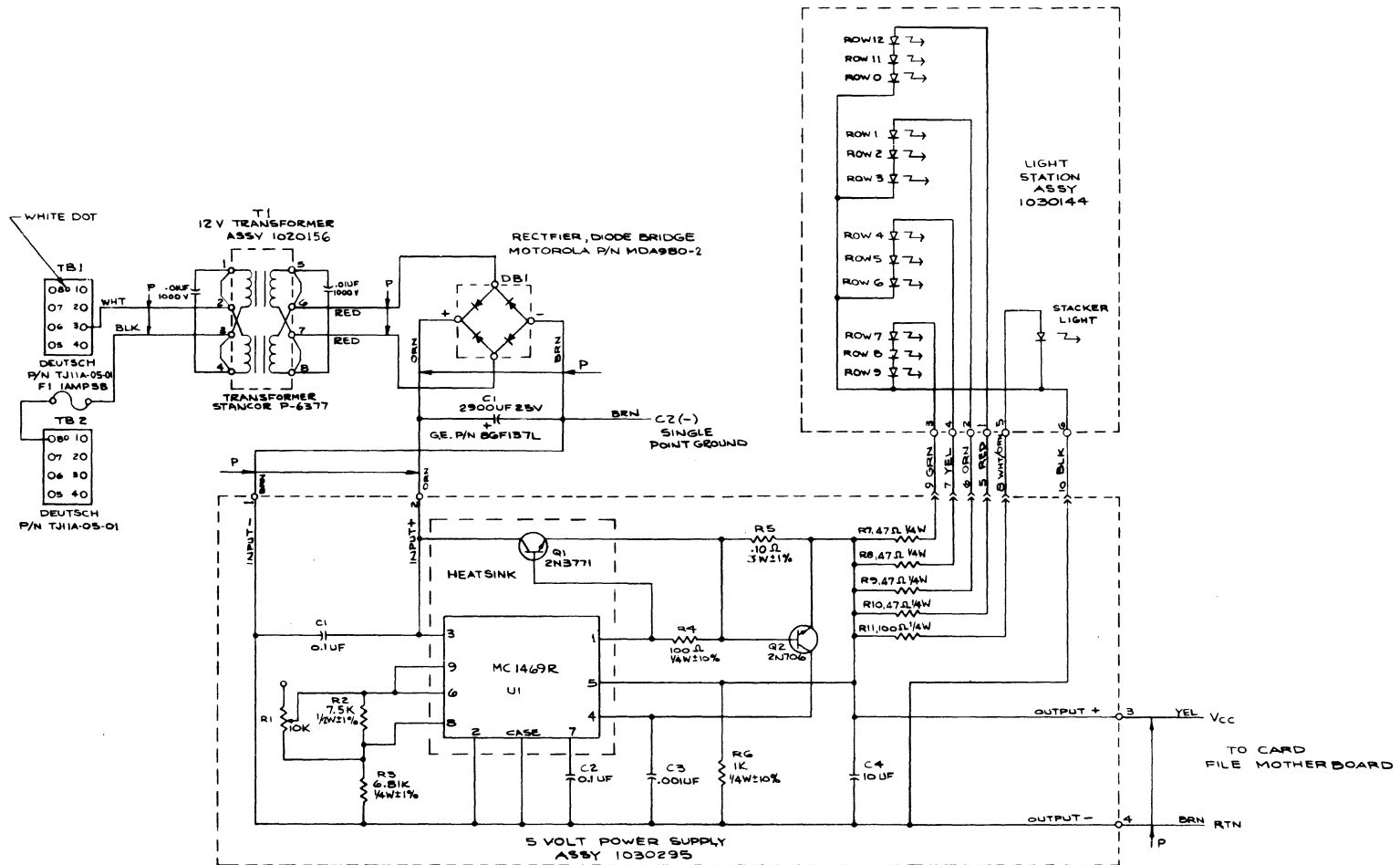


Figure 10-5. Schematic Diagram, 5V Power Supply, 115 VAC, 60 Hz
(Dwg. No. 1140637)

10-5A

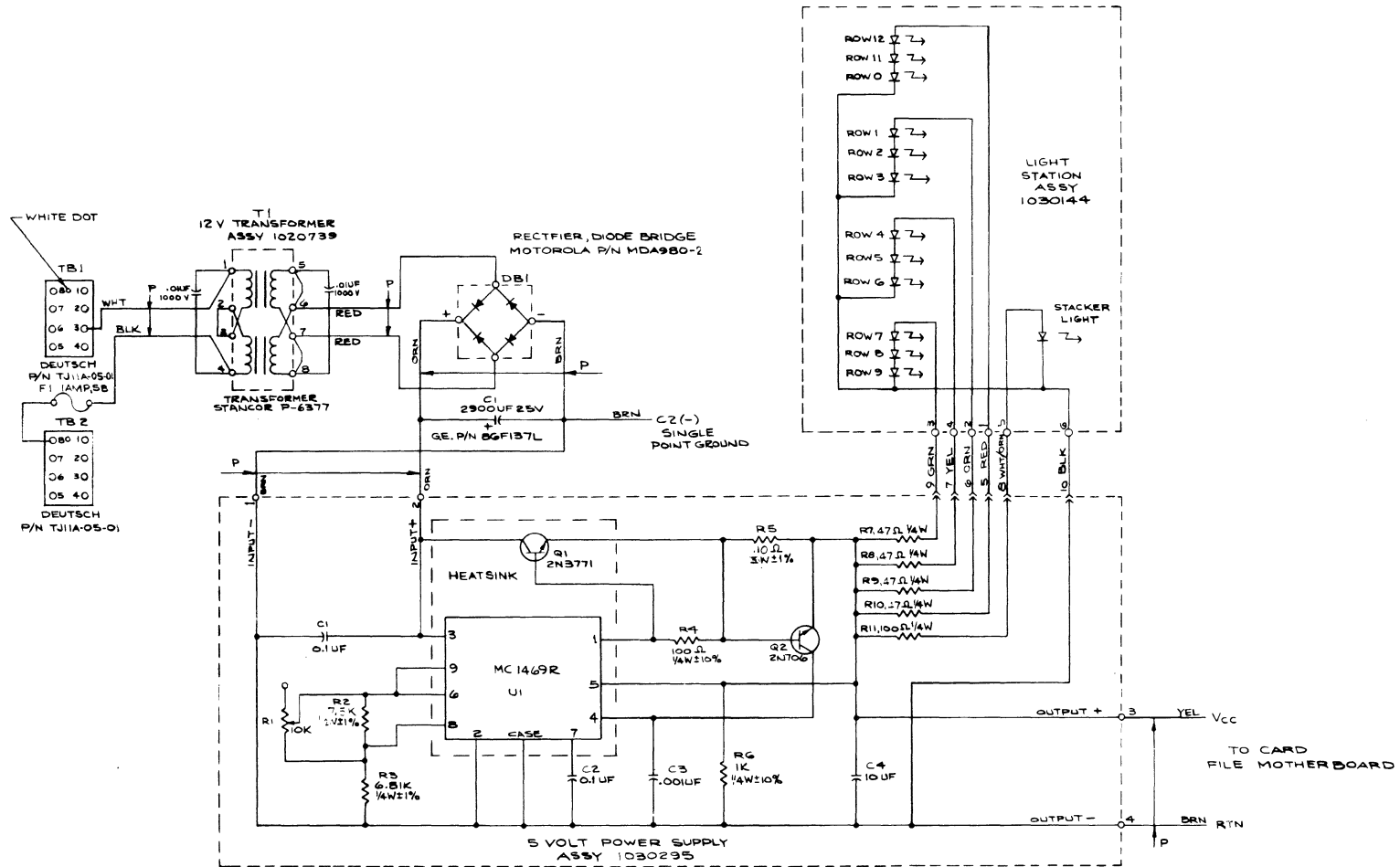


Figure 10-5A. Schematic Diagram, 5V Power Supply, 230 VAC, 50 Hz
(Dwg. No. 1140924)

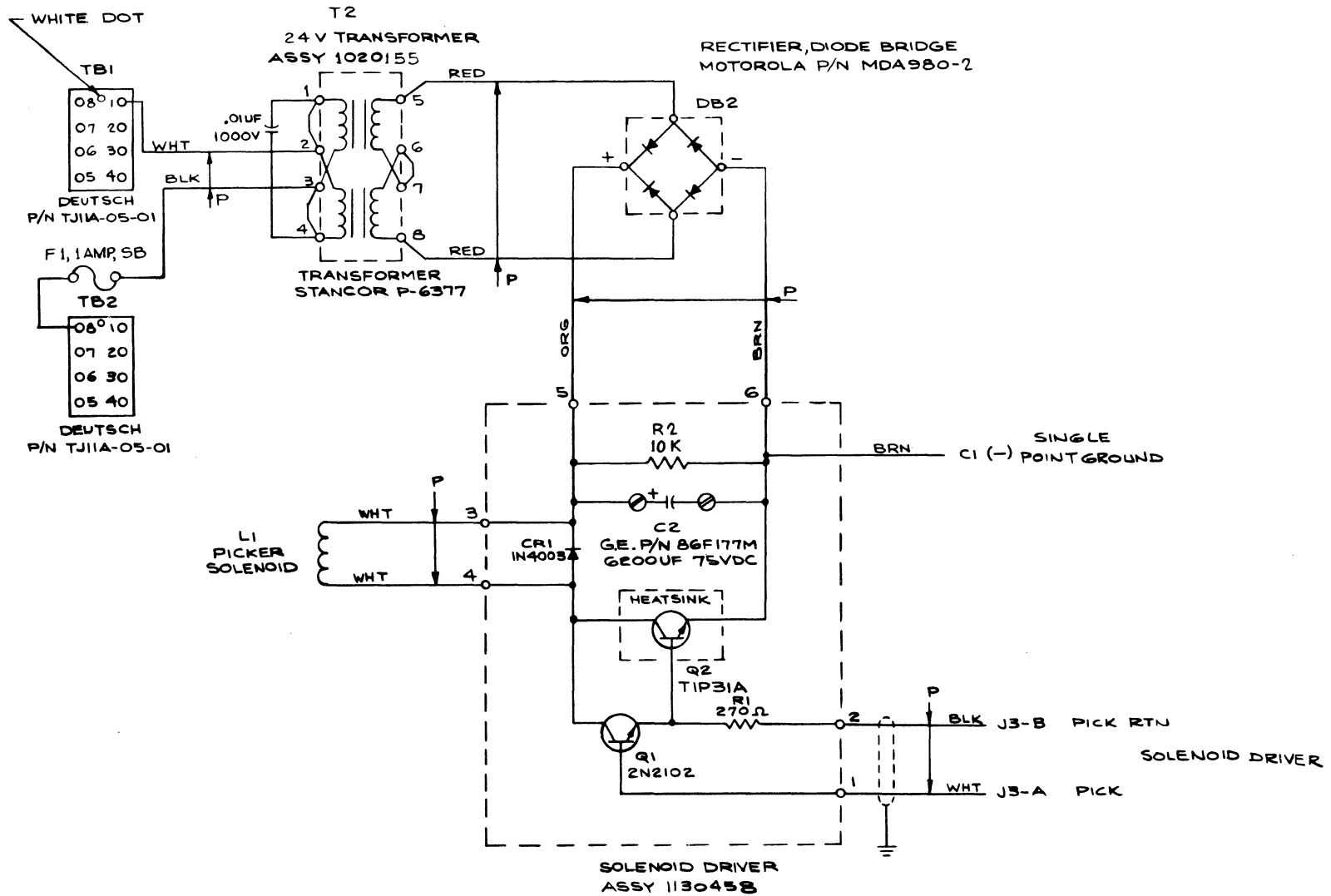


Figure 10-6. Schematic Diagram, Solenoid Driver, 115 VAC, 60 Hz (Dwg. No. 1140632)

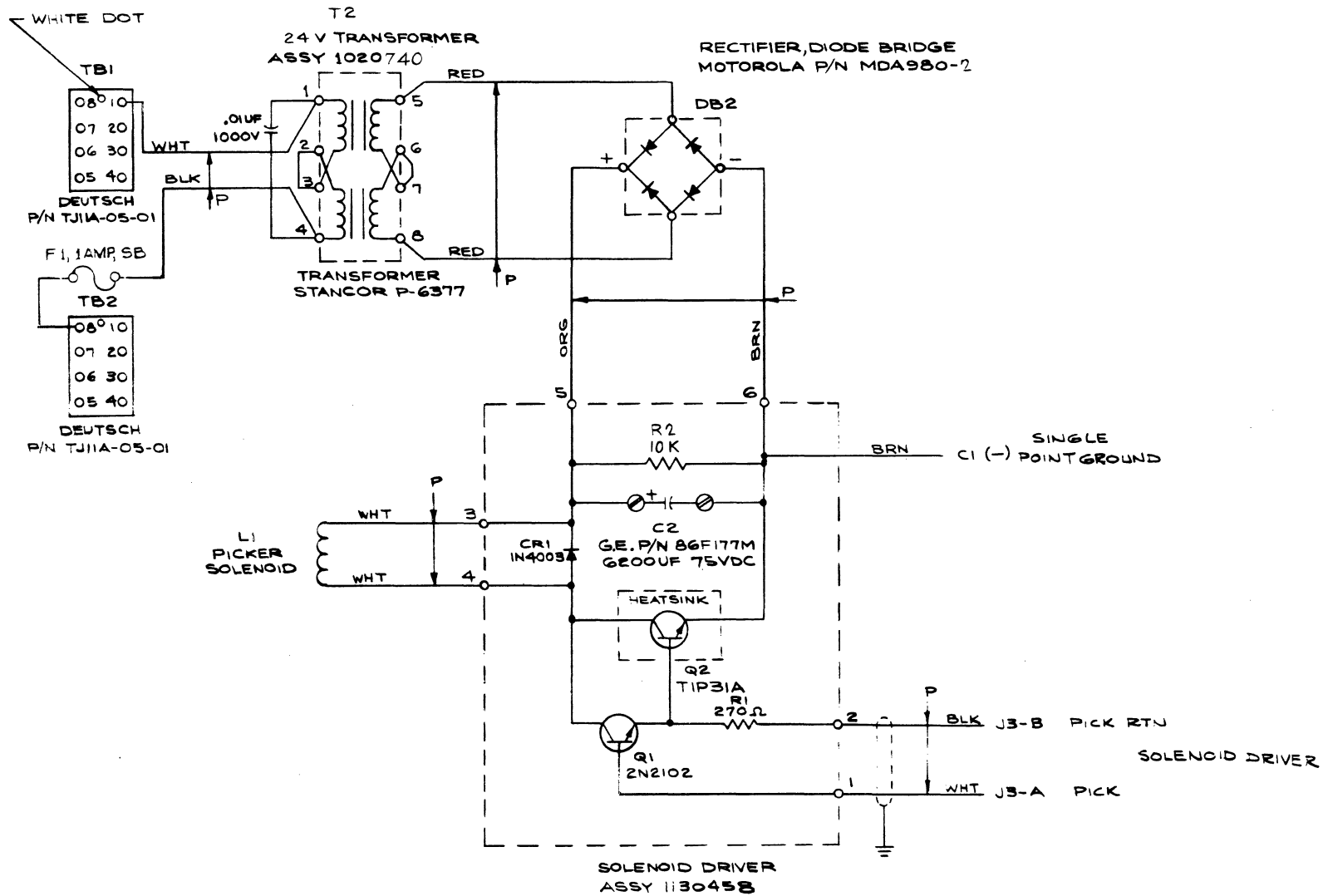


Figure 10-6A. Schematic Diagram, Solenoid Driver, 230 VAC, 50 Hz (Dwg. No. 1140925)

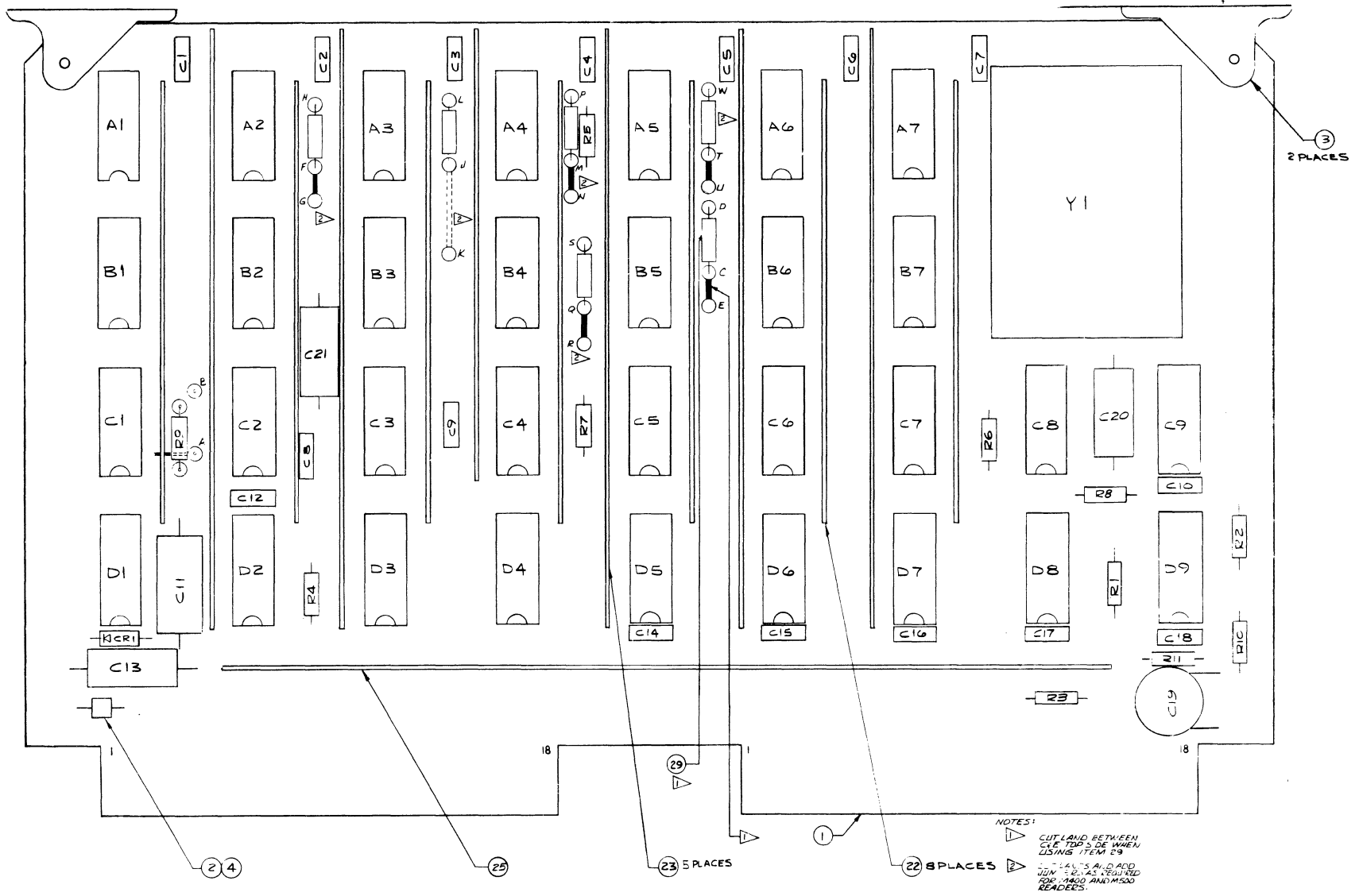


Figure 10-7. Assembly Diagram, Clock Card (Dwg. No. 1040765)

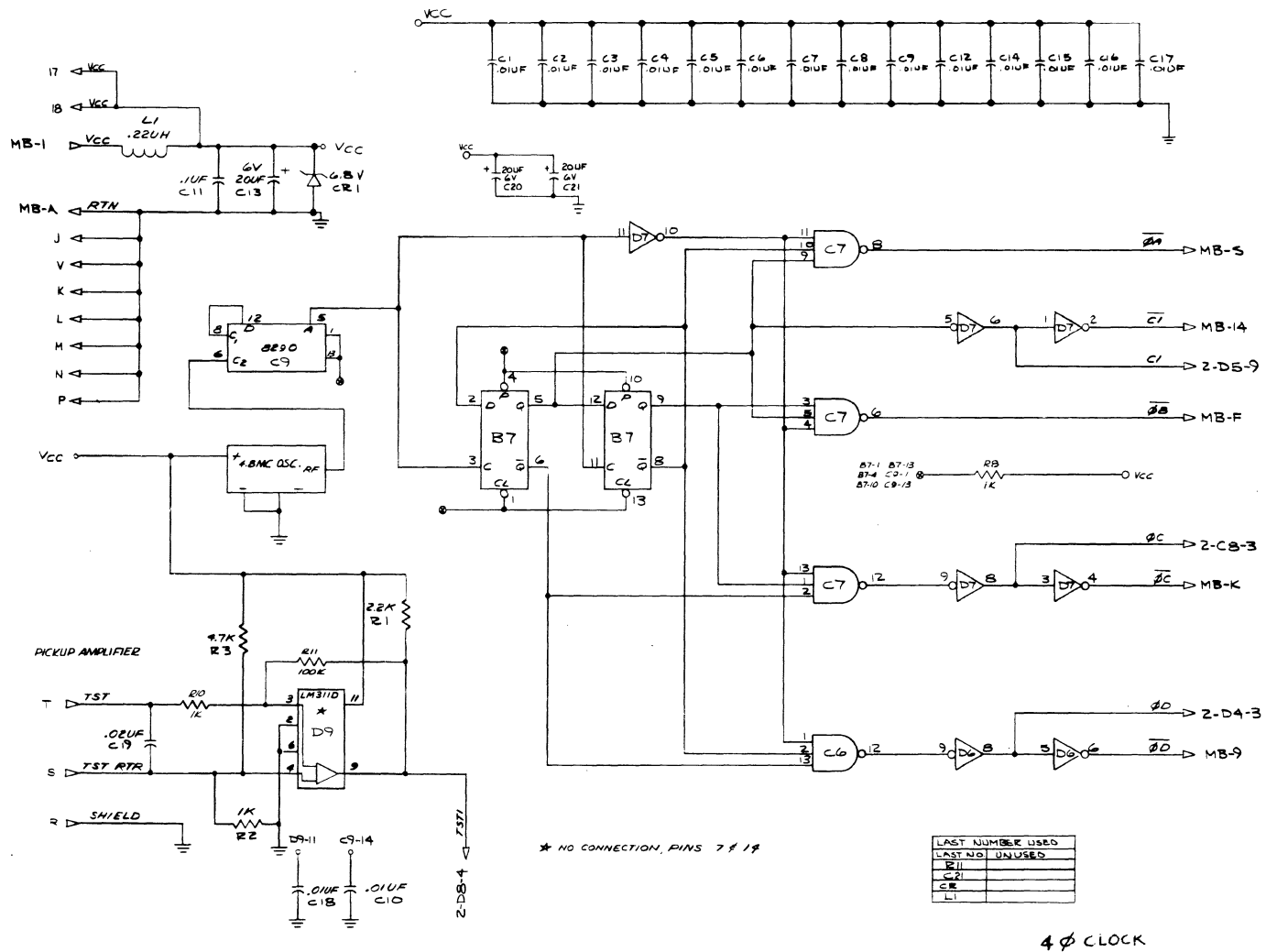


Figure 10-8. Schematic Diagram, Clock Card (Sh. 1 of 3)
(Dwg. No. 1040800)

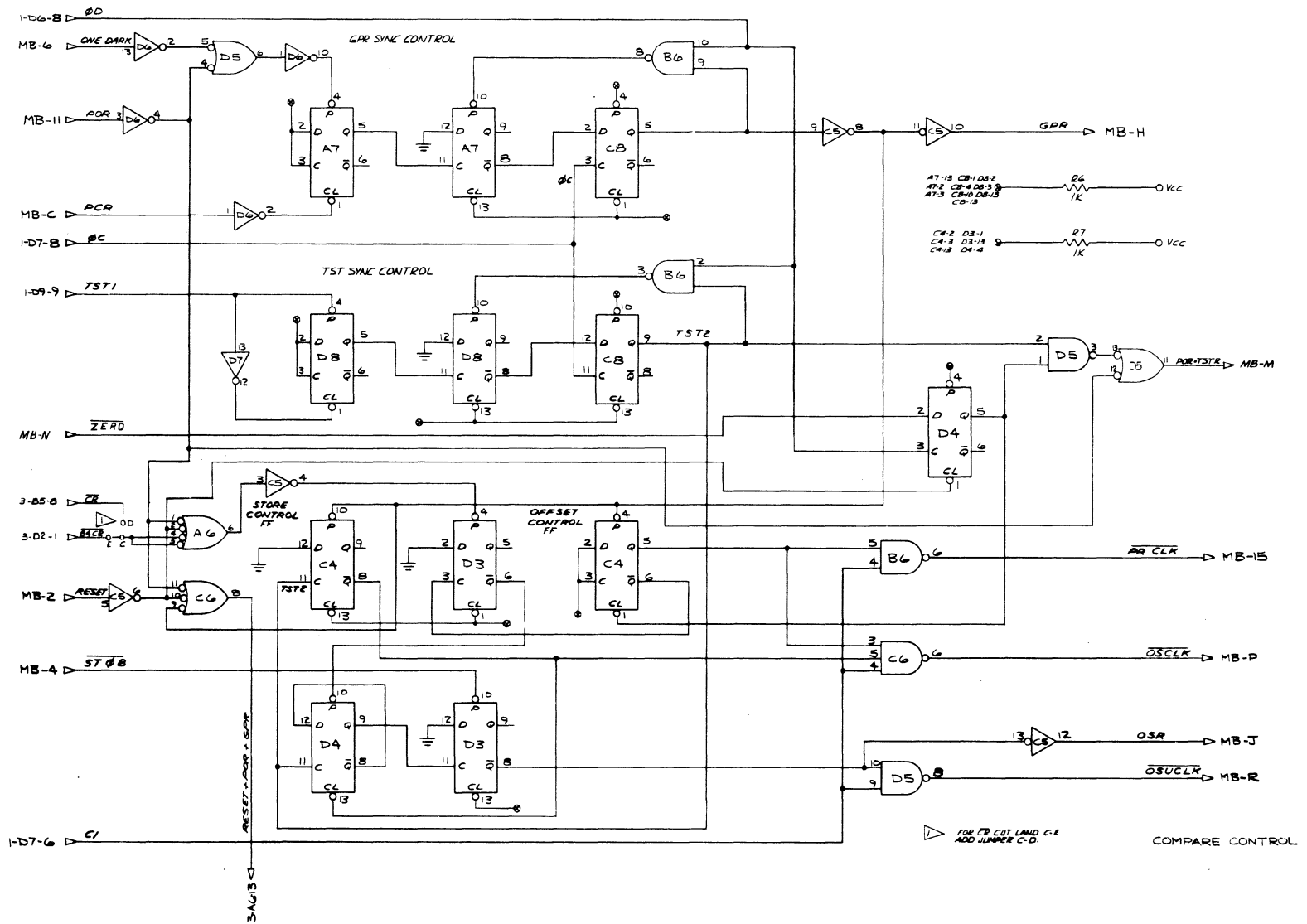
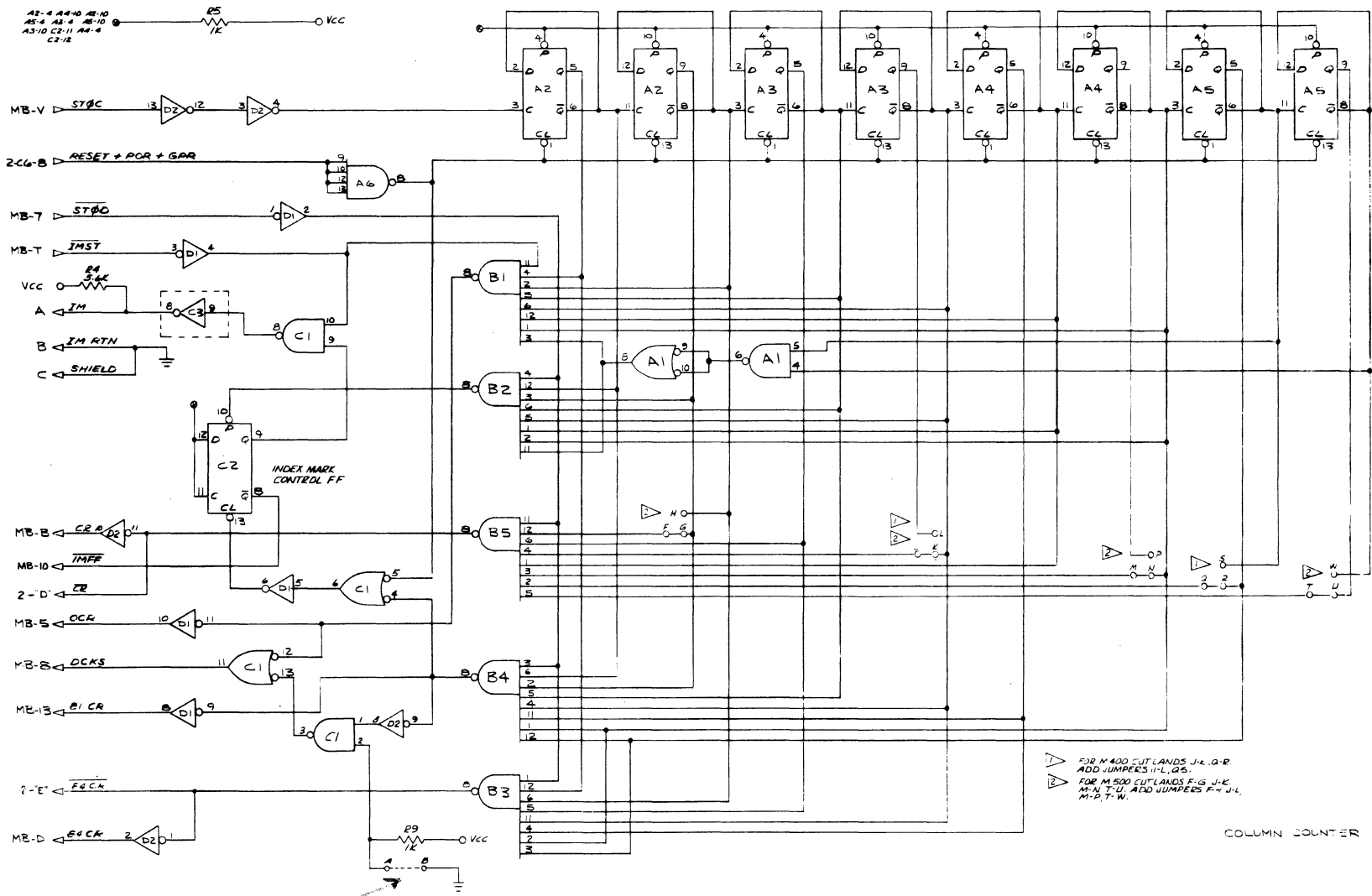


Figure 10-9. Schematic Diagram, Clock Card (Sh. 2 of 3)

10-10



Brüche ist einzulegen, zum Lesen von 87 Spalten

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

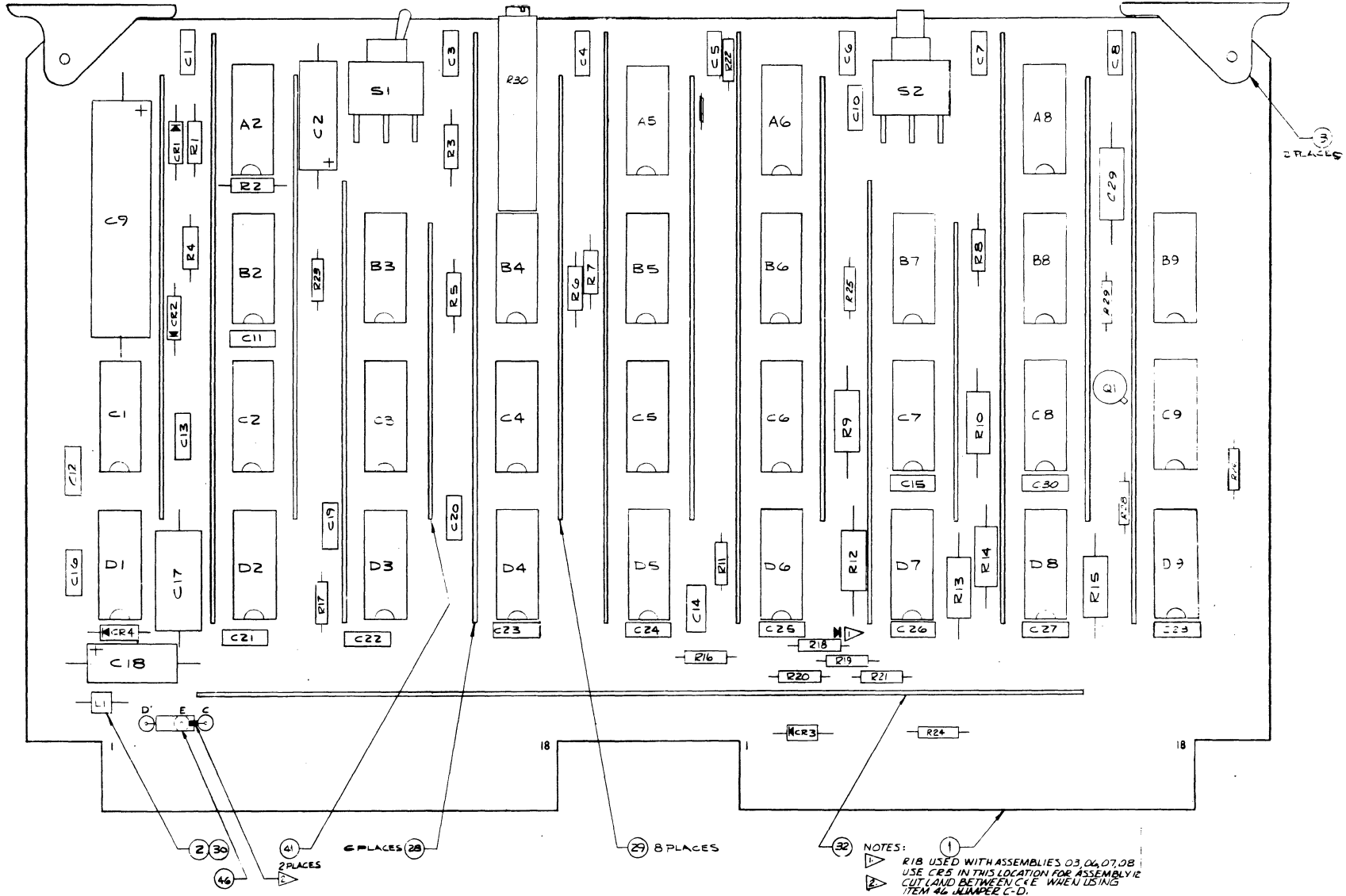


Figure 10-11. Assembly Diagram, Error Card (Dwg. No. 1040610)

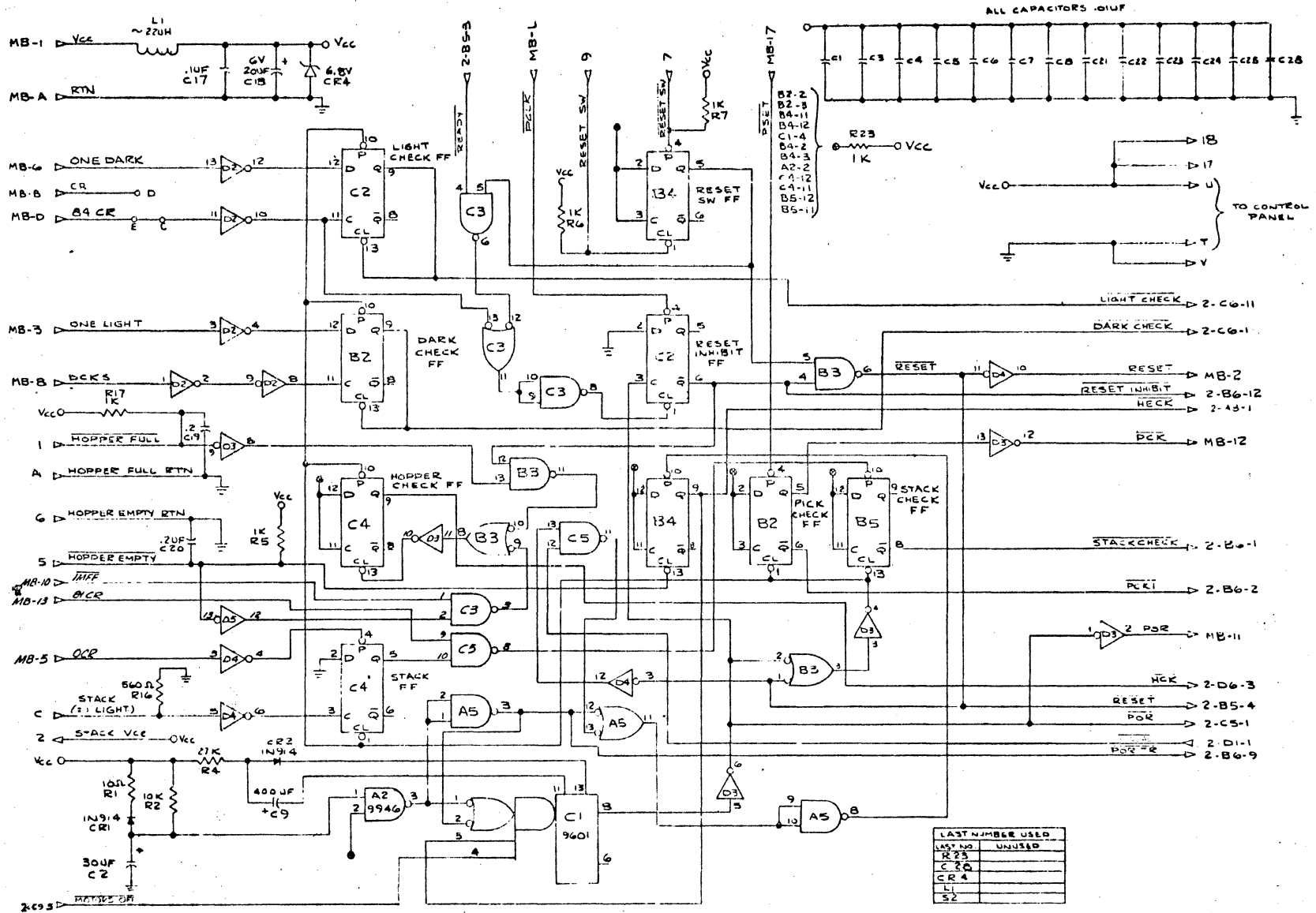


Figure 10-12. Schematic Diagram, Error Card, (Sh. 1 of 2)
 (Dwg. No. 1241716) MODIFIED CS 129 B

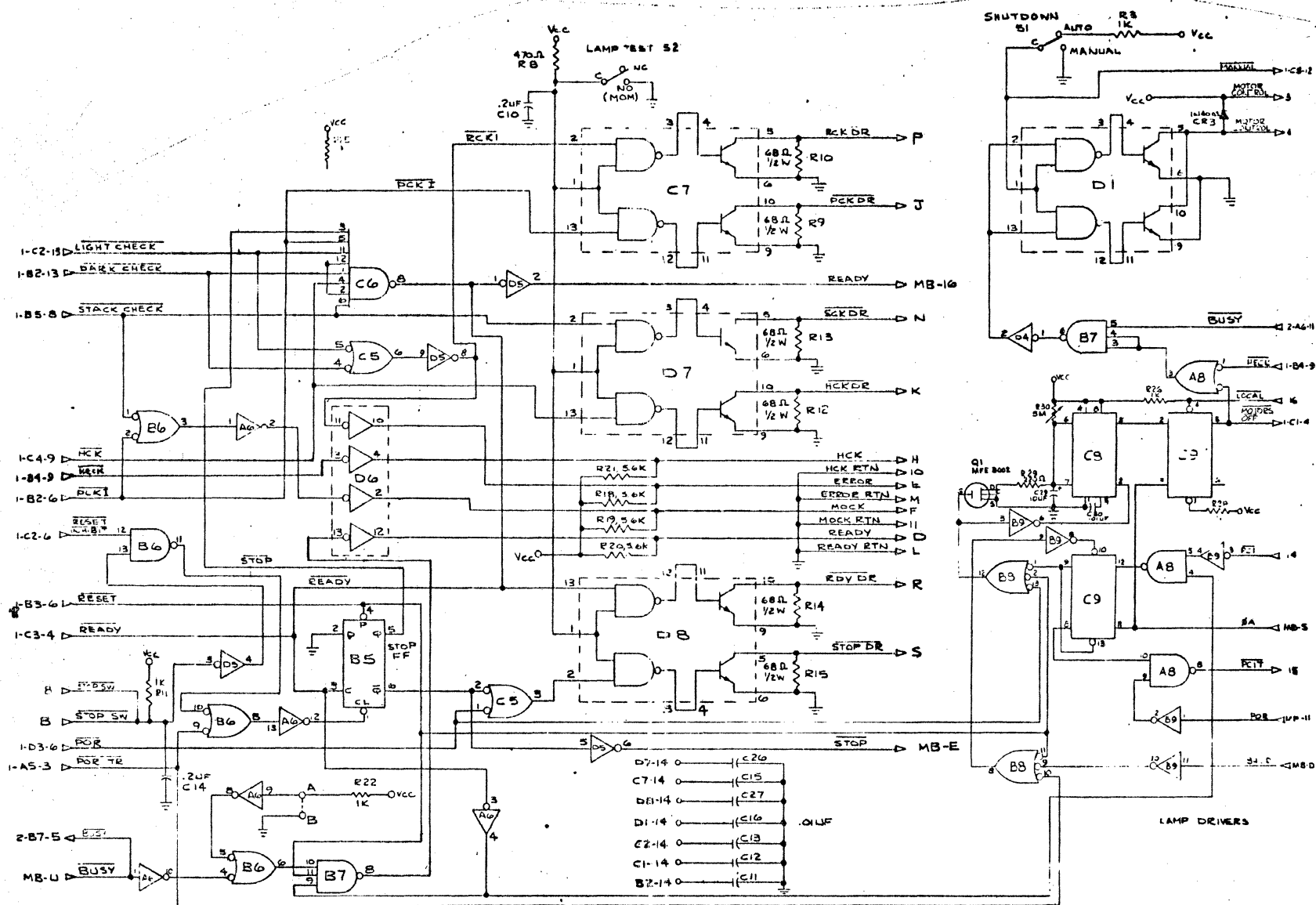


Figure 10-13. Schematic Diagram, Error Card, (Sh. 2 of 2)
MODIFIED CS 129B

10-14

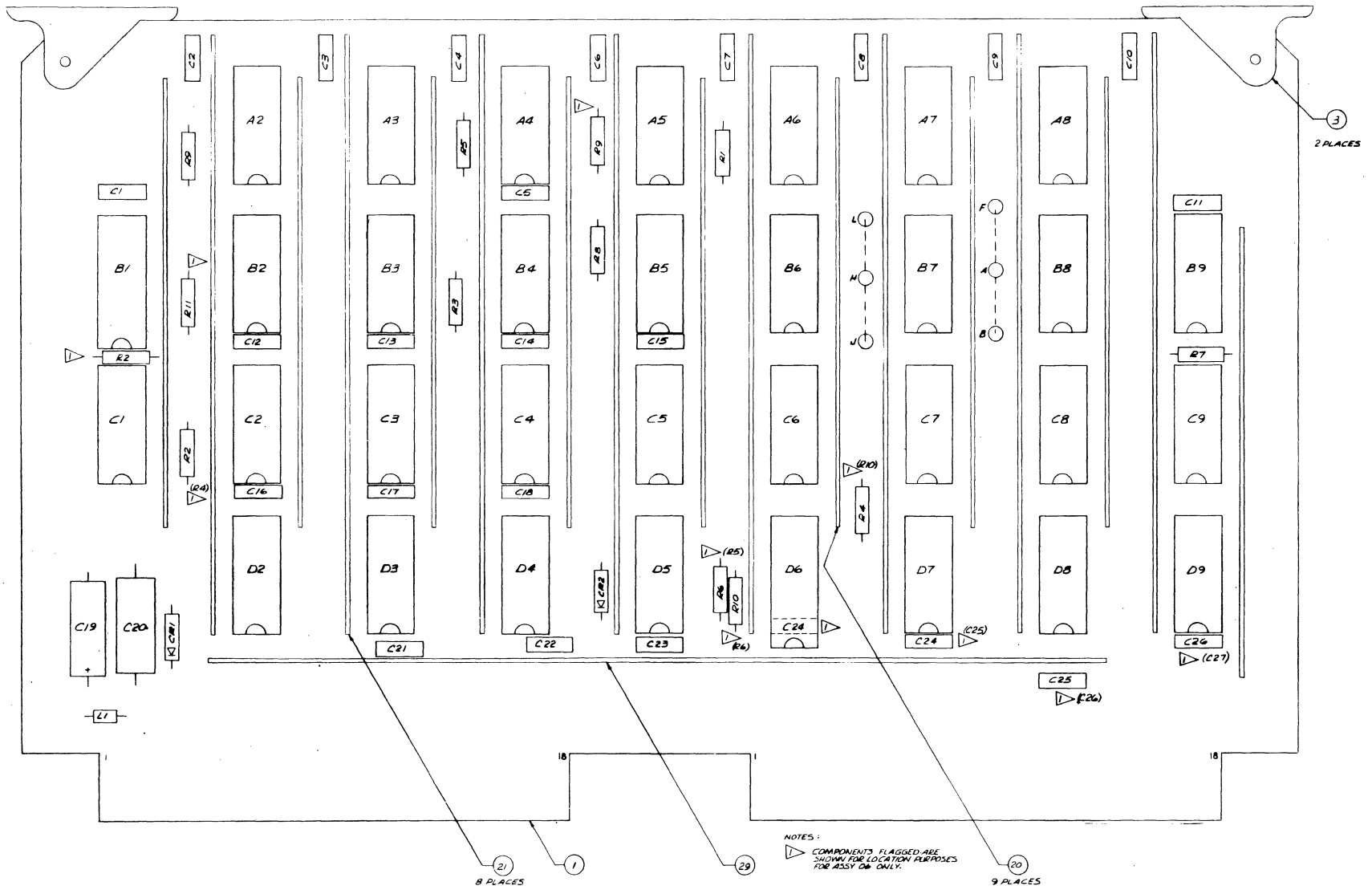


Figure 10-14. Assembly Diagram, Sync Card
(Dwg. No. 1040353)

D6 JUMPER WIRING (CSDS)

D6-1	TO	D6-6	(GND)
-2		-15	(VCC)
-3		-14	(VCC)
-4		-13	(VCC)
-9		-5	(GND)
-10		-14	(VCC)
-11		-13	(VCC)
-12		-15	(VCC)

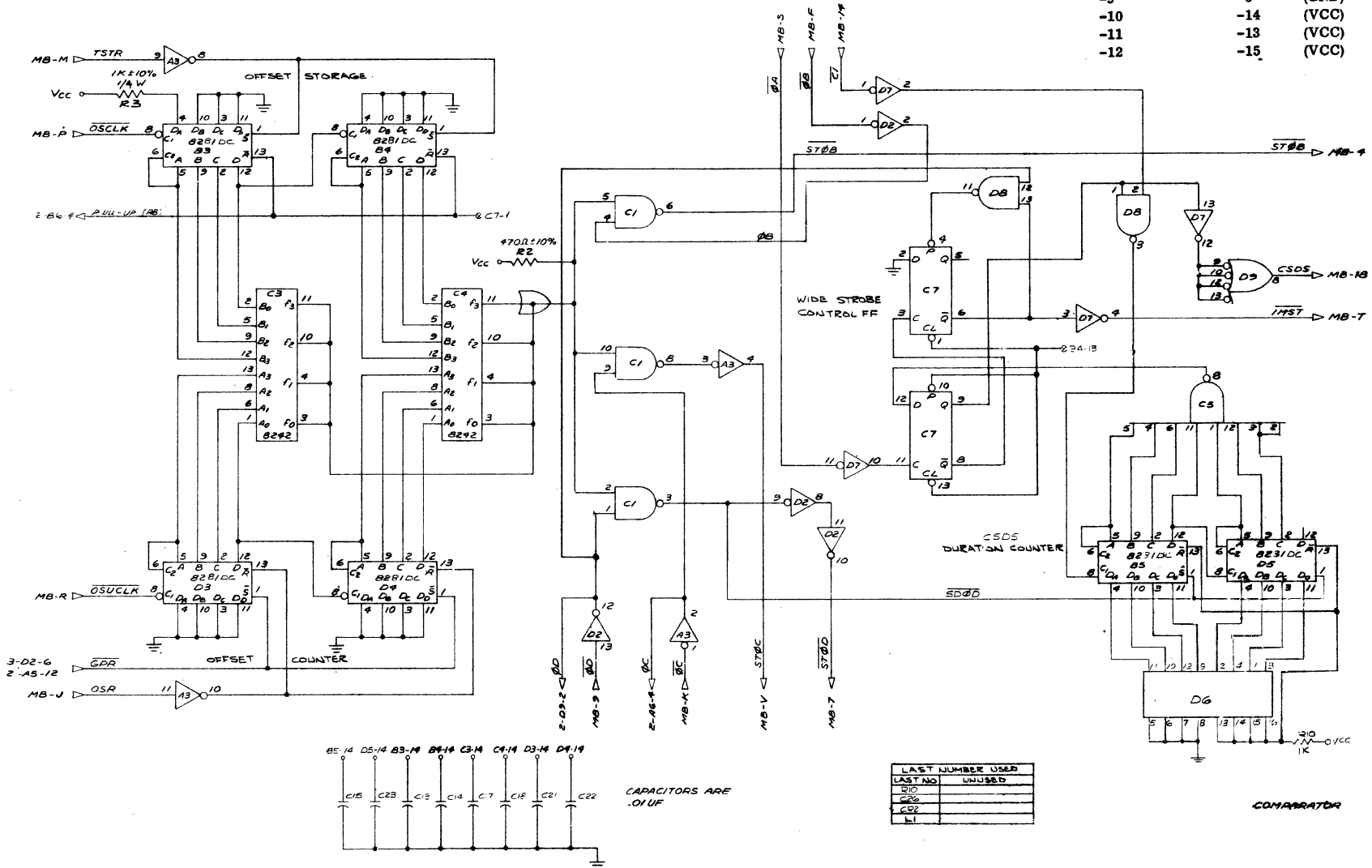


Figure 10-15. Schematic Diagram, Sync Card, (Sh. 1 of 3)
(Dwg. No. 1640943)

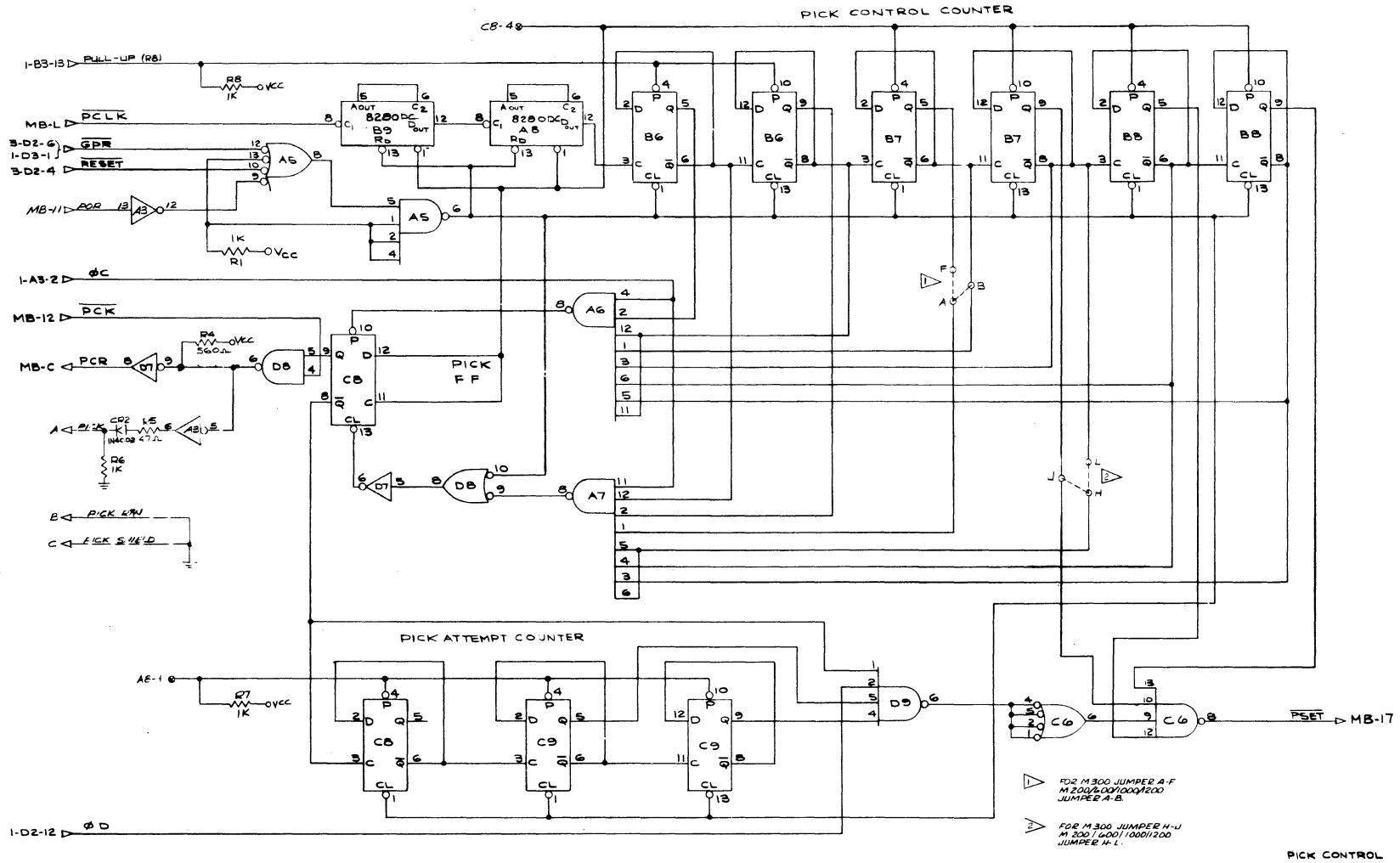


Figure 10-16. Schematic Diagram, Sync Card, (Sh. 2 of 3)

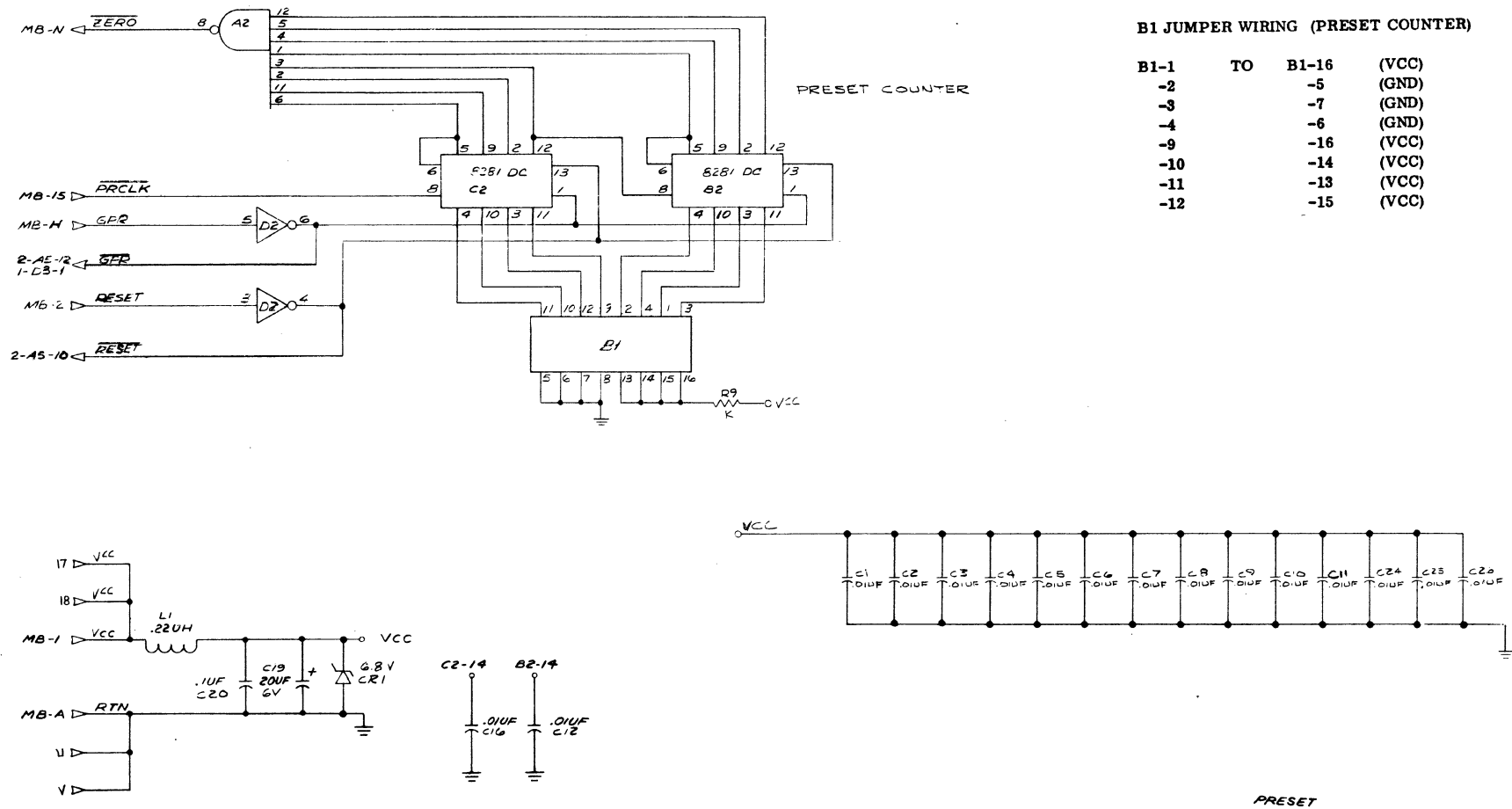
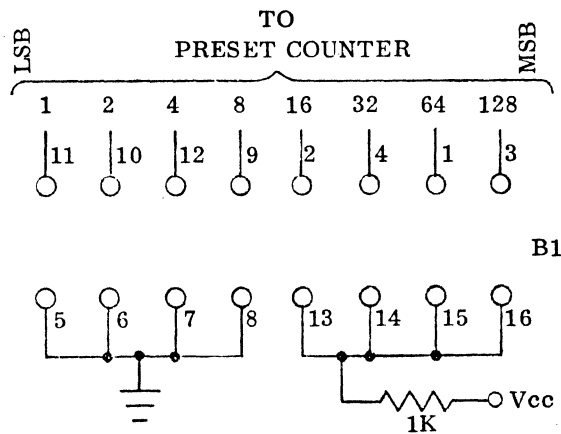
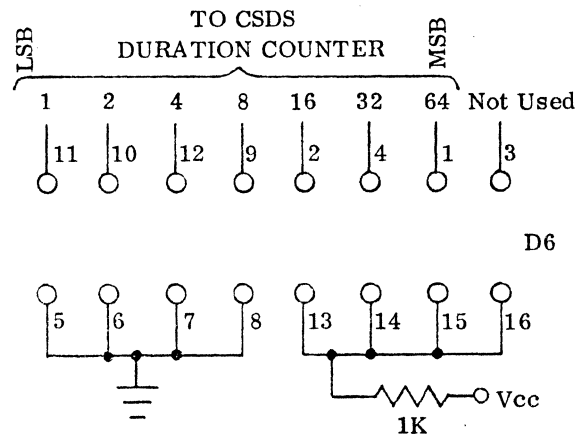


Figure 10-17. Schematic Diagram, Sync Card, (Sh. 3 of 3)



PRESET TIMING REQUIREMENTS

<u>Model</u>	<u>Count</u>	<u>Time In μsec</u>
M 200	176	1466.0
M 300/600	75	625.0
M 1000	44	366.5
M 1200	39	325.0



CSDS TIMING REQUIREMENTS

<u>Model</u>	<u>Count</u>	<u>Time In μsec</u>
M 200	72	599.7
M 300/600	39	324.9
M 1000	11	91.6
M 1200	9	75.0

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

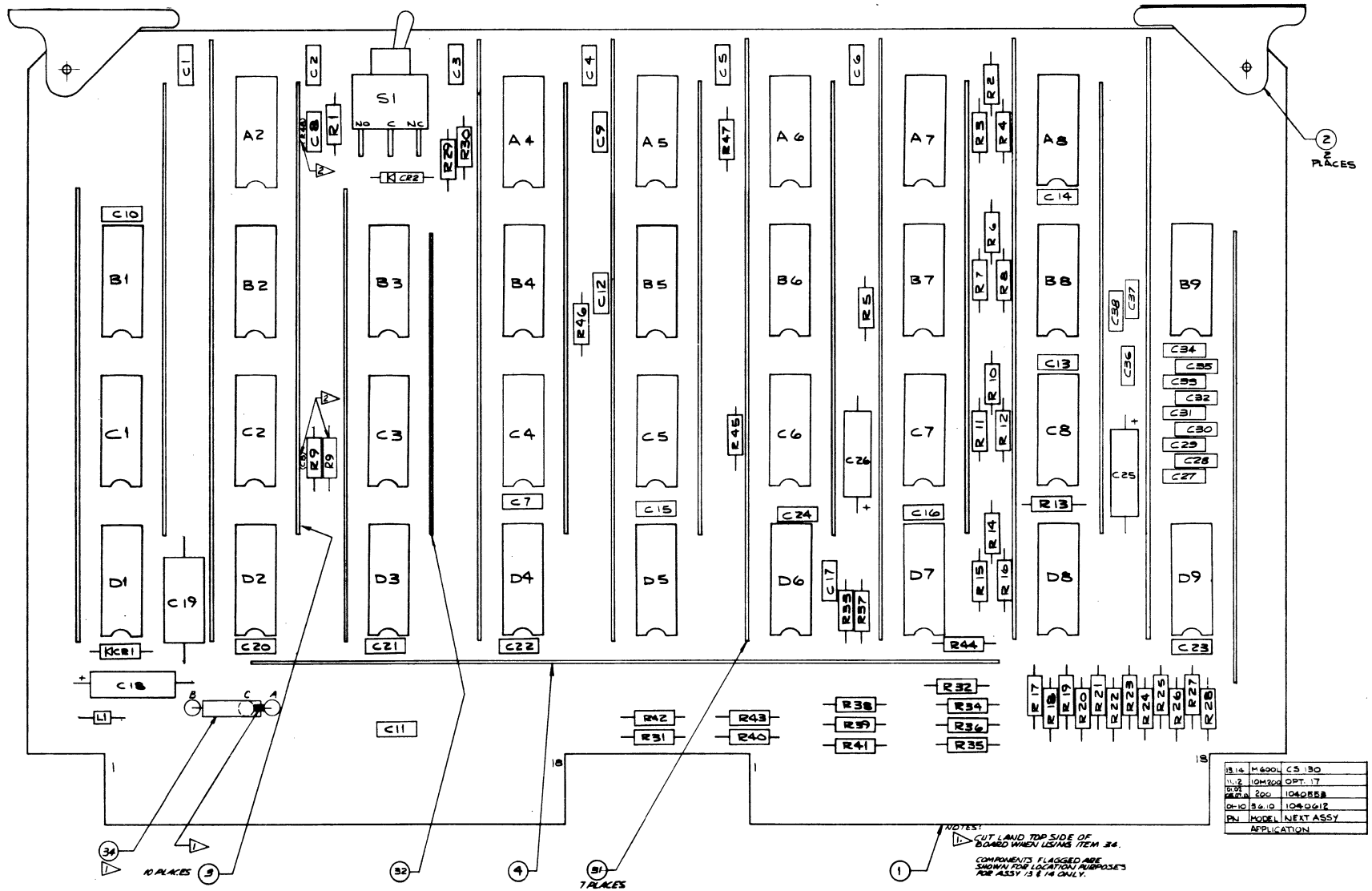


Figure 10-18. Assembly Diagram, Control Card (Dwg. No. 1040619)

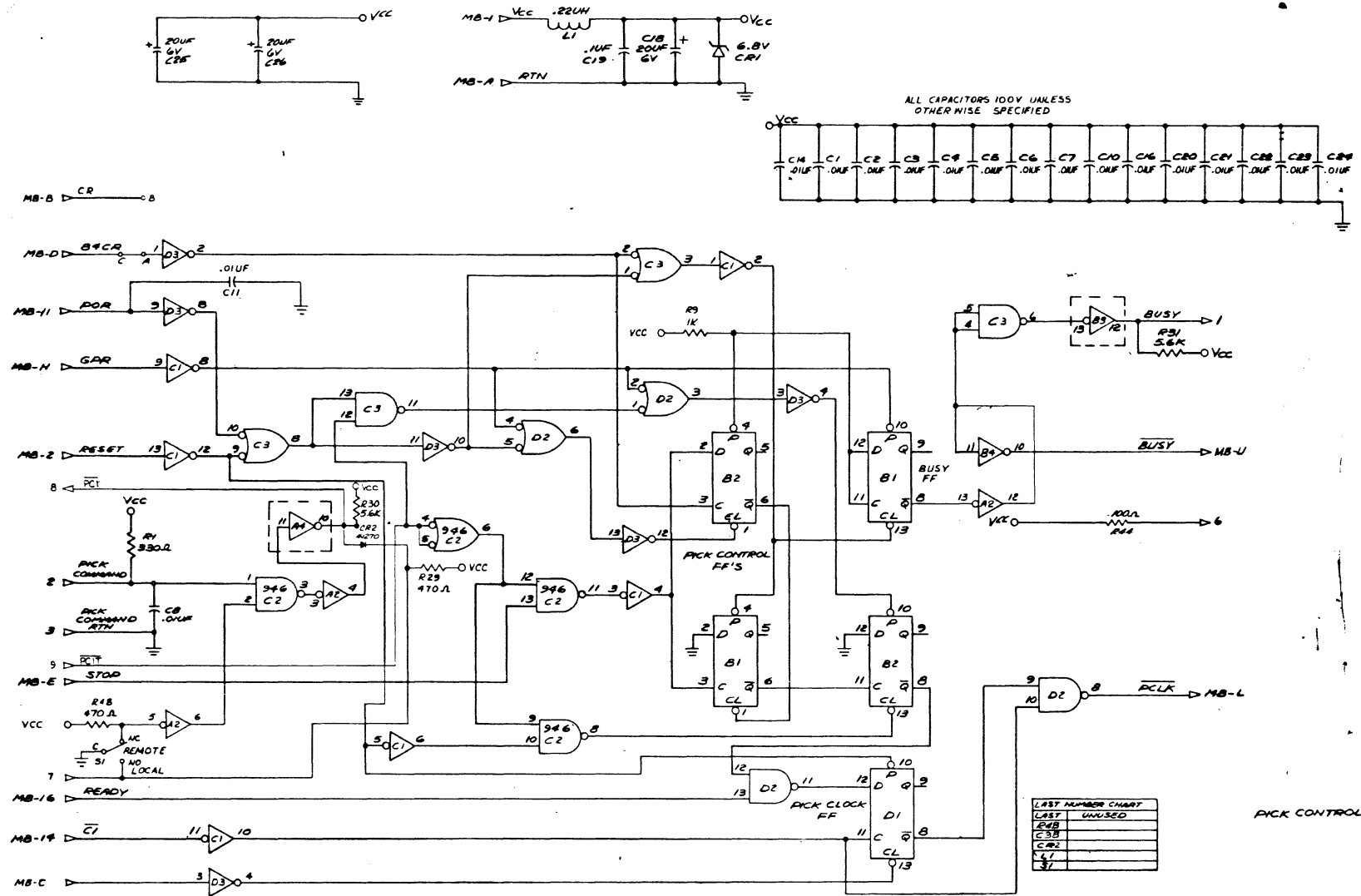


Figure 10-19. Schematic Diagram, Control Card (Sh. 1 of 2)

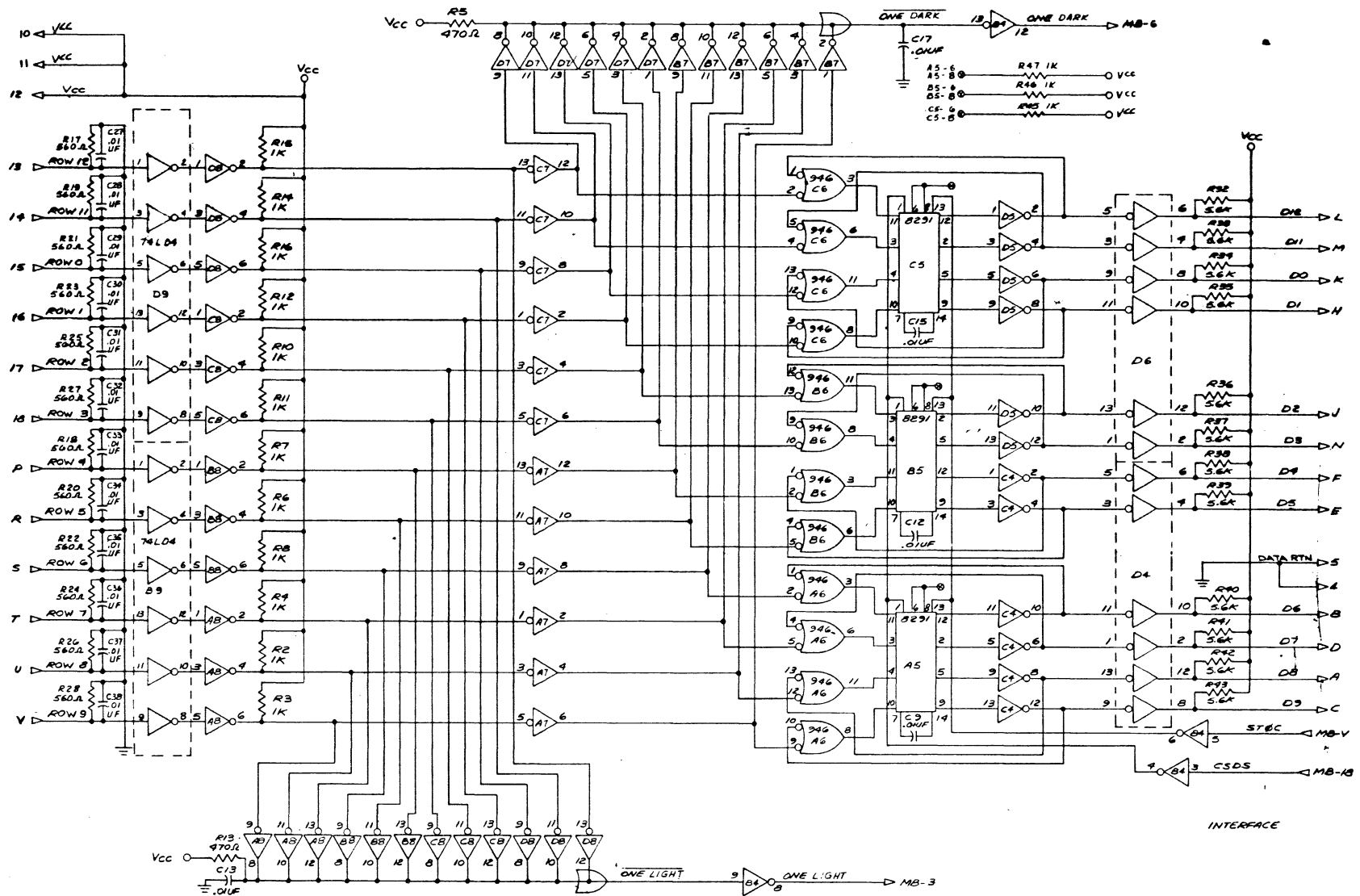


Figure 10-20. Schematic Diagram, Control Card (Sh. 2 of 2)

SECTION 11

SIGNAL MNEMONICS AND ABBREVIATIONS

MNEMONIC	DESCRIPTION	LOCATION	SOURCE
Vcc	+5 volts	MB-1	5 volt power supply (Mother Board)
RTN	+5 volts return	MB-A	5 volt power supply (Mother Board)
TST	Timing Strobe	J3-T	Reluctance Pickup
TST RTN	Timing Strobe Return	J3-S	Reluctance Pickup
SHIELD	Shield for Timing Strobe	J3-R	Reluctance Pickup
TST1	Timing Strobe One	D9-9	Clock Card
øA	Clock Phase A	MB-S	Clock Card
C1	Basic Clock	MB-14	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
ONE DARK	Read Station Any Dark	MB-6	Control Card
POR	Power On Reset	MB-11	Error Card
PCR	Pick Control Reset	MB-C	Sync Card
ZERO	Preset Decode	MB-N	Sync Card
RESET	Gated Reset Switch	MB-2	Sync Card
STøB	Column Strobe Phase B	MB-4	Sync Card
GPR	Good Pick Reset	MB-H	Clock Card
TST2	Timing Strobe Two	C8-9	Clock Card
TSTR + POR	Timing Strobe Reset	MB-M	Clock Card
PRCLK	Preset Clock	MB-15	Clock Card
OSCLK	Offset Clock	MB-P	Clock Card
OSR	Offset Reset	MB-J	Clock Card
OSUCLK	Offset Up-Clock	MB-R	Clock Card
STøC	Column Strobe Phase C	MB-V	Sync Card
STøD	Column Strobe Phase D	MB-7	Sync Card
IMST	Index Mark Strobes	MB-T	Sync Card
IM	Index Marks	J3-A	Clock Card
IM RTN	Return for Index Marks	J3-B	Clock Card
SHIELD	Shield for Index Marks	J3-C	Clock Card
CR	Column Reset	MB-B	Clock Card
OCR	Zero Column Reset	MB-5	Clock Card
DCKS	Dark Check Strobes	MB-8	Clock Card
81CR	81st Column Reset	MB-13	Clock Card
84CR	84th Column Reset	MB-D	Clock Card
PICK COMMAND	Pick Command Input	J8-2	Control Card
PICK COMMAND RTN	Pick Command Input Return	J8-3	Control Card
STOP	Stop	MB-E	Error Card
READY	Ready	MB-16	Error Card

MNEMONIC	DESCRIPTION	LOCATION	SOURCE
BUSY	Busy Output	J8-1	Control Card
PCLK	Pick Clock	MB-L	Control Card
Vcc	+5V to Read Sensor Array	J8-12	Control Card
Row 12	Read Sensor Input Row 12	J8-13	Control Card
Row 11	Read Sensor Input Row 11	J8-14	Control Card
Row 0	Read Sensor Input Row 0	J8-15	Control Card
Row 1	Read Sensor Input Row 1	J8-16	Control Card
Row 2	Read Sensor Input Row 2	J8-17	Control Card
Row 3	Read Sensor Input Row 3	J8-18	Control Card
Row 4	Read Sensor Input Row 4	J8-P	Control Card
Row 5	Read Sensor Input Row 5	J8-R	Control Card
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
ONE LIGHT	Read Station Any Light	MB-3	Control Card
D12	Data Row 12 Output	J8-L	Control Card
D11	Data Row 11 Output	J8-M	Control 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
RTN	Data Drivers Return	J8-5	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
CSDS	Column Storage Data Strobe	MB-18	Sync Card
STACKER FULL	Stacker Full Switch	J4-1	Error Card
STACKER FULL RTN	Stacker Full Switch Return	J4-A	Error Card
HOPPER EMPTY RTN	Hopper Empty Switch Return	J4-6	Error Card
HOPPER EMPTY	Hopper Empty Switch	J4-5	Error Card
STACK	Stack Sensor Input	J4-C	Error Card
STACK Vcc	Stack Sensor +5 volts	J4-2	Error Card
RESET SW	Reset Switch Normally Open	J4-9	Error Card
RESET SW	Reset Switch Normally Closed	J4-7	Error Card
PSET	Pick Check Set	MB-17	Sync Card
LIGHT CHECK	Light Check	C2-9	Error Card
DARK CHECK	Dark Check	B2-9	Error Card
HECK	Hopper Empty Check	B4-8	Error Card
PCK	Pick Check	B2-5	Error Card
STACK CHECK	Output Stacker Check	B5-8	Error Card

MNEMONIC	DESCRIPTION	LOCATION	SOURCE
PCKI	Pick Check Indicator	B2-2	Error Card
HCK	Input or Output Hopper Check	C4-9	Error Card
SHUTDOWN STATUS	Mode Switch Input	S1-C	Error Card
POR TR	Power on Reset Trigger	A5-12	Error Card
STOP SW	Stop Switch Input	J4-B	Error Card
RCK DR	Read Check Lamp Driver	J4-P	Error Card
PCK DR	Pick Check Lamp Driver	J4-J	Error Card
SCK DR	Stack Check Lamp Driver	J4-N	Error Card
HCK DR	Hopper Check Lamp Driver	J4-K	Error Card
HCK	Hopper Check Output	J4-H	Error Card
HCK RTN	Hopper Check Output Return	J4-10	Error Card
ERROR	Error Output	J4-E	Error Card
ERROR RTN	Error Output Return	J4-M	Error Card
MOCK	Motion Check Output	J4-F	Error Card
MOCK RTN	Motion Check Output Return	J4-11	Error Card
READY	Ready Output	J4-D	Error Card
READY RTN	Ready Output Return	J4-L	Error Card
RDY DR	Ready Lamp Driver	J4-R	Error Card
STOP DR	Stop Lamp Driver	J4-S	Error Card
PICK	Pick Driver Output	J5-A	Sync Card
PICK RTN	Pick Driver Output Return	J5-B	Sync Card
SHIELD	Shield for PICK	J5-C	Sync Card
BUSY	Busy Signal	MB-U	Control Card

SECTION 12
ILLUSTRATED PARTS BREAKDOWN

12-1 INTRODUCTION

This section contains, in breakdown order, the complete card reader's assemblies, subassemblies, sub-subassemblies, detail parts of each, and associated attaching parts.

The unit is divided into ten significant assemblies (refer to figure 12-2), each illustrated, and provided with a parts listing keyed to the illustrations. The assembly parts breakdown illustrations and associated parts lists identify and describe all parts of the 115 VAC 60 Hz and the 230 VAC 50 Hz models of the Card Reader. Most parts are common to both models, when a part is common only to the 50 Hz models, it is listed immediately after the equivalent part for the 60 Hz model. In the MAIN FRAME assembly breakdown, for example, (Figure 12-4), under index #16, two circuit breakers are listed for the same index number.

16	00000188 . .	CIRCUIT BREAKER, 8 amp (115 VAC, 60 Hz models)
	00000185 . .	CIRCUIT BREAKER, 6 amp (230 VAC, 50 Hz models)

Table 12-1 list the major assemblies and subassemblies and associated components of the card reader with the figure number in which they are listed and illustrated. In the parts list, Documentation parts or assemblies are identified by an eight-digit number. Parts or assemblies that Documentation purchases from suppliers and used "as is" are identified by manufacturer part number. The manufacturers' are identified by manufacturers codes in the description column of the parts list. Table 12-2 list the names and addresses of all manufacturers' codes used in the parts list.

12-2 HOW TO USE THE ILLUSTRATED PARTS BREAKDOWN

a. When the Part Number is not known (Figure 12-1):

- 1) Refer to Figure 12-2 and locate the index number of the major assembly from which the part was removed.
- 2) In the major assembly listing of Figure 12-2 use the index number to locate the figure number of the parts breakdown illustration for that assembly.
- 3) In the major assembly parts breakdown illustration, locate the index number of the part.

- 4) In the illustration part listing, use the index number to find the part number, description and quantity per unit.
- b. When the assembly and/or the major component of which an item is part of is known, refer to Table 12-1 to locate the figure number which illustrates and list the individual components or parts.
- c. To simplify the updating of Section 12 of this manual, only ODD numbered pages are used.

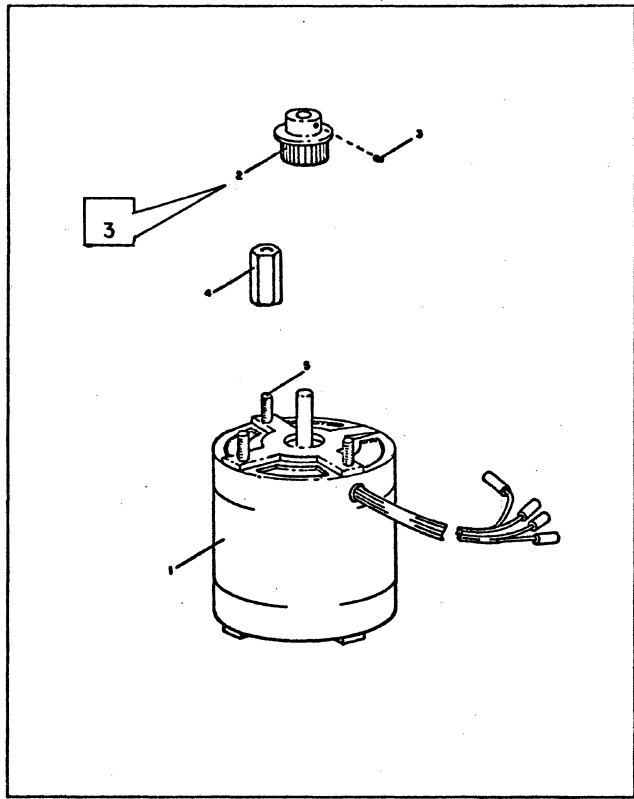
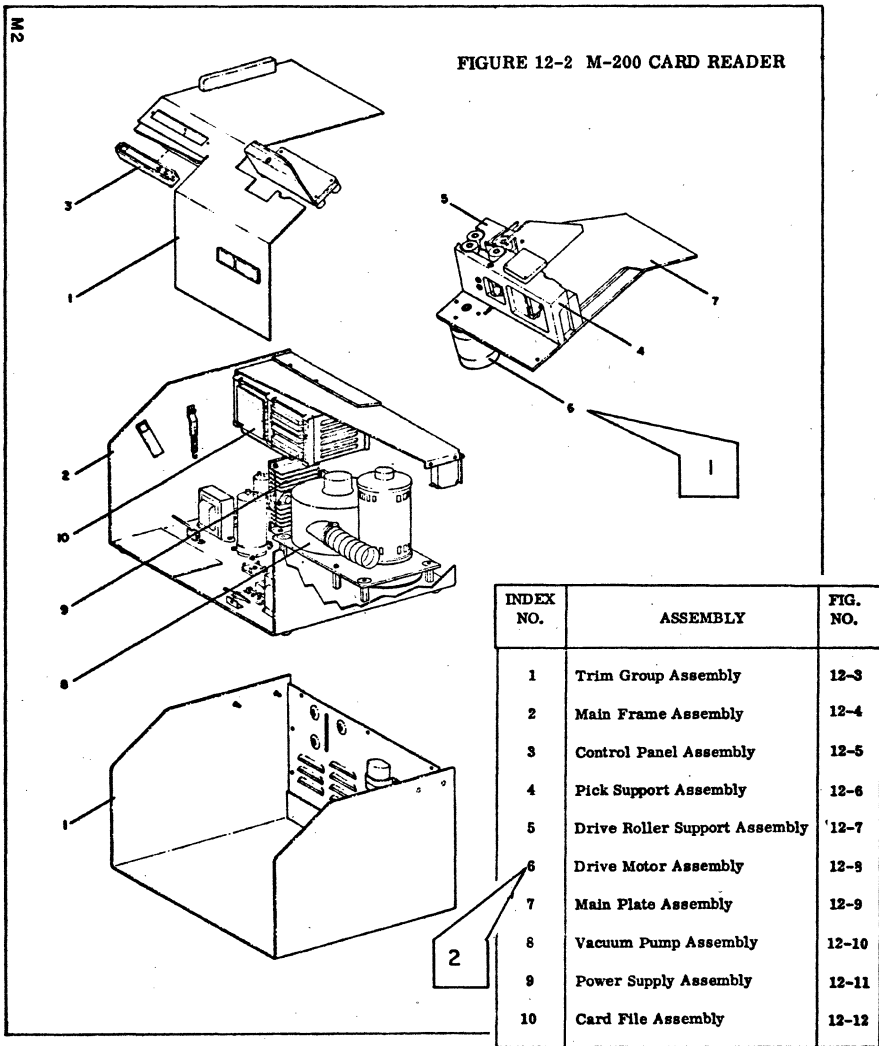


FIGURE 12-8 DRIVE MOTOR ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.
		1 2 3 4 5 6 7		
	20092903	DRIVE MOTOR ASSEMBLY - 115 VAC, 60 Hertz		
	20092904	DRIVE MOTOR ASSEMBLY - 230 VAC, 50 Hertz		
-1	00000882	. MOTOR (15070)	1	H34CBR-5
-3	20127001	. PULLEY - 115 VAC, 60 Hertz	1	
	20127002	. PULLEY - 230 VAC, 50 Hertz (Attaching Parts)	1	
-3	20127001	. SCREW, Set Screws (Supplied with Item 2)		
	00049501	. STANDOFF STUD		

- ① In Figure 12-2, locate index number of major assembly from which part was removed.
- ② In Figure 12-2, use index number of major assembly to find figure number of major assembly parts breakdown illustration.
- ③ In major assembly parts breakdown illustration, locate index number of part.
- ④ In the illustration parts list, use index number of part to find part number, description and quantity per unit.

FIGURE 12-1 HOW TO USE ILLUSTRATED PARTS BREAKDOWN WHEN PART NUMBER IS NOT KNOWN

TABLE 12-1 QUICK REFERENCE LIST

Figure	Assembly	Page
12-3	TRIM GROUP ASSEMBLY Fan Capacitor	12-11a 12-11b 12-11b
12-4	MAIN FRAME ASSEMBLY Switch, Hopper Full Circuit Breaker Transformer, 12 Volt Transformer, 24 Volt Power Supply Assembly Solenoid Driver Assembly Vacuum Pump Assembly Relay Filter Assembly Connector Panel Assembly Rectifier, Diode Bridge Capacitor, 17.5 μ f Capacitor, 10 μ f Capacitor, 4600 μ f Spring Fuse Solenoid Driver Assembly	12-13c 12-13c 12-13c 12-13c 12-13c 12-13d 12-13e 12-13e 12-13e 12-13e 12-13e 12-13e 12-13e 12-13f 12-13f 12-13f 12-13f 12-13f 12-13f 12-13f
12-5	CONTROL PANEL ASSEMBLY Lamp	12-15a 12-15a
12-6	PICK SUPPORT ASSEMBLY Switch Assembly, Hopper Empty Sector Assembly Drive Roller, 2nd Pick Drive Assembly Stack Drive, 1st Pick Drive Assembly	12-17a 12-17a 12-17a 12-17a 12-17b
12-7	DRIVE ROLLER SUPPORT ASSEMBLY First Stack Drive Assembly Second Stack Drive Assembly	12-19a 12-19a 12-19a
12-8	DRIVE MOTOR ASSEMBLY Motor Pulley	12-21a 12-21a 12-21a

TABLE 12-1 QUICK REFERENCE LIST (CONT'D)

Figure	Assembly	Page
12-9	MAIN PLATE ASSEMBLY Drive Motor Assembly Solenoid Assembly Pick-up Timing Disc Assembly Pulley Belt Capacitor, 2 μ f Capacitor, 3 μ f Read/Light Station Assembly	12-23b 12-23b 12-23c 12-23c 12-23c 12-23c 12-23c 12-23c 12-23c 12-23d
12-10	VACUUM PUMP ASSEMBLY Motor Blower Belt Pulley	12-25a 12-25a 12-25a 12-25a 12-25a
12-11	POWER SUPPLY ASSEMBLY P. C. Board Assembly	12-27a 12-27a
12-12	CARD FILE ASSEMBLY Connector, Single Row Connector, Tab	12-29a 12-29a 12-29a
12-13	P. C. ASSEMBLY - Control Card	12-31a
12-14	P. C. ASSEMBLY - Sync Card	12-33a
12-15	P. C. ASSEMBLY - Clock Card	12-35a
12-16	P. C. ASSEMBLY - Error Card	12-37a

TABLE 12-2 LIST OF MANUFACTURERS

CODE	MANUFACTURER	CODE	MANUFACTURER
00779	Amp, Incorporated P.O. Box 3608 Harrisburg, Pennsylvania 17105	05063	Hamilton - Avnet Electronics 70 State Street Westbury, N.Y. 11590
01121	Allen Bradley Company 1201 2nd Street Milwaukee, Wisconsin 53212	05245	Components Corporation 2857 N. Halsted Street Chicago, Illinois 60657
01295	Texas Instruments, Incorporated Semi-Conductor Components Division 13500 North Central Expressway Dallas, Texas 75231	05411	DuPage Manufacturing Company 2250 Curtiss Avenue Downers Grove, Illinois 60515
01634	Aluminum Co. of America 1501 Alcoa Building Pittsburg, Pennsylvania 15219	05972	Loctite Corporation 705 N. Mountain Road Newington, Connecticut 06111
01963	Cherry Electrical Products Corp. 3600 Sunset Avenue Waukegan, Illinois 60085	06229	Electrovert, Incorporated 86 Hartford Avenue Mt. Vernon, N.Y. 10553
02697	Parker Seal Company 2360 Palumbo Drive Lexington, Kentucky 40509	06383	Panduit Corporation 17301 Ridgeland Tinley Park, Illinois 60477
02735	RCA Corporation Solid State Division Route 202 Somerville, N.J. 08876	06540	Amaton Electronic Hardware Division of Mite Corporation 446 Blake Street New Haven, Connecticut
03597	General Electric Company Turbine Division of Apparatus Group Schenectady, N.Y.	07108	R. & J. Dick Co., Inc. 912 E. 5th Street Muscatine, Iowa 52763
03786	Industrial Enterprises, Incorporated 5900 N. Telegraph Road Dearborn, Michigan 48127	07137	Tec, Incorporated 6700 Washington Avenue South Eden Prairie, Minn. 55343
04963	Minnesota Mining and Mfg. Company Center Street St. Paul, Minnesota 55101	07263	Fairchild Semi-Conductor 464 Ellis Street Mountain View, California 94040
04713	Motorola Semi-Conductor Products, Inc. 5005 East McDowell Road Phoenix, Arizona 85008	07355	AirPax Electronic, Inc. Central Engineering Division 6601 N.W. 19th Street Ft. Lauderdale, Florida 33310
04866	Nylok - Detroit 1893 Barrett Road Troy, Michigan 48084	07446	Engler Instrument Company 250 Culver Avenue Jersey City, N.J. 07305

TABLE 12-2 LIST OF MANUFACTURERS (CONT'D)

CODE	MANUFACTURER	CODE	MANUFACTURER
07679	Hardware Specialty Co., Inc. 48 - 75 36th Street Long Island City, N. Y. 11101	12505	Air Product/Chemical Incorporated P. O. Box 1231 R Hanover Avenue Morristown, N. J. 07960
07707	USM "Pop" Rivet Division 510 River Road Shelton, Connecticut 06484	12617	Hamlin, Incorporated Grove and Lake Streets Lake Mills, Wisconsin 53551
07886	National Radio Co., Incorporated Commercial Products Division 78 Stone Place Melrose, Massachusetts 02176	13103	Thermalloy Company 8717 Diplomacy Row Dallas, Texas 75247
08524	Deutsch Fastener Corporation 70001 West Imperial Highway Los Angeles, California 90045	14519	Designatronics, Incorporated Stock Drive Products 55 South Denton Avenue New Hyde Park, N. Y. 11040
08806	General Electric Company Miniature Lamp Department Nela Park Cleveland, Ohio 44112	14563	Neuman & Company 8136 N. Lawndale Skokie, Illinois 60076
09021	Speer Carbon Company Speer Resistor Division A Division of Air Reduction Co., Inc. Foster Brook Road Bradford, Pennsylvania 16701	14927	Kubar, Incorporated 21 Erie Cambridge, Massachusetts 02139
09023	Cornell - Dubilier Division of Fed. Pac. Electric Co. 2526 Dalrymple Sanford, North Carolina 27330	14936	General Instrument Corporation P. O. Box 600 600 W. John Street Hicksville, New York 11802
09353	C. & K. Components, Incorporated 103 Morse Street Watertown, Massachusetts 02172	16059	Devcon Corporation 59 Endicott Street Danvers, Massachusetts 01923
09922	Burndy Corporation Richards Avenue Norwalk, Connecticut 06852	18324	Signetics Corporation 811 E. Arques Sunnyvale, California 94086
10108	Hurst Manufacturing Corporation 64 East Princeton Road Princeton, Indiana 47570	18583	Curtis Instruments, Incorporated 200 Kisco Avenue Mount Kisco, N. Y. 10549
11214	Hardigg Industries, Incorporated N. Main Street South Deerfield, Mass. 01373	18655	Computer Products 1400 N. W. 70th Street Ft. Lauderdale, Florida 33307
11253	Elrad Manufacturing Company 4300 N. California Avenue Chicago, Illinois 60618	18677	Scanbe Manufacturing Corporation 3445 Fletcher Avenue El Monte, California 91731

TABLE 12-2 LIST OF MANUFACTURERS (CONT'D)

CODE	MANUFACTURER	CODE	MANUFACTURER
18714	RCA Corporation Solid State Division Fostoria Road Findley, Ohio 45840	27264	Molex Products Company 5224 Katrine Avenue Downers Grove, Illinois 60515
18788	General Illumination, Incorporated 2233 University Avenue St. Paul, Minnesota 55114	28523	Gulf Electronics Corporation 1740 N.W. 69th Avenue Miami, Florida 33148
19070	Eastern Air Devices, Incorporated 385 Central Avenue Dover, New Hampshire 03820	28818	Soundcoat Co., Incorporated 515 Madison Avenue New York, N.Y. 10010
19401	Gladwin Industries, Incorporated Gladwin Educational Division P.O. Box 80545/1940 Will Ross Ct. Chamblee, Georgia 30341	29227	Herco Hecht Rubber Corporation 482 - 484 Riverside Avenue Jacksonville, Florida 32202
19701	Electra/Midland Corporation P.O. Box 760 Mineral Wells, Texas 76067	29440	Winfred - Berg 499 Ocean Avenue East Rockaway, L. I., N.Y. 11518
20772	Spectronics, Incorporated 24 Kinkle Street Westbury, N.Y. 11590	33062	Ferronics, Incorporated 66 N. Main Street Fairport, New York 14450
22589	Electro - Space Fabricators, Inc. 101 - 125 Centre Avenue Topton, Pennsylvania 19562	33498	Automation Components One Short Avenue Peckville, Pannsylvania 18452
23880	Stanford Applied Engineering 340 Martin Avenue Santa Clara, California 95050	34936	Nashua Corporation 44 Franklin Street Naushua, New Hampshire 03060
23936	William J. Purdy Company Pamotor Division 770 Airport Boulevard Burlingame, California 94010	46384	Penn Eng. and Mfg. Corporation Old Easton Highway Doylestown, Pennsylvania 18901
24161	Gates Rubber Company 999 South Broadway Denver, Colorado 80217	50521	HEI, Incorporated Johnathan Industrial Center Chaska, Minnesota 55318
24211	Grisby - Barton, Incorporated 3800 Industrial Drive Rolling Meadows, Illinois 60008	50522	Monsanto Electronic Special Products 10131 Bubb Road Cupertino, California 95014
27014	National Semi-Conductor Corporation 2950 San Ysidro Way Santa Clara, California 95051	55719	Snap - On Tools Corporation 8026 28th Avenue Kenosha, Wisconsin 53140

TABLE 12-2 LIST OF MANUFACTURERS (CONT'D)

CODE	MANUFACTURING	CODE	MANUFACTURING
56289	Sprague Electric Company North Adams, Massachusetts 01247	71838	Standard Pressed Steel Company Industrial Fastener Division 4444 Lee Road Cleveland, Ohio 44128
60361	Toro Manufacturing Company 8111 Lyndale Avenue South Minneapolis, Minnesota 55420	71984	Dow Corning Corporation South Saginaw Road Midland, Michigan 48641
64475	Welch Allyn, Incorporated Jordan Road Skaneateles Falls, New York 13153	72136	Elmenco South Park and John Streets Willimantic, Connecticut 06226
65083	Westinghouse Electric Corporation Lamp Division MacArthur Avenue Bloomfield, New Jersey 07003	72619	Dialight Corporation 60 Stewart Avenue Brooklyn, New York 11237
70276	Allen Manufacturing Company P.O. Box 570 Hartford, Connecticut 06101	72653	G. C. Electronics Company 400 S. Wyman Street Rockford, Illinois 61101
70854	Barden/NMB 200 Park Avenue Danbury, Connecticut 06810	73138	Beckman Instrument, Incorporated Heliport Division 2500 Harbor Boulevard Fullerton, California 92634
70903	Belden Corporation 415 S. Kilpatrick Avenue Chicago, Illinois	74364	Eastman Chemical Product, Inc. Eastman Road Kingsport, Tennessee 37662
71034	Bliley Electric Company 2545 W. Grandview Blvd. Erie, Pennsylvania 16512	74545	Hubbell Harvey, Incorporated State Street and Bostwick Avenue Bridgeport, Connecticut 06602
71279	Cambion 445 Concord Avenue Cambridge, Massachusetts 02138	75511	Lamb Electric/Ametek 627 Lake Street Kent, Ohio 44240
71590	Centralab Electric 5757 N. Greenbay Avenue Milwaukee, Wisconsin 53201	75915	Littlefuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
71744	Chicago Miniature Lamp Works 4433 Ravenswood Avenue Chicago, Illinois 60640	76005	Lord Manufacturing Company 1635 West 12th Street Erie, Pennsylvania 16512
71785	Cinch Manufacturing Company Division of T. R. W., Inc. Elk Grove Village, Illinois	76599	The Murray Corporation Industrial Park Cockeysville, Maryland 21030

TABLE 12-2 LIST OF MANUFACTURERS (CONT'D)

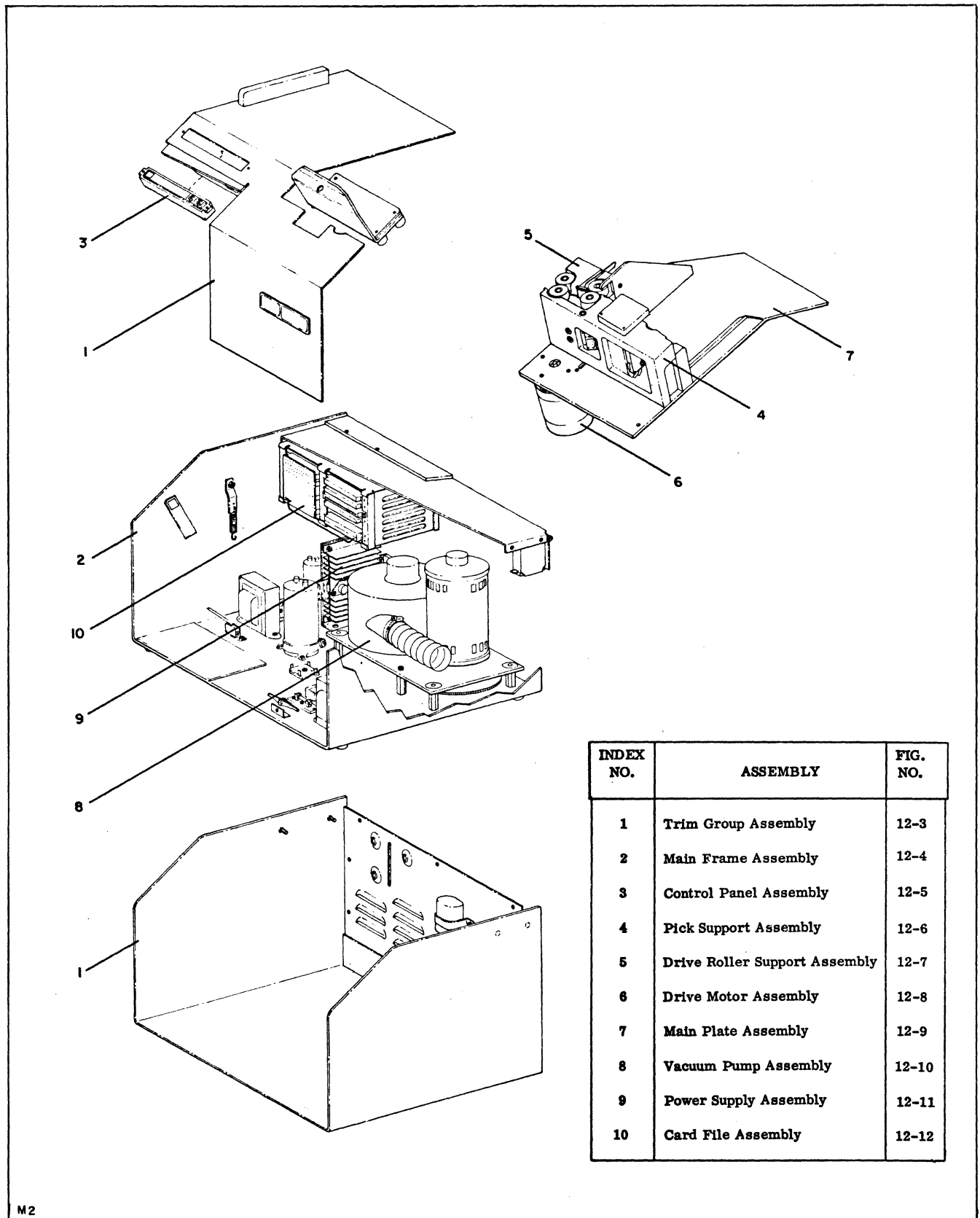
CODE	MANUFACTURER	CODE	MANUFACTURER
79023	United Elastic Company Division of Stevens, J. P. & Co., Inc. P. O. Box 391 50 Payson Avenue East Hampton, Massachusetts 01027	81840	Ledex, Incorporation Ledex Division 123 Webster Street Dayton, Ohio 45402
79136	Waldes Kohinoor, Inc. 47 - 16 Austel Place Long Island, N. Y. 11101	83014	The Hartwell Corporation 9035 Venice Blvd. Los Angeles, California 90034
79405	Wood Electric Corporation Danvers Industrial Park Danvers, Massachusetts 01923	83259	Parker Seal Company 10567 Jefferson Blvd. Culver City, California 90231
80089	Essex International Controls Division 131 Godfrey Street Logansport, Indiana	83330	H. H. Smith, Incorporated 812 Snedicker Avenue Brooklyn, New York 11207
80103	Lambda Electronics Corporation 515 Broad Hollow Road Huntington, New York 11749	83584	Drive-Lok, Incorporated 1140 Park Avenue Sycamore, Illinois 60178
80183	Sprague Products Company Beaver Street North Adams, Massachusetts	84830	Lee Spring Company 30 Main Street Brooklyn, New York 11201
80223	T. R. W. Electronic Components United Transformer Division 150 Varick Street New York, N. Y. 10013	85446	Bokers, Incorporated 3104 Snelling Avenue Minneapolis, Minnesota 55406
80294	Bournes, Incorporated 1200 Columbia Avenue Riverside, California 92507	86577	Precision Metal Prod. of Malden, Inc. 41 Elm Street Stoneham, Massachusetts 02180
80382	Air Reduction Co., Incorporated 150 E. 42nd Street New York, N. Y. 10017	87034	Marco - Oak Industries, Incorporated P. O. Box 4011 207 S. Helena Anaheim, California 92803
80545	Ametek Hunter Spring 1 Spring Avenue Hatfield, Pennsylvania 19440	87730	United Mineral and Chemical Corp. 129 Hudson Street New York, N. Y. 10013
81312	Winchester Electronics Main Street and Hillside Avenue Oakville, Connecticut 06779	88132	Goodyear Rubber Company 25 Hamlin Middletown, Connecticut 06457
81541	Airpax Electronics, Incorporation Woods Road Cambridge, Maryland 21613	91506	Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703
		91637	Dale Electronics, Incorporated P. O. Box 609 Columbus, Nebraska 68601

TABLE 12-2 LIST OF MANUFACTURERS (CONT'D)

CODE	MANUFACTURER	CODE	MANUFACTURER
91662	Elco Corporation Maryland Road and Computer Avenue Willow Grove, Pennsylvania 19090		Dearborn Wire and Cable Company 9299 Evenhouse Rosemont, Illinois
92194	Alpha Wire 711 Lidgerwood Avenue Elizabeth, New Jersey		Extron Corporation P.O. Box 10725 Knoksville, Tennessee 37919
94144	Raytheon Company Components Division Industrial Components Operation 465 Centre Street Quincy, Massachusetts 02169		Merit Fastners 127 Atlantic Boulevard Maitland, Florida 32951
94222	Southco, Incorporated Lester, Pennsylvania 19113		Millitary Packing Company P.O. Box 460 Orlando, Florida 32802
94452	Berkley and Company Highway 9 and 71 Spirit Lake, Iowa 51360		Motronics Corporation Riverside Industrial Park Little Falls, N. Y. 13365
95275	Vitramon, Incorporated P.O. Box 544 Bridgeport, Connecticut 06601		National Gard. Product, Incorporated P.O. Box 7353 Memphis, Tennessee 38107
95987	Weckesser Co., Incorporated 4444 West Irving Park Road Chicago, Illinois 60641		Pipeline Service Company 3240 N. Manheim Road Franklin Park, Illinois 60131
96182	Master Specialties Company 1640 Monrovia Costa Mesa, California 92627		Pötter - Brumfield 1200 E. Broadway Princeton, Indiana 47470
96881	Thomson Industries, Incorporated 1029 Plandome Road Manhasset, New York 11030		Reynolds Aluminum Supply Company 2920 Eunice Avenue Orlando, Florida 32802
99743	IMC Magnetics Corporation 6058 Walker Avenue Maywood, California 90270		Sunset Wire and Cable, Incorporated P.O. Box 224 Cape Canaveral, Florida 32930
	Active and Passive Components 121 - 18 Du Pont Street Plainview, N. Y. 11803		The Torrington Company Clinton Bearing Plant Clinton, South Carolina
	Consolidated Wire and Cable 1637 South Clinton Chicago, Illinois 60616		Thorgren Tool and Moulding Company 110 Evans Avenue Valparaiso, Indiana 46383
			Tri - Power, Incorporated Akron, Ohio

TABLE 12-2 LIST OF MANUFACTURERS (CONT'D)

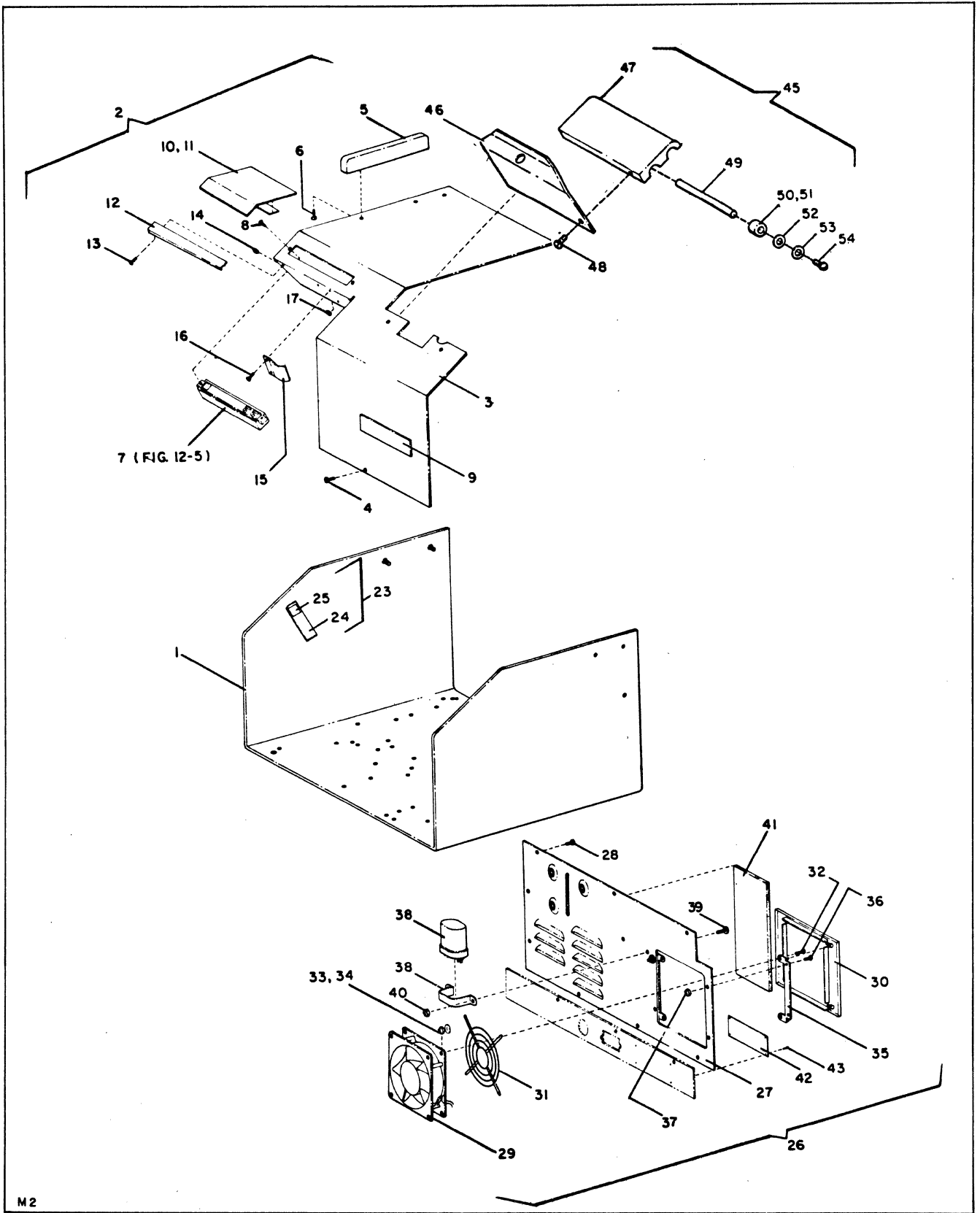
CODE	MANUFACTURER	CODE	MANUFACTURER
	Voyce - Legier 523 N. W. 28th Street Miami, Florida 33127		



INDEX NO.	ASSEMBLY	FIG. NO.
1	Trim Group Assembly	12-3
2	Main Frame Assembly	12-4
3	Control Panel Assembly	12-5
4	Pick Support Assembly	12-6
5	Drive Roller Support Assembly	12-7
6	Drive Motor Assembly	12-8
7	Main Plate Assembly	12-9
8	Vacuum Pump Assembly	12-10
9	Power Supply Assembly	12-11
10	Card File Assembly	12-12

M2

FIGURE 12-2 M-200 CARD READER



1120590 (c)

M2

FIGURE 12-3 TRIM GROUP ASSEMBLY

FIGURE 12-3 TRIM GROUP ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	20059001	TRIM GROUP ASSEMBLY - 115 VAC, 60 Hertz								
	20059002	TRIM GROUP ASSEMBLY - 230 VAC, 50 Hertz								
-1	40076801	. MAIN FRAME ASSEMBLY							1	
-2	40053503	. COVER ASSEMBLY							1	
-3	40052501	. . COVER (Attaching Parts)							1	
-4	00000114	. . . SCREW, Button Head BLK 6 - 32 x 1/4							4	
-5	20043801	. . BAR, Tamp (Attaching Parts)							1	
-6	00000382	. . . SCREW, Machine, Pan Head 8 - 32 x 3/8							2	
-7	00000413	. . CONTROL PANEL ASSEMBLY (Fig. D-5) (Attaching Parts)							1	DPA-7164B
-8	00000296	. . . SCREW, Button Head BLK #6 - 32 x 3/8							2	
-9	20028004	. . TAG, Series							1	
-10	00000558	. . FOAM DAMPING, 1/4" x 4" x 10" Voyce-Legier							1	GP-2
-11	REF	. . RUBBER 1/6 x 1" x 7 1/2"							1	
-12	20062301	. . GUIDE, Stacker (Attaching Parts)							1	
-13	00000096	. . . SCREW, Button Head, #4 - 40 x 1/4							2	
-14	00000062	. . . NUT, Hex #4 - 40							2	
-15	20102301	. . CARD DEFLECTOR (Attaching Parts)							1	
-16	00000114	. . . SCREW, Machine, Button Head #6 - 32 x 1/4							2	
-17	00000301	. . . NUT, Hex #6 - 32								
-18		Not Used								
-19		Not Used								
-20		Not Used								
-21		Not Used								
-22		Not Used								
-23	20061601	. STACK BUMPER PLATE ASSEMBLY							1	
-24	20042701	. . PLATE, Stack Bumper							1	
-25	20042801	. . RUBBER BUMPER							1	
-26	40055701	. REAR PANEL ASSEMBLY - 115 VAC, 60 Hertz							1	
	40082801	. REAR PANEL ASSEMBLY - 230 VAC, 50 Hertz							1	
-27	40050101	. . PANEL, Rear - 115 VAC, 60 Hertz							1	
	40082901	. . PANEL, Rear - 230 VAC, 50 Hertz (Attaching Parts)							1	
-28	00000114	. . . SCREW, Button Head BLK #6 - 32 x 1/4							6	

M/L 1120590 (M)

FIGURE 12-3 TRIM GROUP ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-29	00000325	. . FAN - 115 VAC, 60 Hertz (23936) W/INTEGRAL COMPONENTS	1	4600		
	00000035	CONTACT, Pin (00779)	2	60618-1		
	00000499	HOUSING, Pin (00779)	1	1-408319-0		
	00000127	TUBING, Heatshrink 1/8 Dia. x 1/2" (92194)	2	FIT-105		
	00000164	WIRE, Elec. AWG 20 TWPR BLK-WHT 3" (92194)	1	1854/19		
	00000059	MOUNT, Cable Tie (06383)	1	TA158		
	00000058	TIE, Cable (06383)	1	SSTIM		
	00000326	. . FAN - 230 VAC, 50 Hertz (23936) W/INTEGRAL COMPONENTS	1	2050		
	00000035	CONTACT, Pin (00779)	2	60618-1		
	00000449	HOUSING, Pin (00779)	1	1-408319-0		
	00000087	TUBING, Heatshrink 3/32 Dia. x 1" (92194)	1	FIT-105		
	00000530	RECEPTACLE, Faston (.250) (00779)	3	61370-1		
	00000452	HOUSING, Receptacle (00779)	3	480416-0		
	00000156	WIRE, Elec. AWG 18 TWPR BLK 6 1/2-WHT 7" (92194)	1	1854/19		
	00000059	MOUNT, Cable Tie (06383)	1	TA158		
	00000058	TIE, Cable (06383)	1	SSTIM		
-30	00000323	. . SCREEN, Fan (23936)	1	5503		
-31	00000473	. . GUARD, Finger, Metal Fan (IMC) (Attaching Parts)	1	65-175		
-32	00000302	. . . SCREW, Pan Head #6 - 32 x 1/2	4			
-33	00000295	. . . WASHER, Flat #6	4			
-34	00000301	. . . NUT, Hex #6 - 32	4			
-35	00000324	. . BRACKETS, Mtg (Pair) (23936) (Attaching Parts)	1	5501		
-36	00000356	. . . SCREW, Machine, Flat Head #6 - 32 x 1/4	4			
-37	00000301	. . . NUT, Hex #6 - 32	4			
-38	00000842	. . CAPACITOR, 2.0 μ f 370 VAC and Clamp (230 VAC, 50 Hertz Model only) (56289) (Attaching Parts)	1	200P1901TP		
-39	00000343	. . . SCREW, Button Head BLK 6 - 32 x 3/8	2			
-40	00000301	. . . NUT, Hex #6 - 32	2			
-41	00000558	. . FOAM, Damping 7 3/8 x 3 3/8 (115 VAC, 60 Hertz only) Joyce Legier	1	GP-2		
-42	20028104	. TAG, Model Information - 115 VAC, 60 Hertz	1			
	20028102	. TAG, Model Information - 230 VAC, 50 Hertz (Attaching Parts)	1			
-43	00000488	. . PIN, Drive	4	MS-21318-9		
-44	20014801	. CORD, Power, 115 VAC, 60 Hertz	1			
	20087902	. CORD, Power, 230 VAC, 50 Hertz	1			

M/L 1120590 (M)

FIGURE 12-3 TRIM GROUP ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-45	30158601	.	.	.	.	.	.	.	1	
-46	30158401	.	.	.	.	.	.	.	1	
-47	30158301	.	.	.	.	.	.	.	1	
										(Attaching Parts)
-48	00000346	.	.	.	.	.	.	.	2	
-49	10011901	.	.	.	.	.	.	.	4	
-50	20158501	.	.	.	.	.	.	.	4	
-51	00000518	.	.	.	.	.	.	.	4	5-230
-52	00000431	.	.	.	.	.	.	.	4	SS2-27
										(Attaching Parts)
-53	00000065	.	.	.	.	.	.	.	4	
-54	00000272	.	.	.	.	.	.	.	4	

M/L 1120590 (M)

114075205(J), 114076901(F)

M2

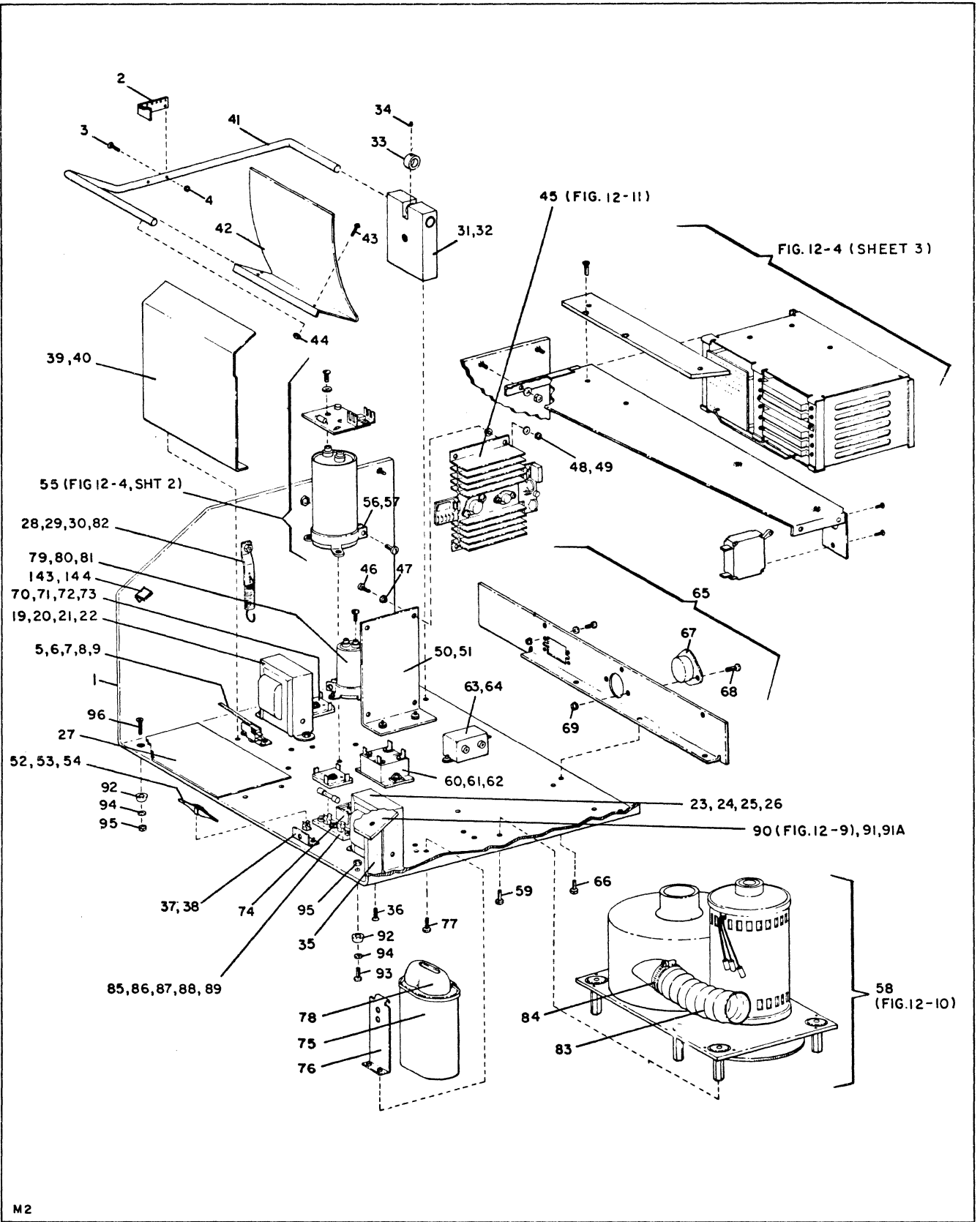


FIGURE 12-4 MAIN FRAME ASSEMBLY (Sheet 1 of 3)

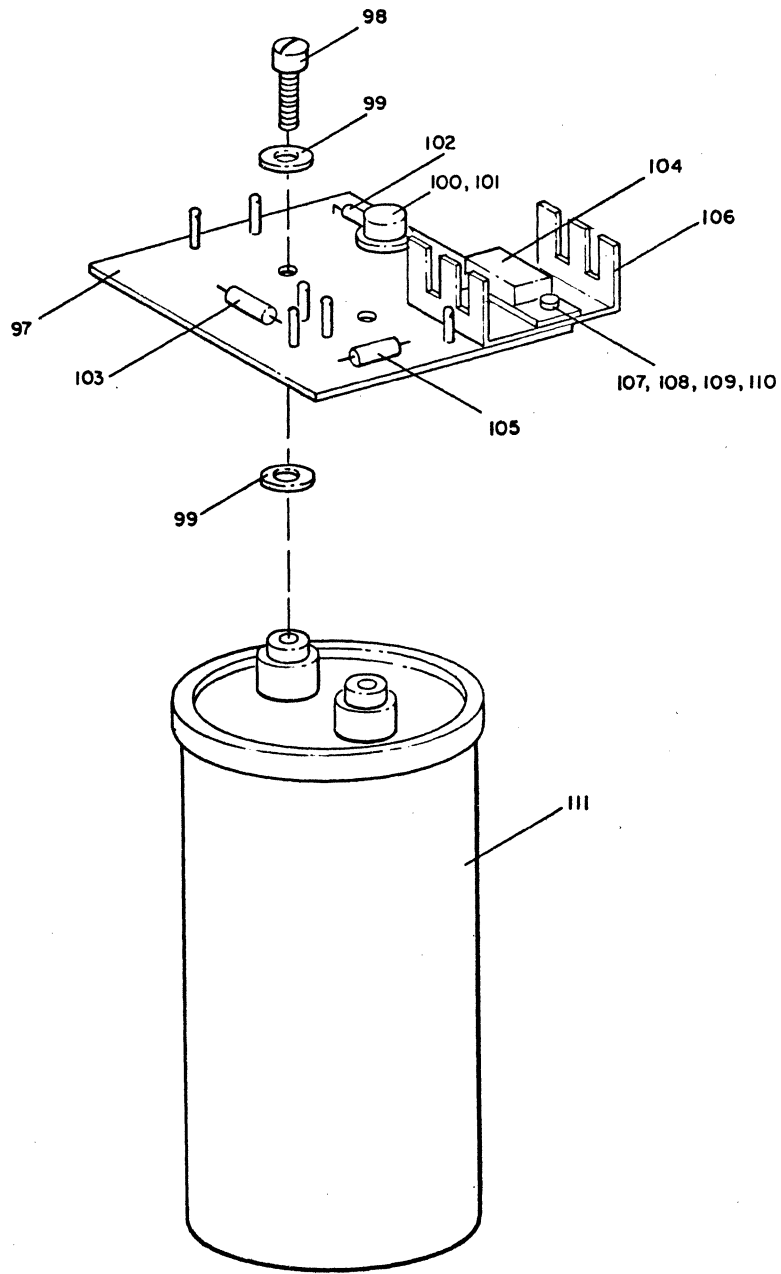


FIGURE 12-4 MAIN FRAME ASSEMBLY (Sheet 2 of 3)

114075205(J), 114076901(F)

M2

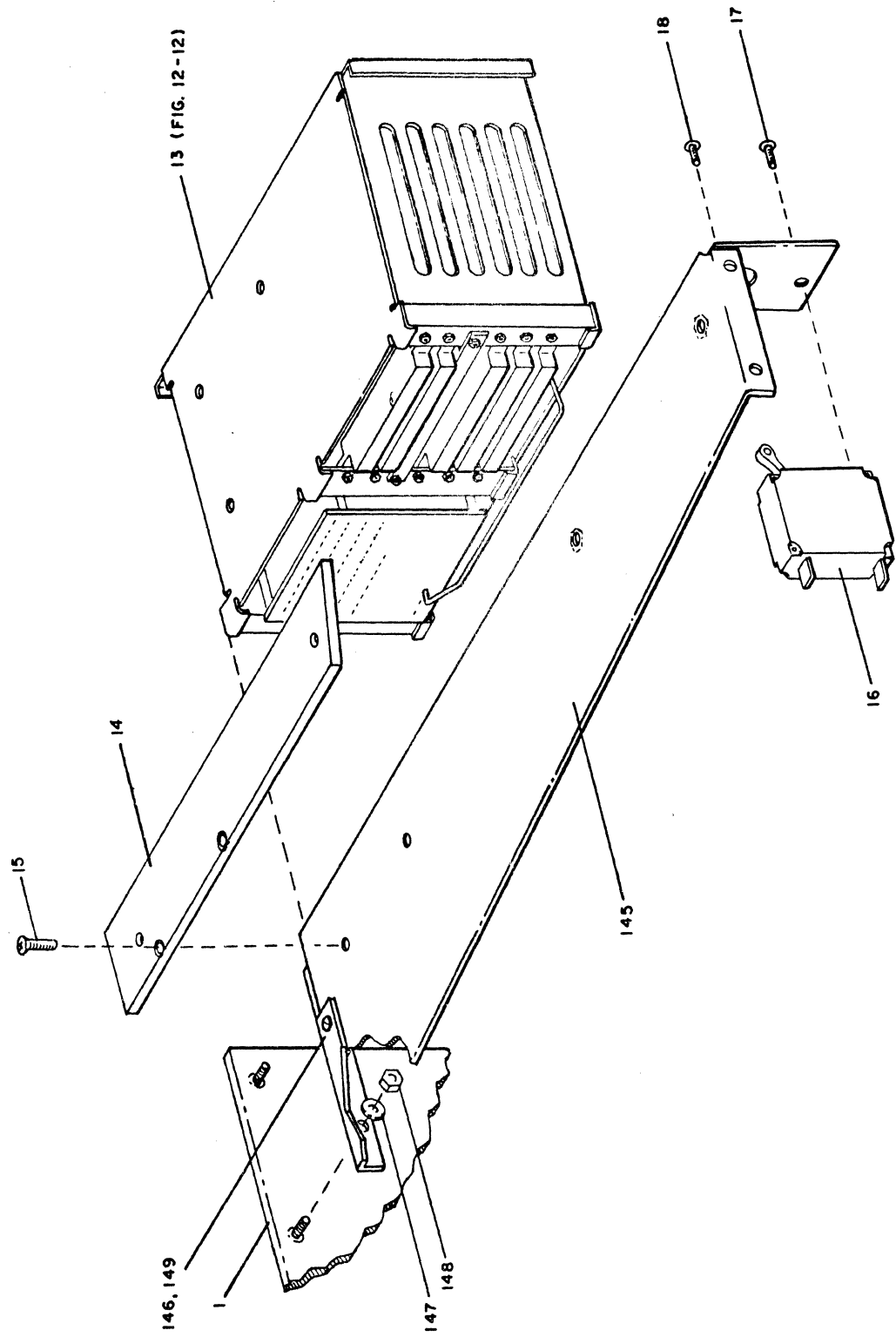


FIGURE 12-4 MAIN FRAME ASSEMBLY (Sheet 3 of 3)

FIGURE 12-4 MAIN FRAME ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR	
				PART NO.	NO.
	40075205	MAIN FRAME ASSEMBLY, 115 VAC, 60 Hertz			
	40076901	MAIN FRAME ASSEMBLY, 230 VAC, 50 Hertz			
-1	40076801	. BASE PLATE	1		
-2	20043001	. PLATE, Spring (Attaching Parts)	1		
-3	00000345	. . SCREW, Machine Flat Head, #4 - 40 x 1/2	2		
-4	00000062	. . NUT, Hex #4 - 40	2		
-5	20042901	. BRACKET, Switch Mounting	1		
-6	00000313	. SWITCH, Hopper Full (01963) (Attaching Parts)	1	E21-85HX	
-7	00000296	. . SCREW, Pan Head, #6 - 32 x 3/8	2		
-8	00000272	. . SCREW, Machine, Pan Head #4 - 40 x 5/8	2		
-9	00000062	. . NUT, Hex #4 - 40	2		
-10		Not Used			
-11		Not Used			
-12		Not Used			
-13	400553XX	. CARD FILE ASSEMBLY (Figure 12-12)	1		
-14	30052001	. BAR SPACER (Attaching Parts)	1		
-15	00000382	. . SCREW, Pan Head #8 - 32 x 3/8	2		
-16	00000188	. CIRCUIT BREAKER, 8 amp - 115 VAC, 60 Hertz (07355)	1	UPG1-1-6-2-802	
	00000185	. CIRCUIT BREAKER, 6 amp - 230 VAC, 50 Hertz (07355) (Attaching Parts)	1	UPG1-1-6-2-602	
-17	00000356	. . SCREW, Machine Flat Head #6 - 32 x 1/4	1		
-18	00000114	. . SCREW, Button Head #6 - 32 x 1/4	1		
-19	20015602	. TRANSFORMER, 12 Volt - 115 VAC, 60 Hertz	1		
	20073902	. TRANSFORMER, 12 Volt - 230 VAC, 50 Hertz (Attaching Parts)	1		
-20	00000299	. . NUT, Hex #8 - 32	2		
-21	00000294	. . WASHER, Flat #8	2		
-22	00000382	. . SCREW, Machine, Pan Head #8 - 32 x 3/8	2		
-23	20015502	. TRANSFORMER, 24 Volt - 115 VAC, 60 Hertz	1		
	20074002	. TRANSFORMER, 24 Volt - 230 VAC, 50 Hertz (Attaching Parts)	1		
-24	00000299	. . NUT, Hex #8 - 32	2		

M/L 1140752 (M) M/L 1140769 (N)

M2

FIGURE 12-4 MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-25	00000294	.	.	WASHER, Flat #8					2	
-26	00000382	.	.	SCREW, Machine, Pan Head #8 - 32 x 3/8					2	
-27	20042201	.		PLATE, Trim					1	
-28	20041701	.		BRACKET, Stack Spring (Attaching Parts)					1	
-29	00000294	.	.	WASHER, Flat #8					1	
-30	00000299	.	.	NUT, Hex #8 - 32					1	
-31	30041603	.		SUPPORT ASSEMBLY, Stacker Bearing (Attaching Parts)					1	
-32	00000379	.	.	SCREW, Machine Pan Head #8 - 32 x 1/2					2	
-33	20053801	.		BUSHING, Retaining (Attaching Parts)					1	
-34	00000297	.	.	SCREW, Set #8 - 32 x 3/16					1	
-35	20039801	.		PLATE, Support (Attaching Parts)					1	
-36	00000382	.	.	SCREW, Machine Pan Head #8 - 32 x 3/8					1	
-37	20039301	.		FASTENER, Bracket (Attaching Parts)					1	
-38	00000498	.	.	RIVET, Pop					2	SD44BS
-39	30046401	.		COVER, Rear, Stacker (Attaching Parts)					1	
-40	00000382	.	.	SCREW, Machine Pan Head, #8 - 32 x 3/8					2	
-41	30054001	.		ROD, Stack Follower					1	
-42	30040201	.		TRAY, Stacker (Attaching Parts)					1	
-43	00000345	.	.	SCREW, Machine, Flat Head #4 - 40 x 1/2					3	
-44	00000062	.	.	NUT, Hex #4 - 40					3	
-45	30029505	.		POWER SUPPLY ASSEMBLY (Figure 12-11) (Attaching Parts)					1	
-46	00000296	.	.	SCREW, Machine Pan Head #8-32 x 1/2					4	
-47	00000567	.	.	WASHER, Nylon (95987)					8	SW-6-NA
-48	00000295	.	.	WASHER, #6					4	
-49	00000301	.	.	NUT #6 - 32					4	

M/L 1140752 (M) M/L 1140769 (N)

M2

FIGURE 12-4 MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-50	20040701	. BRACKET, Power Supply (Attaching Parts)	1			
-51	00000379	. . SCREW, Machine, Pan Head #8 - 32 x 1/2	2			
-52	00000487	. TOOL (08524)	1	M15570-16		
-53	00000132	. CLIP COMPONENT (75915) (Attaching Parts)	1	101002		
-54	00000498	. . RIVET, Pop	1	SD44BS		
-55	30045801	. SOLENOID DRIVER ASSEMBLY	1			
-56	00000479	. CLAMP, Capacitor (03597) (Attaching Parts)	1	942A734AB3		
-57	00000498	. . RIVET, Pop	3	SD44BS		
-58	40033302 40033306	. VACUUM PUMP ASSEMBLY - 115 VAC, 60 Hertz (Fig. 12-10) . VACUUM PUMP ASSEMBLY - 230 VAC, 50 Hertz (Fig. 12-10) (Attaching Parts)				
-59	00000379	. . SCREW, Machine, Pan Head #8 - 32 x 1/2	4			
-60	00000109 00000112	. RELAY, Solid State - 115 VAC, 60 Hertz (12617) . RELAY, Solid State - 230 VAC, 50 Hertz (12617) (Attaching Parts)	1 1	724-11-159 733-12-150		
-61	00000303	. . SCREW, Machine, Pan Head #8 - 32 x 5/8	2			
-62	00000294	. . WASHER, Flat #8	2			
-63	20072001	. FILTER ASSEMBLY - 115 VAC, 60 Hertz (Attaching Parts)	1			
-64	00000498	. . RIVET, Pop	2	SD44BS		
-65	30058201 30082001 40057601 40082701	. CONNECTOR PANEL ASSEMBLY - 115 VAC, 60 Hertz . CONNECTOR PANEL ASSEMBLY - 230 VAC, 50 Hertz . PANEL, Connector - 115 VAC, 60 Hertz . PANEL, Connector - 230 VAC, 50 Hertz (Attaching Parts)	1 1 1 1			
-66	00000296	. . SCREW, Machine Pan Head #6 - 32 x 3/8	3			
-67	00000476 20114401	. . CONNECTOR, AC - 115 VAC, 60 Hertz (74545) . . FILTER ASSEMBLY - 230 VAC, 50 Hertz (Attaching Parts)	1 1	7486		
-68	00000296	. . . SCREW, Machine, Pan Head 6 - 32 x 3/8	2			
-69	00000301	. . . NUT, Plain Hex 6 - 32	2			
-70	00000143	. RECTIFIER, Diode Bridge, 11V - 230 VAC, 50 Hz (04713) (Attaching Parts)	2	MDA980-2		
-71	00000376	. . SCREW, Machine, Pan Head #6 - 32 x 3/4	2			
-72	00000295	. . WASHER, Flat #6	2			
-73	00000301	. . NUT, Hex #6 - 32	2			

M/L 1140752 (M) M/L 1140769 (N)
M2

FIGURE 12-4 MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-74	00000503	. TERMINAL, Junction (08524)	2	TJ11A-0501		
-75	00000202	. CAPACITOR, 17.5 μ f, 370V (115 VAC, 60 Hertz) (03597)	1	45F279		
	00000880	. CAPACITOR, 10 μ f, 370V (230 VAC, 50 Hertz) (03597)	1	45F276		
-76	20214301	. BRACKET ASSEMBLY, Capacitor Mounting (115 VAC, 60 Hertz) (03597)	2			
	20214601	. BRACKET ASSEMBLY, Capacitor Mounting (230 VAC, 50 Hertz) (03597)	2			
-77	00000302	. . SCREW, Machine Pan Head, #6-32 x 1/2	4			
-78	00000472	. BOOT, (03597)	1	614A527P21		
-79	00000200	. CAPACITOR, 4600 μ f 15VDC - (03597)	1	86F119M		
-80	00000479	. CLAMP, Capacitor - 230 VAC, 50 Hertz (03597) (Attaching Parts)	1	942A734AB2		
-81	00000498	. . RIVET, Pop	2	SD44BS		
-82	00000485	. SPRING (84830)	1	LE-041E-6(MW)		
-83	00000471	. HOSE, Flexible, 1 3/4 Dia. x 7 1/2" (80382)	1	606080		
-84	00000407	. CLAMP, Hose 2" Adjustable (76599)	1	H-24		
-85	00000147	. FUSE, 1 amp Slo-Blo (75915)	1	313001		
-86	00000133	. FUSE HOLDER (75915) (Attaching Parts)	1	356001		
-87	00000377	. . SCREW, Machine Pan Head, #6-32 x 5/8	1			
-88	00000295	. . WASHER, Flat #6	1			
-89	00000301	. . NUT, Hex #6-32	1			
-90	40051611	. MAIN PLATE ASSEMBLY - 115 VAC, 60 Hertz (Fig. 12-9)	1			
	40051608	. MAIN PLATE ASSEMBLY - 230 VAC, 50 Hertz (Fig. 12-9) (Attaching Parts)	1			
-91	00000298	. . SCREW, Machine Flat Head, #8-32	2			
-91A	00000379	. . SCREW, Machine Pan Head, #8-32	1			
-92	00000428	. BUMPER, Rubber, White (29227) (Attaching Parts)	4	SC-340X		
-93	00000379	. . SCREW, Machine Pan Head, #8-32 x 1/2	3			
-94	00000294	. . WASHER, Flat #8	4			
-95	00000299	. . NUT, Hex #8-32	4			
-96	00000379	. . SCREW, Machine Flat Head, #8-32 x 1/2	1			
REF	30045801	. SOLENOID DRIVER ASSEMBLY	1			
-97	20010201	. . P. C. BOARD, Solenoid Driver (Attaching Parts)	1			
-98	00000199	. . . SCREW, Machine Pan Head, #10-32 (supplied with item 111)	2			
-99	00000444	. . . WASHER, Lock Internal Tooth #10	4			

M/L 1140752 (M) M/L 1140769 (N)

M2

FIGURE 12-4 MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION						UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6			7
-100	00000107	.	.	PAD, Transistor (RED) (13103)				1	7717-145
-101	00000139	.	.	TRANSISTOR, Power NPN (01295)				1	2N2102
-102	00000247	.	.	RESISTOR, 270 ohm + 10% 1/4W				1	RC07GF271K
-103	00000236	.	.	RESISTOR, 10K +10% 1/2W				1	RC20GF103K
-104	00000141	.	.	TRANSISTOR, Power NPN (10295)				1	TP41C
-105	00000040	.	.	DIODE (01295)				1	1N4003
-106	00000108	.	.	HEATSINK (13103) (Attaching Parts)				1	6107A-14
-107	00000361	.	.	SCREW, Machine Pan Head, #4-40 x 3/8				1	
-108	00000141	.	.	WASHER, Torque (supplied with item 103)				1	
-109	00000062	.	.	NUT, Plain Hex #4-40				1	
-110	00000556	.	.	COMPOUND, Heatsink (13103)				A/R	
-111	00000199	.	.	CAPACITOR, 6200 μf, 75VDC (03597)				1	86F177M
-112	00000157	.	.	WIRE, Electrical AWG 18 BRN 13" (92194)				1	1857/19-7
-113	00000152	.	.	WIRE, Electrical AWG 18 TP ORN-BRN 14" (92194)				1	1858/A
-114	00000160	.	.	WIRE, Electrical AWG 18 TP WHT-WHT 16" (92194)				1	1857/19-1
-115	00000019	.	.	CABLE, 7" (92194)				1	3221-1-2
-116	00000530	.	.	RECEPTACLE, Faston (.250) (00779)				2	61370-1
-117	00000463	.	.	TERMINAL, Ring Tongue (00779)				1	32949
-118	00000035	.	.	CONTACT, Pin (00779)				2	60818-1
-119	00000449	.	.	HOUSING, Pin (00779)				2	1-480319-0
-120	00000036	.	.	CONTACT, Connector, Ampleaf (00779)				2	42839-4
-121	00000034	.	.	CONTACT, Connector, Ampleaf (00779)				1	42840-3
-122	00000086	.	.	TUBING, Heat Shrink 3/16 x 1/2 (92194)				2	FIT-105
-123	00000087	.	.	TUBING, Heat Shrink 3/32 x 1/2 (92194)				1	FIT-105
-124	00000452	.	.	HOUSING, Receptable (00779)				2	480416-0
-125	20028703	.	.	CABLE ASSEMBLY, Fan				1	
-126	20027618	.	.	CABLE ASSEMBLY, Drive Motor				1	
-127	20027602	.	.	CABLE ASSEMBLY, Bridge to Cap				1	
-128	20027502	.	.	CABLE ASSEMBLY, Vacuum Pump Relay				1	
-129	20027510	.	.	CABLE ASSEMBLY, Vacuum Pump Cap.				1	
-130	20027608	.	.	CABLE ASSEMBLY, Relay				1	
-131	20027606	.	.	CABLE ASSEMBLY, Hopper Full				1	
-132	20027605	.	.	CABLE ASSEMBLY, Hopper Empty				1	
-133	20027513	.	.	CABLE ASSEMBLY, Fuse				1	
-134	40075501	.	.	WIRING DIAGRAM - 115 VAC, 60 Hertz					
	40081910	.	.	WIRING DIAGRAM - 230 VAC, 50 Hertz					
-135	00000555	.	.	ADHESIVE, Pliobond (88132)				A/R	
-136	00000556	.	.	COMPOUND, Heatsink (13103)				A/R	
-137	00000531	.	.	LOCTITE, Grade C				A/R	
-138	00000058	.	.	TIE, Cable (06383)				16	SSTIM
-139	00000059	.	.	MOUNT, Cable (06383)				8	TA1S8
-140	00000390	.	.	SCREW, Cap Socket Head, #4-40 x 5/8				4	
-141	00000065	.	.	WASHER, Flat #4				4	
-142	00000062	.	.	NUT, Hex #4-40				4	
-143	20164301	.	.	BRACKET, Cover Support				1	
-144	00000299	.	.	NUT, Hex #8				1	
-145	40050001	.	.	BRACKET, Support				1	
-146	20200401	.	.	BRACE, Support				1	
-147	00000294	.	.	WASHER, Flat #8				4	

M/L 1140752 (M) M/L 1140769 (N)

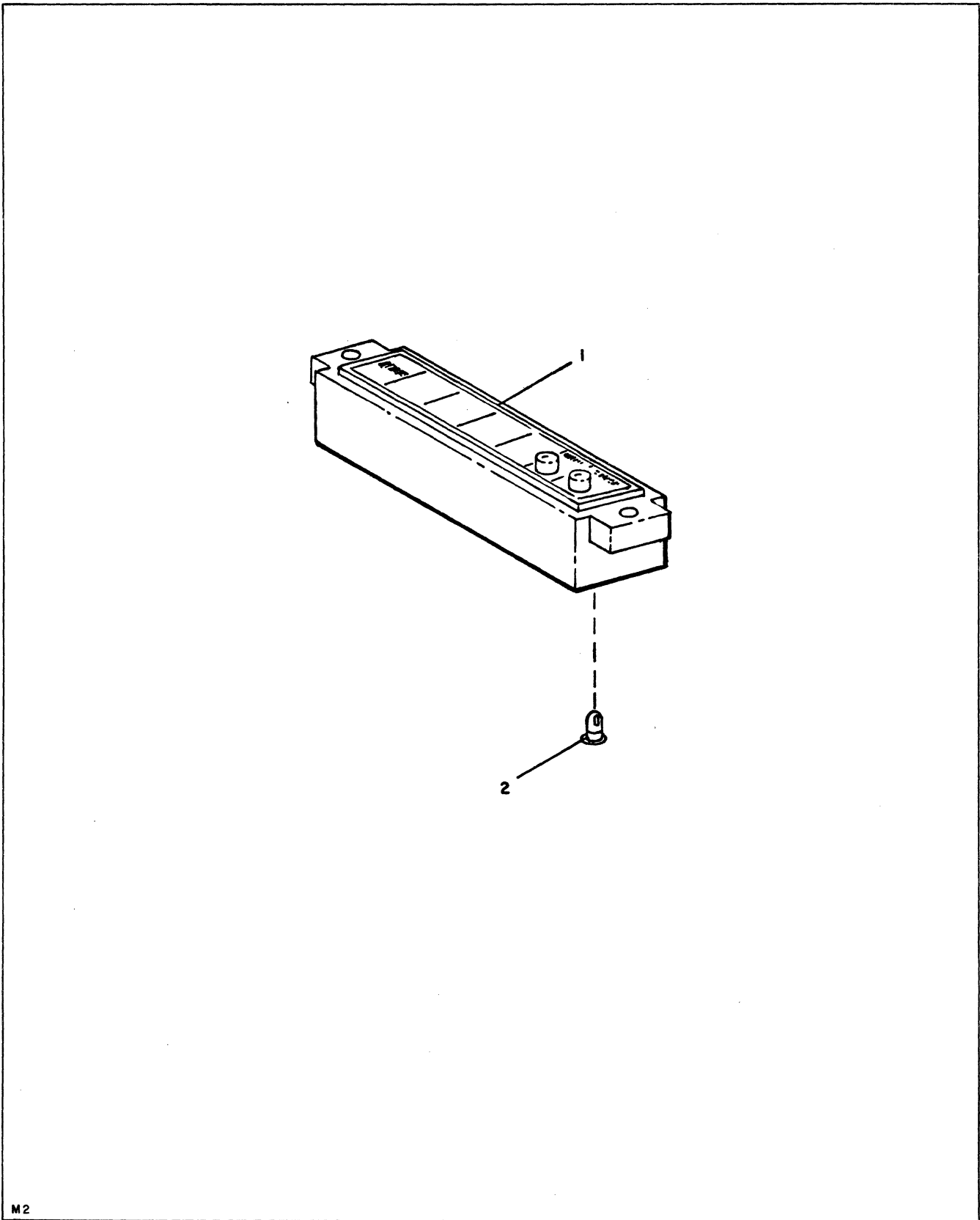
M2

FIGURE 12-4 MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-148	00000299	.	.	NUT, Hex #8-32					4	
-149	00000296	.	.	SCREW, Machine Pan Head, #8-32 x 3/8					2	

M/L 1140752 (M) M/L 1140769 (N)

M2



M2

FIGURE 12-5 CONTROL PANEL ASSEMBLY

FIGURE 12-5 CONTROL PANEL ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-1	00000413	CONTROL PANEL ASSEMBLY (07137)							1	DPA 7164B
-2	00000318	. CONTROL PANEL (07137)								
		. LAMP, Incandescent, 6V @ .2A T-1 3/4 Mid Flg. Base (18788)							7	381

M2

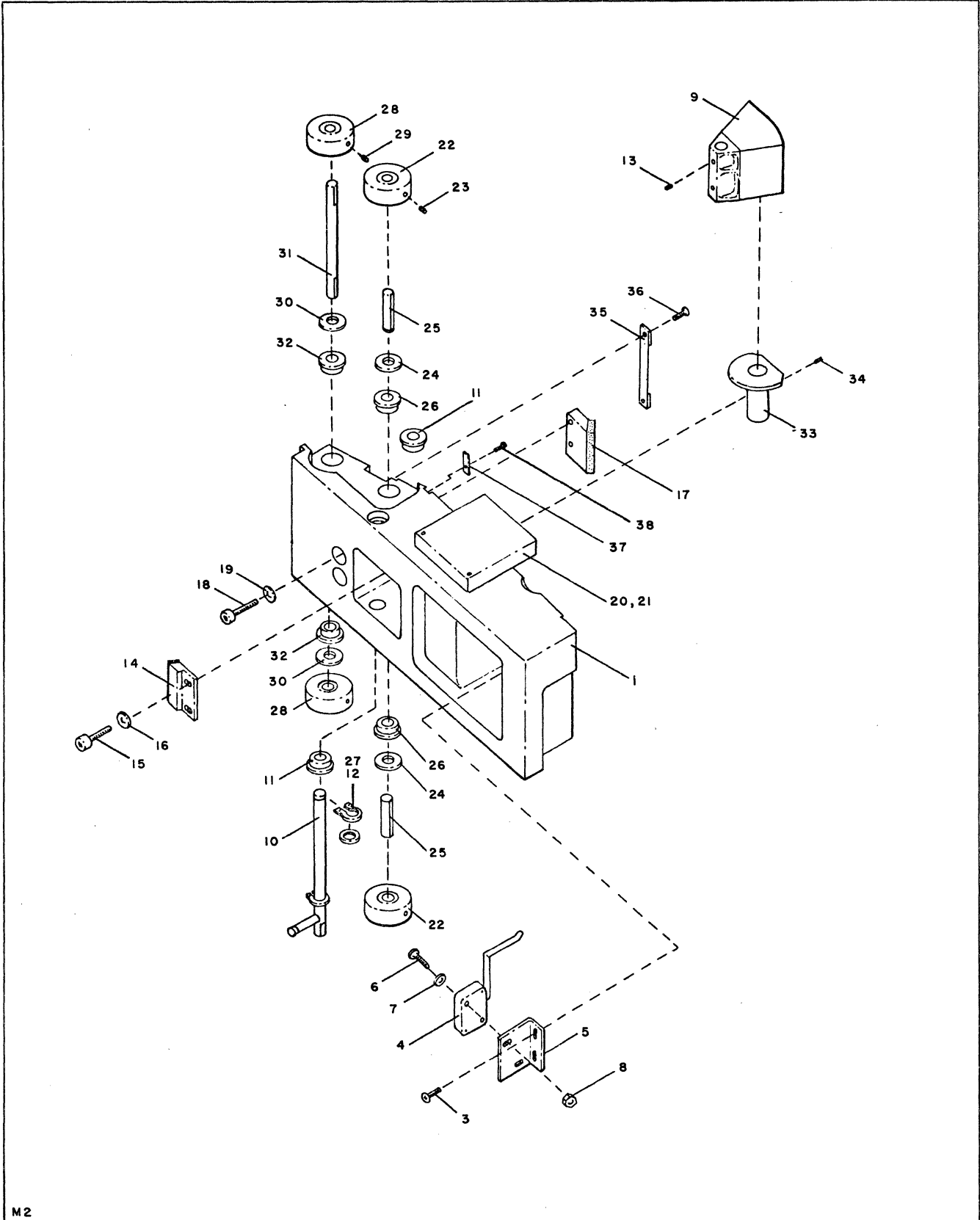


FIGURE 12-6 PICK SUPPORT ASSEMBLY

FIGURE 12-6 PICK SUPPORT ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS	VENDOR PART NO.
			PER ASSY	
	40047102	PICK SUPPORT ASSEMBLY		
-1	40070902	. SUPPORT, Pick	1	
-2	20027701	. SWITCH ASSEMBLY, Hopper Empty (Attaching Parts)	1	
-3	00000096	. . . SCREW, Machine Pan Head 4 - 40 x 1/4	2	
-4	10023501	. . SWITCH, Hopper Empty	1	
-5	20023401	. . BRACKET, Switch (Attaching Parts)	1	
-6	00000272	. . . SCREW, Machine Binder 4 - 40 x 5/8	2	
-7	00000066	. . . WASHER, Lock Int. tooth #4	2	
-8	00000062	. . . NUT, Plain Hex #4 - 40	2	
-9	30003701	. SECTOR ASSEMBLY (Attaching Parts)	1	
-10	20101401	. . SHAFT, Pick Assembly	1	
-11	00000429	. . BEARING, (14927)	2	SFR188TT (3)
-12	00000467	. . RING, Snap (79136)	2	5100-25
-13	00000297	. . SCREW, Set, Cup PT 8 - 32 x 3/16	2	
-14	10004101	. STOP, Pick (Attaching Parts)	1	
-15	00000398	. . SCREW, Cap, Socket Head 6 - 32 x 5/8	2	
-16	00000295	. . WASHER, Flat #6	2	
-17	10004701	. BUMPER, Pick (Attaching Parts)	1	
-18	00000293	. . SCREW, Cap, Socket Head 8 - 32 x 1/2	2	
-19	00000294	. . WASHER, Flat #8	2	
-20	30023303	. CAP ASSEMBLY, Rifle Air (Attaching Parts)	1	
-21	00000391	. . SCREW, Cap, Socket Head, 4 - 40 x 3/4	2	
-22	20005901	DRIVE ROLLER, 2nd Pick Drive Assembly . CAPSTAN (Attaching Parts)	2	
-23	00000292	. . SCREW, Set Knurled Cup, 6 - 32 x 3/16	2	
-24	00000432	. SPACER, Bearing (29440)	2	SS-2-27, 28 or 30

M/L 1140471 (7)

M2

FIGURE 12-6 PICK SUPPORT ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-25	10002201	. SHAFT, Drive Roller							2	
-26	00000429	. BEARING (14927)							4	SFR188TT (3)
-27	00000467	. RING, Snap (79136)							2	5100-25
<hr/>										
STACK DRIVE, 1st Pick Drive Assembly										
-28	20005901	. CAPSTAN (Attaching Parts)							2	
-29	00000391	. . SCREW, Set, Knurled Cup, 3 - 32 x 3/16							2	
-30	00000432	. SPACER, Bearing (29440)							2	SS-2-27, 28 or 30
-31	10003003	. SHAFT, Stack Drive							1	
-32	00000429	. BEARING (14927)							2	SFR188TT (3)
<hr/>										
-33	20004801	. TUBE, Pick Vacuum (Attaching Parts)							1	
-34	00000564	. . SCREW, Set, 4 - 40 x 3/32							1	
<hr/>										
-35	20008101	. GUIDE, Card Attaching Parts)							1	
-36	00000346	. . SCREW, Machine, Flat Head #4 - 40 x 1/4							2	
<hr/>										
-37	20072801	. INSERT, Pick Support (Attaching Parts)							2	
-38	00000565	. . SCREW, Machine, Undercut, Phillips HD 2 - 56 x 3/16							2	

M/L 1140471 (3)

M2

1130512 (D)

M2

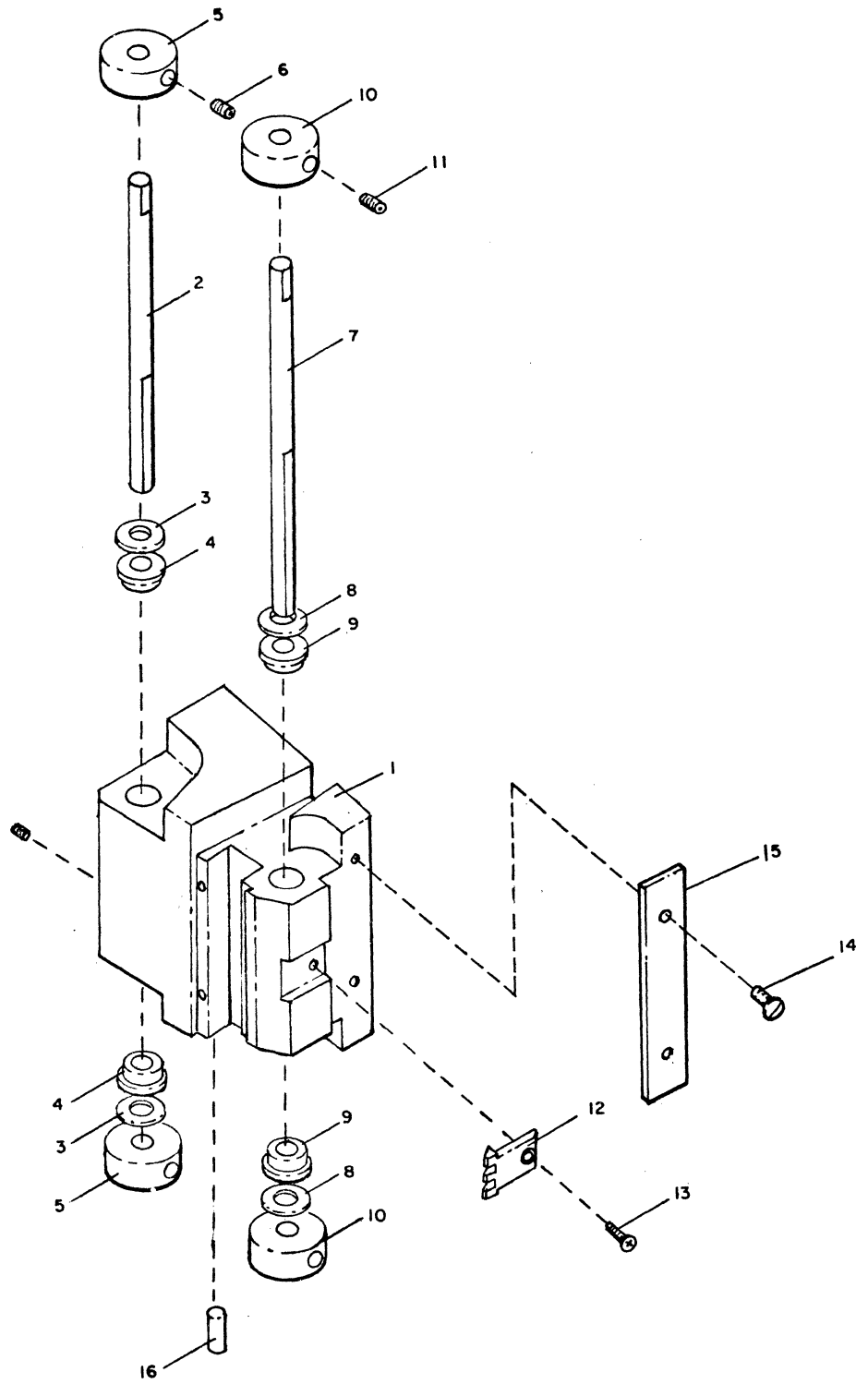


FIGURE 12-7 DRIVE ROLLER SUPPORT ASSEMBLY

FIGURE 12-7 DRIVE ROLLER SUPPORT ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-1	30051202 30050801	DRIVE ROLLER SUPPORT ASSEMBLY . SUPPORT, Drive Roller	1			
<hr/>						
		FIRST STACK DRIVE ASSEMBLY				
-2	10003001	. SHAFT, Stack Drive	1			
-3	00000431	. SPACER, Bearing (29440)	A/R	SS-27		
	00000432	. SPACER, Bearing (29440)	A/R	SS-28		
	00000433	. SPACER, Bearing (29440)	A/R	SS-30		
-4	00000429	. BEARING, (14927)	2	SFR188TT (3)		
-5	20002101	. ROLLER, Drive (Attaching Parts)	2			
-6	00000292	. . SCREW, Set, Knurled Cup PT 6 - 32 x 3/16	2			
<hr/>						
		SECOND STACK DRIVE ASSEMBLY				
-7	10003002	. SHAFT, Stack Drive	1			
-8	00000431	. SPACER, Bearing (29440)	A/R	SS-27		
	00000432	. SPACER, Bearing (29440)	A/R	SS-28		
	00000433	. SPACER, Bearing (29440)	A/R	SS-30		
-9	00000429	. BEARING, (14927)	2	SFR188TT (3)		
-10	20002101	. ROLLER, Drive (Attaching Parts)	2			
-11	00000292	. . SCREW, Set, Knurled Cup PT 6 - 32 x 3/16	2			
<hr/>						
-12	10075801	. THROAT, Pick (Attaching Parts)	1			
-13	00000305	. . SCREW, Machine, Pan Head #4 - 40 x 1/4	1			
<hr/>						
-14	20176501	. GUIDE, Throat (Attaching Parts)	1			
-15	00000382	. . SCREW, Phillips Head #8 - 32 x 3/8	2			
<hr/>						
-16	00000492	. PIN, Dowel .250 Dia. x 1/2 Hard Steel (70276)	1			
<hr/>						

M/L 1130512 (H)

M2

1120929(B)

M2

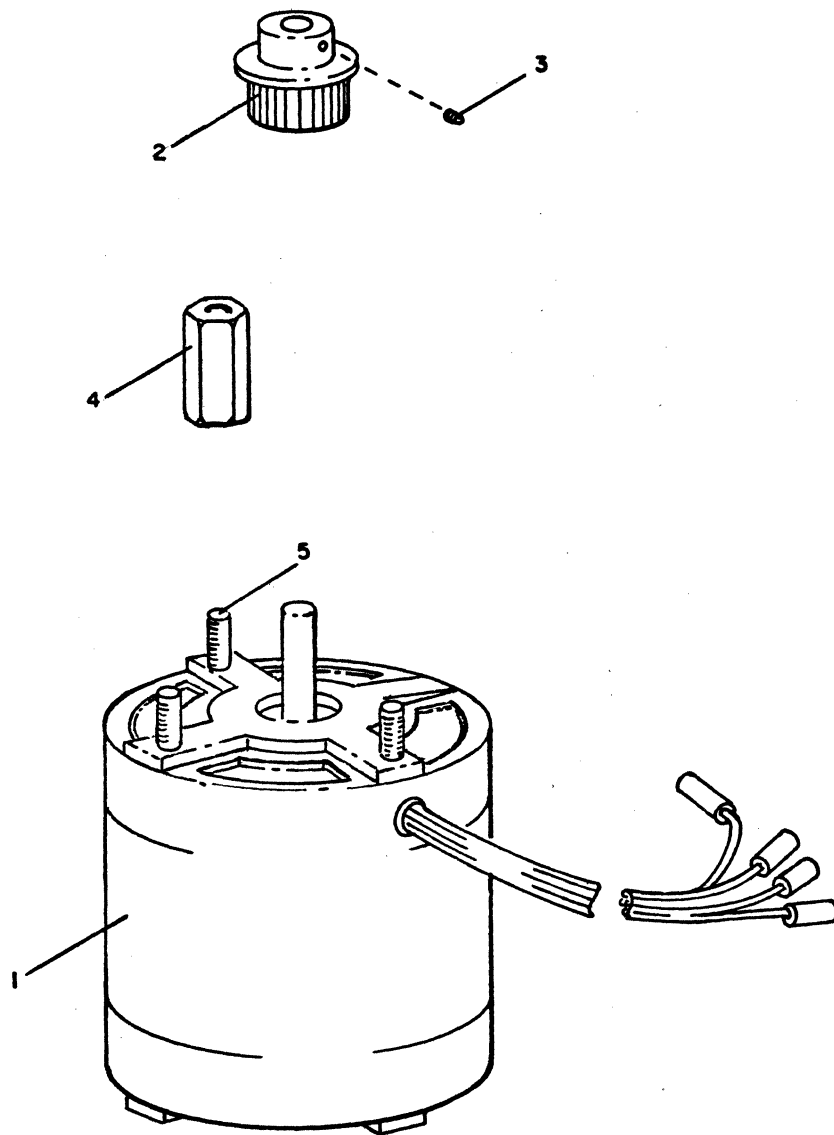


FIGURE 12-8 DRIVE MOTOR ASSEMBLY

FIGURE 12-8 DRIVE MOTOR ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	20092903	DRIVE MOTOR ASSEMBLY - 115 VAC, 60 Hertz								
	20092904	DRIVE MOTOR ASSEMBLY - 230 VAC, 50 Hertz								
-1	00000682	. MOTOR (19070)							1	H34CBR-5
-2	20127001	. PULLEY - 115 VAC, 60 Hertz							1	
	20127002	. PULLEY - 230 VAC, 50 Hertz (Attaching Parts)							1	
-3	20127001	. . SCREW, Set 6 - 32 (Supplied with item 2)							2	
-4	20049601	. STANDOFF							3	
-5	00000434	. STUD, Threaded 10 - 32 x 3/4							3	
-6	00000295	. CONTACT, Connector Socket (00779)							6	60617-1
-7	00000610	. HOUSING, Connector, 6 Pos. SKT (00779)							1	1-480270-0

M/L I120929(A)

M2

1140516 (F)

M2

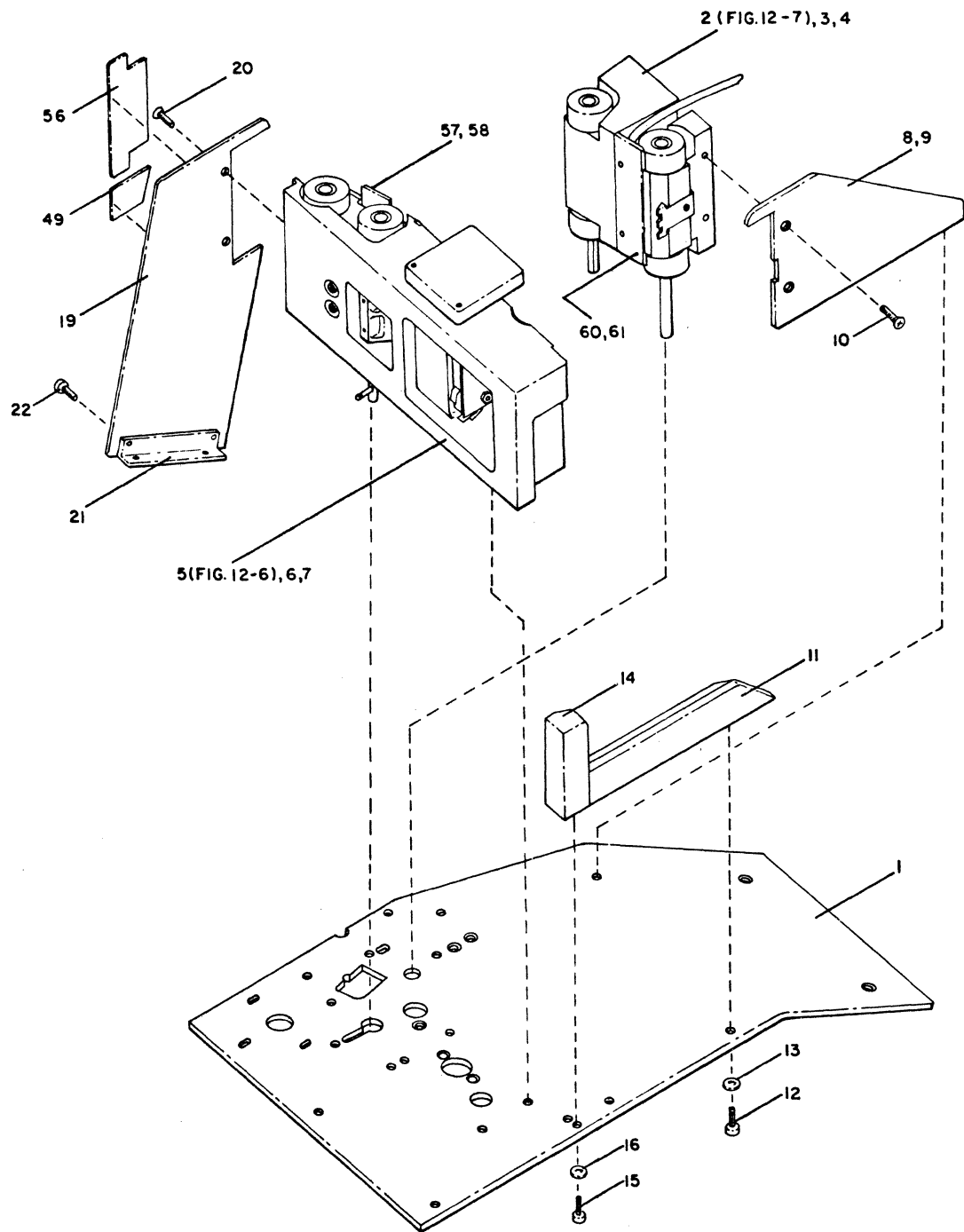


FIGURE 12-9 MAIN PLATE ASSEMBLY (Sheet 1 of 2)

1140516 (F)

M2

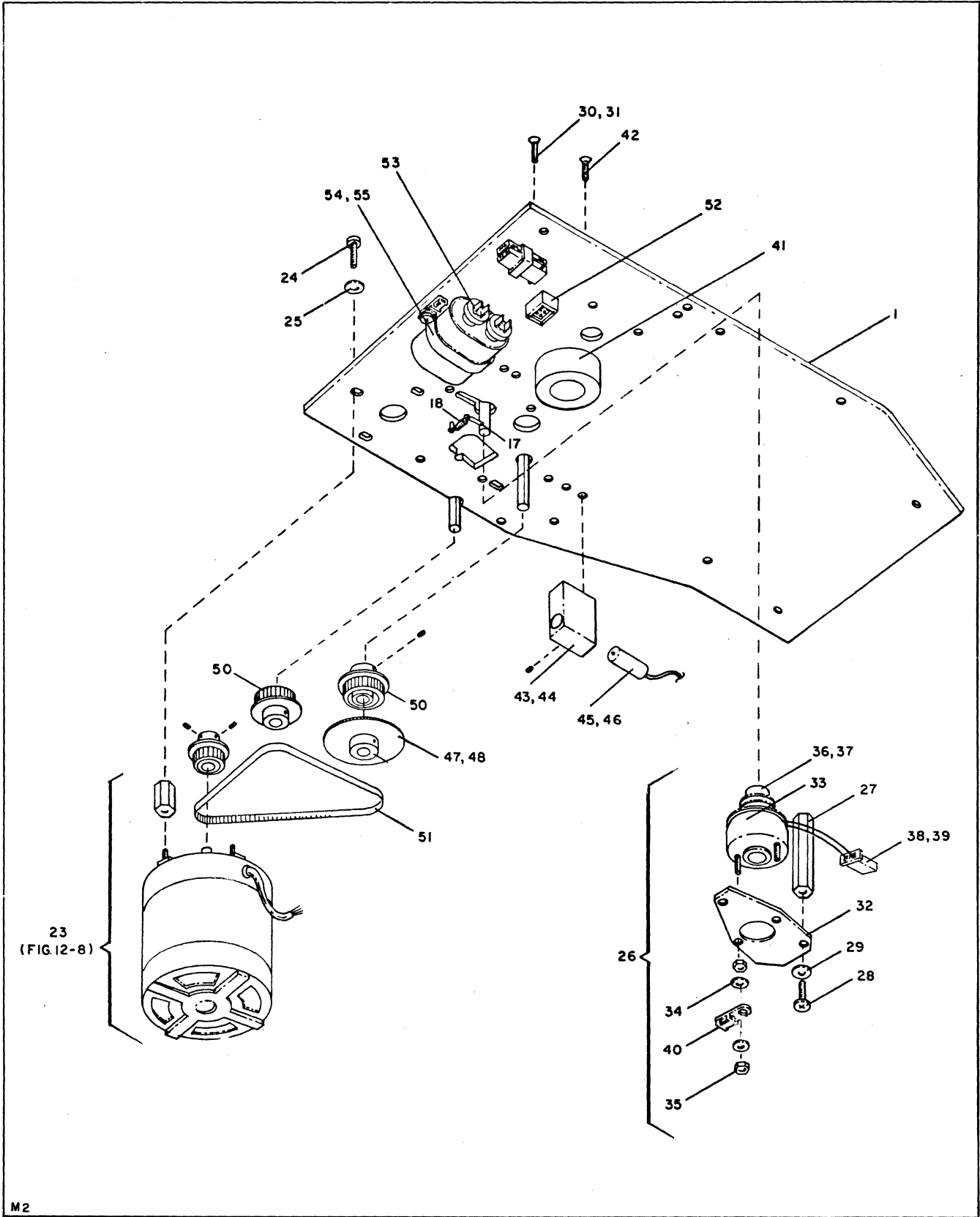


FIGURE 12-9 MAIN PLATE ASSEMBLY (Sheet 2 of 2)

FIGURE 12-9 MAIN PLATE ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40051611	MAIN PLATE ASSEMBLY - 115 VAC, 60 Hertz							1	
	40051608	MAIN PLATE ASSEMBLY - 230 VAC, 50 Hertz							1	
-1	40040402	. PLATE, Picker Mounting							1	
-2	30051202	. DRIVE ROLLER SUPPORT ASSEMBLY (Figure 12-7) (Attaching Parts)							1	
-3	00000396	. . SCREW, Cap Socket Head, 8 - 32 x 5/8							3	
-4	00000294	. . WASHER, Flat #8							3	
-5	40047102	. PICK SUPPORT ASSEMBLY (Figure 12-6) (Attaching Parts)							1	
-6	00000396	. . SCREW, Cap Socket Head, 8 - 32 x 5/8							6	
-7	00000294	. . WASHER, Flat #8							6	
-8	30051101	. WALL, Input Hopper (Attaching Parts)							1	
-9	00000063	. . SCREW, Machine Pan Head, 4 - 40 x 1/2							1	
-10	00000379	. . SCREW, Machine Pan Head, 8 - 32 x 1/2							2	
-11	20043201	. RAIL, Guide (Attaching Parts)							1	
-12	00000396	. . SCREW, Cap Socket Head, 8 - 32 x 5/8							2	
-13	00000294	. . WASHER, Flat #8							2	
-14	20043102	. BLOCK, Guide (Attaching Parts)							1	
-15	00000392	. . SCREW, Cap, Socket Head, 6 - 32 x 1/2							2	
-16	00000295	. . WASHER, Flat #6							2	
-17	00000438	. PIN, Spring (83584)							1	G33-16 x 1-2 LE-026-C2MW
-18	00000285	. SPRING, Solenoid (84830)							1	
-19	30039501	. SUPPORT, Side Plate (Attaching Parts)							1	
-20	00000358	. . SCREW, Machine Flat Head, 8 - 32 x 3/8							2	
-21	20040301	. BRACKET, Side Plate Mtg. (Attaching Parts)							1	
-22	00000382	. . SCREW, Machine Flat Head, 8 - 32 x 3/8							2	
-23	20092903	. DRIVE MOTOR ASSEMBLY - 115 VAC, 60 Hz (Fig. 12-8)								
	20092904	. DRIVE MOTOR ASSEMBLY - 230 VAC, 50 Hz (Fig. 12-8) (Attaching Parts)								
-24	00000561	. . SCREW, Cap, Socket Head, 10 - 32 x 1/2							3	
-25	00000442	. . WASHER, Flat #10							3	

M/L 1140516 (N)

FIGURE 12-9 MAIN PLATE ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-26	20049801	. SOLENOID ASSEMBLY	1			
-27	10022002	. . STANDOFF (Solenoid) (Attaching Parts)	2			
-28	00000396	. . . SCREW, Cap Socket Head, 8 - 32 x 5/8	2			
-29	00000294	. . . WASHER, Flat #8	2			
-30	00000358	. . . SCREW, Machine, Flat Head, 8 - 32 x 3/8	1			
-31	00000298	. . . SCREW, Machine, Flat Head, 8 - 32 x 1/2	1			
-32	20049701	. . PLATE, Solenoid Mounting	1			
-33	20010601	. . SOLENOID, Pick (Attaching Parts)	1			
-34	00000294	. . . WASHER, Flat #8	3			
-35	00000299	. . . NUT, Hex 8 - 32	3			
-36	10010501	. . COUPLING, Solenoid (Attaching Parts)	1			
-37	00000292	. . . SCREW, Set Knurled Cup PT 6 - 32 x 3/16	4			
-38	00000526	. . CONTACT, Socket (00779)	2	60617-1		
-39	00000448	. . HOUSING, Socket (00779)	1	1-480318-0		
-40	00000059	. . MOUNT, Cable Tie (06383)	1	TA158-C		
<hr/>						
-41	20031901	. FITTING AIR OUTLET (Attaching Parts)	1			
-42	00000358	. . SCREW, Machine, Flat Head, 8 - 32 x 3/8	2			
<hr/>						
-43	20010401	. MAGNETIC PICKUP HOLDER (Attaching Parts)	1			
-44	00000304	. . SCREW, Machine, Flat Head, 6 - 32 x 1/2	2			
-45	00000447	. PICK-UP, Magnetic (07355) (Attaching Parts)	1	1-0194/086-2110019		
-46	00000867	. . SCREW, Set, 6 - 32 x 1/8 Flat	1			
<hr/>						
-47	20125801	GEAR, Timing	1			
-48	00000292	. . SCREW, Set Knurled Cup PT, 6 - 32 x 3/16	1			
<hr/>						
-49	20101801	. PLATE, Stack Guide	1			
-50	20127005	. PULLEY	2			
-51	00000282	. BELT (07108)	1	130 XL025		
-52	00000504	. JUNCTION, Terminal (08524)	1	TJ11A-05-02		
<hr/>						
-53	00000511	. CAPACITOR, 2 μ f, 270 VAC (115 VAC, 60 Hz) (03597)	1	45F270		
	00000205	. CAPACITOR, 3 μ f, 370 VAC (230 VAC, 50 Hz) (03597)	1	45F271		
-54	00000289	. CLAMP, Capacitor (03597) (Attaching Parts)	1	K9827065P21		
-55	00000382	. . SCREW, Machine, Pan Head 8 - 32 x 3/8	2			
<hr/>						
-56	20042601	. PLATE, Stack Guide	1			

M/L 1140516 (N)

FIGURE 12-9 MAIN PLATE ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-57*	10158904	. READ/LIGHT STATION ASSY (Matched)	1			
	30014401	. . LIGHT STATION ASSEMBLY (Attaching Parts)	1			
-58	00000344	. . . SCREW, Machine, Flat Head 2 - 56 x 1/4	4			
-59*	30057201	. . READ STATION ASSEMBLY	1			
		(Attaching Parts)				
-60	00000353	. . . SCREW, Machine, Flat Head, 4 - 40 x 1/4	2			
<hr/>						
-61	00000058	. TIE, Cable (06383)	5	SSTIM		
-62	00000059	. MOUNT, Cable Tie (06383)	3	TA158-C		
-63	00000498	. RIVET, Pop	1	SD44BS		
-64	20027505	. CABLE ASSEMBLY, One Wire	1			
-65	20027607	. CABLE ASSEMBLY, Two Wire	1			
-66	20139101	. CABLE ASSEMBLY, 115 VAC, 50 Hertz	1			
	20139102	. CABLE ASSEMBLY, 230 VAC, 60 Hertz	1			
-67	20139101	. CABLE ASSEMBLY, Drive Motor (115 VAC, 60 Hz)				
	20139102	. CABLE ASSEMBLY, Drive Motor (230 VAC, 50 Hz)				
-68	00000555	. COMPOUND ADHESIVE, Pliobond (88132)	A/R			

* Light Station and Read Station Assy must be ordered as a matched set... #10158904

M/L 1140516 (N)

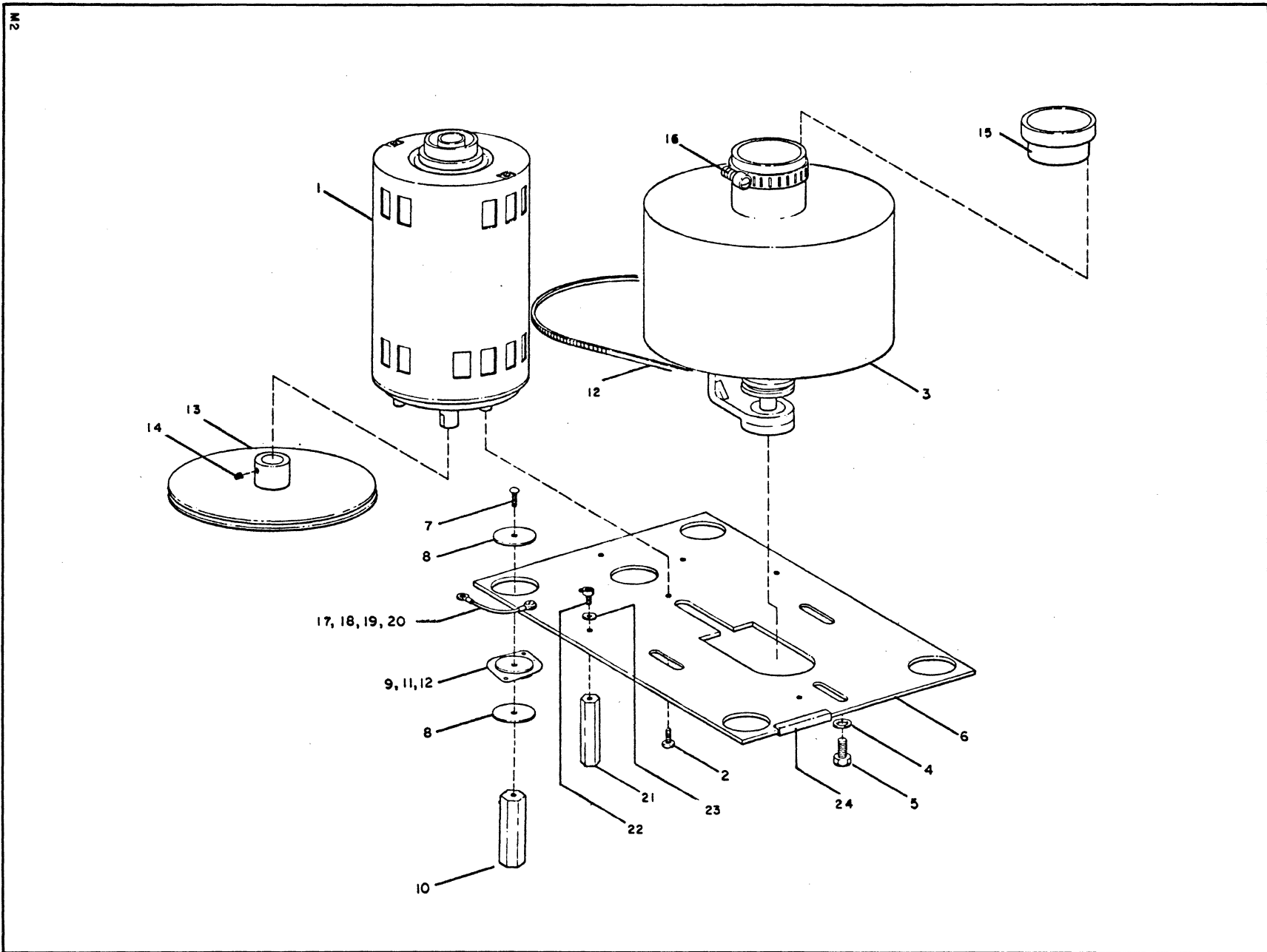


FIGURE 12-10 VACUUM PUMP ASSEMBLY

FIGURE 12-10 VACUUM PUMP ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.
-1	40033319	VACUUM PUMP ASSEMBLY, 115 VAC, 60 Hertz	1	KCPMPG-19OA 5KCP19PG222
	40033306	VACUUM PUMP ASSEMBLY, 230 VAC, 50 Hertz	1	
	00000539	. MOTOR, 60 Hz, 3350 rpm, 115 VAC, 60 Hertz (03597)	1	
	00000540	. MOTOR, 50 Hz, 230 VAC, (03597) (Attaching Parts)	1	
-2	00000379	. . SCREW, Machine, Pan Head, 8 - 32 x 1/2	4	
-3	30055902	. BLOWER, 230 VAC, 50 Hertz	1	60-115626
	00000541	. BLOWER, 115 VAC, 60 Hertz (75511) (Attaching Parts)	1	
-4	00000441	. . WASHER, Flat #1/4	3	
-5	00000855	. . SCREW, Cap, Hex Head, 1/4 - 20 x 5/8	3	
-6	30076701	. PLATE, Blower (Attaching Parts)	1	
-7	00000381	. . SCREW, Machine, Pan Head, 8 - 32 x 3/4	4	
-8	00000294	. . WASHER, Flat, No. 8-7/8 OD (76005)	8	J2049-1
-9	00000505	. . MOUNT, Rubber (76005)	2	100PD2
	00000291	. . MOUNT, Rubber (76005)	2	100PD4
-10	10002004	. . STANDOFF	4	
-11	00000926	. . RIVET, Pop 1/8 x 1/2 (Merit)	8	AD46ABS
-12	00000519	. BELT, 115 VAC, 60 Hertz (24161)	1	5 M 545
	00000520	. BELT, 230 VAC, 50 Hertz (24161)	1	5 M 580
-13	20076101	. PULLEY, 115 VAC, 60 Hertz	1	
	20076102	. PULLEY, 230 VAC, 50 Hertz (Attaching Parts)	1	
-14	00000591	. . SCREW, Set, Nyloc Cup Point STLN BLK, 1/4 - 20 x 3/8 (83014)	1	
-15	20023901	. ADAPTER ASSEMBLY, Vacuum, 115 VAC, 60 Hertz	1	
	20058602	. ADAPTER ASSEMBLY, Vacuum, 230 VAC, 50 Hertz (Attaching Parts)	1	
-16	00000407	. . CLAMP (76599)	1	H-24
-17	20037901	. GROUND STRAP ASSEMBLY (Attaching Parts)	1	
-18	00000296	. . SCREW, Pan Head, 6 - 32 x 3/8	-	
-19	00000445	. . WASHER, Lock, Int. Tooth, #6	1	
-20	00000301	. . NUT, Hex, 6 - 32	1	
-21	10002005	. STANDOFF (Attaching Parts)	2	
-22	00000293	. . SCREW, Cap, Socket Head, 8 - 32 x 1/2	2	
-23	00000294	. . WASHER, Flat #8	2	

M/L 1040333 (Y)

FIGURE 12-10 VACUUM PUMP ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS	VENDOR PART NO.
			PER ASSY	
-24	20160701	. STRIP, Grommet	1	
-25	00000058	. TIE, Cable (06383)	2	SSTIM
-26	00000059	. CABLE TIE, Mount (06383)	1	TA1S8
-27	00000525	. RECEPTACLE, Faston (.250) (00779)	3	60414-1
-28	00000531	. LOCTITE, Grade C	A/R	
-29	00000555	. ADHESIVE, Pliobond	A/R	

M/L 1040333 (X)

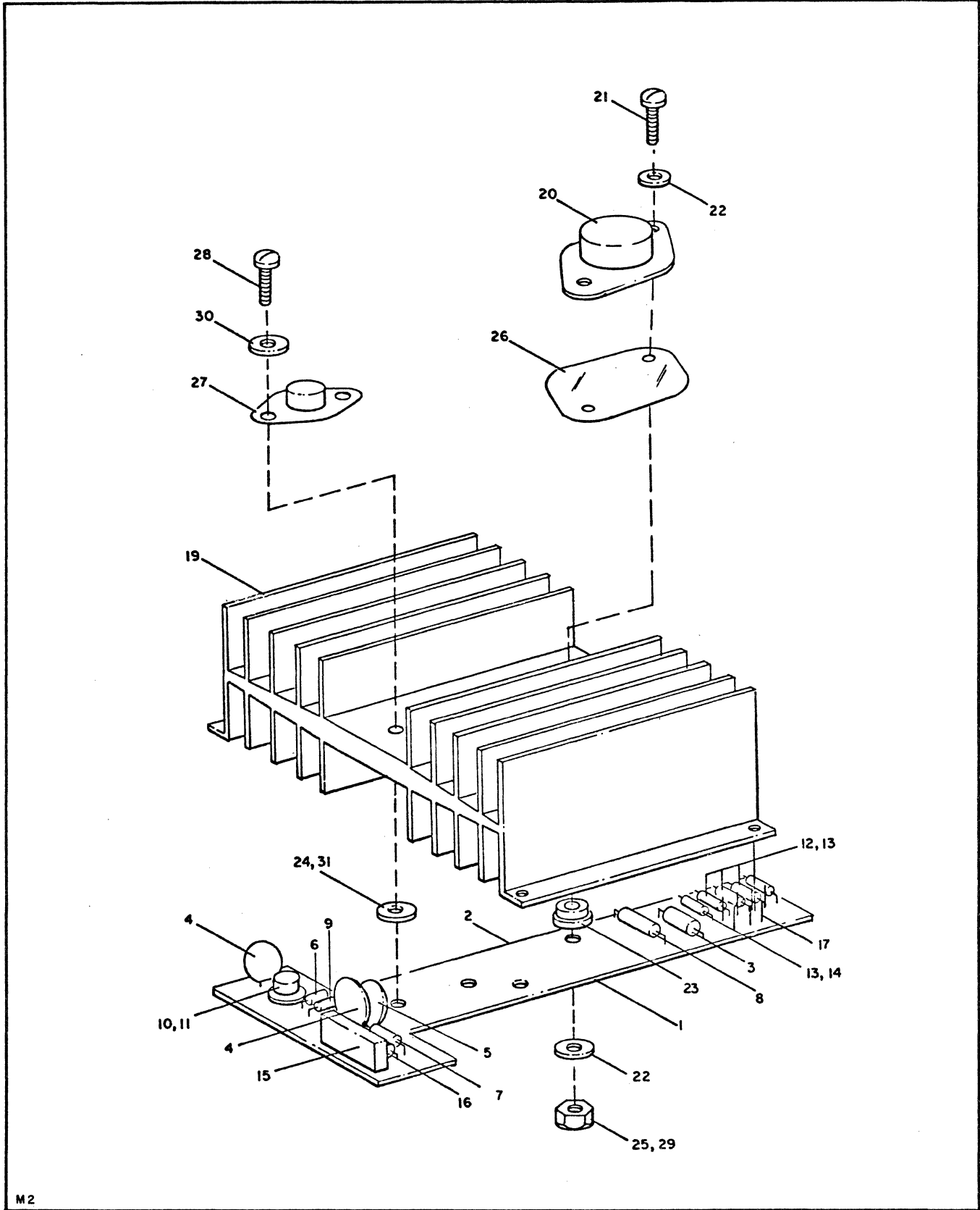


FIGURE 12-11 POWER SUPPLY ASSEMBLY

FIGURE 12-11 POWER SUPPLY ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS	VENDOR PART NO.
			PER ASSY	
	30029505	POWER SUPPLY ASSEMBLY		
		<hr/>		
-1	20032803	. PC BOARD ASSEMBLY	1	
-2	30032703	. . PC BOARD	1	
-3	00000844	. . CAPACITOR, 10.0 UF, 12 VDC \pm 10% (80183)	1	TE 1128
-4	00000190	. . CAPACITOR, .1 UF, 100 VDC \pm 10% (80183)	2	TG-P10
-5	00000195	. . CAPACITOR, .001 UF, 200 VDC (80183)	1	5HK-D10
-6	00000209	. . RESISTOR, Prec., 6.81K \pm 1% 1W	1	RN60D6911F
-7	00000069	. . RESISTOR, 100 ohm \pm 10% 1/4W	1	RCO7GF101K
-8	00000207	. . RESISTOR, .10 ohm \pm 1% 3W	1	RW79UR100F
-9	00000070	. . RESISTOR, 1K ohm \pm 10% 1/4W	1	RCO7GF102K
-10	00000140	. . TRANSISTOR, NPN (04713)	1	2N706
-11	00000107	. . PAD, Transistor mount (red) (13103)	1	7717-14S
-12	00000570	. . RESISTOR, (SAT) \pm 10% 1/4W range 33 to 100 ohm	4	RCO7GF
-13	00000460	. . SOCKET, Miniature Spring (00779)	10	3-331677-6
-14	00000570	. . RESISTOR, (SAT) \pm 10% 1/4W range 82 to 120 ohm	1	RCO7GF
-15	00000232	. . RESISTOR, Variable, 10K \pm 10% 1W	1	3009P-1-103
-16	00000238	. . RESISTOR, 7.5K, \pm 5% 1/2W	1	RC20GF752J
-17	00000671	. . CONTACT, Electrical (.025 sq. MODU) (00779)	7	86094-2
-18	00000463	. . TERMINAL, Ring Tongue (00779)	2	32939
-19	20029101	. . HEAT SINK	1	
-20	00000137	. . TRANSISTOR, NPN, Power (04713)	1	2N3771
		(Attaching Parts)		
-21	00000568	. . . SCREW, Machine, Phillips Head 6 - 32 x 5/8 Nickel Brass Plate	2	
-22	00000445	. . . WASHER, Lock internal tooth #6	3	
-23	00000502	. . . WASHER, Shoulder, nylon (95987)	2	SW-6-NA
-24	00000491	. . . WASHER, Nylon (95987)	1	NW-6-312NA
-25	00000569	. . . NUT, Plain, Hex 6 - 32, Nickel Brass Plate	2	
-26	00000567	. . . WASHER, Insulating (13103)	1	43-03-04
		<hr/>		
-27	00000115	. . INTEGRATED CIRCUIT, Regulator (Attaching Parts)	1	MC 1469R
-28	00000568	. . . SCREW, Machine, Phillips Head, 6 - 32 x 5/8 Nickel Brass Plate	2	
-29	00000569	. . . NUT, Plain, Hex 6 - 32, Nickel Brass Plate	2	
-30	00000445	. . . WASHER, Lock internal tooth #6	4	
-31	00000491	. . . WASHER, Nylon (95987)	2	NW-6-312NA
		<hr/>		
-32	00000108	. COMPOUND, Heatsink (13103)	A/R	

M2

M2

12-29

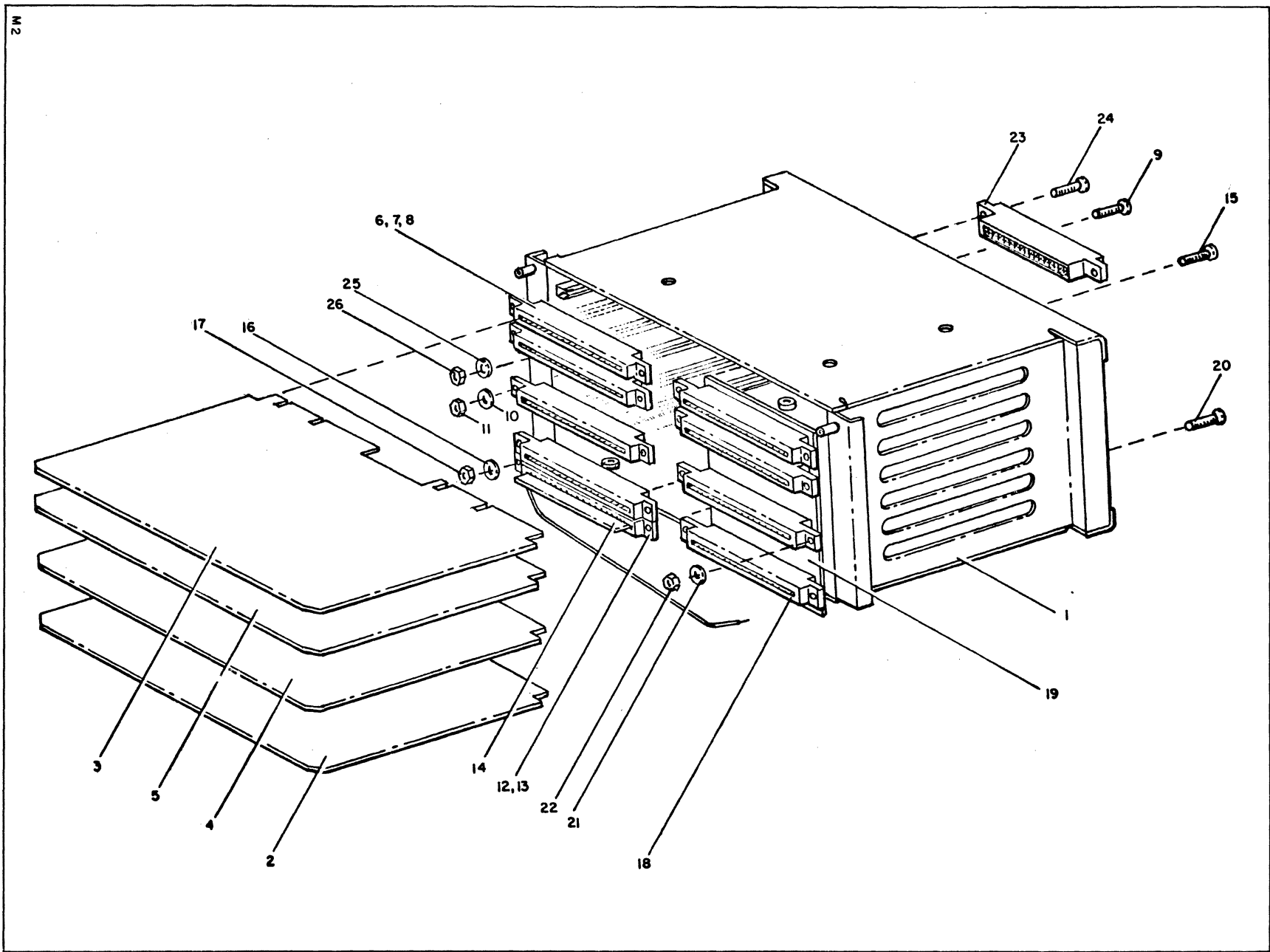


FIGURE 12-12 CARD FILE ASSEMBLY

FIGURE 12-12 CARD FILE ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	VENDOR PART NO.
	400553XX	CARD FILE ASSEMBLY		
-1	300294XX	. CARD CAGE W/GUIDES	1	
-2	40061901	. P. C. CARD ASSEMBLY, Control (PT)	1	
	40061905	. P. C. CARD ASSEMBLY, Control (PTRP)	1	
	40061907	. P. C. CARD ASSEMBLY, Control (GTRP)	1	
	40061910	. P. C. CARD ASSEMBLY, Control (PTOC)	1	
	40061902	. P. C. CARD ASSEMBLY, Control (GTOC)	1	
<hr/>				
-3	40035303	. P. C. CARD ASSEMBLY, Sync (SINGLE)	1	
<hr/>				
-4	40076501	. P. C. CARD ASSEMBLY, Clock (PT)	1	
	40076505	. P. C. CARD ASSEMBLY, Clock (PTRP)	1	
	40076503	. P. C. CARD ASSEMBLY, Clock (GTRP)	1	
	40066611	. P. C. CARD ASSEMBLY, Clock (PTOC)	1	
	40076502	. P. C. CARD ASSEMBLY, Clock (GTOC)	1	
<hr/>				
-5	40061001	. P. C. CARD ASSEMBLY, Error (PT)	1	
	40061003	. P. C. CARD ASSEMBLY, Error (PTRP)	1	
	40061007	. P. C. CARD ASSEMBLY, Error (GTRP)	1	
	40061011	. P. C. CARD ASSEMBLY, Error (PTOC)	1	
	40061002	. P. C. CARD ASSEMBLY, Error (GTOC)	1	
<hr/>				
-6	00000029	. CONN HOUSING, Crimp, Snap-in (00779)	4	1-582191-5
-7	00000030	. PLUG, Keying (00779)	16	582501-5
-8	00000061	. SPRING, Retaining (00779) (Attaching Parts)	20	42973-2
-9	00000064	. . SCREW, Machine, Pan Head, SSL 4 - 40 x 3/8	8	
-10	00000066	. . WASHER, Lock, Internal Tooth #4	8	
-11	00000062	. . NUT, Plain, Hex 4 - 40	8	
<hr/>				
-12	00000032	. CONNECTOR, Singe Row (00779)	1	583302-1
-13	00000702	. CONTACT, Connector (00779)	1	583259-2
-14	20036201	. BUS BAR, Connector (Attaching Parts)	1	
-15	00000064	. . SCREW, Machine, Pan Head, SSL 4 - 40 x 3/8	2	
-16	00000066	. . WASHER, Lock Internal Tooth #4	2	
-17	00000062	. . NUT, Plain, Hex, 4 - 40	2	
<hr/>				
-18	00000032	. CONNECTOR, Tab, Solder Loaded (00779)	4	58334-1
-19	40032401	. P. C. CARD, Mother Board (Attaching Parts)	1	
-20	00000063	. . SCREW, Machine, Pan Head, SSL 4 - 40 x 1/2	8	
-21	00000066	. . WASHER, Lock, Internal Tooth #4	8	
-22	00000062	. . NUT, Plain, Hex 4 - 40	8	
<hr/>				

M2

M2, M3, M6, M10, M12

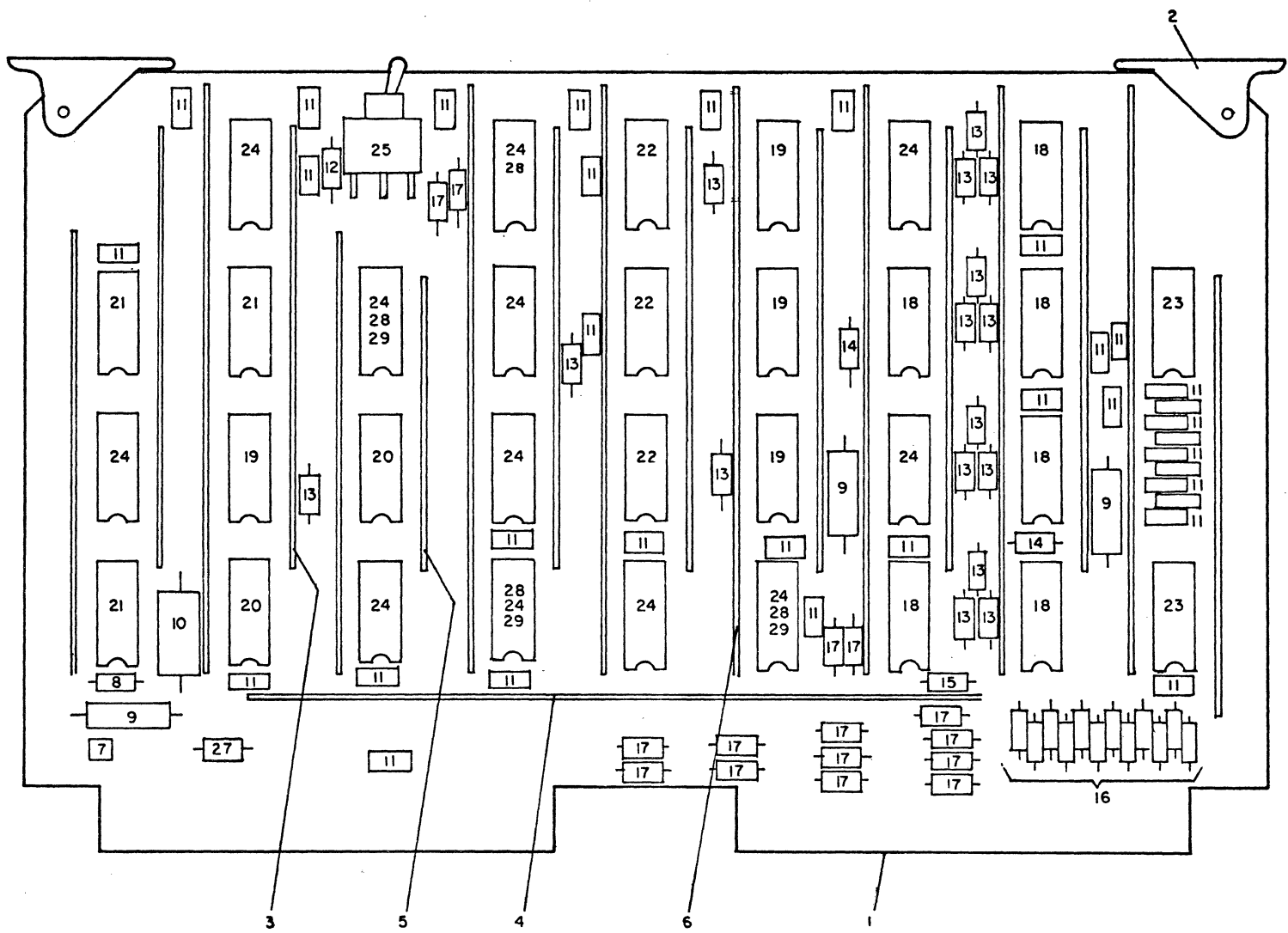


FIGURE 12-13 P. C. ASSEMBLY - Control Card

12-31

FIGURE 12-13 P. C. ASSEMBLY - Control Card

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS/ASSY						VENDOR PART NO.	
			1	2	3	4	5	6		7
	REF	P. C. ASSEMBLY, Control Card								
-1	40064901	. PRINTED CIRCUIT BOARD	1			1	1	1	1	
-2	00000060	. HANDLE, Extractor with roll pin (18617)	2			2	2	2	1	S-203
-3	20031104	. BUS BAR, 4 Pin	10			10	10	10		
-4	20031106	. BUS BAR, 6 Pin	1			1	1	1	1	
-5	20031103	. BUS BAR, 3 Pin	1			1	1	1	1	
-6	20031105	. BUS BAR, 5 Pin	7			7	7	7	7	
-7	00000088	. BEAD, Ferrite (33062)	1			1	1	1	1	21-030-F
-8	00000039	. DIODE, Zener 6.8V (04713)	1			1	1	1	1	IN5235
-9	00000025	. CAPACITOR, Elec., 20 μ f, 6V (03597)	3			3	3	3	3	76F02CC200
-10	00000024	. CAPACITOR, Mylar, 0.1 μ f, 100V (03597)	1			1	1	1	1	BA12A104B
-11	00000023	. CAPACITOR, 0.01 μ f, 100V (80813)	34			34	34	34	34	T6-S10
-12	00000075	. RESISTOR, 300 ohm, \pm 10%, 1/4W	1			1	1	1	1	RC07GF331K
-13	00000070	. RESISTOR, 1K ohm, \pm 10%, 1/4W	16			16	16	16	16	RC07GF102K
-14	00000076	. RESISTOR, 470 ohm, \pm 10%, 1/4W	2			2	2	2	2	RC07GF471K
-15	00000069	. RESISTOR, 100 ohm, \pm 10%, 1/4W	1			1	1	1	1	RC07GF101K
-16	00000258	. RESISTOR, 560 ohm, \pm 5%, 1/4W	12			12	12	12	12	RC07GF561J
-17	00000080	. RESISTOR, 5.6K, \pm 10%, 1/4W	2			15	15	2	2	RC07GF562K
-18	00000049	. INTEGRATED CIRCUIT, Hex Inverter (18324)	6			6	6	6	6	N7405A
-19	00000043	. INTEGRATED CIRCUIT, Quad 2 input DTL gate (07236)	4			4	4	4	4	U6A994659X
-20	00000046	. INTEGRATED CIRCUIT, 2 input (18324)	2			2	2	2	2	N7400A
-21	00000044	. INTEGRATED CIRCUIT, Dual D Flip-Flop (18324)	3			3	3	3	3	N7474A
-22	00000054	. INTEGRATED CIRCUIT, 4 Bit Counter (18324)	3			3	3	3	3	N8281ADC
-23	00000057	. INTEGRATED CIRCUIT, Low Pwr. Hex Inv. (Fairchild)	2			2	2	2	2	U6AL0459X
-24	00000050	. INTEGRATED CIRCUIT, Hex Inverter (18324)	12			9	8	9	8	N7404A
-25	00000083	. SWITCH, SPDT PC Mount (09353)	1			1	1	1	1	7101A
-26	00000020	. WIRE, Bus 18 AWG 11/16"	1			1	1	1	1	
-27	00000198	. JUMPER, 0 ohm Resistor (Speer)	1			1	1	1	1	Res. Jumper 0" ohm
-28	00000124	. INTEGRATED CIRCUIT, Hex Buffer Non Inv. (18324)	-			-	4	-	4	N7417A
-29	00000123	. INTEGRATED CIRCUIT, Hex Inverter (18324)	-			3	-	3	-	N7416A
-30	40065001	. SCHEMATIC	1			1	1	1	1	

M2, M3, M5, M10, M12

M2, M3, M6, M10, M12

12-33

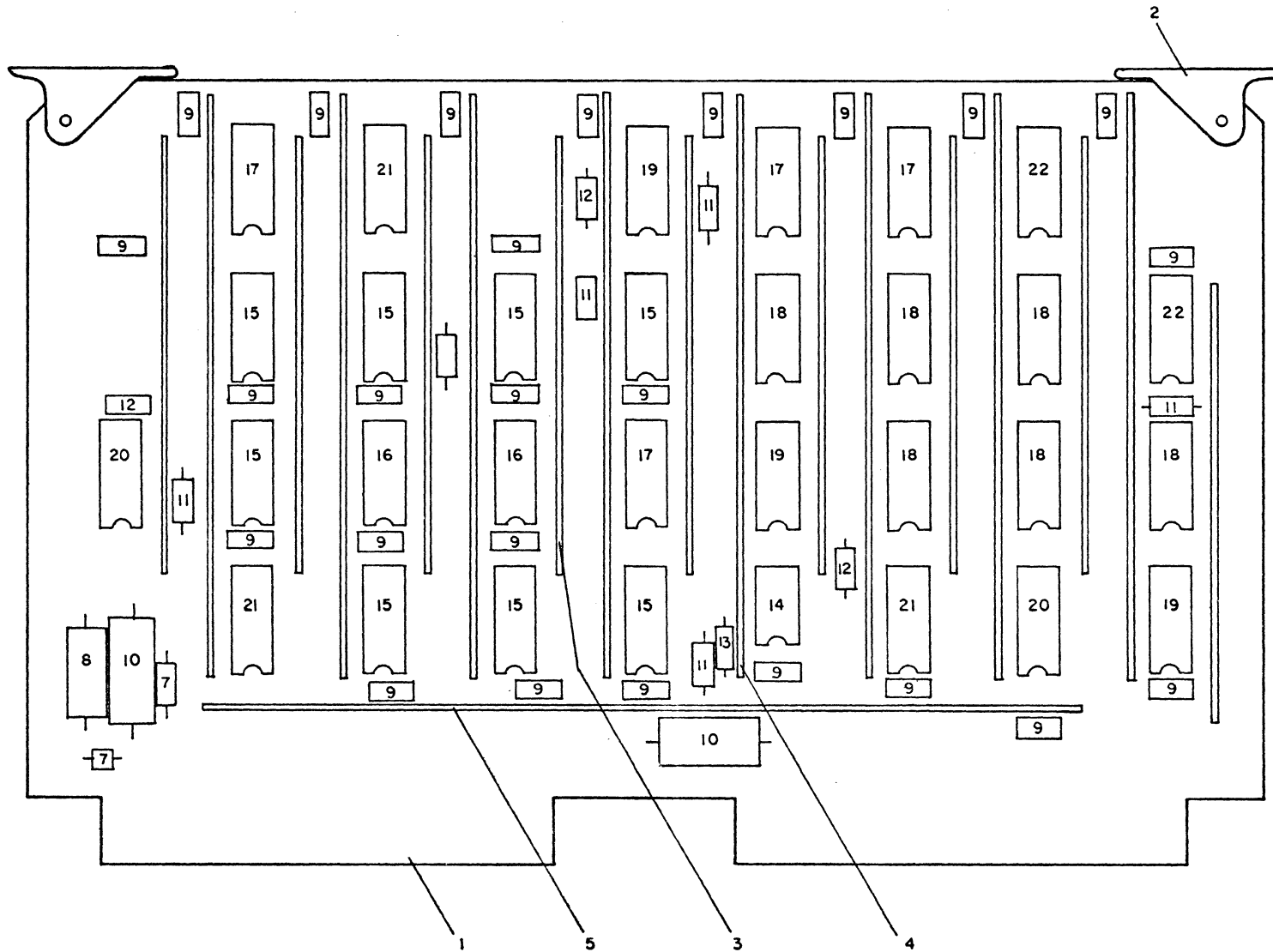


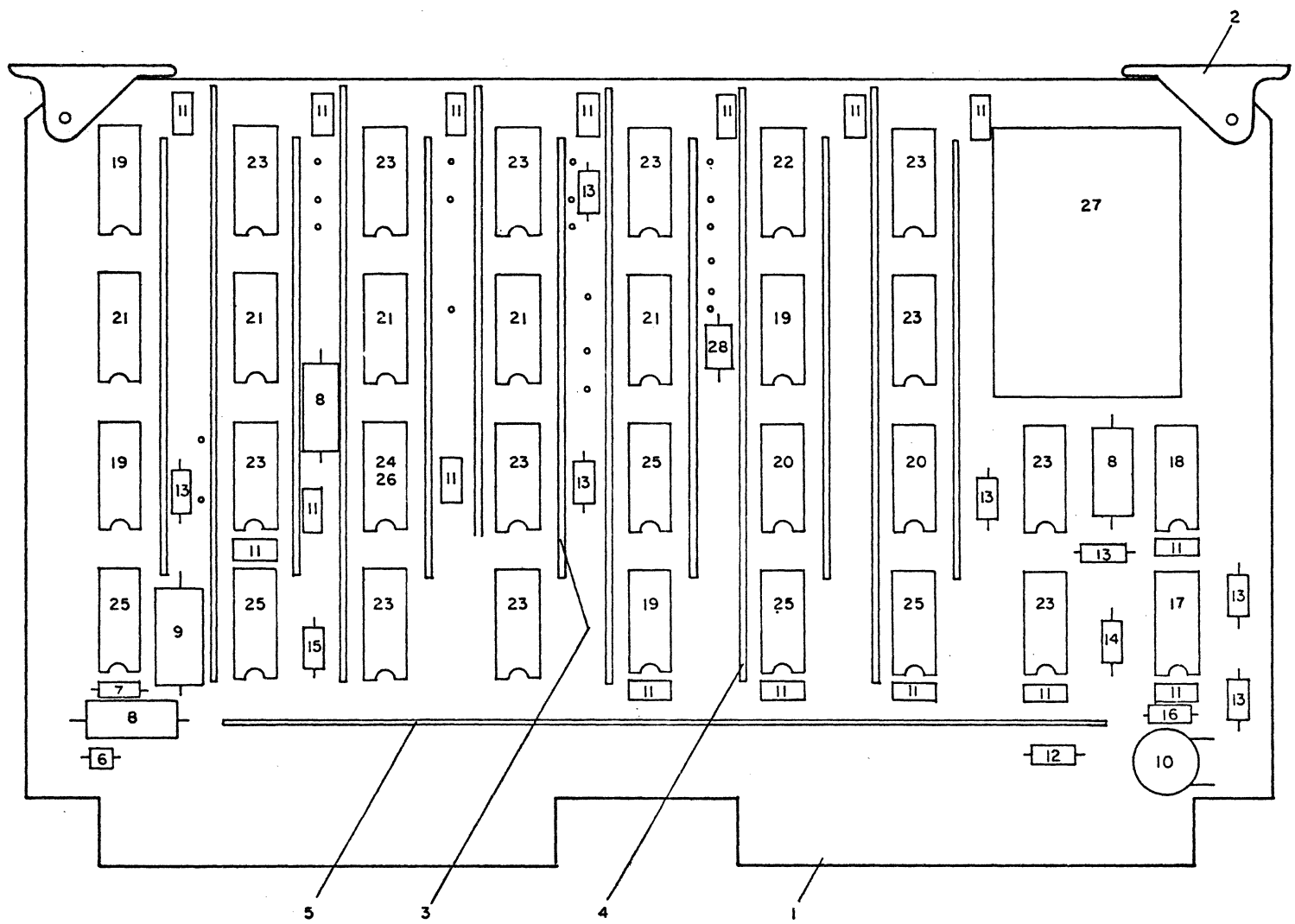
FIGURE 12-14 P. C. ASSEMBLY - Sync Card

FIGURE 12-14 P. C. ASSEMBLY - Sync Card

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40035303	P. C. ASSEMBLY - Sync Card								
-1	40060001	. PRINTED CIRCUIT BOARD							1	
-2	00000060	. HANDLE, Extractor with Roll Pin (18617)							2	S-203
-3	20031104	. BUS BAR, 4 Pin							9	
-4	20031105	. BUS BAR, 5 Pin							8	
-5	20031107	. BUS BAR, 7 Pin							1	
-6	00000088	. BEAD, Ferrite (33062)							1	21-030-F
-7	00000039	. DIODE, Zener 6.8V (04713)							1	1N5235
-8	00000025	. CAPACITOR, Electrolytic, 20 μ f, 6V (03597)							1	76F02CC200
-9	00000023	. CAPACITOR, .01 μ f, 50V (56289)							25	TG-S10
-10	00000024	. CAPACITOR, Mylar, .1 μ f (03597)							2	BA12A104B
-11	00000070	. RESISTOR, 1K ohm, \pm 10% 1/4W							6	RC07GF102K
-12	00000076	. RESISTOR, 470 ohm, \pm 10%, 1/4W							3	RC07GF471K
-13	00000072	. RESISTOR, 220 ohm, \pm 10%, 1/4W							1	RC07GF221K
-14	00000042	. INTEGRATED CIRCUIT, Hybrid Driver (07886)							1	H6F22009XX
-15	00000054	. INTEGRATED CIRCUIT, Counter Register (18324)							8	N8281ADC
-16	00000055	. INTEGRATED CIRCUIT, 4 Bit Comparator O. C. (18324)							2	N8242A
-17	00000047	. INTEGRATED CIRCUIT, Single 8 Input Gate (18324)							4	N7430A
-18	00000044	. INTEGRATED CIRCUIT, Dual D Flip-Flop (18324)							6	N7474A
-19	00000045	. INTEGRATED CIRCUIT, Dual 4 Input Buff (18324)							3	N7440A
-20	00000046	. INTEGRATED CIRCUIT, Quad 2 Input Gate (18324)							2	N7400A
-21	00000050	. INTEGRATED CIRCUIT, Hex Inverter (18324)							3	N7404A
-22	00000053	. INTEGRATED CIRCUIT, Counter Register (18324)							2	N8280ADC
-23	00000020	. WIRE, Bus #AWG 18, 11/16							1	
-24	40094301	. SCHEMATIC								
-25	10167801	. WIRE LIST								

M2, M3, M6, M10, M12

M2, M3, M6, M10, M12



12-35

FIGURE 12-15 P.C. ASSEMBLY - Clock Card

FIGURE 12-15 P. C. ASSEMBLY - Clock Card

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS/ASSY						VENDOR PART NO.	
			1	2	3	4	5	6		7
	REF	P. C. ASSEMBLY, Clock Card								
-1	40079901	. PRINTED CIRCUIT BOARD	-			1	1	-	1	
	40032201	. PRINTED CIRCUIT BOARD	1			-	-	-	-	
	40062601	. PRINTED CIRCUIT BOARD	-			-	-	-	1	
-2	00000060	. HANDLE, Extractor with Roll Pins (18617)	2			2	2	2	2	S-203
-3	20031104	. BUS BAR, 4 Pin	8			8	8	8	8	
-4	20031105	. BUS BAR, 5 Pin	5			5	5	5	5	
-5	20031107	. BUS BAR, 7 Pin	1			1	1	1	1	
-6	00000088	. BEAD, Ferrite	1			1	1	1	1	21-030-F
-7	00000039	. DIODE, Zener 6.8V (04713)	1			1	1	1	1	IN5235
-8	00000025	. CAPACITOR, Electrolytic, 20 μ f, 6V (03597)	1			3	3	-	3	76F02CC200
-9	00000024	. CAPACITOR, Mylar, .1 μ f, 100V (03597)	1			1	1	1	1	BA12A104B
-10	00000022	. CAPACITOR, .02 μ f, 100V (56289)	1			1	1	1	1	TG-S20
-11	00000023	. CAPACITOR, .01 μ f, 100V (56289)	16			16	16	16	16	TG-S10
-12	00000077	. RESISTOR, 4.7K \pm 10%, 1/4W	1			1	1	1	1	RC07GF472K
-13	00000070	. RESISTOR, 1K \pm 10%, 1/4W	1			7	7	6	7	RC07GF102K
-14	00000073	. RESISTOR, 2.2K \pm 10%, 1/4W	1			1	1	1	1	RC07GF222K
-15	00000080	. RESISTOR, 5.6K \pm 10%, 1/4W	-			1	1	-	-	RC07GF562K
-16	00000225	. RESISTOR, 100K \pm 10%, 1/4W	-			1	1	-	1	RC07GF104K
-17	00000056	. INTEGRATED CIRCUIT, Comparator (07886)	1			1	1	1	1	LM311D
-18	00000053	. INTEGRATED CIRCUIT, Counter Register (18324)	1			1	1	1	1	N8280ADC
-19	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (18324)	4			4	4	4	4	N7400A
-20	00000048	. INTEGRATED CIRCUIT, Single 3 input gate (18324)	2			2	2	2	2	N7410A
-21	00000047	. INTEGRATED CIRCUIT, Single 8 input gate (18324)	5			5	5	5	5	N7430A
-22	00000045	. INTEGRATED CIRCUIT, Dual 4 input gate (18324)	1			1	1	1	1	N7440A
-23	00000044	. INTEGRATED CIRCUIT, Dual D Flip Flop (18324)	12			12	12	12	12	N7474A
-24	00000123	. INTEGRATED CIRCUIT, Hex Buff, Inv. O. C. (18324)	-			1	-	-	-	N7416A
-25	00000050	. INTEGRATED CIRCUIT, Hex Inverter (18324)	5			5	5	5	5	N7404A
-26	00000124	. INTEGRATED CIRCUIT, Hex Buff, Non Inv. O. C.	-			-	1	1	1	N7417A
-27	00000067	. OSCILLATOR, Crystal 4.8 MHz (04713)	1			1	1	1	1	K1035A00710
-28	00000198	. RESISTOR, 0 ohm Jumper (Speer)	-			1	1	-	1	
-29	00000020	. WIRE, Bus AWG #18 11/16	1			1	1	1	1	
-30	40080001	. SCHEMATIC	-			1	1	-	1	
	40030801	. SCHEMATIC	1			-	-	-	-	
	40062701	. SCHEMATIC	-			-	-	1	-	

M2, M3, M6, M10, M12

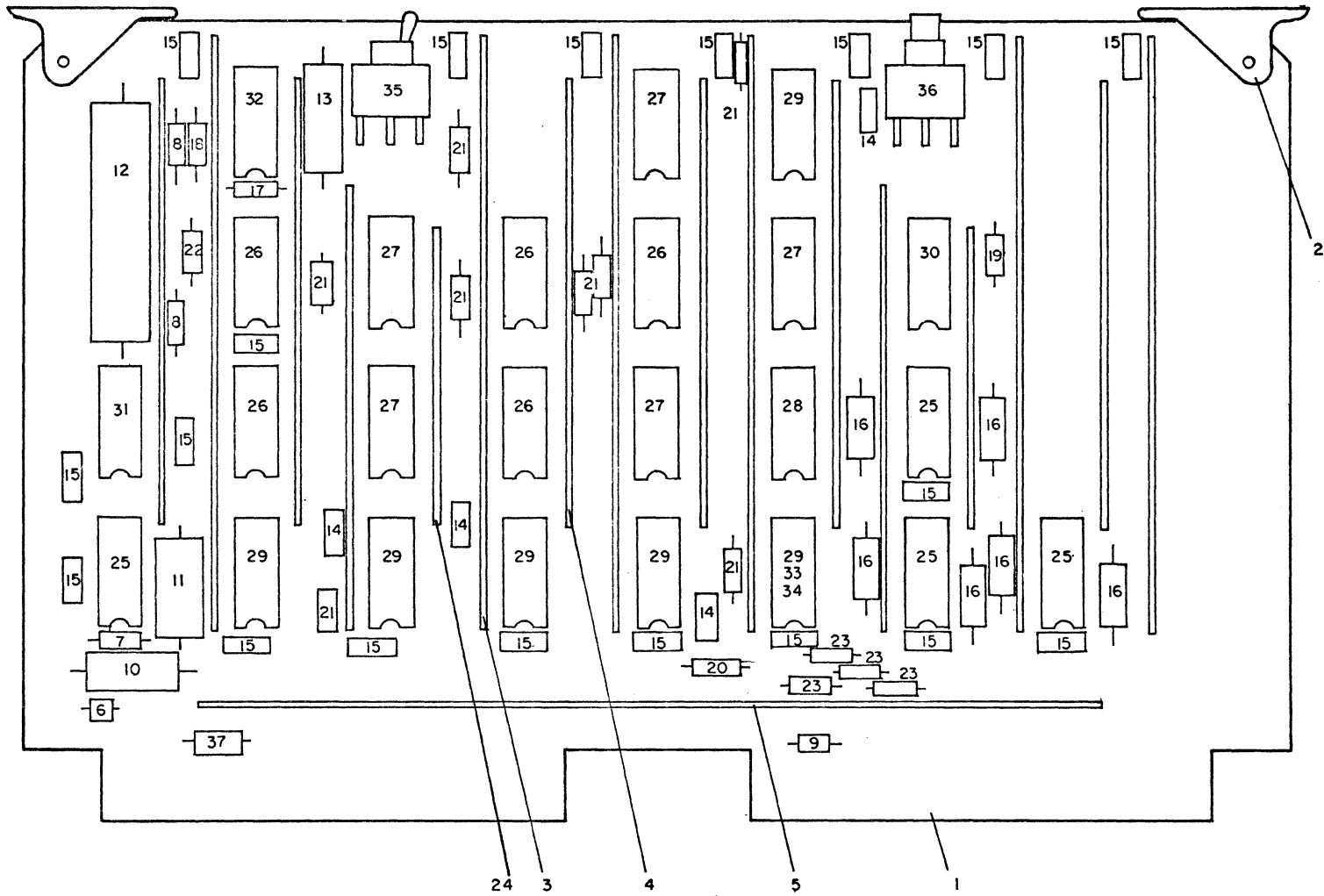


FIGURE 12-16 P. C. ASSEMBLY - Error Card

FIGURE 12-16 P. C. ASSEMBLY - Error Card

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS/ASSY						VENDOR PART NO.	
			1	2	3	4	5	6		7
	REF	P. C. ASSEMBLY - Error Card								
-1	40081001	. PRINTED CIRCUIT BOARD	1							
-2	00000060	. HANDLE, Extractor with Roll Pin (18617)	2	2	2	2	2	2		S-203
-3	20031105	. BUS BAR, 5 Pin	6	6	6	6	6	6		
-4	20031104	. BUS BAR, 4 Pin	8	8	8	8	8	8		
-5	20031107	. BUS BAR, 7 Pin	1	1	1	1	1	1		
-6	00000088	. BEAD, Ferrite (33062)	1	1	1	1	1	1		21-030-F
-7	00000039	. DIODE, Zener 6.8V (04713)	1	1	1	1	1	1		IN5235
-8	00000041	. DIODE, Signal	2	2	2	2	2	2		IN914
-9	00000040	. DIODE	1	1	1	1	1	1		IN4003
-10	00000025	. CAPACITOR, Electrolytic, 20 μ f, 6V (03597)	1	1	1	1	1	1		76F02CC200
-11	00000024	. CAPACITOR, 0.1 μ f, 100V (03597)	1	1	1	1	1	1		BA12A104B
-12	00000026	. CAPACITOR, 400 μ f, 6V (03597)	1	1	1	1	1	1		76F02CM401
-13	00000027	. CAPACITOR, 30 μ f, 12V (03597)	1	1	1	1	1	1		76F02ED300
-14	00000021	. CAPACITOR, .22 μ f, 25V (56289)	4	4	4	4	4	4		2C023224X0250A3
-15	00000023	. CAPACITOR, .01 μ f, 100V (56289)	19	19	19	19	19	19		TG-S10
-16	00000081	. RESISTOR, 68 ohm, \pm 10%, 1/2W	6	6	6	6	6	6		RC20GF680K
-17	00000071	. RESISTOR, 10K ohm, \pm 10%, 1/4W	1	1	1	1	1	1		RC07GF103K
-18	00000068	. RESISTOR, 10 ohm, \pm 10%, 1/4W	1	1	1	1	1	1		RC07GF100K
-19	00000076	. RESISTOR, 470 ohm, \pm 10%, 1/4W	1	1	1	1	1	1		RC07GF471K
-20	00000078	. RESISTOR, 1K ohm, \pm 5%, 1/4W	1	1	1	1	1	1		RC07GF561J
-21	00000070	. RESISTOR, 1K ohm, \pm 10%, 1/4W	8	8	8	8	8	8		RC07GF102K
-22	00000074	. RESISTOR, 27K ohm, \pm 10%, 1/4W	1	1	1	1	1	1		RC07GF273K
-23	00000080	. RESISTOR, 5.6K ohm, \pm 10%, 1/4W	-	4	4	-	-	-		RC07GF562K
-24	20031103	. BUS BAR, 3 Pin	2	2	2	2	2	2		
-25	00000051	. INTEGRATED CIRCUIT, Dual Driver (01295)	4	4	4	4	4	4		SN75450N
-26	00000044	. INTEGRATED CIRCUIT, Dual D Flip Flop (18324)	5	5	5	5	5	5		N7474A
-27	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (18324)	5	5	5	5	5	5		N7400A
-28	00000047	. INTEGRATED CIRCUIT, Single 8 input gate (18324)	1	1	1	1	1	1		N7430A
-29	00000050	. INTEGRATED CIRCUIT, Hex Inverter (18324)	6	5	5	5	5	5		N7404A
-30	00000043	. INTEGRATED CIRCUIT, Triple 3 input gate (18324)	1	1	1	1	1	1		N7410A
-31	00000052	. INTEGRATED CIRCUIT, Delay Element (07263)	1	1	1	1	1	1		U6A960159X
-32	00000042	. INTEGRATED CIRCUIT, Quad 2 input DTL gate (07263)	1	1	1	1	1	1		U6A994659X
-33	00000123	. INTEGRATED CIRCUIT, Hex Buff Inv. O. C. (18324)	-	1	-	1	-	-		N7416A
-34	00000124	. INTEGRATED CIRCUIT, Hex Buff, Non. Inv. O. C. (18324)	-	-	1	1	1	1		N7417A
-35	00000083	. SWITCH, SPDT, P. C. Mount (09353)	1	1	1	1	1	1		7101A
-36	00000082	. SWITCH, SPDT, Push, P. C. Mount (09353)	1	1	1	1	1	1		P8121R
-37	00000198	. JUMPER, 0 ohm, Resistor (Speer)	1	1	1	1	1	1		Res-Jumper 0 ohm
-38	00000020	. WIRE, Bus #AWG 18, 11/16	1	1	1	1	1	1		
-39	40081401	. SCHEMATIC								

M2, M3, M5, M10, M12